PRELIMINARY SITE CHARACTERIZATION REPORT
DIESEL CONTAMINATION SITE ASSESSMENT PROJECT

TATITLEK, ALASKA

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Prepared For:

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APPENDICES

1.0 EXECUTIVE SUMMARY

NORTECH was retained by Tatitlek Environmental in Tatitlek, Alaska, to conduct a preliminary Environmental Site Assessment at several locations within the village of Tatitlek. Two areas assessed as part of this investigation were identified as areas of potential contamination related to past diesel fuel storage and handling. The third area assessed was a control site based on EPA quality requirements. Environmental activities conducted by ***NORTECH*** personnel included the following: POL field screening, POL contamination characterization, and field mapping of the assessed areas. This report documents the work conducted during the project effort and is the Initial Environmental Site Assessment Report for the project site.

Collectively, the three project areas (Areas A, B, and C) comprise approximately 9,500 square feet of surface area that was field screened during the project effort. A total of 31 field screening samples were collected to assess these three project areas. The samples were inspected for visual and olfactory evidence of POL contamination, field screened with a PID, and hot water sheen tested. Visual and field screening indicated the presence of petroleum hydrocarbon contaminants at the three areas. Visual and field screening results indicate the presence of significant concentrations of biogenic hydrocarbon compounds at the sites.

In addition to the field assessment, one sample from each of the three areas was collected for further POL characterization through laboratory analysis. A total of four soil samples (one from each site plus a duplicate) were submitted for GRO/BTEX and DRO/RRO analysis. GRO or BTEX contaminants were not detected through laboratory analysis in any of the samples. Each of the four samples contained DRO contamination in excess of the ADEC Method 2 cleanup level and one sample contained RRO contaminants in concentrations exceeding the ADEC Method 2 Cleanup Level.

At this time, the field screening and laboratory sampling described in the SAP has been performed in accordance with the proposed scope of services. Diesel contamination has been confirmed at two of the original investigation locations as well as the control site. Additional surface and sub-surface soil screening and sampling activities are recommended in order to define the lateral and vertical extents of contamination and determine the potential for future remediation of the contaminated materials. Visual inspection also indicated that some of the assessed areas may be downgradient of the actual petroleum sources and additional investigation to identify and reduce the potential for future releases is also recommended. Due to the high organic and water content of some of the contaminated materials, future laboratory analysis should include hydrocarbon analysis that can differentiate the biogenic hydrocarbons from the petroleum hydrocarbon.

2.0 PROJECT LOCATION, HISTORY, AND PREVIOUS INVESTIGATIONS

Information presented in this section is based on the Tatitlek Environmental RFP and observations made during the field effort.

Tatitlek is located on Prince William Sound in the Central Gulf Coast region of Alaska. The village is situated on the northeast shore of Tatitlek Narrows and is on the mainland of Alaska. Tatitlek is located approximately 30 air miles from Cordova and 30 sea miles from Valdez. The climate is classified as maritime with winter temperatures below freezing and summer temperatures generally in the 50s to low 60s. Annual precipitation is approximately 28 inches of rain and 150 inches of snowfall. Figure 1 shows the general location of Tatitlek within Alaska and Prince William Sound.

Several locations within the Village were identified as areas of potential contamination resulting from previous fuel storage and handling practices. The areas assessed as part of this project effort are discussed below.

Project Area A
Area A consists of four, vertically mounted, above ground storage tanks (AST's), located between the Tatitlek Community Center and current Village Power site (Figure 2). The tank farm, which belonged to Tatitlek Community School during time of operation, held large amounts of diesel fuel. When last used, approximately 30 years ago, village residents reported constant leaking of the tanks and piping, into surrounding tundra. This area is adjacent to the edge of the gravel pad for the current Village Power site, which includes bulk fuel storage.

Project Area B
Area B is located in the vicinity of the previous Village Power site and consists of a tank farm comprised of two large diesel above ground storage tanks (AST's), as well as a smaller tank farm utilized for used oil storage (Figure 2). Although the site has not been actively used in the last decade, there are numerous reports of spills and leaks during operation. In recent years, construction and other activities in this area reported having encountered large amounts of contaminated rock and soil.

Project Area C
Area C is located to the north of the VPSO building and the Community Center, and east of the village orthodox church (Figure 2). This site is comprised of an open lot and was chosen to be a control site. The western most portion of the lot appeared to have been developed previously, but no above ground structural remains were observed at this location during this assessment work.

Future development of the aforementioned locations is anticipated to be consistent with the village activities in the area, which range from residential to light industrial (fuel storage, transportation related activities, and fishing related activities). Tatitlek Environmental identified the two former diesel storage locations for this initial characterization. The control site was chosen by ***NORTECH*** and Tatitlek Environmental personnel during the site characterization effort.

3.0 OBJECTIVES AND METHODOLOGY

3.1 Project Objectives

NORTECH conducted field screening and sampling of Areas A and B in order to assess the potential presence of petroleum contamination at these sites. Area C was field screened and sampled as a control site. Field screening samples from these sites were also sheen tested for potential hydrocarbon contaminants. The field screening, headspace sampling, sheen testing, and laboratory sampling were completed in general accordance with the project specific QAPP, which is available upon request.

Specific objectives for the initial site characterization at each of the locations included:

- Identification and evaluation of release sources
- Mapping of the release point relative to nearby permanent structures
- Surface field screening to delineate approximate area of surface contamination
- Subsurface field screening to delineate approximate depth of contamination near the source (as permitted by time and equipment available)
- Field evaluation of groundwater if encountered during field screening activities
- Laboratory sampling of the most informative location (through field screening) for characterization of standard petroleum contaminants
- Limited assessment of the potential risk to human health and the environment through development of a draft conceptual site model
- Preparation of a report describing initial characterization activities

Specific data quality objectives for this project are fairly basic. The objective of the initial soil characterization is to preliminarily characterize the site in general accordance with the ADEC regulations (18 AAC 75 and 18 AAC 78) and characterization procedures (described in the ADEC Underground Storage Tank Procedures Manual). ADEC Method 2 soil cleanup levels will be utilized as screening criteria for the site. Future assessment and remediation plans will be developed using these initial characterization results and the objective is for field and laboratory data to be of sufficient quality to meet these needs.

3.2 Field Screening Protocols

The primary goal of the project was the surface delineation of contaminated soil in the two areas of concern. The initial delineation activity included a visual inspection of the ground surface. After specific areas of concern were observed, ***NORTECH*** conducted field screening within each area to assess the near-surface soil conditions. The specific number of field screening samples and/or grid spacing was determined based on the specific conditions observed at each location in the field. Field screening sample collection locations are shown in Figures 3-5. Field screening results are summarized in Table 1 (Appendix 2).

Field screening was performed through visual, olfactory, semi-quantitative, and qualitative means. Each method was utilized at each sampling location. Visual and olfactory cues are self-explanatory and were used during the initial inspections and during field screening sample collection. A photoionization detector (PID) that uses the overall volatile organic compound (VOC) content of soil was used for semi-quantitative assessment of surface soil contamination in accordance with standard ADEC procedures. Since many older spills have lost most of the VOCs that are detected by the PID, although petroleum contamination may still present, the hot water sheen test was also used. Each of these methods is described briefly in the following sections.

3.2.1 Handheld Photoionization Detector (PID)

A PhotoVac 2020 Hand Held Air Monitor/Photoionization Detector (PID) was used to field screen the soils for POL contamination. At least one field screening sample was collected for every 10 cubic yards of material to be characterized. ***NORTECH*** used the headspace method of field screening in general accordance with Section 4 of the ADEC SSP and the approved project documents. Headspace screening consists of partially (33%-50%) filling a clean resealable bag with freshly uncovered soils to be field screened. The resealable bag was closed and headspace vapors were allowed to develop for at least 10 minutes and not more than one hour. The bag was agitated at the beginning and end of the headspace development period. In accordance with the SSP, the highest PID reading from each sample was recorded.

3.2.2 Hot Water Sheen Test

NORTECH also used the hot water sheen test (also known as Hydrothermally Induced Iridescent Optroscopy) to corroborate and supplement the PID results and visual and olfactory observations of specific soils. The general methodology is to partially fill a small stainless steel bowl with suspect soil and slowly add hot water to the bowl and note any sheen that appears on the water surface. Then the water and soil are agitated and the surface is evaluated again. The bowl is then decontaminated appropriately for reuse.

This procedure is fairly subjective, but is a reasonable indicator of the presence or absence of petroleum contamination. Typical results are a rainbow sheen, a white wispy sheen, a blocky sheen or no sheen. These specific indications provide a subjective analysis about the suspected contamination. For example, fresh releases have a vibrant rainbow of colors, while older weathered releases are generally dull (white) and wispy. Also, natural organics (biogenic origin) display a blocky pattern and tend to fracture while POL contamination does not.

3.3 Characterization of Assessment Areas

In accordance with the project documents, contaminant characterization through laboratory sampling was completed at each of the project areas. At Areas A and B, the soil sample was collected at the location showing the highest indications of POL contamination through olfactory, visual, PID results and sheen testing. For Area C, the soil sample was collected from the location with the highest headspace PID value. In addition, one duplicate sample was collected during the project effort. The soil sampling locations are shown on Figures 3-5.

Soil samples collected during this investigation were analyzed for the following:

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

SGS Environmental Services in Anchorage, Alaska, performed the laboratory analysis of the samples.

3.4 Regulatory Limits

The analytical methods used for this project are described in the approved QAPP. The laboratory sample results are compared to the State of Alaska 18 AAC 75 Method Two Soil Cleanup Levels (Migration to Groundwater in the Over 40 Inch Zone) in the results summary tables in Appendix 2. ADEC Method Two was identified as the appropriate cleanup level for BTEX and other POL contaminants of concern at the sites.

4.0 FIELD ACTIVITIES

On August 1, 2006, ***NORTECH*** personnel mobilized to the Village of Tatitlek to complete the approved preliminary site characterization. As described above, three areas were assessed as part of this investigation. Two areas were selected due to

assess the potential presence of POL contaminants related to past fuel storage in these areas as described in the project QAPP. The third site was selected by Tatitlek Environmental and ***NORTECH*** personnel during the site visit as a control site to assess and/or establish normal background soil concentrations in accordance with EPA suggestions during the QAPP approval process.

Area A

The first area, Area A, was an old Tank Farm that had been utilized to store diesel fuel which supplied the old community school. Area A is located at the southern end of the village at the end of Copper Mt. Street (Figure 3). For the purposes of this report, Area A is bounded by the warehouse building to the north, the shot rock pad of the new generator complex to the east, and the flowing surface water drainage to the south. The western portion of Area A includes the accessible land west of the tanks to the edge of the bluff.

Four vertically-mounted above ground storage tanks (ASTs) are located at Area A (Photos 1 and 2). The tanks are mounted on wooden platforms above the tundra with two tanks on each of two platforms. The two tanks on the northern platform have an estimated gross capacity of 3,000 gallons each, while the two tanks on the southern platform have an estimated gross capacity of 5,000 gallons each. These tanks were reported by Tatitlek Environmental personnel to have been out of service for approximately thirty years.

The tanks are located about 120 feet to the east of a small bluff dropping approximately ten feet in elevation to the beach. The new generator facility is located to the east and south of these tanks exists (Photos 3-5). This generator facility is constructed upon a shot rock pad that abuts the eastern edges of the wooden platforms holding the old tanks. Two new AST's (one 10,000 gallon capacity and one 2,000 gallon capacity) provide storage of the diesel fuel used by the new generator(s). The generator building is located approximately 25 feet to the southeast of the old tanks.

The ground surface covering most of Area A is primarily comprised of "spongy" moist tundra vegetation surrounded by shrubby vegetation intermixed with spruce and alder trees (Photos 1 and 6). Near surface groundwater was present at a depth of approximately 6 to 14 inches below the ground surface (Photo 7). Surface water was observed at several locations immediately west of the old AST's. Flowing surface water was observed between the northern tank platform and the warehouse building to the north and east. Flowing surface water was also observed emanating from the southwestern corner of the shot-rock pad beneath the current generator building complex. Surface water flows towards the bluff to the west. This corresponds with the ground surface gradient which also slopes to the west.

Field screening locations were chosen primarily to assess the potential contamination originating from the old AST's. A 10-foot by 10-foot sampling grid was initially established along the down gradient side of the AST's, however, actual field screening locations were chosen based on availability of suitable dry areas for the collection of screening samples. Soil screening samples were collected from a total of seventeen locations surrounding Area A. A total of two soil samples (one sample and a duplicate) were collected from Area A for POL characterization through laboratory analysis. The field screening and soil sample collection locations are shown on Figure 3 with results summarized in Tables 1 and 2.

Visual and olfactory evidence of POL contamination was observed at numerous locations assessed in the vicinity of Area A and confirmed through field screening. Visible sheening was observed in every location where surface and/or shallow subsurface water was encountered, although much of this sheen appeared to be biogenic in nature (Photo 8). Olfactory indications of diesel contamination were noted in numerous field screening samples collected west of the old AST's. Headspace screening and hot water sheen testing also indicated the presence of POL contaminants at numerous locations west of the old AST's.

Obvious POL contamination was observed where the water emanates from the southwestern toe of the shot rock pad (Refer to Photos 9 and 10). In addition, significant surface staining of the shot rock pad was observed west of the current generator building. Smaller areas of surface staining were also observed in the vicinity of the new 10,000 gallon AST. Numerous steel drums were noted in this location as well (Photos 4-5).

Area B

The second area, Area B, was a tank farm which had been previously utilized for the storage of diesel fuel which supplied a power generating facility. Area B is located near the western edge of the village along Skiff Lane (see Figures 2 and 4). For the purpose of this report, Area B is bounded by Skiff Lane to the west, a gravel roadway to the north which connects Skiff Lane to Old Village Road, a vegetated hillside to the east, and an old trailer building to the south. Area B is mostly surrounded by shrubby vegetation intermixed with small to medium size alder and spruce trees

A total of four above ground storage tanks were observed in this area. Two of the tanks were contained within an area surrounded by a plastic-lined earthen berm (Photo 11). Measurements of these tanks indicate a gross capacity of 10,000 gallons each. The other two AST's were located outside the southern limits of the containment berm. These tanks had an estimated gross capacity of at least 2,500 gallons. These tanks reportedly had been previously utilized for the storage of used oil. Both of these tanks had been built on wooden cribs above the ground surface. At the time of the site visit, one of the crib structures was observed to have partially collapsed with a portion of the

tank resting on the ground surface (Photo 12). The age of these tanks is not known, but it has been estimated that they had not been used for more than a decade.

Field screening was conducted surrounding the north, west, and south sides of Area B, surrounding the AST's. Due to dense vegetation and the apparent slope of the hillside, the eastern edges of Area B were not screened. The soil screening samples were collected outside of the containment berm surrounding the two 10,000 gallon AST's. Standing water was observed over much of the area contained within the berm. Two screening samples were also collected from inside of the bermed area at locations where standing water was not present. Additional soil screening samples were collected west and south of the 2,500 gallon AST's located outside of the bermed area.

Soil screening samples were collected from a total of eleven locations within Area B. A total of one soil sample was collected from Area B for POL characterization through laboratory analysis. The field screening and soil sample collection locations are shown on Figure 4 and results are summarized in Tables 1 and 2. PID and hot water sheen test results indicate the presence of POL contaminants in this area and sheen was observed on the water surface within the bermed area. However, this sheen could not be readily differentiated between old POL or biogenic sheen. Olfactory evidence of POL contaminants was observed in several locations south of the two 2,500 gallon ASTs.

Area C

The third area, Area C, was located on an undeveloped portion of a vacant lot within the village as shown on Figure 2. Area C was comprised of an open lot on the east side of Copper Mt. Street, immediately north of the VPSO office (Figure 5). No evidence of previous development was observed at the assessed area. However, remnants of a small structure were observed along the western border of the lot adjacent to Copper Mt. Street. According to personnel from Tatitlek Environmental, a derelict structure approximately 12 feet by 16 feet had been abandoned for several decades and been removed from this portion of the lot within the past year.

The ground surface at Area C was generally flat and covered in low growing tundra vegetation (Photos 13 and 14). Standing water was encountered at a depth of approximately 10-12 inches below the ground surface. No olfactory or PID evidence of POL contamination was noted during the screening effort. Biogenic hydrocarbon odors were observed in the samples collected from this area. Visual evidence of what appeared to be biogenic hydrocarbons were also noted upon the water surface at each sampling location as well as during the sheen testing of the soil samples.

A total of three field screening samples and one laboratory sample were collected within Area C. The field screening and soil sample collection locations are shown on Figure 5 and results are summarized in Tables 1 and 2.

5.0 LABORATORY RESULTS

A total of four soil samples, one from each of the three areas and a field duplicate, were collected for laboratory analysis during the project effort. The laboratory samples were delivered to SGS Environmental Services in Anchorage, Alaska for analysis. Field details of the sampling efforts are described in Section 4, while the results and discussion of the three project areas are included in Section 6. Summaries of the laboratory results are presented in Table 2, in Appendix 2 and the samples at each location are described below.

5.1 Results Summary

The sample (and duplicate) collected within Area A did not contain detectable concentration of GRO or BTEX contaminants at or above the laboratory practical quantitation limit (PQL). The sample (and duplicate) had DRO concentrations exceeding the ADEC Method 2 cleanup level while the RRO concentrations were above the PQL, but were below the ADEC Method 2 cleanup level.

The sample collected within Area B did not contain detectable concentration of GRO or BTEX contaminants at or above the laboratory PQLs. The DRO and RRO concentrations each exceeded the ADEC Method 2 cleanup level.

The sample collected within Area C did not contain detectable concentration of GRO or BTEX contaminants at or above the laboratory PQLs. The DRO concentrations exceeded the ADEC Method 2 cleanup level, while the RRO concentration at this location was above the PQL but below the ADEC Method 2 cleanup level.

5.2 Quality Assurance and Quality Control

Quality control analysis indicates that the soil samples were valid as defined in the ADEC UST Manual and Standard Sampling Procedures (SSP). One pair of duplicate samples was collected at the same time from the same location during the soil sampling event. TE06-01-18 is a field duplicate of TE06-01-05 and was analyzed for GRO, DRO, RRO, and BTEX. These samples meet the requirement for one field duplicate sample per every ten assessment samples.

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 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%.

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 RPD results for the duplicate pair are within the range indicated in the SSP for the analytical methods.

The laboratory PQL for benzene exceeded the cleanup level in each of the four samples, however the method detection limit (MDL) was below the cleanup level and benzene was not detected above the MDL in any of the four samples. Review of the detection limits with the laboratory indicated that the percent solids for each of the samples was less than 50% due to the high moisture and natural organic content of the sampled material. This provides an additional line of evidence that the soil at each location is highly organic and has a significant biogenic contribution to the DRO and RRO concentrations reported by the laboratory.

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

6.0 ANALYSIS AND DISCUSSION

NORTECH has completed the field screening and preliminary site characterization of two diesel contaminated sites and a control site in Tatitlek, Alaska. This work was completed in general accordance with the approved QAPP and other project documents.

6.1 Area A

Visual, olfactory, and field screening results indicated the presence of POL contamination at this site. The extent of contamination was assessed primarily to the west of the tanks. This was the evident downslope direction, and was consistent with the direction of surface water flow observed at this area. Strong petroleum hydrocarbon odors were noted in several of the soil samples collected in close proximity to the tanks. Slight to moderate hydrocarbon odors were noted in all of the samples. Generally speaking, the odors diminished with distance away from the tanks and at some locations it was not possible to differentiate between biogenic hydrocarbon odors and petroleum hydrocarbon odors. However, sheen test field screening was used to differentiate between POL and biogenic hyrocarbons. Each sample showed some

evidence of sheening and several of the samples showed clear indications of POL sheening, and others indicated the presence of biogenic hydrocarbons. In addition, numerous samples showed characteristics of both POL and biogenic sheen. While the field screening was considered adequate to obtain a general sense of the contamination within Area A, the field screening effort was limited by site features such as flowing water and the contamination is expected to extend beyond the limits of field screening shown in Figure 3.

The presences of DRO and RRO were confirmed in the near surface soil of Area A through laboratory analysis. The DRO concentration in sample TE06-01-05 exceeded the ADEC Method 2 Cleanup Level, while the RRO concentration was below the cleanup level. GRO and BTEX contaminants were not detected in the sample and are no longer considered contaminants of concern in this area. Future laboratory work should be limited to DRO and RRO. Laboratory quantification of the biogenic contribution to the DRO and RRO results is recommended for future laboratory samples.

Due to the close proximity of this site to the new generator building and associated fuel storage systems, the extent the contamination in Area A associated with past and present fuel storage and handling practices is difficult to discern. Numerous drums were observed in the vicinity of the new AST north of the new generator building and surface staining was evident surrounding the drums. In addition, visual observations of surface staining on the shot rock pad beneath/adjacent to the new generator building, and the free product hydrocarbons observed on the water surface where the water emanates from beneath this pad, conclusively demonstrate an ongoing source of POL contamination in this area. Additional investigation is necessary to document the sources of contamination in this area so that these can be stopped and the remediation strategy ultimately selected for the area is effective.

The contamination within Area A is most likely the result of both past fuel storage (the four tanks that are no longer in use) and the ongoing fuel storage and handling practices associated with the generator. However, the data generated during the field investigation is inadequate to positively identify the originating source(s) of DRO contamination, and/or the relative contributions each source may have contributed. The strong olfactory odors and relatively high PID readings (in excess of 200 ppm) observed at several locations within Area A, suggest more recent fuel releases. The laboratory analysis report indicated the presence of weathered middle distillates. This is consistent with the historic reporting of POL leaks from the older tanks, although the climate in this area of Alaska is expected to quickly remove the more volatile compounds from diesel fuel and produce the weathered middle distillate comment from the laboratory.

6.2 Area B

Soil screening samples were collected primarily down slope surrounding the four ASTs at this location. Sampling locations were limited in the vicinity of the ASTs due to dense vegetation and saturated surface conditions. Moderate POL odors were noted in soil screening samples collected in the vicinity of the former waste oil storage tanks. The highest field screening results were found in this area as well. The extent of contamination within Area B was not fully delineated during this field effort due to physical site limits and time constraints.

DRO and RRO contamination of the near surface soil environment was confirmed in Area B through laboratory analysis. Both DRO and RRO contaminant concentrations in sample TE06-02-08 were in excess of the ADEC Method 2 Cleanup Levels.

The contamination at Area B appears to be, in part, related to the historic waste oil storage activities reported to have taken place in this area. This is evidenced by the laboratory analysis which indicated RRO contaminants consistent lube oil. DRO contamination was also encountered at this area as well, but the source of the DRO contamination may be related to the waste oil tanks, the larger fuel oil tanks, the former generator building or some other unidentified source. Additional source identification and surface delineation is necessary in this area prior to considering potential remediation strategies for this area.

6.3 Area C

Area C was chosen to be a control site because it was free of large vegetation, standing surface water, and above ground structures. In addition, Area C is located within the developed portion of the village and in close proximity to Area A, but not within the area of potential contamination migration from Area A. No reported historic information indicated that potential presence of POL contamination at this site. The soil surface was wet tundra and standing water was encountered at a depth of approximately 10-12 inches below the ground surface. A biogenic hydrocarbon odor was observed in each of the soil samples collected at this area. No POL odors were noted in the field screening or laboratory samples collected from Area C.

The DRO concentration in sample TE06-04-02 was in excess of the ADEC Method 2 Cleanup Levels. The RRO concentration was above the detection limit, but below the cleanup level. As this area was not expected to be contaminated, the delineation efforts in Area C were not adequate to determine the extents of the contamination. The DRO and RRO concentrations in this area were lower than other areas and may represent the biogenic component of the highly organic soils.

6.4 Summary

Field screening, particularly hot water sheen testing, indicated the presence of non-petroleum related hydrocarbon compounds in many of the field screening samples. In addition, a "swamp gas" odor was evident in most sample locations. This is consistent with wet tundra areas, especially in boggy terrains where sphagnum moss (peat) is present. The anaerobic decomposition within this area produces abundant biogenic hydrocarbons.

The laboratory results from soil samples collected during this investigation revealed DRO contamination in concentrations exceeding the ADEC Method 2 Cleanup Level at each of the three areas tested. Additionally, RRO was detected in each of the samples, but the RRO concentrations only exceeded the ADEC Method 2 Cleanup Level at Area B. GRO and BTEX were not detected in any of the samples at or above the laboratory PQL. However, the laboratory analyses utilized during this investigation does not provide segregation of biogenic hydrocarbons from petroleum derived hydrocarbon compounds. Therefore, it is not possible to discern the proportion of RRO and/or DRO contamination contributed by petroleum hydrocarbons versus the biogenic hydrocarbon source utilizing the available data set.

In addition to the biogenic hydrocarbon issues that may be present at the three sites, the sources of petroleum hydrocarbons were not specifically identified. The extent of contamination and quantity of observable product in some areas indicates that diesel releases are significantly more recent than the last reported uses of the tanks 10 to 30 years ago. In fact, surface staining adjacent to Area A suggests that current petroleum handling practices may still be releasing fuel that is migrating through the gravel pad and out into Area A. Future investigations need to be expanded to identify as assess other potential sources as well as attempt to delineate the horizontal and vertical extents of the contamination. Additionally, future investigations should identify and attempt to assess the potential unintended consequences of possible remediation strategies, such as channeling through the tundra due to excavation.

7.0 CONCLUSIONS AND RECOMMENDATIONS

NORTECH has completed field screening and contaminant characterization during the preliminary site assessment conducted at three locations in Tatitlek, Alaska. Based on the activities completed at the sites, ***NORTECH*** has developed the following conclusions:

- The various field screening methods indicated the probable presence of hydrocarbon compounds at the three areas and are considered effective when used together
- Biogenic hydrocarbons were identified through field screening techniques at all three project areas

- DRO concentrations exceed the ADEC Method 2 Cleanup Level at all three project areas
- RRO contaminants were confirmed through laboratory analysis to be present at all three project areas, but only exceed the ADEC Method 2 Cleanup Level at Area B
- GRO and BTEX contaminants were not detected in the four samples and are not considered contaminants of concern in the areas tested
- The contamination observed in some areas appears more recent than the last reported storage of petroleum products in the tanks that were expected to be the sources
- Relatively recent petroleum contamination at Area A appears to be at least partly related to poor fuel management practices at the adjacent generator complex
- Petroleum contamination within Tatitlek does not appear to be limited to those areas with bulk storage of petroleum products

Based on the findings of this investigation, ***NORTECH*** provides the following recommendations:

- Improve the fuel handling, storage, and transfer practices within Tatitlek and particularly at the new generator complex, including secondary containment and regular inspections as necessary
- Identify a control site outside of the Village that is known to be free of petroleum contamination to evaluate the natural DRO/RRO concentrations of the soil in the area
- Utilize specific laboratory methods to differentiate biogenic and petroleum DRO and RRO concentrations during future assessment activities
- Conduct a comprehensive site assessment investigation at each of the project areas. This investigation should include the following:
  - Near surface soil screening and sampling to define the extent of contamination at each project area, including areas which may have been contaminated by surface flow over embankments
  - Surface water and/or near-surface groundwater sampling and analysis to characterize the extent of dissolved contamination
  - Sub-surface soil sampling (beneath the tundra) to assess the vertical migration of contaminants at each project area

8.0 LIMITATIONS

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 the owner. 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. It is recommended that the owner or operator of the property maintain a copy of this report as a record. ***NORTECH*** has performed the work, made the findings, and proposed the recommendations described in this report in accordance with generally accepted environmental engineering practices.

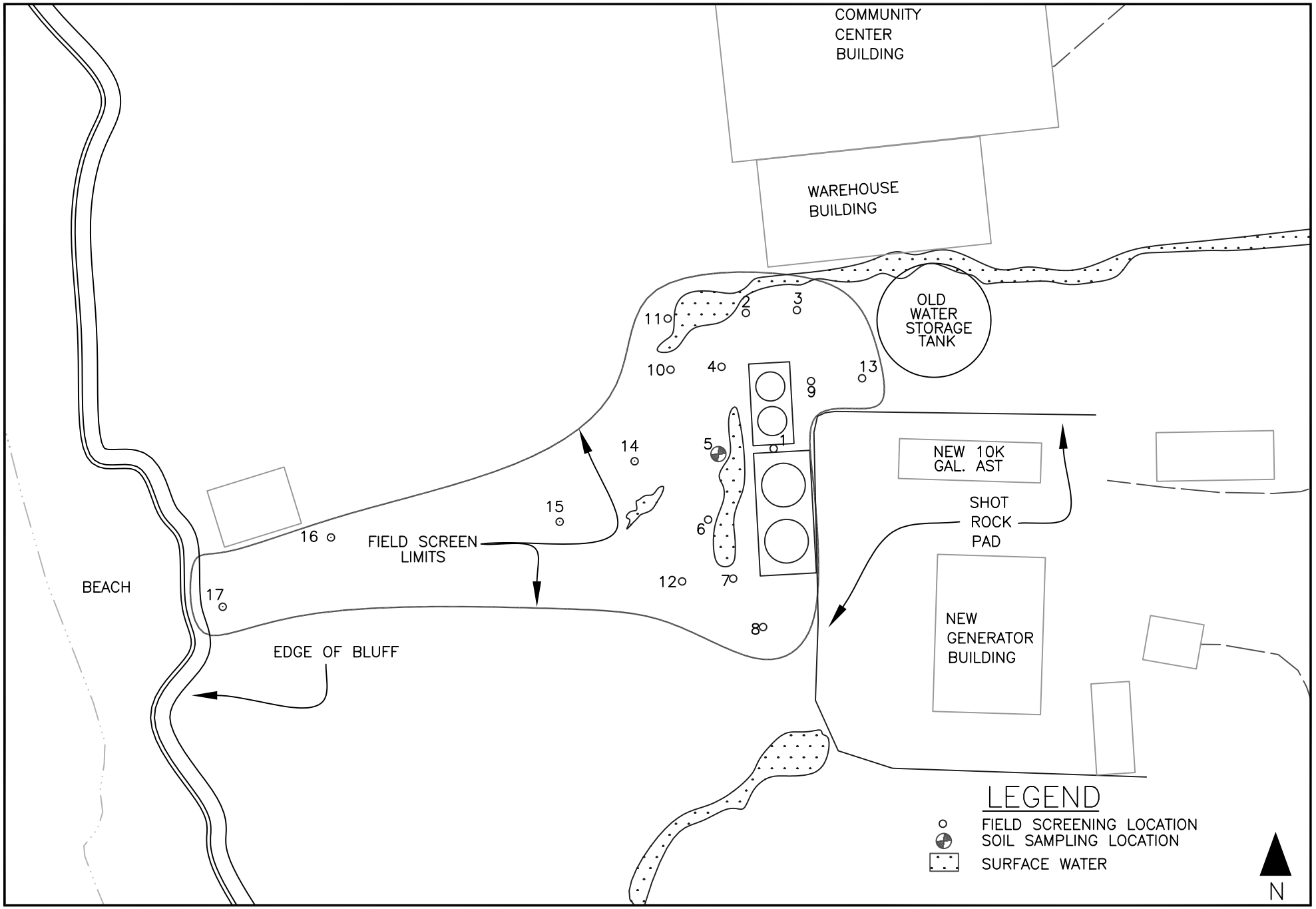
9.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

Ronald Pratt, Environmental Scientist for ***NORTECH,*** has a B.S. in Geography and Masters in Environmental Studies. He has extensive experience conducting environmental assessments, hazardous materials investigations, remedial investigations, and other environmental fieldwork throughout California, Washington, and Alaska.

Ronald J. Pratt
Environmental Scientist

Peter Beardsley, PE, Environmental Engineer, 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 the applicable regulatory requirements.

Peter Beardsley, PE
Environmental Engineer



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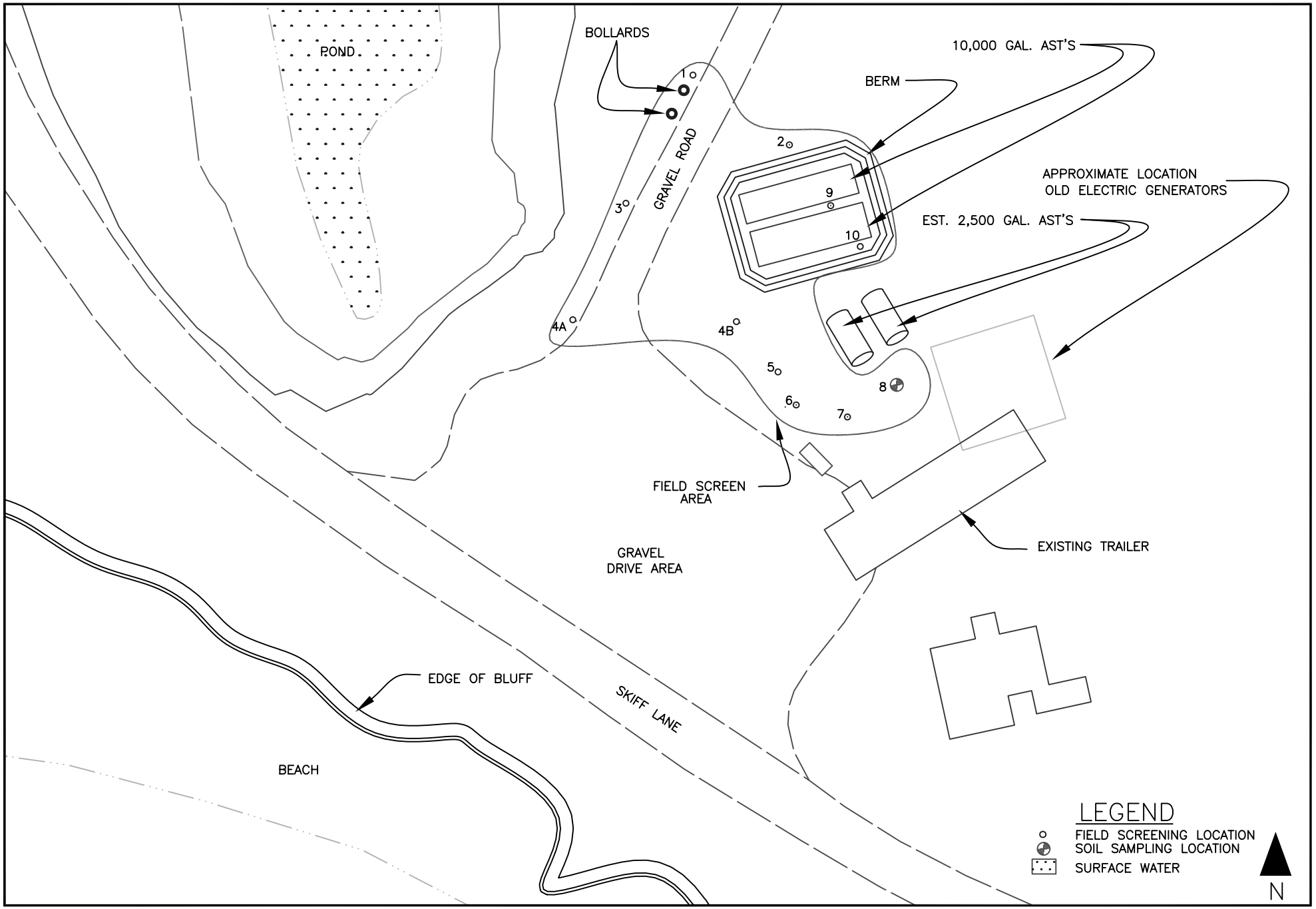
Field Screening Locations Area A
Diesel Contamination Site Characterization
Tatitlek, Alaka

DATE: 08/12/06	SCALE: 1" = 25'
DESIGN: PLB	PROJECT: 06-1035
DRAWN: RJP	DWG: 061035(05)

FIGURE 3



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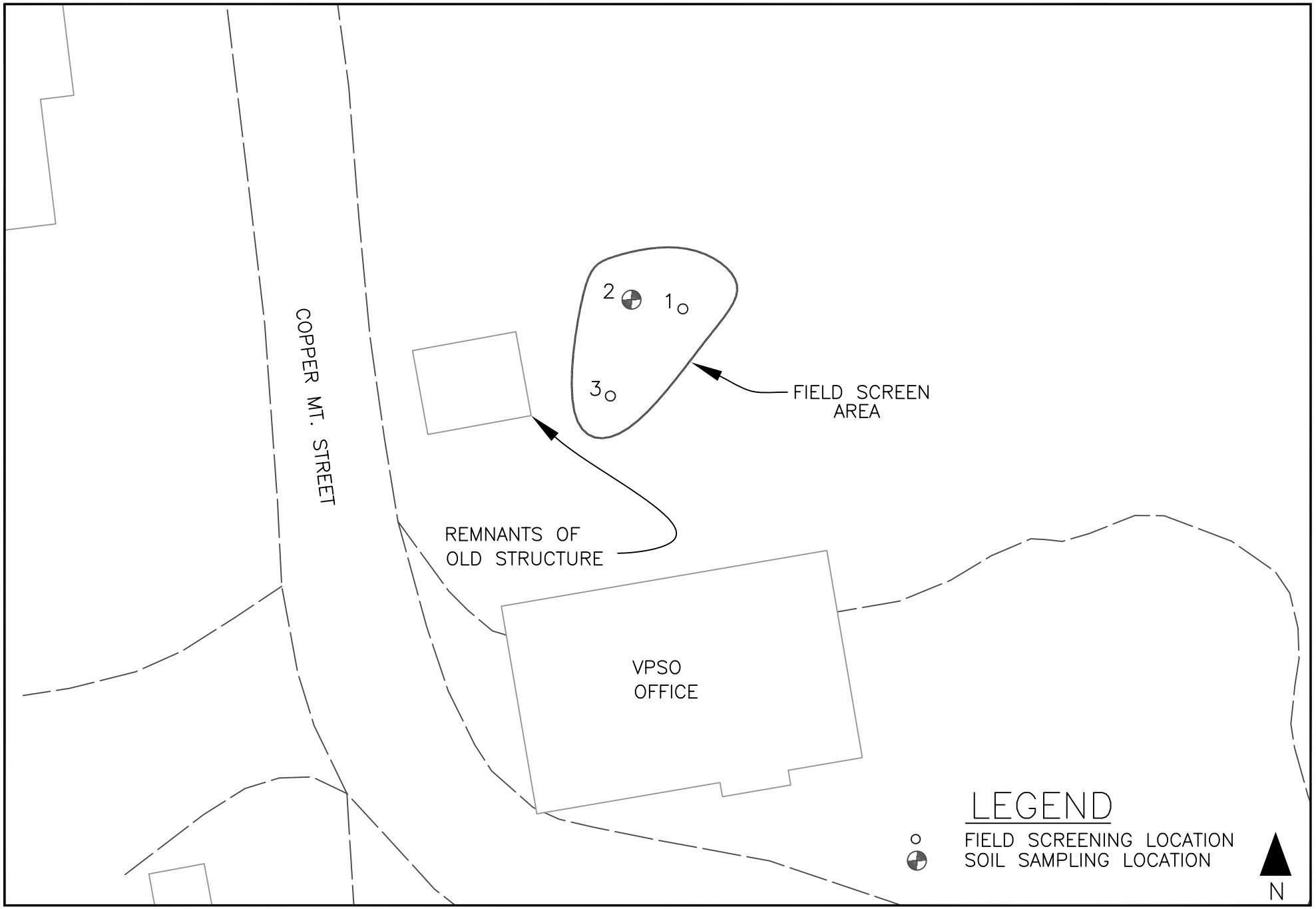
Field Screening Locations Area B
Diesel Contamination Site Characterization
Tatitlek, Alaka

DATE: 08/14/06	SCALE: 1" = 30'
DESIGN: PLB	PROJECT: 06-1035
DRAWN: RJP	DWG: 061035(06)

FIGURE 4



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Field Screening Locations Area C
Diesel Contamination Site Characterization
Tatitlek, Alaka

DATE: 08/12/06	SCALE: 1" = 20'
DESIGN: PLB	PROJECT: 06-1035
DRAWN: RJP	DWG: 061035(07)

FIGURE 5

Table 1
Field Screening Sampling Summary Results
Native Village of Tatitlek Preliminary Site Characterization

Screening Method		HIIO before Agitation		HIIO after Agitation		PID	
Project Area	Sample ID	Quantity Code	Quality Code	Quantity Code	Quality Code	ppm	Olfactory Observations
Area A	GT 1	HS	Dull	HS	Dull & Waxy	29.2	Faint POL odor
Area A	GT 2	MS	Dull	HS	Dull & Waxy	26.5	Faint POL odor
Area A	GT 3	Trace	Dull & Waxy	Trace	Dull & Waxy	0	Hydrocarbon Odor
Area A	GT 4	MS	Grey	HS	Grey	226	Strong POL odor
Area A	GT 5	HS	Grey	HS	Grey	242	Strong POL odor
Area A	GT 6	SS	Dull & Waxy	MS	Dull & Waxy	89.6	Moderate POL odor
Area A	GT 7	SS	Waxy	SS	Waxy	0	Hydrocarbon Odor
Area A	GT 8	MS	Dull/Grey	HS	Dull/Grey	171	Moderate POL odor
Area A	GT 9	MS	Grey (hint blue)	HS	Grey	218	Strong POL odor
Area A	GT 10	Trace	Waxy	Trace	Waxy	1.8	Hydrocarbon Odor
Area A	GT 11	Trace	Waxy	Trace	Waxy	4.4	Hydrocarbon Odor
Area A	GT 12	Trace	Waxy	Trace	Waxy	15.2	Hydrocarbon Odor
Area A	GT 13	Trace	Waxy	Trace	Waxy	11.6	Hydrocarbon Odor
Area A	GT 14	MS	Dull/Grey	HS	Dull/Grey	115	Moderate POL odor
Area A	GT 15	MS	Dull/Grey	HS	Dull/Grey	NA	Moderate POL odor
Area A	GT 16	SS	Dull	MS	Dull & Waxy	36.3	Faint POL odor
Area A	GT 17	SS	Dull	MS	Dull & Waxy	32.7	Faint POL odor
Area B	PP 1	Trace	Silty/Dull	Trace	Silty/Dull	3.8	No odor
Area B	PP2	Trace	Silty/Dull	SS	Silty/Dull	4	No odor
Area B	PP 3	Trace	Silty/Dull	Trace	Silty/Dull	4.3	No odor
Area B	PP 4a	Trace	Silty/Dull	SS	Silty/Dull	3.8	No odor
Area B	PP 4b	Trace	Silty/Dull	Trace	Silty/Dull	4.4	No odor
Area B	PP 5	Trace	Silty/Dull	Trace	Silty/Dull	4.8	Hydrocarbon Odor
Area B	PP 6	Trace	Silty & Waxy	Trace	Silty & Waxy	4.1	Hydrocarbon Odor
Area B	PP 7	SS	Dull w/ hint colors	HS	Dull w/ hint colors	14.1	Moderate POL odor
Area B	PP 8	HS	Dull w/ hint colors	HS	Dull w/ mod. colors	22.8	Moderate POL odor
Area B	PP 9	Trace	Dull	Trace	Dull	3.7	Faint POL odor
Area B	PP 10	Trace	Dull	SS	Dull	3.9	Faint POL odor

Screening Method		HIIO before Agitation		HIIO after Agitation		PID	
Project Area	Sample ID	Quantity Code	Quality Code	Quantity Code	Quality Code	ppm	Olfactory Observations
Area C	CS 1	Trace	Waxy	Trace	Waxy	6.4	Hydrocarbon Odor
Area C	CS 2	Trace	Waxy	Trace	Waxy	13.6	Hydrocarbon Odor
Area C	CS 3	Trace	Waxy	Trace	Waxy	14.2	Hydrocarbon Odor

SHADE	Laboratory sample collection locations
NA	Not analyzed

Key to HIIO Quantity Codes

TNTC	No HIIO effect; exceeds Upper Iridescent Limits (UIL), globules
HS	HII effect dimished due to excessive impact 90+% coverage
MS	50% coverage
SS	20% coverage
Trace	< 20% coverage

Key to HIIO Quality Codes

Dull	No, color, showing weathered effects, loss of lower ends
Silty	HII dull w/ mineral appearance, often seen w/ glacial silt
Waxy	Tiny flakelettes retain shape upon gentle digital coriolitic mixing, not TPH
Fresh	Iridescent brilliant, w/ streaks, often temporal
Blue, Red	Colors as indicated, strong, faint, indicates GRO
Grey	DRO in emulsion
Odors	Aromatics

TABLE 2
Soil Sampling Analysis Results

Sample ID		TE06-01-05	TE06-02-08	TE06-04-02	TE06-01-18	TRIP BLANK
Matrix		Soil	Soil	Soil	Soil	Soil/Solid
Analyte	ADEC Method 2 Cleanup Level	Reporting Units mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
GRO	260	9.69U	10.1U	8.44U	9.48U	2.540U
DRO	230	**89,600**	**5,090**	**2,110**	**55,100**	NA
RRO	9,700	6,180	**12,300**	1,610	4,580	NA
Benzene	0.02	0.0485U	0.0504U	0.0422U	0.0474U	0.0127U
Toluene	4.8	0.194U	0.202U	0.169U	0.190U	0.0508U
Ethylbenzene	5	0.194U	0.202U	0.169U	0.190U	0.0508U
Total Xylenes	69	0.194U	0.202U	0.169U	0.190U	0.0508U
Laboratory Comments		DRO & RRO WMD	DRO WMD RRO LO	DRO WMD RRO UH	DRO & RRO WMD	

U	Analyte not detected at the listed detection limit
NA	Analyte not analyzed for
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
WMD	The Pattern is consistent with a weathered middle distillate
LO	The Pattern is consistent with a lube oil
UH	Unknown hydrocarbon with several peaks is present

Quality Control Summary

Sample ID	TE06-01-05	TE06-01-18	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
GRO	ND	ND	NA	NA	NA
DRO	896,000.00	55,100.00	72,350.00	-34,500.00	**-48%**
RRO	6,180.00	4,580.00	5,380.00	-1,600.00	**-30%**
B	NA	NA	NA	NA	NA
T	NA	NA	NA	NA	NA
E	NA	NA	NA	NA	NA
X	NA	NA	NA	NA	NA

NA	The calculation is not applicable.
RPD	Relative percent difference

Appendix 3 - Photo Log

PHOTO 1 Old Tanks at Area A looking northwest. Generator complex "shot rock" pad in forground.

PHOTO 2 Old Tanks at Area A looking southeast. New 10,000 Gal AST and generator building in background.

Appendix 3 - Photo Log

PHOTO 3 New 10,000 Gal AST and generator building looking south east from edge of old tanks.

PHOTO 4 New 10,000 Gal AST and generator building in background looking west. Note drums near the AST

Appendix 3 - Photo Log

PHOTO 5 New generator building looking west. Note 2,000 Gal. vaulted AST in forground.

PHOTO 6 Surface conditions at Area A. Note standing water.

Appendix 3 - Photo Log

PHOTO 7 Screening location 17 at Area A looking west. Note proximity to edge of bluff and near surface water in shallow pit.

PHOTO 8 Standing water east of Area A. Note biogenic sheen present on water surface.

Appendix 3 - Photo Log

PHOTO 9 POL contamination of surface water emenating from beneath southwest corner of shot rock pad at generator complex.

PHOTO 10 Area of stressed vegetation down gardient from southwest corner of shot rock pad at generator complex.

Appendix 3 - Photo Log

PHOTO 11 10,000 Gal. AST's at Area B looking looking east.

PHOTO 12 Former Waste Oil AST's at Area B looking looking northwest.

Appendix 3 - Photo Log

PHOTO 13 Screening Sample from Area C typifying wet tundra conditions with moss at surface and high organic soil beneath.

PHOTO 14 Control site (Area C) looking east-southeast, with VPSO building in background.