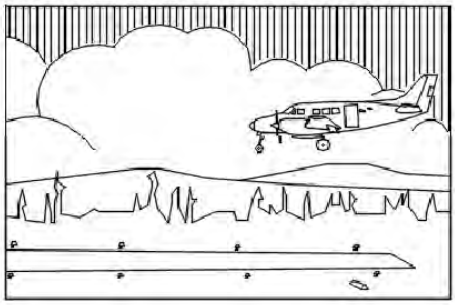
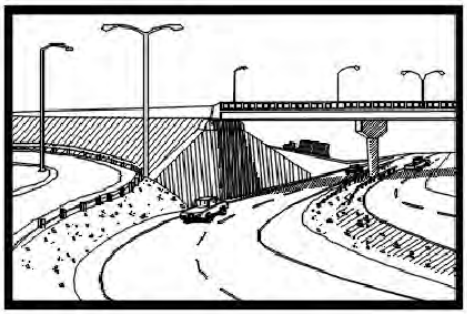
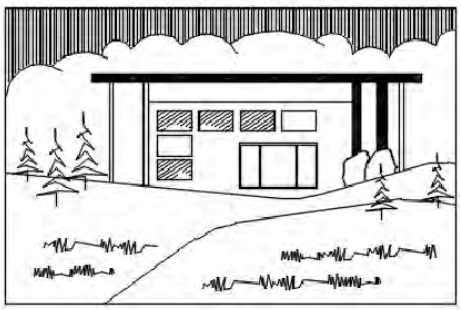
GEOTECHNICAL INVESTIGATION REPORT

NOORVIK AIRPORT REHABILTATION PROJECT

STATE PROJECT: NFAPT00255







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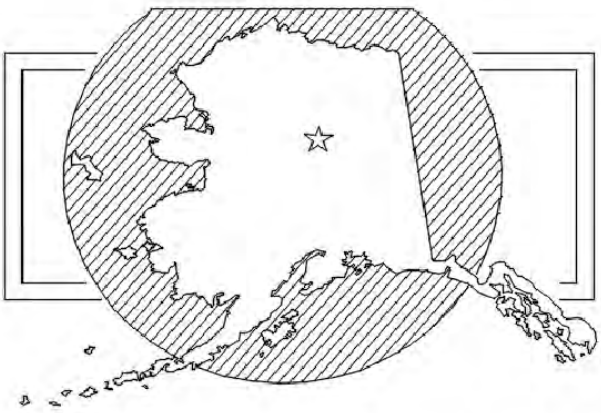

NORTHERN REGION

MARCH 2020

GEOTECHNICAL REPORT
Noorvik Airport Rehabilitation
Program: NFAPT00255
NORTHERN REGION MATERIALS SECTION
March 2020

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Contents

Introduction

At the request of Chris Johnston, P.E., the Northern Region Materials Section (NRMS) conducted an investigation in the vicinity of Noorvik, Alaska (Figure 1). The objectives were:

- Investigate foundation soil conditions for a proposed PAPI replacement.
- Investigate the embankment near areas of settlement and shoulder rotation cracks.
- Identify material for the project, including a source of crushable aggregate for surface course, selected material for embankment repair, and a silt-rich borrow to displace water collecting in settled areas at the toe of the embankment.

Previous investigations applicable to this project include:

State Department of Public Works, Engineering Geology and Soils Report, Noorvik Alaska, August, 1976.

DOT&PF, Engineering Geology Reconnaissance Report, Noorvik Landfill and Hotham Peak Road Material Sources, September, 1995.

Duane Miller and Associates, Geotechnical Investigation, Airport Material Sites, Noorvik Alaska, July 1997.

DOWL, Mining Plan of Operations and Reclamation Hotham Peak Material Site A, Noorvik, August 31, 2017

Summary

Centerline

Results from drilling in the runway indicate that the core of the embankment is thermally stable. In segments with deep fill (up to 11 feet thick), permafrost appears to be stable where the base of the embankment lies in contact with the original ground surface. In segments with thinner fill in the embankment core (up to 8 feet thick) and 2 inches of foam insulation, the top of permafrost appears to lie between the base of the embankment (original ground surface) and the top of visible ice encountered about 3 feet below it. Significant thaw degradation is occurring in the toe of the embankment, particularly in areas where the soil is ice rich. This thaw degradation extends to as far as 25 feet away from the toe, resulting in longitudinal cracks along the shoulder, and significant shoulder rotation.

Materials

Material site drilling and trenching indicates sufficient volumes of accessible selected materials to meet the project's embankment reconstruction needs. Abundant silt and silty sand overburden for use in slope flattening and pond displacement are stockpiled throughout the developed pit and may improve access to more valuable underlying materials if removed. Crushable material, capable of meeting Standard Airport Materials Specifications for Aggregate Surface Course, is available within the developed pit (Site A, Phase 2). Such material was also identified in an undeveloped areas, referred to in this report as Site A Expansion (Figure 8).

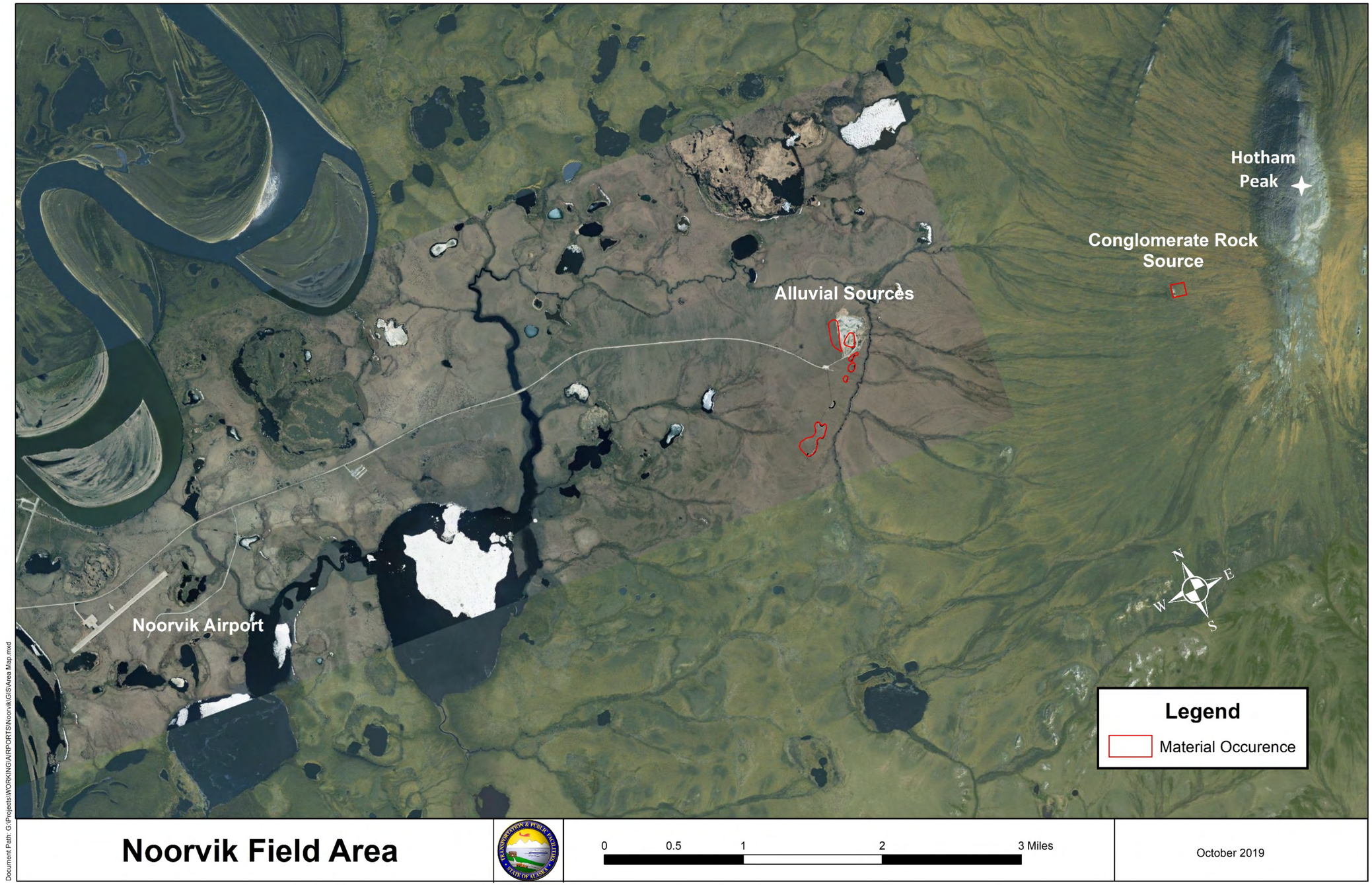

Figure 1. Noorvik Field Area

Physical Setting

Location

Noorvik is an Inupiat village of approximately 600 people located on the Lower Kobuk River, about 40 miles east of Kotzebue in northwest Alaska and within the boundaries of the Northwest Arctic Borough. Travelling to the area is by small aircraft throughout the year with scheduled flight service from Kotzebue. The Kobuk River is navigable from the end of May to early October.

Climate

The Environmental Atlas of Alaska, (Hartman, 1984) indicates the village of Noorvik is located in the transitional climate zone of Alaska, characterized by pronounced temperature variations throughout the day and year. Long term climate data is not available for the Noorvik area. Kotzebue airport at approximately 40 miles west of Noorvik and within the same climate zone is used as a comparison. Table 1 below gives climate data for the Kotzebue Airport area. It should be noted that temperatures in Noorvik are probably lower in the winter and higher in the summer than the Kotzebue area.

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

Table 1: Climate Data Summary. Data for Kotzebue Airport, period of Record: 9/1/1949 to 9/30/2012.

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

Data source: Western Regional Climate Center, wrcc@dri.edu.

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

Likewise, the freezing index, or degree-days below freezing, can be used to calculate the depth of ground freezing during winter. The freezing index listed below averages the annual freezing-degree-days (FDD) for the past thirty years. The design freezing index "coldest" averages the three coldest (highest) FDD for the same period. The "warmest" design freezing index averages the warmest (lowest) FDD.
No data was available for the project site, so data from Kotzebue is used to calculate the thermal indices. Noorvik should be expected to have a higher thawing index.

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

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

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

Data source: Alaska Climate Research Center, Geophysical Institute, University Alaska Fairbanks, climate.gi.alaska.edu.

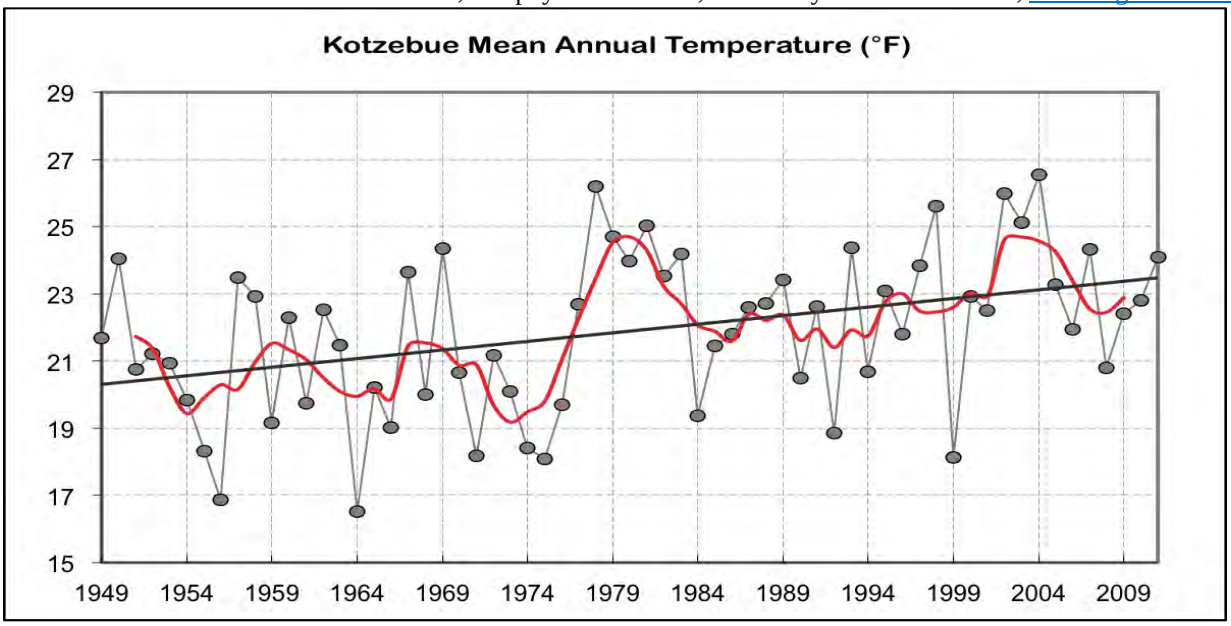

Figure 2: Kotzebue Airport Mean Annual Temperature (°F) from 1949 to 2009.

Geology and Topography

The village of Noorvik is located in the Western Alaska physiographic province and within the Kobuk - Selawik lowland division, (Wahrhaftig, 1965). The Kobuk river lowlands consist mainly of broad alluvial flood plains with numerous lakes and swampy terrain. The river is bordered by gravel and sand terraces 100 to 200 feet above the river level (Wahrhaftig, 1965).

The Hockley Hills at the west end of the Waring Mountains terminate at Hotham Peak, 10 miles east of Noorvik. These are a group of low, rounded hills less than 2,000 feet in elevation. The hills are composed of marine conglomerate, volcanic and calcareous graywacke, and mudstone, overlain by non-marine conglomerate, sandstone and mudstone. (Patton, 1968).

Seismicty

Noorvik lies in an area of low seismic activity, and as a result falls under Seismic Zone 2B according to The Uniform Building Code, 1997 version. The United States Geological Survey Seismic hazard map from 2007 give the area a peak ground acceleration of .10g to .20g, with a 10 percent probability of exceedance in 50 years. The mapped fault shown in red on Figure 3 is the Kobuk Fault and is mapped approximately 100 miles east of Noorvik (Figure 3).

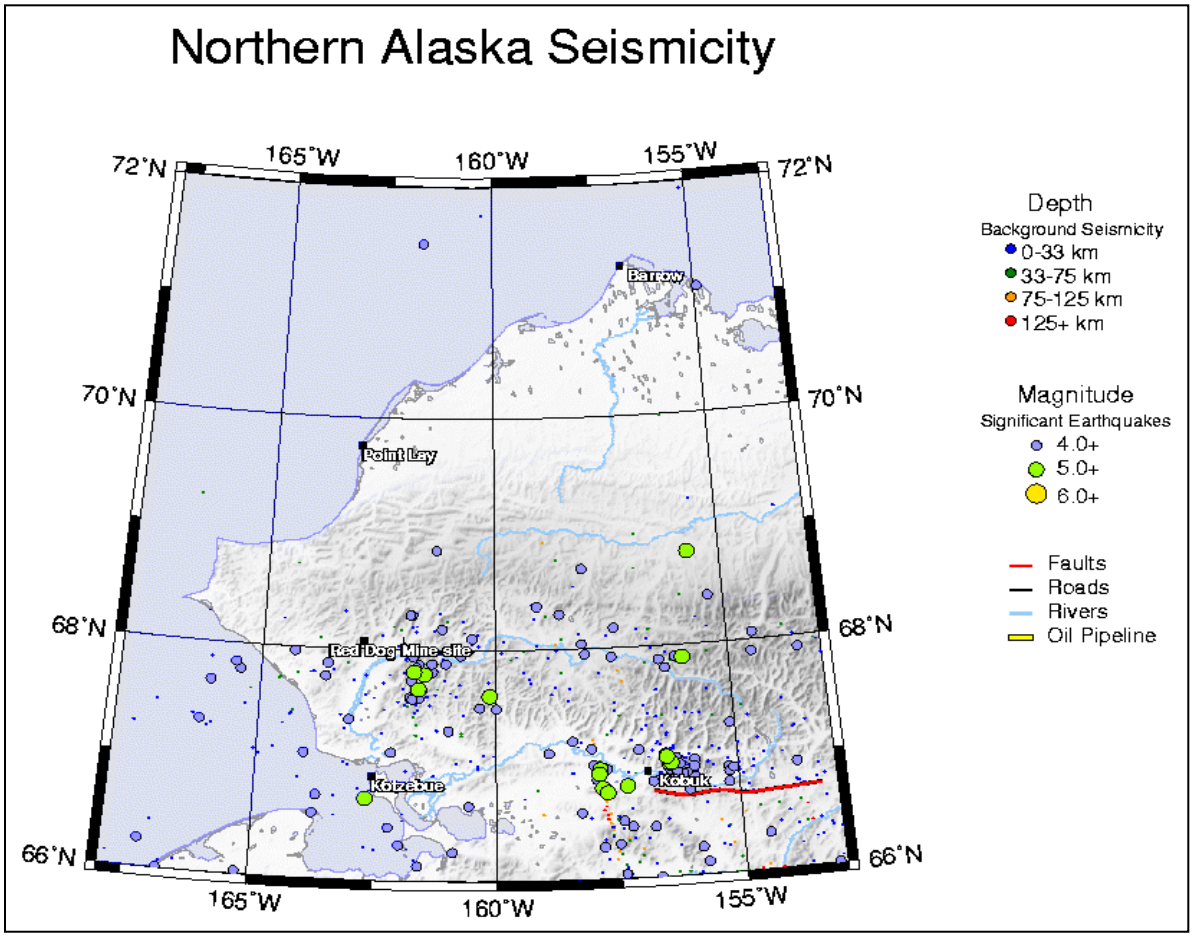

Figure 3: Northwestern Alaska Seismicity, Data from 1958 to 2003. Kiana is located in the lower center of the figure. Source: Alaska Earthquake Information Center. www.aeic.alaska.edu

Field Investigation

This subsurface investigation was conducted from June 17 through July 1, 2019. Several potential material sources were drilled, trenched, or surface sampled. 6 test holes were completed on the runway to provide information about thaw settlement and shoulder rotation. One test hole was drilled to investigate foundation soil for a proposed PAPI relocation. Thermistors were installed temporarily in 2 runway test holes and in the test hole near the PAPI. Data was recorded prior to removal of the thermistors at the end of the investigation. Soil thaw depth profiles were collected at right angles to the runway, adjacent to test holes, using a 6 foot frost probe. Field personnel included Regional Engineering Geologist G. Speeter, Engineering Geologist K. Maxwell and Drillers P. Lanigan, and T. Hartford. Drilling was accomplished using a track-mounted B-24 drill. Test holes were drilled using 4.5 inch solid-stem augers. Samples were collected from auger cuttings. Trenches were completed using a Volvo excavator leased from the City of Noorvik.

Soil samples and test hole conditions were logged in the field using the Unified Soil Classification System. Selected samples were submitted to Northern Region Materials Lab for testing. The testing program included particle size gradations for classification, moisture content analyses, and organic content analyses, as well as quality testing on gravel and bedrock samples. Locations were recorded using a Garmin hand-held GPS (datum NAD 83) with an accuracy of +/- 50 feet. Holes in the material site were backfilled with cuttings.

Centerline Investigation Results

Runway Embankment

Shoulder cracking and rotation are most severe in the same segments where the deepest thaw penetration and greatest surface polygon development were observed, due to thaw consolidation of ice rich foundation soil at the toe of the embankment (Figure 4). We believe that cracking may be exacerbated by the upper 3 to 4 feet of embankment slipping along the inclined surface of the foam insulation, where shoulder settlement resulted in the foam panels dipping toward the embankment toe.

Figure 4. Shoulder cracks and ponding looking southwest at the PAPI and TH19-3030.

6 test holes (TH19-3027 thru TH19-3029, and TH19-3031 thru TH19-3033) were drilled through the embankment, adjacent to settlement areas, to investigate embankment construction and subsurface conditions which may have an impact on embankment settlement (Figure 5). The embankment was constructed with a variety of materials including silty gravel, gravel with silt and sand, gravel with sand, fine-grained poorly-graded sand, as well as silt in some of the deeper fill portions of the embankment. 2 inches of foam insulation was encountered in 4 test holes (TH19-3027 thru TH19-3029 and TH19-3033), where the embankment was found to be less than 8 feet thick. Insulation was not found in two test holes (TH19-3031 and TH19-3032) where the embankment was found to be at least 11 feet thick, at the east end (Figure 5).

Thaw unstable foundation soil was encountered in all 5 test holes (TH19-3028, TH19-3029, and TH19-3031 thru TH19-3033) which reached below the embankment (Appendix A). Thaw depth profiles were collected adjacent to each of these test holes, as well as TH19-3030, near the PAPI. The deepest and widest thaw penetration was observed near TH19-3030 and TH19-3033, where surface polygons are most developed. Thaw depth profiles were measured in tundra soil, adjacent to test holes at 14 locations using a 72 inch frost probe (Figure 5). Thaw depth profiles were oriented at right angles to the embankment, starting at the embankment toe and ending in undisturbed ground, in order to determine the lateral extent of permafrost thawing associated with embankment toe settlement. The potential full depth of seasonal thaw penetration may not occur until mid-August for shallow, undisturbed tundra soil, and September or later for soil in deep ponded areas. Thaw depth profile data and location detail may be found in Appendix D.

Thermistor data was collected in TH19-3030, TH19-3031 and TH19-3033. The temperature gradient from TH19-3030 was collected in undisturbed ground. The temperature gradient from TH19-3031 and TH19-3033 were collected through the embankment. The embankment at TH19-3031 is 11 feet thick and not insulated with foam. Permafrost appears to be stable near its preconstruction depth where the base of the embankment lies in contact with original ground surface here. The embankment at TH19-3033 is 8 feet thick and insulated. The top of permafrost appears to lie between the base of the embankment (original ground surface) and the top of visible ice encountered about 3 feet below it. Thermistor data and thermographs are found in Appendix C.

PAPI

The PAPI embankment is exhibiting the same toe settling, shoulder cracking and rotation that is occurring in the adjacent runway embankment. This is results in sufficient embankment settling to require frequent releveling of the PAPI lights.

Thaw profile data was collected across and adjacent to the PAPI Embankment on July 27, 2019 (Figure 6). Measurements of depth to frozen soil indicate ice rich permafrost soil below and abutting the embankment toe has experienced surface thawing to depths several feet deeper than is typically found here in undisturbed soil. The resulting thawed wet silt exhibits low bearing capacity.

TH19-3030 was drilled in undisturbed ground near the existing PAPI (Figure 4). Frozen silt and silt with sand was encountered to the bottom of the hole at 27 feet below ground (bgs), starting immediately beneath the 6 inch organic mat. Ice content varies from segregated visible ice (Vx) to non-visible ice, bonded, without excess moisture (Nbn), and generally decreases with depth. A thermistor was installed on 6-21-19 and recorded on 6-29-19. The data and thermograph are found in Appendix C.

Figure 5. Map of airport test holes, thaw depth profile locations, and occurrence of foam insulation in runway test holes.

Figure 6. Location of thaw depth profiles adjacent to PAPI showing depth of thaw at intervals along the profile

Material Source Investigation Results

Hotham Peak

The west side of Hotham Peak was investigated at a reconnaissance level as a potential hard rock source (Figure 1). A matrix-supported quartz conglomerate outcrop lies about 2 miles east of the Hotham Peak Material Site A. This rock occurs over an expansive area, however the matrix is soft and precludes the use of this material as a source for crushed products.

Table 3. Hotham Peak Conglomerate Material Quality [# of analyses]

Sample Number	LA Abrasion %	Degradation Value
19-3669, 19-3670, 19-3671 and 19-3672	40-50 [4]	16-49 [4]

4 samples (19-3669, 19-3670, 19-3671 and 19-3672) were analyzed for rock quality. 3 of the 4 samples failed to meet Standard Airport Materials Specifications for all crushed products.

Hotham Peak Material Site

The areas investigated within the active pit are identified by designations included in the NANA Corporation mining plan (Figure 7). Several areas in and around the Hotham Peak Material Site were investigated as potential alluvial material sources (Figure 8):

1. A portion of the active material site identified as Site A/Phase 2 was investigated with test trenching.
2. A proposed expansion area, northwest of the developed portion of the active material site, identified as Site A/Phase 4, was investigated with test drilling.
3. An area immediately to the southwest of the developed portion of the active material site has gravel exposed at the surface. This area, referred to in this report as Site A Expansion was investigated with test drilling and trenching.
4. An area about 2000 feet to the southwest of Site A, identified as Site B, was investigated with test drilling.

Site Description and Access

The Hotham Peak Material Site lies about 6 miles east of the Noorvik. This site is located in T16N, R10W, Sections 3, 4 & 9, Kateel River Meridian. It is accessed by single-lane road from the village. Site A comprises about 30 acres, with over half of the site mined to basal silt and sand. The developed portion of Site A exposes alluvial gravel, sand and silt. Site A, Site A Expansion, and Site B are part of an alluvial terrace which was segmented by erosion. The stratigraphy of these sites is similar, consisting of interbedded sand, gravel, sand with silt, gravel with silt, silty sand and silty gravel, overlain with 0 to 8 feet of silt.

Land Status

Surface and subsurface rights for this site are held by NANA Regional Corporation.

Clearing and Stripping

Phase 1 is cleared and mined to basal silt and sand. The overburden in Phase 2 has been removed from about 70% of the area. The Phase 3 area lies under several feet of overburden stockpiled there. The Phase 4 area is undeveloped and has 3 to 8 feet of mostly frozen silt overburden.

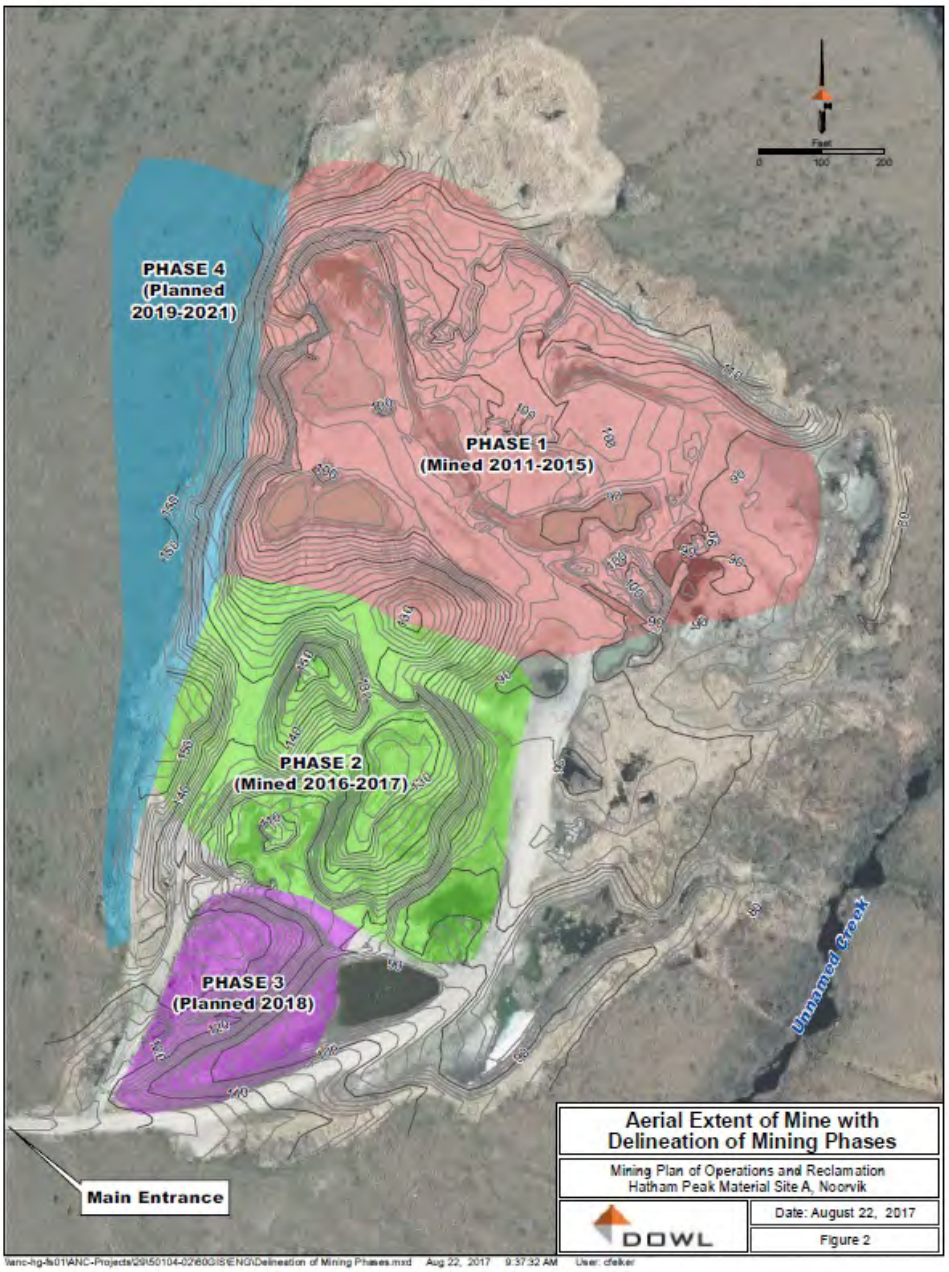

Figure 7. Hotham Peak Material Site A mining plan. From DOWL, 2017.

Water Table

A water table was encountered as shallow as 9 feet bgs surface in Phase 2, and at 12 to 13 feet bgs in the Expansion Area.

Frozen Ground

Frozen soils were encountered below 7 to 10.5 feet bgs in about half of the test trenches in Phase 2. In Phase 4, frozen soil was encountered below 2 feet bgs. This frozen soil was typically classified as non-visible ice, bonded, without excess moisture (Nbn). In the Site A Expansion Area, frozen soil begins at around 18 feet bgs in the center lobes and as shallow as 1 or 2 feet between them. At Site B, frozen soil was encountered below 12 and 17 feet bgs, typically Nbn with ice content increasing at depth.

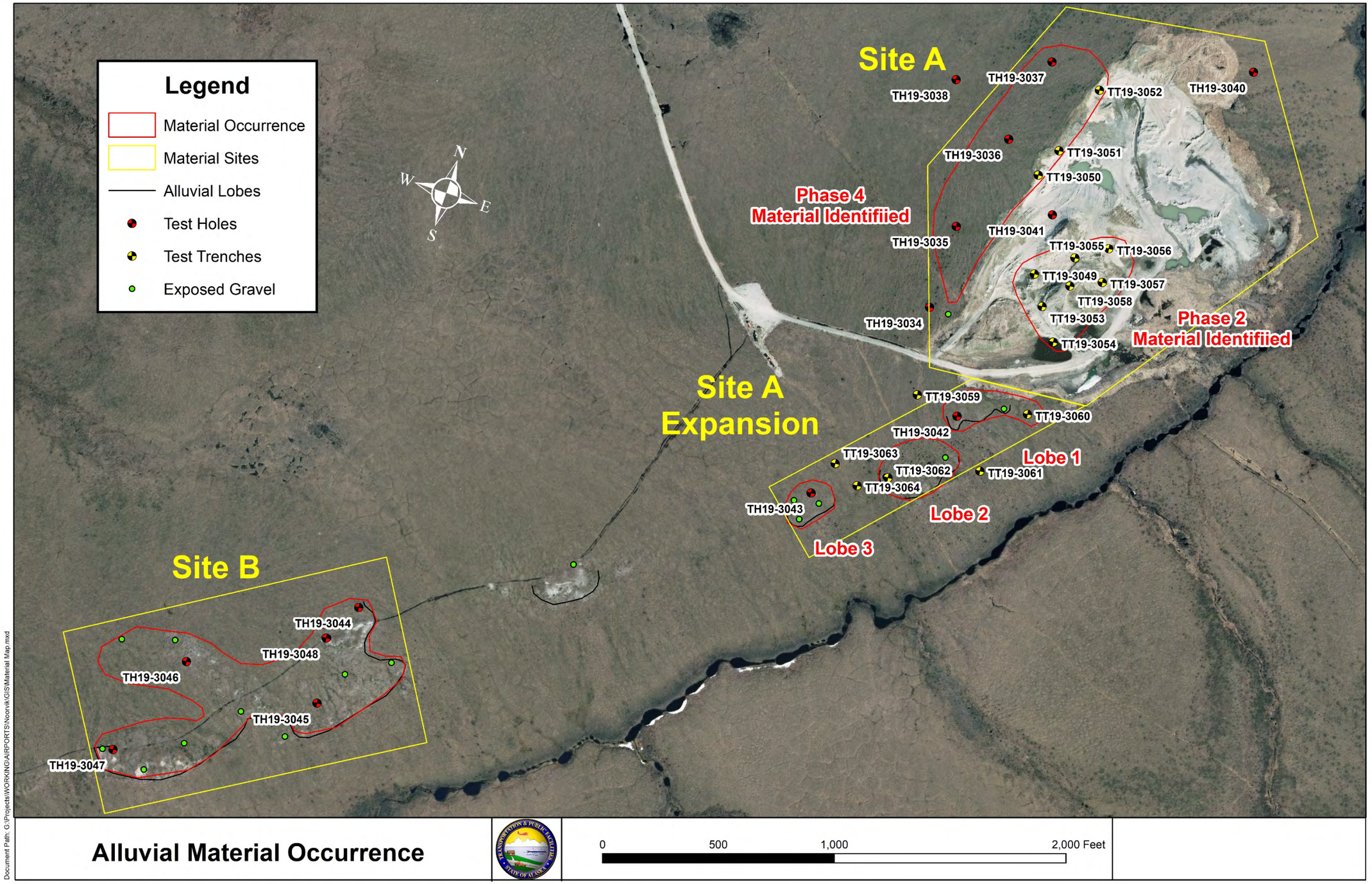

Figure 8. Locations of all material test drilling and trenching.

Subsurface Findings

Site A/Phase 2 Figure 9

This area in the central pit was explored with 7 excavated trenches (TT19-3049 and TT19-3053 thru TT19-3058). These trenches were extended to the depth of frozen soil or a water table. All but one trench (TT19-3054) encountered poorly-graded and well-graded sand or gravel with little or no silt. Based on field and laboratory data, the deposit geometry is permissive to host 50,000 cubic yards of Selected Materials Type A and B. This area will provide a source for crushable aggregate (Table 4).

Site A/Phase 4 Figure 9

This area, contiguous with the northwest side of the developed pit, was explored with 6 test holes (TH19-3034 thru TH19-3038) and 3 hand trenches (TT19-3050 thru TT19-3052). The 3 trenches, which run down the cut slope on the eastern edge of this area, encountered at least vertical 8 feet of material composed of poorly-graded sand with gravel, of poorly-graded sand with silt and gravel, well-graded gravel with silt and sand, and silty sand. This interval will produce Selected Materials Type A or B. The lateral extent of this interval is not known, as its western limits lie somewhere between the 3 trenches and the 3 test holes noted below. The volume of the Selected Materials Type A encountered in the trenches is conservatively estimated to yield on the order of 5,000 cubic yards. Gravel samples failed to meet Standard Specifications for all crushed products except asphalt concrete aggregate (Table 5).

In contrast, three test holes (TH19-3035 thru TH19-3037) drilled near the center of this area encountered 12 to 18 feet of material composed of silty sand, silty sand with gravel, silty gravel with sand, and poorly-graded sand with silt and gravel. This interval will produce Selected Materials Type C, and constitutes the majority of the material available in Phase 4. Based on field and laboratory data, the deposit geometry is permissive to host 150,000 cubic yards of Selected Materials Type C.

Site A Expansion Figure 10

This undeveloped area is characterized by topographic lobes with exposed surface gravel. Three lobes were explored with 2 test holes (TH19-3042 and TH19-3043) and 2 excavated trenches (TT19-3060 and TT19-3062), which encountered poorly-graded and well-graded gravel with silt and sand, well-graded sand with silt and gravel, silty gravel and silty sand. The lobes appear to be laterally discontinuous, but may connect at depth. The material tends to grade into lower silt content at depth. Based on field and laboratory data, the deposit geometry is permissive to host 50,000 cubic yards of Selected Materials Type B. This area will provide a source for crushable aggregate (Table 6).

Site B Figure 11

This undeveloped area is a large, apparently laterally continuous topographic lobe with widely exposed surface gravel. This area was explored with 5 test holes (TH19-3044 thru TH19-3048) which encountered sandy silt with gravel, silty sand, silty sand with gravel, silty gravel with sand, poorly-graded and well-graded gravel with sand, poorly-graded and well-graded sand with gravel, poorly-graded and well-graded sand with silt and gravel, and poorly-graded sand. Silty sand and gravel are the predominant materials encountered in TH19-3044, which will likely yield only Selected Materials Type C. Silty sand and gravel are interbedded with “clean” sand and gravel in TH19-3045, making it difficult to produce better than Selected Materials Type C in this vicinity.

Selected Materials Type A or B can likely be produced in the vicinity of the following 3 test holes. Well-graded gravel with sand and Well-graded sand with silt and gravel are the predominant materials

encountered in TH19-3046. Poorly-graded sand and gravel are the predominant materials encountered in TH19-3047. Poorly-graded sand and well-graded gravel are the predominant materials encountered in TH19-3048. Based on field and laboratory data, the deposit geometry is permissive to host 160,000 cubic yards of Selected Materials Type A, B, or C. The gravel encountered in drilling at this site was found to be too fine to provide a significant source for crushable aggregate.

Available Material

Crushable Aggregate

A source of crushable material is required for production of Crushed Aggregate Surface Coarse. Of the 4 alluvial sources investigated, the following 3 sources contained gravel coarse enough to be crushable. The results of quality analyses for the sources are summarized in Tables 4, 5 and 6.

Table 4. Site A/Phase 2 Material Quality and P200 Analytical Results [# of analyses]

Sample Number	LA Abrasion %	Degradation Value	NaSO4 Soundness Coarse	% Passing #200 (Silt)
19-3658, 19-3664 (combined for rock quality)	37 [1]	52 [1]	2 [1]	2.1-4.2 [2]

Two samples (19-3658 and 19-3664) were combined for a rock quality analysis. The results meet Standard Specifications for all crushed products.

Table 5. Site A/Phase 4 Material Quality and P200 Analytical Results [# of analyses]

Sample Number	LA Abrasion %	Degradation Value	NaSO4 Soundness Coarse	% Passing #200 (Silt)
19-3650, 19-3651, 19-3653a (combined for rock quality) and 19-3653	36 [1]	28-30 [2]	1-4 [2]	2.5-5.9 [4]

Three samples (19-3650, 19-3651 and 19-3653a) were combined for a rock quality analysis. A fourth sample (19-3653) was run individually. The results failed to meet Standard Specifications for all crushed products except asphalt concrete.

Table 6. Site A Expansion Material Quality and P200 Analytical Results [# of analyses]

Sample Number	LA Abrasion %	Degradation Value	NaSO4 Soundness Coarse	% Passing #200 (Silt)
19-3627, 19-3629, 19-3630 (combined for rock quality) and 19-3673, 19-3674, 19-3675 (combined for rock quality)	36 [1]	65-81 [2]	3 [1]	6.9-21.4 [6]

Six samples (19-3627, 19-3629, 19-3630 and 19-3673, 19-3674, 19-3675) were combined for two rock quality analysis. The results meet Standard Specifications for all crushed products.

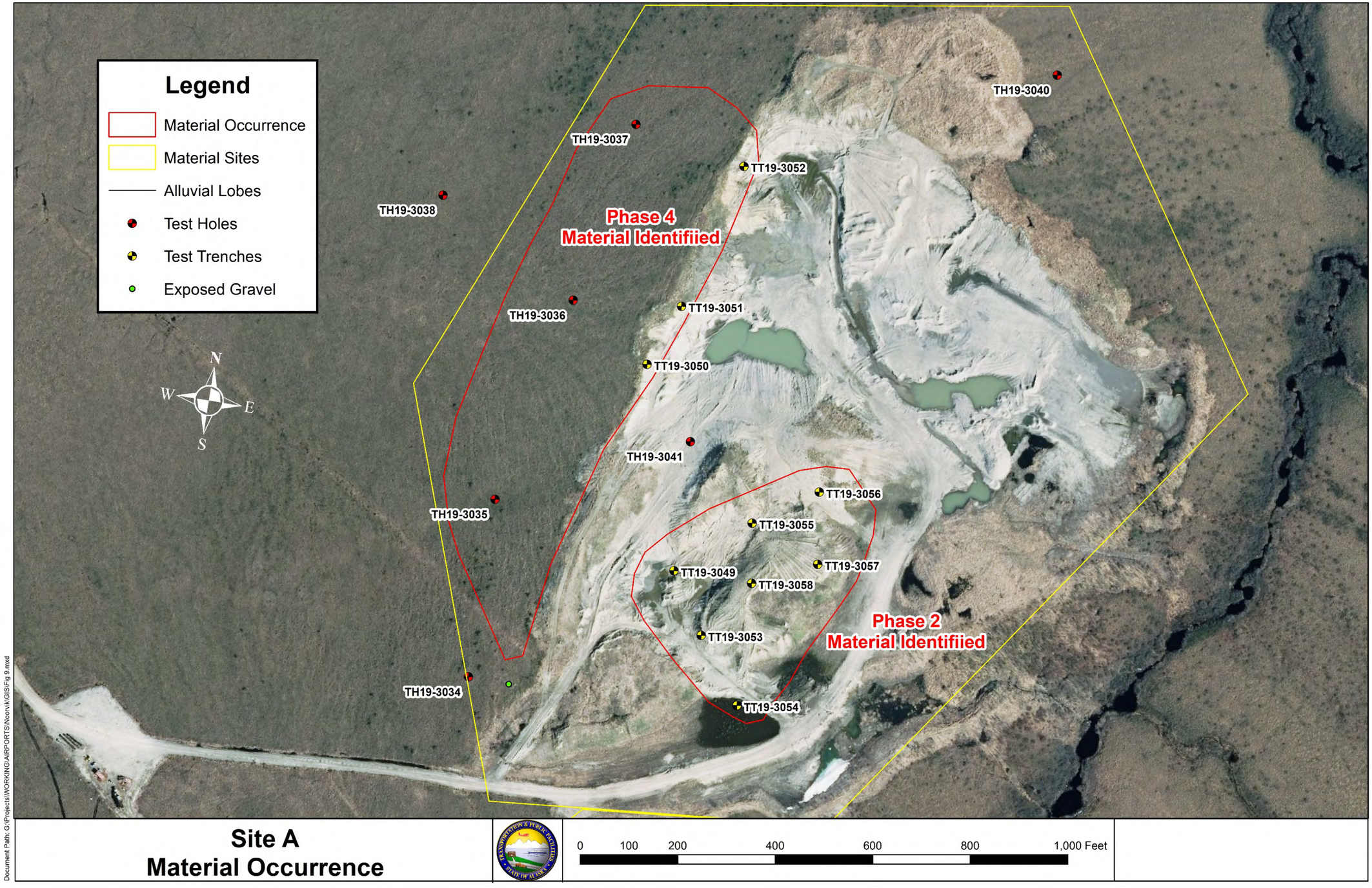

Figure 9. Locations of Site A test drilling and trenching.

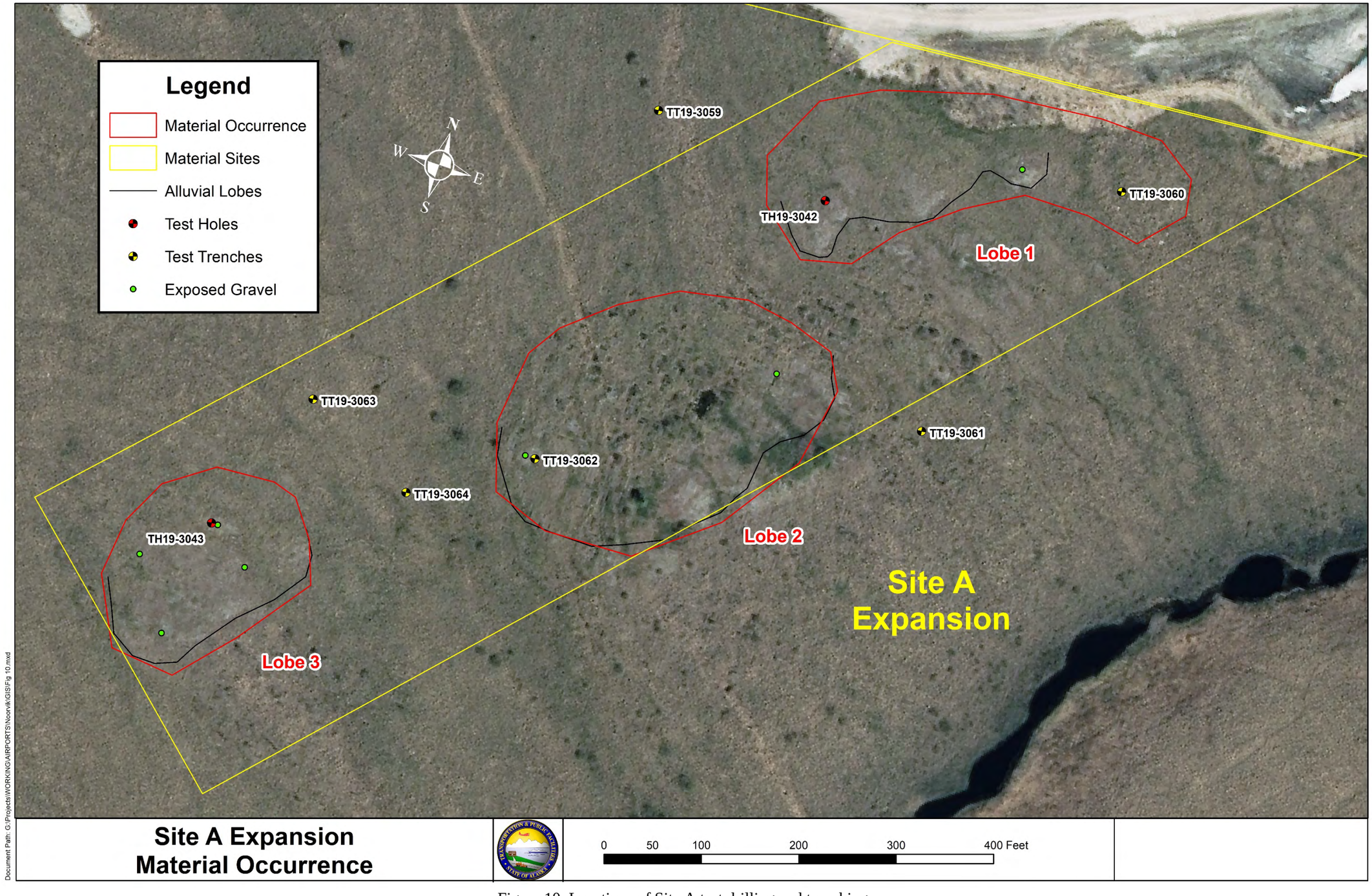

Figure 10. Locations of Site A test drilling and trenching.

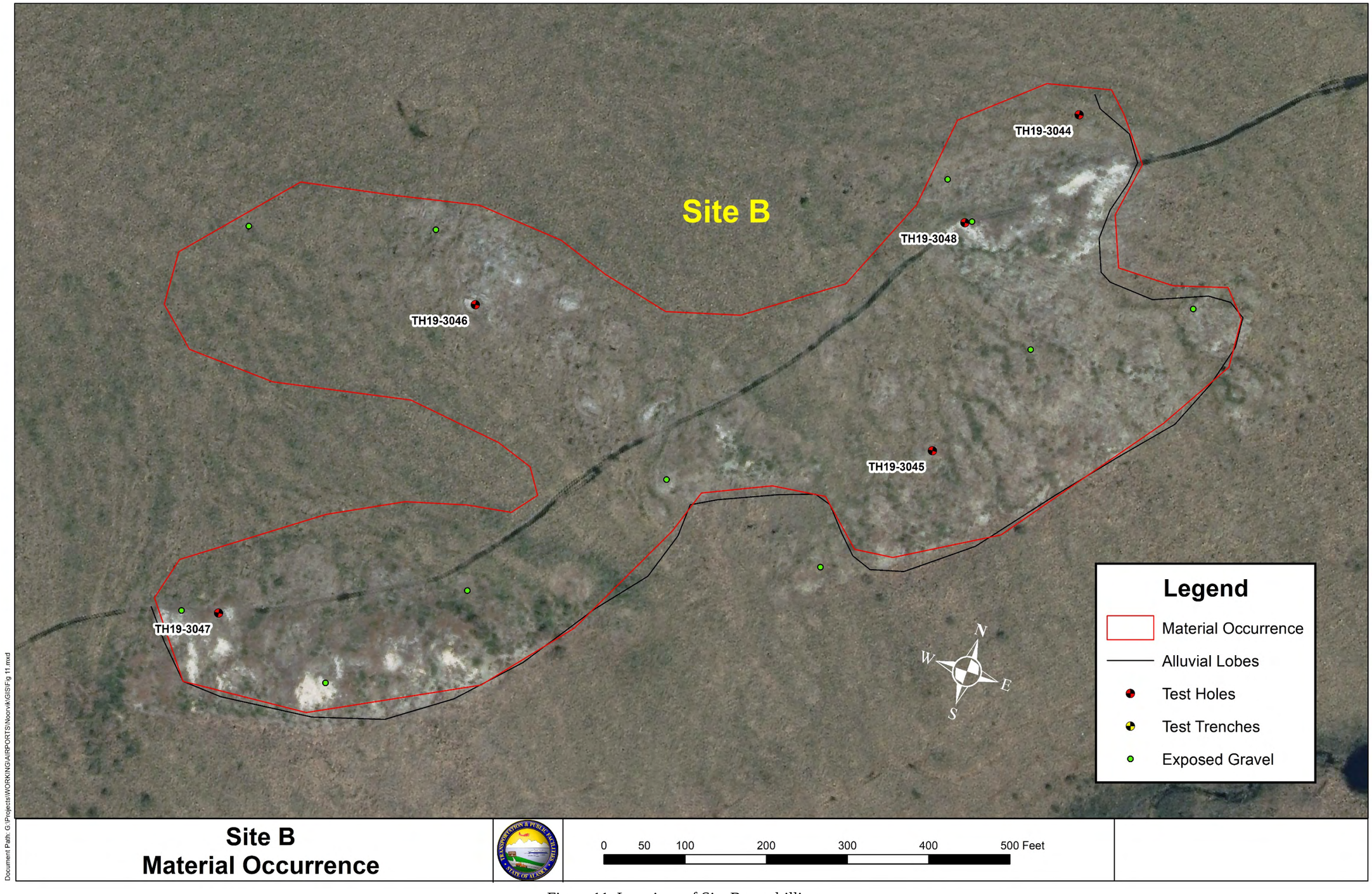

Figure 11. Locations of Site B test drilling.

Silt

Silt rich materials are required for embankment slope flattening and pond displacement. These are abundant in the developed portion of the site (Figure 7). Silt and silty sand may be mined productively from:

- The eastern edge of Phase 2 where overburden can be removed to expose underlying selected materials.
- Phase 3 where silt and silty sand overburden has apparently been stockpiled and now obstructs access to underlying selected materials.
- Phase 4 where overburden silt will need to be removed prior to development of this area.

Comments and Recommendations

General

Shoulder rotation and embankment cracking are the main geotechnical issues affecting the runway embankment. Cracking occurs between the light line and the upper embankment slope, resulting in openings up to 18 inches wide and up to 3 feet deep.

Factors contributing to shoulder rotation and cracking:

- Thaw consolidation begins near the embankment toe, where the organic mat is compressed and its insulation value is lost.
- Thaw consolidation results in formation of ponds trapped against the embankment, which contributes to further thaw consolidation. Ponds are wider and deeper in ice rich permafrost areas.
- Deposition of snow on the embankment slope from snow removal and drifting insulate this area from winter cold, contributing to soil thawing.
- Thaw consolidation is most severe in areas of ice-rich permafrost as indicated by pronounced pattern polygon development.
- Buried insulation board at the embankment edge settles differentially, dipping away from the embankment. This results in a sloping water barrier and potential sliding surface which may contribute to the severity of cracking. Shoulder rotation and cracking were not observed in local roads where insulation board is absent.

The structural core of the embankment appears to be thermally stable. Permafrost is likely accreting into the embankment at TH19-3031, where it is 15 feet thick and not insulated with foam.

Centerline

The following recommendations are intended to repair damaged embankment, fill ponded areas, promote refreezing of that soil, and flatten embankment slopes to shift future ponding and settlement farther away from the structural core and working surface of the embankment.

With those goals in mind, recommend the following:

- Remove ponded water abutting the embankment by displacement, or pumping.
- Backfill pond areas using granular material of between 30% to 50% P200 content.
- Place this material adjacent to the existing slope and construct a working platform, 1 foot above original ground, graded to drain away from the embankment, around the full perimeter of the airport embankment structures.
- The working platform should extend out from the existing toe of slope to encompass the footprint of the final embankment slope, suggested to be 5H:1V to 6H:1V.

- The working platform should be constructed using granular material of between 30% to 50% P200 content, no later than early fall, to allow to the maximum compaction possible without moisture or density control, by routing compaction and haul equipment over the entire surface.
- Remove snow from perimeter working platform during late winter or early spring. Place 4" of insulation board on previously constructed platform, and cover with 12" of Selected Materials Type B Modified (containing less than 20% P200). Reconstruct embankment slopes beyond the existing 2H:1V structural core with Selected Materials Type B Modified during summer, by benching into existing slopes per Section 203-3.03 as required for slopes steeper than 4H:1V. A special provision for Selected Materials Type B Modified will be written upon request.
- Extend existing insulation board by placing 4" of insulation board to the new perimeter of the slope.

PAPI

The PAPI embankment is exhibiting the same toe settling, shoulder cracking and rotation that is occurring in the adjacent runway embankment. Generalized settlement indicates that thaw consolidation at the toe has affected the structural core as well. The ground surface adjacent to the PAPI embankment has been significantly affected by thaw consolidation and ponding.

We recommend the following:

- Reconstruct the shoulders and slopes as specified for the airport embankments above, to stabilize the existing PAPI embankment.
- Place foundation pilings to a sufficient depth in frozen soil, through the existing embankment, to support the PAPI structure.
- Do not construct a new conventional PAPI embankment on thermally disturbed ground.

References

State Department of Public Works, Engineering Geology and Soils Report, Noorvik Alaska, August, 1976.

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Duane Miller and Associates, Geotechnical Investigation, Airport Material Sites, Noorvik Alaska, July 1997.

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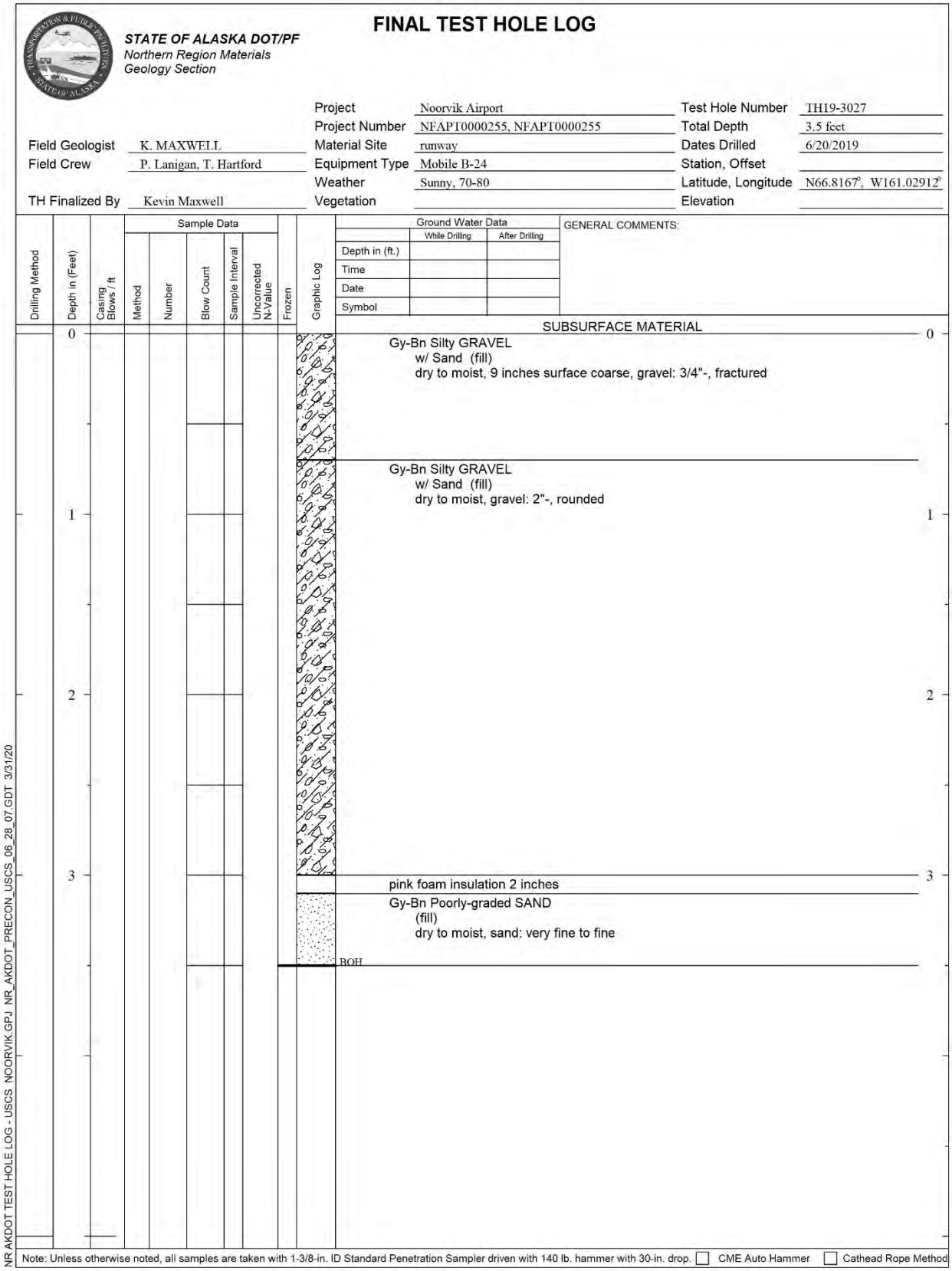
Patton, H.H., Miller, T.P., 1968, 1:250,000 Regional Geologic Map of Selawik and Southeast Baird Mountains, U. S. Geologic Survey.

Wahrhaftig, C. 1965, Physiographic Divisions of Alaska: U.S. Geological Survey Professional Paper 482.

Hartman, C.W., Johnson, P.R., 1984, Environmental Atlas of Alaska, University of Alaska Fairbanks, Alaska.

Appendix A

Drill Logs


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255, NFAPT0000255
Material Site runway
Equipment Type Mobile B-24
Weather Sunny, 70-80
Vegetation
Test Hole Number TH19-3027
Total Depth 3.5 feet
Dates Drilled 6/20/2019
Station, Offset
Latitude, Longitude N66.8167°, W161.02912°
Elevation
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
0
Gy-Bn Silty GRAVEL
w/ Sand (fill)
dry to moist, 9 inches surface coarse, gravel: 3/4"-, fractured
Gy-Bn Silty GRAVEL
w/ Sand (fill)
dry to moist, gravel: 2"-, rounded
1
2
3
pink foam insulation 2 inches
Gy-Bn Poorly-graded SAND
(fill)
dry to moist, sand: very fine to fine
BOH
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/31/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3028
Project Number	NFAPT0000255, NFAPT0000255	Total Depth	13 feet
Material Site	runway	Dates Drilled	6/20/2019 - 6/21/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 70-80	Latitude, Longitude	N66.81711°, W161.0268°
Vegetation		Elevation	
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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

GENERAL COMMENTS:

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

Drilling Method | Depth in (Feet) | Frozen | Graphic Log

SUBSURFACE MATERIAL

0 – Bn-Gy Silty GRAVEL
w/ Sand (fill)
dry to moist, 9 inches surface coarse, gravel: 3/4"-, fractured

1 – Gy-Bn Silty GRAVEL
w/ Sand (fill)
dry to moist, gravel: 2"-, rounded

2 – 3 – pink foam insulation 2 inches

4 – Gy-Bn Poorly-graded SAND
w/ Silt (fill)
dry to moist, sand: very fine to fine

5 – ? ? ? ? ?

6 – Gy-Bn SILT
w/ Sand
moist, sand: very fine to fine

7 – Gy-Bn Silty SAND
moist, sand: very fine

8 – Bn-Bk SILT
hi Org, Nbe

9 – 10 – 11 –

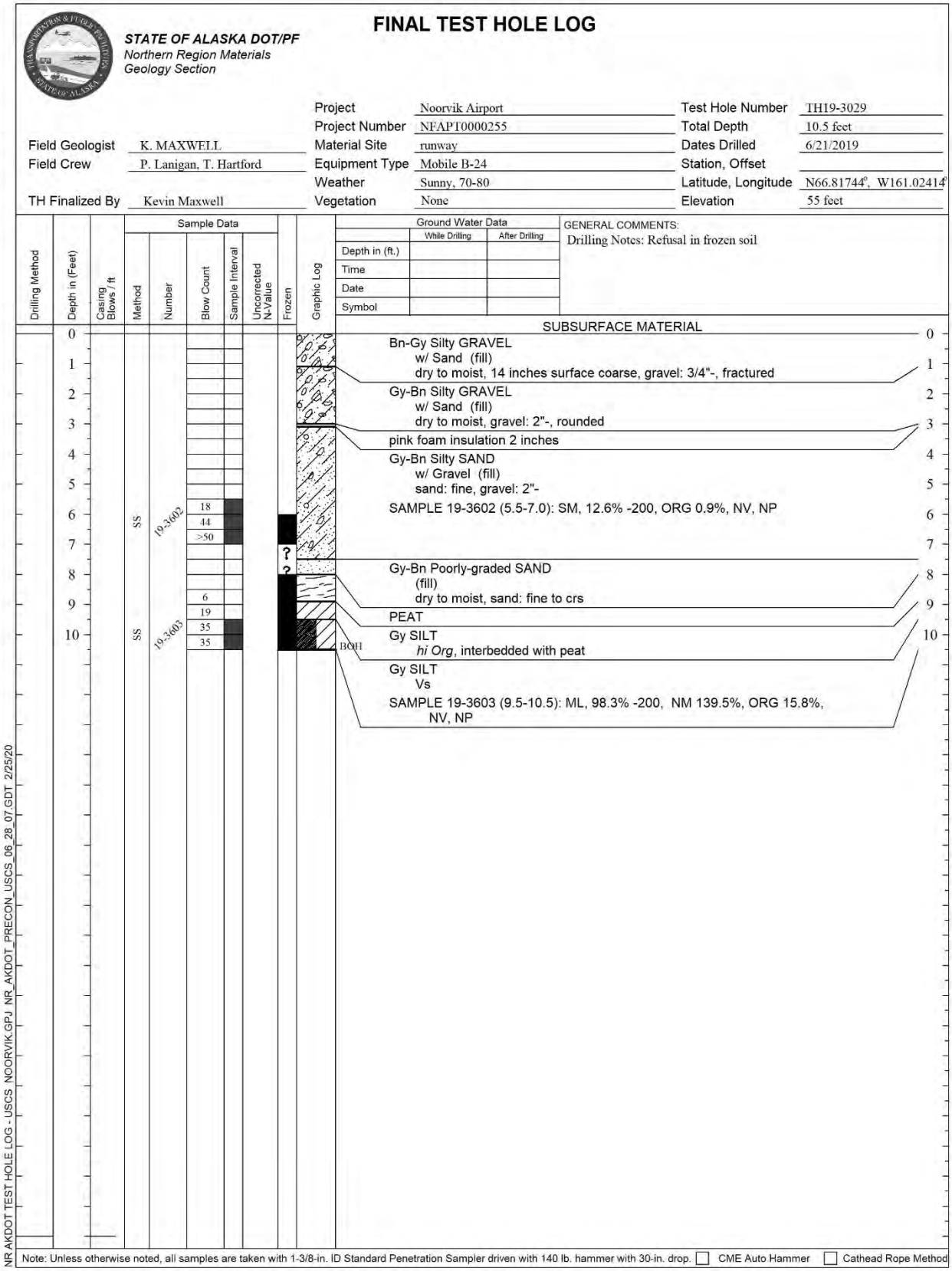
12 – Vx, 5% to 15% ice

13 – BOH

Drilling Notes: Refusal in frozen soil

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 3/31/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site runway
Equipment Type Mobile B-24
Weather Sunny, 70-80
Vegetation None
Test Hole Number TH19-3029
Total Depth 10.5 feet
Dates Drilled 6/21/2019
Station, Offset
Latitude, Longitude N66.81744°, W161.02414°
Elevation 55 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Drilling Notes: Refusal in frozen soil
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn-Gy Silty GRAVEL
w/ Sand (fill)
dry to moist, 14 inches surface coarse, gravel: 3/4"-, fractured
Gy-Bn Silty GRAVEL
w/ Sand (fill)
dry to moist, gravel: 2"-, rounded
pink foam insulation 2 inches
Gy-Bn Silty SAND
w/ Gravel (fill)
sand: fine, gravel: 2"-
SAMPLE 19-3602 (5.5-7.0): SM, 12.6% -200, ORG 0.9%, NV, NP
Gy-Bn Poorly-graded SAND
(fill)
dry to moist, sand: fine to crs
PEAT
Gy SILT
hi Org, interbedded with peat
BOH
Gy SILT
Vs
SAMPLE 19-3603 (9.5-10.5): ML, 98.3% -200, NM 139.5%, ORG 15.8%, NV, NP
SS
19-3602
18
44
>50
SS
19-3603
6
19
35
35
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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3030
Project Number	NFAPT0000255	Total Depth	28.5 feet
Field Geologist	K. MAXWELL	Material Site	PAPI	Dates Drilled	6/21/2019 - 6/22/2019
Field Crew	P. Lanigan, T. Hartford	Equipment Type	Mobile B-24	Station, Offset	
		Weather	Sunny, 70-80	Latitude, Longitude	N66.81601°, W161.03212°
TH Finalized By	Kevin Maxwell	Vegetation	Tundra	Elevation	45 feet

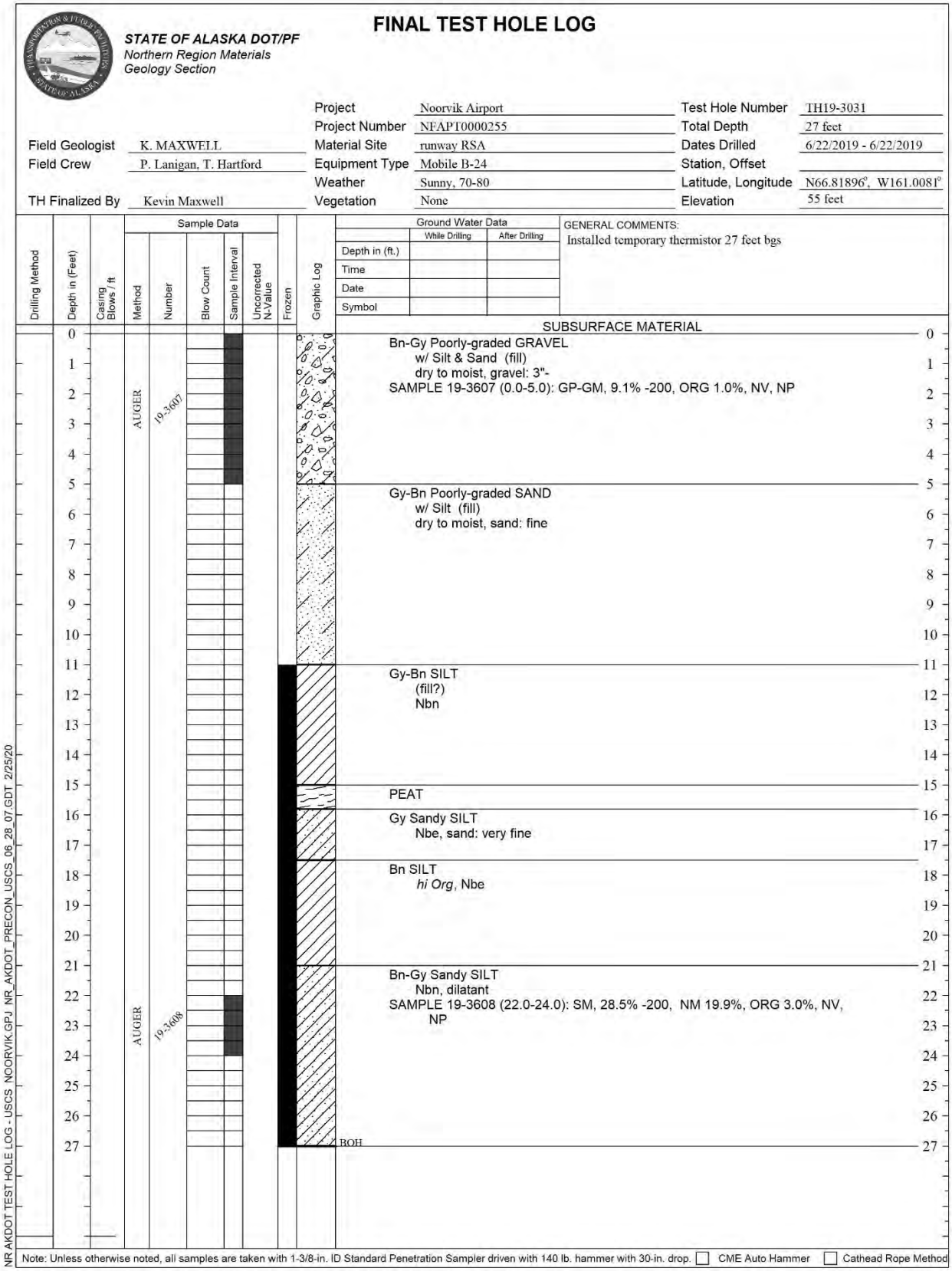
Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

GENERAL COMMENTS:
Installed temporary thermistor 27 feet bgs

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									PEAT
	1									Bn SILT *hi Org*, Nbe
	2									
	3									Vx, 15% ice
	4									
	5									
	6									Gy-Bn SILT *Org*, Nbe
	7		AUGER	19-3604						SAMPLE 19-3604 (7.0-9.0): ML, 97.5% -200, NM 46.5%, ORG 3.4%, NV, NP
	8									
	9									
	10									
	11									
	12									Gy SILT w/ Sand Nbn, sand: fine
	13									
	14									
	15									Gy SILT Nbe
	16		AUGER	19-3605						SAMPLE 19-3605 (16.0-17.0): ML, 97.4% -200, NM 73.1%, ORG 8.3%, NV, NP
	17									
	18									
	19									Gy SILT w/ Sand Nbn, sand: very fine
	20									
	21		AUGER	19-3606						SAMPLE 19-3606 (21.0-22.0): ML, 95.2% -200, NM 34.6%, ORG 3.1%, NV, NP
	22									
	23									
	24									
	25									
	26									
	27									
	28									BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site runway RSA
Equipment Type Mobile B-24
Weather Sunny, 70-80
Vegetation None
Test Hole Number TH19-3031
Total Depth 27 feet
Dates Drilled 6/22/2019 - 6/22/2019
Station, Offset
Latitude, Longitude N66.81896°, W161.0081°
Elevation 55 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Installed temporary thermistor 27 feet bgs
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn-Gy Poorly-graded GRAVEL
w/ Silt & Sand (fill)
dry to moist, gravel: 3"-
SAMPLE 19-3607 (0.0-5.0): GP-GM, 9.1% -200, ORG 1.0%, NV, NP
AUGER
19-3607
Gy-Bn Poorly-graded SAND
w/ Silt (fill)
dry to moist, sand: fine
Gy-Bn SILT
(fill?)
Nbn
PEAT
Gy Sandy SILT
Nbe, sand: very fine
Bn SILT
hi Org, Nbe
Bn-Gy Sandy SILT
Nbn, dilatant
SAMPLE 19-3608 (22.0-24.0): SM, 28.5% -200, NM 19.9%, ORG 3.0%, NV, NP
AUGER
19-3608
BOH
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3032
Project Number	NFAPT0000255	Total Depth	16 feet
Material Site	runway	Dates Drilled	6/23/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 70-80	Latitude, Longitude	N66.8189°, W161.01012°
Vegetation	None	Elevation	55 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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

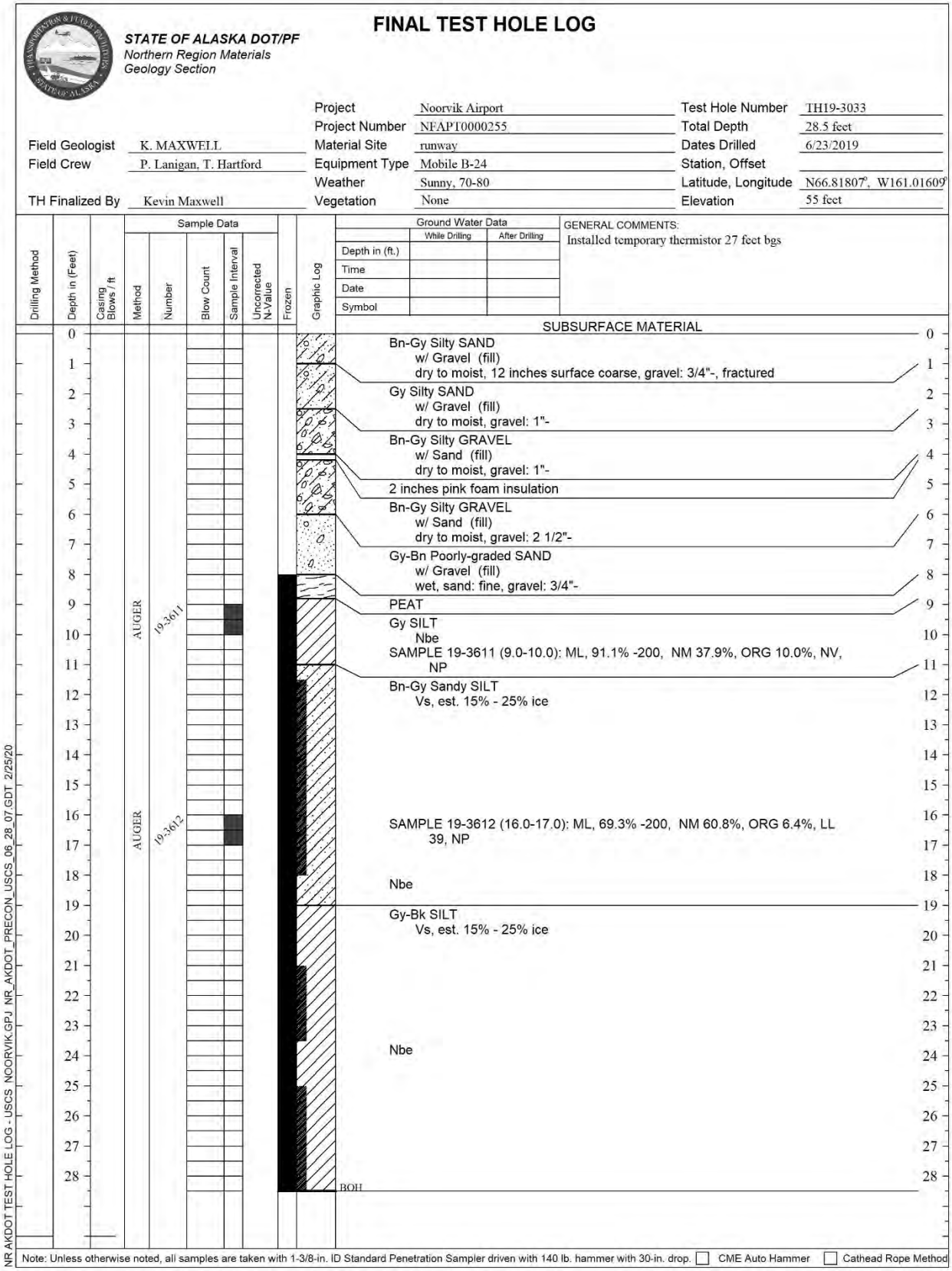
GENERAL COMMENTS:

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0		AUGER	19-3609						Gy-Bn Poorly-graded GRAVEL w/ Silt & Sand (fill) dry to moist, 4 inches surface coarse, sand: coarse, gravel: 3/4"-, fractured
	1									
	2									SAMPLE 19-3609 (0.0-0.3): 10.8% -200, ORG 0.9%
	3									Gy-Bn Silty GRAVEL w/ Sand (fill) dry to moist, gravel: 2"-, rounded
	4									
	5									Gy-Bn Poorly-graded SAND w/ Silt (fill) dry to moist, sand: fine
	6									Gy-Bn Poorly-graded SAND w/ Gravel (fill) dry to moist, gravel: 1"-, rounded
	7									
	8									Gy-Bn Poorly-graded GRAVEL (fill) dry to moist, gravel: 2 1/2"-, rounded
	9									
	10									Bn-Gy Well-graded GRAVEL w/ Silt & Sand (fill) dry to moist, sand: fine, gravel: 3/4"-
	11									Gy SILT (fill?) moist
	12									
	13							?		Bn-Gy Poorly-graded GRAVEL w/ Silt & Sand (fill?) moist, gravel: 1/2"-, sub-rounded to rounded
	14		AUGER	19-3610				?		Bn-Gy Silty SAND moist to wet
	15							?		SAMPLE 19-3610 (14.0-15.0): SM, 27.4% -200, NM 14.0%, ORG 1.5%, NV, NP
	16								BOH	Nbe

Drilling Notes: Refusal in frozen soil

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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site runway
Equipment Type Mobile B-24
Weather Sunny, 70-80
Vegetation None
Test Hole Number TH19-3033
Total Depth 28.5 feet
Dates Drilled 6/23/2019
Station, Offset
Latitude, Longitude N66.81807°, W161.01609°
Elevation 55 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Installed temporary thermistor 27 feet bgs
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn-Gy Silty SAND
w/ Gravel (fill)
dry to moist, 12 inches surface coarse, gravel: 3/4"-, fractured
Gy Silty SAND
w/ Gravel (fill)
dry to moist, gravel: 1"-
Bn-Gy Silty GRAVEL
w/ Sand (fill)
dry to moist, gravel: 1"-
2 inches pink foam insulation
Bn-Gy Silty GRAVEL
w/ Sand (fill)
dry to moist, gravel: 2 1/2"-
Gy-Bn Poorly-graded SAND
w/ Gravel (fill)
wet, sand: fine, gravel: 3/4"-
PEAT
Gy SILT
Nbe
SAMPLE 19-3611 (9.0-10.0): ML, 91.1% -200, NM 37.9%, ORG 10.0%, NV, NP
Bn-Gy Sandy SILT
Vs, est. 15% - 25% ice
SAMPLE 19-3612 (16.0-17.0): ML, 69.3% -200, NM 60.8%, ORG 6.4%, LL 39, NP
Nbe
Gy-Bk SILT
Vs, est. 15% - 25% ice
Nbe
BOH
AUGER
19-3611
AUGER
19-3612
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3034
Project Number	NFAPT0000255	Total Depth	19 feet
Material Site	MS Site A Phase 4	Dates Drilled	6/23/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.80972°, W160.82229°
Vegetation	Tundra	Elevation	135 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

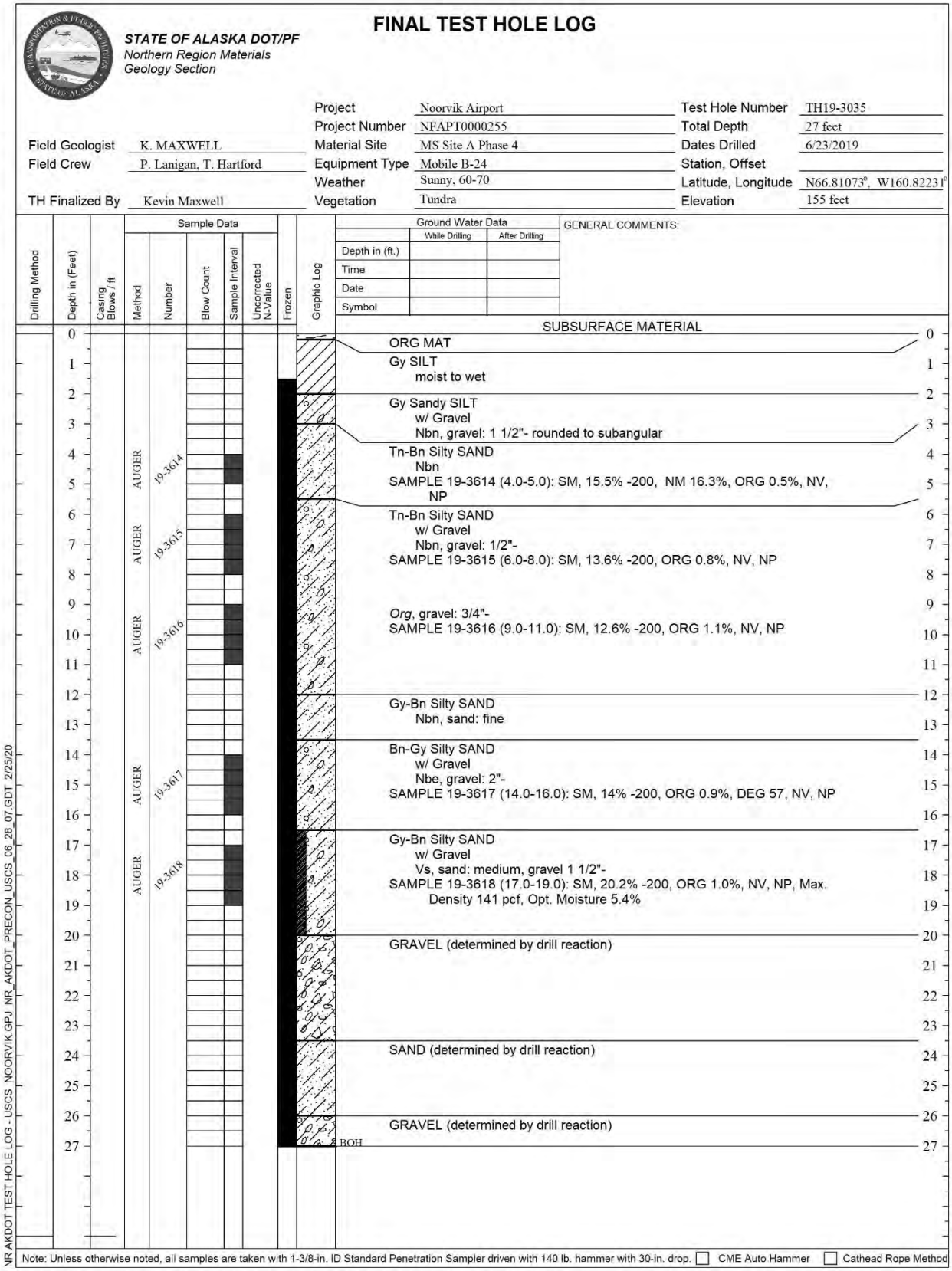
Ground Water Data	While Drilling	After Drilling
Depth in (ft.)	3.0	
Time		
Date	6/23/19	
Symbol	▼	

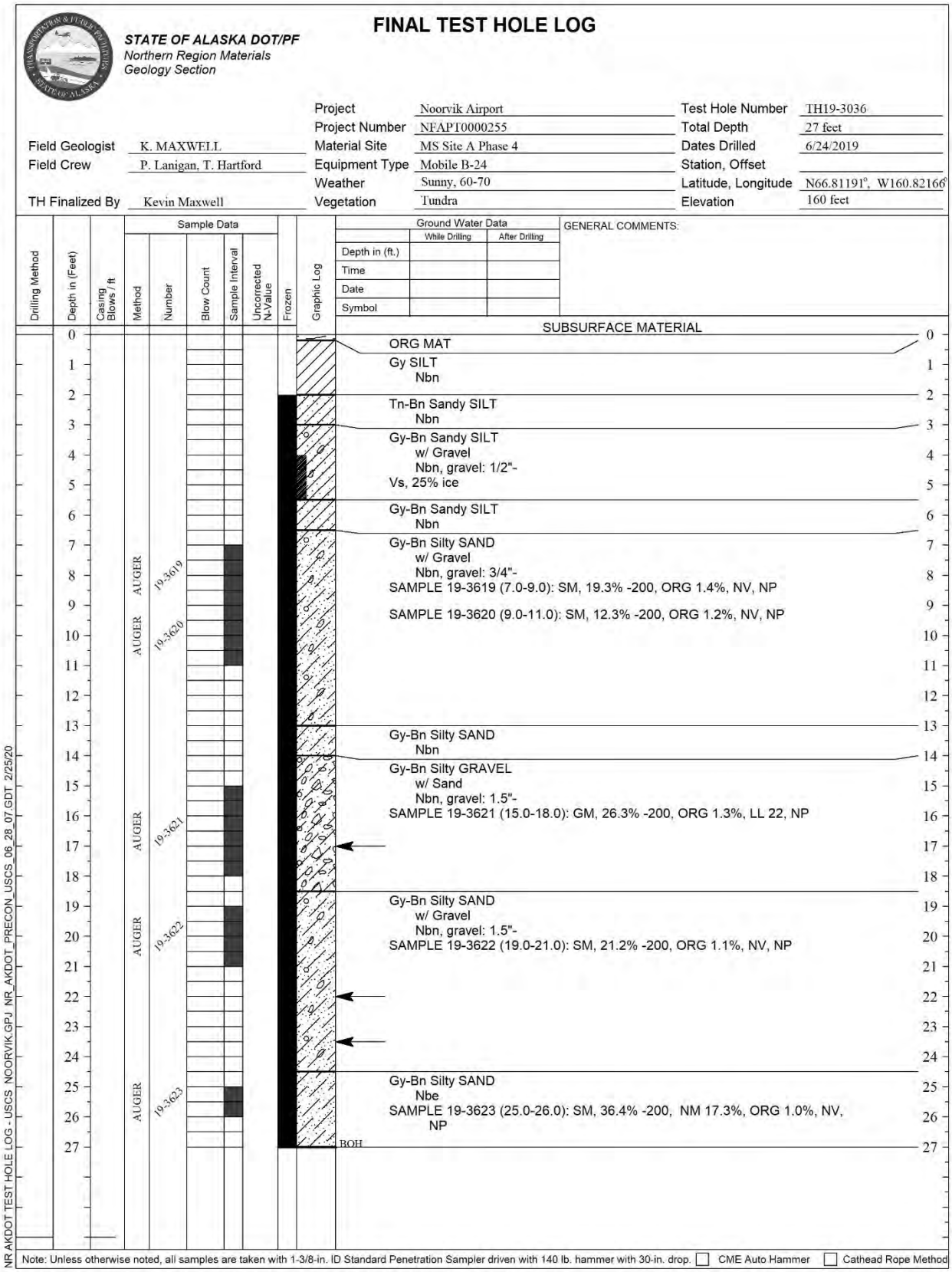
GENERAL COMMENTS:

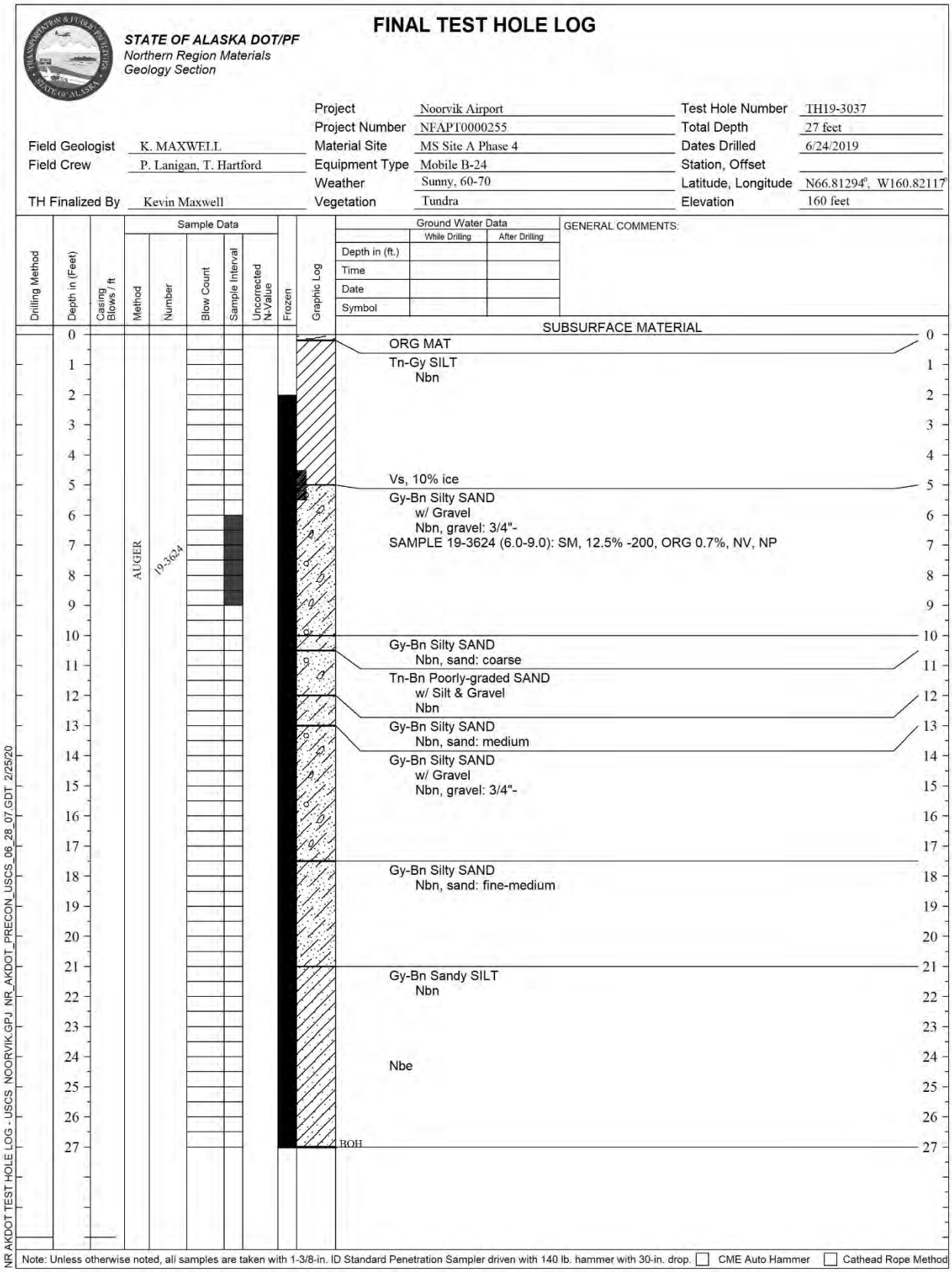
Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Gy SILT moist to wet
	1									
	2									Tn-Bn Sandy SILT wet
▼	3									Tn-Bn Sandy SILT w/ Gravel wet
	4									Vs, >15% ice
	5									
	6									
	7									Bn-Bk Silty SAND w/ Gravel Vs, 5%-10% ice
	8									SAMPLE 19-3613 (8.5-11.0): SM, 13.2% -200, NM 17.3%, ORG 4.0%, NV, NP
	9		AUGER	19-3613						
	10									
	11									
	12									Gy-Bn Sandy SILT Vr, 20% ice
	13									
	14									Nbe
	15									Vr, 10%-25% ice
	16									
	17									
	18									
	19									BOH

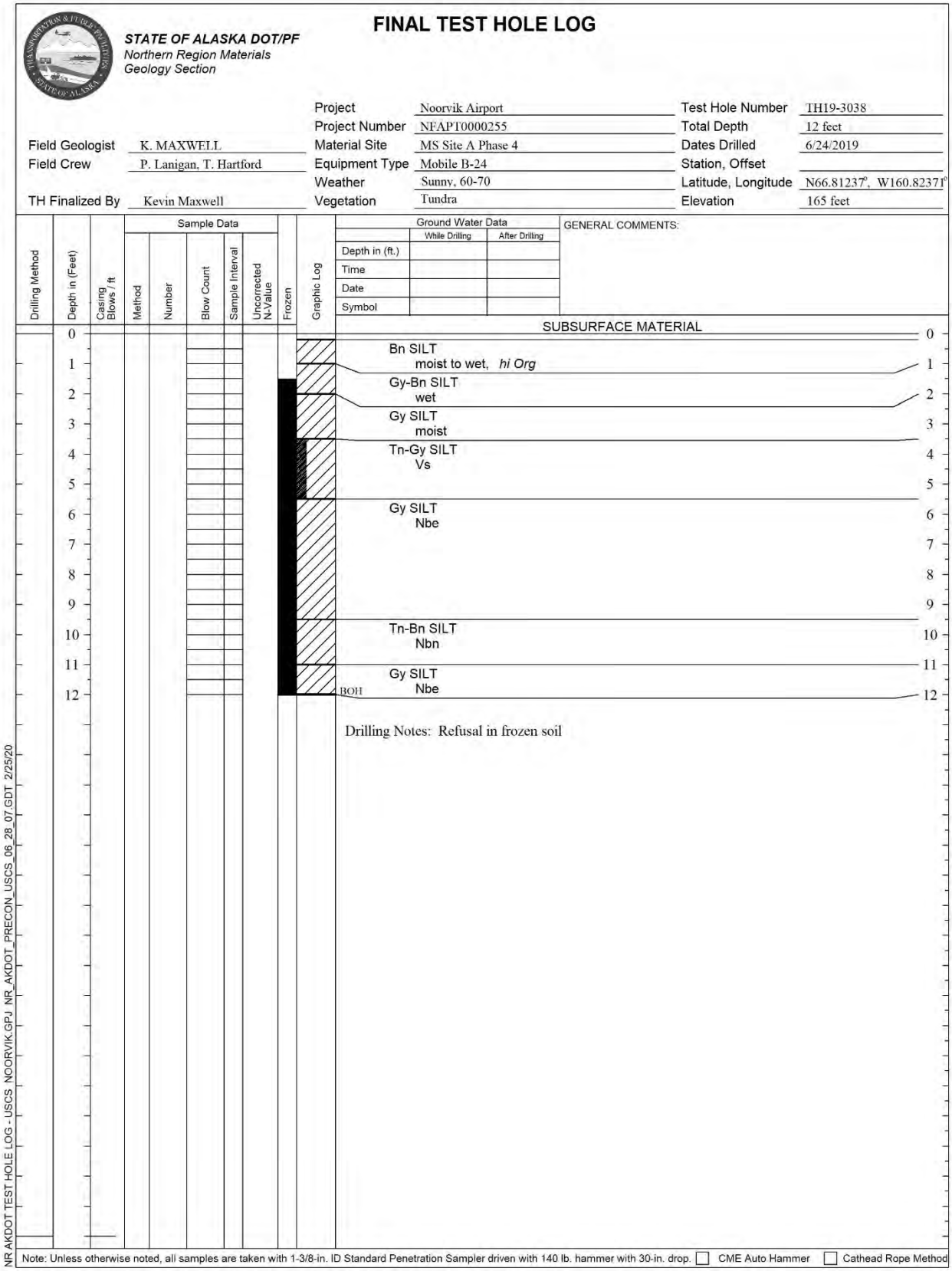
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop. ☐ CME Auto Hammer ☐ Cathead Rope Method

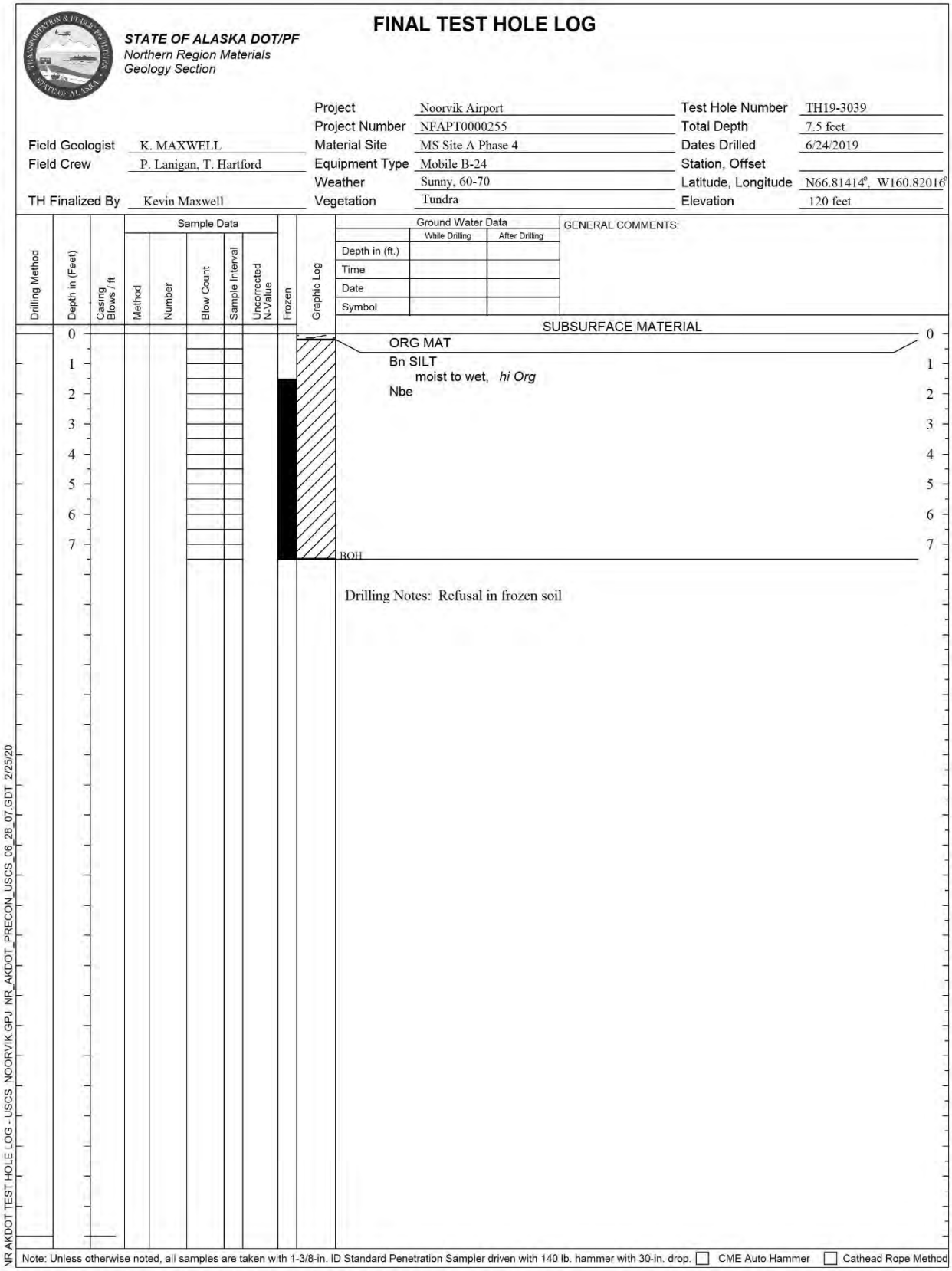
NR AKDOT TEST HOLE LOG - USCS_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Phase 4
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TH19-3035
Total Depth 27 feet
Dates Drilled 6/23/2019
Station, Offset
Latitude, Longitude N66.81073°, W160.82231°
Elevation 155 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Sample Data
Drilling Method
Depth in (Feet)
Casing Blows / ft
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
ORG MAT
Gy SILT
moist to wet
Gy Sandy SILT
w/ Gravel
Nbn, gravel: 1 1/2"- rounded to subangular
Tn-Bn Silty SAND
Nbn
SAMPLE 19-3614 (4.0-5.0): SM, 15.5% -200, NM 16.3%, ORG 0.5%, NV, NP
Tn-Bn Silty SAND
w/ Gravel
Nbn, gravel: 1/2"-
SAMPLE 19-3615 (6.0-8.0): SM, 13.6% -200, ORG 0.8%, NV, NP
Org, gravel: 3/4"-
SAMPLE 19-3616 (9.0-11.0): SM, 12.6% -200, ORG 1.1%, NV, NP
Gy-Bn Silty SAND
Nbn, sand: fine
Bn-Gy Silty SAND
w/ Gravel
Nbe, gravel: 2"-
SAMPLE 19-3617 (14.0-16.0): SM, 14% -200, ORG 0.9%, DEG 57, NV, NP
Gy-Bn Silty SAND
w/ Gravel
Vs, sand: medium, gravel 1 1/2"-
SAMPLE 19-3618 (17.0-19.0): SM, 20.2% -200, ORG 1.0%, NV, NP, Max. Density 141 pcf, Opt. Moisture 5.4%
GRAVEL (determined by drill reaction)
SAND (determined by drill reaction)
GRAVEL (determined by drill reaction)
BOH
AUGER
19-3614
19-3615
19-3616
19-3617
19-3618
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Phase 4
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TH19-3036
Total Depth 27 feet
Dates Drilled 6/24/2019
Station, Offset
Latitude, Longitude N66.81191°, W160.82166°
Elevation 160 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
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
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
ORG MAT
Gy SILT
Nbn
Tn-Bn Sandy SILT
Nbn
Gy-Bn Sandy SILT
w/ Gravel
Nbn, gravel: 1/2"-
Vs, 25% ice
Gy-Bn Sandy SILT
Nbn
Gy-Bn Silty SAND
w/ Gravel
Nbn, gravel: 3/4"-
SAMPLE 19-3619 (7.0-9.0): SM, 19.3% -200, ORG 1.4%, NV, NP
SAMPLE 19-3620 (9.0-11.0): SM, 12.3% -200, ORG 1.2%, NV, NP
Gy-Bn Silty SAND
Nbn
Gy-Bn Silty GRAVEL
w/ Sand
Nbn, gravel: 1.5"-
SAMPLE 19-3621 (15.0-18.0): GM, 26.3% -200, ORG 1.3%, LL 22, NP
Gy-Bn Silty SAND
w/ Gravel
Nbn, gravel: 1.5"-
SAMPLE 19-3622 (19.0-21.0): SM, 21.2% -200, ORG 1.1%, NV, NP
Gy-Bn Silty SAND
Nbe
SAMPLE 19-3623 (25.0-26.0): SM, 36.4% -200, NM 17.3%, ORG 1.0%, NV, NP
BOH
AUGER
19-3619
19-3620
19-3621
19-3622
19-3623
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Phase 4
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TH19-3037
Total Depth 27 feet
Dates Drilled 6/24/2019
Station, Offset
Latitude, Longitude N66.81294°, W160.82117°
Elevation 160 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
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
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
AUGER
19-3624
ORG MAT
Tn-Gy SILT
Nbn
Vs, 10% ice
Gy-Bn Silty SAND
w/ Gravel
Nbn, gravel: 3/4"-
SAMPLE 19-3624 (6.0-9.0): SM, 12.5% -200, ORG 0.7%, NV, NP
Gy-Bn Silty SAND
Nbn, sand: coarse
Tn-Bn Poorly-graded SAND
w/ Silt & Gravel
Nbn
Gy-Bn Silty SAND
Nbn, sand: medium
Gy-Bn Silty SAND
w/ Gravel
Nbn, gravel: 3/4"-
Gy-Bn Silty SAND
Nbn, sand: fine-medium
Gy-Bn Sandy SILT
Nbn
Nbe
BOH
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Phase 4
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TH19-3038
Total Depth 12 feet
Dates Drilled 6/24/2019
Station, Offset
Latitude, Longitude N66.81237°, W160.82371°
Elevation 165 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
Bn SILT
moist to wet, hi Org
Gy-Bn SILT
wet
Gy SILT
moist
Tn-Gy SILT
Vs
Gy SILT
Nbe
Tn-Bn SILT
Nbn
Gy SILT
Nbe
BOH
Drilling Notes: Refusal in frozen soil
NR AKDOT TEST HOLE LOG - USCS NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20
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	Noorvik Airport	Test Hole Number	TH19-3039
Project Number	NFAPT0000255	Total Depth	7.5 feet
Material Site	MS Site A Phase 4	Dates Drilled	6/24/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.81414°, W160.82016°
Vegetation	Tundra	Elevation	120 feet

Field Geologist: K. MAXWELL
Field Crew: P. Lanigan, T. Hartford
TH Finalized By: Kevin Maxwell

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

GENERAL COMMENTS:

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

Drilling Method | Depth in (Feet) | Frozen | Graphic Log

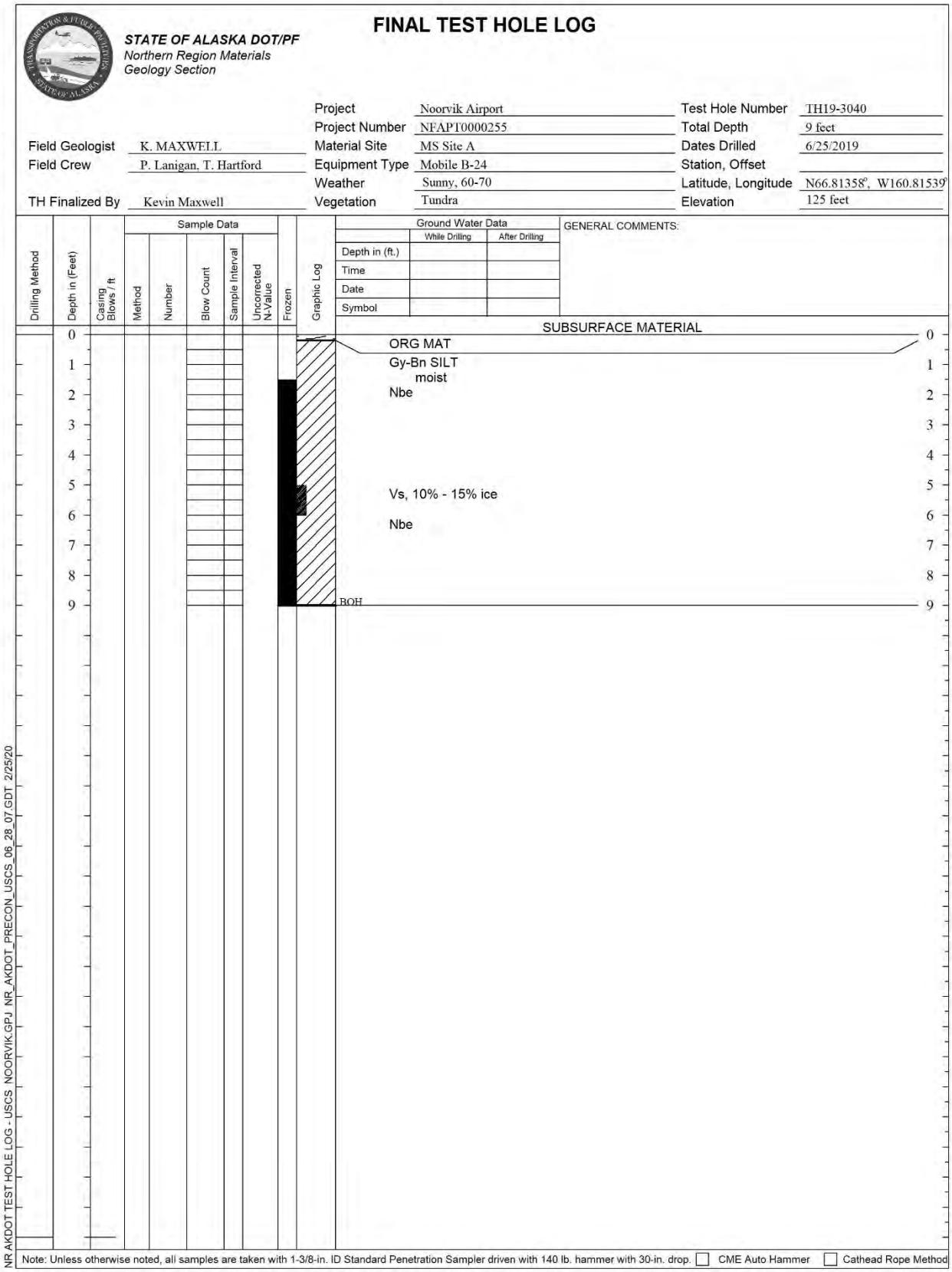
SUBSURFACE MATERIAL

0 ORG MAT
Bn SILT
moist to wet, *hi Org*
Nbe
BOH

Drilling Notes: Refusal in frozen soil

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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TH19-3040
Total Depth 9 feet
Dates Drilled 6/25/2019
Station, Offset
Latitude, Longitude N66.81358°, W160.81539°
Elevation 125 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
ORG MAT
Gy-Bn SILT
moist
Nbe
Vs, 10% - 15% ice
Nbe
BOH
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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3041
Project Number	NFAPT0000255	Total Depth	19.5 feet
Material Site	MS Site A Phase 2	Dates Drilled	6/25/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.81122°, W160.8197°
Vegetation	None	Elevation	145 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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

GENERAL COMMENTS:

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

Graphic Log

SUBSURFACE MATERIAL

0 Bn-Gy Silty SAND
moist, fine

4 SAMPLE 19-3625 (4.0-5.0): SM, 28.8% -200, NM 5.0%, ORG 0.7%, NV, NP
(19-3625)

13 Gy Poorly-graded SAND
Nbn, very fine, dilatant

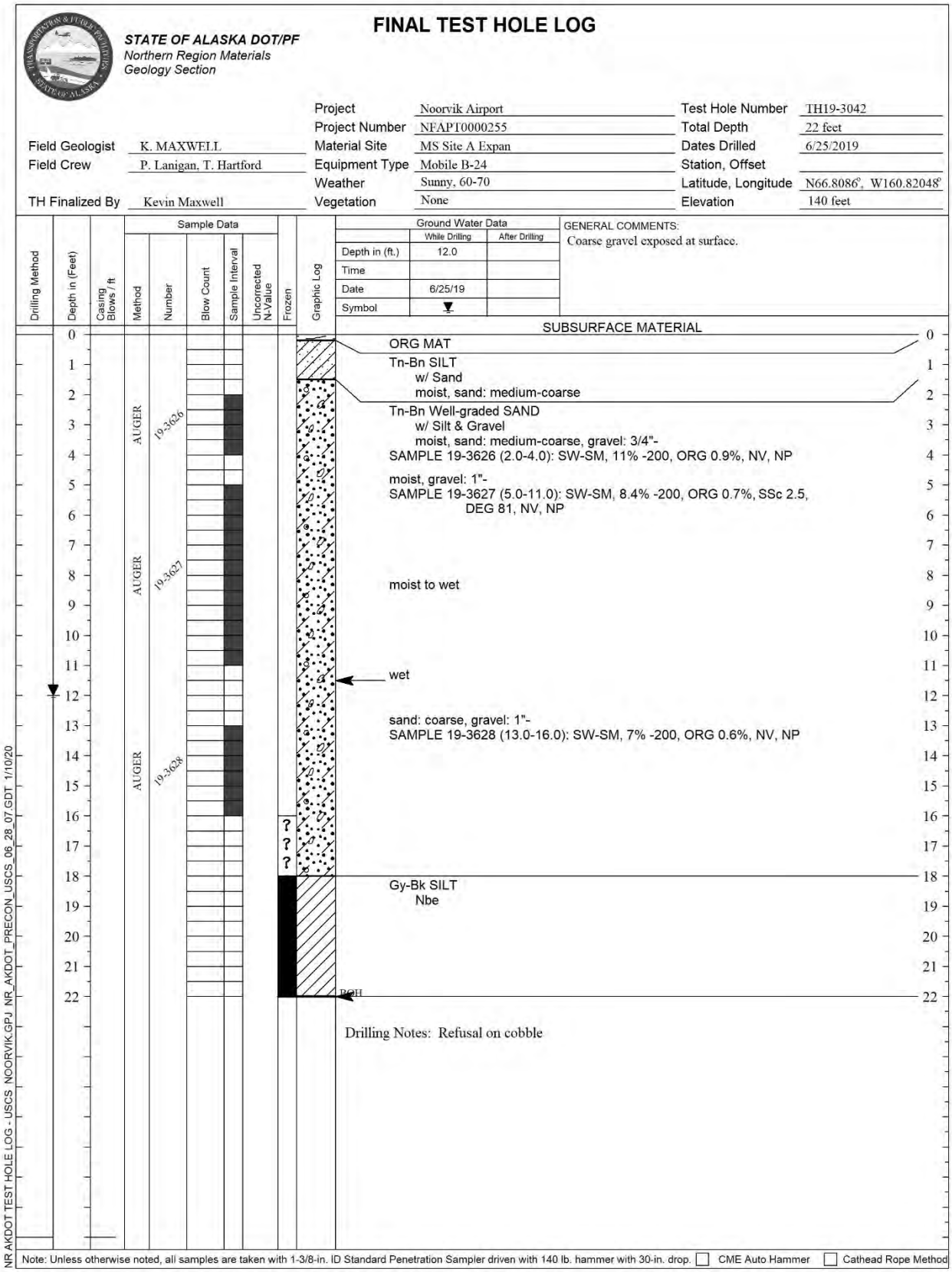
15 Gy-Bk Poorly-graded SAND
Nbn, fine, dilatant

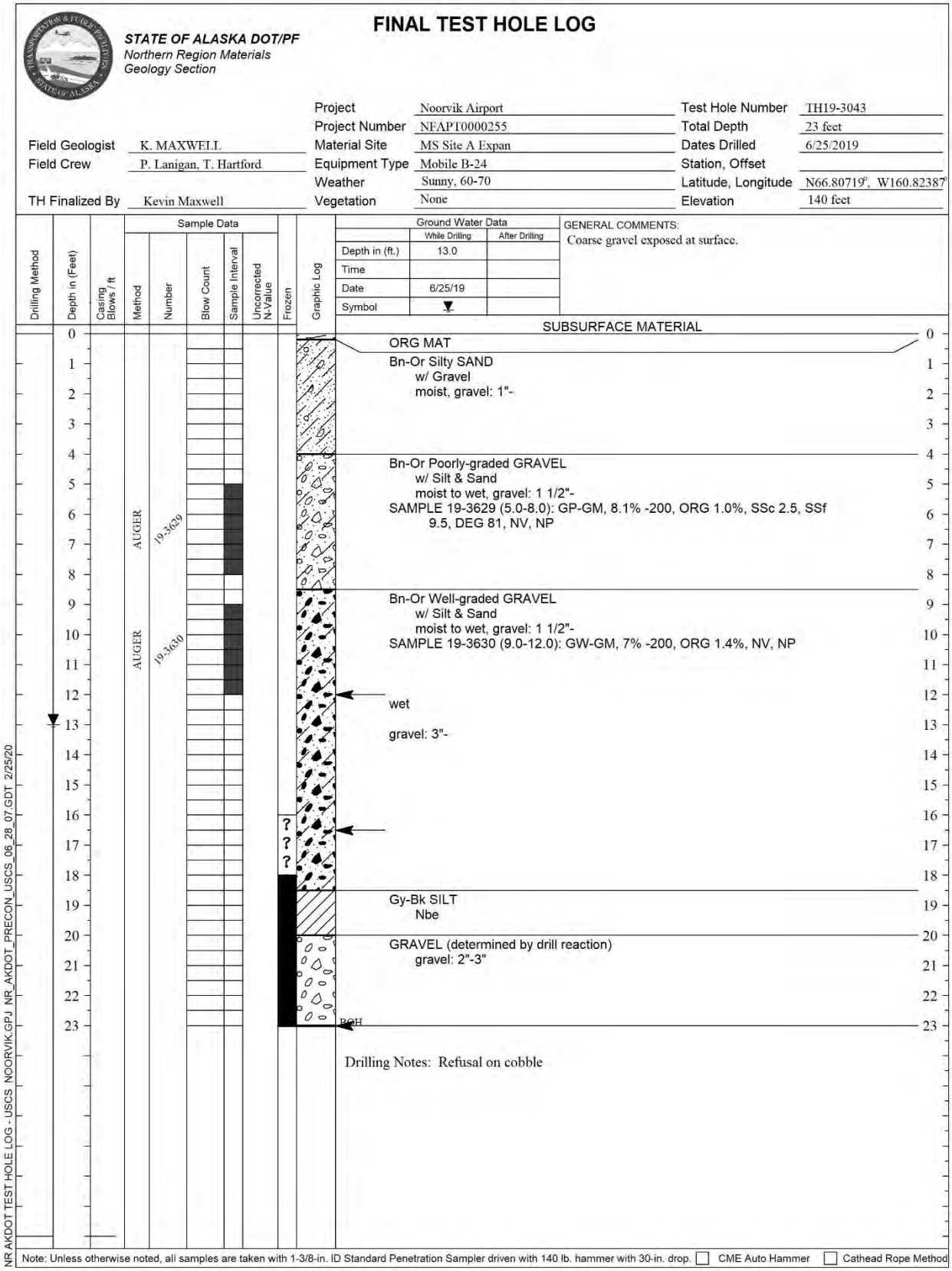
18 Gy-Bk Silty SAND
Nbn, fine

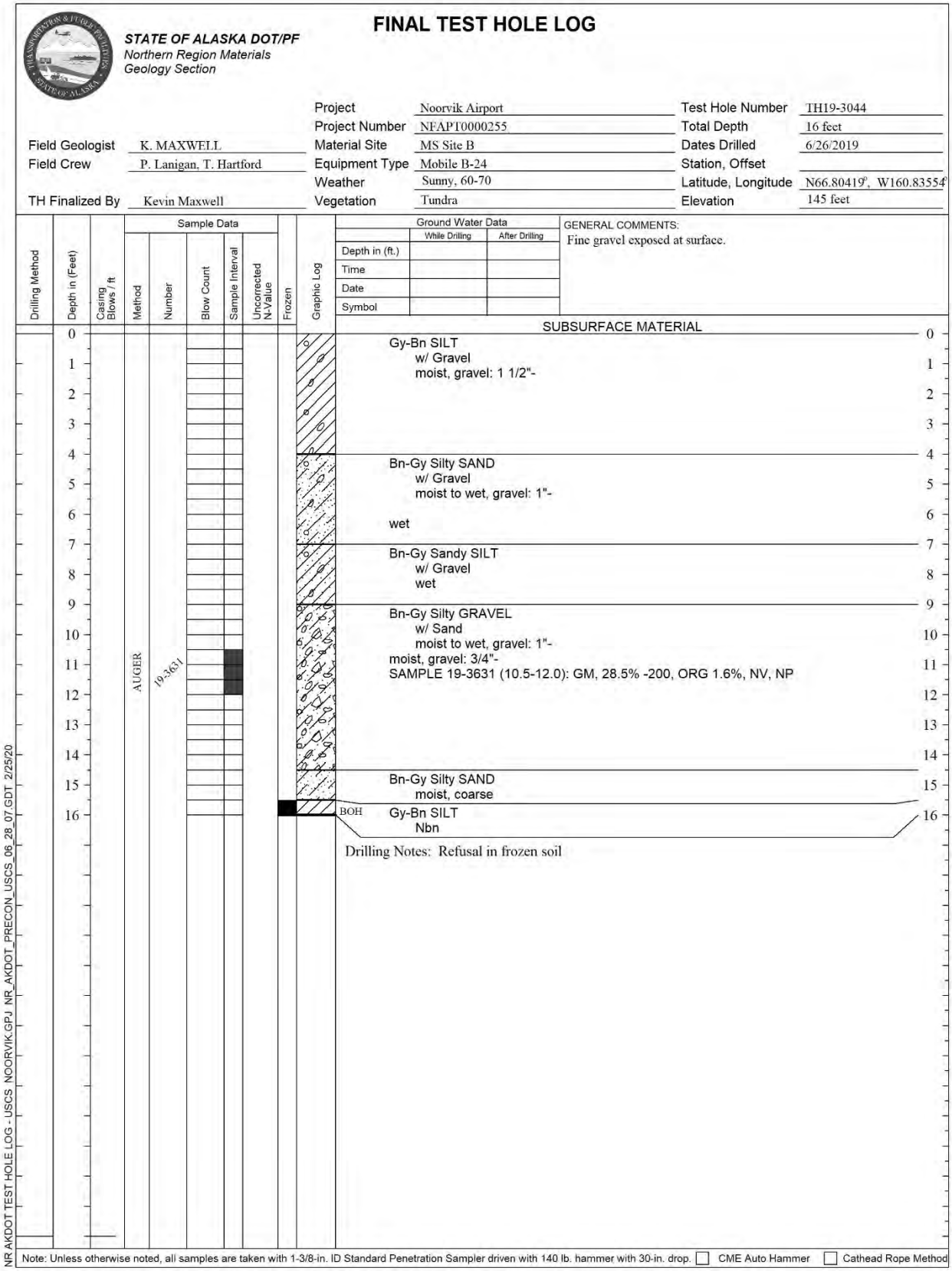
19 BOH

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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Expan
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation None
Test Hole Number TH19-3042
Total Depth 22 feet
Dates Drilled 6/25/2019
Station, Offset
Latitude, Longitude N66.8086°, W160.82048°
Elevation 140 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 12.0
Time
Date 6/25/19
Symbol
GENERAL COMMENTS:
Coarse gravel exposed at surface.
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
ORG MAT
Tn-Bn SILT
w/ Sand
moist, sand: medium-coarse
Tn-Bn Well-graded SAND
w/ Silt & Gravel
moist, sand: medium-coarse, gravel: 3/4"-
SAMPLE 19-3626 (2.0-4.0): SW-SM, 11% -200, ORG 0.9%, NV, NP
moist, gravel: 1"-
SAMPLE 19-3627 (5.0-11.0): SW-SM, 8.4% -200, ORG 0.7%, SSc 2.5,
DEG 81, NV, NP
moist to wet
wet
sand: coarse, gravel: 1"-
SAMPLE 19-3628 (13.0-16.0): SW-SM, 7% -200, ORG 0.6%, NV, NP
Gy-Bk SILT
Nbe
BOH
AUGER
19-3626
AUGER
19-3627
AUGER
19-3628
Drilling Notes: Refusal on cobble
NR AKDOT TEST HOLE LOG - USCS NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 1/10/20
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 Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Expan
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation None
Test Hole Number TH19-3043
Total Depth 23 feet
Dates Drilled 6/25/2019
Station, Offset
Latitude, Longitude N66.80719°, W160.82387°
Elevation 140 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 13.0
Time
Date 6/25/19
Symbol
GENERAL COMMENTS:
Coarse gravel exposed at surface.
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
ORG MAT
Bn-Or Silty SAND
w/ Gravel
moist, gravel: 1"-
Bn-Or Poorly-graded GRAVEL
w/ Silt & Sand
moist to wet, gravel: 1 1/2"-
SAMPLE 19-3629 (5.0-8.0): GP-GM, 8.1% -200, ORG 1.0%, SSc 2.5, SSf 9.5, DEG 81, NV, NP
AUGER
19-3629
Bn-Or Well-graded GRAVEL
w/ Silt & Sand
moist to wet, gravel: 1 1/2"-
SAMPLE 19-3630 (9.0-12.0): GW-GM, 7% -200, ORG 1.4%, NV, NP
AUGER
19-3630
wet
gravel: 3"-
Gy-Bk SILT
Nbe
GRAVEL (determined by drill reaction)
gravel: 2"-3"
BOH
Drilling Notes: Refusal on cobble
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TH19-3044
Total Depth 16 feet
Dates Drilled 6/26/2019
Station, Offset
Latitude, Longitude N66.80419°, W160.83554°
Elevation 145 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Sample Data
Drilling Method
Depth in (Feet)
Casing Blows / ft
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Fine gravel exposed at surface.
SUBSURFACE MATERIAL
AUGER
19-3631
Gy-Bn SILT
w/ Gravel
moist, gravel: 1 1/2"-
Bn-Gy Silty SAND
w/ Gravel
moist to wet, gravel: 1"-
wet
Bn-Gy Sandy SILT
w/ Gravel
wet
Bn-Gy Silty GRAVEL
w/ Sand
moist to wet, gravel: 1"-
moist, gravel: 3/4"-
SAMPLE 19-3631 (10.5-12.0): GM, 28.5% -200, ORG 1.6%, NV, NP
Bn-Gy Silty SAND
moist, coarse
BOH
Gy-Bn SILT
Nbn
Drilling Notes: Refusal in frozen soil
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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3045
Project Number	NFAPT0000255	Total Depth	25.5 feet
Material Site	MS Site B	Dates Drilled	6/26/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.80296°, W160.83581°
Vegetation	None	Elevation	145 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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

GENERAL COMMENTS:
Coarse gravel exposed at surface.

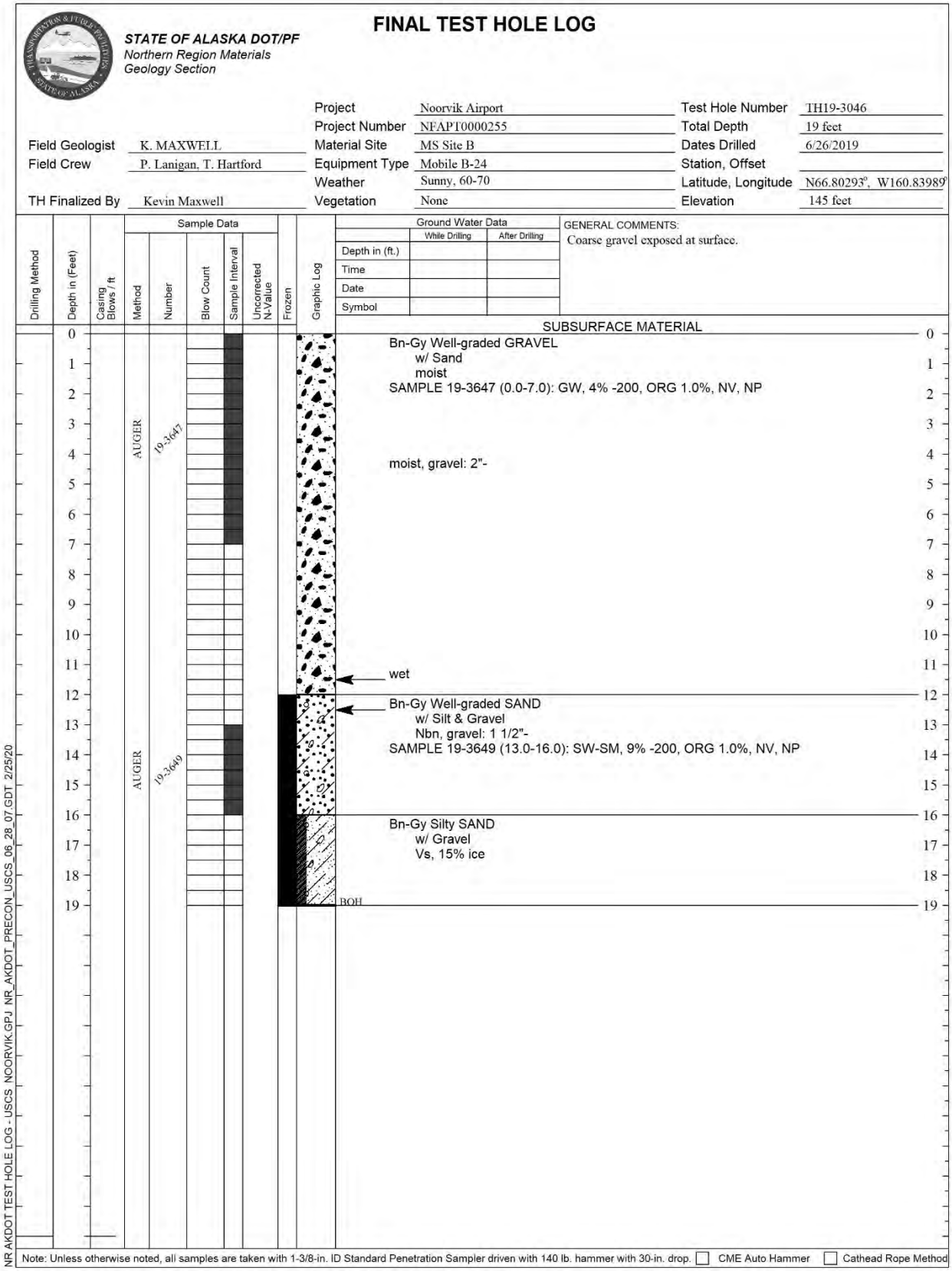
Sample Data: Method | Number | Blow Count | Sample Interval | Uncorrected N-Value | Casing Blows / ft

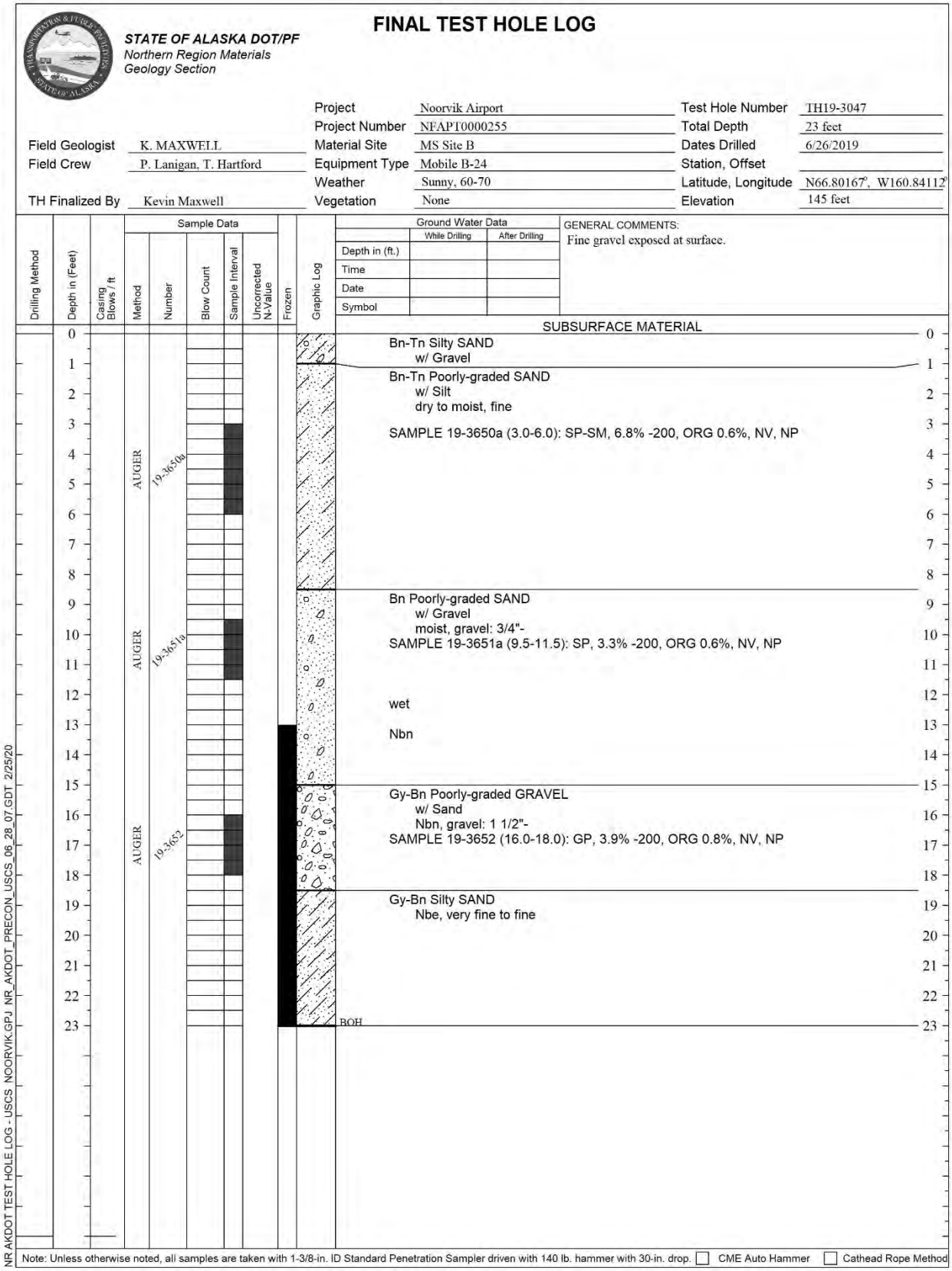
Depth (ft)	Method	Number	Frozen	Graphic Log	SUBSURFACE MATERIAL
0					Bn-Gy Gravelly SILT w/ Sand dry to moist, gravel: 1 1/2"-
3					Bn Poorly-graded SAND w/ Gravel moist
8	AUGER	19-3643			Gy-Bn Silty GRAVEL w/ Sand dry to moist, gravel: 2"- SAMPLE 19-3643 (8.0-10.0): GM, 22.6% -200, ORG 1.1%, NV, NP
10	AUGER	19-3644			moist, gravel: 1"- SAMPLE 19-3644 (10.5-11.5): GM, 12.3% -200, ORG 1.1%, NV, NP
12					Bn-Gy Well-graded GRAVEL w/ Sand moist, gravel: 2"-
14					wet
15					Bn-Gy Poorly-graded SAND Nbn
16					Gy-Bn Silty SAND w/ Gravel Nbn, gravel: 3/4"-
17	AUGER	19-3646			SAMPLE 19-3646 (17.0-20.0): SM, 12.5% -200, ORG 0.6%, NV, NP
23					Bn-Bk Silty SAND Nbn
25				BOH	SILT (determined by drill reaction)

Drilling Notes: Refusal in frozen soil

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation None
Test Hole Number TH19-3046
Total Depth 19 feet
Dates Drilled 6/26/2019
Station, Offset
Latitude, Longitude N66.80293°, W160.83989°
Elevation 145 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Coarse gravel exposed at surface.
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn-Gy Well-graded GRAVEL
w/ Sand
moist
SAMPLE 19-3647 (0.0-7.0): GW, 4% -200, ORG 1.0%, NV, NP
AUGER
19-3647
moist, gravel: 2"-
wet
Bn-Gy Well-graded SAND
w/ Silt & Gravel
Nbn, gravel: 1 1/2"-
SAMPLE 19-3649 (13.0-16.0): SW-SM, 9% -200, ORG 1.0%, NV, NP
AUGER
19-3649
Bn-Gy Silty SAND
w/ Gravel
Vs, 15% ice
BOH
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Note: Unless otherwise noted, all samples are taken with 1-3/8-in. ID Standard Penetration Sampler driven with 140 lb. hammer with 30-in. drop.
CME Auto Hammer
Cathead Rope Method
NR AKDOT TEST HOLE LOG - USCS NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation None
Test Hole Number TH19-3047
Total Depth 23 feet
Dates Drilled 6/26/2019
Station, Offset
Latitude, Longitude N66.80167°, W160.84112°
Elevation 145 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Fine gravel exposed at surface.
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn-Tn Silty SAND
w/ Gravel
Bn-Tn Poorly-graded SAND
w/ Silt
dry to moist, fine
SAMPLE 19-3650a (3.0-6.0): SP-SM, 6.8% -200, ORG 0.6%, NV, NP
AUGER
19-3650a
Bn Poorly-graded SAND
w/ Gravel
moist, gravel: 3/4"-
SAMPLE 19-3651a (9.5-11.5): SP, 3.3% -200, ORG 0.6%, NV, NP
AUGER
19-3651a
wet
Nbn
Gy-Bn Poorly-graded GRAVEL
w/ Sand
Nbn, gravel: 1 1/2"-
SAMPLE 19-3652 (16.0-18.0): GP, 3.9% -200, ORG 0.8%, NV, NP
AUGER
19-3652
Gy-Bn Silty SAND
Nbe, very fine to fine
BOH
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TH19-3048
Project Number	NFAPT0000255	Total Depth	23 feet
Material Site	MS Site B	Dates Drilled	6/27/2019
Equipment Type	Mobile B-24	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.80372°, W160.83617°
Vegetation	None	Elevation	145 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

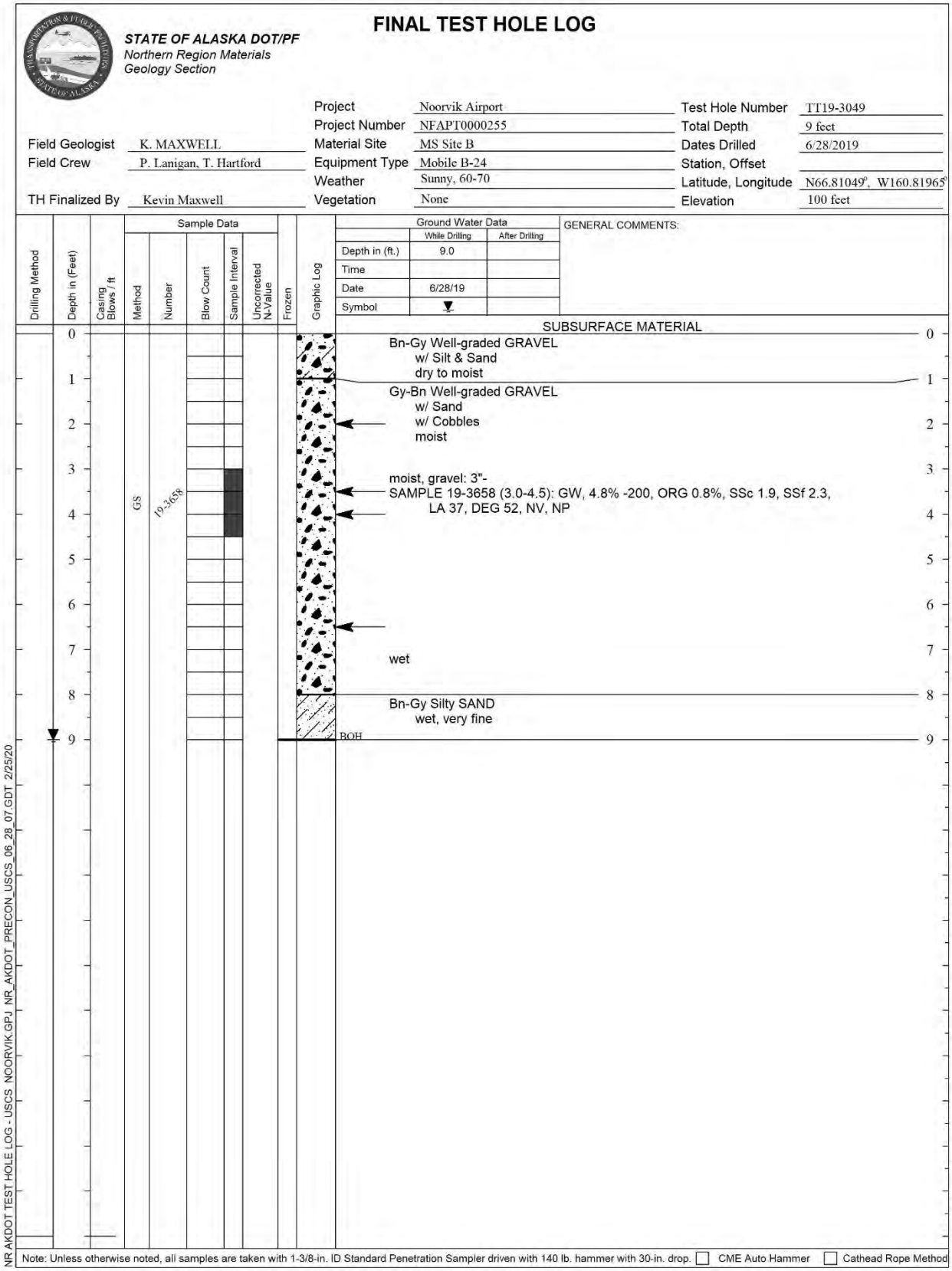
Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

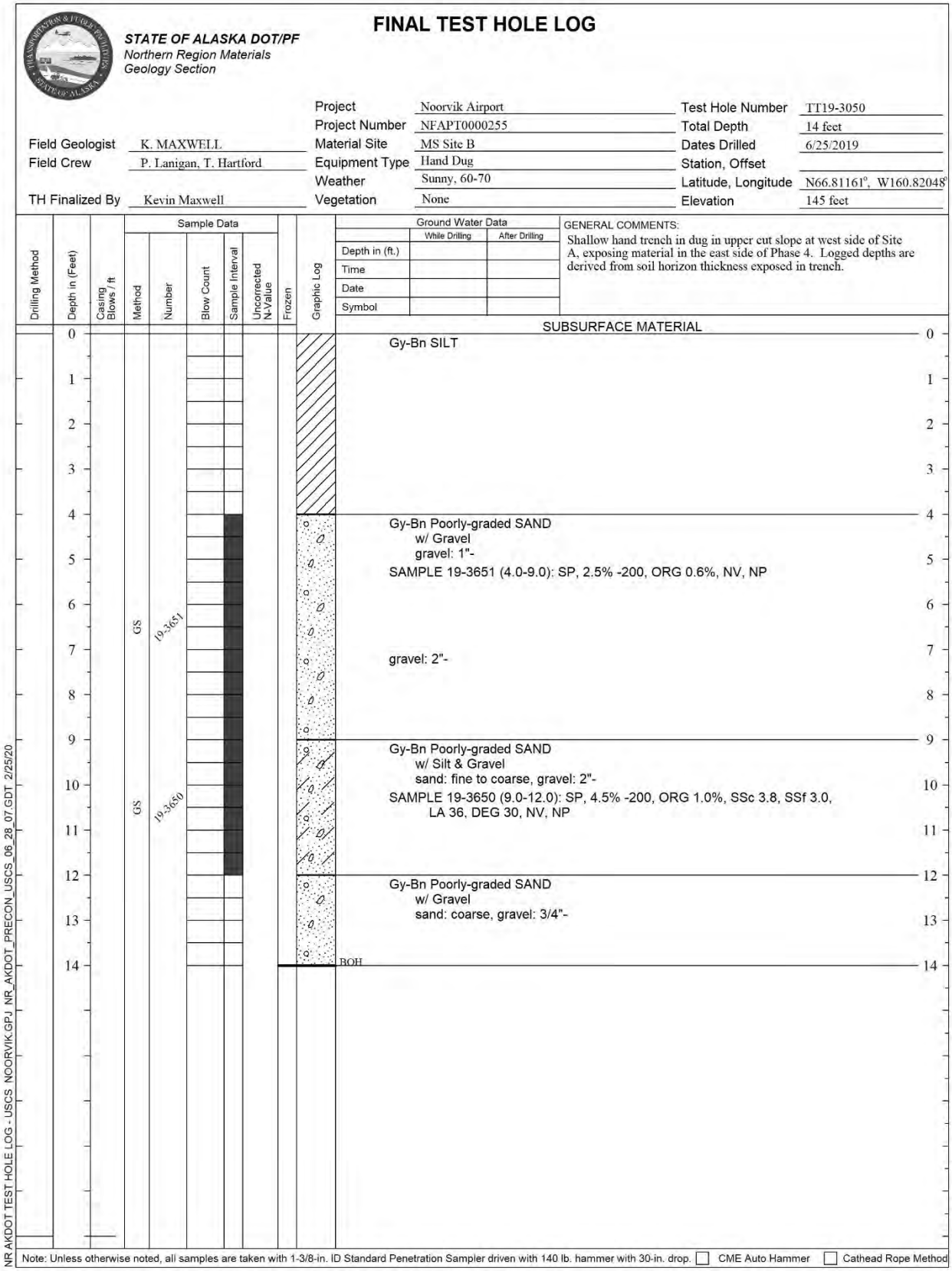
GENERAL COMMENTS:
Fine to medium gravel exposed at surface.

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Bn-Tn Well-graded GRAVEL
	1									w/ Sand
	2									dry to moist, gravel: 2"-
	3		AUGER	19-3654						SAMPLE 19-3654 (2.0-5.0): GW, 2.7% -200, ORG 0.8%, LL 23, NP
	4									
	5									
	6									Bn-Tn Poorly-graded SAND
	7									dry to moist, fine
	8		AUGER	19-3654(A)						SAMPLE 19-3654(A) (8.0-9.0): SP, 4.6% -200, NM 2.5%, ORG 0.4%, NV,
	9									NP
	10									
	11									
	12		AUGER	19-3655						Gy-Bn Poorly-graded SAND
	13									w/ Gravel
	14									moist
	15									SAMPLE 19-3655 (12.0-13.0): SP, 3.4% -200, ORG 0.5%, NV, NP
	16		AUGER	19-3656						moist, gravel: 1/2"-
	17									SAMPLE 19-3656 (15.5-17.5): SP, 3.9% -200, ORG 0.5%, NV, NP
	18									Nbn
	19									Gy-Bn Poorly-graded SAND
	20									w/ Silt & Gravel
	21									Nbn, gravel: 2"-
	22									Gy Silty SAND
	23									Nbe
										BOH

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_NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Mobile B-24
Weather Sunny, 60-70
Vegetation None
Test Hole Number TT19-3049
Total Depth 9 feet
Dates Drilled 6/28/2019
Station, Offset
Latitude, Longitude N66.81049°, W160.81965°
Elevation 100 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 9.0
Time
Date 6/28/19
Symbol
GENERAL COMMENTS:
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn-Gy Well-graded GRAVEL
w/ Silt & Sand
dry to moist
Gy-Bn Well-graded GRAVEL
w/ Sand
w/ Cobbles
moist
moist, gravel: 3"-
SAMPLE 19-3658 (3.0-4.5): GW, 4.8% -200, ORG 0.8%, SSc 1.9, SSf 2.3,
LA 37, DEG 52, NV, NP
GS
19-3658
wet
Bn-Gy Silty SAND
wet, very fine
BOH
0
1
2
3
4
5
6
7
8
9
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Hand Dug
Weather Sunny, 60-70
Vegetation None
Test Hole Number TT19-3050
Total Depth 14 feet
Dates Drilled 6/25/2019
Station, Offset
Latitude, Longitude N66.81161°, W160.82048°
Elevation 145 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Shallow hand trench in dug in upper cut slope at west side of Site A, exposing material in the east side of Phase 4. Logged depths are derived from soil horizon thickness exposed in trench.
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
0 Gy-Bn SILT
4 Gy-Bn Poorly-graded SAND
w/ Gravel
gravel: 1"-
SAMPLE 19-3651 (4.0-9.0): SP, 2.5% -200, ORG 0.6%, NV, NP
GS 19-3651
gravel: 2"-
9 Gy-Bn Poorly-graded SAND
w/ Silt & Gravel
sand: fine to coarse, gravel: 2"-
SAMPLE 19-3650 (9.0-12.0): SP, 4.5% -200, ORG 1.0%, SSc 3.8, SSf 3.0, LA 36, DEG 30, NV, NP
GS 19-3650
12 Gy-Bn Poorly-graded SAND
w/ Gravel
sand: coarse, gravel: 3/4"-
14 BOH
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TT19-3051
Project Number	NFAPT0000255	Total Depth	15 feet
Material Site	MS Site B	Dates Drilled	6/26/2019
Equipment Type	Hand Dug	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.81197°, W160.82013°
Vegetation	None	Elevation	145 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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

GENERAL COMMENTS:
Shallow hand trench in dug in upper cut slope at west side of Site A, exposing material in the east side of Phase 4. Logged depths are derived from soil horizon thickness exposed in trench.

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Gy SILT w/ Sand
	8									Gy-Or Well-graded GRAVEL w/ Silt & Sand
	11									Gy-Bn Well-graded SAND w/ Silt & Gravel
	15									BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TT19-3052
Project Number	NFAPT0000255	Total Depth	15 feet
Material Site	MS Site B	Dates Drilled	6/26/2019
Equipment Type	Hand Dug	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.8128°, W160.81957°
Vegetation	None	Elevation	145 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

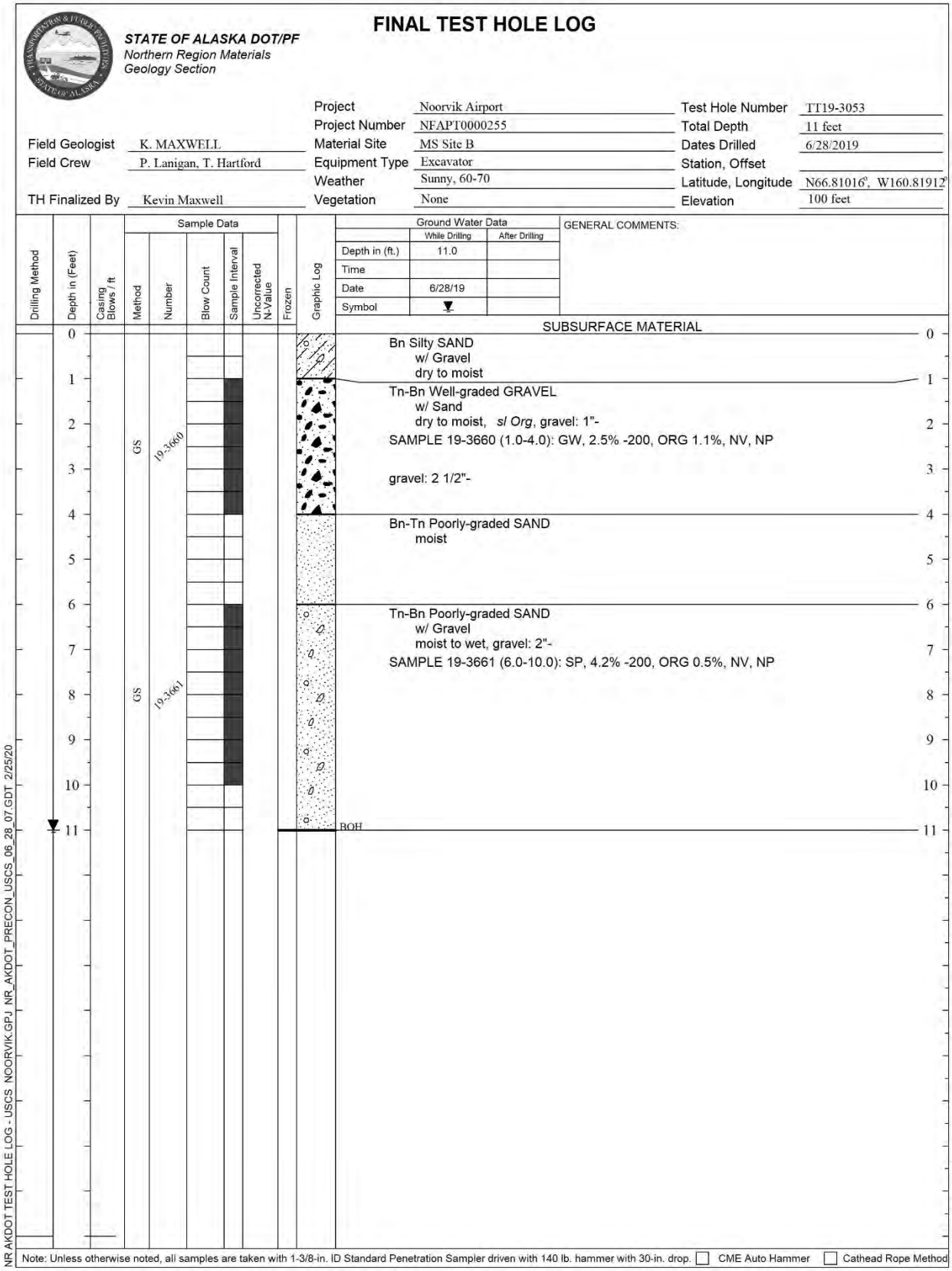
Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

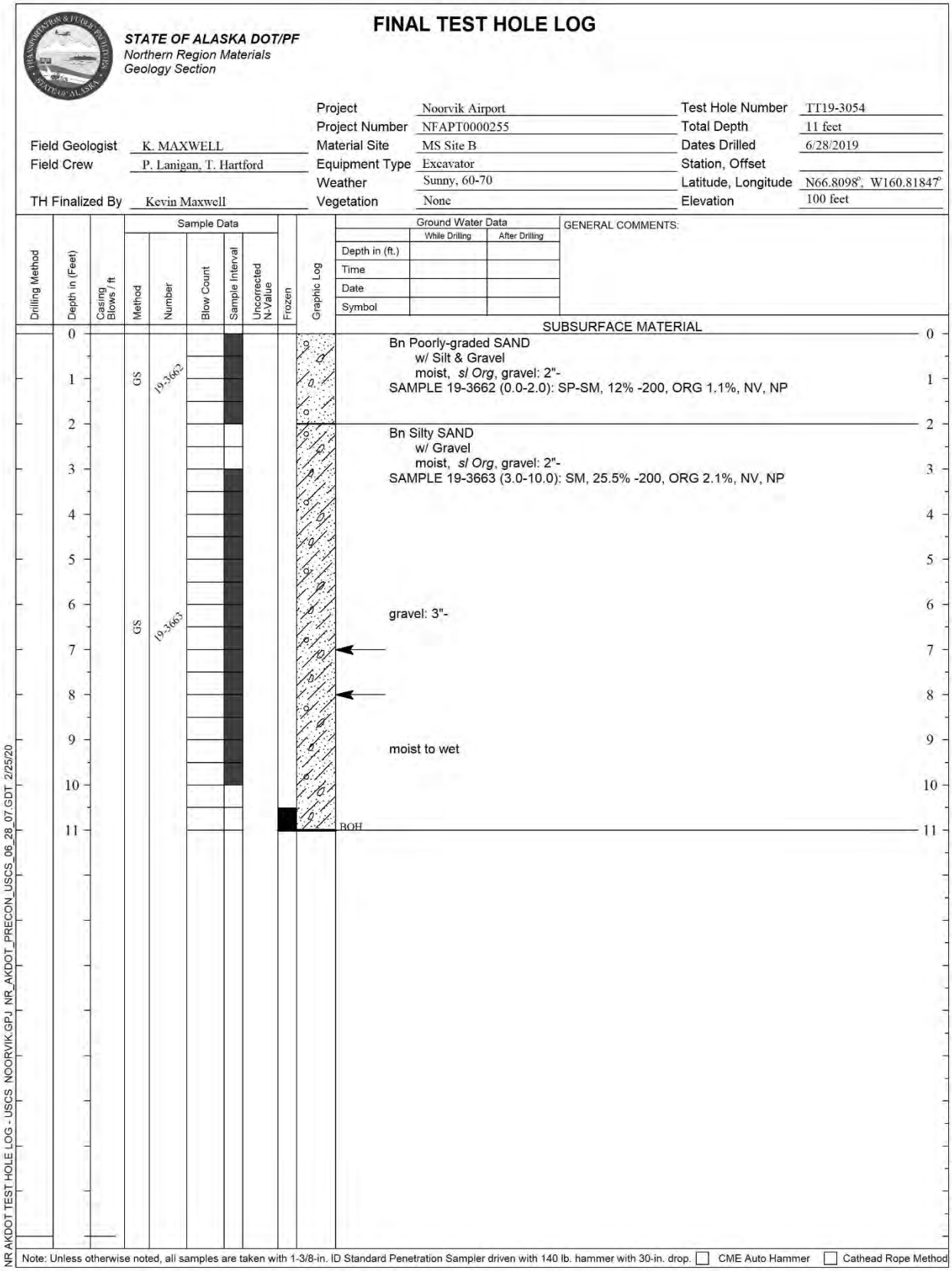
GENERAL COMMENTS:
Shallow hand trench in dug in upper cut slope at west side of Site A, exposing material in the east side of Phase 4. Logged depths are derived from soil horizon thickness exposed in trench.

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Gy-Bn SILT
	6		GS	19-3653a						Gy-Bn Poorly-graded SAND w/ Gravel SAMPLE 19-3653a (6.0-9.0): SP, 3% -200, ORG 0.9%, NV, NP
	9		GS	19-3653						Gy-Bn Well-graded GRAVEL w/ Silt & Sand SAMPLE 19-3653 (9.0-13.0): GW-GM, 5.9% -200, ORG 1.7%, SSc 1.0, SSf 1.0, DEG 28, NV, NP
	13									Gy Silty SAND
	15									BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation None
Test Hole Number TT19-3053
Total Depth 11 feet
Dates Drilled 6/28/2019
Station, Offset
Latitude, Longitude N66.81016°, W160.81912°
Elevation 100 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Ground Water Data
While Drilling
After Drilling
Depth in (ft.) 11.0
Time
Date 6/28/19
Symbol
GENERAL COMMENTS:
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn Silty SAND
w/ Gravel
dry to moist
Tn-Bn Well-graded GRAVEL
w/ Sand
dry to moist, sl Org, gravel: 1"-
SAMPLE 19-3660 (1.0-4.0): GW, 2.5% -200, ORG 1.1%, NV, NP
gravel: 2 1/2"-
Bn-Tn Poorly-graded SAND
moist
Tn-Bn Poorly-graded SAND
w/ Gravel
moist to wet, gravel: 2"-
SAMPLE 19-3661 (6.0-10.0): SP, 4.2% -200, ORG 0.5%, NV, NP
GS
19-3660
GS
19-3661
BOH
0
1
2
3
4
5
6
7
8
9
10
11
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation None
Test Hole Number TT19-3054
Total Depth 11 feet
Dates Drilled 6/28/2019
Station, Offset
Latitude, Longitude N66.8098°, W160.81847°
Elevation 100 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Sample Data
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
Drilling Method
Depth in (Feet)
Casing Blows / ft
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
Bn Poorly-graded SAND
w/ Silt & Gravel
moist, sl Org, gravel: 2"-
SAMPLE 19-3662 (0.0-2.0): SP-SM, 12% -200, ORG 1.1%, NV, NP
GS
19-3662
Bn Silty SAND
w/ Gravel
moist, sl Org, gravel: 2"-
SAMPLE 19-3663 (3.0-10.0): SM, 25.5% -200, ORG 2.1%, NV, NP
GS
19-3663
gravel: 3"-
moist to wet
BOH
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TT19-3055
Project Number	NFAPT0000255	Total Depth	10 feet
Material Site	MS Site B	Dates Drilled	6/28/2019
Equipment Type	Excavator	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.81083°, W160.81866°
Vegetation	None	Elevation	100 feet

Field Geologist: K. MAXWELL
Field Crew: P. Lanigan, T. Hartford
TH Finalized By: Kevin Maxwell

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	Uncorrected N-Value	Frozen	Graphic Log
	0–10		GS	19-3664					

SUBSURFACE MATERIAL

0 – Gy-Bn Well-graded SAND
w/ Gravel
gravel: 1 1/2"-
SAMPLE 19-3664 (0.0-8.0): SP, 2.1% -200, ORG 0.5%, NV, NP, LA 37, DEG 52, NV, NP

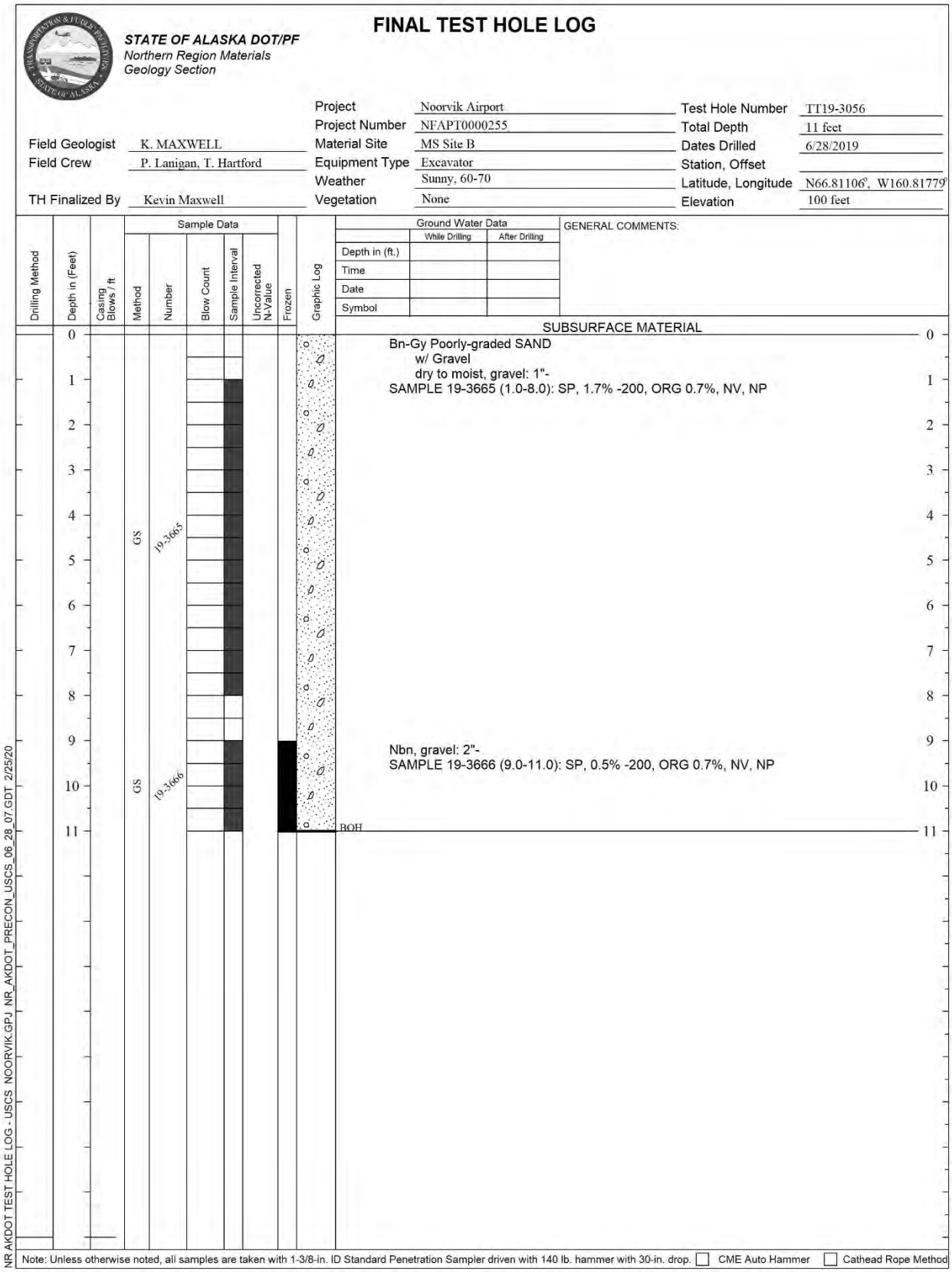
gravel: 2"-

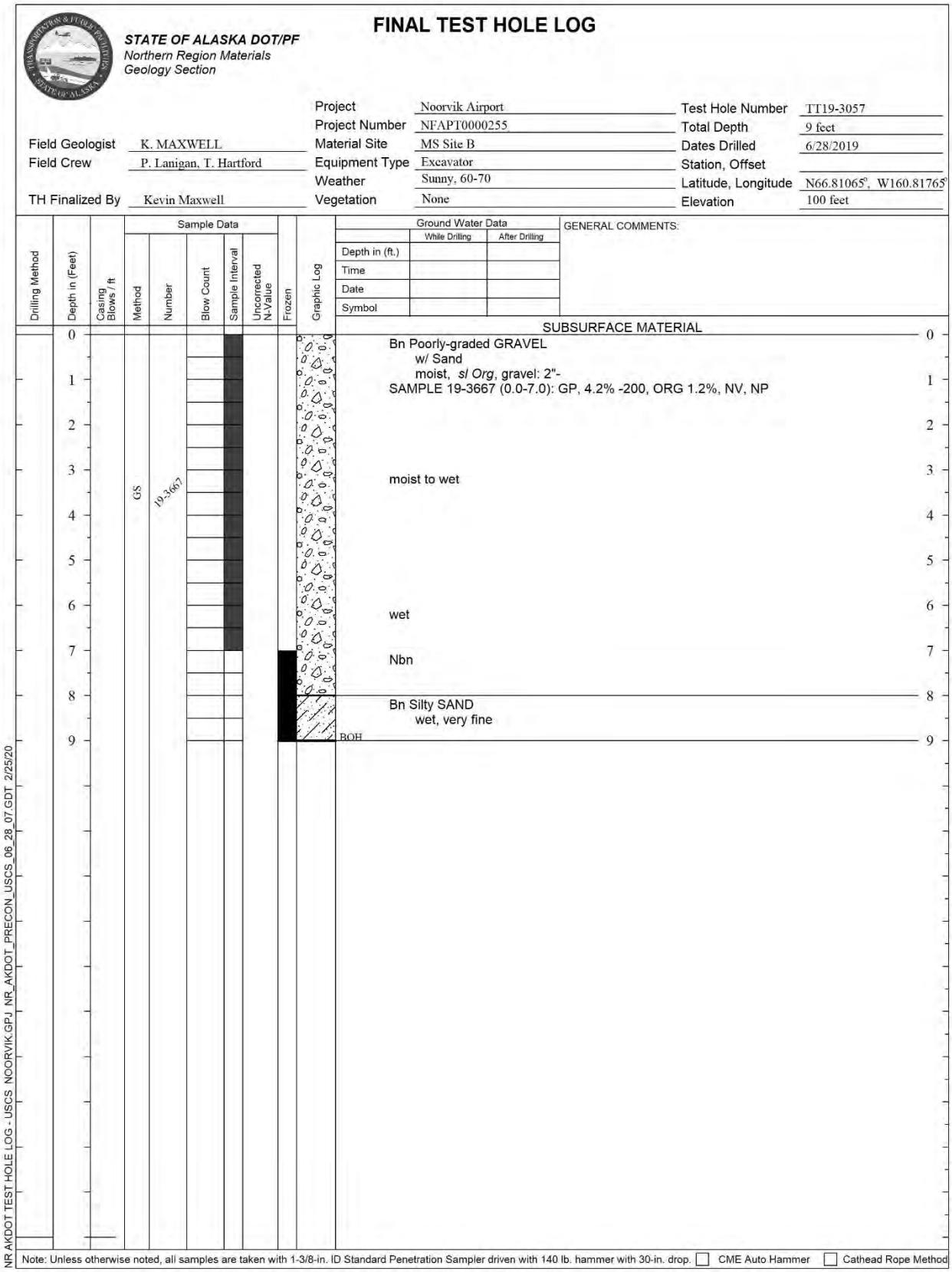
9 – Gy-Bn Well-graded GRAVEL
w/ Sand
Vs, 10% to 15% ice, gravel: 3"-

10 – BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation None
Test Hole Number TT19-3056
Total Depth 11 feet
Dates Drilled 6/28/2019
Station, Offset
Latitude, Longitude N66.81106°, W160.81779°
Elevation 100 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
Bn-Gy Poorly-graded SAND
w/ Gravel
dry to moist, gravel: 1"-
SAMPLE 19-3665 (1.0-8.0): SP, 1.7% -200, ORG 0.7%, NV, NP
GS
19-3665
Nbn, gravel: 2"-
SAMPLE 19-3666 (9.0-11.0): SP, 0.5% -200, ORG 0.7%, NV, NP
GS
19-3666
BOH
0
1
2
3
4
5
6
7
8
9
10
11
NR AKDOT TEST HOLE LOG - USCS NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20
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 Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site B
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation None
Test Hole Number TT19-3057
Total Depth 9 feet
Dates Drilled 6/28/2019
Station, Offset
Latitude, Longitude N66.81065°, W160.81765°
Elevation 100 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Drilling Method
Depth in (Feet)
Casing Blows / ft
Sample Data
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
GS
19-3667
Bn Poorly-graded GRAVEL
w/ Sand
moist, sl Org, gravel: 2"-
SAMPLE 19-3667 (0.0-7.0): GP, 4.2% -200, ORG 1.2%, NV, NP
moist to wet
wet
Nbn
Bn Silty SAND
wet, very fine
BOH
0
1
2
3
4
5
6
7
8
9
NR AKDOT TEST HOLE LOG - USCS NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20
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	Noorvik Airport	Test Hole Number	TT19-3058
Project Number	NFAPT0000255	Total Depth	7 feet
Material Site	MS Site B	Dates Drilled	6/28/2019
Equipment Type	Excavator	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.81049°, W160.81853°
Vegetation	None	Elevation	100 feet

Field Geologist: K. MAXWELL
Field Crew: P. Lanigan, T. Hartford
TH Finalized By: Kevin Maxwell

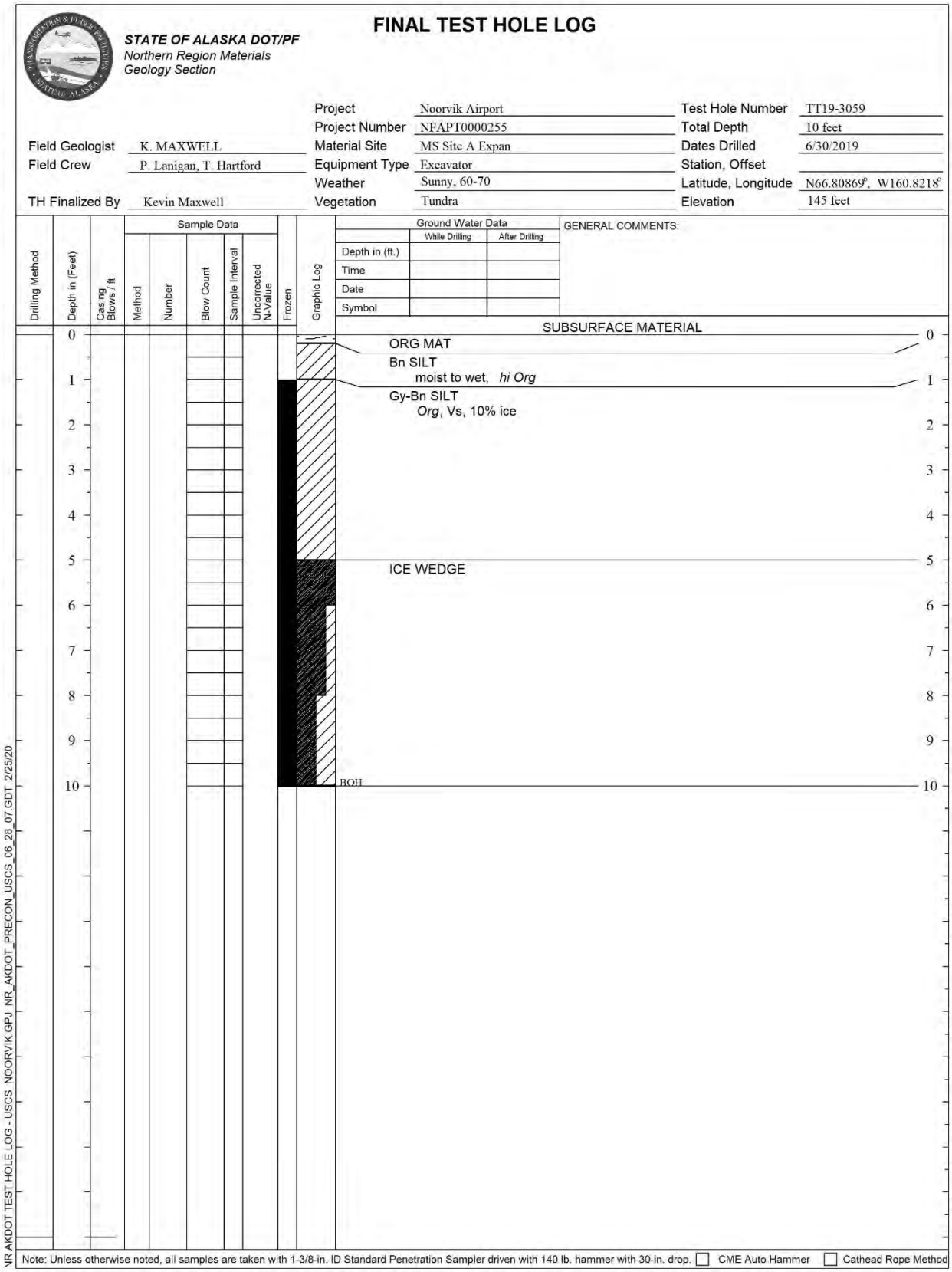
Ground Water Data	While Drilling	After Drilling
Depth in (ft.)		
Time		
Date		
Symbol		

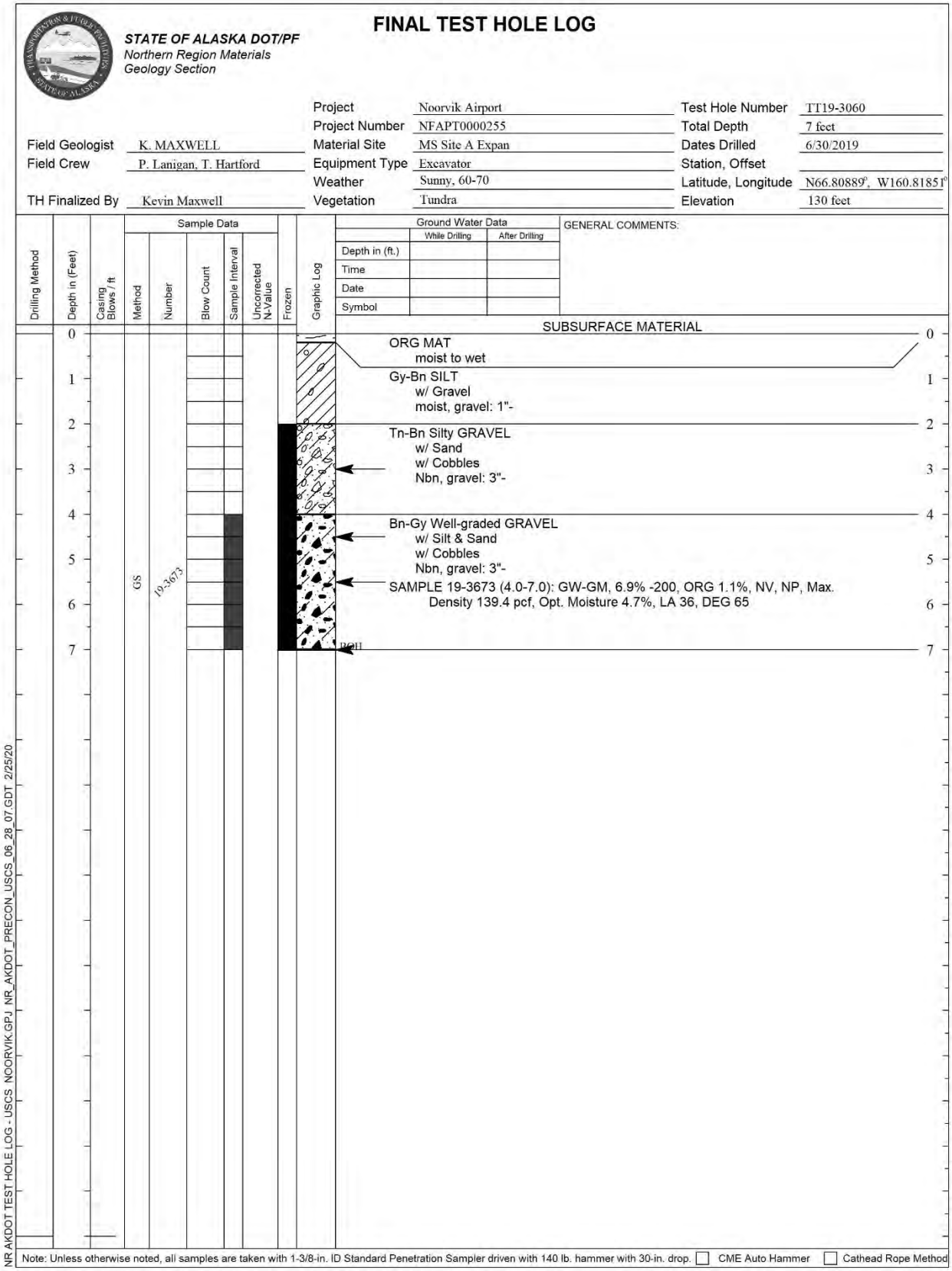
GENERAL COMMENTS:

Drilling Method	Depth in (Feet)	Casing Blows / ft	Sample Data: Method	Number	Blow Count	Sample Interval	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									Bn-Tn Poorly-graded SAND moist, very fine to fine
	1									
	2									
	3									
	4									Bn-Gy Poorly-graded SAND w/ Gravel wet, sand: coarse, gravel: 3/4:-
	5		GS	19-3668						SAMPLE 19-3668 (4.0-7.0): SP, 3.5% -200, ORG 0.9%, NV, NP
	6									Nbn
	7									BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Expan
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TT19-3059
Total Depth 10 feet
Dates Drilled 6/30/2019
Station, Offset
Latitude, Longitude N66.80869°, W160.8218°
Elevation 145 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Sample Data
Drilling Method
Depth in (Feet)
Casing Blows / ft
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
ORG MAT
Bn SILT
moist to wet, hi Org
Gy-Bn SILT
Org, Vs, 10% ice
ICE WEDGE
BOH
0
1
2
3
4
5
6
7
8
9
10
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Expan
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TT19-3060
Total Depth 7 feet
Dates Drilled 6/30/2019
Station, Offset
Latitude, Longitude N66.80889°, W160.81851°
Elevation 130 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Sample Data
Drilling Method
Depth in (Feet)
Casing Blows / ft
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
ORG MAT
moist to wet
Gy-Bn SILT
w/ Gravel
moist, gravel: 1"-
Tn-Bn Silty GRAVEL
w/ Sand
w/ Cobbles
Nbn, gravel: 3"-
Bn-Gy Well-graded GRAVEL
w/ Silt & Sand
w/ Cobbles
Nbn, gravel: 3"-
SAMPLE 19-3673 (4.0-7.0): GW-GM, 6.9% -200, ORG 1.1%, NV, NP, Max. Density 139.4 pcf, Opt. Moisture 4.7%, LA 36, DEG 65
GS
19-3673
Well
0
1
2
3
4
5
6
7
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TT19-3061
Project Number	NFAPT0000255	Total Depth	8 feet
Material Site	MS Site A Expan	Dates Drilled	6/30/2019
Equipment Type	Excavator	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.80807°, W160.81931°
Vegetation	Tundra	Elevation	130 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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	Uncorrected N-Value	Frozen	Graphic Log
	0								
	1								
	2								
	3								
	4								
	5								
	6		GS	19-3674					
	7								
	8								

SUBSURFACE MATERIAL

0 — ORG MAT

1 — Gy SILT
moist to wet

2 — Tn-Gy SILT
moist

3 — Gy-Bk Sandy SILT
dry to moist

4 — Bn-Gy Silty SAND
w/ Gravel
w/ Cobbles
sl Org, Vs, 10% ice, gravel: 3"-

5 — SAMPLE 19-3674 (4.0-7.5): SM, 21.4% -200, ORG 2.0%, LA 36, DEG 65, LL 20, NP

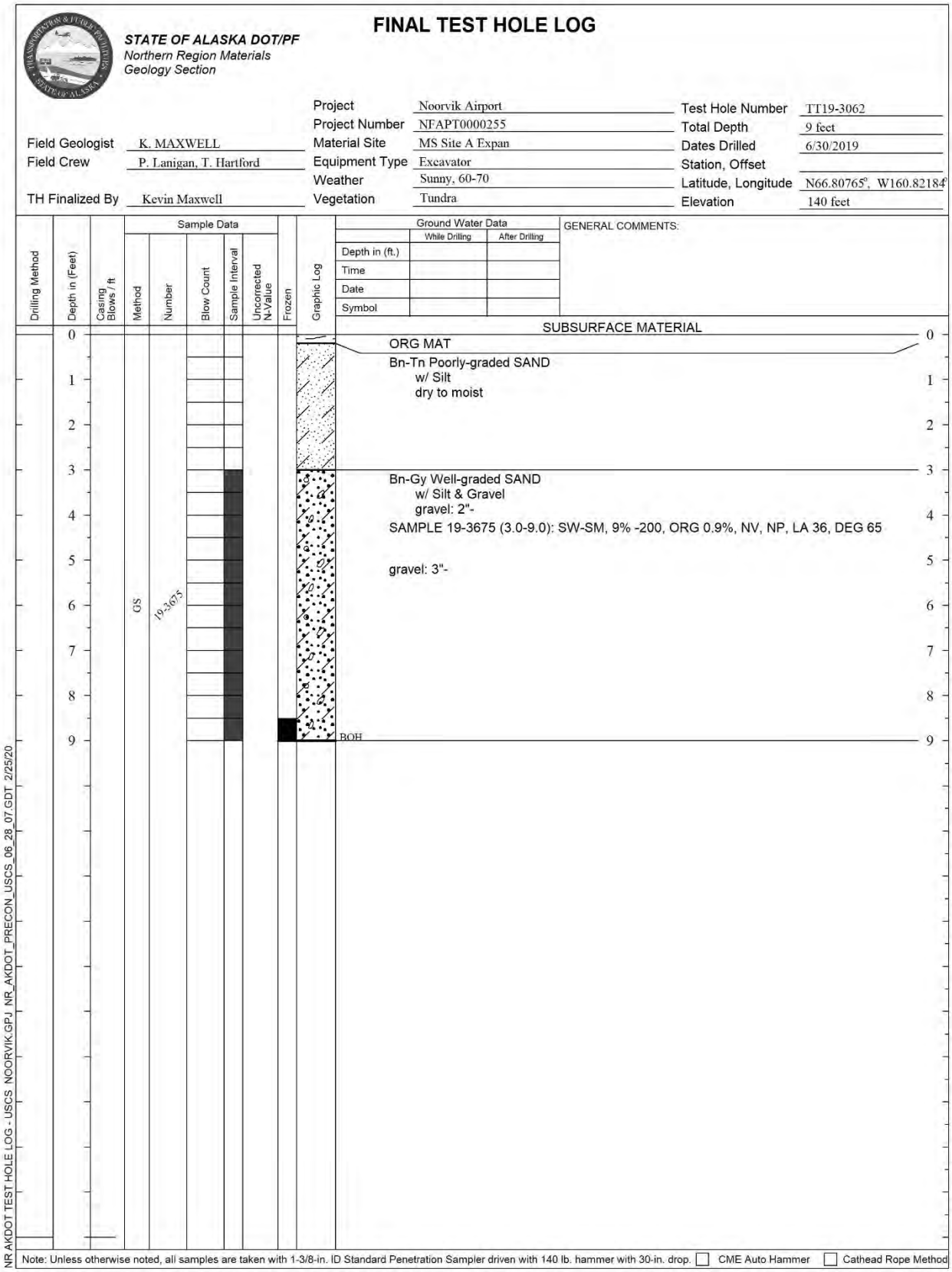
6

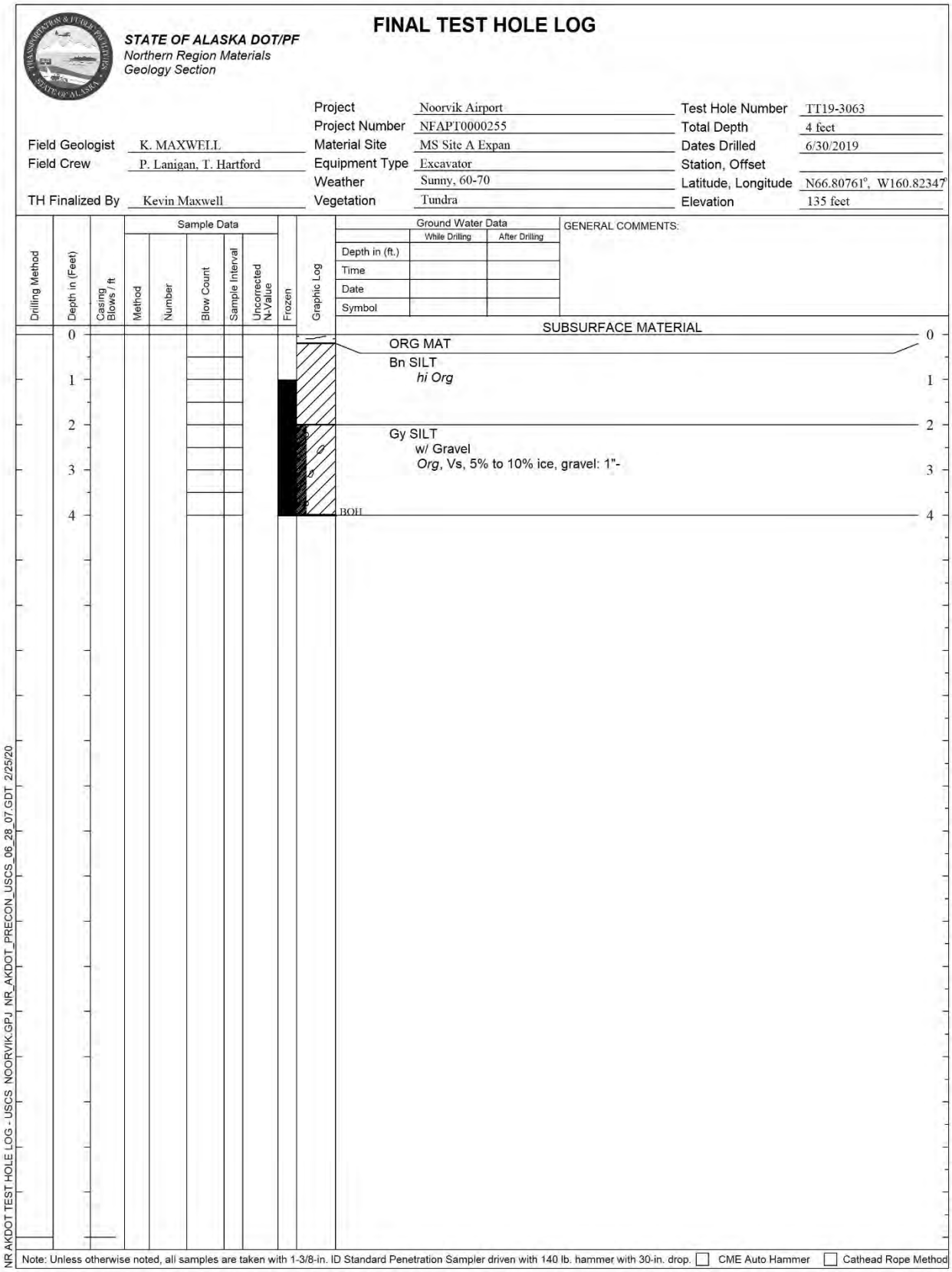
7

8 — BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Expan
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TT19-3062
Total Depth 9 feet
Dates Drilled 6/30/2019
Station, Offset
Latitude, Longitude N66.80765°, W160.82184°
Elevation 140 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
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
Uncorrected N-Value
Frozen
Graphic Log
SUBSURFACE MATERIAL
ORG MAT
Bn-Tn Poorly-graded SAND
w/ Silt
dry to moist
Bn-Gy Well-graded SAND
w/ Silt & Gravel
gravel: 2"-
SAMPLE 19-3675 (3.0-9.0): SW-SM, 9% -200, ORG 0.9%, NV, NP, LA 36, DEG 65
gravel: 3"-
GS
19-3675
BOH
0
1
2
3
4
5
6
7
8
9
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20


FINAL TEST HOLE LOG
STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section
Project Noorvik Airport
Project Number NFAPT0000255
Material Site MS Site A Expan
Equipment Type Excavator
Weather Sunny, 60-70
Vegetation Tundra
Test Hole Number TT19-3063
Total Depth 4 feet
Dates Drilled 6/30/2019
Station, Offset
Latitude, Longitude N66.80761°, W160.82347°
Elevation 135 feet
Field Geologist K. MAXWELL
Field Crew P. Lanigan, T. Hartford
TH Finalized By Kevin Maxwell
Sample Data
Drilling Method
Depth in (Feet)
Casing Blows / ft
Method
Number
Blow Count
Sample Interval
Uncorrected N-Value
Frozen
Graphic Log
Ground Water Data
While Drilling
After Drilling
Depth in (ft.)
Time
Date
Symbol
GENERAL COMMENTS:
SUBSURFACE MATERIAL
ORG MAT
Bn SILT
hi Org
Gy SILT
w/ Gravel
Org, Vs, 5% to 10% ice, gravel: 1"-
BOH
0
1
2
3
4
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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

FINAL TEST HOLE LOG

STATE OF ALASKA DOT/PF
Northern Region Materials
Geology Section

Project	Noorvik Airport	Test Hole Number	TT19-3064
Project Number	NFAPT0000255	Total Depth	4 feet
Material Site	MS Site A Expan	Dates Drilled	6/30/2019
Equipment Type	Excavator	Station, Offset	
Weather	Sunny, 60-70	Latitude, Longitude	N66.80745°, W160.82263°
Vegetation	Tundra	Elevation	135 feet
Field Geologist	K. MAXWELL		
Field Crew	P. Lanigan, T. Hartford		
TH Finalized By	Kevin Maxwell		

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	Uncorrected N-Value	Frozen	Graphic Log	SUBSURFACE MATERIAL
	0									ORG MAT
	1									Bn SILT *hi Org* Nbe
	2									
	3									
	4									BOH

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 NOORVIK.GPJ NR_AKDOT_PRECON_USCS_06_28_07.GDT 2/25/20

Appendix B

Lab Results

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TH19-3029	TH19-3029	TH19-3030	TH19-3030	TH19-3030	TH19-3031	TH19-3031
DEPTH (feet)		5.5-7.0	9.5-10.5	7.0-9.0	16.0-17.0	21.0-22.0	0.0-5.0	22.0-24.0
LATITUDE		N66.81744°	N66.81744°	N66.81601°	N66.81601°	N66.81601°	N66.81896°	N66.81896°
LONGITUDE		W161.02414°	W161.02414°	W161.03212°	W161.03212°	W161.03212°	W161.0081°	W161.0081°
LAB NUMBER		**19-3602**	**19-3603**	**19-3604**	**19-3605**	**19-3606**	**19-3607**	**19-3608**
DATE SAMPLED		21-Jun-19	21-Jun-19	21-Jun-19	21-Jun-19	21-Jun-19	22-Jun-19	22-Jun-19
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**						93	
	0.75"	94					87	
	0.5"	90					72	97
	0.375"	83					65	94
	#4	72					50	86
	#8	65					40	77
	#10	61					40	77
	#16	58					34	72
	#30	51					28	65
Sand	**#40**	44					25	61
	#50	36					21	54
	#60	32		100			19	50
	#80	24		99			16	43
	#100	22	100	99	100	100	14	39
Silt/Clay	**#200**	12.6	98.3	97.5	97.4	95.2	9.1	28.5
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		SM	ML	ML	ML	ML	GP-GM	SM
USCS SOIL DESCRIPTION								
NATURAL MOISTURE			139.5	46.5	73.1	34.6		19.9
ORGANICS		0.9	15.8	3.4	8.3	3.1	1.0	3.0
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. VALUE								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS			hi Org[1]	sl Org[1]	Org[1]	sl Org[1]		sl Org[1]

GENERAL COMMENTS

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

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

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

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

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TH19-3032	TH19-3032	TH19-3033	TH19-3033	TH19-3034	TH19-3035	TH19-3035
DEPTH (feet)		0.0-0.3	14.0-15.0	9.0-10.0	16.0-17.0	8.5-11.0	4.0-5.0	6.0-8.0
LATITUDE		N66.8189°	N66.8189°	N66.81807°	N66.81807°	N66.80972°	N66.81073°	N66.81073°
LONGITUDE		W161.01012°	W161.01012°	W161.01609°	W161.01609°	W160.82229°	W160.82231°	W160.82231°
LAB NUMBER		**19-3609**	**19-3610**	**19-3611**	**19-3612**	**19-3613**	**19-3614**	**19-3615**
DATE SAMPLED		23-Jun-19	23-Jun-19	23-Jun-19	23-Jun-19	23-Jun-19	23-Jun-19	23-Jun-19
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**							
	0.75"	98						99
	0.5"	86				89		94
	0.375"	77	100			85		88
	#4	60	95		98	74		67
	#8	49	85		95	66	99	48
	#10	44	85		93	63	94	47
	#16	40	75	100	92	60	83	38
	#30	34	62	99	88	54	52	29
Sand	**#40**	30	56	98	85	48	40	25
	#50	26	48	97	82	37	32	22
	#60	23	46	96	80	31	29	20
	#80	19	40	94	77	22	24	19
	#100	17	37	93	75	19	22	17
Silt/Clay	**#200**	10.8	27.4	91.1	69.3	13.2	15.5	13.6
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT			NV	NV	39	NV	NV	NV
PLASTIC INDEX			NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION			SM	ML	ML	SM	SM	SM
USCS SOIL DESCRIPTION		GP-GM						
NATURAL MOISTURE			14.0	37.9	60.8	17.3	16.3	
ORGANICS		0.9	1.5	10.0	6.4	4.0	0.5	0.8
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. VALUE								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS				Org[1]	Org[1]	sl Org[1]		

GENERAL COMMENTS

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

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

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

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

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION
NORTHERN REGION
LABORATORY TESTING REPORT

PROJECT NAME:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TH19-3035	TH19-3035	TH19-3035	TH19-3036	TH19-3036	TH19-3036	TH19-3036
DEPTH (feet)		9.0-11.0	14.0-16.0	17.0-19.0	7.0-9.0	9.0-11.0	15.0-18.0	19.0-21.0
LATITUDE		N66.81073°	N66.81073°	N66.81073°	N66.81191°	N66.81191°	N66.81191°	N66.81191°
LONGITUDE		W160.82231°	W160.82231°	W160.82231°	W160.82166°	W160.82166°	W160.82166°	W160.82166°
LAB NUMBER		**19-3616**	**19-3617**	**19-3618**	**19-3619**	**19-3620**	**19-3621**	**19-3622**
DATE SAMPLED		23-Jun-19	23-Jun-19	23-Jun-19	24-Jun-19	24-Jun-19	24-Jun-19	24-Jun-19
% Passing	**3"**							
	2"							
	1.5"							
Gravel	**1.0"**						96	98
	0.75"		99		99	98	88	96
	0.5"	97	96	98	94	90	77	88
	0.375"	95	91	97	89	83	72	81
	#4	83	77	91	73	61	58	62
	#8	73	66	85	56	44	48	53
	#10	72	62	84	50	36	45	52
	#16	63	56	78	44	30	43	45
	#30	50	43	63	35	23	38	37
Sand	**#40**	40	34	52	31	20	36	33
	#50	29	26	40	28	18	33	29
	#60	25	23	36	26	17	32	28
	#80	19	19	30	24	16	30	26
	#100	17	18	26	23	15	30	25
Silt/Clay	**#200**	12.6	14.0	20.2	19.3	12.3	26.3	21.2
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV	22	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		SM	SM	SM	SM	SM	GM	SM
USCS SOIL DESCRIPTION								
NATURAL MOISTURE								
ORGANICS		1.1	0.9	1.0	1.4	1.2	1.3	1.1
SP. GR. (FINE)				2.65				
SP. GR. (COARSE)				2.68				
MAX. DRY DENSITY				141.0				
OPTIMUM MOISTURE				5.4				
L.A. ABRASION								
DEGRAD. VALUE			57					
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS			insufficient material for LA					

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:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TH19-3036	TH19-3037	TH19-3041	TH19-3042	TH19-3042	TH19-3042	TH19-3043
DEPTH (feet)		25.0-26.0	6.0-9.0	4.0-5.0	2.0-4.0	5.0-11.0	13.0-16.0	5.0-8.0
LATITUDE		N66.81191°	N66.81294°	N66.81122°	N66.8086°	N66.8086°	N66.8086°	N66.80719°
LONGITUDE		W160.82166°	W160.82117°	W160.8197°	W160.82048°	W160.82048°	W160.82048°	W160.82387°
LAB NUMBER		**19-3623**	**19-3624**	**19-3625**	**19-3626**	**19-3627**	**19-3628**	**19-3629**
DATE SAMPLED		24-Jun-19	24-Jun-19	25-Jun-19	25-Jun-19	25-Jun-19	25-Jun-19	25-Jun-19
% Passing	**3"**							
	2"							
	1.5"					98		97
Gravel	**1.0"**				98	96	99	90
	0.75"		99		93	93	96	85
	0.5"	98	93		85	86	90	72
	0.375"	97	87		77	80	85	66
	#4	92	68		60	63	64	53
	#8	87	54	100	49	49	44	45
	#10	82	47	99	49	42	36	45
	#16	79	41	99	40	36	30	37
	#30	74	30	99	30	25	20	26
Sand	**#40**	70	26	98	25	20	16	20
	#50	66	22	97	20	16	13	16
	#60	63	20	96	18	14	12	14
	#80	56	17	87	15	12	10	12
	#100	53	16	75	13	11	10	11
Silt/Clay	**#200**	36.4	12.5	28.8	11.0	8.4	7.0	8.1
	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		SM	SM	SM	SW-SM	SW-SM	SW-SM	GP-GM
USCS SOIL DESCRIPTION								
NATURAL MOISTURE		17.3		5.0				
ORGANICS		1.0	0.7	0.7	0.9	0.7	0.6	1.0
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. VALUE								81
SODIUM SULF. (CRSE)								3
SODIUM SULF. (FINE)								10
NORDIC ABRASION								
REMARKS						Samples 3627, 3629, 3630 Mixed for Qualities		Samples 3627, 3629, 3630 Mixed for Qualities

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:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TH19-3043	TH19-3044	TH19-3045	TH19-3045	TH19-3045	TH19-3046	TH19-3046
DEPTH (feet)		9.0-12.0	10.5-12.0	8.0-10.0	10.5-11.5	17.0-20.0	0.0-7.0	13.0-16.0
LATITUDE		N66.80719°	N66.80419°	N66.80296°	N66.80296°	N66.80296°	N66.80293°	N66.80293°
LONGITUDE		W160.82387°	W160.83554°	W160.83581°	W160.83581°	W160.83581°	W160.83989°	W160.83989°
LAB NUMBER		**19-3630**	**19-3631**	**19-3643**	**19-3644**	**19-3646**	**19-3647**	**19-3649**
DATE SAMPLED		25-Jun-19	26-Jun-19	26-Jun-19	26-Jun-19	26-Jun-19	26-Jun-19	26-Jun-19
% Passing	**3"**							
	2"							
	1.5"	97		99			99	97
Gravel	**1.0"**	94		91	97		95	92
	0.75"	88	98	83	92		89	77
	0.5"	67	90	75	75	97	76	72
	0.375"	55	83	69	66	95	68	63
	#4	38	60	57	47	81	49	58
	#8	31	50	50	36	62	37	46
	#10	30	47	50	35	61	35	45
	#16	24	44	45	29	41	25	35
	#30	17	39	39	22	29	16	26
Sand	**#40**	14	37	37	20	25	13	23
	#50	12	35	35	19	22	9	18
	#60	11	34	34	18	20	8	16
	#80	10	32	32	17	18	6	14
	#100	9	32	30	16	16	6	12
Silt/Clay	**#200**	7.0	28.5	22.6	12.3	12.5	4.0	9.0
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		GW-GM	GM	GM	GM	SM	GW	SW-SM
USCS SOIL DESCRIPTION								
NATURAL MOISTURE								
ORGANICS		1.4	1.6	1.1	1.1	0.6	1.0	1.0
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. VALUE								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS		Samples 3627, 3629, 3630 Mixed for Qualities						

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:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TT19-3050	TH19-3047	TT19-3050	TH19-3047	TH19-3047	TT19-3052	TT19-3052
DEPTH (feet)		9.0-12.0	3.0-6.0	4.0-9.0	9.5-11.5	16.0-18.0	9.0-13.0	6.0-9.0
LATITUDE		N66.81161°	N66.80167°	N66.81161°	N66.80167°	N66.80167°	N66.8128°	N66.8128°
LONGITUDE		W160.82048°	W160.84112°	W160.82048°	W160.84112°	W160.84112°	W160.81957°	W160.81957°
LAB NUMBER		**19-3650**	**19-3650a**	**19-3651**	**19-3651a**	**19-3652**	**19-3653**	**19-3653a**
DATE SAMPLED		25-Jun-19	26-Jun-19	25-Jun-19	26-Jun-19	26-Jun-19	26-Jun-19	26-Jun-19
% Passing	**3"**							
	2"			95				
	1.5"	94		91		92		99
Gravel	**1.0"**	89		85		86	96	92
	0.75"	83	99	80	100	80	89	87
	0.5"	74	99	72	97	71	75	79
	0.375"	69	99	68	96	63	66	74
	#4	57	97	58	87	51	43	56
	#8	49	94	48	70	42	31	43
	#10	48	90	42	69	42	30	41
	#16	41	83	34	50	33	22	32
	#30	32	57	17	28	22	16	23
Sand	**#40**	26	39	10	18	16	13	17
	#50	15	25	6	10	11	10	11
	#60	12	20	5	8	9	9	9
	#80	8	14	4	6	7	8	6
	#100	6	12	3	5	6	7	5
Silt/Clay	**#200**	4.5	6.8	2.5	3.3	3.9	5.9	3.0
Hydro	**0.02**							
	0.005							
	0.002							
	0.001							
LIQUID LIMIT		NV	NV	NV	NV	NV	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		SP	SP-SM	SP	SP	GP	GW-GM	SP
USCS SOIL DESCRIPTION								
NATURAL MOISTURE								
ORGANICS		1.0	0.6	0.6	0.6	0.8	1.7	0.9
SP. GR. (FINE)								
SP. GR. (COARSE)		2.68					2.64	
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION		36						
DEGRAD. VALUE		30					28	
SODIUM SULF. (CRSE)		4					1	
SODIUM SULF. (FINE)		3					1	
NORDIC ABRASION								
REMARKS							insufficient material for LA	

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:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TH19-3048	TH19-3048	TH19-3048	TH19-3048	TT19-3049	TT19-3053	TT19-3053
DEPTH (feet)		2.0-5.0	8.0-9.0	12.0-13.0	15.5-17.5	3.0-4.5	1.0-4.0	6.0-10.0
LATITUDE		N66.80372°	N66.80372°	N66.80372°	N66.80372°	N66.81049°	N66.81016°	N66.81016°
LONGITUDE		W160.83617°	W160.83617°	W160.83617°	W160.83617°	W160.81965°	W160.81912°	W160.81912°
LAB NUMBER		**19-3654**	**19-3654(A)**	**19-3655**	**19-3656**	**19-3658**	**19-3660**	**19-3661**
DATE SAMPLED		27-Jun-19	27-Jun-19	27-Jun-19	27-Jun-19	28-Jun-19	28-Jun-19	28-Jun-19
% Passing	**3"**							
	2"	94						98
	1.5"	85				98	97	96
Gravel	**1.0"**	73		99		90	91	89
	0.75"	62		99		81	84	84
	0.5"	50		97	99	63	74	75
	0.375"	44	99	93	95	54	67	69
	#4	32	97	83	76	40	48	53
	#8	25	94	74	53	32	32	42
	#10	22	90	73	52	31	26	37
	#16	18	84	62	39	23	20	32
	#30	12	58	48	29	13	11	22
Sand	**#40**	9	36	35	21	13	8	16
	#50	7	18	17	12	10	5	12
	#60	6	13	13	10	9	5	10
	#80	5	8	8	7	8	4	8
	#100	4	7	6	6	7	4	7
Silt/Clay	**#200**	2.7	4.6	3.4	3.9	4.8	2.5	4.2
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT		23	NV	NV	NV	NV	NV	NV
PLASTIC INDEX		NP	NP	NP	NP	NP	NP	NP
USCS CLASSIFICATION		GW	SP	SP	SP	GW	GW	SP
USCS SOIL DESCRIPTION								
NATURAL MOISTURE			2.5					
ORGANICS		0.8	0.4	0.5	0.5	0.8	1.1	0.5
SP. GR. (FINE)								
SP. GR. (COARSE)								
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION						37		
DEGRAD. VALUE						52		
SODIUM SULF. (CRSE)						2		
SODIUM SULF. (FINE)						2		
NORDIC ABRASION								
REMARKS						Samples 3658 + 3664 Mixed for Qualities		

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:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		TT19-3054	TT19-3054	TT19-3055	TT19-3056	TT19-3056	TT19-3057	TT19-3058
DEPTH (feet)		0.0-2.0	3.0-10.0	0.0-8.0	1.0-8.0	9.0-11.0	0.0-7.0	4.0-7.0
LATITUDE		N66.8098°	N66.8098°	N66.81083°	N66.81106°	N66.81106°	N66.81065°	N66.81049°
LONGITUDE		W160.81847°	W160.81847°	W160.81866°	W160.81779°	W160.81779°	W160.81765°	W160.81853°
LAB NUMBER		**19-3662**	**19-3663**	**19-3664**	**19-3665**	**19-3666**	**19-3667**	**19-3668**
DATE SAMPLED		28-Jun-19	28-Jun-19	28-Jun-19	28-Jun-19	28-Jun-19	28-Jun-19	28-Jun-19
% Passing	**3"**							
	2"		99	97	98	99	94	
	1.5"		95	95	95	96	91	
Gravel	**1.0"**	96	90	88	91	91	83	98
	0.75"	91	87	83	88	86	76	97
	0.5"	81	81	75	83	78	66	93
	0.375"	76	78	70	80	73	60	88
	#4	61	70	55	69	60	46	67
	#8	53	65	44	57	49	37	52
	#10	49	64	38	49	42	33	44
	#16	45	59	31	41	34	28	37
	#30	37	51	18	25	19	19	25
Sand	**#40**	32	46	12	15	11	13	19
	#50	26	41	8	8	5	9	14
	#60	23	39	6	6	4	7	12
	#80	19	34	5	4	2	6	8
	#100	17	32	4	3	2	6	7
Silt/Clay	**#200**	12.0	25.5	2.1	1.7	0.5	4.2	3.5
	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		SP-SM	SM	SP	SP	SP	GP	SP
USCS SOIL DESCRIPTION								
NATURAL MOISTURE								
ORGANICS		1.1	2.1	0.5	0.7	0.7	1.2	0.9
SP. GR. (FINE)							2.66	
SP. GR. (COARSE)							2.66	
MAX. DRY DENSITY								
OPTIMUM MOISTURE								
L.A. ABRASION								
DEGRAD. VALUE								
SODIUM SULF. (CRSE)								
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS			sl Org[1]	Samples 3658 + 3664 Mixed for Qualities			insufficient material for density	

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:	Noorvik Airport
PROJECT NUMBER:	NFAPT0000255
AKSAS NUMBER:	NFAPT0000255
SAMPLED BY:	K. Maxwell
MATERIAL SOURCE:	runway

TEST HOLE NUMBER		19-3669	19-3670	19-3671	19-3672	TT19-3060	TT19-3061	TT19-3062
DEPTH (feet)		0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	4.0-7.0	4.0-7.5	3.0-9.0
LATITUDE		N66.80079°	N66.80064°	N66.80062°	N66.80065°	N66.80889°	N66.80807°	N66.80765°
LONGITUDE		W160.7472°	W160.73617°	W160.7362°	W160.73616°	W160.81851°	W160.81931°	W160.82184°
LAB NUMBER		**19-3669**	**19-3670**	**19-3671**	**19-3672**	**19-3673**	**19-3674**	**19-3675**
DATE SAMPLED		29-Jun-19	29-Jun-19	29-Jun-19	29-Jun-19	30-Jun-19	30-Jun-19	30-Jun-19
% Passing	**3"**							
	2"						94	99
	1.5"					95	91	99
Gravel	**1.0"**					85	86	94
	0.75"					76	83	89
	0.5"					62	76	82
	0.375"					54	73	77
	#4					39	62	60
	#8					33	55	44
	#10					30	52	43
	#16					28	49	31
	#30					22	43	19
Sand	**#40**					18	39	16
	#50					15	35	13
	#60					13	33	13
	#80					11	29	12
	#100					10	27	11
Silt/Clay	**#200**					6.9	21.4	9.0
	0.02							
Hydro	**0.005**							
	0.002							
	0.001							
LIQUID LIMIT						NV	20	NV
PLASTIC INDEX						NP	NP	NP
USCS CLASSIFICATION						GW-GM	SM	SW-SM
USCS SOIL DESCRIPTION								
NATURAL MOISTURE								
ORGANICS						1.1	2.0	0.9
SP. GR. (FINE)						2.67		
SP. GR. (COARSE)						2.64		
MAX. DRY DENSITY						139.4		
OPTIMUM MOISTURE						4.7		
L.A. ABRASION		41	40	50	43		36	
DEGRAD. VALUE		49	25	16	22		65	
SODIUM SULF. (CRSE)		2						
SODIUM SULF. (FINE)								
NORDIC ABRASION								
REMARKS						Samples 3673, 3674, 3675 mixed for Qualities	Samples 3673, 3674, 3675 mixed for Qualities	Samples 3673, 3674, 3675 mixed for Qualities

GENERAL COMMENTS

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

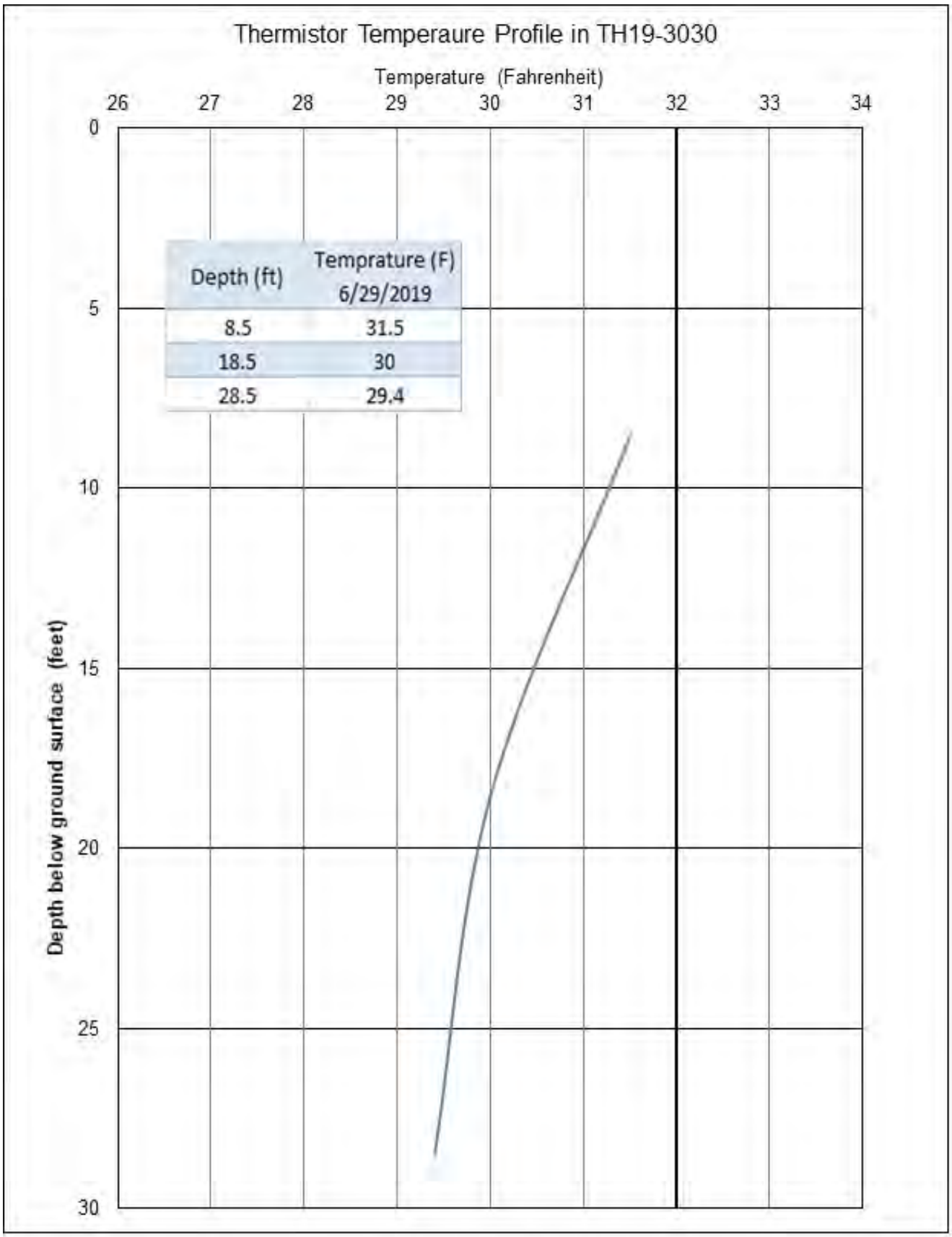
[1] Organic content determination is based on the results of the ATM T-6 test method.

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

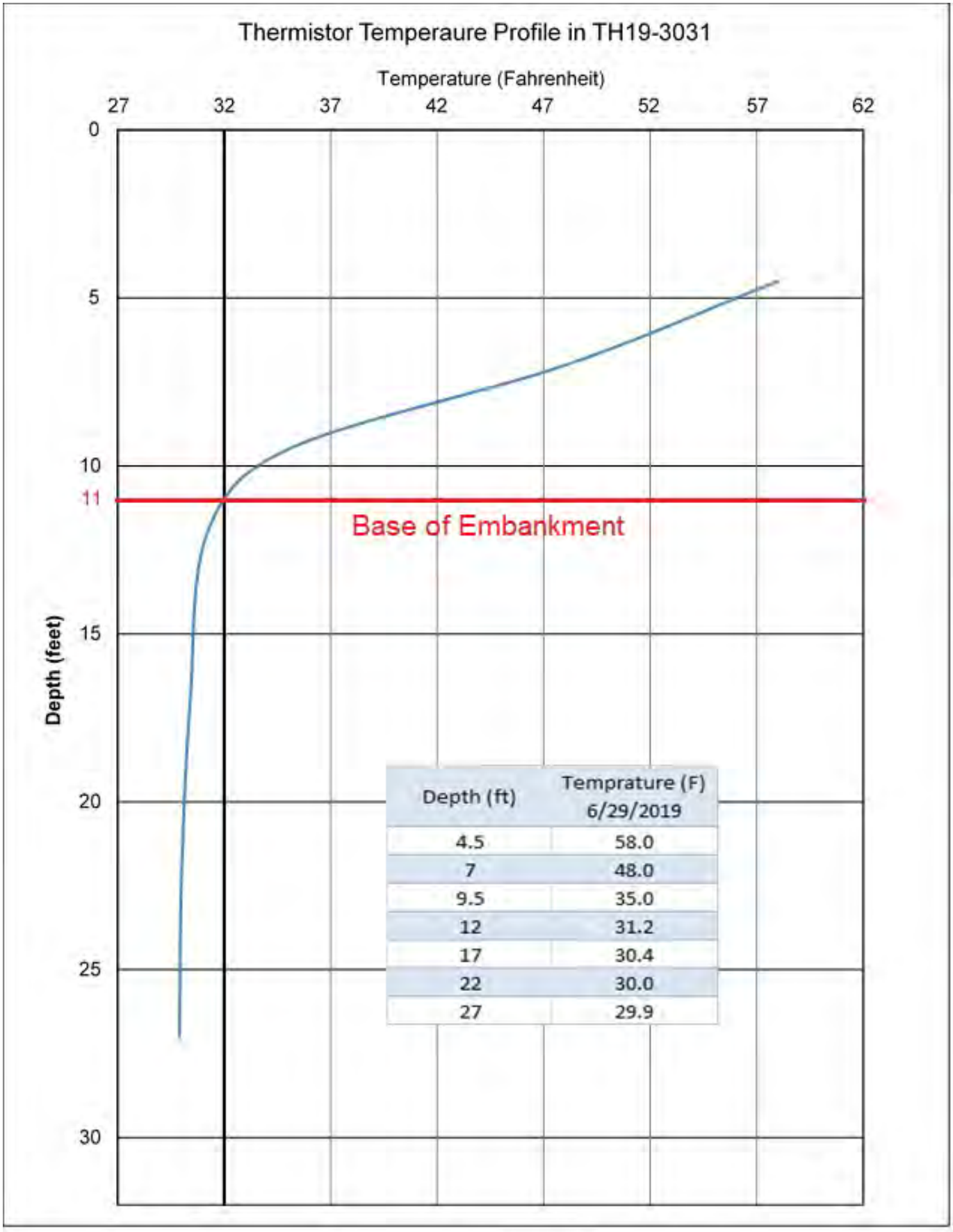
USCS Soil Description Abbreviations: WG = Well-graded; PG = Poorly-graded; E = Elastic; L = Lean; F = Fat

Appendix C

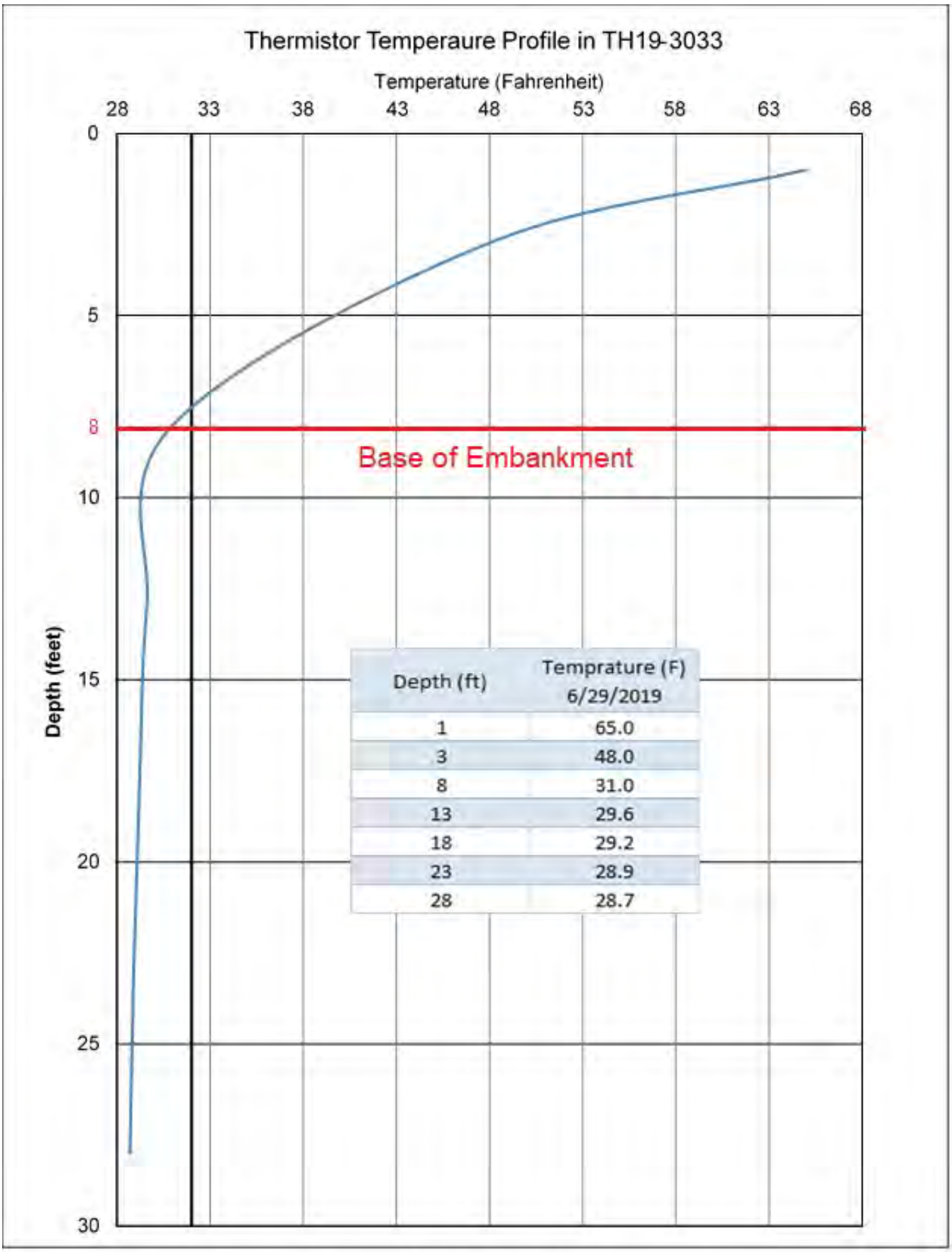
Thermographs



Thermograph for TH19-3030



Thermograph from TH19-3031

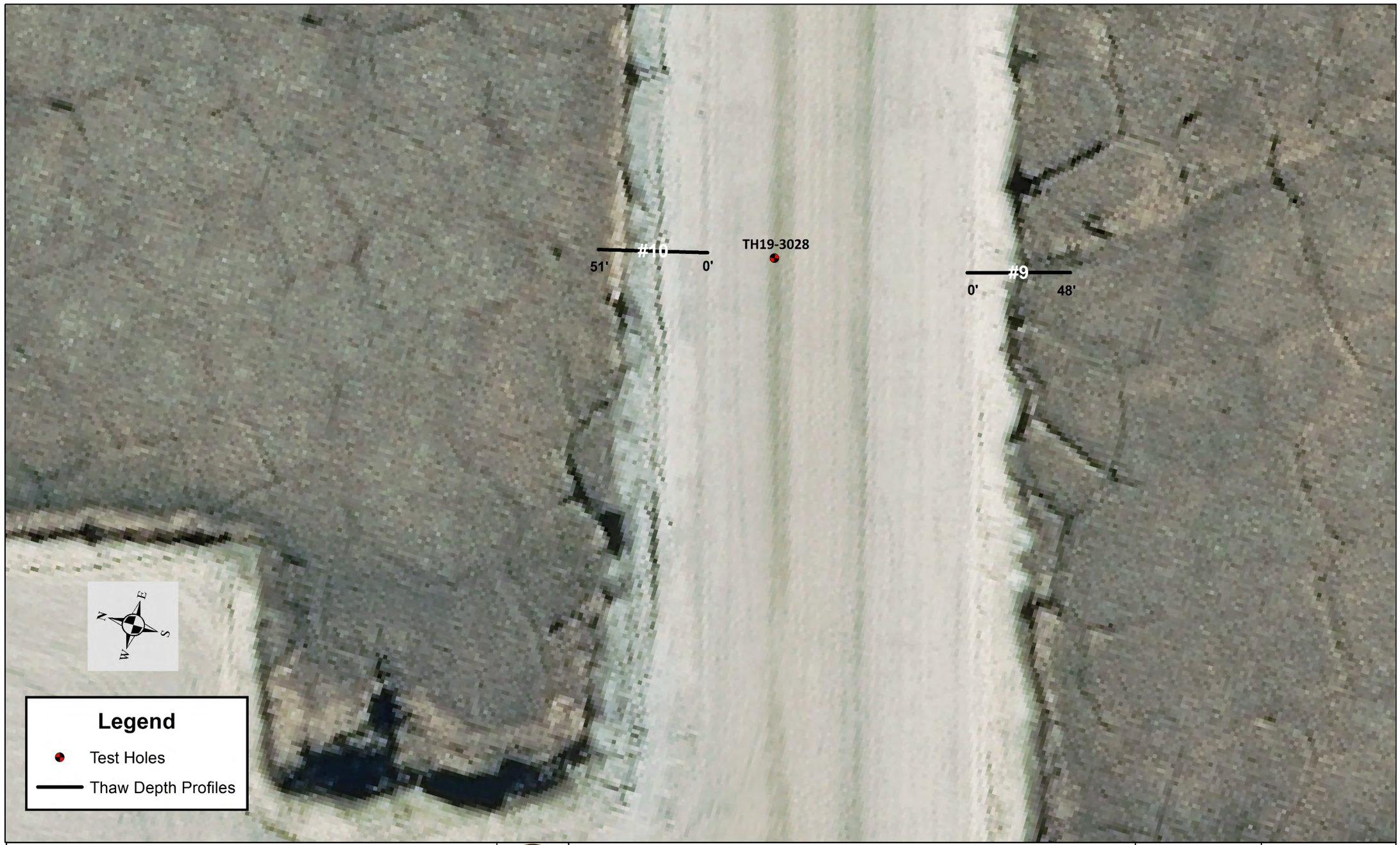


Thermograph from TH19-3033

Appendix D

Thaw Depth Profile Data

TH	Profile #	Offset from:	Offset Direction	Offset Length (ft)	Thaw Depth (in)	Figure Reference	Surface Condition
3031	1	Runway LL	south	55	49	Figure A	dry ditch
				60	18	Figure A	moist 9" tussock
3031	2	Runway LL	north	67	48	Figure A	dry ditch
				73	33	Figure A	moist tussock
				78	12	Figure A	minor tussocks
3032	3	Runway LL	south	72	37	Figure B	willows
				82	35	Figure B	8" pond
				87	26	Figure B	
				92	12	Figure B	
3032	4	Runway LL	north	58	49	Figure B	15' willows
				73	44	Figure B	dry tussocks
				78	33	Figure B	dry tussocks
				82	16	Figure B	undisturbed
				88	11	Figure B	undisturbed
3033	5	Runway LL	south	28	>70	Figure C	
				33	>70	Figure C	8" pond
				38	70	Figure C	pond edge
				48	25	Figure C	edge of settlement
				53	11	Figure C	undisturbed
3033	6	Runway LL	north	26	55	Figure C	wet grass
				29	50	Figure C	1" pond
				34	16	Figure C	alder
				39	14	Figure C	
3029	7	Runway LL	south	45	33	Figure D	5" deep pond
				58	11	Figure D	edge of settlement
3029	8	Runway LL	north	36	53	Figure D	dry ditch
				41	50	Figure D	slightly settled
				46	15	Figure D	edge of settlement
				51	12	Figure D	undisturbed
3028	9	Runway LL	south	43	47	Figure E	
				45	43	Figure E	
				48	58	Figure E	edge of settlement
				53	11	Figure E	deep tussocks
3028	10	Runway LL	north	41	70	Figure E	7" deep pond
				46	44	Figure E	thermokarst gullies
				51	11	Figure E	undisturbed
3030	11	Runway LL	south	53	70	Figure F	6" deep pond
				58	>76	Figure F	22" deep pond
				62	>80	Figure F	28" deep pond
				69	75	Figure F	floating veg mat
				74	62	Figure F	floating veg mat
				79	58	Figure F	
				84	46	Figure F	
				89	27	Figure F	edge of floating mat
				96	10	Figure F	undisturbed
3030	12	Runway LL	north	59	68	Figure F	
				64	44	Figure F	ponded
				69	20	Figure F	ponded
				79	14	Figure F	
3030	13	PAPI CL	west	42	61	Figure F	4" deep pond
				45	70	Figure F	pond edge
				50	52	Figure F	pond
				55	46	Figure F	
				60	38	Figure F	sedges
				70	28	Figure F	
				85	13	Figure F	
				100	16	Figure F	
3030	14	PAPI CL	east	42	43	Figure F	
				47	27	Figure F	minor settlement
				57	9	Figure F	
				67	12	Figure F	
				77	11	Figure F	



Document Path:

Thaw Profile Location for TH19-3028

0 25 50 100 150 Feet

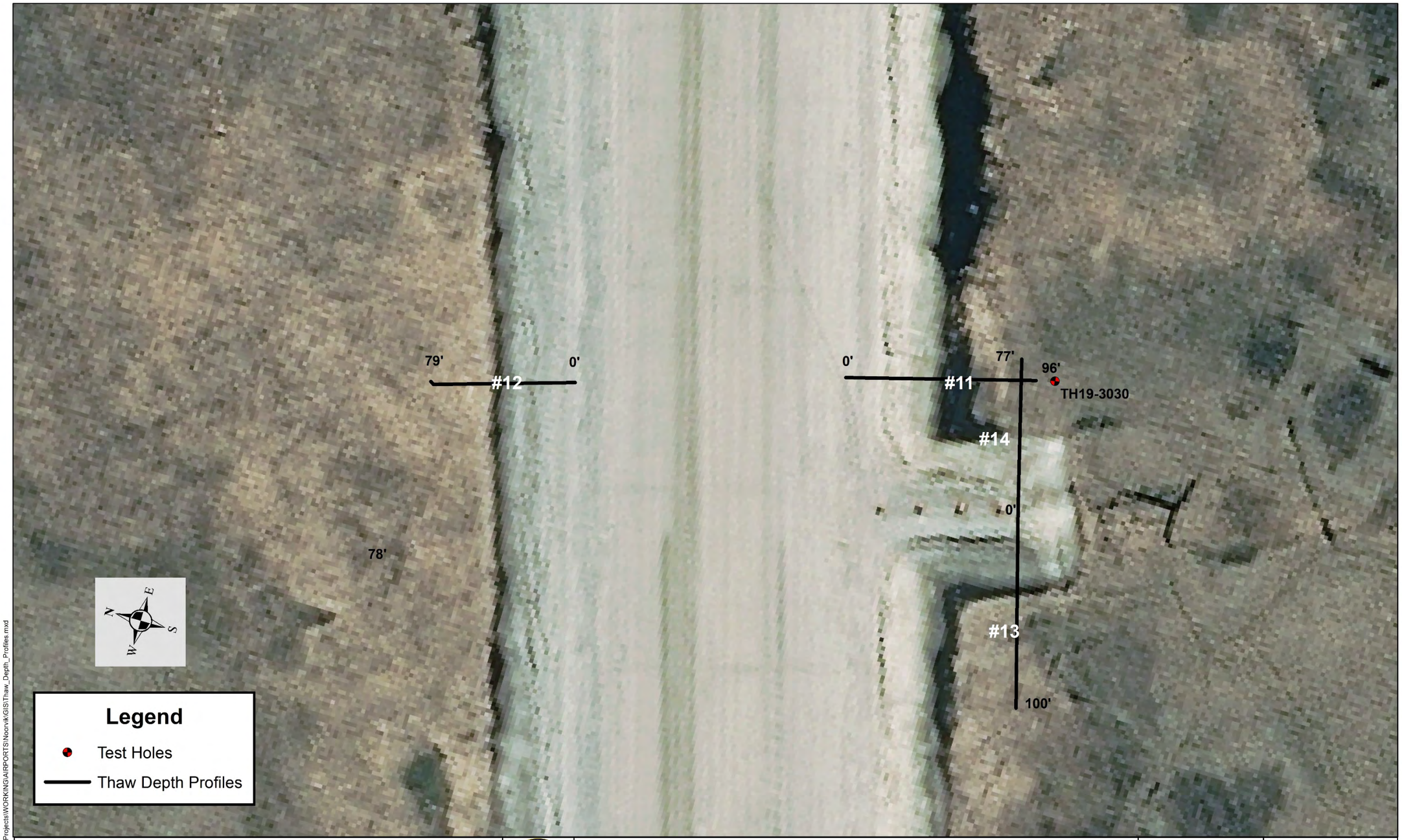
October 2019

Document Path:

Thaw Profile Location for TH19-3029

0 25 50 100 150 Feet

October 2019



Document Path: G:\Projects\WORKING\AIRPORTS\Noorvik\GIS\Thaw_Depth_Profiles.mxd

Thaw Profile Location for TH19-3030

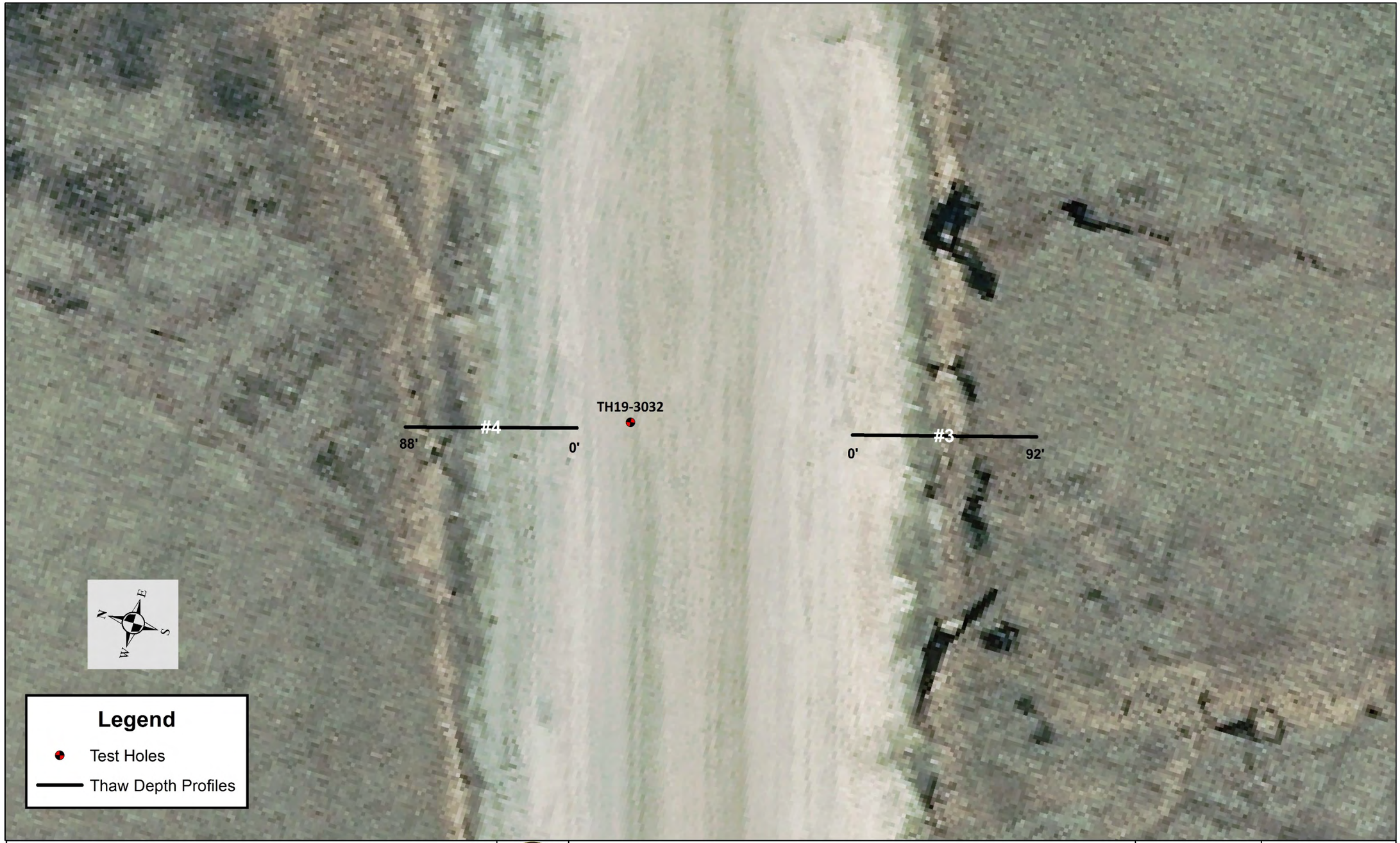
0 25 50 100 150 Feet

Document Path:

Thaw Profile Location for TH19-3031

0 25 50 100 150 Feet

October 2019



Document Path:

Thaw Profile Location for TH19-3032

0 25 50 100 150 Feet

October 2019

Thaw Profile Location for TH19-3033

0 25 50 100 150 Feet

October 2019

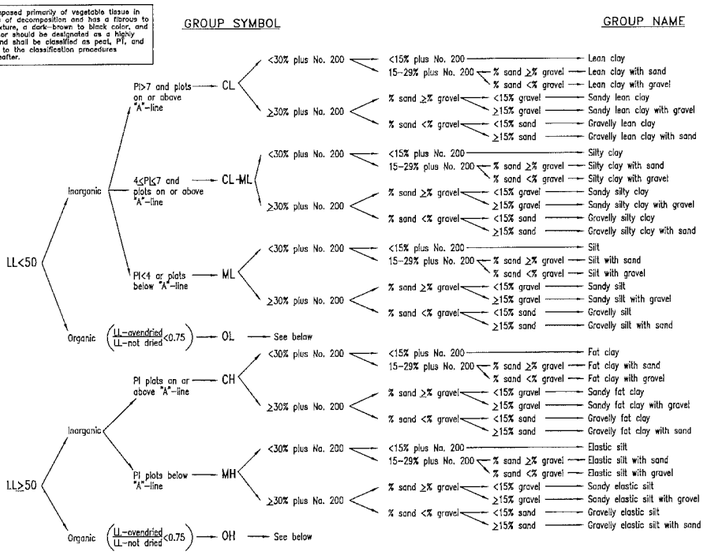
Document Path:

Appendix E

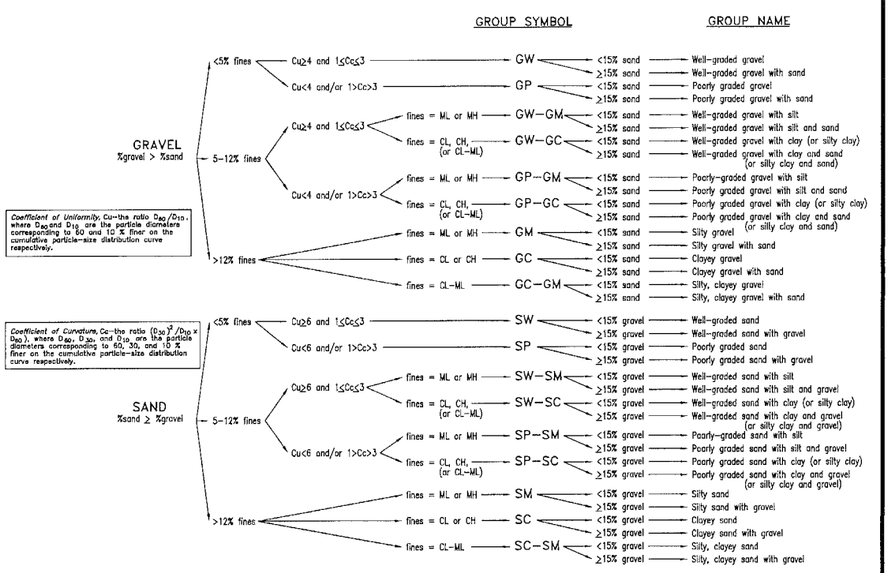
Classification Systems, Symbols and Definitions

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

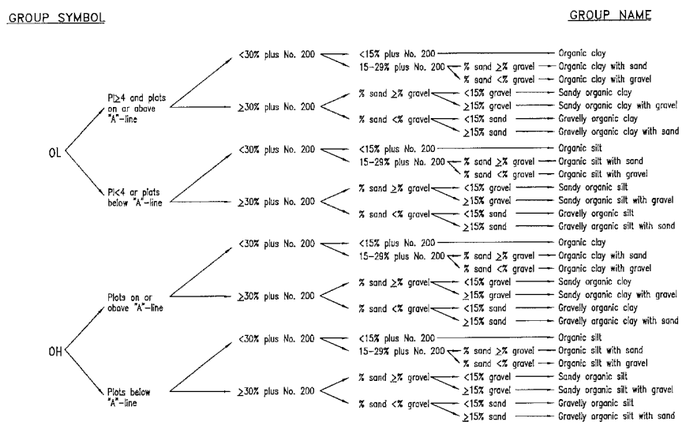
A sample composed primarily of vegetable tissue in various stages of decomposition and has a fibrous to amorphous texture, a dark-brown to black color, and an organic odor should be designated as a highly organic soil and shall be classified as peat, Pt, and not subjected to the classification procedures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



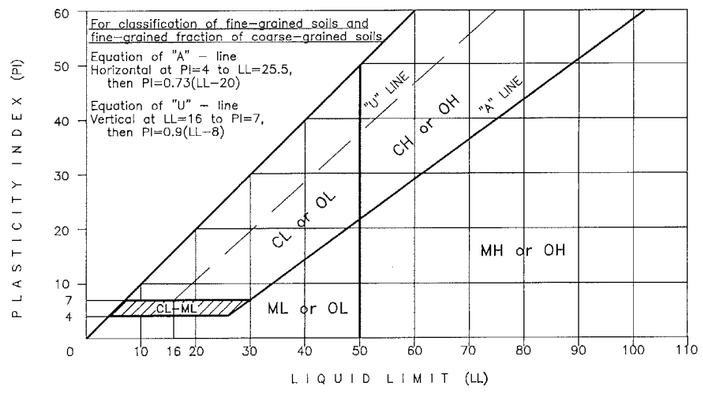
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)



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



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



Plasticity Chart

DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

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

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

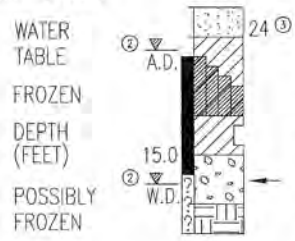
TEST RESULTS

_._%-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

⊗ AUGER TEST HOLE (TH)
DOZER/BACKHOE TEST TRENCH (TT)

DRILLING METHODS

H-S	HOLLOW STEM AUGER
S-S	SOLID STEM AUGER

SAMPLING METHODS

AUGER	AUGER CUTTINGS
CS	GRAB SAMPLE
SS	SPLIT SPOON
CS	CONTINUOUS SAMPLER
SPT	STANDARD PENETRATION TEST
NR	NO RECOVERY

SOIL DENSITY/CONSISTENCY DESCRIPTORS

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

COLOR

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

MOISTURE

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

* OPTIMUM MOISTURE FOR MAXIMUM DENSITY

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