# CORRECTIVE ACTION SUMMARY REPORT
# TYONEK NORTH FORELANDS FACILITY
# TYONEK, ALASKA

**ADEC Spill No. 2337.38.042**

July 2015

Submitted To:

**Alaska Department of Environmental Conservation**

Contaminated Sites Program

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| AK | Alaska Method |
| ASR | Alaska Soil Recycling |
| AST | Aboveground Storage Tank |
| bgs | Below Ground Surface |
| BTEX | Aromatic Hydrocarbons – benzene, toluene, ethylbenzene, xylene |
| º C | Degrees Celsius |
| CAP | Corrective Action Plan |
| CSM | Conceptual Site Model |
| CY/cy | Cubic Yard |
| DL | Detection Limit |
| DOT | U.S. Department of Transportation |
| DQO | Data Quality Objective |
| DRO | Diesel Range Organics |
| EPA | Environmental Protection Agency |
| GPS | Global Positioning System |
| LCS/LCSD | Laboratory Control Sample/Laboratory Control Sample Duplicate |
| LOD | Limit of Detection |
| LOQ | Limit of Quantitation |
| mg/Kg | Milligram Per Kilogram |
| MS/MSD | Matrix Spike/Matrix Spike Duplicate |
| PID | Photoionization Detector |
| ppm | Parts Per Million |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RPD | Relative Percent Difference |
| RRO | Residual Range Organics |
| SGS | SGS Environmental Laboratories North America, Inc. |
| SOPs | Standard Operating Procedures |
| SSHSP | Site Specific Health and Safety Plan |
| TPH | Total Petroleum Hydrocarbons |
| VOC | Volatile Organic Compound |

**CORRECTIVE ACTION PLAN**
**Tyonek North Forelands Facility**
**Tyonek, ALASKA**

## 1.0 INTRODUCTION

This Corrective Action Summary Report has been prepared for the excavation of soil impacted by a release of diesel fuel from an above ground storage tank located near the village of Tyonek in 1997. At the time of the spill, the released fuel volume was estimated at 500-800 gallons. A Phase II Environmental Site Assessment (ESA) was performed in 1998 whose purpose was to delineate the vertical and horizontal extent of impacted soil.

Authorization to proceed with the Corrective Action Workplan and corrective action work was provided from Tyonek Native Corporation by Connie Downing, Director of Lands and Operations on April 14, 2015.

## 2.0 SITE AND PROJECT DESCRIPTION

### 2.1 Site Location

The project site is located near the old Tyonek airstrip about 2 ½ miles southwest of Tyonek, Alaska. The site is located in the northwest corner of Section 14; Township 11N; Range 11W in the Seward Meridian. The site and facility where the release occurred is owned by the Tyonek Native Corporation. A vicinity map showing the property and surrounding area is included as Figure 1 below.

The elevation of the excavation site is approximately 162 feet from sea level and approximately 1100 feet from the bluff that drops down to cook inlet. The location of the landfarm is presented in Figure 4. The elevation of the landfarm site is 128 feet above sea level and located approximately 500 feet from a bluff that drops down to the shores of Cook Inlet.


Figure 1 – Location of the site in the Cook Inlet region.

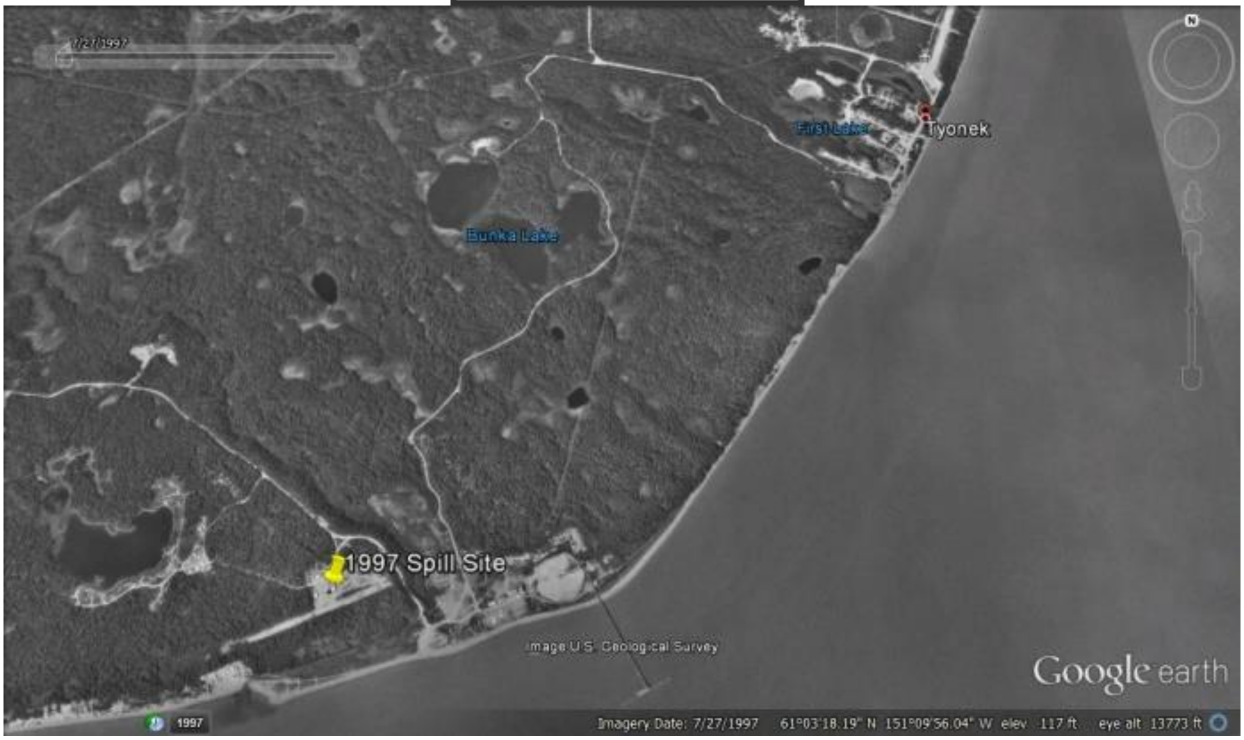

Figure 2 - Site location in the Cook Inlet region & proximity to Tyonek Village.

## 2.2 Background

A Phase II ESA was performed in May of 1998. Nine laboratory analytical samples were collected from 5 (5 of 7) soil borings drilled during the May 1998 ESA that confirmed the presence of released fuel in concentrations exceeding ADEC action levels applicable at that time. Soil samples were collected from impacted soil near the southwest corner of the maintenance building where the AST was located.

As described in the 1998 report, there were a total of seven borings advanced around the AST. Two borings, designated B-1 and B-5 were identified that contained contaminant concentrations that exceeded the proposed ADEC Method 1 cleanup level that was applicable for this site at that time.

The reported lateral and vertical extent of the impacted soil is depicted on Figure 3 and Figure 4 below. The deepest boring in the 1998 ESA was advanced to just over 50 feet below ground surface.

No Ground water was observed in the boring at that depth. There are no serviceable drinking water wells within two miles of the excavation site. There is a small lake 2,500 feet to the west-northwest of the excavation site. Cook Inlet is located approximately 1,100 feet south of the excavation site.

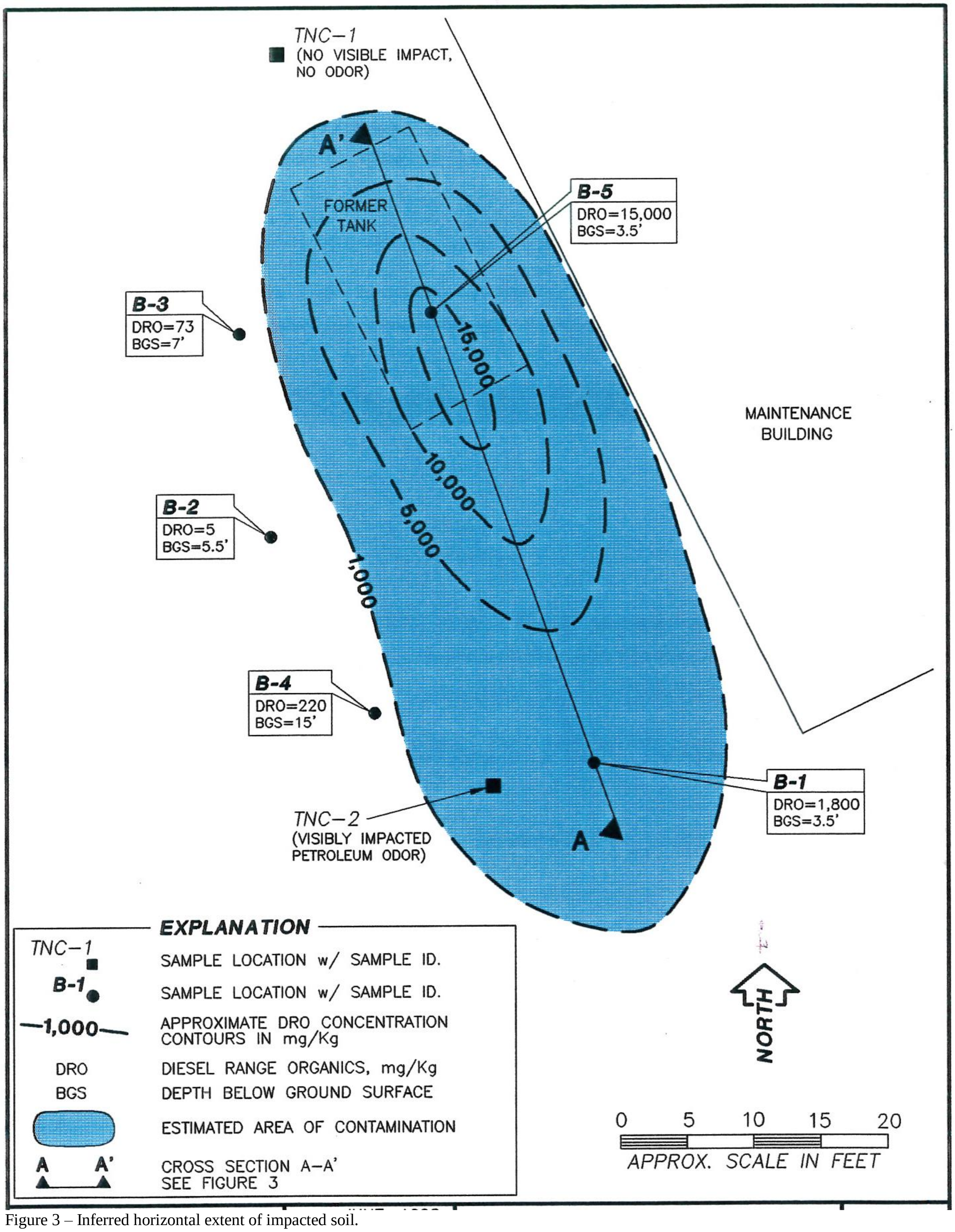


Figure 3 – Inferred horizontal extent of impacted soil.

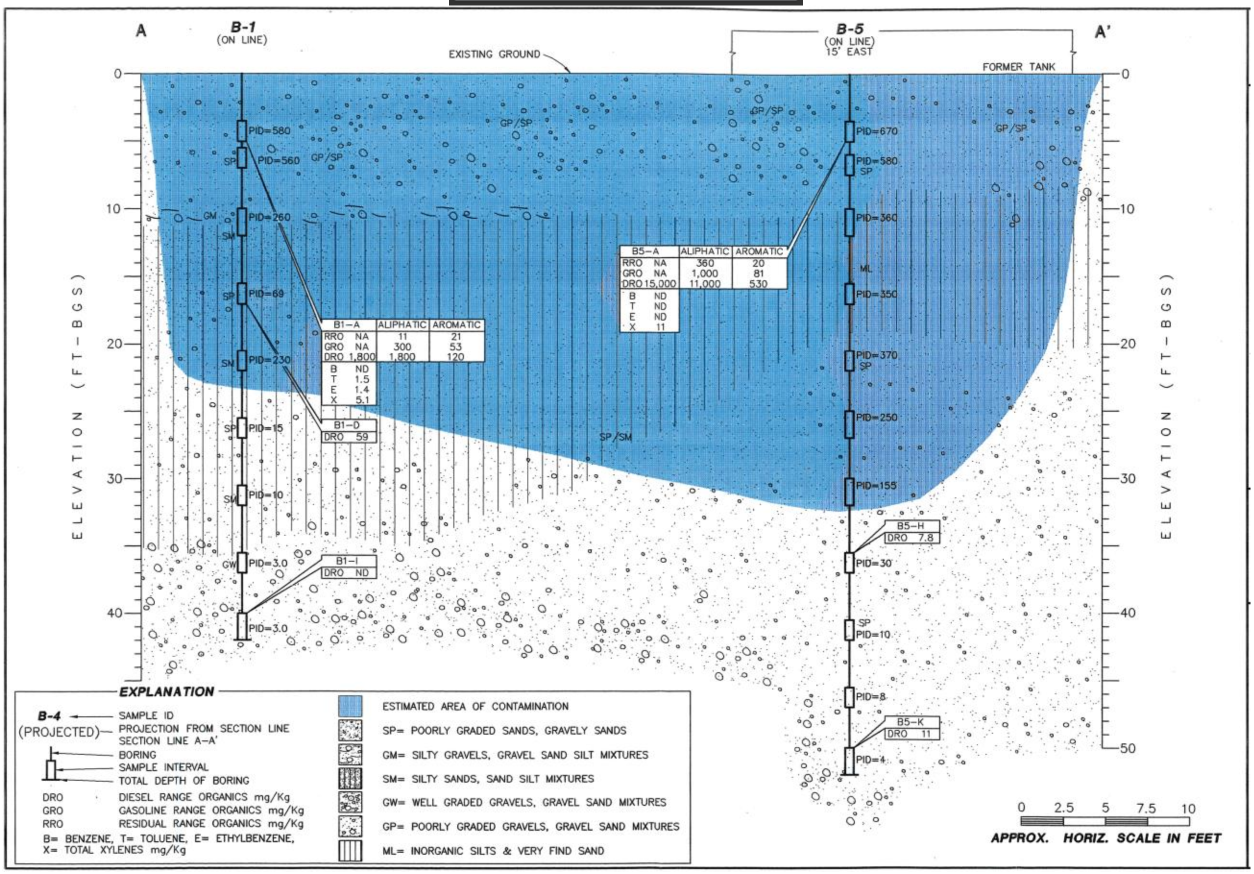


Figure 4 – Inferred vertical extent of impacted soil.

Based on the 1998 analytical soil sample and field screening results, the horizontal extent of contamination appeared to be approximately 25' wide by 75' long and localized to the southwest side of the maintenance building. Impacted soil appeared to extend beneath the western footprint of the maintenance building. Within the inferred horizontal extents of contamination, analytical soil samples collected at 5' bgs contained DRO concentrations exceeding the ADEC cleanup levels. PID readings (from the 1998 ESA) from soil collected at 30 feet bgs were at 155 PPM. Below that point PID readings dropped sharply.

A Corrective Action Plan was drafted based on data reported in the 1998 site assessment that was submitted for ADEC approval entitled: Corrective Action Workplan Tyonek North Forelands Facility dated May 2015. The corrective action work plan was submitted to Joshua Barsis who is the ADEC point of contact for this site in the Contaminated Sites Program on May 27, 2015 and Mr. Barsis provided conditional approval of the corrective action work plan in a letter addressed to Connie Downing with Tyonek Native Corporation dated May 29, 2015.

### 2.3 Project Description and Objective

The overall project objective is to obtain a Cleanup Complete or No Further Action decision with no institutional controls being required by the Alaska Department of Environmental Conservation. The objective of corrective action work performed by EHX June 21-23, 2015 was to eliminate the potential to complete an exposure pathway associated with impacted soil from this site by excavating the impacted soil and treating the impacted soil in a landfarm located near the project site.

Tyonek Native Corporation is a significant landowner in this area of the west side of Cook Inlet and has no neighbors in proximity to this site. Excavation activities were not constrained by neighboring properties.

The close proximity of the AST (no longer place) to the maintenance building and the vertical migration pathway of released fuel was assumed to have impacted soil supporting the structure foundation. This would result in some impacted soil remaining in place after excavation work was complete. We attempted to auger into impacted soil supporting the structure to collect soil samples under the structure but the soil composition prevented any of the 6 attempted borings from advancing below 2'- 4 ½' below the ground surface. After the 6$^{th}$ hole the effort was abandoned.

The proposed scope of work for this site consisted of excavating impacted soil from the area delineated during the 1998 ESA. For planning purposes, we assumed the volume of petroleum impacted soil was going to be approximately 400 cubic yards. The actual excavated soil volume was approximately 540 cubic yards.

Segregation of clean, potentially clean, and contaminated soil was based on field screening data. Contaminated soil was immediately loaded into trucks and placed in a landfarm constructed on an old airstrip near the excavation site.

**2.4 Project Organization and Responsibilities**
Tyonek Native Corporation is the Responsible Party for this contaminated site. Drafting the Corrective Action Work Plan, directing the excavation, performing field screening, collecting analytical samples, drafting a summary report, and landfarm preparation and maintenance is being conducted by EHX under contract to TNC.

**2.4.1 Owner**
Contacts, phone, fax, and e-mail for Tyonek Native Corporation, are listed below.

Tyonek Native Corporation
Attn: Connie Downing
1689 C Street, Suite 219
Anchorage, Alaska 99501
Phone: (907) 272-0707
Email: cdowning@tyonek.com

**2.4.2 Environmental Consultant**
Tyonek Native Corporation has retained EHX to implement the Corrective Action Workplan. EHX tasks include subcontractor coordination, collecting environmental samples, conducting field screening, coordinating sample transport to the project laboratory, and reporting of field activities and analytical results.

Key EHX personnel include Eric Henry, who managed the project; Darren Henry who provided quality assurance review and was an environmental technician; and Ben Carpenter who was an environmental technician. Contacts, phone, and e-mail for EHX are listed below.

EHX
Attn: Eric Henry
52785 Birch Tree Ave
Kenai, AK 99611
Phone (907)350-9008
ehxalaska@hotmail.com

**2.4.3 Subcontractors**

Our primary subcontractor for this project is: SGS North America, Inc. (SGS). SGS is an ADEC approved fixed-laboratory providing chemical analyses.

Attn: Victoria Pennick
SGS Environmental Services
200 West Potter Dr.
Anchorage, AK 99518

**2.4.4 Regulatory Agency**

The Alaska Department of Environmental Conservation will be the lead regulator for this project, and will be responsible for overall project oversight, and for making regulatory determinations under the ADEC Contaminated Sites program. The ADEC point of contact is:

Joshua Barsis
ADEC Contaminated Sites Program
555 Cordova St
Anchorage, AK 99501
Phone: (907) 269-7691
Cell: (907)
Email: joshua.barsis@alaska.gov

## 3.0 FIELD ACTIVITIES

Field activities for this project included: pre-construction sampling of the landfarm, directing excavation of contaminated soil, field screening, analytical sample collection, and directing the placement of soil into the landfarm.

Prior to conducting the excavation activities, the local utilities were contacted to mark buried utilities within the proposed excavation areas. Tyonek Native Corporation advised their personnel who operated the heavy equipment and marked known utilities and subsurface obstacles and/or hazards in the vicinity of the excavation area. A buried unmarked and un-energized electrical power line that appeared to be abandoned ran through the south side of the excavation.

### 3.1 Landfarm Footprint Sampling

Prior to constructing the landfarm, samples were collected from the surface soil within the footprint of the planned landfarm area to evaluate the baseline conditions prior to placement of excavated contaminated material. Three shallow test pits within the footprint of the landfarm were advanced by hand using a shovel and sampling spoons. There was no significant difference between PID readings from background samples or those from locations selected for analytical sampling. Field screening and analytical sampling locations were dug to about 2 feet bgs and field screened at 0.5 foot intervals. Three laboratory analytical samples were collected and analyzed for DRO & RRO. All of the laboratory test results from the landfarm footprint were non-detect for DRO & RRO.

### 3.2 Landfarm Construction

Prior to placement of contaminated soil, the landfarm was prepared by removing vegetation, leveling, and compacting the site. The dimensions of the landfarm perimeter berm are 90 feet by 325 feet. GPS coordinates of each corner of the landfarm area as follow: NW corner - 61˚ 02’ 37.98” N 151˚ 11’ 42.9” W; SW corner - 61˚ 02’ 37.26” N 151˚ 11’ 42.27” W; NE corner - 61˚ 02’ 39.12” N 151˚ 11’ 36.80” W; and SE corner 61˚ 02’ 38.33” N 151˚ 11’ 36.49” W. The perimeter berm is constructed 16” to 18” high and has no openings. Contaminated soil was spread to approximately 6” thick. We estimate that the volume of impacted soil being treated in the landfarm is approximately 540 cubic yards. Landfarmed soil was placed directly on the ground surface with no bottom liner.


Figure 4 – The constructed landfarm site relative to the excavation site.

## 3.3 Excavation Activities

Based on the 1998 site characterization we anticipated excavating approximately 400 cy of impacted material. The calculated volume of soil we actually removed was approximately 540 cubic yards.

Excavating began by removing the top 6 to 12 inches of clean soil closest to the building within the excavators reach. After the eastern edge of impacted soil was delineated, the excavation progressed extending north and south until field screening indicated that we were no longer encountering impacted soil. We continued the excavation along the edge of the building and downward based on field screening results until the reach/digging depth of the excavator had been reached. The excavator was then moved west where the excavator could continue excavating along a north south track. After this was done three times field screening results indicated that the western edge of the impacted area had been reached. The final excavation was a series of tiers down to the final depth which progressed downward based on field screening data.

The excavation progressed downward based on field screening results until the excavator reached its maximum digging depth. When the excavator could no longer remove impacted material we benched down to a location where the excavator could reach the remainder of the impacted soil.

The original estimate of impacted soil we expected to encounter based on the 1998 site assessment was 400 cubic yards. The estimated quantity of excavated impacted soil was 540 cubic yards. There were no concerns about running out of space in the landfarm and the schedule was not impacted by the increase in the scope of the project so the excavation continued until field screening results indicated we had completed the excavation of contaminated soil.

Contaminated soil was field screened using a combination of direct PID readings, Dexsil PetroFLAG® field test kit, soil odor, and visual observations to guide the extent of the excavation. After field screening indicated the extent of impacted material had been removed there were 58 field screening samples collected from the completed excavation prior to confirmation sampling. That is approximately one for every 10 cy (9.3 CY actual) of impacted soil removed. Those “confirmation” field screening samples were used to determine what locations would be selected for laboratory analytical confirmation sampling. Confirmation field screening samples were collected from the excavation base/sidewalls and not the excavator bucket.

PID readings exceeding 25 PPM were considered impacted/contaminated. Any field screen sample results over the 25 PPM threshold placed into the landfarm. Additional details of the field screening procedures are outlined in Section 4.0.

There was very little soil in question as to whether or not it was potentially clean. It appeared that at some point in time between that corrective action work and the spill that approximately 18” of clean gravelly sand was used to cap the underlying impacted material. Soil identified as clean was placed next to the excavation. Impacted soil was placed directly into a dump truck and placed directly into the landfarm.

The excavation was left open for over two weeks until the laboratory analytical results were available; meanwhile, the perimeter was protected with 3’ high berm of clean fill material that was later used to backfill the hole. Following completion of excavation work, confirmation sample locations were recorded using swingties to on-site features.

The excavation was backfilled with a combination of clean fill material from a local borrow source or clean material segregated during the excavation process. During the corrective action excavation work and any time an excavation is left open perimeter slopes were contoured to the angle of repose to assure there was no uncontrolled sloughing of material that would impact site safety or reference points in the excavation.

**3.4 Soil Landfarming**

The excavated material was placed directly into an on-site landfarm. The material was transported to the proposed landfarm by dump truck and spread with a dozer in a single 6 inch lift. The landfarm area is not covered or lined. The perimeter berm around the landfarm was constructed to 16”-18” high exceeding the 12” minimum berm height requested in ADEC’s conditional CAP approval letter.

**3.5 Excavation and Landfarm Baseline Soil Sampling Activities**

Following the excavation work, confirmation headspace field screening was performed to verify all PID readings were below the 25 PPM threshold proposed in the corrective action plan. Confirmation analytical soil samples were collected where the highest PID readings were recorded. Confirmation samples were collected from the base and sidewalls of the excavation to evaluate the remaining impacts, if any, in the excavation.

The purpose of the baseline landfarm sampling was to understand how preexisting background hydrocarbon levels may influence future laboratory analytical results prior to placement of impacted soil into the landfarm. They will also provide a basis of comparison to the post-treatment confirmation sample results.

**3.6 Tilling Activities**

Tilling of the landfarm material has not yet been performed. TNC or EHX will mechanically till the landfarm soil at a minimum of once per season. TNC or EHX will also assess the soil moisture content during the treatment process by monitoring precipitation and adding water if necessary. Soil moisture content should be sufficient to prevent fugitive dust and to promote the remedial process but should not be saturated. Light fertilization may be conducted on an as-needed basis.

**3.7 Post-Treatment Confirmation Sampling Activities**

The treatment process for the contaminated soil in the landfarm has just begun. Post-treatment confirmation sampling of the landfarm will be conducted when monitoring indicates the remediation process has been completed or is nearing completion. Monitoring will be performed to evaluate the ongoing effectiveness of the treatment.

Ideally, the post-treatment sampling work will be conducted in mid-October prior to winter freeze-up each year until a decreasing trend can be demonstrated and soil in the treatment process is at or near the ADEC Method 2 action level for migration to groundwater. The number of field screening and analytical samples will be the same as the proposed baseline sampling activities.

If post-treatment confirmation samples indicate that the concentrations have been reduced to below the ADEC approved cleanup level, the treated soil may be graded out to make the landfarm space useable for other purposes or left in place on site with no regrading.

Prior to any material being transported off site, approval will be requested from the ADEC prior to off-site transport. Conversely, if post-treatment samples indicate that elevated contaminant concentrations remain, the landfarm area will be prepared for the arrival of spring by removing excess snow inside the landfarm berm to the outside of the landfarms perimeter berm to reduce the potential for impacted meltwater from flowing out of the containment berm.

## 4.0 SAMPLING PROCEDURES

Analytical and headspace soil samples were collected using decontaminated, stainless steel spoons, either collected from the sidewalls and base of the excavation.

### 4.1 Calibration and Equipment Maintenance

#### 4.1.1 Field Instruments

To avoid and/or minimize breakdown of instruments in the field, the following procedures were followed:

- EHX personnel operating field screening equipment are trained in the operation of the equipment and will be required to read the operations manual prior to use on site.
- EHX personnel are trained in the routine maintenance of the field screening equipment.
- The operations and maintenance manual was on site for reference.
- The PID was calibrated with isobutylene gas prior to mobilization to the site (FAA restricts transport of compressed gasses on passenger flights). Otherwise, the field screening equipment was maintained and operated as recommended by the manufacturers' guidelines.
- The date and time of the field calibration was recorded in the field notes and included in the Field Activity Reports.

#### 4.1.2 Laboratory Equipment

SGS laboratory instruments are calibrated and maintained in accordance with procedures listed in the laboratory's quality assurance/quality control and standard operating procedures on file with ADEC. SGS is an ADEC approved laboratory.

### 4.2 Field Screening

Field screening was conducted using PID readings and PetroFLAG® samples.

- *Landfarm Footprint*. Field screening samples were collected every 0.5 foot in each test pit and field screened using the PID and headspace methods.
- *Excavated Soil (during excavation)*. Field screening samples were planned to be collected at approximately 10-cy intervals and field screened using a PID and direct screening method; however, approximately 60 samples were selected for direct PID readings. Direct readings were performed during the excavating work to provide real time information needed to direct the excavation work.
- *Excavation Base and Sidewalls*. One field screen sample was collected from the base of the excavation per 25 square feet of excavated area for the first 250 square feet of excavated area. For this excavation which was larger than 250 square feet, one additional field screening sample was collected from the base of the excavation per each additional 100 square feet of excavated area. One field screening sample was collected per 10 linear feet of excavation sidewalls. Samples were screened using a PID and headspace method. Overall, 58 "confirmation" field screen samples were collected for headspace PID readings after the excavation work was believed to have been completed. "Confirmation" field screen sample results are included in the field notes.
- *Stockpile of Potentially Clean Soil*. There was very little potentially clean soil- estimated at less than 20 CY. Field screening samples for this soil were collected at a frequency of one sample from each 10 cy of soil and field screened using the PID and headspace method- i.e. 2 field screen samples were collected.
- *Baseline and Pre-Treatment Sampling*. Field screening samples were collected at a frequency of one sample from each 10 cy of soil after it was placed in the landfarm. This soil was field screened using the PID and headspace method.

#### 4.2.1 PID Field Screening

Soil was field screened for volatile organic compounds using a PID. The PID was calibrated each day by fresh air calibration. Prior to mobilization to the site it was calibrated with 100 parts per million (ppm) of isobutylene standard gas.

The PID was used to sample the total volatiles released from the soil using direct or headspace sampling methods. Headspace samples were collected in sealable plastic bags by filling them with freshly exposed soil to approximately one third to one half of their volumes and then sealing the top. The headspace samples were allowed to warm prior to headspace screening. Screening was accomplished by inserting the PID sampling probe into the air space above the soil in the bag. PID headspace readings were performed within one hour of the time the sample was collected.

For direct screening samples, a hole was created with a sampling spoon. The PID sampling probe was then placed in the hole and the reading evaluated for the purpose of directing excavation work. The results of the confirmation field screening were documented in the project field notebook.

### 4.2.2 PetroFLAG® Field Screening

To evaluate the correlation between PetroFLAG® screening data and laboratory analytical results, locations selected for analytical sample collection were field screened using PetroFLAG® field kit tests.

The PetroFLAG® test kit is a turbidimetric method which measures total petroleum hydrocarbons (TPH). The EPA testing procedure is: SW-846 Method 9074. According to manufacturer guidance, analytical results are frequently lower than the concentrations measured using PetroFLAG®, making PetroFLAG a conservative approach for determining excavation limits and increasing the probability of a complete cleanup of the excavated areas.

For this project, the intended purpose of the PetroFLAG® screening is to not rely on the PID screening alone and to improve on the performance of the PID in determining the presence or absence of weathered DRO concentrations greater than the applicable cleanup level for this site. Approximately 73% of the PetroFlag samples had results exceeding the laboratory results. The relative percent difference (RPD) between the PetroFlag sample results and the laboratory results was 26 percent.

### 4.3 Analytical Sampling

The samples selected for analytical testing were documented in the project field notebook and a chain-of-custody sampling log. We attempted to “mark” analytical sample locations with GPS coordinates but the close proximity of the sample locations didn’t create a clear distinction between sample locations or the tiers (depth) where the samples were collected from. Instead of GPS we used swing tie measurements from existing site features to record the locations where analytical samples were collected

In general, the number of samples collected for laboratory analysis during the July 2015 corrective action work was based on Tables 2A or 2B of the ADEC May 2010 Draft Field Sampling Guidance. For this project sixteen analytical samples were collected from the excavation. Five analytical samples were collected from the landfarm and two analytical samples were collect from the potentially clean stockpile. All samples were analyzed for DRO and RRO.

### 4.3.1 Landfarm Footprint

Based on the field screening results in the proposed landfarm area, analytical samples were collected from locations with the highest PID readings. The lab soil samples were tested for DRO and RRO using Alaska Method AK 102 and AK 103 respectively. The samples were transferred into the appropriate laboratory supplied jars using decontaminated stainless steel spoons. Samples were transported to the laboratory in coolers with ice packs using chain-of-custody procedures. A total of three laboratory samples were analyzed from the landfarm footprint sampling and those results were all non-detect for DRO & RRO. The results are included in Table 1 below.

### 4.3.2 Excavation Confirmation Samples

The completed excavation was roughly 49' by 25' with approximately 148' of perimeter. Based on the field screening results, two analytical samples were collected from the first 250 square feet of excavated surface area and an additional sample was collected from each additional 250 square feet. One analytical soil sample was collected from the excavation sidewalls per 20 linear feet of excavation perimeter. The analytical results from the excavation confirmation sampling are included in Table 1 below.

### 4.3.3 Potentially Clean Soil Stockpile

PID readings from the potentially clean stockpile were below the 25 PPM threshold approved for this site but they were above background levels. The quantity of marginally impacted soil was less than 20 CY. Analytical samples from the potentially clean soil stockpile were used to verify the soil meets cleanup criteria for re-use on the property. The potentially clean stockpile was used as backfill material for the excavation.

### 4.3.4 Landfarm Baseline and Post-Treatment Confirmation Sampling

For both the baseline and post-treatment confirmation sampling events, grab soil samples were/will be collected from the landfarm area. The number of baseline and confirmation samples collected from the landfarm will be based on Table 2A of the ADEC May 2010 Draft Field Sampling Guidance, which specifies three analytical samples for the initial 100 cy of excavated soil and one sample for each additional 200 cy of excavated soil. Five lab samples were collected from the landfarm.

### 4.4 Labeling Sample Containers

Indelible waterproof ink was used to record information on the labels affixed to each sample container. Label information was recorded in the field logbook and chain-of-custody. Label information included the unique identifying number assigned to each sample, the date and time of collection, the name of sampler, and laboratory analysis requested. No volatile analysis was performed for this project.

The field duplicate, TNC-Boring-1, fell outside of the naming sequence set up for this project. The reason for this is I had placed the filled out label on the jar prior to realizing I was not going to have enough sample jars (and labels) to collect the field duplicate samples or to rename the duplicate sample jar.

### 4.5 Decontamination

Reusable sampling equipment was decontaminated prior to sampling and between sampling locations to prevent cross-contamination between samples. At a minimum, stainless steel spoons and other soil sampling tools, if re-used, were cleaned and decontaminated by the following procedure: tools will be scrubbed with a brush in a solution of hot water and Alconox and rinsed with clean tap water. Clean disposable gloves and appropriate protective equipment were worn by individuals decontaminating tools and equipment.

The excavator, bulldozer and dump trucks handling impacted soil were cleaned by Tyonek Contractors LLC personnel prior to demobilizing equipment from this site to the next location or project to prevent potential cross-contamination.

## 5.0 LABORATORY ANALYSES

All project soil samples were analyzed for DRO and RRO by AK 102 and AK 103. The landfarm baseline sampling also included RRO sampling by AK 103. No volatile analysis performed for this project.

The potentially clean stockpile, landfarm footprint, and landfarm pre/post-treatment samples were submitted to SGS on a standard turnaround basis. The number of analytical samples collected for this project was consistent with the ADEC May 2010 Draft Field Sampling Guidance. Laboratory analytical results are included in Table 1 below.

| Excavation Confirmation - July 23, 2015 | | | | | | |
|---|---|---|---|---|---|---|
| | DRO | RRO | PetroFlag | PID | Depth | Location |
| TNC-Boring 1* | 343 | 990 | 789 | 5.9 | | |
| TNC-2-15 | ND | 41.5 | 76 | 0 | 17' | Bottom W. Sidewall |
| TNC-4-1 | ND | ND | 28 | 0.1 | 14' | S. Sidewall |
| TNC-10-2 | 53.7 | ND | 64 | 2.2 | 14' | N. Sidewall |
| TNC-12-3 | 1040 | 51 | 1220 | 78 | 10' | N. Sidewall |
| TNC-13-4 | 53.2 | 26.6 | 79 | 1.1 | 10' | N. Sidewall |
| TNC-15-5 | ND | ND | 132 | 1.4 | 10' | Bottom |
| TNC-19-6* | 381 | 1290 | 826 | 5.9 | 8' | N. Sidewall |
| TNC-24-7 | 346 | 1010 | 1720 | 0.7 | 2' | S. Sidewall |
| TNC-25-8 | 383 | 1240 | 1940 | 0.8 | 4' | Bottom |
| TNC-32-9 | 2330 | 7900 | 6750 | 1 | 2' | S. Sidewall |
| TNC-33-10 | 1090 | 3370 | 5010 | 0.5 | 2' | Bottom |
| TNC-44-11 | 26.6 | 40 | 121 | 3.2 | 10' | Base @ N. Sidewall |
| TNC-45-12 | 483 | 59 | 619 | 6.8 | 9' | N. Sidewall |
| TNC-52-14 | 628 | 146 | 884 | 19 | 3' | N. Sidewall |
| TNC-50-13 | 4500 | 608 | 5990 | 125 | 2' | N. Sidewall |
| Landfarm Soil In Place - July 23, 2015 | | | | | | |
| TNC-LF-1 | 769 | 546 | 1110 | 26 | | |
| TNC-LF-2 | 1180 | 146 | 990 | 32 | | |
| TNC-LF-3 | 241 | 105 | 366 | 6.2 | | |
| TNC-LF-4 | 501 | 249 | 805 | 16 | | |
| TNC-LF-5 | 439 | 22.1 | 810 | 13 | | |
| Potentially Clean Stockpile - July 23, 2015 | | | | | | |
| TNC-PCP-1 | 31.2 | 115 | 125 | 0.6 | | |
| TNC-PCP-2 | 57.4 | 233 | 222 | 0.3 | | |
| Landfarm Baseline - June 15, 2015 | | | | | | |
| LF-1 | ND | ND | N/A | 4.2 | | |
| LF-2 | ND | ND | N/A | 0.6 | | |
| LF-3 | ND | ND | N/A | 2.2 | | |

Table 1 – Lab results reported in mg/Kg. PetroFlag & PID reported in PPM.
XX – Does not meet DQOs
XX – Field duplicate samples

None of the laboratory analytical results exceeded the ADEC approved cleanup level for this project.

## 6.0 SAMPLE TRANSPORT

Following sample collection, the labeled analytical samples from each site were placed in a cooler with frozen gel packs for storage and transport to SGS. Frozen gel packs were used to maintain the cooler temperature between 4 ± 2 degrees Celsius (°C). A temperature blank was placed in the cooler to document the sample temperature. The temperature blank was at 4.1°C when the sample cooler arrived at the lab.

To prepare the cooler for transport, sufficient packing material was used to prevent breakage of sample containers. The laboratory provided chain-of-custody forms were placed in the cooler in a sealed plastic bag. The cooler was secured using at least two wraps of strapping or clear packing tape, applied at two locations on the cooler. The appropriate material declarations and shipping contact information was placed at conspicuous locations on the cooler's exterior prior to sending it to the laboratory.

The samples were transported via air freight from Tyonek to SGS in Anchorage. SGS' courier received the samples at the Anchorage International Airport. Analytical samples were shipped to the laboratory the day following completion of sampling work.

## 7.0 CHEMICAL DATA QUALITY CONTROL

Quality Control was evaluated using field and laboratory QC samples, data assessment, and implementation of internal laboratory procedures.

### 7.1 Data Types

The data to be collected for this project included the following:

- field observations
- photographs
- field screening results for soil samples, using PIDs and PetroFLAG®
- chemical testing data generated using analytical laboratory methods.

### 7.2 Data Uses and Objectives

Data generated during this project was used to inform real-time decisions in the field and to assess consistency with the project goals. The data was also be used to support conclusions and recommendations later in this report regarding the site's regulatory status and the potential need for follow-up work or institutional controls.

Field screening data was used to support field decisions such as:

- selecting soil samples for laboratory analysis
- determining excavation limits

Data quality objectives (DQOs) for the field-screening data were based on the proper calibration and functioning field screening equipment. This equipment included a miniRAE 2000 PID and PetroFLAG® analysis which were used to obtain semi-quantitative and quantitative concentrations of volatile and total petroleum hydrocarbon constituents in the soil samples. Calibration of the PID and the PetroFLAG® instrument were conducted in accordance with the manufacturer's recommendations except as noted in this report. Documentation of the equipment calibration was recorded in the field log book.

In comparison, data from samples collected for laboratory analysis was used to assess conformance with the project's data collection objectives. Laboratory data therefore should be of a higher level of quality, and subjected to a more rigorous laboratory QA/QC effort.

### 7.3 QC Samples

#### 7.3.1 Field QC Samples

Field quality control samples were collected and assessed to document reliability of the sampling and handling procedures. The quality control samples consisted of field duplicates.

Duplicate analytical soil samples were tested for the same parameters as the corresponding primary samples. The duplicate samples were submitted to the laboratory as blind duplicates but named differently from the project samples. The field duplicate sample was collected from as close in time and location as practicable to the primary sample.

#### 7.3.2 Laboratory QC Samples

Laboratory QC sample procedures are performed in accordance with the project laboratory's ADEC-approved standard operating procedures. The internal laboratory QC samples for this project include method blanks, surrogate spikes, laboratory control samples (LCS), matrix spikes (MS), and associated duplicates.

### 7.4 Data Quality Objectives

The quantitative DQOs that were used to assess precision, accuracy, sensitivity, and completeness are presented in Table 1 below. These numerical DQOs are based on EPA methodology and laboratory SOPs. In addition to the numerical DQOs listed in Table 1, qualitative DQOs that were considered include representativeness and comparability. Other than TNC-32-9, SGS reported no errors or abnormalities in the analytical process that would negatively impact the data quality objectives for this project.

| | | Soil Sample Cleanup Levels and MQOs | | | | | |
|---|---|---|---|---|---|---|---|
| | | ADEC Cleanup Levels (mg/Kg) | Sensitivity (mg/Kg) | | Precision (%RPD) | | Acuracy (% recovery) |
| Analysis/Analyte | Method | | MDL | LOQ | LCS | Field Dup | LCS |
| Diesel Range Organics (DRO) | AK 102 | 250 | 2 | 20 | 20 | 50 | 75-125 |
| Residual Range Organics (RRO) | AK 103 | 10,000 | 2 | 20 | 20 | 50 | 60-120 |

| Surrogates | QC Limits (% recovery) |
|---|---|
| DRO surrogate - 5a Androstane | 50-150 |
| RRO surrogate - n-Triacontane-d62 | 50-150 |

Table 2 – Data Quality Objectives

### 7.4.1 Precision

Precision, in the case of laboratory data, is the agreement of discrete measurements of the same property, under similar conditions. For this project, precision was assessed by calculating the relative percent difference (RPD) for duplicate analytical sample sets, and comparing the results to the numerical DQO listed in Table 2 above. Relative percent difference was calculated for DRO at 10.2% and 26.3% for RRO.

In addition to the field duplicate samples, this assessment included the LCS/laboratory control spike duplicate (LCSD), and MS/matrix spike duplicate (MSD) data. Other than TNC-32-9, SGS reported no errors or abnormalities in the analytical process that would impact the accuracy of laboratory results for this project.

### 7.4.2 Accuracy

Accuracy measures the average or systematic error of the analytical methods. It is evaluated by comparing the agreement of measured values with the true or expected value of the measured quantity. For this project, accuracy was assessed using results of LCS sample spikes, and surrogate compounds in the project samples. Other than TNC-32-9 SGS reported no errors or abnormalities in the analytical process that would impact the accuracy of laboratory results for this project.

### 7.4.3 Completeness

Completeness is the percentage of usable measurements, compared to the total number of measurements requested. A valid sample result is one that meets the precision and accuracy DQOs for the associated quality control data. Estimated results are considered valid data. Other than TNC-32-9 SGS reported no errors or abnormalities in the analytical process that would render the completeness of the sample group for this project as unusable.

Sixteen laboratory analytical samples returned results whose purpose was to confirm excavation of impacted material was complete and also to determine to what extent impacted material remains under the structure. Of the 16 analytical samples that returned results 15 were useable which is about 94 percent complete. Per ADEC guidance, the project DQO for percent completeness is 85 percent of analytical data.

### 7.4.4 Sensitivity

Sensitivity is the ability to affirmatively detect target compounds with a specified confidence. The DQOs consist of the limits of quantitation (LOQs), limits of detection (LOD), and detection limits (DL). The LOQs reported by the laboratory reflect the lowest standard that produces a quantitative result for each target analyte within specified limits of precision and bias, as adjusted for sample-specific factors, including moisture content, serial dilutions, and matrix interference.

### 7.4.5 Representativeness
Representativeness measures the degree to which the data characterizes the actual site conditions. Representativeness will be evaluated by considering the range of spatial sampling points, concentration distributions, delineation of impacted media, and conformance with the sampling objectives. Trip blanks and field sample duplicates will also be used to assess representativeness.

## 7.5 Data Assessment
### 7.5.1 Field Data
This report includes a review information recorded on the field notes. This information was checked for completeness; accuracy (transcription errors, internal consistency); unexpected results, with accompanying possible explanation; and adherence to the specified sampling procedures.

### 7.5.2 Laboratory Data
The project laboratory's sample analyst and the laboratory QA officer review the data before providing it to EHX.  Non-conformances with DQOs, variations from SOPs, and other notes of interest are normally presented in a case narrative report to be completed for each data deliverables package. If a DQO is not met, the case narrative would include a statement assessing the potential impact to data quality and usability.  Other than TNC-32-9 SGS reported no errors or abnormalities in the analytical process that would impact the DQOs for this project.

Analytical data was reviewed for conformance with the project's precision, accuracy, representativeness, comparability, completeness, and sensitivity DQOs. The results of this review were documented using the standard ADEC Laboratory Data Review Checklist, with significant findings noted in the summary report. Non-conformances that potentially impact data usability will be discussed with the project laboratory and, if possible, corrective action will be taken to correct the deficiencies.

### 7.5.3 Data Usability
Data usability is largely dependent on confirming proper COC procedures and conformance with numerical DQOs. There were no non-conformances that would potentially impact data usability.

# 8.0 DOCUMENTATION AND REPORTING
Documentation for this project consists primarily of the field notes, laboratory deliverables packages, site photographs, and final Summary Report. QA procedures for these elements consists of verifying that the appropriate information is recorded, as outlined in this section, and that documentation is complete and accurate.

## 8.1 Field Documentation

Field notes were used to document field activities and data collected on-site. EHX personnel working at the site submitted copies of their field notes to Eric Henry at the end of the project and those notes or comments are included in this report where relevant.

**8.2 Laboratory Reports**

Laboratory data was provided to EHX in a data deliverables package. A copy of the laboratory data package is included as an attachment to this Summary Report.

**8.3 Summary Report**

This Summary Report includes a description of field observations and procedures, as-built survey, photographs taken during field activities, tabulated field screening results, and laboratory analytical results. In accordance with ADEC guidance, this report summarizes the data review presented in the completed ADEC's Laboratory Data Review Checklist form. The summary report also includes: a comparison of QC sample results to numerical DQOs; comment on the data's quality and usability; and identify non-conformances and corrective action taken. This report was submitted to Tyonek Native Corporation prior to submittal to the ADEC.

## 9.0 CLEANUP LEVEL

This site is located in a non-residential area. To the extent possible we were able to verify there are no drinking water wells near the site. None of the equipment maintenance facilities around the project site have supplied water or restrooms. The nearest residential area with drinking water wells are in Tyonek Village over two miles to the northeast.

Groundwater at this site has been reported to be over 100 feet below ground surface. The borings from the 1998 ESA were advanced to over 50 below ground surface and no groundwater was observed in those borings. No groundwater was observed during the corrective action work performed at this site.

The project site is perched on a high bluff approximately 2500 feet from the nearest lake and almost 1100 feet from the shores of Cook Inlet. To the east of the site is a valley extending northwest where Tyonek Creek flows. When considering the site's topographical position the reported depth to groundwater is credible.

The excavation site is approximately 160 feet above tide water. All of the land in the area around the project site is owned by Tyonek Native Corporation who has indicated that for the foreseeable future there are no plans to develop land near this site for residential purposes.

Field screening and analytical data from the borings B1 and B5 from the 1998 ESA indicates that DRO drops off significantly between 24 feet and 33 feet below ground surface.

From research performed before and since the corrective action work, including our observations during corrective action, we continue to believe the risk of the diesel fuel release at this site having ever impacted groundwater is very low. The horizontal and vertical distance to the nearest surface water, Cook Inlet, makes impacting that water body even less likely. Additionally, because there are no drinking water wells near this site, there is no potential that humans may consume impacted groundwater if the migration to groundwater pathway were to be completed.

In the ADEC Corrective Action Workplan submitted for this site, we proposed eliminating the migration to groundwater pathway and instead use the ADEC cleanup levels for Direct Contact/Ingestion from 18 AAC 75.341 Method 2 Table B2 of 10,250 mg/Kg DRO for this site. None of our observations during the July 2015 field work conflicted with information supporting the approved cleanup level.

## 10.0 LIMITATIONS & EXCEPTIONS, RECOMMENDATIONS & CONCLUSIONS

### 10.1 Limitations and Exceptions

This report and the work it summarizes has been prepared in accordance with generally accepted environmental methodologies of environmental professionals who engage in characterization and remediation of sites impacted by the release of environmentally hazardous substances. The work this report summarizes was performed in a manner consistent with the regulatory statutes and professional guidance promulgated by the ADEC who is the regulator for this site. This report and the work it summarizes contains all of the limitations inherent in these methodologies.

- The information gathered and summarized in this report is accurate for the time and conditions when and where the data was collected.
- The conclusions and recommendations in this report are based, in part, on the information provided by others.
- The possibility remains that unexpected environmental conditions may be encountered at the property in locations not specifically investigated or where evidence of environmental impacts were concealed.
- No warranties are made pertaining to environmental conditions at the site after the date EHX provided the services summarized in this report.

### 10.2 Conclusions & Recommendations

None of the 16 laboratory analytical confirmation samples collected from the excavation exceeded the ADEC approved cleanup levels for DRO or RRO applicable for this site. Some impacted soil remains in place that could not be excavated without undermining the structure but it does not appear that any of that material exceeds the approved cleanup level.

Approximately 540 cubic yards of impacted soil material was excavated from an excavation measuring approximately 49 feet by 25 feet. Contaminated soil was placed into a landfarm constructed on an old airstrip near the excavation site that measures 90 feet by 325 feet with a perimeter berm. Soil in the landfarm was spread to approximately 6 inches deep.

With the exception of the contaminated soil being treated in the landfarm, this site meets the criteria for no further corrective action required without institutional controls being placed on the property. For soil being treated in the landfarm, we propose annual tilling and annual and PetroFlag sampling performed with a brief summary report drafted for ADEC review. Annual maintenance and monitoring will continue until a decreasing trend can be demonstrated. Soil in the landfarm will be

A reasonable correlation between laboratory analytical results and the PetroFLAG® sample results can be observed in the data reported in Table 2 above. We propose that the future sampling work to be performed at the landfarm use the PetroFlag® test method (versus the AK 102 method) until either a decreasing trend can be demonstrated or the site meets the 18 AAC 75.341 Method 2 Table B2 cleanup level.

**11.0 Signatures & Qualifications of Environmental Professional**

To the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in §312.10 of 40 CFR 312 and 18 AAC 75. I have the specific qualifications based on education, training, and experience to assess environmental hazards of the nature, history, and setting of the subject property. I have performed the work this report summarizes and written this report in conformance with the standards commonly practiced by environmental professionals meeting these qualifications.

**Prepared by:**

Eric Henry – Qualified Environmental Professional
Proprietor EHX

Photo 1 – site prior to excavation work

Photo 2 – Old air sparging placed in the original borings from the 1998 ESA.

Photo 3 – Landfarm site at the old airstrip prior to brush removal and construction of perimeter berms.

Photo 4 – Confirmation field screen sampling in the tiered excavation.

Photo 5 – Field screen and laboratory sample locations.  Boring B-1 from 1998 ESA and the electrical power cables are visible in the photograph.

Photo 6 – A large boulder was uncovered during the excavation.  The depth of the hole was approximately 17' deep at the deepest tier.

Photo 7 – Landfarm baseline field screen and laboratory sample location - typical.