UST REMOVAL AND SITE ASSESSMENT REPORT

FORMER SANI-KLEAN SERVICE STATION MOOSE CREEK, ALASKA

SEPTEMBER 22, 2004

Prepared For:

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APPENDICES

1.0 EXECUTIVE SUMMARY

NORTECH has completed removal of the underground storage tanks and site and characterization activities at the former Sani-Klean Service Station in Moose Creek, Alaska. The primary objective of this project was to close the five regulated underground storage tanks and the two buried heating oil tanks and complete a site assessment for the property. The secondary objective was to remove approximately 400 additional yards of contaminated material from the site.

The three largest tanks (Tanks 1, 2 and 3) were installed in the late 1970s east of the former shop and store buildings. These tanks were intact and clean, except for limited contaminated soil around the fill pipe of Tank 1. Two smaller and older regulated tanks (Tanks 4 and 5) were located northwest of the three tanks. Contaminated soil found around these two tanks extended towards the three larger tanks as well as towards the driveway and former dispenser island. These two tanks also appeared intact and the contamination is probably from one or more surface releases near these tanks.

The contaminated soil extended from Tanks 4 and 5 into the driveway and around the northwest end of the former dispenser island. The source of the contamination is not known, but is probably the results of a number of releases over the lifetime of the facility. The contamination is consistent with a surface spill and extends to the groundwater, approximately 8-10 feet below the existing ground surface. The contaminated area is estimated at 2,200 to 2,500 square feet and 800 to 1050 cubic yards. The contamination is highly volatile and is consistent with weathered gasoline. Contaminants of concern are GRO, DRO, RRO, and BTEX.

The two buried heating oil tanks (Tanks 6 and 7) were removed from the south sides of the former buildings. Contamination was not observed on the original ground surface or the excavation sidewall of these tanks, but limited contamination consistent with weathered middle distillate was identified beneath both of these tanks. This contamination was at a depth of at least seven feet below grade. The contamination was consistent with smear zone contamination underneath the other tanks. Additional excavation in these locations would have required the removal of significant quantities of uncontaminated overburden. DRO is the primary contaminant of concern at these two locations.

Lube and/or used oil contamination was identified west of the former shop/garage shell and contaminants of concern in this area are DRO and RRO. This area was identified near the end of trenching activities and was not fully delineated, but appeared to be relatively localized. This contamination was consistent with a surface release and extends at least four feet below the ground surface. Contaminants of concern in this area are DRO and RRO.

The groundwater gradient is assumed to be northwest (parallel to the Old Richardson Highway) based on hydraulic gradient data from other sites in the vicinity. Groundwater impacts above the ADEC cleanup levels were observed near Tanks 4 and 5. Impacts slightly above the cleanup levels were observed approximately 100 feet downgradient of these tanks. Groundwater impacts were not observed immediately west of the dispenser island beneath an area of known contamination. The observed groundwater contamination was consistent with weathered gasoline and the contaminants of concern in the groundwater are GRO, DRO, RRO, and BTEX.

Soil and groundwater contamination do not appear to be migrating off site or pose a threat to off-site receptors. Current potential receptors are visitors or trespassers to the site that encounter the contaminated surface soil. Future scenarios include exposures to workers and visitors to the site through excavation of contaminated soil and/or groundwater. Additionally, building construction may provide a pathway for vapor intrusion exposure to receptors inside the building.

At this time, the excavations and trenches have been backfilled and the site has been returned to the original driveway grade. No exploration or characterization activities were performed south of the former shop buildings other than removal of the two heating oil tanks. Other potential environmental concerns, including abandoned vehicles, buried vehicles, and stained soil, may be present in other areas of the Site that were outside the scope of this effort.

2.0 PROJECT BACKGROUND

The former Sani-Klean Service (SKS) facility (the Site) is located in the NE ¼ of Section 29, Township 2 South, Range 3 East, Fairbanks Meridian. The Site is within the boundaries of the Fairbanks North Star Borough (FNSB) and is listed in the FNSB assessment records as Tax Lot 2902. The Site address is 3391 Old Richardson Highway and the lot is approximately 108,000 square feet (2.5 acres). The Site and surrounding area are classified as general residential. The Old Richardson and New Richardson Highways bound the Site with vehicular access from the Old Richardson Highway. Figure 1 is a general location map, while Figure 2 shows the Site and vicinity and Figure 3 shows more Site details.

The SKS facility was developed as a retail fuel and service station sometime in the late 1960s. Two tanks were reportedly installed around 1971 and three more were added in 1977. All five of these tanks were reportedly utilized until the facility closed sometime around 1990. The owners of the property resisted tank removal and site assessment efforts in 1994 and the facility has deteriorated steadily since that time. Only a shell of a portion of one of the original three buildings remained standing at the beginning of this project and all dispensers and other aboveground aspects of the fuel systems had been

removed. A variety of vehicles and other debris also appear to have been abandoned on the property since the facility ceased operation.

2.1 General Site Setting and Description

The Site is mostly level with tree and shrub growth that appears to be 10 to 20 years old. Most of the former garage remains standing, although the doors and windows have been broken and/or torn off. The siding and insulation are missing and the structural integrity of the building is suspect. The foundation and floor slab of the second shop and store were present on the site, but the buildings had been removed and portions of the slab were removed for this project. The remains of two other buildings (one west of the shop and one north of the shop) are also present on the site, as well as a significant amount of other household and industrial debris. Vehicles, vehicle components, buffing machines, equipment parts, and a wide variety of building materials were observed across the site.

Site Structures: One structure remains standing on the site at this time. The foundation of an attached building was partially removed during activities at the site. The partial remains of two other buildings are also located on the site, but the debris is mostly limited to concrete blocks and wood.

Site Utilities: The Site utilized shallow onsite wells during operation. One well was located within the remaining shop building. A second well was reportedly installed to a depth of approximately 40 feet behind the former building west of the shop, but the remains of this well were not visibly evident. A third well was reportedly installed in or near the store/garage attached to the east side of the remaining shop, but this well was not located either. Wastewater disposal is assumed to have been onsite, although it was not specifically investigated.

Climate: Climate data for the Fairbanks area, including Moose Creek, is established from the long-term weather observations taken at the Fairbanks International Airport (21 miles west at an elevation of approximately 440 feet). Over the 64-year station record for Fairbanks, the average air temperature has been 25.9 degrees Fahrenheit. The average annual precipitation in Fairbanks is 11.2 inches water equivalent. Average monthly temperatures are generally below freezing from October through April.

2.2 Vicinity Characteristics and Hydrogeologic Characteristics

Topography and Slope: The elevation of the property is approximately 530 feet above mean sea level, based on USGS topographic maps. There is little topographic relief across the Site or within the surrounding area, with the exception of the New Richardson Highway, which has been built up several feet. The Site has been graded in the past, with higher ground at the building locations and a general slope from the

buildings towards the Old Richardson Highway. The lot has gravel and/or topsoil surface except for the building locations.

Local Geology and Hydrogeology: The Moose Creek area is in the physiographic province termed the Tanana Lowlands, which is an arcuate band between the Alaska Range to the south and the Tanana upland to the north. The present day lowland consists of vegetated floodplain, and low benches of the Tanana and Chena Rivers. Typical soils in the Tanana floodplain consist of several feet of silt, underlain by alluvial sands and gravels to a considerable depth. These granular deposits generally become coarser with depth, exhibit wide variability in structure and stratification, and apparently represent ancient glacio-alluvial deposition. Silt-filled swales and oxbow lakes generally represent former positions of rivers and streams. The thickness of alluvial sediments overlying bedrock in the region can as great as 400 to 500 feet. Lenticular deposits of silt, sand, and gravel produce a wide range of permeability and transmissivity.

The Site is approximately 1.5 miles east of the Moose Creek Bluff, which represents the northern edge of the floodplain in this area. Discontinuous permafrost exists throughout the Tanana Lowlands region, and may be present in the Moose Creek area.

Runoff from spring snow melt and summer storms causes periodic flooding over parts of the floodplain. Moose Creek is not within the area protected by the Chena River Flood Control Project. The main river of this floodplain is the Tanana River, which is a tributary of the Yukon River. The Site lies between Moose Creek and Chena Slough, both of which are tributaries to the Tanana. The water table throughout the Tanana floodplain is shallow and usually 10 to 15 feet below the surface, depending on ground elevations and groundwater stage. It is not uncommon to experience water table fluctuations on the order of 2 to 4 feet during rapid recharge events. The Tanana typically acts as a source of recharge for the area while other creeks and rivers act as drains. The slough will act as either, depending on the water level. Other sources of recharge to the groundwater are snowmelt and precipitation.

Depth to Groundwater and Groundwater Flow Direction: Groundwater was observed at this site approximately 8-10 feet below the ground surface. The groundwater depth at the site is estimated to vary seasonally between 8 to 12 feet below the ground surface. Based on groundwater data collected during long-term groundwater monitoring at the Moose Creek General Store, the groundwater flow direction is expected to be northwest (parallel to the Old Richardson Highway) with a magnitude typically 0.001 feet/foot or less.

Surface Water and Surface Water Drainage: The Site surface has been graded to drain away from the buildings. On the north side, surface drainage is towards a swale next to the Old Richardson Highway, although the swale does not appear to have

enough slope to drain anywhere else. The ground surface behind the building is mostly level and surface water is expected to pond prior to infiltration.

Nearest Surface Water Body: The Site is approximately three miles north of the closest reach of the Tanana River, which runs northwest at that point. The site is approximately one-quarter mile north of the closest reach of Chena Slough, which runs east-west at that point, and approximately three quarters of a mile southeast of the closest reach of Moose Creek, which runs west at that point. At this time, a slough of Moose Creek comes within one-quarter mile of the site. Aerial photographs (see Section 4.3) indicate a series of sloughs may have run through the Site prior to development.

On-site Wells: One former well casing was located within the existing shop building. Two other wells may be present on the property, but were not located.

2.3 Previous Site Investigations

The SKS facility is listed in the ADEC Contaminated Sites (CS) and UST databases. The CS database indicates that abandoned drums, USTs, pumps, and carpet cleaning equipment, as well as stained soil and dying vegetation, were observed at the site in June of 1992. The owner of the property did not act to cleanup the site and ADEC assumed responsibility for cleanup actions in May 1994. During the summer of 1994, a variety of work plans for UST removal and site characterization were approved, but never executed due to refusal of the apparent owner to allow access to property. ADEC decided not to pursue legal action to gain site access and no assessment or remedial action was taken.

No on-site data has been collected, although photographs show tank locations, drums, and stained soil. Apparently, ADEC Spill Response Program removed the drums sometime around 2000, although no evidence of soil samples or data about drum contents was found in the CS file. The Pioneer Baptist Church has constructed a new facility on the west site of the SKS site. The director of this group indicated that, after discussions with ADEC, he had one soil and groundwater sample collected by a consultant near the property line with the SKS site. Concentrations of fuel compounds were reportedly low or non-detect and the consultant indicated that it was not a significant threat. As a precaution, the well was installed on the western side of the property.

2.4 Project Objectives

This project is part of an EPA Brownfields Program that is intended to help transfer contaminated and abandoned properties back into use. On this site, the intent was to use available funds to remove and close the five regulated USTs and evaluate the

suspected groundwater and soil contamination through a release investigation. Other known or suspected on-site contamination sources were also investigated as permitted by funding and time. During the project, additional funding was provided to excavate and thermally remediate a larger quantity of contaminated soil than included in the original estimate. Specific activities that were authorized in the scope of work include:

- Review of site files, historical records, and work plan development,
- Removal and disposal of the five USTs,
- Trenching to identify and delineate secondary source soils and other potential sources,
- Excavation and thermal treatment of 75 tons of contaminated material with the tanks,
- Excavation of up to 600 additional tons of contaminated material around the site,
- Groundwater monitoring well installation and sampling to delineate groundwater impacts,
- Reporting

3.0 METHODOLOGY

3.1 Historical Research

The scope of ***NORTECH***'s historical research for the site is in accordance with American Society of Testing and Materials (ASTM) Practice E 1527-00. The information is provided to assist in the completion of "all appropriate inquiry" and to meet the "due diligence" requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") as amended by the Superfund Amendment and Re-authorization Act (SARA) in 1986.

To accomplish the objectives of the project, the following services were provided:

- Review of relevant documentation of the Site, including aerial photographs and borough records
- Review of federal and state databases for known or suspected contaminated sites and leaking USTs within ASTM search radii
- Visual assessment of the property for indications of potential environmental issues and hazardous materials
- Interviewing individuals knowledgeable about the Site and its history.

3.2 Field Sampling Protocol

A PhotoVac 2020 hand held Air Monitor/Photoionization Detector (PID) was used to field screen soils for volatile organic compound (VOC) contamination, including petroleum hydrocarbons. The PID allows for semi-quantitative, real-time analysis of soil contamination. The PID is intrinsically safe and approved for use in Class 1, Division 2, Groups A, B, C, & D Hazardous Locations. Field screening with the PID involved measuring the concentration of vapors in the headspace above a soil sample in a sealed container. The PID yields a semi-quantitative value for soil gas referenced to a certified isobutylene gas standard.

Important specifications of the PhotoVac PID are as follows:

Instrument:	PhotoVac 2020 PID
Calibration:	Certified Isobutylene Standard (nominal 100 ppm)
Detection Limit:	0.1 ppm (VOC)
Response Time:	Less than 3 seconds
Operating Temp:	32^{o} to 105^{o}F (0^{o} to 40^{o}C)

NORTECH used the “headspace screening” method of field screening in accordance with the approved workplan and ADEC SSP, Section 4.4.2. Headspace screening consisted of measuring the VOC concentration in the air portion of a clean, resealable bag partially filled (one third to one half) with freshly uncovered soil. Total capacity of the bag was not less than 8 ounces (app. 350 ml). Equipment used during sampling included disposable gloves and/or stainless steel trowels or spoons.

The bag was agitated at the beginning and end of headspace development and vapors were allowed to develop for at least 10 minutes at ambient temperatures to a temperature of at least 40^{o}F. A small opening was made in the top of the bag and the PID probe was inserted to draw soil gas into the PID for VOC analysis. The highest PID reading was recorded, and a field log was kept of the PID response. Calibration was performed in accordance with the manufacturer's specifications and the SSP.

NORTECH's previous experience using the PhotoVac 2020 PID generally indicates that PID readings below 20 ppm have petroleum contaminant concentrations less than ADEC's most stringent cleanup values (ADEC Method 1, Category A) for Gasoline Range Organics and for Diesel Range Organics. ***NORTECH*** sorted material into three stockpiles on the site based on the PID reading. PID readings less than 20 ppm were considered background, PID readings between 20 and 100 were considered suspect, and PID readings 100 and higher were considered contaminated. ***NORTECH*** conducted field screening on the suspect and known contaminated stockpiles to determine appropriate laboratory sampling locations.

NORTECH also field screened trenches, potholes, and other excavations that may be used to characterize the extent of the contamination across the site. Material from these excavations was usually placed back in the excavation in the original location and PID results are used in conjunction with lab analysis to delineate the contamination.

3.3 Laboratory Sampling and Analysis Procedures

Soil samples were collected to characterize the extent and nature of contamination left in place at the site as well as characterize the contaminated material for thermal remediation purposes. Soil sampling was conducted following ADEC procedures outlined in the *Underground Storage Tanks Procedures Manua*l, dated November 7, 2002, as well as the approved project workplan and Quality Assurance Project Plan. Based on field indications, samples were analyzed for some or all of the following constituents:

- Gasoline Range Organics (GRO) by Alaska Method AK 101
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by EPA Method 8021
- Diesel Range Organics (DRO) by Alaska Method AK 102
- Residual Range Organics (RRO) by Alaska Method AK 103
- Volatile Organic Compounds (VOCs) by EPA Method 8260
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method 8270 SIMS
- RCRA Metals by ICP/MS
- Glycols by EPA 8015 Mod

SGS Environmental Services in Anchorage, Alaska analyzed the samples.

3.4 Groundwater Sampling Procedures

Groundwater samples were collected using modified direct-push techniques. The groundwater sample from Location 1 was collected from a 5-foot long slotted stainless drive point that was installed across the water table. Structural failure of the threads on the stainless drive point prevented use of the unit on additional sampling points, but the unit was extracted prior to completion of the project.

Other locations (2-7) were sampled by advancing a drive casing and disposable point to approximately six inches below the water table (based on observations from previous wells and the nearby excavation with exposed groundwater). Peristaltic pump tubing

was then inserted into the drive casing and the casing was extracted approximately eight inches. The location was purged using low-flow techniques until the extracted water was relatively free from suspended sediment and then a sample was collected. Samples were analyzed for the following constituents:

- Gasoline Range Organics (GRO) by Alaska Method AK 101
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by EPA Method 8021
- Diesel Range Organics (DRO) by Alaska Method AK 102
- Residual Range Organics (RRO) by Alaska Method AK 103

Analyses for other potential contaminants of concern were not performed due to a sample container ordering error on the part of ***NORTECH*** that was not identified until the sampling event had been completed. SGS Environmental Services in Anchorage, Alaska analyzed the samples.

3.5 Soil and Groundwater Cleanup Levels

The initial site cleanup goals for this project have been determined using ADEC's Method 2 for soil and ADEC drinking water standards for groundwater, as outlined in ADEC regulations (18 AAC 75.341, Tables B2 and C). The cleanup goals of common petroleum contaminants are shown in the table below.

Table 1
Soil and Groundwater Cleanup Standards for Petroleum Contaminants

	ADEC Method 2 Soil (mg/kg)	ADEC Drinking Water (mg/L)
Benzene (B)	0.02	0.005
Toluene (T)	5.5	1.0
Ethylbenzene (E)	5.4	0.7
Total Xylenes (X)	78	10.0
Gasoline Range Organics (GRO)	300	1.3
Diesel Range Organics (DRO)	250	1.5
Residual Range Organics (RRO)	2000	1.1

Development of site-specific Method 3 cleanup levels for petroleum and other detected contaminants was considered as part of this project. However, Method 3 cleanup levels were not calculated due to the nature of the contamination at the site (sporadic and difficult to define) and time and funding constraints.

3.6 Personnel and Subcontractors

Peter Beardsley, PE, was in responsible charge of the project, including administrative management, technical content, schedule, and budget. Peter, Tony Barnard, and Dennis Boyce conducted the field activities and are ADEC "qualified personnel" for collecting samples. Mark Rockwell of Rockwell Engineering and Construction (Rockwell E&C) provided personnel certified in UST Decommissioning for the project. Rockwell E&C also conducted excavation and backfilling activities. Homestead Drilling provided direct push services to collect groundwater samples.

4.0 RECORDS REVIEW

4.1 Fairbanks North Star Borough Property/Assessment Records

The Fairbanks North Star Borough (FNSB) Assessing/Property Records were reviewed by Peter Beardsley of ***NORTECH*** to gather information regarding past or present uses of the Site and surrounding properties. These records date to the founding of the FNSB in 1965 and contain information on ownership, assessed value, improvements, land classification, and utilities.

4.1.1 The Site

Tax Lot 2902, Section 29, T2S R3E		Original Building, 1952
1978	Dennison, Hansford and Vera	
1979	Sani-Klean Services	Multiple buildings
1992	Dennison, Hansford	
1994	Talley, Richard	Abandoned
2000	Dennison, Hansford	Buildings deteriorating
2000	FNSB Foreclosure	

A note in the file indicated that records prior to 1978 for the site are missing.

4.1.2 Adjacent Properties

The surrounding property is primarily single and multiple residential units. A church, general store, and school bus storage and maintenance facility are also located in the area.

South:

Tax Lot 2931, Section 29, T2S R3E	
1975	Dennison, Hansford and Vera
1976	Foley, Jack and Julie
1976	United States of America

Tax Lot 2933, Section 29, T2S R3E
- 1975 Dennison, Hansford and Vera
- 1976 Foley, Jack and Julie
- 1976 United States of America

Tax Lot 2935, Section 29, T2S R3E
- 1975 Dennison, Hansford and Vera
- 1976 Foley, Jack and Julie
- 1976 United States of America

East:

Tax Lot 2908, Section 29, T2S R3E
- 1971 Dennison, Hansford and Vera
- 1972 Hemken, Edward
- 1980 Dennison, Hansford
- 2003 Dennison, Vera

Tax Lot 2909, Section 29, T2S R3E
- 1971 Dennison, Hansford and Vera
- 1981 Dennison, Hansford
- 2003 Dennison, Vera

Tax Lot 2910, Section 29, T2S R3E — ADOT&PF ROW
- 1971 Dennison, Hansford and Vera
- 1981 Dennison, Hansford
- 2003 Dennison, Vera

Tax Lot 2937, Section 29, T2S R3E
- 1971 Dennison, Hansford and Vera
- 1981 Dennison, Hansford
- 2003 Dennison, Vera

North:

UMB01 (Lots 1, 2, 3 & 4), Block 3, Moose Creek Acres
- 1969 Al's Texaco
- 1974 Transportation Services, Inc — Structure built
- 1975 Mat-Su
- 1983 Blackard, Joe and Mary
- 2001 Laidlaw

Lot 5, Block 3, Moose Creek Acres

1969	Al's Texaco	
1974	Danis, Howard and Jewell	
1976	Harlan, Kenneth and Olive	
1993	Harlan, Kenneth and Gertrude	

Lot 6, Block 3, Moose Creek Acres

1969	Al's Texaco	
1974	Greaves, George and Kathleen	
1978	Adcox, James and Shirley	
1979	Slayden, William Lee	
1980	Adcox, James and Shirley	
1981	Peterson, James and May Jean	
1984	Ranger, Steve and Deborah	
1989	AHFC	
1990	Adlesperger, Kent and Wanda	
1995	Yox, Jack and Angie	
1997	Roger, Terry and Lynda	
2004	Lacount, Richard and Arinda	

Lot 7, Block 3, Moose Creek Acres

1969	Al's Texaco	
1971	Ferry, Edward and Edith	Residence
1978	Johnson, Shouse, and Wertz	
1980	Dotson, Dotson, and Dotson	
2001	Dotson, Furman, and Dotson, Lawrance	
2003	Hoffart, John	

Lot 1, Block 6, Moose Creek Acres

1969	Hill, John	
1970	Al's Texaco	
1973	Dunn, Joe and Jerry	
1976	Corey, Donald and Sara	
1984	Hall, David and Ruth	
1990	AHFC	
1991	Gregory, Neal	
1998	Gregory, Neal and Diae	

Lot 2, Block 6, Moose Creek Acres		
1969	Hill, John	
1970	Al's Texaco	
1973	Fina, James	Residence
1974	Curran, John	
1981	Moore, Charles and Carole	
1983	Lawrence, Clyde and Caral	
1988	Lawrence Living Trust	
Lot 8, Block 6, Moose Creek Acres		
1969	Hill, John	
1970	Al's Texaco	
1974	Davis, Charles	
1977	Hayes, James and Hazel	
1984	Hawkes, Michael and Lisia	
1999	Brown, Ralph	
1999	Gahrmann, Cynthia	
Lot 9, Block 6, Moose Creek Acres		
1969	Hill, John	
1970	Al's Texaco	Shop/Warehouse/Office
1971	Sani-Klean Service	
1974	Corey, Donald and Sarah	
1979	Sumey, Michael	
1982	Evans, Philip and Carol	
1995	Seppi, Stacy and Venessa	converted to 4-plex

West:

Lot 01, Pioneer Baptist Subdivision		
2002	Dennison, Hansford	
2003	Dennison, Vera	
Lot 02, Pioneer Baptist Subdivision		Church built 2003
2002	Pioneer Baptist Church	

4.2 Environmental Database Searches

Environmental Data Resources, Inc. (ERD) was subcontracted to perform a search of available environmental databases in exceeding the government records search requirements of ASTM E 1527-00. The list of federal and state resources reviewed included: NPL (National Priority List))/Superfund sites, CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) sites, RCRA (Resource Conservation and Recovery Act) Corrective Action (CORRACTS) sites,

RCRA TSD (Treatment, Storage and Disposal) facilities, RCRA small and large quantity generators, Solid Waste facilities, FINDS (Facility Index System) sites, ERNS (Emergency Response Notification System) Hazardous Materials Spill sites, State landfills, HMIRS (Hazardous Materials Information Reporting System) sites, PADS (PCB Activity Database System) sites, TRIS (Toxic Chemical Release Inventory System) sites, TSCA (Toxic Substances Control Act) sites, MLTS (Materials Licensing Tracking System) sites, ROD (Record of Decisions) sites, NPL Superfund Lien sites, Consent (Superfund consent decrees) sites, MINES sites, Registered Underground Storage Tanks (UST) facilities, Leaking Underground storage Tanks (LUST) facilities, AST (Alaska Regulated Aboveground Storage Tanks), ADEC Contaminated Sites (CS) List, AK (Alaska) Spills, and several other federal tracking systems. A copy of the EDR report is located in Appendix 4.

The Site is listed as in the EDR Report Orphan Summary as Sani-Klean Service, Former Texaco. This report serves as a site assessment and release investigation for the Site.

A total of five other sites are listed in the EDR reports as being within the specified search radius. These properties and the potential impacts of each to the Site are discussed below and the relevant sites are shown in Figure 2.

Eielson Air Force Base (EIFAB) is listed as a DOD site within one mile of the Site and most of the sites listed in the Orphan Summary are located on EIAFB. However, the developed portions of EIAFB are significantly more than one mile from the Site and are not considered an environmental threat to the property.

Site 1 is the Moose Creek Bus Barn facility, which has gone by several names over the years. This property is adjacent to the Moose Creek General Store, which is listed as Site 3. Both of these are listed in the UST and LUST databases. While environmental concerns are known to exist at these two locations, more than ten years of groundwater monitoring data at the Moose Creek General Store indicates that the hydraulic gradient is to the northwest, away from the SKS Site. These two sites are not considered a potential environmental threat to the Site.

Site 2 has OIT, Inc listed as a RCRIS Small Quantity Generator with some unresolved violations. However, the location of this facility is incorrect. The actual facility location is more than one mile east of the site, which is outside the ASTM search radius for this type of facility. This OIT facility thermally treats petroleum contaminated materials (including contaminated soil from the Site). OIT is not considered an environmental threat to this site.

The Orphan Summary was also reviewed for potential nearby sites and no other facilities are within the search radii of the Site.

4.3 Aerial Photographs

Aerial photographs from 1959, 1975, 1982 and 1999 were reviewed for past development/uses of the Site and area property. The photographs are reproduced as Figures 8 through 11, respectively, in Appendix 1. Aerial photographs were obtained from ADOT&PF in Fairbanks, AeroMap US, Inc., in Anchorage, or the USGS. A description of the site and surrounding area during each of these time periods is below.

September 1959 Aerial Photo (Figure 8): The Site appears undeveloped at this time. The Old Richardson Highway (the only Richardson Highway at this time) is observed on the north side of the site and a slough is visible slightly south of the site. Vegetation on the site appears to be relatively small and a low area is visible across the site. A few small buildings are visible to the east of the site between the Old Richardson Highway and the slough. A second slough is visible o the north side of the Old Richardson Highway.

August 1975 Aerial Photo (Figure 9): The Site and surrounding area have undergone significant development. The site has several buildings and appears to be operating as a retail fuel and service station. The new Richardson Highway has been built south of the site and appears to have been constructed over the slough that was visible in 1959. The properties between the Old and New Richardson Highways have been developed as a trailer park. A single row of trailers is present on the west side of the site and at least four rows of trailers are visible immediately east of the Site with additional trailers farther to the east. Properties on the north side of the Old Richardson Highway have also been developed and appear to be residences. The Moose Creek Bus Barn and Moose Creek General Store are visible west of the Site.

June1982 aerial Photo (Figure 10): The Site appears similar to the 1975 aerial photograph. An additional structure is visible northeast of the building in the location of the dispenser island. The trailer footprints are still visible, but most of the trailers have been removed from the adjacent properties. Additional residential development has occurred on the north side of the Old Richardson Highway. .

May 1999 Aerial Photo (Figure 11): This photo represents the Site very similar to how it appears today. Vegetation has grown up over most of the former trailer park east and west of the property, as well as around most of the nearby residential units. The bus barn has expanded slightly, but most other properties have stayed about the same. The only additional development in the area that is not shown in this photo is the Pioneer Baptist Church, which was constructed immediately west of the Site in 2003.

4.4 Initial Site Inspection and Interview

Peter Beardsley and John Hargesheimer of ***NORTECH*** met with Mark Rockwell of Rockwell Engineering and Construction (Rockwell E&C) at the site on May 10, 2004 to confirm the existing conditions of the site and develop a conceptual plan for removal of the tanks and other site work. Solid waste was found on the surface of the site, including approximately eight abandoned vehicles, two collapsed and partially removed buildings, and a wide variety of cleaning equipment (buffers, brushes, etc) and other miscellaneous debris. Tires and other debris, including possible vehicle frames, were observed protruding from the ground on the southwest corner of the lot that had been scraped up with a bulldozer.

NORTECH identified fill and vent pipes for six of the seven tanks, a potential service pit in a cut-out section of the floor slab, and one former drinking water well in the remaining building shell. Tank locations and sizes appeared consistent with previous assessments and very little liquid was observed in the fill ends of the tanks. The drinking water well for the neighboring church was identified on the northwest side of that building. A number of potential small issues, such as stained soils, former drum locations, and additional vehicles and vehicle parts, were identified behind the shop, but were determined to not be part of the scope of the tank removal project. ***NORTECH*** used this information to develop the May 19, 2004 Work Plan for UST removal and site assessment that was approved by ADEC.

NORTECH and Rockwell E & C mobilized to the site to begin tank removal on June 4, 2004. Paul Simon, a resident of Moose Creek, stopped during preliminary staging to investigate the activities. Mr. Simon indicated he had worked at the Sani-Klean facility for many years and agreed to provide an overview of the activities on the property.

Mr. Simon began working at Sani-Klean in the mid-1970s as a young teenager. He remembered installation of the three larger tanks and indicated that they had all been gasoline tanks. The two original tanks were used as diesel tanks after the installation of the three larger tanks. He did not expect contamination around the larger tanks, but indicated that he expected contamination around the diesel tanks. He did not think these tanks had leaked, but thought that the piping may have leaked and that fuel had been spilled on the surface around these tanks. He indicated that the tanks had been pumped out when the station had ceased operation, but that the last 200 gallons could not be pumped out with the equipment they had used.

Mr. Simon indicated the cut-out in the concrete floor slab had been used as a service pit. He remembered the service pit being covered with oil and indicated that he expected to see significant contamination in and around the service pit. He indicated that the station had six dispensers in its dispenser island. He remembered that one of these dispensers had been broken off during spring hardpack removal and expected

contamination around the northwest end of the dispenser island. He also indicated that diesel and used oil had been used on the driveway for dust control and that he would not be surprised to find random areas of fuel and sprayed oil around the driveway area. He also remembered a second drinking water well in the building with the service pit, but no trace of this well was found during a brief inspection of the area.

In addition of the service station, the SKS facility had two other buildings. A storage building was located behind (south) the garage and Mr. Simon was not sure if this building was heated or not. A small drive-in/walk-up restaurant was located on the northwest side of the building. He indicated that he had installed a drivepoint well for this building near one of the back corners of the building, but was unable to locate this well. He did not think that either of these buildings had a separate heating oil tank.

Mr. Simon also provided a brief history of the Moose Creek area. He indicated that housing needs for Eielson Air Force Base (EAFB) personnel and pipeline construction workers drove development of Moose Creek. The properties adjacent to the SKS Station had been trailer parks. The trailers used cesspools for wastewater disposal and most of these were failing by the mid-1980s. He did not remember the exact order of events, but indicated that the trailer park was condemned and had been abandoned. Many of the trailers were moved to new locations across the Old Richardson Highway. However, the reduced population of Moose Creek after pipeline construction could no longer support the number of service stations that were present.

In addition to a reduction in the number of patrons, the SKS station also had several management and ownership problems and changes. Mr. Simon could not remember the exact details, but indicated that it changed hands several times prior to closing. After the station closed, the individual that owned the property apparently hired someone to come and take down some of the buildings to prevent waste disposal (vehicles, drums, etc) on the property. Based on the debris left on the site, this job appears to not have been completed.

Mr. Simon also indicated that there had been a slough that ran through the trailer park and there was a low area behind the SKS station. He indicated that people in the area had filled low spots with vehicles and other waste material and then covered the filled area with gravel. He did not remember the specific locations, but indicated that he would not be surprised to at least ten, and probably more, buried vehicles on the south side of the lot. He indicated that there were probably upwards of 100 buried vehicles farther east in the former trailer park.

5.0 FIELD ACTIVITIES

Field activities began with tank excavation and removal on June 4, 2004 and all field activities, including backfilling and grading of the site, were completed on June 30, 2004. A copy of the field notebook is attached as Appendix 7.

June 4-5, 2004
NORTECH and Rockwell E&C mobilized to the site and conducted tank removal and site assessment activities. The three large gasoline tanks were excavated and removed. Field screening and sampling of the tank excavations was undertaken and PID readings indicated that the larger tank excavation were mostly clean. A small area of contamination was identified near the fill pipe for Tank 1 (farthest east). Contamination was also found on the northwest corner of Tank 3, closest to the diesel tanks. The contamination near Tank 3 appeared to be from the diesel tanks (Tanks 4 and 5) and not from Tank 3.

June 7-9, 2004
The two small heating oil tanks and the two diesel tanks were excavated and removed during this time, as well as the piping from each of the five retail tanks to the dispenser island. Field screening indicated that contamination was present beneath and around the two diesel tanks and around and beneath the western end of the former dispenser island. Additional trenching was undertaken to identify the extent of contamination around the dispenser island and at other locations on the site. The trenching indicated contamination extended towards the Old Richardson Highway, but remained within the gravel driveway portion of the Site. Traces of contamination were also identified in a trench located west of the building in a suspect area. Soil samples were collected from the trenching areas. Seven direct push sampling locations were advanced and a total of eight groundwater samples were collected. Reasonable recharge rates were observed using the sampling techniques identified in Section 3.4.

June 21-25, 2004
The Site was cleaned up and uncontaminated material from the trenches was placed back in the trenches while contaminated material was hauled to OIT, Inc for thermal remediation. Additional material, as authorized by the amended contract, was also excavated and hauled to OIT. A total of approximately 600 tons (400-450 cubic yards) were hauled to OIT. Most contaminated material originated around the two diesel tanks and the eastern edge of the contamination that extended towards the dispenser island. An additional set of delineation trenches was excavated to further define the contaminated area in the gravel driveway. Eleven additional soil samples were collected to complete characterization and assessment of the site.

June 28-30, 2004
Rockwell E&C personnel removed the tanks from the property and disposed of them. Backfill material was hauled from OIT and uncontaminated surface material and gravel was used to return the site to the approximate original grade.

6.0 RESULTS

Three sets of soil samples have been collected at this Site to provide assessment and closure of some tanks and characterize the remaining contamination around the site. The soil samples have also been used to confirm the field results and delineation efforts undertaken with the PID. The soil field screening and laboratory results across the site are shown graphically in Appendix 1. Figure 3 summarizes the site and indicates the three areas that the site has been separated into for discussion purposes. The three areas are the tank closure and excavated area (Figure 4), the driveway and dispenser island area (Figure 5), and the other areas around the building (Figure 6). Laboratory analytical results are summarized in Tables 3 – 4 in Appendix 2 and complete copies of laboratories are included in Appendix 5.

Additionally, one round of push-point groundwater sampling was undertaken to characterize the groundwater beneath the site. The groundwater sampling locations are shown in Figure 7. Analytical data is summarized in Table 5 and the laboratory report is included in Appendix 5.

6.1 Soil Results

Three sets of soil samples have been collected at this Site to provide assessment and closure of some tanks and characterize the remaining contamination around the site. The soil samples have also been used to confirm the field results and delineation efforts undertaken with the PID and were analyzed for a variety of potential contaminants as described in Section 3.3. Results for primary fuel components are summarized in Table 3 and other contaminants of concern (PAHs, glycols, metals, and other VOCs) are summarized in Table 4. Each of the three areas of the site is discussed below.

6.1.1 Excavated Area

A total of nine samples were collected from the excavation limits during two different sampling phases (see Figure 4). The first sampling event included five samples around the perimeter of the excavation of the three gasoline tanks (Samples 1, 2, 3, 5, and 6). Four of these were generally non-detect with a trace of residual range organics (RRO) below the cleanup level. Sample 6 (closest to the diesel tanks) had detectable concentrations of GRO, DRO, and RRO, as well as specific volatile organic compounds, but only benzene was above the cleanup levels. Sample 20 was collected from the

piping trench between Tank 4 and the dispenser island. This sample had detectable concentrations of fuel components, but none were above cleanup levels.

The locations with detectable concentrations (Samples 6 and 20) were excavated and thermally treated as part of the over-excavation due elevated PID readings observed in surrounding material. Once the over-excavation was completed, three additional samples were collected from the west side of the excavation to characterize remaining contamination. Results from these samples (Samples 38, 39, and 40) indicate remaining contaminant concentrations (including fuels, metals, PAHs, and chlorinated solvents) are below the ADEC Method 2 Cleanup levels on the west side of the excavation.

6.1.2 Driveway Area

A total of twelve samples (including field duplicates) have been collected to characterize and delineate the contamination that remains in place beneath the driveway near the west end of the former dispenser island. One additional sample was also collected from the former service pit to determine and characterize contamination in this location. These results are shown in Figure 5.

These samples are mostly non-detect and indicate a clean perimeter around an area of contaminated soil. Characterization samples indicate the presence of volatile contaminants, including GRO up to 536 mg/kg (Sample 33) and benzene up to 0.112 mg/kg (Sample 34). A number of other VOCs and PAHs were detected in Sample 3 and these compounds are summarized in Table 4. Compounds exceeding the cleanup levels included xylenes, 1,3,5- and 1,2,4 trimethylbenzene, and ethylene dibromide (EDB). The former service pit had only a trace level of RRO and background or non-detect levels of other contaminants of concern, including metals, PAHs, and VOCs.

6.1.3 Other Areas

Three other areas of potential concern were identified during the project and are shown in Figure 6. Two of these are underground tanks that were used to store heating oil for the heating units inside the shop and store facilities. Tank 7 is located behind the former store, Tank 6 is located behind the former shop/garage, and the west area is located immediately west of the front of the former shop/garage. PID results in the vicinity of Tank 6 and Tank 7 indicated the potential for heating oil contamination beneath the tanks starting at approximately seven feet below the existing grade. A laboratory sample collected beneath Tank 6 (Sample 13) indicated contamination consistent with a weathered middle distillate and a DRO concentration of 21,000 mg/kg. Trace levels of some PAHs were identified and metals concentrations were consistent with background levels in this sample.

Trenching and sampling west of the shop/garage indicated that contamination consistent with lube oil and/or used motor oil was present in that area. The characterization sample had a DRO concentration of 3,880 mg/kg and RRO concentration of 14,500 mg/kg and showed a pattern consistent with lube oil. Trace levels of some BTEX compounds were detected and PAH compounds were not detected. Metals were at background concentrations except lead, which had a concentration of 351 mg/kg. The chromium concentration exceeded the cleanup level, but is below the background upper confidence limit.

6.2 Groundwater Investigation

A total of eight laboratory samples were collected from seven push-point sampling locations. GRO, DRO, and BTEX compounds were all detected above the detection limits in DP-6 (Sample 7), which had a pattern consistent with weathered gasoline. Benzene (0.34 mg/L) and GRO (42.8 mg/L) exceeded the respective cleanup levels (0.005 mg/L and 1.3 mg/L). DP-2 (Sample 2) showed elevated concentration of benzene (0.00717 mg/L) and DRO (0.894 mg/L) and the field duplicate from DP-7 (Sample 9) had a toluene concentration of 0.00201 mg/L. DRO concentrations in the other samples were consistently between 0.408 mg/L and 0.465 mg/L.

6.3 Quality Control Summary

Quality control analysis indicates that the groundwater and soil samples were valid as defined in the ADEC UST Manual and Standard Sampling Procedures (SSP). The relative percent difference (RPD) provides an evaluation of sampling and handling methods and laboratory precision. The RPD values of analytes in the field duplicate pairs were acceptable. This data is summarized in Table 6 and a copy of each of the three laboratory reports is also attached.

Quality control parameters are useful for estimating and evaluating the information content of analytical data. Some of the means used to evaluate this information content include precision, accuracy, detection limits, and other quantifiable indicators.

In this study, the ADEC UST quality control procedures were followed and all requirements met. Completeness is a measure of the amount of valid data obtained compared to the amount expected. The soil and groundwater samples collected and analyses performed for this project were "valid" as determined by Section 3.1 of the ADEC's SSP and the "Completeness" is calculated to be 100%.

Duplicate samples were collected at the same time from the same location during the soil and groundwater sampling events in June 2004 for the BTEX, GRO, DRO, and RRO analyses. Two soil duplicate pairs and one groundwater duplicate pair were analyzed at this site, meeting the ADEC requirement for one field duplicate sample per

every ten assessment samples. The following are the duplicate pair identification number, the activity, the media, and the sample identifications number of the duplicate sample pairs:

Table 2
Duplicate Sample Pair Summary

Duplicate Pair	Media	Primary ID	Duplicate ID
Soil 1	Soil	14	15
Soil 2	Soil	33	42
GW-1	Groundwater	W-8	W-9

Precision, expressed as the relative percentage difference (RPD) between field duplicate sample results, is an indication of the consistency of sampling, sample handling, preservation, and laboratory analysis. The RPD has been calculated according to the method described in the SSP (the difference between the field duplicate results expressed as a percentage of the average of those results). If the analyte was detected in neither the sample nor the field duplicate, then calculation of the RPD is meaningless; however the precision is acceptable.

The QA/QC sample results for the soil and groundwater sampling events were generally within the range specified in the SSP for the method. The only exception was benzene in the Soil 2 duplicate pair. This soil duplicate pair had calculated RPD of 62%, which is above the goal of 40%. However, no laboratory QC issues were noted for this or the other samples. Additionally, the two concentrations are low and within the same order of magnitude. This relative concentration was also confirmed by the VOC analysis on one of the samples. The results are considered adequate in heterogeneous soils.

No deviations from the ADEC's SSP were reported. All of the data may be used for the objectives of the evaluation.

6.4 Conceptual Site Model

The conceptual site model (CSM) is a method used to evaluate the potential receptors that may exist at a site now or at any time in the future. The goal of the CSM is to outline all scenarios that theoretically could lead to an adverse impact on human and/or environment receptors that are present on and off the site. The CSM was completed per the guidelines in the ADEC's Risk Assessment Procedures Manual. A graphical representation of the CSM is shown in Figure 12 of Appendix 1.

The Site has a large right-of-way for the Old Richardson Highway on the north side. The exact location of the southern edge of the ROW across the Site is unknown at this time. For the purposes of the CSM, the ROW is considered part of the Site. The Site is not currently in active use, so the CSM focuses mainly on potential future exposure pathways assuming the site is developed at some point in the future. Current data indicates that contamination does not extend off-site and cleanup efforts have reduced the likelihood of future off-site impacts. The actual likelihood of impacts to these receptors is discussed in Section 7.4.

Soil excavation and remediation efforts removed approximately 400-450 cubic yards of contaminated material from the site during UST removal. Additional soil delineation indicated that approximately 850-1050 cubic yards of contaminated material remain in the driveway area and extend from a few inches below the surface to a depth of at least five feet. Additional soil contamination exists west of the building from a few inches below the surface to a depth of at least four feet, but the contamination appeared relatively localized and the overall volume was not quantified. Other small, but unquantified, areas of surface contamination are expected at other locations on the site. Groundwater and smear zone contamination is expected beneath the former buildings and in the vicinity of the driveway, but groundwater sampling indicated the driveway area is not significantly impacted.

The contaminants of concern (COCs) that are above ADEC soil cleanup levels in the driveway area include gasoline range organics and benzene. Other fuel components, mainly other BTEX compounds and benzene derivatives, are also present at levels near the ADEC standards. DRO is present at the former heating oil tank locations and DRO and RRO are present west of the building. Specific contaminants of concern are addressed in Section 7.3. The existing buildings have concrete slabs on grade and future development is also expected to have concrete slabs. Potential transport pathways of the surface and subsurface soil contaminants include:

- Soil transport through dispersion
- Migration to subsurface soils
- Volatilization to the air
- Volatilization to a building
- Migration to the groundwater
- Exposure of groundwater during a future excavation
- Exposure of the soil during a future excavation

Surface soils are defined as soils within two feet of the surface. While natural attenuation has reduced the contamination in the top few inches of gravel at the site, the surface soils are contaminated by this definition. Contamination may spread from the surface soils through dispersion, migration to subsurface soils (which has already been observed), or volatilization to the air. The migration of contaminated dust and volatilized contaminants provides potential ingestion and inhalation exposure pathways to short and long-term workers and visitors to the Site.

Volatilization from the contaminated subsurface soil may be possible to the surface or into future buildings, particularly if the buildings are constructed with basements. The volatilization pathway into the atmosphere may provide an exposure route above the remaining contamination. Volatilization from the soil into or near the building provides a potential pathway for inhalation exposure route to workers and visitors to the Site.

Excavation of the contaminated soil would provide exposure routes through ingestion, inhalation, and direct contact to short term workers involved with the excavation. Contaminant migration to groundwater has already been observed at the site, and the presence of the buildings and foundations act to limit this migration to some extent. Potential groundwater receptors are discussed below.

The other transport pathways from the soil shown in Figure 12 are unlikely at this site. The site is cleared and no significant uptake by animals or plants is expected. There is no subsistence use on the property. The existing building is not suitable as a residence and the existing development classifications indicate a future residence on the Site is unlikely. Vadose zone soil contamination does not extend offsite.

Contaminant migration to groundwater has also been observed at this site. The potential contaminant transport pathways include:

- Migration with the groundwater flow
- Volatilization to the atmosphere
- Volatilization to a building, and
- Exposure of the groundwater during a future excavation

The hydraulic gradient at other properties near this site is primarily towards the northwest. The groundwater contamination in this direction probably extends beneath the remaining structures, but does not appear to extend offsite. Future development plans for the site should take the known groundwater contamination into account. Additional groundwater delineation would be beneficial to fully define the limits of the groundwater contaminant plume.

Volatilization of groundwater contaminants to the surface or future buildings presents a potential inhalation exposure pathway. Volatilization from the groundwater to the surface appears limited to a relatively small area near the former tanks. Volatilization from the groundwater into future building basements may also occur. Currently, volatilization from the groundwater into the existing building or the atmosphere provides a potential inhalation exposure route to short and long term workers and visitors to the site. Future potential receptors may also include residents if the property is developed as a residence.

Groundwater could be exposed during future excavations on the site. Construction of a building at the property would probably not require excavation to the depth of groundwater (7-10 feet below grade), so this would probably occur during future remediation efforts. Excavation to groundwater would produce ingestion, direct contact, and inhalation exposure routes for short-term workers involved with the excavation.

Subsistence users are not present in the area of the site and would not be impacted by the groundwater contamination. The actual existing impacts to these potential receptors from the groundwater are discussed in Section 7.4.

An ecological conceptual site model is considered unnecessary for the site due to the subsurface nature of the contamination. The groundwater contamination is estimated to vary from around 7-12 feet below the ground surface, below the contact area for most animals, birds, and vegetation.

7.0 ANALYSIS

NORTECH has completed the activities outlined in the May 19, 2004 Work Plan. This scope of work included historical research, removal of underground storage tanks, and site assessment and characterization. The primary objective of this project was to properly close and remove the five regulated underground storage tanks and the two buried heating oil tanks and complete a site assessment. The secondary objective was to remove approximately 400 additional yards of contaminated material from the site in an attempt to remove most gross contamination. This report serves as the summary document for those activities.

7.1 Tank Closure and Characterization

NORTECH and Rockwell E&C completed tank removal and field screening in early June 2004. Visual observation indicated that Tank 1, Tank 2, and Tank 3 were in relatively good condition, although the bottom of Tanks 1 and 3 were observed to be sitting approximately three inches below the top of the groundwater surface. Field screening indicated that a spill had occurred near the fill pipe for Tank 1, but this was very limited.

The remainder of the tank excavation was clean, with the exception of the northwest side of Tank 3, which was contaminated at depth. This contamination appeared to be related to Tanks 4 and 5 and not attributable to Tank 3.

Tank 4 and Tank 5 also appeared to be in good condition, although contaminated soil was observed around and beneath these tanks. The contamination started near the surface and could have been caused by overfilling or some other surface activity near these tanks. Contamination extended from these tanks into the vicinity of Tank 3 and appeared to extend beneath the concrete slab of the former building. Additional excavation around these tanks removed contamination exceeding the ADEC Method 2 cleanup levels on the south and east sides above the groundwater smear zone. Trace levels of some contaminants remain and generally increase towards the north end of the former buildings.

Contamination was also observed in some areas during the removal of the piping from these five tanks to the dispenser island. Contamination was observed in the area closest to Tanks 4 and 5 with contamination extending from Tank 5 to the west end of the dispenser island. This contamination appeared more consistent with a surface spill than with a leak in any of the lines.

Tank 6 was excavated and also appeared intact. The bottom of the tank was approximately seven feet below the ground level and estimated to be one foot above the groundwater surface. The sidewalls of the excavation were clean and a limited area of contamination was observed beneath the tank. A sample was collected from beneath the tank, but additional excavation was not undertaken because the remaining contamination was extremely limited and was consistent with smear zone contamination observed in other areas of the site. Additional excavation would also have required the removal of significant amounts of uncontaminated overburden and would have jeopardized the limited remaining structural integrity of the building.

The exact location of Tank 7 was unknown prior to excavation. The tank was located beneath a mound of debris that included a mangled former dispenser. A variety of debris was also encountered around the tank during excavation. The tank was full of ice and damage observed after removal from the ground appeared to be related to removal activities. Contamination was also identified beneath the tank, and some sidewalls were slightly impacted when water splashed out of the tank. Additional excavation was undertaken to remove most of the contaminated material. Final field screening indicated that limited contamination remained approximately seven to eight feet below the ground surface, but additional excavation was not possible without removing a significant pile of debris and portions of the concrete slab of the former building. The PID readings and observations in this area were generally consistent with the characteristics of the smear zone in the nearby excavation.

The former service pit was excavated to investigate suspected and reported contamination in this area. Excavation extended to approximately one foot above the groundwater surface. PID field screening was lightly elevated during the excavation and some solid waste was removed. However, stained soil was not observed and the bottom of the excavation appeared clean. Field screening at the bottom of the trench indicated the area was not contaminated. Additionally, a hand-auger was used to penetrate into the groundwater beneath the trench. Soil from this area appeared slightly contaminated and consistent with smear zone soils located beneath the Tank 4 and 5 locations, however no evidence of the reported/expected oil contamination was observed. A soil sample collected from the bottom of the trench above the smear zone was not contaminated.

Trenching activities were conducted to delineate the contamination around the dispenser islands and in the driveway in front of the former shop/garage. Two phases of trenching were conducted to a depth of approximately five feet below the ground surface. The trench locations and the approximate area of contamination are shown in Figure 5. Clean limits were identified in all directions from the west end of the dispenser island. Contamination was generally extremely volatile and field screening values generally fell from >2000 ppm to <20 ppm in a few feet. The contaminated area was generally wider at four feet deep than at two feet deep, which is consistent with downward migration from a surface release.

Laboratory analysis indicated that the contamination was consistent with weathered gasoline in most samples from the driveway area. The extreme volatility of the contamination encountered made field screening with the PID difficult because only field readings above the high range of the instrument (>2000 ppm) consistently yielded contamination above the Method 2 cleanup levels. Field screening values below the 300 ppm to 400 ppm range were generally below ADEC cleanup levels.

Based on the laboratory and field screening results, the area with remaining contamination is estimated at 2200 – 2500 square feet. Excavation of this area to a depth of nine feet below grade, the approximate groundwater level, would result in the removal of approximately 675 – 850 cubic yards of “bank” material. Assuming the material “fluffed” during excavation by about 25%, the total volume requiring remediation would be approximately 800 to 1050 cubic yards. Additional areas of contamination could be encountered during this type of excavation, which would increase the total volume of the excavation.

Trenching in an area of stained soil west of the former shop/garage building indicated that the stained soil extended at least two to four feet below the surface and the western extent of the stained soil was not found. Lab results indicated this was consistent with lube oil or used oil and DRO and RRO exceeded the ADEC cleanup levels. Site geometry (buildings, foundations, and debris piles) prevented further exploration of this

area to the west. However, the area is anticipated to be relatively localized due to the apparent surface spill of heavier oil.

At this time, a total of approximately 600 tons of contaminated material have been excavated from the site, primarily from the vicinity of Tanks 4 and 5. The certificate of thermal remediation is located in Appendix 6. Contaminated material excavated during trenching was placed back in the trench at the original location. The property was returned to the approximate original driveway grade using thermally treated material from OIT, Inc. OIT records and limited field screening confirmed this material was not contaminated. The treated backfill was placed at least one foot above the groundwater.

7.2 Groundwater Characterization

Direct push sampling methods were used at seven locations to provide characterization of the groundwater at the Site (see Figure 7). One of these was located southeast of Tank 1 (upgradient, background), one was within the area expected to be contaminated from Tank 4 and Tank 5, a second was located near the west end of the former dispenser island, and the others were located northwest (downgradient) of the known contaminated areas. The hydraulic gradient was assumed to be northwest based on more then 10 years of data from the Moose Creek General Store, which is located approximately one-quarter mile northwest of the Site. Site-specific hydraulic gradient data was not collected.

DRO was detected in five of the locations at low-level concentrations below the ADEC Cleanup Level. The laboratory indicated that this contamination was not consistent with any particular hydrocarbon pattern and was not due to instrumentation problems. This low-level DRO is considered a background level for the Site and may be a result of natural organics or some other property of the aquifer.

Groundwater analytical data indicated that groundwater in the vicinity of Tanks 4 and 5 (W-7) is impacted above the cleanup standards for GRO, DRO, and BTEX compounds. Laboratory notes indicate the pattern is consistent with weathered gasoline. Elevated levels of benzene and DRO were also observed in W-2, which is located northwest of W-7. Toluene was the only contaminant detected in W-9 (the field duplicate of sample W-8) and it was detected two orders of magnitude below the cleanup standard.

Groundwater contaminants were not observed in most downgradient wells and contamination does not appear to be migrating off the site. Groundwater impacts were not observed beneath the edge of the remaining vadose zone soil contamination. Although groundwater contaminant concentrations in the source area are above the cleanup standards, they are significantly lower than those observed on many other contaminated sites in the greater Fairbanks area.

The limited groundwater impacts may indicate that the presumed surface release did not reach the groundwater or the low levels may indicate natural attenuation has reduced the impacts to the aquifer. In either case, the contaminated soil removal efforts undertaken during this project should act to further reduce the groundwater impacts. Natural attenuation should continue to reduce the dissolved concentrations of the contaminants observed.

7.3 Contaminants of Concern

Review of the historical and suspected uses of the site identified a variety of compounds as contaminants of concern at the site. Historically, the SKS facility site was a retail gasoline and diesel fuel outlet and automobile servicing station. The station is assumed to have sold leaded and unleaded gasoline as well as diesel fuel. The station reportedly conducted a variety of automotive services, including oil changes and other waste generating procedures. In an effort to characterize the contamination at the site to the greatest extent possible, a number of samples were analyzed for fuel contaminants (GRO, DRO, RRO, and BTEX), VOCs, PAHs, RCRA Metals, and glycols.

The soil results indicated the primary contaminants of concern are the fuel fractions (GRO, DRO, and RRO) and BTEX compounds. Some or all of these were identified above ADEC cleanup levels beneath the former heating oil tanks, in the driveway area, and west of the building. Future characterization and remediation sampling events should focus on the GRO/BTEX and DRO/RRO analyses. Some other fuel related VOCs, such as acetone, trimethylbenzenes, and other benzene derivatives, were also detected in some of the samples, but the GRO/BTEX compounds are considered adequately representative of these compounds.

Ethylene dibromide (EDB, 1,2 dibromoethane) was detected in soil sample 33 at a concentration of 0.151 mg/kg, several orders of magnitude above the cleanup level of 3.06×10^{-5}. The concentration detected was only slightly above the method detection limit. The analytical laboratory indicates that it does not have a soil method capable of reaching a lower detection limit. Due to the presence of EDB in gasoline and its presence in the sample with the highest level of gasoline-type contaminants, the field screening and GRO/BTEX results are considered adequate to identify and remove the elevated concentrations of EDB.

Chlorinated solvents such as trichloroethene (TCE) and tetrachloroethene (PCE) were not detected in any of the soil samples. Glycols were also not detected in any of the soil samples. Low levels of some PAH compounds were detected in some of the soil samples. However, the concentrations were generally several orders of magnitude below the cleanup levels. Chlorinated solvents, PAHs, and glycols should no longer be considered contaminants of concern at the site and should not be tested for during

future characterization and remediation efforts unless a specific source (like a labeled drum) indicates that these contaminants may be present.

Most RCRA metals were detected at background levels in soils across the site. Lead and chromium were found at an elevated concentration in the used oil area west of the building, but not in the driveway area. These results indicate that the release of fuel in the driveway area was most likely unleaded fuel and not leaded fuel. Future metals analysis should be limited to previously unknown areas and focused only on lead, unless some other indicator suggests other metals may be present. Additionally, lead testing is not necessary in the driveway area.

The groundwater samples collected were only analyzed for GRO/BTEX and DRO/RRO. Although other analyses were not run, the absence or trace concentrations of other potential contaminants of concern in the soil suggest that these are probably not present in the groundwater. In the event that additional direct push sampling or installation of permanent monitoring wells is undertaken, GRO/BTEX and DRO/RRO analyses are considered adequate for characterization unless a specific indicator suggests that additional contaminants may be present. EDB specific analysis should also be performed if a well is installed near the remaining contamination.

7.4 Conceptual Site Model

The conceptual site model indicates that inhalation may be the primary long-term pathway for on-site and off-site persons to be exposed to the hydrocarbon contamination. Since the site is currently abandoned, potential exposure is limited to trespassers and the occasional visit by someone from FNSB or a potential buyer. The building is open and vapors are expected to dissipate upon reaching the atmosphere, so no exposure is expected currently. Future development should take into account the location of remaining contamination to reduce potential inhalation exposure inside or near the building.

The other primary method of exposure is through ingestion or direct contact with contaminated surface soils. Field screening of surface soils showed little evidence of contamination, so most contamination is expected to be more than six inches below the surface. While this is still technically considered surface soil because it is less than two feet deep, this does reduce the potential for windblown dust, direct contact, and ingestion of the contaminated soil. Excavation and remediation of the top two feet of soil would reduce this potential significantly. Due to the potential for additional contaminated material and the relatively limited groundwater impacts in this area, an impermeable surface such as asphalt or concrete may be the most cost effective way to minimize the risk associated with this portion of the site.

Shallow groundwater wells located on the downgradient side of the tanks may expose persons through inhalation, ingestion, and direct contact. Existing onsite wells should not be utilized and should be decommissioned. The contamination does not appear to extend offsite. However, the downgradient property (Pioneer Baptist Church) does have a water well onsite used as a public water source. The well is located on the downgradient side of the church and several hundred feet from the closest groundwater sampling point that had evidence of contamination. Sampling points closer to this well did not have evidence of contamination and this pathway is not complete at this time. Limiting future infiltration with an asphalt or concrete surface over the site and/or additional excavation of contaminated material would be expected to significantly reduce the future potential for contaminant migration to the groundwater and migration of contaminated groundwater across the Site.

Excavation into contaminated soil and groundwater onsite will also expose persons through inhalation, ingestion, and direct contact. On-site contamination is fairly well defined and future excavation is expected to be limited due to the known surface and subsurface conditions. Foundation construction in this area is generally perimeter footing with a crawlspace and large-scale excavation for a foundation during development is considered unlikely. The most likely excavation scenario is a remediation effort to remove and treat the remaining contamination.

Overall, exposure under the current scenario is unlikely due to the lack of activity at the site. This report should be made available for future development plans so that the documented conditions at the site can be taken into account to limit potential exposures.

7.5 Other Potential Contamination

NORTECH observed a number of other potential environmental concerns during the site inspection and learned of more during the interview. Debris observed at the site included a few drums and other materials that were not specifically investigated further as part of this tank removal project. Additional areas of stained soil were observed behind the shop and significant portions of the ground surface could not be investigated due to the presence of various debris and solid waste. The location and type of on-site wastewater disposal was not determined. A number of abandoned vehicles and vehicle parts were also observed. Buried cars were also reported behind the shop and limited evidence was observed that supported this claim. ***NORTECH*** did not undertake any efforts to identify and characterize potential contamination behind the shop other than removal of the two heating oil tanks.

Additionally, delineation trenches in the driveway indicated that the contamination may have come from multiple spills. ***NORTECH*** made an effort to characterize contamination from the most likely places, such as the dispenser island and piping locations. However, additional spills may have occurred outside the areas investigated

and additional contaminated soil may be encountered outside the areas delineated in Figures 4 and 5 during future excavation activities at the site. The extent of groundwater impacts from these other potential spills is unknown, as are the potential contaminants of concern and potential exposures.

8.0 CONCLUSIONS

NORTECH has completed the activities outlined in the May 19, 2004 Work Plan. This scope of work included historical research, removal of underground storage tanks, and site assessment and characterization. The primary objective of this project was to close the five regulated underground storage tanks and the two buried heating oil tanks and complete a site assessment for the property. The secondary objective was to remove approximately 400 additional yards of contaminated material from the site in an attempt to remove most gross contamination. Based on the data collected during activities at the site, ***NORTECH*** has drawn the following conclusions

Tank Removal

- Tank 1 had a small amount of contamination around the fill pipe which was remediated
- No contamination was observed around Tank 2
- Contamination around the northwest end of Tank 3 was attributed to Tanks 4 and 5
- Contaminated soil around Tanks 4 and 5 was from leaking fill and/or vent piping and/or surface spills above these tanks
- Limited contamination remains in place at a depth of seven feet below the surface beneath Tank 6 and is considered part of the smear zone
- Limited contamination remains in place at a depth of seven feet below the surface beneath Tank 7 and is considered part of the smear zone

Contaminated Soil

- Approximately 600 tons (400-450 cubic yards) of contaminated material was excavated and thermally remediated off-site.
- Contaminated soil around Tanks 4 and 5 was excavated to groundwater and the eastern limit extended to the Tank 3 excavation
- Soil beneath the concrete wall west of the former tank location and at the southern limits of excavation has been impacted, but contaminant concentrations are below ADEC Method 2 Cleanup levels.
- Contaminated material may remain beneath the northeast corner of the remaining former garage and store slab west of the former tanks

- Contaminated soil remains in place north of these former tank locations towards the former dispenser island
- Contaminated soil remains in place around the northwest end of the former dispenser island
- Contaminated soil near the dispenser island extends from the surface to more than six feet below grade and probably to groundwater
- Contamination in this area is consistent with weathered gasoline
- The approximate contaminated area is shown in Figure 5 and is estimated at approximately 2200 – 2500 square feet
- The volume of remaining contaminated soil near the dispensers is estimated at 850 – 1050 cubic yards based on an excavation to a depth of nine feet below the existing surface and a "fluff" factor of 25%
- Contamination in this area is consistent with weathered gasoline and contaminants of concern are GRO, BTEX, DRO, and RRO
- Vadose zone soil contamination was not observed in the area of the former service pit
- Smear zone contamination in the former service pit appears consistent with smear zone contamination around Tanks 4 and 5
- Lube oil contamination remains in place west of the former garage and contaminants of concern in this area are DRO and RRO
- Soil contamination does not appear to extend beyond the property boundaries associated with the SKS facility or pose a threat to offsite receptors
- The excavations and trenches have been backfilled and the site has been returned to the original driveway grade

Groundwater Contamination

- The groundwater gradient is assumed to flow northwest based data from other sites in the vicinity
- Groundwater impacts above the ADEC cleanup levels were observed near the former Tanks 4 and 5
- Impacts slightly above the cleanup levels were observed approximately 100 feet downgradient of former Tanks 4 and 5
- Groundwater impacts were not observed immediately downgradient of the dispenser island

- The contaminated soil remaining in place near the dispenser island is not impacting downgradient groundwater
- Groundwater impacts were not observed at downgradient locations closer to the property lines
- Groundwater contaminants of concern are GRO, DRO, RRO, BTEX, and possibly EDB
- Groundwater contamination does not appear to be migrating beyond the property boundaries associated with the SKS facility or pose a threat to off-site receptors

Other Site Concerns and Potential Receptors

- Other potential environmental concerns are present on the site, including abandoned vehicles, buried vehicles, and stained soil
- No exploration or characterization activities were performed south of the former shop buildings other than removal of the heating oil USTs
- Current potential receptors are visitors or trespassers to the site that encounter the contaminated surface soil
- Future excavation activities may encounter contaminated soil and groundwater causing exposures to workers and visitors to the site
- Future building construction may provide vapor intrusion and inhalation exposure pathways to receptors inside the building

9.0 RECOMMENDATIONS

Based on the conclusions outlined above, ***NORTECH*** has the following recommendations for the site:

- Land use controls should be established requiring ADEC notification and field screening during any excavation activities at the site
- Land use controls may also be appropriate to limit the location of future potable water wells and other aspects of development
- Future exposure from surface soil could be reduced by removing the top two to three feet of contaminated soil or paving the remaining contaminated area
- A limited number of direct push microwells are recommended to provide long-term assessment of the groundwater contamination

10.0 LIMITATIONS AND NOTIFICATIONS

NORTECH provides a level of service that is performed within the standards of care and competence of the environmental engineering profession. However, it must be recognized that limitations exist within any site investigation. This report provides results based on a restricted work scope and from the analysis and observation of a limited number of samples. Therefore, while it is our opinion that these limitations are reasonable and adequate for the purposes of this report, actual site conditions may differ. Specifically, the unknown nature of exact subsurface physical conditions, sampling locations, the analytical procedures' inherent limitations, as well as financial and time constraints are limiting factors.

The report is a record of observations and measurements made on the subject site as described. The data should be considered representative only of the time the site investigation was completed. No other warranty or presentation, either expressed or implied, is included or intended. This report is prepared for the exclusive use of ADEC. If it is made available to others, it should be for information on factual data only, and not as a warranty of conditions, such as those interpreted from the results presented or discussed in the report. We certify that except as specifically noted in this report, all statements and data appearing in this report are in conformance with ADEC's Standard Sampling Procedures. ***NORTECH*** has performed the work, made the findings, and proposed the recommendations described in this report in accordance with generally accepted environmental engineering practices.

11.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

Dennis Boyce, Environmental Specialist for ***NORTECH,*** has a B.S. in Geology and extensive experience conducting hazardous materials investigations, property assessments, and other environmental fieldwork throughout Alaska.

Dennis R. Boyce
Environmental Specialist

Peter Beardsley, PE, Environmental Engineer for ***NORTECH*** has a B.S. degree in Environmental Engineering. He has extensive field experience as a consulting environmental engineer. He has worked on all aspects of environmental investigations and cleanup efforts and is well versed in applicable regulatory requirements.

Peter Beardsley, PE
Environmental Engineer