

**NORTH STAR PIT
SITE CHARACTERIZATION WORK PLAN
ADEC File No. TBD
Hazard ID #TBD**

Prepared for:



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Acronyms and Abbreviations

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
bgs	Below ground surface
BMP	Best Management Practices
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
COPC	Contaminants of Potential Concern
DQI	Data Quality Indicators
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
GPS	Global Positioning System
GRO	Gasoline Range Organics
LNAPL	Light Non-Aqueous Phase Liquids
PAH	Polycyclic Aromatic Hydrocarbons
PARCC	Precision, Accuracy, Representativeness, completeness, and comparability
PID	Photo-Ionization Detector
PPE	Personal Protective Equipment
ppm	Parts per Million
QA/QC	Quality Assurance/Quality Control
RRO	Residual Range Organics
SOP	Standard Operating Procedure
TPECI	Travis/Peterson Environmental Consulting, Inc.

VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbons

1.0 INTRODUCTION

On behalf of Knik Construction Company, Inc., Travis/Peterson Environmental Consulting, Inc. (TPECI) prepared this work plan. This work plan was developed in response to the findings of Phase I and Phase II Environmental Site Assessments (ESA) related to a proposed property transfer. The Phase II ESA identified hydrocarbon contaminated soils with the potential for hydrocarbon contaminated groundwater on the property. This work plan details the proposed site characterization investigation, sampling, screening, laboratory analysis, and reporting of petroleum-contaminated soils and groundwater at the North Star Pit in Soldotna, Alaska (the Site). The Site location is shown in Figure 1.

TPECI developed this plan to meet the requirements of 18 AAC 75.325. The purpose of this work plan is to describe the methods and procedures through which action will be taken under regulatory oversight to identify and characterize soil and groundwater contaminant concentrations to numeric and practicable cleanup levels defined in 18 AAC 75.

2.0 OBJECTIVES

The objectives of this work plan are to:

- Acquire and summarize existing environmental data;
- Assess chemical hazards at the site;
- Identify field screening, sampling, and analytical methods;
- Identify the methods for contaminated material handling; and
- Identify the methods for managing investigation generated wastes.

These objectives will be met by presenting the following information:

- The site description and background;
- A field screening and sampling plan for site investigation and characterization;
- The sample collection methods;
- Field quality control measures;
- Field documentation to be used;
- The analytical methods to be employed; and
- Conclusions and recommendations.

The objectives of the proposed work include the completion of the following tasks:

1. Determine the presence or absence of hydrocarbon contamination in the groundwater at and surrounding the oil/water separator.
2. Determine the horizontal and vertical extents of contamination in soil, and groundwater at and surrounding the oil/water separator.

The extent and boundaries of the study are limited to the three land parcels owned by North Star Paving & Construction, Inc. The parcels are identified as Kenai Peninsula Borough Tax Parcels 05704452, 05754097, and 05754086. The focus of the proposed work is to address areas impacted

by oil/water separator at the property. No work is anticipated in the area of the bulk used oil storage tank. No work will be conducted on any adjacent properties.

3.0 SITE DESCRIPTION AND BACKGROUND

The property is located at 44251 Frontier Avenue in Soldotna, Alaska. (Figure 1). The consists of three individual parcels. The three combined parcels are approximately 64.4 acres. The property has been developed as an industrial gravel mining operation and associated equipment storage and maintenance facilities are also located at the site.

The property position is approximately 60.500225° North latitude, -151.06832° West longitude. The Parcel is located in Section 29, Township 5 North, Range 00 West, Seward Meridian, United States Geological Survey Quadrangle. The property is listed in the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Database under the ADEC file number TBD.

The property is accessed via the Kenai Spur Highway. A large open pit from gravel and material mining operations exists on the property. Operation infrastructure, including fuel and oil storage, vehicle and maintenance equipment shops, and vehicle and equipment storage are all located inside of the pit.

Soils throughout the property are primarily silty sands and gravels. Groundwater was estimated to be approximately 19 feet below ground surface (bgs). Minimal vegetation was present in the active material site. No surface waters were present on the property.

In December 2019, TPECI conducted a Phase I ESA on the property. During the Phase I ESA, TPECI identified several areas of potential environmental concern on the property. An aboveground used oil storage tank was located on the property and surface soiling staining was observed at the site. TPECI also identified an oil/water separator at the vehicle and equipment maintenance shop. TPECI determined that the oil/water separator discharged to a leach field immediately adjacent the shop building. In discussions with the property owner, TPECI found that this oil/water separator had been installed in the early 1980s. A CONEX container had been placed on top of the manhole access. Thus, the oil/water separator had not been maintained in at least five to eight years. Further, the property owner stated that minimal water ever was put into the system, likely limited the functionality of the separator and injecting oils into the subsurface through the leach field.

TPECI completed a Phase II ESA in January 2019. The Phase II ESA focused on potential hydrocarbon-contaminated soils at the oil/water separator leach field and at the used oil storage tank. TPECI excavated soils at both locations and collected soil samples for field screening and laboratory analysis.

The oil/water separator leach field pipe was found at approximately eight feet (8.0 ft) bgs embedded in washed drain (septic) rock. The property owner could not recall the specific depth of the drain rock but suspected that it extended three to four feet below the piping (maximum total depth 12 feet bgs).

During the investigation, TPECI observed an unidentified black substance filling drain rock void space beneath the leach field piping. The perforated drainpipe was similarly filled complete with the unidentified black substance. The substance had a consistency similar to that of grease with an observable odor similar to that of gear oil. The ambient air temperature at the time of the investigation was -17°F. As a result, heavy oils such as gear oil may have gelled to a consistency similar to that observed.

Two soil samples were collected from beneath the leach field pipe for field screening (OW-1 and OW-2). Heated headspace field screening results were found to range from 22.8 ppm to 37.5 ppm. Sample OW-1 was selected for laboratory analysis. Laboratory results showed Diesel Range Organics (DRO) concentrations in OW-1 to be 54,300 mg/Kg, above the applicable ADEC cleanup level of 250 mg/Kg. Residual Range Organics (RRO) concentrations in OW-1 were found to be 333,000 mg/Kg, significantly greater than the ADEC cleanup level of 11,000 mg/Kg. Gasoline Range Organics (GRO) and BTEX analyte concentrations were all found to be below laboratory detection limits. Acetone and Methylene chloride were detected in sample OW-1 but were below the applicable ADEC cleanup levels.

The laboratory results indicated that the oil/water separator was not operated correctly and had discharged heavy hydrocarbon contaminants such as lube oil, gear oil, or heavy fuels such as diesel fuel. The presence of acetone and other VOCs indicated the discharge of solvents and degreasers.

While DRO and VOC concentrations above the applicable ADEC cleanup level were observed in soil samples collected at the used oil storage tank, these samples were collected at a relatively shallow depth (1.5 feet bgs). Given the surface staining, the depth to groundwater, and the concentrations observed, TPECI believes the hydrocarbon contamination at the used oil tank is likely limited and additional site characterization efforts are not required prior to remediation actions in the area. No additional sampling or characterization efforts are proposed at the used oil tank at this time.

3.1 Need for Additional Work

Groundwater at the site is estimated to be approximately 19 feet bgs, less than 11 feet below the oil/water separator discharge pipe. If contaminants reached groundwater, it is possible that groundwater contamination exists at the property. Additional soils may be contaminated from the resulting contaminated groundwater plume as well. The installation of groundwater monitoring wells and the collection of groundwater samples for laboratory analysis is necessary to determine if groundwater contamination exists at the property. As part of the proposed property transaction, TPECI plans to conduct site characterization work including the installation and sampling of groundwater monitoring wells at the site. This work plan describes that site characterization work.

4.0 POTENTIAL CONTAMINANTS OF POTENTIAL CONCERN

The contaminants of potential concern (COPC) are diesel fuel, unleaded gasoline, hydraulic fluid, used oil, and solvents. Analytical laboratory samples will be collected for DRO, RRO, GRO, Volatile Organic Compounds (VOCs) including BTEX and Polycyclic Aromatic Hydrocarbons (PAH).

Soil and groundwater samples will be submitted to SGS Environmental Laboratories, Inc. in Anchorage, Alaska for laboratory analysis. The qualified sampler will also perform field screening using a photo-ionization detector (PID) to screen soils for volatile organic compounds.

The project target soil cleanup levels shown in Table 1 below were established from ADEC Title 18, Alaska Administrative Code, Section 75.341 (January 2019), Table B1, Method Two – Soil Cleanup Levels, Under 40 Inch Zone, Migration to Groundwater as shown in Table 1 below. All VOC project cleanup levels in addition to the select analytes shown below are as listed in Table B1, Method Two.

Table 1: Preliminary Project Soil Cleanup Levels

Analyte	Units	Cleanup Level
DRO	mg/Kg	250
RRO	mg/Kg	11,000
GRO	mg/Kg	300
Benzene	mg/Kg	0.022
Ethylbenzene	mg/Kg	0.13
Total Xylenes	mg/Kg	1.5
Toluene	mg/Kg	6.7
1-Methylnaphthalene	mg/Kg	0.41
2-Methylnaphthalene	mg/Kg	1.3
Acenaphthene	mg/Kg	37
Acenaphthylene	mg/Kg	1,900
Anthracene	mg/Kg	390
Benzo(a)anthracene	mg/Kg	0.7
Benzo[a]pyrene	mg/Kg	1.9
Benzo[b]fluoranthene	mg/Kg	20
Benzo[g,h,i]perylene	mg/Kg	15,000
Benzo[k]fluoranthene	mg/Kg	190
Chrysene	mg/Kg	600
Dibenz[a,h]anthracene	mg/Kg	6.3
Fluoranthene	mg/Kg	590
Fluorene	mg/Kg	36
Indeno[1,2,3-c,d]pyrene	mg/Kg	65
Naphthalene	mg/Kg	0.038
Phenanthrene	mg/Kg	39
Pyrene	mg/Kg	87

The project target groundwater cleanup levels shown in Table 2 were established from ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C, Groundwater Cleanup Levels as shown in Table 2 below. All VOC project cleanup levels in addition to the select analytes shown below are as listed in Table C.

Table 2: Project Groundwater Cleanup Levels

Analyte	Units	Cleanup Level
DRO	µg/L	1,500
RRO	µg/L	1,100
GRO	µg/L	2,200
Benzene	µg/L	4.6
Ethylbenzene	µg/L	15
Total Xylenes	µg/L	190
Toluene	µg/L	1,100
1-Methylnaphthalene	µg/L	11
2-Methylnaphthalene	µg/L	36
Acenaphthene	µg/L	530
Acenaphthylene	µg/L	260
Anthracene	µg/L	43
Benzo(a)anthracene	µg/L	0.30
Benzo[a]pyrene	µg/L	0.25
Benzo[b]fluoranthene	µg/L	2.5
Benzo[g,h,i]perylene	µg/L	0.26
Benzo[k]fluoranthene	µg/L	0.80
Chrysene	µg/L	2.0
Dibenz[a,h]anthracene	µg/L	0.25
Fluoranthene	µg/L	260
Fluorene	µg/L	290
Indeno[1,2,3-c,d]pyrene	µg/L	0.19
Naphthalene	µg/L	1.7
Phenanthrene	µg/L	170
Pyrene	µg/L	120

A conceptual site model has been prepared and is enclosed in Appendix B.

5.0 SAMPLING PLAN

This work will be conducted in accordance with the *ADEC 18 AAC 75 Oil and Other Hazardous Substances Pollution Control (revised October 2018)*. Where applicable, the site characterization and analysis will be modeled after procedures described in the *ADEC Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites (March 2017)*. Sampling efforts will be conducted in accordance with the *ADEC Field Sampling Guidance (October 2019)* unless otherwise specified within this document.

TPECI personnel meet the ADEC definition of “Qualified Environmental Professional” in accordance with 18 AAC 75.333. TPECI personnel assigned to this project have not been determined at this time. Resumes for all TPECI personnel are available in Appendix D. While on site, TPECI personnel will be aided by Knik Construction Company, Inc. personnel and third-party contractors. However, all sample collection will be conducted by TPECI personnel and all site work will be conducted under the direction supervision of TPECI personnel.

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5.1 Hydrocarbon Contaminants

TPECI personnel will coordinate with Knik Construction Company, Inc. personnel and third-party contractors, including a drilling contractor on site. TPECI personnel will advance five soil borings using a 6-inch diameter hollow-stem auger and split spoon sampler. The locations of the proposed soil borings are shown in Figure 3 in Appendix A. Upon advancement, GPS coordinates of each soil boring will be recorded. Soil borings will be installed in locations based on the information obtained during Phase I and II Environmental Site Assessments in 2019 and 2020.

These soil borings will aid in the characterization of the horizontal and vertical extents of contaminants at and surrounding the oil/water separator and associated leach field. Soil samples will be collected for field screening at two-foot intervals within each from each soil boring (i.e. 0-2', 2-4', etc.). Soil borings will be advanced to a depth of two feet below groundwater interface or until bedrock (refusal). Ultimately, the depth of the borings shall be dependent on the groundwater depth or boring refusal due to bedrock.

TPECI will use a PID and an elevated field screening threshold (20 ppm) to screen for contaminated soils as described in Section 5.1.1. TPECI will also use an analytical sampling kit (laboratory-supplied sampling containers, labels, and Chain-of-Custody documentation) on site in addition to olfactory and visual clues to determine the presence or absence of the contamination in soils. TPECI will document the presence of any sheen or light non-aqueous phase liquid (LNAPL) during the collection of samples for field screening and laboratory analysis.

Potential seasonal precipitation necessitates careful management of excavated soils and site operations during contaminated soil disturbance. Soil disturbance will be minimized wherever possible and Knik Construction Company, Inc. will utilize storm water best management practices (BMPs) throughout the course of the project. BMPs may be installed along site perimeters or access routes to prevent sediment transport as needed.

5.1.1 Field Screening

The following describes the sampling protocols that TPECI field personnel will follow to screen and collect soil samples within soil borings. Field screening will occur first to characterize the presence (if any) of hydrocarbon contamination within the soil borings. A MiniRAE™ Systems 3000 PID will be the primary equipment utilized for field screening. TPECI personnel will field screen soils with a PID in accordance with the ADEC *October 2019 Field Sampling Guidance*, Section 3.0 Soil Sampling.

5.1.1.1 PID Calibration and Use

The PID will be calibrated according to the manufacturer's specifications in the field using a fresh-air charcoal blank and 100-ppm isobutylene calibration span gas. A re-sealable polyethylene bag with a total capacity not less than eight ounces (approximately 250mL) will be filled one-third to one-half full of soil from the screening sample. The soil, sealed in the bag, will be allowed to warm up to 40 degrees Fahrenheit where it shall be held for at least 10 minutes, but no longer than 60 minutes. The soil sample will be agitated for approximately 15 seconds at the beginning and end

of the headspace development period to assist in volatilization. The tip of the calibrated PID will then be placed inside the bag for thirty seconds or until the reading stabilizes.

5.1.2 Collection of Samples for Laboratory Analysis

TPECI personnel will collect at least two characterization samples for laboratory analysis from each of the soil borings. The field screening sample which exhibited the highest reading on the PID will be chosen for laboratory analysis and one sample will be collected from the groundwater interface depth for laboratory analysis. Additionally, some characterization samples may be collected from locations of particular concern or significantly differing soil types. In these cases, the sampling location may not have exhibited the highest PID readings. TPECI anticipates the collection of two samples for laboratory analysis from each soil boring.

Samples collected for laboratory analysis shall be analyzed in accordance with Section 5.1.4.

5.1.3 Excavated/Stockpiled Soil

Excavated soil cuttings from the soil borings will be stockpiled in 55-gallon drums on the site pending soil sampling results. Fate and disposal of identified, containerized contaminated soils will be determined at a later date as described in Section 8.0 Investigation Derived Waste.

5.1.4 Soil Laboratory Methods

All laboratory soil samples will be analyzed for GRO compounds by method AK101, VOCs by EPA Method 8260C, DRO by method AK102, RRO by method AK103, and PAH by EPA Method 8270D SIM.

Table 3: Laboratory Analytical Methods for Soils

Method	Matrix	Container (jars)	Preservative	Hold time
8260C (VOCs)	Soil	1 4-oz amber wide mouth jar with septa lid	MeOH and 0-6° C.	14 days
AK101 (GRO)	Soil	1 4-oz amber wide mouth jar with septa lid	MeOH and 0-6° C.	14 days
AK102 (DRO)	Soil	1 4oz amber wide mouth jar	0-6° C.	14 days
AK103 (RRO)	Soil	1 4oz amber wide mouth jar	0-6° C.	14 days
8270D SIM (PAH)	Soil	1 4oz amber wide mouth jar	0-6° C.	14 days

Soil samples destined for volatile analysis will be collected first, followed by samples collected for non-volatile analysis. Pre-weighed and pre-labeled soil sample containers will be filled to a volume (mass) ranging from 25 to 50 grams of soil (approximately 1/3rd container volume) and will be immediately preserved by pouring methanol over the soil and promptly securing the Teflon-lined

container lid. Care will be taken to ensure soils are completely covered with preservative provided by the analytical laboratory in pre-measured 25mL portions. Should more than 25mL of preservative be required for a given sample, documentation of total preservative volume will be recorded in the field notes and on the laboratory Chain-of-Custody.

Sample Field Preparation

Sampling shall be performed in accordance with the applicable regulations:

- All samples will be collected using disposable or cleaned and decontaminated sampling equipment;
- Field personnel shall wear disposable gloves, safety goggles, steel toed boots, hard hat, reflective vest, and other appropriate Class D personal protective equipment (PPE). Gloves and sampling devices will be changed between samples;
- Samples will be collected as quickly as possible and placed in laboratory supplied containers;
- Soil for analytical sample testing will not be obtained from field screening *sample* material;
- All samples will be labeled; and
- All samples will be preserved in accordance with laboratory specifications and cooled to a temperature of 0 to 6 degrees Celsius.

5.2 Groundwater Wells and Sampling

The presence and extent of potential hydrocarbon contaminated groundwater on the property is unknown following the December 2019 Phase I Environmental Site Assessment and the January 2020 Phase II Site Assessment. To determine the presence or absence of groundwater, and to assess limited horizontal extents, TPECI will install five permanent groundwater monitoring wells on the property. The location of the proposed groundwater monitoring wells is shown in Figure 3 in Appendix A.

Each of the permanent groundwater monitoring wells will be installed to below groundwater depth. Based on previous site investigations and discussions with the property owner, TPECI estimates wells will have a maximum depth ranging from 20 to 30 feet bgs. The wells will be constructed in accordance with ADEC well installation recommendations as outlined by the ADEC Monitoring Well Guidance document (September 2013). A schematic of the proposed groundwater monitoring wells is enclosed in Appendix C.

A six-inch diameter, hollow-stem auger drill rig will be used to advance soil borings to below groundwater depth. TPECI personnel and the drilling contractor will install the permanent groundwater monitoring wells within these borings. The installed wells will be commercially manufactured, two-inch diameter Schedule 40 PVC and machine-perforated (20-slot). The perforated well screens will be 10 feet long and will be placed so that approximately six feet of well screen is below the groundwater elevation and four feet is above the observed groundwater elevation to accommodate seasonal fluctuations in groundwater. In the unlikely event that shallow groundwater depths (less than 10 feet) are encountered, the length of the well screen will be

shortened, but the same 60/40 (above/below water) placement at the groundwater interface shall be maintained.

TPECI and the drilling contractor will use #10 silica sand for the construction of a well filter pack. The filter pack shall extend at least one foot above the well screen except in shallow depth wells where less than two feet exists between the ground surface and the groundwater elevation. A bentonite annular seal will be placed to fill the top 24 to 36 inches of the soil boring to protect the well from infiltration of storm water or other surface contaminants.

Well casings will utilize locking well caps. In areas where wells require flush mounting, monument caps will be used. The casings will be installed immediately following the placement of bentonite grouting, as soon as the grouting has solidified. Where wells will extend above the ground surface, a protective metal casing will extend at least six inches above the top of the well casing. All wells will be protected from vehicle traffic or other impact damage through marking or installation of protective barriers.

The groundwater monitoring wells shall be developed following installation. The groundwater monitoring wells will be allowed to set for a period of 24 hours between installation and development. Due to the high permeability of the soils on site, well development shall be conducted using a surge block alternating with pumping allowing for a multidirectional flow through the well filter pack. No compressed air will be used for development of the wells at the property. Pumping and surging will continue until turbidity decreases. At the completion of well development, water pumped from the well shall ideally be clear and free of sediment.

Following monitoring well installation and development of the wells, TPECI personnel will wait to allow groundwater stabilization so as to provide a representative sample of groundwater and accurate gradient measurements. Following well development, a water wheel meter will be used for a depth-to-groundwater measurement and to confirm that groundwater levels within each well are in stasis. If the groundwater level for any well is still fluctuating, then TPECI will wait until it is in stasis.

TPECI personnel will measure the depth-to-groundwater surface to the top of each well casing) using a water-wheel meter. The water-wheel meter will be used to measure the distance from the bottom of the well and the top of the casing. The difference between these two points will be calculated to determine the depth of groundwater in the well-point casing. TPECI personnel will calculate the total volume of water in the well casing and convert this amount to gallons. Based on previous site investigations at the property and the observed high permeability of site soils, TPECI does not anticipate that the wells will purge dry.

A peristaltic pump will be used to purge at least three times the calculated well volume. Pumping flow rates shall be electronically controlled via the peristaltic pump controller. Flow rates shall be measured utilizing a stop watch and a container of a known volume. Pumping flow rates shall be maintained at a speed that does not agitate the water within the well casing. TPECI anticipates a drawdown of water elevations within the well casing. However, pumping flow rates shall be controlled so that the well drawdown does not result in purging the well dry. Due to the variation in possible well recharge rates, exact purging/pumping flow rates cannot be specified at this time.

Upon completion of the well purging process, TPECI will use a peristaltic pump for the collection of groundwater samples from each well. Pump tubing will be replaced between well development and sampling. Additionally, all pump all tubing will all be changed and disposed between monitoring wells. Each monitoring well will be sampled for DRO, RRO, GRO, VOC, and PAH. Field duplicate samples will be collected from the wells that have the highest potential for being contaminated and in accordance with Section 6.3.1.1. Groundwater samples for laboratory analysis will be collected, handled, and stored in accordance with *ADEC Field Sampling Guidance (October 2019)*. Laboratory analysis methods are detailed below.

At the completion of groundwater sample collection, TPECI personnel will thoroughly mark the permanent groundwater monitoring wells with a survey lath identifying the well number, installation date, and owner. High-visibility flagging will also be placed in the immediate vicinity of each well. TPECI personnel will survey the top of the well casing in addition to the well monument. The survey will meet or exceed a vertical accuracy of 0.01 feet and a horizontal accuracy of 1.0 feet. The survey will aid in the determination of groundwater flow direction on the property.

All pump tubing and associated solid waste will be disposed in accordance with Section 8.0. Soil cuttings generated from the advancement of soil borings and the installation of groundwater monitoring wells will be stockpiled in 55-gallon drums on site. Each drum will be labeled with the date of generation, suspected soil contaminants, total soil volume, and the name and contact information of the soil generator. All containerized soils will be staged on site pending receipt of laboratory data. That information will be used to determine appropriate treatment and disposal methods in accordance with State and Federal Regulations. An *ADEC Transport, Treatment, & Disposal Approval Form for Contaminated Media* will be completed prior to the transport or disposal of any contaminated soils. The fate and disposal of stockpiled (containerized in 55-gallon drums) contaminated soils will be addressed within the final report.

An estimated maximum of 55-gallons of development and purge water will be collected as part of the sampling process. This water will be collected in clean 55-gallon drums. All containerized groundwater monitoring well development and purge water will be retained until laboratory results are returned. Where applicable, the presence of sheen or LNAPL will be utilized to segregate development and purge water in an effort to minimize the total volume of waste that may require disposal. Containerized water will be transported off site for treatment and disposal in accordance with State and Federal regulations following receipt of laboratory data and completion of the *ADEC Transport, Treatment, & Disposal Approval Form for Contaminated Media*.

Table 4: Laboratory Analytical Methods for Groundwater

Method	Matrix	Container (jars)	Preservative	Hold time
8260C (VOC)	Water	3, 40 mL amber glass VOA vial	HCL and 0-6° C.	14 days
AK101 (GRO)	Water	3, 40 mL amber glass VOA vial	HCL and 0-6° C.	14 days
AK103 (RRO)	Water	1, 1 L amber glass	HCL and 0-6° C.	14-40 days
AK102 (DRO)	Water	1, 1 L amber glass	HCL and 0-6° C.	14-40 days
8270D SIM (PAH)	Water	2, 1 L amber glass	0-6° C.	7 days

Water samples destined for volatile analysis will be collected first, followed by samples collected for semi-volatile analysis.

Sample Field Preparation

Sampling shall be performed in accordance with the applicable regulations:

- All samples will be collected using disposable or cleaned and decontaminated sampling equipment;
- Field personnel shall wear disposable gloves, safety goggles, steel toed boots, hard hat, reflective vest, and other appropriate Class D PPE. Gloves and sampling devices will be changed between samples;
- Samples will be collected as quickly as possible and placed in laboratory supplied containers;
- All samples will be labeled; and
- All samples will be preserved in accordance with laboratory specifications and cooled to a temperature of 0 to 6 degrees Celsius.

The following sections describe field preparation, and sampling protocols.

6.0 FIELD AND SAMPLING PROTOCOLS

6.1 Standard Operating Procedures

The standard operating procedures (SOP) for this project fall into two categories, field SOP and laboratory SOP. Throughout the sampling effort, laboratory hold-times and sample temperatures shall be maintained. The laboratory SGS Quality Assurance Project Plan is filed at the laboratory and at TPECI. Thus, the SOP contained herein refers to generic field sampling and sample preparation.

6.1.1 Field Sampling SOPs

Field personnel shall keep detailed notes that include:

- Project name/Site ID/Client/Page Number;
- Date;
- Weather, site conditions, and other salient observations;
- Full name of on-site personnel, affiliations and project title e.g., team leader (including all visitors);
- Daily objectives;
- Time and location of activities;
- Field observations and comments;
- Deviations from the ADEC Contaminated Sites Program site-specific approved work plan;
- Photographic log (photographic name, roll or frame number, description of photograph, date, and time);

- Site sketches with reference to north direction, sample and field screening locations and depths, and on-site groundwater flow direction;
- Survey and location (latitude and longitude coordinates when possible);
- All field measurements (e.g. leak check results, geochemical parameters, field screening results);
- Daily equipment calibrations and maintenance;
- Sample record (sample identification, date, time, media, number of samples, and location);
- Cleanup or remediation activities (system performance, system calibration or maintenance record, excavation activities and volume of material removed); and
- Waste tracking (when, how much, destination).

Site drawings shall be included within the field notes as part of the field investigations. Site drawings should include a north arrow, and, if applicable, at least one permanent identifying feature (such as a building). All samples collected (screening and analytical) should be noted on the figure. Alternatively, sample locations may be indicated on a field copy of Figure 3 (Appendix A) where applicable.

All laboratory sampling locations shall be documented on Figure 3 (Appendix A) or within separate plan view site drawings within the field notes. If applicable, the sampling location cross-sectional view may be drawn. Any unusual characteristics of the sampling location and any problems encountered during sample collection shall also be recorded for each sample location. GPS coordinates of each sample location shall be documented within the field notes.

Field notes will be collected in an all-weather notebook. The notebook utilized will not be dedicated solely to this project, but only information relevant to the project will be included on pages assigned. Combined project field notebooks reduce project costs and minimize waste generation.

Filed notes will be written in pen, pencil, or water-resistant marker. When field conditions result in illegible content due to dirt, precipitation, or poor penmanship, field notes will be recopied immediately after field activities.

6.1.2 Field Sample Preparation SOP

All samples will be prepared in accordance with laboratory instructions. At a minimum, the following information will be included on the sample label:

- Client name;
- Date and time of sample collection;
- Sampler;
- Sample location;
- Preservative, and
- Analytical test(s) to be run.

In addition, the above information will be recorded in the field notes. Chain of custody records will be maintained for each sample. Samples will be kept between zero (0) and six (6) degrees centigrade (°C). The field technician will place custody seals on all coolers to determine if the samples may have been tampered while being transported to the laboratory. The laboratory will notify TPECI in such an event so that a decision can be made on whether or not re-sampling is necessary.

6.1.3 Field Decontamination Procedures

Decontamination procedures for equipment and personnel are described in the following sections.

6.1.3.1 Equipment

After working in an area of contamination (as determined by field screening) and before moving equipment to another area, equipment and tools shall be decontaminated to remove soil that may contain contamination. Buckets, blades, augers of equipment shall be sprayed with a solution of Alconox or Citrisol and wiped down with paper towels or rags until all soil is removed. Cleaning solution shall be applied such that it does not drip or run off of the equipment, but is absorbed by paper towels or rags used to wipe the equipment. All decontamination shall be conducted immediately adjacent to the known area of contamination. Additionally, decontamination of small hand tools including the washing of sampling spoons/trowels in Alconox or CitriSol shall be conducted in this location. All decontamination waste from the site shall be placed in a drum, contractor trash bag, or other appropriate container for proper disposal as described in Section 8.0.

6.1.3.2 Personnel

In the presence of petroleum contaminated soils or groundwater, all personal may elect to don disposable coveralls, booties, and gloves. Disposable nitrile gloves shall be worn by the Qualified Environmental Professional during the collection and handling of all soil and water samples for field screening and laboratory analysis. All worn disposable PPE must be collected at the end of the day and disposed in accordance with Section 8.0 Investigation Derived Waste.

6.2 Field and Laboratory Calibration Methods

All field and laboratory procedures requiring instrument calibration will be conducted according to the applicable EPA methods, the ADEC methods, and standard operating procedures. The manufacturer certified dealer calibrates the PID annually. The PID will also be calibrated with fresh air and a 100 ppm isobutylene calibration standard daily before it is potentially used. The EPA checks the calibrations traceable quality control standards for the laboratory.

6.3 Routine and Periodic Quality Control Activities

SGS Laboratory, an ADEC-approved laboratory, will be used for all project analyses. This section describes the methods used for determining the quality of laboratory results.

6.3.1 Field Quality Control Samples

Field personnel will take two types of field quality control samples. These are sample duplicates and trip blanks. The objective and frequency of these samples are discussed below.

TPECI will not collect field blanks or equipment blanks. TPECI will rely on field duplicates and trip blanks for quality control and determination of artificially introduced contamination.

6.3.1.1 Field Duplicates

Field duplicates are samples collected simultaneously from the same sampling locations. Field personnel will use identical sampling methods to retrieve one duplicate for every 10 samples for each sample matrix and analyte, per day. Field duplicate samples will be collected from screening locations exhibiting the highest PID heated headspace screening results or visual indicators of hydrocarbon contamination for water samples. Field personnel will split one sample for duplicate analysis from the excavation or stockpile or collected groundwater and will follow the same Quality Assurance/Quality Control (QA/QC) methods for collecting, packaging, recording, and shipping the duplicate samples as all other samples.

6.3.1.2 Trip Blank

Trip blanks are samples prepared from sterile media at the laboratory and shipped with the sample containers. Trip blanks remain with the samples after collection and are analyzed for volatile compounds. This analysis determines if any cross-contamination occurred during shipping. Field personnel will never open the trip blank containers during the entire sampling process. Field personnel will use one trip blank per cooler. If the laboratory finds any contamination within the trip blank, the results will be used to evaluate any possible impacts to associated samples.

6.3.1.3 Field Blank

TPECI will not collect field blanks for this project.

6.3.1.4 Equipment Blank

TPECI will not collect equipment blanks for this project. TPECI will conduct thorough field decontamination procedures as described in Section 6.1.3.

6.3.2 Laboratory Quality Control Samples

The project laboratory will use matrix-spiked samples, spiked duplicates, surrogates, method blanks, duplicates, and laboratory control samples to measure data quality. Matrix spiked samples and laboratory control samples assess sample matrix interference and analytical errors and accuracy. Surrogates evaluate accuracy of an analytical measurement. Method blanks check for laboratory contamination and instrument bias. Duplicates measure the precision of the analysis.

The laboratory will use one method blank per sample period and use one laboratory control sample. The laboratory will use a surrogate spike for every sample, standard, and blank. The laboratory will use one matrix spike per sample period.

6.4 Data Reduction, Validation and Reporting

Data reduction is conducted by the analyst. All calculations are made as specified by the particular analytical method. Units are reported as mg/Kg, µg/Kg, or as otherwise called for in the method. Analytical data reports will include:

- Client name;
- Date and time of sample collection;
- Sample location;
- Date and time samples received at the laboratory;
- Date analysis completed;
- Laboratory sample ID number;
- A list of parameters analyzed;
- The analytical method number for each parameter; and
- Concentration of each parameter.

The laboratory will forward a copy of the completed analytical results to TPECI. Upon receipt of the analytical laboratory report, TPECI will review the data and complete the ADEC Laboratory Data Review Checklist. The Data Quality Objective for the acceptance criteria for laboratory data shall be based on the EPA standard of precision, accuracy, representativeness, completeness, and comparability (PARCC). The primary inputs for a PARCC determination can be made using the project-specific Data Quality Indicators (DQIs) which are in Appendix E as well as using the ADEC Laboratory Data Review Checklist. Through this validation a standard of 85% usable data has been established as the Data Quality Objective (DQO) criteria for this project.

7.0 SITE SPECIFIC SAFETY

The elements of personnel safety for this project are outlined in the following sections. Wards Cove maintains a company health and safety plan. An Activity Hazard Analysis shall be completed prior to the start of all site activities to ensure property safety precautions are in place for each task. TPECI personnel and all third-party contractors shall abide by all Knik Construction Company, Inc. safety guidelines while operating on the site. The third-party contractor may implement additional safety guidelines while operating on the site.

7.1 Hazard Assessment

Project hazards include typical construction hazards (noise, heavy equipment, excavations, slips trips and falls, etc.) and potential exposure to petroleum products.

As soil borings are advanced to groundwater depth; the complete pathways associated with groundwater may be considered a risk. The project will generally consist of work outside which is well ventilated and windy; the complete pathways associated with inhalation of outdoor and indoor air are not considered a risk at this time.

7.2 Site Control

Workers and the public shall be protected from construction and chemical hazards associated with excavation within a potentially contaminated area through marking, fencing, and placing barriers between public areas, work areas, and soil borings.

7.3 Monitoring

No air quality monitoring is proposed.

7.4 Personal Protective Equipment

All workers who have contact with the soil and groundwater in potentially contaminated areas may elect to wear disposable coveralls, booties, and gloves (in addition to typical worksite PPE including safety-toe shoes, safety glasses, high visibility clothing, hardhat, and hearing protection). Workers may wear respiratory protection in accordance with Occupational Safety and Health Administration requirements and comply with the contractor's respiratory protection program.

8.0 INVESTIGATION DERIVED WASTE

Decontamination waste, disposable PPE, disposable sampling equipment, and all other investigative derived solid or liquid waste shall be placed in labeled drums, 5-gallon buckets, contractor trash bags, or other appropriate containers. After project completion, TPECI will provide Knik Construction Company, Inc. with the labeled drums, buckets, contractor trash bags, or other appropriate containers containing the investigative derived waste. Solid wastes other than soils shall be disposed in a permitted landfill. Ultimate disposal of the investigative derived waste is the responsibility of Knik Construction Company, Inc.

Soil cuttings generated from the advancement of soil borings and the installation of groundwater monitoring wells will be stockpiled in 55-gallon drums onsite. Each drum will be labeled with the date of generation, suspected soil contaminants, total soil volume, and the name and contact information of the soil generator. All containerized soils will be staged on site pending receipt of laboratory data. That information will be used to determine appropriate treatment and disposal methods in accordance with State and Federal Regulations. An *ADEC Transport, Treatment, & Disposal Approval Form for Contaminated Media* will be completed prior to the transport or disposal of any contaminated soils.

An estimated maximum of 55-gallons of development and purge water will be collected as part of the sampling process. This water will be collected in clean 55-gallon drums. All containerized groundwater monitoring well development and purge water will be retained until laboratory results are returned. Efforts will be made to containerize this water based on likelihood of hydrocarbon contaminants (i.e. visibly contaminated water will be segregated from non-visibly contaminated water). Containerized water will be transported off site for treatment and disposal in accordance with State and Federal regulations. An *ADEC Transport, Treatment, & Disposal Approval Form for Contaminated Media* will be completed prior to the transport or disposal of any contaminated groundwater.

9.0 PROJECT SCHEDULE

Proposed site characterization actions are planned for April 2020. Actual start date is dependent on weather and site access.

Development of a written report on site activities shall occur following the receipt of laboratory data. Currently, laboratory turn-around times range from approximately two to six weeks. The development of a complete report is estimated to be completed within two weeks following receipt of laboratory data.

TPECI will notify the ADEC project manager by phone and email prior to beginning site work.

10.0 DELIVERABLES

TPECI will document daily operations within the project field notes. The daily summary will include notes regarding weather, site activities, QC activities, safety issues, include a general summary of work completed, observed the extents of contamination, identification of additional contamination or alternate contaminant sources (if any), and any other information pertinent to daily activities. All field notes and daily summaries will be provided to the ADEC project manager with the final written report at the completion of the project.

The data deliverables for the project shall include at the completion of the project a written report summarizing field activities, results, and conclusions. The report shall specifically address the following information:

- Site investigation overview;
- Laboratory results summary for soil boring soil samples and groundwater samples;
- Laboratory results;
- Data Validation and Completion of ADEC Laboratory Data Review Checklist;
- Field observations;
- A Revised Conceptual Site Model;
- Investigation findings; and
- Recommendations for future site work or site closure.

11.0 CONCLUSIONS

A written report summarizing field activities and characterizing the site will be submitted upon receiving laboratory results. The report will propose remediation efforts or site closure measures and address the final disposal of any contaminated media.

12.0 LITERATURE CITED

- DEC, 2009. *Laboratory Data and Quality Assurance Policy – Technical Memorandum*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.
- DEC, 2019. *Laboratory Data Review Checklist*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska. Available at dec.alaska.gov/spar/csp/guidance_forms.
- DEC, 2020. *Transport, Treatment, & Disposal Approval Form for Contaminated Media*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska. Available at dec.alaska.gov/spar/csp/guidance_forms
- DEC, 2013. *Monitoring Well Guidance*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.
- DEC, 2019. *Field Sampling Guidance*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.
- DEC, 2017. *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.
- TPECI, 2019. *North Star Pit Phase I Environmental Site Assessment*. Travis/Peterson Environmental Consulting, Inc. Anchorage, Alaska.
- TPECI, 2020. *North Star Pit Phase II Environmental Site Assessment*. Travis/Peterson Environmental Consulting, Inc. Anchorage, Alaska.
- 18 AAC 75 *Oil and Other Hazardous Substances Pollution Control, Revised as of October, 2018*. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

APPENDIX A:

Figures



Travis/Peterson Environmental Consulting, Inc.
 3305 Arctic Boulevard, Suite 102
 Anchorage, AK 99503
 907-522-4337

**North Star Pit Site Characterization
 Work Plan**
 Soldotna, Alaska

Location and Vicinity Map

Figure #1

Project No: 1405-42

File: Company/Projects/1405/42

Date: 2/20/2020

Scale: None



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**North Star Pit Site Characterization
Work Plan
Soldotna Alaska**

Site Map
Figure #2

Project No: 1405-42

File: Company/Projects/1405/42

Date: 2/20/2020

Scale: None



Legend

- Proposed Groundwater Monitoring Wells

**North Star Pit Site Characterization
Work Plan
Soldotna Alaska**

**Propose Groundwater Monitoring Well
Locations
Figure #3**

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Anchorage, AK 99503
907-522-4337

Project No: 1405-42

File: Company/Projects/1405/42

Date: 2/20/2020

Scale: None

APPENDIX B: Conceptual Site Model

Appendix A - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name:

File Number:

Completed by:

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: *Follow the italicized instructions in each section below.*

1. General Information:

Sources (*check potential sources at the site*)

- | | |
|--|--|
| <input type="checkbox"/> USTs | <input type="checkbox"/> Vehicles |
| <input checked="" type="checkbox"/> ASTs | <input type="checkbox"/> Landfills |
| <input type="checkbox"/> Dispensers/fuel loading racks | <input type="checkbox"/> Transformers |
| <input checked="" type="checkbox"/> Drums | <input checked="" type="checkbox"/> Other: <input type="text" value="Malfunctioning Oil/Water Separator"/> |

Release Mechanisms (*check potential release mechanisms at the site*)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Spills | <input checked="" type="checkbox"/> Direct discharge |
| <input checked="" type="checkbox"/> Leaks | <input type="checkbox"/> Burning |
| | <input type="checkbox"/> Other: <input type="text"/> |

Impacted Media (*check potentially-impacted media at the site*)

- | | |
|---|--|
| <input checked="" type="checkbox"/> Surface soil (0-2 feet bgs*) | <input checked="" type="checkbox"/> Groundwater |
| <input checked="" type="checkbox"/> Subsurface soil (>2 feet bgs) | <input type="checkbox"/> Surface water |
| <input checked="" type="checkbox"/> Air | <input type="checkbox"/> Biota |
| <input type="checkbox"/> Sediment | <input type="checkbox"/> Other: <input type="text"/> |

Receptors (*check receptors that could be affected by contamination at the site*)

- | | |
|--|--|
| <input type="checkbox"/> Residents (adult or child) | <input checked="" type="checkbox"/> Site visitor |
| <input checked="" type="checkbox"/> Commercial or industrial worker | <input checked="" type="checkbox"/> Trespasser |
| <input checked="" type="checkbox"/> Construction worker | <input type="checkbox"/> Recreational user |
| <input type="checkbox"/> Subsistence harvester (i.e. gathers wild foods) | <input type="checkbox"/> Farmer |
| <input type="checkbox"/> Subsistence consumer (i.e. eats wild foods) | <input type="checkbox"/> Other: <input type="text"/> |

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface?
(Contamination at deeper depths may require evaluation on a site-specific basis.) ☐

If the box is checked, label this pathway complete:

Complete

Comments:

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface?
(Contamination at deeper depths may require evaluation on a site specific basis.) ☐

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☐

If both boxes are checked, label this pathway complete:

Complete

Comments:

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater,
or are contaminants expected to migrate to groundwater in the future? ☐

Could the potentially affected groundwater be used as a current or future drinking water
source? Please note, only leave the box unchecked if DEC has determined the ground-
water is not a currently or reasonably expected future source of drinking water according
to 18 AAC 75.350. ☐

If both boxes are checked, label this pathway complete:

Complete

Comments:

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future?

☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).

☐

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods?

☐

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)?

☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.)

☐

If all of the boxes are checked, label this pathway complete:

Incomplete

Comments:

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.)

☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)?

☒

If both boxes are checked, label this pathway complete:

Complete

Comments:

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminated soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures)

☐

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)?

☒

If both boxes are checked, label this pathway complete:

Incomplete

Comments:

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed:

☒

Comments:

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed:

☐

Comments:

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM₁₀). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed:

☐

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed:

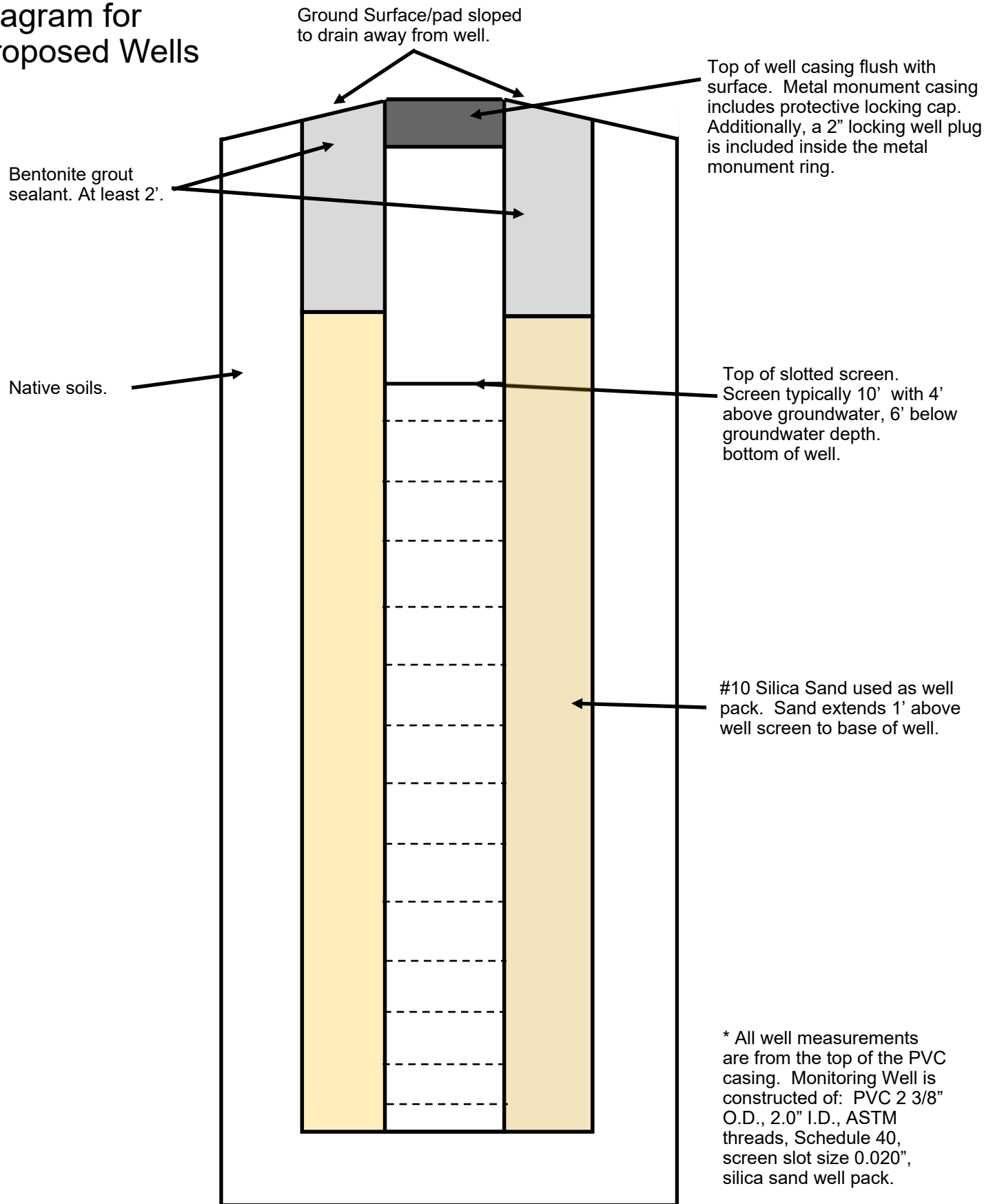
☐

Comments:

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

APPENDIX C:
Groundwater Monitoring Well Diagram

Monitoring Well Diagram for Proposed Wells



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Anchorage, Alaska 99503

North Star Pit Site Characterization
Work Plan Soldotna, Alaska

Monitoring Well
Diagram

Project No: 1405-42

File: Company\Projects\Knik Construction\1405-42

Date: 2/20/20

No Scale

APPENDIX D:
TPECI Personnel Resumes

Erik D. Mundahl, P.E.
Environmental Engineer
Travis/Peterson Environmental Consulting, Inc.
3305 Arctic Boulevard, Suite 102
Anchorage, Alaska 99503

Telephone (907) 522-4337
Fax (907) 522-4313
EMundahl@tpeci.com

EDUCATION

B.S. Environmental Engineering
Michigan Technological University
Houghton, Michigan

REPRESENTATIVE EXPERIENCE

Environmental Engineer

Travis/Peterson Environmental Consulting, Inc., (Alaska), 5/2009 - Present

Senior Environmental Engineer for an environmental consulting and engineering firm. General duties include writing complex environmental documents, design and construction oversight of water and wastewater treatment systems, conducting sanitary surveys, conducting baseline environmental research, site characterization and remediation, biological assessments and species data collection, writing scientific reports, managing projects, and interfacing with regulatory agencies and clients. Other duties include performing environmental records reviews, site assessments, biological analysis, soil sampling, wetlands delineations, and site reconnaissance. These duties require field work in remote areas throughout Alaska while working in inclement weather.

As an Environmental Engineer, he has 10 years of experience in Alaska. Assignments have required close familiarity with designing and implementing remediation plans, hazardous waste management, and performing Environmental Site Assessments and Facility Compliance Audits. Additional assignments have included wetland delineation and restoration work. Mr. Mundahl has designed, permitted, and provided construction supervision for watershed restoration programs including water quality monitoring and analysis. Mr. Mundahl also has a significant background in aquatic biology including fish collection and identification, stream/river habitat assessments, GPS based wildlife monitoring, and aquatic invertebrate collection, sorting, and identification.

Environmental Engineer Intern

Restoration Science and Engineering, (Alaska), 5/2008 – 8/2008

Worked as an engineering intern throughout Alaska including remote project sites. Conducted contaminated site remediation and routine groundwater contaminate modeling. Work also included Phase I and II Environmental Site Assessments and watershed hydraulic analysis for river and stream systems throughout southcentral Alaska.

Environmental Engineer Intern

Oasis Environmental, (Montana), 5/2007 – 8/2007

Worked as an engineering intern in Montana specializing in stream habitat restoration, wetland mitigation, and aquatic biological surveys. Performed wetland mitigation workout throughout

Montana with work ranging from design to construction. Work also included stream hydraulic analysis and restoration design returning agriculturally affected stream channels to natural habitats. Conducted fish and invertebrates population surveys including in-depth studies on the endangered West Slope Cutthroat Trout.

CERTIFICATIONS

State of Alaska	Registered Professional Engineer EV14420
State of Alaska	Certified Erosion & Sediment Control Lead Instructor
AGC of Alaska	Certified Erosion & Sediment Control Lead #AGC-19-0017
NANA Training Systems	HAZWOPER 40-hr. Course, 2009
Environmental Management, Inc.	HAZWOPER 8-hr. Refresher, 5/10, 5/11, 5/12, 5/13, 4/14, 3/15, 2/16, 2/17
Satori Group, Inc.	HAZWOPER 8-hr. Refresher, 2/18, 1/19, 1/20
State of Alaska	Certified Sanitary Survey Inspector
Richard Chinn Training	U.S. Army Corps of Engineers Wetland Delineation Training
American Red Cross	CPR & First Aid Certified
Wilderness Medicine Institute	Wilderness First Responder
North Slope Training Cooperative	NSTC

Michael D. Travis, P. E.

Environmental Engineer

Mike has over 37 years of experience in Environmental projects in Alaska. He manages National Environmental Policy Act (NEPA) documents throughout Alaska. His vast experience with State agencies, Federal laws and statutes, and working with local communities enables him to effectively manage a wide variety of projects. He is a registered civil engineer in Alaska. Relevant projects include Spenard Road Contaminated Sites Study – Municipality of Anchorage and the Spenard Road, Hillcrest to Minnesota Drive Categorical Exclusion – DOT&PF.

Work Experience

Principal, Travis/Peterson Environmental Consulting, Inc.

Responsibilities: Co-Owner and Principal of an environmental engineering consulting firm. Provided a wide range of environmental and engineering services for private and governmental agencies. Performed environmental impact analysis for new and expanded utilities, highways, airports, mines, and power plants. Impact analysis involved air and noise modeling, storm water planning, public involvement, and social-economic analysis.

Chief of Professional Services, Alaska Department of Transportation and Public Facilities (DOT&PF)

Responsibilities: Supervised the contracting and negotiating of engineering and construction projects within the Central Region of the Department. Assisted in the final design of the Whittier Tunnel Access project. Provided environmental expertise for DOT&PF defense of a lawsuit within the Ninth Circuit Court of Appeals.

Vice President, AGRA Earth and Environmental, Inc.

Responsibilities: Managed geotechnical and environmental engineering offices in Fairbanks and Anchorage, Alaska. Reviewed final work products before submitting them to clients. Designed hazardous waste remediation systems. Developed corrective action plans for spill sites. Designed water treatment systems for remote canneries. Performed Environmental Assessments

to fulfill requirements of the NEPA for construction projects throughout Alaska. Environmental Manager for the Whittier Tunnel EIS. Supervised 30 employees.



Education

University of Alaska Fairbanks

B.S. Biology

M.S. Environmental Quality Science

Certifications

Hazardous Waste Operations and Emergency Response Certification, Supervisors Course

Registered Civil Engineer in Alaska. Registration number CE 8048

Affiliations

International Right Of Way Association

Ryan Kingsbery - Staff Scientist

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EDUCATION

Alaska Pacific University
Principia College

MSc: Environmental Science
BA: Environmental Studies

REPRESENTATIVE EXPERIENCE

Staff Environmental Scientist

Travis/Peterson Environmental Consulting, Inc.

Staff Environmental Scientist for an environmental consulting and engineering firm. General duties include project management, site inspections, field operations, report writing, baseline environmental research, site characterization, site remediation, excavation dewatering plans, biological assessments, species data collection, and regulatory agency coordination. Other duties include performing environmental records reviews, Phase 1 site assessments, wetland delineation, biological analysis, soil sampling, and spill response.

Biological Science Technician

U.S. Geological Survey, Alaska Science Center

Biological Science Technician duties included field technician supervision, field logistics, vegetation plot sampling, North Slope bird nesting surveys and capture effort, data entry and data analysis. Additional duties included field logistics preparations and assistance in a walrus tagging effort on the Chukchi Sea coast.

Alaska Pacific University

Master of Science, Environmental Science

Successfully defended thesis in May 2012. Thesis pertained to northern fur seal marine debris entanglement on St. George Island, Alaska. Documentation included five years of observations throughout 2005-2010. Satellite work involved northern fur seal tagging, Steller sea lion entanglement monitoring and near-shore killer whale monitoring.

CERTIFICATIONS

Environmental Management, Inc.	<i>HAZWOPER 40-hr. Initial Course, 4/2014</i>
Environmental Management, Inc.	<i>HAZWOPER 8-hr. Refresher, 4/2015</i>
Satori Group	<i>HAZWOPER 8-hr. Refresher, 2016, 2017, 2018, 2019, 2020</i>
The Associated General Contractors (ACG)	<i>Alaska Certified Erosion & Sediment Control Lead, Certified since 5/2014, AK-CESCL #AGC-17-0327</i>
Richard Chinn Environmental Training, Inc.	<i>38-hr. Army Corps of Engineers Wetland Delineation Training Program, Certified since: 5/2018</i>

EMPLOYMENT RECORD

3/2014 – Present
1/2013 – 10/2013

Travis/Peterson Environmental Consulting, Inc.
U.S. Geological Survey, Alaska Science Center

Casey Volk

Staff Environmental Scientist

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EDUCATION

University of Nevada, Reno

BS- Wildlife Ecology & Conservation

Reno, Nevada (2010-2014)

REPRESENTATIVE EXPERIENCE

Staff Environmental Scientist

Travis/Peterson Environmental Consulting, Inc.

Staff Environmental Scientist for an environmental consulting and engineering firm. General duties include report writing, conducting baseline environmental research, site characterization and remediation, biological assessments and species data collection, and interfacing with regulatory agencies and clients. Other duties include performing environmental records reviews, site assessments, biological analysis, soil sampling, wetlands delineations, and site reconnaissance.

Fish Technician II

Alaska Department of Fish & Game

Fish Technician duties included field technician supervision, field logistics, data entry and preliminary data analysis, and collection of biological samples. Additional duties included the installation and usage of telemetry scanning for mortality rates among Alaskan salmon. Employed while attending college.

CERTIFICATIONS

The Associated General Contractors	Alaska Certified Erosion & Sediment Control Lead, 5/2019
Environmental Management Inc	HAZWOPER 40-hr. Course, 5/2019, 1/2020

EMPLOYMENT RECORD

4/2019 - Present

Travis/Peterson Environmental Consulting, Inc.

7/2015 - 4/2019

Spectra Venue Management

5/2012 - 7/2015

Alaska Department of Fish & Game (Seasonal Permanent)

APPENDIX E:
Data Quality Indicator Worksheets

SAP Worksheet #15

15 - Reference Limits and Evaluation Table AK 101 Soil

Matrix: Soil

Analytical Group: Extractable Hydrocarbons (GRO)

Analyte	CAS Number	DEC Cleanup Levels					Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc	Ingestion	Inhalation	Migration to Groundwater				LOQs	LODs	MDLs
Gasoline Range Organics (GRO)-(C6-C10)	GRO	mg/Kg	-	1400	1400	300	300	300	300	2.5	1.25	0.75

PAL is equal to lowest value of ingestion, inhalation, or migration to groundwater as published in 18 AAC 341 Table B2

18 AAC 75.341 Table B2

PAL for unrestricted use is lower of migration to groundwater or Adjusted Human Health cleanup level

NS indicates no standard has been published by DEC

c/nc indicates carcinogen/non-carcinogen

PAL for Disposal is lowest of Human Health or Migration to Groundwater cleanup level

SAP Worksheet #15

15 - Reference Limits and Evaluation Table EPA 8270D SIM Soil

Matrix: Solid
Analytical Group: Semi-Volatiles by EPA 8270D SIM
Low/Medium

Analyte	CAS Number	DEC Cleanup Levels					Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Migration to Groundwater	Adjusted Human Health				LOQs	LODs	DLs
1-Methylnaphthalene	90-12-0	mg/Kg	c	68	0.41	6.8	0.41	0.41	0.41	0.025	0.0125	0.0075
2-Methylnaphthalene	91-57-6	mg/Kg	nc	310	1.3	3.1	1.3	1.3	1.3	0.025	0.0125	0.0075
Acenaphthene	83-32-9	mg/Kg	nc	4600	37	460	37	37	37	0.025	0.0125	0.0075
Acenaphthylene	208-96-8	mg/Kg	nc	2300	1900	230	230	230	230	0.025	0.0125	0.0075
Anthracene	120-12-7	mg/Kg	nc	230000	390	23000	390	390	390	0.025	0.0125	0.0075
Benzo(a)Anthracene	56-55-3	mg/Kg	m	14	0.7	1.4	0.7	0.7	0.7	0.025	0.0125	0.0075
Benzo[a]pyrene	50-32-8	mg/Kg	m	1.5	1.9	0.15	0.15	0.15	0.15	0.025	0.0125	0.0075
Benzo[b]Fluoranthene	205-99-2	mg/Kg	m	15	20	1.5	1.5	1.5	1.5	0.025	0.0125	0.0075
Benzo[g,h,i]perylene	191-24-2	mg/Kg	nc	2300	15000	230	230	230	230	0.025	0.0125	0.0075
Benzo[k]fluoranthene	207-08-9	mg/Kg	m	150	190	15	15	15	15	0.025	0.0125	0.0075
Chrysene	218-01-9	mg/Kg	m	1500	600	150	150	150	150	0.025	0.0125	0.0075
Dibenzo[a,h]anthracene	53-70-3	mg/Kg	m	1.5	6.3	0.15	0.15	0.15	0.15	0.025	0.0125	0.0075
Fluoranthene	206-44-0	mg/Kg	nc	3100	590	310	310	310	310	0.025	0.0125	0.0075
Fluorene	86-73-7	mg/Kg	nc	3100	36	310	36	36	36	0.025	0.0125	0.0075
Indeno[1,2,3-c,d] pyrene	193-39-5	mg/Kg	m	15	65	1.5	1.5	1.5	1.5	0.025	0.0125	0.0075
Naphthalene	91-20-3	mg/Kg	ca	29	0.038	2.9	0.038	0.038	0.038	0.02	0.01	0.006
Phenanthrene	85-01-8	mg/Kg	nc	2300	39	230	39	39	39	0.025	0.0125	0.0075
Pyrene	129-00-0	mg/Kg	nc	2300	87	230	87	87	87	0.025	0.0125	0.0075

Human Health from 18 AAC 75.341 Table B1 Under 40-inch zone

Migration to Groundwater from 18 AAC 75.341 Table B1 Under 40-inch zone

Adjusted Human health is 1/10th soil based human health cleanup level

NS indicates no standard has been published by DEC

c/nc/m indicates caconigen/non-carcinogen/mutagen

PAL for Disposal is lowest of Human Health or Migration to Groundwater cleanup level

value exceeds disposal PAL

PAL for unrestricted use is Adjusted Human Health cleanup level

SAP Worksheet #15

15 - Reference Limits and Evaluation Table EPA 8260C (MEOH) Soil

Matrix: Solid (Methanol Preserved)

Analytical Group: Volatiles by EPA 8260C Low/Medium

Analyte	CAS Number	DEC Cleanup Levels					Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Migration to Groundwater	Adjusted Human Health				LOQs	LODs	DLs
1,1,1,2-Tetrachloroethane	630-20-6	mg/Kg	c	21	0.022	2.1	0.022	0.022	0.022	0.0062	0.01	0.0062
1,1,1-Trichloroethane	71-55-6	mg/Kg	nc	360	32	36	32	32	32	0.0078	0.0125	0.0078
1,1,2,2-Tetrachloroethane	79-34-5	mg/Kg	c	6.1	0.003	0.61	0.003	0.003	0.003	0.00062	0.001	0.00062
1,1,2-Trichloroethane	79-00-5	mg/Kg	nc	1.6	0.0014	0.16	0.0014	0.0014	0.0014	0.00025	0.0004	0.00025
1,1-Dichloroethane	75-34-3	mg/Kg	c	46	0.092	4.6	0.092	0.092	0.092	0.0078	0.0125	0.0078
1,1-Dichloroethene	75-35-4	mg/Kg	nc	330	1.2	33	1.2	1.2	1.2	0.0078	0.0125	0.0078
1,1-Dichloropropene	563-58-6	mg/Kg	-	NS	NS	NS	-	-	-	0.0078	0.0125	0.0078
1,3-Dichloropropene	542-75-6	mg/Kg	C	21	0.018	2.1	0.018	0.018	0.018	0.0078	0.0125	0.0078
1,2,3-Trichlorobenzene	87-61-6	mg/Kg	nc	81	0.15	8.1	0.15	0.15	0.15	0.015	0.025	0.015
1,2,3-Trichloropropane	96-18-4	mg/Kg	m	0.066	0.000031	0.0066	0.000031	0.000031	0.000031	0.00062	0.0005	0.00062
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	nc	45	0.082	4.5	0.082	0.082	0.082	0.0078	0.0125	0.0078
1,2,4-Trimethylbenzene	95-63-6	mg/Kg	nc	43	0.61	4.3	0.61	0.61	0.61	0.015	0.025	0.015
1,2-Dibromo-3-chloropropane	35407	mg/Kg	-	NS	NS	NS	-	-	-	0.031	0.05	0.031
1,2-Dibromoethane	106-93-4	mg/Kg	c	0.42	0.00024	0.042	0.00024	0.00024	0.00024	0.00062	0.001	0.00062
1,2-Dichlorobenzene	95-50-1	mg/Kg	nc	78	2.4	7.8	2.4	2.4	2.4	0.0078	0.0125	0.0078
1,2-Dichloroethane	107-06-2	mg/Kg	c	5.5	0.0055	0.55	0.0055	0.0055	0.0055	0.00062	0.001	0.00062
1,2-Dichloropropane	78-87-5	mg/Kg	nc	17	0.03	1.7	0.03	0.03	0.03	0.0031	0.005	0.0031
1,3,5-Trimethylbenzene	108-67-8	mg/Kg	nc	37	0.66	3.7	0.66	0.66	0.66	0.0078	0.0125	0.0078
1,3-Dichlorobenzene	541-73-1	mg/Kg	nc	62	2.3	6.2	2.3	2.3	2.3	0.0078	0.0125	0.0078
1,3-Dichloropropane	142-28-9	mg/Kg	-	NS	NS	NS	-	-	-	0.0031	0.005	0.0031
1,4-Dichlorobenzene	106-46-7	mg/Kg	c	21	0.037	2.1	0.037	0.037	0.037	0.0078	0.0125	0.0078
2,2-Dichloropropane	594-20-7	mg/Kg	-	NS	NS	NS	-	-	-	0.0078	0.0125	0.0078
2-Butanone (MEK)	78-93-3	mg/Kg	nc	23000	15	2300	15	15	15	0.078	0.125	0.078
2-Chlorotoluene	95-49-8	mg/Kg	-	NS	NS	NS	-	-	-	0.0078	0.0125	0.0078
2-Hexanone	591-78-6	mg/Kg	nc	270	0.11	27	0.11	0.11	0.11	0.031	0.05	0.031
4-Chlorotoluene	106-43-4	mg/Kg	-	NS	NS	NS	-	-	-	0.0078	0.0125	0.0078
4-Isopropyltoluene	99-87-6	mg/Kg	-	NS	NS	NS	-	-	-	0.025	0.05	0.025
4-Methyl-2-pentanone (MIBK)	108-10-1	mg/Kg	nc	2200	18	220	18	18	18	0.078	0.125	0.078
Acetone	67-64-1	mg/Kg	nc	81000	38		38	38	38	0.078	0.125	0.078
Benzene	71-43-2	mg/Kg	c	11	0.022	1.1	0.022	0.022	0.022	0.0039	0.00625	0.0039
Bromobenzene	108-86-1	mg/Kg	nc	160	0.36	16	0.36	0.36	0.36	0.0078	0.0125	0.0078
Bromochloromethane	74-97-5	mg/Kg	-	NS	NS	NS	-	-	-	0.0078	0.0125	0.0078
Bromodichloromethane	75-27-4	mg/Kg	c	3.6	0.0043	0.36	0.0043	0.0043	0.0043	0.00062	0.001	0.00062
Bromoform	75-25-2	mg/Kg	c	240	0.1	24	0.1	0.1	0.1	0.0078	0.0125	0.0078
Bromomethane	74-83-9	mg/Kg	nc	10	0.024	1	0.024	0.024	0.024	0.0062	0.01	0.0062
Carbon disulfide	75-15-0	mg/Kg	nc	500	2.9	50	2.9	2.9	2.9	0.031	0.05	0.031
Carbon tetrachloride	56-23-5	mg/Kg	c	9.1	0.021	0.91	0.021	0.021	0.021	0.0039	0.00625	0.0039
Chlorobenzene	108-90-7	mg/Kg	nc	180	0.46	18	0.46	0.46	0.46	0.0078	0.0125	0.0078
Chloroethane (Ethyl Chloride)	75-00-3	mg/Kg	nc	1400	72	140	72	72	72	0.062	0.1	0.062
Chloroform	67-66-3	mg/Kg	c	4	0.0071	0.4	0.0071	0.0071	0.0071	0.00062	0.001	0.00062

Chloromethane	74-87-3	mg/Kg	nc	170	0.61	17	0.61	0.61	0.61	0.0078	0.0125	0.0078
Analyte	CAS Number	DEC Cleanup Levels					Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Migration to Groundwater	Adjusted Human Health				LOQs	LODs	DLs
cis-1,2-Dichloroethene	156-59-2	mg/Kg	nc	200	1.2	20	1.2	1.2	1.2	0.0078	0.0125	0.0078
cis-1,3-Dichloropropene	10061-01-5	mg/Kg	-	NS	NS	NS	-	-	-	0.0039	0.00625	0.0039
Dibromochloromethane	124-48-1	mg/Kg	c	110	0.0027	11	0.0027	0.0027	0.0027	0.00062	0.001	0.00062
Dibromomethane	74-95-3	mg/Kg	nc	31	0.025	3.1	0.025	0.025	0.025	0.0078	0.0125	0.0078
Dichlorodifluoromethane	75-71-8	mg/Kg	nc	150	3.9	15	3.9	3.9	3.9	0.015	0.025	0.015
Ethylbenzene	100-41-4	mg/Kg	c	49	0.13	4.9	0.13	0.13	0.13	0.0078	0.0125	0.0078
Freon-113	76-13-1	mg/Kg	nc	740	310	74	310	310	310	0.031	0.05	0.031
Hexachlorobutadiene	87-68-3	mg/Kg	nc	3.3	0.02	0.33	0.02	0.02	0.02	0.0062	0.01	0.0062
Isopropylbenzene (Cumene)	98-82-8	mg/Kg	nc	54	5.6	5.4	5.6	5.6	5.6	0.0078	0.0125	0.0078
Methylene chloride	75-09-2	mg/Kg	nc	460	0.33	46	0.33	0.33	0.33	0.031	0.05	0.031
Methyl-t-butyl ether	1634-04-4	mg/Kg	c	670	0.4	67	0.4	0.4	0.4	0.031	0.05	0.031
Naphthalene	91-20-3	mg/Kg	c	29	0.038	2.9	0.038	0.038	0.038	0.0078	0.0125	0.0078
n-Butylbenzene	104-51-8	mg/Kg	nc	20	23	2	23	2	2	0.0078	0.0125	0.0078
n-Propylbenzene	103-65-1	mg/Kg	nc	52	9.1	5.2	9.1	5.2	5.2	0.0078	0.0125	0.0078
o-Xylene	95-47-6	mg/Kg	nc	57	1.5	5.7	1.5	1.5	1.5	0.0078	0.0125	0.0078
P & M -Xylene	P & M -Xylene	mg/Kg	nc	57	1.5	5.7	1.5	1.5	1.5	0.015	0.025	0.015
sec-Butylbenzene	135-98-8	mg/Kg	nc	28	42	2.8	42	2.8	2.8	0.0078	0.0125	0.0078
Styrene	100-42-5	mg/Kg	nc	180	10	18	10	10	10	0.0078	0.0125	0.0078
tert-Butylbenzene	98-06-6	mg/Kg	nc	36	11	3.6	11	3.6	3.6	0.0078	0.0125	0.0078
Tetrachloroethene	127-18-4	mg/Kg	nc	68	0.19	6.8	0.19	0.19	0.19	0.0039	0.00625	0.0039
Toluene	108-88-3	mg/Kg	nc	200	6.7	20	6.7	6.7	6.7	0.0078	0.0125	0.0078
trans-1,2-Dichloroethene	156-60-5	mg/Kg	nc	960	1.3	96	1.3	1.3	1.3	0.0078	0.0125	0.0078
trans-1,3-Dichloropropene	10061-02-6	mg/Kg	-	NS	NS	NS	-	-	-	0.0039	0.00625	0.0039
Trichloroethene	76-01-6	mg/Kg	nc	4.9	0.011	0.49	0.011	0.011	0.011	0.0015	0.0025	0.0015
Trichlorofluoromethane	75-69-4	mg/Kg	nc	980	41	98	41	41	41	0.015	0.025	0.015
Vinyl acetate	108-05-4	mg/Kg	nc	1400	1.1	140	1.1	1.1	1.1	0.031	0.05	0.031
Vinyl chloride	27398	mg/Kg	c	0.65	0.0008	0.065	0.0008	0.0008	0.0008	0.0008	0.0004	0.00025
Xylenes (total)	1330-20-7	mg/Kg	nc	57	1.5	5.7	1.5	1.5	1.5	0.0228	0.0375	0.0228

Human Health from 18 AAC 75.341 Table B1 Under 40-inch zone
Migration to Groundwater from 18 AAC 75.341 Table B1 Under 40-inch zone
Adjusted Human health is 1/10th soil based human health cleanup level

NS indicates no standard has been published by DEC
c/nc/m indicates caconigen/non-carcinogen/mutagen
PAL for Disposal is lowest of Human Health or Migration to Groundwater cleanup level

value exceeds disposal PAL
PAL for unrestricted use is Adjusted Human Health cleanup level

SAP Worksheet #15

15 - Reference Limits and Evaluation Table AK 102 & AK 103 Soil

Matrix: Soil

Analytical Group: Extractable Hydrocarbons (DRO/RRO)

Analyte	CAS Number	DEC Cleanup Levels					Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc	Ingestion	Inhalation	Migration to Groundwater				LOQs (mg/Kg)	LODs (mg/Kg)	MDLs (mg/Kg)
DRO (nC10-<nC25)	DRO	mg/Kg	-	10250	12500	250	250	250	250	20	10	6.2
RRO (nC25-nC36)	RRO	mg/Kg	-	10000	22000	11000	11000	11000	11000	20	10	6.2

PAL is equal to lowest value of ingestion, inhalation, or migration to groundwater as published in 18 AAC 341 Table B2

18 AAC 75.341 Table B2

PAL for unrestricted use is lower of migration to groundwater or Adjusted Human Health cleanup level

NS indicates no standard has been published by DEC

c/nc indicates carcinogen/non-carcinogen

QAPP WORKSHEET #15

15 – REFERENCE LIMITS AND EVALUTATION TABLE AK101 WATER

Matrix: Water
 Analytical Group or Method: GRO by AK101
 Concentration Level: N/A

Analyte	CAS Number	DEC Cleanup Levels				Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Adjusted Human Health				LOQs	LODs	DLs
Gasoline Range Organics (GRO)-C6-C10	GRO	ug/L	-	2200	220	2200	220	220	100	50	31

indicates above PAL for Disposal

Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C

Adjusted Human health is 1/10th groundwater based human health cleanup level
 c/nc/m indicates
 carcinogen/non-
 carcinogen/mutagen

PAL for Disposal is the Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C

PAL for unrestricted use is groundwater human health screening level (1/10th DEC Clean up Level)

SAP Worksheet #15

15 - Reference Limits and Evaluation Table PAH by EPA 8270D SIM Water

Matrix: Water

Analytical Group: PAH by 8270D SIM

Analyte	CAS Number	DEC Cleanup Levels				Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	Laboratory-specific		
		Units	c/nc/m	Human Health	Adjusted Human Health				LOQs	LODs	DLs
1-Methylnaphthalene	90-12-0	ug/L	ca	11	11	1.1	11	0.0125	0.00625	0.0037	1-Methylnaphthalene
2-Methylnaphthalene	91-57-6	ug/L	nc	36	36	3.6	36	0.0125	0.00625	0.0037	2-Methylnaphthalene
Acenaphthene	83-32-9	ug/L	nc	530	530	53	530	0.0125	0.00625	0.0037	Acenaphthene
Acenaphthylene	208-96-8	ug/L	nc	260	260	26	260	0.0125	0.00625	0.0037	Acenaphthylene
Anthracene	120-12-7	ug/L	nc	43	43	4.3	43	0.0125	0.00625	0.0037	Anthracene
Benzo(a)Anthracene	56-55-3	ug/L	m	0.3	0.3	0.03	0.3	0.0125	0.00625	0.0037	Benzo(a)Anthracene
Benzo[a]pyrene	50-32-8	ug/L	m	0.25	0.25	0.025	0.25	0.005	0.0025	0.0015	Benzo[a]pyrene
Benzo[b]Fluoranthene	205-99-2	ug/L	nc	2.5	2.5	0.25	2.5	0.0125	0.00625	0.0037	Benzo[b]Fluoranthene
Benzo[g,h,i]perylene	191-24-2	ug/L	m	0.26	0.26	0.026	0.26	0.0125	0.00625	0.0037	Benzo[g,h,i]perylene
Benzo[k]fluoranthene	207-08-9	ug/L	m	0.8	0.8	0.08	0.8	0.0125	0.00625	0.0037	Benzo[k]fluoranthene
Chrysene	218-01-9	ug/L	m	2	2	0.2	2	0.0125	0.00625	0.0037	Chrysene
Dibenzo[a,h]anthracene	53-70-3	ug/L	m	0.25	0.25	0.025	0.25	0.005	0.0025	0.0015	Dibenzo[a,h]anthracene
Fluoranthene	206-44-0	ug/L	nc	260	260	26	260	0.0125	0.00625	0.0037	Fluoranthene
Fluorene	86-73-7	ug/L	nc	290	290	29	290	0.0125	0.00625	0.0037	Fluorene
Indeno[1,2,3-c,d] pyrene	193-39-5	ug/L	ca	0.19	0.19	0.019	0.19	0.0125	0.00625	0.0037	Indeno[1,2,3-c,d] pyrene
Naphthalene	91-20-3	ug/L	ca	1.7	1.7	0.17	1.7	0.025	0.0125	0.0078	Naphthalene
Phenanthrene	85-01-8	ug/L	nc	170	170	17	170	0.05	0.025	0.0037	Phenanthrene
Pyrene	129-00-0	ug/L	nc	120	120	12	120	0.05	0.025	0.0037	Pyrene

indicates above PAL for Disposal

PAL for Disposal is the Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C

Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C

PAL for unrestricted use is groundwater human health screening level (1/10th DEC Clean up Level)

Adjusted Human health is 1/10th groundwater based human health cleanup level

SAP Worksheet #15

15 - Reference Limits and Evaluation Table EPA 8260C Water

Matrix: Aqueous

Analytical Group: Volatiles by 8260C

Analyte	CAS Number	DEC Cleanup Levels				Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Adjusted Human Health				LOQs	LODs	DLs
1,1,1,2-Tetrachloroethane	630-20-6	ug/L	c	5.7	0.57	5.7	0.57	0.57	0.5	0.25	0.15
1,1,1-Trichloroethane	71-55-6	ug/L	nc	8000	800	8000	800	800	1	0.5	0.31
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	c	0.76	0.076	0.76	0.076	0.076	0.5	0.25	0.15
1,1,2-Trichloroethane	79-00-5	ug/L	nc	0.41	0.041	0.41	0.041	0.041	0.4	0.2	0.12
1,1-Dichloroethane	75-34-3	ug/L	c	28	2.8	28	2.8	2.8	1	0.5	0.31
1,1-Dichloroethene	75-35-4	ug/L	nc	280	28	280	28	28	1	0.5	0.31
1,1-Dichloropropene	563-58-6	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
1,2,3-Trichlorobenzene	87-61-6	ug/L	nc	7	0.7	7	0.7	0.7	1	0.5	0.31
1,2,3-Trichloropropane	96-18-4	ug/L	m	0.0075	0.00075	0.0075	0.00075	0.00075	1	0.5	0.31
1,2,4-Trichlorobenzene	120-82-1	ug/L	nc	4	0.4	4	0.4	0.4	1	0.5	0.31
1,2,4-Trimethylbenzene	95-63-6	ug/L	nc	56	5.6	56	5.6	5.6	1	0.5	0.31
1,2-Dibromo-3-chloropropane	35407	ug/L	-	NS	NS	-	NS	-	10	5	3.1
1,2-Dibromoethane	106-93-4	ug/L	c	0.075	0.0075	0.075	0.0075	0.0075	0.075	0.0375	0.018
1,2-Dichlorobenzene	95-50-1	ug/L	nc	300	30	300	30	30	1	0.5	0.31
1,2-Dichloroethane	107-06-2	ug/L	c	1.7	0.17	1.7	0.17	0.17	0.5	0.25	0.15
1,2-Dichloropropane	78-87-5	ug/L	nc	8.2	0.82	8.2	0.82	0.82	1	0.5	0.31
1,3,5-Trimethylbenzene	108-67-8	ug/L	nc	60	6	60	6	6	1	0.5	0.31
1,3-Dichlorobenzene	541-73-1	ug/L	nc	300	30	300	30	30	1	0.5	0.31
1,3-Dichloropropane	142-28-9	ug/L	-	NS	NS	-	-	-	0.5	0.25	0.15
1,4-Dichlorobenzene	106-46-7	ug/L	c	4.8	0.48	4.8	0.48	0.48	0.5	0.25	0.15
2,2-Dichloropropane	594-20-7	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
2-Butanone (MEK)	78-93-3	ug/L	nc	5600	560	5600	560	560	10	5	3.1
2-Chlorotoluene	95-49-8	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
2-Hexanone	591-78-6	ug/L	nc	38	3.8	38	3.8	3.8	10	5	3.1
4-Chlorotoluene	106-43-4	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
4-Isopropyltoluene	99-87-6	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
4-Methyl-2-pentanone (MIBK)	108-10-1	ug/L	nc	6300	630	6300	630	630	10	5	3.1
Acetone	67-64-1	ug/L	nc	14000	1400	14000	1400	1400	1	0.5	0.31
Benzene	71-43-2	ug/L	nc	4.6	0.46	4.6	0.46	0.46	0.4	0.2	0.12
Bromobenzene	108-86-1	ug/L	c	62	6.2	62	6.2	6.2	1	0.5	0.31
Bromochloromethane	74-97-5	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
Bromodichloromethane	75-27-4	ug/L	c	1.3	0.13	1.3	0.13	0.13	0.5	0.25	0.15
Bromoform	75-25-2	ug/L	c	33	3.3	33	3.3	3.3	0.5	0.5	0.31
Bromomethane	74-83-9	ug/L	nc	7.5	0.75	7.5	0.75	0.75	1	2.5	1.5
Carbon disulfide	75-15-0	ug/L	nc	810	81	810	81	81	5	5	3.1
Carbon tetrachloride	56-23-5	ug/L	c	4.6	0.46	4.6	0.46	0.46	10	0.5	0.31
Chlorobenzene	108-90-7	ug/L	nc	78	7.8	78	7.8	7.8	1	0.25	0.15
Chloroethane (Ethyl Chloride)	75-00-3	ug/L	nc	21000	2100	21000	2100	2100	0.5	0.5	0.31
Chloroform	67-66-3	ug/L	c	2.2	0.22	2.2	0.22	0.22	1	0.5	0.31
Chloromethane	74-87-3	ug/L	nc	190	19	190	19	19	1	0.5	0.31

Analyte	CAS Number	DEC Cleanup Levels				Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Adjusted Human Health				LOQs	LODs	DLs
cis-1,2-Dichloroethene	156-59-2	ug/L	nc	36	3.6	36	3.6	3.6	1	0.5	0.31
cis-1,3-Dichloropropene	10061-01-5	ug/L	-	NS	NS	-	-	-	1	0.25	0.15
Dibromochloromethane	124-48-1	ug/L	c	8.7	0.87	8.7	0.87	0.87	0.5	0.25	0.15
Dibromomethane	74-95-3	ug/L	nc	8.3	0.83	8.3	0.83	0.83	0.5	0.5	0.31
Dichlorodifluoromethane	75-71-8	ug/L	nc	200	20	200	20	20	1	0.5	0.31
Ethylbenzene	100-41-4	ug/L	c	15	1.5	15	1.5	1.5	1	0.5	0.31
Freon-113	76-13-1	ug/L	nc	10000	1000	10000	1000	1000	1	5	3.1
Hexachlorobutadiene	87-68-3	ug/L	nc	1.4	0.14	1.4	0.14	0.14	10	0.5	0.31
Isopropylbenzene (Cumene)	98-82-8	ug/L	nc	450	45	450	45	45	1	0.5	0.31
Methylene chloride	75-09-2	ug/L	nc	6300	630	6300	630	630	1	2.5	1
Methyl-t-butyl ether	1634-04-4	ug/L	nc	140	14	140	14	14	5	5	3.1
Naphthalene	91-20-3	ug/L	c	1.7	0.17	1.7	0.17	0.17	10	0.5	0.31
n-Butylbenzene	104-51-8	ug/L	nc	1000	100	1000	100	100	1	0.5	0.31
n-Propylbenzene	103-65-1	ug/L	nc	660	66	660	66	66	1	0.5	0.31
o-Xylene	95-47-6	ug/L	nc	190	19	190	19	19	1	0.5	0.31
P & M -Xylene	P & M -Xylene	ug/L	nc	190	19	190	19	19	1	1	0.62
sec-Butylbenzene	135-98-8	ug/L	nc	2000	200	2000	200	200	2	0.5	0.31
Styrene	100-42-5	ug/L	nc	1200	120	1200	120	120	1	0.5	0.31
tert-Butylbenzene	98-06-6	ug/L	nc	690	69	690	69	69	1	0.5	0.31
Tetrachloroethene	127-18-4	ug/L	nc	41	4.1	41	4.1	4.1	1	0.5	0.31
Toluene	108-88-3	ug/L	nc	1100	110	1100	110	110	1	0.5	0.31
trans-1,2-Dichloroethene	156-60-5	ug/L	nc	360	36	360	36	36	1	0.5	0.31
trans-1,3-Dichloropropene	10061-02-6	ug/L	-	NS	NS	-	-	-	1	0.5	0.31
Trichloroethene	79-01-6	ug/L	nc	2.8	0.28	2.8	0.28	0.28	1	0.5	0.31
Trichlorofluoromethane	75-69-4	ug/L	nc	5200	520	5200	520	520	1	0.5	0.31
Vinyl acetate	108-05-4	ug/L	nc	410	41	410	41	41	10	5	3.1
Vinyl chloride	75-01-4	ug/L	c	0.19	0.019	0.19	0.019	0.019	0.15	0.075	0.05
Xylenes (total)	1330-20-7	ug/L	nc	190	19	190	19	19	3	1.5	1

indicates above PAL for Disposal
Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C
Adjusted Human health is 1/10th groundwater based human health cleanup level

PAL for Disposal is the Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C
PAL for unrestricted use is groundwater human health screening level (1/10th DEC Clean up Level)

c/nc/m indicates carcinogen/non-carcinogen/mutagen

SAP Worksheet #15

15 - Reference Limits and Evaluation Table AK102 & AK103 Water

Matrix: Aqueous

Analytical Group: DRO by AK 102 & RRO &103

Analyte	CAS Number	DEC Cleanup Levels				Project Action Limit (Disposal)	Project Action Limit (Unrestricted Use)	Project Quantitation Limit Goal	SGS North America, Inc.		
		Units	c/nc/m	Human Health	Adjusted Human Health				LOQs	LODs	DLs
DRO (nC10-<nC25)	DRO	ug/L	-	1500	150	1500	150	1500	600	300	180
RRO (nC25-nC36)	RRO	ug/L	-	1100	110	1100	110	1100	500	250	150

indicates above PAL for Disposal

Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C

Adjusted Human health is 1/10th groundwater based human health cleanup level

c/nc/m indicates carcinogen/non-carcinogen/mutagen

PAL for Disposal is the Groundwater/Human Health Cleanup Level from 18 AAC 75.341 Table C

PAL for unrestricted use is groundwater human health screening level (1/10th DEC Clean up Level)