ANNUAL LANDFARM OPERATIONS REPORT – 2019
ARCTIC VILLAGE, ALASKA

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
DEC/DEC	Alaska Department of Environmental Conservation
AEI	Ahtna Environmental, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
COC	Contaminant of concern
CSM	Conceptual Site Model
cy	cubic yards
DEED	Department of Education and Early Development
DL	detection limit
DRO	diesel range organics
EPA	Environmental Protection Agency
eV	electron volt
FSG	Field Sampling Guidance
ft	feet
GRO	gasoline range organics
HQ	hazard quotient
LCS	laboratory control sample
LDRC	laboratory data review checklist
LF	linear feet
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NVVTG	Native Village of Venetie Tribal Government
PAH	polycyclic aromatic hydrocarbons
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
RPD	relative percent difference
RRO	residual range organics
SERRC	Southeast Regional Resources Center
SPCC	Spill Prevention Control and Countermeasures
SPLP	Synthetic Precipitate Leachate Procedure
SWPPP	Stormwater Pollution Prevention Plan
TPC	Third Party Consultant
VOC	volatile organic compound
YFSD	Yukon Flats School District

1.0 EXECUTIVE SUMMARY

The Arctic Village landfarm was constructed in 2017 to remediate the petroleum contaminated soil excavated in 2017 from the former YFSD School Site lease lot remediation project in Arctic Village. The primary contaminant of concern (COC) is diesel range organics (DRO) at concentrations above the site-specific cleanup level of 4,000 mg/kg. A total of 6,200 cubic yards (cy) of contaminated soil were excavated and placed in the landfarm for remediation.

The landfarm is constructed on top of a former municipal waste dumpsite that is covered with a compacted 12-inch thick gravel interim closure cap. Interim dump closure was completed in the summer of 2017 as part of the preparation for landfarm construction. The landfarm is surrounded by a permanent chain-link fence and locking gate to prevent unauthorized access. A gravel berm surrounds the landfarm soil, except for the entry/exit point to the north, to eliminate runoff from the landfarm. Once remediated, the landfarm soil will be graded out to create a 24 to 36-inch-deep permanent closure cap for the former dumpsite.

Ahtna Environmental, Inc. (AEI) is responsible for the landfarm operation. AEI shipped six one-ton bags of 40-4-4 (N-P-K) ratio fertilizer to Arctic Village for the landfarm in 2018. Three tons (6,000 lbs) of fertilizer were applied to the landfarm before tilling using a mechanical spreader in 2018 and repeated in 2019. Each one-ton bag provides roughly 800 pounds of nitrogen and 80 pounds each of phosphorus and potassium. A total of 2,400 pounds of nitrogen and 240 pounds each of phosphorus and potassium were tilled into the landfarm in 2019.

Due to concerns about the depth of tilling in 2018, the tilling process was modified in 2019. This included blading the top six inches of material into temporary windrows to make sure the tilling equipment could mix and aerate the soil at the bottom of the landfarm. The tilling consisted of multiple passes in different directions with the custom rake attachment. The windrow and rake processes were successful at tilling the full depth of the soil in the landfarm. Additional tilling events should utilize similar methods to ensure the bottom of the landfarm is receiving appropriate treatment. More frequent tilling or mechanical mixing should be considered, if possible.

Landfarm screening and sampling were completed in August 2019 using the same sampling methods and grid employed in previous years. Headspace field screening with a PID was completed at 237 locations, with results ranging from 1 ppm to 627 ppm. These results are significantly lower than the field screening results in 2017 and 2018. Over 70% of the results are below 100 ppm and the results show a slight increase in result with depth. Future interim sampling should use the same sample locations and methods to generate comparable data.

Laboratory samples were collected from 15 locations with a bias toward the highest field screening results and previous high DRO results. Samples had DRO concentrations ranging from 1330 mg/kg to 21,000 mg/kg, with 12 of the 17 samples had DRO above the 4,000 mg/kg cleanup level. Locations with PID results less than 100 ppm had DRO concentrations below the cleanup level. The DRO results are not significantly lower than previous biased sampling events. Future annual sampling events are recommended to utilize similar selection protocols, while a landfarm closure event should focus on determining the true mean DRO concentration.

The 2019 observations and results indicate a reasonable reduction in contaminant mass. These results also indicate that additional annual tilling and sampling is necessary to achieve the remediation objectives.

2.0 SITE DESCRIPTION

The Project Site (Site) is located in Arctic Village, Alaska which is situated on the East Fork of the Chandalar River. The Site is located at N68°06'22.9166" latitude and W145°36'24.7161" longitude. The topography of Arctic Village is characterized by numerous lakes and sloughs scattered throughout the floodplain and separated by low projecting knolls of varying height. The Site is approximately 2.8 miles west of the Arctic Village School Site which is located on the north side of the village.

2.1 Surface Conditions

The surficial geology of the area consists of alluvial silts, sands, and gravels. Organic soil can be found in and around local sloughs that connect to the Chandalar River. Rock types that have been mapped include schist, limestone, Kanayut Metaclastic and mafic to intermediate igneous rocks that occur east of the Chandalar River valley.

The former dumpsite and landfarm area consist of gently sloping, previously disturbed land. A surficial layer of vegetation is present in areas where no solid waste has been previously deposited. Black spruce and tall willow dominated the local vegetation. Birch and alder plant communities are also found.

Khaali Lake is the nearest surface water body and is located approximately 500 feet south of the landfarm. No surface water bodies are located adjacent to or immediately downgradient of the landfarm.

2.2 Subsurface Conditions

The former dumpsite and landfarm location is located within the "Arctic Zone" as defined in 18 AAC 75 and is underlain by permafrost. Permafrost in the surrounding area typically begins at depths ranging from three to eight feet below ground surface (bgs) and the seasonally active layer is typically only thawed for a few months per year. The landfarm is expected to completely thaw each year, while the former dumpsite material is expected to be slowly refreezing from the bottom up. Material beneath the waste is expected to be permanently frozen.

3.0 BACKGROUND

The following summarizes the history of the former dumpsite and landfarm location, including past activities that resulted in current impacts at this location.

3.1 Site History

The Site is the former Arctic Village dumpsite with documented use dating back to at least April 1992 based on DEC Solid Waste Program inspection records. The Site was historically used as a non-permitted municipal waste collection area or Class III solid waste landfill. Waste disposal had historically consisted of surface disposal of household waste, hunting related wastes such as animal carcasses, and gravel fill. As waste accumulated, the dumpsite was periodically consolidated and leveled with a bulldozer with clean gravel fill placed on top of the new layers of waste. This process has been repeated over approximately 25 years contributing to the buildup of approximately 30 to 40 feet of buried waste.

In 2015, Arctic Village completed the construction of a new lined and permitted Class III Municipal solid waste landfill adjacent to the former dumpsite. The dumpsite was placed into Interim Closure in July 2017 by constructing a 12-inch interim cover of compacted gravel over the compacted waste and installing a permanent chain-link fence with a locking gate. The Site is currently being leased to the YFSD by the Village for use as a contaminated soil landfarm.

The YFSD currently holds primary responsibility for maintaining the Site due to ongoing landfarm operations. Once landfarm remediation is completed, the YFSD will grade the treated material into a permanent cover for the former dump. Then the Village will resume primary responsibility for the dumpsite and complete all post-closure care and monitoring required by the DEC Solid Waste Program.

3.2 Known Nearby Concerns and Environmental Receptors

Other than the solid waste located beneath the active landfarm, this location does not have any known environmental concerns. Inspection and surface water testing was completed during the first two years of landfarm operation and no concerns were noted outside the permitted landfarm area.

The community's new permitted Class III landfill is located 200 feet to the west of the landfarm location. Most local traffic near the landfarm location is related to the new landfill.

The landfarm was constructed three miles away, more than the minimum 200 feet, from the nearest water source that serves as a public water system as defined in 18AAC80.

No other environmental concerns are known to exist near the landfarm location.

4.0 ORGANIZATION AND RESPONSIBILITIES

The following provides the contact information for organizations and personnel directly involved with this project:

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5.0 OBJECTIVES AND SCOPE OF WORK

The objective and rationale for the landfarm are described in the design documents and work plans for the Arctic Village School Site Remediation Project. The goal of the landfarm was to provide a lower cost, local means for remediating 6,200 cubic yards of DRO contaminated soil. In addition, the landfarm development and final treated soil would provide resources for the closure of the former dumpsite. The landfarm was constructed and baseline sampling was performed in 2017.

The project documents required operation and maintenance of the landfarm during active treatment. This included annual inspection of the landfarm perimeter and surrounding area, tilling of the landfarm material, and addition of nutrients to the landfarm. This annual work is performed and reported by Ahtna.

Project documents also require annual field screening and laboratory sampling of the landfarm to evaluate remediation progress. This includes a visual inspection of the landfarm and surrounding area, observation and evaluation of the annual tilling, field screening of the entire landfarm, and a soil sampling program to collect analytical samples to evaluate current conditions and remediation progress. This annual work is performed and reported by ***NORTECH***.

6.0 METHODOLOGY

Landfarm tilling and sampling were completed in general accordance with the Landfarm Construction and Operations Work Plan, the 2017 DEC FSG, 18AAC78 (Contaminated Sites), and 18AAC60.025(b) (Solid Waste) and the DEC technical memorandum for Landfarming at Sites in Alaska dated January 2018.

6.1 Tilling Methods and Equipment

Landfarm tilling equipment consisted of a bulldozer move the top surface six inches of soil into windrows to allow access to deeper landfarm soils. After creating the windrows, a custom-fabricated rake was mounted to the front blade of the bulldozer, which was then driven backward to pull the rake through the soil of the landfarm. The rake is equipped with 24-inch-long tines that are intended to loosen and fluff the soil to allow air and other nutrients to penetrate to the bottom of the landfarm. The bulldozer pulled the rake across the landfarm in multiple directions over a period of days to loosen soil deeper with each successive pass until the full depth of the landfarm had been tilled at least once.

After tilling the full depth of the landfarm, three tons of fertilizer were added to the landfarm surface using a fertilizer spreader attached to an all-terrain vehicle. Fertilizer was visible at the surface after application and then incorporated into the soil with additional tilling. At completion of the tilling, all areas of the landfarm had been tilled multiple times, the windrows were spread out, the surface of the landfarm was contoured appropriately, and fertilizer was no longer visible.

6.2 Contaminants of Potential Concern and Associated Cleanup Levels

Contaminants of Concern
The 2017 baseline assessment of the landfarm included a wide variety of petroleum related analyses, including DRO, RRO, GRO, VOCs, and PAHs. The GRO, VOC, and PAH results from the landfarm confirmed that these potential contaminants are not present at a regulated level in the landfarm. Based upon these results and the recommendations of the 2017 Landfarm Characterization event, the following laboratory analyses were performed:

- Diesel Range Organics (DRO) by Alaska Method AK102
- Residual Range Organics (RRO) by Alaska Method AK103

Site Cleanup Levels Demonstration (18AAC60)
The cleanup goal for the landfarm is for the remediated soil to demonstrate that it is protective of human health and that residual contaminants will not migrate off-site after the material is installed as the permanent cover for the former dumpsite. To satisfy these two criteria, soils in the landfarm are required to meet the following cleanup goals to achieve closure:

1. Human Health cleanup levels
   a. 18AAC75 Arctic Zone Human Health cleanup levels in Table B1
   b. Ingestion and Inhalation cleanup levels in Table B2
   c. 18AAC75 cumulative risk standards
2. Contaminants are not mobile
   a. Synthetic precipitate leachate procedure (SPLP)
   b. DEC Table C Groundwater Cleanup levels.

The landfarm cumulative risk evaluation (Item 1c) and SPLP analysis (Item 2) will be completed once the Human Health cleanup levels (Items 1a and 1b) have been achieved. The target cleanup levels are listed below.

Table 1. Numeric Cleanup Levels

Analyte	Human Health- Based Cleanup Level in mg/kg*	Table C Groundwater Cleanup Levels for Comparison to SPLP Results (mg/L)
GRO	1400	2.2
RRO	13,700	1.1
DRO	4,000 ¥	1.5
Benzene	16	0.0046
Toluene	200	1.1
Ethylbenzene	72	0.015
Total Xylenes	57	0.19
PAHs	By compound	By compound
VOCs	By compound	By compound

* Arctic Zone Method 2 Cleanup Levels, Tables B1 and B2, 18AAC75.340;
¥ DRO Site specific cleanup level

6.3 Field Screening Equipment and Methods

NORTECH has developed standardized field screening methodologies for soil which are provided in Appendix 3. The following site-specific methods were used during this effort to generate a semi-qualitative real time result for petroleum concentration in the soil and to evaluate the tiling method being used.

- Headspace sample locations were the same grid coordinate and depth as the 2018 event to allow a comparative year-over-year analysis
- Evaluation of the effectiveness of the tilling method during sampling through hand excavation and observations

The landfarm has been sampled using a systematic grid with discrete sampling points established in 2017. The purpose of this sampling design was to utilize randomly identified coordinates to develop easily repeatable sample locations that could be used to generate a statistically defensible data set. The 2017 sampling grid included 72 36-foot (ft) by 36-ft major grid units. Each major grid unit contained nine 12-ft by 12-ft squares and one was chosen randomly for field screening. The field screening depth is one of four pre-determined depth intervals. Sample depth intervals were 6 inches, with an assigned number of 1 (0-6 inches) through 4 (18-24 inches). Depths were randomly assigned in each grid location. The random locations/depths established during baseline sampling in 2017 have been utilized in each successive sampling event.

A MiniRae™ 3000 PID is the instrument used to complete field screening at the landfarm. The PID was outfitted with a 10.6 eV lamp and calibrated daily to 0.0 ppm fresh air and 100 ppm isobutylene standard gas. The ***NORTECH*** standard methodology for headspace field screening was followed during landfarm sampling. Headspace sampling was the field screening method used to characterize the landfarm and the soil stockpile prior to collecting laboratory samples. A second field screening sample was collected at the time of laboratory sampling at each landfarm grid laboratory sample location.

6.4 Laboratory Sample Collection

NORTECH has developed standardized laboratory sample collection methodologies for soil, based on the 2017 DEC FSG, 18AAC78, and laboratory guidance, which can be found in Appendix 3. This section includes additional considerations during the laboratory sampling collection activities.

The landfarm laboratory sampling program is intended to evaluate the full range of field screening results expected within the landfarm, from areas that are expected to be clean to the locations with the highest field screening results. However, this program is not intended to provide the "true mean" DRO concentration of the landfarm. Instead, this program has two specific goals: evaluate the highest field screening results in the landfarm and evaluate the expected site-specific DRO cleanup level. This biased sampling program means that the DRO results will be well above the true mean DRO concentration in the landfarm.

The 2019 laboratory sampling locations were selected based on the criteria below:

- High petroleum concentrations – PID results >400 ppm
    - Three (3) locations with the highest DRO results from the previous year (2018)
    - Five (5) of the highest current year PID results (2019)
- Likely contaminated – screening results between 100-399 ppm
    - Up to seven (7) locations with
    - To evaluate clean cutoff field screening criteria

6.5 Data Quality Objectives

Data generated for this project was either definitive data or screening data. Screening data was generated using a portable photoionization detector (PID) that produced rapid semi-quantitative results. While the PID measurements are generally repeatable, they lack the accuracy to provide direct correlation with the absolute values for concentrations of specific contaminants of concern.

Definitive data consisted of laboratory results that represent a precise quantitative analysis and support the field screening results. Definitive data is used to evaluate progress toward compliance with site cleanup and closure objectives.

The objective of this project is to collect data that can be used to evaluate site conditions relative to DEC cleanup criteria for the project. The DEC Laboratory Data Review Checklist (LDRC) is used to evaluate data quality relative to DEC standards and assess the quality of laboratory data collected during this project.

7.0 FIELD ACTIVITIES

The landfarm annual sampling event was completed during the week of August 11, 2019. Weather was variable, ranging from sunny and 50°F to windy with low temperatures near 35°F. This section is organized in chronological order. Due to the size of the landfarm and nature of the tilling and screening operations, these activities were occurring concurrently at different areas of the landfarm during the field work.

7.1 Mobilization and Daily Field Activities

On-site activities began the week of August 12, 2019, after mobilization to Arctic Village from Fairbanks. ***NORTECH*** personnel arrived in Arctic Village at 10:00 am on August 12. The project foreman from Ahtna and Charlie Swaney, the equipment operator from Arctic Village, picked us up at the airport and brought us to the Arctic Village School where we dropped off our gear. After meeting with the school principal and setting up our accommodations in the music and home economics classroom, we went to the landfarm to begin field activities. On the way to the landfarm, we were informed that Ahtna and the village labors began tilling the landfarm the day before and had completed one pass of tilling over the entire landfarm.

Upon arrival at the landfarm, three tons of fertilizer were observed on site from the previous year. ***NORTECH*** personal established the field screening grid on the north side of the landfarm based on the 2018 sample location coordinates while tilling operations continued on the south side of the landfarm. Once the grid was established and pin flags placed and labeled, ***NORTECH*** personnel began field screening activities. Field screening samples were collected at the same depth and location as the 2018 event. The maximum tilling depth was approximately 18 inches. Tilling on the south side of the landfarm continued through the end of the day. Field screening on the north side was 85% complete by when we stopped at 19:00.

On August 13, 2018, ***NORTECH*** personnel were on site at 08:00 to complete field screening on the north side (except far northwest and northeast sections) while Ahtna personnel resumed tilling operations on the south side. Field screening was completed on the north side at 09:00. Used sample bags were emptied and transported to the landfill located west of the landfarm. At 11:00 tilling paused to assess the total depth. To increase the tilling depth to 24-inches, the rake attachment was removed to allow the bulldozer to move the top six inches soil on the north side of the landfarm into temporary windrows. This allowed the rake tines to reach the bottom of the landfarm soil between the windrows. While this modified tilling method was being performed on the north side, ***NORTECH*** personnel began laying out the grid and pin flags on the south side. Crews took a lunch break at noon and returned at 13:00 to resume tilling and grid setup. After completing the grid layout at 15:45, the field screening was started on the south side. Tilling depth checks by hand digging to the top of the gravel landfill cover on the north side verified soil was being tilled to a depth of 24 inches. The crews continued sampling and tilling until 19:15.

On August 14, 2018, ***NORTECH***, Ahtna, and Arctic Village crews mobilized to the landfarm at 07:15 to continue the tilling and sampling operations. Field screening resumed in the southwest corner of the landfarm while tilling operations continued in the north half of the landfarm. At 09:00, Charlie began fertilizing the north side of the landfarm while James from Arctic Village continued tilling. Fertilizer was applied across the entire surface at one time.

At 14:40, the rake attachment was removed from the bulldozer to blade the south side soils into windrows to ensure the full depth of the soil in this portion of the landfarm would be tilled. At 16:00, the rake was reattached to the bulldozer to till the south side. At 18:00, ***NORTECH*** personnel excavated 30 random holes with a shovel to confirm that the tilling had reached the bottom soils. These observations indicate all locations were tilled to the bottom. Personnel left the site at 19:00.

On August 15, 2019, all personnel were on site at 07:05. Charlie applied fertilizer while James concurrently incorporated the fertilizer through tilling. At 10:00 am, Charlie had finished applying the fertilizer. All personnel went to lunch at noon and returned to the site at 1:00 pm. Charlie and James continued to incorporate the fertilizer and completed the task at 6:30 pm. Twenty-three random test pits confirmed the fertilizer was well incorporated and soil sufficiently aerated. At 6:45 p.m. all fieldwork was complete.

7.2 Summary of Field Screening Results

The sampling grid used in 2019 was marked out with wood lath and surveyors flagging at the original X, Y axes. The grid has 51 major units (36 feet by 36 feet) and a total of 237 discrete field screening locations (12-foot by 12-foot sub-grids). Soil samples were collected by hand and field screened with a PID using the headspace method. The 2019 field screening results ranged from 1 ppm to 627 ppm. Field screening results were variable throughout all screening depths. These results were consistent with the reduced odor observed in most areas across the landfarm compared to previous years. Results are shown in Figure 3.

A total of 16 laboratory sample locations were selected based on the PID results and the criteria described in Section 6.4 and shown in Figure 3 and Table 1. These included the three highest field screening locations from the previous year, the five highest field screening locations from this field work, and seven locations that might bracket the soil cleanup target concentration. Laboratory samples were collected on August 14 into laboratory supplied glassware using disposal sampling equipment and placed on ice until delivery to the SGS North America, Inc. sampling receiving facility in Fairbanks.

7.3 Summary of Tilling Observations

The quantity of larger rocks and debris encountered in 2019 was observed to slow the tilling process. Rocks of sufficient size to be caught in the tines of the rake were encountered across the landfarm. The equipment operator had to make frequent stops to remove caught debris and rocks so tilling operations could proceed. Larger rocks were tossed aside on the soil surface and debris was removed by hand and later disposed of off-site.

The surface of the landfarm was observed to be relatively flat and loose. This promotes aerobic conditions and moisture contact within the landfarm, while also having a natural tendency to retain surface water. Rainfall before the annual tilling/sampling activities caused portions of the landfarm to be wetter and muddier than expected. While this reduced the potential for dust during tilling, this also made all the soil a little bit stickier to hand tools and heavy equipment.

Blading the top six inches of the landfarm into windrows was required for the tilling system to loosen the full depth of soil to 24-inches, which was observed in most locations. As previously noted, some areas the landfarm soil is only 12-18 inches deep and the windrow creation was not necessary. Hand excavation of test pits verified the soil was loosened to the bottom throughout the landfarm.

8.0 SAMPLE RESULTS

The sample results are in the following tables and correlate to the figures listed below.

Table 2 Results Location Summary

Sampling Location	Appendix 1	Appendix 2
Landfarm Characterization	Figure 3 (2019) and 4 (Prior Years)	Table 1
Data Quality/Field Duplicates	--	Table 2

Laboratory Results

The 2019 sample results are summarized in Table 1, Appendix 2. The 2019 DRO results are also shown with the headspace field screening results in Figure 3 in Appendix 1.

A total of 17 soil samples, including duplicates, were collected for laboratory analysis for DRO by Method AK102 and RRO by Method AK103, as listed in Section 6.2. DRO was detected in all 17 samples submitted with results ranging from 1,330 mg/kg to 21,900 mg/kg. The DRO concentration was detected above the 4000 mg/kg cleanup target in 12 of the 17 samples.

RRO was detected below the cleanup level except for one sample. The results ranged from 159 ppm to 10,300 ppm.

Laboratory Data Quality Control Summary

Data quality objectives for the project were to meet the requirements of the Landfarm Work Plan and the FSG. The goal of the project was to produce data of adequate quality for comparison to 18 AAC 75 Arctic Zone Human Health cleanup levels and the site-specific DRO target. The primary tool used to assess the quality of the data was the DEC LDRC. An LDRC was completed for the laboratory work order is included in Appendix 4.

Laboratory sampling of the landfarm was completed using discrete grab sampling at selected locations based on PID field screening results so the results would be representative of the conditions as described in the planning documents. Sampling was completed in accordance with the 2017 FSG, confirming the sampling methods were valid.

The blind field duplicate is the primary means to evaluate field quality control. The requirement is one blind duplicate for every 10 samples. Two were collected for 15 primary samples, meeting the minimum requirement for field duplicates for this sampling event. Field duplicate results are presented at the bottom of Table 1 in Appendix 2. Relative percent differences (RPD) for primary duplicate pair analyses were within acceptable limits for soil samples (+/- 50%).

Other data quality observations, including evaluation of laboratory control samples and method blanks, are presented in detail in the LDRC in Appendix 4. No concerns were noted. The data is usable as presented in this report.

9.0 ANALYSIS AND DISCUSSION

9.1 Landfarm Observations

The landfarm occupies approximately 69,000 square feet or 60-70% of the former dumpsite Interim Cover area. The soil surface is generally flat and was observed to be 18-24 inches deep across the landfarm. The landfarm soil is comprised primarily of silt, sand, gravel, larger rocks, and debris, including wood, metal, and plastic.

The material was heterogeneous (not uniform) when excavated and moved to the landfarm so some areas of the landfarm had higher proportions of different materials. The landfarm is becoming more homogenous with each tilling event. Also, in 2017 the soil was not physically screened to remove larger rocks and debris prior to landfarm construction. This has slowed the speed of tilling during the annual events as the operator has to stop the equipment and remove larger rocks and debris from the rake. This has also made hand excavation and auguring of deeper sample locations challenging even after multiple years of tilling the soil. The quantity of larger items in the landfarm is decreasing over time.

In 2019, tilling operations consisted of raking the soil in two perpendicular directions, north to south, and east to west. The tiller rake has tines that are 24 inches long and spaced 10 inches apart. Based on both visual observation and measurements made by hand digging approximately 30 test pits, the initial tilling activity loosened the material down to approximately 18 inches below the surface. To till to the full 24-inch depth of the landfarm, six inches of surface soil was bladed to the side into windrows. The remaining soil was tilled to the bottom of the landfarm. Then the windrows were spread across the landfarm during the perpendicular tilling. This method is expected to provide increased aeriation and incorporation of fertilizer throughout the soil profile.

Fertilizer pellets were spread using a mechanical spreader and an all-terrain vehicle to tow the spreader. The white fertilizer was initially visible on the surface. Once the soil was disturbed, it was quickly covered with muddy soil which made assessment of the penetration depth of the fertilizer difficult. When advancing the test pits, fertilizer was occasionally observed, including at the bottom of the landfarm 24 inches below the surface.

The 2019 sampling event took place in late summer, right after the rainy part of the season and just before annual freeze up. Additional annual soil characterization will be critical in evaluating the efficiency of the current remediation methods and should be completed annually after the late summer rainy season to allow the maximum annual treatment prior to sampling. Sampling should be completed as close as possible to the final tilling while the soil is still loose. Sampling after the beginning of freeze up will be very difficult because seasonal frost appears to penetrate the landfarm material quickly.

9.2 Headspace Field Screening and DRO Evaluation

The annual field screening is intended to provide semi-quantitative data about the average conditions in the landfarm with a PID and then completed laboratory sampling to confirm the conditions. The goal of the field screening is to assess the extent the conditions across the landfarm as a whole, as well as identify specific locations for laboratory testing. The laboratory sampling is intended to provide DRO results of the remaining highest areas and continued confirmation that the headspace field screening method are reasonably representative of the conditions across the landfarm.

The 2017 baseline data showed that the nine lab samples with PID results below 100 ppm had DRO of less than 4,000 mg/kg. In addition (and with one exception), all locations with field screening results above 400 ppm had DRO results above 4,000 mg/kg. The 2017 report recommended that 100 ppm be used as the initial field screening concentration that was indicative of results below the cleanup level.

Evaluation of PID Data Statistics

In order to evaluate the overall progress of treatment, ***NORTECH*** has completed a limited evaluation of the PID results for the three years of available data (2017, 2018, and 2019). This consists of the statistics shown in Table 2 of Appendix 2. Based on this information, PID results in 2019 have a significantly lower maximum, average, and median than in 2017 and 2018. In addition, a much higher percentage of sample locations are below 100 ppm while the number of locations higher than 400 ppm has dropped substantially.

In addition to the overall values, the average PID results were also evaluated by depth. All depths show a significant decrease from 2017 to 2019. The 2017 and 2018 average results are about the same for the four depth intervals, while the 2019 average results show an increase from the surface to the bottom. This shows the importance of tilling to the full depth of the landfarm to successfully treat this soil.

Annual sampling using the established sampling grid is appropriate for future characterization and assessment of the conditions in the landfarm. While the “full” number of grid locations may need to be field screened at the time of closure, the annual progress sampling events should continue to use approximately 50% of these locations to maintain the statistical significance of the PID results.

Evaluation of DRO Data

Table 3 shows a summary of the DRO results and the PID results sorted by increasing DRO concentration for each of the three years of treatment. While the PID results are generally lower in 2019, the DRO results remain in about the same range. The highest concentration remains about 20,000 mg/kg. The three highest locations are above 12,500 mg/kg (the DEC Method 2 Arctic Zone Cleanup Level). Approximately 50%-70% of the lab samples are above 4,000 mg/kg, which is consistent with the sampling bias described in Section 6.4 that is focused on obtaining laboratory results for the locations with the most elevated field screening results.

Overall, the DRO results indicate that the 2019 DRO concentrations associated with the highest field screening results are similar to the results from 2018 and 2017. The DRO concentrations are not sufficient in quantity or randomness to provide a statistical evaluation of the DRO concentration in the landfarm. However, these numbers indicate that additional tilling and treatment is necessary for the landfarm before proposing a closure work plan to DEC.

At this time, biased annual DRO sampling is recommended for future interim sampling events and the number of laboratory samples should be limited to approximately 15 locations. The purpose of this will be to limit costs and evaluate the highest locations and continue to evaluate the “clean” cutoff criteria (currently 100 ppm). To accomplish this, laboratory sampling is recommended based on the following field screening results:

- Three highest laboratory sample locations from the previous year to evaluate remediation progress

- Five highest current year results to evaluate "current" elevated concentrations
- Seven locations in the 100-400 ppm range to evaluate the clean cutoff criteria

The recommended biased sampling should continue during the interim period to identify "hot spots" of elevated DRO that may remain in the landfarm. However, the field screening results indicate the overall contaminant concentration is decreasing as expected while the fertilizer augments the natural biological activity and the tilling results in mechanical mixing. Some hot spots (not necessarily the same locations) are likely to persist into the future as the material is mixed. Based on this, ***NORTECH*** recommends discussing closure options with DEC, including the possibility of using multi-increment sampling or another sampling protocol that will more accurately reflect the "true mean" DRO concentration in the landfarm.

Conceptual Site Model and Exposure Management

The Site consists of a 6,200-cy petroleum contaminated soil landfarm located on the former unpermitted municipal waste dumpsite outside of Arctic Village. The Site and adjoining property are non-residential and located 2.8 miles west of the community of Arctic Village. The landfarm is constructed on top of a 12-inch gravel cap that was installed as the Interim Cover of the former unpermitted dumpsite. The landfarm also has a gravel berm constructed around the perimeter except at the entrance/exit point. The entire landfarm site protected with a permanent chain-link fence with a locking gate on the north side of the Site. The YFSD installed signage on the permanent fence indicating "No Dumping" and directing residents to dispose of household wastes in the new permitted landfill.

The contaminant of concern detected above cleanup levels in the landfarm is DRO. Other volatile and semi-volatile fuel related contaminants are present in the soil but at concentrations below cleanup levels. The DEC Conceptual Site Model human health scoping form and the CSM graphic form were completed previously for this project and remain unchanged from the previous report. The primary exposure methods are incidental ingestion, dermal contact, and outdoor inhalation.

The fencing and signage are expected to reduce the potential for trespassers to the site. Recommended actions for site workers to minimize human exposure risk include wearing PPE, such as gloves and sturdy petroleum-resistant footwear, during tilling and sampling events that are appropriate for petroleum-related compounds like DRO.

Potential exposure pathways related to surface water are not considered complete because surface water is being managed within the landfarm to prevent off site migration. Similarly, groundwater exposure pathways are not considered complete because the permafrost precludes subsurface water migration.

10.0 CONCLUSIONS AND RECOMMENDATIONS

The Arctic Village landfarm project was completed to combine the closeout of the former unpermitted dumpsite for the Village and simultaneously provide a lower cost treatment option for the YFSD to remediate DRO contaminated soil generated during excavation of the School Site lease lot. Following interim closure of the dumpsite, which is detailed in a separate report, a total of 6,200 cy of DRO contaminated soil was excavated and placed in the landfarm.

The landfarm baseline characterization sampling event was completed in September 2017 and included both field screening and laboratory sampling. The majority of the landfarm soil (>80%) was contaminated above the site specific DRO cleanup level of 4,000 mg/kg. Annual field screening and sampling, as well as fertilize addition, was completed during the 2019 tilling event. Based on the field observations and laboratory results, ***NORTECH*** has developed the following conclusions regarding the landfarm:

Tilling Operations and Fertilizer Amendment

- Tilling has utilized a custom-fabricated rake that is attached to the blade of a bulldozer and pulled through the soil
    - Observations in 2017 and 2018 indicating that this rake was effective for the top 18 inches of soil
    - In 2019, the tilling method was modified to include blading six inches of surface soil into windrows and raking the soil in multiple directions to loosen the landfarm material
    - This modification allowed tilling to the full depth of the landfarm in all locations
- Rocks and debris brought to the surface during tilling were removed for disposal
- Six supersacks of 40-4-4 fertilizer was shipped to Arctic Village in 2018
    - Half of that quantity was added to the landfarm prior to tilling in 2018
    - The remaining fertilizer was applied in 2019

Soil Field Screening

- The sampling grid was re-established for year-to-year comparison of data
    - 232 field screening samples were collected from the same locations as the 2018 landfarm assessment
    - PID results ranged from 1 ppm to 627 ppm
    - These results are significantly lower than 2017 and 2018
    - Over 70% of the results are below 100 ppm
    - Results show a slight increase in result with depth
- Future interim sampling should use the same sample locations

Laboratory Sample Collection

- Laboratory samples were collected from 15 locations biased toward the most contaminated soil remaining in the landfarm
- Samples had DRO concentrations ranging from 1330 mg/kg to 21,000 mg/kg
    - 12 of the 17 samples had DRO above the 4,000 mg/kg cleanup level
    - Locations with PID results less than 100 ppm had DRO concentrations below the cleanup level
    - DRO concentrations at these biased locations were not significantly lower than previous biased sampling events
- Future annual sampling events are recommended to follow the same sample selection protocols

11.0 RECOMMENDATIONS

The 2019 observations and results indicate a reasonable reduction in contaminant mass, but that additional annual tilling and sampling is necessary to achieve the remediation objectives. Continued contract expectations should include the following activities by the following entities:

YSSD/SERRC Activities

YFSD and SERRC will provide contract management, construction administration, and overall project management. SERRC will provide coordination with the project stakeholders, including AEI, ***NORTECH***, the Village/Tribe and other parties as appropriate. SERRC/YFSD will contract for the removal and disposal of the used oil drums outside of Arctic Village

AEI Activities:

- A visual inspection of the landfarm and landfarm base material after spring breakup in accordance with Ahtna SWPPP
    - Inspect for settling and erosion related to spring thaw
    - Document continued revegetation on side slopes
    - Complete necessary repairs to all site features as necessary
- Complete nutrient addition, tilling, grading of landfarm for remediation as considered necessary to meet cleanup guidance
- Document all activities in an annual landfarm operations and management report

Provide village liaison coordination and funding to:

- Complete visual inspection with AEI of the landfarm and landfarm base material after spring breakup
- Document inspection and any corrective actions
- Provide documentation to Village/Tribe

NORTECH *Activities*:

- Utilize the annual interim sampling plan from the recommendations in this document to identify field screening and laboratory sampling locations and frequencies
- Complete annual interim sampling plan as approved by YFSD
- Review AEI documents
- Provide summary report

12.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

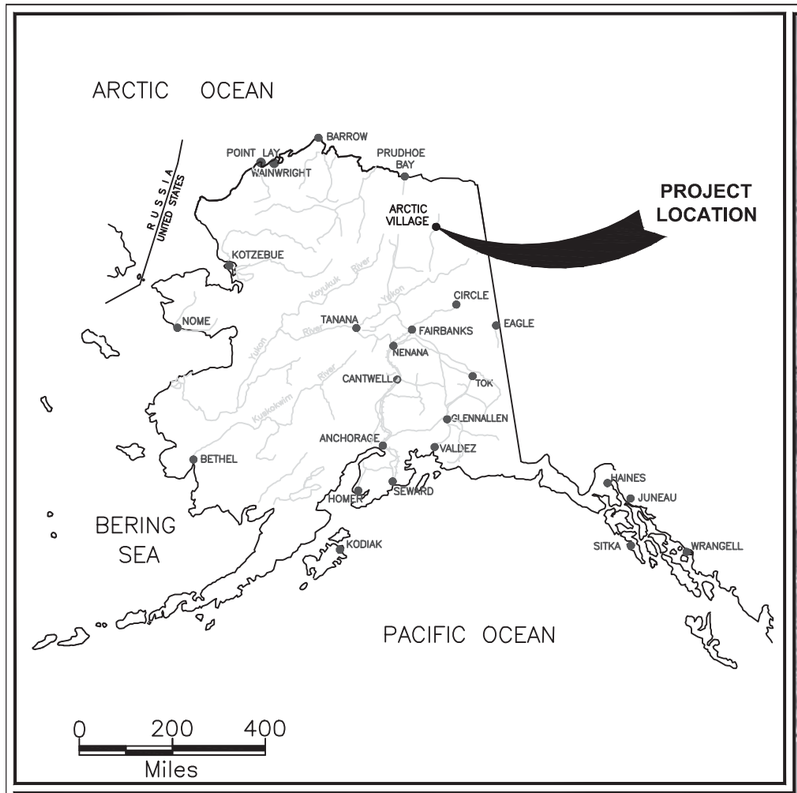
Peter Beardsley, PE, Environmental Engineer of ***NORTECH*** is the Contract Manager and has contractual responsibility for the landfarm project. Following construction, he has been in responsible charge of the project including administrative management, quality control, technical content, schedule, and budget. Peter has over 23 years of experience in environmental engineering design, data analysis, and fieldwork. Peter has designed and/or administered a wide range of environmental projects, including onsite and offsite remediation projects across the state. He also has experience conducting asbestos, lead-based paint, and hazardous materials investigations, spill prevention countermeasures and control (SPCC) and storm water pollution prevention plan (SWPPP) compliance audits, and occupational safety audits. He has extensive project management and field experience in urban and rural Alaska, including multiple projects in the Fairbanks/North Pole area, Marshall, Kaktovik, Coldfoot, and other villages.

Douglas S. Dusek is an Environmental Specialist at ***NORTECH***. He is an DEC Qualified Sampler, HAZWOPER certified, and an AHERA Certified Inspector. He has over twenty years of experience in the environmental field. Mr. Dusek has performed emergency spill response, designed and built catch basins, settling ponds, underflow dams, and contoured land to minimize spill impacts. He has experience with groundwater and soil remediation system maintenance, monitoring, and assessment. He has designed various remediation systems including dual phase extraction systems, AS/SVE, and free product collection devices. He has collected groundwater samples, air samples, and performed groundwater pump tests. Other project management experience includes tank removals, corrective action excavations, and site characterizations with long-term monitoring.

Douglas Dusek
Environmental Specialist

Peter Beardsley, PE
President and CEO

Appendix 1



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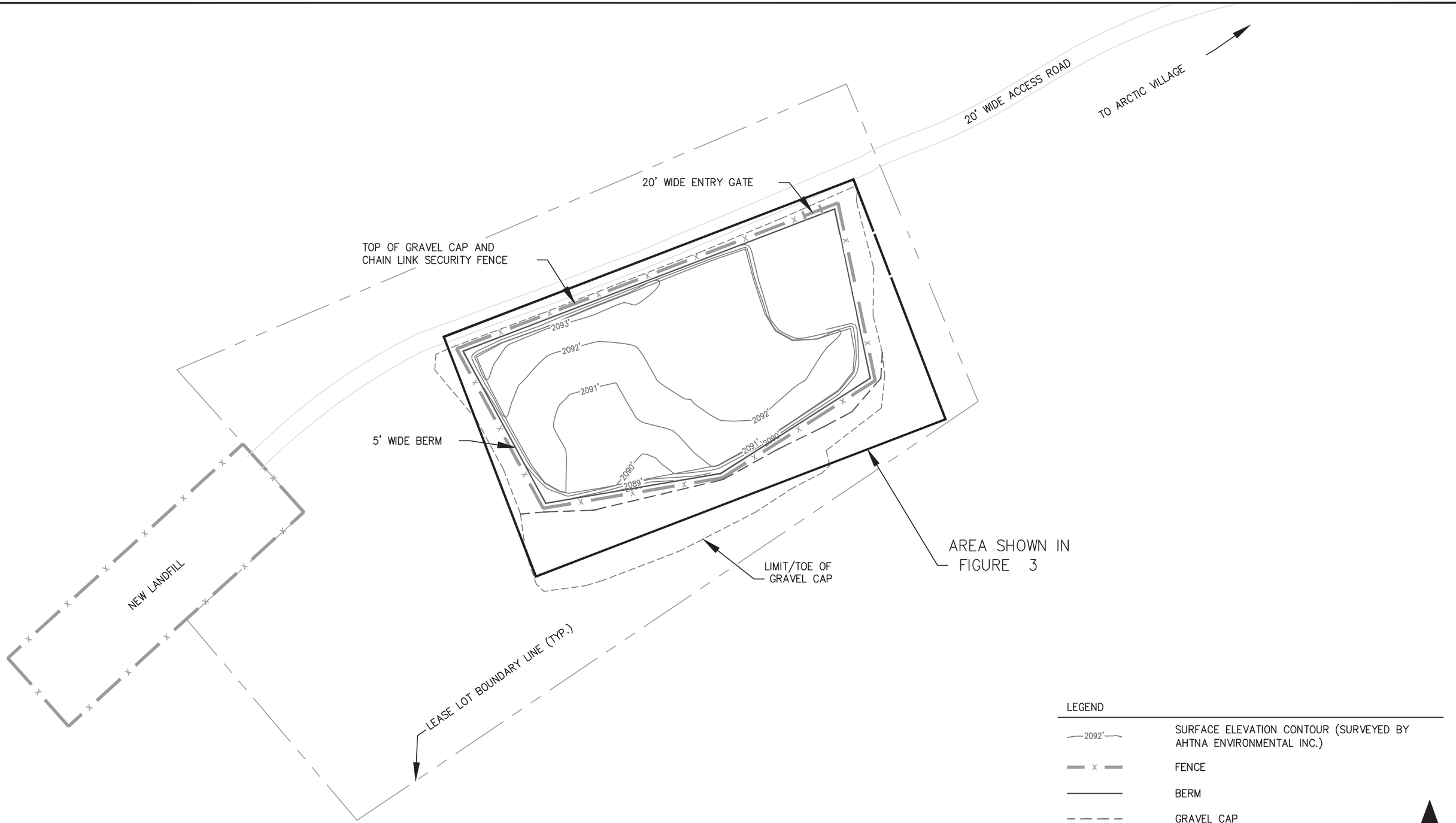
5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

Project Location Map
Arctic Village Land Farm
Arctic Village, Alaska

DATE: 01/14/2020	SCALE: 1" = 900'
PROJ MGR: PLB	PROJECT: 16-1086
DRAWN: KAO/AES	DWG. NO.: 161086e(LF)(01)

FIGURE 1



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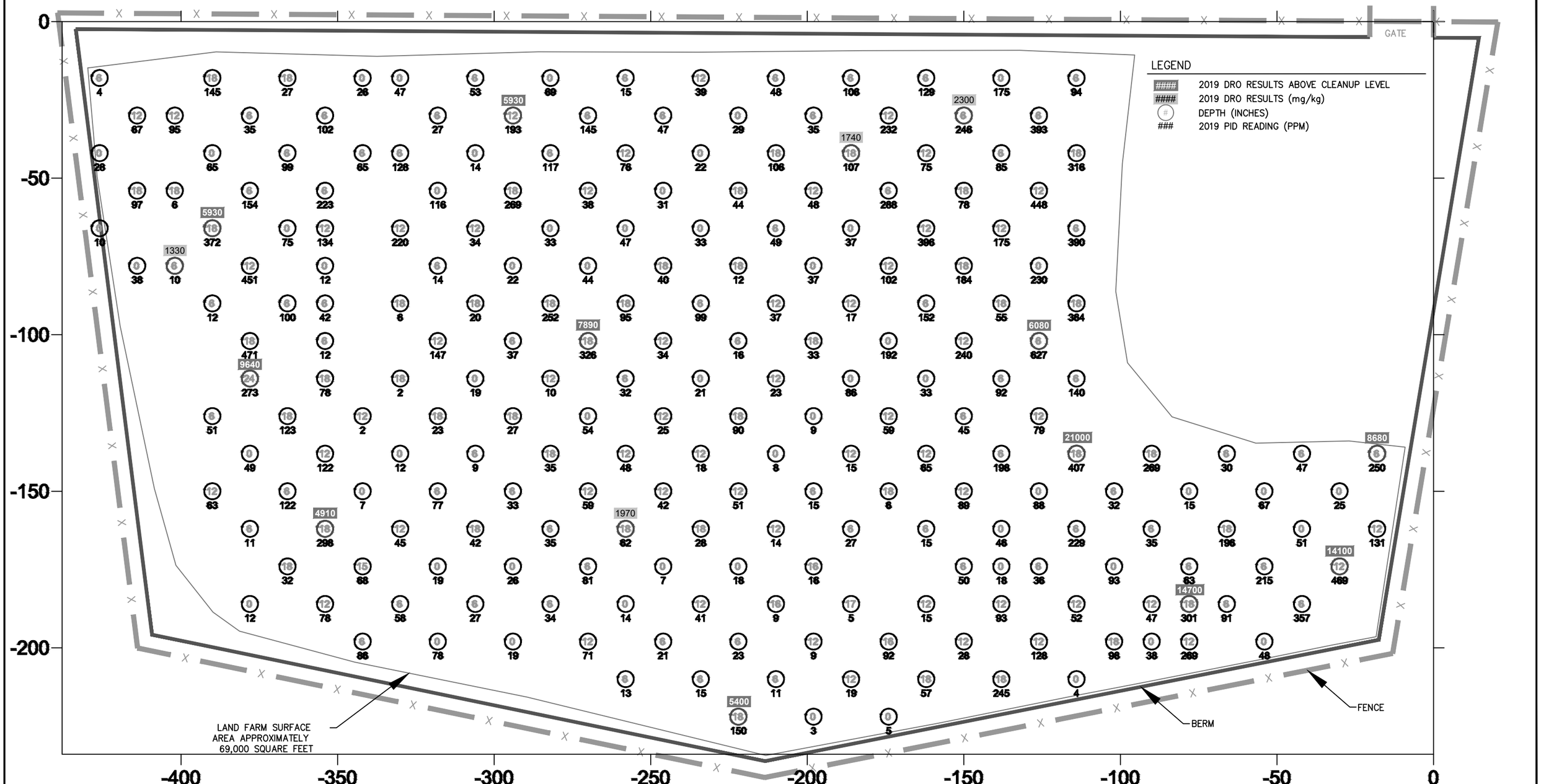
Land Farm Site Plan & Background Sample Locations
Arctic Village Land Farm
Arctic Village, Alaska

DATE: 01/14/2020	SCALE: 1" = 100'
PROJ MGR: PLB	PROJECT: 16-1086
DRAWN: KAO/AES	DWG. NO.: 161086e(LF)(02)

FIGURE 2



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Land Farm Sampling Grid – 2019 PID and DRO Field Screening Results
Arctic Village Land Farm
Arctic Village, Alaska

DATE: 01/14/2020	SCALE: 1" = 30'
PROJ MGR: PLB	PROJECT: 16-1086
DRAWN: KAO/AES	DWG. NO.: 161086e(LF)(03)

FIGURE 3

Appendix 2

Table 1
2019 DRO/RRO Analytical Results Summary - Landfarm

Sample ID	PID (ppm)	2019 DRO	2019 RRO	2019 Depth	Sample Selection Criteria/Rationale
(X,Y coord)	Initial FS	mg/kg	mg/kg	inches	
Soil Cleanup Level		4,000	13,700		
402, 78	10	1,330	218	0-6	2nd highest DRO from 2018 (16,400)
186, 42	107	1,470	159	12-18	likely contaminated (100-399 ppm)
258, 162	62	1,970	526	12-18	possibly clean
150, 30	246	2,300	348	0-6	highest DRO from 2018 (17,000)
Dup-151, 30	246	2,300	243	Dup	field duplicate of 150, 30
354, 162	298	**4,910**	228	12-18	likely contaminated (100-399 ppm)
222, 222	150	**5,400**	310	12-18	likely contaminated (100-399 ppm)
294, 30	193	**5,070**	309	12-18	likely contaminated (100-399 ppm)
390, 66	372	**5,930**	413	18-24	likely contaminated (100-399)
126, 102	627	**6,080**	266	0-6	highest PID
270, 102	326	**7,890**	10,300	12-18	likely contaminated (100-399 ppm)
18, 138	250	**8,680**	171	0-6	highest PID from 2018
378, 114	273	**9,640**	164	18-24	likely contaminated (100-399 ppm)
30, 174	469	**14,100**	201	6-12	2nd highest PID
78, 186	301	**14,700**	173	12-18	3rd highest DRO from 2018 (12,800)
Dup-79, 186	301	**20,500**	194	12-18	field duplicate 78, 186
114, 138	407	**21,900**	310	12-18	contaminated (>400 ppm)

Notes

Dup-ID	Duplicate pair samples
shade	Analyte detected in concentration below site cleanup level
Bold	Analyte detected in concentration above site cleanup level
FS	Field screening

2019 DRO/RRO Duplicate Pairs RPDs

Sample ID	DRO	RPD	RRO	RPD
Unit	mg/kg	%	mg/kg	%
150, 30	2,300	0%	348	36%
Dup-151, 30	2,300		243	
78, 186	14,700	-33%	173	-11%
Dup-79, 186	20,500		194	

Table 2
PID Results Basic Statistics - 2017 to 2019

Year	2019	2018	2017
Locations Tested	233	232	459
Maximum Result (ppm)	627	2570	16675
Minimum Result (ppm)	1	1	2.1
Median Result (ppm)	48	515	687
Average Result - Overall (ppm)	92	602	2323
Average Result - 0-6" (ppm)	44	497	2216
Average Result - 6-12" (ppm)	93	652	2525
Average Result - 12-18" (ppm)	98	659	2326
Average Result - 18-24" (ppm)	139	573	2126
Number of Locations Below 100 ppm	171	14	35
% of Total	73%	6%	8%
Number of Locations Between 100 and 199 ppm	30	27	54
% of Total	13%	12%	12%
Number of Locations Between 200 and 399 ppm	26	58	123
% of Total	11%	25%	27%
Number of Locations 400 ppm and Higher	6	133	247
	3%	57%	54%

Table 3
DRO and PID Results Summary - 2017 to 2019

2019	PID	DRO
(X,Y coord)	ppm	mg/kg
Soil Cleanup Level		4,000
402, 78	10	1,330
186, 42	107	1,470
258, 162	62	1,970
150, 30	246	2,300
Dup-151, 30	246	2,300
354, 162	298	**4,910**
222, 222	150	**5,400**
294, 30	193	**5,070**
390, 66	372	**5,930**
126, 102	627	**6,080**
270, 102	326	**7,890**
18, 138	250	**8,680**
378, 114	273	**9,640**
30, 174	469	**14,100**
78, 186	301	**14,700**
Dup-79, 186	301	**20,500**
114, 138	407	**21,900**

2018	PID	DRO
(X,Y coord)	ppm	mg/kg
Soil Cleanup Level		4,000
378, 54	52	75
210, 42	36	231
354, 126	379.4	1,940
294, 78	669	2,020
126, 102	683	2,030
294, 78A	669	2,300
330, 18	750	2,480
138, 174	519	3,110
378, 114	208	3,910
342, 150	794	**4,240**
354, 30	820	**5,590**
342, 150A	794	**6,990**
306, 138	573	**10,400**
138, 114	1243	**10,900**
162, 18	1230	**10,900**
78,198	929	**12,800**
402, 78	1917	**16,400**
150, 30	1398	**17,000**

2017	PID	DRO
(X,Y coord)	**ppm**	**mg/kg**
Soil Cleanup Level		**4,000**
174, 86	28.9	209
378, 54	16.3	242
78, 162	32.5	939
246, 210	70.8	1,010
426, 54	16.3	1,340
426, 54A[D1]	16.3	1,470
66, 162	56.3	1,720
258, 150	164	2,440
162, 114	294	2,580
234, 42	214	2,660
246, 102	82.3	2,680
210, 126	126	2,860
246, 102A[D3]	82.3	2,860
126, 78	666	2,870
426, 42	128	2,900
162, 90	336	2,910
366, 78	140	2,980
354, 30	235	3,040
54, 162	110	3,060
234, 186	357	3,180
222, 54	288	3,460
246, 162	109	3,590
198, 114	262	3,870
210, 138	271	**4,280**
198, 138	211	**4,300**
270, 138	290	**5,210**
246, 114	344	**5,470**
306, 150	359	**5,850**
306, 78	180	**6,080**
306, 54	259	**6,450**
150, 138	1,210	**6,720**
426, 18	186	**8,700**
306, 186	394	**8,990**
366, 138	127	**10,000**
306, 186A[D2]	394	**10,100**
330, 198	282	**10,100**
378, 114	332	**11,900**
138, 174	108	**14,500**
354, 126	810	**16,600**
126, 150	161	**21,600**

Appendix 3

PID Field Screening
STANDARIZED METHODOLOGY
(Version 1)
March 2017

Field Screening Equipment Description

A Hand Held Air Monitor/Photoionization Detector (PID, PhotoVac 2020, MiniRAE, or similar) will be the instrument used to field screen the soils for total volatile organic contaminants. The PID is the field-screening instrument of choice as field screening with a PID allows for semi-quantitative real time (< 10 minutes) analysis as compared to some of the other field screening methods that either use qualitative analysis or are more sensitive to temperature, humidity and hydrocarbon concentration variations.

Additionally, the MiniRAE 3000 (and other PIDs) is intrinsically safe and approved for use in Class 1, Division 2, Groups A, B, C, & D Hazardous Locations and is rugged in construction. Headspace field screening by a PID involves measuring the concentration of vapors generated by the POL contaminants in soil. The PID yields semi-quantitative concentrations for soil gas in reference to a certified isobutylene gas standard. Important specifications of the MiniRAE PID are as follows:

Instrument:	MiniRAE -3000 PID
Detection Limit:	0.1 ppm
Response Time:	Less than 5 seconds
Calibration:	Certified Isobutylene Standard (nominal 100 ppm)
Operating Temperature Range:	32 to 105°F (0 to 40°C)

Field Screening Methodology

NORTECH proposes to use a PID for all soil field screening to be conducted during the characterization and remedial action effort in the following manner:

The headspace method of field screening will be used in general accordance with the ADEC Field Sampling Guidance, March 2016. Headspace screening consists of partially (33%-50%) filling a clean re-sealable bag with freshly uncovered soils to be field screened. The total capacity of the bag will not be less than 8 ounces (app. 250 ml).

The bag is closed, sealed and headspace vapors are allowed to develop for at least 10 minutes and not more than one hour. The bag will be agitated for approximately 15 seconds at the beginning and end of the headspace development period. The soil and headspace will be tested at a temperature of at least 40° F (5° C). A small opening will be made in the top of the bag and the PID probe will be inserted into the bag. Headspace vapors will be drawn from the center of the space above the soils and analyzed by the PID for total volatile organic compounds. The highest PID reading from each sample will be recorded in the project field notes for inclusion in the final report.

Calibration will be performed in accordance with the manufacturer's specifications. In the event that background air contamination is encountered, it will be zeroed out by performing the calibration in an alternate location without contamination, or by utilizing uncontaminated calibration air. The calibration of the PID will be checked at the beginning and end of each day

and at least every four hours during continuous use. Calibration and calibration checks will also be recorded in the field log.

Site Specific Contamination Level Classification

Headspace field screening is a method of quickly assessing total volatile organic contaminant concentrations in the field without the need for laboratory results. However, a correlation between PID field screening results and laboratory results is generally site specific. ***NORTECH***'s experience with recent heating oil releases is that results generally show a good relationship between PID and laboratory results. PID results at this site more than 20 ppm almost always exceeding the ADEC cleanup level for one or more heating oil COCs.

It should be noted that a PID may yield different responses based on various factors including: the soil matrix being tested, soil moisture content, and the volatility of contaminants that may be present. Based on the available data and past experience, for the purpose of this investigation the following contamination level classifications will be used:

- Excavated soils will be segregated and stockpiled based upon field screening results and the following segregation criteria:
    - Clean: <10 ppm and no odor; correlates to 200 mg/kg or less in laboratory result
    - Warm: <250 ppm; 4,000 mg/kg or less in laboratory result
    - Hot: >250 ppm; 4,000 mg/kg or greater in analytical result
    - field screening criteria to be revised as necessary based upon Correlation Analysis completed during the Preliminary Assessment effort.

Site-specific Field Screening and Sampling Objectives

The site-specific field screening and sampling plan for this project is relatively simple. Field screening will be conducted at all known locations that had been impacted by contamination. Field screening will be conducted for primary purposes as indicated below:

1. To assess the areas suspected of having contaminated soil and to confirm the removal of the contaminated soil
2. To identify laboratory confirmation soil sampling locations
3. To characterize any additional excavated and stockpiled soil material for disposal purposes.

For the purposes of this document, the field screening approach is described below by the following areas of assessment:

- Excavated soil
- Stained areas
- Areas with odors
- Excavation limits

Laboratory Sampling Plan
STANDARIZED METHODOLOGY
(Version 4)
November 2017

Laboratory Sampling Plan

The site-specific laboratory sampling plan for this project is attached and provides site specific details regarding sampling. *If there are discrepancies between the site specific document and this standard methodology, the site specific sampling plan takes precedence*. This document provides the standard methodology used to obtain and analyze the site samples. In general, laboratory sampling will be conducted for the following four primary purposes:

1. to assess the surface and sub-surface soil environment in the subject area for potential contaminants
2. to provide confirmation of contaminant removal from the surface and subsurface soil environment in areas impacted by the contaminant(s).
3. to assess, if necessary, the groundwater environment at the Site for potential impacts resulting from contaminant migration from the source area(s)
4. to characterize any additional excavated soil material generated during the investigation for disposal purposes

For the purposes of this document, the laboratory sampling approach is described below by the following areas:

- Surface soil sampling of suspect areas
- Surface and sub-surface soil sampling of the impacted area to define the horizontal and vertical extent of contamination.
- Groundwater sampling of the source area, an upgradient location, and a downgradient location.

NORTECH will collect all laboratory soil and groundwater samples in general accordance with the ADEC 2017 Field Sampling Guidance document (adopted by reference for sampling guidance, 18 AAC 78 regulations) and the approved work plan. All project soil and groundwater samples will be collected directly into clean glassware provided by the laboratory and immediately placed in a cooler with ice prior to transportation under chain-of-custody to the laboratory. A minimum of one duplicate sample will be collected for each ten samples submitted to the laboratory. If multiple days of sampling are required, a minimum of one duplicate sample will be collected each day. A minimum of one trip blank will accompany each set of volatile samples submitted to the lab.

The contaminants of concern (COCs) for the project are listed in the work plan. Typical fuel contaminants are: gasoline range organics (GRO), diesel range organics (DRO), and benzene, toluene, ethylbenzene, and xylenes (BTEX).

Specific laboratory analyses for these types of contaminants are:

- GRO by method AK 101
- DRO by method AK102
- RRO by method AK 103
- VOC by Method 8260

- Polycyclic Aromatic Hydrocarbons (PAH) by Method 8270SIM

Should the contaminant(s) of concern be other than the above listed or should a deviation be necessary then the site-specific plan will identify those changes, deviations, and any additional required analysis.

NORTECH typically uses SGS Environmental Services in Anchorage, Alaska as the analytical laboratory for all laboratory samples needed for this project. SGS was used during the soil sampling previously conducted at the Site and is an ADEC approved laboratory.

Soil Sampling

Soil samples will be collected from various locations and depths during the project effort. All soil samples will be collected of freshly exposed soils using clean or disposable sampling tools. In general, surface soil sampling (0-2 feet of the ground surface) will be conducted to confirm that contamination has been removed from the site to the applicable cleanup limits. Surface sample locations will be determined by the field screening results and samples will be collected using hand tools. Sub-surface soil sampling (>2 feet) will be conducted to assess the potential presence of contaminants and to characterize contaminant concentration which may remain in the sub-surface soil environment. Sub-surface soil samples will be collected from cores recovered from direct-push borings advanced through the subsurface environment.

Groundwater sampling

If groundwater sampling is included in the project scope of work, existing groundwater wells and the temporary sampling points will be purged and sampled using low-flow techniques. Purging will consist of three to five well volumes and/or until the suspended silt is minimized and field parameters, including dissolved oxygen, pH, ORP, and conductivity, have stabilized. One sample will be collected from each groundwater sampling well/point. At least one field duplicate will be collected for every ten samples submitted.

Soil Cleanup Limits

Laboratory analyses collected during this investigation will include GRO, DRO, RRO, PAH, and volatile contaminants using the methodologies described above. All project soil sample results will be compared to the cleanup levels provided as follows:

Site Cleanup Levels

Contaminant of Concern	Human Health Based Cleanup Level in mg/kg*	Table C Groundwater Cleanup Levels for Comparison to SPLP Results (mg/L)
GRO	1,400	2.2
DRO	4,000*	1.5
RRO	13,700	1.1
Benzene	16	0.0046
Toluene	200	200
Ethylbenzene	72	0.015
Total Xylenes	57	0.19
PAHs	18AAC75.340 Table B1, Arctic Zone	Table C Groundwater Cleanup Levels
VOCs**	18AAC75.340 Table B1, Arctic Zone	Table C Groundwater Cleanup Levels

Appendix 4

Laboratory Report of Analysis

To: Nortech
2400 College Road
Fairbanks, AK 99709

Report Number: **1199654**

Client Project: **16-1086 - Arctic Village**

Dear Doug Dusek,

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

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

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

Sincerely,
SGS North America Inc.

Alaska Division Technical Director

Stephen C. Ede
2019.09.16
16:45:43 -08'00'

Jennifer Dawkins Date
Project Manager
Jennifer.Dawkins@sgs.com

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Case Narrative

SGS Client: **Nortech**
SGS Project: **1199654**
Project Name/Site: **16-1086 - Arctic Village**
Project Contact: **Doug Dusek**

Refer to sample receipt form for information on sample condition.

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

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Laboratory Qualifiers

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

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

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & 17-021 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8015C, 8021B, 8082A, 8260C, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). SGS is only certified for the analytes listed on our Drinking Water Certification, and only those analytes will be reported to the State of Alaska for compliance. Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

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

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
DF	Analytical Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LLQC/LLIQC	Low Level Quantitation Check
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

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

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Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
126, 102	1199654001	08/13/2019	08/20/2019	Soil/Solid (dry weight)
150, 30	1199654002	08/13/2019	08/20/2019	Soil/Solid (dry weight)
151, 30	1199654003	08/13/2019	08/20/2019	Soil/Solid (dry weight)
186, 42	1199654004	08/13/2019	08/20/2019	Soil/Solid (dry weight)
270, 102	1199654005	08/13/2019	08/20/2019	Soil/Solid (dry weight)
294, 30	1199654006	08/13/2019	08/20/2019	Soil/Solid (dry weight)
390, 66	1199654007	08/13/2019	08/20/2019	Soil/Solid (dry weight)
402, 78	1199654008	08/14/2019	08/20/2019	Soil/Solid (dry weight)
114, 138	1199654009	08/14/2019	08/20/2019	Soil/Solid (dry weight)
222, 222	1199654010	08/14/2019	08/20/2019	Soil/Solid (dry weight)
258, 162	1199654011	08/14/2019	08/20/2019	Soil/Solid (dry weight)
354, 162	1199654012	08/14/2019	08/20/2019	Soil/Solid (dry weight)
378, 114	1199654013	08/14/2019	08/20/2019	Soil/Solid (dry weight)
78, 186	1199654014	08/14/2019	08/20/2019	Soil/Solid (dry weight)
79, 186	1199654015	08/14/2019	08/20/2019	Soil/Solid (dry weight)
30, 174	1199654016	08/14/2019	08/20/2019	Soil/Solid (dry weight)
18, 138	1199654017	08/14/2019	08/20/2019	Soil/Solid (dry weight)

Method	Method Description
AK102	Diesel/Residual Range Organics
AK103	Diesel/Residual Range Organics
SM21 2540G	Percent Solids SM2540G

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Detectable Results Summary

Client Sample ID: **126, 102**
Lab Sample ID: 1199654001
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	6080	mg/Kg
Residual Range Organics	266	mg/Kg

Client Sample ID: **150, 30**
Lab Sample ID: 1199654002
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	2300	mg/Kg
Residual Range Organics	348	mg/Kg

Client Sample ID: **151, 30**
Lab Sample ID: 1199654003
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	2300	mg/Kg
Residual Range Organics	243	mg/Kg

Client Sample ID: **186, 42**
Lab Sample ID: 1199654004
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	1470	mg/Kg
Residual Range Organics	159	mg/Kg

Client Sample ID: **270, 102**
Lab Sample ID: 1199654005
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	7890	mg/Kg
Residual Range Organics	10300	mg/Kg

Client Sample ID: **294, 30**
Lab Sample ID: 1199654006
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	5070	mg/Kg
Residual Range Organics	309	mg/Kg

Client Sample ID: **390, 66**
Lab Sample ID: 1199654007
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	5930	mg/Kg
Residual Range Organics	413	mg/Kg

Client Sample ID: **402, 78**
Lab Sample ID: 1199654008
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	1330	mg/Kg
Residual Range Organics	218	mg/Kg

Client Sample ID: **114, 138**
Lab Sample ID: 1199654009
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	21900	mg/Kg
Residual Range Organics	310	mg/Kg

Client Sample ID: **222, 222**
Lab Sample ID: 1199654010
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	5400	mg/Kg
Residual Range Organics	953	mg/Kg

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Detectable Results Summary

Client Sample ID: **258, 162**
Lab Sample ID: 1199654011
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	1970	mg/Kg
Residual Range Organics	526	mg/Kg

Client Sample ID: **354, 162**
Lab Sample ID: 1199654012
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	4910	mg/Kg
Residual Range Organics	228	mg/Kg

Client Sample ID: **378, 114**
Lab Sample ID: 1199654013
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	9640	mg/Kg
Residual Range Organics	164	mg/Kg

Client Sample ID: **78, 186**
Lab Sample ID: 1199654014
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	14700	mg/Kg
Residual Range Organics	173	mg/Kg

Client Sample ID: **79, 186**
Lab Sample ID: 1199654015
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	20500	mg/Kg
Residual Range Organics	194	mg/Kg

Client Sample ID: **30, 174**
Lab Sample ID: 1199654016
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	14100	mg/Kg
Residual Range Organics	201	mg/Kg

Client Sample ID: **18, 138**
Lab Sample ID: 1199654017
Semivolatile Organic Fuels

Parameter	Result	Units
Diesel Range Organics	8680	mg/Kg
Residual Range Organics	171	mg/Kg

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Results of **126, 102**

Client Sample ID: **126, 102**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654001
Lab Project ID: 1199654

Collection Date: 08/13/19 15:30
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):86.7
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	6080		91.8	28.5	mg/Kg	4		08/28/19 01:12
Surrogates								
5a Androstane (surr)	88.7		50-150		%	4		08/28/19 01:12

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 01:12
Container ID: 1199654001-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.138 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	266		91.8	28.5	mg/Kg	4		08/28/19 01:12
Surrogates								
n-Triacontane-d62 (surr)	85.3		50-150		%	4		08/28/19 01:12

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 01:12
Container ID: 1199654001-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.138 g
Prep Extract Vol: 5 mL

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Results of **150, 30**

Client Sample ID: **150, 30**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654002
Lab Project ID: 1199654

Collection Date: 08/13/19 15:35
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):85.5
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	2300		23.2	7.21	mg/Kg	1		08/28/19 00:13
Surrogates								
5a Androstane (surr)	85.7		50-150		%	1		08/28/19 00:13

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 00:13
Container ID: 1199654002-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.17 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	348		23.2	7.21	mg/Kg	1		08/28/19 00:13
Surrogates								
n-Triacontane-d62 (surr)	82.6		50-150		%	1		08/28/19 00:13

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 00:13
Container ID: 1199654002-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.17 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **151, 30**

Client Sample ID: **151, 30**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654003
Lab Project ID: 1199654

Collection Date: 08/13/19 15:37
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):87.7
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	2300		22.8	7.06	mg/Kg	1		08/28/19 00:23
Surrogates								
5a Androstane (surr)	93.6		50-150		%	1		08/28/19 00:23

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 00:23
Container ID: 1199654003-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.046 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	243		22.8	7.06	mg/Kg	1		08/28/19 00:23
Surrogates								
n-Triacontane-d62 (surr)	89.8		50-150		%	1		08/28/19 00:23

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 00:23
Container ID: 1199654003-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.046 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **186, 42**

Client Sample ID: **186, 42**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654004
Lab Project ID: 1199654

Collection Date: 08/13/19 15:45
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):82.6
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1470		24.1	7.46	mg/Kg	1		08/28/19 00:33
Surrogates								
5a Androstane (surr)	83.4		50-150		%	1		08/28/19 00:33

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 00:33
Container ID: 1199654004-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.156 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	159		24.1	7.46	mg/Kg	1		08/28/19 00:33
Surrogates								
n-Triacontane-d62 (surr)	80.2		50-150		%	1		08/28/19 00:33

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 00:33
Container ID: 1199654004-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.156 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **270, 102**

Client Sample ID: **270, 102**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654005
Lab Project ID: 1199654

Collection Date: 08/13/19 16:00
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):80.6
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	7890		98.7	30.6	mg/Kg	4		08/28/19 01:22
Surrogates								
5a Androstane (surr)	90.8		50-150		%	4		08/28/19 01:22

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 01:22
Container ID: 1199654005-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.161 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	10300		98.7	30.6	mg/Kg	4		08/28/19 01:22
Surrogates								
n-Triacontane-d62 (surr)	53.3		50-150		%	4		08/28/19 01:22

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 01:22
Container ID: 1199654005-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.161 g
Prep Extract Vol: 5 mL

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Results of **294, 30**

Client Sample ID: **294, 30**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654006
Lab Project ID: 1199654

Collection Date: 08/13/19 16:10
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):80.2
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	5070		98.8	30.6	mg/Kg	4		08/28/19 01:32
Surrogates								
5a Androstane (surr)	85		50-150		%	4		08/28/19 01:32

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 01:32
Container ID: 1199654006-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.309 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	309		98.8	30.6	mg/Kg	4		08/28/19 01:32
Surrogates								
n-Triacontane-d62 (surr)	82.5		50-150		%	4		08/28/19 01:32

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 01:32
Container ID: 1199654006-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.309 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **390, 66**

Client Sample ID: **390, 66**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654007
Lab Project ID: 1199654

Collection Date: 08/13/19 16:20
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):79.3
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	5930		99.7	30.9	mg/Kg	4		08/28/19 01:41
Surrogates								
5a Androstane (surr)	86.2		50-150		%	4		08/28/19 01:41

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 01:41
Container ID: 1199654007-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.354 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	413		99.7	30.9	mg/Kg	4		08/28/19 01:41
Surrogates								
n-Triacontane-d62 (surr)	82.5		50-150		%	4		08/28/19 01:41

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 01:41
Container ID: 1199654007-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.354 g
Prep Extract Vol: 5 mL

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Results of **402, 78**

Client Sample ID: **402, 78**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654008
Lab Project ID: 1199654

Collection Date: 08/14/19 11:00
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):86.0
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1330		92.1	28.5	mg/Kg	4		08/28/19 01:51
Surrogates								
5a Androstane (surr)	88.3		50-150		%	4		08/28/19 01:51

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 01:51
Container ID: 1199654008-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.308 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	218		92.1	28.5	mg/Kg	4		08/28/19 01:51
Surrogates								
n-Triacontane-d62 (surr)	84.6		50-150		%	4		08/28/19 01:51

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 01:51
Container ID: 1199654008-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.308 g
Prep Extract Vol: 5 mL

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Results of **114, 138**

Client Sample ID: **114, 138**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654009
Lab Project ID: 1199654

Collection Date: 08/14/19 11:28
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):80.0
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	21900		99.1	30.7	mg/Kg	4		08/28/19 02:01
Surrogates								
5a Androstane (surr)	95.8		50-150		%	4		08/28/19 02:01

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 02:01
Container ID: 1199654009-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.261 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	310		99.1	30.7	mg/Kg	4		08/28/19 02:01
Surrogates								
n-Triacontane-d62 (surr)	89.9		50-150		%	4		08/28/19 02:01

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 02:01
Container ID: 1199654009-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.261 g
Prep Extract Vol: 5 mL

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Results of **222, 222**

Client Sample ID: **222, 222**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654010
Lab Project ID: 1199654

Collection Date: 08/14/19 11:32
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):83.3
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	5400		96.0	29.8	mg/Kg	4		08/28/19 02:11
Surrogates								
5a Androstane (surr)	94.9		50-150		%	4		08/28/19 02:11

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 02:11
Container ID: 1199654010-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.027 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	953		96.0	29.8	mg/Kg	4		08/28/19 02:11
Surrogates								
n-Triacontane-d62 (surr)	91.7		50-150		%	4		08/28/19 02:11

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 02:11
Container ID: 1199654010-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.027 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **258, 162**

Client Sample ID: **258, 162**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654011
Lab Project ID: 1199654

Collection Date: 08/14/19 11:36
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):86.1
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	1970		23.1	7.17	mg/Kg	1		08/28/19 00:43
Surrogates								
5a Androstane (surr)	90.6		50-150		%	1		08/28/19 00:43

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 00:43
Container ID: 1199654011-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.144 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	526		23.1	7.17	mg/Kg	1		08/28/19 00:43
Surrogates								
n-Triacontane-d62 (surr)	86.9		50-150		%	1		08/28/19 00:43

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 00:43
Container ID: 1199654011-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.144 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **354, 162**

Client Sample ID: **354, 162**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654012
Lab Project ID: 1199654

Collection Date: 08/14/19 10:00
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):85.3
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	4910		92.3	28.6	mg/Kg	4		08/28/19 02:20
Surrogates								
5a Androstane (surr)	95.8		50-150		%	4		08/28/19 02:20

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/28/19 02:20
Container ID: 1199654012-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.474 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	228		92.3	28.6	mg/Kg	4		08/28/19 02:20
Surrogates								
n-Triacontane-d62 (surr)	92.2		50-150		%	4		08/28/19 02:20

Batch Information

Analytical Batch: XFC15290
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/28/19 02:20
Container ID: 1199654012-A

Prep Batch: XXX42096
Prep Method: SW3550C
Prep Date/Time: 08/24/19 07:15
Prep Initial Wt./Vol.: 30.474 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **378, 114**

Client Sample ID: **378, 114**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654013
Lab Project ID: 1199654

Collection Date: 08/14/19 09:30
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):78.3
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	9640		101	31.4	mg/Kg	4		08/27/19 00:14
Surrogates								
5a Androstane (surr)	87.6		50-150		%	4		08/27/19 00:14

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/27/19 00:14
Container ID: 1199654013-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.298 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	164		101	31.4	mg/Kg	4		08/27/19 00:14
Surrogates								
n-Triacontane-d62 (surr)	83.2		50-150		%	4		08/27/19 00:14

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/27/19 00:14
Container ID: 1199654013-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.298 g
Prep Extract Vol: 5 mL

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Results of **78, 186**

Client Sample ID: **78, 186**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654014
Lab Project ID: 1199654

Collection Date: 08/14/19 09:20
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):81.7
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	14700		97.7	30.3	mg/Kg	4		08/27/19 00:23
Surrogates								
5a Androstane (surr)	85.2		50-150		%	4		08/27/19 00:23

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/27/19 00:23
Container ID: 1199654014-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.09 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	173		97.7	30.3	mg/Kg	4		08/27/19 00:23
Surrogates								
n-Triacontane-d62 (surr)	78.9		50-150		%	4		08/27/19 00:23

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/27/19 00:23
Container ID: 1199654014-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.09 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:45PM

Results of **79, 186**

Client Sample ID: **79, 186**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654015
Lab Project ID: 1199654

Collection Date: 08/14/19 09:24
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):80.7
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	20500		496	154	mg/Kg	20		09/05/19 15:45
Surrogates								
5a Androstane (surr)	94.6		50-150		%	20		09/05/19 15:45

Batch Information

Analytical Batch: XFC15307
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 09/05/19 15:45
Container ID: 1199654015-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.001 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	194		99.1	30.7	mg/Kg	4		08/27/19 00:33
Surrogates								
n-Triacontane-d62 (surr)	86.8		50-150		%	4		08/27/19 00:33

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/27/19 00:33
Container ID: 1199654015-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.001 g
Prep Extract Vol: 5 mL

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Results of **30, 174**

Client Sample ID: **30, 174**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654016
Lab Project ID: 1199654

Collection Date: 08/14/19 11:40
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):82.2
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	14100		96.2	29.8	mg/Kg	4		08/27/19 00:43
Surrogates								
5a Androstane (surr)	89.4		50-150		%	4		08/27/19 00:43

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/27/19 00:43
Container ID: 1199654016-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.341 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	201		96.2	29.8	mg/Kg	4		08/27/19 00:43
Surrogates								
n-Triacontane-d62 (surr)	82.1		50-150		%	4		08/27/19 00:43

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/27/19 00:43
Container ID: 1199654016-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.341 g
Prep Extract Vol: 5 mL

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Results of **18, 138**

Client Sample ID: **18, 138**
Client Project ID: **16-1086 - Arctic Village**
Lab Sample ID: 1199654017
Lab Project ID: 1199654

Collection Date: 08/14/19 11:23
Received Date: 08/20/19 10:46
Matrix: Soil/Solid (dry weight)
Solids (%):77.8
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	8680		103	31.8	mg/Kg	4		08/27/19 00:53
Surrogates								
5a Androstane (surr)	84.5		50-150		%	4		08/27/19 00:53

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK102
Analyst: CMS
Analytical Date/Time: 08/27/19 00:53
Container ID: 1199654017-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.105 g
Prep Extract Vol: 5 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	171		103	31.8	mg/Kg	4		08/27/19 00:53
Surrogates								
n-Triacontane-d62 (surr)	79.4		50-150		%	4		08/27/19 00:53

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK103
Analyst: CMS
Analytical Date/Time: 08/27/19 00:53
Container ID: 1199654017-A

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 08/23/19 14:26
Prep Initial Wt./Vol.: 30.105 g
Prep Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1798349 [SPT/10863]
Blank Lab ID: 1527232

Matrix: Soil/Solid (dry weight)

QC for Samples:
1199654001, 1199654002, 1199654003, 1199654004, 1199654005, 1199654006, 1199654007, 1199654008, 1199654009, 1199654010, 1199654011, 1199654012, 1199654013, 1199654014, 1199654015, 1199654016, 1199654017

Results by **SM21 2540G**

Parameter	Results	LOQ/CL	DL	Units
Total Solids	100			%

Batch Information

Analytical Batch: SPT10863
Analytical Method: SM21 2540G
Instrument:
Analyst: MER
Analytical Date/Time: 8/22/2019 11:52:00PM

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Duplicate Sample Summary

Original Sample ID: 1194747076
Duplicate Sample ID: 1527237
QC for Samples:

Analysis Date: 08/22/2019 23:52
Matrix: Soil/Solid (dry weight)

Results by **SM21 2540G**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Solids	77.9	76.0	%	2.50	(< 15)

Batch Information

Analytical Batch: SPT10863
Analytical Method: SM21 2540G
Instrument:
Analyst: MER

Print Date: 09/16/2019 4:20:49PM

Duplicate Sample Summary

Original Sample ID: 1194801023
Duplicate Sample ID: 1527238

Analysis Date: 08/22/2019 23:52
Matrix: Soil/Solid (dry weight)

QC for Samples:

1199654001, 1199654002, 1199654003, 1199654004, 1199654005, 1199654006, 1199654007, 1199654008, 1199654009, 1199654010, 1199654011, 1199654012, 1199654013, 1199654014, 1199654015, 1199654016,

Results by **SM21 2540G**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Solids	24.2	24.0	%	1.20	(< 15)

Batch Information

Analytical Batch: SPT10863
Analytical Method: SM21 2540G
Instrument:
Analyst: MER

Print Date: 09/16/2019 4:20:49PM

Method Blank

Blank ID: MB for HBN 1798386 [XXX/42092]
Blank Lab ID: 1527389

Matrix: Soil/Solid (dry weight)

QC for Samples:
1199654013, 1199654014, 1199654015, 1199654016, 1199654017

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
5a Androstane (surr)	85.5	60-120		%

Batch Information

Analytical Batch: XFC15278
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CMS
Analytical Date/Time: 8/26/2019 6:01:00PM

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/Time: 8/23/2019 2:26:16PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 5 mL

Blank Spike Summary

Blank Spike ID: LCS for HBN 1199654 [XXX42092]
Blank Spike Lab ID: 1527390
Date Analyzed: 08/26/2019 18:11

Spike Duplicate ID: LCSD for HBN 1199654 [XXX42092]
Spike Duplicate Lab ID: 1527391
Matrix: Soil/Solid (dry weight)

QC for Samples: 1199654013, 1199654014, 1199654015, 1199654016, 1199654017

Results by **AK102**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	833	836	100	833	819	98	(75-125)	2.00	(< 20)
Surrogates									
5a Androstane (surr)	16.7	99.2	99	16.7	95.8	96	(60-120)	3.50	

Batch Information

Analytical Batch: **XFC15278**
Analytical Method: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **CMS**

Prep Batch: **XXX42092**
Prep Method: **SW3550C**
Prep Date/Time: **08/23/2019 14:26**
Spike Init Wt./Vol.: 833 mg/Kg Extract Vol: 5 mL
Dupe Init Wt./Vol.: 833 mg/Kg Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 1798386 [XXX/42092]
Blank Lab ID: 1527389

Matrix: Soil/Solid (dry weight)

QC for Samples:
1199654013, 1199654014, 1199654015, 1199654016, 1199654017

Results by **AK103**

Parameter	Results	LOQ/CL	DL	Units
Residual Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
nA riacontaneAd62 (surr)	84.3	60A120		%

Batch Information

Fnalytical Batch: XTC15278
Fnalytical Method: FK103
Instrument: Fgilent 7890B R
Fnalyst: CMS
Fnalytical Date/- ime: 8/26/2019 6:01:00PM

Prep Batch: XXX42092
Prep Method: SW3550C
Prep Date/- ime: 8/23/2019 2:26:16PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 5 mL

Print Date: 09/16/2019 4:20:53PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1199654 [XXX42092]
Blank Spike Lab ID: 1527390
Date Analyzed: 08/26/2019 18:11

Spike Duplicate ID: LCSD for HBN 1199654 [XXX42092]
Spike Duplicate Lab ID: 1527391
Matrix: Soil/Solid (dry weight)

QC for Samples: 1199654013, 1199654014, 1199654015, 1199654016, 1199654017

Results by **AK102**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Residual Range Organics	833	839	101	833	814	98	(60-120)	3.10	(< 20)
Surrogates									
n-Triacontane-d62 (surr)	16.7	91.5	92	16.7	93.7	94	(60-120)	2.40	

Batch Information

Analytical Batch: **XFC15789**
Analytical Method: **AK102**
Instrument: **Agilent 89R0B M**
Analyst: **C4 S**

Prep Batch: **XXXW70R7**
Prep Method: **S3 2550C**
Prep Date/Time: **09/72/701R 1W76**
Spike Init Wt./Vol.: 833 mg/Kg Extract Vol: 5 mL
Dupe Init Wt./Vol.: 833 mg/Kg Extract Vol: 5 mL

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Method Blank

Blank ID: MB for HBN 179836[X / / 432690]
Blank Lab ID: 1[27379

Matrix: Coil4Colid (dry wpight)

5 Q for CaS mpe:
11990[3661s11990[3662s11990[366, s11990[3663s11990[366[s11990[3660s11990[3667s11990[3668s11990[3669s
11990[3616s11990[3611s11990[3612

Rpeulte by **AK102**

ParaS ptpr	Rpeulte	LO5 4QL	DL	Unite
Dipepl Rangp Organice	16.6U	26.6	0.26	S g4Kg
Surrogates				
[a Androetanp (eurr)	89.2	06-126		%

Batch Information

Analytical Batch: / FQ1[, 67
Analytical Mpthod: AK162
InetruS pnt: Agilpnt 7896B R
Analyet: QMC
Analytical Datp4TiS p: 94[42619 11:17:66AM

PrpmBatch: / / / 32690
PrpmMpthod: CW, [[6Q
PrpmDatp4TiS p: 84234-2619 7:1[:, 3AM
PrpmInitial Wt.4Vol.: , 6 g
PrpmExtract Vol: [S L

Print Datp: 6941042619 3:26:[0PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1199654 [XXX42096]
Blank Spike Lab ID: 1527430
Date Analyzed: 038278 2019 22:/ 6

Spike Duplicate ID: LCSD for HBN 1199654 [XXX42096]
Spike Duplicate Lab ID: 1527431
Matrix: Soil8Solid (dry weight)

QC for Samples: 1199654001, 1199654002, 119965400/ , 1199654004, 1199654005, 1199654006, 1199654007, 1199654003, 1199654009, 1199654010, 1199654011, 1199654012

Results by **AK102**

	Blank Spike (mg8Kg)			Spike Duplicate (mg8Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	3/ /	916	110	3/ /	906	109	(75-125)	1.20	(< 20)
Surrogates									
5a Androstane (surr)	16.7	106	106	16.7	104	104	(60-120)	1.60	

Batch Information

Analytical Batch: **XFC15270**
Analytical Method: **AK102**
Instrument: **Agilent 8970B R**
Analyst: **CMS**

Prep Batch: **XXX4207W**
Prep Method: **S3 / 550C**
Prep Date8Time: **09:24:2017 08615**
Spike Init Wt.8Vol.: 3/ / mg8Kg Extract Vol: 5 mL
Dupe Init Wt.8Vol.: 3/ / mg8Kg Extract Vol: 5 mL

Print Date: 098168 2019 4:20:53PM

Method Blank

Blank ID: MB for HBN 179836[X / / 432690]
Blank Lab ID: 1[27379

Matrix: Coil4Colid (dry wpight)

5 Q for CaS mpe:
11990[3661s11990[3662s11990[366, s11990[3663s11990[366[s11990[3660s11990[3667s11990[3668s11990[3669s
11990[3616s11990[3611s11990[3612

Rpeulte by **AK103**

ParaS ptpr	Rpeulte	LO5 4QL	DL	Unite
Rpeidual Rangp Organice	16.6U	26.6	0.26	S g4Kg
Surrogates				
nA riacontanpAd02 (eurr)	8[.1	06A126		%

Batch Information

Fnalytical Batch: / TQ1[, 67
Fnalytical Mpthod: FK16,
InetruS pnt: Fgilpnt 7896B R
Fnalyet: QMC
Fnalytical Datp4 iS p: 94[42619 11:17:66FM

PrpmBatch: / / / 32690
PrpmMpthod: CW, [[6Q
PrpmDatp4 iS p: 84234-2619 7:1[:, 3FM
PrpmInitial Wt.4Vol.: , 6 g
PrpmExtract Vol: [S L

Print Datp: 6941042619 3:26:[9PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1199654 [XXX42096]
Blank Spike Lab ID: 1527430
Date Analyzed: 038278019 22:/ 6

Spike Duplicate ID: LCSD for HBN 1199654 [XXX42096]
Spike Duplicate Lab ID: 1527431
Matrix: Soil8Solid (dry weight)

QC for Samples: 1199654001, 1199654002, 119965400/ , 1199654004, 1199654005, 1199654006, 1199654007, 1199654003, 1199654009, 1199654010, 1199654011, 1199654012

Results by **AK102**

	Blank Spike (mg8Kg)			Spike Duplicate (mg8Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Residual Range Organics	3/ /	334	106	3/ /	365	104	(60-120)	2.20	(< 20)
Surrogates									
n-Triacontane-d62 (surr)	16.7	102	102	16.7	96.5	97	(60-120)	5.70	

Batch Information

Analytical Batch: **XFC15780**
Analytical Method: **AK102**
Instrument: **Agilent 9R80B M**
Analyst: **C4 S**

Prep Batch: **XXXW7083**
Prep Method: **S/ 2550C**
Prep Date8Time: **0R7W7018 09615**
Spike Init Wt.8Vol.: 3/ / mg8Kg Extract Vol: 5 mL
Dupe Init Wt.8Vol.: 3/ / mg8Kg Extract Vol: 5 mL

Print Date: 098168019 4:21:01PM

SGS

SGS N
CHAIN OF

1199654

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Instructions: Sections 1 - 5 must be filled out.
Omissions may delay the onset of analysis.

Section 1

CLIENT: Nortech

CONTACT: Doug Dusek

PHONE #: 907-452-5688

PROJECT NAME: ~~16-1086~~ Arctic Village

PROJECT/ PWSID/ PERMIT#: 16-1086

REPORTS TO: Doug Dusek

E-MAIL:

Profile #: DDusek@Nortechengr.com

INVOICE TO: Doug Dusek

QUOTE #:

P.O. #:

Section 3 — Preservative

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Comp Grab MI (Multi-incremental)	Analysis* AK 102 DRO	Analysis* AK 103 RRO	REMARKS/LOC ID
(1) A	126, 102	8/13/19	15:30	Soil	1	grab	✓	✓	
(2) A	150, 30	8/13/19	15:35				✓	✓	
(3) A	151, 30	8/13/19	15:37				✓	✓	
(4) A	186, 42	8/13/19	15:45				✓	✓	
(5) A	270, 102	8/13/19	16:00				✓	✓	
(6) A	294, 30	8/13/19	16:10				✓	✓	
(7) A	390, 66	8/13/19	16:20				✓	✓	
(8) A	402, 78	8/14/19	11:05				✓	✓	
(9) A	114, 138	8/14/19	11:28				✓	✓	
(10) A	222, 222	8/14/19	11:32						

NOTE: *The following analyses require specific method and/or compound list: BTEX, Metals, PFAS

Section 5

	Date	Time	
Relinquished By: (1)	8/19/19	8:03	Received By:
Relinquished By: (2)	8/19/19	1230	Received By:
Relinquished By: (3)			Received By:
Relinquished By: (4)	08/20/19	10:46	Received For Laboratory By:

Section 4

DOD Project? Yes No

Data Deliverable Requirements:

Cooler ID:

Requested Turnaround Time and/or Special Instructions:

Profile: 341954

Temp Blank °C: 1.7 or Ambient [ ]

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Delivery Method: Hand Delivery[ ] Commerical Delivery [ ]

ANC: 1F, 1B 2.60 D30

SGS

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CHAIN O

1199654

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Instructions: Sections 1 - 5 must be filled out.
Omissions may delay the onset of analysis.

Section 1

CLIENT: Nortech

CONTACT: Doug Dusek

PHONE #: 907-452-5688

PROJECT NAME: Arctic Village

PROJECT/ PWSID/ PERMIT#: 16-1096

REPORTS TO: Doug Dusek

E-MAIL: ddusek@Nortech-engr.com

Profile #:

INVOICE TO: Doug Dusek

QUOTE #:

P.O. #:

Section 2

Section 3 — Preservative

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Comp / Grab / MI (Multi-incremental)	Analysis* DRO AK102	Analysis* RRO AK103	REMARKS/LOC ID
11 A	258, 162	8/14/19	11:36	Soil	1	grab	✓	✓	
12 A	354, 162	8/14/19	10:00				✓	✓	
13 A	378, 114	8/14/19	9:30				✓	✓	
14 A	78, 186	8/14/19	9:20				✓	✓	
15 A	79, 186	8/14/19	9:24				✓	✓	
16 A	30, 174	8/14/19	11:40				✓	✓	
17 A	18, 138	8/14/19	11:23				✓	✓	

NOTE: *The following analyses require specific method and/or compound list: BTEX, Metals, PFAS

Section 5

	Date	Time	
Relinquished By: (1)	8/19/19	803	Received By:
Relinquished By: (2)	8/19/19	1230	Received By:
Relinquished By: (3)			Received By:
Relinquished By: (4)	08/20/19	10:46	Received For Laboratory By:

Section 4

DOD Project? Yes No

Cooler ID:

Data Deliverable Requirements:

Requested Turnaround Time and/or Special Instructions:

Temp Blank °C: 1.7 or Ambient [ ]

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Delivery Method: Hand Delivery[ ] Commerical Delivery [ ]

AVC: 2.6°D31 1F18

SGS

Returned Bottles Inventory

Name of individual returning bottles: _____

Date Received: 08/20/15

Client Name: _____

Received by: AMG

Project Name: Arctic Village

SGS PM: FBKS

HDPE/Nalgene:	1-L					
	500-ml					
	250-ml or 8-oz					
	125-ml or 4-oz					
	60-ml or 2-oz					
	other					
amber glass:	1-L					
	500-ml					
	250-ml or 8-oz					
	125-ml or 4-oz with or without septa	7				
	40-ml VOA vial					
	other					
Subtotal:		7				

Note: Returned bottles (regardless of size/pres.) are billed back at $4/bottle ***unless otherwise quoted***.

Amount to Invoice Client $: 28

WO#: 1199654

F067_Returned_Bottles_Tally_2014-08-05

e-Sample Receipt Form

SGS Workorder #: 1199654 | 1 1 9 9 6 5 4

Review Criteria	Condition (Yes, No, N/A)	Exceptions Noted below
Chain of Custody / Temperature Requirements		N/A Exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Yes	1 front 1 back
COC accompanied samples?	Yes	
DOD: Were samples received in COC corresponding coolers?	N/A	
N/A **Exemption permitted if chilled & collected <8 hours ago, or for samples where chilling is not required		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Yes	Cooler ID: 1 @ 2.6 °C Therm. ID: D30
If samples received without a temperature blank, the "cooler temperature" will be documented instead & "COOLER TEMP" will be noted to the right. "ambient" or "chilled" will be noted if neither is available.		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
*If >6°C, were samples collected <8 hours ago?	N/A	
If <0°C, were sample containers ice free?	N/A	
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
Holding Time / Documentation / Sample Condition Requirements		Note: Refer to form F-083 "Sample Guide" for specific holding times.
Were samples received within holding time?	Yes	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Yes	Lids were swapped between samples 2 and 3. Logging in per labels.
**Note: If times differ <1hr, record details & login per COC.		
***Note: If sample information on containers differs from COC, SGS will default to COC information		
Were analytical requests clear? (i.e., method is specified for analyses with multiple option for analysis (Ex: BTEX, Metals)	Yes	
	N/A	***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Yes	
Volatile / LL-Hg Requirements		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	N/A	
Were all water VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	N/A	
Were all soil VOAs field extracted with MeOH+BFB?	N/A	

Note to Client: Any "No", answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

e-Sample Receipt Form FBK

SGS Workorder #:	1199654	1199654

Review Criteria	Condition (Yes, No, N/A)	Exceptions Noted below
Chain of Custody / Temperature Requirements	Yes	Exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	N/A	
COC accompanied samples?	Yes	
DOD: Were samples received in COC corresponding coolers?	N/A	
**Exemption permitted if chilled & collected <8 hours ago, or for samples where chilling is not required		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Yes	Cooler ID: 1 @ 1.7 °C Therm. ID: D51
If samples received without a temperature blank, the "cooler temperature" will be documented instead & "COOLER TEMP" will be noted to the right. "ambient" or "chilled" will be noted if neither is available.		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
		Cooler ID: @ °C Therm. ID:
If >6°C, were samples collected <8 hours ago?		
If <0°C, were sample containers ice free?		
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
Holding Time / Documentation / Sample Condition Requirements		Note: Refer to form F-083 "Sample Guide" for specific holding times.
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	N/C	
**Note: If times differ <1hr, record details & login per COC.		
***Note: If sample information on containers differs from COC, SGS will default to COC information		
Were samples in good condition (no leaks/cracks/breakage)?	Yes	
Were analytical requests clear? (i.e., method is specified for analyses with multiple option for analysis (Ex: BTEX, Metals)	Yes	
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	N/A	
Were all water VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	N/A	
Were all soil VOAs field extracted with MeOH+BFB?	N/A	
For Rush/Short Hold Time, was RUSH/Short HT email sent?	N/A	

Note to Client: Any "No", answer above indicates non-compliance with standard procedures and may impact data quality.

Additional notes (if applicable):

SGS Profile #	341954	341954

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1199654001-A	No Preservative Required	OK			
1199654002-A	No Preservative Required	OK			
1199654003-A	No Preservative Required	OK			
1199654004-A	No Preservative Required	OK			
1199654005-A	No Preservative Required	OK			
1199654006-A	No Preservative Required	OK			
1199654007-A	No Preservative Required	OK			
1199654008-A	No Preservative Required	OK			
1199654009-A	No Preservative Required	OK			
1199654010-A	No Preservative Required	OK			
1199654011-A	No Preservative Required	OK			
1199654012-A	No Preservative Required	OK			
1199654013-A	No Preservative Required	OK			
1199654014-A	No Preservative Required	OK			
1199654015-A	No Preservative Required	OK			
1199654016-A	No Preservative Required	OK			
1199654017-A	No Preservative Required	OK			

Container Condition Glossary

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

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM - The container was received damaged.
FR - The container was received frozen and not usable for Bacteria or BOD analyses.
IC - The container provided for microbiology analysis was not a laboratory-supplied, pre-sterilized container and therefore was not suitable for analysis.
NC- The container provided was not preserved or was under-preserved. The method does not allow for additional preservative added after collection.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
QN - Insufficient sample quantity provided.

Laboratory Data Review Checklist

Completed By:

Doug Dusek

Title:

Environmental Specialist

Date:

January 2020

Consultant Firm:

NORTECH

Laboratory Name:

SGS North America Inc.

Laboratory Report Number:

1199654

Laboratory Report Date:

September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

ADEC File Number:

700.38.001/ 700.57.001

Hazard Identification Number:

4021 (School contaminated site)

1199654

Laboratory Report Date:

September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   Yes☒ No☐ N/A☐ Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

   Yes☐ No☐ N/A☒ Comments:

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

   Yes☒ No☐ N/A☐ Comments:

   b. Correct analyses requested?

   Yes☒ No☐ N/A☐ Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

   Yes☒ No☐ N/A☐ Comments:

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

   Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

e. Data quality or usability affected?

Comments:

no

4. Case Narrative

a. Present and understandable?

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☒ N/A☐ Comments:

c. Were all corrective actions documented?

Yes☐ No☐ N/A☒ Comments:

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

Comments:

NA

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Laboratory Report Date:

September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

5. Samples Results

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

Yes☒ No☐ N/A☐ Comments:

b. All applicable holding times met?

Yes☒ No☐ N/A☐ Comments:

c. All soils reported on a dry weight basis?

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

e. Data quality or usability affected?

NA

6. QC Samples

a. Method Blank

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

Yes☒ No☐ N/A☐ Comments:

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes☒ No☐ N/A☐ Comments:

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iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

na

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

Yes☐ No☐ N/A☒ Comments:

v. Data quality or usability affected?

Comments:

NA

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

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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

Yes☒ No☐ N/A☐ Comments:

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September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

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

Comments:

NA

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

Yes☐ No☐ N/A☒ Comments:

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

Comments:

No

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes☒ No☐ N/A☐ Comments:

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes☐ No☐ N/A☒ Comments:

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable?

Yes☒ No☐ N/A☐ Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate.

Yes☒ No☐ N/A☐ Comments:

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Laboratory Report Date:

September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

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

Comments:

na

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

Yes☐ No☐ N/A☒ Comments:

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

Comments:

no

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

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

Yes☒ No☐ N/A☐ Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R for field samples and 60-120 %R for QC samples; all other analyses see the laboratory report pages)

Yes☒ No☐ N/A☐ Comments:

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

Yes☐ No☐ N/A☒ Comments:

iv. Data quality or usability affected?

Comments:

no

1199654

Laboratory Report Date:

September 16, 2019

CS Site Name:

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e. Trip Blanks

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

Yes☐ No☐ N/A☒ Comments:

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

Yes☐ No☐ N/A☒ Comments:

iii. All results less than LOQ and project specified objectives?

Yes☐ No☐ N/A☒ Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

na

v. Data quality or usability affected?

Comments:

na

f. Field Duplicate

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

Yes☒ No☐ N/A☐ Comments:

ii. Submitted blind to lab?

Yes☒ No☐ N/A☐ Comments:

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Laboratory Report Date:

September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

Yes☒ No☐ N/A☐ Comments:

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

Comments:

usable

g. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below)?

Yes☐ No☐ N/A☒ Comments:

i. All results less than LOQ and project specified objectives?

Yes☐ No☐ N/A☒ Comments:

na

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

na

iii. Data quality or usability affected?

Comments:

Na

1199654

Laboratory Report Date:

September 16, 2019

CS Site Name:

700.38.001/ 700.57.001

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

   a. Defined and appropriate?

      Yes☐ No☒ N/A☐ Comments:
