August 28, 2025

Jerry O'Brien
Kenaitze Indian Tribe
150 N Willow Street
Kenai, AK 99611

Subject: Geotechnical Engineering Services
TDHE Elder Housing

Civil Engineering

Geotechnical Engineering

Transportation Engineering

Aviation Engineering

W/WW Engineering

Environmental Services

Surveying & Mapping

Construction Administration

Material Testing

In accordance with the request of the Kenaitze Indian Tribe (Kenaitze), HDL Engineering Consultants, LLC (HDL) conducted a geotechnical engineering evaluation for the proposed development in Kenai, Alaska. This letter report (Report) provides the findings, conclusions, and recommendations that HDL derived from the geotechnical evaluation. This Report includes a description of the project, description and results of the subsurface exploration and laboratory testing, and geotechnical recommendations. This Report is subject to the attached limitations.

BACKGROUND

HDL understands that the Kenaitze/Salamatof Tribally Designated Housing Entity (TDHE) plans to construct an Elder Housing Community located at 1400 Redoubt Ave in Kenai, Alaska (Site). The Site is located approximately 1 mile west of the Kenai Municipal Airport on Kenai Peninsula Borough Parcel Number 04101002. The Site is currently undeveloped, vegetated, and treed.

In December of 2024, Kenaitze requested that HDL provide geotechnical engineering services to support the design of the housing community on 10 to 15 acres located in the southwest quadrant of the aforementioned parcel. The proposed development consists of nine (9) 4-plex housing units (buildings), paved driveways, a paved parking lot, a paved access road, and buried utilities. HDL understands that the proposed road grade will be approximately one foot above existing grade and the finished floor elevation of the proposed buildings will be approximately one foot to two feet above the road grade. The conceptual site plan provided by Kenaitze indicates the buildings will be approximately 135 feet long and 35 feet wide. We understand that a shallow, insulated, thickened edge slab-on-grade foundation will support the proposed buildings.

Kenaitze reported that some of the neighborhoods located west of the Site experience flooding and drainage issues during spring thaw and large rain events.

SETTING

The following section provides information about the geologic and climatic setting for the Site.

General Geology

The Site is located within the Cook Inlet Susitna Lowland subprovince within the Coastal Trough province of Alaska. Glaciated lowland areas containing ground moraine, stagnant ice fields, drumlin fields, eskers, and outwash plains characterize the subprovince. The City of Kenai has an elevation of less than 100 feet above mean sea level (msl) while the rolling uplands east of Kenai reach elevations up to 3,000 feet above msl. The local relief is generally between 50 feet and 250 feet (Wahrhaftig 1965). Permafrost is generally absent in the project area.

Surficial deposits consist of several unconsolidated deposits including glacial deposits of the Naptowne and Brooks Lake glaciations, older glacial deposits (Pleistocene), glaciolacustrine deposits, and alluvial and terrace deposits.

The project is located in a region of moderate seismicity and large-scale earthquakes may cause ground ruptures in some areas. Based on the United States Geologic Survey (USGS) earthquake catalog, there were 136 events above Richter Magnitude 5 within 100 miles of the Site from 1898 through 2024, of which 20 were above Richter Magnitude 6.

Climatology

The project area is located in the gulf coast transitional climate zone. Long, cold winters, and mild summers characterize the zone. The average January temperatures in the area range between 7.4°F and 22.4°F, while average July temperatures range between 48.8°F and 63.3°F. Average annual precipitation is 18.27 inches and average annual snowfall is 67.5 inches (Alaska Climate Research Center, 2025). The data provided is for the Kenai Municipal Airport monitoring station and conditions at the Site may vary.

SUBSURFACE EXPLORATION

HDL evaluated the subsurface conditions at the Site between January 27, 2025 and February 4, 2025. The subsurface evaluation consisted of 14 borings, designated HDL-01 through HDL-14. HDL located the borings in the field using a recreational-grade GPS. Boring elevations were approximated using elevation data from Google Earth and the Kenai Peninsula Borough's (KPB) viewKPB web application. The attached Boring Location Map illustrates the approximate boring locations.

GeoTek Alaska, Inc provided drilling services using a track-mounted Geoprobe 7822DT and hollow stem augers to drill the borings to a maximum depth of 42.0 feet bgs. We conducted split-spoon sampling (designated by LSS, Large Split Spoon, on the boring logs) using the Modified Penetration Test procedure. In the Modified Penetration Test, blows of a 340-pound hammer free-falling 30 inches onto the drill rod drive a 24-inch-long, 3-inch outside diameter split spoon sampler into the bottom of the

advancing hole to recover samples. The number of blows required to advance the sampler the second and third 6-inch interval is termed the Penetration Resistance, or N-value. Onsite personnel recorded the N-value for each sample. The N-values give a measure of the relative density (compactness) or consistency (stiffness) of cohesionless and cohesive soils, respectively.

HDL performed fieldwork in general accordance with the procedures outlined in the Alaska Department of Transportation and Public Facilities (DOT&PF) "Alaska Geotechnical Procedures Manual". An experienced HDL geotechnical engineering assistant located the borings, collected samples, and logged subsurface conditions. We described the subsurface conditions in accordance with the following methods and standards:

- ASTM International Standard (ASTM) D2488 for field description of soils;
- Frost Design Soil Classification using the Municipality of Anchorage (MOA) methodology;
- Description and Classification of Frozen Soils from the DOT&PF Alaska Field Guide for Soil Classification; and,
- Unified Soil Classification System (ASTM D2487) to confirm or modify soil classifications based on laboratory test results.

The attached Boring Log Key, Frost Design Soil Classification Key, Description and Classification of Frozen Soils, and boring logs provide further reference.

LABORATORY TESTING

HDL conducted the following laboratory tests on select soil samples at our AASHTO accredited and United States Army Corps of Engineers validated laboratory:

- One hundred and thirteen (113) natural moisture content tests (ASTM D2216);
- Fourteen (14) grain size distribution tests (ASTM D6913);
- One (1) organic content test (ASTM D2974); and,
- Seven (7) hydrometer tests (ASTM D7928).

The attached boring logs and grain size distribution curves present the results of the laboratory tests.

SUBSURFACE CONDITIONS

The borings encountered an organic mat followed by topsoil underlain by sandy soils extending to the boring termination depths. HDL encountered frozen soils in the organic mat and topsoil layers.

Surficial Organics

The borings encountered an organic mat at the surface underlain by a layer of topsoil extending to depths ranging from 2.2 feet to 3.0 feet bgs. HDL-13 encountered a 0.3-foot thick layer of organic sand beneath the topsoil extending to a depth of 3.2 feet bgs. The topsoil generally classified as silt with sand and is highly frost susceptible (F-4). Table 1 provides a summary of laboratory testing results in this layer.

Table 1: Surficial Organics Laboratory Results Summary

Boring	Depth	Grain Size Distribution		
	(ft)	% Gravel	% Sand	% P200
HDL-01	0.8	3.4	31.8	64.8

Sand

In general, the borings encountered sand with varying amounts of gravel and silt underlying the surficial organics and extending to the boring termination depths. The N-values of the sand ranged from 4 to 44, indicating very loose to dense soils with relative density generally increasing with depth. The sand classified as non-frost susceptible (NFS) to moderately frost susceptible (F-2). Table 2 provides a summary of laboratory testing results in this layer.

Table 2: Sand Laboratory Results Summary

Boring	Depth	Grain Size Distribution			
	(ft)	% Gravel	% Sand	% P200	% Finer than 0.02mm
HDL-02	2.5	9.5	85.3	5.2	3.9
HDL-03	25.0	3.2	90.1	6.7	--
HDL-05	2.2	9.2	83.1	7.7	2.7
HDL-06	5.0	4.2	91.3	4.5	2.2
HDL-06	20.0	0.4	94.0	5.6	--
HDL-08	15.0	3.1	93.1	3.8	--
HDL-09	2.9	15.5	80.1	4.4	2.8
HDL-10	40.0	3.7	88.0	8.3	--
HDL-11	5.0	12.4	80.2	7.4	5.0
HDL-11	15.0	6.7	89.4	3.9	--
HDL-12	15.0	8.6	87.7	3.7	--
HDL-12	30.0	0.9	84.5	14.6	--
HDL-14	2.7	9.8	73.5	16.7	8.0

Groundwater

The borings encountered free groundwater between 9.0 feet and 12.0 feet bgs at the time of drilling. HDL installed monitoring wells in HDL-02 and HDL-12 consisting of one-inch diameter, schedule 40 PVC pipe with 10.0 feet of 0.01-inch slotted screen positioned from approximately 8.0 feet to 18.0 feet bgs. HDL measured the groundwater at a depth of 10.6 feet bgs in HDL-02 8 days after drilling and at 8.0 feet bgs in HDL-12 one day after drilling. Groundwater levels at the Site may fluctuate depending on the season, temperature, and precipitation. Groundwater levels during construction may be higher or lower than those encountered.

ENGINEERING ANALYSIS & RECOMMENDATIONS

Design of the proposed development must consider the bearing support capabilities of the supporting soils as well as seismic loading, expected settlements, and effects of seasonal frost action. The following sections summarize the geotechnical considerations for the proposed development.

Site Preparation and Fill

Clear and grub the Site prior to the onset of construction. Remove and replace soft or unstable soils or other deleterious materials encountered during excavation with compacted fill. We recommend the exposed subgrade be proof-rolled to provide a level, firm, uniform, and unyielding surface prior to the placement of fill or construction. Significant effort may be required to moisture condition and compact the existing subgrade due to the high sand content and low fines content.

The borings encountered highly frost susceptible and organic soils within 3.2 feet of the ground surface. If left in place, these soils will increase the risk of differential settlement and frost related issues at the Site. HDL recommends removing and replacing these soils with compacted fill in paved areas and within the foundation influence zone. The foundation influence zone is the area defined by extending a line outward and downward from the bottom edges of the footing on a slope of 1 horizontal to 1 vertical (1H:1V).

Structural Fill placed within the foundation influence zone should consist of a reasonably well graded mixture of sand and gravel meeting the Municipality of Anchorage Standard Specifications (MASS) requirements for Type II-A Classified Fill and Backfill. These soils should also be low- to non-frost susceptible (F-1 to NFS) gravel or non-frost susceptible sand (NFS). The onsite soils generally do not meet these requirements.

Fill placed outside of the foundation influence zone and beneath the structural sections should be a reasonably well graded mixture of sand and gravel meeting the MASS requirements for Type III Classified Fill and Backfill or better. Onsite soils beneath the surficial organics generally meet these requirements.

Place fill in lifts with a maximum loose thickness of 10 to 12 inches, and compact the lifts to a density of at least 95 percent of the maximum dry density as determined by ASTM D1557. During fill placement, remove cobbles and boulders with dimensions in excess of 2/3 the lift thickness.

Pavement Design

HDL understands that the parking lot, access road, and driveways will typically support light vehicle and truck traffic. We assume that the subgrade below the structural section will be firm and unyielding. Remove the surficial organics and topsoil prior to construction of pavement structural sections. The minimum recommended structural section for paved surfaces is as follows:

2 inches – Asphalt Pavement, Class E
2 inches – Leveling Course
8 inches – Type II-A
As needed – Type III

The Leveling Course should meet the requirements of MASS Section 20.22. Moisture condition the Leveling Course and spread it in thin layers compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. Proof-roll subgrades and final grades to provide smooth, firm non-yielding surfaces.

The in-situ sand encountered beneath the surficial organics and topsoil generally ranges from NFS to F-2. The recommended structural section does not provide full frost protection but is typical for pavement in the area.

Foundations

Design of the proposed building foundations must consider the bearing capability of the supporting soils, behavior during a seismic event, the effects of seasonal frost action, and the expected total and differential settlements. The foundation system must also consider the risk of failure and the cost of construction. HDL understands that a shallow, insulated, thickened edge slab-on-grade foundation will support the buildings.

Subgrade Preparation

Remove the surficial organics and topsoil within the foundation influence zone and replace with compacted fill. Compact exposed subgrade soils in the footing excavations to a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction procedure (ASTM D1557). Dewater excavations as needed and protect them from adjacent runoff. The subgrade soils may become difficult to compact due to natural moisture or exposure to additional rainfall or runoff.

Shallow Insulated Foundations

If the design and construction of the proposed building meets the assumptions outlined in this Report, an insulated, thickened edge slab-on-grade foundation system can support the buildings. Insulate the foundations and heat the structure to account for potential effects of seasonal frost action.

Foundation Recommendations

The thickened edges of the slab-on-grade foundation should bear a minimum of 16 inches below finished grade and be a minimum of 16 inches wide. Interior footings should be a minimum of 16 inches wide.

Construct foundations immediately after subgrade preparation to protect the soil bearing surface and backfill foundation excavations as soon as possible after foundation construction.

Bearing Capacity

HDL assumes the proposed building foundations will bear upon a minimum of 12 inches of compacted Structural Fill. If the soils beneath the proposed foundations are consistent with and prepared in accordance with the requirements provided in this Report, use the allowable soil bearing capacities in Table 3 for the design of foundations.

Table 3: Thickened Edge Slab Foundation Bearing Capacity

Footing Width (inches)	Footing Depth (inches)	Allowable Bearing Capacity (pounds per square foot)
16	16	2,500
18	18	2,800

Increase the provided bearing values by one-third for seismic or wind loading conditions.

Insulation

Place a minimum of 2 inches of hydrophobic rigid foam board insulation vertically along the foundation and a minimum of 4 inches horizontally along the exterior extending a minimum of 2 feet beyond the building. The insulation board should meet AASHTO M 230, Type VI, except that extrusion is not required and the maximum water absorption should not exceed 0.3% by volume, as determined by ASTM C272. Compressive strength at yield of 10% deformation should not be less than 40 pounds per square inch (psi). Thermal resistance (R-value) should not be less than 4.5 (°F·ft2·hr/Btu) per inch at 75°F as determined by ASTM C177.

Prior to placing the insulation, the exposed subgrade soils and Structural Fill should be smooth, compacted, unyielding, and free of snow, ice, deleterious material, debris, and rocks exceeding 3-inches in diameter. Butt all joints tightly and cover the insulation with a minimum of 12 inches of material to reduce the potential for damage. The contractor should be responsible for ensuring the equipment used does not damage the insulation during construction.

Refer to ASCE 32 for further recommendations regarding design and construction of the insulated foundations.

Seismic Analysis

The City of Kenai uses the site characterization criteria found in the 2021 International Building Code (IBC) for design. Chapter 16, Section 1613 of the IBC holds the seismic design criteria. The IBC requires that soil and rock parameters determine the site characterization. Based on the subsurface conditions encountered, we considered the site to be Seismic Site Class "D". We obtained the maximum considered earthquake ground motion spectral response accelerations for short period and for one-second peaks using the Seismic Design Maps created by Structural Engineers Association of California and California's

Office of Statewide Health Planning and Development. Seismic Design Maps is a web interface that uses USGS web services to retrieve seismic design data; results of which we have summarized in Table 4.

Table 4: Seismic Design Criteria

IBC 2021 Seismic Design Criteria	Value
Spectral Response at Short Periods, Ss	1.5
Spectral Response at 1-Second Period, S_1	0.6
Site Modified Peak Ground Acceleration, PGA_m	0.6
Site Class	D
Site Coefficient Fa	1
Site Coefficient Fv	1.5
Site Adjusted Spectral Response at Short Periods, S_{MS}	1.5
Site Adjusted Spectral Response at 1-Second Periods, S_{M1}	0.9

Liquefaction Potential

The extent of liquefaction is dependent on the groundwater elevation which fluctuates depending on the season, temperature, and precipitation. Generally, liquefaction risks decrease as the groundwater lowers and increases as it raises. Liquefaction analyses using the methods of Youd and Idriss (2001), Idriss and Boulanger (2014), and groundwater levels encountered in the borings indicate that potentially liquefiable soils are present throughout the Site extending from approximately 8.0 feet bgs to the depths explored. Based on the conditions encountered and methods of Tokimatsu and Seed (1987) and Idris and Boulanger (2014), we estimate the buildings may experience between 3.8 to 9.0 inches of seismically induced settlements during the design earthquake. The quantity of settlement could be greater if the potentially liquefiable soils extend deeper than explored or groundwater levels raise.

Static Settlement

The total settlements experienced by the proposed improvements are dependent upon the actual loads applied and the care of the placement and compaction of Structural Fill. For the foundations designed as recommended above, we estimate that total settlements of approximately 1 inch could be realized and differential settlements will be approximately one-half the total.

Utilities

HDL understands that the utilities will be buried approximately 8.0 feet to 10.0 feet bgs. The in-situ sand generally meets the MASS requirements for Bedding Material.

Frost Susceptibility

Kenai is in a region of moderate freeze and thaw cycles. Borings encountered a layer of highly frost susceptible surficial organics followed by non-frost susceptible to moderately frost susceptible sand. The

surficial organics, including topsoil, should be removed to reduce the risk of frost related issues at the Site. Heat the structures to reduce the potential effects of seasonal frost action on the buildings. Frost related movement may occur if the buildings are not heated.

Drainage and Dewatering

The borings encountered groundwater between 8.0 feet bgs and 12.0 feet bgs. Based on the drilling performed, utility construction may encounter groundwater. The groundwater elevation during construction will likely vary from what was encountered during drilling. HDL recommends checking the installed PVC monitoring wells at HDL-02 and HDL-12 prior to construction to verify the groundwater elevation. If groundwater is present in excavations, the soils will be prone to collapse and construction may be difficult. The in-situ soils may become difficult to compact due to natural moisture or exposure to additional rainfall or runoff. Dewater excavations as needed to place and compact fill and protect them from adjacent runoff.

HDL recommends grading the Site to promote positive drainage away from the structures and compacting the near surface soils to reduce permeability. If possible, HDL recommends excavating utility trenches during seasonal low groundwater to minimize the need for dewatering the excavations.

Excavations and Shoring

HDL assumes the need for temporary excavations to support the foundation construction, removal of organic soils, and utility construction. We recommend that the contractor be responsible for the trench side slopes, trench bottom conditions, and dewatering efforts as they are present on a day-to-day basis and can adjust efforts to obtain the needed stability and meet the applicable Alaska and Federal Occupational Safety and Health Administration (OSHA) safety regulations. Deviation from the OSHA stipulations requires the approval of a licensed Professional Geotechnical Engineer. Shoring may be required if unstable soils are encountered. Account for additional loads from adjacent equipment, hydrostatic pressure, and structures in the pressure distribution for shoring design.

Heavy precipitation or high seasonal groundwater may cause soils to become saturated and less stable. The contractor should phase construction to minimize exposure of the subgrade and direct surface water away from the excavations.

LIMITATIONS

This Report is subject to the attached limitations.

We appreciate the opportunity to assist you with this important project. If you have any questions, please contact Jacqueline LaBelle at jlabelle@hdlalaska.com or 907.564.2176.

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AECL 861
STATE OF ALASKA
49 TH
Jacqueline A. LaBelle
Date 8/28/25
No. CE 204184
REGISTERED PROFESSIONAL ENGINEER

Attach:
Limitations – 2 Pages
Boring Location Map – 1 Page
Boring Log Key – 1 Page
Frost Design Soil Classification – 1 Page
Description and Classification of Frozen Soils – 1 Page
Boring Logs – 32 Pages
Grain Size Distribution Curves – 3 Pages

GEOTECHNICAL LIMITATIONS

Use of Report

1. HDL Engineering Consultants, LLC (HDL) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to HDL.

2. If substantial time has elapsed between submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at or adjacent to the site, we recommend that HDL be retained to review this report to determine the applicability of the conclusions considering the time lapse or changed conditions.

Standard of Care

3. HDL's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, HDL shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

4. HDL's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

6. Unanticipated soil conditions are commonly encountered and cannot be fully determined by merely taking soil samples or advancing borings. Such unexpected conditions frequently require additional expenditure to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

7. In preparing this report, HDL relied on certain information provided by the Client, state

and local officials, and other parties referenced therein which were made available to HDL at the time of our evaluation. HDL did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

8. Water level readings have been made in test holes (as described in the Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water encountered in the course of the work may differ from that indicated in the Report.

9. HDL's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

10. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

11. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

12. HDL recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

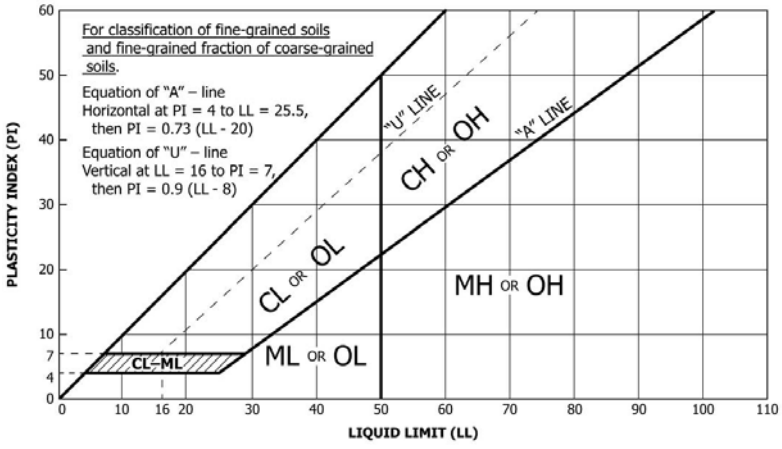
HDL ENGINEERING Consultants LLC	PREPARED BY	PROJECT	LOCATION	SYMBOL KEY
	HDL Engineering Consultants, LLC Anchorage, AK	Name: TDHE Elder Housing Number: 25-101	60.575530, -151.276870 Kenai, AK	Soil Boring

BORING LOG KEY

Summary of the Unified Soil Classification System (from ASTM International Standard D2487)[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (*More than 50% retained on No. 200 sieve*)	Gravels (*More than 50% of coarse fraction retained on No. 4 sieve*)	Gravels with < 5% fines[C]	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or [$C_c < 1$ or $C_c > 3$][D]	GP	Poorly graded gravel[E]
		Gravels with > 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[E,F,G]
			Fines classify as CL or CH	GC	Clayey gravel[E,F,G]
	Sands (*50% or more of coarse fraction passes No. 4 sieve*)	Sands with < 5% fines[H]	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or [$C_c < 1$ or $C_c > 3$][D]	SP	Poorly graded sand[I]
		Sands with > 12% fines[H]	Fines classify as ML or MH	SM	Silty sand[F,G,I]
			Fines classify as CL or CH	SC	Clayey sand[F,G,I]
Fine-grained Soils (*More than 50% passes the No. 200 sieve*)	Silts and Clays (*LL<50*)	Inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		Organic	LL - Oven dried/LL - Not dried <0.75	OL	Organic clay/silt[K,L,M,N/O]
	Silts and Clays (*LL≥50*)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		Organic	LL - Oven dried/LL - Not dried <0.75	OH	Organic clay/silt[K,L,M,P/Q]
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

NOTES:
Visual soil descriptions performed in accordance with ASTM D2488
Lowercase USCS abbreviation indicates field classification
Uppercase USCS abbreviation indicates laboratory classification

[A]Based on the material passing the 3-in. (75-mm) sieve
[B]If field sample contained cobble or boulders, or both, add "with cobbles or boulders, or both" to group name
[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC Well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
[D] $C_u = D_{60}/D_{10}$, $C_c = (D_{30})^2/(D_{10} \times D_{60})$
[E]If soil contains ≥ 15% sand, add "with sand" to group name
[F]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM
[G]If fines are organic, add "with organic fines" to group name
[H]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
[I]If soil contains ≥15% gravel, add "with gravel" to group name
[J]If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay
[K]If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant
[L]If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name
[M]If soil contains ≥ 30% plus No. 200, predominatly gravel, add "gravelly" to group name
[N]PI ≥ 4 and plots on or above "A" line
[O]PI < 4 or plots below "A" line
[P]PI plots on or above "A" line
[Q]PI plots below "A" line



GRAIN SIZE		
Size Class	Inches	mm
Boulders	>12 inches	>300
Cobbles	3 to 12	75 - 300
Gravel		
Coarse	3/4 - 3	19.0 - 75
Fine	3/16 - 3/4	4.76 - 19.0
Sand		
Coarse	1/16 - 3/16	2.0 - 4.76
Medium	1/64 - 1/16	0.42 - 2.0
Fine	1/256 - 1/64	0.074 - 0.42
Silt and Clay	<1/256	<0.074

SOIL CONSISTENCY		
Description	N-Value	Pocket Pen.
Very Soft	<2	<0.25
Soft	2 - 4	0.25 - 0.5
Medium	4 - 8	0.5 - 1.0
Stiff	8 - 15	1.0 - 2.0
Very Stiff	15 - 30	2.0 - 4.0
Hard	>30	>4.0

RELATIVE SOIL DENSITY	
Description	N-Value
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	>50

COMPONENT PROPORTION (Visual)	
Term	Range
Trace	0 - 5%
Little	5 - 15%
Some	15 - 30%
And	30 - 50%

FROST DESIGN SOIL CLASSIFICATION

US Army Corps of Engineers (USACE) Methodology

The following frost design soil classification was developed by the USACE for describing the potential frost susceptibility of soils. The standard is published in USACE, EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions," April 1984.

FROST GROUP	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS(1)	(a) Gravels Crushed Stone Crushed Rock (b) Sands	0-1.5 0-3	GW, GP SW, SP
PFS(2)	(a) Gravels Crushed Stone Crushed Rock (b) Sands	1.5 -3 3-10	GW, GP SW, SP
S1	Gravelly Soils	3-6	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
S2	Sandy Soils	3-6	SW, SP, SW-SM, SP-SM, SW-SC, SP-SC
F1	Gravelly Soils	6-10	GM, GC, GW-GM, GP-GM, GW-GC, GP-GC
F2	(a) Gravelly Soils (b) Sands	10-20 6-15	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3	(a) Gravelly Soils (b) Sands, except very fine silty sands (c) Clays, PI>12	Over 20 Over 15 --	GM, GC, GM-GC SM, SC, SM-SC CL, CH
F4	(a) Silts (b) Very fine silty sands (c) Clays, PI<12 (d) Varied clays or other fine-grained banded sediments	-- Over 15 -- --	ML, MH, ML-CL SM, SC, SM-SC CL, ML-CL CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

(1) Non-frost susceptible

(2) Possibly frost susceptible, requires lab test for void ratio to determine frost design soil classification. Gravel with void ratio > 0.25 would be NFS; Gravel with void ratio < 0.25 would be S1; Sands with void ratio > 0.30 would be NFS; Sands with void ratio < 0.30 would be S2 or F2

Municipality of Anchorage (MOA) and Federal Aviation Administration (FAA) Methodology

MOA and FAA use simplifications of the USACE methodology noted above. The Design Criteria Manual details the MOA method and Section 207 of FAA Advisory Circular 150/5320-6G details the FAA method. Both are summarized below.

FROST GROUP	SOIL TYPE	PERCENTAGE FINER THAN 0.02 mm BY WEIGHT	TYPICAL SOIL TYPES UNDER UNIFIED SOIL CLASSIFICATION SYSTEM
NFS[a]	a. Gravels b. Sands	0 to 3 0 to 3	GW, GP SW, SP
F-1[a] or FG-1[b]	Gravelly soils	3 to 10	GW, GP, GW-GM, GP-GM
F-2[a] or FG-2[b]	a. Gravelly soils b. Sands	10 to 20 3 to 15	GM, GW-GM, GP-GM SW, SP, SM, SW-SM, SP
F-3[a] or FG-3[b]	a. Gravelly soils b. Sands, except very fine silty sands c. Clays, PI>12	Over 20 Over 15 --	GM, GC SM, SC CL, CH
F-4[a] or FG-4[b]	a. All silts b. Very fine silty sands c. Clays, PI<12 d. Varved clays and other fine-grained, banded sediments	-- Over 15 -- -- --	ML, MH SM, SC CL, CL-ML CL, CL-ML CL, CH, ML, SM

[a] Municipality of Anchorage, Project Management & Engineering Department, Design Criteria Manual, January 2007.

[b] Federal Aviation Authority, FAA Advisory Circular 150/5320-6G.

DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

(Summarized from the Alaska Field Guide for Soil Classification)

PART I: Description of Soil Phase—Independent of Frozen State(a)

	Major Group		Sub-Group		Field Identification	Pertinent Properties of Frozen Materials which may be measured by physical tests to supplement field identification.	Guide for Construction on Soils Subject to Freezing and Thawing	
	Description	Designation	Description	Designation			Thaw Characteristics	Criteria
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 coating 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 Nb 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 Inclusions			
			Ice without soil inclusions	Ice				

DEFINITIONS:

Ice Coatings on Particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Clear Ice is transparent and contains only a moderate number of air bubbles. (e)

Cloudy Ice is translucent, but essentially sound and non-pervious.

Porous Ice contains numerous voids, usually interconnected and usually resulting from melting at air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Candled Ice is ice which has rotted or otherwise formed 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.

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.

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.

SOIL BORING: HDL-01

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 6 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57465, -151.27659
Boring Elevation: ~89.0 ft
Location: Southern portion of proposed access road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT**; Nbn							
											0.8							
1			S-1		1.8	6 1 1 2		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, F-4 (topsoil)	3.4	31.8	64.8	20.2	27.5		
2											2.5							
3		LSS	S-2		1.7	1 7 10 11	17	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; trace to little silt; trace gravel, fine grained, rounded; brown, dry, medium dense					5.0		
4																		
5			S-3		2	17 14 15 13	29									4.6		
6											6.0							

Terminated boring at 6.0 feet bgs.

Graphics Legend

- sp-sm
- ml
- Organic Mat
- LSS - Large Split Spoon

Water Levels

- No free groundwater encountered.
- -

SOIL BORING: HDL-02

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/28/2025
Total Depth: 40.9 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57486, -151.27701
Boring Elevation: ~89.0 ft
Location: Southernmost building, west side of access road

Comments Slotted PVC groundwater monitoring well installed to 18 feet bgs.

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
1			S-1		0.9	1 1 0 1					**ORGANIC MAT**; Nbn 0.9							
2								ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn (topsoil) 2.5							
3			S-2		2	4 7 12 15	19	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; little gravel, fine grained, subrounded to rounded; little silt; gray, moist, medium dense, F-2	9.5	85.3	5.2	3.9	8.6		
4																		
5																		
6			S-3		1.7	2 8 17 18	25									10.7		
7																		
8			S-4		1.6	3 4 4 5	8				loose					10.3		
9																		
10																		
11	▼		S-5		1.8	5 8 8 7	16				medium dense					10.8		
12	▽																	
13			S-6		1.6	7 10 12 12	22				wet					18.7		
14																		

Hollow Stem Auger

Graphics Legend

- At Time of Drilling (ATD)
- Static
- sp-sm
- ml
- Organic Mat
- LSS - Large Split Spoon

Water Levels

- ▽ Free groundwater encountered at 12.0 feet bgs.
- ▼ Free groundwater encountered at 10.6 feet bgs.

SOIL BORING: HDL-02

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/28/2025
Total Depth: 40.9 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57486, -151.27701
Boring Elevation: ~89.0 ft
Location: Southernmost building, west side of access road

Comments Slotted PVC groundwater monitoring well installed to 18 feet bgs.

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		1.4	3 3 5	8	sp-sm			loose; ~6 inches of heave present, began adding mud to mitigate heave after S-7					22.1		
17																		
18																		
19																		
20											dense							
21			S-8		2	14 18 28 42	46									20.3		
22																		
23																		
24																		
25											medium dense							
26			S-9		2	3 7 14 29	21									21.3		
27																		
28																		
29																		

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 12.0 feet bgs.

Free groundwater encountered at 10.6 feet bgs.

SOIL BORING: HDL-02

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/28/2025
Total Depth: 40.9 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57486, -151.27701
Boring Elevation: ~89.0 ft
Location: Southernmost building, west side of access road

Comments Slotted PVC groundwater monitoring well installed to 18 feet bgs.

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		1.8	19 21 13 18		sp-sm			dense, ~18 inches of heave					20.7		
32																		
33																		
34																		
35											dark gray							
36			S-11		1.8	11 20 21 32	41									23.2		
37																		
38																		
39																		
40		LSS	S-12		0.9	20 50/0.4'					40.9					21.0		

Terminated boring at 40.9 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 12.0 feet bgs.

Free groundwater encountered at 10.6 feet bgs.

SOIL BORING: HDL-03

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/29/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57526, -151.27613
Boring Elevation: ~89.5 ft
Location: Southern building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
											ORGANIC MAT; Nbn (0.7)							
1			S-1		0.4	1 1 1 1		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn (topsoil) (2.2)							
2																		
3			S-2		1.7	2 4 6 8	10	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; trace to little silt; trace gravel, fine grained, subangular to subrounded; grayish brown, dry, loose					7.3		
4																		
5			S-3		1.4	5 6 7 8	13				medium dense					5.5		
6																		
7			S-4		1.4	6 6 6 3	12				little gravel, fine to coarse grained, subrounded to rounded					8.3		
8																		
9			S-5		1.4	6 5 6 4	11				wet					15.8		
10																		
11			S-6		1.8	2 4 8 13	12				loss of gravel, began adding mud to mitigate heave after sample S-6					20.7		
12																		
13																		
14																		

Hollow Stem Auger

Graphics Legend

- At Time of Drilling (ATD)
- Organic mat
- sp-sm
- ml
- LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

-

SOIL BORING: HDL-03

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/29/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57526, -151.27613
Boring Elevation: ~89.5 ft
Location: Southern building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		1.5	3 8 12 13	20	sp-sm								21.3		
17																		
18																		
19																		
20											dark gray							
21			S-8		1.4	3 8 15 16	23									22.5		
22																		
23																		
24																		
25											25.0							
26			S-9		1.8	11 7 8 13	15				Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; trace gravel, fine grained, subangular to subrounded; dark gray, wet, medium dense	3.2	90.1	6.7		22.3		
27																		
28																		
29																		

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

-

SOIL BORING: HDL-03

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/29/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57526, -151.27613
Boring Elevation: ~89.5 ft
Location: Southern building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		2	9 12 15 16	27	sp-sm								24.5		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40																		
41		LSS	S-11		2	7 8 15 20	23									21.9		
42											42.0							

Terminated boring at 42.0 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

-

SOIL BORING: HDL-04

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/29/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57540, -151.27705
Boring Elevation: ~89.0 ft
Location: Southern building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
											Samples						Lab	
1			S-1		0.9	2 1 1 2					**ORGANIC MAT**; Nbn 0.9							
2								ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, Nbn (topsoil)							
3			S-2		2	3 3 6 8	9				3.0							
4								sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; trace to little silt; trace to little gravel, fine grained, subangular to subrounded; grayish brown, dry					6.0		
5																		
6			S-3		2	5 6 6 6	12				medium dense					6.4		
7																		
8			S-4		1.6	4 3 1 1	4				very loose, began adding mud to mitigate heave after sample S-4					14.9		
9																		
10	▽		S-5		1.1	2 4 9 10	13				medium dense, wet					14.9		
11																		
12																		
13			S-6		1.5	4 5 5 6	10				loose					20.0		
14																		
		Hollow Stem Auger																

Graphics Legend

- At Time of Drilling (ATD)
- organic mat
- sp-sm
- ml
- LSS - Large Split Spoon

Water Levels

- Free groundwater encountered at 10.0 feet bgs.
- -

SOIL BORING: HDL-04

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/29/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57540, -151.27705
Boring Elevation: ~89.0 ft
Location: Southern building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		2	5 8 11 11	19	sp-sm			Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; gray, wet, medium dense					24.8		
17																		
18																		
19																		
20																		
21			S-8		1.8	8 8 12 21	20									21.4		
22																		
23																		
24																		
25											~6 inches of heave							
26			S-9		1.8	5 10 15 23	25									21.5		
27																		
28																		
29																		

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.0 feet bgs.

-

SOIL BORING: HDL-04

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/29/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57540, -151.27705
Boring Elevation: ~89.0 ft
Location: Southern building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		2	5 12 11 20	23	sp-sm			~6 inches of heave					21.4		
32																		
33																		
34																		
35											~6 inches of heave							
36			S-11		1.8	2 6 10 12	16									23.3		
37																		
38																		
39																		
40											sand, fine to coarse grained; dense; ~8 inches of heave							
41		LSS	S-12		2	15 17 17 21										15.6		
42											42.0							

Terminated boring at 42.0 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.0 feet bgs.

-

SOIL BORING: HDL-05

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 6 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57555, -151.27657
Boring Elevation: ~89.0 ft
Location: Southern portion of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT**; Nbn 0.7							
1			S-1		0.7	1 1 1 1		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, (topsoil) 2.2							
2																		
3		LSS	S-2		2	3 8 8 8	16	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; little silt; little gravel, fine to coarse grained, rounded; brown, dry, medium dense, NFS	9.2	83.1	7.7	2.7	7.3		
4											loose							
5			S-3		1.4	5 5 5 7	10									9.0		
6											6.0							

Terminated boring at 6.0 feet bgs.

Graphics Legend

- sp-sm
- ml
- organic mat
- LSS - Large Split Spoon

Water Levels

- No free groundwater encountered.
- -

SOIL BORING: HDL-06

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57567, -151.27609
Boring Elevation: ~89.0 ft
Location: Southern building east of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
1			S-1		0.3	1 1 1 1					**ORGANIC MAT**; Nbn 0.9							
2								ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn, (topsoil) 2.7					18.5		
3			S-2		1.8	1 2 5 7	7	SP			Poorly Graded **SAND** (SP), fine to coarse grained; trace silt; trace gravel, fine grained, subangular to subrounded; brownish gray, dry					6.4		
4																		
5			S-3		1.7	6 6 9 10	15				medium dense, NFS	4.2	91.3	4.5	2.2	7.1		
7																		
8			S-4		2	4 4 4 5	8				trace to little gravel, fine to coarse grained, rounded; loose, moist					14.2		
10	▽																	
11			S-5		1.8	4 4 4 5	8				wet, began adding mud to mitigate heave after S-5					13.8		
12																		
13			S-6		1.4	4 6 6 12	12				medium dense					17.7		
14																		

Hollow Stem Auger

Graphics Legend

- At Time of Drilling (ATD)
- SP
- ml
- organic mat
- LSS - Large Split Spoon

Water Levels

- Free groundwater encountered at 10.5 feet bgs.
- -

SOIL BORING: HDL-06

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57567, -151.27609
Boring Elevation: ~89.0 ft
Location: Southern building east of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		1.8	7 5 12 14	17	SP								18.5		
17																		
18																		
19																		
20											20.0							
21			S-8		1.7	5 7 8 10	15	sp-sm			Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; dark gray, wet, medium dense	0.4	94	5.6		25.8		
22																		
23																		
24																		
25																		
26			S-9		1.7	7 9 12 13	21									23.3		
27																		
28																		
29																		

Graphics Legend

sp-sm

SP

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.5 feet bgs.

-

SOIL BORING: HDL-06

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57567, -151.27609
Boring Elevation: ~89.0 ft
Location: Southern building east of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		1.6	11 10 15 19	25	sp-sm								16.9		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40		LSS	S-11		1.5	20 22 22	44				dense							
41											41.5							

Terminated boring at 41.5 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.5 feet bgs.

-

SOIL BORING: HDL-07

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 40 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57590, -151.27707
Boring Elevation: ~89.0 ft
Location: Central building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
											ORGANIC MAT; Nbn							
											0.7							
1			S-1		1.7	4 1 1 1		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, (topsoil)					31.2		
2											2.3							
3			S-2		2	5 8 9 11	17	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; little silt; trace gravel, fine to coarse grained, subangular to rounded; brown, moist, medium dense					5.6		
4																		
5			S-3		1.5	6 10 8	18									12.1		
6																		
7																		
8			S-4		1.5	5 5 6 6	11				began adding mud to mitigate heave after S-4					15.1		
9																		
10	▽	Hollow Stem Auger									wet							
11			S-5		1.5	3 5 7 8	12									21.7		
12																		
13			S-6		1.6	2 4 6 9	10				loose					18.0		
14																		

Graphics Legend

- At Time of Drilling (ATD)
- organic mat
- sp-sm
- ml
- LSS - Large Split Spoon

Water Levels

- Free groundwater encountered at 10.0 feet bgs.
- -

SOIL BORING: HDL-07

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 40 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57590, -151.27707
Boring Elevation: ~89.0 ft
Location: Central building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
											medium dense 15.0							
16			S-7		1.6	4 7 10 13	17	sp-sm								25.3		
17																		
18																		
19																		
20											20.0							
21			S-8		1.8	7 12 12 10	24				Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; dark gray, wet, medium dense					23.0		
22																		
23																		
24																		
25																		
26			S-9		2	5 8 15 19	23									24.3		
27																		
28																		
29																		

Hollow Stem Auger

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.0 feet bgs.

-

SOIL BORING: HDL-07

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/30/2025
Total Depth: 40 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57590, -151.27707
Boring Elevation: ~89.0 ft
Location: Central building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
30		Hollow Stem Auger	S-10		0.9	8 22 20	42	sp-sm			dense 30.0					23.7		
31																		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40											40.0							

Terminated boring at 40.0 feet bgs, no sample at 40.0 feet due to the rods being stuck in the augers.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.0 feet bgs.

-

SOIL BORING: HDL-08

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/04/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57619, -151.27611
Boring Elevation: ~89.5 ft
Location: Northern building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
1			S-1		2	6 4 1 1					**ORGANIC MAT**; Nbn 1.4							
2								ml			**SILT**; with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, (topsoil) 2.6							
3			S-2		2	3 9 9 10	18	SP			Poorly Graded **SAND** (SP), fine to coarse grained; trace silt; trace gravel, fine grained, subangular to rounded; brown, dry					7.6		
4																		
5			S-3		2	4 9 8 7	17				medium dense					6.5		
6																		
7			S-4		1.7	4 6 7 4	13				brown to gray					20.3		
8																		
9																		
10	▽		S-5		2	4 6 5 4	11				wet, began adding mud to mitigate heave after S-5					20.8		
11																		
12			S-6		2	3 5 7 12	12									20.1		
13																		
14		Hollow Stem Auger																

Graphics Legend

- ▽ At Time of Drilling (ATD)
- ml
- SP
- organic mat
- LSS - Large Split Spoon

Water Levels

- ▽ Free groundwater encountered at 10.0 feet bgs.
- ▼ -

SOIL BORING: HDL-08

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/04/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57619, -151.27611
Boring Elevation: ~89.5 ft
Location: Northern building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		2	4 5 7 11	12	SP			gray	3.1	93.1	3.8		22.8		
17																		
18																		
19																		
20																		
21			S-8		1.8	2 9 9 16	18									24.2		
22																		
23																		
24																		
25																		
26			S-9		2	10 14 14 16	28									19.3		
27																		
28																		
29																		

Graphics Legend

SP

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.0 feet bgs.

-

SOIL BORING: HDL-08

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/04/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57619, -151.27611
Boring Elevation: ~89.5 ft
Location: Northern building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		1.1	3 8 15 23	23	sp-sm			Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; gray, wet, medium dense					23.5		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40		LSS	S-11		1.5	5 16 14	30									23.0		
41											41.5							

Terminated boring at 41.5 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.0 feet bgs.

-

SOIL BORING: HDL-09

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/31/2025
Total Depth: 6 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57645, -151.27657
Boring Elevation: ~90.0 ft
Location: Northern portion of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT**; Nbn							
											0.9							
1			S-1		1.3	3 2 1 2		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn, (topsoil)							
2																33.1		
											2.9							
3		LSS	S-2		2	1 2 3 10	5	SP			Poorly Graded **SAND** (SP), fine to coarse grained; some gravel, fine grained, rounded; trace silt; brown, dry, NFS	15.5	80.1	4.4	2.8	6.5		
4											medium dense							
5			S-3		1.5	11 14 14 9	28									7.2		
6											6.0							

Terminated boring at 6.0 feet bgs.

Graphics Legend

- Organic Mat
- ml
- SP
- LSS - Large Split Spoon

Water Levels

No free groundwater encountered.

-

SOIL BORING: HDL-10

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/31/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57650, -151.27710
Boring Elevation: ~90.0 ft
Location: Northern building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
1			S-1		1.4	6 3 1 1					**ORGANIC MAT**; Nbn 0.9							
2								ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn, (topsoil) 2.2							
3			S-2		2	2 3 6 10	9	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; little silt; trace to little gravel, fine to coarse grained, rounded; brown, dry, loose, trace root hairs loss of root hairs					16.9 8.0	2.8	
4																		
5			S-3		1.7	7 6 6 7	12				medium dense					7.5		
6																		
7			S-4		1.4	2 3 3 3	6				loose					13.6		
8																		
9			S-5		1.7	4 4 4 3	8				wet, began adding mud to mitigate heave after S-5					17.2		
10																		
11			S-6		2	6 8 9 9	17				13.9							
12											Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; trace gravel, fine to coarse grained, subangular to rounded; gray, wet 15.0					21.1		
13																		
14																		

Graphics Legend

- At Time of Drilling (ATD)
- sp-sm
- ml
- Organic Mat
- LSS - Large Split Spoon

Water Levels

- Free groundwater encountered at 11.0 feet bgs.
- -

SOIL BORING: HDL-10

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/31/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57650, -151.27710
Boring Elevation: ~90.0 ft
Location: Northern building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		1.7	3 6 8 10	14	sp-sm			medium dense					22.4		
17																		
18																		
19																		
20																		
21			S-8		1.5	3 6 7 11	13									23.8		
22																		
23																		
24																		
25																		
26			S-9		1.8	8 11 15 14	26									30.5		
27																		
28																		
29																		

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

-

SOIL BORING: HDL-10

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/31/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57650, -151.27710
Boring Elevation: ~90.0 ft
Location: Northern building, west side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		1.8	5 9 12 11	21	sp-sm			sand, fine to coarse grained 30.0					22.2		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40											sand, fine grained							
41		LSS	S-11		2	6 8 13 10	21					3.7	88	8.3		25.3		
42											42.0							

Terminated boring at 42.0 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

-

HDL ENGINEERING Consultants LLC — SOIL BORING: HDL-11

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/04/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57669, -151.27609
Boring Elevation: ~90.0 ft
Location: Northernmost building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT**; Nbn							
											Blow counts omitted due to hammer malfunction 0.8							
1			S-1		1.4			ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, Nbn, trace root hairs, (topsoil)							
2											2.6							
3			S-2		2	6 6 11 11	17	sp-sm			Poorly Graded **SAND** (sp-sm), fine to coarse grained; little silt; little gravel, fine grained, subrounded to rounded; brown, dry					7.3		
4																		
5			S-3		1.4	1 6 7 9	13				medium dense, F-2	12.4	80.2	7.4	5	9.8		
6																		
7																		
8			S-4		1.5	5 5 6	11				began adding mud to mitigate heave after S-4					17.6		
9	▽																	
10											loose, wet							
11			S-5		1.3	3 4 5 5	9									18.5		
12																		
13			S-6		1.5	1 2 4 4	6									22.4		
14																		

Hollow Stem Auger

Graphics Legend

- ▽ At Time of Drilling (ATD)
- sp-sm
- ml
- organic mat
- LSS - Large Split Spoon

Water Levels

- ▽ Free groundwater encountered at 9.0 feet bgs.
- ▼ -

SOIL BORING: HDL-11

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/04/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57669, -151.27609
Boring Elevation: ~90.0 ft
Location: Northernmost building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		1.7	2 3 8 8	11	sp			Poorly Graded **SAND** (SP); little gravel, fine grained, subrounded to rounded; trace silt; brown, wet, medium dense	6.7	89.4	3.9		24.5		
17																		
18																		
19																		
20											gray, less than 6 inches of heave present							
21			S-8		1.3	8 6 7	13									21.9		
22																		
23																		
24																		
25											loss of gravel; loose							
26			S-9		1.6	5 4 6 9	10									20.1		
27																		
28																		
29																		

Graphics Legend

sp

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 9.0 feet bgs.

-

SOIL BORING: HDL-11

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/04/2025
Total Depth: 42 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57669, -151.27609
Boring Elevation: ~90.0 ft
Location: Northernmost building, east side of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		1.8	8 10 11 12	21	sp			medium dense 30.0					21.1		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40		LSS									less than 6 inches of heave present							
41			S-11		2	10 10 13 15	23									21.6		
42											42.0							

Terminated boring at 42.0 feet bgs.

Graphics Legend

sp

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 9.0 feet bgs.

-

SOIL BORING: HDL-12

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/03/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57698, -151.27709
Boring Elevation: ~89.5 ft
Location: Northernmost building, west side of road

Comments Slotted PVC groundwater monitoring well installed to 18 feet bgs.

Depth (ft)	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0									**ORGANIC MAT**; Nbn							
0.6																
1	S-1		1.4			ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, Nf, trace root hairs, (topsoil), Blow counts omitted due to hammer malfunction					131.5		
2																
3	S-2		0.8													
3.0						SP			Poorly Graded **SAND** (SP), fine to coarse grained; little gravel, fine grained, subrounded to rounded; little silt; brownish gray, dry					11.1		
4																
5	S-3		1.6						Blow counts omitted due to hammer malfunction					6.0		
6																
7																
8	S-4		1.6	5 7 7 5	14				trace silt; medium dense, gray, moist					23.1		
9																
10	S-5		1.8	3 5 7 6	12				wet					19.6		
11																
12																
13	S-6		1.2	3 2 6 6	8				loose, began adding mud to mitigate heave after S-6					24.4		
14																

Hollow Stem Auger

Graphics Legend

- At Time of Drilling (ATD)
- After Drilling (AD)
- SP
- ml
- organic mat
- LSS - Large Split Spoon

Water Levels

- Free groundwater encountered at 11.0 feet bgs.
- Free groundwater encountered at 8.0 feet bgs.

SOIL BORING: HDL-12

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/03/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57698, -151.27709
Boring Elevation: ~89.5 ft
Location: Northernmost building, west side of road

Comments Slotted PVC groundwater monitoring well installed to 18 feet bgs.

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
16		Hollow Stem Auger	S-7		1.3	2 3 6 9	9	SP				8.6	87.7	3.7		20.2		
17																		
18																		
19																		
20											less than 6 inches of heave present							
21			S-8		1.4	6 8 8 8	16									21.2		
22																		
23																		
24																		
25											medium dense							
26			S-9		1.8	5 6 9 14	15									19.8		
27																		
28																		
29																		

Graphics Legend

SP

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

Free groundwater encountered at 8.0 feet bgs.

SOIL BORING: HDL-12

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 02/03/2025
Total Depth: 41.5 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57698, -151.27709
Boring Elevation: ~89.5 ft
Location: Northernmost building, west side of road

Comments Slotted PVC groundwater monitoring well installed to 18 feet bgs.

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
31		Hollow Stem Auger	S-10		1.8	3 3 3 8	6	sp-sm			Poorly Graded **SAND** (sp-sm), fine to medium grained; little silt; gray, wet, loose	0.9	84.5	14.6		21.6		
32																		
33																		
34																		
35											little gravel, fine grained, rounded; medium dense							
36			S-11		1.4	1 11 15 12	26									18.6		
37																		
38																		
39																		
40											loss of gravel; dense							
41		LSS	S-12		1.5	4 13 18	31				41.5					24.2		

Terminated boring at 41.5 feet bgs.

Graphics Legend

sp-sm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 11.0 feet bgs.

Free groundwater encountered at 8.0 feet bgs.

SOIL BORING: HDL-13

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/31/2025
Total Depth: 6 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57721, -151.27632
Boring Elevation: ~90.0 ft
Location: Northern parking lot

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT**; Nbn							
											0.8							
1			S-1		1.5	7 2 1 1		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn (topsoil)					36.8		
2																		
			S-2		2	1 3 7 10										45.1		
3								sp-sm			2.9 Organic **SAND** (sp-sm), fine to coarse grained; little silt; little organics; trace gravel; trace gravel; orange, dry, Nbe					26.4		
4		LSS									3.2 Poorly Graded **SAND** (sp-sm), fine to coarse grained; little silt; little gravel, fine to coarse grained, subangular to rounded; brown, dry					9.2		
5			S-3		1.8	8 13 10 10	23				medium dense, brownish gray					7.4		
6											6.0 Terminated boring at 6.0 feet bgs.							

Graphics Legend

- sp-sm
- sp-sm
- organic mat
- ml
- LSS - Large Split Spoon

Water Levels

- No free groundwater encountered.
- -

SOIL BORING: HDL-14

Project Name: TDHE Elder Housing
Project Number: 25-101
Client: Kenaitze Indian Tribe
Date Drilled: 01/31/2025
Total Depth: 6 ft

Drilling Firm: GeoTek Alaska, Inc.
Equipment: Geoprobe 7822DT
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: J. Salter

Station/Offset: - / - -
Lat/Long: 60.57728, -151.27660
Boring Elevation: ~90.0 ft
Location: Northernmost portion of road

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	Visual Classification and Remarks	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
											ORGANIC MAT; Nbn							
											0.9							
1			S-1		0.9	1 1 1 1		ml			**SILT** (ml); with sand, fine to coarse grained; trace gravel, fine grained, rounded; brown, dry, trace root hairs, Nbn, (topsoil)							
2											2.7							
3		LSS	S-2		1.7	1 1 7 9	8	SM			Poorly Graded **SAND** (SM), fine to coarse grained; some silt; little gravel, fine grained, rounded; brown, dry, F-2	9.8	73.5	16.7	8	11.3		
4											medium dense							
5			S-3		2	7 9 11 10	20									8.8		
6											6.0							

Terminated boring at 6.0 feet bgs.

Graphics Legend

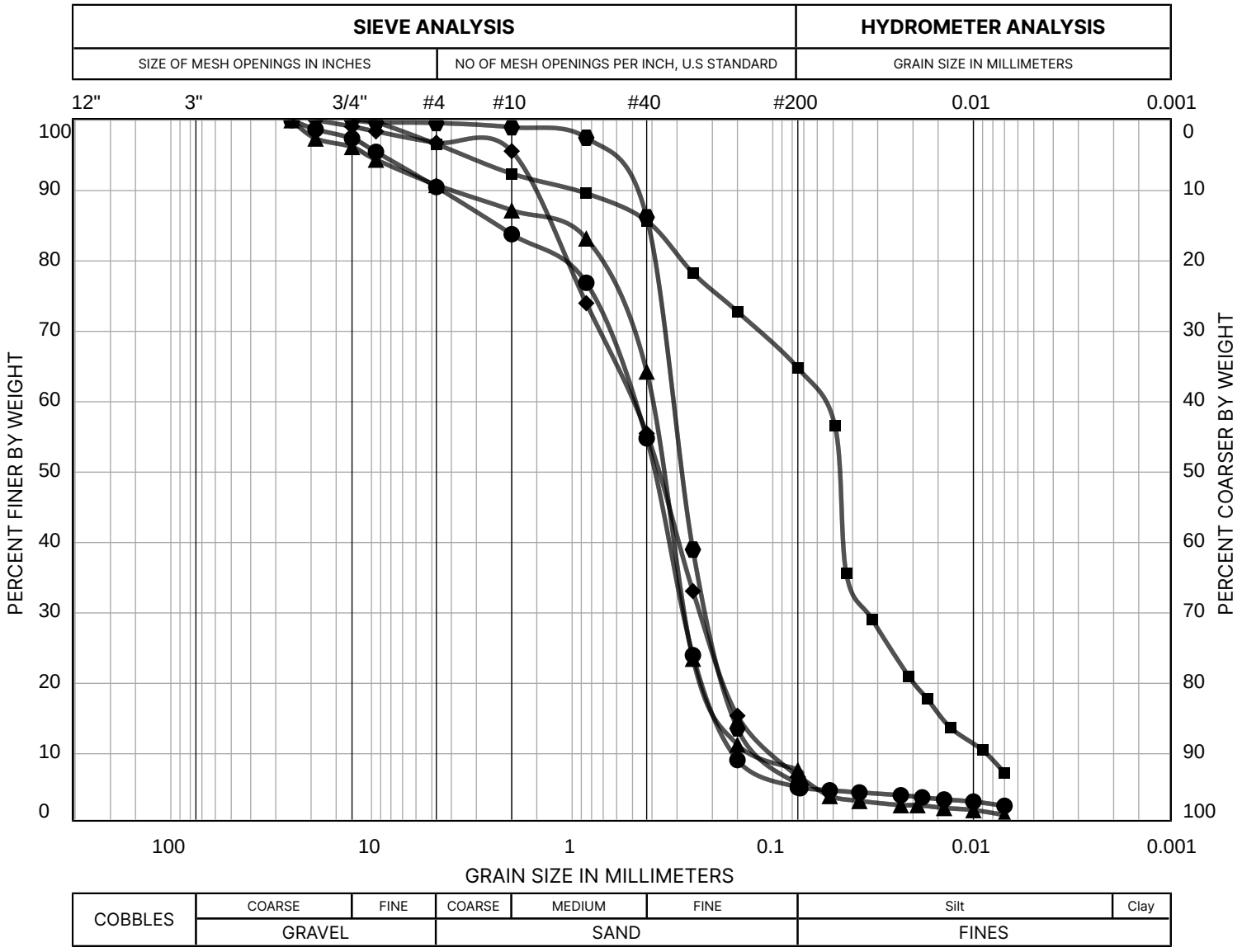
- SM
- ml
- organic mat
- LSS - Large Split Spoon

Water Levels

- No free groundwater encountered.
- -

GRAIN SIZE DISTRIBUTION TEST RESULTS

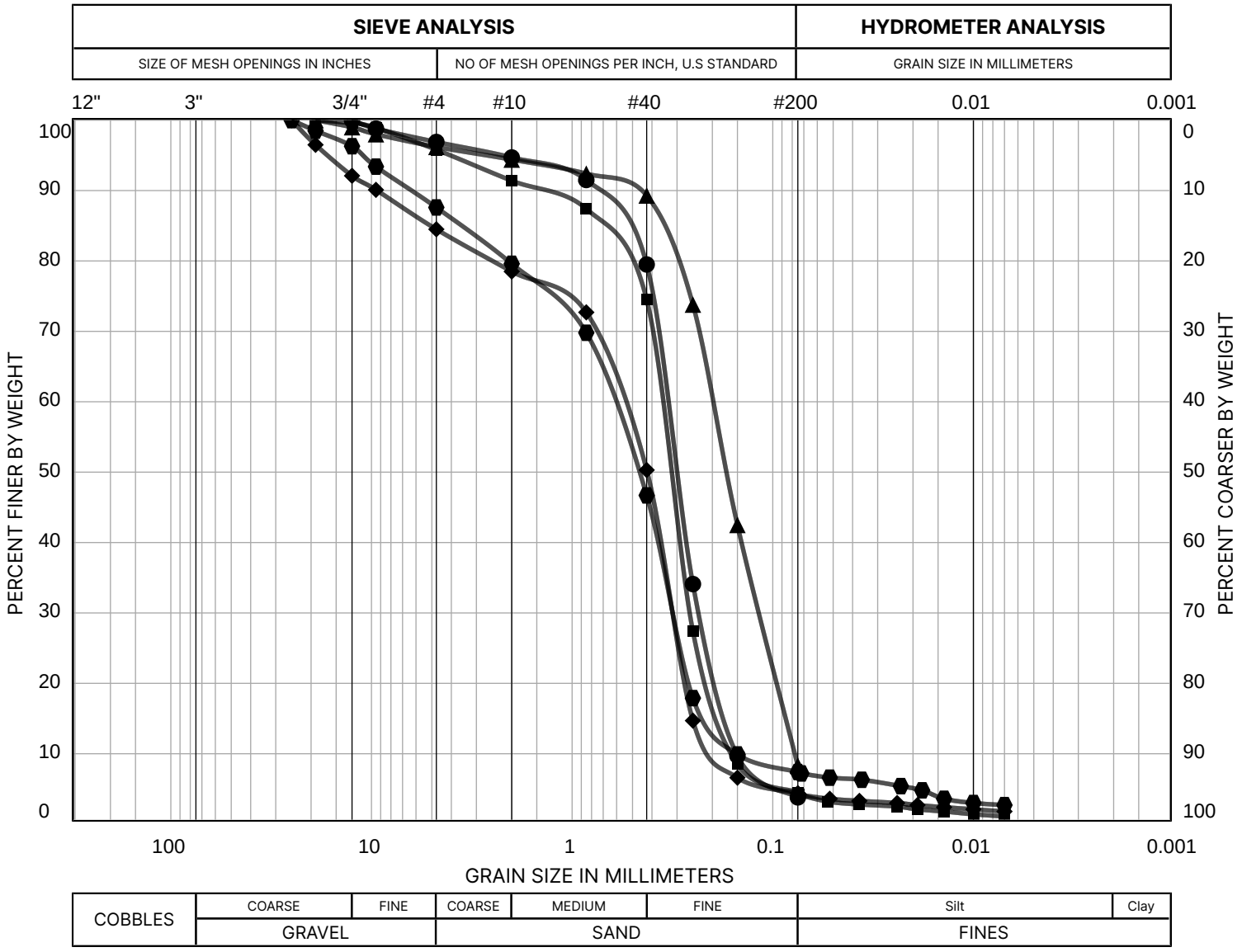
TDHE Elder Housing
Kenai, AK



	EXPLORATION	SAMPLE NUMBER	DEPTH	USCS SYMBOL	GRAVEL (%)	SAND (%)	FINES (%)	D10	D30	D60	CU	CC
■	HDL-01	S-1	0.8	ml	3.4	31.8	64.8	0.01	0.03	0.06	6	1.5
●	HDL-02	S-2	2.5	sp-sm	9.5	85.3	5.2	0.16	0.3	0.54	3.38	1.04
◆	HDL-03	S-9	25	sp-sm	3.2	90.1	6.7	0.11	0.24	0.54	4.91	0.97
▲	HDL-05	S-2	2.2	sp-sm	9.2	83.1	7.7	0.13	0.29	0.41	3.15	1.58
⬢	HDL-06	S-8	20	sp-sm	0.4	94	5.6	0.12	0.23	0.35	2.92	1.26

GRAIN SIZE DISTRIBUTION TEST RESULTS

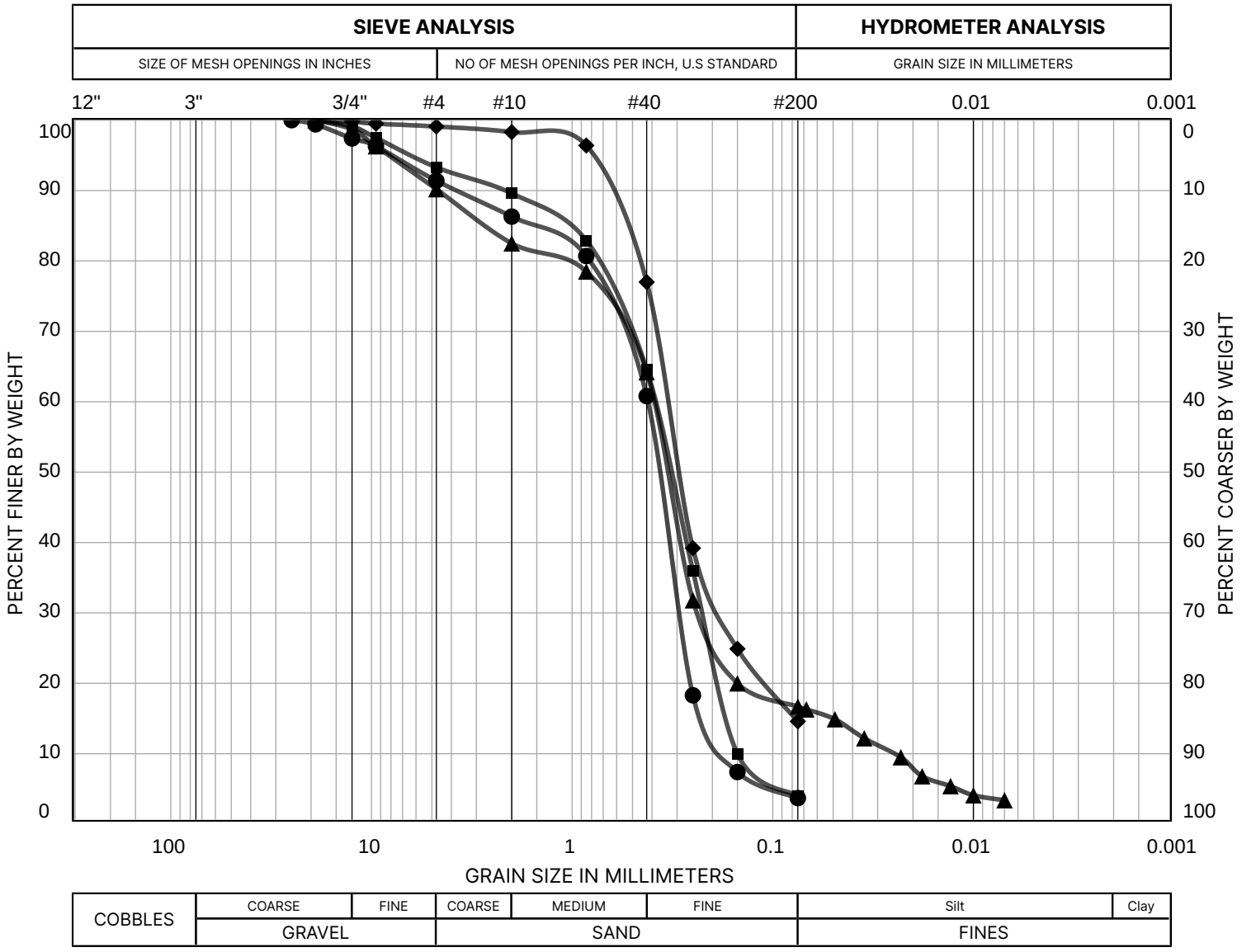
TDHE Elder Housing
Kenai, AK



	EXPLORATION	SAMPLE NUMBER	DEPTH	USCS SYMBOL	GRAVEL (%)	SAND (%)	FINES (%)	D10	D30	D60	CU	CC
■	HDL-06	S-3	5	SP	4.2	91.3	4.5	0.16	0.27	0.39	2.44	1.17
●	HDL-08	S-7	15	SP	3.1	93.1	3.8	0.15	0.24	0.37	2.47	1.04
◆	HDL-09	S-2	2.9	SP	15.5	80.1	4.4	0.2	0.35	0.63	3.15	0.97
▲	HDL-10	S-11	40	sp-sm	3.7	88	8.3	0.08	0.13	0.21	2.63	1.01
⬢	HDL-11	S-3	5	sp-sm	12.4	80.2	7.4	0.15	0.34	0.69	4.6	1.12

GRAIN SIZE DISTRIBUTION TEST RESULTS

TDHE Elder Housing
Kenai, AK



	EXPLORATION	SAMPLE NUMBER	DEPTH	USCS SYMBOL	GRAVEL (%)	SAND (%)	FINES (%)	D10	D30	D60	CU	CC
■	HDL-11	S-7	15	SP	6.7	89.4	3.9	0.15	0.24	0.4	2.67	0.96
●	HDL-12	S-7	15	SP	8.6	87.7	3.7	0.18	0.32	0.42	2.33	1.35
◆	HDL-12	S-10	30	sp-sm	0.9	84.5	14.6		0.19	0.36		
▲	HDL-14	S-2	2.7	sm	9.8	73.5	16.7	0.03	0.24	0.41	13.67	4.68