ENVIRONMENTAL SITE CHARACTERIZATION REPORT / REMEDIAL ACTION PLAN

May 2019

PADEP Facility ID #03-29674
PAUSTIF Claim #2017-0012

Radhe Oil
222 Buffalo Street
Freeport, PA 16229

Prepared for:

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Environmental Site Characterization Report/Remedial Action Plan
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CERTIFICATION

"By affixing my seal to this document, I am certifying that the information is true and correct to the best of my knowledge. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and this it is within my professional expertise to verify the correctness of the information."

-Signed and sealed this day, May 31, 2019

George R. Hunzeker, PG
Director of Operations

"By affixing my seal to this document, I am certifying that the information is true and correct to the best of my knowledge. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and this it is within my professional expertise to verify the correctness of the information."

-Signed and sealed this day, May 31, 2019

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Senior Project Engineer

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LIST OF ACRONYMS

- ° – degrees
- µg/kg – microgram per kilogram
- µg/l – microgram per liter
- ACFM – actual cubic feet per minute
- Act 2 – Pennsylvania Land Recycling and Remediation Standards Act
- ASTM – American Standard Testing Manual
- AWS – air water separator
- BA – Buscheck and Alcantar
- bgs – below ground surface
- BTEX – benzene, toluene, ethylbenzene, and xylenes
- BTWA – Buffalo Township Water Authority
- C – temperature in Celsius degrees
- CAP – Corrective Action Process
- COC – constituent of concern
- COPIAC – chemical of potential indoor air concern
- CSM – Conceptual Site Model
- CWF – cold water fishes
- DMR – Discharge Monitoring Report
- DO – dissolved oxygen
- DTW – depth to water
- ESA – Environmental Site Assessment
- F – temperature in Fahrenheit degrees
- foc – fraction organic carbon
- FSR – focused source remediation
- ft – feet
- ft/day – feet per day
- ft–msl – feet above mean sea level
- g/cm^3 – grams per cubic centimeter
- GAC – granular activated carbon
- gpm – gallons per minute
- GPR – ground penetrating radar
- HASP – Health and Safety Plan
- Hp – horsepower
- HQ-CWF – high quality-cold water fishes
- HQ-WWF – high quality-warm water fishes
- Hz – hertz
- i – hydraulic gradient
- IAQ – Indoor Air Quality
- IBA – Important Bird Area
- in. Hg – inches Mercury
- ISCO – in-situ chemical oxidation
- J & E – Johnson and Ettinger
- K – hydraulic conductivity
- kg/l – kilograms per liter

LIST OF ACRONYMS (Continued)

- koc – organic carbon partition coefficient
- Letterle – Letterle & Associates, Inc.
- LNAPL – light non-aqueous phase liquid
- LRP – liquid ring pump
- MABT – Municipal Authority of Buffalo Township
- mg/kg – milligrams per kilogram
- mg/l – milligrams per liter
- mg/m^3 – milligrams per cubic meter
- ml – milliliter
- MNA – monitored natural attenuation
- mS/cm – milliSiemens per centimeter
- MSC – Medium Specific Concentration
- MTBE – methyl tertiary-butyl ether
- mV – milliVolts
- MW – monitor well (numerically designated)
- NHA – Natural Heritage Area
- NORR – Notice of Reportable Release
- NPDES – National Pollutant Discharge Elimination System
- NUAD – Non-Use Aquifer Determination
- O&M – operation and maintenance
- ORC® - Oxygen Release Compounds
- ORP – oxidation - reduction potential
- PADCNR – Pennsylvania Department of Conservation and Natural Resources
- PADEP – Pennsylvania Department of Environmental Protection
- PAGWIS – Pennsylvania Groundwater Information System
- PAHs – polynuclear aromatic hydrocarbons
- PAWC – Pennsylvania American Water Company
- PCP – Post Remediation Care Plan
- PennDOT – Pennsylvania Department of Transportation
- PID – photoionization detector
- PNDI – Pennsylvania Natural Diversity Inventory
- PNHP – Pennsylvania Natural Heritage Program
- POC – point of compliance
- ppm – parts per million
- ppmv – parts per million by volume
- psi – pounds per square inch
- PVC – polyvinyl chloride
- QA/QC – quality assurance/quality control
- QD – Quick Domenico
- RACR – Remedial Action Completion Report
- RAP – Remedial Action Plan
- RAPR – Remedial Action Progress Report
- RMS – root mean square
- ROI – radius of influence
- RW – recovery well (numerically designated)

LIST OF ACRONYMS (Continued)

- SB – soil boring (numerically designated)
- SBMA – South Buffalo Municipal Authority
- SCFH – standard cubic feet per hour
- SCFM – standard cubic feet per minute
- SCR – Site Characterization Report
- SHS – Statewide Health Standard
- SOP – standard operating procedure
- SRSS – systematic random soil sampling
- SVE – soil vapor extraction
- TDS – total dissolved solids
- TGM – Technical Guidance Manual
- TMB – trimethylbenzene
- TOC – top of casing
- TOS – temporarily out of service
- TPE – total phase extraction
- TPH – total petroleum hydrocarbons
- TPY – ton per year
- TSF – trout stocking fishes
- USCS – Unified Soil Classification System
- USEPA – United States Environmental Protection Agency
- USGS – United States Geological Survey
- UST – underground storage tank
- VEGE – vapor enhanced groundwater extraction
- VLF – very low frequency
- VOC – volatile organic compound
- VP – soil vapor monitor point (numerically designated)
- WWF – warm water fishes
- yd^3 – cubic yard

1.0 INTRODUCTION

Letterle & Associates, Inc. (Letterle) was retained by Superior Petroleum Company (Superior) in March 2017 to conduct environmental site characterization activities at the Radhe Oil (Radhe) facility. Radhe Oil (Facility ID #03-29674) is located at 222 Buffalo Street in Freeport Borough, Armstrong County, Pennsylvania (**Figure 1**). Superior is the current owner of the property, service station, and UST system.

On December 21, 2016, during partial UST closure and upgrade activities, petroleum-impacted soil was observed beneath both dispenser islands. Heavily corroded product piping connectors were observed beneath each dispenser and is presumed to be the source of the confirmed unleaded gasoline release. A verbal notification of release was reported to the PADEP - Southwest Regional Office on December 21, 2016. A written NORR was sent to the PADEP on January 4, 2017. An environmental site characterization was conducted in accordance with 25 Pa. Codes §245.309 and §245.310.

Unleaded gasoline is composed of hydrocarbons and "additives" that are blended with the fuel to improve fuel performance and engine longevity. The hydrocarbons fall primarily in the C_4 to C_{12} range. The lightest of these are highly volatile and rapidly evaporate from spilled gasoline. The aromatic hydrocarbons in gasoline are BTEX, 1,2,4-TMB, and 1,3,5-TMB. Some heavier aromatics are also present including low amounts of PAHs such as naphthalene and cumene. In addition, oxygenated compounds ("oxygenates") such as alcohols (for example, methanol or ethanol) and ethers (for example, MTBE) are generally added to gasoline as octane boosters and to reduce carbon monoxide emissions. MTBE was a common additive between 1980 and 1992.

This SCR includes all characterization activities conducted at the Radhe Oil site to date. In accordance with 25 Pa. Code §245.309, the objectives of the site characterization were to accomplish the following:

- Describe the release, extent of contamination, and the interim remedial actions implemented to address the release.
- Determine whether additional interim remedial actions were necessary to abate an imminent hazard to human health or the environment.
- Determine whether additional site characterization work was required upon completion of an interim remedial action.
- Determine or confirm the source(s) of contamination.
- Provide sufficient physical data, through field investigations, to determine the regulated substances involved, and the extent of migration of those regulated substances in surface water, groundwater, soil, or sediment.
- Determine, from measurements at Radhe Oil, values for input parameters including hydraulic conductivity, source dimensions, hydraulic gradient, water table fluctuation and fraction organic carbon necessary for fate and transport analysis.
- Provide sufficient information to select a remediation standard.
- Provide sufficient information to allow for completion of a RAP.

This report demonstrates that the objectives of a site characterization as detailed in 25 Pa Code §245.309 have been accomplished at Radhe Oil to the extent possible to date. Based on the available soil and groundwater data, this SCR, completed in accordance with 25 Pa. Code §245.310, discusses the nature and extent of regulated substances in the soil and groundwater; analyzes the fate and transport mechanisms for the respective regulated substances; and summarizes the potential risks to human health and the environment from the identified regulated substances at the site. The selected clean-up standard for Radhe Oil is the PADEP SHS for non-residential used aquifers with a TDS concentration less than or equal to 2,500 mg/l as detailed in Act 2, The Land Recycling and Environmental Standards Act.

The following sections provide information about the site location, background, current operations, the site investigation, and the results obtained from the environmental investigation. A conceptual site model including an environmental media evaluation, fate and transport analysis, exposure pathway analysis, and a remediation technologies evaluation is also included. A copy of Letterle's site specific HASP and SOPs with a description of the QA/QC procedures for activities performed or anticipated during the site characterization and remedial action work are included in **Appendices A** and **B**, respectively.

2.0 SITE BACKGROUND

2.1 Site Description

Radhe Oil operates as an active gasoline service station and convenience store located at 222 Buffalo Street in Freeport, Armstrong County, Pennsylvania (40.6762º N, -79.6891º W) (**Figure 1**). The site (Parcel ID #17-196.08-01-61) is located at the northwest corner of the intersection of Buffalo Street and Mill Street. The property is approximately 0.33 acre in size and roughly rectangular in shape.

Radhe Oil is a typical gasoline service station with convenience store. There are currently three USTs (001, 002, and 003) and two dispenser islands on-site. The USTs contain unleaded gasoline and are located in a common cavity located at the southeastern corner of the property. The capacity of each UST is 10,000 gallons, and all USTs are constructed of single-walled steel with galvanic anodes. The USTs were installed in 1987. Structures located on the property include:

- Single-story concrete block building with a former car wash drive through
- Two dispenser islands
- Dispenser island canopy
- Retaining wall bounding the western property

Figure 2 provides a general layout of the building, location of the current UST system, underground utilities, and other pertinent site features. Site photographs are included in **Appendix C**.

According to the topographic coverage of the Freeport Quadrangle Map (USGS 7.5 minute topographic map), the ground surface elevation at the site is approximately 788 feet-msl. The ground surface slopes southwest towards Buffalo Creek (elevation ~ 750 ft-msl). Asphalt primarily covers the ground surface on the usable portions of the site. Grass and vegetation is located on the north, east and western boundaries of the site. Gravel is located adjacent to the north wall of the on-site building where a former waste oil UST was located. Surface water drains via storm sewers and overland flow to Buffalo Creek, which is located approximately 250 feet southwest of the site. **Figure 3** illustrates Buffalo Creek's location relative to the site. Buffalo Creek generally flows to the south; and joins the Allegheny River approximately 2,500 feet south of the site. Buffalo Creek discharges into the Allegheny River (at Freeport, Pennsylvania) located approximately 2,400 feet south of the site. Additional watershed and hydrogeology information is detailed in Section 3.2.

The surrounding land use consists of mixed commercial and residential properties (**Figure 3**). Based on information from the Pennsylvania One Call System, public utilities at the site include municipal water (BTWA), storm sewers (Freeport Borough), electricity (West Penn Power), and natural gas (Peoples Gas). The surrounding land use and public utilities are further detailed in Sections 4.1 and 4.2 of this report, respectively.

2.2 Site History

Letterle performed a file review at the PADEP Northwest Regional Office in Meadville, Pennsylvania in February 2017, to obtain information pertaining to historical site characterization activities performed at the Radhe property. A site history was then compiled based on reports, inter-office and regulatory correspondences, and registration and permitting documents. The following is a summary of pertinent environmental information obtained during the PADEP file review:

- In April 1994, a Storage Tank Notification of Contamination was filed by Petroleum Industry Consultants (PIC) on behalf of BP for minor soil contamination from a waste oil tank removal (UST 004). A letter from PIC to the PADEP stated that two confirmatory samples were collected and one of the samples had a TPH concentration of 620 mg/kg. The letter indicated a Closure Report would be submitted.

- In 2000, there was a confirmed release of unleaded gasoline at the site, based on the results of Phase I and Phase II ESAs conducted at the site. In September 2000, the IT Group (IT), on behalf of BP, conducted a Phase I ESA prior to the sale of the property to Glassmere Fuel Co. The assessment revealed that in 1987, PIC installed four observation wells (OW-1 through OW-4) at the site to monitor any potential leaks from USTs. IT installed six Geoprobe® soil borings in September 2000, and collected soil samples for analysis of benzene, toluene, ethylbenzene, xylenes, naphthalene, cumene, MTBE, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(ghi)perylene, and total lead. All soil samples were below the PADEP SHS.

- The IT Group also collected groundwater samples from the four observation wells for analysis of benzene, toluene, ethylbenzene, xylenes, naphthalene, cumene, and MTBE. The groundwater sample collected from OW-3 exceeded the PADEP SHS for benzene, naphthalene, and ethylbenzene.

- A Phase II ESA was conducted by AGI in November 2000, prior to the sale of the property by BP to Glassmere Fuel Company. Representatives of IT Group, on behalf of BP, provided oversight for all activities conducted by AGI, and collected duplicates of all samples obtained during the Phase II ESA. AGI collected six soil samples: five samples were analyzed for unleaded gasoline parameters, and one sample was analyzed for used motor oil parameters. AGI also collected groundwater samples from the four existing monitor wells OW-1 through OW-4. Soil analytical results were below the PADEP SHS. Groundwater analytical results from observation well OW-3, located near the western property boundary, exceeded the PADEP SHS for benzene, cumene and naphthalene.

- Glassmere sent a notice to BP advising them of the groundwater contamination in December 2000 (prior to the execution of the sale) and requested BP remedy the contamination in accordance with the purchase offer. BP responded with a letter in December 2000 stating the company would take the necessary actions to comply with Pennsylvania environmental regulations, and in a letter to Glassmere's attorney in June 2001, stated BP was in the process of initiating a site assessment.

- Groundwater monitoring occurred at the site from February 2002 through December 16, 2005 (the latest reported sampling date in the PADEP files). Sampling was conducted by URS consultants, on behalf of BP.

- During site characterization, additional monitor wells (MW-5 through MW-7) were installed in January 2002 and MW-8 was installed in November 2005. Monitor wells MW-1 through MW-4 never existed at the site. Soil borings SB-1 through SB-7 were advanced in January 2002 and SB-8 and SB-9 were advanced in March 2005. There were a total of eight groundwater wells on-site and one vapor monitoring point (VP-1). A remedial pilot test was conducted in October 2003 by URS, which concluded that dual phase groundwater/vapor extraction would be a viable remedial technology at the site. Interim remedial actions were conducted by URS using a mobile high vacuum extraction system on three occasions in 2004 (April, May, and June). Approximately 695 gallons of groundwater were removed during the interim remedial actions. URS conducted aquifer slug testing in April 2005.

- During a December 2005 groundwater sampling event, benzene, MTBE, and naphthalene were detected above the PADEP SHS. Benzene exceeded the SHS in OW-3 and MW-6; MTBE exceeded in OW-2 and OW-4; and naphthalene exceeded in OW-3. Shaw Environmental, Inc. (Shaw) completed a risk assessment and proposed the following SSS for groundwater: benzene - 1,230 μg/l; ethylbenzene -167,000 μg/l; MTBE - 114,000 μg/l; naphthalene - 13,400 μg/l.

- During the site characterization process, benzene and naphthalene were detected at concentrations above the PADEP SHS in two soil samples (SB-8 and SB-10), located on the north side of the current UST cavity. Shaw also proposed soil attainment sampling and additional soil gas sampling (previous vapor intrusion modeling indicated benzene, xylenes, and cumene were potentially hazardous to human receptors at the site).

- Shaw prepared a SCR in April 2006 on behalf of BP and submitted it to the PADEP. There was no response from the PADEP in the files.

- A March 2007 email from URS to Mr. Thomas Fuller, P.G. of the PADEP indicated off-site characterization had not been completed due to access issues. Due to data gaps in the PADEP files, it can be assumed the SCR was discussed during one of the BP multi-site agreement meetings and the SCR was disapproved.

- Shaw prepared and submitted a SCR/RAP to the PADEP in June 2008. The RAP selected the PADEP SHS as remedial goals and proposed quarterly monitoring to demonstrate groundwater attainment, soil attainment sampling in impacted area north of the UST cavity, and an additional soil gas sampling event.

- Delta Consultants submitted a RACR to the PADEP in July 2010. The PADEP approved the RACR on January 21, 2011 for SHS MSC Residential Used Aquifer for groundwater. Soil attainment was demonstrated in the area north of the UST cavity using SRSS and statistical analysis (**Figure 2**). The vapor intrusion pathway was determined to be incomplete based on the results of the additional soil gas sampling event. A copy of the 2010 RACR and PADEP approval are included as **Appendix D**.

- During partial UST closure activities in December 2016, the two existing product dispensers and associated piping were removed and replaced (**Figure 2**). On December 21, 2016, petroleum-impacted soil was observed beneath both dispensers. Heavily corroded product piping connectors were observed beneath each dispenser and were presumed to be the source of the petroleum release. A copy of the corresponding January 2017 UST Closure Report and NORR are included as **Appendix E**.

- Four soil samples were collected during the partial UST closure activities. Two samples were collected from below each dispenser island and two samples were collected below the product lines. All of the soil samples were analyzed for the PADEP post-March 2008 short list of unleaded gasoline parameters (BTEX, MTBE, cumene, naphthalene, 1,2,4-TMB, and 1,3,5-TMB). The analytical results (**Table 1**) from the soil samples exceeded the non-residential PADEP SHS at the following locations:

Dispenser 1 (D-1)	Naphthalene and 1,2,4-TMB
Dispenser 2 (D-2)	1,2,4-TMB
Line Sample 1 (LS-1)	Benzene

In addition, the laboratory method detection limit (MDL) exceeded the SHS for benzene and MTBE in soil sample D-1. Soil sample locations are depicted on **Figure 2**.

3.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

The Buffalo Creek Watershed lies within the Pittsburgh Low Plateau section of the Allegheny Plateau Region (Hughes 1933). The Pittsburgh Low Plateau section is considered a true plateau and is primarily composed of clastic shale bedrock and speckled with highly variable regions of sandstone, siltstone, coal and limestone (Briggs 1999).

According to **Figure 4A** (Map 7 Geologic Map of Pennsylvania) and **Figure 4B** (Map 42 and 43 - Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania), bedrock underlying the site is identified as Pennsylvanian Aged – Allegheny Group. The Allegheny Group is characterized by cyclic sequences of shale, limestone, sandstone, and coal.

According to the United States Department of Agriculture Natural Resources Conservation Service website (http://websoilsurvey.nrcs. usda.gov/app/WebSoilSurvey.aspx), soils in the area are classified as Wharton-Gilpin silt loams (WtD) and Sciotoville silt loam (ScC). The WtD has a landform of hillslopes. The parent material for the soil is residuum weathered from shale and siltstone. The WtD profile consists of silt loam, silty clay loam and clay loam, channery silty clay loam over bedrock and occurs in the northeastern 1/3 of the site. The ScC has landform in terraces with parent material of silty alluvium with a profile of mostly silt loam with loam occurring at the base. The ScC occurs in the south west 2/3 of the site.

3.2 Regional Hydrogeology

The site is located within the Lower Buffalo Creek Sub-Watershed (28.6 square miles) of the Buffalo Creek Watershed (171 square miles) of the Allegheny River Basin. The major waterways of the Lower Buffalo Creek Sub-Watershed include Pine Run, Cornplanter Run, and Sipes Run.

As stated in Section 2.1, the closest surface water body to the site is Buffalo Creek, which is located approximately 250 feet to the west. The elevation of the site is approximately 788 feet-msl; the elevation of Buffalo Creek is approximately 750 feet-msl. Buffalo Creek generally flows to the south; and joins the Allegheny River approximately 2,500 feet south of the site. Buffalo Creek has a water use protection designation of Trout Stocking (TSF) by the PADEP.

A review of the Freeport PA USGS 7.5-Minute Topographic Quadrangle map (**Figure 1**) shows the site to be located on the tail end of a west facing sharply cut river valley slope. Therefore, the direction of shallow groundwater flow is inferred to be to the west-southwest. Historical reports indicated groundwater flow was generally to the southwest at and in the vicinity of the site, with a minor component of flow to the southeast and northeast in southwest portion of the site.

4.0 SENSITIVE RECEPTOR SURVEY

In March 2017, Letterle performed a sensitive receptor survey of the area within 2,500 feet of the facility. The survey was performed to evaluate potential receptors in the area from impacted groundwater. The survey included a review of the surrounding land use, an assessment of underground conduits and utilities, and an investigation of groundwater usage in the vicinity of the site.

4.1 Surrounding Land Use

The surrounding land use consists of residential homes and mixed commercial properties (**Figure 3**). Site photographs are included in **Appendix C**. The following properties border the site:

- North – Residential (side-gradient);
- East – Residential (upgradient);
- Southeast – Residential – closest basement (side-gradient);
- South – Residential and auto dealership auxiliary lot (side-gradient);
- Southwest – Second Street Extension and Buffalo Street (side-gradient); and
- West and Northwest – Devereaux Motor Sales (Car Dealership) followed by Buffalo Creek (downgradient).

The closest identified property with a basement is a residence located approximately 100 feet side-gradient of the source area.

4.2 Underground Conduits and Utilities

On March 8, 2017, Letterle performed a utility survey utilizing several geophysical methods to identify underground utilities and conduits at the site. As part of the geophysical investigation, Letterle utilized radio-detection and frequency induction technologies. Radio-detection methods can detect ambient radio waves that are captured by linear subsurface features (i.e. pipes). Frequency induction methods provide a means to trace utilities from a known location, if available. This survey is performed by actively coupling the induction meter with the utility or inducing a current into the utility from the ground surface at a known location.

Subsurface anomalies detected by these methods were marked on the ground surface with temporary marking paint. Areas obscured by landscaping, retaining walls, or other large objects (cars, dumpsters, etc.) that are not accessible were not surveyed.

The following sections identify the utilities and subsurface conduits at and in the vicinity of the site (**Figure 2**) in order to identify potential preferred pathways for regulated constituents to potentially migrate at and beyond the Radhe Oil site.

- **Electric -** Electric service at the site is supplied by West Penn Power. Overhead electric power lines are located parallel to and along the western edge of Mill Street and the northern and southern edges of Buffalo Street. The service connection to the on-site building is located near the southwest building corner and is connected to a utility pole located at the southwest corner of the property. Service formerly entered the property from Mill Street; however, those power lines have been removed. The service line is approximately 20 feet above ground surface and enters the building at the west wall. A communication line enters the site from a pole located along Mill Street and connects to the northern edge of the on-site building.

- **Sanitary Sewer** - The Borough of Freeport provides sewer service at and in the vicinity of the site. During the sensitive receptor survey, sanitary sewer manholes were identified within Buffalo Street and Mill Street. The sanitary connection to the convenience store could not be identified; however, a schedule 80 PVC clean-out was observed in the northwest corner of the property.

- **Storm Sewer -** Several grated stormwater catch basins were identified on the shoulders of Buffalo Street and Mill Street. The depth of the storm drain catch basins ranged from 1.5 feet to 3.5 feet in depth. The collected stormwater discharges into Buffalo Creek to the west. On-site roof and canopy drains discharge to the ground surface.

- **Municipal Water** – The Municipal Authority of Buffalo Township (MABT) is the municipal water supplier for the local area. A municipal water distribution line is located parallel to the eastern portion of Mill Street and another is located parallel and within the southern portion of Buffalo Street. Multiple water valves were observed along each street associated with each building. The service line to the on-site building could not be located; however, a valve along Mill Street is the likely connection point to the on-site building. A fire hydrant was observed on the south side of Buffalo Street due south of the site. The depth of the water lines are unknown at this time but are anticipated to be below the frost line for the region (21-inches).

- **Natural Gas** - Natural gas is supplied to the area by Peoples Gas. Heating for the on-site building is provided by natural gas. A natural gas meter was observed to the east of the UST field at the site. Two natural gas line mains exist beneath Buffalo Street and Mill Street (4-inch steel low pressure and 6-inch steel high pressure).

4.3 Groundwater Usage

Groundwater usage was assessed within a 2,500 ft radius of the site. The assessment included reviewing the PaGWIS; contacting the local provider of municipal water and sanitary sewerage services and/or local municipal representatives for Freeport Borough.

The PaGWIS, located on the Pennsylvania Bureau of Topographic and Geological Survey website (www.dcnr.state.pa.us/topogeo/groundwater/PaGWIS), was reviewed to identify any private water wells within a radial search of 2,500 feet (~1/2 mile) of the site and any private wells within a 2,500 feet municipal criteria search in Freeport Borough.

According to the PaGWIS radial search, one well is located within the search radius. The well is located approximately 800 feet northwest of the site on the opposite side of Buffalo Creek (**Appendix F**). The well is listed as withdrawal for domestic use with a total depth of 232 feet bgs. Static water level is reported as 100 feet.

Since the inventory report is based solely on the data that is reported to the Pennsylvania Topographic and Geological Survey, it is possible that additional wells could exist within 2,500 feet of the site. Therefore, on March 1, 2017, Mr. Tom McCaffrey of the PADEP's Bureau of Safe Drinking Water was contacted. Mr. McCaffrey responded on March 2, 2017 stating that there were no community water supply wells or Zone 2 wellhead protection areas identified within a 2,500-foot radius of the site. Mr. McCaffrey noted a surface water intake for the BTMA located approximately 1/2 mile southwest of the site. According to Mr. McCaffrey, the BTWA provides municipal water in the site vicinity.

On March 2, 2017, Letterle emailed the MABT regarding public water supply availability, ordinance regarding water wells, water intake locations, and future plans for water usage within 1,500 feet of the site.

On March 3, 2017, MABT representative Kristine Donaldson responded that all properties within 0.25 mile of the site are supplied by the public drinking water system located in the Borough of Freeport, which is approximately 0.75 mile from the site (PWSID 5030019). Ms. Donaldson believes there is an ordinance prohibiting water wells. She did not know of any wells within the vicinity of the site.

4.4 Pennsylvania Natural Heritage Program

The PNHP (www.conservationexplorer.dcnr.pa.gov) was reviewed to evaluate for the presence of special concern species and resources. The PNHP enables the public to perform online searches for potential impacts to threatened, endangered, special concern species, and special concern resources in Pennsylvania. According to the PNHP report (**Appendix G**):

- One NHA (Allegheny River Pool #4) is located approximately 4.5 miles southwest, downstream along the Allegheny River (side-gradient). NHAs are sites that have been identified as critical habitat for species or natural communities of concern. This dataset is designed to identify, map and discuss areas that support species of concern, exemplary natural communities, and broad expanses of intact natural ecosystems that support components of Pennsylvania's native species biodiversity. These areas are prioritized based upon their ecological qualities and provided with recommendations regarding their management and protection. Most of the existing NHAs have been developed through PNHPs County Natural Heritage Inventories. The Allegheny River Pool #4 section of the Allegheny River provides habitat for eight species of concern.

- Two Local Parks were also identified (Freeport Community Park and Freeport Riverside Park). The Freeport Community Park is located approximately 0.25 miles northeast of the site and side-gradient. The Freeport Riverside Park is located approximately 0.50 miles southeast of the site and up-gradient. A local park is a publicly owned and publicly accessible park or natural area that engages participants of all ages in outdoor recreational experiences. Local parks and open spaces connect citizens to close-to-home outdoor recreation opportunities for play and physical activities; promote health and wellness, and environmental stewardship.

- One IBA is located in the vicinity of the site. Buffalo Creek Valley (IBA Site #22) includes Buffalo Creek, Little Buffalo Creek, Cornplanter Run, Rough Run, Snipes Run, Patterson Creek, and Marrowbone Run. IBA Site #22 covers a large region, approximately 140,800 acres downgradient, north-northwest of the site. The area is characterized as a mixing zone between southern (yellow-throated warbler, cerulean warbler, yellow-throated vireo, acadian flycatcher) and northern (magnolia warbler, brown creeper, purple finch) fauna. Buffalo Creek Valley runs adjacent to Todd Sanctuary. The sanctuary is managed as a natural area, protecting the upland and ravine forests typical to the area. Buffalo Creek Valley has been recognized as an area of high biological diversity and rare/endangered species.

5.0 INVESTIGATION METHODS AND PROCEDURES

5.1 Advancement of Soil Borings

A total of 18 borings were advanced in four separate phases during the site characterization. The following is a summary of dates and associated borings that were completed during each phase:

- August 24-25, 2017 — SB-1 through SB-6
- September 20-22, 2017 — SB-7 through SB-10
- July 26, 2018 — SB-12 through SB-17
- October 7, 2018 — SB-18

Approximately one week prior to each drilling event, the Pennsylvania One Call, Inc. was notified to alert area utility companies that subsurface work was to be conducted. Prior to drilling each pre-determined boring location was hand cleared or soft-dug with an air knife and vacuum system. A one-foot diameter by four-foot deep hole was made at each boring location. The borings were backfilled following clearing.

During drilling at each soil boring location, soil samples were collected continuously with Macro-Core® sampling devices using 2.25-inch diameter acetate liners (four feet in length) or with two-foot long splitbarrel samplers. All samples were collected in accordance with ASTM D1586-99 (standard test method for penetration test). The soil samples were logged in accordance with the USCS and were field screened for VOCs utilizing a PID using headspace analysis methods.

Decontamination procedures during each drilling event consisted of the setup of a decontamination pad, removal of heavy soil material from the tools, followed by a soapy water wash, potable water rinse, and air-drying. The drilling augers and equipment were cleaned with a high-pressure power washer prior to use at each location. The following sections describe the methodologies that were used to advance the borings during the various phases.

5.1.1 August 24-25, 2017

Based on the soil analytical data results obtained from the partial UST system closure in December 2016, six soil borings (SB-1 through and SB-6) were advanced to evaluate the horizontal and vertical extent of unleaded gasoline constituents that were potentially released to the subsurface at the site (**Figure 5**). The borings were advanced by Chatfield Drilling, Inc. (Chatfield) of Greenville, Pennsylvania, utilizing a truck-mounted CME-55 drill rig equipped with 4.25-inch I.D. hollow stem augers that created an 8.25-inch diameter borehole. Soil borings SB-1, SB-2, SB-4, and SB-6 were advanced to a depth of 25 feet bgs. Due to auger refusal (sandstone), soil borings SB-3 and SB-5 were advanced to 16 feet bgs and 15 feet bgs, respectively. Soil samples were collected continuously to the final depth at each location.

PID results ranged from 0.0 ppm to 15,000 ppm (SB-4, 9-11 feet bgs). Bedrock was encountered at depths ranging from 14.5 feet bgs (SB-5) to 23 feet bgs (SB-1 and SB-2) during drilling. Groundwater was encountered at approximately 24 feet bgs (SB-2 and SB-6). Detailed drilling logs (including PID results) are provided in **Appendix H**.

Discarded portions of the soil cores and decontamination waste were placed in three 55-gallon drums that were properly labeled and secured with a lid for disposal. The 55-gallon drum was loaded by McCutcheon Enterprises, Inc. (McCutcheon) and transported to the Carbon Limestone Landfill in Lowellville, Ohio on October 13, 2017. Waste disposal receipts are included in **Appendix I**.

5.1.2 September 20-22, 2017

Based on the data obtained from initial drilling activities, four additional soil borings (SB-7 through SB-10) were advanced at the following on-site locations:

- SB-7 was advanced approximately 36 feet northwest of the western unleaded gasoline dispenser
- SB-8 was advanced approximately 18 feet south of the western unleaded gasoline dispenser, along the southern property boundary
- SB-9 was advanced approximately 27 feet southwest of the western unleaded gasoline dispenser, near the southwest corner of the property
- SB-10 was advanced approximately 19 feet east of the convenience store

Previously installed SB-1 was converted into monitor well MW-1. Chatfield, under the supervision of a Letterle scientist, advanced the soil borings utilizing a truck-mounted CME-55 drill rig equipped with 4.25-inch I.D. hollow stem augers that created an 8.25-inch diameter borehole. Soil samples were collected continuously to the final depth at each location.

PID results ranged from 0.0 to 366.9 ppm in SB-10 (2 to 3.75 feet bgs). Sandstone bedrock was encountered at depths ranging from 20 feet bgs (SB-7) to 25 feet bgs (SB-8) during drilling. Bedrock was not encountered in SB-10. Groundwater was generally encountered at a depth ranging from 23.0 feet bgs (SB-8) to 25.5 feet bgs (SB-7). Detailed drilling logs (including PID results) are provided in **Appendix H**. Soil borings SB-7 through SB-10 were subsequently completed as monitor wells MW-2 through MW-5, as detailed in Section 5.4.

Discarded soil samples from the soil boring installation activities were collected and placed in 11 properly labeled 55-gallon drums. The 55-gallon drums were loaded by McCutcheon and transported to the Carbon Limestone Landfill in Lowellville, Ohio, Pennsylvania on October 13, 2017. Waste disposal receipts are included in **Appendix I**.

5.1.3 July 26, 2018

A total of five additional soil borings were advanced into the subsurface during the site characterization. On July 26, 2018, soil borings (SB-12 through SB-17) were advanced to further delineate petroleum impacts using direct push technology methods with a track-mounted Geo-Probe® 7822DT, under supervision of a Letterle scientist. It is noted that SB-11 does not exist and was never installed at the site.

Approximately one week prior to drilling, Pennsylvania One Call, Inc. was notified to alert area utility companies that subsurface work was to be conducted at the site. Prior to drilling, each pre-determined boring location was hand cleared by Chatfield to a depth of approximately 5 feet bgs to verify the absence of subsurface utilities.

During drilling at the boring locations, soil samples were collected continuously via a Macro-Core® sampling device using 2.25-inch diameter acetate liners, 4 feet in length. All samples were collected in accordance with the ASTM D1586-99 (standard test method for penetration test). The samples were logged in accordance with the United Soil Classification System and were field screened for VOCs with a PID using headspace analysis methods.

Soil borings SB-12 through SB-17 were advanced to final depth of 25 feet bgs, a depth within the first encountered water-bearing zone, in order to assess source soil impact in and around the former UST cavity. Field PID readings obtained during soil boring advancement activities ranged from ND to 1,345 ppm (SB-13/SS-1/0-2 feet bgs). One soil sample was collected from SB-12 through SB-17 for laboratory analysis. Soil samples were collected from intervals with the highest petroleum impact based upon PID headspace readings, and/or at the interval just above the soil/groundwater interface.

Soils encountered within each of the borings generally consisted of asphalt or concrete at the surface underlain by clay to depths ranging from 17-21 feet bgs. Clay overlies clayey sand and gravel to the final depth of each boring. Groundwater was generally encountered at depths ranging from 14 feet bgs (SB-15) to 19 feet bgs (SB-16).

5.1.4 October 7, 2018

After lengthy access negotiations with the off-site property owner (Devereaux Motor Sales), one off-site soil boring (SB-18) was advanced in an effort to further delineate and characterize the unleaded gasoline release. Chatfield, under the supervision of a Letterle scientist, advanced the soil boring utilizing a truck-mounted drill rig equipped with 4.25-inch inside diameter hollow stem augers that created an 8.25-inch diameter borehole. Soil samples were collected continuously to 25 feet bgs. Bedrock was not encountered during drilling. Groundwater was encountered at a depth of 18 feet bgs.

PID results were ND in all soil samples. A detailed drilling log (including PID results) is provided in **Appendix H**. Soil boring SB-18 was subsequently completed as monitor well MW-6, as detailed in Section 5.4

Discarded soil samples from the soil boring installation activities were collected and placed in two properly labeled 55-gallon drums. The 55-gallon drums were loaded by McCutcheon and transported to the Carbon Limestone Landfill in Lowellville, Ohio, on November 1, 2018. Waste disposal receipts are included in **Appendix I**.

5.1.5 December 12-17, 2018

Soil borings SB-19 and SB-20 were advanced for the purpose of installing pilot testing wells. Chatfield, under the supervision of a Letterle scientist, advanced the soil borings utilizing a truck-mounted drill rig equipped with 4.25-inch inside diameter hollow stem augers that created an 8.25-inch diameter borehole. The borings were installed to a final depth of 20 feet bgs. Neither bedrock nor groundwater was encountered during drilling.

Drilling logs are provided in **Appendix H**. Soil boring SB-19 was subsequently completed as monitoring point MP-3, as detailed in Section 5.4. Soil boring SB-20 was completed as soil vapor extraction (SVE) well SVE-1. In addition, previously advanced soil borings SB-13, SB-15, and SB-17 were over-drilled and completed MP-2, MP-1, and SVE-2, respectively. Well locations are depicted on **Figure 5**.

Discarded soil samples from the soil boring installation activities were collected and placed in two properly labeled 55-gallon drums. The 55-gallon drums were loaded by McCutcheon and transported to the Carbon Limestone Landfill in Lowellville, Ohio, on February 13, 2019. Waste disposal receipts are included in **Appendix I**.

5.2 Soil Sampling and Analysis

Criteria used to select soil samples for laboratory analysis from the various soil borings during the site characterization included the following:

- PID results;
- Visual evidence of staining;
- Petroleum odors; and
- ‘Clean’ confirmation samples.

The soils samples were placed in laboratory-supplied sample containers, labeled, and placed within an insulated cooler with ice to maintain a temperature below approximately 4ºC for preservation. Chain of custody documentation followed standard protocol.

The samples were submitted to Pace Analytical Services, Inc. (Pace) of Greensburg, Pennsylvania for analysis of unleaded gasoline parameters using USEPA SW-846 Method 8260B, in accordance with the storage tank regulations. The regulated unleaded gasoline parameters included the following:

- BTEX
- MTBE
- Cumene
- Naphthalene
- 1,2,4 – TMB
- 1,3,5 – TMB

A discussion of the soil analytical results is provided in Section 6.2.

5.3 Soil Geotechnical Sampling and Analysis

Geotechnical testing was conducted to evaluate site-specific geotechnical parameters that may affect groundwater and/or contaminant migration at and down gradient of the site. One Shelby tube was collected from soil boring location SB-10/SS-4 at a depth range of 6.4-6.9' bgs by Letterle on October 11, 2017. The Shelby tube was submitted to Geotechnics, Inc. of East Pittsburgh, Pennsylvania (Geotechnics) for geotechnical testing of the following parameters:

- Visual description
- Average specific gravity
- Moisture content
- Porosity
- Loss on Ignition

The geotechnical analytical results of the Shelby tube soil sample are detailed in Section 6.1.1.

5.4 Installation of Monitor Wells

Monitor wells MW-1 through MW-5 were completed during the site characterization from September 20-22 2017 to delineate the horizontal and vertical extent of the unleaded gasoline release. Monitor wells MW-1 through MW-5 were screened in the unconsolidated/weathered bedrock aquifer and are all located on the Radhe Oil property.

Monitor well MW-6 was completed on October 5, 2018 to delineate the horizontal extent of the unleaded gasoline release to the west of monitor well MW-2. Specifically, monitor well MW-6 was completed and screened in the unconsolidated/weathered bedrock aquifer on the adjacent property (Devereaux Motor Sales) to the west of the site.

Monitoring points MP-1 through MP-3 were completed from December 12-17, 2018 to serve as observation wells for planned remedial pilot testing. SVE wells SVE-1 and SVE-2 were also installed during this drilling event to serve as recovery wells for planning pilot testing. Well locations are shown on **Figure 5**. Construction details are summarized on **Table 2** and illustrated on drilling logs in **Appendix H**.

Monitor wells MW-1 through MW-5 were constructed with 20 feet of flush-threaded 2-inch diameter, schedule 40 PVC casing and ten feet of 0.010-inch factory-slotted PVC well screen. Monitor well MW-6 was constructed with 15 feet of flush-threaded 2-inch diameter, schedule 40 PVC casing and 10 feet of 0.010-inch factory-slotted PVC well screen. The annular space spanning the length of each well screen interval was filled with clean filter sand and extended to approximately two feet above the top of the well screen. A minimum two-foot thick bentonite pellet seal was placed on top of the sand pack in each well. The remaining annular space was filled with cement-bentonite grout. The monitor wells were completed with locking expansion caps and protected with flush-mount steel manhole covers set in 1.5-foot square concrete pads.

Monitoring points MP-1 through MP-3 were constructed with 3 feet of flush-threaded 2-inch diameter schedule 40 PVC casing and 17 feet of 0.020-inch factory-slotted screen. The annular space spanning the length of each well screen interval was filled with clean filter sand and extended to approximately one feet above the top of the well screen. A minimum two-foot thick bentonite pellet seal was placed on top of the sand pack in each well. The remaining annular space was filled with cement-bentonite grout. The monitor wells were completed with locking expansion caps and protected with flush-mount steel manhole covers set in 1.5-foot square concrete pads.

SVE-1 and SVE-2 were constructed with 3 feet of flush-threaded 4-inch diameter schedule 40 PVC casing and 17 feet of 0.020-inch factory-slotted screen. The annular space spanning the length of each well screen interval was filled with clean filter sand and extended to approximately one feet above the top of the well screen. A minimum two-foot thick bentonite pellet seal was placed on top of the sand pack in each well. The remaining annular space was filled with cement-bentonite grout. The monitor wells were completed with locking expansion caps and protected with flush-mount steel manhole covers set in 1.5-foot square concrete pads.

5.5 Monitor Well Development

Prior to groundwater sampling, all newly installed monitor wells were developed to remove fine-grained materials that may have entered the well during construction, and to ensure proper hydraulic communication with the well's respective aquifer. All wells were developed with a combination of a surge block and Proactive® 12-volt tempest/twister plastic submersible pump. The development water was collected and stored in properly sealed and labeled 55-gallon drums for off-site disposal. Waste disposal documentation is provided in **Appendix I**. Monitor well development sheets are included in **Appendix J**.

5.6 Professional Survey

Letterle retained Hampton in October 2017 to professionally survey the site, adjacent properties, soil borings, monitor wells, and other pertinent features. Hampton's survey included property boundaries, utility locations, building dimensions, and selected features of adjacent properties. The monitor well TOC elevations are included on **Table 3** and within the well construction logs in **Appendix H**.

5.7 Groundwater Sampling and Analysis

Groundwater samples were collected from the monitor wells for laboratory analysis during seven sampling events. The following is a summary of the groundwater sampling dates:

- October 13, 2017 — MW-1 through MW-5
- November 16, 2017 — MW-1 through MW-5
- January 29, 2018 — MW-1 through MW-5
- August 22, 2018 — MW-1 through MW-5
- October 15, 2018 — MW-1 through MW-6
- November 16, 2018 — MW-6 (confirmatory event)
- February 25, 2019 — MW-1 through MW-6

Prior to sample collection, the depth to groundwater in each well was measured using an electronic oil/water interface probe or water level meter accurate to the nearest 0.01 foot. After gauging the depth to water, groundwater was extracted using a ProActive® Mini Monsoon plastic submersible pump at a low flow rate of <0.5 liters per minute. The groundwater was passed through a flow-through cell that measured DO, pH, TDS, temperature, specific conductivity, and ORP. Measurements were recorded until they stabilized or for a maximum of 45 minutes per well. The purge water was collected and stored in properly sealed and labeled 55-gallon drums for off-site disposal (**Appendix I**).

The samples were submitted to Pace for analysis of unleaded gasoline parameters using USEPA SW-846 Method 8260B, in accordance with the storage tank regulations. The regulated unleaded gasoline parameters included BTEX, MTBE, cumene, naphthalene, 1,2,4-TMB, and 1,3,5-TMB. Groundwater samples were also collected from all monitor wells for TDS analysis. The groundwater analytical results are discussed in Section 6.3.

5.8 Aquifer Characterization

On October 17, 2017, Letterle conducted aquifer testing to further characterize the aquifer beneath the site. Rising-head slug testing was performed on on-site monitor wells MW-1 through MW-5.

The static water level and depth to bottom was measured in each monitor well prior to the slug test. A data logging pressure transducer was placed in each test well approximately 0.5 feet above the well bottom. A weighted PVC 'slug' was then lowered inside the test well and submerged within the water column. The water level was given time to stabilize before initiating the rising-head test. After the water level stabilized, the PVC slug was rapidly removed from the test well and the data logger recorded the dynamic water level as it recovered in the well.

The slug test data from each well was reduced with Super Slug™ (Starpoint Software), using the Bower and Rice Method for calculation of hydraulic conductivity. Aquifer slug testing results are discussed in Section 6.1.2.1. Slug test curves are shown in **Appendix K**.

6.0 INVESTIGATION RESULTS

6.1 Site Geology and Hydrogeology

6.1.1 Site Geology

The site-specific geology was interpreted from subsurface information generated during the site characterization. Beneath the asphalt surface, the lithology at and downgradient of the site generally consists of sandy clay ranging in depth from just below the asphalt surface to 25 feet bgs. An approximate 10 foot layer of clayey sand and gravel underlies the sandy clay to a depth of approximately 30 feet bgs, where weathered sandstone bedrock was encountered.

Soil boring and monitor well construction logs (**Appendix H**) were used to prepare geologic cross sections A-A' and B-B' to illustrate stratigraphic relationships across the site property. The cross section locations were selected to show lithology approximately parallel to and perpendicular to the groundwater flow direction. The cross section locations are indicated on **Figure 6**.

Cross section A-A' (**Figure 7**) illustrates stratigraphic relationships from the southwest boring (SB-18/MW-6) to the northeast boring (SB-10/MW-5). Beneath the asphalt/concrete pavement at each location, sandy clay extends to depths ranging from 16 to 21 feet bgs. Clayey sand and gravel underlies the sandy clay and extends to the terminus depth in each boring, with the exception of SB-7/MW-2. Weathered sandstone was encountered in SB-7/MW-2 at a depth of approximately 20 feet bgs beneath the sandy clay and extends to the terminus depth of 30 feet bgs. **Figure 7** also illustrates the static depth to groundwater in each well on October 15, 2018.

Cross section B-B' (**Figure 8**) illustrates stratigraphic relationships from the north boring (SB-15) to the southern boring (SB-8/MW-3). Beneath the asphalt/concrete pavement at each location, sandy clay extends to depths ranging from 12.5 to 25 feet bgs. Clayey sand and gravel underlies the sandy clay and extends to the terminus depth in SB-8 and SB-15. Weathered sandstone was encountered in SB-1, SB-2, and SB-3 at depths ranging from 15.5-23 feet bgs beneath the sandy clay and extends to the terminus depth in each boring. **Figure 8** also illustrates the static depth to groundwater in each well on October 15, 2018.

A Shelby tube soil profile sample was collected on October 11, 2017 by Letterle from the soil boring SB-10/SS-4 location at a depth range of 6.4-6.9 feet bgs and submitted to Geotechnics. The geotechnical laboratory report is included in **Appendix L**, and a summary of results are as follows:

Geotechnical Parameter	SB-10/6.3-6.9'
Visual description	Brown Clay
Average specific gravity	2.70
Moisture content (%)	22.9
Porosity	0.41
Loss on Ignition (%)	2.5

Fraction organic carbon (foc) is the organic carbon content of the soil. Foc was calculated using loss on ignition data collected during geotechnical testing in October 2017, divided by a conversion factor of 1.724. A foc of 0.015 was calculated based on a loss on ignition value of 0.025 (2.5%).

6.1.2 Site Hydrogeology

Groundwater was generally encountered in the shallow unconsolidated aquifer at approximately 25 feet bgs during drilling. Depth to groundwater measurements were collected during six sampling events at Radhe Oil during the site characterization. Groundwater gauging data is summarized on **Table 3**.

The water level measurements from the most recent groundwater gauging event conducted on February 25, 2019 ranged from 15.80 feet below TOC in MW-6 to 23.83 feet below TOC in MW-5. The calculated horizontal hydraulic gradient in the unconsolidated/weathered bedrock aquifer across the site is approximately 0.001 feet/feet, based on the groundwater elevation data for monitor wells MW-5 (764.67 ft-msl) and MW-2 (764.58 ft-msl) with a horizontal distance of 86 feet. A groundwater contour map was constructed for the most recent gauging event (February 25, 2019) and is illustrated on **Figure 9**. The apparent groundwater flow direction in the shallow unconsolidated aquifer is generally to the west, although the static water table is relatively flat.

6.1.2.1 Aquifer Slug Testing

Slug test curves are located in **Appendix K**. The calculated K values, as determined from rising-head (slug-out) aquifer testing (which is typically considered to be more reliable than falling-head (slug-in)), are shown below:

Unconsolidated/Weathered Bedrock Aquifer	
MW-1	11.71
MW-2	0.575
MW-3	9.37
MW-4	27.3
MW-5	0.628
Average K = 0.602 feet/day	

K = hydraulic conductivity

The results from the aquifer slug testing indicate monitor wells MW-2 and MW-5 are an order of magnitude less than MW-1, MW-3, and MW-4. A review of the slug test curves indicates that the adjusted time for slug testing performed at monitor wells MW-1, MW-3, and MW-4 was approximately one minute or less. Therefore, the K values calculated those monitor wells may not be representative of actual site conditions, The average K for the site was therefore calculated based on slug test results at MW-2 and MW-5.

6.1.2.2 Groundwater Flow Velocity

The apparent groundwater flow velocity (Vc) was calculated for the unconsolidated/weathered bedrock aquifer using the average K from monitor wells MW-2 and MW-5 as determined from slug test data collected on October 17 2017, groundwater gradient, and effective porosity by the following relationship (Freeze & Cherry, 1979):

$V_c = Ki/n$

where:

V_c = groundwater flow velocity (ft/day) (or average linear seepage velocity)
K = hydraulic conductivity (ft/day)
i = groundwater gradient (ft/ft)
n = effective porosity (% expressed as a decimal value)

The groundwater flow velocity was calculated using the above equation and following values.

K = 0.6015 feet/day
i = 0.001 ft/ft (from February 25, 2019 gauging data at monitor wells MW-5 and MW-2)
n = 0.41 (based on geotechnical data collected on October 11, 2017)

$V_c = Ki/n$
$V_c = (0.6015 \times 0.001)/0.41$
$V_c = 1.47 \times 10^{-3}$ ft/day

6.2 Soil Quality Evaluation

The analytical results for soil samples collected at or above the static water table during UST upgrade and site characterization activities were compared to the non-residential PADEP SHS. Laboratory analytical results exceeded the PADEP SHS in the following samples:

- Benzene in one soil sample (LS-1/3')
- Naphthalene in one soil sample (D-1/2')
- 1,2,4-TMB in seven soil samples (D-1/2'; D-2/2'; SB-1/11-13'; SB-13/15-17'; SB-15/2-4'; SB-15/7-9'; and SB-17/11-13')

In addition, the laboratory MDL exceeded the PADEP SHS for benzene and/or MTBE in the following or soil samples: D-1/2'; SB-13/15-17'; SB-15/2-4'; and SB-17/11-13. All other unleaded gasoline constituents were below the PADEP SHS.

To evaluate vapor intrusion into buildings, soil analytical results were also compared to the non-residential Soil SHS Vapor Intrusion Screening Values (SV_{soil}). Concentrations of benzene, naphthalene, and 1,2,4-TMB exceeded the SV_{soil} in one or more samples. Vapor intrusion, as it relates to potential exposure pathways (inhalation of volatile emissions) to human and ecological receptors, is discussed further in Section 7.4.3.2. The laboratory results for the soil samples are summarized on **Table 4**. The complete laboratory analytical reports are included in **Appendix L**.

Based on the PID readings and analytical results from the partial UST system closure and site characterization, petroleum-impacted soil is primarily located between the facility building and the existing dispenser island, in the general area of the former dispenser islands. **Figure 10** provides an illustration of the petroleum-impacted soil based only on laboratory analytical results from the UST closure and site characterization (**Table 4**). Based on the dimensions provided in **Figure 10**, and a broad generalization that the impacted soil layer is 15 feet thick (2-17 feet bgs), the volume of petroleum-impacted soil is approximately 629 yd^3 (approximately 944 tons).

However, the volume of petroleum-impacted soil is difficult to estimate because the thickness of impacted soils is not consistent across the site. For example, shallow impacts (<5 feet bgs) appear to be present primarily in the former and existing dispenser area (UST closure samples) and in the vicinity of soil boring SB-15. Petroleum-impacted soil at depths greater than 5 feet bgs are located in the vicinity of soil borings SB-1, SB-13, SB-15, and SB-17. Although not evident in the lab results, and therefore not depicted on **Figure 10**, petroleum-impacted soil likely also extends to soil borings SB-2 and SB-4 where high PID readings were recorded.

6.3 Groundwater Quality Evaluation

The analytical results from groundwater samples collected during the most recent inclusive sampling event (February 25, 2019) indicate that unleaded gasoline constituents are present in groundwater beneath the site. Only naphthalene was detected at concentrations above the PADEP SHS in monitor well MW-2 during the site characterization. All other COCs at all other wells have been non-detect or below the PADEP SHS (**Table 3**).

Laboratory analytical results from the groundwater samples collected on February 25, 2019 are illustrated on **Figure 11**. The laboratory analytical reports for all monitor well sampling events are enclosed in **Appendix L**.

Groundwater field screened parameter readings were obtained from monitor wells MW-1 through MW-6 during each groundwater monitoring event. The results from the most recent sampling event conducted on February 25, 2019 are as follows:

- Temperature ranged from 3.26 °C (MW-1) to 9.98 °C (MW-4);
- Conductivity ranged from 1.130 mS/cm (MW-4) to 3.058 mS/cm (MW-5);
- DO ranged from 0.37 mg/l (MW-2) to 2.57 mg/l (MW-4);
- TDS ranged from 736 mg/l (MW-4) to 1,987 mg/l (MW-5);
- pH ranged from 7.02 (MW-5) to 8.36 (MW-1); and
- ORP ranged from –148.0 mV (MW-2) to 70.0 mV (MW-5).

Field screened parameter readings for all monitor wells are summarized on **Table 5**. Overall, dissolved oxygen is generally present in groundwater at low concentrations indicating anaerobic conditions, with the exception of MW-4. Groundwater pH is slightly basic to neutral throughout the site. ORP readings generally indicate oxidizing conditions at the site, except in monitor wells MW-1 and MW-2. Field TDS readings indicate an average total dissolved solids concentration of 1,097 mg/l.

Laboratory analytical results for groundwater samples collected from monitor wells MW-1 through MW-5 during the site characterization indicated TDS concentrations ranged from 777 mg/l (MW-4) to 1,560 mg/l (MW-5). The average TDS value at the site was calculated at 1,171 mg/l. Therefore, the analytical results were compared to the SHS for non-residential used aquifers with TDS concentrations less than 2,500 mg/l (**Table 6**).

Based on a comparison of the analytical groundwater results for the site characterization to the Non-Residential Groundwater SHS Vapor Intrusion Screening Values (SV_{GW}), concentrations for regulated unleaded gasoline are below the SV_{GW}. Vapor intrusion, as it relates to potential exposure pathways (inhalation of volatile emissions) to human and ecological receptors, is discussed further in Section 7.4.3.4.

Based on the results of groundwater sampling events, the horizontal extent of the groundwater contaminant plume has been delineated. One unleaded gasoline constituent at a single well (MW-2) is periodically and only marginally above the SHSs.

7.0 CONCEPTUAL SITE MODEL

This CSM was developed to assess the nature and extent of regulated substances identified at the site and the potential routes of exposure for human health and ecological receptors. It is based on soil and groundwater data collected during the sampling events conducted to date, which are summarized in Section 6.2 and 6.3 of this report and **Tables 1, 3,** and **4**.

The CSM is intended to serve as the technical basis for evaluation of future investigation and response actions at the site, if needed. The CSM also provides for the identification of additional data needs that will affect the ultimate understanding of the potential risks. In doing so, the CSM focuses activities on potentially complete exposure pathways, bypassing those that do not warrant further attention.

7.1 Environmental Quality

The area in the immediate vicinity of the site has been influenced by human activities in the past, particularly development of residential and commercial properties along Buffalo Street to the south and Mill Street to the east (**Figure 3**). As indicated previously (Section 2.1), surface water drains via storm sewers and overland flow to Buffalo Creek, which is located approximately 250 feet southwest of the site. Buffalo Creek generally flows to the south; and joins the Allegheny River approximately 2,500 feet south of the site. Buffalo Creek discharges into the Allegheny River (in Freeport, Pennsylvania) located approximately 2,400 feet south of the site. Other contributors to degraded water quality likely include runoff from agricultural land, inadequate domestic sewage treatment, and runoff during winter treatment of roadways.

7.2 Environmental Media Evaluation

Based on the results of the site characterization, several regulated substances have been identified in soil (**Table 4**) and groundwater on-site (**Table 3**). The Pennsylvania Land Recycling Program (Act 2) established the PADEP SHSs that must be attained in order to obtain the liability protection provided for in Act 2. The applicable soil and groundwater screening levels used for this SCR are the non-residential standards for used aquifers with TDS concentrations less than or equal to 2,500 mg/l. The selected PADEP SHS are indicated on **Tables 3** and **4**.

7.3 Fate and Transport Analysis

Regulated substances (i.e. unleaded gasoline) that have been released at Radhe Oil have the potential to migrate in the environment. This section evaluates the potential for constituents detected in soil to impact groundwater quality and to migrate in groundwater from the site over time.

Soil samples collected during the partial UST system closure and site characterization activities indicated that benzene, naphthalene, and 1,2,4-TMB were detected at concentrations that exceeded the PADEP SHS

(**Table 4**). Groundwater samples collected during site characterization activities indicated that naphthalene periodically exceeds the PADEP SHS at a single well, MW-2 (**Table 3**).

7.3.1 Physical and Chemical Properties of Regulated Substances

The following briefly summarizes the physical and chemical properties of the regulated unleaded gasoline, constituents that would strongly influence their behavior within the subsurface:

- The BTEX compounds (light aromatics) have relatively high water solubility, are highly volatile, and absorb poorly to soils.

- Benzene is expected to be relatively mobile in the dissolved phase due to its relatively high aqueous solubility (1,781 mg/l) and relatively low tendency to adsorb to carbon in the subsurface (KOC=58 l/kg). Based on human epidemiological studies, benzene has been found to be a human carcinogen. Benzene is generally more mobile in soil and groundwater than xylenes, toluene, and ethylbenzene and would be expected to migrate further from the contaminant source.

- Toluene is expected to be relatively immobile in the dissolved phase due to its relatively low aqueous solubility (532 mg/l) and medium tendency to adsorb to carbon in the subsurface (KOC=130 l/kg).

- Ethylbenzene is expected to be relatively immobile in the dissolved phase due to its relatively low aqueous solubility (161 mg/l) and medium tendency to adsorb to carbon in the subsurface (KOC=220 l/kg).

- Total xylenes are expected to be relatively immobile in the dissolved phase due to the relatively low aqueous solubility (175 mg/l) and relatively high tendency to adsorb to carbon in the subsurface (KOC=350 l/kg).

- MTBE is expected to be relatively mobile in the dissolved phase due to its relatively high aqueous solubility (45,000 mg/l) and relatively low tendency to adsorb to carbon in the subsurface (KOC=12 l/kg). MTBE will generally migrate at or near the same velocity as the water in which it is dissolved. In addition, MTBE has a low potential to biodegrade. Based on its physical and chemical properties, MTBE is expected to have the greatest potential to migrate in the environment.

- Cumene is expected to be relatively immobile in the dissolved phase due to its relatively low aqueous solubility (50 mg/l) and relatively high tendency to adsorb to carbon in the subsurface (KOC=2,800 l/kg).

- Naphthalene is expected to be relatively immobile in the dissolved phase due to its relatively low aqueous solubility (30 mg/l) and relatively high tendency to adsorb to carbon in the subsurface (KOC=950 l/kg).

- Naphthalene and cumene are generally volatile and are very biodegradable. Naphthalene and cumene are expected to have the least potential to migrate in the environment and are generally found closer to the source of the impact.

- 1,2,4-TMB is expected to be relatively immobile in the dissolved phase due to its relatively low aqueous solubility (56 mg/l) and relatively high tendency to adsorb to carbon in the subsurface (KOC=2,200 l/kg).

- 1,3,5-TMB is expected to be relatively immobile in the dissolved phase due to its relatively low aqueous solubility (48.9 mg/l) and relatively high tendency to adsorb to carbon in the subsurface (KOC=660 l/kg). 1,2,4-TMB and 1,3,5-TMB were added to the PADEP's Petroleum Short List in March 2008.

7.3.2 Groundwater Flow Modeling

The site-specific geology was interpreted from subsurface information generated during the site characterization. Beneath the asphalt surface, the lithology at and downgradient of the site generally consists of sandy clay ranging in depth from just below the asphalt surface to 25 feet bgs. An approximate 10-foot layer of clayey sand and gravel underlies the sandy clay to a depth of approximately 30 feet bgs, where weathered sandstone bedrock was encountered. Groundwater was first encountered within the unconsolidated deposits at a depth of 25 feet bgs. On-site groundwater generally flows to the west toward Buffalo Creek. The hydraulic gradient at the site is 0.001 feet/feet.

Initial groundwater sampling results (November 16, 2017) indicated that only naphthalene had reached the property boundary (i.e., point of compliance [POC]) at concentrations above the PADEP SHS and naphthalene may be migrating in groundwater to the adjacent western off-site property. Fate and transport modeling is generally conducted to ascertain how far the contaminant plume is anticipated to migrate within 30 years, and to determine whether the impact would ultimately reach adjoining properties to the west, at the current rate of migration and assuming a continuing contaminant source. In addition, a fate and transport analysis would ordinarily determine whether the petroleum impact would ultimately reach the closest surface water receptor, Buffalo Creek, at the current rate of migration within 30 years.

As previously discussed in Section 5.4, off-site monitor well MW-6 was installed to further delineate the extent of naphthalene impact to groundwater. Based on the laboratory analytical results from groundwater samples collected in February 25, 2019, all unleaded gasoline constituents were below the PADEP SHS in MW-6. Naphthalene concentrations in monitoring well MW-2 have slightly exceeded the SHS on an infrequent basis. However, naphthalene concentrations in MW-6, located downgradient of MW-2, have been non-detect since being installed in 2018.

Fate and transport modeling was considered for the site. However, naphthalene concentrations detected in groundwater to date in MW-2 are at/very near the PADEP SHS and are non-detect in downgradient monitoring well MW-6. In addition, naphthalene is relatively immobile in groundwater and remedial actions are planned for the site that are expected to reduce petroleum impacted source material and limit contaminant loading into the groundwater plume. Therefore, naphthalene concentrations are unlikely to migrate off-site or adversely impact off-site receptors, including Buffalo Creek. Fate and transport analysis will be conducted, if necessary, following the completion of remedial actions.

7.4 Exposure Pathway Analysis

7.4.1 Introduction

An exposure assessment is an analysis that qualitatively evaluates the general exposure scenarios that would apply to the Radhe Oil facility. The objective of the exposure assessment is to estimate the type and magnitude of potential human and ecological exposure to the unleaded gasoline constituents identified in Section 2.0. For exposure to occur, the following components of the exposure pathway must exist:

- A source and mechanism of regulated substances released to the environment
- An environmental transport medium
- A point of potential exposure to the constituents
- An exposure route at the exposure point

As noted in the Pennsylvania Land Recycling guidance, if an exposure pathway is not complete, there is no need to further evaluate the potential risks. Based on the data from the site investigation, regulated substances have been identified in soil and groundwater. For these media, **Figure 12** identifies the potential exposure pathways. This figure shows the fate and transport processes that link the suspected source areas on the site to the potential receptors. The figure also notes which pathways are considered potentially complete or incomplete based on the four components identified above, and as discussed in the following sections. The potential exposure points include soil, groundwater, and surface water associated with the site.

7.4.2 Land Use

The potential exposure pathways for human and ecological receptors are based on the known land use scenario. In these exposure pathway scenarios, the foreseeable future land use is based on local and regional historical use of the land as well as any development plans and zoning regulations existing for Freeport Borough and adjacent governmental entities. The following briefly discusses the current and future land use assumptions inherent in the exposure pathway analysis:

The surrounding land use consists of residential homes and mixed commercial properties. The following properties border the site:

- North – Residential (side-gradient);
- East – Residential (upgradient);
- Southeast – Residential – closest basement (side-gradient);
- South – Residential and auto dealership auxiliary lot (side-gradient);
- Southwest – Second Street Extension and Buffalo Street (side-gradient); and
- West and Northwest – Devereaux Motor Sales (Car Dealership) followed by Buffalo Creek (downgradient).

Sensitive receptors include Buffalo Creek, which is located approximately 250 feet southwest of the presumed release location. Several residential properties are located hydraulically downgradient and within the 2,500 foot radius of Radhe Oil, all of which are connected to the city water supply. The following describes the current site conditions:

- The subject property currently operates as a gasoline service station and convenience store. Asphalt primarily covers the ground surface on the usable portions of the site. Grass and vegetation is located on the north, east and western boundaries of the site. Gravel is located adjacent to the north wall in the area of a former waste oil UST.

- The current land use scenario is not anticipated to change in the near future. There is apparently no deed restriction currently on the property.

7.4.3 Potential Pathways of Exposure

Based on the current and future land use assumptions in the exposure pathway analysis, the following are the potential soil, groundwater and surface water pathways of exposure considered for the facility:

7.4.3.1 Direct Contact for the Soil Pathway

Direct contact for the soil pathway by human receptors is by ingestion and dermal absorption. The ground surface at the Radhe site predominantly consists of concrete and asphalt, which effectively renders the current exposure pathways incomplete. However, future construction or utility workers could possibly be exposed for a limited time to subsurface material while excavating. In addition, analytical results from soil samples collected during UST closure and site characterization activities indicated that concentrations were above the PADEP SHS for regulated unleaded gasoline constituents. Therefore, the direct contact with soil pathway by future site utility and construction worker receptors via incidental ingestion or dermal adsorption is currently considered to be a potentially complete exposure pathway. Remedial actions are planned to mitigate these potentially complete future pathways.

7.4.3.2 Indirect Contact for the Soil Pathway

Indirect contact for the soil pathway by human receptors is inhalation of volatile emissions, as assessed per the Technical Guidance Manual for Vapor Intrusion into Buildings from Groundwater and Soil under Act 2 (January 18, 2017). Soil analytical results from the UST closure and site characterization were compared to the non-residential Soil SHS Vapor Intrusion Screening Values (SV_{soil}). Concentrations of regulated unleaded gasoline constituents exceeded the SV_{soil} in one soil sample (SB-15/2-4'), located within 30 feet of the facility building. Therefore, indirect contact for human receptors via inhalation is currently considered to be a complete current and future exposure pathway. Remedial actions are planned that will mitigate and render this potential pathway incomplete. Soil gas vapor points will be installed and sampled to further evaluate this pathway, as detailed in Section 11.3.

7.4.3.3 Direct Contact for the Groundwater Pathway

Direct contacts for the groundwater pathway by human receptors are ingestion and dermal absorption. Based on the available information presented in Section 4.3, all developed properties within the Borough of Freeport and within 0.25 miles of Radhe are supplied by public water and there are no known potable wells in the vicinity of the site. In addition, the average depth to water at the site is greater than 15 feet bgs; therefore, it is unlikely that future construction or utility workers would encounter petroleum-impacted groundwater. Direct contact for human receptors via ingestion and dermal absorption is currently considered to be an incomplete exposure pathway; however, since groundwater use is not restricted, future human exposures via potable well use is a potentially complete pathway.

7.4.3.4 Indirect Contact for the Groundwater Pathway

Indirect contact for the groundwater pathway by human receptors is inhalation of volatile emissions. IAQ from the vapor intrusion of contaminants into buildings from groundwater was assessed as per the Technical Guidance Manual for Vapor Intrusion into Buildings from Groundwater and Soil under Act 2 (January 18, 2017). The depth to the static water table (>15 feet bgs) is greater than 5 feet below the building foundation (slab on grade). The predominant soil type (sandy clay) is generally considered to be "soil-like", as defined by PADEP technical guidance. As detailed in Section 4.2, the depth of utility laterals (water/sewer/gas) is approximately 3-4 feet bgs, which is above the static water table depth. Furthermore, utility laterals (unlike mains) are often backfilled with native materials and would not be considered a preferential pathway. Therefore, screening with the Groundwater SHS Vapor Intrusion Screening Values (SV_{GW}) is considered to be appropriate for this site. Groundwater analytical results were below the non-residential SV_{GW}. Therefore, the indirect contact for the groundwater pathway for human receptors via inhalation is currently considered to be an incomplete exposure pathway for current and future land use scenarios.

7.4.3.5 Direct Contact for the Surface Water

In general, human health receptors to impacted surface water can occur via dermal contact, ingestion, and inhalation of vapors (volatilization). The nearest surface water body is the aforementioned Buffalo Creek located approximately 250 feet to the southwest of the source.

However, the extent of unleaded gasoline constituents in groundwater has been delineated and is not likely to migrate beyond the property boundary at concentrations above the SHS or Chapter 93 Fish and Aquatic Life Criteria. Therefore, the direct contact for the surface water pathway for human and ecological receptors is currently considered to be an incomplete exposure pathway.

7.4.3.6 Evaluation of Ecological Receptors

As per §250.311 of PA Act 2, all sites remediated to the PADEP SHS must be screened for impacts to ecological receptors. However, since the SHS for petroleum compounds are generally protective for ecological receptors, further ecological screening is unnecessary at sites where jet fuel, gasoline, kerosene, #2 fuel oil, or diesel fuel are the only constituents detected on-site. Since the regulated substance released at the site was unleaded gasoline, and only petroleum products were handled at the site, an ecological assessment is not necessary.

7.4.3.7 Summary

Based on the above evaluation, indirect exposure to soil contaminants via vapor intrusion appears to be the only potentially complete current exposure pathway. Whether this is actually a current potentially complete pathway will be determined via planned soil gas sampling. Potentially complete future pathways include:

- Direct contact with soil by future site utility and construction worker receptors via incidental ingestion or dermal adsorption.

- Direct contact with groundwater via ingestion and dermal absorption through future potable well use.
- Indirect contact with soil by inhalation of volatile emissions via vapor intrusion into future buildings.

8.0 SITE CHARACTERIZATION SUMMARY

During partial UST closure activities on December 21, 2016, petroleum-impacted soil was observed beneath both dispensers. Heavily corroded product piping connectors were observed beneath each dispenser and was presumed to be the source of the petroleum release.

Four soil samples were collected during the partial UST closure activities, two from below each dispenser island and two below two product lines. The analytical results from the soil samples exceeded the PADEP SHS at the following locations:

Dispenser 1 (D-1)	Naphthalene and 1,2,4-TMB
Dispenser 2 (D-2)	1,2,4-TMB
Line Sample 1 (LS-1)	Benzene

The laboratory MDL exceeded the SHS for benzene and MTBE in soil sample D-1.

Findings of the site characterization include the following:

- A sensitive receptor survey performed within 2,500 feet of the facility indicated that the surrounding area generally consists of residential homes with basements and mixed commercial properties.
- According to the PaGWIS, one well is located within the search radius. The well is located approximately 800 feet northwest of the site on the opposite side of Buffalo Creek. The well is listed as withdrawal for domestic use with a total depth of 232 feet bgs. Static water level is reported as 100 feet.
- Eighteen soil borings (SB-1 through SB-18) were advanced to characterize the December 2016 unleaded gasoline release. Six soil borings were converted into five on-site monitor wells (MW-1 through MW-5) and one off-site monitor well (MW-6) to investigate the potential petroleum release at the site. All wells were installed within the unconsolidated/weathered bedrock aquifer.
- The site-specific geology was interpreted from subsurface information generated during the site characterization. The lithology at and downgradient of the site consists of clay with sand ranging from approximately 0 to 25 feet bgs, underlain by 3 to 10 feet of sand with clay and gravel. The sand with clay and gravel is underlain by weathered sandstone bedrock to boring termination at 30 feet bgs.
- The analytical results for soil samples collected at or above the static water table during UST upgrade and site characterization activities were compared to the non-residential PADEP SHS. The analytical results from the soil samples collected at or above the static water table exceeded the non-residential PADEP SHS for the following:

- Benzene in one soil sample (LS-1/3')
- Naphthalene in one soil sample (D-1/2')
- 1,2,4-TMB in seven soil samples (D-1/2'; D-2/2'; SB-1/11-13'; SB-13/15-17'; SB-15/2-4'; SB-15/7-9'; and SB-17/11-13')

The laboratory MDL exceeded the PADEP SHS for benzene and/or MTBE in the following or soil samples: D-1/2'; SB-13/15-17'; SB-15/2-4'; and SB-17/11-13. All other COCs at all remaining soil borings were less than the PADEP SHS.

- The volume of petroleum-impacted soil is difficult to estimate but was conservatively calculated at approximately 629 yd^3 (approximately 944 tons).

- Aquifer slug testing was performed to determine hydraulic conductivity values in the unconsolidated/weathered bedrock aquifer. The slug test results indicated that the average hydraulic conductivity was 0.6015 feet/day.

- Groundwater was encountered within the unconsolidated shallow aquifer at depths ranging from 15.80 feet below TOC in MW-6 to 23.83 feet below TOC in MW-5. Based on the groundwater elevation data for monitor wells MW-5 (764.67 ft-msl) and MW-2 (764.58 ft-msl), the calculated horizontal hydraulic gradient in the unconsolidated shallow aquifer across the site is approximately 0.001 feet/feet. The apparent groundwater flow direction in the shallow aquifer is to the west.

- Analytical groundwater results from the most recent sampling event conducted on February 25, 2019 indicated naphthalene periodically exceeds the PADEP SHS in MW-2. All other regulated unleaded gasoline parameters are below the PADEP SHS in all site wells.

- The following potentially complete exposure pathway exists for current human receptors at the site: indirect contact with soil by inhalation of volatile emission via vapor intrusion into buildings. However, remedial actions are planned that will mitigate this potentially complete exposure pathway.

- The following potentially complete exposure pathways exist for future receptors at the site:

  - Direct contact with soil by future site utility and construction worker receptors via incidental ingestion or dermal adsorption.

  - Direct contact with groundwater via ingestion and dermal absorption through future potable well use.

  - Indirect contact with soil by inhalation of volatile emissions via vapor intrusion into future buildings.

9.0 REMEDIAL ACTION EVALUATION AND GOALS

Letterle evaluated potential remedial options suitable for the Radhe site. The options considered are those regarded to be most effective based on known site conditions, remedial objectives, current regulations as outlined in the Corrective Action Process Regulations (Pennsylvania Code Chapter 245) and Pennsylvania Act 2 (Pennsylvania Code 250), anticipated implementation and operation costs, and the estimated time required to accomplish the remedial goals.

Many remedial options are potentially capable of having some positive effect in reducing the current unleaded gasoline concentrations in soil or groundwater at this site. However, many of the remedial options alone are not likely to attain the PADEP SHS for soil and groundwater in a timely or cost effective manner, if at all. Similar limitations are present with remedial options that generally address only one media such as soil vapor extraction (SVE) and groundwater extraction (i.e., “pump and treat”). The single media remedial options will not be considered since soil and groundwater currently exceed the applicable PADEP Statewide Health Standards at the site; however, testing of these technologies can provide data that is used in remedial technology design.

To facilitate evaluation of multiple remedial approaches, the initial set of technologies was arranged into broad categories (e.g. Institutional Controls) and subcategories (e.g. Deed Restrictions) where the specific technologies were evaluated within the appropriate subcategory. **Tables 7** and **8** identify the categories and potential remedial technologies considered for soil and groundwater, respectively, and the rationale for retaining technologies for further consideration.

Based on the factors described above, the remedial options evaluated for the Radhe site include the following:

- Institutional and/or Engineering Controls (applicable to sites seeking to attain PADEP’s site-specific remedial standards)
- Monitored Natural Attenuation (MNA)
- Enhanced In-Situ Bioremediation
- In-Situ Adsorption
- Soil Vapor Extraction
- Limited Soil Excavation

9.1 Institutional and/or Engineering Controls

A land use risk strategy refers to the management of risks through the control of current and future use of real property. Land use controls include both institutional and engineering controls, which restrict the use of, or limit access to, real property to prevent or reduce risk to human health and the environment or to safe guard the integrity of the remedy.

Institutional controls include legal mechanisms such as restrictive covenants, negative easement, equitable servitudes, and deed notices, and administrative mechanisms such as notices, adopted local land-use plans and ordinances, construction permitting, and other existing management systems to ensure compliance with land-use restrictions.

Engineering controls include a variety of physical mechanisms to contain or reduce contact with contamination or physical barriers to limit access to the property such as capping systems, fencing, grating, or signs.

The use of institutional controls and/or engineering controls at the site may be a viable remedial technology, but is not currently a favorable option for the property owner at this time, who is pursuing PADEP's non-residential SHS cleanup standard (the owner's cleanup goals would need to be relaxed in order to implement institutional or engineering controls).

9.2 Monitored Natural Attenuation

MNA is a remediation method that relies on natural attenuation mechanisms to degrade and reduce concentrations of constituents of concern in groundwater. The natural processes involved are physical, chemical, and biological in nature such as dispersion, dilution, volatilization, sorption, and biodegradation. Biodegradation is the process that accounts for the majority of mass removal and associated concentrations reduction for constituents of concern. The objective of MNA is to employ natural physical, chemical, and biological processes such as dispersion, dilution, volatilization, sorption, and biodegradation to degrade and reduce unleaded gasoline parameters in the groundwater below the PADEP SHS.

The results of groundwater field parameter readings obtained from all site monitor wells on February 25, 2019 are as follows:

- Temperature ranged from 3.26 ^{o}C (MW-1) to 9.98 ^{o}C (MW-4);
- Conductivity ranged from 1.130 mS/cm (MW-4) to 3.058 mS/cm (MW-5);
- DO ranged from 0.37 mg/l (MW-2) to 2.57 mg/l (MW-4);
- TDS ranged from 736 mg/l (MW-4) to 1,987 mg/l (MW-5);
- pH ranged from 7.02 (MW-5) to 8.36 (MW-1); and
- ORP ranged from –148.0 mV (MW-2) to 70.0 mV (MW-5).

Field screened parameter readings for all monitor wells are summarized on **Table 5**. Overall, dissolved oxygen is generally present in groundwater at low concentrations indicating anaerobic conditions, with the exception of MW-4. Groundwater pH is slightly basic to neutral throughout the site. ORP readings generally indicate oxidizing conditions at the site, except in monitor wells MW-1 and MW-2. Field TDS readings indicate an average total dissolved solids concentration of 1,097 mg/l.

MNA is currently considered to be a viable remedial strategy due to the limited areal extent of subsurface impact and relatively low concentrations of naphthalene, and will be further evaluated during future groundwater sampling events.

9.3 Enhanced In-Situ Bioremediation

Enhanced in-situ bioremediation is a technology that utilizes indigenous microorganisms within the subsurface in combination with supplemental added amendments to breakdown complex compounds into simpler, non-toxic compounds without removal of aquifer material. The objective of enhanced in-situ bioremediation at the site is to stimulate the growth and reproduction of indigenous microorganisms to enhance biodegradation of captured dissolved-phase petroleum hydrocarbon constituents in the saturated zones. Enhanced in-situ bioremediation is typically active in the subsurface for a much greater time, when compared to other direct chemical injection methods.

For biodegradation to occur in the subsurface environment, the following basic components are necessary:

- Appropriate microbial population that are able to degrade petroleum products;
- Carbon source for energy;
- Presence of suitable electron acceptors (i.e. DO, nitrate, sulfate, etc.);
- Nutrients for bacteria growth (nitrate and phosphorus); and
- Appropriate environmental conditions for microbial activity (i.e., temperature, pH, concentration of pollutants, etc.)

If the microbial population is not present, electron addition is not suitable for the application. The stimulation of the indigenous microbial population (bacteria) and the enhancements to the above detailed subsurface environment are dependent on the injected materials reaching the desired treatment area, and to ultimately reach the microorganisms and contaminants therein.

9.4 In-Situ Adsorption

ISAD is the direct injection of a chemical mixture (e.g. activated carbon) into the subsurface that adsorbs dissolved-phase petroleum hydrocarbon constituents in groundwater and allows for long term capture. This technology is highly effective at sites with low petroleum concentrations, and the chemicals can be injected into a source or residually impacted areas of a site. The adsorption process requires direct contact of the injected material with the groundwater; therefore, direct injection into an injection well is typically the most viable delivery method.

9.5 Soil Vapor Extraction

SVE is a remediation method that consists of extracting soil vapor from the subsurface utilizing an appropriate vacuum blower or pump. The goal of SVE technology at this site would be to remove adsorbed phase hydrocarbons from the subsurface soils to attain the PADEP SHS on-site. The application of SVE in a full-scale system will facilitate the mass recovery of hydrocarbons by creating a pressure gradient toward each recovery well, which will in turn enhance the bio-degradation in the subsurface by the movement of air through the subsurface.

The depth to groundwater (approximately 21 to 23 feet bgs in the area of on-site soil impacts to be remediated) will allow for the use of well screens in recovery wells above the water table without the use of groundwater drawdown by submersible groundwater pumps. Pilot testing results should provide sufficient engineering data to finalize the design of a full scale continually-operating extraction system.

Therefore, Letterle performed SVE system pilot testing at the site to further evaluate SVE as a potential viable remedial strategy for the site.

9.5.1 SVE System Pilot Test

Letterle performed an SVE pilot test at the Radhe Oil property on February 21 and February 22, 2019 in order to determine the following:

- Evaluate indicators to determine feasibility of the technology based on site geology and site-specific conditions;
- Determine whether vapor extraction would provide a reduction of adsorbed-phase COCs;
- Determine whether, and to what extent, groundwater mounding due to the vapor extraction would occur, and attempt to pattern an extraction schedule to minimize groundwater mounding at the site;
- Characterize the airflow distribution in the subsurface including pneumatic ROI, vapor extraction flow rate and pressure, and extraction schedule; and,
- Provide data to validate the design of the full-scale remedial system.

The SVE pilot test involved the recovery of subsurface vapor from each of the installed vertical extraction wells (SVE-1 and SVE-2), while monitoring induced vacuum and vapor concentrations in surrounding vapor well points (MP-1 through MP-3) and monitoring wells (MW-1 though MW-6) at the site. Recovery well SVE-1 was initially tested on an individual basis to obtain key design parameters and attainable vacuum levels. Both extraction wells (SVE-1 and SVE-2) were then tested in combination. Groundwater elevations were measured in the existing monitoring well network and evaluated for possible groundwater table mounding during the application of subsurface vacuum. Based on gauging data, vacuum measurements were collected from monitor wells with open screen intervals (depth to water below the top of screen). The short term SVE pilot test was conducted over a period of approximately 2 days (approximately 6 hours per SVE pilot test).

The following key criteria from the pilot test demonstrates that SVE is a technically feasible remedial option:

- The design air extraction rate realized during the test was 6.26 scfm per foot of well screen, with an applied vacuum of 54 in H20, indicating suitable extraction rates.
- The groundwater response, defined by groundwater mounding of 0.20 feet or more at a distance from the extraction point of at least 10 feet in multiple directions, was not observed in any monitor wells. A mounding distance could not be calculated from the observed results.
- The maximum attainable vacuum realized during the extraction was near 50 in H_2O, indicating that a regenerative blower could be used without any water entrainment into the system;
- The pneumatic ROI, as defined by an observed vacuum of 0.10 in H_2O after stabilization of the readings, was calculated at a distance of 50 feet (**Figure 13**).
- The attainable vapor extraction rate (213 scfm) was greater than three times the subsurface pore volume in the impacted area, ensuring the complete removal of all subsurface vapor in one day.
- The VOC recovery rate in the extracted vapor calculated from the analytical results was substantial and would likely result in contaminant reduction.

9.5.2 Soil Vapor Extraction Pilot Test Summary

The results of the pilot test indicate that SVE technology is a viable remedial strategy at the site. The benefits of this technology include a relatively small footprint for the remedial equipment and no waste water disposal costs. Details of the complete SVE pilot test are described in the Soil Vapor Extraction Pilot Test Report provided in **Appendix M**.

9.6 Limited Soil Excavation

The objective of limited soil excavation is to remove petroleum hydrocarbon impacted “source” material to reduce the potential risks associated with the petroleum hydrocarbons in soil at the Radhe site and to accelerate the rate at which groundwater is remediated to the PADEP SHS at the site.

Based on the PID readings and analytical results from the partial UST system closure and site characterization, petroleum-impacted soil is primarily located between the facility building and the dispenser island (**Figure 10**). Based on the dimensions provided in **Figure 10**, and a broad generalization that the impacted soil layer is 15 feet thick (2-17 feet bgs), the volume of petroleum-impacted soil is approximately 629 yd^3 (approximately 944 tons).

As previously discussed, the thickness of petroleum-impacted soil is not consistent across the site. Shallow impacts (<5 feet bgs) appear to be present primarily in the dispenser area (UST closure samples) and in the vicinity of soil boring SB-15. Petroleum-impacted soil at depths greater than 5 feet bgs are located in the vicinity of soil borings SB-1, SB-13, SB-15, and SB-17.

An excavation depth of at least 17 feet bgs would be required and would likely extend from the existing canopy to soil borings SB-13 and SB-15. Therefore, due to the location of the current UST system, dispensers, and convenience store, limited soil excavation is not currently considered to be a viable remedial strategy for the identified 2016 release at the site.

10.0 CONCEPTUAL REMEDIAL STRATEGY

The targeted goal of the remedial strategy at this site is the attainment of the PADEP SHS for used aquifers at a non-residential property with a TDS concentration of less than or equal to 2,500 mg/l. The findings of the site characterization indicated that the remedial action goal has not currently been achieved.

Therefore, based on the extent of petroleum-impact to the soil; the geologic lithology immediately beneath the site; and pilot testing results; SVE combined with a dual ISAD/enhanced in-situ bioremediation technology was determined to be the most technically feasible and cost-effective remedial strategy to achieve the goals of the remedial action in a timely manner. Components of this remedial strategy are detailed in the following sections.

10.1 Soil Vapor Extraction

10.1.1 SVE Remediation Well Layout

A Remedial System Design Report is included in **Appendix N**. The number of SVE recovery wells necessary to encompass the unleaded gasoline impacted area of the site was determined based on the pneumatic ROI of 50 feet, calculated during the pilot test. The complete SVE system is designed to extract simultaneously from the two existing vertical SVE recovery wells:

- Recovery well SVE-1 was installed in the area of on-site soil impacts to be remediated, approximately 15 feet west of the former north dispenser (**Figure 10**); and
- Recovery well SVE-2 was also installed in impacted soil area, approximately 5 feet south of the former north dispenser (**Figure 10**).

After boring advancement to the final depths, wells were constructed per the following specifications: SVE-1 and SVE-2 are constructed of 4-inch PVC with a screened interval from 3 to 20 feet bgs.

10.1.2 SVE Remedial System

The SVE system will achieve pneumatic influence of the impacted areas by developing a sufficiently large ROI to remediate the contaminant vadose zone.

The SVE system will apply vacuum to the two SVE wells continuously (due to the length of screen in each well). The design and equipment sizing is based on the pilot test results and the friction losses in piping to the furthest SVE-2 well around the building.

Groundwater will not be recovered during the remediation process; however, any moisture extracted by the SVE blower from the recovery wells to the equipment compound will be collected in an AWS. If the AWS becomes full, a high-level switch will activate a transfer pump to remove and pass the groundwater to an onsite storage tank. The collected water will be removed by a licensed disposal company. A high-level float in the tank will shut the system down if it becomes full. The recovered vapor stream will be directed from the blower through a vapor treatment system of activated carbon prior to atmospheric discharge.

10.1.3 SVE System Equipment Specifications

10.1.3.1 Regenerative Vacuum Blower

A regenerative vacuum blower with a 10-hp XP motor will provide the vacuum application to the subsurface. Based on pilot test data and additional friction losses, the vacuum blower will be operated to provide a total flow rate of 213 scfm at 64 in H_2O. The operational requirements for this system are 60-Hz, three-phase, 230-volt power with a running 28-ampere requirement.

10.1.3.2 AWS

If moisture is removed by the SVE blower, it will collect in an AWS. The AWS is a steel tank configuration that will create a reduction in fluid velocity and allow sufficient residence time for the separation of water and vapor. Air within the AWS will be discharged through the top of the unit, while water collects at the bottom. A water level sensor installed within the AWS unit will serve as a fail-safe for the entire system, should water levels rise too high in the tank.

10.1.3.3 Vapor Phase Granular Activated Carbon

The vapor treatment system will consist of two 600-pound vapor-phase GAC units. The 600 pound vapor-phase GAC units are rated for a maximum pressure of five psi and a maximum airflow rate of 600 scfm.

The GAC units will be connected in a series arrangement. The primary GAC unit will reduce hydrocarbon concentrations in the vapor stream to nominal levels. The secondary GAC unit will eliminate any residual concentrations prior to final discharge. Analytical results from the primary unit that exceed 50% of the influent hydrocarbon concentrations will indicate breakthrough of the primary GAC unit. Upon breakthrough, the secondary GAC unit will be moved to the primary position and the spent GAC unit will be replaced with regenerated carbon. The spent GAC will be removed from the site for regeneration.

10.1.4 SVE Remediation System Construction

The treatment system will be installed within an enclosed 8 feet by 16 feet by 8 feet high trailer staged at the site. The trailer will house the influent SVE manifold including vacuum gauges, flow meters, and all associated valves and piping, an AWS, and the vacuum blower. The control panel will be mounted to the outside front of the trailer wall. The two vapor GAC units will be placed adjacent to the enclosure.

A SVE intake manifold will be constructed inside the enclosure to facilitate system adjustments and monitoring. Valves will be installed on the individual extraction lines to allow for separate vacuum adjustments in each well. A vacuum gauge will be mounted on the intake manifold to monitor applied vacuum.

The vapor flow will be calculated using manufacturer blower curves. Fault controls and probes will be installed to protect the remediation system from overfills and failures. The entire system will be protected by an electronic control system that will de-energize the system in the event of a fault or malfunction. The system controls will be included in a control panel enclosure, placed on the outside of the enclosure.

The trailer will be staged along the western edge of the Radhe property and will be insulated and heated to protect the remediation system from freezing during cold weather. A fenced area surrounding the remediation trailer will be constructed to accommodate the system. The fenced area will be approximately 24 feet by 12 feet in size and consist of an 8-foot high privacy fence with an access gate.

The SVE wells will be connected to the recovery system via subsurface extraction piping installed within a trench from the wells to a location near the western corner property boundary. The SVE piping will consist of two-inch diameter schedule 40 PVC, which will be individually connected to each recovery well. Construction-grade 2B-washed stone will be installed around the subsurface piping and completed in lifts to the existing surface grade. Manholes will provide access to the wells and piping. The piping laterals will be installed at a depth of 3 feet bgs to the proposed trailer location. A well vault will be installed at the trailer location, where the subsurface piping will be connected to the treatment trailer.

10.1.5 SVE Remediation System Controls and Recording Devices

The vapor flow will be calculated using manufacturer pump curves. Fault controls and probes will be installed to protect the remediation system from overfills and failures. The entire system will be protected by an electronic control system that will de-energize the system in the event of a fault or malfunction.

The remedial system will be equipped with a wireless remote access system for PLC based control systems that includes a P & ID user interface that will display status of all inputs, outputs and alarms and will allow for Hand/Off/Auto (HOA) control of all motors, valves or other auxiliary outputs. The system will be accessible from any computer or mobile device with access to the internet. Full access includes the remote reset of alarms, remote shutdown and restart. The system will also have datalogging capabilities. The PLC control will be assembled inside a NEMA4 weather-tight box per UL698A Listing (Industrial Control Panels relating to Hazardous Locations). Each motor and/or device will be controlled via HOA switch located on the HMI screen. A non-resettable hour meter for each motor will be programmed into the HMI to account for cumulative run times. Each motor will be controlled by a manual IEC motor starter with lock out/ tag out switch lever. Signal from system control devices such as floats and switches will be processed as Intrinsically Safe (low voltage).

The system status can be accessed remotely via a computer. The remote access will provide different access levels based on user login information. System alarms will be locally audible and notifications will be sent remotely via text and email. A billing arrangement will be established with the system equipment manufacturer to provide remote PLC access.

10.1.6 SVE Remediation System Permitting

Groundwater and soil gasoline remediation activities have been listed as exempt from permitting by the Air Quality Division of PADEP under 25 PA CODE 127.14(8). Exemption status does require treatment of discharge to the air of less than one ton per year of total C_4-C_{12} hydrocarbons. Vapor phase carbon removal efficiency will be monitored on a monthly basis to ensure that the treatment units are removing hydrocarbons in accordance with discharge limits set by the PADEP. Quarterly vapor samples (influent, midfluent, and effluent) will be collected to further verify vapor-phase GAC efficiency and to determine carbon consumption rates. The vapor samples will be analyzed for total TPH C4-C12, and BTEX and MTBE hydrocarbons by USEPA modified Method 18 and 24.

Mechanical work needed to implement the system installation will conform to all applicable state and local codes. The electrical compound will be classified as a Class I, Division II hazardous and explosion proof area and comply with state, local and the National Electric Code. Additionally, structural components will be constructed as to comply with local and International Building Codes. A building permit will be obtained, if necessary, from the Borough of Freeport for the placement of a remediation enclosure and the completion of site excavation and construction activities.

10.1.7 SVE Remediation System Installation

All remediation system installation work will be performed in accordance with standard and accepted engineering and construction practices. Prior to any intrusive work at the property, Pennsylvania One Call will be contacted for public utility mark-out service. The service will locate public utilities (i.e., electric, natural gas, municipal water, and telephone) along the property boundaries of the site.

Orientation of field personnel will consist of an on-site project briefing for each field team member to review health and safety requirements, QA/QC protocols, and field procedures. The contractors involved in field activities will also participate in on-site briefings before beginning the fieldwork. Before initiating field activities, field personnel will perform a reconnaissance of the work areas.

10.1.7.1 Trenching

Prior to trenching, the excavation contractor will establish staging areas for the excavation debris and a decontamination area. The staging and decontamination areas will be located in an area acceptable to the property owner.

Petroleum-impacted soil exists at depths less than 3 feet bgs both in the vicinity of the former dispenser area and likely near soil borings SB-13 and SB-15. Petroleum-impacted soil may be encountered during installation of subsurface components for the proposed SVE system. While the trenching is being excavated, Letterle will inspect the soil and collect samples from the excavation area for petroleum hydrocarbon field screening. Field screening will be performed by headspace analysis methods using a PID. Letterle will attempt to remove any localized petroleum-impacted soil encountered at depths less than 3 feet bgs during trenching, based on PID readings greater than 50 ppm.

10.1.7.2 Soil Disposal

As detailed in **Appendix N**, the trench will ultimately be backfilled with gravel. Therefore, segregation of the petroleum-impacted soil from "clean" soil encountered during trenching will not be necessary. If localized petroleum-impacted soil is encountered beyond the trenching footprint, efforts will be made to segregate the petroleum-impacted soil from "clean" soil encountered during excavation.

Petroleum-impacted soil will be temporarily stockpiled on-site pending disposal at a landfill within 90 days. The stockpile will be staged on and covered with 6-mil plastic. Appropriate waste disposal samples will be collected from the stockpile and submitted for laboratory analysis.

<u>10.1.8 SVE Remediation System Schedule</u>

Construction of the SVE remediation system will commence once this RAP is approved by the PADEP. The following schedule (in weeks after initiating RAP implementation) will be adhered to as much as possible, assuming that the RAP is approved by the PADEP by July 31, 2019.

ACTIVITY	SCHEDULE
• SVE Well Installation	- Completed
• Permitting with Freeport Borough / EPA	- 2 weeks
• System Subsurface Piping Installation	- 8 weeks
• System Equipment Procurement and Installation	- 12 weeks
• Soil Disposal from Trenching	- within 90 days after trenching
• SVE System Startup	- 16 weeks

<u>10.1.9 SVE Remediation System Start-Up and Troubleshooting</u>

Following remediation system construction and installation activities, a system start-up and shakedown test will be performed. At this time, all equipment fail-safes will be checked for proper operation. In addition, the general operating components will all be checked to verify that the system is performing within the proper operating range, and under normal vacuum and flow for which it was designed. This effort will include system adjustments, modifications, and troubleshooting to establish effective remediation system operation.

<u>10.1.10 SVE Operation and Maintenance</u>

System O&M visits will be performed to maintain the system in proper working order, assist in determining various system operating parameters, and provide the necessary information to make system adjustments.

The system operational parameters (applied vacuum and vapor flow rates) will be monitored and adjusted to maximize hydrocarbon recovery. Performance of the SVE blower and the vapor GAC units will be monitored closely to optimize the operation of the remediation system.

Following system activation, site visits will be performed on a weekly basis for the first month of system operation. After the first month of O&M, site visits will be conducted at least once per month (or more depending on telemetry-triggered events) to monitor operating conditions of the remediation system, adjust and maximize the operating efficiency, and to collect soil vapor discharge compliance samples. System performance data will be monitored for reporting and performance assessment purposes. All O&M activities will be performed in accordance with standard operating procedures and health and safety guidelines.

Field service personnel will perform preventive maintenance tasks during O&M visits to minimize involuntary system shutdown. These preventive maintenance tasks include (but are not limited to) cleaning remediation equipment (such as the filters and level probe) before shutdown occurs, emptying the storage tank, and periodically overseeing the change-out of the vapor-phase GAC units. Preventive maintenance activities will ensure that the remediation equipment operates efficiently and effectively to minimize equipment failure.

Potential problems will be evaluated by tracking system performance information such as flow rates, pressures, vacuums, motor amperage, and motor cycling. This information will be collected during regular site visits, which will be performed at least monthly to minimize system downtime. The system status will be tracked via field notes. System fail-safes that will deactivate the system will be connected to a control panel with warning light capabilities.

10.1.11 Engineering Evaluation

During a project update in April 2019, the PADEP specifically requested that an evaluation of the SVE technology and overall progress toward remedial action completion be performed within two years following system startup. Therefore, annual engineering evaluations will be performed over the anticipated system operation period of two years. The evaluations will be provided in a corresponding RAPR and will include a summary of operational data reported over the previous quarters of operation (Section 10.4), a discussion of mass recovery progress, and an evaluation of system runtime and performance. The first annual engineering evaluation will recommend whether a soil attainment demonstration (SRSS) should be attempted based on vapor sampling results, PID readings, and mass recovery calculations. The SRSS will be conducted no later than 45 days following the completion of 2 years of system operation. If SRSS results indicate overall concentration trends in soil have not been significantly decreased, then a Revised RAP may be required.

In addition, recent groundwater analytical results indicate naphthalene concentrations exceed the PADEP SHS in MW-2. Implementation of the proposed SVE system is anticipated to remove petroleum-impacted source material and reduce contaminant loading into the groundwater plume. Additional remedial actions are planned to address the naphthalene concentrations detected in groundwater, as detailed in Section 10.2. If naphthalene concentrations continue to exceed the SHS following the second annual engineering evaluation, remedial augmentations may be considered.

10.2 ISAD / Enhanced In-Situ Bioremediation

10.2.1 PetroFix™ Description

Letterle has elected to implement a combination of ISAD and enhanced in-situ bioremediation technologies at the site using PetroFix™, which is manufactured by Regenesis®, of San Clemente, California. This safe and effective technology works with the PetroFix Design Assistant®, an online design tool that enables users to individually tailor their site designs and self-apply PetroFix™, which has two functions:

- Removal of hydrocarbons from the dissolved phase by adsorption to activated carbon particles
- Stimulation of hydrocarbon biodegradation by adding electron acceptors

PetroFix™ is a highly concentrated water-based suspension consisting of micron-scale (1-2 microns) activated carbon and bio-stimulating electron acceptors. The activated carbon adsorbs and captures dissolved-phase petroleum hydrocarbon constituents in groundwater while the electron acceptors provide bio-stimulation to degrade concentrations. The formulation consists of both slow and quick-release inorganic electron acceptors using a blend of nitrate/sulfate and/or sulfate salts. Research has shown that petroleum hydrocarbons can be efficiently degraded in anaerobic environments by syntrophic processes, or the symbiotic relationships between microorganisms. The addition of these particular electron acceptors does not result in the direct increase of dissolved oxygen (DO) content in the groundwater like many chemical oxidants and can be highly effective when remediating areas with low concentrations of dissolved-phase petroleum hydrocarbon constituents.

10.2.2 Injection Permitting

Letterle will obtain a UIC permit from the USEPA in accordance with 40 CFR 146.5. In Pennsylvania, the application of PetroFix™ would be classified as a Class V-Aquifer Remediation Well. Letterle will maintain the permit and comply with all rules and regulations set within during the injection period. The turnaround time for approval of injection permits is relatively short (within 30 days).

10.2.3 Pre-Injection Monitoring

Approximately ½-hour prior to the injection event, depth to groundwater will be measured using an electronic interface/water level probe accurate to the nearest 0.01 foot. Measurements will be collected at monitor wells MW-1, MW-2, and MW-6 to provide a baseline groundwater elevation within each monitor well.

Approximately 1-month prior to the injection, a routine quarterly groundwater monitoring event will be conducted at the site, as detailed in Section 10.3. Laboratory analytical results and field-screened parameters collected from monitor wells during the event will serve as a baseline when evaluating PetroFix™ effectiveness.

10.2.4 Injection Methodology

The PetroFix Design Assistant® was used to design an injection plan, which consisted of a series of four injection points (IPs) in the vicinity of monitor well MW-2. A copy of the design spreadsheet is included in

Appendix O. The PetroFix™ injection will be completed within 8 weeks after initial RAP implementation.

Before the on-site injection, Letterle will contact Pennsylvania One Call and perform an on-site utility markout using line locating equipment. The injection locations will be marked with white paint. Four IPs will be advanced using a track-mounted Geoprobe® with 1.5-inch O.D./0.625-inch I.D drive rods to depths of 22-30 feet bgs. The IPs will be spaced approximately 6 feet apart (**Figure 14**). Procedures will be taken to ensure the IPs remain vertical during advancement. After the drive rods have been pushed to 30 feet bgs, the rod assembly will be withdrawn approximately 2 feet, and the application of PetroFix™ will commence through an injection tool mounted on the end of the drive rods. The injection tool provides horizontal dispersion of the injection materials in all directions.

The PetroFix™ volume per point will be 10.2 gallons, mixed with 1 gallon of electron acceptors and approximately 220 gallons of water in a grout mixer for at least 5 minutes until a homogenous mixture is formed. After mixing, the solution will be immediately injected into the subsurface. A pneumatic Geoprobe® piston pump will be used to provide a pulsating pressure gradient to inject the material horizontally into the subsurface soils. The drive rods will be slowly withdrawn at 2-feet intervals while the PetroFix™ injection progresses. The design volume of PetroFix™ will be pumped into the aquifer across the desired vertical treatment interval (22-30 ft bgs). Injection pressures and flow rates will be monitored and recorded during the event.

Based on previously collected site characterization data, the static water table at MW-2 is located within highly weathered sandstone, at depths ranging from approximately 22-24 feet bgs. During drilling at SB-7/MW-2, split spoon samples were successfully collected to the final extent of the boring (30 ft). It is therefore assumed that the formation will accept the PetroFix™ application via Geoprobe™ borings. However, the installation of injection wells may be necessary if injection pressures are too high and the formation will not accept the designed injection volume.

10.2.5 Injection Performance Evaluation

In order to evaluate the physical effects of injection, depth to groundwater measurements will be collected from monitor wells MW-1, MW-2, and MW-6 during the application. The data will provide an indication of the radius of influence (ROI) for the treatment. To ensure adequate ROI around the injection point, the following indicators will be measured incrementally for change:

- Greater than 0.1 feet rise in groundwater levels at MW-2
- Presence of black PetroFix™ coloration in the groundwater at MW-2

Evidence of the preceding criteria will confirm injection influence. Post-injection monitoring will include weekly monitoring for the presence of PetroFix™ at MW-2, for a period of one month. In addition, pre-injection monitoring data will be compared to post-injection groundwater monitoring data (Section 10.3) to evaluate naphthalene concentration trends and overall remedial performance.

10.3 Groundwater Monitoring and Schedule

Groundwater quality will be monitored on a quarterly basis using the site monitor wells so that remedial performance can be evaluated. Groundwater samples will be collected from POC wells MW-2, MW-3, and

MW-4 and the remaining site monitor wells MW-1, MW-5, and MW-6, and analyzed for unleaded gasoline parameters (BTEX, MTBE, cumene, naphthalene, 1,2,4 TMB, and 1,3,5 TMB) via USEPA SW-846 Method 8260B.

In addition, groundwater samples collected from MW-1 through MW-6 will also be field screened for natural biodegradation indicator parameters (**Table 5**):

- Conductivity
- ORP
- Temperature
- pH
- DO
- TDS

A groundwater attainment demonstration will commence once naphthalene concentrations in MW-2 have decreased below the SHS. The attainment demonstration is further described in Section 11.2. If naphthalene concentrations have not decreased below the SHS within 6 months following the injection, a second PetroFix™ application will be performed.

10.4 Reporting

In accordance with 25 Pa. Code §245.312(b), Letterle will prepare quarterly RAPRs describing site activities. The RAPRs will include data on the operation of the remediation system, site data, and a narrative description of site conditions and findings. Data tables summarizing petroleum compound concentrations and analytical results from groundwater sampling will be included. Site-specific data trendline hydrographs and Mann-Kendall statistical tests will be completed and discussed as needed, and appropriate figures will be prepared to illustrate site conditions.

Each quarterly RAPR will include at a minimum:

- A summary of the activities conducted at the site and remedial progress made during the quarter.
- Evaluation of system performance and system optimizations performed.
- System operational data, including applied vacuum, flow rates, PID readings, laboratory analytical results for vapor samples, and mass recovery calculations.
- Operational time logged by system instrumentation (hour meter and totalizer).
- If system operational time falls below 85%, documentation of operation problems and steps taken to correct the problems.
- Tabulated data collected from the monitor wells documenting the depth to groundwater and thickness of any free product encountered.
- At least one groundwater elevation contour map depicting a professional interpretation of groundwater flow direction.
- Tabulated historical quantitative groundwater analytical results including results from the current quarter.
- Current quarter laboratory analytical reports.
- One site-wide isoconcentration contour map for each compound detected in any one well above the PADEP SHS during the quarter.

- For each well exceeding the PADEP SHS, a graphical depiction of historical key contaminant concentrations and groundwater elevations to provide an assessment of correlations between fluctuating water levels/precipitation events and contaminant concentrations.
- For each well exceeding the PADEP SHS, ccompletion of Mann-Kendall statistical testing will be performed to determine whether site data indicates a decreasing trend, an increasing trend, or no reliable trend starting 4 quarters after startup.
- Discussion of the data to offer an updated assessment on whether the contaminant plume at the site is stable, shrinking, or expanding.
- Treatment and disposal documentation for waste generated or transported off-site for proper disposal during the quarter.
- A seal by a Professional Geologist registered in the Commonwealth of Pennsylvania.

11.0 DEMONSTRATION OF ATTAINMENT

11.1 Soil Attainment

Demonstration of attainment of the PADEP Statewide Health Standards for soil will be determined through evaluation of existing soil data and/or confirmatory sampling following the completion of remedial actions at the site. Soil sampling will be performed in accordance with PADEP Act 2 requirements for SRSS and the analytical data will be statistically evaluated using one of the methods indicated in 25 Pa Code Chapter 250 (Act 2). The soil attainment area selected for SRSS will be based on the impacted soil area identified in **Figure 10**.

11.2 Groundwater Attainment

Demonstration of attainment of the PADEP SHS for groundwater will be determined by eight quarters of groundwater sampling where results are below the SHS in POC monitor wells MW-2, MW-3, MW-4, and off-site well MW-6. Following demonstration of attainment of the PADEP SHS for groundwater by eight consecutive quarters of post-remediation groundwater monitoring, all site monitor wells will be abandoned in accordance with Pennsylvania well abandonment requirements.

11.3 Vapor Intrusion Attainment

Demonstration of attainment of the PADEP IAQ Standards will be determined by collecting two rounds of soil gas samples from a vapor monitoring network, to be installed at the site. The soil gas samples will be collected in accordance with the PADEP IAQ guidelines. The SVE remedial technology is anticipated to mitigate and render any potential vapor intrusion pathways incomplete. Therefore, soil gas sampling will be conducted during the post-remediation monitoring period, unless an alternate timeframe is requested by PADEP. The methodology and investigative results will be included a corresponding RAPR.

12.0 SITE CLOSURE

12.1 Remedial Action Completion Report

In accordance with the requirements of 25 Pa. Code § 245.312, the Pennsylvania Land Recycling and Remediation Standards Act (Act 2) and § 245.313 of the CAP, Letterle will prepare a RACR describing site activities. The RACR will include a narrative description of site conditions, a summary of site characterization and remedial actions, and demonstration of soil and groundwater attainment.

The RACR, sealed by a Professional Geologist registered in the Commonwealth of Pennsylvania, will also include tabulated historical quantitative groundwater analytical results including depth to groundwater and thickness of any LNAPL encountered at the site. Appropriate figures will be prepared to illustrate site conditions consisting of at least one groundwater elevation contour map depicting a professional interpretation of groundwater flow direction. The RACR will be submitted to the PADEP following eight consecutive quarters of groundwater monitoring within the POC wells.

12.2 Monitor Well Abandonment and Site Restoration

Following demonstration of attainment of the PADEP SHS for soil by statistical analysis and groundwater by eight consecutive quarters of groundwater monitoring within the POC wells and the PADEP approval of the RACR, all site monitor wells and vapor monitor points will be abandoned in accordance with the Pennsylvania well abandonment requirements. Monitor well abandonment and site restoration activities will be coordinated with the property owner to ensure there are minimal business disruptions.

Prior to abandonment, all wells will be investigated to determine their condition, the details of construction; and whether or not any obstructions exist that will interfere with the filling and sealing process. Any obstructions will be removed by cleaning out the hole if possible.

Well abandonment will be performed by removing the well casing and screen (whenever possible) and grouting the borehole with a cement and bentonite mixture (grout) to the ground surface. During the abandonment activities, the existing concrete pad and manhole will be removed and discarded, where possible. The former well locations will then be finished to the ground surface with asphalt. Well abandonment forms will be completed and filed with the PADEP.

13.0 REFERENCES

The Geology of Pennsylvania, Shultz, C. H., Pennsylvania Geological Survey and Pittsburgh Geological Society, 1999

Groundwater, Freeze, R.A. and Cherry, J., Prentice-Hall, 1979

Land Recycling Program Technical Guidance Manual for Vapor Intrusion into Buildings from Groundwater and Soil under Act 2, January 18, 2017

Pennsylvania Code, Chapter 245 (Storage Tank and Spill Prevention Program), 1993

Pennsylvania Code Chapter 250 (Pennsylvania Land Recycling and Environmental Remediation Standards Act), 1995

Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2) Guidance Manual, December 1997, amended June 2002

Underground Storage Tank Closure Report, Letterle, January 2017

Webpages

(www.dcnr.state.pa.us/topogeo/groundwater/PaGWIS)

www.websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

McWorter and Sunada (1977) referenced within http://web.ead.anl.gov/resrad/datacoll/porosity.htm
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TABLES

TABLE 1
SOIL ANALYTICAL DATA - PARTIAL UST CLOSURE
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Sample ID	Date	Depth (ft-bgs)	PID (ppm)	Benzene (µg/kg)	Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylene (µg/kg)	MTBE (µg/kg)	Cumene (µg/kg)	Naphthalene (µg/kg)	1,2,4-TMB (µg/kg)	1,3,5-TMB (µg/kg)
D-1/2'	12/21/16	2	525	<2,650	13,600	40,200	352,000	<2,650	6,820	*30,200*	*180,000*	82,400
D-2/2'	12/21/16	2	572	<258	19,200	19,700	124,000	<258	4,190	8,770	*72,300*	23,600
LS-1/3'	12/21/16	3	145.8	*2,230*	716	8,220	4,040	<261	1,930	3,990	785	<261
LS-2/3'	12/21/16	3	3.3	<5	<5	<5	<14.9	<5	<5	<5	<5	<5
PADEP Non-Residential Statewide Health Standards-MSC's				500	100,000	70,000	1,000,000	2,000	2,500,000	25,000	35,000	210,000
January 18, 2017 PADEP Non-Residential VI Screening Values (Svsoil)				*130*	*44,000*	*46,000*	*990,000*	*1,400*	*2,500,000*	*25,000*	*35,000*	*210,000*

Notes:

MTBE	methyl tertiary-butyl ether	µg/kg	micrograms per kilogram
TMB	trimethylbenzene	ft-bgs	feet below ground surface
ppm	parts per million	NOC	Not of Concern

MSCs - Medium Specific Concentrations are designated as PADEP Statewide Health Standards for a non-residential used aquifer.

VI_{soil} - Soil Statewide Health Standard Vapor Intrusion Screening Values (as per January 2017 guidance)

Shaded cells indicate an exceedance of the MSCs

TABLE 2
MONITOR WELL CONSTRUCTION DETAILS
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Monitor Well	Soil Boring	Date Installed	Well Depth (feet bgs)	Screen Interval (feet bgs)	Well Diameter (inches)	Borehole Diameter (inches)	Top of PVC Casing Elevation (feet-msl)	Ground Surface Elevation (feet-msl)	Well Depth Elevation (feet-msl)
MW-1	**SB-1**	09/20/17	30	20-30	2.0	8.25	787.30	787.80	757.30
MW-2	**SB-7**	09/20/17	30	20-30	2.0	8.25	786.74	787.44	756.74
MW-3	**SB-8**	09/21/17	30	20-30	2.0	8.25	785.40	785.77	755.40
MW-4	**SB-9**	09/21/17	30	20-30	2.0	8.25	784.16	784.89	754.16
MW-5	**SB-10**	09/22/17	30	20-30	2.0	8.25	788.50	788.77	758.50
MW-6	**SB-18**	10/05/18	25	3-25	2.0	8.25	780.37	781.22	755.37
MP-1	**SB-15**	12/12/18	20	3-20	2.0	8.25	NA	NA	NA
MP-2	**SB-16**	12/12/18	20	3-20	2.0	8.25	NA	NA	NA
MP-3	**SB-19**	12/17/18	20	3-20	2.0	8.25	NA	NA	NA
SVE-1	**SB-20**	12/13/18	20	3-20	4.0	10.25	NA	NA	NA
SVE-2	**SB-17**	12/17/18	20	3-20	4.0	10.25	NA	NA	NA

Notes:
feet bgs - feet below ground surface
feet msl - feet above mean sea level

TABLE 3
GROUNDWATER GAUGING AND ANALYTICAL DATA
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Well ID	Date	TOC Elevation (feet-msl)	Depth to GW (feet below TOC)	GW Elevation (feet-msl)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Xylenes (µg/l)	MTBE (µg/l)	Cumene (µg/l)	Naphth-alene (µg/l)	1,2,4-TMB (µg/l)	1,3,5-TMB (µg/l)
MW-1	02/25/19	787.30	22.68	764.62	<1	<1	<1	<3	<1	2.4	<2	<1	<1
(30/10)	10/15/18	787.30	22.97	764.33	<1	<1	<1	<3	<1	2.4	<2	<1	1.2
[2]	08/22/18	787.30	23.22	764.08	<1	<1	1.2	3.9	<1	2.8	<2	2.1	2.6
	01/29/18	787.30	23.68	763.62	<1	<1	7.1	8	<1	7.8	<2	5.2	2.7
	11/16/17	787.30	24.37	762.93	<1	<1	<1	<3	<1	9.9	<2	<1	<1
	10/12/17	787.30	24.96	762.34	<1	1.1	2.5	3.6	1.2	15.1	<2	4	2.1
MW-2	02/25/19	786.74	22.16	764.58	<1	<1	121	19.4	<1	110	137	<1	1.1
(30/10)	10/15/18	786.74	22.46	764.28	<1	<1	62.8	12.5	<1	57.2	59.4	<1	<1
[2]	08/22/18	786.74	22.70	764.04	<1	<1	79.9	14.2	<1	74.4	76.7	<1	<1
	01/29/18	786.74	23.14	763.60	<1	<1	155	19.2	<1	112	156	1.1	<1
	11/16/17	786.74	23.81	762.93	<1	<1	119	18.8	<1	92.5	131	4.5	1.7
	10/12/17	786.74	24.41	762.33	<1	5.9	94.7	18.3	<1	76.6	90.7	6.7	1.8
MW-3	02/25/19	785.40	20.77	764.63	<1	1.1	<1	<3	<1	<1	<2	<1	<1
(30/10)	10/15/18	785.40	21.05	764.35	<1	<1	<1	<3	<1	<1	<2	<1	<1
[2]	08/22/18	785.40	21.30	764.10	<1	<1	<1	<3	<1	<1	<2	<1	<1
	01/29/18	785.40	21.76	763.64	<1	<1	<1	<3	<1	<1	<2	<1	<1
	11/16/17	785.40	22.44	762.96	<1	5.6	<1	<3	<1	<1	<2	<1	<1
	10/12/17	785.40	23.05	762.35	<1	<1	<1	<3	<1	<1	<2	<1	<1
MW-4	02/25/19	784.16	19.58	764.58	<1	1.1	<1	<3	<1	<1	4.9	<1	<1
(30/10)	10/15/18	784.16	19.84	764.32	<1	<1	<1	<3	<1	<1	<2	<1	<1
[2]	08/22/18	784.16	20.12	764.04	<1	<1	<1	<3	<1	<1	<2	<1	<1
	01/29/18	784.16	20.54	763.62	<1	<1	<1	<3	<1	<1	<2	<1	<1
	11/16/17	784.16	21.20	762.96	<1	5.6	<1	<3	<1	<1	<2	<1	<1
	10/12/17	784.16	21.83	762.33	<1	4.2	<1	<3	<1	<1	<2	<1	<1

TABLE 3
GROUNDWATER GAUGING AND ANALYTICAL DATA
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Well ID	Date	TOC Elevation (feet-msl)	Depth to GW (feet below TOC)	GW Elevation (feet-msl)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Xylenes (µg/l)	MTBE (µg/l)	Cumene (µg/l)	Naphth-alene (µg/l)	1,2,4-TMB (µg/l)	1,3,5-TMB (µg/l)
MW-5	02/25/19	788.50	23.83	764.67	<1	<1	<1	<3	<1	<1	<2	<1	<1
(30/10)	10/15/18	788.50	24.10	764.40	<1	<1	<1	<3	<1	<1	<2	<1	<1
[2]	08/22/18	788.50	24.35	764.15	<1	3.6	<1	<3	6.4	<1	<2	<1	<1
	01/29/18	788.50	24.82	763.68	<1	<1	<1	<3	4.6	<1	<2	<1	<1
	11/16/17	788.50	25.51	762.99	<1	<1	<1	<3	<1	<1	<2	<1	<1
	10/12/17	788.50	26.11	762.39	<1	<1	<1	<3	4.9	<1	<2	<1	<1
MW-6	02/25/19	780.37	15.80	764.57	<1	<1	<1	<3	2.0	<1	<2	<1	<1
	11/16/18	780.37	15.89	764.48	<1	<1	<1	<3	1.9	<1	<2	<1	<1
	10/15/18	780.37	16.11	764.26	<1	<1	<1	<3	2.4	<1	<2	<1	<1

	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	Cumene	Naphth-alene	1,2,4-TMB	1,3,5-TMB
PADEP NON-RES SHS	5	1,000	700	10,000	20	3,500	100	62	1,200
2017 Vapor Intrusion Non-Res Screening Values (SV_{GW})	*350*	*430,000*	*860*	*12,000*	*96,000*	*24,000*	*1,300*	*750*	*1,200*

Notes:

µg/l micrograms per liter
TMB trimethylbenzene
MTBE methyl tertiary-butyl ether
NOC not of concern

(13/10) total depth of well from grade / screen length (feet)
[2] monitor well diameter (inches)

Exceedances of the Non-Residential PADEP SHS during the most recent sampling event are indicated with shaded cells.
Exceedances of the 2017 Vapor Intrusion Non-Residential Screening values during the most recent sampling event are indicated with italicized text.

TABLE 4
HISTORICAL SOIL ANALYTICAL DATA
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Sampling Program	Sample I.D.	Date	Depth (feet-bgs)	PID (ppm)	Benzene (µg/kg)	Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylenes (µg/kg)	MTBE (µg/kg)	Cumene (µg/kg)	Naphthalene (µg/kg)	1,2,4-TMB (µg/kg)	1,3,5-TMB (µg/kg)
Partial UST System Closure	**D-1/2'**	12/21/16	2	525	<2,650	13,600	40,200	352,000	<2,650	6,820	*30,200*	*180,000*	82,400
	D-2/2'	12/21/16	2	572	<258	19,200	19,700	124,000	<258	4,190	8,770	*72,300*	23,600
	LS-1/3'	12/21/16	3	145.8	*2,230*	716	8,220	4,040	<261	1,930	3,990	785	<261
	LS-2/3'	12/21/16	3	3.3	<5	<5	<5	<14.9	<5	<5	<5	<5	<5
Site Characterization	**SB-1**	08/24/17	11-13	1,056	<263	<263	15,000	27,900	<263	4,990	9,200	*95,400*	29,800
	SB-2	08/24/17	15-17	1,023	<5.1	16.3	553	2,860	<5.1	252	1,720	5,950	1,650
	SB-3	08/24/17	4-5	0.7	<4.6	<4.6	<4.6	<13.7	<4.6	<4.6	<4.6	<4.6	<4.6
	SB-4	08/25/17	9-11	15,000	<5.0	<5.0	<5.0	<14.9	<5.0	<5.0	<5.0	<5.0	<5.0
	SB-5	08/25/17	5-7	325.9	<5.9	<5.9	<5.9	<17.7	<5.9	<5.9	<5.9	<5.9	<5.9
	SB-6	08/25/17	4-5	158.1	<5.0	<5.0	<5.0	<15.0	<5.0	<5.0	<5.0	<5.0	<5.0
	SB-7	09/20/17	23-25	21.5	<4.6	<4.6	<4.6	<13.9	<4.6	<4.6	5.6	<4.6	<4.6
	SB-8	09/21/17	21-23	0.2	<5.3	<5.3	<5.3	<15.8	<5.3	<5.3	<5.3	<5.3	<5.3
	SB-9	09/21/17	19-21	0.1	<4.9	<4.9	<4.9	<14.8	<4.9	<4.9	<4.9	<4.9	<4.9
	SB-10	09/22/17	2-4	366.9	*465*	4,470	11,500	8,980	<249	3,890	14,200	5,540	2,020
		09/22/17	7-9	138.9	34.4	189	23.8	153.0	6.2	<5.6	68.8	66.8	13
	SB-12	07/26/18	4.5	356.2	<275	<275	1,700	1,080	<275	605	3,400	1,650	644
		07/26/18	13-15	111.2	<251	<251	<251	<753	<251	<251	<251	<251	<251
	SB-13	07/26/18	4-5	342.0	<274	401	3,350	18,300	<274	981	2,520	16,200	5,110
		07/26/18	15-17	902.1	<2,500	9,440	*50,000*	145,000	<2,500	8,720	17,500	*169,000*	53,900
	SB-14	07/26/18	13-15	238.8	<318	<318	650	1,420	<318	<318	808	2,280	681
	SB-15	07/26/18	2-4	876.4	<2,590	<2,590	15,300	29,100	<2,590	7,110	14,900	*116,000*	28,900
		07/26/18	7-9	306.5	<314	<314	8,890	9,060	<314	2,730	7,120	*49,700*	18,300
	SB-16	07/26/18	5-7	1.6	<4.8	<4.8	<4.8	<14.3	<4.8	<4.8	<4.8	<4.8	<4.8
	SB-17	07/26/18	4-5	55.3	<4.8	<4.8	6.6	16.9	<4.8	<4.8	<4.8	12.5	<4.8
		07/26/18	11-13	412.1	<3,310	<3,310	18,400	51,600	<3,310	5,760	16,900	*126,000*	42,800
	SB-18	10/05/18	14-16	0.0	<3.8	<3.8	<3.8	<11.5	<3.8	<3.8	<3.8	<3.8	<3.8

Standard	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Cumene	Naphthalene	1,2,4-TMB	1,3,5-TMB
PADEP Non-Residential Statewide Health Standards-MSC's	500	100,000	70,000	1,000,000	2,000	2,500,000	25,000	35,000	210,000
January 18, 2017 PADEP Non-Residential VI Screening Values (SVsoil)	*130*	*44,000*	*46,000*	*990,000*	*1,400*	*2,500,000*	*25,000*	*35,000*	*210,000*

Notes:

TMB - Trimethylbenzene
D - dispenser
LS - line sample
µg/kg - micrograms per kilogram
SB - soil boring

MSCs - Medium Specific Concentrations are designated as PADEP Statewide Health Standards for a non-residential used aquifer.
VI_{soil} - Soil Statewide Health Standard Vapor Intrusion Screening Values (as per January 2017 guidance)
Shaded cells indicate an exceedance of the MSCs
Italicized font indicates an exceedance of the SV_{soil}

TABLE 5
MNA Field Screened Parameter Data
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Well ID	Date	Temperature (^oC)	Conductivity (mS/cm)	TDS (mg/l)	Dissolved Oxygen (mg/l)	pH	ORP (mV)
MW-1	02/25/19	3.26	1.281	831	0.64	8.36	-125.3
	10/15/18	16.90	1.615	1,050	0.29	7.78	-149.7
	08/22/18	19.49	1.792	1,164	0.10	7.62	-162.9
	01/29/18	9.52	2.718	1,763	0.10	7.20	-84.9
	11/16/17	12.31	1.790	1,540	1.53	9.71	-278.1
	10/13/17	15.52	1.264	1,003	0.84	8.96	-58.4
MW-2	02/25/19	9.78	1.214	794	0.37	8.26	-148.0
	10/15/18	17.84	1.529	988	0.19	7.81	-153.8
	08/22/18	19.04	1.659	1,049	0.07	7.74	-167.0
	01/29/18	9.35	1.700	1,102	0.09	7.38	-105.7
	11/16/17	12.72	1.281	1,077	1.03	9.85	-277.6
	10/13/17	16.20	0.984	769	0.49	9.07	-54.5
MW-3	02/25/19	9.21	1.750	1,131	0.55	7.86	1.3
	10/15/18	17.86	1.580	1,022	0.25	7.33	26.2
	08/22/18	19.13	1.498	974	0.09	7.17	55.2
	01/29/18	10.25	1.560	1,014	0.10	6.84	63.2
	11/16/17	14.23	1.685	1,094	1.10	6.69	130.4
	10/13/17	16.68	1.044	809	0.54	8.59	14.9
MW-4	02/25/19	9.98	1.130	736	2.57	7.35	62.1
	10/15/18	17.55	1.182	770	2.28	6.60	96.9
	08/22/18	18.69	1.208	785	2.55	6.50	121.2
	01/29/18	11.83	1.318	855	2.28	6.09	110.9
	11/16/17	14.73	1.194	776	2.81	6.08	166.0
	10/13/17	17.49	0.831	639	1.69	7.79	77.6
MW-5	02/25/19	8.03	3.058	1,987	0.58	7.02	70.0
	10/15/18	17.21	2.773	1,809	0.23	6.47	104.3
	08/22/18	23.43	3.388	2,220	0.49	6.31	154.3
	01/29/18	11.19	2.629	1,710	0.31	6.06	116.4
	11/16/17	14.38	2.472	1,594	0.53	6.09	169.8
	10/13/17	16.57	1.373	1,064	1.30	7.87	69.1
MW-6	02/25/19	7.14	1.704	1,105	0.63	7.67	44.5
	11/16/18	9.09	1.759	1,146	0.17	8.15	-64.6
	10/15/18	17.88	1.821	1,184	1.12	7.41	57.8

<u>Notes:</u>

TDS - total dissolved solids
ORP - oxygen-reduction potential
mV - millivolts

mS/cm - milliSiemens per centimeter
mg/l - milligrams per liter

TABLE 6
TOTAL DISSOLVED SOLIDS
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Well ID	Date	Total Dissolved Solids (mg/l)
MW-1	11/16/17	1,540
MW-2	11/16/17	869
MW-3	11/16/17	1,110
MW-4	11/16/17	777
MW-5	11/16/17	1,560

Average	1,171

Notes:
mg/l - milligrams per liter

TABLE 7
REMEDIAL ALTERNATIVES SCREENING SUMMARY - SOIL
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Remedial Technology Groups	**Remedial Technology**	**Applicability/Feasibility**	**Further Consideration**	
			Yes	No
Institutional Controls	Environmental Covenants- Land Use Restrictions	Owner has selected the SHS		X
Engineering Controls	Passive Barrier	Owner has selected the SHS		X
	Passive Venting	Owner has selected the SHS		X
In-Situ Biological Remediation	Bioventing	Limited impacts do not warrant the cost		X
	Enhanced Bioremediation	Soil type, shallow groundwater, and limited unsaturated soil may be suitable for bioremediation	X	
	Phytoremediation	Site is largely paved and not suited for phytoremediation.		X
In-Situ Physical/Chemical Remediation	Chemical Oxidation	Extent of unsaturated soil zone may not be practical for chemical oxidation		X
	Soil Vacuum Extraction	Soil type and impacted soil footprint may be suitable for SVE	X	
	Solidification/Stabilization	Nature of impact renders this approach not feasible.		X

TABLE 7
REMEDIAL ALTERNATIVES SCREENING SUMMARY - SOIL
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Component Technology Type	Process Option	Applicability/Feasibility	Further Consideration	
			Yes	No
Ex-Situ Physical/Chemical Remediation	Chemical Extraction	May be impractical based on cost		X
	Chemical Reduction/Oxidation	May be impractical based on cost and space constraints		X
	Solidification/Stabilization	Nature of impact renders this approach not feasible.		X
	Soil Washing	May be impractical based on cost and space constraints		X
Physical Removal	Excavation and Off-Site Disposal	Deep depths to known soil impacts and proximity to active UST system would render this approach		X

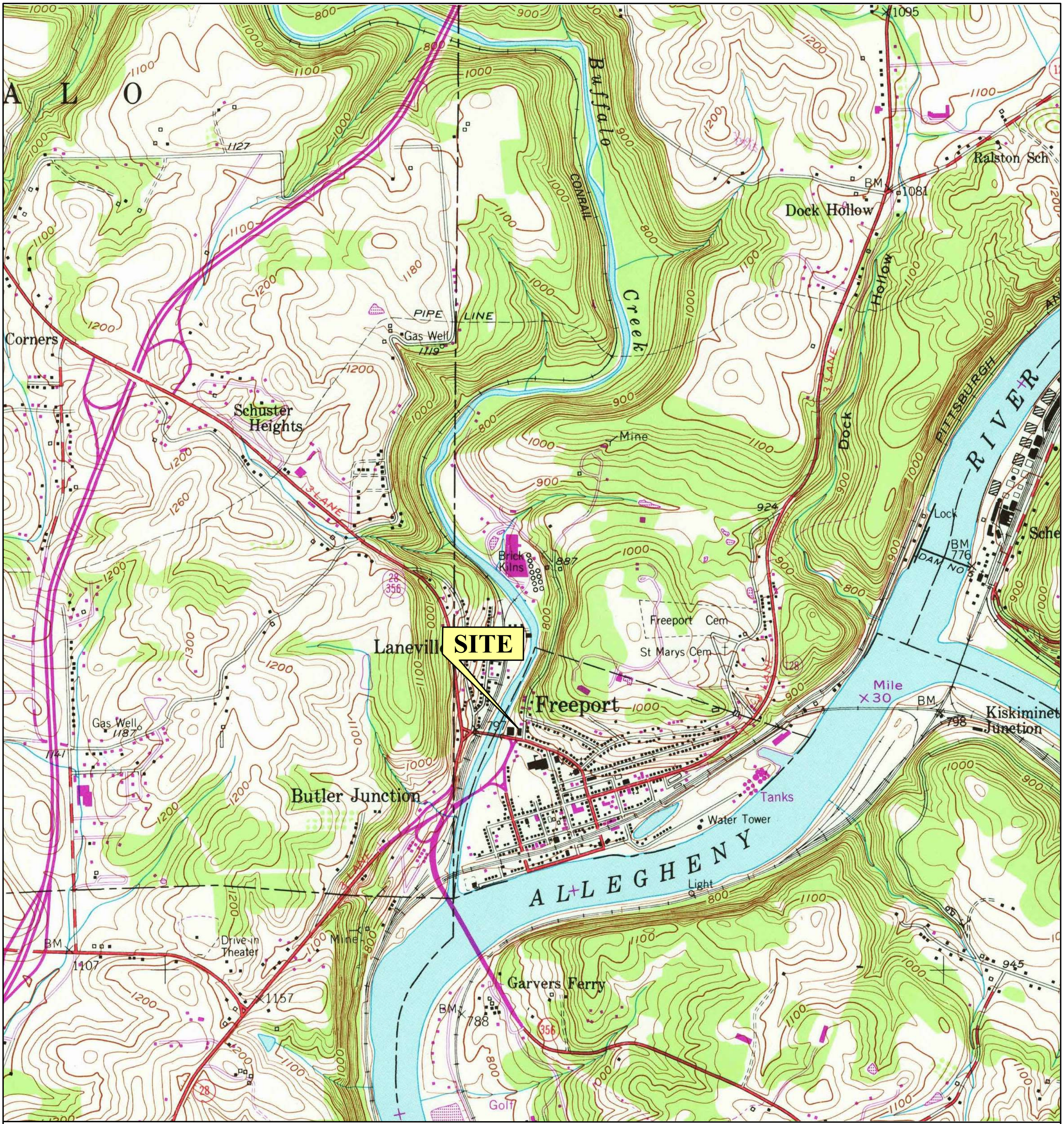
TABLE 8
REMEDIAL ALTERNATIVES SCREENING SUMMARY - GROUNDWATER
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Remedial Technology Groups	**Remedial Technology**	**Applicability/Feasibility**	**Further Consideration**	
			Yes	No
Institutional Controls	Environmental Convenants- Land Use Restrictions	Site would be limited to commercial use only. Owner selected SHS.		X
	Seal/Abandon Existing Wells	Not applicable. No private potable water supply wells onsite.		X
Engineering Controls	Physical Groundwater Barriers	Not practical based on limited impacts.		X
In-Situ Biological Remediation	Monitored Natural Attenuation	Potentially applicable in conjunction with another technology	X	
	Enhanced Bioremediation	Shallow water table and soil type suggest this technology may be feasible	X	
	Biosparging	Limits impacts would not warrant the cost		X
	Phytoremediation	Predominately paved site makes phytoremediation impractical.		X
In-Situ Physical/Chemical Remediation	Air Sparging	Limits impacts would not warrant the cost		X
	Dual Phase Extraction w/reinjection	Limits impacts would not warrant the cost		X
	In Well Air Stripping	Limits impacts would not warrant the cost		X
	Passive/Reactive Treatment Walls	Limits impacts would not warrant the cost		X
	In-Situ Adsorption	Soil type, shallow groundwater, and limited impact would make ISAD feasible	X	

TABLE 8
REMEDIAL ALTERNATIVES SCREENING SUMMARY - GROUNDWATER
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Remedial Technology Groups	Remedial Technology	Applicability/Feasibility	Further Consideration	
			Yes	No
Ex-Situ Biological Remediation	Bioreactors	Not cost effective based on limited impacts		X
Ex-Situ Physical/Chemical Remediation	Dual Phase Extraction w/offsite discharge	Not cost effective based on limited impacts		X
	Groundwater Extraction	Not cost effective based on limited impacts		X
Containment	Physical Barriers - Slurry Walls/Sheet Pilings/Hydraulic Controls	Site structures and size make this approach impractical.		X
	Biological/Chemical Barriers - Sparge Curtain/Adsorption Barrier/Biologically Active Zones	Limited impacts make the technology potentially feasible.	X	

FIGURES



COORDINATES:
40.6762 N
79.6891 W

QUADRANGLE LOCATION

REFERENCE

USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE
FREEPORT, PENNSYLVANIA

SCALE IN FEET

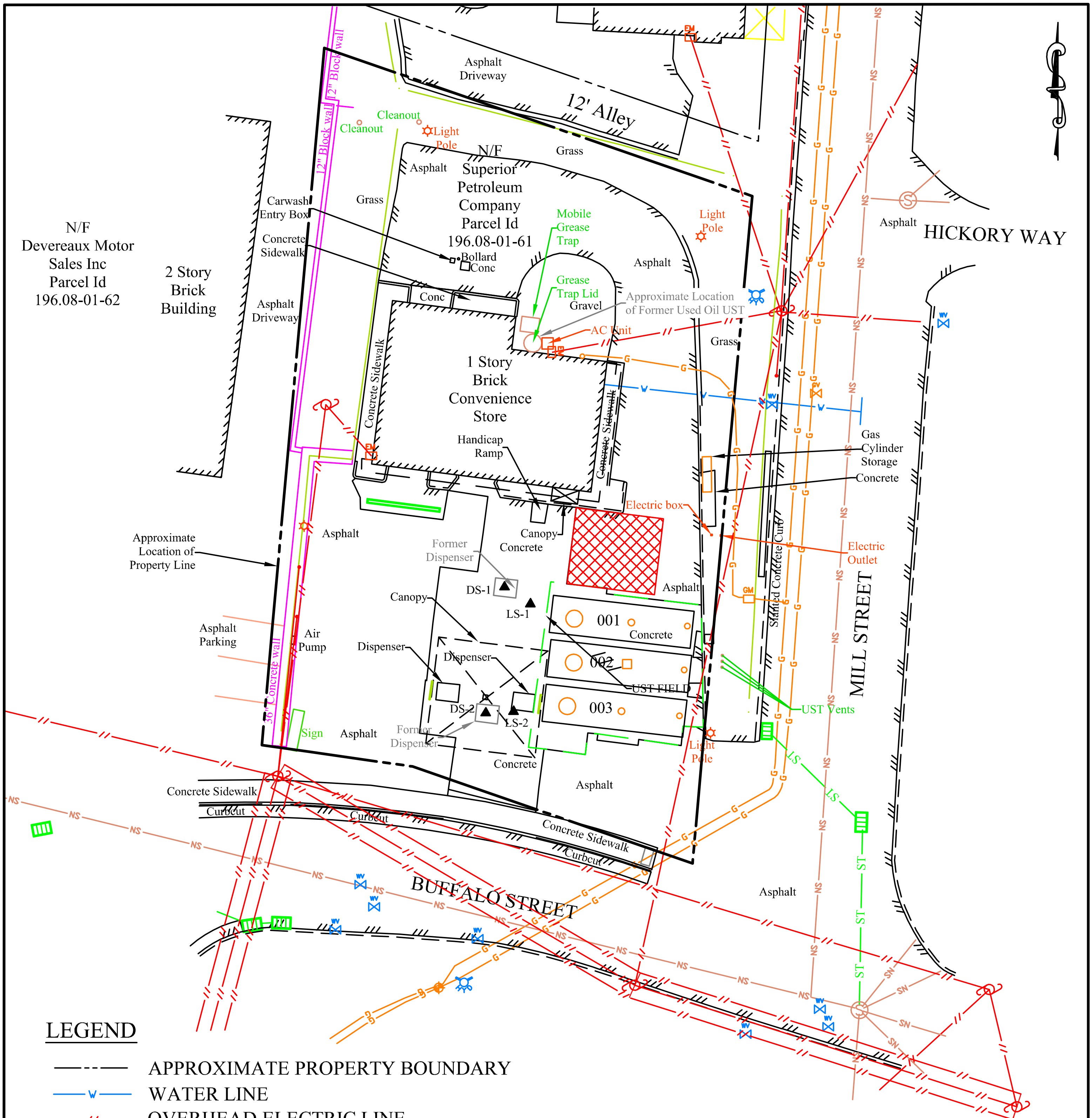
0 2,000

SITE LOCATION MAP

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 1



LEGEND

APPROXIMATE PROPERTY BOUNDARY

WATER LINE

OVERHEAD ELECTRIC LINE

SANITARY LINE

STORM LINE

GAS LINE

UNDERGROUND ELECTRIC LINE

GAS VALVE

CATCH BASIN

SANITARY MANHOLE

UTILITY POLE

APPROXIMATE 2009 SRSS ATTAINMENT AREA (20ft x 15ft)

UST CLOSURE SOIL SAMPLE LOCATION

0' 30'

SCALE IN FEET

GENERALIZED SITE PLAN

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 2

LEGEND

PROPERTY BOUNDARY
1 SUPERIOR - RADHE OIL (SITE)
2 DEVEREAUX (DEVY) AUTO PARK
3 OFFICE FOR DEVY AUTO PARK (CONVERTED RESIDENTIAL)
4 CARRIAGE HOMES (RESIDENTIAL)
5 PARKING FOR DEVY AUTO PARK
6 COMMUNITY PARK
7 FREEPORT MONUMENTAL WORKS
8 FREEPORT JUNIOR HIGH SCHOOL
R RESIDENTIAL

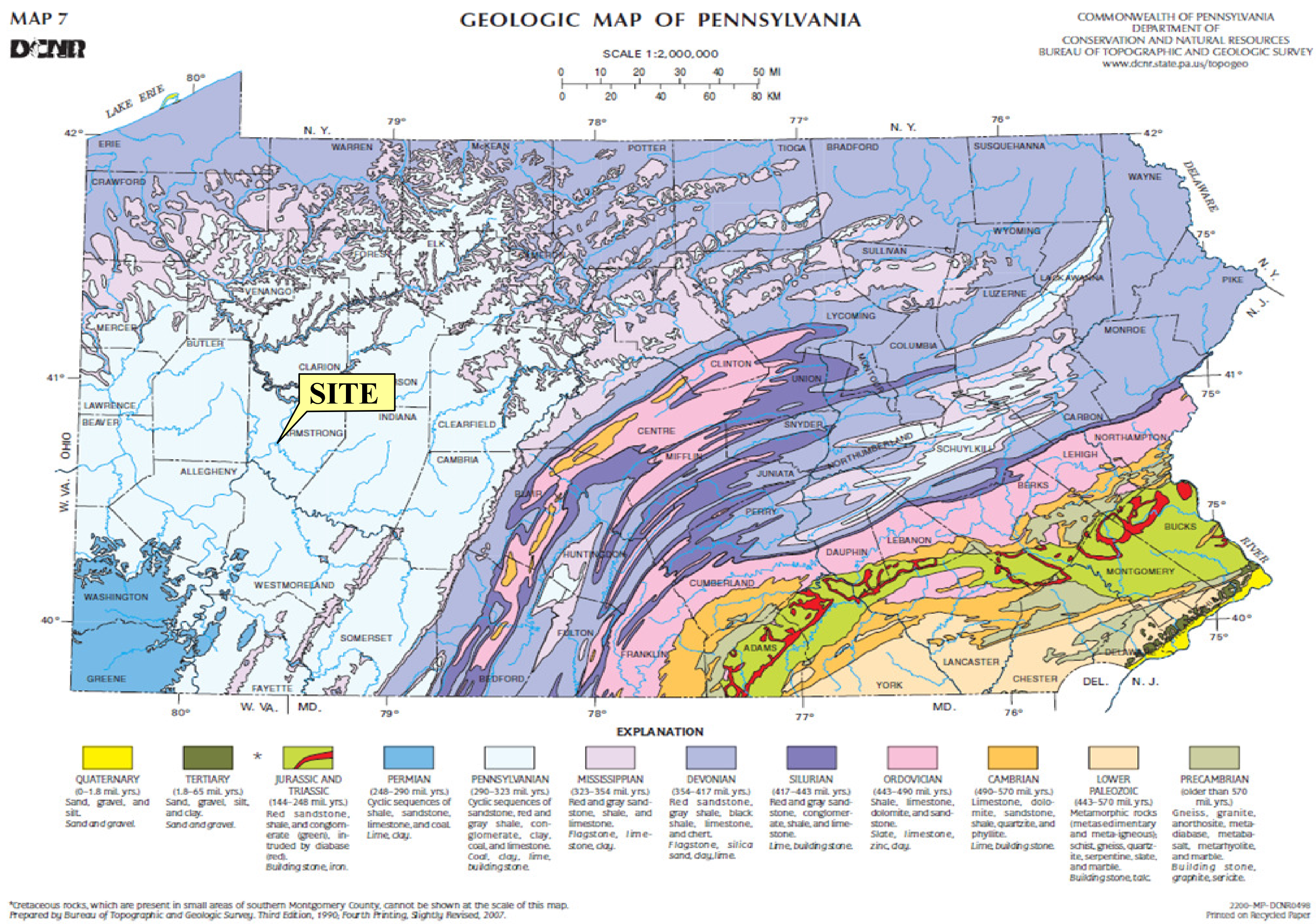
SCALE IN FEET
0 100

SURROUNDING LAND USE AREA MAP

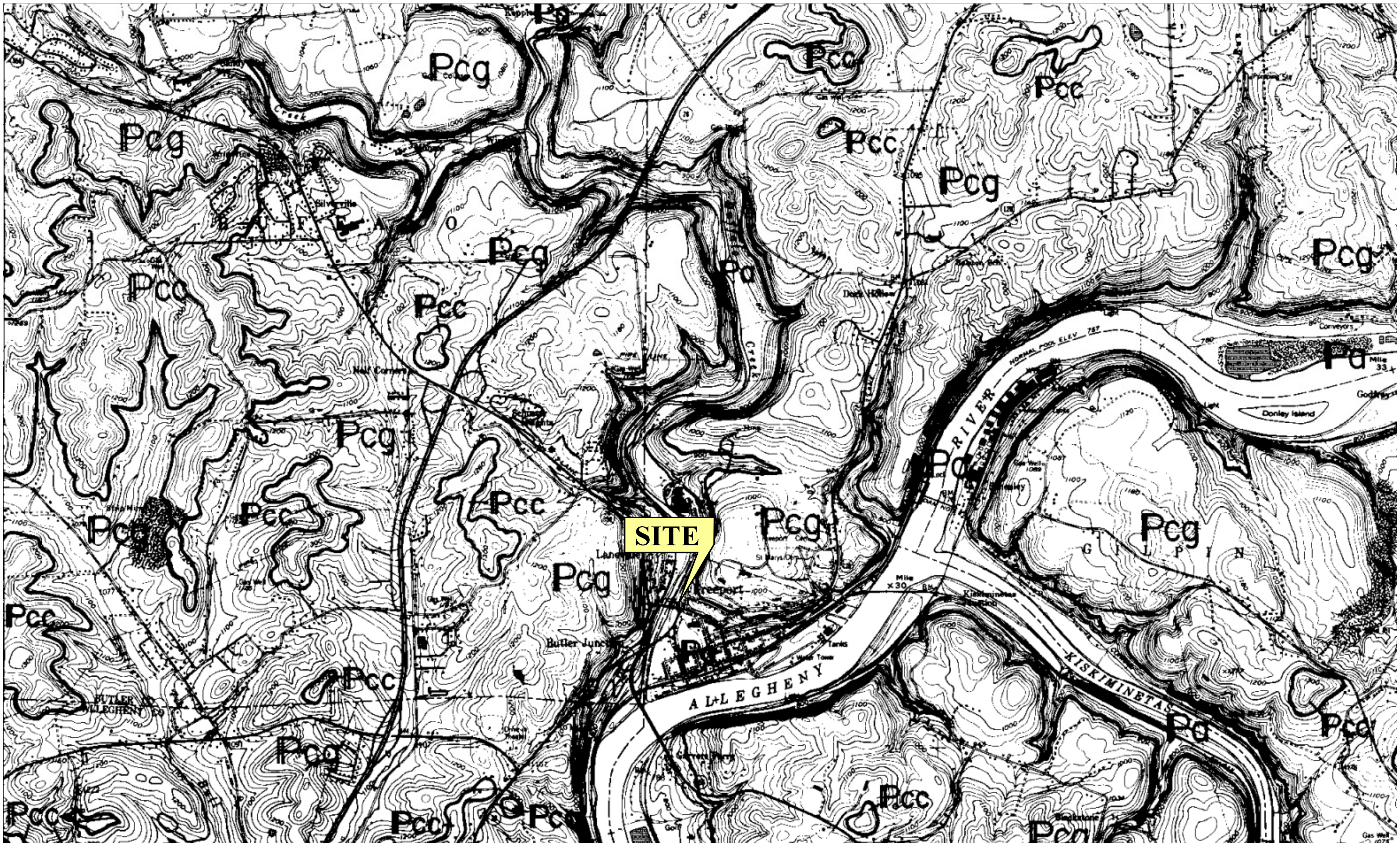
SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 3



GEOLOGIC MAP OF PENNSYLVANIA (MAP 7)	
SUPERIOR - RADHE OIL 222 BUFFALO STREET FREEPORT, PENNSYLVANIA 16229	
Letterle & Associates 2859 Oxford Boulevard Allison Park, Pennsylvania 15101	FIGURE 4A



Pcc	CASSELMAN FORMATION
Pcg	GLENSHAW FORMATION
Pa	ALLEGHENY GROUP

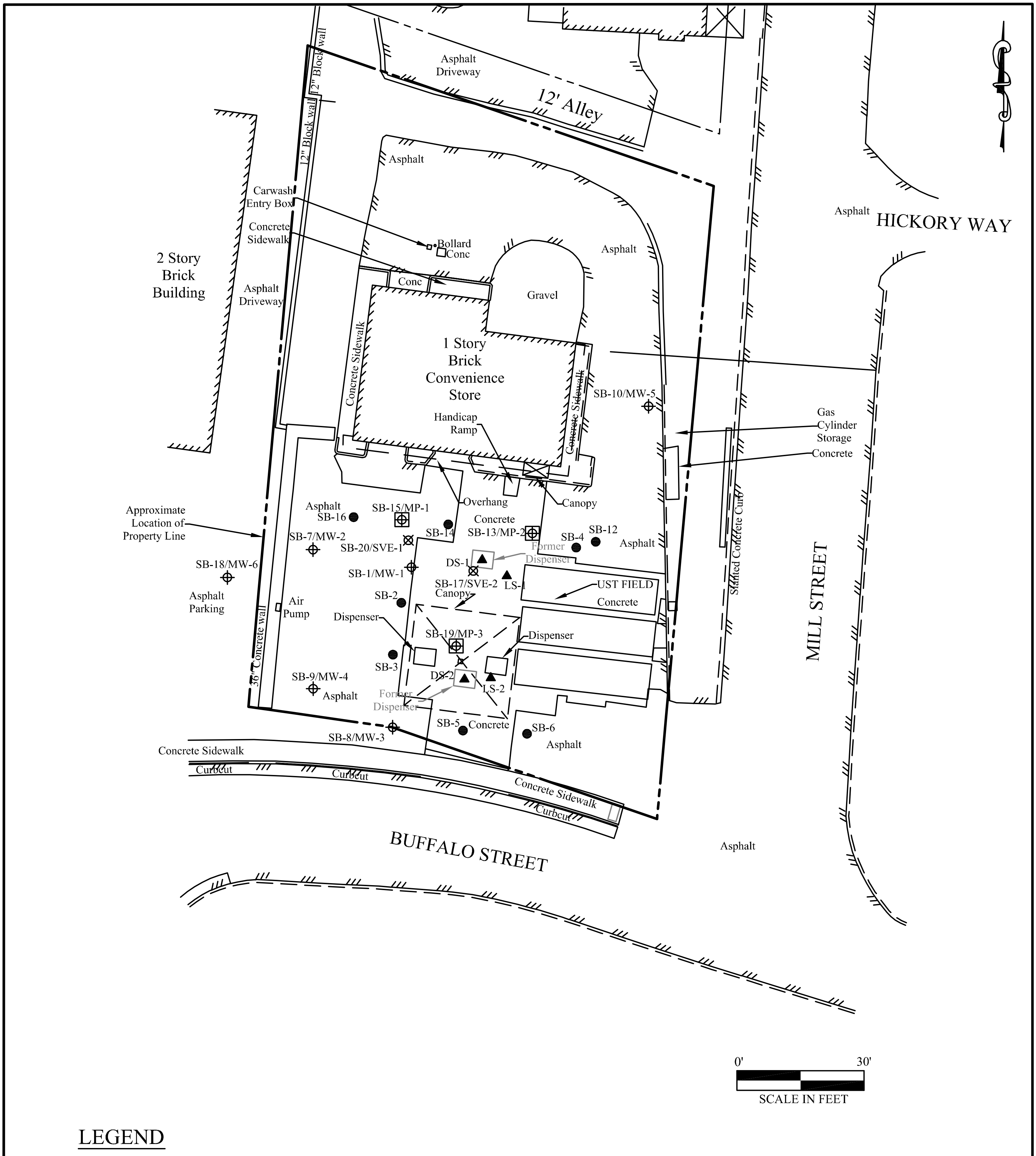
SOURCE MAPS 42 AND 43
FROM MAP 61 - ATLAS OF PRELIMINARY GEOLOGIC QUADRANGLE MAPS OF PENNSYLVAINA
1981 - PA GEOLOGIC SURVEY

PUBLISHED GEOLOGIC MAP
(MAP 42)

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 4B



LEGEND

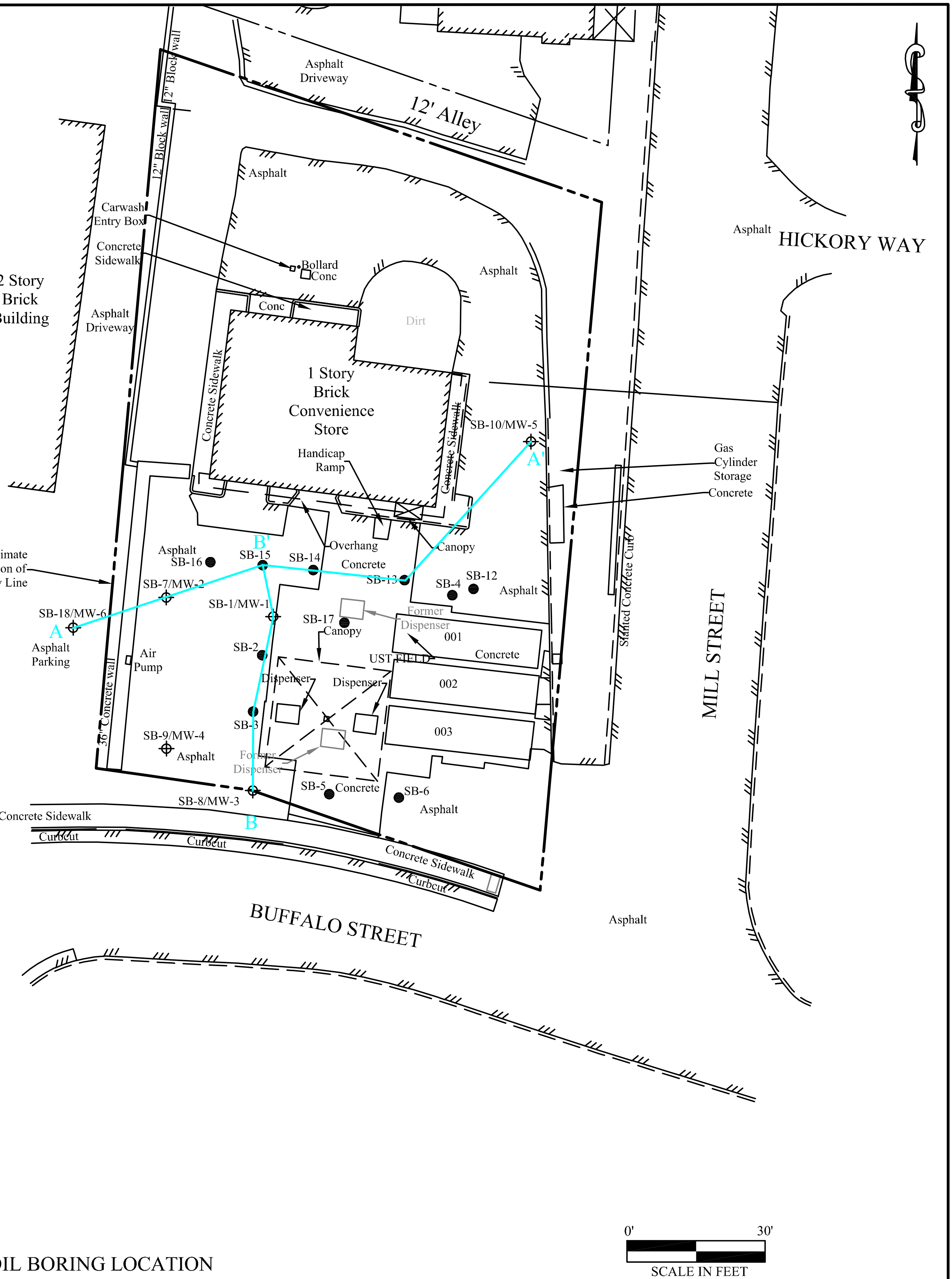
- APPROXIMATE PROPERTY BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- SOIL BORING/MONITOR POINT LOCATION
- SOIL BORING/SVE WELL LOCATION
- UST CLOSURE SOIL SAMPLE LOCATION

SOIL BORING, MONITOR WELL, SOIL VAPOR EXTRACTION, AND MONITOR POINT LOCATION MAP

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 5



LEGEND

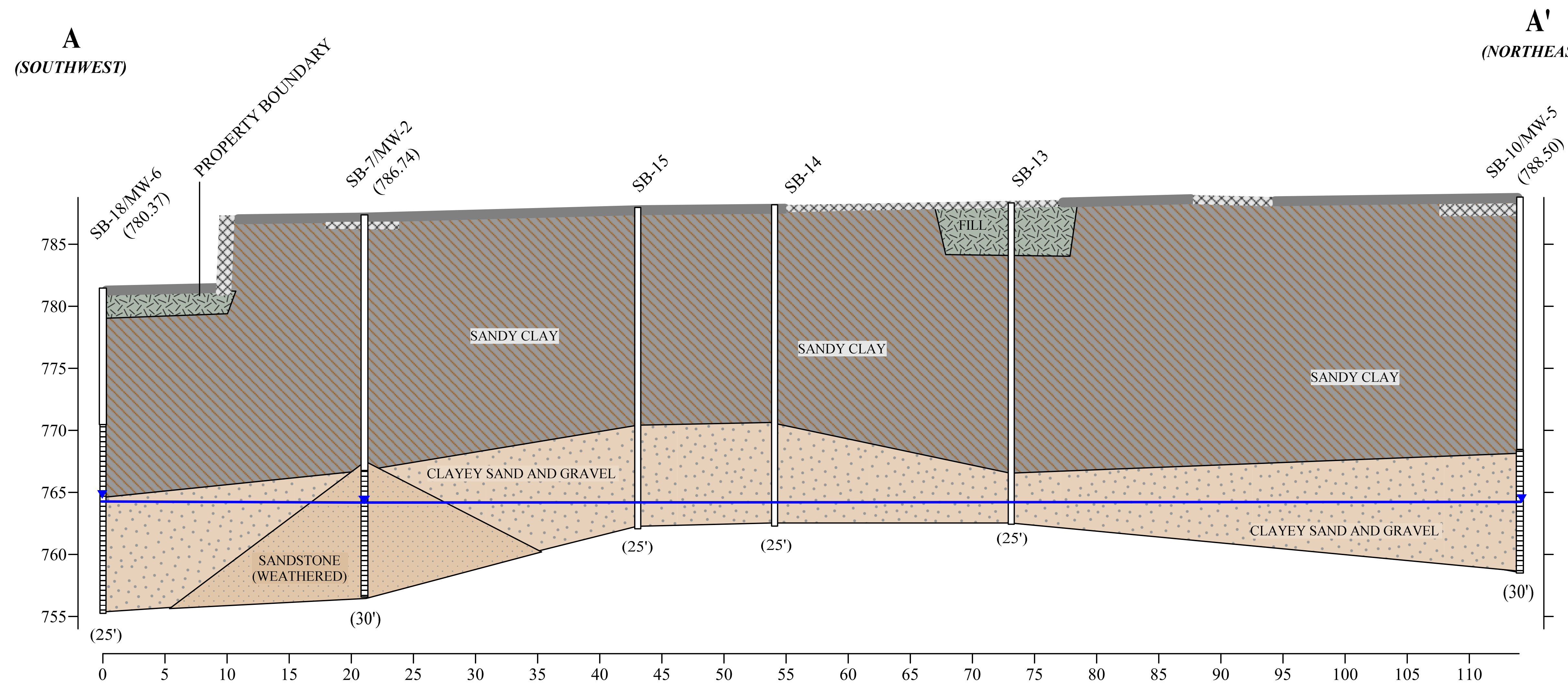
- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- APPROXIMATE PROPERTY BOUNDARY
- CROSS-SECTION LOCATIONS

CROSS-SECTION LOCATION MAP

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 6

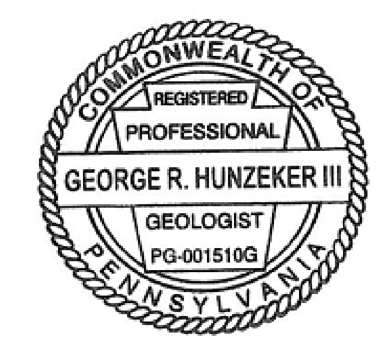


LEGEND

SB / MW (786.74)	SOIL BORING / MONITOR WELL (TOP OF CASING ELEVATION IN FT ABOVE MEAN SEA LEVEL (MSL)
	GROUNDWATER ELEVATION, AS MEASURED ON OCTOBER 15, 2018
	PVC RISER
	PVC SCREEN
(20')	TOTAL DEPTH
	CONCRETE

- ASPHALT
- GRAVEL
- FILL (GRAVEL, SLAG, CLAY)
- SANDY CLAY
- CLAYEY SAND AND GRAVEL
- SANDSTONE

HORIZONTAL SCALE 1 IN = 10 FT
VERTICAL SCALE 1 IN = 10 FT
VERTICAL EXAGGERATION - 0X

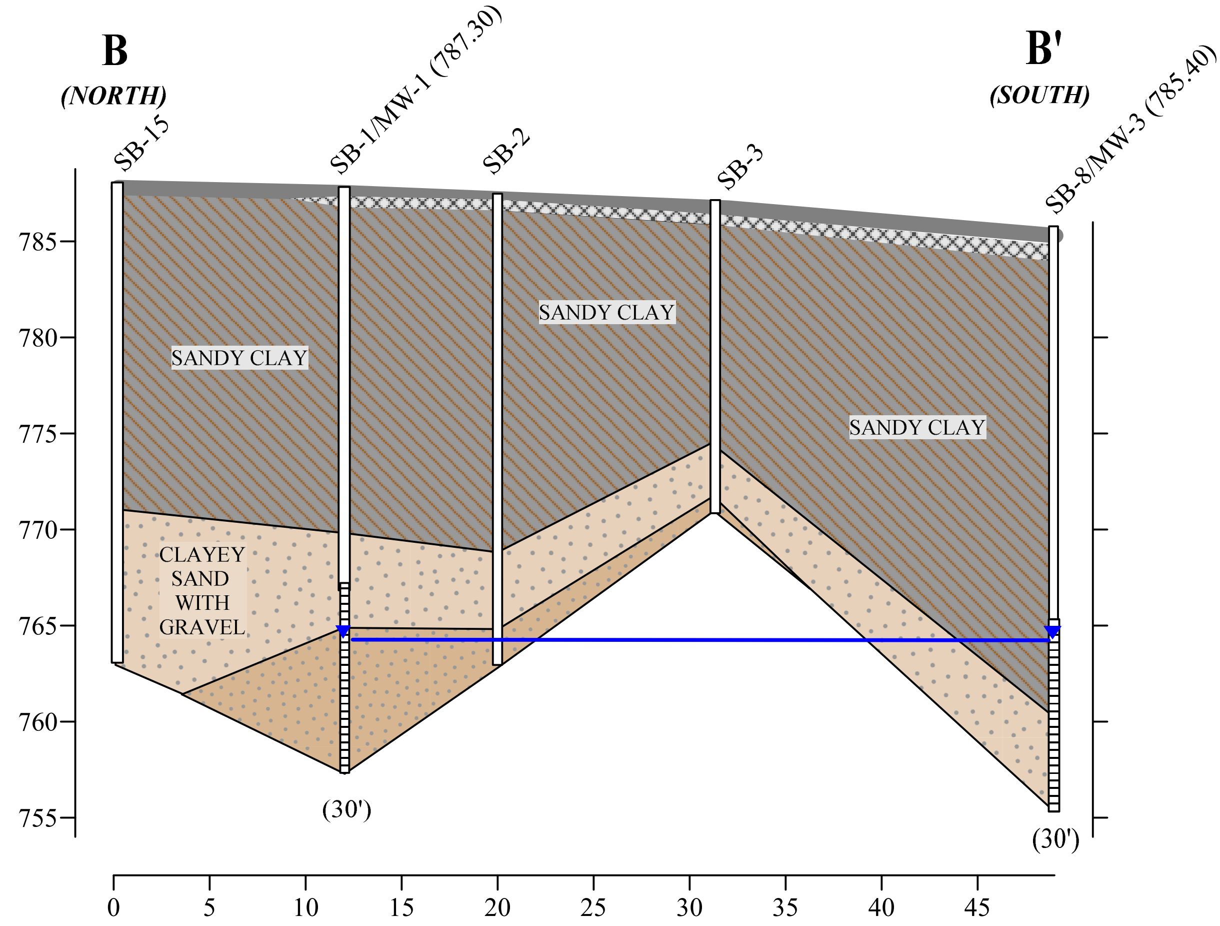


GEOLOGIC CROSS SECTIONS
A - A'

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 7



LEGEND

SB / MW (786.74)	SOIL BORING / MONITOR WELL (TOP OF CASING ELEVATION IN FT ABOVE MEAN SEA LEVEL (MSL)
	GROUNDWATER ELEVATION, AS MEASURED ON OCTOBER 15, 2018
	PVC RISER
	PVC SCREEN
(20')	TOTAL DEPTH
	CONCRETE

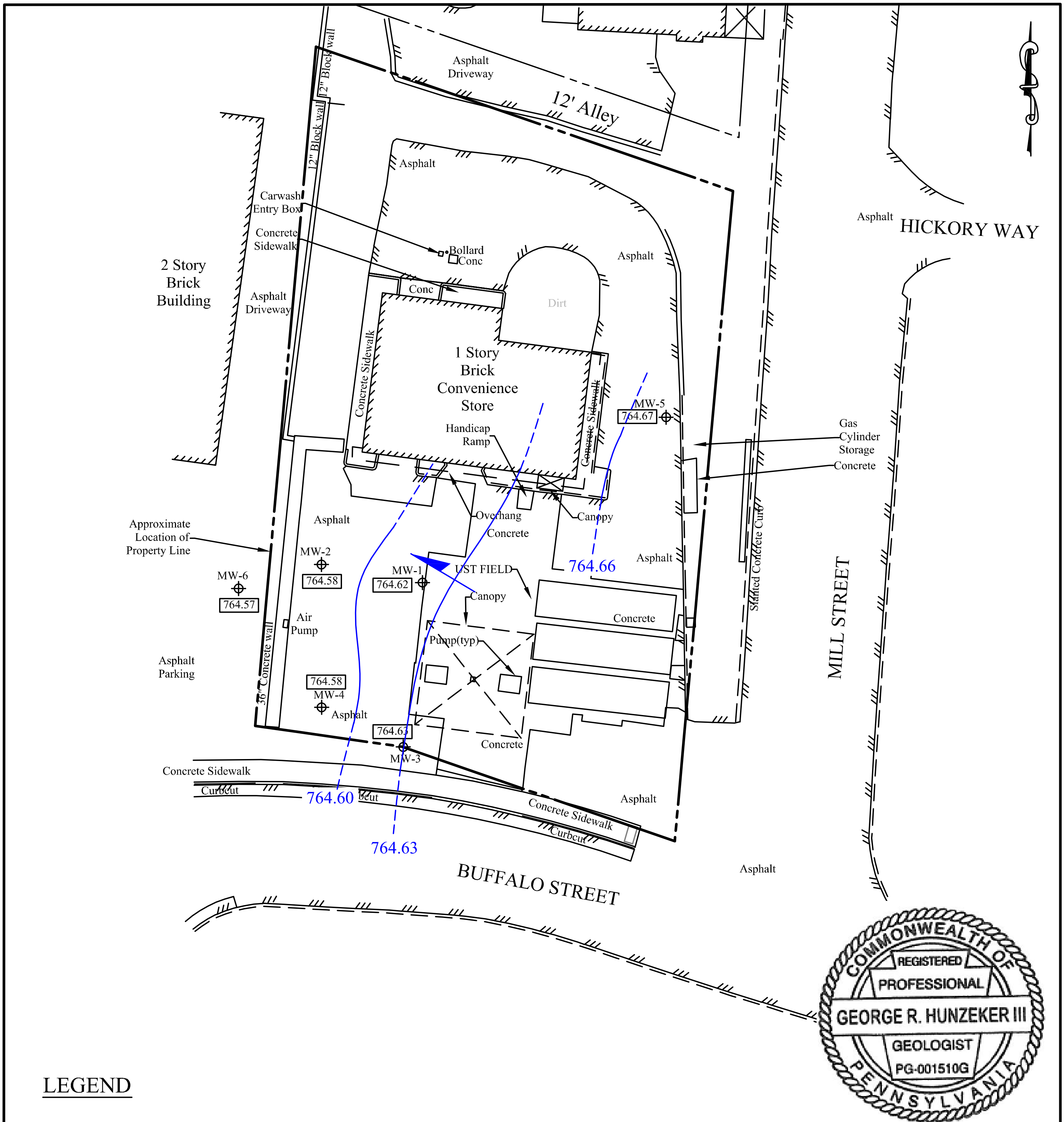
- ASPHALT
- GRAVEL
- FILL (GRAVEL, SLAG, CLAY)
- SANDY CLAY
- CLAYEY SAND AND GRAVEL
- SANDSTONE (WEATHERED)

GEOLOGIC CROSS SECTIONS
B - B'

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 8



LEGEND

- SOIL BORING/MONITOR WELL LOCATION
- APPROXIMATE PROPERTY BOUNDARY
- 764.62 GROUNDWATER ELEVATION (feet)
- GROUNDWATER CONTOUR
  CONTOUR INTERVAL: 0.03 FEET
- 764.60 GROUNDWATER CONTOUR ELEVATION (feet)
- GROUNDWATER FLOW DIRECTION

0' 30'
SCALE IN FEET

GROUNDWATER CONTOUR MAP -
FEBRUARY 25, 2019

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 9

LEGEND

- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- APPROXIMATE PROPERTY BOUNDARY
- SOIL BORING/SVE WELL LOCATION
- SOIL BORING/MONITOR POINT LOCATION
- UST CLOSURE SOIL SAMPLE LOCATION
- EXTENT OF IMPACTED SOIL (2016 RELEASE)

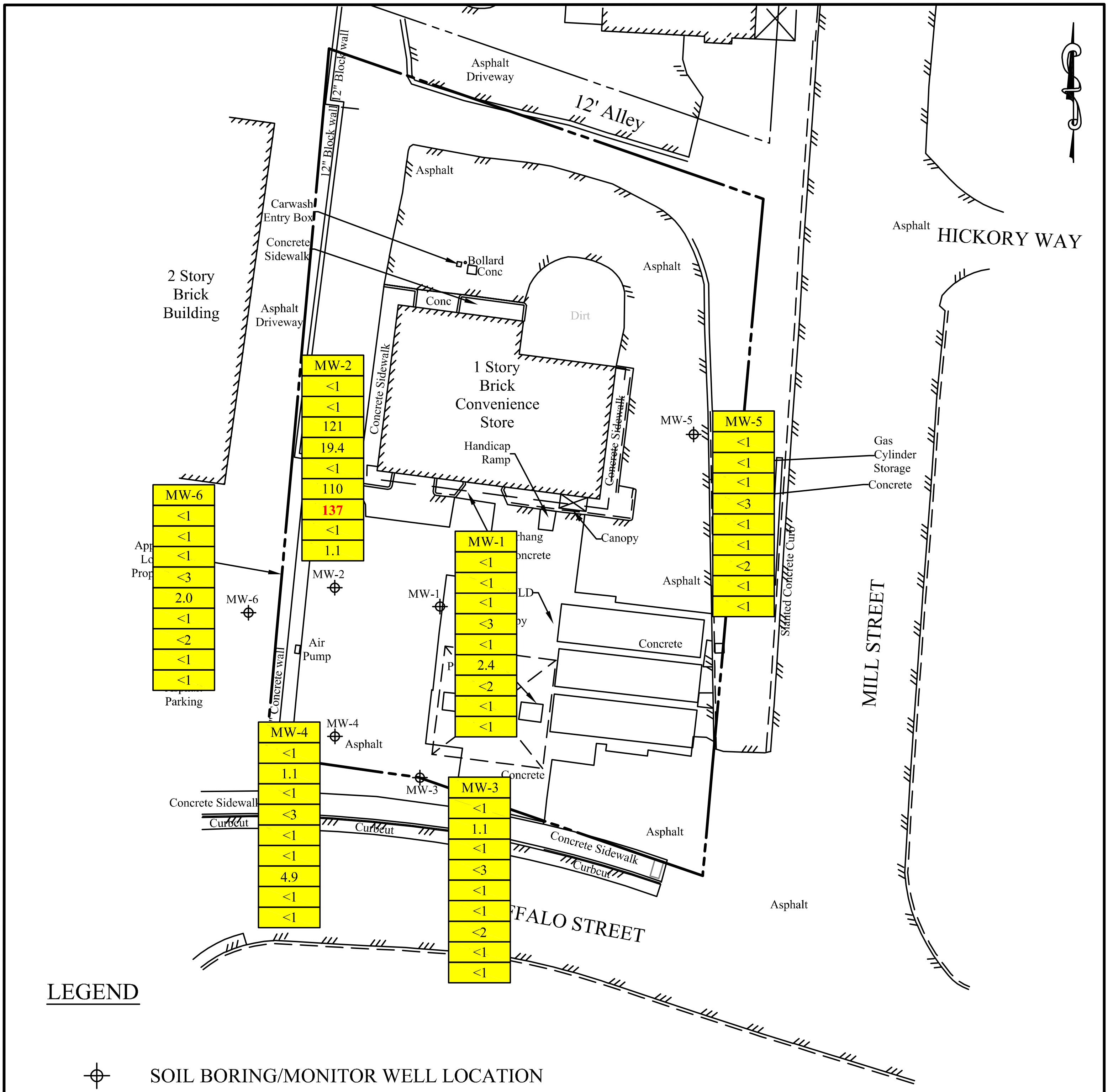
0' 30'
SCALE IN FEET

EXTENT OF SOIL IMPACT - SOIL MAP

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 10



LEGEND

⌖ SOIL BORING/MONITOR WELL LOCATION

—·-·— APPROXIMATE PROPERTY BOUNDARY

MW-1	SAMPLE ID
<1	BENZENE CONCENTRATION (μg/L)
<1	TOLUENE CONCENTRATION (μg/L)
<1	ETHYLBENZENE CONCENTRATION (μg/L)
<3	XYLENES CONCENTRATION (μg/L)
<1	MTBE CONCENTRATION (μg/L)
2.4	CUMENE CONCENTRATION (μg/L)
<2	NAPHTHALENE CONCENTRATION (μg/L)
<1	1,2,4-TMB CONCENTRATION (μg/L)
<1	1,3,5-TMB CONCENTRATION (μg/L)

NOTE: CONCENTRATIONS IN **BOLD RED FONT** INDICATE AN EXCEEDANCE OF THE PADEP SHS.

0' 30'
SCALE IN FEET

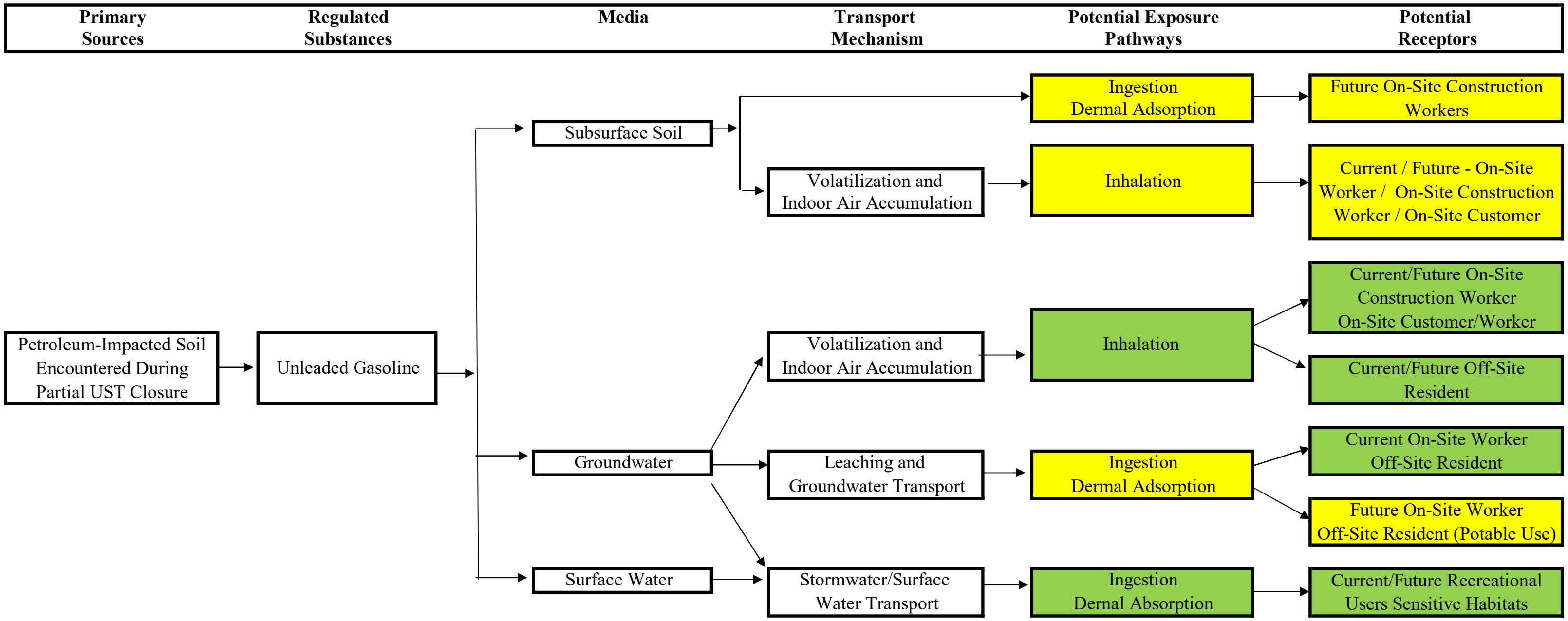
ANALYTE DISTRIBUTION MAP - GROUNDWATER-
FEBRUARY 25, 2019

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

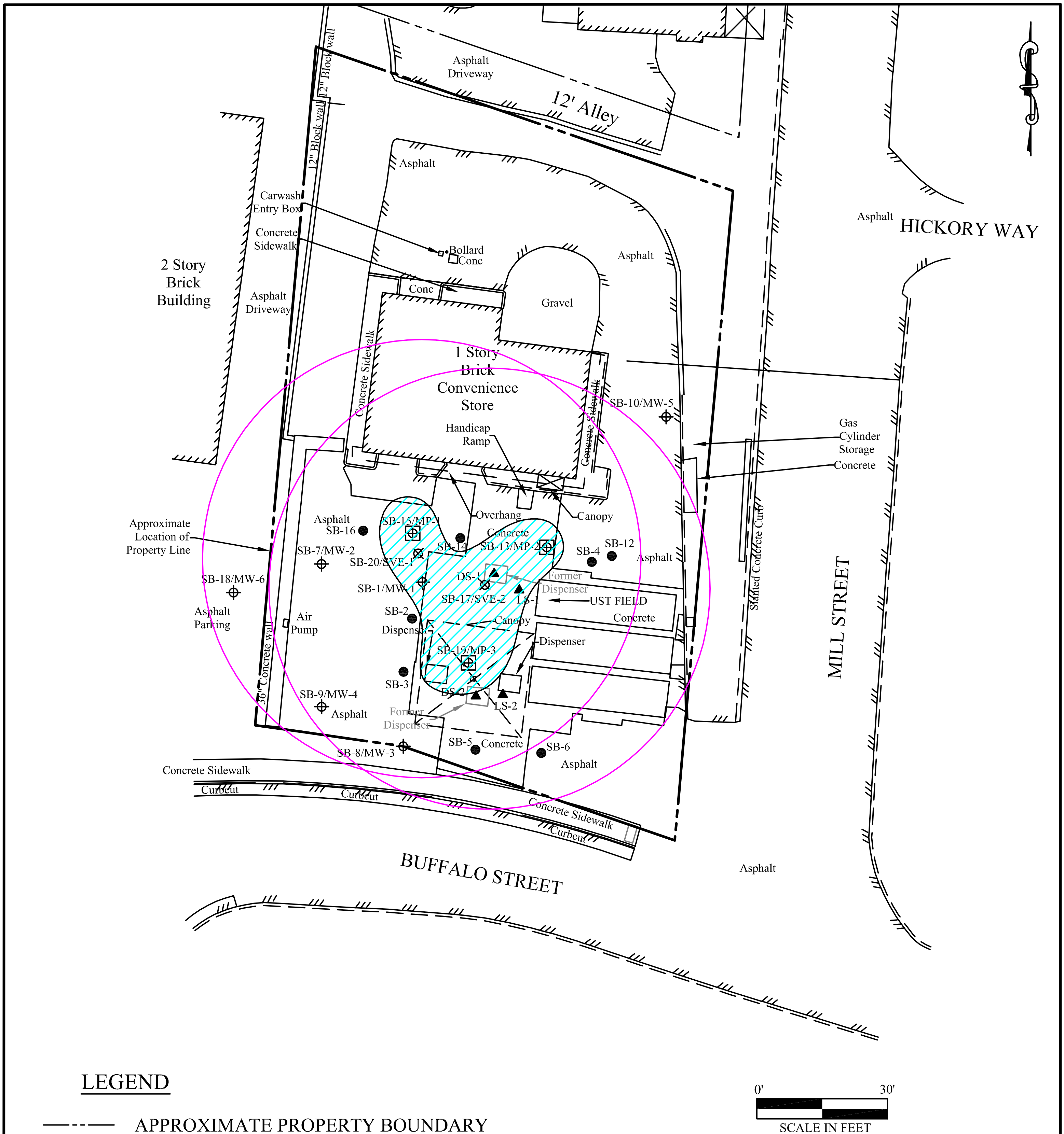
Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 11

FIGURE 12
CONCEPTUAL SITE MODEL
Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229



Notes:
Incomplete exposure pathways
Potentially complete exposure pathways



LEGEND

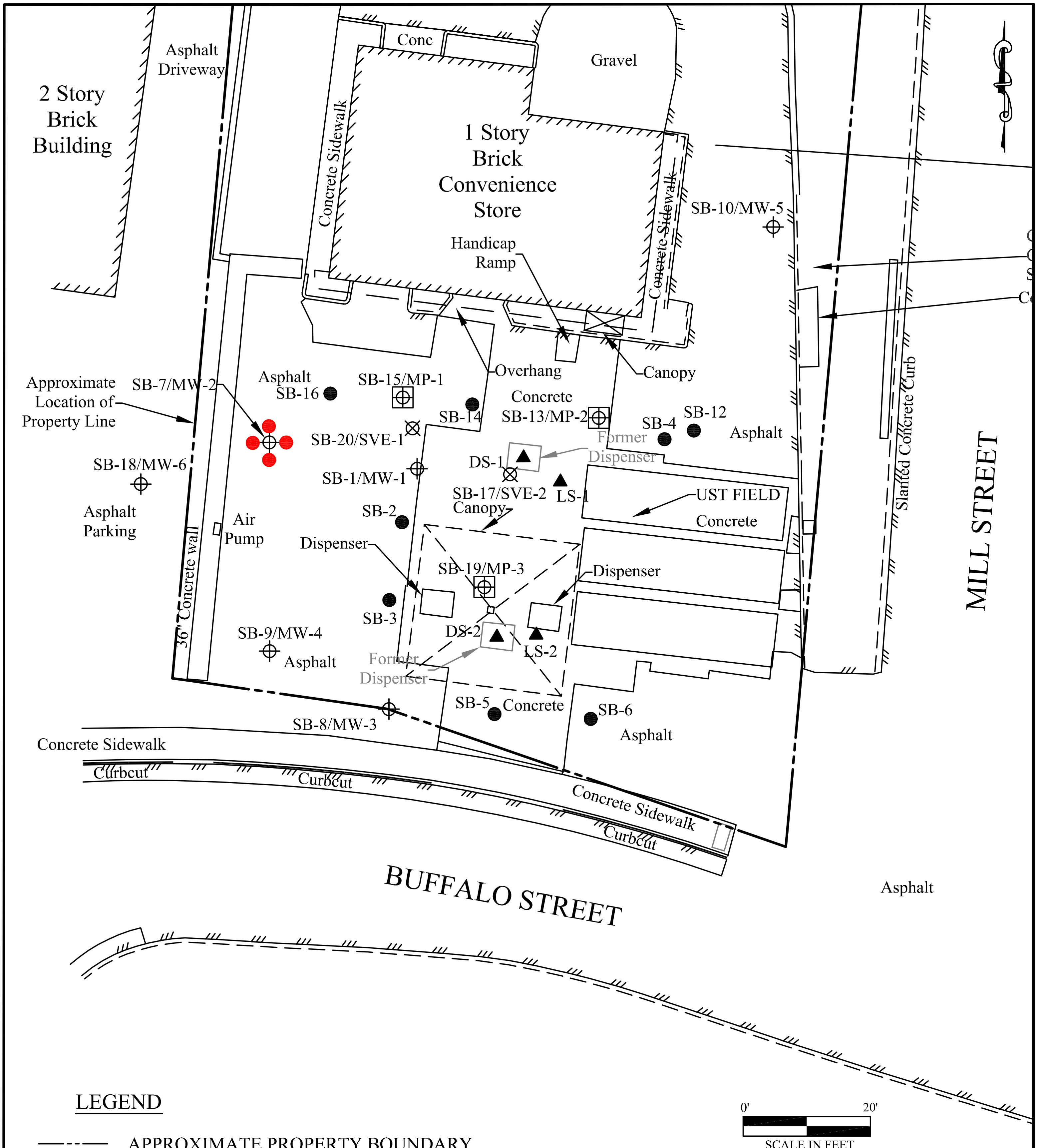
- APPROXIMATE PROPERTY BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- SOIL BORING/MONITOR POINT LOCATION
- SOIL BORING/SVE WELL LOCATION
- PNEUMATIC RADIUS OF INFLUENCE (0.1 inH20)
  (CALCULATED PNEUMATIC RADIUS OF INFLUENCE : 50 FEET)
- UST CLOSURE SOIL SAMPLE LOCATION
- EXTENT OF IMPACTED SOIL (2016 RELEASE)

PNEUMATIC RADIUS OF INFLUENCE MAP

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 13



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- SOIL BORING/MONITOR POINT LOCATION
- SOIL BORING/SVE WELL LOCATION
- UST CLOSURE SOIL SAMPLE LOCATION
- INJECTION POINT LOCATION (3 ft. FROM MW-2 IN ALL DIRECTIONS)

PROPOSED INJECTION POINT LOCATION MAP

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 14

APPENDICES

APPENDIX A

Site Specific Health and Safety Plan

Letterle Associates, Inc.
Site-Specific Health and Safety Plan

Site Information

Site Name:	Radhe Oil - Freeport
Site Location:	222 Buffalo Street Freeport, PA 16229
Site Status:	Site Characterization

Site Description/Work Summary

The site is currently Active

The following work will be/has been performed at this site:

Sensitive Receptor Survey	Vapor Point Installation
Soil Boring/Monitor Well Installation	Soil/Groundwater Sampling
Remedial System Pilot Testing	

Emergency Information

Contact	Person or Agency	Telephone Number
Emergency Services:	Ambulance Service	911
	Fire Department	911
	Police Department	911
	Allegheny Valley Hospital	724-224-5100
Client:	Nila Manning	412-369-4429
Consultant:		
Project Manager:	Tim Kier	814-432-2167 ext 1
Office Manager:	Tim Kier	814-432-2167 ext 1
Health & Safety Supervisor:	Tim Kier	814-432-2167 ext 1

Location of Nearest Hospital

Address: 1301 Carlisle Street
Natrona Heights, PA 15065

Onsite Resources

Water: Emergency only
Telephone: Emergency only

Personal Protective Equipment

Leve D: Steel-toed boots, safety glasses, safety vest, gloves

Potential Physical/Chemical Hazards

Slips, trips, falls, heat stress, cold stress
Traffic and pedestrians
Heavy equipment traffic
Ponds (they are relocated frequently) ** Extreme winter driving hazard **
Poison ivy
Thick vegetation/briars
Bees, ticks, and other biting insects
Deep snow

MSDS Located in Appendix A

APPENDIX B

Standard Operating Procedures (QA/QC)

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly perform a level survey.

2.0 DEFINITION

A monitoring well survey is conducted to locate monitoring wells vertical and horizontal location at a project site.

3.0 TERMINOLOGY

The following technical definitions are employed within this document:

3.1 Auto Level – Instrument for reading stadia rod
3.2 Stadia Rod – a graduated rod
3.3 Stadia Hairs – lines within the auto level scope used to read graduations
3.4 Tripod – a three legged stand designed to hold the auto level

4.0 OBJECTIVE

The objective of the level survey SOP is to establish a method and format for the use and control of field activities.

5.0 REQUIRED MATERIALS

The following items are required materials for a monitoring well survey:

5.1 Bound field logbooks
5.2 Indelible ink pens
5.3 Field forms, if required, with a clip board
5.4 Auto Level
5.5 Tripod
5.6 Stadia Rod

6.0 PROCEDURES – LEVEL SURVEY

6.1 Set up the survey station and level the instrument per manufacturer instruction

6.2 The survey point location for each monitor well is the top-of-casing (TOC) and is permanently marked on each monitoring well.

6.3 Collect Upper stadia hair (USH), middle stadia hair (MSH), and lower stadia hair (LSH) and angle at each rod location

6.4 Check the work by setting up a second survey station and reshooting at least three previously surveyed locations. Compare the data sets (an error of < or = to 0.02 feet is the target goal).

Issue A Effective: 06/04/14

Prepared By: Peter Weir
Peter Weir
Project Scientist

Approved By: G Hunzeker
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly record field notes during all types and phases of Company services, which shall include, but are not limited to, all types of media sampling (soil vapor, soil, groundwater, waste water, etc.) utility clearance, well installation, sample point locating and surveys, site reconnaissance, LNAPL removal, waste handling, and remediation activities (bioremedial injection events, FSR, etc.).

2.0 TERMINOLOGY

The following technical acronyms are employed within this document:

2.1 FSR – Focused Source Remediation
2.2 HASP – Health and Safety Plan
2.3 LNAPL – Light Non-Aqueous Phase Liquid
2.4 O&M – Operation and Maintenance
2.5 PID – Photoionization Detector
2.6 SOP – Standard Operating Procedure
2.7 TPE – Total Phase Extraction
2.8 UST – Underground Storage Tank

3.0 OBJECTIVES

The objective of the field notes SOP is to establish a method and format for the use and control of documentation that consistently and accurately describes field activities.

4.0 REQUIRED MATERIALS

The following items are required materials for recording field notes:

4.1 Bound field logbooks
4.2 Indelible ink pens
4.3 Field forms, if required, with a clip board

5.0 PROCEDURES – Field Logbooks

5.1 This SOP primarily describes the general documentation that is necessary for field logbooks. Details of other field-related forms (e.g., sample labels, chain of custody records, FSR, etc. are discussed in the specific SOP associated with that particular field activity), and are not covered in detail herein.

5.2 Field personnel shall keep accurate written records of their daily activities in a bound logbook that shall be sufficient to recreate the project field activities without reliance on memory. This information shall be recorded in chronological order. All entries shall be legible, written in indelible (preferably black) ink, and contain accurate and inclusive documentation of field activities, including field data observations, deviations from project plans, problems encountered, and actions taken to solve the problem. Prior to use, each page of the field logbook shall be consecutively numbered. Upon completing individual assignments, each page shall be signed and dated by the field author. Pages shall not be removed for any reason. Overall language used shall be site-related, objective, factual, and free of personal opinions. If an error is made in the field, logbook (and any network copy) corrections shall be made by drawing a single line through the error, entering the correct information, and initialing and dating the change. Materials that obliterate the original information, such as correction fluid are prohibited. Within the inside cover of the logbook, record the following: field personnel name, Letterle company name and office address, and company phone number.

5.3 In addition to documenting field activities, field logbooks shall include, but are not limited to, the following:

5.3.1 Date and time of activities
5.3.2 Site location
5.3.3 Purpose of site visit
5.3.4 Site and weather conditions
5.3.5 Personnel present, including sampling crew, facility/site personnel, and representatives (including site arrival and departure times)
5.3.6 Subcontractors present including the full formal name of their company.
5.3.7 Regulatory agencies and their representatives (including phone numbers and arrival/departure times)
5.3.8 Level of health and safety protection, if elevated above level 'D' (e.g., also include documentation of exclusion zone set-up and location)
5.3.9 Sampling methodology and information (make/model of rig, Macrocore® samplers, etc.)
5.3.10 Sample locations sketch if different from proposed locations
5.3.11 Altered site conditions should be discussed with project manager and accurately sketched (e.g., relocation of storm drain or building addition)
5.3.12 Source of sample(s), sample identifications, and sample container types and preservatives used (if not recorded on another form)
5.3.13 Chronological description of the field observations and events
5.3.14 Specific considerations associated with sample acquisition (e.g., field parameter measurements, field screening data (e.g., PID), HASP monitoring data, etc.) (if not recorded on another form)

5.3.15 For soil or rock description conventions, refer to SOP 16-1
5.3.16 Quantity and type of wastes generated and location where waste(s) are stored on-site with confirmation of proper labeling
5.3.17 Field quality assurance/quality control samples collection, preparation, and origin (if not recorded on other forms)
5.3.18 Manufacturer, model, and serial number of field instruments plus source lot number and expiration date of standard, if calibrated in the field
5.3.19 Well construction materials, water sources(s), and other materials used on-site
5.3.20 Sample conditions that could potentially affect the sample results,
5.3.21 If deviating from plan, clearly state the reason(s) for deviation
5.3.22 Persons contacted and topics discussed
5.3.23 Place an 'X' across any unused section(s) of pages and sign the bottom of each page at the end of the day

6.0 PROCEDURES – Photographs

Photographs can be significant to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera lens system having a true perspective similar to that of the naked eye/ telephoto or wide-angle shots cannot be used in enforcement proceedings. Always confirm with the property owner or project manager that photography is permitted. Several items should be recorded in the field logbooks (and transferred to the network as needed) for each photograph taken to accurately document the scene recorded:

6.1 date and time photograph taken
6.2 brief description of the subject and the direction taken;
6.3 the site name, location, field task, and photographer

7.0 PROCEDURES – Additional Field Forms

Additional field forms may be required for a specific field activity. The use of these forms is described in other SOPs specific for the field activities, including, but not limited to the following:

7.1 (SOP 5-1) Groundwater Sampling – Low Flow
7.2 (SOP 6-1) Enhanced Aerobic Bioremediation Pilot Test
7.3 (SOP 7-1) Focused Source Remediation (FSR)
7.4 (SOP 9-1) O&M TPE Remedial System

Issue A Effective: February 22, 2013
Issue B Effective: May 14, 2014

Prepared By: Laurie D. Hall
Laurie D. Hall
Project Scientist

Approved By: GH
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly perform a Pennsylvania One Call required under the Underground Utility Line Protection Act (Act 287).

1.0 DEFINITION

http://www.pa1call.org/pa811/Public/Resource%20Center/PA_Act_287/Public/POCS_Content/Resource_Center/Act_287.aspx?hkey=2b7e0c60-a384-4681-a275-c190a2b10636

An Act "To protect the public health and safety by preventing excavation or demolition work from damaging underground lines used in providing electricity, communication, gas, propane, oil delivery, oil product delivery, sewage, water or other service; imposing duties upon the providers of such service, recorders of deeds, and persons and other entities preparing drawings or performing excavation or demolition work; and prescribing penalties."

2.0 TERMINOLOGY

The following technical definitions are employed within this document:

2.1 **"Business day"** means any day except a Saturday, Sunday or legal holiday prescribed by statute. A business day begins at 12:00:00 a.m. and ends at 11:59:59 p.m.

2.2 **"Excavation work"** means the use of powered equipment or explosives in the movement of earth, rock or other material, and includes but is not limited to anchoring, augering, backfilling, blasting, boring, digging, ditching, drilling, driving-in, grading, plowing-in, pulling-in, ripping, scraping, trenching and tunneling, but does not include soft excavation technology such as vacuum, high pressure air or water, tilling of soil for agricultural purposes to a depth of less than eighteen inches, the direct operations necessary or incidental to the purposes of finding or extracting natural resources, political subdivisions performing minor routine maintenance up to a depth of less than eighteen inches measured from the top of the edge of the cartway or the top of the outer edge of an improved shoulder, in addition to the performance of incidental de minimis excavation associated with the routine maintenance and the removal of sediment buildup, within the right of-way of public roads or employes of the Department of Transportation performing within the scope of their employment work up to depth of twenty-four inches beneath the existing surface within the right-of-way of a State highway.

2.3 **"Excavator"** means any person who or which performs excavation or demolition work for himself or for another person.

2.4 **"Facility owner"** means the public utility or agency, political subdivision, municipality, authority, rural electric cooperative or other person or entity who or which owns or operates a line. This term does not include the Department of Transportation within a State highway right-of-way. The term does not include any of the following:

(1) A person serving the person's own property through the person's own line if the person does not provide service to any other customer.

(2) A person using a line which the person does not own or operate if the use of the line does not serve more than a single property.

2.5 **"Line" or "facility"** means an underground conductor or underground pipe or structure used in providing electric or communication service, or an underground pipe used in carrying, gathering, transporting or providing natural or artificial gas, petroleum, propane, oil or petroleum and production product, sewage, water or other service to one or more transportation carriers, consumers or customers of such service and the appurtenances thereto, regardless of whether such line or structure is located on land owned by a person or public agency or whether it is located within an easement or right-of-way. The term shall include unexposed storm drainage and traffic loops that are not clearly visible. The term shall not include crude oil or natural gas production and gathering lines or facilities unless the line or facility is a regulated onshore gathering line as defined in regulations promulgated after January 1, 2006, by the United States Department of Transportation pursuant to the Pipeline Safety Act of 1992 (Public Law 102-508, 49 U.S.C. § 60101 et seq.), if the regulated gathering line is subject to the damage prevention program requirements of 49 CFR § 192.614.

2.6 **"Locate request"** means a communication between an excavator or designer and the One Call System in which a request for locating facilities is processed. Locate requests submitted by an excavator performing work within the right-of way of any State highway, either under contract to the Department of Transportation or under authority of a permit issued by the Department of Transportation, shall include the number of the Department of Transportation contract or permit.

2.7 **"Powered equipment"** means any equipment energized by an engine or motor and used in excavation or demolition work.

3.0 OBJECTIVE

The objective of the One Call Process SOP is to establish a method and format for the use and control of placing and documenting the One Call Process.

4.0 PROCEDURES – ONE CALL NOTIFICATION

4.1 Gather the appropriate information required to complete the One Call notification form (form attached).

4.2 Enter the information onto the form.

4.3 Place the call to 811 (National Number)

5.0 Documentation

A one call phone record sheet shall be saved in the project folder with the assigned One Call Serial number. The One Call number shall be forwarded to any pertinent excavators. One Call Locate responses via the One Call System shall be saved within the project folder.

Date Issued:

Prepared By: Andrew Frost
Andrew Frost
Senior Staff Scientist

Approved By:
George Hunzeker
Vice President/CTO

www.paonecall.org
DIAL 8-1-1 or
1-800-242-1776

Pennsylvania 811

WORK LOCATION REQUEST FORM

TELEPHONE NUMBER: (________) ________ EXT.:______ CALLER:________________

COMPANY NAME:______________________________

ADDRESS:______________________________

CITY:____________________ STATE:________ ZIP:__________

NOTIFICATION TYPE:

☐ **FINAL DESIGN** (Not less than 10 nor more than 90 Business Days) ☐ **PRELIMINARY DESIGN** (Greater than 90 Business Days)

☐ **EXCAVATION** (Not less than 3 nor more than 10 Business Days) ☐ **DEMOLITION** (Not less than 3 nor more than 10 Business Days)

WORKSITE INFORMATION:

COUNTY: ________________ MUNICIPALITY:________________ WARD: ______

STREET ADDRESS:__________ STREET NAME:____________________

NEAREST INTERSECTION:______________________________

WORKING BETWEEN TWO INTERSECTIONS ☐ YES ☐ NO

SECOND INTERSECTION/NEAREST MAIN ROAD:____________________

SUBDIVISION:________________ LATITUDE/LONGITUDE COORD.:________________

WORKING IN: ☐STREET ☐SIDEWALK ☐PUBLIC PROPERTY ☐PRIVATE PROPERTY (☐Front ☐ Rear ☐ Left ☐ Right)

☐ OTHER (SPECIFY)________________ SITE MARKED IN WHITE: ☐ Yes ☐ No

LOCATION INFORMATION:______________________________

____

____

TYPE OF WORK:________________________ DEPTH:__________

EXTENT OF EXCAVATION:________________ METHOD OF EXCAVATION:________________

PROJECT OWNER:________________ PERSON TO CONTACT:________________

PHONE:(_____) __________ EXT:______ BEST TIME TO CALL:________________

EMAIL ADDRESS*:____________________ FAX #: (_____) __________

SCHEDULED EXCAVATION DATE:________ TIME: ________ DURATION OF JOB:________________

JOB #: ____________________ PENNDOT CONTRACT/PERMIT #:________________

REMARKS:____________________________________

____

____

MEETING REQUEST NUMBER (if applicable)________________________

TO BE COMPLETED AFTER PLACING ONE CALL

LAWFUL START DATES:____________________ THROUGH____________________

OTHER SERIAL NUMBERS REFERENCED:________________________

FACILITY OWNER MEMBERS NOTIFIED:________________________

____

____

SERIAL NUMBER ASSIGNED:____________________ DATE/TIME:________________

THERE IS AN ANNUAL FEE PLEASE DO NOT FAX THIS FORM TO POCS

*if provided you will be emailed a copy of your Notification as delivered to the Members.

Print Form

O.U.P.S. LOCATE WORK ORDER

CALL 48 HOURS BEFORE YOU DIG - 800-362-2764 or 8-1-1

COLOR CODES: Red = Electric   Orange = Phone/Cable TV   Yellow = Gas   Blue = Water   Green = sewer
White = Proposed Excavation

COMPLETING ENTIRE FORM HELPS TO ENSURE A MORE ACCURATE AND TIMELY LOCATE

Contact Phone #: ______________   Caller Name: ______________

Company Name: ______________

Fax Number: ______________   Email: ______________

County: ______________   City/Township: ______________

Address/Location of Work: ______________

Extent of Work: Front/Sides/Rear: ______________

Farthest Distance/Direction back off Road: ______________

Lot #: ______________   Subdivision: ______________   Builder Name: ______________

Cross/Between Streets: ______________

Distance & Direction From Cross Street: ______________

Date of Excavation: ______________   Start Time of Excavation: ______________

Type of Work: ______________

Working for Company: ______________   Work Done by Company: ______________

Means of Excavation: ______________   ☐ Blasting   ☐ PreMarking   ☐ Meet

☐ RR Right of Way   ☐ Highway   Mile Marker At/From: ______________

Comments: ______________

____

O.U.P.S. Ticket Number: ______________

This form is only meant to be used as a reference for anyone calling in a request to excavate. If the information on this form is gathered prior to contacting us, your time on the phone will be significantly reduced. All locates must be called into the center. No e-mail or fax requests are accepted.

SJD - 6/2/11

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly purge and sample groundwater using low-flow and hand bailing techniques and to properly sample surface water.

2.0 TERMINOLOGY

2.1 Gauging, the process of measuring the depth to groundwater within a well, tank, or drum.

2.2 Purging, the process of removing stagnant water from the location (monitor well, dug pit, or hole) prior to sampling and replacing it with groundwater from the adjacent formation.

2.3 Bailer, a tall narrow tube equipped with a check valve on the bottom. The valve allows water to enter from the bottom as the bailer is lowered, then prevents the water's release as the bailer is raised.

2.4 Low-flow, sampling technique designed to allow the collection of representative groundwater samples from the formation surrounding the screened section of the monitor well.

3.0 OBJECTIVES

To ensure proper sampling techniques are used in order to ensure representative measures of groundwater quality are carried out for any groundwater monitoring program.

4.0 REQUIRED DOCUMENTS

Refer to PADEP Groundwater Monitoring Guidance Manual (December 1, 2001) for additional reference.

5.0 REQUIRED GROUNDWATER SAMPLING MATERIALS

5.1 Low-Flow Sampling Materials

5.1.1 Work order
5.1.2 Electronic interface probe or water level meter
5.1.3 General hand tools (socket set, screwdrivers, knife, etc)
5.1.4 Low-flow sampling pump
5.1.4.1 Geopump® peristaltic pump (or equivalent) for use at wells with water levels less than 25 feet below ground surface

(bgs)

5.1.4.2 Proactive® submersible pump (or equivalent) for use at wells with water levels greater than 25 feet bgs

5.1.5 Polyethylene tubing

5.1.5.1 Geopump® peristaltic pump requires 0.17-inch ID x ¼-inch OD tubing

5.1.5.2 Proactive® submersible pump requires 3/8-inch ID x ½-inch OD tubing

5.1.6 Silicone tubing (for use with the Geopump® peristaltic pump)

5.1.7 45-micron field filters

5.1.8 Flow measurement supplies (graduated cylinder, beaker, etc)

5.1.9 Power source (battery)

5.1.10 Disposable sampling gloves

5.1.11 5-gallon buckets

5.1.12 Multi-parameter meter (YSI 556 or equivalent) with in-line flow-through cell

5.1.13 Decontamination supplies (including but not limited to: Liquinox® or other approved non-phosphate detergents, distilled water, and paper towels).

5.1.14 Field book

5.1.15 Sampling containers and labels

5.1.16 Sample preservation supplies (cooler with ice)

5.1.17 Purge water treatment system (carbon filtration system) or storage container (55-gallon drum)

5.1.18 Traffic control devices (cones, barricades, etc)

5.2 Hand Bail Sampling Materials

5.2.1 Work Order

5.2.2 Electronic interface probe or water level meter

5.2.3 General hand tools (socket set, screwdrivers, knife, etc)

5.2.4 Disposable sampling gloves

5.2.5 Disposable bottom-loading bailers

5.2.6 Nylon cord or rope

5.2.7 5-gallon buckets

5.2.8 Decontamination supplies (including but not limited to: Liquinox® or other approved non-phosphate detergents, distilled water, and paper towels).

5.2.9 Field book

5.2.10 Sampling containers and labels

5.2.11 45-micron field filters

5.2.12 Sample preservation supplies (cooler with ice)

5.2.13 Purge water treatment system (carbon filtration system) or storage container (55-gallon drum)

5.2.14 Traffic control devices (cones, barricades, etc)

6.0 PROCEDURES FOR GROUNDWATER SAMPLING USING LOW-FLOW

6.1 Prior to departing office, obtain all sampling equipment identified in Section 5.0 and refer to **SOP 10-1 (Sample Handling)** for procedures regarding sample handling.

Make sure all equipment is calibrated prior to each sampling job either at the office or in the field. Refer to **SOP 12-1 (Monitoring Equipment Calibration)**.

All site activities should be documented as per **SOP 3-1 (Recording Field Notes)**.

6.2 Upon arrival at the site, check in with the site owner/tenant to inform them of planned activities.

6.3 Assure proper traffic control devices are set up as per **SOP 2-1 (Vehicle & Traffic Control Procedures)**.

6.4 Check the condition of the monitoring wells for damage and evidence of tampering (J-plugs, lock, bolts, concrete pad, etc). Note any damage or tampering in a field book. Replace as needed.

6.5 Bail any water from the manhole before opening well. Use a small jar or turkey baster.

6.6 Remove well caps on all wells. Replace manholes after opening wells. Bolt down manholes in high traffic areas. Let water levels stabilize prior to gauging.

6.7 If the well casing does not have a reference point (V-cut or indelible mark in well casing), please refer to **SOP 31-1 (Electronic Interface Probe Well Gauging)** to procedures on how to establish a reference point.

6.8 Measure and record depth to water in all wells using procedures identified in **SOP 31-1 (Electronic Interface Probe Well Gauging)**.

6.9 Gauge wells where LNAPL has been detected last. Do not recover LNAPL during a sampling event. Do not sample well if > 0.02 feet of LNAPL is detected in the well.

6.10 Attach and secure tubing to pump (tubing should be dedicated to well, if possible). Secure tubing, safety cable, and electrical lines to each other using nylon ties.

6.11 Lower submersible pump and/or tubing slowly into the well to a depth specified on the work order. If a depth is not specified, then lower the pump or tubing approximately 3 feet below gauged depth to water. The pump intake should be kept above the bottom of the well.

6.12 Start pumping water from the well so that there is minimal drawdown. Water level needs to be measured continuously until equilibrium between flow rate and drawdown is established. Flow rates are typically at a rate of 100-500 milliliters per minute. Use a graduated cylinder or beaker to measure the flow rate. The pumping rate should cause little to no drawdown in the well.

6.13 If recharge rate of the well is very low, avoid dewatering the well, if possible. If the well is dewatered, wait for the groundwater to recharge and then collect a water sample. Bailers can be used if recharge is a particular problem. Indicate in the field book if bailers are used.

6.14 While purging the well, monitor water quality indicator parameters using the multi-parameter meter and flow-through cell. Parameters should include: temperature, specific conductance, pH, dissolved oxygen, total dissolved solids, and oxygen-reduction potential. Collect readings every 3-5 minutes until all the parameters have stabilized as described on the low flow sampling sheet.

Stabilization is achieved when three rounds of successive readings are within 0.1 for pH, 3% for SC, 10 mV for oxygen-reduction potential, and 10% for dissolved oxygen. Dissolved oxygen and conductivity are the most reliable indicators used to decide when stabilization has been achieved.

6.15 Once stabilization is documented, the flow-through cell should be disconnected and samples should be immediately collected in laboratory–provided bottleware. If dissolved metals are to be sampled as per the site-specific work order, then attach a 45-micron quick filter to the discharge tubing and fill appropriate bottleware.

6.16 All samples should be collected and handled as per **SOP 10-1 (Sample Handling)**.

6.17 Collect quality assurance/quality control (QA/QC) samples, if required. QA/QC samples may consist of a field duplicate, field blank, trip blank, and equipment blank. The required QA/QC samples will be indicated on the site-specific work order.

6.18 After the collection of the samples, the tubing from the pump should be properly discarded or dedicated to the well (by hanging tubing inside the well).

6.19 Groundwater removed during purging and sampling is considered waste material and should be handled as per **SOP 11-1 (Waste Management)**.

6.20 If necessary, restart remedial system.

7.0 PROCEDURES FOR GROUNDWATER SAMPLING USING BAILERS

7.1 Prior to departing office, obtain all sampling equipment identified in Section 5.0 and refer to **SOP 10-1 (Sample Handling)** for procedures regarding sample handling.

Make sure all equipment is calibrated prior to each sampling job either at the office or in the field. Refer to **SOP 12-1 (Monitoring Equipment Calibration)**.

All site activities should be documented as per **SOP 3-1 (Recording Field Notes)**.

7.2 Upon arrival at the site, check in with the site owner/tenant to inform them of planned activities.

7.3 Assure proper traffic control devices as per **SOP 2-1 (Traffic Control Procedures)**.

7.4 Check the condition of the monitoring wells for damage and evidence of tampering (J-plugs, lock, bolts, concrete pad, etc). Note any damage or tampering in a field book.

7.5 Bail any water from the manhole before opening well. Use a small jar or turkey baster.

7.6 Remove well caps on all wells. Replace manholes after opening wells. Bolt down manholes in high traffic areas. Let water levels stabilize prior to gauging.

7.7 If the well casing does not have a reference point (V-cut or indelible mark in well casing), please refer to **SOP 31-1 (Electronic Interface Probe Well Gauging)** to procedures on how to establish a reference point.

7.8 Measure and record depth to water in all wells using procedures identified in **SOP 31-1 (Electronic Interface Probe Well Gauging)**.

7.9 Gauge wells where LNAPL have been detected last. Do not recover LNAPL during a sampling event. Do not sample well if > 0.02 feet of LNAPL is detected in the well.

7.10 Attach disposable bailer to cable, line, or rope for lowering into the well.

7.11 Lower bailer slowly until it contacts the water surface and allow bailer to sink and fill with a minimum of surface disturbance.

7.12 Slowly raise bailer to surface. Do not allow bailer to contact the ground.

7.13 Repeat steps 7.11 through 7.13 above until a minimum of three casing volumes have been purged from the well.

7.14 After a minimum of three casing volumes have been removed, allow the water level to return to a sufficient level to collect a complete sample. It may be necessary to purge all the wells first, then proceed with sampling. If a well has little water or goes dry before three volumes has been purged, proceed to next well to allow sufficient water to re-enter.

If insufficient water is in well either prior or after purging, fill the bottleware designated for unleaded gasoline or diesel fuel parameters first, followed by MNA parameters in the following order: dissolved iron, dissolved manganese, alkalinity, total dissolved solids, nitrate, and sulfate.

7.15 When transferring the sample in the bailer to the sample container, tip the bailer to allow a slow discharge from the bailer top to flow gently down the side of the sample bottle with minimum entry turbulence. When available, a bottom emptying device may be attached to the bailer allowing a slow withdrawal of the sample.

7.16 After sampling, dispose of each bailer upon arrival back to office.

Date Issued:
05/14/14

Prepared By: ______________________
Eric Itle
Project Manager

Approved By: ______________________
George Hunzeker
Vice President/CTO

1.0 PURPOSE

1.1 To ensure procedures are followed by employees of Letterle & Associates, LLC (the Company) to properly handle soil and groundwater samples collected during all types and phases of Company services including UST closure, site characterization and remedial activities as per PA Code Chapters 245 and 250.

2.0 TERMINOLOGY

2.1 Chain of Custody, protocol developed to provide a legal record of the persons having contact with a sample from the moment of collection to final disposal or analysis.

2.2 Volatile Organic Analyte (VOA) vial, sampling container (typically 40 ml) used for collection of water samples to be analyzed for containing volatile organic compounds. VOAs are preserved with hydrochloric acid to a pH of less than 2.

2.3 UST is an abbreviation for Underground Storage Tank.

3.0 OBJECTIVES

To ensure proper handling, record keeping, and transportation of soil, soil vapor, groundwater, and surface water samples.

4.0 REQUIRED DOCUMENTS

Chain of Custody

5.0 REQUIRED SAMPLE HANDLING MATERIALS

5.1 Coolers with ice are required to preserve samples that are collected.
5.2 Bottleware – The bottleware for a specific task will be specified on the work order or as an attachment to the work order.
5.3 Bubble Wrap – Bubble wrap is required to wrap any glass sampling container to prevent breakage. Contact the lab to supply bubble wrap.
5.4 Bottleware labels – If not already attached to the sample containers, take blank self-sticking labels.
5.5 Disposable sampling gloves – Sampling gloves are used to prevent cross-contaminating samples during sample handling activities.

6.0 PROCEDURES FOR HANDLING OF SOIL AND GROUNDWATER SAMPLES

6.1 Prior to departing office for the field, fill cooler(s) with ice and take appropriate bottleware specified on the work order.

6.2 Place a set of trip blank VOAs in the cooler to ensure that the sample containers are not contaminated during shipment. Do not open the trip blank VOAs or the bag/bubble wrap containing them.

6.3 Prior to sample collection; attach a completed label to each vial. Do NOT use water soluble ink. Avoid using tape, additional labels, or labels not provided by the laboratory. They may interfere with the operation of the laboratory equipment.

6.4 Prior to sampling, put on a pair of powder-free, latex-free sampling gloves. A new pair of gloves is required for each sample to avoid cross-contamination.

6.5 Immediately after collection, place the sample(s) in a cooler of loose ice. Do not place the samples on top of the ice, but submerge each container within the ice. The sample coolers must contain enough ice to maintain the sample temperature within a specified range, i.e., 4^{o} +/- 2^{o} Celsius.

6.6 Fuel your field vehicle following the completion of field activities. This will ensure that potential contamination from filling up does not get on your body/clothes and then transferred to samples during sampling.

6.7 Upon arrival back at the office, place cooler and COC in a designated sample pick-up room, drain water, and replenish the cooler with ice. Place a laboratory-provided seal over the lid, sign, and date it. Place the COC at the appropriate designated area. For AP employees, place COCs on designated contact's desk. The COC will be relinquished upon laboratory courier arrival.

6.8 If the samples require an immediate drop off, deliver to the laboratory as soon as possible. In some instances, samples may need to be shipped. Shipped sample coolers require ice to be double-bagged to prevent water from leaking during shipping.

7.0 PROCEDURES FOR HANDLING OF VAPOR SAMPLES

7.1 Prior to departing office for the field, take appropriate vapor sampling container(s) specified on the work order.

7.2 Prior to sample collection, attach a completed label or tag to each sample container. Do NOT use water soluble ink. Avoid using tape, additional labels, or labels not provided by the laboratory.

7.3 Prior to sampling, put on a pair of powder-free, latex-free sampling gloves. A new pair of gloves is required for each sample to avoid cross-contamination.

7.4 Soil vapor samples can be transported in ambient air conditions.

7.5 Place samples and chain of custody in designated field room and notify the laboratory to pick up samples.

Date
Issued:5/24/12

Prepared By: ______________________
Eric A. Itle
Project Manager

Approved By: ______________________
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) for proper containment and handling of all waste generated by all field-related activities.

2.0 TERMINOLOGY

The following technical definitions are employed within this document:

2.1 LNAPL - light non-aqueous phase liquid

2.2 LRP - liquid ring pump (extracts soil vapor and groundwater via high vacuum from the recovery well(s) to an air-water separator and transfers the vapor to the vapor-phase granulated activated carbon units).

2.3 GAC - Granular Activated Carbon, refers to the filter media used for water treatment.

3.0 OBJECTIVE

To outline the procedures that must be followed for the proper handling, containment, and disposal of wastes generated from all field-related activities.

4.0 REQUIRED MATERIALS

The following items are required for proper waste management:

4.1 Containment vessel suitable for specific type and quantity of waste expected to be generated.

4.2 Appropriate container labels

4.3 Means to transfer waste into appropriate container (pump, tubing, buckets, shovels, etc.)

5.0 SCOPE OF APPLICATION

5.1 Non-Hazardous solid waste

- 5.1.1 Soil cuttings from drilling, soil boring activities, trenching activities, etc.
- 5.1.2 Construction debris (Monitor well construction, repair, or abandonment)
- 5.1.3 Spent carbon (extracted soil vapor treatment, Liquid GAC)
- 5.1.4 Used nitrile gloves, used sampling tubing, used bailers/string, and other Non-Hazardous waste generated by field activities

5.2 Non-Hazardous liquid waste

- 5.2.1 Purge water (from groundwater sampling, well development, and aquifer testing, etc.)
- 5.2.2 Decontamination wastewater

5.2.3 Remedial system treated discharge water

5.3 Hazardous solid waste
- 5.3.1 Contaminated soil excavated from confirmed UST release
- 5.3.2 Contaminated solids from drilling or soil boring operations

5.4 Hazardous liquid waste
- 5.4.1 Recovered LNAPL and absorbent socks
- 5.4.2 LRP vacuum pump fluids

6.0 DISPOSAL PROCEDURES

6.1 Disposal of Non-Hazardous solid waste

6.1.1 Solid wastes generated from drilling, soil boring, trenching, and all related activities are to be placed into a DOT-approved 55-gallon drum and staged on-site, pending approval from proposed disposal facility. Supporting documentation shall include the collection of any necessary characterization sampling, analytical data, waste manifests, etc.

6.1.2 Construction debris from monitor well construction, repair, or abandonment will be removed from site and placed in the dumpster for disposal.

6.1.3 Spent carbon from treatment of extracted soil vapor, and Liquid GAC treatment will be transferred into a DOT-approved 55-gallon drum and staged on-site, pending approval from proposed disposal facility. Supporting documentation shall include the collection of any necessary characterization sampling, analytical data, waste manifests, etc.

6.1.4 Used nitrile gloves, sampling tubing, bailers/string, and other Non-Hazardous waste generated by field activities is to be removed from site and placed into the dumpster for disposal.

6.2 Disposal of Non-hazardous liquid waste

6.2.1 Purge water from groundwater sampling, well development, and aquifer testing activities, etc., is assumed to be classified as non-hazardous waste. Waste will be stored in a properly labeled, DOT-Approved steel 55-gallon drum or other appropriately sized storage container. Generated waste will be removed from site either by removal of container, or emptying of container via vacuum truck extraction for disposal of, or treatment by proposed facility.

6.2.2 Decontamination wastewater will be collected and stored in a properly labeled, DOT-Approved steel 55-gallon drum. Waste may be stored in the same manner as purge water.

6.2.3 Wastewater generated from treated remediation system discharge will be disposed of in a manner consistent with local regulations and permits associated with each individual remediation system.

6.3 Disposal of Hazardous solid waste

6.3.1 Contaminated soil excavated from confirmed UST release shall be properly staged on-site pending approval from proposed disposal facility. Waste soil must be stored on and securely covered using an impermeable material for the entire duration of storage.

6.3.2 Solid wastes generated from drilling, soil borings, and related activities, which are field screened to be hazardous waste, are to be placed into a DOT-approved 55-gallon drum and staged on-site, pending approval from proposed disposal facility.

6.4 Disposal of Hazardous liquid waste

6.4.1 Recovered LNAPL and spent absorbent socks are to be placed into a properly vented DOT-approved 55-gallon drum and staged on-site, pending approval from proposed disposal facility.

6.4.2 Used LRP vacuum pump oil is to be placed securely in a leak proof container and transported to EarthSystems, LLC and placed in drum for recycling.

Issue A Effective: 05/27/14

Prepared By: ______________________
Chris Stawecki
Staff Scientist

Approved By: ______________________
George Hunzeker
Vice President/CTO

1.0 PURPOSE

This document defines Letterle & Associates (the Company) policies for calibration of field equipment.

2.0 TERMINOLOGY

2.1 Calibration: a comparison between measurements – one of known magnitude or correctness made or set with one device and another measurement made in as similar a way as possible with a second device.

2.2 Standard: an object, system, or experiment that bears a defined relationship to a unit of measurement of a physical quantity.

3.0 REFERENCES

Manufacturer's operation/instruction manual

4.0 SCOPE

Field instruments requiring calibration on a regular basis include photo ionization detectors, pH meters, specific conductivity meters, and dissolved oxygen meters. Calibration and maintenance procedures are derived from the manufacturer's instruction manuals.

5.0 CALIBRATION PROCEDURES

5.1 Prior to each use, the calibration of the instruments is checked and, if needed, adjustments are made. A running record is kept on "Equipment Calibration" sheets for each instrument.

5.2 In order to obtain the most precise analyses, commercial standard gases, buffers and solutions are employed in instrument calibration procedures. Calibration gases are obtained by the Company from the instrument manufacturer or other environmental supplier.

5.3 All field instruments are calibrated on an as needed basis.

5.4 Periodic calibration checks are to be made during instrument operation, as necessary, including a final calibration check at the end of daily use. Calibration checks during instrument use are to be recorded in the operator's field book.

5.5 Equipment malfunctions or significant calibration deviations noted during use are to be reported to a superior.

5.6 No instrument shall be used unless calibration can be obtained to within tolerances specified by manufacturer.

5.7 Malfunctioning instruments must be clearly be labeled as such and are to be repaired or replaced prior to assignment for use.

Date Issued: May 28, 2014

Prepared By: Andrew Frost
Andrew Frost
Senior Staff Scientist

Approved By: [signature]
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly perform an aquifer slug test.

2.0 DEFINITION

A slug test is conducted to identify the hydraulic conductivity of the aquifer. The aquifer slug test is performed by displacing groundwater within or from a monitoring or recovery well with a slug. From the collected data, aquifer characteristics such as hydraulic conductivity, transmissivity, etc.

3.0 TERMINOLOGY

The following technical definitions are employed within this document:

3.1 Slug – The act of displacing a volume of water at a rapid rate; also a cylinder used to displace water
3.2 SOP – Standard Operating Procedure
3.3 Steady State Conditions – A condition in which the hydraulic head level is neither rising nor falling.
3.4 Transducer/Pressure Transducer – submersible device used to record pressure readings, which are then converted into water drawdown measurements

4.0 OBJECTIVE

The objective of the aquifer constant rate pump test SOP is to establish a method and format for the use and control of field activities.

5.0 REQUIRED MATERIALS

The following items are required materials for an aquifer slug test:

5.1 Bound field logbooks
5.2 Indelible ink pens
5.3 Field forms, if required, with a clip board
5.4 Slug
5.5 Interface probe/water level meter
5.6 Pressure transducer, interface cable, computer with interface software, and transducer operating instructions

6.0 PROCEDURES – AQUIFER SLUG TEST

6.4 Automatic level recorders (pressure transducers) will be utilized to record the change in hydraulic head within each well tested. The pressure data collection interval shall be set to 1 second for each well. The transducer will be submersed within the water column a sufficient amount such that it will not interfere with the introduction and extraction of the slug into the water column (i.e. set approximately 6-inches off the bottom of the monitoring well). A weight on the transducer may assist in keeping the transducer stable during the placement and removal of the slug.

6.5 An electronic interface probe accurate to the nearest 0.01 foot will be used to measure water levels in each tested monitoring well prior to starting the test to provide baseline data to compare with subsequent readings.

6.6 Note the size and diameter of the slug for determining maximum displacement and subsequent error calculations, if necessary

6.7 Lower slug into well as to not cause the slug to bounce when fully submerged or splash as it breaks the surface. Monitor the data using the laptop computer for water level recovery of ~90%.

6.8 Begin slug out test by removing the slug smoothly and quickly, take care to not tangle slug string with the pressure transducer cable. Monitor the data using the laptop computer for water level recovery of ~90%.

7.0 DECONTAMINATION

Decontaminate all equipment per Letterle SOP on decontamination

Date Issued: 10/6/15

Prepared By: Peter Weir
Peter Weir
Project Scientist

Approved By:
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To provide guidance for installing soil borings and monitoring wells at petroleum storage tank sites.

2.0 TERMINOLOGY

2.1 PID - photoionization detector
2.2 USCS – Unified Soil Classification System
2.3 bgs – below ground surface
2.4 PID – photoionization detector

3.0 OBJECTIVES

To ensure proper techniques are used for the installation of soil borings.

4.0 REQUIRED DOCUMENTS

Unified Soil Classification System Field Guide

5.0 REQUIRED MATERIALS

5.1 Health and Safety Plan
5.2 Work Order with current site map detailing proposed and any current well locations, boring/well logs for any previously completed borings and wells, and current contaminant concentrations
5.3 Well Completion Log (sufficient copies, example attached)
5.4 Clip board
5.5 Water level measuring device (optical interface probe or water level meter)
5.6 General hand tools for (eventual) well access
5.7 Disposable sampling gloves
5.8 Decontamination supplies
5.9 Field book
5.10 Photo-Ionization Detector (PID)
5.11 Traffic control devices (cones, barricades, etc.)

6.0 SOIL BORING

6.1 All soil borings will be hand cleared to a depth dictated by site conditions and utility depths. A default depth for hand clearing/soft dig shall be 5 feet.
6.2 Soils that are soft excavated with an air-knife shall not be collected for laboratory analysis due to air pressures volatilizing constituents of concern.

6.3 All soils shall be continuously collected, logged, and described using the USCS.

6.4 Soil samples shall be screened with a PID in two foot intervals. Soil from each interval shall be placed in a plastic bag for headspace analysis; the PID reading will be recorded in the log book. Refer to SOP 24-1 for proper soil sampling procedures.

6.5 Disposal of drill cuttings will be made with an appropriate facility in accordance with all applicable regulations.

7.0 MONITORING WELL INSTALLATION

7.1 Well construction is completed according to project specifications as well as site-specific conditions.

7.2 The monitor wells shall be constructed with a material appropriate for the constituent of concern. Screen slot size shall be chosen based on the formation grain size with a goal of retaining greater than 80 percent of the formation material and 90 to 100 percent of the filter pack material.

7.3 Consideration will be given to the appropriate diameter borehole for the diameter of casing to allow for an appropriate amount of filter pack (2 to 3 –inches on all sides of the screen). Filter pack shall be placed at a rate slow enough to prevent bridging.

7.4 A one-foot thick (at a minimum) bentonite seal will be placed above the gravel pack, while the remaining well annulus will be grouted to grade.

7.5 All wells are completed with a steel protective casing and locking cap or flush-mounted manhole covers and locking caps. The concrete pads will generally be 1.5 foot by 1.5 foot square.

8.0 Waste Management

8.1 Soil cuttings and decontamination water must be handled and disposed of in accordance with federal, state, and local regulations

8.2 All soil waste and decontamination water will be contained in industry standard 55-gallon drums. The drums shall be properly labeled as non-hazardous or hazardous waste and shall include site name, address, boring number, solid or liquid, and date of soil boring installation. The 55-gallon drums will be properly sealed.

Issue A Effective:
06/03/14

Prepared By: Pete Weir
Pete Weir
Project Scientist

Approved By: [signature]
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly develop monitor and recovery wells. The procedures are not appropriate for potable or production wells.

2.0 TERMINOLOGY

The following technical definitions are employed within this document:

2.1 Gauging – the process of measuring the depth to groundwater within a well, tank, or drum.

2.2 Purging – the process of removing water from the well and the adjacent formation.

2.3 Bailer – a hollow cylinder equipped with a check valve on the bottom. The valve allows water to enter from the bottom as the bailer is lowered, then prevents the water's release as the bailer is raised. An appropriate length of rope is attached to the bailer to insert and move the bailer within the well.

2.4 Conductivity (or specific conductance) – a measure of the ability of water to conduct an electrical current, which is highly dependent on the amount of dissolved solids, typically measured in milliSiemens/centimeter (mS/cm).

2.5 TDS (Total Dissolved Solids) – the total amount of mobile charged ions, including minerals, salts, or metals dissolved in a given volume of water, typically measured in milligrams/liter (mg/l).

2.6 DO (Dissolved Oxygen) – the amount of oxygen dissolved in water (typically measured in mg/l).

2.7 pH (potential of hydrogen) – a logarithmic measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14 (pH units or considered unitless).

2.8 ORP (Oxygen Reduction Potential or Oxidation-Reduction Potential) – the ability of a solution to act as an oxidizing or reducing agent. Higher ORP values indicate elevated DO; however, other elements can function like oxygen (in terms of chemistry) and contribute to increased ORP (typically measured in milliVolts (mV)).

2.9 Turbidity – the amount of particulate matter that is suspended in water and makes the water cloudy or opaque; particulate matter may include clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, and microscopic organisms (used qualitatively without quantifying to a particular unit).

2.10 IDW – Investigative-Derived Waste

3.0 REFERENCE

Water-Well Development Guidelines previously published as Chapter 2, Section 2.4.3 in the PADEP publication Groundwater Monitoring Guidance Manual (also available online at http://www.elibrary.dep.state.pa.us/dsweb/Get/Version-48361/383-3000-001.pdf).

4.0 OBJECTIVE

The objective of well development is to remove the fine-grained material to improve the hydraulic efficiency of the well (e.g., well yield), ensure proper hydraulic communication with the aquifer, produce representative groundwater samples with minimal particulate matter, and, if a recovery well, reduce the production of particulate matter that could affect the operation of a remediation system.

5.0 REQUIRED MATERIALS

The following items are required materials for well development:

5.1 Work Order

5.2 Well Development Form (one copy per well; example attached)

5.3 Traffic control devices (cones, barricades, etc)

5.4 Bound field logbooks

5.5 Indelible ink pens

5.6 Site well logs

5.7 Decontamination supplies (Liquinox®, deionized-distilled water, appropriate containers, scrub brush, and sorbent pads or paper towels)

5.8 Electronic interface probe or water level meter

5.9 General hand tools (socket set, screwdrivers, knife, etc)

5.10 Disposable sampling gloves

5.11 5-gallon buckets

5.12 Disposable sampling gloves

5.13 Flow measurement supplies (graduated cylinder, beaker, etc)

5.14 Multi-parameter meter (YSI 556 or equivalent) with in-line flow-through cell

5.15 Nylon cord or rope

5.16 Surge Equipment
- 5.16.1 surge block (sized appropriately for 2" and 4" diameter wells) with appropriately sized polyethylene tubing (typically 5/8-inch OD x 7/16-inch ID tubing)
- 5.16.2 mechanized surge (and purge) machinery (e.g., Waterra® Hydrolift II well development tool)

5.17 Purge Equipment
- 5.17.1 disposable bottom-loading bailers
- 5.17.2 Geopump® peristaltic pump (or equivalent) for use with a surge block at wells with water levels less than 25 feet below ground surface (bgs) with polyethylene tubing (Geopump® peristaltic pump requires 0.17-inch ID x ¼-inch OD tubing)
- 5.17.3 mechanized (surge and) purge machinery (e.g., Waterra® Hydrolift II well development tool)
- 5.17.4 high flow submersible pump (a model capable of tolerating a larger sediment load) with appropriately sized polyethylene tubing (typically 3/8-inch OD x 1/2-inch ID)

5.18 Appropriate storage containers for IDW

6.0 PROCEDURES – WELL DEVELOPMENT

6.1 Well(s) should be developed in accordance with the rules and regulations of the state program under which they were installed and operated.

6.2 Decontaminate any non-dedicated, non-disposable downhole equipment prior to developing the initial well, between each well, and after the last well location in accordance with the following steps:

6.2.1 A clean tap water rinse of equipment to remove excess materials
6.2.2 Equipment scrub in a solution specific to removing the chemical of concern
6.2.3 Thorough equipment rinse with deionized/distilled water

6.3 All well development activities are recorded in the field book or on the monitoring well development form. The notes shall include the date and time, project name and number, persons present on-site, task description, weather conditions, and applicable health and safety information. The form should be completed to include the well ID, depth to water, depth to bottom, well diameter, well development method (such as surge and purge with peristaltic pump/surge block), and water quality parameter readings (see procedure 6.8).

6.4 Open and gauge the depth to water and the well bottom at least at all wells to be developed.

6.5 Begin well development by starting at the well anticipated to be impacted the least (as per work order) and by initiating purging.

6.6 Lower the surge block by the connected tubing to the bottom of the well. Beginning at the bottom of the screen, push and pull the tubing connected to the surge block up and down (up slowly/down quickly) to remove particulates from the sand pack and well screen. By rapidly and repeatedly displacing a portion of the water column through the screen, fine-grained sediments are dislodged. Some mechanized equipment serves to surge and purge, such that a surge block is not necessarily used in conjunction with the mechanized equipment.

6.7 Purge water with entrained sediment and other particulate matter from the well by direct bailing methods, peristaltic pump, submersible pump, or other mechanical extraction means.

6.8 Collect water quality parameter readings after the removal (purge) of every 2 to 5 gallons of extracted groundwater. The parameters that will be monitored include temperature, conductivity, TDS, DO, pH, ORP, and comments/clarity (qualitative turbidity).

6.9 Denote time each reading event was performed and compare to amount purged to determine pumping rate.

6.10 Continue development until no further water can be purged or water has reached a clean clarity level with stabilized water quality parameters.

6.11 Collect IDW and purge water within chemically appropriate storage containers. Label containers with appropriate information such as date, time, site name and address, material, volume, etc.

Issue A Effective: 05/21/14

Prepared By: Laurie D. Hall
Laurie D. Hall
Project Scientist

Approved By: GH
George Hunzeker
Vice President/CTO

Letterle & Associates, LLC

Monitoring Well Development

Project Name:	
Number:	
Development Date:	

Weather Conditions:	
Project Manager:	
Developer Name:	

Well ID:	
Depth to Water:	
Depth to Bottom:	
Well Diameter:	
Methods (i.e. surge and purge):	

Volume Purged (gal)	Time	Pumping Rate (gal/min)	Temp (^oC)	Cond(mS/cm)^2	TDS(g/L)	DO (mg/L)^3	pH	ORP	Comments/Clarity of Water

Take a YSI reading every 2-5 gallons. Denote time each reading was taken and compare to amount purged to determine Pumping Rate
Well is considered to be developed when either no further water can be purged or water has reached a clean clarity level

POLICY & PROCEDURE	SUBJECT **STANDARD OPERATING PROCEDURES FOR SOIL SAMPLING**	Number: SOP 24-1 — Issue: A
Letterle & Associates		Effective: June 16, 2014
		PAGE 1 OF 2
	PREPARED BY Peter Weir, Project Scientist	APPROVED BY George Hunzeker, VP/CTO

1.0 PURPOSE

This document defines Letterle & Associates (the Company) policies for soil sampling.

2.0 TERMINOLOGY

2.1 VOCs – volatile organic compounds

2.2 VOA – volatile organic analysis

3.0 REFERENCE

Sampling Guidelines document available on the Pace Laboratory/Paceport website.

4.0 SCOPE

These procedures ensure the proper collection, screening, and submission of soil samples for laboratory analysis.

5.0 GENERAL SOIL SAMPLING

5.1 Soil samples shall be collected and placed into soil baggies prior to placement in jars to prevent cross contamination.

5.2 Soil samples, which require screening for VOCs, shall be bagged separately from soil that will be submitted to the laboratory for analysis.

5.3 Open the sampling containers immediately prior to inserting the sample, taking care not to expose the container to cross contaminates of any kind.

5.4 Fill the lab-provided container completely full. Rock, gravel, and any material should be removed unless it representative of the sampling site.

5.5 The bottle threads and exterior of the container shall be wiped clean of sampling media prior to packing.

5.6 Complete the bottle label with indelible ink or marker making sure not to smear the writing.

5.7 The filled containers shall be placed on ice immediately after collection. A volume of ice sufficient to cool and maintain a temperature above freezing to $\leq$6 degrees Celsius shall be applied to the samples.

5.8 Samples shall be delivered to the lab as soon as possible. Samples that require shipping shall be sent next-day or overnight. Ice for shipped samples shall be double bagged. Samples shall also be bagged to prevent leakage resulting in non-shipment.

6.0 SOIL SAMPLING FOR VOLATILE ORGANIC COMPOUND ANALYSIS

6.1 Soil samples shall be collected via Terra Core Kit. A Terra Core kit contains three 40ml VOA vials preserved with sodium bisulfate solution or deionized water with methanol and a bulk soil jar.

6.2 A coring handle with a plunger is provided with the kit. The coring handle and plunger is designed to dispense five grams of soil to each VOA vial. In the event that the soil cannot be cored, approximately ½ inch of soil shall be manually placed in the vials.

6.3 The coring handle shall be pushed into the undisturbed soil sample and twisted to free the core.

6.4 Fill the bulk soil jar completely full.

6.5 The bottle threads and exterior of the container shall be wiped clean of sampling media prior to packing.

6.6 Complete the bottle label with indelible ink or marker making sure not to smear the writing.

6.7 The filled containers shall be placed on ice immediately after collection. A volume of ice sufficient to cool and maintain a temperature above freezing to $\leq$6 degrees Celsius shall be applied to the samples.

6.8 Samples shall be delivered to the lab as soon as possible. Samples that require shipping shall be sent next-day or overnight. Ice for shipped samples shall be double bagged. Samples shall also be bagged to prevent leakage resulting in non-shipment.

Issue A Effective: June 16, 2014

Prepared By: Pete Weir
Peter Weir
Project Scientist

Approved By: GH
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates (the Company) to properly gauge the depth to groundwater and/or separate phase hydrocarbons within monitor wells, tanks, or drums.

2.0 TERMINOLOGY

2.1 LNAPL, light non-aqueous phase liquid
2.2 DNAPL, dense non-aqueous phase liquid

3.0 OBJECTIVES

To ensure proper measurement of depth to water and/or hydrocarbons in a well, tank, or drum.

4.0 REQUIRED DOCUMENTS

None

5.0 REQUIRED GAUGING MATERIALS

5.1 Electronic water level or hydrocarbon measuring device.
5.2 Non-phosphate detergent – Detergent such as Liquinox or Alconox is necessary to decontaminate the electronic measuring device between wells or other containers.
5.3 Deionized water – Necessary to rinse electronic measuring device following decontamination.
5.4 Splash protection – Disposable gloves and safety glasses are necessary for personal protection, as well as, to prevent cross-contamination between wells.
5.5 Disposable sampling gloves – Sampling gloves are used to prevent cross-contaminating samples during well gauging activities.

6.0 PROCEDURES FOR ELECTRONIC INTERFACE PROBE GAUGING

6.1 Assure that the electronic gauging instrument (such as an interface probe or water level meter) that will be used to gauge the wells is functioning properly before going to the field. When at the site, check instrument operation before beginning to gauge by inserting the probe into a container of water and noting that the presence of water is signaled. If a tone is not present, replace the battery.

6.2 Familiarize yourself with the way the gauging instrument works (some instruments can read depth to water and depth to LNAPL/DNAPL, while others only read depth to water). Each brand of instrument has unique operating properties. Read the instrument's operating manual or consult the person in charge of instrument care for instructions before using an instrument you are familiar with.

6.3 Decontaminate the electronic interface probe in accordance with standard procedures.

6.4 Consult prior gauging and analytical data for the wells if it is available before gauging. Always attempt to gauge wells in the order of cleanest to dirtiest if possible in order to avoid cross contamination.

6.5 Lower the probe into the well, tank, or drum until a solid or beeping tune is heard and record the depth to the nearest 0.01 feet at the assigned reference point. The solid tune indicates LNAPL and/or DNAPL and the beeping tune indicates water.

6.6 The gauging instrument should be taken to the surveyed mark on the rim of the well riser. If you do not know where that point is, ask the project manager. Generally, the survey point will be a filed or chiseled notch marked with paint or ink. If you cannot determine where the mark is, take measurements from the highest point on the well riser. If no mark exists, take the time to mark it with permanent ink or paint.

6.6 Continue to lower the probe and record the depth to each change in the tune. If DNAPL is suspected, lower the probe (make sure the probe can detect DNAPL) to the bottom of the well and record the thickness of any solid tone yielding zones.

6.7 Record the information in the field book.

6.8 After gauging each well, thoroughly decontaminate the electronic interface probe. Decontaminate the entire length of tape that was submerged in the well in accordance with standard decontamination procedures.

Date Issued:
05/14/14

Prepared By: ______________________
Eric Itle
Project Manager

Approved By: ______________________
George Hunzeker
Vice President/CTO

1.0 PURPOSE

To ensure procedures are followed by employees of Letterle & Associates to properly conduct decontamination activities.

2.0 DEFINITION

Decontamination is the process of cleaning and removal of contamination that have accumulated on equipment or personnel.

3.0 TERMINOLOGY

The following technical definitions are employed within this document:

3.1 Liquinox® – Concentrated phosphate free liquid detergent
3.2 Distilled-deionized water – water purified through the process of distillation which is used as a rinsing agent in the decontamination process.
3.3 Multi-parameter meter – instrument used in groundwater sampling to monitor the parameters including temperature, conductivity, TDS, DO, pH, ORP.
3.4 Interface Probe – A gauging instrument which uses optics as well as an electrical current to determine the level of water in a well in addition to the level of LNAPL or DNAPL.
3.5 Water level meter – A gauging instrument consisting of a measured tape used to gauge the depth to water within a monitoring well.
3.6 Split spoon sampler – A device used in the drilling process to collect a soil or rock sample. Spoon consists of a 2" outside diameter by 2'length steel tubing which is split down center allowing it to be opened up for examination of a soil core sample.
3.7 Methanol – A chemical also known as methyl alcohol. Can be used when field Equipment is highly contaminated.

4.0 OBJECTIVE

The objective of the Decontamination SOP is to establish standard methods for proper decontamination procedures in order to maintain the integrity of all field activities. (Soil sampling, groundwater sampling, auger drilling, etc.)

5.0 REQUIRED MATERIALS

The following items are required materials decontamination:

5.1 Buckets
5.2 Distilled-deionized water
5.3 Liquinox®

5.4 Appropriate brushes/sponges
5.5 Sterile Nitrile gloves
5.6 Paper towels
5.7 55 gal. drum(s) for storage of used decontamination water/solution

6.0 SCOPE OF APPLICATION

6.1 Where practical, disposable items will be used to eliminate the need for decontamination.

6.2 Decontamination procedures are applicable to any activities which expose equipment or persons to any type of contamination.

6.3 Decontamination procedures must be followed for all field related activities.

7.0 PROCEDURES

7.1 Decontamination of groundwater sampling instruments, which include all equipment that comes in contact with groundwater or wells (pumps, tubing, multi-parameter meter, interface probe/water level meter, hand tools, etc.)

7.1.1 Wear disposable nitrile gloves to eliminate the possibility of cross contamination.
7.1.2 Perform and initial rinse with clean tap water to remove excess residuals.
7.1.3 Using an appropriate brush or sponge, scrub equipment in a 1% distilled water/Liquinox® solution.
7.1.4 Double rinse with distilled-deionized water.
7.1.5 Wipe dry with a clean paper towel.
7.1.6 All used decontamination water must be contained in a bucket, and transferred into a 55 gal. drum for storage/disposal.
7.1.7 Remove gloves following completion of decontamination. Repeat the above listed steps following each new task.

7.2 Decontamination of soil boring and drilling equipment. (Augers/bits, drill rods, hand augers, digging tools etc.)

7.2.1 Set up a decontamination pad which is impermeable, capable of containing wastewater. The pad should be constructed to effectively facilitate the removal of water. This may be accomplished by designing the pad with a low point for either a sump, or removal by manual bailing.
7.2.2 Using an appropriate brush, wash all equipment with decontamination solution to remove all traces of soil material.
7.2.3 Wire brushes, high pressure water, steam cleaning of equipment can be utilized decontaminate drilling equipment.

7.2.4 Following decontamination, use clean potable water to thoroughly rinse equipment.

7.2.5 Split spoon samplers must be decontaminated using the steps outlined above, with the addition using a phosphate free detergent followed by a distilled-deionized water final rinse.

7.3 Decontamination of submersible pumps will require the pumping of decontamination solution through the pump.

7.3.1 Run the pump in a 1% Liquinox®/water solution long enough to ensure that pump is free sediment and contaminants.

7.3.2 Using an appropriate sponge or brush, scrub the outside of the pump and its electrical wiring.

7.3.3 Pump clean potable water through the pump for a significant length of time to ensure that the pump is completely free of detergent residuals.

7.3.4 Perform a final rinse of the pump using distilled-deionized water.

7.4 Decontamination solution may be recycled, but must be changed periodically when water becomes visibly dirty.

7.5 Equipment or instruments must be decontaminated prior to sampling the first well, and after sampling each subsequent well.

7.6 For a highly contaminated well, it may be necessary to decontaminate sampling equipment using methanol, followed by a very thorough double-rinse using distilled-deionized water.

8.0 DISPOSAL PROCEDURES

Disposal of wastewater generated by decontamination activities will be stored in a properly labeled drum and will be handled by the selected disposal facility.

Issue A Effective: 05/22/14
Issue B Effective:

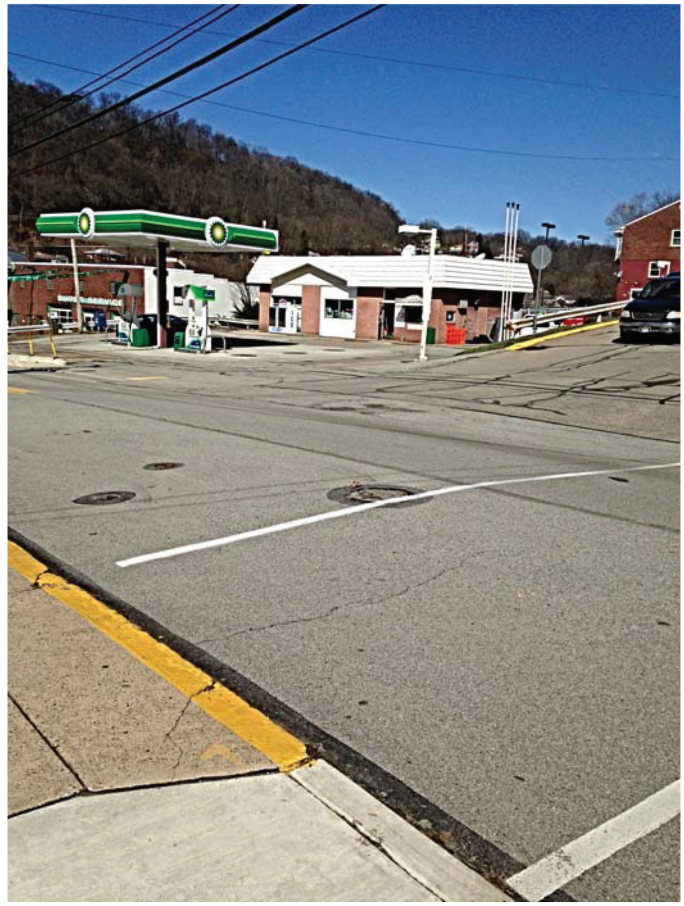
Prepared By: ______________
Chris Stawecki, Staff Scientist

Approved By: ______________
George Hunzeker
Vice President/CTO

APPENDIX C

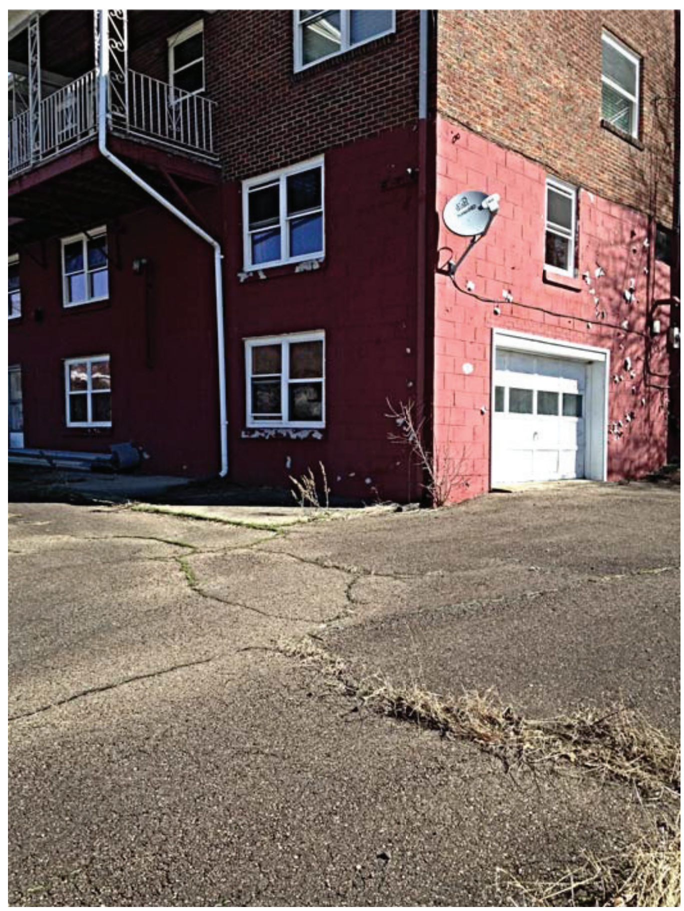
Site Photographs

Site looking north



Site looking northwest

From the Site looking north



From the Site looking north

From the Site looking east

Looking east

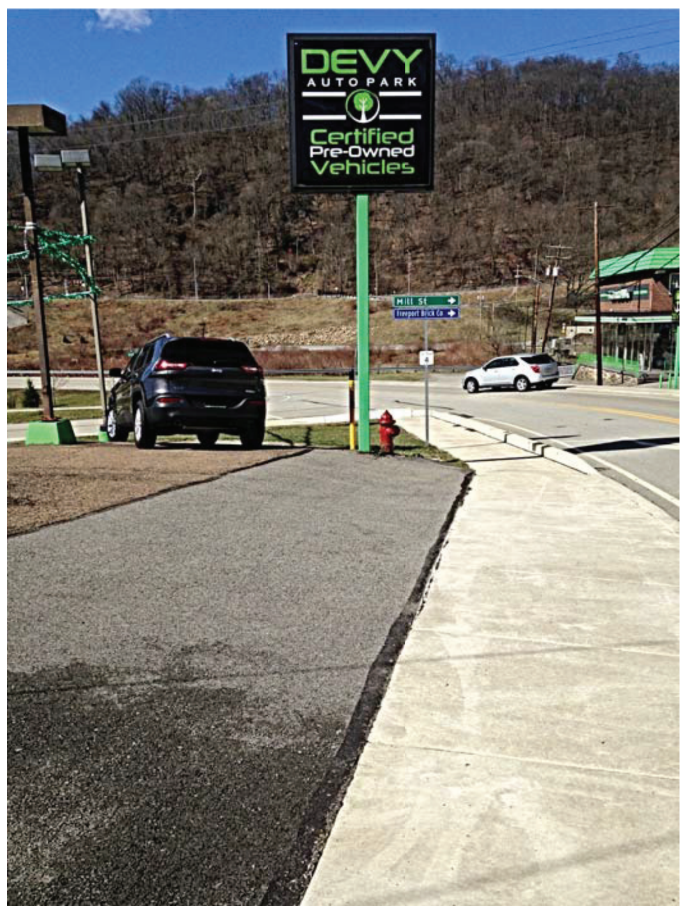
From the Site looking southwest towards Buffalo Street

Looking northeast toward Site from 2nd Street

Looking northeast towards Site from 2nd Street

Auto dealership located west of the Site

Auto dealership located west of the Site



From Buffalo Street looking west toward Buffalo Creek

APPENDIX D

2010 RACR & PADEP Approval Letter

REMEDIAL ACTION COMPLETION REPORT

Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania
PADEP Facility ID No. 03-29674

Prepared for:

Pennsylvania Department of Environmental Protection
Environmental Cleanup Program
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

DELTA

July 6, 2010

Prepared by:

Kelly R. Buchler
Project Professional

Reviewed by:

Jonathan Zimdars, P.G.
Project Manager
No. PG-002166-G

SZ

Remedial Action Completion Report

Background/Site Conditions

The subject site is the former Amoco Site No. 01748 which currently operates as a Gulf retail gasoline facility located at 222 Buffalo Street in Freeport, Pennsylvania. Please refer to Figure 1 – Site Area Map for a map showing the subject site location and the surrounding area land use. On February 1, 2010, Delta assumed management of the subject site environmental case which resulted from a release of a regulated substance at PADEP Facility ID No. 03-29674.

The site currently consists of a single-story service building with an attached drive-through car wash, three 10,000-gallon unleaded gasoline underground storage tanks (USTs), an approximately 400-gallon used oil above-ground storage tank, and two product dispensers located under a canopy. The site was held in private ownership until 1986 when the site was purchased by Amoco. Amoco constructed the site in its current configuration in 1987 and operated the site as a retail gasoline service station until January 2000 when Amoco ceased operations at the site. The site was divested to Glassmere Fuel Services, Inc. (Glassmere) in 2001. Glassmere currently operates the site as a Gulf retail gasoline facility.

Four monitoring wells (OW-1 through OW-4) were installed at the subject property in October 1987 by Petroleum Industry Consultants (PIC) for the purpose of leak detection to monitor for potential UST releases. Please refer to Figure 2 – Site Map for a detailed map of the site including the location of all monitoring wells and soil borings. In April 1994, PIC excavated and removed a 550-gallon used oil UST from the subject property. A Notification of Contamination Report was submitted to the Pennsylvania Department of the Environment (PADEP) based on a TPH concentration of 620 mg/kg detected in confirmatory soil sampling conducted at the time of the excavation.

In November 2000, as part of site divestment activities, IT Corporation (IT) conducted soil sampling at locations SB-1 through SB-6 at the subject property. In January 2001, IT submitted a Phase I Environmental Site Assessment to the PADEP reporting the initial results of groundwater and soil sampling. In January 2002, to further define the soil and groundwater quality, IT installed monitoring wells MW-5 through MW-7 and conducted one additional soil boring (SB-7). Soil and groundwater analysis from the MW-7 location reported benzene concentrations in exceedence of the applicable Statewide Health Standards (SHS) residential, used aquifer Medium-Specific Concentrations (MSCs).

On October 29, 2003, URS conducted an eight-hour dual-phase pilot test on monitoring wells OW-3, MW-6 and MW-7 via a mobile vacuum truck to measure groundwater drawdown and vacuum influence in surrounding monitoring wells. Interim remedial action by way of enhanced fluid recovery events via mobile vacuum truck was conducted by URS on April 20, May 12 and June 29, 2004 on monitoring wells OW-3 and MW-7 for a period of eight hours each. A total of 1,005 gallons of impacted groundwater and approximately 3.5 pounds of vapor-phase hydrocarbons were recovered over the four events.

To further evaluate the soil quality in the vicinity of monitoring well MW-7, URS completed soil borings SB-8 and SB-9 and installed vapor monitoring point VP-1 in March 2005. The soil gas sampling point VP-1 was installed between the existing UST basin and the station building to evaluate the potential effects of vapor intrusion from impacted soil and groundwater to indoor air. The final monitoring well (MW-8) at the subject property was installed in March 2005 in the Pennsylvania Department of Transportation (Penn Dot) right-of-way to act as an off site down gradient point of compliance well.

On July 2, 2008 Shaw Environmental (Shaw) submitted a Site Characterization Report/Remedial Action Plan (SCR/RAP) to the PADEP. The SCR/RAP detailed the results of soil borings, monitoring well installations and groundwater, soil and soil-gas sampling events conducted at the subject property. Additionally, the report presented hydrogeologic analysis, migration potential assessments and a remedial approach for the site. The SCR/RAP proposed a remedial action approach consisting of quarterly groundwater sampling of all site wells and monitored natural attenuation until attainment of SHS MSCs were demonstrated for eight consecutive quarters, additional soil attainment sampling focused in the area where exceedences were found previously (area of MW-7 and VP-1) and collecting a soil gas sample to ensure that concentrations continue to be below screening levels. In a letter dated September 2, 2008, the PADEP approved the SCR/RAP as presented by Shaw.

Due to benzene and naphthalene exceedences of the soil-to-groundwater used aquifer residential SHS detected in the soil samples collected during the installation of monitoring well MW-7, attainment soil sampling

The closest sensitive receptor is a residential basement located 95 feet south of monitoring well OW-1 (non-detect for all analytes during the past four sampling events). Analyte concentrations above laboratory detection limits have not been detected in monitoring well OW-1 since January 2009 (4.1 ug/L MTBE). The last exceedence of a groundwater MSC at monitoring well OW-1 was a detection of 130 ug/L MTBE in March 2004. This basement is located side-gradient of the subject site and is not expected to be impacted by on-site groundwater contamination.

The closest surface water to the subject property is Buffalo Creek located approximately 210 feet west of the subject property. This creek, located side-gradient of the site gradient of the site, is not expected to be impacted by the on-site groundwater contamination.

According to the Municipal Authority of Buffalo Township, the site and nearby properties receive public water from The Municipal Authority of Buffalo Township, which obtains its water from an intake in Freeport along the Allegheny River. The intake is located approximately 1 mile east-southeast from the site. The water authority intake is not a potential receptor of site groundwater due to its distance from the site and location hydrogeologically up-gradient.

An EDR search conducted in 2000 reviewed Federal and State databases to determine if any private water wells were located within a one-mile radius of the subject property. One private well, classified by the Commonwealth of Pennsylvania for use as a domestic supply, was reported on the west side of Buffalo Creek within one mile of the subject property. Due to Buffalo Creek acting as a hydrologic barrier this domestic supply well is not a potential receptor of down-gradient groundwater.

Soil Attainment Sampling Discussion

Benzene and naphthalene exceeded the soil-to-groundwater residential, used aquifer SHS, therefore; additional soil attainment sampling was proposed in the RAP. The soil attainment sampling was conducted on March 30, 2009, April 1, 2009 and April 30, 2009 in accordance with the General Attainment Requirements for Soil as referenced in the 25 PA Code 250.703. The point of compliance is defined as the source area of the release and all sample locations were selected in the area adjacent to those locations which previously reported concentrations in exceedence of the SHS MSC standards.

Twelve attainment soil sampling locations, both horizontally and vertically, were selected based on systematic random sampling as set forth in 25 PA Code 250.703. Sample locations were selected using a random number generator function embedded in Microsoft Excel using a rectangular coordinate system to provide a vertical and horizontal value for each location. A copy of the output from the Random Number Generator Function is included as Appendix A. The provided coordinates were then overlain on the subject source area to provide a map of where each randomly selected soil sample is to be collected from. The attainment soil sample locations are indicated on Figure 4 – Attainment Soil Sample Locations.

On March 30, April 1 and April 30, 2009, personnel from Shaw mobilized to the subject site to collect soil samples from the randomly selected locations discussed above. The samples were collected from specific vertical intervals at each location utilizing direct-push coring techniques. The samples were then transferred to laboratory supplied glassware and submitted to Lancaster Laboratories for analysis benzene, toluene, ethylbenzene and total xylenes (BTEX), methyl tert-butyl ether (MTBE), isopropylbenzene (cumene) and naphthalene by EPA method 8260B.

Soil analytical results indicate exceedences of the soil to groundwater MSCs for benzene (0.5 mg/kg) at sample locations A-6 (3.3 mg/kg) and A-11 (1.4 mg/kg). An exceedence of the naphthalene MSC (25 mg/kg) was detected in the sample collected from location A-6 (44 mg/kg). All other sample locations and analytes were detected either below the Soil to Groundwater MSC or below the laboratory detection limit. Laboratory analytical

Activities Completed During the First Quarter 2010

URS Corporation

- Eight groundwater monitoring wells (OW-1, OW-2, OW-3, OW-4, MW-5, MW-6, MW-7 and MW-8) were gauged using an oil/water interface probe, purged of three well volumes of groundwater and sampled with disposable bailers on January 18, 2010.
- The groundwater samples were placed into laboratory-supplied glassware preserved with HCl and submitted to Lancaster Laboratories in Lancaster, Pennsylvania for laboratory analysis of BTEX, MTBE, naphthalene and cumene per EPA Method 8260

Results Discussion

Semi-Annual Soil-Gas Vapor Sampling Event (October 14, 2009)

Laboratory analytical results indicate benzene concentrations (19 mg/m3) above the Soil Gas Medium Specific Concentration derived from the MSC for Indoor Air (0.27 mg/m3). All other analytes were either below the MSC or below the laboratory detection limit. Current and historical soil-gas concentrations for vapor point VP-1 have been included in Table 2 – Soil Gas Vapor Analytical Results. The laboratory analytical report for the October 2009 soil-gas sampling event is presented in Appendix D.

Vapor Pathway Evaluation

The soil gas pathway was evaluated using current site conditions with the Johnson-Ettinger Model for vapor migration to determine if soil gas concentrations at the subject property are a risk to on-site commercial workers at the slab on grade subject property building. Parameters used in the Johnson-Ettinger Model were taken from the User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings from the US EPA, the Land Recycling Program Technical Guidance Manual from the PADEP and site specific values calculated by Shaw and reported to the PADEP in the approved June 2, 2008 Site Characterization Report/Remedial Action Plan.

Using the Johnson-Ettinger Model a hazard quotient and a risk level were calculated for the subject site using the highest soil gas benzene concentration detected at the subject property (19 mg/m3). The calculated hazard quotient value (0.069) and the risk level (0.0000069) were then compared to the Target Risk - Hazard Quotient Level and the Target Risk - Risk Level provided in the Land Recycling Program Technical Guidance Manual to determine if the vapor intrusion pathway was complete.

The calculated hazard quotient level (0.069) was found to be lower than the Target Risk – Hazard Quotient Level (1) at the subject property. The calculated risk level (0.0000069) was found to be lower than the Target Risk – Risk Level (0.00001) at the subject property. Based on a comparison of site values to the Target Risk values as provided by the Vapor Intrusion into Buildings from Groundwater and Soil under Act 2 Statewide Health Standards (January 24, 2004), the vapor intrusion pathway at the subject property is not complete and the soil gas concentration present at vapor point VP-1 does not pose a vapor intrusion threat to the subject property building. The Johnson-Ettinger Model calculations and input justifications are included in Appendix E.

Quarterly Groundwater Sampling Event (November 20, 2009)

Depth to groundwater ranged from 15.41 (MW-8) to 26.74 (OW-2) feet below top of casing (TOC). Liquid-phase hydrocarbons (LPH) were not detected in any well gauged during the November 2009 event. Groundwater elevation data collected since March 1999 is presented in Table 3 – Groundwater Elevation Summary.

Laboratory analytical results indicate the highest benzene concentration was detected in the groundwater sample collected from monitoring well OW-3, which was below the laboratory elevated detection limit, at a reported concentration of <20 micrograms per liter (ug/L), the highest MTBE concentration was detected in the

Shaw modeled contaminant migration in groundwater utilizing historical site data and included the results in the SCR/RAP submitted to the PADEP on June 27, 2008 and approved by the PADEP on September 2, 2008. This evaluation was conducted to assist in site characterization and to estimate the potential extent of off-site migration of benzene, MTBE, and naphthalene which are the only constituents in groundwater that exceed their respective SHS residential, used aquifer MSCs during the last eight sampling rounds. The fate and transport analysis was provided to assist with a preliminary assessment of potential exposure pathways at the site and is now referenced to show that significant off-site contaminant migration is not a threat at the subject property.

Shaw utilized the Quick Domenico (QD) spreadsheet model as modified by the PADEP from P.A. Domenico (1987). This model was used to calculate the concentration of target constituents of concern in groundwater down gradient of the source area. The model allows for three-dimensional dispersion, first-order decay, and retardation. The Act 2 Guidance Manual proposes the use of QD as a method to support qualitative fate and transport analyses based on professional judgment, experience, or opinion at sites that do not appear to justify the time, expense, and data requirements associated with more rigorous numerical modeling efforts Shaw concluded that the historical high benzene concentration (140ug/L) would migrate an estimated 20 feet before decaying to a concentration below the SHS MSCs and that the historical high naphthalene concentration (550 ug/L) would travel an estimated four feet before decreasing to a level below the SHS MSCs. The SCR/RAP submitted by Shaw and approved by the PADEP has been included as Appendix I for reference.

The historical high concentrations of benzene and naphthalene that Shaw used have not been exceeded at the subject site and off-site migration has not occurred since their initial evaluation. Benzene has never been detected above the laboratory detection limit and naphthalene concentrations have not been historically detected above the SHS MSC in monitoring well OW-4 (located 38 feet down-gradient of OW-3), indicating that significant contaminant decay is taking place and preventing down-gradient contaminant migration. MTBE impact at OW-4 has not exceeded the SHS MSC since June 2006 and the analytical result was below the laboratory detection limit during the January 2010 sampling event.

Based on the M-K statistical test and the fate and transport model provided by Shaw in conjunction with the lack of down-gradient contamination in POC monitoring wells OW-1, OW-4 and MW-5, Delta believes the on-site contaminant plume has been adequately demonstrated to be decreasing or stable and is not a threat to migrate off-site. Furthermore, the fate and transport model indicates that off-site contaminant migration is not likely to result from the limited residual impact located near monitoring well OW-3. Statistical evidence of a stable or decreasing contaminant plume with little off-site migration potential adequately satisfies the attainment standard set forth in 25 PA Code 250.702 and 250.704.

25 PA Code 250.707 (b)(2) states that in addition to meeting the requirements set forth in sections 250.702 and 250.704 of the Pennsylvania Code, each compliance point monitoring well must report seventy-five percent of all samples collected from that well to be equal to or less than the SHS MSC with no individual sample exceeding ten times the SHS on the property or two times the SHS MSC beyond the property boundary. Point of compliance wells at the subject property as proposed in the SCR/RAP and approved by the PADEP have been defined as monitoring wells OW-1, OW-4 and MW-5 and the analytical results for the past eight rounds of sampling are as follows:

- Monitoring well OW-1 has not had any exceedences of the benzene and naphthalene SHS MSCs over the past eight quarters of sampling events and as a result 100% of all samples collected are below the benzene and naphthalene SHS MSCs at this location.

- Monitoring well OW-4 has not had any exceedences of the benzene and naphthalene SHS MSCs over the past eight quarters of sampling events and as a result 100% of all samples collected are below the benzene and naphthalene SHS MSC at this location.

Remarks

The recommendations presented in this report represent Delta's professional opinions based upon the currently available information and are arrived at in accordance with currently acceptable professional standards. This report is based upon a specific scope of work requested by the client. The Contract between Delta and its client outlines the scope of work, and only those tasks specifically authorized by that Contract or outlined in this report were performed. This report is intended only for the use of Delta's Client and anyone else specifically listed on this report. Delta will not and cannot be liable for unauthorized reliance by any other third party. Other than as contained in this paragraph, Delta makes no expressed or implied warranty as to the contents of this report.

By affixing my seal to this Remedial Action Completion Report, I am certifying that the information is true and correct. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and that it is within my professional expertise to verify the correctness of the information.

Table 1
Soil Analytical Data
Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania

Sample Location	Date	Sample Depth (feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	MTBE (mg/kg)	Cumene (mg/kg)
Soil to Groundwater MSCs:			0.5	100	70	1,000	25	2	760
SB-1	11/15/2000	2 - 4	<0.0053	<0.0053	<0.0053	<0.0105	<0.0053	<0.0053	<0.0053
		14 - 16	<0.005	<0.005	<0.005	<0.0099	<0.005	<0.005	<0.005
SB-2	11/15/2000	0 - 2	<0.0052	<0.0052	<0.0052	<0.0099	<0.0052	<0.0052	<0.0052
SB-4	11/15/2000	4 - 6	0.063	<0.25	3.7	4.3	2.2	0.25	0.71
SB-5	11/15/2000	14 - 16	<0.28	<0.28	0.33	<0.56	0.33	<0.28	0.36
SB-6	11/15/2000	2 - 4	0.17	0.86	0.53	1.1	0.63	<0.05	0.07
SB-8	3/30/2005	0 - 3	1.1	14	42	210	17	<3.6	7
		12 - 16	0.12	0.12	1.3	2.8	0.140	<0.0035	0.031
SB-9	3/30/2005	0 - 3	<0.0044	<0.0044	<0.0044	<0.013	<0.0044	<0.0035	<0.0044
		12 -16	<0.0051	<0.0051	<0.0051	<0.015	<0.0051	<0.0041	0.029
VP-1	3/30/2005	0 -3	<4.7	1.2	47	66	30	<3.7	14
		12 - 16	2.3	4	7.1	<15	5.9	<4.1	1.3
MW-5	1/22/2002	0 - 3	<0.0042	<0.0042	<0.0042	<0.0126	<0.0042	0.0063	<0.0042
		5 - 7	<0.004	<0.004	<0.004	<0.0121	<0.004	0.0047	<0.004
		23 - 25	<0.0038	<0.0038	<0.0038	<0.0115	<0.0038	<0.0038	<0.0038
MW-6	1/21/2002	3 - 5	<0.0048	<0.0048	<0.0048	<0.0143	0.059	<0.0048	0.0056
		21 - 23	0.0034	<0.0048	<0.0048	<0.0168	0.15	<0.0048	<0.0048
		23 - 25	0.0014	<0.004	<0.004	<0.0119	0.087	<0.004	<0.004
MW-7	1/23/2002	0 - 3	0.98	9.8	6.5	30.4	4.4	<0.82	1.3
		13 - 15	0.24	<0.85	0.58	<9.05	0.430	<0.85	2.3
		23 - 25	0.0019	0.0096	0.0059	0.0224	<0.0044	<0.0044	<0.0044
MW-8	10/5/2005	0 - 3	<0.005	<0.005	<0.005	<0.015	0.0093	<0.004	<0.005
	11/3/2005	19 - 21	<0.0044	<0.0044	<0.0044	<0.013	0.0035	<0.0044	<0.0044
A1	3/31/2009	4-6	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041
A2	4/30/2009	12-14	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049
A3	4/1/2009	6-8	<0.270	0.48	0.32	1.9	1.1	<0.270	<0.270
A4	4/30/2009	8-10	<0.320	<0.320	2.0	1.8	0.5	<0.320	3.0
A5	4/30/2009	14-16	<0.290	<0.290	7.5	6.4	6.3	<0.290	5.0
A6	3/30/2009	4-6	3.3	98	48.0	270	44	<0.470	10.0
A7	4/30/2009	10-12	<0.290	<0.290	<0.290	<0.290	<0.290	<0.290	<0.290
A8	3/30/2009	0-2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
A9	3/30/2009	2-4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
A10	4/1/2009	4-6	<0.270	1.3	4.3	21	8.6	<0.270	1.1
A11	4/30/2009	8-10	1.4	<0.310	3.3	7.7	6.8	<0.310	4.8
A12	4/30/2009	10-12	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052

Notes:
All data presented on this table was collected by URS prior to Delta assuming project management
mg/kg = Milligrams per kilogram
bgs = Below ground surface
NA = Not analyzed

Table 2
Soil Gas Vapor Analytical Results
Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania

Sample Location	Sample Depth	Date	Benzene (mg/m^3)	Toluene (mg/m^3)	Ethylbenzene (mg/m^3)	Total Xylenes (mg/m^3)	MTBE (mg/m^3)	Naphthalene (mg/m^3)	Cumene (mg/m^3)
Regulated Substance Residential MSC_{SG} *			0.27	56	1.9	14	8.1	0.42	54
Regulated Substance Residential MSC_{IAQ}			0.0027	0.56	0.019	0.14	0.081	0.0042	0.54
VP-1	5	5/4/2005	<0.031	<0.036	<0.041	<0.121	<0.066	<0.048	<0.045
		12/19/2008	19.00	4.90	<0.52	0.92	<0.43	<0.63	<0.59
		4/30/2009	1.3	1.5	<0.043	0.0490	<0.036	<0.052	<0.049
		10/14/2009	19	14	<4.3	<4.3	<3.6	<5.2	<4.9

Notes:
All data presented on this table was collected by URS prior to Delta assuming project management
All samples were analyzed by EPA Method TO-15
Only detected analytes which have established PADEP medium specific concentrations are listed.
* $MSC_{SG} = MSC_{IAQ}/TF$
MSC = Medium-Specific Concentration (IAQ = Indoor Air Quality, SG = Soil Gas).
TF = transfer factor = 0.01 (a value relating concentrations in indoor air to concentrations in soil gas adjacent to a building).

Table 3
Groundwater Elevation Summary
Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania

Well	Date	Elevation (TOC)	Elevation (TOS)	Elevation (BOS)	Depth to Product	Depth to Water	Corrected Groundwater Elevation	Free Product Thickness
OW-1	3/26/1999	99.33	90.43	70.66	NP	27.28	72.05	NA
	2/14/2002	99.33	90.43	70.66	NP	26.62	72.71	NA
	9/24/2003	99.33	90.43	70.66	NP	25.47	73.86	NA
	12/6/2003	99.33	90.43	70.66	NP	24.55	74.78	NA
	3/8/2004	99.33	90.43	70.66	NP	24.60	74.73	NA
	6/9/2004	99.33	90.43	70.66	NP	24.39	74.94	NA
	9/23/2004	99.33	90.43	70.66	NP	23.38	75.95	NA
	12/10/2004	99.33	90.43	70.66	NP	24.68	74.65	NA
	3/8/2005	99.33	90.43	70.66	NP	24.24	75.09	NA
	6/24/2005	99.33	90.43	70.66	NP	25.52	73.81	NA
	9/23/2005	99.33	90.43	70.66	NP	26.97	72.36	NA
	12/16/2005	99.33	90.43	70.66	NP	26.73	72.60	NA
	3/20/2006	99.33	90.43	70.66	NP	25.82	73.51	NA
	6/26/2006	99.33	90.43	70.66	NP	25.01	74.32	NA
	9/7/2006	99.33	90.43	70.66	NP	25.40	73.93	NA
	11/29/2006	99.33	90.43	70.66	NP	24.60	74.73	NA
	1/12/2007	99.33	90.43	70.66	NP	25.21	74.12	NA
	4/4/2007	99.33	90.43	70.66	NP	23.93	75.40	NA
	07/26/2007	99.33	90.43	70.66	NP	26.03	73.30	NA
	10/1/2007	99.33	90.43	70.66	NP	25.75	73.58	NA
	1/8/2008	99.33	90.43	70.66	NP	24.64	74.69	NA
	4/7/2008	99.33	90.43	70.66	NP	24.14	75.19	NA
	7/10/2008	99.33	90.43	70.66	NP	24.64	74.69	NA
	10/9/2008	99.33	90.43	70.66	NP	26.72	72.61	NA
	1/15/2009	99.33	90.43	70.66	NP	22.10	77.23	NA
	4/2/2009	99.33	90.43	70.66	NP	25.28	74.05	NA
	7/20/2009	99.33	90.43	70.66	NP	25.69	73.64	NA
	11/20/2009	99.33	90.43	70.66	NP	26.67	72.66	NA
	1/18/2010	99.33	90.43	70.66	NP	26.11	73.22	NA
OW-2	3/26/1999	99.43	90.00	70.00	NP	27.34	72.09	NA
	2/14/2002	99.43	90.00	70.00	NP	26.61	72.82	NA
	9/24/2003	99.43	90.00	70.00	NP	25.49	73.94	NA
	12/6/2003	99.43	90.00	70.00	NP	24.61	74.82	NA
	3/8/2004	99.43	90.00	70.00	NP	24.67	74.76	NA
	6/9/2004	99.43	90.00	70.00	NP	24.41	75.02	NA
	9/23/2004	99.43	90.00	70.00	NP	23.44	75.99	NA
	12/10/2004	99.43	90.00	70.00	NP	24.72	74.71	NA
	3/8/2005	99.43	90.00	70.00	NP	24.31	75.12	NA
	6/24/2005	99.43	90.00	70.00	NP	26.56	72.87	NA
	9/23/2005	99.43	90.00	70.00	NP	26.98	72.45	NA
	12/16/2005	99.43	90.00	70.00	NP	26.74	72.69	NA
	3/20/2006	99.43	90.00	70.00	NP	25.88	73.55	NA
	6/26/2006	99.43	90.00	70.00	NP	25.03	74.40	NA
	9/7/2006	99.43	90.00	70.00	NP	25.23	74.20	NA
	11/29/2006	99.43	90.00	70.00	NP	24.64	74.79	NA
	1/12/2007	99.43	90.00	70.00	NP	25.31	74.12	NA
	4/4/2007	99.43	90.00	70.00	NP	24.03	75.40	NA
	07/26/2007	99.43	90.00	70.00	NP	26.10	73.33	NA
	10/1/2007	99.43	90.00	70.00	NP	25.83	73.60	NA
	1/8/2008	99.43	90.00	70.00	NP	24.71	74.72	NA
	4/7/2008	99.43	90.00	70.00	NP	24.21	75.22	NA
	7/10/2008	99.43	90.00	70.00	NP	24.71	74.72	NA
	10/9/2008	99.43	90.00	70.00	NP	26.74	72.69	NA
	1/15/2009	99.43	90.00	70.00	NP	25.47	73.96	NA
	4/2/2009	99.43	90.00	70.00	NP	25.32	74.11	NA
	7/20/2009	99.43	90.00	70.00	NP	25.72	73.71	NA
	11/20/090	99.43	90.00	70.00	NP	26.74	72.69	NA
	1/18/2010	99.43	90.00	70.00	NP	26.20	73.23	NA

Table 3
Groundwater Elevation Summary
Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania

Well	Date	Elevation (TOC)	Elevation (TOS)	Elevation (BOS)	Depth to Product	Depth to Water	Corrected Groundwater Elevation	Free Product Thickness
MW-5	2/14/2002	96.80	76.80	66.80	NP	24.26	72.54	NA
	9/24/2003	96.80	76.80	66.80	NP	23.02	73.78	NA
	12/6/2003	96.80	76.80	66.80	NP	22.20	74.60	NA
	3/8/2004	96.80	76.80	66.80	NP	22.17	74.63	NA
	6/9/2004	96.80	76.80	66.80	NP	21.97	74.83	NA
	9/23/2004	96.80	76.80	66.80	NP	20.98	75.82	NA
	12/10/2004	96.80	76.80	66.80	NP	22.28	74.52	NA
	3/8/2005	96.80	76.80	66.80	NP	21.86	74.94	NA
	6/24/2005	96.80	76.80	66.80	NP	23.09	73.71	NA
	9/23/2005	96.80	76.80	66.80	NP	24.55	72.25	NA
	12/16/2005	96.80	76.80	66.80	NP	24.29	72.51	NA
	3/20/2006	96.80	76.80	66.80	NP	23.38	73.42	NA
	6/26/2006	96.80	76.80	66.80	NP	23.01	73.79	NA
	9/7/2006	96.80	76.80	66.80	NP	22.81	73.99	NA
	11/29/2006	96.80	76.80	66.80	NP	22.12	74.68	NA
	1/12/2007	96.80	76.80	66.80	NP	22.81	73.99	NA
	4/4/2007	96.80	76.80	66.80	NP	21.54	75.26	NA
	07/26/2007	96.80	76.80	66.80	NP	23.61	73.19	NA
	10/1/2007	96.80	76.80	66.80	NP	23.31	73.49	NA
	1/8/2008	96.80	76.80	66.80	NP	22.20	74.60	NA
	4/7/2008	96.80	76.80	66.80	NP	21.72	75.08	NA
	7/10/2008	96.80	76.80	66.80	NP	22.23	74.57	NA
	10/9/2008	96.80	76.80	66.80	NP	24.26	72.54	NA
	1/15/2009	96.80	76.80	66.80	NP	22.93	73.87	NA
	4/2/2009	96.80	76.80	66.80	NP	22.82	73.98	NA
	7/20/2009	96.80	76.80	66.80	NP	23.26	73.54	NA
	11/20/2009	96.80	76.80	66.80	NP	24.23	72.57	NA
	1/18/2010	96.80	76.80	66.80	NP	23.68	73.12	NA
MW-6	2/14/2002	98.85	78.85	68.85	NP	26.65	72.20	NA
	9/24/2003	98.85	78.85	68.85	NP	25.03	73.82	NA
	12/6/2003	98.85	78.85	68.85	NP	24.17	74.68	NA
	3/8/2004	98.85	78.85	68.85	NP	24.16	74.69	NA
	6/9/2004	98.85	78.85	68.85	NP	23.97	74.88	NA
	9/23/2004	98.85	78.85	68.85	NP	23.00	75.85	NA
	12/10/2004	98.85	78.85	68.85	NP	24.26	74.59	NA
	3/8/2005	98.85	78.85	68.85	NP	23.85	75.00	NA
	6/24/2005	98.85	78.85	68.85	NP	25.09	73.76	NA
	9/23/2005	98.85	78.85	68.85	NP	26.54	72.31	NA
	12/16/2005	98.85	78.85	68.85	NP	26.29	72.56	NA
	3/20/2006	98.85	78.85	68.85	NP	25.39	73.46	NA
	6/26/2006	98.85	78.85	68.85	NP	24.56	74.29	NA
	9/7/2006	98.85	78.85	68.85	NP	24.79	74.06	NA
	11/29/2006	98.85	78.85	68.85	NP	24.22	74.63	NA
	1/12/2007	98.85	78.85	68.85	NP	24.82	74.03	NA
	4/4/2007	98.85	78.85	68.85	NP	23.48	75.37	NA
	07/26/2007	98.85	78.85	68.85	NP	25.61	73.24	NA
	10/1/2007	98.85	78.85	68.85	NP	25.31	73.54	NA
	1/8/2008	98.85	78.85	68.85	NP	24.17	74.68	NA
	4/7/2008	98.85	78.85	68.85	NP	23.66	75.19	NA
	7/10/2008	98.95	78.85	68.85	NP	24.30	74.65	NA
	10/9/2008	98.95	78.85	68.85	NP	26.28	72.67	NA
	1/15/2009	98.95	78.85	68.85	NP	24.96	73.99	NA
	4/2/2009	98.95	78.85	68.85	NP	24.83	74.12	NA
	7/20/2009	98.95	78.85	68.85	NP	25.31	73.64	NA
	11/20/2009	98.95	78.85	68.85	NP	26.21	72.74	NA
	1/18/2010	98.95	78.85	68.85	NP	19.71	79.24	NA

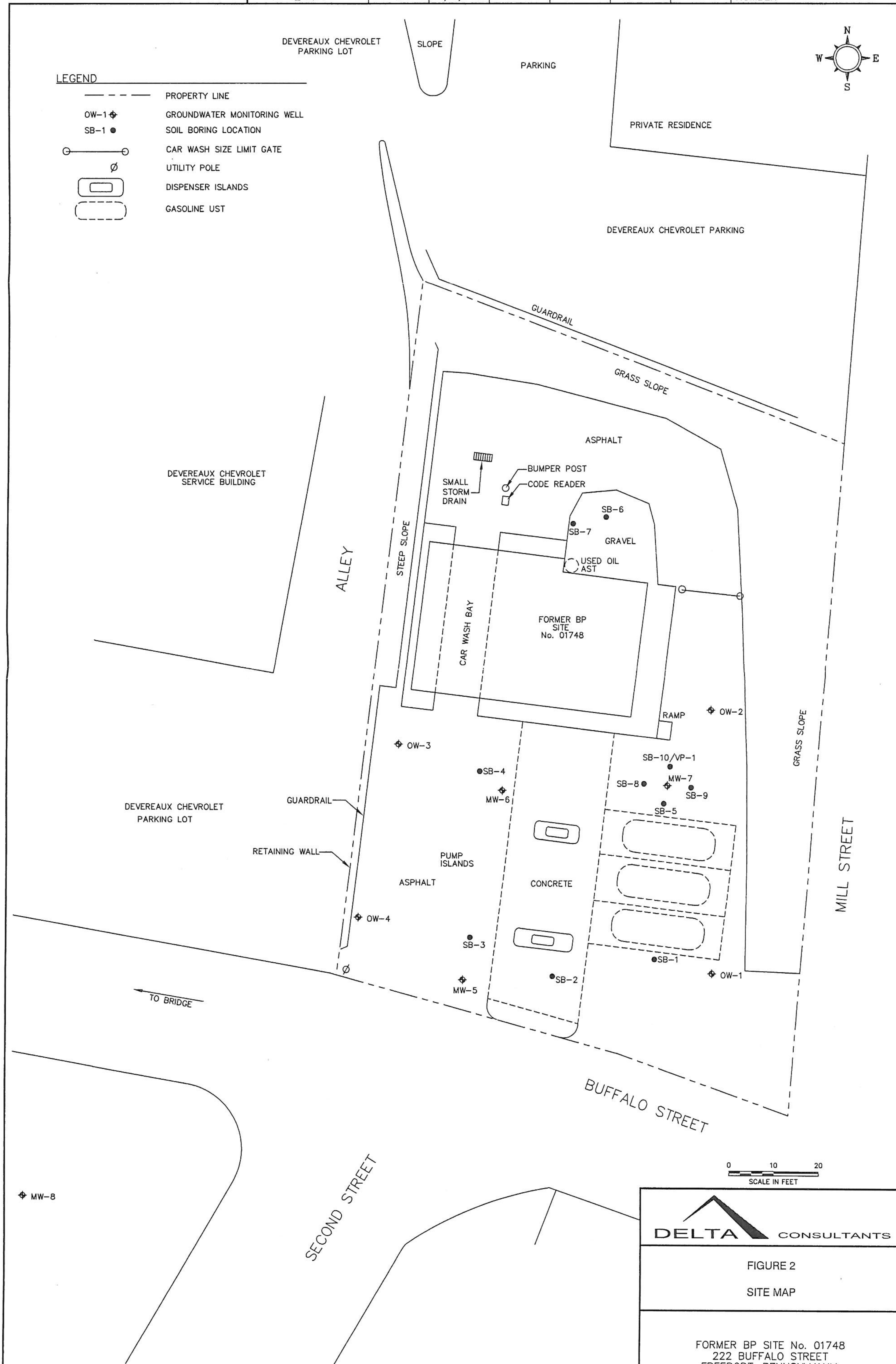
Table 4
Groundwater Analytical Data
Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania

Well	Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Naphthalene (ug/L)	MTBE (ug/L)	Cumene (ug/L)
Groundwater MSCs		5	1,000	700	10,000	100	20	1,100
OW-1	11/16/2000	<5	<5	<5	<10	13	7	14
	2/14/2002	2	<5	<5	<10	<5	14	5.9
	9/24/2003	<5	<5	<5	<10	<5	8.7	<5
	12/6/2003	<5	<5	<5	<10	<5	<5	<5
	3/8/2004	<5	<5	<5	<10	<5	130	<5
	6/9/2004	<5	<5	<5	<10	<5	<5	<5
	9/23/2004	<5	<5	<5	<10	<5	<5	<5
	12/10/2004	<5	<5	<5	<10	<5	<5	<5
	3/8/2005	<5	<5	<5	<10	<5	<4	<5
	9/23/2005	<5	<5	8.4	<10	9.2	<4	11
	12/16/2005	<5	<5	<5	<10	<5	<4	<5
	3/20/2006	<5	<5	<5	<10	9.2	<4	<5
	6/26/2006	<5	<5	<5	<10	<5	<4	<5
	9/7/2006	<5	<5	<5	<10	<5	<4	<5
	11/29/2006	<5	<5	<5	<10	<5	<4	<5
	1/12/2007	<5	<5	<5	<10	<5	<4	<5
	4/4/2007	<1	<5	<5	<10	<5	<4	<5
	07/26/2007	<1	<5	<5	<10	<5	<4	<5
	10/1/2007	<1	<5	<5	<10	53	<4	<5
	1/8/2008	<1	<1	<1	<1	<4	<1	<2
	4/7/2008	<1	<1	<1	<1	<4	<1	<2
	7/10/2008	<1	<1	<1	<1	<4	<1	<2
	10/9/2008	<1	<1	<1	<1	<4	<1	<2
	1/15/2009	<1	<1	<1	<1	<4	4.1	<2
	4/2/2009	<1	<1	<1	<1	<4	<1	<2
	7/20/2009	<1	<1	<1	<1	<4	<1	<2
	11/20/2009	<1	<1	<1	<1	<4	<1	<2
	1/18/2010	<1	<1	<1	<1	<4	<1	<2
OW-2	11/16/2000	<5	<5	<5	<10	<5	7	<5
	2/14/2002	2.8	<5	<5	<10	<5	<5	<5
	9/24/2003	<5	<5	<5	<10	<5	<5	<5
	12/6/2003	<5	<5	<5	<10	<5	25	<5
	3/8/2004	<5	<5	<5	<10	<5	<5	<5
	6/9/2004	<5	<5	<5	<10	<5	<5	<5
	9/23/2004	<5	<5	<5	<10	<5	<5	<5
	12/10/2004	<5	<5	<5	<10	<5	40	<5
	3/8/2005	<5	<5	<5	<10	<5	28	<5
	9/23/2005	<5	<5	<5	<10	<5	44	<5
	12/16/2005	<5	<5	<5	<10	<5	34	<5
	3/20/2006	<5	<5	<5	<10	<5	<4	<5
	6/26/2006	<5	<5	<5	<10	<5	<4	<5
	9/7/2006	<5	<5	<5	<10	<5	<4	<5
	11/29/2006	<5	<5	<5	<10	<5	<4	<5
	1/12/2007	<5	<5	<5	<10	<5	<4	<5
	4/4/2007	<1	<5	<5	<10	<5	<4	<5
	07/26/2007	<1	<5	<5	<10	<5	<4	<5
	10/1/2007	<1	<5	<5	<10	<5	<4	<5
	1/8/2008	<1	<1	<1	<1	<4	<1	<2
	4/7/2008	<1	<1	<1	<1	<4	17	<2
	7/10/2008	<1	<1	<1	<1	<4	1.3	<2
	10/9/2008	<1	<1	<1	<1	<4	3.1	<2
	1/15/2009	<1	<1	<1	<1	<4	3.1	<2
	4/2/2009	<1	<1	<1	<1	<4	<1	<2
	7/20/2009	<1	<1	<1	<1	<4	<1	<2
	11/20/2009	<1	<1	<1	<1	<4	<1	<2
	1/18/2010	<1	<1	<1	<1	<4	<1	<2

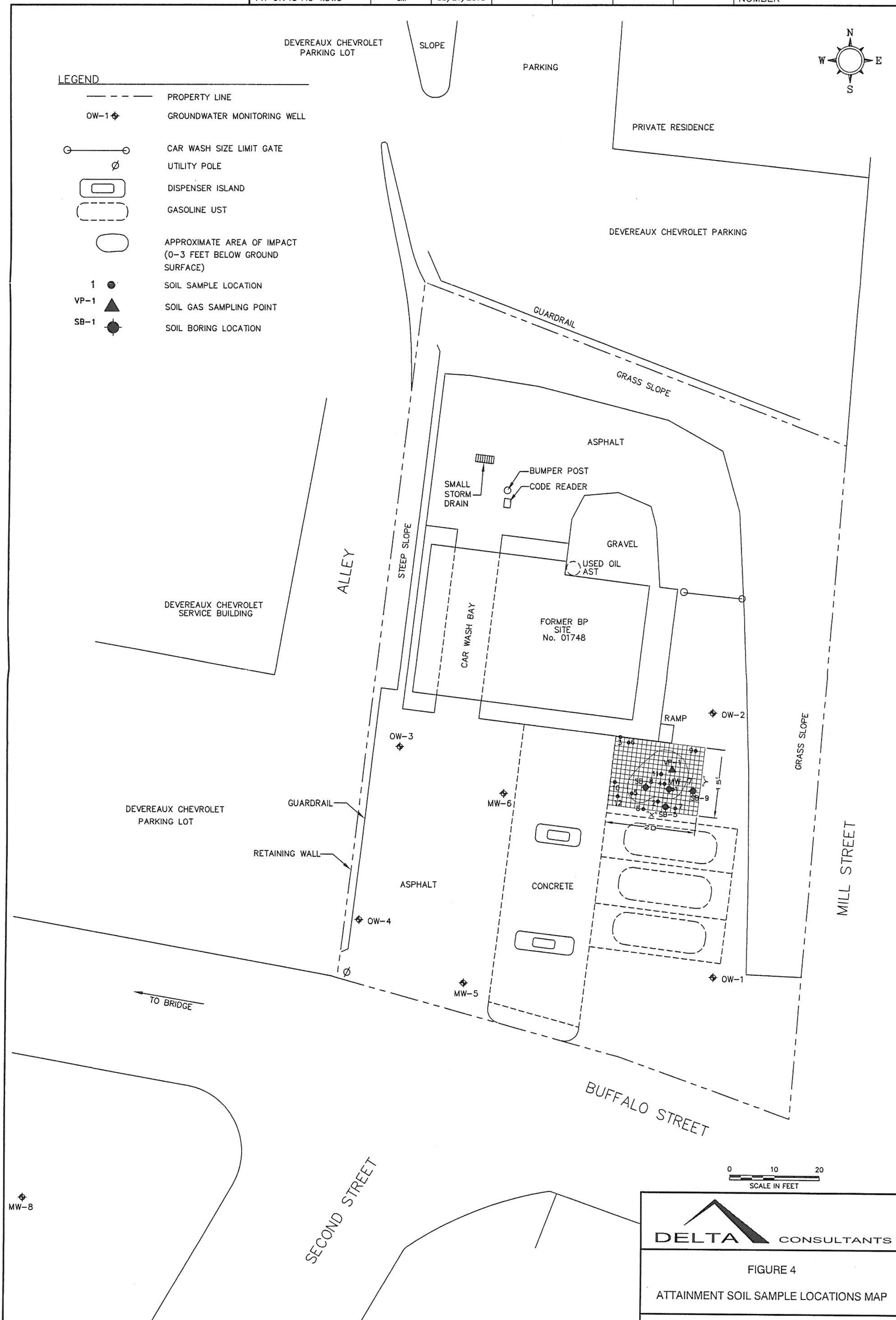
Table 4
Groundwater Analytical Data
Former Amoco Site No. 01748
222 Buffalo Street
Freeport, Pennsylvania

Well	Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Naphthalene (ug/L)	MTBE (ug/L)	Cumene (ug/L)
Groundwater MSCs		5	1,000	700	10,000	100	20	1,100
MW-5	2/14/2002	<5	<5	<5	<10	<5	<5	<5
	9/24/2003	<5	<5	<5	<10	<5	270	<5
	12/6/2003	<5	<5	<5	<10	<5	50	<5
	3/8/2004	<5	<5	<5	<10	<5	40	<5
	6/9/2004	<5	<5	<5	<10	<5	24	<5
	9/23/2004	<5	<5	<5	<10	<5	19	<5
	12/10/2004	<5	<5	<5	<10	<5	51	<5
	3/8/2005	<5	<5	<5	<10	<5	38	<5
	9/23/2005	<5	<5	<5	<10	<5	12	<5
	12/16/2005	<5	<5	<5	<10	<5	7.8	<5
	3/20/2006	<5	<5	<5	<10	<5	14	<5
	6/26/2006	<5	<5	<5	<10	<5	6	<5
	9/7/2006	<5	<5	<5	<10	<5	9	<5
	11/29/2006	<5	<5	<5	<10	<5	7	<5
	1/12/2007	<5	<5	<5	<10	<5	<4	<5
	4/4/2007	<1	<5	<5	<10	<10	<4	<5
	07/26/2007	<1	<5	<5	<10	<10	10.5	<5
	10/1/2007	<1	<5	<5	<10	<5	34	<5
	1/8/2008	<1	<1	<1	<1	<4	6	<2
	4/7/2008	<1	<1	<1	<1	<4	9	<2
	7/10/2008	<1	<1	<1	<1	<4	7.6	<2
	10/9/2008	<1	<1	11	1.4	<4	3.6	24
	1/15/2009	<1	<1	<1	<1	<4	7.7	<2
	4/2/2009	<1	<1	<1	<1	<4	11	<2
	7/20/2009	<1	<1	<1	<1	<4	21	<2
	11/20/2009	<1	<1	<1	<1	<4	4.7	<2
	1/18/2010	<1	<1	<1	<1	<4	<1	<2
MW-6	2/14/2002	42	<50	1,100	420	460	120	240
	9/24/2003	<5	<5	240	<10	57	<5	36
	12/6/2003	<5	<5	<5	<10	<5	46	<5
	3/8/2004	<5	<5	9.9	<10	<5	<5	<5
	6/9/2004	<5	<5	<5	<10	<5	130	<5
	9/23/2004	<5	<5	<5	<10	<5	63	<5
	12/10/2004	<5	<5	<5	<10	<5	26	<5
	3/8/2005	<5	<5	<5	<10	<5	30	<5
	9/23/2005	9.2	<5	66	<10	56	<5	5.4
	12/16/2005	8.5	<5	26	<10	<5	<5	22
	3/20/2006	<5	<5	56	<10	13	<4	41
	6/26/2006	8.6	<5	<5	<10	10	37	5.8
	9/7/2006	<5	<5	9.6	<10	<5	23	<5
	11/29/2006	<5	<5	<5	<10	<5	11	<5
	1/12/2007	<5	<5	<5	<10	<5	<4	<5
	4/4/2007	<1	<5	11.2	<10	<5	<4	<5
	07/26/2007	<1	<5	29.2	<10	7.5	<4	43.3
	10/1/2007	<1	<5	23.6	<10	7.9	<4	42.9
	1/8/2008	<1	<1	<1	<1	<4	9	<2
	4/7/2008	<1	<1	<1	<1	<4	4	<2
	7/10/2008	<1	<1	<1	<1	<4	5.3	<2
	10/9/2008	<1	<1	<1	<1	<4	3.3	<2
	1/15/2009	1.3	<1	1.1	<1	<4	25	5.1
	4/2/2009	<1	<1	<1	<1	<4	8.3	<2
	7/20/2009	<1	<1	2.6	<1	<4	1.6	8.2
	11/20/2009	<1	<1	1.1	<1	<4	6.2	5.1
	1/18/2010	<1	<1	<1	<1	<4	8.2	<2

FILENAME	DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NUMBER PA-01748
PA-01748_10Q2.DWG	JM	04/13/2010					



FILENAME	DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NUMBER
PA-01748 FIG 4.DWG	JM	05/21/2010					PA-01748



DELTA CONSULTANTS

FIGURE 4

ATTAINMENT SOIL SAMPLE LOCATIONS MAP

FORMER BP SITE No. 01748
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA

OFFICIAL FILE COPY

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHWEST REGIONAL OFFICE

January 21, 2011

Randal Coil
BP Products North America, Inc.
501 Westlake Park Blvd
WL1-28.160B
Houston, TX 77079

Re: Storage Tank Program
Facility I.D. No. 03-29674
Former BP Site #01748
222 Buffalo Street
Freeport Borough
Armstrong County
Remedial Action Completion Report - Approval

Dear Mr. Coil:

The Pennsylvania Department of Environmental Protection (Department) has reviewed the Remedial Action Completion Report (RACR) received in our office on July 14, 2010 regarding the investigation and proposed remediation of contamination resulting from a release of a regulated substance at the above-referenced facility.

The site is presently an operating retail fuel sales and carwash facility. The American Oil Company (Amoco) purchased the site from the previous owners and developed the site in its present configuration in 1986. Amoco operated the site until it was divested to Glassmere Fuel Services, Inc. in 2001. The site is located in a limited commercial and residential area. A single-story building with an attached drive-through carwash occupies the parcel. There are two product dispensers present, under a canopy, south of the building. The dispensers are served by three 10,000-gallon underground storage tanks (UST). There is also a 400-gallon aboveground waste oil tank on site.

A series of site characterization efforts to quantify the nature and extent of the release were performed culminating in a July 2, 2008 SCR/RAP report submission. Site characterization work has included soil/rock borings, monitoring well installation, groundwater, soil and soil gas sampling, geologic and hydrogeologic analyses, migration potential assessments, ecological receptor identification and development of a remedial approach for the site. The SCR/RAP was approved by the Department on September 2, 2008.

The SCR identified the following conditions:

- There is a plume of groundwater contamination that has apparently arisen from the site. Benzene, ethylbenzene, naphthalene, and MTBE have historically been found at concentrations exceeding the Residential, Used-Aquifer, Statewide Health Standards (SHS) in the interior of the site and at the Point of Compliance (POC);

- Recent groundwater data indicates that concentrations in groundwater have been reduced to below the Residential, Used-Aquifer, SHS at the POC;

- A demonstration of attainment for Residential, Used-Aquifer, SHS was proposed for groundwater at the site;

- Soil sampling detected benzene and naphthalene at levels above the Residential, Used-Aquifer, Medium Specific Concentration $_{\text{Soil-GW}}$ in one portion of the site;

- The standards selected for attainment in soil are the Residential, Used-Aquifer, Medium Specific Concentration $_{\text{Soil-GW}}$; and

- Concentrations of contaminants present in soil gas, as measured by direct sampling during an original single event, did not exceed screening values and therefore apparently did not represent a complete exposure pathway related to indoor air intrusion at the time the SCR/RAP was submitted.

The RAP proposed the following:

- Quarterly groundwater monitoring at wells OW-1, OW-2, OW-3, OW-4, MW-5, MW-6, MW-7 and MW-8 until attainment of the selected standards in groundwater could be demonstrated for eight consecutive quarters. The proposed POC includes OW-1, OW-4 and MW-5.

- Additional soil attainment sampling to be performed focused in the area where the exceedences of standards were found previously.

- Another soil gas sample to be collected to ensure that concentrations continue to be below applicable screening levels.

The work proposed and approved in the RAP has been completed and the results are provided and interpreted in the RACR.

Attainment for the selected standards has been demonstrated as detailed below:

- SHS (for a residential, used-aquifer scenario) Medium Specific Concentrations (MSCs), were used to demonstrate attainment for all Chemicals of Potential Concern (COPCs) on the "Old Petroleum Shortlist" (the shortlist in effect prior to March 18, 2008) in groundwater. The demonstration included data from POC wells showing concentrations that were below the SHS for a minimum of eight (8) consecutive calendar quarters. **[Note: Any party that may have a current or future interest in the property should be aware that there is a stable benzene groundwater plume present on the property**

in the area of the former tank cavity. The presence of this plume may limit the ability to change property use and the potential to utilize groundwater at the site.]

- SHS, residential, used-aquifer, MSCs $_{\text{Soil-GW}}$, for the "Old Shortlist" constituents have been attained in soil using appropriate statistical methods to analyze the results of the additional soil attainment sampling proposed in the RAP.

- An additional round of soil gas sampling was performed as part of the work detailed in the RAP. A single sampling point yielded a benzene concentration at level exceeding the SHS screening value. The Johnson-Ettinger Model was used to evaluate the data using a non-residential, site-worker exposure scenario. The results of the modeling indicate that the risks associated with the potential for indoor air intrusion by subsurface contamination are acceptable for the exposure scenario employed. **[Note: A non-residential, site-worker exposure scenario was used to calculate the risks posed by the potential intrusion of site contamination to indoor air. Any party that may have a current or future interest in the property should be aware that this calculation of risk may not be appropriate for other potential future site uses.]**

Based on the information provided in the July 14, 2010 RACR by you and/or your environmental consultant, the Department recognizes attainment of the selected standards for soil, groundwater and soil vapor for the chemicals of concern associated with unleaded gasoline at this site.

The Department has determined that a Post Remediation Care Plan is not required at this site. This determination is made based on the demonstration of attainment of the selected standards in groundwater at the POC. No additional sampling of soil will be required based on the demonstrated attainment of SHS. No additional work related to the potential for indoor air intrusion will be required based on the results of soil gas sampling and subsequent modeling.

The Department recognizes that this facility will not require any environmental covenants restricting use, as outlined in the Uniform Environmental Covenants Act (Act 68 of 2007), Title 27, Pa. C.S. Chapter 65 (UECA) of February 19, 2008 and the Frequently Asked Questions (FAQs) as revised in August 2010. The FAQ Number 4 states:

> *If the nonresidential Statewide health standard is utilized by the remediator,* [as it was by virtue of the input parameters used in the Johnson-Ettinger modeling] *it is not necessary to have an environmental covenant to restrict the property to nonresidential uses. If an engineering control has been used to attain the standard* [not the case at this site], *an environmental covenant will be required to document and maintain that control.*

The Department, by its review, finds the site characterization for this facility to be complete and will not require any further characterization, remediation or monitoring of environmental media at this time. Liability protection for attainment of the standards described and established in the RACR is outlined in Chapter 5 of the Land Recycling and Environmental Standards Act. If undetected contaminants are discovered, the Department may require additional characterization and/or remediation in accordance with Section 505 of the Land Recycling and Environmental Remediation Standards Act (1995-2), Storage Tank and Spill Prevention Act (1982-32), and regulations Pa.Code Section 245, Administration of the Storage Tank and Spill Prevention Program.

All site groundwater monitoring wells should be properly abandoned in a manner consistent with the Department's 2001 Groundwater Monitoring Guidance Manual. Please forward copies of the completed abandonment forms so that we may close our files for this facility.

If you have any questions concerning this correspondence, you can contact Mr. Thomas Fuller, P.G. of my staff at 412.442.4121.

Sincerely,

David E. Eberle
Regional Manager
Environmental Cleanup Program

cc: Mr. Jonathan Zimdars, P.G. – Delta Environmental, Inc.

APPENDIX E

January 2017 UST Closure Report & NORR

Letterle & Associates
2859 Oxford Blvd Allison Park, PA 15101
412.486.0600 www.letterleassociates.com

January 26, 2017

Storage Tank Section
Pennsylvania Dept. of Environmental Protection
400 Waterfront Drive
Pittsburgh, Pennsylvania 15222

CERTIFIED MAIL—RETURN RECEIPT REQUESTED

Re: Facility ID #03-29674
Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Dear Sir or Madam:

Please find enclosed two copies of the Underground Storage Tank Closure Report prepared by Letterle & Associates, Inc. (Letterle) on behalf of Superior Petroleum Company (Superior), for the Radhe Oil site, located at 222 Buffalo Street in Freeport, Pennsylvania. Superior is the owner of the underground storage tank (UST) system at the site.

In December 2016, all product piping and two dispensers were closed via removal by certified tank handler, S.I.S, Inc. Following removal, a total of four soil samples were collected. Soil analytical results exceeded the PADEP Statewide Health Standards (SHS) for several unleaded gasoline parameters.

Should you have any comments or questions, please call Eric Itle, Project Manager, at 412-486-0600.

Sincerely,

LETTERLE & ASSOCIATES, INC.

Eric Itle

Eric Itle, P.G.
Project Manager

Enc.

cc: Nila Manning – Superior

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

APPENDIX D

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

UNDERGROUND STORAGE TANK SYSTEM CLOSURE REPORT FORM

03 - 29674
Facility I.D.

Radhe Oil
Facility Name

Freeport	Armstrong
Municipality	County

1/10/17
Date Prepared

Eric Itle
Name of Person Submitting Report
(Please Print)

Letterle & Associates
Company Name
(If Applicable)

Project Manager
Title

Closure Method (Check all that apply):

- ☒ Removal
- ☐ Closure-In-Place
- ☐ Change-In-Service

Site Assessment Results (Check all that apply):

- ☐ No Obvious Contamination - Sample Results Meet Standards/Levels
- ☐ No Obvious Contamination - Sample Results Do Not Meet Standards/Levels
- ☐ Obvious, Localized Contamination - Sample Results Meet Standards/Levels
- ☐ Obvious, Localized Contamination - Sample Results Do Not Meet Standards/Levels
- ☒ Obvious, Extensive Contamination

DATE RECEIVED: ____________

UNDERGROUND STORAGE TANK SYSTEM CLOSURE REPORT FORM

Owners who are permanently closing underground storage tanks may use this form to demonstrate that an underground storage tank closure was performed in accordance with the "Closure Requirements for Underground Storage Tank Systems" document. PLEASE PRINT OR TYPE. COMPLETE ALL QUESTIONS.

SECTION I. Owner/Facility/Tank/Waste Management and Disposal Information

1. Facility ID Number 03 - 29674
2. Facility Name Radhe Oil
3. Facility County Armstrong
4. Facility Municipality Freeport
5. Facility Address 222 Buffalo Street Freeport, PA 16229
6. Facility Contact Person Nila Manning
7. Facility Telephone Number (412) 364 - 2200
8. Owner Name Superior Petroleum Company
9. Owner Mailing Address 8199 McKnight Road Pittsburgh, PA 15237
10. Description of Underground Storage Tanks (Complete for each tank closed)

DATE OF TANK CLOSURE (Month/Day/Year)		12- 21 -2016	12- 21 -2016	12- 21 -2016	- -
Tank Registration Number		1	2	3	
Estimated Total Capacity (Gallons)		10,000	10,000	10,000	
Substance(s) Stored Throughout Operating Life of Tank (Check All That Apply)	a. **Petroleum**				
	Unleaded Gasoline	☒	☒	☒	☐
	Leaded Gasoline	☐	☐	☐	☐
	Aviation Gasoline	☐	☐	☐	☐
	Kerosene	☐	☐	☐	☐
	Jet Fuel	☐	☐	☐	☐
	Diesel Fuel	☐	☐	☐	☐
	Fuel Oil No. 1	☐	☐	☐	☐
	Fuel Oil No. 2	☐	☐	☐	☐
	Fuel Oil No. 4	☐	☐	☐	☐
	Fuel Oil No. 5	☐	☐	☐	☐
	Fuel Oil No. 6	☐	☐	☐	☐
	New Motor Oil	☐	☐	☐	☐
	Used Motor Oil	☐	☐	☐	☐
	Other, Please Specify				
NOTE: If Hazardous Substance Block is Checked, Attach Material Safety Data Sheets (MSDS)	b. **Hazardous Substance**	☐	☐	☐	☐
	Name of Principal CERCLA Substance				
	AND Chemical Abstract Service (CAS) No.				
	c. **Unknown**	☐	☐	☐	☐
Closure Method (Check Only One)	a. **Removal**	☒	☒	☒	☐
	b. **Closure-in-Place**	☐	☐	☐	☐
	c. **Change-In-Service**	☐	☐	☐	☐
Partial System Closure (Yes or No)		yes	yes	yes	

DATE OF TANK CLOSURE (Month/Day/Year)		- -	- -	- -	- -
Tank Registration Number					
Estimated Total Capacity (Gallons)					
Substance(s) Stored Throughout Operating Life of Tank (Check All That Apply)	a. **Petroleum**				
	Unleaded Gasoline	☐	☐	☐	☐
	Leaded Gasoline	☐	☐	☐	☐
	Aviation Gasoline	☐	☐	☐	☐
	Kerosene	☐	☐	☐	☐
	Jet Fuel	☐	☐	☐	☐
	Diesel Fuel	☐	☐	☐	☐
	Fuel Oil No. 1	☐	☐	☐	☐
	Fuel Oil No. 2	☐	☐	☐	☐
	Fuel Oil No. 4	☐	☐	☐	☐
	Fuel Oil No. 5	☐	☐	☐	☐
	Fuel Oil No. 6	☐	☐	☐	☐
	New Motor Oil	☐	☐	☐	☐
	Used Motor Oil	☐	☐	☐	☐
	Other, Please Specify				
NOTE: If Hazardous Substance Block is Checked, Attach Material Safety Data Sheets (MSDS)	b. **Hazardous Substance**	☐	☐	☐	☐
	Name of Principal CERCLA Substance	☐	☐	☐	☐
	AND Chemical Abstract Service (CAS) No.				
	c. **Unknown**	☐	☐	☐	☐
Closure Method (Check Only One)	a. **Removal**	☐	☐	☐	☐
	b. **Closure-in-Place**	☐	☐	☐	☐
	c. **Change-In-Service**	☐	☐	☐	☐
Partial System Closure (Yes or No)					

Yes **N/A**

11. Briefly describe the storage tank facility and the nature of the operations which were conducted at the facility (both historical and present) **including use of tanks:**

The site is currently is an active retail petroleum facility with a convenience store. There are three active USTs (001, 002, and 003) on-site with two dispensers and associated product piping. Both dispensers and all product piping were closed by removal and replaced.

☒ ☐ 12. A site location and sampling map of the site, drawn to scale, is attached. See page 11 of 11.

☒ ☐ 13. Original, color photographs of the closure process are attached (i.e., inside of excavation/piping runs, pit water, tanks showing condition).

☒ ☐ 14. An amended "Storage Tanks Registration/Permitting Application Form" was submitted to the DEP, Bureau of Waste Management, Division of Storage Tanks, P.O. Box 8762, Harrisburg, PA 17105-8762.

Date: 1/18/17

☒ ☐ 15. If a reportable release was confirmed, the appropriate regional office of DEP was notified by the owner or operator.

Date: 12 - 21 - 2016 Office: Southwest

Yes	N/A	
☐	☒	16. If tanks were cleaned on-site:

a. Briefly describe the disposition of usable product: Not applicable

b. Briefly describe the disposal of unusable product, sludges, sediments, and wastewater generated during cleaning. Provide the name and permit number of the processing, treatment, storage or disposal facility. (Attach documentation of proper disposal):

c. If tank contents were determined/deemed to be hazardous waste, provide:

(1) Generator ID Number:

(2) Licensed Hazardous Waste Transporter Name and ID Number:

Yes	N/A	
☐	☒	17. If tanks were removed from the site for cleaning:

a. Provide the name and permit number of the processing, treatment, storage or disposal facility performing the tank cleaning:

b. If tank contents were d determined/deemed to be hazardous waste, provide:

(1) Generator ID Number:

(2) Licensed Hazardous Waste Transporter Name and ID Number:

18. Briefly describe the disposition of tanks/piping (Attach documentation of proper disposal):

The steel piping was picked up by a local citizen and hauled away to a scrap yard. Disposal documentation was not obtained.

Yes	N/A	
☒	☐	19. If contaminated soil is excavated:

a. Briefly describe the disposition and amount 123 (tons) of contaminated soil. Provide the name and permit number of the processing, treatment, storage or disposal facility. (Attach documentation of proper disposal):

Approximately 123 tons of petroleum-impacted soil was removed and transported to Carbon Limestone Landfill in Lowellville, Ohio by McCutcheon Enterprises, Inc. Disposal documentation is attached.

b. If contaminated soil is determined/deemed to be hazardous waste, provide:

(1) Generator ID Number:

(2) Licensed Hazardous Waste Transporter Name and ID Number:

Yes	N/A	
☐	☒	20. Briefly describe the disposition of and amount 0 (tons) of uncontaminated soil (attach analyses):

I, Nila Manning (Print Name), hereby certify, under penalty of law as provided in 18 Pa. C.S. §4904 (relating to unsworn falsification to authorities) that I am the owner of the above referenced storage tank(s) and that the information provided by me in this closure report (Section I) is true, accurate and complete to the best of my knowledge and belief.

Signature of Tank Owner

1/16/17
Date

Superior Petroleum Corporation
Company Name
(If Applicable)

Director of Human Resources
Title

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

UNDERGROUND STORAGE TANK SYSTEM CLOSURE REPORT FORM

SECTION II. Tank Handling Information

Facility ID Number 03 - 29674

Yes N/A

1. Briefly describe the excavation and initial on-site staging of uncontaminated/contaminated soil:
Contaminated soil was staged on and covered with plastic adjacent to the excavation.

2. Briefly describe the method of piping system closure and the closure of the piping systems including the quantity and condition of the piping:
Approximately 40 feet of piping was removed from the subsurface. The piping was in poor condition and was heavily corroded.

3. Briefly describe the condition of the tanks and any problems encountered during tank removal:
The USTs were not removed.

4. Briefly describe the method used to purge the tanks of and monitor for explosive vapors:
Not applicable.

☐ ☒ 5. If tanks were cleaned on-site:
   a. Briefly describe the tank cleaning process: Not applicable.
   b. If subcontracted, name and address of company that performed the tank cleaning:

☐ ☒ 6. If tanks were closed-in-place, briefly describe the tank fill material:

☒ ☐ 7. If contamination was suspected or observed, the "Notification of Contamination" form was submitted.

SECTION II. (continued)

I, William E. DiDonato, hereby certify, under penalty of law as provided in 18 Pa. C.S. §4904
(Print Name)

(relating to unsworn falsification to authorities) that I am the certified installer who performed the tank handling activities associated with the closure of the above referenced storage tank(s) and that the information provided by me in this closure report (Section I) is true, accurate and complete to the best of my knowledge and belief.

[signature]
Signature of Certified Installer

January 20, 2017
Date

1665
Installer Certification Number

54
Company Certification Number

Shelving Installation Service, Inc
DBA: S.I.S., Inc
Company Name

7208 Route 908
Street

Tarentum, PA 15084
City/Town, State, Zip

724-224-1220
Phone

UNDERGROUND STORAGE TANK
CLOSURE REPORT FORM

SECTION III. Site Assessment Information

Tank Registration # 001 (complete one sheet for EACH tank system and attach ALL laboratory sheets pertaining to that system)

Facility ID Number 03 - 29674

A. Provide depth of *BEDROCK* and *WATER* IF encountered during excavation or soil boring (write "N/A: if NOT encountered).

Bedrock NA feet below land surface Water NA feet below land surface

B. Provide Length of *PIPING* IF piping was closed-in-place (write "N/A" if NOT closed-in-place).
Length of piping NA feet

C. **TANK SYSTEM REMOVED FROM THE GROUND**

1). Was obvious contamination observed while excavating?

☐ NO ---------→ Conduct confirmatory sampling ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Do not complete item C.2. below.

☒YES---------→ Report release to DEP within 2 hours ---------→ Describe contamination observed and likely source(s) tank, piping, dispenser, spills, overfills):

Following dispenser and product piping removal, obvious contamination was observed in soil beneath the dispensers and beneath a section of piping. The obvious contamination was observed at a depth of greater than three feet below the dispensers. The source of contamination was likely from highly corroded piping.

---------→ Complete item C.2. below.

2). Was contamination localized (within three feet of the tank system in every direction with no obvious water contamination)?

☐ YES --------→ Remove or remediate contaminated soil --------→ Conduct confirmatory sampling-------→ See end of this section for options on submission and maintenance of closure records -------→ Call Indemnification Fund (717-787-0763).

☐ NO---------→ Continue interim remedial actions ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Call Indemnification Fund (717-787-0763).

D. **TANK SYSTEM CLOSED-IN-PLACE OR CHANGED-IN-SERVICE**

Was obvious contamination observed during sampling, boring or assessing water depths?

☐ NO ---------→ Conduct confirmatory sampling ---------→ See end of this section for options on submission and maintenance of closure records.

☐ YES---------→ Report release to DEP within 2 hours ---------→ Describe contamination observed and likely source(s) tank, piping, dispenser, spills, overfills):

Continue with corrective action ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Call Indemnification Fund (717-787-0763).

UNDERGROUND STORAGE TANK CLOSURE REPORT FORM

SECTION III. Site Assessment Information

Tank Registration # 002 (complete one sheet for EACH tank system and attach ALL laboratory sheets pertaining to that system)

Facility ID Number 03 - 29674

A. Provide depth of *BEDROCK* and *WATER* IF encountered during excavation or soil boring (write "N/A: if NOT encountered).

Bedrock NA feet below land surface Water NA feet below land surface

B. Provide Length of *PIPING* IF piping was closed-in-place (write "N/A" if NOT closed-in-place).
Length of piping NA feet

C. TANK SYSTEM REMOVED FROM THE GROUND

1). Was obvious contamination observed while excavating?

☐ NO ---------→ Conduct confirmatory sampling ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Do not complete item C.2. below.

☒YES---------→ Report release to DEP within 2 hours ---------→ Describe contamination observed and likely source(s) tank, piping, dispenser, spills, overfills):

Following dispenser and product piping removal, obvious contamination was observed in soil beneath the dispensers and beneath a section of piping. The obvious contamination was observed at a depth of greater than three feet below the dispensers. The source of contamination was likely from highly corroded piping.

--------→ Complete item C.2. below.

2). Was contamination localized (within three feet of the tank system in every direction with no obvious water contamination)?

☐ YES --------→ Remove or remediate contaminated soil --------→ Conduct confirmatory sampling-------→ See end of this section for options on submission and maintenance of closure records ------→ Call Indemnification Fund (717-787-0763).

☐ NO--------→ Continue interim remedial actions ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Call Indemnification Fund (717-787-0763).

D. TANK SYSTEM CLOSED-IN-PLACE OR CHANGED-IN-SERVICE

Was obvious contamination observed during sampling, boring or assessing water depths?

☐ NO --------→ Conduct confirmatory sampling ---------→ See end of this section for options on submission and maintenance of closure records.

☐ YES---------→ Report release to DEP within 2 hours ---------→ Describe contamination observed and likely source(s) tank, piping, dispenser, spills, overfills):

Continue with corrective action ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Call Indemnification Fund (717-787-0763).

UNDERGROUND STORAGE TANK CLOSURE REPORT FORM

SECTION III. Site Assessment Information

Tank Registration # 003 (complete one sheet for EACH tank system and attach ALL laboratory sheets pertaining to that system)

Facility ID Number 03 - 29674

A. Provide depth of *BEDROCK* and *WATER* IF encountered during excavation or soil boring (write "N/A: if NOT encountered).

Bedrock NA feet below land surface   Water NA feet below land surface

B. Provide Length of *PIPING* IF piping was closed-in-place (write "N/A" if NOT closed-in-place).
Length of piping NA feet

C. TANK SYSTEM REMOVED FROM THE GROUND

1). Was obvious contamination observed while excavating?

☐ NO ---------→ Conduct confirmatory sampling ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Do not complete item C.2. below.

☒ YES---------→ Report release to DEP within 2 hours ---------→ Describe contamination observed and likely source(s) tank, piping, dispenser, spills, overfills):

Following dispenser and product piping removal, obvious contamination was observed in soil beneath the dispensers and beneath a section of piping. The obvious contamination was observed at a depth of greater than three feet below the dispensers. The source of contamination was likely from highly corroded piping.

---------→ Complete item C.2. below.

2). Was contamination localized (within three feet of the tank system in every direction with no obvious water contamination)?

☐ YES --------→ Remove or remediate contaminated soil --------→ Conduct confirmatory sampling--------→ See end of this section for options on submission and maintenance of closure records --------→ Call Indemnification Fund (717-787-0763).

☐ NO---------→ Continue interim remedial actions ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Call Indemnification Fund (717-787-0763).

D. TANK SYSTEM CLOSED-IN-PLACE OR CHANGED-IN-SERVICE

Was obvious contamination observed during sampling, boring or assessing water depths?

☐ NO ---------→ Conduct confirmatory sampling ---------→ See end of this section for options on submission and maintenance of closure records.

☐ YES---------→ Report release to DEP within 2 hours ---------→ Describe contamination observed and likely source(s) tank, piping, dispenser, spills, overfills):

Continue with corrective action ---------→ See end of this section for options on submission and maintenance of closure records ---------→ Call Indemnification Fund (717-787-0763).

E. If the answer to C.1. is "no", the answer to C.2. if "yes" or the answer to D. is "no", confirmatory samples are required. Use the sample/analysis information sheet on page 10 of 11 to provide the information on confirmatory sampling and complete the diagram on Page 11 of 11.

Options for Submission and Maintenance of Closure Site Assessment Records

Records of the site assessment must be maintained for at least three years after completion of permanent closure or change-in-service in one of the following ways:

(a) By the owners and operators who took the UST system out of service;
(b) By the current owners and operators of the UST system site; or
(c) By mailing these records to the implementing agency if they cannot be maintained at the closed facility.

At least one option must be chosen. If option (c) is chosen, the closure report form should be sent to the DEP regional office responsible for the county in which the tank is located.

Where the results of the site assessment indicate that obvious, localized soil contamination was encountered and the analytical results of the confirmatory sampling show levels below the statewide standard/action levels, this closure report form (Sections I, II, and III) or some other acceptable site characterization report must be received by the Department within 180 days of verbally reporting the release.

Where the results of the site assessment indicate that no obvious contamination or obvious, localized contamination was encountered, but the analytical results of the confirmatory sampling show levels above the statewide standard/action levels, or where there is obvious, extensive contamination, Section 245.310(a)(8) of the CAP regulation requires that details of removal from service be included in the site characterization report. A copy of the completed closure report form should be submitted as part of the site characterization report to satisfy the requirements of Section 245.310(a)(8) of the CAP regulations.

I, Eric Itle (Print Name), hereby certify, under penalty of law as provided in 18 Pa. C.S. §4904 (relating to unsworn falsification to authorities) that I am the person who performed the site assessment activities associated with the closure of the above referenced storage tank(s) and that the information provided by me in this closure report (Section III) is true, accurate and complete to the best of my knowledge and belief.

Eric Itle
Signature of Person Performing Site Assessment

1 / 25 / 2017
Date

Project Manager
Title of Person Performing Site Assessment

Letterle & Associates
Name of Company Performing Site Assessment

412-486-0600
Telephone Number of Person Performing Site Assessment

UNDERGROUND STORAGE TANK SYSTEM CLOSURE REPORT FORM

Sample/Analysis Information
(Attachment for Section III.)

Facility ID Number 03 - 29674

Sample I.D. (See diagram)	Parameter	Analytical Method[1]		Media	Result (units)	Detection Limit (units)	Date Sample Taken	Date Sample Analyzed
See	Attached	Table					/ /	/ /
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Facility ID Number 03 - 29674

Sample I.D. (See diagram)	Parameter	Analytical Method[1]		Media	Result (units)	Detection Limit (units)	Date Sample Taken	Date Sample Analyzed
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[1] Where EPA Method 5035 is required, indicate sample collection option in the right hand box of this column using the following codes:

P - Samples placed in a soil sample vial with a preservative present.
E - Samples collected and stored in a soil collection device which is airtight and affords little to no headspace.
N - Samples placed in soil sample vial without a preservative present.

Site Location and Sampling Map - Use this page or suitable facsimile to provide a large scale map of the site where tanks were closed. Scales between 1" = 10 and 1" = 100 feet frequently work out well. Include the following information as each applies to the site: facility name and I.D., county, township or borough, property boundaries or area of interest, buildings, roads and streets with names or route numbers, utilities, location and ID number of storage tanks removed including piping and dispensers, soil stockpile locations, excavations or other locations of product recovery, north arrow, approximate map scale and legend. Also show depth and location of samples with sample ID numbers cross-referenced to the same ID numbers shown on Page 10 of 11.

Facility Name and ID: Radhe Oil 03 - 29674

County: Armstrong

Township/Borough: Freeport (see attached figures)

TABLE

TABLE 1
SOIL ANALYTICAL DATA - Partial UST Closure
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Sample ID	Date	Depth (ft-bgs)	PID (ppm)	Benzene (µg/kg)	Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylene (µg/kg)	MTBE (µg/kg)	Cumene (µg/kg)	Naphthalene (µg/kg)	1,2,4-TMB (µg/kg)	1,3,5-TMB (µg/kg)
D-1/2'	12/21/16	2	525	<2,650	13,600	40,200	352,000	<2,650	6,820	30,200	180,000	82,400
D-2/2'	12/21/16	2	572	<258	19,200	19,700	124,000	<258	4,190	8,770	72,300	23,600
LS-1/3'	12/21/16	3	145.8	2,230	716	8,220	4,040	<261	1,930	3,990	785	<261
LS-2/3'	12/21/16	3	3.3	<5	<5	<5	<14.9	<5	<5	<5	<5	<5

	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	Cumene	Naphthalene	1,2,4-TMB	1,3,5-TMB
Soil to Groundwater - Residential MSCs	**500**	**100,000**	**70,000**	**1,000,000**	**2,000**	**600,000**	**25,000**	**8,400**	**74,000**
Direct Contact Residential (0-15')	**57,000**	**10,000,000**	**180,000**	**1,900,000**	**1,700,000**	**7,700,000**	**160,000**	**130,000**	**2,200,000**
Indoor Air Soil Screening Values - Residential	**370**	**76,000**	**5,700**	**55,000**	**51,000**	**360,000**	**64,000**	**20,000**	**4,600**

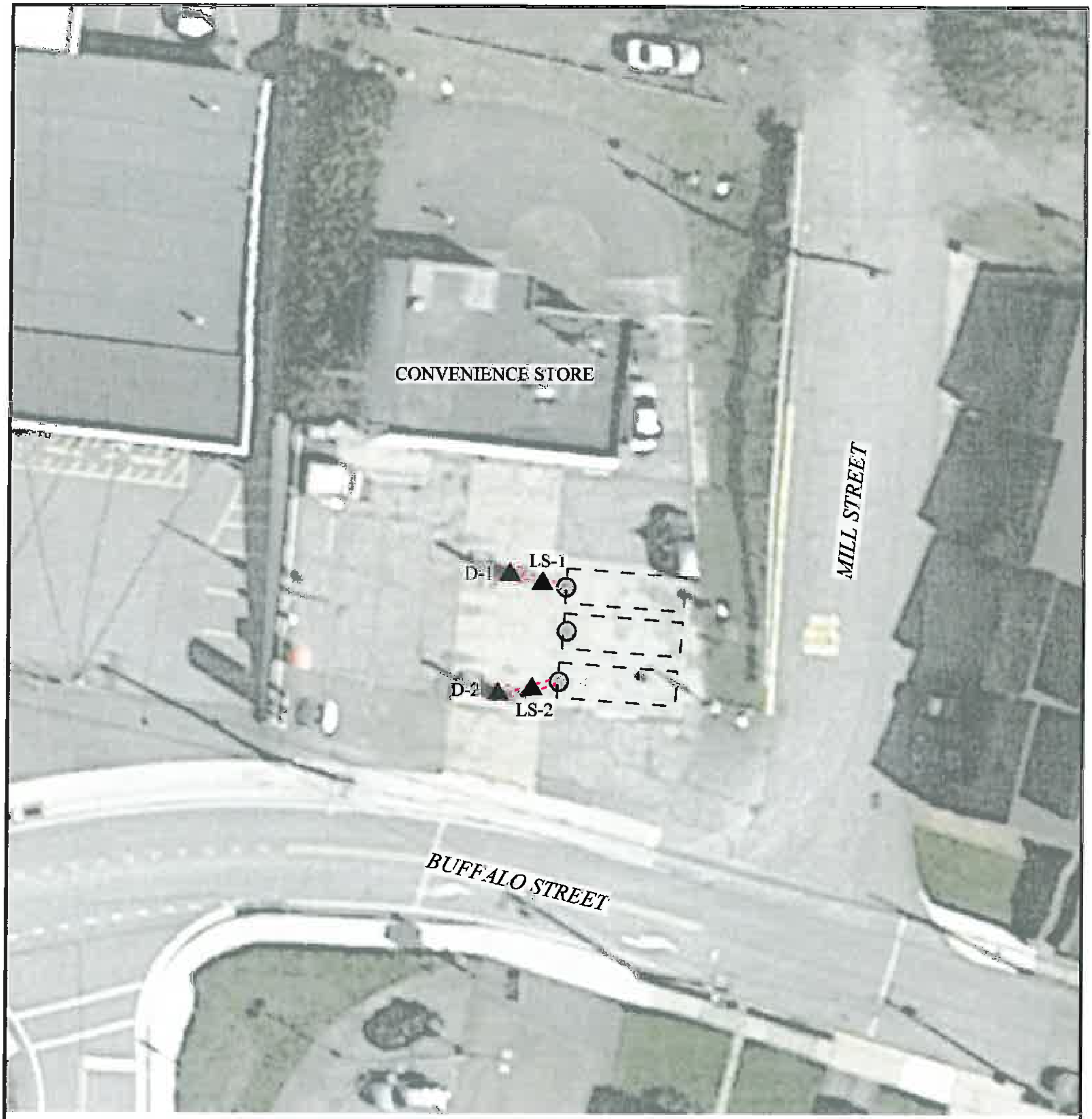
Notes:

MTBE	methyl tertiary-butyl ether	µg/kg	micrograms per kilogram
TMB	trimethylbenzene	ft-bgs	feet below ground surface
ppm	parts per million	NOC	Not of Concern

MSC's - Medium Specific Concentrations are designated as PADEP Statewide Health Standards

MSC's presented are for soil to groundwater numeric values for residential used aquifers - exceedences are highlighted gray.

FIGURES



LEGEND

DISPENSER AND LINES

SOIL SAMPLE LOCATION

SCALE IN FEET

0 20

UST CLOSURE SAMPLE LOCATION MAP

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 1

ATTACHMENT A

PHOTOGRAPHS

Photo 1: Radhe Oil—View of site looking northwest.

Photo 2: Radhe Oil—View of site looking north.

Photo 3: Radhe Oil—View of site looking northeast.

Photo 4: Radhe Oil—View from site looking south.

Photo 5: Radhe Oil—View from site looking southwest.

Photo 6: Radhe Oil—Former canopy and dispenser island area.

Photo 7: Radhe Oil—Former canopy and dispenser island area.

Photo 8: Radhe Oil—Highly corroded product piping connector.

Photo 9: Radhe Oil—Highly corroded product piping connector.

Photo 10: Radhe Oil—Highly corroded product piping connector.

ATTACHMENT B

DISPOSAL RECEIPTS

All Ticket Types
History and Waiting
* - Confirmed Qty Applied to Billing

Detail Contract Activity Report

January 01, 2017 to January 11, 2017
Specific Contract(s) : '5076170115'

5076170115

Ticket Date		Facility &	Ticket Number	Customer	Truck	Material	Billing Quantity	
01/06/2017	I	Y1	1189594	000906 - MCCUTCHEON ENTERPRISE	MCCUTCHE	SW-CONT SOIL W/FUE	16.12	TN
01/06/2017	I	Y1	1189601	000906 - MCCUTCHEON ENTERPRISE	MCCUTCHE	SW-CONT SOIL W/FUE	16.60	TN
01/06/2017	I	Y1	1189684	000906 - MCCUTCHEON ENTERPRISE	MCCUTCHE	SW-CONT SOIL W/FUE	20.08	TN
01/06/2017	I	Y1	1189687	000906 - MCCUTCHEON ENTERPRISE	MCCUTCHE	SW-CONT SOIL W/FUE	20.58	TN
01/09/2017	I	Y1	1189880	000906 - MCCUTCHEON ENTERPRISE	TESONE	SW-CONT SOIL W/FUE	18.39	TN
01/09/2017	I	Y1	1189892	000906 - MCCUTCHEON ENTERPRISE	MCCUTCHE	SW-CONT SOIL W/FUE	18.07	TN
01/09/2017	I	Y1	1189999	000906 - MCCUTCHEON ENTERPRISE	MCCUTCHE	SW-CONT SOIL W/FUE	12.77	TN

Tickets Reported: 7 Items Reported: 7

Material Summary	Weight Inbound	Weight Outbound		Volume Inbound	Volume Outbound		Count Inbound	Count Outbour
VH - SW-CONT SOIL W/FUEL	122.61	0.00	TN	160.00	0.00	YD	0.00	0.0

Tickets Reported: 7 Items Reported: 7

TE

CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

SITE	Y1
TICKET #	1189594
CELL	
WEIGHMASTER	IN - Sheryl H. OUT - Robert S.
DATE/TIME IN	1/6/17 10:01 am
DATE/TIME OUT	1/6/17 10:30 am
VEHICLE	MCCUTCHEON
CONTAINER	
REFERENCE	8
BILL OF LADING	365847

USTOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SCALE IN	GROSS WEIGHT	62,560	NET TONS	16.12
SCALE OUT	TARE WEIGHT	30,320	NET WEIGHT	32,240

INBOUND
INVOICE

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
16.12	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TOTAL AMOUNT
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE

RS-F042UPR (07/12)

10-8

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

MEI McCutcheon Enterprises, Inc. Complete Waste Management

00140005

Non-Hazardous Waste Manifest

1. Generator's US EPA ID No.	Manifest Document No.
2. Page 1 of	00036973
3. Generator's Name and Mailing Address	Rachs Oil 03-29674, 222 Buffalo Street, Freeport, PA 16229
	35847
4. Generator's Phone	(412) 303-2200
B. State Generator's ID	
5. Transporter 1 Company Name	McCutcheon Enterprises Inc
6. US EPA ID Number	PAD0133266N
C. State Trans. ID	
7. Transporter 2 Company Name	
8. US EPA ID Number	
D. Transporter's Phone	( )
E. State Trans. ID	
9. Designated Facility Name and Site Address	Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436
10. US EPA ID Number	OHD987048212
F. Transporter's Phone	( )
G. State Facility's ID	
H. Facility's Phone	(330) 536-8013

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L Waste No.
a. Virgin petroleum fuel contaminated soil/debris	1	DT	15	Y	50
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above

a. 5070 17 0115

b.

c.

d.

K. Handling Codes for Wastes Listed Above

a. b. c. d.

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name: X [illegible] Signature: X [illegible] Month Day Year: 1-11-2017

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Larry Oliver Signature: [signature] Month Day Year: 1-11-2017

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name: Signature: Month Day Year:

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in item 19

Printed/Typed Name: Sheri Wilcox Signature: Sheri Wilcox Month Day Year: 1-11-17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

TE CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

SITE Y1 TICKET # 1189684 CELL

WEIGHMASTER Robert S.

DATE/TIME IN 1/6/17 1:49 pm DATE/TIME OUT 1/6/17 2:22 pm

VEHICLE MCCUTCHEON CONTAINER

REFERENCE 8

BILL OF LADING 35848

ISTOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SCALE IN GROSS WEIGHT 68,720 NET TONS 20.08
SCALE OUT TARE WEIGHT 28,560 NET WEIGHT 40,160

INBOUND
INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
20.08	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TENDERED

CHANGE

CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

S-F042UPR (07/12)

SIGNATURE

D-8

MEI McCutcheon Enterprises, Inc — Complete Waste Management

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

00149906

Non Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No	2. Page 1 of 1	JWO [illegible]574

3. Generator's Name and Mailing Address: [illegible] 23574
222 Buffalo Street
Freeport, PA 16229

4. Generator's Phone ( ) 412 364-2200

35848

B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises inc
6. US EPA ID Number: PAD013826847

C. State Trans. ID: 724-568-[illegible]

7. Transporter 2 Company Name
8. US EPA ID Number

D. Transporter's Phone ( )

E. State Trans. ID

9. Designated Facility Name and Site Address: Carbon Limestone Landfill
8100 S. Stateline Road
Lowellville, OH 44436

10. US EPA ID Number: OHD987048212

F. Transporter's Phone ( )

G. State Facility's ID 330 536-8013

H. Facility's Phone ( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM		12. Containers No	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	Virgin petroleum fuel contaminated soil/debris	1	DT	15.0	Y	503
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
a. 5078 17 0115
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a.
b.
c.
d.

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month	Day	Year
X Paul Faola	X [signature]	1	1	17

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Leroy Alhani	[signature]	1	1	17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Rosanne Simon	[signature]	1	4	17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

TE

CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

SITE	Y1
TICKET #	1189601
CELL	
WEIGHMASTER	IN - Sheryl H. OUT - Robert S.
DATE/TIME IN	1/6/17 10:13 am
DATE/TIME OUT	1/6/17 10:39 am
VEHICLE	MCCUTCHEON
CONTAINER	
REFERENCE	7
BILL OF LADING	35849

ISTOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SCALE IN	GROSS WEIGHT	62,460	NET TONS	16.60	INBOUND
SCALE OUT	TARE WEIGHT	29,260	NET WEIGHT	33,200	INVOICE

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
16.60	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TOTAL
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE 729

tS-F042UPR (07/12)

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

MEI McCutcheon Enterprises, Inc. Complete Waste Management

D7

00149997

Non-hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	JWC 0208975

3. Generator's Name and Mailing Address: Redline Oil 2574, 222 Buffalo Street, Freeport, PA 15229

A. 35849

4. Generator's Phone (412) 384-2200

B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises Inc — 6. US EPA ID Number: PAD013826847

C. State Trans. ID

7. Transporter 2 Company Name — 8. US EPA ID Number

D. Transporter's Phone ( )

E. State Trans. ID

9. Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436 — 10. US EPA ID Number: OHD987048212

F. Transporter's Phone ( )

G. State Facility's ID 330 536-8013

H. Facility's Phone ( )

	HM	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.		Virgin petroleum fuel contaminated soil/debris	001	DT	21	Y	508
b.							
c.							
d.							

J. Additional Descriptions for Materials Listed Above
a. 5076 17 0115
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a. b. c. d.

15. Special Handling Instructions and Additional Information

Quantity Estimated

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law

Printed/Typed Name	Signature	Month Day Year
x William Delwater	x [signature]	10 06 17

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Joel Stanga	[signature]	10 06 17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year
[illegible]	[signature]	[illegible] 17

GENERATOR / TRANSPORTER / FACILITY

GENERATOR COPY — SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

TE	
	CARBON LIMESTONE LANDFILL 330-536-8013 8100 S. Stateline Rd -Lowellville, OH 44436
JSTOMER	000906 MCCUTCHEON ENTERPRISES INC. 250 PARK ROAD APOLLO, PA 15613 Contract:5076170115 Generator:Radhe Oil 03-29674

SITE	TICKET #	CELL
Y1	1189687	

WEIGHMASTER	Robert S.
DATE/TIME IN	1/6/17 2:10 pm
DATE/TIME OUT	1/6/17 2:36 pm
VEHICLE	MCCUTCHEON
CONTAINER	
REFERENCE	7
BILL OF LADING	35861

SCALE IN GROSS WEIGHT 69,740 NET TONS 20.58
SCALE OUT TARE WEIGHT 28,580 NET WEIGHT 41,160

INBOUND
INVOICE

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
20.58	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE ________

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

Complete Waste Management

D7

Non-Hazardous Waste Manifest

1. Generator's US EPA ID No. | Manifest Document No. | 2. Page 1 of

3. Generator's Name and Mailing Address: 222 Buffalo Street, Freeport, PA 16229

4. Generator's Phone ( ) 412 364-2200

5. Transporter 1 Company Name: McCutcheon Enterprises Inc

6. US EPA ID Number: PAD013826847

7. Transporter 2 Company Name

8. US EPA ID Number

9. Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436

10. US EPA ID Number: OHD980679512

B. State Generator's ID

C. State Trans. ID

D. Transporter's Phone ( )

E. State Trans. ID

F. Transporter's Phone ( )

G. State Facility's ID 330 536-8013

H. Facility's Phone ( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L. Waste No.
a. Virgin petroleum fuel contaminated soil/debris		001	DT	24	Y	500
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above

a. 5076 17 0115

b.

c.

d.

K. Handling Codes for Wastes Listed Above

a. b. c. d.

15. Special Handling Instructions and Additional Information

QUANTITY ESTIMATED

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name: X [illegible] | Signature: X [signature] | Month Day Year: 10 06 17

GENERATOR

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Joel Stanka | Signature: [signature] | Month Day Year: 10 06 17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month Day Year

TRANSPORTER

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: [illegible] | Signature: [signature] | Month Day Year: 10 06 17

FACILITY

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

TE
CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

SITE	TICKET #	CELL
Y1	1189892	

WEIGHMASTER IN - Sheryl H. OUT - Robert S.

DATE/TIME IN 1/9/17 10:02 am
DATE/TIME OUT 1/9/17 10:29 am
VEHICLE MCCUTCHEON
CONTAINER
REFERENCE 7
BILL OF LADING 35858

STOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SCALE IN	GROSS WEIGHT	65,280	NET TONS	18.07
SCALE OUT	TARE WEIGHT	29,140	NET WEIGHT	36,140

INBOUND
INVOICE

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
18.07	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

S-F042UPR (07/12)

SIGNATURE 779

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

D7

00150015

Non Hazardous Waste Manifest

Non Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1
			JWO02[illegible]

3. Generator's Names and Mailing Address [illegible]
222 Buffalo Street
Freeport, PA 16229

4. Generator's Phone (412) 384-2200

35855

B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises Inc

6. US EPA ID Number: PAD013[illegible]84[illegible]

C. State Trans. ID

D. Transporter's Phone ( )

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Trans. ID

F. Transporter's Phone ( )

9. Designated Facility Name and Site Address
Carbon Limestone Landfill
8100 S. Stateline Road
Lowellville, OH 44436

10. US EPA ID Number: OHD[illegible]

G. State Facility's ID 330 536-[illegible]

H. Facility's Phone ( )

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L Waste No.
a.	Virgin petroleum fuel contaminated soil/debris	001	D	21	Y	5 0 9
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
a. 5076 17 0015
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a. b. c. d.

15. Special Handling Instructions and Additional Information

Quantity Estimated

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name: X [illegible] | Signature: X [signature] | Month Day Year: 10 09 17

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Joel Stanga | Signature: [signature] | Month Day Year: 10 09 17

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19
Printed/Typed Name: [illegible] | Signature: [signature] | Month Day Year: [illegible]

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

TE

CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

SITE	TICKET #	CELL
Y1	1189999	

WEIGHMASTER Robert S.

DATE/TIME IN	DATE/TIME OUT
1/9/17 1:40 pm	1/9/17 2:12 pm

VEHICLE	CONTAINER
MCCUTCHEON	

REFERENCE 7

BILL OF LADING 35857

ISTOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SCALE IN GROSS WEIGHT 54,140 NET TONS 12.77
SCALE OUT TARE WEIGHT 28,600 NET WEIGHT 25,540

INBOUND
INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
12.77	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE 729

TENDERED
CHANGE
CHECK#

RS-F042UPR (07/12)

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

Complete Waste Management

00150015

D7

Non Hazardous Waste Manifest	1 Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	JWO02[illegible]

3. Generator's Name a[illegible]29574 222 Buffalo Street Freeport, PA 16229	35857
4. Generator's Phone ( ) 412 364-2200	B State Generator's ID
5 Transporter 1 Company Name: McCutcheon Enterprises Inc — 6 US EPA ID Number: PAD013826847	C State Trans. ID [illegible]
7 Transporter 2 Company Name — 8. US EPA ID Number	D. Transporter's Phone ( )
	E. State Trans ID
9 Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436 — 10 US EPA ID Number: OHD097048212	F Transporter's Phone ( )
	G. State Facility's ID 330 536-[illegible]
	H. Facility's Phone ( )

	11 US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12 Containers No.	Type	13 Total Quantity	14. Unit Wt/Vol	L Waste No.
a	Virgin petroleum fuel contaminated soil/debris	001	D	18	Y	5 0 6
b						
c						
d						

J Additional Descriptions for Materials Listed Above		K Handling Codes for Wastes Listed Above	
a 5076 17 0115	c	a.	c
b.	d.	b.	d.

15 Special Handling Instructions and Additional Information

QUANTITY ESTIMATED

16 GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month	Day	Year
X V[illegible]		10	09	17

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Joel Stonga		10	09	17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator Certification of receipt of non-hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Month	Day	Year
Roberta Schultz		10	09	17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

ATTACHMENT C

LABORATORY ANALYTICAL RESULTS AND CHAIN OF CUSTODY FORMS

Pace Analytical
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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

January 05, 2017

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on December 22, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Mr. Andrew Frost, Letterle & Associates
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	Fueland #221(Radhe Oil)
Pace Project No.:	30206462

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

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Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30206462001	**D-1/2'**	Solid	12/21/16 12:30	12/22/16 16:15
30206462002	**D-2/2'**	Solid	12/21/16 12:00	12/22/16 16:15
30206462003	**LS-1/3'**	Solid	12/21/16 12:45	12/22/16 16:15
30206462004	**LS-2/3'**	Solid	12/21/16 12:11	12/22/16 16:15

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SAMPLE ANALYTE COUNT

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30206462001	**D-1/2'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA
30206462002	**D-2/2'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA
30206462003	**LS-1/3'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA
30206462004	**LS-2/3'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA

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ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: D-1/2' **Lab ID: 30206462001** Collected: 12/21/16 12:30 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	2650	722	500	12/28/16 12:00	12/28/16 21:50	71-43-2	1c
Ethylbenzene	**40200**	ug/kg	2650	536	500	12/28/16 12:00	12/28/16 21:50	100-41-4	1c
Isopropylbenzene (Cumene)	**6820**	ug/kg	2650	918	500	12/28/16 12:00	12/28/16 21:50	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	2650	1290	500	12/28/16 12:00	12/28/16 21:50	1634-04-4	1c
Naphthalene	**30200**	ug/kg	2650	515	500	12/28/16 12:00	12/28/16 21:50	91-20-3	1c
Toluene	**13600**	ug/kg	2650	828	500	12/28/16 12:00	12/28/16 21:50	108-88-3	1c
1,2,4-Trimethylbenzene	**180000**	ug/kg	26500	7590	5000	12/28/16 12:00	12/29/16 13:34	95-63-6	1c
1,3,5-Trimethylbenzene	**82400**	ug/kg	2650	892	500	12/28/16 12:00	12/28/16 21:50	108-67-8	1c
Xylene (Total)	**352000**	ug/kg	7960	1510	500	12/28/16 12:00	12/28/16 21:50	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	68-135		500	12/28/16 12:00	12/28/16 21:50	2037-26-5	
4-Bromofluorobenzene (S)	101	%	65-146		500	12/28/16 12:00	12/28/16 21:50	460-00-4	
1,2-Dichloroethane-d4 (S)	93	%	69-137		500	12/28/16 12:00	12/28/16 21:50	17060-07-0	
Dibromofluoromethane (S)	97	%	70-130		500	12/28/16 12:00	12/28/16 21:50	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.4**	%	0.10	0.10	1		01/04/17 12:14		

REPORT OF LABORATORY ANALYSIS

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: D-2/2' **Lab ID: 30206462002** Collected: 12/21/16 12:00 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	258	70.3	50	12/28/16 12:00	12/28/16 22:15	71-43-2	1c
Ethylbenzene	**19700**	ug/kg	258	52.2	50	12/28/16 12:00	12/28/16 22:15	100-41-4	1c
Isopropylbenzene (Cumene)	**4190**	ug/kg	258	89.4	50	12/28/16 12:00	12/28/16 22:15	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	258	126	50	12/28/16 12:00	12/28/16 22:15	1634-04-4	1c
Naphthalene	**8770**	ug/kg	258	50.1	50	12/28/16 12:00	12/28/16 22:15	91-20-3	1c
Toluene	**19200**	ug/kg	258	80.6	50	12/28/16 12:00	12/28/16 22:15	108-88-3	1c
1,2,4-Trimethylbenzene	**72300**	ug/kg	2580	739	500	12/28/16 12:00	12/29/16 14:00	95-63-6	1c
1,3,5-Trimethylbenzene	**23600**	ug/kg	2580	869	500	12/28/16 12:00	12/29/16 14:00	108-67-8	1c
Xylene (Total)	**124000**	ug/kg	7750	1470	500	12/28/16 12:00	12/29/16 14:00	1330-20-7	
Surrogates									
Toluene-d8 (S)	103	%	68-135		50	12/28/16 12:00	12/28/16 22:15	2037-26-5	
4-Bromofluorobenzene (S)	102	%	65-146		50	12/28/16 12:00	12/28/16 22:15	460-00-4	
1,2-Dichloroethane-d4 (S)	97	%	69-137		50	12/28/16 12:00	12/28/16 22:15	17060-07-0	
Dibromofluoromethane (S)	90	%	70-130		50	12/28/16 12:00	12/28/16 22:15	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**19.9**	%	0.10	0.10	1		01/04/17 12:14		

REPORT OF LABORATORY ANALYSIS

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1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: LS-1/3' **Lab ID: 30206462003** Collected: 12/21/16 12:45 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	**2230**	ug/kg	261	71.1	50	12/28/16 12:00	12/28/16 22:41	71-43-2	1c
Ethylbenzene	**8220**	ug/kg	261	52.8	50	12/28/16 12:00	12/28/16 22:41	100-41-4	1c
Isopropylbenzene (Cumene)	**1930**	ug/kg	261	90.4	50	12/28/16 12:00	12/28/16 22:41	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	261	127	50	12/28/16 12:00	12/28/16 22:41	1634-04-4	1c
Naphthalene	**3990**	ug/kg	261	50.7	50	12/28/16 12:00	12/28/16 22:41	91-20-3	1c
Toluene	**716**	ug/kg	261	81.6	50	12/28/16 12:00	12/28/16 22:41	108-88-3	1c
1,2,4-Trimethylbenzene	**785**	ug/kg	261	74.8	50	12/28/16 12:00	12/28/16 22:41	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	261	87.8	50	12/28/16 12:00	12/28/16 22:41	108-67-8	1c
Xylene (Total)	**4040**	ug/kg	784	148	50	12/28/16 12:00	12/28/16 22:41	1330-20-7	
Surrogates									
Toluene-d8 (S)	102	%	68-135		50	12/28/16 12:00	12/28/16 22:41	2037-26-5	
4-Bromofluorobenzene (S)	100	%	65-146		50	12/28/16 12:00	12/28/16 22:41	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	69-137		50	12/28/16 12:00	12/28/16 22:41	17060-07-0	
Dibromofluoromethane (S)	88	%	70-130		50	12/28/16 12:00	12/28/16 22:41	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.4**	%	0.10	0.10	1		01/04/17 12:14		

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ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: LS-2/3' **Lab ID: 30206462004** Collected: 12/21/16 12:11 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.0	1.3	1	12/28/16 12:00	12/28/16 21:24	71-43-2	1c
Ethylbenzene	ND	ug/kg	5.0	1.0	1	12/28/16 12:00	12/28/16 21:24	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.0	1.7	1	12/28/16 12:00	12/28/16 21:24	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.0	2.4	1	12/28/16 12:00	12/28/16 21:24	1634-04-4	1c
Naphthalene	ND	ug/kg	5.0	0.96	1	12/28/16 12:00	12/28/16 21:24	91-20-3	1c
Toluene	ND	ug/kg	5.0	1.5	1	12/28/16 12:00	12/28/16 21:24	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	5.0	1.4	1	12/28/16 12:00	12/28/16 21:24	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	5.0	1.7	1	12/28/16 12:00	12/28/16 21:24	108-67-8	1c
Xylene (Total)	ND	ug/kg	14.9	2.8	1	12/28/16 12:00	12/28/16 21:24	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	68-135		1	12/28/16 12:00	12/28/16 21:24	2037-26-5	
4-Bromofluorobenzene (S)	100	%	65-146		1	12/28/16 12:00	12/28/16 21:24	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	69-137		1	12/28/16 12:00	12/28/16 21:24	17060-07-0	
Dibromofluoromethane (S)	99	%	70-130		1	12/28/16 12:00	12/28/16 21:24	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.4**	%	0.10	0.10	1		01/04/17 12:14		

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

QC Batch: 244877 — Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A — Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30206462001, 30206462002, 30206462003

METHOD BLANK: 1205353 — Matrix: Solid
Associated Lab Samples: 30206462001, 30206462002, 30206462003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	250	71.5	12/28/16 12:43	
1,3,5-Trimethylbenzene	ug/kg	ND	250	84.0	12/28/16 12:43	
Benzene	ug/kg	ND	250	68.0	12/28/16 12:43	
Ethylbenzene	ug/kg	ND	250	50.5	12/28/16 12:43	
Isopropylbenzene (Cumene)	ug/kg	ND	250	86.5	12/28/16 12:43	
Methyl-tert-butyl ether	ug/kg	ND	250	122	12/28/16 12:43	
Naphthalene	ug/kg	ND	250	48.5	12/28/16 12:43	
Toluene	ug/kg	ND	250	78.0	12/28/16 12:43	
Xylene (Total)	ug/kg	ND	750	142	12/28/16 12:43	
1,2-Dichloroethane-d4 (S)	%	93	69-137		12/28/16 12:43	
4-Bromofluorobenzene (S)	%	101	65-146		12/28/16 12:43	
Dibromofluoromethane (S)	%	93	70-130		12/28/16 12:43	
Toluene-d8 (S)	%	99	68-135		12/28/16 12:43	

LABORATORY CONTROL SAMPLE: 1205354

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.3	102	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.7	99	74-129	
Benzene	ug/kg	20	18.9	95	71-137	
Ethylbenzene	ug/kg	20	19.3	96	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.5	97	78-133	
Methyl-tert-butyl ether	ug/kg	20	20.0	100	77-141	
Naphthalene	ug/kg	20	19.9	100	81-126	
Toluene	ug/kg	20	18.8	94	72-127	
Xylene (Total)	ug/kg	60	58.0	97	80-124	
1,2-Dichloroethane-d4 (S)	%			93	69-137	
4-Bromofluorobenzene (S)	%			102	65-146	
Dibromofluoromethane (S)	%			97	70-130	
Toluene-d8 (S)	%			100	68-135	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

QC Batch: 244878 | Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A | Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30206462004

METHOD BLANK: 1205355 | Matrix: Solid
Associated Lab Samples: 30206462004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.4	12/28/16 13:08	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.7	12/28/16 13:08	
Benzene	ug/kg	ND	5.0	1.4	12/28/16 13:08	
Ethylbenzene	ug/kg	ND	5.0	1.0	12/28/16 13:08	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.7	12/28/16 13:08	
Methyl-tert-butyl ether	ug/kg	ND	5.0	2.4	12/28/16 13:08	
Naphthalene	ug/kg	ND	5.0	0.97	12/28/16 13:08	
Toluene	ug/kg	ND	5.0	1.6	12/28/16 13:08	
Xylene (Total)	ug/kg	ND	15.0	2.8	12/28/16 13:08	
1,2-Dichloroethane-d4 (S)	%	97	69-137		12/28/16 13:08	
4-Bromofluorobenzene (S)	%	99	65-146		12/28/16 13:08	
Dibromofluoromethane (S)	%	97	70-130		12/28/16 13:08	
Toluene-d8 (S)	%	99	68-135		12/28/16 13:08	

LABORATORY CONTROL SAMPLE: 1205356

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.3	102	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.7	99	74-129	
Benzene	ug/kg	20	18.9	95	71-137	
Ethylbenzene	ug/kg	20	19.3	96	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.5	97	78-133	
Methyl-tert-butyl ether	ug/kg	20	20.0	100	77-141	
Naphthalene	ug/kg	20	19.9	100	81-126	
Toluene	ug/kg	20	18.8	94	72-127	
Xylene (Total)	ug/kg	60	58.0	97	80-124	
1,2-Dichloroethane-d4 (S)	%			93	69-137	
4-Bromofluorobenzene (S)	%			102	65-146	
Dibromofluoromethane (S)	%			97	70-130	
Toluene-d8 (S)	%			100	68-135	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

QC Batch: 245488   Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87   Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 30206462001, 30206462002, 30206462003, 30206462004

SAMPLE DUPLICATE: 1207819

Parameter	Units	30206462001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	20.4	21.0	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project:	Fueland #221(Radhe Oil)
Pace Project No.:	30206462

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 244877

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 244878

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

1c A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30206462001	D-1/2'	EPA 5035A	244877	EPA 8260B	244939
30206462002	D-2/2'	EPA 5035A	244877	EPA 8260B	244939
30206462003	LS-1/3'	EPA 5035A	244877	EPA 8260B	244939
30206462004	LS-2/3'	EPA 5035A	244878	EPA 8260B	244940
30206462001	D-1/2'	ASTM D2974-87	245488		
30206462002	D-2/2'	ASTM D2974-87	245488		
30206462003	LS-1/3'	ASTM D2974-87	245488		
30206462004	LS-2/3'	ASTM D2974-87	245488		

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CHA WO#:30206462 ...ocument
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30206462

Page: 1 of 1

2094174

Section A
Required Client Information:

Company:	Letterle Associates
Address:	2859 Oxford Blvd Allison Park, PA 15101
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	Standard

Section B
Required Project Information:

Report To:	
Copy To:	
Purchase Order No.:	
Project Name:	Fueland #221 (Radhe Oil)
Project Number:	597

Section C

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Rachel Christner
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☒ UST ☐ RCRA ☐ OTHER

Site Location STATE: PA

Section D
Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	Composite Start DATE	Composite Start TIME	Composite End/Grab DATE	Composite End/Grab TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BTEX	MTBE	Cumene	naphthalene	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	D-1/2'	SL	G			12/21	12:30		4	X					X	X			X	X	X	X	X	X		001
2	D-2/2'	SL	G			↓	12:00		4	X					X	X			X	X	X	X	X	X		002
3	LS-1/3'	SL	G			↓	12:45		4	X					X	X			X	X	X	X	X	X		003
4	LS-2/3'	SL	G			↓	12:11		4	X					X	X			X	X	X	X	X	X		004
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	[signature]	12/22	2:15	[signature] Pace	12-22-16	2:45				
	[signature] Pace	12-22-16	4:45	Alynuk Muchorey Pace	12/22/16	1615	4.3	Y	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Eric Itle

SIGNATURE of SAMPLER: [signature]

DATE Signed (MM/DD/YY):

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: Lettere **Project #** 30206462

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☑ Pace Other ______

Tracking #: ______

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Thermometer Used 6 **Type of Ice:** Wet Blue None

Cooler Temperature **Observed Temp** 4.1 °C Correction Factor +0.2 °C Final Temp: 4.3 °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: ARM 12/22/16

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:	✓			4.
Sample Labels match COC:	✓			5.
-Includes date/time/ID/Analysis Matrix: * SL ARM 12/22/16				
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9.
Correct Containers Used:	✓			10.
-Pace Containers Used:	✓			
Containers Intact:	✓			11.
Filtered volume received for Dissolved tests			✓	12.
All containers needing preservation have been checked.			✓	13.
All containers needing preservation are found to be in compliance with EPA recommendation.			✓	
exceptions: VOA, coliform, TOC, O&G, Phenolics				Initial when completed ARM / Date/time of preservation
				Lot # of added preservative
Headspace in VOA Vials (>6mm):			✓	14.
Trip Blank Present:			✓	15.
Trip Blank Custody Seals Present			✓	
Rad Aqueous Samples Screened > 0.5 mrem/hr			✓	Initial when completed: ARM / Date:

Client Notification/ Resolution:

Person Contacted: ______ Date/Time: ______ Contacted By: ______

Comments/ Resolution: ______

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

Letterle & Associates
2859 Oxford Blvd Allison Park, PA 15101
412.486.0600 www.letterleassociates.com

January 4, 2017

Patrick LaSitis
Water Quality Specialist Supervisor
PADEP Environmental Cleanup Program
Southwest Region
400 Waterfront Drive
Pittsburgh, PA 15222

Re: 15-Day Notification of Reportable Release
Facility ID #03-29674
Radhe Oil
222 Buffalo Street
Freeport, PA 16229

Dear Mr. LaSitis,

Enclosed please find a 15-day notification of a reportable release at the Superior Petroleum Company site located at the above referenced location in accordance with the Pennsylvania Department of Environmental Protection Storage Tank and Spill Prevention Act and Regulations (25 Pa. Code Chapter 245.305(d).

The reportable release was confirmed on December 21, 2016 during partial underground storage tank closure activities. Petroleum-impacted soil was observed beneath each dispenser, possibly due to heavily corroded product piping connectors located beneath each dispenser. Letterle & Associates, Inc., on behalf of Superior, will be investigating the release per respective State regulations. If you have any questions, please contact me at 412.486.0600 ext. 302.

Sincerely,

LETTERLE & ASSOCIATES, INC.

Eric Itle

Eric Itle, P.G.
Project Manager

cc: Freeport Borough
Nila Manning – Superior – electronic
J.R. Bachor – S.I.S., Incorporated – electronic

NOTIFICATION OF REPORTABLE RELEASE *(Owners and Operators)*

☒ Initial
☐ Follow-Up

NOTIFICATION OF CONTAMINATION *(Certified Installers and Inspectors)*

NOTIFICATION OF REPORTABLE RELEASE *(Owners and Operators)*

The Storage Tank Program's Corrective Action Process (CAP) regulations establish release reporting requirements for owners and operators of storage tanks and storage tank facilities.

Subsection 245.305(a) of the regulations requires owners or operators to notify the appropriate regional office of the Department as soon as practicable, but no later than 24 hours, after the confirmation of a reportable release.

Subsection 245.305(d) requires owners or operators to provide an initial written notification to the Department, each municipality in which the reportable release occurred, and each municipality where that release has impacted environmental media or water supplies, buildings, or sewer or other utility lines, within 15 days of the notice required by Subsection 245.305(a).

Subsection 245.305(e) requires owners or operators to provide follow-up written notification to the Department and to each impacted municipality of new impacts to environmental media or water supplies, buildings, or sewer or other utility lines discovered after the initial written notification required by subsection 245.305(d). Written notification is to be made within 15 days of the discovery of the new impact.

This form may be used to comply with Subsection 245.305(d) and (e).

OWNERS AND OPERATORS (O/O)
INDICATE IF THIS IS AN INITIAL OR FOLLOW-UP NOTIFICATION BY MARKING THE APPROPRIATE BOX FOUND IN THE TOP RIGHT-HAND CORNER OF THIS FORM. PLEASE COMPLETE ALL INFORMATION IN SECTIONS I, II, IIIA, IIIB, IV, V, VII and VIII.

NOTIFICATION OF CONTAMINATION
(Certified Installers and Inspectors)

The Storage Tank Program's Certification regulations establish standards of performance for certified installers and inspectors of storage tanks and storage tank facilities.

Subsection 245.132(a)(4) of the regulations requires certified installers and inspectors to report to the Department a release of a regulated substance or confirmed or suspected contamination of soil, surface or groundwater from regulated substances observed while performing services as a certified installer or inspector.

This form may be used to comply with Subsection 245.132(a)(4). Subsection 245.132(a)(4) requires submission of the form within 48 hours of observing suspected or confirmed contamination. Where there is a reportable release, the form may be submitted jointly by the owner, operator, certified installer and certified inspector. In this instance, the form must be received by the appropriate regional office within 15 days of the notice required by Subsection 245.305(a).

CERTIFIED INSTALLERS AND INSPECTORS (I/I)
PLEASE COMPLETE ALL INFORMATION IN SECTIONS I, II, IIIA, IIIC, VI, VII and VIII.

INSTRUCTIONS

I. **FACILITY INFORMATION -** Record the name, I.D. number and physical location (not P.O. Box) of the facility at which a reportable release has been confirmed or at which suspected or confirmed contamination has been observed. Include the name and phone number of a person to contact at the facility.

II. **OWNER/OPERATOR INFORMATION -** Record the name, business address and phone number of the owner of the facility identified in Section I. Also, record the name and phone number of the operator of the facility.

III. **REGULATED SUBSTANCE INFORMATION -** Indicate to the best of your knowledge: A) the type of product or products involved; B) the quantity of product or products released; and C) whether the contamination is suspected or confirmed.

IV. **REPORTABLE RELEASE INFORMATION -** Record the date of confirmation of the reportable release, e.g., "9/18/01"; the date and regional office notified; and the date the local municipality(ies) [provide name of municipality(ies)] was/were sent a copy of this form. Indicate to the best of your knowledge the source/cause of the release, how the release was discovered and the environmental media affected and impacts.

V. **INTERIM REMEDIALACTIONS -** Indicate the interim remedial actions planned, initiated or completed.

VI. **SUSPECTED/CONFIRMED CONTAMINATION INFORMATION -** Record the date of observation of the suspected or confirmed contamination, e.g., "11/24/01". Indicate to the best of your knowledge the indications of a suspected release or extent of confirmed contamination resulting from the release of the regulated substance.

VII. **ADDITIONAL INFORMATION -** Provide any additional, relevant, available information concerning the reportable release or suspected or confirmed contamination. Include in this section specific details or problems about the release. For example, if the piping was the source of the release and the cause was corrosion of a metal connector or flexible connector, it is important to include that information here. Use additional 8½" x 11" sheets of paper, if necessary.

VIII. **CERTIFICATION -** Please print your name, and provide your signature and date of signature. If a certified installer/inspector, provide certification number and company certification number.

IX. **ATTACHMENT -** If a certified installer/inspector, provide a copy of failed valid tightness test(s), if applicable.

PLEASE SEND COMPLETED ORIGINAL FORM TO:

PA Department of Environmental Protection
Environmental Cleanup Program
Storage Tank Section
(and the appropriate address below,
depending on where the FACILITY is located)

Southeast Region	Northeast Region	Southcentral Region	Northcentral Region	Southwest Region	Northwest Region
2 East Main Street Norristown, PA 19401 PHONE: 484-250-5900 FAX: 484-250-5961	2 Public Square Wilkes-Barre, PA 18711-0790 PHONE: 570-826-2511 FAX: 570-820-4907	909 Elmerton Avenue Harrisburg, PA 17110 PHONE: 877-333-1904 FAX: 717-705-4830	208 W. Third Street, Suite 101 Williamsport, PA 17701 PHONE: 570-321-6525/327-3696 FAX: 570-327-3420	400 Waterfront Drive Pittsburgh, PA 15222 PHONE: 412-442-4091/4000 FAX: 412-442-4328	230 Chestnut Street Meadville, PA 16335-3481 PHONE: 814-332-6945 800-373-3398 FAX: 814-332-6121
Counties Bucks, Chester, Delaware, Montgomery, Philadelphia	**Counties** Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne, Wyoming	**Counties** Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry, York	**Counties** Bradford, Cameron, Centre, Clinton, Clearfield, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga, Union	**Counties** Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington, Westmoreland	**Counties** Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren

I. FACILITY INFORMATION (Both O/O and I/I)

Facility Name: Radhe Oil
Facility I.D. Number: 03-29674
Street Address (P.O. Box not acceptable): 222 Buffalo Street
City: Freeport State: PA Zip Code: 16229 - 1330
County: Armstrong Municipality: Freeport
Contact Person: Nila Manning Phone Number: (412) 364 - 2200

II. OWNER/OPERATOR INFORMATION (Both O/O and I/I)

Owner Name: Superior Petroleum Company
Address: 8199
City: McKnight Road State: PA Zip Code: 15237 -
Phone Number: (412) 364 - 2200
Operator Name: Phone Number: ( ) -

III. REGULATED SUBSTANCE INFORMATION

A. Type of Product(s) Involved (Mark All That Apply ☒): Both O/O and I/I		B. Quantity (Gallons) of Product(s) Released: O/O Only	C. Contamination Suspected [S] or Confirmed [C] (Mark All That Apply ☒): I/I Only [S]	[C]
Leaded Gasoline	☐	__ __, __ __ __, __ __ __	☐	☐
Unleaded Gasoline	☒	u n, k n o, w n	☐	☒
Aviation Gasoline	☐	__ __, __ __ __, __ __ __	☐	☐
Kerosene	☐	__ __, __ __ __, __ __ __	☐	☐
Jet Fuel	☐	__ __, __ __ __, __ __ __	☐	☐
Diesel Fuel	☐	__ __, __ __ __, __ __ __	☐	☐
New Motor Oil	☐	__ __, __ __ __, __ __ __	☐	☐
Used Motor Oil	☐	__ __, __ __ __, __ __ __	☐	☐
Fuel Oil No. 1	☐	__ __, __ __ __, __ __ __	☐	☐
Fuel Oil No. 2	☐	__ __, __ __ __, __ __ __	☐	☐
Fuel Oil No. 4	☐	__ __, __ __ __, __ __ __	☐	☐
Fuel Oil No. 5	☐	__ __, __ __ __, __ __ __	☐	☐
Fuel Oil No. 6	☐	__ __, __ __ __, __ __ __	☐	☐
Other (Specify) ______	☐	__ __, __ __ __, __ __ __	☐	☐
Unknown	☐	__ __, __ __ __, __ __ __	☐	☐

IV. REPORTABLE RELEASE INFORMATION (O/O Only)

Date Reportable Release was Confirmed: 12 / 21 / 2016 (m / d / y)

Date Owner/Operator Verbally Notified Appropriate Regional Office of Reportable Release and Office Notified:
Date: 12 / 21 / 2016 (m / d / y) Office: Southwest Region

Date Owner/Operator Sent Copy of this Written Notification to Local Municipality(ies) and Name of Municipality(ies) Notified:
Date: 1 / 3 / 2017 (m / d / y) Municipality: Freeport
Date: ___ / ___ / ___ (m / d / y) Municipality: ______

Source (Mark All That Apply ☒):

- Tank (DEP Assigned Nos. ________) ☐
- Piping System (Aboveground Regulated) ☐
- Piping System (Underground Regulated) ☒
- Piping System (Non-Regulated) ☐
- Dispenser/Dispensing Equipment ☐
- Spill Catchment Basin ☐
- Accident/Natural Disaster ☐
- Submersible Turbine Pump Head/Fittings ☐
- Containment/Sump Failure ☐
- Other (Specify) ______ ☐
- Unknown ☐

Cause (Mark All That Apply ☒):

- Faulty Installation ☐
- Corrosion ☒
- Physical/Mechanical Failure ☐
- Spill During Delivery ☐
- Overfill at Delivery ☐
- Vehicle Gas Tank Overfill ☐
- Product Delivery Hose Rupture ☐
- Other (Specify) ______ ☐
- Unknown ☐

How Discovered (Mark All That Apply ☒):

- During Closure ☒
- Lining Installation ☐
- Routine Leak Detection ☐
- Third Party Inspection ☐
- Tightness Testing Activities ☐
- Visible Product or Odor Reports ☐
- Water in Tank ☐
- Construction ☐
- Upgrade/Repair ☐
- Supply Well Sample Results ☐
- Monitoring Well Sample Results ☐
- Property Transfer ☐
- Other (Specify) ______ ☐
- Unknown ☐

Environmental Media Affected and Impacts (Mark All That Apply ☒):

- Soil ☒
- Sediment ☐
- Surface Water ☐
- Ground Water ☐
- Bedrock ☐
- Water Supplies ☐
- Vapors/Product in Buildings ☐
- Vapors/Product in Sewer/Utility Lines ☐
- Ecological Receptors ☐

V. INTERIM REMEDIAL ACTIONS (O/O Only)

(Mark All That Apply ☒):

	Planned	Initiated	Completed	Not Applicable
Regulated Substance Removed from Storage Tanks	☐	☐	☐	☒
Fire, Explosion and Safety Hazards Mitigated	☐	☐	☒	☐
Contaminated Soil Excavated	☐	☒	☐	☐
Free Product Recovered	☐	☐	☐	☒
Water Supplies Identified and Sampled	☐	☐	☐	☒
Temporary Water Supplies Provided	☐	☐	☐	☒
Other (Specify) ______	☐	☐	☐	☐

VI. SUSPECTED / CONFIRMED CONTAMINATION INFORMATION (I/I Only)

Date of Observation of Suspected/Confirmed Contamination: 12 / 21 / 2016 (m / d / y)

Indication of Suspected Contamination (Mark All That Apply ☒):

- Unusual Level of Vapors ☐
- Erratic Behavior of Product Dispensing Equipment ☐
- Release Detection Results Indicate a Release ☐
- Discovery of Holes in the Storage Tank ☐
- Other (Specify) ______ ☐

Extent of Confirmed Contamination (Mark All That Apply ☒):

- Product Stained or Product Saturated Soil or Backfill ☒
- Ponded Product ☐
- Free Product or Sheen on Ponded Water ☐
- Free Product or Sheen on the Ground Water Surface ☐
- Free Product or Sheen on Surface Water ☐
- Other (Specify) ______ ☐

VII. ADDITIONAL INFORMATION (Both O/O and I/I)

Provide any additional, relevant, available information concerning the reportable release or suspected or confirmed contamination. Include specific details or problems about the release. For example, if the piping was the source of the release and the cause was corrosion of a metal connector or flexible connector, it is important to include that information here. Provide DEP assigned and owner/operator assigned tank number(s), where applicable. Use additional 8½" x 11" sheets of paper, if necessary.

During partial UST closure activities on December 21, 2016, petroleum-impacted soil was observed beneath each dispenser. A possible source of petroleum-impacted soil was heavily corroded product piping connectors located beneath each dispenser. Sumps were not present.

VIII. CERTIFICATION (Both O/O and I/I)

I, Nila Manning, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the owner or operator of the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Owner or Operator — Date: 01/03/2017

I, William E. DiDonato, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the certified installer who performed tank handling activities at the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Certified Installer — Date: 01/03/2017

Installer Certification Number: 1665 — Company Certification Number: 54

I, ______, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the certified inspector who performed inspection activities at the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Certified Inspector — Date: / /

Inspector Certification Number — Company Certification Number

APPENDIX F

PaGWIS Information

PaGWIS Map Search

You must be zoomed to the level where municipality names appear to search.

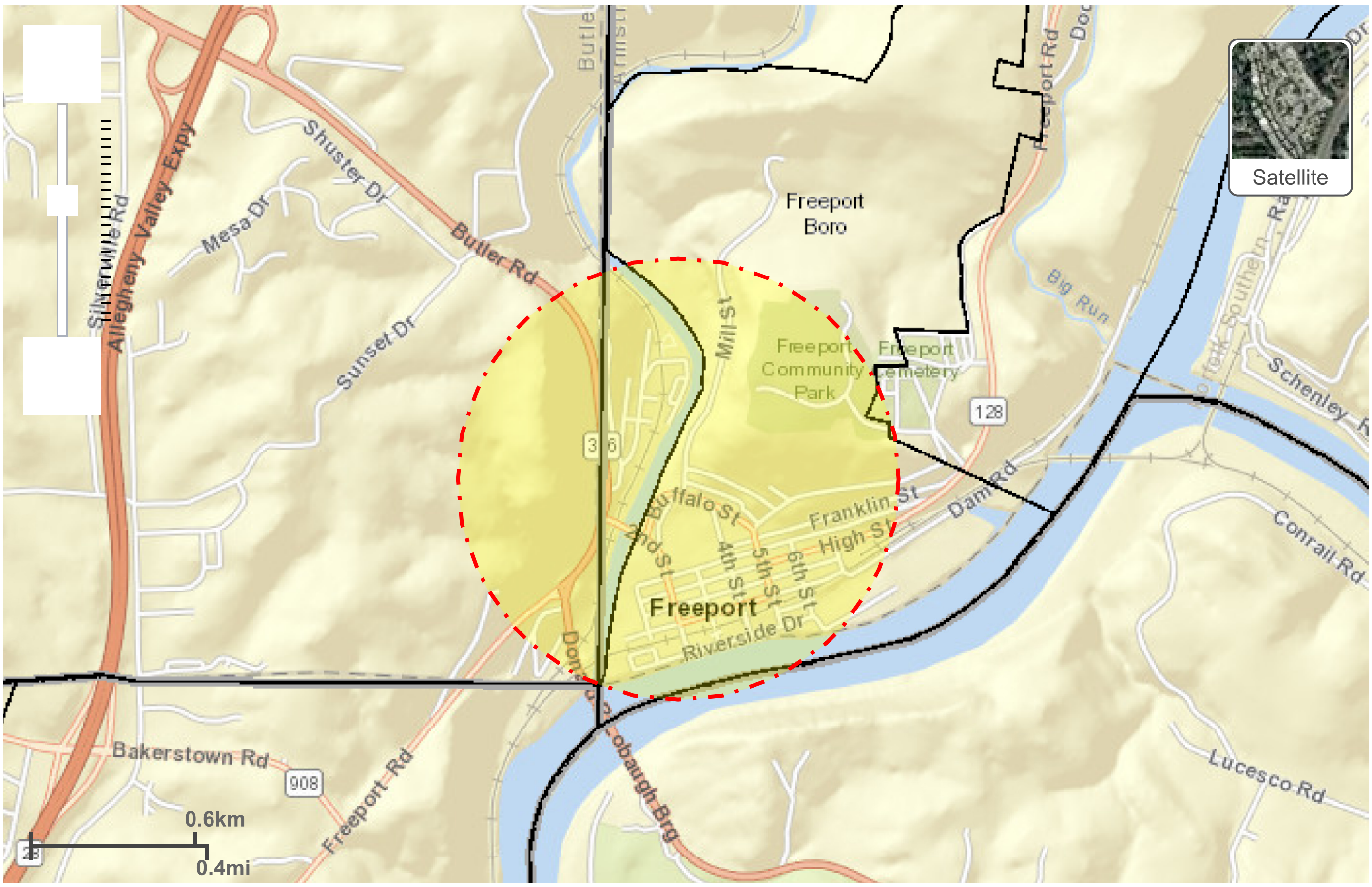
Multiple Criteria   Map

Wells   Springs

Data Packages: General Info   Site Info   Well Construction   Hydrogeologic   Geologic

222 Buffalo Street Freeport Borou   Go   40   -79   Jump to Point

40.686, -79.661   Include unlocated wells within intersected municipalities   Explain



Download Data Package   Clear Selections   Contact Us

'Download Data Package' creates a data package-specific CSV file that you may open or download. If you choose to open the file, it may open in Excel (if you have Microsoft Office installed). Because of the relational nature of the database, there may be more than 1 line per well in the downloaded data. For data on public water supply wells, or water quality data, please see instructions.

Instructions

Total Records To Download : 9 Records

View Items Below

'View Items Below' creates a general list (not data package-specific) that contains links to individual well information. It is based on the search criteria entered. Not all of the records displayed below will necessarily have data

corresponding to the data package you have selected.

For correct record counts after changing any search criteria or data package, you must click again on the "View Items Below" button.

Total Records Returned : 9 Records **Click on the column headers to sort the Search Results.**

PA Well ID	Driller	Driller Ref	Date Drilled	Owner	County	Municipality	Image
477066	B. L. MYERS BROS OF MD,LLC	\`MW\` - 7	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477067	B. L. MYERS BROS OF MD,LLC	\`MW\` - 8	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477671	B. L. MYERS BROS OF MD,LLC	\`MW\` - 5	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477669	B. L. MYERS BROS OF MD,LLC	OW\` - 3	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477064	B. L. MYERS BROS OF MD,LLC	\`MW\` - 6	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477670	B. L. MYERS BROS OF MD,LLC	OW\` - 4	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477062	B. L. MYERS BROS OF MD,LLC	OW\` - 1	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
477063	B. L. MYERS BROS OF MD,LLC	OW\` - 2	3/16/2011	BP	ARMSTRONG	SOUTH BUFFALO TWP.	
1531	UNKNOWN			KERR COAL CO	ARMSTRONG	SOUTH BUFFALO TWP.	

DEPARTMENT OF CONSERVATION & NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
WATER WELL PROGRAM
3240 Schoolhouse Rd
Middletown, PA 17057
717-702-2017

WATER WELL INFORMATION REPORT

PA Well ID: **1531** Local Well ID: **AR 70** Local Permit #:

LOCATION INFORMATION

Owner:	**KERR COAL CO**	Original Paper Record Image Available:	**No**
Address of Well:			
County:	**ARMSTRONG**		
Municipality:	**SOUTH BUFFALO TWP.**		
Latitude:	**40.67778**	Coordinate Method:	
Longitude:	**-79.69167**	Data Reliability:	**FIELD CHECKED BY REPORTING AGENCY (PaDAg pest. survey)**
Description of Well Location and Other Notes:	**100 REPORTED WATER LEVEL, NO DATE**		

WELL CONSTRUCTION INFORMATION

Well Driller:	**UNKNOWN**	License:	**1**	Driller Well ID:	
Type of Activity:		Date Drilled:		Drilling Method:	**CABLE TOOL**
Well Depth (ft):	**232**	Well Finish:	**UNKNOWN**		

WELL SIZE

Top (ft)	Bottom (ft)	Diameter (in)
0	**232**	**0**

CASING

Top (ft)	Bottom (ft)	Diameter (in)	Casing Material	Seal Top	Seal Bottom	Seal Type
0		**6**	**UNKNOWN**			

GROUNDWATER AND GEOLOGICAL INFORMATION

Well Yield (GPM - gal per min):		Yield Measurement Method:	
Water Level when not pumped: (ft below land surface)	**100**	Water Level after yield test: (ft below land surface)	
Length of Yield Test (minutes):		Saltwater Zone (ft):	
Use of Well:	**WITHDRAWAL**	Use of Water:	**DOMESTIC**

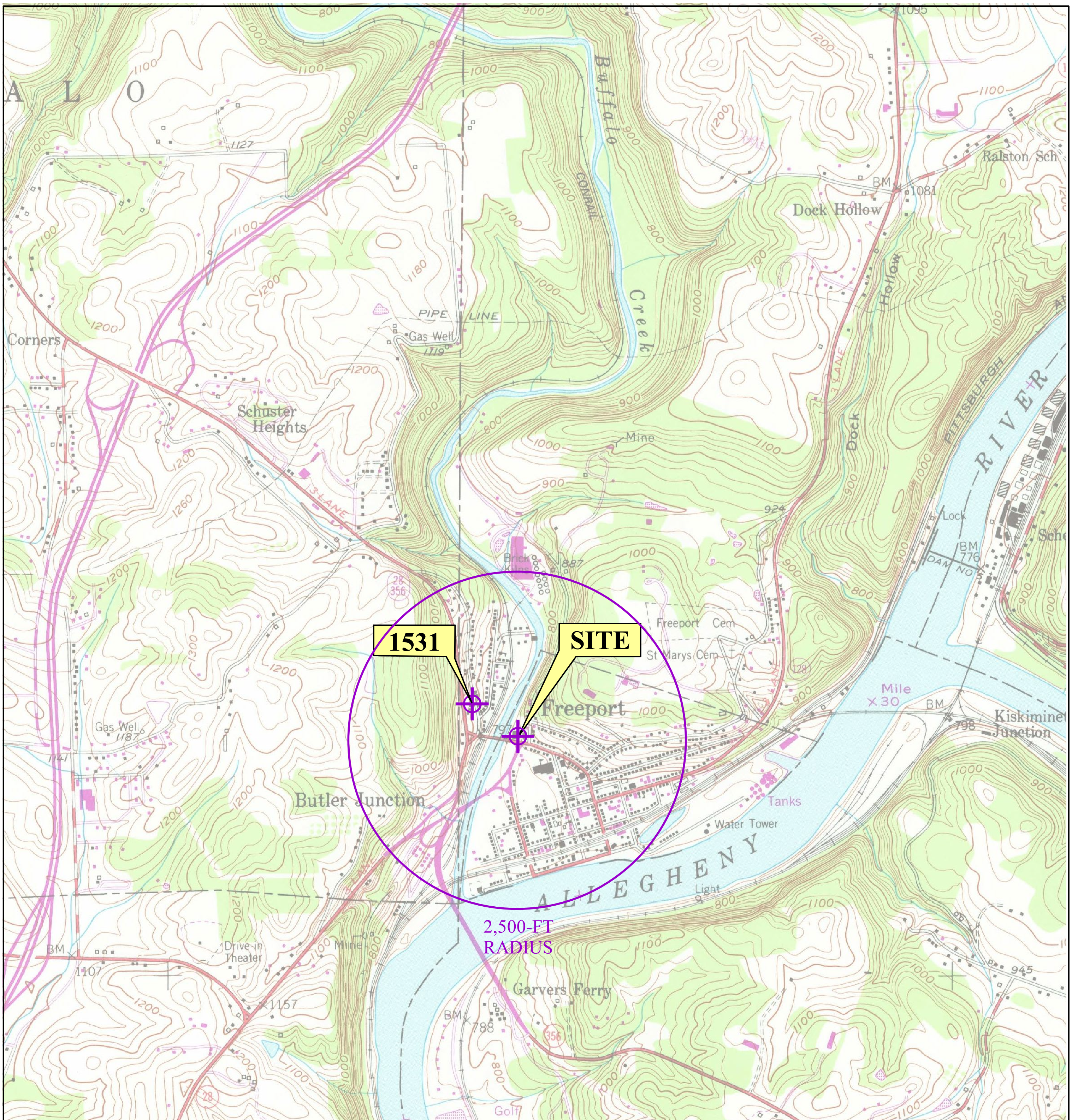
LEVELS WHERE WATER ENTERS WELL

Top (ft)	Bottom (ft)	Yield (GPM)
0	**40**	

	0	**100**
	0	**145**

Depth to Bedrock (ft): Was Well Drilled Into Bedrock? **Yes**

Date Printed: **4/18/2019**



LEGEND

PA WELL ID 1531

PA WELL

* ABANDONED WELLS ASSOCIATED WITH THE SITE WERE NOT PLOTTED

COORDINATES:
40.6762 N
79.6891 W

SCALE IN FEET
0 2,000

PAGWIS WELL LOCATION MAP

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 1

APPENDIX G

Pennsylvania Natural Heritage Program Report

Introduction

This Conservation Planning Report compiles names, descriptions, maps, locations, measurements, links and references for Natural Heritage Areas (core and supporting habitats), Important Bird Areas, State Lands, and agency designated water resources that are coincident with an area of interest defined by the user of the Pennsylvania Conservation Explorer tool. For an overview and additional details, please be sure to visit the website at www.naturalheritage.state.pa.us and download the applicable County Natural Heritage Inventory report(s).

Site Area: 26.15 acres

County(s): Armstrong; Butler

Township/Municipality(s): BUFFALO; FREEPORT; SOUTH BUFFALO

Quadrangle Name(s): FREEPORT

Watersheds HUC 8: Lower Allegheny; Middle Allegheny-Redbank

Watersheds HUC 12: Buffalo Creek-Allegheny River; Chartiers Run-Allegheny River; Garretts Run-Allegheny River

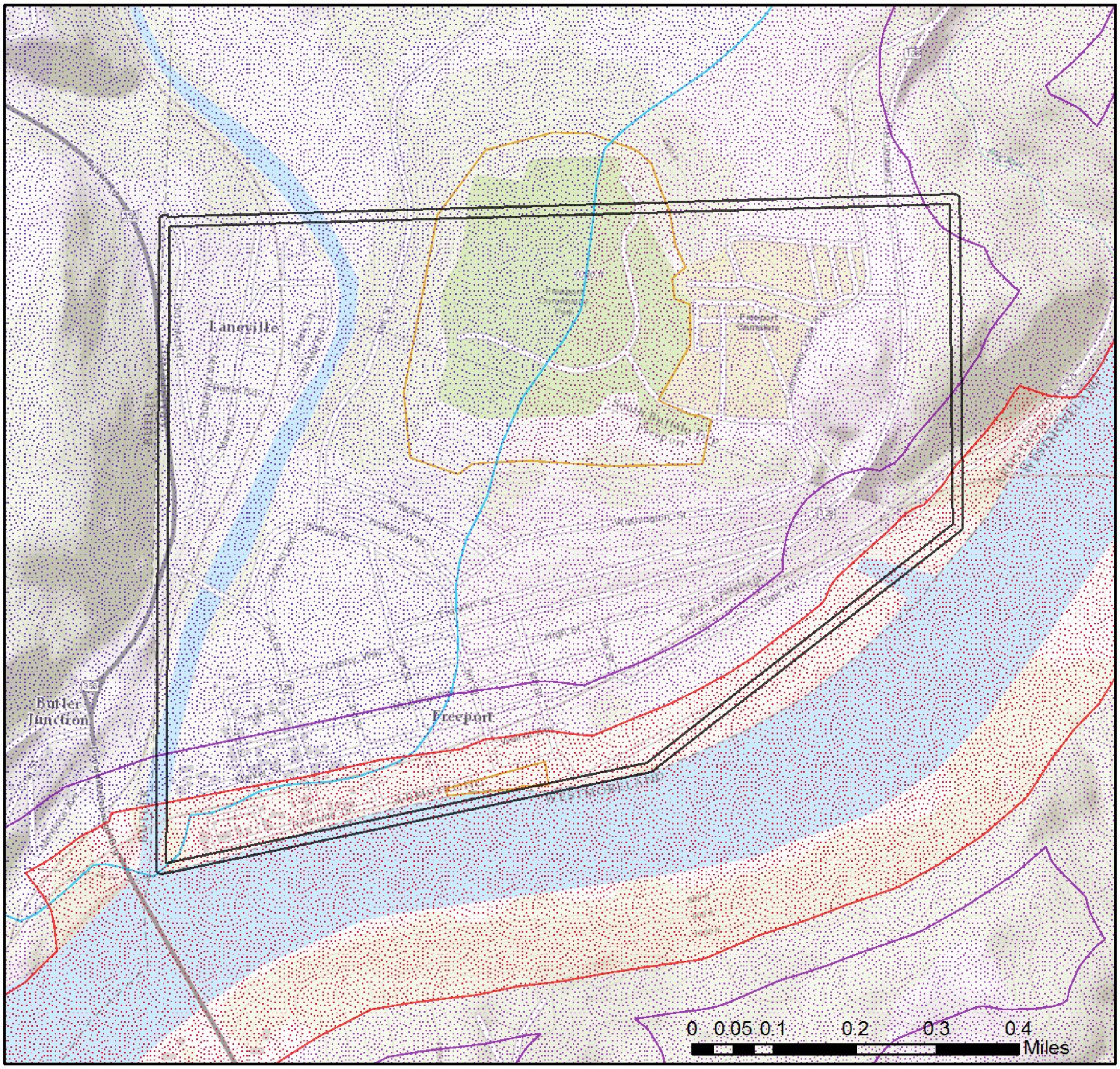
Decimal Degrees: 40.671458 N, -79.683330 W

Degrees Minutes Seconds: 40° 40' 17.2490" N, 79° 40' 59.9876" W

SEARCH RESULT SUMMARY

Conservation Planning Category	Detected Area Summary
Natural Heritage Areas	1 site
Important Bird Areas	1 area

Superior - Radhe Oil



Project Boundary

Core Habitats

Supporting Landscapes

Important Bird Areas

Local Parks

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo,

Natural Heritage Areas
Natural Heritage Areas (NHAs) are sites that have been identified as critical habitat for species or natural communities of concern. This dataset is designed to identify, map and discuss areas that support species of concern, exemplary natural communities, and broad expanses of intact natural ecosystems that support components of Pennsylvanias native species biodiversity. These areas are prioritized based upon their ecological qualities and provided with recommendations regarding their management and protection. Most of the existing NHAs have been developed through PNHPs County Natural Heritage Inventories -- systematic studies of the critical biological resources of a county.

Natural Heritage Site Name	Description	Reference
Allegheny River Pool #4	This section of the Allegheny River provides habitat for eight species of concern.	Link

Local Parks
A local park is a publicly owned and publicly accessible park or natural area that engages participants of all ages in outdoor recreational experiences. Local parks and open spaces connect citizens to close-to-home outdoor recreation opportunities for play and physical activities; promote health and wellness, and environmental stewardship.

Local Park	Park Type	County	State or Federal Grant Funding
Freeport Community Park	Large Urban Parks	Armstrong	No
Freeport Riverside Park	Neighborhood Parks	Armstrong	No

Important Bird Areas (IBAs)
These are areas recognized as being globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. The program was developed and sites are identified by BirdLife International.

IBA Site Number	Name	Reference
22	Buffalo Creek Valley	Link

For additional information about the Pennsylvania Natural Heritage Program, visit the website at www.naturalheritage.state.pa.us or you can email your questions and comments to RA-HeritageReview@pa.gov.

APPENDIX H

Soil Boring/Monitor Well Construction Logs

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: August 24, 2017

Soil Boring
SB-1

DEPTH (feet)	DESCRIPTION
0 – 0.5	**ASPHALT**
0.5 – 1	**CONCRETE**
1 – 3.5	**CL**: Sandy lean clay, gray
3.5 – 5	**CL**: Gravelly lean clay (gray), gravel and sand, some brown clay, coarse-grained
5 – 8.5	**CL**: Lean clay with sandstone fragments
8.5 – 11	**CL**: Lean clay with sandstone fragments and red weathered shale granules
11 – 14	**CL**: Lean clay with coarse-grained sand, some red streaking, petroleum odor
14 – 16	**CL**: Lean clay with coarse-grained sand, petroleum odor
16 – 18	**CL**: Lean clay with sandstone fragments
18 – 20	**GP/GC**: Combination of brown lean clay and sandstone fragments
20 – 23	**GP/GC**: Mainly sandstone fragments with some sandy clay, moisture observed ~20'
23 – 25	**SANDSTONE**: Weathered fragments, moisture present
25	Borehole Terminated

SAMPLES

Depth (feet)	Number	Type	Recovery	Blows (per 6-inches)
0 – 2	1	Hand Clear	100%	
2 – 4	2	Hand Clear	100%	
4 – 5	3	Hand Clear	100%	
5 – 7	4	Split Spoon	100%	6, 7, 5, 6
7 – 9	5	Split Spoon	85%	7, 9, 11, 13
9 – 11	6	Split Spoon	85%	4, 5, 4, 4
11 – 13	*7	Split Spoon	90%	6, 10, 10, 9
13 – 15	8	Split Spoon	60%	8, 7, 7, 9
15 – 17	9	Split Spoon	40%	2, 4, 7, 10
17 – 19	10	Split Spoon	30%	6, 8, 7, 11
19 – 21	11	Split Spoon	30%	5, 12, 10, 14
21 – 23	12	Split Spoon	35%	11, 13, 15, 11
23 – 25	13	Split Spoon	20%	12, 12, 16, 13

PID (ppm)

Depth (feet)	PID (ppm)
2	11.2
4	410.1
5	254.6
7	77.3
9	466.0
11	420.1
13	1,056.0
15	906.5
17	797.2
19	807.2
21	633.5
23	519.8
25	497.5

DETAILS

Total Depth: 25 feet
Borehole Diameter: 2.125 inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner
Surface Elevation: NA

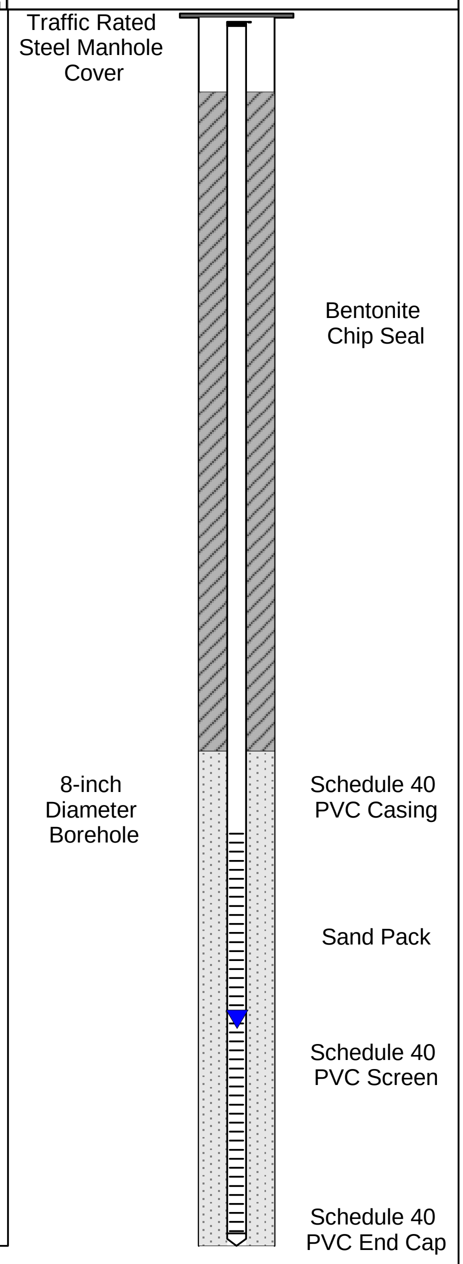
* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: September 20, 2017

Monitoring Well
SB-1/MW-1

DEPTH (feet)	DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES Recovery	SAMPLES Blows (per 6-inches)	PID (ppm) 0 200 400 600	WELL CONSTRUCTION DETAILS
0–30	See SB-1 boring log from August 24, 2017						
30	Borehole Terminated @ 30'						



Total Depth: 30 feet
Borehole Diameter: 8-inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner

Well Diameter: 2-inch
Casing Length: 20 feet
Screen Length: 10 feet
Screen Slot Size: 0.010-inch

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: 24.51
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

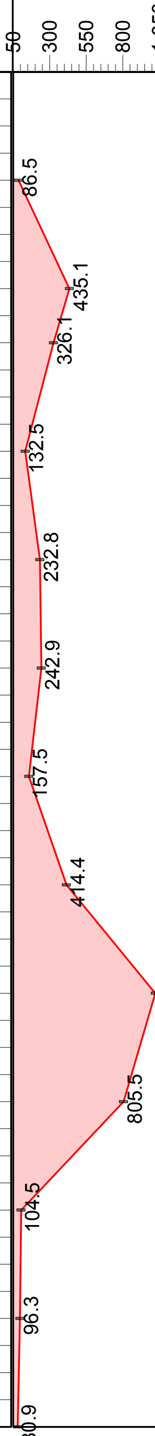
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: August 24, 2017

Soil Boring
SB-2

DEPTH (feet)	DESCRIPTION	DETAILS
0–0.5	**ASPHALT**	
0.5–1	**CONCRETE**	
1–3.5	**CL**: Lean clay with sand, gray with some brown, coarse-grained sand	
3.5–5	**CL**: Sandy lean clay (gray), petroleum odor	
5–8	**CL**: Gravelly lean clay, sandstone fragments observed	
8–11	**CL**: Sandy lean clay (gray), brown and red streaking, sandstone fragments present	
11–13.5	**CL**: Gravelly lean clay (brown), red streaking, sandstone fragments	
13.5–17	**CL**: Sandy lean clay, mainly brown with some gray, coarse-grained sand, petroleum odor	
17–19	**CL**:Gravelly lean clay, light brown coloration, sandstone fragments, petroleum odor	
19–23	**GP/GC**: Gravelly clay, abundant sandstone (granules and cobbles)	Moisture Observed (21)
23–25	**SANDSTONE**: Weathered	
24	Water detected at 24.01' bgs	
25	Borehole Terminated	

SAMPLES Number	Type	Recovery	Blows (per 6-inches)
1	Hand Clear	100%	
2	Hand Clear	100%	
3	Hand Clea r	100%	
4	Split Spoon	100%	9, 6, 7, 5
5	Split Spoon	90%	7, 5, 4, 8
6	Split Spoon	85%	5, 5, 7, 5
7	Split Spoon	85%	5, 4, 8, 12
8	Split Spoon	70%	9, 8, 8, 7
*9	Split Spoon	60%	7, 7, 6, 4
10	Split Spoon	55%	8, 12, 16, 19
11	Split Spoon	20%	15, 18, 15, 17
12	Split Spoon	10%	12, 15, 14, 15
13	Split Spoon	10%	15, 17, 17, 20



Depth (feet)	PID (ppm)
2	86.5
4	435.1
5	326.1
7	132.5
9	232.8
11	242.9
13	157.5
15	414.4
17	1,023.0
19	805.5
21	104.5
23	96.3
25	80.9

Total Depth: 25 feet
Borehole Diameter: 2.125 inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner
* Sample Submitted for Laboratory Analysis
Surface Elevation: NA

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: August 24, 2017

Soil Boring
SB-3

DEPTH (feet)	DESCRIPTION
0	**ASPHALT**
0.5	**CONCRETE**
1	**CL**: Sandy lean clay (brown), poorly sorted fine and coarse grain sand
3.5	**CL**: Sandly lean clay (brown), coarse-grained sand
5	**CL**: Sandy lean clay, coarse-grained sand
7	**CL**: Moisture noted ~7.0'bgs
7.5	**CL**: Lean clay with gravel
10.5	**CL**: Lean clay, dark brown coloration with red streaking visible
12.5	**GP/GC**: Gravelly lean clay with sandstone fragments
15.5	**SANDSTONE**: Extremely hard layer of sandstone, refusal reached Borehole Terminated

SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
1	Hand Clear	100%		0.0
2	Hand Clear	100%		0.0
*3	Hand Clear	100%		2.7
4	Split Spoon	90%	5, 3, 6, 4	0.0
5	Split Spoon	75%	6, 5, 6, 8	0.0
6	Split Spoon	90%	6, 7, 5, 9	0.0
7	Split Spoon	90%	4, 7, 7, 10	0.2
8	Split Spoon	80%	12, 16, 9, 10	0.9
9	Split Spoon	5%	2, 50/6	0.0

DETAILS

Spoon Refusal Reached at 16.0'

Total Depth: 16 feet
Borehole Diameter: 2.125 inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner
Surface Elevation: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: August 25, 2017

Soil Boring
SB-4

DEPTH (feet)	DESCRIPTION
0–0.5	**ASPHALT**
0.5–1	**CONCRETE**
1–3.5	**CL**: Sandy lean clay, both brown and gray coloration present, coarse-grained sand
3.5–5.5	**CL**: Lean clay, gray, moisture observed, petroleum odor noted
5.5–8	**CL**: Sandy lean clay, gray and brown coloration, petroleum odor noted
8–12.5	**CL**: Sandy lean clay (gray), strong petroleum odor noted, moist
12.5–15	**GP/GC**: Gravelly lean clay (gray), slightly moist, petroleum odor noted, sandstone cobbles present
15–22	**SANDSTONE**: Weathered sandstone ranging in size from granules to cobbles
22	Spoon refusal
22–25	**SANDSTONE**: Strong layer of sandstone still evident
25	Borehole Terminated

SAMPLES Number	Type	Recovery	Blows (per 6-inches)	DETAILS
1	Hand Clear	100%		
2	Hand Clear	100%		
3	Hand Clear	100%		
4	Split Spoon	100%	3, 4, 3, 3	
5	Split Spoon	90%	5, 5, 4, 4	
*6	Split Spoon	90%	5, 8, 8, 6	
7	Split Spoon	80%	2, 2, 7, 5	
8	Split Spoon	50%	11, 14, 14, 21	
9	Split Spoon	50%	7, 15, 20, 21	
10	Split Spoon	30%	24, 21, 17, 20	
11	Split Spoon	30%	20, 21, 8, 9	
12	Auger		50/2	
13	Auger			Switch to Auger Drilling

PID (ppm), scale 0, 5,000, 10,000, 15,000

Depth (feet)	PID (ppm)
2	20.7
4	118.3
5	67.0
7	2,113.0
9	3,346.0
11	15,000.0
13	3,583.0
15	3,355.0
17	3,348.0
19	3,214.0
21	2,956.0

Total Depth: 25 feet
Borehole Diameter: 2.125 inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner
Surface Elevation: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: August 25, 2017

Soil Boring
SB-5

DEPTH (feet)	DESCRIPTION
0	**CONCRETE**
1	**CL**: Sandy lean clay, coarse-grained sand present
3	**CL**: Lean clay with sand, fine-grained, slightly moist layer of clay
5.5	**CL**: Lean clay with sand, weathered shale fragments, coarse-grained sand
8.5	**GP/GC**: Poorly graded gravel with clay, shale fragments present, few sandstone fragments
12.5	**SANDSTONE**: Strong layer of slightly weathered sandstone (gray) and few shale fragments
14.5	Spoon refusal reached
15	Borehole Terminated

SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
1	Hand Clear	100%		0.0
2	Hand Clear	100%		22.1
3	Hand Clear	100%		39.0
*4	Split Spoon	100%	4, 6, 5, 4	325.9
5	Split Spoon	100%	4, 3, 5, 6	34.4
6	Split Spoon	80%	3, 4, 5, 6	43.8
7	Split Spoon	60%	5, 6, 7, 7	24.6
8	Split Spoon	20%	7, 6, 50/1	13.4

PID (ppm) scale: 0, 500, 1,000

DETAILS

Total Depth: 15 feet
Borehole Diameter: 2.125 inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner
Surface Elevation: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: August 25, 2017

Soil Boring
SB-6

DEPTH (feet)	DESCRIPTION
0–0.5	**ASHPHALT**
0.5–1	**CONCRETE**
1–3.5	**CL**: Sandy lean clay, petroleum odor noted
3.5–6	**CL**: Sandy lean clay, gray, damp
6–8.5	**GP/GC**: Clayey gravel, brown coloration with red streaking, sandstone granules, dry
8.5–11	**CL**: Sandy lean clay, petroleum odor noted, coarse-grained sand
11–13.5	**CL**: Lean clay
13.5–16	**GP/GC**: Poorly graded gravel with clay, brown clay with black streaking, sandstone cobbles
16–18.5	**CL**: Sandy lean clay, petroleum odor noted, slightly damp
18.5–21.5	**GP/GC**: Poorly graded gravel with clay and sand, abundant sandstone cobbles, slight moisture noted
21.5–23.89	**SANDSTONE**: Spoon refusal reached at 23.0'
23.89–25	Water detected at 23.89' bgs Auger to 25.0' bgs
25	Borehole Terminated

Depth (feet)	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)	DETAILS
0–2	1	Hand Clear	100%			
2–4	2	Hand Clear	100%		77.2	
4–5	*3	Hand Clear	100%		96.6	
5–7	4	Split Spoon	100%	5, 5, 6, 9	158.1	
7–9	5	Split Spoon	80%	8, 10, 10, 13	10.6	
9–11	6	Split Spoon	90%	3, 3, 2, 2	40.7	
11–13	7	Split Spoon	90%	3, 6, 6, 7	16.0	
13–15	8	Split Spoon	70%	8, 7, 16, 8	2.3	
15–17	9	Split Spoon	70%	2, 2, 4, 4	20.5	
17–19	10	Split Spoon	60%	12, 13, 14, 13	18.8	
19–21	11	Split Spoon	40%	11, 14, 14, 14	10.5	
21–23	12	Split Spoon	20%	6, 7, 6, 5	19.5	
23–25	13	Auger		50/1	26.5	Spoon Refusal Reached at 23.0', Switch to Auger Drill Water Detected at 23.89' bgs, SB6/WS1/24' Collected

Total Depth: 25 feet
Borehole Diameter: 2.125 inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner
Surface Elevation: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

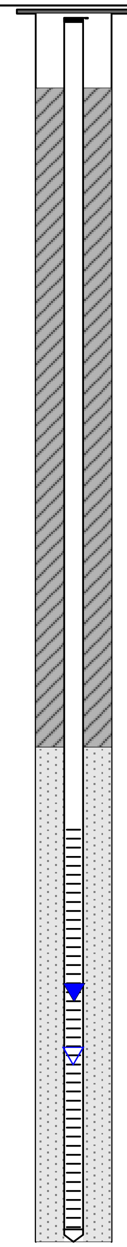
Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: September 20, 2017

Monitoring Well ***SB-7/MW-2***

DEPTH (feet)	DESCRIPTION
0	**Asphalt**
0.5	**Concrete**
1	**CL:** Sandy clay, brown, few sandstone fragments
3.5	Lean clay with coarse-grained sand, mainly light brown, some gray
8.5	With sand and gravel, few sandstone fragments, red/black streaks
14.5	Lean clay (light brown) with sand and gravel, sandstone present, some black streaking
17	Coarse-grained sand, sandstone fragments
20	**Sandstone:** Highly weathered
23	Some clay, moisture present at ~ 25'
25.5	Water @ 25.5' bgs
30	Borehole terminated @ 30'

SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
1	Hand Clear	100%		0.2
2	Hand Clear	100%		0.2
3	Hand Clear	100%		0.1
4	Split Spoon	90%	4, 3, 6, 7	0.3
5	Split Spoon	70%	4, 7, 9, 11	0.3
6	Split Spoon	40%	3, 4, 5, 3	0.2
7	Split Spoon	75%	8, 8, 8, 9	0.2
8	Split Spoon	60%	7, 10, 8, 8	0.3
9	Split Spoon	60%	2, 5, 5, 7	0.3
10	Split Spoon	60%	7, 12, 10, 15	0.2
11	Split Spoon	40%	12, 16, 13, 10	0.1
12	Split Spoon	30%	12, 12, 10, 14	0.1
*13	Split Spoon	35%	13, 16, 16, 14	21.5
14	Split Spoon	30%	12, 17, 18, 17	
15	Split Spoon	30%	13, 19, 18, 19	
16	Split Spoon	15%	15, 19	

WELL CONSTRUCTION DETAILS



Total Depth: 30 feet
Borehole Diameter: 8-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner

Well Diameter: 2-inch
Casing Length: 20 feet
Screen Length: 10 feet
Screen Slot Size: 0.010-inch

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: 23.96
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

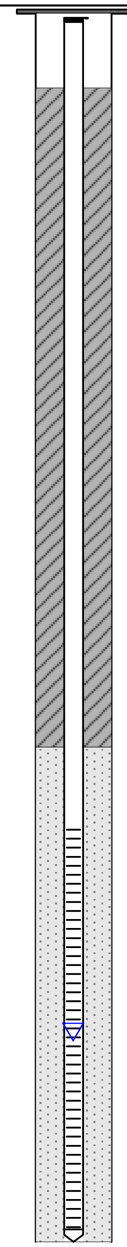
Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: September 21, 2017

Monitoring Well
SB-8/MW-3

DEPTH (feet)	DESCRIPTION
0–0.5	**Asphalt**
0.5–1.5	**Concrete**
1.5–4	**CH:** Gravelly fat clay, dark gray, weathered shale present
4–9	**CL:** Gravelly lean clay with sand, sandstone, and shale fragments, brown/gray mix
9–12.5	Clayey sand with gravel, sandstone fragments, moisture noted ~9.5'
12.5–15.5	Lean clay with coarse-grained sand, gravel, and weathered sandstone
15.5–17.5	**Sandstone:** Weathered fragments
17.5–20	**CL:** Lean clay with gravel, few sandstone fragments, slightly moist
20–22.5	Gravelly lean clay, abundant sandstone fragments
22.5–25	Moisture noted ~ 23' bgs, spoon saturated with water
25–30	**Sandstone:** Highly weathered and brown
30	Borehole terminated @ 30'

SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
1	Hand Clear	100%		0
2	Hand Clear	100%		0
3	Hand Clear	100%		0
4	Split Spoon	60%	4, 5, 6, 6	0.1
5	Split Spoon	60%	8, 11, 5, 5	0
6	Split Spoon	50%	2, 3, 4, 7	0
7	Split Spoon	45%	9, 12, 10, 8	0.1
8	Split Spoon	15%	7, 8, 6, 6	0
9	Split Spoon	30%	2, 2, 4, 4	0.2
10	Split Spoon	70%	4, 6, 6, 7	0.1
11	Split Spoon	60%	8, 16, 15, 20	0.2
*12	Split Spoon	50%	17, 15, 11, 8	0.2
13	Split Spoon	50%	6, 8, 12, 12	
14	Split Spoon	40%	7, 13, 15, 11	
15	Split Spoon	30%	6, 9, 15, 18	
16	Split Spoon	30%	16, 20	

WELL CONSTRUCTION DETAILS



Total Depth: 30 feet
Borehole Diameter: 8-inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner

Well Diameter: 2-inch
Casing Length: 20 feet
Screen Length: 10 feet
Screen Slot Size: 0.010-inch

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: September 21, 2017

Monitoring Well ***SB-9/MW-4***

DEPTH (feet)	DESCRIPTION
0	**Asphalt**
0.5–1.5	**Concrete**
1.5–4.5	**CH:** Sandy fat clay, mix of brown/gray
4.5–8.5	**CL:** Gravelly lean clay with coarse-grained sand, brown, shale fragments present
8.5–12.5	Sandy lean clay with gravel, some sandstone fragments, fine-grained/coarse mix, moisture ~ 8' bgs
12.5–20	Lean clay with gravel, sandstone and shale fragments, some black streaking, slightly moist
20–23.5	**Sandstone:** Highly weathered and brown
23.5–30	Moisture noted ~ 25' bgs
30	Borehole terminated @ 30'

SAMPLES

Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
1	Hand Clear	100%		0
2	Hand Clear	100%		0
3	Hand Clear	100%		0
4	Split Spoon	90%	10, 9, 8, 10	0.1
5	Split Spoon	70%	7, 8, 10, 9	0
6	Split Spoon	60%	6, 6, 7, 8	0.1
7	Split Spoon	70%	8, 10, 8, 11	0.1
8	Split Spoon	70%	8, 7, 9, 10	0
9	Split Spoon	80%	2, 3, 3, 4	0
10	Split Spoon	90%	4, 4, 5, 4	0.4
*11	Split Spoon	60%	2, 7, 16, 17	0.1
12	Split Spoon	50%	18, 20, 20, 16	0
13	Split Spoon	40%	16, 14, 17, 16	0
14	Split Spoon	50%	16, 19, 20, 19	0
15	Split Spoon	30%	19, 19, 20, 17	0.1
16	Split Spoon	30%	18, 16	0

WELL CONSTRUCTION DETAILS

Traffic Rated Steel Manhole Cover

Bentonite Chip Seal

8-inch Diameter Borehole

Schedule 40 PVC Casing

Sand Pack

Schedule 40 PVC Screen

Schedule 40 PVC End Cap

Total Depth: 30 feet
Borehole Diameter: 8-inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner

Well Diameter: 2-inch
Casing Length: 20 feet
Screen Length: 10 feet
Screen Slot Size: 0.010-inch

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: September 21, 2017

Monitoring Well
SB-10/MW-5

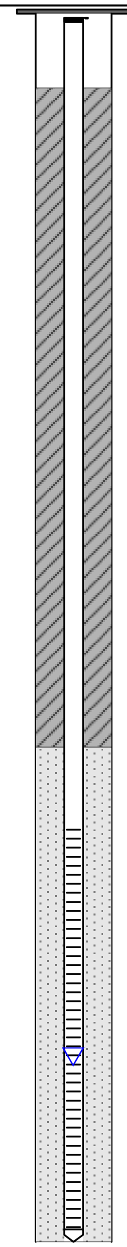
Description

DEPTH (feet)	DESCRIPTION
0–1.5	Asphalt coated concrete
1.5–4	**GC:** Clayey sand with gravel, weathered shale, large sandstone cobbles/boulders, very strong odor
4–5	Hand clear refusal ~ 3.75' bgs
5–7	Shelby tube driven 5'-7' bgs
7–10	**CL:** Lean clay with fine-grained sand, slightly moist brown clay
10–12.5	**Shale:** Highly weathered shale and sandstone fragments
12.5–18	**CL:** Lean clay with gravel, slightly moist clay, sandstone present, moisture noted ~ 14.5' bgs
18–20.5	Lean clay with fine-grained sand, brown with black streaks, moist in some areas
20.5–25	Clayey sand with gravel, weathered shale present (black), slightly moist, some sandstone fragments
25–30	Clayey sand, moist
30	Borehole terminated @ 30'

Samples

Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
1	Hand Clear	100%		204.2
*2	Hand Clear	100%		366.9
3				
4	Shelby Tube			
*5	Split Spoon	90%	3, 3, 4, 5	138.9
6	Split Spoon	5%	4, 3, 4, 5	57
7	Split Spoon	10%	8, 7, 6, 8	27.8
8	Split Spoon	70%	4, 5, 6, 7	29
9	Split Spoon	70%	2, 2, 2, 5	14.4
10	Split Spoon	70%	5, 5, 6, 8	12.9
11	Split Spoon	80%	3, 3, 4, 6	12.1
12	Split Spoon	80%	6, 6, 6, 7	7.8
13	Split Spoon	70%	11, 21, 8, 6	7.6
14	Split Spoon	70%	10, 17, 19, 12	5.2
15	Split Spoon	50%	11, 18, 18, 6	4.1
16	Split Spoon	50%	9, 16	1.2

WELL CONSTRUCTION DETAILS



Total Depth: 30 feet
Borehole Diameter: 8-inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Alex Kantner

Well Diameter: 2-inch
Casing Length: 20 feet
Screen Length: 10 feet
Screen Slot Size: 0.010-inch

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Sheet: 1 of 1

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: July 26, 2018

Soil Boring
SB-12

DEPTH (feet)	DESCRIPTION	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)	WELL CONSTRUCTION DETAILS
0–0.25	Asphalt						
0.25–0.5	Concrete						
0.5–5	CH: Soft, gray, sandy, some gravel, moist, strong odor, SANDY FAT CLAY WITH GRAVEL	1	Hand Clear	100%		404.8	
		2	Hand Clear	100%		324.6	
		*3	Hand Clear	100%		356.2	
5–11	CH: Soft, brown, some gray, moist, FAT CLAY	4	Direct Push	100%		47.8	
		5	Direct Push	100%		8.5	
		6	Direct Push	100%		5.5	
11–13	CH: Soft, silty, gray, moist, FAT CLAY	7	Direct Push	100%		74.5	
13–15	CH: Soft, silty, gray, some brown, some black, sandy, moist, FAT CLAY WITH SAND	*8	Direct Push	100%		111.2	
15–20	CH: Soft, silty, gray, some brown, some gravel, sandy, moist, SANDY FAT CLAY WITH GRAVEL	9	Direct Push	75%		12.1	
		10	Direct Push	100%		15.3	
20–25	SP: Loose, brown, some white, some clay, very gravelly, moist, POORLY GRADED SAND WITH CLAY AND GRAVEL	11	Direct Push	100%		6.3	
		12	Direct Push	100%		14.3	
		13	Direct Push	100%		3.6	
25	Borehole Terminated @ 25' bgs						

Total Depth: 25 feet
Borehole Diameter: 2.25-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: NA
Casing Length: NA
Screen Length: NA
Screen Slot Size: NA

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

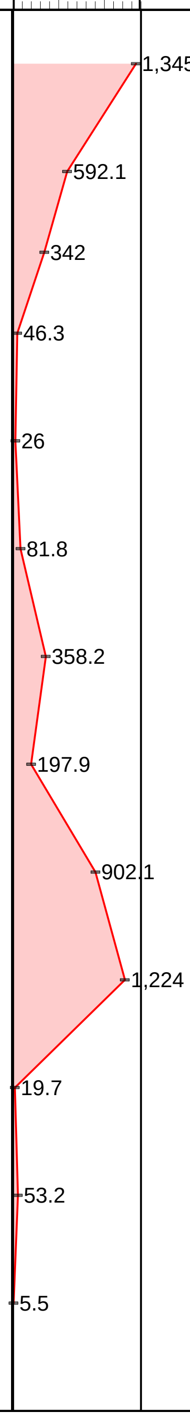
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: July 26, 2018

Soil Boring SB-13

DEPTH (feet)	DESCRIPTION
0	Concrete
0–4	Fill: Clay-Soft, gray, some gravel chunks, moist, strong odor
4–5	CH: Soft, brown, some gravel, moist, FAT GRAVELLY CLAY
5–11	CH: Firm, brown, some gravel, moist, FAT GRAVELLY CLAY
11–15	CH: Soft, silty, brown, some gray, moist, odor, FAT CLAY
15–19	CH: Soft, silty, brown, some gray, *wet around 18.5', FAT CLAY
19–21	CH: Firm, silty, brown, very sandy, very gravelly, SANDY FAT CLAY WITH GRAVEL
21–25	SP: Loose, brown, very gravelly, some clay, moist, POORLY GRADED SAND WITH CLAY AND GRAVEL
25	Borehole terminated @ 25' bgs

Depth (feet)	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
0–2	1	Hand Clear	100%		1,345
2–4	2	Hand Clear	100%		592.1
4–5	*3	Hand Clear	100%		342
5–7	4	Direct Push	100%		46.3
7–9	5	Direct Push	100%		26
9–11	6	Direct Push	100%		81.8
11–13	7	Direct Push	100%		358.2
13–15	8	Direct Push	100%		197.9
15–17	*9	Direct Push	100%		902.1
17–19	10	Direct Push	100%		1,224
19–21	11	Direct Push	100%		19.7
21–23	12	Direct Push	100%		53.2
23–25	13	Direct Push	100%		5.5



WELL CONSTRUCTION DETAILS

Total Depth: 25 feet
Borehole Diameter: 2.25-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: NA
Casing Length: NA
Screen Length: NA
Screen Slot Size: NA

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

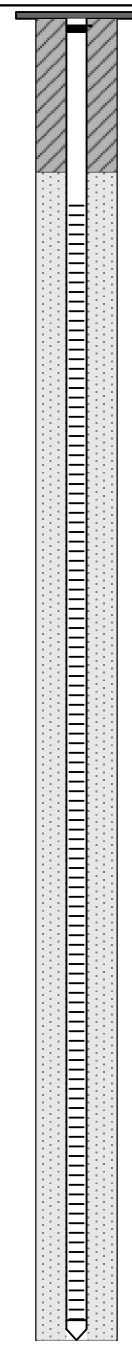
Sheet: 1 of 1

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 12, 2018

SVE-Well
SB-13/MP-2

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600	WELL CONSTRUCTION DETAILS
0	ASPHALT						Traffic Rated Steel Manhole Cover
0.5	CONCRETE						
1	CL: Sandy lean clay, both brown and gray coloration present, coarse-grained sand						Bentonite Chip Seal; Schedule 40 PVC Casing; 8.25-inch Diameter Borehole
3.5	CL: Lean clay, gray, moisture observed, petroleum odor noted						
5.5	CL: Sandy lean clay, gray and brown coloration, petroleum odor noted						
8	CL: Sandy lean clay (gray), strong petroleum odor noted, moist						Sand Pack
12.5	GP/GC: Gravelly lean clay (gray), slightly moist, petroleum odor noted, sandstone cobbles present						Schedule 40 PVC Screen
15	SANDSTONE: Weathered sandstone ranging in size from granules to cobbles						Schedule 40 PVC End Cap
20	Borehole Terminated @ 20' bgs						



Total Depth: 20 feet
Borehole Diameter: 8.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 2-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: July 26, 2018

Soil Boring
SB-14

DEPTH (feet)	DESCRIPTION	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 / 500 / 1,000	WELL CONSTRUCTION DETAILS
0	Concrete						
0–5	CH: Soft, brown, some gravel, moist, FAT CLAY WITH GRAVEL	1	Hand Clear	100%		2.4	
		2	Hand Clear	100%		6	
		3	Hand Clear	100%		8	
5–10	CH: Firm, brown, sandy, some gravel, dry, SANDY FAT CLAY WITH GRAVEL	4	Direct Push	100%		11.1	
		5	Direct Push	100%		40.9	
10–17	CH: Firm, brown, dry, *damp around 16', FAT CLAY	6	Direct Push	100%		43.6	
		7	Direct Push	100%		112.7	
		*8	Direct Push	100%		238.8	
		9	Direct Push	100%		62	
17–25	SP: Loose, brown, some gray, some clay, gravelly, moist, POORLY GRADED SAND WITH CLAY AND GRAVEL	10	Direct Push	100%		12.7	
		11	Direct Push	100%		198.1	
		12	Direct Push	100%		398.6	
		13	Direct Push	100%		125.7	
25	Borehole terminated @ 25' bgs						

Total Depth: 25 feet
Borehole Diameter: 2.25-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: NA
Casing Length: NA
Screen Length: NA
Screen Slot Size: NA

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: July 26, 2018

Soil Boring **SB-15**

DEPTH (feet)	DESCRIPTION	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 – 500 – 1,000	WELL CONSTRUCTION DETAILS
0	Asphalt						
0–5	CH: Soft, gray, some brown, some gravel, moist, FAT CLAY WITH GRAVEL	1	Hand Clear	100%		13.2	
		*2	Hand Clear	100%		876.4	
		3	Hand Clear	100%		125.1	
5–17	CH: Firm, silty, brown, some gray, moist, *wet @ 14', FAT CLAY	4	Direct Push	100%		110.2	
		*5	Direct Push	100%		306.5	
		6	Direct Push	100%		127.1	
		7	Direct Push	100%		90.2	
		8	Direct Push	100%		23.1	
		9	Direct Push	100%		6.7	
17–25	SP: Loose, brown, some gray, gravelly, some clay, moist, POORLY GRADED SAND WITH CLAY AND GRAVEL	10	Direct Push	100%		9.3	
		11	Direct Push	100%		90.1	
		12	Direct Push	100%		13.7	
		13	Direct Push	100%		8.9	
25	Borehole terminated @ 25' bgs						

Total Depth: 25 feet
Borehole Diameter: 2.25-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: NA
Casing Length: NA
Screen Length: NA
Screen Slot Size: NA

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 12, 2018

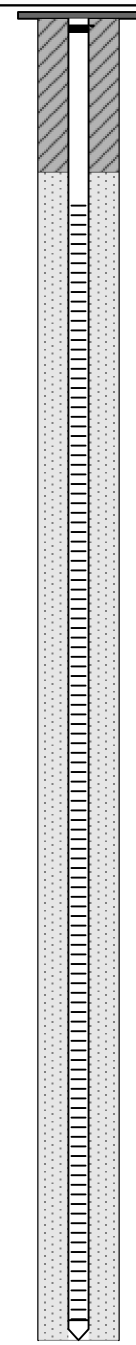
SVE-Well
SB-15/MP-1

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	Concrete					
0–5	CH: Soft, brown, some gravel, moist, FAT CLAY WITH GRAVEL					
5–10	CH: Firm, brown, sandy, some gravel, dry, SANDY FAT CLAY WITH GRAVEL					
10–17	CH: Firm, brown, dry, *damp around 16', FAT CLAY					
17–20	SP: Loose, brown, some gray, some clay, gravelly, moist, POORLY GRADED SAND WITH CLAY AND GRAVEL					
20	Borehole terminated @ 20' bgs					

WELL CONSTRUCTION DETAILS

Traffic Rated Steel Manhole Cover

8.25-inch Diameter Borehole



Bentonite Chip Seal

Schedule 40 PVC Casing

Sand Pack

Schedule 40 PVC Screen

Schedule 40 PVC End Cap

Total Depth: 20 feet
Borehole Diameter: 8.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 2-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

Sheet: 1 of 1

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: July 26, 2018

Soil Boring
SB-16

DEPTH (feet)	DESCRIPTION	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 500 1,000	WELL CONSTRUCTION DETAILS
0	Asphalt						
0–5	CH: Firm, brown, sandy, moist, FAT CLAY WITH SAND	1	Hand Clear	100%		2.3	
		2	Hand Clear	100%		2.1	
		3	Hand Clear	100%		3.3	
5–14	CH: Firm, silty, brown, some gray. sandy, gravelly, moist, SANDY FAT CLAY WITH GRAVEL	4	Direct Push	100%		1.6	
		5	Direct Push	100%		1.2	
		6	Direct Push	100%		1.4	
		7	Direct Push	100%		0	
		8	Direct Push	100%		0	
14–17	CH: Hard, silty, brown, very sandy, some gravel, dry, SANDY FAT CLAY WITH GRAVEL	*9	Direct Push	100%		0	
17–25	SP: Loose, brown, some gray, gravelly, moist, *wet @ 19' and 24.5', POORLY GRADED SAND WITH CLAY AND GRAVEL	10	Direct Push	100%		0	
		11	Direct Push	100%		0	
		12	Direct Push	100%		0	
		13	Direct Push	100%		0	
25	Borehole terminated @ 25' bgs						

Total Depth: 25 feet
Borehole Diameter: 2.25-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: NA
Casing Length: NA
Screen Length: NA
Screen Slot Size: NA

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: July 26, 2018

Soil Boring
SB-17

DEPTH (feet)	DESCRIPTION
0	Concrete
0.5	Pea Gravel
1.5	CH: Soft, gray, some brown, moist, FAT CLAY
5	CH: Firm, brown, some gravel, moist, FAT CLAY WITH GRAVEL
7	CH: Firm, brown, sandy, some gravel, dry, SANDY FAT CLAY WITH GRAVEL
13	CH: Soft, silty, gray, some brown, some gravel, *wet @ 14', FAT CLAY WITH GRAVEL
17	SP: Loose, brown, some gray, gravelly, some clay, moist, POORLY GRADED SANDY WITH CLAY AND GRAVEL
25	Borehole terminated @ 25' bgs

DEPTH (feet)	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)	WELL CONSTRUCTION DETAILS
0-2	1	Hand Clear	100%		272	
2-4	2	Hand Clear	100%		10.4	
4-5	*3	Hand Clear	100%		9	
5-7	4	Direct Push	100%		0.6	
7-9	5	Direct Push	100%		1.7	
9-11	6	Direct Push	100%		380.3	
11-13	*7	Direct Push	100%		412.1	
13-15	8	Direct Push	100%		20.1	
15-17	9	Direct Push	100%		12.3	
17-19	10	Direct Push	100%		11.8	
19-21	11	Direct Push	100%		6.3	
21-23	12	Direct Push	100%		3.8	
23-25	13	Direct Push	100%		6.4	

Total Depth: 25 feet
Borehole Diameter: 2.25-inch
Drill Method: Direct Push
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: NA
Casing Length: NA
Screen Length: NA
Screen Slot Size: NA

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: NA
Gauging Date: NA

* Sample Submitted for Laboratory Analysis

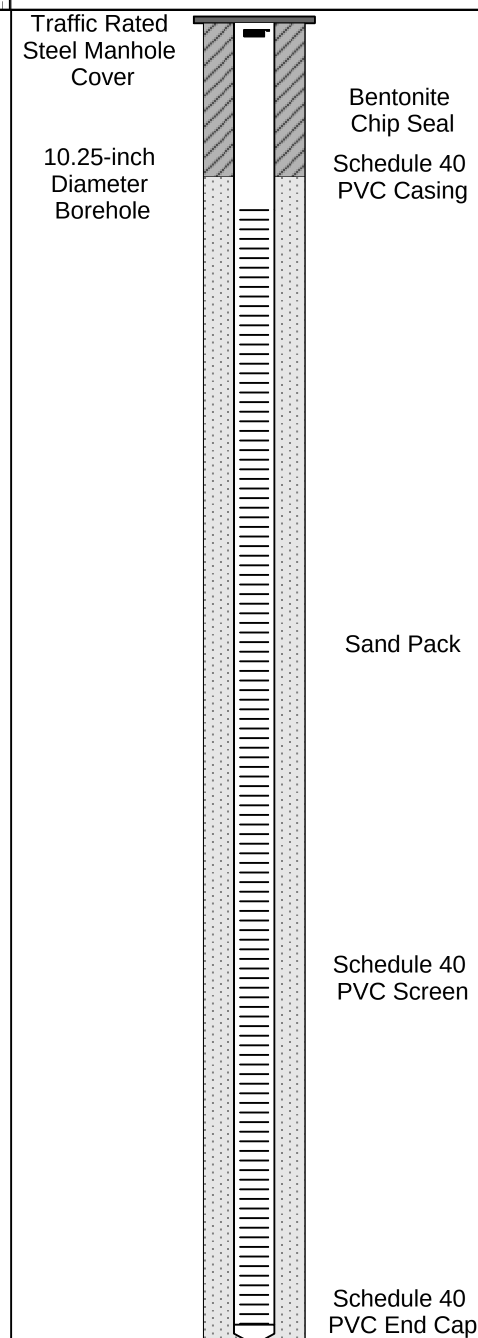
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 17, 2018

SVE-Well
SB-17/SVE-2

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	SAMPLES: Type	SAMPLES: Recovery	SAMPLES: Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
	CONCRETE					
1	CL: Sandy lean clay, gray					
3	CL: Gravelly lean clay (gray), gravel and sand, some brown clay, coarse-grained					
5	CL: Lean clay with sandstone fragments					
8.5	CL: Lean clay with sandstone fragments and red weathered shale granules					
11	CL: Lean clay with coarse-grained sand, some red streaking, petroleum odor					
14	CL: Lean clay with coarse-grained sand, petroleum odor					
16	CL: Lean clay with sandstone fragments					
18	GP/GC: Combination of brown lean clay and sandstone fragments					
20	Borehole Terminated @ 20' bgs					
21						

WELL CONSTRUCTION DETAILS



Total Depth: 20 feet
Borehole Diameter: 10.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 4-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: October 5, 2018

Monitoring Well
SB-18/MW-6

DEPTH (feet)	DESCRIPTION	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm)
0–0.6	Asphalt					
0.6–2	Fill-Large angular gravel	1	Hand Clear	100%		0
2–10	CH: Firm, brown, some sand, some gravel, moist, SANDY FAT CLAY WITH GRAVEL	2	Hand Clear	100%		0
		3	Hand Clear	100%		0
		4	Split Spoon	90%	4, 3, 6, 7	0
		5	Split Spoon	70%	4, 7, 9, 11	0
10–14	CH: Firm, brown, some small gravel, moist, FAT CLAY WITH GRAVEL	6	Split Spoon	40%	3, 4, 5, 3	0
		7	Split Spoon	75%	8, 8, 8, 9	0
14–16	CH: Firm, brown, sandy, gravelly, moist, SANDY FAT CLAY WITH GRAVEL	8	Split Spoon	60%	7, 10, 8, 8	0
16–25	SP: Loose, brown, very gravelly, some clay, wet, *Saturated from 18-25' bgs, POORLY GRADED SAND WITH CLAY AND GRAVEL	9	Split Spoon	60%	2, 5, 5, 7	0
		10	Split Spoon	60%	7, 12, 10, 15	0
		11	Split Spoon	40%	12, 16, 13, 10	0
		12	Split Spoon	30%	12, 12, 10, 14	0
		*13	Split Spoon	35%	13, 16, 16, 14	0
25	Borehole terminated @ 25' bgs					

WELL CONSTRUCTION DETAILS
- Traffic Rated Steel Manhole Cover
- 8.25-inch Diameter Borehole
- Bentonite Chip Seal
- Schedule 40 PVC Casing
- Sand Pack
- Schedule 40 PVC Screen
- Schedule 40 PVC End Cap

Total Depth: 25 feet
Borehole Diameter: 8.25-inch
Drill Method: Hollow Stem Auger
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 2-inch
Casing Length: 10 feet
Screen Length: 15 feet
Screen Slot Size: 0.010-inch

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: 18.00 feet
Gauging Date: October 5, 2018

* Sample Submitted for Laboratory Analysis

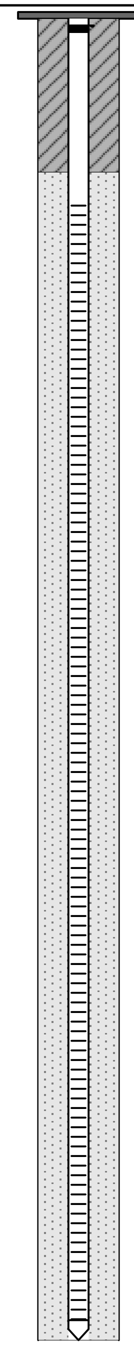
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 17, 2018

SVE-Well
SB-19/MP-3

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
0.5	CONCRETE					
1	CL: Lean clay with sand, gray with some brown, coarse-grained sand					
3.5	CL: Sandy lean clay (gray), petroleum odor					
5	CL: Gravelly lean clay, sandstone fragments observed					
8	CL: Sandy lean clay (gray), brown and red streaking, sandstone fragments present					
11	CL: Gravelly lean clay (brown), red streaking, sandstone fragments					
13.5	CL: Sandy lean clay, mainly brown with some gray, coarse-grained sand, petroleum odor					
17	CL:Gravelly lean clay, light brown coloration, sandstone fragments, petroleum odor					
19	GP/GC: Gravelly clay, abundant sandstone (granules and cobbles)					
20	Borehole Terminated @ 20'					

WELL CONSTRUCTION DETAILS



Traffic Rated Steel Manhole Cover

8.25-inch Diameter Borehole

Bentonite Chip Seal

Schedule 40 PVC Casing

Sand Pack

Schedule 40 PVC Screen

Schedule 40 PVC End Cap

Total Depth: 20 feet
Borehole Diameter: 8.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 2-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

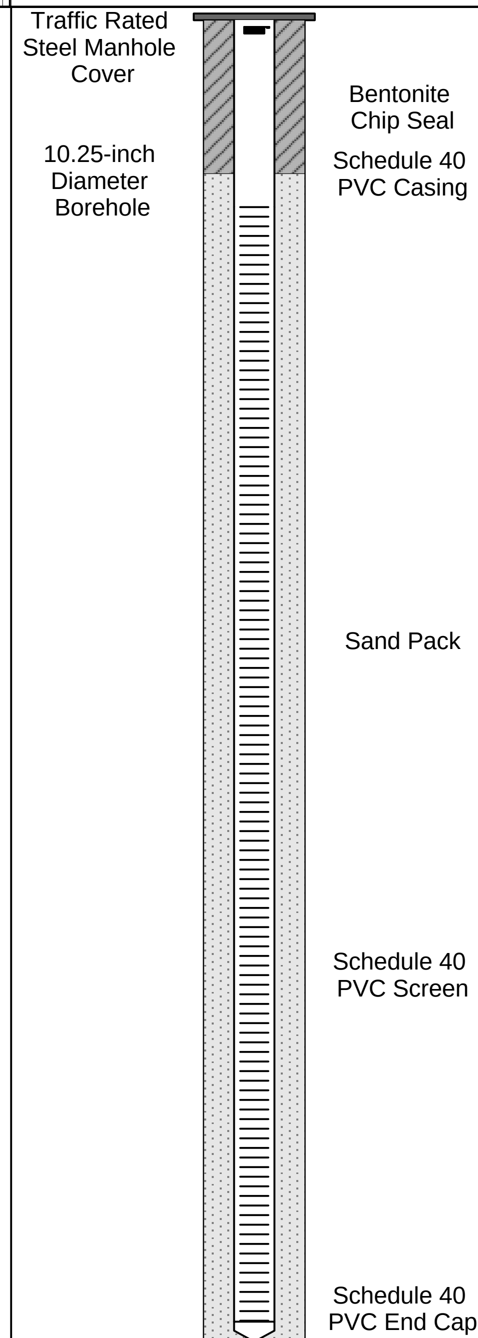
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 13, 2018

SVE-Well
SB-20/SVE-1

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
0.5	CONCRETE					
1	CL: Sandy lean clay, gray					
3.5	CL: Gravelly lean clay (gray), gravel and sand, some brown clay, coarse-grained					
5	CL: Lean clay with sandstone fragments					
8.5	CL: Lean clay with sandstone fragments and red weathered shale granules					
11	CL: Lean clay with coarse-grained sand, some red streaking, petroleum odor					
14	CL: Lean clay with coarse-grained sand, petroleum odor					
16	CL: Lean clay with sandstone fragments					
18	GP/GC: Combination of brown lean clay and sandstone fragments					
20	Borehole Terminated @ 20' bgs					

WELL CONSTRUCTION DETAILS



Total Depth: 20 feet
Borehole Diameter: 10.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 4-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

APPENDIX I

Waste Disposal Receipts

MEI

CERTIFICATE OF DISPOSAL

McCutcheon Enterprises, Inc. Biosolids Treatment Facility
certifies acceptance of the waste as identified below. This material has been processed in accordance with Permit Number 101674 and all applicable Commonwealth of Pennsylvania Department of Environmental Protection waste management regulations.

Generator: **Superior Petroleum Co.**
8199 McKnight Road
Pittsburgh, PA 15237
Radhe Oil

Document No: MC84577
Approval Number: 020819-00005999
Acceptance Date: 02/13/2019
Quantity: 10 drums, 2.70 tons
Soil

I certify that the information in this document is accurate and complete as to the identification of the materials from the generator listed above and the handling, processing, and disposal of the material in accordance with applicable regulations.

Name: Owen Biltz

Title: Facility Compliance Manager

Signature: Owen Biltz

Date: 2/20/2019

250 Park Road Apollo, PA 15613 Telephone: 724-568-3623 Fax: 724-568-2571

SITE	CARBON LIMESTONE LANDFILL 330-536-8013 8100 S. Stateline Rd -Lowellville, OH 44436
CUSTOMER	000906 MCCUTCHEON ENTERPRISES INC. 250 PARK ROAD APOLLO, PA 15613 Contract:5076170115 Generator:Radhe Oil 03-29674

SITE Y1	TICKET # 1189594	CELL	
WEIGHMASTER	IN - Sheryl H. OUT - Robert S.		
DATE/TIME IN	1/6/17 10:01 am	DATE/TIME OUT	1/6/17 10:30 am
VEHICLE	MCCUTCHEON	CONTAINER	
REFERENCE	8		
BILL OF LADING	365847		

SCALE IN GROSS WEIGHT 62,560 NET TONS 16.12
SCALE OUT TARE WEIGHT 30,320 NET WEIGHT 32,240

INBOUND
INVOICE

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
16.12	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE ________

RS-F042UPR (07/12)

110-8

McCutcheon Enterprises, Inc.
Complete Waste Management

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

00140005

Non-Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	nw0026973

3. Generator's Name and Mailing Address
Radha Oil 03-29674
222 Buffalo Street
Freeport, PA 16229

4. Generator's Phone (412) 384-2200

A. 35847

B. State Generator's ID

5. Transporter 1 Company Name	6. US EPA ID Number	C. State Trans. ID
McCutcheon Enterprises Inc	PAD013826847	D. Transporter's Phone ( )
7. Transporter 2 Company Name	8. US EPA ID Number	E. State Trans. ID
9. Designated Facility Name and Site Address	10. US EPA ID Number	F. Transporter's Phone ( )
Carbon Limestone Landfill 8100 S. Stateline Road Lowellville, OH 44436	OHD987048212	G. State Facility's ID. H. Facility's Phone (330) 536-8013

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM		12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	Virgin petroleum fuel contaminated soil/debris	1	DT	15.40	Y	508
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above		K. Handling Codes for Wastes Listed Above	
a. 5076 17 0115	c.	a.	c.
b.	d.	b.	d.

15 Special Handling Instructions and Additional Information

16 GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.
I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month Day Year
X	X	1-11-17

17 Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Larry DiNardo		1-11-17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

19 Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19

Printed/Typed Name	Signature	Month Day Year
Sheri Wilcox	Sheri Wilcox	1-11-17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

SITE	
CARBON LIMESTONE LANDFILL 330-536-8013 8100 S. Stateline Rd -Lowellville, OH 44436	

CUSTOMER	
000906 MCCUTCHEON ENTERPRISES INC. 250 PARK ROAD APOLLO, PA 15613 Contract:5076170115 Generator:Radhe Oil 03-29674	

SITE	TICKET #	CELL
Y1	1189684	
WEIGHMASTER	Robert S.	
DATE/TIME IN	1/6/17 1:49 pm	DATE/TIME OUT 1/6/17 2:22 pm
VEHICLE	MCCUTCHEON	CONTAINER
REFERENCE	8	
BILL OF LADING	35848	

SCALE IN	GROSS WEIGHT	68,720	NET TONS	20.08	INBOUND
SCALE OUT	TARE WEIGHT	28,560	NET WEIGHT	40,160	INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
20.08	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

NET AMOUNT
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE Ray Obrun

RS-F042UPR (07/12)

D-8

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

MEI McCutcheon Enterprises, Inc — Complete Waste Management

00140096

Non Hazardous Waste Manifest

1. Generator's US EPA ID No.	
Manifest Document No.	
2. Page 1 of 1	
	JW0028974
	35848
3. Generator's Name and Mailing Address	Fredric OH 08-23674 222 Buffalo Street Freeport, PA 16229
4. Generator's Phone	(412) 354-2200
B. State Generator's ID	
5. Transporter 1 Company Name	McCutcheon Enterprises Inc
6. US EPA ID Number	PAD013826847
C. State Trans. ID	
7. Transporter 2 Company Name	
8. US EPA ID Number	
D. Transporter's Phone	( )
E. State Trans. ID	
9. Designated Facility Name and Site Address	Carbon Limestone Landfill 8100 S. Stateline Road Lowellville, OH 44436
10. US EPA ID Number	OHD987048212
F. Transporter's Phone	( )
G. State Facility's ID	330 536-8013
H. Facility's Phone	( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	HM	12. Containers No	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Virgin petroleum fuel contaminated soil/debris		1	D	20	Y	508
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above

a. 5078 17 0115

b.

c.

d.

K. Handling Codes for Wastes Listed Above

a. b. c. d.

15. Special Handling Instructions and Additional Information

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month Day Year
Paul Freda	[signature]	11/16/17

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Leroy O'Hara	[signature]	11/16/17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year
[illegible]	[signature]	11/16/17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

SITE
CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

CUSTOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SITE	TICKET #	CELL
Y1	1189601	

WEIGHMASTER	IN - Sheryl H. OUT - Robert S.
DATE/TIME IN	1/6/17 10:13 am
DATE/TIME OUT	1/6/17 10:39 am
VEHICLE	MCCUTCHEON
CONTAINER	
REFERENCE	7
BILL OF LADING	35849

SCALE IN GROSS WEIGHT 62,460 NET TONS 16.60
SCALE OUT TARE WEIGHT 29,260 NET WEIGHT 33,200

INBOUND
INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
16.60	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE 729

TENDERED

CHANGE

CHECK#

RS-F042UPR (07/12)

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

D7

00149997

Non-hazardous Waste Manifest	1. Generator's US EPA ID No	Manifest Document No.	2. Page 1 of 1	JWC-0208975

3. Generator's Name and Mailing Address [illegible]-29574
222 Buffalo Street
Freeport, PA 16229
4. Generator's Phone (412) 364-2200

A. 35549

B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises inc
6. US EPA ID Number: PAD013826847
C. State Trans. ID
D. Transporter's Phone ( )

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address
Carbon Limestone Landfill
8100 S. Stateline Road
Lowellville, OH 44436
10. US EPA ID Number: OHD987048212
G. State Facility's ID 330 536-8013
H. Facility's Phone ( )

	HM	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.		Virgin petroleum fuel contaminated soil/debris	001	DT	21	Y	508
b.							
c.							
d.							

J. Additional Descriptions for Materials Listed Above
a. 5076 17 0115
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a. b. c. d.

15. Special Handling Instructions and Additional Information

QUANTITY ESTIMATED

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month	Day	Year
William DiFebo [illegible]	[signature]	10	06	17

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
JOEL STANGA	[signature]	10	06	17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
[illegible]	[signature]			17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

SITE
CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd -Lowellville, OH 44436

CUSTOMER 000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:5076170115
Generator:Radhe Oil 03-29674

SITE Y1	TICKET # 1189687	CELL	
WEIGHMASTER Robert S.			
DATE/TIME IN 1/6/17 2:10 pm		DATE/TIME OUT 1/6/17 2:36 pm	
VEHICLE MCCUTCHEON		CONTAINER	
REFERENCE 7			
BILL OF LADING 35861			

SCALE IN GROSS WEIGHT 69,740 NET TONS 20.58
SCALE OUT TARE WEIGHT 28,580 NET WEIGHT 41,160

INBOUND
INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
20.58	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

SIGNATURE 729

TENDERED
CHANGE
CHECK#

RS-F042UPR (07/12)

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

D7

Non Hazardous Waste Manifest

Non Hazardous Waste Manifest	1. Generator's US EPA ID No. / Manifest Document No.	2. Page 1 of 1
3. Generator's Name and Mailing Address: Radnor Oil Dist 23674, 222 Buffalo Street, Freeport, PA 16229		A. 33801
4. Generator's Phone ( ) 412 364-2200		B. State Generator's ID
5. Transporter 1 Company Name: McCutcheon Enterprises Inc	6. US EPA ID Number: PAD013826847	C. State Trans. ID
7. Transporter 2 Company Name	8. US EPA ID Number	D. Transporter's Phone ( )
		E. State Trans. ID
9. Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S Stateline Road, Lowellville, OH 44436	10. US EPA ID Number: OHD987048212	F. Transporter's Phone ( )
		G. State Facility's ID 330 536-8013
		H. Facility's Phone ( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L. Waste No.
a. Virgin petroleum fuel contaminated soil/debris		001	DT	1124	Y	508
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above

a. 5076 17 0115
b.
c.
d.

K. Handling Codes for Wastes Listed Above

a. b. c. d.

15 Special Handling Instructions and Additional Information

QUANTITY ESTIMATED

16 **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month Day Year
x [illegible]	x [signature]	10/06/17

TRANSPORTER

17 Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Joel Stanka	[signature]	10/06/17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

19 Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year
Robert Sein	[signature]	10/06/17

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

SITE CARBON LIMESTONE LANDFILL 330-536-8013 8100 S. Stateline Rd -Lowellville, OH 44436	SITE Y1 | TICKET # 1189892 | CELL
CUSTOMER 000906 MCCUTCHEON ENTERPRISES INC. 250 PARK ROAD APOLLO, PA 15613 Contract:5076170115 Generator:Radhe Oil 03-29674	WEIGHMASTER IN - Sheryl H. OUT - Robert S. DATE/TIME IN 1/9/17 10:02 am | DATE/TIME OUT 1/9/17 10:29 am VEHICLE MCCUTCHEON | CONTAINER REFERENCE 7 BILL OF LADING 35858

SCALE IN GROSS WEIGHT 65,280 NET TONS 18.07
SCALE OUT TARE WEIGHT 29,140 NET WEIGHT 36,140

INBOUND
INVOICE

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
18.07	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE 729

MEI McCutcheon Enterprises, Inc. — Complete Waste Management

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

D7

00150015

Non Hazardous Waste Manifest

Non Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1
			JWO02090 [illegible]

3. Generator's Name and Mailing Address: [illegible] 05-29574
222 Buffalo Street
Freeport, PA 16229

4. Generator's Phone (412) 384-2200

A. 33858

B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises Inc
6. US EPA ID Number: PAD013826847

C. State Trans. ID: [illegible]
D. Transporter's Phone ( )

7. Transporter 2 Company Name
8. US EPA ID Number

E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address:
Carbon Limestone Landfill
8100 S. Stateline Road
Lowellville, OH 44436

10. US EPA ID Number: OHD987048212

G. State Facility's ID: 330-536-8013
H. Facility's Phone ( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Virgin petroleum fuel contaminated soil/debris		001	D	21	Y	509
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
5076 17 0115
a.
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a.
b.
c.
d.

15. Special Handling Instructions and Additional Information.
QUANTITY ESTIMATED

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month Day Year
X [illegible]	X [illegible]	01 09 17

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Joel Stanga	[illegible]	01 09 17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19

Printed/Typed Name	Signature	Month Day Year
[illegible]	[illegible]	[illegible]

GENERATOR COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

SITE	
CARBON LIMESTONE LANDFILL 330-536-8013 8100 S. Stateline Rd -Lowellville, OH 44436	

CUSTOMER	
000906 MCCUTCHEON ENTERPRISES INC. 250 PARK ROAD APOLLO, PA 15613 Contract:5076170115 Generator:Radhe Oil 03-29674	

SITE	TICKET #	CELL
Y1	1189999	

WEIGHMASTER	Robert S.
DATE/TIME IN	1/9/17 1:40 pm
DATE/TIME OUT	1/9/17 2:12 pm
VEHICLE	MCCUTCHEON
CONTAINER	
REFERENCE	7
BILL OF LADING	35857

SCALE IN	GROSS WEIGHT	54,140	NET TONS	12.77	INBOUND
SCALE OUT	TARE WEIGHT	28,600	NET WEIGHT	25,540	INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
12.77	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 4				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

TENDERED
CHANGE
CHECK#

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SIGNATURE 729

RS-F042UPR (07/12)

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

00150015 D7

Non-Hazardous Waste Manifest

Non-Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1 — TWO0209010
3. Generator's Name and Mailing Address: Radio OH 08-29574, 222 Buffalo Street, Freeport, PA 16229			A. 35857
4. Generator's Phone ( ) 412 364-2200			B. State Generator's ID
5. Transporter 1 Company Name: McCutcheon Enterprises Inc	6. US EPA ID Number: PAD013826847		C. State Trans. ID
7. Transporter 2 Company Name	8. US EPA ID Number		D. Transporter's Phone ( )
			E. State Trans ID
9. Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436	10. US EPA ID Number: OHD987048212		F. Transporter's Phone ( )
			G. State Facility's ID 330 536-8013
			H. Facility's Phone ( )

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L. Waste No.
a.	Virgin petroleum fuel contaminated soil/debris	001	D T	18	Y	505
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
5076 17 0115
a. c.
b. d.

K. Handling Codes for Wastes Listed Above
a. c.
b. d.

15. Special Handling Instructions and Additional Information

QUANTITY ESTIMATED

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name: [illegible] | Signature | Month Day Year: 10 09 17

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Joel Stonga | Signature | Month Day Year: 10 09 17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: [illegible] | Signature | Month Day Year: 10 09 17

GENERATOR COPY

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MEI McCUTCHEON Enterprises, Inc.
Complete Waste Management

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

Rahde

00178516

Non Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No. 081177	2. Page 1 of 1	JWO0246040

3. Generator's Name and Mailing Address
Superior Pretoleum Co.
8199 McKnight Road
Pittsburgh, PA 15237
4. Generator's Phone 412 364-2200

A. MC084577
B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises Inc
6. US EPA ID Number: PAD013826847
C. State Trans. ID
D. Transporter's Phone (724)568-3623

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address
McCutcheon Ent. Biosolids Treatment Facility
250 Park Road
Apollo, PA 15613
10. US EPA ID Number: PAD013826847
G. State Facility's ID
H. Facility's Phone (724 568-3623

HM	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L Waste No.
a.	Virgin petroleum fuel contaminated soil/debris	010	DM	4000	P	508
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
a. 020819-00005999
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a. b. c. d.

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.
I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name	Signature	Month Day Year
[illegible]	[illegible]	02 13 19

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Michael W Pearson	Michael W Pearson	02 13 19

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year

GENERATOR INITIAL COPY

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SITE

CARBON LIMESTONE LANDFILL 330-536-8013
8100 S. Stateline Rd Lowellville, OH 44436

CUSTOMER

000906
MCCUTCHEON ENTERPRISES INC.
250 PARK ROAD
APOLLO, PA 15613
Contract:50761715613
Generator:Radhe Oil -03-29674

SITE	TICKET #	CELL
Y1	1259258	

WEIGHMASTER: IN - Robert S. OUT - Heather H.

DATE/TIME IN: 10/13/17 10:54 am

DATE/TIME OUT: 10/13/17 11:21 am

VEHICLE: MCCUTCHEON

CONTAINER:

REFERENCE: 5

BILL OF LADING: 369794

SCALE IN GROSS WEIGHT 36,560 NET TONS 3.67
SCALE OUT TARE WEIGHT 29,220 NET WEIGHT 7,340

INBOUND
INVOICE

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
20.00	YD	Tracking QTY				
3.67	tn	SW-CONT SOIL W/FUEL Origin:ARMSTRONG-PA 100%				
1.00		ENVIRONMENTAL FEE 1				

Hours of operation:
M-F 8:00 AM to 3:00 PM
Sat 8:00 AM to 12:00 PM
THANK YOU FOR YOUR BUSINESS!

NET AMOUNT

TENDERED

CHANGE

CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE

McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

MEI McCUTCHEON Enterprises, Inc.
Complete Waste Management

BV5

061719

Non Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	JWO0223636

3. Generator's Name and Mailing Address: Wadle Oil 05-29674, 222 Buffalo Street, Freeport, PA 16229 — 39794

4. Generator's Phone ( ) 412 364-2200

B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises Inc — 6. US EPA ID Number: PAD013826847

C. State Trans. ID 724-568-3623

7. Transporter 2 Company Name — 8. US EPA ID Number

D. Transporter's Phone ( )

E. State Trans. ID

9. Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436 — 10. US EPA ID Number: OHD987048212

F. Transporter's Phone ( )

G. State Facility's ID 330 536-8013

H. Facility's Phone ( )

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L Waste No.
a.	Petroleum Contaminated Soil	014	DM	EST 4000	P	999
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
5076 17 15613
a. c.
b. d.

K. Handling Codes for Wastes Listed Above
a. c.
b. d.

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

X Printed/Typed Name: Austin Hess — Signature: Aaron Hess — Month Day Year: 10 13 17

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Josh Chedrick — Signature: Josh Chedrick — Month Day Year: 10 13 17

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: Robert Jenny — Signature — Month Day Year: 10 13 17

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McCutcheon Enterprises, Inc.
250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

00175755

Non Hazardous Waste Manifest	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 1	JWO0242414

3. Generator's Name and Mailing Address: Sunoco Petroleum - Fuelland #215, 1200 Butler Rd, Freeport, PA 16229 — 44344
4. Generator's Phone ( ) 412 241-7668
B. State Generator's ID

5. Transporter 1 Company Name: McCutcheon Enterprises Inc
6. US EPA ID Number: PAD013826847
C. State Trans. ID
D. Transporter's Phone ( ) 724-568-3623

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address: Carbon Limestone Landfill, 8100 S. Stateline Road, Lowellville, OH 44436
10. US EPA ID Number: OHD987048212
G. State Facility's ID
H. Facility's Phone ( ) 330 536-8013

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L Waste No.
a.	Petroleum Contaminated Soil	013	DM	EST 11000	P	999
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above
a. 5078 17 4673
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a. b. c. d.

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

I hereby certify that the above-named material is not hazardous waste as defined by 40 CFR Part 261 or any applicable state law.

Printed/Typed Name [illegible] | Signature [illegible] | Month Day Year

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name Michael W. Pearson | Signature Michael W. Pearson | Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name | Signature | Month Day Year

GENERATOR INITIAL COPY

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250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

Complete Waste Management

BV5

Non-Hazardous Waste Manifest

1. Generator's US EPA ID No. | Manifest Document No.

2. Page 1 of 1

3. Generator's Name and Mailing Address
4195 McKnight Road
Pittsburgh, PA 15237
412-364-2200

4. Generator's Phone ( )

A. (Manifest No.)

B. State Generator's ID

5. Transporter 1 Company Name
McCutcheon Enterprises Inc

6. US EPA ID Number
PAD0[illegible]

C. State Trans. ID

7. Transporter 2 Company Name

8. US EPA ID Number

D. Transporter's Phone ( )

E. State Trans. ID

9. Designated Facility Name and Site Address
McCutcheon Ent. Biosolids Treatment Facility
250 Park Road,
Apollo, PA 15613

10. US EPA ID Number
PAD0[illegible]

F. Transporter's Phone ( )

G. State Facility's ID 724-568-3623

H. Facility's Phone ( )

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM		12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.		Oil/water emulsions, oily wastewaters	003	DM	EST 550	P	
b.							
c.							
d.							

J. Additional Descriptions for Materials Listed Above
a. 042417 00005487
b.
c.
d.

K. Handling Codes for Wastes Listed Above
a.
b.
c.
d.

15. Special Handling Instructions and Additional Information
220 Buffalo St
Freeport Pa

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

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Printed/Typed Name	Signature	Month Day Year
[illegible]	[illegible]	10/3/17

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Josh Chedrick	[signature]	10/03/17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year

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250 Park Road
Apollo, PA 15613
(724)568-3623 Fax (724)568-2571
www.completewastemgmt.com

MEI McCUTCHEON Enterprises, Inc.
Complete Waste Management

BV5

Non-Hazardous Waste Manifest

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of	[illegible]
3. Generator's Name and Mailing Address: [illegible] 122 Buffalo Street Freeport, PA [illegible]			[illegible]
4. Generator's Phone ( ) [illegible] 2200			B. State Generator's ID
5. Transporter 1 Company Name McCutcheon Enterprises inc	6. US EPA ID Number PAD [illegible]		C. State Trans. ID
7. Transporter 2 Company Name	8. US EPA ID Number		D. Transporter's Phone ( )
			E. State Trans. ID
9. Designated Facility Name and Site Address Carbon Limestone Landfill 8100 S. Stateline Road Lowellville, OH 44436	10. US EPA ID Number OHD [illegible]		F. Transporter's Phone ( )
			G. State Facility's ID [illegible]
			H. Facility's Phone ( )

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	L Waste No.
a. Petroleum Contaminated Soil		514	DM	EST 4000	P	[illegible]
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above		K. Handling Codes for Wastes Listed Above	
a. 5076 47 15613	c.	a.	c.
b.	d.	b.	d.

15. Special Handling Instructions and Additional Information

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Printed/Typed Name	Signature	Month Day Year
X [illegible]	[illegible]	10 13 17

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
Josh Chedrick	[signature]	10 13 17

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year

GENERATOR INITIAL COPY

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

APPENDIX J

Well Development Sheets

Letterle & Associates, LLC

Monitoring Well Development

Project Name:	Rodhe Oil
Number:	597
Development Date:	10-3-17

Weather Conditions:	60° Sunny
Project Manager:	ET
Developer Name:	J. Packard

Well ID:	MW-3
Depth to Water:	22.89
Depth to Bottom:	29.69
Well Diameter:	2"
Methods (i.e. surge and purge):	Surge + purge

Volume Purged (gal)	Time	Pumping Rate (gal/min)	Temp (°C)	Cond(mS/cm)[2]	TDS(g/L)	DO (mg/L)[3]	pH	ORP	Comments/Clarity of Water
0	1027		16.02	1.377	0.894	1.32	6.89	-57.8	Chocolate Milk
5	1031		16.42	1.627	1.058	0.32	6.67	-64.1	SAA
10	1041		16.04	1.682	1.093	0.42	6.63	-58.5	Milky/Clearing up
15	1045		16.08	1.683	1.094	0.38	6.61	-52.3	Off Clear/Milky
20	1050		16.07	1.680	1.092	0.54	6.64	-48.1	SAA
25	1056		16.14	1.693	1.101	0.43	6.60	-42.9	~~SAA~~ Off Clear
30	1100		15.96	1.688	1.088	0.52	6.60	-39.7	Clear
35	1105		16.08	1.692	1.100	0.56	6.61	-36.5	Clear

Take a YSI reading every 2-5 gallons. Denote time each reading was taken and compare to amount purged to determine Pumping Rate
Well is considered to be developed when either no further water can be purged or water has reached a clean clarity level

Letterle & Associates, LLC

Monitoring Well Development

Project Name: Radhe Oil	Weather Conditions: 60 sunny
Number: 597	Project Manager: [illegible]
Development Date: 10-3-17	Developer Name: J. Packard

Well ID: MW-4
Depth to Water: 21.67
Depth to Bottom: 27.11
Well Diameter: 2"
Methods (i.e. surge and purge): surge and purge

Volume Purged (gal)	Time	Pumping Rate (gal/min)	Temp (°C)	Cond(mS/cm)^2	TDS(g/L)	DO (mg/L)^3	pH	ORP	Comments/Clarity of Water
0	9:43		16.12	1.10	0.728	1.82	6.82	-25.3	Chocolate milk
5	9:48		16.09	1.298	0.844	0.69	6.66	-2.7	SAA
10			16.10	1.543	1.004	0.59	6.57	17.4	SAA
15	956		16.01	1.541	1.002	1.01	6.56	26.2	milky, clearing up
20	10:00		15.96	1.517	0.986	1.11	6.58	29.0	SAA
25	1004		15.98	1.398	0.909	1.62	6.46	34.9	SAA
30	1009		15.84	1.388	0.902	1.49	6.42	45.7	Off clear,
35	10:13		15.81	1.353	0.879	1.55	6.40	50.7	SAA
40	1016		15.80	1.311	0.852	2.11	6.32	60.8	SAA
45	1020		15.76	1.318	0.857	2.68	6.31	66.0	Clear

Take a YSI reading every 2-5 gallons. Denote time each reading was taken and compare to amount purged to determine Pumping Rate
Well is considered to be developed when either no further water can be purged or water has reached a clean clarity level

Letterle & Associates, LLC

Monitoring Well Development

Project Name:	Radke Oil
Number:	597
Development Date:	10-3-17

Weather Conditions:	60° Sunny
Project Manager:	VT
Developer Name:	J. Packard

Well ID:	Mw-2
Depth to Water:	24.25
Depth to Bottom:	29.25
Well Diameter:	2"
Methods (i.e. surge and purge):	surge and purge

Volume Purged (gal)	Time	Pumping Rate (gal/min)	Temp (°C)	Cond(mS/cm)^2	TDS(g/L)	DO (mg/L)^3	pH	ORP	Comments/Clarity of Water
0	930		15.58	1.465	0.952	3.28	7.09	-78.7	Chocolate milk
2.5 (dry)	9:32		15.68	1.468	0.954	0.14	7.15	-94.1	SAA
4 dry	9:35		15.93	1.457	0.947	0.10	7.22	-109.7	SAA
5.5 (dry)	9:39		16.00	1.454	0.945	0.11	7.23	-120.1	SAA

Take a YSI reading every 2-5 gallons. Denote time each reading was taken and compare to amount purged to determine Pumping Rate
Well is considered to be developed when either no further water can be purged or water has reached a clean clarity level

Letterle & Associates, LLC

Monitoring Well Development

Project Name:	Radke Oil
Number:	597
Development Date:	10-3-17

Weather Conditions:	60 Sunny
Project Manager:	FE
Developer Name:	J. Pollard

Well ID:	MW-1
Depth to Water:	24.80
Depth to Bottom:	29.25
Well Diameter:	2"
Methods (i.e. surge and purge):	Surge + Purge

Volume Purged (gal)	Time	Pumping Rate (gal/min)	Temp (°C)	Cond(mS/cm)^2	TDS(g/L)	DO (mg/L)^3	pH	ORP	Comments/Clarity of Water
0	8:45		15.17	1.542	1.002	1.11	6.68	-37.4	Chocolate milk
5	8:50		15.51	1.781	1.159	0.47	6.85	-73.0	Same as Above SAA
7 dry	8:52		15.53	1.946	1.264	0.38	6.87	-89.3	SAA
10 gallon	8:56		15.61	1.881	1.222	0.29	6.92	-101.2	Milky off color
15 gallon			15.61	2.032	1.321	0.46	6.93	-107.4	Off color/clearing up
20	9:05		15.62	2.042	1.327	0.45	6.95	-109.0	Same as above
25	9:10	1	15.66	2.037	1.324	0.27	6.98	-117.3	SAD
30	9:14		15.61	2.055	1.335	0.41	6.97	-115.8	Just off clear
35			15.65	2.054	1.335	0.42	6.97	-114.7	Clear

Take a YSI reading every 2-5 gallons. Denote time each reading was taken and compare to amount purged to determine Pumping Rate
Well is considered to be developed when either no further water can be purged or water has reached a clean clarity level

Letterle & Associates, LLC

Monitoring Well Development

Project Name:	Radke 01
Number:	597
Development Date:	10-3-17

Weather Conditions:	60° Sunny
Project Manager:	EF
Developer Name:	J. Packard

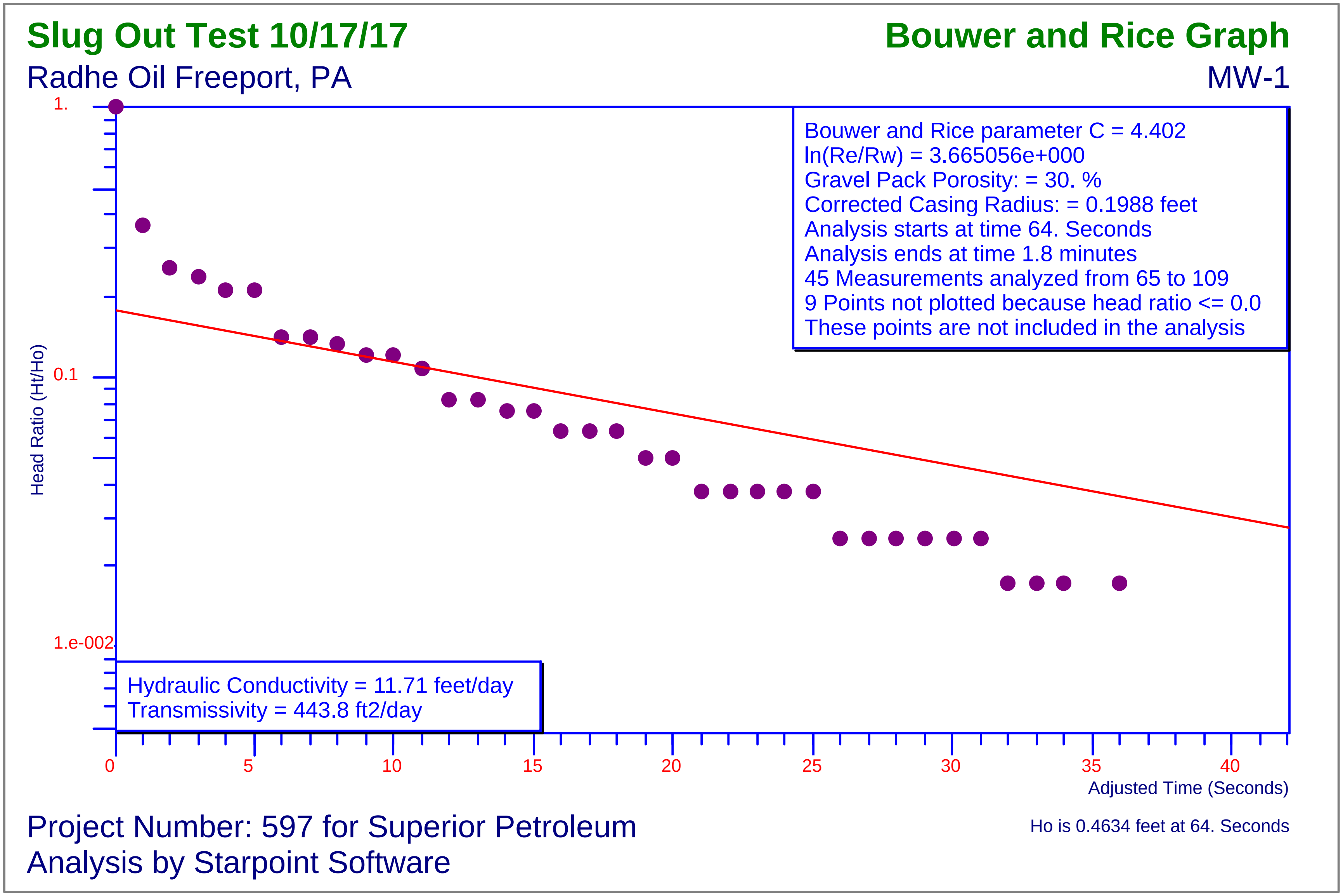
Well ID:	MW-5
Depth to Water:	25.96
Depth to Bottom:	29.45
Well Diameter:	2"
Methods (i.e. surge and purge):	surge purge

Volume Purged (gal)	Time	Pumping Rate (gal/min)	Temp (°C)	Cond(mS/cm)^2	TDS(g/L)	DO (mg/L)^3	pH	ORP	Comments/Clarity of Water
0	8:31		14.61	1.592	1.037	4.09	7.26	-16.4	Chocolate milk
2.5 (Dry)	8:33	1.28	14.79	1.689	1.094	3.11	6.63	3.6	Same as above (SAA)
3.5 (Dry)	8:38		14.74	1.793	1.165	2.85	6.38	7.6	(SAA)
4									

Take a YSI reading every 2-5 gallons. Denote time each reading was taken and compare to amount purged to determine Pumping Rate
Well is considered to be developed when either no further water can be purged or water has reached a clean clarity level

APPENDIX K

Slug Test Curves

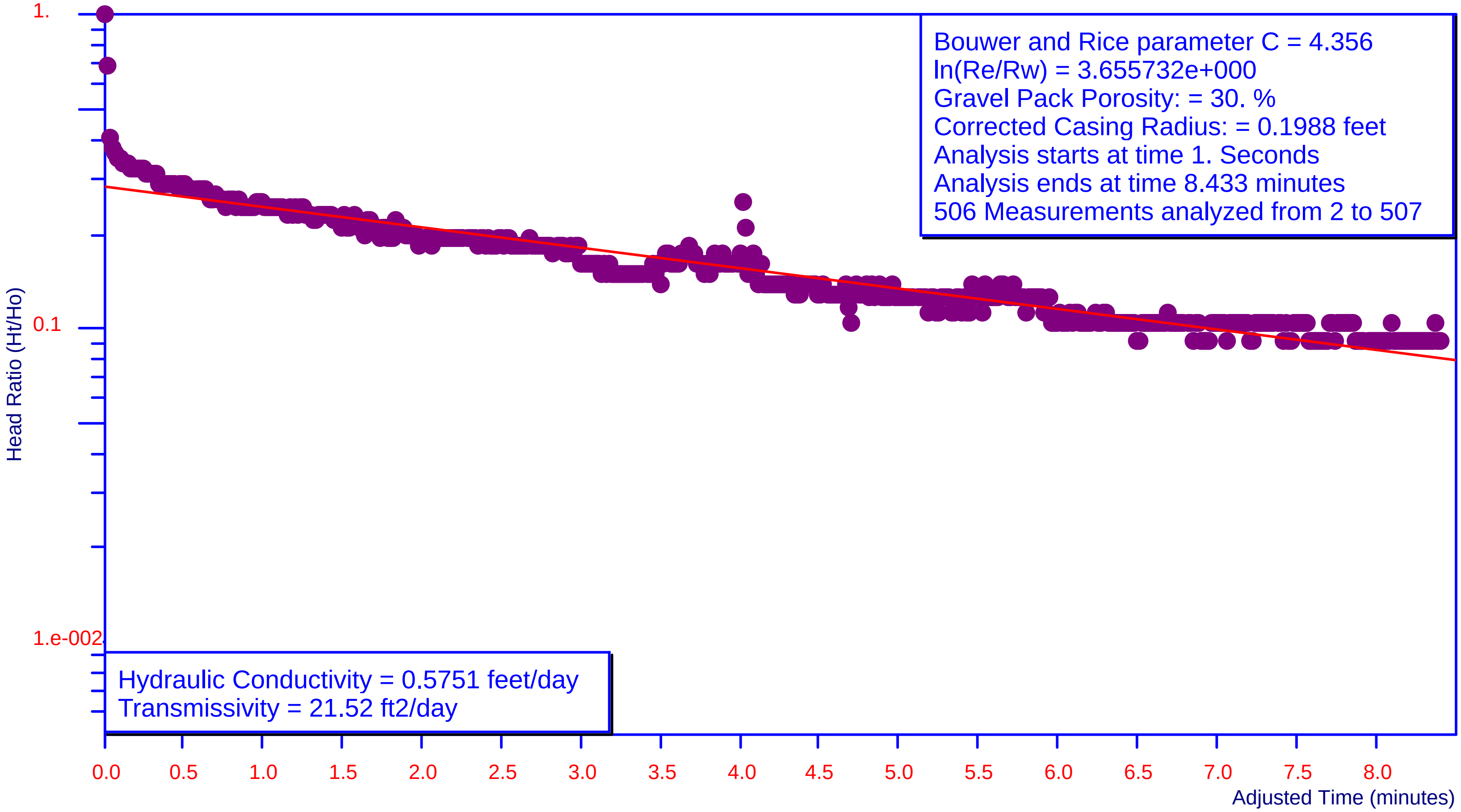

Slug Out Test 10/17/17
Bouwer and Rice Graph
Radhe Oil Freeport, PA
MW-1
Bouwer and Rice parameter C = 4.402
ln(Re/Rw) = 3.665056e+000
Gravel Pack Porosity: = 30. %
Corrected Casing Radius: = 0.1988 feet
Analysis starts at time 64. Seconds
Analysis ends at time 1.8 minutes
45 Measurements analyzed from 65 to 109
9 Points not plotted because head ratio <= 0.0
These points are not included in the analysis
Hydraulic Conductivity = 11.71 feet/day
Transmissivity = 443.8 ft2/day
Head Ratio (Ht/Ho)
1.
0.1
1.e-002
0
5
10
15
20
25
30
35
40
Adjusted Time (Seconds)
Project Number: 597 for Superior Petroleum
Analysis by Starpoint Software
Ho is 0.4634 feet at 64. Seconds

Slug Out Test 10/17/17

Bouwer and Rice Graph

Radhe Oil Freeport, PA

MW-2



Ho is 0.6212 feet at 1. Seconds

Project Number: 597 for Superior Petroleum

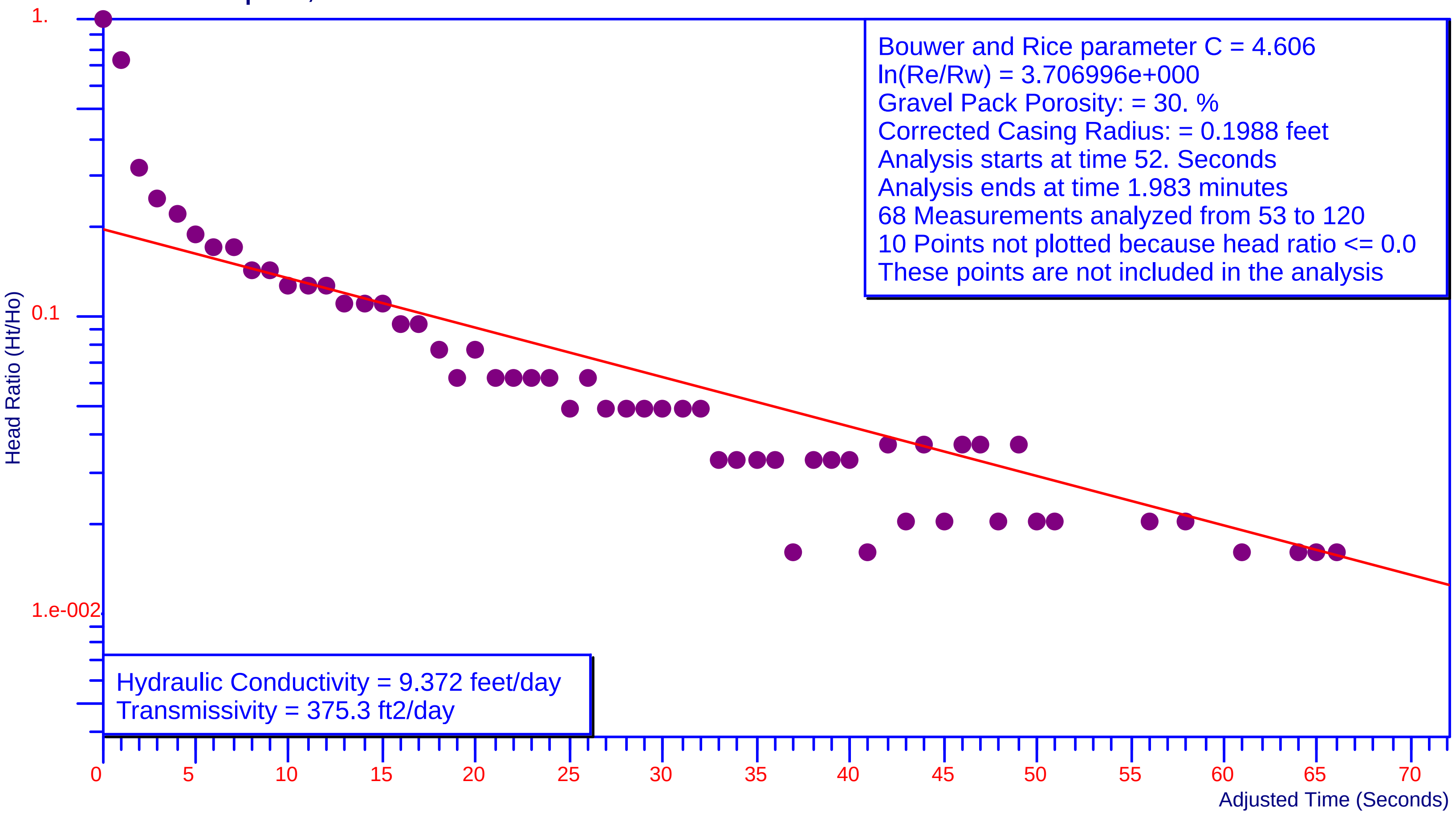
Analysis by Starpoint Software

Slug Out Test 10/17/17

Bouwer and Rice Graph

Radhe Oil Freeport, PA

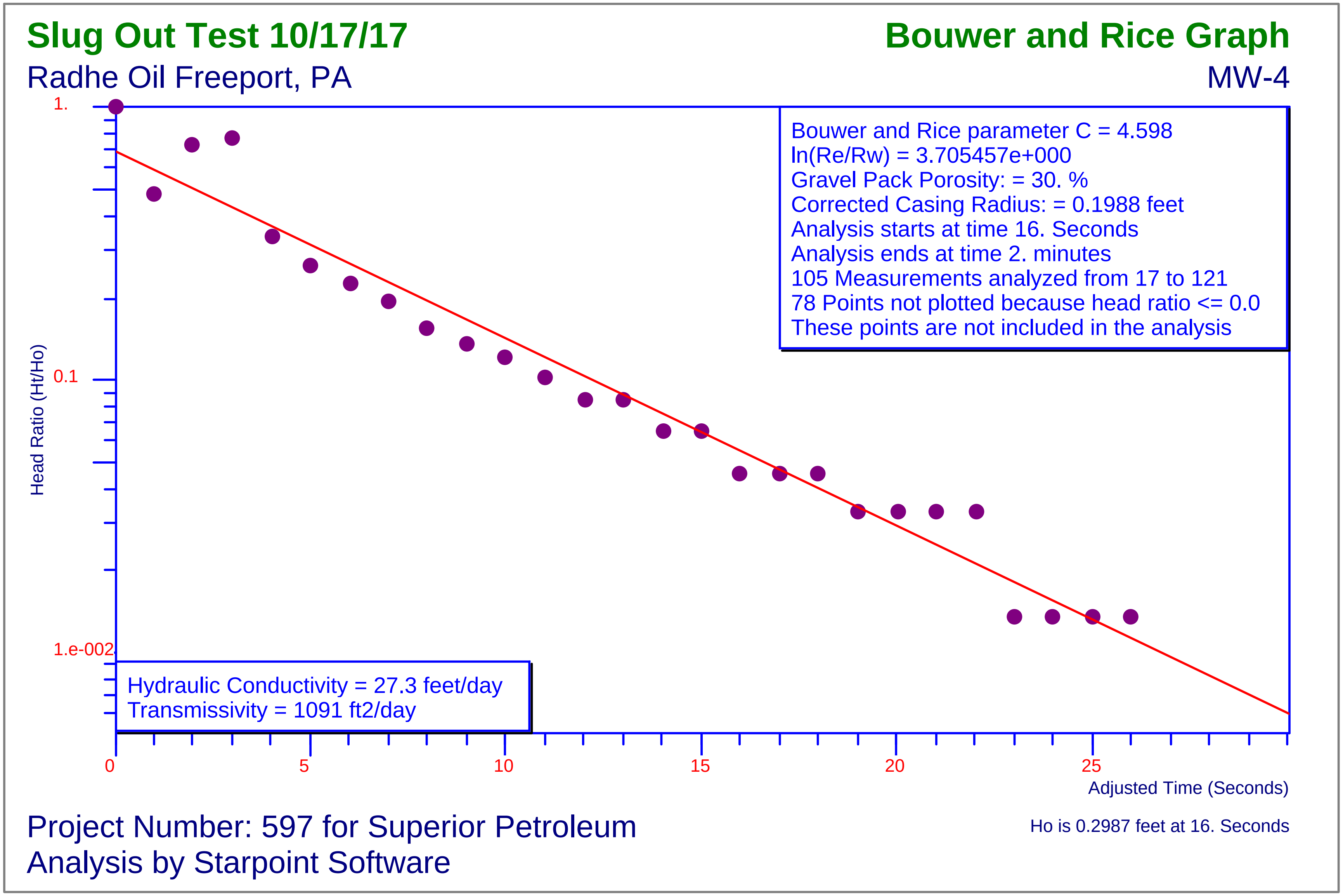
MW-3



Ho is 0.4629 feet at 52. Seconds

Project Number: 597 for Superior Petroleum

Analysis by Starpoint Software



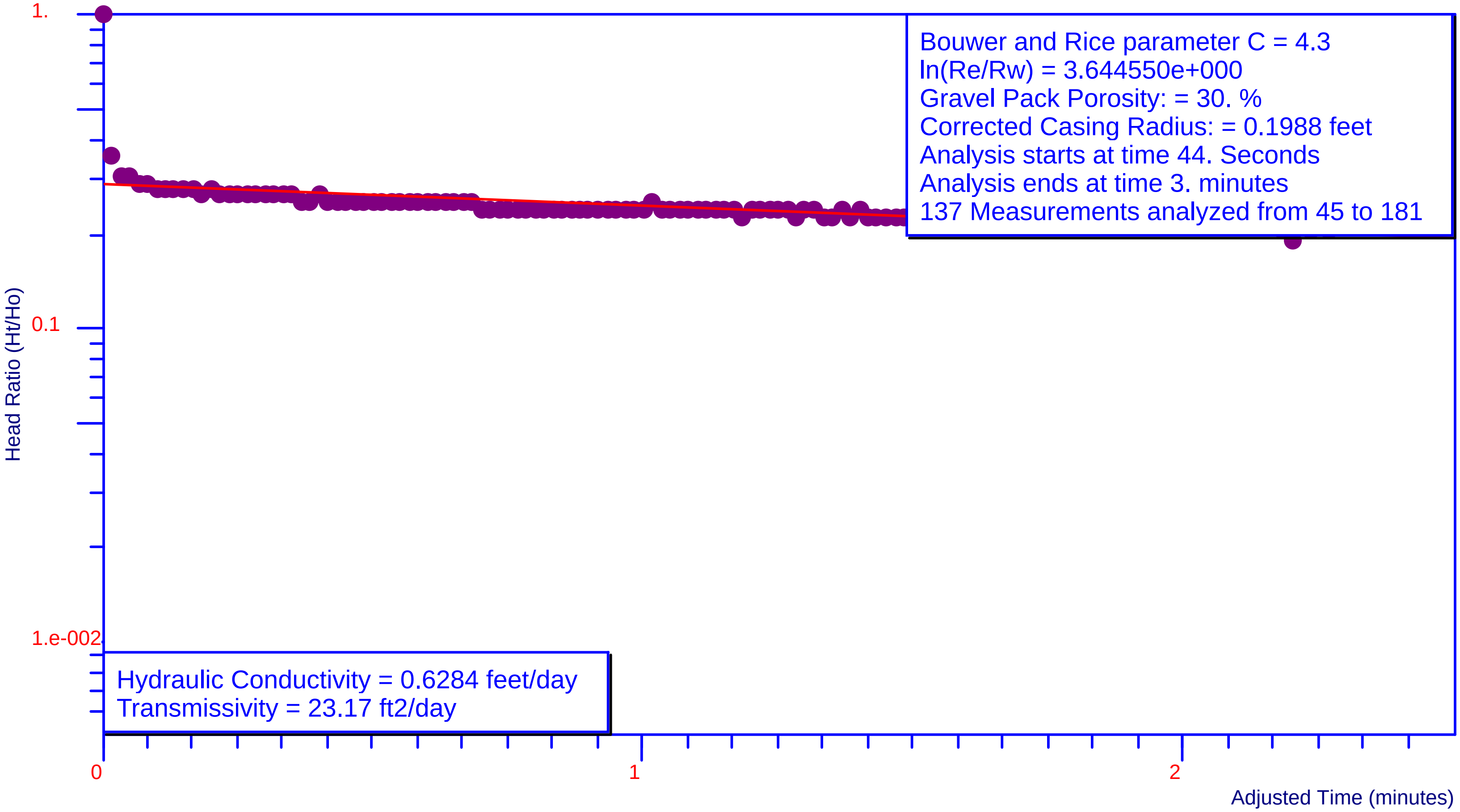
Slug Out Test 10/17/17
Bouwer and Rice Graph
Radhe Oil Freeport, PA
MW-4
Bouwer and Rice parameter C = 4.598
ln(Re/Rw) = 3.705457e+000
Gravel Pack Porosity: = 30. %
Corrected Casing Radius: = 0.1988 feet
Analysis starts at time 16. Seconds
Analysis ends at time 2. minutes
105 Measurements analyzed from 17 to 121
78 Points not plotted because head ratio <= 0.0
These points are not included in the analysis
Hydraulic Conductivity = 27.3 feet/day
Transmissivity = 1091 ft2/day
1.
0.1
1.e-002
Head Ratio (Ht/Ho)
0
5
10
15
20
25
Adjusted Time (Seconds)
Ho is 0.2987 feet at 16. Seconds
Project Number: 597 for Superior Petroleum
Analysis by Starpoint Software

Slug Out Test 10/17/17

Bouwer and Rice Graph

Radhe Oil Freeport, PA

MW-5



Ho is 0.57 feet at 44. Seconds

Project Number: 597 for Superior Petroleum

Analysis by Starpoint Software

APPENDIX L

Laboratory Analytical Reports

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

January 05, 2017

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on December 22, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Mr. Andrew Frost, Letterle & Associates
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	Fueland #221(Radhe Oil)
Pace Project No.:	30206462

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30206462001	**D-1/2'**	Solid	12/21/16 12:30	12/22/16 16:15
30206462002	**D-2/2'**	Solid	12/21/16 12:00	12/22/16 16:15
30206462003	**LS-1/3'**	Solid	12/21/16 12:45	12/22/16 16:15
30206462004	**LS-2/3'**	Solid	12/21/16 12:11	12/22/16 16:15

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30206462001	**D-1/2'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA
30206462002	**D-2/2'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA
30206462003	**LS-1/3'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA
30206462004	**LS-2/3'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	MLL	1	PASI-PA

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Greensburg, PA 15601
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ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: D-1/2' **Lab ID: 30206462001** Collected: 12/21/16 12:30 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	2650	722	500	12/28/16 12:00	12/28/16 21:50	71-43-2	1c
Ethylbenzene	**40200**	ug/kg	2650	536	500	12/28/16 12:00	12/28/16 21:50	100-41-4	1c
Isopropylbenzene (Cumene)	**6820**	ug/kg	2650	918	500	12/28/16 12:00	12/28/16 21:50	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	2650	1290	500	12/28/16 12:00	12/28/16 21:50	1634-04-4	1c
Naphthalene	**30200**	ug/kg	2650	515	500	12/28/16 12:00	12/28/16 21:50	91-20-3	1c
Toluene	**13600**	ug/kg	2650	828	500	12/28/16 12:00	12/28/16 21:50	108-88-3	1c
1,2,4-Trimethylbenzene	**180000**	ug/kg	26500	7590	5000	12/28/16 12:00	12/29/16 13:34	95-63-6	1c
1,3,5-Trimethylbenzene	**82400**	ug/kg	2650	892	500	12/28/16 12:00	12/28/16 21:50	108-67-8	1c
Xylene (Total)	**352000**	ug/kg	7960	1510	500	12/28/16 12:00	12/28/16 21:50	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	68-135		500	12/28/16 12:00	12/28/16 21:50	2037-26-5	
4-Bromofluorobenzene (S)	101	%	65-146		500	12/28/16 12:00	12/28/16 21:50	460-00-4	
1,2-Dichloroethane-d4 (S)	93	%	69-137		500	12/28/16 12:00	12/28/16 21:50	17060-07-0	
Dibromofluoromethane (S)	97	%	70-130		500	12/28/16 12:00	12/28/16 21:50	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.4**	%	0.10	0.10	1		01/04/17 12:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: D-2/2' **Lab ID: 30206462002** Collected: 12/21/16 12:00 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	258	70.3	50	12/28/16 12:00	12/28/16 22:15	71-43-2	1c
Ethylbenzene	**19700**	ug/kg	258	52.2	50	12/28/16 12:00	12/28/16 22:15	100-41-4	1c
Isopropylbenzene (Cumene)	**4190**	ug/kg	258	89.4	50	12/28/16 12:00	12/28/16 22:15	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	258	126	50	12/28/16 12:00	12/28/16 22:15	1634-04-4	1c
Naphthalene	**8770**	ug/kg	258	50.1	50	12/28/16 12:00	12/28/16 22:15	91-20-3	1c
Toluene	**19200**	ug/kg	258	80.6	50	12/28/16 12:00	12/28/16 22:15	108-88-3	1c
1,2,4-Trimethylbenzene	**72300**	ug/kg	2580	739	500	12/28/16 12:00	12/29/16 14:00	95-63-6	1c
1,3,5-Trimethylbenzene	**23600**	ug/kg	2580	869	500	12/28/16 12:00	12/29/16 14:00	108-67-8	1c
Xylene (Total)	**124000**	ug/kg	7750	1470	500	12/28/16 12:00	12/29/16 14:00	1330-20-7	
Surrogates									
Toluene-d8 (S)	103	%	68-135		50	12/28/16 12:00	12/28/16 22:15	2037-26-5	
4-Bromofluorobenzene (S)	102	%	65-146		50	12/28/16 12:00	12/28/16 22:15	460-00-4	
1,2-Dichloroethane-d4 (S)	97	%	69-137		50	12/28/16 12:00	12/28/16 22:15	17060-07-0	
Dibromofluoromethane (S)	90	%	70-130		50	12/28/16 12:00	12/28/16 22:15	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**19.9**	%	0.10	0.10	1		01/04/17 12:14		

REPORT OF LABORATORY ANALYSIS

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www.pacelabs.com

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: LS-1/3' **Lab ID: 30206462003** Collected: 12/21/16 12:45 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	**2230**	ug/kg	261	71.1	50	12/28/16 12:00	12/28/16 22:41	71-43-2	1c
Ethylbenzene	**8220**	ug/kg	261	52.8	50	12/28/16 12:00	12/28/16 22:41	100-41-4	1c
Isopropylbenzene (Cumene)	**1930**	ug/kg	261	90.4	50	12/28/16 12:00	12/28/16 22:41	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	261	127	50	12/28/16 12:00	12/28/16 22:41	1634-04-4	1c
Naphthalene	**3990**	ug/kg	261	50.7	50	12/28/16 12:00	12/28/16 22:41	91-20-3	1c
Toluene	**716**	ug/kg	261	81.6	50	12/28/16 12:00	12/28/16 22:41	108-88-3	1c
1,2,4-Trimethylbenzene	**785**	ug/kg	261	74.8	50	12/28/16 12:00	12/28/16 22:41	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	261	87.8	50	12/28/16 12:00	12/28/16 22:41	108-67-8	1c
Xylene (Total)	**4040**	ug/kg	784	148	50	12/28/16 12:00	12/28/16 22:41	1330-20-7	
Surrogates									
Toluene-d8 (S)	102	%	68-135		50	12/28/16 12:00	12/28/16 22:41	2037-26-5	
4-Bromofluorobenzene (S)	100	%	65-146		50	12/28/16 12:00	12/28/16 22:41	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	69-137		50	12/28/16 12:00	12/28/16 22:41	17060-07-0	
Dibromofluoromethane (S)	88	%	70-130		50	12/28/16 12:00	12/28/16 22:41	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.4**	%	0.10	0.10	1		01/04/17 12:14		

REPORT OF LABORATORY ANALYSIS

Pace Analytical
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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Sample: LS-2/3' **Lab ID: 30206462004** Collected: 12/21/16 12:11 Received: 12/22/16 16:15 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.0	1.3	1	12/28/16 12:00	12/28/16 21:24	71-43-2	1c
Ethylbenzene	ND	ug/kg	5.0	1.0	1	12/28/16 12:00	12/28/16 21:24	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.0	1.7	1	12/28/16 12:00	12/28/16 21:24	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.0	2.4	1	12/28/16 12:00	12/28/16 21:24	1634-04-4	1c
Naphthalene	ND	ug/kg	5.0	0.96	1	12/28/16 12:00	12/28/16 21:24	91-20-3	1c
Toluene	ND	ug/kg	5.0	1.5	1	12/28/16 12:00	12/28/16 21:24	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	5.0	1.4	1	12/28/16 12:00	12/28/16 21:24	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	5.0	1.7	1	12/28/16 12:00	12/28/16 21:24	108-67-8	1c
Xylene (Total)	ND	ug/kg	14.9	2.8	1	12/28/16 12:00	12/28/16 21:24	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	68-135		1	12/28/16 12:00	12/28/16 21:24	2037-26-5	
4-Bromofluorobenzene (S)	100	%	65-146		1	12/28/16 12:00	12/28/16 21:24	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	69-137		1	12/28/16 12:00	12/28/16 21:24	17060-07-0	
Dibromofluoromethane (S)	99	%	70-130		1	12/28/16 12:00	12/28/16 21:24	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.4**	%	0.10	0.10	1		01/04/17 12:14		

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

QC Batch: 244877 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30206462001, 30206462002, 30206462003

METHOD BLANK: 1205353 Matrix: Solid
Associated Lab Samples: 30206462001, 30206462002, 30206462003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	250	71.5	12/28/16 12:43	
1,3,5-Trimethylbenzene	ug/kg	ND	250	84.0	12/28/16 12:43	
Benzene	ug/kg	ND	250	68.0	12/28/16 12:43	
Ethylbenzene	ug/kg	ND	250	50.5	12/28/16 12:43	
Isopropylbenzene (Cumene)	ug/kg	ND	250	86.5	12/28/16 12:43	
Methyl-tert-butyl ether	ug/kg	ND	250	122	12/28/16 12:43	
Naphthalene	ug/kg	ND	250	48.5	12/28/16 12:43	
Toluene	ug/kg	ND	250	78.0	12/28/16 12:43	
Xylene (Total)	ug/kg	ND	750	142	12/28/16 12:43	
1,2-Dichloroethane-d4 (S)	%	93	69-137		12/28/16 12:43	
4-Bromofluorobenzene (S)	%	101	65-146		12/28/16 12:43	
Dibromofluoromethane (S)	%	93	70-130		12/28/16 12:43	
Toluene-d8 (S)	%	99	68-135		12/28/16 12:43	

LABORATORY CONTROL SAMPLE: 1205354

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.3	102	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.7	99	74-129	
Benzene	ug/kg	20	18.9	95	71-137	
Ethylbenzene	ug/kg	20	19.3	96	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.5	97	78-133	
Methyl-tert-butyl ether	ug/kg	20	20.0	100	77-141	
Naphthalene	ug/kg	20	19.9	100	81-126	
Toluene	ug/kg	20	18.8	94	72-127	
Xylene (Total)	ug/kg	60	58.0	97	80-124	
1,2-Dichloroethane-d4 (S)	%			93	69-137	
4-Bromofluorobenzene (S)	%			102	65-146	
Dibromofluoromethane (S)	%			97	70-130	
Toluene-d8 (S)	%			100	68-135	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

QC Batch: 244878 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30206462004

METHOD BLANK: 1205355 Matrix: Solid
Associated Lab Samples: 30206462004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.4	12/28/16 13:08	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.7	12/28/16 13:08	
Benzene	ug/kg	ND	5.0	1.4	12/28/16 13:08	
Ethylbenzene	ug/kg	ND	5.0	1.0	12/28/16 13:08	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.7	12/28/16 13:08	
Methyl-tert-butyl ether	ug/kg	ND	5.0	2.4	12/28/16 13:08	
Naphthalene	ug/kg	ND	5.0	0.97	12/28/16 13:08	
Toluene	ug/kg	ND	5.0	1.6	12/28/16 13:08	
Xylene (Total)	ug/kg	ND	15.0	2.8	12/28/16 13:08	
1,2-Dichloroethane-d4 (S)	%	97	69-137		12/28/16 13:08	
4-Bromofluorobenzene (S)	%	99	65-146		12/28/16 13:08	
Dibromofluoromethane (S)	%	97	70-130		12/28/16 13:08	
Toluene-d8 (S)	%	99	68-135		12/28/16 13:08	

LABORATORY CONTROL SAMPLE: 1205356

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.3	102	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.7	99	74-129	
Benzene	ug/kg	20	18.9	95	71-137	
Ethylbenzene	ug/kg	20	19.3	96	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.5	97	78-133	
Methyl-tert-butyl ether	ug/kg	20	20.0	100	77-141	
Naphthalene	ug/kg	20	19.9	100	81-126	
Toluene	ug/kg	20	18.8	94	72-127	
Xylene (Total)	ug/kg	60	58.0	97	80-124	
1,2-Dichloroethane-d4 (S)	%			93	69-137	
4-Bromofluorobenzene (S)	%			102	65-146	
Dibromofluoromethane (S)	%			97	70-130	
Toluene-d8 (S)	%			100	68-135	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

QC Batch: 245488 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 30206462001, 30206462002, 30206462003, 30206462004

SAMPLE DUPLICATE: 1207819

Parameter	Units	30206462001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	20.4	21.0	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 244877

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 244878

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

1c A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Fueland #221(Radhe Oil)
Pace Project No.: 30206462

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30206462001	**D-1/2'**	EPA 5035A	244877	EPA 8260B	244939
30206462002	**D-2/2'**	EPA 5035A	244877	EPA 8260B	244939
30206462003	**LS-1/3'**	EPA 5035A	244877	EPA 8260B	244939
30206462004	**LS-2/3'**	EPA 5035A	244878	EPA 8260B	244940
30206462001	**D-1/2'**	ASTM D2974-87	245488		
30206462002	**D-2/2'**	ASTM D2974-87	245488		
30206462003	**LS-1/3'**	ASTM D2974-87	245488		
30206462004	**LS-2/3'**	ASTM D2974-87	245488		

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WO#:30206462
30206462

Page: 1 of 1
2094174

Section A
Required Client Information:

Company:	Letterle Associates
Address:	2859 Oxford Blvd, Allison Park, PA 15101
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	Standard

Section B
Required Project Information:

Report To:	
Copy To:	
Purchase Order No.:	
Project Name:	Fueland #221 (Radhe Oil)
Project Number:	597

Section C

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Rachel Christner
Pace Profile #:	

REGULATORY AGENCY
☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☒ UST ☐ RCRA ☐ OTHER ______

Site Location STATE: PA

Section D
Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test	BTEX	MTBE	Cumene	naphthalene	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene						Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	D-1/2'	SL	G			12/21	12:30		4	X					X	X			X	X	X	X	X	X							001
2	D-2/2'	SL	G			↓	12:00		4	X					X	X			X	X	X	X	X	X							002
3	LS-1/3'	SL	G			↓	12:45		4	X					X	X			X	X	X	X	X	X							003
4	LS-2/3'	SL	G			↓	12:11		4	X					X	X			X	X	X	X	X	X							004
5																															
6																															
7																															
8																															
9																															
10																															
11																															
12																															

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	SSK	12/22	2:15	Alex Pau	12-22-16	2:45				
	Alex Pau	12-22-16	4:45	AlyciaR Muchorey Pace	12/22/16	1615	4.3	Y	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Eric Itle
SIGNATURE of SAMPLER: Eric Itle
DATE Signed (MM/DD/YY):

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

September 07, 2017

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on August 28, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Mr. Andrew Frost, Letterle & Associates
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	597 Superior: Radke Oil
Pace Project No.:	30228428

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30228428001	**SB1/SS7/11-13**	Solid	08/24/17 12:20	08/28/17 13:35
30228428002	**SB2/SS9/15-17**	Solid	08/24/17 15:00	08/28/17 13:35
30228428003	**SB3/SS3/4-5**	Solid	08/24/17 16:10	08/28/17 13:35
30228428004	**SB4/SS6/9-11**	Solid	08/25/17 09:40	08/28/17 13:35
30228428005	**SB5/SS4/5-7**	Solid	08/25/17 11:25	08/28/17 13:35
30228428006	**SB6/SS3/4-5**	Solid	08/25/17 12:40	08/28/17 13:35
30228428007	**SB2/WS1/24**	Water	08/24/17 14:55	08/28/17 13:35
30228428008	**SB6/WS1/24**	Water	08/25/17 12:45	08/28/17 13:35

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SAMPLE ANALYTE COUNT

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30228428001	**SB1/SS7/11-13**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	JTK	1	PASI-PA
30228428002	**SB2/SS9/15-17**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	JTK	1	PASI-PA
30228428003	**SB3/SS3/4-5**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	JTK	1	PASI-PA
30228428004	**SB4/SS6/9-11**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	JTK	1	PASI-PA
30228428005	**SB5/SS4/5-7**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	JTK	1	PASI-PA
30228428006	**SB6/SS3/4-5**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	JTK	1	PASI-PA
30228428007	**SB2/WS1/24**	EPA 8260B	JAS	13	PASI-PA
30228428008	**SB6/WS1/24**	EPA 8260B	JAS	13	PASI-PA

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB1/SS7/11-13 **Lab ID: 30228428001** Collected: 08/24/17 12:20 Received: 08/28/17 13:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.
Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	263	76.4	50	08/30/17 11:16	08/30/17 19:38	71-43-2	1c
Ethylbenzene	**15000**	ug/kg	263	80.6	50	08/30/17 11:16	08/30/17 19:38	100-41-4	1c
Isopropylbenzene (Cumene)	**4990**	ug/kg	263	76.4	50	08/30/17 11:16	08/30/17 19:38	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	263	41.6	50	08/30/17 11:16	08/30/17 19:38	1634-04-4	1c
Naphthalene	**9200**	ug/kg	263	117	50	08/30/17 11:16	08/30/17 19:38	91-20-3	1c
Toluene	ND	ug/kg	263	76.4	50	08/30/17 11:16	08/30/17 19:38	108-88-3	1c
1,2,4-Trimethylbenzene	**95400**	ug/kg	2630	690	500	08/30/17 11:16	08/31/17 14:07	95-63-6	1c
1,3,5-Trimethylbenzene	**29800**	ug/kg	2630	706	500	08/30/17 11:16	08/31/17 14:07	108-67-8	1c
Xylene (Total)	**27900**	ug/kg	790	232	50	08/30/17 11:16	08/30/17 19:38	1330-20-7	
Surrogates									
Toluene-d8 (S)	105	%	68-135		50	08/30/17 11:16	08/30/17 19:38	2037-26-5	
4-Bromofluorobenzene (S)	108	%	65-146		50	08/30/17 11:16	08/30/17 19:38	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	69-137		50	08/30/17 11:16	08/30/17 19:38	17060-07-0	
Dibromofluoromethane (S)	87	%	70-130		50	08/30/17 11:16	08/30/17 19:38	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.6**	%	0.10	0.10	1		09/06/17 14:44		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB2/SS9/15-17 **Lab ID: 30228428002** Collected: 08/24/17 15:00 Received: 08/28/17 13:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.
Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.1	1.5	1	08/30/17 11:12	08/30/17 13:54	71-43-2	1c
Ethylbenzene	**553**	ug/kg	262	80.2	50	08/31/17 13:39	08/31/17 21:46	100-41-4	1c
Isopropylbenzene (Cumene)	**252**	ug/kg	5.1	1.5	1	08/30/17 11:12	08/30/17 13:54	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.1	0.81	1	08/30/17 11:12	08/30/17 13:54	1634-04-4	1c
Naphthalene	**1720**	ug/kg	262	116	50	08/31/17 13:39	08/31/17 21:46	91-20-3	1c
Toluene	**16.3**	ug/kg	5.1	1.5	1	08/30/17 11:12	08/30/17 13:54	108-88-3	1c
1,2,4-Trimethylbenzene	**5950**	ug/kg	262	68.7	50	08/31/17 13:39	08/31/17 21:46	95-63-6	1c
1,3,5-Trimethylbenzene	**1650**	ug/kg	262	70.3	50	08/31/17 13:39	08/31/17 21:46	108-67-8	1c
Xylene (Total)	**2860**	ug/kg	786	231	50	08/31/17 13:39	08/31/17 21:46	1330-20-7	
Surrogates									
Toluene-d8 (S)	109	%	68-135		1	08/30/17 11:12	08/30/17 13:54	2037-26-5	
4-Bromofluorobenzene (S)	114	%	65-146		1	08/30/17 11:12	08/30/17 13:54	460-00-4	
1,2-Dichloroethane-d4 (S)	97	%	69-137		1	08/30/17 11:12	08/30/17 13:54	17060-07-0	
Dibromofluoromethane (S)	94	%	70-130		1	08/30/17 11:12	08/30/17 13:54	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.8**	%	0.10	0.10	1		09/06/17 14:44		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB3/SS3/4-5 **Lab ID: 30228428003** Collected: 08/24/17 16:10 Received: 08/28/17 13:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	4.6	1.3	1	08/31/17 13:36	08/31/17 14:16	71-43-2	1c
Ethylbenzene	ND	ug/kg	4.6	1.4	1	08/31/17 13:36	08/31/17 14:16	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	4.6	1.3	1	08/31/17 13:36	08/31/17 14:16	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	4.6	0.72	1	08/31/17 13:36	08/31/17 14:16	1634-04-4	1c
Naphthalene	ND	ug/kg	4.6	2.0	1	08/31/17 13:36	08/31/17 14:16	91-20-3	1c
Toluene	ND	ug/kg	4.6	1.3	1	08/31/17 13:36	08/31/17 14:16	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	4.6	1.2	1	08/31/17 13:36	08/31/17 14:16	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	4.6	1.2	1	08/31/17 13:36	08/31/17 14:16	108-67-8	1c
Xylene (Total)	ND	ug/kg	13.7	4.0	1	08/31/17 13:36	08/31/17 14:16	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%	68-135		1	08/31/17 13:36	08/31/17 14:16	2037-26-5	
4-Bromofluorobenzene (S)	95	%	65-146		1	08/31/17 13:36	08/31/17 14:16	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	69-137		1	08/31/17 13:36	08/31/17 14:16	17060-07-0	
Dibromofluoromethane (S)	96	%	70-130		1	08/31/17 13:36	08/31/17 14:16	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**14.3**	%	0.10	0.10	1		09/06/17 14:45		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB4/SS6/9-11 **Lab ID: 30228428004** Collected: 08/25/17 09:40 Received: 08/28/17 13:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.0	1.4	1	08/30/17 11:12	08/30/17 14:47	71-43-2	1c
Ethylbenzene	ND	ug/kg	5.0	1.5	1	08/30/17 11:12	08/30/17 14:47	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.0	1.4	1	08/30/17 11:12	08/30/17 14:47	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.0	0.79	1	08/30/17 11:12	08/30/17 14:47	1634-04-4	1c
Naphthalene	ND	ug/kg	5.0	2.2	1	08/30/17 11:12	08/30/17 14:47	91-20-3	1c
Toluene	ND	ug/kg	5.0	1.4	1	08/30/17 11:12	08/30/17 14:47	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	5.0	1.3	1	08/30/17 11:12	08/30/17 14:47	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	5.0	1.3	1	08/30/17 11:12	08/30/17 14:47	108-67-8	1c
Xylene (Total)	ND	ug/kg	14.9	4.4	1	08/30/17 11:12	08/30/17 14:47	1330-20-7	
Surrogates									
Toluene-d8 (S)	127	%	68-135		1	08/30/17 11:12	08/30/17 14:47	2037-26-5	
4-Bromofluorobenzene (S)	106	%	65-146		1	08/30/17 11:12	08/30/17 14:47	460-00-4	
1,2-Dichloroethane-d4 (S)	112	%	69-137		1	08/30/17 11:12	08/30/17 14:47	17060-07-0	
Dibromofluoromethane (S)	83	%	70-130		1	08/30/17 11:12	08/30/17 14:47	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**19.5**	%	0.10	0.10	1		09/06/17 14:45		

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ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB5/SS4/5-7 **Lab ID: 30228428005** Collected: 08/25/17 11:25 Received: 08/28/17 13:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.
Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.9	1.7	1	08/30/17 11:12	08/30/17 15:14	71-43-2	1c
Ethylbenzene	ND	ug/kg	5.9	1.8	1	08/30/17 11:12	08/30/17 15:14	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.9	1.7	1	08/30/17 11:12	08/30/17 15:14	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.9	0.93	1	08/30/17 11:12	08/30/17 15:14	1634-04-4	1c
Naphthalene	ND	ug/kg	5.9	2.6	1	08/30/17 11:12	08/30/17 15:14	91-20-3	1c
Toluene	ND	ug/kg	5.9	1.7	1	08/30/17 11:12	08/30/17 15:14	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	5.9	1.5	1	08/30/17 11:12	08/30/17 15:14	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	5.9	1.6	1	08/30/17 11:12	08/30/17 15:14	108-67-8	1c
Xylene (Total)	ND	ug/kg	17.7	5.2	1	08/30/17 11:12	08/30/17 15:14	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	68-135		1	08/30/17 11:12	08/30/17 15:14	2037-26-5	
4-Bromofluorobenzene (S)	95	%	65-146		1	08/30/17 11:12	08/30/17 15:14	460-00-4	
1,2-Dichloroethane-d4 (S)	93	%	69-137		1	08/30/17 11:12	08/30/17 15:14	17060-07-0	
Dibromofluoromethane (S)	94	%	70-130		1	08/30/17 11:12	08/30/17 15:14	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.1**	%	0.10	0.10	1		09/06/17 14:45		

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ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB6/SS3/4-5 **Lab ID: 30228428006** Collected: 08/25/17 12:40 Received: 08/28/17 13:35 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.
Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.0	1.5	1	08/30/17 11:12	08/30/17 15:40	71-43-2	1c
Ethylbenzene	ND	ug/kg	5.0	1.5	1	08/30/17 11:12	08/30/17 15:40	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.0	1.5	1	08/30/17 11:12	08/30/17 15:40	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.0	0.79	1	08/30/17 11:12	08/30/17 15:40	1634-04-4	1c
Naphthalene	ND	ug/kg	5.0	2.2	1	08/30/17 11:12	08/30/17 15:40	91-20-3	1c
Toluene	ND	ug/kg	5.0	1.5	1	08/30/17 11:12	08/30/17 15:40	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	5.0	1.3	1	08/30/17 11:12	08/30/17 15:40	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	5.0	1.3	1	08/30/17 11:12	08/30/17 15:40	108-67-8	1c
Xylene (Total)	ND	ug/kg	15.0	4.4	1	08/30/17 11:12	08/30/17 15:40	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	68-135		1	08/30/17 11:12	08/30/17 15:40	2037-26-5	
4-Bromofluorobenzene (S)	93	%	65-146		1	08/30/17 11:12	08/30/17 15:40	460-00-4	
1,2-Dichloroethane-d4 (S)	93	%	69-137		1	08/30/17 11:12	08/30/17 15:40	17060-07-0	
Dibromofluoromethane (S)	95	%	70-130		1	08/30/17 11:12	08/30/17 15:40	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**15.5**	%	0.10	0.10	1		09/06/17 14:45		

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ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB2/WS1/24 **Lab ID: 30228428007** Collected: 08/24/17 14:55 Received: 08/28/17 13:35 Matrix: Water

Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		08/31/17 15:27	71-43-2	
Ethylbenzene	**12.5**	ug/L	1.0	0.21	1		08/31/17 15:27	100-41-4	
Isopropylbenzene (Cumene)	**1.7**	ug/L	1.0	0.25	1		08/31/17 15:27	98-82-8	
Methyl-tert-butyl ether	**2.0**	ug/L	1.0	0.27	1		08/31/17 15:27	1634-04-4	
Naphthalene	**4.2**	ug/L	2.0	0.39	1		08/31/17 15:27	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		08/31/17 15:27	108-88-3	
1,2,4-Trimethylbenzene	**31.7**	ug/L	1.0	0.21	1		08/31/17 15:27	95-63-6	
1,3,5-Trimethylbenzene	**12.2**	ug/L	1.0	0.40	1		08/31/17 15:27	108-67-8	
Xylene (Total)	**45.5**	ug/L	3.0	1.1	1		08/31/17 15:27	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	80-120		1		08/31/17 15:27	2037-26-5	
4-Bromofluorobenzene (S)	99	%	79-129		1		08/31/17 15:27	460-00-4	
1,2-Dichloroethane-d4 (S)	116	%	80-120		1		08/31/17 15:27	17060-07-0	
Dibromofluoromethane (S)	97	%	80-120		1		08/31/17 15:27	1868-53-7	

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ANALYTICAL RESULTS

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Sample: SB6/WS1/24 **Lab ID: 30228428008** Collected: 08/25/17 12:45 Received: 08/28/17 13:35 Matrix: Water

Comments: • Trip blank was not received with samples.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		08/31/17 14:32	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		08/31/17 14:32	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		08/31/17 14:32	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		08/31/17 14:32	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		08/31/17 14:32	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		08/31/17 14:32	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/31/17 14:32	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		08/31/17 14:32	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		08/31/17 14:32	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	80-120		1		08/31/17 14:32	2037-26-5	
4-Bromofluorobenzene (S)	99	%	79-129		1		08/31/17 14:32	460-00-4	
1,2-Dichloroethane-d4 (S)	113	%	80-120		1		08/31/17 14:32	17060-07-0	
Dibromofluoromethane (S)	102	%	80-120		1		08/31/17 14:32	1868-53-7	

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QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

QC Batch: 269915 | Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A | Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30228428001

METHOD BLANK: 1328256 | Matrix: Solid
Associated Lab Samples: 30228428001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	250	65.5	08/30/17 13:01	
1,3,5-Trimethylbenzene	ug/kg	ND	250	67.0	08/30/17 13:01	
Benzene	ug/kg	ND	250	72.5	08/30/17 13:01	
Ethylbenzene	ug/kg	ND	250	76.5	08/30/17 13:01	
Isopropylbenzene (Cumene)	ug/kg	ND	250	72.5	08/30/17 13:01	
Methyl-tert-butyl ether	ug/kg	ND	250	39.5	08/30/17 13:01	
Naphthalene	ug/kg	ND	250	111	08/30/17 13:01	
Toluene	ug/kg	ND	250	72.5	08/30/17 13:01	
Xylene (Total)	ug/kg	ND	750	220	08/30/17 13:01	
1,2-Dichloroethane-d4 (S)	%	91	69-137		08/30/17 13:01	
4-Bromofluorobenzene (S)	%	93	65-146		08/30/17 13:01	
Dibromofluoromethane (S)	%	95	70-130		08/30/17 13:01	
Toluene-d8 (S)	%	98	68-135		08/30/17 13:01	

LABORATORY CONTROL SAMPLE: 1328257

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.1	101	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.6	98	74-129	
Benzene	ug/kg	20	20.0	100	71-137	
Ethylbenzene	ug/kg	20	18.5	92	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.1	96	78-133	
Methyl-tert-butyl ether	ug/kg	20	20.3	101	77-141	
Naphthalene	ug/kg	20	21.1	106	81-126	
Toluene	ug/kg	20	18.7	94	72-127	
Xylene (Total)	ug/kg	60	57.8	96	80-124	
1,2-Dichloroethane-d4 (S)	%			85	69-137	
4-Bromofluorobenzene (S)	%			94	65-146	
Dibromofluoromethane (S)	%			96	70-130	
Toluene-d8 (S)	%			97	68-135	

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QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

QC Batch: 270037 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30228428002, 30228428004, 30228428005, 30228428006

METHOD BLANK: 1328780 Matrix: Solid
Associated Lab Samples: 30228428002, 30228428004, 30228428005, 30228428006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.3	08/30/17 13:28	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.3	08/30/17 13:28	
Benzene	ug/kg	ND	5.0	1.4	08/30/17 13:28	
Ethylbenzene	ug/kg	ND	5.0	1.5	08/30/17 13:28	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.4	08/30/17 13:28	
Methyl-tert-butyl ether	ug/kg	ND	5.0	0.79	08/30/17 13:28	
Naphthalene	ug/kg	ND	5.0	2.2	08/30/17 13:28	
Toluene	ug/kg	ND	5.0	1.4	08/30/17 13:28	
Xylene (Total)	ug/kg	ND	15.0	4.4	08/30/17 13:28	
1,2-Dichloroethane-d4 (S)	%	93	69-137		08/30/17 13:28	
4-Bromofluorobenzene (S)	%	93	65-146		08/30/17 13:28	
Dibromofluoromethane (S)	%	95	70-130		08/30/17 13:28	
Toluene-d8 (S)	%	96	68-135		08/30/17 13:28	

LABORATORY CONTROL SAMPLE: 1328781

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.1	101	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.6	98	74-129	
Benzene	ug/kg	20	20.0	100	71-137	
Ethylbenzene	ug/kg	20	18.5	92	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.1	96	78-133	
Methyl-tert-butyl ether	ug/kg	20	20.3	101	77-141	
Naphthalene	ug/kg	20	21.1	106	81-126	
Toluene	ug/kg	20	18.7	94	72-127	
Xylene (Total)	ug/kg	60	57.8	96	80-124	
1,2-Dichloroethane-d4 (S)	%			85	69-137	
4-Bromofluorobenzene (S)	%			94	65-146	
Dibromofluoromethane (S)	%			96	70-130	
Toluene-d8 (S)	%			97	68-135	

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QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

QC Batch: 270219 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30228428002

METHOD BLANK: 1329725 Matrix: Solid
Associated Lab Samples: 30228428002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	250	65.5	08/31/17 13:15	
1,3,5-Trimethylbenzene	ug/kg	ND	250	67.0	08/31/17 13:15	
Ethylbenzene	ug/kg	ND	250	76.5	08/31/17 13:15	
Naphthalene	ug/kg	ND	250	111	08/31/17 13:15	
Xylene (Total)	ug/kg	ND	750	220	08/31/17 13:15	
1,2-Dichloroethane-d4 (S)	%	93	69-137		08/31/17 13:15	
4-Bromofluorobenzene (S)	%	95	65-146		08/31/17 13:15	
Dibromofluoromethane (S)	%	96	70-130		08/31/17 13:15	
Toluene-d8 (S)	%	97	68-135		08/31/17 13:15	

LABORATORY CONTROL SAMPLE: 1329726

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.2	101	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.8	99	74-129	
Ethylbenzene	ug/kg	20	18.0	90	78-126	
Naphthalene	ug/kg	20	18.7	94	81-126	
Xylene (Total)	ug/kg	60	54.7	91	80-124	
1,2-Dichloroethane-d4 (S)	%			95	69-137	
4-Bromofluorobenzene (S)	%			93	65-146	
Dibromofluoromethane (S)	%			94	70-130	
Toluene-d8 (S)	%			98	68-135	

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QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

QC Batch: 270221 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30228428003

METHOD BLANK: 1329729 Matrix: Solid
Associated Lab Samples: 30228428003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.3	08/31/17 13:41	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.3	08/31/17 13:41	
Benzene	ug/kg	ND	5.0	1.4	08/31/17 13:41	
Ethylbenzene	ug/kg	ND	5.0	1.5	08/31/17 13:41	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.4	08/31/17 13:41	
Methyl-tert-butyl ether	ug/kg	ND	5.0	0.79	08/31/17 13:41	
Naphthalene	ug/kg	ND	5.0	2.2	08/31/17 13:41	
Toluene	ug/kg	ND	5.0	1.4	08/31/17 13:41	
Xylene (Total)	ug/kg	ND	15.0	4.4	08/31/17 13:41	
1,2-Dichloroethane-d4 (S)	%	95	69-137		08/31/17 13:41	
4-Bromofluorobenzene (S)	%	94	65-146		08/31/17 13:41	
Dibromofluoromethane (S)	%	96	70-130		08/31/17 13:41	
Toluene-d8 (S)	%	99	68-135		08/31/17 13:41	

LABORATORY CONTROL SAMPLE: 1329730

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	20.2	101	79-125	
1,3,5-Trimethylbenzene	ug/kg	20	19.8	99	74-129	
Benzene	ug/kg	20	19.4	97	71-137	
Ethylbenzene	ug/kg	20	18.0	90	78-126	
Isopropylbenzene (Cumene)	ug/kg	20	19.6	98	78-133	
Methyl-tert-butyl ether	ug/kg	20	21.0	105	77-141	
Naphthalene	ug/kg	20	18.7	94	81-126	
Toluene	ug/kg	20	18.6	93	72-127	
Xylene (Total)	ug/kg	60	54.7	91	80-124	
1,2-Dichloroethane-d4 (S)	%			95	69-137	
4-Bromofluorobenzene (S)	%			93	65-146	
Dibromofluoromethane (S)	%			94	70-130	
Toluene-d8 (S)	%			98	68-135	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

QC Batch: 270185 | Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B | Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30228428007, 30228428008

METHOD BLANK: 1329495 | Matrix: Water
Associated Lab Samples: 30228428007, 30228428008

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.21	08/31/17 11:48	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.40	08/31/17 11:48	
Benzene	ug/L	ND	1.0	0.35	08/31/17 11:48	
Ethylbenzene	ug/L	ND	1.0	0.21	08/31/17 11:48	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.25	08/31/17 11:48	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.27	08/31/17 11:48	
Naphthalene	ug/L	ND	2.0	0.39	08/31/17 11:48	
Toluene	ug/L	ND	1.0	0.29	08/31/17 11:48	
Xylene (Total)	ug/L	ND	3.0	1.1	08/31/17 11:48	
1,2-Dichloroethane-d4 (S)	%	117	80-120		08/31/17 11:48	
4-Bromofluorobenzene (S)	%	99	79-129		08/31/17 11:48	
Dibromofluoromethane (S)	%	102	80-120		08/31/17 11:48	
Toluene-d8 (S)	%	99	80-120		08/31/17 11:48	

LABORATORY CONTROL SAMPLE: 1329496

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	22.5	112	70-130	
1,3,5-Trimethylbenzene	ug/L	20	22.4	112	70-130	
Benzene	ug/L	20	21.8	109	70-130	
Ethylbenzene	ug/L	20	21.9	110	70-130	
Isopropylbenzene (Cumene)	ug/L	20	22.2	111	70-130	
Methyl-tert-butyl ether	ug/L	20	22.1	110	70-130	
Naphthalene	ug/L	20	23.1	116	70-130	
Toluene	ug/L	20	21.0	105	70-130	
Xylene (Total)	ug/L	60	66.3	110	70-130	
1,2-Dichloroethane-d4 (S)	%			105	80-120	
4-Bromofluorobenzene (S)	%			99	79-129	
Dibromofluoromethane (S)	%			104	80-120	
Toluene-d8 (S)	%			97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1329497 1329498

Parameter	Units	30228641001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	19.8	21.5	99	107	75-125	8	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	18.7	21.3	94	107	76-121	13	30	
Benzene	ug/L	ND	20	20	20.3	22.0	102	110	67-121	8	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1329497 1329498

Parameter	Units	30228641001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	19.5	21.1	98	105	70-127	7	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	19.5	21.7	98	108	80-122	11	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	22.1	20.6	110	103	79-135	7	30	
Naphthalene	ug/L	ND	20	20	18.9	20.9	95	105	62-131	10	30	
Toluene	ug/L	ND	20	20	20.8	22.4	104	112	77-125	7	30	
Xylene (Total)	ug/L	ND	60	60	60.6	66.3	101	111	69-128	9	30	
1,2-Dichloroethane-d4 (S)	%						110	112	80-120			
4-Bromofluorobenzene (S)	%						99	101	79-129			
Dibromofluoromethane (S)	%						108	103	80-120			
Toluene-d8 (S)	%						100	98	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

QC Batch: 270698 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 30228428001, 30228428002, 30228428003, 30228428004, 30228428005, 30228428006

SAMPLE DUPLICATE: 1331930

Parameter	Units	92352510001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	82.2	82.2	0	20	

SAMPLE DUPLICATE: 1331979

Parameter	Units	30228428001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	16.6	16.2	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project:	597 Superior: Radke Oil
Pace Project No.:	30228428

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA   Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 269915

[M5]   A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 270037

[M5]   A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 270219

[M5]   A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 270221

[M5]   A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

1c   A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 597 Superior: Radke Oil
Pace Project No.: 30228428

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30228428001	**SB1/SS7/11-13**	EPA 5035A	269915	EPA 8260B	270055
30228428002	**SB2/SS9/15-17**	EPA 5035A	270037	EPA 8260B	270054
30228428002	**SB2/SS9/15-17**	EPA 5035A	270219	EPA 8260B	270234
30228428003	**SB3/SS3/4-5**	EPA 5035A	270221	EPA 8260B	270233
30228428004	**SB4/SS6/9-11**	EPA 5035A	270037	EPA 8260B	270054
30228428005	**SB5/SS4/5-7**	EPA 5035A	270037	EPA 8260B	270054
30228428006	**SB6/SS3/4-5**	EPA 5035A	270037	EPA 8260B	270054
30228428007	**SB2/WS1/24**	EPA 8260B	270185		
30228428008	**SB6/WS1/24**	EPA 8260B	270185		
30228428001	**SB1/SS7/11-13**	ASTM D2974-87	270698		
30228428002	**SB2/SS9/15-17**	ASTM D2974-87	270698		
30228428003	**SB3/SS3/4-5**	ASTM D2974-87	270698		
30228428004	**SB4/SS6/9-11**	ASTM D2974-87	270698		
30228428005	**SB5/SS4/5-7**	ASTM D2974-87	270698		
30228428006	**SB6/SS3/4-5**	ASTM D2974-87	270698		

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WO#: 30228428

30228428

Page: 1 of 1

2166525

Section A
Required Client Information:

Company:	Letterle - Assoc
Address:	2859 Oxford Blvd, Allison Park, PA 15101
Email To:	eric@letterleassociates.com
Phone:	412-486-0600
Fax:	
Requested Due Date/TAT:	Standard

Section B
Required Project Information:

Report To:	Eric Itle
Copy To:	
Purchase Order No.:	
Project Name:	Superior: Radhe Oil
Project Number:	597

Invoice Information:

Attention:	T. Jerrewiske
Company Name:	Letterle - Assoc
Address:	
Pace Quote Reference:	
Pace Project Manager:	Rachel Christner
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
✓ UST ☐ RCRA ☐ OTHER

Site Location STATE: PA

Section D
Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Cumene	Naphthalene	1,2,4 TMB	1,3,5 TMB	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	SB1 SS7 11-13	SL	G		~~8.24~~	8.24	1220		4	1					2	1			X	X	X	X	X	X	X	X	X		001
2	SB2 SS9 15-17	↓	↓			8.24	1500		↓	↓					↓	↓			X	X	X	X	X	X	X	X	X		002
3	SB3 SS3 4-5	↓	↓			8.24	1610		↓	↓					↓	↓			X	X	X	X	X	X	X	X	X		003
4	SB4 SS6 9-11	↓	↓			8.25	~~0940~~		↓	↓					↓	↓			X	X	X	X	X	X	X	X	X		004
5	SB5 SS4 5-7	↓	↓			8.25	1105		↓	↓					↓	↓			X	X	X	X	X	X	X	X	X		005
6	SB6 SS3 4-5	↓	↓			8.25	1240		↓	↓					↓	↓			X	X	X	X	X	X	X	X	X		006
7	SB2 WS1 24	WT	↓			8.24	1455		3				3						X	X	X	X	X	X	X	X	X		007
8	SB6 WS1 24	WT	↓			8.25	1245		3				3						X	X	X	X	X	X	X	X	X		008
9																													
10																													
11																													
12																													

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
SB4 SS6 9-11 @ 0940	S&K	8/28/17	9:00	[signature]	8-28-17	9:00				
	[signature]	8-28-17	1:35	[signature]	8/28/17	1335	2.9	Y	N	Y
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Alex Kantor

SIGNATURE of SAMPLER: [signature]

DATE Signed (MM/DD/YY): 08/25/17

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

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WO# : 30228428
30228428

Section A
Required Client Information:

Company: LeHele - Assoc
Address: 2859 Oxford Blvd
Allison Park, PA 15101
Email To: eric@letterleassociates.com
Phone: 412-486-0600 Fax:
Requested Due Date/TAT: Standard

Section B
Required Project Information:

Report To: Eric Itle
Copy To:
Purchase Order No.:
Project Name: Superior: Radhe Oil
Project Number: 597

Invoice Information:
Attention: T. Jerrewicz
Company Name: LeHele - Assoc
Address:
Pace Quote Reference:
Pace Project Manager: Rachel Christner
Pace Profile #:

Page: 1 of 1

2166525

REGULATORY AGENCY
☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☑ UST ☐ RCRA ☐ OTHER ______

Site Location STATE: PA

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes
MATRIX / CODE
Drinking Water DW
Water WT
Waste Water WW
Product P
Soil/Solid SL
Oil OL
Wipe WP
Air AR
Tissue TS
Other OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Cumene	Naphthalene	1,2,4 TMB	1,3,5 TMB	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	SB1 SS7 11-13	SL	G		~~8.24~~	8.24	1220		4	1					2	1			X	X	X	X	X	X	X	X	X		001
2	SB2 SS9 15-17					8.24	1500												X	X	X	X	X	X	X	X	X		002
3	SB3 SS3 4-5					8.24	1610												X	X	X	X	X	X	X	X	X		003
4	SB4 SS6 9-11					8.25	~~0940~~												X	X	X	X	X	X	X	X	X		004
5	SB5 SS4 5-7					8.25	1105												X	X	X	X	X	X	X	X	X		005
6	SB6 SS3 4-5					8.25	1240												X	X	X	X	X	X	X	X	X		006
7	SB2 WS1 24	WT				8.24	1455		3				3						X	X	X	X	X	X	X	X	X		007
8	SB6 WS1 24	WT				8.25	1245		3				3						X	X	X	X	X	X	X	X	X		008
9																													
10																													
11																													
12																													

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
SB4 SS6 9-11 @ 0940	SSK	8/28/17	9:00	[signature]	8-28-17	9:00				
	RLM	8-28-17	1:35	C. Chesney	8/28/17	1335	2.9	Y	N	Y
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

ORIGINAL

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Alex Kantor
SIGNATURE of SAMPLER: [signature]
DATE Signed (MM/DD/YY): 08/25/17

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

October 06, 2017

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on September 22, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	597 Superior: Radhe Oil
Pace Project No.:	30230885

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30230885001	**SB-7/SS-13/25'**	Solid	09/20/17 13:15	09/22/17 16:50
30230885002	**SB-8/SS-12/23'**	Solid	09/21/17 14:20	09/22/17 16:50
30230885003	**SB-9/SS-11/21'**	Solid	09/21/17 12:30	09/22/17 16:50
30230885004	**SB-10/SS-2/2-4'**	Solid	09/22/17 11:40	09/22/17 16:50
30230885005	**SB-10/SS-5/7-9'**	Solid	09/22/17 12:00	09/22/17 16:50
30230885006	**Trip Blank**	Water	09/22/17 00:01	09/22/17 16:50

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30230885001	**SB-7/SS-13/25'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	APW	1	PASI-PA
30230885002	**SB-8/SS-12/23'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	APW	1	PASI-PA
30230885003	**SB-9/SS-11/21'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	APW	1	PASI-PA
30230885004	**SB-10/SS-2/2-4'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	APW	1	PASI-PA
30230885005	**SB-10/SS-5/7-9'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	APW	1	PASI-PA
30230885006	**Trip Blank**	EPA 8260B	JAS	13	PASI-PA

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ANALYTICAL RESULTS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Sample: SB-7/SS-13/25' **Lab ID: 30230885001** Collected: 09/20/17 13:15 Received: 09/22/17 16:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	4.6	1.3	1	09/29/17 09:33	09/29/17 14:04	71-43-2	1c
Ethylbenzene	ND	ug/kg	4.6	1.4	1	09/29/17 09:33	09/29/17 14:04	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	4.6	1.3	1	09/29/17 09:33	09/29/17 14:04	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	4.6	0.73	1	09/29/17 09:33	09/29/17 14:04	1634-04-4	1c
Naphthalene	**5.6**	ug/kg	4.6	2.1	1	09/29/17 09:33	09/29/17 14:04	91-20-3	1c
Toluene	ND	ug/kg	4.6	1.3	1	09/29/17 09:33	09/29/17 14:04	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	4.6	1.2	1	09/29/17 09:33	09/29/17 14:04	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	4.6	1.2	1	09/29/17 09:33	09/29/17 14:04	108-67-8	1c
Xylene (Total)	ND	ug/kg	13.9	4.1	1	09/29/17 09:33	09/29/17 14:04	1330-20-7	
Surrogates									
Toluene-d8 (S)	96	%	76-124		1	09/29/17 09:33	09/29/17 14:04	2037-26-5	
4-Bromofluorobenzene (S)	99	%	70-133		1	09/29/17 09:33	09/29/17 14:04	460-00-4	
1,2-Dichloroethane-d4 (S)	106	%	74-131		1	09/29/17 09:33	09/29/17 14:04	17060-07-0	
Dibromofluoromethane (S)	103	%	71-130		1	09/29/17 09:33	09/29/17 14:04	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**14.0**	%	0.10	0.10	1		10/01/17 13:54		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Sample: SB-8/SS-12/23' **Lab ID: 30230885002** Collected: 09/21/17 14:20 Received: 09/22/17 16:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	5.3	1.5	1	09/29/17 09:33	09/29/17 14:29	71-43-2	1c
Ethylbenzene	ND	ug/kg	5.3	1.6	1	09/29/17 09:33	09/29/17 14:29	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.3	1.5	1	09/29/17 09:33	09/29/17 14:29	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	5.3	0.83	1	09/29/17 09:33	09/29/17 14:29	1634-04-4	1c
Naphthalene	ND	ug/kg	5.3	2.3	1	09/29/17 09:33	09/29/17 14:29	91-20-3	1c
Toluene	ND	ug/kg	5.3	1.5	1	09/29/17 09:33	09/29/17 14:29	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	5.3	1.4	1	09/29/17 09:33	09/29/17 14:29	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	5.3	1.4	1	09/29/17 09:33	09/29/17 14:29	108-67-8	1c
Xylene (Total)	ND	ug/kg	15.8	4.6	1	09/29/17 09:33	09/29/17 14:29	1330-20-7	
Surrogates									
Toluene-d8 (S)	100	%	76-124		1	09/29/17 09:33	09/29/17 14:29	2037-26-5	
4-Bromofluorobenzene (S)	102	%	70-133		1	09/29/17 09:33	09/29/17 14:29	460-00-4	
1,2-Dichloroethane-d4 (S)	109	%	74-131		1	09/29/17 09:33	09/29/17 14:29	17060-07-0	
Dibromofluoromethane (S)	106	%	71-130		1	09/29/17 09:33	09/29/17 14:29	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.1**	%	0.10	0.10	1		10/01/17 13:54		

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ANALYTICAL RESULTS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Sample: SB-9/SS-11/21' **Lab ID: 30230885003** Collected: 09/21/17 12:30 Received: 09/22/17 16:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	4.9	1.4	1	09/29/17 09:33	09/29/17 14:55	71-43-2	1c
Ethylbenzene	ND	ug/kg	4.9	1.5	1	09/29/17 09:33	09/29/17 14:55	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	4.9	1.4	1	09/29/17 09:33	09/29/17 14:55	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	4.9	0.78	1	09/29/17 09:33	09/29/17 14:55	1634-04-4	1c
Naphthalene	ND	ug/kg	4.9	2.2	1	09/29/17 09:33	09/29/17 14:55	91-20-3	1c
Toluene	ND	ug/kg	4.9	1.4	1	09/29/17 09:33	09/29/17 14:55	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	4.9	1.3	1	09/29/17 09:33	09/29/17 14:55	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	4.9	1.3	1	09/29/17 09:33	09/29/17 14:55	108-67-8	1c
Xylene (Total)	ND	ug/kg	14.8	4.3	1	09/29/17 09:33	09/29/17 14:55	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	76-124		1	09/29/17 09:33	09/29/17 14:55	2037-26-5	
4-Bromofluorobenzene (S)	97	%	70-133		1	09/29/17 09:33	09/29/17 14:55	460-00-4	
1,2-Dichloroethane-d4 (S)	104	%	74-131		1	09/29/17 09:33	09/29/17 14:55	17060-07-0	
Dibromofluoromethane (S)	105	%	71-130		1	09/29/17 09:33	09/29/17 14:55	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.8**	%	0.10	0.10	1		10/01/17 13:54		

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ANALYTICAL RESULTS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Sample: SB-10/SS-2/2-4' **Lab ID: 30230885004** Collected: 09/22/17 11:40 Received: 09/22/17 16:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	**465**	ug/kg	249	72.3	50	09/29/17 09:36	09/29/17 21:20	71-43-2	1c
Ethylbenzene	**11500**	ug/kg	249	76.3	50	09/29/17 09:36	09/29/17 21:20	100-41-4	1c
Isopropylbenzene (Cumene)	**3890**	ug/kg	249	72.3	50	09/29/17 09:36	09/29/17 21:20	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	249	39.4	50	09/29/17 09:36	09/29/17 21:20	1634-04-4	1c
Naphthalene	**14200**	ug/kg	249	111	50	09/29/17 09:36	09/29/17 21:20	91-20-3	1c
Toluene	**4470**	ug/kg	249	72.3	50	09/29/17 09:36	09/29/17 21:20	108-88-3	1c
1,2,4-Trimethylbenzene	**5540**	ug/kg	249	65.3	50	09/29/17 09:36	09/29/17 21:20	95-63-6	1c
1,3,5-Trimethylbenzene	**2020**	ug/kg	249	66.8	50	09/29/17 09:36	09/29/17 21:20	108-67-8	1c
Xylene (Total)	**8980**	ug/kg	748	219	50	09/29/17 09:36	09/29/17 21:20	1330-20-7	
Surrogates									
Toluene-d8 (S)	107	%	76-124		50	09/29/17 09:36	09/29/17 21:20	2037-26-5	
4-Bromofluorobenzene (S)	104	%	70-133		50	09/29/17 09:36	09/29/17 21:20	460-00-4	
1,2-Dichloroethane-d4 (S)	93	%	74-131		50	09/29/17 09:36	09/29/17 21:20	17060-07-0	
Dibromofluoromethane (S)	80	%	71-130		50	09/29/17 09:36	09/29/17 21:20	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.0**	%	0.10	0.10	1		10/01/17 13:54		

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ANALYTICAL RESULTS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Sample: SB-10/SS-5/7-9' **Lab ID: 30230885005** Collected: 09/22/17 12:00 Received: 09/22/17 16:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	**34.4**	ug/kg	5.6	1.6	1	10/04/17 07:56	10/04/17 12:46	71-43-2	1c
Ethylbenzene	**23.8**	ug/kg	5.6	1.7	1	10/04/17 07:56	10/04/17 12:46	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	5.6	1.6	1	10/04/17 07:56	10/04/17 12:46	98-82-8	1c
Methyl-tert-butyl ether	**6.2**	ug/kg	5.6	0.88	1	10/04/17 07:56	10/04/17 12:46	1634-04-4	1c
Naphthalene	**68.8**	ug/kg	5.6	2.5	1	10/04/17 07:56	10/04/17 12:46	91-20-3	1c
Toluene	**189**	ug/kg	5.6	1.6	1	10/04/17 07:56	10/04/17 12:46	108-88-3	1c
1,2,4-Trimethylbenzene	**66.8**	ug/kg	5.6	1.5	1	10/04/17 07:56	10/04/17 12:46	95-63-6	1c
1,3,5-Trimethylbenzene	**13.0**	ug/kg	5.6	1.5	1	10/04/17 07:56	10/04/17 12:46	108-67-8	1c
Xylene (Total)	**153**	ug/kg	16.7	4.9	1	10/04/17 07:56	10/04/17 12:46	1330-20-7	
Surrogates									
Toluene-d8 (S)	102	%	76-124		1	10/04/17 07:56	10/04/17 12:46	2037-26-5	
4-Bromofluorobenzene (S)	101	%	70-133		1	10/04/17 07:56	10/04/17 12:46	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	74-131		1	10/04/17 07:56	10/04/17 12:46	17060-07-0	
Dibromofluoromethane (S)	106	%	71-130		1	10/04/17 07:56	10/04/17 12:46	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.8**	%	0.10	0.10	1		10/01/17 13:54		

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ANALYTICAL RESULTS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Sample: Trip Blank **Lab ID: 30230885006** Collected: 09/22/17 00:01 Received: 09/22/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		09/26/17 16:51	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		09/26/17 16:51	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		09/26/17 16:51	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		09/26/17 16:51	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		09/26/17 16:51	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		09/26/17 16:51	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		09/26/17 16:51	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		09/26/17 16:51	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		09/26/17 16:51	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	80-120		1		09/26/17 16:51	2037-26-5	
4-Bromofluorobenzene (S)	103	%	79-129		1		09/26/17 16:51	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	80-120		1		09/26/17 16:51	17060-07-0	
Dibromofluoromethane (S)	99	%	80-120		1		09/26/17 16:51	1868-53-7	

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QUALITY CONTROL DATA

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

QC Batch: 273618 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30230885001, 30230885002, 30230885003

METHOD BLANK: 1345833 Matrix: Solid
Associated Lab Samples: 30230885001, 30230885002, 30230885003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.3	09/29/17 13:12	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.3	09/29/17 13:12	
Benzene	ug/kg	ND	5.0	1.4	09/29/17 13:12	
Ethylbenzene	ug/kg	ND	5.0	1.5	09/29/17 13:12	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.4	09/29/17 13:12	
Methyl-tert-butyl ether	ug/kg	ND	5.0	0.79	09/29/17 13:12	
Naphthalene	ug/kg	ND	5.0	2.2	09/29/17 13:12	
Toluene	ug/kg	ND	5.0	1.4	09/29/17 13:12	
Xylene (Total)	ug/kg	ND	15.0	4.4	09/29/17 13:12	
1,2-Dichloroethane-d4 (S)	%	98	74-131		09/29/17 13:12	
4-Bromofluorobenzene (S)	%	104	70-133		09/29/17 13:12	
Dibromofluoromethane (S)	%	104	71-130		09/29/17 13:12	
Toluene-d8 (S)	%	99	76-124		09/29/17 13:12	

LABORATORY CONTROL SAMPLE: 1345834

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	19.8	99	70-130	
1,3,5-Trimethylbenzene	ug/kg	20	19.3	96	70-130	
Benzene	ug/kg	20	18.1	91	70-130	
Ethylbenzene	ug/kg	20	18.3	91	70-130	
Isopropylbenzene (Cumene)	ug/kg	20	19.4	97	70-130	
Methyl-tert-butyl ether	ug/kg	20	20.3	102	70-130	
Naphthalene	ug/kg	20	20.3	102	70-130	
Toluene	ug/kg	20	18.5	93	70-130	
Xylene (Total)	ug/kg	60	58.0	97	70-130	
1,2-Dichloroethane-d4 (S)	%			86	74-131	
4-Bromofluorobenzene (S)	%			99	70-133	
Dibromofluoromethane (S)	%			98	71-130	
Toluene-d8 (S)	%			101	76-124	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

QC Batch: 273621   Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A   Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30230885004

METHOD BLANK: 1345838   Matrix: Solid
Associated Lab Samples: 30230885004

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	250	65.5	09/29/17 12:47	
1,3,5-Trimethylbenzene	ug/kg	ND	250	67.0	09/29/17 12:47	
Benzene	ug/kg	ND	250	72.5	09/29/17 12:47	
Ethylbenzene	ug/kg	ND	250	76.5	09/29/17 12:47	
Isopropylbenzene (Cumene)	ug/kg	ND	250	72.5	09/29/17 12:47	
Methyl-tert-butyl ether	ug/kg	ND	250	39.5	09/29/17 12:47	
Naphthalene	ug/kg	ND	250	111	09/29/17 12:47	
Toluene	ug/kg	ND	250	72.5	09/29/17 12:47	
Xylene (Total)	ug/kg	ND	750	220	09/29/17 12:47	
1,2-Dichloroethane-d4 (S)	%	97	74-131		09/29/17 12:47	
4-Bromofluorobenzene (S)	%	99	70-133		09/29/17 12:47	
Dibromofluoromethane (S)	%	95	71-130		09/29/17 12:47	
Toluene-d8 (S)	%	97	76-124		09/29/17 12:47	

LABORATORY CONTROL SAMPLE: 1345839

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	19.8	99	70-130	
1,3,5-Trimethylbenzene	ug/kg	20	19.3	96	70-130	
Benzene	ug/kg	20	18.1	91	70-130	
Ethylbenzene	ug/kg	20	18.3	91	70-130	
Isopropylbenzene (Cumene)	ug/kg	20	19.4	97	70-130	
Methyl-tert-butyl ether	ug/kg	20	20.3	102	70-130	
Naphthalene	ug/kg	20	20.3	102	70-130	
Toluene	ug/kg	20	18.5	93	70-130	
Xylene (Total)	ug/kg	60	58.0	97	70-130	
1,2-Dichloroethane-d4 (S)	%			86	74-131	
4-Bromofluorobenzene (S)	%			99	70-133	
Dibromofluoromethane (S)	%			98	71-130	
Toluene-d8 (S)	%			101	76-124	

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QUALITY CONTROL DATA

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

QC Batch: 274288 | Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A | Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30230885005

METHOD BLANK: 1348989 | Matrix: Solid
Associated Lab Samples: 30230885005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.3	10/04/17 11:25	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.3	10/04/17 11:25	
Benzene	ug/kg	ND	5.0	1.4	10/04/17 11:25	
Ethylbenzene	ug/kg	ND	5.0	1.5	10/04/17 11:25	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.4	10/04/17 11:25	
Methyl-tert-butyl ether	ug/kg	ND	5.0	0.79	10/04/17 11:25	
Naphthalene	ug/kg	ND	5.0	2.2	10/04/17 11:25	
Toluene	ug/kg	ND	5.0	1.4	10/04/17 11:25	
Xylene (Total)	ug/kg	ND	15.0	4.4	10/04/17 11:25	
1,2-Dichloroethane-d4 (S)	%	102	74-131		10/04/17 11:25	
4-Bromofluorobenzene (S)	%	103	70-133		10/04/17 11:25	
Dibromofluoromethane (S)	%	107	71-130		10/04/17 11:25	
Toluene-d8 (S)	%	97	76-124		10/04/17 11:25	

LABORATORY CONTROL SAMPLE: 1348990

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	21.6	108	70-130	
1,3,5-Trimethylbenzene	ug/kg	20	21.1	106	70-130	
Benzene	ug/kg	20	20.3	101	70-130	
Ethylbenzene	ug/kg	20	21.4	107	70-130	
Isopropylbenzene (Cumene)	ug/kg	20	21.7	109	70-130	
Methyl-tert-butyl ether	ug/kg	20	20.5	103	70-130	
Naphthalene	ug/kg	20	21.8	109	70-130	
Toluene	ug/kg	20	21.1	106	70-130	
Xylene (Total)	ug/kg	60	63.2	105	70-130	
1,2-Dichloroethane-d4 (S)	%			92	74-131	
4-Bromofluorobenzene (S)	%			96	70-133	
Dibromofluoromethane (S)	%			98	71-130	
Toluene-d8 (S)	%			99	76-124	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

QC Batch: 273194 — Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B — Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30230885006

METHOD BLANK: 1343906 — Matrix: Water
Associated Lab Samples: 30230885006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.21	09/26/17 15:55	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.40	09/26/17 15:55	
Benzene	ug/L	ND	1.0	0.35	09/26/17 15:55	
Ethylbenzene	ug/L	ND	1.0	0.21	09/26/17 15:55	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.25	09/26/17 15:55	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.27	09/26/17 15:55	
Naphthalene	ug/L	ND	2.0	0.39	09/26/17 15:55	
Toluene	ug/L	ND	1.0	0.29	09/26/17 15:55	
Xylene (Total)	ug/L	ND	3.0	1.1	09/26/17 15:55	
1,2-Dichloroethane-d4 (S)	%	97	80-120		09/26/17 15:55	
4-Bromofluorobenzene (S)	%	104	79-129		09/26/17 15:55	
Dibromofluoromethane (S)	%	100	80-120		09/26/17 15:55	
Toluene-d8 (S)	%	98	80-120		09/26/17 15:55	

LABORATORY CONTROL SAMPLE: 1343907

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	22.7	113	70-130	
1,3,5-Trimethylbenzene	ug/L	20	22.3	111	70-130	
Benzene	ug/L	20	21.4	107	70-130	
Ethylbenzene	ug/L	20	21.7	108	70-130	
Isopropylbenzene (Cumene)	ug/L	20	22.3	111	70-130	
Methyl-tert-butyl ether	ug/L	20	24.1	121	70-130	
Naphthalene	ug/L	20	23.0	115	70-130	
Toluene	ug/L	20	22.1	111	70-130	
Xylene (Total)	ug/L	60	64.4	107	70-130	
1,2-Dichloroethane-d4 (S)	%			94	80-120	
4-Bromofluorobenzene (S)	%			105	79-129	
Dibromofluoromethane (S)	%			100	80-120	
Toluene-d8 (S)	%			98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1343908 1343909

Parameter	Units	30230723001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	200	200	230	218	115	109	75-125	6	30	
1,3,5-Trimethylbenzene	ug/L	ND	200	200	219	209	110	105	76-121	5	30	
Benzene	ug/L	ND	200	200	221	217	111	108	67-121	2	30	

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QUALITY CONTROL DATA

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1343908 1343909

Parameter	Units	30230723001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	200	200	218	213	109	107	70-127	2	30	
Isopropylbenzene (Cumene)	ug/L	ND	200	200	225	223	112	112	80-122	1	30	
Methyl-tert-butyl ether	ug/L	ND	200	200	217	220	109	110	79-135	1	30	
Naphthalene	ug/L	ND	200	200	214	209	107	105	62-131	2	30	
Toluene	ug/L	ND	200	200	227	219	113	109	77-125	4	30	
Xylene (Total)	ug/L	ND	600	600	667	652	111	109	69-128	2	30	
1,2-Dichloroethane-d4 (S)	%						94	98	80-120			
4-Bromofluorobenzene (S)	%						103	104	79-129			
Dibromofluoromethane (S)	%						100	102	80-120			
Toluene-d8 (S)	%						98	97	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

QC Batch: 273760 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 30230885001, 30230885002, 30230885003, 30230885004, 30230885005

SAMPLE DUPLICATE: 1346944

Parameter	Units	30230693001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	18.3	18.9	3	20	

SAMPLE DUPLICATE: 1346945

Parameter	Units	30230693002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	13.1	13.4	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 273618

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 273621

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 274288

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

1c A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 597 Superior: Radhe Oil
Pace Project No.: 30230885

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30230885001	**SB-7/SS-13/25'**	EPA 5035A	273618	EPA 8260B	273644
30230885002	**SB-8/SS-12/23'**	EPA 5035A	273618	EPA 8260B	273644
30230885003	**SB-9/SS-11/21'**	EPA 5035A	273618	EPA 8260B	273644
30230885004	**SB-10/SS-2/2-4'**	EPA 5035A	273621	EPA 8260B	273645
30230885005	**SB-10/SS-5/7-9'**	EPA 5035A	274288	EPA 8260B	274289
30230885006	**Trip Blank**	EPA 8260B	273194		
30230885001	**SB-7/SS-13/25'**	ASTM D2974-87	273760		
30230885002	**SB-8/SS-12/23'**	ASTM D2974-87	273760		
30230885003	**SB-9/SS-11/21'**	ASTM D2974-87	273760		
30230885004	**SB-10/SS-2/2-4'**	ASTM D2974-87	273760		
30230885005	**SB-10/SS-5/7-9'**	ASTM D2974-87	273760		

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WO#:30230885

30230885

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

30230885

2166542

Section A
Required Client Information:

Company: Letterle & Assoc.
Address: 2859 Oxford Blvd.
Allison Park, PA 15101
Email To: eitle@letterleassociates.com
Phone: 4124860600 Fax:
Requested Due Date/TAT: Standard

Report To: Eric Itle
Copy To:
Purchase Order No.:
Project Name: Superior: Radhe Oil
Project Number: 597

Section C
Invoice Information:
Attention: T. Jennewine
Company Name: Letterle & Assoc.
Address:
Pace Quote Reference:
Pace Project Manager: Rachel Christner
Pace Profile #:

REGULATORY AGENCY
NPDES / GROUND WATER / DRINKING WATER
UST (checked) / RCRA / OTHER

Site Location STATE: PA

Section D
Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE (G=GRAB C=COMP)	Composite Start DATE	Composite Start TIME	Composite End/Grab DATE	Composite End/Grab TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Cumene	Naphthalene	1,2,4-TMB	1,3,5-TMB	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	SB-7 / SS-13 / 25'	SL	G			9.20	1315		4	1					2	1			X	X	X	X	X	X	X	X	X		001
2	SB-8 / SS-12 / 23'					9.21	1420												X	X	X	X	X	X	X	X	X		002
3	SB-9 / SS-11 / 21'					9.21	1230												X	X	X	X	X	X	X	X	X		003
4	SB-10 / SS-2 / 2-4'					9.22	1140												X	X	X	X	X	X	X	X	X		004
5	SB-10 / SS-5 / 29'					9.22	1200												X	X	X	X	X	X	X	X	X		005
6	SB-10 / Shelby Tube / 5-7'					9.22	1030		1								1		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	AK 9/22	
7	Trip Blank	WT	-			9.22	-		2				2						X	X	X	X	X	X	X	X	X		006
8																													
9																													
10																													
11																													
12																													

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
Please disregard Shelby Tube sample.	SSK	9/22/17	3:16	[signature] / Pace	9/22/17	1516				
	[signature] / Pace	9/22/17	1650	C. Carney	9/22/17	1650	3.7	Y	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Alex Kantner
SIGNATURE of SAMPLER: [signature]
DATE Signed (MM/DD/YY): 09/22/17

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

October 26, 2017

Project No. 2017-552-001

Mr. Eric Itle
Letterle & Associates, LLC
2859 Oxford Blvd., Suite 110
Allison Park, PA 15101

Transmittal
Laboratory Test Results
Superior-Rodhe Oil #597

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

David R. Backstrom
Laboratory Director

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1 geotechnics geotechnical & geosynthetic testing

SIEVE AND HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client:	Letterle & Associates, Inc.		Boring No.:	SB-10
Client Reference:	Superior-Rodhe Oil #597		Depth (ft):	6.4-6.9
Project No.:	2017-552-001		Sample No.:	SS-4
Lab ID:	2017-552-001-001		Soil Color:	Brown

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay

USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	14.16
Finer Than #200	*Silt & Clay*	85.84

USCS Symbol:

cl, ASSUMED

USCS Classification:

LEAN CLAY

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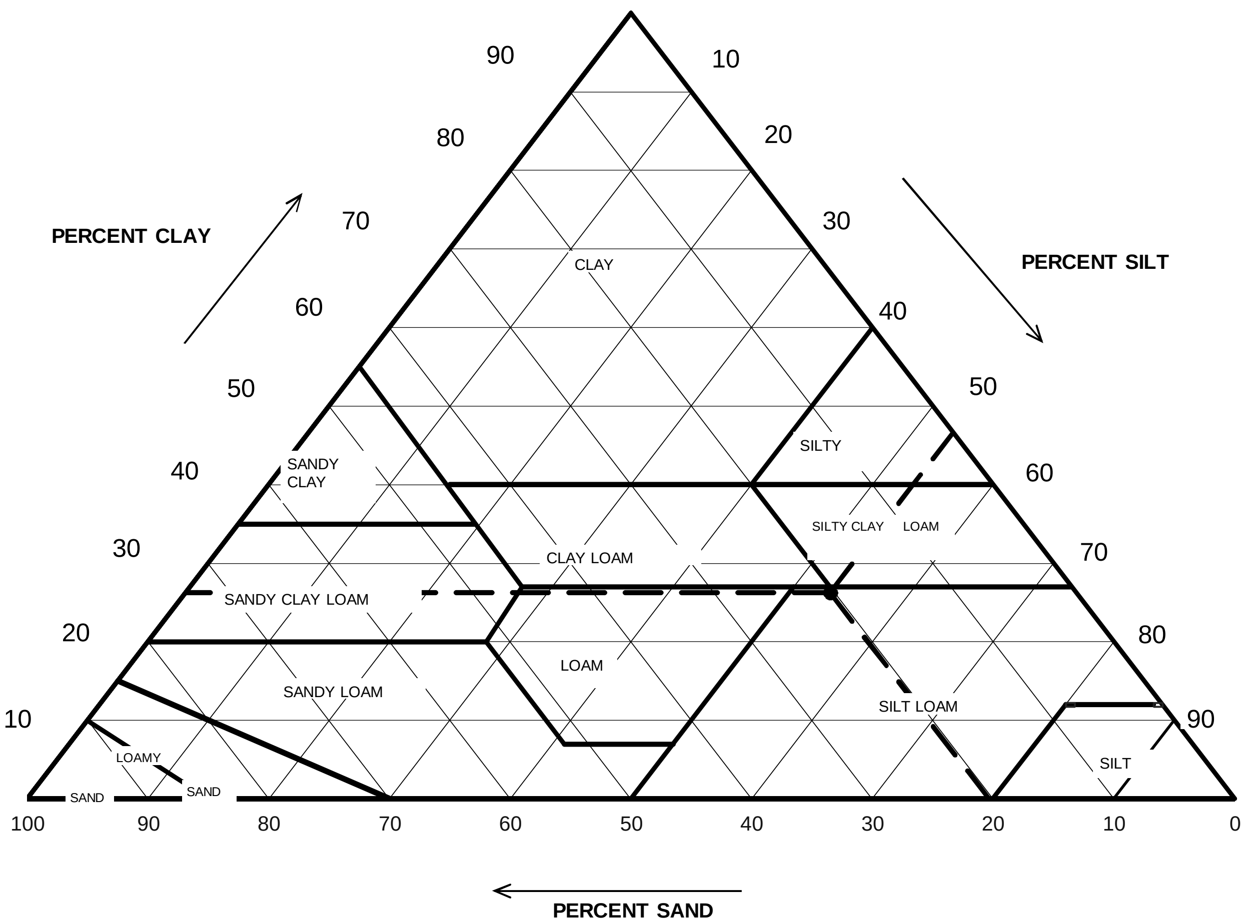
USDA CLASSIFICATION CHART

Client:	Letterle & Associates, Inc.	Boring No.:	SB-10
Client Reference:	Superior-Rodhe Oil #597	Depth (ft):	6.4-6.9
Project No.:	2017-552-001	Sample No.:	SS-4
Lab ID:	2017-552-001-001	Soil Color:	Brown



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.08	**0.00**
2	99.92	*Sand*	20.33	**20.35**
0.05	79.58	*Silt*	53.35	**53.40**
0.002	26.23	*Clay*	26.23	**26.25**

USDA Classification: ***SILT LOAM***

DCN: CT-S3A DATE: 3/24/16 REVISION: 12e

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	Letterle & Associates, Inc.	Boring No.:	SB-10
Client Reference:	Superior-Rodhe Oil #597	Depth (ft):	6.4-6.9
Project No.:	2017-552-001	Sample No.:	SS-4
Lab ID:	2017-552-001-001	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1450	Tare No.	NA
Weight of Tare & Wet Sample (g)	1371.30	Weight of Tare & Wet Sample (g)	NA
Weight of Tare & Dry Sample (g)	1155.18	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	144.93	Weight of Tare (g)	NA
Weight of Water (g)	216.12	Weight of Water (g)	NA
Weight of Dry Sample (g)	1010.25	Weight of Dry Sample (g)	NA
***Moisture Content (%)**	**21.4**	***Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	1010.25
Dry Weight of -3/4" Sample (g)	1010.25	Weight of - #200 Material (g)	867.24
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Material (g)	143.01
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	0.00	0.00	0.00		100.00	**100.00**
#10	2.00	0.84	0.08	0.08		99.92	**99.92**
#20	0.85	5.73	0.57	0.65		99.35	**99.35**
#40	0.425	3.78	0.37	1.02		98.98	**98.98**
#60	0.250	1.77	0.18	1.20		98.80	**98.80**
#140	0.106	60.45	5.98	7.18		92.82	**92.82**
#200	0.075	70.44	6.97	14.16		85.84	**85.84**
Pan	-	867.24	85.84	100.00		-	**-**

* Moisture Content result is not to be interpreted as the "As Received" Moisture Content.
The procedure is used only to determine the dry weight of the sample portion being sieved.

Tested By	TV	Date	10/18/17	Checked By	TMP	Date	10/26/17

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

Client:	Letterle & Associates, Inc.	Boring No.:	SB-10
Client Reference:	Superior-Rodhe Oil #597	Depth (ft):	6.2-6.4
Project No.:	2017-552-001	Sample No.:	SS-4
Lab ID:	2017-552-001-001	Soil Color:	Brown

Elapsed Time (min)		R Measured	Temp. (^{o}C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		49.0	22.7	6.11	42.9	81.3	0.01302	0.0265	**69.8**
5		42.5	22.7	6.11	36.4	69.0	0.01302	0.0178	**59.2**
19		33.5	22.7	6.11	27.4	51.9	0.01302	0.0098	**44.6**
30		31.0	22.7	6.11	24.9	47.2	0.01302	0.0080	**40.5**
60		27.5	22.8	6.07	21.4	40.6	0.01300	0.0058	**34.9**
250		23.0	23.5	5.82	17.2	32.5	0.01290	0.0029	**27.9**
1440		20.5	23.6	5.79	14.7	27.9	0.01288	0.0012	**23.9**

Soil Specimen Data		Other Corrections		
Tare No.	976			
Weight of Tare & Dry Material (g)	156.50	a - Factor	0.99	
Weight of Tare (g)	99.25			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	85.84	
Weight of Dry Material (g)	52.3			
		Specific Gravity	2.7	Measured

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 10/25/17 Checked By TMP Date 10/26/17

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Moisture, Ash, and Organic Matter (Loss on Ignition)

ASTM D 2974-14

Client:	Letterle & Associates. Inc.
Client Reference:	Superior-Rodhe Oil #597
Project No.:	2017-552-001

Method A

Moisture Content

ASTM D2216

Lab ID:	001
Boring No.:	SB-10
Depth (ft):	5-7
Sample No.:	SS-4
Tare Number	EE
Weight of Tare & Wet Sample (g)	259.49
Weight of Tare & Dry Sample (g)	256.49
Weight of Tare (g)	126.92
Weight of Water (g)	3.00
Weight of Dry Sample (g)	129.57
Moisture Content	**2.3%**

Method C

Ash Content, Organic Matter

Furnace Temperature (°C)	440
Weight of Tare & Ash (g)	253.25
Weight of Volatiles (g)	3.24
Weight of Ash (g)	126.33
Ash Content (%)	**97.5%**
Organic Matter (%)	**2.5%**

Tested By *RAL* *Date* *10/23/17* *Checked By* *TMP* *Date* 10/23/17

DCN: CT-S8, REV: 4e, DATE: 4/18/17

\\GEOSERVER\Data Drive\2017 GEOTECHNICAL PROJECTS\Letterle & Associates, Inc\2017-552-001 Superior-Rodhe Oil\[2017-552-001-00.

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SPECIFIC GRAVITY

ASTM D 854-14

Client:	Letterle & Associates, Inc.	Boring No.:	SB-10
Client Reference:	Superior-Rodhe Oil #597	Depth (ft):	5.9-6.1
Project No.:	2017-552-001	Sample No.:	SS-4
Lab ID:	2017-552-001-001	Visual Description:	Brown Clay

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	G 1255	G 1504
Weight of Pycnometer & Soil & Water (g):	747.62	733.88
Temperature (^{o}C):	26.3	26.2
Weight of Pycnometer & Water (g):	684.92	672.09
Tare Number:	2337	664
Weight of Tare & Dry Soil (g):	195.74	192.78
Weight of Tare (g):	96.11	94.47
Weight of Dry Soil (g):	99.63	98.31
Specific Gravity of Soil @ Measured Temperature:	2.698	2.692
Specific Gravity of Water @ Measured Temperature:	0.99671	0.99674
Conversion Factor for Measured Temperature:	0.99850	0.99853
Specific Gravity @ 20^{o} Celsius:	2.702	2.696

Average Specific Gravity @ 20^{o} Celsius	2.70

Tested By *TO* *Date* *10/25/17* *Checked By* *TMP* *Date* *10/26/17*

DCN: CT-S5 Date: 3/5/14 Revision: 20

S:\Excel\Excel QA\Spreadsheets\Specific Gravity.xls

DENSITY (UNIT WEIGHT) WITH POROSITY

ASTM D7263-09

Client:	Letterle & Associates, Inc.	Boring No.:	SB-10
Client Project:	Superior-Rodhe Oil #597	Depth (ft):	6.4-7.0
Project No.:	2017-552-001	Sample No.:	SS-4
Lab ID No.:	2017-552-001-001		

Specific Gravity 2.70 Measured

Visual Description: Brown Clay

MOISTURE CONTENT:

Tare Number:	1718
Wt. of Tare & WS (g):	361.65
Wt. of Tare & DS (g):	309.62
Wt. of Tare (g):	81.99
Wt. of Water (g):	52.03
Wt. of DS (g):	227.63
Moisture Content (%):	**22.9**

SPECIMEN: Undisturbed

Wt. of Mold/Tube & WS (g):	1635.80
Wt. of Mold/Tube (g):	406.92
Wt. of WS (g):	1228.88
Length 1 (in):	5.938
Length 2 (in):	5.933
Length 3 (in):	5.926
Top Diameter (in):	2.885
Middle Diameter (in):	2.872
Bottom Diameter (in):	2.874
Average Length (in):	5.93
Average Area (in^2):	6.50
Sample Volume (cm^3):	631.97
Unit Wet Wt. (g/cm^3):	1.94
Unit Wet Wt. (pcf):	121.4
Unit Dry Wt. (pcf):	98.8
Unit Dry Wt. (g/cm^3):	1.58
Void Ratio, e:	0.71
Porosity, n:	0.41
Pore Volume (cm^3):	261.5

Tested By: JAB Date: 10/16/17 Checked By: TMP Date: 10/26/17

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CHAIN OF CUSTODY RECORD

geotechnics

Client: Letterle + Associates
Client Project / Project No.: Superior - Radhe Oil ~~[illegible]~~ #597
Project Location (City, State): Freeport, PA
Client Contact: Eric Itle
Client Phone: 412-486-0600 x302
Fax:

Geotechnics Contact: Kevin L.
Geotechnics Project No.:

Send Report To: Eric Itle
2859 Oxford Blvd
Allison Park, PA 15101

Send Invoice To; Tracey Kim
Same

BORING	DEPTH	SAMPLE No.	CONTAINER	QUANTITY	LIQUID	SOIL	AGGR	TESTING / REMARKS
SB-10	5-7	SS-4	Shelby Tube	1		1		sieve + hydrometer analyses, effective porosity, FOC, soil bulk density

RELINQUISHED BY	DATE	FIRM	RECEIVED BY	DATE	FIRM
			[illegible]	10/11/17	

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Greensburg, PA 15601
(724)850-5600

August 10, 2018

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: 597 Radke Oil
Pace Project No.: 30260641

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on July 27, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Colton Gotshall, Letterle & Associates
Mr. Austin Hess, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Tim Kier, Letterle & Associates LLC
Mr. Jordan Packard, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

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CERTIFICATIONS

Project:	597 Radke Oil
Pace Project No.:	30260641

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: 597 Radke Oil
Pace Project No.: 30260641

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30260641001	**SB-12 SS-3/4.5'**	Solid	07/26/18 13:40	07/27/18 17:30
30260641002	**SB-12 SS-8/13-15'**	Solid	07/26/18 13:45	07/27/18 17:30
30260641003	**SB-13 SS-3/4-5'**	Solid	07/26/18 13:50	07/27/18 17:30
30260641004	**SB-13 SS-9/15-17'**	Solid	07/26/18 13:55	07/27/18 17:30
30260641005	**SB-14 SS-8/13-15''**	Solid	07/26/18 14:00	07/27/18 17:30
30260641006	**SB-15 SS-2/2-4''**	Solid	07/26/18 14:05	07/27/18 17:30
30260641007	**SB-15 SS-5/7-9''**	Solid	07/26/18 14:10	07/27/18 17:30
30260641008	**SB-16 SS-9/5-7'**	Solid	07/26/18 14:15	07/27/18 17:30
30260641009	**SB-17 SS-3/4-5'**	Solid	07/26/18 14:20	07/27/18 17:30
30260641010	**SB-17 SS-7/11-13'**	Solid	07/26/18 14:25	07/27/18 17:30
30260641011	**Trip Blanks**	Water	07/26/18 00:00	07/27/18 17:30

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SAMPLE ANALYTE COUNT

Project: 597 Radke Oil
Pace Project No.: 30260641

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30260641001	**SB-12 SS-3/4.5'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641002	**SB-12 SS-8/13-15'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641003	**SB-13 SS-3/4-5'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641004	**SB-13 SS-9/15-17'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641005	**SB-14 SS-8/13-15''**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641006	**SB-15 SS-2/2-4''**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641007	**SB-15 SS-5/7-9''**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641008	**SB-16 SS-9/5-7'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641009	**SB-17 SS-3/4-5'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641010	**SB-17 SS-7/11-13'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30260641011	**Trip Blanks**	EPA 8260B	JAS	13	PASI-PA

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-12 SS-3/4.5' **Lab ID: 30260641001** Collected: 07/26/18 13:40 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	275	79.9	50	08/08/18 14:38	08/08/18 20:14	71-43-2	1c
Ethylbenzene	**1700**	ug/kg	275	84.3	50	08/08/18 14:38	08/08/18 20:14	100-41-4	1c
Isopropylbenzene (Cumene)	**605**	ug/kg	275	79.9	50	08/08/18 14:38	08/08/18 20:14	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	275	43.5	50	08/08/18 14:38	08/08/18 20:14	1634-04-4	1c
Naphthalene	**3400**	ug/kg	275	122	50	08/08/18 14:38	08/08/18 20:14	91-20-3	1c
Toluene	ND	ug/kg	275	79.9	50	08/08/18 14:38	08/08/18 20:14	108-88-3	1c
1,2,4-Trimethylbenzene	**1650**	ug/kg	275	72.2	50	08/08/18 14:38	08/08/18 20:14	95-63-6	1c
1,3,5-Trimethylbenzene	**644**	ug/kg	275	73.8	50	08/08/18 14:38	08/08/18 20:14	108-67-8	1c
Xylene (Total)	**1080**	ug/kg	826	242	50	08/08/18 14:38	08/08/18 20:14	1330-20-7	
Surrogates									
Toluene-d8 (S)	94	%	76-124		50	08/08/18 14:38	08/08/18 20:14	2037-26-5	
4-Bromofluorobenzene (S)	105	%	70-133		50	08/08/18 14:38	08/08/18 20:14	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	74-131		50	08/08/18 14:38	08/08/18 20:14	17060-07-0	
Dibromofluoromethane (S)	101	%	71-130		50	08/08/18 14:38	08/08/18 20:14	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**14.7**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-12 SS-8/13-15' **Lab ID: 30260641002** Collected: 07/26/18 13:45 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	251	72.8	50	08/08/18 14:38	08/08/18 20:40	71-43-2	1c
Ethylbenzene	ND	ug/kg	251	76.8	50	08/08/18 14:38	08/08/18 20:40	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	251	72.8	50	08/08/18 14:38	08/08/18 20:40	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	251	39.7	50	08/08/18 14:38	08/08/18 20:40	1634-04-4	1c
Naphthalene	ND	ug/kg	251	111	50	08/08/18 14:38	08/08/18 20:40	91-20-3	1c
Toluene	ND	ug/kg	251	72.8	50	08/08/18 14:38	08/08/18 20:40	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	251	65.8	50	08/08/18 14:38	08/08/18 20:40	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	251	67.3	50	08/08/18 14:38	08/08/18 20:40	108-67-8	1c
Xylene (Total)	ND	ug/kg	753	221	50	08/08/18 14:38	08/08/18 20:40	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%	76-124		50	08/08/18 14:38	08/08/18 20:40	2037-26-5	
4-Bromofluorobenzene (S)	100	%	70-133		50	08/08/18 14:38	08/08/18 20:40	460-00-4	
1,2-Dichloroethane-d4 (S)	106	%	74-131		50	08/08/18 14:38	08/08/18 20:40	17060-07-0	
Dibromofluoromethane (S)	97	%	71-130		50	08/08/18 14:38	08/08/18 20:40	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.9**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-13 SS-3/4-5' **Lab ID: 30260641003** Collected: 07/26/18 13:50 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	274	79.4	50	08/08/18 14:38	08/08/18 21:07	71-43-2	1c
Ethylbenzene	**3350**	ug/kg	274	83.7	50	08/08/18 14:38	08/08/18 21:07	100-41-4	1c
Isopropylbenzene (Cumene)	**981**	ug/kg	274	79.4	50	08/08/18 14:38	08/08/18 21:07	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	274	43.2	50	08/08/18 14:38	08/08/18 21:07	1634-04-4	1c
Naphthalene	**2520**	ug/kg	274	122	50	08/08/18 14:38	08/08/18 21:07	91-20-3	1c
Toluene	**401**	ug/kg	274	79.4	50	08/08/18 14:38	08/08/18 21:07	108-88-3	1c
1,2,4-Trimethylbenzene	**16200**	ug/kg	274	71.7	50	08/08/18 14:38	08/08/18 21:07	95-63-6	1c
1,3,5-Trimethylbenzene	**5110**	ug/kg	274	73.3	50	08/08/18 14:38	08/08/18 21:07	108-67-8	1c
Xylene (Total)	**18300**	ug/kg	821	241	50	08/08/18 14:38	08/08/18 21:07	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	76-124		50	08/08/18 14:38	08/08/18 21:07	2037-26-5	
4-Bromofluorobenzene (S)	104	%	70-133		50	08/08/18 14:38	08/08/18 21:07	460-00-4	
1,2-Dichloroethane-d4 (S)	107	%	74-131		50	08/08/18 14:38	08/08/18 21:07	17060-07-0	
Dibromofluoromethane (S)	96	%	71-130		50	08/08/18 14:38	08/08/18 21:07	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**11.1**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-13 SS-9/15-17' **Lab ID: 30260641004** Collected: 07/26/18 13:55 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	2500	726	500	08/08/18 14:38	08/08/18 21:33	71-43-2	1c
Ethylbenzene	**50000**	ug/kg	2500	766	500	08/08/18 14:38	08/08/18 21:33	100-41-4	1c
Isopropylbenzene (Cumene)	**8720**	ug/kg	2500	726	500	08/08/18 14:38	08/08/18 21:33	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	2500	396	500	08/08/18 14:38	08/08/18 21:33	1634-04-4	1c
Naphthalene	**17500**	ug/kg	2500	1110	500	08/08/18 14:38	08/08/18 21:33	91-20-3	1c
Toluene	**9440**	ug/kg	2500	726	500	08/08/18 14:38	08/08/18 21:33	108-88-3	1c
1,2,4-Trimethylbenzene	**169000**	ug/kg	2500	656	500	08/08/18 14:38	08/08/18 21:33	95-63-6	1c
1,3,5-Trimethylbenzene	**53900**	ug/kg	2500	671	500	08/08/18 14:38	08/08/18 21:33	108-67-8	1c
Xylene (Total)	**145000**	ug/kg	7510	2200	500	08/08/18 14:38	08/08/18 21:33	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	76-124		500	08/08/18 14:38	08/08/18 21:33	2037-26-5	
4-Bromofluorobenzene (S)	106	%	70-133		500	08/08/18 14:38	08/08/18 21:33	460-00-4	
1,2-Dichloroethane-d4 (S)	109	%	74-131		500	08/08/18 14:38	08/08/18 21:33	17060-07-0	
Dibromofluoromethane (S)	96	%	71-130		500	08/08/18 14:38	08/08/18 21:33	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.2**	%	0.10	0.10	1		08/05/18 14:11		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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(724)850-5600

ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-14 SS-8/13-15" **Lab ID: 30260641005** Collected: 07/26/18 14:00 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	318	92.3	50	08/08/18 14:38	08/08/18 22:00	71-43-2	1c
Ethylbenzene	**650**	ug/kg	318	97.4	50	08/08/18 14:38	08/08/18 22:00	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	318	92.3	50	08/08/18 14:38	08/08/18 22:00	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	318	50.3	50	08/08/18 14:38	08/08/18 22:00	1634-04-4	1c
Naphthalene	**808**	ug/kg	318	141	50	08/08/18 14:38	08/08/18 22:00	91-20-3	1c
Toluene	ND	ug/kg	318	92.3	50	08/08/18 14:38	08/08/18 22:00	108-88-3	1c
1,2,4-Trimethylbenzene	**2280**	ug/kg	318	83.4	50	08/08/18 14:38	08/08/18 22:00	95-63-6	1c
1,3,5-Trimethylbenzene	**681**	ug/kg	318	85.3	50	08/08/18 14:38	08/08/18 22:00	108-67-8	1c
Xylene (Total)	**1420**	ug/kg	955	280	50	08/08/18 14:38	08/08/18 22:00	1330-20-7	
Surrogates									
Toluene-d8 (S)	101	%	76-124		50	08/08/18 14:38	08/08/18 22:00	2037-26-5	
4-Bromofluorobenzene (S)	102	%	70-133		50	08/08/18 14:38	08/08/18 22:00	460-00-4	
1,2-Dichloroethane-d4 (S)	101	%	74-131		50	08/08/18 14:38	08/08/18 22:00	17060-07-0	
Dibromofluoromethane (S)	91	%	71-130		50	08/08/18 14:38	08/08/18 22:00	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.8**	%	0.10	0.10	1		08/05/18 14:11		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-15 SS-2/2-4" **Lab ID: 30260641006** Collected: 07/26/18 14:05 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	2590	751	500	08/08/18 14:38	08/08/18 22:26	71-43-2	1c
Ethylbenzene	**15300**	ug/kg	2590	793	500	08/08/18 14:38	08/08/18 22:26	100-41-4	1c
Isopropylbenzene (Cumene)	**7110**	ug/kg	2590	751	500	08/08/18 14:38	08/08/18 22:26	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	2590	409	500	08/08/18 14:38	08/08/18 22:26	1634-04-4	1c
Naphthalene	**14900**	ug/kg	2590	1150	500	08/08/18 14:38	08/08/18 22:26	91-20-3	1c
Toluene	ND	ug/kg	2590	751	500	08/08/18 14:38	08/08/18 22:26	108-88-3	1c
1,2,4-Trimethylbenzene	**116000**	ug/kg	2590	679	500	08/08/18 14:38	08/08/18 22:26	95-63-6	1c
1,3,5-Trimethylbenzene	**38900**	ug/kg	2590	694	500	08/08/18 14:38	08/08/18 22:26	108-67-8	1c
Xylene (Total)	**29100**	ug/kg	7770	2280	500	08/08/18 14:38	08/08/18 22:26	1330-20-7	
Surrogates									
Toluene-d8 (S)	95	%	76-124		500	08/08/18 14:38	08/08/18 22:26	2037-26-5	
4-Bromofluorobenzene (S)	99	%	70-133		500	08/08/18 14:38	08/08/18 22:26	460-00-4	
1,2-Dichloroethane-d4 (S)	99	%	74-131		500	08/08/18 14:38	08/08/18 22:26	17060-07-0	
Dibromofluoromethane (S)	96	%	71-130		500	08/08/18 14:38	08/08/18 22:26	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.4**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-15 SS-5/7-9'' **Lab ID: 30260641007** Collected: 07/26/18 14:10 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	314	91.2	50	08/08/18 14:38	08/08/18 22:53	71-43-2	1c
Ethylbenzene	**8890**	ug/kg	314	96.2	50	08/08/18 14:38	08/08/18 22:53	100-41-4	1c
Isopropylbenzene (Cumene)	**2730**	ug/kg	314	91.2	50	08/08/18 14:38	08/08/18 22:53	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	314	49.7	50	08/08/18 14:38	08/08/18 22:53	1634-04-4	1c
Naphthalene	**7120**	ug/kg	314	140	50	08/08/18 14:38	08/08/18 22:53	91-20-3	1c
Toluene	ND	ug/kg	314	91.2	50	08/08/18 14:38	08/08/18 22:53	108-88-3	1c
1,2,4-Trimethylbenzene	**49700**	ug/kg	3140	824	500	08/08/18 14:38	08/09/18 16:29	95-63-6	
1,3,5-Trimethylbenzene	**18300**	ug/kg	314	84.3	50	08/08/18 14:38	08/08/18 22:53	108-67-8	1c
Xylene (Total)	**9060**	ug/kg	943	277	50	08/08/18 14:38	08/08/18 22:53	1330-20-7	
Surrogates									
Toluene-d8 (S)	101	%	76-124		50	08/08/18 14:38	08/08/18 22:53	2037-26-5	
4-Bromofluorobenzene (S)	112	%	70-133		50	08/08/18 14:38	08/08/18 22:53	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	74-131		50	08/08/18 14:38	08/08/18 22:53	17060-07-0	
Dibromofluoromethane (S)	96	%	71-130		50	08/08/18 14:38	08/08/18 22:53	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**13.4**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-16 SS-9/5-7' **Lab ID: 30260641008** Collected: 07/26/18 14:15 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	4.8	1.4	1	08/08/18 14:32	08/08/18 15:49	71-43-2	1c
Ethylbenzene	ND	ug/kg	4.8	1.5	1	08/08/18 14:32	08/08/18 15:49	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	4.8	1.4	1	08/08/18 14:32	08/08/18 15:49	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	4.8	0.75	1	08/08/18 14:32	08/08/18 15:49	1634-04-4	1c
Naphthalene	ND	ug/kg	4.8	2.1	1	08/08/18 14:32	08/08/18 15:49	91-20-3	1c
Toluene	ND	ug/kg	4.8	1.4	1	08/08/18 14:32	08/08/18 15:49	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	4.8	1.2	1	08/08/18 14:32	08/08/18 15:49	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	4.8	1.3	1	08/08/18 14:32	08/08/18 15:49	108-67-8	1c
Xylene (Total)	ND	ug/kg	14.3	4.2	1	08/08/18 14:32	08/08/18 15:49	1330-20-7	
Surrogates									
Toluene-d8 (S)	93	%	76-124		1	08/08/18 14:32	08/08/18 15:49	2037-26-5	
4-Bromofluorobenzene (S)	97	%	70-133		1	08/08/18 14:32	08/08/18 15:49	460-00-4	
1,2-Dichloroethane-d4 (S)	112	%	74-131		1	08/08/18 14:32	08/08/18 15:49	17060-07-0	
Dibromofluoromethane (S)	103	%	71-130		1	08/08/18 14:32	08/08/18 15:49	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.3**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-17 SS-3/4-5' **Lab ID: 30260641009** Collected: 07/26/18 14:20 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	4.8	1.4	1	08/08/18 14:32	08/08/18 16:16	71-43-2	1c
Ethylbenzene	**6.6**	ug/kg	4.8	1.5	1	08/08/18 14:32	08/08/18 16:16	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	4.8	1.4	1	08/08/18 14:32	08/08/18 16:16	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	4.8	0.75	1	08/08/18 14:32	08/08/18 16:16	1634-04-4	1c
Naphthalene	ND	ug/kg	4.8	2.1	1	08/08/18 14:32	08/08/18 16:16	91-20-3	1c
Toluene	ND	ug/kg	4.8	1.4	1	08/08/18 14:32	08/08/18 16:16	108-88-3	1c
1,2,4-Trimethylbenzene	**12.5**	ug/kg	4.8	1.3	1	08/08/18 14:32	08/08/18 16:16	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	4.8	1.3	1	08/08/18 14:32	08/08/18 16:16	108-67-8	1c
Xylene (Total)	**16.9**	ug/kg	14.3	4.2	1	08/08/18 14:32	08/08/18 16:16	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%	76-124		1	08/08/18 14:32	08/08/18 16:16	2037-26-5	
4-Bromofluorobenzene (S)	99	%	70-133		1	08/08/18 14:32	08/08/18 16:16	460-00-4	
1,2-Dichloroethane-d4 (S)	119	%	74-131		1	08/08/18 14:32	08/08/18 16:16	17060-07-0	
Dibromofluoromethane (S)	104	%	71-130		1	08/08/18 14:32	08/08/18 16:16	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**12.4**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: SB-17 SS-7/11-13' **Lab ID: 30260641010** Collected: 07/26/18 14:25 Received: 07/27/18 17:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	3310	961	500	08/08/18 14:38	08/08/18 23:19	71-43-2	1c
Ethylbenzene	**18400**	ug/kg	3310	1010	500	08/08/18 14:38	08/08/18 23:19	100-41-4	1c
Isopropylbenzene (Cumene)	**5760**	ug/kg	3310	961	500	08/08/18 14:38	08/08/18 23:19	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	3310	524	500	08/08/18 14:38	08/08/18 23:19	1634-04-4	1c
Naphthalene	**16900**	ug/kg	3310	1470	500	08/08/18 14:38	08/08/18 23:19	91-20-3	1c
Toluene	ND	ug/kg	3310	961	500	08/08/18 14:38	08/08/18 23:19	108-88-3	1c
1,2,4-Trimethylbenzene	**126000**	ug/kg	3310	868	500	08/08/18 14:38	08/08/18 23:19	95-63-6	1c
1,3,5-Trimethylbenzene	**42800**	ug/kg	3310	888	500	08/08/18 14:38	08/08/18 23:19	108-67-8	1c
Xylene (Total)	**51600**	ug/kg	9940	2920	500	08/08/18 14:38	08/08/18 23:19	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	76-124		500	08/08/18 14:38	08/08/18 23:19	2037-26-5	
4-Bromofluorobenzene (S)	103	%	70-133		500	08/08/18 14:38	08/08/18 23:19	460-00-4	
1,2-Dichloroethane-d4 (S)	102	%	74-131		500	08/08/18 14:38	08/08/18 23:19	17060-07-0	
Dibromofluoromethane (S)	95	%	71-130		500	08/08/18 14:38	08/08/18 23:19	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.5**	%	0.10	0.10	1		08/05/18 14:11		

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ANALYTICAL RESULTS

Project: 597 Radke Oil
Pace Project No.: 30260641

Sample: Trip Blanks **Lab ID: 30260641011** Collected: 07/26/18 00:00 Received: 07/27/18 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/04/18 03:48	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		08/04/18 03:48	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		08/04/18 03:48	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/04/18 03:48	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/04/18 03:48	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		08/04/18 03:48	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		08/04/18 03:48	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/04/18 03:48	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		08/04/18 03:48	1330-20-7	
Surrogates									
Toluene-d8 (S)	93	%	80-120		1		08/04/18 03:48	2037-26-5	
4-Bromofluorobenzene (S)	102	%	79-129		1		08/04/18 03:48	460-00-4	
1,2-Dichloroethane-d4 (S)	102	%	80-120		1		08/04/18 03:48	17060-07-0	
Dibromofluoromethane (S)	96	%	80-120		1		08/04/18 03:48	1868-53-7	

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QUALITY CONTROL DATA

Project: 597 Radke Oil
Pace Project No.: 30260641

QC Batch: 308854 | Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A | Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30260641008, 30260641009

METHOD BLANK: 1509203 | Matrix: Solid
Associated Lab Samples: 30260641008, 30260641009

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.3	08/08/18 15:04	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.3	08/08/18 15:04	
Benzene	ug/kg	ND	5.0	1.4	08/08/18 15:04	
Ethylbenzene	ug/kg	ND	5.0	1.5	08/08/18 15:04	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.4	08/08/18 15:04	
Methyl-tert-butyl ether	ug/kg	ND	5.0	0.79	08/08/18 15:04	
Naphthalene	ug/kg	ND	5.0	2.2	08/08/18 15:04	
Toluene	ug/kg	ND	5.0	1.4	08/08/18 15:04	
Xylene (Total)	ug/kg	ND	15.0	4.4	08/08/18 15:04	
1,2-Dichloroethane-d4 (S)	%	110	74-131		08/08/18 15:04	
4-Bromofluorobenzene (S)	%	98	70-133		08/08/18 15:04	
Dibromofluoromethane (S)	%	104	71-130		08/08/18 15:04	
Toluene-d8 (S)	%	95	76-124		08/08/18 15:04	

LABORATORY CONTROL SAMPLE: 1509204

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	17.9	89	70-130	
1,3,5-Trimethylbenzene	ug/kg	20	17.1	86	70-130	
Benzene	ug/kg	20	17.2	86	70-130	
Ethylbenzene	ug/kg	20	16.7	83	70-130	
Isopropylbenzene (Cumene)	ug/kg	20	16.6	83	70-130	
Methyl-tert-butyl ether	ug/kg	20	19.6	98	70-130	
Naphthalene	ug/kg	20	20.9	104	70-130	
Toluene	ug/kg	20	15.7	79	70-130	
Xylene (Total)	ug/kg	60	52.0	87	70-130	
1,2-Dichloroethane-d4 (S)	%			100	74-131	
4-Bromofluorobenzene (S)	%			102	70-133	
Dibromofluoromethane (S)	%			103	71-130	
Toluene-d8 (S)	%			93	76-124	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 597 Radke Oil
Pace Project No.: 30260641

QC Batch: 308855 — Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A — Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30260641001, 30260641002, 30260641003, 30260641004, 30260641005, 30260641006, 30260641007, 30260641010

METHOD BLANK: 1509205 — Matrix: Solid
Associated Lab Samples: 30260641001, 30260641002, 30260641003, 30260641004, 30260641005, 30260641006, 30260641007, 30260641010

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	250	65.5	08/08/18 14:38	
1,3,5-Trimethylbenzene	ug/kg	ND	250	67.0	08/08/18 14:38	
Benzene	ug/kg	ND	250	72.5	08/08/18 14:38	
Ethylbenzene	ug/kg	ND	250	76.5	08/08/18 14:38	
Isopropylbenzene (Cumene)	ug/kg	ND	250	72.5	08/08/18 14:38	
Methyl-tert-butyl ether	ug/kg	ND	250	39.5	08/08/18 14:38	
Naphthalene	ug/kg	ND	250	111	08/08/18 14:38	
Toluene	ug/kg	ND	250	72.5	08/08/18 14:38	
Xylene (Total)	ug/kg	ND	750	220	08/08/18 14:38	
1,2-Dichloroethane-d4 (S)	%	106	74-131		08/08/18 14:38	
4-Bromofluorobenzene (S)	%	99	70-133		08/08/18 14:38	
Dibromofluoromethane (S)	%	103	71-130		08/08/18 14:38	
Toluene-d8 (S)	%	95	76-124		08/08/18 14:38	

LABORATORY CONTROL SAMPLE: 1509206

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	17.9	89	70-130	
1,3,5-Trimethylbenzene	ug/kg	20	17.1	86	70-130	
Benzene	ug/kg	20	17.2	86	70-130	
Ethylbenzene	ug/kg	20	16.7	83	70-130	
Isopropylbenzene (Cumene)	ug/kg	20	16.6	83	70-130	
Methyl-tert-butyl ether	ug/kg	20	19.6	98	70-130	
Naphthalene	ug/kg	20	20.9	104	70-130	
Toluene	ug/kg	20	15.7	79	70-130	
Xylene (Total)	ug/kg	60	52.0	87	70-130	
1,2-Dichloroethane-d4 (S)	%			100	74-131	
4-Bromofluorobenzene (S)	%			102	70-133	
Dibromofluoromethane (S)	%			103	71-130	
Toluene-d8 (S)	%			93	76-124	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 597 Radke Oil
Pace Project No.: 30260641

QC Batch: 308352 — Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B — Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30260641011

METHOD BLANK: 1507046 — Matrix: Water
Associated Lab Samples: 30260641011

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	08/04/18 02:54	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	08/04/18 02:54	
Benzene	ug/L	ND	1.0	0.24	08/04/18 02:54	
Ethylbenzene	ug/L	ND	1.0	0.31	08/04/18 02:54	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	08/04/18 02:54	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	08/04/18 02:54	
Naphthalene	ug/L	ND	2.0	0.82	08/04/18 02:54	
Toluene	ug/L	ND	1.0	0.30	08/04/18 02:54	
Xylene (Total)	ug/L	ND	3.0	0.78	08/04/18 02:54	
1,2-Dichloroethane-d4 (S)	%	103	80-120		08/04/18 02:54	
4-Bromofluorobenzene (S)	%	105	79-129		08/04/18 02:54	
Dibromofluoromethane (S)	%	93	80-120		08/04/18 02:54	
Toluene-d8 (S)	%	92	80-120		08/04/18 02:54	

LABORATORY CONTROL SAMPLE: 1507047

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	18.9	94	70-130	
1,3,5-Trimethylbenzene	ug/L	20	19.0	95	70-130	
Benzene	ug/L	20	19.0	95	70-130	
Ethylbenzene	ug/L	20	19.3	96	70-130	
Isopropylbenzene (Cumene)	ug/L	20	19.4	97	70-130	
Methyl-tert-butyl ether	ug/L	20	19.8	99	70-130	
Naphthalene	ug/L	20	19.2	96	70-130	
Toluene	ug/L	20	18.5	92	70-130	
Xylene (Total)	ug/L	60	56.0	93	70-130	
1,2-Dichloroethane-d4 (S)	%			91	80-120	
4-Bromofluorobenzene (S)	%			104	79-129	
Dibromofluoromethane (S)	%			99	80-120	
Toluene-d8 (S)	%			98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1507399 1507400

Parameter	Units	30260637002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	5.5	20	20	28.9	27.4	117	109	75-125	5	30	
1,3,5-Trimethylbenzene	ug/L	26.7	20	20	50.4	49.0	119	112	76-121	3	30	
Benzene	ug/L	ND	20	20	21.1	21.7	105	109	67-121	3	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: 597 Radke Oil
Pace Project No.: 30260641

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1507399 1507400

Parameter	Units	30260637002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	21.5	21.6	104	105	70-127	1	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	21.1	21.1	105	105	80-122	0	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	22.0	23.6	94	102	79-135	7	30	
Naphthalene	ug/L	13.1	20	20	36.4	35.8	117	114	62-131	2	30	
Toluene	ug/L	ND	20	20	20.7	20.1	103	100	77-125	3	30	
Xylene (Total)	ug/L	21.9	60	60	87.0	87.0	109	109	69-128	0	30	
1,2-Dichloroethane-d4 (S)	%						94	99	80-120			
4-Bromofluorobenzene (S)	%						101	102	79-129			
Dibromofluoromethane (S)	%						99	100	80-120			
Toluene-d8 (S)	%						99	95	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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(724)850-5600

QUALITY CONTROL DATA

Project: 597 Radke Oil
Pace Project No.: 30260641

QC Batch: 308428 | Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 | Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 30260641001, 30260641002, 30260641003, 30260641004, 30260641005, 30260641006, 30260641007, 30260641008, 30260641009, 30260641010

SAMPLE DUPLICATE: 1507544

Parameter	Units	30260641001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	14.7	15.5	5	20	

SAMPLE DUPLICATE: 1507545

Parameter	Units	30260641002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	16.9	19.0	12	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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Greensburg, PA 15601
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QUALIFIERS

Project: 597 Radke Oil
Pace Project No.: 30260641

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 308854

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: 308855

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

1c A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 597 Radke Oil
Pace Project No.: 30260641

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30260641001	**SB-12 SS-3/4.5'**	EPA 5035A	308855	EPA 8260B	308891
30260641002	**SB-12 SS-8/13-15'**	EPA 5035A	308855	EPA 8260B	308891
30260641003	**SB-13 SS-3/4-5'**	EPA 5035A	308855	EPA 8260B	308891
30260641004	**SB-13 SS-9/15-17'**	EPA 5035A	308855	EPA 8260B	308891
30260641005	**SB-14 SS-8/13-15''**	EPA 5035A	308855	EPA 8260B	308891
30260641006	**SB-15 SS-2/2-4''**	EPA 5035A	308855	EPA 8260B	308891
30260641007	**SB-15 SS-5/7-9''**	EPA 5035A	308855	EPA 8260B	308891
30260641008	**SB-16 SS-9/5-7'**	EPA 5035A	308854	EPA 8260B	308886
30260641009	**SB-17 SS-3/4-5'**	EPA 5035A	308854	EPA 8260B	308886
30260641010	**SB-17 SS-7/11-13'**	EPA 5035A	308855	EPA 8260B	308891
30260641011	**Trip Blanks**	EPA 8260B	308352		
30260641001	**SB-12 SS-3/4.5'**	ASTM D2974-87	308428		
30260641002	**SB-12 SS-8/13-15'**	ASTM D2974-87	308428		
30260641003	**SB-13 SS-3/4-5'**	ASTM D2974-87	308428		
30260641004	**SB-13 SS-9/15-17'**	ASTM D2974-87	308428		
30260641005	**SB-14 SS-8/13-15''**	ASTM D2974-87	308428		
30260641006	**SB-15 SS-2/2-4''**	ASTM D2974-87	308428		
30260641007	**SB-15 SS-5/7-9''**	ASTM D2974-87	308428		
30260641008	**SB-16 SS-9/5-7'**	ASTM D2974-87	308428		
30260641009	**SB-17 SS-3/4-5'**	ASTM D2974-87	308428		
30260641010	**SB-17 SS-7/11-13'**	ASTM D2974-87	308428		

CHAIN-OF-CUSTODY / Analytical Request Document

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The Chain-of-Custody is a LE[...] [...]be completed accurately.

WO# : 30260641

30260641

Page: 1 of 1

2264030

Section A
Required Client Information:

Company: Letterle and Associates
Address: 2859 Oxford Blvd
Allison Park PA 15101
Email To:
Phone: | Fax:
Requested Due Date/TAT: Standard

Section B
Required Project Information:

Report To: Same
Copy To:
Purchase Order No.:
Project Name: Radke Oil
Project Number: 597

Company Name:
Address:
Pace Quote Reference:
Pace Project Manager: Rachel Christner
Pace Profile #:

AGENCY
NPDES | GROUND WATER | DRINKING WATER
✓ UST | RCRA | OTHER

Site Location STATE: PA

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes
MATRIX / CODE
Drinking Water DW
Water WT
Waste Water WW
Product P
Soil/Solid SL
Oil OL
Wipe WP
Air AR
Tissue TS
Other OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BTEX	MTBE	Napthalene	Cumene	124 TMB	135 TMB	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	SB-12 SS-3/4-5'	SL	G			7-26	1340		4	1					2	1			X	X	X	X	X	X		001
2	SB-12 SS-8/13-15'						1345																			002
3	SB-13 SS-3/4-5'						1350																			003
4	SB-13 SS-9/15-17'						1355																			004
5	SB-14 SS-8/13-15'						1400																			005
6	SB-15 SS-2/2-4'						1405																			006
7	SB-15 SS-5/7-9'						1410																			007
8	SB-16 SS-9/5-7'						1415																			008
9	SB-17 SS-3/4-5'						1420																			009
10	SB-17 SS-7/11-13'						1425																			010
11	Trip Blank																									011
12																										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature]			[signature]	7/27/18	1550				
	[signature]	7/27/18	1730	[signature]	7/27/18	1730	5.1	Y	N	Y
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Jordan Pollard
SIGNATURE of SAMPLER: [signature]
DATE Signed (MM/DD/YY): 07/26/18

ORIGINAL

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-C-010-rev.00, 09Nov2017

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

October 16, 2018

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Radhe Oil 597
Pace Project No.: 30267324

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on October 05, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Colton Gotshall, Letterle & Associates
Mr. Austin Hess, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Tim Kier, Letterle & Associates LLC
Mr. Jordan Packard, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	Radhe Oil 597
Pace Project No.:	30267324

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: Radhe Oil 597
Pace Project No.: 30267324

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30267324001	**SB-18 SS-8 14-16'**	Solid	10/05/18 11:15	10/05/18 16:30
30267324002	**Trip Blank**	Water	10/05/18 00:01	10/05/18 16:30

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SAMPLE ANALYTE COUNT

Project: Radhe Oil 597
Pace Project No.: 30267324

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30267324001	**SB-18 SS-8 14-16'**	EPA 8260B	JEW	13	PASI-PA
		ASTM D2974-87	ARG	1	PASI-PA
30267324002	**Trip Blank**	EPA 8260B	JAS	13	PASI-PA

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: Radhe Oil 597
Pace Project No.: 30267324

Sample: SB-18 SS-8 14-16' **Lab ID: 30267324001** Collected: 10/05/18 11:15 Received: 10/05/18 16:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B Preparation Method: EPA 5035A								
Benzene	ND	ug/kg	3.8	1.1	1	10/11/18 10:02	10/11/18 11:37	71-43-2	1c
Ethylbenzene	ND	ug/kg	3.8	1.2	1	10/11/18 10:02	10/11/18 11:37	100-41-4	1c
Isopropylbenzene (Cumene)	ND	ug/kg	3.8	1.1	1	10/11/18 10:02	10/11/18 11:37	98-82-8	1c
Methyl-tert-butyl ether	ND	ug/kg	3.8	0.61	1	10/11/18 10:02	10/11/18 11:37	1634-04-4	1c
Naphthalene	ND	ug/kg	3.8	1.7	1	10/11/18 10:02	10/11/18 11:37	91-20-3	1c
Toluene	ND	ug/kg	3.8	1.1	1	10/11/18 10:02	10/11/18 11:37	108-88-3	1c
1,2,4-Trimethylbenzene	ND	ug/kg	3.8	1.0	1	10/11/18 10:02	10/11/18 11:37	95-63-6	1c
1,3,5-Trimethylbenzene	ND	ug/kg	3.8	1.0	1	10/11/18 10:02	10/11/18 11:37	108-67-8	1c
Xylene (Total)	ND	ug/kg	11.5	3.4	1	10/11/18 10:02	10/11/18 11:37	1330-20-7	
Surrogates									
Toluene-d8 (S)	100	%.	76-124		1	10/11/18 10:02	10/11/18 11:37	2037-26-5	
4-Bromofluorobenzene (S)	103	%.	70-133		1	10/11/18 10:02	10/11/18 11:37	460-00-4	
1,2-Dichloroethane-d4 (S)	115	%.	74-131		1	10/11/18 10:02	10/11/18 11:37	17060-07-0	
Dibromofluoromethane (S)	108	%.	71-130		1	10/11/18 10:02	10/11/18 11:37	1868-53-7	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**10.5**	%	0.10	0.10	1		10/15/18 11:54		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Radhe Oil 597
Pace Project No.: 30267324

Sample: Trip Blank **Lab ID: 30267324002** Collected: 10/05/18 00:01 Received: 10/05/18 16:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/12/18 13:12	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/12/18 13:12	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		10/12/18 13:12	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/12/18 13:12	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/12/18 13:12	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/12/18 13:12	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/12/18 13:12	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/12/18 13:12	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/12/18 13:12	1330-20-7	
Surrogates									
Toluene-d8 (S)	106	%.	80-120		1		10/12/18 13:12	2037-26-5	
4-Bromofluorobenzene (S)	99	%.	79-129		1		10/12/18 13:12	460-00-4	
1,2-Dichloroethane-d4 (S)	108	%.	80-120		1		10/12/18 13:12	17060-07-0	
Dibromofluoromethane (S)	92	%.	80-120		1		10/12/18 13:12	1868-53-7	

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Radhe Oil 597
Pace Project No.: 30267324

QC Batch: 316277 Analysis Method: EPA 8260B
QC Batch Method: EPA 5035A Analysis Description: 8260B MSV UST-SOIL
Associated Lab Samples: 30267324001

METHOD BLANK: 1543482 Matrix: Solid
Associated Lab Samples: 30267324001

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	ND	5.0	1.3	10/11/18 10:31	
1,3,5-Trimethylbenzene	ug/kg	ND	5.0	1.3	10/11/18 10:31	
Benzene	ug/kg	ND	5.0	1.4	10/11/18 10:31	
Ethylbenzene	ug/kg	ND	5.0	1.5	10/11/18 10:31	
Isopropylbenzene (Cumene)	ug/kg	ND	5.0	1.4	10/11/18 10:31	
Methyl-tert-butyl ether	ug/kg	ND	5.0	0.79	10/11/18 10:31	
Naphthalene	ug/kg	ND	5.0	2.2	10/11/18 10:31	
Toluene	ug/kg	ND	5.0	1.4	10/11/18 10:31	
Xylene (Total)	ug/kg	ND	15.0	4.4	10/11/18 10:31	
1,2-Dichloroethane-d4 (S)	%.	110	74-131		10/11/18 10:31	
4-Bromofluorobenzene (S)	%.	102	70-133		10/11/18 10:31	
Dibromofluoromethane (S)	%.	111	71-130		10/11/18 10:31	
Toluene-d8 (S)	%.	100	76-124		10/11/18 10:31	

LABORATORY CONTROL SAMPLE: 1543483

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/kg	20	18.2	91	70-130	
1,3,5-Trimethylbenzene	ug/kg	20	17.0	85	70-130	
Benzene	ug/kg	20	16.3	82	70-130	
Ethylbenzene	ug/kg	20	18.7	94	70-130	
Isopropylbenzene (Cumene)	ug/kg	20	19.4	97	70-130	
Methyl-tert-butyl ether	ug/kg	20	14.5	72	70-130	
Naphthalene	ug/kg	20	19.3	96	70-130	
Toluene	ug/kg	20	17.9	89	70-130	
Xylene (Total)	ug/kg	60	57.0	95	70-130	
1,2-Dichloroethane-d4 (S)	%.			106	74-131	
4-Bromofluorobenzene (S)	%.			103	70-133	
Dibromofluoromethane (S)	%.			102	71-130	
Toluene-d8 (S)	%.			105	76-124	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: Radhe Oil 597
Pace Project No.: 30267324

QC Batch: 316455 Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30267324002

METHOD BLANK: 1544387 Matrix: Water
Associated Lab Samples: 30267324002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	10/12/18 11:52	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	10/12/18 11:52	
Benzene	ug/L	ND	1.0	0.24	10/12/18 11:52	
Ethylbenzene	ug/L	ND	1.0	0.31	10/12/18 11:52	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	10/12/18 11:52	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	10/12/18 11:52	
Naphthalene	ug/L	ND	2.0	0.82	10/12/18 11:52	
Toluene	ug/L	ND	1.0	0.30	10/12/18 11:52	
Xylene (Total)	ug/L	ND	3.0	0.78	10/12/18 11:52	
1,2-Dichloroethane-d4 (S)	%.	102	80-120		10/12/18 11:52	
4-Bromofluorobenzene (S)	%.	98	79-129		10/12/18 11:52	
Dibromofluoromethane (S)	%.	93	80-120		10/12/18 11:52	
Toluene-d8 (S)	%.	105	80-120		10/12/18 11:52	

LABORATORY CONTROL SAMPLE: 1544388

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	20.9	105	70-130	
1,3,5-Trimethylbenzene	ug/L	20	20.6	103	70-130	
Benzene	ug/L	20	17.1	85	70-130	
Ethylbenzene	ug/L	20	20.0	100	70-130	
Isopropylbenzene (Cumene)	ug/L	20	21.4	107	70-130	
Methyl-tert-butyl ether	ug/L	20	18.2	91	70-130	
Naphthalene	ug/L	20	22.5	113	70-130	
Toluene	ug/L	20	20.2	101	70-130	
Xylene (Total)	ug/L	60	59.2	99	70-130	
1,2-Dichloroethane-d4 (S)	%.			103	80-120	
4-Bromofluorobenzene (S)	%.			103	79-129	
Dibromofluoromethane (S)	%.			99	80-120	
Toluene-d8 (S)	%.			108	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1544389 1544390

Parameter	Units	30266836001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	21.2	21.2	106	106	75-125	0	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	20.7	21.1	104	106	76-121	2	30	
Benzene	ug/L	ND	20	20	18.4	18.3	92	91	67-121	1	30	

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QUALITY CONTROL DATA

Project: Radhe Oil 597
Pace Project No.: 30267324

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1544389 1544390

Parameter	Units	30266836001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	20.5	20.7	103	103	70-127	1	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	21.1	21.1	105	106	80-122	0	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	16.7	17.6	83	88	79-135	5	30	
Naphthalene	ug/L	ND	20	20	19.9	20.6	100	103	62-131	3	30	
Toluene	ug/L	ND	20	20	20.2	21.0	101	105	77-125	4	30	
Xylene (Total)	ug/L	ND	60	60	61.3	63.2	102	105	69-128	3	30	
1,2-Dichloroethane-d4 (S)	%.						103	99	80-120			
4-Bromofluorobenzene (S)	%.						99	98	79-129			
Dibromofluoromethane (S)	%.						92	93	80-120			
Toluene-d8 (S)	%.						104	106	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: Radhe Oil 597
Pace Project No.: 30267324

QC Batch: 316637
Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 30267324001

SAMPLE DUPLICATE: 1545363

Parameter	Units	30267102006 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	41.8	38.2	9	20	

SAMPLE DUPLICATE: 1545364

Parameter	Units	30267102007 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	30.9	28.1	9	20	

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QUALIFIERS

Project:	Radhe Oil 597
Pace Project No.:	30267324

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 316277

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

1c A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Radhe Oil 597
Pace Project No.: 30267324

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30267324001	**SB-18 SS-8 14-16'**	EPA 5035A	316277	EPA 8260B	316281
30267324002	**Trip Blank**	EPA 8260B	316455		
30267324001	**SB-18 SS-8 14-16'**	ASTM D2974-87	316637		

WO# : 30267324

30267324

CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY

Company: Cotterle + Associates
Address: 2859 Oxford Blvd
Report To: Same
Copy To: Same
Customer Project Name/Number: Koehe Oil 597

Billing Information: Same
Email To: cotte@cotterleassociates.com
Site Collection Info/Address:
State: County/City: / Time Zone Collected: [ ]PT [ ]MT [ ]CT [ ]ET

Phone:
Email:
Site/Facility ID #: 597
Compliance Monitoring? [ ] Yes [ ] No

Collected By (print): Jordan Pollard
Purchase Order #:
Quote #:
DW PWS ID #:
DW Location Code:

Collected By (signature):
Turnaround Date Required: Standard
Immediately Packed on Ice: [✓] Yes [ ] No

Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: ______ [ ] Hold: ______
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [ ] No
Analysis: ______

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Container Preservative Type **: 6 | 7 | U

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other ______

Lab Project Manager:

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	BTEX	MTBE	Naphthalene	Cumene	124 TMB	135 TMB
SB-18 SS-8 14-16'	SL	G	10-5	1115				4	X	X	X	X	X	X
Trip blank								2	X	X	X	X	X	X

Lab Profile/Line:

```
Lab Sample Receipt Checklist:
Custody Seals Present/Intact  Y N NA
Custody Signatures Present    Y N NA
Collector Signature Present   Y N NA
Bottles Intact                Y N NA
Correct Bottles               Y N NA
Sufficient Volume             Y N NA
Samples Received on Ice       Y N NA
VOA - Headspace Acceptable    Y N NA
USDA Regulated Soils          Y N NA
Samples in Holding Time       Y N NA
Residual Chlorine Present     Y N NA
Cl Strips: ______
Sample pH Acceptable          Y N NA
pH Strips: ______
Sulfide Present               Y N NA
Lead Acetate Strips: ______

LAB USE ONLY:
Lab Sample # / Comments:
```

BLM/MDS

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None
Packing Material Used: Bubblewrap & ice
Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A
Lab Tracking #:
Samples received via: FEDEX UPS Client Courier Pace Courier

```
LAB Sample Temperature Info:
Temp Blank Received:  Y N NA
Therm ID#: 9
Cooler 1 Temp Upon Receipt: 4.6 oC
Cooler 1 Therm Corr. Factor: -.1 oC
Cooler 1 Corrected Temp: 4.5 oC
Comments:
```

MDS 10-5-18

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
	10-5-18		10/5/18 1515
	10/5/18 1630	M S	10-5-18 1630

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO
Page: 1 of: 1

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

March 11, 2019

Mr. Eric Itle
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Radhe Oil/597
Pace Project No.: 30281462

Dear Mr. Itle:

Enclosed are the analytical results for sample(s) received by the laboratory on February 26, 2019. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Colton Gotshall, Letterle & Associates
Mr. Austin Hess, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Tim Kier, Letterle & Associates LLC
Mr. Jordan Packard, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

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CERTIFICATIONS

Project:	Radhe Oil/597
Pace Project No.:	30281462

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: Radhe Oil/597
Pace Project No.: 30281462

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30281462001	**MW-1**	Water	02/25/19 08:40	02/26/19 12:15
30281462002	**MW-2**	Water	02/25/19 09:15	02/26/19 12:15
30281462003	**MW-3**	Water	02/25/19 09:50	02/26/19 12:15
30281462004	**MW-4**	Water	02/25/19 10:30	02/26/19 12:15
30281462005	**MW-5**	Water	02/25/19 11:05	02/26/19 12:15
30281462006	**MW-6**	Water	02/25/19 11:35	02/26/19 12:15
30281462007	**Field dupe(MW-1)**	Water	02/25/19 08:40	02/26/19 12:15
30281462008	**Trip Blank**	Water	02/25/19 00:01	02/26/19 12:15

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SAMPLE ANALYTE COUNT

Project: Radhe Oil/597
Pace Project No.: 30281462

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30281462001	**MW-1**	EPA 8260B	JAS	13	PASI-PA
30281462002	**MW-2**	EPA 8260B	JAS	13	PASI-PA
30281462003	**MW-3**	EPA 8260B	LEL	13	PASI-PA
30281462004	**MW-4**	EPA 8260B	JAS	13	PASI-PA
30281462005	**MW-5**	EPA 8260B	LEL	13	PASI-PA
30281462006	**MW-6**	EPA 8260B	JAS	13	PASI-PA
30281462007	**Field dupe(MW-1)**	EPA 8260B	LEL	13	PASI-PA
30281462008	**Trip Blank**	EPA 8260B	LEL	13	PASI-PA

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: MW-1 **Lab ID: 30281462001** Collected: 02/25/19 08:40 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/07/19 16:27	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/07/19 16:27	100-41-4	
Isopropylbenzene (Cumene)	**2.4**	ug/L	1.0	0.24	1		03/07/19 16:27	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/07/19 16:27	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		03/07/19 16:27	91-20-3	L1
Toluene	ND	ug/L	1.0	0.30	1		03/07/19 16:27	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/07/19 16:27	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/07/19 16:27	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/07/19 16:27	1330-20-7	
Surrogates									
Toluene-d8 (S)	101	%.	80-120		1		03/07/19 16:27	2037-26-5	
4-Bromofluorobenzene (S)	104	%.	78-122		1		03/07/19 16:27	460-00-4	
1,2-Dichloroethane-d4 (S)	110	%.	80-120		1		03/07/19 16:27	17060-07-0	
Dibromofluoromethane (S)	105	%.	80-120		1		03/07/19 16:27	1868-53-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: MW-2 **Lab ID: 30281462002** Collected: 02/25/19 09:15 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/07/19 16:52	71-43-2	
Ethylbenzene	**121**	ug/L	1.0	0.31	1		03/07/19 16:52	100-41-4	
Isopropylbenzene (Cumene)	**110**	ug/L	1.0	0.24	1		03/07/19 16:52	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/07/19 16:52	1634-04-4	
Naphthalene	**137**	ug/L	2.0	0.82	1		03/07/19 16:52	91-20-3	L1
Toluene	ND	ug/L	1.0	0.30	1		03/07/19 16:52	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/07/19 16:52	95-63-6	
1,3,5-Trimethylbenzene	**1.1**	ug/L	1.0	0.21	1		03/07/19 16:52	108-67-8	
Xylene (Total)	**19.4**	ug/L	3.0	0.78	1		03/07/19 16:52	1330-20-7	
Surrogates									
Toluene-d8 (S)	88	%.	80-120		1		03/07/19 16:52	2037-26-5	
4-Bromofluorobenzene (S)	103	%.	78-122		1		03/07/19 16:52	460-00-4	
1,2-Dichloroethane-d4 (S)	104	%.	80-120		1		03/07/19 16:52	17060-07-0	
Dibromofluoromethane (S)	97	%.	80-120		1		03/07/19 16:52	1868-53-7	

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(724)850-5600

ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: MW-3 **Lab ID: 30281462003** Collected: 02/25/19 09:50 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/05/19 14:18	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/05/19 14:18	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		03/05/19 14:18	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/05/19 14:18	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		03/05/19 14:18	91-20-3	
Toluene	**1.1**	ug/L	1.0	0.30	1		03/05/19 14:18	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/05/19 14:18	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/05/19 14:18	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/05/19 14:18	1330-20-7	
Surrogates									
Toluene-d8 (S)	90	%.	80-120		1		03/05/19 14:18	2037-26-5	
4-Bromofluorobenzene (S)	104	%.	78-122		1		03/05/19 14:18	460-00-4	
1,2-Dichloroethane-d4 (S)	119	%.	80-120		1		03/05/19 14:18	17060-07-0	
Dibromofluoromethane (S)	101	%.	80-120		1		03/05/19 14:18	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: MW-4 **Lab ID: 30281462004** Collected: 02/25/19 10:30 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/07/19 17:16	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/07/19 17:16	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		03/07/19 17:16	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/07/19 17:16	1634-04-4	
Naphthalene	**4.9**	ug/L	2.0	0.82	1		03/07/19 17:16	91-20-3	L1
Toluene	**1.1**	ug/L	1.0	0.30	1		03/07/19 17:16	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/07/19 17:16	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/07/19 17:16	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/07/19 17:16	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%.	80-120		1		03/07/19 17:16	2037-26-5	
4-Bromofluorobenzene (S)	107	%.	78-122		1		03/07/19 17:16	460-00-4	
1,2-Dichloroethane-d4 (S)	112	%.	80-120		1		03/07/19 17:16	17060-07-0	
Dibromofluoromethane (S)	109	%.	80-120		1		03/07/19 17:16	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: MW-5 **Lab ID: 30281462005** Collected: 02/25/19 11:05 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/05/19 17:39	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/05/19 17:39	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		03/05/19 17:39	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/05/19 17:39	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		03/05/19 17:39	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		03/05/19 17:39	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/05/19 17:39	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/05/19 17:39	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/05/19 17:39	1330-20-7	
Surrogates									
Toluene-d8 (S)	88	%.	80-120		1		03/05/19 17:39	2037-26-5	
4-Bromofluorobenzene (S)	99	%.	78-122		1		03/05/19 17:39	460-00-4	
1,2-Dichloroethane-d4 (S)	117	%.	80-120		1		03/05/19 17:39	17060-07-0	
Dibromofluoromethane (S)	102	%.	80-120		1		03/05/19 17:39	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: MW-6 **Lab ID: 30281462006** Collected: 02/25/19 11:35 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/07/19 17:41	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/07/19 17:41	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		03/07/19 17:41	98-82-8	
Methyl-tert-butyl ether	**2.0**	ug/L	1.0	0.23	1		03/07/19 17:41	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		03/07/19 17:41	91-20-3	L1
Toluene	ND	ug/L	1.0	0.30	1		03/07/19 17:41	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/07/19 17:41	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/07/19 17:41	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/07/19 17:41	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%.	80-120		1		03/07/19 17:41	2037-26-5	
4-Bromofluorobenzene (S)	103	%.	78-122		1		03/07/19 17:41	460-00-4	
1,2-Dichloroethane-d4 (S)	104	%.	80-120		1		03/07/19 17:41	17060-07-0	
Dibromofluoromethane (S)	105	%.	80-120		1		03/07/19 17:41	1868-53-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: Field dupe(MW-1) **Lab ID: 30281462007** Collected: 02/25/19 08:40 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/05/19 19:45	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/05/19 19:45	100-41-4	
Isopropylbenzene (Cumene)	**2.4**	ug/L	1.0	0.24	1		03/05/19 19:45	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/05/19 19:45	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		03/05/19 19:45	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		03/05/19 19:45	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/05/19 19:45	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/05/19 19:45	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/05/19 19:45	1330-20-7	
Surrogates									
Toluene-d8 (S)	95	%.	80-120		1		03/05/19 19:45	2037-26-5	
4-Bromofluorobenzene (S)	99	%.	78-122		1		03/05/19 19:45	460-00-4	
1,2-Dichloroethane-d4 (S)	116	%.	80-120		1		03/05/19 19:45	17060-07-0	
Dibromofluoromethane (S)	109	%.	80-120		1		03/05/19 19:45	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30281462

Sample: Trip Blank **Lab ID: 30281462008** Collected: 02/25/19 00:01 Received: 02/26/19 12:15 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		03/05/19 16:24	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		03/05/19 16:24	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		03/05/19 16:24	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		03/05/19 16:24	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		03/05/19 16:24	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		03/05/19 16:24	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		03/05/19 16:24	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		03/05/19 16:24	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		03/05/19 16:24	1330-20-7	
Surrogates									
Toluene-d8 (S)	96	%.	80-120		1		03/05/19 16:24	2037-26-5	
4-Bromofluorobenzene (S)	95	%.	78-122		1		03/05/19 16:24	460-00-4	
1,2-Dichloroethane-d4 (S)	129	%.	80-120		1		03/05/19 16:24	17060-07-0	S3,ST
Dibromofluoromethane (S)	112	%.	80-120		1		03/05/19 16:24	1868-53-7	

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QUALITY CONTROL DATA

Project: Radhe Oil/597
Pace Project No.: 30281462

QC Batch: 332303 Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30281462003, 30281462005, 30281462007, 30281462008

METHOD BLANK: 1616938 Matrix: Water
Associated Lab Samples: 30281462003, 30281462005, 30281462007, 30281462008

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	03/05/19 13:53	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	03/05/19 13:53	
Benzene	ug/L	ND	1.0	0.24	03/05/19 13:53	
Ethylbenzene	ug/L	ND	1.0	0.31	03/05/19 13:53	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	03/05/19 13:53	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	03/05/19 13:53	
Naphthalene	ug/L	ND	2.0	0.82	03/05/19 13:53	
Toluene	ug/L	ND	1.0	0.30	03/05/19 13:53	
Xylene (Total)	ug/L	ND	3.0	0.78	03/05/19 13:53	
1,2-Dichloroethane-d4 (S)	%.	123	80-120		03/05/19 13:53	S3,ST
4-Bromofluorobenzene (S)	%.	97	78-122		03/05/19 13:53	
Dibromofluoromethane (S)	%.	105	80-120		03/05/19 13:53	
Toluene-d8 (S)	%.	90	80-120		03/05/19 13:53	

LABORATORY CONTROL SAMPLE: 1616939

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	20.0	100	70-130	
1,3,5-Trimethylbenzene	ug/L	20	19.5	97	70-130	
Benzene	ug/L	20	20.0	100	70-130	
Ethylbenzene	ug/L	20	20.3	101	70-130	
Isopropylbenzene (Cumene)	ug/L	20	19.4	97	70-130	
Methyl-tert-butyl ether	ug/L	20	20.2	101	70-130	
Naphthalene	ug/L	20	21.6	108	69-135	
Toluene	ug/L	20	19.4	97	70-130	
Xylene (Total)	ug/L	60	59.9	100	70-130	
1,2-Dichloroethane-d4 (S)	%.			113	80-120	
4-Bromofluorobenzene (S)	%.			102	78-122	
Dibromofluoromethane (S)	%.			101	80-120	
Toluene-d8 (S)	%.			95	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1616940 1616941

Parameter	Units	30281462003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	20.9	20.8	104	104	70-130	0	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	20.6	20.2	103	101	70-130	2	30	
Benzene	ug/L	ND	20	20	20.5	20.9	102	104	67-119	2	30	

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QUALITY CONTROL DATA

Project: Radhe Oil/597
Pace Project No.: 30281462

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1616940 1616941

Parameter	Units	30281462003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	20.3	20.7	101	104	69-127	2	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	21.2	20.5	106	103	70-130	3	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	21.3	23.5	106	118	70-130	10	30	
Naphthalene	ug/L	ND	20	20	19.2	19.8	96	99	60-136	3	30	
Toluene	ug/L	1.1	20	20	23.0	22.7	109	108	70-130	1	30	
Xylene (Total)	ug/L	ND	60	60	60.7	61.1	101	102	69-128	1	30	
1,2-Dichloroethane-d4 (S)	%.						106	108	80-120			
4-Bromofluorobenzene (S)	%.						101	98	78-122			
Dibromofluoromethane (S)	%.						102	101	80-120			
Toluene-d8 (S)	%.						97	99	80-120			

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QUALITY CONTROL DATA

Project: Radhe Oil/597
Pace Project No.: 30281462

QC Batch: 332648 Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30281462001, 30281462002, 30281462004, 30281462006

METHOD BLANK: 1618659 Matrix: Water
Associated Lab Samples: 30281462001, 30281462002, 30281462004, 30281462006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	03/07/19 11:10	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	03/07/19 11:10	
Benzene	ug/L	ND	1.0	0.24	03/07/19 11:10	
Ethylbenzene	ug/L	ND	1.0	0.31	03/07/19 11:10	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	03/07/19 11:10	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	03/07/19 11:10	
Naphthalene	ug/L	ND	2.0	0.82	03/07/19 11:10	
Toluene	ug/L	ND	1.0	0.30	03/07/19 11:10	
Xylene (Total)	ug/L	ND	3.0	0.78	03/07/19 11:10	
1,2-Dichloroethane-d4 (S)	%.	110	80-120		03/07/19 11:10	
4-Bromofluorobenzene (S)	%.	95	78-122		03/07/19 11:10	
Dibromofluoromethane (S)	%.	109	80-120		03/07/19 11:10	
Toluene-d8 (S)	%.	97	80-120		03/07/19 11:10	

LABORATORY CONTROL SAMPLE: 1618660

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	21.7	108	70-130	
1,3,5-Trimethylbenzene	ug/L	20	21.4	107	70-130	
Benzene	ug/L	20	20.1	100	70-130	
Ethylbenzene	ug/L	20	21.5	108	70-130	
Isopropylbenzene (Cumene)	ug/L	20	21.2	106	70-130	
Methyl-tert-butyl ether	ug/L	20	14.9	74	70-130	
Naphthalene	ug/L	20	27.4	137	69-135	L1
Toluene	ug/L	20	21.9	110	70-130	
Xylene (Total)	ug/L	60	62.7	105	70-130	
1,2-Dichloroethane-d4 (S)	%.			106	80-120	
4-Bromofluorobenzene (S)	%.			106	78-122	
Dibromofluoromethane (S)	%.			96	80-120	
Toluene-d8 (S)	%.			109	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1618938 1618939

Parameter	Units	30281799001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	22.1	21.1	111	106	70-130	5	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	22.0	21.4	110	107	70-130	2	30	
Benzene	ug/L	ND	20	20	20.9	20.2	105	101	67-119	4	30	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: Radhe Oil/597

Pace Project No.: 30281462

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1618938 1618939

Parameter	Units	30281799001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	22.0	21.7	110	109	69-127	1	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	22.2	21.9	111	110	70-130	1	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	19.1	16.3	95	82	70-130	16	30	
Naphthalene	ug/L	ND	20	20	21.1	21.2	106	106	60-136	1	30	
Toluene	ug/L	ND	20	20	20.7	20.3	103	101	70-130	2	30	
Xylene (Total)	ug/L	ND	60	60	64.9	62.2	108	104	69-128	4	30	
1,2-Dichloroethane-d4 (S)	%.						105	94	80-120			
4-Bromofluorobenzene (S)	%.						109	107	78-122			
Dibromofluoromethane (S)	%.						114	102	80-120			
Toluene-d8 (S)	%.						97	98	80-120			

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QUALIFIERS

Project:	Radhe Oil/597
Pace Project No.:	30281462

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA	Pace Analytical Services - Greensburg

ANALYTE QUALIFIERS

L1	Analyte recovery in the laboratory control sample (LCS) was above QC limits. Results for this analyte in associated samples may be biased high.
S3	Surrogate recovery exceeded laboratory control limits. Analyte presence below reporting limits in associated sample.
ST	Surrogate recovery was above laboratory control limits. Results may be biased high.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Radhe Oil/597
Pace Project No.: 30281462

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30281462001	**MW-1**	EPA 8260B	332648		
30281462002	**MW-2**	EPA 8260B	332648		
30281462003	**MW-3**	EPA 8260B	332303		
30281462004	**MW-4**	EPA 8260B	332648		
30281462005	**MW-5**	EPA 8260B	332303		
30281462006	**MW-6**	EPA 8260B	332648		
30281462007	**Field dupe(MW-1)**	EPA 8260B	332303		
30281462008	**Trip Blank**	EPA 8260B	332303		

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CHAIN-OF-CUSTODY Analytical Request Document

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WO# : 30281462

30281462

ALL SHADED AREAS

Company: Letterle & Associates
Address: 2859 Oxford Blvd.
Report To: Same
Copy To:
Billing Information: Same
Email To: citte@letterleassociates.com
Site Collection Info/Address: Freeport, PA
Customer Project Name/Number: Radhe Oil / 597
State: / County/City: Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET
Phone:
Email:
Site/Facility ID #:
Compliance Monitoring? [ ] Yes [ ] No
Collected By (print): Colton Gotshall
Purchase Order #:
Quote #:
DW PWS ID #:
DW Location Code:
Collected By (signature): Colton Gotshall
Turnaround Date Required: Standard
Immediately Packed on Ice: [X] Yes [ ] No
Sample Disposal: [X] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [ ] No
Analysis:

Container Preservative Type **

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other

Lab Project Manager:

Lab Profile/Line:

Lab Sample Receipt Checklist:

Item	Response
Custody Seals Present/Intact	N
Custody Signatures Present	N
Collector Signature Present	Y
Bottles Intact	Y
Correct Bottles	Y
Sufficient Volume	Y
Samples Received on Ice	Y
VOA - Headspace Acceptable	Y
USDA Regulated Soils	NA
Samples in Holding Time	Y
Residual Chlorine Present	NA
Cl Strips:	
Sample pH Acceptable	NA
pH Strips:	
Sulfide Present	NA
Lead Acetate Strips:	

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected Date	Collected Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	BTEX	MTBE	Cumene	Napthalene	1,2,4-TMB	1,3,5-TMB	LAB USE ONLY: Lab Sample # / Comments: BLM/JJB
mw-1	GW	G	02-25	0840				3	X	X	X	X	X	X	001
mw-2	↓	↓	↓	0915				↓	↓	↓	↓	↓	↓	↓	002
mw-3	↓	↓	↓	0950				↓	↓	↓	↓	↓	↓	↓	003
mw-4	↓	↓	↓	1030				↓	↓	↓	↓	↓	↓	↓	004
mw-5	↓	↓	↓	1105				↓	↓	↓	↓	↓	↓	↓	005
mw-6	↓	↓	↓	1135				↓	↓	↓	↓	↓	↓	↓	006
Field dupe (MW-1)	↓	↓	↓	0840				↓	↓	↓	↓	↓	↓	↓	007
Trip Blank								2	↓	↓	↓	↓	↓	↓	008

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None (Wet circled)

Packing Material Used: bubble wrap

Radchem sample(s) screened (<500 cpm): Y N NA (NA circled)

SHORT HOLDS PRESENT (<72 hours): Y N N/A (N circled)

Lab Tracking #: 2317481

Samples received via: FEDEX UPS Client Courier Pace Courier (Pace Courier circled)

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
[signature]	2/26/19 10:25	[signature] Pace	2/26/19 1025
[signature] Pace	2/26/19 1215	[signature] PACE	02/26/19 1215

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Lab Sample Temperature Info:
Temp Blank Received: Y N NA (N circled)
Therm ID#: 11
Cooler 1 Temp Upon Receipt: 1.3 oC
Cooler 1 Therm Corr. Factor: 0 oC
Cooler 1 Corrected Temp: 1.3 oC
Comments: JJB 02/26/19

Trip Blank Received: Y N NA (N circled)
HCL MeOH TSP Other

Non Conformance(s): YES / NO (NO circled)

Page: 1 of: 1

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

November 27, 2018

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Radke / 597
Pace Project No.: 30271969

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on November 16, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Colton Gotshall, Letterle & Associates
Mr. Austin Hess, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Tim Kier, Letterle & Associates LLC
Mr. Jordan Packard, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

REPORT OF LABORATORY ANALYSIS

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	Radke / 597
Pace Project No.:	30271969

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: Radke / 597
Pace Project No.: 30271969

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30271969001	**MW-6**	Water	11/16/18 11:50	11/16/18 17:30
30271969002	**Trip blank**	Water	11/16/18 00:00	11/16/18 17:30

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Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: Radke / 597
Pace Project No.: 30271969

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30271969001	**MW-6**	EPA 8260B	LEL	13	PASI-PA
30271969002	**Trip blank**	EPA 8260B	LEL	13	PASI-PA

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Radke / 597
Pace Project No.: 30271969

Sample: MW-6 **Lab ID: 30271969001** Collected: 11/16/18 11:50 Received: 11/16/18 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		11/20/18 18:46	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		11/20/18 18:46	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		11/20/18 18:46	98-82-8	
Methyl-tert-butyl ether	**1.9**	ug/L	1.0	0.23	1		11/20/18 18:46	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		11/20/18 18:46	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		11/20/18 18:46	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		11/20/18 18:46	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		11/20/18 18:46	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		11/20/18 18:46	1330-20-7	
Surrogates									
Toluene-d8 (S)	94	%.	80-120		1		11/20/18 18:46	2037-26-5	
4-Bromofluorobenzene (S)	100	%.	79-129		1		11/20/18 18:46	460-00-4	
1,2-Dichloroethane-d4 (S)	96	%.	80-120		1		11/20/18 18:46	17060-07-0	
Dibromofluoromethane (S)	104	%.	80-120		1		11/20/18 18:46	1868-53-7	

Pace Analytical Services, LLC
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(724)850-5600

ANALYTICAL RESULTS

Project: Radke / 597
Pace Project No.: 30271969

Sample: Trip blank **Lab ID: 30271969002** Collected: 11/16/18 00:00 Received: 11/16/18 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		11/20/18 12:54	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		11/20/18 12:54	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		11/20/18 12:54	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		11/20/18 12:54	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		11/20/18 12:54	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		11/20/18 12:54	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		11/20/18 12:54	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		11/20/18 12:54	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		11/20/18 12:54	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%.	80-120		1		11/20/18 12:54	2037-26-5	
4-Bromofluorobenzene (S)	102	%.	79-129		1		11/20/18 12:54	460-00-4	
1,2-Dichloroethane-d4 (S)	104	%.	80-120		1		11/20/18 12:54	17060-07-0	
Dibromofluoromethane (S)	105	%.	80-120		1		11/20/18 12:54	1868-53-7	

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(724)850-5600

QUALITY CONTROL DATA

Project: Radke / 597
Pace Project No.: 30271969

QC Batch: 321288 | Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B | Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30271969001, 30271969002

METHOD BLANK: 1566926 Matrix: Water
Associated Lab Samples: 30271969001, 30271969002

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	11/20/18 11:13	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	11/20/18 11:13	
Benzene	ug/L	ND	1.0	0.24	11/20/18 11:13	
Ethylbenzene	ug/L	ND	1.0	0.31	11/20/18 11:13	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	11/20/18 11:13	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	11/20/18 11:13	
Naphthalene	ug/L	ND	2.0	0.82	11/20/18 11:13	
Toluene	ug/L	ND	1.0	0.30	11/20/18 11:13	
Xylene (Total)	ug/L	ND	3.0	0.78	11/20/18 11:13	
1,2-Dichloroethane-d4 (S)	%.	103	80-120		11/20/18 11:13	
4-Bromofluorobenzene (S)	%.	103	79-129		11/20/18 11:13	
Dibromofluoromethane (S)	%.	103	80-120		11/20/18 11:13	
Toluene-d8 (S)	%.	99	80-120		11/20/18 11:13	

LABORATORY CONTROL SAMPLE: 1566927

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	18.6	93	70-130	
1,3,5-Trimethylbenzene	ug/L	20	18.4	92	70-130	
Benzene	ug/L	20	18.3	92	70-130	
Ethylbenzene	ug/L	20	18.4	92	70-130	
Isopropylbenzene (Cumene)	ug/L	20	18.8	94	70-130	
Methyl-tert-butyl ether	ug/L	20	17.8	89	70-130	
Naphthalene	ug/L	20	17.8	89	70-130	
Toluene	ug/L	20	18.8	94	70-130	
Xylene (Total)	ug/L	60	54.2	90	70-130	
1,2-Dichloroethane-d4 (S)	%.			99	80-120	
4-Bromofluorobenzene (S)	%.			98	79-129	
Dibromofluoromethane (S)	%.			103	80-120	
Toluene-d8 (S)	%.			98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1566928 1566929

Parameter	Units	30271887003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	22.4	20.5	112	102	75-125	9	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	20.6	20.2	103	101	76-121	2	30	
Benzene	ug/L	ND	20	20	20.4	22.3	102	112	67-121	9	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Radke / 597
Pace Project No.: 30271969

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1566928 1566929

Parameter	Units	30271887003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	20.4	19.7	102	99	70-127	3	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	21.4	20.7	107	104	80-122	3	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	18.8	20.2	94	101	79-135	7	30	
Naphthalene	ug/L	ND	20	20	22.3	18.2	112	91	62-131	20	30	
Toluene	ug/L	ND	20	20	21.1	21.5	106	108	77-125	2	30	
Xylene (Total)	ug/L	ND	60	60	60.2	59.4	100	99	69-128	1	30	
1,2-Dichloroethane-d4 (S)	%.						105	108	80-120			
4-Bromofluorobenzene (S)	%.						99	102	79-129			
Dibromofluoromethane (S)	%.						103	112	80-120			
Toluene-d8 (S)	%.						97	101	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project:	Radke / 597
Pace Project No.:	30271969

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA	Pace Analytical Services - Greensburg

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Radke / 597
Pace Project No.: 30271969

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30271969001	**MW-6**	EPA 8260B	321288		
30271969002	**Trip blank**	EPA 8260B	321288		

Pace Analytical®

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

WO#: 30271969

30271969

Company: Letterle and Associates
Address: 2859 Oxford Boulevard
Report To: Same
Copy To: Same
Customer Project Name/Number: Radke Oil / 597

Billing Information: Same
Email To:
Site Collection Info/Address: PA
State: / County/City: Time Zone Collected: [ ]PT [ ]MT [ ]CT [ ]ET

Phone:
Email:
Site/Facility ID #:
Compliance Monitoring? [ ] Yes [ ] No

Collected By (print): Austin Hess
Purchase Order # :
Quote #:
DW PWS ID #:
DW Location Code:

Collected By (signature):
Turnaround Date Required: Standard
Immediately Packed on Ice: [✓] Yes [ ] No

Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [ ] No
Analysis:

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Container

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	BTEX	MTBE	Naphthalene	Cumene	1,2,4-TMB	1,3,5-TMB	Lab Sample # / Comments
MW-6	GW	G	11/16/18	1150				3	X	X	X	X	X	X	001
Trip Blank								2	X	X	X	X	X	X	002

Lab Profile/Line:

Lab Sample Receipt Checklist:
Custody Seals Present/Intact Y N NA — NA
Custody Signatures Present Y N NA — Y
Collector Signature Present Y N NA — Y
Bottles Intact Y N NA — Y
Correct Bottles Y N NA — Y
Sufficient Volume Y N NA — Y
Samples Received on Ice Y N NA — Y
VOA - Headspace Acceptable Y N NA — MDS 11/16/18
USDA Regulated Soils Y N NA — NA
Samples in Holding Time Y N NA — NA
Residual Chlorine Present Y N NA — NA
Cl Strips:
Sample pH Acceptable Y N NA — NA
pH Strips:
Sulfide Present Y N NA — NA
Lead Acetate Strips:

LAB USE ONLY:
Lab Sample # / Comments: BMJ / MDS

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None — Wet
Packing Material Used: Bubblebag and ICE
Radchem sample(s) screened (<500 cpm): Y N NA — NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A — N/A
Lab Tracking #: NA
Samples received via: FEDEX UPS Client Courier Pace Courier — Pace Courier

LAB Sample Temperature Info:
Temp Blank Received: Y N NA — NA
Therm ID#: 10
Cooler 1 Temp Upon Receipt: 1.9 oC
Cooler 1 Therm Corr. Factor: 0 oC
Cooler 1 Corrected Temp: 1.9 oC
Comments: MJS 11-16-18

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	MTJL LAB USE ONLY
SBK	11/16/18 3:15	Pace	11/16/18 1515	Table #:
Pace	11/16/18 1730		11/16/18 1730	Acctnum: Template: Prelogin:
				PM: PB:

Trip Blank Received: Y N NA — Y
HCL MeOH TSP Other — HCL

Non Conformance(s): YES / NO
Page: 1 of: 1

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

October 23, 2018

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Radhe Oil/597
Pace Project No.: 30268461

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on October 16, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Colton Gotshall, Letterle & Associates
Mr. Austin Hess, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Tim Kier, Letterle & Associates LLC
Mr. Jordan Packard, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	Radhe Oil/597
Pace Project No.:	30268461

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: Radhe Oil/597
Pace Project No.: 30268461

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30268461001	**MW-1**	Water	10/15/18 09:20	10/16/18 17:40
30268461002	**MW-2**	Water	10/15/18 09:50	10/16/18 17:40
30268461003	**MW-3**	Water	10/15/18 10:20	10/16/18 17:40
30268461004	**MW-4**	Water	10/15/18 10:50	10/16/18 17:40
30268461005	**MW-5**	Water	10/15/18 11:30	10/16/18 17:40
30268461006	**MW-6**	Water	10/15/18 12:00	10/16/18 17:40
30268461007	**Field Dupe (MW-1)**	Water	10/15/18 09:20	10/16/18 17:40
30268461008	**Trip Blank**	Water	10/15/18 00:01	10/16/18 17:40

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SAMPLE ANALYTE COUNT

Project: Radhe Oil/597
Pace Project No.: 30268461

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30268461001	**MW-1**	EPA 8260B	JAS	13	PASI-PA
30268461002	**MW-2**	EPA 8260B	JAS	13	PASI-PA
30268461003	**MW-3**	EPA 8260B	JAS	13	PASI-PA
30268461004	**MW-4**	EPA 8260B	JAS	13	PASI-PA
30268461005	**MW-5**	EPA 8260B	JAS	13	PASI-PA
30268461006	**MW-6**	EPA 8260B	JAS	13	PASI-PA
30268461007	**Field Dupe (MW-1)**	EPA 8260B	JAS	13	PASI-PA
30268461008	**Trip Blank**	EPA 8260B	JAS	13	PASI-PA

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: MW-1 **Lab ID: 30268461001** Collected: 10/15/18 09:20 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 16:47	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/22/18 16:47	100-41-4	
Isopropylbenzene (Cumene)	**2.4**	ug/L	1.0	0.24	1		10/22/18 16:47	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 16:47	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/22/18 16:47	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 16:47	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 16:47	95-63-6	
1,3,5-Trimethylbenzene	**1.2**	ug/L	1.0	0.21	1		10/22/18 16:47	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 16:47	1330-20-7	
Surrogates									
Toluene-d8 (S)	104	%.	80-120		1		10/22/18 16:47	2037-26-5	
4-Bromofluorobenzene (S)	98	%.	79-129		1		10/22/18 16:47	460-00-4	
1,2-Dichloroethane-d4 (S)	98	%.	80-120		1		10/22/18 16:47	17060-07-0	
Dibromofluoromethane (S)	94	%.	80-120		1		10/22/18 16:47	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: MW-2 **Lab ID: 30268461002** Collected: 10/15/18 09:50 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 17:14	71-43-2	
Ethylbenzene	**62.8**	ug/L	1.0	0.31	1		10/22/18 17:14	100-41-4	
Isopropylbenzene (Cumene)	**57.2**	ug/L	1.0	0.24	1		10/22/18 17:14	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 17:14	1634-04-4	
Naphthalene	**59.4**	ug/L	2.0	0.82	1		10/22/18 17:14	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 17:14	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 17:14	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/22/18 17:14	108-67-8	
Xylene (Total)	**12.5**	ug/L	3.0	0.78	1		10/22/18 17:14	1330-20-7	
Surrogates									
Toluene-d8 (S)	104	%.	80-120		1		10/22/18 17:14	2037-26-5	
4-Bromofluorobenzene (S)	98	%.	79-129		1		10/22/18 17:14	460-00-4	
1,2-Dichloroethane-d4 (S)	108	%.	80-120		1		10/22/18 17:14	17060-07-0	
Dibromofluoromethane (S)	90	%.	80-120		1		10/22/18 17:14	1868-53-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: MW-3 **Lab ID: 30268461003** Collected: 10/15/18 10:20 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 15:01	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/22/18 15:01	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		10/22/18 15:01	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 15:01	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/22/18 15:01	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 15:01	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 15:01	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/22/18 15:01	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 15:01	1330-20-7	
Surrogates									
Toluene-d8 (S)	108	%.	80-120		1		10/22/18 15:01	2037-26-5	
4-Bromofluorobenzene (S)	103	%.	79-129		1		10/22/18 15:01	460-00-4	
1,2-Dichloroethane-d4 (S)	103	%.	80-120		1		10/22/18 15:01	17060-07-0	
Dibromofluoromethane (S)	95	%.	80-120		1		10/22/18 15:01	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: MW-4 **Lab ID: 30268461004** Collected: 10/15/18 10:50 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 15:28	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/22/18 15:28	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		10/22/18 15:28	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 15:28	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/22/18 15:28	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 15:28	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 15:28	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/22/18 15:28	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 15:28	1330-20-7	
Surrogates									
Toluene-d8 (S)	107	%.	80-120		1		10/22/18 15:28	2037-26-5	
4-Bromofluorobenzene (S)	106	%.	79-129		1		10/22/18 15:28	460-00-4	
1,2-Dichloroethane-d4 (S)	106	%.	80-120		1		10/22/18 15:28	17060-07-0	
Dibromofluoromethane (S)	96	%.	80-120		1		10/22/18 15:28	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: MW-5 **Lab ID: 30268461005** Collected: 10/15/18 11:30 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 15:54	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/22/18 15:54	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		10/22/18 15:54	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 15:54	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/22/18 15:54	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 15:54	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 15:54	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/22/18 15:54	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 15:54	1330-20-7	
Surrogates									
Toluene-d8 (S)	104	%.	80-120		1		10/22/18 15:54	2037-26-5	
4-Bromofluorobenzene (S)	103	%.	79-129		1		10/22/18 15:54	460-00-4	
1,2-Dichloroethane-d4 (S)	101	%.	80-120		1		10/22/18 15:54	17060-07-0	
Dibromofluoromethane (S)	95	%.	80-120		1		10/22/18 15:54	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: MW-6 **Lab ID: 30268461006** Collected: 10/15/18 12:00 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 16:21	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/22/18 16:21	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		10/22/18 16:21	98-82-8	
Methyl-tert-butyl ether	**2.4**	ug/L	1.0	0.23	1		10/22/18 16:21	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/22/18 16:21	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 16:21	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 16:21	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/22/18 16:21	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 16:21	1330-20-7	
Surrogates									
Toluene-d8 (S)	104	%.	80-120		1		10/22/18 16:21	2037-26-5	
4-Bromofluorobenzene (S)	105	%.	79-129		1		10/22/18 16:21	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%.	80-120		1		10/22/18 16:21	17060-07-0	
Dibromofluoromethane (S)	97	%.	80-120		1		10/22/18 16:21	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: Field Dupe (MW-1) **Lab ID: 30268461007** Collected: 10/15/18 09:20 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 17:40	71-43-2	
Ethylbenzene	**1.2**	ug/L	1.0	0.31	1		10/22/18 17:40	100-41-4	
Isopropylbenzene (Cumene)	**2.8**	ug/L	1.0	0.24	1		10/22/18 17:40	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 17:40	1634-04-4	
Naphthalene	**3.6**	ug/L	2.0	0.82	1		10/22/18 17:40	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 17:40	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 17:40	95-63-6	
1,3,5-Trimethylbenzene	**1.3**	ug/L	1.0	0.21	1		10/22/18 17:40	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 17:40	1330-20-7	
Surrogates									
Toluene-d8 (S)	105	%.	80-120		1		10/22/18 17:40	2037-26-5	
4-Bromofluorobenzene (S)	98	%.	79-129		1		10/22/18 17:40	460-00-4	
1,2-Dichloroethane-d4 (S)	97	%.	80-120		1		10/22/18 17:40	17060-07-0	
Dibromofluoromethane (S)	92	%.	80-120		1		10/22/18 17:40	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil/597
Pace Project No.: 30268461

Sample: Trip Blank **Lab ID: 30268461008** Collected: 10/15/18 00:01 Received: 10/16/18 17:40 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		10/22/18 13:15	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		10/22/18 13:15	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		10/22/18 13:15	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		10/22/18 13:15	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		10/22/18 13:15	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		10/22/18 13:15	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		10/22/18 13:15	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/22/18 13:15	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		10/22/18 13:15	1330-20-7	
Surrogates									
Toluene-d8 (S)	106	%.	80-120		1		10/22/18 13:15	2037-26-5	
4-Bromofluorobenzene (S)	102	%.	79-129		1		10/22/18 13:15	460-00-4	
1,2-Dichloroethane-d4 (S)	107	%.	80-120		1		10/22/18 13:15	17060-07-0	
Dibromofluoromethane (S)	97	%.	80-120		1		10/22/18 13:15	1868-53-7	

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QUALITY CONTROL DATA

Project: Radhe Oil/597
Pace Project No.: 30268461

QC Batch: 317501 Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30268461001, 30268461002, 30268461003, 30268461004, 30268461005, 30268461006, 30268461007, 30268461008

METHOD BLANK: 1549130 Matrix: Water
Associated Lab Samples: 30268461001, 30268461002, 30268461003, 30268461004, 30268461005, 30268461006, 30268461007, 30268461008

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	10/22/18 12:23	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	10/22/18 12:23	
Benzene	ug/L	ND	1.0	0.24	10/22/18 12:23	
Ethylbenzene	ug/L	ND	1.0	0.31	10/22/18 12:23	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	10/22/18 12:23	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	10/22/18 12:23	
Naphthalene	ug/L	ND	2.0	0.82	10/22/18 12:23	
Toluene	ug/L	ND	1.0	0.30	10/22/18 12:23	
Xylene (Total)	ug/L	ND	3.0	0.78	10/22/18 12:23	
1,2-Dichloroethane-d4 (S)	%.	104	80-120		10/22/18 12:23	
4-Bromofluorobenzene (S)	%.	104	79-129		10/22/18 12:23	
Dibromofluoromethane (S)	%.	95	80-120		10/22/18 12:23	
Toluene-d8 (S)	%.	106	80-120		10/22/18 12:23	

LABORATORY CONTROL SAMPLE: 1549131

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	21.4	107	70-130	
1,3,5-Trimethylbenzene	ug/L	20	20.7	104	70-130	
Benzene	ug/L	20	17.9	90	70-130	
Ethylbenzene	ug/L	20	20.3	101	70-130	
Isopropylbenzene (Cumene)	ug/L	20	21.5	108	70-130	
Methyl-tert-butyl ether	ug/L	20	17.8	89	70-130	
Naphthalene	ug/L	20	23.8	119	70-130	
Toluene	ug/L	20	20.5	102	70-130	
Xylene (Total)	ug/L	60	61.3	102	70-130	
1,2-Dichloroethane-d4 (S)	%.			101	80-120	
4-Bromofluorobenzene (S)	%.			104	79-129	
Dibromofluoromethane (S)	%.			99	80-120	
Toluene-d8 (S)	%.			110	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1549132 1549133

Parameter	Units	30268963001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	20.5	21.0	103	105	75-125	2	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	19.4	20.6	97	103	76-121	6	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: Radhe Oil/597
Pace Project No.: 30268461

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1549132 1549133

Parameter	Units	30268963001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Benzene	ug/L	ND	20	20	19.0	19.3	95	96	67-121	2	30	
Ethylbenzene	ug/L	ND	20	20	21.1	21.5	105	107	70-127	2	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	20.6	21.3	103	107	80-122	4	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	18.2	16.9	91	85	79-135	7	30	
Naphthalene	ug/L	ND	20	20	19.7	20.4	99	102	62-131	4	30	
Toluene	ug/L	ND	20	20	21.7	22.0	108	110	77-125	1	30	
Xylene (Total)	ug/L	ND	60	60	63.3	65.9	106	110	69-128	4	30	
1,2-Dichloroethane-d4 (S)	%.						102	96	80-120			
4-Bromofluorobenzene (S)	%.						98	98	79-129			
Dibromofluoromethane (S)	%.						97	97	80-120			
Toluene-d8 (S)	%.						107	106	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project:	Radhe Oil/597
Pace Project No.:	30268461

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA	Pace Analytical Services - Greensburg

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Radhe Oil/597
Pace Project No.: 30268461

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30268461001	**MW-1**	EPA 8260B	317501		
30268461002	**MW-2**	EPA 8260B	317501		
30268461003	**MW-3**	EPA 8260B	317501		
30268461004	**MW-4**	EPA 8260B	317501		
30268461005	**MW-5**	EPA 8260B	317501		
30268461006	**MW-6**	EPA 8260B	317501		
30268461007	**Field Dupe (MW-1)**	EPA 8260B	317501		
30268461008	**Trip Blank**	EPA 8260B	317501		

CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE **WO#: 30268461**

30268461

umber or

Company: Letterle & Associates
Address: 2859 Oxford BLVD.
Report To: Same
Copy To: Same
Customer Project Name/Number: Radhe Oil / 597
Phone:
Email:
Collected By (print): Colton Gotshall
Collected By (signature): [signature]
Sample Disposal: [X] Dispose as appropriate [ ] Return [ ] Archive: ______ [ ] Hold: ______

Billing Information: Same
Email To: eitle@letterleassociates.com
Site Collection Info/Address: Freeport, PA
State: / County/City: Time Zone Collected: [ ]PT [ ]MT [ ]CT [ ]ET
Site/Facility ID #:
Compliance Monitoring? [ ] Yes [ ] No
Purchase Order #:
Quote #:
DW PWS ID #:
DW Location Code:
Turnaround Date Required: Standard
Immediately Packed on Ice: [X] Yes [ ] No
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [X] No
Analysis: ______

Container Preservative Type **: 3 3 3 3 3 3

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other ______

Lab Project Manager:

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Time	Composite End Date	Time	Res Cl	# of Ctns	BTEX	MTBE	Cumene	Napthalene	1,2,4-TMB	1,3,5-TMB	Lab Sample # / Comments: ET/MDS
MW-1	GW	G	10-15	0920				3	X	X	X	X	X	X	001
MW-2	↓	↓	↓	0950				↓	↓	↓	↓	↓	↓	↓	002
MW-3				1020											003
MW-4				1050											004
MW-5				1130											005
MW-6				1200											006
Field dupe (mw-1)	↓	↓	↓	0920				↓							007
Trip Blank								2	↓	↓	↓	↓	↓	↓	008

Lab Profile/Line:

Lab Sample Receipt Checklist:
- Custody Seals Present/Intact Y N (NA)
- Custody Signatures Present (Y) N NA
- Collector Signature Present (Y) N NA
- Bottles Intact (Y) N NA
- Correct Bottles (Y) N NA
- Sufficient Volume (Y) N NA
- Samples Received on Ice (Y) N NA
- VOA - Headspace Acceptable (Y) N NA
- USDA Regulated Soils Y N (NA)
- Samples in Holding Time (Y) N NA
- Residual Chlorine Present Y N (NA)
- Cl Strips: ______
- Sample pH Acceptable Y N (NA)
- pH Strips: ______
- Sulfide Present Y N (NA)
- Lead Acetate Strips: ______

LAB USE ONLY:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: (Wet) Blue Dry None
Packing Material Used: Bubble bags and ice
Radchem sample(s) screened (<500 cpm): Y N (NA)

SHORT HOLDS PRESENT (<72 hours): Y N (N/A)
Lab Tracking #: NA
Samples received via: FEDEX UPS Client Courier (Pace Courier)

LAB Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: 10
Cooler 1 Temp Upon Receipt: 2.9oC
Cooler 1 Therm Corr. Factor: +0.1oC
Cooler 1 Corrected Temp: 3.0oC
Comments:
MDS 10-16-18

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
[signature]	10/16/18 10:45	[signature] Pace	10/16/18 1045
[signature] Pace	10/16/18 1740	[signature]	10/16/18 1740

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Trip Blank Received: (Y) N NA
(HCL) MeOH TSP Other

Non Conformance(s): YES / NO
Page: 1 of: 1

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

August 28, 2018

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Radke Oil / 597
Pace Project No.: 30263020

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on August 22, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Colton Gotshall, Letterle & Associates
Mr. Austin Hess, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Tim Kier, Letterle & Associates LLC
Mr. Jordan Packard, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	Radke Oil / 597
Pace Project No.:	30263020

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad
Wyoming Certification #: 8TMS-L

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(724)850-5600

SAMPLE SUMMARY

Project: Radke Oil / 597
Pace Project No.: 30263020

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30263020001	**MW-1**	Water	08/22/18 09:20	08/22/18 15:55
30263020002	**MW-2**	Water	08/22/18 09:50	08/22/18 15:55
30263020003	**MW-3**	Water	08/22/18 10:20	08/22/18 15:55
30263020004	**MW-4**	Water	08/22/18 10:50	08/22/18 15:55
30263020005	**MW-5**	Water	08/22/18 11:30	08/22/18 15:55
30263020006	**Field Dupe (MW-1)**	Water	08/22/18 09:20	08/22/18 15:55
30263020007	**Trip Blank**	Water	08/22/18 00:01	08/22/18 15:55

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SAMPLE ANALYTE COUNT

Project: Radke Oil / 597
Pace Project No.: 30263020

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30263020001	**MW-1**	EPA 8260B	LEL	13	PASI-PA
30263020002	**MW-2**	EPA 8260B	LEL	13	PASI-PA
30263020003	**MW-3**	EPA 8260B	LEL	13	PASI-PA
30263020004	**MW-4**	EPA 8260B	LEL	13	PASI-PA
30263020005	**MW-5**	EPA 8260B	LEL	13	PASI-PA
30263020006	**Field Dupe (MW-1)**	EPA 8260B	LEL	13	PASI-PA
30263020007	**Trip Blank**	EPA 8260B	LEL	13	PASI-PA

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: MW-1 **Lab ID: 30263020001** Collected: 08/22/18 09:20 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 19:33	71-43-2	
Ethylbenzene	**1.2**	ug/L	1.0	0.31	1		08/27/18 19:33	100-41-4	
Isopropylbenzene (Cumene)	**2.8**	ug/L	1.0	0.24	1		08/27/18 19:33	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/27/18 19:33	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/27/18 19:33	91-20-3	
Toluene	**1.7**	ug/L	1.0	0.30	1		08/27/18 19:33	108-88-3	
1,2,4-Trimethylbenzene	**2.1**	ug/L	1.0	0.25	1		08/27/18 19:33	95-63-6	
1,3,5-Trimethylbenzene	**2.6**	ug/L	1.0	0.21	1		08/27/18 19:33	108-67-8	
Xylene (Total)	**3.9**	ug/L	3.0	0.78	1		08/27/18 19:33	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%.	80-120		1		08/27/18 19:33	2037-26-5	
4-Bromofluorobenzene (S)	100	%.	79-129		1		08/27/18 19:33	460-00-4	
1,2-Dichloroethane-d4 (S)	96	%.	80-120		1		08/27/18 19:33	17060-07-0	
Dibromofluoromethane (S)	94	%.	80-120		1		08/27/18 19:33	1868-53-7	

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: MW-2 **Lab ID: 30263020002** Collected: 08/22/18 09:50 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 21:15	71-43-2	
Ethylbenzene	**79.9**	ug/L	1.0	0.31	1		08/27/18 21:15	100-41-4	
Isopropylbenzene (Cumene)	**74.4**	ug/L	1.0	0.24	1		08/27/18 21:15	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/27/18 21:15	1634-04-4	
Naphthalene	**76.7**	ug/L	2.0	0.82	1		08/27/18 21:15	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		08/27/18 21:15	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		08/27/18 21:15	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/27/18 21:15	108-67-8	
Xylene (Total)	**14.2**	ug/L	3.0	0.78	1		08/27/18 21:15	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%.	80-120		1		08/27/18 21:15	2037-26-5	
4-Bromofluorobenzene (S)	100	%.	79-129		1		08/27/18 21:15	460-00-4	
1,2-Dichloroethane-d4 (S)	96	%.	80-120		1		08/27/18 21:15	17060-07-0	
Dibromofluoromethane (S)	96	%.	80-120		1		08/27/18 21:15	1868-53-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
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(724)850-5600

ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: MW-3 **Lab ID: 30263020003** Collected: 08/22/18 10:20 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 13:13	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		08/27/18 13:13	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		08/27/18 13:13	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/27/18 13:13	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/27/18 13:13	91-20-3	MH
Toluene	ND	ug/L	1.0	0.30	1		08/27/18 13:13	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		08/27/18 13:13	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/27/18 13:13	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		08/27/18 13:13	1330-20-7	
Surrogates									
Toluene-d8 (S)	99	%.	80-120		1		08/27/18 13:13	2037-26-5	
4-Bromofluorobenzene (S)	98	%.	79-129		1		08/27/18 13:13	460-00-4	
1,2-Dichloroethane-d4 (S)	92	%.	80-120		1		08/27/18 13:13	17060-07-0	
Dibromofluoromethane (S)	97	%.	80-120		1		08/27/18 13:13	1868-53-7	

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(724)850-5600

ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: MW-4 **Lab ID: 30263020004** Collected: 08/22/18 10:50 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 18:17	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		08/27/18 18:17	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		08/27/18 18:17	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/27/18 18:17	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/27/18 18:17	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		08/27/18 18:17	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		08/27/18 18:17	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/27/18 18:17	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		08/27/18 18:17	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%.	80-120		1		08/27/18 18:17	2037-26-5	
4-Bromofluorobenzene (S)	96	%.	79-129		1		08/27/18 18:17	460-00-4	
1,2-Dichloroethane-d4 (S)	98	%.	80-120		1		08/27/18 18:17	17060-07-0	
Dibromofluoromethane (S)	103	%.	80-120		1		08/27/18 18:17	1868-53-7	

Pace Analytical Services, LLC
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(724)850-5600

ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: MW-5 **Lab ID: 30263020005** Collected: 08/22/18 11:30 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 18:42	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		08/27/18 18:42	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		08/27/18 18:42	98-82-8	
Methyl-tert-butyl ether	**6.4**	ug/L	1.0	0.23	1		08/27/18 18:42	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/27/18 18:42	91-20-3	
Toluene	**3.6**	ug/L	1.0	0.30	1		08/27/18 18:42	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		08/27/18 18:42	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/27/18 18:42	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		08/27/18 18:42	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%.	80-120		1		08/27/18 18:42	2037-26-5	
4-Bromofluorobenzene (S)	98	%.	79-129		1		08/27/18 18:42	460-00-4	
1,2-Dichloroethane-d4 (S)	95	%.	80-120		1		08/27/18 18:42	17060-07-0	
Dibromofluoromethane (S)	97	%.	80-120		1		08/27/18 18:42	1868-53-7	

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: Field Dupe (MW-1) **Lab ID: 30263020006** Collected: 08/22/18 09:20 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 19:08	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		08/27/18 19:08	100-41-4	
Isopropylbenzene (Cumene)	**2.9**	ug/L	1.0	0.24	1		08/27/18 19:08	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/27/18 19:08	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/27/18 19:08	91-20-3	
Toluene	**2.1**	ug/L	1.0	0.30	1		08/27/18 19:08	108-88-3	
1,2,4-Trimethylbenzene	**2.0**	ug/L	1.0	0.25	1		08/27/18 19:08	95-63-6	
1,3,5-Trimethylbenzene	**2.2**	ug/L	1.0	0.21	1		08/27/18 19:08	108-67-8	
Xylene (Total)	**3.4**	ug/L	3.0	0.78	1		08/27/18 19:08	1330-20-7	
Surrogates									
Toluene-d8 (S)	100	%.	80-120		1		08/27/18 19:08	2037-26-5	
4-Bromofluorobenzene (S)	97	%.	79-129		1		08/27/18 19:08	460-00-4	
1,2-Dichloroethane-d4 (S)	98	%.	80-120		1		08/27/18 19:08	17060-07-0	
Dibromofluoromethane (S)	98	%.	80-120		1		08/27/18 19:08	1868-53-7	

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ANALYTICAL RESULTS

Project: Radke Oil / 597
Pace Project No.: 30263020

Sample: Trip Blank **Lab ID: 30263020007** Collected: 08/22/18 00:01 Received: 08/22/18 15:55 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		08/27/18 16:10	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		08/27/18 16:10	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		08/27/18 16:10	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		08/27/18 16:10	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		08/27/18 16:10	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		08/27/18 16:10	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		08/27/18 16:10	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		08/27/18 16:10	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		08/27/18 16:10	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%.	80-120		1		08/27/18 16:10	2037-26-5	
4-Bromofluorobenzene (S)	95	%.	79-129		1		08/27/18 16:10	460-00-4	
1,2-Dichloroethane-d4 (S)	93	%.	80-120		1		08/27/18 16:10	17060-07-0	
Dibromofluoromethane (S)	99	%.	80-120		1		08/27/18 16:10	1868-53-7	

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QUALITY CONTROL DATA

Project: Radke Oil / 597
Pace Project No.: 30263020

QC Batch: 310992 Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30263020001, 30263020002, 30263020003, 30263020004, 30263020005, 30263020006, 30263020007

METHOD BLANK: 1519233 Matrix: Water
Associated Lab Samples: 30263020001, 30263020002, 30263020003, 30263020004, 30263020005, 30263020006, 30263020007

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	08/27/18 12:47	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	08/27/18 12:47	
Benzene	ug/L	ND	1.0	0.24	08/27/18 12:47	
Ethylbenzene	ug/L	ND	1.0	0.31	08/27/18 12:47	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	08/27/18 12:47	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	08/27/18 12:47	
Naphthalene	ug/L	ND	2.0	0.82	08/27/18 12:47	
Toluene	ug/L	ND	1.0	0.30	08/27/18 12:47	
Xylene (Total)	ug/L	ND	3.0	0.78	08/27/18 12:47	
1,2-Dichloroethane-d4 (S)	%.	89	80-120		08/27/18 12:47	
4-Bromofluorobenzene (S)	%.	98	79-129		08/27/18 12:47	
Dibromofluoromethane (S)	%.	98	80-120		08/27/18 12:47	
Toluene-d8 (S)	%.	101	80-120		08/27/18 12:47	

LABORATORY CONTROL SAMPLE: 1519234

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	19.6	98	70-130	
1,3,5-Trimethylbenzene	ug/L	20	19.4	97	70-130	
Benzene	ug/L	20	15.0	75	70-130	
Ethylbenzene	ug/L	20	19.5	97	70-130	
Isopropylbenzene (Cumene)	ug/L	20	19.5	98	70-130	
Methyl-tert-butyl ether	ug/L	20	20.9	104	70-130	
Naphthalene	ug/L	20	22.6	113	70-130	
Toluene	ug/L	20	16.4	82	70-130	
Xylene (Total)	ug/L	60	58.1	97	70-130	
1,2-Dichloroethane-d4 (S)	%.			93	80-120	
4-Bromofluorobenzene (S)	%.			99	79-129	
Dibromofluoromethane (S)	%.			98	80-120	
Toluene-d8 (S)	%.			96	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1519235 1519236

Parameter	Units	30263020003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	21.3	22.5	107	113	75-125	6	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	20.9	21.6	105	108	76-121	3	30	
Benzene	ug/L	ND	20	20	16.3	15.6	81	78	67-121	4	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: Radke Oil / 597
Pace Project No.: 30263020

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1519235 1519236

Parameter	Units	30263020003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	21.0	20.4	105	102	70-127	3	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	21.5	20.8	107	104	80-122	3	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	17.7	18.1	89	91	79-135	2	30	
Naphthalene	ug/L	ND	20	20	25.3	26.6	127	133	62-131	5	30	MH
Toluene	ug/L	ND	20	20	18.2	17.9	88	86	77-125	2	30	
Xylene (Total)	ug/L	ND	60	60	61.7	61.4	103	102	69-128	0	30	
1,2-Dichloroethane-d4 (S)	%.						98	91	80-120			
4-Bromofluorobenzene (S)	%.						102	101	79-129			
Dibromofluoromethane (S)	%.						98	96	80-120			
Toluene-d8 (S)	%.						97	98	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: Radke Oil / 597
Pace Project No.: 30263020

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

ANALYTE QUALIFIERS

MH Matrix spike recovery and/or matrix spike duplicate recovery was above laboratory control limits. Result may be biased high.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Radke Oil / 597
Pace Project No.: 30263020

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30263020001	**MW-1**	EPA 8260B	310992		
30263020002	**MW-2**	EPA 8260B	310992		
30263020003	**MW-3**	EPA 8260B	310992		
30263020004	**MW-4**	EPA 8260B	310992		
30263020005	**MW-5**	EPA 8260B	310992		
30263020006	**Field Dupe (MW-1)**	EPA 8260B	310992		
30263020007	**Trip Blank**	EPA 8260B	310992		

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CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here

WO#: 30263020

30263020

ALL SHADED AREAS are for LAB USE ONLY

Company: Letterle & Associates
Address: 2859 Oxford BLVD.
Report To: Same
Copy To: Same
Customer Project Name/Number: Radhe Oil / 597
Phone:
Email:
Collected By (print): Colton Gotshall
Collected By (signature): [signature]
Sample Disposal: [X] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:

Billing Information: Same
Email To: eittle@letterleassociates.com
Site Collection Info/Address: Freeport, PA
State: / County/City:
Time Zone Collected: [ ]PT [ ]MT [ ]CT [ ]ET
Site/Facility ID #:
Compliance Monitoring? [ ] Yes [ ] No
Purchase Order #:
Quote #:
DW PWS ID #:
DW Location Code:
Turnaround Date Required: Standard
Immediately Packed on Ice: [X] Yes [ ] No
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [X] No
Analysis:

Container Preservative Type **: 3 3 3 3 3 3

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other

Lab Project Manager:

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	BTEX	MTBE	Cumene	Napthalene	1,2,4-TMB	1,3,5-TMB	Lab Sample # / Comments
MW-1	GW	G	08/22	0920				3	X	X	X	X	X	X	001
MW-2	↓	↓	↓	0950				↓	↓	↓	↓	↓	↓	↓	002
MW-3	↓	↓	↓	1020				↓	↓	↓	↓	↓	↓	↓	003
MW-4	↓	↓	↓	1050				↓	↓	↓	↓	↓	↓	↓	004
MW-5	↓	↓	↓	1130				↓	↓	↓	↓	↓	↓	↓	005
Field dupe (MW-1)	↓	↓	↓	0920				↓	↓	↓	↓	↓	↓	↓	006
Trip Blank								2	↓	↓	↓	↓	↓	↓	007

Lab Profile/Line:
Lab Sample Receipt Checklist:
Custody Seals Present/Intact Y N NA — N
Custody Signatures Present Y N NA — N
Collector Signature Present Y N NA — Y
Bottles Intact Y N NA — Y
Correct Bottles Y N NA — Y
Sufficient Volume Y N NA — Y
Samples Received on Ice Y N NA — Y
VOA - Headspace Acceptable Y N NA — N
USDA Regulated Soils Y N NA — NA
Samples in Holding Time Y N NA — Y
Residual Chlorine Present Y N NA — NA
Cl Strips:
Sample pH Acceptable Y N NA — NA
pH Strips:
Sulfide Present Y N NA — NA
Lead Acetate Strips:

LAB USE ONLY:
Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None
Packing Material Used:
Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A
Lab Tracking #:
Samples received via: FEDEX UPS Client Courier Pace Courier

LAB Sample Temperature Info:
Temp Blank Received: Y N NA — N
Therm ID#: 9
Cooler 1 Temp Upon Receipt: 3.3 oC
Cooler 1 Therm Corr. Factor: 0 oC
Cooler 1 Corrected Temp: 3.3 oC
Comments: 8/22/18 JLB

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	MTJL LAB USE ONLY
[signature] Letterle	8/22/18 14:40	[signature] Pace	8/22/18 1440	Table #:
[signature] Pace	8/22/18 1535	[signature] PACE	8/22/18 1535	Acctnum: Template: Prelogin:
				PM: PB:

Trip Blank Received: Y N NA — Y
HCL MeOH TSP Other — HCL

Non Conformance(s): YES / NO
Page: ___ of: ___

Pace Analytical Services, LLC
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February 06, 2018

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: Radhe Oil
Pace Project No.: 30242130

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on January 30, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

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CERTIFICATIONS

Project:	Radhe Oil
Pace Project No.:	30242130

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: Radhe Oil
Pace Project No.: 30242130

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30242130001	**MW-1**	Water	01/29/18 09:00	01/30/18 13:35
30242130002	**MW-2**	Water	01/29/18 08:30	01/30/18 13:35
30242130003	**MW-3**	Water	01/29/18 09:30	01/30/18 13:35
30242130004	**MW-4**	Water	01/29/18 10:00	01/30/18 13:35
30242130005	**MW-5**	Water	01/29/18 10:30	01/30/18 13:35
30242130006	**Field Dupe(MW-1)**	Water	01/29/18 09:00	01/30/18 13:35
30242130007	**Trip Blank**	Water	01/29/18 00:01	01/30/18 13:35

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SAMPLE ANALYTE COUNT

Project: Radhe Oil
Pace Project No.: 30242130

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30242130001	**MW-1**	EPA 8260B	RES	13	PASI-PA
30242130002	**MW-2**	EPA 8260B	RES	13	PASI-PA
30242130003	**MW-3**	EPA 8260B	RES	13	PASI-PA
30242130004	**MW-4**	EPA 8260B	RES	13	PASI-PA
30242130005	**MW-5**	EPA 8260B	RES	13	PASI-PA
30242130006	**Field Dupe(MW-1)**	EPA 8260B	RES	13	PASI-PA
30242130007	**Trip Blank**	EPA 8260B	RES	13	PASI-PA

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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: MW-1 **Lab ID: 30242130001** Collected: 01/29/18 09:00 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 15:13	71-43-2	
Ethylbenzene	**7.1**	ug/L	1.0	0.31	1		02/02/18 15:13	100-41-4	
Isopropylbenzene (Cumene)	**7.8**	ug/L	1.0	0.24	1		02/02/18 15:13	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		02/02/18 15:13	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		02/02/18 15:13	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 15:13	108-88-3	
1,2,4-Trimethylbenzene	**5.2**	ug/L	1.0	0.25	1		02/02/18 15:13	95-63-6	
1,3,5-Trimethylbenzene	**2.7**	ug/L	1.0	0.21	1		02/02/18 15:13	108-67-8	
Xylene (Total)	**8.0**	ug/L	3.0	0.78	1		02/02/18 15:13	1330-20-7	
Surrogates									
Toluene-d8 (S)	96	%	80-120		1		02/02/18 15:13	2037-26-5	
4-Bromofluorobenzene (S)	97	%	79-129		1		02/02/18 15:13	460-00-4	
1,2-Dichloroethane-d4 (S)	98	%	80-120		1		02/02/18 15:13	17060-07-0	
Dibromofluoromethane (S)	93	%	80-120		1		02/02/18 15:13	1868-53-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: MW-2 **Lab ID: 30242130002** Collected: 01/29/18 08:30 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 16:07	71-43-2	
Ethylbenzene	**155**	ug/L	1.0	0.31	1		02/02/18 16:07	100-41-4	
Isopropylbenzene (Cumene)	**112**	ug/L	1.0	0.24	1		02/02/18 16:07	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		02/02/18 16:07	1634-04-4	
Naphthalene	**156**	ug/L	2.0	0.82	1		02/02/18 16:07	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 16:07	108-88-3	
1,2,4-Trimethylbenzene	**1.1**	ug/L	1.0	0.25	1		02/02/18 16:07	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		02/02/18 16:07	108-67-8	
Xylene (Total)	**19.2**	ug/L	3.0	0.78	1		02/02/18 16:07	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	80-120		1		02/02/18 16:07	2037-26-5	
4-Bromofluorobenzene (S)	96	%	79-129		1		02/02/18 16:07	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	80-120		1		02/02/18 16:07	17060-07-0	
Dibromofluoromethane (S)	89	%	80-120		1		02/02/18 16:07	1868-53-7	

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Greensburg, PA 15601
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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: MW-3 **Lab ID: 30242130003** Collected: 01/29/18 09:30 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 13:53	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		02/02/18 13:53	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		02/02/18 13:53	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		02/02/18 13:53	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		02/02/18 13:53	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 13:53	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		02/02/18 13:53	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		02/02/18 13:53	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		02/02/18 13:53	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	80-120		1		02/02/18 13:53	2037-26-5	
4-Bromofluorobenzene (S)	97	%	79-129		1		02/02/18 13:53	460-00-4	
1,2-Dichloroethane-d4 (S)	104	%	80-120		1		02/02/18 13:53	17060-07-0	
Dibromofluoromethane (S)	97	%	80-120		1		02/02/18 13:53	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: MW-4 **Lab ID: 30242130004** Collected: 01/29/18 10:00 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 14:19	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		02/02/18 14:19	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		02/02/18 14:19	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		02/02/18 14:19	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		02/02/18 14:19	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 14:19	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		02/02/18 14:19	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		02/02/18 14:19	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		02/02/18 14:19	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%	80-120		1		02/02/18 14:19	2037-26-5	
4-Bromofluorobenzene (S)	98	%	79-129		1		02/02/18 14:19	460-00-4	
1,2-Dichloroethane-d4 (S)	106	%	80-120		1		02/02/18 14:19	17060-07-0	
Dibromofluoromethane (S)	98	%	80-120		1		02/02/18 14:19	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: MW-5 **Lab ID: 30242130005** Collected: 01/29/18 10:30 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 14:46	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		02/02/18 14:46	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		02/02/18 14:46	98-82-8	
Methyl-tert-butyl ether	**4.6**	ug/L	1.0	0.23	1		02/02/18 14:46	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		02/02/18 14:46	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 14:46	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		02/02/18 14:46	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		02/02/18 14:46	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		02/02/18 14:46	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%	80-120		1		02/02/18 14:46	2037-26-5	
4-Bromofluorobenzene (S)	97	%	79-129		1		02/02/18 14:46	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	80-120		1		02/02/18 14:46	17060-07-0	
Dibromofluoromethane (S)	97	%	80-120		1		02/02/18 14:46	1868-53-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: Field Dupe(MW-1) **Lab ID: 30242130006** Collected: 01/29/18 09:00 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 15:40	71-43-2	
Ethylbenzene	**6.6**	ug/L	1.0	0.31	1		02/02/18 15:40	100-41-4	
Isopropylbenzene (Cumene)	**8.1**	ug/L	1.0	0.24	1		02/02/18 15:40	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		02/02/18 15:40	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		02/02/18 15:40	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 15:40	108-88-3	
1,2,4-Trimethylbenzene	**5.0**	ug/L	1.0	0.25	1		02/02/18 15:40	95-63-6	
1,3,5-Trimethylbenzene	**2.8**	ug/L	1.0	0.21	1		02/02/18 15:40	108-67-8	
Xylene (Total)	**7.4**	ug/L	3.0	0.78	1		02/02/18 15:40	1330-20-7	
Surrogates									
Toluene-d8 (S)	96	%	80-120		1		02/02/18 15:40	2037-26-5	
4-Bromofluorobenzene (S)	98	%	79-129		1		02/02/18 15:40	460-00-4	
1,2-Dichloroethane-d4 (S)	100	%	80-120		1		02/02/18 15:40	17060-07-0	
Dibromofluoromethane (S)	94	%	80-120		1		02/02/18 15:40	1868-53-7	

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ANALYTICAL RESULTS

Project: Radhe Oil
Pace Project No.: 30242130

Sample: Trip Blank **Lab ID: 30242130007** Collected: 01/29/18 00:01 Received: 01/30/18 13:35 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.24	1		02/02/18 11:12	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.31	1		02/02/18 11:12	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.24	1		02/02/18 11:12	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.23	1		02/02/18 11:12	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.82	1		02/02/18 11:12	91-20-3	
Toluene	ND	ug/L	1.0	0.30	1		02/02/18 11:12	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.25	1		02/02/18 11:12	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.21	1		02/02/18 11:12	108-67-8	
Xylene (Total)	ND	ug/L	3.0	0.78	1		02/02/18 11:12	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	80-120		1		02/02/18 11:12	2037-26-5	
4-Bromofluorobenzene (S)	96	%	79-129		1		02/02/18 11:12	460-00-4	
1,2-Dichloroethane-d4 (S)	105	%	80-120		1		02/02/18 11:12	17060-07-0	
Dibromofluoromethane (S)	99	%	80-120		1		02/02/18 11:12	1868-53-7	

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QUALITY CONTROL DATA

Project: Radhe Oil
Pace Project No.: 30242130

QC Batch: 286854 Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30242130001, 30242130002, 30242130003, 30242130004, 30242130005, 30242130006, 30242130007

METHOD BLANK: 1406575 Matrix: Water
Associated Lab Samples: 30242130001, 30242130002, 30242130003, 30242130004, 30242130005, 30242130006, 30242130007

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.25	02/02/18 10:45	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.21	02/02/18 10:45	
Benzene	ug/L	ND	1.0	0.24	02/02/18 10:45	
Ethylbenzene	ug/L	ND	1.0	0.31	02/02/18 10:45	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.24	02/02/18 10:45	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.23	02/02/18 10:45	
Naphthalene	ug/L	ND	2.0	0.82	02/02/18 10:45	
Toluene	ug/L	ND	1.0	0.30	02/02/18 10:45	
Xylene (Total)	ug/L	ND	3.0	0.78	02/02/18 10:45	
1,2-Dichloroethane-d4 (S)	%	102	80-120		02/02/18 10:45	
4-Bromofluorobenzene (S)	%	98	79-129		02/02/18 10:45	
Dibromofluoromethane (S)	%	98	80-120		02/02/18 10:45	
Toluene-d8 (S)	%	97	80-120		02/02/18 10:45	

LABORATORY CONTROL SAMPLE: 1406576

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	22.1	111	70-130	
1,3,5-Trimethylbenzene	ug/L	20	21.7	108	70-130	
Benzene	ug/L	20	20.9	104	70-130	
Ethylbenzene	ug/L	20	21.5	107	70-130	
Isopropylbenzene (Cumene)	ug/L	20	21.7	108	70-130	
Methyl-tert-butyl ether	ug/L	20	22.0	110	70-130	
Naphthalene	ug/L	20	24.2	121	70-130	
Toluene	ug/L	20	20.5	103	70-130	
Xylene (Total)	ug/L	60	64.2	107	70-130	
1,2-Dichloroethane-d4 (S)	%			102	80-120	
4-Bromofluorobenzene (S)	%			94	79-129	
Dibromofluoromethane (S)	%			97	80-120	
Toluene-d8 (S)	%			98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406795 1406796

Parameter	Units	30242126005 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	23.5	22.3	117	111	75-125	5	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	22.8	22.0	114	110	76-121	3	30	
Benzene	ug/L	ND	20	20	21.7	21.5	108	108	67-121	1	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: Radhe Oil
Pace Project No.: 30242130

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1406795 1406796

Parameter	Units	30242126005 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	22.4	21.7	112	109	70-127	3	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	22.8	22.5	114	112	80-122	2	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	18.7	19.3	94	97	79-135	3	30	
Naphthalene	ug/L	ND	20	20	18.6	19.6	93	98	62-131	5	30	
Toluene	ug/L	ND	20	20	22.3	21.8	112	109	77-125	3	30	
Xylene (Total)	ug/L	ND	60	60	68.4	66.1	114	110	69-128	4	30	
1,2-Dichloroethane-d4 (S)	%						100	99	80-120			
4-Bromofluorobenzene (S)	%						98	96	79-129			
Dibromofluoromethane (S)	%						98	98	80-120			
Toluene-d8 (S)	%						99	99	80-120			

SAMPLE DUPLICATE: 1406794

Parameter	Units	30242130001 Result	Dup Result	RPD	Max RPD	Qualifiers
1,2,4-Trimethylbenzene	ug/L	5.2	5.0	5	30	
1,3,5-Trimethylbenzene	ug/L	2.7	2.8	3	30	
Benzene	ug/L	ND	.76J		30	
Ethylbenzene	ug/L	7.1	6.6	7	30	
Isopropylbenzene (Cumene)	ug/L	7.8	8.1	4	30	
Methyl-tert-butyl ether	ug/L	ND	.45J		30	
Naphthalene	ug/L	ND	ND		30	
Toluene	ug/L	ND	ND		30	
Xylene (Total)	ug/L	8.0	7.4	8	30	
1,2-Dichloroethane-d4 (S)	%	98	100	2		
4-Bromofluorobenzene (S)	%	97	98	1		
Dibromofluoromethane (S)	%	93	94	0		
Toluene-d8 (S)	%	96	96	1		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: Radhe Oil
Pace Project No.: 30242130

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Radhe Oil
Pace Project No.: 30242130

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30242130001	**MW-1**	EPA 8260B	286854		
30242130002	**MW-2**	EPA 8260B	286854		
30242130003	**MW-3**	EPA 8260B	286854		
30242130004	**MW-4**	EPA 8260B	286854		
30242130005	**MW-5**	EPA 8260B	286854		
30242130006	**Field Dupe(MW-1)**	EPA 8260B	286854		
30242130007	**Trip Blank**	EPA 8260B	286854		

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CHAIN-[obscured] WO#: 30242130 [obscured]ment

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30242130

Page: 1 of 1

2191764

Section A
Required Client Information:

Company:	Letterle and Associates
Address:	2859 Oxford Blvd
	Allison Park PA 15101
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	Standard

Section B
Required Project Information:

Report To:	Same
Copy To:	
Purchase Order No.:	
Project Name:	Radke Oil
Project Number:	597

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Rachel Christner
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☑ UST ☐ RCRA ☐ OTHER ______

Site Location STATE: PA

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes	MATRIX / CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BTEX	MTBE	Naphthalene	Cumene	124 TMB	135 TMB						Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-1	WT	G			1-29	9:00		3				3						X	X	X	X	X	X							001
2	MW-2	↓	↓			↓	8:30		↓				↓						↓	↓	↓	↓	↓	↓							002
3	MW-3						9:30																								003
4	MW-4						10:00																								004
5	MW-5						10:30																								005
6	Field Dupe (MW-1)						9:00																								006
7	Trip Blank								2				2																		007
8																															
9																															
10																															
11																															
12																															

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	[signature]	1/30/18	10:50	[signature] Pace	1/30/18	1050				
	[signature] Pace	1/30/18	1335	[signature]	1/30/18	1335	1.9	Y	N	Y

SAMPLE CONDITIONS

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Jordan Pickard

SIGNATURE of SAMPLER: [signature]

DATE Signed (MM/DD/YY): 01/29/18

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

November 29, 2017

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: 597 Radhe Oil
Pace Project No.: 30236527

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on November 17, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project:	597 Radhe Oil
Pace Project No.:	30236527

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: 597 Radhe Oil
Pace Project No.: 30236527

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30236527001	**MW-1**	Water	11/16/17 08:30	11/17/17 16:59
30236527002	**MW-2**	Water	11/16/17 09:00	11/17/17 16:59
30236527003	**MW-3**	Water	11/16/17 08:30	11/17/17 16:59
30236527004	**MW-4**	Water	11/16/17 09:00	11/17/17 16:59
30236527005	**MW-5**	Water	11/16/17 09:30	11/17/17 16:59
30236527006	**Field Dupe (MW-1)**	Water	11/16/17 08:30	11/17/17 16:59
30236527007	**Trip Blank**	Water	11/16/17 00:01	11/17/17 16:59

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SAMPLE ANALYTE COUNT

Project: 597 Radhe Oil
Pace Project No.: 30236527

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30236527001	**MW-1**	EPA 8260B	JAS	13	PASI-PA
		SM2540C-97	SEF	1	PASI-PA
30236527002	**MW-2**	EPA 8260B	JAS	13	PASI-PA
		SM2540C-97	SEF	1	PASI-PA
30236527003	**MW-3**	EPA 8260B	JAS	13	PASI-PA
		SM2540C-97	SEF	1	PASI-PA
30236527004	**MW-4**	EPA 8260B	JAS	13	PASI-PA
		SM2540C-97	SEF	1	PASI-PA
30236527005	**MW-5**	EPA 8260B	JAS	13	PASI-PA
		SM2540C-97	SEF	1	PASI-PA
30236527006	**Field Dupe (MW-1)**	EPA 8260B	JAS	13	PASI-PA
30236527007	**Trip Blank**	EPA 8260B	JAS	13	PASI-PA

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: MW-1 **Lab ID: 30236527001** Collected: 11/16/17 08:30 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		11/27/17 19:49	71-43-2	M5
Ethylbenzene	ND	ug/L	1.0	0.21	1		11/27/17 19:49	100-41-4	M5
Isopropylbenzene (Cumene)	**9.9**	ug/L	1.0	0.25	1		11/27/17 19:49	98-82-8	M5
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/27/17 19:49	1634-04-4	M5
Naphthalene	ND	ug/L	2.0	0.39	1		11/27/17 19:49	91-20-3	M5
Toluene	ND	ug/L	1.0	0.29	1		11/27/17 19:49	108-88-3	M5
1,2,4-Trimethylbenzene	**1.3**	ug/L	1.0	0.21	1		11/27/17 19:49	95-63-6	M5
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		11/27/17 19:49	108-67-8	M5
Xylene (Total)	ND	ug/L	3.0	1.1	1		11/27/17 19:49	1330-20-7	M5
Surrogates									
Toluene-d8 (S)	94	%	80-120		1		11/27/17 19:49	2037-26-5	M5
4-Bromofluorobenzene (S)	97	%	79-129		1		11/27/17 19:49	460-00-4	M5
1,2-Dichloroethane-d4 (S)	105	%	80-120		1		11/27/17 19:49	17060-07-0	M5
Dibromofluoromethane (S)	100	%	80-120		1		11/27/17 19:49	1868-53-7	M5
2540C Total Dissolved Solids	Analytical Method: SM2540C-97								
Total Dissolved Solids	**1540**	mg/L	10.0	10.0	1		11/22/17 16:15		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: MW-2 **Lab ID: 30236527002** Collected: 11/16/17 09:00 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		11/27/17 20:16	71-43-2	M5
Ethylbenzene	**119**	ug/L	1.0	0.21	1		11/27/17 20:16	100-41-4	M5
Isopropylbenzene (Cumene)	**92.5**	ug/L	1.0	0.25	1		11/27/17 20:16	98-82-8	M5
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/27/17 20:16	1634-04-4	M5
Naphthalene	**131**	ug/L	2.0	0.39	1		11/27/17 20:16	91-20-3	M5
Toluene	ND	ug/L	1.0	0.29	1		11/27/17 20:16	108-88-3	M5
1,2,4-Trimethylbenzene	**4.5**	ug/L	1.0	0.21	1		11/27/17 20:16	95-63-6	M5
1,3,5-Trimethylbenzene	**1.7**	ug/L	1.0	0.40	1		11/27/17 20:16	108-67-8	M5
Xylene (Total)	**18.8**	ug/L	3.0	1.1	1		11/27/17 20:16	1330-20-7	M5
Surrogates									
Toluene-d8 (S)	92	%	80-120		1		11/27/17 20:16	2037-26-5	M5
4-Bromofluorobenzene (S)	99	%	79-129		1		11/27/17 20:16	460-00-4	M5
1,2-Dichloroethane-d4 (S)	107	%	80-120		1		11/27/17 20:16	17060-07-0	M5
Dibromofluoromethane (S)	100	%	80-120		1		11/27/17 20:16	1868-53-7	M5
2540C Total Dissolved Solids	Analytical Method: SM2540C-97								
Total Dissolved Solids	**869**	mg/L	10.0	10.0	1		11/22/17 16:16		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: MW-3 **Lab ID: 30236527003** Collected: 11/16/17 08:30 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		11/23/17 01:34	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 01:34	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		11/23/17 01:34	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/23/17 01:34	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		11/23/17 01:34	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		11/23/17 01:34	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 01:34	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		11/23/17 01:34	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		11/23/17 01:34	1330-20-7	
Surrogates									
Toluene-d8 (S)	90	%	80-120		1		11/23/17 01:34	2037-26-5	
4-Bromofluorobenzene (S)	102	%	79-129		1		11/23/17 01:34	460-00-4	
1,2-Dichloroethane-d4 (S)	108	%	80-120		1		11/23/17 01:34	17060-07-0	
Dibromofluoromethane (S)	101	%	80-120		1		11/23/17 01:34	1868-53-7	
2540C Total Dissolved Solids	Analytical Method: SM2540C-97								
Total Dissolved Solids	**1110**	mg/L	10.0	10.0	1		11/22/17 16:16		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: MW-4 **Lab ID: 30236527004** Collected: 11/16/17 09:00 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		11/23/17 02:01	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 02:01	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		11/23/17 02:01	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/23/17 02:01	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		11/23/17 02:01	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		11/23/17 02:01	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 02:01	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		11/23/17 02:01	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		11/23/17 02:01	1330-20-7	
Surrogates									
Toluene-d8 (S)	89	%	80-120		1		11/23/17 02:01	2037-26-5	
4-Bromofluorobenzene (S)	100	%	79-129		1		11/23/17 02:01	460-00-4	
1,2-Dichloroethane-d4 (S)	106	%	80-120		1		11/23/17 02:01	17060-07-0	
Dibromofluoromethane (S)	101	%	80-120		1		11/23/17 02:01	1868-53-7	
2540C Total Dissolved Solids	Analytical Method: SM2540C-97								
Total Dissolved Solids	**777**	mg/L	10.0	10.0	1		11/22/17 16:16		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: MW-5 **Lab ID: 30236527005** Collected: 11/16/17 09:30 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		11/23/17 02:28	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 02:28	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		11/23/17 02:28	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/23/17 02:28	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		11/23/17 02:28	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		11/23/17 02:28	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 02:28	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		11/23/17 02:28	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		11/23/17 02:28	1330-20-7	
Surrogates									
Toluene-d8 (S)	89	%	80-120		1		11/23/17 02:28	2037-26-5	
4-Bromofluorobenzene (S)	100	%	79-129		1		11/23/17 02:28	460-00-4	
1,2-Dichloroethane-d4 (S)	109	%	80-120		1		11/23/17 02:28	17060-07-0	
Dibromofluoromethane (S)	99	%	80-120		1		11/23/17 02:28	1868-53-7	
2540C Total Dissolved Solids	Analytical Method: SM2540C-97								
Total Dissolved Solids	**1560**	mg/L	10.0	10.0	1		11/22/17 16:16		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: Field Dupe (MW-1) **Lab ID: 30236527006** Collected: 11/16/17 08:30 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	**1.5**	ug/L	1.0	0.35	1		11/27/17 19:22	71-43-2	M5
Ethylbenzene	**1.3**	ug/L	1.0	0.21	1		11/27/17 19:22	100-41-4	M5
Isopropylbenzene (Cumene)	**9.2**	ug/L	1.0	0.25	1		11/27/17 19:22	98-82-8	M5
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/27/17 19:22	1634-04-4	M5
Naphthalene	**2.5**	ug/L	2.0	0.39	1		11/27/17 19:22	91-20-3	M5
Toluene	**1.5**	ug/L	1.0	0.29	1		11/27/17 19:22	108-88-3	M5
1,2,4-Trimethylbenzene	**1.9**	ug/L	1.0	0.21	1		11/27/17 19:22	95-63-6	M5
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		11/27/17 19:22	108-67-8	M5
Xylene (Total)	**3.6**	ug/L	3.0	1.1	1		11/27/17 19:22	1330-20-7	M5
Surrogates									
Toluene-d8 (S)	94	%	80-120		1		11/27/17 19:22	2037-26-5	M5
4-Bromofluorobenzene (S)	97	%	79-129		1		11/27/17 19:22	460-00-4	M5
1,2-Dichloroethane-d4 (S)	108	%	80-120		1		11/27/17 19:22	17060-07-0	M5
Dibromofluoromethane (S)	102	%	80-120		1		11/27/17 19:22	1868-53-7	M5

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30236527

Sample: Trip Blank **Lab ID: 30236527007** Collected: 11/16/17 00:01 Received: 11/17/17 16:59 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		11/23/17 00:40	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 00:40	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		11/23/17 00:40	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		11/23/17 00:40	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		11/23/17 00:40	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		11/23/17 00:40	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		11/23/17 00:40	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		11/23/17 00:40	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		11/23/17 00:40	1330-20-7	
Surrogates									
Toluene-d8 (S)	90	%	80-120		1		11/23/17 00:40	2037-26-5	
4-Bromofluorobenzene (S)	96	%	79-129		1		11/23/17 00:40	460-00-4	
1,2-Dichloroethane-d4 (S)	110	%	80-120		1		11/23/17 00:40	17060-07-0	
Dibromofluoromethane (S)	104	%	80-120		1		11/23/17 00:40	1868-53-7	

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QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30236527

QC Batch: 280154 | Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B | Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30236527003, 30236527004, 30236527005, 30236527007

METHOD BLANK: 1376059 | Matrix: Water
Associated Lab Samples: 30236527003, 30236527004, 30236527005, 30236527007

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.21	11/23/17 00:13	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.40	11/23/17 00:13	
Benzene	ug/L	ND	1.0	0.35	11/23/17 00:13	
Ethylbenzene	ug/L	ND	1.0	0.21	11/23/17 00:13	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.25	11/23/17 00:13	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.27	11/23/17 00:13	
Naphthalene	ug/L	ND	2.0	0.39	11/23/17 00:13	
Toluene	ug/L	ND	1.0	0.29	11/23/17 00:13	
Xylene (Total)	ug/L	ND	3.0	1.1	11/23/17 00:13	
1,2-Dichloroethane-d4 (S)	%	107	80-120		11/23/17 00:13	
4-Bromofluorobenzene (S)	%	99	79-129		11/23/17 00:13	
Dibromofluoromethane (S)	%	104	80-120		11/23/17 00:13	
Toluene-d8 (S)	%	88	80-120		11/23/17 00:13	

METHOD BLANK: 1376591 | Matrix: Water
Associated Lab Samples: 30236527003, 30236527004, 30236527005, 30236527007

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.21	11/27/17 13:17	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.40	11/27/17 13:17	
Benzene	ug/L	ND	1.0	0.35	11/27/17 13:17	
Ethylbenzene	ug/L	ND	1.0	0.21	11/27/17 13:17	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.25	11/27/17 13:17	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.27	11/27/17 13:17	
Naphthalene	ug/L	ND	2.0	0.39	11/27/17 13:17	
Toluene	ug/L	ND	1.0	0.29	11/27/17 13:17	
Xylene (Total)	ug/L	ND	3.0	1.1	11/27/17 13:17	
1,2-Dichloroethane-d4 (S)	%	107	80-120		11/27/17 13:17	
4-Bromofluorobenzene (S)	%	98	79-129		11/27/17 13:17	
Dibromofluoromethane (S)	%	104	80-120		11/27/17 13:17	
Toluene-d8 (S)	%	90	80-120		11/27/17 13:17	

LABORATORY CONTROL SAMPLE: 1376060

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	18.0	90	70-130	
1,3,5-Trimethylbenzene	ug/L	20	17.7	89	70-130	
Benzene	ug/L	20	17.9	89	70-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30236527

LABORATORY CONTROL SAMPLE: 1376060

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Ethylbenzene	ug/L	20	17.9	89	70-130	
Isopropylbenzene (Cumene)	ug/L	20	18.6	93	70-130	
Methyl-tert-butyl ether	ug/L	20	19.1	96	70-130	
Naphthalene	ug/L	20	17.3	86	70-130	
Toluene	ug/L	20	17.3	86	70-130	
Xylene (Total)	ug/L	60	52.5	87	70-130	
1,2-Dichloroethane-d4 (S)	%			102	80-120	
4-Bromofluorobenzene (S)	%			99	79-129	
Dibromofluoromethane (S)	%			104	80-120	
Toluene-d8 (S)	%			91	80-120	

LABORATORY CONTROL SAMPLE: 1376592

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	18.9	95	70-130	
1,3,5-Trimethylbenzene	ug/L	20	18.2	91	70-130	
Benzene	ug/L	20	17.8	89	70-130	
Ethylbenzene	ug/L	20	18.1	91	70-130	
Isopropylbenzene (Cumene)	ug/L	20	18.9	94	70-130	
Methyl-tert-butyl ether	ug/L	20	20.1	101	70-130	
Naphthalene	ug/L	20	17.4	87	70-130	
Toluene	ug/L	20	18.4	92	70-130	
Xylene (Total)	ug/L	60	54.0	90	70-130	
1,2-Dichloroethane-d4 (S)	%			103	80-120	
4-Bromofluorobenzene (S)	%			101	79-129	
Dibromofluoromethane (S)	%			107	80-120	
Toluene-d8 (S)	%			94	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1376061 1376062

Parameter	Units	30236660008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	18.9	19.3	95	96	75-125	2	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	18.7	19.2	94	96	76-121	2	30	
Benzene	ug/L	ND	20	20	18.2	19.0	91	95	67-121	4	30	
Ethylbenzene	ug/L	ND	20	20	19.1	19.1	95	95	70-127	0	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	19.9	20.4	99	102	80-122	3	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	19.5	20.6	97	103	79-135	6	30	
Naphthalene	ug/L	ND	20	20	16.4	17.4	82	87	62-131	6	30	
Toluene	ug/L	ND	20	20	18.8	19.6	94	98	77-125	4	30	
Xylene (Total)	ug/L	ND	60	60	54.4	56.2	91	94	69-128	3	30	
1,2-Dichloroethane-d4 (S)	%						107	108	80-120			
4-Bromofluorobenzene (S)	%						103	103	79-129			
Dibromofluoromethane (S)	%						104	104	80-120			

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QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30236527

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1376061 1376062

Parameter	Units	30236660008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Toluene-d8 (S)	%						95	93	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30236527

QC Batch: 280286 — Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B — Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30236527001, 30236527002, 30236527006

METHOD BLANK: 1376494 — Matrix: Water
Associated Lab Samples: 30236527001, 30236527002, 30236527006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.21	11/27/17 13:30	M5
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.40	11/27/17 13:30	M5
Benzene	ug/L	ND	1.0	0.35	11/27/17 13:30	M5
Ethylbenzene	ug/L	ND	1.0	0.21	11/27/17 13:30	M5
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.25	11/27/17 13:30	M5
Methyl-tert-butyl ether	ug/L	ND	1.0	0.27	11/27/17 13:30	M5
Naphthalene	ug/L	ND	2.0	0.39	11/27/17 13:30	M5
Toluene	ug/L	ND	1.0	0.29	11/27/17 13:30	M5
Xylene (Total)	ug/L	ND	3.0	1.1	11/27/17 13:30	M5
1,2-Dichloroethane-d4 (S)	%	109	80-120		11/27/17 13:30	M5
4-Bromofluorobenzene (S)	%	100	79-129		11/27/17 13:30	M5
Dibromofluoromethane (S)	%	104	80-120		11/27/17 13:30	M5
Toluene-d8 (S)	%	91	80-120		11/27/17 13:30	M5

LABORATORY CONTROL SAMPLE: 1376495

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	18.2	91	70-130	M5
1,3,5-Trimethylbenzene	ug/L	20	18.5	92	70-130	M5
Benzene	ug/L	20	18.1	90	70-130	M5
Ethylbenzene	ug/L	20	18.3	91	70-130	M5
Isopropylbenzene (Cumene)	ug/L	20	18.6	93	70-130	M5
Methyl-tert-butyl ether	ug/L	20	20.0	100	70-130	M5
Naphthalene	ug/L	20	18.0	90	70-130	M5
Toluene	ug/L	20	18.2	91	70-130	M5
Xylene (Total)	ug/L	60	54.3	91	70-130	M5
1,2-Dichloroethane-d4 (S)	%			108	80-120	M5
4-Bromofluorobenzene (S)	%			96	79-129	M5
Dibromofluoromethane (S)	%			108	80-120	M5
Toluene-d8 (S)	%			93	80-120	M5

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QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30236527

QC Batch: 280110 | Analysis Method: SM2540C-97
QC Batch Method: SM2540C-97 | Analysis Description: 2540C Total Dissolved Solids
Associated Lab Samples: 30236527001, 30236527002, 30236527003, 30236527004, 30236527005

METHOD BLANK: 1375885 | Matrix: Water
Associated Lab Samples: 30236527001, 30236527002, 30236527003, 30236527004, 30236527005

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	ND	10.0	10.0	11/22/17 16:09	

LABORATORY CONTROL SAMPLE: 1375886

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	1000	984	98	85-115	

SAMPLE DUPLICATE: 1375887

Parameter	Units	30236460001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	128	129	1	5	

SAMPLE DUPLICATE: 1375888

Parameter	Units	30236515002 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	318	313	2	5	

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QUALIFIERS

Project:	597 Radhe Oil
Pace Project No.:	30236527

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

BATCH QUALIFIERS

Batch: 280286

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

M5 A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 597 Radhe Oil
Pace Project No.: 30236527

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30236527001	**MW-1**	EPA 8260B	280286		
30236527002	**MW-2**	EPA 8260B	280286		
30236527003	**MW-3**	EPA 8260B	280154		
30236527004	**MW-4**	EPA 8260B	280154		
30236527005	**MW-5**	EPA 8260B	280154		
30236527006	**Field Dupe (MW-1)**	EPA 8260B	280286		
30236527007	**Trip Blank**	EPA 8260B	280154		
30236527001	**MW-1**	SM2540C-97	280110		
30236527002	**MW-2**	SM2540C-97	280110		
30236527003	**MW-3**	SM2540C-97	280110		
30236527004	**MW-4**	SM2540C-97	280110		
30236527005	**MW-5**	SM2540C-97	280110		

CHAIN-OF-CUSTODY / Analytical Request Document

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The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

2166699

Section A Required Client Information:		**Section B** Required Project Information:		**Section C** Invoice Information:	
Company:	Letterle and Associates	Report To:	Same	Attention:	
Address:	2859 Oxford Boulevard	Copy To:	Same	Company Name:	
	Allison Park, PA 15101			Address:	
Email To:		Purchase Order No.:		Pace Quote Reference:	
Phone:	Fax:	Project Name:	Rache Oil	Pace Project Manager:	Rachel Christner
Requested Due Date/TAT:	Standard	Project Number:	597	Pace Profile #:	

REGULATORY AGENCY

☐ NPDES	☐ GROUND WATER	☐ DRINKING WATER
☑ UST	☐ RCRA	☐ OTHER

Site Location STATE: PA

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BTEX	MTBE	Naphthalene	Cumene	1,2,4-TMB	1,3,5-TMB	TDS					Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-1	WT	G			11/16/17	0830		4	1			3						X	X	X	X	X	X	X						001
2	MW-2						0900																								002
3	MW-3						0830																								003
4	MW-4						0900																								004
5	MW-5						0930																								005
6	Field Dupe (MW-1)						0830																								006
7	Trip Blank								2				2																		007
8																															
9																															
10																															
11																															
12																															

WO#: 30236527

30236527

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
[illegible] / Letterle	11/17/17	15:35	[illegible] / Pace	11/17/17	1535				
[illegible] / Pace	11/17/17	1654	[illegible]	11/17/17	1659	1.2	Y	N	Y
						Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Austin Hess

SIGNATURE of SAMPLER: [illegible]

DATE Signed (MM/DD/YY): 11/16/17

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

October 18, 2017

Mr. Mark Valenty
Letterle & Associates
2859 Oxford Boulevard
Suite 110
Allison Park, PA 15101

RE: Project: 597 Radhe Oil
Pace Project No.: 30233039

Dear Mr. Valenty:

Enclosed are the analytical results for sample(s) received by the laboratory on October 13, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner
rachel.christner@pacelabs.com
724-850-5611
Project Manager

Enclosures

cc: Mr. Ken Dudash, Letterle & Associates LLC
Ms. Laurie Hall, Letterle & Associates
Mr. George Hunzeker, Letterle & Associates
Mr. Eric Itle, Letterle & Associates
Ms. Stephanie Profeta, Letterle & Associates
Ms. Amy Watenpool, Letterle & Associates
Mr. Pete Weir, Letterle & Associates

Pace Analytical Services, LLC
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CERTIFICATIONS

Project:	597 Radhe Oil
Pace Project No.:	30233039

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: 597 Radhe Oil
Pace Project No.: 30233039

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30233039001	**MW-1**	Water	10/12/17 08:25	10/13/17 16:50
30233039002	**MW-2**	Water	10/12/17 09:25	10/13/17 16:50
30233039003	**MW-3**	Water	10/12/17 09:55	10/13/17 16:50
30233039004	**MW-4**	Water	10/12/17 10:25	10/13/17 16:50
30233039005	**MW-5**	Water	10/12/17 10:55	10/13/17 16:50
30233039006	**Field Dupe(MW-1)**	Water	10/12/17 08:25	10/13/17 16:50
30233039007	**Trip Blank**	Water	10/12/17 00:01	10/13/17 16:50

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SAMPLE ANALYTE COUNT

Project: 597 Radhe Oil
Pace Project No.: 30233039

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
30233039001	**MW-1**	EPA 8260B	JAS	13	PASI-PA
30233039002	**MW-2**	EPA 8260B	JAS	13	PASI-PA
30233039003	**MW-3**	EPA 8260B	JAS	13	PASI-PA
30233039004	**MW-4**	EPA 8260B	JAS	13	PASI-PA
30233039005	**MW-5**	EPA 8260B	JAS	13	PASI-PA
30233039006	**Field Dupe(MW-1)**	EPA 8260B	JAS	13	PASI-PA
30233039007	**Trip Blank**	EPA 8260B	JAS	13	PASI-PA

Pace Analytical Services, LLC
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(724)850-5600

ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: MW-1 **Lab ID: 30233039001** Collected: 10/12/17 08:25 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 18:35	71-43-2	
Ethylbenzene	**2.5**	ug/L	1.0	0.21	1		10/17/17 18:35	100-41-4	
Isopropylbenzene (Cumene)	**15.1**	ug/L	1.0	0.25	1		10/17/17 18:35	98-82-8	
Methyl-tert-butyl ether	**1.2**	ug/L	1.0	0.27	1		10/17/17 18:35	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		10/17/17 18:35	91-20-3	
Toluene	**1.1**	ug/L	1.0	0.29	1		10/17/17 18:35	108-88-3	
1,2,4-Trimethylbenzene	**4.0**	ug/L	1.0	0.21	1		10/17/17 18:35	95-63-6	
1,3,5-Trimethylbenzene	**2.1**	ug/L	1.0	0.40	1		10/17/17 18:35	108-67-8	
Xylene (Total)	**3.6**	ug/L	3.0	1.1	1		10/17/17 18:35	1330-20-7	
Surrogates									
Toluene-d8 (S)	101	%	80-120		1		10/17/17 18:35	2037-26-5	
4-Bromofluorobenzene (S)	96	%	79-129		1		10/17/17 18:35	460-00-4	
1,2-Dichloroethane-d4 (S)	112	%	80-120		1		10/17/17 18:35	17060-07-0	
Dibromofluoromethane (S)	98	%	80-120		1		10/17/17 18:35	1868-53-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: MW-2 **Lab ID: 30233039002** Collected: 10/12/17 09:25 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 21:17	71-43-2	
Ethylbenzene	**94.7**	ug/L	1.0	0.21	1		10/17/17 21:17	100-41-4	
Isopropylbenzene (Cumene)	**76.6**	ug/L	1.0	0.25	1		10/17/17 21:17	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		10/17/17 21:17	1634-04-4	
Naphthalene	**90.7**	ug/L	2.0	0.39	1		10/17/17 21:17	91-20-3	
Toluene	**5.9**	ug/L	1.0	0.29	1		10/17/17 21:17	108-88-3	
1,2,4-Trimethylbenzene	**6.7**	ug/L	1.0	0.21	1		10/17/17 21:17	95-63-6	
1,3,5-Trimethylbenzene	**1.8**	ug/L	1.0	0.40	1		10/17/17 21:17	108-67-8	
Xylene (Total)	**18.3**	ug/L	3.0	1.1	1		10/17/17 21:17	1330-20-7	
Surrogates									
Toluene-d8 (S)	101	%	80-120		1		10/17/17 21:17	2037-26-5	
4-Bromofluorobenzene (S)	100	%	79-129		1		10/17/17 21:17	460-00-4	
1,2-Dichloroethane-d4 (S)	110	%	80-120		1		10/17/17 21:17	17060-07-0	
Dibromofluoromethane (S)	94	%	80-120		1		10/17/17 21:17	1868-53-7	

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: MW-3 **Lab ID: 30233039003** Collected: 10/12/17 09:55 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 12:42	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 12:42	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		10/17/17 12:42	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		10/17/17 12:42	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		10/17/17 12:42	91-20-3	
Toluene	**5.6**	ug/L	1.0	0.29	1		10/17/17 12:42	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 12:42	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		10/17/17 12:42	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		10/17/17 12:42	1330-20-7	
Surrogates									
Toluene-d8 (S)	100	%	80-120		1		10/17/17 12:42	2037-26-5	
4-Bromofluorobenzene (S)	99	%	79-129		1		10/17/17 12:42	460-00-4	
1,2-Dichloroethane-d4 (S)	109	%	80-120		1		10/17/17 12:42	17060-07-0	
Dibromofluoromethane (S)	98	%	80-120		1		10/17/17 12:42	1868-53-7	

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: MW-4 **Lab ID: 30233039004** Collected: 10/12/17 10:25 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 17:41	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 17:41	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		10/17/17 17:41	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		10/17/17 17:41	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		10/17/17 17:41	91-20-3	
Toluene	**4.2**	ug/L	1.0	0.29	1		10/17/17 17:41	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 17:41	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		10/17/17 17:41	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		10/17/17 17:41	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%	80-120		1		10/17/17 17:41	2037-26-5	
4-Bromofluorobenzene (S)	97	%	79-129		1		10/17/17 17:41	460-00-4	
1,2-Dichloroethane-d4 (S)	114	%	80-120		1		10/17/17 17:41	17060-07-0	
Dibromofluoromethane (S)	96	%	80-120		1		10/17/17 17:41	1868-53-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: MW-5 **Lab ID: 30233039005** Collected: 10/12/17 10:55 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 18:08	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 18:08	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		10/17/17 18:08	98-82-8	
Methyl-tert-butyl ether	**4.9**	ug/L	1.0	0.27	1		10/17/17 18:08	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		10/17/17 18:08	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		10/17/17 18:08	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 18:08	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		10/17/17 18:08	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		10/17/17 18:08	1330-20-7	
Surrogates									
Toluene-d8 (S)	98	%	80-120		1		10/17/17 18:08	2037-26-5	
4-Bromofluorobenzene (S)	94	%	79-129		1		10/17/17 18:08	460-00-4	
1,2-Dichloroethane-d4 (S)	116	%	80-120		1		10/17/17 18:08	17060-07-0	
Dibromofluoromethane (S)	100	%	80-120		1		10/17/17 18:08	1868-53-7	

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: Field Dupe(MW-1) **Lab ID: 30233039006** Collected: 10/12/17 08:25 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 19:29	71-43-2	
Ethylbenzene	**2.4**	ug/L	1.0	0.21	1		10/17/17 19:29	100-41-4	
Isopropylbenzene (Cumene)	**14.6**	ug/L	1.0	0.25	1		10/17/17 19:29	98-82-8	
Methyl-tert-butyl ether	**1.3**	ug/L	1.0	0.27	1		10/17/17 19:29	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		10/17/17 19:29	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		10/17/17 19:29	108-88-3	
1,2,4-Trimethylbenzene	**4.4**	ug/L	1.0	0.21	1		10/17/17 19:29	95-63-6	
1,3,5-Trimethylbenzene	**2.3**	ug/L	1.0	0.40	1		10/17/17 19:29	108-67-8	
Xylene (Total)	**3.7**	ug/L	3.0	1.1	1		10/17/17 19:29	1330-20-7	
Surrogates									
Toluene-d8 (S)	101	%	80-120		1		10/17/17 19:29	2037-26-5	
4-Bromofluorobenzene (S)	99	%	79-129		1		10/17/17 19:29	460-00-4	
1,2-Dichloroethane-d4 (S)	108	%	80-120		1		10/17/17 19:29	17060-07-0	
Dibromofluoromethane (S)	98	%	80-120		1		10/17/17 19:29	1868-53-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 597 Radhe Oil
Pace Project No.: 30233039

Sample: Trip Blank **Lab ID: 30233039007** Collected: 10/12/17 00:01 Received: 10/13/17 16:50 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260B MSV	Analytical Method: EPA 8260B								
Benzene	ND	ug/L	1.0	0.35	1		10/17/17 12:15	71-43-2	
Ethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 12:15	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.25	1		10/17/17 12:15	98-82-8	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.27	1		10/17/17 12:15	1634-04-4	
Naphthalene	ND	ug/L	2.0	0.39	1		10/17/17 12:15	91-20-3	
Toluene	ND	ug/L	1.0	0.29	1		10/17/17 12:15	108-88-3	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.21	1		10/17/17 12:15	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.40	1		10/17/17 12:15	108-67-8	
Xylene (Total)	ND	ug/L	3.0	1.1	1		10/17/17 12:15	1330-20-7	
Surrogates									
Toluene-d8 (S)	97	%	80-120		1		10/17/17 12:15	2037-26-5	
4-Bromofluorobenzene (S)	98	%	79-129		1		10/17/17 12:15	460-00-4	
1,2-Dichloroethane-d4 (S)	113	%	80-120		1		10/17/17 12:15	17060-07-0	
Dibromofluoromethane (S)	100	%	80-120		1		10/17/17 12:15	1868-53-7	

Pace Analytical Services, LLC
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QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30233039

QC Batch: 275735 | Analysis Method: EPA 8260B
QC Batch Method: EPA 8260B | Analysis Description: 8260B MSV UST-WATER
Associated Lab Samples: 30233039001, 30233039002, 30233039003, 30233039004, 30233039005, 30233039006, 30233039007

METHOD BLANK: 1355508 | Matrix: Water
Associated Lab Samples: 30233039001, 30233039002, 30233039003, 30233039004, 30233039005, 30233039006, 30233039007

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/L	ND	1.0	0.21	10/17/17 11:21	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	0.40	10/17/17 11:21	
Benzene	ug/L	ND	1.0	0.35	10/17/17 11:21	
Ethylbenzene	ug/L	ND	1.0	0.21	10/17/17 11:21	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	0.25	10/17/17 11:21	
Methyl-tert-butyl ether	ug/L	ND	1.0	0.27	10/17/17 11:21	
Naphthalene	ug/L	ND	2.0	0.39	10/17/17 11:21	
Toluene	ug/L	ND	1.0	0.29	10/17/17 11:21	
Xylene (Total)	ug/L	ND	3.0	1.1	10/17/17 11:21	
1,2-Dichloroethane-d4 (S)	%	111	80-120		10/17/17 11:21	
4-Bromofluorobenzene (S)	%	95	79-129		10/17/17 11:21	
Dibromofluoromethane (S)	%	102	80-120		10/17/17 11:21	
Toluene-d8 (S)	%	96	80-120		10/17/17 11:21	

LABORATORY CONTROL SAMPLE: 1355509

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/L	20	19.8	99	70-130	
1,3,5-Trimethylbenzene	ug/L	20	19.7	99	70-130	
Benzene	ug/L	20	19.4	97	70-130	
Ethylbenzene	ug/L	20	20.3	102	70-130	
Isopropylbenzene (Cumene)	ug/L	20	19.9	99	70-130	
Methyl-tert-butyl ether	ug/L	20	22.0	110	70-130	
Naphthalene	ug/L	20	20.6	103	70-130	
Toluene	ug/L	20	19.8	99	70-130	
Xylene (Total)	ug/L	60	60.9	101	70-130	
1,2-Dichloroethane-d4 (S)	%			111	80-120	
4-Bromofluorobenzene (S)	%			100	79-129	
Dibromofluoromethane (S)	%			103	80-120	
Toluene-d8 (S)	%			101	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1355741 1355742

Parameter	Units	30233039003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
1,2,4-Trimethylbenzene	ug/L	ND	20	20	20.0	20.4	100	102	75-125	2	30	
1,3,5-Trimethylbenzene	ug/L	ND	20	20	20.2	20.2	101	101	76-121	0	30	
Benzene	ug/L	ND	20	20	20.0	20.6	100	103	67-121	3	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA

Project: 597 Radhe Oil
Pace Project No.: 30233039

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1355741 1355742

Parameter	Units	30233039003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Ethylbenzene	ug/L	ND	20	20	20.8	20.9	104	105	70-127	1	30	
Isopropylbenzene (Cumene)	ug/L	ND	20	20	20.9	21.0	104	105	80-122	1	30	
Methyl-tert-butyl ether	ug/L	ND	20	20	20.9	21.6	104	108	79-135	3	30	
Naphthalene	ug/L	ND	20	20	19.1	19.9	96	99	62-131	4	30	
Toluene	ug/L	5.6	20	20	25.4	26.5	99	105	77-125	4	30	
Xylene (Total)	ug/L	ND	60	60	61.4	61.1	102	102	69-128	0	30	
1,2-Dichloroethane-d4 (S)	%						106	107	80-120			
4-Bromofluorobenzene (S)	%						96	95	79-129			
Dibromofluoromethane (S)	%						103	104	80-120			
Toluene-d8 (S)	%						101	100	80-120			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Greensburg, PA 15601
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QUALIFIERS

Project: 597 Radhe Oil
Pace Project No.: 30233039

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-PA Pace Analytical Services - Greensburg

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 597 Radhe Oil
Pace Project No.: 30233039

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
30233039001	**MW-1**	EPA 8260B	275735		
30233039002	**MW-2**	EPA 8260B	275735		
30233039003	**MW-3**	EPA 8260B	275735		
30233039004	**MW-4**	EPA 8260B	275735		
30233039005	**MW-5**	EPA 8260B	275735		
30233039006	**Field Dupe(MW-1)**	EPA 8260B	275735		
30233039007	**Trip Blank**	EPA 8260B	275735		

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CHAIN [WO#: 30233039] ...ument
The Chain-of ... ccurately.

30233039

Page:	1	of	1

2166600

Section A
Required Client Information:

Company:	Letterle and Associates
Address:	2859 Oxford Boulevard, Allison Park, PA 15101
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	Standard

Section B
Required Project Information:

Report To:	Same
Copy To:	Same
Purchase Order No.:	
Project Name:	Radhe Oil
Project Number:	597

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Rachel Christner
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☑ UST ☐ RCRA ☐ OTHER ______

Site Location STATE: PA

Section D
Required Client Information

Matrix Codes
MATRIX / CODE
Drinking Water DW
Water WT
Waste Water WW
Product P
Soil/Solid SL
Oil OL
Wipe WP
Air AR
Tissue TS
Other OT

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BTEX	MTBE	Naphthalene	Cumene	1,2,4-TMB	1,3,5-TMB	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Mw-1	WT	G			10/13/17	0825		3				3						X	X	X	X	X	X		001
2	Mw-2						0925																			002
3	Mw-3						0955																			003
4	Mw-4						1625																			004
5	Mw-5						1655																			005
6	Field Dupe (Mw-1)						0825																			006
7	Trip Blank								2				2													007
8																										
9																										
10																										
11																										
12																										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	[signature]	10/13/17	3:30	[signature]	10/13/17	1530				
	[signature]	10/13/17	1650	Michael [signature]	10-13-17	1650	-1.5	Y	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Austin Hess

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10/13/17

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

APPENDIX M

SVE Pilot Test Report

SOIL VAPOR EXTRACTION PILOT TEST REPORT

PADEP Facility ID #03-29674
PAUSTIF Claim #2017-0012

Radhe Oil
222 Buffalo Street
Freeport, PA 16229

Prepared for:

Superior Petroleum Company
8199 McKnight Road
Pittsburgh, PA 15237

Letterle & Associates, Inc.
2859 Oxford Blvd., Allison Park, PA 15101

COMMONWEALTH OF PENNSYLVANIA
REGISTERED
PROFESSIONAL
KENNETH WAYNE DUDASH
ENGINEER
PE052222

Kenneth W. Dudash, PE
Senior Project Engineer

"By affixing my seal to this document, I am certifying that the information is true and correct to the best of my knowledge. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and that it is within my professional expertise to verify the correctness of the information."

-Kenneth W. Dudash, P.E., signed and sealed this day, March 26, 2019

TABLE OF CONTENTS

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APPENDICES

1.0 INTRODUCTION

Letterle & Associates, Inc. (Letterle) was retained by Superior Petroleum Company (Superior) in March 2017 to conduct environmental site characterization activities at the Radhe Oil facility. Radhe Oil (Facility ID #03-29674) is located at 222 Buffalo Street in Freeport Borough, Armstrong County, Pennsylvania (**Figure 1**). Superior is the current owner of the property, service station, and UST system.

The targeted goals of the remedial action are the attainment of the PADEP SHS for Used Aquifers at a Non-Residential property with a TDS concentration of less than or equal to 2,500 mg/l as detailed in the Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2).

Based on the results of soil sampling activities conducted from 2016 through 2018, attainment of the PADEP SHS has not been achieved at the site. Remedial actions will be necessary to reduce concentrations of constituents of concern (COC) in soil and attain the PADEP SHS. The mass of petroleum-impacted soil is primarily located in the vicinity of the UST system, near soil borings SB-1, SB-13, SB-15, and SB-17.

Letterle performed a remedial options evaluation for the site, which included remedial pilot testing. In February 2019, Letterle performed a soil vapor extraction (SVE) pilot test at the site to evaluate SVE technology as a potentially viable remedial option. The following key parameters were evaluated during the pilot test:

- Overall technical feasibility of SVE as a remedial strategy;
- Cost-effectiveness of SVE based on site specific conditions;
- Achieve pneumatic control of the impacted area(s);
- Ability to significantly reduce COC concentrations within the source area(s);
- Confirm that SVE will likely result in a timely site closure; and
- Establish final design criteria.

2.0 PERTINENT SITE CHARACTERIZATION DATA

The results of the site characterization indicate that unleaded gasoline COCs are present in soil and groundwater, at concentrations exceeding the PADEP SHS. The lithology beneath the surface in the vicinity of soil borings SB-1, SB-13, SB-15, and SB-17 (impacted area) consists of an asphalt surface underlain by clay with sand and gravel to the final depth of the boreholes at 25 feet below ground surface (bgs). Groundwater was encountered at approximately 22 feet bgs in the vicinity of the source area (estimated near the current dispenser island).

The primary COC in soil, based on concentrations, is 1,2,4-trimethylbenzene (1,2,4-TMB). Concentrations of 1,2,4-TMB in unsaturated soil are located primarily in the southern portion of the property. Soil excavation is not currently considered to be practical based on proximity to the existing UST system and the depth to impacted soil.

2.0 SVE PILOT TESTING

3.1 Background and Rationale for SVE Pilot Testing

SVE is a remediation method that consists of extracting soil vapor from the subsurface utilizing an appropriate vacuum blower or pump. The goal of SVE technology at this site would be to remove adsorbed phase hydrocarbons from subsurface soil to attain the PADEP SHS. The application of SVE in a full-scale system will facilitate the mass recovery of hydrocarbons by creating a pressure gradient toward each recovery well. An additional benefit is that SVE can also enhance bio-degradation by adding oxygen via air movement through the subsurface.

Pilot testing was performed to provide the engineering data necessary to design a full-scale system that will remediate the remaining adsorbed phase hydrocarbons in soil. The testing was also performed to determine whether SVE can be properly implemented without adversely affecting groundwater.

The results of the pilot study will indicate whether soil vapor extraction is possible using applied vacuum and determine whether significant volatilization of COCs will occur. The results will detail and effects on groundwater and quantify the volume (if any) extracted with subsurface vapor at high vacuum levels. The pilot testing will also determine if the entire impacted soil under the site can be influenced by an SVE system and how much volatilization and corresponding concentration reduction can be expected. The resulting extraction flow rates and vacuums will be used to determine equipment sizes for a remedial system, and ROI calculations will be used to confirm the number and distance between extraction points.

3.2 Pilot Testing Methodology

The SVE pilot test involved the recovery of subsurface vapor from the installed vertical extraction wells (SVE-1 and SVE-2), while monitoring induced vacuum and vapor concentrations in surrounding vapor monitoring points (MP-1 through MP-3) and monitoring wells (MW-1 though MW-6) at the site. Boring logs for SVE-1 and SVE-2 are included in **Appendix A**.

Recovery well SVE-1 was tested initially on an individual basis to obtain a design (attainable) vacuum. A stepped-rate test was performed on SVE-1 to provide the design extraction well capacities and system curves. A constant rate test was then performed on SVE-1 and SVE-2 to investigate areas of influence and efficiencies at a design vacuum level and flow rate which provided results to calculate the air permeability values of the overburden.

Prior to testing, groundwater elevations were measured in existing wells to evaluate open screen intervals in order to collect vacuum measurements and monitor groundwater mounding during the pilot test. The SVE pilot testing was conducted over a period of approximately 2 days (approximately 6 hours per SVE pilot test). **Appendix B** contains the field data sheets.

During the SVE step testing, a low-vacuum regenerative vacuum pump was connected to the SVE well to extract subsurface vapor. A two-inch diameter flexible hose was connected to the influent piping of the blower and the top of the SVE well with a Fernco fitting. A UN-approved drum containing 600 pounds of vapor carbon was connected to the outlet of the pump with temperature resistant hosing to remove volatile organic compounds (VOCs). The drum provided treatment and final polishing prior to atmospheric discharge via PVC stack.

During the step test, the vacuum blower was adjusted to apply varied vacuums via a bleed valve, while monitoring the soil vacuum response versus applied vacuum. The applied vacuum was increased during a minimum of four intervals, until a maximum vacuum was established. If the maximum capacity of the regenerative blower was achieved (near 7 inHg) before a design vacuum level was established, the regenerative blower would have been replaced with a high vacuum liquid ring pump (LRP).

The resulting maximum attainable vacuum and response vacuum were evaluated to determine the design vacuum level and appropriate extraction equipment for the subsurface conditions. The design vacuum was considered to be the level of applied vacuum that does not result in a significant rise in response vacuum. Operating at vacuum levels higher than the design vacuum would be uneconomical. Higher attainable vacuums may be possible using larger extraction equipment, but do not necessary relate to higher VOC extraction rates or a larger radius of influence.

3.2.1 Vapor and Vacuum Monitoring

During the SVE pilot test, the induced vacuum was measured in the surrounding subsurface at monitor points MP-1 through MP-3 and monitor wells MW-1 through MW-6. Each well was sealed from the atmosphere to obtain accurate vacuum influence readings. Vacuum readings at each well were measured using a magnehelic pressure gauge with a range of either 0 to 1 in. H_2O, or 0 to 10 inH_2O if the response vacuum was over 1 inH20. The vapor stream velocity was measured by an in-field flowmeter and periodically calculated during the test using the pump manufacturer performance curves for comparison. The VOC content of the extracted vapor was field-measured with a photo-ionization detector (PID). Vapor samples were collected during the test for laboratory analysis of total petroleum hydrocarbons (TPH).

The SVE pilot test was conducted until vacuum levels in the surrounding observation wells had stabilized and an increase in applied vacuum resulted in no significant increase to the response vacuum. Once the step test was completed, a constant rate pilot test was performed using both SVE wells in combination. Vapor and vacuum monitoring during the constant rate test followed similar methodology.

3.2.2 ROI Determination

Data obtained from monitoring the vacuum influence at the observation wells was then used to obtain an approximate pneumatic radius of influence (ROI). The pneumatic ROI is the radial distance from an extraction well that has adequate air flow for effective removal of contaminants when a vacuum is applied to the extraction well. Beyond this point, air velocity through the soil decreases to the point in which the contaminants will not volatize. The ROI is calculated by measuring vacuum levels (in. H_2O) in monitoring points at multiple distances from the extraction well. Generally, a level of 0.1 in. H_2O is the industry-accepted standard for the volatilization threshold (due to lack of subsurface vapor flow) and is therefore considered to be the ROI.

Observed vacuum recordings vs. radial distance of the monitoring points were plotted on a semi-log graph to establish an estimated trendline. The distance at which the trendline intersects the vacuum level of 0.1 in. H_2O was the calculated ROI. The ROI will provide a base point for maximum distance between remedial well locations and will be used in the original design.

Air permeability (k, in Darcys) was calculated for each responding vapor point by measuring the pressure/vacuum changes over time in several monitoring points during constant rate pilot testing from a single SVE well.

3.3 SVE Pilot Test – SVE-1

On February 15, 2019, five days prior to starting the pilot test, automatic recording pressure transducers (Schlumberger MicroDiver® - Model #D1601-10m) were installed in monitor wells MW-1 through MW-6 to record fluctuations in groundwater during the pilot test. An electronic interface probe accurate to the nearest 0.01 foot was used to manually measure water levels in monitor wells MW-1 through MW-6 prior to transducer installation. Static water levels were measured in the designated monitor wells (**Table 1**) prior to starting the test to provide baseline data to compare with subsequent readings. The groundwater depth measurements at the monitor wells and their distances to the recovery well were used to determine an approximate minimum hydraulic influence zone, if present. Groundwater level measurements were also used to calculate open screened intervals in the monitor wells.

The pre-test (February 15, 2019) static water level measurements indicated that the depth to groundwater ranged from 15.75 feet bgs in monitor well MW-6 to 23.75 feet bgs in monitor well MW-5. All observation wells had adequate open screen available (>1 foot) for monitoring vacuum influence except for MW-4 and MW-3 with none in MW-4 and only 0.67 feet of open screen in MW-3. In general, there was sufficient well screen available above the water table, which will allow for SVE without the need to expose well screen by first drawing down the water table.

Letterle performed the SVE step pilot test on February 21, 2019, utilizing recovery well SVE-1 as the extraction well. A 7.5 horsepower (hp) Rotron EG&G EN808, 3-phase regenerative blower capable of an extraction flow rate of 350 scfm and a maximum vacuum of 97 in. H20 was connected to SVE-1 for removal of vapor. SVE-1 is constructed with three feet of 4-inch diameter polyvinyl chloride (PVC) riser and 17 feet of PVC screen (0.020-slot) to a depth of 20 feet bgs. No water was detected in SVE-1 via the water level meter prior to the test start. A 4-inch well extension with a reducing tee was connected to the top of SVE-1 with a Fernco coupling to allow for connection to the influent piping of the vacuum pump. Initially, the regenerative blower was operated at an applied vacuum of 2.5 inHg (34 in. H_20), measured at the top of SVE-1, for sixty minutes. Extracted air flow rates were periodically measured with a TSI 9565 VelociCalc flow meter inserted in the SVE blower pipe connected to SVE-1.

During the step test, the regenerative blower was adjusted to apply varied vacuums, beginning at 2.5 inHg at the wellhead for one hour, and then increased to 3.5 inHg for one hour, then to 5.5

inHg for one hour, and then by fully closing the bleed valve and operating at maximum achievable vacuum (near 7 inHg) for an additional one hour.

3.4 Pilot Test Results - SVE-1

The February 21, 2019 SVE pilot test was performed on vertical SVE-1 for a total of five hours. Once the blower was in full operation and applying vacuum to SVE-1, step testing was performed up to the maximum achievable applied vacuum (near pump capacity at 7 inHg [95 inH_2O]). At this applied vacuum, the blower was extracting approximately 75 scfm from the subsurface around SVE-1. To obtain the maximum vacuum level, all adjusting bleed valves were fully closed with no other air entries into the blower present. Perched groundwater was entrained into SVE-1 to a depth of 19.31 feet below top of casing (TOC) beginning at the 5.5 inHg applied vacuum level but none was present in the extracted vapor.

Eight of the observation wells responded to the extraction of vapor from SVE-1 at the initial applied vacuum level of 2.5 inH_2O, with an observed significant vacuum influence (>0.10 inH_2O). Vacuum responses increased substantially up to the applied vacuum of 5.5 in. H_20. Increasing the applied vacuum to 7 H_20 did not significantly increase the response vacuum in the surrounding wells (**Chart 1**).

A maximum response vacuum of >10 in H_2O was recorded in MP-1 at a distance of 3 feet from SVE-1 (**Table 2**). No significant vacuum response was observed in MW-3 and MW-4 due to a lack of open screened interval. Graphs were prepared for the resulting vacuum influences vs. distance from the extraction well (**Chart 2**). The pneumatic ROI was estimated at 50 feet.

Groundwater in the eight observation wells did not respond significantly to the application of any levels of vacuum to SVE-1 (**Chart 3**). No mounding of greater than 0.2 feet was recorded in any of the observed wells. These results indicate that the use of SVE technology does not induce significant groundwater mounding when applied to SVE-1. No significant volumes of groundwater entered the extraction well or extracted vapor during the test; however, subsequent system design should include equipment to handle extracted groundwater in the vapor if it occurs.

Based on PID measurements collected in the field, VOC concentrations were detected at high levels in the extracted vapor as the stepped vacuum levels were applied. Initial extracted VOC concentrations were very high at 1708 parts per million volume (ppmv). A maximum of 3,860 ppmv was observed in the extracted vapor at a vacuum of 3.5 inHg.

One influent vapor sample (pre-blower) was collected at the end of each SVE test step for laboratory analysis to determine the VOC content (in ppmv) of the extracted vapor. A portable vacuum pump with the capability to apply 24 inHg of vacuum was used to collect the vapor sample from the extraction piping without bleed air influence. The sample was collected by inserting a needle attached to a disposable syringe into the exhaust vapors of the portable vacuum pump. Once the syringe was filled, the collected vapor was discharged into a vacuum enhanced vial for transport to the lab.
Vapor sampling procedures were followed according to Letterle's SOP 35-1 for Remedial System Vapor Sampling. The vapor sampling kit consisted of a 38 cubic centimeter (cc) disposable

syringe, two pre-evacuated 22 cc glass vials with Teflon-lined septa, a disposable 22-gauge stainless steel needle, and a luer-type shut-off valve. Once collected, the gas samples in each vial were submitted to a laboratory, where they were analyzed by gas chromatography. The vapor samples were analyzed for TPH.

The laboratory results for the vapor sample indicated that TPH concentrations were detected at high levels during each step interval. However, concentrations decreased from 2,000 ppmv during the initial step test on SVE-1, to a final concentration of 770 ppmv during the fourth step interval.

3.5 SVE Pilot Test Results – SVE-1 and SVE-2

Letterle performed the second phase of SVE pilot testing on February 21, 2019, operating extraction wells SVE-1 and SVE-2 in combination. The 7.5 hp regenerative blower was connected to SVE-1 and SVE-2 for removal of subsurface vapor via two extraction hoses connected to a combination header which led to the SVE knockout (KO) tank and subsequent blower. SVE well SVE-2 is constructed with three feet of 4-inch diameter PVC riser and 17 feet of PVC screen (0.020-slot) to a depth of 20 feet bgs. No water was detected in SVE-2 using a water level meter prior to the test start. A 4-inch K-packer with a reducing fitting was inserted into the top of SVE-2 to allow for connection of the influent piping of the vacuum pump. The regenerative blower was operated at the maximum attainable applied vacuum by the blower which started at 3.5 inHg (47.6 inH20) at the top of SVE-1.

After approximately two hours, the blower attained a vacuum of 4.0 inHg (54.4 inH20) during the pilot test at the top of SVE-1. The vacuum resulted in an average vapor flow rate of approximately 88 scfm from SVE-2, which corresponds to the manufacturer's 7.5-hp vacuum pump performance curve of 212 scfm at 4 inHg. The flow from extraction well SVE-1 was estimated at near 124 scfm based on the blower manufacture performance curve. A direct flow reading was not collected from SVE-1. At the end of the test, the vacuum to SVE-1 and SVE-2 was turned off and no accumulated groundwater could be measured in SVE-2.

3.5.1 Hydraulic Response

Groundwater in the eight observation wells did not significantly respond to the applied vacuum levels using SVE-1 and SVE-2 in combination. Groundwater mounding (>0.2 feet) was not evident in any of the observed wells (**Chart 4**). The results indicate that the use of SVE technology does not induce significant groundwater mounding when applied to SVE-1 and SVE-2. No significant volume of groundwater entered the extraction wells or extracted vapor during the test. However, subsequent system design should include equipment to handle extracted groundwater in the vapor if it should occur.

3.5.2 Pneumatic Response

A significant vacuum influence [>0.10 inches of water (inH$_2$O)] was observed at all three monitor points and six monitor wells during the SVE pilot test at SVE-1 and SVE-2. Based on transducer readings, groundwater levels at the start of the test decreased in MW-3 and MW-4 to a point which would allow for an open screened interval and subsequent subsurface airflow to produce a response vacuum. Open screened intervals were present in all monitoring points (MP-1 through MP-3) and monitoring wells (MW-1 through MW-6). A vacuum response greater than 10 in. H_20 was evident in MP-1 through MP-3, MW-1, and MW-5. The farthest monitor well exhibiting a vacuum response from the extraction wells was MW-5 (located 56 feet across the tank field, northeast of SVE-2), which had a vacuum response of >10 in. H_2O at the end of the pilot test (**Figure 2**).

Based on vacuum readings in the surrounding wells, a pneumatic ROI was calculated at 50 feet from extraction wells SVE-1 and SVE-2 (**Chart 5**), which is believed to be a result of subsurface vapor flow through the subsurface sand and gravel, with considerable flow through the backfill of the tankfield area. ROI calculations are included in **Appendix C**.

Field measurements of COC concentrations in the extracted vapor decreased as the test went on from 1836 ppmv (start of test) to 1257 ppmv (end of the test). The laboratory results for the vapor sample indicated that TPH concentrations were reported near 220 ppmv throughout the test on SVE-1/SVE-2. The analytical results for the vapor samples are summarized in **Table 4**. All laboratory reports are included in **Appendix D**.

4.0 CRITICAL CRITERIA

There are several key criterion and quantified value ranges that were expected during the pilot testing to ensure that the technology is technically feasible, the system will operate as planned, and the proposed clean-up schedule can be met. The criteria and value ranges include the following:

1) ***The pneumatic ROI, as defined by an observed vacuum of 0.1 inH₂O after stabilization of the readings, should be observed at a minimum distance of 20 feet from the existing SVE extraction points at two observation points located in different directions from the nearest test well.***

   The pneumatic ROI indicates the ability to extract volatilized hydrocarbons from the soil pore spaces under applied vacuum. The pneumatic ROI is calculated to determine the quantity and placement of recovery wells in a full-scale system design. At a minimum distance of 20 feet, the number of recovery wells and corresponding extraction equipment sizes needed in the remedial design plan are generally considered economical.

   The pilot testing activities indicated a pneumatic ROI of 50 feet, which is greater than the required minimum of 20 feet.

2) ***While applying vacuum to SVE-1 and SVE-2, a vacuum response of greater than 0.1 inH₂O should be observed in all wells in the impacted soil area, including MP-1 through MP-3, and MW-1, which are within 20 feet of the nearest extraction well.***

   When graphed, the resulting vacuum responses in the surrounding wells versus distance from the nearest extraction well should indicate a point on the graph that is a distance of at least 20 feet from the nearest extraction well, with a vacuum level of 0.1 inH_2O.

A significant vacuum response was recorded in all monitor points and wells, indicating that the geology in that area is permeable enough for subsurface air flow. Monitor well MW-5, which is located the farthest distance from the SVE wells, indicated a response of >10 inH_2O. The pneumatic ROI was calculated at a distance of 50 feet from SVE-1 and SVE-2, which meets the criteria. The existing extraction wells SVE-1 and SVE-2 are sufficient to remediate the site.

3) ***The applied vacuum level during the SVE test should not result in groundwater table mounding. The groundwater mounding response, defined by an upwelling of groundwater of greater than 0.20 feet, should not be observed in any monitor well.***

Significant groundwater mounding (>0.2 feet) was not evident in any of the observed wells. Some minor upwelling of groundwater >0.10 feet was observed in several monitor wells. However, those wells are primarily located downgradient and have a smaller open screened interval. High soil permeability in the vadose zone allowed this criteria to be met.

4) ***To utilize SVE regenerative vacuum extraction technology, the maximum attainable applied vacuum measured at the extraction well should be less than 7 inHg, and the extracted vapor flow rate should be greater than 15.5 scfm when a sufficient ROI is generated.***

The minimum attainable vapor extraction rate should be greater than 15.5 scfm during the constant rate test, operating on two extraction wells with no added bleed air to ensure that site remediation can be completed within a reasonable timeframe. At this rate, a minimum of three pore space volumes of vapor can be removed from the subsurface within the pneumatic ROI over a 24-hour period.

Assuming a minimum pneumatic ROI of 20 feet is attainable, the dimensions of influence area would be 1,256 square feet ($A=\pi r^2$) by 20 feet deep around the extraction well. The corresponding pore space volume, assuming 30% porosity, equals 7,540 cubic feet ($V=\pi r^2 h*0.3$). The time required to remove at least three pore volumes (3V) with one recovery well operating in the hydraulic ROI area at less than 15.5 scfm would be longer than 24 hours. Operating at a flow rate lower than 15.5 scfm would extend the timeframe to remedial action completion and would not be cost-effective. In addition, this flow rate is also near the minimum capacity of adequate vacuum pumps operating at high applied vacuum levels. Vapor flow rates less than the threshold of 15.5 scfm would indicate very tight geological subsurface conditions at the site and the need for a larger number of recovery wells placed at short intervals, larger vacuum equipment, and/or increased operational periods.

Lower attainable vacuum levels tend to produce higher vapor flowrates. Regenerative blowers were designed to operate at levels below 7 inHg and at higher vapor flow rates. If the vacuum attained is higher than 7 inHg, then the subsurface will also demonstrate very low transmissivity, which would likely result in the need to consider other vacuum technologies.

Pilot testing results indicated a design vacuum of approximately 5.5 inHg is attainable at the vacuum pump, based on the subsurface conditions in the vicinity of extraction well SVE-1.

The results are considered representative of conditions within the entire impacted area. Therefore, a regenerative blower is the appropriate vacuum equipment based on site conditions. Air flow rates from SVE-1 were recorded at higher than 68 scfm at the 7 inHg level. Based on this data, the design of the appropriate regenerative blower will produce subsurface vapor extraction rates to create a sufficient pneumatic ROI (as indicated by the pilot test results). Therefore, this key criterion has been met.

5) ***The hydrocarbon recovery rate in the extracted vapor should be greater than 0.07 pounds per day, as calculated from the analytical results of the extracted vapor or field measured hydrocarbon levels.***

Based on current calculations, a total of 51 pounds of TPH are present within the unsaturated soil surrounding SVE-1 and SVE-2. Therefore, a recovery rate of 0.07 pounds per day is needed to remove the existing contaminant level to 0 ppm within 2 years of system operation. Laboratory analysis of the extracted soil vapor collected during pilot testing should confirm that greater than 0.07 pounds/day of TPH can be extracted from the recovery wells.

Pilot test results indicate that 17.16 pounds per day can be extracted from SVE-1 and SVE-2 in the vapor (considering the extracted vapor flow rate and analytical results from recovery well SVE-1 and SVE-2), which meets this criterion. Pilot test results indicate that 19.26 pounds per day can be extracted from SVE-1 alone in the extracted vapor (considering the extracted vapor flow rate and analytical results from recovery well SVE-1, which meets this criterion.

5.0 CONCLUSION

An SVE pilot test was conducted at the site in order to design a remedial strategy to remove adsorbed-phase hydrocarbons in the unsaturated soil, which is located primarily between the dispensers and building at the site. The following results were obtained during testing at SVE-1 and SVE-2:

- The design vacuum, where the ROI can no longer be enhanced, is near 5.5 inHg. An extraction flow rate of 88 scfm was obtained from SVE-1, with a corresponding flow rate of 6.26 scfm per foot of well screen.
- The calculated pneumatic ROI was approximately 50 feet.
- A total of 17.16 lbs. per day of TPH can be removed from the subsurface utilizing SVE-1 and SVE-2 in combination for recovery of subsurface vapors.
- No significant groundwater mounding was evident during pilot testing.
- The pneumatic ROI covers the entire impacted area and additional recovery wells may not be required at the site. Extraction wells SVE-1 and SVE-2 can influence the remaining soil impact area with a conservative overlap to ensure complete coverage.
- TPH concentrations were detected in the field at high concentrations in the vapor stream during the test from both extraction wells. High concentrations of TPH hydrocarbons in the vapor stream were reported in the laboratory results.

The pilot test results indicated that utilizing low vacuum SVE technology on multiple recovery wells may be an effective and aggressive remediation strategy to reduce dissolved phase petroleum hydrocarbons in soil. All critical criterion conditions were met, indicating the SVE technology is feasible, and will have a positive remedial effect on the impacts at the former Radhe Oil facility.

The step test performed on SVE#1 revealed an accurate representation of the application of vacuum capabilities of the site. Due to the location of SVE-1, and possibly the subsurface geology, the permeability is very high with a large response influence surrounding the vertical SVE well location. The entire impacted soil area at the site can be influenced by SVE-1 and SVE-2 at an applied vacuum of 5.5 inH_2O. The applied vacuum level revealed that the use of SVE will not mound the groundwater table and a significant capture of injected air is possible at distances of 50 feet in the vicinity of the extraction well. This relates to a flow rate of 6.26 scfm per foot of SVE well. Since the SVE well is installed above the static groundwater table at the site, the potential to entrain perched groundwater entering the soil from the surface exists in non-paved areas, but it appears that the groundwater will be limited; however, system components should be installed to deal with small amounts of entrained groundwater should static groundwater levels rise at the site.

TABLES

TABLE 1
PILOT TEST STATIC GROUNDWATER ELEVATIONS
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

2/15/2019
SVE Test on SVE-1 and SVE-2

Monitor Well	Depth to Screen (feet)	Length of Screen (feet)	Screen Interval (feet bgs)	Static Depth to Water Prior to Test (feet)	Exposed Screen (feet)	Screen in Saturated Zone (feet)
MW-1	20	10.00	20-30	22.60	2.60	7.40
MW-2	20	10.00	20-30	22.10	2.10	7.90
MW-3	20	10.00	20-30	20.67	0.67	9.33
MW-4	20	10.00	20-30	19.47	0.00	10.00
MW-5	20	10.00	20-30	23.75	3.75	6.25
MW-6	10	15.00	10-25	15.75	5.75	9.25
MP-1	3	17.00	3-20	NM	-	-
MP-2	3	17.00	3-20	NM	-	-
MP-3	3	17.00	3-20	NM	-	-
SVE-1	3	17.00	3-20	none	17.00	0.00
SVE-2	3	17.00	3-20	NM	-	-

Notes:
feet bgs - feet below ground surface
NM - Not Measured

TABLE 2
PILOT TEST VACUUM INFLUENCE READINGS

Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

2.21.19
SVE Test on SVE-1

Observation Well I.D.	Distance from SVE-1 (feet)	Vacuum at Observation Well (inH2O) with SVE-1 During SVE Test @ 95 inH2O, 75 scfm
MW-1	5	8.60
MW-2	23	5.00
MW-3	43.0	0.02
MW-4	41.0	0.02
MW-5	65	6.00
MW-6	44.0	0.72
MP-1	6	>10
MP-2	29	6.40
MP-3	26	5.50
SVE-2	17	1.60

2.22.19
SVE Test on SVE-1 & SVE-2

Observation Well I.D.	Closest Distance from SVE-1 or SVE-2 (feet)	Vacuum at Observation Well (inH2O) with SVE-1 and SVE-2 During SVE Test @ 54.4 inH2O, 212 scfm
MW-1	5	>10
MW-2	23	7.20
MW-3	41.0	0.20
MW-4	41.0	0.10
MW-5	56	>10
MW-6	44.0	1.10
MP-1	6	>10
MP-2	16	>10
MP-3	18	>10

Notes:
(inH2O) - inches of water vacuum
scfm - standard cubic feet per minute
gpm - gallons per minute
NM - not measured

TABLE 3
PILOT TEST SUMMARY

Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

2.22.2019
SVE Test on SVE-1 & SVE-2

Recovery well	AttainedVac. At Wellhead(inH2O)	Estimated Pneumatic Radius of Influence (feet)	Field PID Hydrocarbon Concentration (ppm)	Water Table Elevation Change (feet)	Vapor Flow (scfm)
SVE-1	95.0	50.00	3860.0	<0.2	75.0
SVE-1/SVE-2	54.4	50.00	1257	<0.2	212

Notes:
NA - Not Analyzed
in Hg - inches of mercury
scfm - standard cubic feet per minute
gpm - gallons per minute

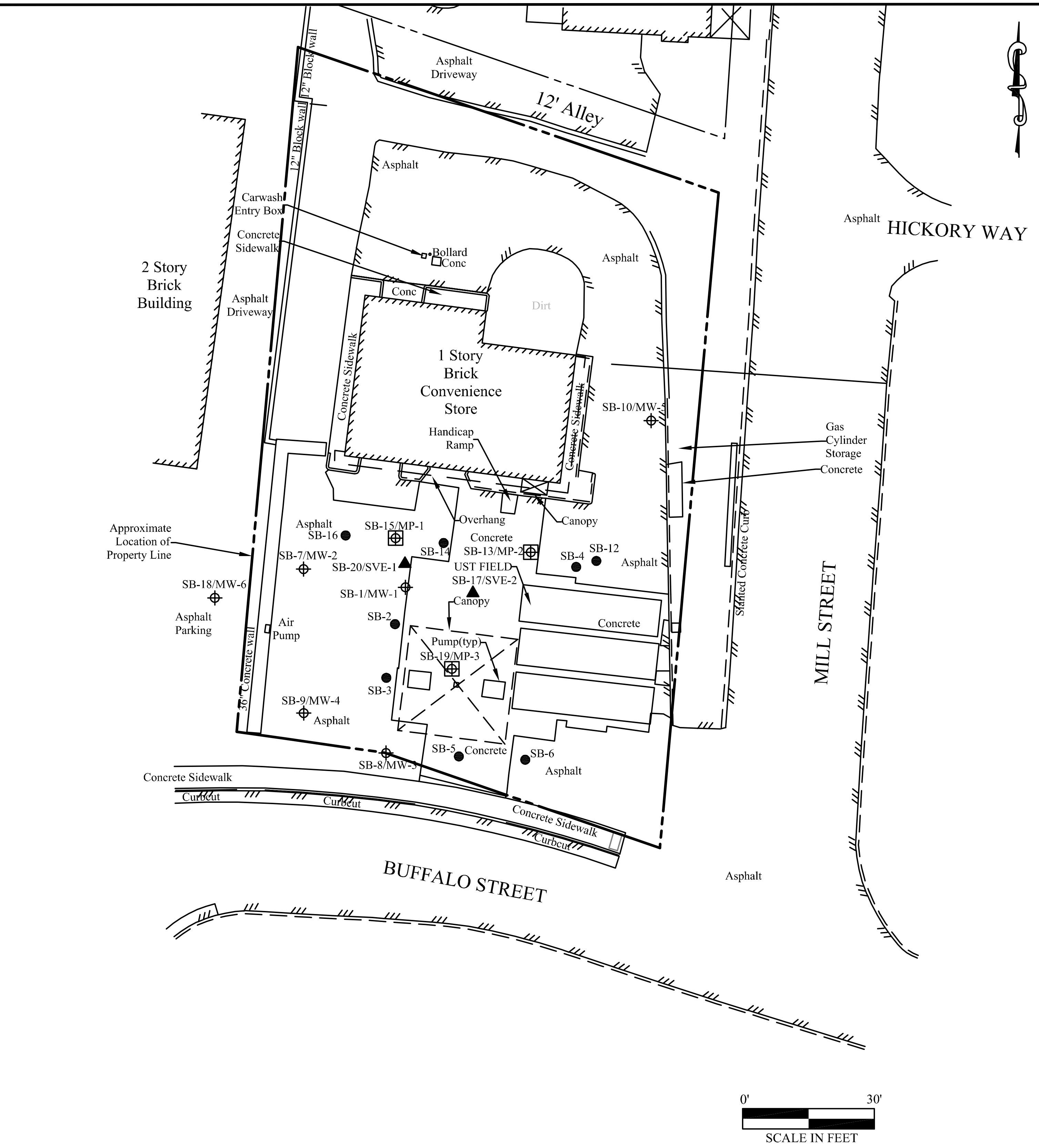
TABLE 4
PILOT TEST SOIL VAPOR QUALITY ANALYTICAL RESULTS
Superior Radhe Oil
222 Buffalo Street
Freeport, PA 16229
2/21/2019 2/22/19

VEGE Test on SVE-1 & SVE-1/SVE-2

Extraction Well	TPH C4-C12 (ppmv)
SVE -1 Start	2,000.0
SVE-1 Stage 2	1,300.0
SVE-1 Stage 3	970.0
SVE-1 Stage 4	770.0
SVE-1/SVE-2 Start	210.0
SVE-SVE-2 Stage 2	230.0
SVE-1/SVE -2 Stage 3	220.0

Notes:
ppmv - parts per million by volume

FIGURES



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- SOIL BORING/MONITOR POINT LOCATION
- SOIL BORING/SOIL VAPOR EXTRACTION POINT

SOIL BORING, MONITOR WELL, SOIL VAPOR EXTRACTION, AND MONITOR POINT LOCATION MAP

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 1

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- SOIL BORING LOCATION
- SOIL BORING/MONITOR WELL LOCATION
- SOIL BORING/MONITOR POINT LOCATION
- SOIL BORING/SOIL VAPOR EXTRACTION POINT
- >10 MEASURED RESPONSE VACUUM IN H20 DURING PILOT TEST
- EXTENT OF VACUUM RESPONSE OF 0.1 INCHES OF H20
- EXTENT OF VACUUM RESPONSE OF 1.0 INCHES OF H20
- EXTENT OF IMPACTED SOIL

0' 30'

SCALE IN FEET

PNEUMATIC INFLUENCE DURING SVE PILOT TEST AT SVE-1 AND SVE-2 - FEBRUARY 21, 2019

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 2

CHARTS

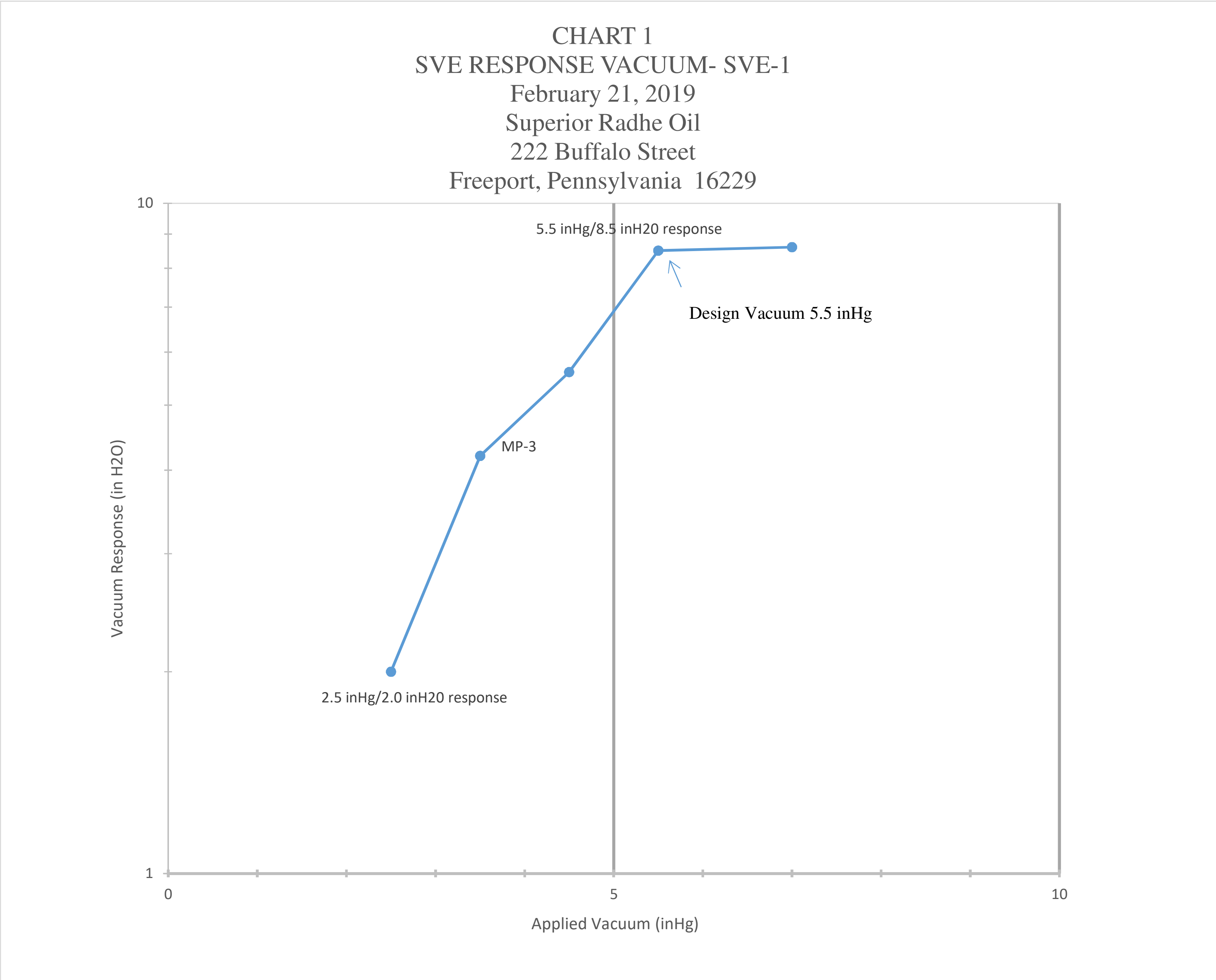


CHART 1
SVE RESPONSE VACUUM- SVE-1
February 21, 2019
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229
5.5 inHg/8.5 inH20 response
Design Vacuum 5.5 inHg
MP-3
2.5 inHg/2.0 inH20 response
Vacuum Response (in H2O)
Applied Vacuum (inHg)
10
1
0
5
10

CHART 2
RESPONSE VACUUM VS. DISTANCE FROM EXTRACTION WELL SVE-1
Radhe Oil
Freeport, Pennsylvania

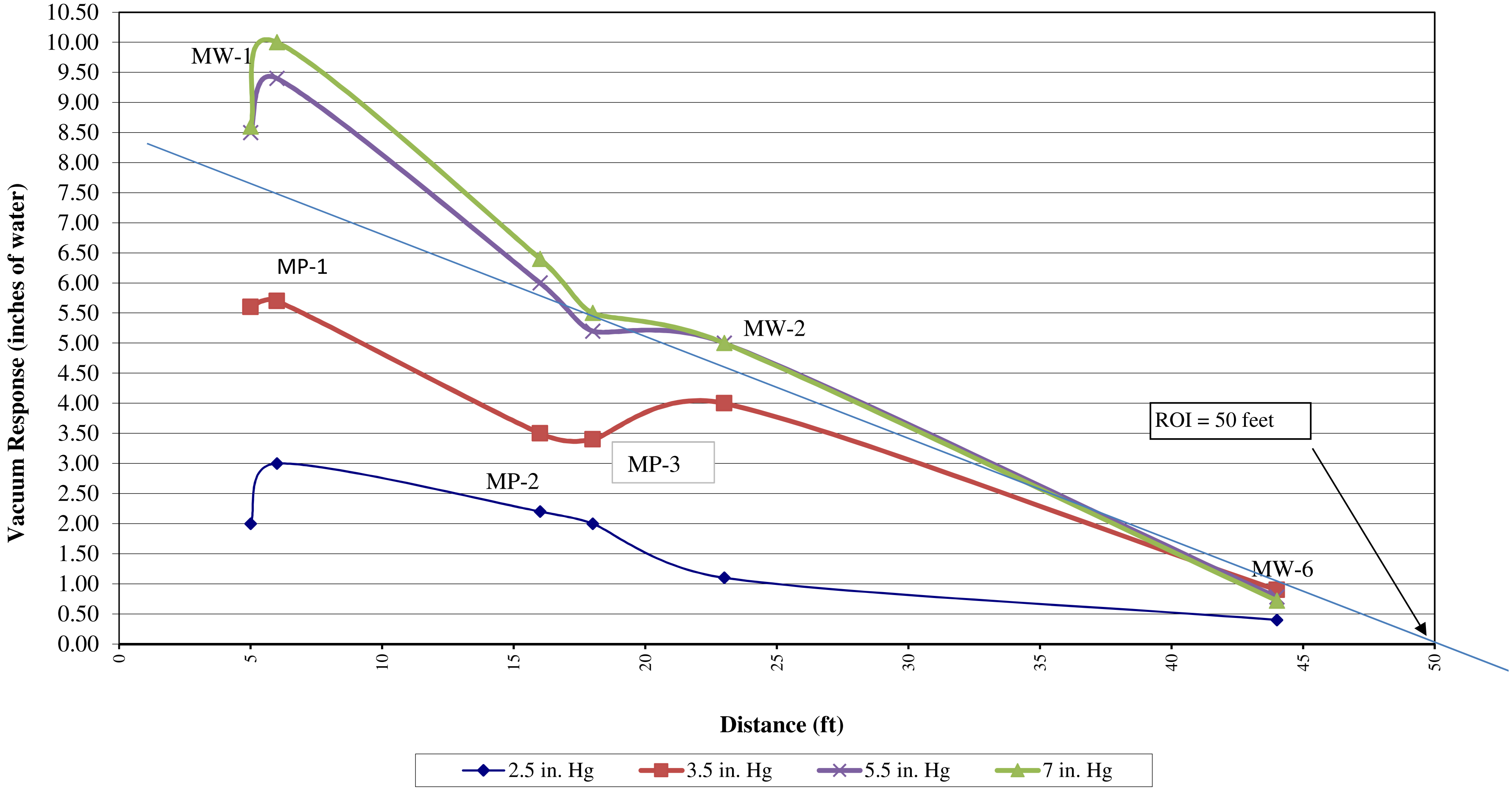


CHART 3
TRANSDUCER RECORDED GROUNDWATER DRAWDOWN VS TIME
RADHE PILOT TEST - FEBRUARY 21 - FEBRUARY 22, 2019

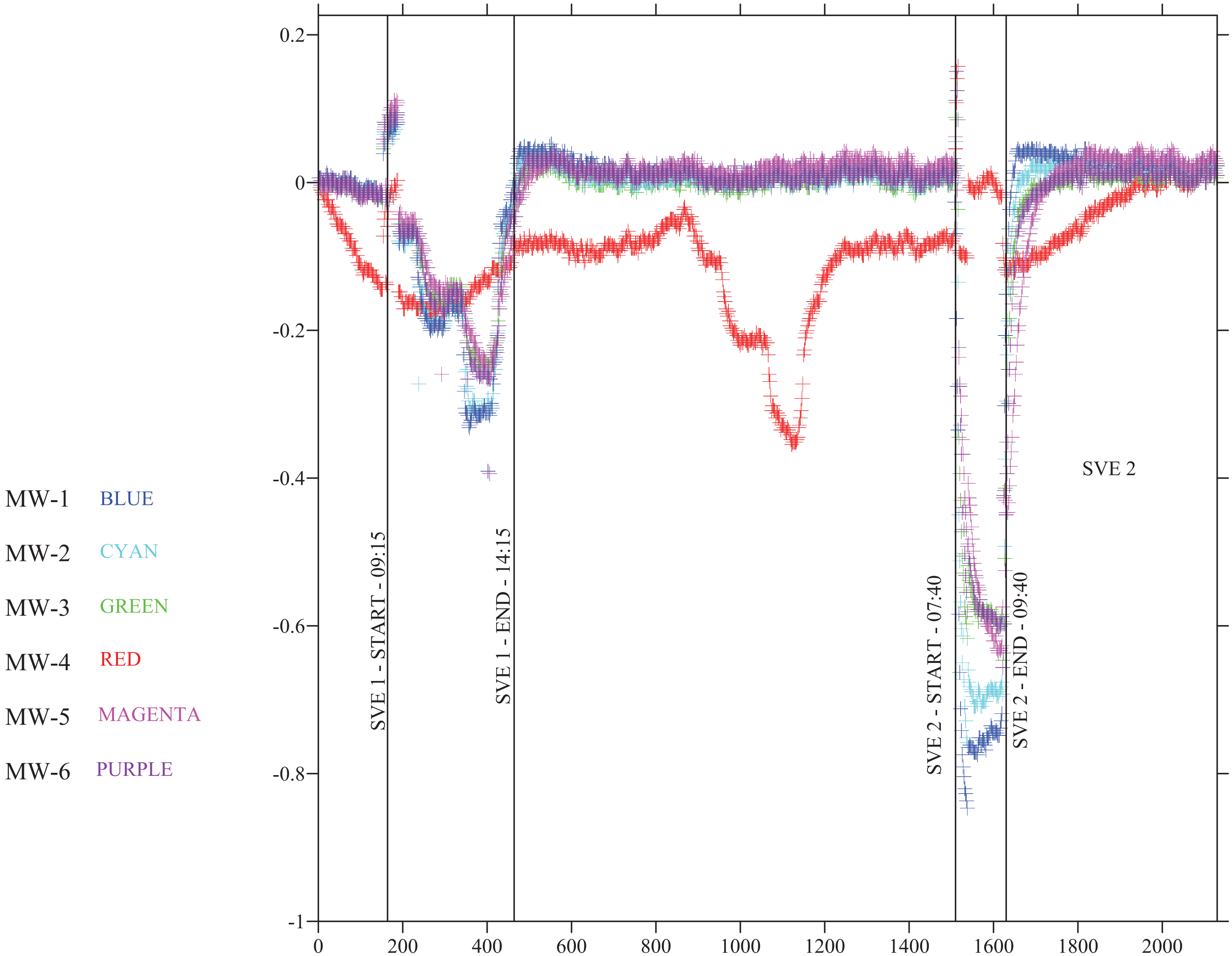
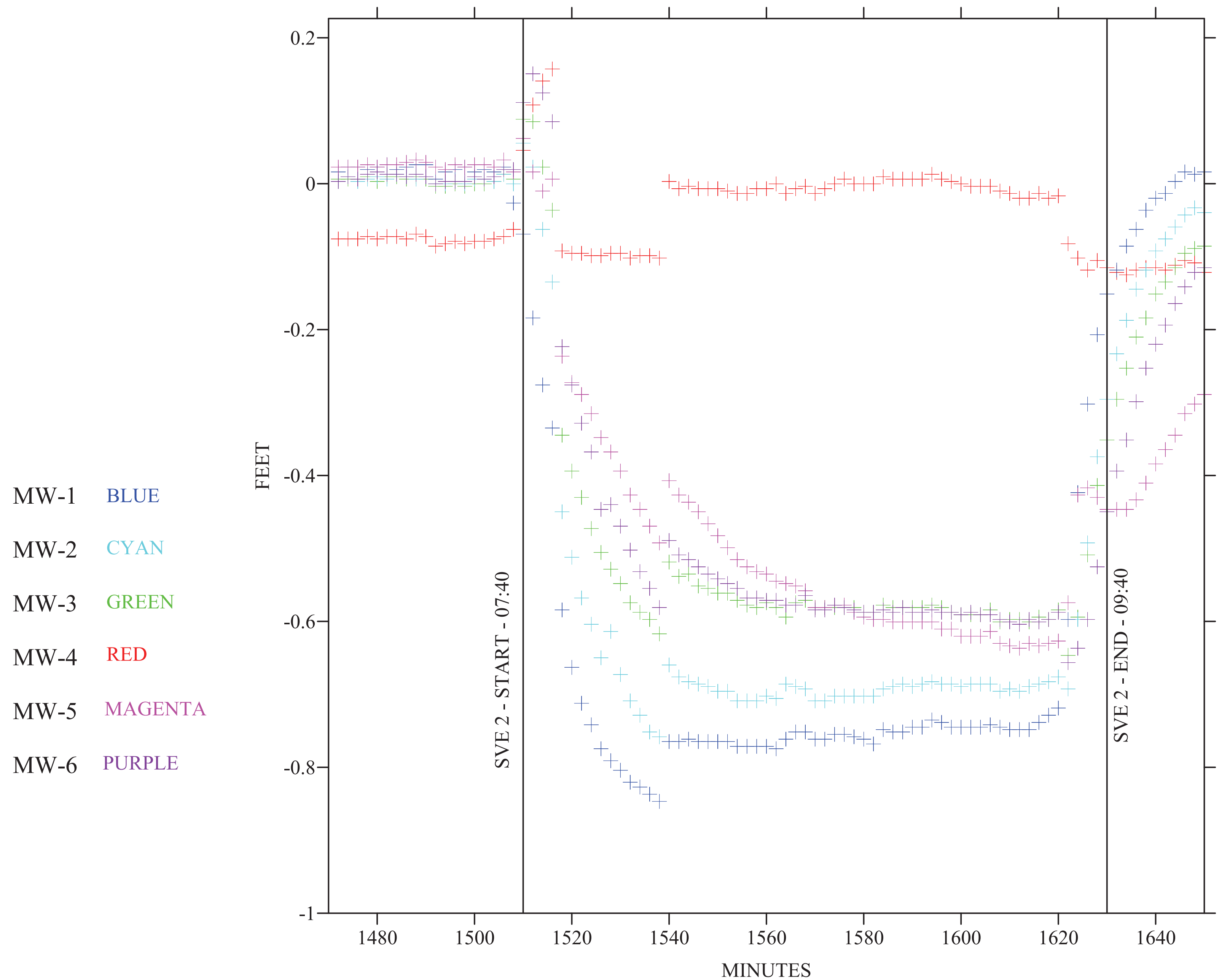


CHART 4
TRANSDUCER RECORDED GROUNDWATER DRAWDOWN VS TIME
RADHE PILOT TEST - FEBRUARY 22, 2019 - SVE 2



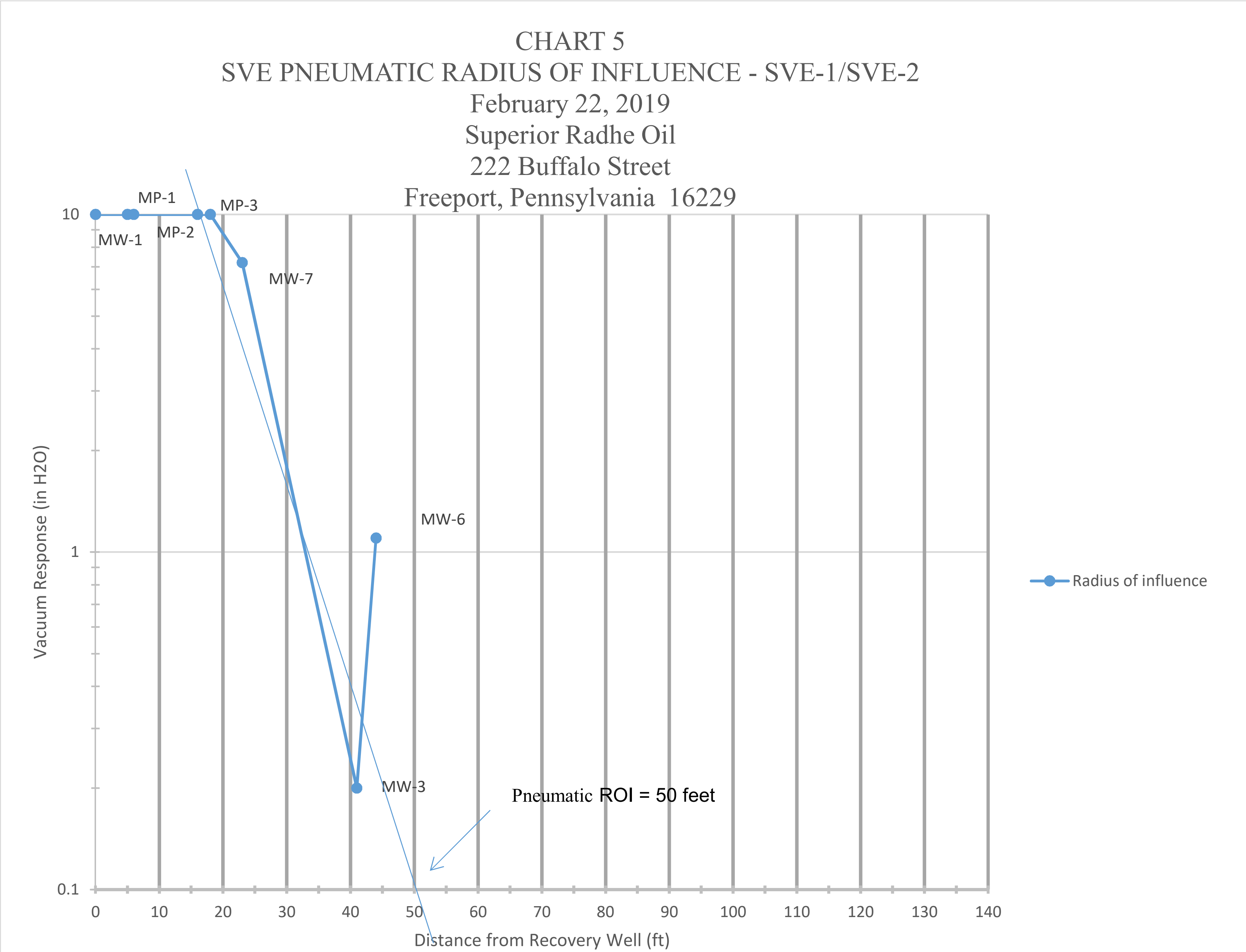


CHART 5
SVE PNEUMATIC RADIUS OF INFLUENCE - SVE-1/SVE-2
February 22, 2019
Superior Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229
MP-1
MP-3
MW-1
MP-2
MW-7
MW-6
MW-3
Pneumatic ROI = 50 feet
Vacuum Response (in H2O)
10
1
0.1
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Distance from Recovery Well (ft)
Radius of influence

APPENDICES

APPENDIX A

Boring Logs

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 12, 2018

SVE-Well
SB-15/MP-1

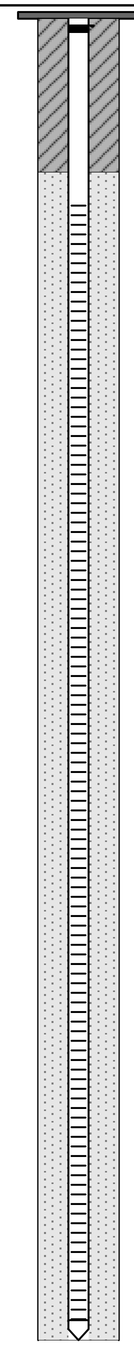
DEPTH (feet)	DESCRIPTION	SAMPLES: Number	SAMPLES: Type	SAMPLES: Recovery	SAMPLES: Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	Concrete					
0.4–5	CH: Soft, brown, some gravel, moist, FAT CLAY WITH GRAVEL					
5–10	CH: Firm, brown, sandy, some gravel, dry, SANDY FAT CLAY WITH GRAVEL					
10–17	CH: Firm, brown, dry, *damp around 16', FAT CLAY					
17–20	SP: Loose, brown, some gray, some clay, gravelly, moist, POORLY GRADED SAND WITH CLAY AND GRAVEL					
20	Borehole terminated @ 20' bgs					

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

WELL CONSTRUCTION DETAILS

Traffic Rated Steel Manhole Cover

8.25-inch Diameter Borehole



Bentonite Chip Seal

Schedule 40 PVC Casing

Sand Pack

Schedule 40 PVC Screen

Schedule 40 PVC End Cap

Total Depth: 20 feet
Borehole Diameter: 8.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 2-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

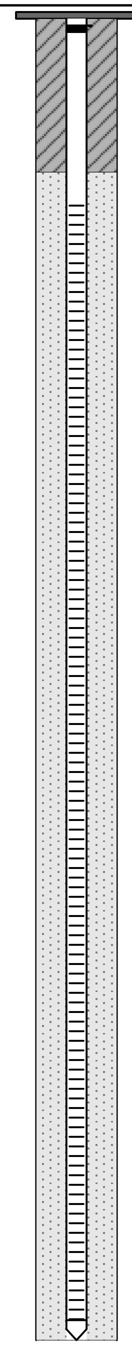
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 12, 2018

SVE-Well
SB-13/MP-2

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
0.5	CONCRETE					
1	CL: Sandy lean clay, both brown and gray coloration present, coarse-grained sand					
3.5	CL: Lean clay, gray, moisture observed, petroleum odor noted					
5.5	CL: Sandy lean clay, gray and brown coloration, petroleum odor noted					
8	CL: Sandy lean clay (gray), strong petroleum odor noted, moist					
12.5	GP/GC: Gravelly lean clay (gray), slightly moist, petroleum odor noted, sandstone cobbles present					
15	SANDSTONE: Weathered sandstone ranging in size from granules to cobbles					
20	Borehole Terminated @ 20' bgs					

WELL CONSTRUCTION DETAILS



Total Depth: 20 feet	*Well Diameter:* 2-inch	*Surface Elevation:* NA
Borehole Diameter: 8.25"	*Casing Length:* 3 feet	*Casing Elevation:* NA
Drill Method: Hollow Stem Auger, CME-55	*Screen Length:* 17 feet	*Depth to Water - Static:* Dry
Drilled By: Chatfield Drilling, Inc.	*Screen Slot Size:* 0.020" slot	*Gauging Date:* 12/31/18
Logged By: Jordan Packard	* Sample Submitted for Laboratory Analysis	*Sheet:* 1 of 1

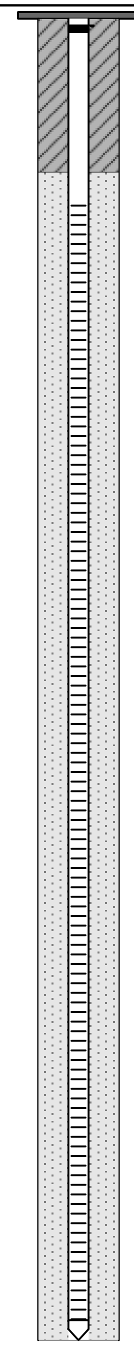
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 17, 2018

SVE-Well
SB-19/MP-3

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
	CONCRETE					
1	CL: Lean clay with sand, gray with some brown, coarse-grained sand					
3.5	CL: Sandy lean clay (gray), petroleum odor					
5	CL: Gravelly lean clay, sandstone fragments observed					
8	CL: Sandy lean clay (gray), brown and red streaking, sandstone fragments present					
11	CL: Gravelly lean clay (brown), red streaking, sandstone fragments					
13.5	CL: Sandy lean clay, mainly brown with some gray, coarse-grained sand, petroleum odor					
17	CL:Gravelly lean clay, light brown coloration, sandstone fragments, petroleum odor					
19	GP/GC: Gravelly clay, abundant sandstone (granules and cobbles)					
20	Borehole Terminated @ 20'					

WELL CONSTRUCTION DETAILS



Total Depth: 20 feet
Borehole Diameter: 8.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 2-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

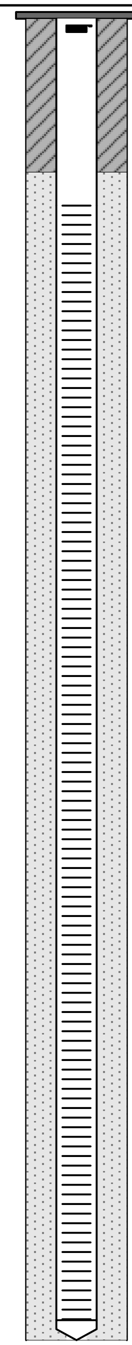
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 13, 2018

SVE-Well
SB-20/SVE-1

DEPTH (feet)	DESCRIPTION	SAMPLES Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
0.5	CONCRETE					
1	CL: Sandy lean clay, gray					
3.5	CL: Gravelly lean clay (gray), gravel and sand, some brown clay, coarse-grained					
5	CL: Lean clay with sandstone fragments					
8.5	CL: Lean clay with sandstone fragments and red weathered shale granules					
11	CL: Lean clay with coarse-grained sand, some red streaking, petroleum odor					
14	CL: Lean clay with coarse-grained sand, petroleum odor					
16	CL: Lean clay with sandstone fragments					
18	GP/GC: Combination of brown lean clay and sandstone fragments					
20	Borehole Terminated @ 20' bgs					

WELL CONSTRUCTION DETAILS



Total Depth: 20 feet
Borehole Diameter: 10.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 4-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

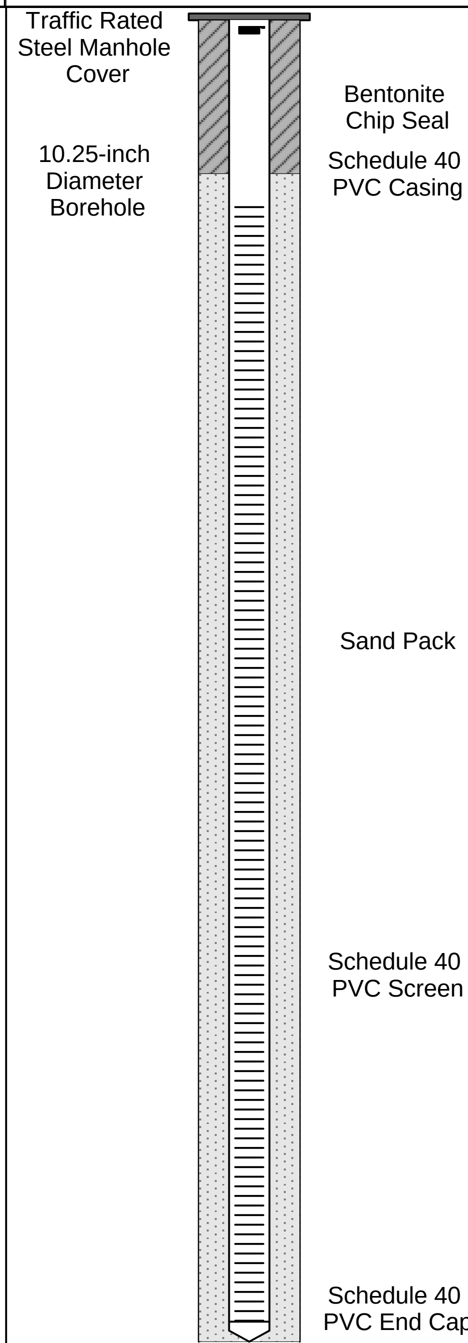
Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

Project: Superior-Radhe Oil
Location: 222 Buffalo Street, Freeport, PA 16229
Client: Superior Petroleum Company
Drill Date: December 17, 2018

SVE-Well
SB-17/SVE-2

DEPTH (feet)	DESCRIPTION	SAMPLES: Number	Type	Recovery	Blows (per 6-inches)	PID (ppm) 0 200 400 600
0	ASPHALT					
0.5	CONCRETE					
1	CL: Sandy lean clay, gray					
3.5	CL: Gravelly lean clay (gray), gravel and sand, some brown clay, coarse-grained					
5	CL: Lean clay with sandstone fragments					
8.5	CL: Lean clay with sandstone fragments and red weathered shale granules					
11	CL: Lean clay with coarse-grained sand, some red streaking, petroleum odor					
14	CL: Lean clay with coarse-grained sand, petroleum odor					
16	CL: Lean clay with sandstone fragments					
18	GP/GC: Combination of brown lean clay and sandstone fragments					
20	Borehole Terminated @ 20' bgs					

WELL CONSTRUCTION DETAILS



Total Depth: 20 feet
Borehole Diameter: 10.25"
Drill Method: Hollow Stem Auger, CME-55
Drilled By: Chatfield Drilling, Inc.
Logged By: Jordan Packard

Well Diameter: 4-inch
Casing Length: 3 feet
Screen Length: 17 feet
Screen Slot Size: 0.020" slot

Surface Elevation: NA
Casing Elevation: NA
Depth to Water - Static: Dry
Gauging Date: 12/31/18

* Sample Submitted for Laboratory Analysis

APPENDIX B

Event Summary Sheets
SVE Pilot Test Data

PILOT TEST SUMMARY

SITE: Superior Radhe | **TEST START TIME:** 9:40

DATE: 2.21.19 | **TEST FINISH TIME:** 14:15

EXTRACTION WELL: SVE-1 | **ELAPSED TIME:** 270 minutes (4.5 hrs)

GROUNDWATER GAUGING DATA
ELAPSED TIME (IN HRS.)

	9:15	10:15	11:15	12:15	1:15	2:15							Total Drawdown
Initial DTW SVE-1	none	none	none	18.1	16.9	19.31							
Applied Vac (inHg)	2.5	3.5	3.5	5.5	7.0	3.5							
Applied Vac (inH20)	34	47.6	47.6	74.8	95.2	47.6							
PID	1,708	3,860	1,160	1,132	1,262	2,418							
SVE-1Airflow (scfm	20.1	22.4	43.2	88	68	7.7							
Bleed Airflow (scfm)	250		194	57	7								
Manufacturer Airflov	270	237	237	145	75	237							

SOIL VAPOR GAUGING DATA
ELAPSED TIME (IN HRS.)

Well	9:40	10:40	11:40	12:40	13:40	14:15	Distance From Recovery Well
MW-1	2.00	4.20	5.60	8.50	8.60	1.50	
MW-2	1.10	2.70	4.00	5.00	5.00	1.60	
MW-3	0.00	0.04	0.00	0.02	0.02	0.00	
MW-4	0.00	0.04	0.00	0.02	0.02	0.00	
MW-5	1.20	2.20	3.50	4.10	6.00	1.00	
MW-6	0.40	0.70	0.90	0.78	0.72	0.3.0	
SVE-2	0.21	0.50	1.00	1.40	1.60	0.30	
MP-1	--	--	5.70	9.40	>10	2.60	
MP-2	--	--	3.50	6.00	6.40	1.20	
MP-3	--	--	3.40	5.20	5.50	1.00	

NOTES:

	TIME
Initial Groundwater Sample:	
Final Groundwater Sample:	

Initial Vapor Sample:	
Final Vapor Sample:	

Drop tube length (from TOC) ___________

PILOT TEST SUMMARY

SITE: Superior Radhe

DATE: 2.22.19

EXTRACTION WELL: SVE-1 and SVE-2

TEST START TIME: 7:40

TEST FINISH TIME: 9:40

ELAPSED TIME: 2 hours

GROUNDWATER GAUGING DATA
ELAPSED TIME (IN HRS.)

	7:40	8:40	9:40										Total Drawdown
Initial DTW SVE-2	none	none	none										
Applied Vac (Hg)	3.5	4.25	4.00										
Applied Vac (inH20)	47.6	57.8	54.40										
PID	213	295	302										
Airflow SVE-2 (scfm)	80	92	88										
Airflow SVE-1 (scfm)	157	118	125										
TOTAL PID	1,836	1,088	1,257										
Bleed Flowrate	0	0	0										
Manufacturer Flowrate	237	210	213										
Totalizer													

SOIL VAPOR GAUGING DATA
ELAPSED TIME (IN HRS.)

Well	7:40	8:40	9:40			
MW-1	>10	>10	>10			
MW-2	6.40	7.10	7.20			
MW-3	0.30	0.20	0.02			
MW-4	0.08	0.15	0.10			
MW-5	>10	>10	>10			
MW-6	1.00	1.10	1.10			
SVE-2						
MP-1	>10	>10	>10			
MP-2	>10	>10	>10			
MP-3	>10	>10	>10			

	TIME
Initial Groundwater Sample:	
Final Groundwater Sample:	

Initial Vapor Sample:	
Final Vapor Sample:	

Drop tube length (from TOC) ____________

APPENDIX C

Hydrocarbon Removal Calculations
Radius of Influence Calculations

VAPOR-PHASE HYDROCARBON REMOVAL CALCULATIONS

SVE-1/SVE-2 Test Radhe Oil

Convert vapor concentration in ppmv to g/m^3 using the following equation:

Concentration in mg/m3 = (Concentration in ppmv)*(MW)/[(0.08206)* (273.15 + °C)]
where:
ppmv = ppm by volume (i.e., volume of gaseous concentration per 106 volumes of vapor)
mg/m3 = milligrams of gaseous concentration per cubic meter of vapor
MW = molecular weight of the chemical (g/mol)
°C = vapor temperature in degrees Celsius
0.08206 = universal gas constant (L atm K-1 mol-1)

Calculation for removal at the end of the pilot test:
PPMV conversion to g/m^3:

Enter the reported analytical concentration of TPH from the lab results:

= 220 ppm(v)
Concentration of TPH in mg/m3 =
220 ppm(v)*100g/mol/(0.08206*(273.15 + 25))
899.20 mg/m3
Vapor Concentration = 0.90 g/m3 C4-C12

Mass Removed [lb/day] = Vapor Concentration [g/m^3] * Vapor Flow Rate [scfm] * |Conversion Factor|
Enter Vapor Flow Rate = 212 scfm
= 0.90 g/m3 * 23.4 scfm * |0.09 lb/day/g/m3 scfm|
= 17.16 lb/day

Calculate the mass removal during SVE-1/SVE- **17.16** lb/day

Calculate the mass removal during SVE-1 Step 1
Enter the reported TPH concentration 2000 ppm(v)
Enter the flowrate 20.10 scfm
Concentration of TPH in g/m3 = 8.17455 g/m3
Calculated mass removal during AS Step 1 = **14.79** lb/day

Calculate the mass removal during SVE-1 Step 2
Enter the reported TPH concentration 1300 ppm(v)
Enter the flowrate 43.20 scfm
Concentration of TPH in g/m3 = 5.31346 g/m3
Calculated mass removal during AS Step 2 = **20.66** lb/day

Calculate the mass removal during SVE-1 Step 3		
Enter the reported TPH concentration	970	ppm(v)
Enter the flowrate	88.00	scfm
Concentration of TPH in g/m3 =	3.96466	g/m3
Calculated mass removal during AS Step 3 =	**31.40**	lb/day

SOIL VAPOR EXTRACTION DARCY & RADIUS OF INFLUENCE CALCULATIONS FOR SVE-1/SVE-2

Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania

CALCULATION OF SOIL PERMEABILITY AND THEORETICAL RADIUS OF INFLUENCE

Determination of soil permeability (k) in darcys:

The governing equation[1] is:

$$k = \frac{Q * u * \ln(Rw/Ro)}{H * pi * Pw[1-(Po/Pw)^2]} \qquad (1)$$

Where:
- Q = air flow at the extraction well[2] (cm^3/sec)
- u = viscosity of air in centipoise
- Rw = radius of extraction well (cm)
- Ro = distance to observation well (cm)
- H = height of screen affected by applied vacuum (cm)
- Pw = pressure at the extraction well (atm)
- Po = pressure at the observation well (atm)

1 - As described by P. C. Johnson et al, Groundwater, Vol. 28, No. 3, May-June 1990
2 - Johnson's equation requires air flow in actual, not standard conditions. Field measurements are reported in standard cubic feet per minute (scfm). Thus for the calculation of k, the soil permeability, it is necessary to convert to actual cubic feet per minute (acfm):

$$Q\text{ (acfm)} = Q\text{ (scfm)} / \frac{391.95\ "H_2O - \text{Applied Vacuum } ("H_2O)}{391.95\ "H_2O} \qquad (2)$$

SVE-1/SVE-2 Pilot Test 1:
Observation Point 1:

Enter the Test Date: February 22, 2019
Enter the Extraction Points: SVE-1/SVE-2
Enter the Observation Point: MW-6
Enter the Screened Interval At Extraction Point: 3' - 20'
Enter the Depth To Water At Extraction Point: 20'
Test Data Representative of Steady-State Conditions:

Enter Flowrate Q =	212	scfm			
Calculated Q in ACFM =	246.166198	acfm	=	116177.508	cm^3/sec
u =	0.018	Centipoise	=	0.018	centipoise
Enter Rw =	0.167	feet	=	5.080	cm
Enter Ro =	44	feet	=	1341.120	cm
Enter H =	5.75	feet	=	175.260	cm
Enter the Vacuum at the Extraction Well =	4.0	inches-mercury			
Calculated Vacuum at the Extraction Well =	54.4	inches-H_2O	=	0.8663	atm
Enter the Vacuum at the Observation Well =	1.1	inches-H_2O	=	0.9973	atm

Given the above conditions, the permeability of the formation is:

Calculated k = 75.21 Darcy

Determination of the distance, Ri, to a vacuum of 0.1 inches H_2O:

The governing equation[3] is: $Po = Pw[1+(1-(Pi/Pw)^2)*\ln(Ro/Rw)/\ln(Rw/Ri)]^{1/2}$ (3)

Where: Ri = radial extent of vacuum influence (ft)
Pi = pressure at the radial extent of vacuum influence (inches H_2O)

3 - As described by P. C. Johnson et al, Groundwater, Vol. 28, No. 3, May-June 1990

Rearranging Equation (3) and solving for Ri results in the following:

$$Ri = Rw(Ro/Rw) \wedge -[(1-(Pi/Pw)^2)/((Po/Pw)^2-1)] \quad (4)$$

Solving Equation (4) for the conditions summarized above results in the following value of Ri:

Calculated ROI = 49.3 ft.

SVE-1/SVE-2 Pilot Test 1:
Observation Point 2:

Enter the Test Date: February 22, 2019
Enter the Extraction Points: SVE-1/SVE-2
Enter the Observation Point: MW-2
Enter the Screened Interval At Extraction Point: 3' - 20'
Enter the Depth To Water At Extraction Point: 20'

Test Data Representative of Steady-State Conditions:

Q =	212	scfm			
Q =	246.166198	acfm	=	116177.508	cm^3/sec
u =	0.018	Centipoise	=	0.018	centipoise
Rw =	0.167	feet	=	5.090	cm
Ro =	23	feet	=	701.040	cm
H =	2.1	feet	=	64.008	cm
Enter the Vacuum at the Extraction Well =	4.0	inches-mercury			
Calculated Vacuum at the Extraction Well =	54.4	inches-H_2O	=	0.8663	atm
Vacuum at MW-2 =	7.2	inches-H_2O	=	0.9823	atm

Given the above conditions, the permeability of the formation is:

Calculated k = 207.08 Darcy

Determination of the distance, Ri, to a vacuum of 0.1 inches H_2O:

Calculated ROI = 51.0 ft.

Calculate the ROI for SVE Pilot Test SVE-1/SVE-2

ROI equals the average = 50.164109 feet

APPENDIX D

Pilot Test Laboratory Analytical Data

Pace Analytical Energy Services LLC
220 William Pitt Way
Pittsburgh, PA 15238

Phone: (412) 826-5245
Fax: (412) 826-3433

March 8, 2019

Eric Itle
Letterle & Associates
2859 Oxford Blvd.
Allison Park, PA 15101

RE: **RADHE OIL / 597**

Pace Workorder: *29559*

Dear Eric Itle:

Enclosed are the analytical results for sample(s) received by the laboratory on Monday, February 25, 2019. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Ruth Welsh

Ruth Welsh 03/08/2019
Ruth.Welsh@pacelabs.com

Customer Service Representative

Enclosures

As a valued client we would appreciate your comments on our service.
Please email PAESfeedback@pacelabs.com.

Total Number of Pages 15

CERTIFICATE OF ANALYSIS

Pace Analytical Energy Services LLC
220 William Pitt Way
Pittsburgh, PA 15238

Phone: (412) 826-5245
Fax: (412) 826-3433

LABORATORY ACCREDITATIONS & CERTIFICATIONS

Accreditor:	Pennsylvania Department of Environmental Protection, Bureau of Laboratories
Accreditation ID:	02-00538
Scope:	NELAP Non-Potable Water
Accreditor:	West Virginia Department of Environmental Protection, Division of Water and Waste Management
Accreditation ID:	395
Scope:	Non-Potable Water
Accreditor:	South Carolina Department of Health and Environmental Control, Office of Environmental Laboratory Certification
Accreditation ID:	89009003
Scope:	Clean Water Act (CWA); Resource Conservation and Recovery Act (RCRA)
Accreditor:	State of Virginia
Accreditation ID:	460201
Scope:	Non-Potable Water
Accreditor:	NELAP: New Jersey, Department of Environmental Protection
Accreditation ID:	PA026
Scope:	Non-Potable Water
Accreditor:	NELAP: New York, Department of Health Wadsworth Center
Accreditation ID:	11815
Scope:	Non-Potable Water
Accreditor:	State of Connecticut, Department of Public Health, Division of Environmental Health
Accreditation ID:	PH-0263
Scope:	Clean Water Act (CWA) Resource Conservation and Recovery Act (RCRA)
Accreditor:	NELAP: Texas, Commission on Environmental Quality
Accreditation ID:	T104704453-09-TX
Scope:	Non-Potable Water
Accreditor:	State of New Hampshire
Accreditation ID:	299409
Scope:	Non-potable water
Accreditor:	State of Georgia
Accreditation ID:	Chapter 391-3-26
Scope:	As per the Georgia EPD Rules and Regulations for Commercial Laboratories, PAES is accredited by the Pennsylvania Department of Environmental Protection Bureau of Laboratories under the National Environmental Laboratory Approval Program (NELAC).

Pace Analytical Energy Services LLC
220 William Pitt Way
Pittsburgh, PA 15238

Phone: (412) 826-5245
Fax: (412) 826-3433

SAMPLE SUMMARY

Workorder: 29559 RADHE OIL / 597

Lab ID	Sample ID	Matrix	Date Collected	Date Received
295590001	SVE-1 START	Vapor	2/21/2019 09:30	2/25/2019 09:00
295590002	SVE-1 STAGE 2	Vapor	2/21/2019 10:30	2/25/2019 09:00
295590003	SVE-1 STAGE 3	Vapor	2/21/2019 11:30	2/25/2019 09:00
295590004	SVE-1 STAGE 4	Vapor	2/21/2019 12:30	2/25/2019 09:00
295590005	SVE-2 START	Vapor	2/22/2019 07:40	2/25/2019 09:00
295590006	SVE-2 STAGE 2	Vapor	2/22/2019 08:40	2/25/2019 09:00
295590007	SVE-2 STAGE 3	Vapor	2/22/2019 09:40	2/25/2019 09:00

Pace Analytical Energy Services LLC
220 William Pitt Way
Pittsburgh, PA 15238
Phone: (412) 826-5245
Fax: (412) 826-3433

ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID:	**295590001**	Date Received:	2/25/2019 09:00	Matrix:	Vapor
Sample ID:	**SVE-1 START**	Date Collected:	2/21/2019 09:30		

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors		Analytical Method: AM4.02 Vapors						
Total TPH C4-C12	**2000**	ppmv	0.70		1	2/26/2019 21:52	BW	n

Pace Analytical Energy Services LLC
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Pittsburgh, PA 15238
Phone: (412) 826-5245
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ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID:	**295590002**	Date Received:	2/25/2019 09:00	Matrix:	Vapor
Sample ID:	**SVE-1 STAGE 2**	Date Collected:	2/21/2019 10:30		

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors			Analytical Method: AM4.02 Vapors					
Total TPH C4-C12	**1300**	ppmv	0.70		1	2/26/2019 22:58	BW	n

CERTIFICATE OF ANALYSIS

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ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID:	**295590003**	Date Received:	2/25/2019 09:00	Matrix:	Vapor
Sample ID:	**SVE-1 STAGE 3**	Date Collected:	2/21/2019 11:30		

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors		Analytical Method: AM4.02 Vapors						
Total TPH C4-C12	**970**	ppmv	0.70		1	2/27/2019 00:05	BW	n

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ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID: **295590004**
Sample ID: **SVE-1 STAGE 4**
Date Received: 2/25/2019 09:00 Matrix: Vapor
Date Collected: 2/21/2019 12:30

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors		Analytical Method: AM4.02 Vapors						
Total TPH C4-C12	**770**	ppmv	0.70		1	2/27/2019 01:12	BW	n

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ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID:	**295590005**	Date Received:	2/25/2019 09:00	Matrix:	Vapor
Sample ID:	**SVE-2 START**	Date Collected:	2/22/2019 07:40		

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors		Analytical Method: AM4.02 Vapors						
Total TPH C4-C12	**210**	ppmv	0.70		1	2/27/2019 02:18	BW	n

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ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID:	**295590006**	Date Received:	2/25/2019 09:00	Matrix:	Vapor
Sample ID:	**SVE-2 STAGE 2**	Date Collected:	2/22/2019 08:40		

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors		Analytical Method: AM4.02 Vapors						
Total TPH C4-C12	**230**	ppmv	0.70		1	2/27/2019 03:26	BW	n

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ANALYTICAL RESULTS

Workorder: 29559 RADHE OIL / 597

Lab ID: **295590007** Date Received: 2/25/2019 09:00 Matrix: Vapor
Sample ID: **SVE-2 STAGE 3** Date Collected: 2/22/2019 09:40

Parameters	Results	Units	PQL	MDL	DF	Analyzed	By	Qualifiers
RISK - PAES								
Analysis Desc: AM4.02 Vapors		Analytical Method: AM4.02 Vapors						
Total TPH C4-C12	**220**	ppmv	0.70		1	2/27/2019 04:32	BW	n

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ANALYTICAL RESULTS QUALIFIERS

Workorder: 29559 RADHE OIL / 597

DEFINITIONS/QUALIFIERS

MDL	Method Detection Limit. Can be used synonymously with LOD; Limit Of Detection.
PQL	Practical Quanitation Limit. Can be used synonymously with LOQ; Limit Of Quantitation.
ND	Not detected at or above reporting limit.
DF	Dilution Factor.
S	Surrogate.
RPD	Relative Percent Difference.
% Rec	Percent Recovery.
U	Indicates the compound was analyzed for, but not detected at or above the noted concentration.
J	Estimated concentration greater than the set method detection limit (MDL) and less than the set reporting limit (PQL).
n	The laboratory does not hold NELAP/TNI accreditation for this method or analyte.

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QUALITY CONTROL DATA

Workorder: 29559 RADHE OIL / 597

QC Batch: VAP/2145 Analysis Method: AM4.02 Vapors
QC Batch Method: AM4.02 Vapors
Associated Lab Samples: 295590001, 295590002, 295590003, 295590004, 295590005, 295590006, 295590007

METHOD BLANK: 59914

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
RISK				
Total TPH C4-C12	ppmv	<0.70	0.70	n

LABORATORY CONTROL SAMPLE & LCSD: 59915 59916

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limit	RPD	Max RPD	Qualifiers
RISK										
Total TPH C4-C12	ppmv		<0.70	<0.70				0		n

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QUALITY CONTROL DATA QUALIFIERS

Workorder: 29559 RADHE OIL / 597

QUALITY CONTROL PARAMETER QUALIFIERS

n	The laboratory does not hold NELAP/TNI accreditation for this method or analyte.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Workorder: 29559 RADHE OIL / 597

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
295590001	SVE-1 START			AM4.02 Vapors	VAP/2145
295590002	SVE-1 STAGE 2			AM4.02 Vapors	VAP/2145
295590003	SVE-1 STAGE 3			AM4.02 Vapors	VAP/2145
295590004	SVE-1 STAGE 4			AM4.02 Vapors	VAP/2145
295590005	SVE-2 START			AM4.02 Vapors	VAP/2145
295590006	SVE-2 STAGE 2			AM4.02 Vapors	VAP/2145
295590007	SVE-2 STAGE 3			AM4.02 Vapors	VAP/2145

Pace Analytical®

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

MTJL Log-in Number Here JW 2bU19

29559

ALL SHADED AREAS are for LAB USE ONLY

Company: Letterle & Associates
Address: 2859 Oxford BLVD.
Report To: Same
Copy To: Same
Billing Information: Same
Email To: eittle@letterleassociates.com
Site Collection Info/Address: Freeport, PA
Customer Project Name/Number: Radke Oil 1597
State: / County/City: Time Zone Collected: [ ]PT [ ]MT [ ]CT [ ]ET
Phone:
Email:
Site/Facility ID #:
Compliance Monitoring? [ ] Yes [ ] No
Collected By (print): Colton Gotshall
Purchase Order #:
Quote #:
DW PWS ID #:
DW Location Code:
Collected By (signature): Colton Gotshall
Turnaround Date Required: Standard
Immediately Packed on Ice: [ ] Yes [X] No
Sample Disposal: [X] Dispose as appropriate [ ] Return [ ] Archive: ______ [ ] Hold: ______
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [ ] No
Analysis: ______

Container Preservative Type **

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other ______

Lab Project Manager:

Analyses: TPH

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Time	Composite End Date	Time	Res Cl	# of Ctns	TPH
SVE-1 Start	AR	G	02-21	0930				1	X
SVE-1 Stage 2	↓	↓	02-21	1030				↓	↓
SVE-1 Stage 3	↓	↓	02-21	1130				↓	↓
SVE-1 Stage 4	↓	↓	02-21	1230				↓	↓
SVE-2 Start	↓	↓	02-22	0740				↓	↓
SVE-2 Stage 2	↓	↓	02-22	0840				↓	↓
SVE-2 Stage 3	↓	↓	02-22	0940				↓	↓

Lab Profile/Line:
Lab Sample Receipt Checklist:
Custody Seals Present/Intact Y N NA
Custody Signatures Present Y N NA
Collector Signature Present Y N NA
Bottles Intact Y N NA
Correct Bottles Y N NA
Sufficient Volume Y N NA
Samples Received on Ice Y N NA
VOA - Headspace Acceptable Y N NA
USDA Regulated Soils Y N NA
Samples in Holding Time Y N NA
Residual Chlorine Present Y N NA
Cl Strips: ______
Sample pH Acceptable Y N NA
pH Strips: ______
Sulfide Present Y N NA
Lead Acetate Strips: ______

LAB USE ONLY:
Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None
Packing Material Used: bubble wrap
Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A
Lab Tracking #:
Samples received via: FEDEX UPS Client Courier Pace Courier

LAB Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: ______
Cooler 1 Temp Upon Receipt: __oC
Cooler 1 Therm Corr. Factor: __oC
Cooler 1 Corrected Temp: __oC
Comments:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	MTJL LAB USE ONLY
SSK	2/22/19 3:17	[signature]	2-22-19 1517	Table #:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature) Nessa PACE	Date/Time: 2.25.19 0900	Acctnum: Template: Prelogin:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:	PM: PB:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO

Page: 1 of: 1

APPENDIX N

Remedial System Design Report

REMEDIAL SYSTEM DESIGN REPORT

PADEP Facility ID #03-29674
PAUSTIF Claim #2017-0012

Radhe Oil
222 Buffalo Street
Freeport, PA 16229

Prepared for:

Superior Petroleum Company
8199 McKnight Road
Pittsburgh, PA 15237

Letterle & Associates, Inc.
2859 Oxford Blvd., Allison Park, PA 15101

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KENNETH WAYNE DUDASH
ENGINEER
PE052222

Kenneth W. Dudash, PE
Senior Project Engineer

Timothy J. Kier
Project Manager

"By affixing my seal to this document, I am certifying that the information is true and correct to the best of my knowledge. I further certify I am licensed to practice in the Commonwealth of Pennsylvania and that it is within my professional expertise to verify the correctness of the information."

-Kenneth W. Dudash, P.E., signed and sealed this day, May 10, 2019

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1.0 PILOT TEST SUMMARIES

1.1 Introduction

Letterle & Associates, Inc. (Letterle) performed soil vacuum extraction (SVE) pilot tests at the Radhe Oil property on February 21 and 22, 2019. The pilot tests were conducted to assess the feasibility of SVE technology to remediate unleaded gasoline-impacted soil at the site.

The pilot test evaluated the subsurface response created by extracting subsurface vapor from recovery wells SVE-1 and SVE-2 with a regenerative blower, while monitoring surrounding soils for pneumatic and hydraulic influence and contaminant recovery rates. Pilot testing provided the engineering data necessary to design a full-scale system. Pilot test data was used to determine the proper size of the regenerative blower for the system and calculate the pneumatic radius of influence (ROI) and anticipated contaminant recovery rates.

1.2 SVE Pilot Test Results at SVE-1/SVE-2

Pilot testing included both stepped-rate and constant rate tests. A stepped-rate test was performed on SVE-1 to provide the design extraction well capacities and system curves. A constant rate test was then performed on SVE-1 and SVE-2 to investigate areas of influence and efficiencies at a design vacuum level and flow rate which provided results to calculate the air permeability values of the overburden.

Results of the constant rate test indicated that a design vacuum of approximately 5.5 inHg is attainable at the vacuum pump, based on the subsurface conditions in the vicinity of extraction well SVE-1. During the constant rate testing conducted at recovery wells SVE-1 and SVE-2 in combination, the subsurface yield was approximately 212 scfm under an achievable vacuum of 54.4 in H_2O. The following is a summary of the SVE pilot test findings:

- Hydraulic response was limited to an observed groundwater rise of less than 0.2 feet in the surrounding monitor wells (MW-1 through MW-6) and monitor points (MP-1 through MP-3).
- The pneumatic ROI was calculated at 50 feet, within the sandy, gravelly clay above the static groundwater beneath the site.
- Significant vacuum response (>0.10 in H_2O) was observed in all monitor wells (MW-1 through MW-6) and monitor points (MP-1 through MP-3).
- VOC concentrations decreased during the initial hour of testing and became stable as the extraction of vapor proceeded (1,836 ppmv to 1,257 ppmv). Elevated TPH concentrations were also detected in the vapor stream (220 ppmv).

2.0 SVE SYSTEM DESIGN BASIS

The pilot testing conducted at SVE-1 and SVE-2 has indicated that SVE technology would be an effective and aggressive remediation strategy, based on site geology and site-specific conditions. Pilot test results were used to design site-specific system equipment to allow for simultaneous extraction from multiple recovery wells.

For design purposes, the TPH results from vapor samples collected during the pilot test are considered to the initial anticipated concentrations upon startup of a full-time system. These concentrations are then expected to decrease asymptotically over time. TPH results are presented in **SVE Design Table 1**. The pre-blower concentrations in **SVE Design Table 1** were derived using the highest lab-measured TPH analytical concentrations reported during the pilot tests. The expected values for flow rate and concentration of vapor from the SVE extraction wells are also summarized in the table.

Extracted vapors will be treated with a series of granulated activated carbon (GAC) units, as detailed later in this design package. The activated carbon is expected to remove 99.9% of the hydrocarbon concentrations prior to atmospheric discharge. The anticipated vapor concentrations before, during, and after the carbon treatment process are summarized in **SVE Design Table 2**.

Routine vapor sampling will be conducted at key points through the treatment process to assess progress toward remedial action completion, monitor for contaminant breakthrough in the GAC units, and ensure proper treatment of extracted vapors. Samples will be collected from the following locations:

- Influent – Prior to the vapor GAC units and after the blower
- Mid-fluent – Between vapor GAC units #1 and #2
- Effluent – After the vapor GAC units (GAC #2 - Effluent)

3.0 WELL INSTALLATION AND COMPLETION

3.1 Well Locations and Installation

The number of SVE recovery wells required to encompass the impacted area of the site was determined based on the pneumatic ROI of 50 feet, which was calculated during the pilot test at SVE-1 and SVE-2 (**Figure 1**). The complete SVE system was designed to extract vapor simultaneously from two on-site recovery wells. The pre-existing recovery wells SVE-1 and SVE-2 were installed for the SVE pilot tests, in the most impacted area of the plume.

3.1.1 SVE Well Construction

After borehole completion, SVE wells SVE-1 and SVE-2 were constructed with 4-inch diameter schedule 40 PVC with a screened interval (0.020-inch slot) of 3 to 20 feet bgs. SVE well installations conform to PA state requirements. Well screen and casing were placed in the boreholes per the above specifications. Each well screen and riser were installed through the augers to ensure that the screen did not contact the overburden material. The augers were raised incrementally as the filter pack sand was placed in the well annulus. A minimum of one-foot of sand was maintained in the augers to prevent the screen from contacting the formation, as well as to prevent borehole bridging and/or collapse. The evenly distributed sand pack was extended to approximately one foot above the top of the well screen. A minimum two-foot thick hydrated bentonite seal was placed on top of the sand pack in each well. The remaining annulus was filled with a bentonite/cement grout to the surface.

The bottom cap of the screen/riser was flush threaded, with an O-ring seal, and compatible with the screen/riser installed. Joints and fastenings are watertight, equipped with an o-ring seal, and flush-threaded; no solvent glue or setscrews were used. A loose fitted cap was installed on the top of the riser pipe until final surface completion. An SVE Well Diagram is included as **Figure 2**.

The SVE wells were completed with locking expansion caps and protected with flush-mount steel manhole covers set in 1.5-foot square concrete pads. During system installation, the existing manholes and pads will remain intact and the extraction piping will be connected underneath.

3.1.2 Well Construction Logs

Well construction logs were been prepared by a staff scientist and reviewed/sealed by a Pennsylvania-certified professional geologist (P.G.) following installation of the SVE wells. The well construction logs illustrate the as-built condition of each well and include the following:

- Name of the project and site
- Well ID number
- Name of driller and drilling company
- Date of installation
- Details of well construction materials, types, sizes and dimensions
- Total depth and diameter of borehole, total depth of well
- Depth to top and bottom of screen, filter pack, and bentonite seal
- Grout mix volume and components and method of placement
- Screen type and slot size
- Water level elevation upon well completion
- Surface completion details

3.2 Decontamination Procedures

All well construction materials were stored and maintained in a clean, uncontaminated condition throughout the course of the project. Materials were protected from contamination prior to placement by either storage in plastic lined bags, or in a location protected from the weather and contamination on plastic sheeting. Materials were transported to the well site in a manner that prevents contamination by other soils, oils, grease, and other chemicals. A temporary decontamination area was constructed at the site where non-dedicated drilling and development-related equipment can be cleaned.

3.3 System Install-Derived Waste Management

All drill cuttings and decontamination waste were placed into 55-gallon PennDOT-approved and appropriately-labeled steel drums. Drums were sealed and stored at a site-approved staging area for the subsequent coordination of transportation and disposal by Letterle.

All trenching spoils will be stockpiled on-site on plastic sheeting and covered prior to off-site disposal.

4.0 REMEDIAL SYSTEM INSTALLATION

4.1 Remedial System Trenching, Piping and Connection of SVE Wells

The SVE wells will be connected to the recovery system via extraction piping installed within a subsurface trench. The trench will extend from the wells to the closest available fence location along the western property boundary, where a remediation trailer will be positioned. Subsurface excavation activities will be performed by a construction/remediation company that holds a 40-hr OSHA certification. A backhoe or excavator will be used to perform the trenching in a series of 40 ft lengths to minimize disruption to business operations at the site. Excavated materials will be placed on 6-mil plastic and staged on-site prior to off-site disposal. Letterle personnel will assist with and supervise the installation of all subsurface piping. Pressure testing will be performed after the piping has been installed to ensure integrity.

The SVE piping will consist of two-inch diameter; schedule 40 PVC, which will be individually connected to each extraction well. The previously installed manholes will provide access to the wells and piping. All piping to the proposed remedial system location will be installed at a depth of 2.5 feet below ground surface (bgs). The piping will be placed between two layers of construction-grade 2B-modified gravel. The first 4-inch layer will be placed into the trench after the excavation is completed and leveled. The SVE pipe will then be installed followed by a one-foot layer of gravel placed on top of the piping for protection.

Backfilling will then be completed with construction-grade 2B-modified stone in compacted in 6-inch lifts with a portable jumping jack-style automatic tamper to original ground surface grade. Trenching will begin at recovery well SVE-2, proceed west towards SVE-1, and onward to the system location.

Pressure testing of the installed subsurface piping will consist of connecting a pneumatic line from a portable air compressor to the ends of the subsurface piping with a manifold and Fernco connectors. A pressure of 10 psi will be applied and maintained with an air regulator on the air compressor. Pressure in the air tank will be monitored for loss over a 10-minute period. If a leak in the pipe is apparent, all joints will be investigated and repaired as needed. Once repairs are made, re-testing will be performed as previously described prior to backfilling.

Once installation activities are complete, an asphalt cap will be installed over the excavated trench in two separate 2-inch lifts. The first lift consist of a base coat layer that will be compacted and allowed to cure, followed by a wear/top coat to surrounding asphalt surface grade. Once compacted and cured, all seams will be sealed with a hot asphalt sealant.

4.2 Remedial System Compound Equipment

4.2.1 SVE Well Airflow Design

Total system airflow requirements were calculated from the pilot test data based on well depth and available screen. An extracted flow rate per unit length of screen was obtained for each well. The SVE system design flow rate is shown in **Appendix A** (**SVE Design Sheet 1**).

To calculate the required total vacuum, the vacuum required to pull the vapor from the SVE wells was added to all friction losses due to piping, fittings, and equipment losses. The SVE friction losses are detailed in **Appendix A** (**SVE Design Sheet 2**). An applied vacuum of 64 in H20 is required to produce a flow rate of approximately 213 scfm from the extraction wells. A Process Flow Diagram for the SVE system is included as **Figure 3**.

4.2.2 SVE Equipment Design

One 10-hp regenerative blower will provide vapor extraction from SVE-1 and SVE-2. Groundwater will not be directly extracted from SVE-1 and SVE-2; however, an air-water separator (AWS) will be provided if any entrained groundwater is extracted along with the extracted vapor. Volume should be limited to less than five gallons over a two-week period. The manufacturer's specifications for the SVE equipment are included in **Appendix B**.

4.2.3 Treatment Equipment Design

SVE treatment equipment includes an AWS and vapor granular activated carbon (GAC). The GAC units are sized based on the vapor flow rates and concentrations obtained during pilot testing.

Limited water is anticipated in the extracted subsurface vapor; however, any extracted fluids that are entrained in the vapor will be processed through the AWS following extraction. The AWS will separate the vapor from the water, while suspended solids settle to the bottom of the AWS. A one horsepower single-phase centrifugal pump with an explosive proof (XP) motor will transfer water from the AWS collection chamber to the storage tank. The transfer pump will be capable of pumping four gallons per minute (gpm) at ten feet of total dynamic reach for intermittent pumping from the AWS. The storage tank will contain a high-level float to shut the system down when full to prevent over-fill. System transfer pump design calculations are detailed in **Appendix A** (**SVE Design Sheet 3**). Collected water will be transported and disposed of by a licensed disposal company coordinated by Letterle. The recovered vapor stream will be directed through the AWS and the vacuum pump to the vapor GAC prior to atmospheric discharge. The manufacturer's specifications for the treatment equipment are included in **Appendix B**.

The effluent vapor from the SVE vacuum pump will be directed through two 600-pound vapor-phase GAC units. The units will be rated for a maximum pressure of five psi and a maximum airflow rate of 600 scfm. The GAC units will be connected in series arrangement. An estimated carbon usage rate was calculated for the starting period, when the influent VOC concentration will be at 230 ppmv. Based on a total system flow rate of 213 scfm and an average TPH concentration of 230 ppmv, the initial petroleum hydrocarbon recovery rate is expected to be approximately 18.3 lbs./day as detailed in Activated Vapor Carbon Treatment Design Calculations (**Appendix A, SVE Design Sheet 4)**.

Since influent hydrocarbon concentrations in the vapor stream are expected to decrease asymptotically (a first-order decrease), a decrease in hydrocarbon concentration is estimated with a first-order decrease k-coefficient of 0.05 over the first 60 days. This value is based on an assumed permeability of the vadose zone and the length of well casing at the SVE extraction wells. It is estimated that the system influent hydrocarbon concentration will decrease from 230 ppmv to 21 ppmv following 60 days of system operation. The corresponding carbon consumption rate is estimated to decrease from 122 lbs. /day to 11 lbs. /day during the initial 60 days of operation with the GAC units. Therefore, Letterle recommends vapor-phase GAC treatment during system operation. It is estimated that one carbon changeout will be required in the first 20 days of system operation, another at 60 days of operation, and a final changeout after the first year of operation.

4.2.4 Design Summary

The principal equipment associated with the remediation system is the following:

- One regenerative vacuum pump Rotron EG&G EN 858 (270 scfm at 54 in H_2O)
- One AWS
- One transfer pump and level controls (4 gpm at 10 feet of head)
- Two 600-pound vapor-phase GACs (rated for 213 scfm)
- Control panel(s) for the vacuum pump and the transfer pump (including all system interlocks).

The remedial system will be equipped with a PLC-based control system. Each motor and/or device will be controlled via Hand-Off-Auto switch located on the control panel. A non-resettable hour meter for each motor will be installed in the control panel to account for cumulative run times. Each motor will be controlled by a manual IEC motor starter with lockout tag-out switch lever. Signals from system control devices such as floats and switches will be processed as intrinsically safe (low voltage).

The system status can be accessed remotely via a computer or smart phone. The remote access will provide different access levels based on user login information. System alarms will be annunciated locally and remotely via text and email. Coordination with the local internet and phone service will be conducted in order to connect to the system equipment via an IP address.

System O&M visits will determine various system operating parameters as well as provide the necessary information to make system adjustments. System piping and instrumentation diagrams are included as **Figures 4a** and **4b**. Example manufacturer's specifications for the treatment system equipment are included in **Appendix B**.

4.3 Remediation System Enclosure Specifications

The SVE treatment system will be installed within a mobile trailer staged on-site. The trailer will be constructed with one room for treatment. The room will house the influent SVE manifold including vacuum gauges, flow meter, and all associated valves and piping, AWS, and the vacuum pump. The control panel will be mounted to the outside front of the trailer.

An intake manifold will be constructed inside the trailer to facilitate system adjustments and monitoring. Valves will be installed on the individual extraction lines to allow for separate vacuum adjustments in each well. A vacuum gauge will be mounted on the intake manifold to monitor applied vacuum. The two vapor 600-lb GAC units will be placed outside adjacent to the enclosure when in use.

The vapor flow will be calculated using the manufacturer's pump curves. Fault controls and probes will be installed to protect the remediation system from overfills and failures. The entire system will be protected by an electronic control system that will de-energize the system in the event of a fault or malfunction. The system controls will be included in a control panel enclosure, placed on the outside of the trailer. A generalized layout of equipment within the trailer is shown on **Figure 5**.

4.4 Remediation System Layout and Construction

The trailer will be staged along the western corner of the property or at another suitable location, as determined by the property owner and/or local zoning requirements. The remediation trailer will be insulated and heated to protect the remediation system from freezing during cold weather. A fenced area surrounding the remediation trailer will be constructed to accommodate the vapor phase treatment equipment. The fenced area treatment compound will be approximately 12 feet wide by 25 feet long and will be contained within a 6-foot high privacy fence with one access gate.

As previously stated, the recovery wells will be connected to the recovery system via subsurface extraction piping. The extraction piping will consist of two-inch diameter schedule 40 PVC sections, which will be individually connected to each recovery well. The piping trenches will be backfilled with construction-grade stone and completed in lifts to the existing surface grade (**Figure 6**). Manholes will provide access to the wells and piping.

4.5 Electrical Service

Electrical requirements of the remediation system including the vacuum blower, transfer pump, heater, ventilation, and controls are outlined in **Appendix A** (**Design Sheet 5**). A variable frequency drive will be used to convert single phase to three phase service for the 10 hp vacuum blower.

One temporary electric pole will be installed to extend the electrical service line from near the southwestern corner of the property and Buffalo Street to a location near the treatment compound. The temporary utility pole will be used to mount the meter socket and fused quick disconnect switch to shutoff all power to the shed in case of an emergency. Once the pole and the electrical boxes are installed and a final inspection has been granted, local electric company will install the electric lines from Buffalo Street to the new pole and meter socket.

A short above-ground 3-inch PVC conduit will be installed from the temporary pole to the enclosure to extend the electric service from the meter to the trailer disconnect switch and breaker box. The electrical service provided will be 120/240 1-phase 200 amp.

4.6 Permitting

Any accumulated groundwater will be transported and disposed of off-site as coordinated by Letterle.

Groundwater and soil remediation activities for gasoline releases have been listed as exempt from permitting by the Air Quality Division of PADEP under 25 PA CODE 127.14(8). Exemption status does require treatment of discharge to the air of less than one ton per year of total C_4-C_{12} hydrocarbons. Vapor phase carbon removal efficiency will be monitored on a monthly basis to ensure that the treatment units are removing hydrocarbons in accordance with discharge limits set by the PADEP. Quarterly vapor samples (influent, midfluent, and effluent) will be collected to further verify vapor-phase GAC efficiency and to determine carbon consumption rates. The vapor samples will be analyzed for BTEX and MTBE hydrocarbons per USEPA modified Method 18 and 24.

Mechanical work needed to implement the system installation will conform to all applicable state and local codes. The electrical compound will be classified as a Class I, Division II hazardous and explosion proof area and comply with state, local and the National Electric Code. Additionally, structural components will be constructed as to comply with local and International Building Codes. A building permit will be obtained, if necessary, from the City of Freeport for the placement of a remediation enclosure and the completion of site excavation and construction activities.

TABLES

SVE DESIGN TABLE 1
Expected Vapor Flow and Concentration Data from SVE Wells
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

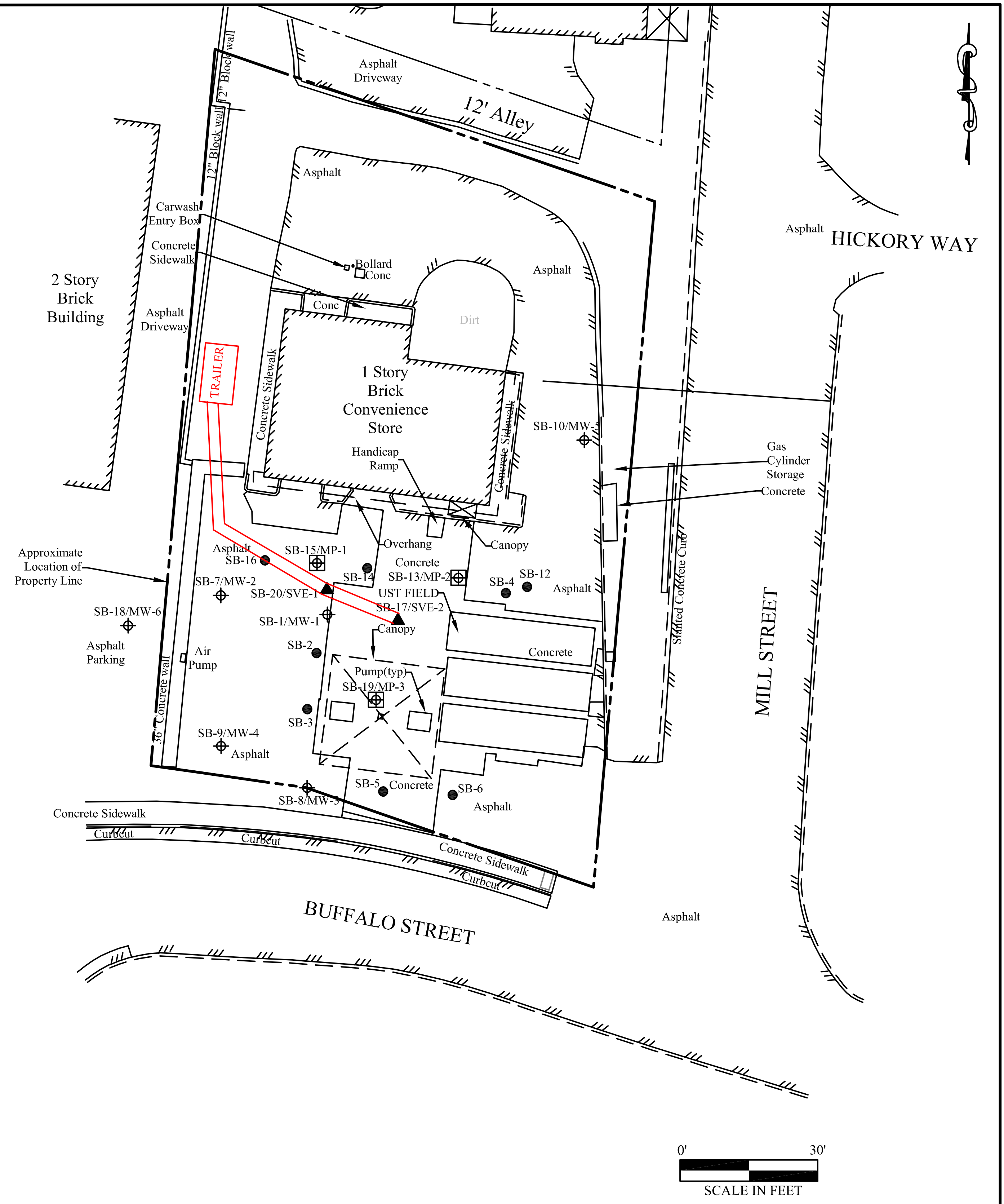
Location	Applied Vacuum [inH2O]	Vapor Flow [scfm]	Total Petroleum Hydrocarbons [ppmv]
Pre-Vacuum Pump	54	212	230.00
Post-Vacuum Pump	54	212	227.70

ND - Not Detected at or above lower practical quantitative limit

SVE DESIGN TABLE 2
Expected SVE System Vapor Concentrations (at start-up)
Superior - Radhe Oil
222 Buffalo Street
Freeport, Pennsylvania 16229

Constituent	Before Vapor GAC #1&2 (after vac pump) [ppmv]	After GAC #1 & #2 [ppmv]	After GAC #3 and #4 Effluent [ppmv]
TPE Hydrocarbons	227.70	2.28	<1

FIGURES



LEGEND

— - · - —	APPROXIMATE PROPERTY BOUNDARY
●	SOIL BORING LOCATION
⌖	SOIL BORING/MONITOR WELL LOCATION
⊞	SOIL BORING/MONITOR POINT LOCATION
▲	SOIL BORING/SOIL VAPOR EXTRACTION POINT

REMEDIAL SYSTEM TRENCHING PLAN

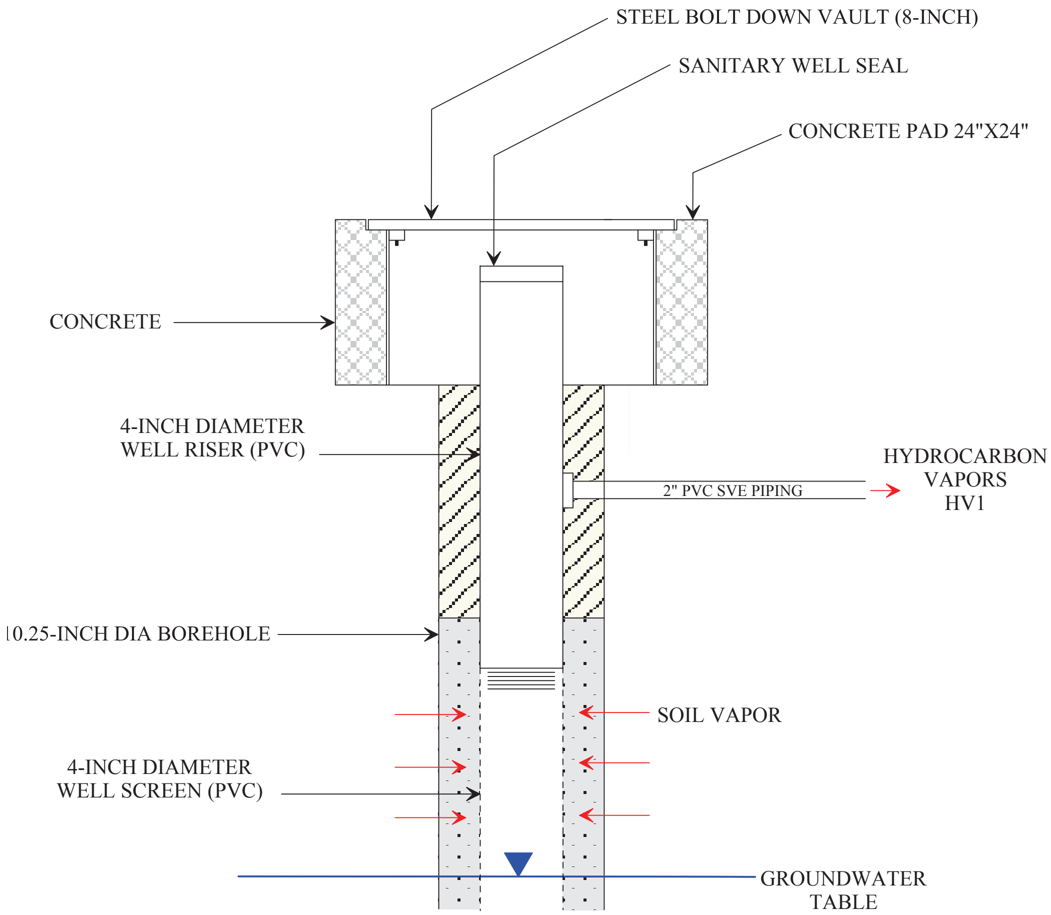
SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 1

POSITION	APPLIED VACUUM	EXPECTED FLOW
IN SVE-1	54 in H_2O	106 SCFM
IN SVE-2	54 in H O	106 SCFM

WELL	TOTAL DEPTH	CASING DIAMETER	BORING DIAMETER	DEPTH TO WATER	SCREEN INTERVAL
RW-1	30 FEET	4-INCH	10.25-INCH	~20 FEET	3-20 FEET
RW-2	30 FEET	4-INCH	10.25-INCH	~20 FEET	3-20 FEET

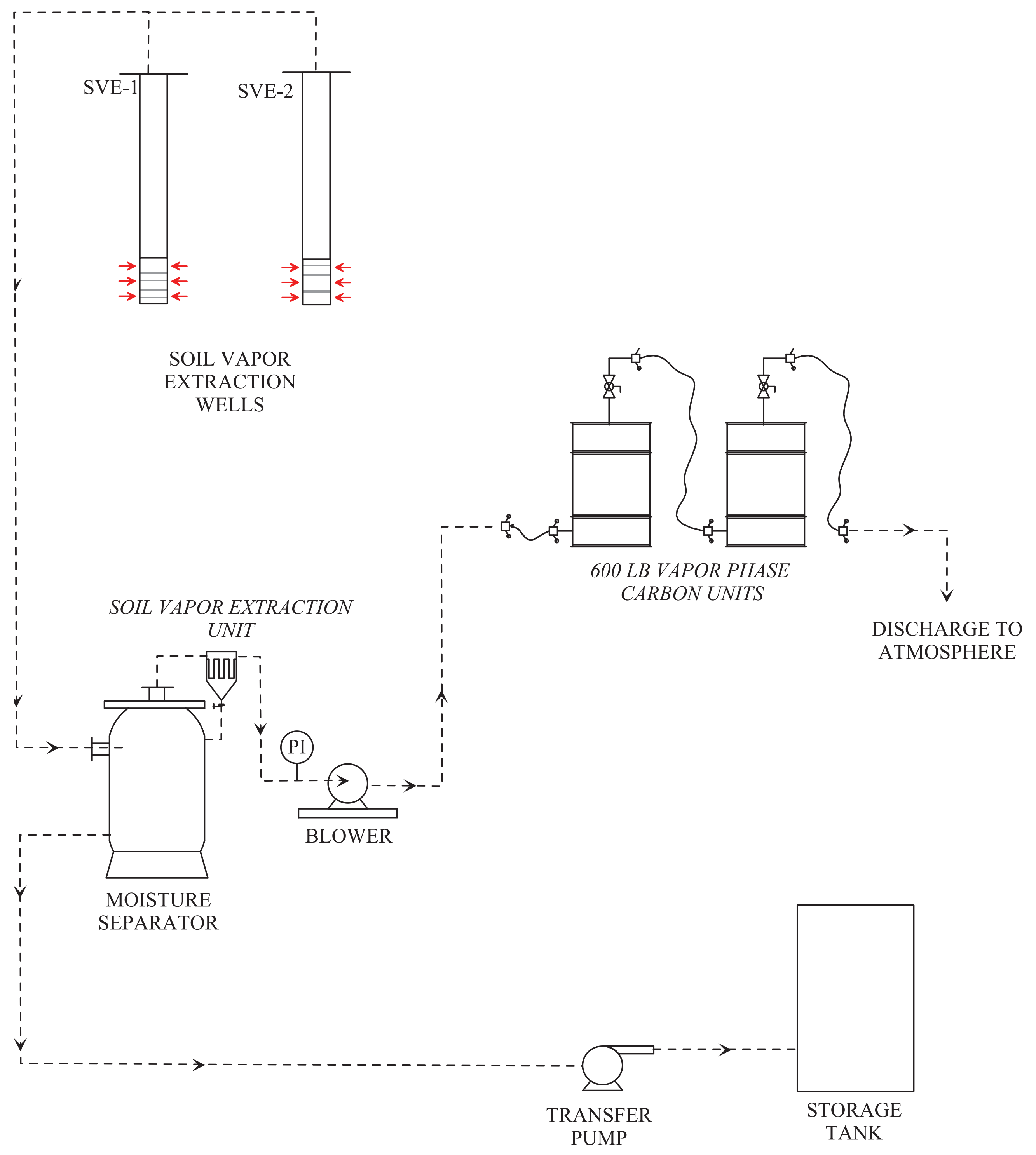


SVE RECOVERY WELL DIAGRAM

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates, Inc.
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 2



SVE SYSTEM
PROCESS FLOW DIAGRAM

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

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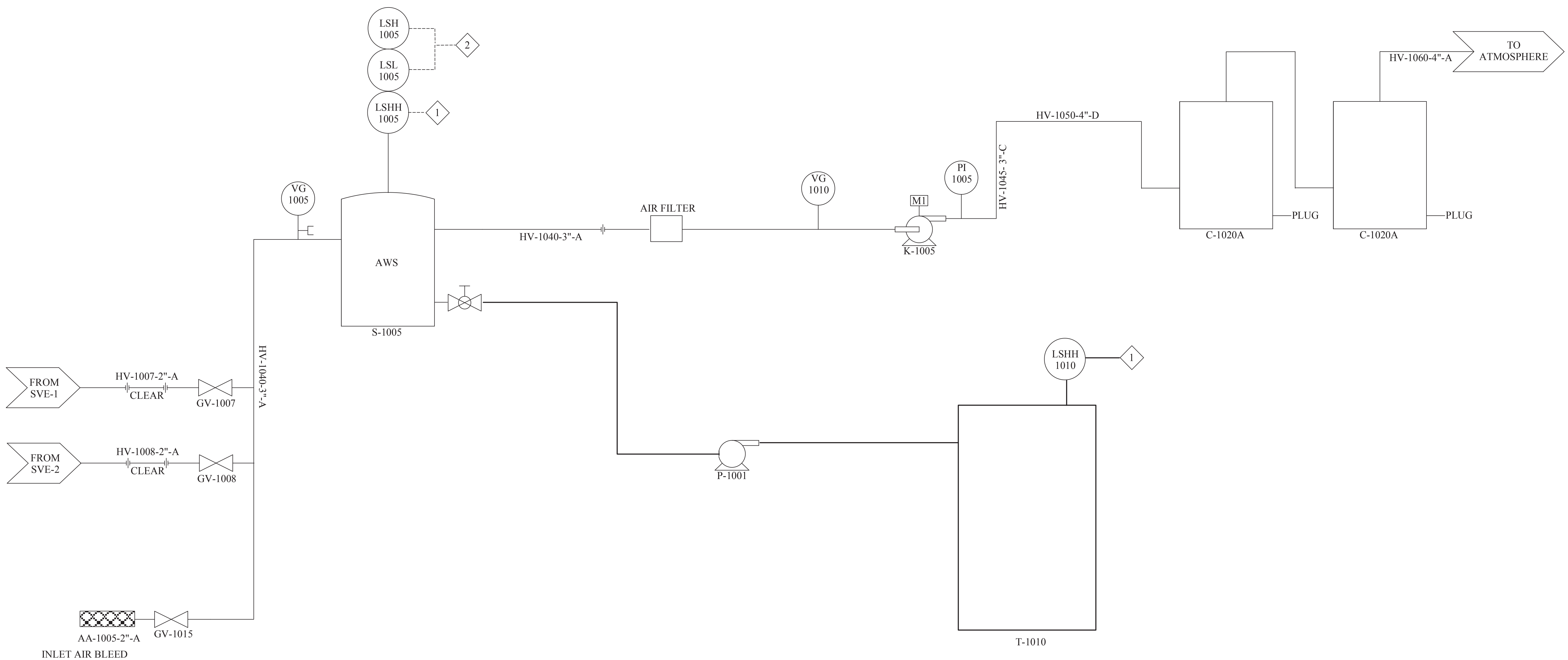
Allison Park, Pennsylvania 15101

FIGURE 3

INTERLOCKS:

1. LSHH-1005, LSHH-1010 SHUTS SYSTEM DOWN ON HIGH LEVEL

2. LSL-1005 TURNS OFF P-1001, LSH-1005 TURNS ON P-1001



PIPING AND INSTRUMENTATION DIAGRAM
SVE SYSTEM

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

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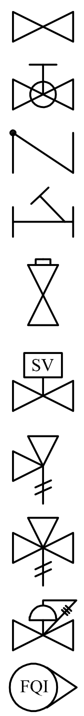
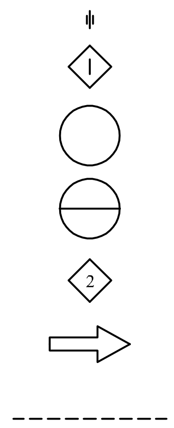
Allison Park, Pennsylvania 15101

FIGURE 4A

INSTRUMENT/VALVE SYMBOLS

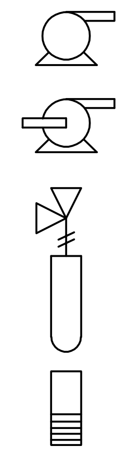


- GATE VALVE
- BALL VALVE
- CHECK VALVE
- WYE STRAINER
- SAMPLE PORT
- SOLENOID VALVE
- SIPHON/PRESSURE RELIEF VALVE
- PRESSURE/VACUUM RELIEF VALVE
- PRESSURE/VACUUM REGULATOR
- FLOW TOTALIZER



- UNION OR FERNCO
- SYSTEM INTERLOCK
- INSTRUMENT BUBBLE (LOCALLY MOUNTED)
- INSTRUMENT BUBBLE (PANEL MOUNTED)
- STREAM TAG (USED TO DESIGNATE A STREAM ON A PROCESS FLOW DIAGRAM)
- STREAM LABEL (USED WHEN A STREAM ENTERS OR EXITS THE SYSTEM OR CONINUES O ANOTHER DRAWING)
- TRAILER LIMITS

PROCESS EQUIPMENT SYMBOLS



- TRANSFER PUMP
- BLOWER/COMPRESSOR
- CARTRIDGE FILTER
- WELL PUMP

ABBREVIATIONS

LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOW LOW
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
PI	PRESSURE INDICATOR
VG	VACUUM GAUGE
I	SYSTEM INTERLOCK
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
PSL	PRESSURE SWITCH LOW
PSH	PRESSURE SWITCH HIGH
FT	FLOW TRANSMITTER
FE	FLOW ELEMENT
FM	FLOW METER
LCV	LEVEL CONTROL VALVE
PRV	PRESSURE RELIEF VALVE
GV	GATE VALVE
CV	CHECK VALVE
BV	BALL VALVE
SP	SAMPLE PORT
SV	SOLENOID VALVE
TE	TEMPERATURE ELEMENT
P	PUMP
K	BLOWER/COMPRESSOR
S	SEPARATOR
C	COLUMNS (GAC, AIR STRIPPER, ETC.)
CF	CARTRIDGE FILTER
GW	GROUNDWATER
TF	TOTAL FLUIDS
HV	HYDROCARBON VAPOR
LH	LIQUID HYDROCARBON
AA	AMBIENT AIR
A	SCHEDULE 40 PVC
B	SCHEDULE 80 PVC
C	CARBON STEEL
D	TUBING
E	DEFINED BY VENDOR
F	FLEXIBLE HOSING

PROCESS FLOW DIAGRAM GENERAL NOTES

1. THE FIRST TREATMENT SYSTEM INSTALLED ON A SITE WILL BE DESIGNATED AREA 10. ALL EQUIPMENT THAT IS A PART OF THIS SYSTEM WILL BE DESIGNATED BY A LETTER FOLLOWED BY A DASH, THE AREA NUMBER AN A NUMBER FROM 01 TO 99 IN INCREMENTS OF 5. FOR EXAMPLE P-1005 FOLLOWED BY P-1010. THE SECOND TREATMENT SYSTEM ON A SITE WILL BE DESIGNATED AREA 20 AND SO ON.

2. ALL SEPARTORS WILL BE DESIGNATED AS S-XXXX. THIS INCLUDES VAPOR/LIQUID SEPERATORS, PARTICULATE FILTERS, AND OIL/WATER SEPARATORS.

3. ALL BLOWERS WILL BE DESIGNATED AS B-XXXX. BLOWERS THAT CAN DO A 2 TO 1 OR GREATER COMPRESSION ARE CONSIDERED COMPRESSORS AND WILL BE DESIGNATED K-XXXX.

4. ALL COLUMNS WILL BE DESIGNATED AS C-XXXX. THIS INCLUDES ACTIVATED CARBON, TRAY AERATORS, AIR STRIPPERS, AND SPARGE TANKS.

5. STORAGE TANKS WILL BE DESIGNATED T-XXXX. THIS INCLUDES SUMPS AND SECONDARY CONTAINMENT.

6. ALL PROCESS STREAMS WHICH ENTER OR LEAVE THE SYSTEM, OR HAVE UNDERGONE A CHANGE WILL HAVE A STREAM TAG. INFORMATION WILL BE PROVIDED ON THE FLOWRATES, PRESSURE, TEMPERATURE, pH, SPECIFIC GRAVITY, CONTAMINANT CONCENTRATION, AND ANY OTHER INFORMATION REQUIRED TO FULLY UNDERSTAND THE PROCESS. STREAM TAGS WILL START AT 1 AND INCREASE SEQUENTIALLY.

PIPING AND INSTRUMENTATION DIAGRAM GENERAL NOTES

1. ALL LINES ON THE P AND ID WILL BE LABELLED AS FOLLOWS:
   TWO LETTERS WILL INDICATE THE TYPE OF SERVICE, FOLLOWED BY A DASH, THE AREA NUMBER, AND A NUMBER FROM 01 TO 99, FOLLOWED BY THE INTERNAL DIAMETER OF THE LINE IN INCHES, FOLLOWED BY THE MATERIAL DESIGNATION. THE TYPES OF SERVICE ARE AS FOLLOWS:
   AA - AMBIENT AIR
   GW - GROUNDWATER
   HV - HYDROCARBON VAPOR
   LH - LIQUID HYDROCARBON
   PIPING MATERIAL DESIGNATIONS ARE AS FOLLOWS:
   A - SCHEDULE 40 PVC
   B - SCHEDULE 80 PVC
   C - CARBON STEEL (GALVANIZED)
   D - TUBING
   E - DEFINED BY VENDOR
   FOR EXAMPLE THE DESIGNATION FOR THE FIRST GROUNDWATER LINE IN AREA 10 CONSTRUCTED FROM 2" SCHEDULE 40 PVC WOULD BE GW-1001-2"-A.

2. ALL INSTRUMENTATION NOMENCLATURE, ABBREVIATIONS, AND SYMBOLS SHALL CONFORM TO INSTRUMENTATION SOCIETY OF AMERICAN (ISA) STANDARDS.

3. THE OPERATION OF ALL SYSTEM INTERLOCKS WILL BE SHOWN AT THE BOTTOM OF THE DRAWING.

4. THE MAJOR EQUIPMENT WILL BE SUMMARIZED AT THE BOTTOM OF THE PAGE AND WILL SHOW IN ADDITION TO THE NAME OF THE PIECE OF EQUIPMENT, THE MAXIMUM FLOWRATE, THE MATERIAL OF CONSTRUCTION, AND THE HORSEPOWER WHERE APPLICABLE.

PIPING & INSTRUMENTATION DIAGRAM TOTAL-PHASE EXTRACTION SYSTEM: SYMBOLS, ABBREVIATIONS, & NOTES

SUPERIOR - RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

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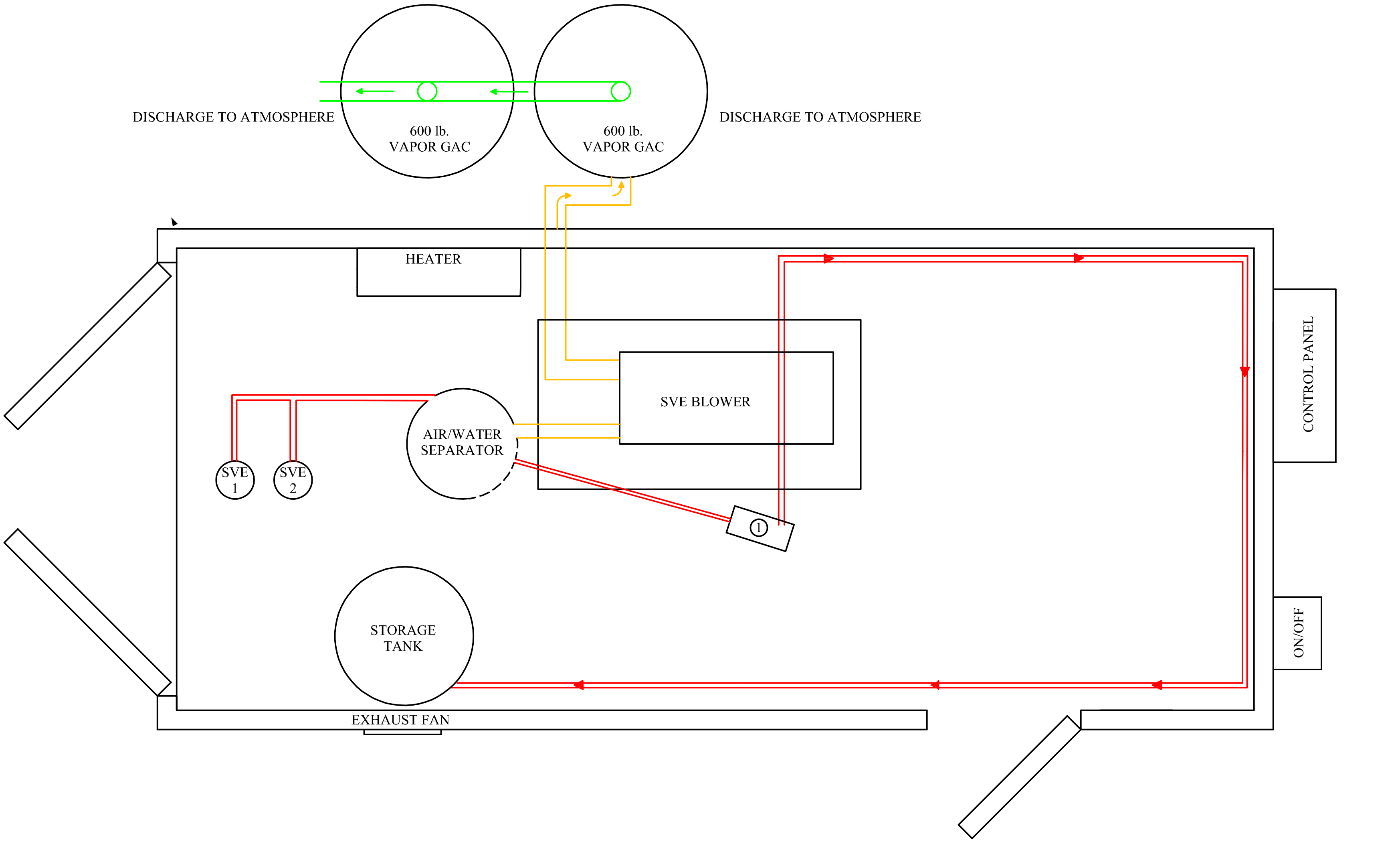
Allison Park, PA 15101

FIGURE 4B



LEGEND

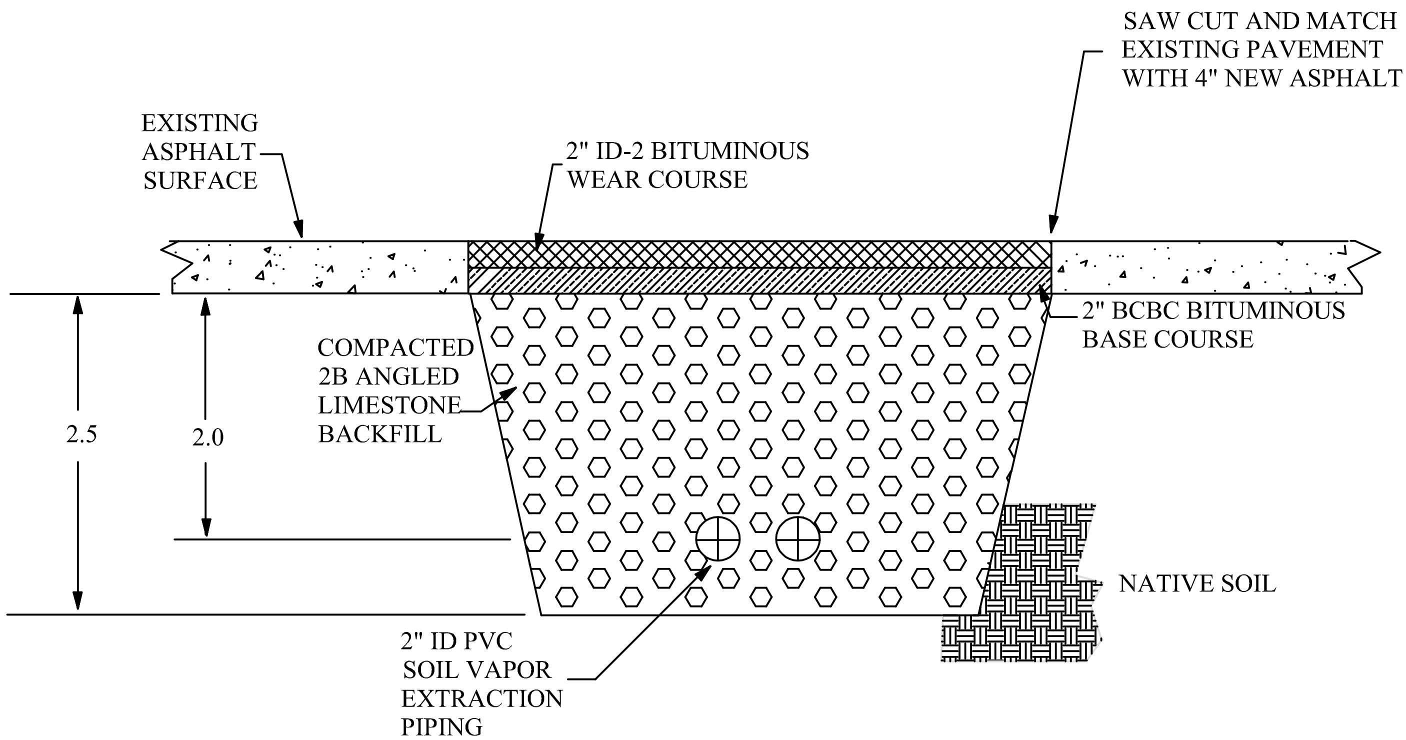
- UNTREATED WATER LINE
- UNTREATED AIR LINE
- TREATED AIR LINE
- (1) 2 - hp TRANSFER PUMP

REMEDIATION TRAILER LAYOUT DIAGRAM

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
191 Howard Street, Suite 108
Franklin, Pennsylvania 16323

FIGURE 5



CONSTRUCTION DETAILS
(TRENCH CROSS SECTION)

SUPERIOR RADHE OIL
222 BUFFALO STREET
FREEPORT, PENNSYLVANIA 16229

Letterle & Associates
2859 Oxford Boulevard
Allison Park, Pennsylvania 15101

FIGURE 6

APPENDICES

APPENDIX A

Remediation Design Calculations

SVE DESIGN SHEET 1: AIR FLOW DESIGN

I. Calculate The System Design Flowrate

The system design flowrate is obtained from calculations utilizing the results of a complete pilot test encompassing multiple wells in many areas of the impacted area.

Pilot Test Data

Enter pilot test flowrate =	213.0	scfm
Enter length of test well =	34.0	feet
Enter vacuum from pilot test =	54.4	in. H2O
Enter Pneumatic Radius of Influence (ROI) =	47.0	feet
Enter Average Aquifer Thickness (b) =	0	feet

Flowrate Per Unit Length Of Exposed Screen =

Pilot Test Flowrate / depth of test well **6.26** scfm/ft

II. Total Air Flow (Design) From Extraction Wells

Enter number of extraction wells = 3

Enter extraction well number, screened interval

TABLE 1: Extraction Well Screen Detail

	Extraction Well	Screen Interval1 (ft) Length		Depth of Groundwater (ft)	Available Screen (ft)	Anticipated Flow (scfm) (Q/H * Avail. Screen)
1	SVE 1	17		19.5	17.0	106.5
2	SVE-2	17		20.0	17.0	106.5

Total Length of Available Screen = 34.0 ft

Since the three SVE wells will be cycled, the system is designed for the longest SVE well.

III. TPE System Airflow and Vacuum Requirements

Total Design Flow = F/H * Total Available Screen = **213.0** scfm

Total Design Flow in acfm = $Q\ (acfm) = Q\ (scfm) * \dfrac{391.95\ in.H_2O}{391.95\ "H_2O - \text{Pilot Test Vacuum}("H_2O)}$

SVE System Vacuum Required = **54.4** in. H2O

SVE Sytem Minimum Design Flowrate = **247** acfm

IV. Flowrate Required To Extract The Equivalent of Three Pore Volumes Per Day

Areal Extent of Vacuum Influence[1] =	1075	sq. ft
Average Vertical Extent of Vacuum Influence[2] =	20.0	ft
Assumed Soil Porosity =	0.30	

Estimated Pore Volume Influenced   Areal Extent of Influence* Vertical Extent of Vacuum Influence * Porosity

Estimated Pore Volume Influenced = **21,500** cu. ft.

Required Daily Volumetric Flow = 3 * Pore Volume Influenced = **64,500** cu. ft./day

SVE Sytem Minimum Design Flowrate = 213.0 scfm

SVE Sytem Minimum Design Daily Flowrate = **306,720** scfd

Estimated Daily Total System Flowrate		Minimum Required Flowrate (for 3 x Pore volume extraction)
306,720 scfd	>	64,500 scfd

The system is therefore capable of extracting 3 pore volumes per day.
A summary of the data from the pilot test is presented in the Appendix.

V. Air Flow Requirement Summary

SVE System Vacuum Required =	**54.4**	in. H2O
SVE Sytem Minimum Flowrate =	**247**	acfm
Three Pore Volumes of ROI Zone =	64,500	scfd
Total System Vapor Flowrate =	306,720	scfd
Minumum Flowrate vs System Flowrate Difference =	476%	*
Total System Flowrate is Greater than 3 times the Pore		

NOTES:

- Calculations based on pilot testing data, and may not be representative of entire site. Actual full system results may very.
- The Johnson equation assumes radial flow; however, as a factor of safety, the vertical extent of vacuum influence is assumed to extend the ground surface to the average operational water level.

* Percent difference of minimum flowrate and system flowrate is easily equalized with ambient-air inlet control

Abbreviations:

scfm - Standard cubic feet per minute
acfm - Actual cubic feet per minute
scfd - Standard cubic feet per day
in. Hg - Inches of mercury
in. H_2O - Inches of water

SVE DESIGN SHEET 2: SYSTEM FRICTION LOSS DESIGN CALCULATIONS

I. Calculate The Maximum Frictional Loss In Extraction Piping (Vacuum Side)

In order to calculate the maximum frictional losses associated with the individual extraction piping, the longest distance of piping from the system location to the furthest extraction well is utilized.

Enter System Design Vacuum(1) =	54.4	inH2O			
Enter System Design Flowrate(1) =	213.0	scfm			
Enter Number of Extraction Wells(1) =	2				
Calculated Design Flowrate from Farthest Extraction Well(1) =	**107**	scfm			
Enter Diameter of Lateral Extraction Pipe =	4	inch			
Frictional Loss per Unit Length of Pipe(2) =	0.01	inches H20/ft (@	106.50	scfm)	
Enter Distance to Furthest Well =	120	ft			

Frictional Loss = 120 ft x 0.01 inches H20/ft = **1.7** Inches H20

II. Calculate The Frictional Loss in the Pipe Fittings To the Extraction Well (Vacuum Side)

Enter Number of 45 Degree Elbows =	1	
Equivalent Length of Pipe(3) =	2.5	ft
Enter Number of 90 Degree Elbows =	2	
Equivalent Length of Pipe(3) =	10.0	ft
Total Equivalent Length of Pipe =	**13**	ft

Frictional Loss = 12.5 ft x 0.01 inches H20/ft = **0.2** Inches H20

III. Obtain Frictional Loss at Moisture Separator

Total System Flowrate =	213	scfm
Enter the Maximum Pump Flow Including Dilution Air(4) =	400	scfm
Enter the Friction Loss of Moisture Separator Operating at System Flowrate(5) =	2.5	Inches H20

IV. Enter the Frictional Loss due to Manifold & Valving (6) 1.0 Inches H20

V. Calculate theTotal Friction Losses on Vacuum Side of the blower

Maximum Frictional Losses in 4-inch Pipe =	1.7	Inches H20
Frictional Losses in 4-inch Pipe Fittings =	0.2	Inches H20
Frictional Loss Across Moisture Separator =	2.5	Inches H20
Frictional Losses in Manifold & Valving =	1.0	Inches H20
Total Vacuum Losses =	**5.4**	Inches H20

VI. Calculate The Frictional Loss In Process Pipe (Pressure Side)

Enter Diameter of System Discharge Pipe =			4 inch		
Frictional Loss per Unit Length of Pipe(2) =			0.01 Inches H20/ft (4" Pipe @	213	scfm)
Enter Total Length of Pipe (7) =			10 ft		
Frictional Loss =	10 ft	x	0.01 Inches H20/ft =	2.1 Inches H20	
Total Frictional Loss in Process Pipe =				**2.1** Inches H20	

VII. Calculate The Frictional Loss in 4-Inch Pipe Fittings (Pressure Side)

Enter Number of 90 Degree Elbows =			8	
Equivalent Length of Pipe(3) =			96.0 ft	
Frictional Loss =	96.0 ft	x	0.01 Inches H20/ft	1.3 Inches H20
Total Frictional Loss in Process Pipe Fittings =				**1.3** Inches H20

VIII. Enter the Frictional Loss in GAC units at System Design Flowrate (7) 0.5 Inches H20

IX. Total Losses on Pressure Side of Vacuum Pump

Total Frictional Losses in Process Pipe =	2.1 Inches H20
Frictional Losses in 4-inch Pipe Fittings =	1.3 Inches H20
Frictional Loss at GAC units =	0.5 Inches H20
Total Pressure Side Losses =	**3.9** Inches H20

X. Vacuum Required (Design) at Extraction Well/Lateral(1)

System Design Vacuum(1) = **54.4** Inches H20

XI. Summary of Vacuum Pump Performance Requirements

Vacuum Requirements = Vacuum at Extraction Well + Losses on Vacuum Side of Pump

54.4 Inches H2 + 5.4 Inches H20 59.755 Inches H20

Pressure Requirements = Losses on Pressure Side of Pump

3.9 Inches H2 = 3.9 Inches H20

Total Vacuum and Pressure Requirements = **64** Inches H20

Since the vacuum requirements for the pump are greater than the pressure requirements, the pump is sized using the vacuum performance curve (4).

Vacuum Pump Design Requirements: 213 scfm @ 64 Inches H20

1 - Based on information provided in the Sheet 1: SVE System Design Calculations section of this report.
2 - Based on nomagraph provided by Harrington Industrial Plastics, Cranberry Twp. PA.
3 - Based on nomagraph provided by Harrington Industrial Plastics, Cranberry Twp. PA.
4 - Obtained from chosen manufacture (Rotron) blower performance curve
5 - Based on equipment specifications provided by EG&G Rotron, Kent, Ohio.
6 - Assumed frictional losses through the SVE manifold and valves.
7 - Discharge stack has a diameter of 4 inches and is 5-feet tall, however, the frictional losses through a 4-inch pipe are negligible.
8 - Based on frictional losses through the GAC Units by Carbon Services of Eighty Four, Pa..

SVE DESIGN SHEET 3: SYSTEM TRANSFER PUMP DESIGN CALCULATIONS
Radhe Oil

I. Calculate Transfer Pump Flowrate

Transfer pump flowarate is based on a 50% duty cycle that indicates that the storage tank(air/water seperator) should be evacuated twice as fast as it is being filled.

Enter number of extraction wells(1)	=	2	
Enter Pilot Test Extracted Groundwater Flowrate(1)	=	1	gpm
Total System Extracted Groundwater Flowrate(1)	=	**2**	gpm
Transfer Pump Design Flowrate	=	**4**	gpm

II. Calculate The Maximum Headloss In Suction Components (Delivery Side)

In order to calculate the maximum headloss associated with the delivery piping, the system vacuum plus additional friction losses in piping from the storage tank (air/water seperator) to the transfer pump is utilized.

Enter System Design Vacuum(1)	=	4	in. Hg
Calculate Headloss Due to System Vacuum	=	**4.533**	feet

The following formula will provide the head loss in ft through the pipe:

$$\text{Head Loss} = \frac{10.44 * [\text{Equiv. Length (ft)}] * [\text{Flowrate (gpm)}]^{1.85}}{[\text{Hazen-Williams Coeff.}]^{1.85} * [\text{Diameter (inches)}]^{4.8655}}$$

Enter the Hazen-Williams Coefficient(2)	=	140	for PVC
Pump Design Flowrate	=	4	gpm
Enter the Piping Diameter(1)	=	1.25	inch
Enter the Length of Straight Pipe	=	5	feet
Enter the Number of 90 Degree Elbows	=	2	
Equivalent Length of Pipe for Elbows(2)	=	10.0	ft
Enter the Number of Y-Strainers	=	1.0	
Equivalent Length of Pipe for Y-Strainer(2)	=	5.0	ft

Equivalent Length of Pipe = Length of Straigth Pipe + Equivalent Length of Pipe for Fittings

Equivalent Length of Pipe	=	19.0	feet
Headloss in Piping	=	**0.093**	feet
Enter the Height of Water in Storage Tank(3)	=	5	feet

Total headloss in suction piping is equal to the system vaccum plus friction losses in piping and fittings minus height of water in the storage tank.

Headloss Due to System Vacuum	=	**4.533**	feet			
Headloss Due to Piping	=	**0.09**	feet			
Height of Water in Storage Tank(3)	=	**5**	feet			
Calculate Total Headloss in Suction Piping	=	**9.6**	feet	or	**4.2**	psi

III. Calculate The Head Loss In Process Discharge Components (Pressure Side)

Enter Diameter of System Discharge Pipe	=	1	inch	
Frictional Loss per Unit Length of Pipe(2)	=	0.014	Inches H20/ft (1" Pipe @	4
Enter Total Length of Pipe	=	10	ft	gpm

Frictional Loss	10 ft	x	0.014	Inches H20/ft =	2.1 Inches H20

Total Frictional Loss in Process Pipe	=	2.1	Inches H20
	=	**0.175**	Feet of Head

IV. Calculate The Frictional Loss in Discharge Pipe Fittings (Pressure Side)

Enter Number of 90 Degree Elbows	=	8	
Equivalent Length of Pipe(2)	=	96.0	ft

Frictional Loss	96.0 ft	x	0.014	Inches H20/ft	1.3 Inches H20

Total Frictional Loss in Process Pipe Fittings	=	1.3	Inches H20
	=	**0.1**	Feet of Head

V. Obtain Frictional Loss in Filter units at System Design Flowrate (4)	0	psi
Assume 75% blockage of filters	**0.0**	Feet of Head
VI. Obtain Frictional Loss in GAC units at System Design Flowrate (5)	0	psi
	0.0	Feet of Head

VII. Total Losses on Pressure Side of Transfer Pump

Total Frictional Losses in Process Pipe	=	0.175	Feet of Head
Frictional Losses in Pipe Fittings	=	0.1	Feet of Head
Frictional Loss at Filter units	=	0.0	Feet of Head
Frictional Loss at GAC units	=	0.0	Feet of Head
Total Pressure Side Losses	=	**0.3**	Feet of Head

VIII. Summary of Transfer Pump Performance Requirements

Suction Side Requirements = System Vacuum + Losses on Suction Side of Transfer Pump

Total Headloss in Suction Piping = 9.6 Feet of Head

Pressure Side Requirements = Losses on Pressure Side of Transfer Pump

0.3 Feet of Head = 0.3 Feet of Head

Total Suction and Pressure Requirements = 9.9 Feet of Head

To ensure adequate pump sizing the suction headloss is added to the pressure headloss for pump sizing using the pump manufacture performance curve (6).

Transfer Pump Design Requirements:	**4** gpm	@	10	Feet of Head or	**4.3** psi
Enter selected pump and manufacture	1 hp	Goulds 1ST	3500 rpm		

1 - Based on information provided in the Sheet 2: SVE System Design Calculations section of this report.
2 - Based on nomagraph provided by Harrington Industrial Plastics, Cranberry Twp. PA.
3 - Based on equipment specifications provided by Product Recovery Corporation, NC.
4 - Based on frictional losses through the Filter Units by Pentek Filtration of Sheboygan, Wisconsin
5 - Based on frictional losses through the GAC Units by Carbon Services of Eighty Four, Pa..
6 - Based on pump performance curve provided by Goulds Pumps of Seneca Falls, NY

SVE DESIGN SHEET 4: ACTIVATED VAPOR CARBON TREATMENT DESIGN CALCULATIONS

Vapor Recovery & Carbon Usage Over Time

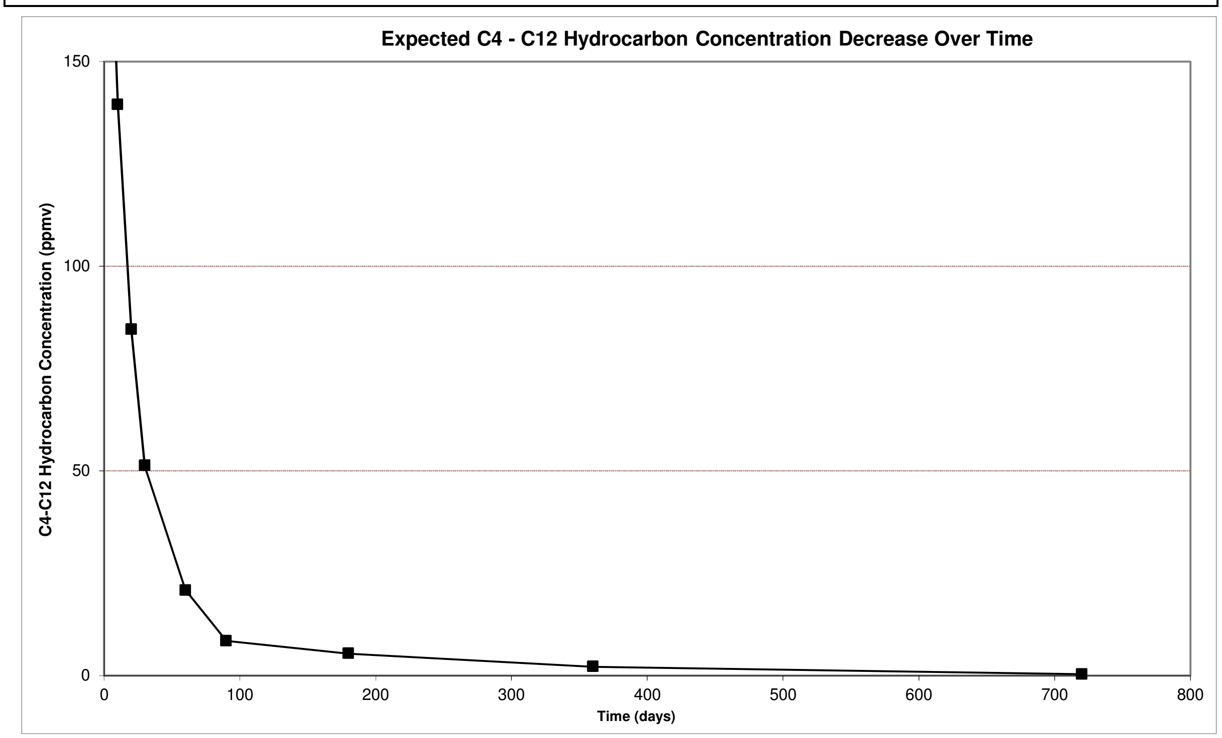
{assuming a first order decrease in vapor concentrations}

Enter pilot test hydrocarbon conc.=	230	ppmv
molecular weight	100	
k coef. during days 0-59	0.05	1/day
k coef. during days 60-179	0.03	1/day
k coef. during days 180-720	0.005	1/day
Enter design vapor flow rate	213	scfm
carbon adsorption capacity	15%	

Time (days)	BTEX Concentration (ppmv)	BTEX Concentration (ug/l)	BTEX Recovery Rate (lb/day)	Total BTEX Recovered (lbs)	Vapor-Phase Carbon Usage Rate (lb/day)	Total Carbon Usage To Date (lbs)	Carbon Cost Per Day ($/day)
0	230	956	18.30	0	122	0	$112.26
1	219	910	17.41	18	116	119	$106.79
10	140	580	11.10	146	74	974	$68.09
20	85	352	6.73	235	45	1,569	$41.30
30	51	213	4.08	289	27	1,930	$25.05
60	21	87	1.66	376	11	2,504	$10.18
90	8	35	0.68	411	5	2,738	$4.14
180	5	22	0.43	460	3	3,069	$2.64
360	2	9	0.18	515	1	3,433	$1.07
720	0	2	0.03	552	0	3,677	$0.18

EQUATIONS:

Concentration(ug/l) =	Concentration^(-kt)	molecular weight		(ug/l = mg/m^3)			
		24.05 L/mol					
lb/day recovery =	Conc (ug/l)	Flow(ft^3/min)	1 mg	1,000 l	1 pound	0.0283 m^3	
			1,000 ug	m^3	454,000 mg	ft^3	



SVE DESIGN SHEET 5: SYSTEM ELECTRIC REQUIREMENTS
Radhe Oil

I. Obtain Required Electrical Loads of the Vacuum Regenerative Pump

To calculate required power loads for all system equipment, electrical data from each equipment tag must be obtained

Enter liquid ring pump voltage =		230	Volts	
Enter liquid ring pump phase =		3	Phase	
Enter liquid ring pump horespower =		10	Hp	
Enter per cent duty cycle =		100	%	
Enter full load amperage =		28	Amps	
	Calculate KVA =	**11.1412**		
	Calculate KW =	**8.91296**		
	Calculate Kwh =	6417		
	Cost per month @0.06561 per Kwh			$ 421.04

III. Obtain Required Electrical Loads of the Transfer Pump

Enter transfer pump voltage =		230	Volts	
Enter transfer pump phase =		1	Phase	
Enter transfer pump horespower =		2	Hp	
Enter per cent duty cycle =		50	%	
Enter full load amperage =		15	Amps	
	Two Pumps *2			
	Calculate KVA =	**6.9**		
	Calculate KW =	**5.934**		
	Calculate Kwh =	**2136**		
				$ 140.16

IV. Obtain Required Electrical Loads of the Variable Frequency Drive

Enter phase convertor voltage =		230	Volts	
Enter phase convertor phase =		1	Phase	
Enter phase convertor horespower =		5	Hp	
Enter per cent duty cycle =		100	%	
Enter full load amperage =		37	Amps	
	Calculate KVA =	**8.51**		
	Calculate KW =	**7.2335**		
	Calculate Kwh =	**5208**		
				$ 341.70

Page 1 of 2

V. Obtain Required Electrical Loads of the Control Circuts

Enter control voltage =		120	Volts
Enter control phase =		1	Phase
Enter control horespower =		1/4	Hp
Enter per cent duty cycle =		100	%
Enter full load amperage =		5	Amps
	Calculate KVA =	**0.6**	
	Calculate KW =	**0.516**	

	Calculate Kwh =	**372**		$ 24.38

VI. Obtain Required Electrical Loads of the Heater

Enter control voltage =	240	Volts	
Enter control phase =	1	Phase	
Enter control horespower =	n/a	Hp	
Enter per cent duty cycle =	30	%	
Enter full load amperage =	7.5	Amps	
Calculate KVA =	**1.8**		
Calculate KW =	**1.548**		
Calculate Kwh =	**334**		$ 21.94

VII. Obtain Required Electrical Loads of the Ventilation

Enter control voltage =	115	Volts	
Enter control phase =	1	Phase	
Enter control horespower =	0.25	Hp	
Enter per cent duty cycle =	50	%	
Enter full load amperage =	4.5	Amps	
Calculate KVA =	**0.5175**		
Calculate KW =	**0.44505**		
Calculate Kwh =	**160**		
-			$ 10.51

VIII. TOTALS	**97**	Amps @	**230**	Volts	
Required Service:	200	Amps	**230**	Volts	$ 959.73

APPENDIX B

Manufacturer's Equipment Specifications

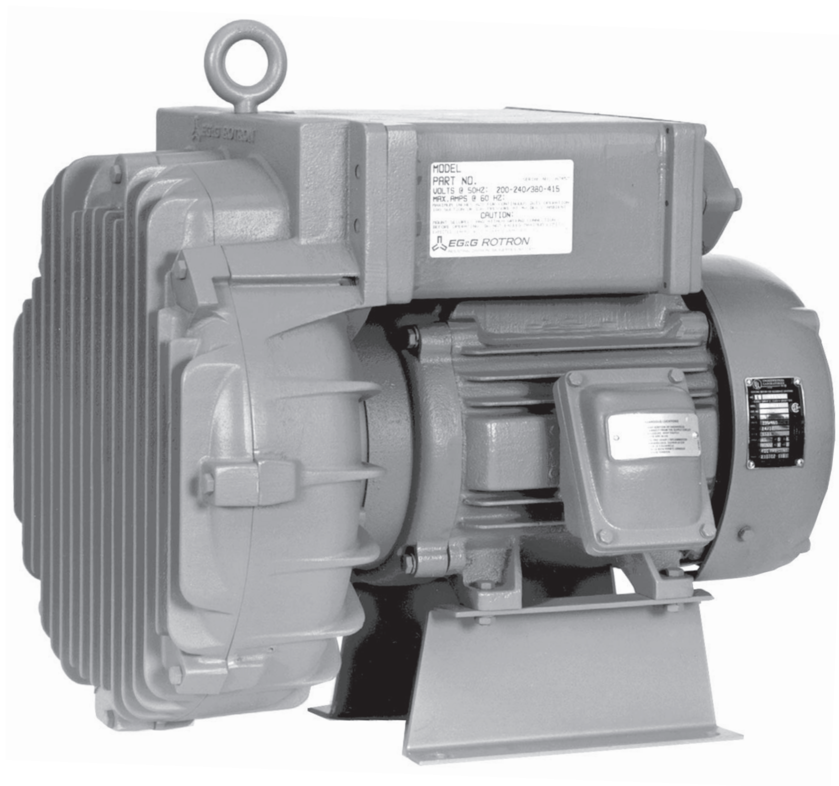
EN 858 & CP 858
Sealed Regenerative Blower w/Explosion-Proof Motor

FEATURES
- Manufactured in the USA – ISO 9001 compliant
- Maximum flow: 400 SCFM
- Maximum pressure: 120 IWG
- Maximum vacuum: 98 IWG
- Standard motor: 10 HP, explosion-proof
- Cast aluminum blower housing, cover, impeller & manifold; cast iron flanges (threaded); teflon lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

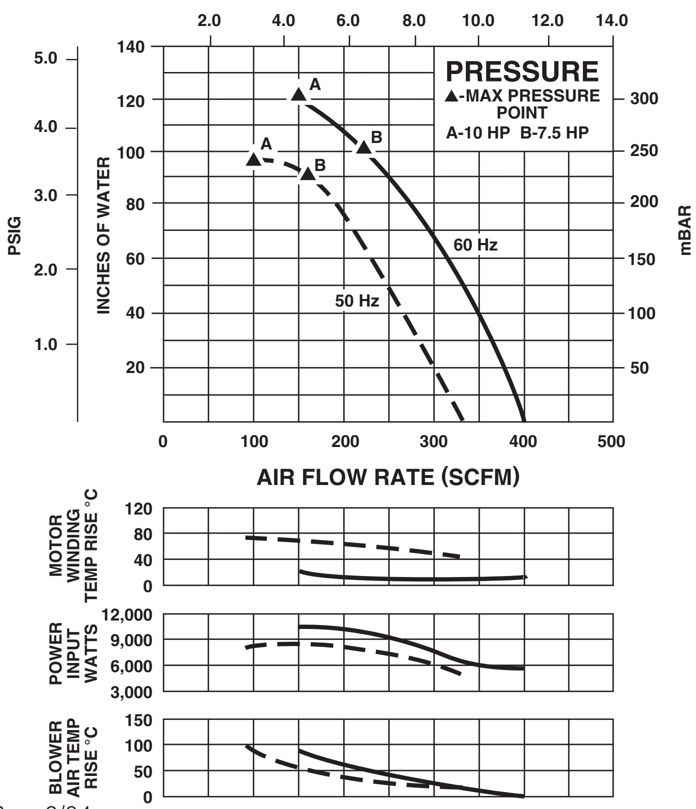
MOTOR OPTIONS
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

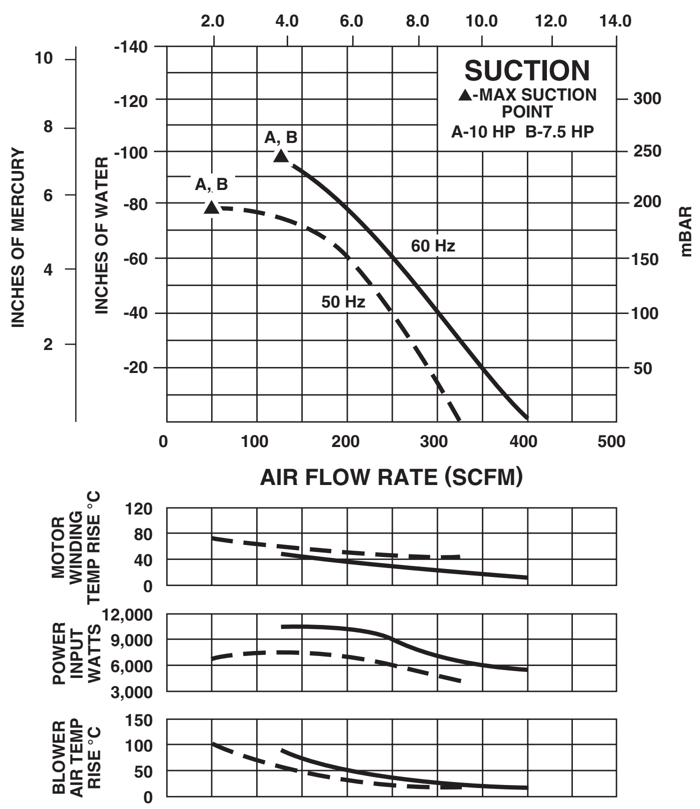
BLOWER OPTIONS
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES (See Catalog Accessory Section)
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package



BLOWER PERFORMANCE AT STANDARD CONDITIONS



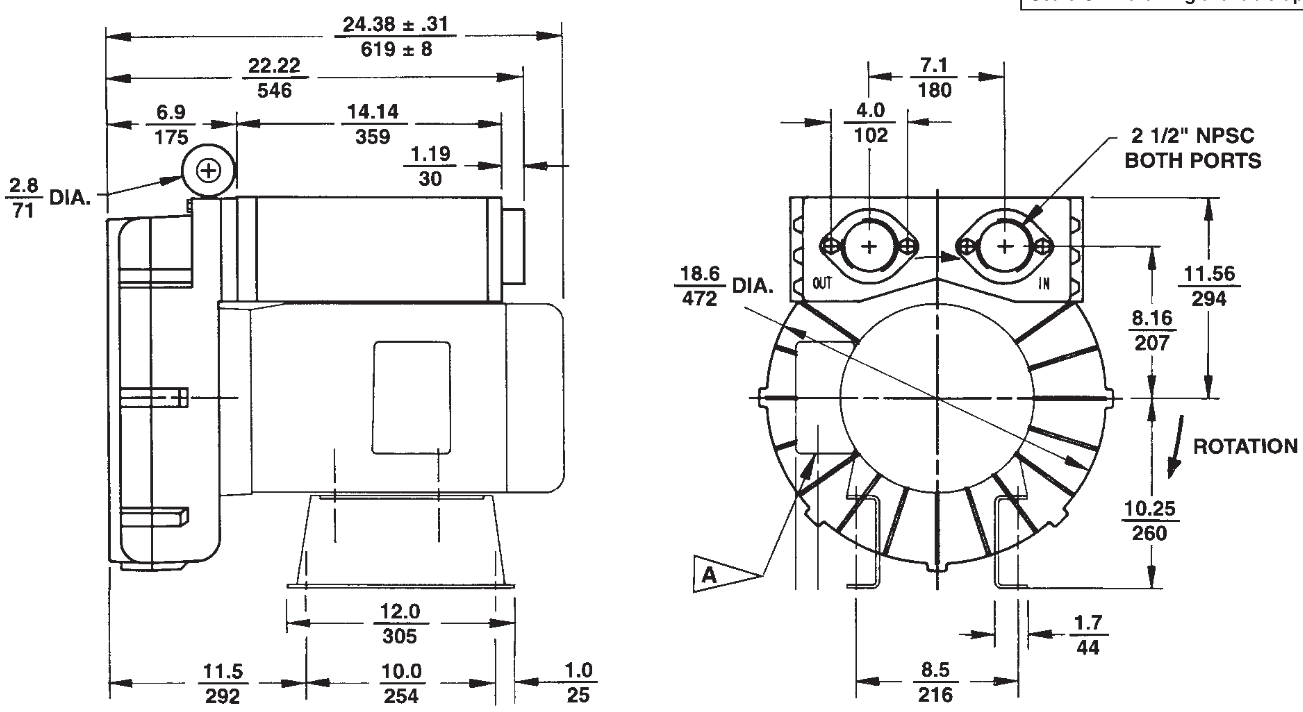


Rev. 2/04

AMETEK Technical and Industrial Products, Kent, OH 44240 • e mail: rotronindustrial@ametek.com • internet: www.ametektmd.com

EN 858 & CP 858
Sealed Regenerative Blower w/Explosion-Proof Motor

Scale CAD drawing available upon request.



DIMENSIONS: $\frac{IN}{MM}$
TOLERANCES: .XX ± $\frac{.1}{2.5}$
(UNLESS OTHERWISE NOTED)

A 0.75" NPT CONDUIT CONNECTION AT 12 O'CLOCK POSITION

SPECIFICATIONS

MODEL	EN858BD72WL		EN858BD86WL	EN858BA72WL		CP858FZ72WLR
Part No.	038744		038745	080070		038980
Motor Enclosure – Shaft Material	Explosion-proof – **CS**		Explosion-proof – **CS**	Explosion-proof – **CS**		Chem XP – **SS**
Horsepower	10.0		10.0	7.5		Same as EN858BD72WL – 038744 except add Chemical Processing (CP) features from catalog inside front cover
Phase – Frequency [1]	Three - 60 Hz		Three - 60 Hz	Three - 60 Hz		
Voltage [1]	230	460	575	230	460	
Motor Nameplate Amps	24	12	9.6	17	8.5	
Max. Blower Amps [3]	24	12	11.6	26	13	
Inrush Amps	162	81	93	126	63	
Starter Size	2	1	1	1	1	
Service Factor	1.0		1.0	1.0		
Thermal Protection [2]	Class B - Pilot Duty		Class B - Pilot Duty	Class B - Pilot Duty		
XP Motor Class – Group	I-D, II-F&G		I-D, II-F&G	I-D, II-F&G		
Shipping Weight	332 lb (151 kg)		332 lb (151 kg)	320 lb (145 kg)		

1 Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

2 Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

3 Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

Rev. 2/04

MODEL#	MAX AIR FLOW(SCFM)	DIAMETER (INCHES)	HEIGHT (INCHES)	LIQUID CAPACITY (GAL)
MS-30	300	14	48	15
MS-60	400	18	60	30
MS-80	500	20	60	40
MS-120	750	24	60	60
MS-200	1100	32	60	100

MS-30 NOT SHOWN - THE TANK USES AN EXTERNAL FILTER
INLET AND OUTLET SIZES WILL BE CUSTOM SIZED FOR EACH JOB.

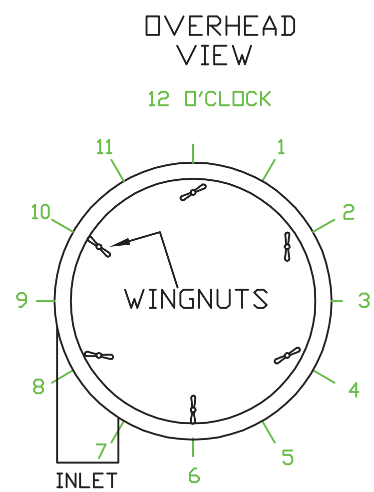
OPTIONAL FILTERS

FILTER #	RATED FLOW (SCFM)
31P	195
231P	300
235P	570
245P	880
377P	1825

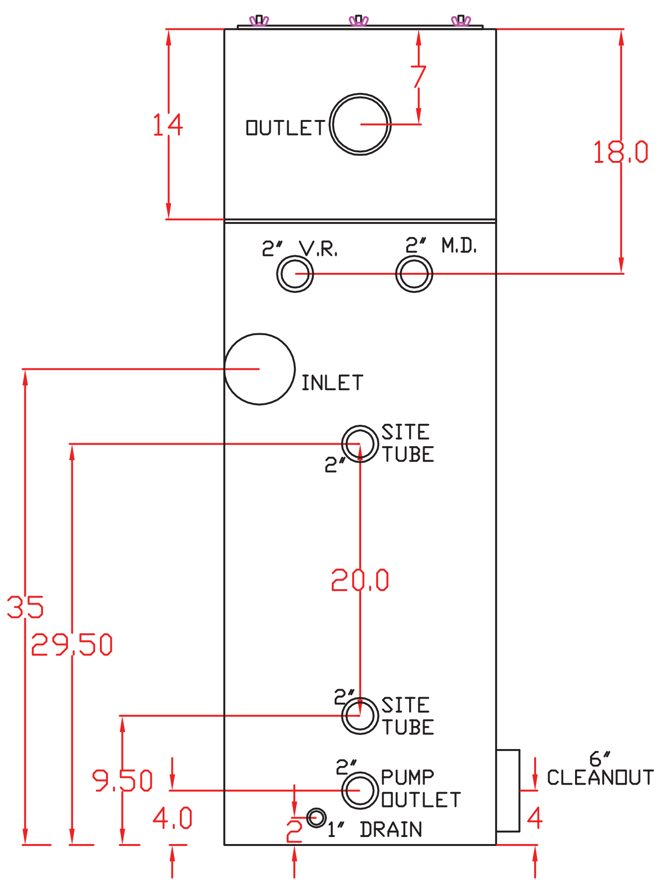
FLOAT OPTIONS

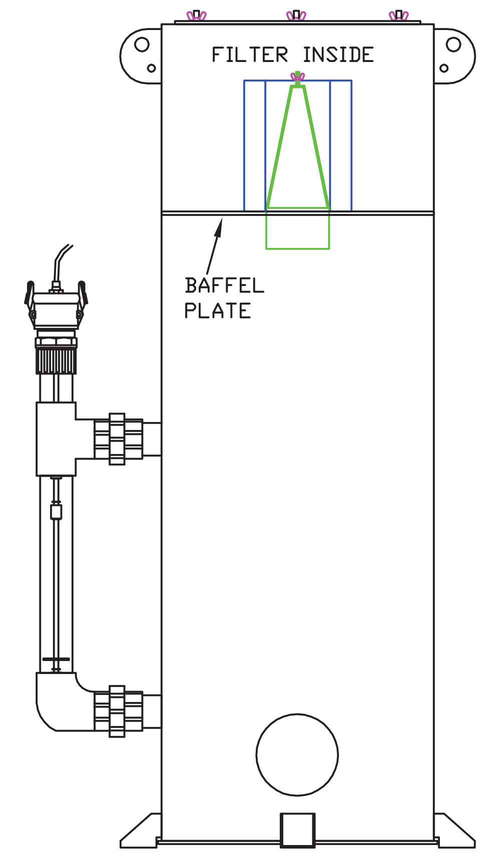
IN A 2" CLEAR PVC SITE TUBE
THREE FLOAT STEM (ON/OFF/HL)
SINGLE FLOAT STEM (HL)

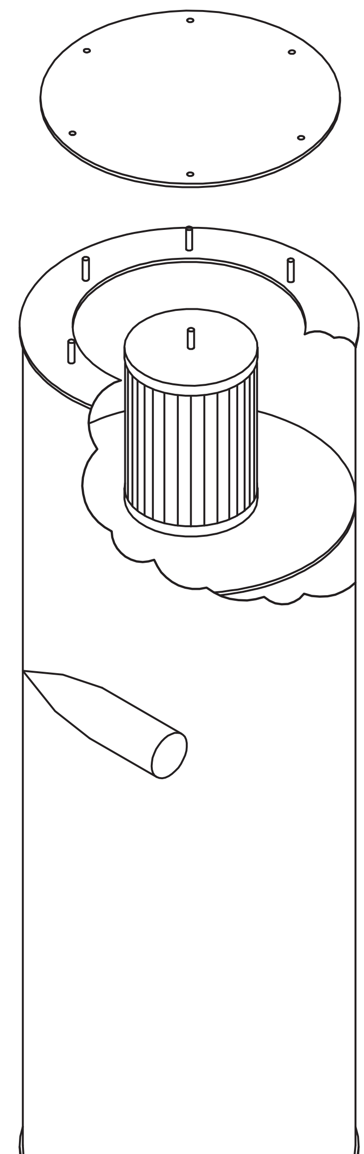
IN A 2" TEE FITTING WITH POLY TUBE
DWYER L6 (HL)



OUTLET	6 O'CLOCK
MAN DLU.	
VAC RL.	
SITE TUBE=	
PUMP OUTLET	
DRAIN	
CLEANOUT	







1705 NEW RALEIGH ROAD
DURHAM, NORTH CAROLINA 27703
TEL: (919) 957-8890
DRAWN BY GAC

LOW VAC MOISTURE SEPARATORS

PRODUCT RECOVERY MANAGEMENT
DIVISION OF PHILLIPS ELECTRIC

G&L Pumps

NPE

316L Stainless Steel End Suction Centrifugal Pumps

Goulds Pumps

ITT Industries

A FULL RANGE OF PRODUCT FEATURES

- The close coupled compact, flexible design saves space, can be mounted horizontally or vertically, and simplifies maintenance.
- Standard NEMA motors are open drip-proof, totally enclosed fan-cooled or explosion proof enclosure, have stainless steel shaft, and are designed for continuous duty under all conditions with single and three phase available.
- Superior, complete AISI 316L stainless steel liquid handling components for corrosion resistance and improved strength and durability.
- Casing and adapter have NPT threaded centerline connections, easily accessible vent, prime and drain connections with stainless plugs.
- Unique floating O-ring enclosed impeller design maintains maximum efficiencies.
- Standard John Crane mechanical seal of silicon carbide, viton and stainless metal parts with optional high temperature and chemical duty seals available.

TYPICAL APPLICATIONS

Specifically designed for a broad range of general applications traditionally requiring various materials such as all iron, bronze fitted, all bronze or stainless construction.

- Water circulation
- Booster service
- Liquid transfer
- Spray system
- Chillers
- Washing/cleaning systems
- Injection molding cooling
- Reverse osmosis
- Air scrubbers
- Heat exchangers
- Filtration systems
- Jockey pumps
- OEM applications
- General water services

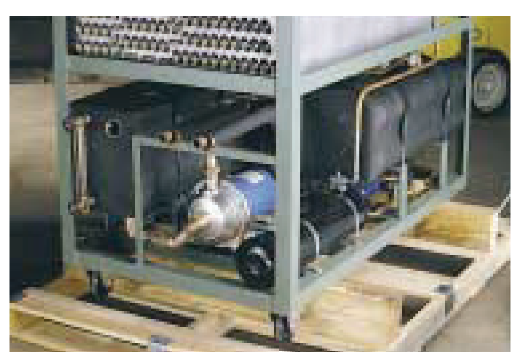
SPECIFICATIONS

Capacities to:
75 GPM (283L/min) at 1750 RPM
150 GPM (550L/min) at 3500 RPM

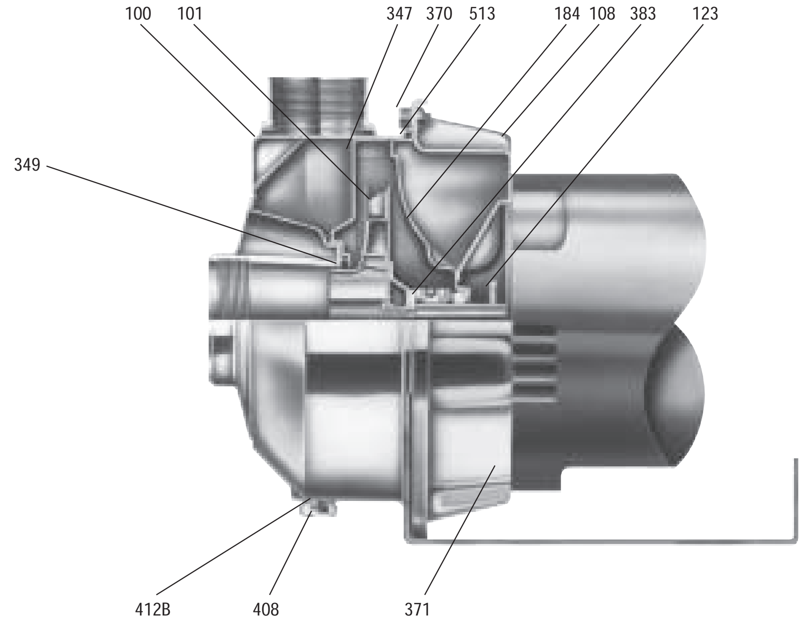
Heads to:
39 feet (11 m) at 1750 RPM
150 feet (50 m) at 3500 RPM

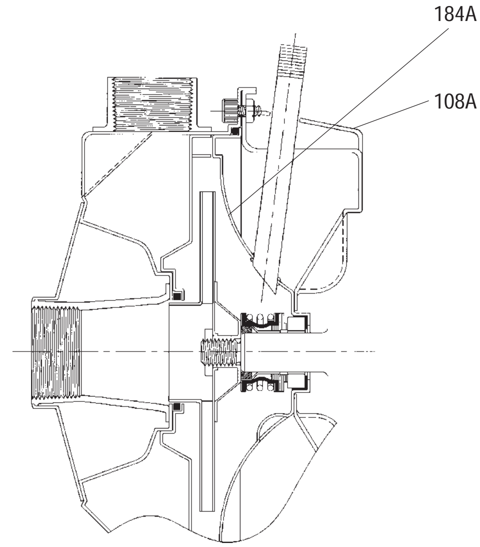
Working pressures to:
125 PSIG (9 bars)

Maximum temperatures to:
212°F (100°C) with standard seal or
250°F (121 °C) with optional high temperature seal.



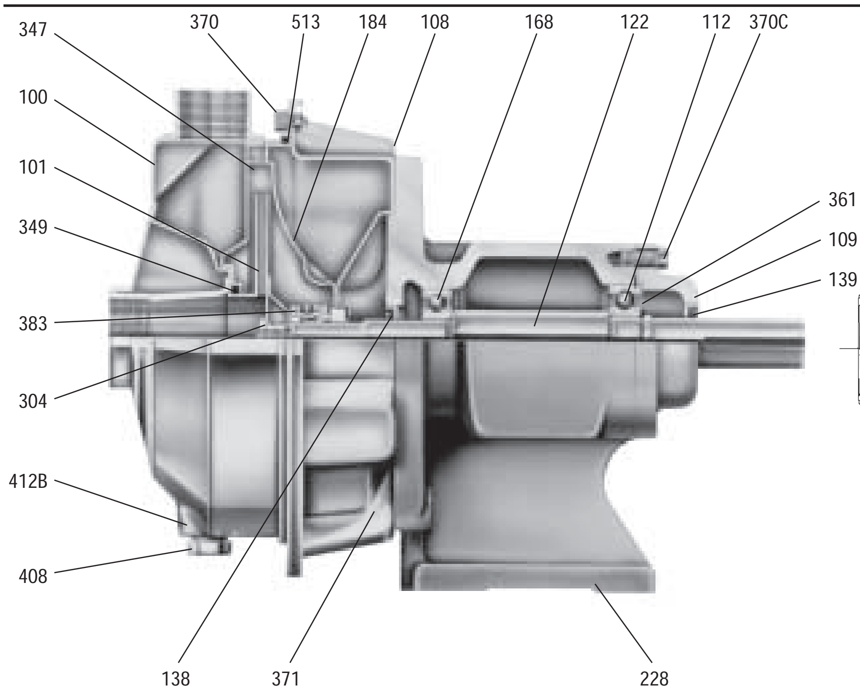
NPE CLOSE COUPLED MAJOR COMPONENTS: MATERIALS OF CONSTRUCTION

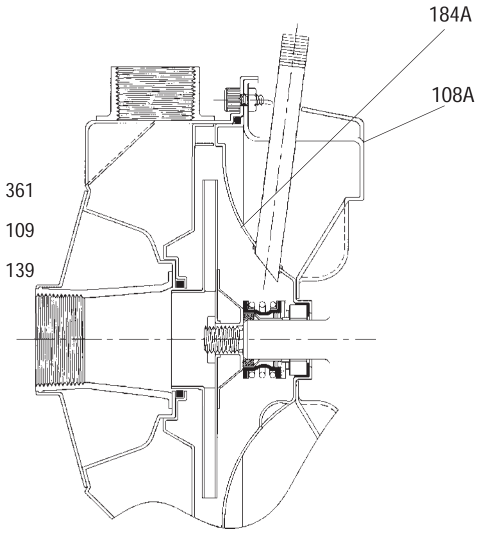




Seal Face Vent/Flush Option

NPE FRAME MOUNTED MAJOR COMPONENTS: MATERIALS OF CONSTRUCTION





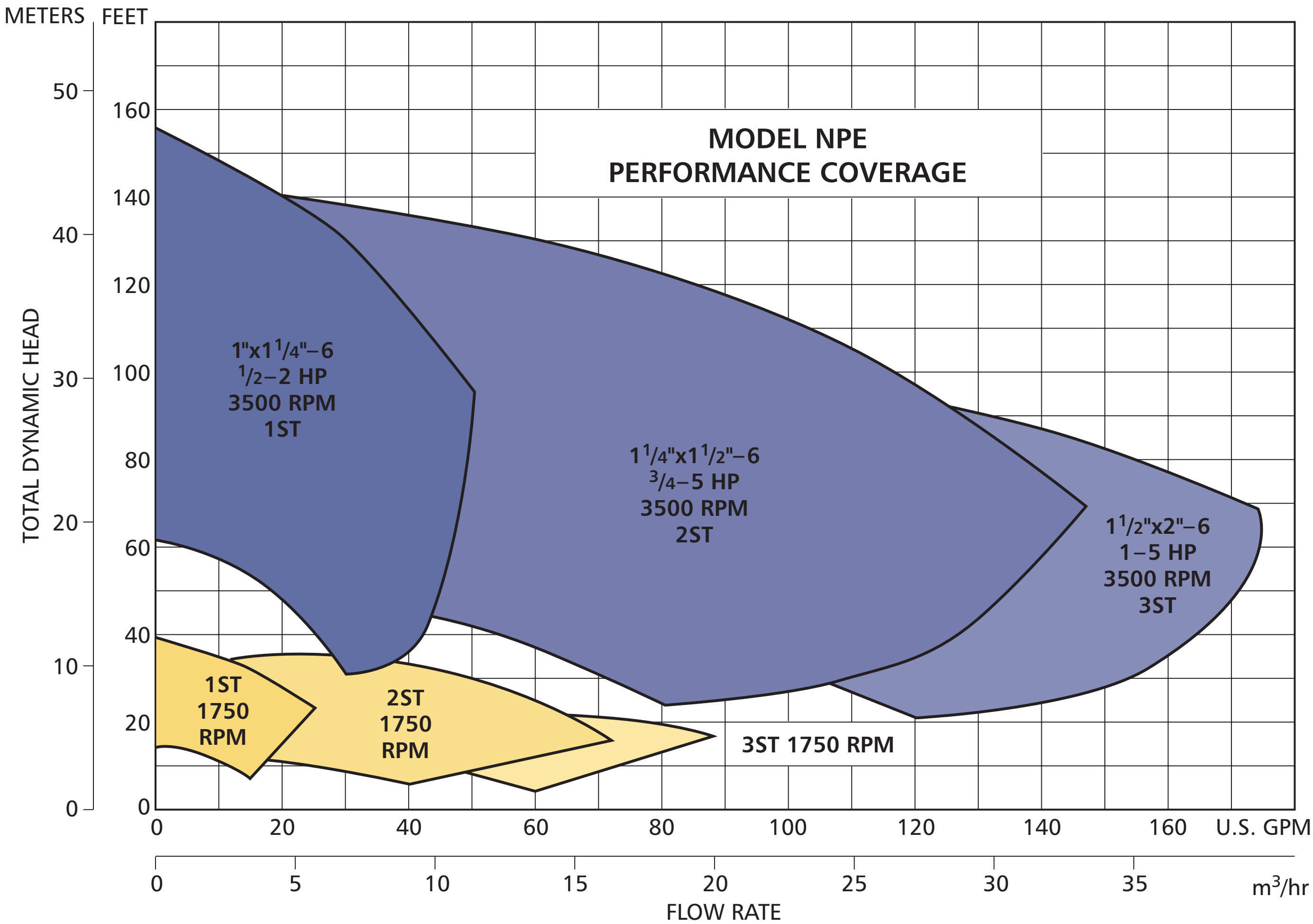
Seal Face Vent/Flush Option

Item No.	Description	Materials
100	Casing	AISI 316 SS
101	Impeller	AISI 316 SS
108	Motor adapter	AISI 304 SS
108A	Motor adapter seal vent/flush	AISI 304 SS
109	Bearing cover	Cast iron
112	Ball bearing (outboard)	Steel
122	Shaft	AISI 316 SS
123	Deflector	BUNA-N
138	Lip-seal (inboard)	BUNA/steel
139	Lip-seal (outboard)	BUNA/steel
168	Ball bearing (inboard)	Steel
184	Seal housing	AISI 316 SS
184A	Seal housing seal vent/flush	AISI 316 SS
228	Bearing frame	Cast iron
304	Impeller locknut	AISI 316 SS
347	Guidevane	AISI 316 SS

Item No.	Description	Materials
349	O-ring	Viton
361	Retaining ring	Steel
370	Socket head screws, casing	AISI 430 SS
370C	Hex head screw, bearing cover	Plated steel
371	Bolts, motor	Plated steel
383	Mechanical seal	Carbon/Sil-Carbide, Viton elastomers, 316 Stainless metal parts*
400	Shaft key	316
408	Drain and vent plug, casing	AISI 316 SS
412B	O-ring, drain and vent plug	Viton
513	O-ring, casing	Viton
Motor	NEMA standard, 56J flange	

**Optional high temperature and chemical duty seals available*

NPE PERFORMANCE CURVES 60 Hz USA



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Goulds Pumps
1 Goulds Drive
Auburn, NY 13021

Goulds Pumps

ITT Industries

AIR 600

TYPICAL FLOWS	50-450 scfm
MAXIMUM SUGGESTED FLOW	600 scfm
MAXIMUM OPERATING PRESSURE	5 psig
MAXIMUM TEMPERATURE	140ºF

Height: 46”
Diameter: 36”

STANDARD FEATURES

- Up-flow adsorber with 600 lbs. coal-base virgin or reactivated carbon
- Heavy-duty vessel with corrosion resistant interior coating and components
- Over 1,000 in² of surface area for superior air distribution and the lowest pressure drops
- 4” FNPT inlet and outlet connections
- Advanced internal distribution and collection systems designed to optimize carbon usage rates, minimizing operating expenses

OPTIONAL FEATURES

- Polyethylene liner
- Cam-Lok fittings
- Pressure gauge assembly
- Sample port assembly
- Pressure relief valve
- Condensate drain line
- Flexible hose assemblies

•P.O. Box 305•Eighty Four, PA 15330•Phone: 724.222.3334•Fax: 724.222.4095•
•P.O. Box 618102•Orlando, FL 32861•Phone: 407.313.9113•Fax: 407.313.9114•

APPENDIX O

PetroFix Design Assistant® Spreadsheet

SUPERIOR RADHE OIL

LAST UPDATED
05.30.19

Around MW-2

SOURCE AREA

Application Summary

PetroFix Amount	400 lbs
Treatment Surface Area	154.0 ft^2
Delivery Points	4
Point Spacing	6.0 ft
Top of Treatment Interval	22.0 ft bgs
Bottom of Treatment Interval	30.0 ft bgs
Vertical Treatment Interval Thickness	8.0 ft
Treatment Volume	46 yd^3
PetroFix Dose	8.77 lb/yd^3

Total Volume	922 gal
Product Volume	41 gal
Water Volume	881 gal
Injection Volume/Point	230 gal
Inject Volume/Vertical ft	29 gal
Product/Point	10.2 gal
Water/Point	220.2 gal
Soil Type	Mix of coarse and fine
Effective Pore Volume Fill %	50%

Mix Tank Volume	NA gal
Dilution Factor	22.51
PetroFix per Mix Tank	NA gal
Water per Mix Tank	NA gal
Number of Batches Required	NA

AREA NOTES

REPORTED

Ground Water Concentrations (µg/L)

Benzene	0
Toluene	0
Ethylbenzene	121
Xylenes	19
Trimethylbenzenes	0
Butylbenzene	0

NAPL Present?	No
Isopropylbenzene	110
Naphthalenes	137
MTBE	0
TPH-GRO	0
TPH-DRO	0
Total Contaminant Mass:	**387**