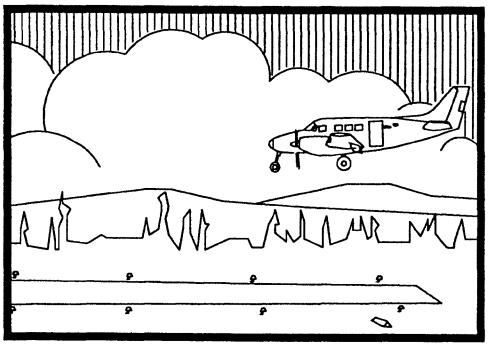
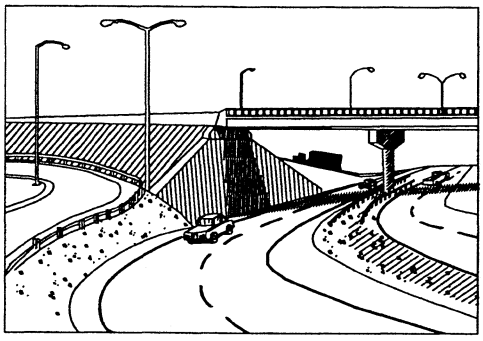
REPORT #4355
AREA # 8

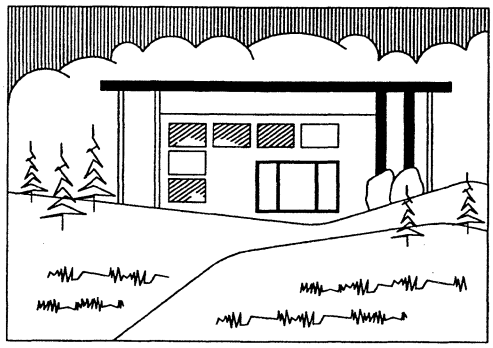
GEOTECHNICAL REPORT

KOBUK AIRPORT RECONSTRUCTION

PROJECT NO. AIP-3-02-0427-03/60995

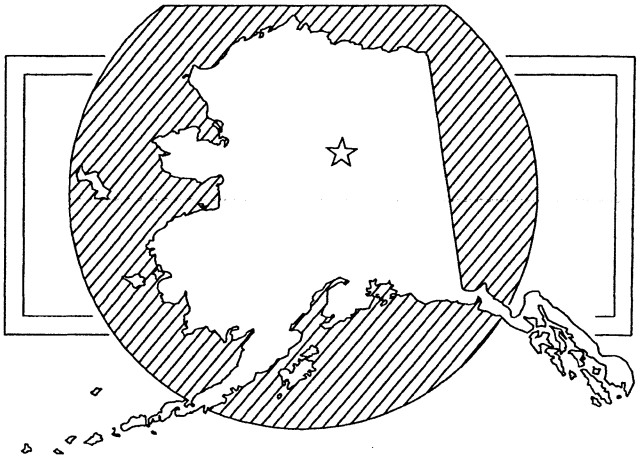






STATE OF ALASKA

Department of Transportation and Public Facilities



NORTHERN REGION

June 2003

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GEOTECHNICAL REPORT
KOBUK AIRPORT RECONSTRUCTION
FEDERAL PROJECT NO. AIP 3-02-0427-03
STATE PROJECT NO. 60995
DOT&PF NORTHERN REGION

PREPARED BY:

THORWALD BERGSTROM
Engineering Geologist

REVIEWED BY:

DAVID STANLEY, C.P.G.
Chief Geologist

REVIEWED AND EDITED BY:

DIANA SOLIE, Ph.D., C.P.G.
Regional Engineering Geologist

APPROVED BY:

6-16-03

Leo Woster, P.E.
Regional Materials Engineer

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Kobuk Airport Reconstruction
Federal Project No. AIP 3-02-0427-03
State Project No. 60995
ADOT & PF Northern Region

Introduction

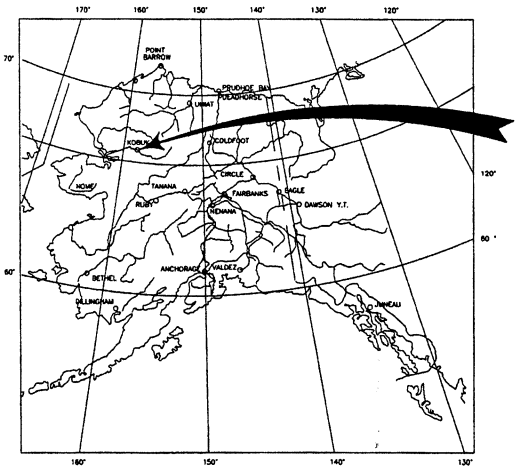
The Alaska Department of Transportation and Public Facilities (ADOT&PF) plans to reconstruct and add improvements to the Kobuk Airport in Kobuk, AK. The proposed improvements include the realignment and lengthening of the runway to 4,000 feet, an addition to the existing apron areas, as well as installation of new lighting systems and construction of a new taxiway.

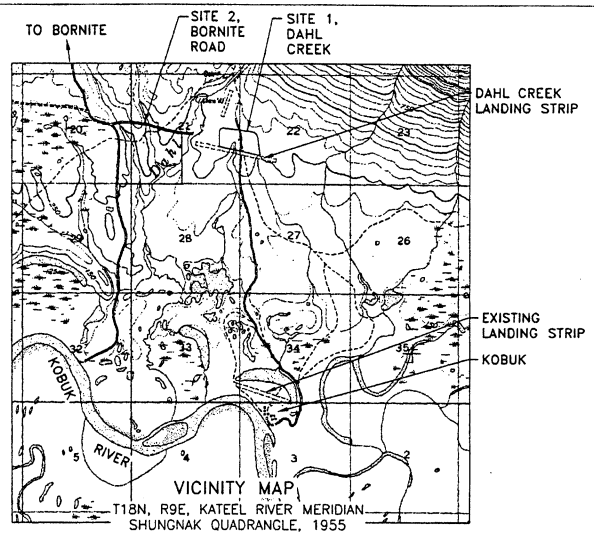
At the request of Cynthia Little, Project Manager, the Northern Region Engineering Geology Section (NREGS) conducted a geotechnical investigation under the direction of Engineering Geologist Barry Benko in August 9-18, 2000. The areas investigated included selected areas of the airport and the Dahl Creek Airport material site. The main goal of his investigation entailed the characterization of frozen ground under the proposed Kobuk Airport Runway. A second investigation under the direction of Engineering Geologist Thor Bergstrom, conducted June 15-19, 2002 was needed because of an increase in gravel quantities required for the project. Also portions of the Dahl Creek Airport material site may no longer be available for gravel extraction. The area explored is 1000 to 3500 feet west of the Dahl Creek Runway. The investigation determined availability, quality, and quantity of materials for construction of the project. Approximately 400,000 cubic yards of material are needed for the project.

The scope of the 2000 work entailed soils investigation of the Kobuk runway by digging five test pits with a Case 9010B excavator and drilling 16 test holes with a B24 drill. Twenty-one test pits were dug in the Dahl Creek material site. NREGS drillers T. Johnson and S. Parker performed the work. Fifty-two soil samples were taken and transported to the Northern Region Materials Lab for analysis and testing.

The scope of the 2002 work entailed digging 27 test trenches with a Case 9010B excavator. Twenty-nine soil samples were taken and transported to the Northern Region Materials Lab for analysis and testing. NREGS drillers J. Nelson and S. Parker performed the work. The work was carried out in accordance with ADOT&PF's *Engineering Geology & Geotechnical Exploration Procedures Manual.*

The purpose of this report is to consolidate and present the information gathered from all of the geotechnical investigations of the Kobuk Airport, material sites, and to make geotechnical recommendations based on the information in English units. This report supercedes the previous reports.





VICINITY MAP
T18N, R9E, KATEEL RIVER MERIDIAN
SHUNGNAK QUADRANGLE, 1955

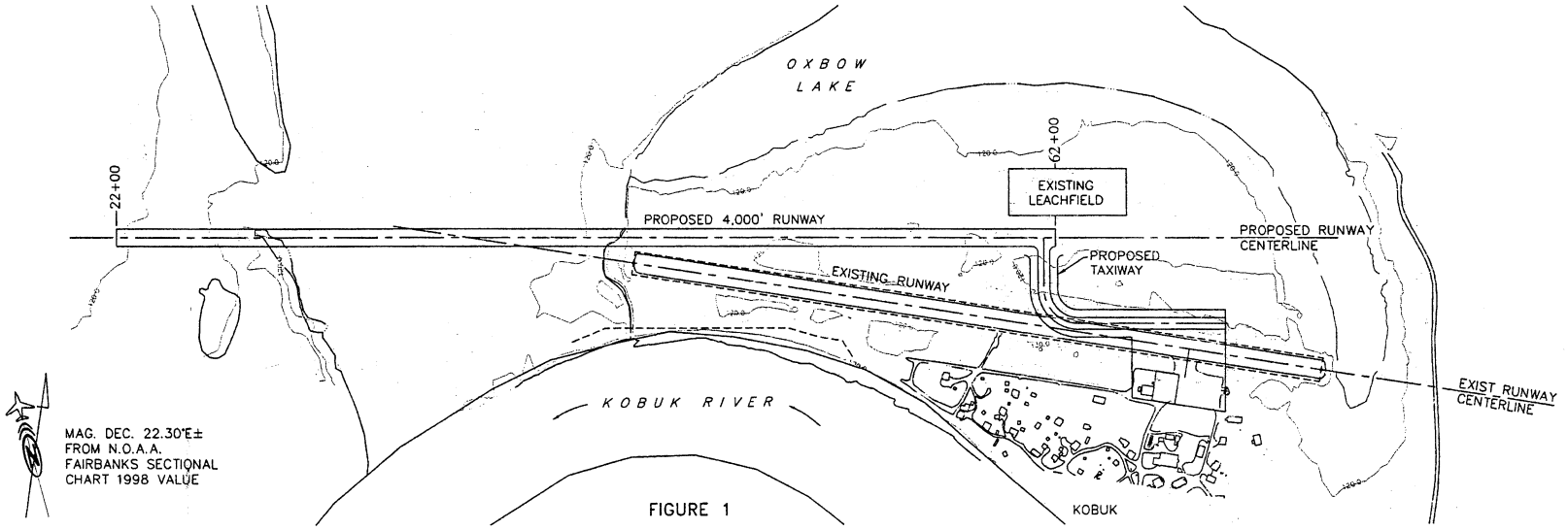
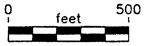


FIGURE 1



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

DATA:	KOBUK AIRPORT RECONSTRUCTION LOCATION MAP
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Location

The village of Kobuk is located on the north side of the Kobuk River, approximately 150 miles east of Kotzebue and 300 miles northwest of Fairbanks. The USGS map Shungnak (D-2) covers the area described in this report.

Geology and topography

Kobuk is located north of the Arctic Circle in a wide river valley. To the north of the village lay the Schwatka Mountains. The distance to the foothills is approximately four miles. The terrain rises rapidly a few miles beyond that.

The area within four miles of the village is low land spotted with numerous lakes, ponds, creeks and swampy areas. Many of the lakes and ponds are former channels of the meandering Kobuk River. Floods and high water are a common occurrence. According to the best estimates of the lifetime residents in the village, floods due to spring ice jamming can be expected every five years. Don Carlson, Northern Region Hydraulic Engineer performed a study of the effect of the runway embankment on flooding that is appended to the Environmental Assessment, September 2000.

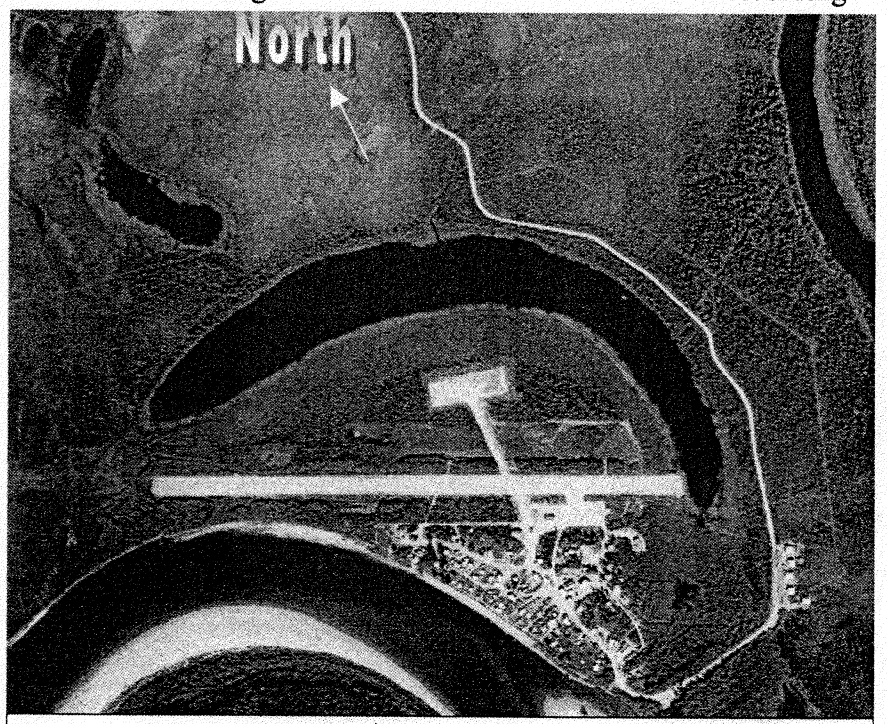


Figure 2 – View of Kobuk, the rectangle in the center of the photo is the village septic leach field. The road to the North goes to the Dahl Creek landing strip. 7-21-2000

The road heading generally to the north is the Dahl Creek Road.

Climate

Kobuk is located in the Subarctic Climate Zone. The following climate observations are available on the Western Regional Climate Center's web page. The average freeze up occurs in mid-October and the average break-up occurs in mid-May. Freezing temperatures can be expected between mid-August to early June. Variations from these averages are expected

KOBUK, ALASKA Period of Record Monthly Climate Summary

Period of Record Monthly Climate Summary

Period of Record : 1979 to 2000, Ave. Max Temp, Ave. Min Temp, Ave. Total Precipitation.

Period of Record : 8/16/1953 to 12/31/979, Ave. Total Precipitation, Ave. Snow Depth.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Annual**
Average Max. Temperature (F)	2.4	1.9	11.4	27.8	51.4	65.2	69.4	64.6	51.3	28.9	11.1	1.6	**32.4**
Average Min. Temperature (F)	-17.4	-21.4	-14.7	3.1	27.8	41.5	45.0	42.7	32.8	12.2	-5.6	-17.8	**10.8**
Average Total Precipitation (in.)	0.54	0.30	0.27	0.29	0.61	2.16	2.66	3.52	2.75	1.12	0.76	0.57	**15.56**
Average Total SnowFall (in.)	7.3	4.9	8.0	4.7	0.7	0.1	0.0	0.0	1.9	6.9	11.4	8.0	**54.0**
Average Snow Depth (in.)	25	31	34	35	13	0	0	0	0	3	12	19	**14**

Percent of possible observations for period of record.
Max. Temp.: 57.7% Min. Temp.: 58% Precipitation: 58.3% Snowfall: 57.7% Snow Depth: 57.2%
Western Regional Climate Center,
wrcc@dri.edu
(http://www.wrcc.dri.edu:80/cgi-bin/cliMAIN.pl?akbarr)

The following table contains climate data from the Environmental Atlas of Alaska. This data was used for the thermal analysis in this report.

Freezing Index	6400 F-Degree Days
Design Freezing Index	7700 F-Degree Days
Thawing Index	2000 F-Degree Days
Design Thawing Index	2500 F-Degree Days

The design freezing index is the average freezing index for the three coldest winters of the last thirty on record. The design thawing index is the average thawing index for the three warmest summers of the last thirty years on record.

August 2000 investigation activities

NREGS personnel performed the fieldwork from between August 9-18, 2000. The scope of the fieldwork included:

- Drilling sixteen test holes and excavating five test trenches along the proposed runway and taxiway alignments at the Kobuk Airport.
- Excavation of twenty-one material exploration test trenches on the Dahl Creek Airport property.

- Collection of surface and subsurface samples at these locations for laboratory testing.

The Kobuk Airport runway test holes were drilled with a mobile B24 drill rig on a Raid-Trac carrier, using both hollow stem and solid flight auger to advance holes. Samples were taken from the auger flights and from split spoon samplers. Holes were drilled to a minimum depth of 14 feet and a maximum depth of 19.5 feet.

The Dahl Creek Airport material site test trenches were dug with a Case 9010B excavator rented from the village of Kobuk. Samples were taken directly from the trench sidewalls or from the excavator bucket. Trenches were excavated to a minimum depth of 5 feet and a maximum depth of 8.5 feet.

June 2002 investigation activities

NREGS personnel performed the fieldwork from between June 15-19, 2002. The scope of the fieldwork included:

- Excavation of twenty-seven test holes on land 1000 to 3500 feet west of the Dahl Creek runway on a potential material site referred to as the Bornite Road material site
- Collection of surface and subsurface samples at these locations for laboratory testing, to supply supplemental information for evaluating the quality and quantity of available materials.

The test trenches were excavated with a Case 9010B excavator rented from the village of Kobuk. Samples were taken directly from the bucket. Trenches were excavated to a minimum depth of 4 feet and a maximum depth of 16 feet.

General history

Wien Airlines built the original runway at Kobuk in the summer of 1959. A D-8 dozer was used to strip the site. The site was then dragged to form a relatively smooth landing strip. Very little improvements were made until the state gained control of the runway in the early 1980's and the runway was lengthened and embankment was raised.

A geotechnical investigation was performed in 1980 by Tom Ottley to study the soils along the existing runway and along the proposed runway extension. The test holes drilled in August 1980 indicated that the original runway was built by stripping the vegetative cover, with no embankment material added. The subgrade soils consisted of silty sand and sandy silt, sandy gravel, and gravelly sand.

Centerline and apron descriptions and recommendations

General descriptions

Soils

According to test hole logs and notes by Barry Benko, Engineering Geologist in August 2000 the soils along the runway alignment are generally as follows:

Station 23+00 to 26+00	0-2ft	Organic Mat and Peat
	2-5ft	Gray Silt, frozen
	5-12.5ft	Gray Clay Silt, soft
	12.5-15	Gravelly Sand

Station 26+00 to 30+00 Same as above alignment, but crosses a pond and creek

Station 30+00 to 40+00	0-1ft	Organic Mat and Organic Silt
	1-10ft	Gray Silt, slightly organic
	10-15ft	Gravelly Sand

Frozen at 1 ft in depth to bottom of test holes. The bottom of the silt layer ranges from 6 to 10 feet. Moisture contents range from 25 to 250% in the silt layer and from 10.8 to 50% in the underlying sand/gravely sand.

Station 40+00 to 47+00	0-2ft	Organic Silt
	2-10ft	Silt
	10-15ft	Sandy Gravel

The soils are mostly unfrozen, with a 1.5 foot frozen layer in one hole. The moisture content varies.

Station 47+00 to 51+50	0-2ft	Silt, waste pile from old borrow site
	2-5ft	slightly Organic Silt, frozen 2-3 feet
	5-10ft	Sand
	10-15ft	Sandy Gravel

The soils are mostly unfrozen. The frozen layer encountered was probably seasonally frozen ground. The soils are wet and the water table is at 5 feet.

Station 51+50 to 61+50	0-7ft	Silty Sand, 10% moisture
	7-15ft	Gravelly Sand

The soils are unfrozen, with a water table at 3 to 6 feet.

Thermal analysis

The main region of thermal concern over the proposed alignment is between Stations 30+00 and 40+00. This area is topographically higher than the surrounding areas and is covered by moss and organics. The drill logs show that frozen ground was found approximately 1 foot below the surface in August, just under the moss layer. Data from this area was used to assign soil properties to layers in the analysis.

Thermal modeling, including a sensitivity analysis, was undertaken using the Multilayer User-Friendly Thermal Model in 1 Dimension (MUT1D) to estimate the depth of thaw. Soil properties from lab results and available climate data were used. Four models were run in MUT1D to estimate depth of freeze and thaw. Frank Ganley, NREGS Geotechnical Engineering Assistant, performed the thermal analysis.

The depth of thaw before embankment placement was calculated to be less than six feet. An embankment thickness of at least six feet will minimize thaw consolidation of foundation soils. Alternatively a four feet thick embankment with two inches of insulation would minimize thaw consolidation of foundation soils.

Depth of freeze will reach into the soils in all four models. The shallow water table and the nature of the fine grained soils make ice lens formation and resulting heave a concern. Building the embankment up 6 feet minimum height will serve to minimize heaving.

General design recommendations

- The organic mat should be left in place during the construction wherever possible. Heavy duty separation geotextile should be placed where the organic mat is torn by construction equipment and the area has not been previously excavated.
- Between Station 30+00 to Station 40+00, from 1 foot depth to 6 –10 feet depth, the frozen silt material has 25 to 250 percent natural moisture. The deep ice-rich silt, if thawed, could thaw consolidate. Avoid stripping overburden west of Station 30+00, build the embankment out of thaw stable material a minimum of six feet thick. Two inches of insulation under the thaw stable material would allow a minimum embankment thickness of four feet. Silt should not be used for embankment construction between Station 30+00 and 40+00.
- Building up the embankment over the entire length of the runway with a minimum of 6 feet of thaw stable gravel will limit frost heaving.
- Where embankment is placed against existing embankments, bench the existing slopes. Benches should be of sufficient width to allow placement and compaction of materials.
- Drainage ditches should be placed as far from the runway as practical. Cutting the organic mat to construct ditches will lead to thawing of the underlying permafrost and result in settling.
- Care should be taken during construction not to degrade the permafrost.

- The gravely sand may have compaction problems. Some gradations indicate that blending might be required to attain requisite compaction. If necessary silt from low organic overburden layers may be used, provided the silt is selected for low natural moisture content (less than 40%).
- If silt from excavation of the ditch is to be used, it should be placed six feet below finished grade, and it must be thawed and drained to meet optimum moisture and compaction needs. Waste highly organic and ice-rich silts.
- If the design retains the frozen silt foundation soils, consider placement of lower embankment material in the winter while the organic mat is frozen. Compaction would have to take place after the fill material has thawed in the summer.

Estimates for swell and shrink of materials:

In bank	**In truck**	**In embankment**
Sand	5% swell	11% shrink
Sandy Gravel	5% swell	7% shrink
Silt	35% swell	17% shrink

Material sources

Overview

NREGS personnel investigated two potential material sources during investigations in 2000 and 2002. The sources are located approximately 2.5 miles north of the village of Kobuk and the subsurface rights are owned by NANA. The Dahl Creek Airport material site was investigated in 2000. Most of the Dahl Creek site is not available to this reconstruction project. A second material site was explored in 2002. The Bornite Mine Road material site is located 1000 to 3500 feet west of the Dahl Creek runway and is bound on the west and north by Bornite Mine roads.

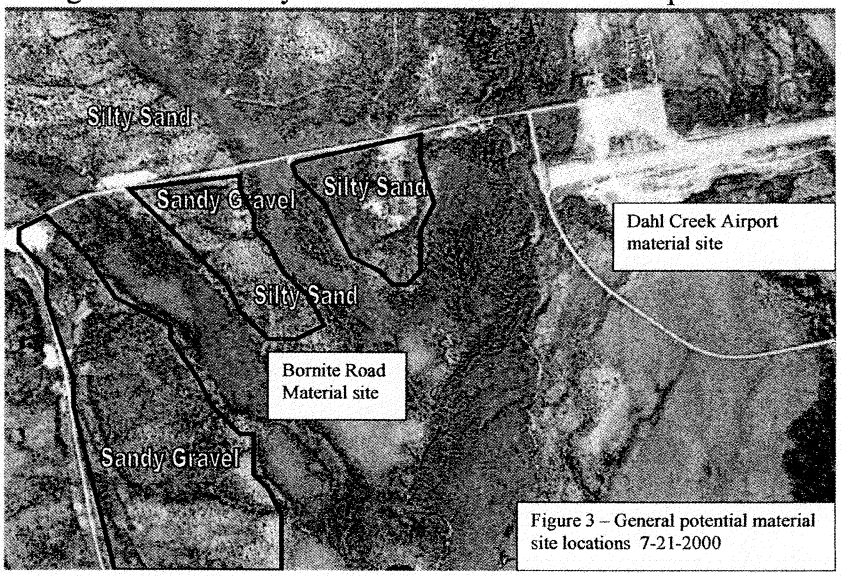


Figure 3 – General potential material site locations 7-21-2000

Two wood bridge structures at stream crossings may need to be replaced or repaired to ensure access to the material sites. The wood structures are made of untreated spruce logs logged from the Dahl Creek area. The Dahl Creek bridge is the larger of the two

wood structures, but may be avoided if mined in the winter. A low water ford is located below the bridge. The other structure is a wood box culvert located between Kobuk and the landfill.

Upstream from the proposed Dahl Creek material sources, asbestos has been found on Asbestos Mountain. On March 5, 2003, the Regional Engineering Geologist collected six grab samples from the proposed Dahl Creek and Bornite Road material sources to be tested for asbestos. Page 27 shows the sample locations. Samples 03-2002 and 03-2006 consisted of silty sand. The other four samples consisted of silty sandy gravel. The soil samples were tested by Northern Testing Laboratories, Inc. in Fairbanks AK using the Polarizing Light Microscopy (PLM) Test Method. The laboratory did not detect any asbestos in the six samples tested. The sample results are in Appendix C.

Information regarding the Dahl Creek material site can be found in the following reports:

- Staff, 1982, *Engineering Geology & Soils Report, Dahl Creek Airport.*
- Staff, 1981, *Engineering Geology & Soils Report, Kobuk Airport Materials Investigation.*
- R&M Consultants, Inc., 1995, *Kobuk Airport ALP Narrative Report.*

General Mining Plan Recommendations

- The Contractor should perform an investigation of the specific area to be mined in each site prior to beginning extraction to assure that the required quantity and quality of material is present in the area to be mined.
- The Contractor should formulate a detailed mining and reclamation plan for the specific area to be mined in each material site. The Construction Engineer should approve such plans prior to any excavation.
- Review the property ownership, pertinent rights of way, and regulatory permits to assure that applicable stipulations are met and that applicable fees or royalties are paid.
- Locate by accurate methods and mark the boundaries of each material site prior to beginning of mining activities.

Dahl Creek Airport Material Site

Location and access

The material site is located approximately two and a half miles north of the village of Kobuk. A gravel road provides access. There are several areas of existing excavation on both sides of the runway. This material site has been used extensively for past runway construction projects.

Land status

The material site is located on airport property and the State of Alaska controls the surface rights. NANA owns the subsurface rights.

Site description

The site is located on an alluvial fan. Existing mined areas are located north and south of the runway, with the bulk of the remaining material north of the runway between the north pit and the lease parcels. Most of the useable material in the south pit was used for the 1986 project that improved the Dahl Creek Airport. Periodically the south pit has been used for materials for other projects in the Kobuk/Dahl Creek area. Use of the north pit for material extraction apparently pre-dates the opening of the south pit.

Materials at the Dahl Creek Airport material sites consist of slightly silty gravel to sandy gravel, with up to 38% cobbles and boulders. The largest boulder measured approximately 1.5 x 1.5 x 2 feet. Jade boulders have been noted in the site.

Clearing and stripping

The previously excavated areas have been cleared and stripped, both north and south of the runway.

All areas not previously excavated are covered with lichen, with blueberry bushes and scattered birch and black spruce. Overburden is typically 1 to 3.8 feet of silt and sandy silt.

Water table

Water was encountered in one trench dug in August 2000. The test hole was dug in the deepest portion of the existing pit and water was encountered at 17.5 feet.

Frozen ground

Dry frozen ground was found in 10 of 21 test trenches dug in August 2000. Permafrost was found at varying depths starting at 8 to 14 feet in depth.

Quality of materials

Test results of submitted samples indicate the sandy gravel generally meets the requirements for borrow embankment material. We ran two samples each for Degradation value, Los Angeles Abrasion loss (L. A.), and one Soundness (sodium sulfate). Results of these tests indicated Degradation values of 21 and 25, L. A. Abrasion loss of 36 and 37, Soundness of 1.3 percent (coarse) and 3.8 percent (fine). The gravel contains 15 to 35% cobbles including up to 5% boulders, based on cobble count data and visual estimates.

Recommendations

- The bulk of the material left in this site is north of the runway and adjacent to the apron. These areas are potential future leasing and apron areas. For these reasons material extraction in the Dahl Creek property is not recommended.
- If this site is used the contractor should be aware of height restrictions on berms and stockpiles due to the material site's proximity to the runway.

Bornite Road Material Site

Location and access

The material site is located approximately two and a half miles north of the village of Kobuk. A gravel road provides access. Several stream crossings should be checked for structural stability prior to hauling, the largest being the Dahl Creek bridge. There are several areas of existing shallow excavations used for the construction of the Bornite Mine road.

Land status

NANA owns the surface and subsurface rights to the land in this area.

Site description

The site is situated on low elongate hills separated by a small creek.

Test pits 02-009 to 02-020 and 02-026 were dug in silt underlain by about 8 feet of sandy gravel with up to 11% cobbles. The largest boulder measured about 1 foot in diameter. The upper gravel is the coarsest, with the material fining at depth to silty sand. Test pits 02-021 to 02-025 and 02-027 were dug in silty sand. The gravel appears to be glacial outwash. The outwash gravel is locally over lain by silty sand. The sand may be sand dunes.

The first test trenches 02-001 to 02-004 were silty sand from 0 to 15 feet. The material appeared to be a dune with a thin gravel layer around the toe. Gravel was found in test pits 02-005 to 02-008. Pieces of jade material may be present in the site.

Clearing and stripping

All areas not previously excavated are covered with lichen, with blue berry bushes and scattered birch and black spruce up to 8 inches in diameter. Overburden is typically 1.7 to 7 feet of silt and sandy silt.

Water table

Water was not encountered during the July 2002 exploration.

Frozen ground

Dry frozen ground was found in most of the test trenches dug in June 2002. The permafrost was found at varying depths starting at 1 to 4 feet in depth. Some of the gravel may be difficult to rip.

Quality of materials

The sample results of tested samples from the Bornite Mite Road site sand gravel are based on four Degradation value, three Los Angeles Abrasion loss (L. A.), and two Soundness (sodium sulfate). Results of these tests indicated Degradation values of (42, 57, 67, 78), L. A. Abrasion loss range from 34 to 35, Soundness of 1.0 and 1.9 percent (coarse) and 1.5 and 4.2 percent (fine). The gravel contains 3 to 11% cobbles based on both visual and cobble counts.

Recommendations

- The top layer of gravel is the coarsest material and most suitable for crushing.
- The sand layer under the gravel should meet embankment material requirements. A proctor was run to determine compactability as the sand appears to have a low amount of minus 200 mesh material.
- Overburden should be placed in low berms in areas that have been previously excavated. It should be placed in a manner that will not impede future mining or drainage. The silty sand dune material locally on top of the gravel may be used as a binder if the organic surface material is removed.

Selected References

Andersland, Orlando B., and Ladanyi, Branko, 1994, An Introduction to Frozen Ground Engineering, Chapman & Hall, New York, 352p.

Braley, W. Alan, and Zarling, John P., 1990, MUT1D, Multilayer User-Friendly Thermal Model in 1 Dimension, State of Alaska, Department of Transportation and Public Facilities, Statewide Research, 67 p.

Corps of Engineers, Alaskan Communities Flood Hazard Data, June 2000.

Fernald, A.T., 1964, Surficial Geology of the Central Kobuk River Valley, Northwestern Alaska, U.S.G.S. Bulletin 1181-K.

Fritts, C.E., 1970, Geology and Geochemistry of the Cosmos Hills, Ambler River & Shungnak Quadrangles, Alaska, Geologic Report No. 39, Division of Mines & Geology, Department of Natural Resources, State of Alaska.

Fritts, C.E., 1969, Geology and Geochemistry in the Southeastern Part of the Cosmos Hills, Shungnak D-2 Quadrangle, Alaska, Geologic Report No. 37, Division of Mines & Geology, Department of Natural Resources, State of Alaska.

Ganley, Frank, 2001, Memorandum To: Per Sather – Engineering Assistant III – Thermal Analysis – Kobuk Airport, Alaska Department of Transportation and Public Facilities, Materials Section, 7p.

Hartman, C.W., and Johnson, P.R., 1984, Environmental Atlas of Alaska, 2nd Edition, Revised: Institute of Water Resources, University of Alaska, Fairbanks, 95p.

R&M Consultants, Inc., 1995, Kobuk Airport ALP Narrative Report.

R&M Consultants, Inc. and Robert Senner and Company, Inc., 2000, Environmental Assessment, Kobuk Airport Improvements Project No. 66134.

(Assembled by Rose Martell-Greenblatt), No Date, Northern Region ROW Section, Documentary, History of the Kobuk-Dahl Creek Road, 1910-1969.

Staff, 1982, Engineering Geology & Soils Report, Dahl Creek Airport.

Staff, 1981, Engineering Geology & Soils Report, Kobuk Airport Materials Investigation.

Wahrhaftig, Clyde, 1965, *Physiographic Divisions of Alaska*, U.S. Geological Survey Prof. Paper 482, U.S. Government Printing Office, Washington D.C., 52p., 6 plates.

Appendix A:

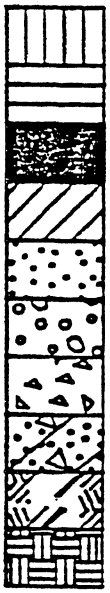
Log Explanation

Unified Soils Classification System

Description and Classification of Frozen Soils

LOG EXPLANATION

BASIC MATERIAL SYMBOLS



ORGANICS (Org)

CLAY (Cl)

ICE

SILT (Si)

SAND (Sa)

GRAVEL (Gr)

ANGULAR FRAGMENTS (Ang Frags)

COLLUVIUM (Coll) **

BEDROCK (Bx), soft (type)

BEDROCK (Bx), hard (type)

** MIXTURE OF ROCK FRAGMENTS IN SILT AND SAND MATRIX.

NOTE: SIGNIFICANT MIXTURES ARE SHOWN BY COMBINING SYMBOLS.

SIZE DEFINITIONS

BOULDERS	+10"
COBBLES	3" TO 10"
GRAVEL	#4 TO 3" (ROUNDED)
ANG.FRAGS.	#4 TO 3" (ANGULAR)
SAND	#200 TO #4
SILT	MINUS #200 (P.I.10 OR LESS)
CLAY	MINUS #200 (P.I.>10)

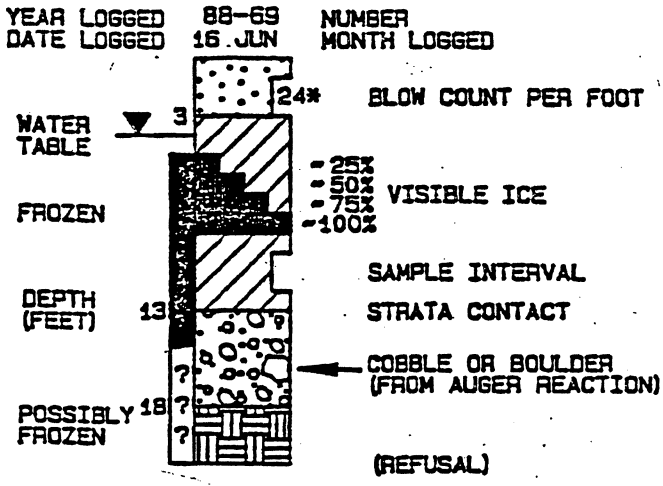
TEST RESULTS

__%-200	= % PASSING #200 SIEVE
N.M._%	= NATURAL MOISTURE
ORG._%	= ORGANIC CONTENT
L.A.__	= LOS ANGELES ABRASION
DEG.__	= DEGRADATION
P.I.__	= PLASTIC INDEX

MISC.

Tr.	= TRACE (0-6%)
sl.	= SLIGHTLY (7-12%)
w/__	= WITH UNSPECIFIED AMOUNT
X'tls	= CRYSTALS

TYPICAL LOG



* BLOW COUNT INDICATES SAMPLE TAKEN WITH STANDARD PENETRATION TEST (1.4"I.D., 2.0"O.D. SAMPLER DRIVEN WITH 140 LB. HAMMER, 30" FREE FALL)

PLAN VIEW SYMBOLS

- POWER AUGER TEST HOLE (T.H.)
- HAND AUGER TEST HOLE (T.H.)
- EXPOSED MATERIAL
- PROBE
- HAND DUG TEST PIT (T.P.)
- BLASTED TEST PIT (T.P.)
- DOZER/BACKHOE TEST TRENCH (T.T.)
- XXXXX WASTE BERM
- BANK
- SWAMP
- TREELINE

COLOR

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

MOISTURE

Dry	= < OPTIMUM*
Damp	= OPTIMUM*
WET	= > OPTIMUM*

* OPTIMUM MOISTURE FOR MAXIMUM DENSITY

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 may also be classed as thaw-stable if frozen with insufficient water to permit ice segregation. 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. 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.
			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	
			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.		
			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.

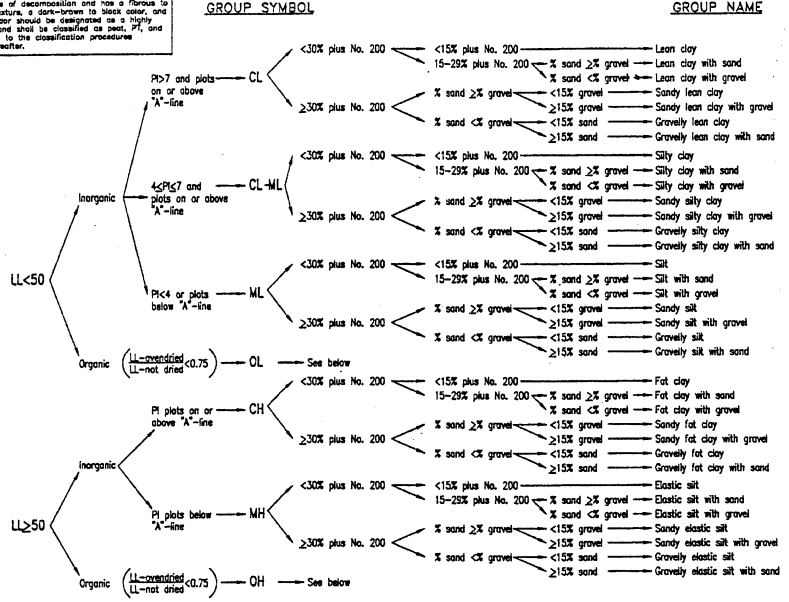
(d) Where special forms of ice, such as hoarfrost, can be distinguished, more explicit description should be given.

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

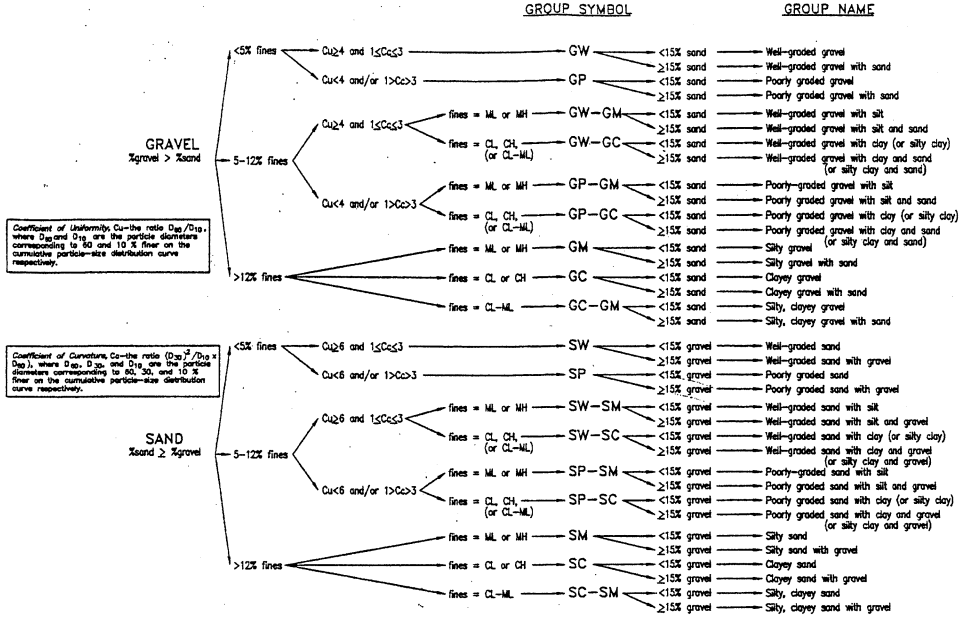
Figure 5-1
Description and Classification of Frozen Soils
(After ASTM D 4083)

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

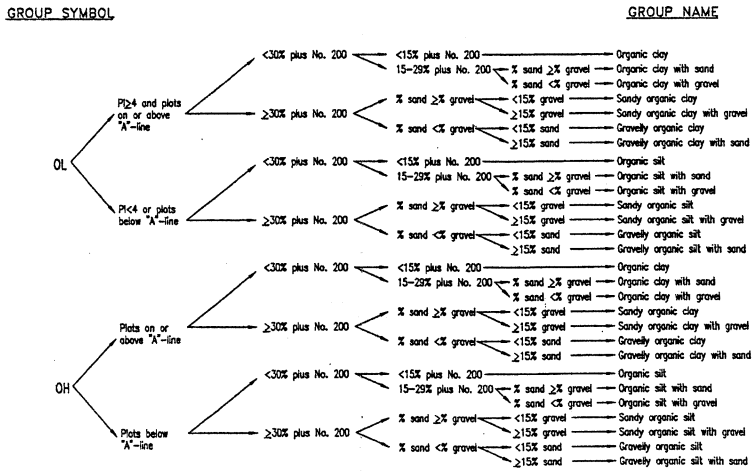
A sample composed primarily of vegetable tissue in various stages of decomposition and has a fibrous to amorphous texture, a dark-brown to black color, and an organic odor should be designated as a highly organic soil and shall be classified as peat, PT, and not subjected to the classification procedures described hereafter.



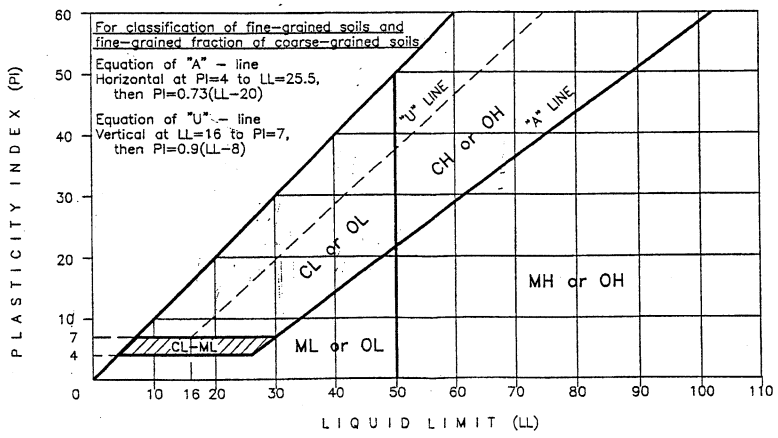
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)



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

y:\mlr\geo\SOILUSCS

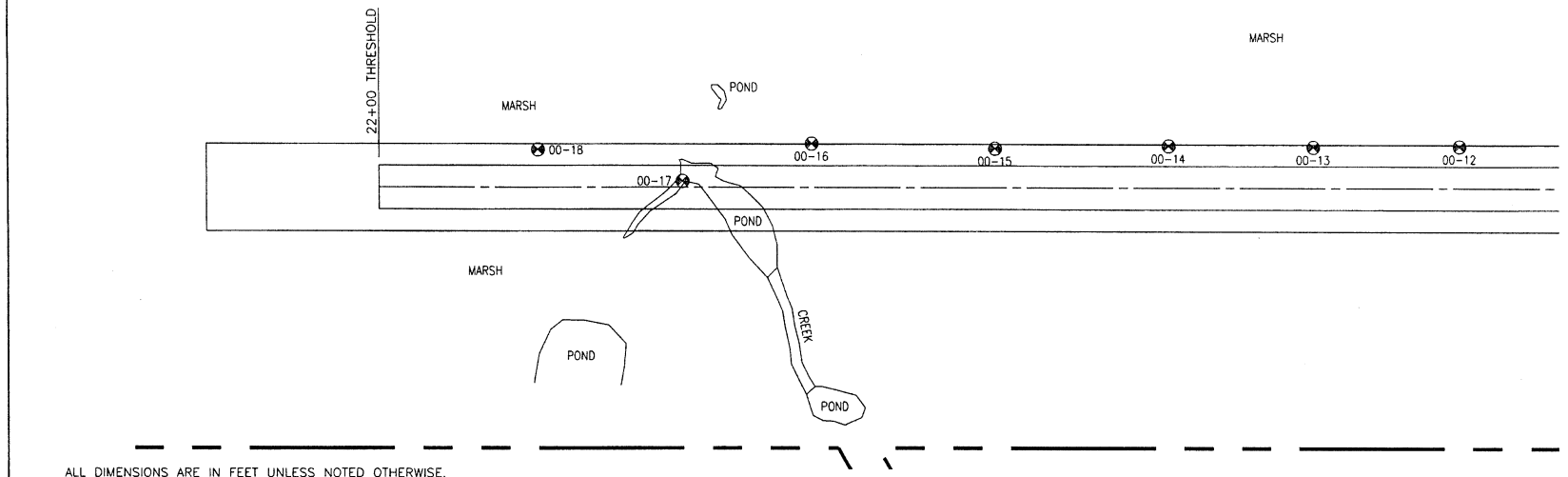
Appendix B:

Test hole locations

Test hole logs

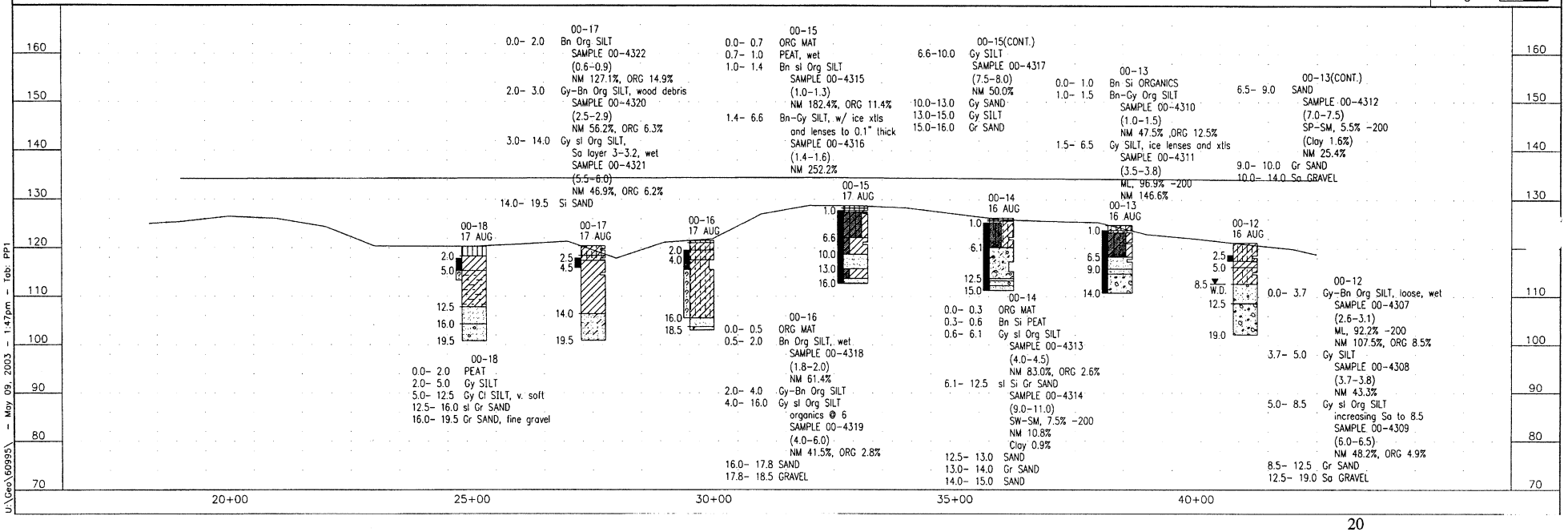
60995P+P	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
	ALASKA	AIP 3-02-0427-03	2001		

U:\Geo\60995\60995P+P-PP1



ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.

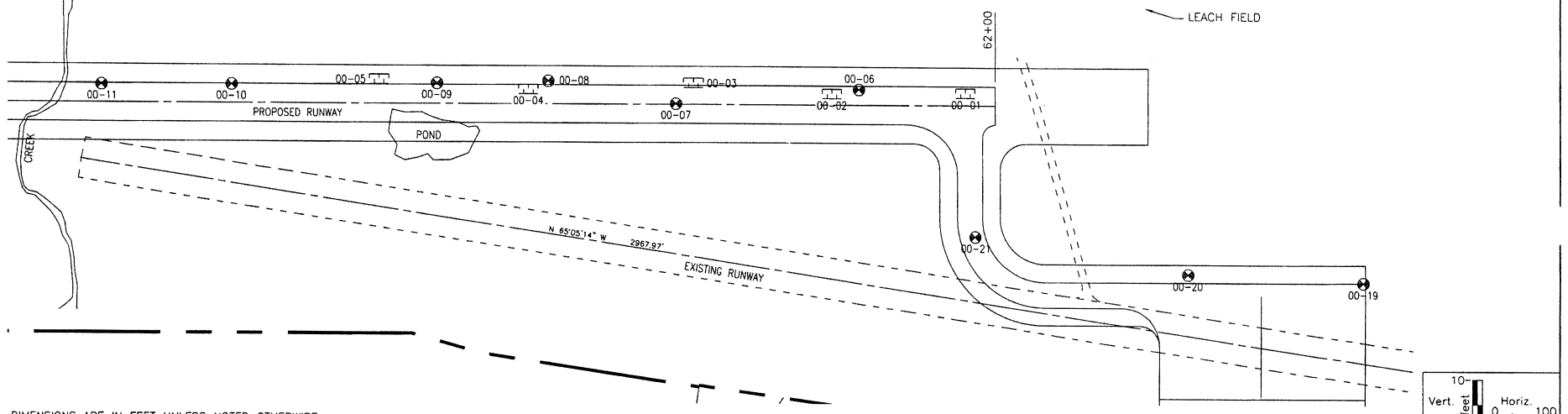
Vert. 10 feet 0 — Horiz. 0 feet 100

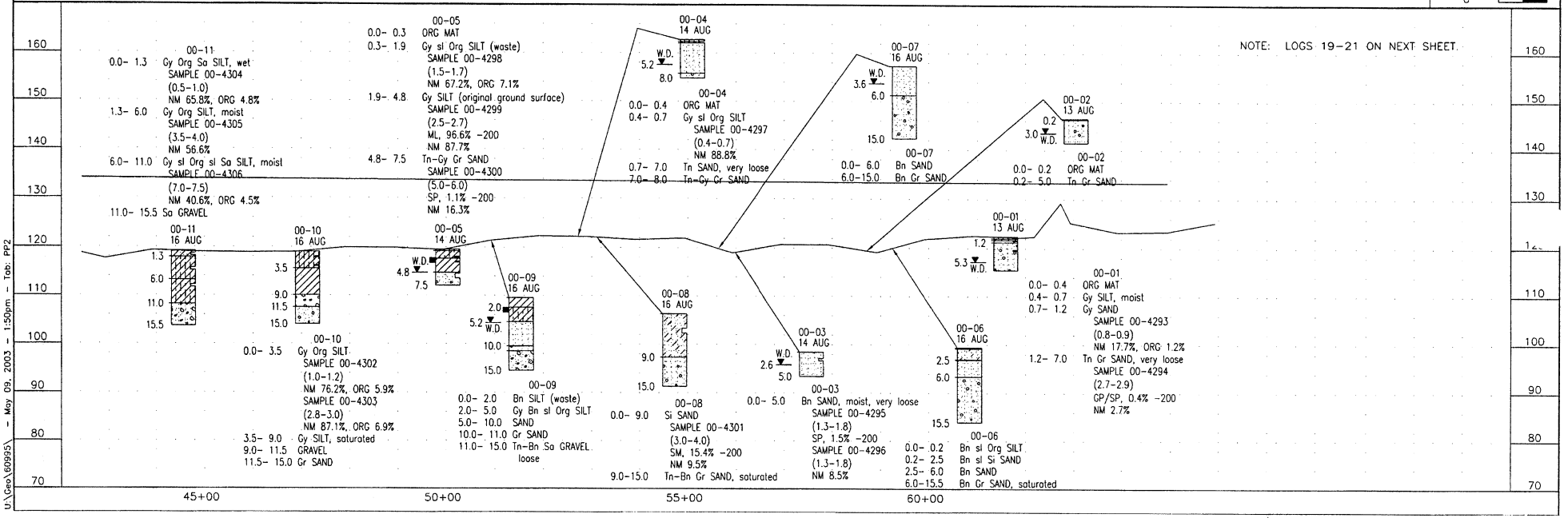


U:\Geo\60995\ - May 09, 2003 - 1:47pm - Tab: PP1

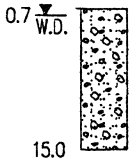
60995P+P	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
	ALASKA	AIP 3-02-0427-03	2001		

U:\Geo\60995\60995P+P-PP2

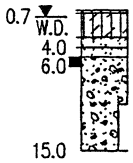




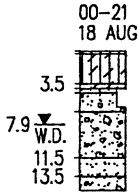
U:\Geo\60995 - May 09, 2003 - 1:50pm - Tab: PP2



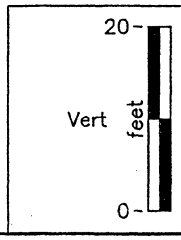
0.0–15.0 Sa GRAVEL



0.0– 0.3 ORG MAT
0.3– 2.9 Si ORGANICS (waste)
2.9– 4.0 Rd–Bn Si SAND
4.0– 5.0 Bn SAND
5.0–15.0 Bn Sa GRAVEL
SAMPLE 00-4323
(10.0–15.0)
GW, 2.2%-200



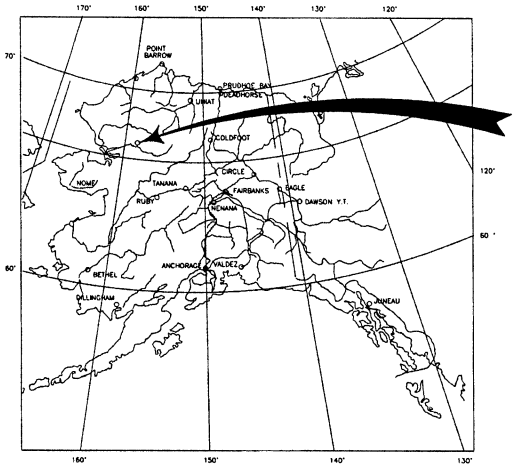
0.0– 0.3 ORG MAT
0.3– 3.5 Bn Si ORGANICS (waste)
3.5– 4.0 Bn Si SAND, moist
4.0– 4.5 Tn SAND
SAMPLE 00-4325
(4.0–6.0)
SP–SM 7.2%-200
(Clay 1.0%)
NM 3.9%
4.5– 6.5 Tn sl Si Gr SAND
6.5–11.5 Tn Sa GRAVEL
11.5–13.5 Bn SAND
13.5–15.0 Gy–Bn Sa GRAVEL



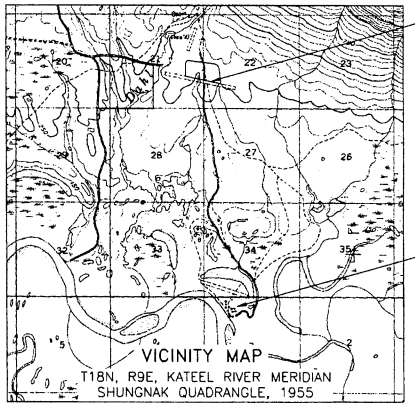
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

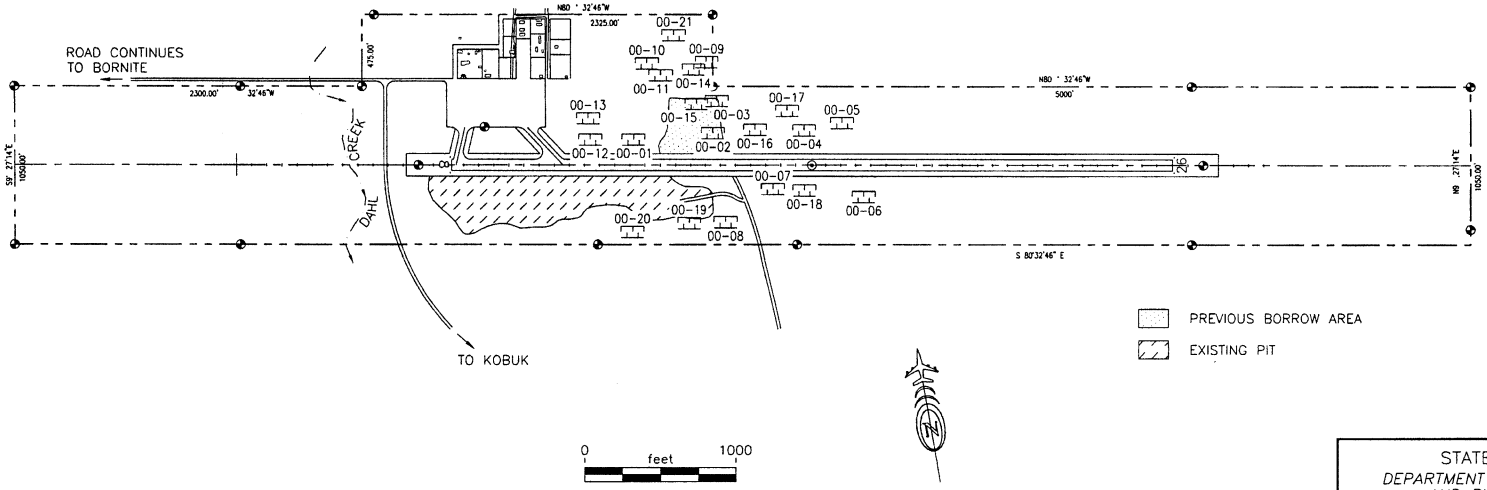
DATA: BB	KOBUK AIRPORT RECONSTRUCTION TEST PITS/HOLES – NEW ALIGNMENT
DRAWN: SLC	
APPROVED: DNS	PROJECT NO. AIP 3-02-0427-03
DATE: Mar 2003	U:\Geo\60995\60995Z03-Z05

Mar 07, 2003 - 8:47am

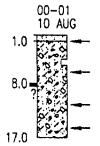


DAHL CREEK



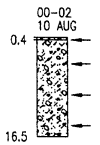


STATE OF ALASKA *DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES* *ENGINEERING GEOLOGY UNIT*	
DATA: BB	KOBUK AIRPORT RECONSTRUCTION DAHL CREEK MATERIAL SITE
DRAWN: SLC	
APPROVED: DNS	PROJECT NO. AIP 3-02-0427-03
DATE: May 2003	U:\Geo\60995\60995S01



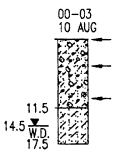
00-01

0.0– 1.0	Gy sl Org Si SAND
1.0–17.0	Gy sl Si Sa GRAVEL w/ cobbles and boulders, poorly graded flat and elongate clast shape, est. 30% cobbles, 5% boulders, 1.6 max boulder size @ 12: lower oversize content, est. 15% cobbles, <5% boulders SAMPLE 00-4235 (4.0–5.0) SSc 1.3, SSf 3.8, LA 37



00-02

0.0– 0.4	Bn sl Org SILT
0.4–16.5	Gy Si Sa GRAVEL w/ cobbles and boulders, largest observed boulder 3.0 x 1.3 x 1.5

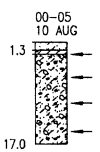


00-03

0.0– 0.1	sl Org Si GRAVEL
0.1–11.5	Gy–Gn Si Sa GRAVEL w/ cobbles and boulders largest observed boulder: 2.1 x 1.4 x 1.3
11.5–17.5	Gy–Gn Si SAND varies to sandy silt

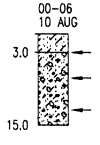
00-04

0.0– 2.0	Bn–Rd Si SAND
2.0 –5.0	Gy–Gn Sa Si GRAVEL w/ cobbles and boulders strong odor of diesel fuel.



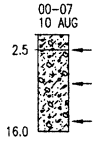
00-05

0.0– 1.3	Bn–Rd Si SAND
1.3– 2.0	Gy–Gn Gr SILT
2.0–17.0	Gy Si Sa GRAVEL, moist w/ cobbles and boulders largest observed boulder: 1.1 x 1.4 x 1.1



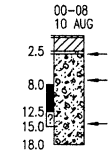
00-06

0.0– 3.0	Bn–Or Si SAND also contains Gn silt
3.0–15.0	Si Sa GRAVEL w/ cobbles and boulders largest observed boulder: 1.5 x 1.1 x 0.7



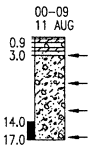
00-07

0.0– 2.5	Bn–Rd Gr Si SAND
2.5–16.0	Si Sa GRAVEL w/ cobbles and boulders, observed 1.0–wide sand column, largest boulder observed: 1.2 x 0.7 x 2.0



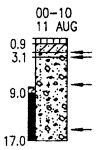
00-08

0.0– 0.3	ORG MAT
0.3– 2.5	Gy SILT, iron oxide–orange laminations/ thin lenses poorly graded
2.5– 3.0	Gn–Gy Gr SAND
3.0–18.0	Gy Si Sa GRAVEL w/ cobbles and boulders, occas. sandy silt lenses @ 5.5– 6.5: est. 25% fines; @ 9– 11: est. 15% fines, 10% sand, 70% gravel, 5% oversize; est. 25% oversize in test pit on average; largest observed: 3.0 x 1.5 x 1.1



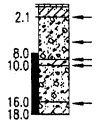
00-09

0.0– 0.3	ORG MAT
0.3– 0.9	Bn–Rd Sa SILT variable gravel content
0.9– 1.7	GRAVEL
1.7– 2.3	Gy SILT, @ 2.0: whiskey bottle
2.3– 3.0	Gy fine grained sand, SAND coarsens downward
3.0–17.0	Gy Sa Si GRAVEL, moist w/ cobbles, @ 4–6: est. 15% oversize @ 11–13: est. 20% oversize largest boulder observed: 0.7 x 1.1 x 2.1



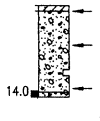
00-10

0.0– 0.9	ORG MAT
0.9– 2.3	Sa SILT, moist
2.3– 3.1	Bn–Gy Si Sa GRAVEL, moist w/ cobbles and boulders
3.1–17.0	Bn–Gy sl Si Sa GRAVEL w/ platy cobbles @ 5–6: est. 12% fines, 10% oversize; @ 10–11: est. 15% fines, 15% oversize; largest boulder oberved: 1.7 x 1.2 x 1.0



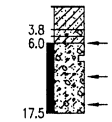
00-11

0.0– 0.4	ORG MAT
0.4– 2.1	Gy Sa SILT, moist
2.1– 9.0	Sa Si GRAVEL w/ cobbles and boulders @ 5–7: est. 15% fines 10% oversize
9.0–10.0	Gy Si GRAVEL w/ cobbles and boulders est. 30% fines
10.0–16.0	Gy sl Si Sa GRAVEL, poorly graded w/ platy cobbles, common silty frozen lenses and sandy lenses; @ 10–11: est. 10% fines, 5% oversize; @ 14–16: est. 7% fines, 15% oversize;
16.0–18.0	Si Sa GRAVEL w/ cobbles and boulders @ 16–18: est. 20% fines 12% oversize; est. ave. oversize content 15–20%, largest observed: 0.6 x 0.8 x 1.2



00-12

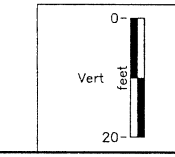
0.0– 0.9	Bn SILT
0.9–14.2	Bn–Gy Sa GRAVEL w/ cobbles and boulders, ave. 24% cobbles and 1% boulders SAMPLE 00-4271 & 4272 (10.5–11.5) NM 4.8% GW/GW-GM, 4.6% –200
14.2–15.0	Bn Sa Si GRAVEL



00-13

0.0– 0.1	ORG MAT
0.1– 3.8	Bn–Rd Sa SILT
3.8– 4.9	Bn–Gy Si Gr SAND
4.9– 6.0	Bn Sa SILT
6.0–17.5	Bn–Gy sl Si Sa GRAVEL w/ platy cobbles ave. oversize content: 33% cobbles, 0% boulders (dry–frozen, Nf) SAMPLE 00-4273 & 4274 (8.0–9.0) NM 3.6% GW-GM, 7.2% –200

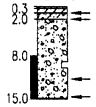
ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.



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

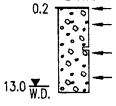
DATA: BB	KOBUK AIRPORT RECONSTRUCTION TEST PITS AT DAHL CREEK AP
DRAWN: SLC	
APPROVED: DNS	PROJECT NO. AIP 3-02-0427-03
DATE: May 2003	U:\Geo\60995\60995Z01-Z01

May 09, 2003 - 3:01pm



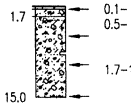
00-14
12 AUG

0.0– 0.3	ORG MAT
0.3– 1.0	Bn–Rd SILT
1.0– 2.0	Gy sl Si Sa GRAVEL, moist w/ cobbles and boulders
2.0–15.0	Sa GRAVEL w/ cobbles and boulders largest boulder oberved: 1.2 x 1.2 x 1.2 ave est. oversize content: 32% cobbles, 2% boulders (Nf; hard–frozen at 15) SAMPLE 00–4275 (9.0–10.0) GW–GM, 5.6%–200 Deg 25 SAMPLE 00–4276 (9.0–10.0) NM 6.3%



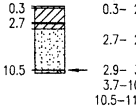
00-15
12 AUG

0.0– 0.2	Bn Sa Si GRAVEL
0.2–14.0	Gy GRAVEL w/ cobbles and boulders, ave est. oversize content: 36% cobbles @ 6.9: 2.3 size granite boulder SAMPLE 00–4277 (6.5–7.0) GW, 3.2% –200 LA–36 SAMPLE 00–4279 (6.5–7.0) NM 5.1%



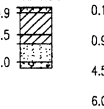
00-16
12 AUG

0.0– 0.1	Bn–Rd sl Org Si SAND
0.1– 0.5	Tn Si SAND
0.5– 1.7	Bn–Gy sl Si Sa GRAVEL fine to coarse grained sand with fine gravel
1.7–15.0	Gy sl Si Sa GRAVEL, moist w/ platy cobbles, ave. oversize content: 32% cobbles, 0% boulders @ 9.8: 1.8 size boulder SAMPLE 00–4280 (7.5–8.0) Deg 21 SAMPLE 00–4281 (7.5–8.0) NM 5.3%, Org 0.6%



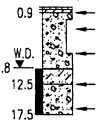
00-17
12 AUG

0.0– 0.3	ORG MAT
0.3– 2.7	Bn SILT, loose displaced material
2.7– 2.9	PEAT, previous native ground surface
2.9– 3.7	Gy SILT, moist
3.7–10.5	Bn–Yw, SAND
10.5–11.0	Sa GRAVEL w/ cobbles and boulders



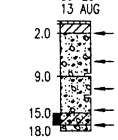
00-18
13 AUG

0.0– 0.1	ORG MAT
0.1– 0.9	Bn–Rd Org SILT est. 5+% organics
0.9– 4.5	Bn–Rd SILT, loose, displaced material
4.5– 6.0	Gy SILT, moist previous native surface
6.0– 9.0	Bn–Yw SAND
9.0–10.0	Gy sl Si Sa GRAVEL



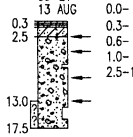
00-19
13 AUG

0.0– 0.4	ORG MAT
0.4– 0.9	Rd/Bn Org SILT
0.9–10.0	Bn/Gy Sa GRAVEL w/ cobbles and boulders @ 3.0: 0.7 x 7 sand lens @ 4–5: oversize content weighed, 31% cobbles, 0% boulders SAMPLE 00–4283 (2.0–7.5) SP/SP–SM, 4.9%– 200 NM 6.2%
10.0–12.5	Bn/Gy Si SAND, frozen hard (Nbn)
12.5–17.5	Bn/Gy Sa GRAVEL w/cobbles and boulders (Nf)



00-20
13 AUG

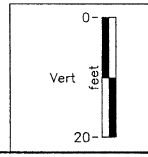
0.0– 0.5	ORG MAT
0.5– 2.0	Gy SILT, moist
2.0– 9.0	Gy Sa GRAVEL, moist w/cobbles and boulders well graded ave. oversize content: 27% cobbles, 0% boulders SAMPLE 00–4284 & 4285 (8.5–9.0) NM 5.8% GW/GW–GM, 4.5% –200
9.0–15.0	Gy Sa GRAVEL poorly graded SAMPLE 00–4286 (12.0–12.5) GW, 3.9% –200 SAMPLE 00–4287 (12.0–12.5) NM 8.8%
15.0–17.0	Bn–Yw Gr Sa SILT (Nbn)
17.0–18.0	Gy Sa GRAVEL w/ cobbles and boulders



00-21
13 AUG

0.0– 0.3	ORG MAT
0.3– 0.6	Bn/Rd Sa SILT
0.6– 1.0	Bn Si SAND
1.0– 2.5	Tn Sa SILT
2.5–17.5	Gy Sa GRAVEL w/cobbles and boulders ave. oversize content: 35% cobbles, 0% boulders; @ 5: 1.5 elongate serpentine boulder SAMPLE 00–4288 (7.0–7.5) GW, 3.8% –200 SAMPLE 00–4289 (7.0–7.5) NM 0.8% SAMPLE 00–4290 (14.0–16.0) GP 4.3%–200 SAMPLE 00–4292 (14.0–16.0) Org 0.7%

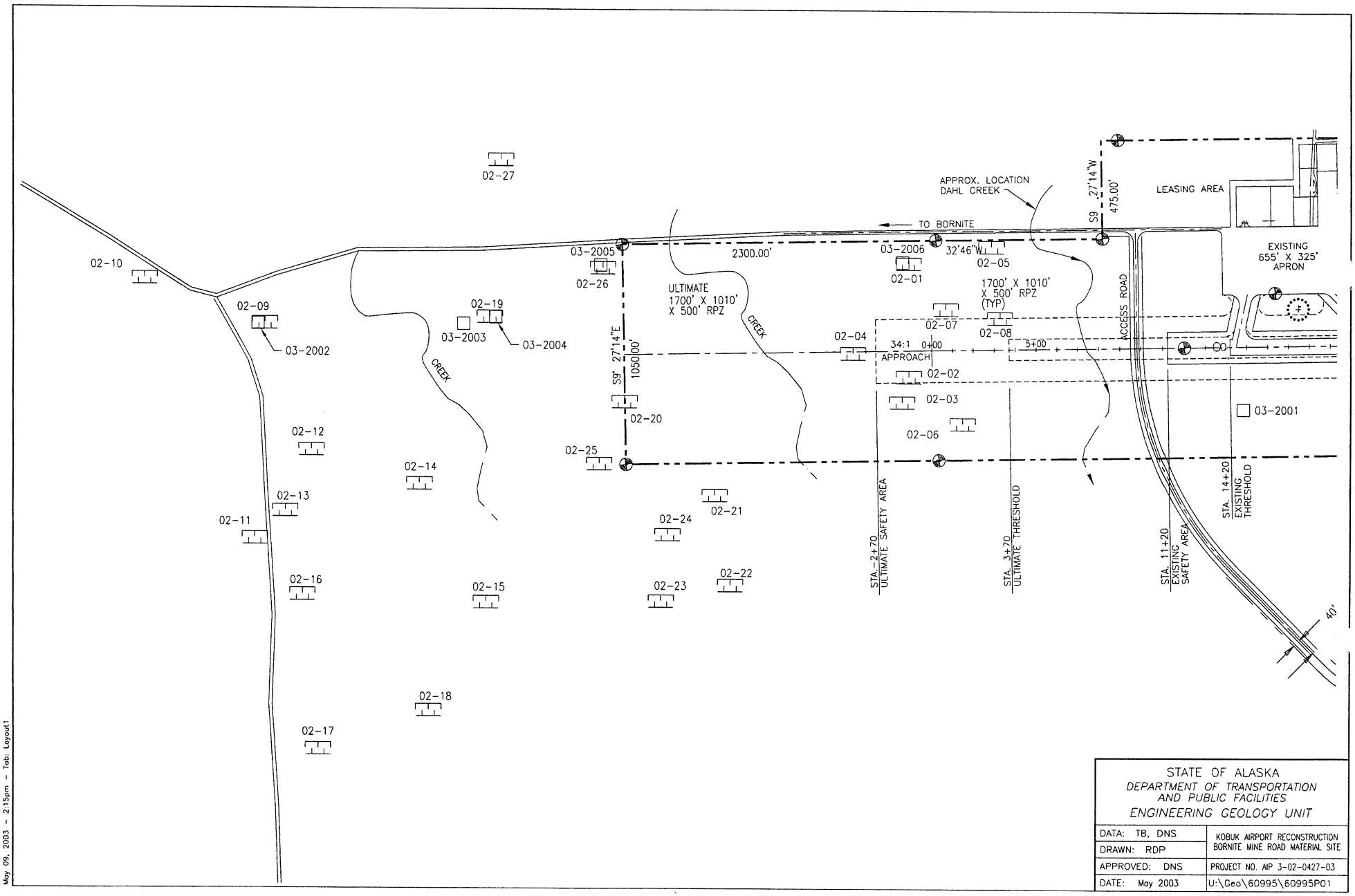
ALL DIMENSIONS ARE IN FEET UNLESS NOTED OTHERWISE.



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

DATA: BB	KOBUK AIRPORT RECONSTRUCTION TEST PITS AT DAHL CREEK AP
DRAWN: SLC	
APPROVED: DNS	PROJECT NO. AIP 3-02-0427-03
DATE: May 2003	U:\Geo\60995\60995Z01–Z02

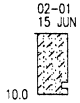
May 09, 2003 – 3:04pm



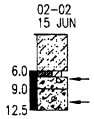
May 09, 2003 - 2:15pm - Tab: Layout1

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

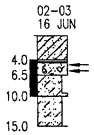
DATA: TB, DNS	KOBUK AIRPORT RECONSTRUCTION BORNITE MINE ROAD MATERIAL SITE
DRAWN: RDP	
APPROVED: DNS	PROJECT NO. AIP 3-02-0427-03
DATE: May 2003	U:\Geo\60995\60995P01



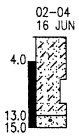
02-01
15-Jun
0.0– 10.0 Bn sl Si SAND
SAMPLE 02-6061
(8.0–9.0)
SP-SM, 9.2% –200
N.M. 3.9%



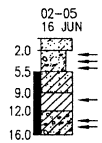
02-02
15-Jun
0.0– 6.0 Bn Si SAND
6.0– 7.0 Gy SILT, frozen, 50% ice
SAMPLE 02-6062
(6.0–7.0)
N.M. 25.3%
7.0– 9.0 Gy/Bn Si Sa GRAVEL, dry frozen
9.0– 12.5 Bn/Gy Si Gr SAND w/8% cobbles



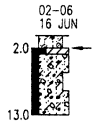
02-03
16-Jun
0.0– 4.0 Gy Sa SILT
4.0– 4.5 Or CLAY, frozen, dry
4.5– 6.5 Or/Bn Si Sa GRAVEL
6.5– 10.0 Bn/Gy sl Si SAND
SAMPLE 02-6064
(6.5–9.5)
SP-SM, 7.9% –200
10.0– 15.0 Gy, Si SAND
SAMPLE 02-6065
(10.0–15.0)
SM, 17.0% –200
N.M. 4.3%



02-04
16-Jun
0.0– 13.0 GY/Bn Si SAND
SAMPLE 02-6066
(7.0–11.0)
SM, 18.1% –200
13.0– 15.0 Bn Gr SAND



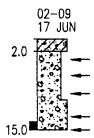
02-05
16-Jun
0.0– 2.0 Bn Si SAND
2.0– 5.5 Bn Si Sa GRAVEL
SAMPLE 02-6067
(2.0–5.5)
SM, 21.2% –200
5.5– 9.0 Sa SILT
9.0– 12.0 Gy SILT, w/cobbles
12.0– 16.0 Bn Gr Sa SILT
SAMPLE 02-6068
(12.0–16.0)
SM, 36.7% –200
LARGEST BOULDER
0.6' X 1.0' X 1.3'



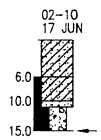
02-06
16-Jun
0.0– 2.0 Or/Bn Si Sa GRAVEL, w/40% cobbles
SAMPLE 02-6070
(0.0–2.0)
SM, 20.5% –200
N.M. 22.0%
SSc 1.0
SSf 4.2
2.0– 3.0 Gy SILT
3.0– 13.0 Gy/Bn Sa Si GRAVEL
SAMPLE 02-6071
(6.0–9.0)
SM, 41.3% –200
N.M. 11.8%

02-07
16-Jun
0.0– 0.5 ORGANIC MAT
0.5– 6.0 Bn sl Si Sa GRAVEL
6.0– 7.0 Gy Sa SILT, frozen

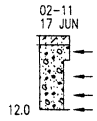
02-08
16-Jun
0.0– 1.5 Bn Sa GRAVEL, w/20% cobbles
1.5– 4.0 Bn Si SAND, (2'–4' frozen w/ 25% ice)



02-09
17-Jun
0.0– 2.0 Gy sl Gr Sa SILT, dry
2.0– 15.0 Bn Sa GRAVEL, w/11% cobbles, moist
SAMPLE 02-6072
(2.0–10.0)
N.M. 4.7%
Deg 67
SSc 1.9
SSf 1.5

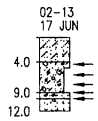


02-10
17-Jun
0.0– 6.0 Gy/Bn Sa SILT
6.0– 10.0 Bn Sa SILT
10.0– 11.0 Bn Gr SAND
11.0– 15.0 Bn Sa GRAVEL, w/10% cobbles
SAMPLE 02-6073
(11.0–15.0)
SP-SM, 6.3% –200

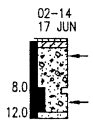


02-11
17-Jun
0.0– 1.5 Bn/Rd Si SAND, dry
1.5– 12.0 Bn/Bk Sa GRAVEL, w/cobbles, moist
SAMPLE 02-6074
(4.0–12.0)
SP, 3.6% –200

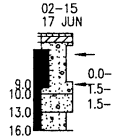
02-12
17-Jun
0.0– 6.0 Bn Si SAND, moist
Trench dug in Gravel Pit bottom.



02-13
17-Jun
0.0– 4.0 Bn/Rd Si SAND, moist
4.0– 9.0 Bn/Bk sl Si Sa GRAVEL, w/30% cobbles, moist
SAMPLE 02-6075
(5.0–9.0)
SP-SM, 7.5% –200
9.0– 10.0 Gy Sa GRAVEL, w/4% cobbles, dry
10.0– 12.0 Rd Gr SAND



02-14
17-Jun
0.0– 0.5 ORG MAT
0.5– 1.5 Bn Sa SILT
1.5– 12.0 Bn/Gy Sa GRAVEL
SAMPLE 02-6076
(8.0–9.0)
GW, 2.8% –200
12.0– 13.0 Gy SAND, very dry



02-15
17-Jun
0.0– 0.5 ORG MAT
0.5– 1.5 Bn SILT
1.5– 10.0 Gy Gr SAND
SAMPLE 02-6077
(2.0–8.0)
SP, 4.0% –200
10.0– 13.0 Gy Gr SAND
13.0– 16.0 Gy sl Gr SAND
SAMPLE 02-6078
(13.0–16.0)
SP, 2.3% –200

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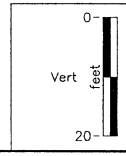
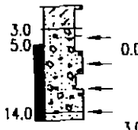


STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
ENGINEERING GEOLOGY UNIT

DATA: TB	KOBUK AIRPORT RECONSTRUCTION TEST PITS BORNITE MINE ROAD SITE
DRAWN: RDP	
APPROVED: DNS	PROJECT NO. AIP 3-02-0427-03
DATE: May 2003	U:\Geo\60995\60995P02-Z01

May 09, 2003 - 3:11pm

02-16
17 JUN



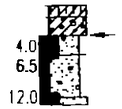
02-16
18-Jun

0.0- 3.0 Or Si SAND
SAMPLE 02-6079
(0.5 -4.0)
WL, 2.3% -200

3.0- 14.0 Gy h GRAVEL,
w/11% cobbler
WPLE 02-6080
(4.0-6.0)
LA 35
SAMPLE 02-6081
(9.0-11.0)
GP. 3.8% -200

14.0- 15.0 Rd WD

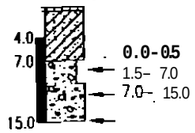
02-17
18 N N



02-17
18-Jun

0.0- 1.5 Or SILT
1.5- 4.0 Cy G SILT,
w/8" cobbles. moist
4.0- 6.5 Bn/Gy G W O .
w/<10% cobbles
SAMPLE 02-6082
(4.0-6.5)
SW-SM, 5.7% -2w
N.U. 5.8%
6.5- 12.0 fh G SAND
SAMPLE 02-608)
(6.5-120)
12.0- 13.0 Bn SAM). Opt m 7.8%

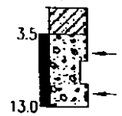
02-18
18 U N



02-18
18-Jun

0.0-0.5 OK MAT
1.5- 7.0 Rd/Gy Sa SILT, dry
7.0-. 15.0 Cy So GRAVEL,
w/10% cobbles
SAMPLE 02-6084
(7.0- 10.0)
GW, 2.4% -200
LA 34, Deg 57

02-13
I8 JUN



02-19
18-Jun

0.0- 3.5 Bn h SILT. dry
3.5- 13.0 Gy/Bn Sa GRAVEL,
moist. frozen
SAMPLE 02-6065
(7.0- 10.0)
W 34, Deg 78

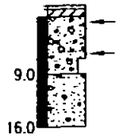
02-20
18 NN

02-20
18-Jun

0.0- 0.5 O K MAT
0.5- 2.5 Bn d si SAND, moist
SAMPLE 02-6086
(0.5-1.5)
SP-SM, 9 . n -200
Org 0.4%
2.5- 6.5 Gy h GRAVEL, moist,
frozen
SAMPLE 02-6087
(2.5-6.5)
SP, 3.3% - 2w
6.5- 12.0 Gy h GRAVEL, frozen,
hard, w/15% cobbles
SAMPLE 02-6088
(6.5-8.0)
Org/SM2. 2N5%. 2280

12.0- 15.0 Cy 4 Gr W D . dry,
frozen, w/5% cobbles
SAMPLE 02-6089
(12.0-13.0)
Opt U. 7.6%

02-21
LD JUN



02-21
18-Jun

0.0- 0.5 ORG MAT
1.5- 1.5 Bn SILT
1.5- 9.0 cy h GRAVEL
SAMPLE 02-6090
(6.5-8.0)
SP/GP, 1.1% -200

9.0- 16.0 Gy h GRAVEL, dry

m-22
19 JUN

02-22
19-Jun

0.0- 0.5 ORG MAT
0.5- 4.0 Bn So SILT
4.0- 10.0 Gy 4 SAND,
moist, frozen
SAMPLE 01-6091
(6.5-8.0)
SM, 15.5% - 2W

02-23
19 N N

02-23
19-Jun

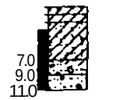
0.0- 2.0 Rd/Bn SILT
2.0- 5.0 Bn SILT. moist, frozen
5.0- 10.0 Gy SILT

02-24
19 JUN

02-24
19-Jun

0.0- 4.0 Bn SILT, w/3" layer
of moss and lichen
4.0- 6.5 sl Si So GRAVEL,
w/<5% cobbles
6.5- 8.0 Cy 4 Gr SAND
8.W 10.0 cy SAND

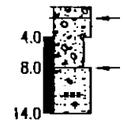
02-25
19 JUN



02-25
19-Jun

0.0- 1.0 Bn Org SILT.
w/3" layer of moss
and lichen
1.0- 2.0 Bn SILT. moist
2.0- 7.0 Bn So SILT. moist
7.0- 9.0 Rd/Bk/Bn Si h GRAVEL
9.0- 11.0 Gy sl. Gr SAND

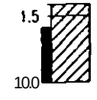
02-26
19 JUN



02-26
19-Jun

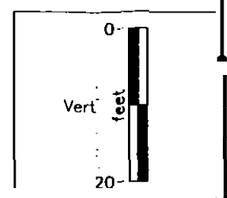
0.0- 1.5 Bn E So GRAVEL,
w/10% cobbles
1.5- 8.0 Gy/Bn h GRAVEL,
w/10% cobbles
SAMPLE 02-6098
(4.0-8.0)
GP, 2.9% -200
opt U 5.9%
8.0-14.0 Cy G SAM)

02-27
19 JUN



02-27
19-Jun

0.0- 1.5 Rd SILT,
w/3" organic mat
1.5- 100 Gy YLT. moist.
frozen (3-10) w/10% ice



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

DATA. BE	KOBUK AIRPORT RECONSTRUCTION TEST PITS BORNITE MINE ROAD SIT
DRAWN: SLC	
APPROVED: DNS	PROJECT NO. NP 3-02-0427-03
DATE: Moy 2003	U:\Geo\60995\60995P02-Z0

ALL DIMENSIONS ARE IN FEE3 UNLESS NOTED OTHERWISE.

2R

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		CENTERLINE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-01	00-01	00-03	00-03	00-04	00-05	00-05
DEPTH (feet)		0.8-0.9	2.7-2.9	1.3-1.8	1.3-1.8	0.4-0.7	1.5-1.7	2.5-2.7
STATION			61+40	56+00	56+00		49+98	49+98
OFFSET			25' Lt	40' Lt	40' Lt		50' Lt	50' Lt
LAB NO.		00-4293	00-4294	00-4295	00-4296	00-4297	00-4298	00-4299
DATE SAMPLED		13-Aug-00	13-Aug-00	14-Aug-00	14-Aug-00	14-Aug-00	14-Aug-00	14-Aug-00
% Passing	3"							
	2"							
	1.0"		100					
	0.75"		94					
	0.5"		82					
	0.375"		72					
	#4		50					
	#10		35	100				
	#40		9	54				
	#50		5	26				100
	#100		1	8				99
	#200		0.4	1.5				96.6
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT			NV	NV				NV
PLASTIC INDEX			NP	NP				NP
UNIFIED CLASS.			GP/SP	SP				ML
SOIL DESCRIPTION			Sa	Sa				Si
NATURAL MOISTURE		17.7	2.7		8.5	88.8	67.2	87.7
ORGANIC		1.2					7.1	
SP.GR. (FINE)			2.79					
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								

REMARKS:

Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		CENTERLINE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-05	00-08	00-10	00-10	00-11	00-11	00-11
DEPTH (feet)		5.0-6.0	3.0-4.0	1.0-1.2	2.8-3.0	0.5-1.0	3.5-4.0	7.0-7.5
STATION			53+20	47+05	47+05		44+40	44+40
OFFSET			45' Lt	40' Lt	40' Lt		40' Lt	40' Lt
LAB NO.		00-4300	00-4301	00-4302	00-4303	00-4304	00-4305	00-4306
DATE SAMPLED		14-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00
% Passing	3"							
	2"							
	1.0"	100						
	0.75"	97						
	0.5"	89						
	0.375"	85						
	#4	77	100					
	#10	72	98					
	#40	41	73					
	#50	19	50					
	#100	3	25					
	#200	1.1	15.4					
	0.02		7.2					
Hydro	0.005		2.5					
	0.002		1.4					
LIQUID LIMIT		NV	NV					
PLASTIC INDEX		NP	NP					
UNIFIED CLASS.		SP	SM					
SOIL DESCRIPTION		GrSa	SiSa					
NATURAL MOISTURE		16.3	9.5	76.2	87.1	65.8	56.6	40.6
ORGANIC				5.9	6.9	4.8		4.5
SP.GR. (FINE)			2.71					
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								

REMARKS:

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STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		CENTERLINE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-12	00-12	00-12	00-13	00-13	00-13	00-14
DEPTH (feet)		2.6-3.1	3.7-3.8	6.0-6.5	1.0-1.5	3.5-3.8	7.0-7.5	4.0-4.5
STATION			40+70	40+70	38+20		38+20	35+70
OFFSET			75' Lt	75' Lt	75' Lt		75' Lt	75' Lt
LAB NO.		00-4307	00-4308	00-4309	00-4310	00-4311	00-4312	00-4313
DATE SAMPLED		16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00	16-Aug-00
% Passing	3"							
	2"							
	1.0"							
	0.75"							
	0.5"							
	0.375"							
	#4							
	#10	100					100	
	#40	98					92	
	#50	97				100	76	
	#100	97				99	17	
	#200	92.2				96.9	5.5	
	0.02						5.4	
Hydro	0.005						2.4	
	0.002						1.6	
LIQUID LIMIT		* NV						
PLASTIC INDEX		NP						
UNIFIED CLASS.		ML				ML	SP-SM	
SOIL DESCRIPTION		Org Si				Si		
NATURAL MOISTURE		107.5	43.3	48.2	47.5	146.6	25.4	83
ORGANIC		8.5		4.9	12.5			2.6
SP.GR. (FINE)							2.71	
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								

REMARKS:	Dry prep only
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STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		CENTERLINE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-14	00-15	00-15	00-15	00-16	00-16	00-17
DEPTH (feet)		9.0-11.0	1.0-1.3	1.4-1.6	7.5-8.0	1.8-2.0	4.0-6.0	2.5-2.9
STATION			33+25	32+70	32+70		29+55	27+30
OFFSET			75' Lt	75' Lt	75' Lt		75' Lt	10' Lt
LAB NO.		00-4314	00-4315	00-4316	00-4317	00-4318	00-4319	00-4320
DATE SAMPLED		16-Aug-00	17-Aug-00	17-Aug-00	17-Aug-00	17-Aug-00	17-Aug-00	17-Aug-00
% Passing	3"							
	2"							
	1.0"							
	0.75"	100						
	0.5"	99						
	0.375"	96						
	#4	78						
	#10	51						
	#40	22						
	#50	15						
	#100	10						
	#200	7.5						
	0.02	4.8						
Hydro	0.005	1.9						
	0.002	0.9						
LIQUID LIMIT		NV						
PLASTIC INDEX		NP						
UNIFIED CLASS.		SW-SM						
SOIL DESCRIPTION		sl.SiGrSa						
NATURAL MOISTURE		10.8	182.4	252.2	50.0	61.4	41.5	56.2
ORGANIC			11.4				2.8	6.3
SP.GR. (FINE)		2.69						
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								

REMARKS:

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STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		CENTERLINE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-17	00-17	00-20	00-21			
DEPTH (feet)		5.5-6.0	0.6-0.9	10.0-15.0	4.0-6.0			
STATION			27+30	65+73	69+13			
OFFSET			10' Lt	330' Rt	255' Rt			
LAB NO.		00-4321	00-4322	00-4323	00-4325			
DATE SAMPLED		17-Aug-00	17-Aug-00	18-Aug-00	18-Aug-00			
% Passing	3"							
	2"			100	100			
	1.0"			97	93			
	0.75"			87	88			
	0.5"			60	79			
	0.375"			46	74			
	#4			27	65			
	#10			20	59			
	#40			10	28			
	#50			8	20			
	#100			4	12			
	#200			2.2	7.2			
	0.02			1.7	4.6			
Hydro	0.005			0.6	1.4			
	0.002			0.3	1.0			
LIQUID LIMIT				NV	NV			
PLASTIC INDEX				NP	NP			
UNIFIED CLASS.				GW	SP-SM			
SOIL DESCRIPTION				SaGr	slSiGrSa			
NATURAL MOISTURE		46.9	127.1		3.9			
ORGANIC		6.2	14.9					
SP.GR. (FINE)				2.72	2.70			
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								

REMARKS:

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STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		DAHL CREEK MATERIAL SITE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-01	00-12	00-12	00-13	00-13	00-14	00-14
DEPTH (feet)		4.0-5.0	10.5-11.5	10.5-11.5	8.0-9.0	8.0-9.0	9.0-10.0	9.0-10.0
STATION								
OFFSET								
LAB NO.		00-4235K	00-4271	00-4272	00-4273	00-4274	00-4275	00-4276
DATE SAMPLED		10-Aug-00	12-Aug-00	12-Aug-00	12-Aug-00	12-Aug-00	12-Aug-00	12-Aug-00
% Passing	3"		100		100		100	
	2"		97		84		83	
	1.0"		73		61		66	
	0.75"		66		54		60	
	0.5"		55		46		51	
	0.375"		49		42		46	
	#4		36		35		36	
	#10		25		28		26	
	#40		11		19		13	
	#50		10		16		11	
	#100		7		11		8	
	#200		4.6		7.2		5.6	
	0.02				3.4			
Hydro	0.005				1.1			
	0.002				0.8			
LIQUID LIMIT					NV		NV	
PLASTIC INDEX					NP		NP	
UNIFIED CLASS.			GW/GW-GM		GW-GM		GW-GM	
SOIL DESCRIPTION			Gr		sl.SiSaGr			
NATURAL MOISTURE				4.8		3.6		6.3
ORGANIC								
SP.GR. (FINE)					2.79			
SP.GR. (COARSE)			2.74					
MAX DRY DENSITY			140.9					
OPTIMUM MOISTURE			5.9					
L.A. ABRASION		37						
DEGRAD. FACTOR							25	
SODIUM SULF. (CRSE)		1.3						
SODIUM SULF. (FINE)		3.8						
REMARKS:			See proctor					
			sheet					
		Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.						

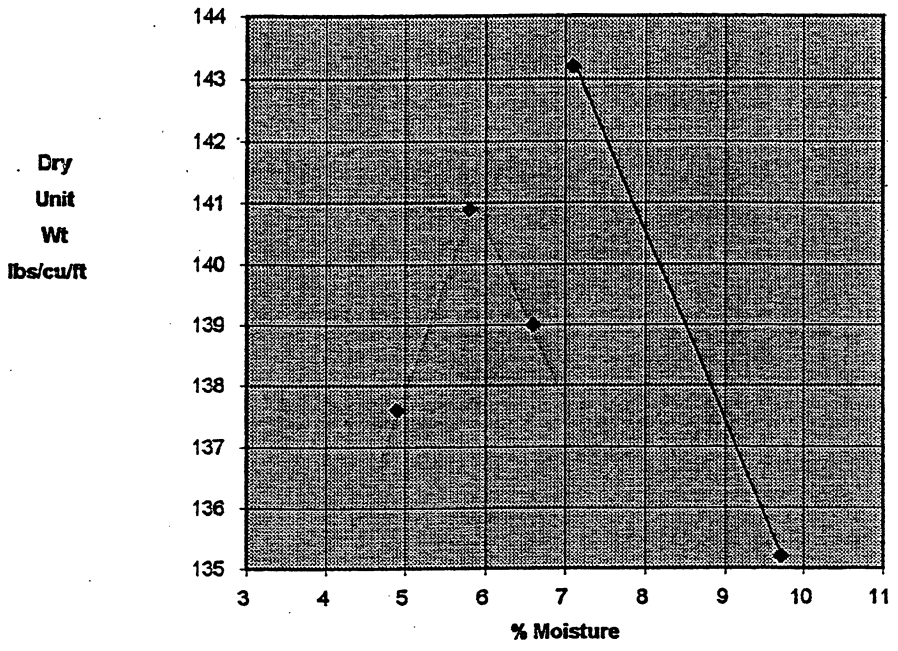
State of Alaska Department of Transportation Northern Region Materials

COMPACTION REPORT

Lab Number: 00-4271

Project: KOBUK AIRPORT RECONSTRUCTION

Source: DAHL CK A/P Field #:



Dry Unit Wt	1	2	3	4	ZAV	ZAV
lbs/cu/ft	140.9	137.6	139		135.2	143.2
kg/cu/m	2257	2204	2227		2166	2294
% Moisture	5.8	4.9	6.6		9.7	7.1
Free Moist:			Bleed			

ASTM D-1557	Reg Lab		
AASHTO T-180D	lbs/cu/ft	kg/cu/m	Field
Max. Density	140.9	2257	
Opt. Moist	5.9		

Signature: [signature]

Regional Laboratory Supervisor

	Accept.	Unaccept
Accept/Assur Comparison		
Conforms to Specs		

Signature:

Quality Assurance Inspector

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		DAHL CREEK MATERIAL SITE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-15	00-15	00-16	00-16	00-19	00-20	00-20
DEPTH (feet)		6.5-7.0	6.5-7.0	7.5-8.0	7.5-8.0	2.0-7.0	8.5-9.0	8.5-9.0
STATION								
OFFSET								
LAB NO.		00-4277	00-4279	00-4280	00-4281	00-4283	00-4284	00-4285
DATE SAMPLED		12-Aug-00	12-Aug-00	12-Aug-00	12-Aug-00	13-Aug-00	13-Aug-00	13-Aug-00
% Passing	3"	100					100	
	2"	90					92	
	1.0"	75					70	
	0.75"	68				100	63	
	0.5"	58				91	54	
	0.375"	52				84	49	
	#4	38				61	39	
	#10	22				38	29	
	#40	8				13	16	
	#50	6				11	13	
	#100	4				7	7	
	#200	3.2				4.9	4.5	
	0.02	2.1					7.7	
Hydro	0.005	0.8					0.7	
	0.002						0.1	
LIQUID LIMIT		NV					NV	
PLASTIC INDEX		NP					NP	
UNIFIED CLASS.		GP				SP/SP-SM	GW	
SOIL DESCRIPTION		Gr				SaGr		
NATURAL MOISTURE			5.1		5.3	6.2		5.8
ORGANIC					0.6			
SP.GR. (FINE)		2.78				2.79	2.76	
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		36						
DEGRAD. FACTOR				21				
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								

REMARKS:

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STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		DAHL CREEK MATERIAL SITE						
SAMPLED BY:		B. BENKO						
TESTHOLE		00-20	00-20	00-21	00-21	00-21	00-21	
DEPTH (feet)		12.0-12.5	12.0-12.5	7.0-7.5	7.0-7.5	14.0-16.0	14.0-16.0	
STATION								
OFFSET								
LAB NO.		00-4286	00-4287	00-4288	00-4289	00-4290	00-4292	
DATE SAMPLED		13-Aug-00	13-Aug-00	13-Aug-00	13-Aug-00	13-Aug-00	13-Aug-00	
% Passing	3"	100		100		100		
	2"	89		92		90		
	1.0"	74		70		79		
	0.75"	67		62		74		
	0.5"	58		54		66		
	0.375"	53		49		60		
	#4	42		37		48		
	#10	30		25		34		
	#40	13		9		12		
	#50	10		7		10		
	#100	7		5		6		
	#200	3.9		3.8		4.3		
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT		NV		NV		NV		
PLASTIC INDEX		NP		NP		NP		
UNIFIED CLASS.		GW		GW		GP		
SOIL DESCRIPTION		SaGr		SaGr		SaGr		
NATURAL MOISTURE			8.8		0.8			
ORGANIC							0.7	
SP.GR. (FINE)								
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)							2.0	

REMARKS:

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STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		SITE 2, Bornite Road Site						
SAMPLED BY:		T. BERGSTROM						
TESTHOLE		02-01	02-02	02-03	02-03	02-04	02-05	02-05
DEPTH (feet)		8.0-9.0	6.0-7.0	6.5-9.5	10.0-15.0	7.0-11.0	2.0-5.5	12.0-16.0
STATION								
OFFSET								
LAB NO.		02-6061	02-6062	02-6064	02-6065	02-6066	02-6067	02-6068
DATE SAMPLED		15-Jun-02	15-Jun-02	15-Jun-02	16-Jun-02	16-Jun-02	16-Jun-02	16-Jun-02
% Passing	3"						100	
	2"						95	100
	1.0"	100					85	91
	0.75"	98		100			82	88
	0.5"	97		99	100		78	84
	0.375"	97		99	99		76	82
	#4	97		95	99		71	77
	#10	96		90	98		64	71
	#40	89		52	93	92	53	60
	#50	79		35	86	81	52	57
	#100	36		14	50	43	47	48
	#200	9.2		7.9	17.0	18.1	23.3	36.7
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT		NV		NV	NV	NV	NV	NV
PLASTIC INDEX		NP		NP	NP	NP	NP	NP
UNIFIED CLASS.		SP-SM		SP-SM	SM	SM	SM	SM
SOIL DESCRIPTION		sl.SiSa		sl.SiSa	SiSa	SiSa		GrSaSi
NATURAL MOISTURE		3.9	25.3		4.3			
ORGANIC								
SP.GR. (FINE)								
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
REMARKS:								
		Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.						

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		SITE 2, Bornite Road Site						
SAMPLED BY:		T. BERGSTROM						
TESTHOLE		02-06	02-06	02-09	02-10	02-11	02-13	02-14
DEPTH (feet)		0.0-2.0	6.0-9.0	2.0-10.0	11.0-15.0	4.0-12.0	5.0-9.0	8.0-9.0
STATION								
OFFSET								
LAB NO.		02-6070	02-6071	02-6072	02-6073	02-6074	02-6075	02-6076
DATE SAMPLED		16-Jun-02	16-Jun-02	17-Jun-02	17-Jun-02	17-Jun-02	17-Jun-02	17-Jun-02
% Passing	3"	100			100	100	100	100
	2"	92			98	98	96	93
	1.0"	82			79	85	79	78
	0.75"	77	100		73	79	74	72
	0.5"	73	98		66	71	67	64
	0.375"	71	96		63	66	63	58
	#4	64	92		54	55	54	41
	#10	59	89		46	43	46	29
	#40	50	83		26	19	28	12
	#50	47	79		21	14	23	9
	#100	40	67		13	7	13	5
	#200	24.1	41.3		6.3	3.6	7.5	2.8
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT			NV		NV	NV	NV	NV
PLASTIC INDEX			NP		NP	NP	NP	NP
UNIFIED CLASS.		SM	SM		SP-SM	SP	SP-SM	GW
SOIL DESCRIPTION		SiSaGr	SaSi		SaGr	SaGr		SaGr
NATURAL MOISTURE		22.0	11.8	4.7				
ORGANIC								
SP.GR. (FINE)								
SP.GR. (COARSE)								
MAX DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR				67				
SODIUM SULF. (CRSE)		1.0		1.9				
SODIUM SULF. (FINE)		4.2		1.5				

REMARKS:

Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION								
NORTHERN REGION								
LABORATORY TESTING REPORT								
PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		SITE 2, Bornite Road Site						
SAMPLED BY:		T. BERGSTROM						
TESTHOLE		02-15	02-15	02-16	02-16	02-16	02-17	02-17
DEPTH (feet)		2.0-8.0	13.0-16.0	0.5-4.0	4.0-6.0	9.0-11.0	4.0-6.5	6.5-12.0
STATION								
OFFSET								
LAB NO.		02-6077	02-6078	02-6079	02-6080	02-6081	02-6082	02-6083
DATE SAMPLED		17-Jun-02	17-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
% Passing	3"	100				100	100	
	2"	96	100			98	97	
	1.0"	89	93			87	91	
	0.75"	87	89			79	87	
	0.5"	84	81			70	82	
	0.375"	81	76			64	78	
	#4	75	67			51	70	
	#10	63	59	100		38	62	
	#40	24	25	94		16	38	
	#50	16	16	85		12	29	
	#100	6	6	53		6	12	
	#200	4.0	2.3	24.9		3.8	5.7	
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT		NV	NV	NV		NV	NV	
PLASTIC INDEX		NP	NP	NP		NP	NP	
UNIFIED CLASS.		SP	SP	ML		GP	SP-SM	
SOIL DESCRIPTION		GrSa	GrSa	Si Sa		SaGr	GrSa	
NATURAL MOISTURE		7.3					5.8	
ORGANIC								
SP.GR. (FINE)								
SP.GR. (COARSE)		2.72						2.77
MAX DRY DENSITY		129.9						132.5
OPTIMUM MOISTURE		7.9						7.8
L.A. ABRASION					35			
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
REMARKS:		See proctor sheet						Ran Proctor with no gradation
		Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.						

State of Alas epartment of Transportation Northern Regic iterials

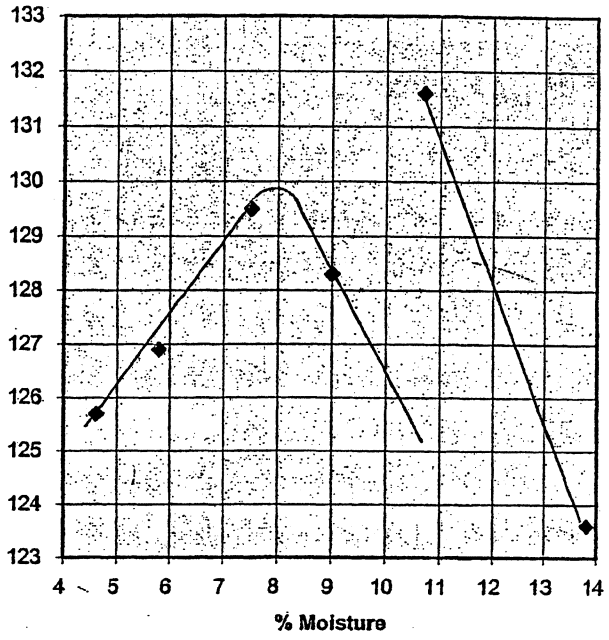
COMPACTION REPORT

Lab Number: 02-6077

Project: KOBUK AIRPORT RECONSTRUCTION

Source: SP Field #: ~~SITE 3~~ Bornite Road Site

MOISTURE / DENSITY RELATIONS



Dry Unit Wt	1	2	3	4	ZAV	ZAV
lbs/cu/ft	125.7	126.9	129.5	128.3	123.6	131.6
kg/cu/m	2014	2033	2074	2055	1980	2108
% Moisture	4.6	5.8	7.5	9	13.8	10.7
Free Moist						

ASTM D-1557	Reg Lab		
AASHTO T-180D*	lbs/cu/ft	kg/cu/m	Field
Max. Density	129.9	2081	
Opt. Moist	7.9	7.9	

*Sector face rammer used

Signature: Arthur T. DeMeerotto

Steve Meierotto

Regional Laboratory Supervisor

	Accept	Unaccept
Accept/Assur Comparison		
Conforms to Specs		

Signature:

Quality Assurance Inspector

State of Alask ;partment of Transportation Northern Regio. .terials

COMPACTION REPORT

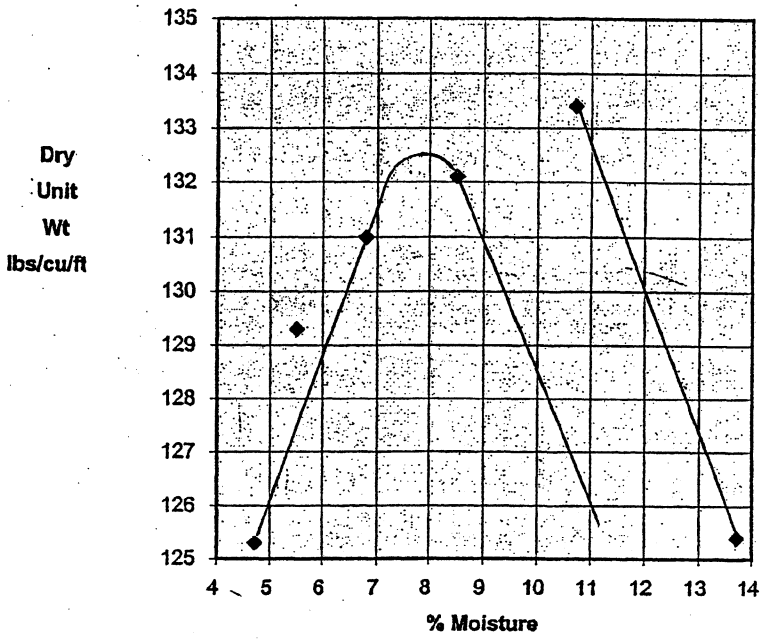
Lab Number: 02-6083

Project: KOBUK AIRPORT RECONSTRUCTION

Source:

Field #: ~~SITE 3~~ Barnite Road Site

MOISTURE / DENSITY RELATIONS



Dry Unit Wt	1	2	3	4	ZAV	ZAV
lbs/cu/ft	125.3	129.3	131	132.1	125.4	133.4
kg/cu/m	2007	2071	2098	2116	2009	2137
% Moisture	4.7	5.5	6.8	8.5	13.7	10.7
Free Moist						

ASTM D-1557	Reg. Lab		
AASHTO T-180D*	lbs/cu/ft	kg/cu/m	Field
Max. Density	132.5	2123	
Opt. Moist	7.8	7.8	

*Sector face rammer used

Signature: Steve T. Meierotto

Steve Meierotto

Regional Laboratory Supervisor

Accept/Assur Comparison	Accept.	Unaccept
Conforms to Specs		

Signature:

Quality Assurance Inspector

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION								
NORTHERN REGION								
LABORATORY TESTING REPORT								
PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		SITE 2, Bornite Road Site						
SAMPLED BY:		T. BERGSTROM						
TESTHOLE		02-18	02-19	02-20	02-20	02-20	02-20	02-21
DEPTH (feet)		7.0-10.0	7.0-10.0	0.5-1.5	2.5-6.5	6.5-8.0	9.0-13.0	6.5-8.0
STATION								
OFFSET								
LAB NO.		02-6084	02-6085	02-6086	02-6087	02-6088	02-6089	02-6090
DATE SAMPLED		18-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02	18-Jun-03	18-Jun-02
% Passing	3"	100			100	100		100
	2"	91			95	87		99
	1.0"	76			81	77		89
	0.75"	70		100	76	73		82
	0.5"	61		99	69	66		73
	0.375"	56		99	64	62		67
	#4	45		99	54	51		51
	#10	36		99	43	38		33
	#40	17		85	16	13		5
	#50	12		73	12	8		4
	#100	5		32	6	4		2
	#200	2.4		9.7	3.3	2.5		1.1
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT		NV		NV	NV	NV		NV
PLASTIC INDEX		NP		NP	NP	NP		NP
UNIFIED CLASS.		GW		SP-SM	SP	GP/SP		SP/GP
SOIL DESCRIPTION		SaGr		sl.SiSa	SaGr	SaGr		SaGr
NATURAL MOISTURE						2.7		
ORGANIC				0.4				
SP.GR. (FINE)								
SP.GR. (COARSE)								
MAX DRY DENSITY							121.7	
OPTIMUM MOISTURE							7.6	
L.A. ABRASION		34	34					
DEGRAD. FACTOR		57	78			42		
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
REMARKS:							No gradation	
							SiGrSand	
							SW-SM	
		Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.						

State of Ala... Department of Transportation Northern Regi... Materials

COMPACTION REPORT

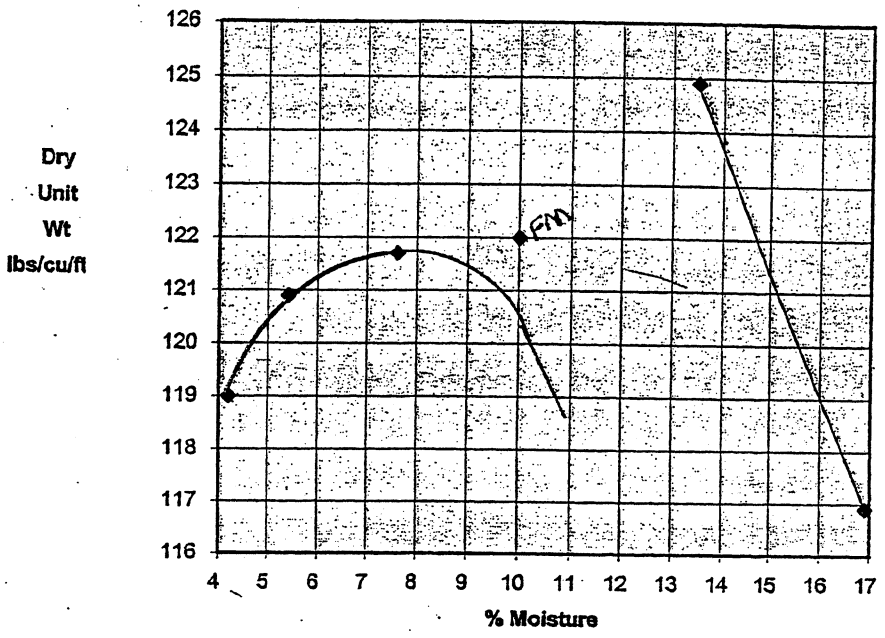
Lab Number: 02-6089

Project: KOBUK AIRPORT RECONSTRUCTION

Source:

Field #: ~~SITE-4~~ Bornite Road Site

MOISTURE / DENSITY RELATIONS



Dry Unit Wt	1	2	3	4	ZAV	ZAV
lbs/cu/ft	119	120.9	121.7	122	116.9	124.9
kg/cu/m	1906	1937	1950	1954	1873	2001
% Moisture	4.2	5.4	7.6	10	16.9	13.5
Free Moist						

ASTM D-1557	Reg. Lab		
AASHTO T-180D*	lbs/cu/ft	kg/cu/m	Field
Max. Density	121.7	1950	
Opt. Moist	7.6	7.6	

*Sector face rammer used

Signature: Steve Meierotto

Regional Laboratory Supervisor

	Accept	Unaccept
Accept/Assur Comparison		
Conforms to Specs		

Signature:

Quality Assurance Inspector

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION

NORTHERN REGION

LABORATORY TESTING REPORT

PROJECT NAME:		KOBUK AIRPORT RECONSTRUCTION						
PROJECT NUMBER:		AIP 3-02-0427-03						
AKSAS NUMBER:		60995						
MATERIAL SOURCE:		SITE 2, Bornite Road Site						
SAMPLED BY:		T. BERGSTROM						
TESTHOLE		02-22	02-26					
DEPTH (feet)		6.5-8.0	4.0-8.0					
STATION								
OFFSET								
LAB NO.		02-6091	02-6093					
DATE SAMPLED		19-Jun-02	19-Jun-02					
% Passing	3"		100					
	2"		90					
	1.0"	100	75					
	0.75"	98	70					
	0.5"	98	62					
	0.375"	98	58					
	#4	97	47					
	#10	95	36					
	#40	86	12					
	#50	77	9					
	#100	44	5					
	#200	15.5	2.9					
	0.02							
Hydro	0.005							
	0.002							
LIQUID LIMIT		NV	NV					
PLASTIC INDEX		NP	NP					
UNIFIED CLASS.		SM	GP					
SOIL DESCRIPTION		SiSa	SaGr					
NATURAL MOISTURE								
ORGANIC								
SP.GR. (FINE)								
SP.GR. (COARSE)			2.73					
MAX DRY DENSITY			137.1					
OPTIMUM MOISTURE			5.9					
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
REMARKS:			see proctor					
			sheet					
		Gradation is percent of material passing the 3 in. sieve, Alaska Test Method T-7.						

State of Alas... Department of Transportation Northern Regio... Materials

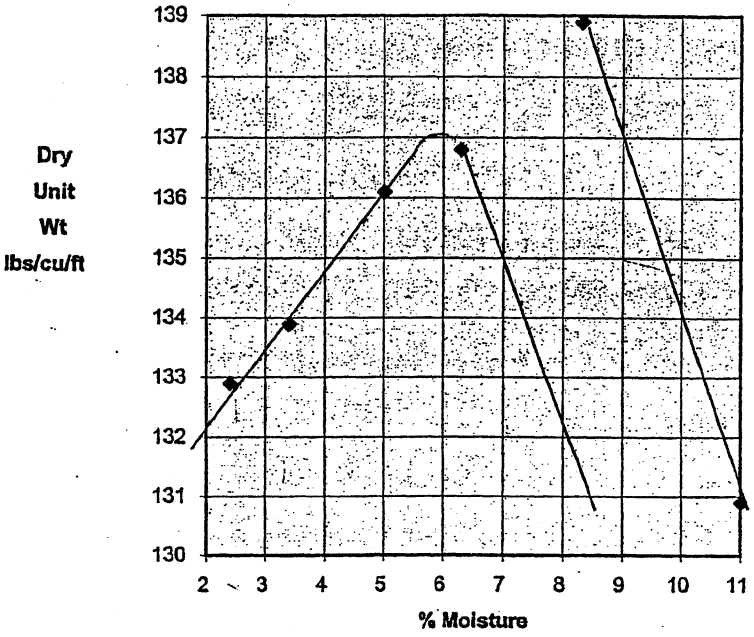
COMPACTION REPORT

Lab Number: 02-6093

Project: KOBUK AIRPORT RECONSTRUCTION

Source:

Field #: ~~SITE-4~~ BORNITE Road Site



Dry Unit Wt	1	2	3	4	ZAV	ZAV
lbs/cu/ft	132.9	133.9	136.1	136.8	130.9	138.9
kg/cu/m	2129	2145	2180	2191	2097	2225
% Moisture	2.4	3.4	5	6.3	11	8.3
Free Moist				Bleed		

ASTM D-1557	Reg Lab		
AASHTO T-180D*	lbs/cu/ft	kg/cu/m	Field
Max. Density	137.1	2196	
Opt. Moist	5.9	5.9	

*Sector face rammer used

Signature: Stephen T. Mercatt

Steve Meierotto

Regional Laboratory Supervisor

	Accept	Unaccept
Accept/Assur Comparison		
Conforms to Specs		

Signature:

Quality Assurance Inspector

NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL AVENUE
5761 SILVERADO WAY; UNIT N
POUCH 340043

FAIRBANKS, ALASKA 99701
ANCHORAGE, ALASKA 99518
PRUDHOE BAY, ALASKA 99734

(907) 456-3116 • FAX 456-3125
(907) 349-1000 • FAX 349-1016
(907) 659-2145 • FAX 659-2146

Phone: (907) 451-2228 Fax: (907)451-2353 Contract number: 104C

Attn: Diana N. Solie Paula Sue Hess (907)451-2206

Client **ADOT & PF**
Materials
2301 Peger Road
Fairbanks, AK 99709-539

Invoice to: Alaska DOT & PF
2301 Peger Rd.
Fairbanks, AK 99709

NTL Job Number: **2168'** Client Job Number: **DO# 2033621**

Sample Type: **Bulk** Sample Condition: **Good** Turnaround Time: **Routine**
Project Description: Sampled By: **Solie**

NTL Sample Dates	
Arrival:	**3/6/03**
Analyzed:	**3/13/03**
Report:	**3/13/03**

Bulk Asbestos Identification by PLM Test Method: EPA 600/R-93/116 and 40 CFR Part 763

Client Name: **ADOT & PF**

Lab Sample Number: **2168'-1** Client Sample #: **03-2001 (cyl TJB-6-A)** Sample Date: **3/5/03**

Comments: Heterogeneous

Lab Sample: **2168' - 1** Layer: **1** Description: **Dirt** Color: **Varied**

Client Sample #: **03-2001 (cyl TJB-6-A)**

Asbestos Fibers	Non-Asbestos Fibers	Non-Fibrous
None Detected	2 % Cellulose	98 % Mineral Filler

Lab Sample Number: **2168'-2** Client Sample #: **03-2002 (cyl 58)** Sample Date: **3/5/03**

Comments: Heterogeneous

Lab Sample: **2168' - 2** Layer: **1** Description: **Dirt** Color: **Varied**

Client Sample #: **03-2002 (cyl 58)**

Asbestos Fibers	Non-Asbestos Fibers	Non-Fibrous
None Detected	None Detected	100 % Mineral Filler

Patryce D. McKinney Environmental Analyst II 3/13/03

Phone # (907) 456-3116 Ext. 232

Bulk Asbestos Identification by PLM Test Method: EPA 600/R-93/116 and 40 CFR Part 763

Client Name: **ADOT & PF**

Lab Sample Number: **2168'-3** Client Sample #: **03-2003 (cyl 404)** Sample Date: **3/5/03**

Comments: Heterogeneous

Lab Sample: **2168' - 3** Layer: **1** Description: **Dirt** Color: **Varied**

Client Sample #: **03-2003 (cyl 404)**

Asbestos Fibers	Non-Asbestos Fibers	Non-Fibrous
None Detected	3 % Cellulose	97 % Mineral Filler

Lab Sample Number: **2168'-4** Client Sample #: **03-2004 (cyl 01-6253)** Sample Date: **3/5/03**

Comments: Heterogeneous

Lab Sample: **2168' - 4** Layer: **1** Description: **Dirt** Color: **Varied**

Client Sample #: **03-2004 (cyl 01-6253)**

Asbestos Fibers	Non-Asbestos Fibers	Non-Fibrous
None Detected	2 % Cellulose	98 % Mineral Filler

Lab Sample Number: **2168'-5** Client Sample #: **03-2005 (cyl TJP-8)** Sample Date: **3/5/03**

Comments: Heterogeneous

Lab Sample: **2168' - 5** Layer: **1** Description: **Dirt** Color: **Varied**

Client Sample #: **03-2005 (cyl TJP-8)**

Asbestos Fibers	Non-Asbestos Fibers	Non-Fibrous
None Detected	5 % Cellulose	95 % Mineral Filler

Lab Sample Number: **2168'-6** Client Sample #: **03-2006 (cyl 2-3065)** Sample Date: **3/5/03**

Comments: Heterogeneous

Lab Sample: **2168' - 6** Layer: **1** Description: **Dirt** Color: **Varied**

Client Sample #: **03-2006 (cyl 2-3065)**

Asbestos Fibers	Non-Asbestos Fibers	Non-Fibrous
None Detected	10 % Cellulose	90 % Mineral Filler

Patryce D. McKinney Environmental Analyst II 3/13/03

Phone # (907) 456-3116 Ext. 232

NORTHERN TESTING LABORATORIES, INC. Fairbanks, AK

Bulk Asbestos Identification by PLM Test Method: EPA 600/R-93/116 and 40 CFR Part 763

Client Name: **ADOT & PF**

Patryce D. McKinney Environmental Analyst II 3/13/03

Phone # (907) 456-3116 Ext. 232

NORTHERN TESTING LABORATORIES, INC. Fairbanks, AK