

## Transmittal

To: Petro Star Inc.

Attn: Ms. Lisa Lewis

3900 C Street, Suite 802

Date: 1/15/16

Anchorage, AK 99503

Project: Monitoring Well Installation and Sampling,  
Petro Star Refinery, North Pole, Alaska  
(31-1-11551-008)

Copies To: Mr. Robert Burgess, ADEC (*PDF by E-mail and 1 hard copy by USPS*)

We have enclosed the following items:

Copies	Description
1	Hard copy (1 original) <i>Monitoring Well Installation &amp; Sampling, Petro Star Refinery, North Pole, Alaska</i>
1	CD with PDF copy <i>Monitoring Well Installation &amp; Sampling, Petro Star Refinery, North Pole, Alaska</i>

These are transmitted by:

☒ E-mail

☒ USPS

☐ Courier

☐ Hand-delivered

Comments:

By: Jennifer Davis  
Title: Environmental Scientist

**Monitoring Well Installation and Sampling  
Petro Star Refinery  
North Pole, Alaska**

January 2016

Submitted To:  
Petro Star Inc.  
3900 C Street, Suite 802  
Anchorage, Alaska 99503

By:  
Shannon & Wilson, Inc.  
2355 Hill Road  
Fairbanks, Alaska 99709-5326

31-1-11551-008

**MONITORING WELL INSTALLATION AND SAMPLING  
PETRO STAR REFINERY  
NORTH POLE, ALASKA**

January 2016

Prepared by:

SHANNON & WILSON, INC.  
2355 Hill Road  
Fairbanks, Alaska 99709-5326

Prepared by:           Jennifer Davis  
                                Environmental Scientist

Reviewed by:           Mark Lockwood, C.P.G.  
                                Senior Associate

Prepared for:

Petro Star Inc.  
3900 C Street, Suite 802  
Anchorage, Alaska 99503

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION.....	1
2.0 BACKGROUND.....	1
3.0 SAMPLING AND OBSERVATIONS .....	2
3.1 Soil Borings.....	2
3.2 Monitoring-Well Installation, Development, & Sampling.....	3
3.3 Investigated-Derived Waste (IDW) .....	4
3.4 Deviations from Work Plan.....	4
4.0 RESULTS.....	4
4.1 Soil Samples.....	5
4.2 Groundwater Samples .....	6
5.0 QUALITY ASSURANCE/QUALITY CONTROL REVIEW .....	7
5.1 Sample Handling and Holding Times .....	7
5.2 Analytical Sensitivity .....	7
5.3 Accuracy.....	8
5.4 Precision .....	8
5.5 Data Quality Summary .....	9
6.0 CONCLUSIONS AND RECOMMENDATIONS.....	10
6.1 Soil .....	10
6.2 Groundwater.....	10
7.0 LIMITATIONS .....	10
8.0 REFERENCES.....	13

TABLES

1     Soil-Sample Analytical Results ..... 5  
2     Groundwater-Sample Analytical Results ..... 6

FIGURES

1     Figure 1 – Vicinity Map  
2     Figure 2 – Site Map  
3     Figure 3 – Monitoring Well Locations & Soil/Water Sampling Results  
4     Figure 4 – Log of Geoprobe SB15-01  
5     Figure 5 – Log of Geoprobe SB15-02  
6     Figure 6 – Log of Geoprobe SB15-03  
7     Figure 7 – Log of Geoprobe SB15-04

APPENDICES

A     SGS Analytical Laboratory Reports and ADEC Laboratory Data-Review Checklists  
B     *Important Information about your Geotechnical/Environmental Report*

**ACRONYMS**

ADEC	Alaska Department of Environmental Conservation
bgs	below the ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes, Total Xylenes
COC	chain-of-custody
DTW	depth to water
EPA	Environmental Protection Agency
GRO	gasoline range organics
IDW	investigation-derived waste
kg	kilogram
LCS	laboratory control samples
LCSD	laboratory control sample duplicates
LOD	limit of detection
LOQ	limit of quantitation
MC	Macro-Core®
MS	matrix spikes
MSD	matrix spike duplicates
mg	milligram
PID	photoionization detector
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RPD	relative percent difference
SP	Screen Point
WO	work order
µg/L	micrograms per liter

## **MONITORING WELL INSTALLATION AND SAMPLING PETRO STAR REFINERY, NORTH POLE, ALASKA**

### **1.0 INTRODUCTION**

We completed the installation, development, and environmental sampling of four monitoring wells at the Petro Star Refinery, located at 1200 H&H Road in North Pole, Alaska (Figure 1). The work was part of the long-term monitoring plan for the area in which gasoline fuel was released in December 2010. This work was performed in accordance with Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Regulations (18 AAC 75) and our July 2015 Groundwater Investigation Work Plan. Our objectives for this project were to install and develop monitoring wells downgradient (northwest) of the gasoline release area (Figure 2), and to sample soil and groundwater at the location of each monitoring well in order determine if contaminants have migrated downgradient of the release area.

### **2.0 BACKGROUND**

In December 2010, approximately 230 gallons of unleaded gasoline were released from a 600-gallon above-ground storage tank to ground surface. Shannon & Wilson performed an initial site assessment in December 2010, followed by excavation of contaminated soil, and field-screening and sampling of soil from the extent of the excavation and from test pits located outside the area of release, in 2011. In September 2014, we installed and sampled soil and groundwater at temporary well-points and soil borings in order to characterize the lateral and vertical extent of contamination. We summarized the results of the September 2014 characterization in the Gasoline Release Investigation, Soil and Groundwater Characterization report from February 2015. We detected benzene, toluene, ethylbenzene, and xylenes (BTEX) at concentrations above the Alaska Department of Environmental Conservation (ADEC) cleanup levels in groundwater at four sampling locations (SB14-02, SB14-03, SB14-06 and SB14-07; Figure 2), and in one soil sample location (SB14-06). Contamination in subsurface soil appeared confined to the east edge of the 2011 excavation, where structures restricted further excavation. We recommended installing four monitoring-wells downgradient (northwest) of the release in order to allow for monitoring of contaminated groundwater migration. We performed this work in July and August of 2015 and this report describes our results.

### 3.0 SAMPLING AND OBSERVATIONS

On July 29, 2013, Shannon & Wilson advanced and sampled four soil borings and installed four monitoring wells at each soil boring, which were downgradient of the gasoline release area. We field-screened and collected analytical samples from each soil boring to assess the presence and magnitude of petroleum contamination at the monitoring well locations. We developed each monitoring well (labeled MW-1 through MW-4 in Figure 2), collecting one groundwater sample from each. We retained the services of GeoTek Alaska, Inc. (GeoTek) to perform soil sampling and install monitoring wells using a Geoprobe® direct-push, track-mounted drill rig (Geoprobe). Soil boring and monitoring well locations are shown in Figure 3.

Shannon & Wilson personnel performed field activities and handled analytical and quality control samples in accordance with our ADEC-approved July 2015 Work Plan and the ADEC 2010 Draft Field Sampling Guidance.

#### 3.1 Soil Borings

GeoTek advanced soil borings with a Geoprobe equipped with a Macro-Core® (MC) tooling system, which retrieved continuous soil cores in 5-foot-long, 2.00-inch-diameter, PVC sample tubes. Seth Robinson, a Qualified Person per ADEC definitions, with our Fairbanks office, field-screened soil samples using a photoionization detector (PID) to select appropriate samples for laboratory analysis, collected soil samples for analytical testing, and visually classified soil cores.

We advanced and logged each boring to 15 feet below ground surface (bgs). We encountered groundwater-saturated soil between 6.5 and 8 feet bgs. If we encountered groundwater-saturated soil in the bottom half of a sample tube, we logged and field screened soil from one additional 5-foot sample interval. We present soil boring logs as Figures 4 through 7 and summarize subsurface conditions below:

- Subsurface-soil conditions were 0.5-foot to 1.6 feet of fill, consisting of gray-brown silty gravel with sand. The fill was underlain by 0.6-foot to 1.8 feet of gray silt laminated with red-brown silt, with trace (less than 5 percent by mass) to some (0 to 15 percent by mass) sand, or gray sand laminated with red-brown sand, with few (5 to 10 percent by mass) silts. The layer of gray sand and/or silt with red sand/silt laminations was underlain by 4.1 feet to 13.2 feet of gray to gray-brown poorly graded sand with trace to some gravel and cobbles. With the exception of SB15-04, the poorly graded sand layer was underlain



by gray to dark gray poorly graded gravel with trace to little (15 to 25 percent by mass) sand and cobbles.

- At soil borings SB15-01 and SB15-04, we encountered a 0.6-foot to 1.2-foot layer of red-brown sand with little silt beneath the layer of laminated silt.
- The bottom layer of poorly graded gravel at soil boring SB15-02 was interbedded with a 0.4-foot thick layer of poorly graded sand with trace silt.
- Soil did not exhibit an odor or petroleum-hydrocarbon sheen.

PID field-screening results ranged from 0 parts per million (ppm) to 4.8 ppm; therefore, we collected one analytical soil sample from the 1- to 2-foot interval located immediately above the soil-water interface at each soil boring. We submitted four analytical soil samples and one field duplicate to SGS North America Inc. (SGS) in Fairbanks, an ADEC-approved analytical laboratory. SGS analyzed the samples for gasoline range organics (GRO) by Alaska Method AK101, and BTEX by Environmental Protection Agency (EPA) Method 8021B.

### **3.2 Monitoring-Well Installation, Development, & Sampling**

The groundwater monitoring wells were installed in general accordance with ADEC Monitoring Well Guidance, dated September 2013. The monitoring well was constructed of two-inch-diameter Schedule 40 PVC and has an approximate ten-foot section of 0.010-inch slotted screen and threaded cap end. The screen extends from 6.1 to 16.1 feet bgs at MW-1 (Figure 4), 4.9 to 14.8 ft bgs at MW-2 (Figure 5), 4.5 to 14.5 ft bgs for MW-3 (Figure 6), and 5.5 to 15.3 at MW-4 (Figure 7). The filter pack at each well extends from approximately two feet above the screened interval to the base of the well, and is comprised of 10/20 Colorado silica sand. We backfilled each boring with approximately one foot of hydrated bentonite above the sand filter pack. We then used natural backfill to fill the hole to the surface. All four monitoring wells were constructed with a flush-mount monument, comprised of 8-inch-diameter steel, encased with a 12-inch concrete skirt.

We developed each well the day after well installation to ensure proper hydraulic connection to the aquifer. We used a submersible pump with disposable 3/4-inch internal diameter cross-lined polyethylene tubing to develop the well. We removed approximately 30 gallons of purge water from each well, agitating continuously in order to remove the maximum amount of silt and fine-grained sand. The amount of sediment removed from each well during development ranged

from 0.01 to 0.05 feet, based on depth-of-well measurements. We observed final purge water from each well to be clear. Refer to Figures 4 through 7 for monitoring well construction details.

Prior to collecting analytical groundwater samples from monitoring wells, Shannon & Wilson personnel measured depth to groundwater (DTW) with a water level meter. We purged and sampled monitoring wells with a 12-volt, battery-powered submersible pump. DTW ranged from 4.56 feet bgs in monitoring well MW-3 to 5.26 feet bgs at monitoring well MW-4. No product was observed in the monitoring wells at the time of sampling.

We submitted groundwater samples from monitoring wells to SGS for analysis of GRO and BTEX by the methods previously described.

### **3.3 Investigated-Derived Waste (IDW)**

Soil field-screening results did not exceed 20 ppm; therefore, Shannon & Wilson spread excess soil not used as soil-boring backfill and not selected for laboratory analysis on the ground surface at each boring location, as per our July 2015 work plan.

We routed purge and decontamination water into the on-site oil/water separator drain. Other IDW, consisting of disposable sampling equipment (e.g., nitrile gloves and pump tubing), was disposed of at the Fairbanks North Star Borough landfill.

### **3.4 Deviations from Work Plan**

The investigative work summarized in this report was completed in general accordance with the July 2015 Work Plan. No deviations from the Work Plan were noted

## **4.0 RESULTS**

The laboratory analytical report and ADEC Laboratory Data-Review Checklists for the soil and groundwater samples are included as attachments to this report. Analytical results for soil and groundwater are presented as Tables 1 and Table 2, respectively. We compared soil sample results to Alaska's 18 AAC 75.341 Tables B1 and B2, Method Two – Soil Cleanup Level for Migration to Groundwater for the "Under 40 Inch Zone" and groundwater sample results to the cleanup levels listed in 18 AAC 75.345 Table C – Groundwater Cleanup Levels. Relevant ADEC soil and groundwater cleanup levels are included in Tables 1 and 2.

#### 4.1 Soil Samples

We summarize soil-sample analytical results in Table 1. Analytes were not detected above their limits of quantitation (LOQs) or ADEC soil cleanup levels in soil samples. SGS detected o-xylene at estimated concentrations below the LOQ of 0.0105J milligrams per kilogram (mg/kg) and 0.0212J mg/kg in samples *SB15-02(6.0'-7.0')* and *SB15-03(6.3'-7.3')*, respectively. SGS also detected toluene at estimated concentrations below the LOQ in each soil sample; however, these detections are attributable to transportation cross-contamination, and we consider these toluene results to be not detected at the LOQ; see the Quality Assurance/Quality Control (QA/QC) section for details. Other analytes were not detected in soil samples.

**TABLE 1**  
**SOIL-SAMPLE ANALYTICAL RESULTS**

Analyte	Units	ADEC Cleanup Level	SB15-01 (6.0'-6.5')	SB15-02 (6.0'-7.0')	SB15-102 (6.0'-7.0')	SB15-03 (6.3'-7.3')	SB15-04 (7.0'-8.0')
			Project Sample	Project Sample	Duplicate Sample	Project Sample	Project Sample
GRO	mg/kg	300	<1.23	<1.25	<1.41	<1.51	<1.14
Total Solids	mg/kg	--	86.9	89.7	87.7	80.8	89.8
Benzene	mg/kg	0.025	<0.00610	<0.00625	<0.00705	<0.00760	<0.00570
Ethylbenzene	mg/kg	6.90	<0.0123	<0.0126	<0.0141	<0.0152	<0.0114
o-Xylene	mg/kg	--	<0.0123	0.0105J	<0.0141J*	0.0212J	<0.0114
P & M - Xylene	mg/kg	--	<0.0245	<0.0251	<0.0281	<0.0303	<0.0227
Xylenes (total)	mg/kg	63	<0.0368	<0.0356J	<0.0422J*	<0.0515J	<0.0341
Toluene	mg/kg	6.50	<0.0245B*	<0.0251B*	<0.0281B*	<0.0303B*	<0.0227B*

- ^ ADEC Soil-Cleanup Levels from 18 AAC 75.341 Tables B1 and B2, Method Two - Migration to Groundwater for the "Under 40 Inch Zone"
- ADEC Alaska Department of Environmental Conservation
- mg/kg milligrams per kilogram
- < Analyte not detected; limit of detection (LOD) listed. Flag applied by laboratory.
- J Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ). Flag applied by laboratory.
- J\* Result is considered estimated due to quality-control failures. See checklist for additional details. Flag applied by Shannon & Wilson, Inc.
- B\* Result is considered not detected at the LOQ or reported concentration (higher value reported) due to contamination identified in a blank. Flag applied by Shannon & Wilson, Inc.
- Not applicable

## 4.2 Groundwater Samples

Groundwater-sample analytical results from well points and groundwater monitoring wells are summarized in Table 2. SGS detected benzene at estimated concentrations below the LOQ of 0.160J micrograms per liter ( $\mu\text{g/L}$ ) and 0.180J  $\mu\text{g/L}$  in samples *MW-1* and *MW-2*, respectively. Sample *MW-1* had estimated o-xylene and p-&m-xylene detections of 0.650J  $\mu\text{g/L}$  and 0.950  $\mu\text{g/L}$ , respectively. Additionally, benzene was detected above the LOQ, but below the cleanup level in sample *MW-3* at a concentration of 1.33  $\mu\text{g/L}$ . Other analytes were not detected in groundwater samples.

**TABLE 2**  
**GROUNDWATER-SAMPLE ANALYTICAL RESULTS**

Analyte / Measurement	Units	ADEC Cleanup Level	MW-1 mg/L	MW-2 Project Sample	MW-102 Duplicate Sample	MW-3 Project Sample	MW-4 Project Sample
Depth-to-Water	ft bgs	--	6.81	5.30	--	4.98	5.99
GRO	mg/L	2.20	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Benzene	mg/L	0.005	0.000160J	0.000180J	<0.000250J*	0.00133	<0.000250
Ethylbenzene	mg/L	0.70	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
o-Xylene	mg/L	--	0.000650J	<0.000500	<0.000500	<0.000500	<0.000500
P & M -Xylene	mg/L	--	0.000950J	<0.00100	<0.00100	<0.00100	<0.00100
Xylenes (total)	mg/L	10	0.001600J	<0.00150	<0.00150	<0.00150	<0.00150
Toluene	mg/L	1.00	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500

^	ADEC water-Cleanup Levels from 18 AAC 75.345 Table C, Groundwater Cleanup Levels
ADEC	Alaska Department of Environmental Conservation
mg/L	milligrams per liter
<	Analyte not detected; limit of detection (LOD) listed. Flag applied by laboratory.
--	Analyte not analyzed in the sample; not applicable
J	Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ). Flag applied by laboratory.
J*	Result is considered estimated due to quality-control failures. See checklist for additional details. Flag applied by Shannon & Wilson, Inc.
ft	Feet
bgs	Below ground surface

## 5.0 QUALITY ASSURANCE/QUALITY CONTROL REVIEW

Quality assurance (QA) and quality control (QC) activities for this project were designed to achieve data quality and reliability. We reviewed the analytical results for laboratory QC samples, and also conducted our own QA assessment for this project (Appendix A, ADEC Laboratory Data Review Checklist). Our QA-review procedures allow us to document the accuracy and precision of the analytical data, and check that the analyses are sufficiently sensitive to detect analytes at levels below regulatory standards.

For this report, we reviewed the soil boring and groundwater data reports for SGS Work Order 1158402. The laboratory report contained a case narrative, sample-receipt form, analytical results, and a copy of chain-of-custody form. Details regarding the results of our QA analysis are presented in the ADEC data-review checklist, included in Appendix A, along with a copy of the SGS laboratory report in Appendix A.

### 5.1 Sample Handling and Holding Times

We reviewed the chain-of-custody and sample-receipt forms included in the laboratory report. The samples were received within the acceptable temperature range of 0 °C to 6 °C.

We checked that each sample was analyzed within the appropriate holding time for selected analyses. In each case, samples were extracted and analyzed within holding-time limits.

### 5.2 Analytical Sensitivity

To evaluate soil-sample limits of detection (LODs), we used 18 AAC 75.341, Method Two, Tables B1 (organic analytes) and B2 (petroleum hydrocarbons) Migration to Groundwater soil-cleanup levels (for the less than 40-inches precipitation zone). To evaluate groundwater-sample LODs we used 18 AAC 75.345 Table C. LODs were below ADEC-established cleanup levels for both soil-sample and groundwater-sample results, where applicable for not-detected results.

We submitted trip blanks with soil and water samples to be analyzed for volatile constituents (GRO and BTEX) to determine if cross-contamination among samples or contamination from an outside source may have occurred during shipment or storage. Toluene was detected in the soil trip blank at a concentration of 0.0135J mg/kg. All of the soil samples produced toluene detections below the LOQ and similar in concentration to that of the trip blank detection, suggesting that some degree of toluene cross-contamination occurred. To account for the

analytical bias the toluene concentrations in all soil samples were flagged 'UB' at the LOQ, denoting them as non-detect values at the most conservative level of sensitivity.

### 5.3 Accuracy

The laboratory assessed the accuracy of its analytical procedures by analyzing laboratory control samples (LCS), LCS duplicates (LCSD), matrix spikes (MS) and matrix spike duplicates (MSD), and analyte surrogates. LCS/LCSD analysis allows the laboratory to evaluate its ability to recover analytes added to clean aqueous matrices, while MS/MSD analysis allows them to evaluate their ability to recover analytes from matrices similar to those of project samples.

Surrogates are organic compounds that are similar to the analytes being evaluated by a given method, and are used to identify the potential for matrix interferences or inefficiencies with sample extraction. LCS/LCSD and MS/MSD samples were reported for GRO, PAH, and BTEX results in soil-sample analyses. In cases where only the LCS was reported for BTEX analysis, a MS/MSD sample set was also analyzed. Laboratory accuracy was also measured for each sample by assessing the recovery of analyte surrogates added to individual project samples.

After a thorough review of the data it was found that all LCS/LCSD, MS/MSD, and surrogate recovery rates were within laboratory control limits. Since all QC criteria were met and no discrepancies or anomalies were reported, the results are considered accurate.

### 5.4 Precision

To evaluate data precision and reproducibility of our sampling techniques, we calculated the relative percent difference (RPD) of duplicate results. RPD is defined as the difference between the sample and its duplicate divided by the mean of the two. We can only evaluate RPDs if the results of the analysis for both the sample and its duplicate are greater than the LOQs for a given analyte.

We collected one duplicate soil-sample pair, samples *SB15-02(6.0'-7.0')* / *SB15-102(6.0'-7.0')*, and one duplicate groundwater sample pair, *MW-2* / *MW-102*. Field duplicate RPDs for GRO and BTEX, were within QC acceptance criteria where RPDs were calculable with two exceptions.

- The soil-sample duplicate pair *SB15-02(6.0'-7.0')* / *SB15-102(6.0'-7.0')* produced an o-xylene detection below the LOQ in the project sample, but the duplicate sample showed no detectable o-xylene concentration. A RPD cannot be calculated in this

situation but the discrepancy must be treated as an RPD failure. The detected o-xylene concentration in the project sample was already flagged 'J' by the laboratory denoting it as an estimate due to it being detected below the LOQ. The o-xylene concentration in the duplicate sample was flagged 'UJ' by Shannon & Wilson, Inc. in order to account for the uncertainty introduced by the RPD failure.

- Similarly the water-sample duplicate pair *MW-2 / MW-102* produced a benzene detection below the LOQ in the project sample, but the duplicate sample showed no detectable benzene concentration. As with the previous duplicate pair an RPD could not be calculated, but the discrepancy was treated as an RPD failure. The detected benzene concentration in the project sample was already flagged 'J' by the laboratory denoting it as an estimate due to it being detected below the LOQ. The benzene concentration in the duplicate sample was flagged 'UJ' by Shannon & Wilson, Inc. in order to account for the uncertainty introduced by the RPD failure.

We also evaluated laboratory analytical precision by RPD calculations. The MS/MSDs and LCS/LCSDs provide information regarding the reproducibility of laboratory procedures, and are therefore a measure of the laboratory's analytical precision. After reviewing the data it was found that all project analytes were recovered within laboratory control limits.

## 5.5 Data Quality Summary

By working in accordance with our proposed scope of services, we consider the samples we collected to be representative of site conditions at the locations and times they were obtained. Based on our QA review, no samples were rejected as unusable due to QC failures. For this project, the quality of the analytical data does not appear to have been compromised by analytical irregularities, and results affected by QC anomalies are qualified with appropriate flags.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our observations, field screening, and analytical results of soil and groundwater, Shannon & Wilson presents the following conclusions and recommendations:

### 6.1 Soil

The samples collected from four soil borings installed as part of this project did not contain analytes in exceedance of applicable cleanup levels (Figure 3; Table 1). The extent of subsurface-soil contamination from the gasoline release is restricted to the area along the western edge of the return cooler foundation (Figure 3), where further excavation of contaminated soil was restricted by the foundation.

### 6.2 Groundwater

Groundwater samples collected from the monitoring wells did not contain analytes in exceedance of ADEC cleanup levels (Figure 3; Table 2). Groundwater flow direction in the area of the gasoline spill is generally to the northwest, based on observations on adjacent properties. The monitoring wells were installed to the west and northwest of the 2011 excavation/gasoline spill area. Based on the results of analytical data, we conclude that the gasoline release had not affected groundwater quality in the area of the monitoring wells at the time of sampling. Shannon & Wilson recommends resampling groundwater from the four newly installed monitoring wells (i.e. MW-1, MW-2, MW-3, and MW-4) during spring of 2016 and submitting the samples for analysis of GRO and BTEX. If the analytical sample results determine that GRO and BTEX are not detected in quantities exceeding ADEC cleanup levels and have not increased in concentration, we recommend requesting that ADEC change the site status to “Cleanup Complete – Institutional Controls.”

## 7.0 LIMITATIONS

This report was prepared for the exclusive use of our Client, Petro Star, Inc., and their representatives to document environmental conditions at the Petro Star North Pole refinery site. This work presents our professional judgment as to the conditions in the site. Information presented here is based on the sampling and analyses we performed. It should not be construed as a definite conclusion about the soil or groundwater conditions in the area, and it is possible our tests do not represent the highest levels of contamination at the site. Interpretations and recommendations made by Shannon & Wilson are based solely upon information available to Shannon & Wilson at the time the interpretations and recommendations are made.



The information included in this report is based on limited research and sampling at the site and should be considered representative of the time and location at which the sampling occurred. It was not the intent of our investigation to detect the presence of soil, groundwater, or surface water contaminants other than those for which laboratory analyses were performed; no conclusions can be drawn on the presence or absence of other contaminants. The observed levels of contamination may be dependent upon changes due to natural forces or human activity. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, or other factors beyond our control, our observations and recommendations applicable to this site may need to be revised. If substantial time has elapsed between submission of this report and the start of activities or action based upon it, we recommend this report be reviewed to determine the applicability of the conclusions. We have prepared and included in Appendix B, *Important Information about your Geotechnical/Environmental Report*, to assist you and others in understanding the use and limitations of our reports.

Within the limitations of scope, schedule, and budget, Shannon & Wilson has prepared this report in a professional manner, using that level of skill and care normally exercised for similar projects under similar conditions by reputable and competent environmental consultants currently practicing in this area.

This report was prepared for the exclusive use of our Client; if it is made available to others, it should be for information on the data presented and not as a warranty of conditions described in this report. All documents prepared by Shannon & Wilson are instruments of service with respect to the project for the sole use of our Client. Only our Client shall have the right to rely upon such documents. Such documents are not intended or represented to be suitable for reuse by our Client or others after the passage of time, on extensions of the project, or on any other project. Any such reuse without written verification or adaptation by Shannon & Wilson, as appropriate for the specific purpose intended, shall be at the user's sole risk.

Copies of documents that may be relied upon by our Client are limited to the printed copies (also known as hard copies) signed or sealed by Shannon & Wilson. Text, data, or graphics files in electronic media format are furnished solely for the convenience of our Client. Any conclusion or information obtained or derived from such electronic files shall be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

Because data stored in electronic media can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the Client should perform acceptance tests or procedures within 60 days after its receipt, after which, unless notice of any errors are given in

writing to Shannon & Wilson, the Client shall be deemed to have accepted the data thus transferred. Any errors reported within the 60-day acceptance period shall be corrected by Shannon & Wilson. Shannon & Wilson shall not be responsible for maintaining documents stored in electronic media format after acceptance by the Client.

When transferring documents in electronic media format, Shannon & Wilson does not make any representations as to long-term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used for the document's creation.

## 8.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2016, 18 AAC 75: Oil and other hazardous substances pollution control: Juneau, Alaska, available <http://dec.alaska.gov/commish/regulations/>.

Alaska Department of Environmental Conservation (ADEC), 2016, 18 AAC 75.341 Tables B1 and B2, Method Two – Soil Cleanup Level for Migration to Groundwater for the “Under 40 Inch Zone”.

Alaska Department of Environmental Conservation (ADEC), 2016, 18 AAC 75.345 Table C – Groundwater Cleanup Levels.

Alaska Department of Environmental Conservation (ADEC), 2002, Method AK101: Juneau, Alaska, available <https://dec.alaska.gov/eh/docs/lab/CS/AK101.pdf>

Alaska Department of Environmental Conservation (ADEC), 2010, Draft Field Sampling Guidance, available [http://dec.alaska.gov/spar/csp/guidance/Draft Field Sampling Guidance.pdf](http://dec.alaska.gov/spar/csp/guidance/Draft%20Field%20Sampling%20Guidance.pdf).

ARCADIS U.S., Inc., 2014, Fourth Quarter 2013 Groundwater Monitoring Report, available <http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents.htm>

U.S. Environmental Protection Agency, 1996, Method 8260B, Volatile organic compounds by gas chromatography/mass spectrometry (GC/MS) (rev. 2), in Test methods for evaluating solid waste, physical/chemical methods: Washington, D.C., U.S. Environmental Protection Agency, SW-846, available: <http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>.

## **FIGURES**

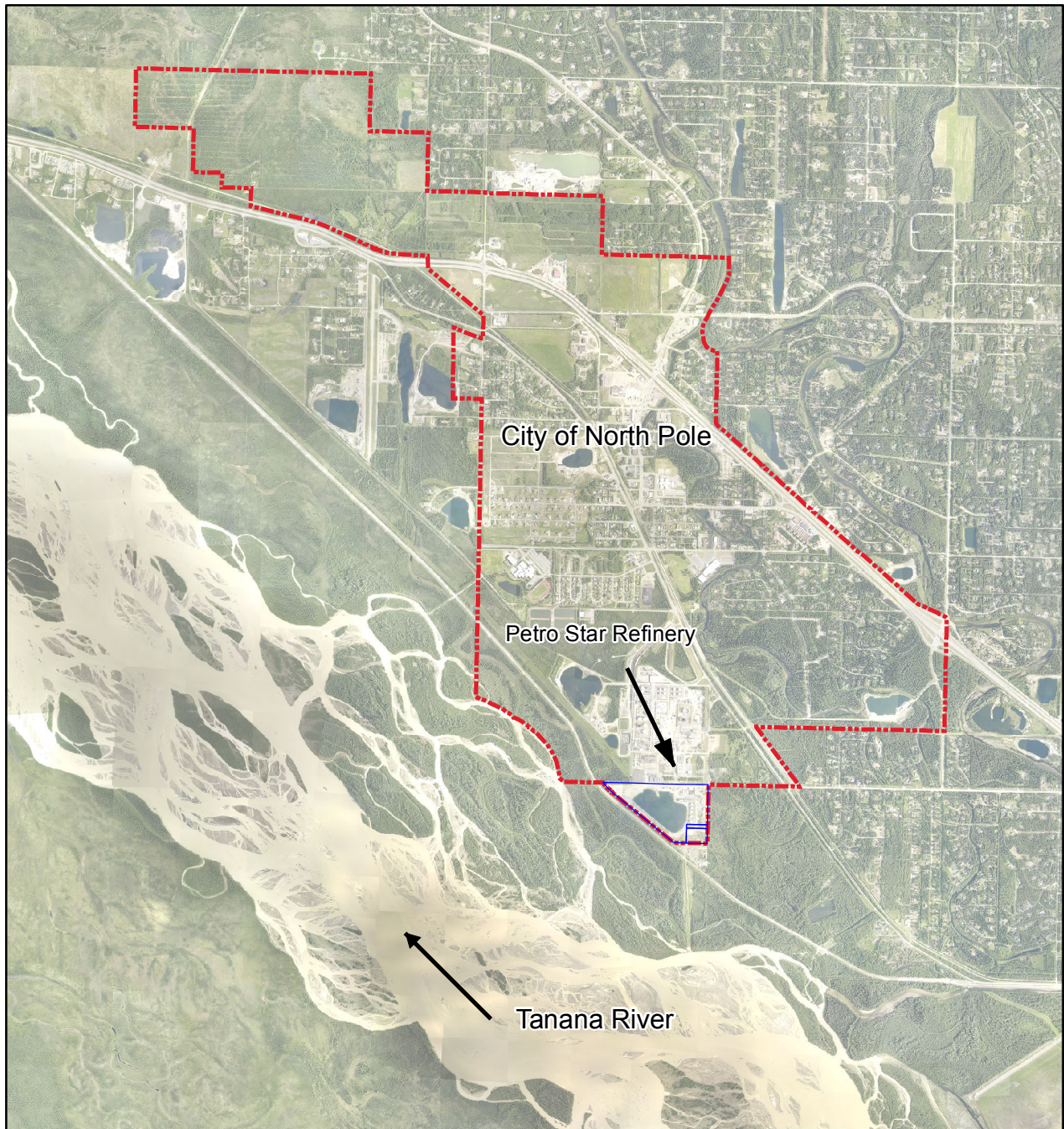


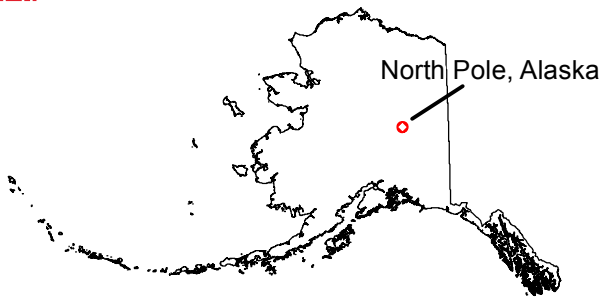
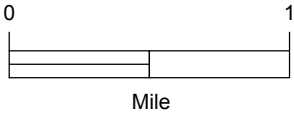
Image provided courtesy of Pictometry International 2012.


**LEGEND**

Petro Star Property Boundary



City of North Pole Boundary



Monitoring Well Installation and Sampling Petro Star Refinery North Pole, Alaska	
<b>VICINITY MAP</b>	
January 2016	31-1-11551-008
 <b>SHANNON &amp; WILSON, INC.</b> <small>GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS</small>	
<b>Figure 1</b>	



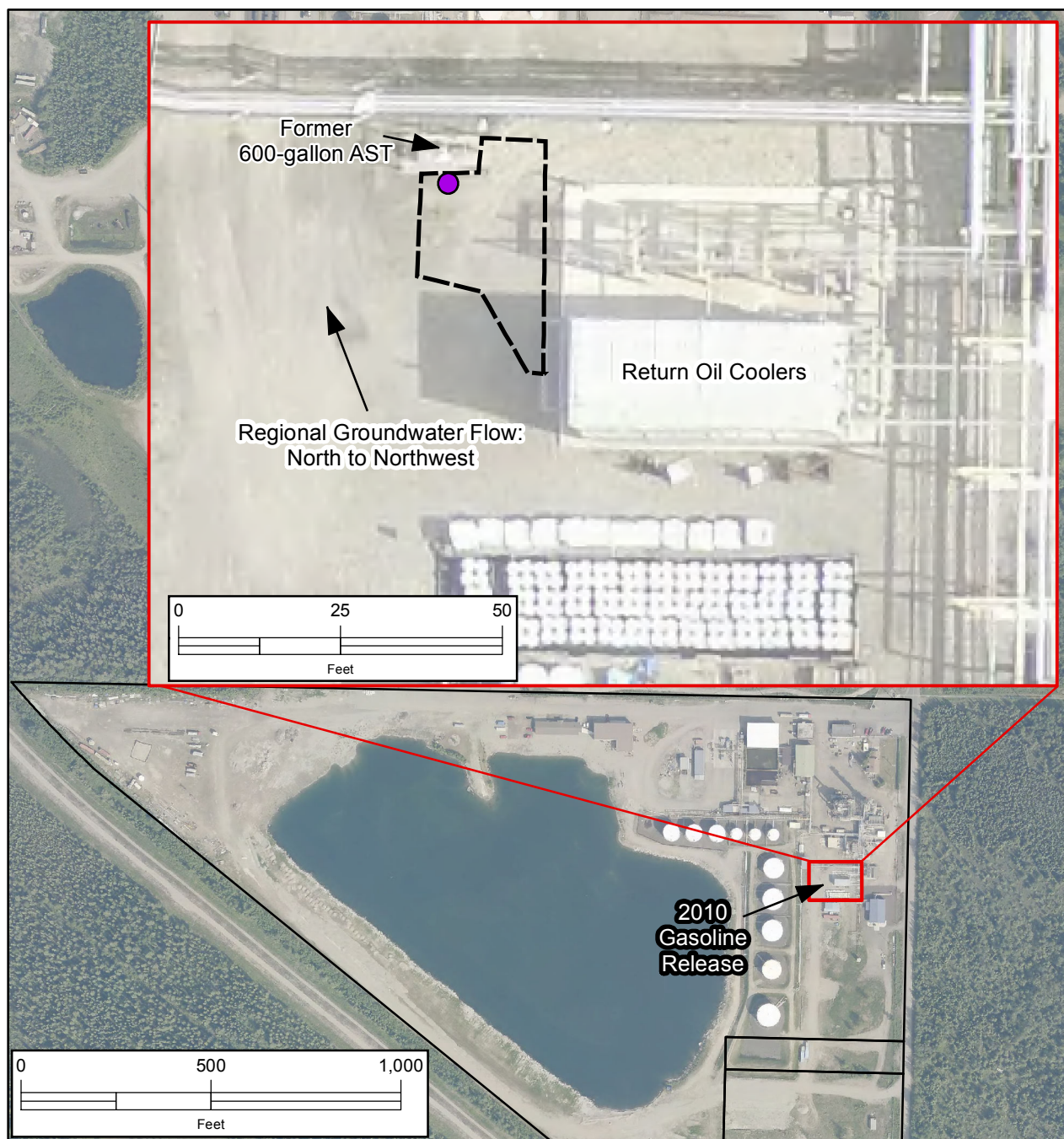


Image provided courtesy of Pictometry International 2012.

### LEGEND

- Petro Star Property Line
- Approximate Surface Extent of Release
- Approximate Gasoline Release Point

Note: Regional groundwater flow direction based on groundwater investigations on adjacent properties. Refer to Section 8.0 for references.



Monitoring Well Installation and Sampling  
Petro Star Refinery  
North Pole, Alaska

### SITE MAP

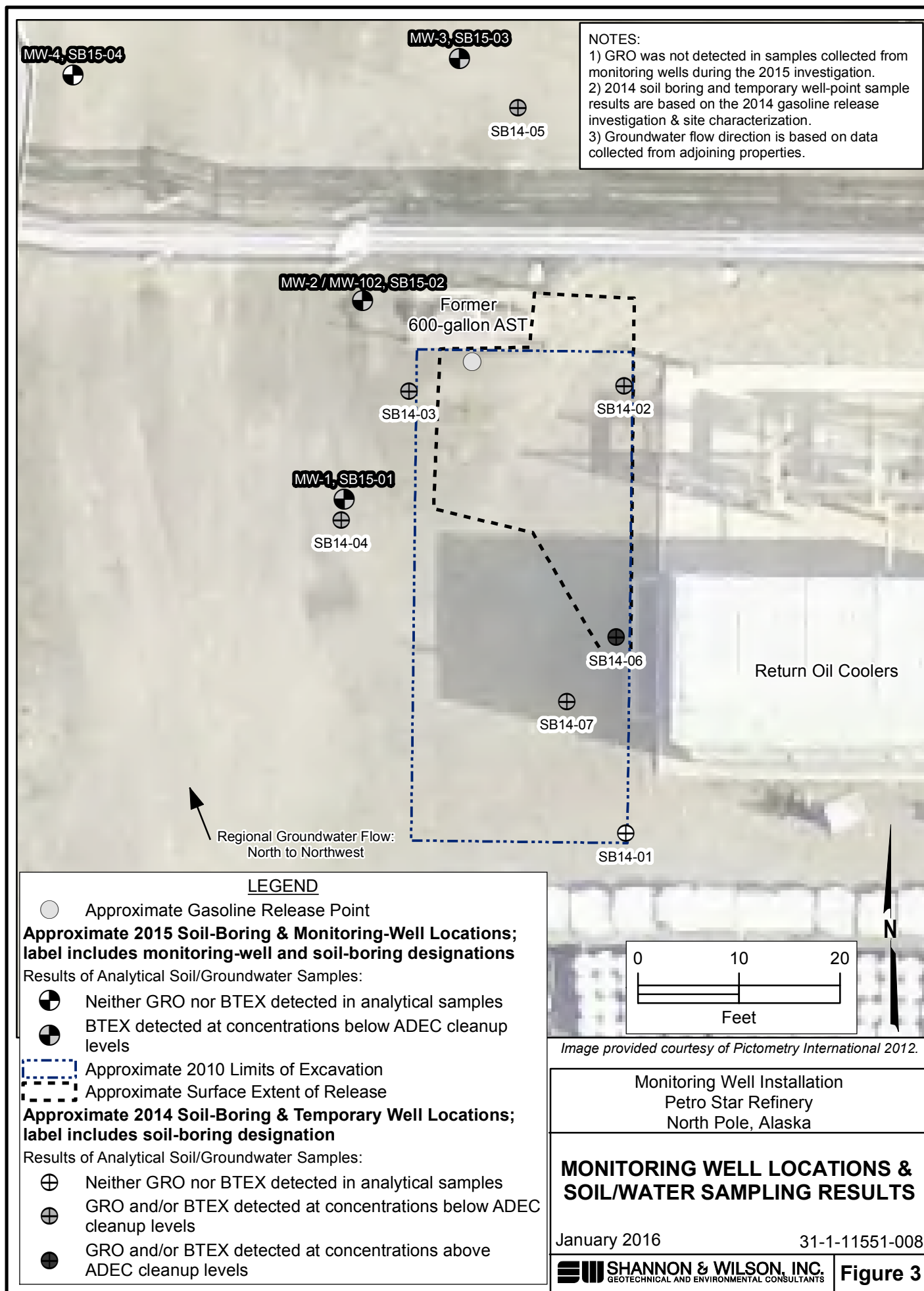
January 2016

31-1-11551-008



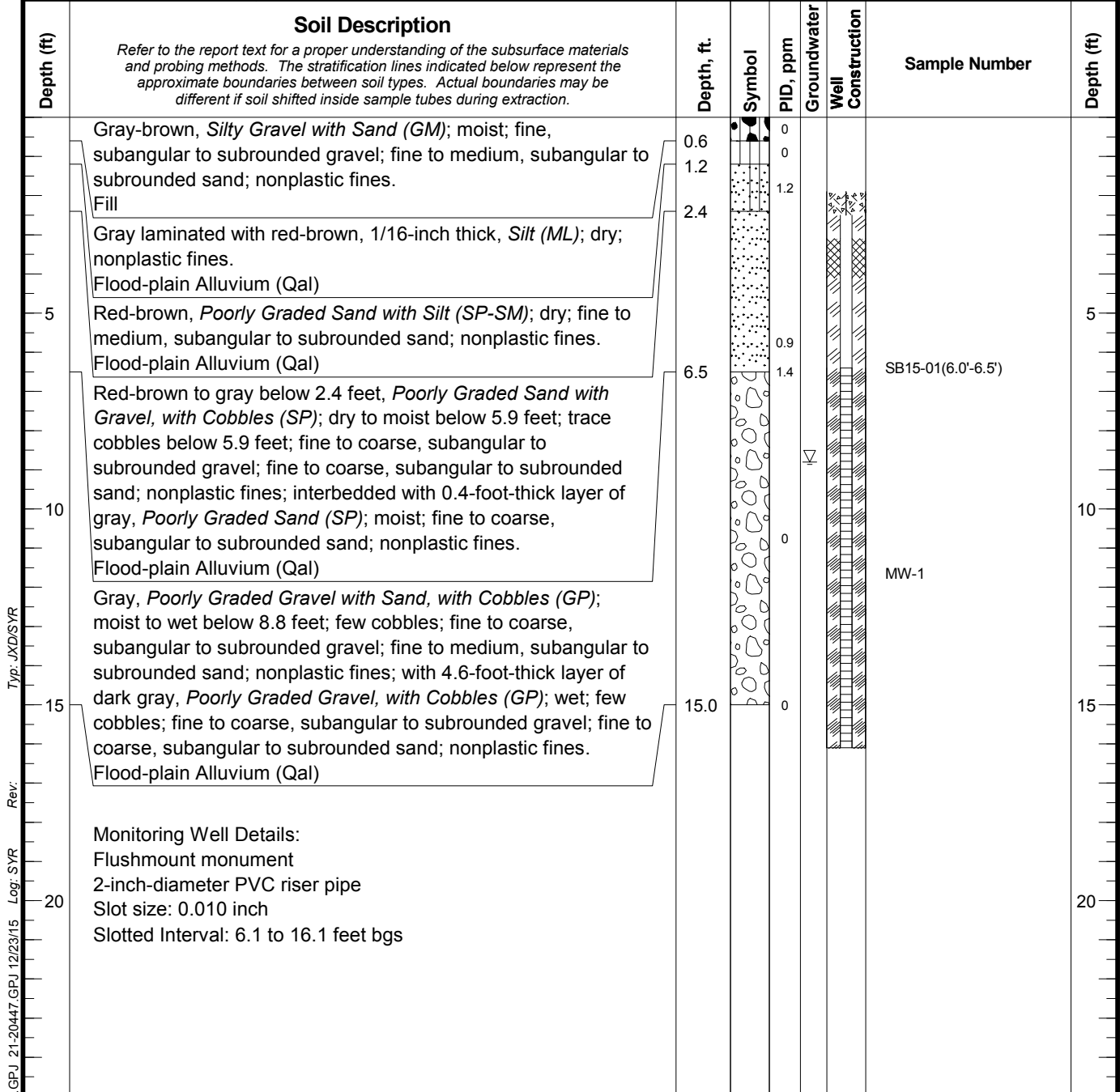
**SHANNON & WILSON, INC.**  
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

**Figure 2**



# LOG OF GEOPROBE

Date Started: 7/29/15	Location: West of release area	Ground Elevation: (Not Measured)
Date Completed: 7/29/15		Typical Run Length: 5 feet
Total Depth: (ft) 16.2	Drilling Company: GeoTek Alaska, Inc.	Hole Diameter: 2.25 inches



## NOTES

- PID calibrated daily with Isobutylene gas.
- Monitoring well, MW-1, installed immediately adjacent to boring location.

## LEGEND

□ Screen

▽ Groundwater Level measured during drilling should be considered approximate.

Monitoring Well Installation and Sampling  
North Pole, Alaska

## LOG OF GEOPROBE SB15-01 (MW-1)

January 2016

31-1-11551-008

**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants

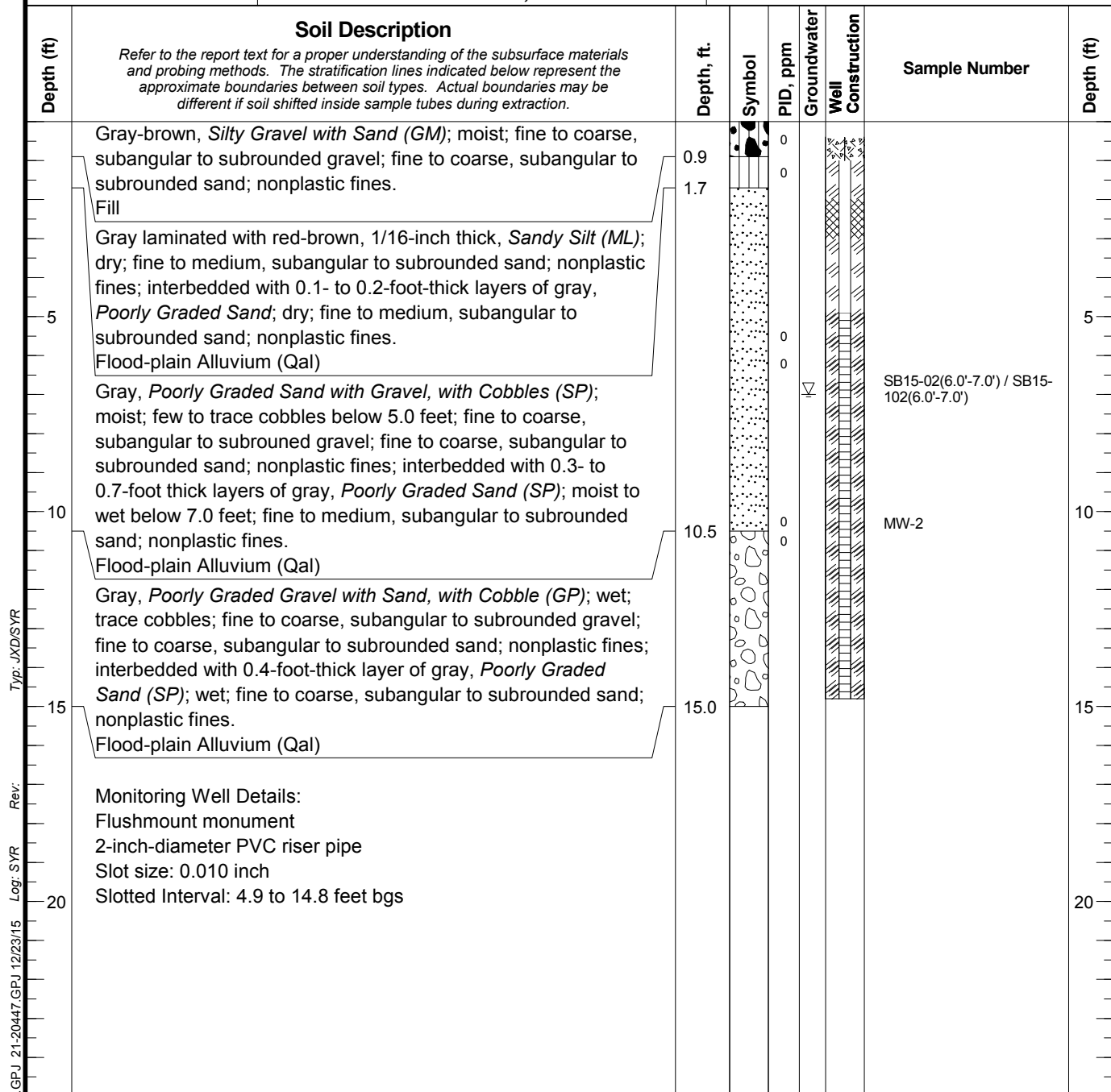
**FIG. 4**

GEOPROBE WELL PEGE 31-1-11551-008 REDO.GPJ 21-20447.GPJ 12/23/15 Log: SYR Rev: Typ: JXD/SYR



# LOG OF GEOPROBE

Date Started:	7/29/15	Location:	Northwest of release area	Ground Elevation:	(Not Measured)
Date Completed:	7/29/15			Typical Run Length:	5 feet
Total Depth: (ft)	15.0	Drilling Company:	GeoTek Alaska, Inc.	Hole Diameter:	2.25 inches



## NOTES

- PID calibrated daily with Isobutylene gas.
- Monitoring well, MW-2, installed immediately adjacent to boring location.

## LEGEND

Screen

Groundwater Level measured during drilling should be considered approximate.

Monitoring Well Installation and Sampling  
North Pole, Alaska

## LOG OF GEOPROBE SB15-02 (MW-2)

January 2016

31-1-11551-008

**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants

**FIG. 5**

# LOG OF GEOPROBE

Date Started:	7/29/15	Location:	Ground Elevation:
Date Completed:	7/29/15	North of release area	(Not Measured)
Total Depth: (ft)	15.0	Drilling Company:	Typical Run Length:
		GeoTek Alaska, Inc.	5 feet
			Hole Diameter:
			2.25 inches

Depth (ft)	Soil Description	Depth, ft.	Symbol	PID, ppm	Groundwater	Well Construction	Sample Number	Depth (ft)
	Refer to the report text for a proper understanding of the subsurface materials and probing methods. The stratification lines indicated below represent the approximate boundaries between soil types. Actual boundaries may be different if soil shifted inside sample tubes during extraction.							
	Gray-brown, Silty Gravel with Sand (GM); dry; fine to medium, subangular to subrounded sand; nonplastic fines. Fill	0.5		0				
		2.1		4.8				
5	Gray laminated with red-brown, 1/16-inch thick, Silt with Sand (ML); dry; fine to medium, subangular to subrounded sand; nonplastic fine; interbedded with 1.0-foot-thick layer of gray laminated with red-brown, 1/16-inch thick, Poorly Graded Sand with Silt (SP-SM); dry; fine to medium, subangular to subrounded sand; nonplastic fines. Flood-plain Alluvium (Qal)			2.5				5
		7.5		1.3			SB15-03(6.3'-7.3')	
10	Gray, Poorly Graded Sand with Gravel (SP); dry to moist below 2.9 feet to wet below 7.3 feet; fine, subangular to subrounded sand gravel; fine to coarse, subangular to subrounded sand; nonplastic fines. Flood-plain Alluvium (Qal)			0				
				0			MW-3	10
	Gray, Poorly Graded Gravel with Sand, with Cobbles (GP); wet; few cobbles; fine to coarse, subangular to subrounded gravel; fine to coarse, subangular to subrounded sand; nonplastid fines. Flood-plain Alluvium (Qal)			1.4				
15		15.0		0				15
	Monitoring Well Details: Flushmount monument 2-inch-diameter PVC riser pipe Slot size: 0.010 inch Slotted Interval: 4.5 to 14.5 feet bgs							
20								20

## NOTES

- PID calibrated daily with Isobutylene gas.
- Monitoring well, MW-3, installed immediately adjacent to boring location.

## LEGEND

□ Screen

▽ Groundwater Level measured during drilling should be considered approximate.

Monitoring Well Installation and Sampling  
North Pole, Alaska

## LOG OF GEOPROBE SB15-03 (MW-3)

January 2016

31-1-11551-008

SHANNON & WILSON, INC.  
Geotechnical and Environmental Consultants

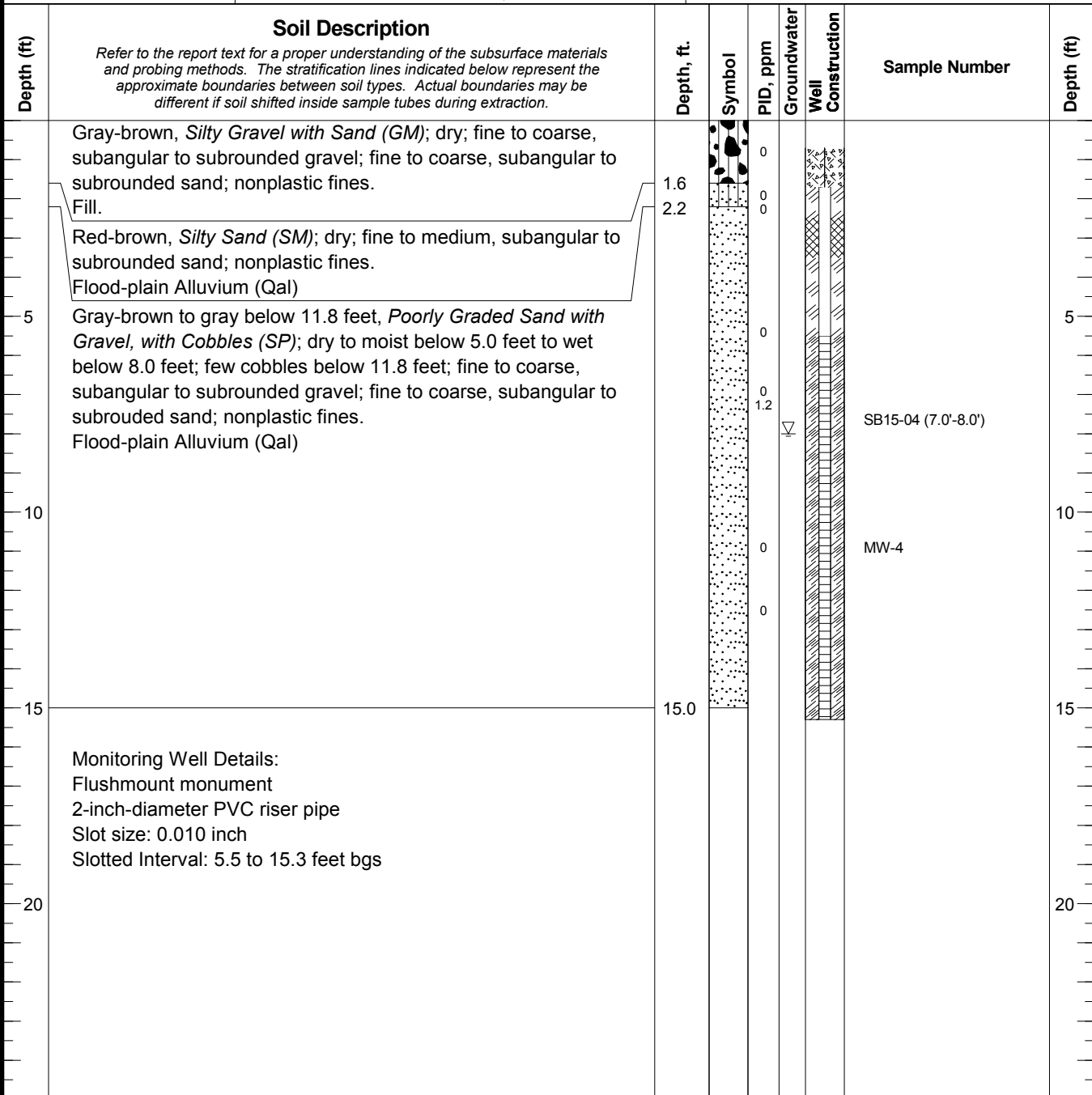
FIG. 6

GEOPROBE WELL PEGE 31-1-11551-008 REDO.GPJ 21-20447.GPJ 12/23/15 Log: SYR Rev: Typ: JXD/SYR

REV 2

# LOG OF GEOPROBE

Date Started: 7/29/15	Location: Northwest of release area	Ground Elevation: (Not Measured)
Date Completed: 7/29/15		Typical Run Length: 5 feet
Total Depth: (ft) 15.5	Drilling Company: GeoTek Alaska, Inc.	Hole Diameter: 2.25 inches



## NOTES

- PID calibrated daily with Isobutylene gas.
- Monitoring well, MW-4, installed immediately adjacent to boring location.

## LEGEND

Screen

Groundwater Level measured during drilling should be considered approximate.

Monitoring Well Installation and Sampling  
North Pole, Alaska

## LOG OF GEOPROBE SB15-04 (MW-4)

January 2016

31-1-11551-008

**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants

**FIG. 7**

**APPENDIX A**

**SGS ANALYTICAL LABORATORY REPORT AND**

**ADEC LABORATORY DATA REVIEW CHECKLIST**

## Laboratory Report of Analysis

To: Shannon & Wilson-Fairbanks  
2355 Hill Rd  
Fairbanks, AK 99709  
(907)479-0600

Report Number: **1158402**

Client Project: **1551-008 Petro Star**

Dear Seth Robinson,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Jennifer at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,  
SGS North America Inc.

  
Alaska Division Technical Director

Stephen Ede  
2015.08.14  
15:36:14 -08'00'

Jennifer Dawkins  
Project Manager

Date

Print Date: 08/14/2015 3:16:38PM

## Case Narrative

SGS Client: **Shannon & Wilson-Fairbanks**

SGS Project: **1158402**

Project Name/Site: **1551-008 Petro Star**

Project Contact: **Seth Robinson**

Refer to sample receipt form for information on sample condition.

\*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

Print Date: 08/14/2015 3:16:39PM

## Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

## Sample Summary

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Collected</u>	<u>Received</u>	<u>Matrix</u>
SB15-01(6.0'-6.5')	1158402001	07/29/2015	08/05/2015	Soil/Solid (dry weight)
SB15-02(6.0'-7.0')	1158402002	07/29/2015	08/05/2015	Soil/Solid (dry weight)
SB15-03(6.3'-7.3')	1158402003	07/29/2015	08/05/2015	Soil/Solid (dry weight)
SB15-04(7.0'-8.0')	1158402004	07/29/2015	08/05/2015	Soil/Solid (dry weight)
SB15-102(6.0'-7.0')	1158402005	07/29/2015	08/05/2015	Soil/Solid (dry weight)
MW-1	1158402006	08/03/2015	08/05/2015	Water (Surface, Eff., Ground)
MW-2	1158402007	08/03/2015	08/05/2015	Water (Surface, Eff., Ground)
MW-3	1158402008	08/03/2015	08/05/2015	Water (Surface, Eff., Ground)
MW-4	1158402009	08/03/2015	08/05/2015	Water (Surface, Eff., Ground)
MW-102	1158402010	08/03/2015	08/05/2015	Water (Surface, Eff., Ground)
Trip Blank	1158402011	07/29/2015	08/05/2015	Soil/Solid (dry weight)
Trip Blank	1158402012	07/29/2015	08/05/2015	Water (Surface, Eff., Ground)

<u>Method</u>	<u>Method Description</u>
AK101	AK101/8021 Combo.
SW8021B	AK101/8021 Combo.
AK101	AK101/8021 Combo. (S)
SW8021B	AK101/8021 Combo. (S)
SM21 2540G	Percent Solids SM2540G

Print Date: 08/14/2015 3:16:42PM



## Detectable Results Summary

Client Sample ID: **SB15-01(6.0'-6.5')**

Lab Sample ID: 1158402001

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Toluene	0.0179J	mg/Kg

Client Sample ID: **SB15-02(6.0'-7.0')**

Lab Sample ID: 1158402002

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
o-Xylene	0.0105J	mg/Kg
Toluene	0.0161J	mg/Kg

Client Sample ID: **SB15-03(6.3'-7.3')**

Lab Sample ID: 1158402003

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
o-Xylene	0.0212J	mg/Kg
Toluene	0.0234J	mg/Kg

Client Sample ID: **SB15-04(7.0'-8.0')**

Lab Sample ID: 1158402004

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Toluene	0.00842J	mg/Kg

Client Sample ID: **SB15-102(6.0'-7.0')**

Lab Sample ID: 1158402005

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Toluene	0.0197J	mg/Kg

Client Sample ID: **MW-1**

Lab Sample ID: 1158402006

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Benzene	0.160J	ug/L
o-Xylene	0.650J	ug/L
P & M -Xylene	0.950J	ug/L

Client Sample ID: **MW-2**

Lab Sample ID: 1158402007

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Benzene	0.180J	ug/L

Client Sample ID: **MW-3**

Lab Sample ID: 1158402008

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Benzene	1.33	ug/L

Client Sample ID: **Trip Blank**

Lab Sample ID: 1158402011

### Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Toluene	0.0135J	mg/Kg

## Results of SB15-01(6.0'-6.5')

Client Sample ID: **SB15-01(6.0'-6.5')**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402001  
 Lab Project ID: 1158402

Collection Date: 07/29/15 12:06  
 Received Date: 08/05/15 10:00  
 Matrix: Soil/Solid (dry weight)  
 Solids (%):86.9  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.23 U	2.45	0.734	mg/Kg	1		08/07/15 13:54

### Surrogates

4-Bromofluorobenzene (surr)	103	50-150		%	1		08/07/15 13:54
-----------------------------	-----	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12568  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/07/15 13:54  
 Container ID: 1158402001-B

Prep Batch: VXX27684  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 12:06  
 Prep Initial Wt./Vol.: 85.246 g  
 Prep Extract Vol: 36.2081 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.00610 U	0.0122	0.00391	mg/Kg	1		08/07/15 13:54
Ethylbenzene	0.0123 U	0.0245	0.00763	mg/Kg	1		08/07/15 13:54
o-Xylene	0.0123 U	0.0245	0.00763	mg/Kg	1		08/07/15 13:54
P & M -Xylene	0.0245 U	0.0489	0.0147	mg/Kg	1		08/07/15 13:54
Toluene	0.0179 J	0.0245	0.00763	mg/Kg	1		08/07/15 13:54

### Surrogates

1,4-Difluorobenzene (surr)	87.2	72-119		%	1		08/07/15 13:54
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12568  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/07/15 13:54  
 Container ID: 1158402001-B

Prep Batch: VXX27684  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 12:06  
 Prep Initial Wt./Vol.: 85.246 g  
 Prep Extract Vol: 36.2081 mL

## Results of SB15-02(6.0'-7.0')

Client Sample ID: **SB15-02(6.0'-7.0')**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402002  
 Lab Project ID: 1158402

Collection Date: 07/29/15 14:10  
 Received Date: 08/05/15 10:00  
 Matrix: Soil/Solid (dry weight)  
 Solids (%):89.7  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.25 U	2.51	0.753	mg/Kg	1		08/06/15 19:04

## Surrogates

4-Bromofluorobenzene (surr)	95.6	50-150		%	1		08/06/15 19:04
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 19:04  
 Container ID: 1158402002-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 14:10  
 Prep Initial Wt./Vol.: 72.091 g  
 Prep Extract Vol: 32.4485 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.00625 U	0.0125	0.00402	mg/Kg	1		08/06/15 19:04
Ethylbenzene	0.0126 U	0.0251	0.00783	mg/Kg	1		08/06/15 19:04
o-Xylene	0.0105 J	0.0251	0.00783	mg/Kg	1		08/06/15 19:04
P & M -Xylene	0.0251 U	0.0502	0.0151	mg/Kg	1		08/06/15 19:04
Toluene	0.0161 J	0.0251	0.00783	mg/Kg	1		08/06/15 19:04

## Surrogates

1,4-Difluorobenzene (surr)	86	72-119		%	1		08/06/15 19:04
----------------------------	----	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 19:04  
 Container ID: 1158402002-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 14:10  
 Prep Initial Wt./Vol.: 72.091 g  
 Prep Extract Vol: 32.4485 mL

## Results of SB15-03(6.3'-7.3')

Client Sample ID: **SB15-03(6.3'-7.3')**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402003  
 Lab Project ID: 1158402

Collection Date: 07/29/15 15:40  
 Received Date: 08/05/15 10:00  
 Matrix: Soil/Solid (dry weight)  
 Solids (%):80.8  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.51 U	3.03	0.910	mg/Kg	1		08/06/15 19:23

### Surrogates

4-Bromofluorobenzene (surr)	111	50-150		%	1		08/06/15 19:23
-----------------------------	-----	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 19:23  
 Container ID: 1158402003-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 15:40  
 Prep Initial Wt./Vol.: 83.752 g  
 Prep Extract Vol: 41.0609 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.00760 U	0.0152	0.00485	mg/Kg	1		08/06/15 19:23
Ethylbenzene	0.0152 U	0.0303	0.00946	mg/Kg	1		08/06/15 19:23
o-Xylene	0.0212 J	0.0303	0.00946	mg/Kg	1		08/06/15 19:23
P & M -Xylene	0.0303 U	0.0607	0.0182	mg/Kg	1		08/06/15 19:23
Toluene	0.0234 J	0.0303	0.00946	mg/Kg	1		08/06/15 19:23

### Surrogates

1,4-Difluorobenzene (surr)	84.4	72-119		%	1		08/06/15 19:23
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 19:23  
 Container ID: 1158402003-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 15:40  
 Prep Initial Wt./Vol.: 83.752 g  
 Prep Extract Vol: 41.0609 mL

## Results of SB15-04(7.0'-8.0')

Client Sample ID: **SB15-04(7.0'-8.0')**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402004  
 Lab Project ID: 1158402

Collection Date: 07/29/15 17:17  
 Received Date: 08/05/15 10:00  
 Matrix: Soil/Solid (dry weight)  
 Solids (%):89.8  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.14 U	2.27	0.682	mg/Kg	1		08/06/15 19:42

### Surrogates

4-Bromofluorobenzene (surr)	90.7	50-150		%	1		08/06/15 19:42
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 19:42  
 Container ID: 1158402004-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 17:17  
 Prep Initial Wt./Vol.: 81.411 g  
 Prep Extract Vol: 33.2722 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.00570 U	0.0114	0.00364	mg/Kg	1		08/06/15 19:42
Ethylbenzene	0.0114 U	0.0227	0.00710	mg/Kg	1		08/06/15 19:42
o-Xylene	0.0114 U	0.0227	0.00710	mg/Kg	1		08/06/15 19:42
P & M -Xylene	0.0227 U	0.0455	0.0136	mg/Kg	1		08/06/15 19:42
Toluene	0.00842 J	0.0227	0.00710	mg/Kg	1		08/06/15 19:42

### Surrogates

1,4-Difluorobenzene (surr)	86.9	72-119		%	1		08/06/15 19:42
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 19:42  
 Container ID: 1158402004-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 17:17  
 Prep Initial Wt./Vol.: 81.411 g  
 Prep Extract Vol: 33.2722 mL

## Results of SB15-102(6.0'-7.0')

Client Sample ID: **SB15-102(6.0'-7.0')**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402005  
 Lab Project ID: 1158402

Collection Date: 07/29/15 14:00  
 Received Date: 08/05/15 10:00  
 Matrix: Soil/Solid (dry weight)  
 Solids (%):87.7  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.41 U	2.81	0.844	mg/Kg	1		08/06/15 20:01

### Surrogates

4-Bromofluorobenzene (surr)	99.4	50-150		%	1		08/06/15 20:01
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 20:01  
 Container ID: 1158402005-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 14:00  
 Prep Initial Wt./Vol.: 67.555 g  
 Prep Extract Vol: 33.316 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.00705 U	0.0141	0.00450	mg/Kg	1		08/06/15 20:01
Ethylbenzene	0.0141 U	0.0281	0.00877	mg/Kg	1		08/06/15 20:01
o-Xylene	0.0141 U	0.0281	0.00877	mg/Kg	1		08/06/15 20:01
P & M -Xylene	0.0281 U	0.0562	0.0169	mg/Kg	1		08/06/15 20:01
Toluene	0.0197 J	0.0281	0.00877	mg/Kg	1		08/06/15 20:01

### Surrogates

1,4-Difluorobenzene (surr)	85.9	72-119		%	1		08/06/15 20:01
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 20:01  
 Container ID: 1158402005-B

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 14:00  
 Prep Initial Wt./Vol.: 67.555 g  
 Prep Extract Vol: 33.316 mL

## Results of MW-1

Client Sample ID: **MW-1**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402006  
 Lab Project ID: 1158402

Collection Date: 08/03/15 14:37  
 Received Date: 08/05/15 10:00  
 Matrix: Water (Surface, Eff., Ground)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		08/08/15 04:12

### Surrogates

4-Bromofluorobenzene (surr)	91.4	50-150		%	1		08/08/15 04:12
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 04:12  
 Container ID: 1158402006-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.160 J	0.500	0.150	ug/L	1		08/08/15 04:12
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		08/08/15 04:12
o-Xylene	0.650 J	1.00	0.310	ug/L	1		08/08/15 04:12
P & M -Xylene	0.950 J	2.00	0.620	ug/L	1		08/08/15 04:12
Toluene	0.500 U	1.00	0.310	ug/L	1		08/08/15 04:12

### Surrogates

1,4-Difluorobenzene (surr)	86	77-115		%	1		08/08/15 04:12
----------------------------	----	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 04:12  
 Container ID: 1158402006-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

## Results of MW-2

Client Sample ID: **MW-2**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402007  
 Lab Project ID: 1158402

Collection Date: 08/03/15 15:06  
 Received Date: 08/05/15 10:00  
 Matrix: Water (Surface, Eff., Ground)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		08/08/15 05:29

### Surrogates

4-Bromofluorobenzene (surr)	88.5	50-150		%	1		08/08/15 05:29
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 05:29  
 Container ID: 1158402007-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.180 J	0.500	0.150	ug/L	1		08/08/15 05:29
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		08/08/15 05:29
o-Xylene	0.500 U	1.00	0.310	ug/L	1		08/08/15 05:29
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		08/08/15 05:29
Toluene	0.500 U	1.00	0.310	ug/L	1		08/08/15 05:29

### Surrogates

1,4-Difluorobenzene (surr)	86.5	77-115		%	1		08/08/15 05:29
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 05:29  
 Container ID: 1158402007-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL



## Results of MW-3

Client Sample ID: **MW-3**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402008  
 Lab Project ID: 1158402

Collection Date: 08/03/15 15:42  
 Received Date: 08/05/15 10:00  
 Matrix: Water (Surface, Eff., Ground)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		08/08/15 05:48

### Surrogates

4-Bromofluorobenzene (surr)	87.8	50-150		%	1		08/08/15 05:48
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 05:48  
 Container ID: 1158402008-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	1.33	0.500	0.150	ug/L	1		08/08/15 05:48
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		08/08/15 05:48
o-Xylene	0.500 U	1.00	0.310	ug/L	1		08/08/15 05:48
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		08/08/15 05:48
Toluene	0.500 U	1.00	0.310	ug/L	1		08/08/15 05:48

### Surrogates

1,4-Difluorobenzene (surr)	85.2	77-115		%	1		08/08/15 05:48
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 05:48  
 Container ID: 1158402008-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

## Results of MW-4

Client Sample ID: **MW-4**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402009  
 Lab Project ID: 1158402

Collection Date: 08/03/15 14:05  
 Received Date: 08/05/15 10:00  
 Matrix: Water (Surface, Eff., Ground)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		08/08/15 06:07

### Surrogates

4-Bromofluorobenzene (surr)	86.3	50-150		%	1		08/08/15 06:07
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 06:07  
 Container ID: 1158402009-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		08/08/15 06:07
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		08/08/15 06:07
o-Xylene	0.500 U	1.00	0.310	ug/L	1		08/08/15 06:07
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		08/08/15 06:07
Toluene	0.500 U	1.00	0.310	ug/L	1		08/08/15 06:07

### Surrogates

1,4-Difluorobenzene (surr)	86.1	77-115		%	1		08/08/15 06:07
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 06:07  
 Container ID: 1158402009-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

## Results of MW-102

Client Sample ID: **MW-102**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402010  
 Lab Project ID: 1158402

Collection Date: 08/03/15 14:56  
 Received Date: 08/05/15 10:00  
 Matrix: Water (Surface, Eff., Ground)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		08/08/15 06:26

### Surrogates

4-Bromofluorobenzene (surr)	89.9	50-150		%	1		08/08/15 06:26
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 06:26  
 Container ID: 1158402010-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		08/08/15 06:26
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		08/08/15 06:26
o-Xylene	0.500 U	1.00	0.310	ug/L	1		08/08/15 06:26
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		08/08/15 06:26
Toluene	0.500 U	1.00	0.310	ug/L	1		08/08/15 06:26

### Surrogates

1,4-Difluorobenzene (surr)	85.7	77-115		%	1		08/08/15 06:26
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 06:26  
 Container ID: 1158402010-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

## Results of Trip Blank

Client Sample ID: **Trip Blank**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402011  
 Lab Project ID: 1158402

Collection Date: 07/29/15 12:06  
 Received Date: 08/05/15 10:00  
 Matrix: Soil/Solid (dry weight)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.25 U	2.50	0.749	mg/Kg	1		08/06/15 18:26

### Surrogates

4-Bromofluorobenzene (surr)	99.6	50-150		%	1		08/06/15 18:26
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 18:26  
 Container ID: 1158402011-A

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 12:06  
 Prep Initial Wt./Vol.: 50.097 g  
 Prep Extract Vol: 25 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	0.00625 U	0.0125	0.00399	mg/Kg	1		08/06/15 18:26
Ethylbenzene	0.0125 U	0.0250	0.00778	mg/Kg	1		08/06/15 18:26
o-Xylene	0.0125 U	0.0250	0.00778	mg/Kg	1		08/06/15 18:26
P & M -Xylene	0.0250 U	0.0499	0.0150	mg/Kg	1		08/06/15 18:26
Toluene	0.0135 J	0.0250	0.00778	mg/Kg	1		08/06/15 18:26

### Surrogates

1,4-Difluorobenzene (surr)	85.8	72-119		%	1		08/06/15 18:26
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/06/15 18:26  
 Container ID: 1158402011-A

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 07/29/15 12:06  
 Prep Initial Wt./Vol.: 50.097 g  
 Prep Extract Vol: 25 mL

## Results of Trip Blank

Client Sample ID: **Trip Blank**  
 Client Project ID: **1551-008 Petro Star**  
 Lab Sample ID: 1158402012  
 Lab Project ID: 1158402

Collection Date: 07/29/15 12:06  
 Received Date: 08/05/15 10:00  
 Matrix: Water (Surface, Eff., Ground)  
 Solids (%):  
 Location:

## Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		08/08/15 00:05

### Surrogates

4-Bromofluorobenzene (surr)	88.2	50-150		%	1		08/08/15 00:05
-----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 00:05  
 Container ID: 1158402012-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		08/08/15 00:05
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		08/08/15 00:05
o-Xylene	0.500 U	1.00	0.310	ug/L	1		08/08/15 00:05
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		08/08/15 00:05
Toluene	0.500 U	1.00	0.310	ug/L	1		08/08/15 00:05

### Surrogates

1,4-Difluorobenzene (surr)	87.2	77-115		%	1		08/08/15 00:05
----------------------------	------	--------	--	---	---	--	----------------

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Analyst: CRD  
 Analytical Date/Time: 08/08/15 00:05  
 Container ID: 1158402012-A

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/15 08:00  
 Prep Initial Wt./Vol.: 5 mL  
 Prep Extract Vol: 5 mL

## Method Blank

Blank ID: MB for HBN 1716153 [SPT/9685]  
Blank Lab ID: 1281894

Matrix: Soil/Solid (dry weight)

QC for Samples:  
1158402001, 1158402002, 1158402003, 1158402004, 1158402005

## Results by SM21 2540G

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Total Solids	99.4			%

## Batch Information

Analytical Batch: SPT9685  
Analytical Method: SM21 2540G  
Instrument:  
Analyst: A.R  
Analytical Date/Time: 8/6/2015 6:40:00PM

Print Date: 08/14/2015 3:16:47PM

## Duplicate Sample Summary

Original Sample ID: 1154262032

Duplicate Sample ID: 1281897

QC for Samples:

Analysis Date: 08/06/2015 18:40

Matrix: Soil/Solid (dry weight)

## Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	69.0	68.5	%	0.76	(< 15 )

## Batch Information

Analytical Batch: SPT9685

Analytical Method: SM21 2540G

Instrument:

Analyst: A.R

Print Date: 08/14/2015 3:16:48PM

## Duplicate Sample Summary

Original Sample ID: 1154262048

Duplicate Sample ID: 1281898

QC for Samples:

1158402001, 1158402002, 1158402003

Analysis Date: 08/06/2015 18:40

Matrix: Soil/Solid (dry weight)

## Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	79.4	80.1	%	0.84	(< 15 )

## Batch Information

Analytical Batch: SPT9685

Analytical Method: SM21 2540G

Instrument:

Analyst: A.R

Print Date: 08/14/2015 3:16:48PM



## Duplicate Sample Summary

Original Sample ID: 1158402003

Duplicate Sample ID: 1281899

QC for Samples:

1158402001, 1158402002, 1158402003, 1158402004, 1158402005

Analysis Date: 08/06/2015 18:40

Matrix: Soil/Solid (dry weight)

## Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	80.8	81.3	%	0.63	(< 15 )

## Batch Information

Analytical Batch: SPT9685

Analytical Method: SM21 2540G

Instrument:

Analyst: A.R

Print Date: 08/14/2015 3:16:48PM

## Method Blank

Blank ID: MB for HBN 1716157 [VXX/27676]  
Blank Lab ID: 1281909

Matrix: Soil/Solid (dry weight)

QC for Samples:  
1158402002, 1158402003, 1158402004, 1158402005, 1158402011

## Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	1.25U	2.50	0.750	mg/Kg
<b>Surrogates</b>				
4-Bromofluorobenzene (surr)	87.2	50-150		%

## Batch Information

Analytical Batch: VFC12565  
Analytical Method: AK101  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/6/2015 11:08:00AM

Prep Batch: VXX27676  
Prep Method: SW5035A  
Prep Date/Time: 8/6/2015 8:00:00AM  
Prep Initial Wt./Vol.: 50 g  
Prep Extract Vol: 25 mL

Print Date: 08/14/2015 3:16:50PM

## Blank Spike Summary

Blank Spike ID: LCS for HBN 1158402 [VXX27676]  
 Blank Spike Lab ID: 1281912  
 Date Analyzed: 08/06/2015 12:06

Spike Duplicate ID: LCSD for HBN 1158402  
 [VXX27676]  
 Spike Duplicate Lab ID: 1281913  
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1158402002, 1158402003, 1158402004, 1158402005, 1158402011

## Results by AK101

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	10.0	9.37	94	10.0	9.74	97	( 60-120 )	3.80	(< 20 )
<b>Surrogates</b>									
4-Bromofluorobenzene (surr)	1.25	88.7	89	1.25	90.1	90	( 50-150 )	1.60	

## Batch Information

Analytical Batch: **VFC12565**  
 Analytical Method: **AK101**  
 Instrument: **Agilent 7890 PID/FID**  
 Analyst: **CRD**

Prep Batch: **VXX27676**  
 Prep Method: **SW5035A**  
 Prep Date/Time: **08/06/2015 08:00**  
 Spike Init Wt./Vol.: 10.0 mg/Kg Extract Vol: 25 mL  
 Dupe Init Wt./Vol.: 10.0 mg/Kg Extract Vol: 25 mL

Print Date: 08/14/2015 3:16:52PM

## Method Blank

Blank ID: MB for HBN 1716157 [VXX/27676]  
Blank Lab ID: 1281909

Matrix: Soil/Solid (dry weight)

QC for Samples:  
1158402002, 1158402003, 1158402004, 1158402005, 1158402011

## Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	0.00625U	0.0125	0.00400	mg/Kg
Ethylbenzene	0.0125U	0.0250	0.00780	mg/Kg
o-Xylene	0.0125U	0.0250	0.00780	mg/Kg
P & M -Xylene	0.0250U	0.0500	0.0150	mg/Kg
Toluene	0.0125U	0.0250	0.00780	mg/Kg
<b>Surrogates</b>				
1,4-Difluorobenzene (surr)	86.1	72-119		%

## Batch Information

Analytical Batch: VFC12565  
Analytical Method: SW8021B  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/6/2015 11:08:00AM

Prep Batch: VXX27676  
Prep Method: SW5035A  
Prep Date/Time: 8/6/2015 8:00:00AM  
Prep Initial Wt./Vol.: 50 g  
Prep Extract Vol: 25 mL

## Blank Spike Summary

Blank Spike ID: LCS for HBN 1158402 [VXX27676]  
 Blank Spike Lab ID: 1281910  
 Date Analyzed: 08/06/2015 11:27

Spike Duplicate ID: LCSD for HBN 1158402  
 [VXX27676]  
 Spike Duplicate Lab ID: 1281911  
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1158402002, 1158402003, 1158402004, 1158402005, 1158402011

## Results by SW8021B

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	1.25	1.37	110	1.25	1.40	112	( 75-125 )	2.00	(< 20 )
Ethylbenzene	1.25	1.28	102	1.25	1.30	104	( 75-125 )	2.00	(< 20 )
o-Xylene	1.25	1.23	98	1.25	1.26	101	( 75-125 )	2.70	(< 20 )
P & M -Xylene	2.50	2.50	100	2.50	2.56	102	( 80-125 )	2.10	(< 20 )
Toluene	1.25	1.34	107	1.25	1.36	109	( 70-125 )	1.80	(< 20 )
<b>Surrogates</b>									
1,4-Difluorobenzene (surr)	1.25	90.2	90	1.25	92.8	93	( 72-119 )	2.80	

## Batch Information

Analytical Batch: VFC12565  
 Analytical Method: SW8021B  
 Instrument: Agilent 7890 PID/FID  
 Analyst: CRD

Prep Batch: VXX27676  
 Prep Method: SW5035A  
 Prep Date/Time: 08/06/2015 08:00  
 Spike Init Wt./Vol.: 1.25 mg/Kg Extract Vol: 25 mL  
 Dupe Init Wt./Vol.: 1.25 mg/Kg Extract Vol: 25 mL

## Matrix Spike Summary

Original Sample ID: 1154231001  
MS Sample ID: 1281914 MS  
MSD Sample ID: 1281915 MSD

Analysis Date: 08/06/2015 12:43  
Analysis Date: 08/06/2015 13:02  
Analysis Date: 08/06/2015 13:21  
Matrix: Soil/Solid (dry weight)

QC for Samples: 1158402002, 1158402003, 1158402004, 1158402005, 1158402011

## Results by SW8021B

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	0.00840U	1.50	1.71	113	1.50	1.73	115	75-125	1.50	(< 20 )
Ethylbenzene	0.0636	1.50	1.57	100	1.50	1.59	102	75-125	1.70	(< 20 )
o-Xylene	0.0498	1.50	1.52	98	1.50	1.55	99	75-125	1.50	(< 20 )
P & M -Xylene	0.205	3.00	3.15	98	3.00	3.21	100	80-125	1.80	(< 20 )
Toluene	0.0169U	1.50	1.60	106	1.50	1.63	108	70-125	1.80	(< 20 )

## Surrogates

1,4-Difluorobenzene (surr)	1.50	1.36	91	1.50	1.37	92	72-119	1.50
----------------------------	------	------	----	------	------	----	--------	------

## Batch Information

Analytical Batch: VFC12565  
Analytical Method: SW8021B  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/6/2015 1:02:00PM

Prep Batch: VXX27676  
Prep Method: AK101 Extraction (S)  
Prep Date/Time: 8/6/2015 8:00:00AM  
Prep Initial Wt./Vol.: 44.68g  
Prep Extract Vol: 25.00mL

Print Date: 08/14/2015 3:16:57PM

## Method Blank

Blank ID: MB for HBN 1716660 [VXX/27684]  
Blank Lab ID: 1282329

Matrix: Soil/Solid (dry weight)

QC for Samples:  
1158402001

## Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	1.25U	2.50	0.750	mg/Kg
<b>Surrogates</b>				
4-Bromofluorobenzene (surr)	88.8	50-150		%

## Batch Information

Analytical Batch: VFC12568  
Analytical Method: AK101  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/7/2015 12:18:00PM

Prep Batch: VXX27684  
Prep Method: SW5035A  
Prep Date/Time: 8/7/2015 8:00:00AM  
Prep Initial Wt./Vol.: 50 g  
Prep Extract Vol: 25 mL

## Blank Spike Summary

Blank Spike ID: LCS for HBN 1158402 [VXX27684]  
 Blank Spike Lab ID: 1282332  
 Date Analyzed: 08/07/2015 13:15

Spike Duplicate ID: LCSD for HBN 1158402 [VXX27684]  
 Spike Duplicate Lab ID: 1282333  
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1158402001

## Results by AK101

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	10.0	9.92	99	10.0	9.99	100	( 60-120 )	0.79	(< 20 )
<b>Surrogates</b>									
4-Bromofluorobenzene (surr)	1.25	89.4	89	1.25	89.2	89	( 50-150 )	0.18	

## Batch Information

Analytical Batch: VFC12568  
 Analytical Method: AK101  
 Instrument: Agilent 7890 PID/FID  
 Analyst: CRD

Prep Batch: VXX27684  
 Prep Method: SW5035A  
 Prep Date/Time: 08/07/2015 08:00  
 Spike Init Wt./Vol.: 10.0 mg/Kg Extract Vol: 25 mL  
 Dupe Init Wt./Vol.: 10.0 mg/Kg Extract Vol: 25 mL

Print Date: 08/14/2015 3:16:59PM



## Method Blank

Blank ID: MB for HBN 1716660 [VXX/27684]  
Blank Lab ID: 1282329

Matrix: Soil/Solid (dry weight)

QC for Samples:  
1158402001

## Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	0.00625U	0.0125	0.00400	mg/Kg
Ethylbenzene	0.0125U	0.0250	0.00780	mg/Kg
o-Xylene	0.0125U	0.0250	0.00780	mg/Kg
P & M -Xylene	0.0250U	0.0500	0.0150	mg/Kg
Toluene	0.0125U	0.0250	0.00780	mg/Kg
<b>Surrogates</b>				
1,4-Difluorobenzene (surr)	83.2	72-119		%

## Batch Information

Analytical Batch: VFC12568  
Analytical Method: SW8021B  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/7/2015 12:18:00PM

Prep Batch: VXX27684  
Prep Method: SW5035A  
Prep Date/Time: 8/7/2015 8:00:00AM  
Prep Initial Wt./Vol.: 50 g  
Prep Extract Vol: 25 mL

## Blank Spike Summary

Blank Spike ID: LCS for HBN 1158402 [VXX27684]  
 Blank Spike Lab ID: 1282330  
 Date Analyzed: 08/07/2015 12:37

Spike Duplicate ID: LCSD for HBN 1158402 [VXX27684]  
 Spike Duplicate Lab ID: 1282331  
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1158402001

## Results by SW8021B

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	1.25	1.39	111	1.25	1.42	113	( 75-125 )	2.00	(< 20 )
Ethylbenzene	1.25	1.24	99	1.25	1.27	102	( 75-125 )	2.70	(< 20 )
o-Xylene	1.25	1.21	97	1.25	1.23	98	( 75-125 )	1.70	(< 20 )
P & M -Xylene	2.50	2.43	97	2.50	2.49	100	( 80-125 )	2.30	(< 20 )
Toluene	1.25	1.31	105	1.25	1.35	108	( 70-125 )	2.90	(< 20 )
<b>Surrogates</b>									
1,4-Difluorobenzene (surr)	1.25	91.9	92	1.25	91.3	91	( 72-119 )	0.63	

## Batch Information

Analytical Batch: VFC12568  
 Analytical Method: SW8021B  
 Instrument: Agilent 7890 PID/FID  
 Analyst: CRD

Prep Batch: VXX27684  
 Prep Method: SW5035A  
 Prep Date/Time: 08/07/2015 08:00  
 Spike Init Wt./Vol.: 1.25 mg/Kg Extract Vol: 25 mL  
 Dupe Init Wt./Vol.: 1.25 mg/Kg Extract Vol: 25 mL

## Matrix Spike Summary

Original Sample ID: 1158402001  
MS Sample ID: 1282334 MS  
MSD Sample ID: 1282335 MSD

Analysis Date: 08/07/2015 13:54  
Analysis Date: 08/07/2015 14:13  
Analysis Date: 08/07/2015 14:32  
Matrix: Soil/Solid (dry weight)

QC for Samples: 1158402001

## Results by SW8021B

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	0.00610U	0.843	0.953	113	0.843	0.928	110	75-125	2.70	(< 20 )
Ethylbenzene	0.0123U	0.843	0.858	102	0.843	0.839	100	75-125	2.30	(< 20 )
o-Xylene	0.0123U	0.843	0.834	99	0.843	0.816	97	75-125	2.30	(< 20 )
P & M -Xylene	0.0245U	1.69	1.69	100	1.69	1.65	98	80-125	2.60	(< 20 )
Toluene	0.0179J	0.843	0.917	107	0.843	0.896	104	70-125	2.40	(< 20 )

## Surrogates

1,4-Difluorobenzene (surr)	0.843	0.778	92	0.843	0.778	92	72-119	0.11
----------------------------	-------	-------	----	-------	-------	----	--------	------

## Batch Information

Analytical Batch: VFC12568  
Analytical Method: SW8021B  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/7/2015 2:13:00PM

Prep Batch: VXX27684  
Prep Method: AK101 Extraction (S)  
Prep Date/Time: 8/7/2015 8:00:00AM  
Prep Initial Wt./Vol.: 85.25g  
Prep Extract Vol: 25.00mL

Print Date: 08/14/2015 3:17:03PM

## Method Blank

Blank ID: MB for HBN 1716661 [VXX/27685]  
Blank Lab ID: 1282336

Matrix: Water (Surface, Eff., Ground)

QC for Samples:  
1158402006, 1158402007, 1158402008, 1158402009, 1158402010, 1158402012

## Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
<b>Surrogates</b>				
4-Bromofluorobenzene (surr)	89.1	50-150		%

## Batch Information

Analytical Batch: VFC12569  
Analytical Method: AK101  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/7/2015 11:08:00PM

Prep Batch: VXX27685  
Prep Method: SW5030B  
Prep Date/Time: 8/7/2015 8:00:00AM  
Prep Initial Wt./Vol.: 5 mL  
Prep Extract Vol: 5 mL

Print Date: 08/14/2015 3:17:04PM

## Blank Spike Summary

Blank Spike ID: LCS for HBN 1158402 [VXX27685]  
 Blank Spike Lab ID: 1282449  
 Date Analyzed: 08/07/2015 22:30

Spike Duplicate ID: LCSD for HBN 1158402 [VXX27685]  
 Spike Duplicate Lab ID: 1282450  
 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1158402006, 1158402007, 1158402008, 1158402009, 1158402010, 1158402012

## Results by AK101

Parameter	Blank Spike (mg/L)			Spike Duplicate (mg/L)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	1.00	1.01	101	1.00	0.995	100	( 60-120 )	1.60	(< 20 )
<b>Surrogates</b>									
4-Bromofluorobenzene (surr)	0.0500	93.5	94	0.0500	90.6	91	( 50-150 )	3.10	

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: AK101  
 Instrument: Agilent 7890 PID/FID  
 Analyst: CRD

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/2015 08:00  
 Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL  
 Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

Print Date: 08/14/2015 3:17:05PM

## Method Blank

Blank ID: MB for HBN 1716661 [VXX/27685]  
Blank Lab ID: 1282336

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

1158402006, 1158402007, 1158402008, 1158402009, 1158402010, 1158402012

## Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
<b>Surrogates</b>				
1,4-Difluorobenzene (surr)	86.6	77-115		%

## Batch Information

Analytical Batch: VFC12569  
Analytical Method: SW8021B  
Instrument: Agilent 7890 PID/FID  
Analyst: CRD  
Analytical Date/Time: 8/7/2015 11:08:00PM

Prep Batch: VXX27685  
Prep Method: SW5030B  
Prep Date/Time: 8/7/2015 8:00:00AM  
Prep Initial Wt./Vol.: 5 mL  
Prep Extract Vol: 5 mL

## Blank Spike Summary

Blank Spike ID: LCS for HBN 1158402 [VXX27685]  
 Blank Spike Lab ID: 1282337  
 Date Analyzed: 08/07/2015 22:11

Spike Duplicate ID: LCSD for HBN 1158402 [VXX27685]  
 Spike Duplicate Lab ID: 1282448  
 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1158402006, 1158402007, 1158402008, 1158402009, 1158402010, 1158402012

## Results by SW8021B

Parameter	Blank Spike (ug/L)			Spike Duplicate (ug/L)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	100		117	100		115	( 80-120 )	1.90	(< 20 )
Ethylbenzene	100		107	100		105	( 75-125 )	1.90	(< 20 )
o-Xylene	100		104	100		102	( 80-120 )	2.80	(< 20 )
P & M -Xylene	200		106	200		103	( 75-130 )	2.80	(< 20 )
Toluene	100		112	100		111	( 75-120 )	1.20	(< 20 )
<b>Surrogates</b>									
1,4-Difluorobenzene (surr)	50	95.5	96	50	94.8	95	( 77-115 )	0.74	

## Batch Information

Analytical Batch: VFC12569  
 Analytical Method: SW8021B  
 Instrument: Agilent 7890 PID/FID  
 Analyst: CRD

Prep Batch: VXX27685  
 Prep Method: SW5030B  
 Prep Date/Time: 08/07/2015 08:00  
 Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL  
 Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

1158402



**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants

400 N. 34th Street, Suite 100  
Seattle, WA 98103  
(206) 682-8020

2355 Hill Road  
Fairbanks, AK 99709  
(907) 479-0600

2255 S.W. Canyon Road  
Portland, OR 97201-2498  
(503) 223-6147

CHAIN-OF-

2705 Saint Andrews Loop, Suite A  
Pasco, WA 99301-3378  
(509) 946-6309

RD

Laboratory SGS Page 1 of 2  
Attn: J. Dawkins

Analysis Parameters/Sample Container Description  
(include preservative if used)

Sample Identity	Lab No.	Time	Date Sampled	Comp	Grab	1202	1575	Total Number of Containers	Remarks/Matrix
SB15-01(6.0'-6.5')	① AB	1206	7/29/15	X	X	X		2	soil
SB15-02(6.0'-7.0')	② AB	1410	"	X					
SB15-03(6.3'-7.3')	③ AB	1540		X					
SB15-04(7.0'-8.0')	④ AB	1717		X					
SB15-102(6.0'-7.0')	⑤ AB	1400		X					
MW-1	⑥ A-C	1437	8/3/15	X				3	Groundwater
MW-2	⑦ A-C	1506		X				3	
MW-3	⑧ A-C	1542		X				3	
MW-4	⑨ A-C	1405		X				3	
MW-102	⑩ A-C	1456		X				3	

Project Information		Sample Receipt	
Project Number:	1551-008	Total Number of Containers	
Project Name:	Petro Stn	COC Seals/Intact?	Y/N/NA
Contact:	SD	Received Good Cond./Cold	
Ongoing Project?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Delivery Method:	Hand
Sampler:	SYL	(attach shipping bill, if any)	

Instructions	
Requested Turnaround Time:	STD TAT
Special Instructions:	Bill to SEW

Distribution: White - w/shipment - returned to Shannon & Wilson w/ laboratory report  
Yellow - w/shipment - for consignee files  
Pink - Shannon & Wilson - Job File

Relinquished By: 1.		Relinquished By: 2.		Relinquished By: 3.	
Signature:	Time: 1645	Signature:	Time: 144	Signature:	Time:
Printed Name:	Date: 8.3.15	Printed Name:	Date: 8.4.15	Printed Name:	Date:
Company:	Shannon & Wilson	Company:	SGS	Company:	
Received By: 1.		Received By: 2.		Received By: 3.	
Signature:	Time: 1645	Signature:	Time:	Signature:	Time: 10:15
Printed Name:	Date: 8.3.15	Printed Name:	Date:	Printed Name:	Date: 8.15.15
Company:	Shannon & Wilson	Company:		Company:	SGS





**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants

400 N. 34th Street, Suite 100 2043 Westport Center Drive  
Seattle, WA 98103 St. Louis, MO 63146-3564  
(206) 632-8020 (314) 699-9660

2355 Hill Road  
Fairbanks, AK 99709  
(907) 479-0600

2255 S.W. Canyon Road  
Portland, OR 97201-2498  
(503) 223-6147

# CHAN-C

2705 Saint Andrews Loop, Suite A  
Pasco, WA 99301-3378  
(509) 946-6309

5430 Fairbanks Street, Suite 3  
Anchorage, AK 99518  
(907) 561-2120

1321 Bannock Street, Suite 200  
Denver, CO 80204  
(303) 825-3800

# FOR YOU

Laboratory SGS  
Attn: J. Davis

Page 2 of 2

Analysis Parameters/Sample Container Description (include preservative if used)

[illegible]

Project Information	Sample Receipt
Project Number: 1551-008	Total Number of Containers
Project Name: P422 Stew	COC Seals/Intact? Y/N/NA
Contact: SJD	Received Good Cond./Cold
Ongoing Project? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Delivery Method: Hand
Sampler: S/R	(attach shipping bill, if any)

<b>Relinquished By: 1.</b> Signature: <u>[Signature]</u> Date: <u>10/4/15</u> Printed Name: <u>Seth Robinson</u> Company: <u>Shannon &amp; Wilson</u>	<b>Relinquished By: 2.</b> Signature: <u>[Signature]</u> Date: <u>8/31/15</u> Printed Name: <u>David</u> Company: <u>[Signature]</u>	<b>Relinquished By: 3.</b> Signature: _____ Date: _____ Printed Name: _____ Company: _____
<b>Received By: 1.</b> Signature: <u>[Signature]</u> Date: <u>10/4/15</u> Printed Name: <u>Seth Robinson</u> Company: <u>[Signature]</u>	<b>Received By: 2.</b> Signature: _____ Date: _____ Printed Name: _____ Company: _____	<b>Received By: 3.</b> Signature: _____ Date: _____ Printed Name: _____ Company: _____

## Instructions

Requested Turnaround Time: STD ~~FAST~~

Special Instructions:

**Distribution:** White - w/shipment - returned to Shannon & Wilson w/ laboratory report  
Yellow - w/shipment - for consignee files  
Pink - Shannon & Wilson - Job File

F-19-91/UR

Trip blanks kept in vesperine coolers throughout sampling event.  
One cooler houses blank samples one held soil samples

No. 33483



# FAIRBANKS SAMPLE RECEIPT FORM

**Note: This form is to be completed by Fairbanks Receiving Staff for all samples**

[illegible]

[illegible]

## Sample Containers and Preservatives

<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>	<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>
1158402001-A	No Preservative Required	OK			
1158402001-B	Methanol field pres. 4 C	OK			
1158402002-A	No Preservative Required	OK			
1158402002-B	Methanol field pres. 4 C	OK			
1158402003-A	No Preservative Required	OK			
1158402003-B	Methanol field pres. 4 C	OK			
1158402004-A	No Preservative Required	OK			
1158402004-B	Methanol field pres. 4 C	OK			
1158402005-A	No Preservative Required	OK			
1158402005-B	Methanol field pres. 4 C	OK			
1158402006-A	HCL to pH < 2	OK			
1158402006-B	HCL to pH < 2	OK			
1158402006-C	HCL to pH < 2	OK			
1158402007-A	HCL to pH < 2	OK			
1158402007-B	HCL to pH < 2	OK			
1158402007-C	HCL to pH < 2	OK			
1158402008-A	HCL to pH < 2	OK			
1158402008-B	HCL to pH < 2	OK			
1158402008-C	HCL to pH < 2	OK			
1158402009-A	HCL to pH < 2	OK			
1158402009-B	HCL to pH < 2	OK			
1158402009-C	HCL to pH < 2	OK			
1158402010-A	HCL to pH < 2	OK			
1158402010-B	HCL to pH < 2	OK			
1158402010-C	HCL to pH < 2	OK			
1158402011-A	Methanol field pres. 4 C	OK			
1158402012-A	HCL to pH < 2	OK			
1158402012-B	HCL to pH < 2	OK			
1158402012-C	HCL to pH < 2	OK			
1158402012-D	HCL to pH < 2	OK			

### Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates that an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.

PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

BU - The container was received with headspace greater than 6mm.

## Laboratory Data Review Checklist

Completed by: Adam Wyborny

Title: Environmental Engineer I Date: August 31, 2015

CS Report Name: 1551-008 Petro Star Report Date: August 14, 2015

Consultant Firm: Shannon & Wilson, Inc.

Laboratory Name: SGS North America Inc. Laboratory Report Number: 1158402

ADEC File Number: 100.38.102 ADEC RecKey Number:

### 1. Laboratory

- a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?  
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

- b. If the samples were transferred to another “network” laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?  
☐ Yes ☐ No ☒ NA (Please explain.) Comments:

Analyses were performed by SGS North America in Anchorage, AK

### 2. Chain of Custody (COC)

- a. COC information completed, signed, and dated (including released/received by)?  
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

- b. Correct analyses requested?  
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

### 3. Laboratory Sample Receipt Documentation

- a. Sample/cooler temperature documented and within range at receipt ( $4^{\circ} \pm 2^{\circ} \text{C}$ )?  
☒ Yes ☐ No ☐ NA (Please explain.) Comments:

The temperature blank or cooler was measured within the acceptable temperature range of  $0^{\circ} \text{C}$  to  $6^{\circ} \text{C}$  upon receipt at the Pace Analytical laboratory, as specified in the EPA publication SW-846. This range has been approved by ADEC.

- b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

- c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

The sample receipt form notes that the samples were received in good condition.

- d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

There were no discrepancies identified by the laboratory.

- e. Data quality or usability affected? (Please explain.)

Comments:

The data quality and usability were not affected; see above.

#### 4. Case Narrative

- a. Present and understandable?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

- b. Discrepancies, errors or QC failures identified by the lab?

☐ Yes ☒ No ☒ NA (Please explain.)

Comments:

No discrepancies, errors, or QC failures were identified by the laboratory.

- c. Were all corrective actions documented?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

No corrective actions were required; see above.

- d. What is the effect on data quality/usability according to the case narrative?

Comments:

The data quality and usability were not affected; see above.

#### 5. Samples Results

- a. Correct analyses performed/reported as requested on COC?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

- b. All applicable holding times met?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

c. All soils reported on a dry weight basis?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

Reporting limits are all below the ADEC cleanup levels.

e. Data quality or usability affected?

Comments:

The data quality and usability were not affected; see above.

## 6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

ii. All method blank results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iii. If above PQL, what samples are affected?

Comments:

N/A; project analytes were not detected in the method blank.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

Project analytes were not detected in the method blank.

v. Data quality or usability affected? (Please explain.)

Comments:

The data quality and usability were not affected; see above.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

Metals/inorganics were not included in this work order.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

N/A; the percent recovery and RPD values were within acceptable limits.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

The percent recovery and RPD values were within acceptable limits.

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

The data quality and usability were not affected; see above.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)



☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

There were no surrogate recovery failures.

iv. Data quality or usability affected? (Use the comment box to explain.)

Comments:

The data quality and usability were not affected; see above.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iii. All results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

The trip blank included with the soil samples (1158402011) produced a toluene detection that was below the LOQ.

iv. If above PQL, what samples are affected?

Comments:

The soil trip blank detection will affect samples SB15-01(6.0' - 6.5'), SB15-02(6.0' - 7.0'), SB15-03(6.3' - 7.3'), SB15-04(7.0' - 8.0'), and SB15-102(6.0' - 7.0').

v. Data quality or usability affected? (Please explain.)

Comments:

The affected samples will have their toluene concentrations flagged 'UB' at their respective LOQs to identify them as non-detect values due to the bias represented by the soil trip blank detection.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

The field duplicate pairs SB15-02(6.0'-7.0')/SB15-102(6.0'-7.0') and MW-2/MW-102 were included with this work order.

ii. Submitted blind to lab?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs?  
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where  $R_1$  = Sample Concentration

$R_2$  = Field Duplicate Concentration

☐ Yes ☒ No ☐ NA (Please explain.)

Comments:

The field duplicate pair SB15-02(6.0'-7.0')/SB15-102(6.0'-7.0') met QC criteria for all project analytes except o-xylene. The project sample produced an o-xylene detection below the LOQ but the duplicate sample produced no such detection. An RPD cannot be calculated given that one of the values is a non-detection, but the discrepancy will be treated as an RPD failure.

The field duplicate pair MW-2/MW-102 met QC criteria for all project analytes except benzene. The project sample produced a benzene detection below the LOQ but the duplicate sample produced no such detection. An RPD cannot be calculated given that one of the values is a non-detection, but the discrepancy will be treated as an RPD failure.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

The o-xylene concentration in the sample "SB15-02(6.0'-7.0')\" will be flagged 'J' denoting it as an estimated value due to the uncertainty introduced by the RPD failure. However the laboratory already flagged the concentration 'J' due to the value detected being below the LOQ. The o-xylene concentration in the sample "SB15-102(6.0'-7.0')\" will be flagged 'UJ' denoting it as an estimated non-detection.

The benzene concentration in the sample "MW-2\" will be flagged 'J' denoting it as an estimated value due to the uncertainty introduced by the RPD failure. However the laboratory already flagged the concentration 'J' due to the value detected being below the LOQ. The benzene concentration in the sample "MW-102\" will be flagged 'UJ' denoting it as an estimated non-detection.

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☐ No ☒ NA (Please explain.)      Comments:

Equipment blanks were not deemed necessary due to the limited potential for cross-contamination inherent in the tools used. All reusable equipment was thoroughly decontaminated prior to the collection of each sample.

i. All results less than PQL?

☐ Yes ☐ No ☒ NA (Please explain.)      Comments:

An equipment blank was not required for this project.

ii. If above PQL, what samples are affected?

Comments:

An equipment blank was not required for this project.

iii. Data quality or usability affected? (Please explain.)

Comments:

Data quality/usability were not affected; see above.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

☐ Yes ☐ No ☒ NA (Please explain.)      Comments:

The data quality and usability were not affected; see above.

**APPENDIX B**

**IMPORTANT INFORMATION ABOUT YOUR**

**GEOTECHNICAL/ENVIRONMENTAL REPORT**

Date: January 2016

---

To: Petro Star Inc.  
Attn. Lisa Lewis

---

Re: Monitoring Well Installation and  
Sampling

---

## **IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT**

### **CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.**

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

### **THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.**

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

### **SUBSURFACE CONDITIONS CAN CHANGE.**

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

### **MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.**

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

## **A REPORT'S CONCLUSIONS ARE PRELIMINARY.**

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

## **THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.**

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

## **BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.**

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

## **READ RESPONSIBILITY CLAUSES CLOSELY.**

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the  
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland