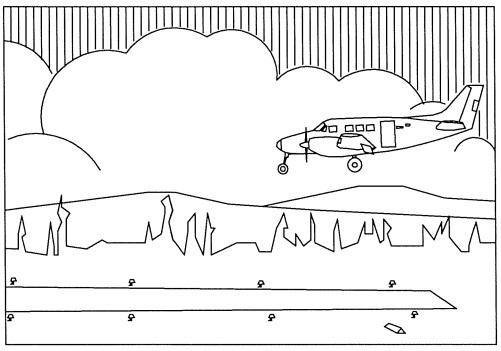
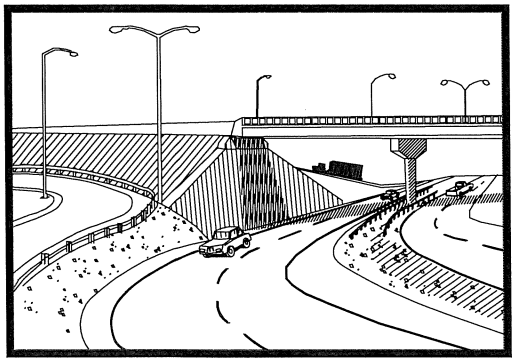
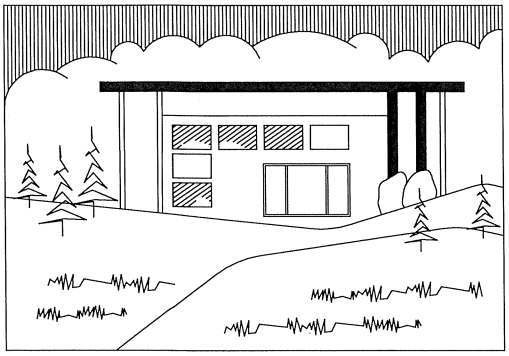
Material Site Report

AMBLER MINING DISTRICT ACCESS PHASE 1

AKSAS: 63812

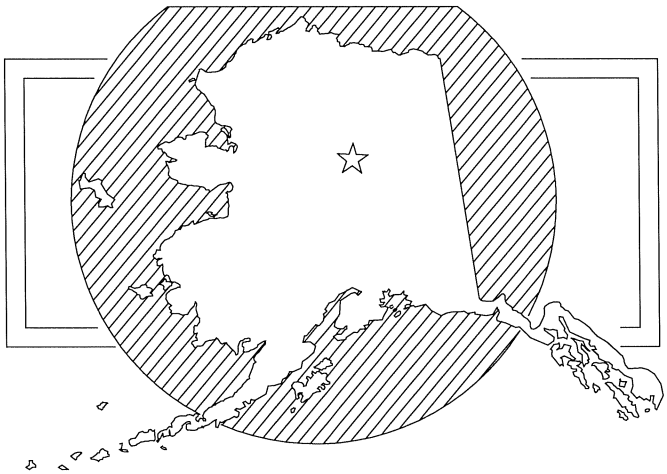






STATE OF ALASKA

Department of Transportation and Public Facilities



NORTHERN REGION

January 2014

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MATERIAL SITE REPORT
AMBLER MINING DISTRICT ACCESS
PHASE 1
AKSAS 63812

JANUARY 2014

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Summary

Northern Region Materials Section (NRMS) personnel conducted geotechnical drilling of six material sites and exploratory prospect drilling in the Ambler Mining District Access Corridor. Material sites drilled included:

- Site 1 Heart Mountain Sag Drift;
- Site 2 Iniakuk Lake Alluvium;
- Site 3 Malamute Itkillik Outwash;
- Site 4 Helpmejack Piedmont Gravel;
- Site 5 Alatna Portage Piedmont Gravel;
- John River Glacial Drift.

Prospect Drilling was conducted on:

- Alluvial deposits on the Malamute fork of the Alatna River;
- Glacial Drift deposits exposed on the north bank of the Malamute Fork of the Alatna River;
- Lacustrine deposits that overlook Bedrock Creek.

Fieldwork took place from August 2nd, 2013 to August 26th 2013. A reconnaissance trip was completed from June 2, 2013 to June 7, 2013. NRMS personnel collected 4 samples from potential material sites in Gates of The Arctic National Park during the reconnaissance trip.

Geotechnical drilling conducted in the summer of 2013 yielded the following summarized results:

Material Sites Completed

Site 1. Heart Mountain Glacial Drift

Test holes drilled in this deposit intercepted the following soil profile:

- 0 to 0.5-foot thick organic/lichen mat;
- 0 to 7-feet of silt, sandy silt with gravel, silt with gravel, or silty sand;
- Underlain by at least 43 to 47 feet of well- or poorly-graded gravel with sand and sometimes silt, or well- or poorly-graded sand with gravel.

NRMS personnel drilled 12 test holes in this deposit.

Deposit geometry is permissive to host 1 million cubic yards of material.

NRMS personnel collected 13 samples for gradation. Of these 13 samples:

- 7 met Standard Highway Material Specifications for Select Materials Type A.
- 3 met Standard Highway Material Specifications for Select Materials Type B.
- 3 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 2 samples for LA Abrasion and Degradation Value determinations. Both samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Site 2. Iniakuk Lake Alluvium
Test holes drilled in this deposit intercepted the following soil profile:

- 0.1 to 0.5-foot tick lichen mat;
- 15 to 30 feet of well-or poorly-graded alluvial gravel with silt, sand, and cobbles;
- Underlain by well- or poorly-graded sand with gravel or silty sand.

NRMS personnel drilled 9 test holes in this deposit.

Deposit geometry is permissive to host 1 million cubic yards of material.

NRMS personnel collected 14 samples for gradation. Of these 13 samples:

- 4 met Standard Highway Material Specifications for Select Materials Type A.
- 2 met Standard Highway Material Specifications for Select Materials Type B.
- 8 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 4 samples for LA Abrasion and 2 samples for Degradation Value determinations. All samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Site 3. Malamute Itkillik Outwash
Test holes drilled in this deposit intercepted the following soil profile:

- 0.2 to 0.5-foot thick lichen mat;
- Underlain by alternating layers of well-or poorly-graded gravel with sand and cobble or well-and poorly-graded sand with gravel and cobbles.

NRMS personnel drilled 9 test holes in this deposit.

Deposit geometry is permissive to host 1 million cubic yards of material.

NRMS personnel collected 13 samples for gradation. Of these 13 samples:

- 12 met Standard Highway Material Specifications for Select Materials Type A.
- 1 met Standard Highway Material Specifications for Select Materials Type B.

NRMS personnel collected 2 samples for LA Abrasion and 3 samples for Degradation Value determinations. All samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Site 4. Helpmejack Piedmont Gravel
Test holes drilled in this deposit intercepted the following soil profile:

- 0.1 to 0.5-foot thick lichen mat;
- 0 to 8-feet of silt, silty sand, or sandy silt;
- 10 to 35-feet of well-or poorly-graded gravel with sand and silt or silty gravel with sand, all of which contained occasional cobbles;
- 0 to 7-feet of silty sand with gravel or poorly-graded sand with silt and gravel;
- 0 to 13-feet of poorly-graded gravel with silt and sand;

- 0 to 22-feet of silty sand with gravel, silty sand, poorly-graded sand with silt and gravel, sandy silt with gravel or silt;
- Underlain by weak to moderately strong, moderately weathered graphite schist with close foliation spacing.

NRMS personnel drilled 9 test holes in this deposit.

Deposit geometry is permissive to host 1 million cubic yards of material.

NRMS personnel collected 15 samples for gradation from the resource layer. Of these 15 samples:

- 1 met Standard Highway Material Specifications for Select Materials Type A.
- 6 met Standard Highway Material Specifications for Select Materials Type B.
- 8 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 4 samples for LA Abrasion and Degradation Value determinations. Both samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Site 5. Alatna Portage Piedmont Gravel

Test holes drilled in this deposit intercepted the following soil profile:

- 0 to 0.2-foot lichen mat;
- 3 to 26-feet of well-graded sand with gravel, poorly-graded sand with gravel, or silty sand;
- 13 to 37-feet of well-or poorly-graded gravel with sand and cobbles or cobbles with gravel.

NRMS personnel drilled 9 test holes in this deposit.

Deposit geometry is permissive to host 1 million cubic yards of material.

NRMS personnel collected 15 samples for gradation from the resource layer. Of these 15 samples:

- 3 met Standard Highway Material Specifications for Select Materials Type A.
- 4 met Standard Highway Material Specifications for Select Materials Type B.
- 8 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 4 samples for LA Abrasion and 5 samples for Degradation Value determinations. All samples showed LA Abrasion percentages that meet standard highway material quality standards for Subbase, Base Course, and Surface Course. 2 out of 5 samples have Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Material Sites That Require Additional Drilling

John River Glacial Drift

Test holes drilled in this deposit intercepted the following soil profile:

- 0.2-foot thick organic mat;
- 0-2 feet silty sand with gravel and cobbles;
- 21 to 28-feet of well- or poorly- graded gravel with sand and cobbles, or well-graded sand with gravel and cobbels;
- Underlain by silty sand or sandy silt with gravel.

NRMS personnel drilled 2 test holes in this deposit. Equipment failure resulted in abandonment of drilling this site in the summer 2013. Additional drilling is suggested.

NRMS personnel collected 4 samples for gradation from the resource layer. Of these 15 samples:
- 3 met Standard Highway Material Specifications for Select Materials Type A.
- 1 met Standard Highway Material Specifications for Select Materials Type B.

NRMS personnel collected 1 samples for LA Abrasion and Degradation Value determinations. This sample showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Prospect Drilling

Malamute Fork of the Alatna River Alluvium

Test hole TH13-1050 intercepted the following soil profile:
- 0 to 0.2-feet organic mat;
- 0.2 to 4-feet sandy silt;
- 4 to 10-feet well- or poorly-graded gravel with sand, silt, cobbles, and boulders;
- Underlain by hard bedrock.

This deposit is not a good location for a material site because bedrock in the area is too shallow.

Malamute Itkillik Drift

Lower

Test holes drilled in this deposit intercepted the following soil profile:
- 0 to 0.2-feet lichen mat;
- 0 to 3-feet sandy silt with gravel.
- 25 to 40 feet of silty sand with gravel or poorly-graded sand with gravel and silt.

This deposit is not a good location for a material site because the deposit is too fine-grained.

Upper

Test holes drilled in this deposit intercepted the following soil profile:
- 0 to 0.2-foot thick organic mat;
- 0 to 3- feet silty sand with gravel;
- 0 to 38- feet of poorly- or well-graded gravel with sand and silt;
- 0 to 8 feet of silty sand with gravel or well-graded sand with silt and gravel;
- Underlain by hard andesite bedrock.

This deposit is a marginal location for a material site. The deposit has high fines content and depth to bedrock is decreasing to the north. Observations in the field suggest the deposit is laterally continuous and additional material is available across the small drainage to the east.

Bedrock Creek Lacustrine Deposit

A single test hole drilled in this deposit encountered the following soil profile;

- 23-feet of poorly-graded sand;
- 7-feet of poorly-graded sand with gravel;
- 8-feet of silty sand.

TH13-1057 did not encounter frozen soil or groundwater.

This deposit is not a good location for a material site because the deposit is too fine-grained.

Introduction

This document presents brief descriptions and a selection of photographs. Test hole locations and descriptions are included along with comments on vegetation types, and thickness/type of overburden.

Comments are a synthesis of observations by Engineering Geologist II Garrett Speeter during a helicopter supported drilling program initiated in the summer of 2013.

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.

Phase 0
Geotechnical reconnaissance including brief geologic hazards description, broad-scale terrain unit mapping, reconnaissance alignment drilling, and extensive sampling for potential material sites (including riprap) was conducted in the NRMS personnel in the summers of 2011 and 2012. The final report was published in 2013 and is listed in the "Past Reports" section of this report.

Phase 1 (this report)
NRMS personnel drilled material sites between Gates of The Arctic National Park and the Koyukuk River using an air-portable CME-45 drilled and Helicopter operated by Soloy Helicopters.

Phase 2
NRMS personnel will drill material sites along the current rout from The Ambler Lowlands to the border of Gates of The Arctic National Park using a helicopter portable CME 45 drill rig.

Past Reports

Data and field observations from the geotechnical reconnaissance studies conducted by the Alaska Department of Transportation and Public Facilities can be found in:

Speeter, G, G., 2013, Reconnaissance Material Site Report Ambler Mining District Access AKSAS:63812. Geotechnical Investigation Report, Alaska Department of Transportation and Public Facilities, 243p

Field Investigation

Sites were selected for investigation based on interpretation of aerial photographs and satellite imagery, and a compilation of: published Alaska DOT&PF Material Site Reconnaissance Report Ambler Mining District Access, published USGS and State of Alaska geologic maps (1:250,000 scale), and observations in the field. Much of the information presented in the geologic maps proved accurate and reliable. The unknown variable with the available data is the third dimension, or thickness of the observed materials which was addressed by drilling presented in this report.

Field personnel included Engineering Geologist II Garrett Speeter, Driller Journey Peter Lanigan, and Drill Sub Journeys Gaelan Nelson and Matthew Sousa. At each site, the geologist described soil type or lithology type on site, assessed potential resource volume, documented overburden thickness, and collected samples. A recreational grade Garmin 72 GPS receiver with an estimated position accuracy of +/-50-ft was used to record site locations in NAD-83 geographic datum.

NRMS personnel drilled 60 test holes distributed over the eight locations listed in the introduction section. Drilling was conducted using 6-inch hollow stem augers and an air-portable CME-45 drill rig. Soil samples were logged in the field using the unified soil classification system. Test holes ranged in depth from 11- to 50-feet. Samples were collected from auger cuttings and submitted to the Northern Region Materials Laboratory in Fairbanks for analyses that include moisture/organics content gradation and quality analyses (LA Abrasion, Degradation and Sodium Sulfate Soundness).

Laboratory Testing

Selected samples were submitted to the Northern Region Materials Laboratory for testing. The testing program included gradation, organic content, LA Abrasion, Degradation, and sodium sulfate soundness.

Table 1. List of tests and standards offered by NRMS Materials Laboratory.

Test Method	AASHTO	ASTM
Index Tests		
Gradation	T27	C136
Minus #200 Gradation	T11	C117
Hydrometer	T88	D422
Liquid Limit	T89	D4318
Plastic Limit	T90	D4318
Moisture Content – Aggregate Soil	T255 T265	C566 D2216
Organic Content (Burn)	T267	
Proctor	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 Soundness	T104	C88
Nordic Abrasion	ATM 312	

Helicopter support

Drilling operations were supported by a Eurocopter AS350 B2 operated by Soloy Helicopters. A small, three-man, brushing crew cleared drill sites selected by the geologist before drilling commenced. The brushing crew was supported by a Hughes 500D helicopter operated by Soloy Helicopters.



Figure 1. Soloy Helicopter Moving the drill rig at site 4.

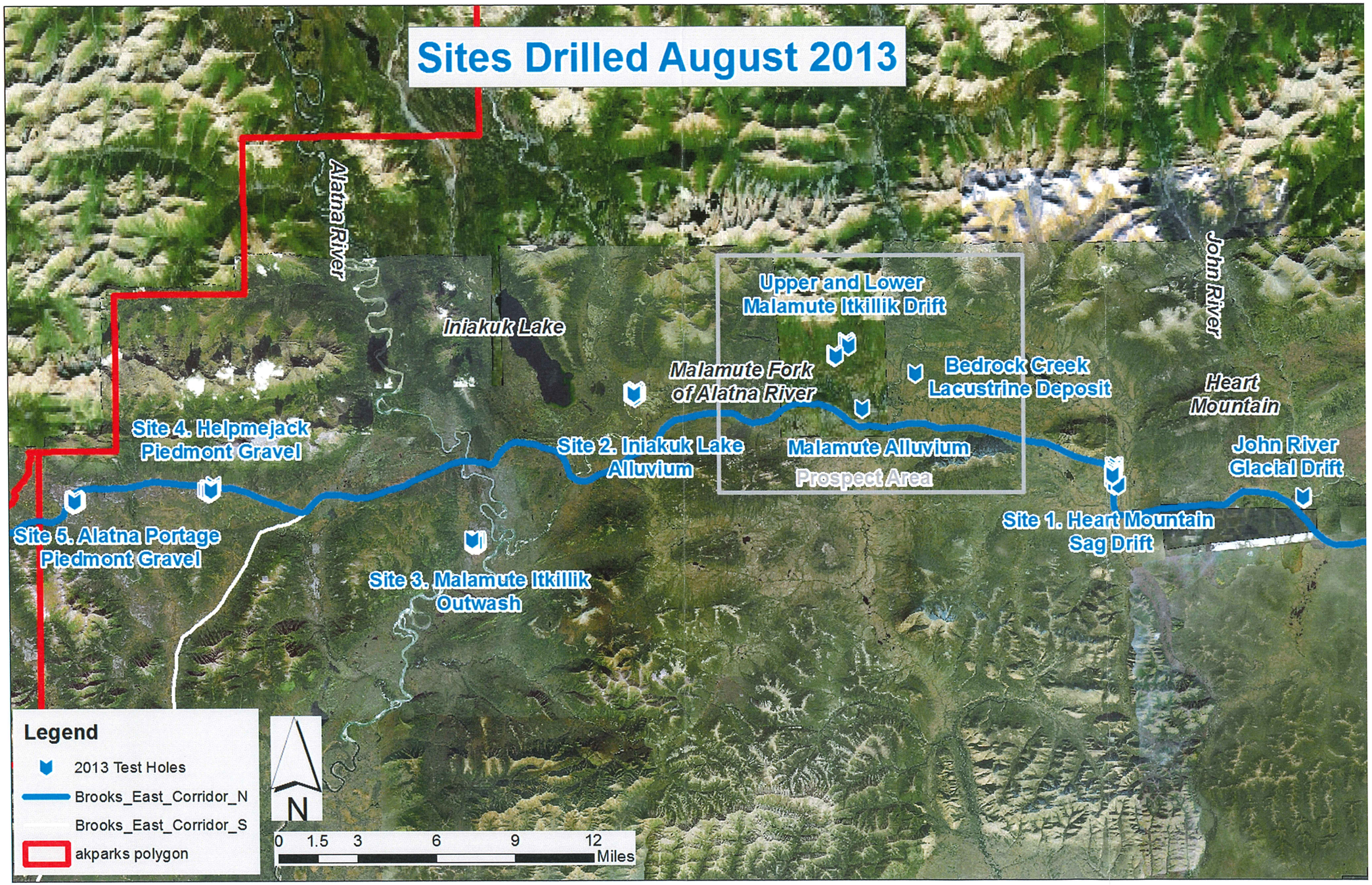


Figure 2. Map of all sites drilled in summer 2013.

Table 2. Summary of data from each site drilled.

Site	Deposit type	Acres*	Material type (# of determinations)	L.A./Deg (# determinations)	%Gravel/ %Silt (# of determinations)	Dominant overburden type	Based on Drill Data			
							Primary Unit Thickness (ft)	Inferred volume (million cy)	Dominant Lithology/soil type	Estimated overburden Thickness (ft)
Material Sites										
Site 2. Iniakuk Lake Alluvium	Alluvial over Lacustrine	500	GP (2), GP-GM (3), SP-SM (1), SM (2), SW-SM (2)	37-43/66-78 (4/2)	2-82/4.2-16.8 (4-13)	Organic mat	15-35	>1 million	Poorly-Graded Gravel with silt and sand	0-1
Site 3. Malamute Itkillik Outwash	Glacial outwash	>500	SP-SM (3), SP (3), GP (2), GW-GM (2), GW (1)	38-40/79-82 (2/3)	13-76/3.8-6.6 (12)	Organic mat	45	>1 million	Gravels with silt and sand or sands with gravel and silt	0-1.5
Site 4. Helpmejack Piedmont Gravel	Piedmont gravel	>500	GP-GM (3), GM (3), GP (2), GW-GM (1), SM (1)	34-37/48-71 (4)	6-78/4.6-79.4 (17)	Organic mat, silty sand, or sandy silt	14-35	>1 million	Poorly-and well-graded gravel with silt and sand or silty gravel with sand layers	0.1-8
Site 5. Alatna Portage Piedmont Gravel	Piedmont gravel	>500	SM (4), GP-GM (3), GW-GM (2), GW (2), SW-SM (2), GM (1), SP-SM (1)	36-39/29-88 (4/5)	3-79/3.5-25.9 (18)	Organic mat	45	>1 million	Gravels with silt and sand or sands with gravel and silt	0.1-16
Site 1. Heart Mountain Glacial Drift	Glacial Drift	>500	GP-GM (4), GP (4), GW (2), GM (2), GW-GM (1)	32-35/74-79 (2)	42-73/3-12.5 (13)	Organic mat, silt, sandy silt with gravel, silt with gravel, or silty sand.	22-47	>1 million	Poorly-and well graded gravels with sand and silt	0-7
John River Glacial Drift	Glacial Drift	?	GP (2), GW (1), GP-GM (1) (4)	37/57 (1)	52-87/2.3-6.9 (4)	Organic mat, silty sand with gravel	23-28	?	Well-and poorly-graded gravels with silt and sand	0-0.5
Prospecting Sites										
Malamute Fork Alatna River Alluvium	Alluvial terrace	<500	SW-SM (1)	-	0-28/12-47.6 (2)	Organic mat, sandy silt	6	?	Poorly- and well-graded gravels with silt and sand	4
Lower Malamute Itkillik Drift	Glacial Drift	>500	GP-GM (2), SM (2)	-	2-64/7.4-43.3 (4)	Organic mat	45	>1 million	Silty sand and sandy silt. Sporadic deposits of poorly-graded gravel with sand and silt	0-0.2
Upper Malamute Itkillik Drift	Glacial Drift	>500?	GP-GM (2), SM (2), SW-SM (1)	75/- (1)	40-66/5.2-13.7 (5)	Organic mat, silty sand with gravel	8-39	?	Poorly graded gravel with silt and sand, silty sand with gravel	0-3
Bedrock Creek Lacustrine Deposit	Polygenetic sand/ lacustrine	>500?	SM (1)	-	7/17.2 (1)	Not intercepted	>45	?	Silty sand	Not intercepted

Site and Subsurface Conditions

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.

Material Sites Completed

Site 1. Heart Mountain Glacial Drift



Figure 3. Map of Site 1. Heart Mountain Glacial Drift.

Location
Site 1. Heart Mountain Glacial Drift is located east of Heart Mountain in Section 7 Township 19N Range 24E of the Kateel River Meridian, Alaska.

Description
NRMS personnel drilled 12 test holes in a 300 acre 40 to 60-foot tall, glacial drift deposit located adjacent Heart Mountain. The deposit is vegetated with moderately thick black spruce trees.

Test holes drilled in this deposit intercepted the following soil profile (TH13-1037 to 13-1048):

- 0 to 0.5-foot thick organic/lichen mat;
- 0 to 7-feet of silt, sandy silt with gravel, silt with gravel, or silty sand;
- Underlain by at least 43 to 47 feet of well- or poorly-graded gravel with sand and sometimes silt, or well- or poorly-graded sand with gravel.

TH13-1047 intercepted groundwater 45-feet below the ground surface.

TH13-1040 intercepted frozen silt from 4 to 7-feet below the ground surface. TH13-1041 intercepted frozen soil from 2- feet below the ground surface to the bottom of the test hole at a depth of 35-feet below the ground surface. TH13-1044 intercepted frozen soil from 2.5- to 6-feet below the ground surface. TH13-1048 intercepted frozen soil with 25% visible ice (Vx) from 32- to 45-feet below the ground surface. These test holes were drilled on the east side of the deposit where vegetation and overburden is the thickest.

TH13-1043 intercepted frozen soil with 25% visible ice (Vr) from 33-to 42.5-feet below the ground surface.

Laboratory data
NRMS personnel collected 13 samples for gradation. Of these 13 samples:

- 7 met Standard Highway Material Specifications for Select Materials Type A.
- 3 met Standard Highway Material Specifications for Select Materials Type B.
- 3 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 2 samples for LA Abrasion and Degradation Value determinations. Both samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Table 3. Laboratory data from Heart Mountain Glacial Drift. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Site 1	Overburden Layer									
	-	-	-	-	-	-	26.9 (1)	3.5 (1)	-	-
	Resource Layer									
	42-73 (13)	24-44.7 (13)	3-12.5 (13)	GP-GM (4), GP (4), GW (2), GM (2), GW-GM (1)	32 (1)	74 (1)	1.4-2.4 (7)	0.5-0.7 (7)	-	NV/NP (13)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1037
Project Number	24425248, AKSAS 63812	Total Depth	48 feet
Field Geologist	G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/18/2013 - 8/18/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06047°, W153.69296°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log
S-S Auger	0–48		AUGER	13-5857					

SUBSURFACE MATERIAL

Bn Well-graded SAND
w/ Gravel
moist
SAMPLE 13-5857 (0.5-19.5): GP-GM, 6.9% -200, NM 4.3%, ORG 1.1%, LA 35, DEG 79, NV, NP

Bn Poorly-graded GRAVEL
w/ Silt & Sand
moist, 3"- gravel. Well rounded.

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1038
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Field Geologist: G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/18/2013 - 8/18/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.06038°, W153.69001°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Casing Blows / ft | Method: AUGER | Number: 13-5858 | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

Bn Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist, loose, 3 inch - rounded aggregates. Well drained. Clean.
SAMPLE 13-5858 (3.0-11.0): GP-GM, 6.6% -200, NM 1.8%, ORG 0.7%,
NV, NP

Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
moist, loose, 2 inch - rounded aggregates. Well drained. Clean.
Quartzite aggrigates suggest high quality.

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1039
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Field Geologist: G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/18/2013 - 8/18/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.05937°, W153.68811°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Sample Data: Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log | Casing Blows / ft | Depth in (Feet) | Drilling Method

SUBSURFACE MATERIAL

Gn ORG MAT

Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
Well drained. 3-inch - quarzite aggregates.

AUGER 13-5859

SAMPLE 13-5859 (10.0-20.0): GW, 4.3% -200, NM 1.8%, ORG 0.5%, NV, NP

AUGER 13-5860

SAMPLE 13-5860 (25.0-35.0): GW, 3% -200, LA 32, DEG 74, NV, NP

Bn Well-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
Well drained. 1-inch - quarzite aggregates.

Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
Well drained. 3-inch - quarzite aggregates.

BOH

Drilling Notes: Density based on drill reaction.

S-S Auger

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1040
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Field Geologist: G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/18/2013 - 8/18/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.05966°, W153.68519°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Method | Number | Blow Count | Sample Interval | N-Value

Casing Blows / ft | Frozen | Graphic Log

SUBSURFACE MATERIAL

Gn ORG MAT

Tn SILT
moist, Nbn
SAMPLE 13-5861 (1.0-2.5): NM 26.9%, ORG 3.5%

Bn Silty GRAVEL
w/ Sand
w/ Cobbles
moist, loose, Sandy. 6.9 deg C. Well drained. Quartzite and quartz aggrigate.
SAMPLE 13-5862 (9.0-18.0): GM, 12.5% -200, NV, NP

Bn Poorly-graded SAND
w/ Gravel

Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist, loose

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1041
Project Number	24425248, AKSAS 63812	Total Depth	35 feet
Field Geologist	G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/19/2013 - 8/19/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0607°, W153.68506°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									ORG MAT
	1–4									Tn SILT moist, Nbn, -0.3 deg C
	5–15									Bn Well-graded GRAVEL w/ Silt & Sand moist, Nbn
	16									Bn Silty SAND
	17–28									Bn Silty GRAVEL w/ Sand Nbn, Poor returns.
	29–30									Bn Silty SAND moist to wet, Nbn
	31–34									Bn Sandy SILT wet, Nbn
	35									BOH

Drilling Notes: Poor returns from 9 to 29 feet. Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1042
Project Number	24425248, AKSAS 63812	Total Depth	40 feet
Field Geologist: G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/19/2013 - 8/19/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.02934°, W153.31205°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method | Depth in (Feet) | Casing Blows / ft | Sample Data: Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

Gn ORG MAT

Bn Sandy SILT
w/ Gravel
moist

Bn Well-graded GRAVEL
w/ Silt & Sand
w/ Cobbles and Boulders
moist, loose, 200psi down pressure. 3-inch minus aggrigates. Lots of quartz and quartzite suggests high quality. clean
SAMPLE 13-5863 (7.0-15.0): GW-GM, 10.7% -200, NV, NP

Drilling Method: S-S Auger
Method: AUGER
Number: 13-5863
BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1043
Project Number	24425248, AKSAS 63812	Total Depth	42.5 feet
Field Geologist	G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/20/2013 - 8/20/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.03052°, W153.3103°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5864; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log; Casing Blows / ft

SUBSURFACE MATERIAL

Depth (ft)	
0	Gn ORG MAT
2	Bn Silty SAND moist
3	Bn Poorly-graded GRAVEL w/ Sand moist, Well drained.
11	SAMPLE 13-5864 (11.0-16.0): GP, 4.3% -200, NM 2.4%, ORG 0.5%, NV, NP
20	Bn Poorly-graded GRAVEL w/ Sand moist
28	Bn Well-graded SAND w/ Gravel moist, loose
33	Bn Well-graded SAND w/ Gravel moist, Vr
42	BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1044
Project Number	24425248, AKSAS 63812	Total Depth	43 feet
Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/20/2013 - 8/20/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.03185°, W153.31162°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	3									Bn Sandy SILT w/ Gravel moist, loose, Nbn
	5		AUGER	13-5865						Bn Silty GRAVEL w/ Sand moist, Nbn
	10									SAMPLE 13-5865 (3.0-10.0): GM, 15.6% -200, NM 2.3%, ORG 0.5%, NV, NP
	12									Bn Well-graded SAND w/ Gravel moist, loose
	13		AUGER	13-5866						Bn Poorly-graded GRAVEL w/ Silt & Sand moist, 300psi down pressure. Has occasional sand layers. Almost no fines. Well drained.
	16									SAMPLE 13-5866 (12.0-15.0): GP-GM, 9.9% -200, NV, NP
	20									Bn Well-graded SAND w/ Gravel moist
	23									Bn Poorly-graded GRAVEL w/ Sand w/ Cobbles moist
	26		AUGER	13-5867						SAMPLE 13-5867 (26.0-30.0): GP, 4.1% -200, NM 1.4%, ORG 0.6%, NV, NP
	37									Bn Well-graded SAND w/ Gravel moist
	43									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1045
Project Number	24425248, AKSAS 63812	Total Depth	48 feet
Field Geologist	G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/20/2013 - 8/20/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.03166°, W153.31547°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5868; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log; Casing Blows / ft

Depth in (Feet)

SUBSURFACE MATERIAL

- Bn ORG MAT
- Bn Sandy SILT
  w/ Gravel
  moist
- Bn Well-graded GRAVEL
  w/ Sand
  w/ Cobbles
  moist, loose, 1.5 to 3-inch-. Rounded. Well drained.

SAMPLE 13-5868 (28.0-34.0): GP, 3.5% -200, NM 1.8%, ORG 0.5%, NV, NP

- Bn Well-graded SAND
  w/ Gravel
  moist, Whith 1-inch- gravel. Clean.

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1046
Project Number	24425248, AKSAS 63812	Total Depth	47.5 feet
Field Geologist	G. SPEETER	Material Site	Site 1 Heart MountainSag Drift	Dates Drilled	8/21/2013 - 8/21/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.03062°, W153.31549°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5869; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log; Depth in (Feet); Casing Blows / ft

SUBSURFACE MATERIAL

Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
moist, well drained

SAMPLE 13-5869 (8.5-15.0): GP, 3.3% -200, NM 1.7%, ORG 0.5%, NV, NP

Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
moist, 3-inch- gravel. Well drained. Rounded. 300psi down pressure.

Bn Poorly-graded SAND
w/ Silt & Gravel
moist

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1047
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Field Geologist: G. SPEETER	Material Site: Site 1 Heart MountainSag Drift	Dates Drilled	8/21/2013 - 8/21/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type	Station, Offset	
	Weather	Latitude, Longitude	N67.02946°, W153.31549°
TH Finalized By: G. SPEETER	Vegetation	Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	45.0	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger
Sample Data: Method: AUGER; Number: 13-5870; Blow Count; Sample Interval; N-Value
Frozen
Graphic Log

SUBSURFACE MATERIAL

Gn ORG MAT

Tn Sandy SILT
moist

Bn Well-graded GRAVEL
w/ Sand
moist, 2-inch - rounded with lots of quartz.

Gy Poorly-graded SAND
w/ Gravel
moist

Bn Poorly-graded GRAVEL
w/ Silt & Sand
moist, 3-inch - rounded with lots of quartz. Well drained.

SAMPLE 13-5870 (18.0-25.0): GP-GM, 5.7% -200, NV, NP

Bn Poorly-graded SAND
w/ Gravel
moist, very loose, Drilled with 50psi down pressure.

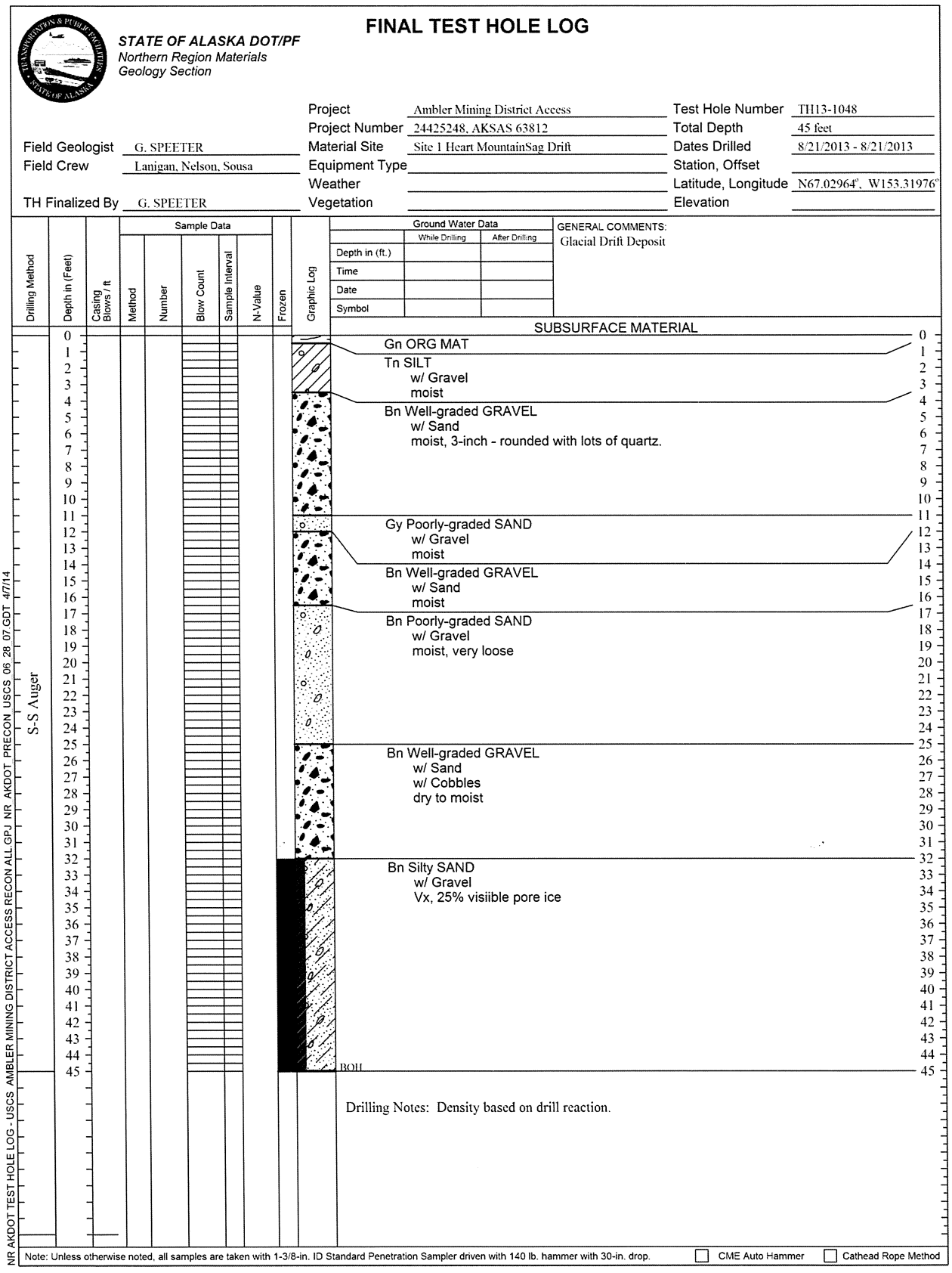
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
dry to moist, 2-inch - rounded with lots of quartz. Well drained.

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06_28_07.GDT 4/7/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Ambler Mining District Access
Project Number 24425248, AKSAS 63812
Material Site Site 1 Heart MountainSag Drift
Equipment Type
Weather
Vegetation
Test Hole Number TH13-1048
Total Depth 45 feet
Dates Drilled 8/21/2013 - 8/21/2013
Station, Offset
Latitude, Longitude N67.02964°, W153.31976°
Elevation
Field Geologist G. SPEETER
Field Crew Lanigan, Nelson, Sousa
TH Finalized By G. SPEETER
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Glacial Drift Deposit
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
S-S Auger
Gn ORG MAT
Tn SILT
w/ Gravel
moist
Bn Well-graded GRAVEL
w/ Sand
moist, 3-inch - rounded with lots of quartz.
Gy Poorly-graded SAND
w/ Gravel
moist
Bn Well-graded GRAVEL
w/ Sand
moist
Bn Poorly-graded SAND
w/ Gravel
moist, very loose
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
dry to moist
Bn Silty SAND
w/ Gravel
Vx, 25% visiible pore ice
BOH
Drilling Notes: Density based on drill reaction.
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method
NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 1

TEST HOLE NUMBER		TH13-1043	TH13-1044	TH13-1044	TH13-1044	TH13-1045	TH13-1046	TH13-1047
DEPTH (feet)		11.0-16.0	3.0-10.0	12.0-15.0	26.0-30.0	28.0-34.0	8.5-15.0	18.0-25.0
LATITUDE		N67.03052°	N67.03185°	N67.03185°	N67.03185°	N67.03166°	N67.03062°	N67.02946°
LONGITUDE		W153.3103°	W153.31162°	W153.31162°	W153.31162°	W153.31547°	W153.31549°	W153.31549°
LAB NUMBER		**13-5864**	**13-5865**	**13-5866**	**13-5867**	**13-5868**	**13-5869**	**13-5870**
DATE SAMPLED		20-Aug-13	20-Aug-13	20-Aug-13	20-Aug-13	20-Aug-13	21-Aug-13	21-Aug-13
% Passing	**3"**							
	2"			95		94	98	
	1.5"	98	97	92	98	85	93	95
Gravel	**1.0"**	86	90	84	91	69	84	83
	0.75"	75	83	75	81	59	76	72
	0.5"	63	75	61	65	47	67	58
	0.375"	57	70	52	53	41	61	50
	#4	44	58	36	33	29	48	31
	#8	35	48	28	21	22	41	22
	#10	33	46	27	19	21	39	21
	#16	28	40	23	15	17	34	17
	#30	22	32	19	11	14	28	14
Sand	**#40**	19	28	17	10	11	24	12
	#50	14	23	15	8	9	19	10
	#60	12	21	14	7	7	16	9
	#80	8	19	12	6	6	10	8
	#100	7	18	12	5	5	8	7
Silt/Clay	**#200**	4.3	15.6	9.9	4.1	3.5	3.3	5.7
	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	GM	GP-GM	GP	GP	GP	GP-GM
USCS SOIL DESCRIPTION		(PGGr w/Sa)	(SiGr w/Sa)	(PGGr w/Si&Sa)	(PGGr w/Sa)	(PGGr w/Sa)	(PGGr w/Sa)	(PGGr w/Si&Sa)
NATURAL MOISTURE		2.4	2.3		1.4	1.8	1.7	
ORGANICS		0.5	0.5		0.6	0.5	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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 1

TEST HOLE NUMBER		TH13-1037	TH13-1038	TH13-1039	TH13-1039	TH13-1040	TH13-1040	TH13-1042
DEPTH (feet)		0.5-19.5	3.0-11.0	10.0-20.0	25.0-35.0	1.0-2.5	9.0-18.0	7.0-15.0
LATITUDE		N67.06047°	N67.06038°	N67.05937°	N67.05937°	N67.05966°	N67.05966°	N67.02934°
LONGITUDE		W153.69296°	W153.69001°	W153.68811°	W153.68811°	W153.68519°	W153.68519°	W153.31205°
LAB NUMBER		**13-5857**	**13-5858**	**13-5859**	**13-5860**	**13-5861**	**13-5862**	**13-5863**
DATE SAMPLED		18-Aug-13	18-Aug-13	18-Aug-13	18-Aug-13	18-Aug-13	18-Aug-13	19-Aug-13
% Passing	**3"**							
	2"	99	97		99			99
	1.5"	97	91	98	95		97	97
Gravel	**1.0"**	88	83	89	86		90	91
	0.75"	79	74	80	76		81	82
	0.5"	65	63	66	59		69	71
	0.375"	57	56	58	48		62	64
	#4	43	41	40	27		46	50
	#8	38	37	28	16		34	40
	#10	36	35	26	15		32	39
	#16	31	30	20	11		27	34
	#30	25	25	15	9		22	27
Sand	**#40**	21	21	12	8		19	23
	#50	16	16	10	6		17	19
	#60	14	14	9	6		16	17
	#80	11	11	7	5		15	14
	#100	10	10	6	4		14	13
Silt/Clay	**#200**	6.9	6.6	4.3	3.0		12.5	10.7
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV		NV	NV
PLASTIC INDEX		NP	NP	NP	NP		NP	NP
USCS CLASSIFICATION		GP-GM	GP-GM	GW	GW		GM	GW-GM
USCS SOIL DESCRIPTION		(PGGr w/Si&Sa)	(PGGr w/Si&Sa)	(WGGr w/Sa)	(WGGr w/Sa)	(Si)	SiGr w/Sa	(WGGr w/Si&Sa)
NATURAL MOISTURE		4.3	1.8	1.8		26.9		
ORGANICS		1.1	0.7	0.5		3.5		
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		35			32			
DEGRAD. FACTOR		79			74			
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

Site 2. Iniakuk Lake Alluvium

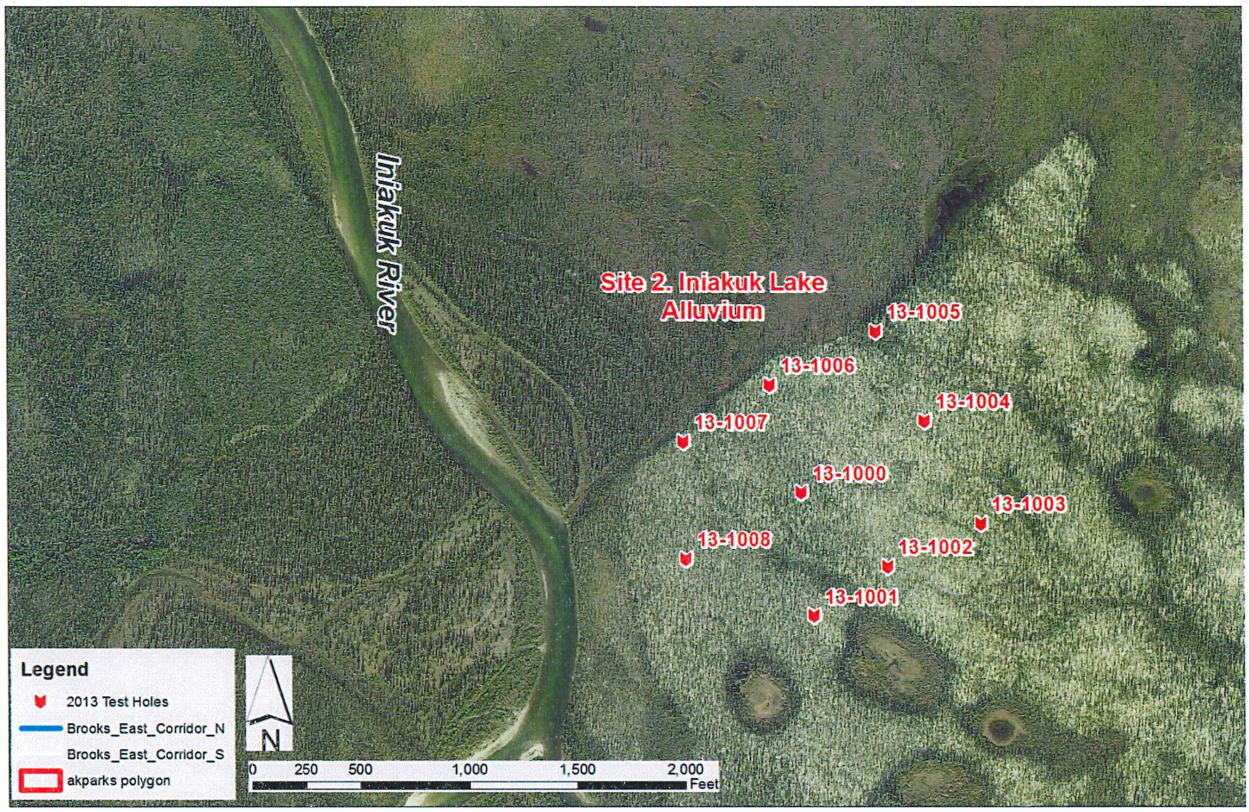


Figure 4. Map of Site 2. Iniakuk Lake Alluvium

Location

Site 2. Iniakuk Lake is located east of Iniakuk Lake Section 27 of Township 26N Range 21W in the Fairbanks Meridian, Alaska.

Description

NRMS personnel drilled 9 test holes in an approximately 500 acre, 10 to 40-foot tall, alluvial deposit that overlies glacial lacustrine deposits located 2.5 miles east of Iniakuk Lake. The deposit is sparsely vegetated with black spruce trees.

Test holes drilled in this deposit intercepted the following soil profile (TH13-1000 to 13-1008):

- 0.1 to 0.5-foot tick lichen mat;
- 15 to 30 feet of well-or poorly-graded alluvial gravel with silt, sand, and cobbles;
- Underlain by well- or poorly-graded sand with gravel, silty sand, or sand silt.

Frozen soil was encountered by all test holes at depths that ranged from 15 to 22.5-feet below the ground surface. Ice was typically classified as Nbn.

No ground water was intercepted by test holes drilled during this investigation.

Laboratory data

NRMS personnel collected 14 samples for gradation. Of these 13 samples:

- 4 met Standard Highway Material Specifications for Select Materials Type A.
- 2 met Standard Highway Material Specifications for Select Materials Type B.
- 8 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 4 samples for LA Abrasion and 2 samples for Degradation Value determinations. All samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Table 4. Laboratory data from Site 2. Iniakuk Lake alluvium. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture/ Organic	Sodium Sulfate (coarse / fine)	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Site 2	Resource Layer									
	2-82 (13)	13.8-87.2 (13)	4.2-16.8 (13)	GP (2), GP-GM (3), SP-SM (1), SM (2), SW-SM (2)	37-43 (4)	66-78 (2)	2.4-19.6/0.4-1.5 (5)	-	-	NV/NP (13)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1000
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist	G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/2/2013 - 8/2/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0453°, W152.1533°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method: S-S Auger

Sample Data: Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log | Casing Blows / ft

SUBSURFACE MATERIAL

Gn-Bk ORG MAT
hi Org

Bn Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist

Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
loose, 45.5 deg F

AUGER 13-5791
SAMPLE 13-5791 (13.0-18.0): GP, 4.8% -200, LA 37, NV, NP

AUGER 13-5792
SAMPLE 13-5792 (14.0-27.0): SW-SM, 10.1% -200, NM 13.2%, ORG 0.4%, NV, NP

Gy Well-graded SAND
w/ Silt & Gravel
wet, Vx, 25% visible pore ice. -0.3 deg C

AUGER 13-5793
SAMPLE 13-5793 (32.0-41.0): SW-SM, 10.6% -200, NM 16.1%, ORG 0.3%, NV, NP

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1001
Project Number	24425248, AKSAS 63812	Total Depth	25 feet
Field Geologist	G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/2/2013 - 8/2/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.04654°, W152.15394°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log
	0–25		AUGER	13-5794					

SUBSURFACE MATERIAL

0 Gn-Bk ORG MAT

Bn Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist, loose
SAMPLE 13-5794 (4.0-10.5): GP-GM, 5% -200, NM 2.4%, ORG 1.5%, LA 41, NV, NP

21 Gy Silty SAND
moist, Nbn

25 BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1002
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist: G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/3/2013 - 8/3/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.12013°, W152.69297°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn-Bk ORG MAT
	1									Bn Well-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	2–19									
	20		AUGER	13-5795						Gy Poorly-graded SAND w/ Silt & Gravel Nbn SAMPLE 13-5795 (20.0-26.0): SP-SM, 8.6% -200, NV, NP
	21–27									
	28									Gy Silty SAND Nbn
	29–41									
	42		AUGER	13-5796						SAMPLE 13-5796 (42.0-45.0): SM, 13.5% -200, NM 19.6%, ORG 0.4%, NV, NP
	43–44									
	45									Gy Well-graded SAND w/ Gravel Nbn
	46–49									
	50									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1003
Project Number	24425248, AKSAS 63812	Total Depth	27 feet
Field Geologist	G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/3/2013 - 8/3/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.13834°, W152.78937°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method: Tri-cone & Casing

Sample Data: Casing Blows / ft | Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

0 Gn-Bk ORG MAT

Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
rounded

SAMPLE 13-5797 (5.0-10.0): GP, 4.2% -200, NV, NP

AUGER 13-5797

BOH 27

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1004
Project Number	24425248, AKSAS 63812	Total Depth	60 feet
Field Geologist: G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/3/2013 - 8/3/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.13733°, W152.78742°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method | Depth in (Feet) | Casing Blows / ft | Sample Data: Method, Number, Blow Count, Sample Interval, N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

- Gn-Bk ORG MAT
- Bn Poorly-graded GRAVEL
  - w/ Sand
  - w/ Cobbles
  - dry to moist
- Gy Silty SAND
  - w/ Gravel
  - Nbn
- SAMPLE 13-5798 (31.5-39.0): SM, 12.2% -200, NV, NP
- Gy Silty SAND
  - w/ Gravel
  - Vx, pore ice structures

S-S Auger

AUGER 13-5798

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06_28_07.GDT 4/7/14

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

FINAL TEST HOLE LOG

Test Hole Number TH13-1004

Drilling Method	Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	55									55
S-S Auger	56									56
	57									57
	58									58
	59									59
	60								BOH	60

Drilling Notes: Density based on drill reaction.

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1005
Project Number	24425248, AKSAS 63812	Total Depth	30 feet
Field Geologist	G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/4/2013 - 8/4/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.13681°, W152.78974°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log
S-S Auger	0–30		AUGER	13-5799					

SUBSURFACE MATERIAL

0 Gn-Bk ORG MAT

2 Bn Well-graded SAND
w/ Silt & Gravel
w/ Cobbles
moist, loose, well drained
SAMPLE 13-5799 (1.5-10.0): SW-SM, 10.6% -200, NM 6.0%, ORG 1.3%, NV, NP

30 BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1006
Project Number	24425248, AKSAS 63812	Total Depth	45 feet
Field Geologist	G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/4/2013 - 8/4/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.13597°, W152.7867°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method	Depth in (Feet)	Casing Blows/ ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1–4									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	5–10									Bn Poorly-graded GRAVEL w/ Silt & Sand moist
	11–12		AUGER	13-5800						SAMPLE 13-5800 (11.5-18.0): GP-GM, 6% -200, LA 37, DEG 78, NV, NP
	13–22									
	23									Gy Well-graded SAND w/ Gravel moist, Nbn
	24–34									
	35									Gy Silty SAND wet, Nbn, Well drained. Liquifies when agitated.
	36–41									
	42–45		AUGER	13-5801						SAMPLE 13-5801 (42.0-45.0): SM, 14.7% -200, NM 15.3%, ORG 0.3%, NV, NP BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1007
Project Number	24425248, AKSAS 63812	Total Depth	40 feet
Field Geologist	G. SPEETER	Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/5/2013 - 8/5/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.13129°, W152.8061°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5802, 13-5803, 13-5804; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log; Casing Blows / ft

SUBSURFACE MATERIAL

Gn-Bk ORG MAT

Bn Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist, Vx, pore ice structures
SAMPLE 13-5802 (1.5-7.3): GP-GM, 7% -200, NV, NP

SAMPLE 13-5803 (26.0-35.0): SM, 16.8% -200, NV, NP

Gy Well-graded SAND
w/ Silt
wet, Nbn, well drained. Liquifies when agitated.
SAMPLE 13-5804 (35.0-38.0): SW-SM, 10.8% -200, LA 43, DEG 66, NV, NP

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1008
Project Number	24425248, AKSAS 63812	Total Depth	42 feet
Material Site	Site 2 Iniakuk Lake Alluvium	Dates Drilled	8/5/2013 - 8/5/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.12995°, W152.80614°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvium underlain by Lacustrine Deposit

Drilling Method: S-S Auger

Sample Data: Method | Number | Blow Count | Sample Interval | N-Value

Casing Blows / ft | Frozen | Graphic Log

SUBSURFACE MATERIAL

Depth (Feet)	
0	ORG MAT
2	Bn Poorly-graded GRAVEL w/ Sand moist
15	Gy Well-graded SAND w/ Gravel Nbn, -0.3 deg C
20	Gy Poorly-graded SAND w/ Gravel Nbn
30	Gy Silty SAND Nbn
37	Gy Sandy SILT Nbn
42	BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 2

TEST HOLE NUMBER		TH13-1000	TH13-1000	TH13-1000	TH13-1001	TH13-1002	TH13-1002	TH13-1003
DEPTH (feet)		13.0-18.0	14.0-27.0	32.0-41.0	4.0-10.5	20.0-26.0	42.0-45.0	5.0-10.0
LATITUDE		N67.0453°	N67.0453°	N67.0453°	N67.04654°	N67.12013°	N67.12013°	N67.13834°
LONGITUDE		W152.1533°	W152.1533°	W152.1533°	W152.15394°	W152.69297°	W152.69297°	W152.78937°
LAB NUMBER		**13-5791**	**13-5792**	**13-5793**	**13-5794**	**13-5795**	**13-5796**	**13-5797**
DATE SAMPLED		2-Aug-13	2-Aug-13	2-Aug-13	2-Aug-13	3-Aug-13	3-Aug-13	3-Aug-13
% Passing	**3"**							
	2"	97			98			87
	1.5"	94			95			82
Gravel	**1.0"**	84	99		87	100		72
	0.75"	76	98		78	98		60
	0.5"	60	96		59	93		42
	0.375"	50	93	100	50	89	99	32
	#4	29	80	97	33	74	98	18
	#8	20	69		24	62		13
	#10	18	67		23	60		12
	#16	15	59	87	18	53	92	11
	#30	11	49		14	43		9
Sand	**#40**	10	40		11	34		8
	#50	9	29		9	25		7
	#60	8	24		9	21		7
	#80	7	18		8	15		6
	#100	7	16	17	7	14	27	6
Silt/Clay	**#200**	4.8	10.1	10.6	5.0	8.6	13.5	4.2
Hydro	**0.02**							
	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	SW-SM		GP-GM	SP-SM		GP
USCS SOIL DESCRIPTION		(PGGr w/Sa)	(PGGr w/Sa)	(WGSa w/Si&Gr)	(PGGr w/Si&Sa)	(PGSa w/Si&Gr)	(SiSa)	(PGGr)
NATURAL MOISTURE			13.2	16.1	2.4		19.6	
ORGANICS			0.4	0.3	1.5		0.4	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		37			41			
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 2

TEST HOLE NUMBER		TH13-1004	TH13-1005	TH13-1006	TH13-1006	TH13-1007	TH13-1007	TH13-1007
DEPTH (feet)		31.5-39.0	1.5-10.0	11.5-18.0	42.0-45.0	1.5-7.3	26.0-35.0	35.0-38.0
LATITUDE		N67.13733°	N67.13681°	N67.13597°	N67.13597°	N67.13129°	N67.13129°	N67.13129°
LONGITUDE		W152.78742°	W152.78974°	W152.7867°	W152.7867°	W152.8061°	W152.8061°	W152.8061°
LAB NUMBER		**13-5798**	**13-5799**	**13-5800**	**13-5801**	**13-5802**	**13-5803**	**13-5804**
DATE SAMPLED		3-Aug-13	4-Aug-13	4-Aug-13	4-Aug-13	5-Aug-13	5-Aug-13	5-Aug-13
% Passing	**3"**							
	2"			93		97		
	1.5"			87		95		
Gravel	**1.0"**		97	74		86		
	0.75"		91	63		76	99	
	0.5"	100	82	49		59	98	
	0.375"	99	75	40		42	95	100
	#4	97	58	26	98	34	85	99
	#8	94	45	20		27	63	87
	#10	93	42	19		25	60	84
	#16	89	34	16	95	20	49	75
	#30	82	26	13		15	39	62
Sand	**#40**	74	23	12		13	36	50
	#50	59	20	10		12	32	35
	#60	49	18	10		11	30	29
	#80	30	16	9		10	27	20
	#100	25	15	8	25	9	25	17
Silt/Clay	**#200**	12.2	10.6	6.0	14.7	7.0	16.8	10.8
	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		SM	SW-SM	GP-GM		GP-GM	SM	SW-SM
USCS SOIL DESCRIPTION		(SiSa w/Gr)	(WGSa w/Si&Gr)	(PGGr w/SiCl&Sa)	(SiSa)	(PGGr w/Si&Sa)	(PGGr w/Si&Sa)	(WGSa w/Si)
NATURAL MOISTURE			6.0		15.3			
ORGANICS			1.3		0.3			
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION				37				43
DEGRAD. FACTOR				78				66
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

Site 3. Malamute Itkillik Outwash

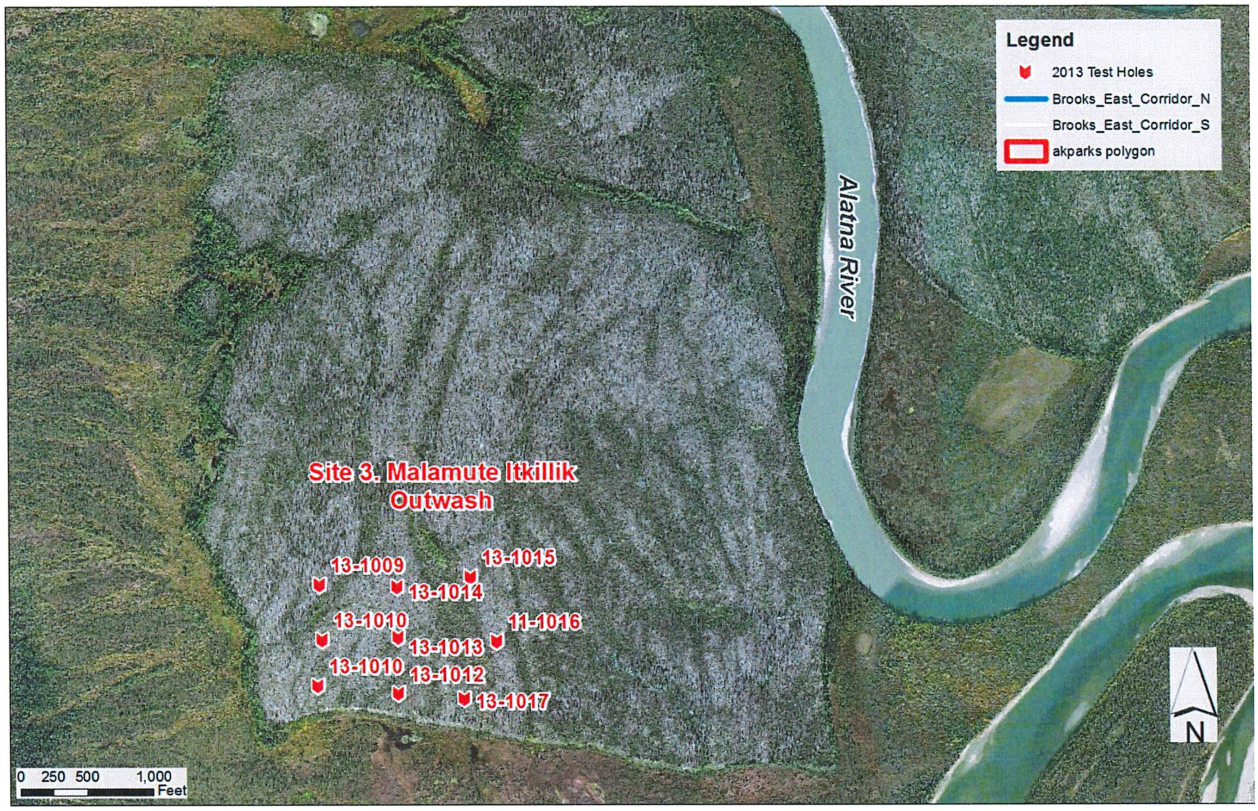


Figure 5. Map of Site 3. Malamute Itkillik Outwash

Location

Site 3. Malamute Itkillik Outwash is located west of the Alatna River in Section 2 Township 26N Range 24W of the Fairbanks Meridian, Alaska.

Description

NRMS personnel drilled 9 test holes in an approximately 750 acre, 10 to 20-foot tall, glacial outwash deposit located adjacent the Malamute Fork of the Alatna River. The deposit is sparsely vegetated with black spruce trees.

Test holes drilled in this deposit intercepted the following soil profile (TH13-1009 to 13-1017):

- 0.2 to 0.5-foot thick lichen mat;
- Underlain by alternating layers of well-or poorly-graded gravel with sand and cobbles or well-and poorly-graded sand with gravel and cobbles.

This deposit is very gradationally heterogeneous, sand with gravel and gravel with sand layers vary in thickness and stratigraphic position from hole to hole.

Groundwater was intercepted between 23.5 and 35 feet below the ground surface.

Frozen soil was not intercepted by any test holes drilled in this deposit.

Laboratory data

NRMS personnel collected 13 samples for gradation. Of these 13 samples:

- 12 met Standard Highway Material Specifications for Select Materials Type A.
- 1 met Standard Highway Material Specifications for Select Materials Type B.

NRMS personnel collected 2 samples for LA Abrasion and 3 samples for Degradation Value determinations. All samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Table 5. Laboratory data from site 3. Malamute Itkillik Outwash. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Site 3	Resource Layer									
	13-76 (12)	20.2-80.9 (12)	3.8-6.6 (12)	SP-SM (3), SP (3), GP (2), GW-GM (2), GW (1)	38-40 (2)	79-82 (3)	2.0-4.4 (7)	0.3-0.9 (7)	-	NV/NP (12)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1009
Project Number	24425248, AKSAS 63812	Total Depth	48 feet
Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/5/2013 - 8/5/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.1008°, W152.76854°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	31.0	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5805; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log; Casing Blows / ft

SUBSURFACE MATERIAL

Gn-Bk ORG MAT

Bn Well-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist, 12.8-10 deg C
SAMPLE 13-5805 (1.5-7.5): GW-GM, 5.3% -200, NM 2.6%, ORG 0.9%, LA 38, NV, NP

Bn Poorly-graded SAND
w/ Silt & Gravel
moist to wet, 7.3-7.1 deg C. Well-drained. Liquifies when agitated. 1-2 inch minus sized.
SAMPLE 13-5806 (37.0-48.0): SP-SM, 5.7% -200, NV, NP

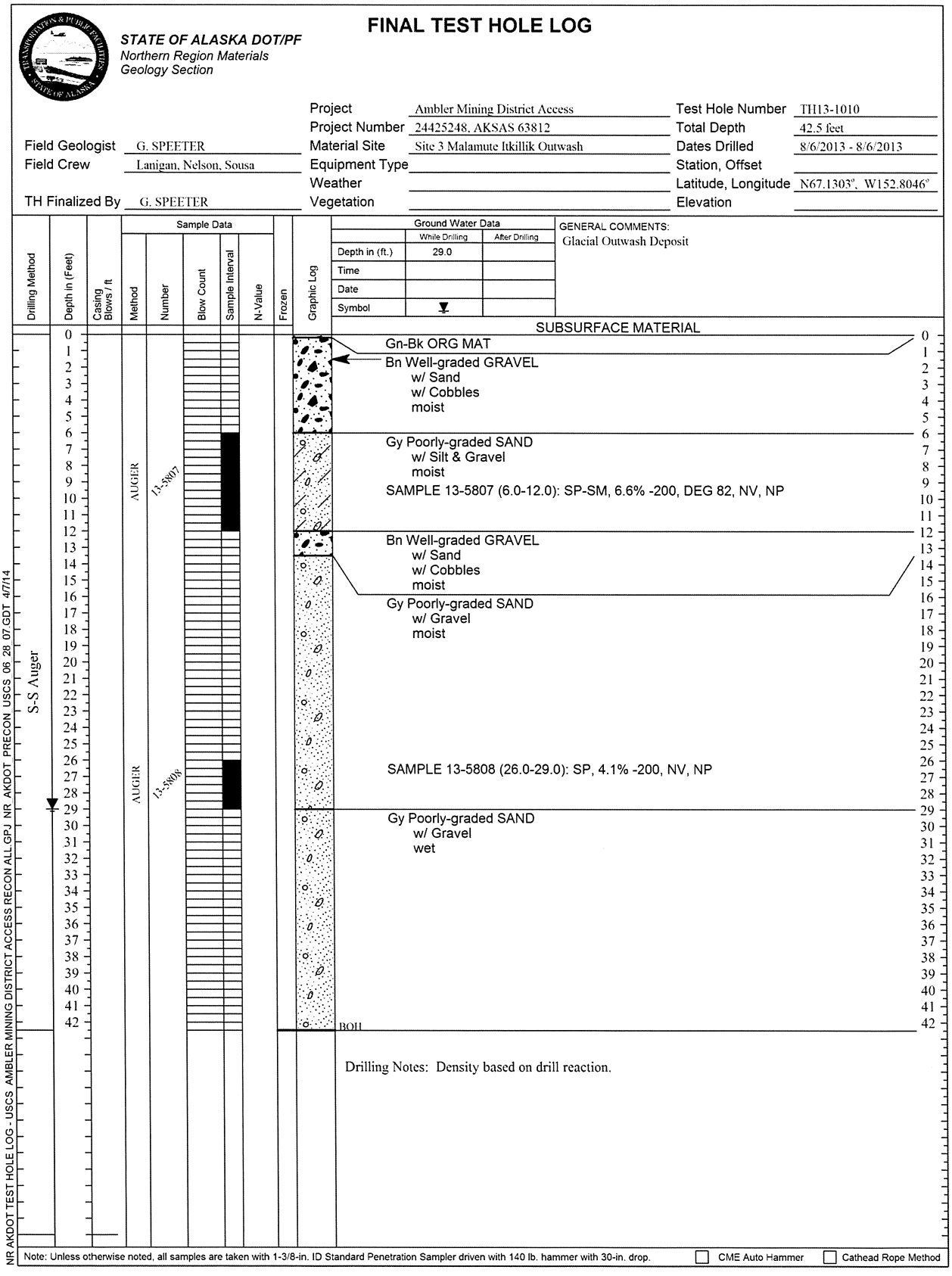
Method: AUGER; Number: 13-5806

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Ambler Mining District Access
Project Number 24425248, AKSAS 63812
Material Site Site 3 Malamute Itkillik Outwash
Equipment Type
Weather
Vegetation
Test Hole Number TH13-1010
Total Depth 42.5 feet
Dates Drilled 8/6/2013 - 8/6/2013
Station, Offset
Latitude, Longitude N67.1303°, W152.8046°
Elevation
Field Geologist G. SPEETER
Field Crew Lanigan, Nelson, Sousa
TH Finalized By G. SPEETER
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 29.0
Time
Date
Symbol
GENERAL COMMENTS:
Glacial Outwash Deposit
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Gn-Bk ORG MAT
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist
Gy Poorly-graded SAND
w/ Silt & Gravel
moist
SAMPLE 13-5807 (6.0-12.0): SP-SM, 6.6% -200, DEG 82, NV, NP
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist
Gy Poorly-graded SAND
w/ Gravel
moist
SAMPLE 13-5808 (26.0-29.0): SP, 4.1% -200, NV, NP
Gy Poorly-graded SAND
w/ Gravel
wet
BOH
S-S Auger
AUGER
13-5807
AUGER
13-5808
Drilling Notes: Density based on drill reaction.
NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1011
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Field Geologist	G. SPEETER	Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/6/2013 - 8/6/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.05793°, W152.42179°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	35.0	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Gn-Bk ORG MAT
	1–8		AUGER	13-5809						Gy Poorly-graded GRAVEL w/ Sand moist, loose SAMPLE 13-5809 (5.0-8.5): GP, 4.8% -200, NM 2.8%, ORG 0.7%, NV, NP
	9–17		AUGER	13-5810						Gy Poorly-graded SAND w/ Gravel moist SAMPLE 13-5810 (9.0-13.0): SP, 2.8% -200, NM 4.2%, ORG 0.4%, SSc 3.0, SSf 3.1, DEG 79, NV, NP
	18–47									Gy Well-graded SAND w/ Gravel moist, loose
	47									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1012
Project Number	24425248, AKSAS 63812	Total Depth	30 feet
Field Geologist: G. SPEETER	Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/6/2013 - 8/6/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.0556°, W152.4182°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	23.5	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–3		AUGER	13-5811						Gn-Bk ORG MAT Bn Well-graded SAND w/ Gravel moist
	3–23									Bn Well-graded GRAVEL w/ Sand moist SAMPLE 13-5811 (5.0-23.0): GW, 3.6% -200, NV, NP
	23–30									Gy Well-graded SAND w/ Gravel moist
	30									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1013
Project Number	24425248, AKSAS 63812	Total Depth	45 feet
Field Geologist	G. SPEETER	Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/7/2013 - 8/7/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.05527°, W152.412°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	30.0	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–45		AUGER	13-5812						Gn ORG MAT Bn Silty SAND w/ Gravel moist Bn Well-graded GRAVEL w/ Sand w/ Cobbles moist, 3-inch - rounded aggregates. SAMPLE 13-5812 (8.0-12.0): NM 2.0%, ORG 0.8% Bn Well-graded SAND w/ Gravel moist, Well drained. Bn Well-graded GRAVEL w/ Sand w/ Cobbles moist Bn Poorly-graded SAND w/ Gravel wet, Very immature sand. Lots of large mica graines and thin angular chirt flakes. SAMPLE 13-5813 (29.5-31.5): SP, 3.1% -200, NM 3.5%, ORG 0.3%, NV, NP BOH
			AUGER	13-5813						

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1014
Project Number	24425248, AKSAS 63812	Total Depth	37 feet
Field Geologist	G. SPEETER	Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/7/2013 - 8/7/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06063°, W152.41995°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	27.0	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method: S-S Auger
Sample Data: Method: AUGER; Number: 13-5814; Blow Count; Sample Interval; N-Value
Casing Blows / ft
Frozen
Graphic Log

SUBSURFACE MATERIAL

0 Gn ORG MAT
lichen mat

Bn Silty SAND
w/ Gravel
moist

Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist

Bn Poorly-graded SAND
w/ Gravel
moist
SAMPLE 13-5814 (7.0-9.0): NM 4.4%, ORG 0.3%

Bn Well-graded GRAVEL
w/ Sand
moist

Gn Well-graded SAND
w/ Gravel
wet, immature sand, very angular. Weak minerology exoectung low deg results.

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1015
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist	G. SPEETER	Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/7/2013 - 8/7/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06639°, W152.41986°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	27.5	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method | Depth in (Feet) | Casing Blows / ft. | Sample Data: Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

Gn ORG MAT

Bn Silty SAND
w/ Gravel
moist

Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
moist, 2"- rounded aggrigates. Well drained.
SAMPLE 13-5815 (2.5-5.0): GP, 3.8% -200, NV, NP

Bn Well-graded SAND
w/ Silt & Gravel
moist, loose, gravels 0.5"-.

Gy Well-graded SAND
w/ Gravel
wet, gravels 0.5"-. immature sand, very angular. Weak minerology
exoectung low deg results.

BOH

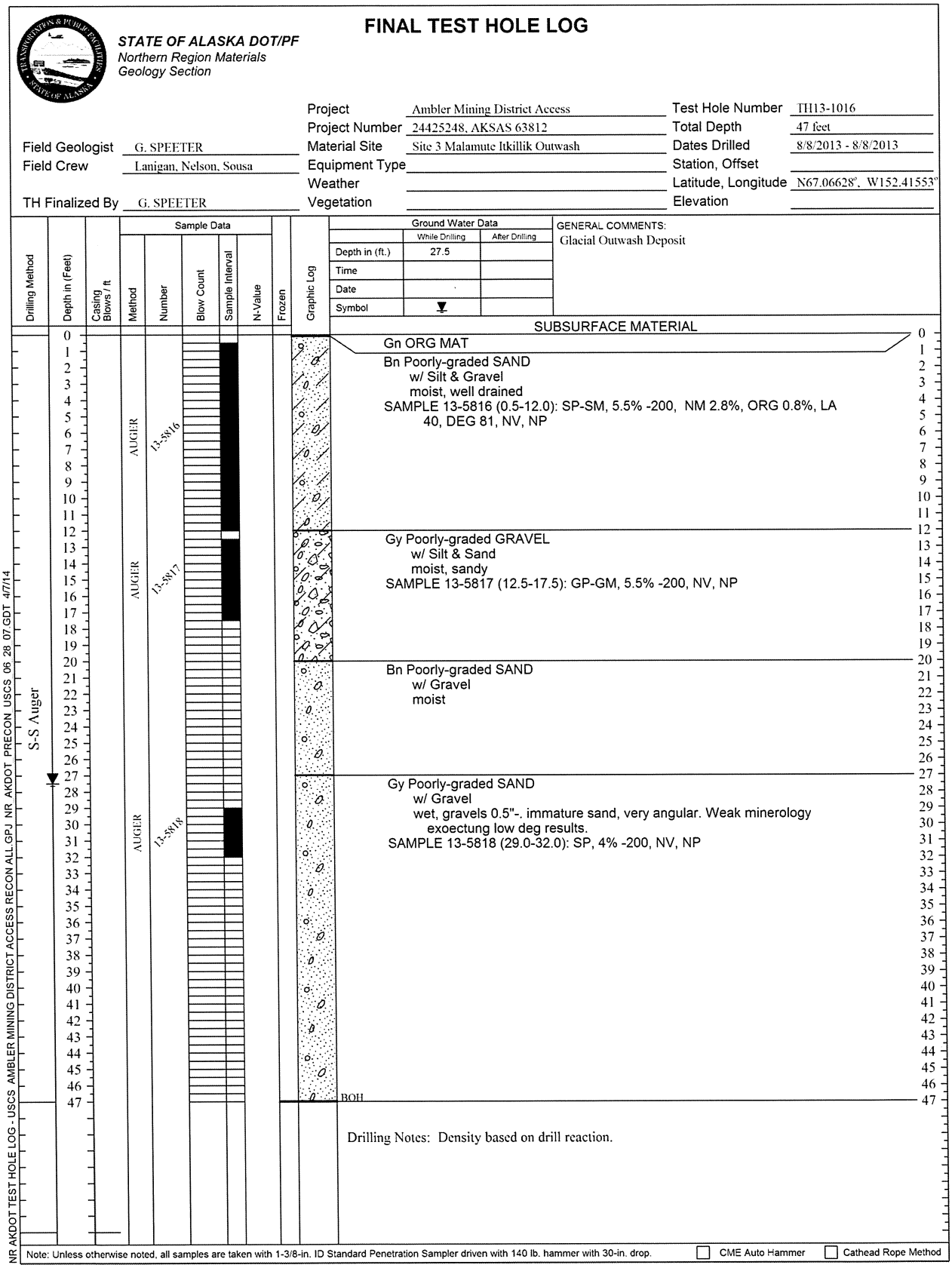
Drilling Notes: Density based on drill reaction.

S-S Auger

AUGER 13-5815

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Ambler Mining District Access
Project Number 24425248, AKSAS 63812
Material Site Site 3 Malamute Itkillik Outwash
Equipment Type
Weather
Vegetation
Test Hole Number TH13-1016
Total Depth 47 feet
Dates Drilled 8/8/2013 - 8/8/2013
Station, Offset
Latitude, Longitude N67.06628°, W152.41553°
Elevation
Field Geologist G. SPEETER
Field Crew Lanigan, Nelson, Sousa
TH Finalized By G. SPEETER
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 27.5
Time
Date
Symbol
GENERAL COMMENTS:
Glacial Outwash Deposit
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
S-S Auger
AUGER
13-5816
AUGER
13-5817
AUGER
13-5818
Gn ORG MAT
Bn Poorly-graded SAND
w/ Silt & Gravel
moist, well drained
SAMPLE 13-5816 (0.5-12.0): SP-SM, 5.5% -200, NM 2.8%, ORG 0.8%, LA 40, DEG 81, NV, NP
Gy Poorly-graded GRAVEL
w/ Silt & Sand
moist, sandy
SAMPLE 13-5817 (12.5-17.5): GP-GM, 5.5% -200, NV, NP
Bn Poorly-graded SAND
w/ Gravel
moist
Gy Poorly-graded SAND
w/ Gravel
wet, gravels 0.5"-. immature sand, very angular. Weak minerology exoectung low deg results.
SAMPLE 13-5818 (29.0-32.0): SP, 4% -200, NV, NP
BOH
Drilling Notes: Density based on drill reaction.
NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1017
Project Number	24425248, AKSAS 63812	Total Depth	43 feet
Field Geologist	G. SPEETER	Material Site	Site 3 Malamute Itkillik Outwash	Dates Drilled	8/8/2013 - 8/8/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06476°, W152.41767°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	27.0	
Time		
Date		
Symbol	▼	

GENERAL COMMENTS:
Glacial Outwash Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5819; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log

SUBSURFACE MATERIAL

Depth (ft)	
0	Gn ORG MAT
10	Bn Poorly-graded GRAVEL w/ Sand moist SAMPLE 13-5819 (2.0-10.0): GP, 3.8% -200, NM 5.1%, ORG 0.7%, NV, NP
13	Bn Well-graded SAND w/ Gravel moist, well drained
15	Bn Well-graded GRAVEL w/ Sand w/ Cobbles moist
23	Bn Poorly-graded GRAVEL w/ Sand moist
27	Bn Well-graded GRAVEL w/ Sand w/ Cobbles moist, sandy
29	Gy Well-graded SAND w/ Gravel wet, gravels 0.5"-. immature sand, very angular. Weak minerology expecting low deg results.
43	Gy Well-graded SAND w/ Silt & Sand wet, gravels 0.5"-. immature sand, very angular. Weak minerology expecting low deg results. BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 3

TEST HOLE NUMBER		TH13-1013	TH13-1013	TH13-1014	TH13-1015	TH13-1016	TH13-1016	TH13-1016
DEPTH (feet)		8.0-12.0	29.5-31.5	7.0-9.0	2.5-5.0	0.5-12.0	12.5-17.5	29.0-32.0
LATITUDE		N67.05527°	N67.05527°	N67.06063°	N67.06639°	N67.06628°	N67.06628°	N67.06628°
LONGITUDE		W152.412°	W152.412°	W152.41995°	W152.41986°	W152.41553°	W152.41553°	W152.41553°
LAB NUMBER		**13-5812**	**13-5813**	**13-5814**	**13-5815**	**13-5816**	**13-5817**	**13-5818**
DATE SAMPLED		7-Aug-13	7-Aug-13	7-Aug-13	7-Aug-13	8-Aug-13	8-Aug-13	8-Aug-13
% Passing	**3"**							
	2"							
	1.5"				93		99	
Gravel	**1.0"**				78	96	94	
	0.75"				65	90	88	100
	0.5"		98		48	79	75	99
	0.375"		96		39	72	67	96
	#4		84		24	58	49	83
	#8				17	47	39	60
	#10				16	46	37	55
	#16		52		13	37	30	41
	#30				9	25	21	27
Sand	**#40**				8	18	16	18
	#50				7	12	12	11
	#60				6	11	10	9
	#80				5	9	8	6
	#100		5		5	8	8	5
Silt/Clay	**#200**		3.1		3.8	5.5	5.5	4.0
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV		NV	NV	NV	NV
PLASTIC INDEX			NP		NP	NP	NP	NP
USCS CLASSIFICATION					GP	SP-SM	GP-GM	SP
USCS SOIL DESCRIPTION		(WGGr w/Sa)	(PGSa w/Gr)	(PGSa w/Gr)	(PGGr w/Sa)	(PGSa w/Si&Gr)	(PGGr w/Si&Sa)	(PGSa w/Gr)
NATURAL MOISTURE		2.0	3.5	4.4		2.8		
ORGANICS		0.8	0.3	0.3		0.8		
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION						40		
DEGRAD. FACTOR						81		
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 3

TEST HOLE NUMBER		TH13-1009	TH13-1009	TH13-1010	TH13-1010	TH13-1011	TH13-1011	TH13-1012
DEPTH (feet)		1.5-7.5	37.0-48.0	6.0-12.0	26.0-29.0	5.0-8.5	9.0-13.0	5.0-23.0
LATITUDE		N67.1008°	N67.1008°	N67.1303°	N67.1303°	N67.05793°	N67.05793°	N67.0556°
LONGITUDE		W152.76854°	W152.76854°	W152.8046°	W152.8046°	W152.42179°	W152.42179°	W152.4182°
LAB NUMBER		**13-5805**	**13-5806**	**13-5807**	**13-5808**	**13-5809**	**13-5810**	**13-5811**
DATE SAMPLED		5-Aug-13	5-Aug-13	6-Aug-13	6-Aug-13	6-Aug-13	6-Aug-13	6-Aug-13
% Passing	**3"**							
	2"							99
	1.5"	97		99	99		98	95
Gravel	**1.0"**	92	100	97	94	96	94	83
	0.75"	85	99	91	90	89	89	72
	0.5"	72	95	86	78	77	83	55
	0.375"	63	90	83	70	68	81	46
	#4	44	72	77	53	52	75	31
	#8	32	63	73	39	38	71	23
	#10	29	61	72	37	36	70	22
	#16	22	53	69	31	28	66	17
	#30	14	42	61	24	17	52	12
Sand	**#40**	11	33	51	19	11	38	9
	#50	9	23	32	14	9	21	7
	#60	9	19	25	11	8	15	7
	#80	7	13	16	8	7	9	6
	#100	7	10	14	7	6	7	5
Silt/Clay	**#200**	5.3	5.7	6.6	4.1	4.8	2.8	3.6
Hydro	**0.02**							
	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		GW-GM	SP-SM	SP-SM	SP	GP	SP	GW
USCS SOIL DESCRIPTION		(WGGr w/Si&Sa)	(PGSa w/Si&Gr)	(PGSa w/Si&Gr)	(PGSa w/Gr)	(PGGr)	(PGSa w/Gr)	(WGGr w/Sa)
NATURAL MOISTURE		2.6				2.8	4.2	
ORGANICS		0.9				0.7	0.4	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		38						
DEGRAD. FACTOR				82			79	
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 3

TEST HOLE NUMBER		TH13-1017						
DEPTH (feet)		2.0-10.0						
LATITUDE		N67.06476°						
LONGITUDE		W152.41767°						
LAB NUMBER		**13-5819**						
DATE SAMPLED		8-Aug-13						
% Passing	**3"**							
	2"							
	1.5"	95						
Gravel	**1.0"**	85						
	0.75"	71						
	0.5"	54						
	0.375"	44						
	#4	28						
	#8	20						
	#10	18						
	#16	14						
	#30	10						
Sand	**#40**	9						
	#50	7						
	#60	7						
	#80	5						
	#100	5						
Silt/Clay	**#200**	3.8						
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV						
PLASTIC INDEX		NP						
USCS CLASSIFICATION		GP						
USCS SOIL DESCRIPTION		(PGGr w/Sa)						
NATURAL MOISTURE		5.1						
ORGANICS		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								

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

Site 4. Helpmejack Piedmont Gravel

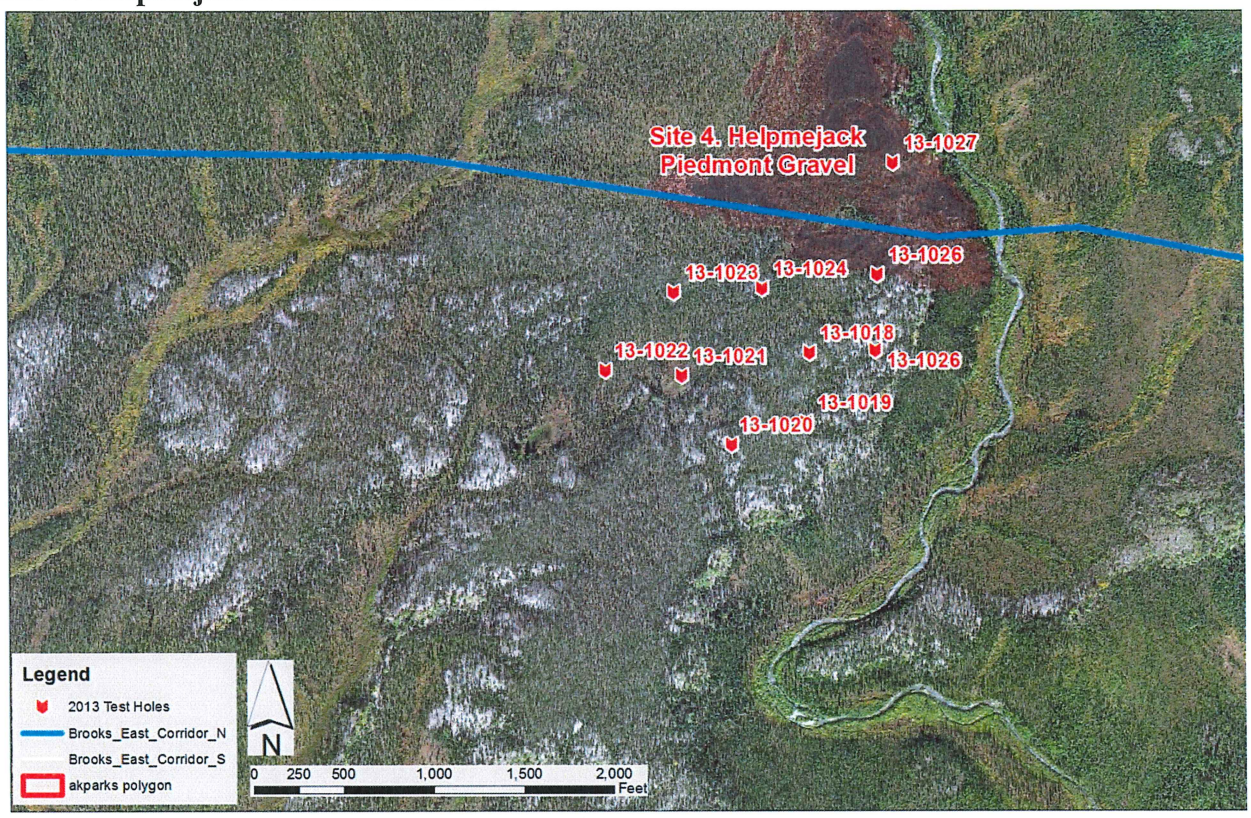


Figure 6. Map of Site 4. Helpmejack Piedmont Gravel

Location

Site 4. Helpmejack Piedmont Gravel is located west of Helpmejack Creek in Section 21 Township 26N Range 22W of the Fairbanks Meridian, Alaska.

Description

NRMS personnel drilled10 test holes in an approximately 750 acre, 30- to 50-foot tall, piedmont gravel deposit located adjacent Helpmejack Creek. The deposit is vegetated with moderately thick black spruce trees.

Test holes drilled in this deposit intercepted the following soil profile (TH13-1018 to 13-1027):

- 0.1 to 0.5-foot thick lichen mat;
- 0 to 8-feet of silt, silty sand, or sandy silt;
- 10 to 35-feet of well-or poorly-graded gravel with sand and silt or silty gravel with sand, all of which contained occasional cobbles;
- 0 to 7-feet of silty sand with gravel or poorly-graded sand with silt and gravel;
- 0 to 13-feet of poorly-graded gravel with silt and sand;
- 0 to 22-feet of silty sand with gravel, silty sand, poorly-graded sand with silt and gravel, sandy silt with gravel or silt;
- Underlain by weak to moderately strong, moderately weathered graphite schist with close foliation spacing.

No groundwater or frozen soil was encountered by test holes drilled in this deposit.

Depth to bedrock appears to decrease as you move north in the deposit. Weak to moderately strong, moderately weathered graphite schist with close foliation spacing is exposed at the base of the surficial deposit by Helpmejack Creek just to the east of the drilling footprint.

Laboratory data

NRMS personnel collected 15 samples for gradation from the resource layer. Of these 15 samples:

- 1 met Standard Highway Material Specifications for Select Materials Type A.
- 6 met Standard Highway Material Specifications for Select Materials Type B.
- 8 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 4 samples for LA Abrasion and Degradation Value determinations. All samples showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Table 6. Laboratory data from Site 4. Helpmejack Piedmont Gravel. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Site 4	Overburden Layer									
	3-12 (3)	16.4-52 (3)	36-58 (3)	-	-	-	6.8-29.6 (2)	1-3.5 (2)	-	30-NV/NP (3)
	Resource Layer									
	32-79 (14)	17.4-521.1 (14)	7-37.6 (14)	GP-GM (3), GM (3), GP (2), GW-GM (1), SM (1)	34-37 (4)	48-71 (4)	2.9-16.4 (7)	0.5-3.5 (7)	-	NV/NP (14)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1018
Project Number	24425248, AKSAS 63812	Total Depth	45 feet
Field Geologist	G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/8/2013 - 8/8/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06219°, W152.42165°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows/ ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–6		AUGER	13-5820						Gn ORG MAT Bn Silty GRAVEL w/ Sand w/ Cobbles moist SAMPLE 13-5820 (1.5-6.0): GM, 12.3% -200, NM 3.2%, ORG 1.3%, LA 37, DEG 71, NV, NP
S-S Auger	6–16		AUGER	13-5821						Gy Poorly-graded GRAVEL w/ Silt & Sand moist SAMPLE 13-5821 (6.0-16.0): GP-GM, 7% -200, NV, NP
S-S Auger	16–20									Gy Silty SAND w/ Gravel moist
S-S Auger	20–33									Gy Poorly-graded GRAVEL w/ Silt & Sand moist
S-S Auger	33–37									Gy Silty SAND w/ Gravel moist
S-S Auger	37–45									Gy Silty SAND moist BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1019
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist	G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/9/2013 - 8/9/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0631°, W152.41978°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1									
	2									Gy Silty SAND w/ Gravel moist
	3									
	4		AUGER	13-5822						Gy Poorly-graded GRAVEL w/ Silt & Sand moist
	5									
	6									
	7									SAMPLE 13-5822 (3.0-8.0): GP-GM, 7.7% -200, NV, NP
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									Gy Silty SAND w/ Gravel moist
	16									
	17									
	18									
	19									
	20									
	21									
	22									Gy Poorly-graded GRAVEL w/ Silt & Sand moist
	23									
	24									
	25									
	26									
	27									
	28									Gy Silty SAND w/ Gravel moist
	29									
	30									
	31									
	32									
	33									
	34									
	35									
	36									
	37									Gy Silty SAND moist
	38									
	39									
	40									SAMPLE 13-5823 (40.0-47.0): SM, 22.4% -200, NM 2.9%, ORG 0.5%, NV, NP
	41									
	42									
	43		AUGER	13-5823						
	44									
	45									
	46									
	47									
	48									
	49									
	50									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1020
Project Number	24425248, AKSAS 63812	Total Depth	30 feet
Field Geologist	G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/9/2013 - 8/9/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0629°, W152.4168°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method | Depth in (Feet) | Casing Blows/ ft | Sample Data: Method, Number, Blow Count, Sample Interval, N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

S-S Auger

0 ORG MAT

Well-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
SAMPLE 13-5824 (2.0-10.0): GW-GM, 7.7% -200, NM 8.4%, ORG 2.2%, NV, NP

AUGER 13-5824

Silty SAND
w/ Gravel

30 BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1021
Project Number	24425248, AKSAS 63812	Total Depth	32 feet
Field Geologist	G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/10/2013 - 8/10/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06188°, W152.4186°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1									Tn SILT
	2									w/ Gravel
	3									moist to wet
	4									Bn Silty GRAVEL
	5									w/ Sand
	6									moist
	7		AUGER	13-5825						SAMPLE 13-5825 (4.0-9.5): SM, 29.1% -200, NM 16.4%, ORG 3.5%, NV, NP
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									SAMPLE 13-5826 (18.0-22.0): GM, 17% -200, NV, NP
	20									
	21									
	22		AUGER	13-5826						
	23									Tn SILT
	24									w/ Gravel
	25									w/ Cobbles
	26									wet
	27									
	28									
	29									
	30									Bk BEDROCK, soft(Graphite schist)
	31									Weak to moderatly strong, moderatly weathered graphite schist with
	32									close foliation spacing.
										BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1022
Project Number	24425248, AKSAS 63812	Total Depth	30 feet
Field Geologist	G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/10/2013 - 8/10/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06132°, W152.4203°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

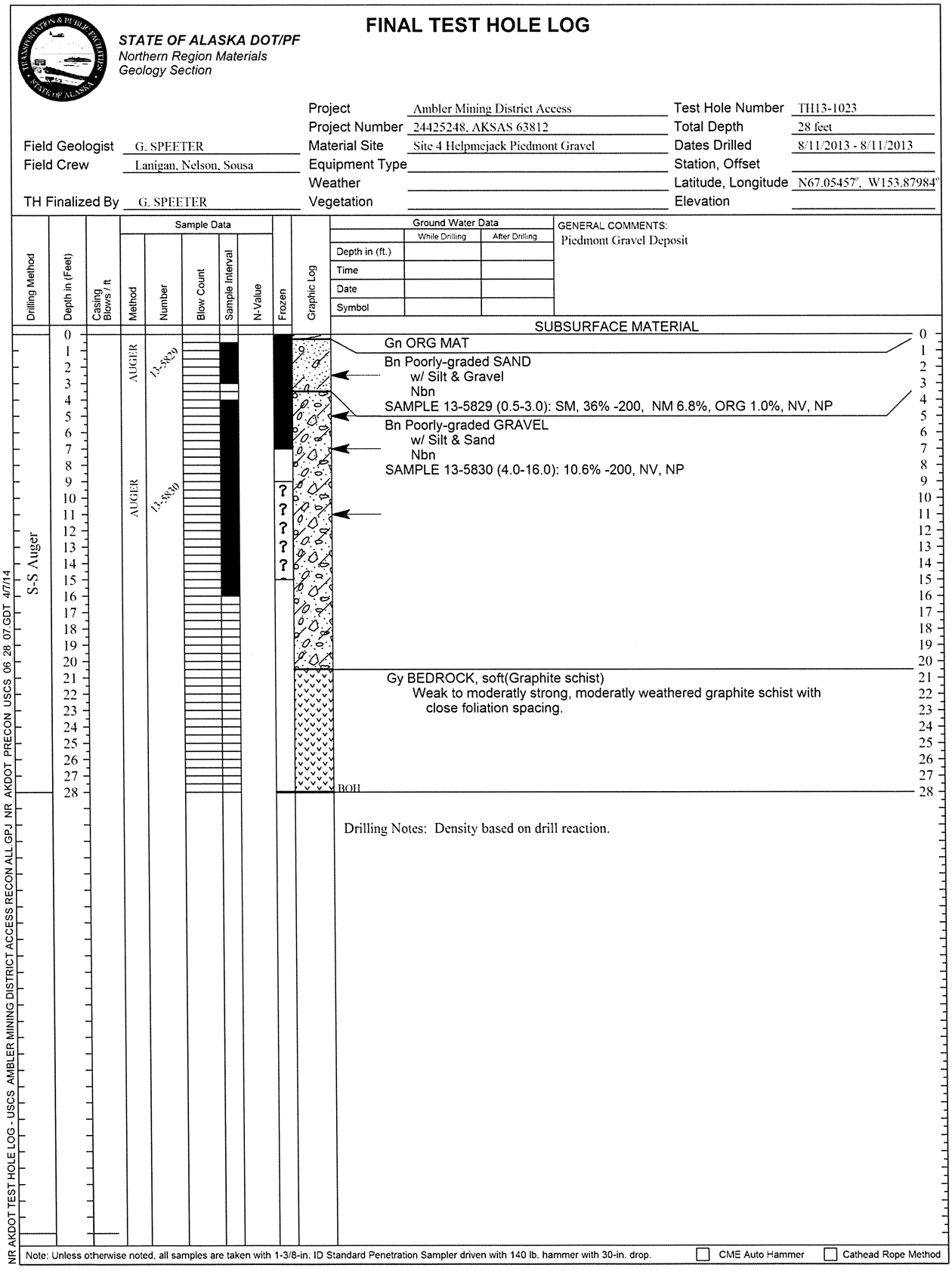
GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1–3		AUGER	13-5827						Gy Sandy SILT wet, Nbn, -0.3 deg C SAMPLE 13-5827 (1.0-4.5): ML, 58.2% -200, NM 29.6%, ORG 3.5%, LL 31, NP
	4–8									
	9–12		AUGER	13-5828						Gn Silty GRAVEL w/ Sand moist, Nbn, pulverised by auger. Classification suspect. -0.3 deg C SAMPLE 13-5828 (9.0-12.0): SM, 13.9% -200, NV, NP
	13–26									
	27–29									Gy BEDROCK, soft(Graphite schist) Weak to moderatly strong, moderatly weathered graphite schist with close foliation spacing.
	30									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Ambler Mining District Access
Project Number 24425248, AKSAS 63812
Material Site Site 4 Helpmejack Piedmont Gravel
Equipment Type
Weather
Vegetation
Test Hole Number TH13-1023
Total Depth 28 feet
Dates Drilled 8/11/2013 - 8/11/2013
Station, Offset
Latitude, Longitude N67.05457°, W153.87984°
Elevation
Field Geologist G. SPEETER
Field Crew Lanigan, Nelson, Sousa
TH Finalized By G. SPEETER
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Piedmont Gravel Deposit
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
S-S Auger
AUGER
13-5829
AUGER
13-5830
Gn ORG MAT
Bn Poorly-graded SAND
w/ Silt & Gravel
Nbn
SAMPLE 13-5829 (0.5-3.0): SM, 36% -200, NM 6.8%, ORG 1.0%, NV, NP
Bn Poorly-graded GRAVEL
w/ Silt & Sand
Nbn
SAMPLE 13-5830 (4.0-16.0): 10.6% -200, NV, NP
Gy BEDROCK, soft(Graphite schist)
Weak to moderatly strong, moderatly weathered graphite schist with close foliation spacing.
BOH
Drilling Notes: Density based on drill reaction.
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method
NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1024
Project Number	24425248, AKSAS 63812	Total Depth	45 feet
Field Geologist: G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/11/2013 - 8/11/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.0538°, W153.8792°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	3		AUGER	13-5831						Bn Poorly-graded SAND w/ Silt & Gravel moist
	10		AUGER	13-5832						Gy Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist SAMPLE 13-5831 (3.0-10.0): GW-GM, 9.4% -200, NM 2.9%, ORG 1.0%, LA 34, DEG 60, NV, NP SAMPLE 13-5832 (10.0-15.0): GP-GM, 7.9% -200, LA 35, DEG 48, NV, NP
	13									Bn Poorly-graded SAND w/ Silt & Gravel moist
	16									Gy Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	23									Gy Silty SAND w/ Gravel moist
	27									Gy Sandy SILT w/ Gravel moist
	40									Gy BEDROCK, soft(Graphite schist) Weak to moderatly strong, moderatly weathered graphite schist with close foliation spacing.
	45									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1025
Project Number	24425248, AKSAS 63812	Total Depth	40 feet
Field Geologist: G. SPEETER	Material Site: Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/11/2013 - 8/11/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type	Station, Offset	
	Weather	Latitude, Longitude	N67.05421°, W153.87616°
TH Finalized By: G. SPEETER	Vegetation	Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Gn ORG MAT
	1–4									Gy Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	5–10		AUGER	13-5833						SAMPLE 13-5833 (1.0-10.0): GP-GM, 6.2% -200, NM 9.8%, ORG 0.8%, NV, NP
	10–18		AUGER	13-5834						SAMPLE 13-5834 (10.0-18.5): GP, 4.6% -200, LA 37, DEG 56, NV, NP
	35									Gy BEDROCK, soft(Graphite schist) Weak to moderatly strong, moderatly weathered graphite schist with close foliation spacing.
	40									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1026
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Field Geologist: G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/13/2013 - 8/13/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.05453°, W153.87161°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows/ ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–2		AUGER	13-5835						ORG MAT Bn SILT w/ Sand moist
	2–3									SAMPLE 13-5835 (1.0-3.0): ML, 79.4% -200, ORG 2.3%, LL 30, NP
	3–6									Bn Silty SAND w/ Gravel moist
	6–19									Bn Poorly-graded GRAVEL w/ Silt & Sand moist
	19–20									Bn Silty SAND w/ Gravel moist
	20–24		AUGER	13-5836						SAMPLE 13-5836 (23.5-25.0): SM, 37.6% -200, NM 2.6%, ORG 0.5%, NV, NP
	24–27									Bn Silty SAND w/ Gravel moist
	27–37									Gy BEDROCK, soft(Graphite schist) Weak to moderatly strong, moderatly weathered graphite schist with close foliation spacing.
	37–47									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1027
Project Number	24425248, AKSAS 63812	Total Depth	38 feet
Field Geologist	G. SPEETER	Material Site	Site 4 Helpmejack Piedmont Gravel	Dates Drilled	8/13/2013 - 8/13/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0555°, W153.87302°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1–2									Bn Silty GRAVEL
	3									w/ Sand
	4									w/ Cobbles
	5		AUGER	13-5837						moist
	6									SAMPLE 13-5837 (2.0-9.0): GM, 13% -200, NM 3.6%, ORG 1.1%, NV, NP
	7–25									
	26									Gy Poorly-graded GRAVEL
	27–30									w/ Silt & Sand
	31									moist
	32									Gy Silty SAND
	33–34									w/ Gravel
	35									moist
	36									Gy BEDROCK, soft(Graphite schist)
	37									Weak to moderatly strong, moderatly weathered graphite schist with close foliation spacing.
	38									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 4

TEST HOLE NUMBER		TH13-1018	TH13-1018	TH13-1019	TH13-1019	TH13-1020	TH13-1021	TH13-1021
DEPTH (feet)		1.5-6.0	6.0-16.0	3.0-8.0	40.0-47.0	2.0-10.0	4.0-9.5	18.0-22.0
LATITUDE		N67.06219°	N67.06219°	N67.0631°	N67.0631°	N67.0629°	N67.06188°	N67.06188°
LONGITUDE		W152.42165°	W152.42165°	W152.41978°	W152.41978°	W152.4168°	W152.4186°	W152.4186°
LAB NUMBER		**13-5820**	**13-5821**	**13-5822**	**13-5823**	**13-5824**	**13-5825**	**13-5826**
DATE SAMPLED		8-Aug-13	8-Aug-13	9-Aug-13	9-Aug-13	9-Aug-13	10-Aug-13	10-Aug-13
% Passing	**3"**							
	2"	96	95	97		98		
	1.5"	93	90	95		95		99
Gravel	**1.0"**	87	79	85		83	99	91
	0.75"	80	71	74		75	96	84
	0.5"	72	58	59	93	63	89	69
	0.375"	66	50	50	93	56	82	61
	#4	52	36	35	86	42	68	45
	#8	43	27	29		33	55	36
	#10	41	25	27		31	53	35
	#16	35	21	24	69	26	47	30
	#30	30	17	20		20	42	27
Sand	**#40**	27	15	18		17	39	25
	#50	23	13	16		15	37	23
	#60	21	12	15		14	36	22
	#80	18	10	12		12	33	21
	#100	17	10	12	38	11	33	20
Silt/Clay	**#200**	12.3	7.0	7.7	22.4	7.7	29.1	17.0
	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		GM	GP-GM	GP-GM		GW-GM	SM	GM
USCS SOIL DESCRIPTION		(SiGr)	(PGGr w/Si&Sa)	(PGGr w/Si&Sa)	(SiSa)	(WGGr w/Si&Sa)	(SiSa)	(SiGr)
NATURAL MOISTURE		3.2			2.9	8.4	16.4	
ORGANICS		1.3			0.5	2.2	3.5	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		37						
DEGRAD. FACTOR		71						
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 4

TEST HOLE NUMBER		TH13-1022	TH13-1022	TH13-1023	TH13-1023	TH13-1024	TH13-1024	TH13-1025
DEPTH (feet)		1.0-4.5	9.0-12.0	0.5-3.0	4.0-16.0	3.0-10.0	10.0-15.0	1.0-10.0
LATITUDE		N67.06132°	N67.06132°	N67.05457°	N67.05457°	N67.0538°	N67.0538°	N67.05421°
LONGITUDE		W152.4203°	W152.4203°	W153.87984°	W153.87984°	W153.8792°	W153.8792°	W153.87616°
LAB NUMBER		**13-5827**	**13-5828**	**13-5829**	**13-5830**	**13-5831**	**13-5832**	**13-5833**
DATE SAMPLED		10-Aug-13	10-Aug-13	11-Aug-13	11-Aug-13	11-Aug-13	11-Aug-13	11-Aug-13
% Passing	**3"**				98			
	2"				96			98
	1.5"				95	97	99	93
Gravel	**1.0"**		100		91	88	93	83
	0.75"		98		83	80	86	72
	0.5"		92	98	71	68	73	56
	0.375"		86	93	63	60	64	47
	#4	94	66	88	47	45	44	32
	#8		52		37	36	33	25
	#10		49		35	35	32	23
	#16	86	42	85	30	30	26	20
	#30		35		25	26	21	16
Sand	**#40**		29		22	23	19	14
	#50		27		19	21	16	12
	#60		25		18	19	15	11
	#80		21		15	16	13	9
	#100	67	20	55	14	15	12	9
Silt/Clay	**#200**	58.2	13.9	36.0	10.6	9.4	7.9	6.2
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		31	NV	NV	NV	NV	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION			SM			GW-GM	GP-GM	GP-GM
USCS SOIL DESCRIPTION		(Si)	(SiGr)	(SiSa)	(PGGr w/Si&Sa)	PGGr w/Si&Sa	PGGr w/Si&Sa	(PGGr w/Si&Sa)
NATURAL MOISTURE		29.6		6.8		2.9		9.8
ORGANICS		3.5		1.0		1.0		0.8
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION						34	35	
DEGRAD. FACTOR						60	48	
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 4

TEST HOLE NUMBER		TH13-1025	TH13-1026	TH13-1026	TH13-1027			
DEPTH (feet)		10.0-18.5	1.0-3.0	23.5-25.0	2.0-9.0			
LATITUDE		N67.05421°	N67.05453°	N67.05453°	N67.0555°			
LONGITUDE		W153.87616°	W153.87161°	W153.87161°	W153.87302°			
LAB NUMBER		**13-5834**	**13-5835**	**13-5836**	**13-5837**			
DATE SAMPLED		11-Aug-13	13-Aug-13	13-Aug-13	13-Aug-13			
% Passing	**3"**							
	2"	99			95			
	1.5"	95			89			
Gravel	**1.0"**	82			81			
	0.75"	69			73			
	0.5"	50		99	62			
	0.375"	39	99	97	56			
	#4	22	97	90	43			
	#8	16			34			
	#10	15			33			
	#16	13	91	80	28			
	#30	11			24			
Sand	**#40**	10			22			
	#50	8			19			
	#60	8			18			
	#80	7			17			
	#100	6	81	62	16			
Silt/Clay	**#200**	4.6	79.4	37.6	13.0			
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	30	NV	NV			
PLASTIC INDEX		NP	NP	NP	NP			
USCS CLASSIFICATION		GP			GM			
USCS SOIL DESCRIPTION		(PGGr w/Si&Sa)	(Si w/Sa)	(SiSa)	(SiGr)			
NATURAL MOISTURE				2.6	3.6			
ORGANICS			2.3	0.5	1.1			
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		37						
DEGRAD. FACTOR		56						
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

Site 5. Alatna Portage Piedmont Gravel

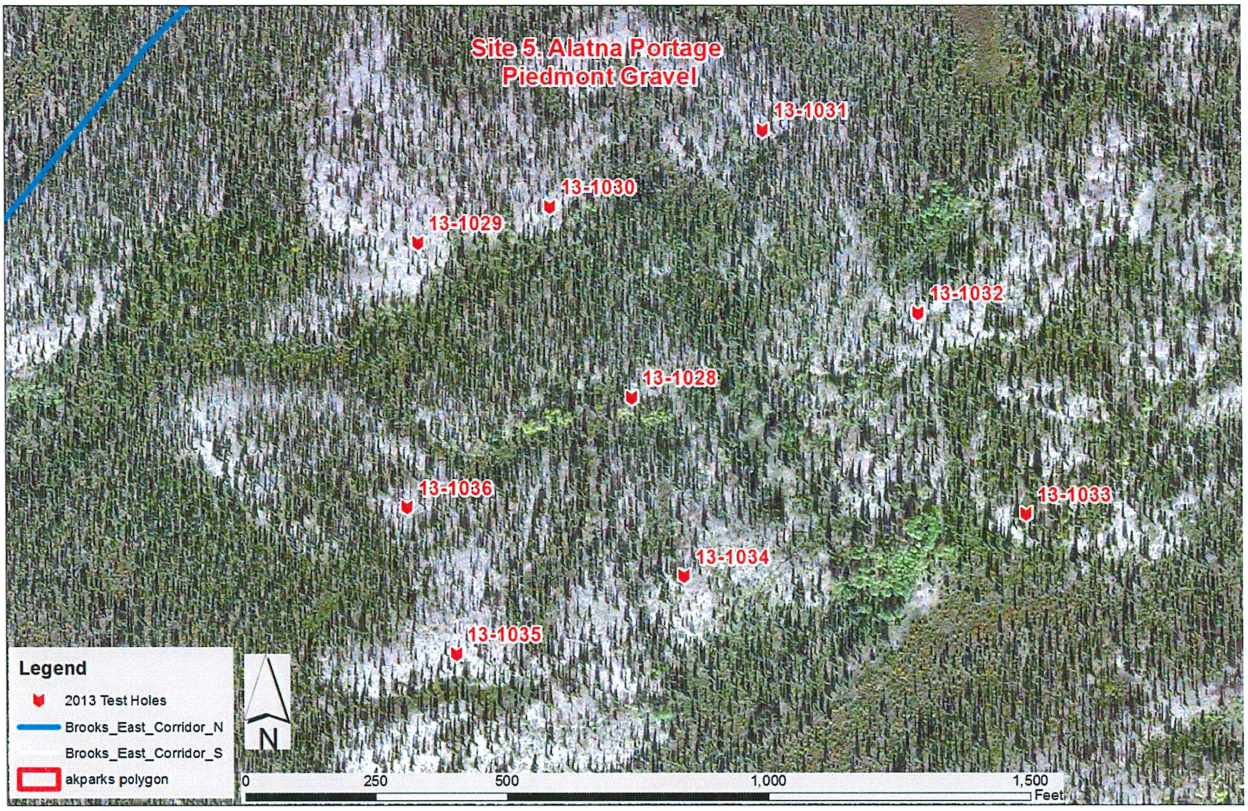


Figure 7. Map of Site 5. Alatna Portage Piedmont Gravel.

Location

Site 5. Alatna Portage Piedmont Gravel is located in Section 8 Township 19N Range 23E of the Kateel River Meridian, Alaska.

Description

NRMS personnel drilled 9 test holes in a large (>1,000 acre) 20-to 50-foot tall, piedmont gravel deposit located adjacent Alatna Portage. The deposit is vegetated with moderately thick black spruce trees.

Test holes drilled in this deposit intercepted the following soil profile (TH13-1028 to 13-1036):

- 0 to 0.2-foot lichen mat;
- 3 to 26-feet of well-graded sand with gravel, poorly-graded sand with gravel, or silty sand;
- 13 to 37-feet of well-or poorly-graded gravel with sand and cobbles or cobbles with gravel.

TH13-1032 did not intercept a gravel layer. TH13-1030 intercepted a 5-foot thick silty sand layer within the gravel layer.

Test holes in this deposit did not intercept a water table or frozen soil.

Laboratory data

NRMS personnel collected 15 samples for gradation from the resource layer. Of these 15 samples:

- 3 met Standard Highway Material Specifications for Select Materials Type A.
- 4 met Standard Highway Material Specifications for Select Materials Type B.
- 8 met Standard Highway Material Specifications for Select Materials Type C.

NRMS personnel collected 4 samples for LA Abrasion and 5 samples for Degradation Value determinations. All samples showed LA Abrasion percentages that meet standard highway material quality standards for Subbase, Base Course, and Surface Course. 3 out of 5 samples have Degradation Values that failed to meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Table 7. Laboratory data from site 5. Alatna Portage Piedmont Gravel. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Site 5	Overburden Layer									
	3-37 (6)	47.9-91.9 (6)	5.1-15.1 (6)	SW-SM (2), SM (2)	-	-	3.2-4.4 (3)	0.6-0.9 (3)	-	NV/NP (6)
	Resource Layer									
	6-79 (12)	17.2-82 (12)	2.8-25.9 (12)	SM (2), GP-GM (3), GW-GM (2), GW (2), GM (1), SP-SM (1)	36-39 (4)	29-55 (4)	2.8-6.8 (4)	0.3-0.9 (4)	-	NV/NP (12)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1028
Project Number	24425248, AKSAS 63812	Total Depth	47 feet
Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/14/2013 - 8/14/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.0565°, W153.87508°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method: S-S Auger

Sample Data: Method, Number, Blow Count, Sample Interval, N-Value; Casing Blows / ft; Frozen; Graphic Log

SUBSURFACE MATERIAL

- Gn ORG MAT
- Bn Silty SAND
  moist
- Bn-Gy Silty SAND
  w/ Gravel
  moist, loose, well drained
  SAMPLE 13-5838 (3.0-4.0): SW-SM, 9.3% -200, NM 4.4%, ORG 0.6%, NV, NP
  SAMPLE 13-5839 (6.0-11.0): SM, 12.4% -200, NV, NP
- Tn Silty SAND
  moist
- Bn Well-graded GRAVEL
  w/ Silt & Sand
  w/ Cobbles
  moist, Sandy. 2.5-inch -. Coarser with depth. rounded.
  SAMPLE 13-5840 (19.0-39.0): GW-GM, 5.6% -200, NV, NP
- BOH

Method	Number	Sample Interval
AUGER	13-5838	3.0-4.0
AUGER	13-5839	6.0-11.0
AUGER	13-5840	19.0-39.0

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1029
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist	G. SPEETER	Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/14/2013 - 8/14/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0561°, W153.87791°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–13		AUGER	13-5841						Gn ORG MAT Bn-Gy Well-graded SAND w/ Silt & Gravel moist, loose, well drained SAMPLE 13-5841 (2.5-4.5): SW-SM, 8.5% -200, NM 3.2%, ORG 0.8%, NV, NP
S-S Auger	13–25		AUGER	13-5842						Bn Well-graded GRAVEL w/ Silt & Sand w/ Cobbles moist, loose, Sandy.3-inch -. Coarser with depth. rounded. SAMPLE 13-5842 (13.5-19.0): GW-GM, 6.4% -200, NV, NP
S-S Auger	25–50		AUGER	13-5843						SAMPLE 13-5843 (25.5-49.0): GW, 2.8% -200, LA 39, DEG 35, NV, NP BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1030
Project Number	24425248, AKSAS 63812	Total Depth	26 feet
Field Geologist	G. SPEETER	Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/14/2013 - 8/14/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0559°, W153.87968°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	3									Bn-Gy Well-graded SAND w/ Gravel moist, loose, well drained
	10									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles dry to moist, loose, Sandy.3-inch -. Coarser with depth. rounded.
	15									Gy Silty SAND moist
	26									Bn Well-graded GRAVEL w/ Sand w/ Cobbles and Boulders dry to moist, loose, Sandy.3-inch -. Coarser with depth. rounded.

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1031
Project Number	24425248, AKSAS 63812	Total Depth	43 feet
Field Geologist	G. SPEETER	Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/15/2013 - 8/15/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.0551°, W153.87685°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–6		AUGER	13-5844						Bn Poorly-graded SAND w/ Silt moist, Immature coarse sand. Mica grains visibke. Probably low quality. Angular. Well drained. SAMPLE 13-5844 (2.5-5.0): SP-SM, 5.1% -200, NM 3.9%, ORG 0.6%, NV, NP
	6–12									Gy Poorly-graded SAND w/ Gravel moist
	12–17									Bn Silty SAND moist, very loose
	17–35									COBBLES No returns. Based on drill reaction.
	35–43									Gy Well-graded SAND w/ Silt & Gravel moist, very loose, Had to straight pull to identify soil.
	43									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1032
Project Number	24425248, AKSAS 63812	Total Depth	43 feet
Field Geologist: G. SPEETER	Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/15/2013 - 8/15/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.0636°, W153.68175°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method: S-S Auger

Sample Data: Method | Number | Blow Count | Sample Interval | N-Value | Frozen

Casing Blows / ft

Graphic Log

SUBSURFACE MATERIAL

Depth (ft)	Description
0	Gn ORG MAT
3	Gy Silty SAND w/ Gravel moist
7	Gy Poorly-graded SAND w/ Gravel moist
10	Gy Well-graded SAND w/ Silt & Gravel w/ Cobbles moist, Immature sand, angular with mica grains SAMPLE 13-5844x (3.0-10.0): SW-SM, 8.1% -200, DEG 88, NV, NP
12	Bn Poorly-graded SAND w/ Silt moist SAMPLE 13-5845 (12.0-14.5): SP-SM, 12% -200, NM 3.8%, ORG 0.3%, NV, NP
25	Bn Silty SAND w/ Gravel moist SAMPLE 13-5846 (25.5-30.0): SM, 13.1% -200, NV, NP
34	Gy Silty SAND w/ Gravel moist
43	BOH

AUGER 13-5844x
AUGER 13-5845
AUGER 13-5846

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1033
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist	G. SPEETER	Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/16/2013 - 8/16/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06076°, W153.6825°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method: S-S Auger

Sample Data: Casing Blows / ft | Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

Depth (ft)	Method	Number	Description
0			ORG MAT
0			Bn Sandy SILT w/ Gravel moist, loose
7			Gy Silty GRAVEL w/ Sand w/ Cobbles moist, loose SAMPLE 13-5847 (8.0-15.0): GM, 17% -200, NM 6.8%, ORG 0.9%, LA 39, DEG 55, NV, NP
8	AUGER	13-5847	
15			Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist, loose SAMPLE 13-5848 (15.0-19.0): GP-GM, 11.3% -200, NV, NP
15	AUGER	13-5848	
28			Bn Silty SAND w/ Gravel w/ Cobbles moist, loose
50			BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1034
Project Number	24425248, AKSAS 63812	Total Depth	50 feet
Field Geologist	G. SPEETER	Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/16/2013 - 8/16/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.06191°, W153.68239°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method: S-S Auger

Sample Data: Casing Blows / ft | Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

0 – Bn Well-graded SAND
w/ Silt & Gravel
dry to moist
SAMPLE 13-5849 (0.0-5.0): SW-SM, 7% -200, NM 4.4%, ORG 0.9%, NV, NP

AUGER 13-5849

14 – Bn Poorly-graded SAND
w/ Gravel
moist

19 – Bn Silty SAND
w/ Gravel
moist
SAMPLE 13-5850 (21.0-25.0): SM, 25.9% -200, NV, NP

AUGER 13-5850

26 – Gy Poorly-graded SAND
w/ Silt & Gravel
moist, loose, 1-inch-. Rounded.

SAMPLE 13-5851 (30.0-36.5): SP-SM, 7% -200, NV, NP

AUGER 13-5851

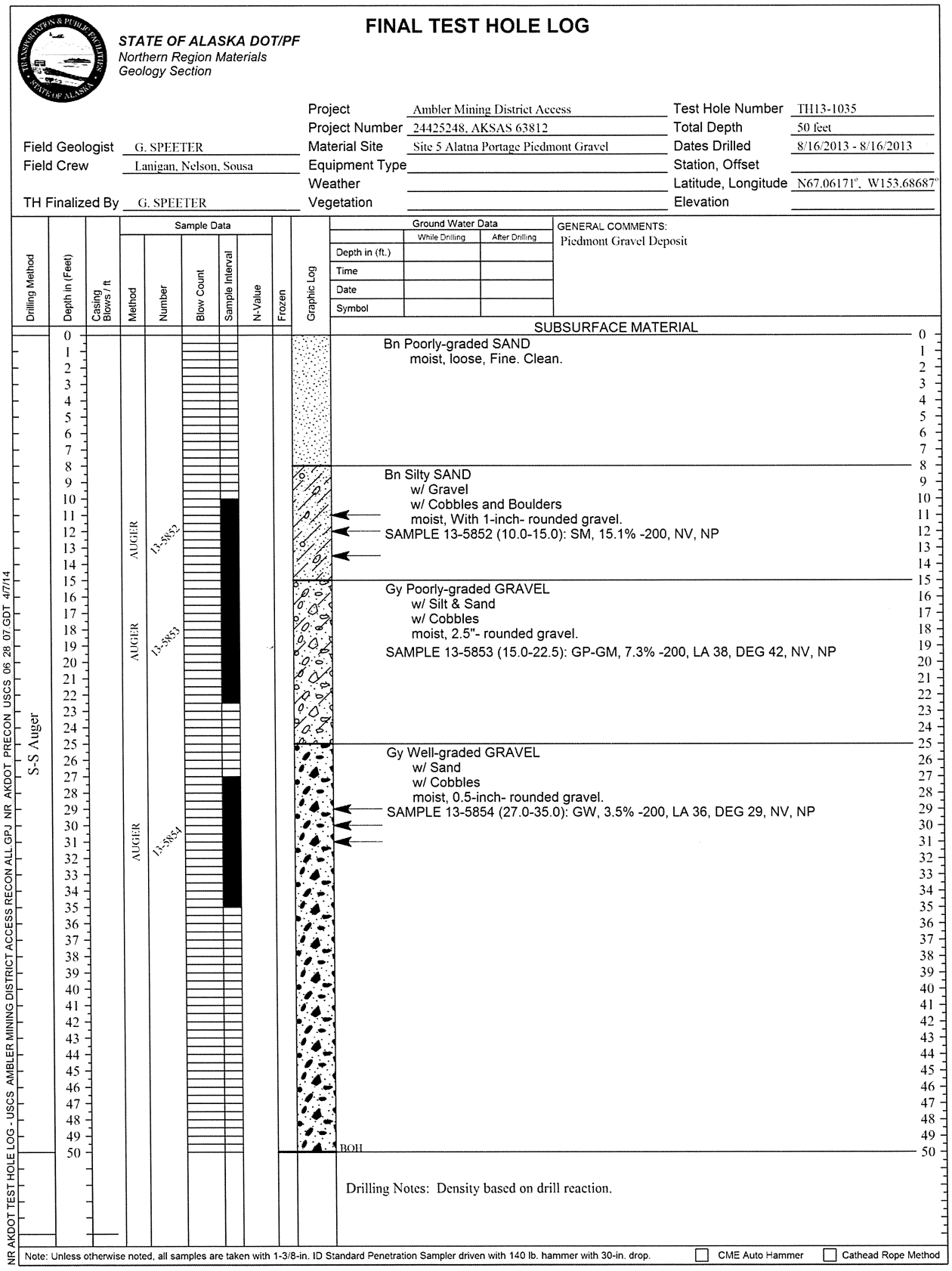
42 – Gy Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist, 3-inch-. Rounded.

50 – BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Ambler Mining District Access
Project Number 24425248, AKSAS 63812
Material Site Site 5 Alatna Portage Piedmont Gravel
Equipment Type
Weather
Vegetation
Test Hole Number TH13-1035
Total Depth 50 feet
Dates Drilled 8/16/2013 - 8/16/2013
Station, Offset
Latitude, Longitude N67.06171°, W153.68687°
Elevation
Field Geologist G. SPEETER
Field Crew Lanigan, Nelson, Sousa
TH Finalized By G. SPEETER
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Piedmont Gravel Deposit
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn Poorly-graded SAND
moist, loose, Fine. Clean.
Bn Silty SAND
w/ Gravel
w/ Cobbles and Boulders
moist, With 1-inch- rounded gravel.
SAMPLE 13-5852 (10.0-15.0): SM, 15.1% -200, NV, NP
Gy Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist, 2.5"- rounded gravel.
SAMPLE 13-5853 (15.0-22.5): GP-GM, 7.3% -200, LA 38, DEG 42, NV, NP
Gy Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist, 0.5-inch- rounded gravel.
SAMPLE 13-5854 (27.0-35.0): GW, 3.5% -200, LA 36, DEG 29, NV, NP
AUGER
13-5852
AUGER
13-5853
AUGER
13-5854
S-S Auger
BOH
Drilling Notes: Density based on drill reaction.
NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1036
Project Number	24425248, AKSAS 63812	Total Depth	48 feet
Material Site	Site 5 Alatna Portage Piedmont Gravel	Dates Drilled	8/16/2013 - 8/16/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.06166°, W153.69028°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Piedmont Gravel Deposit

Drilling Method: S-S Auger

Sample Data: Casing Blows / ft | Method | Number | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

- Bn Well-graded SAND, moist, very loose
- Bn Poorly-graded SAND, w/ Silt, moist, very loose
- Gy Poorly-graded SAND, w/ Silt, moist, very loose
- Gy Poorly-graded SAND, w/ Gravel, w/ Cobbles, moist, very loose
- Gy Poorly-graded GRAVEL, w/ Silt & Sand, w/ Cobbles, moist, very loose

AUGER 13-5855

SAMPLE 13-5855 (18.0-30.0): GP-GM, 10.8% -200, NV, NP

AUGER 13-5856

SAMPLE 13-5856 (27.0-28.0): NM 2.3%, ORG 0.4%

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 5

TEST HOLE NUMBER		TH13-1028	TH13-1028	TH13-1028	TH13-1029	TH13-1029	TH13-1029	TH13-1031
DEPTH (feet)		3.0-4.0	6.0-11.0	19.0-39.0	2.5-4.5	13.5-19.0	25.5-49.0	2.5-5.0
LATITUDE		N67.0565°	N67.0565°	N67.0565°	N67.0561°	N67.0561°	N67.0561°	N67.0551°
LONGITUDE		W153.87508°	W153.87508°	W153.87508°	W153.87791°	W153.87791°	W153.87791°	W153.87685°
LAB NUMBER		**13-5838**	**13-5839**	**13-5840**	**13-5841**	**13-5842**	**13-5843**	**13-5844**
DATE SAMPLED		14-Aug-13	14-Aug-13	14-Aug-13	14-Aug-13	14-Aug-13	14-Aug-13	15-Aug-13
% Passing	**3"**							
	2"			97				
	1.5"			92			99	
Gravel	**1.0"**		95	82		85	93	
	0.75"		92	73		76	85	
	0.5"		84	62		64	64	
	0.375"		79	55		55	49	
	#4		68	40	86	39	21	97
	#8		59	32		30	12	
	#10		58	31		29	11	
	#16	92	51	24	57	23	9	78
	#30	71	41	18		18	7	
Sand	**#40**	54	34	16		16	6	
	#50	36	27	14		13	5	
	#60	29	24	13		11	5	
	#80	20	20	11		9	4	
	#100	17	18	9	13	8	4	8
Silt/Clay	**#200**	9.3	12.4	5.6	8.5	6.4	2.8	5.1
Hydro	**0.02**							
	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			SM	GW-GM		GW-GM	GW	
USCS SOIL DESCRIPTION		(SiSa w/Gr)	(SiSa w/Gr)	WGGr w/Si&Sa	(WGSa w/Si&Gr)	(WGGr w/Si&Sa)	(WGGr w/Si&Sa)	(PGSa w/Si)
NATURAL MOISTURE		4.4			3.2			3.9
ORGANICS		0.6			0.8			0.6
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION							39	
DEGRAD. FACTOR							35	
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 5

TEST HOLE NUMBER		TH13-1032	TH13-1032	TH13-1032	TH13-1033	TH13-1033	TH13-1034	TH13-1034
DEPTH (feet)		3.0-10.0	12.0-14.5	25.5-30.0	8.0-15.0	15.0-19.0	0.0-5.0	21.0-25.0
LATITUDE		N67.0636°	N67.0636°	N67.0636°	N67.06076°	N67.06076°	N67.06191°	N67.06191°
LONGITUDE		W153.68175°	W153.68175°	W153.68175°	W153.6825°	W153.6825°	W153.68239°	W153.68239°
LAB NUMBER		**13-5844x**	**13-5845**	**13-5846**	**13-5847**	**13-5848**	**13-5849**	**13-5850**
DATE SAMPLED		15-Aug-13	15-Aug-13	15-Aug-13	16-Aug-13	16-Aug-13	16-Aug-13	16-Aug-13
% Passing	**3"**							
	2"	97				98		
	1.5"	95		97	98	90		
Gravel	**1.0"**	92		88	92	80	98	96
	0.75"	89		82	86	69	95	91
	0.5"	85	99	75	74	56	90	85
	0.375"	82	98	71	67	49	86	82
	#4	78	94	63	53	37	78	74
	#8	75		58	45	31	67	70
	#10	74		57	44	29	64	69
	#16	68	88	53	39	26	51	65
	#30	55		48	35	23	30	58
Sand	**#40**	43		44	33	22	21	54
	#50	29		38	31	20	14	51
	#60	23		35	29	19	12	49
	#80	15		28	25	17	10	45
	#100	13	34	24	23	15	9	43
Silt/Clay	**#200**	8.1	12.0	13.1	17.0	11.3	7.0	25.9
	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		SW-SM		SM	GM	GP-GM	SW-SM	SM
USCS SOIL DESCRIPTION		(WGSa w/Cl)	(PGSa w/Si)	(SiSa)	(SiGr)	(PGGr w/Si)	(WGSa w/Si&Gr)	(SiSa)
NATURAL MOISTURE			3.8		6.8		4.4	
ORGANICS			0.3		0.9		0.9	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION					39			
DEGRAD. FACTOR		88			55			
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:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Site 5

TEST HOLE NUMBER		TH13-1034	TH13-1035	TH13-1035	TH13-1035	TH13-1036	TH13-1036	
DEPTH (feet)		30.0-36.5	10.0-15.0	15.0-22.5	27.0-35.0	18.0-30.0	27.0-28.0	
LATITUDE		N67.06191°	N67.06171°	N67.06171°	N67.06171°	N67.06166°	N67.06166°	
LONGITUDE		W153.68239°	W153.68687°	W153.68687°	W153.68687°	W153.69028°	W153.69028°	
LAB NUMBER		**13-5851**	**13-5852**	**13-5853**	**13-5854**	**13-5855**	**13-5856**	
DATE SAMPLED		16-Aug-13	16-Aug-13	16-Aug-13	16-Aug-13	16-Aug-13	16-Aug-13	
% Passing	**3"**							
	2"			99				
	1.5"			98		97		
Gravel	**1.0"**	99	96	94	97	86		
	0.75"	96	90	86	92	75		
	0.5"	89	80	71	82	61		
	0.375"	83	74	60	71	54		
	#4	60	63	39	36	43		
	#8	42	56	31	13	39		
	#10	38	55	30	12	38		
	#16	27	51	27	9	36		
	#30	19	46	24	8	33		
Sand	**#40**	16	43	22	8	32		
	#50	14	37	20	7	29		
	#60	13	34	18	7	27		
	#80	12	26	14	6	23		
	#100	11	23	12	5	20		
Silt/Clay	**#200**	7.0	15.1	7.3	3.5	10.8		
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV		
PLASTIC INDEX		NP	NP	NP	NP	NP		
USCS CLASSIFICATION		SP-SM	SM	GP-GM	GW	GP-GM		
USCS SOIL DESCRIPTION		(PGSa w/Si)	(SiSa w/Gr)	(PGGr w/Si&Sa)	(WGGr w/Sa)	(PGGr w/Si&Sa)	(PGGr w/Si&Sa)	
NATURAL MOISTURE							2.3	
ORGANICS							0.4	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION				38	36			
DEGRAD. FACTOR				42	29			
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

Material Sites that Require Additional Drilling

John River Glacial Drift

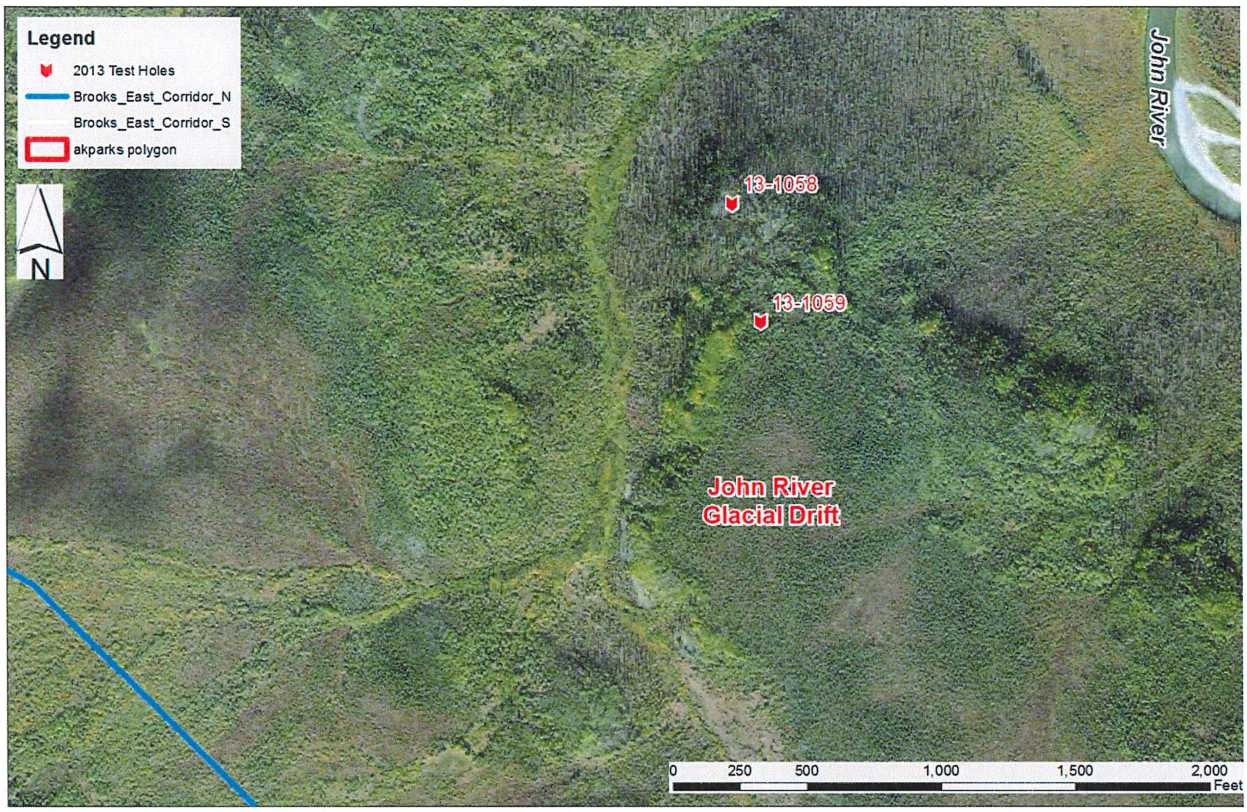


Figure 8. Map of John River Glacial Drift.

Location

John River Glacial Drift is located south of the John River in Section 26 Township 20N Range 26E of the Kateel River Meridian, Alaska.

Description

NRMS personnel drilled 2 test holes in a 100-foot tall glacial drift deposit exposed on the south bank of the John River to evaluate the deposits suitability for use as a material site. The nearby John River has bedrock exposed along most of the cut banks in the area so alluvial terraces in point bars along the river were not explored. Drilling on this site was cut short due to malfunction of the drill rig.

Test holes drilled in this deposit intercepted the following soil profile (TH13-1058 and 13-1059):

- 0.2-foot thick organic mat;
- 0-2 feet silty sand with gravel and cobbles;
- 21 to 28-feet of well- or poorly- graded gravel with sand and cobbles, or well-graded sand with gravel and cobbels;
- Underlain by silty sand or sandy silt with gravel.

TH13-1058 intercepted frozen soil with 50% percent visible ice (Vx) from 28-to 40-feet below the ground surface.

TH13-1059 intercepted frozen soil from 22-feet to the bottom of the test hole.

No groundwater was encountered by test holes in this deposit.

Drill rig malfunction caused TH13-1059 and further exploration of this deposit to be terminated prematurely.

NRMS personnel drilled 2 test holes in this deposit. Equipment failure resulted in abandonment of drilling this site in the summer 2013. Additional drilling is suggested.

Laboratory data

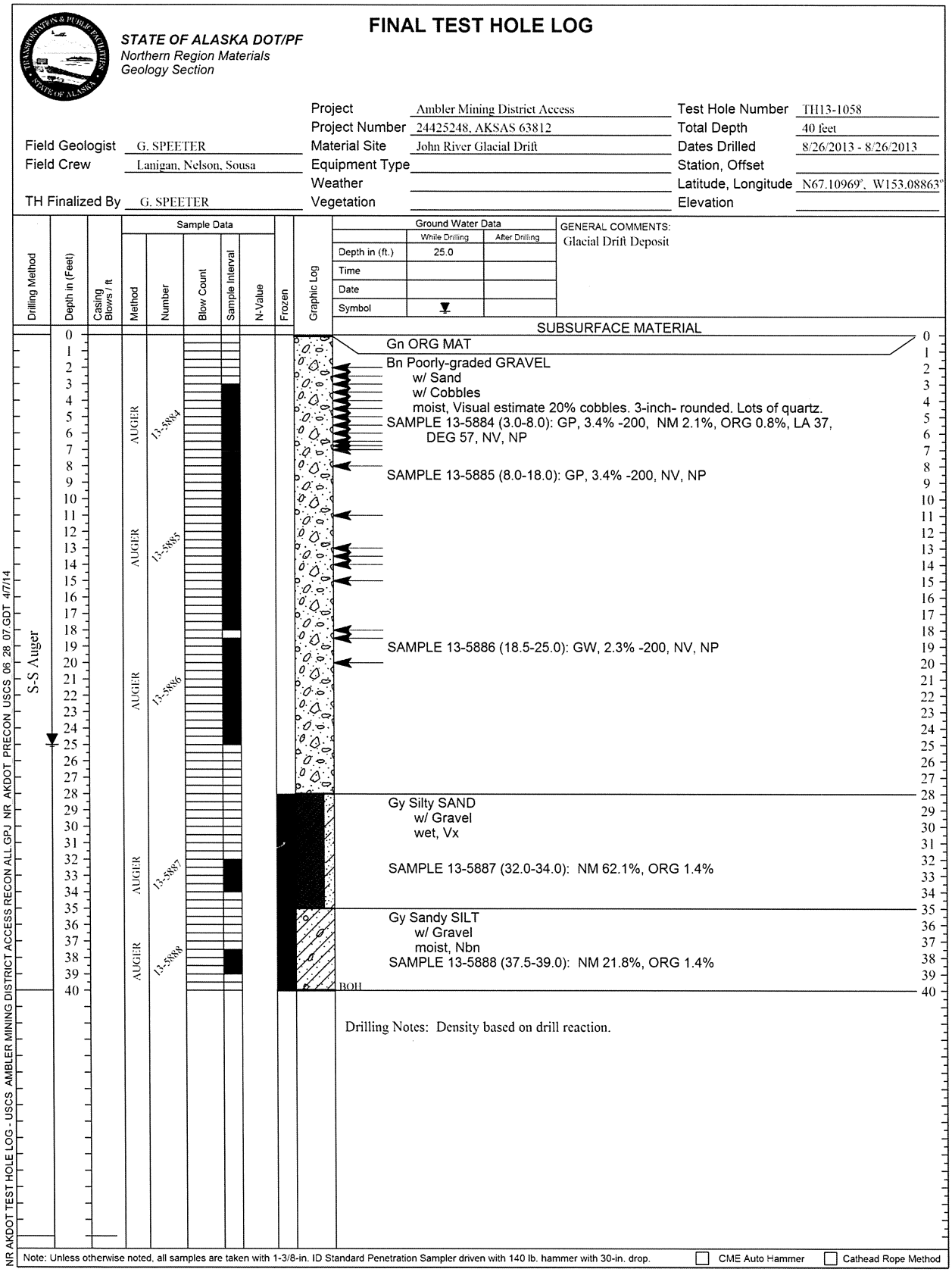
NRMS personnel collected 4 samples for gradation from the resource layer. Of these 15 samples:

- 3 met Standard Highway Material Specifications for Select Materials Type A.
- 1 met Standard Highway Material Specifications for Select Materials Type B.

NRMS personnel collected 1 sample for LA Abrasion and Degradation Value determinations. This sample showed LA Abrasion percentages and Degradation Values that meet standard highway material quality standards for Subbase, Base Course, and Surface Course.

Table 8. Laboratory data from John River Glacial Drift. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
John River GD	Resource Layer									
	52-87 (4)	10.7-41.1 (4)	2.3-6.9 (4)	GP (2), GW (1), GP-GM (1) (4)	37 (1)	57 (1)	2.1-62.1 (4)	0.8-1.4 (4)	-	NV/NP (4)


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Ambler Mining District Access
Project Number 24425248, AKSAS 63812
Material Site John River Glacial Drift
Equipment Type
Weather
Vegetation
Test Hole Number TH13-1058
Total Depth 40 feet
Dates Drilled 8/26/2013 - 8/26/2013
Station, Offset
Latitude, Longitude N67.10969°, W153.08863°
Elevation
Field Geologist G. SPEETER
Field Crew Lanigan, Nelson, Sousa
TH Finalized By G. SPEETER
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 25.0
Time
Date
Symbol
GENERAL COMMENTS:
Glacial Drift Deposit
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
S-S Auger
AUGER
13-5884
AUGER
13-5885
AUGER
13-5886
AUGER
13-5887
AUGER
13-5888
Gn ORG MAT
Bn Poorly-graded GRAVEL
w/ Sand
w/ Cobbles
moist, Visual estimate 20% cobbles. 3-inch- rounded. Lots of quartz.
SAMPLE 13-5884 (3.0-8.0): GP, 3.4% -200, NM 2.1%, ORG 0.8%, LA 37, DEG 57, NV, NP
SAMPLE 13-5885 (8.0-18.0): GP, 3.4% -200, NV, NP
SAMPLE 13-5886 (18.5-25.0): GW, 2.3% -200, NV, NP
Gy Silty SAND
w/ Gravel
wet, Vx
SAMPLE 13-5887 (32.0-34.0): NM 62.1%, ORG 1.4%
Gy Sandy SILT
w/ Gravel
moist, Nbn
SAMPLE 13-5888 (37.5-39.0): NM 21.8%, ORG 1.4%
BOH
Drilling Notes: Density based on drill reaction.
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method
NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1059
Project Number	24425248, AKSAS 63812	Total Depth	23 feet
Field Geologist	G. SPEETER	Material Site	John River Glacial Drift	Dates Drilled	8/26/2013 - 8/26/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.11125°, W153.08895°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1									
	2									Bn Silty SAND w/ Gravel w/ Cobbles moist
	3									
	4									
	5		AUGER	13-5889						Gy Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	6									
	7									
	8									
	9									
	10									SAMPLE 13-5889 (2.0-10.0): GP-GM, 6.9% -200, NM 2.0%, ORG 0.6%, NV, NP
	11									Gy Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles
	12									
	13									
	14									
	15									Gy Well-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	16									
	17									
	18									
	19									
	20									
	21									
	22									
	23									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	John River

TEST HOLE NUMBER		TH13-1058	TH13-1058	TH13-1058	TH13-1058	TH13-1058	TH13-1059	
DEPTH (feet)		3.0-8.0	8.0-18.0	18.5-25.0	32.0-34.0	37.5-39.0	2.0-10.0	
LATITUDE		N67.10969°	N67.10969°	N67.10969°	N67.10969°	N67.10969°	N67.11125°	
LONGITUDE		W153.08863°	W153.08863°	W153.08863°	W153.08863°	W153.08863°	W153.08895°	
LAB NUMBER		**13-5884**	**13-5885**	**13-5886**	**13-5887**	**13-5888**	**13-5889**	
DATE SAMPLED		26-Aug-13	26-Aug-13	26-Aug-13	26-Aug-13	26-Aug-13	26-Aug-13	
% Passing	**3"**							
	2"		97	97			97	
	1.5"	96	91	93			94	
Gravel	**1.0"**	82	78	67			88	
	0.75"	70	66	49			80	
	0.5"	55	51	28			68	
	0.375"	44	43	21			61	
	#4	27	28	13			48	
	#8	20	21	10			39	
	#10	19	20	9			38	
	#16	15	16	7			33	
	#30	11	12	6			26	
Sand	**#40**	9	10	5			21	
	#50	7	8	4			15	
	#60	6	7	4			13	
	#80	5	5	3			10	
	#100	5	5	3			9	
Silt/Clay	**#200**	3.4	3.4	2.3			6.9	
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV			NV	
PLASTIC INDEX		NP	NP	NP			NP	
USCS CLASSIFICATION		GP	GP	GW			GP-GM	
USCS SOIL DESCRIPTION		(PGGr w/Sa)	(PGGr w/Sa)	(PGGr w/Sa)	(SiSa w/Gr)	(SaSi)	(PGGr w/Si&Sa)	
NATURAL MOISTURE		2.1			62.1	21.8	2.0	
ORGANICS		0.8			1.4	1.4	0.6	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		37						
DEGRAD. FACTOR		57						
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

Prospect Drilling

Prospecting Malamute Fork of the Alatna River Alluvium and nearby glacial deposits

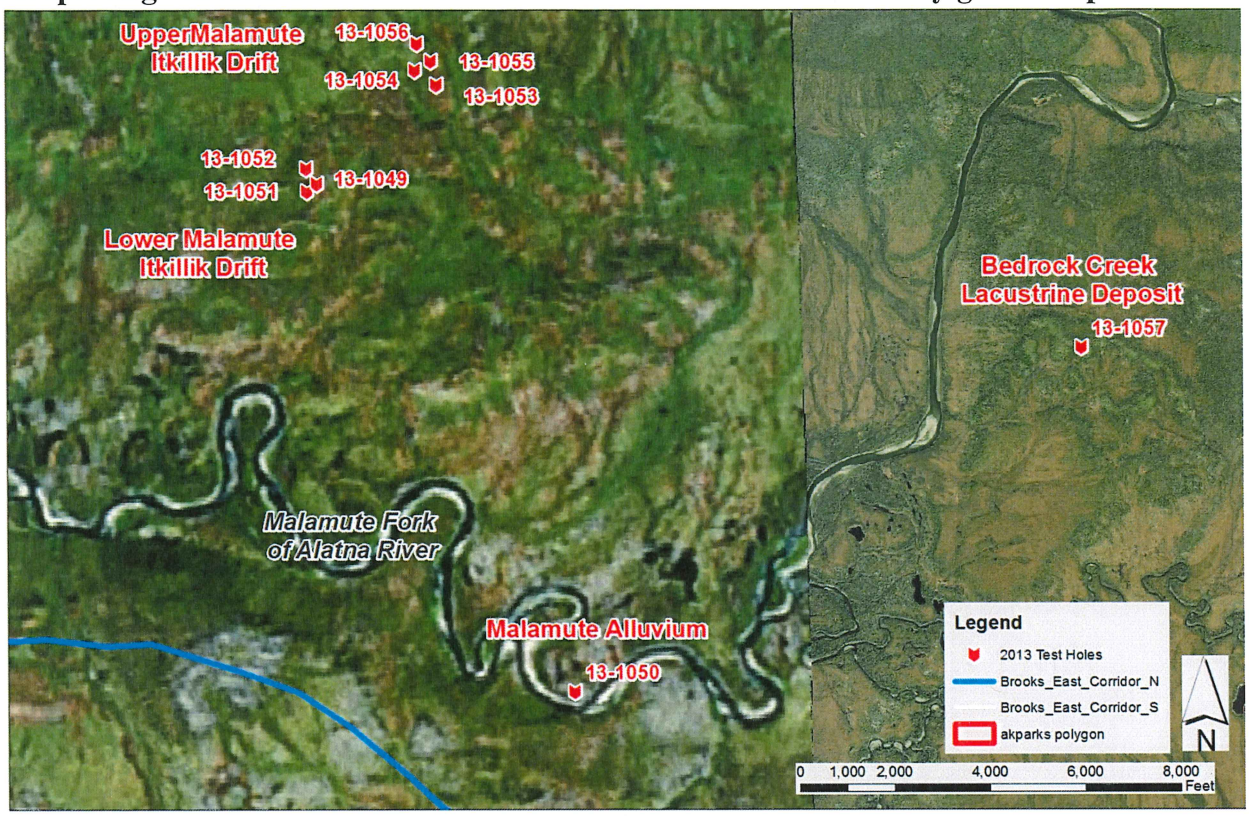


Figure 9. Map of prospecting drill holes around the Malamute Fork of the Alatna River.

Malamute Fork of the Alatna River Alluvium

Location

TH13-1050 is located in Section 23 Township 19N Range 25E of the Kateel River Meridian, Alaska.

Description

NRMS personnel drilled one hole in an alluvial terrace on the Malamute Fork of the Alatna River. Bedrock is visible along numerous cut banks along the stretch of river that runs from Deadman Mountain to site 2.

Test hole TH13-1050 intercepted the following soil profile (TH13-1050):

- 0 to 0.2-feet organic mat;
- 0.2 to 4-feet sandy silt;
- 4 to 10-feet well- or poorly-graded gravel with sand, silt, cobbles, and boulders;
- Underlain by hard bedrock.

TH13-1050 intercepted frozen soil from 2-feet below the ground surface until the bottom of the test hole.

The gravel layer in TH13-1050 contained 25%visible pore ice.
Bedrock is shallow beneath this deposit. Bedrock outcrops are exposed throughout the area. This area is not worth further exploration because a very large area would have to be mined to achieve a 1 million cubic yard volume given the shallow bedrock.

TH10-1050 did not intercept a water table.

Laboratory data
Laboratory analyses of samples collected from this site suggests that materials encountered in drilling meet standard highway quality specifications for Selected Materials Type C.

Table 9. Laboratory data from Malamute Fork of The Alatna River Alluvium. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
MM Fork Alatna River Alluvium	Overburden Layer									
	0 (1)	38.4 (1)	47.6 (1)	-	-	-	43 (1)	1.6 (1)	-	NV/NP (1)
	Resource Layer									
	28 (1)	60 (1)	12 (1)	SW-SM (1)	-	-	-	-	-	NV/NP (1)

Malamute Itkillik Drift

Location
Malamute Itkillik Drift is located in Section 26 Township 20N Range 26E of the Kateel River Meridian, Alaska.

Description
NRMS personnel conducted prospect drilling of glacial drift deposits that make up the bluffs that overlook the Malamute Fork of the Alatna River on the north side. These bluffs are approximately 100-feet tall and have a knob and kettle morphology. NRMS personnel drilled 3 test holes in the lower portion of the deposit and 4 test holes in the upper portion of the deposit.

Lower
Test holes drilled in this deposit intercepted the following soil profile (TH13-1049, 13-1051, and 13-1052):

- 0 to 0.2-feet lichen mat;
- 0 to 3-feet sandy silt with gravel.
- 25 to 40 feet of silty sand with gravel or poorly-graded sand with gravel and silt.

Topographic "knobs" show local gravel exposures that are not widespread or laterally continuous. TH13-1051 was drilled on one of these "knobs" and intercepted a gravel layer from 3 to 17-feet below the ground surface.

This deposit is not a good location for a material site because the deposit is too fine-grained.

No frozen soil or groundwater was encountered by test holes in the lower portion of the deposit.

Laboratory data

Laboratory analyses of samples collected from this site suggests that materials encountered in drilling meet Standard Highway Materials Quality Specifications for Selected Materials Type C. The material is too fine to be of use for crushed aggregate products.

Table 10. Laboratory data from Lower Malamute Itkillik Drift. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Lower Malamute ID	Resource Layer									
	2-64 (4)	28.6-77.8 (4)	7.4-43.3 (4)	GP-GM (2), SM (2)	-	-	2.2 (1)	0.6 (1)	-	NV/NP (4)

Upper

Test holes drilled in this deposit intercepted the following soil profile (TH13-1053 to 13-1056):

- 0 to 0.2-foot thick organic mat;
- 0 to 3- feet silty sand with gravel;
- 0 to 38- feet of poorly- or well-graded gravel with sand and silt;
- 0 to 8 feet of silty sand with gravel or well-graded sand with silt and gravel;
- Underlain by hard andesite bedrock.

No frozen soil or groundwater was encountered by test holes in the lower portion of the deposit.

This deposit is a marginal location for a material site. The deposit has high fines content and depth to bedrock is decreasing to the north. Observations in the field suggest the deposit is laterally continuous and additional material is available across the small drainage to the east.

Depth to bedrock decreases moving north through the deposit toward the Baird Mountains.

Laboratory data

Laboratory analyses of samples collected from this site suggests that materials encountered in drilling meet Standard Highway Material Quality Specifications for Selected Materials Type C. L.A. Abrasion values suggest material meets standard highways materials quality specifications.

Table 11. Laboratory data from upper Malamute Itkillik Drift. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Upper Malamute ID	Resource Layer									
	40-66 (5)	28.8-48.3 (5)	5.2-13.7 (5)	GP-GM (2), SM (2), SW-SM (1)	75 (1)	-	-	-	-	NV/NP (5)

Bedrock Creek Lacustrine Deposit

Location

Bedrock Creek Lacustrine Deposit is located at Section 26 Township 20N Range 26E of the Kateel River Meridian, Alaska.

Description
NRMS personnel drilled one test hole (TH13-1057) to evaluate whether or not gravel is present between sand in lacustrine deposits the make up the bluffs that overlook Bedrock Creek on its south side. The bluffs are approximately 50-feet tall and cover at least 600 acres.

TH13-1057 encountered the following soil profile;

- 23-feet of poorly-graded sand;
- 7-feet of poorly-graded sand with gravel;
- 8-feet of silty sand.

TH13-1057 did not encounter frozen soil or groundwater.

This deposit is not a good location for a material site because the deposit is too fine-grained.

Laboratory data
Laboratory analyses of samples collected from this site suggests that materials encountered in drilling meet Standard Highway Material Quality Specifications for Selected Materials Type C. The material is too fine to be of use for crushed aggregate products.

Table 12. Laboratory Data from the Bedrock Creek Lacustrine Deposit. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
Bedrock Creek Lacustrine	Resource Layer									
	7 (1)	75.8 (1)	17.2 (1)	SM (1)	-	-	-	-	-	NV/NP (1)

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1049
Project Number	24425248, AKSAS 63812	Total Depth	25 feet
Field Geologist: G. SPEETER	Material Site	Malamute Itkillik Drift	Dates Drilled	8/22/2013 - 8/22/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
	Weather		Latitude, Longitude	N67.03059°, W153.31947°
TH Finalized By: G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–25									Bn Silty SAND w/ Gravel moist, fine sand BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1050
Project Number	24425248, AKSAS 63812	Total Depth	11 feet
Material Site	Malamute Alluvium	Dates Drilled	8/22/2013 - 8/22/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.03173°, W153.31956°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Alluvial Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1									
	2									Bn Silty SAND
	3									moist
	4		AUGER	13-5871						SAMPLE 13-5871 (2.0-3.5): SM, 47.6% -200, NM 40.3%, ORG 1.6%, NV, NP
	5									Bn Well-graded GRAVEL
	6									w/ Silt & Sand
	7									w/ Cobbles and Boulders
	8		AUGER	13-5872						Nbn, with 25% visible pore ice. Pulverized cuttings.
	9									SAMPLE 13-5872 (6.0-9.0): SW-SM, 12% -200, NV, NP
	10									BOH BEDROCK, hard
	11									no returns

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1051
Project Number	24425248, AKSAS 63812	Total Depth	40 feet
Field Geologist	G. SPEETER	Material Site	Lower Malamute Itkillik Drift	Dates Drilled	8/22/2013 - 8/22/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.11044°, W153.09274°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0–2									Bn SILT moist, loess
	2–4									Gn Poorly-graded SAND w/ Silt & Gravel moist
	4–17		AUGER	13-5873						Gy Poorly-graded GRAVEL w/ Silt & Sand moist, 1-inch- rounded. SAMPLE 13-5873 (4.0-9.5): GP-GM, 9.2% -200, NM 2.2%, ORG 0.6%, NV, NP SAMPLE 13-5874 (10.0-17.0): GP-GM, 7.4% -200, NV, NP
	17–40		AUGER	13-5875						Bn Silty SAND w/ Gravel moist, Well drained. SAMPLE 13-5875 (17.0-24.0): SM, 43.3% -200, NV, NP
	40									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1052
Project Number	24425248, AKSAS 63812	Total Depth	32.5 feet
Field Geologist	G. SPEETER	Material Site	Lower Malamute Itkillik Drift	Dates Drilled	8/23/2013 - 8/23/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.11192°, W153.09274°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5876; Blow Count; Sample Interval; N-Value

Casing Blows / ft

Frozen

Graphic Log

SUBSURFACE MATERIAL

Depth (ft)	
0	Bn Silty SAND moist
6	Bn Sandy SILT moist
16	Gy Poorly-graded SAND w/ Silt & Gravel
19	Bn Poorly-graded SAND w/ Silt moist SAMPLE 13-5876 (19.5-23.0): SM, 19.2% -200, NV, NP
32	BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1053
Project Number	24425248, AKSAS 63812	Total Depth	43 feet
Material Site	Upper Malamute Itkillik Drift	Dates Drilled	8/23/2013 - 8/23/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.11262°, W153.08992°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method: S-S Auger

Sample Data: Method: AUGER; Number: 13-5877, 13-5878; Blow Count; Sample Interval; N-Value; Frozen; Graphic Log; Casing Blows / ft

SUBSURFACE MATERIAL

Bn Silty SAND
w/ Gravel

Gy Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
dry to moist, loose, Rounded to sub-angular.

SAMPLE 13-5877 (1.0-14.0): GP-GM, 11.4% -200, NV, NP

SAMPLE 13-5878 (14.0-23.0): GP-GM, 5.2% -200, NV, NP

Gy BEDROCK, hard
Andesite

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1054
Project Number	24425248, AKSAS 63812	Total Depth	27 feet
Material Site	Upper Malamute Itkillik Drift	Dates Drilled	8/23/2013 - 8/23/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.11328°, W153.08646°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log
S-S Auger	0–27		AUGER	13-5880					

SUBSURFACE MATERIAL

- 0 – Gn ORG MAT
- 3 – Bn Silty SAND w/ Gravel
- 3 – Gy Silty SAND w/ Gravel w/ Cobbles dry to moist, loose, Rounded to sub-angular. 1-inch-.
- SAMPLE 13-5880 (4.0-10.0): SM, 12.3% -200, NV, NP
- 13 – Bn Silty SAND w/ Gravel w/ Cobbles
- 21 – Gy BEDROCK, hard Andesite
- 27 – BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1055
Project Number	24425248, AKSAS 63812	Total Depth	32 feet
Field Geologist: G. SPEETER	Material Site: Upper Malamute Itkillik Drift	Dates Drilled	8/24/2013 - 8/24/2013
Field Crew: Lanigan, Nelson, Sousa	Equipment Type	Station, Offset	
	Weather	Latitude, Longitude	N67.11214°, W153.08493°
TH Finalized By: G. SPEETER	Vegetation	Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
S-S Auger	0									Gn ORG MAT
	1									
	2									Bn Silty GRAVEL
	3									w/ Sand
	4									moist
	5									Bn Poorly-graded GRAVEL
	6									w/ Silt & Sand
	7									dry to moist, Sub-angular. 2-inch-. Pulverized.
	8		AUGER	13-5881						SAMPLE 13-5881 (3.0-10.0): SM, 13.7% -200, NV, NP
	9									
	10									
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									SAMPLE 13-5882 (19.0-26.5): SW-SM, 10.1% -200, DEG 75, NV, NP
	20									
	21									
	22									
	23		AUGER	13-5882						
	24									
	25									
	26									
	27									
	28									BEDROCK, hard
	29									Andesite
	30									
	31									
	32									BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1056
Project Number	24425248, AKSAS 63812	Total Depth	13.5 feet
Field Geologist	G. SPEETER	Material Site	Upper Malamute Itkillik Drift	Dates Drilled	8/24/2013 - 8/24/2013
Field Crew	Lanigan, Nelson, Sousa	Equipment Type		Station, Offset	
		Weather		Latitude, Longitude	N67.11083°, W153.08319°
TH Finalized By	G. SPEETER	Vegetation		Elevation	

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Glacial Drift Deposit

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log
S-S Auger	0–13								

SUBSURFACE MATERIAL

0 Gn ORG MAT

Gy-Bn Silty SAND
w/ Gravel
moist

8 Gy BEDROCK, hard
Andesite.

13 BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 4/7/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Ambler Mining District Access	Test Hole Number	TH13-1057
Project Number	24425248, AKSAS 63812	Total Depth	38 feet
Material Site	Bedrock Creek Lacustrine Deposit	Dates Drilled	8/24/2013 - 8/24/2013
Equipment Type		Station, Offset	
Weather		Latitude, Longitude	N67.1103°, W153.08622°
Vegetation		Elevation	
Field Geologist	G. SPEETER		
Field Crew	Lanigan, Nelson, Sousa		
TH Finalized By	G. SPEETER		

Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Lacustrine Deposit

Drilling Method: S-S Auger

Sample Data: Casing Blows / ft | Method: AUGER | Number: 13-5883 | Blow Count | Sample Interval | N-Value | Frozen | Graphic Log

SUBSURFACE MATERIAL

Gy-Bn Silty SAND
moist, loose, Well drained. Uniform. Clean.

SAMPLE 13-5883 (3.0-15.0): SM, 17.2% -200, NV, NP

Gy Poorly-graded SAND
w/ Gravel
moist, loose, Well drained. Clean.

Gy Silty SAND
loose, 1.9C

BOH

Drilling Notes: Density based on drill reaction.

Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

NR AKDOT TEST HOLE LOG - USCS AMBLER MINING DISTRICT ACCESS RECON ALL.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 4/7/14

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Prospecting

TEST HOLE NUMBER		TH13-1050	TH13-1050	TH13-1051	TH13-1051	TH13-1051	TH13-1052	TH13-1053
DEPTH (feet)		2.0-3.5	6.0-9.0	4.0-9.5	10.0-17.0	17.0-24.0	19.5-23.0	1.0-14.0
LATITUDE		N67.03173°	N67.03173°	N67.11044°	N67.11044°	N67.11044°	N67.11192°	N67.11262°
LONGITUDE		W153.31956°	W153.31956°	W153.09274°	W153.09274°	W153.09274°	W153.09274°	W153.08992°
LAB NUMBER		**13-5871**	**13-5872**	**13-5873**	**13-5874**	**13-5875**	**13-5876**	**13-5877**
DATE SAMPLED		22-Aug-13	22-Aug-13	22-Aug-13	22-Aug-13	22-Aug-13	23-Aug-13	23-Aug-13
% Passing	**3"**							
	2"							
	1.5"			99				95
Gravel	**1.0"**		100	91	85			85
	0.75"		98	80	76		100	76
	0.5"		94	66	62	100	99	65
	0.375"		89	58	54	99	98	57
	#4		72	43	36	98	97	43
	#8		56	34	27	98	96	34
	#10		54	32	25	98	96	32
	#16		44	27	20	97	96	27
	#30		34	22	16	97	95	23
Sand	**#40**		30	20	14	97	94	21
	#50		25	17	12	96	92	18
	#60		23	16	11	95	88	17
	#80		20	14	10	89	68	14
	#100	86	18	13	10	82	56	13
Silt/Clay	**#200**	47.6	12.0	9.2	7.4	43.3	19.2	11.4
Hydro	**0.02**							
	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			SW-SM	GP-GM	GP-GM	SM	SM	GP-GM
USCS SOIL DESCRIPTION		(SiSa)	(WGGr w/Si&Sa)	(PGGr w/Si&Sa)	(PGGr w/Si&Sa)	(SiSa)	(PGSa w/Si)	(PGGr w/Si&Sa)
NATURAL MOISTURE		40.3		2.2				
ORGANICS		1.6		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

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Prospecting

TEST HOLE NUMBER		TH13-1053	TH13-1054	TH13-1055	TH13-1055	TH13-1057		
DEPTH (feet)		14.0-23.0	4.0-10.0	3.0-10.0	19.0-26.5	3.0-15.0		
LATITUDE		N67.11262°	N67.11328°	N67.11214°	N67.11214°	N67.1103°		
LONGITUDE		W153.08992°	W153.08646°	W153.08493°	W153.08493°	W153.08622°		
LAB NUMBER		**13-5878**	**13-5880**	**13-5881**	**13-5882**	**13-5883**		
DATE SAMPLED		23-Aug-13	23-Aug-13	24-Aug-13	24-Aug-13	24-Aug-13		
% Passing	**3"**							
	2"	98						
	1.5"	95	98	99	98			
Gravel	**1.0"**	82	95	97	95			
	0.75"	70	91	93	90	100		
	0.5"	57	81	82	81	99		
	0.375"	49	73	75	73	97		
	#4	34	57	60	56	93		
	#8	27	46	51	40	88		
	#10	26	43	49	38	87		
	#16	22	37	43	30	84		
	#30	18	30	36	25	79		
Sand	**#40**	16	27	33	23	74		
	#50	13	23	29	20	65		
	#60	12	22	27	19	60		
	#80	9	19	23	16	48		
	#100	8	17	21	15	42		
Silt/Clay	**#200**	5.2	12.3	13.7	10.1	17.2		
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV		
PLASTIC INDEX		NP	NP	NP	NP	NP		
USCS CLASSIFICATION		GP-GM	SM	SM	SW-SM	SM		
USCS SOIL DESCRIPTION		(PGGr w/Si&Sa)	(SiSa)	(SiSa)	(WGSa w/Si)	(SiSa)		
NATURAL MOISTURE								
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR					75			
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

Sampling in Gates of the Arctic National Park

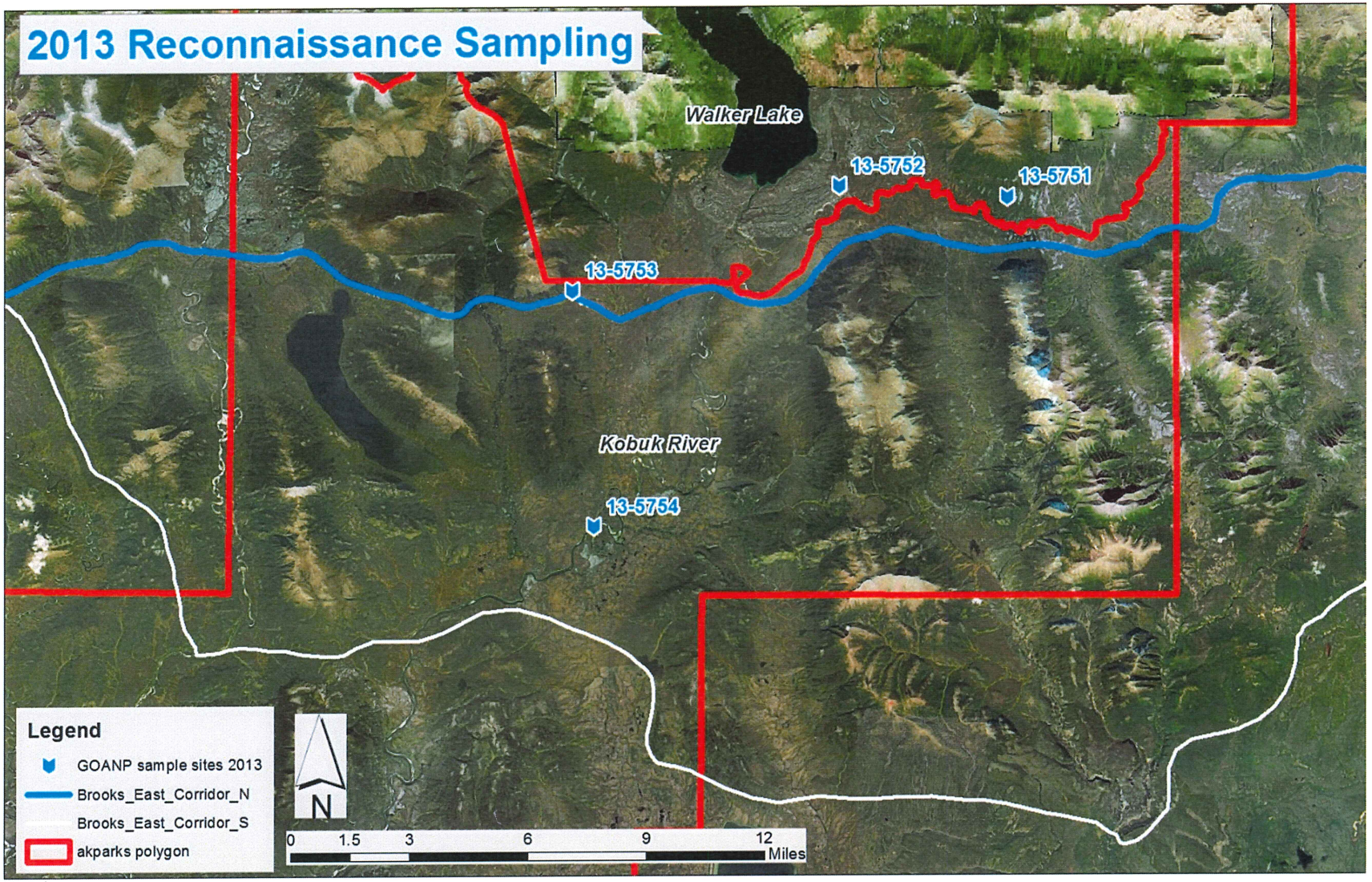


Figure 10. Map of sites sampled in Gates of The Arctic National Park.

13-5751

Location
13-5751 is located in Section 8 Township 19N Range 22E of the Kateel River Meridian in Alaska.

Description
NRMS personnel sampled an 800-acre piedmont gravel deposit at 13-5751.
Material was field classified as well-graded sand with silt and gravel.

Laboratory data
Laboratory analyses of a single surface sample collected from this deposit suggest that material will meet Standard Highway Materials Specifications for Selected Materials Type C. Material may be too fine to crush. Results from sample 13-5751 met Standard Highway Materials Specifications for quality (L.A. Abrasion and Degradation) for Subbase, Base Course, and Surface Course.

Table 13. Laboratory data from 13-5751. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
13-5751	Surface Sample									
	38 (1)	51.8 (1)	10.2 (1)	SW-SM (1)	47 (1)	84 (1)	-	-	-	NV(NP (1)

13-5752

Location
13-5752 is located in Section 28 Township 19N Range 20E of the Kateel River Meridian in Alaska.

Description
NRMS personnel sampled a glacial drift terrace and end moraine at the south shore of Walker Lake. This deposit covers >1,000 acres and includes both ground and end moraines that likely vary in gradation. Material on site was field classified as poorly-graded sand with silt and gravel.

Laboratory data
Laboratory analyses of a single surface sample collected from this deposit suggest that material will meet Standard Highway Materials Specifications for Selected Materials Type A and all crushed aggregate products. Material may be too fine to crush. Sample size was not sufficient to run laboratory analyses to determine L.A. Abrasion percentage or Degradation value.

Table 14. Laboratory data from 13-5751. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
13-5752	Surface Sample									
	4 (1)	90.6 (1)	5.4 (1)	SP-SM (1)	-	-	-	-	-	NV/NP (1)

13-5753

Location
13-5753 is located in Section 8 Township 19N Range 22E of the Kateel River Meridian in Alaska.

Description
NRMS personnel sampled a 30-acre glacial drift deposit that is surrounded by small mountain drainages. This deposit is surrounded by multiple similar and larger glacial drift deposits. Material on site was field classified as poorly-graded sand with silt and gravel.

Laboratory data
Laboratory analyses of a single surface sample collected from this deposit suggest that material will meet Standard Highway Materials Specifications for Selected Materials Type A and all crushed aggregate products. Material may be too fine to crush. Sample size was not sufficient to run laboratory analyses to determine L.A. Abrasion percentage. Degradation value from this sample met specification for Subbase, Base Course and Surface Course.

Table 15. Laboratory data from 13-5751. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
13-5753	Surface Sample									
	9 (1)	85.5 (1)	5.5 (1)	SP-SM (1)	-	88	-	-	-	NV/NP (1)

12-5754

Location
13-5754 is located in Section 10 Township 19N Range 21E of the Kateel River Meridian in Alaska.

Description
NRMS personnel sampled a pint bar adjacent a 130-acre alluvial terrace deposit on the Kobuk River near the south route through Gates of the Arctic National Park. Material on site was field classified as poorly-graded sand with gravel.

Laboratory data
Laboratory analyses of a single surface sample collected from this deposit suggest that material will meet Standard Highway Materials Specifications for Selected Materials Type A and all crushed aggregate products. Material may be too fine to crush. Results from sample 13-5754 met Standard Highway Materials Specifications for quality (L.A. Abrasion and Degradation) for Subbase, Base Course, and Surface Course.

Table 16. Laboratory data from 13-5751. (Parenthesis=number of determinations)

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	LA Abrasion	Degradation	%Moisture	Organic	Max density / %Opt. moisture	Liquid Limit / Plastic Index
13-5754	Surface Sample									
	30 (1)	69.3 (1)	0.7 (1)	SP (1)	40 (1)	70 (1)	-	-	-	NV?NP (1)

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Ambler Mining District Access
PROJECT NUMBER:	24425248
AKSAS NUMBER:	63812
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	GANP Sampling

TEST HOLE NUMBER		13-5751	13-5752	13-5753	13-5754			
DEPTH (feet)		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5			
LATITUDE		N66.93473°	N67.02123°	N67.05587°	N67.05999°			
LONGITUDE		W154.46647°	W154.48839°	W154.08418°	W154.24056°			
LAB NUMBER		**13-5751**	**13-5752**	**13-5753**	**13-5754**			
DATE SAMPLED		2-Jul-13	2-Jul-13	2-Jul-13	2-Jul-13			
% Passing	**3"**	98						
	2"	96						
	1.5"	94		100				
Gravel	**1.0"**	89		98	98			
	0.75"	86	100	97	94			
	0.5"	80	99	96	87			
	0.375"	75	98	94	82			
	#4	62	96	91	70			
	#8	52	93	87	62			
	#10	49	92	86	61			
	#16	39	85	82	56			
	#30	27	71	74	51			
Sand	**#40**	21	57	64	46			
	#50	17	38	45	29			
	#60	16	30	35	21			
	#80	13	17	20	8			
	#100	13	13	15	4			
Silt/Clay	**#200**	10.2	5.4	5.5	0.7			
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV			
PLASTIC INDEX		NP	NP	NP	NP			
USCS CLASSIFICATION		SW-SM	SP-SM	SP-SM	SP			
USCS SOIL DESCRIPTION		(WGSa w/Si&Gr)	(PGSa w/Si)	(PGSa w/Si)	(WGSa w/Gr)			
NATURAL MOISTURE								
ORGANICS								
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		47			40			
DEGRAD. FACTOR		84		88	70			
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

References

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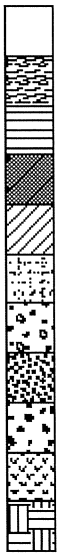
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Appendix A-Symbols and Classification Sections

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

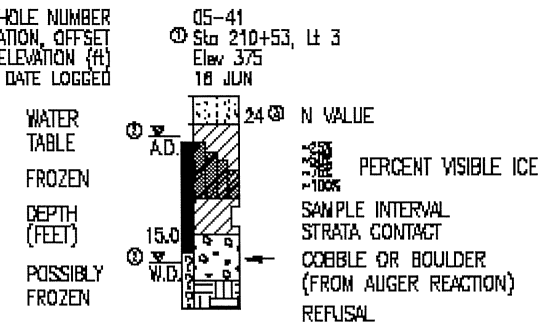
TEST RESULTS

_._%-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.

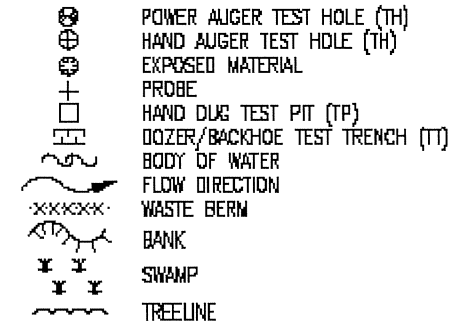
Tr	= TRACE
sl	= SLIGHTLY
hi	= HIGHLY
w/_	= WITH UNSPECIFIED AMOUNT
X'tls	= CRYSTALS
TH	= TEST HOLE
TT	= TEST TRENCH
TP	= TEST PIT

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

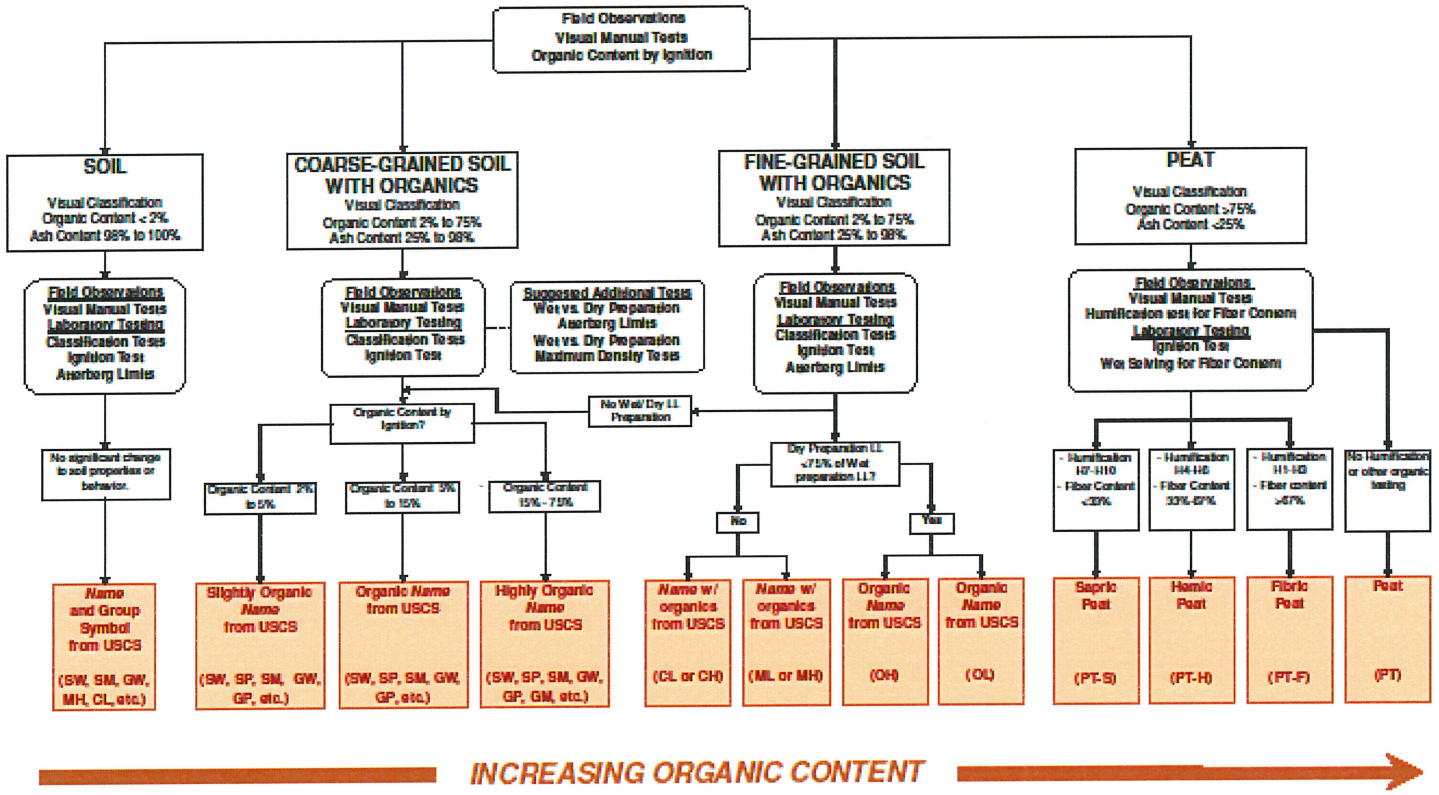
Bk = BLACK	Gy = GRAY	Tn = TAN
Bl = BLUE	Or = ORANGE	Wh = WHITE
Bn = BROWN	Rd = RED	Yw = YELLOW
Gn = GREEN		

MOISTURE

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

* OPTIMUM MOISTURE FOR MAXIMUM DENSITY

Peat and Organic Soil Classification System



DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

Part I Description of Soil Phase (at (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.
				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 }		Usually Thaw-Unstable	
			Ice coatings on particles	Vc				
			Random or irregularly oriented ice formations	Vr				
			Stratified or distinctly oriented ice formations	Vs	Estimate volume of visible segregated ice present as percent of total sample volume			
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:			
			Ice without soil inclusions	Ice	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 Inclu-sions	Same as Part II above, as applicable, with special emphasis on Ice Crystal Structure.		

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.