Approved Contaminated Soil and Water Management Plan
Terminal Road Water Line Rehabilitation
Port of Anchorage, Alaska

February 2018

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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Submitted To:
Stephl Engineering, LLC
3900 Arctic Boulevard, Suite 204
Anchorage, Alaska 99503

By:
Shannon & Wilson, Inc.
5430 Fairbanks Street, Suite 3
Anchorage, Alaska 99518
Phone: 907-561-2120
Fax: 907-561-4483

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APPROVED CONTAMINATED SOIL AND WATER MANAGEMENT PLAN TERMINAL ROAD WATER LINE REHABILITATION PORT OF ANCHORAGE, ALASKA

1.0 INTRODUCTION

This document constitutes the approved contaminated soil and water management plan (CSWMP) for the planned excavation activities associated with the Terminal Road water line rehabilitation project. This document incorporates review comments made by the Alaska Department of Environmental Conservation (ADEC). It is our understanding that Anchorage Water and Wastewater Utilities (AWWU) intends to install approximately 1,145 feet of new water line along Terminal Road, beginning about 1,300 feet west of the Tidewater Road intersection and extending northward along the western shoulder of Terminal Road. A site plan is provided in Figure 1.

The purpose of this plan is to outline soil screening, analytical sampling, and handling procedures for potentially contaminated soil and water which may be encountered during the water line installation project. This soil and water management plan was also developed in accordance with the ADEC's August 2017 *Field Sampling Guidance* document and April 2017 *Technical Memorandum: Managing Petroleum-Contaminated Soil, Water, or Free Product During Public Utility and Right-of-Way Construction and Maintenance Projects*.

AWWU's Contractor will be responsible for implementing the CSWMP and providing assurance that appropriate resources, including a Qualified Environmental Professional (QEP), are retained and mobilized to the site when required. The Contractor will also be responsible for proper management of excavated soil and encountered groundwater in accordance with this CSWMP and an ADEC Excavation Dewatering Permit (to be acquired by the contractor).

2.0 PROJECT DESCRIPTION

The planned construction activities include the installation of approximately 1,145 linear feet of 16-inch diameter, polyvinyl chloride (PVC) water pipe. The water line will be installed with the top of the pipe placed at depths ranging between 10 and 14 feet below the ground surface (bgs) using open trench methods. Imported bedding material will be placed around the new pipe and excavated material that is geotechnically suitable as backfill will be used to backfill the water line excavation. The upper 4 feet of the excavation will be backfilled with imported structural fill material under Terminal Road. As discussed in Section 4.0, excess or unsuitable (typically fine-grained or organic soils) soil will be stockpiled, screened, sampled, and disposed offsite. Groundwater was encountered at depths ranging between 5 and 8 feet bgs in geotechnical borings (Section 3.0) conducted for the project. Therefore, it is assumed that construction dewatering will be needed during installation of the water line.

3.0 BACKGROUND

In 2017, Golder Associates, Inc. (Golder) advanced four borings (G17-POA-01 through G17-POA-04) along the project alignment to evaluate the subsurface geotechnical and environmental conditions. The borings are shown on Figure 2 in Appendix A. The borings were advanced to approximately 30 feet bgs. Groundwater was encountered between 5 and 8 feet bgs during drilling. Soil samples were collected from each boring and field screened using a photoionization detector (PID) and headspace screening techniques. PID readings ranged between 0.0 and 7.0 parts per million (ppm). The highest reading was measured in the sample interval collected from 5 to 6.5-foot bgs (Sample POA-03) in G17-POA-02. One analytical soil sample from each boring was collected and submitted for chemical analysis. The samples were generally collected from the sample interval near the groundwater table interface. Groundwater samples were also collected from observation and monitoring wells installed in each of the borings. Note, the groundwater samples were collected from undeveloped wells and should be considered as screening level data. Details regarding sampling methods and laboratory reports are included in Golder's Draft December 8, 2017, *Terminal Road Water Main Rehabilitation, Geotechnical Data Report* and July 25, 2017, *Draft Geotechnical Field Investigation Work Plan, Terminal Road Water Main Rehabilitation, Port of Anchorage, Alaska.*

The soil and water samples were analyzed for gasoline range organics (GRO), diesel range organics (DRO), residual range organics (RRO), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). The soil samples were also analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX). At least one of the soil samples contained estimated (J-flagged) concentrations of GRO, toluene, ethylbenzene, xylenes and bis(2-ethylhexyl)phthalate at concentrations less than the applicable ADEC Method Two cleanup levels. The samples also contained a maximum of 213 mg/kg DRO, 1,400 mg/kg RRO, and 0.0187 mg/kg benzene, which are less than the ADEC Method Two cleanup levels of 250 mg/kg, 10,000 mg/kg, and 0.22 mg/kg, respectively. The soil sample results are summarized in Table 1 in Appendix A.

DRO (maximum of 0.326 J milligrams per liter [mg/L]) and/or RRO (maximum of 0.502 mg/L) was detected in the groundwater samples collected from G17-POA-02 and/or G17-POA-04. The DRO and RRO concentrations in the groundwater samples were less than ADEC Table C groundwater cleanup levels of 1.5 mg/L and 1.1 mg/L, respectively. The remaining analytes were not detected. The groundwater sample results are summarized in Table 1 in Appendix A.

The project is located adjacent, south and east, to the Anchorage Fueling and Service Company (AFSC) and Tesoro #2 tank farms, respectively, which are listed in the ADEC database as "active" contaminated sites. Various petroleum-related spills at both sites have resulted in documented soil and groundwater contamination with GRO, DRO, benzene, xylenes at concentrations above applicable cleanup levels. Concentrations of total aqueous hydrocarbons (TAH) exceeding Alaska's Water Quality Standards have reportedly been detected in samples collected along the storm drain system located north of the Tesoro #2 tank farm. Groundwater flow in the area is generally to the northwest. Therefore, these two sites are located downgradient of the project area.

The former Defense Fuels Support Point – Anchorage (DFSP-A), listed as "cleanup complete with institutional controls", is located approximately 200 feet southeast (assumed to be upgradient) of the project area. Numerous releases of diesel fuel, turbine fuel, unleaded gasoline, slop fuel, and transformer fluid were documented at the facility between 1960 and 1989. Contaminants of concern in the soil, groundwater, and surface water at the site are GRO, DRO, and BTEX. It is unknown whether contamination from this site has impacted the project area.

Based on the available information to date, soil and groundwater contamination at concentrations exceeding ADEC cleanup levels has not been documented at the project site. However, based on the project's proximity to known contaminated sites, and DRO concentrations that approached ADEC cleanup levels in soil samples collected during geotechnical explorations for the water line project, there is a potential that contaminated soil and groundwater could be encountered within the project area during construction

4.0 HANDLING OF EXCAVATED SOIL

According to the ADEC's *Technical Memorandum: Managing Petroleum-Contaminated Soil, Water, or Free Product during Public Utility and Right-of-Way Construction and Maintenance Projects,* contaminated soil encountered during utility trenching typically may be replaced to avoid delays and expedite the construction and maintenance of the utility projects so long as the soil handling is properly managed. Soil handling will include collecting field screening and analytical soil samples, stockpiling soil, and disposing of potentially impacted, unsuitable, or excess soil.

4.1 Excavation Soil Screening and Segregation

A QEP, as defined by 18 Alaska Administrative Code (AAC) 75.990, provided by an independent third party environmental consultant, will be on site during excavation activities for the project to implement this CSWMP. The QEP will conduct field screening and sampling to document the environmental conditions and assist the Contractor in segregating soils for potential reuse and/or disposal. The QEP will conduct field screening with a hand-held PID that measures total volatile compounds present as vapors, as a semi-quantitative indication of hydrocarbon presence. The PID will be calibrated daily using a response factor for benzene and 100 parts per million (ppm) isobutylene-in-air standard gas, or as directed by the PID's instruction manual. Additional calibration checks may be performed during the day, as deemed appropriate. All field screening and analytical sampling activities will be performed in accordance with the ADEC's August 2017 *Field Sampling Guidance*.

During construction, excavated soil will be monitored at a frequency of one screening sample per 50 cubic yards (cy) of excavation. If potentially contaminated or contaminated soil is encountered the field screening frequency will increase to one screening sample per 10 cy of excavation until potentially clean soil is encountered. Soil samples for screening will be collected from freshly excavated soil, either from the excavator bucket or from the excavation when the excavation depth is less than 4 feet, using a direct screening method. To screen, a small divot will be made in the freshly excavated soils using a clean, stainless steel spoon, or other implement, and the instrument probe will be inserted into the divot until readings stabilize or begin to decrease. The highest displayed reading will be recorded. If soil temperatures are below 40 degrees Fahrenheit (°F) the samples will be screened using an ADEC-approved headspace screening method. Headspace screening is performed by placing screening samples in a re-sealable plastic bag to approximately one-half of its capacity using a clean stainless-steel spoon. The samples are then warmed for at least 10 minutes, but not more than one hour. The temperature of the samples should be consistent, and must be at least 40 °F prior to screening. To screen, the sample will be agitated for about 15 seconds, the seal of the bag will be opened slightly, the instrument probe will be inserted into the air space above the soil, and the bag held closed around the probe.

Soil will be designated potentially clean, potentially contaminated, or contaminated based on screening results taken by the QEP. Potentially clean soil will not exhibit petroleum odors or staining and direct screening readings will be less than 5 ppm. Soil with direct screening PID readings between 5 ppm and 50 ppm, without obvious staining or free product, will be considered potentially contaminated. Soil with direct screening PID readings of 50 ppm or greater, free product, or obvious staining or odors will be considered contaminated. The soil will be segregated into individual stockpiles based on the above designations and handled as discussed in Section 4.3. Potentially clean soil that is suitable for reuse as backfill may be placed on the ground surface adjacent to the excavation. Potentially contaminated soil that is suitable for reuse as backfill will be placed on an impermeable surface (i.e. asphalt or concrete), or a minimum 10 mil liner, adjacent to the excavation or at the designated stockpile location shown on Figure 1. Potentially contaminated soil that will not be used as backfill and contaminated soil will be placed directly on an impermeable surface (i.e. asphalt or concrete), or a minimum 10 mil liner, at the designated stockpile location for further screening, sampling, and characterization prior to reuse or removal from the site. Stockpiled soil shall be covered with a 6-mil liner to prevent precipitation runoff from the stockpile. A summary field decision matrix for use by the QEP is shown in Figure 2.

4.2 Backfilling with Excavated Soil

In general, material excavated during utility trenching that is deemed suitable for reuse as backfill will be placed adjacent to the water line trench and returned to the trench as backfill at the approximate depth from which it was removed. Potentially contaminated or contaminated soil, based on field screening or physical indications, shall not be placed as trench backfill more than 100 linear feet from its origin. Potentially contaminated or contaminated soil will not be mixed with uncontaminated imported fill material. Potentially contaminated or contaminated soil will be placed at least 18 inches above the waterline.

The top 4 feet of the excavation and the bedding surrounding the water line will be backfilled with imported fill under Terminal Road. Therefore, any excavated material which cannot be used as backfill will be stockpiled, screened, and sampled prior to disposal, as discussed in Sections 4.3 and 4.4.

4.3 Soil Stockpiling

An estimated 4,000 cy of excess or unusable excavated material are anticipated to be generated from excavations for the project. Excess or unusable excavated soil which cannot be returned to the excavation, including potentially contaminated soil and contaminated soil, will be placed in short-term storage cells. In accordance with ADEC regulations of 18 AAC 75.370, potentially contaminated soil can be stockpiled in a short-term storage cell for up to 180 days. Potentially contaminated soil should not remain in a short-term storage cell over the winter season.

Excess or unusable excavated material will be stockpiled on 10-mil, petroleum resistant liners (additional liner specifications are included in 18 AAC 75.370) at the designated stockpile location shown on Figure 1. If saturated soil is excavated, the vehicle used to transport the material from the project site to the stockpile location will be lined to prevent the loss of material during transport. It will also be necessary to control water runoff with the use of berms or other methods. Stockpiled soils will be segregated into individual stockpiles and designated as potentially clean, potentially contaminated, or contaminated. Organic soils will be stockpiled separately under the same designation system.

Following placement of the excess or unusable excavated material, the storage cells will be covered with a 6-mil petroleum resistant liner. The cover for the excess or unusable material will extend beyond the bottom liner to shed rainwater away from the cell and be held down with anchor material. A general schematic of a typical soil storage cell is provided in Figure 3.

4.4 Stockpile Screening and Sampling

Field screening and analytical samples will be collected from the stockpiled excess or unusable material in general accordance with the ADEC's *Field Sampling Guidance*. For stockpiles smaller than 200 cy, field screening samples will be collected at a frequency of one field screening sample per each 10-cy of stockpiled material. For stockpiles larger than 200 cy, field screening samples will be collected at a frequency of one field screening sample per each 50-cy of stockpiled material. The field screening samples will be collected from approximately 18 to 20 inches beneath the surface of the stockpile(s). The samples will be screened using headspace screening techniques, as presented in Section 4.1.

Analytical samples will be collected in accordance with Table 2A of the *Field Sampling Guidance* document. For stockpiles bigger than 100 cy, a minimum of three samples plus one sample for each additional 200 cy will be collected. Samples will be collected from the locations with the highest field screening readings. Field duplicate samples will be collected at a 10-percent frequency.

Analytical samples will be submitted to an ADEC-approved analytical laboratory for testing. The soil samples will be analyzed for GRO by Alaska Method (AK) 101, DRO by AK 102, RRO by AK 103, VOCs by Environmental Protection Agency (EPA) Method 8260B, and SVOCs by EPA Method 8270. Depending on the test results, additional samples may need to be analyzed using the toxicity characteristic leaching procedure (TCLP), EPA Method 1311/6000, to properly characterize the material for disposal. The analytical soil sample results will be compared to the ADEC Method Two cleanup levels presented in the October 2017, 18 AAC 75 regulations. Specifically, the most stringent levels listed in Tables B1 and B2 of 18 AAC 75.341, for the "under 40-inch (precipitation) zone".

Excess or unusable material which cannot be returned to the excavation will remain stockpiled at the designated stockpile location until laboratory analytical sample results are reviewed by the contractor's environmental consultant, and the ADEC approves disposal and/or treatment of the soil.

4.5 Off Site Soil Disposal

Soil which does not exceed the applicable ADEC cleanup levels can be disposed offsite, as approved by AWWU and ADEC. Stockpiled soil containing contaminant concentrations greater than the applicable ADEC cleanup criteria will require off-site disposal and/or treatment.

Depending on the contaminant levels, potential disposal facilities include Alaska Soil Recycling (ASR), Anchorage Regional Landfill (ARL), or an out-of-state facility. It will be the responsibility of the Contractor's Qualified Environmental Professional to determine appropriate disposal facility and coordinate disposal with AWWU, the ADEC, and the appropriate disposal/treatment facilities.

4.6 Transportation of Contaminated Soil

Prior to transporting soil from the project site or the stockpile storage area, the Contractor's environmental consultant will prepare a *Contaminated Soil Transport and Treatment Approval Form* (Appendix B) and submit the form to the ADEC project manager (TBD). Soil transport and/or treatment will not be conducted without ADEC approval.

Soil hauled off-site to a disposal/treatment facility will be transported in tarped vehicles and otherwise in accordance with all local, state and federal regulations, including applicable U.S. Department of Transportation and ADEC requirements. If the soil is wet, the vehicle will be lined to prevent the loss of material during transport.

If out-of-state disposal is required, it will be the contractor's environmental consultant's responsibility to determine the appropriate shipping requirements.

5.0 HANDLING OF GROUNDWATER

Because several contaminated sites are located within 1,500 feet of the project, the Contractor or the Contractor's environmental consultant will be responsible for obtaining an ADEC Excavation Dewatering Permit, AKG002000, prior to discharge of groundwater. The details provided in this CSWMP herein are considered a minimum level of effort needed to perform excavation dewatering for the project and handling of discharges from excavation dewatering will ultimately be managed in accordance with the terms and conditions of the Excavation Dewatering Permit. In the event of a conflict, the conditions outlined in the approved Excavation Dewatering Permit will supersede the conditions described herein. In addition to the ADEC's Excavation Dewatering Permit, the Contractor shall obtain permission from the Port of Anchorage for the discharge into the storm drain system.

The Contractor will primarily conduct dewatering using sumps constructed with a filter pack to minimize sediment. Based on our experience in the area, we anticipate that the maximum flows for a 40-foot long trench will be on the order of 100 gallons per minute (gpm). The contractors dewatering system must be designed to treat up to 100 gpm of dewatering flow. Alternately, the contractor may elect to manage dewatering flows by utilizing shorter trench sections or recirculation of water in the open excavations. However, the contractor is responsible for obtaining ADEC permission for these alternate techniques. Dewatering will generally be accomplished by pumping from the constructed sump areas as needed to control the groundwater.

All discharges must meet ADEC water quality standards for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH). Prior to beginning discharge to the storm drain, a sample will be collected from the discharge of the polishing system and analyzed for TAH/TAqH. If the ADEC water quality standards are met, monthly TAH/TAqH samples will be collected to demonstrate continued compliance. The monthly sample results shall be provided within 48 hours of sampling. If the monthly TAH/TAqH results exceed ADEC's water quality standards the discharge will be stopped immediately and ADEC will be notified within 24 hours.

The following discharge control and treatment measures will be implemented:

- Primary dewatering will be from sumps with filter packs to minimize sediment. The filter pack shall be clean uniform sand or gravel sized to not pass through the slots in the sump.
- All flow will be directed to a three-chambered, 18,000-gallon baffle tank. The tank contains three compartments; each of which can be inspected via hatches on the top of the tank. The residence time in the first compartment is sufficient to trap oil particles larger than 90 microns. The second and third compartments will trap sediment particles greater than 0.02 millimeters.
- If a sheen is observed in the excavation, the sump(s) and trench pumping locations will be surrounded with petroleum-absorbent boom.
- If a sheen is observed in the excavation, the first and third compartments of the weir tank will be observed for sheen (visual), every 15 minutes for the first hour, and once an hour for the next three hours.
- If no sheen is observed in the weir tank, visual observations for sheen will be conducted on a twice daily basis until there is no sheen observed in the excavation.
- If a sheen is observed in the weir tank, petroleum absorbent materials will be used to remove the sheen.
- If a measurable thickness of fuel is observed in the first chamber, or a sheen is observed in the third chamber, all discharge will stop until the source of the product is identified and corrective measures are initiated. The ADEC will be notified within 24 hours of this condition.
- The discharge from the tank will be via gravity to the polishing system. The polishing system will be constructed as follows:
    - Will contain 1.5 cubic feet of granular activated carbon (GAC) for each gallon of flow (150 cubic feet for 100 gpm flow).
    - The GAC will be in a container or parallel containers with a positive connection on the top and a gravity discharge on the bottom.
    - A diffuser shall be used to distribute flow across the top of the GAC.
    - The GAC container shall have an aspect ratio such that no more than 2.5 gpm is applied per square foot of surface area of GAC.
- Discharge will cease immediately if there is a sheen in the discharge. The ADEC will be notified of this condition and contacted for approval to resume discharging.
- Monitoring will be conducted in accordance with Table 4 of the General Permit No. AKG002000 with the addition of monthly TAH/TAqH sampling described above.
- A calibrated flow meter/totalizer will be used to monitor flow rates.

6.0 HEALTH AND SAFETY MONITORING

Each contractor/working field personnel will follow their own health and safety plan prepared specifically for the project. Employers of workers that may be in contact with potentially impacted soil and/or water are responsible for contacting the Alaska Occupational Safety and Health Administration (OSHA) or a Certified Industrial Hygienist (CIH) to determine whether the Hazardous Site Operations training requirements specified in 29 CFR 1910.120(e) apply for this project. Hazardous Site Operations trained workers must have completed an initial 40-hour training course and subsequent annual 8-hour refresher training courses. Before the start of work activities, field representatives and the field construction team will hold an initial safety meeting to discuss excavation procedures and safety issues at the project site. The contractor shall notify the Anchorage Fire Department of potential confined space activities prior to excavation. Periodic safety meetings, at least daily, will be conducted thereafter to review progress, safety procedures, and address new concerns.

The atmosphere in work areas during excavation will be monitored with the PID or equivalent to check for the presence of volatile organic vapors during initial excavation and periodically during soil removal activities. The work area will also be monitored with an explosimeter or gas detectors for flammable or explosive atmospheres. Areas checked and the highest readings will be noted in the daily field reports. Based on the information collected to date, we are assuming that the contaminants are non-hazardous and that Level D, and potentially Level C, personnel protection equipment (PPE) is sufficient. The required PPE will be determined daily by the contractor's environmental consultant. It is also the contractor's environmental consultant's responsibility to develop action limits which correspond to the volatile hydrocarbon vapor meter selected.

7.0 REPORTS

The Contractor will maintain notes that discuss earthwork activities, areas disturbed, where soil was placed at the site, other soil movements, and whether evidence of contamination was observed and soil screening and sampling activities. The environmental consultant representative's field screening daily field notes will be recorded in a bound notebook that will include a description of field activities. This notebook will contain the following:

- Documentation of project progress with notes, sketches of the extent of contamination, photographs, and construction manager decisions.
- PID screening results of potentially impacted excavated soil.
- Dates when material was placed in a stockpile and volumes.
- Instrument calibration records.

A summary report will be prepared by the environmental consultant to document field activities, soil screening/sampling data, and the final disposition of excavated soil. Photographs, copies of field notebooks, field sketches, individual laboratory reports, raw data, and ADEC laboratory data review checklists will be included in appendices. Field screening and analytical data will be summarized in tables. The report will be provided to AWWU.

8.0 CLOSURE/LIMITATIONS

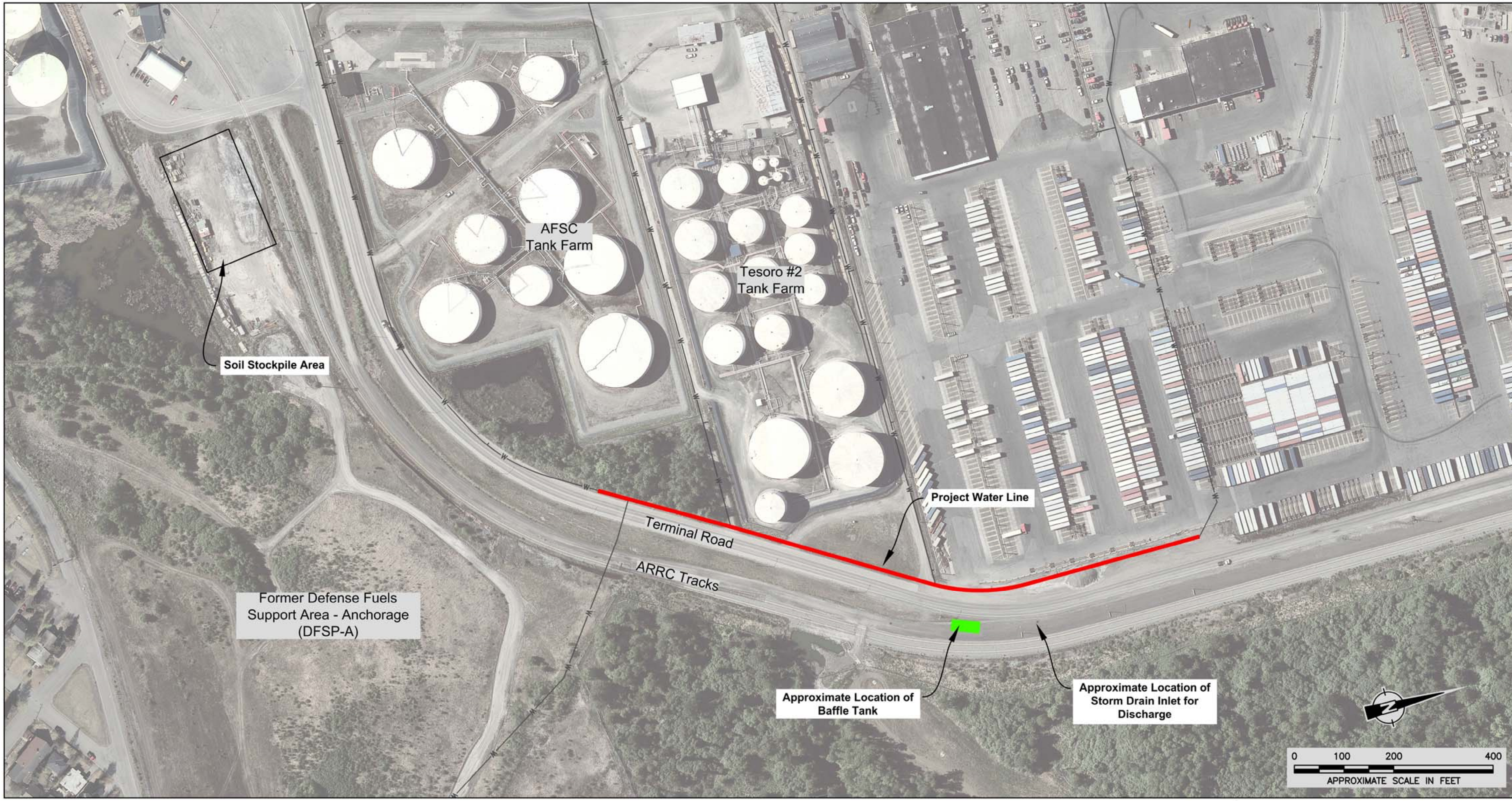
The interpretations and recommendations contained in this soil management plan are based on our knowledge of the ADEC regulations and limited research and soil sampling conducted at the project site. This soil management plan is not intended to facilitate cleanup of all impacted soil and groundwater in the area, but to describe the requirements the contractor will implement to handle and remediate/dispose potentially contaminated materials that may be encountered during the construction efforts. The contractor conducting the excavation will be responsible to hire a qualified environmental professional to implement this soil and groundwater management plan.

If, during construction, subsurface conditions different from those described herein are observed or appear to be present, AWWU should be advised so that these conditions can be reviewed and recommendations can be reconsidered as necessary. It is our understanding that the project is scheduled for 2018. If there is a substantial lapse of time (greater than one year) between the submittal of this plan and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this plan be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse. In addition, note that unanticipated soil conditions are commonly encountered and cannot fully be predicted by soil characterization field efforts. Shannon & Wilson has prepared the attachment in Appendix C, *Important Information About Your Geotechnical/Environmental Report*, to assist in understanding the use and limitations of this soil management plan.

We appreciate this opportunity to be of service. Please contact the undersigned at (907) 561-2120 with questions or comments concerning the contents of this report.

SHANNON & WILSON, INC.

Stafford Glashan, P.E.
Senior Engineer III



NOTES

1. Aerial imagery provided by the Municipality of Anchorage. Image date: May 2015
2. Water line locations should be considered approximate.

Terminal Road Water Line Rehabilitation
Port of Anchorage, Alaska

SITE PLAN

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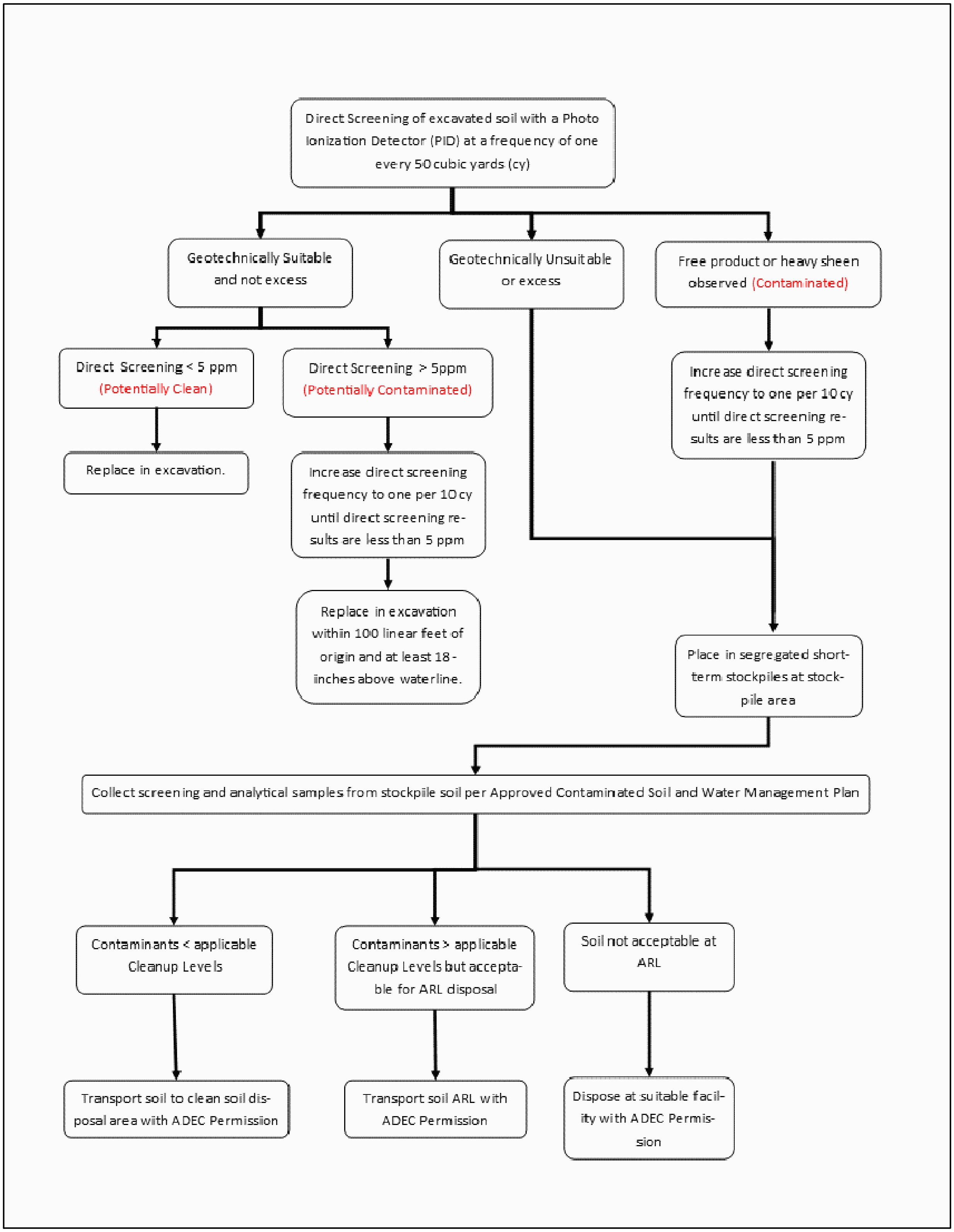
FIG. 1



Terminal Road Water Line Rehabilitation
Port of Anchorage, Alaska

DECISION MATRIX

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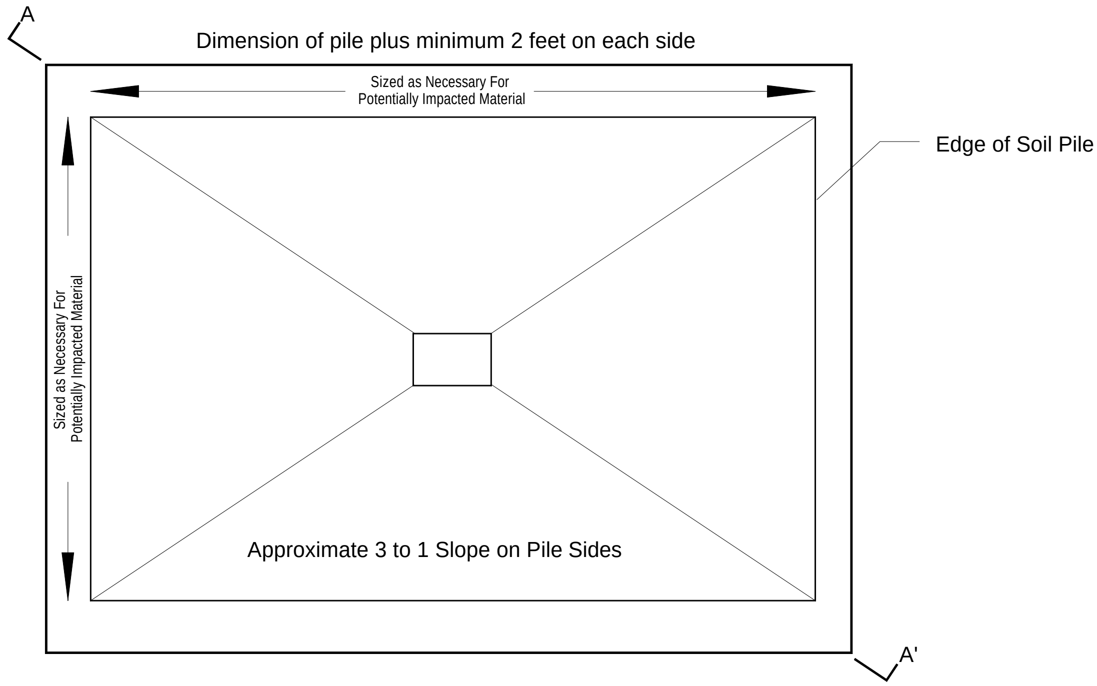
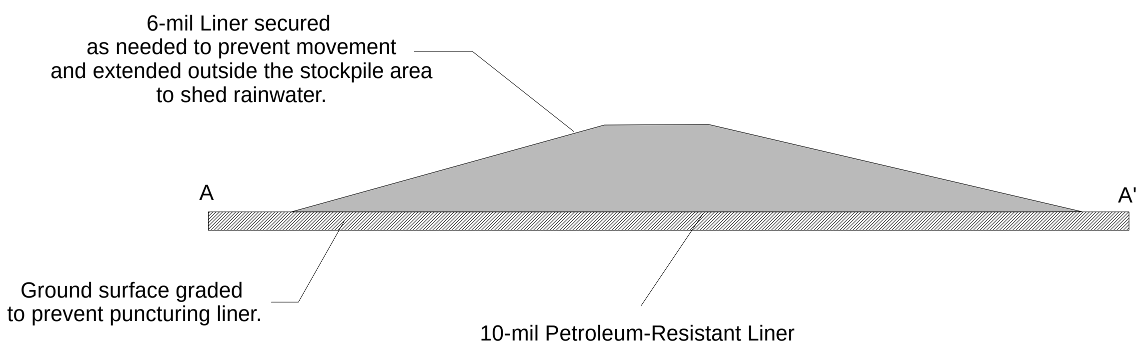
FIG. 2



Plan View



Profile A - A'

Terminal Road Water Line Rehabilitation
Port of Anchorage, Alaska

**SHORT-TERM SOIL
STORAGE CELL SCHEMATIC**

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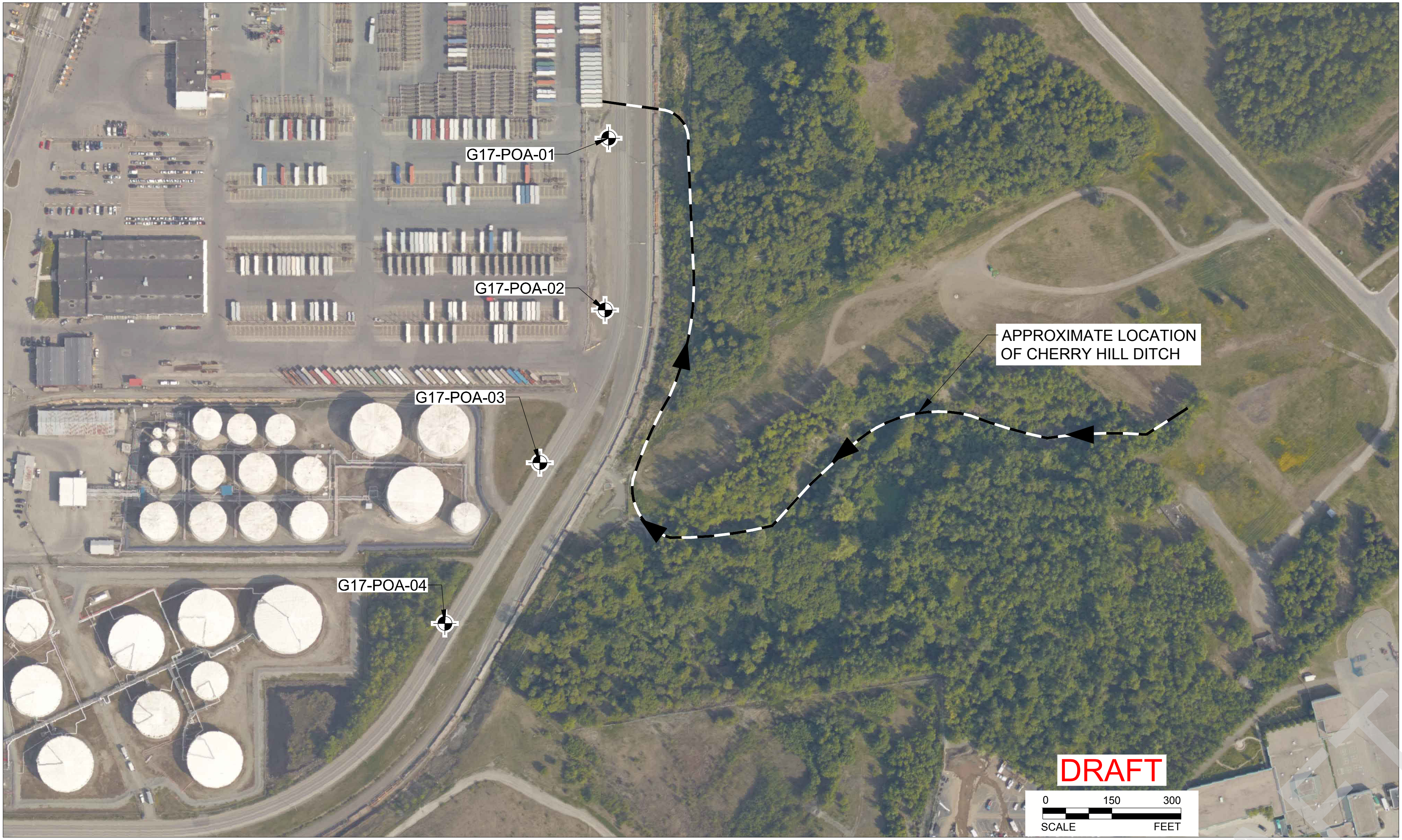
FIG. 3

APPENDIX A

SITE PLAN AND ANALYTICAL RESULTS FROM DRAFT, DECEMBER 2017 GEOTECHNICAL DATA REPORT

Last Edited By: agarrigus Date: 2017-12-08 Time:12:36:10 PM | Printed By: AGarrigus Date: 2017-12-08 Time:1:36:13 PM
Path: \\Anchorage\Public\Geomatics\Stephl Engineering LLC\Anchorage\99_PROJECTS\1774404, Stephl Terminal Rd Water Main\0001\02_PRODUCTION\DWG\ | File Name: 1774404.003.dwg



LEGEND

G17-POA-01
AS-BUILT 2017 GEOTECHNICAL BOREHOLE LOCATION

REFERENCES

1. SURVEYED BOREHOLE LOCATION PROVIDED BY STEPHL ENGINEERING LLC ON 2017-08-22.
2. NOAA NGS ORTHO-RECTIFIED COLOR MOSAIC ACQUIRED IN 2016 AND DISTRIBUTED BY NOAA/NOS DATA EXPLORER.

CLIENT
STEPHL ENGINEERING LLC

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-12-08
DESIGNED	-
PREPARED	APG
REVIEWED	TAV
APPROVED	-

PROJECT
TERMINAL ROAD WATER MAIN REHABILITATION

ANCHORAGE, AK

TITLE
BOREHOLE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
1774404		A	2

DRAFT

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

Table 1: Soil Sample Analytical Laboratory Results Summary

	Borehole Number	Analytical Method	Potential Soil Cleanup Level [1]	G17-POA-01	G17-POA-01	G17-POA-02	G17-POA-03	G17-POA-04
	Depth Range (feet)			7.5-8.4	7.5-8.4	2.5-4.0	8.1-8.4	8.0-9.0
	Sample Number			POA 1-4	POA 1-5 (Field Duplicate of POA 1-4)	POA 2-2	POA 3-4	POA 4-4
	Date Collected			8/2/17	8/2/17	8/2/17	8/3/17	8/3/17
	Analytical Lab Sample ID			1172911001	1172911015	1172911003	1172911017	1172911007
Parameter and units [1]	**Gasoline Range Organics (GRO) (mg/kg)**	*AK101*	*300*	2.36 J	ND(3.66)	1.98 J	1.29 J	1.29 J
	Diesel Range Organics (DRO) (mg/kg)	*AK102*	*250*	140	157	213	202	21.7 J
	Residual Range Organics (RRO) (mg/kg)	*AK103*	*11000*	1030	1400	476	596	93.9
	Benzene (ug/kg)	*(BTEX) 8021B*	*22*	ND(17.3)	ND(18.3)	18.7	ND(8.65)	ND(7.15)
	Ethylbenzene (ug/kg)		*130*	ND(34.5)	ND(36.5)	12.4 J	ND(17.4)	ND(14.4)
	Toluene (ug/kg)		*6700*	ND(34.5)	ND(36.5)	11.3 J	ND(17.4)	ND(14.4)
	o-Xylene (ug/kg)		*1500*	ND(34.5)	ND(36.5)	18.0 J	ND(17.4)	ND(14.4)
	P & M -Xylene (ug/kg)			ND(69.0)	ND(73.0)	16.2 J	ND(34.6)	ND(28.7)
	Benzene (ug/Kg)	*(VOCs) 8260C*	*22*	ND(17.3)	ND(18.3)	14.2	ND(8.65)	ND(7.15)
	bis(2-Ethylhexyl)phthalate (mg/Kg)	*(SVOCs) 8270D*	*88*	ND(0.205)	ND(0.218)	0.0920 J	ND(0.610)	ND(0.141)

Notes:
-- = No analysis
mg/kg = concentration in milligrams per kilogram
ug/kg = concentration in micrograms per kilogram
ND(__) - Not detected at concentrations above the limit of detection (LOD) shown
J - Estimated value, detected at concentration greater than the LOD but below the limit of quantitation (LOQ)
[1] Tables B1 and B2. Method Two. Migration to Groundwater Cleanup Level "18AAC75, Oil and Other Hazardous Substances Pollution Control," Revised November 6, 2016.
Only Volatile Organic Compounds (VOCs) and Semivolatile Organic Compounds (SVOCs) compounds with detections shown

Table 2: Groundwater Sample Analytical Laboratory Results Summary

	Borehole Number	Analytical Method	G17-POA-02	G17-POA-03	G17-POA-04	G17-POA-04
	Sample Number		POA-02	POA-03	POA-04	POA-04B (POA-04 Field Duplicate)
	Date Collected		9/6/17	9/6/17	9/6/17	9/6/17
	Analytical Lab Sample ID		1176335001	1176335002	1176335003	1176335004
Parameter and units [1]	Gasoline Range Organics (GRO)	*AK101*	ND(50.0)	ND(50.0)	ND(50.0)	ND(50.0)
	Diesel Range Organics (DRO)	*AK102*	326J	ND(302)	235J	233J
	Residual Range Organics (RRO)	*AK103*	502	ND(252)	ND(252)	ND(252)
	1,1,1,2-Tetrachloroethane	*(VOCs) 8260C*	ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	1,1,1-Trichloroethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,1,2,2-Tetrachloroethane		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	1,1,2-Trichloroethane		ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
	1,1-Dichloroethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,1-Dichloroethene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,1-Dichloropropene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,2,3-Trichlorobenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,2,3-Trichloropropane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,2,4-Trichlorobenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,2,4-Trimethylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,2-Dibromo-3-chloropropane		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	1,2-Dibromoethane		ND(0.0375)	ND(0.0375)	ND(0.0375)	ND(0.0375)
	1,2-Dichlorobenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,2-Dichloroethane		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	1,2-Dichloropropane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,3,5-Trimethylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,3-Dichlorobenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	1,3-Dichloropropane		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	1,4-Dichlorobenzene		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	2,2-Dichloropropane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	2-Butanone (MEK)		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	2-Chlorotoluene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	2-Hexanone		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	4-Chlorotoluene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	4-Isopropyltoluene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	4-Methyl-2-pentanone (MIBK)		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	Benzene		ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
	Bromobenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Bromochloromethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Bromodichloromethane		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	Bromoform		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Bromomethane		ND(2.50)	ND(2.50)	ND(2.50)	ND(2.50)
	Carbon disulfide		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	Carbon tetrachloride		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Chlorobenzene		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	Chloroethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Chloroform		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Chloromethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	cis-1,2-Dichloroethene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	cis-1,3-Dichloropropene		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	Dibromochloromethane		ND(0.250)	ND(0.250)	ND(0.250)	ND(0.250)
	Dibromomethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Dichlorodifluoromethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Ethylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Freon-113		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	Hexachlorobutadiene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Isopropylbenzene (Cumene)		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Methylene chloride		ND(2.50)	ND(2.50)	ND(2.50)	ND(2.50)
	Methyl-t-butyl ether		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	Naphthalene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	n-Butylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	n-Propylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	o-Xylene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	P & M -Xylene		ND(1.00)	ND(1.00)	ND(1.00)	ND(1.00)
	sec-Butylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Styrene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	tert-Butylbenzene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Tetrachloroethene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Toluene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	trans-1,2-Dichloroethene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	trans-1,3-Dichloropropene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Trichloroethene		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Trichlorofluoromethane		ND(0.500)	ND(0.500)	ND(0.500)	ND(0.500)
	Vinyl acetate		ND(5.00)	ND(5.00)	ND(5.00)	ND(5.00)
	Vinyl chloride		ND(0.0750)	ND(0.0750)	ND(0.0750)	ND(0.0750)
	Xylenes (total)		ND(1.50)	ND(1.50)	ND(1.50)	ND(1.50)

Table 2: Groundwater Sample Analytical Laboratory Results Summary

	Borehole Number	Analytical Method	G17-POA-02	G17-POA-03	G17-POA-04	G17-POA-04
	Sample Number		POA-02	POA-03	POA-04	POA-04B (POA-04 Field Duplicate)
	Date Collected		9/6/17	9/6/17	9/6/17	9/6/17
	Analytical Lab Sample ID		1176335001	1176335002	1176335003	1176335004
Parameter and units (1)	1,2,4-Trichlorobenzene	(SVOCs) 8270D	ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	1,2-Dichlorobenzene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	1,3-Dichlorobenzene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	1,4-Dichlorobenzene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	1-Chloronaphthalene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	1-Methylnaphthalene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,4,5-Trichlorophenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,4,6-Trichlorophenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,4-Dichlorophenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,4-Dimethylphenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,4-Dinitrophenol		ND(27.3)	ND(26.6)	ND(26.5)	ND(26.9)
	2,4-Dinitrotoluene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,6-Dichlorophenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2,6-Dinitrotoluene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2-Chloronaphthalene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2-Chlorophenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2-Methyl-4,6-dinitrophenol		ND(27.3)	ND(26.6)	ND(26.5)	ND(26.9)
	2-Methylnaphthalene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2-Methylphenol (o-Cresol)		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2-Nitroaniline		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	2-Nitrophenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	3&4-Methylphenol (p&m-Cresol)		ND(11.0)	ND(10.7)	ND(10.6)	ND(10.7)
	3,3-Dichlorobenzidine		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	3-Nitroaniline		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	4-Bromophenyl-phenylether		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	4-Chloro-3-methylphenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	4-Chloroaniline		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	4-Chlorophenyl-phenylether		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	4-Nitroaniline		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	4-Nitrophenol		ND(27.3)	ND(26.6)	ND(26.5)	ND(26.9)
	Acenaphthene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Acenaphthylene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Aniline		ND(27.3)	ND(26.6)	ND(26.5)	ND(26.9)
	Anthracene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Azobenzene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Benzo(a)Anthracene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Benzo[a]pyrene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Benzo[b]Fluoranthene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Benzo[g,h,i]perylene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Benzo[k]fluoranthene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Benzoic acid		ND(27.3)	ND(26.6)	ND(26.5)	ND(26.9)
	Benzyl alcohol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Bis(2chloro1methylethyl)Ether		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Bis(2-Chloroethoxy)methane		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Bis(2-Chloroethyl)ether		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	bis(2-Ethylhexyl)phthalate		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Butylbenzylphthalate		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Carbazole		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Chrysene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Dibenzo[a,h]anthracene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Dibenzofuran		ND(2.73)	ND(2.66)	ND(2.65)	ND(2.69)
	Diethylphthalate		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Dimethylphthalate		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Di-n-butylphthalate		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	di-n-Octylphthalate		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Fluoranthene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Fluorene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Hexachlorobenzene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Hexachlorobutadiene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Hexachlorocyclopentadiene		ND(16.4)	ND(15.9)	ND(15.9)	ND(16.2)
	Hexachloroethane		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Indeno[1,2,3-c,d] pyrene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Isophorone		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Naphthalene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Nitrobenzene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	N-Nitrosodimethylamine		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	N-Nitroso-di-n-propylamine		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	N-Nitrosodiphenylamine		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Pentachlorophenol		ND(27.3)	ND(26.6)	ND(26.5)	ND(26.9)
	Phenanthrene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Phenol		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)
	Pyrene		ND(5.45)	ND(5.30)	ND(5.30)	ND(5.40)

Notes:
-- = No analysis
All concentrations in micrograms per liter (ug/L)
ND(__) - Not detected at concentrations above the limit of detection (LOD) shown
J - Estimated value, detected at concentration greater than the LOD but below the limit of quantitation (LOQ)
All results below Table C. Method Two. Groundwater Cleanup Levels "18AAC75, Oil and Other Hazardous Substances Pollution Control," Revised November 6, 2016.

APPENDIX B

ADEC SOIL TRANSPORT AND TREATMENT APPROVAL FORM

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites and Prevention and Emergency Response Programs

Transport, Treatment, & Disposal Approval Form for Contaminated Media

DEC HAZARD/SPILL ID #	NAME OF SPILL OR CONTAMINATED SITE	
SITE OR SPILL LOCATION		
CURRENT LOCATION AND TYPE OF CONTAMINATED MEDIA	SOURCE OF THE CONTAMINATION	
COMPOUNDS OF CONCERN	ESTIMATED VOLUME	DATE(S) GENERATED
POST TREATMENT ANALYSIS REQUIRED *(such as GRO, DRO, RRO, BTEX, and/or Chlorinated Solvents)*		
COMMENTS		

Facility Accepting the Contaminated Media

NAME OF THE FACILITY	PHYSICAL ADDRESS/PHONE NUMBER

Responsible Party and Contractor Information

BUSINESS/NAME	ADDRESS/PHONE NUMBER

Name of the Person Requesting Approval (printed) ______________________

Title/Association ______________________

Signature ______________________

Date ______________

Phone Number ______________

--------------------DEC USE ONLY--------------------

Based on the information provided, ADEC approves transport of the above-described media for treatment in accordance with the approved facility operations plan. The Responsible Party or their consultant must submit to the DEC Project Manager a copy of weight/volume receipts of the loads transported to the facility and a post treatment analytical report. If the media is contaminated soil, it shall be transported as a covered load in compliance with 18 AAC 60.015.

DEC Project Manager Name (printed) ______________________

Project Manager Title ______________________

Signature ______________________

Date ______________

Phone Number ______________

APPENDIX C

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

Date:	December 2017
To:	Stephl Engineering, Inc.
Re:	Terminal Road Water Line Rehabilitation, Port of Anchorage, Alaska

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