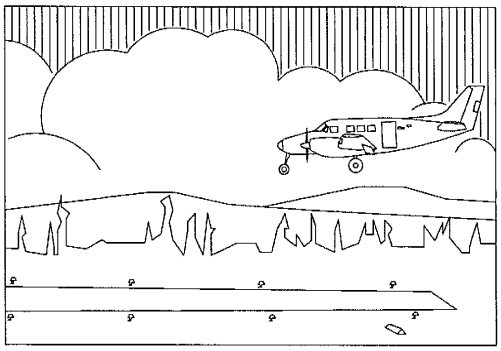
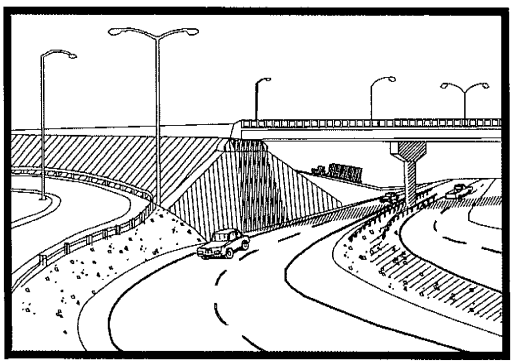
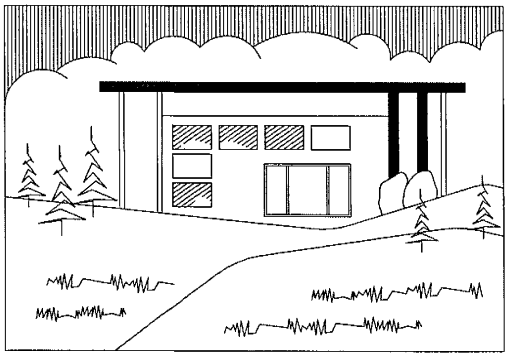
Geotechnical Report

PARKS HIGHWAY MP 163-305 PASSING LANES

FEDERAL PROJECT NO. MAP21-IM-000S(716) AKSAS: 63515

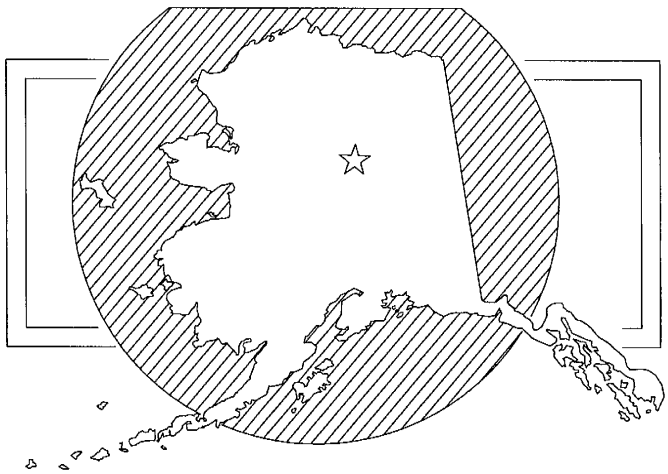






STATE OF ALASKA

Department of Transportation and Public Facilities



NORTHERN REGION

JUNE 2014

Z:\WORKING\HIGHWAYS\PARKS\Parks Passing Lanes 163-305\Parks Passing Lanes 232-235\GEOTECH REPORT COVER-GEORPT, Jun 30, 2014 - 9:32am

GEOTECHNICAL REPORT
PARKS HIGHWAY MP 163-305
PASSING LANES
PROJECT: 63515
FEDERAL NUMBER MAP21-IM-000S(716)
JUNE 2014

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Figure 1. Map of all test holes drilled in 2013 and 2014.

Introduction

At the request of Project Manager Al Beck, P.E. NRMS personnel conducted geotechnical drilling in: the Parks Highway embankment shoulder between mileposts 232 and 235, areas with patching between Parks Highway milepost 232 and 233, and potential material sources from Parks Highway mileposts 232 to 235. See figures 1 through 6 for test hole locations.

Summary

Eleven test holes were drilled on the shoulder to investigate foundation soil where passing lanes are proposed. Drilling typically encountered granular soil with an indistinct transition from embankment to native soil. No frozen soil or ground water was encountered.

Six shallow embankment and six alignment test holes and were drilled to evaluate the embankment and foundation soil in damaged areas. Overly thick asphalt and buried layers of asphalt were encountered, indicating repair of settling embankment. Test holes 14-1022, 14-1021, 14-1023, 14-1024, 13-5099, 13-5100, 13-5102, and 13-5103 intercepted multiple layers of buried asphalt to depths of 10.5 feet. TH14-1021 intercepted 6 feet of stratified ice in subgrade and intercepted 6 buried asphalt layers in embankment section indicating the melting remnant buried glacial ice is largely responsible for ongoing maintenance problems in this section of the Parks Highway alignment as are loose silts and sand in the subgrade (Figures 8-15, Appendix E).

Four test holes were drilled to evaluate proposed road cuts for use as construction material. The material was generally consistent and suitable for construction use; however one test hole drilled near a kettle lake, encountered a frozen interval. This location is likely a poor choice for mining due to proximity to the lake.

Physical Setting

Location

The area explored in this investigation spans the Parks Highway from milepost 232 to 235.

Climate

The project area is in a subarctic climate with long, cold winters and short warm summers. Most annual precipitation falls during the summer months. Winter typically lasts from September to May. Average winter temperatures range from -7.8F to 25F, with extreme cold snaps that can reach -40F and warm periods that can reach 40F. Strong temperature inversions are common along the road alignment with temperatures in topographic highs being 10's of degrees warmer than in topographic lows.

Table 1. Monthly climate summary from Denali Park, Alaska. Period of record: 9/1/1949 to 9/30/2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	9.2	16.3	24.8	38.8	53.6	64.2	66.3	61.4	50.7	32.4	17.3	11.2	37.2
Average Min. Temperature (F)	-7.8	-4.1	0.4	15.8	29.9	39.7	43.4	39.9	30.6	14.5	0.9	-5.6	16.5
Average Total Precipitation (in.)	0.68	0.60	0.46	0.37	0.80	2.32	3.14	2.57	1.54	0.92	0.83	0.90	15.12
Average Total SnowFall (in.)	10.3	10.2	7.7	5.1	2.9	0.3	0.0	0.0	4.2	12.3	13.1	13.4	79.5
Average Snow Depth (in.)	17	20	21	17	2	0	0	0	1	3	8	13	8

Percent of possible observations for period of record. Max. Temp.: 94.3% Min. Temp.: 94.4% Precipitation: 95% Snowfall: 95% Snow Depth: 93.2%Source: Western Regional Climate Center, www.wrcc.dri.edu

Laboratory data

Soil samples and test hole conditions were logged in the field using the unified soil classification system. Samples were sealed and transported to the Northern Region Materials Laboratory in Fairbanks. Selected samples were tested in accordance with ASTM/AASHTO methods for a determination of any one or a combination of the following properties:

- Classification (particle size distribution)
- Moisture content
- Atterberg Limits
- Organic content

Table 2. List of tests and standard methods offered by the Northern Region Material 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	

Geology/Seismicity

The north end of the project area is located approximately 3 miles south of the main trace of the Denali Fault. The Denali Fault crosses the Parks Highway at MP 238.5.

The Denali Fault is a right lateral strike-slip fault that extends from northwestern British Columbia to central Alaska. The Denali Fault was responsible for a magnitude 7.9 earthquake in 2002 that resulted in a 209 mile long surface rupture that crossed several rivers, glaciers, and roads. The Denali Fault is still active with displacement rates that range from 1 to 35mm/year.

Alluvial, fluvial, and glacial deposits above metamorphic, sedimentary, or plutonic bedrock dominate the surficial geology in the project area. The USGS deaggregation calculator indicates that there is a 10 percent probability of the peak horizontal ground acceleration exceeding 27%g in 50 years with a mean return period of 475 years. Currently (as of 2014), this software accesses a 1996 database. As such, it does not factor subsequent events, including the major earthquake on the Denali Fault in 2002.

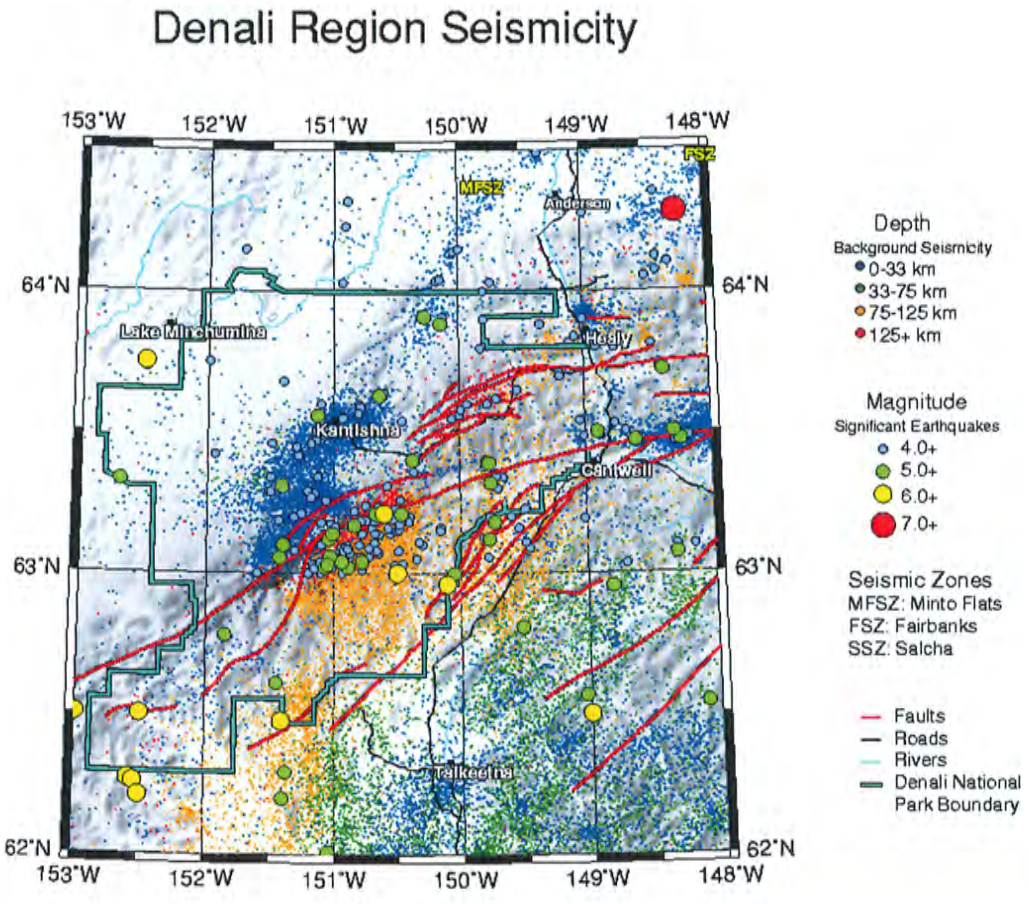


Figure 2. Map of seismicity for interior Alaska. Data displayed is from events that occurred between 1904 and 1-31-2005. Map is available online at http://www.aeic.alaska.edu/maps/interiorseismicitymap.html

Geology

Denali National Park is home to the tallest mountain in North America (Denali or Mount McKinley) which is located in the Alaska Range and has a summit elevation of 20,320 feet. The Denali Fault is located in the Alaska Range approximately 13-miles south of the project area. The Denali Fault is North America's largest crustal break with a strike that stretches for 1,300 miles. The Denali Fault is tectonically active with an annual movement of 3/8-inch per year and is responsible for the 2002 earthquake that caused major damage to infrastructure in Alaska including the Parks and Richardson Highways and the Trans-Alaska Pipeline System. Glacial till deposits and alluvial gravels cover the project area and contain little or no permanently frozen soil within the top 30 feet in most places.

Permafrost

Frozen soil was encountered by 3 of 27 test holes drilled in the project area. TH14-1021 intercepted 100% stratified ice from depths of 23.5 to 29.5 (Appendix E). TH14-1022 intercepted frozen soil at a depth of 27.5 feet below the surface. TH14-1025 intercepted a 2.5-foot thick layer of frozen silt 7.5-feet below the surface.

Vegetation

Topographic highs are typically thickly covered by a mixture of Black Spruce, Birch, and Alder. Topographic lows are typically covered with thick Black Spruce trees and Alder with tundra. Stream beds are typically lined by Alder Willows and tundra grasses.

Field Investigation

NRMS personnel drilled 27 test holes from November 2 thru November 23, 2013 and May 11 through May 12, 2014. Test holes were drilled to depths between 4.5-and 35-feet, with a track mounted CME-850 drill rig or truck mounted CME-55 drill rig and 6-inch solid stem augers or 6.5-inch hollow stem augers. Drilling was conducted in the embankment shoulder ranging in depth from 8 to 22-feet, in the patched areas from 4 to 31.5-feet and in potential material sites from 22 to 35-feet.

Samples were collected from auger cuttings and split-spoon samplers and submitted to the NRMS Materials Laboratory for gradation analyses, moisture content, quality, and organic content analysis.

Site and Subsurface Conditions

Drilling on embankment shoulder (TH13-5089 and TH13-5099)

Test holes drilled in the northbound and southbound shoulder of the Parks Highway between mileposts 232 and 235 intercepted the following generalized soil profile:

- 0.1 to 1-foot of (fill) asphalt, sometimes in 2 layers;
- 0 to 1-foot of (fill) crushed silty sand with gravel or well graded sand with gravel;
- 4 to 14 feet of (fill) poorly- or well-graded gravel with sand and cobbles;
- Underlain by 0 to 17 feet of looser (based on drill reaction) poorly- or well-graded gravel with sand and cobbles.

TH13-5089 was drilled in a stretch of the alignment where the embankment was shallow. TH13-5089 intercepted an organic mat beneath the embankment that was underlain by 17-feet of thawed silt, sandy silt with gravel, or silt with sand.

Test holes drilled in the embankment shoulder between mileposts 232 and 235 of the Parks Highway did not intercept frozen soil or groundwater.

Shallow embankment and alignment drilling between milepost 232 and 233 (TH13-5100 to 13-5105 and TH14-1020 to 14-1025)

Undamaged areas

Undamaged areas (TH13-5105 and 13-5101) intercepted the following generalized profile:

- 0.2 feet asphalt layer;
- 0 to 1.5 feet of crushed (fill) silty sand with gravel;
- Underlain by (fill) poorly-or well-graded gravel with sand and cobbles.

Patched areas

Test holes drilled in patched areas between milepost 232 and 233 encountered variable material profiles.

TH13-5100 intercepted:

- 0.75-feet asphalt;
- 3.75-feet crushed (fill) well-graded sand with silt and gravel.

TH13-5102 intercepted:

- 0.5-feet asphalt;
- 1-foot crushed (fill) silty sand with gravel;
- 0.75-feet (fill) well-graded gravel with sand;
- 0.75-feet asphalt;
- 1.5-feet crushed (fill) well-graded sand with silt and gravel.

TH13-5103 intercepted:

- 0.1- feet asphalt;
- 1.9-feet (fill) well-graded gravel with sand;
- 0.5-feet crushed (fill) well-graded sand with silt and gravel;
- 0.25-feet asphalt;
- 1.75-feet crushed (fill) well-graded sand with silt and gravel.

TH13-5104 intercepted:

- 0.25-feet asphalt;
- 0.5-feet crushed (fill) well-graded sand with silt and gravel;
- 3.25-feet (fill) well-graded gravel with sand, silt, and cobbles.

TH14-1021 intercepted:

- 0 to 12-feet contained 6 alternating layers of crushed base course material and asphalt;
- 9.5-feet of poorly-graded sand with gravel or silty sand with gravel (fill?);

- 3-feet of silt
- 0.5-feet of poorly-graded sand with gravel;
- 6-feet of stratified solid ice;
- Underlain by sandy silt.

TH14-1022 and TH14-1023

- 6 to 9-feet contained 4 alternating layers of crushed base course material and asphalt;
- 13 to 14-feet of poorly-graded gravel with sand and silt or silty sand with gravel;
- Underlain by silt, silt with sand, or sandy sit.

TH14-1024

- 6 feet of alternating crushed base course and asphalt layers;
- Underlain by loose-medium dense well- or poorly-graded sand with silt and gravel or silty sand with gravel.

Laboratory Data

Laboratory analyses of samples collected from drilling in the existing embankment are summarized below:

- Three of 18 samples collected for gradation in the embankment met standard highways materials gradation standards for Selected Materials Type A.
- Twelve of 18 samples collected for gradation in the embankment met standard highways materials gradation standards for Selected Materials Type B.
- Three of 18 samples collected for gradation in the embankment met standard highways materials gradation standards for Selected Materials Type C.

Table 3. Laboratory data from alignment and shallow embankment drilling (number of determinations in parenthesis).

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	%Moisture/ Organic	Liquid Limit / Plastic Index
Parks Highway Mileposts 232-235	Embankment					
	34-70 (18)	26.1 - 58.3 (18)	5.3-11.5 (18)	GW-GM(8), SW-SM(7), GW(1), SP-SM(1), GP-GM(1)	1.1-9.2(7)/1.0-2.9(7)	NV/NP (18)
	Subgrade					
	0-88 (9)	9.8-56.8 (9)	2.2-51.8 (9)	GW(3), GW-GM(1), GP-GM(1), GP(1), ML(1)	1.5-13.4(5)/0.8-3.1(5)	18-NV/NP (9)

Expected Physical Site Conditions

- Expect to find frozen ground, either seasonal or perennially frozen, anywhere at the site, at any time of the year.
- Boulders and/or cobbles should be anticipated in the glacial and fluvial deposits.

Comments and Recommendations

- Expect water table elevations to fluctuate from than those shown in this report. The water table generally fluctuates with changing river levels and precipitation.

- As noted in the Geology section of this report, the project area is approximately 13-miles south of main strand of the Denali Fault which is an active fault that shows approximately 3/8-inch of slip per year and is the source of the 2002 earthquake that was responsible for major damage to infrastructure throughout Alaska.

- Fill material placed in the Parks Highway Embankment is very similar to the native soil the embankment sits on. There appeared to be a slight density contrast between the in-situ density of the embankment fill (higher density) and the native material (looser). In many cases this distinction was evidenced only by drill reaction. It was very difficult to accurately pinpoint the native/fill transition in most of the test holes drilled in this project area.

- Stratified massive ice intercepted by TH14-1021 is likely thawing, reducing in volume, and contributing to ongoing settlement in the embankment. It is probable that this ice is present on either side of the embankment as well. Due to the depth of this ice and its potential lateral extent, excavation and removal of this ice is not considered cost-effective or practicable. Ongoing maintenance due to settlement related to continued melting of this ice and consolidation of material above the ice should be expected.

- TH14-1022, TH14-1023 and TH14-1024 encountered multiple layers of asphalt interbeded with layers of gravel and sand fill to depths between 4.5 - 6.5 feet over thawed layers that included silt with sand, silty sand, sand, and gravel. This amount of settlement and the presence of massive ice in TH14-1021 suggests the road embankment at these locations was likely constructed over massive ice at depth that thawed with the subsequent collapse of the overlying material. Continued, but decreasing, consolidation of the subgrade with corresponding maintenance requirements should be expected.

Material Sources Investigated

NRMS personnel drilled one test hole in each of the four road cuts under consideration as potential material sites.

TH13-5125 was drilled in glacial till adjacent to a kettle lake on the southwest side of the alignment. Based on this proximity, it is probably the least favorable of the four locations for mining.

TH13-5125 intercepted the following soil profile:

- 0.2-foot organic mat;
- 1.8-feet poorly-graded sand with silt;
- 6-feet well-graded gravel with silt, sand, and cobbles;
- 1-foot (frozen? Nbn) silt with gravel;
- 6-feet silty sand with gravel and cobbles;
- 9-feet of poorly-graded gravel with silt, sand, and cobbles;
- 6-feet silty sand with gravel;
- Underlain by poorly-graded gravel with silt and sand.

TH13-5125 did not intercept groundwater.

TH13-5125 intercepted a 1-foot thick frozen? (Nbn) layer at a depth of 8-feet below the ground surface. TH13-5128, TH13-5129, and TH13-5130

TH13-5128, TH13-5129 and TH13-5130 were drilled in a till deposit. Based on limited inspection, this deposit looks potentially suitable for use as a construction material.

TH13-5128 intercepted the following soil profile:

- 0.2-foot organic mat;
- 0.8-feet poorly-graded sand with silt;
- 13-feet poorly-graded gravel with sand and silt;
- Underlain by silty sand with gravel and cobbles

TH13-5128 did not intercept frozen soil or a water table.

TH13-5129 intercepted the following soil profile:

- 0.1-foot organic mat;
- 0.9-feet silty sand with gravel;
- 22-feet of well-graded gravel with silt, sand, and cobbles.

TH13-529 did not intercept frozen soil or groundwater.

TH13-5130 intercepted the following soil profile:

- 0.1-foot organic mat;
- 0.9-feet silty sand;
- 2.5-feet poorly-graded gravel with silt, sand, and cobbles;
- 1.5-feet silty sand;

- 13-feet poorly-graded gravel with silt, sand, and cobbles;
- 2-feet poorly-graded sand with silt and gravel;
- 3-feet poorly graded gravel with silt and sand.

Laboratory Data

Laboratory analyses of samples collected from drilling in the road cuts are summarized below:

- Four of 4 samples collected for quality met standard highways materials standards for crushed aggregate products.
- Four of 9 samples collected for gradation met standard highways materials gradation standards for Selected Materials Type A.
- One of 9 samples collected for gradation met standard highways materials gradation standards for Selected Materials Type B.
- Four of 9 samples collected for gradation met standard highways materials gradation standards for Selected Materials Type C.

Table 4. Laboratory data from test holes in road cuts (number of determinations in parenthesis).

Site	% Gravel (+#4)	% Sand (-#4, +#200)	% Fines (-#200)	USCS Classification	%Moisture/ Organic	Liquid Limit / Plastic Index	L.A. Abrasion/ Degradation Factor
Parks Highway Mileposts 232-235	8-85(9)	8.7-56.5(9)	3.0-44(9)	GP-GM(3), GP(1),GM(1), GW(1), SM(1)	4.6-7.1(2)/1.0-1.8(2)	NV/NP(9)	13-20(4)/70-78(4)

Other Material Sources

52-2-049-2

This material site, located at Parks Highway MP 226, is retained as a non-expiring right of way grant from the BLM. The site is reportedly undeveloped and hasn't been drilled to define material volume. Scant material testing indicated the soil to be silty sand with gravel of glacial origin. The coarse gravel component ranges up to 2-inches in size and has an LA Abrasion value of 22, indicating the likely suitability for use in making crushed aggregate.

52-2-051-2

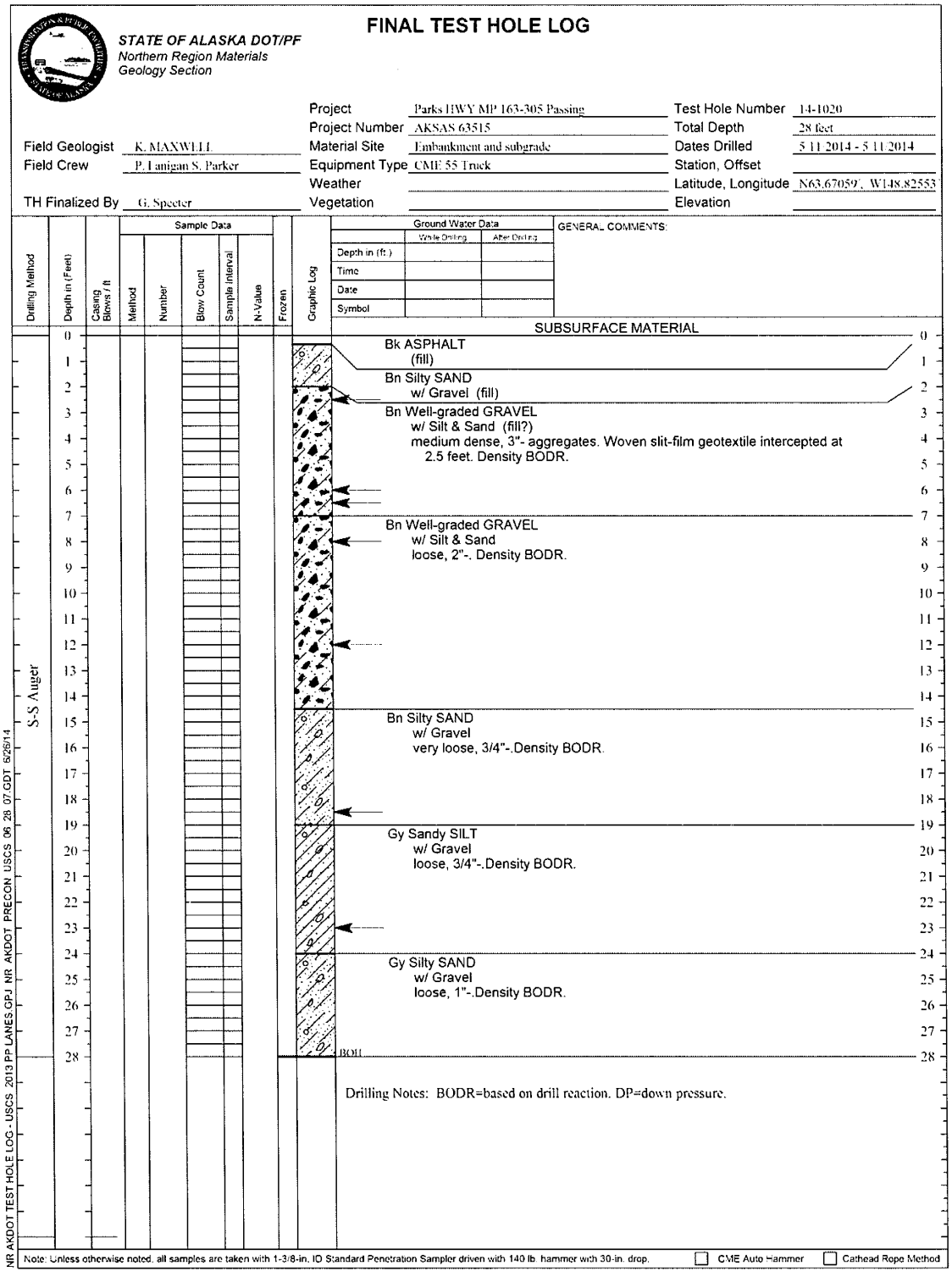
This material site, located at Parks Highway MP 230, was permitted by DNR until its expiration in 2009. An expansion area with the potential to yield 35,000 cubic yards, has yet to be developed. Selected Material Type A and crushable aggregate have been produced from this pit in the past. The coarse gravel component ranges up to 2-inches in size and has an LA Abrasion value of 17 and a Deg Value of 61, indicating suitability for use in making crushed aggregate.

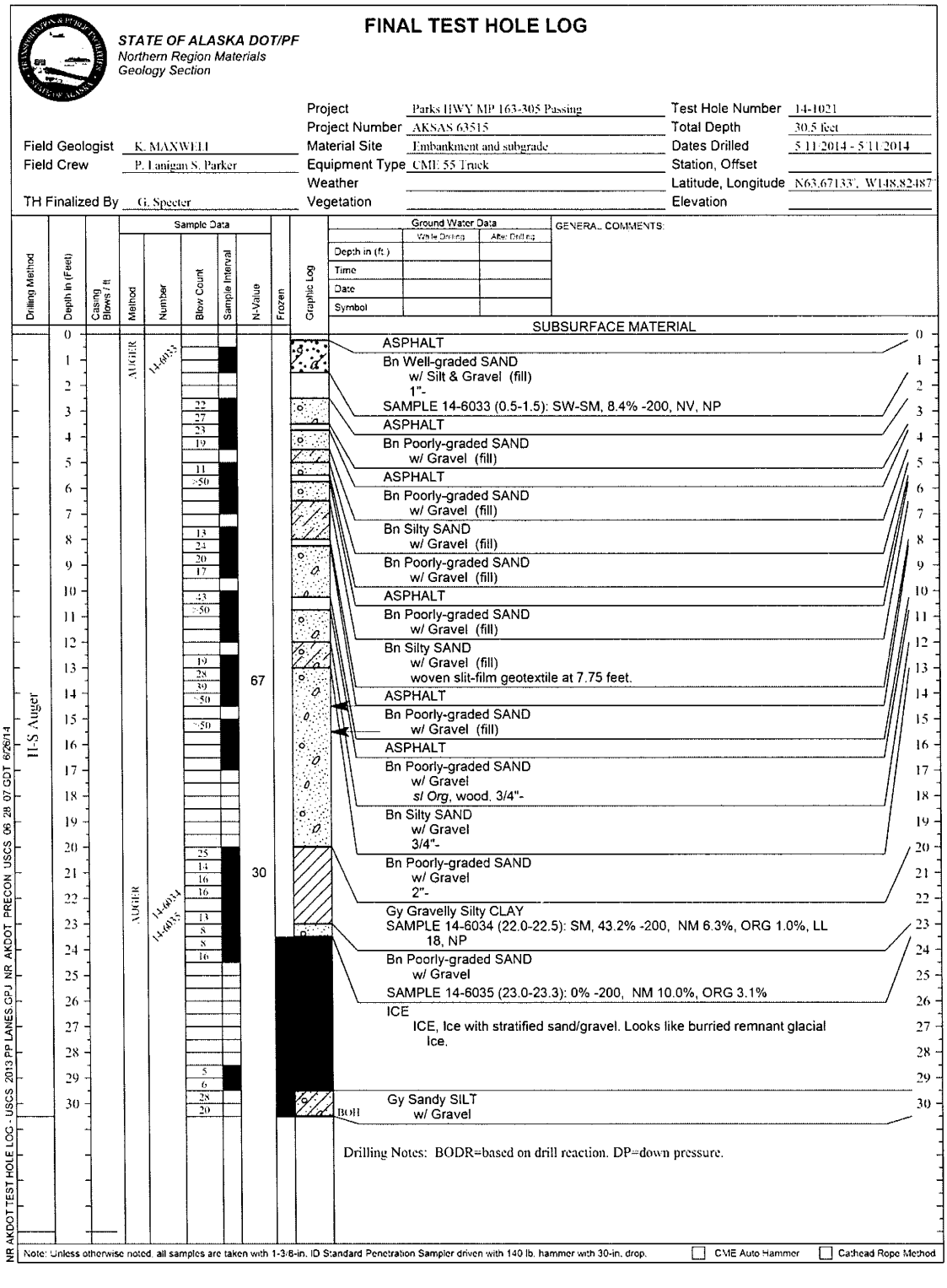
37-2-010-2
This material site, located at Parks Highway MP 245, was permitted for production of 400,000 cubic yards, by DNR through 2023. It has produced borrow of silty sand and gravel.

References

Alaska Department of Transportation and Public Facilities. 2003, Alaska Field Rock Classification and Structural Mapping Guide: State of Alaska, ADOT&PF Geotechnical Procedures Manual, 31 p.

Appendix A. Alignment Test Hole Logs


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Embankment and subgrade
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number 14-1020
Total Depth 28 feet
Dates Drilled 5 11 2014 - 5 11 2014
Station, Offset
Latitude, Longitude N63.67059°, W148.82553°
Elevation
Field Geologist K. MAXWELL
Field Crew P. Lanigan S. Parker
TH Finalized By G. Specter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
Bk ASPHALT
(fill)
Bn Silty SAND
w/ Gravel (fill)
Bn Well-graded GRAVEL
w/ Silt & Sand (fill?)
medium dense, 3"- aggregates. Woven slit-film geotextile intercepted at 2.5 feet. Density BODR.
Bn Well-graded GRAVEL
w/ Silt & Sand
loose, 2"-. Density BODR.
Bn Silty SAND
w/ Gravel
very loose, 3/4"-.Density BODR.
Gy Sandy SILT
w/ Gravel
loose, 3/4"-.Density BODR.
Gy Silty SAND
w/ Gravel
loose, 1"-.Density BODR.
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Embankment and subgrade
Equipment Type CME 55 Track
Weather
Vegetation
Test Hole Number 14-1021
Total Depth 30.5 feet
Dates Drilled 5/11/2014 - 5/11/2014
Station, Offset
Latitude, Longitude N63.67133°, W148.82487°
Elevation
Field Geologist K. MAXWELL
Field Crew P. Lanigan S. Parker
TH Finalized By G. Specter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
ASPHALT
Bn Well-graded SAND
w/ Silt & Gravel (fill)
1"-
SAMPLE 14-6033 (0.5-1.5): SW-SM, 8.4% -200, NV, NP
ASPHALT
Bn Poorly-graded SAND
w/ Gravel (fill)
ASPHALT
Bn Poorly-graded SAND
w/ Gravel (fill)
Bn Silty SAND
w/ Gravel (fill)
Bn Poorly-graded SAND
w/ Gravel (fill)
ASPHALT
Bn Poorly-graded SAND
w/ Gravel (fill)
Bn Silty SAND
w/ Gravel (fill)
woven slit-film geotextile at 7.75 feet.
ASPHALT
Bn Poorly-graded SAND
w/ Gravel (fill)
ASPHALT
Bn Poorly-graded SAND
w/ Gravel
sl Org, wood, 3/4"-
Bn Silty SAND
w/ Gravel
3/4"-
Bn Poorly-graded SAND
w/ Gravel
2"-
Gy Gravelly Silty CLAY
SAMPLE 14-6034 (22.0-22.5): SM, 43.2% -200, NM 6.3%, ORG 1.0%, LL 18, NP
Bn Poorly-graded SAND
w/ Gravel
SAMPLE 14-6035 (23.0-23.3): 0% -200, NM 10.0%, ORG 3.1%
ICE
ICE, Ice with stratified sand/gravel. Looks like burried remnant glacial Ice.
Gy Sandy SILT
w/ Gravel
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
11-S Auger
AUGER
14-6033
14-6034
14-6035
67
30
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	14-1022
Project Number	AKSAS 63515	Total Depth	29 feet
Material Site	Embankment and subgrade	Dates Drilled	5-11-2014 - 5-11-2014
Equipment Type	CME 55 Truck	Station, Offset	
Weather		Latitude, Longitude	N63.6717°, W148.8246°
Vegetation		Elevation	

Field Geologist: K. MAXWELL
Field Crew: P. Lanigan S. Parker
TH Finalized By: G. Specter

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

GENERAL COMMENTS:

Drilling Method: S-S Auger
Casing Blows / ft:
Sample Data: Method: AUGER; Number: 14-6036; Blow Count; Sample Interval; N-Value; Frozen
Graphic Log

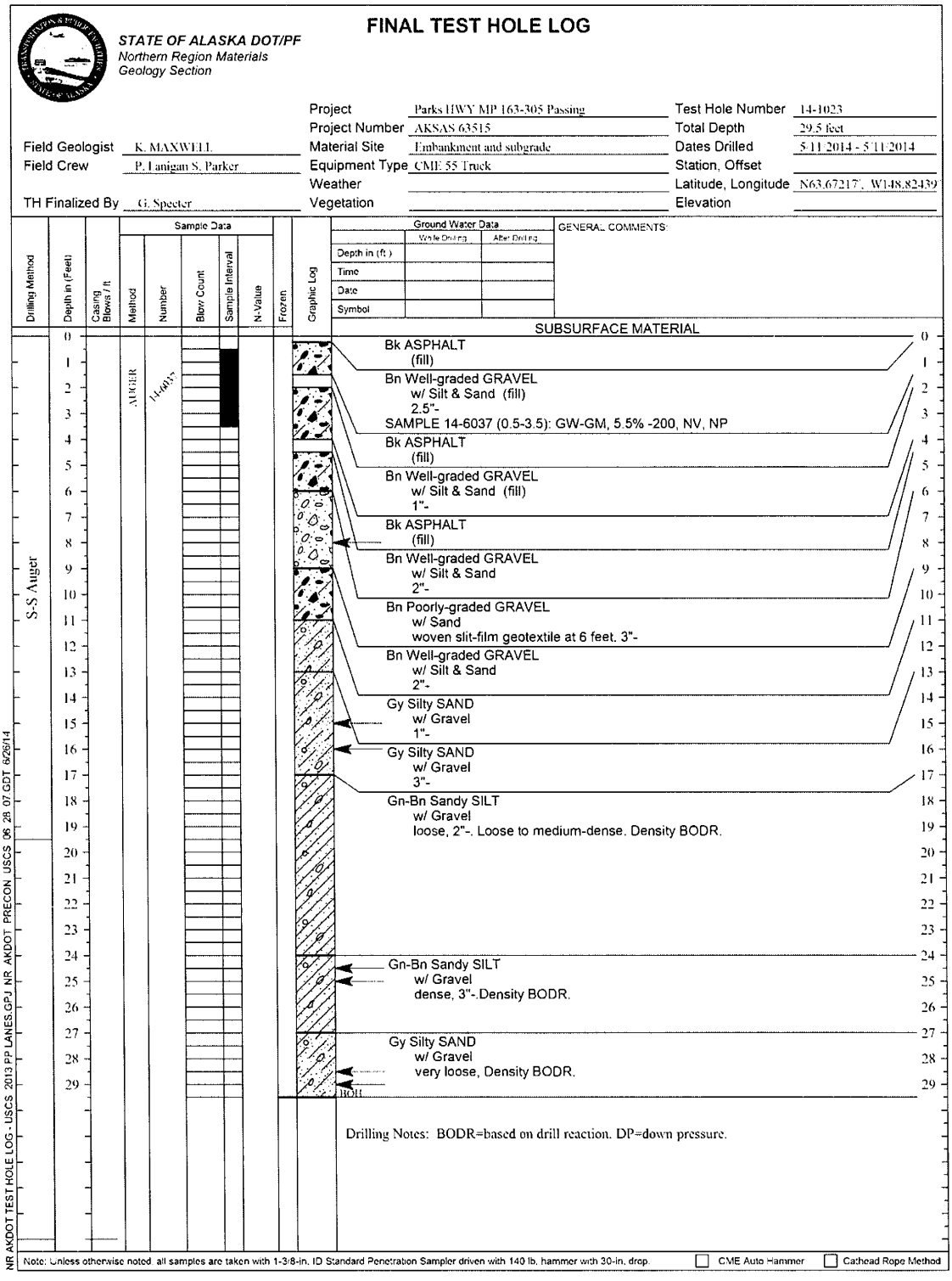
SUBSURFACE MATERIAL

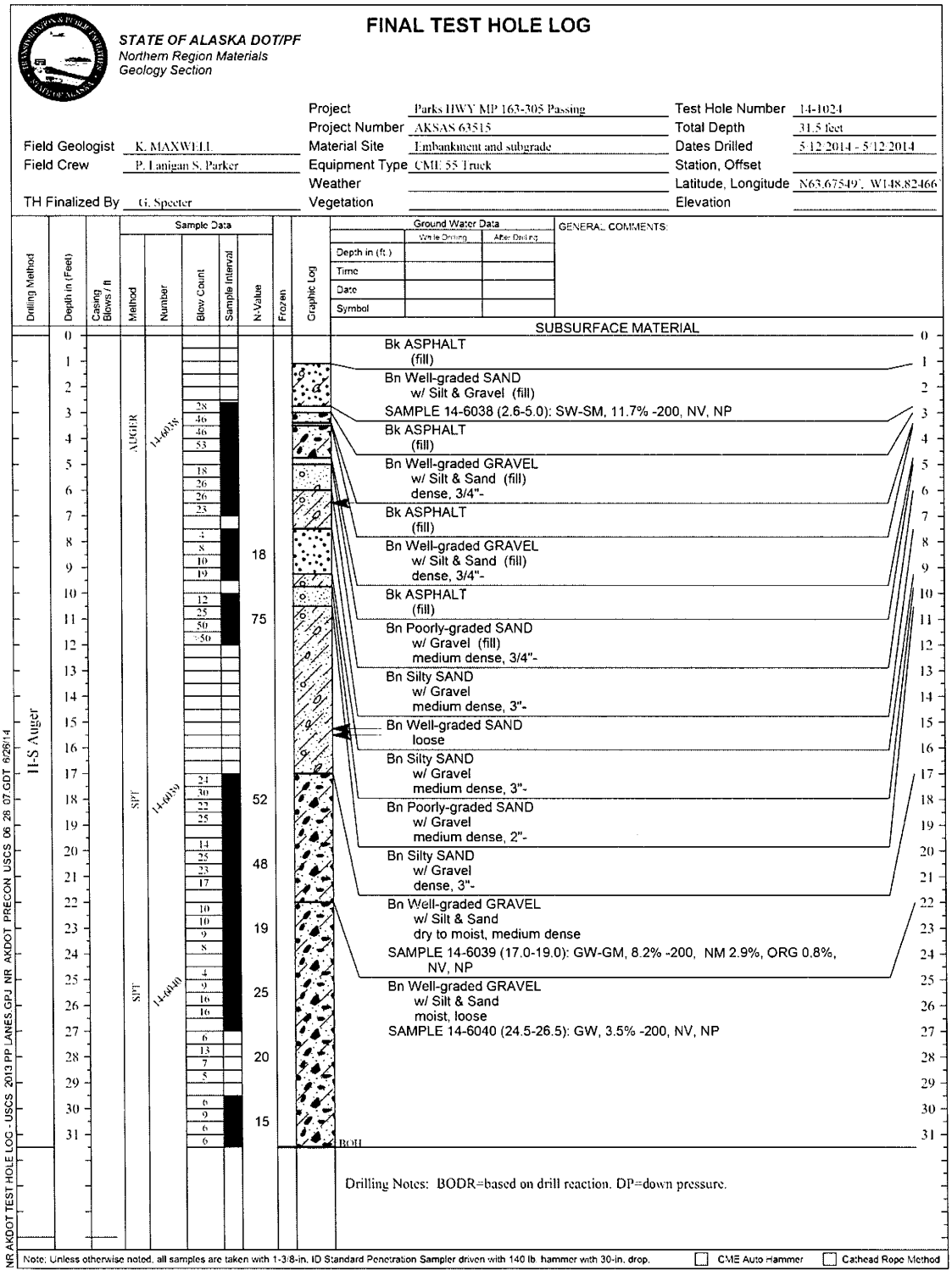
Depth (ft)	
0	Bk ASPHALT
1	SAMPLE 14-6036 (0.4-2.5): GW-GM, 6.4% -200, NV, NP
2	Bn Well-graded GRAVEL w/ Silt & Sand (fill)
3	Bk ASPHALT
4	Bn Well-graded GRAVEL w/ Silt & Sand (fill)
5	Bk ASPHALT
6	Bn Poorly-graded GRAVEL w/ Silt & Sand (fill) loose, woven slit-film geotextile at 5.5 feet. Density BODR.
7	Bk ASPHALT
8	Bn Poorly-graded GRAVEL w/ Silt & Sand (fill?)
9	Bn Silty SAND w/ Gravel loose, Density BODR.
10–19	
20	Bn SILT w/ Sand
21–24	
25	Bn Sandy SILT w/ Gravel 3"-
26–28	
29	BOH

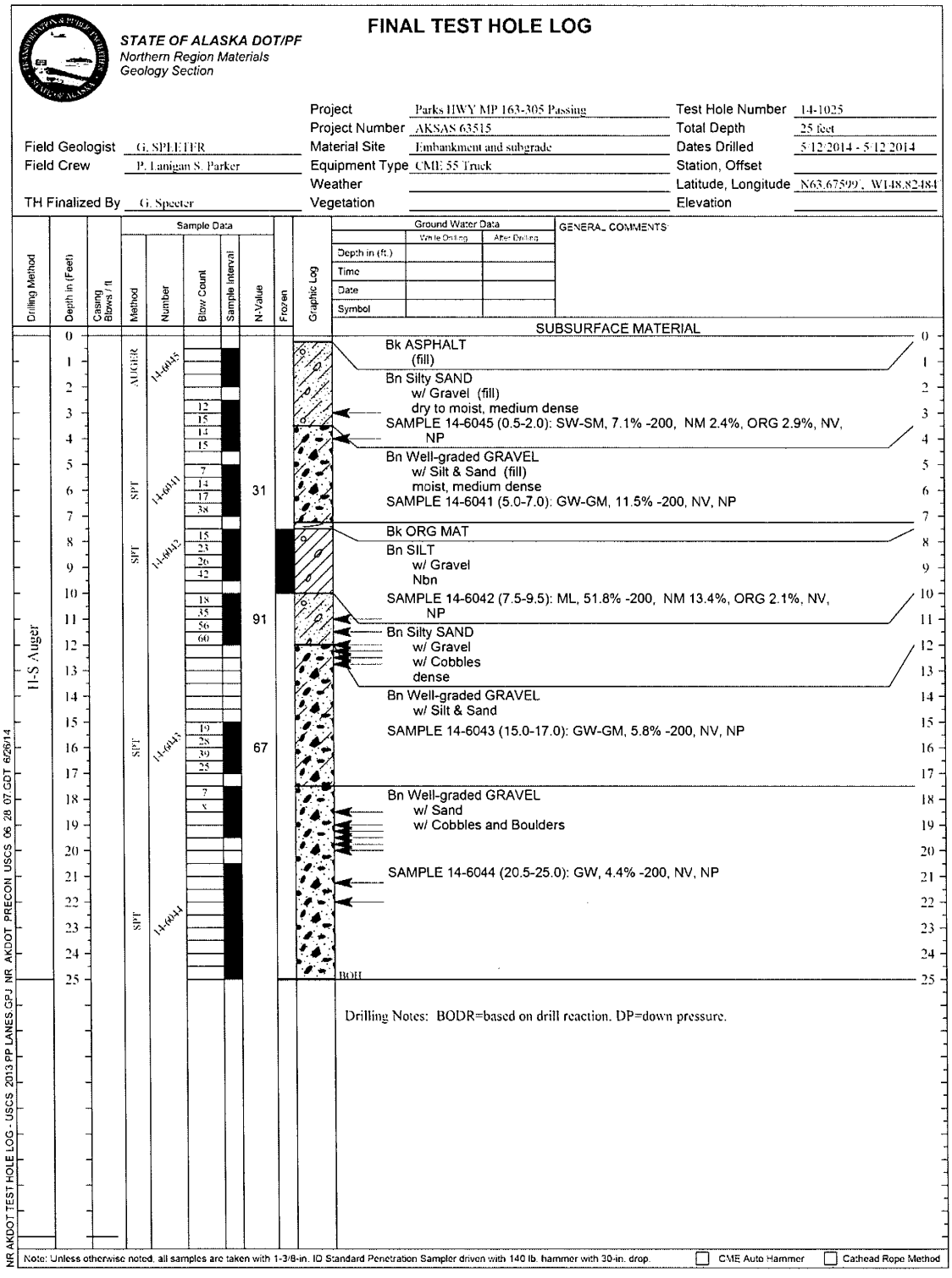
Drilling Notes: BODR=based on drill reaction. DP=down pressure.

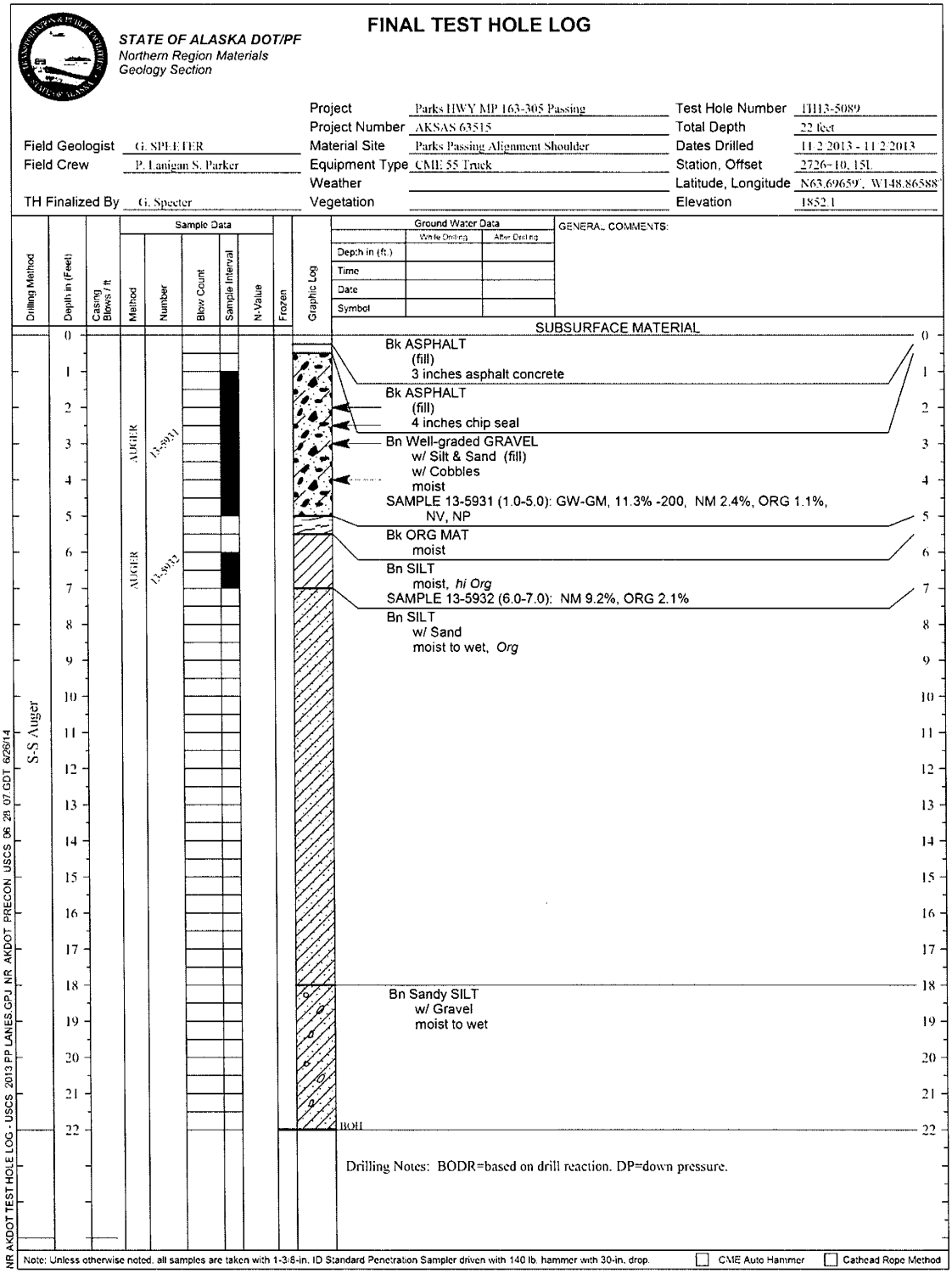
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

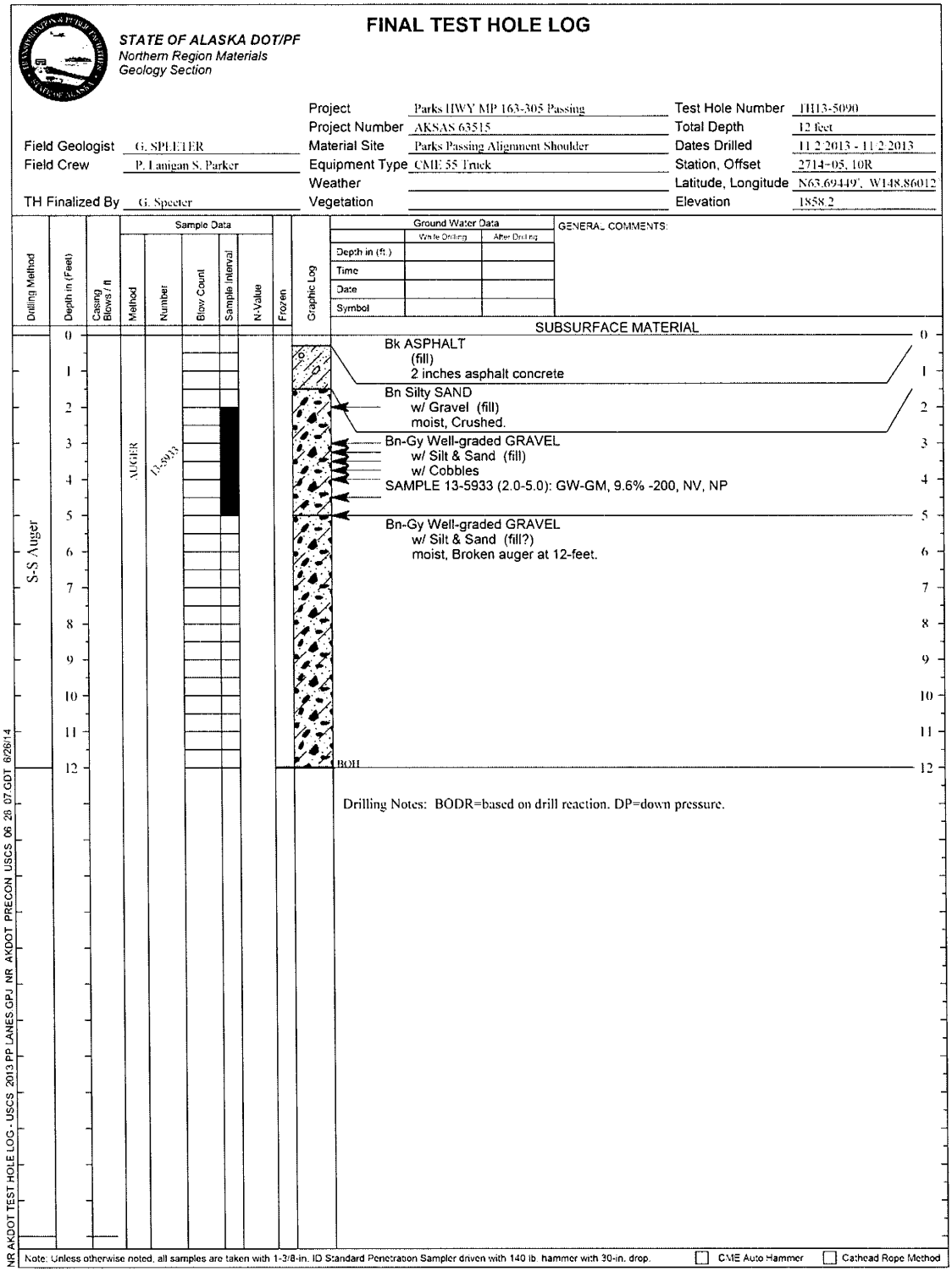
NR AKDOT TEST HOLE LOG - USCS 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14

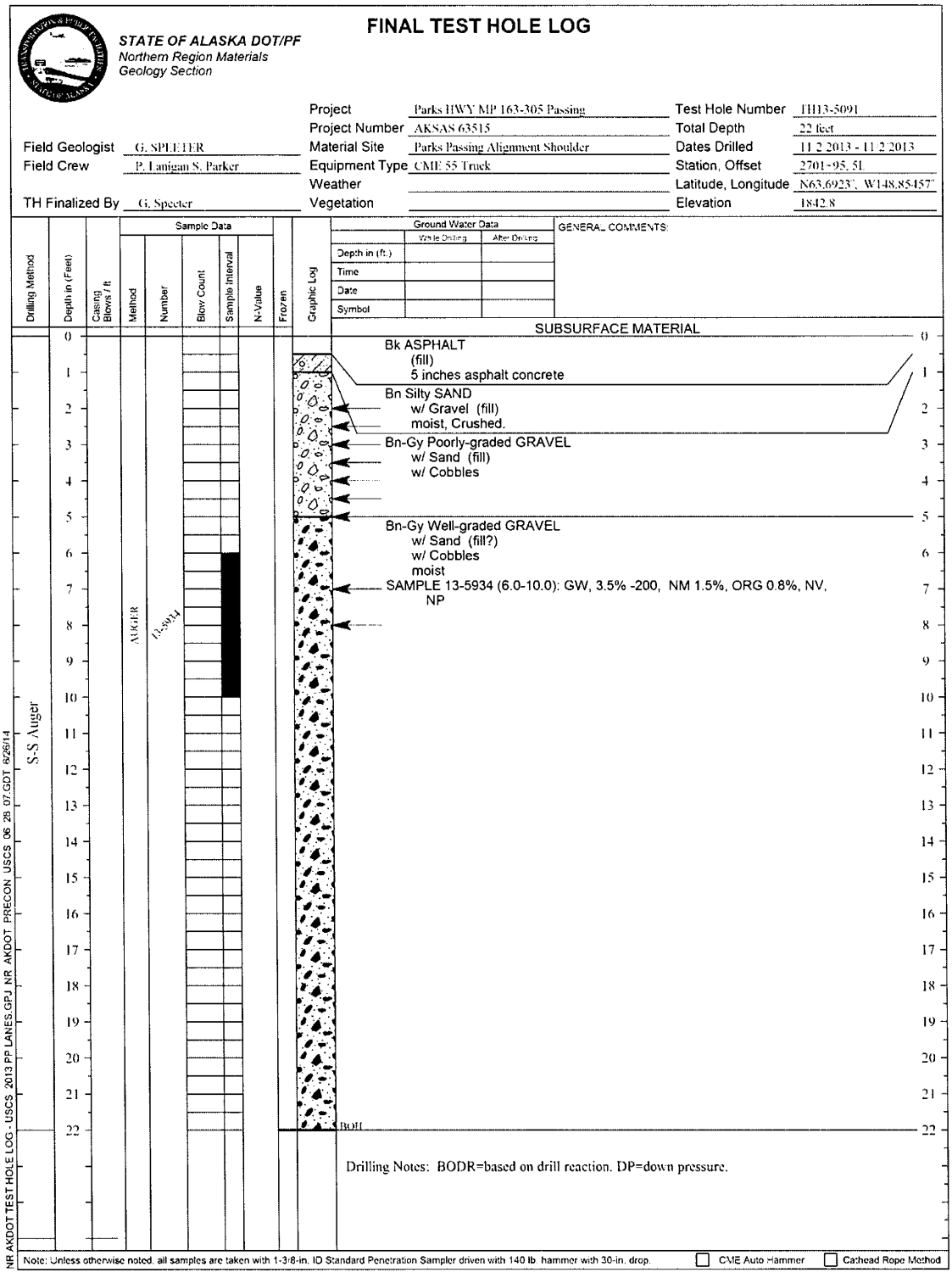

FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Embankment and subgrade
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number 14-1023
Total Depth 29.5 feet
Dates Drilled 5/11/2014 - 5/11/2014
Station, Offset
Latitude, Longitude N63.67217°, W148.82439°
Elevation
Field Geologist K. MAXWELL
Field Crew P. Lanigan S. Parker
TH Finalized By G. Specter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
14-6037
Bk ASPHALT
(fill)
Bn Well-graded GRAVEL
w/ Silt & Sand (fill)
2.5"-
SAMPLE 14-6037 (0.5-3.5): GW-GM, 5.5% -200, NV, NP
Bk ASPHALT
(fill)
Bn Well-graded GRAVEL
w/ Silt & Sand (fill)
1"-
Bk ASPHALT
(fill)
Bn Well-graded GRAVEL
w/ Silt & Sand
2"-
Bn Poorly-graded GRAVEL
w/ Sand
woven slit-film geotextile at 6 feet. 3"-
Bn Well-graded GRAVEL
w/ Silt & Sand
2"-
Gy Silty SAND
w/ Gravel
1"-
Gy Silty SAND
w/ Gravel
3"-
Gn-Bn Sandy SILT
w/ Gravel
loose, 2"-. Loose to medium-dense. Density BODR.
Gn-Bn Sandy SILT
w/ Gravel
dense, 3"-.Density BODR.
Gy Silty SAND
w/ Gravel
very loose, Density BODR.
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14

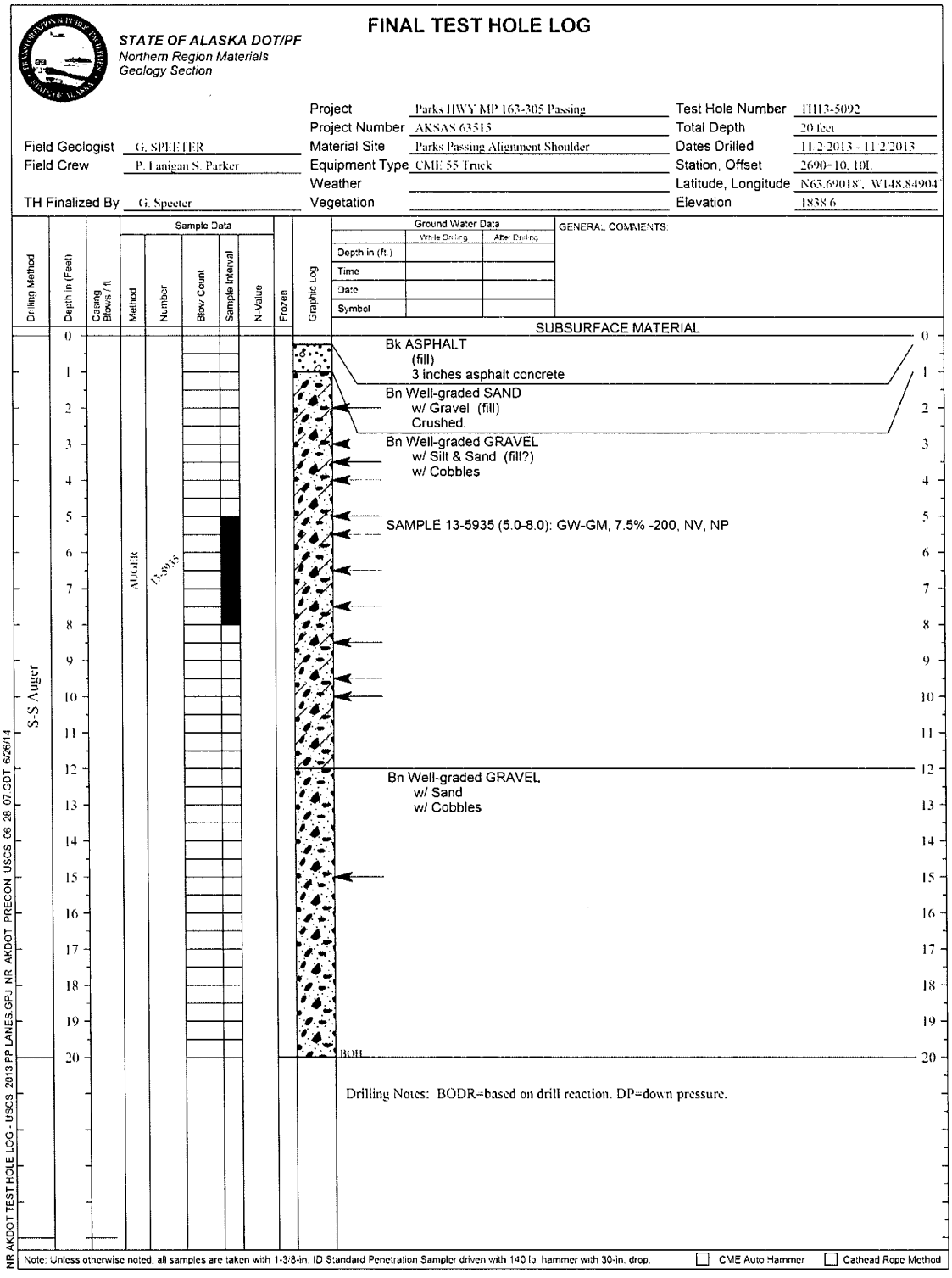

FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Embankment and subgrade
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number 14-1024
Total Depth 31.5 feet
Dates Drilled 5/12/2014 - 5/12/2014
Station, Offset
Latitude, Longitude N63.67549°, W148.82466°
Elevation
Field Geologist K. MAXWELL
Field Crew P. Lanigan S. Parker
TH Finalized By G. Specter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bk ASPHALT (fill)
Bn Well-graded SAND w/ Silt & Gravel (fill)
SAMPLE 14-6038 (2.6-5.0): SW-SM, 11.7% -200, NV, NP
Bk ASPHALT (fill)
Bn Well-graded GRAVEL w/ Silt & Sand (fill) dense, 3/4"-
Bk ASPHALT (fill)
Bn Well-graded GRAVEL w/ Silt & Sand (fill) dense, 3/4"-
Bk ASPHALT (fill)
Bn Poorly-graded SAND w/ Gravel (fill) medium dense, 3/4"-
Bn Silty SAND w/ Gravel medium dense, 3"-
Bn Well-graded SAND loose
Bn Silty SAND w/ Gravel medium dense, 3"-
Bn Poorly-graded SAND w/ Gravel medium dense, 2"-
Bn Silty SAND w/ Gravel dense, 3"-
Bn Well-graded GRAVEL w/ Silt & Sand dry to moist, medium dense
SAMPLE 14-6039 (17.0-19.0): GW-GM, 8.2% -200, NM 2.9%, ORG 0.8%, NV, NP
Bn Well-graded GRAVEL w/ Silt & Sand moist, loose
SAMPLE 14-6040 (24.5-26.5): GW, 3.5% -200, NV, NP
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
11-S Auger
AUGER
SPT
14-6038
14-6039
14-6040
18
75
52
48
19
25
20
15
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_26_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Embankment and subgrade
Equipment Type CME 55 Track
Weather
Vegetation
Test Hole Number 14-1025
Total Depth 25 feet
Dates Drilled 5/12/2014 - 5/12/2014
Station, Offset
Latitude, Longitude N63.67599°, W148.82484°
Elevation
Field Geologist G. SPEETER
Field Crew P. Lanigan S. Parker
TH Finalized By G. Speeter
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS
SUBSURFACE MATERIAL
H-S Auger
AUGER
SPT
14-6045
14-6041
14-6042
14-6043
14-6044
31
91
67
Bk ASPHALT
(fill)
Bn Silty SAND
w/ Gravel (fill)
dry to moist, medium dense
SAMPLE 14-6045 (0.5-2.0): SW-SM, 7.1% -200, NM 2.4%, ORG 2.9%, NV, NP
Bn Well-graded GRAVEL
w/ Silt & Sand (fill)
moist, medium dense
SAMPLE 14-6041 (5.0-7.0): GW-GM, 11.5% -200, NV, NP
Bk ORG MAT
Bn SILT
w/ Gravel
Nbn
SAMPLE 14-6042 (7.5-9.5): ML, 51.8% -200, NM 13.4%, ORG 2.1%, NV, NP
Bn Silty SAND
w/ Gravel
w/ Cobbles
dense
Bn Well-graded GRAVEL
w/ Silt & Sand
SAMPLE 14-6043 (15.0-17.0): GW-GM, 5.8% -200, NV, NP
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles and Boulders
SAMPLE 14-6044 (20.5-25.0): GW, 4.4% -200, NV, NP
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Parks Passing Alignment Shoulder
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number TH13-5089
Total Depth 22 feet
Dates Drilled 11 2 2013 - 11 2 2013
Station, Offset 2726+10, 15L
Latitude, Longitude N63.69659°, W148.86588°
Elevation 1852.1
Field Geologist G. SPEETER
Field Crew P. Lanigan S. Parker
TH Finalized By G. Specter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
13-5931
AUGER
13-5932
Bk ASPHALT
(fill)
3 inches asphalt concrete
Bk ASPHALT
(fill)
4 inches chip seal
Bn Well-graded GRAVEL
w/ Silt & Sand (fill)
w/ Cobbles
moist
SAMPLE 13-5931 (1.0-5.0): GW-GM, 11.3% -200, NM 2.4%, ORG 1.1%,
NV, NP
Bk ORG MAT
moist
Bn SILT
moist, hi Org
SAMPLE 13-5932 (6.0-7.0): NM 9.2%, ORG 2.1%
Bn SILT
w/ Sand
moist to wet, Org
Bn Sandy SILT
w/ Gravel
moist to wet
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Parks Passing Alignment Shoulder
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number 1H13-5090
Total Depth 12 feet
Dates Drilled 11/2/2013 - 11/2/2013
Station, Offset 2714+05, 10R
Latitude, Longitude N63.69449', W148.86012
Elevation 1858.2
Field Geologist G. SPEETER
Field Crew P. Lanigan S. Parker
TH Finalized By G. Speeter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
13-5933
Bk ASPHALT
(fill)
2 inches asphalt concrete
Bn Silty SAND
w/ Gravel (fill)
moist, Crushed.
Bn-Gy Well-graded GRAVEL
w/ Silt & Sand (fill)
w/ Cobbles
SAMPLE 13-5933 (2.0-5.0): GW-GM, 9.6% -200, NV, NP
Bn-Gy Well-graded GRAVEL
w/ Silt & Sand (fill?)
moist, Broken auger at 12-feet.
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_26_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Parks Passing Alignment Shoulder
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number TH13-5091
Total Depth 22 feet
Dates Drilled 11-2-2013 - 11-2-2013
Station, Offset 2701+95, 5L
Latitude, Longitude N63.6923°, W148.85457°
Elevation 1842.8
Field Geologist G. SPEETER
Field Crew P. Lanigan S. Parker
TH Finalized By G. Specter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
13-5934
Bk ASPHALT
(fill)
5 inches asphalt concrete
Bn Silty SAND
w/ Gravel (fill)
moist, Crushed.
Bn-Gy Poorly-graded GRAVEL
w/ Sand (fill)
w/ Cobbles
Bn-Gy Well-graded GRAVEL
w/ Sand (fill?)
w/ Cobbles
moist
SAMPLE 13-5934 (6.0-10.0): GW, 3.5% -200, NM 1.5%, ORG 0.8%, NV, NP
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Parks Passing Alignment Shoulder
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number 1H13-5092
Total Depth 20 feet
Dates Drilled 11/2/2013 - 11/2/2013
Station, Offset 2690+10, 10L
Latitude, Longitude N63.69018°, W148.84904°
Elevation 1838.6
Field Geologist G. SPEETER
Field Crew P. Lanigan S. Parker
TH Finalized By G. Speeter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
13-5935
Bk ASPHALT
(fill)
3 inches asphalt concrete
Bn Well-graded SAND
w/ Gravel (fill)
Crushed.
Bn Well-graded GRAVEL
w/ Silt & Sand (fill?)
w/ Cobbles
SAMPLE 13-5935 (5.0-8.0): GW-GM, 7.5% -200, NV, NP
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5093
Project Number	AKSAS 63515	Total Depth	22 feet
Material Site	Parks Passing Alignment Shoulder	Dates Drilled	11/3/2013 - 11/3/2013
Equipment Type	CME 55 Truck	Station, Offset	2679+85, 51
Weather		Latitude, Longitude	N63.68837°, W148.84422°
Vegetation		Elevation	1865.3

Field Geologist: G. SPEETER
Field Crew: P. Lanigan S. Parker
TH Finalized By: G. Speeter

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

GENERAL COMMENTS:

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

Drilling Method: S-S Auger

SUBSURFACE MATERIAL

Bk ASPHALT
(fill)
3 inches asphalt concrete

Bn Well-graded SAND
w/ Gravel (fill)
Crushed.

Bn Well-graded GRAVEL
w/ Sand (fill?)
w/ Cobbles

Bn Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
SAMPLE 13-5936 (9.0-15.0): GP-GM, 7.8% -200, NV, NP

Method: AUGER
Number: 13-5936

BOH

Drilling Notes: BODR=based on drill reaction, DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_2R_07.GDT 8/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5094
Project Number	AKSAS 63515	Total Depth	8 feet
Material Site	Parks Passing Alignment Shoulder	Dates Drilled	11/3/2013 - 11/3/2013
Equipment Type	CME 55 Truck	Station, Offset	2669+95, 5R
Weather		Latitude, Longitude	N63.6863°, W148.8403°
Vegetation		Elevation	1878.4

Field Geologist: G. SPEETER
Field Crew: P. Lanigan S. Parker
TH Finalized By: G. Speeter

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

GENERAL COMMENTS:

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		AUGER	13-5937						Bk ASPHALT (fill) 3 inches asphalt concrete
	1									Bn Well-graded SAND w/ Gravel (fill) Crushed.
	2									
	3									Bn Poorly-graded GRAVEL w/ Silt & Sand (fill?) w/ Cobbles Refusal on granite boulder. SAMPLE 13-5937 (3.0-5.0): GP-GM, 7.1% -200, NM 2.2%, ORG 1.1%, NV, NP
	4									
	5									
	6									
	7									
	8									BOH

Drilling Notes: BODR=based on drill reaction, DP=down pressure.

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 2013 PP LANES.GPJ NR AKDOT PRECON USCS 06_28_07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	1H13-5095
Project Number	AKSAS 63515	Total Depth	22 feet
Field Geologist	G. SPEETER	Material Site	Parks Passing Alignment Shoulder	Dates Drilled	11/3/2013 - 11/3/2013
Field Crew	P. Lanigan S. Parker	Equipment Type	CME 55 Truck	Station, Offset	2660+15, 15R
		Weather		Latitude, Longitude	N63.68396°, W148.83737°
TH Finalized By	G. Speeter	Vegetation		Elevation	1897.9

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

GENERAL COMMENTS:

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

Drilling Method: S-S Auger

Casing Blows / ft:

Graphic Log

SUBSURFACE MATERIAL

Bk ASPHALT
(fill)
3 inches asphalt concrete

Bn Silty SAND
w/ Gravel (fill)
Crushed.

Bn Well-graded GRAVEL
w/ Silt & Sand (fill?)
w/ Cobbles

SAMPLE 13-5938 (1.5-5.0): GW-GM, 6.7% -200, NM 3.2%, ORG 1.4%, NV, NP

Bn Poorly-graded GRAVEL
w/ Sand (fill?)
w/ Cobbles

SAMPLE 13-5939 (17.0-22.0): GP, 2.2% -200, NV, NP

BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5096
Project Number	AKSAS 63515	Total Depth	13 feet
Material Site	Parks Passing Alignment Shoulder	Dates Drilled	11/3/2013 - 11/3/2013
Equipment Type	CME 55 Truck	Station, Offset	2650+10, 10R
Weather		Latitude, Longitude	N63.68161°, W148.83421°
Vegetation		Elevation	1884.8
Field Geologist	G. SPEETER		
Field Crew	P. Lanigan S. Parker		
TH Finalized By	G. Speeter		

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

GENERAL COMMENTS:

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									Bk ASPHALT (fill) 1 inch asphalt concrete
	1									Bn Silty SAND w/ Gravel (fill)
	2									Bn Well-graded GRAVEL w/ Sand (fill) w/ Cobbles
	3									
	4									
	5									
	6									
	7									Bn Well-graded GRAVEL w/ Sand (fill?) w/ Cobbles Looser BODR.
	8									
	9									
	10									
	11									
	12									
	13									BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06_28_07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5097
Project Number	AKSAS 63515	Total Depth	22 feet
Material Site	Parks Passing Alignment Shoulder	Dates Drilled	11/3/2013 - 11/3/2013
Equipment Type	CME 55 Truck	Station, Offset	2640+10, 15L
Weather		Latitude, Longitude	N63.67972°, W148.82975°
Vegetation		Elevation	1908.9

Field Geologist: G. SPEETER
Field Crew: P. Lanigan S. Parker
TH Finalized By: G. Speeter

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

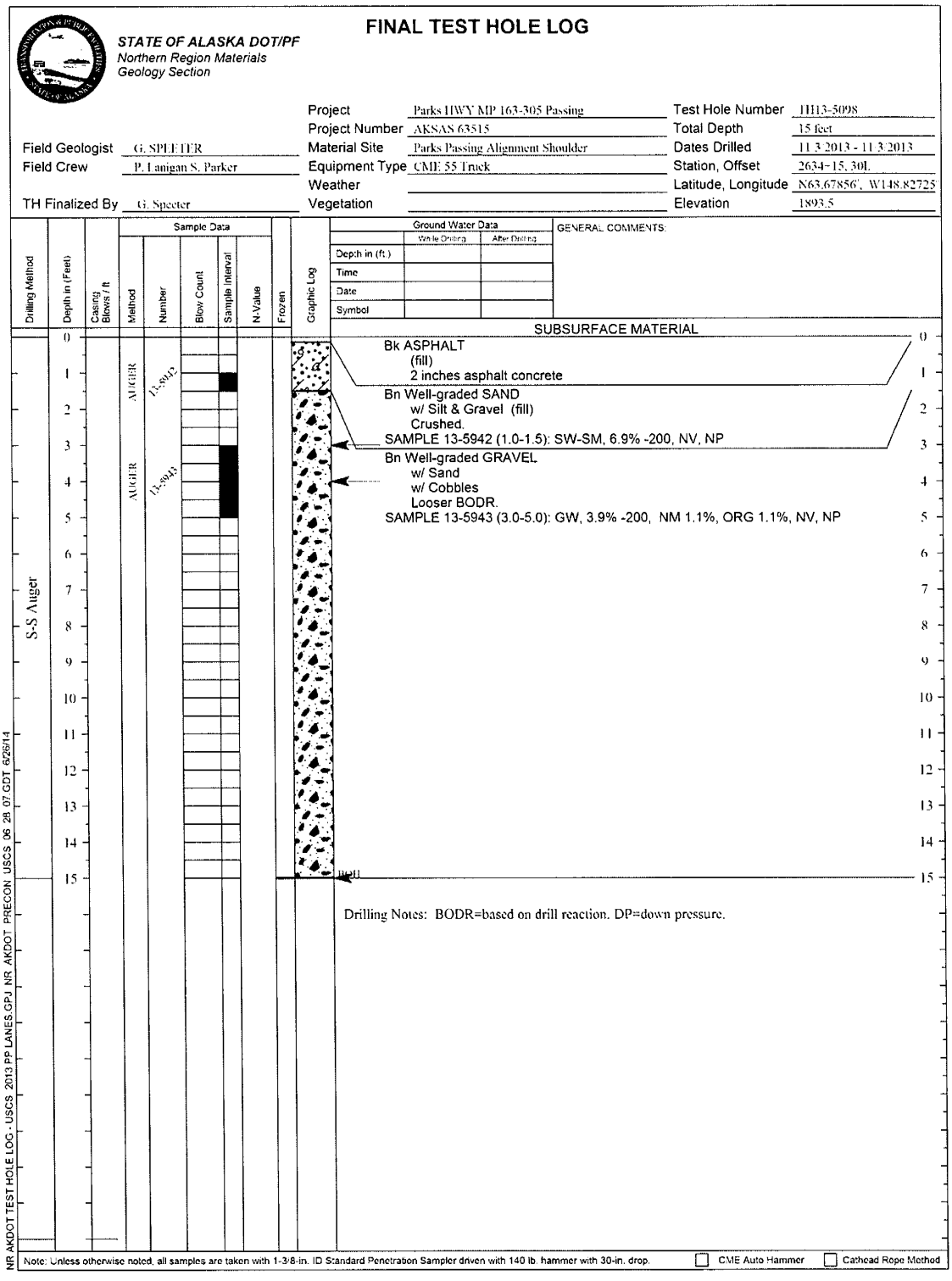
GENERAL COMMENTS:

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									Bk ASPHALT (fill) 2 inches asphalt concrete
	1									
	2									Bn Well-graded SAND w/ Gravel (fill) Crushed.
	3		AUGER	13-5940						Bn Well-graded GRAVEL w/ Silt & Sand (fill?) w/ Cobbles
	4									SAMPLE 13-5940 (2.0-5.0): GW-GM, 5.3% -200, NM 5.5%, ORG 1.0%, NV, NP
	5									
	6									
	7									
	8									SAMPLE 13-5941 (8.0-11.0): SP-SM, 7.6% -200, NV, NP
	9		AUGER	13-5941						Bn Well-graded GRAVEL w/ Silt & Sand looser BODR.
	10									
	11									Bn Well-graded GRAVEL w/ Sand w/ Cobbles
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									
	20									
	21									
	22									BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013.PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Parks Passing Alignment Shoulder
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number 1H13-5098
Total Depth 15 feet
Dates Drilled 11 3 2013 - 11 3 2013
Station, Offset 2634+15, 30L
Latitude, Longitude N63.67856', W148.82725
Elevation 1893.5
Field Geologist G. SPEETER
Field Crew P. Lanigan S. Parker
TH Finalized By G. Speeter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
13-5942
AUGER
13-5943
Bk ASPHALT
(fill)
2 inches asphalt concrete
Bn Well-graded SAND
w/ Silt & Gravel (fill)
Crushed.
SAMPLE 13-5942 (1.0-1.5): SW-SM, 6.9% -200, NV, NP
Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
Looser BODR.
SAMPLE 13-5943 (3.0-5.0): GW, 3.9% -200, NM 1.1%, ORG 1.1%, NV, NP
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	11I13-5099
Project Number	AKSAS 63515	Total Depth	15 feet
Field Geologist	G. SPEETER	Material Site	Parks Passing Alignment Shoulder	Dates Drilled	11/3/2013 - 11/3/2013
Field Crew	P. Lanigan S. Parker	Equipment Type	CME 55 Truck	Station, Offset	2633+00, 30L
		Weather		Latitude, Longitude	N63.67578°, W148.82495°
TH Finalized By	G. Speeter	Vegetation		Elevation	1909.3

Ground Water Data

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

GENERAL COMMENTS:

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

Drilling Method: S-S Auger

SUBSURFACE MATERIAL

Bk ASPHALT
(fill)
4 inches asphalt concrete

Bn ASPHALT
(fill)
moist, chip sealed SW

Bn Well-graded SAND
w/ Silt & Gravel (fill)
moist, crushed
SAMPLE 13-5944 (1.0-2.0): SW-SM, 9.9% -200, NV, NP

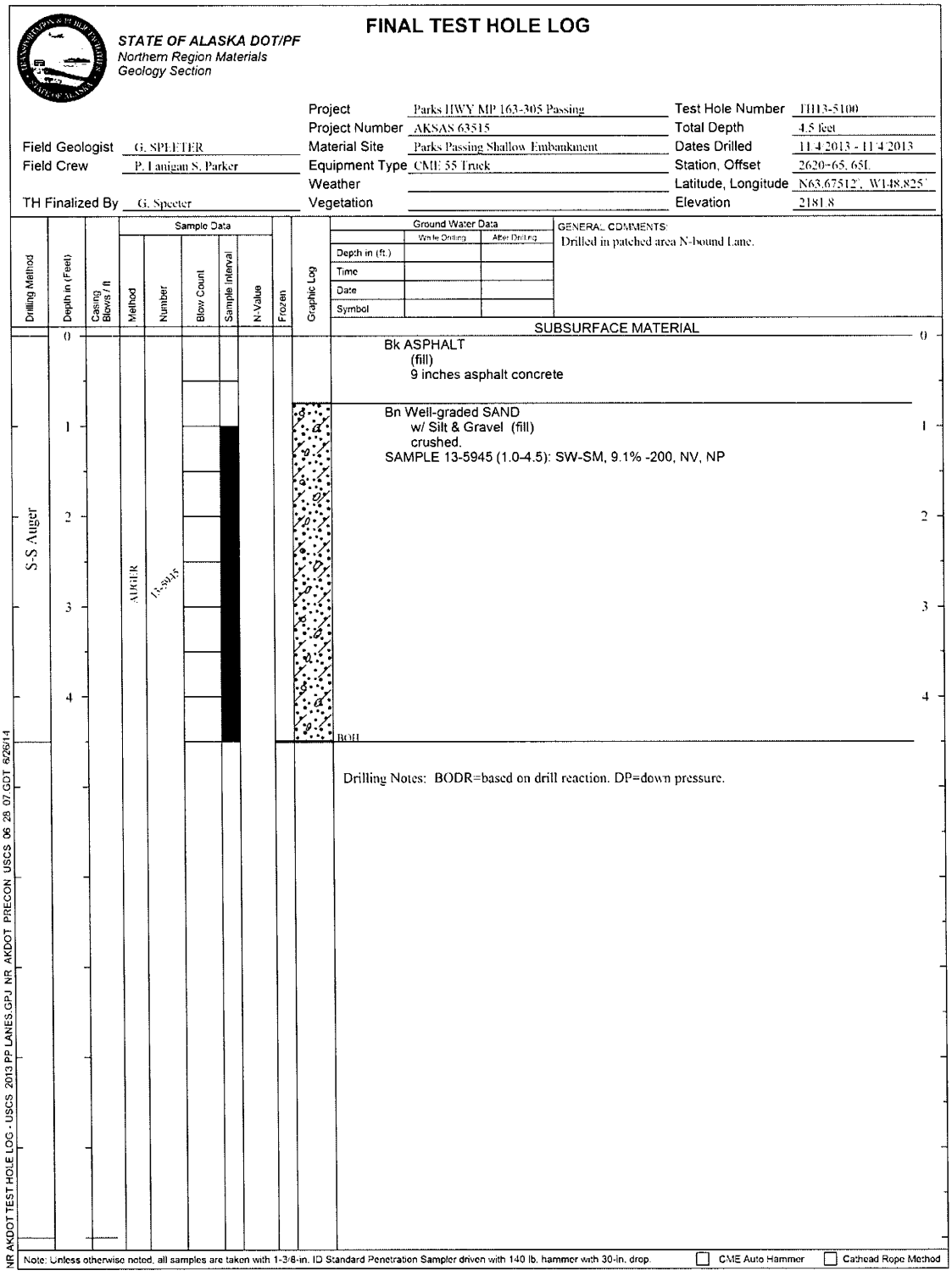
Bn Well-graded GRAVEL
w/ Sand (fill?)
w/ Cobbles
moist, Refusal on boulder at 15-feet.

BOH

Drilling Notes: BODR=based on drill reaction, DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/26/14



FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5100
Project Number	AKSAS 63515	Total Depth	4.5 feet
Material Site	Parks Passing Shallow Embankment	Dates Drilled	11/4/2013 - 11/4/2013
Equipment Type	CME 55 Truck	Station, Offset	2620+65, 65L
Weather		Latitude, Longitude	N63.67512°, W148.825°
Vegetation		Elevation	2181.8

Field Geologist: G. SPEETER
Field Crew: P. Lanigan S. Parker
TH Finalized By: G. Speeter

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

GENERAL COMMENTS:
Drilled in patched area N-bound Lane.

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	N-Value	Frozen	Graphic Log
S-S Auger	0–4		AUGER	13-5945					

SUBSURFACE MATERIAL

0 — Bk ASPHALT
(fill)
9 inches asphalt concrete

1 — Bn Well-graded SAND
w/ Silt & Gravel (fill)
crushed.
SAMPLE 13-5945 (1.0-4.5): SW-SM, 9.1% -200, NV, NP

4 — BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

NR AKDOT TEST HOLE LOG - USCS 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 6/26/14

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	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5101
Project Number	AKSAS 63515	Total Depth	4 feet
Material Site	Parks Passing Shallow Embankment	Dates Drilled	11/4/2013 - 11/4/2013
Equipment Type	CME 55 Truck	Station, Offset	2616+30, 5L
Weather		Latitude, Longitude	N63.67398°, W148.82429°
Vegetation		Elevation	1931.3
Field Geologist	G. SPEETER		
Field Crew	P. Lanigan S. Parker		
TH Finalized By	G. Speeter		

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

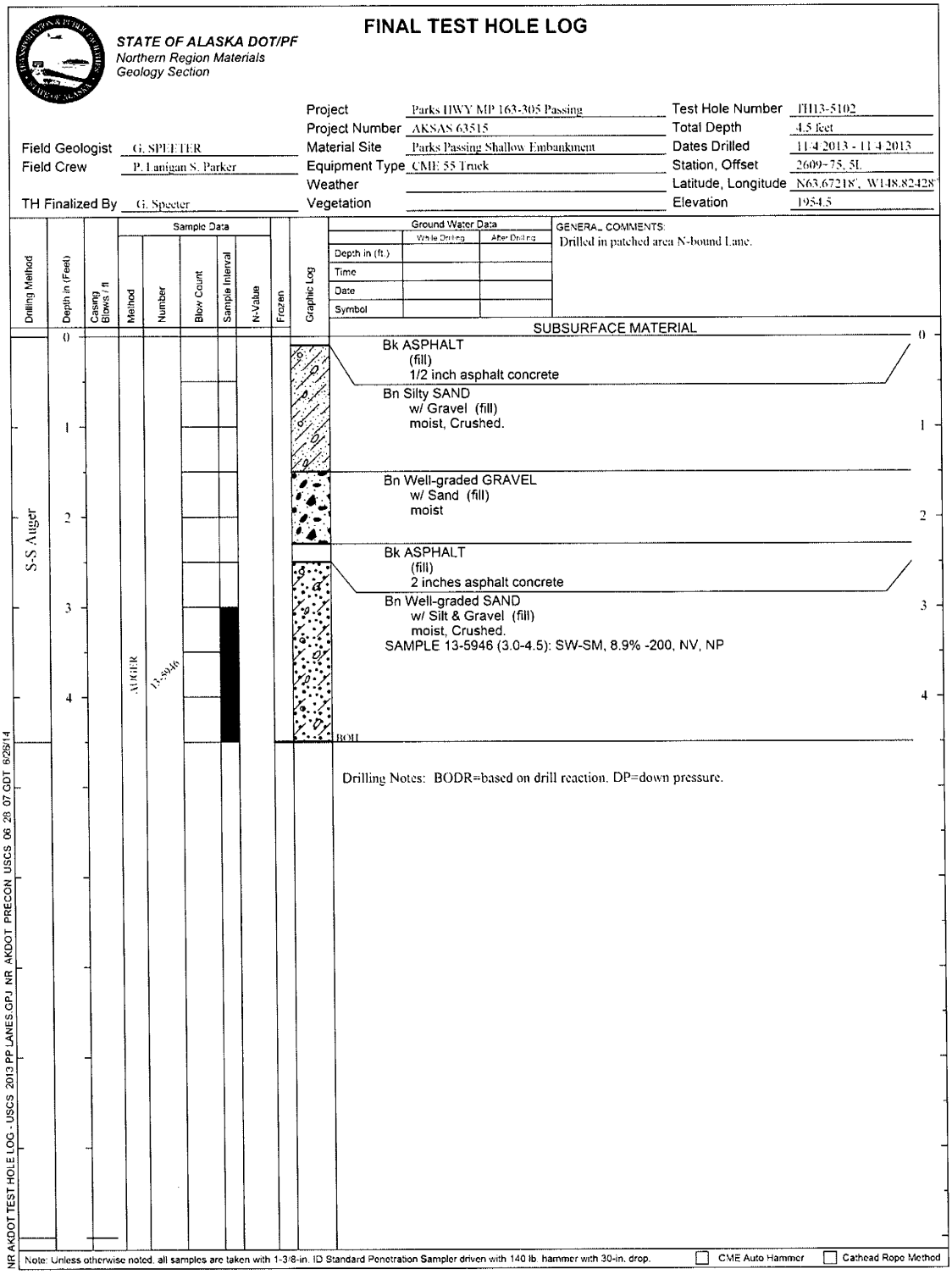
GENERAL COMMENTS:
Drilled in non-patched area N-bound Lane.

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									Bk ASPHALT (fill) 3 inches asphalt concrete
	1									Bn Silty SAND w/ Gravel (fill) Crushed.
	2									Bn Well-graded GRAVEL w/ Sand (fill) w/ Cobbles
	3									
	4									BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 6/26/14



FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5102
Project Number	AKSAS 63515	Total Depth	4.5 feet
Material Site	Parks Passing Shallow Embankment	Dates Drilled	11/4/2013 - 11/4/2013
Equipment Type	CME 55 Truck	Station, Offset	2609+75, 5L
Weather		Latitude, Longitude	N63.67218°, W148.82428°
Vegetation		Elevation	1954.5
Field Geologist	G. SPEETER		
Field Crew	P. Lanigan S. Parker		
TH Finalized By	G. Speeter		

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

GENERAL COMMENTS:
Drilled in patched area N-bound Lane.

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		AUGER	13-5946					
	1								
	2								
	3								
	4								

SUBSURFACE MATERIAL

0 — Bk ASPHALT
(fill)
1/2 inch asphalt concrete

Bn Silty SAND
w/ Gravel (fill)
moist, Crushed.

1

Bn Well-graded GRAVEL
w/ Sand (fill)
moist

2

Bk ASPHALT
(fill)
2 inches asphalt concrete

Bn Well-graded SAND
w/ Silt & Gravel (fill)
moist, Crushed.
SAMPLE 13-5946 (3.0-4.5): SW-SM, 8.9% -200, NV, NP

3

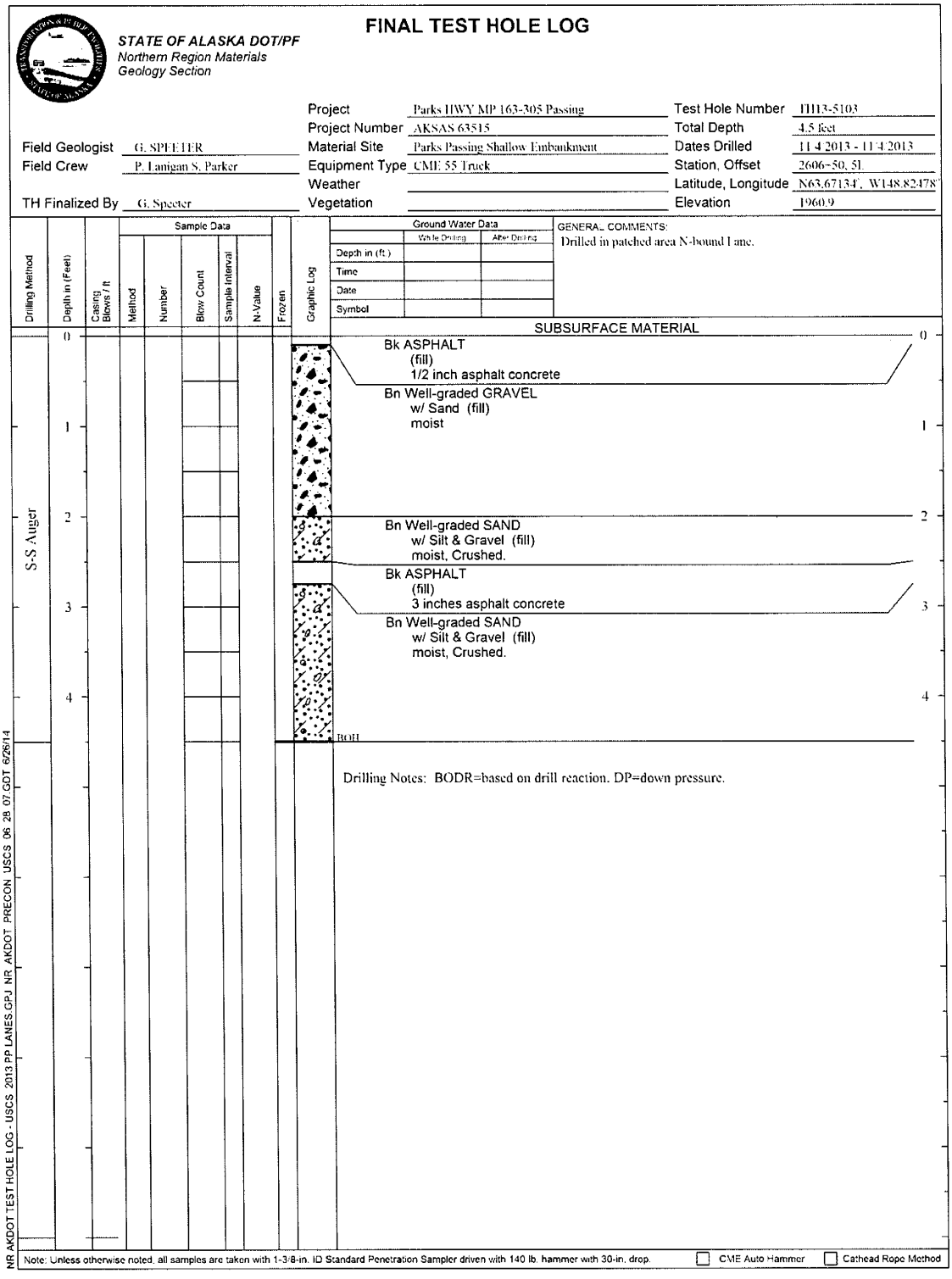
4

BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06.28.07.GDT 6/28/14



FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5103
Project Number	AKSAS 63515	Total Depth	4.5 feet
Field Geologist	G. SPEETER	Material Site	Parks Passing Shallow Embankment	Dates Drilled	11/4/2013 - 11/4/2013
Field Crew	P. Lanigan S. Parker	Equipment Type	CME 55 Truck	Station, Offset	2606+50, 51
		Weather		Latitude, Longitude	N63.67134°, W148.82478°
TH Finalized By	G. Speeter	Vegetation		Elevation	1960.9

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

GENERAL COMMENTS:
Drilled in patched area N-bound Lane.

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									Bk ASPHALT (fill) 1/2 inch asphalt concrete
	1									Bn Well-graded GRAVEL w/ Sand (fill) moist
	2									Bn Well-graded SAND w/ Silt & Gravel (fill) moist, Crushed.
	3									Bk ASPHALT (fill) 3 inches asphalt concrete
	4									Bn Well-graded SAND w/ Silt & Gravel (fill) moist, Crushed.
										BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 - USGS 2013 PP LANES.GPJ NR_AKDOT_PRECON_USGS_06_28_07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	HH13-5104
Project Number	AKSAS 63515	Total Depth	4.5 feet
Field Geologist	G. SPEETER	Material Site	Parks Passing Shallow Embankment	Dates Drilled	11/4/2013 - 11/4/2013
Field Crew	P. Lanigan S. Parker	Equipment Type	CME 55 Truck	Station, Offset	2603+65, 5L
		Weather		Latitude, Longitude	N63.67062°, W148.82548°
TH Finalized By	G. Speeter	Vegetation		Elevation	1969.8

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

GENERAL COMMENTS:
Drilled in patched area on re-paved section N-bound Lane.

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								
	1								
	2								
	3								
	4								

SUBSURFACE MATERIAL

0 — Bk ASPHALT
(fill)
3 inches asphalt concrete

Bn Well-graded SAND
w/ Silt & Gravel (fill)
dry to moist

1

Bn Well-graded GRAVEL
w/ Silt & Sand (fill)
w/ Cobbles
dry to moist, Woven slit-film geotextile @ 2-feet.

2

3

4 — BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 6/26/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5105
Project Number	AKSAS 63515	Total Depth	4 feet
Material Site	Parks Passing Shallow Embankment	Dates Drilled	11/4/2013 - 11/4/2013
Equipment Type	CME 55 Truck	Station, Offset	2603+25, 51
Weather		Latitude, Longitude	N63.67052°, W148.8256°
Vegetation		Elevation	1976.4
Field Geologist	G. SPEETER		
Field Crew	P. Lanigan S. Parker		
TH Finalized By	G. Speeter		

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

GENERAL COMMENTS:
Drilled in non-patched area N-bound Lane.

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									Bk ASPHALT (fill) 3 inches asphalt concrete
	1									Bn Well-graded GRAVEL w/ Sand (fill) w/ Cobbles dry to moist
	2									
	3									
	4									Refl

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06.28.07.GDT 5/26/14

Appendix B. Alignment Laboratory Data

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME: Parks HWY MP 163-305 Passing
PROJECT NUMBER: 63515
AKSAS NUMBER: G. Speeter
SAMPLED BY: Parks Highway Alignment
MATERIAL SOURCE:

TEST HOLE NUMBER		TH13-5089	TH13-5089	TH13-5090	TH13-5091	TH13-5092	TH13-5093	TH13-5094
DEPTH (feet)		1.0-5.0	6.0-7.0	2.0-5.0	6.0-10.0	5.0-8.0	9.0-15.0	3.0-5.0
LATITUDE		2726+10	2726+10	2714+05	2701+95	2690+10	2679+85	2669+95
LONGITUDE		15L	15L	10R	5L	10L	5L	5R
LAB NUMBER		**13-5931**	**13-5932**	**13-5933**	**13-5934**	**13-5935**	**13-5936**	**13-5937**
DATE SAMPLED		2-Nov-13	2-Nov-13	2-Nov-13	2-Nov-13	2-Nov-13	3-Nov-13	3-Nov-13
% Passing	**3"**							
	2"				96	96		97
	1.5"	99		96	92	95	98	95
Gravel	**1.0"**	95		94	78	89	96	84
	0.75"	88		88	67	81	90	76
	0.5"	77		80	53	66	79	63
	0.375"	69		72	46	57	71	53
	#4	54		55	34	41	54	39
	#8	44		42	25	31	42	30
	#10	43		40	24	30	40	28
	#16	35		32	18	24	31	23
	#30	26		24	12	19	30	18
Sand	**#40**	22		20	9	16	17	15
	#50	19		17	7	13	14	13
	#60	18		16	6	12	13	12
	#80	16		14	5	11	11	11
	#100	15		13	5	10	10	10
Silt/Clay	**#200**	11.3		9.6	3.5	7.5	7.8	7.1
	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		GW-GM		GW-GM	GW	GW-GM	GP-GM	GP-GM
USCS SOIL DESCRIPTION		(WGGr w/Si&Sa)	(Si)	(WGGr w/Si&Sa)	(WGGr w/Sa)	(WGGr w/Si&Sa)	(PGGr w/Si&Sa)	(PGGr w/Si&Sa)
NATURAL MOISTURE		2.4	9.2		1.5			2.2
ORGANICS		1.1	2.1		0.8			1.1
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS			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:	Parks HWY MP 163-305 Passing
PROJECT NUMBER:	
AKSAS NUMBER:	63515
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Parks Highway Alignment

TEST HOLE NUMBER		TH13-5095	TH13-5095	TH13-5097	TH13-5097	TH13-5098	TH13-5098	TH13-5099
DEPTH (feet)		1.5-5.0	17.0-22.0	2.0-5.0	8.0-11.0	1.0-1.5	3.0-5.0	1.0-2.0
LATITUDE		2660+15	2660+15	2640+10	2640+10	2634+15	2634+15	2633+00
LONGITUDE		15R	15R	15L	15L	30L	30L	30L
LAB NUMBER		**13-5938**	**13-5939**	**13-5940**	**13-5941**	**13-5942**	**13-5943**	**13-5944**
DATE SAMPLED		3-Nov-13	3-Nov-13	3-Nov-13	3-Nov-13	3-Nov-13	3-Nov-13	3-Nov-13
% Passing	**3"**						92	
	2"	89						
	1.5"	86	97	87	96			
Gravel	**1.0"**	78	79	79	90		75	
	0.75"	70	69	71	85	100	66	100
	0.5"	61	50	59	77	93	55	94
	0.375"	54	37	50	70	82	47	87
	#4	40	12	36	57	60	30	67
	#8	30	5	26	47	40	20	50
	#10	29	5	25	46	37	19	48
	#16	23	4	19	38	27	14	36
	#30	18	4	14	26	19	10	26
Sand	**#40**	15	4	12	20	15	9	22
	#50	13	3	10	15	13	7	18
	#60	12	3	9	14	12	7	17
	#80	10	3	8	12	10	6	14
	#100	9	3	7	11	9	5	13
Silt/Clay	**#200**	6.7	2.2	5.3	7.6	6.9	3.9	9.9
	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		GW-GM	GP	GW-GM	SP-SM	SW-SM	GW	SW-SM
USCS SOIL DESCRIPTION		(WGGr w/Si&Sa)	(PGGr)	(WGGr w/Si&Sa)	(WGGr w/Si&Sa)	(WGSa w/Si&Gr)	(WGGr w/Sa)	(WGSa w/Si&Gr)
NATURAL MOISTURE		3.2		5.5			1.1	
ORGANICS		1.4		1.0			1.1	
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

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: Parks HWY MP 163-305 Passing
PROJECT NUMBER:
AKSAS NUMBER: 63515
SAMPLED BY: G. Speeter
MATERIAL SOURCE: Parks Highway Alignment

TEST HOLE NUMBER		TH13-5100	TH13-5102	14-1021	14-1021	14-1021	14-1022	14-1023
DEPTH (feet)		1.0-4.5	3.0-4.5	0.5-1.5	22.0-22.5	23.0-23.3	0.4-2.5	0.5-3.5
LATITUDE		2620+65	2609+75	N63.67133°	N63.67133°	N63.67133°	N63.6717°	N63.67217°
LONGITUDE		65L	5L	W148.82487°	W148.82487°	W148.82487°	W148.82462°	W148.82439°
LAB NUMBER		**13-5945**	**13-5946**	**14-6033**	**14-6034**	**14-6035**	**14-6036**	**14-6037**
DATE SAMPLED		4-Nov-13	4-Nov-13	11-May-14	11-May-14	11-May-14	11-May-14	11-May-14
% Passing	**3"**							
	2"							
	1.5"							100
Gravel	**1.0"**			97			97	96
	0.75"	99	97	92			92	93
	0.5"	93	90	82			81	84
	0.375"	86	84	75			72	75
	#4	66	65	57			51	53
	#8	49	49	45			37	37
	#10	47	47	42			35	35
	#16	35	36	33	93		26	25
	#30	24	25	23	80		17	17
Sand	**#40**	20	21	19	73		14	14
	#50	17	17	16	64		12	11
	#60	15	16	15	60		11	10
	#80	13	13	12	56		9	8
	#100	12	12	11	53		8	8
Silt/Clay	**#200**	9.1	8.9	8.4	43.2		6.4	5.5
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	18		NV	NV
PLASTIC INDEX		NP	NP	NP	NP		NP	NP
USCS CLASSIFICATION		SW-SM	SW-SM	SW-SM			GW-GM	GW-GM
USCS SOIL DESCRIPTION		(WGSa w/Si&Gr)	(WGSa w/Si&Gr)	(WGSa w/Si&Gr)	(GrSiCl)	(PGSa)	(WGGr w/Si&Sa)	(WGGr w/Si&Sa)
NATURAL MOISTURE					6.3	10.0		
ORGANICS					1.0	3.1		
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS						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: Parks HWY MP 163-305 Passing
PROJECT NUMBER: 63515
AKSAS NUMBER:
SAMPLED BY: G. Speeter
MATERIAL SOURCE: Parks Highway Alignment

TEST HOLE NUMBER		14-1024	14-1024	14-1024	14-1025	14-1025	14-1025	14-1025
DEPTH (feet)		2.6-5.0	17.0-19.0	24.5-26.5	7.5-9.5	15.0-17.0	20.5-25.0	0.5-2.0
LATITUDE		N63.67549°	N63.67549°	N63.67549°	N63.67599°	N63.67599°	N63.67599°	N63.67599°
LONGITUDE		W148.82466°	W148.82466°	W148.82466°	W148.82484°	W148.82484°	W148.82484°	W148.82484°
LAB NUMBER		**14-6038**	**14-6039**	**14-6040**	**14-6042**	**14-6043**	**14-6044**	**14-6045**
DATE SAMPLED		12-May-14	12-May-14	12-May-14	12-May-14	12-May-14	12-May-14	12-May-14
% Passing	**3"**							
	2"							
	1.5"						94	
Gravel	**1.0"**	100	88	84		92	81	
	0.75"	99	79	80	98	81	67	98
	0.5"	94	67	70	91	71	50	87
	0.375"	88	61	62	86	64	38	78
	#4	70	51	48	80	50	20	56
	#8	52		33	75	38	12	42
	#10	50		30	74	37	11	40
	#16	39	31	22	71	27	9	30
	#30	29		14	66	19	7	21
Sand	**#40**	25		11	64	16	7	17
	#50	21		8	61	13	6	14
	#60	19		7	60	12	6	13
	#80	17		6	58	10	6	11
	#100	15	11	5	57	9	5	10
Silt/Clay	**#200**	11.7	8.2	3.5	51.8	5.8	4.4	7.1
	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		GW	ML	GW-GM	GW	SW-SM
USCS SOIL DESCRIPTION		(WGSa w/Si&Gr)	(WGSa w/Si&Gr)	(WGSa w/Si&Gr)	(Si w/Gr)	(WGGr w/Si&Sa)	(WGGr w/Sa)	(SiSa w/Gr)
NATURAL MOISTURE			2.9		13.4			2.4
ORGANICS			0.8		2.1			2.9
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. FACTOR								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS					sl Org[1]			sl Org[1]

GENERAL COMMENTS

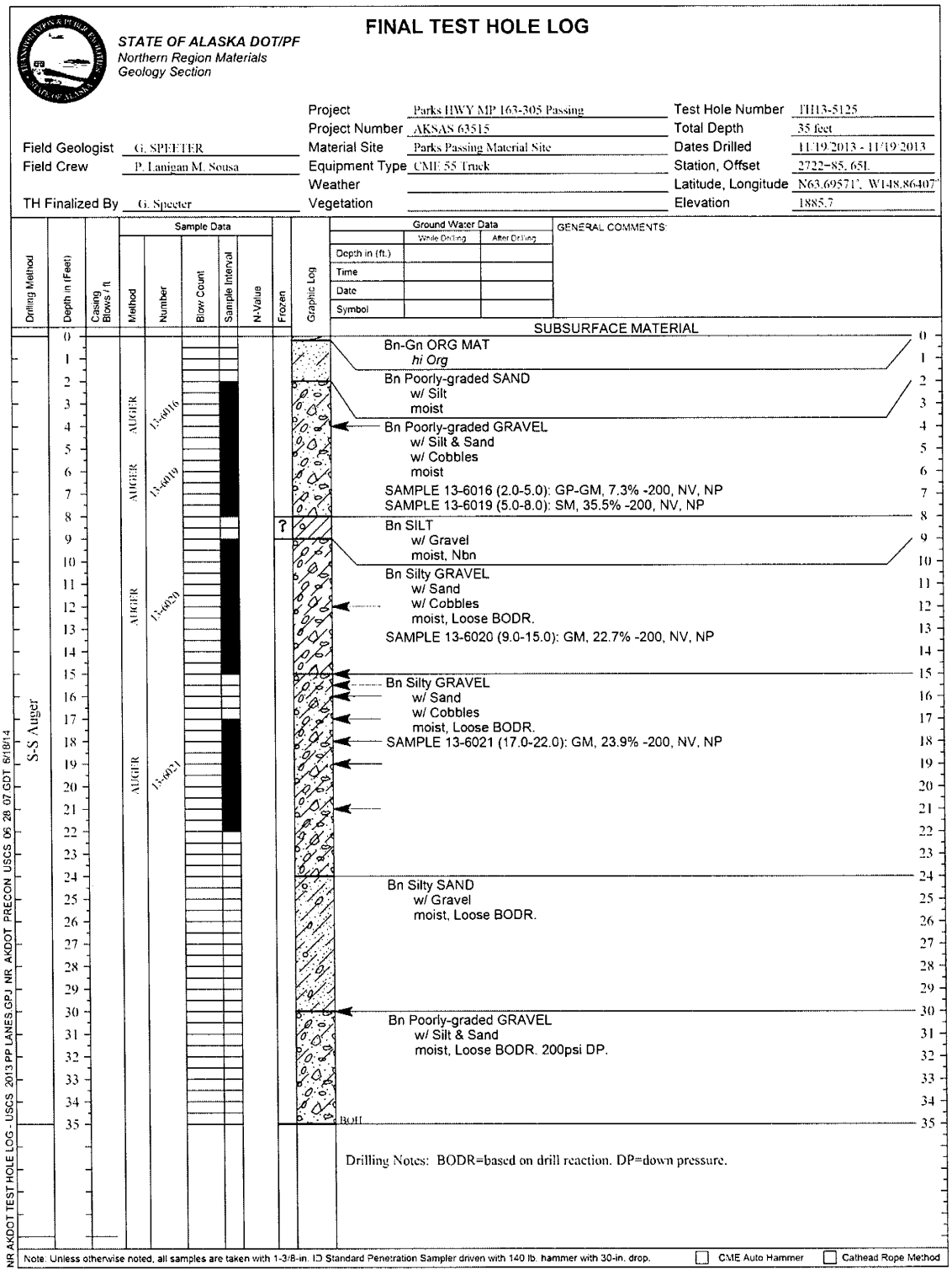
Gradation is based on material passing the 3" sieve, according to Alaska Test Method T-7.

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

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

USCS Soil Description Abbreviations: W - Well-graded; P - Poorly-graded; E - Elastic; L - Lean; F - Fat

Appendix C. Road Cut Drilling Test Hole Logs


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Parks HWY MP 163-305 Passing
Project Number AKSAS 63515
Material Site Parks Passing Material Site
Equipment Type CME 55 Truck
Weather
Vegetation
Test Hole Number TH13-5125
Total Depth 35 feet
Dates Drilled 11/19/2013 - 11/19/2013
Station, Offset 2722+85, 65L
Latitude, Longitude N63.69571°, W148.86407°
Elevation 1885.7
Field Geologist G. SPEETER
Field Crew P. Lanigan M. Sousa
TH Finalized By G. Speeter
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
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
13-6016
13-6019
13-6020
13-6021
Bn-Gn ORG MAT
hi Org
Bn Poorly-graded SAND
w/ Silt
moist
Bn Poorly-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
moist
SAMPLE 13-6016 (2.0-5.0): GP-GM, 7.3% -200, NV, NP
SAMPLE 13-6019 (5.0-8.0): SM, 35.5% -200, NV, NP
Bn SILT
w/ Gravel
moist, Nbn
Bn Silty GRAVEL
w/ Sand
w/ Cobbles
moist, Loose BODR.
SAMPLE 13-6020 (9.0-15.0): GM, 22.7% -200, NV, NP
Bn Silty GRAVEL
w/ Sand
w/ Cobbles
moist, Loose BODR.
SAMPLE 13-6021 (17.0-22.0): GM, 23.9% -200, NV, NP
Bn Silty SAND
w/ Gravel
moist, Loose BODR.
Bn Poorly-graded GRAVEL
w/ Silt & Sand
moist, Loose BODR. 200psi DP.
BOH
Drilling Notes: BODR=based on drill reaction. DP=down pressure.
NR AKDOT TEST HOLE LOG - USCS 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 05.28.07.GDT 6/18/14
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	Parks HWY MP 163-305 Passing	Test Hole Number	HH13-5128
Project Number	AKSAS 63515	Total Depth	22 feet
Material Site	Parks Passing Material Site	Dates Drilled	11 22 2013 - 11 22 2013
Equipment Type	CME 55 Truck	Station, Offset	2714+85, 10R
Weather		Latitude, Longitude	N63.69479°, W148.86024°
Vegetation		Elevation	1877.1
Field Geologist	G. SPEETER		
Field Crew	P. Lanigan M. Sousa		
TH Finalized By	G. Speeter		

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

GENERAL COMMENTS

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									Bn-Gn ORG MAT *hi Org*
	1									Bn Poorly-graded SAND w/ Silt moist
	2									
	3		AUGER	13-6029						Bn Silty SAND w/ Gravel w/ Cobbles
	4									SAMPLE 13-6029 (1.0-5.0): SM, 44% -200, LL 24, NP
	5									
	6									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist, Loose BODR.
	7									
	8									SAMPLE 13-6030 (6.0-14.0): GP-GM, 6.3% -200, LA 13, DEG 70, NV, NP
	9									
	10		AUGER	13-6030						
	11									
	12									
	13									
	14									Bn Silty SAND w/ Gravel w/ Cobbles moist, Poor returns.
	15									
	16									
	17									
	18									
	19									
	20									
	21									
	22									BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR AKDOT PRECON USCS 06 28 07.GDT 6/18/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5129
Project Number	AKSAS 63515	Total Depth	23 feet
Material Site	Parks Passing Material Site	Dates Drilled	11/23/2013 - 11/23/2013
Equipment Type	CME 55 Truck	Station, Offset	2677+10, 75L
Weather		Latitude, Longitude	N63.68771°, W148.84329°
Vegetation		Elevation	1820.2
Field Geologist	G. SPEETER		
Field Crew	P. Lanigan M. Sousa		
TH Finalized By	G. Speeter		

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

GENERAL COMMENTS:

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	0–1		AUGER	13-6031						Gn-Bn ORG MAT *hi Org*
	1–2									Bn Silty SAND w/ Gravel moist
	2–3									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	3–4									
	4–5									SAMPLE 13-6031 (1.0-9.0): GP-GM, 5.6% -200, NM 7.1%, ORG 1.8%, LA 20, DEG 78, NV, NP
	5–6									
	6–7									
	7–8									
	8–9									
	9–10									
	10–11									
	11–12									Bn Well-graded GRAVEL w/ Sand w/ Cobbles moist, Loose BODR. Intermittent sand layers BODR.
	12–13									
	13–14									
	14–15		AUGER	13-6032						SAMPLE 13-6032 (14.0-20.0): GW, 3% -200, LA 18, DEG 74, NV, NP
	15–16									
	16–17									
	17–18									
	18–19									
	19–20									
	20–21									
	21–22									
	22–23									
	23									BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 6/18/14

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Parks HWY MP 163-305 Passing	Test Hole Number	TH13-5130
Project Number	AKSAS 63515	Total Depth	23 feet
Material Site	Parks Passing Material Site	Dates Drilled	11/23/2013 - 11/23/2013
Equipment Type	CME 55 Truck	Station, Offset	2697+00, 90L
Weather		Latitude, Longitude	N63.69123°, W148.85256°
Vegetation		Elevation	1874.4

Field Geologist: G. SPEETER
Field Crew: P. Lanigan M. Sousa
TH Finalized By: G. Speeter

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

GENERAL COMMENTS:

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		AUGER	13-6033						Gn ORG MAT *hi Org*
	1									Bn Silty SAND moist
	2									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist
	3									
	4									Bn Silty SAND w/ Gravel moist
	5									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles moist, Loose BODR. 100psi DP.
	6									
	7									SAMPLE 13-6033 (5.5-17.5): GP, 4.1% -200, NM 4.6%, ORG 1.0%, LA 16, DEG 77, NV, NP
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									Bn Poorly-graded SAND w/ Silt & Gravel moist, Field call BODR poor returns.
	19									
	20									Bn Poorly-graded GRAVEL w/ Silt & Sand w/ Cobbles
	21									
	22									
	23									BOH

Drilling Notes: BODR=based on drill reaction. DP=down pressure.

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 2013 PP LANES.GPJ NR_AKDOT_PRECON_USCS 06 28 07.GDT 6/18/14

Appendix D. Laboratory Data from Road Cut Drilling

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Parks HWY MP 163-305 Passing
PROJECT NUMBER:	
AKSAS NUMBER:	63515
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Parks Highway Road Cuts

TEST HOLE NUMBER		TH13-5125	TH13-5125	TH13-5125	TH13-5125	TH13-5128	TH13-5128	TH13-5129
DEPTH (feet)		2.0-5.0	5.0-8.0	9.0-15.0	17.0-22.0	1.0-5.0	6.0-14.0	1.0-9.0
LATITUDE		2722+85	2722+85	2722+85	2722+85	2714+85	2714+85	2677+10
LONGITUDE		65L	65L	65L	65L	10R	10R	75L
LAB NUMBER		**13-6016**	**13-6019**	**13-6020**	**13-6021**	**13-6029**	**13-6030**	**13-6031**
DATE SAMPLED		19-Nov-13	19-Nov-13	19-Nov-13	19-Nov-13	22-Nov-13	22-Nov-13	23-Nov-13
% Passing	**3"**						96	
	2"	85					84	98
	1.5"	77		86			67	92
Gravel	**1.0"**	59		77	95		44	77
	0.75"	49	99	74	93		30	65
	0.5"	35	98	68	83	97	21	50
	0.375"	29	96	63	75	94	18	42
	#4	22	92	54	58	84	15	29
	#8	19	89	49			14	21
	#10	19	89	48			14	20
	#16	18	86	44	42	63	13	16
	#30	16	79	39			12	12
Sand	**#40**	14	74	37			11	11
	#50	13	65	34			10	9
	#60	12	61	32			10	9
	#80	11	52	30			9	8
	#100	10	48	28	29	48	8	7
Silt/Clay	**#200**	7.3	35.5	22.7	23.9	44.0	6.3	5.6
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	24	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		GP-GM	SM	GM			GP-GM	GP-GM
USCS SOIL DESCRIPTION		(PGGr w/Si&Sa)	(PGGr w/Si&Sa)	(SiGr w/Sa)	(PGGr w/Si&Sa)	(SiSa w/Gr)	(PGGr w/Si&Sa)	(PGGr w/Si&Sa)
NATURAL MOISTURE								7.1
ORGANICS								1.8
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION							13	20
DEGRAD. FACTOR							70	78
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:	Parks HWY MP 163-305 Passing
PROJECT NUMBER:	
AKSAS NUMBER:	63515
SAMPLED BY:	G. Speeter
MATERIAL SOURCE:	Parks Highway Road Cuts

TEST HOLE NUMBER		TH13-5129	TH13-5130					
DEPTH (feet)		14.0-20.0	5.5-17.5					
LATITUDE		2677+10	2697+00					
LONGITUDE		75L	90L					
LAB NUMBER		**13-6032**	**13-6033**					
DATE SAMPLED		23-Nov-13	23-Nov-13					
% Passing	**3"**							
	2"		93					
	1.5"	89	85					
Gravel	**1.0"**	67	71					
	0.75"	53	57					
	0.5"	38	42					
	0.375"	30	33					
	#4	18	22					
	#8	12	17					
	#10	12	16					
	#16	9	14					
	#30	7	11					
Sand	**#40**	6	9					
	#50	5	7					
	#60	5	7					
	#80	4	6					
	#100	4	5					
Silt/Clay	**#200**	3.0	4.1					
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV					
PLASTIC INDEX		NP	NP					
USCS CLASSIFICATION		GW	GP					
USCS SOIL DESCRIPTION		(WGGr w/Sa)	(PGGr w/Si&Sa)					
NATURAL MOISTURE			4.6					
ORGANICS			1.0					
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		18	16					
DEGRAD. FACTOR		74	77					
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS								

GENERAL COMMENTS

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

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

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

USCS Soil Description Abbreviations: W Well-graded; P Poorly-graded; E Elastic; L Lean; F Fat

Appendix E. Drilling Photographs

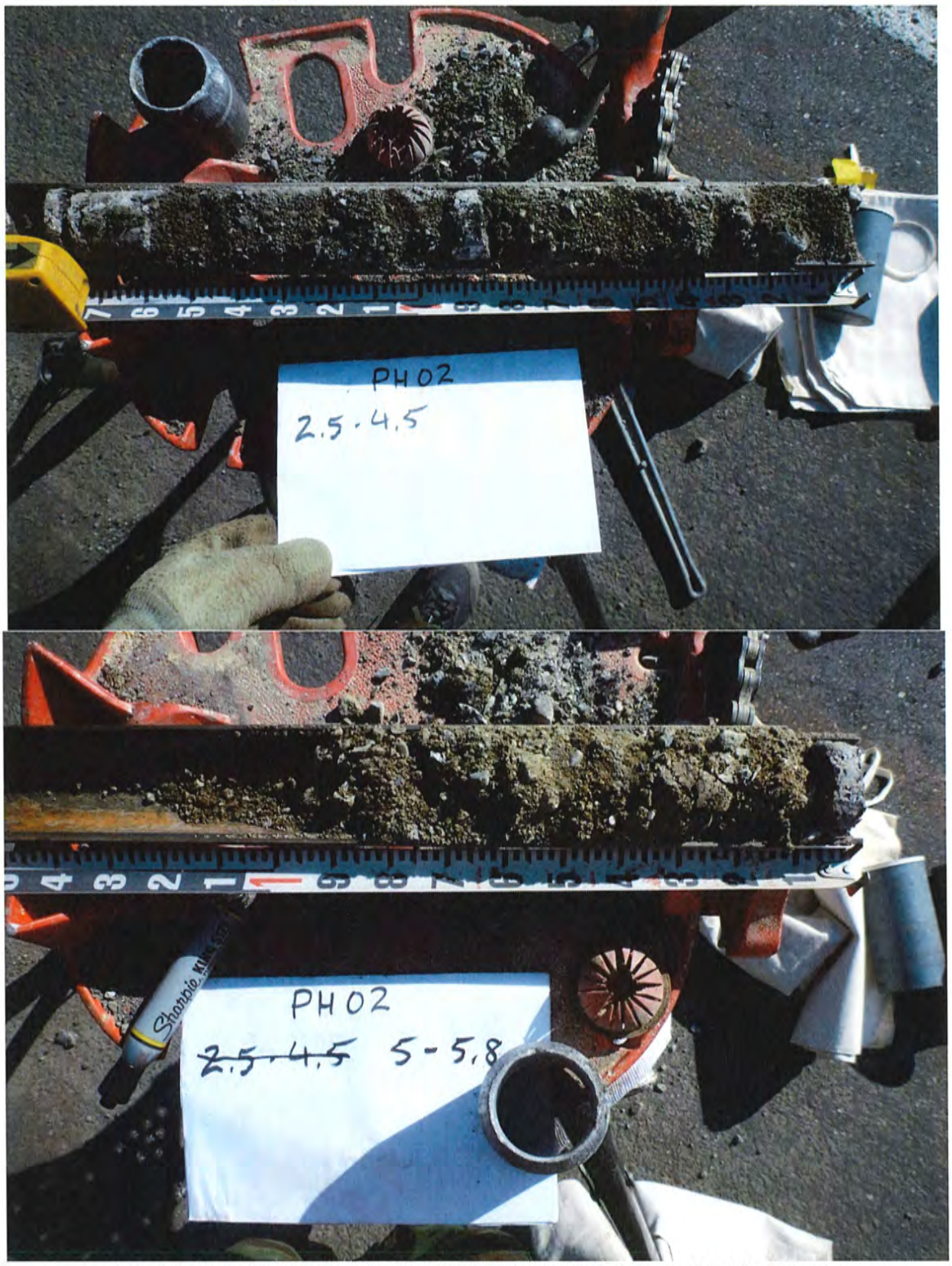


Figure 3. Samples from TH14-1021 2.5to 4.5 feet (top) and 5 to 5.8 feet (bottom).

Figure 4. Samples from TH14-1021 7.5 to 9.5 feet (top) and 10 to 10.8 feet (bottom).

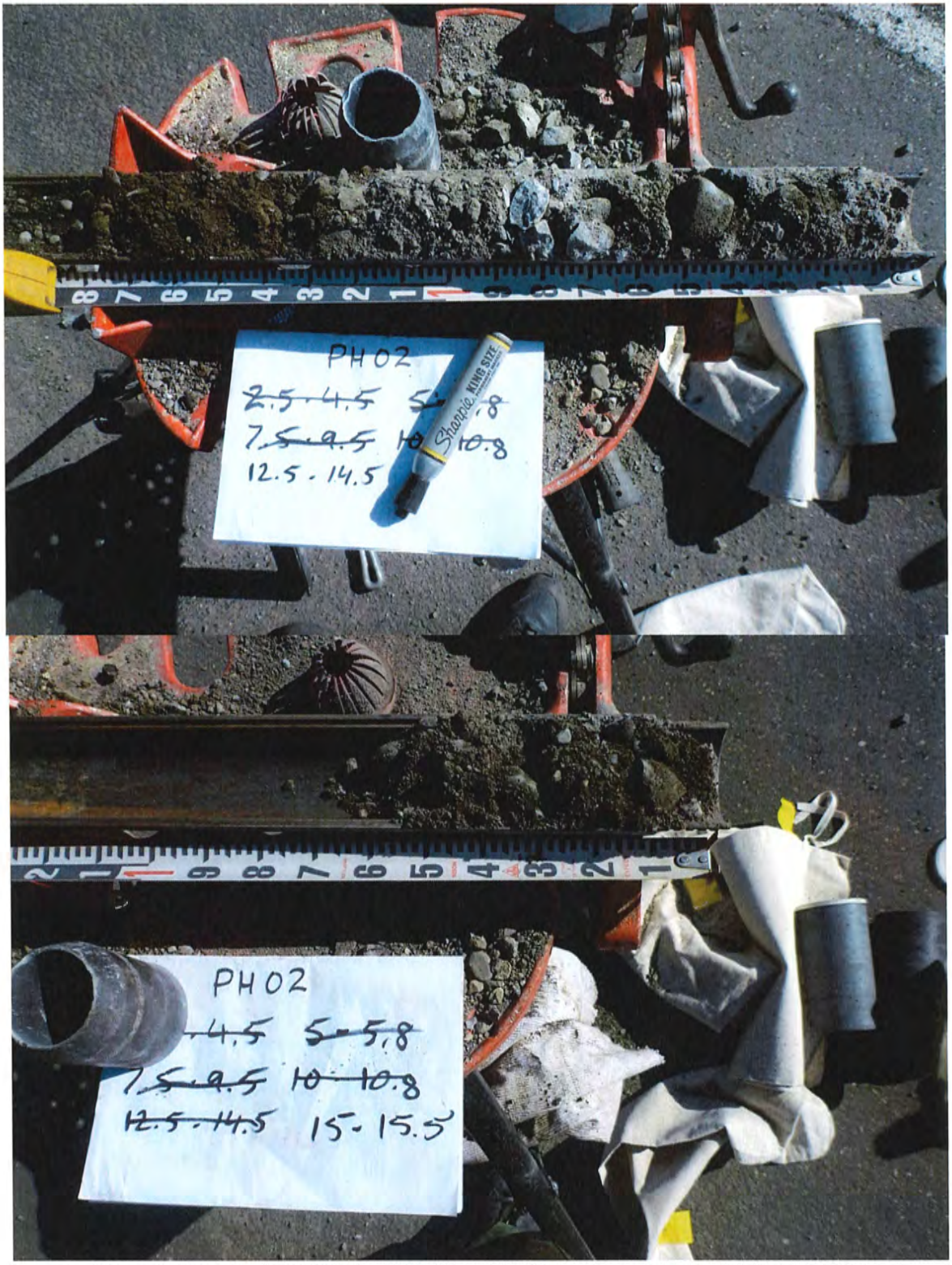


Figure 5. Samples from TH14-1021 12.5 to 14.5 feet (top) and 15 to 15.5 feet (bottom).

Figure 6. Samples from TH14-1021 20 to 20.2 feet (top) 22.5 to 24.5 feet (bottom).

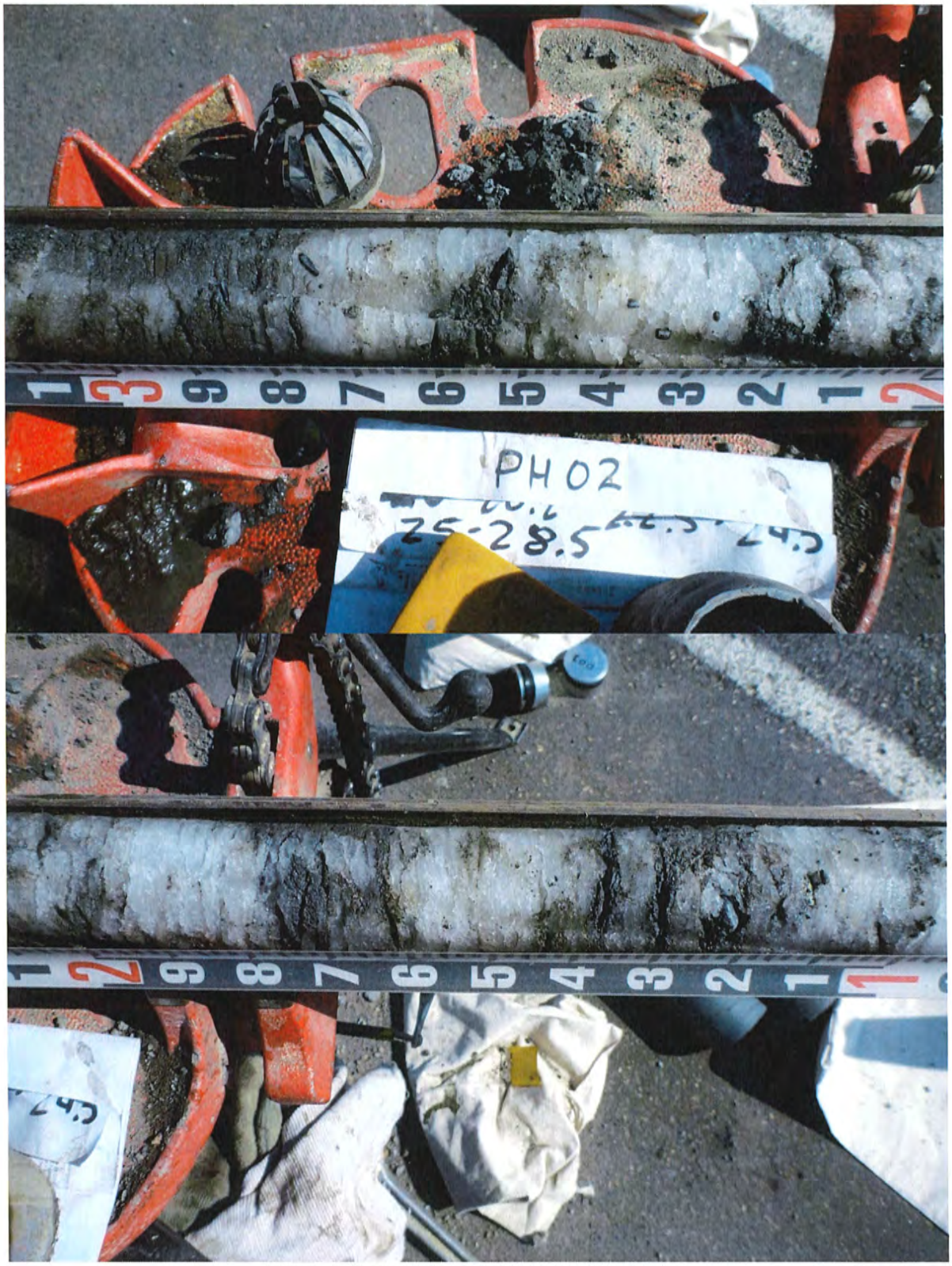


Figure 7. Samples from TH14-1021 25-28.5 feet.

Figure 8. Samples from TH14-1021 28.5 to 30.5 feet.

Figure 9. Samples from TH14-1024 2.5 to 4.5 feet (top) 5 to 7 feet (bottom).

Figure 10. Samples from TH14-1024 10 to 12 feet (top) 7.5 to 9.5 feet (bottom).

Appendix F. Detailed Test Hole Maps

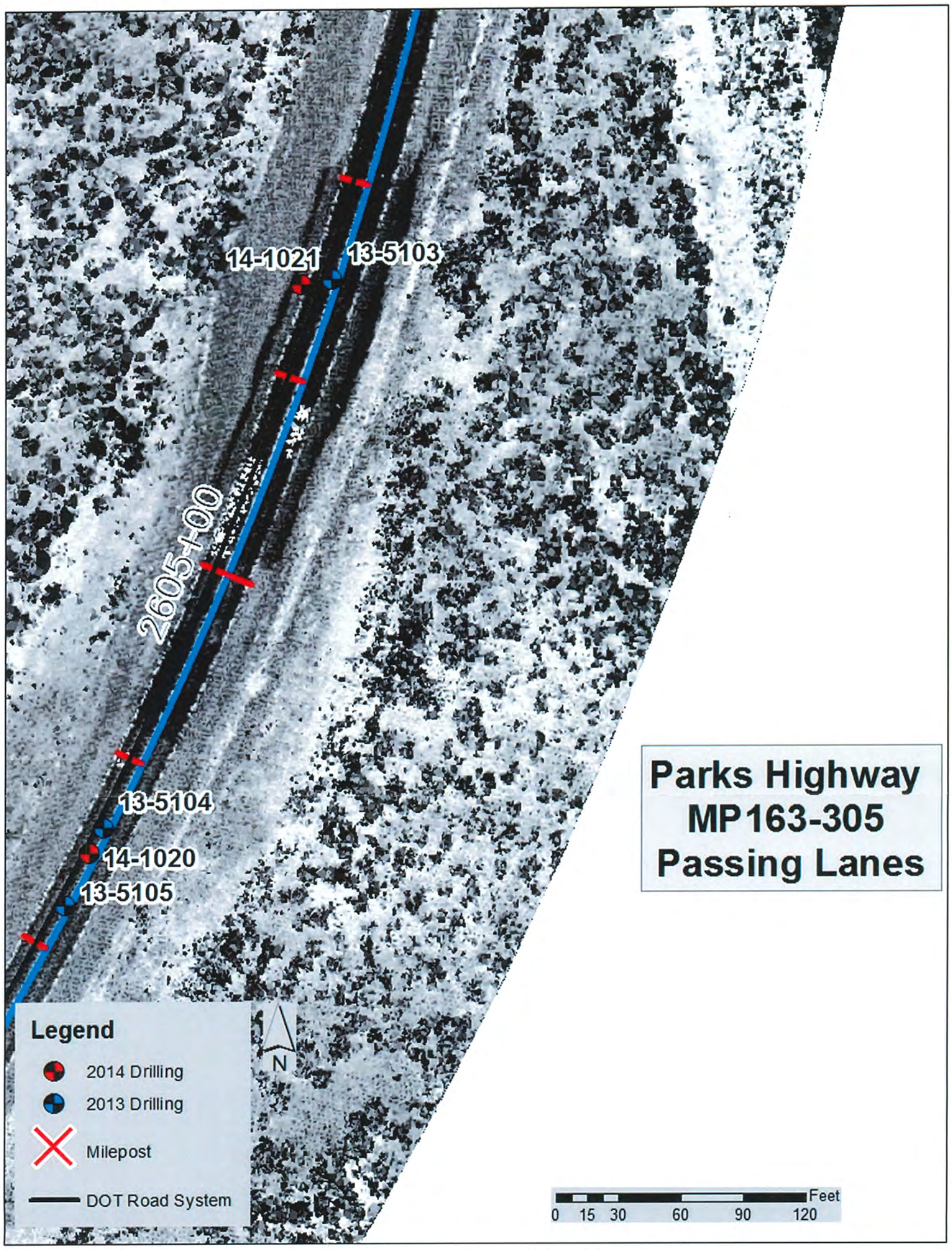


Figure 11. Map of Test holes 13-5105, 14-1020, 13-5104, 13-5103, and 14-1021.

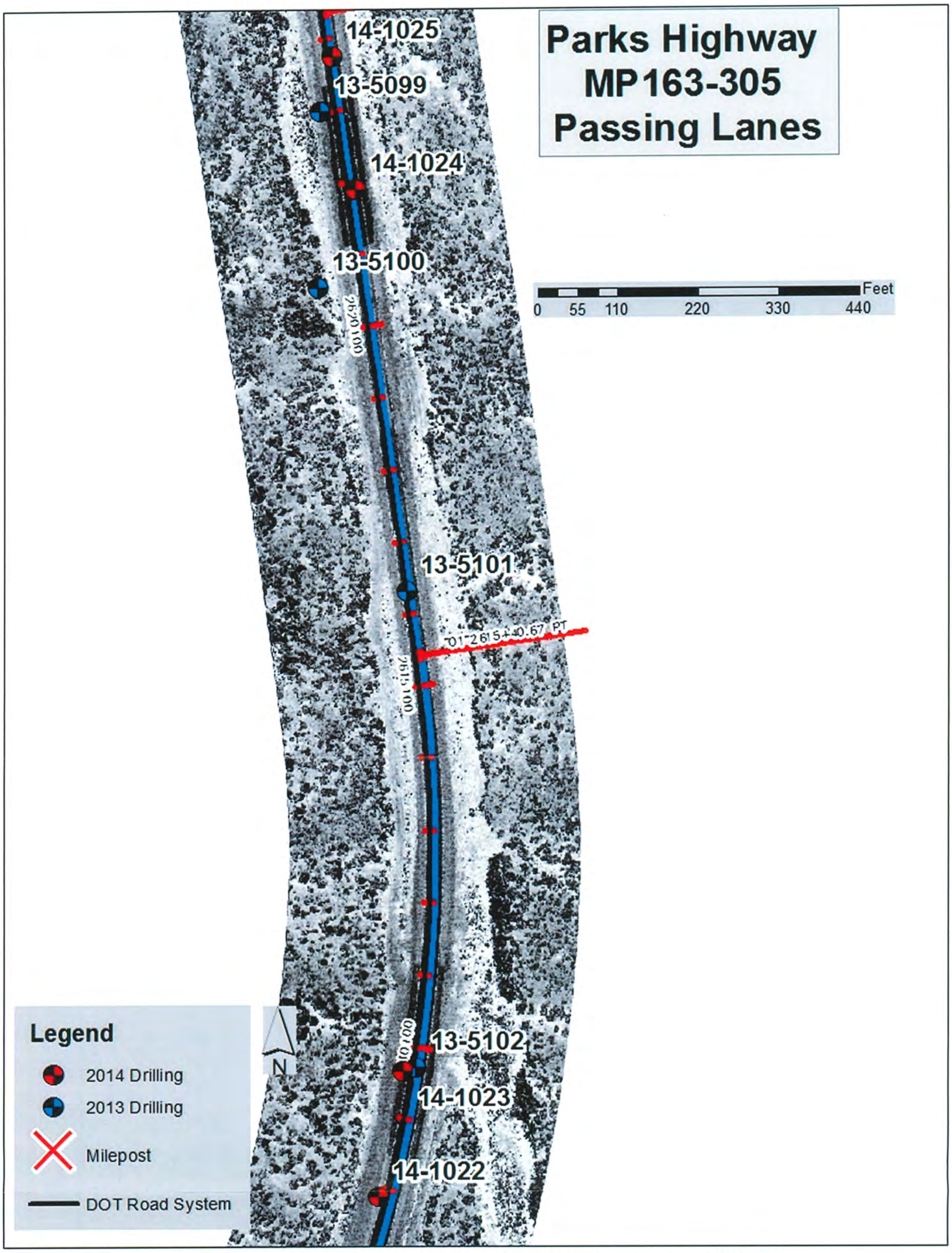


Figure 12. Map of test holes 14-1022, 14-1023, 13-5102, 13-5101, 13-5100, 14-1024, 13-5099, and 14-1025.

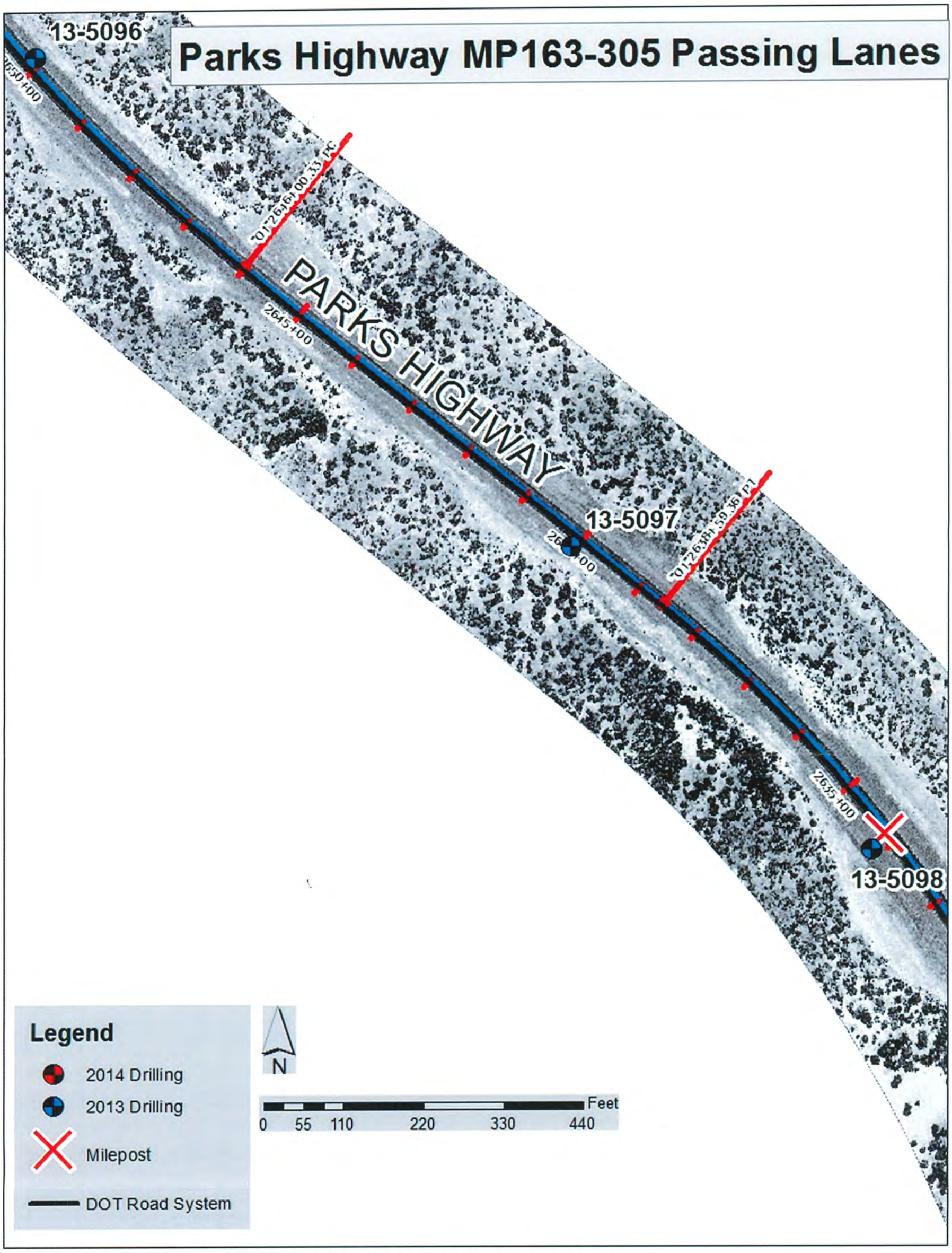


Figure 13. Map of test holes 13-5098, 13-5097, and 13-5096.

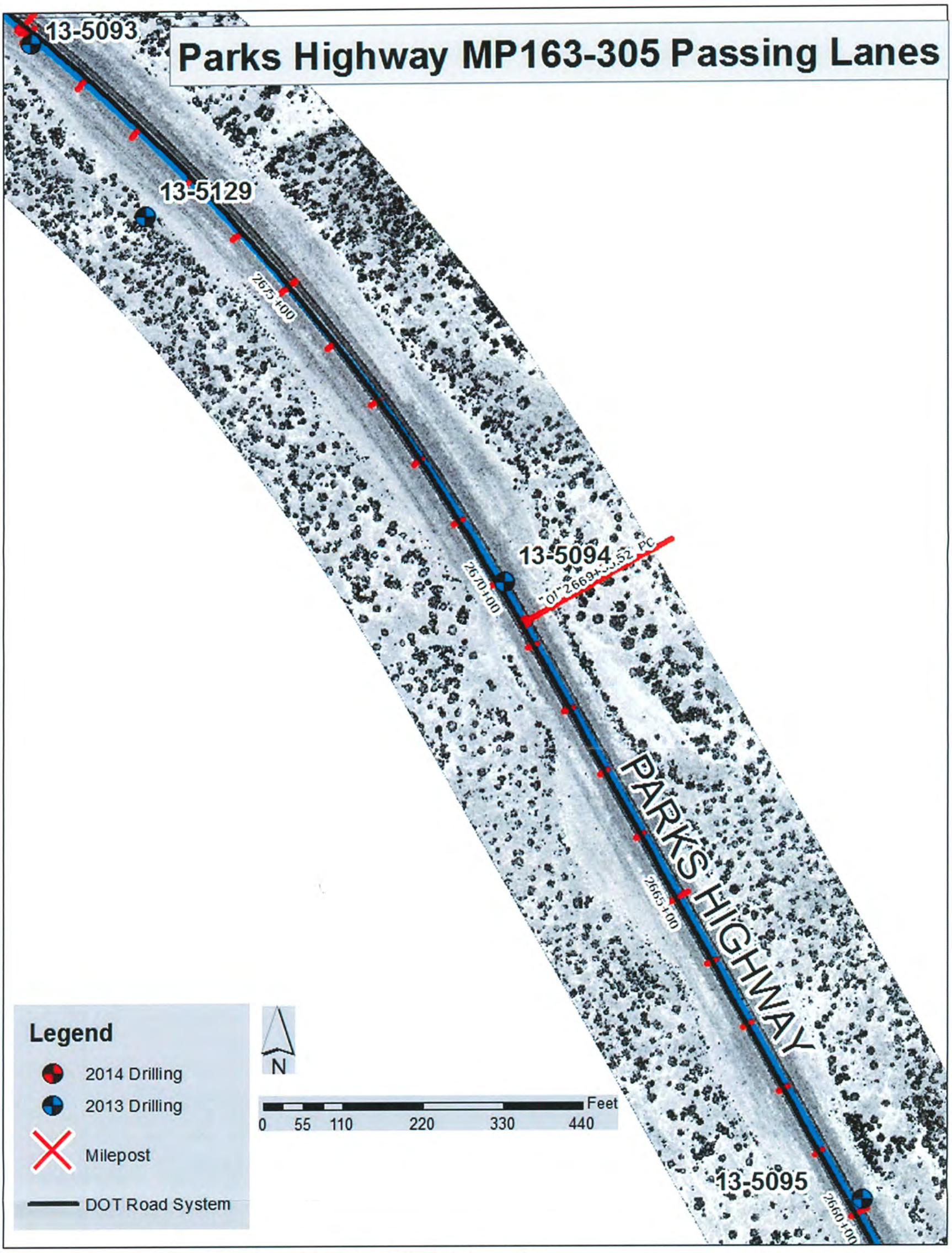


Figure 14. Map of test holes 13-5095, 13-5094, 13-5121, and 13-5093.

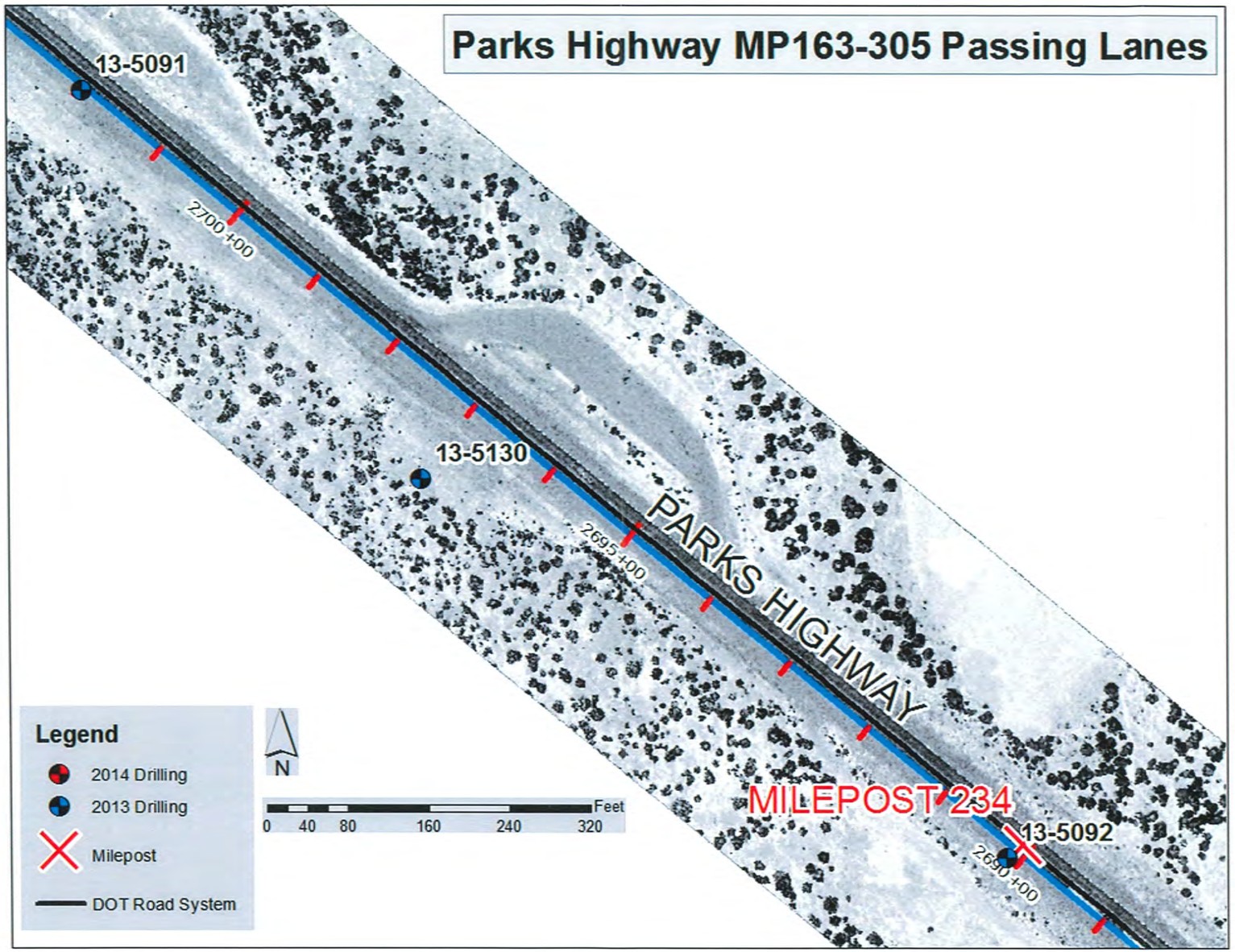


Figure 15. Map of test holes 13-5092, 13-5130, and 13-5091.

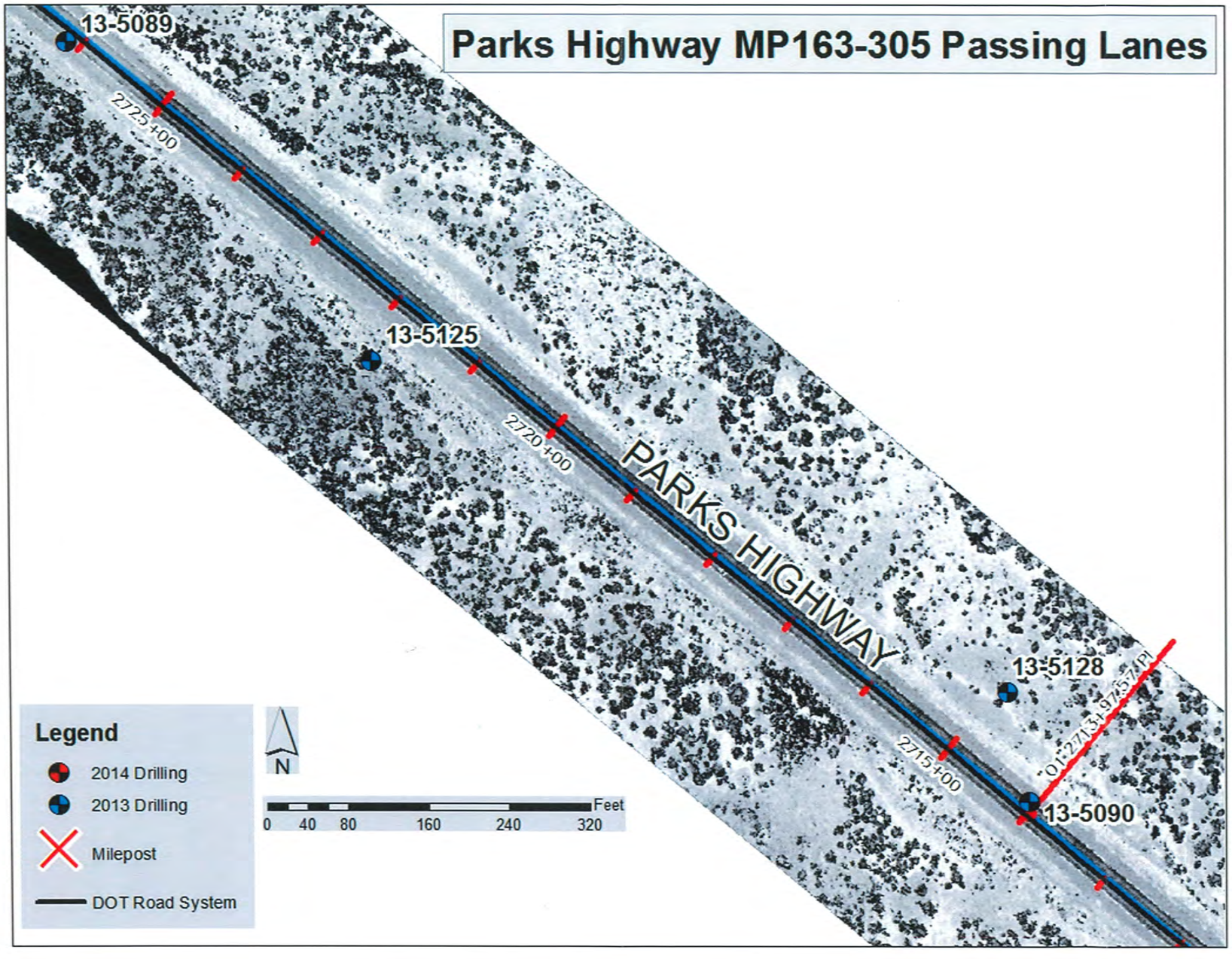
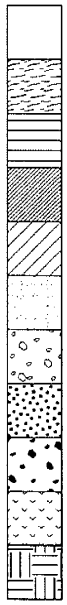


Figure 16. Map of test holes 13-5090, 13-5128, 13-5125, and 13-5089.

Appendix F. Symbols and Definitions

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

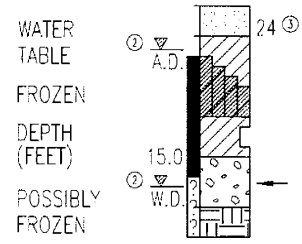
TEST RESULTS

_._%-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.

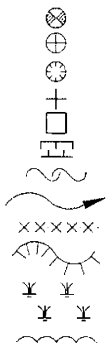
Tr	= TRACE
sl	= SLIGHTLY
hi	= HIGHLY
w/_	= WITH UNSPECIFIED AMOUNT
X'tls	= CRYSTALS
TH	= TEST HOLE
TT	= TEST TRENCH
TP	= TEST PIT

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 RELATIVE DENSITY	BLOWS/FOOT (N) VALUE	COHESIVE 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

DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

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

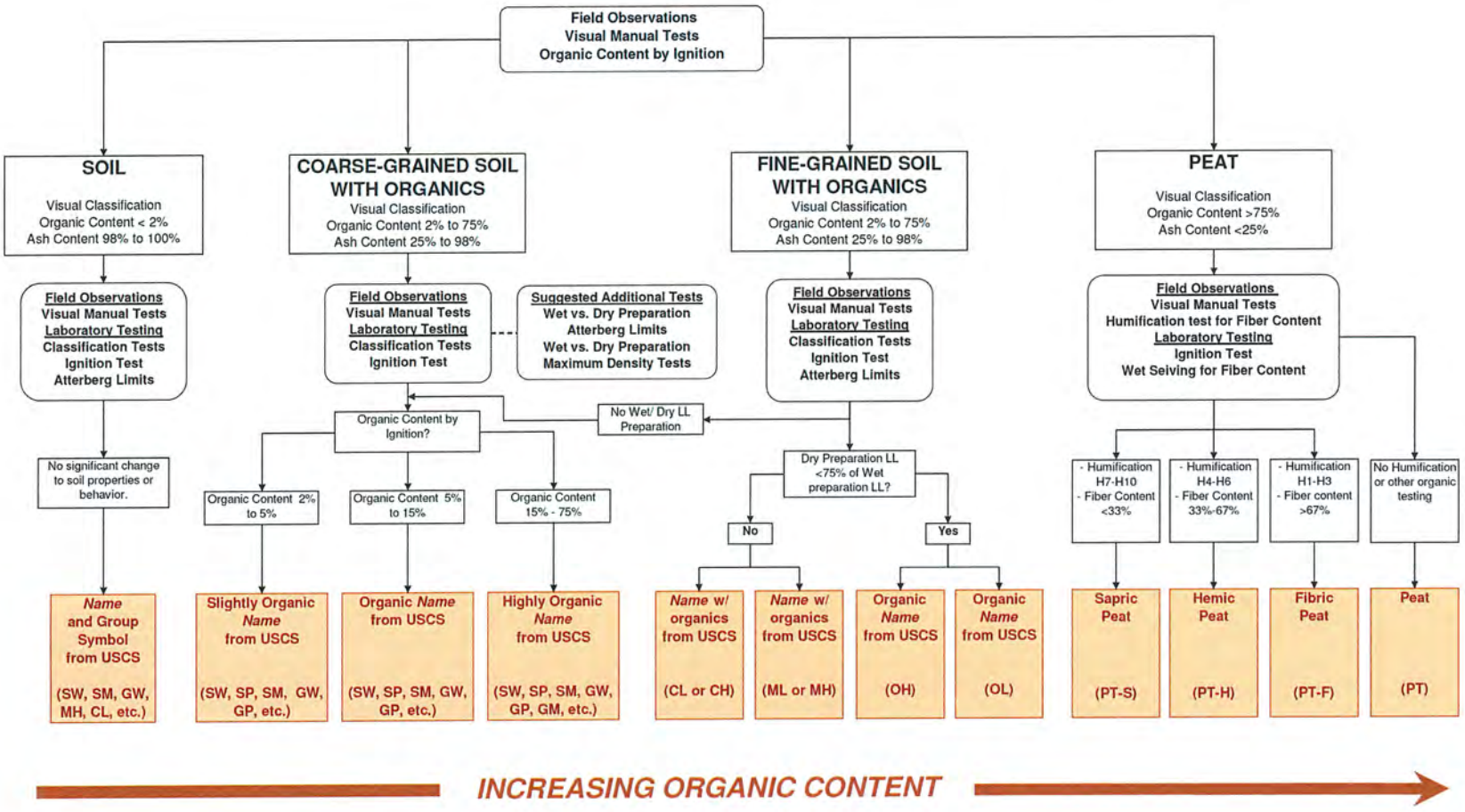
(b) Frozen soils in the N group may on close examination indicate presence of ice within the voids of the material by crystalline reflections or by a sheen on fractured or trimmed surfaces. However, the impression to the unaided eye is that none of the frozen water occupies space in excess of the original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

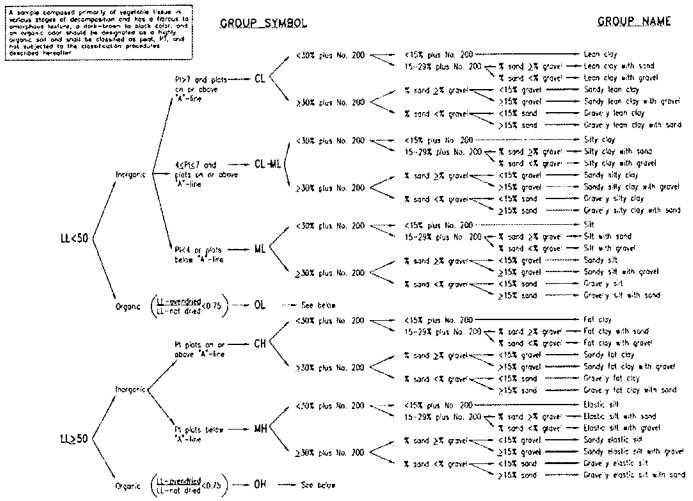
(d) Where special forms of ice, such as hoarfrost, can be distinguished, more explicit description should be given.

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

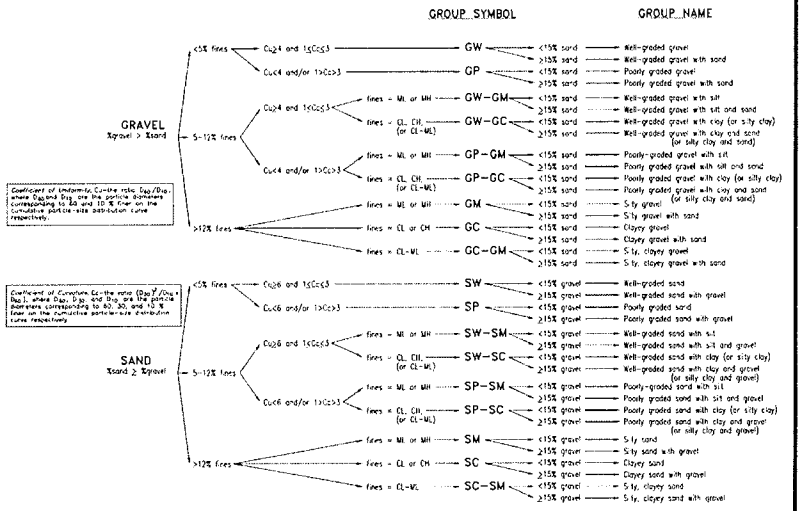
Peat and Organic Soil Classification System



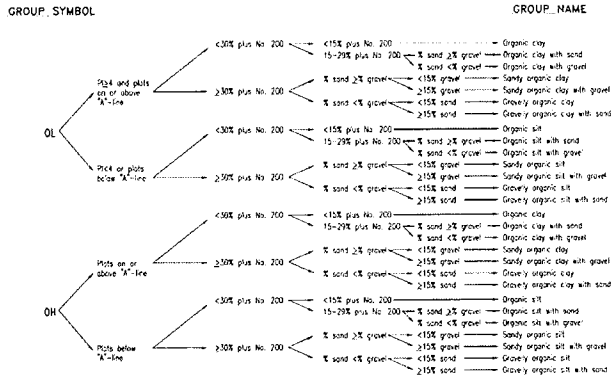
Classification of Soils for Engineering Purposes (Unified Soil Classification System)



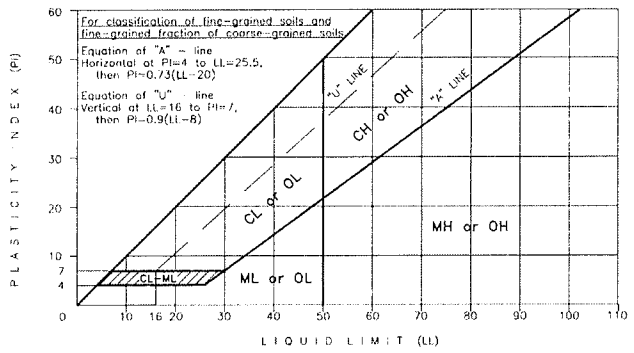
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)



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



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



Plasticity Chart