CORRECTIVE ACTION PLAN
(COST PROPOSAL NO. 15)

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

FACILITY I.D. NO. 12534-055-005151
INCIDENT NO. UST14-04-05

PPM PROJECT NO. 451603-CAP-D

FEBRUARY 14, 2019

PPM CONSULTANTS

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(COST PROPOSAL NO. 15)

FOR

BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

FACILITY I.D. NO. 12534-055-005151
INCIDENT NO. UST14-04-05

PREPARED FOR:

IRA PHILLIPS, INC.
P. O. BOX 799
GADSDEN, ALABAMA 35902

PPM PROJECT NO. 451603-CAPD

FEBRUARY 14, 2019

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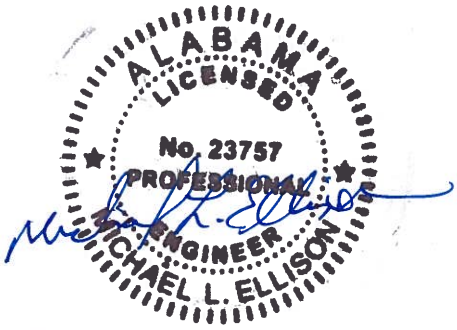
CERTIFICATION PAGE

I certify under penalty of law that this Corrective Action Plan for the Bama Texaco facility located at 815 Cleveland Avenue in Attalla, Alabama, and the plans, specifications, and technical data submitted within were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiring of the person or persons who directly gathered the enclosed information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information.



Michael L. Ellison, P.E.
AL No. 23757

02/14/19
Date

UST RELEASE FACT SHEET

GENERAL INFORMATION:

SITE NAME: Bama Texaco

ADDRESS: 815 Cleveland Avenue, Attalla, Alabama

FACILITY I.D. NO.: 12534-055-005151

INCIDENT NO.: UST14-04-05

RESULTS OF EXPOSURE ASSESSMENT:

How many private drinking water wells are located within 1,000 ft. of site?	0
How many public water supply wells are located within 1 mile of the site?	0
Have any drinking water supply wells been impacted by contamination from this release?	{ } Yes { X } No
Is there an imminent threat of contamination to any drinking water wells?	{ } Yes { X } No
Have vapors or contaminated groundwater posed a threat to the public?	{ } Yes { X } No
Are any underground utilities impacted or imminently threatened by the release?	{ } Yes { X } No
Have surface waters been impacted by the release?	{ } Yes { X } No
Is there an imminent threat of contamination to surface waters?	{ } Yes { X } No
What is the type of surrounding population?	Commercial/Residential

CONTAMINATION DESCRIPTION:

Type of contamination at site: {X} Gasoline, {X} Diesel, { } Waste Oil { } Kerosene, { } Other __

Free product present in wells? { } Yes {X} No

Maximum COC concentration measured in soil:
3.47 mg/kg benzene (MW-20-4-6)
143 mg/kg BTEX (MW-20-4-6)
2.63 mg/kg MTBE (MW-22-6-8)
5.26 mg/kg Naphthalene (O-27-7.5)

Current maximum COC concentrations measured in groundwater:
(9/25/18)
9.180 mg/L Benzene (MW-25)
21.410 mg/L BTEX (MW-9)
0.415 mg/L MTBE (MW-25)
0.193 mg/L Naphthalene (MW-20)

ADEM Form 479 8/02

ADEM GROUNDWATER BRANCH
UST SITE CLASSIFICATION SYSTEM CHECKLIST

Please read all of the following statements and mark either yes or no if the statement applies to your site. If you have conducted a Preliminary or Secondary Investigation, all questions should be answered. Closure site assessment reports may not provide you with all the necessary information, but answer the statements with the knowledge obtained during the closure site assessment.

SITE NAME: Bama Texaco
SITE ADDRESS: 815 Cleveland Avenue, Attalla, Alabama

FACILITY I.D. NO.: 12534-055-005151
INCIDENT NO.: UST14-04-05

OWNER NAME: Ira Phillips, Inc.
OWNER ADDRESS: P.O. Box 799 Gadsden, AL 35902

NAME & ADDRESS OF PERSON COMPLETING THIS FORM: Walter B. Henley, Jr., P.G., PPM Consultants, Inc.
5555 Bankhead Highway, Birmingham, Alabama 35210

CLASSIFICATION	***DESCRIPTION***	***YES***	***NO***
CLASS A	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
A.1	Vapor concentrations at or approaching explosive levels that could cause health effects, are present in a residence or building.	☐	☒
A.2	Vapor concentrations at or approaching explosive levels are present in subsurface utility system(s), but no buildings or residences are impacted.	☐	☒
CLASS B	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
B.1	An active public water supply well, public water supply line, or public surface water intake is impacted or immediately threatened.	☐	☒
B.2	An active domestic water supply well, domestic water supply line or domestic surface water intake is impacted or immediately threatened.	☐	☒
B.3	The release is located within a designated Wellhead Protection Area I.	☐	☒
CLASS C	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
C.1	Ambient vapor/particulate concentrations exceed concentrations of concern from an acute exposure, or safety viewpoint.	☐	☒
C.2	Free product is present on the groundwater, at ground surface, on surface water bodies, in utilities other than water supply lines, or in surface water runoff.	☐	☒
CLASS D	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
D.1	There is a potential for explosive levels, or concentrations of vapors that could cause acute effects, to accumulate in a residence or other building.	☐	☒
D.2	A non-potable water supply well is impacted or immediately threatened.	☐	☒

ADEM GROUNDWATER BRANCH
UST SITE CLASSIFICATION SYSTEM CHECKLIST (continued)

CLASSIFICATION	*DESCRIPTION*	*YES*	*NO*
D.3	Shallow contaminated surface soils are open to public access, and dwellings, parks, playgrounds, day care centers, schools or similar use facilities are within 500 feet of those soils.	☐	☒
CLASS E	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
E.1	A sensitive habitat or sensitive resources (sport fish, economically important species, threatened and endangered species, etc.) are impacted and affected.	☐	☒
CLASS F	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
F.1	Groundwater is impacted and a public well is located within 1 mile of the site.	☐	☒
F.2	Groundwater is impacted and a domestic well is located within 1,000 feet of the site.	☐	☒
F.3	Contaminated soils and/or groundwater are located within designated Wellhead Protection Areas (Areas II or III).	☐	☒
CLASS G	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
G.1	Contaminated soils and/or groundwater are located within areas vulnerable to contamination from surface sources.	☒	☐
GLASS H	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
H.1	Impacted surface water, stormwater or groundwater discharges within 500 feet of a surface water body used for human drinking water, whole body water-contact sports, or habitat to a protected or listed endangered plant and animal species.	☐	☒
CLASS I	LONG TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
I.1	Site has contaminated soils and/or groundwater but does not meet any of the above-mentioned criteria.	☐	☒

ADDITIONAL COMMENTS:

Attalla Water Department owns a test well approximately 5,400 feet west-northwest of the site in downtown Attalla. The well is not currently being utilized for public use.

Complete the classification evaluation questions listed above. Upon completion, determine the highest rank of the site (A.1 is the highest rank) based on the statements answered with a yes.

Enter the determined classification ranking:	**G.1**

ADEM GROUNDWATER BRANCH
SITE CLASSIFICATION CHECKLIST
(5/8/95)

1.0 INTRODUCTION

PPM Consultants, Inc. (PPM) was retained by Ira Phillips, Inc. (Phillips) to prepare a Corrective Action Plan (CAP) for the Bama Texaco facility located on the southwestern corner of the intersection of Cleveland Avenue and Neely Street in Attalla, Etowah County, Alabama. The preparation of the CAP was authorized by the Alabama Department of Environmental Management (ADEM) with their approval of Cost Proposal No. 15 via letter dated October 30, 2018.

The purpose of this CAP is to provide an approach to decrease constituent-of-concern (COC) concentrations in groundwater to below Site-Specific Corrective Action Levels (SSCALs). The COCs for the site include benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tertiary butyl ether (MTBE), and naphthalene.

This CAP provides a summary of pertinent environmental activities conducted to date at the facility and a detailed description of the proposed approach for site remediation. A schedule and cost estimates are included for the implementation of the CAP and associated effectiveness monitoring.

2.0 SITE BACKGROUND

2.1 SITE LOCATION

Bama Texaco is an active retail petroleum station and convenience store facility located in a commercial and residential area of Attalla, Alabama. Geographically, the site is located in the northeast ¼ of the southeast ¼ of Section 2, Township 12 South, Range 5 East, on the *Gadsden West, Alabama* Quadrangle. More specifically the site is located at 34° 01' 04" North latitude and 86° 04' 17" West longitude. The site location is shown in **Figure 1**, **Site Location Map** in **Appendix A**, **Figures**.

2.2 ADJACENT PROPERTIES

The site property is located on the southwest corner of Cleveland Avenue and Neely Street, approximately 750 feet east of Interstate 59 in Attalla, Alabama. A former retail petroleum station, the Rainbow Food Mart No. 102, was located directly east of the site and across Neely Street on a lot that is now occupied by the offices for a motel. A residence is located to the southeast of the site property, also across Neely Street. The motel rooms are located in buildings located on adjacent lots immediately south and southwest of the site property.

An active Shell retail petroleum station is located adjacent to the site on the west side. Located across Cleveland Avenue from the site are a vacant lot to the northwest, a nightclub to the north, and a vacant building to the northeast. The building to the northeast appears to have formerly been a petroleum station based on the remnants of likely dispenser islands visible on the lot. Additional residential properties are located to the southeast of the site. The site and surrounding properties are shown on **Figure 2, Area Map**.

2.3 SITE DESCRIPTION

The Bama Texaco facility is an active retail petroleum station. The topography of the area and the site generally slopes to the northwest and then west toward Little Wills Creek located approximately 750 feet west of the site. Structures present at the property include the main store building with an attached canopy, which extends north from the store building and covers two gasoline dispensers. A third dispenser, for diesel fuel, is located near the western property line. A fourth dispenser, for kerosene, and the associated above-ground storage tank (AST) are located near the southeast corner of the building.

The underground storage tank (UST) system is comprised of one 12,000-gallon steel UST storing regular-grade gasoline, one 8,000-gallon steel UST storing premium-grade gasoline, and one 3,000-gallon steel UST containing diesel fuel. The USTs are situated in a tank pit located northwest of the store building and just south of the Cleveland Avenue right-of-way (R.O.W.). The gasoline product piping lines are believed to extend from the UST pit directly east to the southern gasoline dispenser and then north to the northern gasoline dispenser. The diesel product line is believed to extend directly from the diesel UST to the diesel dispenser. The exact locations of the product lines have not been determined at this time. Concrete and asphalt mostly cover the surface of the facility property including the UST system. Site features are shown on **Figure 3**, **Site Map**.

Underground utilities known to exist in the vicinity of the site include storm sewer, sanitary sewer, natural gas, electric, telephone, and water. Overhead power lines are also present at the site. The storm sewer line appears to traverse east-west under several drop inlets located just south of the travel lanes of Cleveland Avenue. Natural gas and water lines traverse east-west near the south edge of Cleveland Avenue. The municipal sanitary sewer is located under the travel lanes of Cleveland Avenue. Overhead power lines are located parallel to and on both sides of Cleveland Avenue. Onsite, the sanitary sewer line has been located extending from the east side of the store building to the northeast toward the municipal sewer line. The water lateral to the building traverses south from the water

meter north of the canopy to the southeast corner of the building. Underground electric lines extend to the sign, lights, USTs, and air compressor located at various places across the site.

2.4 SITE HISTORY

The following provides a brief summary of pertinent events conducted at the site:

Groundwater Investigation on Adjacent Property to East: During the groundwater investigation of the former Rainbow Food Mart No. 102 (ADEM Incident No. UST93-06-07) located across Neely Street to the east, permission was requested of and granted by Phillips to install several monitoring wells on the Bama Texaco property. In January 2011, monitoring wells MW-9, MW-10, and MW-12 were installed by CDG Engineers & Associates, Inc. (CDG), the consultants for that site. In October 2013, monitoring wells MW-13 through MW-16 were installed on the Bama Texaco property by CDG. Groundwater monitoring has been periodically conducted with those wells since their installation with the last sampling event reported by CDG on April 25, 2014.

Analytical results from the November 2013 sampling event led CDG to conclude that an off-site source was contributing to the groundwater impacts identified during the Rainbow Food Mart No. 102 investigation. CDG identified two possible off-site sources including the UST system owned by Phillips on the Bama Texaco property and a UST system located at the Shell petroleum station (Facility ID No. 22811-055-011649) located adjacent to the Bama Texaco to the west.

Notification of Requirement to Conduct Investigative and Corrective Actions: On May 9, 2014, the ADEM issued a letter to Phillips requiring that a Preliminary Investigation be performed on the Bama Texaco property to investigate potential contributions from the Phillips UST system. Incident No. UST14-04-05 was assigned to the release.

Preliminary/Secondary Investigation: Phillips retained PPM to perform a Preliminary/Secondary Investigation in which nine monitoring wells were installed on the Bama Texaco property (MW-17 though MW-20 and MW-22 through MW-25) and on the Cleveland Avenue R.O.W. adjacent to the Shell petroleum station to the west (MW-21). Soil samples collected from every boring installed in the Preliminary/Secondary Investigation, except MW-21, contained concentrations of COCs that exceeded ADEM's Initial Screening Levels (ISLs).

Groundwater samples were collected in September 2014 from the new monitoring wells plus seven other monitoring wells previously installed by CDG on the Bama Texaco site (MW-9, MW-10, and MW-12 through MW-16). The investigation results indicated that 12 of the 16 wells sampled had dissolved COC concentrations that exceeded ISLs. In addition, slug tests were performed and soil samples were collected for analysis of physical parameters that were required to complete an Alabama Risk-Based Corrective Action (ARBCA) evaluation.

Groundwater elevation measurements on April 28, 2014 (collected prior to the Preliminary/Secondary Investigation) and on September 29 and October 14, 2014 (during the Preliminary/Secondary Investigation) indicated that groundwater flowed radially from the tank pits on both the Bama Texaco and Shell properties. In addition, mounded groundwater was apparent at MW-12, which is located very near a broken sewer line. The result of the mounded groundwater was that flow was directed toward the south side of the site as evidenced by the relatively low groundwater elevations at MW-22, MW-24, MW-16, and MW-9. On the Cleveland Avenue side of the tank pits, groundwater flow appeared to be to the northwest as evidenced by the relatively low groundwater elevation at MW-21.

The highest concentrations of benzene and MTBE from the September 2014 sampling event were in the sample from MW-22, which is located closest to the Shell tank pit. Concentrations decreased toward potential sources on the Bama Texaco property as evidenced by MW-23, which is located between the Bama Texaco tank pit and MW-22. Benzene concentrations decreased from 18.5 milligrams per liter (mg/L) in MW-22 to 0.905 mg/L in MW-23. MTBE concentrations decreased from 99.2 mg/L in MW-22 to 0.118 mg/L in MW-23. The location of the highest concentrations was consistent with the observed groundwater flow direction and was highly indicative of a source at the Shell tank pit.

Incident Number UST15-02-01 on Adjacent Shell Property: Based on the information from the Preliminary/Secondary Investigation, ADEM issued a Notification of Requirement to Conduct Investigative and Corrective Actions (Incident No. UST15-02-01) on March 17, 2015, to TriTech Oil Inc., the owner of the adjacent Shell station. A Preliminary Investigation, consisting of the installation of four monitoring wells, was completed on that site in August 2015. A Secondary Investigation, consisting of six additional Type II monitoring wells and one Type III monitoring well, was completed on October 4, 2016. In this report, the Type II monitoring wells associated with the Shell investigations are designated MW-1 (Shell) through MW-10 (Shell) and the Type III

monitoring well associated with the Shell investigations is designated VW-1 (Shell). All but two of those wells are on the Shell property and the other two are located on the property immediately adjacent to its south.

Tightness Testing of Tanks and Lines: After reviewing the Preliminary/Secondary Investigation Report, ADEM requested tightness testing of the tanks and lines at the Bama Texaco site. Cost Proposal No. 2 (CP2) was submitted to ADEM for the tightness testing on February 11, 2015, and approved by ADEM on May 8, 2015. On July 20, 2015, Metro Service & Equipment Co., Inc. (Metro) conducted tightness tests on the three active USTs including one 12,000-gallon unleaded gasoline tank, one 3,000-gallon diesel tank, and one 8,000-gallon premium (super unleaded) tank. The product transfer lines associated with the two gasoline USTs were also tightness tested. The product line associated with the diesel fuel UST is a suction line and it was not tested. All of the tanks and lines that were tested passed.

Groundwater Monitoring and ARBCA Evaluation: ADEM also required Phillips to submit cost proposals for groundwater monitoring and an ARBCA evaluation. PPM submitted a Workplan for Groundwater Monitoring on February 11, 2015, along with the associated cost proposals for three triannual sampling events (CP3 through CP5) plus one for the ARBCA evaluation (CP6). All of those cost proposals were approved by ADEM on May 12, 2015. The ARBCA evaluation was performed using the data generated in the Preliminary Investigation/Secondary Investigation and in the first two groundwater sampling events and an ARBCA Evaluation report was submitted to ADEM on December 31, 2015. The proposed SSCALs were approved by ADEM in a letter dated March 14, 2016.

The first three tri-annual groundwater monitoring events were performed on June 24 and October 21, 2015, and January 12, 2016. During the January 2016 event, six monitoring wells on the Texaco property exceeded a SSCAL proposed in the ARBCA Evaluation.

The second set of three tri-annual groundwater monitoring events were conducted on September 19, 2016; January 30, 2017; and May 12, 2017.

High Resolution Vertical Profiling (HRVP) Investigation: In response to an ADEM request for an HRVP study, PPM submitted a workplan and CP10 on April 17, 2017, for conducting a subsurface investigation using high-resolution profiling techniques including Membrane Interface Probe (MIP) and Hydraulic Profiling Tool (HPT) technology. ADEM approved the workplan and associated cost proposal in correspondence dated July 6, 2017.

A report of the HRVP study was submitted to ADEM on September 29, 2017. The findings indicated that a gasoline release likely occurred from the UST system located on the Bama Texaco site. The release appears to have migrated along the piping trench between the tank pit and dispensers. From that point, the plume of dissolved constituents diverged to the southeast toward monitoring well MW-9 and to the southwest toward monitoring well MW-24. Previously collected groundwater data indicate that a northwest-southeast orientation is apparent in the groundwater plume on the adjacent Shell property that is similar to the one near MW-9. The parallel patterns and angular divergences suggest that an underlying fracture network controls the migration pathways of the plume. It was not clear from the data collected by PPM in the HRVP study, how much a release from the Shell property contributed to the known impacts on the Bama Texaco property.

Continued Groundwater Monitoring: On September 7, 2017, PPM submitted CP11 to CP13 to continue tri-annual groundwater monitoring at the site. The cost proposals were approved by ADEM on November 21, 2017.

Three sampling events were completed in 2018 including events on January 24, 2018; May 22, 2018; and September 25, 2018. In the September 2018 event, dissolved benzene concentrations exceeded the SSCAL based on Groundwater Resource Protection (GRP) at monitoring wells MW-9, MW-16, MW-17, MW-20, and MW-25. Relative to the sampling event performed in May 2018, the dissolved benzene concentrations increased at MW-9, MW-16, MW-17, and MW-25 but decreased at MW-20. The benzene concentration in MW-24 decreased below the SSCAL for the first time; however, the benzene concentration in MW-25 increased to its historical high. None of the other COCs exceeded an SSCAL at any of the wells. The dissolved naphthalene concentration at MW-9 decreased below its SSCAL.

Corrective Action Evaluation: In a letter dated November 28, 2017, ADEM required a cost proposal for Corrective Action Plan Evaluation (CAP-E). PPM submitted CP14 to cover the evaluation on December 19, 2017. ADEM approved the cost proposal in a letter dated February 28, 2018. On July 9, 2018, PPM submitted the CAP Evaluation to ADEM. PPM recommended remedial activities that included a combination of ozone sparging, oxygen sparging, vapor recovery, periodic mobile enhanced multiphase extraction (MEME) events, and Remediation by Natural Attenuation (RNA) monitoring. ADEM requested a cost proposal for developing a CAP based on the PPM recommendations. PPM submitted CP15 to develop the CAP and it was approved by ADEM on October 30, 2018.

2.5 SITE CONDITIONS

2.5.1 Soil

Subsurface lithology was identified from visual inspection of soils encountered during installation of soil borings at the site. Below 6 to 8 inches of concrete, where present, the lithology of the site generally consists of a non-plastic to highly plastic, firm to stiff, silty clay (CL per the Unified Soil Classification System). Some of the clay contains fragments of weathered rock. During the Preliminary Investigation, the soil borings were advanced with hollow-stem augers and were terminated at approximately 13.5 feet below ground surface (BGS) before bedrock was encountered. However, direct push technology (DPT) probe refusal was encountered at 10 and 12 feet in two MIP borings advanced during the HRVP survey. The information indicates that the top of bedrock is likely between 10 to 15 feet BGS at the site. The underlying bedrock in the area of the site is comprised of argillaceous limestone of the Conasauga Formation. A detailed description of the soil encountered at the site is shown in the boring logs in **Appendix B, Soil Boring/Monitoring Well Construction Logs**. Cross-sections of the soil are included as **Figure 4A, Geologic Cross-Section A-A'** and **Figure 4B, Geologic Cross-Section B-B'**.

2.5.2 Groundwater

The initial zone of saturation could not be determined while drilling the soil borings during the investigations. Groundwater levels measured in the Type II monitoring wells and tank pit observation wells on September 25, 2018, ranged from 1.52 feet below top of casing (BTOC) in observation well OW-NE in the Bama Texaco tank pit to 7.67 feet BTOC in monitoring well MW-3R on the Rainbow No. 102 parcel. Based on these measurements, groundwater appears to flow radially from the tank pits located at the Shell station and the Bama Texaco. On the southeast sides of both pits, groundwater flow appears to be directed away from the Texaco and Shell tank pits toward the southwestern corner of the Bama Texaco property, where it gradually turns to the west and then northwest. A small area of groundwater mounding is also evident at MW-12, which is located adjacent to and is apparently influenced by a sewer line that has been determined to be leaking. On the northwest sides of the tank pits, groundwater flow is generally to the northwest.

The hydraulic gradient between monitoring wells MW-25 and MW-17 was estimated to be 0.035 feet/foot (ft/ft). **Figure 5**, **Groundwater Elevation Map (September 25, 2018)** depicts the groundwater elevation and estimated flow direction. Groundwater elevation data are shown in **Table 1, Groundwater Elevation Survey Data** in **Appendix C, Tables**.

2.5.3 COCs in Soil

Free product was not encountered in any of the soil borings advanced during the various soil investigations. No COC concentrations exceeded an approved SSCAL. A summary of soil data is presented in **Table 2, Soil Analytical Summary**. The distribution of soil impacts is shown in **Figure 6, Maximum BTEX Concentration in Soil**.

2.5.4 COCs in Groundwater

No measurable free product was encountered in the monitoring wells sampled on September 25, 2018. The range of dissolved COC concentrations observed during the current event was as follows:

- Benzene: <0.001 mg/L – 9.180 mg/L
- Toluene: <0.001 mg/L – 4.770 mg/L
- Ethylbenzene: <0.001 mg/L – 2.190 mg/L
- Total Xylenes: <0.003 mg/L – 8.240 mg/L
- Total BTEX: Below detection limits (BDL) – 21.410 mg/L
- MTBE: <0.001 mg/L – 0.415 mg/L
- Naphthalene: <0.005 mg/L – 0.193 mg/L.

Dissolved benzene concentrations exceeded the SSCALs based on GRP at monitoring wells MW-9, MW-16, MW-17, MW-20, and MW-25. Relative to the last sampling event performed in May 2018, the dissolved benzene concentrations increased at MW-9, MW-16, MW-17, and MW-25 but decreased at MW-20. The benzene concentration in MW-24 decreased below the SSCAL for the first time. The benzene concentration in MW-25 increased to its historical high. None of the other COCs exceeded an SSCAL at any of the wells. The dissolved naphthalene concentration at MW-9 decreased below its SSCAL.

The historical groundwater analytical results are summarized in **Table 3**, **Groundwater Analytical Summary**. The apparent extent of COC impacts in groundwater is shown in the following figures:

- **Figure 7 – Dissolved Benzene Isoconcentration Map (September 25, 2018)**
- **Figure 8 – Dissolved MTBE Isoconcentration Map (September 25, 2018)**
- **Figure 9 – Dissolved Naphthalene Isoconcentration Map (September 25, 2018)**.

2.5.5 Linear Groundwater Flow Patterns

As noted in **Section 2.4**, one of the conclusions drawn from the HRVP investigation was that an underlying fracture/joint network appears to control migration pathways of the groundwater plume at this site. One of the study maps, included as **Figure 10, Maximum FID Values (from MIP Investigation)**, displays at least two strong linear patterns emanating from the source area around the dispensers, USTs, and associated piping. An examination of the distribution of dissolved COCs in groundwater (**Figures 7** through **9**) indicates a similar linear flow pattern. For instance, from a maximum concentration of dissolved benzene at MW-25, the plume is strongly oriented toward the southeast in the direction of MW-9. A secondary orientation can also be seen extending from MW-25 to the southwest toward MW-24. The orientations are suggestive of joint patterns in the bedrock and overlying residuum. By definition, the hydraulic conductivity along joints is likely higher than in the surrounding clay soil matrix, which has significant implications for the positioning of potential extraction or injection points in a remedial design.

3.0 REMEDIAL APPROACH

3.1 REMEDIAL OBJECTIVES

This CAP has been prepared to achieve the following objectives:

- Reduce the potential for further migration of dissolved COCs
- Reduce dissolved COC concentrations in groundwater to below SSCALs
- Accomplish site objectives in a safe, timely, and cost-effective manner.

3.2 CORRECTIVE ACTION OVERVIEW

The following combination of remedial techniques was recommended by PPM in the CAP Evaluation:

- Ozone sparging in areas beyond 15 feet of UST system components (i.e., tanks, piping, and dispensers)
- Oxygen sparging in areas proximal to the UST system
- Installation of horizontal vapor recovery piping in the same trench in which ozone delivery piping is placed

- Installation of ozone monitoring devices in a vapor monitoring point installed within the fuel piping trench and in one dispenser
- Performance of MEME events utilizing recovery wells and/or existing tank pit observation wells in the area indicated by the HRVP survey to have the highest impacts (between the tank pit and the dispensers)
- RNA monitoring to track changes in groundwater chemistry such as dissolved oxygen (DO).

A baseline groundwater monitoring event, which should include collection of natural attenuation parameters such as DO, should be conducted to provide site conditions just prior to initiating ozone sparge at the site. Subsequent groundwater monitoring events are recommended throughout corrective action activities to assess the overall effectiveness of the remedial approach and to aid in selecting the future course of actions at the site. The following provides a description of the proposed corrective actions and associated effectiveness monitoring.

3.2.1 Overview of Ozone Sparge

Ozone (O_3) is an allotrope of oxygen, consisting of three oxygen atoms that are less stable than diatomic oxygen (O_2). Ozone is more soluble than oxygen in water and is commonly used in municipal water treatment applications for disinfectant purposes. However, the use of ozone for soil and groundwater remediation projects has increased over the last decade as alternative methods have been pursued and the technology has subsequently evolved.

In general, the ozone-based process for site remediation is similar to other chemical oxidation techniques in which the oxidant of choice is sparged into the desired treatment area. However, the use of ozone is different from most oxidation processes as the ozone can be injected as a gas or liquid (as ozonated water). This approach provides the opportunity to deliver more continuous oxidation as opposed to batch applications typically associated with other techniques.

An ozone generator uses electrical current to convert O_2 (readily available in atmospheric air) to O_3. A compressor is then used to sparge the ozone into the subsurface using one or more sparge points. Although ozone gas is typically sparged into the water table for groundwater remediation, it can be sparged into the vadose zone for soil treatment. Once delivered to the subsurface, the ozone facilitates deconstruction of COC molecules and other oxidizable substances. As an added benefit, the reaction results in the release of

oxygen that is beneficial in producing conditions that are conducive to aerobic degradation of select contaminants. As COC concentrations decrease over time, the volume of ozone and, in this case, oxygen sparged into the subsurface can be decreased accordingly and individual sparge points can gradually be taken off line.

One of the concerns in an ozone sparge approach is the potential for the ozone to have a corrosive effect on susceptible components of the UST system (e.g., steel tanks or fittings in the piping and dispensers). To reduce that potential, PPM proposes to sparge ozone only through six sparge points (SP-1 through SP-6) that are located more than 15 feet of the UST system. Oxygen will be sparged through one point closer than 15 feet (SP-7). In addition, a soil vapor extraction (SVE) system will be constructed to remove residual ozone and to collect and treat soil vapors. A discussion of SVE is included below. Finally, ozone monitoring instruments will be placed into subsurface locations in the piping trench and underneath dispensers to ensure that ozone is not contacting the UST system components. The locations of the sparge points and SVE points are indicated in **Figure 11, Proposed System Layout**.

3.2.2 Overview of Oxygen Sparge

Oxygen instead of ozone will be sparged in the area in close proximity to the UST system components such as the steel tanks and fuel transfer lines to reduce the potential for corrosion. One sparge point will be utilized for oxygen injection (SP-7). Oxygen will be produced by the same equipment as the ozone generating system and sparged into the groundwater at controlled pressures and volumes through a sparge point placed below the water table. The sparged oxygen moves upward through the groundwater into the unsaturated zone. Two important processes occur as the air moves through the subsurface and groundwater: 1) in-situ stripping and volatilization of the COCs within the screened zone of the water table, and 2) enhanced biodegradation of both dissolved and adsorbed phase COCs due to the increase in dissolved oxygen levels.

Combining oxygen sparging and SVE can be effective in remediating sites where COCs are present in both the unsaturated and saturated zones. For example, if the COCs are dissolved in the groundwater, then air sparging can be used to volatilize the chemicals and transport them closer to the surface for recovery.

3.2.3 Overview of Soil Vapor Extraction

SVE is a common remedial technology that has proven to be effective at treating the vadose zone. This technology involves the application of vacuum to the soil matrix, creating a negative pressure gradient that causes movement of vapors toward extraction points. The increased flow of oxygen that occurs in the subsurface resulting from the SVE process promotes increased biological degradation, aiding in potentially shorter cleanup duration. At this site, the two primary SVE points (SVE-1 and SVE-2) will consist of horizontal screens that will be placed between the ozone sparge points and the UST system to intercept potential fugitive ozone and prevent contact with parts of the UST system that may be susceptible to corrosion. The system is designed so that SVE may also be performed in two recovery wells (RW-1 and RW-2) installed adjacent to the fuel transfer piping where the highest soil and groundwater impacts are expected to be, based on the results of the MIP investigation. The locations of the SVE screens and recovery wells are shown in **Figure 11**.

3.2.4 Overview of Mobile Enhanced Multiphase Extraction

MEME is a common remedial technology that has proven to be effective at removing select adsorbed and dissolved phase contaminants from the soil and groundwater. The concept is similar to conventional SVE in that vacuum is applied to a recovery well, creating a negative pressure gradient that results in the removal of volatile organic compounds (VOCs) from the subsurface. However, in addition to vapor removal, MEME includes removal of liquid phases of hydrocarbons, both dissolved and free product, by using a stinger pipe with the intake point placed below the static water level. The technique results in drawing down the water table and creating a capture zone for potential free product floating on the groundwater. The remedial method has the additional benefit of exposing the smear zone where high concentrations of residual product may be trapped. Induced vacuum may be accomplished by means of an appropriately sized blower (regenerative or liquid ring, typically) that is connected to multiple extraction points strategically positioned at key areas within the zone of impact.

MEME also creates favorable conditions for biological activity. Oxygen can be delivered to bacteria in previously saturated soils much faster by air than by liquid phase transport. Soil gases sweeping across the surface of the aquifer will typically help maintain moist soil conditions. A moist, oxygenated environment enhances bacterial growth and activity, which aids VOC desorption from soil particles.

At this site, MEME is recommended to remove potential free product in the area between the dispensers and the USTs where previous investigations have indicated the highest impacts to be located. Two 4-inch nominal diameter recovery wells will be installed in that area to use as extraction points for the MEMEs (RW-1 and RW-2) as shown on **Figure 11**. The four tank pit observation wells (OW-NE, OW-SE, OW-SW, and OW-NW) will also be periodically used as extraction points during the MEMEs.

3.2.5 Overview of Remediation by Natural Attenuation

Natural attenuation is a term applied to the natural processes that help reduce contaminant concentrations and, in some cases, reduce the potential for contaminant migration. There are multiple components that comprise natural attenuation including: biodegradation; sorption; dispersion and dilution; and volatilization. Biodegradation is often considered the most important component of RNA as it results in chemical changes to the contaminant often rendering it less harmful to the environment.

RNA is typically not considered for sites with elevated contaminant concentrations or free product, as it alone will not achieve site objectives within a reasonable time frame. However, RNA is often selected for sites with low to moderate impact that show indications that it may be effective. In addition, RNA may be used in conjunction with other remedial methods that address contaminant source control and, in the case of ozone and oxygen sparge, to gauge the effectiveness of the ozone/oxygen sparging by monitoring the level of DO.

If dissolved COC concentrations appear to be stable and near SSCALs, RNA monitoring without active remedial techniques may be implemented at the site. It is anticipated that ozone sparge will not only reduce the overall contaminant mass, but will also create conditions conducive to microbial activity. If so, an RNA monitoring program may be necessary to ensure that active remediation is no longer warranted at the site.

Select water quality parameters [pH, temperature, specific conductance, oxidation reduction potential (ORP), and DO, etc.] will also be monitored during the RNA groundwater monitoring events.

3.3 OZONE/OXYGEN SPARGE AND SVE DESIGN CONSIDERATIONS

PPM has selected a remedial approach that should achieve site objectives in a cost effective and timely manner. One of the most important aspects of any chemical oxidation

program is providing adequate contact with the substance to be oxidized. Typically, most applications deliver the oxidant throughout the area of impact in an effort to provide a greater amount of destruction. Sparge points are strategically placed across the area of impact and along suspected natural migration pathways (i.e., relict joints) to provide overlap of the oxidant injections.

PPM used existing COC concentration data to estimate the mass of contaminants requiring treatment. In addition, consideration was also given to other oxidizable materials known or suspected to be present in the subsurface. A site oxidant demand was then estimated using this information. Based on the oxidant demand, an ozone sparge system was selected capable of producing a sufficient mass of ozone per day so that site objectives could be achieved within a reasonable time frame. A summary of these calculations is provided in **Appendix D**, **Design Calculations**.

Ozone sparge materials consisting of delivery tubing and sparge points are required to be resistant to corrosion because of contact with the ozone gas. At this site, Teflon delivery tubing and stainless steel sparge points will be utilized. PPM requested a quote for the ozone sparge materials and ozone-producing equipment from both H_2O Engineering, Inc. (H_2O) and Ozone Solutions, Inc. Copies of the bid documents and ozone sparge materials and equipment quotes are included in **Appendix E**, **Equipment Specifications and Quotations**. The subcontractor quotes for installation services are included in **Appendix F**, **Subcontractor Specifications and Quotations**.

The SVE system, in addition to removing adsorbed COCs from the soil, will be required at this site to recover potential vapors that may be produced during deconstruction of hydrocarbons in the subsurface and to reduce the potential for ozone gas to come into contact with components of the UST system. For those purposes, SVE will be employed in the areas within 15 feet of the UST system components, primarily by slotted vapor recovery piping placed between ozone sparge points and the USTs, dispensers, and fuel piping. SVE will also be performed from two 4-inch nominal diameter recovery wells placed very near the fuel transfer piping between the dispensers and the USTs where the highest soil and groundwater impacts have been identified by previous investigations. PPM requested quotes for the SVE equipment from both Mid-Atlantic Environmental Equipment, Inc. (MAE_2) and MK Environmental, Inc. Copies of the bid documents and quotes are included in **Appendix E**.

To monitor the effectiveness of the system, PPM proposes to conduct groundwater monitoring events prior to and on a quarterly basis after implementation of this CAP.

Groundwater sampling methodology and recommended sampling frequency are discussed further in **Section 3.10**. Based on the results of these events, the decision will be made to continue with ozone sparging and SVE or potentially proceeding with RNA alone.

3.3.1 Ozone Sparge Unit

PPM recommends that a trailer-mounted H_2O Model No. OSU10-104 ozone unit, or comparable system, be used at the site. The unit is capable of producing up to 5.5 pounds per day (ppd) of ozone for remedial efforts. The ozone delivery pump can sparge ozone at a rate up to 4.0 standard cubic feet per minute (scfm) at a maximum pressure of 50 pounds per square inch (psi) for up to 20 ozone sparge points.

The unit has a field programmable controller with an interface panel viewer. Independent time duration control for each sparge point is available ranging from 1 to 120 minutes per location. A programmable cycle lag time is used to control the time duration between each sparge cycle.

System components that are in contact with ozone are manufactured of ozone resistant material to maintain acceptable runtime during the project. Components can be easily replaced during maintenance intervals recommended by the equipment manufacturer. More detailed information regarding the unit is provided in **Appendix E**.

3.3.2 Fail-safe Components

The ozone unit will contain a fail-safe automatic shutdown device to stop ozone production and sparging in the event that an ozone leak is detected within the unit or within the trailer. Ozone monitoring sensors will also be placed within two ozone monitoring points (OMP-1 and OMP-2 as shown on **Figure 11**) installed within the fuel transfer piping trench and in the remediation system piping trench east of the southern fuel dispenser. These sensors will also be connected to an automatic shutdown device in the event that ozone is detected in near contact with the UST components in order to prevent the potential for corrosion of susceptible parts. Finally, inside the ozone unit, an ambient ozone monitor sensor, a built-in high limit pressure switch, and a pressure relief valve are provided to protect against equipment damage.

The unit will be equipped with a telemetry system to provide remote system monitoring. A programmable logic controller will be connected to the telemetry system to allow the ozone system to be monitored and manipulated remotely through the internet. A router

will be installed to provide a firewall for system internet security. A wireless cellular provider, or similar, will be utilized to facilitate communication with the telemetry system.

Although it is anticipated that ozone sparged into the subsurface will be depleted during the oxidation process, it is possible that some residual ozone may remain after the oxidant demand has been met. If this should occur, ozone escape is not anticipated to be an issue for outdoor inhalation or indoor inhalation within surface structures, primarily due to dilution effects with ambient air and the SVE system.

3.3.3 Sparge Points

PPM recommends that ozone and/or oxygen be applied to the subsurface by means of seven sparge points strategically placed in the area of groundwater impact on the property and close to the locations of potential subsurface soil fractures or relict joints. The sparge points (SP-1 through SP-7) will be installed to depths of approximately 13 to 15 feet BGS. Ozone sparging will be performed through sparge points SP-1 through SP-6, which are located more than 15 feet from the UST system components. Ozone sparge at these locations should achieve an overall decrease of COC concentrations within the vicinity of each sparge point. An estimate of approximately 20 feet was chosen as the design radius of influence. The actual points will be placed closer to each other than the design so that overlapping areas of influence can be achieved. Oxygen will be sparged through the sparge point (SP-7), which is located in close proximity to the UST system. The placement of the proposed sparge points is provided on **Figure 11**.

Ozone/oxygen sparge points will be constructed of 1-inch inside diameter (I.D.) Schedule (SCH) 80 polyvinyl chloride (PVC) risers connected to a 1.5-inch outside diameter (O.D.) stainless steel oxidation point approximately 15 inches long at the base of the riser pipe. The risers and oxidation points will be joined using threaded, flush joint connections complete with ozone-resistant fittings.

Sand will be placed in the boring annulus for each proposed sparge point from the bottom of the boring to approximately 6 inches above the top of the sparge point. A bentonite seal approximately 2 to 4 feet thick will be constructed at the top of the sand pack. A cement/bentonite grout will be placed above the bentonite seal to within approximately 2 feet BGS. The bentonite seal and grout are intended to reduce the potential for ozone escaping up the boring and to the land surface.

The proposed sparge points will be set within 12-inch diameter steel manhole covers surrounded by concrete pads. The larger diameter manhole covers are necessary to facilitate easy access to the well head connections. The manhole covers will extend slightly above the existing land surface in an effort to reduce the potential for inflow from the land surface. Each sparge point will be completed with a well head connection that will facilitate ozone delivery and measurement of sparge pressures. An illustration of the wellhead and sparging point construction is provided in **Figure 12, Ozone Sparge Point and Monitoring Point Construction Details**.

Existing monitoring wells will be used to monitor site response and to serve as locations for measuring pressure gradients once the system is operational. Should the radius of influence from these sparge points be deemed insufficient to contact the majority of COC impact over time, additional sparge points may be added as needed.

3.3.4 SVE Unit

PPM recommends using a SVE unit manufactured by MAE_2 that utilizes an 80 actual cubic feet per minute (ACFM) regenerative vacuum blower to recover potential vapors that may be generated during the oxidation process, to remove adsorbed COC impact in soil, and to reduce the potential for ozone contacting the UST system components. The blower produces a negative pressure at select areas on site to remove vapors and transfer them through a 500-pound granulated activated carbon (GAC) vessel prior to discharge to the atmosphere. More detailed information regarding the unit is provided in **Appendix E**.

Although the unit is slightly higher in cost than the other SVE system quote, the MAE_2 unit is recommended for several reasons. The knock-out tank has a capacity of 60 gallons versus 30 gallons and is constructed of aluminum to limit corrosion. The carbon canister contains 500 pounds of GAC versus 400 pounds in the other system. The blower has a higher maximum flow and vacuum of 80 ACFM at 5.8 inches of mercury versus 75 ACFM at 5.5 inches of mercury. Most importantly, the noise rating for the MAE_2 system is rated at 69.8 decibels (dB) versus 80-81 dB on the other blower. MAE_2 also provides a customized sound-dampening enclosure to reduce the noise level by at least 10-12 dB, which is critical at this site because it is adjacent to a motel with rooms within 40 feet of the system.

The SVE blower will be interlocked with the controls of the ozone sparge system to prevent the ozone sparge system from operating if the SVE blower were to unexpectedly

shut down. A manual override is provided to allow ozone sparge system operation without the SVE blower if site conditions allow.

3.3.5 Extraction Points for SVE and MEME

PPM recommends that SVE extraction be performed utilizing two horizontal 20-foot sections of 2-inch nominal diameter PVC screen with 0.01-inch slots. The screens and the connecting pipe to the SVE system will be constructed of SCH 40 PVC. The screens will be located between the proposed sparge points and the dispensers/fuel piping so that they can intercept hydrocarbon vapors and/or fugitive ozone. The horizontal screen will be placed over and covered by well-sorted gravel at the base of a trench excavated to approximately 1.5 feet BGS. A seal of 6-mil plastic sheeting will be placed over the top of the gravel bed and pipe and on both sides of the trench (but not underneath the horizontal screen) to limit short-circuiting of the system by air from the surface. The plastic sheeting will also be secured around the solid pipe connection to the screens to limit intrusion of air from the remainder of the trench. Areas of the trench above the sheeting and outside the screened area will be backfilled with crushed rock.

The SVE extraction screens will be installed during system installation activities, concurrently with the installation of the trenches and delivery piping to the sparge points. The locations of the proposed SVE screens are provided in **Figure 11**. An illustration of the construction of the SVE screens is shown in **Figure 13, Trench Details**.

Two 4-inch nominal diameter recovery wells (RW-1 and RW-2) will be installed to a depth of approximately 15 feet BGS, one on either side of the fuel transfer piping between the tank pit and the southernmost dispenser. The recovery wells will be utilized for extraction during periodic MEME events. The recovery wells will also be connected to the SVE system so that vapors can be extracted from them by the remediation system during times between MEME events. The locations of the recovery wells are shown in **Figure 11**. The details of the piping connections at the wellhead of each recovery well is provided in **Figure 14, Recovery Well and Junction Box Construction Details**. The SVE piping will be connected to a manifold at the SVE system. The construction details of the manifold are shown in **Figure 15, Profile View of Manifold**.

3.4 OZONE SPARGE / SVE SYSTEM ELECTRICAL COMPONENTS

The ozone sparge unit and SVE unit will utilize single-phase, 240-volt, 200-amp electrical service. Power will be connected to a power supply provided by Alabama Power Company.

3.5 SYSTEM TELEMETRY

The system will be equipped with an Allen Bradley programmable logic controller (PLC) connected to a telemetry system with a CradlePoint modem that allows the system to be monitored remotely through the internet.

3.6 ANTICIPATED SITE RESPONSE

The following provides information regarding the anticipated site response to treatment based on actual and assumed site conditions.

3.6.1 Oxidation of COC

Ozone sparged into the subsurface will rapidly react with oxidizable substances that it comes in contact with, essentially deconstructing the molecules in a short time period. An important factor in this process is providing an adequate mass of ozone based on the oxidant demand. The actual oxidant demand for the site is unknown, but has been estimated using the assumptions outlined in **Appendix D**. Six ozone sparge points are proposed to provide sufficient contact in the treatment area.

3.6.2 Removal of Soil Vapors and Potential Free Product

The SVE extraction points including both the horizontal recovery piping and the two vertical recovery wells are designed to remove vapors in the area between the USTs and the dispensers where the highest soil and groundwater impacts are suspected. The SVE will be supplemented by periodic MEME events during which groundwater and vapors will be extracted from the two recovery wells and, possibly, the four tank pit observation wells.

3.6.3 Remediation by Natural Attenuation

The final phase of effectiveness monitoring will be initiated once active remediation efforts have ceased at the site. Anticipated site response to RNA cannot be adequately predicted at this time, as it is unknown what site conditions will be on completion of the active

remediation efforts. However, efforts will be made to obtain site remedial objectives within two years of implementing corrective action activities outlined in this CAP.

3.7 PERMITS

Once the CAP and associated cost proposals are approved, PPM will apply for an Underground Injection Control (UIC) permit, which is required prior to sparging ozone or oxygen at the site. Notification to the ADEM Air Division will be required for the emissions from the SVE system and the periodic MEME events. A waste profile will be required to be approved for disposal of solid waste generated during the installation process.

PPM spoke with Mr. Scott Parrish of the Buildings & Revenue Department of the City of Attalla. According to Mr. Parrish, the city will require a building permit for the construction activities. Upon approval of the CAP by ADEM, the building permit application will be submitted to the City of Attalla.

3.8 OZONE SPARGE / SVE SYSTEM INSTALLATION

3.8.1 General

The ozone sparge unit and SVE unit will be located inside a fence southeast of the store building in a grassy area. The primary reasons for selecting this area are proximity to the sparge field, locations of utilities, security, property access, and pedestrian and vehicular traffic. The proposed location of the units is shown on **Figure 11**.

CAP implementation dates will be based on the approval date of this CAP by ADEM, issuance of a building permit by the City of Attalla, equipment availability, and subcontractor scheduling. Initial implementation activities will consist of the following:

- Installation of nine borings using hollow stem augers
- Construction of six ozone sparge points (SP-1 through SP-6) and one oxygen sparge point (SP-7)
- Construction of two 4-inch nominal diameter recovery wells (RW-1 and RW-2)
- Installation of two 20-foot lengths of horizontal SVE screens (SVE-1 and SVE-2) between the UST system and the nearest ozone sparge points
- Installation of protective piping and ozone/oxygen delivery tubing from sparge points SP-1 through SP-7 to the ozone system location

- Installation of SVE piping from the recovery wells and SVE screens to the SVE unit location
- Mobilization of the ozone system and SVE unit to the site
- Installation of required electrical power supply equipment and lines
- Preliminary testing of the ozone system and SVE unit.

3.8.2 Soil Borings

Alabama One Call will be notified so that underground utilities will be marked prior to soil boring advancement and subsurface disturbance. Additionally, the first 4 feet of each new boring will be advanced with hand-held equipment to check for the presence of unmarked utilities.

The borings for the proposed sparge points will be advanced with hollow stem auger drilling equipment using a minimum of 4.25-inch I.D. hollow-stem augers. Borings for sparge points SP-1 through SP-7 will each be advanced to approximately 13 to 15 feet BGS. The borings for the proposed recovery wells points will be advanced with hollow stem auger drilling equipment using a minimum of 6.25-inch I.D. hollow-stem augers. The borings for recovery wells RW-1 and RW-2 will each be advanced to approximately 15 feet BGS.

While installing the borings for the recovery wells, soil samples will be collected on 5-foot intervals for description and possible laboratory analysis. Each sample will be field screened using headspace techniques. Disposable gloves will be worn during sample handling and changed between each sample acquisition. Headspace analysis will consist of half-filling clean glass Mason jars with soil and covering the jars with aluminum foil and lid rings. Vapors will be allowed to equilibrate in each jar after being shaken for at least 15 seconds. A headspace reading will be obtained by inserting the probe tip of a hydrocarbon analyzer (RKI Eagle) through the aluminum foil. After each reading, the instrument will be allowed to return to background concentrations in the ambient air. One soil sample will be selected for analysis from each recovery well boring, typically the one with the highest headspace reading above the water table. The soil samples will be analyzed by Sutherland Environmental Company, Inc. of Birmingham, Alabama, for BTEX, MTBE, and naphthalene per Environmental Protection Agency (EPA) Method 8260.

Down-hole equipment will be cleaned prior to use at each location with a high-pressure rinse. Soil cuttings generated during boring advancement will be hauled to the Republic

Service Sand Valley landfill in Collinsville, Alabama. A waste profile will be required to be submitted to ADEM for approval of the waste disposal. A copy of the landfill quote is included in **Appendix G, Waste Disposal Quote**.

3.8.3 Ozone Sparge Point Installation

Ozone sparge points will be constructed of a 1-inch I.D. SCH 80 PVC riser connected to 1.5-inch O.D. stainless steel oxidation point approximately 15 inches long. The risers and oxidation points will be joined using threaded, flush joint connections complete with ozone-resistant fittings.

Sand will be placed in the boring annulus for each proposed sparge point from the bottom of the boring to approximately 6 inches above the top of the oxidation point. A bentonite seal approximately 2 to 4 feet thick will be constructed at the top of the sand pack. A cement/bentonite grout will be placed above the bentonite seal to within approximately 2 feet BGS. The bentonite seal and grout are intended to reduce the potential for ozone escaping up the boring and to the land surface.

The proposed sparge points will be set within 12-inch diameter steel manhole covers surrounded by concrete pads. The larger diameter manhole covers are necessary to facilitate easy access to the well head connections. The manhole covers will extend slightly above the existing land surface in an effort to reduce the potential for inflow from the land surface. Each sparge point will be completed with a well head connection that will facilitate ozone delivery. Sparging well construction details are shown in **Figure 12**.

3.8.4 SVE Extraction Piping and Recovery Well Installation

The construction of the two horizontal screens proposed at the site is discussed in **Section 3.3.5** and shown in **Figure 13**.

Each of the two proposed recovery wells will be constructed of a 4-inch I.D. SCH 40 PVC riser connected to 4-inch I.D. SCH 40 PVC screen with 0.01-inch slots. The screen length in each recovery well will be 10 feet.

Sand will be placed in the boring annulus for each proposed recovery well from the bottom of the boring to approximately 1 to 2 feet above the top of the screen. A bentonite seal approximately 1 to 2 feet thick will be constructed at the top of the sand pack. A

cement/bentonite grout will be placed above the bentonite seal to within approximately 1 foot BGS.

The proposed recovery wells will be set within 18-inch diameter steel manhole covers surrounded by concrete pads. The larger diameter manhole covers are necessary to facilitate easy access to the well head connections. The manhole covers will extend slightly above the existing land surface in an effort to reduce the potential for inflow from the land surface. Each recovery well will be completed with a well head connection that will facilitate both SVE during normal system operations and MEME events. Recovery well construction details are shown in **Figure 14**.

3.8.5 Electrical Hookup

An electrical subcontractor will provide the connection from the service provider to the main disconnect for the system. The electrical supply will be from a new, temporary power pole and meter. The pole will be set near the system enclosure by the electrical subcontractor. The electrical service line will be dropped to the pole and a meter set by Alabama Power Company. Electrical work will be performed in accordance with applicable local codes.

3.8.6 Sparge Point Configuration

Sparge point locations were strategically selected so that remedial objectives can be obtained within a reasonable time period. The area selected for treatment at the site is focused in and around the known extent of dissolved COC impact above SSCALs on the property. Placement of sparge points is intended to reduce existing COC impact in these areas and reduce the potential for further COC migration. The locations of the UST pit and the product lines were factored into the selection of the layout.

Sparge point specifications will consist of the following:

- Installation of a 12-inch diameter by 12-inch deep manhole cover at each proposed sparge point
- Installation of a well head connection including a SCH 80 flush threaded cap, a type 316 stainless steel tee, and a compression fitting
- Connection of the delivery tubing to the well head via the compression fitting

- Installation of an independent 1-inch I.D., SCH 40 PVC piping from the manhole to the ozone sparge system.

Typical construction details of sparge points are presented on **Figure 12**.

3.8.7 Protective Piping

Ozone resistant tubing (1/2-inch O.D. by 3/8-inch I.D.) will be used to convey the ozone from the system to each sparge point. The tubing will be placed inside 1-inch I.D. SCH 40 PVC for protection. The piping beneath concrete pavement will be installed to a depth of approximately 6 inches below the base of the concrete. For landscaped areas of the site, piping will be installed to a depth of approximately 12 inches BGS. Efforts will be made to ensure that the piping does not interfere with existing underground utilities. Construction details are depicted on **Figure 13**.

Concrete generated during the installation of manhole covers and trenching will be disposed of at the Sand Valley landfill. Soil excavated from the area where concrete will not be replaced will be used as backfill material since it is not anticipated to be impacted by petroleum constituents.

3.8.8 Security

The ozone sparge system will be contained in a trailer-mounted enclosure. The SVE system will be contained in an aluminum, sound-proofed enclosure. Both units will be surrounded by an 8-foot tall, four-sided, privacy fence. Appropriate warning signs and emergency contact information will be installed on the fence.

3.9 MEME EVENTS

A MEME event will be conducted from RW-1 and RW-2 and, if possible, from at least one of the tank pit observation wells in each of the first two quarters of system operations. Each 8-hour MEME event will be conducted approximately one month following each quarterly groundwater sampling event.

A representative of PPM will be on site during the MEME events, which will be conducted by Brown Remediation, Inc., utilizing a vacuum truck equipped with a thermal oxidizer treatment system. The thermal oxidizer will be used to treat off-gases prior to release to the atmosphere. The ADEM Air Division will be notified prior to initiating MEME events at the site.

Groundwater levels will be measured at select well locations prior to initiating each MEME event to establish static conditions for comparison to conditions observed during the event. Vacuum gauges will be installed in the flexible 2-inch hoses that connect the wellheads to the vacuum pump. A gate valve will control the applied vacuum to the extraction point. Airflow rates, VOC concentrations, and applied vacuum will be measured periodically throughout the event. Field measurements will be used to evaluate the site response to treatment and estimate the pounds of hydrocarbons removed throughout the operating period. Recovery wells RW-1 and RW-2 will be the primary recovery point although other locations, including at least one tank pit observation well, if possible, may also be selected.

The duration/frequency of the MEME events can be modified, with ADEM approval, based on results of subsequent groundwater sampling activities

3.10 GROUNDWATER MONITORING

A groundwater monitoring event will be conducted at the site prior to system start-up to establish baseline conditions prior to initiating corrective actions. Samples will be collected from each accessible well on-site, including the new recovery wells, for analysis of COCs per EPA Method 8260.

The following provides a detailed description of the fieldwork methodology for effectiveness monitoring events.

A groundwater elevation survey will be performed prior to sampling the wells. Depth to groundwater measurements will be accomplished at each well location to be sampled with an oil/water interface probe capable of measuring the water depth to within +/- 0.01 feet. The interface probe will be cleaned prior to use at each well location by means of a phosphate free soap rinse, an isopropyl rinse, and a rinse of distilled water. Rinse fluids will be discharged to the land surface in areas that do not drain back to the respective well locations.

Each monitoring well scheduled for sampling will be sampled in general accordance with PPM's internal Quality Assurance/Quality Control (QA/QC) plan. Prior to sampling, each well will be purged of approximately three well-casing volumes (or to near dryness) utilizing single use, disposable PVC bailers and nylon rope. Purge water from sampled monitoring wells will be contained in 55-gallon drums and transported to PPM's office in Birmingham for temporary storage. Environmental Products and Services of Vermont,

Inc. (EPS) will mobilize to PPM's office to collect the purge water for final disposal at Allied Energy Company LLC (AEC) in Birmingham, Alabama. It is estimated that less than 100 gallons of purge water will be generated during each sampling event.

Each sample for COC analysis will be transferred from the bailer into 40-milliliter (ml) glass vials containing hydrochloric acid (HCl) as a preservative. Each container will be filled with the sample, promptly capped, and appropriately labeled to indicate the sample origin. A duplicate sample from one well will be collected for QA/QC protocol. Containers will then be placed in an iced cooler for preservation during shipment to the laboratory.

PPM personnel will wear disposable nitrile gloves during well purge and sample collection activities in an effort to reduce the potential for cross-contamination and as part of personal protective equipment (PPE) for the project. Gloves will be changed and discarded between each sample acquisition.

Select water quality parameters (pH, temperature, specific conductance, ORP, and dissolved oxygen) will be measured during sample collection. Measurements will be performed for each well sampled and will be representative of the water collected from the well. Instrument readings will be documented in the project field book.

On completion of sampling activities, sample coolers will be transported or shipped under standard chain-of-custody protocol to an independent testing laboratory for analyses. A copy of PPM's **Technical Sampling and QA/QC Plan** is provided in **Appendix H**.

3.11 OZONE SPARGE / SVE SYSTEM START-UP / INITIAL OPTIMIZATION

PPM personnel will be on site during system startup and initial operation. System components will be monitored to ensure that the system is operating properly prior to their departure from the site. During the first day of operation, oxygen will be gradually sparged to the various points. Connections, piping, and well heads will be checked for the presence of leaks and modifications/repairs will be promptly made upon discovery. Data will be collected to evaluate the initial pressure gradient generated throughout the sparge areas and fluctuations in groundwater elevations (if any).

The initial startup period is anticipated to be completed in approximately two days. Once it has been determined that the ozone sparge system is functioning properly, ozone will be sparged into the subsurface.

System information will be collected and recorded, on a daily basis during the first two days of the optimization study. These measurements will be used to perform modifications and adjustments to the system as needed to enhance the remedial efforts.

3.12 SYSTEM OPERATIONS AND MAINTENANCE

Following completion of the optimization study, PPM will periodically visit the site to conduct operations and maintenance (O&M) and monitoring activities. These activities will be conducted by a PPM engineer, geologist, or technician experienced in subsurface investigations and remediation.

PPM anticipates visiting the site approximately two times per month during normal system operation. Additional visits may be required based on site-specific conditions encountered. O&M and monitoring activities to be conducted during these routine visits are discussed in the following sections.

Normal operations will include O&M of the system and continuing optimization of system performance as needed. Scheduled visits will be made to maintain the system components and ensure the system is operating as intended. Minor system components will be regularly inspected and replaced or repaired as required. If a shutdown of the system occurs, PPM will attempt to provide personnel to restart/repair the system within 72 hours of receiving notification of shutdown.

Typical ozone sparge and SVE O&M activities will include the following:

- Visual inspection of system components and their condition (including tubing connections for potential leaks)
- Monitoring of pressure/vacuum readings and air flow
- Monitoring of SVE effluent concentrations
- Monitoring of sparge times
- Checking SVE blower oil level and air filter conditions
- Greasing equipment fittings
- Remove and transport accumulated water in SVE knock-out tank to temporary holding tank at PPM office.

3.13 EFFECTIVENESS MONITORING

The progress of corrective action activities will be monitored to evaluate if the remedial objectives are being met. Results from baseline groundwater sampling will be used to gauge the progress of groundwater remediation efforts.

3.13.1 System Monitoring

System monitoring will include routine measurement of parameters discussed in **Section 3.12** and will coincide with O&M activities. Additional parameters to be measured, recorded, or calculated during the routine activities are as follows:

- Date of each site visit
- Measuring groundwater elevations in select monitoring wells (minimum of once per quarter)
- Measurement of DO and ORP in select monitoring wells to aid in evaluation the radius of influence (minimum of once per month)
- Total system runtimes and explanations of unscheduled shutdowns
- O&M activities and system condition
- Progress of the remedial system toward achieving site cleanup objectives.

An example of a monitoring form to be used is included in **Appendix I**, **Remediation Monitoring Forms**.

3.13.2 Groundwater Sampling

PPM recommends groundwater samples be collected from all monitoring wells on a quarterly basis for the first year of operation. Following four quarters of sampling, PPM may recommend to reduce the number of wells sampled each quarter. Groundwater samples will be analyzed for BTEX, MTBE, and naphthalene per EPA Method 8260. Analytical data obtained during these events will be evaluated to ascertain if modifications to the ozone sparge program are warranted. This may include removing the ozone system, performing alternating months of sparging, adjusting the ozone sparge cycle time or modifying the number of sparge points used.

The system will be shut down at least 48 to 72 hours in advance of each scheduled monitoring event. Sampling activities will be conducted in accordance with the methodology outlined in **Section 3.10**

4.0 REPORTING

PPM will submit reports in accordance with ADEM requirements. These reports will include:

1. System Delivery

2. Report of Corrective Action Implementation
   This report will be submitted within 60 days of system start-up and will include as-built drawings of the system layout and a description of the work performed.

3. Reporting of Corrective Action Effectiveness
   PPM proposes to submit quarterly progress reports, which summarize field activities and progress of the system toward reducing COC concentrations to below SSCALs. These reports will include an evaluation of the system effectiveness and recommendations concerning any additional modifications or changes in remedial approaches that may be necessary. ADEM Corrective Action System Effectiveness Monitoring Report (CASEMR) forms will be included with each report.

4. Site Closure Report/Monitoring Well Abandonment
   This report will describe in detail the closure of the site and removal of all remediation equipment.

5.0 CLOSURE EVALUATION

The data collected during site monitoring activities will be evaluated on a quarterly basis or more frequently if needed. Criteria for considering termination of remedial activities will include reduction of COC concentrations to at or below SSCALs or a determination that asymptotic levels have been reached.

Remedial measures will be terminated following approval from ADEM. The site will be monitored for potential increases in COC concentrations (rebound) once corrective actions

have ceased. Recommendations will be made concerning further remedial action should COC concentrations rebound.

6.0 SITE HEALTH AND SAFETY

A site-specific Health and Safety Plan (HASP) for proposed corrective action activities at the facility is included in **Appendix J**, **Site Health and Safety Plan**. The HASP was specifically designed to address the proposed corrective actions and monitoring activities at the site. Project personnel will be familiar with the HASP prior to performing any work at the site. The HASP will be kept on site throughout the duration of the project.

7.0 PROJECT SCHEDULE

PPM will notify ADEM five days in advance of any planned drilling, trenching, system installation, or start-up activities to allow department personnel the opportunity to visit the site during work activities if possible. If rescheduling is necessary, PPM will notify ADEM by telephone of the new date and reason for rescheduling.

7.1 ESTIMATED SCHEDULE FOR SYSTEM INSTALLATION

Upon approval of the CAP by ADEM, PPM will prepare the applications for the UIC permit and the building permit. The permits should require six weeks for approval. PPM estimates that sparge point installation activities will be completed in two work days. Trenching and system installation will require approximately seven work days to complete, pending site and weather conditions encountered. This includes installing the ozone system and SVE system, connection of power, ozone tubing connection, and construction of the fence. A baseline groundwater monitoring event will be completed less than one month prior to completion of system installation activities.

System start-up activities will require approximately two days for adequate system monitoring prior to departing from the site. A site visit will be conducted approximately one week following start-up activities to further optimize system operation. Based on this anticipated schedule, PPM estimates that well installation, system installation, start-up, and initial optimization efforts can be completed within 30 days of initiating site activities. A report can be prepared within 30 days of start-up. Therefore, the report can be submitted within 120 days of authorization from ADEM.

7.2 ESTIMATED CLEANUP TIME

Although the length of time required to obtain cleanup objectives from ozone sparging cannot be accurately predicted, it is anticipated that active remedial efforts will be required for at least two years. This time frame is based on several factors including, but not limited to: estimated mass of COC in soil and groundwater; estimated mass of oxidizable substances in the subsurface (non COC material); estimated radii of influence for sparge points; estimated ozone delivery rate from the system; and estimated system runtime. A summary of design calculations, including estimated cleanup time, is provided in **Appendix D**. It is noted that this is a theoretical estimate only and the actual cleanup time can be expected to vary from that predicted.

A more accurate prediction of cleanup time can be provided once the system has been in operation long enough to establish trends for dissolved COC concentrations during system operation.

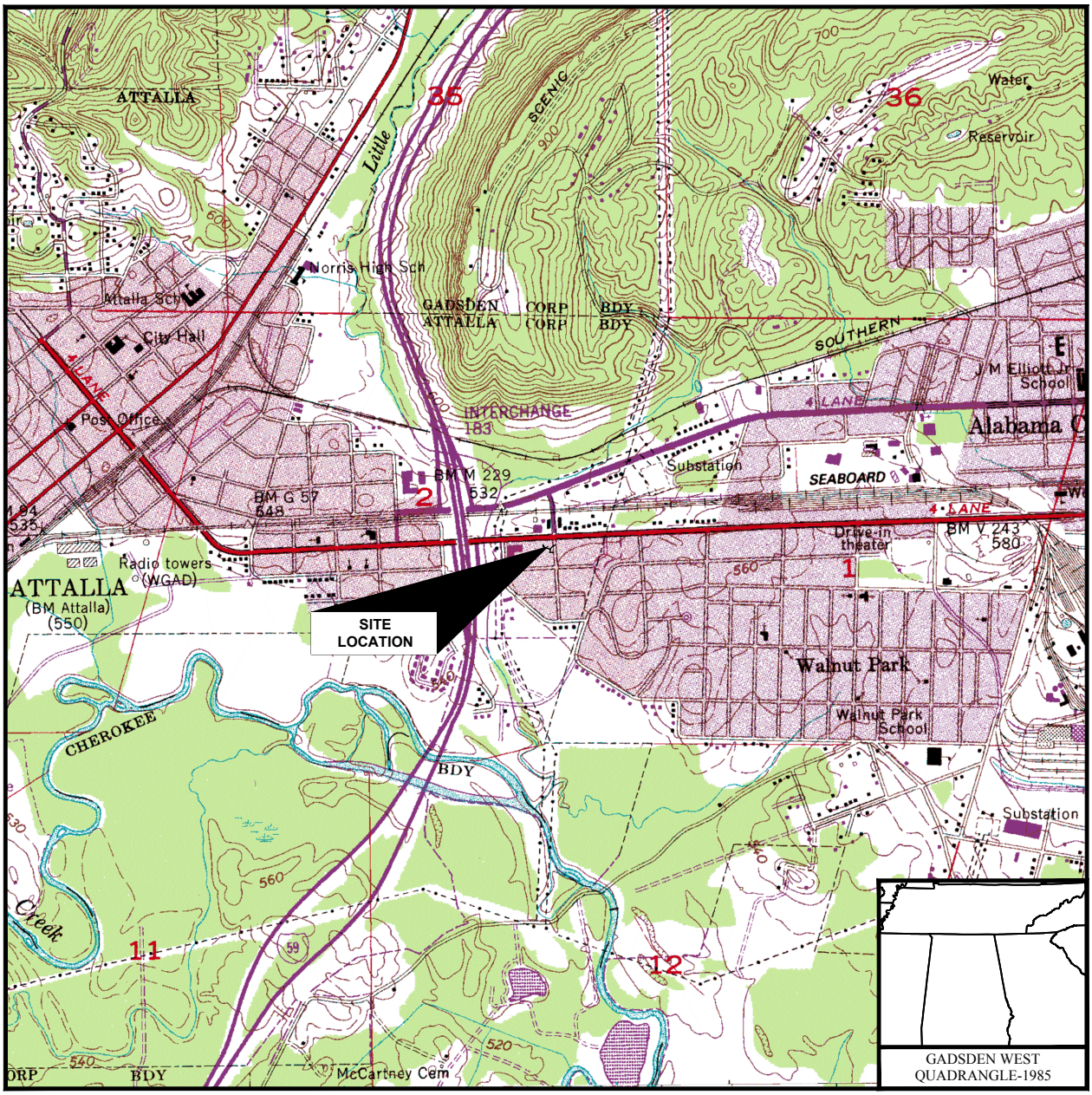
8.0 COST ESTIMATE

The work elements for this CAP are eligible for reimbursement from the Alabama Tank Trust Fund (ATTF). Cost proposals for completion of the activities associated with implementation of the CAP are included as follows:

- **Appendix K – Cost Proposal No. 16 – System Equipment Purchase and UIC Permit**
- **Appendix L – Cost Proposal No. 17 – System Installation, Baseline Groundwater Monitoring, and Start-up**
- **Appendix M – Cost Proposal No. 18 – First Quarter O&M and Effectiveness Monitoring**
- **Appendix N – Cost Proposal No. 19 – Second Quarter O&M and Effectiveness Monitoring**.

APPENDICES

APPENDIX A – FIGURES



SCALE: 1 : 24,000

1 .5 0 1
MILES
1000 0 1000 5000 10,000
FEET
1 0 KILOMETER 1 2
1000 0 METER 1000 2000

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PROJECT NUMBER: 451603	BILLING GROUP: CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

SITE LOCATION MAP

FIGURE NUMBER
1

N

0 20 40

SCALE: 1"=40'
(Approximate)

CLEVELAND AVENUE

NEELY STREET

GRAVEL

SIGN

MW-6 (SHELL)

FUEL DISPENSERS

MW-21

FUEL DISPENSERS

MW-7 (SHELL)

MW-4 (SHELL)

CANOPY

MW-3 (SHELL)

OW-SHELL

UST

UST

UST

UST

MW-5 (SHELL)

SHELL STATION

MW-8 (SHELL)

SIGN

MW-1 (SHELL)

MW-2 (SHELL)

VW-1 (SHELL)

MW-9 (SHELL)

MW-10 (SHELL)

MW-11 (SHELL)

MW-19

MW-18

DIESEL DISPENSER

UST

OW-NE

OW-NW

UST

UST

UST

MW-20

OW-SW

OW-SE

CANOPY

MW-17

GASOLINE DISPENSERS

MW-25

PRODUCT TRANSFER LINE

MW-12

MW-23

BAMA TEXACO

MW-16

MW-24

MW-22

MW-13

MW-14

FORMER TANK PIT

WATER METER

MW-10

SIGN

APPROXIMATE PROPERTY LINE

MW-9

AIR / VACUUM

MW-15

MOTEL

MW-11

MW-5R

MW-4R

MW-6R

CANOPY

MW-2

MW-2D

FORMER TANK PIT

FORMER RAINBOW NO. 102 (MOTEL OFFICE)

MW-1R

MW-3R

LEGEND:

- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- P — POWER LINE
- UT — UNDERGROUND TELEPHONE LINE
- W — WATER LINE
- S — STORM SEWER LINE
- SS — SANITARY SEWER LINE
- G — NATURAL GAS LINE
- NYI — NOT YET INSTALLED ON 9/19/16
- X — FENCE
- POWER POLE
- STORM DRAIN

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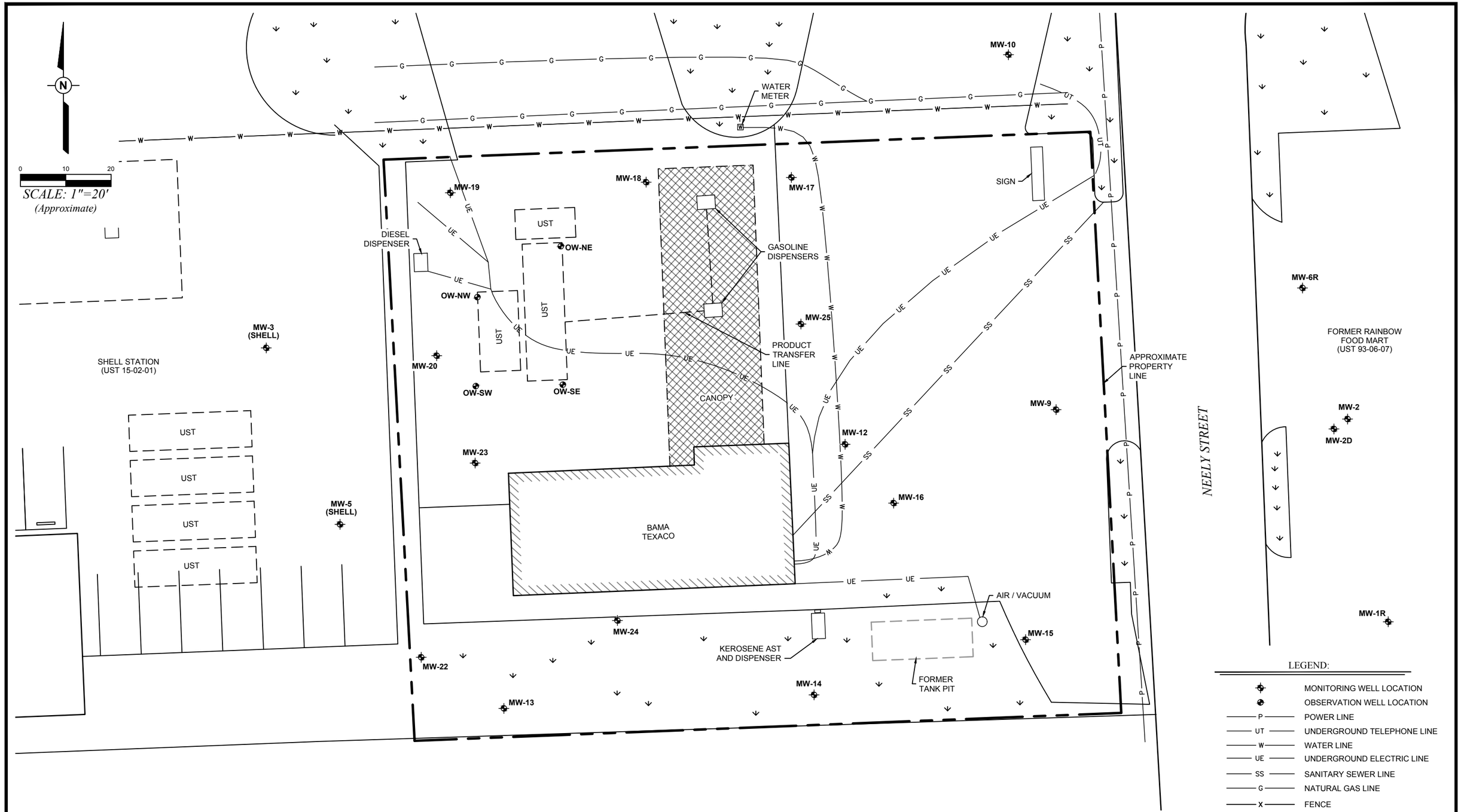
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

AREA MAP

FIGURE NUMBER
2



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IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

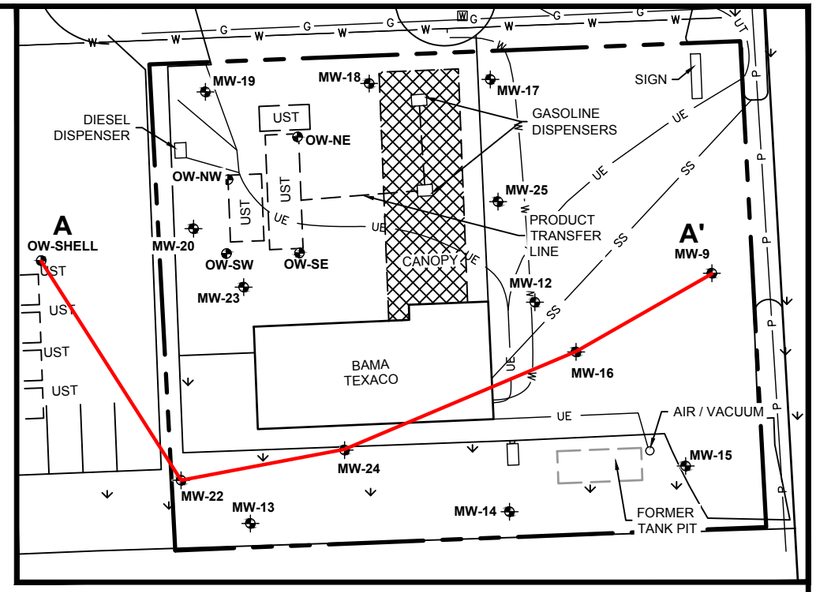
SITE MAP

FIGURE NUMBER
3

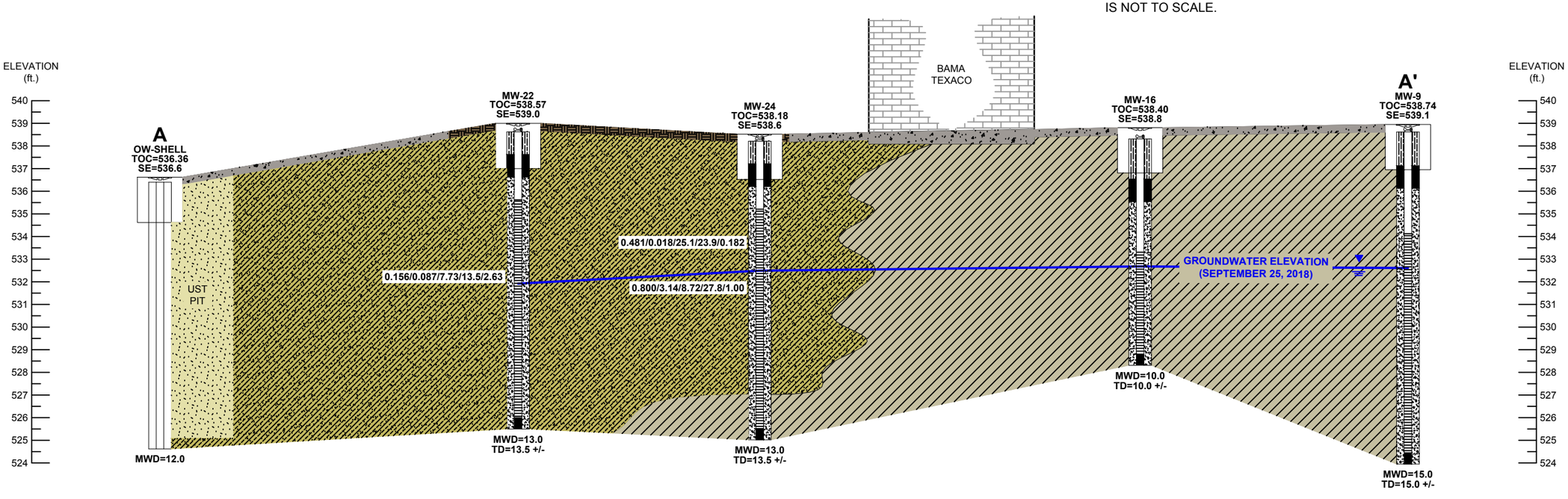
LEGEND:

	SILTY CLAY
	CLAY
	TANK PIT BACKFILL
	CONCRETE
	TOP SOIL
TOC=535.25	TOP OF CASING (ft.)
SE=535.4	SURFACE ELEVATION (ft.)
TD=15.0 +/-	TOTAL DEPTH OF BORING (ft.)
MWD=15.0	MEASURED WELL DEPTH (ft.)
	SCREENED INTERVAL W/SUMP
0.800/3.14/8.72/27.8/1.00	BENZENE / TOLUENE / ETHYLBENZENE / TOTAL XYLENES / MTBE CONCENTRATION (mg/kg)
NM	NOT MEASURED

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=5'



NOTE:
THE HORIZONTAL SCALE FOR WELL SCHEMATICS IS NOT TO SCALE.



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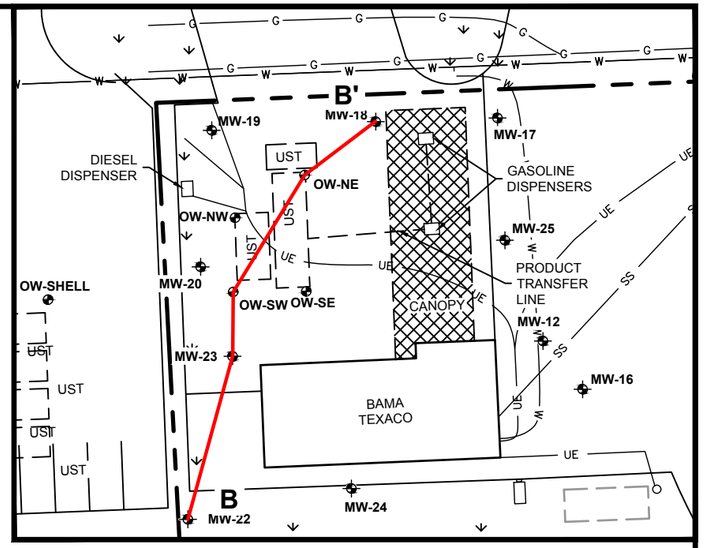
IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

GEOLOGIC CROSS-SECTION
A-A'

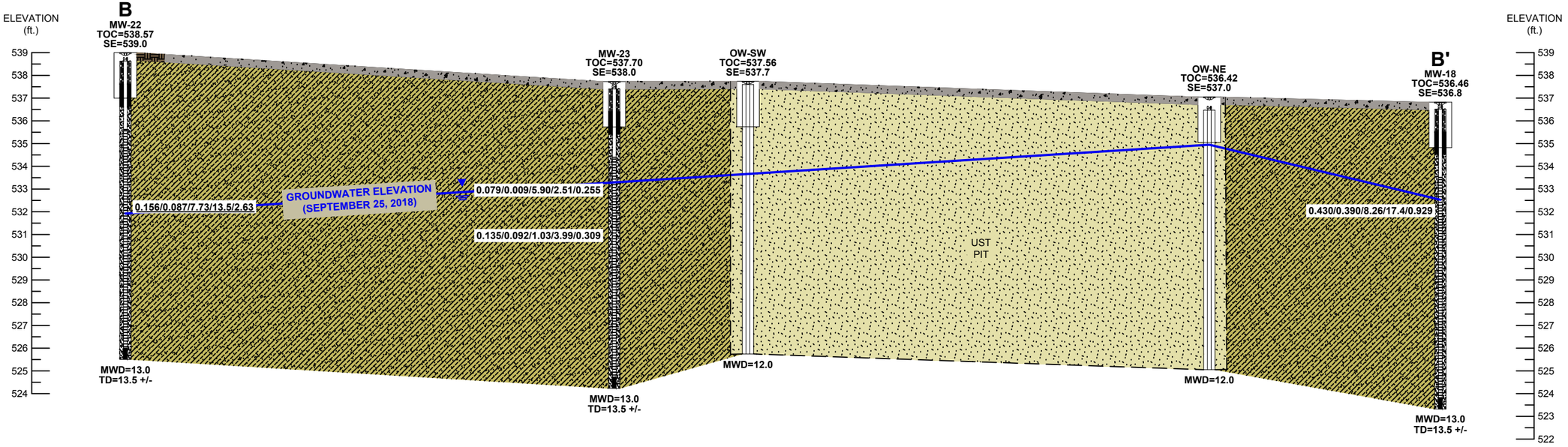
FIGURE NUMBER
4A

LEGEND:

	SILTY CLAY
	TANK PIT BACKFILL
	CONCRETE
	TOP SOIL
TOC=533.15	TOP OF CASING (ft.)
SE=533.5	SURFACE ELEVATION (ft.)
TD=13.5 +/-	TOTAL DEPTH OF BORING (ft.)
MWD=13.0	MEASURED WELL DEPTH (ft.)
	SCREENED INTERVAL W/SUMP
0.430/0.390/8.26/17.4/0.929	BENZENE / TOLUENE / ETHYLBENZENE / TOTAL XYLENES / MTBE CONCENTRATION (mg/kg)



HORIZ. SCALE: 1"=10'
VERT. SCALE: 1"=5'



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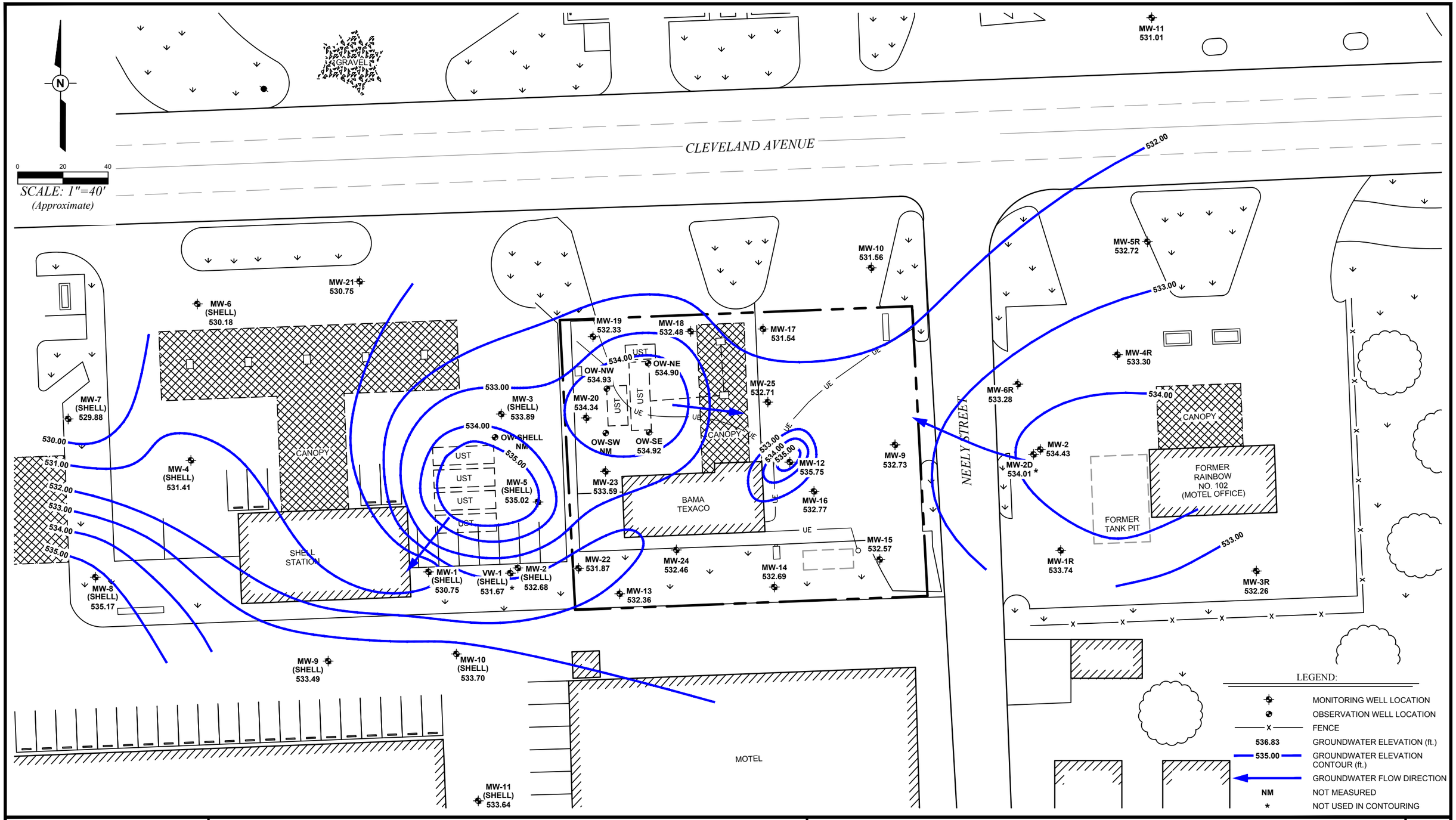
IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

GEOLOGIC CROSS-SECTION
B-B'

FIGURE NUMBER
4B



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BAMA TEXACO
815 CLEVELAND AVENUE
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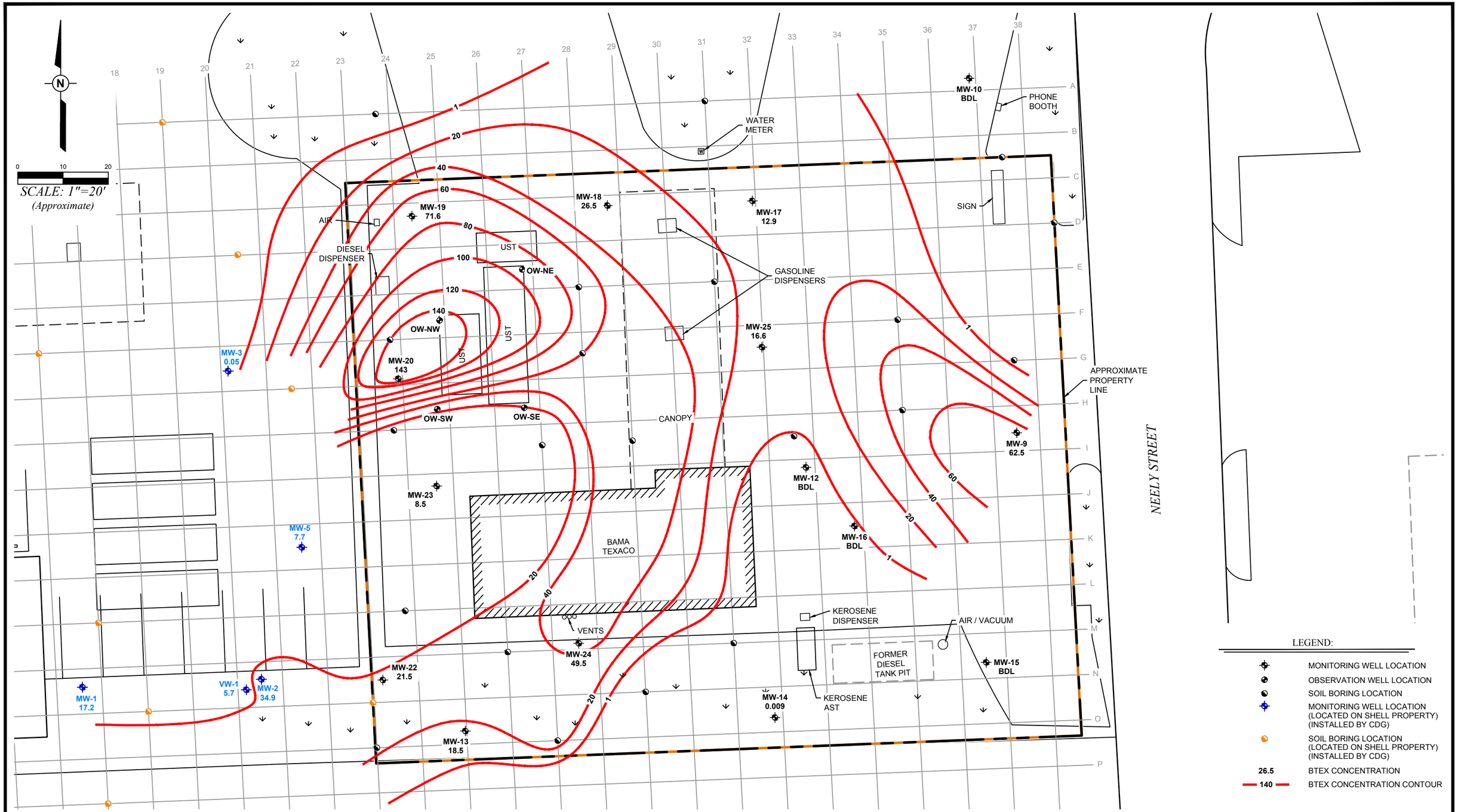
GROUNDWATER ELEVATION MAP
(SEPTEMBER 25, 2018)

FIGURE NUMBER
5



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BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

MAXIMUM BTEX CONCENTRATION IN SOIL

FIGURE NUMBER
6

N

0 20 40

SCALE: 1"=40'
(Approximate)

CLEVELAND AVENUE

NEELY STREET

GRAVEL

MW-11

MW-6 (SHELL)

MW-21 <0.001

0.005

MW-10 <0.001

MW-18 0.092

MW-17 1.380

0.100

MW-19 0.419

UST

OW-NE

OW-NW

MW-20 3.040

MW-3 (SHELL)

MW-25 9.180

MW-9 6.210

OW-SW

OW-SE

CANOPY

UE

MW-7 (SHELL)

OW-SHELL

MW-4 (SHELL)

MW-23 0.499

MW-12 <0.001

MW-5 (SHELL)

BAMA TEXACO

MW-16 1.270

MW-24 0.215

MW-15 0.021

MW-22 0.007

MW-8 (SHELL)

SHELL STATION

MW-1 (SHELL)

VW-1 (SHELL)

MW-2 (SHELL)

MW-14 <0.001

MW-13 0.004

MW-5R

MW-4R

MW-6R

MW-2

MW-2D

FORMER RAINBOW NO. 102 (MOTEL OFFICE)

FORMER TANK PIT

MW-1R

MW-3R

MW-9 (SHELL)

MW-10 (SHELL)

MOTEL

MW-11 (SHELL)

LEGEND:

- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- x FENCE
- 1.270 BENZENE CONCENTRATION (mg/L) (VALUES IN RED EXCEED SSCAL)
- 0.005 BENZENE CONCENTRATION CONTOUR (mg/L)

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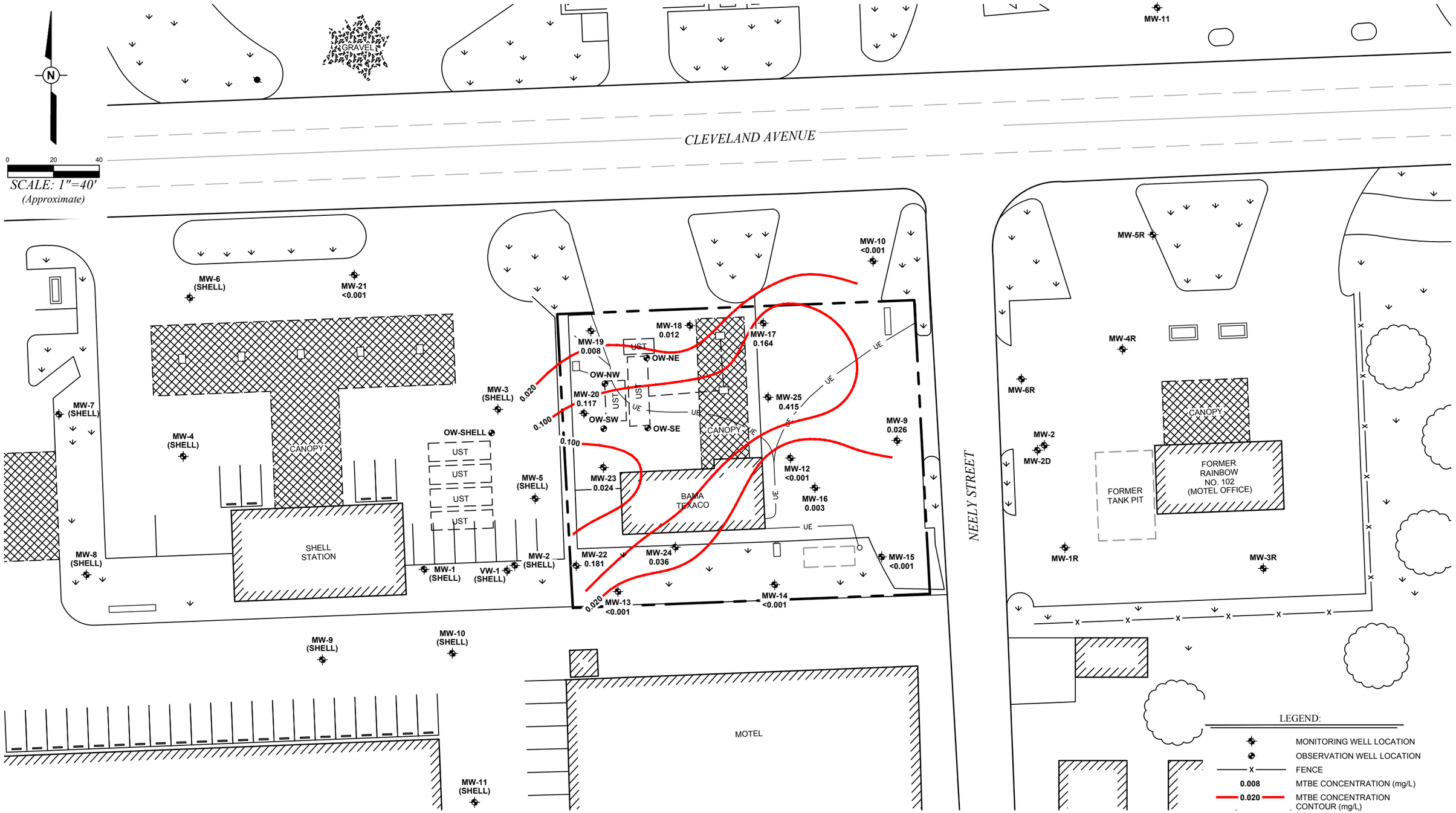
DISSOLVED BENZENE ISOCONCENTRATION MAP (SEPTEMBER 25, 2018)

FIGURE NUMBER
7



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DISSOLVED MTBE ISOCONCENTRATION MAP (SEPTEMBER 25, 2018)

FIGURE NUMBER
8

N

0 20 40

SCALE: 1"=40'
(Approximate)

CLEVELAND AVENUE

GRAVEL

MW-11

MW-10 <0.005

MW-5R

MW-4R

MW-6R

MW-6 (SHELL)

MW-21 <0.005

MW-18 <0.025

MW-17 0.026

MW-19 0.025

UST

OW-NE

OW-NW

MW-3 (SHELL)

MW-20 0.193

UST

UST

UE

0.020

0.100

OW-SW

OW-SE

CANOPY

MW-25 0.010

MW-9 0.170

MW-2

MW-2D

FORMER RAINBOW NO. 102 (MOTEL OFFICE)

FORMER TANK PIT

MW-7 (SHELL)

OW-SHELL

MW-4 (SHELL)

CANOPY

UST

UST

UST

MW-5 (SHELL)

MW-23 0.016

BAMA TEXACO

MW-12 <0.005

MW-16 <0.025

UE

MW-8 (SHELL)

SHELL STATION

MW-1 (SHELL)

VW-1 (SHELL)

MW-2 (SHELL)

MW-22 <0.005

MW-24 <0.025

MW-14 <0.005

MW-15 <0.005

MW-13 <0.005

NEELY STREET

MW-1R

MW-3R

MW-9 (SHELL)

MW-10 (SHELL)

MOTEL

MW-11 (SHELL)

LEGEND:

- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- FENCE
- 0.170 NAPHTHALENE CONCENTRATION (mg/L)
- 0.020 NAPHTHALENE CONCENTRATION CONTOUR (mg/L)

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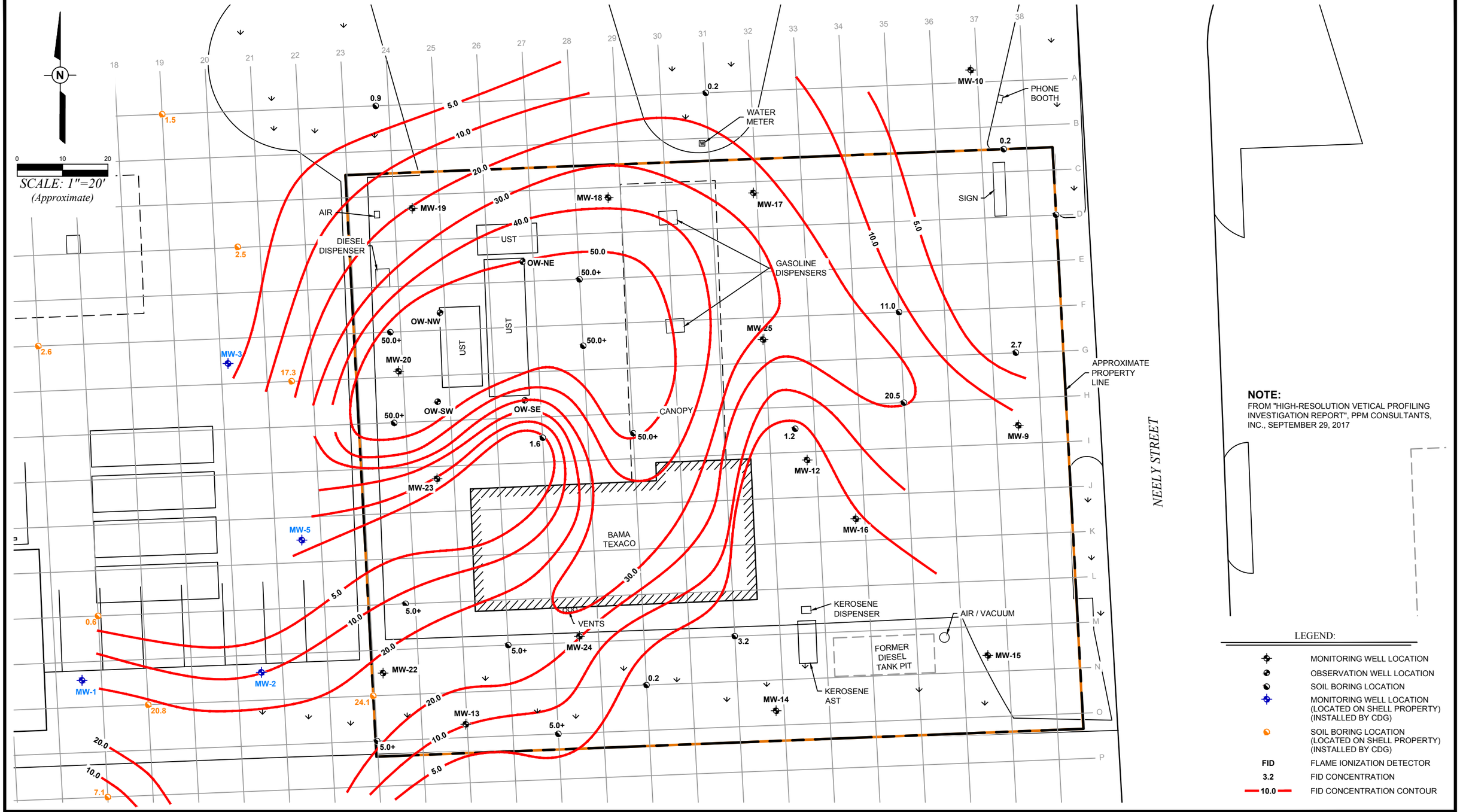
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

DISSOLVED NAPHTHALENE ISOCONCENTRATION MAP (SEPTEMBER 25, 2018)

FIGURE NUMBER
9



NOTE:
FROM "HIGH-RESOLUTION VETICAL PROFILING INVESTIGATION REPORT", PPM CONSULTANTS, INC., SEPTEMBER 29, 2017

LEGEND:

- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- SOIL BORING LOCATION
- MONITORING WELL LOCATION (LOCATED ON SHELL PROPERTY) (INSTALLED BY CDG)
- SOIL BORING LOCATION (LOCATED ON SHELL PROPERTY) (INSTALLED BY CDG)
- FID — FLAME IONIZATION DETECTOR
- 3.2 — FID CONCENTRATION
- 10.0 — FID CONCENTRATION CONTOUR

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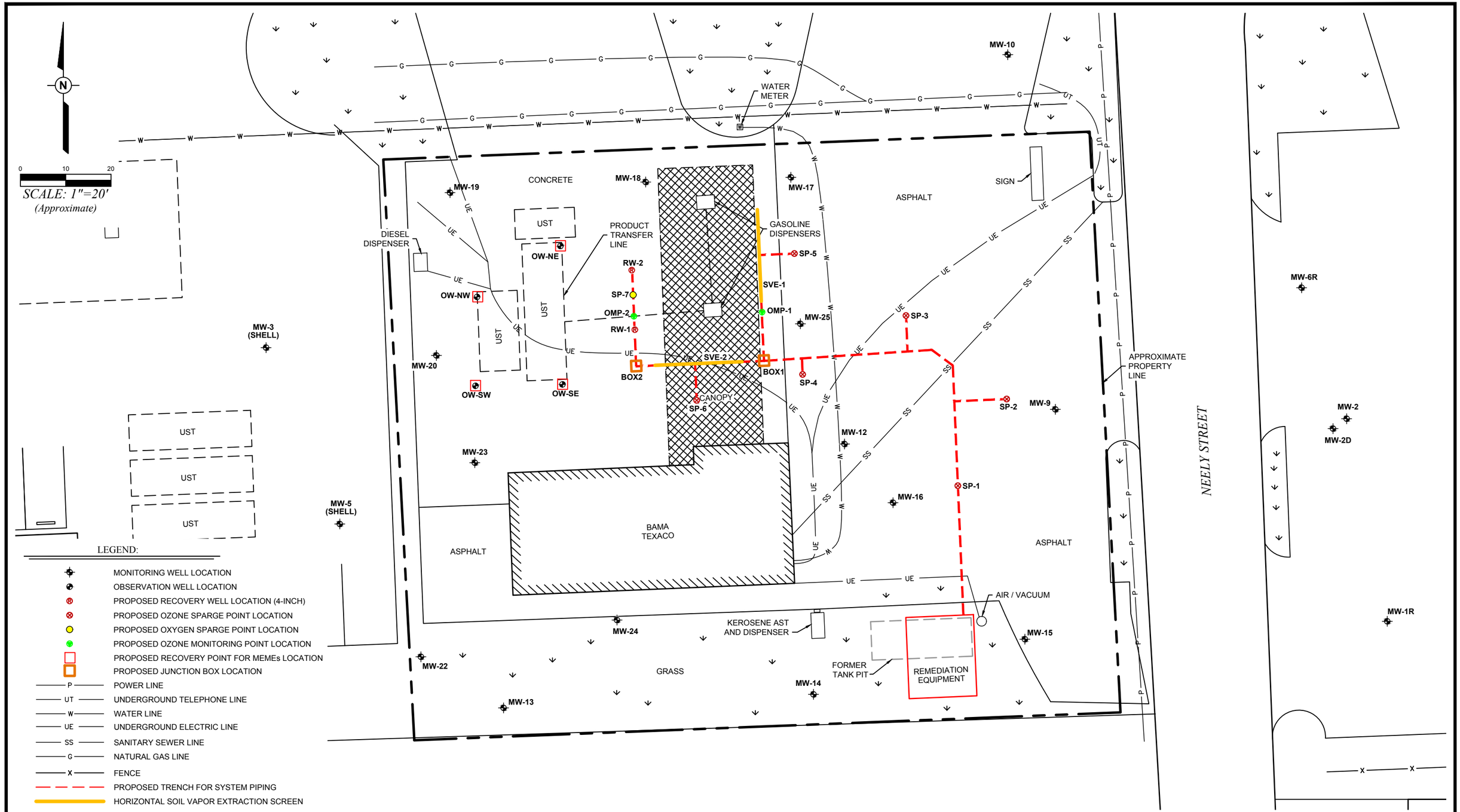
DRAWN BY:	DRAWN DATE:
JCP	01/16/19
PROJECT NUMBER:	BILLING GROUP:
451603	CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

MAXIMUM FID VALUES (FROM MIP INVESTIGATION)

FIGURE NUMBER
10



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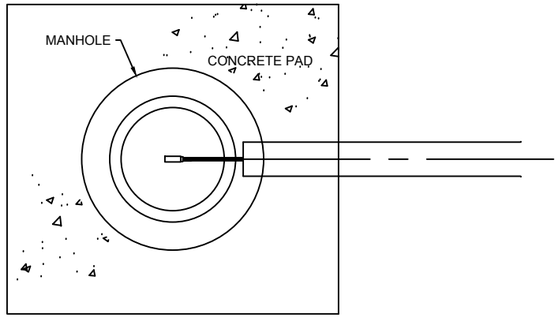
JCP	01/16/19
PROJECT NUMBER:	BILLING GROUP:
451603	CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

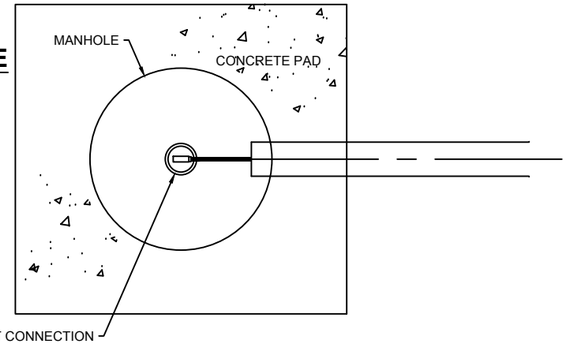
PROPOSED SYSTEM LAYOUT

FIGURE NUMBER
11



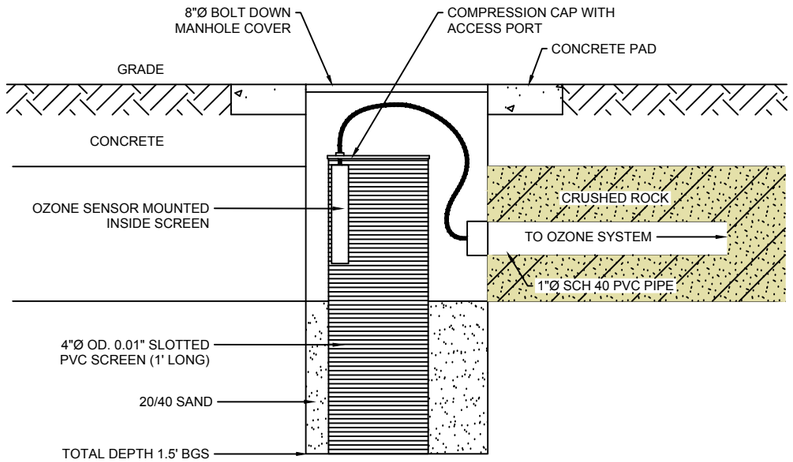
TYPICAL OZONE / OXYGEN SPARGE WELL PLAN VIEW

NOT TO SCALE



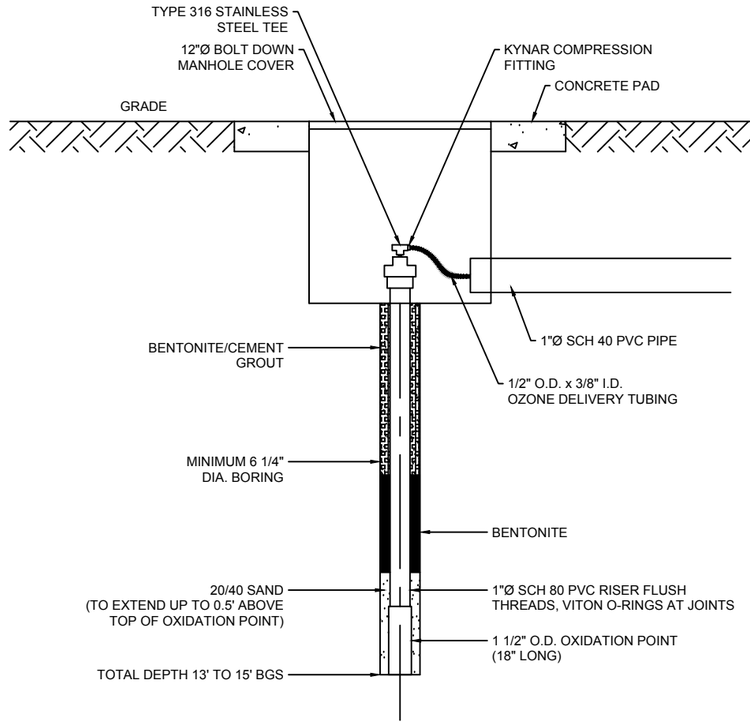
NOTES:

1. WELLHEAD CONNECTIONS, RISER AND OXIDATION POINTS TO BE PROVIDED BY EQUIPMENT MANUFACTURER.
2. OZONE DELIVERY TUBING TO BE PROVIDED BY EQUIPMENT MANUFACTURER.
3. OZONE DELIVERY TUBING TO BE INSTALLED DURING PLACEMENT OF 1"Ø SCHEDULE 40 PVC CONDUIT.
4. MANHOLE COVERING TO BE PROVIDED AND INSTALLED BY SYSTEM INSTALLATION CONTRACTOR.
5. OZONE SENSORS TO BE PROVIDED BY EQUIPMENT MANUFACTURER.



OZONE MONITORING POINT DETAIL

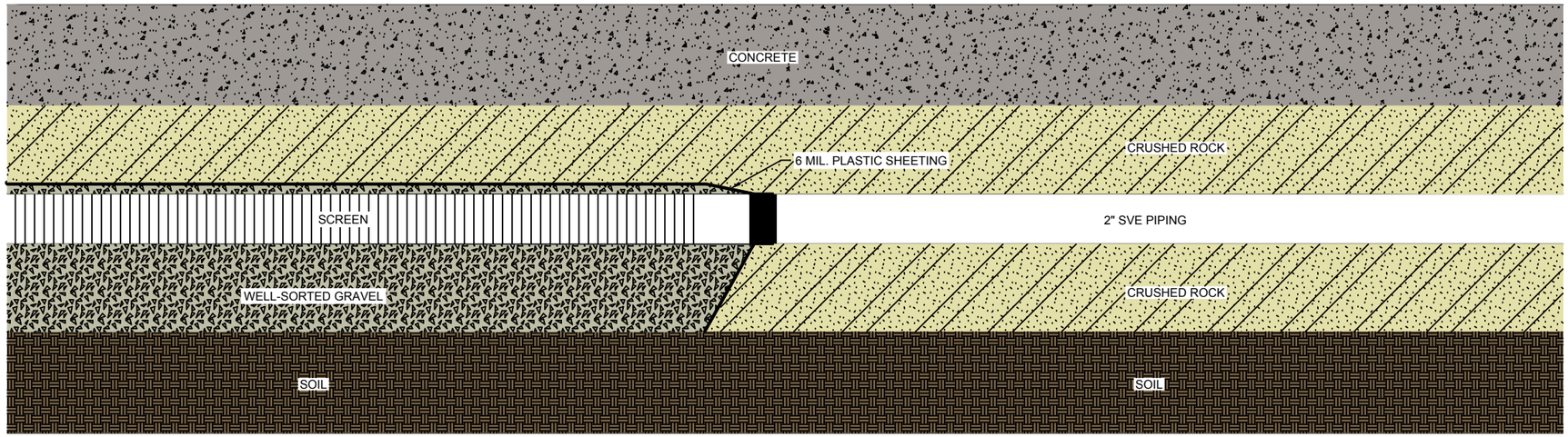
NOT TO SCALE



TYPICAL SPARGING WELL DETAIL

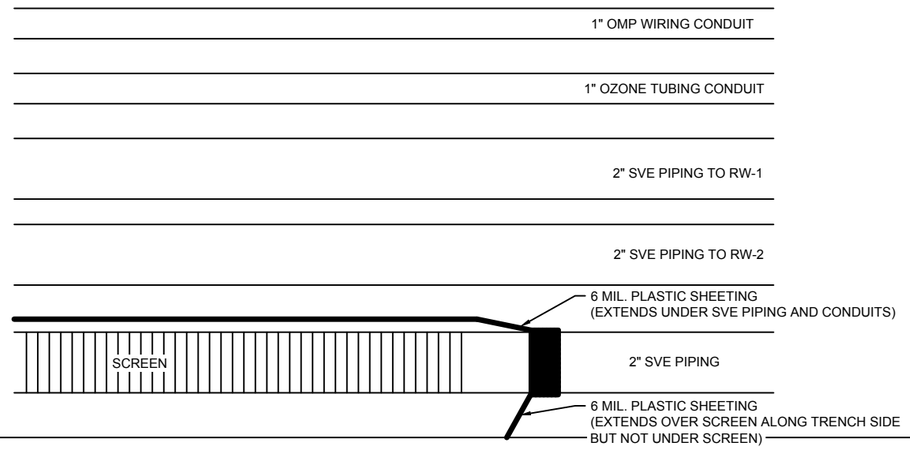
NOT TO SCALE

PPM CONSULTANTS, INC. www.ppmco.com		IRA PHILLIPS, INC. **BAMA TEXACO** 815 CLEVELAND AVENUE ATTALLA, ALABAMA	OZONE SPARGE POINT AND MONITORING POINT CONSTRUCTION DETAILS
DRAWN BY: JCP	DRAWN DATE: 01/16/19		FIGURE NUMBER 12
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D		



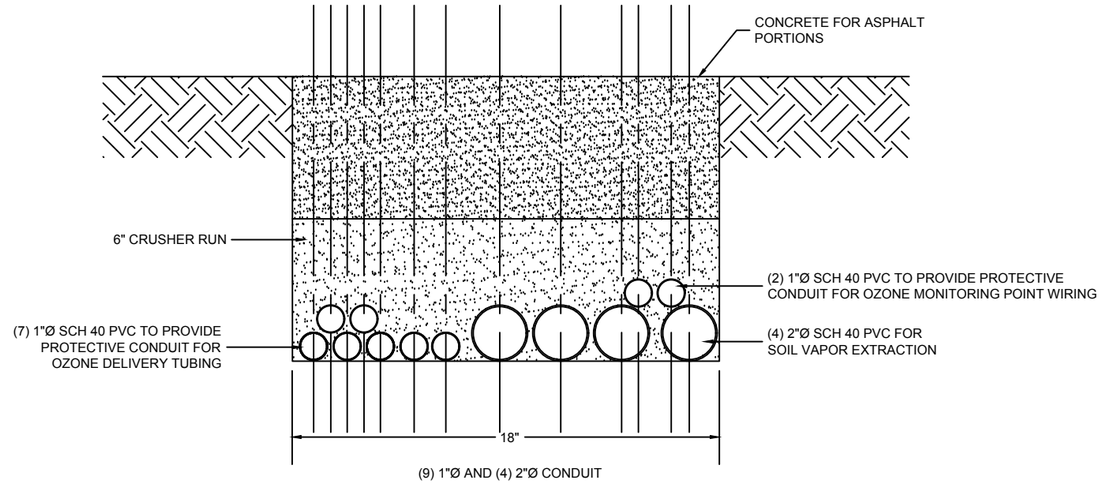
TRENCH DETAIL AT SVE-2 (CROSS-SECTION VIEW)

NOT TO SCALE



TRENCH DETAIL AT SVE-2 (PLAN VIEW)

NOT TO SCALE



TYPICAL TRENCH DETAIL

NOT TO SCALE

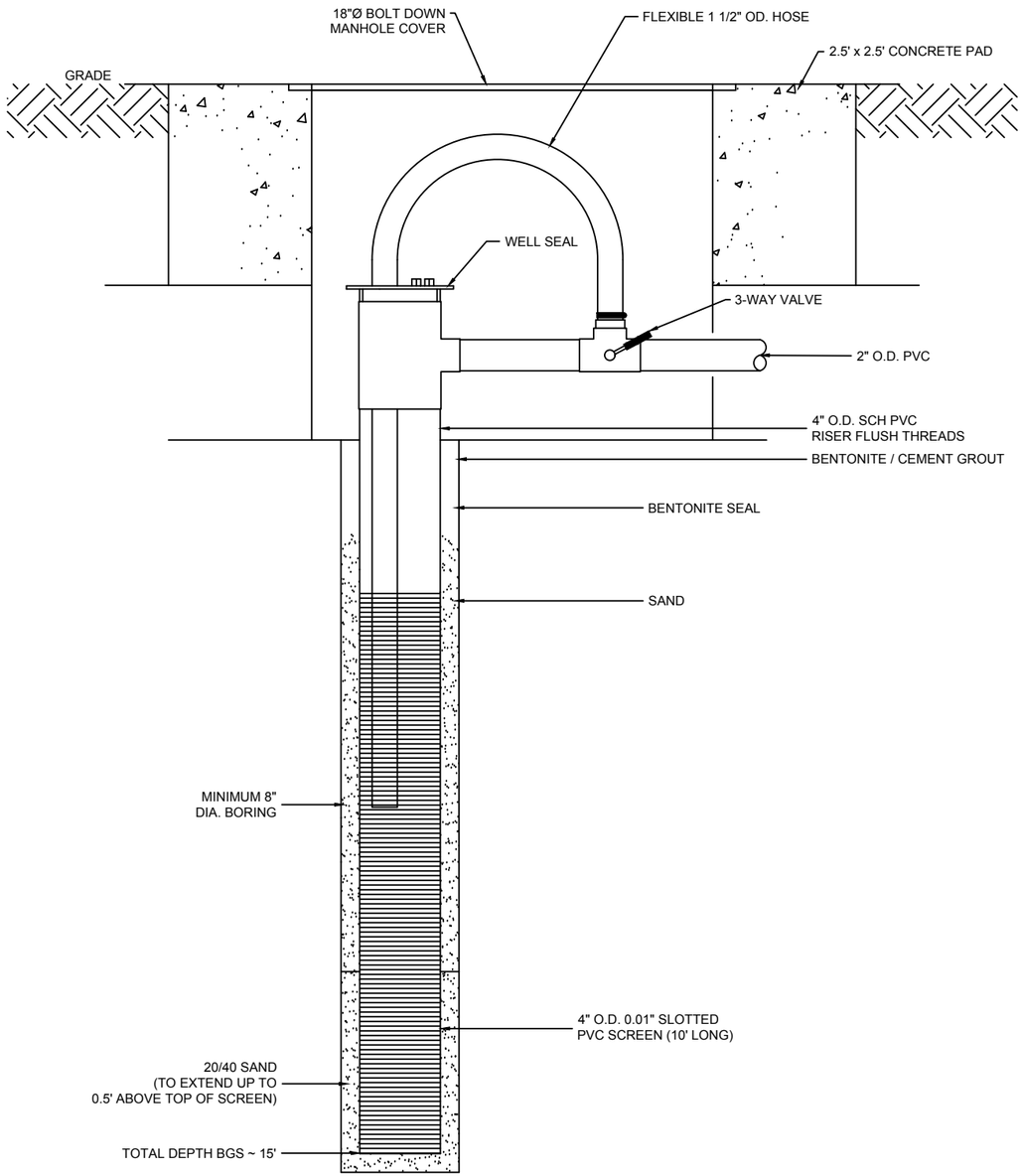
PPM CONSULTANTS, INC.
www.ppmco.com

DRAWN BY:	DRAWN DATE:
JCP	01/16/19
PROJECT NUMBER:	BILLING GROUP:
451603	CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

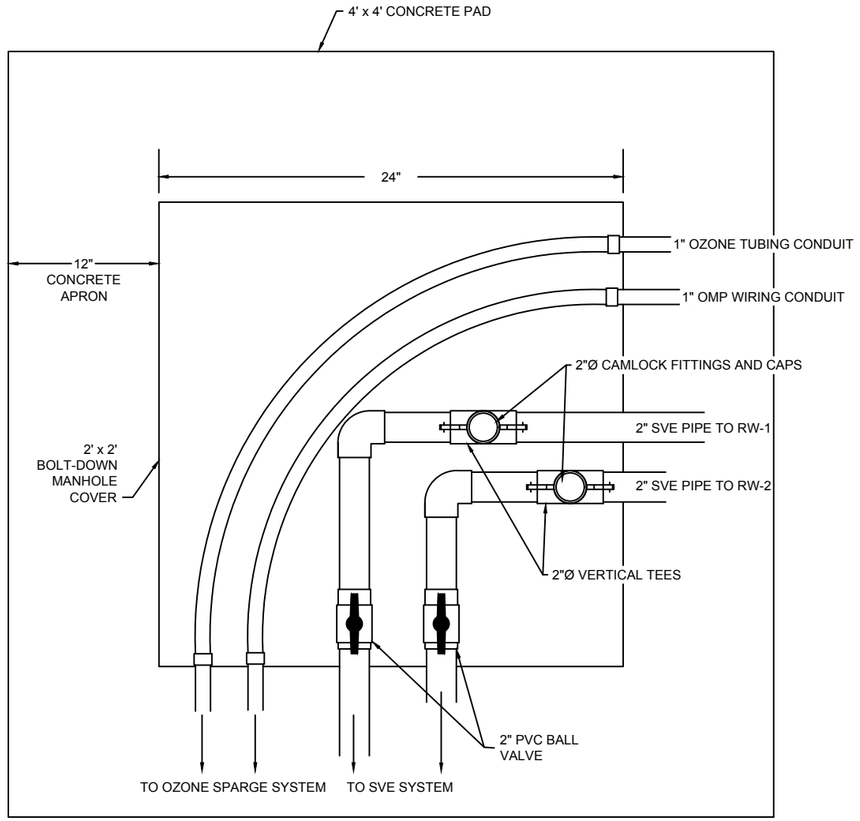
TRENCH DETAILS

FIGURE NUMBER
13



TYPICAL RECOVERY WELL / SVE POINT DETAIL

NOT TO SCALE



JUNCTION BOX 2 DETAIL

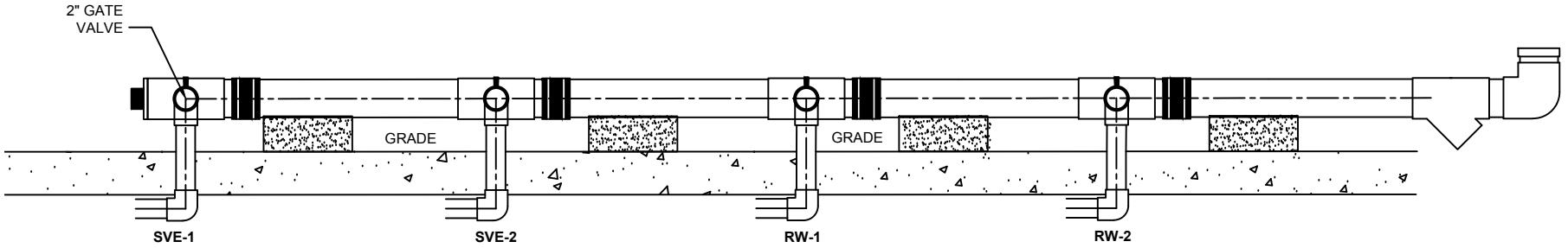
NOT TO SCALE

PPM CONSULTANTS, INC. www.ppmco.com	
DRAWN BY: JCP	DRAWN DATE: 01/16/19
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

RECOVERY WELL AND JUNCTION BOX CONSTRUCTION DETAILS

FIGURE NUMBER
14



NOT TO SCALE

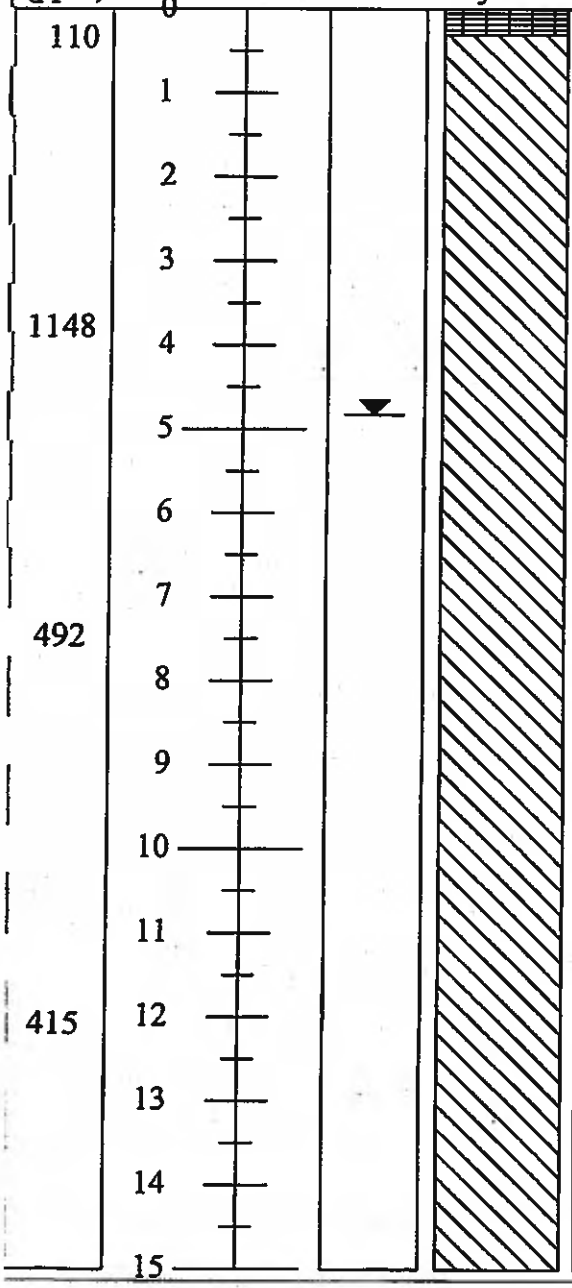
PPM CONSULTANTS, INC. www.ppmco.com		IRA PHILLIPS, INC. **BAMA TEXACO** 815 CLEVELAND AVENUE ATTALLA, ALABAMA	PROFILE VIEW OF MANIFOLD
DRAWN BY: JCP	DRAWN DATE: 01/16/19		FIGURE NUMBER 15
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D		

APPENDIX B – SOIL BORING/MONITORING WELL CONSTRUCTION LOGS

Boring Log

CDG Engineers & associates
562 Cahaba Valley Road
Pelham, Alabama 35124
(205) 733-9431

Job Number: 320700535	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 535.79	Casing Elev.: 535.47
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 529.66	
Boring ID: SB-9/MW-9	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 4 1/4" HSA	
Direction of Boring: ☒ Vertical ☐ Inclined:	Size and Type of Sampler: 5.0' Split Spoon	
Thickness of Overburden: 15 feet	Drill Rig Manufacturer: Mobile B-58	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 15 feet	Total Number of Core Boxes: 0	
Log Prepared By: LN	Date Started: 1-19-11	Date Completed: 1-19-11
Remarks: All depths are in ft-bls.	Total Core Recovery: 15	



Classification of Materials	USCS
Approximately 1.5" layer of concrete.	
Yellowish orange very fine grained clay, soft to moderately stiff, slightly plastic, damp to wet, slight odor.	CL
****Saturated @ approximately 5 ft-bls****	
Yellowish orange very fine grained clay, soft to moderately stiff, slightly plastic, abundant limestone fragments, saturated, heavy odor.	CL
Yellowish orange very fine grained clay, soft to moderately stiff, not plastic, slightly fewer limestone fragments, saturated, heavy odor.	CL
****Boring Terminated @ 15 ft-bls****	

Monitoring Well Completion Log

CDG Engineers & associates
562 Cahaba Valley Road
Pelham, Alabama 35124
(205) 733-9431

Project: Rainbow Food Mart #102

Job Number: 320700535	Auger Size: 4 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-9	Date: 1-19-11

Materials Used:

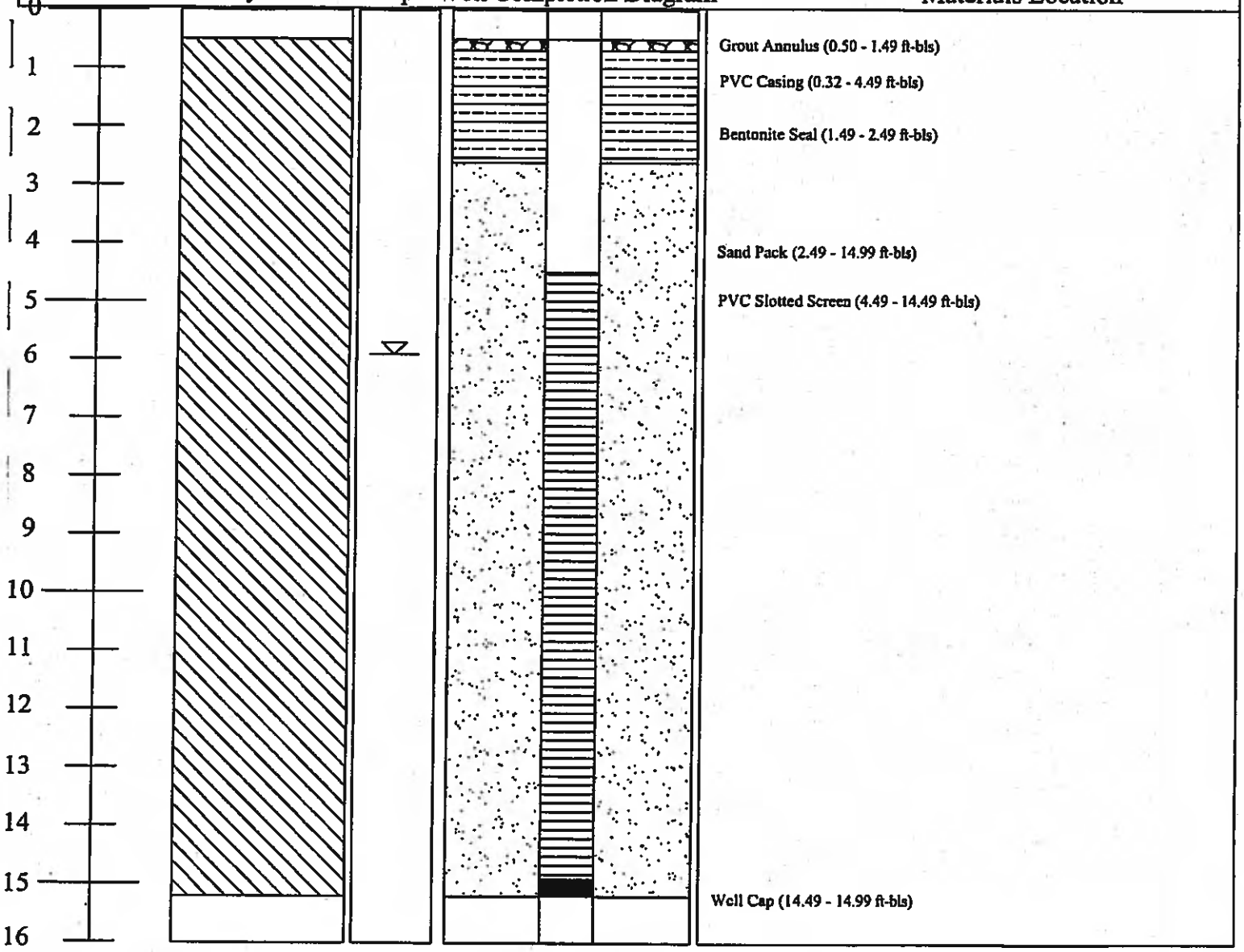
6.0 Sacks of 0.85 mm Sand
1 Sacks of Portland Cement
25 Pounds of Bentonite Pellets
4.17 Feet of 2 Inch Diameter PVC Blank Casing
10 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

Method: Bailer Date: 1-20-11

Gallons Removed: 7.5 Turbidity: Clear

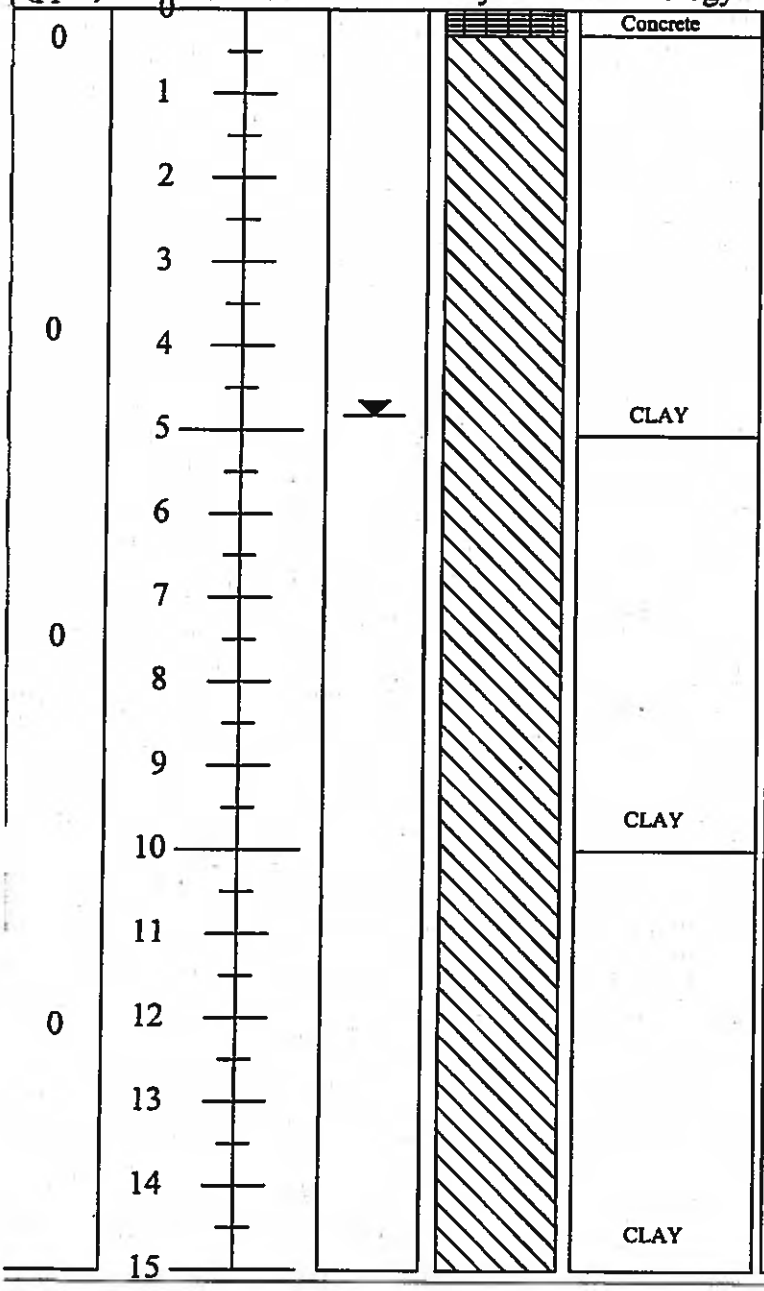
Remarks: All depths are measured in ft-bls.



Boring Log

CDG Engineers & associates
562 Cahaba Valley Road
Pelham, Alabama 35124
(205) 733-9431

Job Number: 320700535	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 533.57	Casing Elev.: 533.21
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 528.73	
Boring ID: SB-10/MW-10	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 4 1/4" HSA	
Direction of Boring: ☒ Vertical ☐ Inclined:	Size and Type of Sampler: 5.0' Split Spoon	
Thickness of Overburden: 15 feet	Drill Rig Manufacturer: Mobile B-58	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 15 feet	Total Number of Core Boxes: 0	
Log Prepared By: LN	Date Started: 1-19-11	Date Completed: 1-19-11
Remarks: All depths are in ft-bls.	Total Core Recovery: 15	



Lithology	Classification of Materials	USCS
Concrete	Approximately 1.5" layer of concrete.	
	Yellowish orange very fine grained clay, soft to moderately stiff, not plastic, damp to wet, no odor.	CL
CLAY	****Saturated @ approximately 5 ft-bls****	
	Yellowish orange very fine grained clay, moderately stiff, slightly plastic, abundant limestone fragments, saturated, no odor.	CL
CLAY		
	Yellowish orange very fine grained clay, soft to moderately stiff, not plastic, slightly fewer limestone fragments, saturated, no odor.	CL
CLAY	****Boring Terminated @ 15 ft-bls****	

Monitoring Well Completion Log

CDG Engineers & associates
562 Cahaba Valley Road
Pelham, Alabama 35124
(205) 733-9431

Project: Rainbow Food Mart #102

Job Number: 320700535	Auger Size: 4 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-10	Date: 1-19-11

Materials Used:

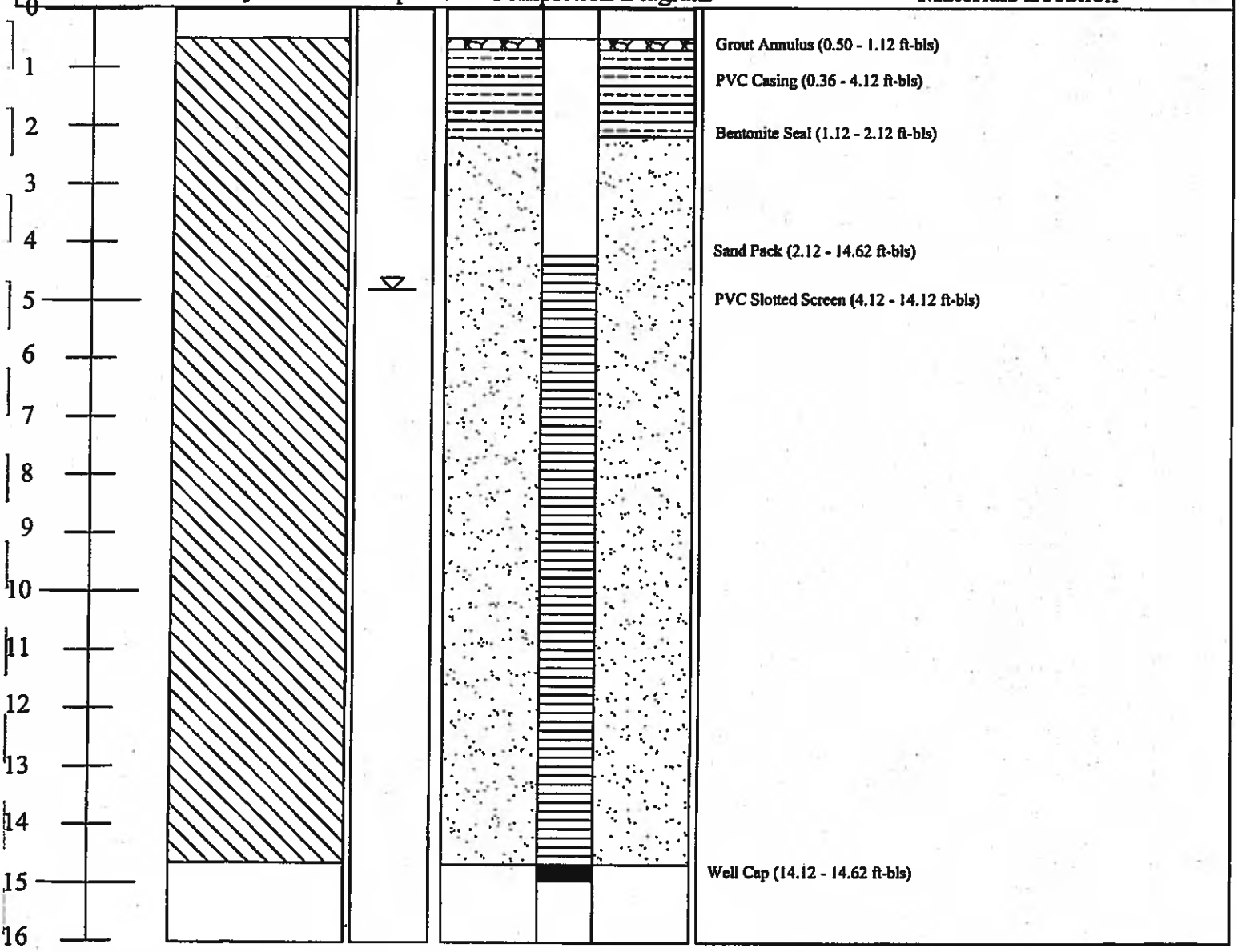
- 6.0 Sacks of 0.85 mm Sand
- 1 Sacks of Portland Cement
- 25 Pounds of Bentonite Pellets
- 3.76 Feet of 2 Inch Diameter PVC Blank Casing
- 10 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

Method: Bailer Date: 1-20-11

Gallons Removed: 8.0 Turbidity: Clear

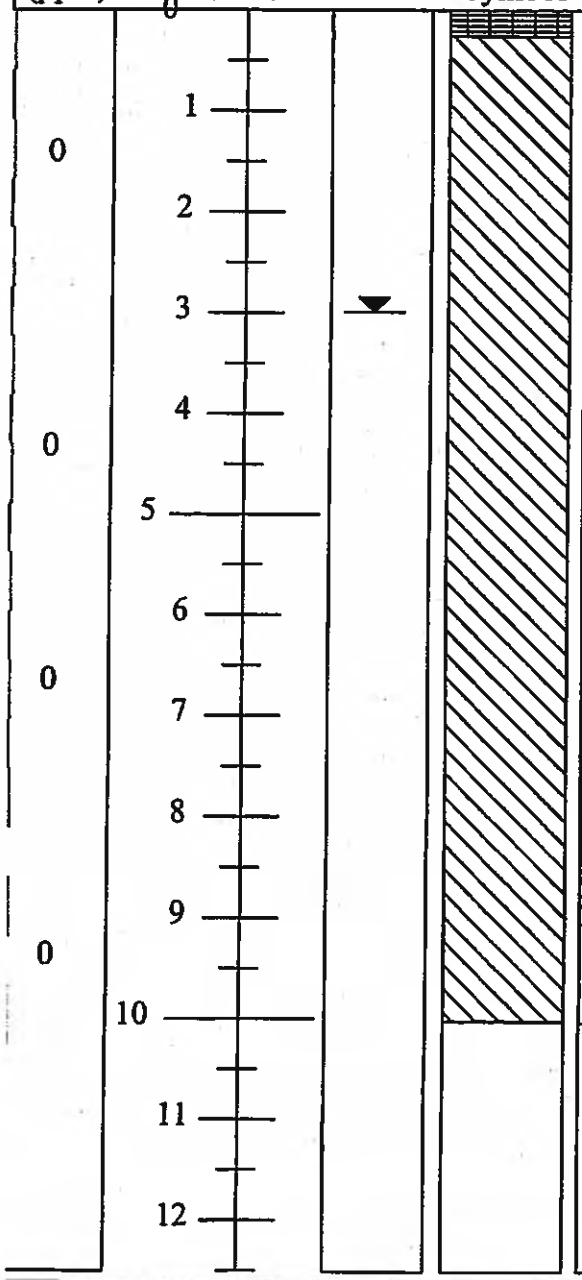
Remarks: All depths are measured in ft-bls.



Boring Log

CDG Engineers & associates
562 Cahaba Valley Road
Pelham, Alabama 35124
(205) 733-9431

Job Number: 320700535	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 535.25	Casing Elev.: 534.79
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 533.50	
Boring ID: SB-12/MW-12	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 4 1/4" HSA	
Direction of Boring: ☒ Vertical ☐ Inclined:	Size and Type of Sampler: 5.0' Split Spoon	
Thickness of Overburden: 10 feet	Drill Rig Manufacturer: Mobile B-58	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 10 feet	Total Number of Core Boxes: 0	
Log Prepared By: LN	Date Started: 1-19-11	Date Completed: 1-19-11
Remarks: All depths are in ft-bls.	Total Core Recovery: 10	



Lithology	Classification of Materials	USCS
Asphalt	Approximately 1.2" layer of asphalt.	
CLAY	Yellowish orange very fine to fine grained clay, soft to moderately stiff, not plastic, damp to wet, no odor.	CL
CLAY	****Saturated @ approximately 3 ft-bls****	
CLAY	Yellowish orange to light brown very fine to fine grained clay, soft to moderately stiff, not plastic, saturated, no odor.	CL
CLAY	Yellowish orange to light brown very fine grained clay, limestone fragments abundant, moderately stiff, slightly plastic, saturated, no odor.	CL
CLAY	Yellowish orange to light brown very fine to fine grained clay, limestone fragments fewer, moderately stiff, not plastic, saturated, no odor.	CL
	****Boring Terminated @ 10 ft-bls****	

Monitoring Well Completion Log

CDG Engineers & associates
562 Cahaba Valley Road
Pelham, Alabama 35124
(205) 733-9431

Project: Rainbow Food Mart #102

Job Number: 320700535	Auger Size: 4 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-12	Date: 1-19-11

Materials Used:

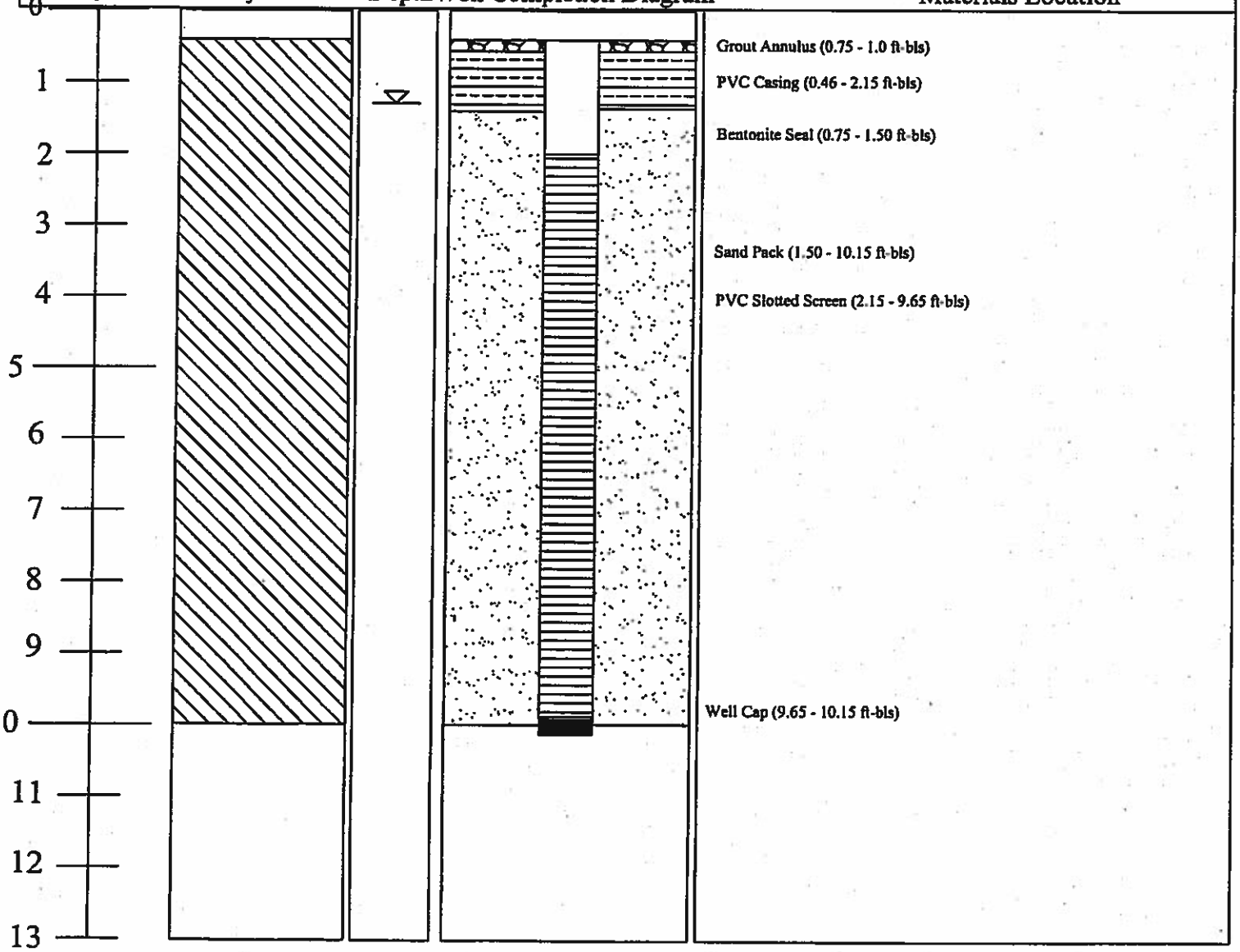
5.0 Sacks of 0.85 mm Sand
1 Sacks of Portland Cement
25 Pounds of Bentonite Pellets
1.69 Feet of 2 Inch Diameter PVC Blank Casing
7.5 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

Method: Bailer Date: 1-20-11

Gallons Removed: 7.5 Turbidity: Clear

Remarks: All depths are measured in ft-bls.

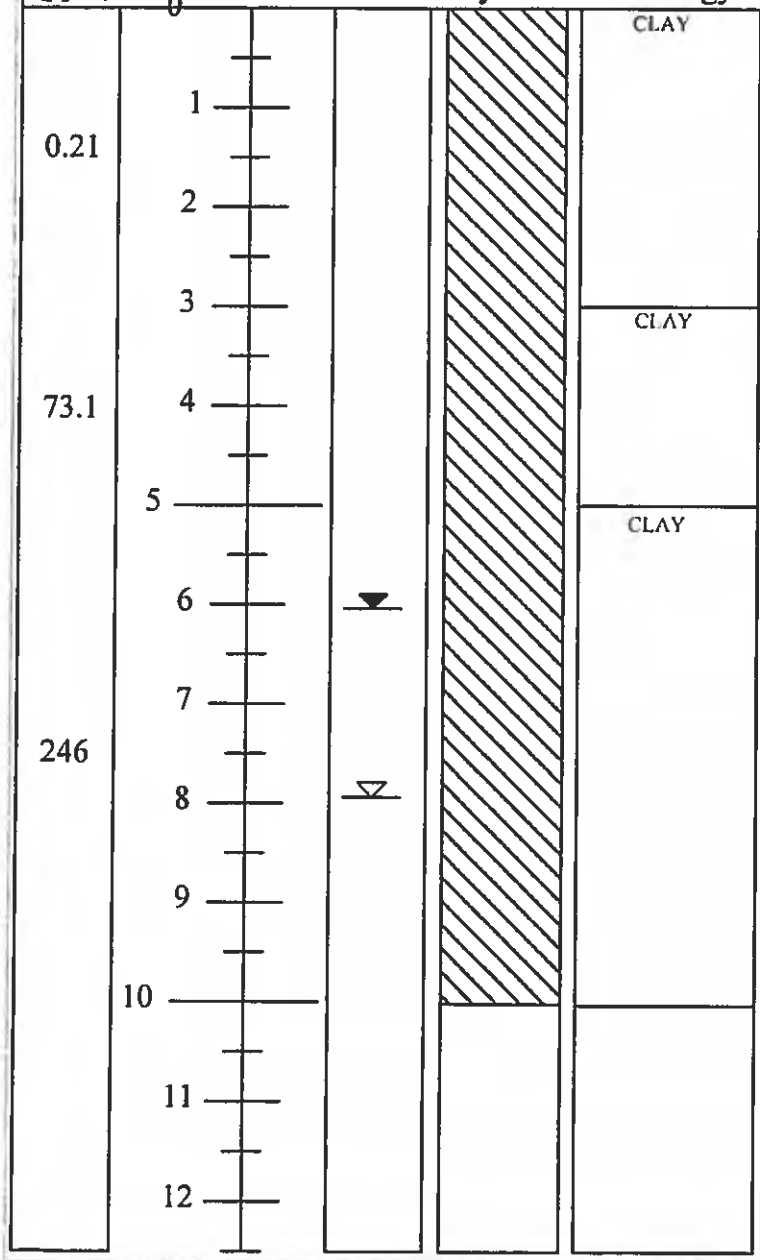


Boring Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Job Number: 320700541	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 535.55	Casing Elev.: 535.30
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 527.38	
Boring ID: SB-13/MW-13	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 3 1/4" HSA	
Direction of Boring: [X] Vertical [ ] Inclined:	Size and Type of Sampler:	
Thickness of Overburden: 10 feet	Drill Rig Manufacturer: Bobcat	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 10 feet	Total Number of Core Boxes: 0	
Log Prepared By: AD/DD	Date Started: 10-9-13	Date Completed: 10-9-13
Remarks: All depths are in ft-bls.	Total Core Recovery: 10	



PID (ppm)	Lithology	Classification of Materials	USCS
0.21	CLAY	Orange to brown clay. Some silt present. Some plasticity. Damp. No hydrocarbon odor.	CL
73.1	CLAY	Tan to orange clay. Very plastic. Minimal silt present. Damp. Heavy hydrocarbon odor.	CL
246	CLAY	SAA	CL
		Groundwater encountered @ 6 ft-bls during drilling activities.	
		Groundwater encountered @ 7.92 ft-btoc during sampling activities.	
		****Boring Terminated @ 10 ft-bls****	

Monitoring Well Completion Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Project: Rainbow Food Mart #102

Job Number: 320700541	Auger Size: 6 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-13	Date: 10-9-13

Materials Used:

- 5.0 Sacks of 0.85 mm Sand
- 1 Sacks of Portland Cement
- 20 Pounds of Bentonite Pellets
- 4 Feet of 2 Inch Diameter PVC Blank Casing
- 5 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

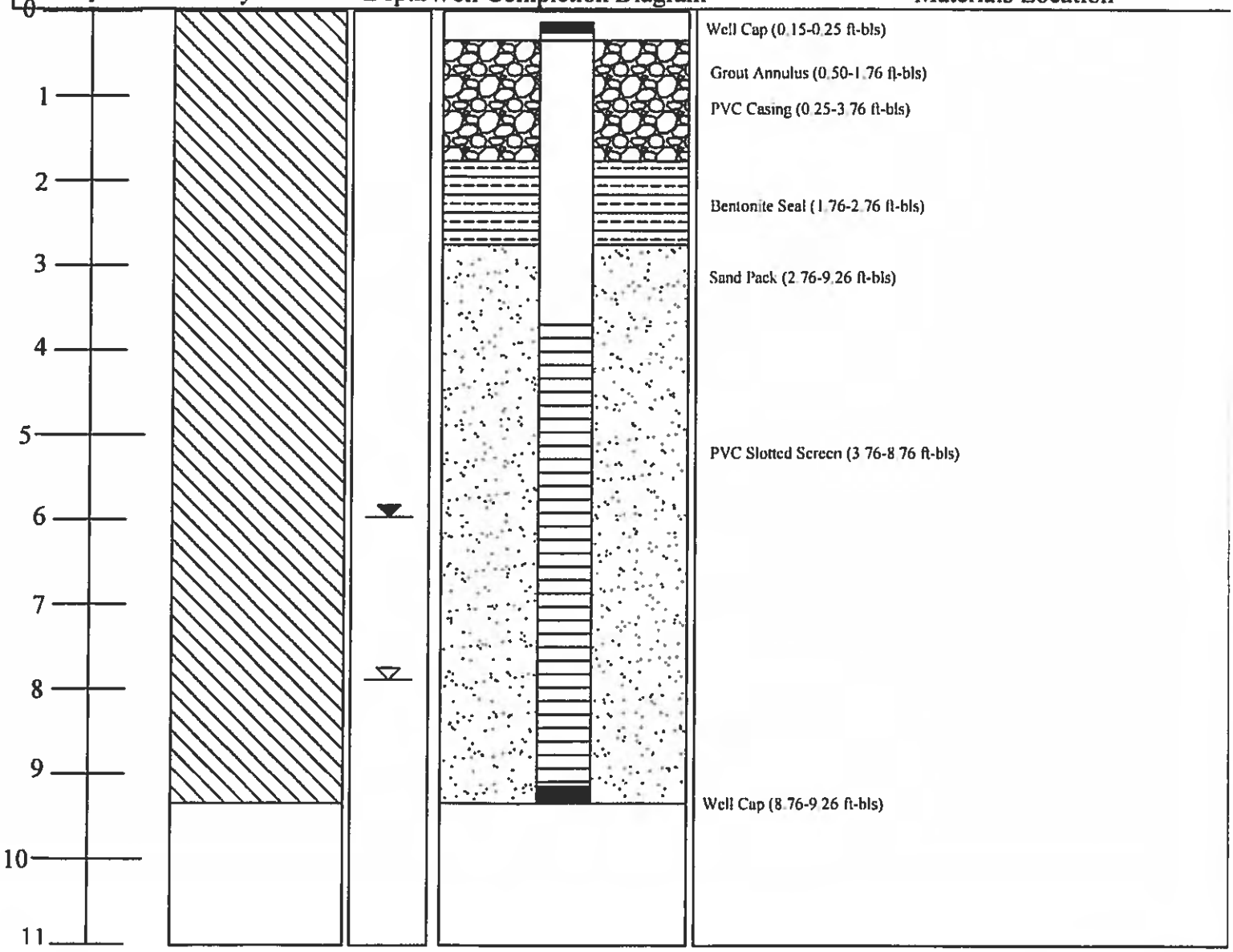
Method: Bailer Date: 11-1-13

Gallons Removed: Turbidity:

Remarks: All depths are measured in ft-bls.

▼ Depth of Water during drilling activities = 6 ft-bls

▽ Depth of Water during sampling activities = 7.92 ft-btoc

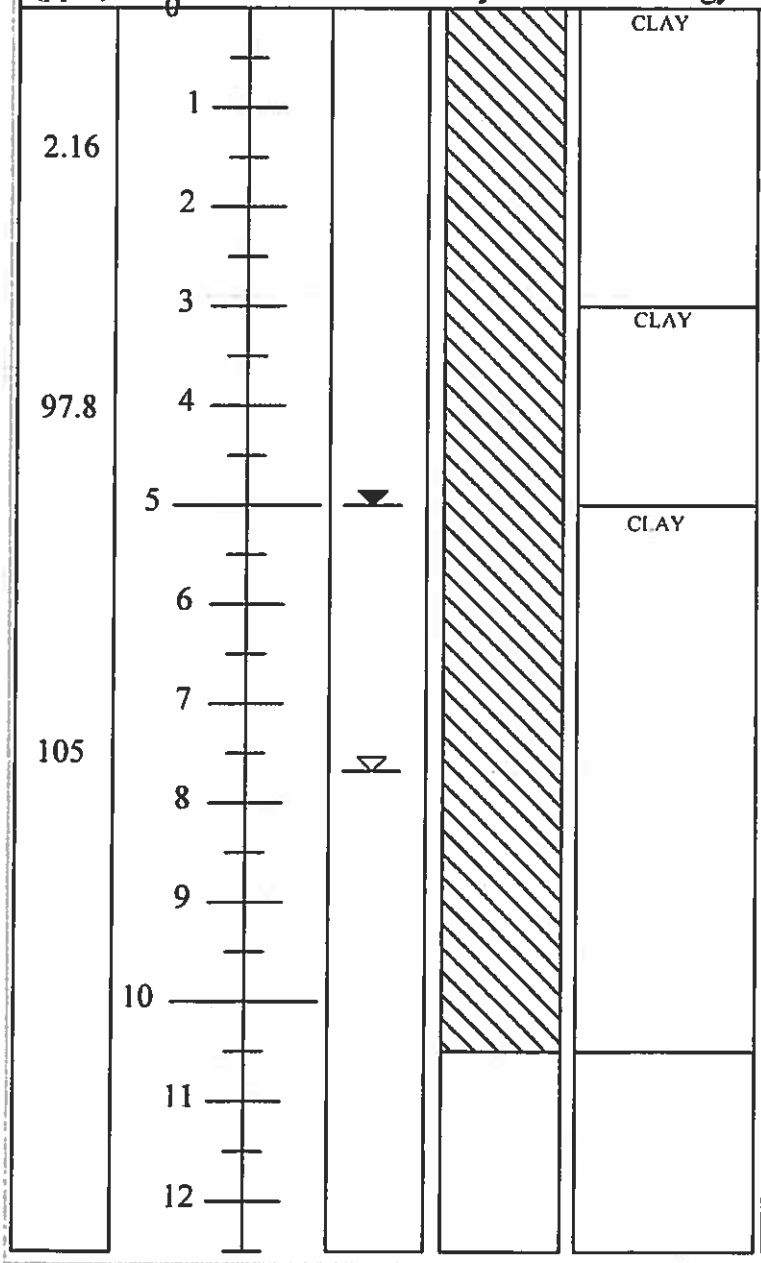


Boring Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Job Number: 320700541	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 536.50	Casing Elev.: 535.99
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 528.36	
Boring ID: SB-14/MW-14	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 3 1/4" HSA	
Direction of Boring: [X] Vertical [ ] Inclined:	Size and Type of Sampler:	
Thickness of Overburden: 10.5 feet	Drill Rig Manufacturer: Bobcat	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 10.5 feet	Total Number of Core Boxes: 0	
Log Prepared By: AD/DD	Date Started: 10-9-13	Date Completed: 10-9-13
Remarks: All depths are in ft-bls.	Total Core Recovery: 10	



PID (ppm)	Lithology	Classification of Materials	USCS
2.16	CLAY	Orange and brown clay. Some silt present. Moderate plasticity. Damp. No hydrocarbon odor.	CL
97.8	CLAY	Tan to orange clay. Slight plasticity. Damp. Heavy hydrocarbon odor.	CL
	CLAY	Groundwater encountered @ 5 ft-bls during drilling activities. SAA.	CL
105		Groundwater encountered @ 7.63 ft-btoc during sampling activities.	
		****Boring Terminated @ 10.5 ft-bls****	

Monitoring Well Completion Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Project: Rainbow Food Mart #102

Job Number: 320700541	Auger Size: 6 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-14	Date: 10-9-13

Materials Used:

5.0 Sacks of 0.85 mm Sand
1 Sacks of Portland Cement
20 Pounds of Bentonite Pellets
5 Feet of 2 Inch Diameter PVC Blank Casing
5 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

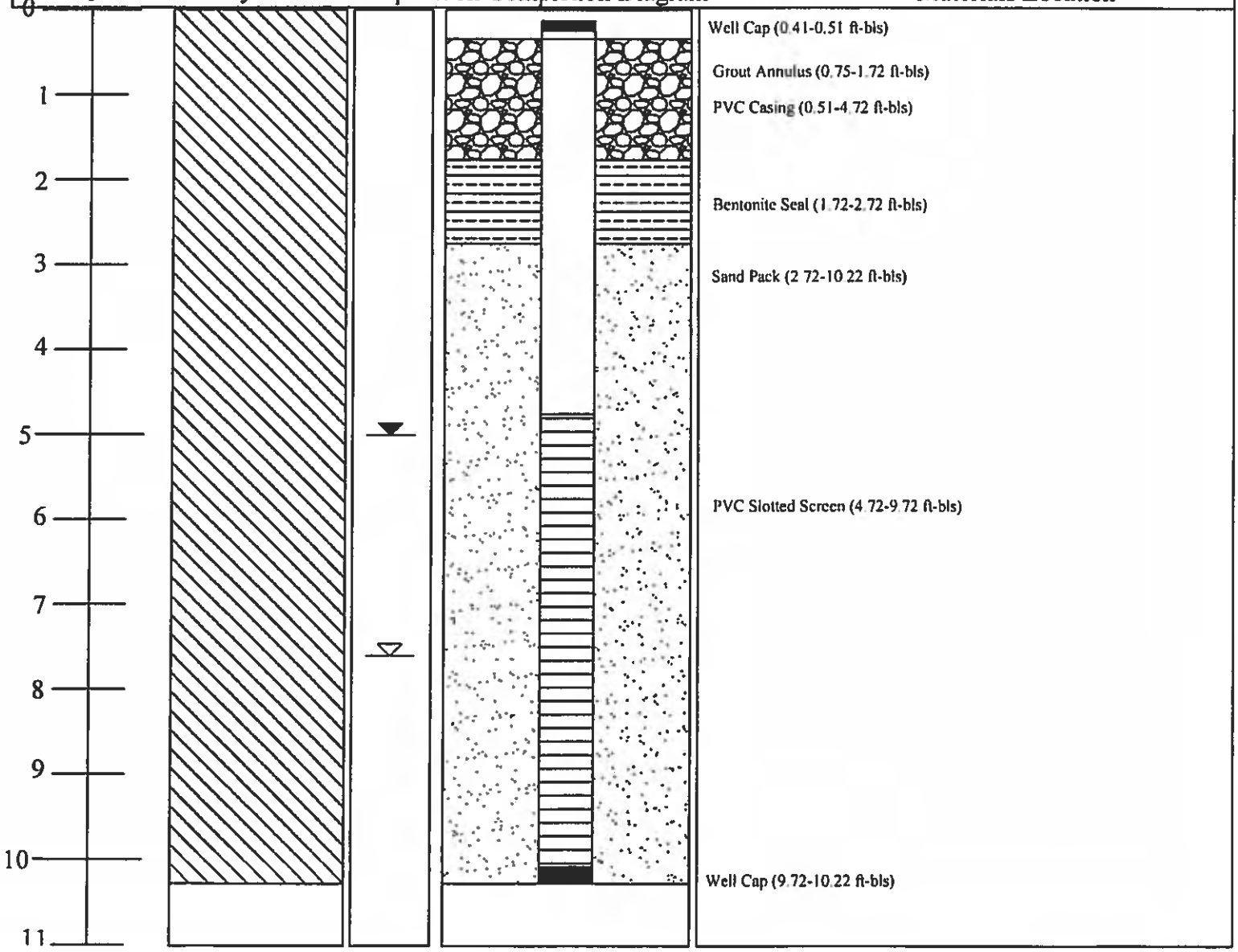
Method: Bailer Date: 11-1-13

Gallons Removed: Turbidity:

Remarks: All depths are measured in ft-bls.

▼ Depth of Water during drilling activities = 5 ft-bls

▽ Depth of Water during sampling activities = 7.63 ft-btoc

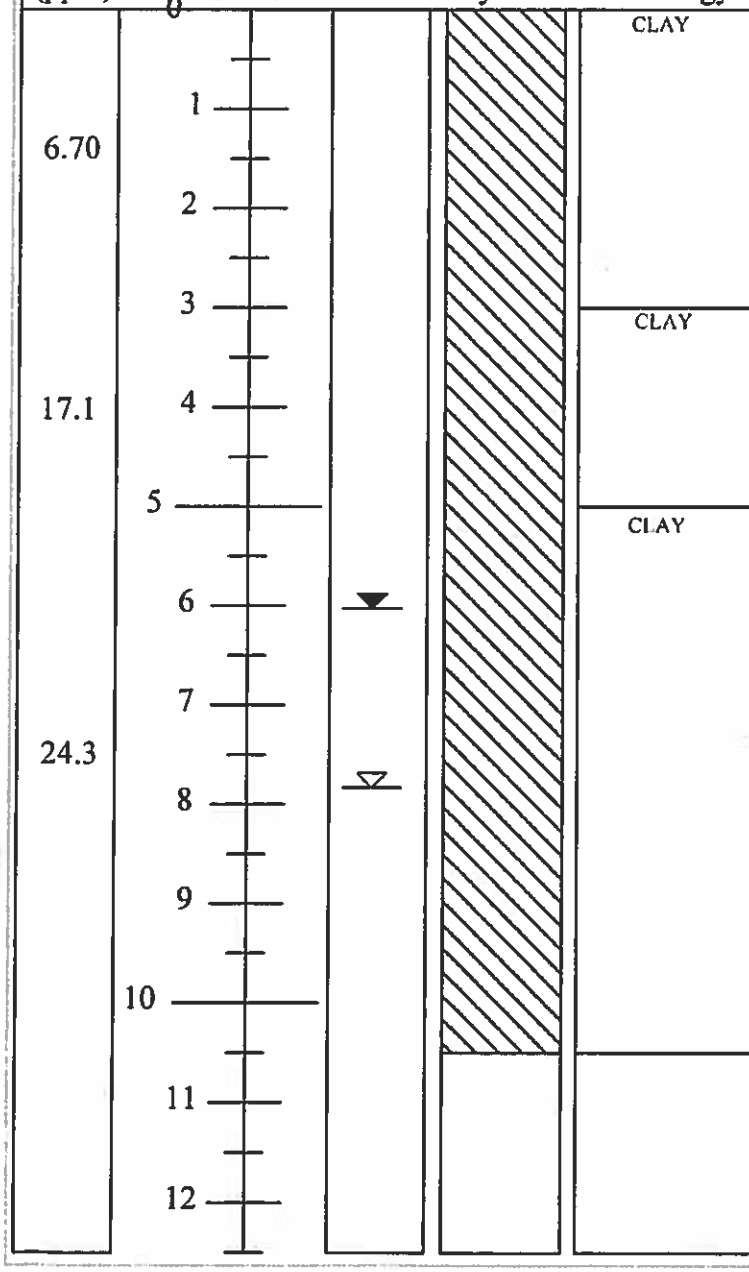


Boring Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Job Number: 320700541	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 536.69	Casing Elev.: 536.29
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 528.44	
Boring ID: SB-15/MW-15	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 3 1/4" HSA	
Direction of Boring: ☒ Vertical ☐ Inclined:	Size and Type of Sampler:	
Thickness of Overburden: 10.5 feet	Drill Rig Manufacturer: Bobcat	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 10.5 feet	Total Number of Core Boxes: 0	
Log Prepared By: AD/DD	Date Started: 10-9-13	Date Completed: 10-9-13
Remarks: All depths are in ft-bls.	Total Core Recovery: 10	



PID (ppm)	Lithology	Classification of Materials	USCS
6.70	CLAY	Tan and brown clay. Some silt present. Moderate plasticity. Very dense. Damp. No hydrocarbon odor.	CL
17.1	CLAY	Tan clay. Some silt present. Moderate plasticity. Moderately dense. Damp. Heavy hydrocarbon odor.	CL
	CLAY	SAA. Wet.	CL
		Groundwater encountered @ 6 ft-bls during drilling activities.	
		Groundwater encountered @ 7.85 ft-btoc during sampling activities.	
		****Boring Terminated @ 10.5 ft-bls****	

Monitoring Well Completion Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Project: Rainbow Food Mart #102

Job Number: 320700541	Auger Size: 6 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-15	Date: 10-9-13

Materials Used:

- 5.0 Sacks of 0.85 mm Sand
- 1 Sacks of Portland Cement
- 20 Pounds of Bentonite Pellets
- 5 Feet of 2 Inch Diameter PVC Blank Casing
- 5 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

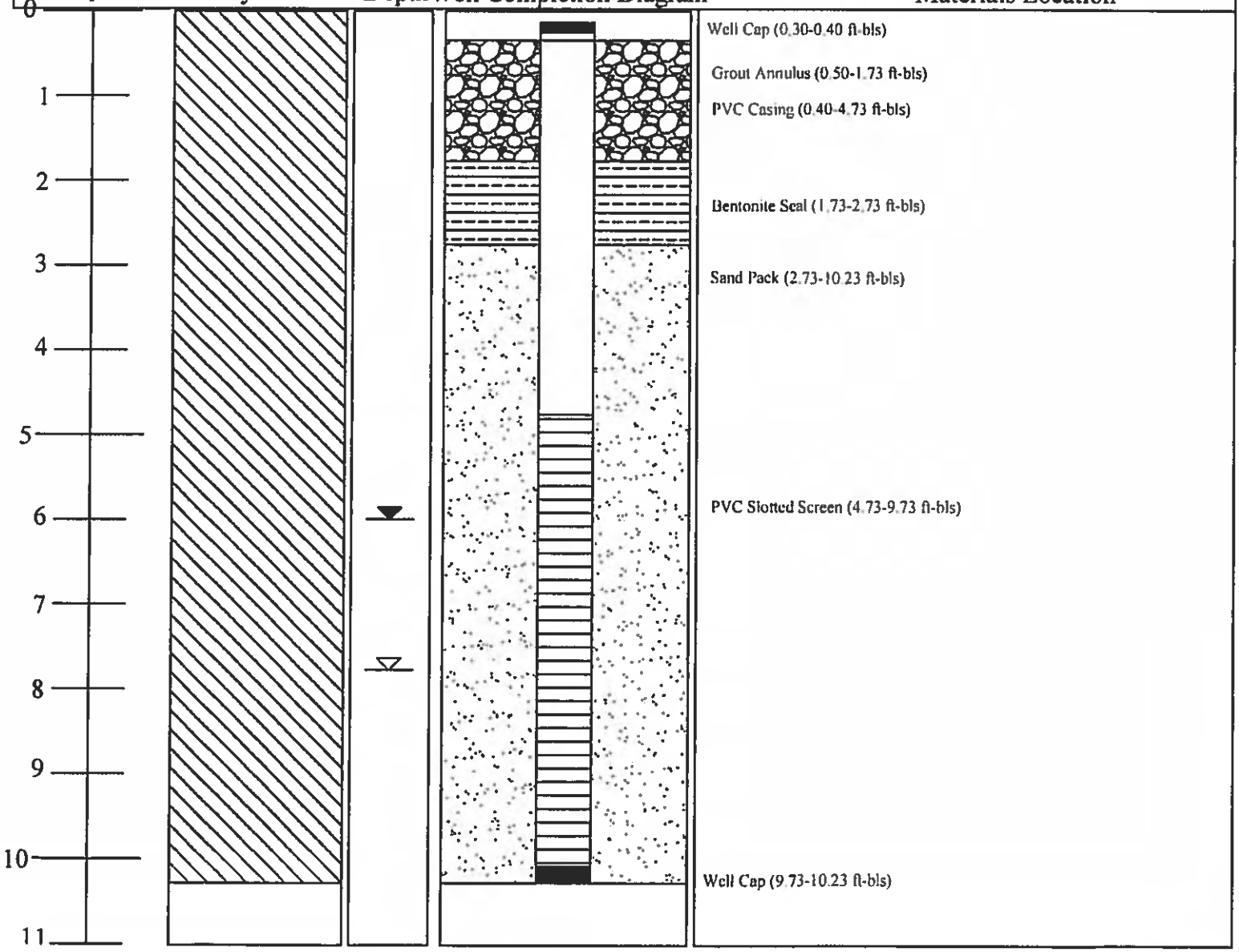
Method: Bailer Date: 11-1-13

Gallons Removed: Turbidity:

Remarks: All depths are measured in ft-bls.

▼ Depth of Water during drilling activities = 6 ft-bls

▽ Depth of Water during sampling activities = 7.85 ft-btoc

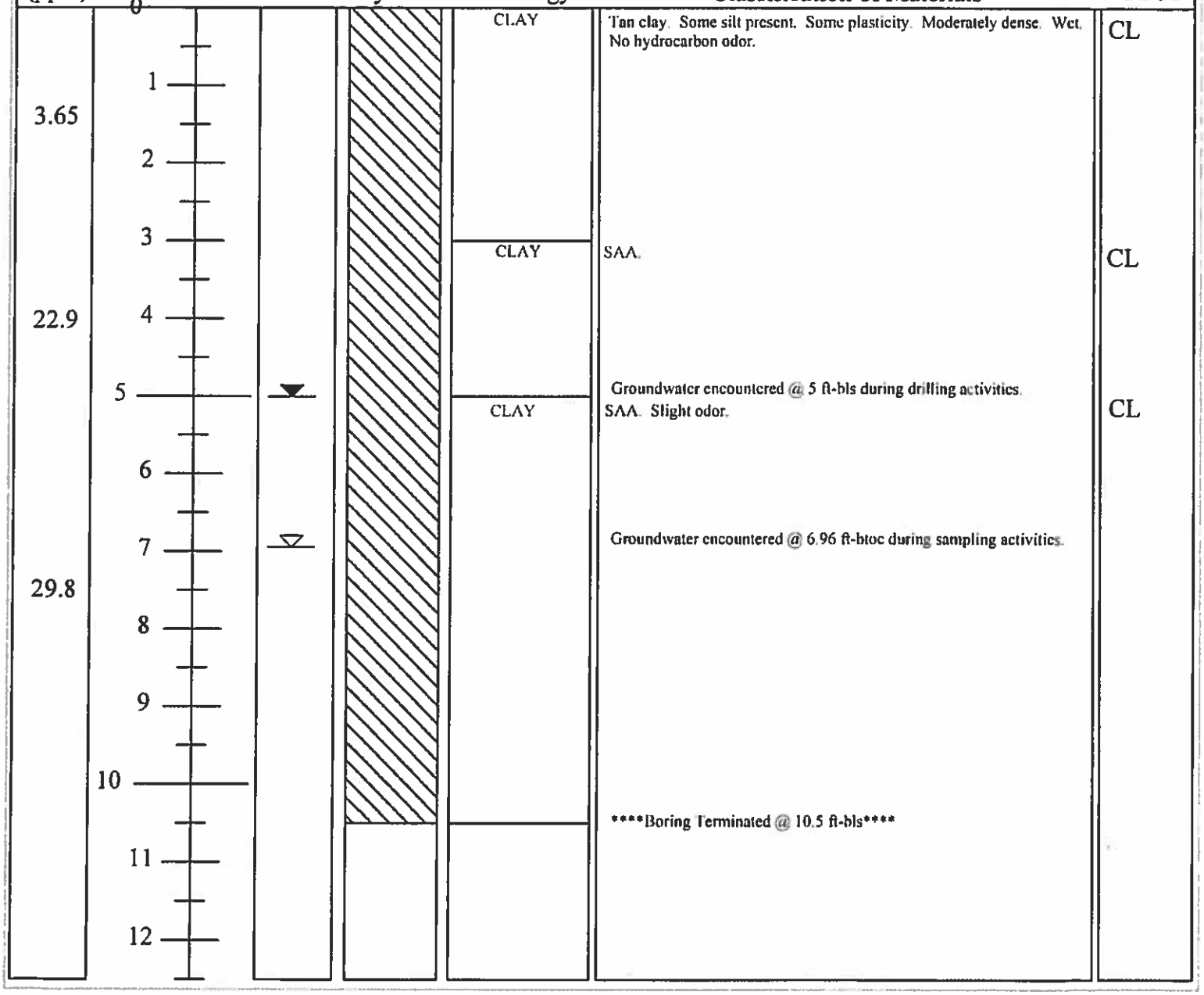


Boring Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Job Number: 320700541	Client: Hollar Oil Company, Inc.	Sheet 1 of 1
Project: Rainbow Food Mart #102	Ground Elevation: 535.71	Casing Elev.: 535.27
Location: 901 Cleveland Avenue, Attalla, Alabama	Groundwater Elevation: 528.31	
Boring ID: SB-16/MW-16	Datum Elevation: (TBM or MSL) MSL	
Driller: CDG Engineers & Associates, Inc.	Size and Type of Auger: 3 1/4" HSA	
Direction of Boring: ☒ Vertical ☐ Inclined:	Size and Type of Sampler:	
Thickness of Overburden: 10.5 feet	Drill Rig Manufacturer: Bobcat	
Depth Drilled into Rock: 0	No. of Overburden Samples: Disturbed 2	Undisturbed 0
Total Depth of Boring: 10.5 feet	Total Number of Core Boxes: 0	
Log Prepared By: AD/DD	Date Started: 10-9-13	Date Completed: 10-9-13
Remarks: All depths are in ft-bls.	Total Core Recovery: 10	



Monitoring Well Completion Log

CDG Engineering Environmental Answers

100 Concourse Pkwy, Suite 170
Birmingham, Alabama 35244
(205) 403-2600

Project: Rainbow Food Mart #102

Job Number: 320700541	Auger Size: 6 1/4" HSA
Location: 901 Cleveland Avenue, Attalla, Alabama	Water Used for Well Completion: 0 Gallons
Client: Hollar Oil Company, Inc.	Decontamination Method: Steam
Boring Identification: MW-16	Date: 10-9-13

Materials Used:

- 5.0 Sacks of 0.85 mm Sand
- 1 Sacks of Portland Cement
- 20 Pounds of Bentonite Pellets
- 5 Feet of 2 Inch Diameter PVC Blank Casing
- 5 Feet of 2 Inch Diameter 0.010 Inch Slotted Screen

Well Development:

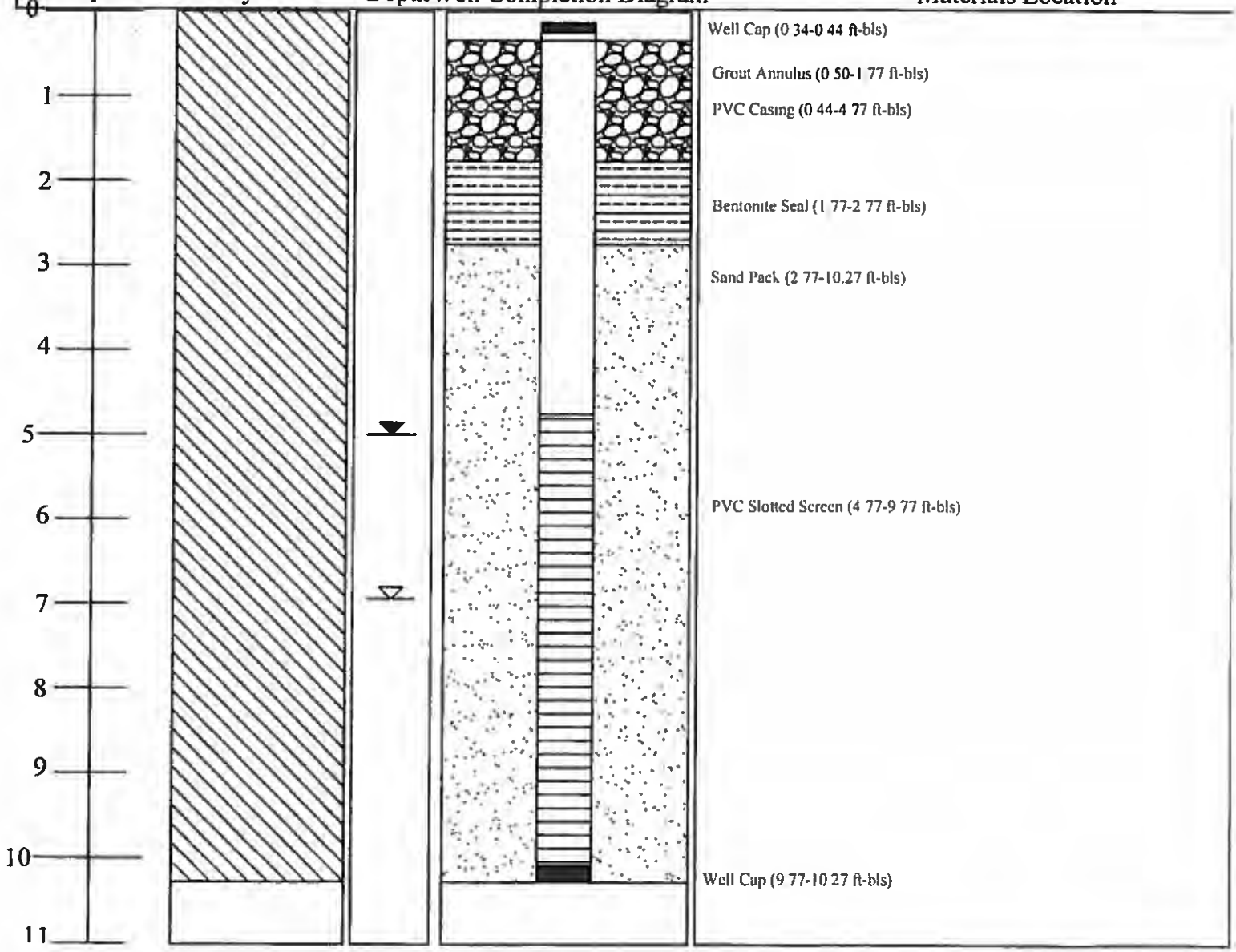
Method: Bailer Date: 11-1-13

Gallons Removed: Turbidity:

Remarks: All depths are measured in ft-bls.

▼ Depth of Water during drilling activities = 5 ft-bls

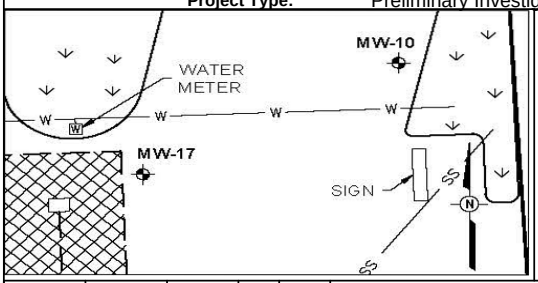
▽ Depth of Water during sampling activities = 6.96 ft-btoc



PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-17



Boring Information:

Date / Time / Logged By:	8/27/14 / 6:50 - 7:50 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	5.20' (9/3/14)
Surface Elevation (ft):	533.6'
Sampling Interval:	5' Centers

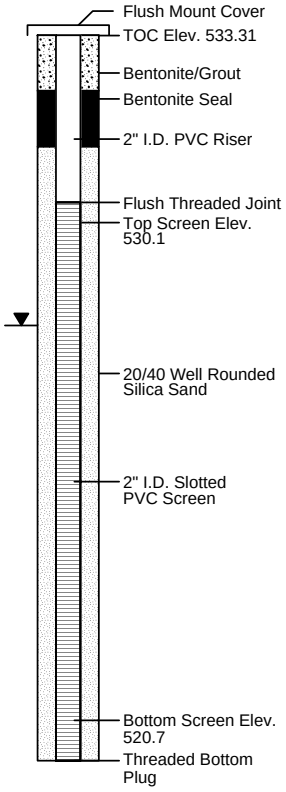
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/27/14
Total Well Depth:	13.2' BTOC
Screened Interval:	3.2' - 12.6'
Development Method:	Pump
Gallons Purged:	6.5 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.533.6	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	533				CONCRETE			
2	531							
4	529		▼		SILTY CLAY, tan/olive color, sitff, fragments of weathered rock, medium plastic, medium petroleum-like odor	1	70	3,300*
6	527	CL			SILTY CLAY, tan with abundent amount of weathered rock, hard, non-plastic, slight petroleum-like odor	2	60	590
8	525							
10	523				SILTY CLAY, tan, with weathered limestone, brittle, no odor, non-plastic	3	60	630
12	521							
14	519				*(Boring terminated @ 13.5' BGS)*			
16	517							
18	515							
20								

Well Schematic: MW-17



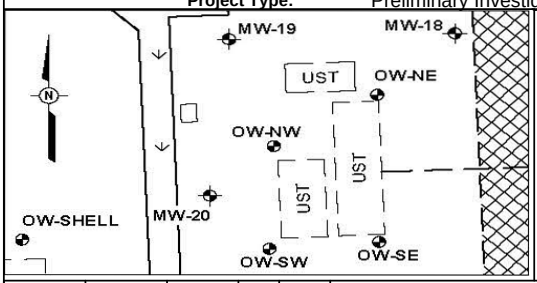
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PIMW-17.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-18



Boring Information:

Date / Time / Logged By:	8/26/14 / 17:35 - 18:45 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	4.23' (9/3/14)
Surface Elevation (ft):	533.5'
Sampling Interval:	5' Centers

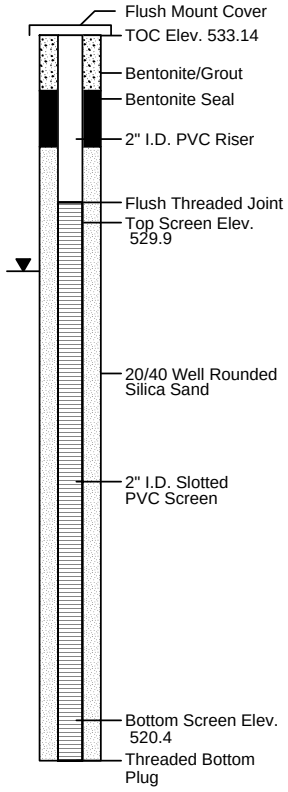
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/26/14
Total Well Depth:	13.3' BTOC
Screened Interval:	3.3-12.7'
Development Method:	Pump
Gallons Purged:	7.4 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.533.5	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	533				CONCRETE			
2	531							
4	529		▼		SILTY CLAY, gray with orangish-tan, mottled, medium stiff, strong petroleum-like odor, slightly plastic, with weathered rock	1		11,000*
6	527	CL			SILTY CLAY, tan with light olive, weathered rock, stiff, very strong petroleum-like odor, non-plastic	2		7,200
8	525							
10	523							
12	521				SILTY CLAY, tan, light brown, abundant amount of gray weathered rock, no odor, non-plastic	3		70
14	519				*(Boring terminated @ 13.5' BGS)*			
16	517							
18	515							
20								

Well Schematic: MW-18



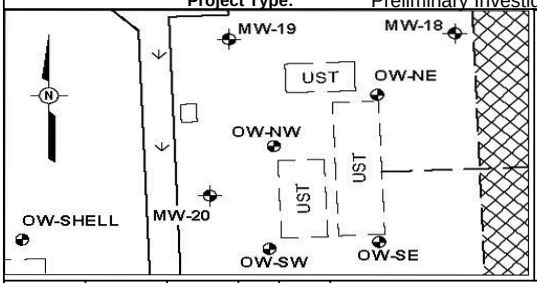
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PI\MW-18.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-19



Boring Information:

Date / Time / Logged By:	8/26/14 / 13:00 - 13:48 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	4.33' (9/3/14)
Surface Elevation (ft):	533.4'
Sampling Interval:	5' Centers

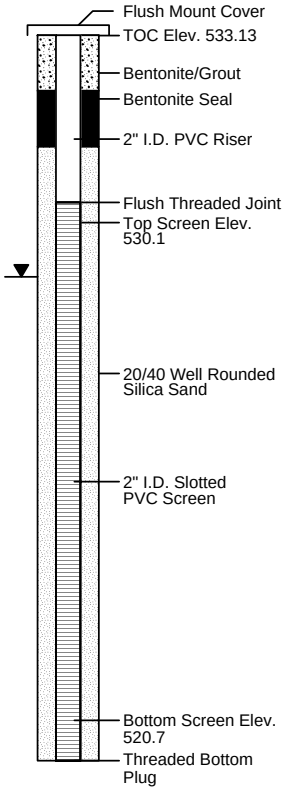
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/26/14
Total Well Depth:	13.0' BTOC
Screened Interval:	3.0-12.4'
Development Method:	Pump
Gallons Purged:	7.1 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.533.4	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	533				CONCRETE			
2	531				CLAY, orangish tan, firm, some organic material (wood), dull petroleum-like odor	1		50
4	529		▼		SILTY CLAY, grayish - olive brown, firm, small amount of weathered rock, strong petroleum-like odor, high plastic	2		11,000*
6	527	CL			SILTY CLAY, orangish tan, firm, small amount of weatherd rock, moderate petroleum-like odor, high plastic	3		2,950
8	525							
10	523				SILTY CLAY, orangish tan with some gray, medium stiffness, gray weathered limestone at 11.5' - 12' BGS, high plastic, no odor	4		3,500
12	521							
14	519				*(Boring terminated @ 13.5' BGS)*			
16	517							
18	515							
20								

Well Schematic: MW-19



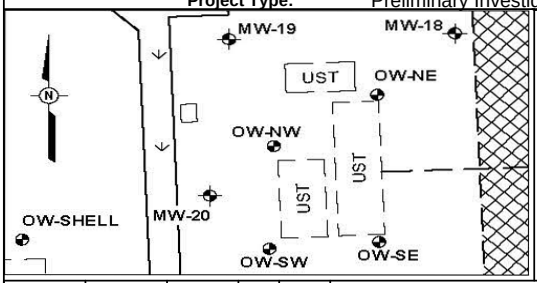
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PI\MW-19.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-20



Boring Information:

Date / Time / Logged By:	8/26/14 / 10:15 - 11:25 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	16.0' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	3.36' (9/3/14)
Surface Elevation (ft):	534.3'
Sampling Interval:	continuous

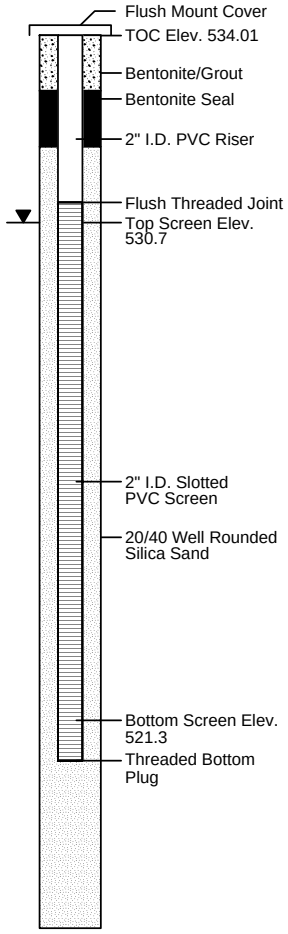
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/26/14
Total Well Depth:	13.3' BTOC
Screened Interval:	3.3-12.7'
Development Method:	Pump
Gallons Purged:	8.1 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.534.3	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	534				CONCRETE			
					CLAY, brownish gray, plastic, very moist, dull petroleum-like odor			
2	532		▼		SILTY CLAY, orangish tan, firm, moist, slight petroleum-like odor to 3' then moderate odor, gray-black staining and strong odor at 4'			
4	530				SILTY CLAY, grayish olive-brown, firm, moist, strong petroleum-like odor, some gray and orange mottling	1		11,000*
6	528				SILTY CLAY, grayish olive-brown, firm, moist, some weathered rock, strong petroleum-like odor	2		11,000*
8	526	CL			SILTY CLAY, tan, gray, abundant weathered rock, slight petroleum-like odor	3		70
10	524				SILTY CLAY, orange mottled with gray, firm, moist, no odor	4		0
12	522				SILTY CLAY, orange with some gray, gray in last 3", moist, no odor	5		0
14	520				SILTY CLAY, gray, dark brown, friable in places, moist, no odor	6		0
16	518				*(Boring terminated @ 16.0' BGS)*			
18	516							
20								

Well Schematic: MW-20



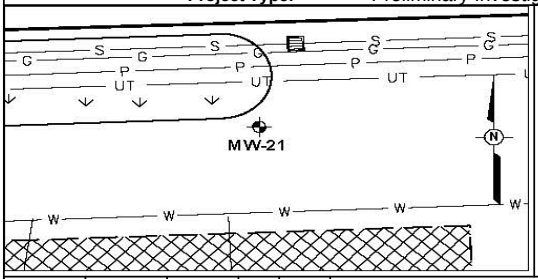
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PIMW-20.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-21



Boring Information:

Date / Time / Logged By:	8/26/14 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	4.40' (9/3/14)
Surface Elevation (ft):	531.9'
Sampling Interval:	5' Centers

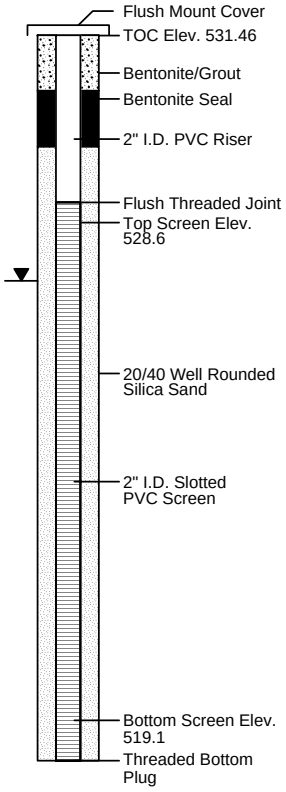
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/26/14
Total Well Depth:	12.9' BTOC
Screened Interval:	2.9-12.3'
Development Method:	Pump
Gallons Purged:	6.9 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.531.9	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0					CONCRETE			
	531				SILTY CLAY, orangish tan, very moist, firm, slight odor on fresh break			
2								
	529					1		25
4			▼		SILTY CLAY, orangish tan, mottled with gray, moist, firm, possible faint odor			
	527					2		60*
6		CL			SILTY CLAY, olive gray, firm, abundant rock fragments, moist, no odor			
	525					3		35
8								
	523							
10								
	521							
12		ML			CLAYEY SILT, brownish tan, abundant weathered rock fragments, slightly moist, no odor	4		10
	519							
14					*(Boring terminated @ 13.5' BGS)*			
	517							
16								
	515							
18								
	513							
20								

Well Schematic: MW-21



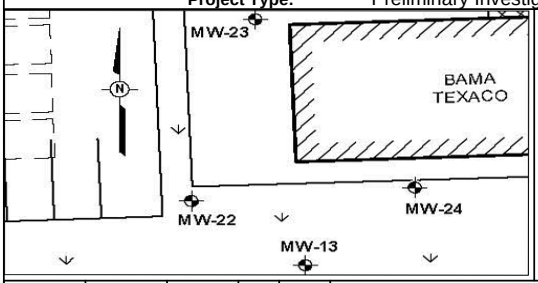
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PI\MW-21.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-22



Boring Information:

Date / Time / Logged By:	8/27/14 / 9:45 - 11:35 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	8.07' (9/3/14)
Surface Elevation (ft):	535.6'
Sampling Interval:	5' Centers

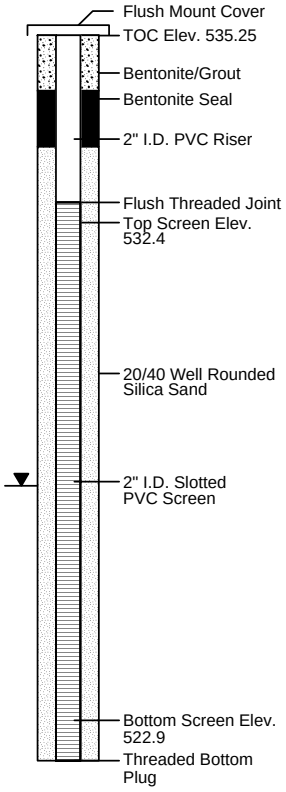
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/27/14
Total Well Depth:	12.9' BTOC
Screened Interval:	2.9-12.3'
Development Method:	Pump
Gallons Purged:	4.0 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.535.6	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	535				GRASS			
2	533							
4	531	CL	▼		SILTY CLAY, orangish tan, hard, high plastic, small amount of weathered rock, strong petroleum-like odor	1		2,400
6	529				SILTY CLAY, gray-tan, with mostly weathered rock, no plastic, brittle, very strong petroleum-like odor	2		11,000*
8	527							
10	525				SILTY CLAY, tan-brown, firm, with weathered rock, brittle, very strong petroleum-like odor, no plastic	3		5,250
12	523							
14	521				*(Boring terminated @ 13.5' BGS)*			
16	519							
18	517							
20								

Well Schematic: MW-22



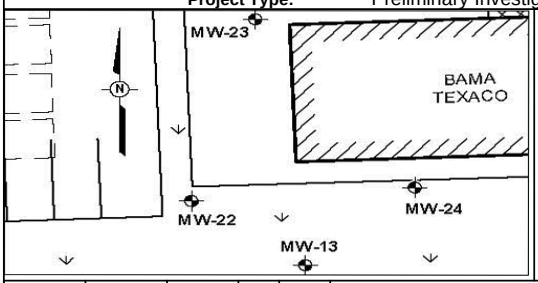
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PI\MW-22.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-23



Boring Information:

Date / Time / Logged By:	8/26/14 / 17:05 - 17:35 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	4.52' (9/3/14)
Surface Elevation (ft):	534.7'
Sampling Interval:	5' Centers

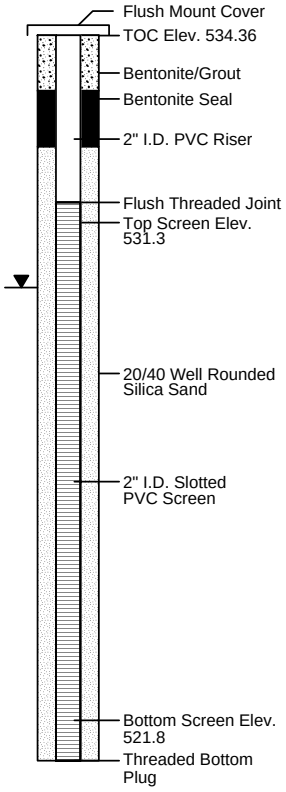
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/26/14
Total Well Depth:	13.1' BTOC
Screened Interval:	3.1' - 12.5'
Development Method:	Pump
Gallons Purged:	7.0 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev. 534.7	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	534				CONCRETE			
2	532							
4	530	CL	▼		SILTY CLAY, orangish-tan, with gray weathered rock, stiff, strong petroleum-like odor, slightly plastic	1		7,850*
6	528				SILTY CLAY, grayish brown, weathered limestone, stiff, strong petroleum-like odor, slightly plastic	2		11,000*
8	526							
10	524				SILTY CLAY, brownish-gray with gray weathered rock, stiff, strong petroleum-like odor	3		5
12	522							
14	520				*(Boring terminated @ 13.5' BGS)*			
16	518							
18	516							
20								

Well Schematic: MW-23



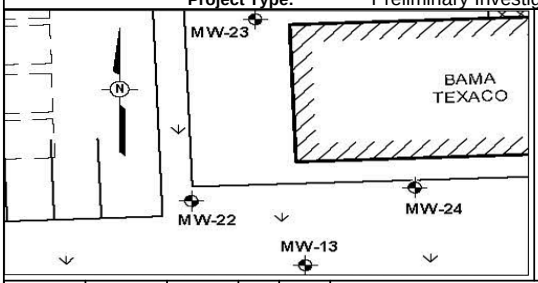
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PI\MW-23.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-24



Boring Information:

Date / Time / Logged By:	8/27/14 / 12:45 - 14:00/ HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	6.75' (9/3/14)
Surface Elevation (ft):	535.2'
Sampling Interval:	5' Centers

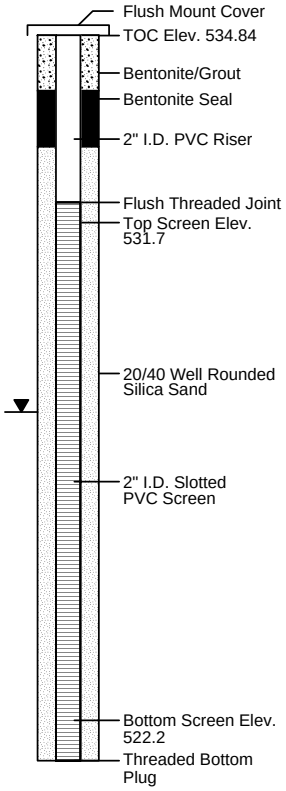
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/27/14
Total Well Depth:	13.2' BTOC
Screened Interval:	3.2' - 12.6'
Development Method:	Pump
Gallons Purged:	5.2 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev.535.2	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	535				GRASS			
2	533							
4	531				SILTY CLAY, tan-olive with weathered rock, medium brittle, strong petroleum-like odor	1		5,750*
6	529	CL	▼		Same as above - very strong petroleum-like odor	2		11,000*
8	527							
10	525							
12	523				SILTY CLAY, brown to olive from 11'-11.5', then SILTY CLAY with abundant amount of weathered rock fragments gray in color, brittle, no plastic, strong petroleum-like odor	3		4,550
14	521				*(Boring terminated @ 13.5' BGS)*			
16	519							
18	517							
20								

Well Schematic: MW-24



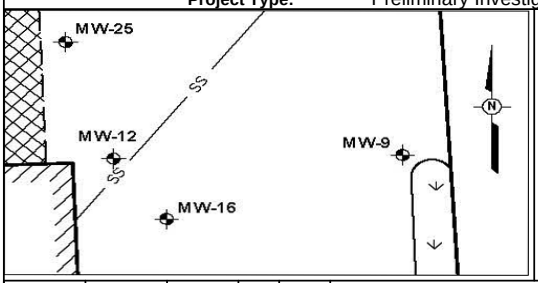
NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PIMW-24.bor

PPM CONSULTANTS

Client:	Ira Phillips, Inc.
Site:	Bama Texaco
Location:	Attalla, Alabama
Agency Interest No.:	UST14-04-05
PPM Project No.:	451603-PI
Project Type:	Preliminary Investigation

LOG OF BORING MW-25



Boring Information:

Date / Time / Logged By:	8/27/14 / 8:55 - 9:17 / HW
Drilling Company:	Technical Drilling Services, Inc.
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	13.5' BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	5.51' (9/3/14)
Surface Elevation (ft):	534.4'
Sampling Interval:	continuous

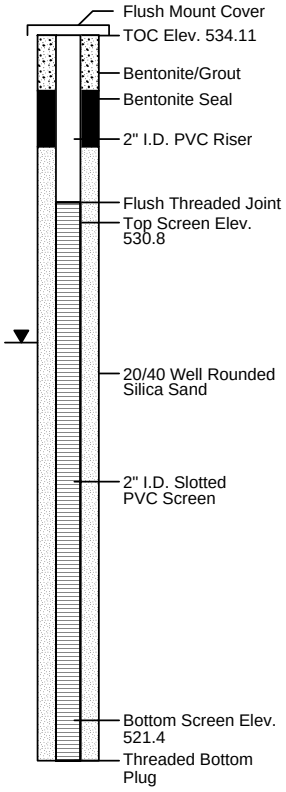
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8/27/14
Total Well Depth:	13.3' BTOC
Screened Interval:	3.3' - 12.7'
Development Method:	Pump
Gallons Purged:	6.3 gallons

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surface Elev. 534.4	USCS Symbol	Water Level	Graphic	DESCRIPTION	Sample No./Interval	Percent Recovery	Headspace Concentration (ppm)
0	534				CONCRETE			
2	532							
4	530		▼		SILTY CLAY, brownish-tan, olive color, weathered rock, firm, slight petroleum-like odor	1		2,550
6	528	CL			SILTY CLAY, orangish-tan, oliver color with weathered rock, stiff, strong petroleum-like odor (fragments of limestone), small amount of organic material	2		11,000*
8	526							
10	524							
12	522				SILTY CLAY, tan-grayish olive, stiff, strong petroleum-like odor, weathered rock	3		320
14	520				*(Boring terminated @ 13.5' BGS)*			
16	518							
18	516							
20								

Well Schematic: MW-25



NOTES:
-Postholed to 4.0' BGS prior to drilling
-*Samples submitted for laboratory analysis
-Headspace analysis conducted using RKI Eagle (calibrated to hexane)

11-07-2014 C:\Program Files\mtech2012\Boring Log files\451603-PI\MW-25.bor

APPENDIX C – TABLES

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-1R	4/28/2014	540.3	539.86	NM	NM	2.60	537.26
	9/3/2014			NM		NM	NM
	9/29/2014			15.0		8.41	531.45
	10/14/2014			NM		NM	NM
	6/24/2015			15.0		5.05	534.81
	10/21/2015			15.0		9.00	530.86
	1/21/2016			14.9		3.67	536.19
	9/19/2016			15.0		8.96	530.90
	1/30/2017			15.0		6.18	533.68
	5/12/2017			NM		3.74	536.12
	1/24/2018			NM		3.78	536.08
	5/22/2018			NM		3.33	536.53
	9/25/2018			14.9		6.12	533.74
MW-2	4/28/2014	539.1	538.57	NM	NM	1.49	537.08
	9/3/2014			NM		NM	NM
	9/29/2014			11.6		5.53	533.04
	10/14/2014			NM		NM	NM
	6/24/2015			11.6		3.51	535.06
	10/21/2015			11.6		5.78	532.79
	1/21/2016			11.6		3.36	535.21
	9/19/2016			11.4		4.83	533.74
	1/30/2017			11.6		4.63	533.94
	5/12/2017			NM		3.49	535.08
	1/24/2018			NM		4.24	534.33
	5/22/2018			NM		3.38	535.19
	9/25/2018			11.6		4.14	534.43
MW-2D	4/28/2014	539.2	538.83	NM	NM	4.13	534.70
	9/3/2014			NM		NM	NM
	9/29/2014			28.0		5.98	532.85
	10/14/2014			NM		NM	NM
	6/24/2015			28.0		4.83	534.00
	10/21/2015			28.0		6.03	532.80
	1/21/2016			28.0		4.75	534.08
	9/19/2016			27.9		6.76	532.07
	1/30/2017			28.0		5.54	533.29
	5/12/2017			NM		NM	NM
	1/24/2018			NM		4.45	534.38
	5/22/2018			NM		4.65	534.18
	9/25/2018			27.8		4.82	534.01
MW-3R	4/28/2014	540.4	539.93	NM	NM	NM	NM
	9/3/2014			NM		NM	NM
	9/29/2014			12.3		9.56	530.37
	10/14/2014			NM		NM	NM
	6/24/2015			12.3		5.87	534.06
	10/21/2015			12.3		10.30	529.63
	1/21/2016			12.3		3.49	536.44
	9/19/2016			12.3		10.38	529.55
	1/30/2017			12.4		5.70	534.23
	5/12/2017			NM		3.90	536.03
	1/24/2018			NM		3.32	536.61
	5/22/2018			NM		3.10	536.83
	9/25/2018			12.3		7.67	532.26

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-4R	4/28/2014	538.3	538.01	NM	NM	3.35	534.66
	9/3/2014			NM		NM	NM
	9/29/2014			10.6		5.85	532.16
	10/14/2014			NM		NM	NM
	6/24/2015			10.6		4.13	533.88
	10/21/2015			10.6		6.00	532.01
	1/21/2016			10.6		3.85	534.16
	9/19/2016			10.6		5.86	532.15
	1/30/2017			10.6		4.71	533.30
	5/12/2017			NM		4.08	533.93
	1/24/2018			NM		4.37	533.64
	5/22/2018			NM		3.94	534.07
	9/25/2018			10.6		4.71	533.30
MW-5R	4/28/2014	537.8	537.61	NM	NM	4.91	532.70
	9/3/2014			NM		NM	NM
	9/29/2014			13.8		5.96	531.65
	10/14/2014			NM		NM	NM
	6/24/2015			13.8		5.43	532.18
	10/21/2015			13.8		6.03	531.58
	1/21/2016			13.8		4.91	532.70
	9/19/2016			13.8		5.65	531.96
	1/30/2017			13.8		5.37	532.24
	5/12/2017			NM		5.27	532.34
	1/24/2018			NM		5.33	532.28
	5/22/2018			NM		5.24	532.37
	9/25/2018			13.8		4.89	532.72
MW-6R	4/28/2014	538.4	537.95	NM	NM	3.45	534.50
	9/3/2014			NM		NM	NM
	9/29/2014			11.0		5.93	532.02
	10/14/2014			NM		NM	NM
	6/24/2015			11.0		4.45	533.50
	10/21/2015			11.0		6.07	531.88
	1/21/2016			11.0		3.91	534.04
	9/19/2016			11.0		5.85	532.10
	1/30/2017			11.0		4.82	533.13
	5/12/2017			NM		4.16	533.79
	1/24/2018			NM		4.54	533.41
	5/22/2018			NM		4.02	533.93
	9/25/2018			11.0		4.67	533.28
MW-9	4/28/2014	539.1	538.74	NM	NM	4.48	534.26
	9/3/2014			NM		NM	NM
	9/29/2014			14.0		7.28	531.46
	10/14/2014			NM		7.13	531.61
	6/24/2015			14.0		5.51	533.23
	10/21/2015			14.0		7.50	531.24
	1/21/2016			14.0		5.10	533.64
	9/19/2016			14.0		7.12	531.62
	1/30/2017			14.1		6.22	532.52
	5/12/2017			14.1		5.09	533.65
	1/24/2018			14.0		5.65	533.09
	5/22/2018			14.3		4.98	533.76
	9/25/2018			14.2		6.01	532.73

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-10	4/28/2014	536.7	536.31	NM	NM	4.37	531.94
	9/3/2014			NM		NM	NM
	9/29/2014			14.2		5.26	531.05
	10/14/2014			NM		4.66	531.65
	6/24/2015			14.2		5.02	531.29
	10/21/2015			14.2		5.42	530.89
	1/21/2016			14.1		4.71	531.60
	9/19/2016			14.2		5.22	531.09
	1/30/2017			14.3		4.90	531.41
	5/12/2017			14.3		4.82	531.49
	1/24/2018			14.2		4.79	531.52
	5/22/2018			14.3		4.78	531.53
	9/25/2018			14.3		4.75	531.56
MW-11	4/28/2014	535.8	535.42	NM	NM	2.88	532.54
	9/3/2014			NM		NM	NM
	9/29/2014			9.4		5.49	529.93
	10/14/2014			NM		NM	NM
	6/24/2015			9.4		3.71	531.71
	10/21/2015			9.4		5.20	530.22
	1/21/2016			9.4		2.72	532.70
	9/19/2016			9.4		5.27	530.15
	1/30/2017			9.4		2.90	532.52
	5/12/2017			NM		3.20	532.22
	1/24/2018			NM		3.23	532.19
	5/22/2018			NM		3.09	532.33
	9/25/2018			9.4		4.41	531.01
MW-12	4/28/2014	538.4	538.05	NM	NM	1.61	536.44
	9/3/2014			NM		NM	NM
	9/29/2014			9.6		5.78	532.27
	10/14/2014			NM		3.86	534.19
	6/24/2015			9.6		2.15	535.90
	10/21/2015			9.8		5.75	532.30
	1/21/2016			9.7		1.81	536.24
	9/19/2016			9.7		3.63	534.42
	1/30/2017			9.7		1.52	536.53
	5/12/2017			9.7		1.51	536.54
	1/24/2018			9.7		2.34	535.71
	5/22/2018			9.7		1.49	536.56
	9/25/2018			9.7		2.30	535.75
MW-13	4/28/2014	539.2	538.69	NM	NM	5.19	533.50
	9/3/2014			NM		NM	NM
	9/29/2014			9.3		7.68	531.01
	10/14/2014			NM		2.41	536.28
	6/24/2015			9.3		5.82	532.87
	10/21/2015			9.3		7.82	530.87
	1/21/2016			9.3		4.33	534.36
	1/21/2016			9.2		6.50	532.19
	1/30/2017			9.3		3.02	535.67
	5/12/2017			9.3		4.38	534.31
	1/24/2018			9.0		5.04	533.65
	5/22/2018			9.3		4.01	534.68
	9/25/2018			9.3		6.33	532.36

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-14	4/28/2014	539.7	539.09	NM	NM	4.44	534.65
	9/3/2014			NM		NM	NM
	9/29/2014			10.2		7.63	531.46
	10/14/2014			NM		3.05	536.04
	6/24/2015			10.2		5.35	533.74
	10/21/2015			10.2		8.17	530.92
	1/21/2016			10.2		4.98	534.11
	9/19/2016			10.1		7.53	531.56
	1/30/2017			10.2		6.27	532.82
	5/12/2017			10.2		5.08	534.01
	1/24/2018			10.2		5.48	533.61
	5/22/2018			10.2		4.77	534.32
	9/25/2018			10.2		6.40	532.69
MW-15	4/28/2014	539.8	539.34	NM	NM	4.17	535.17
	9/3/2014			NM		NM	NM
	9/29/2014			10.3		8.04	531.30
	10/14/2014			NM		8.30	531.04
	6/24/2015			10.3		5.95	533.39
	10/21/2015			10.3		8.47	530.87
	1/21/2016			10.3		4.97	534.37
	9/19/2016			10.3		8.13	531.21
	1/30/2017			10.3		6.87	532.47
	5/12/2017			10.3		5.01	534.33
	1/24/2018			10.3		5.36	533.98
	5/22/2018			10.3		4.60	534.74
	9/25/2018			10.3		6.77	532.57
MW-16	4/28/2014	538.8	538.40	NM	NM	4.22	534.18
	9/3/2014			NM		NM	NM
	9/29/2014			10.3		6.95	531.45
	10/14/2014			NM		6.97	531.43
	6/24/2015			10.3		5.73	532.67
	10/21/2015			10.3		7.17	531.23
	1/21/2016			10.2		4.80	533.60
	9/19/2016			10.2		6.85	531.55
	1/30/2017			10.2		5.89	532.51
	5/12/2017			10.3		4.87	533.53
	1/24/2018			10.2		5.33	533.07
	5/22/2018			10.3		5.79	532.61
	9/25/2018			10.2		5.63	532.77
MW-17	9/3/2014	536.9	536.64	NM	3.2-12.6	5.20	531.44
	9/29/2014			13.2		5.40	531.24
	10/14/2014			NM		5.27	531.37
	6/24/2015			13.2		5.74	530.90
	10/21/2015			13.2		5.52	531.12
	1/21/2016			13.2		4.83	531.81
	9/19/2016			13.2		5.63	531.01
	1/30/2017			13.2		4.95	531.69
	5/12/2017			13.2		5.12	531.52
	1/24/2018			13.2		4.98	531.66
	5/22/2018			13.2		5.20	531.44
	9/25/2018			13.2		5.10	531.54

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-18	9/3/2014	536.8	536.46	NM	3.3-12.7	4.23	532.23
	9/29/2014			13.3		4.35	532.11
	10/14/2014			NM		4.28	532.18
	6/24/2015			13.3		4.29	532.17
	10/21/2015			13.4		4.05	532.41
	1/21/2016			13.3		3.81	532.65
	9/19/2016			13.3		4.30	532.16
	1/30/2017			13.3		3.92	532.54
	5/12/2017			13.3		4.01	532.45
	1/24/2018			13.3		3.85	532.61
	5/22/2018			13.3		3.98	532.48
	9/25/2018			13.2		3.98	532.48
MW-19	9/3/2014	536.7	536.42	NM	3.0-12.4	4.33	532.09
	9/29/2014			13.0		4.63	531.79
	10/14/2014			NM		4.31	532.11
	6/24/2015			13.1		3.89	532.53
	10/21/2015			13.0		4.62	531.80
	1/21/2016			13.0		3.75	532.67
	9/19/2016			13.0		4.52	531.90
	1/30/2017			13.1		4.12	532.30
	5/12/2017			13.0		3.79	532.63
	1/24/2018			13.0		4.03	532.39
	5/22/2018			13.0		3.67	532.75
	9/25/2018			13.0		4.09	532.33
MW-20	9/3/2014	537.6	537.34	NM	3.3-12.7	3.36	533.98
	9/29/2014			13.3		3.67	533.67
	10/14/2014			NM		3.59	533.75
	6/24/2015			13.3		3.37	533.97
	10/21/2015			13.3		3.70	533.64
	1/21/2016			13.3		2.89	534.45
	9/19/2016			13.3		3.55	533.79
	1/30/2017			13.3		3.17	534.17
	5/12/2017			13.3		2.80	534.54
	1/24/2018			13.3		3.15	534.19
	5/22/2018			13.1		2.83	534.51
	9/25/2018			13.3		3.00	534.34
MW-21	9/3/2014	535.2	534.81	NM	2.9-12.3	4.40	530.41
	9/29/2014			12.9		4.65	530.16
	10/14/2014			NM		4.23	530.58
	6/24/2015			12.9		3.95	530.86
	10/21/2015			12.9		4.67	530.14
	1/21/2016			12.8		3.74	531.07
	9/19/2016			12.8		4.34	530.47
	1/30/2017			12.9		4.52	530.29
	5/12/2017			12.9		4.25	530.56
	1/24/2018			12.8		4.16	530.65
	5/22/2018			12.9		3.90	530.91
	9/25/2018			12.9		4.06	530.75

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-22	9/3/2014	539.0	538.57	NM	2.9-12.3	8.07	530.50
	9/29/2014			12.9		8.22	530.35
	10/14/2014			NM		8.32	530.25
	6/24/2015			12.9		6.19	532.38
	10/21/2015			13.0		8.35	530.22
	1/21/2016			12.9		5.01	533.56
	9/19/2016			12.9		5.23	533.34
	1/30/2017			13.0		5.17	533.40
	5/12/2017			13.0		5.70	532.87
	1/24/2018			13.0		5.98	532.59
	5/22/2018			12.9		5.67	532.90
	9/25/2018			12.9		6.70	531.87
MW-23	9/3/2014	538.0	537.70	NM	3.1-12.5	4.52	533.18
	9/29/2014			13.1		4.84	532.86
	10/14/2014			NM		4.87	532.83
	6/24/2015			13.1		4.28	533.42
	10/21/2015			13.1		4.46	533.24
	1/21/2016			13.1		4.25	533.45
	9/19/2016			13.1		4.65	533.05
	1/30/2017			12.9		4.53	533.17
	5/12/2017			13.1		4.15	533.55
	1/24/2018			13.1		3.96	533.74
	5/22/2018			13.1		3.54	534.16
	9/25/2018			13.1		4.11	533.59
MW-24	9/3/2014	538.6	538.18	NM	3.2-12.6	6.75	531.43
	9/29/2014			13.2		7.13	531.05
	10/14/2014			NM		7.04	531.14
	6/24/2015			13.2		5.33	532.85
	10/21/2015			13.2		7.28	530.90
	1/21/2016			13.2		4.88	533.30
	9/19/2016			13.2		6.91	531.27
	1/30/2017			13.2		5.95	532.23
	5/12/2017			13.2		4.85	533.33
	1/24/2018			13.2		5.44	532.74
	5/22/2018			13.2		4.80	533.38
	9/25/2018			13.2		5.72	532.46
MW-25	9/3/2014	537.7	537.43	NM	3.3-12.7	5.51	531.92
	9/29/2014			13.3		5.65	531.78
	10/14/2014			NM		5.65	531.78
	6/24/2015			13.3		4.48	532.95
	10/21/2015			13.3		5.97	531.46
	1/21/2016			13.3		4.13	533.30
	9/19/2016			13.3		5.67	531.76
	1/30/2017			13.3		4.90	532.53
	5/12/2017			13.3		4.15	533.28
	1/24/2018			13.3		4.59	532.84
	5/22/2018			13.3		4.05	533.38
	9/25/2018			13.3		4.72	532.71

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
OW-NE	4/28/2014	537.0	536.42	NM	NM	1.45	534.97
	9/3/2014			NM		NM	NM
	9/29/2014			NM		NM	NM
	10/14/2014			NM		2.01	534.41
	6/24/2015			10.8		1.53	534.89
	10/21/2015			NM		1.95	534.47
	1/21/2016			10.9		1.41	535.01
	9/19/2016			NM		1.91	534.51
	1/30/2017			10.5		1.45	534.97
	5/12/2017			NM		1.43	534.99
	1/24/2018			NM		1.81	534.61
	5/22/2018			NM		1.43	534.99
	9/25/2018			NM		1.52	534.90
OW-SE	4/28/2014	537.8	537.40	NM	NM	2.42	534.98
	9/3/2014			NM		NM	NM
	9/29/2014			NM		NM	NM
	10/14/2014			NM		3.00	534.40
	6/24/2015			12.4		2.54	534.86
	10/21/2015			NM		2.97	534.43
	1/21/2016			12.0		2.34	535.06
	9/19/2016			NM		2.92	534.48
	1/30/2017			12.0		2.50	534.90
	5/12/2017			NM		2.47	534.93
	1/24/2018			NM		2.76	534.64
	5/22/2018			NM		2.42	534.98
	9/25/2018			NM		2.48	534.92
OW-NW	4/28/2014	537.2	536.81	NM	NM	1.84	534.97
	9/3/2014			NM		NM	NM
	9/29/2014			NM		NM	NM
	10/14/2014			NM		2.40	534.41
	6/24/2015			11.5		1.90	534.91
	10/21/2015			NM		2.35	534.46
	1/21/2016			11.2		1.81	535.00
	9/19/2016			NM		2.22	534.59
	1/30/2017			12.2		2.49	534.32
	5/12/2017			NM		1.86	534.95
	1/24/2018			NM		2.18	534.63
	5/22/2018			NM		1.79	535.02
	9/25/2018			NM		1.88	534.93
OW-SW	4/28/2014	537.7	537.56	NM	NM	2.43	535.13
	9/3/2014			NM		NM	NM
	9/29/2014			NM		NM	NM
	10/14/2014			NM		2.98	534.58
	6/24/2015			12.3		2.55	535.01
	10/21/2015			NM		2.95	534.61
	1/21/2016			12.4		2.42	535.14
	9/19/2016			NM		NM	NM
	1/30/2017			11.2		1.89	535.67
	5/12/2017			NM		NM	NM
	1/24/2018			NM		NM	NM
	5/22/2018			NM		NM	NM
	9/25/2018			NM		NM	NM

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
OW-Shell	4/28/2014	536.6	536.36	NM	NM	1.64	534.72
	9/3/2014			NM		NM	NM
	9/29/2014			NM		NM	NM
	10/14/2014			NM		NM	NM
	6/24/2015			NM		NM	NM
	10/21/2015			NM		NM	NM
	1/21/2016			5.8		1.56	534.80
	9/19/2016			NM		NM	NM
	1/30/2017			NM		1.89	534.47
	5/12/2017			NM		NM	NM
	1/24/2018			NM		NM	NM
	5/22/2018			NM		1.66	534.70
	9/25/2018			NM		NM	NM
MW-1 (Shell)	1/21/2016	537.7	537.18	14.0	3.5-13.5	5.25	531.93
	9/19/2016			14.0		6.56	530.62
	1/30/2017			NM		5.37	531.81
	5/12/2017			NM		4.77	532.41
	1/24/2018			NM		5.53	531.65
	5/22/2018			NM		4.44	532.74
	9/25/2018			NM		6.43	530.75
MW-2 (Shell)	1/21/2016	538.5	538.00	14.3	3.9-13.9	5.60	532.40
	9/19/2016			14.3		7.60	530.40
	1/30/2017			NM		6.31	531.69
	5/12/2017			NM		5.47	532.53
	1/24/2018			NM		5.90	532.10
	5/22/2018			NM		5.46	532.54
	9/25/2018			NM		5.32	532.68
MW-3 (Shell)	1/21/2016	536.5	535.99	9.1	3.6-8.6	1.91	534.08
	9/19/2016			9.1		2.66	533.33
	1/30/2017			NM		2.36	533.63
	5/12/2017			NM		2.03	533.96
	1/24/2018			NM		2.25	533.74
	5/22/2018			NM		1.87	534.12
	9/25/2018			NM		2.10	533.89
MW-4 (Shell)	1/21/2016	536.5	536.06	14.3	3.8-13.8	4.76	531.30
	9/19/2016			14.4		5.80	530.26
	1/30/2017			NM		4.38	531.68
	5/12/2017			NM		3.89	532.17
	1/24/2018			NM		4.33	531.73
	5/22/2018			NM		4.38	531.68
	9/25/2018			NM		4.65	531.41
MW-5 (Shell)	1/30/2017	538.09	537.80	NM	4.9-14.9	3.05	534.75
	5/12/2017			NM		2.57	535.23
	1/24/2018			NM		2.97	534.83
	5/22/2018			NM		2.58	535.22
	9/25/2018			NM		2.78	535.02

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	WELL DEPTH (ft BTOC)	SCREENED INTERVAL (ft BTOC)	DEPTH TO WATER (ft BTOC)	GROUND-WATER ELEVATION (ft)
MW-6 (Shell)	1/30/2017	534.77	534.41	NM	4.1-9.1	4.80	529.61
	5/12/2017			NM		3.38	531.03
	1/24/2018			NM		4.24	530.17
	5/22/2018			NM		4.02	530.39
	9/25/2018			NM		4.23	530.18
MW-7 (Shell)	1/30/2017	535.07	534.59	NM	4.0-14.0	3.77	530.82
	5/12/2017			NM		4.03	530.56
	1/24/2018			NM		5.00	529.59
	5/22/2018			NM		4.23	530.36
	9/25/2018			NM		4.71	529.88
MW-8 (Shell)	1/30/2017	537.17	536.90	NM	4.3-14.3	1.27	535.63
	5/12/2017			NM		1.77	535.13
	1/24/2018			NM		4.10	532.80
	5/22/2018			NM		1.79	535.11
	9/25/2018			NM		1.73	535.17
MW-9 (Shell)	1/30/2017	536.63	536.17	NM	4.9-14.9	3.00	533.17
	5/12/2017			NM		2.28	533.89
	1/24/2018			NM		2.93	533.24
	5/22/2018			NM		2.28	533.89
	9/25/2018			NM		2.68	533.49
MW-10 (Shell)	1/30/2017	536.80	536.28	NM	4.8-14.8	2.77	533.51
	5/12/2017			NM		1.78	534.50
	1/24/2018			NM		2.30	533.98
	5/22/2018			NM		1.78	534.50
	9/25/2018			NM		2.58	533.70
MW-11 (Shell)	9/25/2018	NM	536.83	NM	4.9-14.9	3.19	533.64
MW-12 (Shell)	9/25/2018	NM	536.15	NM	4.9-14.9	3.15	533.00
MW-13 (Shell)	9/25/2018	NM	536.16	NM	4.6-14.6	3.86	532.30
VW-1 (Shell)	1/30/2017	538.40	538.04	NM	33.4-38.9	6.30	531.74
	5/12/2017			NM		NM	NM
	1/24/2018			NM		5.34	532.70
	5/22/2018			NM		5.73	532.31
	9/25/2018			NM		6.37	531.67
UW-1 (Shell)	1/30/2017	536.92	536.43	NM	Unknown	3.04	533.39
	5/12/2017			NM		2.03	534.40
	1/24/2018			NM		NM	NM
	5/22/2018			NM		NM	NM
	9/25/2018			NM		NM	NM

Notes: *Surface elevations and top of casing elevations at all monitoring wells on Rainbow Food Mart No. 102 and Bama Texaco sites and at monitoring wells MW-1 through MW-4 on TriTech Shell site were surveyed on January 28, 2016, by Engineering Design Group (EDG). Top of casing elevations at tank pit observation wells were determined from survey by PPM Consultants on September 3, 2014. Ground surface elevations and top of casing elevations at monitoring wells MW-5 through MW-13 and VW-1 on TriTech Shell site were surveyed by CDG and adjusted to fit EDG data by using average of elevation differences (3.15 feet at top of casing) in wells MW-1 (Shell) through MW-13 (Shell) on TriTech site.*

ft BTOC - feet below top of casing

NM - not measured

Source: *Engineering Design Group, Inc.*

CDG Engineeers, Inc.

PPM Consultants, Inc.

PPM Project No. 451603-GWM9

TABLE 2
SOIL ANALYTICAL SUMMARY
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

BORING I.D.	SAMPLE DEPTH (ft BGS)	DATE COLLECTED	HEADSPACE READING (ppmv)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	MTBE (mg/kg)	NAPH-THALENE (mg/kg)
Preliminary Investigation										
MW-17-4-6	4-6	8/27/2014	3,300	0.700	0.211	3.46	8.57	12.9	1.10	1.10
MW-18-4-6	4-6	8/26/2014	11,000	0.430	0.390	8.26	17.4	26.5	0.929	0.929
MW-19-4-6	4-6	8/26/2014	11,000	0.644	2.19	11.9	56.9	71.6	<0.100	<0.100
MW-20-4-6	4-6	8/26/2014	11,000	3.47	0.692	38.3	101	143	0.452	0.452
MW-20-6-8	6-8	8/26/2014	11,000	0.318	0.208	6.64	13.9	21.1	0.348	0.348
MW-21-4-6	4-6	8/26/2014	60	<0.005	<0.005	<0.005	<0.015	BDL	<0.010	<0.010
MW-22-6-8	6-8	8/27/2014	11,000	0.156	*0.087*	7.73	13.5	21.5	2.63	2.63
MW-23-4-6	4-6	8/26/2014	7,850	0.079	0.009	5.90	2.51	8.50	0.255	0.255
MW-23-6-8	6-8	8/26/2014	11,000	0.135	0.092	1.03	3.99	5.25	0.309	0.309
MW-24-4-6	4-6	8/27/2014	5,750	0.481	0.018	25.1	23.9	49.5	0.182	0.182
MW-24-6-8	6-8	8/27/2014	11,000	0.800	3.14	8.72	27.8	40.5	1.00	1.00
MW-25-6-8	6-8	8/27/2014	11,000	*0.048*	2.30	2.44	11.8	16.6	0.624	0.624
Membrane Interface Probe Survey										
O-27-6.5	6.5	8/11/2017	NM	0.414	2.480	1.760	6.470	11.124	0.684	4.960
O-27-7.5	7.5	8/11/2017	NM	0.612	2.300	6.140	30.700	39.752	0.646	5.260
O-23-5.5	5.5	8/11/2017	NM	0.334	2.240	3.320	3.760	9.654	0.718	3.900
O-23-6.0	6.0	8/11/2017	NM	0.460	2.980	7.940	35.600	46.980	0.818	4.880
H-23.8-5.5	5.5	8/11/2017	NM	0.015	0.218	0.540	2.200	2.973	<0.005	1.460
H-23.8-6.5	6.5	8/11/2017	NM	0.541	0.910	1.900	6.950	10.301	0.010	1.020
SSCAL - GRP Source (Borings MW-20 and MW-21)				**44.19**	**2,344**	**1,077**	**1,350**	**--**	**51.96**	**1,111**
SSCAL - Indoor Air Inhalation (Commercial)				**219.0**	**2,344**	**1,077**	**1,350**	**--**	**29,830**	**1,111**

Notes: *mg/kg - milligrams per kilogram*
ppmv - parts per million by volume
SSCALs - Site-Specific Corrective Action Levels based on either Indoor Air Inhalation or Groundwater Resource Protection (GRP) at the Source
BDL - Below Detection Limit
BGS - below ground surface
NM - not measured
Headspace analysis conducted with a RKI Eagle
BTEX/MTBE/Naphthalene analysis per EPA Method 8260
Values in italics indicate concentrations above detection limit but below reporting limit

Sources: *PPM Consultants, Inc.*
PPM Project No. 451603-CAP-D

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPH-THALENE (mg/L)
MW-9	9/29/2014	**12.200**	2.990	3.330	13.700	32.220	**0.499**	NA
	6/24/2015	**10.200**	4.400	5.060	21.900	41.560	**0.430**	NA
	10/21/2015	**7.780**	1.700	2.490	8.820	20.790	0.200	NA
	1/21/2016	**6.880**	5.690	3.650	15.200	31.420	0.369	**1.010**
	9/19/2016	**6.340**	5.190	3.000	11.100	25.630	<0.100	*0.055*
	1/30/2017	**6.620**	8.030	3.510	13.900	32.060	0.160	**0.970**
	5/12/2017	**4.770**	4.830	3.030	10.300	22.930	0.126	**0.781**
	1/24/2018	**7.120**	3.150	3.440	11.800	25.510	0.120	*0.333*
	5/22/2018	**5.260**	4.480	2.770	10.500	23.010	0.122	**1.410**
	9/25/2018	**6.210**	4.770	2.190	8.240	21.410	*0.026*	*0.170*
SSCAL-GRP POC		0.1001	20.03	14.02	175	--	0.4006	0.4006
MW-10	9/29/2014	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	6/24/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	10/21/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	1/21/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/19/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/30/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/12/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/24/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/22/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/25/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL-GRP POC		0.1145	22.91	16.04	175	--	0.4582	0.4582
MW-12	9/29/2014	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	6/24/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	10/21/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	1/21/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/19/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/30/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/12/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/24/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/22/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/25/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL-GRP POC		0.2979	59.58	41.70	175	--	1.192	1.192
MW-13	9/29/2014	**3.780**	0.313	1.860	6.590	12.543	**2.960**	NA
	6/24/2015	**7.390**	0.342	2.150	4.350	14.232	**1.380**	NA
	10/21/2015	**2.150**	*0.032*	1.100	*0.076*	3.358	0.190	NA
	1/21/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/19/2016	0.053	0.002	0.049	<0.003	0.104	0.005	0.021
	1/30/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/12/2017	0.017	<0.001	<0.001	<0.003	0.017	<0.001	<0.005
	1/24/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/22/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/25/2018	0.004	<0.001	0.002	<0.003	0.006	<0.001	<0.005
SSCAL-GRP POC		0.2298	45.95	32.17	175	--	0.9191	0.9191
MW-14	9/29/2014	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	6/24/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	10/21/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	1/21/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/19/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/30/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/12/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/24/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/22/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/25/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL-GRP POC		0.1600	31.99	22.40	175	--	0.6399	0.6399

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPH-THALENE (mg/L)
MW-15	9/29/2014	**0.240**	0.005	0.585	0.026	0.856	0.006	NA
	6/24/2015	0.036	<0.001	0.066	<0.003	0.102	0.002	NA
	10/21/2015	**0.306**	0.006	0.637	0.005	0.954	0.009	NA
	1/21/2016	**0.125**	0.003	0.109	<0.003	0.237	0.009	0.010
	9/19/2016	0.077	0.002	0.195	<0.003	0.274	<0.001	0.010
	1/30/2017	**0.360**	0.015	0.476	0.095	0.946	0.010	0.053
	5/12/2017	0.099	0.003	0.038	<0.003	0.140	0.014	0.010
	1/24/2018	0.004	<0.001	0.004	<0.003	0.008	0.002	<0.005
	5/22/2018	0.007	<0.001	0.008	<0.003	0.015	0.003	<0.005
	9/25/2018	0.021	<0.001	0.002	<0.003	0.023	<0.001	<0.005
SSCAL-GRP POC		0.1018	20.36	14.25	175	--	0.4072	0.4072
MW-16	9/29/2014	**2.360**	*0.003*	0.716	0.667	3.746	*0.019*	NA
	6/24/2015	**3.740**	*0.017*	0.860	1.200	5.817	*0.019*	NA
	10/21/2015	**1.290**	*0.004*	0.408	0.177	1.879	*0.009*	NA
	1/21/2016	0.048	<0.001	0.014	0.007	0.069	0.003	<0.005
	9/19/2016	**0.285**	<0.005	0.027	<0.015	0.312	0.007	*0.021*
	1/30/2017	0.022	<0.001	0.002	<0.003	0.024	0.001	<0.005
	5/12/2017	0.010	<0.001	0.001	<0.003	0.011	<0.001	<0.005
	1/24/2018	0.005	<0.001	<0.001	<0.003	0.005	0.003	<0.005
	5/22/2018	**0.710**	0.006	0.189	0.109	1.014	0.009	*0.019*
	9/25/2018	**1.270**	*0.003*	0.113	*0.003*	1.389	*0.003*	<0.025
SSCAL-GRP POC		0.2148	42.96	30.07	175	--	0.8592	0.8592
MW-17	9/29/2014	0.100	0.039	0.008	0.104	0.251	0.051	NA
	6/24/2015	**0.895**	0.019	0.084	0.034	1.032	0.212	NA
	10/21/2015	0.109	*0.002*	0.031	*0.004*	0.146	0.265	NA
	1/21/2016	**0.391**	0.018	0.185	0.082	0.676	0.388	0.030
	9/19/2016	0.221	0.009	0.048	0.024	0.302	0.240	<0.025
	1/30/2017	**0.900**	0.099	0.259	0.222	1.480	0.505	0.065
	5/12/2017	**0.535**	0.059	0.110	0.151	0.855	0.208	*0.028*
	1/24/2018	**1.700**	0.174	0.448	0.564	2.886	0.428	*0.046*
	5/22/2018	**0.879**	0.097	0.212	0.315	1.503	0.367	0.060
	9/25/2018	**1.380**	0.082	0.171	0.284	1.917	0.164	*0.026*
SSCAL-GRP POC		0.3724	74.48	52.14	175	--	1.490	1.490
MW-18	9/29/2014	0.323	0.297	0.091	0.568	1.279	0.066	NA
	6/24/2015	**1.490**	0.410	0.656	0.398	2.954	0.832	NA
	10/21/2015	**1.530**	0.316	0.379	0.549	2.774	1.210	NA
	1/21/2016	**1.320**	0.414	0.464	0.724	2.922	1.150	0.116
	9/19/2016	0.281	0.038	0.056	0.077	0.452	0.218	<0.050
	1/30/2017	0.635	0.165	0.232	0.390	1.422	0.359	0.056
	5/12/2017	0.310	0.144	0.094	0.223	0.771	0.201	*0.017*
	1/24/2018	0.640	0.074	0.257	0.285	1.256	0.285	*0.021*
	5/22/2018	0.136	0.053	0.027	0.066	0.282	0.124	0.062
	9/25/2018	0.092	0.007	0.011	0.015	0.125	0.012	<0.025
SSCAL-GRP POC		0.6414	128.3	89.80	175	--	2.566	2.566
MW-19	9/29/2014	0.023	0.019	0.006	0.044	0.092	0.003	NA
	6/24/2015	0.105	0.028	0.107	0.063	0.303	0.019	NA
	10/21/2015	0.196	0.030	0.131	0.061	0.418	0.044	NA
	1/21/2016	0.369	0.091	0.293	0.131	0.884	0.085	0.046
	9/19/2016	0.137	0.075	0.110	0.222	0.544	0.034	0.066
	1/30/2017	0.306	0.121	0.212	0.446	1.085	0.035	0.078
	5/12/2017	0.369	0.226	0.222	0.593	1.410	0.042	0.073
	1/24/2018	**0.800**	0.295	0.478	1.210	2.783	0.037	0.086
	5/22/2018	0.552	0.297	0.317	0.932	2.098	0.039	0.130
	9/25/2018	0.419	0.026	0.111	0.338	0.894	*0.008*	*0.025*
SSCAL-GRP POC		0.6259	125.2	87.62	175	--	2.504	2.504

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPH-THALENE (mg/L)
MW-20	9/29/2014	**1.700**	0.386	0.806	1.910	4.802	0.302	NA
	6/24/2015	**3.600**	0.624	2.180	2.480	8.884	0.608	NA
	10/21/2015	**3.500**	0.423	1.550	1.920	7.393	0.580	NA
	1/21/2016	**3.730**	0.468	1.670	2.260	8.128	0.836	0.212
	9/19/2016	**2.920**	0.560	1.440	2.360	7.280	0.476	0.612
	1/30/2017	**3.240**	0.524	1.540	2.210	7.514	0.320	0.448
	5/12/2017	**4.080**	0.870	2.180	3.270	10.400	0.433	0.530
	1/24/2018	**3.720**	0.488	2.380	2.750	9.338	0.390	0.230
	5/22/2018	**3.180**	0.404	1.280	1.890	6.754	0.380	*0.196*
	9/25/2018	**3.040**	0.243	1.300	1.470	6.053	0.117	*0.193*
SSCAL-GRP Source		0.6534	130.7	91.47	175	--	2.613	2.613
MW-21	9/29/2014	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	6/24/2015	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	NA
	10/21/2015	<0.001	<0.001	<0.001	<0.003	BDL	0.001	NA
	1/21/2016	<0.001	<0.001	<0.001	<0.003	BDL	0.001	<0.005
	9/19/2016	<0.001	<0.001	<0.001	<0.003	BDL	0.001	<0.005
	1/30/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/12/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/24/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/22/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	9/25/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL Indoor Air Inhalation		114.8	526	169	175	--	48,000	31
MW-22	9/29/2014	**18.500**	1.180	3.820	16.600	40.100	**99.200**	NA
	6/24/2015	**14.200**	*0.088*	3.400	8.060	25.748	**40.400**	NA
	10/21/2015	**14.600**	*0.057*	2.200	5.120	21.977	**67.500**	NA
	1/21/2016	**0.378**	*0.002*	0.117	0.226	0.723	**1.240**	0.058
	9/19/2016	**1.650**	*0.003*	0.563	*0.028*	2.244	**2.840**	0.609
	1/30/2017	0.022	<0.001	0.011	<0.003	0.033	0.044	<0.005
	5/12/2017	0.158	<0.001	0.124	<0.003	0.282	0.174	0.051
	1/24/2018	0.040	<0.005	0.139	<0.015	0.179	0.457	<0.025
	5/22/2018	0.004	<0.001	0.056	<0.003	0.060	0.092	<0.005
	9/25/2018	0.007	<0.001	0.183	<0.003	0.190	0.181	<0.005
SSCAL-GRP POC		0.3053	61.05	42.74	175	--	1.221	1.221
MW-23	9/29/2014	**0.905**	0.325	0.841	3.670	5.741	0.118	NA
	6/24/2015	0.377	0.021	0.530	0.405	1.333	0.052	NA
	10/21/2015	0.475	0.035	0.440	0.695	1.645	0.091	NA
	1/21/2016	0.434	0.056	0.490	0.766	1.746	0.101	0.068
	9/19/2016	0.176	0.009	0.136	0.247	0.568	0.031	0.044
	1/30/2017	0.086	0.010	0.097	0.181	0.374	0.011	0.007
	5/12/2017	0.338	0.025	0.163	0.219	0.745	0.051	0.047
	1/24/2018	0.275	0.018	0.193	0.147	0.633	0.023	*0.010*
	5/22/2018	0.431	0.036	0.139	0.226	0.832	0.046	0.025
	9/25/2018	0.499	0.027	0.134	0.242	0.902	0.024	*0.016*
SSCAL-GRP Source		0.6534	130.7	91.47	175	--	2.613	2.613
MW-24	9/29/2014	**15.100**	16.900	5.820	25.200	63.020	**16.900**	NA
	6/24/2015	**13.500**	14.700	5.780	21.000	54.980	**11.100**	NA
	10/21/2015	**12.500**	7.720	3.540	9.210	32.970	**9.640**	NA
	1/21/2016	**8.800**	5.080	3.360	8.320	25.560	**5.580**	*0.414*
	9/19/2016	**6.230**	2.270	2.880	7.810	19.190	**3.300**	*0.288*
	1/30/2017	**5.380**	1.420	1.870	4.330	13.000	**4.380**	*0.395*
	5/12/2017	**8.290**	1.910	2.610	6.410	19.220	**6.590**	1.110
	1/24/2018	**1.710**	0.180	0.640	1.280	3.810	0.512	0.054
	5/22/2018	**0.396**	0.023	0.093	0.137	0.649	0.060	<0.010
	9/25/2018	0.215	0.010	0.031	0.069	0.325	0.036	<0.025
SSCAL-GRP POC		0.3370	67.39	47.18	175	--	1.348	1.348

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

WELL I.D.	DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPH-THALENE (mg/L)
MW-25	9/29/2014	**3.200**	1.010	0.534	2.780	7.524	0.480	NA
	6/24/2015	**5.600**	0.491	1.770	1.230	9.091	0.740	NA
	10/21/2015	**7.600**	0.170	1.090	*0.147*	9.007	1.410	NA
	1/12/2016	**7.560**	1.210	1.360	1.610	11.740	1.240	*0.200*
	9/19/2016	**6.560**	0.436	0.672	1.350	9.018	1.400	*0.155*
	1/30/2017	**8.190**	1.050	1.090	2.580	12.910	0.934	*0.304*
	5/12/2017	**8.000**	0.682	1.080	2.660	12.422	1.070	0.551
	1/24/2018	**8.000**	1.030	1.230	2.680	12.940	0.720	*0.098*
	5/22/2018	**8.480**	0.614	0.868	2.380	12.342	1.290	*0.132*
	9/25/2018	**9.180**	0.251	0.334	0.710	10.475	0.415	*0.010*
SSCAL-GRP POC		0.3818	76.37	53.46	175	--	1.527	1.527

Notes: *mg/L - milligrams per liter*
BTEX/MTBE/Naphthalene analysis per EPA Method 8260
BDL - Below detection limit
NA - Not analyzed
SSCALs - Site-Specific Corrective Action Levels approved March 14, 2016
GRP - Groundwater Resource Protection
POC - Point of Compliance
Bold *values exceed approved SSCAL*
Values in italics indicate concentrations above detection limit but below reporting limit

Sources: *PPM Consultants, Inc.*
PPM Project No. 451603-CAP-D

APPENDIX D – DESIGN CALCULATIONS

PPM Consultants, Inc.

MASS REDUCTION ESTIMATE

Geologist: Walt Henley
Checked By: Matt Ebbert
Site Name: Bama Texaco

1) Dissolved COC Reduction Required in Groundwater:

Data from the last year of groundwater monitoring events were averaged to represent COC concentrations in groundwater.

Sample ID	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Total Xylenes (mg/L)	MTBE (mg/L)	Naphthalene (mg/L)
MW-9	6.20	4.13	2.80	10.2	0.089	0.638
MW-16	0.662	0.003	0.101	0.038	0.005	0.016
MW-17	1.32	0.118	0.277	0.388	0.320	0.044
MW-25	8.55	0.632	0.811	1.92	0.808	0.080
Average	**4.18**	**1.22**	**1.00**	**3.13**	**0.306**	**0.195**
SSCAL (Source)	**0.1001**	**20.3**	**14.02**	**175**	**0.401**	**0.401**
Reduction Goal	**4.08**	**0.977**	**0.798**	**2.51**	**0.244**	**0.156**

Note: where average COC cocentration is below SSCAL, an 80% reduction target is utilized for the reduction goal.

2) Adsorbed COC Reduction Required in Soil:

COC concentrations in soil are based on the average soil concentrations from borings within the area of proposed ozone treatment.

Sample ID	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	MTBE (mg/kg)	Naphthalene (mg/kg)
MW-9-3-5	0.0890	5.2631	9.3766	47.7882	0.0211	--
MW-17-4-6	0.700	0.211	3.46	8.57	1.10	--
MW-25-6-8	*0.048*	2.30	2.44	11.8	0.624	--
Average	**0.279**	**2.59**	**5.09**	**22.72**	**0.582**	**--**
Lowest SSCAL	**44.19**	**2,344**	**1,077**	**1,350**	**51.96**	**1,111**
Reduction Goal	**0.223**	**2.07**	**4.07**	**18.2**	**0.465**	**--**

Note: where average COC cocentration is below SSCAL, an 80% reduction target is utilized for the reduction goal.

3) Groundwater Treatment Volume:

The areal extent of hydrocarbon-impacts will be estimated using the equation for an ellipsoid:

$$V = (4/3) \times \pi \times L \times W \times D \times P$$

Where:

L = Length (feet)
W = Width (feet)
D = Depth/Thickness (feet)
P = Porosity

Length (ft) =	120	
Width (ft) =	50	
Thickness (ft) =	10	
Porosity =	0.489	From ARBCA Evaluation

Total Treatment Volume, GW =	122,849	ft^3
Total Treatment Volume, GW =	3,478,453	L

Notes:

1. COC impacts are estimated to be present within a water-bearing zone with an average thickness of 10 feet in the water bearing zone.

2. Areal extent of the groundwater treatment area is estimated based upon an elliptical area of the benzene plume exceeding the SSCALsin the sparge field.

PPM Consultants, Inc.

MASS REDUCTION ESTIMATE

Geologist: Walt Henley
Checked By: Matt Ebbert
Site Name: Bama Texaco

4) Soil Treatment Volume:

The areal extent of hydrocarbon-impacts will be estimated using the equation for a rectangle:

V = L x W x D

Where:

L= Length (feet)
W= Width (feet)
D= Depth/Thickness (feet)

Length (ft) =	120	
Width (ft) =	50	
Thickness (ft) =	6	
Soil Density (lb/ft^3) =	95.0	From ARBCA Evaluation

Total Treatment Volume, Soil =	36,000	ft^3
Soil Weight =	3,420,000	lb
Soil Mass =	1,550,970	kg

Notes:
1. Areal extent of the soil treatment area is estimated based on area between MW-9 and MW-25 and in ozone treatment area south of gasoline dispensers.

5) Dissolved COC Mass to be Removed

	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene
Conc., mg/L	4.08	0.977	0.798	2.51	0.244	0.156
mass, mg	1.42E+07	3.40E+06	2.77E+06	8.72E+06	8.50E+05	5.41E+05
Weight, lb	31.3	7.50	6.12	19.2	1.875	1.19
Total lbs.	67					

6) Adsorbed Hydrocarbon Mass to be Removed

	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene
Conc., mg/kg	0.223	2.07	4.07	18.2	0.465	--
mass, mg	3.46E+05	3.22E+06	6.32E+06	2.82E+07	7.22E+05	--
Weight, lb	0.763	7.09	13.9	62.2	1.59	--
Total lbs.	85.5					

Total Mass of COCs to be Removed =	153	lbs

7) Ozone Required for Treatment

Number of COCs	6	
Gram Equivalent to Oxidize COC (13.6 g/g for BTEX, 3.0 g/g for MTBE, 3.0 g/g for nap.)	19.6	g/g
Total Mass of Ozone Required for COCs	499	lbs
Assume COCs Comprise 30% of Hydrocarbons Released	30%	
Total Mass of Ozone Required for all Hydrocarbons	1,663	lbs
Pounds of Ozone Per Day System Can Generate	5.4	lbs/day
No. of Days Required for all Hydrocarbons	308	days
Safety Factor for Naturally Occurring Oxidant Demand	20%	
No. Days Required for Hydrocarbons and Nat. Occurring Oxidant Demand	370	days
General Safety Factor	15%	
No. Days Required for Hydrocarbons, Nat. Oxidant Demand, and Safety Factor	425	
No. of Years Required for Hydrocarbons, Nat. Oxidant Demand, and Safety Factor	1.2	years
No. of Years Required assuming 75% Runtime	1.6	years

It is noted that the estimated cleanup time does not take into account the affects of natural attenuation.

APPENDIX E – EQUIPMENT SPECIFICATIONS AND QUOTATIONS

January 14, 2019

Mr. Kevin Gomes
H2O Engineering, Inc.
189 Granada Drive
San Luis Obispo, CA 93401

Re: **Request for Bid for Ozone/Oxygen Sparge Remediation Equipment**
Bama Texaco
815 Cleveland Avenue
Attalla, Alabama
Facility I.D. No. 12534-055-005151
Incident No. UST14-04-05
PPM Project No. 451603-CAP-D

Dear Mr. Gomes:

On behalf of Ira Phillips, Inc., PPM Consultants Inc., (PPM) is requesting a quote from your company to construct an ozone/oxygen sparge remediation system for use at the referenced site and that will meet the following conditions:

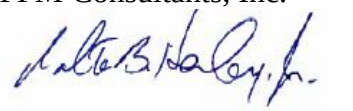
- Generator capable of delivering approximately 5.5 pounds of ozone per day
- Capable of generating ozone at pressure up to 50 pounds per square inch (psi)
- Manifold capable of utilizing 10 points
- Sparge flow rate at each sparge point of approximately 4 standard cubic feet per minute (SCFM)
- Refrigerated air dryer
- Equipment to be powered by available single-phase, 240-volt power
- Seven sparge points constructed of ozone-compatible material
- Riser pipe constructed of ozone-compatible material for seven, 15-foot sparge points and well-head connections for each point
- Ozone supply tubing constructed of ozone-compatible material to each of the seven sparge points (approximately 735 feet total with longest single run of approximately 155 feet)
- System controls with wiring/sensors to monitor system status and capable of remote re-start
- Wireless telemetry to accommodate system alarms and restart functions plus an additional three inputs and one output for separate soil vapor extraction (SVE) system (not provided by you)

- Well-ventilated enclosure mounted on trailer, if possible, and equipped with sound-dampening walls/blankets, heater, fan, and lights
- Ozone monitors inside enclosure and in two subsurface points along delivery trench (located 115 and 140 feet from equipment enclosure near underground storage tanks and ancillary components)
- Wiring from system to subsurface ozone monitoring points (approximately 275 feet)

Please provide a quote for a one-time purchase of the equipment/materials and shipping of the equipment to the site and the materials to PPM's office. Please include in the quote your time required for start-up assistance. This system will be operated in conjunction with a soil vapor extraction (SVE) system. Therefore, also please include time for working with the SVE vendor to wire the telemetry so that the ozone and SVE systems can be operated concurrently. The telemetry functions should ensure that the sparge system is not operated if the SVE system is not running. All information should be submitted by close of business on January 25, 2019.

If you have any comments or questions, please do not hesitate to contact me at (205) 836-5650.

Sincerely,
PPM Consultants, Inc.



Walter B. Henley, Jr., P.G.
Project Manager / Senior Geologist

c: Mr. Ira Phillips, Jr.

January 14, 2019

Mr. Jim Frydl
MAE2
182 Spring Oaks Ln.
Ruckersville, VA 22968

Re: **Request for Bid for Soil Vapor Extraction (SVE) Remediation Equipment**
Bama Texaco
815 Cleveland Avenue
Attalla, Alabama
Facility I.D. No. 12534-055-005151
Incident No. UST14-04-05
PPM Project No. 451603-CAP-D

Dear Mr. Frydl:

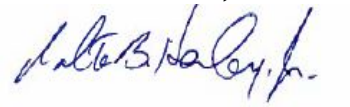
On behalf of Ira Phillips, Inc., PPM Consultants Inc., (PPM) is requesting a quote from your company to construct a soil vapor extraction (SVE) remediation system for use at the referenced site and that will meet the following conditions:

- Flow up to 75 cubic feet per minute (CFM) but typically in the 40 CFM range
- Vacuum of up to 10 inches mercury (in-Hg)
- Dilution valve to reduce vacuum at well head to approximately 1 in-Hg
- Knock-out tank of approximately 100 gallons equipped with high level switch
- One 500-pound carbon canister to treat extracted vapors
- Explosion-proof motor capable of operating with single-phase, 240-volt power
- System controls with wiring/sensors to monitor power, pressure, and temperature conditions and capable of remote re-start (see telemetry notes below)
- Well-ventilated enclosure mounted on a trailer, if possible, with sound-dampening walls/blankets and equipped with heater, fan, and lights.

Please provide a quote for a one-time purchase of the equipment and shipping to the site. Please include in the quote your time required for start-up assistance to include wiring the controls for your equipment to the telemetry that will be provided with separate ozone sparge equipment (not provided by you) that will also be used at the site. All information should be submitted by close of business on January 25, 2019.

If you have any comments or questions, please do not hesitate to contact me at (205) 836-5650.

Sincerely,
PPM Consultants, Inc.



Walter B. Henley, Jr., P.G.
Project Manager / Senior Geologist

c: Mr. Ira Phillips, Jr.

Proposal for

PPM-Birmingham
Bama Texaco
Attalla, AL
1/24/2019

Prepared by
Kevin Gomes | kgomes@h2oengineering.com | 805-547-0303

1 Executive Summary

H2O Engineering is pleased to provide PPM-Birmingham with the following proposal to supply a detailed engineering package and fabricated MOSU10-104 Ozone trailer. In this proposal, you will find all of the commercial and technical details for the water treatment solution designed, fabricated and packaged by H2O Engineering, Inc.

During communication with Walt Henley regarding this project, several needs were identified. These include:

- Select a firm who has extensive water treatment experience with engineering, PLC programming and fabrication capabilities in-house
- Select a firm who has experience manufacturing water treatment systems of this scale and complexity with strict performance and safety requirements.
- Provide an optimum equipment arrangement with an objective to minimize footprint.
- Provide start-up assistance, training and service as needed.

A detailed scope of supply for the equipment and services proposed are provided in the following sections.

If you have any questions regarding our proposal, please do not hesitate to contact me.

Sincerely,

Kevin Gomes
Account Manager
H2O Engineering Inc.

189 Granada Drive
San Luis Obispo, CA 93401
Email: kgomes@h2oengineering.com
Tel: (805) 547-0303
Cell: (805) 704-1337

Table of Contents

2 H2O Engineering Scope of Supply

2.1 Mobile Ozone Sparge System

All ozone wetted parts to be of ozone compatible materials (i.e., stainless steel, glass, PVDF, PTFE, and Viton)

Ozone output verification will be performed upon completion of fabricating the ozone sparge system. This system is an air-cooled piece of equipment. Adequate ventilation is required to ensure reliable operation.

2.1.1 Design basis

- The sparge system is rated to produce 104 g/h (5.5 lb/day) of ozone. Ozone pressure will be boosted through a diaphragm pump to a maximum 50 psi.
- Oxygen will be created by two oxygen concentrators, each providing 90-95% pure oxygen at 30 SCFH at 10 psi
- Blend air will be supplied from a compressor, providing 3.5 SCFM at up to 90 PSI
- Generated ozone will be routed through a 20-point manifold.
- Manifold will connect to up to 20 sparge points using ½-inch OD PFA tubing
- Sparge flow rate for each sparge point is up to 4 SCFM
- Maximum sparge pressure is 50 PSIG, breakthrough sparge pressure is 90 PSIG

2.2 Kaeser 5 HP Air tower,

- Built in tank and refrigerated dryer.
- Maximum air / breakthrough sparge pressure of 90 PSI

2.2.1 Oxygen Concentrators, 2 each

- Each calibrated to deliver 30 SCFH of 90 to 95% purity oxygen at a maximum delivery pressure of 10 PSIG

2.2.2 Oxygen Purity Monitor

- Oxygen purity monitor located upstream of ozone generators to alarm if purity falls below 85%

2.2.3 Ozone Generators, 2 each

- 104 g/h total (5.5 lb/day) at up to 5% by weight ozone from oxygen at 60 SCFH, 10 PSIG
- Integrated alarms with dry contact to PLC
- Backpressure regulators downstream of generators to control feed gas pressure, provide optimum ozone output, and isolate ozone generators from variable manifold pressure

2.2.4 Ozone Delivery Pump

- Inlet pressure at 10 PSIG
- Outlet pressure at up to 50 PSIG

2.2.5 Ozone Delivery Manifold

- Delivery flow and pressure displayed and logged via PLC, viewable from HMI and telemetry
- Maximum air / breakthrough sparge pressure of 90 PSI
- 20 solenoid valves
- 1/2" OD Kynar compression fittings

2.3 Mobile Ozone Sparge System Enclosure

2.3.1 Dimensions

- Overall Dimensions: 11'9"L x 6'9"Wx 6'8"H

2.3.2 Trailer

- Single axle, spare tire, stabilizer jacks, 2" ball hitch, hitch lock, 4 way flat trailer plug
- Access ports in walls/floors, as appropriate, for ventilation, air supply lines and ozone discharge lines
- Exterior painted white
- Exterior service disconnect/emergency switch located on side wall of trailer
- Interior lighting and 10A convenience outlet

2.3.3 Interior ozone monitor

- Connected to system PLC
- Alarm set point: 1.0 ppmv

2.3.4 Temperature Control

- Wall mount electric heater
- Interior foam-board and plywood insulation of walls and roof
- PLC controlled fan ventilation
- One 12" exhaust fan in side wall

2.3.5 Other

- Startup Service Kit included for initial 6 months of O&M
- Full one-year warranty includes materials and workmanship
- Service contracts and start-up assistance available

2.4 Control System

- Automatic regression from ozone to air / breakthrough mode upon high pressure detection
- User selectable delivery gas for each sequence step (ozone or oxygen, either with or without air flow boost, or air flow boost only)
- Independent time duration control for each sequence step (programmable from 1 to 120 minutes)
- User configurable valve sparge sequence ordering, allows user to repeat valves within the sequence or change sparge sequence order without plumbing changes
- Variable ozone output can be individually configured for each valve (10-100%)
- Automated maintenance notifications
- Automated email alarm notifications, up to 3 email addresses
- PLC based system located on interior wall of trailer
- Total system power consumption monitored by PLC
- Allen Bradley PanelView Plus 400 4" Human Machine Interface (HMI) with touch pad to allow modification to programming while operating
- Cell-phone based telemetry system included (Verizon Wireless service contract required)
- Onboard VNC Server to allow control and monitoring of system from multiple computers, tablets, smartphones (free apps available)

2.5 Electrical Requirements

- Final electric service connection (240V/60 Hz, 60A) by others
- All control panel components to be UL 508A listed

3 Sparge Well Material Specifications

3.1 In-situ Oxidation Point: IOP100-12-P

- Stainless Steel Body
- (16) 3/8" x 1-1/2" Outlets
- 50 mesh internal stainless screen
- 1" x 8 T.P.I. F-480 Male Flush Thread w/ Viton® O-ring

3.2 Riser Pipe: RP100

- 1"ID x 10'L with Viton® O-ring
- Sch. 80
- 1" x 8 T.P.I. F-480 Male Flush Thread

3.3 Riser Pipe: RP100-5

- 1"ID x 5'L with Viton® O-ring
- Sch. 80
- 1" x 8 T.P.I. F-480 Male Flush Thread

3.4 Well Head Connection: WHC10

- ¼" Stainless Steel Tee
- ¼" Stainless Steel Plug
- ¼" Stainless Steel Nipple
- 1/2" Compression fitting for ozone delivery tubing
- 1" Slip Sch. 80 Union with insert

3.5 Ozone Delivery Tubing: TUB-PFA-8

- PFA
- 1/2" OD x 3/8" ID

3.6 Ozone Resistant Monitoring Well Plugs

- Available in 2" and 4" sizes
- Standard monitoring well plugs cannot withstand ozone gas and will leak over a short period of time
- Ozone resistant sealing gasket prevents ozone from short circuiting from an active sparge well to a nearby monitoring well

3.6.1 Other Equipment and Service Options

3.6.1.1 Portable Oxygen Purity Analyzer: ACC-112

- Range: 0-100 % O2
- Display: digital readout in .01 % increments
- Includes flow cell and 10 ft. cable
- Size: 4.62 x 2.5 x 1.5 in.
- Weight: 1.37 lb
- Power requirements: 9V battery
- Battery Lifetime: 1400 hours approx.

3.6.1.2 Hand-held Passive Ambient Ozone Monitor: ACC-105

- Range: 0-10 ppm; sensitivity as low as .02 ppm
- Display: digital readout in .01 ppm increments
- Measurement principle: HMOS (heated metal oxide semiconductor) sensor
- Size: 50 × 100 × 25 mm (2 × 4 × 1 in)
- Weight: 170 grams (6 oz)
- Power requirements: 12 VDC unregulated; AC adapters available worldwide
- Battery: Rechargeable batteries last more than 8 hours

3.6.1.3 Portable Gas Leak Detector: ACC-175 + ACC-175a

- Range: Ozone, 0-5/200 PPM (20 PPM Std.)
- Display: Back-lit graphics liquid crystal display
- Accuracy: ± 5% of value
- Sensitivity: 1% of sensor module range
- Outputs: RS-232 output of stored gas values
- Memory: 12,000 data points
- Storage Interval: Programmable from 1 minute to 60 minutes
- Typical Capacity: 8 days at 1 minute storage interval
- Alarms: Three concentration alarms (caution, warning, and alarm with adjustable setpoints)
- Low flow and low battery alarms
- Alarms displayed on LCD & Indicated by audible beeper
- Power: D cell battery, alkaline recommended, 75 hours operation
- Internal rechargeable Nicad for backup power, 6 hours operation
- 120 or 220 VAC chargers available
- Operating Temp.: -25º to +55ºC
- Humidity: 0-95% Non-condensing
- Detector Material: Glass Filled Polycarbonate
- Includes Carrying Case
- Size: 3.5”(W) x 9”(H) x 5.5”(D)
- Shipping Weight: 7 lbs. (3.2 Kg.)

3.6.1.4 Remote Ozone Gas Detector System

- ATi Two Point Ozone Gas Detector System
  - (1) Power Supply Module, 120VAC
  - (1) Horn alarm
  - (2) B12 sensor receivers
  - (2) 25ft cables for sensors
  - (1) 3 module NEMA4X enclosure
- (2) B12 Ozone sensors 0-2 ppm range

3.7 Service & Maintenance Kit Specifications

3.7.1 OSUXX-104 Six Month Service Kit, Series D.4, includes

(Parts are subject to change based on final design specifications.)

- (4) V-C-104 - 1/4" MPT 316SS Check Valve
- (1) S-IF-11-8.75 - Intake Filter
- (1) S-OF-SX - Oil Filter
- (1) S-AFC-4.7-2.0 - Air Filter
- (1) S-FB-OR-F9KE-F - Oil Filter Element
- (1) S-FB-PF-F9KB-F - Particulate Filter Element
- (1) S-OWS-25-F - Oil/Water Separator Element
- (2) F-OR-100 - Filter, Oil Removal,Inline, 1/4"

3.7.2 OSUXX-104 Twelve Month Service Kit, Series D.4, includes

(Parts are subject to change based on final design specifications.)

- (4) V-C-104 - 1/4" MPT 316SS Check Valve
- (1) S-ECH-O3-200-A - O3 Sensor, 0-2ppm Replacement Ozone Sensor
- (1) V-PR-101 - Manifold Pressure Relief Valve, 100psi
- (2) V-PR-207 - Oxygen Pressure Relief Valve, 45psi
- (3) S-V-S-102-SK Solenoid Valve Rebuild Kit for Viton Valves Only
- (2) S-CMP-O3-100-SK ODP Compressor Rebuild Kit
- (2) F-OR-100 Inline Oil/Particulate Filter
- (1) S-IF-11-8.75 - Intake Filter
- (1) S-OF-SX - Oil Filter
- (1) S-AFC-4.7-2.0 - Air Filter
- (1) S-OSC-SX - Oil Separator Cartridge
- (4) S-OIL-SYN-QT - Synthetic Oil, quart
- (1) S-DB-4307 - Drive Belt
- (1) S-FB-OR-F9KE-F - Oil Filter Element
- (1) S-FB-PF-F9KB-F - Particulate Filter Element
- (1) S-OWS-25-F - Oil/Water Separator ElementDisclosures

4 Disclosures

4.1 General

- All quotes/proposals are good for 30 days from date of submission to the Customer. H2O Engineering reserves the right to increase previously quoted pricing after the 30 days.
- Any and all recommendations specific to the site remediation strategies made by H2O Engineering, Inc., are based solely on the data provided by client.

4.2 Rentals

- Rentals are available on a first-come, first-served basis. A rental is considered reserved when a signed rental agreement, security deposit and first month's rent are received by H2O Engineering.
- Rate does not include sales tax, handling, freight or transportation costs to location, or loading/off-loading, unless otherwise indicated.
- All shipments are FOB San Luis Obispo, CA.
- Shipping, installation and start-up assistance of system are quoted separately, unless otherwise indicated.
- Rental delivery lead time is based on availability.

4.3 Purchases

- Price does not include sales tax, handling, freight or transportation costs to location, or loading/off-loading, unless otherwise indicated.
- All shipments are FOB San Luis Obispo, CA.

4.4 Sparge Well Materials

- Price does not include sales tax, handling, freight or transportation costs to location.
- All shipments are FOB San Luis Obispo, CA.
- Materials delivery lead time is based on availability.

4.5 Start-Up Assistance Estimate

- Based on onsite labor, travel, prep reporting, accommodations, meals, transportation and fuel.
- Company vehicles mileage expenses will be invoiced at $.55/mile.
- Hotel, airfare, rental car and related travel expenses will be invoiced at 1.15 times the cost.
- Meal, unless otherwise indicated, will be invoiced at $52.00 per day.

5 Costing

Equipment Purchase and Service Estimate

Purchase Unit Price:

Qty	Description	Cost per unit	Cost
1	MOSU10-104	$76,000.00	$76,000.00
	Shipping Estimate one Way		$3,500.00

Sparge Well Materials:

QTY:	Item Description	Unit cost	Final Cost
7	In-situ Oxidation Point	$319.04	$2,233.28
7	Riser Pipe (10ft)	$35.75	$250.25
7	Riser Pipe (5ft)	$26.07	$182.49
7	Well Head Connections	$143.85	$1,006.95
735	Ozone Delivery Tubing (per foot)	$4.33	$3,182.55
0	Monitoring Well Plugs	$40.00	$0.00
	Total Sparge Well Materials ***(Shipping not included)***		**$6,855.52**

Total Purchase Estimate ***(For shipments within CA only, add 8%)***

Total	$86,355.52

Additional Equipment and Service Options:

Equipment Options:

QTY:	Item Description	Unit cost	Final Cost
1	Telemetry Package (if applicable)	$2,200.00	Included
0	Portable Oxygen Purity Analyzer	$650.00	$0.00
0	Hand-held ambient ozone monitor	$767.00	$0.00
2	Mounted Ozone Gas Leak Detectors	$2,372.50	$4,745.00

PPM CONSULTANTS

RMT-100

OZONE SOLUTIONS

451 Black Forest Road / Hull, Iowa / 51239
P 712 . 439 . 6880 / F 712 . 439 . 6733
E info@ozonesolutions.com / W www.ozonesolutions.com

OZONE SYSTEM FOR:

PPM CONSULTANTS

CUSTOMER: PPM Consultants
CONTACT: Walt Henley
DATE: January 24, 2019
FROM: Jimmy Moler, Ozone Solutions Inc.

OPTIONS REQUESTED:

- Extra Parts.....$2,500.00
- Telemetry System.....$2,100.00
- Start-Up.....$5,000.00
- Paint.....$2,500.00
- PLC Upgrade.....$3,000.00
- Monitoring System.....$3,000.00

BUDGET:

CUSTOMER: PPM Consultants
CONTACT: Walt Henley
DATE: January 24, 2019
FROM: Jimmy Moler, Ozone Solutions Inc.

PURCHASE PRICING:

Ozone System:
RMT-100 (Ozone Generation System) $165,880.00

DELIVERY OF EQUIPMENT:

Delivery of Ozone System $6,000.00

Lead time will vary depending on the arrival of oxygen concentrator, which has a lead time of 6-8 weeks from time of order.

TERMS:

50% At Time of Sales Order
30% At Time of Shipment
20% 30 Days after Delivery (Net30)

451 Black Forest Road / Hull, Iowa / 51239
P 712 . 439 . 6880 / F 712 . 439 . 6733
E info@ozonesolutions.com / W www.ozonesolutions.com

WARRANTY:

The ozone system in this quote is warranted against defects in workmanship and labor for period of 1 year on all parts that are not outlined in the maintenance schedule. The liability is limited to the value of the equipment; Ozone Solutions shall not be liable for incidental or consequential damages. This warranty will be void if any piece of the equipment is used in any other manner than is explicitly outlined in the quote and the O&M manuals to follow. Ozone Solutions is offering a Monthly or Yearly Service Contract (up to 5 Years) which will cover on-site routine maintenance yearly for the ozone generator and its components. The details of this contract will be outlined in a seperate Service Contract document which will be signed by both parties.

We do not warranty equipment manufactured by others. Equipment provided by Advance and Atlas Copco will be subject to their specific warranties and will not be covered by Ozone Solutions. Advance offers a 1 year warranty and Atlas Copco offers a 5 year warranty (with option for an extended warranty). It is the customer's responsibility to ensure this system is operated in accordance to the specific O&M procedures provided.

QUOTE APPROVAL:

_____

Signature

_____

Printed Name, Title

_____

Company

_____

Date

OZONE SOLUTIONS

451 Black Forest Road / Hull, Iowa / 51239
P 712 . 439 . 6880 / F 712 . 439 . 6733
E info@ozonesolutions.com / W www.ozonesolutions.com

MID-ATLANTIC ENVIRONMENTAL EQUIPMENT MAE2.com

QUOTE

Friday, February 01, 2019

Mr. Walt Henley
PPM
5555 Bankhead Highway
Birmingham, AL 35210

Subject: Bama Texaco

Mr. Henley,

We are pleased to provide the following proposal for (1) turnkey Regenerative Blower system based upon your specifications provided and an assumed site voltage of 240 volt, 60Hz, 1-phase. The system will be built to Class I Div. 2 NEC standards. We will supply the following equipment completely pre-piped, pre-wired, and pre-tested (unless stated otherwise) with appropriate piping, valves, and instrumentation to insure a minimum amount of field connections upon installation of the system. Major equipment is described below for your review and consideration:

VAPOR LIQUID SEPARATOR

Includes: **60 G vapor liquid separator** with:

- 2" Tangential inlet
- 2" outlet
- Aluminum construction
- Internal Demister Plate
- 6" cleanout port with plug
- 2" clear PVC sight tube with true union ends
- Stainless steel stem mounted level assembly
  - High High level alarm switch
- Manual drain valve

VACUUM BLOWER

Includes: One SCL-K05-MS regenerative vacuum blower with 3HP 230/1P EXP motor:

- Max Performance at inlet of blower: 80 ACFM @ 5.8" Hg

Inlet piping to blower to contain:

- Vacuum gauge
- Vacuum transmitter (wired to Ozone PLC)
- Adjustable Vacuum relief valve

MID-ATLANTIC ENVIRONMENTAL EQUIPMENT, INC.
Main Phone:
877-MAE2inc
(877-623-2462)
mae2.com

Corporate Headquarters
15 Carroll Drive
Bluffton, SC 29910
843-836-1804
Fax: 843-836-1805
Email: sevans@mae2.com

Assembly Plant
Hardeeville, SC
843-296-4580

Regional Sales Office
182 Spring Oaks Lane
Ruckersville, VA 22968
434-531-3472
Fax: 434-985-1214
Email: jfrydl@mae2.com

- One (1) 2” Solberg inline filter
- 1” Dilution valve with 1” Solberg Filter Silencer
- Sample Port
- 2” SCH80 PVC piping

Discharge piping from blower to contain:

- Sample port
- Pressure gauge 0-100” wc
- Temperature gauge 50-500 F
- Adjustable Temperature Switch
- 2” adsorptive discharge silencer
- 2” SCH40 Aluminized discharge stack with rain flapper cap

Vapor Phase Carbon:

MAE2 model VS 500 Vapor vessel with: (shipped loose for installation by others)

- 500 lbs of vapor phase carbon
- 4” inlet and outlet
- Low pressure drop
- Polyamide epoxy resin internal coating
- (1) 4” D 7’ L hose with camlock to connect from system discharge to carbon inlet

Remediation Enclosure:

Built to NEC Class 1 Div 2 standards, all wiring intrinsically safe, all equipment pre-piped, factory tested

6’ x 6’ x 3’ Custom Steel Sound Enclosure with the following standard features:

- Aluminum siding
- Plywood floor with anti skid paint
- 2” Quiet Rock with expandable metal cover overlay on walls, ceiling and doors
- Removable double access doors
- Control panel mounted to outside wall

Interior to contain the following:

- Vacuum extraction system
- (1) 100 watt Exp Light
- 12” EXP Ventilation fan with remote Tstat and sound attenuating rain hood
- 500 Watt EXP heater with remote Tstat
- (1) 16” Passive vent louver with sound attenuating rain hood

Relay Control Panel

- Control enclosure, NEMA 4
- Main circuit breaker, 230V, 1-pole
- Circuit breakers, 230V, 1-pole, for motor short circuit
- Circuit breakers, 120V, 1-pole for control circuit
- Motor contactor with adjustable overload relay
- Push button, ESTOP
- Push button, reset
- Selector switch, 3-position
- Green motor run indicator
- Pilot alarm lights, red
- DC power supply
- IS relay, dual channel
- Contracts for remote shut down and restart
- Contact for alarm retransmission to PLC panel
- Lot of control relays, terminals, etc.
- 20 Amp GFCI outdoor outlet with inuse cover

Operation And Maintenance Manual (One Copy):

Operating instructions for all treatment system components
Copy of operating manual for each piece of equipment
Summary of operation controls and failsafes

Pricing Summary:

Regenerative Blower System	$ 32,657.00
Carbon Vessel with inlet hose	$ 3,418.00
Start Up and Training	$ 1,000.00
Freight to Attalla Alabama	$ 750.00

The above pricing does not include applicable state or local taxes.

Should you have any questions or concerns regarding this proposal please feel free to contact me at 1-843-836-1804.

Thank you for the opportunity to provide you with this proposal.

MAE2, Inc.

Shawn T. Evans
Vice President
15 Carroll Drive
Bluffton, SC 29910
Toll Free 877-623-2462
(843) 836-1804
Fx (843) 836-1804

North American Office
Acoustiblok, Inc.
6900 Interbay Boulevard
Tampa, FL 33616 USA
Phone: 813-980-1400
Fax: 813-549-2653
www.acoustiblok.com
sales@acoustiblok.com

QuietFiber®

Non-Fiberglass Hydrophobic Industrial Noise Absorption Material Benefits and Specifications

Engineered specifically for maximum noise absorption and is used extensively in the industrial, residential and commercial applications. QuietFiber® is an easily installed solution to many noise applications.

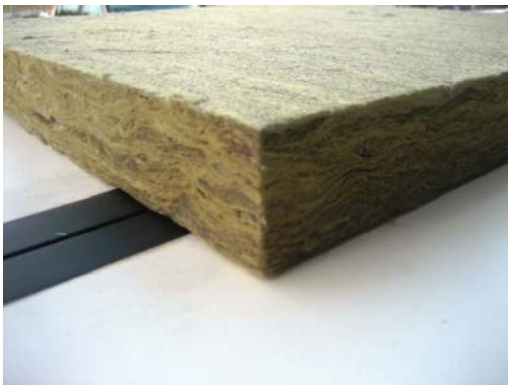
The non-fiberglass QuietFiber has the highest noise reduction rating of NRC 1.00. Easily used with a high STC material; such as Acoustiblok, for a composite solution that provides high absorption and barrier properties.

Areas of high noise levels; including sound reverberation, can be resolved easily and economically by installing QuietFiber into as much of the area as possible. Available in 2" thick sheets in sizes 4' x 6', 4' x 4', and 2' x 4' sheets

Unlike other fibrous materials or fiberglass which does not have the high NRC ratings that QuietFiber has, QuietFiber is "hydrophobic," meaning it will not absorb nor combine with water. This is an obvious attribute should the material become wet, humid or need steam cleaning. Marine noise reduction applications are endless.

QuietFiber Benefits:

- Highest noise absorption rating of NRC 1.00 (far exceeding fiberglass ratings)
- QuietFiber® material is virtually fireproof. Class A fire rating, 0 smoke spread and 0 flame development.
- Hydrophobic, will not combine with water.
- Will not support mold or mildew growth.
- Easy installation.
- Full outdoor weather and U.V. tolerant.
- Significant sound benefit when used in wall or floor assemblies vs. fiberglass batt.
- Install on top of existing acoustical ceiling tiles as to reduce room to room crossover sound.
- High temperature capable for high temperature sound abatement.
- Comprised of up to 90% recycled material. 100% recyclable. Non-fiberglass composition.



NRC 1.0 Rated	125hz	250hz	500hz	1000hz	2000hz	4000hz
	0.36	0.79	1.15	1.04	1.01	1.04

Technical Data:

- ASTM C 423 - NRC1.0
- ASTM E 84 - Class 1, 0 Flame 0 Smoke
- ASTM C 518 – R 4.2 per inch
- ASTM C 518 – 0.24k @ 75 (24° C)

Standards Compliance:

- ASTM C 665 Non-Corrosive Type I
- ASTM C 612 1A, 1B, II, III
- ASTM E 136 Rated Non-combustible per NFPA Std 220
- ASTM C 1104 Absorption less than 1% by volume
- ASTM C 356 Linear shrinkage <2% @ 1200° F (650°C)

MK ENVIRONMENTAL INC.

765 Springer Drive
Lombard, IL. 60148-6412
615-392-7737

jgiltz@mkenv.com

QUOTATION

Date	2/1/2019
Quote No.	219006B
Reference	Bama Texaco
Page No.	1 of 2
Freight	Included
Terms	Net 90 Days
Ship Via	Best
F.O.B.	Factory

SOLD TO:	**SHIP TO:**
Walt Henley	Facility I.D. No. 12534-055-005151
PPM Consulting, Inc.	Bama Texaco
5555 Bankhead Highway	815 Cleveland Avenue
Birmingham, AL. 35210	Attalla, AL.
205-836-5650	PPM Project No. 451603-CAP-D

Quotation valid for 90 days

QUANTITY		UNIT PRICE	AMOUNT
	100 amp 1/60/230 volt 3 wire plus ground electrical service Brought to NEMA 3R control Panel Interior electrical will comply with NEC requirements for Class 1, Division 1, Group D Hazardous locations Motors will be Explosion-proof (XP) construction		
1	Soil Vapor Extraction (SVE) Model EN513W58L Rotorn regenerative blower 1.5 HP, 115/208-230 volt, Explosion-proof (XP) motor 40 SCFM @ 44" wc vacuum (3.2"Hg) Maximum flow: 78 SCFM Maximum vacuum: 75" wc (5.5"Hg) Inlet particulate filter with vacuum gauge 30 gallon knockout condensate drum with tangential inlet design High level k/o drum float switch Clean out port Manual drain valve Vacuum relief valve Dilution valve with filter/silencer Exhaust temperature gauge Exhaust sample port High temperature switch Discharge silencer Vacuum transducer to measure vacuum via telemetry anlalog input. Telemetry by others.	18,066.00	$18,066.00
1	Master Control Panel System, Including: NEMA 3R weather proof enclosure Operator control knob Off/Run/Start Motor starter with MSP breaker and thermal overload protection Control transformer (4) intrinsically safe relays, (4) alarm indicator LED's, (8) output channels Hard wired relay logic SVE Hour meter Anti-falsing alarm circuit to prevent nuisance tripping (1) exterior GFCI utility outlet Emergency E-stop LED red indicator light located on swing out sub panel MCP to be mounted and wired outside the system trailer <u>SVE automatic shut down upon:</u> SVE condenstate k/o drum high liquid level SVE exhaust high temperature switch Interior Emergency Stop Mushroom button with twist to release detent SVE interlock		
1	SVE Interlocks Contrrols MK supplied engineered interlock controls. If the SVE shuts down upon alarm it will send a signal to shut down the ozone equipment and vise-versa. The ozone equipment requires the same setup on its end. MK to wire its own interlock and ozone manufacturer to do the same. Separate conduit with interlock wires to be ran by the local electrician. Detailed conduit schedule with wire size and quantity will be supplied after approval and review of ozone logic.		

MK ENVIRONMENTAL INC.

Walt Henley
PPM Consulting, Inc.

Date 2/1/2019
Quote No. 219006B
Reference Bama Texacc

QUANTITY		UNIT PRICE	AMOUNT
1	MK Custom Mini Enclosure Sized to accommodate the equipment specified Removable front and side panels Fully insulated panels XP ventilation fan Fresh air intake for cross circulation Control panel mounted outside the enclosure Custom sound insulated blackets for noise abatement Mechanical & electrical installation. Piping, mounting and wiring of the SVE package Enclosure large enough to fit the SVE regenerative package inside	12,170.00	$12,170.00
1	Vapor Phase Carbon Vessels - SVE offgas VR-400 lbs drums 400 lb initial load each 4" plain pipe fitting Off loading, placement & piping pı` Installed outside the system trailer by others		
1	AWS3 knock out tank prior to oxidizer to minimize condensed liquids from entering burner or vapor phase carbon bed.		
1	Startup & Training Services 1-day remediation system startup & training services. Based on 2 weeks prior notice.	2,500.00	$2,500.00
1	Freight Services Freight to jobsite. Off loading and placement by others.	2,000.00	$2,000.00
	Optional Equipment:		
1	Air to air heat exchanger (Soil vapor extraction exhaust stream) **ADD $ 5,815.00** for the offgas treatment prior to the carbon drum. To reduce the outlet temperature of the dual phase offgas stream to help knockout the condensate in the air stream. Includes an elevated stand to mount the heat exchanger and fit over the AWS-3 knockout drum. Includes starter controls for the heat exchanger motor in the master control panel. 20' of wiring with flex conduite included from the heat exchanger starter to the heat exchanger motor. Wiring termintions provided by the local electrician or MK at startup. Located outside the system trailer.		
	Notes: Not sure what type, brand or model the ozone sparge equipment telemetry will be providing. The telemetry would require the following available input and outputs: (3) digital inputs - SVE on/off - SVE k/o tank high liquid level - SVE discharge temperature high (1) analog input - Vacuum reading, 4-20 mA signal (2) digital outputs - remote restart - remote shutdown 100 amp meter base and fused main disconnect provided by others. Consult MK factory for this option or any other option requirements.		

EQUIP. SUB TOTAL	$34,736.00
EQUIP. SALES TAX	
START UP/TRAINING	
FREIGHT	
NET TOTAL	$34,736.00

Does not include permits, fees, etc…
Offloading & placement by others.

Jerry Giltz,
MK Environmental, Inc.

APPENDIX F – SUBCONTRACTOR SPECIFICATIONS AND QUOTATIONS

January 18, 2019

Mr. Tim Walker
Environmental, Inc.
1345 Blair Farms Road
Odenville, Alabama 35120

Re: Quotation Request for Installing Ozone Sparge/Soil Vapor Extraction System
Bama Texaco
815 Cleveland Drive
Attalla, Alabama
Facility I.D. No. 12534-055-005151
UST Incident No. UST14-04-05
PPM Project No. 451603-CAPD

Dear Mr. Walker:

PPM Consultants, Inc. (PPM) is proposing to install a groundwater remediation system at the referenced site and requests price quotations for the following work elements:

- Trench approximately 110 feet in concrete and 105 feet in asphalt for the installation of piping (**Figure 1, Proposed System Layout, in Attachment A, Figures**). The majority of the concrete will be less than 6 inches thick. The piping should be installed approximately 12 inches below ground surface (BGS). PPM requests that the contractor minimize the width of the concrete cuts and trench (preferably 1.5 feet or less in width). Soil and concrete removed should be placed in a roll-off, provided by PPM.

- Trench approximately 20 feet in soil for the installation of piping. The piping should be installed at least 12 inches BGS. PPM requests that the contractor minimize the width of the trench.

- Install approximately 735 feet of 1-inch nominal diameter Schedule 40 polyvinyl chloride (PVC) lines that will contain ozone delivery tubing (one individual line to each sparge point) and another 275 feet of 1-inch nominal diameter PVC lines that will contain wiring for ozone monitors to be placed at two subsurface locations. Each sparge point (7 total) will have separate delivery tubing connected to the manifold at the ozone system. The ozone delivery tubing and manifold will be provided by the

equipment manufacturer. **Figure 2, Ozone Sparge Point and Monitoring Point Construction Details** shows a diagram of the wellhead connections. A cross-section of the typical trench construction is shown in **Figure 3, Trench Details**.

- Install approximately 550 feet of 2-inch nominal diameter Schedule 40 PVC soil vapor extraction (SVE) piping and two horizontal extraction points, each comprised of 20 feet of slotted (0.01-inch) screen (40 feet total screen). The SVE piping will also be connected to two 4-inch nominal diameter recovery wells (installed by others). Diagrams of the horizontal screens and recovery wells are shown, respectively, in **Figure 3** and in **Figure 4, Recovery Well and Junction Box Construction Details**.

- Construction and installation of a 4-point manifold for the SVE piping. The manifold will be constructed in accordance with **Figure 5, Profile View of Manifold**. Each horizontal screen and recovery well will have separate lines connected to the manifold at the SVE system.

- Open trenches should be covered with steel plates rated for vehicular traffic until finished with concrete.

- Trenching and piping will be performed in accordance with the dimensions and details on the attached drawings.
    - Except at horizontal screen locations, trenches performed in concrete and asphalt will be backfilled with new crusher run stone to 6 inches below the ground surface and then covered with 6 inches of concrete (see below).
    - Trenches performed in soil will be backfilled with excavated materials.
    - Trenches at horizontal screen locations will be lined on each side with 6-mil plastic sheeting and backfilled with clean, well-rounded gravel so that the screen is surrounded on all sides by at least 3 inches of gravel. The plastic will be secured with duct tape to the solid SVE pipe where connections to the screens exist. The gravel will then be covered with 6-mil plastic sheeting wrapped from each side of the trench and the edges of the sheeting secured together with duct tape. The portion of the trench above the plastic sheeting will be backfilled with new crusher run and concrete as described above.
- Provide and install 4-inch nominal diameter slotted screen placed vertically to the base of the trench at the two subsurface ozone monitoring point locations. Eight-inch diameter manholes will be constructed in 2-foot by 2-foot, 6-inch thick concrete well pads over the ozone monitoring points. The construction of the ozone monitoring points is shown in **Figure 2**.

- Provide and install 12-inch diameter manholes at the seven sparge points. Manholes will be constructed in 2-foot by 2-foot, 6-inch thick concrete well pads. The sparge points will be installed under a separate quote request.

- Provide and install 18-inch diameter manholes at the two recovery wells. Manholes will be constructed in 2.5-foot by 2.5-foot, 6-inch thick concrete well pads. The recovery wells will be installed under a separate quote request.

- Provide and install 24-inch square steel manholes at two junction boxes along the piping trench. Manholes will be constructed in 4-foot by 4-foot, 6-inch thick concrete pads. The junction boxes will be constructed in the manner shown in **Figure 4**.

- Trenches and manholes performed in concrete will be completed with a minimum thickness of 6 inches of concrete. Steel dowel pins will be drilled into the existing concrete at 3-foot linear spacing per side. Dowel pins will extend at least 3 inches into the existing concrete with at least 4 inches of reveal in the new concrete. The finished grade of concrete should match the existing grade on both sides of the trench and a light broom finish should be applied after the concrete has been allowed to slightly cure. **Note: If the concrete work does not look professional, look clean, match the existing surface, or significantly cracks within one year, the contractor may be required to remove and replace the concrete at their own costs**.

- Installation of materials and connections for ozone sparge points, SVE screens, and recovery wells will be in accordance with **Figures 2** through **5**. This includes connecting the individual ozone delivery lines to the ozone system manifold.

- Installation of a four-sided, 8-foot tall fence. The compound measures approximately 20 feet in length and 20 feet in width. A double gate that measures 8 feet wide will be installed on the north side of the compound. Please provide separate pricing for <u>both</u> a wooden fence and a chain link fence with privacy slats.

- Restoration of site to original conditions.

Unit prices should be broken out accordingly. Technical specifications for installation of the ozone lines and SVE lines are included, respectively, in **Attachment B**, **Ozone Sparge Lines,** and **Attachment C, SVE Lines**. Specifications for site cleanup are included in **Attachment D, Cleanup, Repair, Etc.**

The site shall be barricaded for safety reasons during all work. The contractor shall perform work in consecutive workdays until such time that the project is complete. A schedule of implementation should be submitted one week prior to initiation of work. Work for each phase shall be performed during contiguous days and work shall commence on a Monday, prior to noon. All electrical will be contracted directly by PPM and is not part of this proposal.

Please provide your estimates in a unit rate format that can be utilized if a work change order is necessary. Also, please provide your estimated number of days to complete the work. Alternate, more economical trenching methods are welcome, but must be included as a separate quote with accompanying documentation justifying the deviations. Payment will be made based on actual measurements following completion of the work. Should the estimated quantities be exceeded, a change order should be requested prior to initiation of work. If this is not practical, at a minimum, a verbal confirmation should be requested and followed up by written correspondence (fax). It is noted that all unit rates should be consistent with Alabama Tank Trust Fund (ATTF) rates, when applicable, including per diem.

PPM strongly recommends, but does not require, that you visit the site prior to your submittal. **Proposals are due to PPM by end of day, Monday, January 29, 2019**. If you have any questions or need additional information, please contact me at your convenience.

Sincerely,
PPM Consultants, Inc.

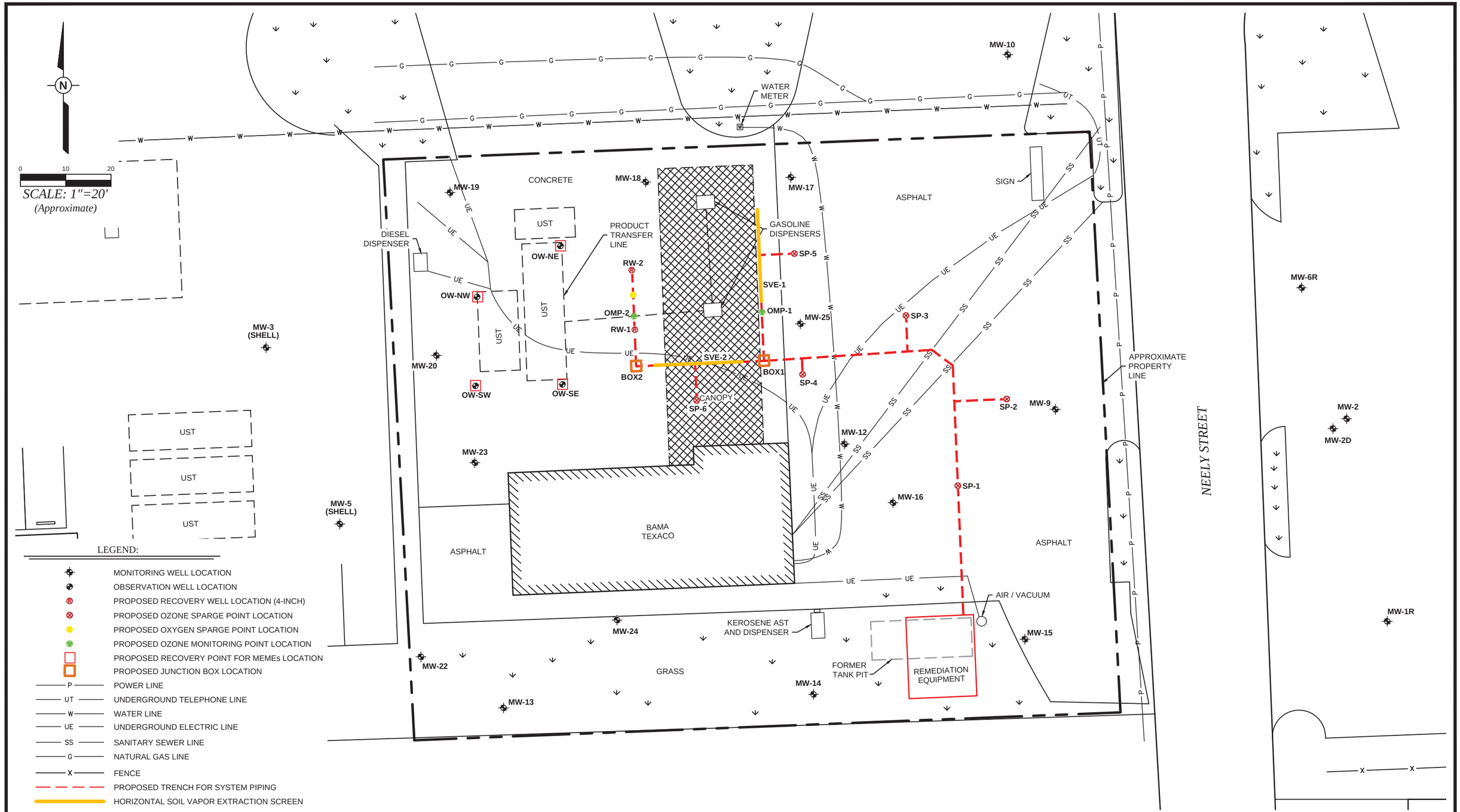
Walter B. Henley, Jr., P.G.
Project Manager

Attachments: Attachment A – Figures
Attachment B – Ozone Sparge Lines
Attachment C – SVE Lines
Attachment D – Cleanup, Repair, Etc.

ATTACHMENTS

ATTACHMENT A

FIGURES



PPM CONSULTANTS, INC.
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DRAWN BY:	DRAWN DATE:
JCP	01/16/19
PROJECT NUMBER:	BILLING GROUP:
451603	CAP-D

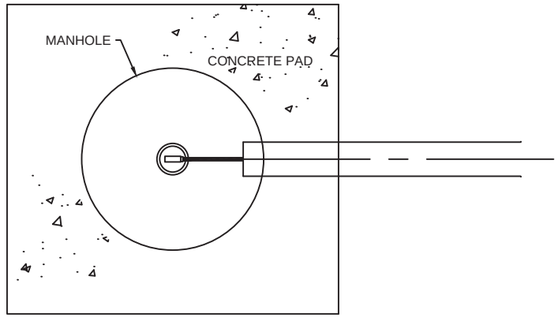
IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

PROPOSED SYSTEM LAYOUT

FIGURE NUMBER
1

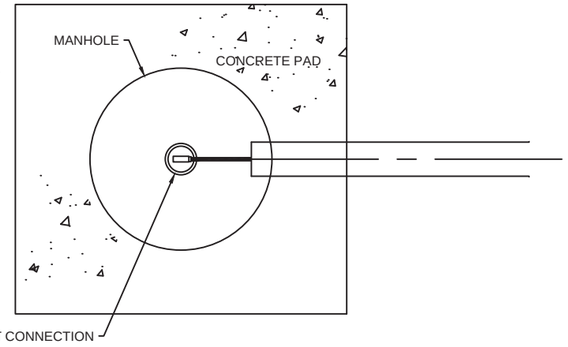
NOTES:

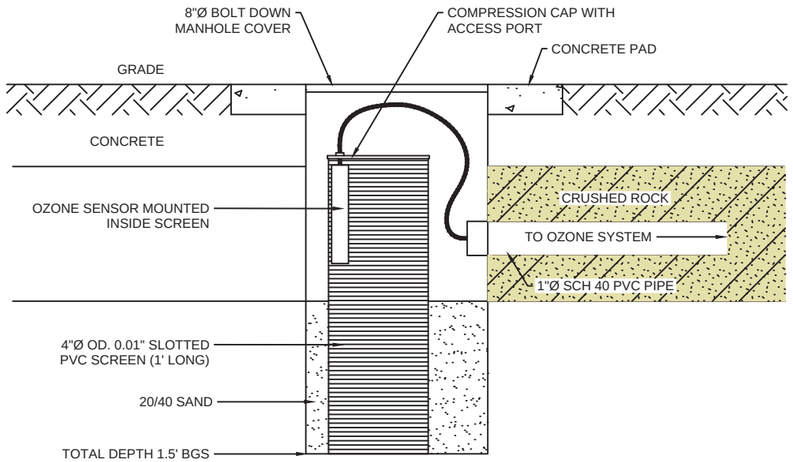
1. WELLHEAD CONNECTIONS, RISER AND OXIDATION POINTS TO BE PROVIDED BY EQUIPMENT MANUFACTURER.
2. OZONE DELIVERY TUBING TO BE PROVIDED BY EQUIPMENT MANUFACTURER.
3. OZONE DELIVERY TUBING TO BE INSTALLED DURING PLACEMENT OF 4"Ø SCHEDULE 40 PVC CONDUIT.
4. MANHOLE COVERING TO BE PROVIDED AND INSTALLED BY SYSTEM INSTALLATION CONTRACTOR.



TYPICAL OZONE SPARGE WELL PLAN VIEW

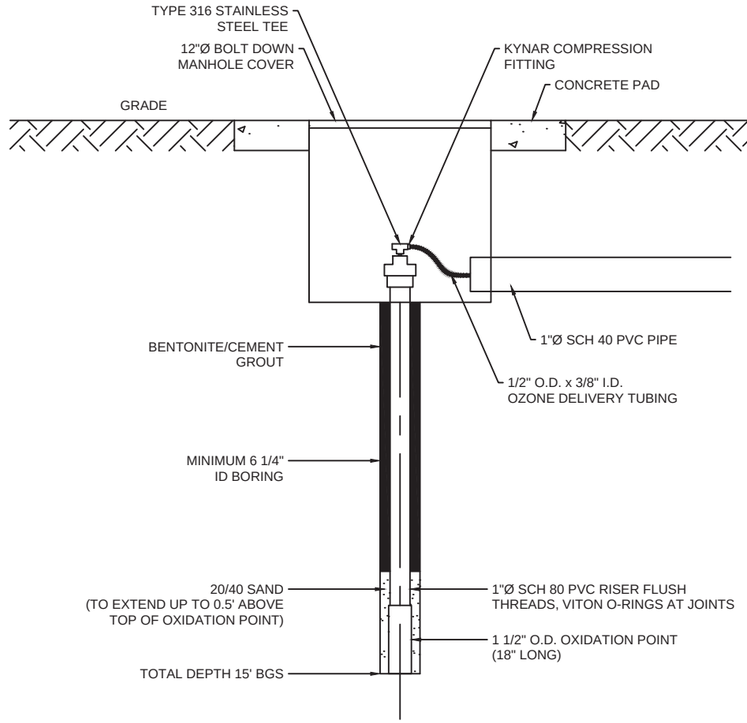
NOT TO SCALE





OZONE MONITORING POINT DETAIL

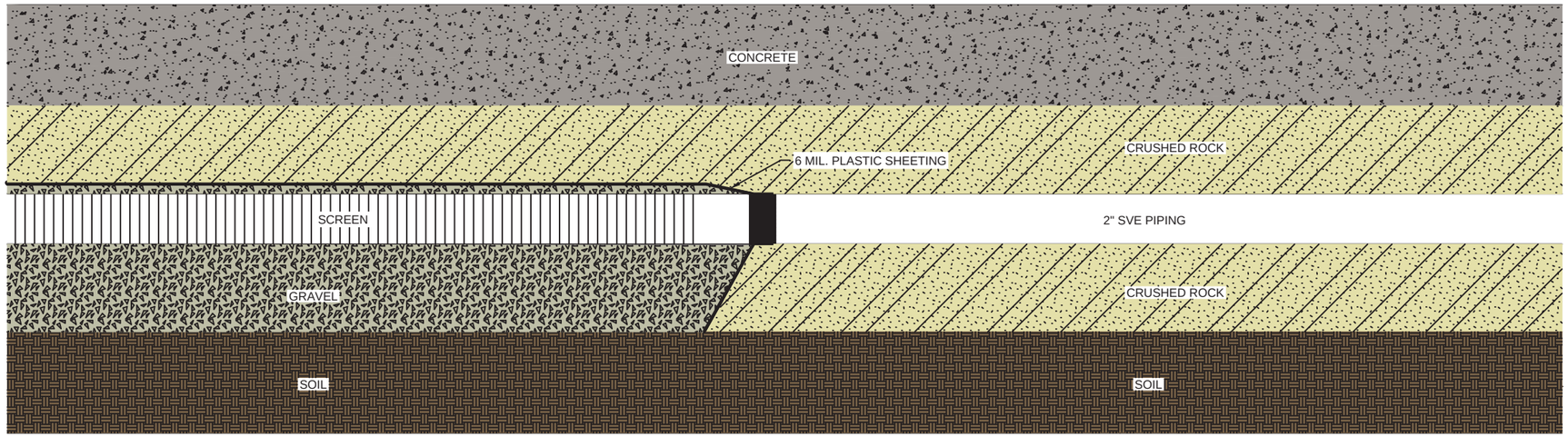
NOT TO SCALE



TYPICAL SPARGING WELL DETAIL

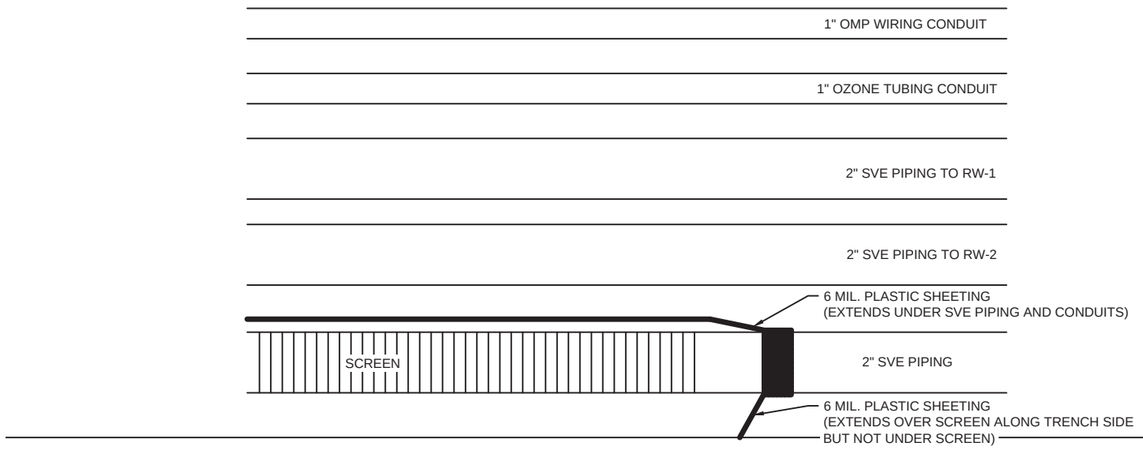
NOT TO SCALE

PPM CONSULTANTS, INC. www.ppmco.com		IRA PHILLIPS, INC. **BAMA TEXACO** 815 CLEVELAND AVENUE ATTALLA, ALABAMA	OZONE SPARGE POINT AND MONITORING POINT CONSTRUCTION DETAILS
DRAWN BY: JCP	DRAWN DATE: 01/16/19		FIGURE NUMBER 2
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D		



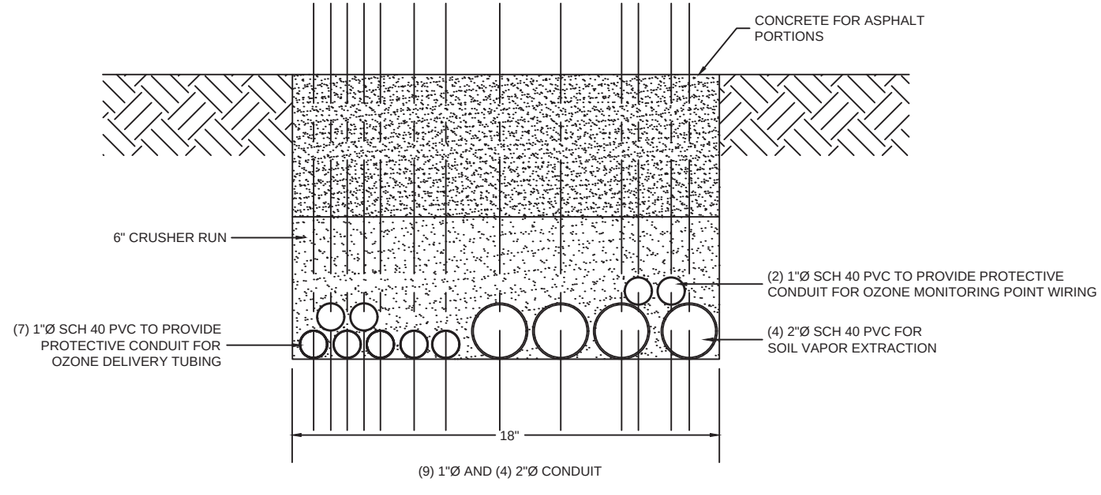
TRENCH DETAIL AT SVE-2 (CROSS-SECTION VIEW)

NOT TO SCALE



TRENCH DETAIL AT SVE-2 (PLAN VIEW)

NOT TO SCALE



TYPICAL TRENCH DETAIL

NOT TO SCALE

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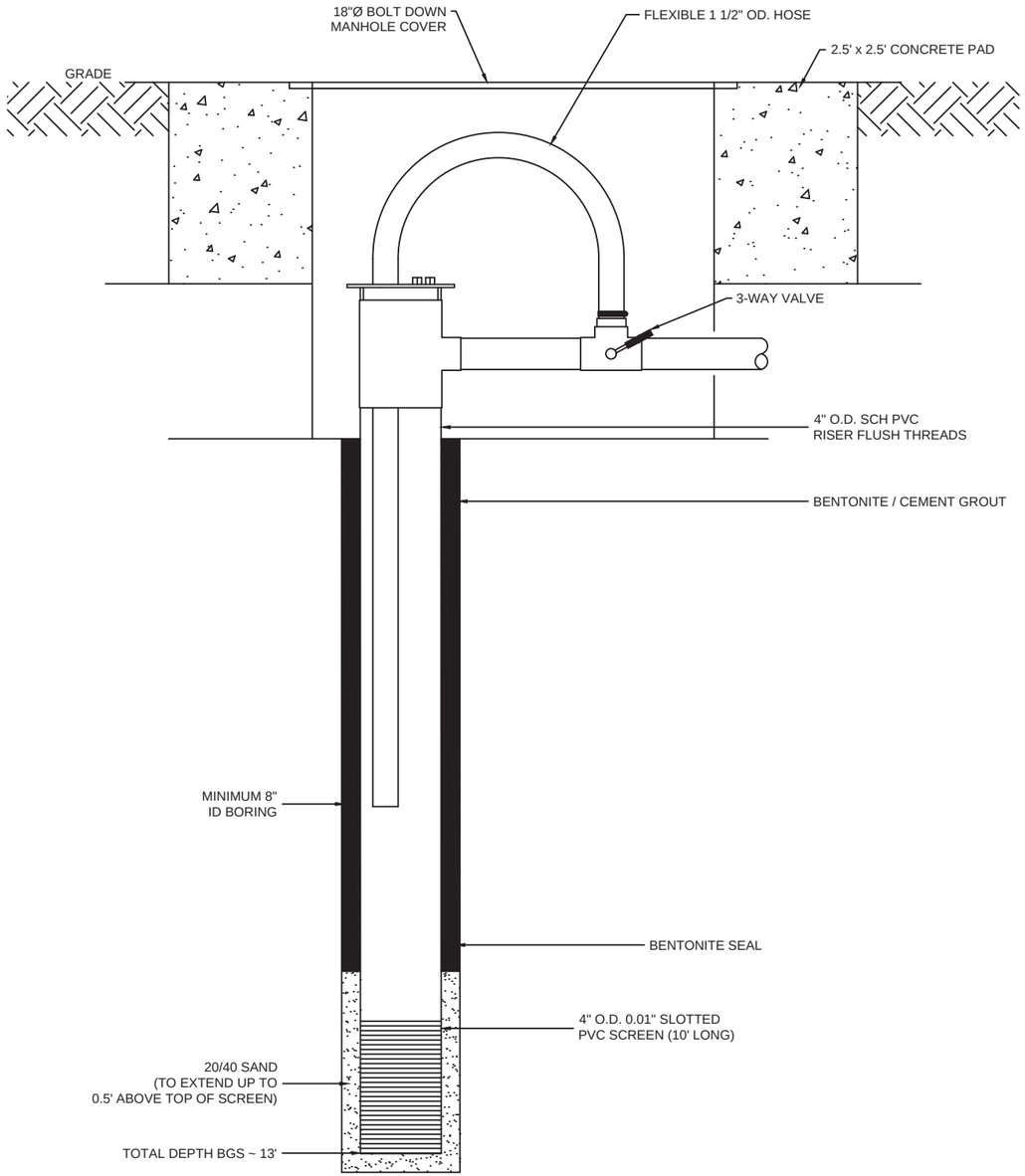
DRAWN BY: JCP	DRAWN DATE: 01/16/19
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

TRENCH DETAILS

FIGURE NUMBER
3

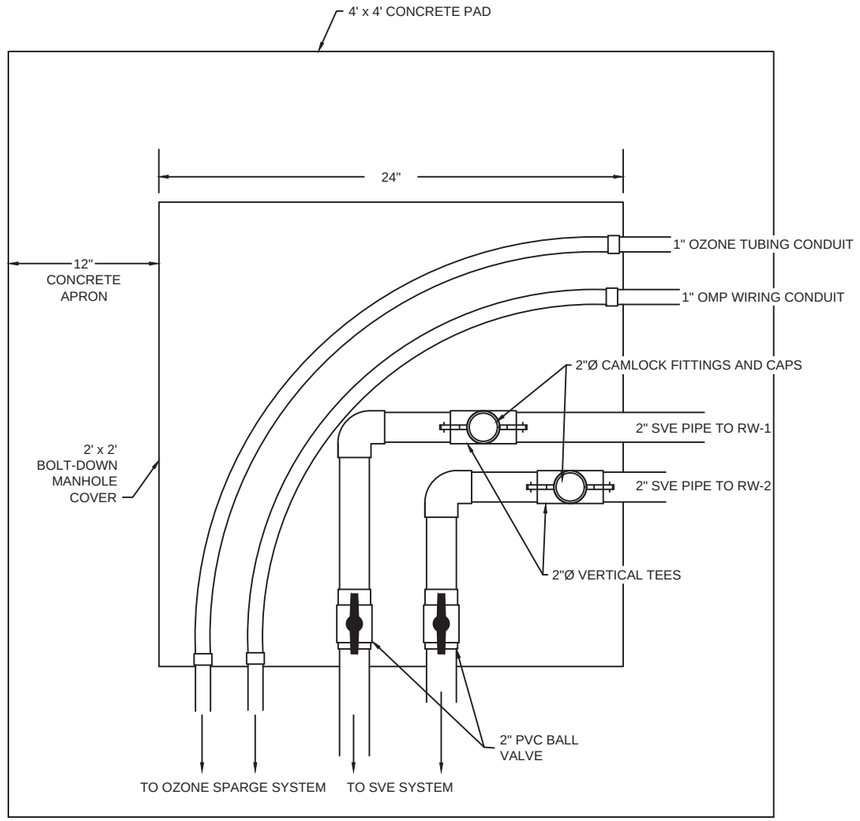


TYPICAL RECOVERY WELL / SVE POINT DETAIL

NOT TO SCALE

NOTES:

1. WELLHEAD CONNECTIONS, RISER AND OXIDATION POINTS FOR SPARGE WELLS TO BE PROVIDED BY EQUIPMENT MANUFACTURER.
2. OZONE DELIVERY TUBING TO BE PROVIDED BY EQUIPMENT MANUFACTURER.
3. MANHOLE COVERING TO BE PROVIDED AND INSTALLED BY SYSTEM INSTALLATION CONTRACTOR.



JUNCTION BOX 2 DETAIL

NOT TO SCALE

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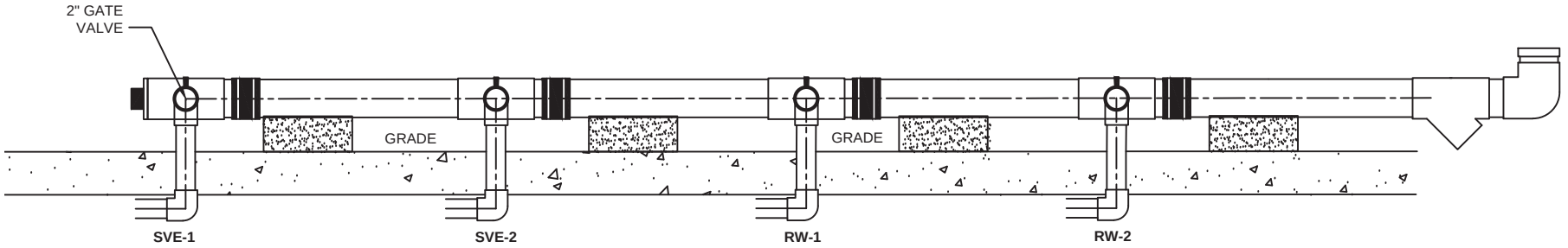
DRAWN BY: JCP	DRAWN DATE: 01/16/19
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA

RECOVERY WELL AND JUNCTION BOX CONSTRUCTION DETAILS

FIGURE NUMBER
4



NOT TO SCALE

PPM CONSULTANTS, INC. www.ppmco.com		IRA PHILLIPS, INC. **BAMA TEXACO** 815 CLEVELAND AVENUE ATTALLA, ALABAMA	PROFILE VIEW OF MANIFOLD
DRAWN BY: JCP	DRAWN DATE: 01/16/19		FIGURE NUMBER 5
PROJECT NUMBER: 451603	BILLING GROUP: CAP-D		

ATTACHMENT B

OZONE SPARGE LINES

PPM Consultants, Inc.
5555 Bankhead Highway
Birmingham, Alabama 35210

SECTION 4201 OZONE INJECTION LINES

4201.0 OZONE INJECTION LINES

4201.1 GENERAL

This part of the Work includes installation of ozone injection lines and other appurtenances for conveying the ozone into the subsurface, excavation and backfill of trenches, cutting and replacing walks and roadway surfaces, and other miscellaneous work necessary to complete and make ready for operation of an ozone injection system.

4201.2 MATERIALS

4201.3 BEDDING, HAUNCHING, AND BACKFILL MATERIALS

Requirements for various bedding and backfill classes should be as detailed on the Drawings, and the materials used shall be in accordance with the following Specifications.

4201.3.1 Coarse Aggregate

Crushed aggregate or graded gravel shall be clean, free from clay, sticks, or other deleterious substances, meeting the following graduation:

SIEVE	PERCENT PASSING BY WEIGHT
3/8”	95-100
No. 100	0-7

4201.3.2 Granular Backfill

Granular backfill shall be sharp “flume sand,” clean, free from clay, sticks, or other deleterious substances meeting the following graduation:

SIEVE	PERCENT PASSING BY WEIGHT
3/8”	95-100
No. 100	0-3

4201.3.3 Select Native Soil

Select native soil shall be fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures (Unified Soil Classification soil types GM, GC, SM, and SC), or inorganic silts, very fine sands, silty or clayey fine sands, or inorganic clays of low to medium plasticity, silty clays, lean clays, having a liquid limit of fifty percent

(50%) or less (United Soil Classification soil types ML, CL, or CLML), as described in ASTM D2487.

4201.4 CONSTRUCTION METHODS

4201.4.1 General

The Contractor shall be required to install the subsurface ozone lines upon completing the installation of ozone injection wells (**PPM Technical Specification No. 200**). Sizes of ozone lines are specified on Drawings. At a minimum, the ozone lines should be installed to 12 inches below ground surface. These lines are to be stubbed up perpendicular to ground surface near the unit and in the excavated area for later completion as specified on the Drawings.

4201.4.2 Cooperation with Utility Officials

The Contractor's attention is directed to the fact that his Work will be performed in the close proximity of existing utilities, streets, drainage structures, etc. The Contractor shall at all times cooperate with the various utility and street officials and shall notify the appropriate personnel prior to excavation in areas where known utilities are located.

4201.4.3 Clearing of Right-of-Way

The Contractor shall clear the right-of-way provided for the ozone line of all objectionable debris and obstructions that will interfere with the installations of the mains. Wooded areas shall be cleared and grubbed and surface obstructions to remain shall be protected in accordance with **PPM Technical Specification No. 1000**.

4201.4.4 Excavation of Trench and Backfill

Excavation, preparation for trenches, and backfill shall be in accordance with the latest revisions of the applicable standards for Polyvinyl Chloride ASTM D2321, unless otherwise amended by these Specifications or the Drawings.

It is the intent of these Specifications that all pipes be properly supported and then backfilled with granular or select material meeting the requirements of **PPM Technical Specification No. 2000**. If the native soil in the trench is satisfactory for backfill (in any horizon), the Contractor shall preserve that material for use as backfill in the pipe zone. If the entire trench is in a soil which does not conform to the backfill requirements, the Contractor shall refurnish a borrow material which conforms to **PPM Technical Specification No. 2000** for use in the pipe zone. Compensation shall be as noted in the payment section.

4201.5 SURFACE OBSTRUCTIONS

4201.5.1 Obstruction of Streets, Premises, etc.

All materials shall be placed as to interfere as little as possible with public travel. At street crossings and other points as directed by the Engineer, trenches shall be bridged in a manner so as to prevent any serious interruption of public travel. The closure of both sides of a double roadway to vehicular traffic will not be permitted except by written permission by the proper authorities. Special care shall be taken to give free access at all times to all fire hydrants, water valves, fire alarm boxes, and Police and Fire Department driveways.

In case the Contractor shall fail to keep open streets, sidewalks, approaches to premises, etc., and shall refuse or neglect to open them within twelve (12) hours after written notification by the Engineer; or shall the Contractor fail to afford proper and necessary access to fire hydrants, water valves, fire alarm boxes, or Police Department or Fire Department driveways, and shall neglect or refuse to afford such access within one (1) hour of receiving written or oral notice to do so, the Engineer shall be and is hereby authorized and empowered to put on such force as may be necessary and to do the Work, deducting the actual cost thereof from any money which may be due or may become due the Contractor.

4201.5.2 Conflict with Surface Obstruction

All shade trees, shrubbery, utility poles, etc., within the right-of-way provided shall be protected, and any building or structure, which may be endangered during the Work, shall be shored up and otherwise protected. The cost thereof from any amounts due or to become due the Contractor.

Any properties disturbed or damaged by the Contractor shall be restored to its original condition. No additional compensation will be made from this corrective Work.

4201.6 SUBSURFACE OBSTRUCTION

The Contractor shall anticipate all underground obstructions such as water lines, gas lines, sewer lines, utility lines, concrete and debris. Any such lines or obstructions indicated on the Drawings show only the approximate location and must be verified in the field by the Contractor. The Engineer does not imply or guaranty the exact location of any existing underground utility; however, the Engineer will endeavor to familiarize the Contractor with all known underground obstructions.

The Contractor shall take the necessary precautions not to injure any gas or water pipe, sewer, drain or service pipes connected therewith or conduits or other underground structures, and the Contractor must repair or have repaired at once, at his own cost, any public or private structure or pipe damage by or in the course of his Work. Should the Contractor fail to repair or have repaired such damage or injury within a reasonable time, the Engineer may after twenty-four (24) hours reasonable notice, have such repairs made and deduct the cost thereof from any amounts due or become due the Contractor.

The Contractor shall assume all risks and be responsible for all expense and damage attending the presence or proximity of any gas or water pipes, sewers, drains, conduits, or other underground structures where such pipes or other structures cross the trench or appear in the trench in such a manner as not to demand their rearrangement or realignment. The Contractor's risks and responsibilities shall also apply to such structures as are approximately parallel with or adjacent to but outside of said trench.

The Contractor shall uncover known subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction.

Should any pipe or other obstruction (so located as to interfere with the Work) be encountered, the Contractor shall at once notify the Engineer of the locality and circumstances, and the place shall be passed over until satisfactory arrangements are made.

Should the obstruction parallel the trench, the Engineer may require the Contractor to offset or re-align his pipeline to miss the obstruction. This re-alignment may be made by the use of fittings, pipe deflection, and/or manholes as the case may dictate.

4201.7 MEASUREMENT AND PAYMENT

4201.7.1 Ozone Lines

4201.7.1.1 Measurement

Ozone lines shall be measured by the linear foot along the centerline of the pipe without deduction for valves or fittings. Pipe installation in casing will be included. Measurement will be from center to center of crosses, reducers, etc.

4201.7.1.2 Payment

Ozone lines shall be paid for at the Contract Unit Price Bid per linear foot for pipe of the various sizes, types, and classes, which price and payment shall constitute full compensation for furnishing all plant, labor, equipment, and materials, including hauling, trenching, bed preparation, laying, jointing, and backfilling, testing, sterilization, and other operations incidental to the satisfactory completion of the Work as shown on the Drawings.

4201.7.2 Replacement or Repair of Street and Sidewalk Surfacing

4201.7.2.1 Measurement

All surface areas authorized cut by the Engineer shall be measured for payment by the square yard (SY), and will be equal to the actual length of trench cutting the payment times the allowable trench width as shown on the Drawings plus two feet (2').

4201.7.2.2 Payment

Payment shall be made at the Contract Unit Price Bid per square yard for the various types of surfacing, which price and payment shall constitute full compensation for furnishing all plant, labor, equipment, and performing all Work, including all other operations incidental to the satisfactory completion of Work shown on the Drawings and specified herein. No additional compensation of any type shall be paid for repairing damaged surfacing which was not authorized in writing by the Engineer, and all repairs thereto shall be promptly made by the Contractor to the satisfaction of the Engineer at no additional cost to the Engineer.

4201.7.3 Maintenance Gravel

4201.7.3.1 Measurement

Maintenance gravel used to maintain traffic on streets and drives shall be measured by the cubic yard by measured truck.

4201.7.3.2 Payment

Maintenance gravel, ordered placed by the Engineer or Resident Inspector, shall be paid for at the Contract Unit Price Bid per cubic yard for "Maintenance Gravel" which price and payment shall constitute full compensation for all plant, labor, equipment, and materials necessary to produce, store, transport, place, and spread the gravel as directed.

4201.7.4 Line Tie-In

Line tie-in shall be measured per each, complete, and paid for at the Unit Price Bid.

ATTACHMENT C

SVE LINES

PPM Consultants, Inc.
5555 Bankhead Highway
Birmingham, Alabama 35210

SECTION 4200 EXTRACTION LINES

4200.0 EXTRACTION LINES

4200.1 GENERAL

This part of the Work includes installation of extraction lines and other appurtenances for extracting contaminated vapors and liquids from the subsurface, excavation and backfill of trenches, cutting and replacing walks and roadway surfaces, and other miscellaneous work necessary to complete and make ready for operation a complete extraction system.

4200.2 MATERIALS

4200.3 BEDDING, HAUNCHING, AND BACKFILL MATERIALS

Requirements for various bedding and backfill classes should be as detailed on the Drawings, and the materials used shall be in accordance with the following Specifications.

4200.3.1 Coarse Aggregate

Crushed aggregate or graded gravel shall be clean, free from clay, sticks, or other deleterious substances, meeting the following graduation:

SIEVE	PERCENT PASSING BY WEIGHT
3/8”	95-100
No. 100	0-7

4200.3.2 Granular Backfill

Granular backfill shall be sharp “flume sand,” clean, free from clay, sticks, or other deleterious substances meeting the following graduation:

SIEVE	PERCENT PASSING BY WEIGHT
3/8”	95-100
No. 100	0-3

4200.3.3 Select Native Soil

Select native soil shall be fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures (Unified Soil Classification soil types GM, GC, SM, and SC), or inorganic silts, very fine sands, silty or clayey fine sands, or inorganic clays of low to medium plasticity, silty clays, lean clays, having a liquid limit of fifty percent

(50%) or less (United Soil Classification soil types ML, CL, or CLML), as described in ASTM D2487.

4200.4 CONSTRUCTION METHODS

4200.4.1 General

The Contractor shall be required to install the subsurface extraction lines upon the completion of the excavation for the well vaults (**PPM Technical Specification No. 200**). Sizes of extraction lines are specified on Drawings. The extraction lines should be installed to approximately 12 to 18 inches below ground surface based on the space required for the number of pipes to be installed. These lines are to be stubbed up perpendicular to ground surface near the unit and in the excavated area for later completion as specified on the Drawings.

4200.4.2 Cooperation with Utility Officials

The Contractor's attention is directed to the fact that his Work will be performed in the close proximity of existing utilities, streets, drainage structures, etc. The Contractor shall at all times cooperate with the various utility and street officials and shall notify the appropriate personnel prior to excavation in areas where known utilities are located.

4200.4.3 Clearing of Right-of-Way

The Contractor shall clear the right-of-way provided for the extraction line of all objectionable debris and obstructions that will interfere with the installations of the mains. Wooded areas shall be cleared and grubbed and surface obstructions to remain shall be protected in accordance with **PPM Technical Specification No. 1000**.

4200.4.4 Excavation of Trench and Backfill

Excavation, preparation for trenches, and backfill shall be in accordance with the latest revisions of the applicable standards for Polyvinyl Chloride ASTM D2321, unless otherwise amended by these Specifications or the Drawings.

It is the intent of these Specifications that all pipes be properly supported, and then backfilled with granular or select material meeting the requirements of **PPM Technical Specification No. 2000**. If the native soil in the trench is satisfactory for backfill (in any horizon), the Contractor shall preserve that material for use as backfill in the pipe zone. If the entire trench is in a soil which does not conform to the backfill requirements, the Contractor shall refurnish a borrow material which conforms to **PPM Technical Specification No. 2000** for use in the pipe zone. Compensation shall be as noted in the payment section.

4200.5 SURFACE OBSTRUCTIONS

4200.5.1 Obstruction of Streets, Premises, etc.

All materials shall be placed as to interfere as little as possible with public travel. At street crossings and other points as directed by the Engineer, trenches shall be bridged in a manner so as to prevent any serious interruption of public travel. The closure of both sides of a double roadway to vehicular traffic will not be permitted except by written permission by the proper authorities. Special care shall be taken to give free access at all times to all fire hydrants, water valves, fire alarm boxes, and Police and Fire Department driveways.

In case the Contractor shall fail to keep open streets, sidewalks, approaches to premises, etc., and shall refuse or neglect to open them within twelve (12) hours after written notification by the Engineer; or shall the Contractor fail to afford proper and necessary access to fire hydrants, water valves, fire alarm boxes, or Police Department or Fire Department driveways, and shall neglect or refuse to afford such access within one (1) hour of receiving written or oral notice to do so, the Engineer shall be and is hereby authorized and empowered to put on such force as may be necessary and to do the Work, deducting the actual cost thereof from any money which may be due or may become due the Contractor.

4200.5.2 Conflict with Surface Obstruction

All shade trees, shrubbery, utility poles, etc., within the right-of-way provided shall be protected, and any building or structure, which may be endangered during the Work, shall be shored up and otherwise protected. The cost thereof from any amounts due or to become due the Contractor.

Any properties disturbed or damaged by the Contractor shall be restored to its original condition. No additional compensation will be made from this corrective Work.

4200.6 SUBSURFACE OBSTRUCTION

The Contractor shall anticipate all underground obstructions such as water lines, gas lines, sewer lines, utility lines, concrete and debris. Any such lines or obstructions indicated on the Drawings show only the approximate location and must be verified in the field by the Contractor. The Engineer does not imply or guaranty the exact location of any existing underground utility; however, the Engineer will endeavor to familiarize the Contractor with all known underground obstructions.

The Contractor shall take the necessary precautions not to injure any gas or water pipe, sewer, drain or service pipes connected therewith or conduits or other underground structures, and the Contractor must repair or have repaired at once, at his own cost, any public or private structure or pipe damage by or in the course of his Work. Should the Contractor fail to repair or have repaired such damage or injury within a reasonable time, the Engineer may after twenty-four (24) hours reasonable notice, have such repairs made and deduct the cost thereof from any amounts due or become due the Contractor.

The Contractor shall assume all risks and be responsible for all expense and damage attending the presence or proximity of any gas or water pipes, sewers, drains, conduits, or other underground structures where such pipes or other structures cross the trench or appear in the trench in such a manner as not to demand their rearrangement or realignment. The Contractor's risks and responsibilities shall also apply to such structures as are approximately parallel with or adjacent to but outside of said trench.

The Contractor shall uncover known subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction.

Should any pipe or other obstruction (so located as to interfere with the Work) be encountered, the Contractor shall at once notify the Engineer of the locality and circumstances, and the place shall be passed over until satisfactory arrangements are made.

Should the obstruction parallel the trench, the Engineer may require the Contractor to offset or re-align his pipeline to miss the obstruction. This re-alignment may be made by the use of fittings, pipe deflection, and/or manholes as the case may dictate.

4200.7 MEASUREMENT AND PAYMENT

4200.7.1 Extraction Lines

4200.7.1.1 Measurement

Extraction lines shall be measured by the linear foot along the centerline of the pipe without deduction for valves or fittings. Pipe installation in casing will be included. Measurement will be from center to center of crosses, reducers, etc.

4200.7.1.2 Payment

Extraction lines shall be paid for at the Contract Unit Price Bid per linear foot for pipe of the various sizes, types, and classes, which price and payment shall constitute full compensation for furnishing all plant, labor, equipment, and materials, including hauling, trenching, bed preparation, laying, jointing, and backfilling, testing, sterilization, and other operations incidental to the satisfactory completion of the Work as shown on the Drawings.

4200.7.2 Replacement or Repair of Street and Sidewalk Surfacing

4200.7.2.1 Measurement

All surface areas authorized cut by the Engineer shall be measured for payment by the square yard (SY), and will be equal to the actual length of trench cutting the payment times the allowable trench width as shown on the Drawings plus two feet (2').

4200.7.2.2 Payment

Payment shall be made at the Contract Unit Price Bid per square yard for the various types of surfacing, which price and payment shall constitute full compensation for furnishing all plant, labor, equipment, and performing all Work, including all other operations incidental to the satisfactory completion of Work shown on the Drawings and specified herein. No additional compensation of any type shall be paid for repairing damaged surfacing which was not authorized in writing by the Engineer, and all repairs thereto shall be promptly made by the Contractor to the satisfaction of the Engineer at no additional cost to the Engineer.

4200.7.3 Maintenance Gravel

4200.7.3.1 Measurement

Maintenance gravel used to maintain traffic on streets and drives shall be measured by the cubic yard by measured truck.

4200.7.3.2 Payment

Maintenance gravel, ordered placed by the Engineer or Resident Inspector, shall be paid for at the Contract Unit Price Bid per cubic yard for "Maintenance Gravel" which price and payment shall constitute full compensation for all plant, labor, equipment, and materials necessary to produce, store, transport, place, and spread the gravel as directed.

4200.7.4 Line Tie-In

Line tie-in shall be measured per each, complete, and paid for at the Unit Price Bid.

ATTACHMENT D

CLEANUP, REPAIR, ETC.

SECTION 1300 CLEANUP, REPAIRS, ETC.

1300.0 CLEANUP, REPAIRS, ETC.

1300.1 GENERAL

The Scope of the Work required by this section includes cleaning up of all areas in which the contractor has worked; repairing all property (both public and private) which has been damaged, disturbed, altered, etc., by the Contractor's operations; and maintenance of necessary access to and across the work area.

1300.2 PROTECTION, REMOVAL, AND REPLACEMENT OF EXISTING FACILITIES

The Contractor shall be required to work around existing facilities, including, but not limited to, buildings, utilities, fences, roads, streets, sidewalks, etc., and will, in some cases, be required to remove and replace or reinstall such.

The Contractor shall exercise care not to damage any such property, and shall be fully responsible for any such damages, whether to the owner's property or any responsibility from such damages.

Any property removed shall be replaced such that, after replacement, it shall be similar and equal in all respects to that removed.

1300.3 PROTECTION OF PROPERTY

The Contractor shall be responsible for protecting all property, both private and public, and shall be responsible for any damages or blockage to streets, alley, adjacent property, etc., and shall be responsible for the stoppage or diversion of any surface waters, rainfall, etc., and does hereby indemnify the Engineer of any responsibilities from such damages.

1300.4 CLEAN-UP

The Contractor shall, after acceptance of the various items of work, neatly clean all his work area, including any access areas, such that after clean up, the areas will be in a neat condition and shall be in at least an equal condition as when the Contractor started his operations.

1300.4.1 Repairs to Roads, Streets, etc.

The Contractor shall repair any and all damages to roads, streets, etc., occurring as a result of his operations. All construction methods, materials, etc., shall be strictly in accordance with state, parish (county), or local specifications or codes as applicable and

the contractor shall replace or repair such to the satisfaction of the applicable governing body and the Engineer, or as specified elsewhere herein and/or as shown on the plans.

1300.4.2 Repair and Maintenance or Replacement of Fences, Lawns, Driveways, etc.

The Contractor shall repair or replace any and all damage or alterations to fences, lawns, or other property as a result of his operations. All such repair or replacement shall be performed such that the finished product shall be in a condition of at least equal to that prior to its damage or removal, all as determined by the Engineer.

The Contractor shall maintain such temporary fencing, gates, etc., as is required to protect livestock, etc., at all times during his operations and shall be fully responsible for any and all damages to such as a result of his negligence.

The Contractor shall exercise due care with respect to damage to lawns, sidewalks, driveways, entrances, etc., and shall maintain access to all property, both public and private, at all times. The Contractor shall promptly repair any such damages to the satisfaction of the Engineer.

1300.5 RESPONSIBILITY OF CONTRACTOR

Should the Contractor fail to repair or replace any damages as specified herein or should he fail to maintain access, or to protect any property, all as specified herein, within a reasonable time as determined by the Engineer, the Engineer hereby reserves the right to perform, or have performed for him, such work and deduct the cost thereof from any money due or which shall become due to the Contractor.

1300.6 MEASUREMENT AND PAYMENT

No separate measurement or payment will be made for any of the items covered in this section, and all cost thereof shall be included in the prices for the other items of work.

ENVIRONMENTAL, INC.

1345 Blair Farms Road, Odenville, Alabama 35120
Environmental and Remediation Services
AL GC Lic. No: 44074; AL UST Cont. Lic No. 022718-WalTim

VIA: Email Walt.Henley@PPMCo.com

Name/Address
Walt Henley, P.G. PPM Consultants, Inc. 5555 Bankhead Highway Birmingham, AL 35210 January 30, 2019

Project Description
Proposal No. R19-93 Treatment System Installation Bama Texaco 815 Cleveland Drive Attalla, AL

Description	Rate	Est Qty	Cost
Mobe/Demobe; Men & Equip; safety, traffic control (Lump Sum)	$5,085.00	1	$5,085.00
Trench approx. 110 LF in concrete, install piping and tubing (per/ft)	$48.30	110 ft	$5,313.00
Install dowels, backfill, cap/restore 110' trench w/concrete (per/ft)	$18.10	110 ft	$1,990.00
Trench approx. 105 LF in asphalt, install piping and tubing (per/ft)	$38.85	105 ft	$4,080.00
Install dowels, backfill, cap/restore 105' trench w/concrete (per/ft)	$14.60	105 ft	$1,533.00
Trench approx. 20 LF in soil and install piping and tubing (per/ft)	$13.00	20 ft	$260.00
Backfill 20' trench and restore with soil/overburden (per/ft)	$5.00	20 ft	$100.00
Install 7-12" dia sparge pt. MH and 2-18" RW vaults (lump sum)	$2,905.00	1	$2,905.00
Install SVE/Ozone manifolds;spread stone in compound (lump sum)	$1,950.00	1	$1,950.00
Build 2 SVE trenches and 2 Ozone monitoring points (lump sum)	$950.00	1	$950.00
Build 2 – 24" square junction boxes (lump sum)	$1,405.00	1	$1,405.00
			Total $25,570.00
Install 20'X20'X8' wooden fence w/8'dble gate (per/ft)	$42.00	80 ft	$3,360.00
Install 20'X20'X8' chain link fence w/priv. slats w/8'dble gate (per/ft)	$58.00	80 ft	$4,640.00

$28,930.00

Estimated number of days to complete Ozone/SVE System Installation: 7

The above costs are based on the following assumptions:

1) Installation to be conducted in accordance with instructions/specifications provided in Quotation Request dated January 18, 2019.
2) PPM/others to supply all ozone fittings/tubing. Interference from underground utilities/obstructions is **NOT** anticipated along the trench so long as maximum depth of disturbance is 12" below ground surface. Will machine-excavate trench.
3) Pea gravel to be placed around 2" dia. SVE screen and enclosed with 6-mil plastic sheeting on both sides and top.
4) Will backfill/restore trench to match adjacent surface.
5) PPM to handle overburden/concrete disposal.
6) Costs in this quote are good for 60 days.
7) Trenches installed in concrete and asphalt to be finished w/6" of crusher run and 6" of 3.8k psi ready mix w/fibers.
8) Trenches installed in soil to be backfilled w/overburden.
9) #4 rebar dowel pins to be installed along each side of the concrete trench at 3' linear spacing.
10) Fence to be installed in grassy area at southeastern portion of site.
11) EI to have unobstructed access to work site continuously until completion.

Timothy W. Walker, P.G.
President

Attachment: General Conditions

TECHNICAL DRILLING SERVICES, INC.
QUOTE FORM
For
PPM CONSULTANTS, INC.
BAMA TEXACO
ATTALLA, ALABAMA

January 30, 2019

Description	Units	Estimated Quantity	Unit Cost	Total Cost
Mobilization/demobilization	LS	1	200.00	200.00
Mobilization/demobilization	Mile	0	2.32	0.00
Mobilization/demobilization	Mile	270	1.16	313.20
Per diem (6 man crew)	Day	5	600.00	3000.00
Cut trench in concrete pavement with concrete saw	Foot	110	8.00	880.00
Cut trench in asphalt pavement	Foot	105	4.00	420.00
Excavate a 1' x 18" trench & backfill with crusher run	Foot	215	15.00	3225.00
Excavate a 1' x 18" trench & excavated soil	Foot	20	10.00	200.00
Provide & install 1" PVC pipe in trench for ozone tubing	Foot	1010	2.00	2020.00
Install tubing or wiring provided by client in trench	Foot	1010	0.50	505.00
Provide & install 2" PVC pipe in trench (coupled)	Foot	550	2.00	1100.00
Provide & install 2" PVC pipe in trench (threaded)	Foot	0	4.00	0.00
Provide & install 2" PVC screen in trench (threaded)	Foot	40	25.00	1000.00
Drill & install 4" PVC screen inside trench	Foot	2	100.00	200.00
Install 1/2" steel dowels on 3' centers in existing concrete	Each	73	10.00	730.00
Provide & install a 8" manhole cover	Each	2	150.00	300.00
Provide & install a 12" manhole cover	Each	7	200.00	1400.00
Construct a concrete pad & install an 18" boltdown cover	Each	2	325.00	650.00
Construct a concrete pad & install an 18" locking vault	Each	0	450.00	0.00
Provide & install a 2' x 2' vault	Each	2	750.00	1500.00
Cap 16" trench with 6" 3000 psi concrete	Foot	215	10.00	2150.00
Cap soil excavation with grass seeds & hay	Foot	20	5.00	100.00
Traffic control signage and barricades	Week	1	500.00	500.00
Setup and movement of traffic barricades	Hour	2	150.00	300.00
Construct manifold & system hook up	LS	1	3200.00	3200.00
Building set up, site cleanup, etc.	LS	0	400.00	0.00
Bobcat rental for movement of cuttings & debris	Week	1	750.00	750.00
Rental equipment pick up and return	Each	2	125.00	250.00
Excavator, concrete saw & compactor rental	Day	3	700.00	2100.00
Construct 20' x 20' x 8' tall chain link fence on gravel	LS	0	5000.00	0.00
Construct 20' x 20' x 8' tall wood fence with slats on gravel	LS	1	4600.00	4600.00
Provide & compact 4" crusher run inside fenced area	Yard	5	80.00	400.00
Stand-by Rate (per crew)	Hour	0	200.00	0.00
			TOTAL JOB ESTIMATE:	**$31,993.20**

January 30, 2019

Mr. Walt Henley
PPM Consultants
5555 Bankhead Highway
Birmingham, Al 35210

RE: Installing Ozone Sparge/Soil Vapor Extraction System
Bama Texaco
815 Cleveland Drive
Attalla, Alabama
PPM Project Number: 451603-CAPD

Dear Mr. Henley:

GSE, Inc. (GSE) appreciates the opportunity to submit this proposal for Installing Ozone Sparge/Soil Vapor Extraction System at a site in Attalla, Alabama. GSE understands the statement of work to be the following:

1. GSE will mobilize personnel and equipment to the site in Attalla, Alabama.
2. GSE will trench approximately 110 feet in concrete and 105 feet in asphalt for the installation of piping. The trench will be 12 inches below ground surface (BGS) and will be 1.5 feet or less in width. GSE will place removed soil and concrete in roll off containers provided by PPM. GSE will saw cut areas prior to trenching.
3. GSE will trench approximately 20 feet in grassy area for the installation of piping. The trench will be 12 inches below ground surface (BGS) and will be 1.5 feet or less in width.
4. GSE will provide and install approximately 735 feet of 1-inch diameter SCH 40 PVC lines that will contain delivery tubing and another 275 feet of 1-inch diameter SCH 40 PVC lines that will contain wiring for ozone monitors.
5. GSE will install ozone delivery tubing and wiring for ozone monitors into the 1-inch PVC lines. Ozone delivery tubing and wiring will be provided by others.
6. GSE will provide and install approximately 550 feet of 2-inch diameter SCH 40 PVC soil vapor extraction piping and two horizontal extraction points, each comprised of 20 feet of slotted 0.010-inch screen (40' total screen). The SVE Piping will be connected to two 4-inch recovery wells (installed by others).
7. GSE will construct and install a 4-point manifold for the SVE Piping. Each horizonal screen and recovery well will have separate lines connected to the manifold at the SVE System.
8. GSE will cover open trenches with steel plates rated for vehicular traffic until finished with concrete.
9. GSE will perform trenching and piping in accordance with the dimensions and details on the provided drawings.
    - o Except at horizontal screen locations, GSE will backfill trenches performed in concrete and asphalt with new crusher run stone to 6 inches below the ground surface and then cover with 6 inches of concrete.
    - o GSE will backfill trenches performed in soil with excavated materials.
    - o GSE will line trenches at horizontal screen locations on each side with 6-mil plastic sheeting and backfill with clean, well-rounded gravel so that the screen is surrounded on all sides by at least 3 inches of gravel. GSE will secure the plastic with duct tape to the solid SVE pipe where connections to the screens exist. GSE will cover the gravel with 6-mil plastic sheeting wrapped from each side of the trench and will secure the edges of the sheeting together with duct tape. GSE will backfill the portion of the trench above the plastic sheeting with new crusher run and concrete as described above.
10. GSE will provide and install a 1-foot piece of 4-inch diameter slotted screen placed vertically to the base of the trench at the two subsurface ozone monitoring point locations. GSE will construct 8-inch diameter manholes in 2-foot by 2-foot, 6-inch thick concrete well pads over the ozone monitoring points.
11. GSE will provide and install 12-inch diameter manholes at the seven sparge points. GSE will construct manholes in 2-foot by 2-foot, 6-inch thick concrete well pads. The sparge points will be installed by others.

12. GSE will provide and install 18-inch diameter manholes at the two recovery wells. GSE will construct manholes in 2.5-foot by 2.5-foot, 6-inch thick concrete pads.
13. GSE will provide and install 24-inch square steel manholes at two junction boxes along piping trench. GSE will construct manholes in 4-foot by 4-foot, 6-inch thick concrete pads.
14. GSE will complete trenches and manholes performed in concrete with a minimum thickness of 6 inches of concrete. GSE will drill steel dowel pins into the existing concrete at 3-foot linear spacing per side. Dowel pins will extend at least 3 inches into the existing concrete with at least 4 inches of reveal in the new concrete. The finished grade of concrete will match the existing grade on both sides of the trench and a light broom finish will be applied after the concrete has been allowed to slightly cure.
15. GSE will provide install the materials and connections for ozone sparge points, SVE screens, and recovery wells in accordance with the provided figures.
16. GSE will install a four-sided, 8-foot tall fence around the compound that measures approximately 20 feet in length and 20 feet in width. GSE will install a double gate that measures 8 feet wide on the north side of the compound.
17. GSE will restore site to original conditions.

GSE proposes to perform the above scope as per the cost schedule below using a Komatsu PC35 Mini Excavator and Bobcat T-650.

GSE appreciates the opportunity to offer this proposal. Should you find this proposal acceptable, please forward your company Purchase Order and we will schedule this work to meet your schedule.

Sincerely,

Chris Ratley

Chris Ratley
GSE, Inc.
Operations Manager
256-350-9754

Installing Ozone Sparge/Soil Vapor Extraction System
Bama Texaco
815 Cleveland Drive
Attalla, Alabama

Description	Estimated Quantity	Rate	Unit	Cost
Mobilization/Demobilization	1	$1,400.00	MOB	$1,400.00
Per Diem (3-man crew)	27	$100.00	DAY	$2,700.00
Saw Cutting Concrete/Asphalt	555	$5.00	FT	$2,775.00
Trench and Backfill with Crusher Run	235	$28.50	FT	$6,697.50
Provide and Install 1” SCH 40 PVC Piping	1,010	$1.60	FT	$1,616.00
Provide and Install 2” SCH 40 PVC Piping with 40’ Screen	550	$3.00	FT	$1,650.00
Construct and Install 4-Point Manifold for SVE	1	$350.00	EA	$350.00
Steel Plates to Cover Trench (4’x10’)	22	$130.00	EA	$2,860.00
Install 4” Ozone Monitoring Point	2	$150.00	EA	$300.00
Provide and Install 8” Manhole with Pad	2	$150.00	EA	$300.00
Provide and Install 12” Manhole with Pad	7	$175.00	EA	$1,225.00
Provide and Install 18” Manhole with Pad	2	$250.00	EA	$500.00
Provide and Install 24” Square Manhole with Pad	2	$600.00	EA	$1,200.00
Cap Trench with 6” of Concrete	235	$9.00	FT	$2,115.00
Install Ozone Tubing and Wiring into 1” PVC Line	1,010	$2.00	FT	$2,020.00
Provide and Install Well Head Hook-up for Ozone Points, SVE Wells, and Recovery Wells	1	$2,750.00	LS	$2,750.00
Fence Installation- (Wooden)	1	$4,180.00	LS	$4,180.00
Fence Installation- (Chain-Link w/ Privacy Slats)	1	$4,465.00	LS	$0.00
Site Restoration/Cleanup	1	$1,400.00	LS	$1,400.00
Project estimated to be 9 days			**Total**	**$36,038.50**

Client Acceptance: _____

Accounts Payable Contact Name: _____

Accounts Payable Address: _____

Accounts Payable Phone Number: _____

Accounts Payable Email: _____

Date: _____

APPENDIX G – WASTE DISPOSAL QUOTE

Comparison of Waste Disposal Estimates
System Installation
Bama Texaco, Attalla, AL

		Advanced Disposal		Republic Services	
	Units	**Rate**	**Subtotal**	**Rate**	**Subtotal**
Delivery charge	2	$225.00	$450.00	$190.58	$381.16
Haul charge	6	$450.00	$2,700.00	$265.00	$1,590.00
Disposal rate	100	$39.50	$3,950.00	$35.00	$3,500.00
Liners	6	$60.00	$360.00	$30.00	$180.00
Fees (~29.5%)					$1,667.09
Total			$7,460.00		$7,318.25

REPUBLIC SERVICES

PROPOSAL

1/25/2019

Walt Henley
PPM Texaco SPW Soil Temp
815 CLEVELAND AVE
ATTALLA, AL 35954
Quote: A193969957

PPM CONSULTANTS:

Below is our proposal of recommended services, customized for your business needs identified during our discussions. If you ever need additional services, or just need an extra pickup, please give us a call at 256-237-7219. It's that easy.

Service Details

LARGE CONTAINERS

Equipment Qty/Type/Size:	2 - Open Top 20.00Yd(s)	Haul Rate:	$265.00 per haul
Frequency:	On-Call	Disposal Rate:	$35.00 per ton
Material Type:	Special Waste	Basic Service Charge:	$120.00 per month
Hauls/ month:	10.0		

Estimated Monthly Amount *

Large Container Haul Charge		$2,650.00
Large Container Disposal Charge (100 tons)	10 tons/box 8-10cy/box	$3,500.00
Large Container Rental Charge		$120.00
Additional Per Haul Items		
1 - Liner		$30.00 x 6
Total Fuel/ Environmental Recovery Fees**	29%	$1,854.72
Total Estimated Amount		$8,154.72

One Time Charges

Delivery Charge Subtotal	$381.16 - 2 boxes
Total Fuel/ Environmental Recovery Fees**	$112.21
Total One-Time Amount	$493.37

Zachary Smith
Republic Services
205-255-3915
zsmith@republicservices.com
www.republicservices.com

* The Total Estimated Amount is merely an estimate of your typical monthly invoice amount without one-time start-up charges (e.g., delivery). It does not include any applicable taxes or local fees, which would be additional charges on your invoice.

** FRF, ERF & ADMIN: The Fuel Recovery Fee (FRF) is a variable charge that changes monthly. For more information on the FRF, Environmental Recovery Fee (ERF) and Administrative Fee, please visit the links available on the Bill Pay page of our website, www.republicservices.com. The proposed rates above are valid for 60 days. This proposal is not a contract or agreement or an offer to enter into a contract or agreement. The purpose of this proposal is to set forth the

Proposal

Advanced Disposal

Cedar Hill Landfill Inc.
Ragland Alabama 35131

DATE:	**1/31/2019**
CUSTOMER:	**PPM**
CONTACT:	**Walt Henley**
EMAIL:	***walt.henley@ppmco.com***

T&D Pricing for Non-hazardous Soil and debris from Attalla to Ragland Alabama

Quantity	Description	Amount
Two	**Delivery of two 20 CY lined rolloffs to Cleveland Avenue Attalla Alabama**	**$225.00 / Each**
6 est	**Haul charge for Permit 58-01 loaded rolloff from project site to Ragland Alabama Cedar Hill Landfill**	**$450.00 / Each**
90 Tons est	**Disposal of non-hazardous soil and debris**	**$39.50 / Ton**
One	**ADEM Approval profile submittal if done by ADS with clients signed form 300 and analysis**	**$265.00 / Each**
6	**Rolloff liners**	**$60.00 / Each**
1	**Estimated project total assuming one load at app 1 ton disposal would be as follows**	**$7,330.00**

The foregoing rate quotation is for services, which may be provided by Advanced Disposal, at its discretion, for the Customer specifically requesting the quotation. The quotation is confidential and shall not be disseminated by the Customer to any person or for any purpose except as may be necessary to the Customer's evaluation thereof. The parties expressly agree that the issuance and delivery of this quotation shall create no legal rights or obligations on the part of either party, except the confidentiality restriction described above. In particular, Advanced Disposal may modify or revoke this quotation at any time prior to the execution by the parties of a comprehensive written agreement for its services. No other legal rights or obligations can be created except by the parties' execution of such comprehensive written agreement.

I look forward to being able to work with PPM on this project if allotted the opportunity. I am confident that you will be pleased with our service to you and your client.

Advanced Disposal Services Cedar Hill Landfill
1319 No Business Creek Road
Ragland Alabama 35131
Phone: 256-474-0767
Cell: 205-368-3560

Sales Rep: Bert Broome Jr.

_____

APPENDIX H – TECHNICAL SAMPLING AND QA/QC PLAN

1.0 TECHNICAL SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER MONITORING

1.1 PURPOSE

This Technical Sampling and Analysis (TS&A) Plan describes the methods and procedures to be followed during groundwater monitoring activities at leaking underground storage tank sites. Any modification to the sampling process will be addressed and described within in the monitoring reports.

1.2 LIQUID GAUGING PROCEDURES

Prior to groundwater sampling, liquid levels are measured in each well to determine the groundwater elevation and flow direction. Liquid levels inside the wells are measured with an ORS or Keck interface probe from the top of the well casing using the same reference point from which the survey elevations determined during the assessment were recorded. Groundwater elevations at the site are calculated to a common datum. Calculations for determining the water table elevations are as follows:

$$WTE = ETC - DTW$$

Where:
WTE = water table elevation
ETC = elevation to the top of the casing
DTW = depth to water

Where free product is present, the groundwater elevation is adjusted using the following formula:

$$Z_{aw} = (1-\Gamma_{ro})(Z_{ow}) + (\Gamma_{ro})(Z_{ao})$$

Γ_{ro} = 0.755 (specific gravity)
Z_{ow} = oil/water elevation
Z_{ao} = air/oil elevation
Z_{aw} = air/water elevation

Groundwater flow direction at the site is determined through groundwater contouring based on water table elevations calculated from the monitoring wells installed at the site.

1.3 GROUNDWATER SAMPLING PROCEDURES

After the depth to water is measured, each well is purged of at least five well volumes of liquid prior to sampling using a submersible pump or bailer. Purged water is contained in sealed 55 gallon drums and disposed of at an approved disposal facility. Groundwater samples are collected using disposable bailers and immediately transferred into 40 ml glass VOA vials. The vials are immediately sealed and placed on ice inside coolers. The samples are shipped with chain-of-custody forms via common courier to an independent testing laboratory for analysis. One trip blank and one duplicate sample are submitted per event for QA/QC purposes. QA/QC procedures are described in detail in the QA/QC Plan.

1.4 LABORATORY ANALYSES

Laboratory analyses are performed by an independent testing laboratory. The laboratory used will maintain a QA/QC program which utilizes spike and duplicate analysis. Groundwater samples will be analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per EPA SW-846, Test Method 5030/8020, and other parameters that may be applicable to the constituents of concern. Results of the internal QA/QC program used by the laboratory are included in each report.

2.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

2.1 PURPOSE

This Quality Assurance/Quality Control (QA/QC) Plan describes the procedures followed by personnel during the project to ensure that all data generated is accurate and representative of conditions encountered. Any modification of these procedures will be documented in the respective quarterly update.

2.2 GROUNDWATER SAMPLING

2.2.1 Well Purging

Groundwater is purged from monitoring wells prior to sampling to ensure each sample is representative of existing subsurface conditions. At a minimum, five well volumes of standing water are purged using a submersible pump or bailer. Only water inside the upper column of the well is purged. Each well is purged at a minimal rate to avoid aeration through cascading action of groundwater in the screened interval. When the bailing method is employed, the bailer is slowly lowered and retrieved from the groundwater to minimize aeration inside the well. Groundwater in wells is allowed to recover to near static water level before sampling.

2.2.2 Sample Collection

Groundwater samples are collected using disposable bailers. Procedures for sampling groundwater are described below:

1) The bailer is lowered into the well slowly to avoid aeration of the sample;

2) The bailer is filled from the top of the water column and retrieved; and

3) The first bailer of water is transferred from the bottom of the bailer into 40 ML, prepared, VOA vials or applicable containers specific to the analyte. The sample container is filled completely to the top and tightly sealed. Samples are placed on ice immediately following collection.

2.2.3 Decontamination

Disposable vinyl gloves are worn during well purging and sample collection. During well purging, the gloves are changed between each well. Gloves are also changed between each sample acquisition during the sampling process. When a pump is used, all downhole equipment is decontaminated between each use by circulating clean water and phosphate-free detergent. Disposable bailers are used for collecting samples; therefore, no additional decontamination procedures are employed.

2.2.4 Sample Dispatch

Groundwater samples are packed in individual plastic protective envelopes (bubble pack) inside a cooler to avoid breakage during shipment. The coolers used are insulated to maintain sample temperature near 4° C. Each cooler is sealed with tape to discourage tampering. The samples are shipped to the laboratory via common courier.

2.3 SAMPLE CUSTODY

A traceable link is established from the time samples are obtained until submission of analytical results. The following section describes chain-of-custody (COC) procedures which are adhered to during the project to establish that traceable link.

2.3.1 Documentation

Protocols for documentation are used to ensure appropriate sample identification and transfer. This documentation includes sample labels, seals, and COC forms. Labels and seals will be filled out using water-proof ink. Information to be supplied on COC forms consists of the following:

- Project number and location of the site.

- Sample identification/location.
- Sample point (depth).
- Signature of collector.
- Date and time of sample collection.
- Sample matrix (water).
- Method of preservation (HCl).
- Number of containers per sample location.
- Analytical method requested.
- Name of person(s) in possession of the COC and samples.
- Applicable remarks.

Custody seals are placed on coolers in such a manner that the container cannot be opened without breaking the seal. At least two seals are used, (one on either side of the cooler).

2.3.2 Custody Procedures

COC procedures implemented during the project are as follows:

- Each sample collected for the project is entered on the COC record.
- The original COC record accompanies the sample containers during transport to document their custody.
- The shipping package is sealed with strapping tape and a custody seal affixed. The seal is placed on the package in such a manner that the package cannot be opened without breaking the seal. The seal documents that the samples remained unaltered during shipment through the common parcel carrier.
- The laboratory assumes custody of the sample upon receipt and a designated sample custodian is charged with sample care and receipt.

- The laboratory retains custody of the samples in a secure area for a minimum of one month following the date of receipt. At that time, the samples are disposed of in accordance with appropriate disposal procedures.

- The sampler maintains the final copy of the COC to verify that the samples were collected and sent to the laboratory.

2.4 QUALITY CONTROL CHECKS

The following quality control checks are implemented during the project to verify the adherence to the QA/QC plan, and to provide measurement for method and samplers performance.

2.4.1 Trip Blanks

Trip blanks are used to determine the QA/QC of sample handling procedures. The trip blanks are filled with distilled water in the laboratory and will accompany the cooler to and from the project site. One trip blank is sent per cooler.

2.4.2 Duplicate Samples

Duplicate groundwater samples are collected to provide a check on sampling techniques as well as laboratory equipment. Duplicate samples are collected simultaneously from the same well and labeled with a different well designation number. Duplicate samples are collected at a frequency of one per 10 samples submitted for laboratory analysis.

3.0 TS&A AND QA/QC PLAN APPROVAL/SIGN-OFF FORMAT

I have read, understood, and agreed with the information set forth in the TS&A and QA/QC Plan.

Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date
Name	Signature	Affiliation	Date

APPENDIX I – REMEDIATION MONITORING FORMS

OZONE/SVE SYSTEM FIELD MONITORING FORM

Site ID: *Bama Texaco*	**Client:** *Ira Phillips, Inc.*	**Project Number:** *451603-OM*	
Site Location: *815 Cleveland Avenue, Attalla, AL*		**System Configuration:**	
Date:		**Time of Arrival / Departure:** /	
Personnel:		**Status of System:**	

SPARGE POINT DATA

Valve No.	Sparge Point	Online (Y/N)	Online? (O2 or O3)	Cycle Time	Pressure @ Manifold (psi)	Airflow @ Manifold (cfm)	Operational Time			
							Total	O_3	O_2	Air
1	SP-1									
2	SP-2									
3	SP-3									
4	SP-4									
5	SP-5									
6	SP-6									
7	SP-7									

SVE BLOWER DATA

Blower Operating		**SVE Blower Vac (in-H20)**	
Blower Effluent Temp		**SVE-1 Vac (in-H20)**	
Airflow @ Blower (in-H20)		**SVE-2 Vac (in-H20)**	
Blower Effluent Pressure (in-H20)		**RW-1 Vac (in-H20)**	
Bearings Greased (Y/N)		**RW-2 Vac (in-H20)**	
Effluent Reading - Pre-Carbon (ppmv)		**Effluent Reading - Post Carbon (ppmv)**	

SVE Moisture Separator Level	SVE Blower Vacuum	SVE Blower Temp.

OZONE/SVE SYSTEM FIELD MONITORING FORM

MISCELLANEOUS ***Date*** ***Initials***

Ambient Temp. (°F)	Ozone Reading in Enclosure (ppm)	Cabinet Temp. (ºF)	Building Temp. (ºF)	O2 Moisture Indicator BLUE (Y/N)	A-Side			B-Side		
					ATF Inlet Pressure (psi)	O2 Airflow (scfm)	O3 Reactor Pressure (psi)	ATF Inlet Pressure (psi)	O2 Airflow (scfm)	O3 Reactor Pressure (psi)

O&M Readings Time	System Runtime (hrs)	Cycle Lag Time (minutes)	Air Tower Runtime (hrs)	A-Side ATF O2 Percent	B-Side ATF O2 Percent	Comp. Pres. (psi)	Comp. Temp. (ºF)	Air to Manifold Reg. Pressure (psi)	System Comps. Checked for Leaks (Y / N)	System Comps. Checked for Leaks (Y / N)

Ozone Reading at OMP1 (ppmv)	Ozone Reading at OMP2 (ppmv)

MONITORING WELL DATA

Well ID	Depth to Water (ft BTOC)	Induced Pressure	Sparge Point(s) Online?	Other Info
MW-9				
MW-10				
MW-11				
MW-12				
MW-13				
MW-14				
MW-15				
MW-16				
MW-17				
MW-18				
MW-19				
MW-20				
MW-22				
MW-23				
MW-24				
MW-25				
RW-1				
RW-2				

OZONE/SVE SYSTEM FIELD MONITORING FORM

Work to be Performed This Visit

COMMENTS:

APPENDIX J – SITE HEALTH AND SAFETY PLAN

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

HEALTH AND SAFETY PLAN

IRA PHILLIPS, INC.
BAMA TEXACO
815 CLEVELAND AVENUE
ATTALLA, ALABAMA
ETOWAH COUNTY

PPM PROJECT NO. 451603-CAPD

FEBRUARY 4, 2019

PREPARED UNDER THE DIRECTION OF:
JERI F. THRASHER, CSP|MBA / HEALTH AND SAFETY DIRECTOR
1600 LAMY LANE, MONROE, LOUISIANA 71201
(P) 318.812.3454 / (C) 318.884.8188

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

TABLE OF CONTENTS

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

PROJECT CHECKLIST – HASP AND JSA

Project/Task and Corresponding Job Safety Analysis:

- ☐ Asbestos Inspection
- ☐ Carbon Change-Out
- ☐ Chemical Injection
- ☐ DPVE/SVE/Air Sparge Installation
- ☐ DPVE/SVE/Air Sparge Demobilization
- ☒ Drilling/Probing [Hand Auger]
- ☒ Drilling/Probing [Heavy Equipment]
- ☐ Mobile Vacuum Event [Emergency Response]
- ☒ Ozone System Installation
- ☐ Ozone System Demobilization
- ☐ Remediation System Modification* [specify below]
- ☐ Spill Bucket Replacement/Closure
- ☒ Trenching/Excavation
- ☐ UST Pull/Closure
- ☐ Well Plugging and Abandonment [Grout In Place]
- ☐ Well Plugging and Abandonment [Overdrilling]
- ☐ Other* [specify below and contact HSD with details]

Hazard Assessment:

Chemical Hazards

- ☐ Acids [HCl, HNO_3, H_3PO_4, H_2SO_4]
- ☐ Activated Carbon
- ☒ Alconox®/Liquinox®/Isopropanol
- ☐ Asbestos
- ☐ Bases [NaOH/KOH/$CaOH_2$/NH_3/Na_2CO_3]
- ☐ Calibration Gas [Meth/Hex/Isobutyl]
- ☐ Carbon Dioxide [Dry Ice]
- ☐ Chlorinated Solvents [Dry Cleaners]
- ☐ Descaling Agents [Analytix AN-754GH]
- ☒ Diesel/PAHs
- ☒ Dust [Nuisance/Concrete]
- ☐ Dust [Granular Carbon/Aluminum Oxide]
- ☐ Fuel Gases [Meth/Hex/Butane/Prop]
- ☒ Gasoline [BTEX]
- ☐ Hydrogen Sulfide[H_2S]
- ☐ Kerosene
- ☐ Metals [As/Cd/Cr/Cu/Pb/Hg/Zn]
- ☒ Methyl-Tertiary Butyl Ether [MTBE]
- ☐ Oil/Lubricating Oils
- ☐ Oxidizer [NXT/ORC®/ORC Advanced®]
- ☐ Oxidizer [RegenOx A/B™]
- ☒ Ozone
- ☐ Ozone/Hydrogen Peroxide
- ☐ Pesticides [Industrial/Agricultural]
- ☐ Polychlorinated Biphenyls [PCB]

- ☐ Other C/P/B Hazard* [contact HSD]
- ☐ Unknown C/P/B Hazard* [contact HSD]

Physical/Biological Hazards

- ☐ Aerial Lifts
- ☒ Biological
- ☐ Combustion/Flammability
- ☐ Compressed Gas [cylinders]
- ☒ Concrete [coring/cutting]
- ☒ Cuts/Lacerations
- ☒ Driving
- ☐ Drowning
- ☐ Electrical
- ☐ Elevated Working Surfaces
- ☐ Forklift/Crane [truck-mount]
- ☒ Hand/Power Tools
- ☒ Heat/Cold Stress
- ☒ Heavy Equipment
- ☐ Illumination
- ☐ Ladder Safety
- ☒ Material Handling [back safety]
- ☒ Noise
- ☒ Repetitive Motion
- ☐ Scaffolding/Scissor Lifts
- ☒ Slips/Trips/Falls
- ☒ Traffic or Secluded Sites
- ☐ Uneven Working Surfaces
- ☐ Unstable Soils/Cave-Ins

Protective Equipment:

- ☐ Apron and Goggles
- ☐ Booties/Foot Covers
- ☒ Ear Plugs/Canal Caps
- ☐ Face Shield
- ☐ Flame-Retardant Clothing
- ☐ Hand – Cotton Gloves
- ☐ Hand – Kevlar Gloves
- ☐ Hand – Leather Gloves
- ☒ Hand – Nitrile Gloves
- ☐ Hand – Other*
- ☒ Hard Hat [Class E]
- ☐ Harness and Lanyard
- ☒ High Visibility Shirt/Vest
- ☐ Protective Suits [tyvek]*
- ☐ Reflective Shirt/Vest
- ☐ Respirator [air-purifying]*
- ☐ Respirator [supplied air]*
- ☒ Safety Glasses
- ☒ Steel-Toed Boots
- ☐ Other PPE* [contact HSD]

Documentation Required:

- ☒ Ambient Air Monitoring
- ☐ Crane Operator Inspection
- ☐ Forklift Safety Inspection
- ☒ HASP Acknowledgement Form
- ☐ Incident Report/Log [as applicable]
- ☒ Subsurface Clearance Checklist
- ☒ Tailgate Safety Meeting Log
- ☒ Trench/Excavation Inspection

Return Pages in the Following Order:

- HASP Coverpage
- Project Checklist
- Emergency Summary Information and Maps
- Personnel Roles and Responsibilities, p.3
- One Call (if electronic copy)
- Subsurface Clearance Checklist
- Ambient Air
- Trench/Excavation Checklist
- HASP Acknowledgment
- Tailgate Logs

HASP Generated By [Print Name]: Brandy Hall Date Generated: 2/4/19

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

EMERGENCY SUMMARY INFORMATION

Medical Facility:

In cases of incidents or near-misses, the Health and Safety Director (HSD) must be verbally contacted immediately once any spills/releases have been contained and appropriately isolated. Incidents resulting in injury or illness must be reported immediately to the HSD for further instruction and injury case management. 911 should be called for life-threatening cases or cases requiring immediate attention. Be prepared to administer CPR and first aid care only if you have been trained to do so, acquire consent from injured worker (unless unconscious in which consent is implied), and training is up-to-date.

Name of Hospital: Riveriew Regional Medical Center Phone: (256) 543-5200

Address: 600 S 3rd Street City, State: Gadsden, AL Zip: 35901

Directions and Map: See attached (next page) Distance: 7.5 mi Time: 9 min

Company and Emergency Contact Information:

Agency/Emergency Responder	Telephone	Website
Fire Department / Police Department / Ambulance	911	--
Center for Disease Control and Prevention	800-232-4636	www.cdc.gov
CDC – Public Health Preparedness and Response	404-639-7405	cdcinfo@cdc.gov
CDC – Bioterrorism Preparedness and Response	404-639-0385	cdcinfo@cdc.gov
CDC – Toxic Substances and Disease Registry	770-488-7100	cdcinfo@cdc.gov
Chemtrec [24-Hour Emergency Chemical Spill]	800-262-8200	chemtrec@chemtrec.com
EPA RCRA Superfund Hotline	800-424-9346	--
Poison Control Center	800-222-1222	www.aapcc.org

PPM Contact Information	Representative	Office	Cell
Principal [Primary Regional Safety PIC]	Shawn Ivey	318-323-7270	318-237-0677
Principal [Alternate Regional Safety PIC]	Zane Hood	205-836-5650	205-240-9883
Health and Safety Director	Jeri Thrasher	318-812-3454	318-884-8188
Safety Supervisor [Baton Rouge]	David Durbin	225-293-7270	225-603-8050
Safety Supervisor [Birmingham]	Brandy Hall	205-836-5650	205-913-5471
Safety Supervisor [Jackson]	Regan Byrd	601-956-8233	601-862-8693
Safety Supervisor [Mobile/Pensacola]	Kay Williams	251-990-9000	251-753-4455
Safety Supervisor [Monroe]	Matt Colvin	318-812-3467	318-355-6415
Safety Supervisor [Orlando]	Amy Guilfoyle	407-240-1127	941-730-5600

Note: District and Project Managers can be contacted by using the office phone numbers provided for each location.

Designated Break and Evacuation Locations:

Personal protective equipment is required at all times within the work zone and can only be doffed when in the site's designated break area. Smoking will be permitted within the break area pending the site's ambient contaminant concentrations. In the event of an emergency, workers must report to the designated evacuation area for a headcount. This site's designated break and evacuations areas are outlined as follows:

Break Area: _____ Evacuation Area: _____

1.0 INTRODUCTION

1.1 COMPANY COMMITMENT

PPM is committed to the safety and wellbeing of its employees and subcontractors. Our mission to exceed client expectations is done under the provision that worker health, safety and security is not compromised in the process. In addition, the company strives to ensure that the environment and its natural resources are preserved and not otherwise negatively impacted as the result of company-related processes. This commitment to our workers and our environment is outlined within our written health, safety, security and environmental (HSSE) program, which establishes the company's expectations through its policies and procedures.

1.2 HASP PURPOSE

The purpose of this health and safety plan (HASP) is to mitigate those hazards associated with routine company-related tasks that could not otherwise be substituted or eliminated. This document outlines the control measures, protective equipment and emergency response procedures necessary to ensure worker safety and wellbeing are maintained. This HASP has been prepared in accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 standard for typical conditions encountered during routine field activities.

1.3 APPLICABILITY

All field-related projects and/or tasks require a HASP, unless otherwise exempted by the safety department. The provisions outlined within this plan are applicable to all personnel assigned to the project and subcontracted workers hired by the company to complete the project. PPM will not be responsible for the safety of contracted workers hired directly by the client or partnering companies unless otherwise specified by these entities to do so. Accountability for the health, safety and security of contractors under these circumstances must be pre-established and explicitly outlined within the proposed scope of work and must additionally be approved by a Principal of the company.

1.4 EXCEPTIONS

This general report template has been prepared specifically for common chemicals and tasks associated with routine company-related field processes as outlined within the Project Checklist – HASP and Job Safety Analysis (JSA) form. Any project involving a chemical or field-related task not otherwise specified within this form is considered non-routine and is not covered by the provisions of this written plan. HASP requests and proposed scope-of-work for non-routine chemicals and/or job-related tasks must be sent directly to the Health and Safety Director (HSD) so that a site-specific HASP can be prepared. When possible, please allow five days for preparation.

Common, repetitive field tasks such as groundwater monitoring, operation and maintenance of remediation systems, environmental site assessments, mobile vacuum events and other similar tasks that do not require exposure monitoring will be addressed within a separate HASP prepared specifically for these activities.

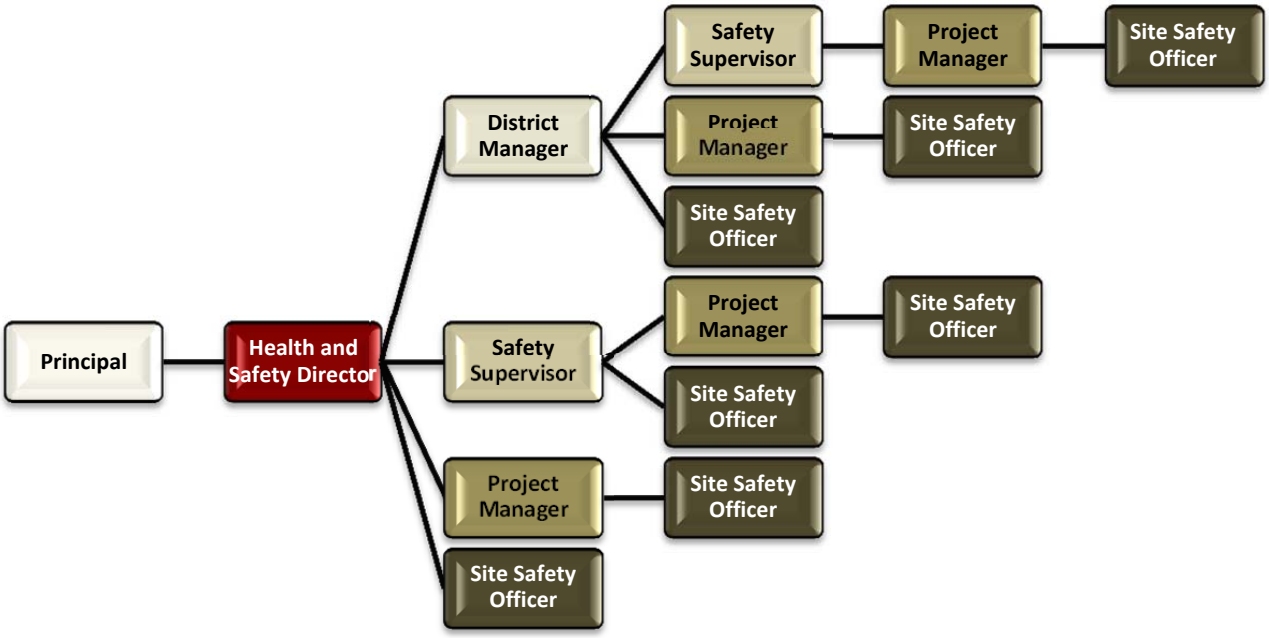
1.5 MANAGEMENT OF CHANGE

Should any unexpected conditions arise that introduces new hazards or eliminates existing hazards, work will cease immediately and this HASP will be amended to accommodate changes in site conditions. Additions or changes to this HASP will be communicated to all affected personnel and subcontractors.

2.0 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

2.1 CHAIN-OF-COMMAND

The hierarchy of command creates a system for accountability and is extremely beneficial to the reporting process. As indicated by the graphic below, PPM has built-in redundancies within its command chain to ensure that all affected parties are notified and accountable as well as to compensate for designated personnel when they are inaccessible. There are various ways in which to notify management; however, when it involves worker safety and health, the HSD and Principal must be notified and cannot be by-passed.



2.2 PERSONNEL ROLES AND RESPONSIBILITIES

Safety is the responsibility of every worker within the company, regardless of position. Workers are accountable for their own personal safety as well as the safety of the co-workers around them. Also, key personnel within the company have additional safety obligations due to their designated leadership roles within the organization. PPM expects its managers to set the tone for safety through their exemplary leadership thereby creating the foundation for a strong safety culture. Positions requiring additional safety responsibilities include the following:

- **Principal**. Principals are assigned responsibility for different departments within the company. The primary Safety Principal-in-Charge (PIC) is Shawn Ivey [Monroe], and the alternate Safety PIC is Zane Hood [Birmingham]. Each is responsible for authorizing HSSE policies and procedures set forth by the safety department and establishing the final provisions when discrepancies are noted.
- **Health and Safety Director**. The HSD is responsible for proposing and generating HSSE policy/procedures under the advisement of the Safety PIC, communicating these provisions to all affected workers within the organization, and ensuring uniform implementation of these provisions throughout all branch offices.

- **District Manager**. Each branch office has a designated District Manager who is responsible for ensuring that HSSE policies and procedures are implemented by the workers assigned to his or her office. The District Manager is directly accountable to the Principals for the safety performance of his/her office.
- **Safety Supervisor**. Each branch office has a designated Safety Supervisor (SS) assigned by the District Manager. The SS is responsible for ensuring HSSE compliance by all within his/her office through consistent toolbox training, unscheduled site safety inspections and any other task delegated by the HSD. The SS is directly accountable to the HSD for his/her supervisory role and is also accountable to his/her District Manager regarding the office's safety performance.
- **Project Manager**. Project Managers are responsible for all aspects of their assigned projects, including the safety and wellbeing of the workers assigned to their jobsite. Project Managers establish the overall scope-of-work for the project and must consider the appropriate safety provisions (i.e., engineering design, protective equipment, etc.) during the planning phase. Project Managers are directly accountable to their District Managers for the job-related safety aspects.
- **Site Safety Officer**. A site safety officer (SSO) is assigned to each field project. An alternate SSO is assigned to any field project with more than one PPM employee onsite. The SSO is responsible for jobsite safety, which includes, but is not limited to, the following:

  → Designate break and evacuation areas based on current site conditions
  → Review the provisions outlined within the HASP and JSA with all affected personnel, subcontractors, client, and regulatory officials
  → Ensure site security and preventing unauthorized entry to the work zone
  → Ensure subsurface utilities have been marked and appropriate Principal approval has been obtained for exclusion zone disturbances
  → Locate emergency shut-off devices to pumps and heavy equipment
  → Establish communication system with equipment operators
  → Ensure all workers and contractors wear required protective equipment
  → Prohibit onsite smoking, except when permitted within designated areas
  → Complete required field documentation outlined within the HASP for worker exposure monitoring and other site safety inspections
  → Report to management any incident or near-miss involving worker injury/illness, property damage, contact with overhead or subsurface utilities, chemical/product releases or auto accident

  The alternate SSO is responsible for jobsite safety in the absence of the SSO or when under the direction of the SSO.

The following personnel are assigned to this project:

NAME	TITLE/POSITION
Michael Ellison	District Manager
Walt Henley	Project Manager
Jeri F. Thrasher, CSP	Health and Safety Director
Brandy Hall	Safety Supervisor (SS)
Andrew Paradis/Connor Gaston	Site Safety Officer (SSO)
Jeb Burttram/Walt Henley	Alternate SSO
Environmental Inc.	Subcontractor

2.3 SHORT SERVICE EMPLOYEES

Short service employees are defined as any worker employed by PPM for less than six months or workers who have not yet completed required training and certification. Short service employees are assigned a mentor and supervised at all times when in the field - (exception: establishing offices that do not have a mentor may require that short service employees perform field duties unsupervised; however, Principal exemption is required).

2.4 TRAINING AND MEDICAL MONITORING

PPM field personnel associated with this project have received company HSSE policy and procedural training as part of their safety orientation. Personnel have additionally received initial 40-Hour HAZWOPER certification, which is updated annually through an 8-Hour refresher. This training course meets the requirements of the OSHA 29 CFR 1910.120 standard. Short-service employees not otherwise HAZWOPER-certified will be provided training after 90-day probationary period.

In accordance with the medical monitoring requirements outlined within 29 CFR 1910.120, workers who are or may potentially be exposed to hazardous materials are provided a medical evaluation paid for by the company. Only those employees who have been medically cleared for duty by a physician are permitted to perform field duties.

3.0 HAZARD ASSESSMENT AND CONTROL MEASURES

A hazard is defined as a "situation that poses a level of threat to life, health, property or environment." For purposes of this written plan, hazards have been categorized in four ways – chemical, physical, biological and environmental. Hazards further outlined within the following sections are those that could not otherwise be eliminated or substituted as part of the risk assessment process. The control measures discussed throughout the following sections are required to mitigate the hazards posed to workers in order to ensure that worker safety and health is maintained.

3.1 CHEMICAL HAZARDS AND CONTROLS

PPM is an environmental consulting firm that specializes in environmental spill response, remediation and general regulatory compliance. As part of these functions, workers will likely be exposed to chemical hazards through the following routes: site contamination, chemicals used as part of the remediation process, chemicals used for equipment maintenance and calibrations, and chemicals used/stored at client facilities.

3.1.1 Gases and Fumes

3.1.1.1 Acids

Acids have a pH <7, change litmus paper to red, taste sour (most citrus fruits are acidic), are corrosive to metals, and are commonly found in car/forklift batteries, used as sample preservatives and used to prevent algae, calcium and other similar buildups in piping systems. Common acids encountered through company-related processes include but are not limited to: hydrochloric (muriatic), nitric, phosphoric and sulfuric acid. Acids can cause moderate to severe skin and eye burns, and breathing the fumes created by these materials can cause extreme burning of the respiratory system. Materials with a pH <2 must be disposed as a hazardous waste; however, acids can be neutralized with a bases/alkali.

Control Measures: Never pour water into acid! Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures

(i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations, itching and burning and prevent accidental ingestion. Prevent contact with metals.

3.1.1.2 Bases/Alkali

Commonly referred to as caustics, bases have a pH >7, change litmus paper to blue, have a bitter taste, feel slippery and are commonly used to make soap and textiles, found in common household detergents, cleaners (i.e., Drano, oven cleaners and ammonia products), milk of magnesia and antacids. Common bases encountered through company-related processes include but are not limited to: sodium hydroxide, potassium hydroxide, calcium hydroxide, ammonia, and sodium carbonate. Bases can cause moderate to severe skin and eye burns, and breathing the fumes created by these materials can cause extreme burning of the respiratory system and pulmonary edema. Materials with a pH >12.5 must be disposed as a hazardous waste. While bases react violently with acids, they can also be neutralized by acids.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations, itching and burning and prevent accidental ingestion.

3.1.1.3 Calibration and Fuel Gases

Calibration gases are used to calibrate air monitoring equipment. Common calibration gases used for equipment calibration include: hexane, isobutylene and methane. Calibration gases are used in small quantities, are highly flammable, and must be stored and handled safely. Gases such as hexane, methane, butane, and propane are used as fuel sources and may be encountered in larger quantities at oil and gas facilities. Workers may also come across methane gas through work in landfills, swamps, and agricultural land associated with raising livestock.

Control Measures: Keep containers upright, lids secured and store in climate-controlled environment away from heat sources. Calibration gases are asphyxiants (displace oxygen) so calibrate equipment in well-ventilated areas. When these gases are anticipated in larger quantities, workers must air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.1.4 Carbon Dioxide (Dry Ice)

Dry ice is carbon dioxide in a solid form. It may be used as a refrigerant and/or to displace vapors and has been used on some PPM jobsites for such purposes. Some hazards associated with the use of dry ice include, but are not limited to: frostbite through direct skin contact, asphyxiation due to displacement of oxygen in the atmosphere, and explosion from release of pressure exerted by the conversion of carbon dioxide solid to gas which could produce projectiles of the dry ice.

Control Measures: Avoid direct contact with solid dry ice to prevent frostbite. Avoid storing in areas with limited air flow (ventilation) such as buildings, vehicles, or other confined areas where gases can accumulate and be inhaled. Store inside a paper bag within a refrigerator, freezer, or cooler with a tight seal.

3.1.1.5 Hydrogen Sulfide

Hydrogen sulfide (H_2S) is a colorless gas known for its pungent odor (often referred to as a "rotten egg" odor) at low concentrations. It is a highly flammable and toxic substance associated with oil and gas refining, mining, tanning, pulp and paper processing, and rayon manufacturing. It can also occur naturally in sewers, well water, oil and gas wells, manure pits, and volcanoes. Hydrogen sulfide is heavier than air so it settles in low-lying enclosed areas such as manholes, sewers, and underground telephone vaults. Another characteristic of hydrogen sulfide is that it fatigues a worker's sense of smell so it cannot be relied upon in determining the continuous presence of H_2S gas. Health effects depend upon the exposure concentration and include, but are not limited to: irritation of eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (tears), photophobia (intolerance to light), corneal vesiculation; dizziness, headache, weakness, exhaustion, irritability, insomnia; gastrointestinal disturbance; as a liquid: frostbite.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Wear personal monitoring badges for H_2S within the breathing zone. Where applicable, rely upon stationary monitoring devices and when alarms are triggered, evacuate the area upwind immediately. Use escape only respiratory protection when issued by PPM and/or the client facility.

3.1.2 Oxidizers

3.1.2.1 Nano Xothermal Technology (NXT)

NXT is process used to treat chemical contamination. It is a system comprised of two compounds: Klozur® (sodium persulfate) and dry caustic potash (potassium hydroxide). This material can either be injected into the subsurface or can be placed inside open excavations as part of in-situ remediation. This material is a white solid with a pH range that is undetermined but anticipated to be on the caustic side. Symptoms of exposure include: skin, eye and respiratory irritation, itching, redness and burning; can cause permanent eye damage.

Control Measures: When in powder form, this material is to be treated as a nuisance dust. Avoid creating dusty environments during the mixing process. When dealing with unknown dust concentrations, wear air-purifying respirator with P-100 HEPA filter until product becomes slurry mixture. Wear nitrile, neoprene or rubber gloves for hand protection and safety glasses or goggles for eye protection. Avoid storing oxidizers near combustible materials, other strong oxidizers (including ozone), acids, heavy metals, etc. (see safety data sheet for complete list of incompatibles).

3.1.2.2 Oxygen Release Compound® (ORC) and ORC Advanced®

ORC® and ORC Advanced® are forms of enhanced aerobic bioremediation which supplies oxygen to accelerate the biodegradation of soil and groundwater contaminants. Both materials are a white powder that gets mixed with water and injected in subsurface soils. Once mixed, these materials have a pH of 10 [ORC] and 11-13 [ORC Advanced], making them a significant skin and eye irritant. Symptoms of exposure include: cough, sore throat, nose bleeds (extended exposures), eye watering and redness, eye lesions (extended exposures), nausea and vomiting if ingested and skin irritation.

Control Measures: When in powder form, this material is to be treated as a nuisance dust. Avoid creating dusty environments during the mixing process. When dealing with unknown dust concentrations, wear air-purifying respirator with P-100 HEPA filter until product becomes slurry mixture. Wear nitrile, neoprene or rubber gloves for hand protection and safety glasses or goggles for eye protection. Avoid storing oxidizers near combustible materials, other strong

oxidizers, strong acids or other strong chemical agents. etc. (see safety data sheet for complete list of incompatibles).

3.1.2.3 Ozone

Ozone is a pale, blue gas with a distinctive odor similar to that of chlorine bleach and can be smelled at relatively low concentrations. It is a powerful oxidizer injected into subsurface soils for the treatment of contaminants such as MTBE, BTEX, hydrocarbons – aliphatic and polyaromatic, diesel fuel, chlorinated solvents, VOCs, and pesticides. Symptoms of exposure include: dryness of mouth, coughing, irritation to nose, throat and chest; difficult breathing, headache, and fatigue; eye irritation causing pain, lacrimation (tears) and inflammation.

Control Measures: Because ozone is injected into subsurface soils, worker exposures will likely result from a release at the monitoring wellhead, sparge point or other similar avenues that will lead the substance to ground surface. Workers must consistently air monitor sparge points and monitoring wells for evidence of ozone leakage. Collections must occur at the wellhead (source) as well as within the breathing zone of the worker. Ozone rapidly coverts into O_2, CO_2 and other less toxic molecules but exposure limits can be triggered at the wellhead so workers must keep face away from the source while collecting the sample until it can be confirmed that the sample is acceptable for worker exposure.

Although this system has built-in safety features which shut down the system if a leak is detected, sometimes ozone concentrations can build up inside the mobile ozone trailer. Workers should use caution when opening door and should keep door open while in use to allow for ventilation.

3.1.2.4 RegenOx A and B™

RegenOx™ is an oxidizing compound comprised of two parts (A and B) that is injected into subsurface soils as part of in-situ remediation. Part A is a white, odorless powder with a pH of 10.5 and is the oxidizer/catalyst component of this mixture. Part B is a blue/green, odorless liquid with a pH of 11 and is the activator complex. Both parts are mixed together prior to subsurface injection. The mixing of these materials is a relatively safe process but exposures can result in skin, eye, respiratory and gastrointestinal irritations. Symptoms include: coughing, shortness of breath, irritation to mucous membranes, nose and throat; skin and eye itching/redness; vomiting and diarrhea associated with ingestion [Part A] and irritation to mouth, esophagus and stomach [Part B].

Control Measures: When mixing materials, wear protective clothing such as neoprene, rubber or PVC gloves for hand protection and goggles or face-shield for eye protection. Avoid storing oxidizers near combustible materials, other strong oxidizers, acids, bases, salts of heavy metals, reducing agents, etc. (see safety data sheet for complete list of incompatibles).

3.1.2.5 Hydrogen Peroxide (30-50%)

Hydrogen peroxide is a colorless liquid with a slightly sharp odor. It is a powerful oxidizer injected into subsurface soils, in conjunction with ozone, for the treatment of contaminants such as MTBE, BTEX, hydrocarbons – aliphatic and polyaromatic, diesel fuel, chlorinated solvents, VOCs, and pesticides. It is generally noncombustible, but upon contact with a combustible material, may result in spontaneous combustion. Direct contact may result in severe skin and eye damage. Symptoms of exposure include: irritation of eyes, nose, and throat; corneal ulcer; burning and redness of skin; and bleaching of hair.

Control Measures: Because hydrogen peroxide is injected into subsurface soils, worker exposures will likely result from a release at the monitoring wellhead, sparge point or other similar avenues that will lead the substance to ground surface. Therefore, workers must routinely air monitor around sparge points and monitoring wells for evidence of leakage. Collections must occur at the wellhead (source) as well as within the breathing zone of the worker. Hydrogen peroxide is injected into the subsurface via tubing from storage containers of liquid hydrogen peroxide so workers may have direct contact with these storage containers during initial setup and when replacing empty containers with new containers. Wear face shields, elbow-length gloves, and aprons as necessary to prevent direct contact with substance, and workers must keep face away from the source while collecting ambient air samples to avoid potential inhalation exposures and splash hazards.

3.1.3 Particulates and Fibers

Particulates are commonly referred as particulate matter and consist of pieces of solid matter suspended in a gas or liquid. Particulate matter can occur naturally or be man-made. Fibers consist of continuous filaments or elongated pieces like those similar to thread. Fibers are used to produce various materials such as paper, rope, and clothing. The common types of particulates and fibers encountered by personnel are outlined in the following sections.

3.1.3.1 Aluminum Oxide

Aluminum oxide is a byproduct generated by ozone remediation systems. Condensation forms on aluminum metal parts which when combined with oxygen creates a white, odorless, crystalline powder scale which can build up on metal parts of the system and presents a potential contact, inhalation, and/or ingestion exposure to workers. Aluminum oxide is a noncombustible solid, is not considered carcinogenic, and may include symptoms such as irritation of eyes, skin, and respiratory system.

Control Measures: To eliminate contact exposures, workers must wear chemical-resistant gloves and aprons to remove powder scale buildup from aluminum piping during routine system maintenance. Workers should avoid creating dust buildup of this substance, and when this cannot otherwise be avoided, workers must upgrade to respiratory equipment with P-100 filter to prevent inhalation of this material.

3.1.3.2 Asbestos

Asbestos is a naturally-occurring fibrous material used in many products due to its attractive features. Asbestos has tensile strength, can easily be woven, and is heat and chemical resistant. It is most commonly found in roofing shingles, floor and ceiling tiles, textiles, coatings, paper and cement products, piping insulation and friction products such as automobile clutch, brake and transmission parts. The three most common forms of asbestos include:

- **Amosite**. Also called brown asbestos. Amphibole fiber formation (straight, needle-like fibers). Originated in Africa and used industrially as a fire retardant in thermal insulation, used in cement sheeting and is also found in ceiling tiles.

- **Chrysotile**. Also called white asbestos. Serpentine fiber formation (curled fibers). Is less friable (less-likely to be inhaled) than other types of asbestos and therefore viewed by many to be the safest type of the asbestos, which is why it is the most common form of asbestos used in the U.S. mostly in the form of building materials.

- **Crocidolite**. Also called blue asbestos. Amphibole fiber formation (straight, needle-like fibers). Originated in South Africa and Australia and used for thermal and chemical insulation as well as construction piping and water casings. Is considered to be the most dangerous type of asbestos.

When asbestos is disturbed through repairs, remodeling or demolition, airborne fibers can be inhaled by workers causing respiratory diseases such as lung cancer, asbestosis and mesothelioma – all of which have a latency period between exposure and onset of symptoms. These respiratory diseases are chronic in nature and generally irreversible. Smokers are more susceptible to the damaging health effects of asbestos exposures. Symptoms of asbestos exposure include: shortness of breath, difficult breathing or swallowing, persistent coughing that progressively worsens, wheezing and hoarseness, coughing up blood, pain or tightening in the chest, swelling of face or neck, loss of appetite, weight loss, fatigue or anemia.

Control Measures: Asbestos-containing areas must be identified by signs, which will likely be found when working at larger industrial and commercial facilities. In these cases, workers must avoid these areas and take all necessary precautions to prevent disturbing any materials within these areas. In most cases, potential asbestos exposures will be in the form of sample collection as part of environmental site assessments performed on commercial properties. Personnel must be certified asbestos inspectors to perform these collections. In some cases, demolition of structures potentially containing asbestos materials may be supervised. At a minimum, the designated PPM-representative must be asbestos certified; however, the demolition and air monitoring requirements will be subcontracted to an appropriately state-certified contractor.

Because the sample collection process disturbs asbestos-containing materials (ACM) or potential asbestos-containing materials (PACM), workers must wear air-purifying respiratory protection in the form of half-mask respirator with P-100 high efficiency particulate air (HEPA) filters and must also wet the sample area with a soap-water mixture to reduce the dispersion of fibers. *Note: asbestos-containing materials will be presumed until otherwise verified through laboratory analysis. Buildings constructed prior to the 1980s have a greater likelihood of containing asbestos. PACMs must be treated as if they contain asbestos, and the greatest level of control should be used when collecting samples*.

3.1.3.3 Heavy Metals

Numerous heavy metals bind naturally to soils; therefore, dusty environments can introduce these hazards to workers. Heavy metals are poisonous to humans and can cause severe health effects due to their proven or suspected carcinogenic characteristics. Common heavy metals encountered through company-related processes include:

- **Aluminum**. A silvery-white, malleable, ductile, and odorless solid (metal); combustible as a solid (although takes effort), but easily ignitable when in fine dust form which can cause explosions; can cause damage to the eyes, skin and respiratory system; symptoms include: skin, eye and respiratory irritation.
- **Arsenic**. A silver-gray or tin-white metal commonly associated with under-ground storage tanks; noncombustible in solid form but presents slight explosion hazard in dust form when exposed to flame; is considered potential lung and lymphatic system carcinogen and can also affect liver, kidneys and skin through inhalation, skin absorption, skin/eye contact and ingestion exposures; symptoms include: respiratory irritations such as ulceration of nasal septum, dermatitis, gastrointestinal disturbances, hyperpigmentation (darkening) of the skin, and peripheral neuropathy (problem with nerves that carry information to and from the brain and spinal cord which can result in pain, loss of sensation and inability to control muscles).
- **Barium**. A silvery-white metal that exists naturally in the environment; because it is very reactive in its natural state, it is often combined with other elements such as oxygen, carbon and sulfur; it has many uses, but one likely exposure source is that it is used by the oil and gas industry to make drilling mud, which lubricates the drill and simplifies the process when drilling through rock; barium in its natural state is highly flammable and reacts violently with water; may cause irritation of skin, eye, nose, throat and upper respiratory tract, allergic reactions, and central nervous system damage; symptoms include: corneal damage including blindness, poisoning, dermatitis, and skin, eye and throat burns.
- **Cadmium**. A soft, bluish-white metal commonly associated with underground storage tanks; noncombustible in solid form but will burn in powder form; is considered potential prostate and lung carcinogen and can also affect respiratory system, kidneys and blood through inhalation and ingestion exposures; symptoms include: pulmonary edema (fluid in air sacs of lungs) which causes difficult breathing, cough, chest tightness, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, loss of smell, emphysema, proteinuria (protein in urine), and mild anemia.
- **Chromium**. A hard, steel-gray metal commonly associated with underground storage tanks; noncombustible in solid form but finely dispersed dust particles will rapidly burn when exposed to a flame; chromium is not considered a likely carcinogen, but does affect skin, eyes and respiratory system through inhalation, ingestion and contact exposures; symptoms include: skin and eye irritation and lung fibrosis (scarring of the lungs).
- **Copper**. A soft, malleable reddish-orange metal commonly associated with underground storage tanks; noncombustible in solid form but may ignite when in powder form; copper is not considered a likely carcinogen, but does affect skin, eyes, respiratory system, liver and kidneys through inhalation, ingestion and contact exposures; symptoms include: skin, eye and pharynx irritation, nasal septum perforation, metallic taste, and dermatitis.
- **Iron**. A lustrous metal with a grayish tinge commonly used in industry in the construction of machinery, tools, automobiles, ships and building components; it is the most commonly used of all metals and can also be found in numerous dietary sources; elevated iron in the blood can react with peroxides to produce free radicals that can damage DNA, proteins, lipids and other cellular components; upon exposure, iron can cause skin, eye, mucous and respiratory irritations; it is also flammable as a fine dust.

- **Lead**. A soft, gray metal commonly associated with underground storage tanks, paints and coatings; noncombustible in solid form; lead is not considered a likely carcinogen, but does affect eyes, gastrointestinal tract, central nervous system, kidneys, blood and gingival tissue (soft tissue of the mouth surrounding the teeth) through inhalation, ingestion and contact exposures; symptoms include: eye irritation, weakness, exhaustion, insomnia, facial pallor (paleness), weight loss/anorexia, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis of wrist and ankles, encephalopathy (various brain disorders), kidney disease, and hypertension.
- **Magnesium**. A strong, silvery-white, light-weight metal that exists naturally in the environment; because it is very reactive in its natural state, it is often combined with other elements to form magnesium oxide, various salts, and other industrially-important compounds; magnesium is the third most commonly used metal; because it is light-weight, it is widely used in manufacturing numerous electronics; upon exposure, magnesium can cause skin and eye irritations; it is also flammable as a fine dust.
- **Mercury**. A silver-white, liquid metal associated with underground storage tanks, batteries, fluorescent bulbs, thermometers and thermostats; noncombustible liquid; mercury is not considered a likely carcinogen but does affect skin, eyes, respiratory system, central nervous system and kidneys through inhalation, skin absorption, ingestion and contact exposures; symptoms include: skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pnuemonitis (lung inflammation), tremor, insomnia, irritability, indecision, headache, weakness, exhaustion, stomatitis (inflammation of lining within the mouth), salivation, gastrointestinal disturbance, weight loss/anorexia, and proteinuria (protein in urine).
- **Selenium**. Crystalline, red to gray solid that is considered to be combustible when in fine dust form; elemental selenium is rare – it is most commonly produced as a byproduct of refining copper or producing sulfuric acid; selenium can cause damage to the skin, eyes, respiratory system, liver, kidneys, blood and spleen; symptoms include: skin, eye, nose, and throat irritations, visual disturbance, headache, chills, fever, difficulty breathing, bronchitis, metallic taste, garlic breath, gastrointestinal disturbance, dermatitis, and skin and eye burns.
- **Silver**. A white, lustrous metal that is noncombustible in solid form but can become flammable when in dust form. Silver can cause damage to the nasal septum, skin and eyes. Symptoms include: blue-gray eyes, nasal septum, throat and skin, ulceration of skin, and gastrointestinal disturbance.
- **Zinc**. A bluish-white metal commonly associated with underground storage tanks and used as an anti-corrosion agent; zinc is commonly found in common cold lozenges and over-the-counter cold remedies, as a dietary supplement and also within common foods such as beans, nuts, whole grains and pumpkin/sunflower seeds; zinc is commonly considered non-toxic but in abundance can result in gastrointestinal irritation through ingestion exposures; symptoms include: loss of appetite, nausea, vomiting, stomach cramps, diarrhea and headaches.

Control Measures: Soils should be wet and kept moist to reduce the amount of airborne dust concentrations generated. Providing sufficient ventilation, wearing safety glasses with side-shield protection and wearing dust masks or respiratory equipment with P100 filter are other alternatives for working in dusty environments. Most PPM jobsites can be mitigated using wet methods only. Workers should use additional precautions when using both wet methods and power tools or corded equipment to avoid electrical shock.

3.1.3.4 Nuisance and Concrete Dust

Dust generation is a common occurrence when working with contaminated soils and when mixing or dismantling concrete. In most cases, activities that result in dust accumulation are subcontracted making them more susceptible to these respiratory hazards than PPM personnel. Generally, dust accumulation is minimal, but the SSO must ensure that subcontractors are using effective controls to minimize dust accumulation, and that they are also equipped and wearing the appropriate protective equipment when performing these tasks. Contaminants associated with common job-related dusty environments include:

- **Total and respirable dust**. Dust found in the air that can cause breathing difficulties if inhaled. OSHA has established permissible exposure limits (PELs) for both total and respirable dusts to regulate worker exposures. Respirable dust is defined as dust particles less than 10 micrometers in diameter, which is too small to be visible. Symptoms of exposure can include coughing, wheezing and breathing difficulties.
- **Concrete dust**. Commonly generated through core drilling and jack-hammering through concrete. Also, small areas of concrete can be replaced by workers who may generate dusts from bags of cement as part of the mixing process. Trace amounts of crystalline silica, alkaline compounds and hexavalent chromium are found within cement. OSHA has established PELs for Portland cement to regulate worker exposures. Symptoms of exposure can include coughing, wheezing, eye irritations and in severe cases silicosis. Wet cement can also cause skin burns so workers should wear goggles and aprons or long-sleeved clothing when mixing cement.

Control Measures: Soils should be wet and kept moist to reduce the amount of airborne dust concentrations generated. Providing sufficient ventilation, wearing safety glasses with side-shield protection and wearing dust masks or respiratory equipment with P100 filter are other alternatives for working in dusty environments. Most PPM jobsites can be mitigated using wet methods only. Workers should use additional precautions when using both wet methods and power tools or corded equipment to avoid electrical shock.

3.1.4 Volatile and Semi-Volatile Organic Compounds

Volatile organic compounds (VOCs) are a broad group of materials that have the ability to vaporize (change from a solid or liquid into a gas) with an increase in ambient temperature. Some example VOCs include: paints and lacquers, paint thinners, pesticides, solvents and degreasers, glues/adhesives and petroleum fuels. Semi-volatile organic compounds (SVOCs) include phenols and polycyclic aromatic hydrocarbons (PAHs), which have a higher boiling point than water and may vaporize with an increase in ambient temperature. VOC/SVOCs are not known for acute toxicity but have significant chronic health effects because concentrations are often low and symptoms are slow to develop, which is why several VOC/SVOCs are suspected or known carcinogens. Common VOC/SVOCs are outlined in the following sections.

3.1.4.1 Chlorinated Compounds

A chlorinated solvent is a type of organochlorine, which is an organic compound (contains carbon) that also contains chlorine. They are found in a variety of products and used as part of the dry cleaning process due to its ability to dissolve materials such as fats and greases. Workers are most likely to be exposed to these chemicals as part of soil and groundwater assessment and remediation associated with dry cleaning contaminants. Chlorinated solvents can be environmentally persistent and tend to evaporate easily making inhalation the primary route of worker exposure. However, workers may additionally be exposed to chlorinated solvents through ingestion, absorption and skin/eye contact. Common chlorinated solvents encountered through company-related processes include:

- **Carbon tetrachloride**. A noncombustible, colorless liquid with ether-like odor; considered a potential carcinogen with damaging effects to the central nervous system, eyes, lungs, liver, kidneys, and skin; symptoms include: skin and eye irritation, central nervous system depression, nausea, vomiting, drowsiness, dizziness, and incoordination.
- **Chloroform**. A noncombustible, colorless liquid with pleasant odor; considered a potential carcinogen with damaging effects to the liver, kidneys, heart, eyes, skin, and central nervous system; symptoms include: skin and eye irritation, dizziness, mental dullness, nausea, confusion, headache, weakness, exhaustion, anesthesia, and enlarged liver.
- **Methylene chloride**. A combustible, colorless liquid with chloroform-like odor; considered a potential carcinogen with damaging effects to the eyes, skin, cardiovascular system, and central nervous system; symptoms include: skin and eye irritation, weakness, exhaustion, drowsiness, dizziness, numb and tingling limbs, and nausea.
- **Perchloroethylene (Tetrachloroethylene)**. A noncombustible, colorless liquid with mild chloroform-like odor; when in a fire, it decomposes to hydrogen chloride and phosgene; considered a potential carcinogen with damaging effects to the eyes, skin, respiratory system, liver, kidneys and central nervous system; symptoms include: skin, eye, nose, throat and respiratory irritation, nausea, flushed face and neck, dizziness, incoordination, headache, drowsiness, skin redness, and liver damage.
- **Trichloroethylene**. A combustible, colorless liquid with chloroform-like odor; will burn when exposed to flame, but is difficult to burn; considered a potential carcinogen with damaging effects to the eyes, skin, respiratory system, heart, liver, kidneys, and central nervous system; symptoms include: skin and eye irritation, headache, visual disturbance, weakness, exhaustion, dizziness, tremor, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, parasthesia (tingling or numbness of the skin), and liver injury.
- **Vinyl chloride**. A combustible, colorless gas or liquid (below 7º F) with pleasant odor at high concentrations; considered a potential carcinogen with damaging effects to the liver, central nervous system, blood, respiratory system, and lymphatic system; symptoms include: weakness, exhaustion, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities, and frostbite (as a liquid).

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.4.2 Isopropyl Alcohol

After bailers and reusable sampling equipment is decontaminated with alconox® solution, it is then sprayed with isopropyl alcohol. Also referred to as isopropanol, isopropyl alcohol is a colorless, flammable liquid commonly known as rubbing alcohol. It is considered a skin, eye and respiratory system irritant that causes damage through inhalation, ingestion and skin/eye contact exposures. Symptoms of overexposure include: irritation of eyes, nose and throat, drowsiness, dizziness, headache and dry, cracking skin.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind

of concentrations) or upgrade protective equipment. Increase frequency of air monitoring if action limits are triggered and remove or isolate all ignition sources if flammability limits are triggered. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations.

3.1.4.3 Methyl-Tertiary Butyl Ether (MTBE)

MTBE is a colorless, flammable liquid with an ether-like odor used as a fuel additive to reduce emission gases such as ozone and carbon monoxide. At one point gasoline could consist of as much as 10-15% MTBE but has since been replaced with ethanol and other additions less harmful to humans and the environment. MTBE poses a concern because it is considered a potential human carcinogen, can easily travel through soils, and is very soluble in water creating larger contaminant plumes than other gasoline constituents. It is also more resistant to biodegradation making it more environmentally persistent. MTBE is considered a skin, eye, respiratory and central nervous system irritant with symptoms that include: skin, eye and mucous membrane irritation, dizziness, nausea, headache, intoxication, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.

Control Measures: Avoid prolonged exposures to oil mist, liquid or vapor. Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations.

3.1.4.4 Organic Hydrocarbons

Total petroleum hydrocarbon (TPH) is a broadly used term referring to a large family of compounds that originate from crude oil. Crude oil is a naturally-occurring, flammable liquid comprised of a complex mixture of various hydrocarbons. It is recovered through oil drilling, but can be refined and separated into other substances such as gasoline, kerosene, diesel and lubricating oils. TPH is generally comprised of hydrogen and carbon; hence the term "hydrocarbon". Because there are so many different mixtures, TPH is divided into groups or fractions, and each fraction consists of hydrocarbons that exhibit similar soil and groundwater traits. Fractioning TPH is beneficial in the risk assessment process because certain fractions may be eliminated as contaminants of concern. Common petroleum-based chemicals encountered through company-related processes include:

- **Gasoline**. Gasoline is extracted from crude oil through a distillation process. It is comprised primarily of aliphatic hydrocarbons, but also includes some aromatic hydrocarbons such as benzene and toluene to increase octane ratings. Additional additives such as tetraethyl lead and methyl-tertiary butyl ether (MTBE) were added to gasoline to enhance performance and reduce harmful carbon monoxide exhaust emissions and reduce smog. Due its harmful effects to human health and the environment, neither additive is currently used and has been replaced instead with alcohols such as ethanol or methanol.

  Gasoline is used primarily as a fuel source but can also be used as a solvent. Components of gasoline are considered to be carcinogenic, and because gasoline is highly volatile, inhalation of vapors is always a concern for workers. Gasoline is also a skin and eye irritant, its vapors are highly flammable, and it is a major source of pollution gas (i.e., 1 U.S. gallon of gasoline produces 19.4 pounds of carbon dioxide, a greenhouse gas). Gasoline is comprised of the following four constituents:

→ Benzene – a colorless, flammable liquid with a sweet odor; makes up on average 0.62% to 1% of gasoline; is considered a known carcinogen with damaging effects to skin, eyes, respiratory system, blood, central nervous system and bone marrow, which can result in anemia (decreased red blood cell count making one weak and tired), decreased white blood cell count (difficult to fight off infections), and low blood platelet count (excessive bleeding); benzene causes damage through inhalation, skin absorption, ingestion and contact exposures; symptoms include: drowsiness, dizziness, headaches, confusion, tremors, skin/eye irritations, redness and blistering of the skin, vomiting, stomach irritation, convulsions, rapid heart rate, unconsciousness, leukemia (long-term) and death (large doses).

→ Toluene – a colorless, flammable liquid with benzene-like odor (smells like paint thinner); can produce damaging effects to skin, eyes, respiratory and central nervous systems, liver and kidneys; toluene causes damage through inhalation, skin absorption, ingestion, and contact exposures; symptoms include: eye and nose irritation, weakness, exhaustion, confusion, euphoria, dizziness, headaches, dilated pupils, lacrimation (tears), anxiety, muscle fatigue, insomnia, parathesia (tingling or numbness of the skin), dermatitis, and liver/kidney damage.

→ Ethylbenzene – a colorless, flammable liquid with aromatic odor (smells like gasoline); is considered a potential human carcinogen that can produce damaging effects to skin, eyes, respiratory and central nervous systems; ethylbenzene causes damage through inhalation, skin/eye contact and ingestion exposures; symptoms include: irritation of the eyes, skin and mucuous membranes, headaches, dizziness, dermatitis, narcosis (unconsciousness) and coma.

→ Xylene – colorless, flammable liquid with sweet, balsam-like odor; is a mixture of ortho-, meta- and para-xylene isomers that releases carbon monoxide gas when burned; can produce damaging effects to skin, eyes, respiratory and central nervous systems, gastrointestinal tract, blood, liver and kidneys; xylene causes damage through inhalation, skin absorption, ingestion and skin/eye contact exposures; symptoms include: irritation of skin, eyes, nose and throat, dizziness, excitement, drowsiness, incoord-ination, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain and dermatitis.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring once action limits are triggered to ensure that all ignition sources are removed or isolated when flammability limits are triggered.

- **Kerosene**. Kerosene is a source of fuel refined from crude oil that is heavier than gasoline but lighter than diesel. It is a colorless to yellowish oily liquid used in households as a lamp oil and used industrially as jet fuel for aircraft and rocket engines. Kerosene has a strong odor, is highly flammable, and causes damage to the eyes, skin, respiratory system, and central nervous system. Workers may be exposed to liquid kerosene and its vapors through inhalation, ingestion, skin and/or eye contact. Symptoms include: irritation of eyes, skin, nose and throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; and chemical

pneumonitis (aspiration liquid). Kerosene is commonly referred to as paraffin in other countries.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring once action limits are triggered to ensure that all ignition sources are removed or isolated when flammability limits are triggered.

- **Diesel/polycyclic aromatic hydrocarbons (PAHs)**. Diesel is a source of fuel refined from crude oil and used in diesel trucks, boats, school and city buses, trains, cranes, farming equipment, emergency response vehicles and power generators. Diesel is an attractive fuel source because it is less volatile and emits smaller amounts of greenhouse gases (CO and CO_2); however, during combustion it does release large amounts of soot which can lead to acid rain, smog and poor health conditions. PAHs are found in crude oil and soot and are also a by-product of petroleum processing or combustion, specifically the incomplete burning of oil and gas. Common PAH constituents include: acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h) anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene. The regulated PAH constituents are outlined below:

  → Coal tar pitch volatiles - PAH components anthracene, benzo(a)pyrene, chrysene, phenanthrene, and pyrene, all of which have the same chemical description, target organs, and regulatory threshold limits are not addressed by NIOSH as individual components. Instead, they are classified and regulated as coal tar pitch volatiles. Coal tar pitch volatiles may vary slightly but are described as combustible, black or brown amorphous residues and are considered a potential human carcinogen with damaging effects to respiratory system, skin, bladder, and kidneys. Symptoms include: dermatitis and bronchitis.

  → Naphthalene – Naphthalene is a combustible, colorless to brown solid with an odor or mothballs that causes damaging effects to eyes, skin, blood, liver, kidneys, and central nervous system. Symptoms include: eye irritation, headache, confusion, excitement, discomfort, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, jaundice, blood in urine, renal failure, dermatitis, optic and cornea damage.

  Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring once action limits are triggered to ensure that all ignition sources are removed or isolated when flammability limits are triggered.

- **Hydraulic and lubrication oils**. Oils used for internal combustion engines to lubricate moving parts, prevent corrosion and to cool the engine. Lubricating oils are made from crude oil but also include additives to improve certain properties. Lubricating oils can be highly flammable and can cause irritation of nose, throat and lungs, headaches, dizziness, nausea, vomiting and diarrhea.

Control Measures: Avoid prolonged exposures to oil mist, liquid or vapor. Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations.

3.1.4.5 Pesticides

A pesticide is another type of organochlorine commonly used for crop dusting agricultural farmland not only to kill insects, rodents and germs, but is also used for weed and mildew control. The term "pesticide" includes a broad category of chemicals that can be further broken down into insecticides, rodenticides and fungicides. Some older and more recently banned pesticides (such as DDT) tend to be environmentally persistent. Workers are potentially exposed to pesticides as part of the assessment or remediation of impacted farmland as well as commercial pesticide manufacturing and/or storage facilities. Similarly to chlorinated solvents, pesticides can be volatile making inhalation the primary route of worker exposures. However, workers may additionally be exposed to pesticides through ingestion, absorption and skin/eye contact. There are numerous pesticides tested as part of assessment and remediation of impacted sites; however, the following pesticides are OSHA-regulated materials that pose a potential health risk to workers:

- **Aldrin**. A noncombustible, colorless to dark-brown crystalline solid with mild chemical odor; may dissolve in flammable liquids; formerly used as an insecticide and is considered a potential carcinogen with damaging effects to the central nervous system, kidneys, liver, and skin; symptoms include: headache, dizziness, nausea, vomiting, vague feeling of discomfort, jerking of limbs, convulsions, coma, hematuria (blood in urine), and azotemia (blood containing high levels of urea, creatinine and other nitrogen-rich compounds).
- **Dichlorodiphenyltrichloroethane (DDT)**. A combustible, colorless crystals or off-white powder with a slight aromatic odor; considered a potential carcinogen with damaging effects to the eyes, skin, central nervous system, liver, kidneys, and peripheral nervous system; symptoms include: skin and eye irritation, tingling and numbness of tongue, lips and face, tremor, anxiety, dizziness, confusion, vague feeling of discomfort, headache, weakness, exhaustion, convulsions, partial loss or impaired movement of hands, and vomiting.
- **Dieldrin**. A noncombustible, colorless to light-tan crystals with a mild chemical odor; used as an insecticide and is considered a potential carcinogen with damaging effects to the central nervous system, liver, kidneys, and skin; symptoms include: headache, dizziness, nausea, vomiting, vague feeling of discomfort, sweating, jerking of limbs, convulsions, and coma.
- **Endrin**. A noncombustible, colorless to tan, crystalline solid with a mild chemical odor; may dissolve in flammable liquids; used as an insecticide with damaging effects to the central nervous system and liver; symptoms include: epileptic-like convulsions, stupor, headache, dizziness, abdominal discomfort, nausea, vomiting, anorexia, insomnia, aggressiveness, confusion, drowsiness, weakness, and exhaustion.
- **Heptachlor**. A noncombustible, white to light-tan crystals with a camphor-like odor; may dissolve in flammable liquids; used as an insecticide and is considered a potential carcinogen with damaging effects to the central nervous system and liver; symptoms provided for animals only and include: tremor, convulsions, and liver damage.

- **Lindane**. A noncombustible, white to yellow crystalline powder with slight, musty odor; may dissolve in flammable liquids; causes damaging effects to skin, eyes, respiratory system, central nervous system, blood, liver, and kidneys; symptoms include: skin, eye, nose and throat irritation, headache, nausea, convulsions, respiratory difficulty, cyanosis, aplastic anemia, and muscle spasm.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.4.6 Polychlorinated Biphenyls (PCB)

Polychlorinated biphenyls (PCBs) are a mixture of numerous chlorinated compounds and are commercially sold under the trade name Aroclor® 1242 (contains 42% Cl^-) and Aroclor® 1254 (contains 54% Cl^-). It is a colorless to light-yellow, oily solid or liquid with no known taste or smell and can volatilize to a vapor with a slight increase in temperature. PCBs were used as coolants and lubricants in transformers, capacitors and electrical equipment because they do not burn easily and are good insulators. Production in the U.S. was discontinued in 1977 due to its environmental persistence and damaging health effects. PCBs do not easily break down, bind strongly to soil, accumulate in fish and marine life, and can travel far distances in air.

Workers are likely to be exposed to PCBs through damaged or burning transformers, known/suspected site contamination, or ingestion of contaminated fish. PCBs can also be found in pre-1977 fluorescent light fixtures, electrical devices (TVs and appliances), and hydraulic oils. Worker exposures are likely to occur through inhalation, absorption, ingestion and contact causing damaging effects to the skin, eyes, liver and reproductive system. Symptoms include: eye irritation, chloracne (acne-like skin condition in adults), liver damage, and reproductive effects.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.5 Other/Unknown Chemicals

3.1.5.1 Activated Carbon

Also referred to as activated charcoal, this material comes in various forms but is most often purchased by PPM in granular form (occasionally purchased in pellet form). Activated carbon is a porous material that is effective in the adsorption of gases/vapors and is commonly used as part of the groundwater treatment process. This material is non-toxic but can be irritating to the skin and eyes. Loose granules can also present a slip hazard and dusts can accumulate when replacing spent carbon with unspent carbon.

Control Measures: Keep granules inside storage bag or carbon vessel and immediately remove spilled granules from the work area to prevent slipping. Wear appropriate protective clothing such as gloves and safety glasses when working with/near this material to prevent skin and eye contact. Keep dust generation to a minimum using a porta vac and be prepared to wear a dust mask or half mask with P-100 HEPA cartridge when dusts cannot otherwise be mitigated.

3.1.5.2 Alconox®/Liquinox®

Alconox® (powder) and Liquinox® (liquid) are detergents used to decontaminate bailers and equipment to prevent cross-contamination of samples. Detergents generally can be skin or eye irritants that can cause itching, pain, redness or burning.

Control Measures: Keep face away from solution when mixing and wear safety glasses with side-shield protection or goggles depending upon the degree of splashing.

3.1.5.3 Descaling Agents (Analytix AN-754GH)

Various chemicals may be used to prevent the accumulations of scaling along monitoring well walls. These descalers may vary by office location; however, most of these chemicals exhibit similar characteristics. They are typically acidic in nature and may be extremely corrosive to skin, eyes, and respiratory system.

Control Measures: Keep face away from solution when handling and wear safety glasses with side-shield protection or goggles depending upon the degree of splashing. Use safe precautions when handling material and make every effort to avoid direct contact with this material through the use of protective clothing and equipment such as chemical-resistant gloves, goggles and aprons. Avoid inhaling any fumes that may arise from these chemicals.

3.1.5.4 Unknown Chemicals and/or Concentrations

Workers do not often come into contact with unknown chemicals and/or chemical concentrations. Although rare, workers may potentially encounter unknowns during drum characterizations as requested by a particular client. When the client cannot identify the material(s) inside a drum or other container, this material(s) is to be treated as an extremely hazardous substance using the highest level of safety precautions including, but not limited to, personal protective clothing/equipment. When working with known chemicals at unknown concentrations, the same level of safety precautions must be implemented to preserve worker safety and wellbeing. These situations are considered an immediately dangerous to life and/or health (IDLH) environment.

Control Measures: When this type of work is proposed by a client, it must be presented and approved by Shawn Ivey or Zane Hood, Regional Principals. Due to the increase in safety precautions, a site-specific HASP must be generated by the Health and Safety Director, which may require additional time to prepare. Never open a site drum/container that does not belong to PPM if the contents or concentrations are unknown.

3.1.6 Chemical/Physical Properties

The following table outlines the chemical and physical properties associated with the most common volatile or semi-volatile constituents encountered by PPM.

Chemical Name	VP[1]	VD[2]	SG[3]	Sol[4]	FP[5]	LEL[6]	UEL[7]
Diesel	0.009 psia	>1	0.83-0.88	Negligible	125	0.6	7.5
Gasoline	38-300	3-4	0.72-0.76	Insoluble	45	1.4	7.6
Benzene	75	2.8	0.88	<1	12	1.2	7.8
Toluene	21	4	0.87	<1	40	1.1	7.1
Ethylbenzene	7	4	0.87	<1	55	0.8	6.7
Xylene	9	4	0.86	<1	81	1.1	7.0
MTBE	245-256	3.1	0.74	4.8	-17	1.6	8.4
Ozone	>1 atm	1.7	2.14	<1	N/A	N/A	N/A

1 – Vapor Pressure (mmHg) – the higher the VP, the more likely it is to change from a liquid to a vapor with an increase in temperature.
2 – Vapor Density – how heavy the material is in air; anything >1 will sink into worker breathing zone; anything <1 will rise.
3 – Specific Gravity – how heavy the material is in water; anything >1 will sink in water; anything <1 will float on water.
4 – Solubility (%) – how likely the material is to be dissolved in water.
5 – Flash Point (°F) – lowest temp that material vapors will ignite/burn.
6 – Lower Explosive Limit (%) – lowest concentration in which vapors will ignite.
7 – Upper Explosive Limit (%) – highest concentration in which vapors will ignite.

3.2 PHYSICAL HAZARDS AND CONTROLS

3.2.1 Combustion/Flammability

The three elements needed to produce a fire are: combustible material, oxygen, and ignition source (heat). As part of most projects, the presence of gasoline (flammable contaminant) within an outdoor environment (sufficient oxygen content) when combined with the use of heavy equipment (electrical source) provides all three elements necessary to produce a flammable setting. Fires can also be the result of overloading circuitry and improper chemical storage.

Control Measures: Monitor ambient site concentrations to ensure flammable action limits are not triggered. Oxidizers are capable of releasing oxygen and generating heat so store them away from combustible materials. Do not overload power outlets. Remove foot heaters or other electrical devices if they trip ground fault circuit interrupters (GFCI) or produce burnt smell and/or smoke. Use ABC-rated fire extinguisher to extinguish fire or follow company evacuation procedures when warranted.

3.2.2 Contaminated Water/Splash Hazards

Beware of splash hazards posed by purging and/or development of groundwater monitoring wells. Chemical splash hazards may also be encountered during drum sampling of known contaminants. Contaminants are likely to vary; therefore, the chemical hazards section of this plan should be referenced to address the hazards posed by the contaminant.

Control Measures: Workers must wear safety glasses with side-shield protection. Goggles may be necessary depending upon the degree of splashing. Goggles are required when moving containers of or working with severe eye irritants, acids or caustics.

3.2.3 Compressed Gas

Compressed gases such as acetylene and oxygen may be used to operate cutting torches. Cylinders can become projectiles if they are not secured and/or stored properly. Improper handling of cylinders can also result in muscular sprains/strains, falls, bruising, or broken bones. Other hazards may include chemical burns, explosion fire, poisoning, and cold burns due to container mishandling. In addition, utility gas lines are often buried onsite nearby areas where drilling, trenching or other similar surface disturbances are likely to occur. Contact with a subsurface gas line could result in an explosion, fire, and other significant physical bodily injury.

Control Measures: Only qualified workers appropriately trained in compressed gas safety are permitted to work with compressed gases. Keep compressed gas cylinders upright and secured when in storage, transit or use. The valve protection cap must remain in place when not in use and during storage and should only be removed when the cylinder is secured and/or ready for use. Never drag or slide a compressed gas cylinder, drop a cylinder, or subject cylinders to strikes from other objects as this may cause damage to the valves. Store in a climate-controlled environment away from heat sources, heavily traveled paths, and emergency exits and store other combustible materials in a separate location away from compressed gas cylinders. Smoking is prohibited near compressed gases. Keep empty and full cylinders segregated and replace empty cylinders promptly. Restrict unauthorized access to compressed gases and visually inspect containers weekly.

3.2.4 Concrete Coring and Cutting

The use of jackhammers and coring equipment is necessary to cut through concrete when conducting subsurface work. The use of this equipment is extremely loud, creates dusty environments and can create projectiles out of broken pieces of concrete.

Control Measures: Wet affected areas of concrete to reduce amount of dust generated; however, avoid creating large puddles of water as some equipment being used is corded and can create electrical hazards. If dust continues to be a problem, workers must wear air-purifying respirator with P-100 HEPA filter. Use vacuum-based core drills or secure the base of the core drill to concrete when working on uneven surfaces. Know where the manual shut-off switch is located and if not within reaching distance of worker, someone must be present at electrical outlet to unplug equipment should it be necessary. Operator and any worker required to be within 10 feet of coring/cutting process must wear face shield over safety glasses with side-shield protection to protect against flying particles.

3.2.5 Cuts and Lacerations

Acetate liners used for soil collections must be cut to collect the sample. Also, tubing materials used when groundwater sampling or used for air monitoring must be cut in various lengths. Shears or tube cutters are alternatives to using knives or other blades; however, there may be instances in which the use of knives or blades cannot be avoided.

Control Measures: Always use sharpened blades as dull blades can require more applied force. Wear leather or Kevlar® gloves to protect hands. Secure the object being cut keeping free hand out of the way and always cut away from the body. If cut must be made towards the body, cut the object at an angle away from the body. Utility knives must have a self-retracting blade and should not be stored in pockets of clothing.

When collecting soil samples, workers should rely upon the subcontractor to cut the sample liners whenever possible. When workers must cut the liners, the following specific instructions are required:

- Secure the liner to a stable structure (i.e., the truck tailgate or portable table).
- Use the proper cutting tool for the job (see photo); subcontractors often have this tool.
- Cut the liner perpendicular to the body – avoid cutting towards the body.

3.2.6 Driving Safety

Most company-related field activities occur offsite and require personnel to drive from the office to the jobsite. Collision with another vehicle or into a structure can result in property damage, worker injury or even a fatality.

Control Measures: Drivers must have valid state license to drive and must be classified appropriate to the type of vehicle he/she will be required to operate (i.e., vehicles with gross vehicle weight rating [GVWR] >10,000 lbs or any vehicle/trailer combination GVWR >10,000 lbs requires a commercial drivers license). Additional safety precautions for driver safety include, but are not limited to, the following:

- Obey all federal and state traffic laws (i.e., speed limits, yielding, etc.)
- Plan route to site in advance to avoid traffic congestion, construction, road closures, inclement weather or other similar forms of delay
- Perform pre-use inspection to ensure vehicle is fueled and in good working order
- Ensure all materials are secured
- Avoid distractions such as changing radio stations, reading texts or emails, eating, drinking, or other similar functions
- Pull over to take or make a phone call even when using hands-free devices
- Texting while driving is strictly prohibited by PPM and is a law in several states
- Drive defensively - yield to aggressive drivers, slow down when driving through adverse weather conditions or when driving through school zones

3.2.7 Drowning

Water bodies where the potential for drowning exists includes: oceans, rivers, lakes, seas, gulfs, bays, ponds, wetlands, bayous, streams or other similar water sources. Work over or near these types of water bodies is rarely encountered, and routine company job tasks do not usually result in the use of a boat. However, when they arise, jobs of this nature do pose a risk of drowning. When sample collections are anticipated to occur from within a boat, this will likely take place in various locations of the water body with varying or unknown depths, currents, floating and subsurface debris, and/or other similar hazards.

Control Measures: Tasks requiring work over or near water where the potential for drowning could occur requires a minimum of two workers. Use a boat with a flat, stable surface to reduce the potential for rollover. In addition, workers must wear a U.S. Coast Guard-approved life preserver at all times when inside the boat or when otherwise performing a task where the potential for drowning still exists. Once over water, movement within the boat should be minimized, and workers must use caution when collecting the sample. Workers must be equipped with buoys or other similar means to extract any individual that should fall into the water.

3.2.8 Electrical

3.2.8.1 Subsurface and Overhead Utilities

Typical jobsites will pose both subsurface and overhead utility hazards. Also, remediation systems are electrically operated and pose similar electrical hazards. Contact with power lines or exposed electrical wires can result in electric shock, severe skin burns and electrocution. Electrical wires are generally insulated as a first line of defense; however, tears or damage to the insulated material can directly expose workers to the wire. Other utility lines may be present at common jobsites and include water, sewer, natural gas, telephone and fiber optic. A punctured natural gas line can spontaneously combust and cause a massive explosion. In addition, active retail gas stations contain subsurface product lines running from the tank pit to the dispenser islands and the layout of these lines can often be difficult to determine. Damage to some utilities may not necessarily pose a safety risk but damage to these structures can disrupt normal business functions and be very costly.

Control Measures: Treat all electrical lines and wires as active and avoid contact. Keep all equipment at least 10 feet away from all overhead power lines unless they have been isolated or shielded by the local energy company. Add an additional 0.4 inches to this distance for every 1 kV in excess of 50 kV. Follow all clearance procedures outlined within the company's written Subsurface Clearance program, which includes but is not limited to the following measures:

Pre-Work Clearance (Offsite and Onsite Preparations)

- Request as-built drawings and/or obtain specialized knowledge of subsurface utility/structural locations from the client or property owner
- Pre-plan borehole locations and visually review with client or property owner
- Contact state one-call 48-72 hours (state-specific time requirements vary) to mark utility locations prior to field work; make secondary notices if site not marked
- Contact additional local utility providers that do not subscribe to one-call to mark utility locations prior to field work; make secondary notices if site not marked
- Hire private utility locators to identify presence of subsurface structures in addition to or in the absence of other clearance methods
- Perform visual site observations for indicators of subsurface utilities/structures
- Locate all emergency shut-off devices and isolate the work area
- Identify and avoid exclusion zones (*any area within 10-foot circumference of UST pit)* or obtain principal approval when there are no other alternatives to avoidance
- Follow clearance procedures for exclusion zones, critical zones (*any area within 10 feet of furthest edge of any fuel dispenser, product distribution lines, or aboveground electrical utility; entire area between UST pit and dispenser islands; and/or any area within 10 feet of suspected subsurface utilities/structures*), and non-exclusion zones (*any area not otherwise defined as exclusion or critical*).

Subsurface Clearance Procedures

- Clear all boreholes horizontally to 110% of the diameter of the widest digging instrument intended for use starting in all four cardinal directions (NSEW) then fully covering the entire circumference of the area
- Clear all boreholes vertically to minimum 4-foot depth BGS unless greater depths are specified by the Office Manager/Principal
- Use company-approved clearance methods (for drilling/probing) in order of preference outlined as follows:
  1) Blunt-tip push probe
  2) Tiered approach – use push probe for vertical clearance, then use digging tools (i.e., hand auger or post-hole diggers) to clear horizontally to same depth previously cleared vertically; then use push probe to further advance vertically; continue until depth-requirement is achieved
  3) Hand auger and/or post-hole digger – used only when push probe cannot otherwise be advanced vertically due to soil type(s)
- Use flat-edge shovel to clear for trenches/excavations when in areas of marked or suspected subsurface utilities/structures; clear area until utility/structure is located; if not located within depth-requirement, proceed with trenching/excavating

3.2.8.2 Electrical Tools and Power Cords

Assorted power tools may be required for certain tasks. Power tools can be battery operated or otherwise have an electrical power cord, which can be plugged into an electrical outlet. Due to this factor, energy can be controlled by plugging or unplugging the cord and does not require energy isolation. The electrical wires are typically insulated; however, kinks or cuts made to the power cord jacket can expose workers to these electrical wires resulting in electric shock or electrocution.

Control Measures: Perform an initial inspection to ensure tools and cords are in good working order and immediately discard or label damaged tools/cords to prevent use until repairs or replacements can be made. Additional safety precautions for electrical protection include, but are not limited to, the following:

- Only use electrical outlets and matching cords with grounding wire (3-prong)
- Never remove grounding prong to accommodate a 2-prong electrical outlet
- Electrical cords should be rated for hard or extra hard use
- Insulated jackets should show no evidence of kinks, cuts or tears; any sign of wear (frayed insulation or exposed wires) requires immediate labeling of the cord as "damaged" and must be immediately removed from the work area
- Avoid placing electrical cords or tools in pools of water or other wet areas
- All portable or temporary wiring must be protected by GFCI
- Avoid using tools or cords that trip the GFCI
- Do not run over cords or place them through doors, windows or other pinch points

3.2.8.3 Lockout/Tagout

Remediation systems are electrically-operated systems that may require energy isolation as part of operation, maintenance or repairs. According to 29 CFR 1910.147(a)(2)(ii), energy must be isolated when 1) a worker must remove or by-pass safety guards or devices; or 2) a worker must place a body part at the point of operation or where a danger zone exists in the operating cycle. These requirements do not apply to corded equipment as this power source can be isolated by unplugging the equipment. It also does not apply to other pressurized systems for gas or steam if it can be proven that continuity of service is essential or that shut down of the system is impractical.

Routine operations and maintenance procedures typically do not trigger the requirements for energy isolation. However, it should be noted that during certain system or component repairs, these criteria may be triggered and the locking and tagging of the system and/or its components is necessary to prevent the unintentional startup of the system.

Control Measures: Locking and tagging of the system must be conducted in accordance with company requirements outlined within its written Lockout/Tagout program. An itemized procedure list for system deactivation and reactivation are posted at all remediation systems.

3.2.9 Hand and Power Tools

The electrical hazards posed by the use of power tools have previously been addressed. However, other hazards are posed by the use of hand or power tools. Removing or by-passing safety guards can expose a worker to the piercing, cutting, crushing or rotating hazards of mechanical equipment. Improper posture or repetition of hand tools can lead to musculoskeletal disorders as outlined within the previous section.

Control Measures: Use equipment in accordance with manufacturer guidelines and according to its intended purpose. Always select the appropriate tool for the job and refrain from making adjustments. Never remove or bypass safety guards. Perform an initial inspection to ensure tools are in good working order and immediately discard or label damaged tools to prevent use until repairs or replacements can be made. Keep tools stored appropriately to prevent rust or other signs of weathering. Wear appropriate head, eye, hand, and foot protection at all times. Avoid wearing jewelry or loose-fitting protective gloves/clothing that could become entangled in moving parts of the tool.

3.2.10 Illumination

Most company-related tasks will be conducted during normal, daylight hours; however, some tasks may be required to be conducted at night. When these instances occur, visibility will be decreased making the jobsite and the task more dangerous. In addition, the overall visibility of workers to drivers, equipment operators, etc. may be decreased.

Control Measures: The National Cooperative Highway Research Program (NCHRP) Report 498: Illumination Guidelines for Nighttime Highway Work outlines a set of guidelines for adequate lighting when working at night. Workers should adhere to these requirements to ensure appropriate visibility during all phases of the project. The three categories outlined by the NCHRP include the following:

- Level I illuminance is necessary in areas where the work crew is in motion, moving from spot to spot. Required for low accuracy tasks that may involve the use of slow-moving equipment, and where large objects must be visible.
- Level II illuminance is necessary in areas on or around construction equipment. A higher degree of lighting in this area will provide a safer environment for equipment operators allowing them to perform tasks that require a moderate level of accuracy.
- Level III illuminance is necessary for tasks that require a higher level of visual acuity or difficulty.

Sample tasks and the illumination requirements for those tasks are outlined below:

SAMPLE TASKS (NOT ALL-INCLUSIVE)	ILLUMINATION LEVELS	AVERAGE MINIMUM MAINTAINED ILLUMINANCE
All work operation areas; setup of lane or road closures, lane closure tapes, and flagging stations	Level I	54 lux (5 foot-candles)
Areas on or around construction equipment; asphalt paving, milling and concrete placement and/or removal	Level II	108 lux (10 foot-candles)
Pavement or structural crack/ pothole filling; joint repair, pavement patching/repairs; installation of signal/electrical/ mechanical equipment	Level III	215 lux (20 foot-candles)

Note: A foot-candle (fc) is defined as a unit of illumination that is equal to one lumen per square foot, or 10.764 lux.

Increased lighting can be provided using portable light plant towers, balloon lighting, roadway luminaires mounted on temporary poles, and factory-installed lights on equipment. Workers should select a light source and position it in a manner that reduces the amount of glare. When conducting night tasks on or near road system right-of-ways, workers must additionally adhere to appropriate state DOT roadway and traffic control requirements. Reflective clothing/vests are required when working at night or decreased illumination.

3.2.11 Ladder Safety

3.2.11.1 Portable Ladder Safety

Portable ladders are commonly used when replacing spent carbon with inactivated granular carbon or to access stationary aboveground storage tanks for inspections and/or maintenance. Carbon vessels consist of 55-gallon drums or other vessels that commonly range from 8-30 feet in height. It should be noted that carbon vessels can exceed 30 feet but these vessels are not common to current company processes. As part of this change-out process, workers must climb portable ladders at heights greater than 4 feet and they must do so carrying 50-lb sacks of granular carbon or other materials.

Control Measures: Falls from ladder use are exempted from the fall protection standards (29 CFR 1926 Subpart M). Instead falls from ladders are outlined within Subpart X of 29 CFR 1926.1053, which does not require the use of personal fall arrest system when working at elevations in excess of 4 feet. Use buddy system when able or check in periodically with the office to relay status. Use a portable A-frame ladder and ensure that it is locked in place. Place

ladder on level, compact ground surfaces and avoid wet areas. Never place ladder near entrance/exit or other pathway that could interfere with ladder usage. Use ladder for its intended purpose and in accordance with manufacturer's guidelines. Use two hands when ascending or descending. **Note: PPM purposely chooses to reference the most stringent safety measures under construction industry standards, while additionally enforcing the more stringent general industry height requirement of 4 feet. This is an overlap of standards but provides the greatest level of worker protection.*

3.2.11.2 Fixed Ladder Safety

Fixed ladders may be used at client facilities to access rooftops or other similar elevated walking/working surface. This is often necessary with asbestos and/or lead sample collections, vacuum events, and industrial compliance; specifically air compliance.

Control Measures: Falls from ladder use are exempted from the fall protection standards (29 CFR 1926 Subpart M). Instead falls from ladders are outlined within Subpart X of 29 CFR 1926.1053, which does not require the use of personal fall arrest system when working at elevations in excess of 4 feet (general industry). According to OSHA requirements, fixed ladders must have cages, wells, ladder safety devices, or self-retracting lifelines when the climb is less than 24 feet but the top of the ladder is greater than 24 feet above lower levels. When a fixed ladder is greater than 24 feet, it must be equipped with one of the following: ladder safety devices or self-retracting lifelines with rest platforms at intervals not to exceed 150 feet. When able and it does not otherwise introduce additional safety hazards, personnel may be required to use personal fall arrest system. This will be determined on a case-by-case basis. **Note: PPM purposely chooses to reference the most stringent safety measures under construction industry standards, while additionally enforcing the more stringent general industry height requirement of 4 feet. This is an overlap of standards but provides the greatest level of worker protection.*

3.2.12 Material Handling and Back Safety

It is common for workers to transport materials such as hand or power tools, bailers, sampling containers and monitoring equipment from the office to various site locations. Workers are also likely to relocate drums or other chemical storage containers. Materials may be heavy putting strain on the back, or they may be large or bulky and obstruct vision during transport.

Control Measures: When lifting or relocating heavy or large items, mechanical devices should be used as a first line of defense. When mechanical means are not available, workers should use the buddy system to lift and transport loads in excess of 50 lbs or load that obstruct view of travel. When lifting an object, workers should bend at the knees and lift with the legs – avoid applied pressure to the back as muscle strain will likely occur. Keep loads close to the body and avoid twisting while carrying loads. Ensure travel paths are free of obstructions prior to lift and relocating materials.

3.2.13 Mobile Equipment

3.2.13.1 Heavy Equipment and Machinery

Various types of heavy equipment are necessary to perform routine tasks such as drilling, geoprobing (direct push), mobile vacuum, trenching, excavating, remediation system installations and removals, underground storage tank removals, and other similar tasks. The use of this type of equipment is mostly subcontracted, and PPM requires its subcontractors be adequately trained to safely operate these types of heavy machinery. Other forms of heavy equipment such as forklifts, knuckle-boom truck-mounted crane, skid steers, and core drills can be operated by company personnel. PPM requires that operators of these types of equipment

be deemed competent by the company through safety, instructional and observational training and/or operator experience. Also, equipment must be inspected by a competent prior to use, documented and returned to the safety department for recordkeeping. Hazards associated with the use of heavy equipment include, but are not limited to, the following:

- Pinching, rolling, crushing, rotating hazards
- Contact with overhead or underground utilities gas lines, power lines, etc.)
- Falling loads
- Hydraulic or pressurized equipment parts
- Swing radius of equipment
- Operator blind spots
- Hot equipment parts

Control Measures: Use equipment in accordance with its intended purpose. Machinery must be grounded prior to use and equipped with emergency stop devices. Workers must locate and test these devices prior to using the equipment. When the equipment is in use, one worker must be readily available to engage emergency stop devices unless other workers remain away from the equipment while in operation. Equipment must remain at least 10 feet away from any overhead utility line unless the line has been otherwise isolated or shielded from accidental contact. Derricks/masts of mobile equipment must be lowered prior to relocating equipment from one location to another while onsite. Personnel who work with or near rotating or other moving parts are prohibited from wearing jewelry, loose clothing or other similar means that could become entangled within the equipment. Long hair should be tied back and protective clothing should fit securely. Workers should not collect samples or otherwise place hands in or near augers when it is rotating, and workers must also avoid climbing mast of equipment when it is in operation. Wheels should be chocked and hand brakes set to secure equipment when at rest.

Contact with hot parts must be avoided and it should be noted that metal parts become extremely hot with sun exposure, which can cause significant skin burns. Workers are prohibited from working beneath elevated loads and must avoid any area impacted by the swing radius of operating equipment unless a spotter is used. Additionally, workers must be aware of operator blind spots which may also require the use of a spotter.

3.2.13.2 Aerial and Scissor Lifts

Use of aerial and scissor lifts is strictly prohibited. Company personnel are not appropriately trained for working with aerial and scissor lifts and are therefore not authorized on these machines without additional safety training and approval from the safety department. Workers should be aware that aerial and scissor lifts are not synonymous and are covered under two separate OSHA regulations. Regulatory requirements for aerial lifts can be found in §1926.453, while requirements for scissor lifts (defined by OSHA as a mobile scaffolding system) can be found in §1926.452(w). This equipment can reach elevations in excess of 4 feet triggering fall protection. It should be noted that per OSHA guidelines, aerial lifts require the use of personal fall arrest systems in conjunction with the use of a guardrail system, while scissor lifts require the use of personal fall arrest systems only in the absence of a guardrail system.

3.2.14 Noise

OSHA regulates worker exposures to noise. The established action limit for an 8-hour workday is 85 decibels (dB), a time-weighted average (TWA). Levels at or in excess of this limit can cause hearing loss, which depending upon exposure can be a temporary or permanent loss. Noisy environments can also interfere with worker communication and comprehension, which poses additional safety risks.

Noise exposures can be measured using sound level meters or noise dosimeters. Certain work-related processes considered to be noisy include but are not limited to the following:

- Remediation systems – systems vary, but noise levels have been measured ≥90 dB
- Heavy equipment operation (including vac trucks) – have been measured ≥120 dB
- Use of power tools – sound levels vary (electric drill – 95 dB, power saw 110 dB, power drill – 130 dB, pneumatic drill – 120 dB)
- Work conducted nearby high traffic roadways – typical freeway traffic is 70 dB; however, large 18-wheelers have been measured ≥90 dB
- Coring and cutting of concrete – use of jackhammers or coring equipment have been measured ≥130 dB

Control Measures: When available, workers should carry sound level meters to assess noise levels. In the absence of monitoring equipment, workers who must shout at a co-worker 5 feet away are likely triggering regulatory threshold limits for noise exposures. Those environments ≥85 dB require the use of administrative controls or protective equipment. Administrative measures such as limiting work hours within noisy environments should be the first line of defense used to control worker exposures to noise levels in excess of 85 dB. When this cannot be achieved use hearing protectors such as earplugs, canal caps or ear muffs to protect worker hearing.

3.2.15 Repetitive Motion

Some tasks require a degree of repetition that may put strain on muscles and joints of the body. Poor posture can also put a similar degree of strain on the body. Typical symptoms of repetitive motion strain do not necessarily occur immediately (i.e., they can appear at rest during sleep) and include but are not limited to the following:

- Tingling, swelling or numbness of wrists, knees, elbow or other joints
- Sharp, piercing pain
- Loss of flexibility or muscle strength

Control Measures: Avoid performing repetitive tasks that target specific parts of the body for extended periods of time. Recognize symptoms promptly and vary job task for a while. Stretching and flexibility exercises can strengthen muscles over time. Report any signs or symptoms of repetitive motion strain to the HSD immediately. These injuries progressively worsen so prevention is imperative.

3.2.16 Scaffolding

Use of scaffolding systems, which includes walking, working, assembling, disassembling, and/or other similar uses, is strictly prohibited. Company personnel are not appropriately trained for working with scaffolding systems and are therefore not authorized on these systems without additional safety training and approval from the safety department. Work requiring the use of a scaffolding system will be subcontracted to appropriately qualified contractors.

3.2.17 Slips, Trips, and Falls

Open boreholes generated through drilling or direct push as well as improper materials storage can pose tripping hazards. In addition, typical groundwater monitoring activities can result in open monitoring wells producing the same results. Trenching and excavating jobs can result in large, open earth depressions of varied depths and widths in which workers, tools or equipment could potentially fall. Carbon change-outs, asbestos/lead sampling, aboveground storage tank inspections and/or maintenance, and use of catwalks may require work at elevations ≥4 feet, which may require additional safety measures such as the use of fall protective equipment (i.e. full-body harness and lanyard). Only personnel who have received

additional fall protection training are considered competent for performing these tasks – all other workers are prohibited from working at elevations ≥4 feet without additional training and certification.

Control Measures: Store all materials away from work areas until ready for use and keep all travel paths unobstructed. Walk around materials – never walk over them. Use secured, steel sheet plates or wood to cover open boreholes. Use company truck and cones to isolate traffic from open monitoring wells. Heavy equipment, barricades and caution tape must be used to isolate open excavations from vehicular traffic and unauthorized personnel. Use full-body harness and lanyard to tie-off to stable structure when working on walking/working surfaces at elevations ≥4 feet (refer to Section 3.2.19). Refer to Section 3.2.11 for fall hazards associated with the use of ladders.

3.2.18 Traffic and Secluded Areas

Most petroleum remediation activities occur at active retail gasoline facilities, which expose workers to vehicular traffic. In some cases, work may be required within roadway right-of-ways or workers may be required to cross highways to perform work on an adjoining property or within a median. Secluded areas are not typical of most field-related projects; however, they do exist on occasion. Workers required to perform tasks at remote locations should be aware that these locations may be unlawfully inhabited and/or have the potential for illegal activities.

Control Measures: Use buddy system when working in high traffic areas as first line of defense, especially on spill bucket closures, groundwater sampling, or other similar tasks that require workers to bend, kneel or sit at or slightly above ground level which greatly decreases worker visibility. When these conditions are triggered, the buddy system will require one worker to stand nearby the other worker to create a unit whereby the observer has the primary responsibility of ensuring the safety of the worker with decreased visibility. When working upright, the buddy system will permit workers to separate only to distances that are clearly visible to both workers in a manner that ensures both can continuously monitor the other during all phases of the task. For example, during the sample collection, workers must fill vials or other containers at the vehicle so that they remain in an upright position during collection. Collections at the well are prohibited unless workers are together as a unit because when workers are separated, this process generally requires the worker to bend or kneel, which decreases the visibility of that individual. In addition, the worker is no longer in a position to observe his/her co-worker voiding the effectiveness of the buddy system. If operating as a unit, one worker may observe while the other collects the sample at the well.

When the buddy system cannot be implemented, use the company vehicle and cones to clearly define and block traffic from your work area. Relocate vehicle and cones when work area changes. Workers must wear high visibility safety shirts or ANSI Class II vests to increase visibility even when using additional safety precautions. Reflective clothing/vests are required when working at night or decreased illumination. Additional illumination requirements for night work can be found in Section 3.2.10. When conducting night tasks on or near road system right-of-ways, workers must additionally adhere to appropriate state DOT roadway and traffic control requirements. When working in secluded or unsafe areas, the following measures are required:

- Schedule work during daylight hours
- Contact local police department and inquire about security
- Never go to site alone; use buddy system
- Notify manager or co-worker regarding your location, estimated time to perform duties and anticipated time of return; make intermittent calls throughout the day
- Have cell phone readily available and pre-set to 911

- Carry whistle and pepper spray as alternate methods of defense
- Wear work clothes and protective equipment to identify you are there in a professional capacity
- Park vehicle nearby and never exit the vehicle if anyone or anything appears suspicious

Note: The use of the buddy system as outlined above applies to traffic hazards only and should not be incorporated universally without additional discussion and management approval. For instance, the use of the buddy system as required when conducting emergency response is clearly specified by OSHA §1910.120 in a manner that opposes the previously outlined requirements. In the absence of regulatory direction, PPM will adhere to this definition of the buddy system.

3.2.19 Walking/Working Surfaces

3.2.19.1 Elevated Walking/Working Surfaces

Carbon change-outs, asbestos/lead sampling, and aboveground storage tank inspections and/or maintenance may require work at elevations ≥4 feet. In addition, use of catwalks may exist at heights ≥4 feet. According to §1910.21, a catwalk is considered a runway which is defined as a passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings. When working on multilevel surfaces, any floor deteriorations or openings must be obstructed to prevent inadvertent falls from an elevated surface. Working at elevated heights can create fall hazards that can result in a fatality or serious physical impairment. Due to these risks, tasks such as these may require additional safety measures such as the use of fall protective equipment (i.e. full-body harness and lanyard). Only personnel who have received additional fall protection training are considered competent for performing these tasks - all other workers are prohibited from working at elevations ≥4 feet without additional training and certification.

Control Measures: Walking/working surfaces located greater than 4 feet (general industry) above ground surface requires fall protection in the form of a guardrail system to protect against inadvertent falls from elevated heights. Use barriers to isolate floor openings to prevent inadvertent trips and/or falls through such openings. Holes and openings must always be covered when not otherwise needed to perform a task. To protect workers from falling objects, runways must include toeboards, screens, guardrail system, debris nets, catch platforms, canopy structures, or barricades. Workers on lower levels must also wear hard hats at all times. Runways should consist of a nonskid surface material or grating, handrail supports for 200 pounds of force, and means of egress that is permanent and stationary (ex. fixed ladders or stairs). Workers should wear laced footwear with rubber soles to give better foot and ankle support and to reduce the likelihood of slips.

3.2.19.2 Uneven Walking/Working Surfaces

Uneven walking and/or working surfaces are not uncommon. Sites with minimal grounds-keeping can disguise potholes, which could result in trips/falls or foot injuries. Dense vegetation can also disguise dips and potholes. Using limbs, branches, or other similar debris to cross over streams creates an unstable ground surface that can become structurally unsafe after repeated use.

Control Measures: When work is to be performed at an inactive facility, bring weed eaters and sprayer to address overgrown vegetation. When grounds keeping is the responsibility of the client, the Project Manager should call in advance and request site maintenance be performed prior to PPM's arrival onsite. Workers should also wear laced, steel-toed boots which gives better ankle support than slip-on safety footwear. When working in highly vegetative areas

that must be accessed, workers should use mechanical equipment to clear cut access paths or use other hand tools. Avoid walking over vegetation or other debris that may become unstable after repeated use.

3.2.19.3 Unstable Soils and Cave-Ins

Soil is an extremely heavy material, and may weigh more than 100 pounds per cubic foot. A cubic yard of soil may weigh more than 2,700 pounds. That is nearly one and a half tons, the equivalent weight of a car. Furthermore, wet soil or rocky soil is usually heavier. The human body cannot support such heavy loads without being injured. The primary hazard associated with a trench or excavation is a cave-in. Common excavations consist of an average depth of 10-15 feet, and when soils cave-in on or around a worker, it will generally result in death.

Control Measures: Any trench or excavation ≥4 feet in depth must have the following protective measures implemented:

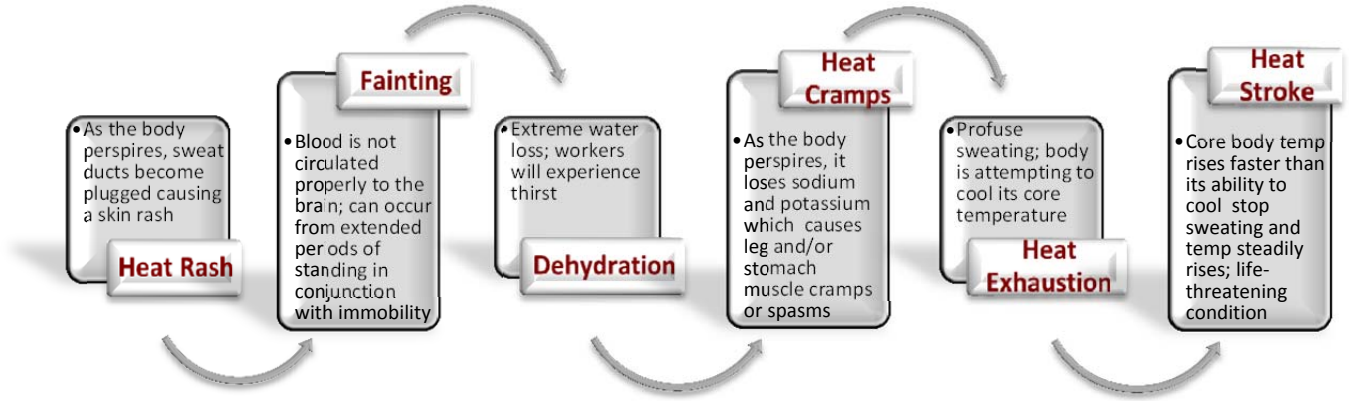
- Perform visual inspections prior to start of work daily and conduct additional inspections warranted by changes in site conditions.
- Provide onsite competent person with the knowledge and authority to correct any noted hazards derived from daily visual inspections.
- Keep all tools, materials, equipment and workers at least 2 feet away from edge of trench/excavation.
- Ladder or other means of egress in accordance with 29 CFR 1926.651(c)(2) must be provided by the subcontractor and be present onsite at all times – PPM requires a ladder be present onsite under these conditions regardless of whether a worker enters the trench/excavation.
- When controls are used and workers are required to enter a trench/excavation, ladders must be placed so that workers are not required to travel lateral distances greater than 25 feet.

OSHA requires that any trench/excavation with a depth ≥4 feet use engineering controls to prevent cave-ins. In addition, OSHA also requires that any trench/excavation with a depth ≥20 feet use a qualified engineer to determine the appropriate engineering control. *When PPM does not incorporate these engineering controls, under no circumstances must any individual enter a trench/excavation with a depth of 4 feet or greater. In addition, no equipment requiring an individual to be placed on or inside the equipment during its operation is permitted inside the trenched/excavated area. Soil packing and obtaining samples must be conducted through alternative methods*.

3.2.20 Weather

3.2.20.1 Heat Stress

Heat is a common concern for states in the southern U.S. and the use of personal protective clothing only adds to this stress. Heat stress can occur in as little as 15 minutes. Symptoms are generally progressive but some exceptions do apply. Some symptoms of heat stress may not arise, may go unnoticed or may occur simultaneously depending on the degree of progression and the awareness level of the worker. The following symptoms are associated with heat stress:



Control Measures: Heat stress can occur very rapidly; therefore, workers must be alert to the signs and symptoms and should be additionally aware of sluggishness or behavioral changes in their co-workers. Workers should be acclimated to their environment and breaks should be taken as necessary to replenish fluids and cool down core body temperature. Alternate workers as necessary to keep work going. Remove excess protective clothing and break in a shaded, cool area. Any worker exhibiting symptoms of heat stress will be prohibited from performing additional duties for the remainder of the day.

3.2.20.2 Cold Stress

The degree of coldness depends upon temperature, wind and wetness. When exposed to colder climates, the body loses heat faster than it can be generated. Prolonged exposures can rapidly use up the body's stored energy resulting in frostbite, trench foot, chilblains and hypothermia.

COLD STRESS	DEFINITION	SYMPTOMS OF EXPOSURE
Trench foot	Injury to the feet when immersed in water for prolonged period of time; wet feet lose heat and blood vessels constrict causing cells to die due to lack of oxygen	Reddening of skin, numbness, leg cramps, swelling, tingling pain, blisters or ulcers, bleeding under skin, gangrene (foot turns dark purple, blue or gray)
Chilblain	Exposures to temperature slightly above freezing to 60°F causing damage to capillary blood vessels in skin; damage is permanent and returns with additional exposures	Redness and itching mostly on cheeks, ears, fingers and toes, possible blistering, inflammation, possible ulceration (severe cases)
Frostbite	Injury caused by freezing of the skin (nose, ears, cheeks, chin, fingers or toes); can lead to amputation	Reduced blood flow to hands/feet numbness, tingling or stinging, aching, bluish or pale, waxy skin
Hypothermia	Body is losing heat faster than it can be generated producing an abnormally low body temperature, which impairs the brain and makes a person unable to think clearly or move well; is extremely dangerous because a person may not realize it is happening	Early symptoms - shivering, fatigue, loss of coordination, confusion and disorientation; Late symptoms – no shivering, blue skin, dilated pupils, slowed pulse and breathing and loss of consciousness

Control Measures: Workers should be acclimated to their environment, wear multiple layers of clothing, remove wet or damp clothing promptly and breaks should be taken as necessary to drink warm fluids and warm core body temperature. Alternate workers as necessary to keep work going. Any worker exhibiting symptoms of cold stress will be prohibited from performing additional duties for the remainder of the day.

3.2.20.3 Adverse Weather Conditions

Adverse weather conditions can include heavy rainfall, thunderstorm, lightning, hail, snow, tornado watch/warning, tropical storm or hurricane advisory to name a few. These types of weather conditions interfere with travel and field work. Workers who attempt to drive under these conditions put themselves at risk.

Control Measures: Follow local weather advisories and postpone work as necessary. Weather conditions can change rapidly while onsite. Carry NOAA weather radios when in the field to monitor changes in weather. Be prepared to use stop-work authority as necessary to address changes in weather. Plan your escape route in advance and be prepared to move to higher ground and/or evacuate. Never drive through flooded roads.

3.3 BIOLOGICAL HAZARDS AND CONTROLS

3.3.1 Insects and Mosquitoes

Insects and mosquitoes are prominent in just about any work location. Large ant beds as well as other insect nests such as hornets, wasps, yellow jackets and bees can be found as early as spring. They can reside in trees, high vegetative areas, holes within the ground or within piles of trash and debris.

Mosquitoes can carry infectious diseases such as West Nile virus and Zika virus, which can cause long-term debilitating illnesses, birth defects, or fatality. They are most active at dusk or dawn. Symptoms vary and can appear between 3-14 days after a bite.

- West Nile (mild symptoms): fever, headache, body aches, nausea, vomiting, and swollen lymph glands or skin rash on chest, stomach and back; symptoms may last for several days to a few weeks; occurs in up to 20% of people infected.
- West Nile (severe symptoms): high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis; symptoms may last for several weeks and neurological symptoms may be permanent; occurs in 1 out of 250 people infected.
- Zika: mild fever, skin rashes, muscle and joint pain, and conjunctivitis (pink eye) that usually last between 2-7 days; can cause severe birth defects in offspring of pregnant women.

Control Measures: PPM contracts a professional spraying company to spray for insect nests; however, workers should carry pest-control materials as necessary and keep extra cans of wasp, hornet, bee and ant spray as a secondary precaution. Workers required to carry allergy treatments such as an epinephrine injection (epipen) must keep this nearby at all times, and co-workers must know the location of this treatment should it be needed. To prevent mosquito bites, use insect repellant containing DEET, wear long-sleeved shirts and long pants and remove any standing water from buckets or barrels where mosquitoes can lay their eggs.

3.3.2 Ticks and Spiders

Spiders can be found in highly vegetative areas, in and around remediation systems and in other similar areas. Black widow spiders are commonly found inside well vaults, beneath a system in dark crevices and other similar dark spaces.

Black Widow Brown Widow Brown Recluse

Ticks can be encountered in highly vegetative areas with limited grounds keeping. Ticks are external parasites and there are more than 800 different species. Deer ticks carry Lyme disease, but <5% of all tick bites result in Lyme infection. Symptoms of Lyme infection include: flu-like illness with red skin rash that occurs within 3 weeks of bite. Rash should be circular and can increase daily. Symptoms of exposure should be reported immediately to the safety department and medical attention should be sought as necessary.

Control Measures: PPM contracts a professional spraying company to spray for spiders when also spraying for insects. Avoid placing hands and arms in dark spaces that cannot be seen. Use caution when opening well vaults or when working in other dark places. Do post-job body inspection and remove ticks immediately.

3.3.3 Rodents, Reptiles and Roaming Animals

The southeast U.S. is home to various species of venomous snakes. Venomous snakes will likely be found beneath piles of debris, near bodies of water or in high or heavily vegetative areas. They generally have a triangular-shaped head, elliptical pupils, and some have rattlers. A few common species of venomous snakes are identified below.

Southern Copperhead Water Moccasin E. Diamondback Rattler Coral Snake

Facilities located nearby lakes, rivers, bayous, streams or that otherwise have ponds may have alligators present. Alligators will come out of the water and onto land surface to build nests for their eggs or to sunbathe. They are also known to lie beneath the water's surface in wait when they are preparing to attack and they may not be visible to workers.

Highly vegetative areas and areas with trash or debris can be home to rodents such as rats or mice. Remediation systems provide warmth in colder climates and it is not uncommon to find rodents and other animals within or around the unit.

Sites located in populated areas may have wandering animals. Pets may be trained to attack when approached, may have mange (parasitic skin diseases) or may carry other diseases.

Control Measures: When working in or around bodies of water, workers must be aware of any indicators of alligator presence, which require that workers immediately evacuate the area. General awareness and caution must be used when working in highly vegetative areas and workers must never place hands or other parts of body in an area that is not clearly visible. Snake guards/chaps should be worn when working in suspected snake-infested areas. Workers

must avoid wandering animals – they may appear to be a pet; however, they can carry diseases and they may bite or scratch.

3.3.4 Poison Plants

Heavily vegetative areas may have poisonous plants such as poison ivy, oak or sumac, which produce a poisonous sap called urushiol. Typically the first exposure to these plants may not result in any symptoms as this is classified as a "sensitization period". Future exposures to these plants will then produce bumps often mistaken for mosquito bites until they begin to ooze. This is spread by scratching affected areas and touching other unaffected areas.

Control Measures: First line of defense is to be able to identify and avoid these plants. Weed killers should be used to minimize mowing and to eliminate exposure to poison ivy, oak or sumac. It should be noted that poisonous plants still thrive throughout the winter and they are more difficult to locate without their leaves. Workers should wear long-sleeved shirts and long pants tucked into boots when working in highly vegetative areas. Pre-medicated towelettes or lotions form a barrier on the skin and prevent adverse reactions. Rubbing alcohol can remove the oil resin up to 30 minutes after exposure, and antihistamines (non-drowsy) can also be taken post-exposure to minimize the reaction.

3.3.5 Bloodborne Pathogens

Sharps hazards come in various forms and may include hypodermic needles, cutting tools or equipment/machinery with sharp edges like box cutters, scissors, machinery blades, etc. Hypodermic needles are occasionally encountered at some jobsites. Needles may be used for insulin injections or drug use. Other sharps may become contaminated upon contact with infected sources. Life-threatening illnesses such as hepatitis or human immunodeficiency virus [HIV] (also referred to as bloodborne pathogens) may be transmitted via contaminated sharps so workers should be extremely cautious at all field locations. Also, bloodborne pathogens can be transmitted from an infected individual to another when providing first aid. All individuals and sharps must be treated as other potentially infectious materials (OPIM).

Control Measures: Never reach beneath the remediation system or stick hands in areas not clearly visible. Do a visual inspection before reaching for any component or item. Never recap a needle! Remove needles carefully using puncture-resistant gloves. Place them in plastic containers with a closed lid. Duct tape the lid before discarding. Drop off at community drop sites (where available). This type of waste is considered biohazardous waste; however, only healthcare facilities and medical waste industries are regulated. Be aware that the state of Florida requires disposal of this waste at established drop off locations, but all other states in which PPM has an office only recommend using these locations where available. Avoid contact with sharp edges of equipment/machinery, use cutting tools in accordance with manufacturer's guidelines, and always cut away from or perpendicular to the body. Use the concept of universal precautions for infection control. This concept is to treat all human blood and certain human body fluids as if known to be infectious for HIV, hepatitis B, and other bloodborne pathogens.

4.0 EXPOSURE MONITORING

As part of company-related processes, employees will or have the potential to be exposed to various chemical hazards. Chemicals that pose an inhalation hazard may not be considered a threat to worker health until a regulatory limit or more stringent company-imposed action limit is triggered. In addition, some chemicals can become flammable at certain limits. To ensure workers are not working within hazardous or flammable atmospheres, ambient air monitoring will be performed for any work-related process in which chemicals pose an inhalation hazard and have assigned regulatory limits for permissible worker exposures or are otherwise considered a potential fire hazard. Air monitoring will not be required when working with or near materials considered to be non-hazardous in nature or do not otherwise pose an inhalation or fire hazard to workers.

4.1 TERMINOLOGY/DEFINITIONS

In order to determine existing or potential worker overexposures to hazardous or flammable substances, workers must first understand common exposure terminology. Some commonly used exposure terms are defined in the following table:

TERM	DEFINITION
Action Limit	Company-assigned exposure limit assigned to a chemical that is more stringent than the regulatory or recommended exposure limit.
Ceiling Limit	Maximum concentration of a chemical a worker can be exposed to at any point during a work shift. This is an instantaneous reading.
Flammability/Explosive Range	The concentration range (LEL-UEL) of a combustible or flammable material (gas/vapor) that will burn or explode when introduced to an ignition source.
Immediately Dangerous to Life and/or Health (IDLH)	Concentration of a chemical beyond which a worker will be capable of escaping death or permanent injury without help in less than 30 minutes.
Lower Flammability/ Explosive Limit (LFL/LEL)	The lowest concentration of a gas/vapor needed to produce a fire or explosion when exposed to an ignition source.
Permissible Exposure Limit (PEL)/Threshold Limit Value (TLV)	OSHA's regulatory exposure limit is the PEL, whereas the TLV is used to represent other published recommended exposure limits (NIOSH or ACGIH).
Short-Term Exposure Limit (STEL)	Maximum concentration of a chemical a worker can be exposed to without adverse effects over a 15-minute period (unless otherwise noted) not to exceed 4 times per work shift with 1-hr rest intervals between exposures.
Time-Weighted Average (TWA)	Maximum concentration of a chemical a worker can be exposed to without any adverse effect. Based on an 8-hr day/40-hr week.
Upper Flammability/ Explosive Limit (UFL/UEL)	The highest concentration of a gas/vapor needed to produce a fire or explosion when exposed to an ignition source.

4.2 ESTABLISHING EXPOSURE AND FLAMMABILITY LIMITS

4.2.1 Exposure Limits

For any material that has an established regulatory or recommended exposure limit, PPM has established a more conservative action limit. It is the company's intention to take some form of action before a worker is exposed at regulatory or recommended levels. The exception to this concept applies only to contaminants with very low exposure limits and also to the detection capabilities of air monitoring equipment.

Action limits are established on a case-by-case basis and in accordance with general industry practice. When ambient air concentrations trigger action limits, engineering, administrative or work practice controls should be incorporated to eliminate the exposure or reduce worker exposures to an acceptable limit. When this cannot be achieved, workers will be required to upgrade personal protective equipment.

4.2.2 Flammability Limits

PPM has adopted general industry practice by setting its flammability action limits to be 10% of the regulatory limit. Since lower and upper explosive limits are provided as a percentage, PPM has additionally converted the flammability ranges of commonly encountered combustible and flammable materials into parts per million (ppm). Regardless of the volatile monitoring equipment used, workers will be able to determine when a given work environment is or becomes a flammable environment. Workers must also recognize that when working in environments in which chemical concentrations >UEL, as effective control measures are introduced the chemical concentration will again fall back into the flammability range and ignition sources must be eliminated until concentrations once again fall below the material's assigned LEL.

4.3 REGULATORY EXPOSURE LIMITS

Whenever an action, regulatory or recommended exposure limit is triggered, workers must be prepared to immediately report site conditions to management, to develop and implement alternative control measures, to evacuate the site when warranted and/or be prepared to upgrade personal protective equipment (i.e., wear respiratory protection). Workers must be aware that in order to wear respiratory protection, they must first be medically cleared by a physician, be fit-tested to a specific respirator and have received training in accordance with the procedures outlined within the company's Respiratory Protection program. To ascertain eligibility, workers must receive authorization from the safety department prior to using a respirator.

Action, regulatory, and/or recommended exposure limits assigned to routine chemicals commonly encountered by workers are outlined within the following table:

CONSTITUENT	TOXICITY					FIRE
	ACTION	PEL/TLV	STEL	CEILING	IDLH	LEL-UEL
Activated carbon	--	--	--	--	--	--
Alconox® [nuisance dust]	5	5	--	--	--	--
Aldrin[pesticide]	0.25	0.25	--	--	25	--
Aluminum[metal]	5	5	--	--	--	--
Aluminum oxide[nuisance dust]	5	5	--	--	--	--
Ammonia[base]	50	50	35†	--	300	15,000-28,000
Arsenic[metal]	0.01	0.01	--	--	5	--
Analytix AN-754GH	--	--	--	--	--	--
Asbestos	0.1	0.1	1	--	--	--
Barium[metal]	0.5	0.5	--	--	--	--
Benzene	1	1	5	--	500	1,200-7,800
n-Butane	400	800	--	--	--	1,600-8,400
Cadmium[metal]	0.005	0.005	--	--	9	--
Calcium hydroxide[base]	5	5	--	--	--	--
Carbon dioxide[dry ice]	2,500	5,000†	30,000	--	40,000	--

CONSTITUENT	TOXICITY					FIRE
	ACTION	PEL/TLV	STEL	CEILING	IDLH	LEL-UEL
Carbon tetrachloride	2	2†	--	25	200	--
Chloroform	2	2†	2 [60-min]	50	500	--
Chromium[metal]	0.5	0.5	--	--	250	--
Coal tar pitch volatiles[PAH]	0.2	0.2	--	--	80	--
Copper[metal]	1	1	--	--	100	--
DDT[pesticide]	1	1	--	--	500	--
Dieldrin[pesticide]	0.25	0.25	--	--	50	--
Diesel	100[skin]	100[skin]	--	--	--	600-7,500
Dust [Total]	15	15	--	--	--	--
Dust [Respirable]	5	5	--	--	--	--
Dust [Portland Cement]	50	50	--	--	--	--
Endrin[pesticide]	0.1	0.1	--	--	2	--
Ethylbenzene	100	100†	125†	--	800	800-6,700
Gasoline	100	300†	500†	--	--	1,400-7,600
Heptachlor[pesticide]	0.5	0.5	--	--	35	--
Hexane	50	50†	--	--	1,100	1,100-7,500
Hydrochloric acid[HCl]	--	--	--	5	50	--
Hydrogen peroxide[30-50%]	1	1	--	--	75	--
Hydrogen Sulfide[H_2S]	1	1	--	10	100	4,000-44,000
Iron[metal]	--	--	--	--	--	--
Isobutylene	--	--	--	--	--	1,800-9,600
Isopropyl alcohol	200	400†	500†	--	2,000	2,000-12,700
Kerosene	50	100	--	--	--	700-5,000
Klozur[sodium persulfate]	5	5	--	--	--	--
Lead[metal]	0.05	0.05	--	--	100	--
Lindane[pesticide]	0.5	0.5	--	--	50	--
Liquinox®	--	--	--	--	--	--
Lubricating oils[motor oil]	--	--	--	--	--	--
Magnesium[metal]	--	--	--	--	--	--
Mercury[metal/vapor]	0.1[skin]	0.1†[skin]	--	0.1†[skin]	10[skin]	--
Methane	--	--	--	--	--	5,000-15,000
Methylene chloride	25	25	125	--	2,300	13,000-23,000
MTBE	50	50	--	--	--	1,000-8,000
Muriatic acid[HCl]	--	--	--	5	50	--
Naphthalene[PAH]	10	10†	15†	--	250	900-5,900
Nitric acid	2	2†	4†	--	25	--
NXT[Klozur – sodium persulfate]	5	5	--	--	--	--
Oil[crude]	0.2[mg/m^3]	0.2[mg/m^3]	--	--	--	1,000-8,000
ORC®/ORC Advanced®	5	5	--	--	--	--
Ozone	0.05	0.1†	0.3†	0.1	5	--
PCB	0.5[skin]	0.5[skin]	--	--	5	--
Perchloroethylene[PERC]	25	25†	--	150[cap]	150	--
Phosphoric acid[H_3PO_4]	1	1†	3†	--	1,000	--
Potassium hydroxide[base]	2	2†	--	2	--	--
Propane	500	1,000	--	--	2,100	2,100-9,500
RegenOx A or B™	--	--	--	--	--	--
Selenium[metal]	0.2	0.2	--	--	1	--
Silver[metal]	0.01	0.01	--	--	10	--

CONSTITUENT	TOXICITY					FIRE
	ACTION	PEL/TLV	STEL	CEILING	IDLH	LEL-UEL
Sodium carbonate[base]	--	--	--	--	--	--
Sodium hydroxide[base]	2	2	--	2†	10	--
Sulfuric acid[H_2SO_4]	1	1	15†	--	15	--
Tetrachloroethylene[PERC]	25	25†	100	150[cap]	150	--
Toluene	100	100†	150†	300	500	1,100-7,100
Trichloroethylene	50	50†	200†	200	1,000	8,000-10,500*
Vinyl chloride	1	1	--	5[15-min]	--	3,600-33,000
Xylene	100	100†	150†	--	900	1,100-7,000
Zinc[metal]	--	--	--	--	--	--

NOTES:
† - More protective OSHA PELs vacated by the 11th Circuit Court of Appeals in July 1992; however, OSHA can enforce under the General Duty Clause. PPM will adhere to these exposure limits to ensure worker health and wellbeing is maintained.
Diesel, dusts, heavy metals, bases/alkalis, Trap & Treat BOS-200, and PCBs are all measured as mg/m^3 – not ppm!
Asbestos is measured as number of fibers per unit air (f/cc); Portland cement is measured as million parts per cubic feet (mppcf).
Action limit and PEL are time-weighted averages over 8-hour work period. STEL is TWA over 4 15-min periods, with the exception of asbestos, which has a 30-minute excursion limit. Others are instantaneous readings.
PAHs - coal tar pitch volatile components of TPH-D include anthracene, benzo(a)pyrene, chrysene, phenanthrene and pyrene, all of which have the same permissible exposure and IDLH limits; therefore, all components lumped into one group. The only other regulated component of PAH is naphthalene which is a component of crude or refined oil and is listed separately from other PAHs.
Only the regulated pesticide components of EPA SWA-846 Methods 8080/8081 are included above.
Perchloroethylene (PCE) has a ceiling limit of 200 ppm for 5 minutes within any 3-hr period not to exceed 300 ppm but this has been capped at 150 ppm to match IDLH concentrations for this material. Trichloroethylene's flammability range is effective ≥77ºF.

Any constituent not otherwise specified above that is anticipated as part of company-related processes in which workers have the potential to be exposed must be immediately reported to the safety department and will require a site-specific HASP. This HASP will be generated and issued by the safety department and requires a 1-week advanced notice.

4.4 MONITORING EQUIPMENT AND CALIBRATION

Because PPM works with a variety of chemicals, not all constituents can be detected with one universal monitoring device. Some monitoring equipment can provide instantaneous readings, while others require laboratory analysis (wet method analysis). In addition, each monitoring device has its advantages and disadvantages. Some commonly used monitoring devices used by PPM include the following:

- **Organic vapor analyzers (OVA)**. This monitoring device is used to detect volatile and semi-volatile substances. Some OVAs used by the company include MiniRAE 2000 PGM 7600, GasTech®, RKI Eagle® photoionization detector (PID), and Micro FID® flame ionization detector (FID). The advantage of this monitoring device is that it is a direct-read instrument and provides instantaneous readings. Some disadvantages of this equipment are that it generally does not provide readings less than 1 ppm, it does not give percent LEL or provide oxygen content. OVAs generally detect a group of chemicals and do not indicate which compound is being detected.

- **Ozone meters**. This monitoring device is used to detect ozone gas and is also a direct-read instrument. The ozone meter used by some offices within the company is the EcoSensor Ozone Sensor A-21ZX. It is chemical-specific but has some interference from other oxidizing gases.

- **PortaSens II gas detector**. The monitoring device is a portable, direct-read gas leak detector that has the ability to measure a variety of different gases by simply inserting a gas-specific sensor. This instrument is lightweight and can measure gases such as acetylene, ammonia, carbon monoxide, fluorine, formaldehyde, hydrogen, hydrogen chloride, hydrogen cyanide, hydrogen peroxide, hydrogen sulfide, oxygen, ozone, phosgene, and sulfur dioxide. For a composite list of gases, refer to the manufacturer's website.

- **Portable air monitoring pumps**. These monitoring devices are used to assess continuous personnel and background exposures and are commonly used for sampling heavy metals, asbestos, silica or nuisance/respirable dusts. A common portable air monitoring pump used by the company is the SKC AirChek52®. Pumps are set to a specific flow rate of air (can be low volume or high volume) and contaminants are captured using a filter, which is later sent for laboratory analysis. Some advantages of this monitoring equipment are that these pumps are small, light-weight and portable. Some disadvantages of this monitoring equipment are that they do not provide instantaneous readings; exposures are unknown until laboratory results are received.

- **Personal monitoring badges**. These monitoring devices are used to assess continuous personnel exposures. They are light-weight, easy to use and can target specific constituents as opposed to a group of compounds. Badges must be sent to lab for analysis so they do not provide instantaneous readings. In addition, other constituents with similar chemical make-up can cause interference giving inaccurate exposures so samplers must be able to identify potential cross-interference prior to sampling.

- **Colorimetric indicator tubes**. These monitoring devices are used to assess continuous personnel exposures. Passive diffusion tubes are used when determining longer term exposures and workers need only break off the tip of the tube to initiate sampling. Pumps can also be used to draw in air and generally give a short-term exposure assessment during the period of time the air is extracted. Tubes are contaminant-specific and change color when in contact with the constituent giving an instantaneous reading.

  Colorimetric tubes have a $^{+/-}$25% degree of error and chemicals with similar make-up can cause interference giving inaccurate exposures so samplers must be able to identify potential cross-interference prior to sampling.

To ensure it is in good working order, air monitoring equipment must be calibrated in accordance with manufacturer recommendations for each monitoring device. Workers must be aware that each office utilizes different monitoring equipment; therefore, readings from instruments calibrated with methane may not be the same as readings from instruments calibrated with hexane. Be sure to use the instrument's conversion tables as provided by the manufacturer when warranted. In addition, some metals can produce toxic gases when burned or exposed to open flames; therefore, the safety data sheet should be referenced when working with metal-contaminated soils.

4.5 SAMPLE COLLECTION

To appropriately determine exposures, samples must be collected within the breathing zone (shoulder level) of the worker, subcontractor or other affected pedestrian when relevant to site concentrations and location of these concentrations in relation to the general public. It should be noted that there may be times in which samples must be collected at the source (i.e., inside manhole) for technical purposes. These concentrations must be identified and reported as separate readings not indicative of worker exposures. Additional precautions must be taken to prevent impact to worker breathing zone during the sample collection when at or near the contaminant source. Depending on the concentrations in this given area or when impact to worker breathing zone cannot otherwise be avoided, respiratory protection may be required.

4.6 MONITORING FREQUENCY AND DOCUMENTATION

Ambient air monitoring is required prior to field work to establish a baseline and intermittently throughout the course of a project to compensate for changes in site conditions. Samples must be collected every two hours so long as concentrations are well below established action limits. Areas selected for monitoring must compensate for worker/subcontractor exposures, general public exposures, residential areas, potential nearby business exposures, etc. and may warrant numerous collection locations.

When there is a noted increase in ambient site concentrations, the sampling frequency must be increased to every 30 minutes until site conditions indicate a decreasing trend. If site concentrations are elevating at a rapid pace, continuous air monitoring must be conducted to ensure no threshold limits are triggered. This may require temporary postponement of site activities until concentrations can be reduced to an acceptable limit. Whenever any threshold limit is triggered, site activities must be halted and the safety department notified.

All monitoring areas, concentrations, sample collection times and/or notations (i.e., change in site conditions, contaminant source readings, etc.) must be documented using the company's Ambient Air Monitoring Report form. Forms must be completed fully and returned to the safety department for review upon completion of the project.

5.0 PERSONAL PROTECTIVE EQUIPMENT

While the use of protective clothing/equipment provides protection against chemical and physical hazards, there are additional disadvantages associated with its usage. Personal protective equipment can be heavy, bulky and uncomfortable, slow down the work process and/or increase the degree of heat stress put on a worker. Therefore, the use of personal protective equipment is always a last resort. Only when other alternatives such as engineering, administrative or work practice controls fail to eliminate or reduce a hazard to an acceptable level will the use of protective clothing and/or equipment become a consideration.

5.1 PROTECTIVE CLOTHING AND EQUIPMENT

5.1.1 Head Protection

In accordance with 29 CFR 1910.135, the company provides head protection from impact and penetration hazards posed by falling objects, projectiles, and shock/burn hazards posed by contact with electricity. While OSHA requires that head protection be provided, it is the American National Standards Institute (ANSI) that sets criteria for head protection. ANSI Z89.1-2014 separates protective helmets into different types and categories as follows:

HARD HAT TYPES	
Type I – hard hat that provides protection from impact to the top of the head only	Type II – hard hat that provides protection from impact to the top and sides of the head

CLASSIFICATION	PROTECTION PROVIDED	
Class G [Formerly Class A]	G – General; intended to reduce the force of impact of falling objects and reduce the danger of contact with exposed low-voltage electrical conductors; proof-tested at 2,200 volts of electrical charge	
Class E [Formerly Class B]	E – Electrical; intended to reduce the force of impact of falling objects and reduce the danger of contact with exposed high-voltage electrical conductors; proof-tested at 20,000 volts	
Class C [Formerly Class C]	C – Conductive; intended to reduce the force of impact of falling objects, but offer no electrical protection	

PPM's preference for hard hat selection is ANSI Z89.1-2014 approved Type II, Class E hard hat with ratchet suspension; however, Type I and Class G hard hats are permitted for use. PPM prohibits the use of Class C hard hats because they provide no protection against electrical hazards.

5.1.2 Eye and Face Protection

In accordance with 29 CFR 1910.133, the company requires each affected employee to use appropriate eye and/or face protection when exposed to hazards from particulates, flying particles (projectiles), molten metal, liquid chemicals, chemical gases, vapors, or fumes, metal shavings, and/or potentially injurious light radiation. PPM requires the use of safety glasses with side-shield protection for all outdoors field activities. Workers are permitted to use prescriptive lenses so long as side-shield protectors are used. Safety glasses may be upgraded to goggles or face shields when mixing chemicals, when dealing with chemical splash hazards, or when working in extremely dusty environments that cannot otherwise be addressed through the use of controls. Face shields may also be required when working with projectiles. Eye and face protection must be ANSI Z87.1-2010 approved.

5.1.3 Hand Protection

In accordance with 29 CFR 1910.138, the company requires workers to use appropriate hand protection when their hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes. PPM bases this selection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards/potential hazards identified. The following gloves are recommended for typical company tasks:

- Nitrile gloves – good for working with oil and grease and can also protect against some dry chemicals; they are disposable and easy to use; this is the most commonly used glove provided by the company

- Neoprene, vinyl [PVC] and rubber gloves – also good for working with chemicals such as janitorial or cleaning products, fuels, oils and grease; can be purchased as disposable or reusable; neoprene is preferred when working with acids or bases

- Butyl or laminate gloves – good for working with ketones
- Latex gloves – good for working with bloodborne pathogens such as viral and bacterial agents; nitrile gloves will work as well so latex is not commonly provided by the company

- Cotton or leather gloves – good for material handling of heavy and abrasive objects; leather is sturdy and can resist splinters from wood products and provides some protection against heat
- Cut-resistant gloves – good when working with sharp or cutting objects; there are various brands of cut-resistant gloves including Kevlar®, Magid® and Ansell®

Hand protection must be ANSI/ISEA 105-2011 approved. *Note: ISEA is the International Safety Equipment Association*.

5.1.4 Foot Protection

In accordance with 29 CFR 1910.136, the company requires workers to use protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, sharp edges, slippery surfaces, and unlevel walking/working surfaces. PPM requires ASTM F2412/F2413-approved steel-toed footwear for all field sites. *Exception: Rubber boots or other footwear may be used when workers collect samples within body of water or when workers are required to enter a boat*. Composite-toed shoes are permitted when they meet the ASTM testing requirements for compressive strength.

5.1.5 Skin Protection and Visibility

Typical PPM jobsites warrant level D protective clothing, which consists of long pants and short or long-sleeved shirt. Other clothing may be required based on the hazard exposure and is outlined below:

- Fire-retardant clothing – required by clients within the oil and gas industry to access their facility
- High visibility clothing – reflective, high visibility company-provided t-shirts or DOT Class II/III reflective high visibility safety vests are required when working in/nearby active traffic and when working on/nearby roadway right-of-way

Special considerations may require that full-body protective suits such as Tyvek®, Saranex™, or Tychem® be worn. The need for this type of equipment requires pre-planning by the safety department and management and must be discussed during the proposal phase of a project. Skin protection must be ANSI 103-2010 approved.

5.1.6 Hearing Protection

Preservation of hearing is of utmost importance. Most of the hearing lost cannot ever be recovered. Through the aging process, workers will be prone to natural hearing loss. Therefore, it is the company's responsibility to distinguish between natural and work-related hearing loss and to ensure that workers exposed to noise levels ≥85 dB are provided with hearing protection. The most common form of hearing protection provided to workers is the earplug. Earplugs come in various shapes and sizes and are relatively inexpensive so they can

be tailored to the comfort preferences of the individual. Workers who do not respond well to the use of earplugs will be provided canal caps or ear muffs upon verbal request to the safety department. Hearing protection must be ANSI S12.68-2007 approved.

5.1.7 Respiratory Protection

In accordance with 29 CFR 1910.134, the company provides respiratory protection when workers are exposed to hazardous materials at triggered regulatory threshold limits. Only those workers who have been medically cleared by a physician are permitted to wear respiratory equipment. Workers that have been medically cleared must also be fit-tested prior to respirator use. Documentation must be received by the safety department before a worker is approved for respiratory use.

Because workers are not required to work with extremely hazardous materials, with unknowns or within oxygen-deficient environments, supplied-air respiratory equipment is not applicable to current company processes. PPM purchases a variety of National Institute for Occupational Safety and Health (NIOSH)-approved air-purifying half-mask and full-face respirators to be worn when ambient chemical concentrations trigger company-assigned action limits. It should be noted that because most field work is conducted in outdoor, open environments, respiratory protection is generally not required.

5.1.8 Electrical Protective Equipment

Insulating equipment such as rubber insulating blankets, rubber insulating matting, rubber insulating covers, rubber insulating line hose, rubber insulating gloves, and rubber insulating sleeves is required when working on or near energized equipment and/or devices. Insulating equipment must be capable of withstanding, without failure, the voltages that may be imposed upon it. Insulating equipment must be proof-tested and inspected in accordance with the provisions outlined within 29 CFR 1910.137. Use of damage or defective insulating equipment is strictly prohibited!

5.1.9 Life Saving Equipment

In accordance with 29 CFR 1926.106, employees working over or near water, where the danger of drowning exists, must be provided a U.S. Coast-Guard-approved life jacket or buoyant work vest. Where applicable, ring buoys with at least 90 feet of line must be provided and readily available for emergency rescue operations. The distance between ring buoys cannot exceed 200 feet. In addition, at least one life-saving skiff must be immediately available at locations where employees are working over or adjacent to water.

5.2 OTHER PROTECTIVE AIDS

Protective equipment can be used in a number of ways to draw attention to the worker or work area, to isolate the work area from unauthorized persons and/or traffic, or to identify the hazard(s) posed by the activity. Common examples of protective equipment used by PPM include, but are not limited to the following:

- Signs, posters, labels
- Cones, barricades, caution tape
- Heavy equipment/machinery or company vehicles
- Steel plate covers or wood for monitoring wells and/or holes
- First aid kit
- Flashing lights
- Flag extensions on cones for greater visibility
- Portable 10 or 20-lb ABC fire extinguishers

- Lockout/tagout devices
- Handheld eyewash bottles

5.3 PROJECT-SPECIFIC PPE REQUIREMENTS

Depending on the degree of the hazard(s) posed by field tasks, various levels of protective clothing and equipment may be required. Protective clothing and/or equipment required by routine tasks covered by this HASP are outlined further in the table below. Protective clothing and/or equipment not otherwise covered by this plan will require a site-specific HASP. Contact the HSD for further instructions.

FIELD TASK	PROTECTIVE CLOTHING/EQUIPMENT										
	STEEL-TOED SHOES[1]	SAFETY GLASSES[2]	HIGH VISIBILITY SHIRT/VEST[3]	GLOVES[4]	HEARING PROTECTOR[5]	HARD HAT (CLASS E)[6]	GOGGLES/FACE SHIELD[7]	RESPIRATOR (APR)[8]	HARNESS/LANYARD	FLOTATION DEVICES/BUOYS	FIRE RETARDANT CLOTHING[9]
Asbestos inspections or sampling	X	X	X	X				X			
Carbon change-out	X		X	X	X	X	X	X	X		
Chemical injection	X	X	X	X	X	X					
▪ Working with dry powder	X		X	X	X	X	X	X			
▪ Working with liquid/mixing w/H_20	X		X	X	X	X	X				
Compliance audits/visual inspections[Phase 1]	X	X	X								
DPT - drilling, geoprobing[Hand Auger]	X	X	X	X							
DPT - drilling, geoprobing[Heavy Equipment]	X	X	X	X	X	X					
Groundwater sampling	X	X	X	X							
Mobile vacuum event	X	X	X	X	X						
Mobile ozone	X	X	X	X	X						
Monitoring well plugging and abandonment	X	X	X	X	X	X					
Operation and maintenance of system	X	X	X	X	X						
Remediation system install/demobilization	X	X	X	X	X	X					
Spill bucket replacement/closure	X	X	X	X	X	X					
Trenching and excavating	X	X	X	X	X	X					
UST pull/closure	X	X	X	X	X	X					
Any work over or near water body		X		X			X			X	
Any work performed at oil and gas facility, terminals, or other similar property	X	X		X	X	X					X

1 – Steel-toed boots/shoes or equivalent ANSI-approved composite-toe footwear
2 – Safety glasses must be equipped with side-shield protection; prescription lenses are permitted if equipped with side-shield protection
3 – DOT Class II or III high visibility clothing or safety vests with exposure to traffic and/or mobile equipment
4 – Nitrile gloves for petroleum contamination; Kevlar®/leather gloves for cutting hazards; other chemical-resistant gloves needed for more stringent chemical hazards
5 – Ear plugs, canal caps or ear muffs when noise levels ≥85 dB
6 – Class E hard hats required for protection against electrical hazards
7 – Safety glasses must be upgraded to goggles or face shield when working with/mixing powders or when working with liquids that present splash hazard
8 – Air-purifying respirator (half-mask or full-face) required for all asbestos sample collections and when chemical threshold limits are triggered and control measures are ineffective
9 – Fire-retardant clothing is a client-specific requirement; clients within the oil/gas industry generally require fire-retardant clothing

5.4 REDUCTION OF PROTECTIVE CLOTHING AND EQUIPMENT

The use of protective clothing and equipment is mandatory at all times during the course of a project except when inside a designated break area. A break area will be assigned by the Site Safety Officer during the pre-entry safety briefing. The break area must be:

- Located a minimum of 50 feet away from the work zone
- Located where ambient concentrations are not > chemical detection limit
- Located out of the way of vehicular traffic and must not hinder any functions of other businesses

The break area must be clearly designated by posting cones, barricades, or caution tape. Affected personnel and subcontractors must be informed of the break area during the pre-work safety briefing. Only when inside the break area may protective clothing and/or equipment be removed. If the conditions noted above cannot be met, the safety department must be contacted. Variances may be granted based on certain site conditions.

6.0 SITE ACCESS, CONTROL, AND DECONTAMINATION

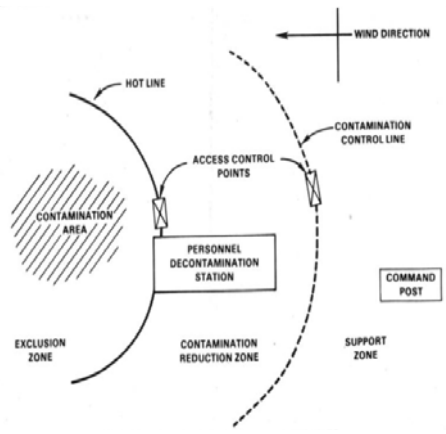
6.1 SITE ACCESS

Typical PPM jobsites occur in areas open and accessible to the general public. However, when working at unguarded gated facilities, workers must secure appropriate means of site access from the client. This can include a coordinated effort to meet the client at a designated date and time, or acquiring keys to the facility from the client. *Note: Personnel and/or subcontractors are prohibited from climbing over or crawling beneath site fencing to secure site access.*

6.2 DESIGNATED WORK ZONES

Each jobsite must be assigned designated work areas to isolate hazardous work areas from unprotected persons, to prevent the migration of contamination, and to prevent the transfer of contamination through impacted protective clothing as well as monitoring and sampling equipment. Designated work areas include the following:

- Exclusion zone – the area denoting site contamination where heavy equipment operation and sample collection is likely to occur
- Contamination reduction zone – the area surrounding the exclusion zone where clothing and equipment is decontaminated to prevent the transfer of contaminants
- Support zone – any area not otherwise considered the exclusion or contamination reduction zone



6.3 AUTHORIZED PERSONNEL

Only authorized personnel are permitted within the exclusion zone. An authorized person is considered to be any individual who has a relevant role or function in relation to the project, participates in onsite safety briefings, and signs the HASP acknowledgement form. Facility managers, client, agency representatives, and law enforcement or regulatory officials may refuse to participate in planned safety meetings or HASP review. As this situation arises, all equipment and job tasks should be temporarily halted to allow for onsite inspection and

monitoring by these individuals. When unauthorized persons exit the exclusion zone, all site activities may resume.

6.4 STOP-WORK AUTHORITY

The SSO has full stop-work authority and should use this authority under the following conditions:

- When a hazardous condition, unsafe behavior or other safety concern is noted
- When a near-miss or incident is reported
- When an unauthorized individual enters the designated work zone
- When lightning or other signs of inclement weather is noted within the area
- When a contaminant action limit is triggered
- When unexpected conditions arise that could warrant changes to safety procedures and/or scope of work

6.5 GENERAL SITE CONTROL AND SAFETY PRECAUTIONS

The following denotes simple procedures for maintaining site control and worker safety:

- Designated parking and pedestrian walkways in areas a reasonable distance away from active investigation
- Use buddy system whenever feasible
- Perform pre-job inspection to establish appropriate baselines and to visually inspect for obstacles, clearances, etc.
- Avoid smoking on the jobsite unless within authorized areas (i.e., break areas when deemed appropriate by the SSO for smoking)
- Use appropriate safety devices (i.e., cones, barricades, etc.) to clearly identify work zones and break areas
- Prevent unauthorized entry and use stop-work authority as necessary
- Perform post-job inspection to ensure all materials have been removed from the site; pay close attention to the vehicles to ensure animals or person(s) are not located beneath the vehicle and that all cab and toolbox doors have been secured

6.6 DECONTAMINATION PROCEDURES

In order to prevent the spread of contamination from impacted work zones, monitoring equipment, sampling equipment, and/or workers, decontamination must take place. Decontamination is defined as the removal or reduction of contaminants. Decontamination procedures vary based on the degree of site contamination as well as the contaminant(s) involved, and this process must take place within the contamination reduction zone. As impacted workers and equipment exit the exclusion zone, they must be decontaminated using appropriate detergent solutions. Disposal protective clothing must be discarded in garbage bags or lined containers for proper disposal.

Typical company functions require a low level of decontamination which involves the cleaning of bailers, purge materials and/or other similar equipment as samples are collected in various areas of a jobsite. Most chemicals in which workers are exposed are classified as skin and eye irritants; therefore, it is important for workers to remove contaminated clothing as soon as possible, flush eyes for a minimum of 20 minutes and use alconox®/liquinox® solution to wash impacted skin.

7.0 EMERGENCY RESPONSE

7.1 ALARMS AND ONSITE NOTIFICATIONS

To compensate for unexpected conditions and/or changes in existing site conditions, each jobsite must have an effective communication system in place. Workers are notified of emergencies through various forms of effective communication consisting of the following:

- Verbal communication – is generally the most effective form of communication for the majority of all job-related tasks associated with a project
- Hand communication – hand signals are used in place of verbal communication under the following conditions:
  - → When noise levels become elevated due to heavy equipment operation or other similar measures that prevent workers from hearing verbal communications
  - → When equipment operator's line of vision is obstructed
  - → Under any situation deemed necessary by the SSO
- Continuous horn blast of vehicle or air horn – used in lieu of verbal and hand communications due to:
  - → Large, dispersed work zones or multiple work areas that prevent overall effectiveness of other forms of communication
  - → Multiple site distractions that inhibit immediate worker attention
  - → Elevated noise levels that inhibit immediate worker attention

  One continuous blast is to be used so as not to confuse workers with other equipment sounds.

7.2 PERSONNEL ASSESSMENT AND EVACUATION

Once an alarm has been triggered, workers must be evacuate the work zone and meet in the designated area assigned during the pre-entry safety briefing. This location is determined by the SSO based on distance from existing hazards and verification that it is upwind of any chemical hazard source. Site evacuation is warranted under the following conditions:

- When ambient air concentrations meet or exceed an established action limit assigned for a constituent
- When new hazards not otherwise addressed within this safety plan are encountered
- When subcontractor, field personnel, clients, or regulatory officials violate the safety provisions outlined within this plan
- Upon client or regulatory agency request
- Under any condition the SSO deems unsafe

When evacuation is warranted, all field personnel and subcontractors will meet at the designated area for a preliminary head count, which is conducted by the SSO. Further provisions will be discussed at that time.

7.3 INCIDENT, NEAR-MISS, AND HAZARD RECOGNITION REPORTING

Incidents, near-misses or other noted hazards must be reported promptly to the safety department so that each case can be further investigated to determine the root-cause of the event in order to prevent future recurrences. An incident is defined as an occurrence that results in worker injury or property damage. Examples of an incident include but are not limited to the following:

- Underground storage tank (UST) puncture
- Auto-related accident regardless of fault
- Contact with overhead or subsurface utilities (i.e., water, sewer, telephone, fiber optic, power, transfer product lines, etc.)
- Chemical spill or release
- Slips, trips, or falls

A near miss is defined as an unplanned event that did not result in injury, illness or damage but had the potential to do so. Unexpected hazards may arise from unsafe acts or conditions or changes in site conditions. Incidents, near-misses and hazards must be reported to the safety department immediately once the site has been secured. The site is considered secured once all leaks have been properly contained, and the area has been evacuated and further isolated to prevent unauthorized entry. All reports must be made to the District Manager or can be made to the safety department directly. In addition, all reports must be documented using the Incident, Near-Miss and Hazard Recognition Report.

7.4 INJURY REPORTING AND CASE MANAGEMENT

Any incident that results in injury must be reported immediately to the HSD. Reported injuries or illnesses that warrant medical care must be managed by the safety department. In order to achieve this, all cases are evaluated for medical necessity. Whenever possible, workers are sent to the company's pre-established occupational medicine clinics that specialize in work-related injury care. Workers are permitted to seek medical attention (911) without prior company consent only when the injury appears to be life-threatening or when the injury requires immediate medical attention and contact with designated company officials cannot be achieved.

Workers who seek medical attention without company consent will be required to pay for their own medical care out-of-pocket. This provision also applies to follow up care when an injury/illness does not get better. Workers must additionally report changes in medical condition to the HSD, and additional medical evaluations must be coordinated by the company.

7.5 GENERAL MEDICAL CARE AND FIRST AID

It is company policy that all field workers be trained in adult CPR and first aid. Workers who have received this level of training should be prepared to administer care for minor injuries. Certified workers may additionally be called upon to provide care to more seriously injured persons while waiting for additional medical attention. If the victim is conscious, workers must indicate that they are certified and they must additionally obtain consent prior to administering care. Consent is implied when the victim is unconscious.

Some general emergency care provisions are outlined below (not all-inclusive):

HAZARD CATEGORY	HAZARD	RESPONSE
Chemical	Inhalation	Move worker to fresh air. If vomiting, dizzy or groggy, seek medical attention immediately. Administer CPR if certified.
	Dermal/Contact	Remove contaminated clothing and flush affected area with soap/water for ~20 minutes. Seek medical care if pain persists.
	Ingestion	Seek immediate medical attention. Do not give fluids to an unconscious person. Do not induce vomiting.
	Eye	Flush with copious amounts of water for ~20 minutes. Seek medical attention if pain persists.

HAZARD CATEGORY	HAZARD	RESPONSE
Physical	Heat stress	Apply warm, moist heat and pressure to reduce pain in legs/ abdomen. Give electrolyte drinks by mouth, if conscious. Remove excess clothing and attempt to cool core body temperature promptly using cold water. Medical attention is warranted for extreme heat stress.
	Cold stress	Remove any wet clothing immediately and bundle in extra clothing and/or blankets. Drink warm fluids, if conscious. Attempt to warm core body temperature using heater or other methods. Medical attention is warranted for extreme cold stress.
	Sprain/strain	Use combination heat/cold therapies to reduce swelling and apply pain relief. Take an over-the-counter naproxen sodium (Aleve) or ibuprofen (Advil) for pain and inflammation. Seek medical attention if pain persists for more than a few days.
	Tingling/ numbness	Generally an indication of swelling but can lead to permanent nerve damage. Take an over-the-counter naproxen sodium (Aleve) or ibuprofen (Advil) for pain and inflammation. Seek medical attention if symptoms persist.
	Cuts/lacerations	Apply pressure to wound for blood to clot and use bandages to cover wound. Antibiotic creams can prevent infection. Seek medical attention for deep cuts that require stitches.
	Ringing in ears	Symptom of hearing loss, which will require medical testing to determine if this is a temporary or permanent hearing loss.
Biological	Needle stick	Immediately remove needle. Squeeze the area to extract blood from the wound. Seek immediate medical care and carry the needle with you to the medical clinic.
	Insect/spider/ tick/animal bite	Immediately remove insect or tick and pay close attention over the next few days for symptoms of delayed illness. Seek medical attention if noted. Seek medical attention for black/brown widow and brown recluse spider bites as well as animal bites.
	Poison plants	Pay attention for evidence of allergic reaction (itching, redness and irritation) and seek medical attention if over-the-counter remedies prove ineffective or if affected area spreads.

***Caution**: Individuals with heart problems, on a "low sodium" diet, or who otherwise have blood pressure issues and work in hot environments should consult a physician for proper alternative care when working under these conditions.*

7.6 HAZARDOUS SUBSTANCE RELEASE

In the event that hazardous substances migrate from the work zone and potentially endanger unprotected personnel or the community, the area will be isolated and the spill contained and cleaned by authorized personnel. On-site activities will cease until the release is brought under control and the site is returned to its previous condition or otherwise poses no additional harm to site personnel. All hazardous materials must be containerized and labeled until it can be profiled and disposed in accordance with regulatory requirements at an approved landfill. Workers should reference the SDS for additional information.

7.7 REGULATORY, CLIENT, OR OTHER AGENCY NOTIFICATIONS

In the event of an emergency, all reporting must be made to your direct project or office manager and/or safety department. Other required client, regulatory or other agency notifications will be made by management within appropriate reporting deadlines.

8.0 WASTE MANAGEMENT

Under normal conditions associated with the remediation process, groundwater monitoring wells are purged of impacted groundwater and as part of the investigation process, impacted soils are stored within containers until these wastes can be profiled and disposed at an approved landfill. Other chemicals may be ordered for maintenance or to otherwise facilitate the remediation process. It is the company's objective to ensure all containers are in good condition and labeled appropriately so as to prevent any release of contaminated materials from these containers until it can be appropriately disposed.

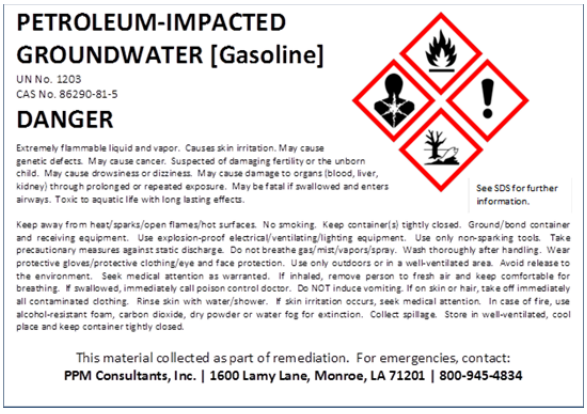
8.1 CONTAINER LABELING

All containers used by the company must be appropriately labeled – even when a waste is in accumulation or a material is still in use. Containers are defined by the company as any bucket, bottle, barrel, drum, jar, tote, can, box, crate, tank, or other similar means used to contain, store, and/or transport materials. Containers may be movable or stationary and can vary in weight and dimension; however, common containers used by the company include drums, totes, buckets, soil bags or super sacks.

8.1.1 Hazardous Material/Waste Labeling

Any hazardous material or waste container(s) must be labeled in accordance with 29 CFR 1910.1200 using a globally harmonized system (GHS) for chemical classification and labeling. Tags using the same GHS-format should be used for soil bags and super sacks. Each label must contain six required elements, which include the following:

- Product identifier – should match the product name on the safety data sheet
- Signal word – "danger" (severe) or "warning" (less severe)
- Hazard statements – phrase assigned to a hazard class used to describe the nature of the product's hazards
- Precautionary statements – a measure to minimize or prevent adverse effects that results from exposure
- Supplier identification – name, address, and telephone number of the supplier or manufacturer*
- Pictograms – graphical symbols used to convey specific hazard information visually



*Note: *Hazardous materials ordered by PPM must have the manufacturer or supplier information posted on the containers; however, materials generated as part of the remediation process must identify PPM as the emergency contact.*

The GHS labeling system will replace the HMIS labeling system previously used by the company. In general, HMIS labels may still be used in conjunction with, or as a component of, the GHS labeling system. The international requirements for HMIS labeling are similar to those developed by the American Coatings Association with the exception that the degree of

hazard severity as indicated by the numbering system is reversed (example: under the old system the higher the number, the higher the hazard severity; under international GHS requirements, the lower the number, the higher the hazard severity). Therefore, workers may continue to see HMIS labels as part of the GHS labeling system when used by other companies; however, PPM will discontinue the use of HMIS labels moving forward.

8.1.2 Nonhazardous Material/Waste Labeling

Containers of nonhazardous materials and/or wastes must also be labeled. They will be labeled using the same labeling system as addressed within the previous section; however, workers should expect these labels to be less detailed since these materials are not likely to pose hazards. Continued use of this labeling system will permit workers to identify the contents of any container used by the company.

Once materials have been deemed as a waste, then non-hazardous waste labels must additionally be affixed to the container(s) so long as the material is truly considered to be a nonhazardous substance. Verbiage for this label template has been modified to meet the needs of the company, and workers are required to complete the label in accordance with the following requirements:

- Generator – PPM must never be identified as the generator; wastes are generated on behalf of the client and therefore, must have the client's name.
- Contact – PPM will be considered the contact; this will enable clients with multiple subcontractors to identify which of their contractors is generating the waste.
- Phone – Provide PPM's phone number in case of emergency (800-945-4834).
- Contents – Identify the material being stored within the container.
- Start date – Indicate the date that the material is first placed inside the container; if the container will be accumulating, worker must still provide a date and must also indicate that it is in accumulation.

8.2 CONTAINER STORAGE AND DISPOSAL

In accordance with company policy, all wastes must be stored within fenced remediation systems, behind buildings or in other inconspicuous areas so as not to be disturbed by unauthorized individuals. Wastes must also be profiled and disposed within 90 days of task completion. Drums that are in accumulation may reside onsite for a period no greater than 365 days. Materials in accumulation must be profiled and disposed at least once per calendar year to ensure container integrity. Variances to this policy must be approved by the District Manager or safety department in advance.

8.3 CONTAINER INSPECTIONS

Containers stored at sites with a remediation system undergo routine visual inspections. Inspections occur on a quarterly basis to ensure that container integrity is maintained and that there is no evidence of leakage, excessive rusting, bulging or other forms of container damage that could result in a release. Inspections are documented and retained by the safety department. Evidence of container damage is promptly addressed.

9.0 PERSONNEL/CONTRACTOR SAFETY REVIEW

This HASP and any corresponding JSA(s) must be outlined during a safety briefing that is to be held by the SSO. This safety briefing shall occur prior to the start of the project and consists of an entire review of all relevant sections of this safety plan as it relates to all phases of the project. Affected company personnel, subcontractors, clients, and/or regulators assigned to the project must participate in the safety briefing to gain access to the work zone. Changes or additions in site personnel will require an additional safety briefing be conducted with all affected person(s) to permit site access. Participants of the safety briefing will be required to sign a form to acknowledge they have received safety instructions and agree to abide by the provisions outlined within the HASP and JSA.

Additional tailgate meetings shall occur on a daily basis prior to the initiation of work activities. All authorized persons must attend the tailgate meeting held by the SSO to discuss the safety provisions affected by the task(s) to be performed for that day. Each participant will be required to sign the tailgate meeting log to acknowledge they have received safety instructions and agree to abide by those provisions reviewed during the tailgate meeting. ***No one should be permitted to participate in the tailgate meetings until a complete review of the HASP and corresponding JSA(s) has been completed!***

10.0 CONTRACTOR RESPONSIBILITY AND SUPERVISION

Subcontractors must abide by all safety procedures outlined within this plan, or they will be required to leave the premises until these procedures are implemented. Subcontractors will be permitted to operate under a separate safety plan as long as it meets the minimum requirements established by this HASP, has been reviewed and approved by the HSD in advance of the project's start date, and does not other otherwise conflict with the provisions of this HASP.

Subcontractors may not initiate work without the authorization of PPM, and all subcontracted work must be performed under the supervision of a PPM representative. Managers and field workers must coordinate schedules with the subcontractor(s) in advance of the project. All field processes must be shut down when a PPM representative leaves the jobsite unless otherwise approved by the District Manager; however, notations must be made within the HASP when this exception is granted.

Subcontractors must provide advanced notification when bringing additional chemicals not otherwise covered by this safety plan onto the jobsite. A safety data sheet must be provided to the HSD for review/approval before any chemical will be permitted onsite. If approved, any additional hazards, preventive measures, and emergency response procedures associated with the introduction of these substances must be incorporated into this HASP prior to the start of the project.

11.0 CONFINED SPACE

Confined space is defined by OSHA as any space that is "large enough and so configured that an employee can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous employee occupancy." In accordance with this definition, PPM will not be conducting any field-related task that can be defined as confined space entry. PPM personnel have not been adequately trained for confined space entry; therefore, in the event site conditions warrant this type of work, a qualified contractor will be hired for this task.

12.0 LIST OF ABBREVIATIONS

ACM	asbestos-containing material
ANSI	American National Standards Institute
BGS	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
CO/CO_2	carbon monoxide/dioxide
CSP	Certified Safety Professional
dB	decibel
DEET	N,N-diethyl-meta-toluamide
DOT	Department of Transportation
fc	foot-candle
FID	flame ionization detector
GFCI	ground fault circuit interrupter
GHS	Globally Harmonized System of Chemical Classification and Labeling
GVWR	gross vehicle weight rating
HASP	health and safety plan
HEPA	high efficiency particulate air
HIV	human immunodeficiency virus
HMIS	hazardous materials information system
HSD	Health and Safety Director
HSSE	health, safety, security and environmental
IDLH	immediately dangerous to life and/or health
JSA	job safety analysis
kV	kilo volt
LEL	lower explosive limit
LFL	lower flammability limit
MTBE	methyl-tertiary butyl ether
NCHRP	National Cooperative Highway Research Program
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
O_2/O_3	oxygen/ozone
ORC	oxygen release compound
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PACM	presumed asbestos-containing material
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
P.E.	Professional Engineer
PEL	permissible exposure limit
P.G.	Professional Geologist
PIC	Principal-in-Charge
PID	photo-ionization detector
PPM	PPM Consultants, Inc.
ppm	parts per million
SDS	safety data sheet
SS	Safety Supervisor
SSO	Site Safety Officer
STEL	short-term exposure limit
SVOC	semi-volatile organic compound
TPH	total petroleum hydrocarbon
TLV	threshold limit value
TWA	time-weighted average
UEL	upper explosive limit
UFL	upper flammability limit
VOC	volatile organic compound
UST	underground storage tank

APPENDIX K – COST PROPOSAL NO. 16 – SYSTEM EQUIPMENT PURCHASE AND UIC PERMIT

Alabama Tank Trust Fund
Cost Proposal
Part I

I.1 Cost Proposal Information:

Cost Proposal Number:	Date of Cost Proposal (mm/dd/yy):
16 451603-EQP	2/14/2019
UST or AST Incident Number:	Facility I.D. Number:
UST14-04-05	12534-055-005151

I.2 Facility Information

Facility Name:	Bama Texaco
Facility Address:	815 Cleveland Avenue Attalla, Etowah County, Alabama

I.3 Owner Information:

Owner Name:	Ira Phillips, Inc.
Owner Address:	P.O. Box 799 Gadsden, AL 35902
Employer Tax Number (IRS):	63-0422062

I.4 Response Action Contractor Information:

Approved Response Action Contractor Name:	PPM Consultants, Inc. 5555 Bankhead Highway Birmingham, Alabama 35210
Approved Response Action Contractor Address:	
Project Contact:	Walt Henley
Project Contact Phone #:	205-836-5650
Project Contact E-mail:	walt.henley@ppmco.com
Employer Tax Number (IRS):	72-1256279

Cost Proposal Number: 16

Facility Name: Bama Texaco

I.5 Activity Information:

	Indicate below the activities for which the cost proposal is submitted:
	Site Stabilization/Initial Abatement
	Preliminary Investigation
	Secondary Investigation / Additional Well Installation
	Alabama Risk Based Corrective Action (ARBCA)
	Groundwater Sampling
	Free Product Removal/Mobile Enhanced Multiphase Extraction (MEME)
	Corrective Action Plan Evaluation
	Develop Corrective Action Plan
X	Corrective Action
	Stockpile Sampling / Management / Disposal
	Provision of Alternate Water Supply
	Pilot Test
	Monitoring/Recovery/Injection Well Abandonment
	System Decommissioning/Removal

Activities/Other/Brief Summary of Activities:

Application for Underground Injection Control (UIC) permit and fees; purchase and shipping of Ozone Sparge equipment and materials; purchase and shipping of soil vapor extraction (SVE) equipment; purchase letter.

Provide proposed completion date for this phase of work activities:

08/31/19

Provide projected date of cleanup completed:

12/31/21

I.6 Subcontractor Information:

Indicate Subcontractors to be used during this phase of work:

Name & Address	Service Provided
Mid-Atlantic Environmental Equipment, Inc. (MAE2)	SVE equipment
H2O Engineering	Ozone sparge unit and materials

Cost Proposal Number:	Facility Name:
16	Bama Texaco

Signatures must be provided in Sections I.7 and I.8 below for this proposal to be processed.

I.7 Certification of Unintentional release of Motor Fuel & Cost Proposal- Owner Signature:

I certify that an unintentional release has occurred from a motor fuel underground or aboveground tank system at this site and I authorize this Cost Proposal amount for corrective action activities to be conducted at this site.

1.Owner or Operator Signature:	
Typed or Printed Name and Title:	Ira Phillips, Jr., President
Email address:	doublepop@gmail.com
Date:	

I.8 Cost Proposal- Contractor Signature:

2.Response Action Contractor Signature:	Michael L. Ellison
Typed or Printed Name and Title:	Michael L. Ellison, P.E., Principal
Date:	02/14/19

I.9 Trust Fund Obligation Information:

Estimated Total Cost of all Anticipated Response Actions (To be updated overtime):	$750,000.00
Total of Previously Approved Cost Proposals:	$126,692.22
Total Proposed Costs to Date (Approved Costs Plus Costs Proposed in this Cost Proposal):	$264,704.52
Estimate Percent Completion of entire project to date:	35%

I.10 Cost Proposal Amount

Proposed Costs under this Cost Proposal:	**$138,012.30**	**Personnel**	**$2,082.00**
		Field Equipment	**$0.00**
Owners Required Contribution for UST Release($5,000): *Applicable for CP#1 Only*		**Mileage**	**$0.00**
		Per Diem	**$0.00**
		Drilling	**$0.00**
Owners Required Contribution for AST Release($10,000): *Applicable for CP#1 Only*		**Analytical**	**$0.00**
		Other	**$135,930.30**
Total of This Cost Proposal:	**$138,012.30**		

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$138,012.30	12534-055-005151	16	UST14-04-05	Bama Texaco

Part II- Alabama Tank Trust Fund Itemization Form "A" Cost Proposal

Scenarios	Unit $	Units	Quantity	Requested$
System Purchase Letter	$1,311	/ltr	1	$1,311.00
UIC General Permit Application Preparation	$771	/permit	1	$771.00
Total Report and Plan Costs				**$2,082.00**

Part II- Alabama Tank Trust Fund Itemization Form "B" Cost Proposal

Postage / Shipping and Copying (plans reports, ADEM and owner)	$85	/sow	1	$85.00
Total Field Costs				**$85.00**

Part II- Alabama Tank Trust Fund Itemization Form "C" Cost Proposal

Total Drilling Costs				**$0.00**

Part II- Alabama Tank Trust Fund Itemization Form "D" Cost Proposal

		Pass Through	Quoted Amoun	Requested$
Corrective Action System Purchase		5%	$108,657.00	$114,089.85
UIC Permit Application (permit fee)		10%	$1,385.00	$1,523.50
Other/Misc. (receipts required)	Freight on Ozone system shipping	5%	$3,500.00	$3,675.00
Other/Misc. (receipts required)	Freight on SVE unit shipping	5%	$750.00	$787.50
Other/Misc. (receipts required)	Sparge points, riser, connections, tubing	5%	$6,855.52	$7,198.30
Other/Misc. (receipts required)	Mounted ozone gas leak detectors	5%	$4,745.00	$4,982.25
Other/Misc. (receipts required)	Carbon vessel for SVE unit	5%	$3,418.00	$3,588.90
Total Subs / Vendors / Utilities				**$135,845.30**

APPENDIX L – COST PROPOSAL NO. 17 – SYSTEM INSTALLATION, BASELINE GROUNDWATER MONITORING, AND START-UP

Alabama Tank Trust Fund
Cost Proposal
Part I

I.1 Cost Proposal Information:

Cost Proposal Number:	Date of Cost Proposal (mm/dd/yy):
17 451603-INST	2/14/2019
UST or AST Incident Number:	Facility I.D. Number:
UST14-04-05	12534-055-005151

I.2 Facility Information

Facility Name:	Bama Texaco
Facility Address:	815 Cleveland Avenue Attalla, Etowah County, Alabama

I.3 Owner Information:

Owner Name:	Ira Phillips, Inc.
Owner Address:	P.O. Box 799 Gadsden, AL 35902
Employer Tax Number (IRS):	63-0422062

I.4 Response Action Contractor Information:

Approved Response Action Contractor Name:	PPM Consultants, Inc. 5555 Bankhead Highway Birmingham, Alabama 35210
Approved Response Action Contractor Address:	
Project Contact:	Walt Henley
Project Contact Phone #:	205-836-5650
Project Contact E-mail:	walt.henley@ppmco.com
Employer Tax Number (IRS):	72-1256279

Cost Proposal Number: 17

Facility Name: Bama Texaco

I.5 Activity Information:

Indicate below the activities for which the cost proposal is submitted:	
	Site Stabilization/Initial Abatement
	Preliminary Investigation
	Secondary Investigation / Additional Well Installation
	Alabama Risk Based Corrective Action (ARBCA)
X	Groundwater Sampling
	Free Product Removal/Mobile Enhanced Multiphase Extraction (MEME)
	Corrective Action Plan Evaluation
	Develop Corrective Action Plan
X	Corrective Action
	Stockpile Sampling / Management / Disposal
	Provision of Alternate Water Supply
	Pilot Test
	Monitoring/Recovery/Injection Well Abandonment
	System Decommissioning/Removal

Activities/Other/Brief Summary of Activities:

Gauging of 38 MWs, 2 RWs, and 5 tank pit observation wells on Bama Texaco site, adjacent Rainbow 102 site, adjacent Shell site, and adjacent ROW; baseline sampling of 16 MWs and 2 RWs; purge water disposal. Install seven ozone/oxygen sparge points and two 4-inch recovery wells to approximately 15 feet BGS; saw-cut asphalt/concrete, trench; lay ozone tubing and conduit; lay 2-inch diameter SVE piping and two 20-foot SVE horizontal screens; building/equipment set-up; construct SVE manifold; backfill trenches and concrete surface; site survey; provide electrician for power hookup; cellular setup; disposal of IDW; system start-up training; report.

Provide proposed completion date for this phase of work activities:
10/31/19
Provide projected date of cleanup completed:
12/31/21

I.6 Subcontractor Information:

Indicate Subcontractors to be used during this phase of work:

Name & Address	Service Provided
Sutherland Environmental Company, Inc.	Laboratory services
EPS of Vermont, Inc.	Purge water disposal
Environmental, Inc.	System installation
Technical Drilling Services, Inc.	Drilling services
Tortorice Electric Co.	Electrician services
Mid-Atlantic Engineering Equipment, Inc.	Start-up training
Republic Services, Inc.	IDW disposal

Cost Proposal Number:	Facility Name:
17	Bama Texaco

Signatures must be provided in Sections I.7 and I.8 below for this proposal to be processed.

I.7 Certification of Unintentional release of Motor Fuel & Cost Proposal- Owner Signature:

I certify that an unintentional release has occurred from a motor fuel underground or aboveground tank system at this site and I authorize this Cost Proposal amount for corrective action activities to be conducted at this site.

1.Owner or Operator Signature:	
Typed or Printed Name and Title:	Ira Phillips, Jr., President
Email address:	doublepop@gmail.com
Date:	

I.8 Cost Proposal- Contractor Signature:

2.Response Action Contractor Signature:	Michael L. Ellison
Typed or Printed Name and Title:	Michael L. Ellison, P.E., Principal
Date:	02/14/19

I.9 Trust Fund Obligation Information:

Estimated Total Cost of all Anticipated Response Actions (To be updated overtime):	$750,000.00
Total of Previously Approved Cost Proposals:	$264,704.52
Total Proposed Costs to Date (Approved Costs Plus Costs Proposed in this Cost Proposal):	$344,652.15
Estimate Percent Completion of entire project to date:	46%

I.10 Cost Proposal Amount

Proposed Costs under this Cost Proposal:	**$79,947.63**	**Personnel**	**$24,745.15**
		Field Equipment	**$1,286.00**
Owners Required Contribution for UST Release($5,000): *Applicable for CP#1 Only*		**Mileage**	**$348.00**
		Per Diem	**$1,089.25**
		Drilling	**$7,640.22**
Owners Required Contribution for AST Release($10,000): *Applicable for CP#1 Only*		**Analytical**	**$1,501.50**
		Other	**$43,337.51**
Total of This Cost Proposal:	**$79,947.63**		

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$79,947.63	12534-055-005151	17	UST14-04-05	Bama Texaco

Part II- Alabama Tank Trust Fund Itemization Form "A" Cost Proposal

Scenarios	Unit $	Units	Quantity	Requested$
CA System Installation Report (all Classes same)	$7,552	/report	1	$7,552.00
ADEM Solid Waste Profile Preparation	$216.50	/profile	1	$216.50
Total Report and Plan Costs				**$7,768.50**

Part II- Alabama Tank Trust Fund Itemization Form "B" Cost Proposal

Porous material 0-30 feet	$324	/well	9	$2,916.00
Site Survey during Investigation (not a Licensed Surveyor)	$252.00	/sow	1	$252.00
Groundwater Sampling Set-up (2hrs tech time)	$126.00	/sow	1	$126.00
Purge/Development Water Handling (see Basis)	$94.50	/sow	1	$94.50
Gauging Well (no sampling)	$15.75	/well	27	$425.25
Groundwater Sampling and Gauging 2" Well	$63.00	/well	16	$1,008.00
Groundwater Sampling and Gauging 4" Well	$72.45	/well	2	$144.90
Soil Sampling Setup (1-4 wells)	$174	/sow	1	$174.00
System Installation Oversight (up to 7 days in field)	$8,714	/system	1	$8,714.00
System Startup	$1,664	/system	1	$1,664.00
Travel				
Mileage Rate			$0.580	
Mileage (One way office to site)			60	
Number of round trips to site			5	$348.00
Technician(s)-travel time	$63	/hr	10	$630.00
Geologist/Engineer-travel time	$87	/hr	4	$348.00
PG/PE-travel time	$120	/hr	4	$480.00
Per diem (6-12hrs)	$12.75	/day	7	$89.25
Per diem >2 consecutive days (overnight)(invoice(s) required)	$100	/day	10	$1,000.00
Equipment and Equipment Kits				
55-Gallon Drums	$50	/drum	2	$100.00
Sampling Expendables(gloves, ice, string, jars, foil, distilled water, paper towels,	$50	/sow	2	$100.00
Expendables O&M	$25	/day	2	$50.00
Monitoring Well/Boring Installation	$60	/day	10	$600.00
Groundwater Monitoring	$160	/day	1	$160.00
Bailers	$7	/bailer	18	$126.00
Ozone Sparge O&M	$75	/day	2	$150.00
Postage / Shipping and Copying (plans reports, ADEM and owner)	$85	/sow	1	$85.00
Postage / Shipping (Sample Shipping)	$50	/samples	1	$50.00

Analytical Samples

Method	Pass	Sample #

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$79,947.63	12534-055-005151	17	UST14-04-05	Bama Texaco

	Method			Pass Through	Sample #	
BTEX/MTBE/Naph (water)	8260	$65	/sample	10%	18	$1,287.00
BTEX/MTBE/Naph (soil)	8260	$65	/sample	10%	2	$143.00
Other	QA/QC - 8260	$65.00	/sample	10%	1	$71.50
		Total Field Costs				**$21,336.40**

Part II- Alabama Tank Trust Fund Itemization Form "C" Cost Proposal

Scenarios		Unit $	Unit	Quantity	Requested$
Mileage Rate (Current Federal Rate)				$0.580	
Mileage (drilling device driven or ATV) (**ONE WAY** mileage up to 450		$2.32	/mile	135	
Number of Mobilizations (includes $200 mob/demob amount)				1	$826.40
4" Monitoring Well (HSA) [3]		$45.00	/foot	30	$1,350.00
Per Diem (overnight) (man days)(hotel receipts required)		$100.00	/day	9	$900.00
Other (receipts required)	Sparge point (PVC provid	$40.00		105	$4,200.00
Pass Through (if appropriate) Enter "5" or "10" as appropriate				5%	$363.82
	Total Drilling Costs				**$7,640.22**

Part II- Alabama Tank Trust Fund Itemization Form "D" Cost Proposal

		Pass Through	Quoted Amoun	Requested$
ADEM Solid Waste Profile (ADEM review fee)		5%	$217.00	$227.85
Corrective Action System Install		5%	$28,930.00	$30,376.50
Phone Costs (telemetry)		5%	$100.00	$105.00
Roll off Dumpster (includes hauling/handling)		5%	$561.16	$589.22
Solid Waste Soil Disposal (to include hauling/handli		5%	$6,757.09	$7,094.94
Water Treatment/Disposal	EPS of Vermont	5%	$150.00	$157.50
Other/Misc. (receipts required)	Attalla Building Permit fee	5%	$750.00	$787.50
Other/Misc. (receipts required)	Electrician	5%	$2,680.00	$2,814.00
Other/Misc. (receipts required)	Start-up Training (MAE2)	5%	$1,000.00	$1,050.00
	Total Subs / Vendors / Utilities			**$43,202.51**

Part II- Alabama Tank Trust Fund Itemization Form "E" Cost Proposal

Per diem allowed for Alabama Tank Trust Fund Contractor Personnel Only
Maximum allowable rates are referenced on the "Maximum Rates" Tab in this document.
This page should be submitted whenever per diem is being claimed.

Points of Travel From	To	Projected Date mm/dd/yy	Personnel Classification	Hour of Departure am/pm	Hour of Return am/pm	Activity To Be Performed	Amount Per diem claimed
Use this section to enter claims for daily per diems							
Irondale	Attalla		Tech			GW sampling	$12.75
Irondale	Attalla		Tech			GW sampling	$12.75
Irondale	Attalla		Tech			GW sampling	$12.75
Irondale	Attalla		PG/PE			Start-up	$12.75
Irondale	Attalla		Tech			Start-up	$12.75
Irondale	Attalla		PG/PE			Start-up	$12.75
Irondale	Attalla		Tech			Start-up	$12.75
				Total number of daily per diems			7
Use this section to enter claims for extended daily per diems							
				Total number of ext. daily per diems			0
Use this section to enter claims for overnight per diems							
Irondale	Attalla		Geologist			Drilling oversight	$100.00
Irondale	Attalla		Geologist			Drilling oversight	$100.00
Irondale	Attalla		Geologist			Drilling oversight	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
Irondale	Attalla		Geologist			System Install	$100.00
				Total number of overnight per diems			10

TECHNICAL DRILLING SERVICES, INC.
QUOTE FORM
For
PPM CONSULTANTS, INC.
BAMA TEXACO
ATTALLA, ALABAMA

January 30, 2019

Description	Units	Estimated Quantity	Unit Cost	Total Cost
Mobilization/demobilization	LS	1	200.00	200.00
Mobilization/demobilization	Mile	270	2.32	626.40
Mobilization/demobilization	Mile	0	1.16	0.00
Per diem (3 man crew)	Day	3	300.00	900.00
Drill, sample & install a 4" PVC recovery well in soil	Foot	30	45.00	1350.00
Drill, sample & install a sparge point in soil*	Foot	105	40.00	4200.00
Provide & install a 8" manhole cover	Each	0	150.00	0.00
Provide & install a 12" manhole cover	Each	0	200.00	0.00
Construct a concrete pad & install an 18" boltdown cover	Each	0	325.00	0.00
Construct a concrete pad & install an 18" locking vault	Each	0	450.00	0.00
Provide & install a 2' x 2' vault	Each	0	750.00	0.00
55-gallon drum	Each	0	50.00	0.00
Stand-by Rate (per crew)	Hour	0	200.00	0.00
			TOTAL JOB ESTIMATE:	**$7,276.40**

Comparison of Waste Disposal Estimates
System Installation
Bama Texaco, Attalla, AL

		Advanced Disposal		Republic Services	
	Units	**Rate**	**Subtotal**	**Rate**	**Subtotal**
Delivery charge	2	$225.00	$450.00	$190.58	$381.16
Haul charge	6	$450.00	$2,700.00	$265.00	$1,590.00
Disposal rate	100	$39.50	$3,950.00	$35.00	$3,500.00
Liners	6	$60.00	$360.00	$30.00	$180.00
Fees (~29.5%)					$1,667.09
Total			$7,460.00		$7,318.25

Henley, Walt

From: kathy tortorice <tortoriceelec@bellsouth.net>
Sent: Monday, February 04, 2019 7:37 AM
To: Henley, Walt
Cc: CHARLES TORTORICE
Subject: attala, job

Price for installing new overhead service with panel for new equipment.
install 200 amp single phase service pole mounted.
install 2 60 amp single phase circuits for new equipment.

labor material and permitting $2680.00

APPENDIX M – COST PROPOSAL NO. 18 – FIRST QUARTER O&M AND EFFECTIVENESS MONITORING

Alabama Tank Trust Fund
Cost Proposal
Part I

I.1 Cost Proposal Information:

Cost Proposal Number:	Date of Cost Proposal (mm/dd/yy):
18 451603-OM1	2/14/2019
UST or AST Incident Number:	Facility I.D. Number:
UST14-04-05	12534-055-005151

I.2 Facility Information

Facility Name:	Bama Texaco
Facility Address:	815 Cleveland Avenue Attalla, Etowah County, Alabama

I.3 Owner Information:

Owner Name:	Ira Phillips, Inc.
Owner Address:	P.O. Box 799 Gadsden, AL 35902
Employer Tax Number (IRS):	63-0422062

I.4 Response Action Contractor Information:

Approved Response Action Contractor Name:	PPM Consultants, Inc. 5555 Bankhead Highway Birmingham, Alabama 35210
Approved Response Action Contractor Address:	
Project Contact:	Walt Henley
Project Contact Phone #:	205-836-5650
Project Contact E-mail:	walt.henley@ppmco.com
Employer Tax Number (IRS):	72-1256279

Cost Proposal Number: 18

Facility Name: Bama Texaco

I.5 Activity Information:

Indicate below the activities for which the cost proposal is submitted:	
	Site Stabilization/Initial Abatement
	Preliminary Investigation
	Secondary Investigation / Additional Well Installation
	Alabama Risk Based Corrective Action (ARBCA)
X	Groundwater Sampling
X	Free Product Removal/Mobile Enhanced Multiphase Extraction (MEME)
	Corrective Action Plan Evaluation
	Develop Corrective Action Plan
	Corrective Action
	Stockpile Sampling / Management / Disposal
	Provision of Alternate Water Supply
	Pilot Test
	Monitoring/Recovery/Injection Well Abandonment
	System Decommissioning/Removal

Activities/Other/Brief Summary of Activities:

Quarterly O&M of ozone sparge and SVE systems (2 visits per month); One 8-hour MEME event; Quarterly effectiveness monitoring event (gauge 45 wells, sample 16 of the MWs and 2 RWs); report.

Provide proposed completion date for this phase of work activities:

12/31/19

Provide projected date of cleanup completed:

12/31/21

I.6 Subcontractor Information:

Indicate Subcontractors to be used during this phase of work:

Name & Address	Service Provided
Sutherland Environmental Company, Inc.	Laboratory services
Brown Remediation, Inc.	MEME/water disposal

Cost Proposal Number:	Facility Name:
18	Bama Texaco

Signatures must be provided in Sections I.7 and I.8 below for this proposal to be processed.

I.7 Certification of Unintentional release of Motor Fuel & Cost Proposal- Owner Signature:

I certify that an unintentional release has occurred from a motor fuel underground or aboveground tank system at this site and I authorize this Cost Proposal amount for corrective action activities to be conducted at this site.

1.Owner or Operator Signature:	
Typed or Printed Name and Title:	Ira Phillips, Jr., President
Email address:	doublepop@gmail.com
Date:	

I.8 Cost Proposal- Contractor Signature:

2.Response Action Contractor Signature:	Michael L. Ellison
Typed or Printed Name and Title:	Michael L. Ellison, P.E., Principal
Date:	02/14/19

I.9 Trust Fund Obligation Information:

Estimated Total Cost of all Anticipated Response Actions (To be updated overtime):	$750,000.00
Total of Previously Approved Cost Proposals:	$344,652.15
Total Proposed Costs to Date (Approved Costs Plus Costs Proposed in this Cost Proposal):	$367,540.60
Estimate Percent Completion of entire project to date:	49%

I.10 Cost Proposal Amount

Proposed Costs under this Cost Proposal:	**$22,888.45**	**Personnel**	**$10,118.15**
		Field Equipment	**$1,006.00**
Owners Required Contribution for UST Release($5,000): *Applicable for CP#1 Only*		**Mileage**	**$556.80**
		Per Diem	**$127.50**
		Drilling	**$0.00**
Owners Required Contribution for AST Release($10,000): *Applicable for CP#1 Only*		**Analytical**	**$1,358.50**
		Other	**$9,721.50**
Total of This Cost Proposal:	**$22,888.45**		

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$22,888.45	12534-055-005151	18	UST14-04-05	Bama Texaco

Part II- Alabama Tank Trust Fund Itemization Form "A" Cost Proposal

Scenarios	Unit $	Units	Quantity	Requested$
SEMR - Ozone, AS, SVE, Chemox, Biosparge - Reports				
1-12 wells, BTEX/MTBE/Naphthalene	$4,371	/report	1	$4,371.00
SEMR adder >12 wells, BTEX/MTBE/Naph	$37.50	/well	6	$225.00
Total Report and Plan Costs				**$4,596.00**

Part II- Alabama Tank Trust Fund Itemization Form "B" Cost Proposal

Groundwater Sampling Set-up (2hrs tech time)	$126.00	/sow	1	$126.00
Gauging Well (no sampling)	$15.75	/well	27	$425.25
Groundwater Sampling and Gauging 2" Well	$63.00	/well	16	$1,008.00
Groundwater Sampling and Gauging 4" Well	$72.45	/well	2	$144.90
MEME Event/Pilot Test/Injection Event (hourly rate)	$63	/hr	10	$630.00
Ozone, biosparge, SVE, biovent and Air Sparge O&M 3 months	$1,928	/quarter	1	$1,928.00
Travel				
Mileage Rate			$0.580	
Mileage (One way office to site)			60	
Number of round trips to site			8	$556.80
Technician(s)-travel time	$63	/hr	20	$1,260.00
Per diem (6-12hrs)	$12.75	/day	10	$127.50
Equipment and Equipment Kits				
Sampling Expendables(gloves, ice, string, jars, foil, distilled water, paper towels,	$50	/sow	1	$50.00
Expendables O&M	$25	/day	6	$150.00
Groundwater Monitoring	$160	/day	1	$160.00
Bailers	$7	/bailer	18	$126.00
MEME Event	$70	/event	1	$70.00
Ozone Sparge O&M	$75	/day	6	$450.00
Postage / Shipping and Copying (plans reports, ADEM and owner)	$85	/sow	1	$85.00
Postage / Shipping (Sample Shipping)	$50	/samples	1	$50.00

Analytical Samples

	Method			Pass Through	Sample #	
BTEX/MTBE/Naph (water)	8260	$65	/sample	10%	18	$1,287.00
Other	QA/QC	$65.00	/sample	10%	1	$71.50
Total Field Costs						**$8,705.95**

Part II- Alabama Tank Trust Fund Itemization Form "C" Cost Proposal

Total Drilling Costs		**$0.00**

Part II- Alabama Tank Trust Fund Itemization Form "D" Cost Proposal

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$22,888.45	12534-055-005151	18	UST14-04-05	Bama Texaco

	Pass Through	Quoted Amoun	Requested$
8-hr MEME Event	10%	$3,000.00	$3,300.00
MEME Water Disposal Amount includes hauling	10%	$825.00	$907.50
Phone Costs (telemetry)	10%	$390.00	$429.00
Power Costs	10%	$4,500.00	$4,950.00
Total Subs / Vendors / Utilities			**$9,586.50**

Part II- Alabama Tank Trust Fund Itemization Form "E" Cost Proposal

Per diem allowed for Alabama Tank Trust Fund Contractor Personnel Only
Maximum allowable rates are referenced on the "Maximum Rates" Tab in this document.
This page should be submitted whenever per diem is being claimed.

Points of Travel From	To	Projected Date mm/dd/yy	Personnel Classification	Hour of Departure am/pm	Hour of Return am/pm	Activity To Be Performed	Amount Per diem claimed
Use this section to enter claims for daily per diems							
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			MEME	$12.75
Irondale	Attalla		Tech			GWS	$12.75
Irondale	Attalla		Tech			GWS	$12.75
Irondale	Attalla		Tech			GWS	$12.75
				Total number of daily per diems			10
Use this section to enter claims for extended daily per diems							
				Total number of ext. daily per diems			0
Use this section to enter claims for overnight per diems							
				Total number of overnight per diems			0

APPENDIX N – COST PROPOSAL NO. 19 – SECOND QUARTER O&M AND EFFECTIVENESS MONITORING

Alabama Tank Trust Fund
Cost Proposal
Part I

I.1 Cost Proposal Information:

Cost Proposal Number:	Date of Cost Proposal (mm/dd/yy):
19 451603-OM2	2/14/2019
UST or AST Incident Number:	Facility I.D. Number:
UST14-04-05	12534-055-005151

I.2 Facility Information

Facility Name:	Bama Texaco
Facility Address:	815 Cleveland Avenue Attalla, Etowah County, Alabama

I.3 Owner Information:

Owner Name:	Ira Phillips, Inc.
Owner Address:	P.O. Box 799 Gadsden, AL 35902
Employer Tax Number (IRS):	63-0422062

I.4 Response Action Contractor Information:

Approved Response Action Contractor Name:	PPM Consultants, Inc. 5555 Bankhead Highway Birmingham, Alabama 35210
Approved Response Action Contractor Address:	
Project Contact:	Walt Henley
Project Contact Phone #:	205-836-5650
Project Contact E-mail:	walt.henley@ppmco.com
Employer Tax Number (IRS):	72-1256279

Cost Proposal Number: 19

Facility Name: Bama Texaco

I.5 Activity Information:

Indicate below the activities for which the cost proposal is submitted:	
	Site Stabilization/Initial Abatement
	Preliminary Investigation
	Secondary Investigation / Additional Well Installation
	Alabama Risk Based Corrective Action (ARBCA)
X	Groundwater Sampling
X	Free Product Removal/Mobile Enhanced Multiphase Extraction (MEME)
	Corrective Action Plan Evaluation
	Develop Corrective Action Plan
	Corrective Action
	Stockpile Sampling / Management / Disposal
	Provision of Alternate Water Supply
	Pilot Test
	Monitoring/Recovery/Injection Well Abandonment
	System Decommissioning/Removal

Activities/Other/Brief Summary of Activities:

Quarterly O&M of ozone sparge and SVE systems (2 visits per month); One 8-hour MEME event; Quarterly effectiveness monitoring event (gauge 45 wells, sample 16 of the MWs and 2 RWs); report.

Provide proposed completion date for this phase of work activities:

03/31/20

Provide projected date of cleanup completed:

12/31/21

I.6 Subcontractor Information:

Indicate Subcontractors to be used during this phase of work:

Name & Address	Service Provided
Sutherland Environmental Company, Inc.	Laboratory services
Brown Remediation, Inc.	MEME events/water disposal

Cost Proposal Number:	Facility Name:
19	Bama Texaco

Signatures must be provided in Sections I.7 and I.8 below for this proposal to be processed.

I.7 Certification of Unintentional release of Motor Fuel & Cost Proposal- Owner Signature:

I certify that an unintentional release has occurred from a motor fuel underground or aboveground tank system at this site and I authorize this Cost Proposal amount for corrective action activities to be conducted at this site.

1.Owner or Operator Signature:	
Typed or Printed Name and Title:	Ira Phillips, Jr., President
Email address:	doublepop@gmail.com
Date:	

I.8 Cost Proposal- Contractor Signature:

2.Response Action Contractor Signature:	Michael L. Ellison
Typed or Printed Name and Title:	Michael L. Ellison, P.E., Principal
Date:	02/14/19

I.9 Trust Fund Obligation Information:

Estimated Total Cost of all Anticipated Response Actions (To be updated overtime):	$750,000.00
Total of Previously Approved Cost Proposals:	$367,540.60
Total Proposed Costs to Date (Approved Costs Plus Costs Proposed in this Cost Proposal):	$390,429.05
Estimate Percent Completion of entire project to date:	52%

I.10 Cost Proposal Amount

Proposed Costs under this Cost Proposal:	**$22,888.45**	**Personnel**	**$10,118.15**
		Field Equipment	**$1,006.00**
Owners Required Contribution for UST Release($5,000): *Applicable for CP#1 Only*		**Mileage**	**$556.80**
		Per Diem	**$127.50**
		Drilling	**$0.00**
Owners Required Contribution for AST Release($10,000): *Applicable for CP#1 Only*		**Analytical**	**$1,358.50**
		Other	**$9,721.50**
Total of This Cost Proposal:	**$22,888.45**		

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$22,888.45	12534-055-005151	19	UST14-04-05	Bama Texaco

Part II- Alabama Tank Trust Fund Itemization Form "A" Cost Proposal

Scenarios	Unit $	Units	Quantity	Requested$
SEMR - Ozone, AS, SVE, Chemox, Biosparge - Reports				
1-12 wells, BTEX/MTBE/Naphthalene	$4,371	/report	1	$4,371.00
SEMR adder >12 wells, BTEX/MTBE/Naph	$37.50	/well	6	$225.00
Total Report and Plan Costs				**$4,596.00**

Part II- Alabama Tank Trust Fund Itemization Form "B" Cost Proposal

Groundwater Sampling Set-up (2hrs tech time)	$126.00	/sow	1	$126.00
Gauging Well (no sampling)	$15.75	/well	27	$425.25
Groundwater Sampling and Gauging 2" Well	$63.00	/well	16	$1,008.00
Groundwater Sampling and Gauging 4" Well	$72.45	/well	2	$144.90
MEME Event/Pilot Test/Injection Event (hourly rate)	$63	/hr	10	$630.00
Ozone, biosparge, SVE, biovent and Air Sparge O&M 3 months	$1,928	/quarter	1	$1,928.00
Travel				
Mileage Rate			$0.580	
Mileage (One way office to site)			60	
Number of round trips to site			8	$556.80
Technician(s)-travel time	$63	/hr	20	$1,260.00
Per diem (6-12hrs)	$12.75	/day	10	$127.50
Equipment and Equipment Kits				
Sampling Expendables(gloves, ice, string, jars, foil, distilled water, paper towels,	$50	/sow	1	$50.00
Expendables O&M	$25	/day	6	$150.00
Groundwater Monitoring	$160	/day	1	$160.00
Bailers	$7	/bailer	18	$126.00
MEME Event	$70	/event	1	$70.00
Ozone Sparge O&M	$75	/day	6	$450.00
Postage / Shipping and Copying (plans reports, ADEM and owner)	$85	/sow	1	$85.00
Postage / Shipping (Sample Shipping)	$50	/samples	1	$50.00

Analytical Samples

	Method			Pass Through	Sample #	
BTEX/MTBE/Naph (water)	8260	$65	/sample	10%	18	$1,287.00
Other	QA/QC	$65.00	/sample	10%	1	$71.50
Total Field Costs						**$8,705.95**

Part II- Alabama Tank Trust Fund Itemization Form "C" Cost Proposal

Total Drilling Costs	**$0.00**

Part II- Alabama Tank Trust Fund Itemization Form "D" Cost Proposal

Cost Proposal Summary

CP Total	Facility I.D. #	CP #	Incident Number	Site Name
$22,888.45	12534-055-005151	19	UST14-04-05	Bama Texaco

	Pass Through	Quoted Amoun	Requested$
8-hr MEME Event	10%	$3,000.00	$3,300.00
MEME Water Disposal Amount includes hauling	10%	$825.00	$907.50
Phone Costs (telemetry)	10%	$390.00	$429.00
Power Costs	10%	$4,500.00	$4,950.00
Total Subs / Vendors / Utilities			**$9,586.50**

Part II- Alabama Tank Trust Fund Itemization Form "E" Cost Proposal

Per diem allowed for Alabama Tank Trust Fund Contractor Personnel Only
Maximum allowable rates are referenced on the "Maximum Rates" Tab in this document.
This page should be submitted whenever per diem is being claimed.

Points of Travel From	To	Projected Date mm/dd/yy	Personnel Classification	Hour of Departure am/pm	Hour of Return am/pm	Activity To Be Performed	Amount Per diem claimed
Use this section to enter claims for daily per diems							
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			OM	$12.75
Irondale	Attalla		Tech			MEME	$12.75
Irondale	Attalla		Tech			GWS	$12.75
Irondale	Attalla		Tech			GWS	$12.75
Irondale	Attalla		Tech			GWS	$12.75
				Total number of daily per diems			10
Use this section to enter claims for extended daily per diems							
				Total number of ext. daily per diems			0
Use this section to enter claims for overnight per diems							
				Total number of overnight per diems			0