MEMORANDUM

State of Alaska

Department of Transportation & Public Facilities Northern Region Design and Engineering Services

TO: Chris Johnston, P.E.

Engineering Manager Northern Region

DATE:

May 10, 2019

Garrett Speeter THRU:

Regional Geologist Northern Region

FILE NO:

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PHONE NO: 458-6883 FAX NO: 451-2353

FROM: Jocelyn Simpson

Engineering Geologist Northern Region

SUBJECT: Selawik Barge Landing Access Rd and Boardwalk Improvements: Spud

Farm Material Site Reconnaissance

Investigation Z637720000

Final Geotechnical Memorandum

Introduction

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

At the request of Engineering Manager Chris Johnston, P.E., Northern Region Materials Section (NRMS) personnel conducted a reconnaissance level geotechnical investigation of the Spud Farm Material Site (MS 206-08-02) (Figure 1). The purpose of this investigation was to prove out 15,000 cubic yards of material for the Barge Landing Access Road project and develop a large-scale drill plan for future projects.

The investigation took place in September 2018 and involved shallow test hole drilling with a hand-held, gasoline-powered auger and digging shallow test pits. These test holes and pits were located in three areas: 1) inside the existing pit; 2) within an area adjacent to the existing pit; and 3) in an undisturbed area around the site. The purpose of this effort was to collect samples for analyses and determine potential for expansion. Laboratory analyses have been conducted on collected samples; results of which are included in this memorandum.

Collaboration: Please contact NRMS personnel if a meeting to discuss the data and recommendations presented in this memorandum is desired.

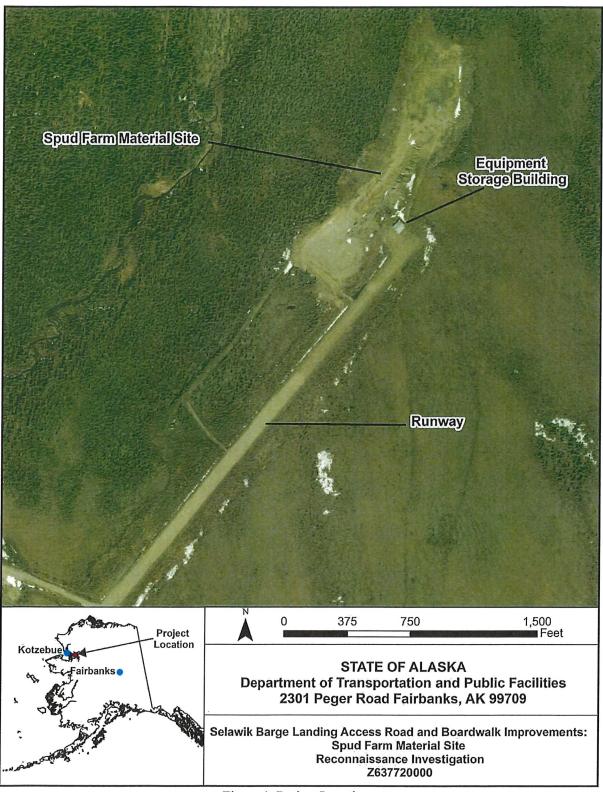


Figure 1. Project Location

Summary

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A reconnaissance geotechnical investigation of the Spud Farm Material Site (MS 206-08-02) was performed in September 2018 to assess the amount of remaining material in the active pit and access the potential for future expansion at this site. We understand this project is in need of 15,000 cubic yards of various types of material and future airport construction projects in Selawik will require 150,000 cubic yards of material.

The investigation involved shallow test hole drilling with a hand-held, gasoline-powered auger and digging shallow test pits. These efforts occurred within the existing pit and adjacent to the existing pit where vegetation and overburden has been stripped. The undisturbed area around this site was also investigated to determine the possibly of expanding this material site. These areas are illustrated in Figure 2.

Samples taken from these areas were analyzed for classification, LA Abrasion, Degradation Value, Sodium Sulfate Loss and Moisture-Density Relations. The material sampled and observed included well-graded gravel with sand, well- and poorly-graded gravel with sand and silt, silty gravel with sand, well- and poorly-graded sand with silt and gravel, gravelly silt, silty clayey gravel with sand, and sandy silt with gravel.

Our findings suggest the potential to extract 15,000 cubic yards from the existing site; however, surface material sampled in the stripped area of the site resulted in higher silt contents than those in the existing pit. Further investigation would be needed to determine if these siltier soils persist to greater depths and to define the quality and quantity of material in the existing site.

We believe areas either northeast or southwest of the existing pit have the greatest aggregate potential. These areas are in line with the general northeast trend of the existing pit. Expansion by widening the area showed lower potential with thicker, silty overburden and less gravelly soil. However, the overall potential for the expansion of this site would need further investigation.

The equipment that has been stored at the Spud Farm was determined to be unusable. In addition, the small size of the runway at the Spud Farm prohibits equipment to be flown to and from the site. Therefore, future drilling at this site would require barging equipment to Selawik during the summer season and transporting it to the site by the winter road for winter season drilling.

Location and Access

The Spud Farm is located approximately 12 miles north of Selawik. The area lies within the Selawik Quadrangle, Kateel River Meridian, T16N, R7W, SE ¼ of SE ¼ of Sec. 22 and NE ¼ of NE ¼ of Sec. 27. It is accessible by small aircraft or from Selawik by a winter trail/road that continues north to Kiana.

Field Investigation

The field investigation was conducted between September 7th and September 10th, 2018. NRMS field personnel included Engineering Geologist J. Simpson and Driller P. Lanigan. Eight test holes were drilled using a hand-held, gasoline-powered auger and 21 test pits were dug by hand. Test hole conditions were logged in the field in accordance to the Unified Soil Classification System (USCS). Test hole locations were recorded with a handheld Garmin GPS 62st, using the North American Datum (NAD) 83, with an accuracy of 50 feet.

Frozen Soil

Frozen ground was encountered in 3 test holes at depths between 3 and 7 feet. Most test holes and pits were shallow in depth and may not have been deep enough to encounter frozen material. Also, assessing whether soil is frozen while drilling with the hand held auger can be difficult. Frozen soil, therefore, should be expected anywhere in the undisturbed area around the existing site.

Groundwater

Groundwater was not encountered in any test holes during this investigation.

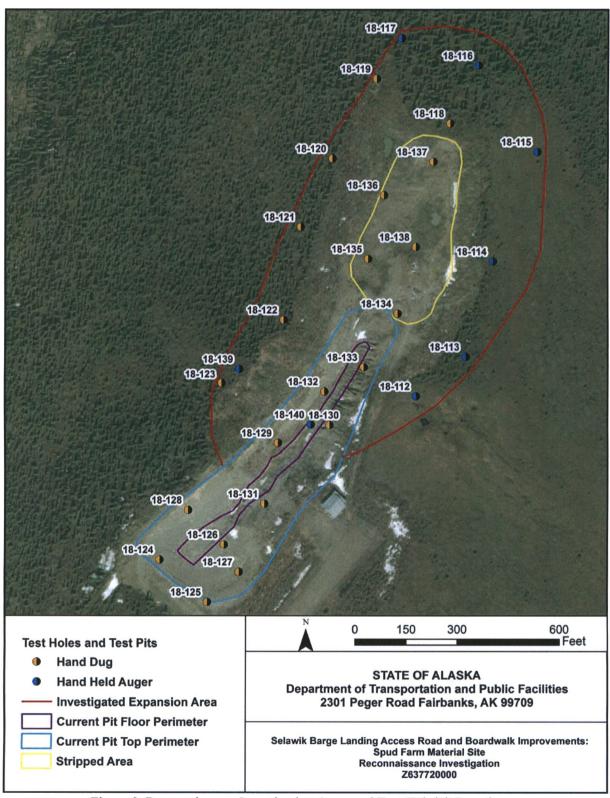


Figure 2. Reconnaissance Investigation Areas and Test Hole/Pit Locations.

Laboratory Testing

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Seventeen samples were collected and submitted to the Northern Region Materials Laboratory (NRML) for testing. Testing included USCS classification, moisture and organic contents, LA Abrasion, Degradation Value, Sodium Sulfate Loss, and Moisture-Density Relations. Table 1 describes NRML's laboratory tests and standards.

Table 1. Laboratory Tests and Standards.

Test Method	AASHTO	ASTM
	ndex Tests	
Gradation	T27	C136
Minus #200 Gradation	T11	C117
Hydrometer	T88	D422
Liquid Limit	T89	D4318
Plastic Limit	T90	D4318
Moisture Content – Aggregate	T255	C566
Soil	T265	D2216
Organic Content (Burn)	T267	
Proctor	T180	D1557
USCS Classification	D24	87
Fine Specific Gravity	T100	D854
Coarse Specific Gravity	T85	D127
Q^{i}	uality Tests	
Degradation	T1:	3
Los Angeles Abrasion	T96	C131
Sodium Soundness	T104	C88
Nordic Abrasion	ATM	312

Site Conditions and Findings

The developed portion of this site contains an excavated area approximately 1,000 feet long by up to 400 feet wide. The depth of the excavation ranges from 15 to 40 feet. Adjacent to the excavated pit is an area measuring approximately 13,000 square yards. This area was previously stripped of vegetation and overburden with a gravel surface now exposed. Surrounding the majority of the perimeter of the site are waste berms from previous overburden removal and excavation. The undisturbed area surrounding the site consists mainly of spruce, blueberry bushes and moss. Spruce trees are very sparse to the east of the site and become denser to the north and west. The terrain gently slopes down towards a creek on the western side of the site, while little relief exists to the east.

An expansion area was chosen to explore during this reconnaissance investigation based upon information from a previous investigation of this site in the 1980s. This expansion area follows the general trend of the current site to the north east, but also extends out to the east and northwest. The following describes the findings in the three areas described above:

Expansion Area

Seven test holes were drilled using a hand held auger and 6 shallow test pits were dug by hand in the expansion area.

- Test holes 18-112 through 18-115 encountered 6 to 10 feet of organic mat and silty soil before the drill reaction indicated the presence of gravel.
- Test holes and test pits 18-116 through 18-120 encountered only 5" to 9" of organic mat and overburden before encountering gravel. The soil in this area was generally sandy silt with gravel, silty gravel with sand, and gravelly silt.

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• Test holes and test pits 18-121 through 18-123 and 18-139 encountered smaller amounts of gravel at shallow depths with the last test hole (TH 18-139) not encountering any gravel until 4.5 feet bgs.

Developed Area

One test hole was drilled in the floor of the developed pit and nine test pits were dug near the top perimeter or in the side walls of the pit.

- Test pits 18-124 through 18-133 encountered well-graded gravel with sand, well- and poorly-graded gravel with silt and sand, silty gravel with sand, and poorly-graded sand with silt and gravel.
- Silty soil covers a portion of the floor of the pit, most likely run-off from the surface above. Test hole 18-140 was drilled to determine the thickness of the silt layer and to confirm the presence of gravel beneath it. Approximately 1.5 feet of silty soil was encountered before drill reaction indicated gravel.

Stripped Area

Five test pits were dug in this area which lies to the northeast of the developed pit.

- Test pits 18-134 through 18-138 encountered poorly-graded gravel with silt and sand, silty gravel with sand, silty clayey gravel with sand, and well-graded sand with silt and gravel.
- Siltier soils were encountered in the western portion of this area.
- Some test pits encountered pockets and layers of silt.

Laboratory Results

Seventeen samples were submitted to NRML for testing. Table 2 summarizes the laboratory results. The testing performed included 17 classifications, 3 LA Abrasion, Degradation, and Sodium Sulfate Loss tests, and 3 Moisture-Density Relations. The laboratory results show that:

- 13 of the 17 samples failed to meet specifications for Select Type A material;
- 11 of the 17 samples failed to meet specifications for Select Type B material;
- All 17 samples meet specifications for Select Type C material;
- 2 of the 3 samples failed to meet quality specifications for Subbase material;
- Maximum dry densities and optimum moisture contents in the 3 tests performed were as follows:
 - o 140.1 lb/ft3; 5.5%
 - o 132.5 lb/ft3; 9.7%
 - o 132.2 lb/ft3; 8.4%

Table 2. Summary of Laboratory Results (# of analyses).

% Gravel (+#4)	% Sand (±#4 to +#200),	% Fines (-#200)	Liquid Limit/ Plastic Index	USCS · Classification	LA Abrasion (%)	Degradation	Sodium Sulfate Loss Coarse (%)	Sodium Sulfate Loss Fine (%)	Max Dry Density (lb/ft³)	Optimum Moisture (%)
22-66 (17)	11.7-52.7 (17)	3.8-66.3 (17)	NV-7/ NP-4 (17)	GW (3), GM (5), GW-GM (1), GP-GM (4), GC-GM (1), SW-SM (1), SP-SM (1)	31-32	6-59 (3)	19-24 (3)	21-24 (3)	132.2- 140.1 (3)	5.5-9.7

Expected Physical Site Conditions

The following conditions can be expected either in the developed material site or in the undisturbed area around the site:

- Cobbles and boulders throughout the area;
- Seasonally and/or perennially frozen ground;
- Silty overburden documented by this investigation in the undisturbed areas was found to be up to 10 feet thick, but could possibly be thicker;
- Trash littered throughout the site to include barrels, cans, old appliances, etc. Clusters of trash were found in the existing pit and the stripped area adjacent to the pit;
- Groundwater was not observed in any test hole; however, expect groundwater conditions to change seasonally.

Future Access for Drilling Program

The equipment currently stored at the Spud Farm was determined unusable for any future investigation. Due to the small size of the runway at the Spud Farm, it is not possible to transport the equipment we would need by aircraft to conduct a more in depth geotechnical investigation. Equipment would have to be barged into Selawik during the summer and brought to the site by the winter road for winter season drilling. NRMS personnel would stay in Selawik during this time and make a daily commute to the site along the winter road.

Comments and Recommendations

Based upon this reconnaissance investigation, comments and recommendations for the future extraction of material from the Spud Farm are as follows:

- There remains usable material in the developed area of this site if the existing pit sides were cut back and steepened. Deepening of the existing pit may also be possible, but this would have to be determined with a more in-depth investigation.
- Given the size of the stripped area and assuming an average depth of usable material similar to the existing pit, along with material available in the existing pit, it is believed the material needs for the Selawik Barge Landing Access Road and Boardwalk Improvement project would be met. However, due to the low Degradation values, subbase specifications may need to be modified for this project.
- Some areas in the existing site showed the presence of siltier soil. The extent and depth of these areas would be better defined by future drilling. Depending on future material needs, silty material may need processing.
- Assessing future material extraction beyond this project would require a more in-depth investigation. Such an investigation would assess the quantity and quality of material beneath the existing floor, along the margins of the existing pit, underlying the stripped areas, and within the proposed expansion area.
- Figure 3 illustrates possible expansion areas that would be investigated based upon this preliminary work.

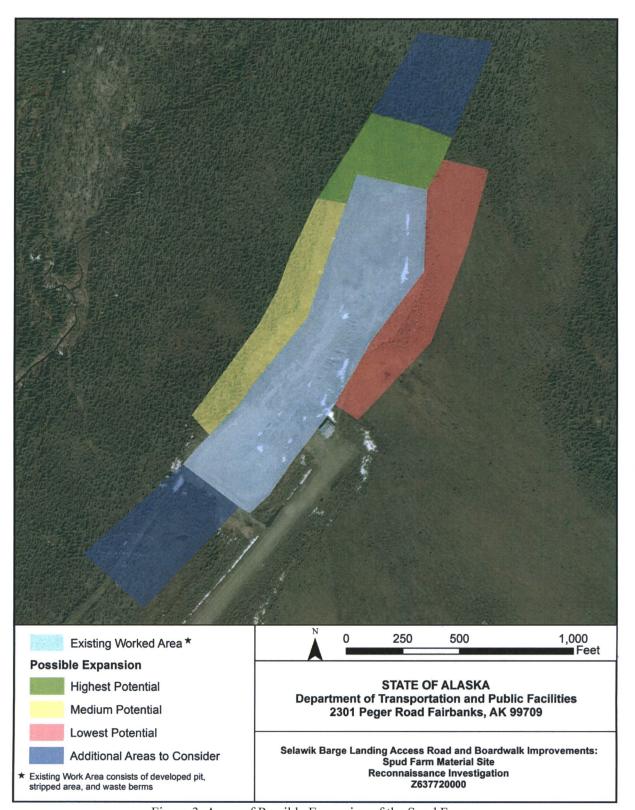


Figure 3. Areas of Possible Expansion of the Spud Farm.

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5/10/2019

Attachments:

- Field Photographs; Figures 4 through 13
- Test Hole Logs
- Laboratory Results
- Symbols and Definitions
- Classification of Soils for Engineering Purposes
- Description and Classification of Frozen Soils

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Figure 4. Aerial View of Material Site.



Figure 5. Developed Pit Looking Northeast.



Figure 6. Developed Pit Looking Southwest.

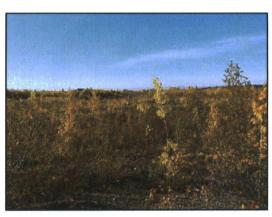


Figure 7. Stripped Area Looking Southwest.



Figure 8. View Looking East of Material Site (Lowest Potential for Expansion).



Figure 9. North of Material Site (Highest Potential for Expansion).



Figure 10. Test Pit 18-118; Silty Gravel with Sand.

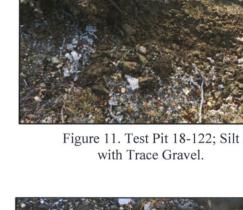




Figure 12. Test Pit 18-124; Poorly-graded Gravel with Silt and Sand.



Figure 13. Typical Cobbles Seen at Site.

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	d Geo		<u>J. S</u>	SIMPS	SON_				Pro 	roject Selawik Barge Landing Access Road Test Hole Number 18-113 roject Number Z637720000 Total Depth 8 feet Dates Drilled 9/8/2018	
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TH	Finaliz	ed By	/J.	Simps	on					egetation spruce, blueberry bushes, moss Elevation 357.0	100.1
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-	2 -										
										small pebbles	
	3 -							?			
Hand Auger	4 -							????			
	5 -							? ? ?		trace gravel 1/2"-	
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THI	Finaliz	zed By	, 1	Simps	on					eather getation		sunny, ca. blue	clear berry bushes,	moss	.	Latitude, Longitude Elevation	N66.7662 355.0	5°, W160.138
	·	ΓÍ			ample [Data					Grou	nd Water	Data		NERAL COMMENTS			
Drilling Method	Depth in (Feet)	Casing Blows / ft	po	ber	Blow Count	Sample Interval	Uncorrected N-Value	en.	Graphic Log	Depth in (f		Drilling	After Drilling	– Ex	pansion Area			
Driff		Casi Blow	Method	Number	Blow	Sam	N-Va	Frozen	Grap	Symbol			81	IRSI	JRFACE MATE	DIAI		
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Field	d Goo	logict		SIMPS	OON					oject oject Numbe	Selawik Bar 263772000	ge Landing A	ccess Road	Test Hole Number Total Depth Dates Drilled	18-121 1 feet 9/9/2018	
	d Crev		-	Laniga				_	— Еа	uipment Typ	oe .			Station, Offset	9/9/2016	
	. 0.0.	•		Lang	4!					eather	50F, sunny,	dear		Latitude, Longitude	N66.76572°, V	V160.139
TH F	-inaliz	ed By	yJ	. Simps	on				_ Ve	getation		berry bushes, i	moss		351.0	
			L.,	S	ample [Data					Ground Water While Drilling	Data After Drilling	GENERAL COMMENTS	:		
Drilling Method	Depth In (Feet)	ŧ		<u>.</u>	ount	Sample Interval	Uncorrected N-Value		c Log	Depth in (ft.) Time Date	verme Drining	Ater Driving	Expansion Area			
rlllng	epth i	Casing Blows / ft	Method	Number	Blow Count	ample	Incorn I-Valu	Frozen	Graphic Log	Symbol		<u> </u>	_			
	0 -	0 m	2	z	<u>a</u>	S	DΖ	<u> </u>	٠			su	BSURFACE MATE	RIAL		
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	i Crev			Laniga						uipment Typ				Station, Offset		
THE	-inaliz	ed R	, ,	Simps	on					eather getation	50F, sunny,	clear berry bushes, r	2000	Latitude, Longitude Elevation	N66.76498°, V 349.0	V160.13
- 	THOUSE .	, CG 15,			ample I	Data		T	_ -	T	Ground Water		GENERAL COMMENTS		343.0	
Drilling Method	Depth in (Feet)	Casing Blows / ft	po	ber	Blow Count	Sample Interval	Uncorrected N-Value	E .	Graphic Log	Depth in (ft.) Time Date	While Dritting	After Drilling	Expansion Area			
P P		Casi	Method	Number	Blow	Sam	5 ž	Frozen	Grap	Symbol		611	DOUBLACE MATE	DIAL		
	0 -						-			OR	G MAT	50	BSURFACE MATE	RIAL		
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) DII	w/ Cobbles	.				
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Field Field		logist							Pro		er <u>Z63772000</u>	rge Landing A 0	ccess Road	Test Hole Number Total Depth Dates Drilled	18-123 2.5 feet 9/9/2018	
rieia	Crev	N	<u> </u>	Laniga	an		•		_ ⊏q We	uipment Typ eather	55F, sunny,	dear		Station, Offset Latitude, Longitude	N66.76449°.	W160.141
THF	inaliz	zed By	/ <u>J.</u>	Simps	on					getation	spruce, blue	berry bushes,	moss		319.0	
				Sa	ample [Data	l				Ground Water While Drilling	Data After Drilling	GENERAL COMMENTS Expansion Area	:		
poq	eet)					ervai	-	١.	5 7	Depth in (ft.)	ļ	ļ				
Drilling Method	Depth in (Feet)	ار ال	٦	0	Blow Count	de Int	Tecta	اء	Graphic Log	Date			-			
	Dept	Casing Blows / ft	Method	Number	Blow	Sample Interval	Uncorrected N-Value	Frozen	Grapl	Symbol						
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	d Geo d Crev			SIMPS Laniga					Pro _ _ Eq:	Selawik Barge Landing Access Road Test Hole Number 18-124 Diject Number Z637720000 Total Depth 1 feet Dates Drilled 9/9/2018 Station, Offset
THE	Finaliz	ed By	/ <u> </u>	. Simps	on					eather <u>55F, sunny, clear</u> Latitude, Longitude <u>N66.76308°, W160.</u> getation <u>320.0</u>
Drilling Method	Depth in (Feet)	Casing Blows / ft	Method	Number 92	Blow Count	Sample Interval pt	Uncorrected N-Value	Frozen	Graphic Log	Ground Water Data While Drilling After Drilling Depth in (ft.) Time Date Symbol GENERAL COMMENTS: Top of existing pit
Hand-dug	1		89	A STATE OF THE STA					600 900 900 900 900 900	SUBSURFACE MATERIAL Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles dry to moist, 3"-, siltier with depth SAMPLE 18-4383 (0.0-1.0): GP-GM, 10.4% -200, SSc 19.4, SSf 21.7, LA 31, DEG 59, NV, NP
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	d Geo			.SIMPS					Pro	roject roject Number quipment Type	_Z63772000	rge Landing Ac 0	ccess Road	Test Hole Number Total Depth Dates Drilled	18-125 0.75 feet 9/9/2018
riei	1016/	N		. Lanig	an					juipment rypi eather	55F, sunny	dear		Station, Offset Latitude, Longitude	N66.76273°, W160.14
THI	Finaliz	zed By	<u>y_J</u>	l. Simpe	on				_ Ve	egetation				Elevation	326.0
fethod	(Feet)				ample [T	ted		po_	Depth in (ft.)	Ground Wate While Drilling	r Data After Drilling	GENERAL COMMENTS Top of existing pit	:	
Drilling Method	O Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	Date Symbol		SU	BSURFACE MATE	RIAL	
Hand-dug			S9	A A					6 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6	SAI	w/ Silt & S w/ Cobbles dry to mois	s st. 3"-	: GP-GM, 5.6% -200	D, NV, NP	·····
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Fiel	d Cre	w	P	SIMPS Laniga	an			<u> </u>	Pro — Equ We	Project Selawik Barge Landing Access Road Test Hole Number 18-126 Project Number 2637720000 Total Depth 1 feet Dates Drilled 9/9/2018 Equipment Type Station, Offset Veather 55F, sunny, clear Latitude, Longitude N66.76319°, leading Vegetation Elevation 309.0	W16
Drilling Method	O Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	Ground Water Data While Drilling After Drilling Depth in (ft.) GENERAL COMMENTS: Benched area in existing pit	
Hand-dug	U -		SS	A A A A A A A A A A A A A A A A A A A					8000 00 00 00 00 00 00 00 00 00 00 00 00	Bn Poorly-graded GRAVEL w/ Silt & Sand moist, 3"- SAMPLE 18-4385 (0.0-1.0): GP-GM, 10.7% -200, NV, NP	
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	-									ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. CME Auto Hammer Cather	

	d Geo			SIMPS Laniga		· • •			Pro Eq	oject oject Number uipment Type eather			ccess Road	Test Hole Number Total Depth Dates Drilled Station, Offset Latitude, Longitude	18-127 1 feet 9/9/2018 3 N66.76297°, W160.1409
THE	Finaliz	zed By	<u>/_J</u>	Simps					_ Ve	getation			T	Elevation	311.0
Drilling Method	Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	T	Frozen	Graphic Log	Depth in (ft.) Time Date Symbol	Ground Water While Drilling	After Dritting	GENERAL COMMENTS Benched area in exist	ting pit	
Hand-dug	1 -		SS	_Q LC ²⁸							Well-graded w/ Sand w/ Cobbles moist MPLE 18-43 pcf, Opt.	GRAVEL): GW, 3.8% -200, N		y 140.1 1
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										oject oject Numb	Selawik Ba er <u>Z63772000</u>	rge Landing Ad 0	ocess Road	_ Test Hole Number _ Total Depth	1 feet
	i Geo i Crev			SIMPS Laniga					— Еа	uipment Ty	/ne			Dates Drilled Station, Offset	9/9/2018
					<u></u>				We	eather	60F, sunny,	clear			e N66.76348°, W160.14
THE	inaliz	ed By	/J	. Simps					_ Ve	getation				_ Elevation	314.0
			<u> </u>	s	ample D	ata		-			Ground Water While Drilling	r Data After Drilling	GENERAL COMMENT	'S: side of wall. Height of w	all calculated at
P P	eet)					ival	_			Depth in (ft.)			approximately 35 fe	et.	
Met	ř.	_ *	_ ت	5	orut	e Inte	recter Je	_	lc Log	Time Date			1		
Drilling Method	Depth In (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Loze	Graphic Log	Symbol					
	0 -	0.00	_			0)	22	<u></u>			144 11 1	SU	BSURFACE MAT	ERIAL	
l									<i>! -</i>	B	n Well-graded w/ Sand	GRAVEL			
ł										1	w/ Cobbles	3			
ĝ									4	s	moist, 3"- AMPLE 18-43	387 (0.0-1.0)	: GW, 4.7% -200,	NV, NP	
Hand-dug	-		SS	, or Albert						}		, ,	·	•	
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FINAL TEST HOLE LOG STATE OF ALASKA DOT/PF Northern Region Materials

				SIMPS					Pro —	oject oject Number	Z637720000	ge Landing Ad	coess Road	Test Hole Number Total Depth Dates Drilled	18-129 1 feet 9/9/2018
Field	Crev	′	<u>P.</u>	Laniga	n					uipment Type		····		Station, Offset	- Nan Tanani Natan Adam
TH F	inaliz	ed Rv	, .1	. Simps	on					ather getation	60F, sunny,	dear		Latitude, Longitude Elevation	N66.76399°, W160.14008 306.0
					ample D	Data					Ground Water	Data	GENERAL COMME		
Drilling Method	Depth In (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	Depth in (ft.) Time Date Symbol	While Drilling	After Drilling	Sample taken fro approximately 31	m side of wall. Height of wa I feet.	alicalcufated at
	0 -							-	خولا، کو		Bn Silty GRA	SU	BSURFACE MA	ATERIAL	0
6no-oueu	1 _		SS	A STANCE OF THE						SAI	w/ Sand moist, less MPLE 18-43	gravel with (88 (0.0-1.0)	: GM, 36,9% -20	00, SSc 19.4, SSf 23.9, .5 pcf, Opt. Moisture 9.	LA 32, 7%
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				SIMPS					Pro		z637720000	ge Landing Ad	ccess Road	Test Hole Number Total Depth Dates Drilled	18-130 1 feet 9/9/2018
Field	d Crev	N	P	Laniga	an					uipment Tyr eather				Station, Offset	N66.76412°, W160.13
TH	Finaliz	ed By	yJ	. Simps	on					eamer getation	60F, sunny,	clear		Elevation	313.0
				s	ample C	ata		Γ		Ţ	Ground Water While Drilling	Data After Drilling	GENERAL COMMENTS	i:	
Drilling Method	Depth In (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	uezo	Graphic Log	Depth in (ft.) Time Date Symbol	varing Draining	Aiter Ursling	Sample taken from si approximately 35 fee	de of wall. Height of wat.	alical culated at
Hand-dug Dril	0 -	S C C C C C C C C C C C C C C C C C C C		A A A A A A A A A A A A A A A A A A A	8	Sar	วนัก 💮	F	ago	Bn	Well-graded W/ Sand W/ Cobbles moist MPLE 18-43	GRAVEL	 BSURFACE MATE : GW, 4.1% -200, N		
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Fleld Crew P. Larigan Equipment Type Weather 50F, sunny, deer Latitude, Longitude Ne6.76351*, W160.14 Weather 50F, sunny, deer Elevation 334.0 Elevation 334.	Weather Vegetation Sor, sunry, dear Latitude, Longitude N66.76351°, W160.14 TH Finalized By J. Smpson Sample Data Ground Water Data General Comments: Sample taken from side of wall. Time Date Symbol SUBSURFACE MATERIAL Bn Poorly-graded SAND W/ Silt & Gravel moist, 2"- SAMPLE 18-4390 (0.0-1.0): SP-SM, 8.3% -200, NV, NP		Geologi							Pro		Selawik Barge La Z637720000	anding Ac	cess Road	Test Hole Number Total Depth Dates Drilled	18-131 1 feet 9/10/2018
TH Finalized ByI symple Data	TH Finalized ByI symple Data	Field (Crew	<u></u> F	. Laniga	an				_ Eq We	uipment Type eather					N66 76351° W160 14
Depth in (ft.) Depth in (ft.) Depth in (ft.) Sample taken from side of wall.	Depth in (ft.) Depth in (ft.) Depth in (ft.) Sample taken from side of wall.	TH Fi	nalized	Зу	J. Simps	on										
SUBSURFACE MATERIAL Bn Poorly-graded SAND w/ Silt & Gravel moist, 2"- SAMPLE 18-4390 (0.0-1.0): SP-SM, 8.3% -200, NV, NP	SUBSURFACE MATERIAL Bn Poorly-graded SAND w/ Silt & Gravel moist, 2"- SAMPLE 18-4390 (0.0-1.0): SP-SM, 8.3% -200, NV, NP	Iling Method	pth in (Feet)	thod				corrected /alue	zen	aphic Log	Time Date	Ground Water Data While Drilling Aft	er Drilling			
Bn Poorly-graded SAND w/ Silt & Gravel moist, 2"- SAMPLE 18-4390 (0.0-1.0): SP-SM, 8.3% -200, NV, NP	Bn Poorly-graded SAND w/ Silt & Gravel moist, 2"- SAMPLE 18-4390 (0.0-1.0): SP-SM, 8.3% -200, NV, NP	ā		₩	ž	98	Sar	51	5	Gra	,		SUI	BSURFACE MATE	RIAL	
			1 -	SO	A LONG CO.					(4	SAI	w/ Silt & Gravel moist, 2"-		SP-SM, 8.3% -200), NV, NP	

FINAL TEST HOLE LOG STATE OF ALASKA DOT/PF Northern Region Materials Geology Section Project Selawik Barge Landing Access Road Test Hole Number 18-132 Project Number Z637720000 Total Depth 1 feet **Dates Drilled** Field Geologist __J.SIMPSON 9/10/2018 Field Crew P. Lanigan Equipment Type Station, Offset Weather 50F, sunny, clear Latitude, Longitude N66.7644°, W160.1391° TH Finalized By J. Simpson Vegetation Elevation 317.0 Sample Data Ground Water Data GENERAL COMMENTS: While Drilling After Drilling Sample taken from side of wall. Height of wall calculated at Depth in (ft.) approximately 15 feet. Sample Interval Depth in (Feet) Drilling Method Time Casing Blows / ft Method Frozen Symbol SUBSURFACE MATERIAL Bn Well-graded GRAVEL w/ Silt & Sand w/ Cobbles moist, 3"-SAMPLE 18-4391 (0.0-1.0): GW-GM, 10.2% -200, NV, NP Hand-dug Brasy SS 1 SUBJUST LOOP BY 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 322

FINAL TEST HOLE LOG STATE OF ALASKA DOT/PF Northern Region Materials Geology Section Test Hole Number 18-133 Project Selawik Barge Landing Access Road Project Number Z637720000 Total Depth 1 feet Field Geologist J. SIMPSON **Dates Drilled** 9/10/2018 Field Crew Equipment Type_ Station, Offset P. Lanigan Weather Latitude, Longitude N66.76458°, W160.13828° 50F, sunny, clear TH Finalized By J. Simpson Vegetation Elevation 318.0 Sample Data Ground Water Data GENERAL COMMENTS: Sample taken from side of wall. Height of wall calculated at approximately 41 feet. While Drilling After Drilling Depth in (ft.) Sample Interval Drilling Method Depth In (Feet) Time Blow Count Date Frozen Symbol SUBSURFACE MATERIAL Bn Silty GRAVEL w/ Sand moist SAMPLE 18-4392 (0.0-1.0): GM, 17.8% -200, NV, NP H-S Auger RASSL SS 1 NR AKDOT TEST HOLE LOG - USCS SPUD FARM RECON.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT_5/10/19

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

STATE OF ALASKA DOT/PF

FINAL TEST HOLE LOG

			Geo	logy S	ection	wa	contaio	•	_								
										oject oject Number	Selawik Barg		ccess Road		est Hole Number otal Depth		
Field	d Geo	logist	.1	SIMPS	NOS				FIC	jedi Number	_203/120000	'			Dates Drilled	1 feet 9/10/2018	
	d Crev			Lanig					Equ	uipment Type	e				Station, Offset		
										ather	50F, sunny, o	dear				e N66.765°, W160.1	13756°
THI	Finaliz	ed By	/J	. Simps	on				_ Ve	getation				E	levation	340.0	
				s	ample [ata					Ground Water		GENERAL COM				
ا ہا	•									Depth in (ft.)	While Drilling	After Drilling	Stripped area a	adjacent to	o pit.		
etho	Fee				#	let	D E		8	Time			1				
M B	ë	s/ft	8	þer	8	흥	Tecl Ine	E	皇	Date							
Drilling Method	Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	Symbol			<u> </u>				
NK AKUOT IEST HOLE LOG - USCS SPUD FARM RECONGPJ NR AKDOT PRECON USCS 06 28 07.6DT 5/10/19 PARTICULAR AKDOT PRECON USCS 06 28 07.6DT 5/10/19 Hand-dug	1 -		S9	es es es es es es es es es es es es es e							Well-graded w/ Silt & Gn moist, 2"-, p MPLE 18-43: 31, DEG	SAND avel ockets/laye 93 (0.0-1.0)	: SW-SM, 11.	5% -200	o, SSc 23.8, SSf 2 cf, Opt. Moisture 8	20.9, LA B.4%	1
§	1		- 1	- 1													
≼ Note: U	nless of	herwise	note	d. all sa	moles a	re tal	ken w ^{jr}	 հ 1-1	3/8-in ID	Standard Penet	ration Sampler d	riven with 140 II	o. hammer with 30-)-in drop	CME Auto Hamm	ner Cathead Rop	e Metha
											34						

	d Geo d Crev			SIMPS Laniga					Pro Eq	oject oject Numb uipment Ty eather	per <u>Z6377200</u>		ccess Road	Tota Dat	t Hole Number al Depth es Drilled tion, Offset	18-135 1 feet 9/10/2018 • N66.76544°, W160.1
THI	Finaliz	ed By	<u>/_J</u>	. Simps	on					getation	55F, Suffity	, crear			vation	351.0
Drilling Method	Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval pt	Uncorrected N-Value	Frozen	Graphic Log	Depth in (ft. Time Date Symbol	Ground Wat While Drilling	After Drilling	GENERAL COMM Stripped area a	adjacent to p		
Hand-dug	1 -		SS	P. Linda					10 pg 6 9 gg 6 9 gg 6 gg 6 gg 6 gg 6 gg 6	B	in SILT moist In Silty GRA\ W/ Sand W/ Cobble moist SAMPLE 18-4	/EL es): GM, 33.9% -:			

	d Geo								Pro —		Selawik Barge Landing A r_Z637720000	ccess Road	Dates Drilled	18-136 1 feet 9/10/2018
	d Crev Finaliz			Laniga Simps					We	uipment Type eather getation	e55F, sunny, clear		Station, Offset Latitude, Longitude Elevation	N66.76595°, W160.1
			, <u>.</u>		ample D	Data		Γ			Ground Water Data While Drilling After Drilling	GENERAL COMMENTS Stripped area adjacen	:	000.0
Drilling Method	Depth in (Feet)	Casing Blows / ft	Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	rozen	Graphic Log	Depth In (ft.) Time Date Symbol			. Сорт	
Hand-dug	1 -		SO	a de la companya de l					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Bn	Silty SAND moist Silty Clayey GRAVEL W/ Sand moist MPLE 18-4395 (0.1-1.0): GC-GM, 38.7% -2		
	-										tration Sampler driven with 140		o. CME Auto Hamm	er 🔲 Cathead Rope M

FINAL TEST HOLE LOG STATE OF ALASKA DOT/PF Northern Region Materials Geology Section Test Hole Number 18-137 Project Selawik Barge Landing Access Road 1 feet Project Number Z637720000 Total Depth **Dates Drilled** Field Geologist J. SIMPSON 9/10/2018 Field Crew Equipment Type_ Station, Offset P. Lanigan Weather 55F, sunny, clear Latitude, Longitude N66.7662°, W160.13673° TH Finalized By J. Simpson Vegetation Elevation 365.0 Ground Water Data GENERAL COMMENTS: While Drilling After Drilling Stripped area adjacent to pit. Depth in (ft.) Sample Interval Depth in (Feet) Drilling Method Time Frozen Symbol SUBSURFACE MATERIAL Bn Silty GRAVEL w/ Sand moist, 3"-, silty pockets/layers SAMPLE 18-4396 (0.0-1.0): GM, 24.3% -200, NV, NP Hand-dug 84386 တ္ပ 1 SECOND TO SECOND

FINAL TEST HOLE LOG STATE OF ALASKA DOT/PF Northern Region Materials Geology Section Project Selawik Barge Landing Access Road Test Hole Number 18-138 Project Number Z637720000 Total Depth 1 feet **Dates Drilled** Field Geologist J. SIMPSON 9/10/2018 Field Crew Equipment Type_ Station, Offset P. Lanigan Weather 60F, sunny, clear Latitude, Longitude N66.76553°, W160.13715 TH Finalized By J. Simpson Vegetation Elevation 350.0 Sample Data Ground Water Data GENERAL COMMENTS: While Drilling After Drilling Stripped area adjacent to pit. Depth in (ft.) Sample Interval Depth in (Feet) Drilling Method Time Casing Blows / ft Date Symbol SUBSURFACE MATERIAL Bn SILT moist Bn Poorly-graded GRAVEL w/ Silt & Sand Hand-dug RAPSI SAMPLE 18-4397 (0.2-1.0): GP-GM, 7.1% -200, NV, NP SS 1 State Look By Note: Unloss otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 ib. hammer with 30-in. drop. | CME Auto Hammer | Cathead Rope Method

- :										oject oject Num		Selawik Bar Z637720000	ge Landing A	coess Road	Test Hole Number Total Depth	4.5 feet	
	d Geo d Cre	ologist w		Laniga					- _ Eq	uipment T	Гуре	Hand Auger			Dates Drilled Station, Offset	9/10/2018	
TU	Cinatio	and D		0:						eather		60F, sunny,			Latitude, Longitude		408
10	rman.	zed By	/ <u> </u>		ample D)ata			_ ve	getation	-	Spruce, blue Ground Water	berry bushes, Data	GENERAL COMMENTS		330.0	_
					<u> </u>					Depth In (f		While Drilling	After Drilling	Expansion Area	•		
Drilling Method	Depth in (Feet)	_ ا			ij	Sample Interval	sted		Б	Time		***					
g g	Pt is	Casing Blows / ft	Method	Number	Blow Count	mple	Uncorrected N-Value	zen	Graphic Log	Date Symbol	\dashv			-			
μα	0 -	នួឌ	Me	Ž	Blc	Sa	52	표	Ö				SL	I IBSURFACE MATE	RIAL		- (
											ORG	3 MAT					- `
											Bn S	W T					-
									///	1 '	BU S	moist, trace	e gravel				
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									///	و	grave	el BODR					
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Note: a										Drilling	Not	es: BODP:	Based on dr	ill reaction			
											, , , , , ,	J. DODIN.	Dawn Oil U				

STATE OF ALASKA DOT/PF Northern Region Materials

FINAL TEST HOLE LOG

Field	d Geo	logist	J.	SIMPS	ON.				Pro	oject Number	<u>Z63772000</u>	0			Total Depth Dates Drilled	2 feet 9/10/2018
	d Crev			Laniga						uipment Typ					Station, Offset	
TU I	Finaliz	rad Di	, 1	Ciman a						eather getation	60F, sunny,	dear				N66.76414°, W160.1
1111	r II I a II z	eu by	<u></u>		ample [Dete		Т	_	getation	Ground Water	r Data	GENERAL COM		Elevation	303.0
					ampio E			1		D	White Drilling	After Drilling			assess the thickness of	silt run-off
potte	Jeet)				7	terva	-p		 ਨੂ	Depth in (ft.)		+	-			
Drilling Method	Depth in (Feet)	Casing Blows / ft	8	je j	Blow Count	Sample Interval	Uncorrected N-Value	 =	Graphic Log	Date						
Drilli	Dept	Casi	Method	Number	Blow	Sam	N-Va	Frozen	Grap	Symbol			<u> </u>			
	0 -					+			///	Bn	SILT	S	UBSURFACE	MATER	RIAL	
Hand Auger	1 -									вон	SILT W/ Gravel gravel BOI		drill reaction			
	4															
	_															
lote: U	nless o	herwise	noted	, all sar	nples a	re tal	ken wit	h 1-3	1/8-in. IC	Standard Penet		driven with 140	lb, hammer with 3	0-in. drop.	CME Auto Hamm	er Cathead Rope M
											40				-	

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION **NORTHERN REGION** LABORATORY TESTING REPORT

PROJECT NAME:

Selawik Barge Landing Access Road

PROJECT NUMBER: AKSAS NUMBER: SAMPLED BY:

Z637720000 J. SIMPSON

MATERIAL SOURCE:

							,	
TEST HOLE	NUMBER	18-116	18-118	18-124	18-125	18-126	18-127	18-128
DEPTH (feet)	1.0-1.5	0.5-1.5	0.0-1.0	0.0-0.8	0.0-1.0	0.0-1.0	0.0-1.0
LATITUDE		N66.76696°	N66.7665°	N66.76308°	N66.76273°	N66.76319°	N66.76297°	N66.76348°
LONGITUDE	Ī	W160.13576°	W160.13638°	W160.14255°	W160.1416°	W160.14124°	W160.14095°	W160.14194
LAB NUMBE	R	18-4380	18-4382	18-4383	18-4384	18-4385	18-4386	18-4387
DATE SAMP	LED	8-Sep-18	9-Sep-18	9-Sep-18	9-Sep-18	9-Sep-18	9-Sep-18	9-Sep-18
% Passing	*3"				97	97	88	
, o i a gai. 19	ž"			99	97	95	81	95
		94	95	88	92	93	79	92
	1:0"	91	78	80	80	86	71	84
Gravel	0.75"	89	68	74	71	80	65	78
SR.	0.5"	86	59	62	60	71	54	67
	*0,375 "	83	54 54	56	54	66	48	60
	#4	78	46	41	39	52	34	44
	#8	77	41	32	28	43	25	32
	#10	77	41	32	27	41	24	31
	#16	75	38	26	22	35	19	22
	#30	73	35	21	17	29	12	15
Sand	#40	73	34	19	15	25 25	10	12
Cana	#40 #50	71	33	16	13	23	9	9
		70	32	15	12	20	7	8
	#60	69	3∠ 31	13	10	16	6	7
	#80	69	30	13	8	15	6	6
*na.i	#100							
silt/Clay	6. Alexand 2.2 or 6.	66.3	28.4	10.4	5.6	10.7	3.8	4.7
	0.02							
Hydro	0.005							
	0.002							
	0.001							
LIQUID LIMIT	r	27	NV	NV	NV	NV	NV	NV
PLASTIC INC	DEX	NP	NP	NP	NP	NP	NP	NP
USCS CLASS	SIFICATION	ML	GM	GP-GM	GP-GM	GP-GM	GW	GW
USCS SOIL I	DESCRIPTION	GrSi	SiGr	PGGr	PGGr	PGGr	WGGr	WGGr
			w/Sa	w/Si&Sa	w/Si&Sa	w/Si&Sa	w/Sa	w/Sa
NATURAL M	OISTURE							
ORGANICS							· ·	
SP. GR. (FIN	E)						2.69	
SP. GR. (CO	•						2.71	
MAX. DRY D								
							140.1	
OPTIMUM M							5.5	
L.A. ABRASIC				31				
DEGRAD. FA				59				
SODIUM SUL	.F. (CRSE)			19				
SODIUM SUL	, ,			22				
NORDIC ABR	RASION			_				
DE1445170								
REMARKS								
		<u> </u>						
GENERAL CO	OMMENTS	Gradation is base	d on material passin	g the 3" sieve, accor	ding to Alaska Test	Method T-7.		

GENERAL COMMENTS

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

 $\label{eq:USCS} \textbf{Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat \\ \textbf{MG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat \\ \textbf{MG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat \\ \textbf{MG = Well-graded; PG = Poorly-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat \\ \textbf{MG = Well-graded; PG = Poorly-graded; PG$

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

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION **NORTHERN REGION** LABORATORY TESTING REPORT

PROJECT NAME: PROJECT NUMBER: Selawik Barge Landing Access Road

AKSAS NUMBER: SAMPLED BY:

Z637720000 J. SIMPSON

MATERIAL SOURCE:

TEST HOLE	NUMBER	18-129	18-130	18-131	18-132	18-133	18-134	18-135
DEPTH (feet))	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.1-1.0
LATITUDE		N66.76399°	N66.76412°	N66.76351°	N66.7644°	N66.76458°	N66.765°	N66.76544°
LONGITUDE		W160,14008°	W160.13901°	W160.14038°	W160.1391°	W160.13828°	W160.13756°	W160.13812°
LAB NUMBE	:R	18-4388	18-4389	18-4390	18-4391	18-4392	18-4393	18-4394
DATE SAMP	LED	9-Sep-18	9-Sep-18	10-Sep-18	10-Sep-18	10-Sep-18	10-Sep-18	10-Sep-18
. % Passing	3"	·					· · · ·	
	2:"	98	94		94	96		93
ł	1,5"	90	90	99	89	92	95	92
0.8.8	4.0"	82	82	97	84	87	90	87
Gravel	0.75"	76	74	93	81	81	85	82
	*0.5"	68	63	84	72	71	78	76
*	*0.375"	63	56	78	67	65	72	72
	, # 4	54	40	61	51	51	56	58
	#8	49	30	48	39	42	45	54
	#10	49	28	47	39	41	45	53
	#16	46	22	40	31	36	37	50
	#30	43	16	34	25	32	29	47
Sand	#40	42	13	30	21	30	25	45
	#50	41	10	25	18	28	20	43
	#60	41	9	22	16	27	18	42
	#80	39	7	17	14	24	16	39
	#100	39	6	15	13	23	14	38
* Silt/Clay	#200	36.9	4.1	8.3	10.2	17.8	11.5	33.9
10 - 10	0.02		· · · · · · · · · · · · · · · · · · ·					
11	0.005							
Hydro	0.002							
	0.001							
LIQUID LIMIT	-	25	NV	NV	NV	NV	NV	NV
PLASTIC INC	EX	NP	NP	NP	NP	NP	NP	NP
USCS CLASS	SIFICATION	GM :	GW	SP-SM	GW-GM	GM	SW-SM	GM
USCS SOIL E	DESCRIPTION	SiGr w/Sa	WGGr w/Sa	WGSa w/Si&Gr	WGGr w/Si&Sa	SiGr w/Sa	WGSa w/Si&Gr	SiGr w/Sa
		10/Ja	w/Ja	WOO	Wolded	w/Ga	WORKS	w/oa
NATURAL M	OISTURE							
ORGANICS								
SP. GR. (FIN	•	2.79					2.68	
SP. GR. (CO)	,	2.71					2.72	
MAX. DRY DI		132.5					132.2	
ОРТІМИМ М		9.7					8.4	
L.A. ABRASIO		32		ĺ			31	
DEGRAD. FA		6					6	
SODIUM SUL		19					24	
SODIUM SUL		24					21	
NORDIC ABR	RASION				!			
REMARKS								-
GENERAL CO	DMMENTS	Gradation is base	d on material passin	o the 3" sieve accor	ding to Alaska Test	Method T-7		

GENERAL COMMENTS

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

(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

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

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION **NORTHERN REGION** LABORATORY TESTING REPORT

PROJECT NAME:

Selawik Barge Landing Access Road

PROJECT NUMBER: AKSAS NUMBER: SAMPLED BY:

Z637720000 J. SIMPSON

MATERIAL SOURCE:

TEST HOLE	NUMBER	18-136	18-137	18-138			
DEPTH (feet		0.1-1.0	0.0-1.0	0.2-1.0			
LATITUDE	•	N66.76595°	N66.7662°	N66.76553°			
LONGITUDE			W160.13673°	i			
LAB NUMBE		18-4395	18-4396	18-4397			
DATE SAMP		10-Sep-18	10-Sep-18	10-Sep-18			
			10-3ep-16			ļ	
% Passing	3" * * 2"	97		90			
		96	94	88			
	41 15 <u>"</u>	90	93	85			
- Ĝravel	1.0"	86	84	78			
- 0,4,0,	0.75"	83	79	74			
	0.5"	77	71	65			
	Õ.375 [®]	73	66	58			
MAN NO 25 SP 19 250	°#4	62	54	43			
	#8	57	47	28			
1	#10	57	47	26			
ŀ	#16	53	42	20			
1	#30	50	37	17			
Sand	#40	48	35	15			'
	#50	46	33	13			
		45	33 31	12			
	#60	1 -	15			1	
	#80	44	29	10			
	#100	42	28	9		ļ	
Silt/Clay	#200°	38.7	24.3	7.1			
	0.02						
Livedina	0.005						
Hydro	0.002						
	0.001						
1/0/1/0			1 D /	.			
LIQUID LIMIT		23	NV	NV			
PLASTIC INC		4	NP	NP			
USCS CLASS	SIFICATION	GC-GM	GM	GP-GM			
		0,0,0	0'0"	DO0-		Ì	
USCS SOIL I	DESCRIPTION	SiCiGr w/Sa	SiGr w/Sa	PGGr w/Si&Sa			
		w/Sa	W/Sa	Wisiasa			
NATURAL M	OISTURE						
ORGANICS							
SP. GR. (FIN	E)						
SP. GR. (CO)	,						
MAX. DRY D							
OPTIMUM M							
1							
	L.A. ABRASION						
DEGRAD. FACTOR							
SODIUM SULF. (CRSE)							!
SODIUM SULF. (FINE)							
NORDIC ABF	NORDIC ABRASION						
DEMARKS	· · · · · · · · · · · · · · · · · · ·					 	
REMARKS							
Ī							
GENERAL CO	OMMENTS	Gradation is base	d on material passin	g the 3" sieve, accor	ding to Alaska Test	Method T-7.	

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

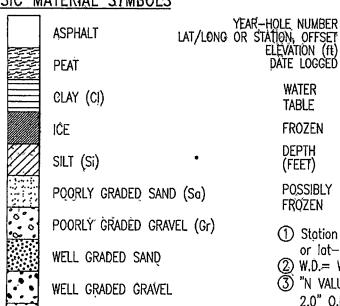
¹ Organic content determination is based on the results of the ATM T-6 test method. (Soil descriptions shown in parentheses are based on field determinations.)

SYMBOLS AND DEFINITIONS

DATE LOGGED

BASIC MATERIAL SYMBOLS

TYPICAL LOG



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 ŠIZE DEFINITIONS

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

TEST RESULTS

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

MISC.

Tr	=	TRACE
si	=	SLIGHTLY
hi	=	HIGHLY
w/_ X'tis	=	WITH UNSPECIFIED AMOUNT
X'tis	=	CRYSTALS
TH	=	TEST HOLE
П	=	TEST TRENCH
TP	=	TEST PIT

05-41 O Sta 210+53, Lt 3 Elev 375 16 JUN

科型24◎ N VALUE WATER TABLE A.D. PERCENT VISIBLE ICE **FROZEN** SAMPLE INTERVAL DEPTH STRATA CONTACT (FEET) 15.0 COBBLE OR BOULDER **POSSIBLY** (FROM AUGER REACTION) FROZEN REFUSAL

(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

1 1	ENT TIEN GIMDOLO
⊗ ⊕ ⊕	POWER AUGER TEST HOLE (TH) HAND AUGER TEST HOLE (TH)
£.3	EXPOSED MATERIAL
	PROBE
Ċ	HAND DUG TEST PIT (TP) DOZER/BACKHOE TEST TRENCH (TT)
77	DOZER/BACKHOE TEST TRENCH (TT)
\sim	BODY OF WATER
	FLÖW DIRECTION
×××××	WASTE BERM
م ان کرد	BANK
末 末 末 詳	SWAMP
$\sim\sim$	TREELINE

SOIL DENSITY/CONSISTENCY DESCRIPTORS

NON-COH		<u>COHES</u>	IVE
RELATIVE	BLOWS/FOOT		BLOWS/FOOT
DENSITY	(Ň) VALUE	CONSISTENCY	(N) VALUE
VERY LOOSE	< 4	VERY SOFT	< 2
LOOSE	Ş−1Õ	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

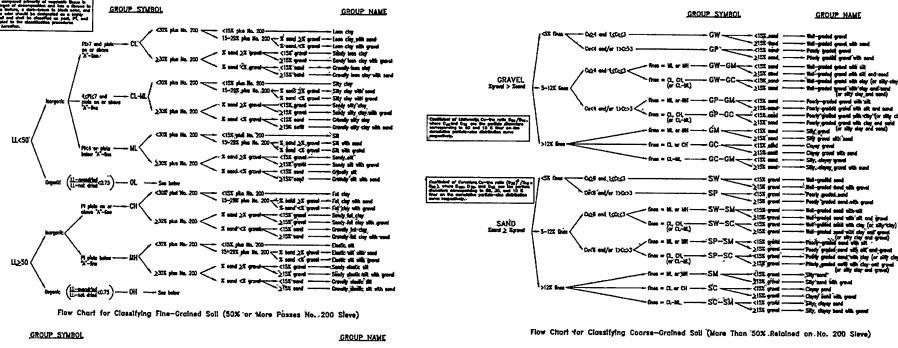
Bk = BLACK	Gy = GRAY	Tn = TAN
BI = BLUE	Or = ORANGE	Wh = WHITE
Bn = BROWN	Rd = RED	Yw = YELLOW
Gn = GREEN		

MOISTURE

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

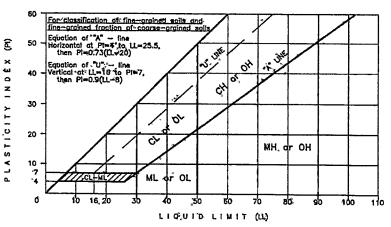
* OPTIMUM MOISTURE FOR MAXIMUM DENSITY

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









Plasticity Chart

Part I								
Description of Soi								
Phase (a) (Independent of				DESC	RIPTION AND CLA	SSIFICATION OF F	ROZEN	SOILS
Frozen State)								00.20
	Major	Group	Sub-G	roup			Guide for Construc	tion on Soils Subject to Freezing and Thawing
	Description (2)	Designation	Description	Designation (5)	Field Identification (6)	Pertinent Properties of Frozen Materials	Thaw	tion on soils subject to Freezing and mawing
	Description (2)	(3)	(4)	Designation (5)	1	which may be measured by physical tests to supplement field identification. (7)	Characteristics (8)	Criteria (9)
			Poorly Bonded or			as supplement note recruited in (1)	A	
			Friable	Nf	Identify by visual examination. To	In-Place Temperature Density and Void Ratio	T	The potential intensity of ice segregation in a soil is dependent to
	Segregated ice is not visible by	N	No excess ice	n	determine presence of excess ice, use procedure under note (c) below and hand magnifying lens as necessary. For soils	a) In Frozen State b) After Thawing in Place Water Content (Total H ₂ 0, including ice) a)	Usually Thaw-Stable	a large degree on its void sizes and may be expressed as an empirical function of grain size as follows:
	eye (b)		Well Bonded	Nb	saturation: Medium, Low. Note presence	Average b) Distribution	↓	Most inorganic soils containing 3 percent or more of grains finer than 0.02 mm in diameter by weight are frost-susceptible.
			Excess ice	е	of crystals, or of ice coatings around	Strength	*	Gravels, well-graded sands and silty sands, especially those approaching the theoretical maximum density curve, which
Part II						a) Compressive b) Tensile		contain 1.5 to 3 percent finer than 0.02 mm by weight without
Description of Frozen Soil			crystals or inclusions	Vx	For ice phase, record the following as	c) Shear d) Adfreeze		being frost-susceptible. However, their tendency to occur interbedded with other soils usually makes it impractical to consider them separately.
	Segregated ice		Ice coatings on particles	Vc	applicable: Location Size			Soils classed as frost-susceptible under the above criteria are
	is visible by eye. (Ice 1 inch or less in thickness) (b)	٧	Random or irregularly oriented ice formations	Vr	Spacing Pattern of arrangement Length Hardness }	Elastic Properties Plastic Properties Thermal Properties	Usually	likely to develop significant ice segregation and frost heave if frozen at normal rates with free water readily available. Soils so frozen will fall into the thaw-unstable category. However, they ma also be classed as thaw-stable if frozen with insufficient water to permit ice segregation.
			Stratified or distinctly oriented ice formations		Structure } per part III Below Color } Estimate volume of visible segregated ice present as percent of total sample volume			Soils classed as non-frost-susceptible (*NFS) under the above criteria usually occur without significant ice segregation and are
Part III	lce	Ice	Ice with soil inclusions	Type	descriptive terms as follows usually one	b) Crystal size c) Crystal shape d) Pattern of Arrangement		not exact and may be inadequate for some structure applications: exceptions may also result from minor soil variations.
Description of Substantial Ice Strata	(Greater than 1 inch in thickness)		Ice without soil inclusions	Ice	Hardness Structure Color Admixtures Hard Clear e.g.: e.g.: Soft Cloudy Color- Contains (mass, Porous less Thin Silt not indi- crystals) Granular Blue ions	Same as Part II above, as applicable, with special emphasis on Ice Crystal Structure.		In permafrost areas, ice wedges, pockets, veins, or other ice bodies may be found whose mode of origin is different from that described above. Such ice may be the result of long-time surface expansion and contraction phenomena or may be glacial or other ice which has been buried under a protective earth cover.

DEFINITIONS:

Ice Coatings on Particles are discernible layers of ice found on or below the larger soil Well-bonded signifies that the soil particles are strongly held together by the ice and that the frozen 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.

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 However, the impression to the unaided eye is that none of the 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.

- (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. 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.