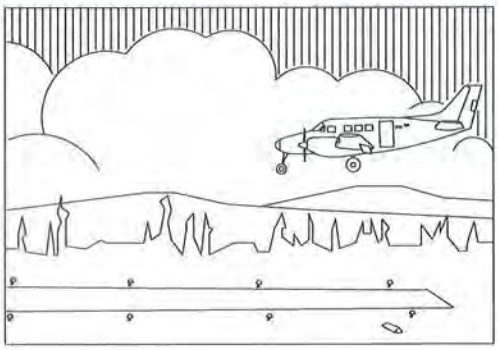
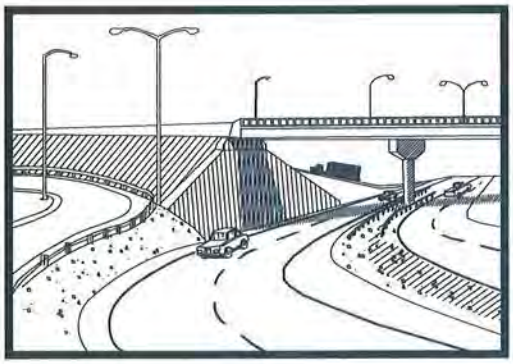
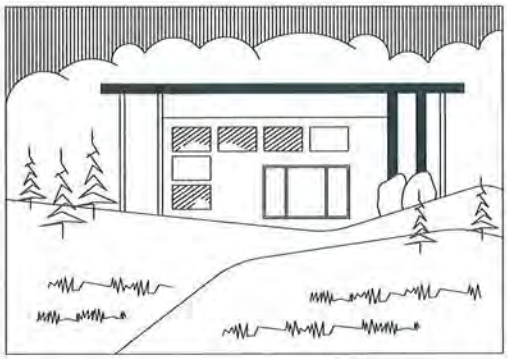
GEOTECHNICAL REPORT

KIANA AIRPORT IMPROVEMENTS PROJECT

AKSAS 63179

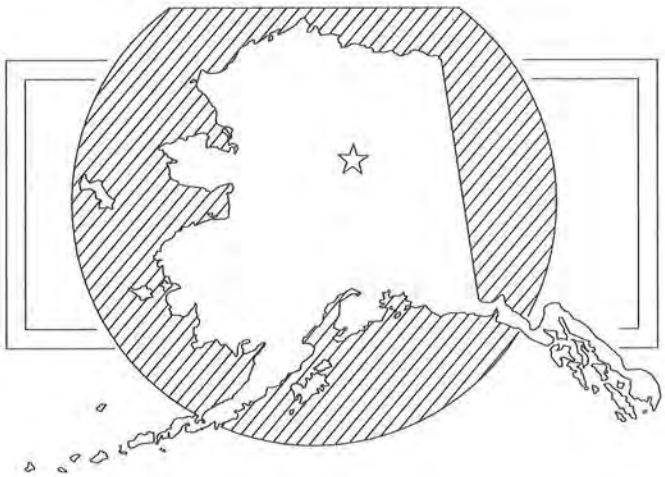






STATE OF ALASKA

Department of Transportation and Public Facilities



NORTHERN REGION

APRIL 2013

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GEOTECHNICAL REPORT
KIANA AIRPORT IMPROVEMENTS
AKSAS NUMBER: 63179
APRIL 2013

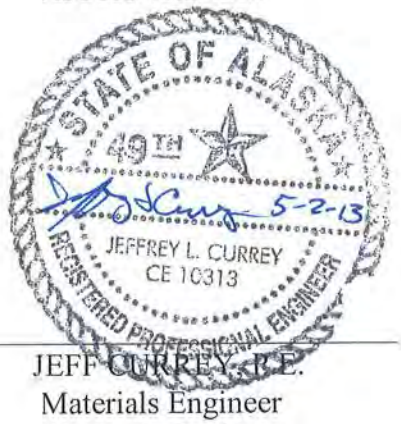
PREPARED BY:

TIM WEISS
Engineering Geologist II
Northern Region

REVIEWED BY:

STEVE MASTERMAN
Regional Engineering Geologist
Northern Region

APPROVED BY:



JEFF CURREY, P.E.
Materials Engineer
Northern Region

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GEOTECHNICAL REPORT
KIANA AIRPORT IMPROVEMENTS
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Summary

The Alaska Department of Transportation and Public Facilities (ADOT&PF) Northern Region design engineers are evaluating alternatives for expansion or improvements to the Bob Baker Memorial Airport in Kiana, (Figure 1). Potential runway alternatives include:

- (Runway option 1), extending the current runway to the west approximately 800 feet, and adding an aircraft parking apron to the southwest of the existing runway.
- (Runway option 2), moving the entire runway north and parallel to the existing runway, and adding an aircraft parking apron to the northeast of the existing runway.
- (Runway option 3), rotating the west end of the existing runway north and extending approximately 1,000 feet west, and adding similar aircraft parking apron as option 2.

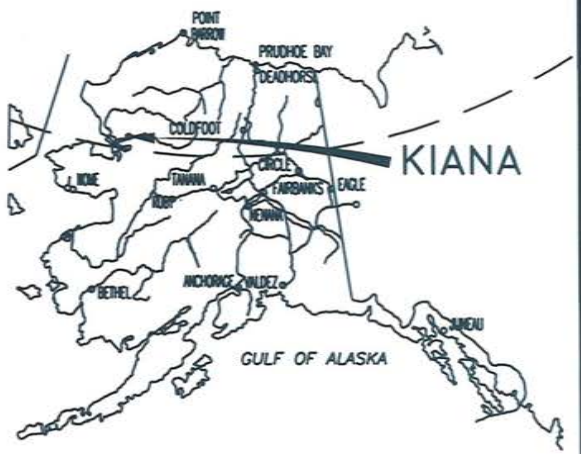
To supply this project and future material source needs to the community, we estimate approximately 700,000 cubic yards of material is needed. To assist with evaluation and planning, Northern Region Materials Section (NRMS) personnel conducted a geotechnical investigation with drilling explorations for the following:

- The three proposed airport runway expansion options.
- Two proposed aircraft parking apron areas.
- Material source (MS) approximately 2.5 miles northwest of the airport; site (MS A-1).
- Potential borrow area to the west of the existing airport runway; site (MS A-6).

Results from this investigation are:

- Runway option 1, extending the existing runway to the west approximately 800 feet is, from a geotechnical perspective, the best expansion option.
- The parking apron to the southwest, as part of runway option 1, is the best geotechnical option.
- Material source (A-1) to the northwest of the airport is estimated to contain gravel and sandy borrow, sufficient to supply material needed for the project.
- The proposed borrow site (A-6), west of the airport is unattractive as a borrow source as frozen silt with excess moisture is dominant.

This report will initially present the results of the airport geotechnical investigation. Each of the three potential runway options will be presented separately in the appropriate section. The material source reconnaissance and investigation will then be discussed, and lastly the test hole logs and laboratory test results are presented at the end of the report.



LOCATION MAP

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

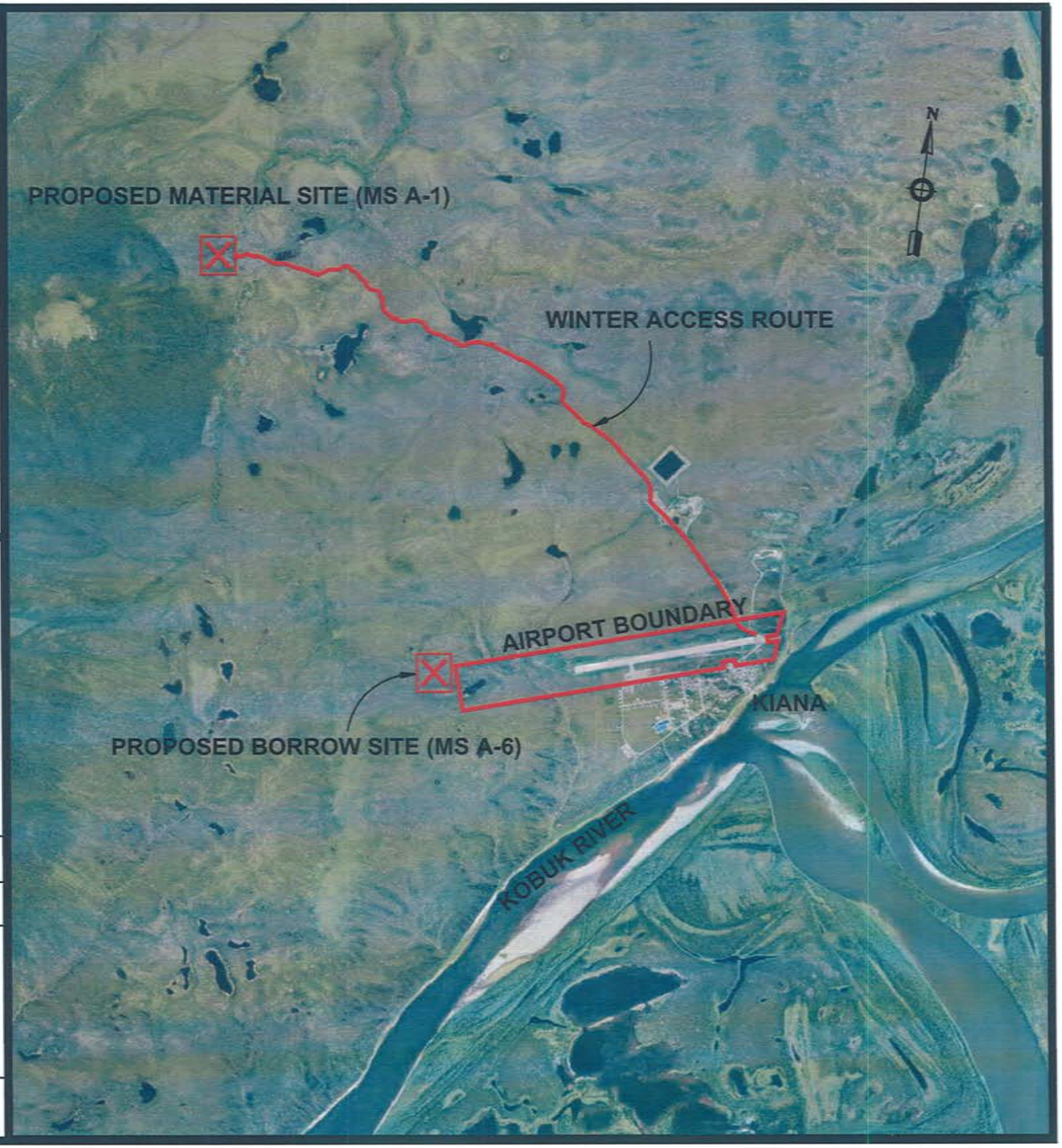
ENGINEERING GEOLOGY UNIT

KIANA AIRPORT IMPROVEMENTS

DATE: 6/12 PROJECT No. 63179

VICINITY MAP
PROTRACTED T18N, R8W
KATEEL RIVER MERIDIAN
USGS SELAWIK (D3), ALASKA

FIGURE 1



Introduction

This report documents physical site conditions and subsurface geotechnical conditions, provides interpretation of anticipated site conditions, and recommends design and construction criteria for the project. This report is intended to serve as a geotechnical guide during project design and a geotechnical reference during construction.

The purpose of this project and the geotechnical investigation presented here is to improve safety and efficiency at the Kiana Airport. Kiana is often supplied by air freight making the airport essential to the community. The current runway length does not support fully loaded larger aircraft. In addition, the existing runway's deteriorating surface causes operational problems that result in frequent closures during the spring breakup due to soft conditions from poor drainage.

The Bob Baker Memorial Airport (IAN) in Kiana is approximately 3,400 foot long and 100 foot wide gravel runway with 270 foot overruns, located 1 mile north of the village of Kiana at N66°58.56' and W160°26.19' at 166 feet above mean sea level. The runway is oriented 60 degrees northeast and 240 degrees southwest, and is elevated above natural terrain at both ends.

The airport expansion or improvement geotechnical field investigation was conducted from July 19th thru 26th, 2011. A total of 36 test holes (TH) were drilled as part of this investigation;

- Twenty-seven test holes drilled for the three proposed runway options; six holes for runway option 1, 15 for option 2, and six for option 3.
- Nine test holes drilled for two proposed new aircraft parking apron locations. Two holes drilled northeast of the airport, and seven drilled southwest.
- We collected 80 soil samples from the test hole locations.

Field work and access was coordinated with the Alaska Department of Natural Resources, NANA Regional Corporation, and the village of Kiana.

Physical Setting

Location

Kiana is an Inupiat village of approximately 372 people located on a bluff overlooking the confluence of the Kobuk and Squirrel Rivers, about 60 miles east of Kotzebue in northwest Alaska and within the boundaries of the Northwest Arctic Borough. Travelling to the area is by small aircraft throughout the year with scheduled flight service from Kotzebue. The Kobuk River is navigable from the end of May to early October.

Climate

The Environmental Atlas of Alaska, (Hartman, 1984) indicates the village of Kiana is located in the transitional climate zone of Alaska, characterized by pronounced temperature variations throughout the day and year. Long term climate data is not available for the Kiana area. Kotzebue airport at approximately 60 miles west of Kiana and within the same climate zone is used as a comparison. Table 1 below gives climate data for the Kotzebue Airport area. It should be noted that with Kiana 60 miles inland of the Kotzebue airport, temperatures in Kiana are probably lower in the winter and higher in the summer than the Kotzebue area.

Temperature extremes in the Kotzebue area are 85 degrees Fahrenheit during the summer and minus 52 degrees Fahrenheit during the winter. In the summer, sunset in July is approximately at midnight and sunrise is 2:30 am, while winter sunset is 3:00 pm and sunrise is 11:00 am. Wind direction is generally northwest or southeast with average speeds of 10 mph, with the average maximum speed during the summer at 35 mph and 48 mph during the winter, (Hartman, 1984).

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max. Temp. (F)	3.8	4.2	8.4	21.4	38.0	50.7	59.2	56.5	46.9	28.2	14.0	5.5	28.1
Min. Temp. (F)	-9.5	-10.2	-7.9	4.3	25.1	38.8	48.8	47.1	37.3	19.0	3.4	-7.3	15.7
Total Precip. (in.)	0.49	0.51	0.37	0.44	0.35	0.56	1.48	2.14	1.53	0.80	0.63	0.57	9.87
Total Snowfall (in.)	7.8	7.5	5.8	5.3	1.4	0.1	0.0	0.0	1.0	6.6	9.4	9.3	54.3
Snow Depth (in.)	18	21	24	22	6	0	0	0	0	1	6	12	9

Table 1: Climate Data Summary. Data for Kotzebue WSO Airport, period of Record: 9/1/1949 to 9/30/2012. Data source: Western Regional Climate Center, wrcc@dri.edu.

Figure 2 below is a graphic representation of mean annual temperatures from 1949 to 2009 for the Kotzebue Airport area. The red line is the 5 year average and the solid black line is the trend line.

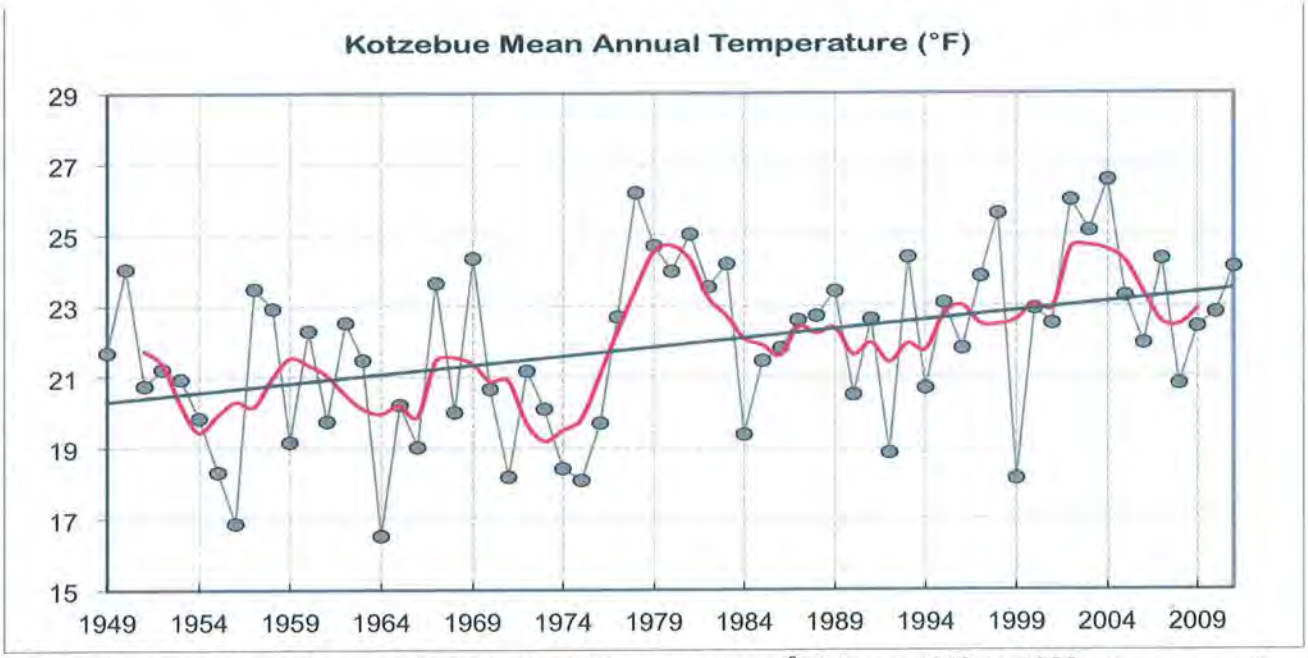


Figure 2: Kotzebue Airport Mean Annual Temperature (°F) from 1949 to 2009. Data source: The Alaska Climate Research Center, Geophysical Institute at University Alaska Fairbanks, climate.gi.alaska.edu.

The following thawing and freezing indices shown in Table 2 are for Kotzebue Airport. The thawing index, or degree-days above freezing, is a measure of thawing that occurs during the year. The thawing index listed below takes the annual thawing-degree days (TDD) for the last thirty years and averages them. The design thawing index takes the average of the three warmest (highest) TDD over the last thirty years.

Likewise, the freezing index, or degree-days below freezing, can be used to calculate the depth of ground freezing during winter. The freezing index listed below averages the annual freezing-degree-days (FDD) for the past thirty years. The design freezing index "coldest" averages the three coldest (highest) FDD for the same period. The "warmest" design freezing index averages the warmest (lowest) FDD.

No data was available for the project site, so data from Kotzebue is used to calculate the thermal indices. Kiana should be expected to have a higher thawing index and site-specific temperature data should be utilized for any thaw-depth calculations or thermal modeling.

Table 2: Thawing and Freezing Index. Kotzebue Airport, 1976 to 2005.

Thawing Index	2200 Fahrenheit degree-days
Freezing Index	5459 Fahrenheit degree-days
Design Thawing Index	2673 Fahrenheit degree-days
Design Freezing Index	6762 Fahrenheit degree-days
Freezing Index (average of warmest three annual FDDs in 30 years)	4435 Fahrenheit degree-days

Geology and Topography

The village of Kiana is located in the Western Alaska physiographic province and within the Kobuk - Selawik lowland division, (Wahrhaftig, 1965). Kiana lies in the northern portion of the Selawik topographic quadrangle and just south of the Baird Mountains quadrangle, both within the Kateel River Meridian. The Kobuk river lowlands consist mainly of sand and gravel broad river flood plains with numerous lakes and swampy terrain. The river is bordered by gravel and sand terraces 100 to 200 feet above the river level, (Wahrhaftig, 1965).

The Baird Mountains to the north of Kiana are the western end of the Southern Brooks Range fold and thrust belt. The Squirrel River drains from the Baird Mountains. The Kiana Hills to the west of Kiana are a group of low rounded hills less than 2,000 feet in elevation. The hills are underlain primarily by schist, schistose quartzite and phyllite rocks, with minor recrystallized limestone or dolomite and altered basaltic volcanic rocks, (Patton, 1968). Some of these rocks crop-out 2 to 3 miles southwest of Kiana along the north bank of the Kobuk River.

Moderately thick to thin discontinuous permafrost underlies areas of fine grained deposits. Isolated masses of permafrost occur in areas of coarse grained deposits near the river systems. Fine grained sand and silt glacial outwash cover areas above river floodplains, and comprise the majority of the material underlying the airport and village areas.

Kiana lies in an area of low seismic activity, (Figure 3), and as a result falls under Seismic Zone 2B according to The Uniform Building Code, 1997 version. The United States Geological Survey Seismic hazard map from 2007 give the area a peak ground acceleration of .10g to .20g, with a 10

percent probability of exceedance in 50 years. The mapped fault shown in red on Figure 3 is the Kobuk Fault and is mapped approximately 65 miles east of Kiana.

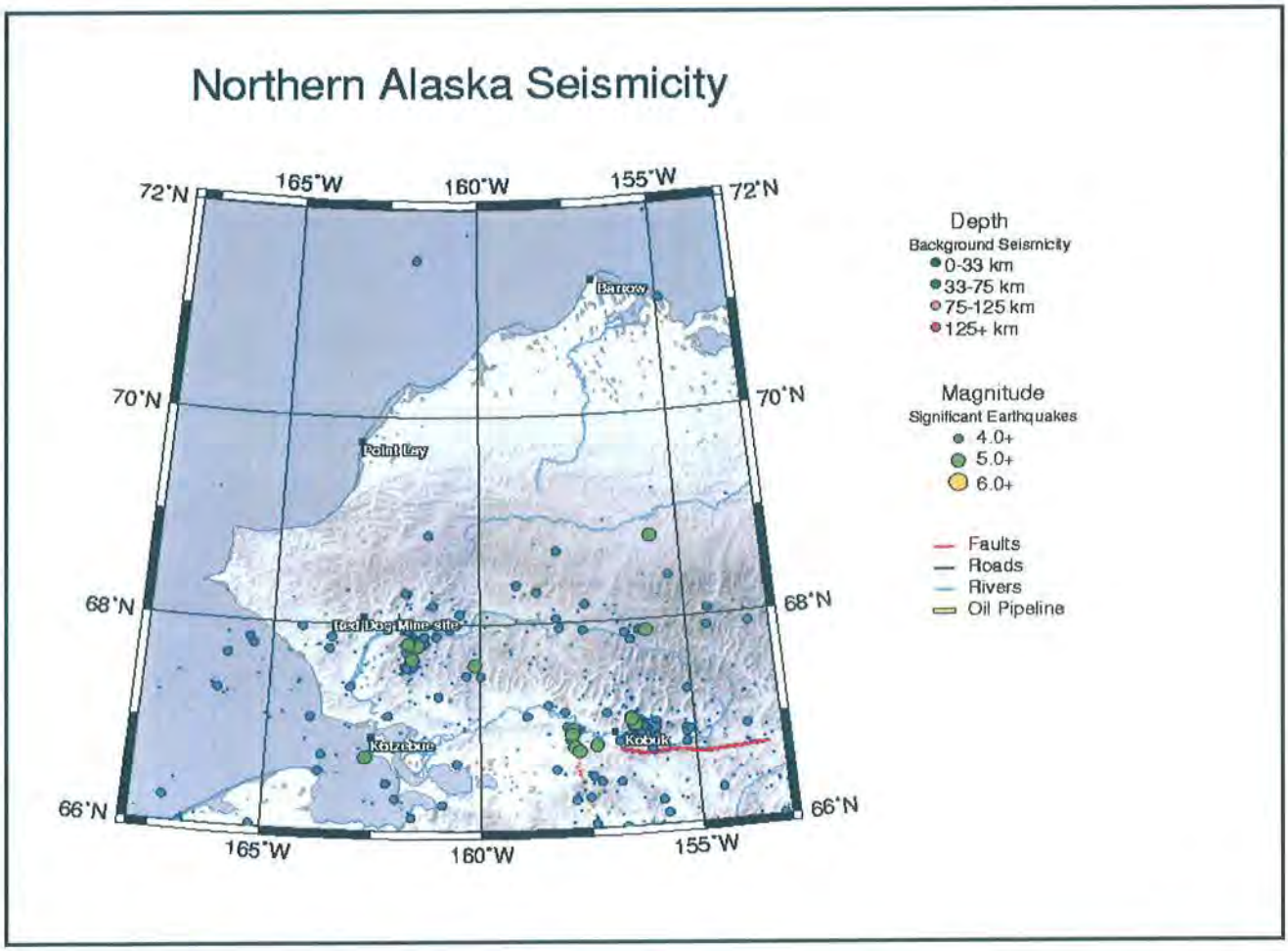


Figure 3: Northwestern Alaska Seismicity, Data from 1958 to 2003. Kiana is located in the lower center of the figure. Source: Alaska Earthquake Information Center. www.aeic.alaska.edu

Airport Field Investigation and Subsurface Findings

The airport geotechnical investigation was conducted by NRMS personnel consisting of drillers S. Parker and G. Nelson, and engineering geologist T. Weiss. A Central Mine Equipment (CME) 45B drill mounted on a Bombardier carrier was used to drill the test holes, using 6.5-inch hollow stem and 6- inch solid flight augers. Drilling and test hole conditions were logged in the field using the Unified Soil Classification System (USCS) (Appendix D). Samples were collected from auger cuttings and laboratory analysis was conducted by the Northern Region Materials Laboratory. The testing program included gradations with classification, and moisture and organic content analysis.

All test hole locations were recorded using a hand held Global Positioning System (GPS) Garmin GPS 72 model using the North American Datum (NAD) 83. The GPS has an accuracy of plus or minus 50 feet. After drilling and sample collection, all test holes were backfilled with auger cuttings with some locations containing a small mound of excess material.

Proposed Runway Option 1

Proposed alternatives to expand the existing runway include Option 1. This option involves extending the current runway approximately 800 feet to the west, and building a 500 by 350 foot new aircraft parking apron with access ramp at the southwest corner of the existing runway, (Figure 4).

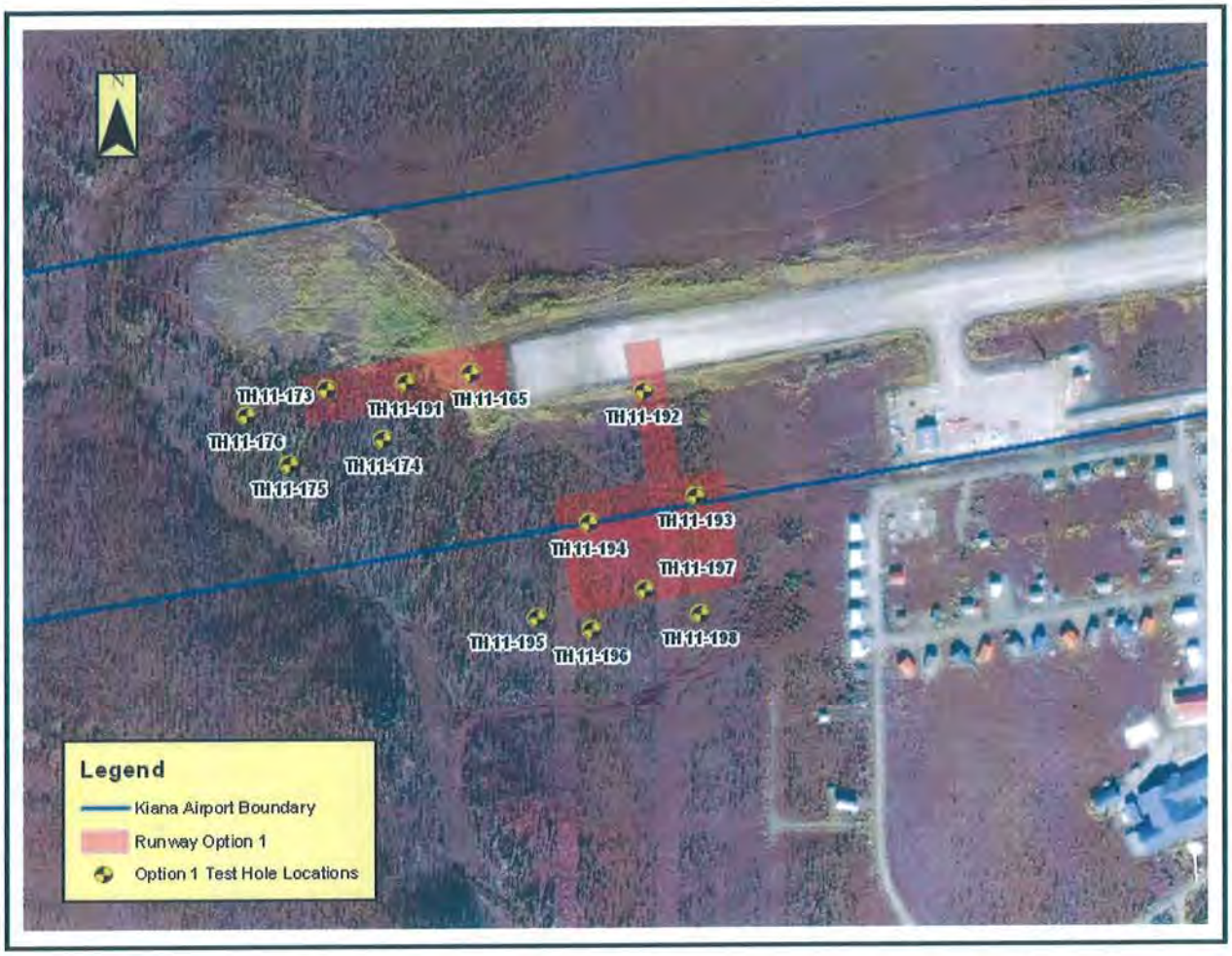


Figure 4: Proposed Runway Option 1, with Test Hole Locations. Some test holes drilled beyond planned extension in proposed fill slope areas.

We drilled 13 test holes for runway Option 1 and these holes ranged from 15 to 30 feet in depth. Some test holes shown in Figure 4 were located near proposed fill slope areas, assuming deep fills to construct the runway extension and parking apron.

The area west of the existing runway is mostly undisturbed tundra with thin to moderately thick black spruce up to 1 foot in diameter. The area slopes moderately to the west and is approximately 13 to 60 feet below the runway elevation.

An All Terrain Vehicle (ATV) trail exists at the fill slope toe of the western end of the existing runway. This area and 100 feet west, is disturbed ground covered with young thick brush as compared to the tundra area to the west. TH11-165 was located in this disturbed area and TH11-191 located just to the west in tundra. A large area to the northwest of the existing runway is also disturbed ground covered with young grasses and brush. The boundary between disturbed and undisturbed areas are marked by a line of spruce trees, as indicated below in Figure 5.

Figure 5: Disturbed area northwest of the existing runway, looking south toward proposed runway Option 1. The west end of the runway is to the left background.

The area of the proposed new aircraft parking apron southwest of the runway is also mostly undeveloped tundra with a gradual slope to the south and is 10 to 40 feet below the runway elevation. Black spruce trees are also present but less abundant and smaller at up to 6 inches in diameter. TH11-192 was located at the proposed parking apron access ramp and near a drainage ditch running along the edge of the runway. The runway to the north is approximately 10 feet higher in elevation than the ditch and the test hole location. The ditch is choked and obstructed with thick brush.

Runway Extension Subsurface Findings

Test holes located in tundra areas of the proposed runway extension, TH11-173 thru 176 and 191, encountered the following:

- One foot thick organic mat.
- Seasonal thaw from 1 to 5 feet in depth, consisting of silt, sandy silt to silty sand material.
- Two moisture content samples in thawed material indicated 14.5 and 25.8 percent, and organic contents of 1.6 and 2.4 percent.
- Frozen inter-layered silt, sandy silt and silty sand material underlying seasonal thaw and to depths explored at 15 to 27 feet.
- Moisture contents in the frozen material ranged from 25.2 to 38.9 percent.
- Organic contents were slight and ranged from 0.6 to 2.4 percent. Wood chips were observed in auger cuttings in TH11-175 at 10 feet and TH11-191 at 18 feet in depth.

TH11-191 drilled approximately 150 feet west of TH11-165 and 250 feet west of the existing runway, did not encounter fill material. Frozen material was encountered at five feet depth and continued to

the depth explored at 25 feet. A five foot high scarp was observed at the surface 10 feet to the east of TH11-191.

TH11-165 was drilled near the toe of the existing runway fill slope. The test hole encountered thawed fill material to 4.5 feet in depth. Underlying the fill is a thin organic mat, and thawed sandy silt material that was moist to wet to 20.5 feet in depth. Frozen silty sand material was encountered from 20.5 to the depth explored at 25 feet.

Visible Ice was not encountered in these test holes to the depths explored, frozen material encountered was classified as nonvisible bonded with no excess ice (Nbn), to nonvisible bonded with excess ice (Nbe), see Appendix D for a key to frozen ground classification.

Proposed Aircraft Parking Apron Subsurface Findings.

Test holes 11-193 to 198 were drilled at the new proposed aircraft parking apron southwest of the existing runway. These test holes generally encountered:

- 1 to 1.5 feet thick organic mat at the surface.
- Seasonally thawed silt to sandy silt material underlying the organic mat at most locations 1 to 5 feet in depth. TH11-193 encountered frozen material underlying the organic mat.
- Frozen silt, silt with sand, sandy silt or silty sand material was encountered from 1 to 5 feet below the surface and continued to depths explored at 15 to 30 feet.
- TH11-198 encountered 10 to 30 percent ice from 2 to 9 feet in depth, with a buried peat layer at 3.5 to 4.5 feet.
- A pocket of pressurized gas was encountered at TH11-196, at a depth of 9.5 feet. This was easily noted as visible air blowing out of the drilled auger hole.
- Moisture contents in the frozen material ranged from 24.7 to 37.4 percent.
- Organic contents were slight and ranged from 0.7 to 2.7 percent. Wood chips were observed in TH11-197 at 16 feet in depth.

TH11-192 was drilled just south of the active runway and near a deep drainage channel. Seasonally thawed sandy silt was encountered to a depth of 12 feet, with the material being wet and loose at 7 to 12 feet. Underlying the sandy silt material was one foot thick wet silty sand material, overlying frozen sandy silt to a depth of 20 feet. The frozen material was field classified as Nbe or Nbn.

Groundwater was not encountered in any holes.

Test hole logs of all Option 1 test holes including the aircraft parking apron are included in Appendix A at the end of this report. Laboratory test results are included in Appendix B.

Proposed Runway Option 2

Runway Option 2 involves relocating the entire runway north and adjacent to the existing runway, and extending to the west approximately 1,000 feet, (Figure 6). The area just north of the existing runway is thick with brush, grasses, and black spruce to 1 foot in diameter, except the west central portion, where vegetation is less abundant.

Figure 6: Proposed Runway Option 2, with Test Hole Locations.

The Option 2 area is generally slightly higher in elevation than the existing runway, except the western and eastern ends. The eastern end near the Precision Approach Path Indicator's (PAPI) drops dramatically compared to the existing runway by approximately 10 to 15 feet. The area is thick with vegetation and the ground is wet and spongy in some locations. The western end of the option gradually gets lower than the runway, with the steepest gradient at the west end.

An abrupt vegetation difference is present along the northern edge of runway Option 2. Thick young vegetation is present near the existing runway and quickly changes to sparse tundra with stunted black spruce at approximately 250 feet north of the existing runway. The young vegetation area near the runway appears to have been disturbed, with uneven ground, sink holes, fissures, and debris or garbage observed. These features combined with test hole results indicate possible fill material spread throughout most of the Option 2 area. The origin of this fill material is unknown, but probably originated from previous runway construction work. The abrupt vegetation change was located with a hand held GPS, as shown in Figure 7, and one example location shown in Figure 8.

Fourteen test holes were drilled for runway Option 2, shown in Figure 6. These test holes were drilled north, northwest, and parallel to the existing runway from 90 to 250 feet north of the runway centerline. Two additional test holes, TH11-152 and 153 were drilled at a proposed aircraft parking apron approximately 300 feet north and northeast of the existing runway.

Figure 7: GPS Surveyed Abrupt Vegetation Change Boundary.

Subsurface Findings

Drilling at the eastern end and east of the PAPI devices at TH11-150 and 151, indicated a 1 foot thick spongy organic mat at the surface. Underlying the mat was wet, loose and thawed silty sand or sandy silt material from 1 to over 20 feet in depth. TH11-150 did not encounter frozen material to the depth drilled at 23 feet. Drilling met little resistance in the loose thawed material and water filled the test holes to the surface. TH11-151 encountered frozen silty sand material at 23 feet and was classified as Nbe.

As test hole drilling continued from east to west, the permafrost table decreased in depth with the thawed, wet, and loose material decreasing in moisture and increasing in relative density. This observation holds until the western end of the proposed runway option, with the permafrost table depth increasing again. All runway Option 2 test holes west of the PAPI devices indicated possible disturbed fill material from 2.5 to 13.5 feet in depth, except TH11-177 at the western end. The following is a summary of the Option 2 test hole subsurface findings:

- Thin organic mat from the surface to 1 foot in depth.
- Seasonally thawed silt, silt with sand, sandy silt or silty sand material from 1.5 to 20 feet in depth.

Figure 8: Abrupt Vegetation Change Contact. Boundary between young vegetation on the right and tundra vegetation on the left. Photo taken near TH11-160, looking east with the runway in the middle right background.

- Frozen silt, silt with sand, sandy silt or silty sand material was encountered from 1.5 to 20 feet and continued to depths explored at 10 to 25 feet in depth, was classified as Nbe.
- Visible ice was only encountered in TH11-159; from 7 to 19 feet in depth and was classified as visible ice crystals (Vx).
- Moisture contents ranged from 13.1 to 40.7 percent, with typical values ranging from 25 to 35 percent. Water filled most drill holes, most commonly at the eastern and western ends of the proposed runway option.
- Organic contents ranged from 0.7 to 7.8 percent, with typical values ranging from 1 to 3.5 percent. Visible wood chips were encountered in TH11-158 at 3 feet and TH11-172 at 15 feet in depth.

A drill rod and connector lowered down the test hole and driven with a 130 pound cat-head rope hammer was used to simulate blow counts. These blow counts were driven two feet and performed at TH11-157 and 11-158 locations. TH11-157 blow counts indicated 2, 3, 4 and 4 from 5 to 7 feet, and 0, 1, 1 and 1 from 10 to 12 feet. An attempt at blow counts deeper than 10 feet was not possible, as wet and loose flowing sandy material filled the hollow stem auger. TH11-158 encountered frozen material at 7 feet and the rod was driven from 5 to 7 feet in depth and yielded blow counts of 6, 12, 13 and 15 for each six inches driven. These blow counts are only for reference, and are not similar to Standard Penetration Test (SPT) blow counts and should not be related or correlated to n-values.

At the western end of Option 2, a second area has been disturbed, as shown in Figures 5 and 7. This area was explored as part of runway Options 2 and 3, and has young vegetation, settlement holes, and fissures at the surface in the area. Thawed material consisting of silt, silt with sand, sandy silt and

silty sand was encountered to depths of 13.5 feet. A scarp approximately 6 feet in height and 900 feet west of the existing runway was observed which immediately dropped and transitioned to tundra terrain. A previous geotechnical investigation performed in 1989 indicated this area was a borrow area at one time and has since been filled-in. See previous geotechnical investigation section in this report on page 18 for more detail.

Option 2 drilling was also performed to the north of the existing runway at TH11-152 and 153, this area was defined as a potential aircraft parking apron. These holes were drilled in tundra areas, and drilling indicated permafrost sandy silt material underlying the organic mat at 1 to 2 feet in depth and continuing to depths explored at 20 feet. Massive ice was encountered at TH11-152 from 5 to 14 feet in depth, while 20 to 50 percent ice was encountered in TH11-153 from near the surface to the depth explored at 17.5 feet and classified as Vx.

Test hole logs of all runway Option 2 test holes including the proposed aircraft parking apron to the northeast are included in Appendix A at the end of this report. Laboratory test results are shown in Appendix B.

Proposed Runway Option 3

Runway Option 3 is similar to Option 2, except the west end is rotated to the north and the east end is at the existing runway location. Because of this similarity, test holes for this option were drilled only at the west end of the option, as shown in Figure 9 below. A portion of runway Option 3, as opposed to Option 2, extends to the north and into undisturbed tundra areas. The western end also lies within the disturbed area mentioned above in Option 2 drilling, and shown in Figures 7 and 9.

Subsurface Findings

TH11-160, 161 and 163 are located in tundra areas, these test holes encountered:

- 1 foot thick organic mat.
- Frozen silt, silt with sand, and sandy silt material to depths explored at 15 to 20 feet.
- TH11-163 encountered a peat layer from 2 to 3.5 feet with visible ice. Wood chips were observed in auger cuttings in TH11-160 at 18 feet and TH11-163 at 11 feet in depth.
- Visible ice up to approximately 25 percent was encountered in all three test holes and at various depths. The ice was classified as Vx or visible ice stratified (Vs). All other frozen material was classified as Nbe.
- Moisture contents in frozen material ranged from 27.1 to 296.8 percent.
- Organic contents ranged from 1.4 to 54.0 percent.

TH11-166, 167, 168 and 170 were drilled in the disturbed area northwest of the exiting runway, and at the western end of runway Option 3, these holes generally encountered:

- Organic mat from the surface to 1 foot in depth.
- Thawed sandy silt, silty sand, or sand with silt material underlying the organic mat from 4 to 15 feet in depth.
- Permafrost sandy silt or silty sand material was encountered from 4 to 14 feet and continued to depths explored at 15 to 28.5 feet.
- Minor visible ice was encountered in TH11-167 from 6.5 to 9 feet and classified as Vx. All other frozen material was classified as Nbe or Nbn.
- Wood chips were observed in auger cutting at TH11-166 and 168, both at 12.5 feet in depth.

- Moisture contents ranged from 15.8 to 44.1 percent.
- Organic contents were slight and ranged from 0.6 to 4.7 percent.

Figure 9: Proposed Runway Option 3, with Test Hole Locations

Test hole logs of all runway Option 3 test holes are included in Appendix A at the end of this report. Laboratory test results are included in Appendix B.

Previous Geotechnical Investigation

A geotechnical investigation was accomplished in 1989 for proposed improvements to the airport that include lengthening and widening the main runway, construction of a new taxiway, and aircraft parking apron with a connecting access road. The investigation explored a potential borrow area approximately 500 feet west of the existing runway at that time. This area was noted in the investigation report, "The site has been cut into the side of a hill sloping down from the west end of the runway. An existing work area 300 feet long by 300 feet wide has been excavated 1 to 5 feet deep", (Ondra, 1990). The area now appears to be larger, (Figures 6 and 9), and deeper as indicated in runway Option 2 and 3 test hole logs.

The previous investigation and report also noted an existing berm north of the runway, approximately 10 feet in height above the runway and extending the length of it. The report also recommends placing waste material north of the existing runway.

Expected Physical Site Conditions

Based on variability common in natural environments, climate of the project area and conditions observed in this investigation, anticipate the following physical conditions:

- Expect frozen ground, either seasonally or perennially frozen within the project area at any time of the year.
- Expect perched groundwater on top of frozen layers.
- Expect pumping of silt soils at the bottom of excavations.
- Expect to encounter areas of massive ice in foundation soils, ice-rich soil will be wet and unstable upon thawing.
- Expect thaw bulbs in the vicinity of culverts.
- Expect difficulty handling moist or wet thawed silty soils.

Comments and Recommendations

The existing gravel runway appears to be in relatively good working condition, with some thaw subsidence cracking observed parallel to the embankment and near the edges. Some minor perpendicular cracking was observed and could be related to airport lighting crossings.

These geotechnical comments and recommendations are based on the results of this investigation. Recommendations are given only for Option 1, to include the proposed aircraft parking apron to the southwest of the airport. Comments are only given for proposed runway Options 2 and 3.

Option 1, west runway extension and new aircraft parking apron to the southwest

- From a geotechnical standpoint this is the best of the three runway options. Disturbed fill material was encountered only at the west end of the existing runway, as part of the original runway construction. Frozen silt or sand material with minimal ice was encountered throughout more than half of the proposed extension.
- Remove fill material west of the runway and discard, do not reuse.
- Place woven reinforcement geotextile fabric in areas after fill removal, lapping onto undisturbed ground 50 feet and run seams parallel to the runway centerline.
- Wherever possible preserve the surface organic mat. Place a separation geotextile where the organic mat has been compromised. High-strength separation geotextile may be necessary to allow equipment to place fill on wet terrain depending on the season.
- Hand clear or mechanically clear when ground is frozen. This is especially important in areas with massive ice if encountered.
- Bench to place embankment on steep slopes. Benching should be continuous across the fill area.
- Benching is also needed to key the placement of new embankment into the existing embankment. Overlap new embankment material over existing gradually without an abrupt transition.
- Do not use frost susceptible fine grained fill material within 8 feet of proposed finished grade.

- If frost susceptible fine grained fill is used, place separation geotextile fabric at 8 feet below finished grade and complete the embankment with non-frost susceptible (NFS) material. NFS material is specified as less than 6 percent by weight passing the #200 sieve.
- Organic silts and/or material coming from cuts or sub-excavations into ice-rich soils should not be used for embankment construction.
- Design structural embankment side slopes at 1.5H:1V or flatter when using NFS, and for frost susceptible material, design structural embankment side slopes at 2H:1V or flatter.
- Protect foreslopes from erosion by revegetating.
- Drainage around the existing airport is poor and improvements are needed.
- Design for positive drainage of the embankment and ditches throughout the project, including the existing embankment and ditches.
- Line ditches with gradients greater than 2 percent and in fine grained soils with one foot of ditch lining or acceptable alternative.

Option 2, moving the entire runway to the north of the existing runway

- This option is the least desirable of the three runway options. The entire option is situated along a noticeable disturbed area containing old fill material. The old fill material may not have been compacted, as determined by observed settlement holes and fissures at the surface.
- Underlying the old fill material is up to 20 feet of thawed silt or sand material that was observed to be very loose, wet and flowing sands at some locations. This is more evident at the eastern end of the proposed option.
- This option may require deep sub-excavations or a means to consolidate thawed, wet and lose soils below the fill material.
- Massive ice was encountered in one test hole in the tundra area at the proposed parking apron to the northeast of the airport.

Option 3, rotating the west end of the runway to the north, with the east end as a pivot at the existing runway

- This option is possible, but may require deep sub-excavations of old fill material and saturated thawed material. The eastern and western ends of this option alignment are the most problematic.

Material Source Investigation

Introduction

The materials source information included in this section is for the purpose of assisting in the project design process. It does not signify that the sources are available or suitable for use during the construction of any current or future project. This Geotechnical Report does not determine source availability or suitability for any construction project; it only provides information that can be used to make that determination during the project design process. Sources available or suitable for use for a construction project will be specified in the appropriate section of the Plans and Specifications of the Contract Documents for the construction project.

To support the airport expansion or improvements project, NRMS personnel conducted a material source reconnaissance of 6 sites and drill investigation at proposed material source (MS A-1) northwest of the airport, and potential material source (MS A-6) to the west of the existing runway, (Figures 1 and 10).

Results from this investigation are:

- Material site (A-1) to the northwest of the airport is estimated to contain gravel and sandy borrow material sufficient to supply the material needed for the project.
- The proposed site (A-6), west of the airport is unattractive as a borrow source as frozen silt with excess moisture is dominant.
- No other sites were explored as part of this investigation, with the exception of the reconnaissance survey samples obtained at four other possible material sites mentioned in this report.

The field reconnaissance survey, drilling exploration work, and all access were coordinated with appropriate members of the Alaska Department of Natural Resources, the NANA Regional Corporation, and the village of Kiana.

Field Investigation

The material source reconnaissance occurred from July 5th thru 8th, 2011. Field personnel were: State of Alaska Department of Transportation Northern Materials Section (NRMS) J. Currey, Materials Engineer, S. Masterman, Regional Engineering Geologist, T. Weiss, Engineering Geologist, and S. Parker, Driller. A. Depew, Geologist with the Department of Natural Resources was also a member of the reconnaissance survey. Six sites were visited and surface soil samples were collected from five of the six locations, (Figure 10).

Based on the reconnaissance survey, drilling explorations were then conducted at material site (A-1) and proposed borrow site (A-6) between November 11th thru 21st, 2011. This work was performed by drillers S. Parker and G. Nelson, and engineering geologist T. Weiss. A Central Mine Equipment (CME) 45B drill mounted on a Bombardier carrier was used to drill a total of 38 test holes at the two sites, using 6 inch solid flight augers.

Drilling and test hole conditions were logged in the field using the Unified Soil Classification System (USCS). We recorded test hole locations with a hand held Garmin 72 Global Positioning System (GPS) using the North American Datum (NAD) 83. The GPS has an accuracy of plus or minus 50 feet. Test holes were backfilled with drilled auger cuttings once drilling was complete.

From the two material sites, 98 soil samples were collected from drill auger cuttings. Laboratory testing of the samples was conducted by the Northern Region Materials Laboratory. The testing program included gradations with classification, L.A. abrasion, degradation, sodium sulfate loss, plasticity index, and moisture and organic content analysis. All tests were performed according to the standard test methods shown in Table 3. The results of the testing program are included in Appendix C after the test hole logs for each material site.

Test Method	AASHTO	ASTM
Index Tests		
Gradation	T27	C136
Minus #200 Gradation	T11	C117
Liquid Limit	T89	D4318
Plastic Limit	T90	D4318
Moisture Content – Aggregate Soil	T255 T265	C566 D2216
Organic Content (Burn)	T267	
Proctor (Moisture Density Relationship)	T180	D1557
USCS Classification	D2487	
Fine Specific Gravity	T100	D854
Coarse Specific Gravity	T85	D127
Quality Tests		
Degradation	T13	
Los Angeles Abrasion	T96	C131
Sodium Sulfate Soundness	T104	C88

Table 3: Laboratory Standard Test Methods.

Material Source Reconnaissance

Prior to performing the drilling investigation, NRMS personnel conducted a material source reconnaissance. Six potential material sources (MS A-1 thru A-6) were visited, (Figure 10). The purpose was to identify one or more material sources close to the airport to supply the estimated 700,000 cubic yards of material needed for the airport improvements project. Prior information was gathered and the six sites shown were determined to be the best for possible gravel, borrow, and proximity to the project. A summary of the field reconnaissance survey is given below:

- Sites A-1, A-2, A-3 and A-4 were all estimated to have a gravel resource. Collected samples indicted poor- or well-graded gravel with sand, with L.A. Abrasion values from 35 to 41 and degradation factors from 39 to 68.
- Site A-1 was considered the best possible gravel resource due to its close location to the airport, and would be the first priority for exploration. If drilling explorations did not show adequate gravel quantities additional sites would be explored.
- Sites A-3 and A-2 were considered the second and third priority sites, respectively.
- Sites A-5 and A-6 were estimated to not have sufficient gravel quantities, but could supply borrow material. Collected samples from three locations at A-5 indicated poorly-graded sand with gravel, silty sand, and silty sand with gravel material, meeting standard specifications for Selected Material Type C.
- Sites A-5 and A-4 were eliminated as a possible material source due to the interest in these locations by the City of Kiana.
- Site A-6 would be explored for borrow material only.

Laboratory test results in Appendix C contain detailed sample results from the reconnaissance survey.

Due to the presence of naturally occurring asbestos (NOA) at sites upstream on the Kobuk River, samples from the five reconnaissance sites as well as from the airport borrow area (Site A-6) were analyzed for NOA by EMSL Analytical of San Leandro California. None of the samples contained detectable NOA material at the 0.1% level of sensitivity analyzed. Laboratory results are presented in Appendix C at the end of this report.

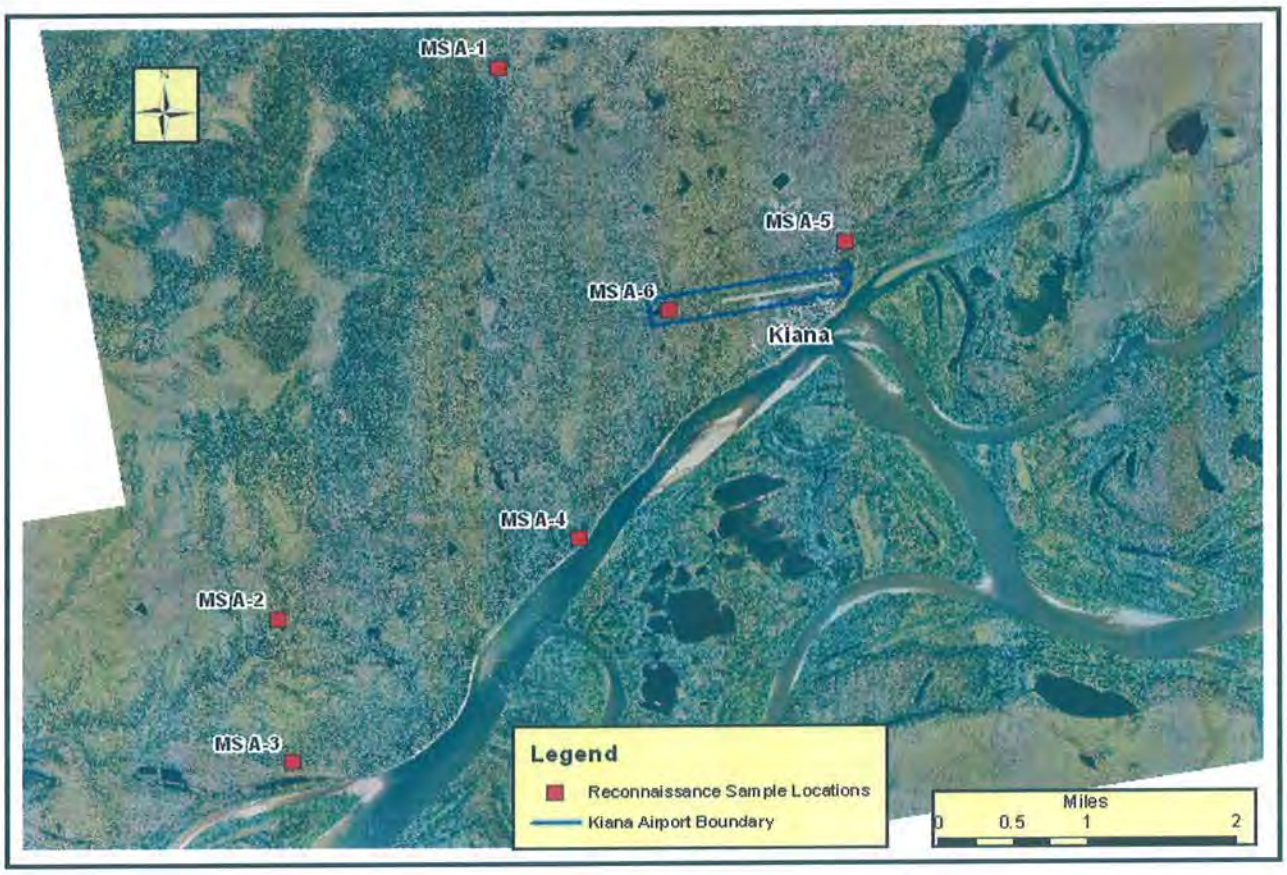


Figure 10: Reconnaissance Material Source (MS) Locations.

Material Source A-1, Northwest of the Airport

Location and Access

Potential Material Site A-1 is undeveloped and located approximately 2.5 miles northwest of Kiana and the airport. The site is located within the Kateel River Meridian Baird Mountains topographic quadrangle sheet A-4, Section 31 of Township 19 North, Range 8 West, and at N67° 0.032' and W160° 30.106'. All-season access does not exist to the site, and for this investigation access was accomplished by snow machine along the route shown in Figure 1.

Description

The site is on alluvial fan material from the Kiana Hills to the west. The site is between a bedrock ridge to the west and a small stream to the east. The site drains from west to east and is gradually to steeply sloped, vegetation is light to heavy with 6-inch or larger diameter trees present. At the time of our investigation, snow was approximately 2 to 3 feet deep.

Land Status

The site is located on NANA Regional Corporation land.

Explorations and Sampling

Unconsolidated high terrace gravels were observed on steep slopes at the site during the reconnaissance survey. Reconnaissance laboratory test results indicated well-graded gravel with 4.9 percent passing the #200 sieve, L.A abrasion of 37, and degradation factor of 39. An independent contractor also collected a surface sample in the area. Their laboratory testing indicated quality

values of 56 for degradation and 36 for L.A. abrasion loss, and 5 percent passing the #200 sieve and 45 percent passing the #4 sieve.

We drilled twenty test holes (TH11-455 to TH11-474) at Site A-1 to depths ranging from 30 to 50 feet, (Figure 16 in Appendix C). Test holes were located on a grid of 300 to 600 feet across the site. A summary of Material Site A-1 drilling is given below in Table 4. The summary includes some laboratory test results from samples collected from auger cuttings.

Detailed logs and laboratory test results are included in Appendix C. A symbol and definition sheet, the Unified Soil Classification System (USCS), and key to frozen soils classifications are shown in Appendix D.

Quality of Materials

A summary of material site A-1 explorations are given below in Table 4. Test hole locations can be found in Appendix C, Figure 16.

Table 4: Summary of Material Site A-1 Test Hole Results. Shaded rows indicate gravel result locations.

Test Hole Number	Depth Drilled (Feet)	Silt Overburden (Feet)	Sand Zone/ Shaded Gravel Zone (feet)	Comments
TH11-455	40	18	18-35	PI 3 from 20 to 23.5 feet Bedrock at 35 feet
TH11-456	40	21	21-29 and 32.5-	Silt 29 to 32.5 feet
TH11-457	40	8.5-23	8.5-15 and 23-	Organic 5.4 percent at 5 feet Bedrock at 34.5 feet
TH11-458	50	2.5	2.5-15 and 16.5-	LA 32 from 10 to 15 feet Silt 15 to 16.5 feet
TH11-459	40	5	5-40	
TH11-460	40	2.5	2.5-40	Gravel
TH11-461	30	2.5	2.5-21	PI 4 from 12.5 to 17 feet Bedrock at 21 feet
TH11-462	38	5	5-38	Wet at 30 feet and thawed from 25 to 35 feet
TH11-462	-	-	-	LA 32 and Deg. 77 from 15 to 20 feet; thawed from 25 to 35 feet
TH11-463	40	3	3-40	PI 2 from 4 to 8 feet
TH11-464	40	4	4-37	PI 4 at 14 feet Bedrock at 37 feet
TH11-465	30	14	5.5-8 and 14-22 and 23-27.5	Silt Interlayering

Table 4: Summary of Material Site A-1 Test Hole Results. (Continued)

Test Hole Number	Depth Drilled (Feet)	Silt Overburden (Feet)	Sand Zone/ Shaded Gravel Zone (feet)	Comments
TH11-466	35	4.5	4.5-31.5	PI 4 from 20 to 24 feet Silt 31.5 to 35 feet
TH11-467	30	10	10-20.5	Silt 20.5 to 30 feet
TH11-468	50	3	3-44	PI 4 from 19 to 23 feet Silt 44 to 50
TH11-469	40	2.5	2.5-40	
TH11-470	35	5.5	5.5-28	Deg. 34 from 11.5 to 15 feet Silt 28 to 35 feet
TH11-471	40	3.5	3.5-20	PI 7 from 24 to 29 feet Silt 20 to 40 feet
TH11-472	30	7.5	7.5-30	Organic 4.6 percent at 10 feet PI 3 from 25 to 30 feet
TH11-473	40	0.5	0.5-36.5	Gravel, Deg 61 and 58 from 15 to 23 feet
TH11-474	30	3.5	3.5-30	Gravel

(PI) is Plasticity Index, (LA) is L.A. abrasion, (Deg.) is Degradation

From Table 4, field observations, and laboratory test results the following comments can be made for the quality of subsurface materials at Material Site A-1:

- Organic contents ranged from 0.4 to 9.2 percent.
- Material was mostly non-plastic with some samples indicating a plastic index (PI) from 2 to 4 and liquid limit (LL) from 18 to 35. Testing of a sample at TH11-471, from 24 to 29 feet in depth indicated a PI of 7 and LL of 33.
- Bedrock was encountered at depth in four test holes. The rock was highly weathered, showed low drill resistance, was sandy in nature, and field classified as a mica-rich metamorphic rock.
- In general, frozen sandy material was encountered from 5 to 25 feet in depth and throughout the middle of the site. This area extends from the stream at its lowest eastern extent to approximately 500 feet upslope to the west.
- Frozen gravel material was mostly encountered to the north and south of the sandy material and generally at the same depth.
- In general, silty material was encountered to the west at approximately 500 feet upslope from the creek bed level.
- The contact between silty material and gravel or sand material could be sharp. This is indicated by TH11-473 and TH11-456. TH11-473 encountered clean gravel material from 10 to 30 feet in depth, while TH11-456 encountered mostly silt with some sand and gravel throughout the depth of the test hole. The distance between the two test holes is approximately 300 feet. Figure 16 indicates a heavily vegetated area near TH11-473 compared to the area around TH11-456.

- To the south of the site, an area with large spruce trees near TH11-460, suggests the gravel encountered at that test hole may extend further south.

Frozen Ground Conditions

Test holes were drilled in November, 2011, and generally the permafrost table was encountered at 2 to 7 feet and continued to depths explored. Seasonal frosted soils near the surface may have been present at the time drilling was performed, but was not easily recognizable. Frozen material was typically classified as nonvisible, bonded with no excess ice (Nbn) to nonvisible bonded with excess ice (Nbe). Only one test hole, TH11-457, encountered an estimated 25 percent visible ice (Vx); from 14 to 20 feet in depth. Moisture contents in frozen material classified as Nbn or Nbe ranged from 4.9 to 33 percent.

Clearing and Stripping

Generally the surface organic mat throughout the site is approximately one foot thick. Vegetation is thick to moderately thick, with most being spruce trees up to 2 feet in diameter. Larger trees mostly exist to the south.

Silt overburden ranged from 0.5 to 23 feet in depth, with 3 to 5 feet typical. Test holes drilled uphill (western edge) of the site at TH11-456, 472, 457, and 465 generally encountered the deepest overburden, with TH11-455 and 467 being the exception.

Groundwater

Groundwater was encountered in only TH11-462, at approximately 30 feet in depth, and corresponds to approximately the level of the creek at the bottom of the hill. Disturbances to frozen ground could release water from ice-rich soils and perched water tables.

Results, Comments and Conclusions

- Drilling and laboratory test results indicate the site has the potential to supply the material needed for the project. Mining plans will need to maximize available materials.
- Sand and gravel material depth is approximately 4 to 29 feet thick, becoming silty with increased moisture at depth. Cobbles with some boulders may be present throughout the site and at any depth.
- Bedrock may be encountered; rock encountered may range from very soft to hard over short intervals, with varying fracture orientations.
- Sand and gravel material appears to be open to the north and south.
- The material is limited to the west, becoming progressively silt-rich upslope.
- Laboratory test results indicate not all the gravel meets standard specifications for all crushed aggregate products.
- Auger drilling in frozen soils, and the resulting cuttings and samples may indicate higher fines content than samples collected by other means.
- Laboratory test results indicate the sandy material meets standard specifications for Selected Material, Type C, with some areas having the potential to meet Selected Material, Type B standard specifications.
- High fines content of samples suggests screening will be required to meet requirements for most products.
- Material quality and gradation are variable over the site due to interlayered coarser and finer material.

- The frozen material may need drying prior to compaction, as we anticipate natural moisture is above optimum moisture in some areas of the site.
- Expect frozen ground conditions throughout the site and anytime of the year.
- A water table is often not observable when drilling frozen ground because of low permeability. In excavations below water table elevation, expect accumulation of ground water from infiltration and thawing of contained ice as well as accumulation from precipitation and surface runoff.
- Expect pumping of silt soils at the bottom of excavations.

Borrow Source A-6, West of the Airport

Location and Access

Potential material Site A-6 is undeveloped and is located approximately 1,100 feet west of the airport. The site is located within the Kateel River Meridian Selawik topographic quadrangle sheet D-3, Section 8 of Township 18 North, Range 8 West, and at N66° 58.502' and W160° 27.608'. Access is not provided to the site, but a small all terrain vehicle trail connects the site to the western end of the airport.

Description

Fine grained sand and silt glacial outwash derived material underlies tundra throughout the majority of the site. Most of the site is low rolling hills, with swampy ground in intervening low areas and a few small ponds present. Vegetation is light to heavy, with spruce trees to 6 inches in diameter. The larger and thicker vegetation is concentrated near drainages.

Land Status

The site is partially located on NANA Regional Corporation land and partially on state airport property.

Explorations and Sampling

We drilled eighteen test holes west of the existing runway (TH11-178 to TH11-190 and TH11-450 to TH11-454). Test holes were drilled to depths ranging from 20 to 30 feet and from 700 to 3,000 feet west of the airport, and approximately 900 feet south of the projected airport centerline to 1,850 feet north, (Figure 19 in Appendix C).

The site was initially explored in July, 2011 and results indicated mostly silt material with some sand and no gravel. The exception to this was a hill to the north at TH11-178 and TH11-179, where laboratory tests indicated silty sand material was present. This area was determined to have the greatest potential for sandy borrow material, and five additional test holes (TH11-450 to 454) were drilled in this area during the November 2011 drilling.

Quality of Materials

Results from the drilling and laboratory test results are summarized as followed:

- Thawed and wet silt or sandy silt material was encountered ranging from 2 to 8.5 feet in depth.
- Three samples at TH11-181, 186 and 190 indicated silt with sand material, and the percent passing #200 sieve at 83 to 85 percent.
- Six samples at TH11-178, 179, 451, 452, and 453 indicated silty sand material. This material was encountered beginning at 8, 12, 10, 4.5, and 11 feet respectively. The percent material

passing the #200 sieve ranged between 24.5 and 49.5 percent, with four of six samples over 40 percent passing.
- Organic contents ranged from 0.4 to 4.3 percent.

Frozen Ground Conditions
Visible ice was encountered in TH11-452, 454, 181, 182, 183, 184, 187, 188 and 189. Massive ice was encountered at TH11-454, 181, 184, 187 and 188. All other frozen material was classified as Nbn or Nbe, with Nbe typical. Seasonal frosted soils near the surface may have been present during the November drilling, but was not easily recognizable. Moisture contents in frozen material ranged from 10 to 45 percent, with typical values from 30 to 40 percent.

Clearing and Stripping
Generally the surface organic mat throughout the site is approximately six to 16 inches thick. Vegetation is moderately thick to thin, with spruce trees up to 6 inches in diameter.

Groundwater
Groundwater was not encountered in any test holes to depths explored.

Results, Comments and Conclusions
- Most material was classified as sandy silt. A hill to the north of the site contained silty sand in five of the seven test holes from 4 to 12 feet below the surface.
- Considering the depth of the sandy material and limited extent, the site may be considered marginal for borrow extraction.
- Additionally, natural moisture contents indicate excess moisture throughout the site.
- The site is considered unattractive for a project borrow site. It could potentially supply frost susceptible borrow material that is located close to the project and the airport, that meets standard specification for Selected Material, Type C. However, we expect natural moisture contents to be above optimum moisture, and that thawing, draining and drying will be necessary prior to compacting this material.
- Auger drilling in frozen soils, and the resulting cuttings and samples may indicate higher fines content than samples collected by other means.
- Expect frozen ground conditions throughout the site and anytime of the year.
- Expect pumping of silt soils at the bottom of excavations

References:

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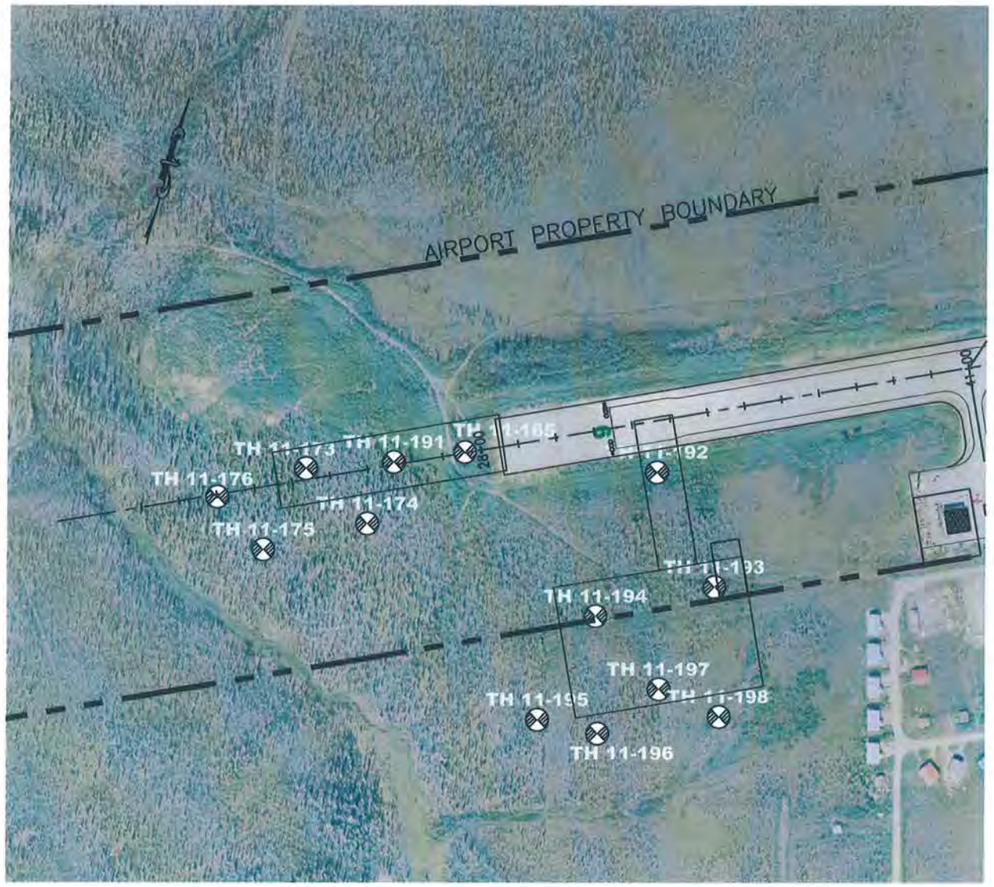
APPENDIX A

TEST HOLE LOGS: Runway Option 1



RUNWAY OPTION 1 TEST HOLE LOCATIONS

FEET
200 0 100 200 400

TH11-165
STA 27+50, 5'R
22 JUL 2011

2.5	0.0– 0.5	Bn–Bk ORG MAT moist, hi Org
4.5	0.5– 2.5	Bn–Gy Sa SILT (fil) moist, sl Org
	2.5– 4.5	Bn Si SAND (fil) moist, sl Org
	4.5– 5.0	Bk ORG MAT moist, hi Org
20.5	5.0–20.5	Bn–Gy Sa SILT moist SAMPLE 11–2237 (8.5–9.0) NM 20.8%, ORG 1.7% SAMPLE 11–2238 (12.0–15.0) ML, 68.3% –200 NV, NP 13.5–moist to wet 14.5–sl Org SAMPLE 11–2239 (18.0–18.5) NM 26.8%, ORG 2.0%
25.0	20.5–25.0	Gy Si SAND sl Org, Nbe

TH11-173
STA 23+25, 10'L
23 JUL 2011

1.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
3.0	1.0– 3.0	Bn–Bk SILT Org, Nbn
7.0	3.0– 7.0	Gy SILT w/ Sa Nbe SAMPLE 11–2254 (4.0–4.5) NM 30.8%, ORG 1.7%
12.0	7.0–12.0	Gy Sa SILT Nbe SAMPLE 11–2255 (8.0–8.5) NM 37.9%, ORG 1.7% 11.0–Wood chips
27.0	12.0–27.0	Gy Sa SILT Nbe SAMPLE 11–2256 (15.0–17.0) ML,60.6% –200 NV, NP 23.0–Consistent SAMPLE 11–2257 (23.0–23.5) NM 25.2%, ORG 1.0%

TH11-174
STA 24+80, 150'R
23 JUL 2011

4.5	0.0– 1.0	Bn–Bk ORG MAT moist to wet, hi Org
6.0	1.0– 6.0	Gy Sa SILT moist to wet 3.5– wet 4.5–Nbe SAMPLE 11–22.58 (5.0–5.5) NM 25.8%, ORG 1.4%
9.0	6.0– 9.0	Gy–Bn Si SAND Nbe
13.0	9.0–13.0	Gy Sa SILT Nbe SAMPLE 11–2259 (11.0–11.5) NM 34.2%, ORG 1.3%
15.0	13.0–15.0	Gy Si SAND Nbn

TH11-175
STA 21+70, 170'R
23 JUL 2011

4.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
7.0	1.0– 7.0	Gy–Bn Si SAND moist SAMPLE 11–2260 (3.0–3.5) NM 14.5%, ORG 1.6% 4.0– Nbe
9.0	7.0– 9.0	Gy Sa SILT Nbe
12.5	9.0–12.5	Gy Si SAND Nbe 10.0–Wood chips
14.5	12.5–14.5	Gy Sa SILT Nbe SAMPLE 11–2261 (13.0–13.5) NM 25.6%, ORG 1.0%
20.0	14.5–20.0	Gy Si SAND Nbn 16.5–Consistent

TH11-176
STA 20+80, 10'R
23 JUL 2011

3.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
5.5	1.0– 5.5	Bn Si SAND moist, sl Org 3.0– Nbn SAMPLE 11–2262 (5.0–8.0) ML, 67.8% –200 NV, NP
20.0	5.5–20.0	Gy Sa SILT sl Org, Nbe 11.0–Consistent SAMPLE 11–2263 (15.0–15.5) NM 38.9%, ORG 2.4%
25.0	20.0–25.0	Gy Si SAND Nbn 23.0–Consistent

TH11-191
STA 25+60, 5'R
24 JUL 2011

5.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
7.0	1.0– 5.0	Gy–Bn Sa SILT moist, sl Org 4.0– 38.1 degrees F
	5.0– 7.0	Bn Si SAND sl Org, Nbe SAMPLE 11–2293 (5.0–5.5) NM 28.9%, ORG 2.4%
22.0	7.0–22.0	Gy Sa SILT Nbe SAMPLE 11–2294 (7.5–8.0) NM 29.6%, ORG 0.6% SAMPLE 11–2295 (8.5–11.0) ML, 58% –200 NV, NP 13.5–Thin sandy zones SAMPLE 11–2296 (15.0–15.5) NM 32.5%, ORG 1.2% 16.5– Consistent 18.0–Wood chips
25.0	22.0–25.0	Gy Si SAND sl Org, Nbn

TH11-192
STA 32+30, 140'R
24 JUL 2011

12.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
13.5	1.0–12.0	Bn–Gy Sa SILT (fill?) moist, sl Org 5.5–moist to wet 7.5–wet SAMPLE 11–2297 (8.5–9.0) NM 28.5%, ORG 1.8%
20.0	12.0–13.5	Gy Si SAND wet
	13.5–20.0	Gy Sa SILT sl Org, Nbe 15.5–Nbn 16.0–Limited cuttings, water in hole

TH11-193
STA 33+20, 450'R
24 JUL 2011

1.5	0.0– 1.5	Bn–Bk ORG MAT moist, hi Org
7.0	1.5– 7.0	Bn–Gy Sa SILT Nbn 3.5–Nbe SAMPLE 11–2298 (6.0–6.5) NM 31.9%, ORG 1.0%
10.0	7.0–10.0	Gy Si SAND Nbe
15.0	10.0–15.0	Gy Sa SILT Nbe SAMPLE 11–2299 (11.0–11.5) NM 32.3%, ORG 1.3%

TH11-194
STA 30+10, 470'R
24 JUL 2011

4.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
15.0	1.0–15.0	Bn Sa SILT moist 4.0–Bn–Gy Nbe SAMPLE 11–2300 (4.0–4.5) NM 30.3%, ORG 0.9% SAMPLE 11–2301 (5.0–7.0) ML, 59.4% –200 NV, NP SAMPLE 11–2302 (10.5–11.0) NM 32.6%, ORG 1.7% 11.0– Consistent

TH11-195
STA 28+30, 700'R
25 JUL 2011

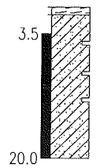
3.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
9.0	1.0– 9.0	Bn–Gy SILT w/ Sa moist, sl Org 3.0–Nbe SAMPLE 11–2303 (4.5–5.0) NM 37.4%, ORG 2.7% SAMPLE 11–2304 (5.5–8.0) ML, 77.8% –200 NV, NP
11.0	9.0–11.0	Gy Si SAND sl Org, Nbn
15.0	11.0–15.0	Gy Sa SILT Nbe SAMPLE 11–2305 (13.0–13.5) NM 35.9%, ORG 1.5%

– FIGURE 11 –

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS RUNWAY OPTION 1
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 30

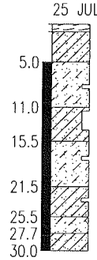
Jan 15, 2013 – 11:47am – Tab: OPTION 1 VIC MAP T:\00 Aviation & Community Rds & Buildings\Kiana\63179 Kiana Airport Improvements\08 Geology\Geology Figures\MS1-Testholes_cp-OPTION 1 VIC MAP Jan/15/13



TH11-196
STA 29+80, 760'R
25 JUL 2011

0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org

1.0-20.0 Bn-Gy Sa SILT moist to wet, sl Org 3.5-Gy Nbe
SAMPLE 11-2306
(4.5-5.0)
NM 37.4%, ORG 2.0%
SAMPLE 11-2307
(8.5-9.0)
NM 37.2%, ORG 2.2%
9.5-Methane Pocket
SAMPLE 11-2308
(12.0-12.5)
NM 34.7%, ORG 1.5%
14.0-Consistent



TH11-197
STA31+50, 670'R
25 JUL 2011

0.0- 1.0 Bn-Gy ORG MAT moist, hi Org

1.0- 5.0 Gy-Bn Sa SILT moist, sl Org
3.0-moist to wet 4.5- wet

5.0-11.0 Gy Si SAND Nbe
SAMPLE 11-2309
(8.0-8.5)
NM 33.1%, ORG 1.5%

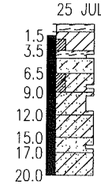
11.0-15.5 Gy Sa SILT Nbe
SAMPLE 11-2310
(11.5-14.0)
ML, 59.2% -200 NV, NP

15.5-21.5 Gy Si SAND Nbe 16.0- Wood chips
SAMPLE 11-2311
(17.5-18.0)
NM 30.9%, ORG 1.0%

21.5-25.5 Gy Sa SILT Nbe
SAMPLE 11-2312
(23.0-23.5)
NM 33.1%, ORG 1.6%

25.5-27.7 Gy Si SAND Nbe

27.5-30.0 Gy Sa SILT Nbe



TH11-198
STA 32+90, 780'R
25 JUL 2011

0.0- 1.0 Bn-Bk ORG MAT moist, hi Org

1.0- 3.5 Bn SILT hi Org, Nbe 2.0-Vx

3.5- 4.5 Bn PEAT hi Org, Vx
SAMPLE 11-2313
(4.0-4.5)
NM 125.2%, ORG 20.0%

4.5- 6.5 Gy Si SAND sl Org, Vx, 10 to 20 Percent Ice

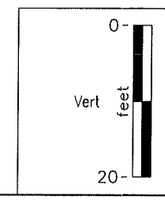
6.5- 9.0 Gy Sa SILT Vx
SAMPLE 11-2314
(8.0-8.5)
NM 24.7%, ORG 0.7%

9.0-12.0 Gy Si SAND Nbe
SAMPLE 11-2315
(9.5-11.5)
SM, 39.3% -200
NV, NP

12.0-15.0 Gy Sa SILT Nbe

15.0-17.0 Gy Si SAND Nbe
SAMPLE 11-2316
(16.0-16.5)
NM 28.0%, ORG 1.6%

17.0-20.0 Gy Sa SILT Nbe



– FIGURE 12 –

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS OPTION 1 SITE
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 31

APPENDIX A

TEST HOLE LOGS: Runway Option 2

RUNWAY OPTION 2 TEST HOLE LOCATIONS

FEET
200 0 100 200 400

TH11-150
STA 84+90, 90'L
21 JUL 2011

0.0– 1.0		Bn–Bk ORG MAT moist to wet, hi Org
1.0– 2.5		Gy Sa SILT (fill?) wet, Org, Easy Drilling
2.5– 3.5		Gy Si SAND (fill?) wet, sl Org
3.5–16.5	16.5	Gy Sa SILT wet, sl Org 6.0–No cuttings, water in hole 12.5– Easy Drilling
16.5–22.5	22.5	Gy Si SAND wet, Org 18.0– Easy Drilling

TH11-151
STA 63+40, 140'L
21 JUL 2011

0.0– 1.0		Bn–Bk ORG MAT wet, hi Org, Water below mat
1.0– 8.5	8.5	Gy Sa SILT wet, sl Org, Mica rich sand 3.0–Easy Drilling, 100 psi down pressure 5.5–Limited cuttings, water in hole 7.0–moist to wet SAMPLE 11-2210 (7.0–7.5) NM 31.6%, ORG 1.5%
8.5–23.0	23.0	Gy Si SAND moist to wet 15.0–wet 18.5– Firm Drilling
23.0–27.5	27.5	Gy Si SAND Nbe

TH11-152
STA 62+70, 320'L
21 JUL 2011

0.0– 1.0	2.0	Bn–Bk ORG MAT moist to wet, hi Org
1.0– 5.0	5.0	Gy Sa SILT sl Org, Mica rich sand
5.0–14.0	14.0	Wh ICE ICE
14.0–20.0	20.0	Gy Si SAND Vx SAMPLE 11-2211 (17.5–18.0) NM 24.9%, ORG 0.7%

TH11-153
STA 59+10, 340'L
21 JUL 2011

0.0– 1.0	1.0	Bn–Bk ORG MAT moist to wet, hi Org
1.0–10.0	5.5	Gy Sa SILT sl Org, Vx 5.5–Wood chips 7.5–Org SAMPLE 11-2212 (9.0–9.5) NM 61.3%, ORG 9.2%
10.0–16.0	10.0	Gy SILT w/ Sa Vx SAMPLE 11-2213 (12.0–15.0) ML,78.7% –200 NV, NP
16.0–17.5	16.0	Gy Si SAND Vx

TH11-154
STA 59+70, 120'L
21 JUL 2011

0.0– 1.0	4.0	Bn–Bk ORG MAT moist, hi Org
1.0– 4.0	12.5	Bn Si SAND (fill) moist, sl Org
4.0– 5.5	20.0	Bn Sa SILT (fill) moist to wet, sl Org
5.5–12.5	25.0	Gy Elastic SILT w/ Sa wet, Org 10.0–Easy Drilling
12.5–20.0		Gy Si SAND wet, sl Org 15.0–No Cuttings, water in hole 17.0–Firm drilling, Frosted
20.0–25.0		Gy Sa SILT Nbe, Small cutting chips, water in hole

TH11-155
STA 57+30, 80'L
21 JUL 2011

0.0– 1.0	6.5	Bn–Bk ORG MAT moist to wet, hi Org
1.0– 6.5	12.0	Bn Sa SILT (fill) moist, sl Org 5.5–moist to wet
6.5–12.0	19.5	Gy Si SAND wet, sl Org 7.5–Easy Drilling
12.0–19.5	22.5	Gy Sa SILT wet, sl Org, Water in hole 16.0– moist to wet, Firm Drilling, Frosted
19.5–22.5		Gy Si SAND sl Org, Nbe

TH11-156
STA 55+20, 150'L
21 JUL 2011

0.0– 1.0	10.0	Bn–Bk ORG MAT moist, hi Org
1.0–10.0	17.5	Bn Sa SILT (fill) moist, sl Org SAMPLE 11-2214 (4.0–4.5) NM 21.5%, ORG 2.1% SAMPLE 11-2215 (5.0–9.0) ML, 61.4% –200 NV, NP 9.0– moist to wet
10.0–17.5	22.5	Gy Si SAND wet, Org 12.5– Easy Drilling 13.0– moist to wet
17.5–22.5		Gy Sa SILT sl Org, Nbe

TH11-157
STA 58+10, 110'L
22 JUL 2011

0.0– 1.0	8.0	Bn–Bk ORG MAT moist to wet, hi Org
1.0– 8.0	19.0	Bn Sa SILT (fill) moist to wet SAMPLE 11-2216 (3.0–3.5) NM 27.6%, ORG 1.8% 6.5–wet
8.0–19.0		Gy Si SAND moist to wet SAMPLE 11-2217 (11.0–11.5) NM 19.3%, ORG 0.7% 13.0–wet 15.0–heaving sands, can't keep hole open
19.0–20.0		Gy Sa SILT Nbe

Vert
0
feet
20

– FIGURE 13 –

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

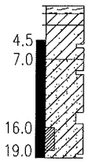
DATA:	KIANA AIRPORT IMPROVEMENTS RUNWAY OPTION 2
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 33

Jan 15, 2013 – 11:58am – Tab: OPTION 2 VIC MAP T:\00 Aviation & Community Rds & Buildings\Kiana\63179 Kiana Airport Improvements\08 Geology\Geology Figures\MS1-Testholes_cp-OPTION 2 VIC MAP Jan/15/13

TH11-158
STA 49+90, 100'L
22 JUL 2011

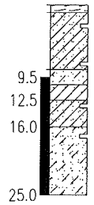
0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 3.5 Bn-Bk SILT (fill) moist, Org, Wood chips
3.5- 5.0 Gy SILT w/ Sa moist, sl Org
5.0-10.0 Gy Sa SILT sl Org, Frosted, mica rich
SAMPLE 11-2218
(6.5-7.0)
NM 37.6%, ORG 2.3%
7.0- Nbe
SAMPLE 11-2219
(9.0-9.5)
NM 33.0%, ORG 1.6%

TH11-159
STA 44+20, 90'L
22 JUL 2011



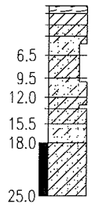
0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 2.5 Bn-Bk SILT (fill) moist to wet, sl Org
2.5- 7.0 Gy SILT w/ Sa moist to wet, sl Org 4.5-Nbe, 31.7 degrees F
SAMPLE 11-2220
(5.0-5.5)
NM 40.7%, ORG 3.3%
7.0-20.0 Gy Sa SILT sl Org, Vx, 10 to 20 Percent Ice
SAMPLE 11-2221
(8.5-9.0)
NM 36.7%, ORG 2.6%
10.0- Thin Sandy layers 14.0- Less organics
SAMPLE 11-2222
(14.0-14.5)
NM 31.4%, ORG 1.2%
SAMPLE 11-2223
(19.5-20.0)
NM 33.3%, ORG 1.7%

TH11-162
STA 34+80, 140'L
22 JUL 2011



0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 8.5 Bn Sa SILT (fill) moist to wet, sl Org
SAMPLE 11-2228
(2.5-3.0)
NM 22.3%, ORG 3.5%
5.0-39.2 degrees F
6.0-Eosy Drilling
SAMPLE 11-2229
(7.5-8.0)
NM 22.3%, ORG 1.9%
8.5-10.5 Gy Si SAND moist to wet 9.5- Nbe, 31.8 degrees F
10.5-12.5 Gy SILT w/ Sa sl Org, Nbe
12.5-16.0 Gy Sa SILT sl Org, Nbe
SAMPLE 11-2230
(13.0-13.5)
NM 35.3%, ORG 2.6%
16.0-25.0 Gy Si SAND Nbn
SAMPLE 11-2231
(17.0-17.5)
NM 22.5%, ORG 0.7%

TH11-164
STA 29+50, 100'L
22 JUL 2011



0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 2.5 Bn-Bk SILT moist, Org
2.5- 4.0 Gy-Bn Sa SILT (fill) moist, sl Org
4.0- 6.5 Gy-Bn Si SAND (fill) moist, sl Org
SAMPLE 11-2235
(5.0-10.0)
ML, 51.9% -200 NV, NP
5.5- Easy Drilling
6.5- 9.5 Bn Sa SILT (fill) moist, sl Org
9.5-12.0 Bn Si SAND (fill) moist to wet, sl Org
12.0-13.5 Bn Sa SILT (fill) moist to wet, sl Org
SAMPLE 11-2236
(13.0-13.5)
NM 26.9%, ORG 3.3%
13.5-15.5 Gy Sa SILT moist to wet, sl Org
15.5-18.0 Gy Si SAND wet, sl Org
16.5- Easy Drilling
18.0-25.0 Gy Sa SILT sl Org, Nbe

TH11-169
STA 20+30, 200'L
22 JUL 2011

0.0- 0.5 Bn-Bk ORG MAT moist, hi Org
0.5- 6.0 Gy-Bn Si SAND (fill) moist, sl Org
5.0- moist to wet
6.0- 7.0 Bn ORG MAT wet, hi Org
7.0- 9.5 Gy Sa SILT wet, sl Org
8.0- Eosy Drilling
9.5-12.0 Gy Si SAND wet, sl Org
10.5- sl Org, Nbe
12.0-15.0 Gy Sa SILT sl Org, Nbe

TH11-171
STA 22+50, 170'L
23 JUL 2011

0.0- 7.0 Bn Sa SILT (fill) moist, sl Org 2.0- Easy drilling
SAMPLE 11-2249
(2.0-5.0)
ML, 69.6% -200 NV, NP
7.0- 9.0 Gy Sa SILT moist
SAMPLE 11.2250
(8.0-8.5)
NM 13.1%, ORG 0.7%
9.0-11.0 Gy Si SAND moist to wet
11.0-13.0 Gy Sa SILT moist to wet
13.0-14.5 Gy Si SAND moist to wet
SAMPLE 11.2251
(13.0-13.5)
NM 20.8%, ORG 0.9%
14.5-19.0 Gy Sa SILT moist to wet
16.0- Nbn
19.0-23.0 Gy Si SAND sl Org, Nbn

TH11-172
STA 25+10, 180'L
23 JUL 2011

0.0- 0.5 Bn-Bk ORG MAT moist, hi Org
0.5- 5.5 Bn-Bk SILT w/ So (fill) moist to wet, Org
SAMPLE 11-2252
(4.5-5.0)
NM 26.7%, ORG 7.8%
5.5-11.5 Gy-Bn Sa SILT (fill) moist to wet, sl Org
10.5- Orgonics
11.5-13.5 Bn Si SAND (fill) moist to wet, Org
13.5-15.5 Gy-Bn Sa SILT moist to wet
SAMPLE 11-2253
(14.5-15.0)
NM 23.0%, ORG 1.2%
15.0- Wood chips
15.5-18.0 Gy Si SAND sl Org, Nbn
18.0-20.0 Gy Sa SILT sl Org, Nbn

TH11-177
STA 18+60, 250'L
23 JUL 2011

0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 3.5 Gy Sa SILT moist to wet, sl Org 1.5-Nbe
3.5-11.0 Gy Si SAND Nbe
SAMPLE 11-2264
(6.5-7.0)
NM 31.4%, ORG 1.0%
SAMPLE 11-2265
(10.0-10.5)
NM 29.2%, ORG 1.0%
11.0-15.0 Gy Sa SILT Nbe

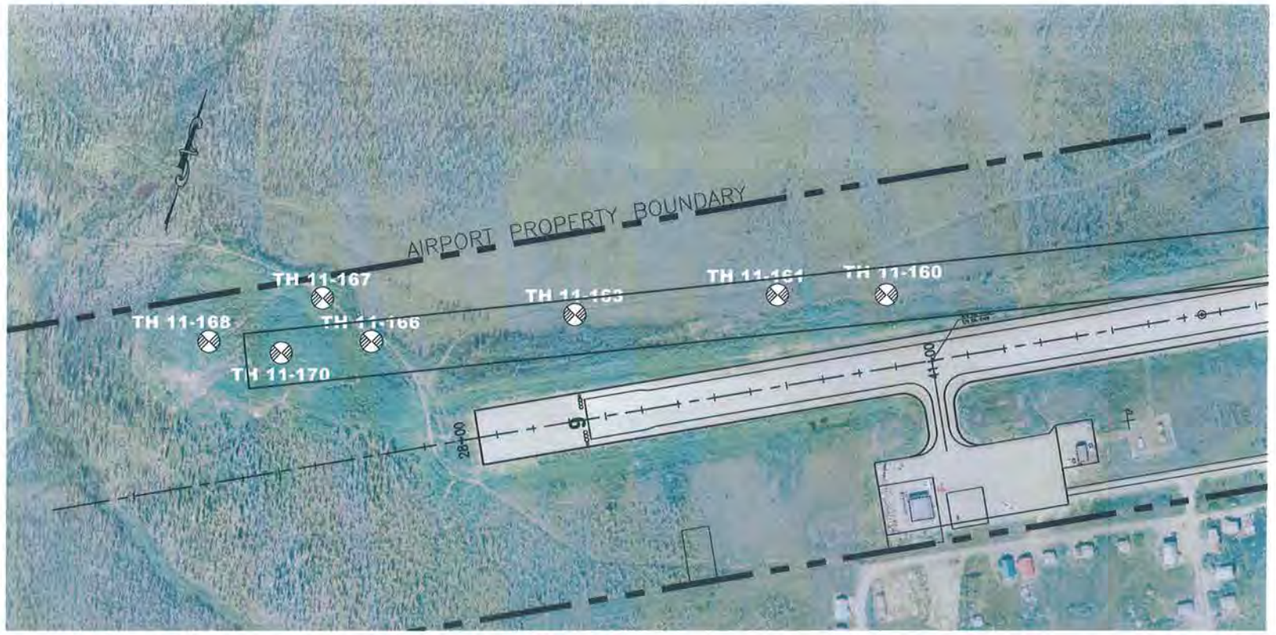
- FIGURE 14 -

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS RUNWAY OPTION 2
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 34

APPENDIX A

TEST HOLE LOGS: Runway Option 3



RUNWAY OPTION 3 TEST HOLE LOCATIONS

FEET
200 0 100 200 400

TH11-160
STA 40+00, 170'L
22 JUL 2011

1.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
4.5	1.0–13.0	Gy SILT w/ So sl Org, Nbe 3.0–Vx, 10 Percent Ice SAMPLE 11–2224 (5.0–10.0) ML,83.4% –200 NV, NP 6.5–5 to 10 Percent Ice
6.5		
13.0	13.0–17.0	Gy–Bn Sa SILT Nbe SAMPLE 11–2225 (13.0–13.5) NM 27.1%, ORG 1.4%
17.0	17.0–20.0	Gy SILT w/ Sa sl Org, Vx 18.0– Wood chips
20.0		

TH11-161
STA 37+10, 230'L
22 JUL 2011

1.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
2.5	1.0– 2.0	Bn SILT Org, Nbe
4.5	2.0–12.5	Gy SILT w/ Sa Org, Vx SAMPLE 11–2226 (4.0–4.5) NM 81.1%, ORG 5.1% SAMPLE 11–2227 (10.0–10.5) NM 38.3%, ORG 2.6% 10.5–sl Org, Vs
7.0		
9.0		
10.5		
12.5	12.5–15.0	Gy Sa SILT sl Org, Vs
15.0		

TH11-163
STA 31+60, 260'L
22 JUL 2011

0.5	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
3.0	1.0– 3.0	Bn–Bk SILT Org, Nbe
	3.0– 4.5	Bn PEAT hi Org, Vx SAMPLE 11–2232 (4.0–4.5) NM 296.8%, ORG 54.0%
15.0	4.4– 6.0	Gy SILT w/ Sa hi Org, Vx
	6.0–15.0	Gy Sa SILT sl Org, Nbe SAMPLE 11–2233 (8.0–8.5) NM 49.3%, ORG 3.7% 11.0– Wood chips 14.5– sl Org, Nbe SAMPLE 11–2234 (14.5–15.0) NM 34.2%, ORG 2.1%

TH11-166
STA 26+00, 290'L
22 JUL 2011

5.5	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
9.5	1.0– 2.0	Bn PEAT moist, hi Org
11.5	2.0– 5.5	Bn–Gy Si SAND (fill) moist, sl Org SAMPLE 11–2240 (5.0–5.5) NM 15.8%, ORG 2.4%
15.5	5.5– 7.0	Bn Sa SILT (fill) moist to wet, sl Org
20.0	7.0– 9.5	Bn Si SAND (fill?) wet, sl Org SAMPLE 11–2241 (9.0–9.5) NM 24.0%, ORG 3.2%
	9.5–11.5	Gy Sa SILT sl Org, Nbe
	11.5–15.5	Gy Si SAND Nbe 12.5– Wood chips SAMPLE 11–2242 (13.0–13.5) NM 26.1%, ORG 1.1%
	15.5–20.0	Gy Sa SILT Nbe

TH11-167
STA 24+80, 420'L
22 JUL 2011

4.0	0.0– 1.0	Bn–Bk ORG MAT moist, hi Org
	1.0– 4.0	Gy–Bn Sa SILT (fill) moist, sl Org 2.5–moist to wet SAMPLE 11–2243 (3.0–3.5) NM 35.6%, ORG 4.7%
15.0	4.0–15.0	Gy Sa SILT sl Org, Nbe, 31.7 derees F 6.5–Vx, 10 Percent Ice SAMPLE 11–2244 (8.0–8.5) NM 44.1%, ORG 3.4% 9.0– Nbe

TH11-168
STA 21+60, 350'L
22 JUL 2011

11.0	0.0– 0.5	Bn–Bk ORG MAT moist, hi Org
14.0	0.5–11.0	Bn PG SAND w/ Si (fill) moist, sl Org SAMPLE 11–2245 (5.0–9.0) SP–SM, 7.8% –200 NV, NP 7.0– Easy drilling and consistent
20.0	11.0–14.0	Gy Si SAND moist to wet, sl Org 12.5– Wood chips
	14.0–17.5	Gy Si SAND Nbn
	17.5–20.0	Gy Sa SILT Nbn SAMPLE 11–2246 (18.5–19.0) NM 25.0%, ORG 1.5%

TH11-170
STA 23+50, 300'L
23 JUL 2011

3.5	0.0– 0.5	Bn–Bk ORG MAT moist, hi Org
8.0	0.5– 3.5	Bn Si SAND (fill) moist, sl Org
	3.5– 8.0	Bn–Gy Sa SILT (fill) moist, sl Org
13.5	8.0–13.5	Gy–Bn Si SAND (fill) moist, sl Org 11.0–moist to wet, Easy Drilling 13.0– Organics
16.5	13.5–16.5	Gy Si SAND wet, sl Org 15.0– Nbe SAMPLE 11–2247 (15.5–16.0) NM 21.4%, ORG 1.3%
20.0	16.5–20.0	Gy Sa SILT Nbn
25.5	20.0–25.5	Gy Si SAND Nbn SAMPLE 11–2248 (23.0–23.5) NM 20.8%, ORG 0.6%
28.5	25.5–28.5	Gy Sa SILT Nbn

Vert 0 – 20 feet

– FIGURE 15 –

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS RUNWAY OPTION 3
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 36

APPENDIX B

LABORATORY TEST RESULTS: Runway Options 1 Thru 3

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 1

TEST HOLE NUMBER		TH11-165	TH11-165	TH11-165	TH11-173	TH11-173	TH11-173	TH11-173
DEPTH (feet)		8.5-9.0	12.0-15.0	18.0-18.5	4.0-4.5	8.0-8.5	15.0-17.0	23.0-23.5
STATION		27+50	27+50	27+50	23+25	23+25	23+25	23+25
OFFSET		5R	5R	5R	10L	10L	10L	10L
LAB NUMBER		**11-2237**	**11-2238**	**11-2239**	**11-2254**	**11-2255**	**11-2256**	**11-2257**
DATE SAMPLED		22-Jul-11	22-Jul-11	22-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50		99.1					
	#60		98.5				99.3	
	#80		96.4				97.7	
	#100		94.7				95.7	
Silt/Clay	**#200**		68.3				60.6	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV				NV	
PLASTIC INDEX			NP				NP	
USCS CLASSIFICATION			ML				ML	
USCS SOIL DESCRIPTION		SaSi	SaSi	(SaSi)	(Si w/Sa)	(SaSi)	SaSi	SaSi
NATURAL MOISTURE		20.8		26.8	30.8	37.9		25.2
ORGANICS		1.7		2.0	1.7	1.7		1.0
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

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SAMPLED BY: T. Weiss
MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 1

TEST HOLE NUMBER		TH11-174	TH11-174	TH11-175	TH11-175	TH11-176	TH11-176	TH11-191
DEPTH (feet)		5.0-5.5	11.0-11.5	3.0-3.5	13.0-13.5	5.0-8.0	15.0-15.5	5.0-5.5
STATION		24+80	24+80	21+70	21+70	20+80	20+80	25+60
OFFSET		150R	150R	170R	170R	10R	10R	5R
LAB NUMBER		**11-22.58**	**11-2259**	**11-2260**	**11-2261**	**11-2262**	**11-2263**	**11-2293**
DATE SAMPLED		23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	24-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8					99.1		
	#10					98.3		
	#16					95.9		
Sand	**#20**					94.4		
	#40							
	#50							
	#60							
	#80							
	#100							
Silt/Clay	**#200**					67.8		
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT						NV		
PLASTIC INDEX						NP		
USCS CLASSIFICATION						ML		
USCS SOIL DESCRIPTION		(SaSi)	(SaSi)	(SiSa)	(SaSi)	SaSi	SaSi	(SiSa)
NATURAL MOISTURE		25.8	34.2	14.5	25.6		38.9	28.9
ORGANICS		1.4	1.3	1.6	1.0		2.4	2.4
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS							sl Org[1]	sl Org[1]

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

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MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 1

TEST HOLE NUMBER		TH11-191	TH11-191	TH11-191	TH11-192	TH11-193	TH11-193	TH11-194
DEPTH (feet)		7.5-8.0	8.5-11.0	15.0-15.5	8.5-9.0	6.0-6.5	11.0-11.5	4.0-4.5
STATION		25+60	25+60	25+60	32+30	33+20	33+20	30+10
OFFSET		5R	5R	5R	140R	450R	450R	470R
LAB NUMBER		**11-2294**	**11-2295**	**11-2296**	**11-2297**	**11-2298**	**11-2299**	**11-2300**
DATE SAMPLED		24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50		99.4					
	#60		98.8					
	#80		96.1					
	#100		93.8					
Silt/Clay	**#200**		58.0					
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV					
PLASTIC INDEX			NP					
USCS CLASSIFICATION			ML					
USCS SOIL DESCRIPTION		SaSi	SaSi	SaSi	(SaSi)	(SaSi)	(SaSi)	SaSi
NATURAL MOISTURE		29.6		32.5	28.5	31.9	32.3	30.3
ORGANICS		0.6		1.2	1.8	1.0	1.3	0.9
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

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[1] Organic content determination is based on the results of the ATM T-6 test method.

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MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 1

TEST HOLE NUMBER		TH11-194	TH11-194	TH11-195	TH11-195	TH11-195	TH11-196	TH11-196
DEPTH (feet)		5.0-7.0	10.5-11.0	4.5-5.0	5.5-8.0	13.0-13.5	4.5-5.0	8.5-9.0
STATION		30+10	30+10	28+30	28+30	28+30	29+80	29+80
OFFSET		470R	470R	700R	700R	700R	760R	760R
LAB NUMBER		**11-2301**	**11-2302**	**11-2303**	**11-2304**	**11-2305**	**11-2306**	**11-2307**
DATE SAMPLED		24-Jul-11	24-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50				99.4			
	#60	99.2			99.1			
	#80	96.9			98.3			
	#100	95.0			97.3			
Silt/Clay	**#200**	59.4			77.8			
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV			NV			
PLASTIC INDEX		NP			NP			
USCS CLASSIFICATION		ML			ML			
USCS SOIL DESCRIPTION		SaSi	(SaSi)	Si w/Sa	Si w/Sa	(SaSi)	(SaSi)	(SaSi)
NATURAL MOISTURE			32.6	37.4		35.9	37.4	37.2
ORGANICS			1.7	2.7		1.5	2.0	2.2
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				sl Org[1]				sl Org[1]

GENERAL COMMENTS

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TEST HOLE NUMBER		TH11-196	TH11-197	TH11-197	TH11-197	TH11-197	TH11-198	TH11-198
DEPTH (feet)		12.0-12.5	8.0-8.5	11.5-14.0	17.5-18.0	23.0-23.5	4.0-4.5	8.0-8.5
STATION		29+80	31+50	31+50	31+50	31+50	32+90	32+90
OFFSET		760R	670R	670R	670R	670R	780R	780R
LAB NUMBER		**11-2308**	**11-2309**	**11-2310**	**11-2311**	**11-2312**	**11-2313**	**11-2314**
DATE SAMPLED		25-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11	25-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50			99.3				
	#60			98.6				
	#80			95.5				
	#100			93.3				
Silt/Clay	**#200**			59.2				
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT				NV				
PLASTIC INDEX				NP				
USCS CLASSIFICATION				ML				
USCS SOIL DESCRIPTION		(SaSi)	(SiSa)	SaSi	(SiSa)	(SaSi)	(Si)	(SaSi)
NATURAL MOISTURE		34.7	33.1		30.9	33.1	125.2	24.7
ORGANICS		1.5	1.5		1.0	1.6	20.0	0.7
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS							hi Org[1]	

GENERAL COMMENTS

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TEST HOLE NUMBER		TH11-198	TH11-198					
DEPTH (feet)		9.5-11.5	16.0-16.5					
STATION		32+90	32+90					
OFFSET		780R	780R					
LAB NUMBER		**11-2315**	**11-2316**					
DATE SAMPLED		25-Jul-11	25-Jul-11					
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50	98.7						
	#60	97.6						
	#80	93.7						
	#100	89.4						
Silt/Clay	**#200**	39.3						
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV						
PLASTIC INDEX		NP						
USCS CLASSIFICATION		SM						
USCS SOIL DESCRIPTION		SiSa	(SiSa)					
NATURAL MOISTURE			28.0					
ORGANICS			1.6					
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

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TEST HOLE NUMBER		TH11-151	TH11-152	TH11-153	TH11-153	TH11-156	TH11-156	TH11-157
DEPTH (feet)		7.0-7.5	17.5-18.0	9.0-9.5	12.0-15.0	4.0-4.5	5.0-9.0	3.0-3.5
STATION		63+40	62+70	59+10	59+10	55+20	55+20	58+10
OFFSET		140L	320L	340L	340L	150L	150L	110L
LAB NUMBER		**11-2210**	**11-2211**	**11-2212**	**11-2213**	**11-2214**	**11-2215**	**11-2216**
DATE SAMPLED		21-Jul-11	21-Jul-11	21-Jul-11	21-Jul-11	21-Jul-11	21-Jul-11	22-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**				99.4		99.2	
	#50				98.4		98.1	
	#60				97.5		97.0	
	#80				94.7		92.9	
	#100				92.4		89.9	
Silt/Clay	**#200**				78.7		61.4	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT					NV		NV	
PLASTIC INDEX					NP		NP	
USCS CLASSIFICATION					ML		ML	
USCS SOIL DESCRIPTION		(SaSi)	(SiSa)	(SaSi)	Si w/Sa	SaSi	SaSi	(SaSi)
NATURAL MOISTURE		31.6	24.9	61.3		21.5		27.6
ORGANICS		1.5	0.7	9.2		2.1		1.8
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				Org[1]		sl Org[1]		

GENERAL COMMENTS

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TEST HOLE NUMBER		TH11-157	TH11-158	TH11-158	TH11-159	TH11-159	TH11-159	TH11-159
DEPTH (feet)		11.0-11.5	6.5-7.0	9.0-9.5	5.0-5.5	8.5-9.0	14.0-14.5	19.5-20.0
STATION		58+10	49+90	49+90	44+20	44+20	44+20	44+20
OFFSET		110L	100L	100L	90L	90L	90L	90L
LAB NUMBER		**11-2217**	**11-2218**	**11-2219**	**11-2220**	**11-2221**	**11-2222**	**11-2223**
DATE SAMPLED		22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50							
	#60							
	#80							
	#100							
Silt/Clay	**#200**							
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT								
PLASTIC INDEX								
USCS CLASSIFICATION								
USCS SOIL DESCRIPTION		(SiSa)	(SaSi)	(SaSi)	(Si w/Sa)	(SaSi)	(SaSi)	(SaSi)
NATURAL MOISTURE		19.3	37.6	33.0	40.7	36.7	31.4	33.3
ORGANICS		0.7	2.3	1.6	3.3	2.6	1.2	1.7
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS			sl Org[1]		sl Org[1]	sl Org[1]		

GENERAL COMMENTS

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TEST HOLE NUMBER		TH11-162	TH11-162	TH11-162	TH11-162	TH11-164	TH11-164	TH11-171
DEPTH (feet)		2.5-3.0	7.5-8.0	13.0-13.5	17.0-17.5	5.0-10.0	13.0-13.5	2.0-5.0
STATION		34+80	34+80	34+80	34+80	29+50	29+50	22+50
OFFSET		140L	140L	140L	140L	100L	100L	170L
LAB NUMBER		**11-2228**	**11-2229**	**11-2230**	**11-2231**	**11-2235**	**11-2236**	**11-2249**
DATE SAMPLED		22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	23-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**					99.1		
	#50					97.4		
	#60					95.8		99.0
	#80					90.4		96.5
	#100					85.7		94.6
Silt/Clay	**#200**					51.9		69.6
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT						NV		NV
PLASTIC INDEX						NP		NP
USCS CLASSIFICATION						ML		ML
USCS SOIL DESCRIPTION		(SaSi)	(SaSi)	(SaSi)	(SiSa)	SaSi	(SaSi)	SaSi
NATURAL MOISTURE		22.3	22.3	35.3	22.5		26.9	
ORGANICS		3.5	1.9	2.6	0.7		3.3	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		sl Org[1]		sl Org[1]			sl Org[1]	

GENERAL COMMENTS

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[1] Organic content determination is based on the results of the ATM T-6 test method.

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SAMPLED BY: T. Weiss
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TEST HOLE NUMBER		TH11-171	TH11-171	TH11-177	TH11-177			
DEPTH (feet)		8.0-8.5	13.0-13.5	6.5-7.0	10.0-10.5			
STATION		22+50	22+50	18+60	18+60			
OFFSET		170L	170L	250L	250L			
LAB NUMBER		**11-2250**	**11-2251**	**11-2264**	**11-2265**			
DATE SAMPLED		23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11			
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50							
	#60							
	#80							
	#100							
Silt/Clay	**#200**							
	0.02							
	0.005							
Hydro	**0.002**							
	0.001							
LIQUID LIMIT								
PLASTIC INDEX								
USCS CLASSIFICATION								
USCS SOIL DESCRIPTION		SaSi	(SiSa)	(SiSa)	(SiSa)			
NATURAL MOISTURE		13.1	20.8	31.4	29.2			
ORGANICS		0.7	0.9	1.0	1.0			
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 3

TEST HOLE NUMBER		TH11-160	TH11-160	TH11-161	TH11-161	TH11-163	TH11-163	TH11-163
DEPTH (feet)		5.0-10.0	13.0-13.5	4.0-4.5	10.0-10.5	4.0-4.5	8.0-8.5	14.5-15.0
STATION		40+00	40+00	37+10	37+10	31+60	31+60	31+60
OFFSET		170L	170L	230L	230L	260L	260L	260L
LAB NUMBER		**11-2224**	**11-2225**	**11-2226**	**11-2227**	**11-2232**	**11-2233**	**11-2234**
DATE SAMPLED		22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50	99.3						
	#60	98.8						
	#80	97.3						
	#100	96.4						
Silt/Clay	**#200**	83.4						
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV						
PLASTIC INDEX		NP						
USCS CLASSIFICATION		ML						
USCS SOIL DESCRIPTION		Si w/Sa	(SaSi)	(Si w/Sa)	(Si w/Sa)	(Si w/Sa)	(SaSi)	(SaSi)
NATURAL MOISTURE			27.1	81.1	38.3	296.8	49.3	34.2
ORGANICS			1.4	5.1	2.6	54.0	3.7	2.1
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				Org[1]	sl Org[1]	hi Org[1]	sl Org[1]	sl Org[1]

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 3

TEST HOLE NUMBER		TH11-166	TH11-166	TH11-166	TH11-167	TH11-167	TH11-168	TH11-168
DEPTH (feet)		5.0-5.5	9.0-9.5	13.0-13.5	3.0-3.5	8.0-8.5	5.0-9.0	18.5-19.0
STATION		26+00	26+00	26+00	24+80	24+80	21+60	21+60
OFFSET		290L	290L	290L	420L	420L	350L	350L
LAB NUMBER		**11-2240**	**11-2241**	**11-2242**	**11-2243**	**11-2244**	**11-2245**	**11-2246**
DATE SAMPLED		22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11	22-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8						98.1	
	#10						93.6	
	#16						88.8	
	#20						71.6	
Sand	**#40**						56.1	
	#50							
	#60							
	#80							
	#100							
Silt/Clay	**#200**						7.8	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT							NV	
PLASTIC INDEX							NP	
USCS CLASSIFICATION							SP-SM	
USCS SOIL DESCRIPTION		(SiSa)	(SaSi)	(SiSa)	(SaSi)	(SaSi)	PGSa w/Si	(SaSi)
NATURAL MOISTURE		15.8	24.0	26.1	35.6	44.1		25.0
ORGANICS		2.4	3.2	1.1	4.7	3.4		1.5
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		sl Org[1]	sl Org[1]		sl Org[1]	sl Org[1]		

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: CENTERLINE, RUNWAY OPTION 3

TEST HOLE NUMBER	TH11-170	TH11-170					
DEPTH (feet)	15.5-16.0	23.0-23.5					
STATION	23+50	23+50					
OFFSET	300L	300L					
LAB NUMBER	**11-2247**	**11-2248**					
DATE SAMPLED	23-Jul-11	23-Jul-11					
% Passing **3"**							
2"							
1.5"							
Gravel **1.0"**							
0.75"							
0.5"							
0.375"							
#4							
#8							
#10							
#16							
#20							
Sand **#40**							
#50							
#60							
#80							
#100							
Silt/Clay **#200**							
0.02							
Hydro **0.005**							
0.002							
0.001							
LIQUID LIMIT							
PLASTIC INDEX							
USCS CLASSIFICATION							
USCS SOIL DESCRIPTION	(SiSa)	(SiSa)					
NATURAL MOISTURE	21.4	20.8					
ORGANICS	1.3	0.6					
SP. GR. (FINE)							
SP. GR. (COARSE)							
MAX. DRY DENSITY							
OPTIMUM MOISTURE							
L.A. ABRASION							
DEGRAD. FACTOR							
SODIUM SULF. (CRSE)							
SODIUM SULF. (FINE)							
NORDIC ABRASION							
REMARKS							

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

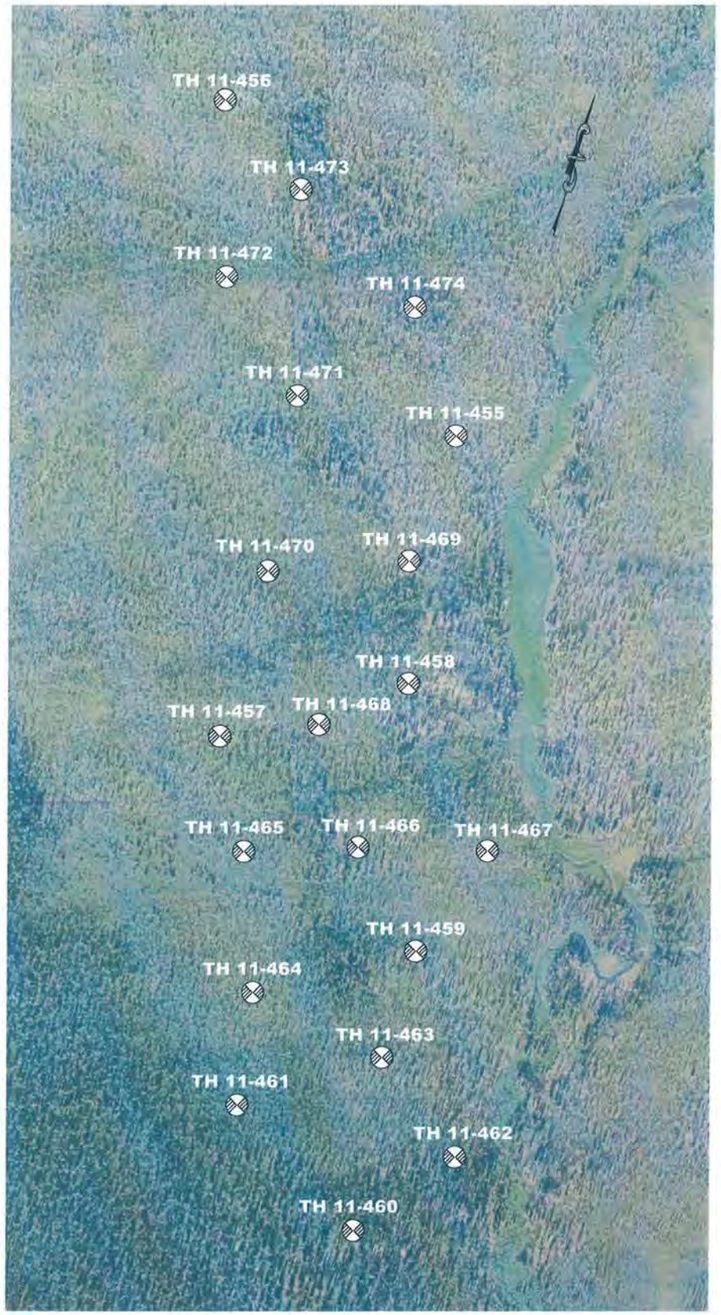
[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

APPENDIX C

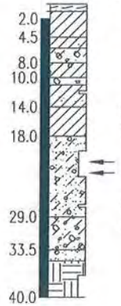
MATERIAL SOURCE: SITE A-1
TEST HOLE LOGS AND LABORATORY TEST RESULTS:



MATERIAL SITE A-1

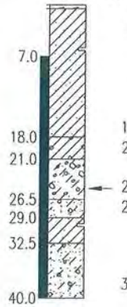
FEET
200 0 100 200 400

TH11-455
N67.00249, W160.50168
13 NOV 2011



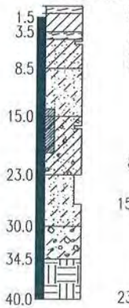
0.0– 1.0 Bk–Bn ORG MAT hi Org
1.0– 4.5 Gy–Bk SILT sl Org 2.0– Nbe
4.5– 6.0 Gy SILT w/ Sa
6.0– 8.0 Gy Si GRAVEL w/ Sa Nbn
8.0–10.0 Gy Sa SILT w/ Gr Nbn
10.0–11.0 Gy Si GRAVEL w/ Sa
11.0–14.0 Gy Sa SILT w/ Gr Nbe
SAMPLE 11–2511
(11.8–12.2)
NM 24.1%
14.0–18.0 Bk SILT sl Org, Nbe
18.0–29.0 Gy Si SAND w/ Gr Nbn
19.0– 3 inch gravel
SAMPLE 11–2512
(20.0–23.5)
SM, 35.5% –200
LL 22, PI 3 23.5– Slow drilling
SAMPLE 11–2513
(27.3–27.7)
NM 10.9% LL 20, NP
29.0–33.5 Gy Si GRAVEL w/ Sa Nbn 31.0– 3 inch gravel 32.0– Variety of rock types in gravel
33.5–35.0 Gy Si SAND w/ Gr
35.0–40.0 Bn BEDROCK
SAMPLE 11–2514
(37.0–40.0)
SM, 23.1% –200
NV, NP 37.5– Low resistance, sandy cuttings

TH11–456
N67.00504, W160.50593
13 NOV 2011



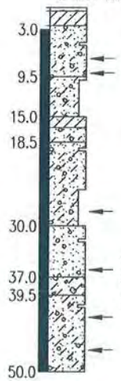
0.0– 0.5 Bk–Bn ORG MAT hi Org
0.5–18.0 Gy–Bn SILT w/ Sa moist to wet
SAMPLE 11–2515
(5.8–6.2)
ORG 1.3% NV, NP
7.0– Gy Nbe
18.0–21.0 Gy Sa SILT w/ Gr Nbe
21.0–26.5 Gy Si GRAVEL w/ Sa Nbe
22.5–2 inch gravel
26.5–29.0 Gy Si SAND w/ Gr Nbe
29.0–32.5 Gy SILT w/ Sa Nbe
SAMPLE 11–2516
(29.8–30.2)
NM 23.8%
32.5–40.0 Gy Si SAND w/ Gr Nbe
36.0– Possible Ice

TH11–457
N67.00028, W160.50627
13 NOV 2011



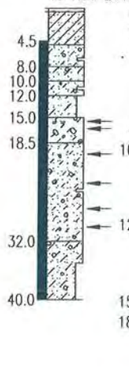
0.0– 1.0 Bk–Bn ORG MAT hi Org
1.0– 3.5 Bn Sa SILT sl Org, Nbe
3.5– 4.5 Bn PEAT Org
4.5– 8.5 Bn Sa SILT sl Org, Nbn
SAMPLE 11–2517
(4.8–5.2)
ORG 5.4% NV, NP
7.5– w/ Gr
8.5–15.0 Gy Si SAND Nbn 12.0– w/ Gr 14.0– Vx
15.0–23.0 Gy Sa SILT w/ Gr sl Org, Vx
SAMPLE 11–2518
(16.3–16.7)
NM 112.2% 17.0– Thin gravel layers 20.5– Nbe, Less gravel
23.0–30.0 Gy Si SAND Nbn
SAMPLE 11–2519
(23.0–27.0)
SM, 20.1% –200 NV, NP
30.0–34.5 Gy–Bn Si GRAVEL w/ Sa Nbn
34.5–40.0 Bn BEDROCK Nbn, low resistance
36.5– Consistent, all one rock type, mica rich

TH11–458
N67.00064, W160.50267
15 NOV 2011



0.0– 0.5 Bk–Bn ORG MAT hi Org
0.5– 2.5 Gy–Bn SILT w/ Sa sl Org
2.5– 9.5 Bn PG SAND w/ Si & Gr Nbn
4.5–Thin silty layers to 7 feet
SAMPLE 11–2520
(4.8–5.2)
NM 19.9%, ORG 2.0%
9.5–15.0 Bn Si SAND w/ Gr Nbn
SAMPLE 11–2521
(10.0–15.0)
SM, 19.4% –200
SSc 2.9, SSf 2.5
LA 32 NV, NP 12.0–Consistent
15.0–16.5 Bk SILT w/ Sa Nbn
16.5–18.5 Gy PG SAND w/ Si & Gr Nbn
18.5–30.0 Gy Si SAND w/ Gr Nbe
SAMPLE 11–2522
(19.3–19.7)
NM 22.8%
SAMPLE 11–2522B
(25.0–30.0)
SM, 18.7% –200
NV, NP
30.0–37.0 Gy PG SAND w/ Gr Nbn, Coarse sand
SAMPLE 11–2523
(31.8–32.2)
ORG 0.4%
37.0–39.5 Gy Si GRAVEL w/ Sa Nbe
39.5–50.0 Gy Si SAND w/ Gr Nbn
SAMPLE 11–2524
(40.8–41.2)
NM 9.4% NV, NP
45.0– Gravel zones

TH11–459
N66.99863, W160.50263
15 NOV 2011



0.0– 0.5 Bk–Bn ORG MAT hi Org
0.5– 5.0 Gy–Bn Sa SILT sl Org
. 5.0– 8.0 Gy PG SAND w/ Si & Gr Nbn
SAMPLE 11–2525
(6.8–7.2)
ORG 1.7%
8.0–10.0 Gy Si SAND w/ Gr Nbn
10.0–12.0 Gy PG SAND w/ Si & Gr Nbe
SAMPLE 11–2526
(10.8–11.2)
NM 20.7%
12.0–15.0 Gy Si SAND Coarse sand
SAMPLE 11–2527
(12.0–15.0)
SM, 21.2% –200 NV, NP
15.0–18.5 Gy PG GRAVEL w/ Si & Sa Nbn
18.5–32.0 Gy PG SAND w/ Si & Gr Nbn
22.0– Coarse, Gravel zones
SAMPLE 11–2528
(24.8–25.2)
NM 10.2% 26.0–Thin Silty zones
32.0–40.0 Gy Si SAND w/ Gr Nbn, Coarse sand
SAMPLE 11–2529
(35.0–40.0)
SM, 31.2% –200 NV, NP

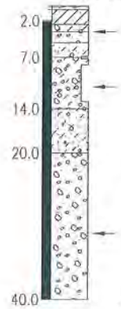
Vert 0– 20– feet

– FIGURE 16 –

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS MATERIAL SITE (A–1)
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 52

TH11-460
N66.99655, W160.50393
16 NOV 2011

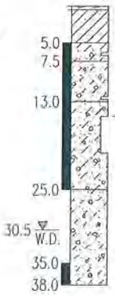


0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 2.5 Bk SILT w/ Sa sl Org
2.5- 3.5 Bn Si GRAVEL w/ Sa Nbn
3.5- 5.0 Bn PG GRAVEL w/ Sa w/ Cobbles Nbn
5.0- 7.0 Bn PG SAND w/ Si & Gr Nbn
SAMPLE 11-2530
(6.8-7.2)
NM 4.9%, ORG 0.5%
7.0-14.0 Bn PG GRAVEL w/ Si & Sa w/ Cobbles Nbn
SAMPLE 11-2531
(8.0-13.0)
GP-GM, 8.7% -200 NV, NP
10.0-Coarse and loose gravel
14.0-20.0 Gy PG SAND w/ Si & Gr Nbn, 2 inch gravel 16.5- Consistent, low resistance
20.0-40.0 Gy PG GRAVEL w/ Sa Nbn
24.0- Consistently coarse, Loose clean gravel, 2 to 3 inches
32.0-Larger gravel

TH11-461
N66.99751, W160.50608
16 NOV 2011

0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 2.5 Bk-Gy SILT w/ Sa moist, sl Org
2.5- 5.0 Bn Si SAND moist
SAMPLE 11-2532
(3.8-4.2)
ORG 4.9% NV, NP
5.0- 9.0 Gy PG SAND w/ Si & Gr sl Org, Nbn 8.5-Thin silty layers
9.0-21.0 Gy Si Cl SAND w/ Gr Nbn
SAMPLE 11-2533
(11.8-12.2)
NM 8.2% LL 21, PI 4
SAMPLE 11-2534
(12.5-17.0)
SC-SM, 36.1% -200
LL 21, PI 4
21.0-30.0 Bn BEDROCK Nbn, Weathered Metamorphic rock
SAMPLE 11-2535
(21.0-25.0)
SM, 20% -200 LL 20, NP
23.5- Soft, Sandy cuttings
25.0-Harder 26.5- Soft 27.5-

TH11-462
N66.99708, W160.50197
17 NOV 2011

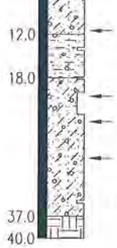


0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 5.0 Bn-Gy SILT w/ Sa moist, sl Org
3.0-w/ Gr
5.0- 7.5 Gy Si SAND w/ Gr Nbn
SAMPLE 11-2536
(6.3-6.7)
NM 15.9% NV, NP
7.5-13.0 Gy PG SAND w/ Si & Gr Nbn
SAMPLE 11-2537
(12.3-12.7)
ORG 0.6% NV, NP
13.0-25.0 Gy Si SAND w/ Gr Nbn, 1 inch gravel
SAMPLE 11-2538
(15.0-20.0)
SM, 18.2% -200 LA 32, DEG 77
NV, NP 16.0-2 inch gravel 21.0-Consistent
25.0-38.0 Gy PG SAND w/ Si & Gr moist, Thawed 30.5-wet, Level of stream at bottom of hill? 35.0- Nbe

TH11-463
N66.99784, W160.50332
17 NOV 2011

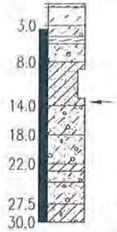
0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 3.0 Bn SILT w/ Sa sl Org
3.0-31.5 Bn-Gy Si SAND w/ Gr w/ Cobbles Nbn
SAMPLE 11-2539
(4.0-8.0)
SM, 17.6% -200
LL 18, PI 2 10.5-2 inch gravel
SAMPLE 11-2540
(12.8-13.2)
NM 8.1% 14.0- Gy
17.0- Boulder 22.0- Less gravel
SAMPLE 11-2541
(25.0-30.0)
SM, 44.6% -200 NV, NP
31.5-40.0 Gy PG SAND w/ Si & Gr Nbn, Increased gravel 37.0-Consistent

TH11-464
N66.99835, W160.50574
18 NOV 2011



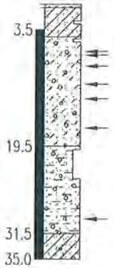
0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 2.5 Gy-Bn Sa SILT sl Org
2.5- 4.0 Bk SILT w/ Sa Nbe
4.0-12.0 Gy Si SAND w/ Gr Nbn
8.0- Consistent
12.0-18.0 Gy Cl SAND w/ Gr Nbn
SAMPLE 11-2542
(13.8-14.2)
NM 14.6% LL 19, PI 4
17.0-Increased fines
SAMPLE 11-2543
(17.8-18.2)
NM 11.8%
18.0-37.0 Gy Si SAND w/ Gr Nbn
SAMPLE 11-2544
(20.0-23.0)
SM, 30.9% -200 LL 18, NP
27.0-Consistent 31.0- Increased moisture
SAMPLE 11-2545
(34.8-35.2)
NM 16.2%
37.0-40.0 Bn BEDROCK Nbn, Highly weathered Metamorphic rock

TH11-465
N66.99941, W160.50586
18 NOV 2011



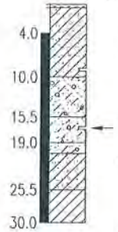
0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 3.0 Gy SILT w/ Sa moist, sl Org
3.0- 4.5 Gy Si SAND w/ Gr Nbn
4.5- 5.5 Bn PEAT hi Org
5.5- 8.0 Bn PG SAND w/ Si & Gr Nbn
8.0-14.0 Bn Sa SILT Nbn
SAMPLE 11-2546
(9.0-13.0)
ML, 57.3% -200 LL 29, NP
10.5- Interbedded silt layers
14.0-18.0 Gy Si SAND w/ Gr Nbn
15.0- Thin gravel layers
18.0-22.0 Gy PG SAND w/ Si & Gr Nbn
22.0-23.0 Gy SILT w/ Sa Nbn
23.0-24.5 Gy PG SAND w/ Si & Gr Nbn
24.5-27.5 Gy Si SAND w/ Gr Nbe
27.5-30.0 Gy Sa SILT w/ Gr Nbe

TH11-466
N66.99942, W160.50369
18 NOV 2011



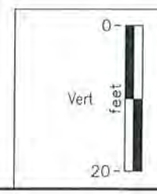
0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 4.5 Bn-Gy Sa SILT Org
2.0-w/ Gr
SAMPLE 11-2547
(2.3-2.7)
ORG 9.2% 3.5-Nbe
4.5-19.5 Gy PG SAND w/ Si & Gr Nbe
SAMPLE 11-2548
(4.8-5.2)
NM 30.6%
19.5-31.5 Gy Si Cl SAND w/ Gr Nbe, Variety of rock types
SAMPLE 11-2549
(20.0-24.0)
SC-SM, 45.3% -200
LL 19, PI 4
31.5-35.0 Gy Sa SILT w/ Gr Nbe

TH11-467
N66.99937, W160.50124
18 NOV 2011



0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5-10.0 Gy-Bn Sa SILT Org
4.0- Nbe
SAMPLE 11-2550
(8.8-9.2)
ORG 5.4% LL 35, NP
10.0-15.5 Gy Si SAND w/ Gr Nbe
10.5- Less gravel
15.5-19.0 Gy PG SAND w/ Si & Gr Nbe
SAMPLE 11-2552
(16.8-17.2)
NM 19.3%
19.0-20.5 Gy Si SAND w/ Gr Nbe
20.5-25.5 Gy Sa SILT Org, Nbe
25.5-30.0 Bk-Gy SILT Org, Nbe

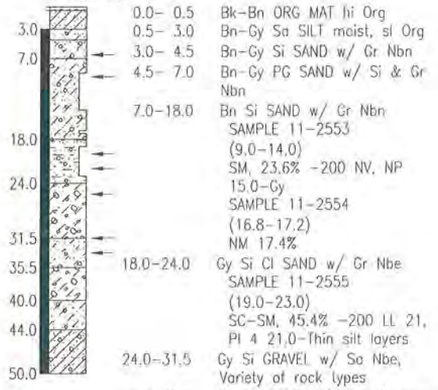
- FIGURE 17 -



STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

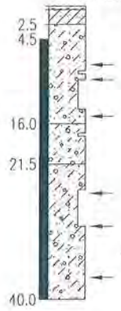
DATA:	KIANA AIRPORT IMPROVEMENTS MATERIAL SITE (A-1)
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 53

Dec 21, 2012 - 11:17am - Tab: TH SHT1 T:\00 Aviation & Community Rds & Buildings\Kiana\63179 Kiana Airport Improvements\08 Geology\Geology Figures\MS1-Testholes_cp-TH SHT1 Dec/21/12



TH11-468
N67.00035, W160.50439
19 NOV 2011

3.0	0.0– 0.5	Bk–Bn ORG MAT hi Org
	0.5– 3.0	Bn–Gy Sa SILT moist, sl Org
7.0	3.0– 4.5	Bn–Gy Si SAND w/ Gr Nbn
	4.5– 7.0	Bn–Gy PG SAND w/ Si & Gr Nbn
18.0	7.0–18.0	Bn Si SAND w/ Gr Nbn SAMPLE 11–2553 (9.0–14.0) SM, 23.6% –200 NV, NP 15.0–Gy SAMPLE 11–2554 (16.8–17.2) NM 17.4%
24.0		
31.5		
35.5	18.0–24.0	Gy Si Cl SAND w/ Gr Nbe SAMPLE 11–2555 (19.0–23.0) SC–SM, 45.4% –200 LL 21, PI 4 21.0–Thin silt layers
40.0	24.0–31.5	Gy Si GRAVEL w/ Sa Nbe, Variety of rock types
44.0	31.5–35.5	Gy PG SAND w/ Si & Gr Nbn
50.0	35.5–40.0	Gy Si GRAVEL w/ Sa Nbe
	40.0–44.0	Gy Si SAND w/ Gr Nbn
	44.0–50.0	Gy Sa SILT w/ Gr Nbe 46.5– Sandy layers

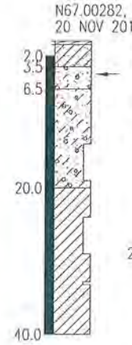


TH11-469
N67.00156, W160.50261
19 NOV 2011

2.5	0.0– 0.5	Bk–Bn ORG MAT hi Org
4.5	0.5– 2.5	Gy–Bn Sa SILT moist, sl Org
16.0	2.5–16.0	Gy–Bn Si SAND w/ Gr 4.5–Nbn SAMPLE 11–2556 (8.8–9.2) NM 10.5% SAMPLE 11–2557 (10.0–14.0) SM, 19.2% –200 NV, NP 12.0–Consistent
21.5	16.0–21.5	Gy–Bn PG SAND w/ Si & Gr Nbn, 1 inch gravel SAMPLE 11–2558 (17.3–17.7) NM 7.8%
40.0	21.5–40.0	Gy–Bn Si SAND w/ Gr Nbn SAMPLE 11–2559 (25.0–30.0) SM, 29.1% –200 NV, NP 26.0–Increased silt content 32.5–Nbe, Silty zones 34.0–w/ Gr

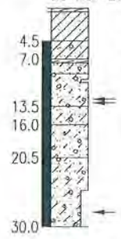
TH11-470
N67.00151, W160.50529
19 NOV 2011

3.0	0.0– 0.5	Bk–Bn ORG MAT hi Org
5.5	0.5– 5.5	Gy–Bk SILT w/ Sa moist, sl Org 3.0–Nbn 4.0– Sandy and organic
28.0	5.5– 7.0	Gy Si SAN Nbn
35.0	7.0–28.0	Gy Si SAND w/ Gr Nbn SAMPLE 11–2560 (11.3–11.7) NM 13.9% SAMPLE 11–2561 (11.7–15.0) SM, 30.4% –200 DEG 34 NV, NP 12.0– 1/2 inch gravel and silty zones SAMPLE 11–2562 (15.0–20.0) SM, 25.3% –200 NV, NP 15.5– Coarse sand and 1 inch gravel 17.0– Gy–Bn 18.5– Nbn, 1/2 inch gravel 22.0– 1 inch gravel
	28.0–35.0	Gy Sa SILT Nbe, Trace gravel SAMPLE 11–2563 (28.8–29.2) NM 24.1% 31.5– Consistent



TH11-471
N67.00282, W160.50467
20 NOV 2011

2.0	0.0– 0.5	Bk–Bn ORG MAT hi Org
3.5	0.5– 3.5	Bn–Gy Sa SILT sl Org 2.0– Nbn
6.5	3.5– 6.5	Tn PG SAND w/ Si & Gr Nbn
20.0	6.5–20.0	Gy Si SAND w/ Gr Nbn 10.5–Consistent 12.0–1 inch gravel SAMPLE 11–2564 (14.0–19.0) SM, 20.1% –200 NV, NP
40.0	20.0–40.0	Gy SILT Nbe, Trace gravel SAMPLE 11–2565 (24.0–29.0) ML, 87.6% –200 LL 33, PI 7 25.0– Consistent 26.0–Org 27.5– No gravel SAMPLE 11–2566 (32.8–33.2) NM 32.9%, ORG 1.3% 34.0–Trace gravel

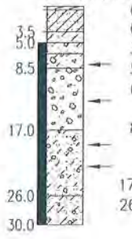


TH11-472
N67.00372, W160.50597
20 NOV 2011

4.5	0.0– 0.5	Bk–Bn ORG MAT hi Org
7.0	0.5– 4.5	Gy SILT w/ Sa moist, sl Org
	4.5– 7.0	Bn Sa SILT w/ Gr Nbn
13.5	7.0– 7.5	Bn PEAT hi Org
16.0	7.5– 9.0	Bn Si SAND w/ Gr sl Org, Nbe, Wood chips
20.5	9.0–13.5	Gy PG SAND w/ Si & Gr sl Org, Nbe SAMPLE 11–2567 (9.8–10.2) NM 33.3%, ORG 4.6% 12.0–1 inch gravel
30.0	13.5–16.0	Gy Si SAND w/ Gr Nbn
	16.0–20.5	Gy PG SAND w/ Si & Gr Nbn 19.0– Interbedded silt layers
	20.5–30.0	Gy Si SAND w/ Gr Nbn, Slightly plastic SAMPLE 11–2568 (25.0–30.0) SM, 46.4% –200 LL 23, PI 3 25.5–sand and gravel zones

TH11-473
N67.00436, W160.50453
21 NOV 2011

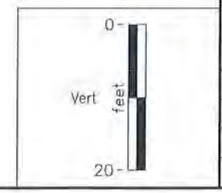
3.0	0.0– 0.5	Bk–Bn ORG MAT hi Org
4.5	0.5– 2.5	Bn Si SAND moist, sl Org
9.5	2.5– 4.5	Bn PG SAND w/ Si & Gr Nbn, 2 inch gravel
	4.5– 9.5	Bn PG GRAVEL w/ Si & Sa Nbn, 2 to 3 inch gravel
31.0	9.5–31.0	Bn PG GRAVEL w/ Sa Nbn 12.5– Consistent, no fines SAMPLE 11–2570 (15.0–23.0) GP, 4.8% –200 DEG 61 NV, NP SAMPLE 11–2570b (15.0–23.0) DEG 58 16.5–Loose, 2 to 3 inch gravel
36.5	31.0–36.5	Gy–Bn Si SAND w/ Gr Nbe
40.0	36.5–40.0	Gy Sa SILT w/ Gr Nbe



TH11-474
N67.00346, W160.50241
21 NOV 2011

3.5	0.0– 0.5	Bk–Bn ORG MAT hi Org
5.0	0.5– 3.5	Gy–Bn Sa SILT moist, sl Org
8.5	3.5– 5.0	Bn Si SAND w/ Gr dry to moist
	5.0– 6.5	Bn PG SAND w/ Si & Gr Nbn
17.0	6.5– 8.5	Bn PG GRAVEL w/ Si & Sa Nbn, 2 to 3 inch gravel
	8.5–17.0	Bn PG GRAVEL w/ Sa Nbn 12.0–Loose gravel 14.0–1 inch gravel
26.0	17.0–26.0	Bn PG SAND w/ Si & Gr Nbn
30.0	26.0–30.0	Gy Si SAND w/ Gr Nbe

– FIGURE 18 –



STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS MATERIAL SITE (A-1)
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 54

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-455	TH11-455	TH11-455	TH11-455	TH11-456	TH11-456	TH11-457
DEPTH (feet)		11.8-12.2	20.0-23.5	27.3-27.7	37.0-40.0	5.8-6.2	29.8-30.2	4.8-5.2
LATITDUE		N67.00249°	N67.00249°	N67.00249°	N67.00249°	N67.00504°	N67.00504°	N67.00028°
LONGITUDE		W160.50168°	W160.50168°	W160.50168°	W160.50168°	W160.50593°	W160.50593°	W160.50627°
LAB NUMBER		**11-2511**	**11-2512**	**11-2513**	**11-2514**	**11-2515**	**11-2516**	**11-2517**
DATE SAMPLED		13-Nov-11	13-Nov-11	13-Nov-11	13-Nov-11	13-Nov-11	13-Nov-11	13-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**		100		99			
	0.75"		99		98			
	0.5"		95		94			
	0.375"		92		91			
	#4		75		79			
	#8		64.6		63.1			
	#10		63.3		60.5			
	#16		57.4		48.8			
	#20							
Sand	**#40**		49.9		37.9			
	#50		47.6		35.6			
	#60		46.5		34.4			
	#80		44.2		31.7			
	#100		43.0		30.4			
Silt/Clay	**#200**		35.5		23.1			
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			22	20	NV	NV		NV
PLASTIC INDEX			3	NP	NP	NP		NP
USCS CLASSIFICATION			SM		SM			
USCS SOIL DESCRIPTION		(SaSi w/Gr)	SiSa w/Gr	SiSa w/Gr	(Bx-soft)	(Si w/Sa)	(Si w/Sa)	(SaSi)
NATURAL MOISTURE		24.1		10.9			23.8	
ORGANICS						1.3		5.4
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								Org[1]

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-457	TH11-457	TH11-458	TH11-458	TH11-458	TH11-458	TH11-458
DEPTH (feet)		16.3-16.7	23.0-27.0	4.8-5.2	10.0-15.0	19.3-19.7	25.0-30.0	31.8-32.2
LATITDUE		N67.00028°	N67.00028°	N67.00064°	N67.00064°	N67.00064°	N67.00064°	N67.00064°
LONGITUDE		W160.50627°	W160.50627°	W160.50267°	W160.50267°	W160.50267°	W160.50267°	W160.50267°
LAB NUMBER		**11-2518**	**11-2519**	**11-2520**	**11-2521**	**11-2522**	**11-2522B**	**11-2523**
DATE SAMPLED		13-Nov-11	13-Nov-11	15-Nov-11	15-Nov-11	15-Nov-11	15-Nov-11	15-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**				99		100	
	0.75"				98		99	
	0.5"				92		97	
	0.375"				86		93	
	#4				69		81	
	#8				53.2		70.0	
	#10				50.8		68.5	
	#16				40.2		60.4	
	#20							
Sand	**#40**		95.0		30.0		47.4	
	#50		88.0		27.9		41.5	
	#60		81.8		27.0		38.4	
	#80		62.5		25.3		32.0	
	#100		53.2		24.2		29.3	
Silt/Clay	**#200**		20.1		19.4		18.7	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV		NV		NV	
PLASTIC INDEX			NP		NP		NP	
USCS CLASSIFICATION			SM		SM		SM	
USCS SOIL DESCRIPTION		(SaSi w/Gr)	SiSa	(PGSa w/Si&Gr)	SiSa w/Gr	(SiSa w/Gr)	SiSa w/Gr	(PGSa w/Gr)
NATURAL MOISTURE		112.2		19.9		22.8		
ORGANICS				2.0				0.4
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION					32			
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)					3			
SODIUM SULF. (FINE)					3			
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-458	TH11-459	TH11-459	TH11-459	TH11-459	TH11-459	TH11-460
DEPTH (feet)		40.8-41.2	6.8-7.2	10.8-11.2	12.0-15.0	24.8-25.2	35.0-40.0	6.8-7.2
LATITDUE		N67.00064°	N66.99863°	N66.99863°	N66.99863°	N66.99863°	N66.99863°	N66.99655°
LONGITUDE		W160.50267°	W160.50263°	W160.50263°	W160.50263°	W160.50263°	W160.50263°	W160.50393°
LAB NUMBER		**11-2524**	**11-2525**	**11-2526**	**11-2527**	**11-2528**	**11-2529**	**11-2530**
DATE SAMPLED		15-Nov-11	15-Nov-11	15-Nov-11	15-Nov-11	15-Nov-11	15-Nov-11	16-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**				99		100	
	0.75"				99		99	
	0.5"				99		96	
	0.375"				99		92	
	#4				96		79	
	#8				92.2		66.0	
	#10				91.1		64.2	
	#16				82.8		53.2	
	#20							
Sand	**#40**				66.3		47.2	
	#50				60.2		44.4	
	#60				56.7		43.0	
	#80				47.2		40.0	
	#100				42.3		38.6	
Silt/Clay	**#200**				21.2		31.2	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV			NV		NV	
PLASTIC INDEX		NP			NP		NP	
USCS CLASSIFICATION					SM		SM	
USCS SOIL DESCRIPTION		(SiSa w/Gr)	(PGSa w/Si&Gr)	(PGSa w/Si&Gr)	SiSa	(PGSa w/Si&Gr)	SiSa w/Gr	(PGSa w/Si&Gr)
NATURAL MOISTURE		9.4		20.7		10.2		4.9
ORGANICS			1.7					0.5
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-460	TH11-461	TH11-461	TH11-461	TH11-461	TH11-462	TH11-462
DEPTH (feet)		8.0-13.0	3.8-4.2	11.8-12.2	12.5-17.0	21.0-25.0	6.3-6.7	12.3-12.7
LATITDUE		N66.99655°	N66.99751°	N66.99751°	N66.99751°	N66.99751°	N66.99708°	N66.99708°
LONGITUDE		W160.50393°	W160.50608°	W160.50608°	W160.50608°	W160.50608°	W160.50197°	W160.50197°
LAB NUMBER		**11-2531**	**11-2532**	**11-2533**	**11-2534**	**11-2535**	**11-2536**	**11-2537**
DATE SAMPLED		16-Nov-11	16-Nov-11	16-Nov-11	16-Nov-11	16-Nov-11	17-Nov-11	17-Nov-11
% Passing	**3"**							
	2"	95						
	1.5"	88						
Gravel	**1.0"**	72			99	99		
	0.75"	59			98	97		
	0.5"	43			93	90		
	0.375"	36			89	82		
	#4	24			76	62		
	#8	18.8			64.3	47.0		
	#10	18.3			62.4	45.2		
	#16	16.5			55.3	38.3		
	#20							
Sand	**#40**	14.9			48.7	31.0		
	#50	14.1			46.8	29.3		
	#60	13.7			45.8	28.5		
	#80	12.6			43.8	26.9		
	#100	11.9			42.5	25.8		
Silt/Clay	**#200**	8.7			36.1	20.0		
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	21	21	20	NV	NV
PLASTIC INDEX		NP	NP	4	4	NP	NP	NP
USCS CLASSIFICATION		GP-GM			SC-SM	SM		
USCS SOIL DESCRIPTION		PGGr w/Si&Sa	(SiSa)	SiClSa w/Gr	SiClSa w/Gr	(Bx-soft)	(SiSa w/Gr)	(PGSa w/Si&Gr)
NATURAL MOISTURE				8.2			15.9	
ORGANICS			4.9					0.6
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS			sl Org[1]					

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-462	TH11-463	TH11-463	TH11-463	TH11-464	TH11-464	TH11-464
DEPTH (feet)		15.0-20.0	4.0-8.0	12.8-13.2	25.0-30.0	13.8-14.2	17.8-18.2	20.0-23.0
LATITDUE		N66.99708°	N66.99784°	N66.99784°	N66.99784°	N66.99835°	N66.99835°	N66.99835°
LONGITUDE		W160.50197°	W160.50332°	W160.50332°	W160.50332°	W160.50574°	W160.50574°	W160.50574°
LAB NUMBER		**11-2538**	**11-2539**	**11-2540**	**11-2541**	**11-2542**	**11-2543**	**11-2544**
DATE SAMPLED		17-Nov-11	17-Nov-11	17-Nov-11	17-Nov-11	18-Nov-11	18-Nov-11	18-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**	98	100					100
	0.75"	96	98		100			98
	0.5"	87	92		98			92
	0.375"	81	86		97			87
	#4	66	66		88			69
	#8	56.0	50.9		78.9			56.9
	#10	54.4	48.4		77.6			55.6
	#16	46.8	38.3		71.1			50.7
	#20							
Sand	**#40**	35.1	28.4		62.3			44.3
	#50	31.3	26.4		59.2			42.0
	#60	29.6	25.5		57.7			40.9
	#80	26.3	23.8		54.4			38.7
	#100	24.9	22.7		52.9			37.2
Silt/Clay	**#200**	18.2	17.6		44.6			30.9
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	18		NV	19		18
PLASTIC INDEX		NP	2		NP	4		NP
USCS CLASSIFICATION		SM	SM		SM			SM
USCS SOIL DESCRIPTION		SiSa w/Gr	SiSa w/Gr	SiSa w/Gr	SiSa w/Gr	(SiSa w/Gr)	(SiSa w/Gr)	SiSa w/Gr
NATURAL MOISTURE				8.1		14.6	11.8	
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		32						
DEGRAD. FACTOR		77						
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-464	TH11-465	TH11-466	TH11-466	TH11-466	TH11-467	TH11-467
DEPTH (feet)		34.8-35.2	9.0-13.0	2.3-2.7	4.8-5.2	20.0-24.0	8.8-9.2	16.8-17.2
LATITDUE		N66.99835°	N66.99941°	N66.99942°	N66.99942°	N66.99942°	N66.99937°	N66.99937°
LONGITUDE		W160.50574°	W160.50586°	W160.50369°	W160.50369°	W160.50369°	W160.50124°	W160.50124°
LAB NUMBER		**11-2545**	**11-2546**	**11-2547**	**11-2548**	**11-2549**	**11-2550**	**11-2552**
DATE SAMPLED		18-Nov-11	18-Nov-11	18-Nov-11	18-Nov-11	18-Nov-11	18-Nov-11	18-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**					99		
	0.75"					97		
	0.5"		100			93		
	0.375"		99			90		
	#4		96			80		
	#8		91.4			73.8		
	#10		90.5			72.7		
	#16		85.8			68.1		
	#20							
Sand	**#40**		78.1			61.1		
	#50		75.2			58.5		
	#60		73.6			57.2		
	#80		70.1			54.6		
	#100		85.4			52.8		
Silt/Clay	**#200**		57.3			45.3		
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			29			19	35	
PLASTIC INDEX			NP			4	NP	
USCS CLASSIFICATION			ML			SC-SM		
USCS SOIL DESCRIPTION		(SiSa w/Gr)	SaSi	(SaSi w/Gr)	(PGSa w/Si&Gr)	SiClSa w/Gr	(SaSi)	(PGSa w/Si&Gr)
NATURAL MOISTURE		16.2			30.6			19.3
ORGANICS				9.2			5.4	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				Org[1]			Org[1]	

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-468	TH11-468	TH11-468	TH11-469	TH11-469	TH11-469	TH11-469
DEPTH (feet)		9.0-14.0	16.8-17.2	19.0-23.0	8.8-9.2	10.0-14.0	17.3-17.7	25.0-30.0
LATITDUE		N67.00035°	N67.00035°	N67.00035°	N67.00156°	N67.00156°	N67.00156°	N67.00156°
LONGITUDE		W160.50439°	W160.50439°	W160.50439°	W160.50261°	W160.50261°	W160.50261°	W160.50261°
LAB NUMBER		**11-2553**	**11-2554**	**11-2555**	**11-2556**	**11-2557**	**11-2558**	**11-2559**
DATE SAMPLED		19-Nov-11	19-Nov-11	19-Nov-11	19-Nov-11	19-Nov-11	19-Nov-11	19-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**	99		100		99		99
	0.75"	98		99		98		99
	0.5"	92		96		93		94
	0.375"	86		93		87		89
	#4	69		82		68		74
	#8	56.2		72.5		51.6		62.3
	#10	54.3		71.1		49.4		60.3
	#16	45.7		65.7		39.8		52.7
	#20							
Sand	**#40**	36.7		59.0		30.4		44.1
	#50	34.5		56.6		28.3		41.6
	#60	33.4		55.3		27.3		40.4
	#80	31.3		52.7		25.6		37.9
	#100	29.9		51.5		24.4		36.3
Silt/Clay	**#200**	23.6		45.4		19.2		29.1
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV		21		NV		NV
PLASTIC INDEX		NP		4		NP		NP
USCS CLASSIFICATION		SM		SC-SM		SM		SM
USCS SOIL DESCRIPTION		SiSa w/Gr	SiSa w/Gr	SiClSa w/Gr	SiSa w/Gr	SiSa w/Gr	(PGSa w/Si&Gr)	SiSa w/Gr
NATURAL MOISTURE			17.4		10.5		7.8	
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-470	TH11-470	TH11-470	TH11-470	TH11-471	TH11-471	TH11-471
DEPTH (feet)		11.3-11.7	11.7-15.0	15.0-20.0	28.8-29.2	14.0-19.0	24.0-29.0	32.8-33.2
LATITDUE		N67.00151°	N67.00151°	N67.00151°	N67.00151°	N67.00282°	N67.00282°	N67.00282°
LONGITUDE		W160.50529°	W160.50529°	W160.50529°	W160.50529°	W160.50467°	W160.50467°	W160.50467°
LAB NUMBER		**11-2560**	**11-2561**	**11-2562**	**11-2563**	**11-2564**	**11-2565**	**11-2566**
DATE SAMPLED		19-Nov-11	19-Nov-11	19-Nov-11	19-Nov-11	20-Nov-11	20-Nov-11	20-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**		100	100		99		
	0.75"		99	99		97		
	0.5"		97	96		91		
	0.375"		93	93		85		
	#4		81	79		67	95	
	#8		68.3	64.8		53.6	94.0	
	#10		66.3	62.8		51.8	93.8	
	#16		57.8	54.0		43.0	93.1	
	#20							
Sand	**#40**		47.3	42.9		33.2	91.6	
	#50		43.8	39.3		29.7	90.7	
	#60		42.3	37.6		28.2	90.3	
	#80		39.2	34.5		25.7	89.5	
	#100		37.9	32.6		24.7	89.2	
Silt/Clay	**#200**		30.4	25.3		20.1	87.6	
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV	NV		NV	33	
PLASTIC INDEX			NP	NP		NP	7	
USCS CLASSIFICATION			SM	SM		SM	ML	
USCS SOIL DESCRIPTION		SiSa w/Gr	SiSa w/Gr	SiSa w/Gr	(SaSi)	SiSa w/Gr	Si	Si
NATURAL MOISTURE		13.9			24.1			32.9
ORGANICS								1.3
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR			34					
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-1)

TEST HOLE NUMBER		TH11-472	TH11-472	TH11-473	TH11-473			
DEPTH (feet)		9.8-10.2	25.0-30.0	15.0-23.0	15.1-23.0			
LATITDUE		N67.00372°	N67.00372°	N67.00436°	N67.00436°			
LONGITUDE		W160.50597°	W160.50597°	W160.50453°	W160.50453°			
LAB NUMBER		**11-2567**	**11-2568**	**11-2570**	**11-2570b**			
DATE SAMPLED		20-Nov-11	20-Nov-11	21-Nov-11	21-Nov-11			
% Passing	**3"**							
	2"			97				
	1.5"			91				
Gravel	**1.0"**		100	73				
	0.75"		98	59				
	0.5"		94	36				
	0.375"		90	25				
	#4		79	14				
	#8		71.1	11.1				
	#10		70.4	10.7				
	#16		66.8	9.0				
	#20							
Sand	**#40**		61.2	7.1				
	#50		58.9	6.7				
	#60		57.7	6.5				
	#80		55.2	6.1				
	#100		53.6	5.9				
Silt/Clay	**#200**		46.4	4.8				
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			23	NV				
PLASTIC INDEX			3	NP				
USCS CLASSIFICATION			SM	GP				
USCS SOIL DESCRIPTION		(PGSa w/Si&Gr)	SiSa w/Gr	PGGr	PGGr			
NATURAL MOISTURE		33.3						
ORGANICS		4.6						
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR				61	58			
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		sl Org[1]			2nd Deg from 11-2570.			

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

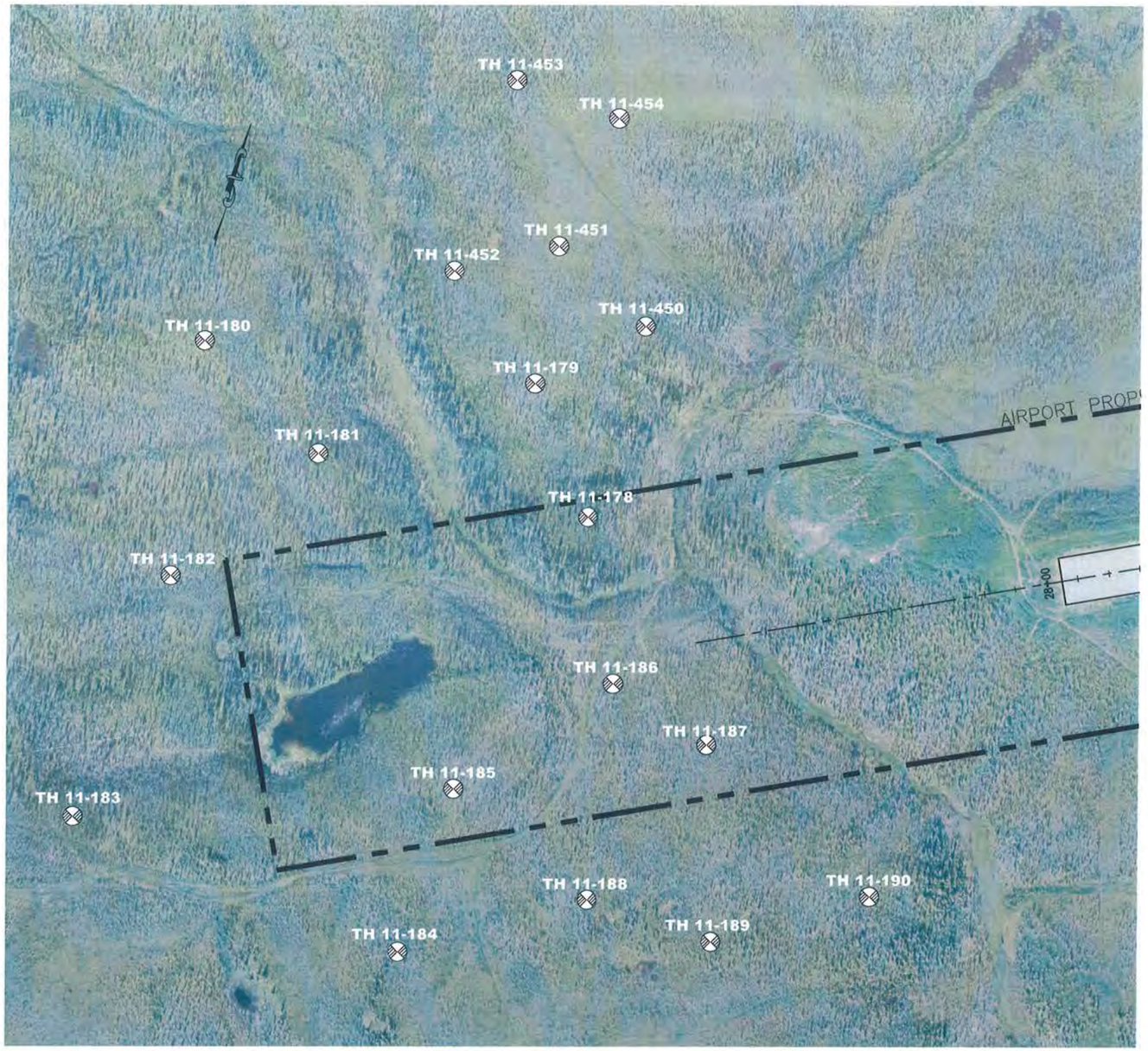
[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

APPENDIX C

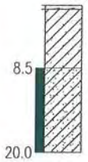
MATERIAL SOURCE: BORROW SITE A-6
TEST HOLE LOGS AND LABORATORY TEST RESULTS:



BORROW SITE A-6

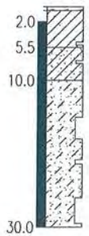
FEET
200 0 100 200 400

TH11-450
STA. 14+50. 950'L
11 NOV 2011



0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 8.5 Gy-Bn SILT w/ Sa moist to wet, sl Org
4.0-High Organic layer
8.5-20.0 Gy Sa SILT Nbe
12.0-Water in hole

TH11-451
STA. 13+10, 1350'L
11 NOV 2011



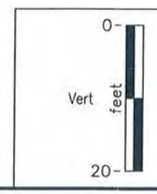
0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 5.5 Bn SILT w/ Sa moist, sl Org 2.0- Nbn
SAMPLE 11-2500
(4.8-5.2)
NM 10.3%
5.5-10.0 Gy Sa SILT Nbe
SAMPLE 11-2501
(7.3-7.7)
NM 31.3%
10.0-30.0 Gy Si SAND Nbe
SAMPLE 11-2502
(15.0-18.0)
SM, 46.5% -200
NV, NP 18.5-Consistent
19.5- Organic zones
SAMPLE 11-2503
(20.8-21.4)
NM 28.3%, ORG 0.7%
23.5- Nbn
SAMPLE 11-2504
(26.0-29.5) SM, 45.4%
-200 NV, NP

TH11-452
STA. 10+00, 1300'L
11 NOV 2011

0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 4.5 Gy-Bn SILT moist to wet, sl Org
3.0- Nbe
4.5-23.0 Gy Si SAND Nbe
SAMPLE 11-2505
(5.8-6.2)
NM 25.9% 9.0-Vx
SAMPLE 11-2506
(11.0-15.0)
SM, 27.3% -200 NV, NP 12.0-Nbe
14.5- Nbn 16.0-Fine Sand 17.0-Consistent
SAMPLE 11-2507
(17.8-18.2)
NM 36.7%, ORG 1.1%
19.0- Nbe

TH11-453
STA. 12+50, 1850'L
11 NOV 2011

0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 3.0 Gy-Bn SILT sl Org
3.0- 5.5 Gy-Bn SILT w/ Sa Nbe
5.5-11.0 Gy Sa SILT sl Org, Nbe
SAMPLE 11-2508
(5.8-6.2)
ORG 2.2%
11.0-25.0 Tn Si SAND Nbe
SAMPLE 11-2509
(14.3-14.7)
NM 33.0%, ORG 1.9%
19.0-Wood chips
21.0-Nbn
SAMPLE 11-2510
(21.0-25.0)
SM, 49.5% -200
NV, NP



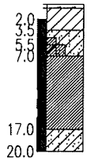
- FIGURE 19 -

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS BORROW SITE (A-6)
DRAWN: CP	
APPROVED: TW	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 65

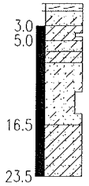
Dec 21, 2012 - 11:18am - Tab: BORROW SITE VIC MAP T:\00 Aviation & Community Rds & Buildings\Kiana\63179 Kiana Airport Improvements\08 Geology\Geology Figures\MS1-Testholes_cp-BORROW SITE VIC MAP Dec/21/12

TH11-454
STA. 13+90, 1700'L
11 NOV 2011



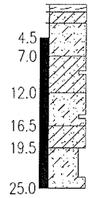
0.0- 0.5 Bk-Bn ORG MAT hi Org
0.5- 3.5 Gy-Bn SILT sl Org 2.0-Nbe
3.5- 7.0 Gy Sa SILT Nbe 4.5- Vx
7.0-17.0 Wh-Gy ICE ICE
17.0-20.0 Gy Sa SILT Vx 18.0- Nbe

TH11-178
STA. 13+80, 400'L
23 JUL 2011



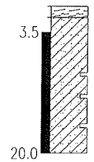
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 3.0 Bn Si SAND moist, sl Org
3.0- 5.0 Gy Sa SILT Nbe
SAMPLE 11-2266
(4.0-4.5)
NM 32.6%, ORG 1.4%
5.0- 6.5 Gy-Bn Si SAND Nbn
6.5- 8.0 Gy Sa SILT sl Org, Nbe
8.0-16.5 Gy Si SAND Nbe
SAMPLE 11-2267
(12.0-15.0)
SM, 42.2% -200
NV, NP
13.0- Nbn 13.5- Consistent
16.5-23.5 Gy Sa SILT sl Org, Nbe

TH11-179
STA. 12+70, 840'L
23 JUL 2011



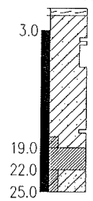
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 2.5 Gy-Bn Sa SILT moist to wet, sl Org
2.5- 7.0 Gy-Bn Si SAND moist to wet, sl Org 4.5- Nbn
7.0-12.0 Gy Sa SILT sl Org, Nbe
SAMPLE 11-2268
(9.0-9.5)
NM 38.0%, ORG 2.7%
12.0-16.5 Gy Si SAND Nbn
SAMPLE 11-2269
(15.0-15.5)
NM 20.7%, ORG 0.4%
16.5-19.5 Gy Sa SILT sl Org, Nbe
19.5-25.0 Gy Si SAND Nbn
SAMPLE 11-2270
(19.5-23.5)
SM, 24.5% -200
NV, NP

TH11-180
STA. 3+00, 1150'L
23 JUL 2011



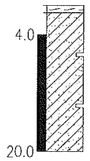
0.0- 1.5 Bn-Bk ORG MAT moist to wet, hi Org
1.5-20.0 Gy Sa SILT moist to wet, sl Org 3.5- Nbe 8.0-sl Org
SAMPLE 11-2271
(9.0-9.5)
NM 37.9%, ORG 4.3%
SAMPLE 11-2272
(12.0-12.5)
NM 34.1%, ORG 1.8%
13.0- Consistent
SAMPLE 11-2273
(16.0-16.5)
NM 32.8%, ORG 1.3%
17.0-Bn 19.0-Gy

TH11-181
STA. 5+90, 750'L
23 JUL 2011



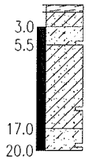
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0-19.0 Gy-Bn SILT w/ Sa Moist to wet, sl Org 3.0-Nbe
SAMPLE 11-2274
(4.0-4.5)
NM 45.1%, ORG 2.7%
SAMPLE 11-2275
(5.0-8.0)
ML, 84.9% -200
NV, NP 6.0-Vx, 10
Percent Ice 7.0- Nbe 12.0-Vs, Thin Ice lens
SAMPLE 11-2276
(16.5-17.0)
NM 39.3%, ORG 2.2%
17.5-Vx
19.0-22.0 Wh ICE ICE
22.0-25.0 Gy-Wh Sa SILT sl Org, Vx

TH11-182
STA. 0+70, 450'L
23 JUL 2011



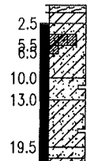
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0-20.0 Bn-Gy Sa SILT moist to wet, sl Org 2.5- wet 4.0- Nbe
SAMPLE 11-2277
(6.5-7.0)
NM 35.1%, ORG 3.4%
8.0-Vx, 10 Percent Ice 9.0-Nbe
SAMPLE 11-2278
(13.5-14.0)
NM 34.1%, ORG 1.7%
15.0-Consistent 17.0-Nbn

TH11-183
STA. -3+90, 200'R
24 JUL 2011



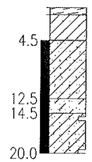
0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 3.0 Bn-Gy Sa SILT moist, sl Org
3.0- 5.5 Gy Si SAND Nbe
SAMPLE 11-2279
(5.0-5.5)
NM 29.5%, ORG 0.9%
5.5-17.0 Gy Sa SILT Nbe 7.0-Nbn 10.5- sl Org, Vx, 5 Percent Ice
SAMPLE 11-2280
(14.0-14.5)
NM 40.6%, ORG 1.5%
14.5-Consistent
17.0-20.0 Gy Si SAND Nbe
SAMPLE 11-2281
(19.0-19.5)
NM 37.5%, ORG 1.8%

TH11-184
STA. 5+40, 780'R
24 JUL 2011



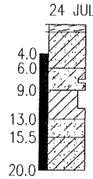
0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 2.5 Gy-Bn SILT moist, sl Org
2.5-10.0 Gy Sa SILT sl Org, Nbe 4.0- Ice + .. 5.5-Vx
10.0-13.0 Gy Si SAND sl Org, Vx
SAMPLE 11-2282
(11.0-11.5)
NM 32.7%, ORG 2.5%
13.0-19.5 Gy Sa SILT sl Org, Nbe 16.5-Bn
SAMPLE 11-2283
(17.0-17.5)
NM 41.0%, ORG 3.6%
19.5-21.0 Gy Si SAND Nbn
21.0-23.5 Gy Sa SILT Nbn

TH11-185
STA.8+00, 300'R
24 JUL 2011



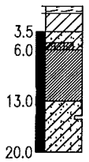
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 4.5 Gy-Bn SILT w/ Sa wet, sl Org
4.5-12.5 Gy Sa SILT Nbe
12.5-14.5 Gy Si SAND Nbn
14.5-20.0 Gy Sa SILT Nbe
SAMPLE 11-2284
(15.0-15.5)
NM 35.1%, ORG 1.5%
SAMPLE 11-2285
(19.5-20.0)
NM 36.6%, ORG 1.9%

TH11-186
STA. 13+70, 90'R
24 JUL 2011



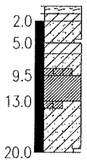
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 6.0 Gy-Bn Sa SILT moist to wet, sl Org 3.0- Gy wet 4.0- Nbe
6.0- 9.0 Gy Si SAND sl Org, Nbe
SAMPLE 11-2286
(7.5-8.0)
NM 39.6%, ORG 3.3%
9.0-13.0 Gy SILT sl Org, Nbe
SAMPLE 11-2287
(9.0-11.5)
ML, 85.2% -200 NV, NP
13.0-15.5 Gy Si SAND Nbn
15.5-20.0 Gy Sa SILT Nbe

TH11-187
STA. 16+10, 300'R
24 JUL 2011



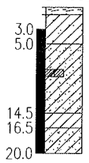
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 3.5 Gy-Bn SILT moist to wet, sl Org 2.5- wet
3.5- 6.0 Gy Sa SILT sl Org, Nbe 5.0- Ice + ...
6.0-13.0 Wh ICE ICE 12.5- Wood chips
13.0-20.0 Gy Sa SILT sl Org, Nbe 14.5-Bn 15.0-Nbn
SAMPLE 11-2288
(15.0-15.5)
NM 38.9%, ORG 4.2%
18.0- Gy

TH11-188
STA. 11+65, 720'R
24 JUL 2011



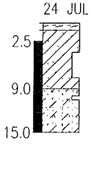
0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 2.0 Cy-Bn SILT w/ Sa moist to wet, sl Org
2.0- 5.0 Gy Sa SILT sl Org, Nbe
SAMPLE 11-2289
(4.5-5.0)
NM 33.7%, ORG 2.5%
5.0- 6.5 Gy SILT sl Org, Nbe
6.5- 9.5 Gy Sa SILT sl Org, Nbe 8.5- Ice +...
9.5-13.0 Wh ICE ICE 12.5- Wood chips
13.0-20.0 Gy-Bn Sa SILT sl Org, Vx, 0 to 10 Percent Ice
SAMPLE 11-2290
(19.5-20.0)
NM 31.9%, ORG 2.6%

TH11-189
STA. 15+10, 920'R
24 JUL 2011

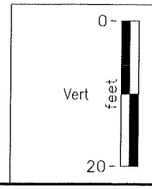


0.0- 1.0 Bn-Bk ORG MAT moist to wet, hi Org
1.0- 5.0 Cy-Bn SILT w/ Sa moist to wet, sl Org 3.0-Nbe
5.0-14.5 Gy Sa SILT sl Org, Nbe 8.5-Vx 10.0-10 Percent Ice 13.0-Nbe
14.5-16.5 Bn SILT Org, Vx, 10 Percent Ice
16.5-20.0 Gy Sa SILT sl Org, Vx, 10 to 20 Percent Ice 19.0-Nbe

TH11-190
STA. 20+50, 870'R
24 JUL 2011



0.0- 1.0 Bn-Bk ORG MAT moist, hi Org
1.0- 9.0 Gy-Bn SILT w/ Sa moist, sl Org 2.5-Nbe
SAMPLE 11-2291
(4.0-7.5)
ML, 83.1% -200
NV, NP
9.0-15.0 Gy Si SAND sl Org, Nbe
SAMPLE 11-2292
(10.0-10.5)
NM 38.5%, ORG 2.8%
13.0- Consistent



- FIGURE 20 -

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA:	KIANA AIRPORT IMPROVEMENTS BORROW SITE (A-6)
DRAWN:	
APPROVED:	PROJECT NO. 63179
DATE: JUNE 2012	PAGE 66

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-6)

TEST HOLE NUMBER		TH11-451	TH11-451	TH11-451	TH11-451	TH11-451	TH11-452	TH11-452
DEPTH (feet)		4.8-5.2	7.3-7.7	15.0-18.0	20.8-21.4	26.0-29.5	5.8-6.2	11.0-15.0
STATION		13+10	13+10	13+10	13+10	13+10	10+00	10+00
OFFSET		1350L	1350L	1350L	1350L	1350L	1300L	1300L
LAB NUMBER		**11-2500**	**11-2501**	**11-2502**	**11-2503**	**11-2504**	**11-2505**	**11-2506**
DATE SAMPLED		11-Nov-11	11-Nov-11	11-Nov-11	11-Nov-11	11-Nov-11	11-Nov-11	11-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							96.6
	#50			98.8		99.0		90.0
	#60			97.8		98.2		84.8
	#80			93.0		94.3		69.4
	#100			89.0		89.3		62.0
Silt/Clay	**#200**			46.5		45.4		27.3
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT				NV		NV		NV
PLASTIC INDEX				NP		NP		NP
USCS CLASSIFICATION				SM		SM		SM
USCS SOIL DESCRIPTION		(Si w/Sa)	(SaSi)	SiSa	SiSa	SiSa	(SiSa)	SiSa
NATURAL MOISTURE		103.0	31.3		28.3		25.9	
ORGANICS					0.7			
SP. GR. (FINE)								2.69
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-6)

TEST HOLE NUMBER		TH11-178	TH11-178	TH11-179	TH11-452	TH11-453	TH11-453	TH11-453
DEPTH (feet)		4.0-4.5	12.0-15.0	9.0-9.5	17.8-18.2	5.8-6.2	14.3-14.7	21.0-25.0
STATION		13+80	13+80	12+70	10+00	12+50	12+50	12+50
OFFSET		400L	400L	840L	1300L	1850L	1850L	1850L
LAB NUMBER		**11-2266**	**11-2267**	**11-2268**	**11-2507**	**11-2508**	**11-2509**	**11-2510**
DATE SAMPLED		23-Jul-11	23-Jul-11	23-Jul-11	11-Nov-11	11-Nov-11	11-Nov-11	11-Nov-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							98
	0.75"							98
	0.5"							96
	0.375"							94
	#4							86
	#8							79.5
	#10							78.7
	#16							75.5
	#20							
Sand	**#40**		99.0					69.9
	#50		97.4					67.3
	#60		95.9					65.9
	#80		91.2					62.8
	#100		85.9					60.5
Silt/Clay	**#200**		42.2					49.5
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV					NV
PLASTIC INDEX			NP					NP
USCS CLASSIFICATION			SM					SM
USCS SOIL DESCRIPTION		(SaSi)	SiSa	(SaSi)	(SiSa)	(SaSi)	(SiSa)	SiSa w/Gr
NATURAL MOISTURE		32.6		38.0	36.7		33.0	
ORGANICS		1.4		2.7	1.1	2.2	1.9	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				sl Org[1]		sl Org[1]		

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-6)

TEST HOLE NUMBER		TH11-179	TH11-179	TH11-180	TH11-180	TH11-180	TH11-181	TH11-181
DEPTH (feet)		15.0-15.5	19.5-23.5	9.0-9.5	12.0-12.5	16.0-16.5	4.0-4.5	5.0-8.0
STATION		12+70	12+70	3+00	3+00	3+00	5+90	5+90
OFFSET		840L	840L	1150L	1150L	1150L	750L	750L
LAB NUMBER		**11-2269**	**11-2270**	**11-2271**	**11-2272**	**11-2273**	**11-2274**	**11-2275**
DATE SAMPLED		23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11	23-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**		99.2					
	#50		97.5					
	#60		95.7					
	#80		88.1					
	#100		78.9					
Silt/Clay	**#200**		24.5					84.9
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV					NV
PLASTIC INDEX			NP					NP
USCS CLASSIFICATION			SM					ML
USCS SOIL DESCRIPTION		(SiSa)	SiSa	(SaSi)	(SaSi)	(SaSi)	Si w/Sa	Si w/Sa
NATURAL MOISTURE		20.7		37.9	34.1	32.8	45.1	
ORGANICS		0.4		4.3	1.8	1.3	2.7	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				sl Org[1]			sl Org[1]	

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-6)

TEST HOLE NUMBER		TH11-181	TH11-182	TH11-182	TH11-183	TH11-183	TH11-183	TH11-184
DEPTH (feet)		16.5-17.0	6.5-7.0	13.5-14.0	5.0-5.5	14.0-14.5	19.0-19.5	11.0-11.5
STATION		5+90	0+70	0+70	-3+90	-3+90	-3+90	5+40
OFFSET		750L	450L	450L	200R	200R	200R	780R
LAB NUMBER		**11-2276**	**11-2277**	**11-2278**	**11-2279**	**11-2280**	**11-2281**	**11-2282**
DATE SAMPLED		23-Jul-11	23-Jul-11	23-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50							
	#60							
	#80							
	#100							
Silt/Clay	**#200**							
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT								
PLASTIC INDEX								
USCS CLASSIFICATION								
USCS SOIL DESCRIPTION		(Si w/Sa)	(SaSi)	(SaSi)	(SiSa)	(SaSi)	(SiSa)	(SiSa)
NATURAL MOISTURE		39.3	35.1	34.1	29.5	40.6	37.5	32.7
ORGANICS		2.2	3.4	1.7	0.9	1.5	1.8	2.5
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		sl Org[1]	sl Org[1]					sl Org[1]

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-6)

TEST HOLE NUMBER		TH11-184	TH11-185	TH11-185	TH11-186	TH11-186	TH11-187	TH11-188
DEPTH (feet)		17.0-17.5	15.0-16.0	19.5-20.0	7.5-8.0	9.0-11.5	15.0-15.5	4.5-5.0
STATION		5+40	8+00	8+00	13+70	13+70	16+10	11+65
OFFSET		780R	300R	300R	90R	90R	300R	720R
LAB NUMBER		**11-2283**	**11-2284**	**11-2285**	**11-2286**	**11-2287**	**11-2288**	**11-2289**
DATE SAMPLED		24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11	24-Jul-11
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#8							
	#10							
	#16							
	#20							
Sand	**#40**							
	#50							
	#60							
	#80					99.2		
	#100					94.9		
Silt/Clay	**#200**					85.2		
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT						NV		
PLASTIC INDEX						NP		
USCS CLASSIFICATION						ML		
USCS SOIL DESCRIPTION		(SaSi)	(SaSi)	(SaSi)	(SiSa)	Si	(SaSi)	(SaSi)
NATURAL MOISTURE		41.0	35.1	36.6	39.6		38.9	33.7
ORGANICS		3.6	1.5	1.9	3.3		4.2	2.5
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		sl Org[1]			sl Org[1]		sl Org[1]	sl Org[1]

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: MATERIAL SITE (A-6)

TEST HOLE NUMBER		TH11-188	TH11-190	TH11-190			
DEPTH (feet)		19.5-20.0	4.0-7.5	10.0-10.5			
STATION		11+65	20+50	20+50			
OFFSET		720R	870R	870R			
LAB NUMBER		**11-2290**	**11-2291**	**11-2292**			
DATE SAMPLED		24-Jul-11	24-Jul-11	24-Jul-11			
% Passing	**3"**						
	2"						
	1.5"						
Gravel	**1.0"**						
	0.75"						
	0.5"						
	0.375"						
	#4						
	#8						
	#10						
	#16						
	#20						
Sand	**#40**						
	#50						
	#60						
	#80		99.4				
	#100		98.8				
Silt/Clay	**#200**		83.1				
	0.02						
	0.005						
Hydro	**0.002**						
	0.001						
LIQUID LIMIT			NV				
PLASTIC INDEX			NP				
USCS CLASSIFICATION			ML				
USCS SOIL DESCRIPTION		(SaSi)	Si w/Sa	(SiSa)			
NATURAL MOISTURE		31.9		38.5			
ORGANICS		2.6		2.8			
SP. GR. (FINE)							
SP. GR. (COARSE)							
MAX. DRY DENSITY							
OPTIMUM MOISTURE							
L.A. ABRASION							
DEGRAD. FACTOR							
SODIUM SULF. (CRSE)							
SODIUM SULF. (FINE)							
NORDIC ABRASION							
REMARKS		sl Org[1]		sl Org[1]			

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

APPENDIX C

MATERIAL SOURCE RECONNAISSANCE: LABORATORY TEST RESULTS and ASBESTOS SAMPLE RESULTS:

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Kiana Airport Improvements
PROJECT NUMBER:
AKSAS NUMBER: 63179
SAMPLED BY: T. Weiss
MATERIAL SOURCE: RECONNAISSANCE MATERIAL SITE (A-1 THRU A-5)

TEST HOLE NUMBER		MS-A-3	MS-A-4	MS-A-2	MS-A-5-1	MS-A-5-2	MS-A-5-3	MS-A-1
DEPTH (feet)		0.0-1.5	0.0-1.5	0.0-1.5	0.0-1.5	0.0-1.5	0.0-1.5	0.0-1.5
LATITUDE		N66.9284°	N66.95092°	N66.94335°	N66.98102°	N66.9824°	N66.9827°	N67.00004°
LONGITUDE		W160.5585°	W160.4866°	W160.5613°	W160.41937°	W160.4196°	W160.4197°	W160.502°
LAB NUMBER		**11-2200**	**11-2201**	**11-2202**	**11-2203**	**11-2204**	**11-2205**	**11-2317**
DATE SAMPLED		14-Jul-11	14-Jul-11	15-Jul-11	15-Jul-11	15-Jul-11	15-Jul-11	26-Jul-11
% Passing	**3"**							
	2"	98		95		99		88
	1.5"	96	98	89	99	99	98	83
Gravel	**1.0"**	87	87	78	98	99	95	71
	0.75"	79	81	71	97	99	93	60
	0.5"	68	70	60	95	98	88	49
	0.375"	62	63	54	94	98	85	42
	#4	47	45	39	90	97	76	28
	#8	32.8	33.3	28.2	86.1	95.6	68.0	18.7
	#10	29.9	31.3	26.4	85.5	95.4	66.7	17.5
	#16	16.9	20.8	18.0	80.5	94.7	60.5	13.1
	#20							
Sand	**#40**	5.8	5.6	6.8	47.2	92.4	49.8	8.6
	#50	4.0	3.9	4.6	29.6	89.2	45.0	7.7
	#60	3.4	3.4	3.9	24.7	86.6	42.6	7.4
	#80	2.6	2.8	2.9	14.6	78.8	37.6	6.7
	#100	2.4	2.6	2.6	11.2	72.3	34.4	6.5
Silt/Clay	**#200**	1.5	1.9	1.4	4.9	40.3	23.2	4.9
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		GP	GP	GP	SP	SM	SM	GW
USCS SOIL DESCRIPTION		PGGr w/Sa	PGGr w/Sa	PGGr w/Sa	PGSa w/Gr	SiSa	SiSa w/Gr	WGGr w/Sa
NATURAL MOISTURE								
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		41	37	35				37
DEGRAD. FACTOR		51	58	68				39
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

[1] Organic content determination is based on the results of the ATM T-6 test method.

(Soil descriptions shown in parentheses are based on field determinations.)

USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

EMSL Analytical, Inc
2235 Polvorosa Ave , Suite 230, San Leandro, CA 94577
Phone: (510) 895-3675 Fax: (510) 895-3680 Email: sanleandrolab@emsl.com

Attn: **Tim Weiss**
Alaska DOT & PF
6860 Glacier Highway
Juneau, AK 99801

Fax: (907) 465-3506 Phone: (907) 465-4449
Project: **63179**

Customer ID: AKDO62
Customer PO: NRPO-12-56070
Received: 09/12/11 9:00 AM
EMSL Order: 091110295

EMSL Proj:
Analysis Date: 9/25/2011

Test Report: PLM Analysis of Bulk Samples for Asbestos via EPA 600/R-93/116 Method with CARB 435 Prep (Milling). Level B for 0.1% Target Analytical Sensitivity

			Non-Asbestos		Asbestos
Sample	Description	Appearance	% Fibrous	% Non-Fibrous	% Type
11-2317 *091110295-0001*	Material Site #1	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
11-2201 *091110295-0002*	Material Site #2	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
11-2200 *091110295-0003*	Material Site #3	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
11-2201 *091110295-0004*	Material Site #4	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
11-2203 *091110295-0005*	Material Site #5	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**
11-2262 *091110295-0006*	Airport Site, west	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	**None Detected**

Initial report from

Analyst(s)
Baojia Ke (6)

Baojia Ke, Laboratory Manager
or other approved signatory

Test Report PLMPTC-7.121.0 Printed:

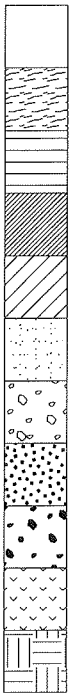
THIS IS THE LAST PAGE OF THE REPORT.

APPENDIX D

SYMBOLS AND DEFINITIONS
UNIFIED SOIL CLASSIFICATION SYSTEM
DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

SYMBOLS AND DEFINITIONS

BASIC MATERIAL SYMBOLS



ASPHALT

PEAT

CLAY (Cl)

ICE

SILT (Si)

POORLY GRADED SAND (Sa)

POORLY GRADED GRAVEL (Gr)

WELL GRADED SAND

WELL GRADED GRAVEL

BEDROCK (Bx), soft(Type)

BEDROCK (Bx), hard(Type)

SOFT OR HARD BEDROCK BASED ON DRILLING RATE

NOTE

MAIN COMPONENT (UPPER CASE ... SOLID LINES)
MINOR COMPONENT (Title Case ... DASHED LINES OR SPARSER PATTERN)

USCS SIZE DEFINITIONS

BOULDERS (Boulders)	12"+
COBBLES (Cobbles)	3" TO 12"
GRAVEL	#4 TO 3"
ANGULAR FRAGMENTS	#10 +
SAND	#200 TO #4
SILT	#200 TO 0.005 mm
CLAY	MINUS 0.005 mm

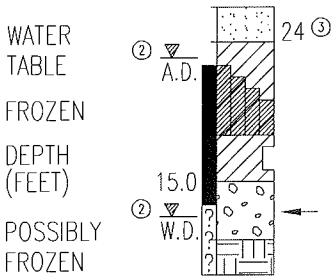
TEST RESULTS

_._%-200	= % PASSING #200 SIEVE
NM _._%	= NATURAL MOISTURE
ORG _._%	= ORGANIC CONTENT
SSc _	= SODIUM SULFATE LOSS(coarse)
SSf _	= SODIUM SULFATE LOSS(fine)
LA _	= LOS ANGELES ABRASION
DEG _	= DEGRADATION
LL _	= LIQUID LIMIT (NV = no value)
PI _	= PLASTIC INDEX (NP = non-plastic)

MISC.

Tr	= TRACE
sl	= SLIGHTLY
hi	= HIGHLY
w/_	= WITH UNSPECIFIED AMOUNT
X'tls	= CRYSTALS
TH	= TEST HOLE
TT	= TEST TRENCH
TP	= TEST PIT

TYPICAL LOG

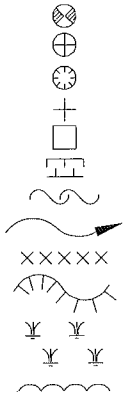


① Station value may also be on centerline e.g. Sta 210+53, CL or lat-long format e.g. N64.56789°, W145.67890°

② W.D.= WHILE DRILLING, A.D.= AFTER DRILLING

③ "N VALUE" INDICATES STANDARD PENETRATION TEST (1.4" I.D., 2.0" O.D. SAMPLER DRIVEN WITH 140 LB. HAMMER, 30" FREE FALL) AND IS SUM OF 2nd AND 3rd 6" OF PENETRATION.

PLAN VIEW SYMBOLS



POWER AUGER TEST HOLE (TH)

HAND AUGER TEST HOLE (TH)

EXPOSED MATERIAL

PROBE

HAND DUG TEST PIT (TP)

DOZER/BACKHOE TEST TRENCH (TT)

BODY OF WATER

FLOW DIRECTION

WASTE BERM

BANK

SWAMP

TREELINE

SOIL DENSITY/CONSISTENCY DESCRIPTORS

NON-COHESIVE		COHESIVE	
RELATIVE DENSITY	BLOWS/FOOT (N) VALUE	CONSISTENCY	BLOWS/FOOT (N) VALUE
VERY LOOSE	< 4	VERY SOFT	< 2
LOOSE	5-10	SOFT	2-4
MEDIUM DENSE	11-30	FIRM	5-8
DENSE	31-50	STIFF	9-15
VERY DENSE	> 50	VERY STIFF	16-30
		HARD	> 30

COLOR

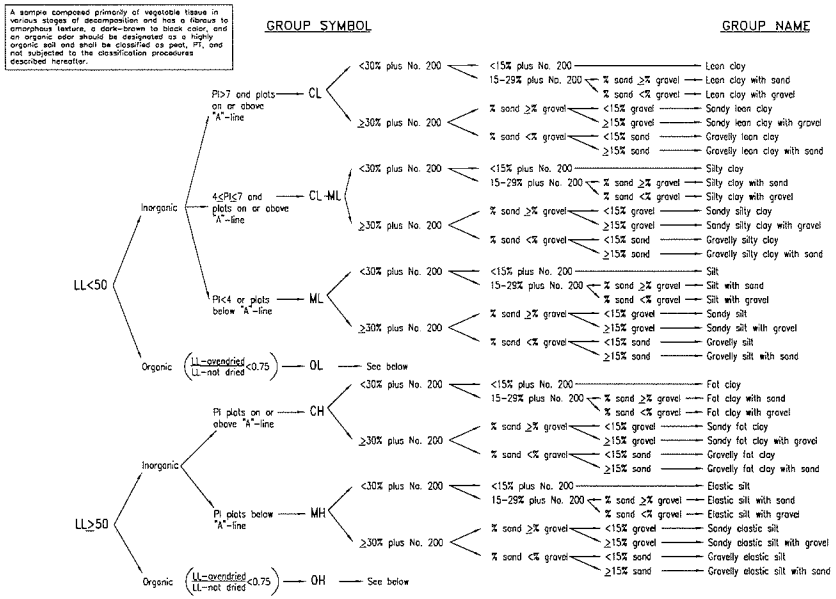
Bk = BLACK	Gy = GRAY	Tn = TAN
Bl = BLUE	Or = ORANGE	Wh = WHITE
Bn = BROWN	Rd = RED	Yw = YELLOW
Gn = GREEN		

MOISTURE

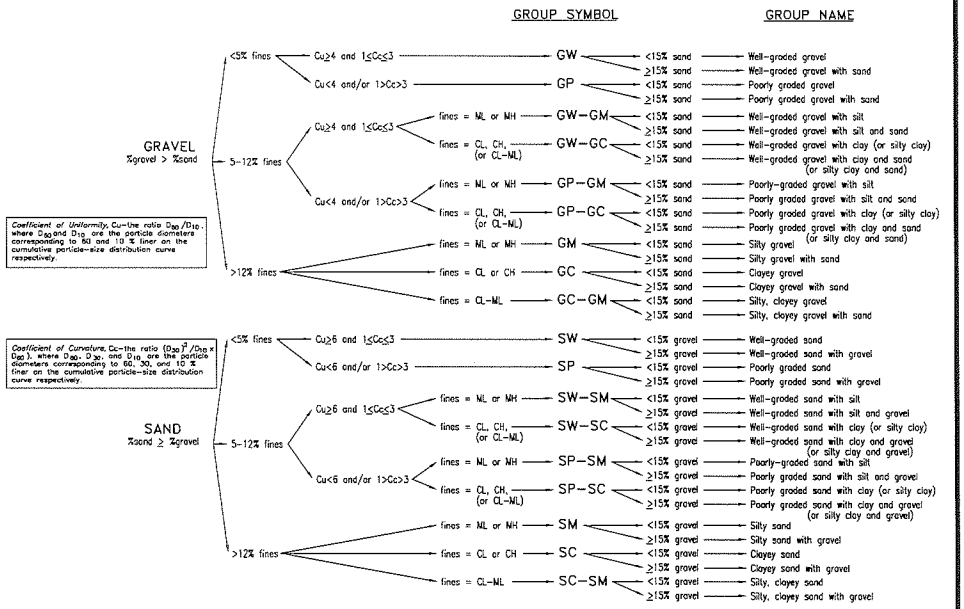
dry	= < OPTIMUM*	DUSTY, DRY TO THE TOUCH
moist	~ OPTIMUM*	DAMP, NO VISIBLE WATER
wet	= > OPTIMUM*	VISIBLE FREE WATER

* OPTIMUM MOISTURE FOR MAXIMUM DENSITY

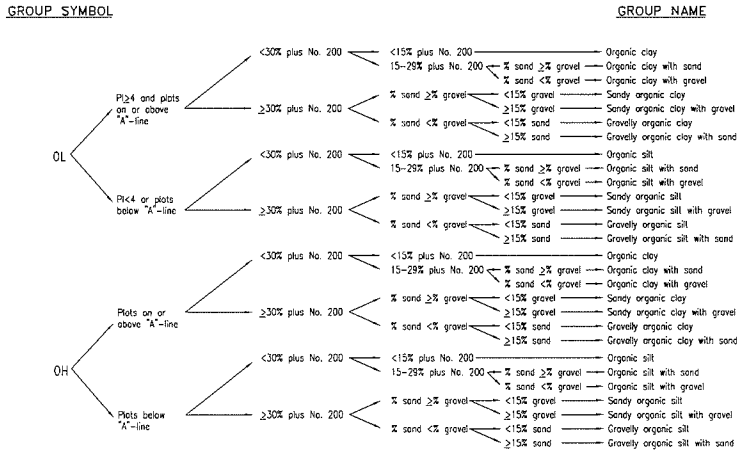
Classification of Soils for Engineering Purposes (Unified Soil Classification System)



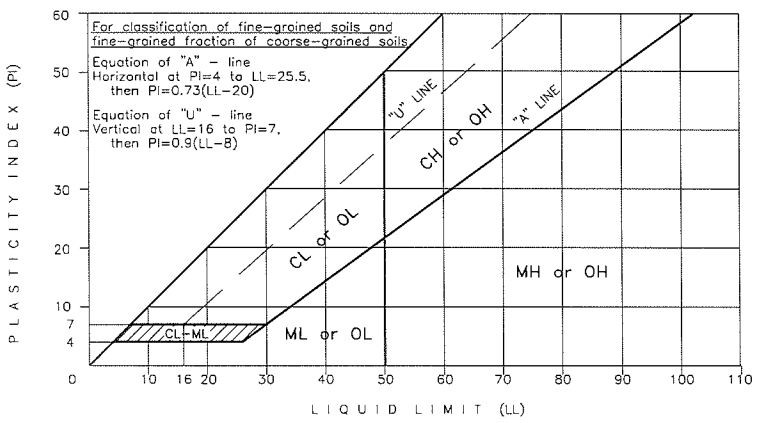
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)



Flow Chart for Classifying Coarse-Grained Soil (More Than 50% Retained on No. 200 Sieve)



Flow Chart for Classifying Organic Fine-Grained Soil (50% or More Passes No. 200 Sieve)



Plasticity Chart

DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

Part I Description of Soil Phase (a) (Independent of Frozen State)	Major Group		Sub-Group		Field Identification (6)	Pertinent Properties of Frozen Materials which may be measured by physical tests to supplement field identification. (7)	Guide for Construction on Soils Subject to Freezing and Thawing	
	Description (2)	Designation (3)	Description (4)	Designation (5)			Thaw Characteristics (8)	Criteria (9)
Part II Description of Frozen Soil	Segregated ice is not visible by eye (b)	N	Poorly Bonded or Friable	Nf	Identify by visual examination. To determine presence of excess ice, use procedure under note (c) below and hand magnifying lens as necessary. For soils not fully saturated, estimate degree of ice saturation: Medium, Low. Note presence of crystals, or of ice coatings around larger particles.	In-Place Temperature Density and Void Ratio a) In Frozen State b) After Thawing in Place Water Content (Total H_2O, including ice) a) Average b) Distribution Strength a) Compressive b) Tensile c) Shear d) Adfreeze Elastic Properties Plastic Properties Thermal Properties Ice Crystal Structure (using optional instruments.) a) Orientation of Axes b) Crystal size c) Crystal shape d) Pattern of Arrangement	Usually Thaw-Stable	The potential intensity of ice segregation in a soil is dependent to a large degree on its void sizes and may be expressed as an empirical function of grain size as follows: Most inorganic soils containing 3 percent or more of grains finer than 0.02 mm in diameter by weight are frost-susceptible. Gravels, well-graded sands and silty sands, especially those approaching the theoretical maximum density curve, which contain 1.5 to 3 percent finer than 0.02 mm by weight without being frost-susceptible. However, their tendency to occur interbedded with other soils usually makes it impractical to consider them separately. Soils classed as frost-susceptible under the above criteria are likely to develop significant ice segregation and frost heave if frozen at normal rates with free water readily available. Soils so frozen will fall into the thaw-unstable category. However, they ma also be classed as thaw-stable if frozen with insufficient water to permit ice segregation.
			No excess ice Well Bonded Excess ice	Nb (n / e)				
	Segregated ice is visible by eye. (Ice 1 inch or less in thickness) (b)	V	Individual ice crystals or inclusions	Vx	For ice phase, record the following as applicable: Location Size Orientation Shape Thickness Spacing Pattern of arrangement Length Hardness } Structure } per part III Below Color } Estimate volume of visible segregated ice present as percent of total sample volume		Usually Thaw-Unstable	Soils classed as non-frost-susceptible (*NFS) under the above criteria usually occur without significant ice segregation and are not exact and may be inadequate for some structure applications; exceptions may also result from minor soil variations.
			Ice coatings on particles	Vc				
			Random or irregularly oriented ice formations	Vr				
			Stratified or distinctly oriented ice formations	Vs				
Part III Description of Substantial Ice Strata	Ice (Greater than 1 inch in thickness)	Ice	Ice with soil inclusions	Ice + Soil Type	Designate material as ICE (d) and use descriptive terms as follows, usually one item from each group, as applicable: Hardness: Hard; Soft (mass, not indi-crystals) Structure: Clear; Cloudy; Porous; Candled; Granular; Stratified Color: e.g.: Color-less; Gray; Blue Admixtures: e.g.: Contains Thin Silt Inclus-ions	Same as Part II above, as applicable, with special emphasis on Ice Crystal Structure.		In permafrost areas, ice wedges, pockets, veins, or other ice bodies may be found whose mode of origin is different from that described above. Such ice may be the result of long-time surface expansion and contraction phenomena or may be glacial or other ice which has been buried under a protective earth cover.
			Ice without soil inclusions	Ice				

DEFINITIONS:

Ice Coatings on Particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Clear ice is transparent and contains only a moderate number of air bubbles.(e)

Cloudy Ice is translucent, but essentially sound and non-pervious

Porous Ice contains numerous voids, usually interconnected and usually resulting from melting at air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Candled ice is ice which has rotted or otherwise formed into long columnar crystals, very loosely bonded together.

Granular Ice is composed of coarse, more or less equidimensional, ice crystals weakly bonded together.

Ice Lenses are lenticular ice formations in soil occurring essentially parallel to each other, generally normal to the direction of heat loss and commonly in repeated layers.

Ice Segregation is the growth of ice as distinct lenses, layers, veins and masses in soils, commonly but not always oriented normal to direction of heat loss.

Well-bonded signifies that the soil particles are strongly held together by the ice and that the frozen soil possesses relatively high resistance to chipping or breaking.

Poorly-bonded signifies that the soil particles are weakly held together by the ice and that the frozen soil consequently has poor resistance to chipping or breaking.

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Thaw-Stable frozen soils do not, on thawing, show loss of strength below normal, long-time thawed values nor produce detrimental settlement.

Thaw-Unstable frozen soils show on thawing, significant loss of strength below normal, long-time thawed values and/or significant settlement, as a direct result of the melting of the excess ice in the soil.

Modified from: Linell, K. A. and Kaplar, C. W., 1966, *Description and Classification of Frozen Soils*, Proc. International Conference on Permafrost (1963), Lafayette, IN, U.S. National Academy of Sciences, Publ. 1287, pp 481-487.

NOTES:

(a) When rock is encountered, standard rock classification terminology should be used.

(b) Frozen soils in the N group may on close examination indicate presence of ice within the voids of the material by crystalline reflections or by a sheen on fractured or trimmed surfaces. However, the impression to the unaided eye is that none of the frozen water occupies space in excess of the original voids in the soil. The opposite is true of frozen soils in the V group.

(c) When visual methods may be inadequate, a simple field test to aid evaluation of volume of excess ice can be made by placing some frozen soil in a small jar, allowing it to melt and observing the quantity of supernatant water as a percent of total volume.

(d) Where special forms of ice, such as hoarfrost, can be distinguished, more explicit description should be given.

(e) Observer should be careful to avoid being misled by surface scratches or frost coating on the ice.