Draft Geotechnical Report

Appendix F

DRAFT Geotechnical Report

48th Avenue and Cordova Street Reconstruction

MOA PM&E No. 06-26

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Contact
Steven Halcomb, PE, GE
shalcomb@crweng.com

3940 Arctic Blvd., Suite 300 Anchorage, AK 99503
p (907) 562.3252 | f (907) 561.2273

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Geotechnical Investigation
48th Avenue and Cordova Street Reconstruction
(MOA PM&E Project No 06-26)

Submitted To:

Julie Makela, PE
Project Administrator
Municipality of Anchorage
Project Management & Engineering Department
4700 Elmore Road
Anchorage, AK 99519

Submitted By:

CRW Engineering Group, LLC
3940 Arctic Blvd., Suite 300
Anchorage, AK 99503
(907) 562-3252
www.crweng.com

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Steven Halcomb, P.E., G.E.	Michelle Harrison, E.I.T.
Senior Geotechnical Engineer	Staff Engineer

Table of Contents

Tables

Figures

Appendices

1. Introduction and Project Description

CRW Engineering Group, LLC (CRW) has prepared this geotechnical data and design recommendations report to support the design and construction of the proposed reconstruction of E. 48th Avenue, between Cordova Street and Old Seward Highway, and Cordova Street, between E. 48th Avenue and International Airport Road, in Anchorage, AK. The project is being managed by the Municipality of Anchorage (MOA) Project Management and Engineering (PM&E) Department. The project area consists of approximately 3,200 linear feet of roadway located in Midtown Anchorage. Proposed improvements may include new roadway structural section, drainage improvements, pedestrian facilities, traffic calming, street lights, and landscaping. The general project location is shown in Figure 1.

The scope of work included:

- Review of historical geotechnical investigations within and near the project area.
- Performing a geotechnical investigation consisting of 14 boreholes along the project alignment and soil sampling.
- Installation of 9 piezometer wells for groundwater level monitoring.
- Overseeing index laboratory testing of recovered soil samples including moisture content, grain size distribution including hydrometer, and Atterberg Limits (no secondary laboratory testing was performed).
- Analysis of field observations and testing results.
- Preparation of this geotechnical report to provide recommendations for the project.

2. Site Conditions

E. 48th Avenue and Cordova Street lie in Midtown Anchorage with Cordova Street oriented north to south and E. 48th Avenue oriented east to west. Cordova Street is a mix of light industrial business on the south end to residential and health care facilities on the northern end. E. 48th Avenue ranges from residential on the western end to light industrial/commercial on the eastern end near Old Seward Highway.

Cordova Street is characterized as a Collector street while E. 48th Avenue is characterized as a Neighborhood Collector. Both roads currently exist with two-lane cross-sections generally about 32 feet in width with rolled curb and gutter on both sides. Neither of the two roadways currently have pedestrian facilities.

Cordova Street shows significant pavement distress on the southern portion including extensive asphalt cracks and potholes. E. 48th Avenue shows moderate signs of pavement distress in the forms of transverse and longitudinal cracking, with several areas exhibiting fatigue cracking. The road shoulders along the project area are paved and contain potholes. Pavement patches were present in multiple areas of the alignment, notably in areas with buried utilities.

Surface water runoff is currently conveyed north through curb flow on Cordova Street to the intersection of E. 48th Avenue where it is collected in a piped storm drain system that flows to Tudor Road. Runoff on E. 48th Avenue is conveyed via curbs flow to storm drain inlets generally located at side street intersections. Piped drainage flows either northward towards Tudor Road or eastward towards Old Seward Highway.

3. Historical Geotechnical Investigations

CRW consulted the MOA Soil Boring map to evaluate historic borings along Cordova Street and E. 48th Avenue. A brief discussion of the historic investigations and their findings are provided below. Historical logs are included in Appendix C.

3.1 R&M 1974 and 1975 Investigations

R&M Consultants, Inc. (R&M) performed two geotechnical investigations in 1974 and 1975 along 48th Avenue. R&M's 1974 investigation consisted of two borings along 48th Avenue between East Street and Cordova Street. The two borings were drilled to a depth of 10 feet below ground surface (BGS) and encountered silty sand with gravel fill ranging from 4 inches to 2 feet thick overlaying silt with varying amounts of sand containing traces of gravel and clay. No groundwater was observed.

R&M's 1975 investigation consisted of several borings north of 48th Avenue however one boring, TH-6, occurred at the intersection of Denali Street and 48th Avenue. TH-6 was drilled to a depth of 6 feet and encountered 1.5 feet of gravel fill overlaying clayey silt. The clayey silt was frozen at the time of the investigation which occurred in April. No groundwater was observed.

3.2 Municipality of Anchorage Department of Public Works

Several test holes were completed by MOA from 1978 through 1981 along Cordova Street. Materials encountered during these investigations include sand and gravel of varying fines content fill overlying silt to sandy silt. The borings were completed to depths of 10 to 12 BGS. No groundwater was observed.

Several test holes were completed by MOA in 1981 along 48th Avenue. Materials encountered during these investigations include sand and gravel of varying fines content fill overlying sandy silt to silty sand. The borings were completed to a depth of 10 feet BGS. Peat was observed in one boring, closest to Old Seward Highway, and was observed to be from 4 to 5 feet BGS. No groundwater was observed.

4. Subsurface Investigation (2018)

CRW's geotechnical investigation consisted of drilling and sampling 14 geotechnical boreholes (BH-01 through BH-14) from October 30th to November 5th, 2018 at the locations shown in Figures 2 and 3. Borehole locations were selected following the guidelines presented in the 2007 Municipality of Anchorage (MOA) Project Management and Engineering (PM&E) Design Criteria Manual (DCM) Section 1.7 – Soil Investigation Standards. Initial boring locations were submitted to local utilities for clearance but were then adjusted during utility locates and traffic control requirements during drilling. Select site investigation photographs can be found in Appendix D.

4.1 Subsurface Drilling

Drilling services were provided by Discovery Drilling Inc. (Discovery) of Anchorage, Alaska, using a truck-mounted CME-75 drill rig equipped with a nominal 8-inch outer diameter (O.D.) hollow-stem auger. When drilling through the asphalt pavement, an approximately 12-inch diameter hole was cut in the pavement with a saw tooth bit prior to advancing the borehole.

Traffic control was contracted by Discovery and provided by Northern Dame Construction. Traffic control was performed in accordance with the requirements of the MOA approved traffic control plan.

CRW engineer, Dylan Baffrey, was onsite during the field investigation program. She logged the recovered soil samples and managed the field operations. Most borings were advanced to a nominal depth of 17 feet BGS (depth of the last split-spoon advanced beyond the auger). Two boreholes were terminated before the nominal depth due to encountering contaminated soils and one borehole was terminated early due to encountering a buried utility.

4.2 Sample Collection

Soil samples were obtained by advancing an oversized split-spoon sampler into the soil beyond the bottom of the auger or by collecting cuttings from the auger. Driven samples were collected using a 3-inch outer diameter (O.D.) split-spoon sampler as a modified Standard Penetration Test (SPT). The sampler was driven 18 inches, counted in 6-inch intervals, using a 340-pound automatic hammer. The number of blows required to drive the sample each 6-inch interval is reported on the borehole logs. The blow counts shown on the borehole logs are field values that have not been corrected for overburden, sampler size, hammer energy, rod length, or other factors.

Split-spoon samples were collected at approximately 2.5-foot intervals in the top 10 feet of the boring and every 5 feet thereafter. A surface grab sample was also collected just below the asphalt. Recovered samples were visually classified in the field before being individually sealed in double plastic bags and transported to the soils laboratory for additional testing. Field visual classifications were verified by laboratory testing. Soil characteristics, such as classification, consistency, moisture, and color were noted for each recovered sample. Classification was performed following the Unified Soils Classification System (USCS) according to ASTM D2487/D2488. Frost classifications of the soil were described in accordance with DCM standards.

4.3 Borehole Completion and Piezometer well Installation

Except where contaminated soils were encountered, all boreholes were backfilled with cuttings brought to the ground surface during drilling. In select borings (BH-01, BH-02, BH-03, BH-06, BH-07, BH-08, BH-09, BH-10, and BH-11), a 1-inch PVC pipe piezometer well was installed for groundwater level monitoring. The PVC pipe was hand-slotted the last 10 feet and installed for the full depth of the boring. After the PVC

pipe was installed, the annual space around the PVC was backfilled with cuttings. A 7-inch flush mount cover was installed at the surface with the annulus filled with pea gravel. A cold patch asphalt was placed around the flush mount cover to match the existing pavement surface. If no piezometer well was installed, the boring was backfilled with cuttings and cold patch asphalt was placed at the surface to match the existing pavement. Borings with contamination were backfilled with bentonite chips to seal the boring and covered with cold patch asphalt to match the existing pavement grade.

4.4 Ground Water Monitoring

Groundwater levels were noted during drilling. Additional groundwater level measurements occurred on November 15, 2018, approximately two weeks after completion of drilling and again on May 2, 2019. Groundwater levels observed during drilling and measurements after drilling are presented on the borehole logs and in this report. Additional water level readings are anticipated in the fall of 2019.

4.5 PID Field Testing

Soil samples were tested with a Photo Ionization Detector (PID) to estimate the presence of volatile organic compounds (VOC) after being placed into a polyurethane bags during sampling. The PID was calibrated at the beginning of each field day with 100-parts per million (ppm) isobutylene calibration gas. The PID used was equipped with a 10.2-eV lamp. Prior to screening, each sample was shaken or agitated for 15 seconds to assist volatilization. After vapor development, the PID sampling probe was inserted to about one-half the headspace depth and the highest measurement was recorded, which was normally between 2 and 5 seconds after probe insertion. Care was taken when inserting the sampling probe into the bag to avoid uptake of any moisture or soil particles. The field PID measurements are presented on the borehole logs.

4.6 Contaminated Soils Disposal

Contaminated soils were encountered in BH-12 and BH-13. In coordination with the Alaska Department of Environmental Conservation (DEC), soil cuttings from these borings were placed into 55-gallon drums and disposed of by Discovery at a DEC approved facility.

4.7 Encountered Buried Utility

CRW and Discovery encountered a buried water utility pipe while drilling on BH-04 at a depth of 10 feet BGS on October 30th, 2018. Drilling was halted while Anchorage Water and Wastewater Utility (AWWU) was notified. AWWU personal arrived on site and shut off the water supply and temporarily backfill the boring. AWWU arrived the next day to repair the waterline. No additional sampling occurred at BH-04.

5. Laboratory Testing and Results

Soil laboratory tests to evaluate index properties of recovered samples were performed by Alaska Testlab (ATL) in their Anchorage, Alaska facility. The laboratory testing program consisted of soil index tests to determine the water content, grain-size distribution including hydrometer, Limited Mechanical Analysis, and Atterberg Limits.

The laboratory tests were performed in accordance with the test methods of ASTM International. In total, 71 samples were submitted for testing. All samples were tested for their water content per ASTM D2216.

Thirteen samples were selected for grain-size distribution testing in accordance with ASTM D6913 and D422. The hydrometer test was performed to determine frost classification.

Seven samples were washed through the No. 200 mesh sieve in accordance with ASTM D1140. The coarse fraction of the remaining soil was then dried and sieved through the No. 4 sieve to determine the sand and gravel content. This method is termed the Limited Mechanical Analysis (LMA). The LMA is a means to determine the percentage of coarse and fine soil in a sample without having to perform full gradations.

Eight samples were tested for their Atterberg Limits in accordance with ASTM D4318.

Results of the laboratory testing are presented in Appendix B. Laboratory results are included on the borehole logs.

6. Site Conditions

6.1 Geology

The surficial geology for the project area was determined from the Simplified Geologic Map of Central and East Anchorage, Alaska, as mapped by R.A. Combellick with the Alaska Division of Geologic and Geophysical Surveys (DGGS) in 1999 in addition to the 1972 map by Schmoll and Dobrovolny. The surficial geology of the project area consists of silt and clay of glacioestuarine or lacustrine origin from Cordova Street/International Airport Road extending along the project alignment until approximately 48th Avenue/Fairbanks Street where the geology transitions to silt and fine sand of glacioestuarine or eolian origin.

The glacioestuarine or lacustrine deposits are generally clay, clayey silt, and silty clay with scattered pebbles (gravels), scattered layers of silt and fine sand, and rare cobbles. Consistency ranges from very soft to stiff. The deposits include lake deposits and cohesive facies of the Bootlegger Cove formation.

The glacioestuarine or eolian deposits are dominantly silt, fine sandy silt, and silty fine sand including noncohesive fine-grained facies of the Bootlegger Cove formation. There are local deposits of medium to coarse sand and scattered pebbles (gravels). Densities range but are commonly dense to very dense.

6.2 Pavement Thickness and General Soil Lithology

The pavement thickness varied from 2 to 3 inches based on measurements at the borehole locations.

The subsurface condition generally consisted of a 2 to 5 foot thick layer of granular fill underlain with a mix of coarse to fine grained material. Coarse grained materials ranged from clean gravel silty/clayey gravel. Fine grained material ranged from silt to clay with varying amounts of sand and gravel.

A generalized discussion of subsurface conditions is presented below along the project alignment organized by stationing. Detailed subsurface conditions can be found on the borehole logs in Appendix A.

6.3 Station-to-Station Subsurface Description

The project alignment begins at Station 10+00 near the intersection of Cordova Street and International Airport Road and ends at approximately Station 23+00 near the intersection of Cordova Street and E. 48th Avenue. Stationing then changes to 30+00 at E. 48th Avenue and Cordova Street and continues along E. 48th Avenue to 49+00 at the intersection of 48th Avenue and Old Seward Highway.

6.3.1 Station 10+00 (BOP) to 12+00

BH-01 was advanced in this section of the project. Subsurface conditions consisted of asphalt overlying a 5-foot thick fill classified as silty sand with gravel and a frost classification of F2. The gravel content was 25 percent and the fines content was 18 percent. The moisture content ranged from 23 to 36 percent.

Underlying the silty sand is a clay layer with varying amounts of sand and gravel that extends from 5 feet BGS to the extent of the borehole. The clay layer has a frost classification of F3 to F4 (MOA Frost Classification, see Appendix A). Fines content was 54 percent at a depth of 7.5 feet BGS. Moisture content ranged from 16 to 24 percent.

Ground water was observed at approximately 2.5 feet BGS at the time of drilling and 5.4 feet approximately two weeks after drilling.

6.3.2 Station 12+00 to 32+00

Boreholes BH-02 through BH-06 were advanced in this section of the project. The upper 2.5 to 5 feet generally consisted of granular fill that ranged from well graded gravel with sand to poorly graded sand with silt and gravel. The fill layer had a frost classifications ranging from non-frost susceptible (NFS) to F2. Gravel content ranged from 45 to 62 percent and fines content ranged from 4 to 9 percent. The moisture content ranged from 3 to 9 percent.

Below the fill, conditions were generally silty sand and gravel to silt though layers of lean clay were noted at various depths.

Where groundwater was observed it ranged from 2.5 feet to 7.5 feet BGS while drilling and 1.8 to 5.5 feet BGS two weeks after drilling.

6.3.3 Station 32+00 to 40+50

Boreholes BH-07 through BH-10 were advanced in this section of the project. The subsurface conditions generally consisted of granular fill that ranged from a poorly graded sand with silt and gravel to poorly graded gravel with silt and sand. The granular fill has a frost classification of F2. Gravel content ranged from 42 to 49 percent and the fines content was 9 percent. Moisture contents ranged between 4 and 7 percent.

Underlying the granular fill is layers of poorly graded sand and gravel to silty sand and gravels of varying thickness. Below the sand gravel is a silt containing varying amounts of sand and gravel with an F4 frost classification. The silt layer ranged in depth from 5 to 15 feet BGS and increased in depth moving from BH-07 to BH-10.

Where groundwater was observed it ranged from 2.5 feet to 7.5 feet BGS while drilling and 3.5 to 7.7 feet BGS two weeks after drilling.

6.3.4 Station 40+50 to 49+00 (EOP)

Boreholes BH-11 through BH-13 were advanced in this section of the project. Contaminated soils were found in BH-12 and BH-13 as previously noted therefore the soils in this section are based on BH-11.

Subsurface conditions consisted 2.5 to 5 foot thick granular fill that ranged from a poorly graded gravel with silt and sand to a poorly graded sand with silt and gravel. The granular fill has a frost classification of F1 to F2. The moisture content ranged from 3 to 21 percent.

Underlying the granular fill is a layer of poorly graded gravel with varying fines content that was approximately 2.5 feet thick in BH-11. Below the poorly graded gravel was a silty sand that extended the depth of boring. BH-09 was noted to have a 2.5 foot thick silt layer interbedded between the granular fill and the silty gravel layer.

Groundwater was observed in BH-11 at 2.5 feet BGS at the time of drilling and 6.3 feet BGS two weeks after drilling.

6.3.1 51st Avenue

BH-14 was advanced on 51st Avenue as there may be potential that this road will be upgraded as part of this project. Subsurface conditions consisted of a 2.5 foot thick gravel fill with a frost classification of F1. Gravel content was 48 percent and the fines content was 10 percent. The moisture content was 4 percent.

Underlying the granular fill was a 2.5 foot layer of sandy silt followed by a 5 foot thick layer of clay. A poorly graded sand layer was encountered below the clay from approximately 10 to 15 feet BGS. Below the sand was a gravelly clay which extended to the depth of boring.

Ground water was observed in BH-14 at approximately 2.5 feet BGS at the time of drilling.

6.4 PID Field Screening Results

During the geotechnical field investigation sampled soils were tested for the presence of volatile organic compounds (VOCs), such as petroleum hydrocarbons, using a photo ionization detector (PID). Soil samples with PID readings of 20 parts per million (ppm) or higher are considered contaminated based on local practice. Contaminated soil was encountered in BH-12 and BH-13 and the boreholes were terminated at depths of 5.0 feet and 2.5 feet, respectively. The sampled soils had PID readings of 110 ppm to 210 ppm respectively. CRW's scope of services did not include collecting contaminated soil samples therefore no analytical testing was performed on the potentially contaminated soil. Samples were disposed of as previously stated.

6.5 Groundwater Conditions

Groundwater, if observed, was recorded on the borehole logs and select borings had piezometer wells installed. Table 1 provides a summary of the groundwater levels at the time of drilling and subsequent measurements. All depths are relative to the existing roadway surface. Additional ground water measurements are anticipated to take place in the fall of 2019.

Table 1 – Summary of Groundwater Levels

Borehole	While Drilling (feet)	11/15/2018 (feet)	05/02/2019 (feet)
BH-01	2.5	5.4	4.0
BH-02	7.5	2.9	0.2(1)
BH-03	2.5	1.8	0.3
BH-04	Not Observed	No PVC installed	No PVC installed
BH-05	Not Observed	No PVC installed	No PVC installed
BH-06	5.0	5.5	4.7
BH-07	5.0	3.5	1.7
BH-08	5.0	3.8	1.6
BH-09	2.5	4.6	2.7
BH-10	7.5	7.7	7.3
BH-11	2.5	6.3	4.7
BH-12	Not Observed	No PVC installed	No PVC installed
BH-13	Not Observed	No PVC installed	No PVC installed
BH-14	2.5	No PVC installed	No PVC installed

1) Unable to locate boring on 5/2/2019. Reading taken on 5/6/2019.

7. Geotechnical Engineering Recommendations

CRW has developed the following recommendations based on our understanding of the project scope and considering the data obtained during our geotechnical investigation.

7.1 Site Preparation

All pavement/sidewalks and pathways, existing fill, existing curbs and gutters, trees, stumps, and all other deleterious material should be cleared. Exposed subgrade at the bottoms of excavations should be scarified, moisture conditioned, and compacted to 95 percent of the maximum Proctor density as determined from ASTM D1557.

7.2 Excavation and Dewatering

Any excavations for utilities should follow proper local, state, and federal requirements, including OSHA. The soil and groundwater conditions for utility excavations will vary. Based on the subsurface conditions observed it is anticipated that the soils exposed will range between Type "A", "B", or "C" soils in relation to the OSHA 29 CFR Part 1926 Occupational Safety and Health Standards – Excavations.

The contractor is responsible for trench stability, worker safety, and regulation compliance as he will be present on a day to day basis and can adjust efforts to obtain the needed stability. Surface runoff entering the excavation could present challenges and should be accounted for during construction. As appropriate, trench shoring should be used by the utility contractor.

Excavations above the water table may stand relatively steeply initially but fail suddenly without warning. As the in-situ soils dry, they will tend to ravel and slough to their natural angle of repose, which is estimated to be between 1.8 to 1.5H:1V (horizontal to vertical). Below the water table, or if surface water is allowed to enter the trench, in-situ soils may slough, soften, squeeze, slump over time or due to disturbance, to slopes of 2.5 to 3H:1V or flatter.

Excavations should be performed with equipment that minimizes disturbance of the in-situ soils. CRW also recommend that the excavation bottoms be evaluated by a qualified geotechnical engineer or trained inspector to identify soft or unsuitable soils. If soft or unsuitable soils are encountered, they should be over excavated a minimum of 2 feet and replaced with granular fill, such as MOA Type II material.

Groundwater was observed between approximately 1.8 to 7.7 feet BGS two weeks after drilling however groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as existing swales. The contractor must determine the actual groundwater levels at the time of construction to determine groundwater impacts on the construction procedures, if necessary.

Depending on the depth of excavation below the groundwater table or potential surface seeps, dewatering may be required. Dewatering with sumps and pumps should only be used for excavations that penetrate 2 to 3 feet below the water table. If excavations extend several feet below the water table, area-wide dewatering with well points or pressure relief wells may be required. Additional recommendations on dewatering, like well point spacing or pumping rates, can be provided on request.

7.3 Frost Depth and Permafrost

Significant seasonal frost was not observed in the borings at the time of drilling.

Typical design frost depths between 8 and 11 feet in Anchorage are common for relatively dry granular soils. It should be noted that seasonal fluctuations of snow cover, temperatures, infiltration/evaporation, groundwater table, and other climatic effects will have an impact on the design frost depth therefore any calculated value should only be considered an average design value as deeper frost penetrations are possible. Design frost depths have been estimated based on the modified Berggren equation using the commercially available Microsoft DOS program Berg2 as discussed in the next section of this report.

Permafrost was not encountered in the borehole and is not anticipated at the project site.

7.4 Recommended Road Structural Sections

CRW has developed a recommended road structural section based on the current MOA Design Criteria Manual (DCM) as outlined in Chapter 1 Streets, Section 1.10 Road Structural Fill Design. The structural section design uses the goal of reducing the freezing and thawing impacts to a specified percentage.

The DCM recommends two methods for frost considerations in the structural section design: the Complete Protection Method and the Limited Subgrade Frost Penetration Method.

The Complete Protection Method involves the removal of all frost susceptible subgrade soils beneath the roadway to the calculated frost penetration depth. These soils are replaced with non-frost susceptible fill. This method may be used regardless of the frost susceptibility of the subgrade soils. Board insulation may also be used in the subbase of the structural section to reduce the required depth of classified fill and backfill. The Complete Protection Method would require excavation and replacement of frost susceptible soils down to depths of 8 to 10 feet which is not typically considered to be economical and therefore not recommended. The addition of insulation in the roadway structural section could be used to reduce the required excavation depth.

The Limited Subgrade Frost Penetration Method attempts to restrict roadway surface movements to levels that will not adversely affect road surface life or quality. The method permits frost penetration into a frost susceptible subgrade equal to a maximum of 10 percent of the structural section design thickness.

Due to encountering potentially contaminated soils, two of the boreholes located at the east end of 48th Avenue were not advanced to the required DCM depth. Based on the general area geology the soil conditions towards the east end of 48th Avenue are assumed to be similar as BH-11. CRW recommends that the subgrade soils be characterized following USCS, or similar classification system, if environmental sampling occurs in these locations to confirm our design assumptions.

The frost depth was analyzed using the commercially available MSDOS computer program Berg2 written by Braley and Connor (Braley and Connor, 1989). The Berg2 computer program was used to calculate the estimated total frost penetration depth and determine the recommended structural section. For the analysis, the program default climate parameters for Anchorage were used and assumed conservative surface freeze/thaw n-factors based on local practice and published values. Soil layers were assigned in the program with estimated dry unit weights of the soil and average or anticipated water contents. Soil thermal parameters were calculated from the equations built into the Berg2 program (see Braley and Connor for further discussion).

7.4.1 Recommended Structural Section – Limited Subgrade Frost Protection Method

In general, Cordova Street and 48th Avenue contain a frost susceptible subgrade with an F2 to F4 frost classification within 8 feet of the ground surface. Based on this, an insulated structural section using Limited Subgrade Frost Penetration for the entire project alignment is recommended. CRW has developed two potential recommended structural sections based on a Berg2 analysis. Roadway sections with both 2

inches and 3 inches of insulation were evaluated. The recommended structural sections are presented in Table 2 and Table 3. A typical section is presented in Figure 4 using 2 inches of insulation.

Table 2 – Recommended Structural Section – 2 inches Insulation

Layer	Minimum Thickness, inches
Asphalt Pavement	3.5
Leveling Course	2
MOA Type IIA	16
Insulation	2
MOA Type II	21
Geotextile	N/A
Subgrade	N/A
Total Thickness	44.5

Table 3 – Recommended Structural Section – 3 inches Insulation

Layer	Minimum Thickness, inches
Asphalt Pavement	3.5
Leveling Course	2
MOA Type IIA	16
Insulation	3
MOA Type II	12
Geotextile	N/A
Subgrade	N/A
Total Thickness	36.5

See Appendix E for Berg2 analysis and detailed results. Note that the recommended structural section considers only minimum thicknesses. Layers maybe need to be thicker due to pavement design requirements or other project requirements.

7.5 Rigid Insulation

Rigid board foam insulation with a minimum compressive strength of 60 psi and a maximum water absorption of 0.3 percent by volume in accordance with the current version of Municipality of Anchorage Standard Specifications (MASS) is recommended. The insulation should have a minimum R-value of R-4.5 per inch. A minimum of 18 inches of fill should be placed over the insulation to protect from wheel loads during construction and to prevent frost formation in the form of differential icing.

Board insulation installation should be extended a minimum of 3 feet beyond the back of the curb or 1 foot beyond the back of the sidewalk. The designers may consider reducing the minimum distance beyond the back of curb however reduced board lengths will increase the risk of the curb heaving up or “cub rolling.” The potential for curb rolling decreases as the distance the insulation extends beyond the back of curb increases.

Transitions between insulated and non-insulated sections should involve the extension of insulation out from the roadway section 8 to 12 feet with the thickness reduced in these areas to minimize the possibility of differential heave. The insulation can be tapered from an R-value of 9 to an R-value of 4.5 in the transition zone.

7.6 Geotextiles

A geotextile is recommended to be used at the base of the structural section along the overall project to preserve the structural section over frost susceptible subgrade. The use of a geotextile reduces the effects of thaw weakening, prevents fines migration, and increases lateral drainage at the base of the structural section. If soil layers near the top of the water table are looser the geotextile will provide additional stabilization.

A woven or non-woven geotextile that meets MOA specifications may be used. Woven geotextiles may help provide stabilization while a non-woven geotextile will help reduce fines migration. Any woven geotextiles should meet specification to reduce passage of fines into the structural section. The selected geotextile should be placed on top of the excavated subgrade soils prior to placement of classified fill and any insulation. The geotextile should be extended up the sides of excavations.

Typical installation involves placing the geotextile transverse to the centerline in order to avoid large overlaps. Fabric joints should be overlapped according to manufactures recommendations. In sections where subgrades are soft fabric joints may require sewing together.

7.7 Subdrains

Incorporation of subdrains into the design of the structural section is recommended to help mitigate against the effects of high ground water levels. High groundwater levels, or groundwater that reaches the pavement structural section, can collect in the structural section and impact the overall road performance. Subdrains will mitigate against water infiltration in the structural section and improve overall road performance. The depth of subdrain installation should be below insulation to prevent seasonal freezing of the subdrain.

Edge drains should be placed at the outer edges of the structural section and consist of a geotextile wrapped perforated PVC Pipe with a minimum O.D. of 4 inches. Construction should be per MASS Specifications. Roadway subgrade should be sloped with a minimum of 2% towards subdrains to assist with drainage. Termination of the subdrains should be to the drainage system manholes or suitable outfalls. Subdrains should be hydraulic sized and consider potential icing issues.

Should edge drains not be feasible, an alternate would be a perforated drain placed in a shallow trench near the center of the structural section. Additional recommendations can be provided if this alternate is required.

For areas were contamination was encountered the designers may want to consider limiting the subdrains.

7.8 Reuse of Material

Fill and native material that meets the classification for MOA Type II and Type II-A fill can be reused as classified fill. It is anticipated that the majority of material along 48th Avenue and Cordova Street contains frost susceptible material and will not meet MOA Type II and Type II-A classification.

When reusing material, consideration should be given to the ability to excavate, sort, and store reusable materials. This effort may be less efficient and cost more than complete removal and replacement with imported materials.

7.9 Contaminated Site Review

Soil samples were tested using a PID. Values registered between 0.0 and 210 ppm. Values above 20 ppm constitute contaminated soils and were encountered in the fill material in BH-12 and the entire length of BH-13. The extent of the contamination in the vicinity of BH-12 and BH-13 (east end of 48th Avenue near Old Seward Highway) is unknown. Additional environmental assessments should be conducted around BH-11 through BH-13 including chemical testing to better define the extents of the contamination and impacts on project costs and schedule. Soil that was just below contamination levels was encountered in BH-07, at a depth of 2.5 feet BGS. This sample had a PID value of 17.5 ppm; this suggests that there may be contaminated soil in the area.

7.10 Utility Recommendations

All utilities should be bedded per pipe manufacture, governing utility, and current MASS specifications, with the bedding material compacted to provide support. The satisfactory performance of piped utilities is highly dependent upon the quality of soil below and along the sides of the pipe. Backfill around and over the utilities should be NFS sand and gravel similar to MOA Type II classified fill.

Buried utilities which are susceptible to damage from freezing need to be frost-protected by sufficient amounts of backfill, insulation, or active freeze protection like heat tape or a combination of these methods. Where possible, pipelines should be designed to maintain adequate burial depth to protect from freezing per MASS. Insulation recommendations can be provided if burial depths cannot be achieved.

8. Limitations and Closure

The information submitted in this report is based on CRW's interpretation of data from a field geotechnical investigation performed for this project. The conclusions contained in this report are based on site conditions as they were observed on the drilling dates indicated. It is presumed that the exploratory borings are representative of the subsurface conditions throughout the site. Effort was made to obtain information representative of existing conditions at the site. If, however, subsurface conditions are found to differ, CRW should be notified immediately to review these recommendations in light of additional information.

If there is substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions considering the changed conditions and time lapse. Unanticipated soil conditions are commonly encountered and cannot fully be determined by collecting discrete samples or advancing borings. The client and contractor should be aware of this risk and account for contingency accordingly.

This report was prepared by CRW Engineering Group, LLC for use on this project and is not intended for use on other projects. CRW is not responsible for conclusions, opinions, or recommendations made by others based on data presented in this report.

9. References

Braley, W.A. and Connor, B., 1989. Berg2 Micro-Computer Estimation of Freeze and Thaw Depths and Thaw Consolidation. A report prepared for the State of Alaska Department of Transportation and Public Facilities Statewide Research, June, 1989.

Combellick, R.A., 1999. Simplified geologic map and cross sections of central and east Anchorage, Alaska: Alaska Division of Geological and Geophysical Surveys Preliminary Interpretive Report 1999-1.

Schmoll, H.R. and Dobrovolny, E., 1972. Generalized Geologic Map of Anchorage and Vicinity, Greater Anchorage Area Borough, Alaska. US. Geological Survey Open File Report: Technical Data Unit Classification number 513.

Figures

FILE NAME: J:\JobsData\10143.00 48th Ave And Cordova St Reconstruction\00 CADD\02 Figures\05 Geotech Exploration\Geotech Report Figures\Anchorage Vicinity.dwg

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ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
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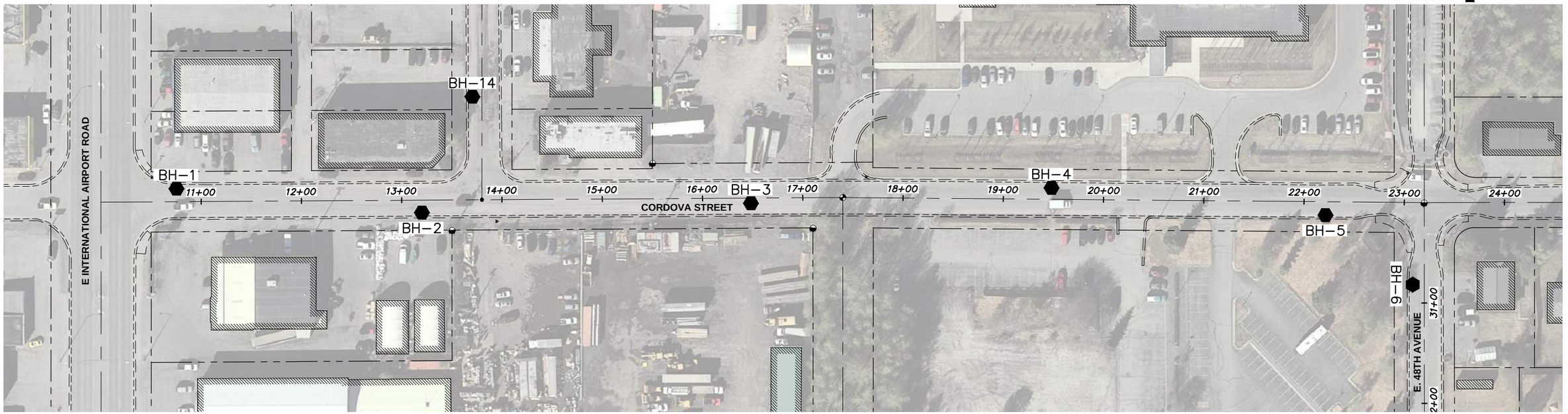
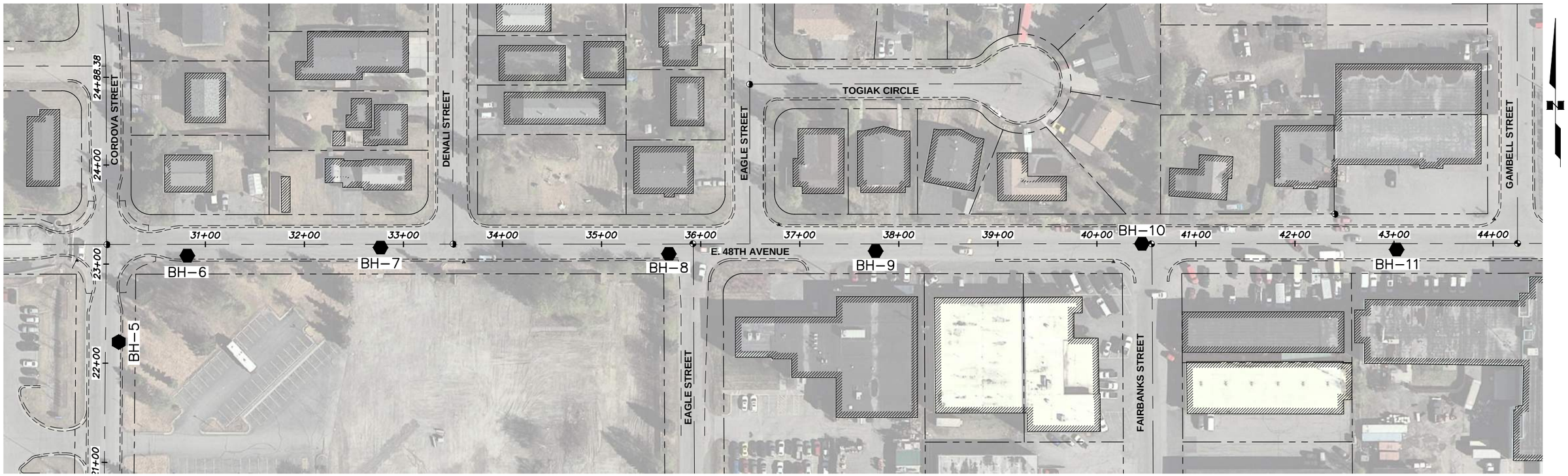
VICINITY MAP

48TH AVE AND CORDOVA ST RECONSTRUCTION

ANCHORAGE, ALASKA

Project No:	10143.01
Drawn By:	CRW
Scale:	NTS
Date:	March 2019
Figure:	1





LEGEND

BH–X

BOREHOLE LOCATION AND NUMBER

50' 0 50' 100'

PROJECT: 10143.00

STATUS: DRAFT

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48TH AVE. & CORDOVA ST. RECONSTRUCTION MOA 06-24

BOREHOLE SITE PLAN

DATE: MAR 2019

SCALE: GRAPHIC

FIGURE: 2

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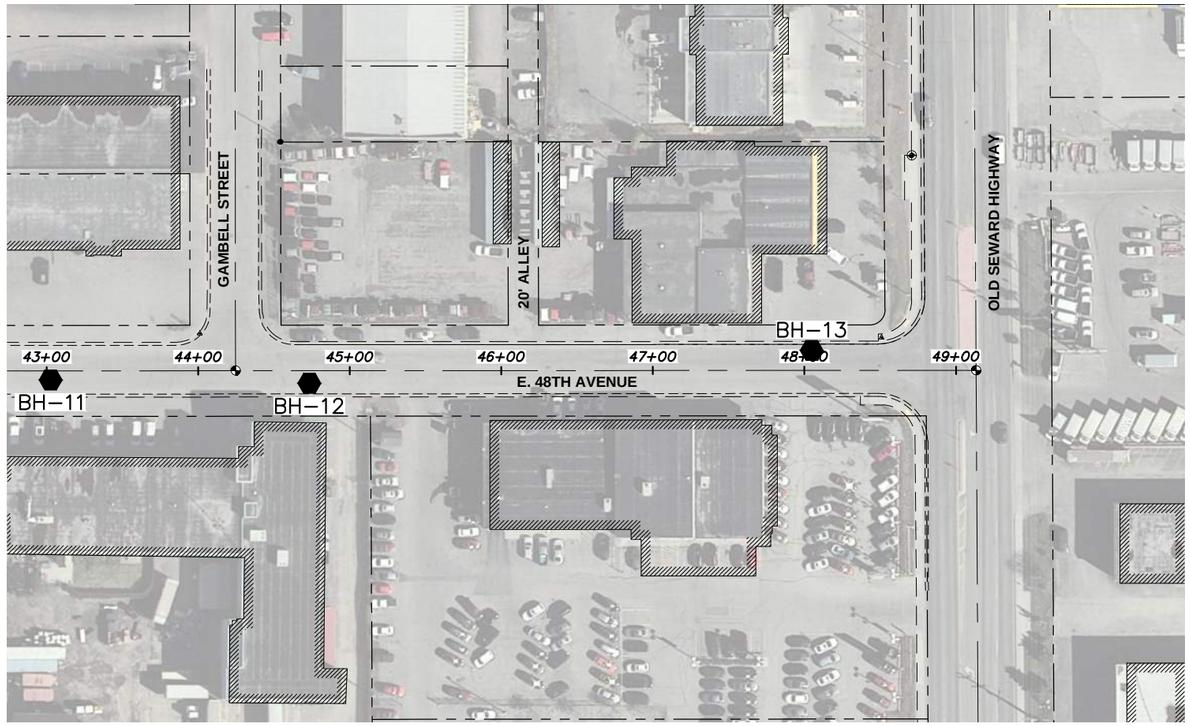

LEGEND

BH–X

BOREHOLE LOCATION AND NUMBER

50' 0 50' 100'

PROJECT: 10143.00

STATUS: DRAFT

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48TH AVE. & CORDOVA ST.
RECONSTRUCTION MOA 06–24

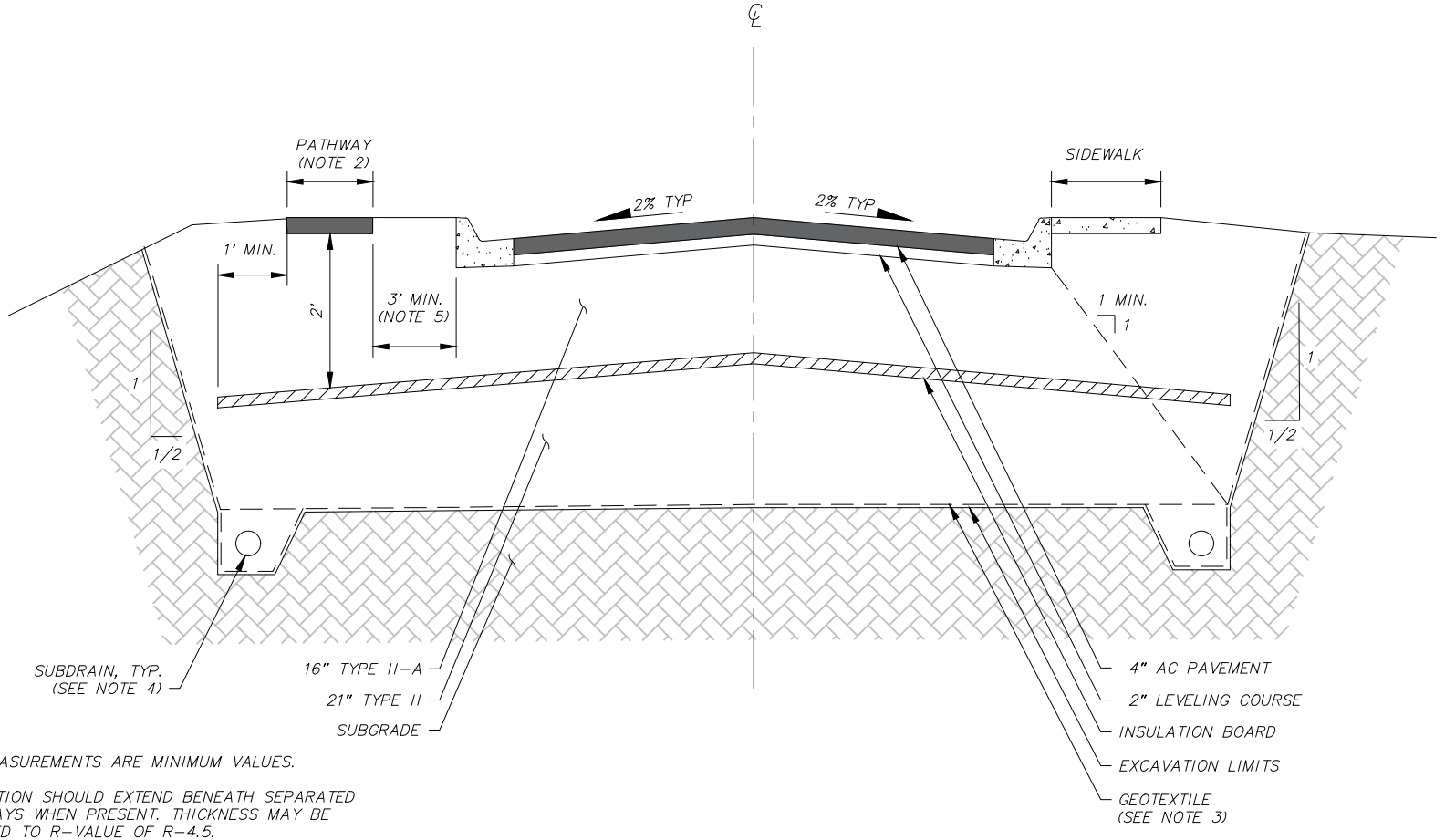
BOREHOLE SITE PLAN

DATE: MAR 2019

SCALE: GRAPHIC

FIGURE: 3

File: \\crweng.com\Projects\JobsData\10143.00 48th Ave And Cordova St Reconstruction\00 CADD\02 Figures\05 Geotech Exploration\Geotech Report Figures\10143.00 Geotech Map.dwg



NOTES:

1. ALL MEASUREMENTS ARE MINIMUM VALUES.
2. INSULATION SHOULD EXTEND BENEATH SEPARATED PATHWAYS WHEN PRESENT. THICKNESS MAY BE REDUCED TO R-VALUE OF R-4.5.
3. GEOTEXTILE SHALL MEET MOA MASS SECTION 20.25 CLASS 2, TYPE A, NON-WOVEN FABRIC WHEN SPECIFIED.
4. INSTALL SUBDRAINS PER M.A.S.S. DETAIL #55-3.
5. EXTEND INSULATION A MINIMUM OF 3 FEET BEYOND THE BACK OF CURB WHEN NO PATHWAY OR SIDEWALK ARE PRESENT.
6. INSULATION MIN. 60 PSI, ABSORPTION 0.30% MAX. BY VOLUME PER M.A.S.S.

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48TH AVE. AND CORDOVA ST.
RECONSTRUCTION MOA 06-26

TYPICAL INSULATED SECTION
WITH EDGE SUBDRAINS

48TH AND CORDOVA

Project No:	10143.00
Drawn By:	CRW
Scale:	NTS
Date:	JAN 2019
Figure:	4

Appendix A

Borehole Logs

Included in this section:

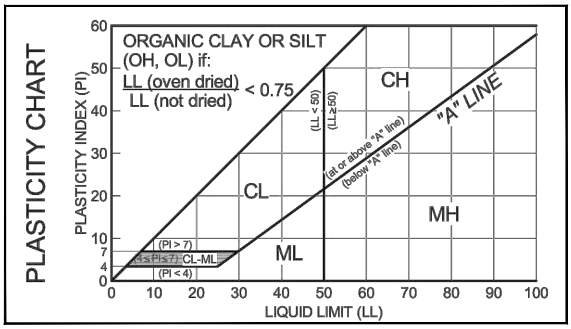
1) Borehole Log Legend
2) Borehole Logs (BH-01 thru BH-14)

UNIFIED SOIL CLASSIFICATION (ASTM D 2487)

GROUP SYMBOL	SOIL GROUP NAMES & LEGEND	
GW	WELL-GRADED GRAVEL	If soil contains ≥ 15% sand, add "with sand"
GP	POORLY GRADED GRAVEL	
GM	SILTY GRAVEL	
GC	CLAYEY GRAVEL	
SW	WELL-GRADED SAND	If soil contains ≥ 15% gravel, add "with gravel"
SP	POORLY GRADED SAND	
SM	SILTY SAND	
SC	CLAYEY SAND	
CL	LEAN CLAY	If soil contains coarse-grained soil from 15% to 29%, add "with sand" or "with gravel" for whichever type is prominent, or for ≥30%, add "sandy" or "gravelly"
ML	SILT	
OL	ORGANIC CLAY OR SILT	
CH	FAT CLAY	
MH	ELASTIC SILT	
OH	ORGANIC CLAY OR SILT	
PT	PEAT	

Gravels or sands with 5% to 12 % fines require dual symbols (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC) and add "with clay or "with silt" to group name. If fines classify as CL-ML for GM or SM, use dual symbol GC-GM or SC-SM.

Optional Abbreviations: Lower case "s" after USCS group symbol denotes either "sandy or "with sand" and "g" denotes either "gravelly" or "with gravel."



COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 IN.
COBBLES	3 IN. TO 12 IN.
GRAVEL	3 IN. TO NO. 4 (4.76 mm)
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 (4.76 mm)
SAND	NO. 4 (4.76 mm) TO NO. 200 (0.074 mm)
COARSE SAND	NO. 4 (4.76 mm) TO NO. 10 (2.0 mm)
MEDIUM SAND	NO 10 (2.0 mm) TO NO. 40 (0.42 mm)
FINE SAND	NO. 40 (0.42 mm) TO NO. 200 (0.074 mm)
SILT AND CLAY	SMALLER THAN NO. 200 (0.074 mm)
SILT	0.074 mm TO 0.005 mm
CLAY	LESS THAN 0.005 mm

DESCRIPTIVE TERMINOLOGY FOR PERCENTAGES (ASTM D 2488)

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0 - 5%
FEW	5 - 10%
LITTLE	10 - 25%
SOME	30 - 45%
MOSTLY	50 - 100%

RELATIVE DENSITY / CONSISTENCY ESTIMATE USING STANDARD PENETRATION TEST (SPT) VALUES (FROM TERZAGHI & PECK 1996)

COHESIONLESS SOILS[a]		COHESIVE SOILS[b]		
RELATIVE DENSITY	N_{60} (BLOWS/FOOT)[c]	CONSISTENCY	N_{60} (BLOWS/FOOT)[c]	UNCONFINED COMPRESSIVE STRENGTH (TSF)[d]
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MED DENSE	10 - 30	MEDIUM	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

(a) Soils consisting of gravel, sand and silt, either separately or in combination possessing no characteristics of plasticity, and exhibiting drained behavior.
(b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
(c) Refer to ASTM D 1586-99 for a definition of N.
(d) Undrained shear strength, s_u = 1/2 unconfined compression strength, U_c. Note that Torvane measures s_u and Pocket Penetrometer measures U_c.

CRITERIA FOR DESCRIBING MOISTURE CONDITION (ASTM D 2488)

DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

SAMPLER ABBREVIATIONS

SS	SPT Sampler (2 in. OD, 140 lb hammer)	C	Core (Rock)
SSO	Oversize Spit Spoon (2.5 in. OD, 140 lb typ.)	TW	Thin Wall (Shelby Tube)
HD	Heavy Duty Split Spoon (3 in. OD, 300/340 lb typ.)	MS	Modified Shelby
BD	Bulk Drive (4 in. OD, 300/340 lb hammer typ.)	GP	Geoprobe
CA	Continuous Core (Soil in Hollow-Stem Auger)	AR	Air Rotary Cuttings
G	Grab Sample from surface / testpit	AG	Auger Cuttings

LABORATORY TEST ABBREVIATIONS

Consol	Consolidation	PM	Modified Proctor	TXCD	Consolidated Drained Triaxial
Dd	Dry Density	PP	Pocket Penetrometer	TXCU	Consolidated Undrained Triaxial
MA	Sieve and Hydrometer Analysis	MC	Moisture Content	TXUU	Unconsolidated Undrained Triaxial
NP	Non-plastic	SA	Sieve Analysis	LL	Liquid Limit
OLI	Organic Loss	SpG	Specific Gravity	PL	Plastic Limit
P200	Percent Fines (Silt & Clay)	TS	Thaw Consolidation	VS	Vane Shear
PID	Photoionization Detector	TV	Torvane	Ω	Soil Resistivity

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ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
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SOIL CLASSIFICATION / LEGEND

FIGURE A-1

FILE NAME: M:\Engineering_References\Tech_Geotechnical\Alaska Geotechnical Reports\Geotech.dwg

FROZEN SOIL CLASSIFICATION (ASTM D 4083)

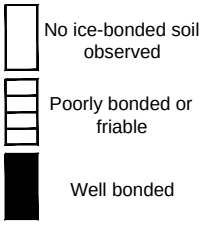
1. DESCRIBE SOIL INDEPENDENT OF FROZEN STATE	CLASSIFY SOIL BY THE UNIFIED SOIL CLASSIFICATION SYSTEM				
	MAJOR GROUP		SUBGROUP		
	DESCRIPTION	DESIGNATION	DESCRIPTION		DESIGNATION
2. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF FROZEN SOIL	Segregated ice not visible by eye	N	Poorly bonded of friable		N_f
			Well bonded	No excess ice	Nbn
				Excess ice	Nbe
	Segregated ice visible by eye (ice less than 25 mm thick)	V	Individual ice crystals or inclusions		V_x
			Ice coatings on particles		V_c
			Random or irregularly oriented ice formations		V_r
			Stratified or distinctly oriented ice formations		V_s
			Uniformly distributed ice		V_u
3. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF SUBSTANTIAL ICE STRATA	Ice greater than 25 mm thick	ICE	Ice with soil inclusions		ICE+soil type
			Ice without soil inclusions		ICE

FROST DESIGN SOIL CLASSIFICATION[1]

FROST GROUP[2]	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS[3]	(a) Gravels Crushed stone Crushed rock	0 - 1.5	GW, GP
	(b) Sands	0 - 3	SW, SP
PFS[4] [MOA NFS]	(a) Gravels Crushed stone Crushed rock	1.5 - 3	GW, GP
[MOA F2]	(b) Sands	3 - 10	SW, SP
S1 [MOA F1]	Gravelly soils	3 - 6	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
S1 [MOA F2]	Sandy soils	3 - 6	SW, SP, SW-SM, SP-SM, SW-SC, SP-SC
F1[5]	Gravelly soils	6 - 10	GM, GC, GM-GC, GW-GM, GP-GM, GW-GC, GP-GC
F2[5]	(a) Gravelly soils	10 - 20	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
	(b) Sands	6 - 15	SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3[5]	(a) Gravelly soils	10 -20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	6 - 15	SM, SC, SM-SC
	(c) Clays, PI>12	--	CL, CH
F4[5]	(a) Silts	--	ML, MH, ML-CL
	(b) Very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI<12	--	CL, ML-CL
	(d) Varved clays or other fine-grained banded sediments	--	CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

(1) From the U.S. Army Corps of Engineers (USACE), EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions", April 1984
(2) USACE frost groups directly correspond to frost groups in Municipality of Anchorage (MOA) Design Criteria Manual (DCM).
(3) Non-frost susceptible
(4) Possibly frost susceptible, requires lab test for void ratio to determine frost design classification.
(5) Consistent with MOA Definition.

ICE BONDING SYMBOLS



DEFINITIONS

Candled Ice is ice which has rotted or otherwise formed into long columnar crystals, very loosely bonded together.

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

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

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Granular Ice is composed of coarse, more or less equidimensional, ice crystals weakly bonded together.

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.

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.

Massive Ice is a large mass of ice, typically nearly pure and relatively homogeneous.

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.

Porous Ice contains numerous void, 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.

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.

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.

CRW ENGINEERING GROUP, LLC
3940 ARCTIC BLVD. SUITE 300
ANCHORAGE, ALASKA 99503
PHONE: (907) 562-3252
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FROZEN SOIL CLASSIFICATION / LEGEND

FIGURE A-2

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Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-01

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/30/18 **COMPLETED** 10/30/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 2.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 4.00 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				1.3	MA		
	SM		SILTY SAND WITH GRAVEL, (SM) 25% gravel, 57% sand, 18% fines, brown, moist, Fill, Frost Class = MOA F2 (9.3% finer than 0.02mm)	HD 2	63	14-5-3-2 (8)			1.5			Piezometer
5	CL		LEAN CLAY WITH GRAVEL, (CL) brown, moist	HD 3	83	2-4-5-7 (9)	4.5		1.2	AL		1-in. sch. 40. PVC
	CL		GRAVELLY LEAN CLAY WITH SAND, (CL) 27% gravel, 19% sand, 54% fines, brown, moist	HD 4	83	2-5-5-6 (10)	2.5		2.2	LMA		
10	CL		LEAN CLAY WITH SAND, (CL) moist, brown to gray, sand content increased with depth	HD 5	75	2-6-9-8 (15)	3.5		1.2			1-in. sch. 40. PVC slotted
15			Brown sand seams	HD 6	75	5-4-5-7 (9)	3.6		2.6			
			Bottom of borehole at 17.0 feet.									

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3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-02

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/30/18 **COMPLETED** 10/30/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 7.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 0.20 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				2.5			
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, Fill	HD 2	75	10-8-6-6 (14)			2.1			Piezometer
5	GP		POORLY GRADED GRAVEL WITH SAND, (GP) brown, moist	HD 3	71	2-3-3-3 (6)			3			1-in. sch. 40. PVC
	GM		SILTY GRAVEL WITH SAND, (GM) 62% gravel, 18% sand, 20% fines, brown, moist to wet	HD 4	58	3-3-1-1 (4)			1.6	LMA		
10	SP-SC		POORLY GRADED SAND WITH CLAY AND GRAVEL, (SP-SC) gray, moist to wet	HD 5	75	1-2-3-3 (5)			1.2			1-in. sch. 40. PVC slotted
15	CL		LEAN CLAY WITH SAND, (CL) gray, moist	HD 6	75	1-1-4-4 (5)	2.5		2.5	AL		

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-03

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/2/18 **COMPLETED** 11/2/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 2.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 0.30 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				0	MA		
	GW		WELL GRADED GRAVEL WITH SAND, (GW) 62% gravel, 34% sand, 4% fines, brown, moist, Fill, MOA Frost Class = NFS (1.9% finer than 0.02mm)									
	GW-GC		WELL GRADED GRAVEL WITH CLAY AND SAND, (GW-GC) gray, moist to wet	HD 2	33	7-10-8-6 (18)			3.2			Piezometer
5	SM		SILTY SAND WITH GRAVEL, (SM) grayish brown, moist to wet	HD 3	83	4-5-4-5 (9)			0			1-in. sch. 40. PVC
	ML		SANDY SILT, (ML) 6% gravel, 26% sand, 68% fines, brown, moist to wet, color turned to gray with depth, MOA Frost Class = F4 (12.1% finer than 0.02mm)	HD 4	83	2-3-4-5 (7)	1.5		2.8	MA		
10	ML			HD 5	83	2-3-5-6 (8)	2.8		2.6	AL		1-in. sch. 40. PVC slotted
15	ML		SANDY SILT WITH GRAVEL, (ML) gray, moist	HD 6	67	1-3-4-5 (7)			0			

Bottom of borehole at 17.0 feet.

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3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-04

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/30/18 **COMPLETED** 10/30/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES Encountered water line at 11.5'
AFTER DRILLING ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40
0	AC		ASPHALT CONCRETE, (AC) black								
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, Fill	G 1	100				0.3		○
	SM		SILTY SAND WITH GRAVEL, (SM) brown, moist	HD 2A / HD 2B / HD 2C	71	19-4-4-5 (8)			0.1		▲ ○
5	CL		LEAN CLAY WITH GRAVEL, (CL) brown, moist								
	GM		SILTY GRAVEL WITH SAND, (GM) 57% gravel, 22% sand, 21% fines, brown, moist	HD 3	63	4-4-3-3 (7)			0.5	LMA	▲ ○
	CL		LEAN CLAY WITH GRAVEL, (CL) gray, moist	HD 4	75	3-3-3-3 (6)	3.33		1.5		▲ ○
10				HD 5	100	1-1-2 (3)					▲ ○

Bottom of borehole at 11.5 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-05

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/1/18 **COMPLETED** 11/1/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				1.6	MA	
	SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) 45% gravel, 46% sand, 9% fines, brown, moist, Fill, MOA Frost Class = F2 (5.5% finer than 0.02mm)	HD 2	17	26-9-9-10 (18)			3.2		
5	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, rock in sampler	HD 3	42	9-10-12-10 (22)			2.6		
	GM		SILTY GRAVEL WITH SAND, (GM) 40% gravel, 30% sand, 30% fines, gray, moist	HD 4	71	2-5-5-5 (10)			1.4	LMA	
10				HD 5	75	4-4-4-7 (8)			0.4		
15	ML		SILT WITH GRAVEL, (ML) gray, moist	HD 6	67	3-4-5-6 (9)	4.5		0.9	AL	

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-06

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/1/18 **COMPLETED** 11/1/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 5.00 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 4.70 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				3.8			
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, Fill	HD 2	71	6-6-7-3 (13)			1.4			Piezometer
5	GM		SILTY GRAVEL WITH SAND, (GM) 53% gravel, 22% sand, 25% fines, brown, wet	HD 3	75	2-5-4-7 (9)			1.9	LMA		1-in. sch. 40. PVC
	CL		SANDY LEAN CLAY WITH GRAVEL, (CL) gray, wet	HD 4	79	4-5-6-8 (11)	4.5		0.7			
10	GM		SILTY GRAVEL WITH SAND, (GM) gray, wet	HD 5	83	4-6-10-11 (16)			1.3			1-in. sch. 40. PVC slotted
15				HD 6	92	5-6-6-8 (12)			1			

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-07

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/1/18 **COMPLETED** 11/1/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 5.00 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 1.70 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				8.4	MA	○	
	SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) 42% gravel, 49% sand, 9% fines, brown, moist, Fill, MOA Frost Class = F2 (5.2% finer than 0.02mm)	HD 2	50	5-10-8-8 (18)			17.5		○ ▲	Piezometer
5			SANDY SILT WITH GRAVEL, (ML) brown, moist	HD 3	58	4-3-3-4 (6)			4.9	AL	▲ ⊕	1-in. sch. 40. PVC
	ML		20% gravel, 27% sand, 53% fines, MOA Frost Class = F4 (37.7% finer than 0.02mm)	HD 4	75	1-2-3-5 (5)	2.0		1.1	MA	▲ ○	
10			SANDY SILT, (ML) gray, moist	HD 5	75	4-1-3-4 (4)			0.7		▲ ○	1-in. sch. 40. PVC slotted
	ML											
15				HD 6	75	3-2-5-6 (7)			0.5		▲ ○	

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-08

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/5/18 **COMPLETED** 11/5/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 5.00 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 1.60 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				0.6			
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, Fill	HD 2	75	7-10-7-6 (17)			0.2			Piezometer
5	SM		SILTY SAND WITH GRAVEL, (SM) 26% gravel, 26% sand, 48% fines, gray, wet, MOA Frost Class = F4 (32.2% finer than 0.02mm)	HD 3	75	3-2-4-5 (6)			1.6	MA		1-in. sch. 40. PVC
			SILT, (ML) gray, moist to wet	HD 4	75	2-2-3-3 (5)			0	AL		
10	ML		4% gravel, 8% sand, 88% fines, sand lenses	HD 5	83	2-2-3-4 (5)	2.25		0	LMA		1-in. sch. 40. PVC slotted
15				HD 6	75	2-3-4-4 (7)	2.25		0			

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-09

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/5/18 **COMPLETED** 11/5/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 2.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 2.70 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				1	MA		
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) 49% gravel, 42% sand, 9% fines, brown, moist, Fill, MOA Frost Class = F1 (5.4% finer than 0.02mm)									
	ML		SILT WITH GRAVEL, (ML) gray, moist to wet	HD 2	13	12-12-8-7 (20)			3			Piezometer
5	GM		SILTY GRAVEL WITH SAND, (GM) 46% gravel, 37% sand, 17% fines, brown, wet	HD 3	67	5-5-2-5 (7)			0.7	LMA		1-in. sch. 40. PVC
	SM		SILTY SAND, (SM) gray, wet	HD 4	83	3-6-6-6 (12)			1			
10	ML		SILT, (ML) gray, wet, sand lenses	HD 5	83	2-4-6-6 (10)	4.5		0.8			1-in. sch. 40. PVC slotted
15	ML		SILT WITH GRAVEL, (ML) gray, wet, gravel up to 2"	HD 6	88	2-4-3-10 (7)	<1.0		0	AL		

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-10

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/5/18 **COMPLETED** 11/5/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 7.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 7.30 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				1.3			
	GW-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GW-GM) brown, moist, Fill	HD 2	75	10-11-9-6 (20)			1.5			Piezometer
5	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) 52% gravel, 39% sand, 9% fines, brown, moist, MOA Frost Class = NFS (1.1% finer than 0.02mm)	HD 3	42	3-5-4-5 (9)			1.2	MA		1-in. sch. 40. PVC
	SP		POORLY GRADED SAND WITH GRAVEL, (SP) 17% gravel, 81% sand, 2% fines, brown, moist to wet	HD 4	75	6-8-8-11 (16)			2.2	SA		
10				HD 5	75	7-9-8-8 (17)			1.2			1-in. sch. 40. PVC slotted
15	ML		SANDY SILT, (ML) 0% gravel, 49% sand, 51% fines, gray, moist	HD 6	75	6-8-4-5 (12)			2.6	LMA		

Bottom of borehole at 17.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-11

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/5/18 **COMPLETED** 11/5/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 2.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING 4.70 ft

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40	WELL DIAGRAM
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				0.3	MA		
	SP-SM		POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) 36% gravel, 53% sand, 11% fines, brown, moist to wet, Fill, MOA Frost Class = F2 (7.7% finer than 0.02mm)	HD 2	83	8-14-10-13 (24)			0.5			Piezometer
5	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, wet	HD 3	83	7-4-3-5 (7)			0.3			1-in. sch. 40. PVC
			SILTY SAND, (SM) brownish gray, wet	HD 4	67	0-2-2-4 (4)			0.2			
10	SM		2% gravel, 85% sand, 13% fines	HD 5	67	4-4-3-4 (7)			0	SA		1-in. sch. 40. PVC slotted
15			8% gravel, 60% sand, 32% fines	HD 6	67	12-16-17-19 (33)			0.1	LMA		
			Bottom of borehole at 17.0 feet.									

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-12

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/2/18 **COMPLETED** 11/2/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES No samples retained due to contamination.
AFTER DRILLING ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40
0	AC		ASPHALT CONCRETE, (AC) black								PL MC LL 10 20 30 40
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, Fill	G 1	100				110		
	GM		SILTY GRAVEL, (GM) gray, moist	HD 2A							
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) blackish gray, moist	HD 2B	75	5-7-7-5 (14)			12		▲
5											

Bottom of borehole at 5.0 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-13

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 11/1/18 **COMPLETED** 11/1/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING ---
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES No samples retained due to contamination.
AFTER DRILLING ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40
0	AC		ASPHALT CONCRETE, (AC) black	G 1					210		PL MC LL 10 20 30 40
	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, Fill								

Bottom of borehole at 2.5 feet.

CRW Engineering Group, LLC
3940 Arctic Blvd Ste 300
Anchorage, AK 99503
Telephone: (907) 562-3252
Fax: (907) 561-2273

BOREHOLE BH-14

CLIENT Municipality of Anchorage
PROJECT NAME 48th Avenue and Cordova Street
PROJECT NUMBER 10143.00
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/30/18 **COMPLETED** 10/30/18
GROUND ELEVATION
DRILLING CONTRACTOR Discovery Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow-Stem Auger
AT TIME OF DRILLING 2.50 ft
LOGGED BY DMB **CHECKED BY** SMH
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	ICE BOND	PID (ppm)	OTHER TESTS	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40
0	AC		ASPHALT CONCRETE, (AC) black	G 1	100				0.3	MA	
	GW-GM		WELL GRADED GRAVEL WITH SILT AND SAND, (GW-GM) 48% gravel, 42% sand, 10% fines, brown, moist, Fill, MOA Frost Class = F1 (5.0% finer than 0.02mm)								
	SM		SILTY SAND, (SM) brown, wet	HD 2	50	13-5-5-4 (10)			1		
5	CL		LEAN CLAY, (CL) brown, wet	HD 3	50	3-3-6-4 (9)	2.1		7.7	AL	
	CL		SANDY LEAN CLAY, (CL) gray, wet	HD 4	50	2-2-4-4 (6)	1.5		0.6		
10	SP		POORLY GRADED SAND, (SP) gray, wet	HD 5	50	4-6-8-9 (14)			3.5		
15	CL		GRAVELLY LEAN CLAY, (CL) 40% gravel, 9% sand, 51% fines, blueish gray, wet	HD 6	75	3-5-7-7 (12)	3.1		1.3	LMA	

Bottom of borehole at 17.0 feet.

Appendix B

Laboratory Results

Included in this section:

1) Laboratory Results from Alaska TestLab

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client: CRW
W.O. #: 350
Project: 48th and Cordova
Lab #: 867
Location: BH-01 to BH-14

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Test Performed
Moisture Content, ASTM D2216

Sample ID	Results (%)	Sample ID	Results (%)
BH-01 Sample 1	23	BH-06 Sample 2	5
BH-01 Sample 2	36	BH-06 Sample 3	13
BH-01 Sample 3	16	BH-06 Sample 4	13
BH-01 Sample 4	16	BH-06 Sample 5	16
BH-01 Sample 5	24	BH-06 Sample 6	13
BH-01 Sample 6	24	BH-07 Sample 1	4
BH-02 Sample 1	7	BH-07 Sample 2	6
BH-02 Sample 2	9	BH-07 Sample 3	26
BH-02 Sample 3	19	BH-07 Sample 4	27
BH-02 Sample 4	8	BH-07 Sample 5	26
BH-02 Sample 5	27	BH-07 Sample 6	22
BH-02 Sample 6	17	BH-08 Sample 1	3
BH-03 Sample 1	5	BH-08 Sample 2	7
BH-03 Sample 2	18	BH-08 Sample 3	26
BH-03 Sample 3	8	BH-08 Sample 4	27
BH-03 Sample 4	27	BH-08 Sample 5	21
BH-03 Sample 5	18	BH-08 Sample 6	28
BH-03 Sample 6	14	BH-09 Sample 1	2
BH-04 Sample 1	4	BH-09 Sample 2	21
BH-04 Sample 2	16	BH-09 Sample 3	23
BH-04 Sample 3	14	BH-09 Sample 4	12
BH-04 Sample 4	19	BH-09 Sample 5	20
BH-04 Sample 5	12	BH-09 Sample 6	25
BH-05 Sample 1	4	BH-10 Sample 1	3
BH-05 Sample 2	3	BH-10 Sample 2	12
BH-05 Sample 3	7	BH-10 Sample 3	4
BH-05 Sample 4	12	BH-10 Sample 4	22
BH-05 Sample 5	14	BH-10 Sample 5	22
BH-05 Sample 6	24	BH-10 Sample 6	23
BH-06 Sample 1	3	BH-11 Sample 1	3

Test Performed
Moisture Content, ASTM D2216

Sample ID	Results (%)	Sample ID	Results (%)
BH-11 Sample 2	3	BH-14 Sample 2	20
BH-11 Sample 3	12	BH-14 Sample 3	21
BH-11 Sample 4	18	BH-14 Sample 4	24
BH-11 Sample 5	19	BH-14 Sample 5	19
BH-11 Sample 6	22	BH-14 Sample 6	21
BH-14 Sample 1	4		

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	867
Location	BH-01 Sample 3		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
867	Plasticity Index	ASTM D4318	Liquid Limit	27	CL
			Plastic Limit	19	
			Plasticity Index	12	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	873
Location	BH-03 Sample 5		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
873	Plasticity Index	ASTM D4318	Liquid Limit	30	ML
			Plastic Limit	23	
			Plasticity Index	7	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	877
Location	BH-5 Sample 6		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
877	Plasticity Index	ASTM D4318	Liquid Limit	34	ML
			Plastic Limit	26	
			Plasticity Index	8	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	880
Location	BH-07 Sample 3		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
880	Plasticity Index	ASTM D4318	Liquid Limit	33	ML
			Plastic Limit	26	
			Plasticity Index	7	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	883
Location	BH-08 Sample 4		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
883	Plasticity Index	ASTM D4318	Liquid Limit	30	ML
			Plastic Limit	24	
			Plasticity Index	6	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	887
Location	BH-09 Sample 6		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
887	Plasticity Index	ASTM D4318	Liquid Limit	35	ML
			Plastic Limit	28	
			Plasticity Index	7	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	895
Location	BH-14 Sample 3		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
895	Plasticity Index	ASTM D4318	Liquid Limit	32	CL
			Plastic Limit	19	
			Plasticity Index	13	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

Date Sample Recv'd: 11/14/2018

Client	CRW Engineering	W.O. #	350
Project	48th and Cordova	Lab #	870
Location	BH-02 Sample 6		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Sample ID	Test Performed	Test Method	Results		
870	Plasticity Index	ASTM D4318	Liquid Limit	29	CL
			Plastic Limit	21	
			Plasticity Index	8	

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Testing Report Summary

		Date Sample Recv'd	11/14/2018
Client	CRW	W.O. #	350
Project	48th and Cordova	Lab #	868 to 896
Location	BH-01 to BH-14		

All results will be posted to the website for your access and convenience. Samples will be kept for 30 days before being disposed. Please contact us if you would like the remaining material returned.

Test Performed
Limited Mechanical Analysis

Sample ID	Results (%) Gravel	Sand	Silt
BH-01 S4 (ATL#868)	27	19	54
BH-02 S4 (ATL#869)	62	18	20
BH-04 S3 (ATL#874)	57	22	21
BH-05 S4(ATL#876)	40	30	30
BH-06 S3(ATL#878)	53	22	25
BH-08 S5(ATL#884)	4	8	88
BH-09 S3(ATL#886)	46	37	17
BH-10 S6(ATL#890)	0	49	51
BH-11 S6(ATL#893)	8	60	32
BH-14 S6(ATL#896)	40	9	51

If you have questions regarding this summary report or the test procedures, please contact us.

Oscar
Oscar Lage
Laboratory Supervisor

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

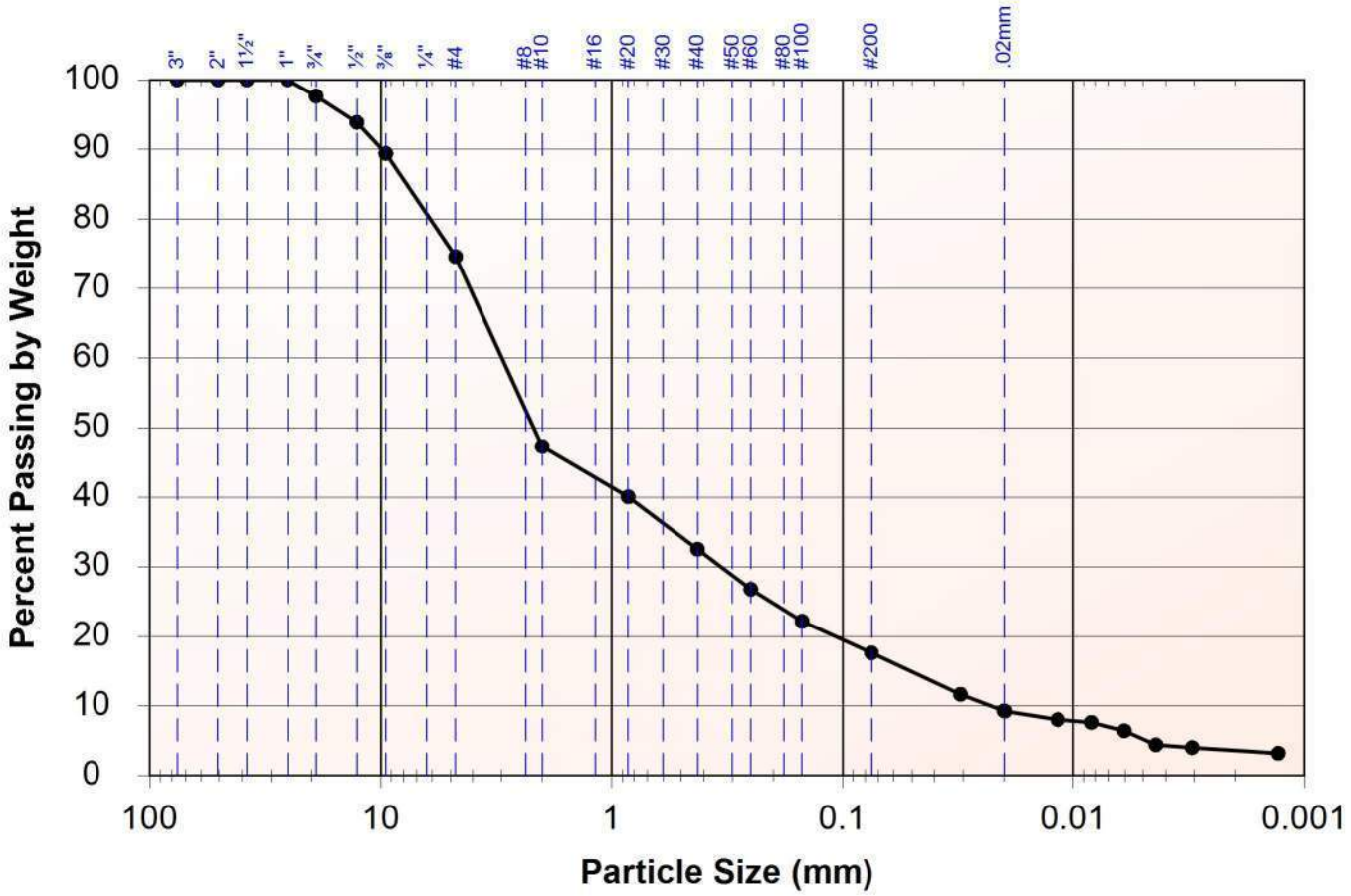
ASTM D422

Location: BH-01 Sample 1

Lab Number	2018-866
Received	11/29/2018
Reported	11/29/2018

Engineering Classification: **Silty Sand with Gravel, SM**

Frost Classification: **F2**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	98%	
½"	94%	
⅜"	89%	
#4	75%	
#10	47%	
Total Weight of Sample 2072.9g		
#20	40%	
#40	33%	
#60	27%	
#100	22%	
#200	17.6%	
Total Weight of Fine Fraction 498.4g		
0.02 mm	9.3%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

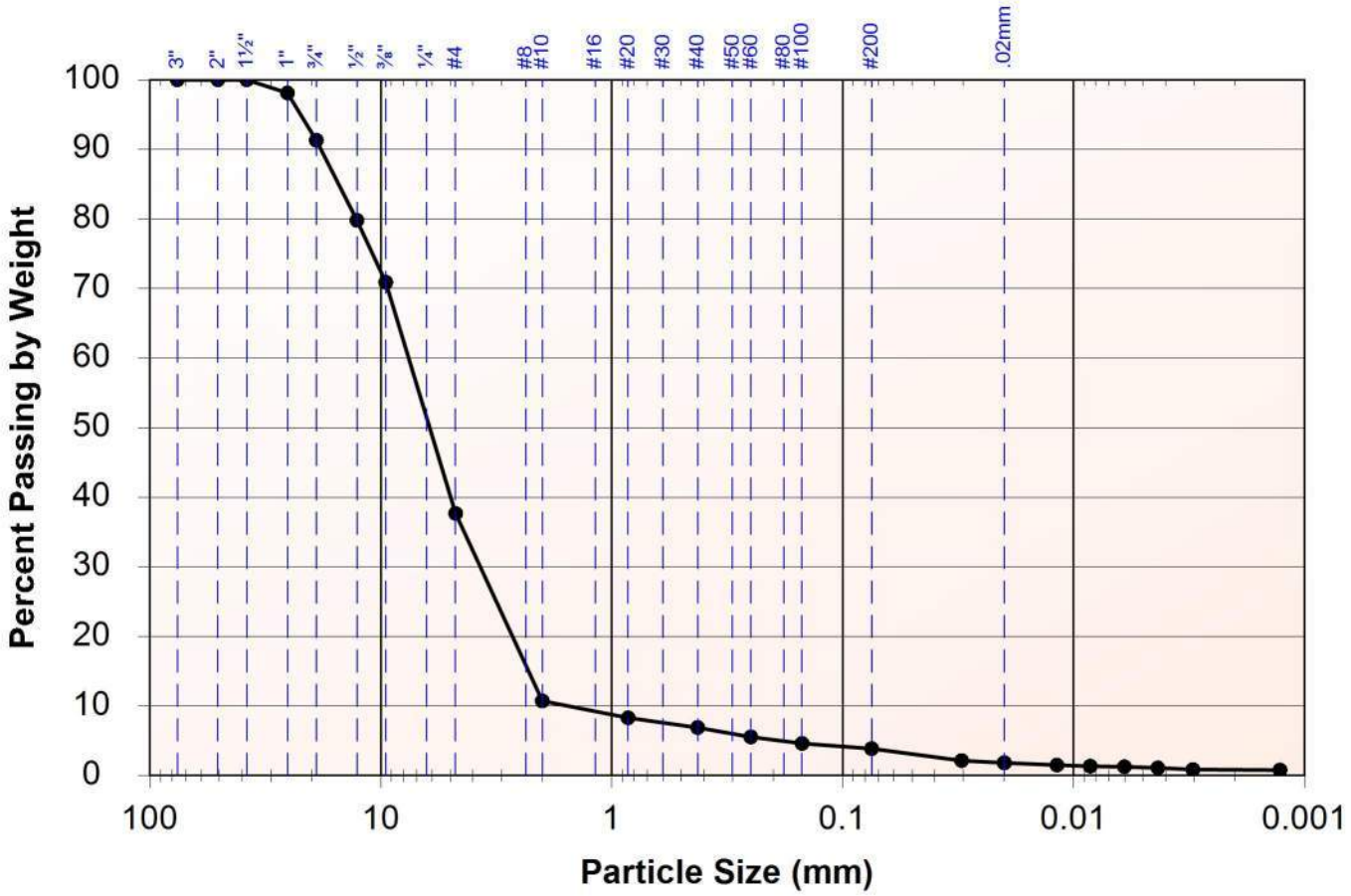
ASTM D422

Location: BH-03 Sample 1

Lab Number	2018-871
Received	12/3/2018
Reported	12/3/2018

Engineering Classification: **Well Graded Gravel with Sand, GW**

Frost Classification: **NFS**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	98%	
¾"	91%	
½"	80%	
⅜"	71%	
#4	38%	
#10	11%	
Total Weight of Sample 1904.2g		
#20	8%	
#40	7%	
#60	6%	
#100	5%	
#200	3.9%	
Total Weight of Fine Fraction 204.5g		
0.02 mm	1.9%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

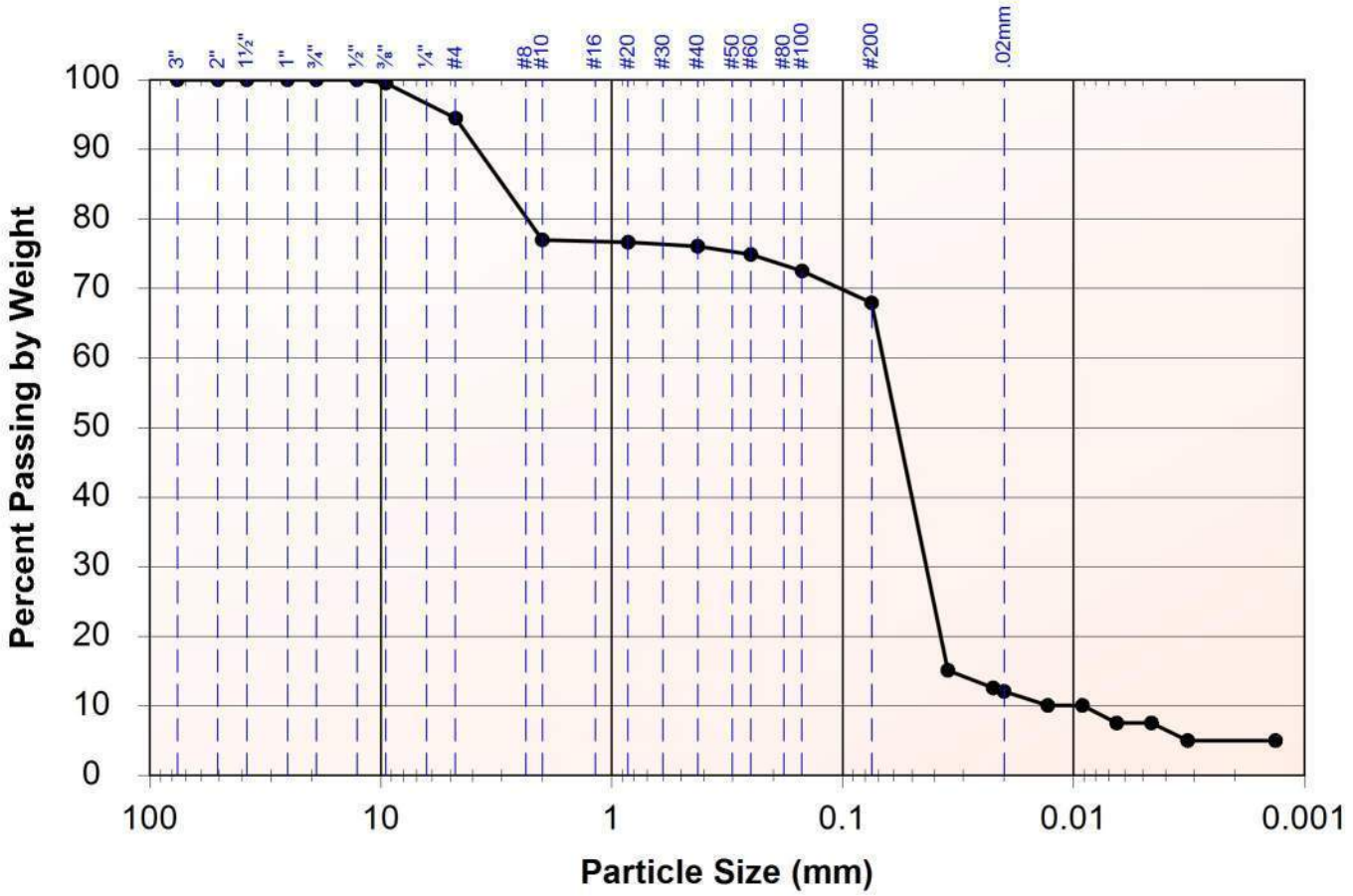
ASTM D422

Location: BH 03 Sample 4

Lab Number	2018-872
Received	11/29/2018
Reported	11/29/2018

Engineering Classification: **Sandy Silt, ML**

Frost Classification: **F4**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	100%	
½"	100%	
⅜"	100%	
#4	94%	
#10	77%	
Total Weight of Sample 391.6g		
#20	77%	
#40	76%	
#60	75%	
#100	73%	
#200	68.0%	
Total Weight of Fine Fraction 301.5g		
0.02 mm	12.1%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

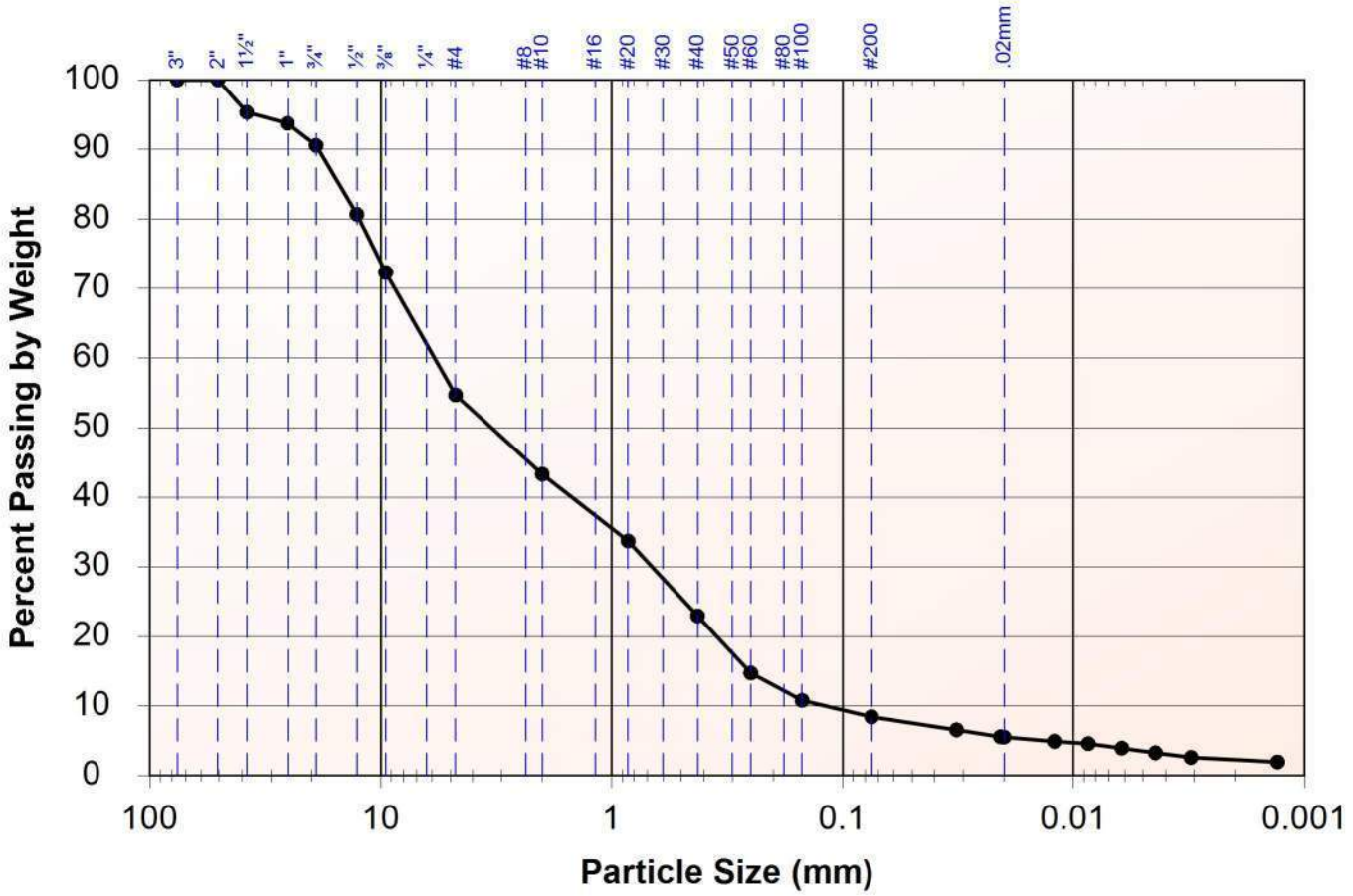
ASTM D422

Location: BH-05 Sample 1

Lab Number	2018-875
Received	11/29/2018
Reported	11/29/2018

Engineering Classification: **Poorly Graded Sand with Silt and Gravel, SP-SM**

Frost Classification: **S2**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	95%	
1"	94%	
¾"	91%	
½"	81%	
⅜"	72%	
#4	55%	
#10	43%	
Total Weight of Sample 2826.7g		
#20	34%	
#40	23%	
#60	15%	
#100	11%	
#200	8.5%	
Total Weight of Fine Fraction 547.9g		
0.02 mm	5.5%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

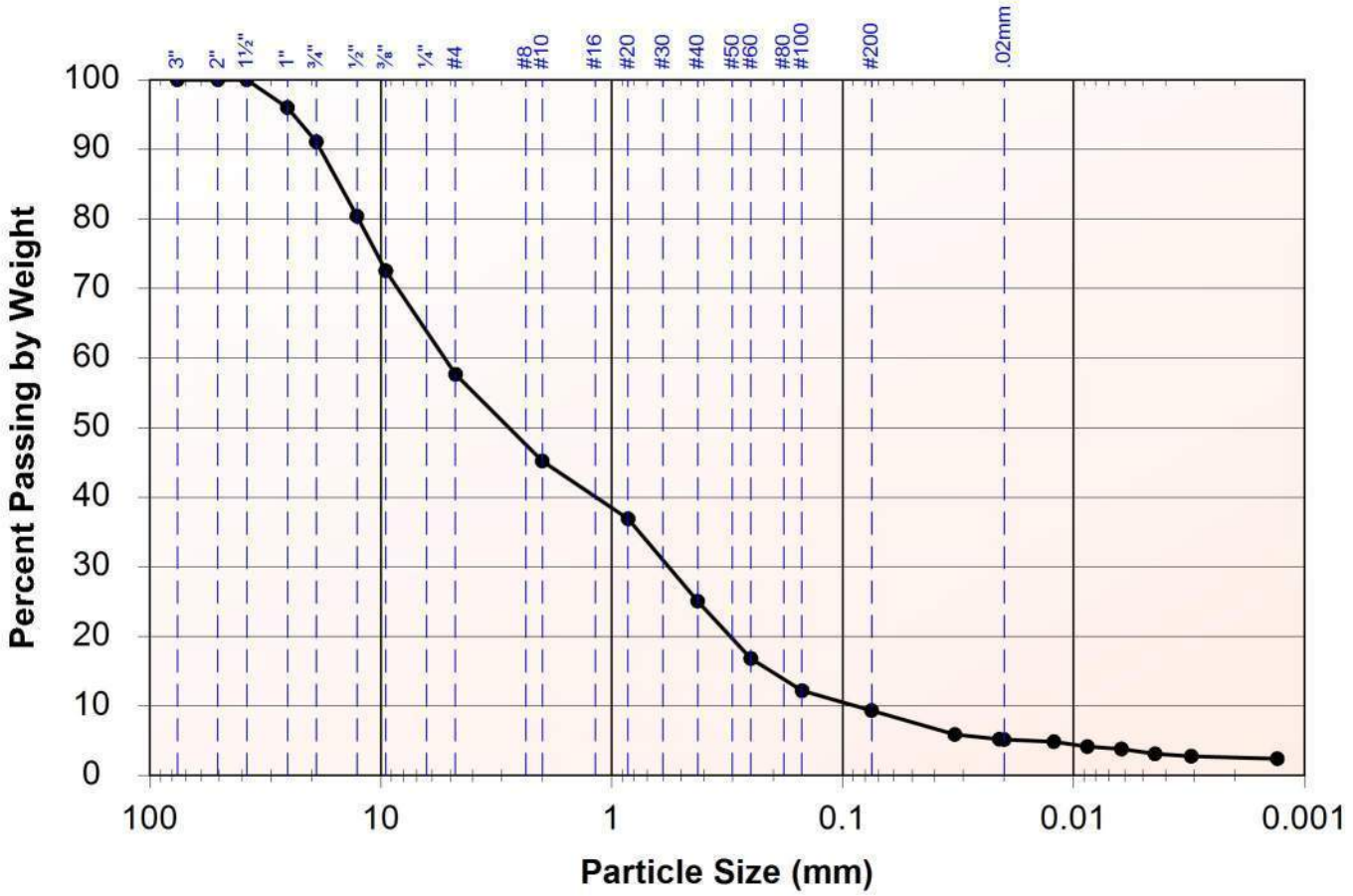
ASTM D422

Location: BH-07 Sample 1

Lab Number	2018-879
Received	11/29/2018
Reported	11/29/2018

Engineering Classification: **Poorly Graded Sand with Silt and Gravel, SP-SM**

Frost Classification: **S2**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	96%	
¾"	91%	
½"	80%	
⅜"	73%	
#4	58%	
#10	45%	
Total Weight of Sample 3629.9g		
#20	37%	
#40	25%	
#60	17%	
#100	12%	
#200	9.4%	
Total Weight of Fine Fraction 452.3g		
0.02 mm	5.2%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

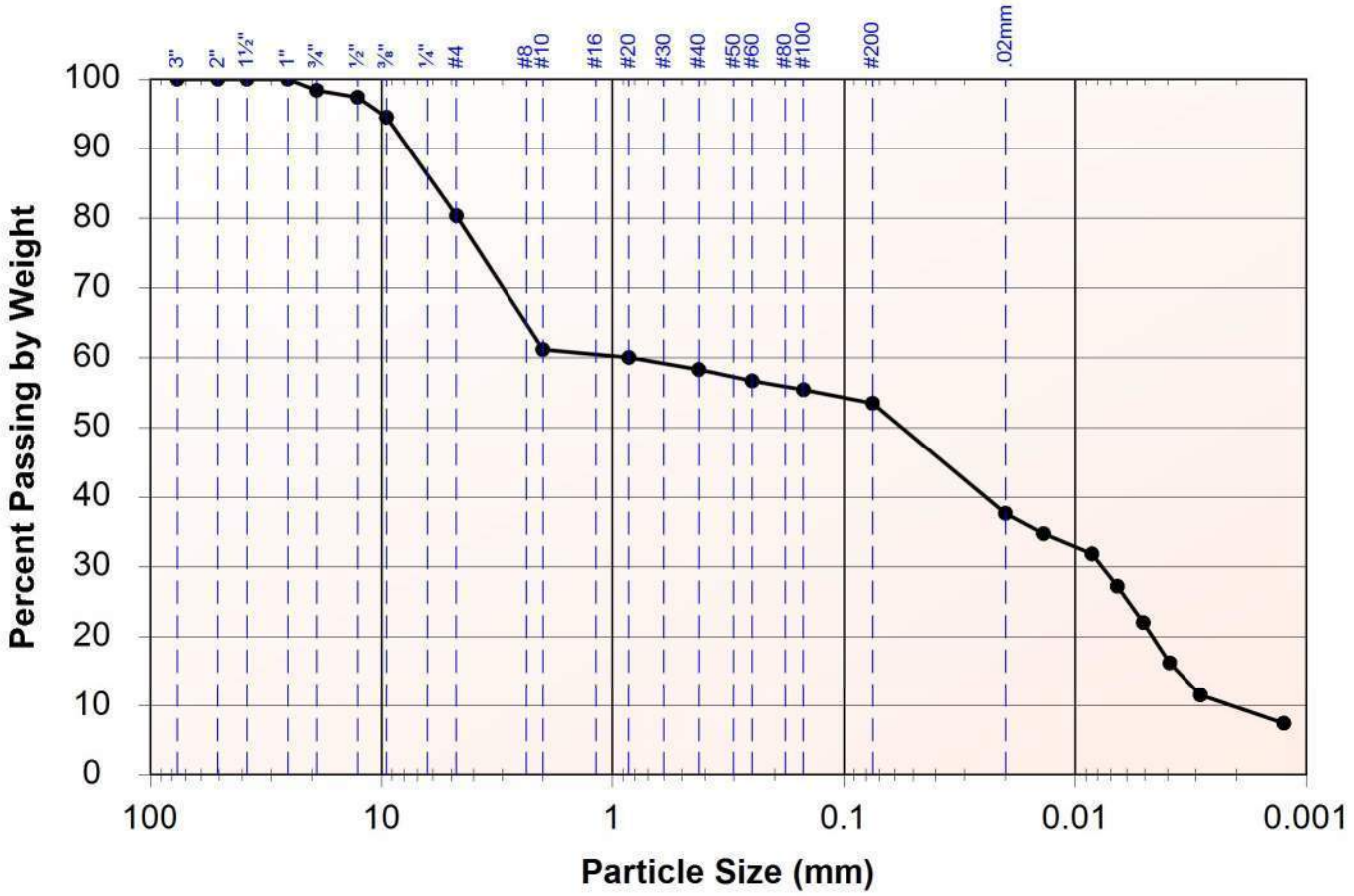
ASTM D422

Location: BH-07 Sample 4

Lab Number	2018-881
Received	11/29/2018
Reported	12/4/2018

Engineering Classification: **Sandy Silt with Gravel, ML**

Frost Classification: **F4**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	98%	
½"	97%	
⅜"	95%	
#4	80%	
#10	61%	
Total Weight of Sample 2622.3g		
#20	60%	
#40	58%	
#60	57%	
#100	55%	
#200	53.5%	
Total Weight of Fine Fraction 566.4g		
0.02 mm	37.7%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

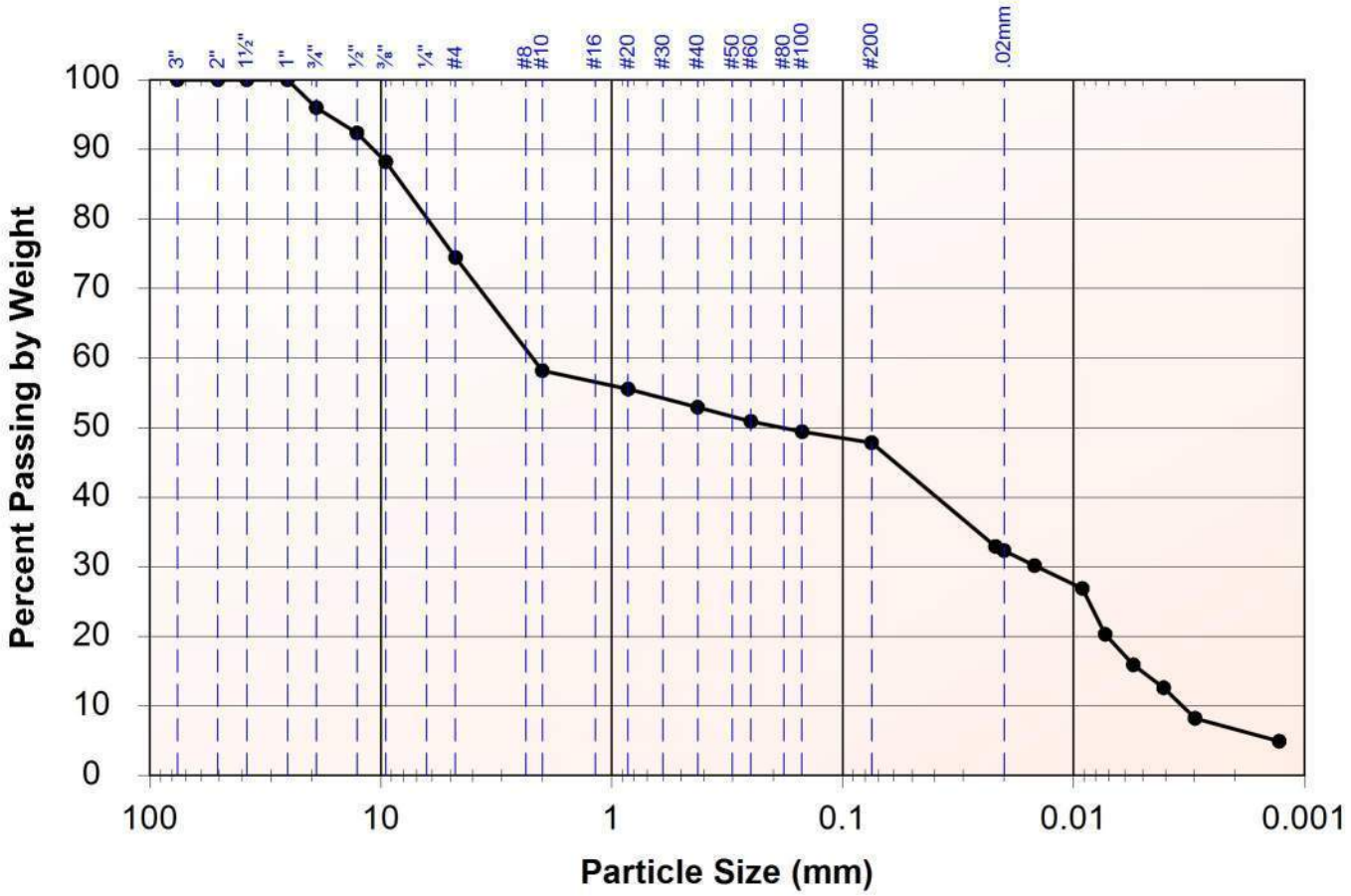
ASTM D422

Location: BH-08 Sample 3

Lab Number	2018-882
Received	11/29/2018
Reported	11/29/2018

Engineering Classification: **Silty Sand with Gravel, SM**

Frost Classification: **F4**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	96%	
½"	92%	
⅜"	88%	
#4	74%	
#10	58%	
Total Weight of Sample 1682.1g		
#20	56%	
#40	53%	
#60	51%	
#100	49%	
#200	47.9%	
Total Weight of Fine Fraction 471.1g		
0.02 mm	32.3%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

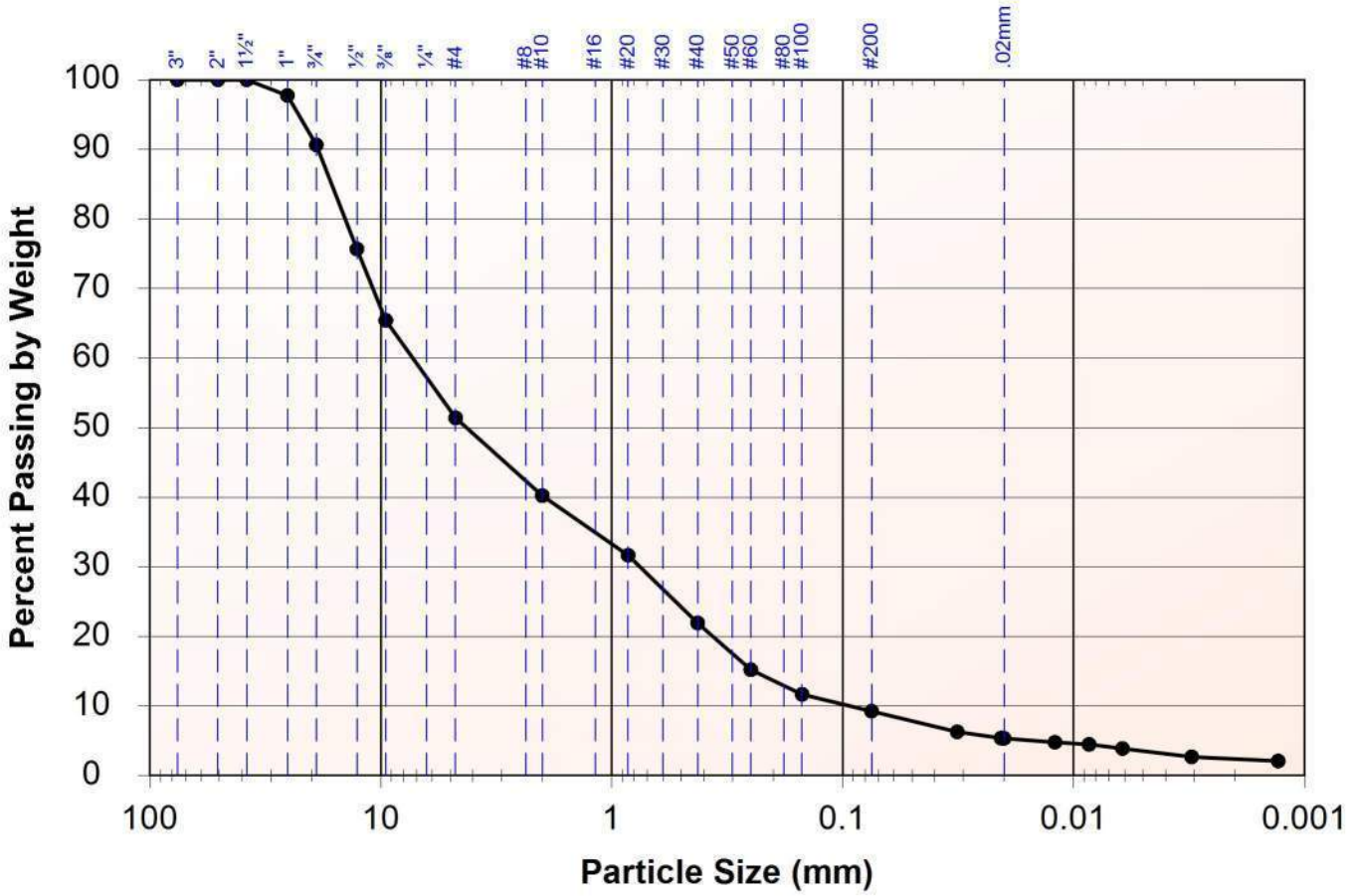
ASTM D422

Location: BH-09 Sample 1

Lab Number	2018-885
Received	11/30/2018
Reported	11/30/2018

Engineering Classification: **Poorly Graded Gravel with Silt and Sand, GP-GM**

Frost Classification: **S1**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	98%	
¾"	91%	
½"	76%	
⅜"	65%	
#4	51%	
#10	40%	
Total Weight of Sample 3686.1g		
#20	32%	
#40	22%	
#60	15%	
#100	12%	
#200	9.3%	
Total Weight of Fine Fraction 501.5g		
0.02 mm	5.4%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

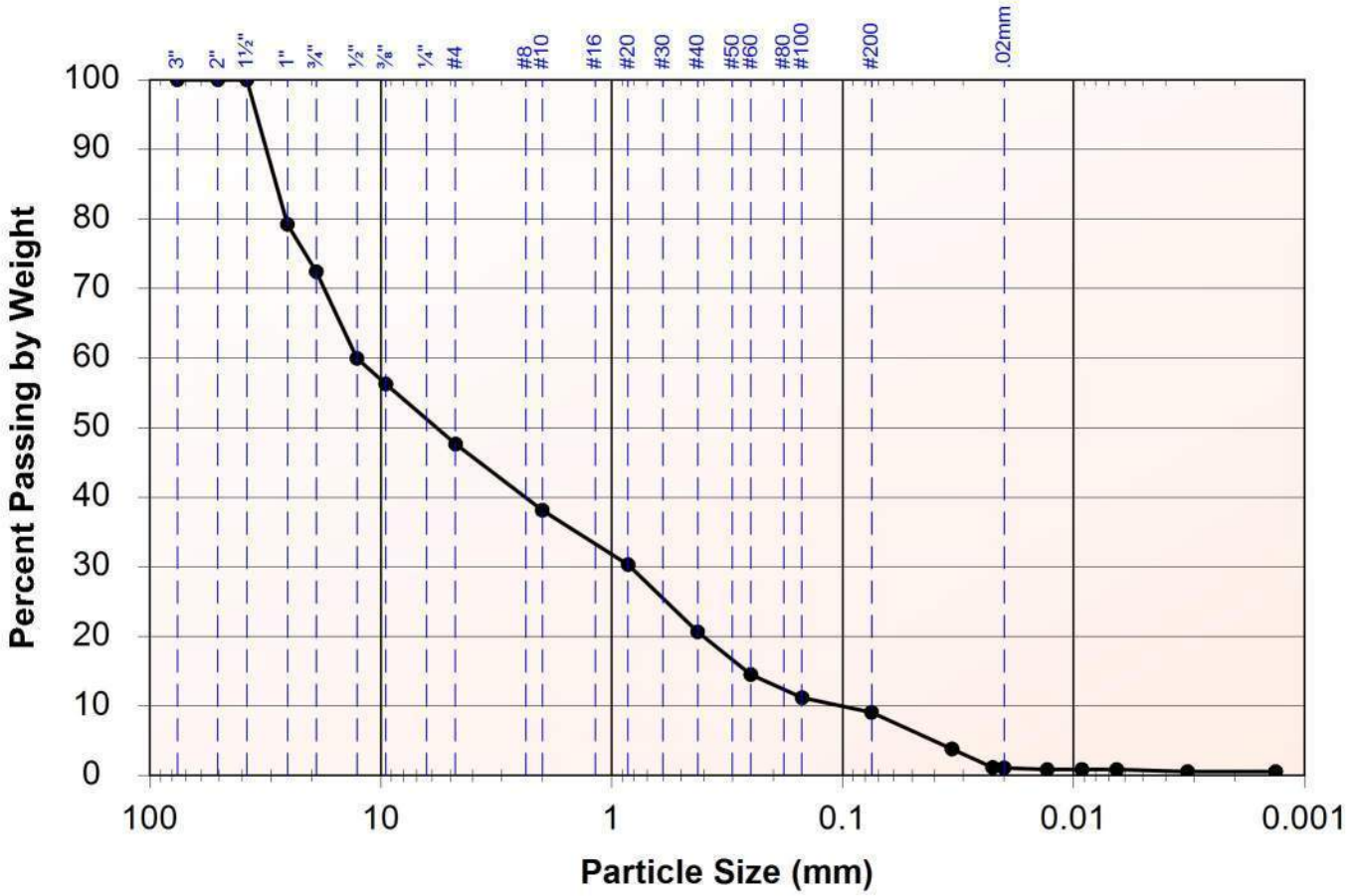
ASTM D422

Location: BH-10 Sample 3

Lab Number	2018-888
Received	11/30/2018
Reported	11/30/2018

Engineering Classification: **Poorly Graded Gravel with Silt and Sand, GP-GM**

Frost Classification: **NFS**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	79%	
¾"	72%	
½"	60%	
⅜"	56%	
#4	48%	
#10	38%	
Total Weight of Sample 954.6g		
#20	30%	
#40	21%	
#60	15%	
#100	11%	
#200	9.1%	
Total Weight of Fine Fraction 364.1g		
0.02 mm	1.1%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

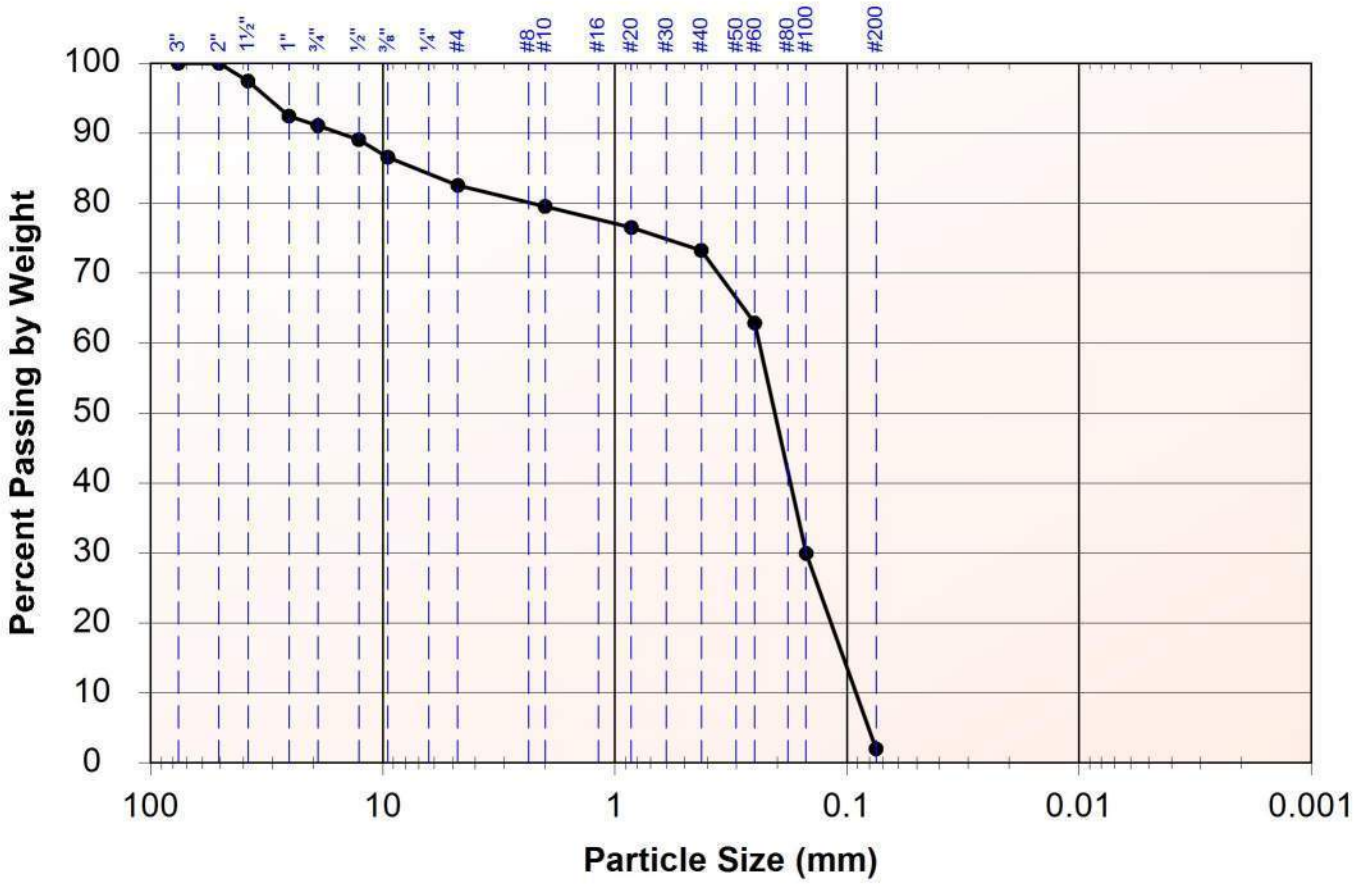
ASTM D422

Location: BH-10 Sample 4

Lab Number	2018-889
Received	12/3/2018
Reported	12/3/2018

Engineering Classification: **Poorly Graded Sand with Gravel, SP**

Frost Classification: **NFS**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	97%	
1"	92%	
¾"	91%	
½"	89%	
⅜"	87%	
#4	83%	
Total Weight of Sample 2397g		
#10	80%	
#20	77%	
#40	73%	
#60	63%	
#100	30%	
#200	2.0%	
Total Weight of Fine Fraction 399.1g		

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

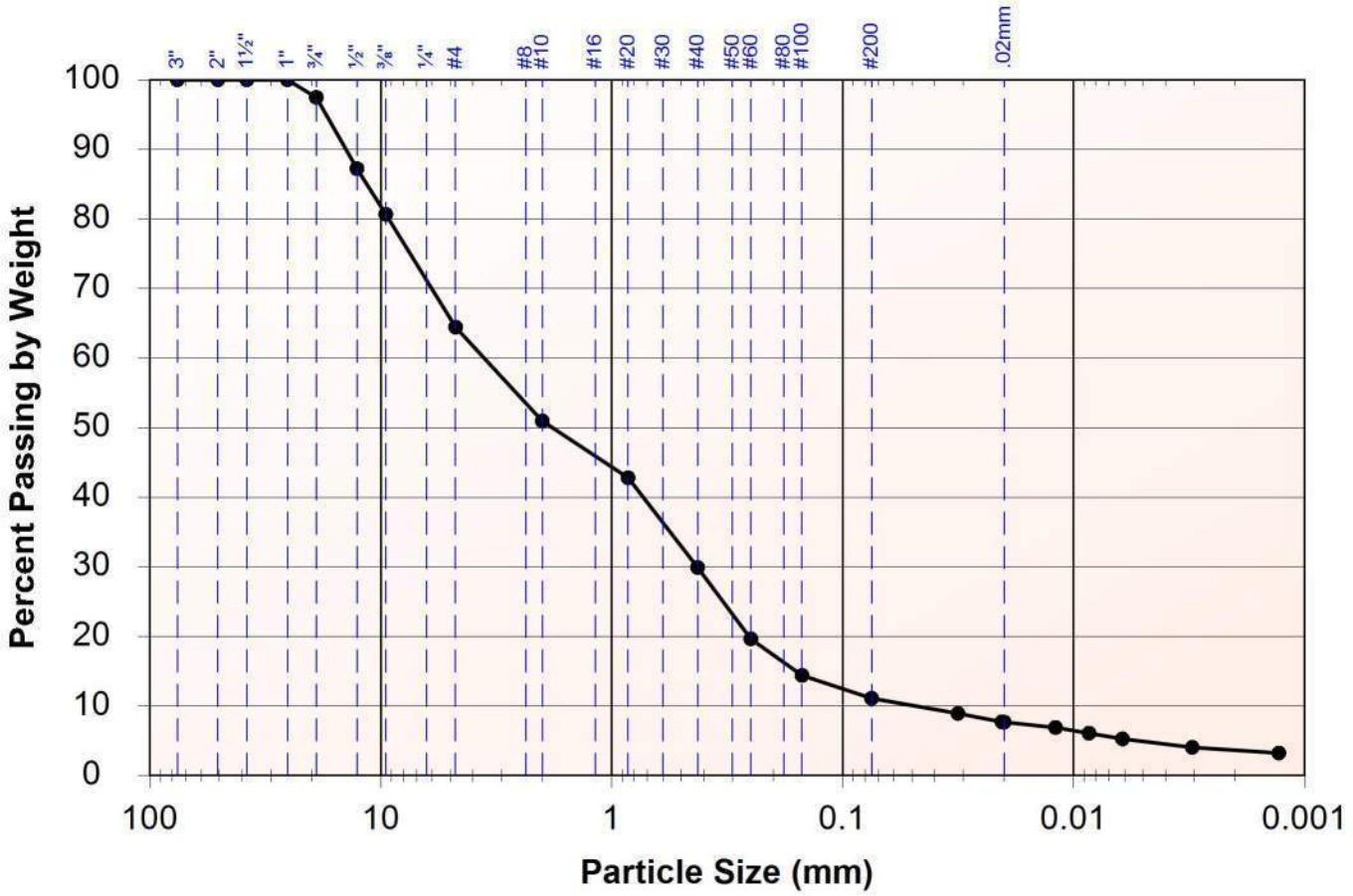
ASTM D422

Location: BH-11 Sample 1

Lab Number	2018-891
Received	11/30/2018
Reported	11/30/2018

Engineering Classification: **Poorly Graded Sand with Silt and Gravel, SP-SM**

Frost Classification: **F2**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	97%	
½"	87%	
⅜"	81%	
#4	64%	
#10	51%	
Total Weight of Sample 2712.8g		
#20	43%	
#40	30%	
#60	20%	
#100	14%	
#200	11.1%	
Total Weight of Fine Fraction 581.8g		
0.02 mm	7.7%	

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

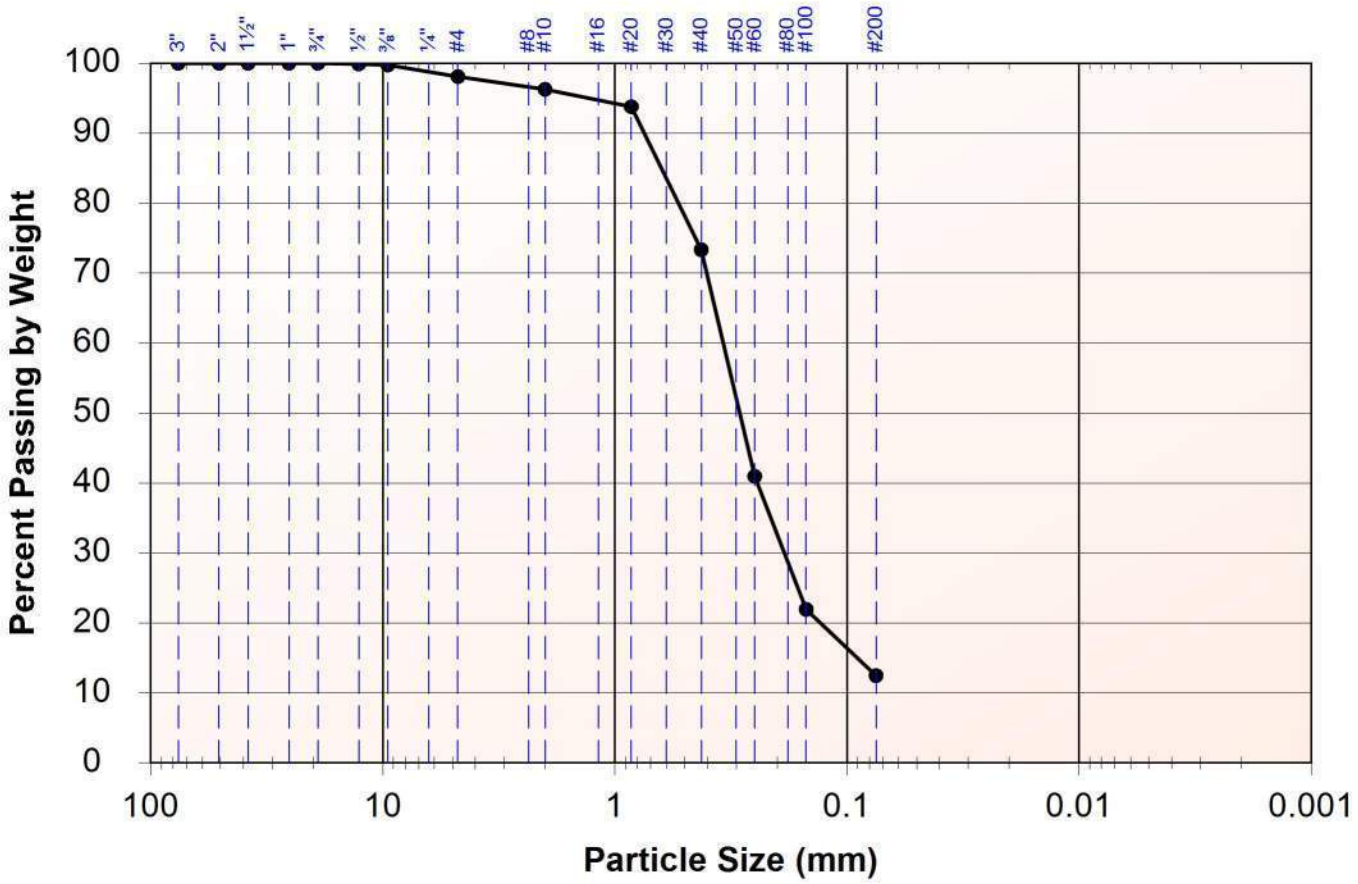
ASTM D422

Location: BH-11 Sample 5

Lab Number	2018-892
Received	11/30/2018
Reported	11/30/2018

Engineering Classification: **Poorly Graded Sand with Silt, SP-SM**

Frost Classification: **Not Measured**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	100%	
¾"	100%	
½"	100%	
⅜"	100%	
#4	98%	
Total Weight of Sample 2439.5g		
#10	96%	
#20	94%	
#40	73%	
#60	41%	
#100	22%	
#200	12.5%	
Total Weight of Fine Fraction 462.4g		

Alaska Testlab

Client: CRW Engineering Group, LLC
Project: 48th and Cordova
Work Order: 350

Particle Size Distribution

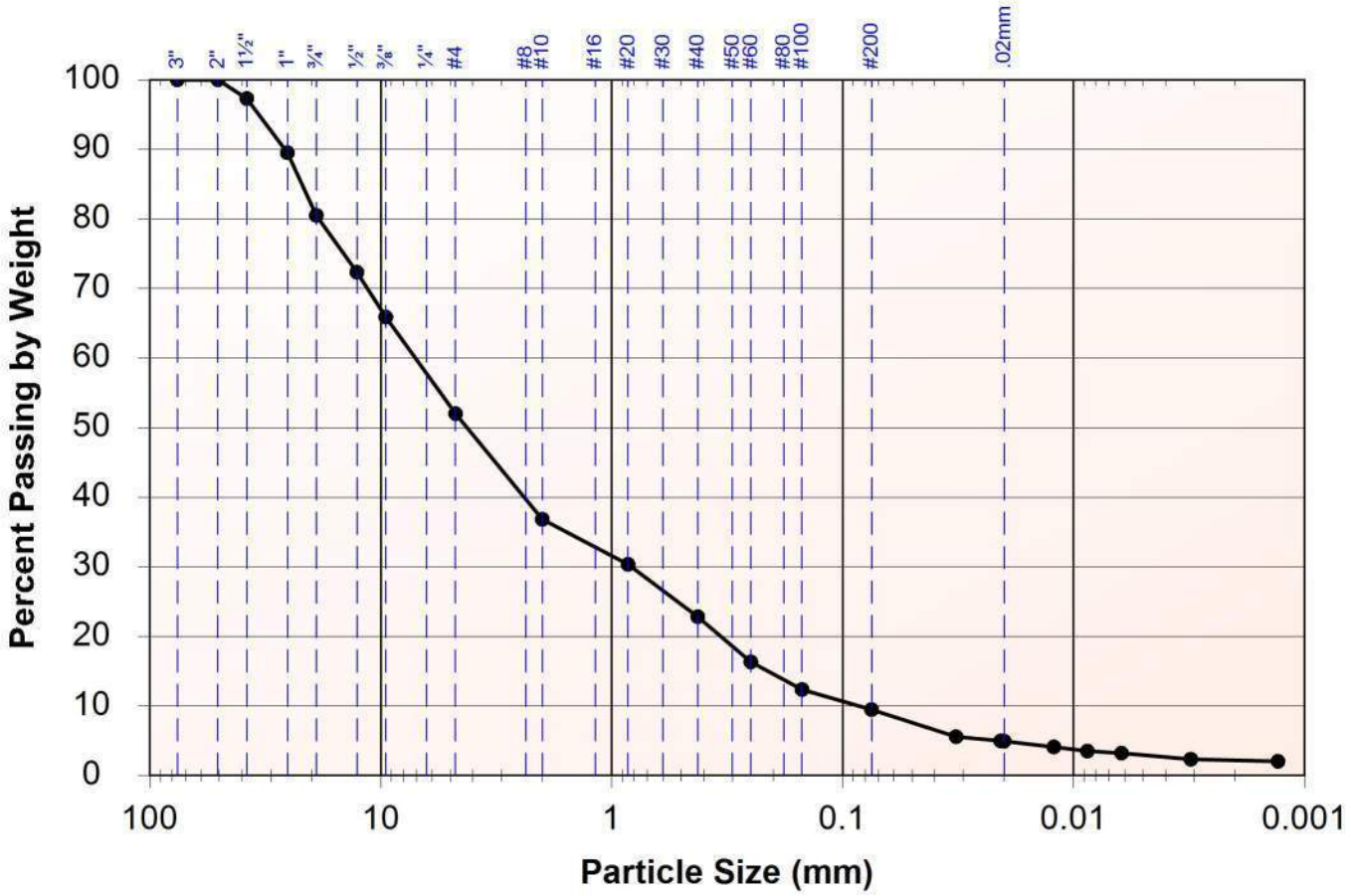
ASTM D422

Location: BH-14 Sample 1

Lab Number	2018-894
Received	11/30/2018
Reported	11/30/2018

Engineering Classification: **Well Graded Gravel with Silt and Sand, GW-GM**

Frost Classification: **S1**



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	97%	
1"	90%	
¾"	81%	
½"	72%	
⅜"	66%	
#4	52%	
#10	37%	
Total Weight of Sample 2959.1g		
#20	30%	
#40	23%	
#60	16%	
#100	12%	
#200	9.5%	
Total Weight of Fine Fraction 526.9g		
0.02 mm	5.0%	

Appendix C

Historic Geotechnical Data

Included in this section:

1) Historic Borehole Logs for Cordova Street
2) Historic Borehole Logs for 48th Avenue

1) Historic Borehole Logs

For

Cordova Street

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. (4)

LOCATION 12Et west of Cordova St. / 300Et South of E E 48th

DATE July 12, 1978

BY BdVes

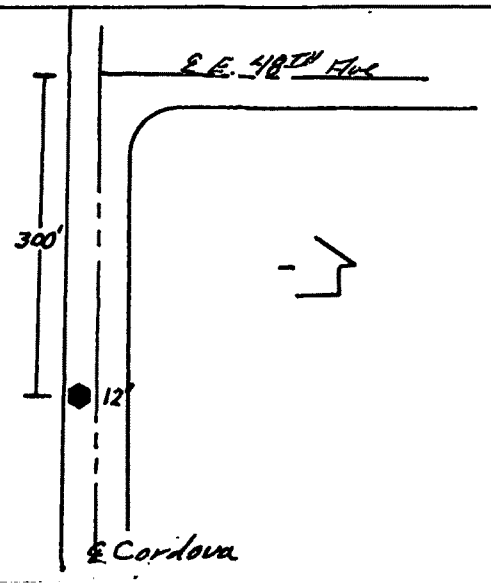
COMMENTS Waterline by AWU; Tam Const. / -12Et of BC.

DEPTH 12Et

WATER TABLE NA

DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
0	GM	F-1	Brown; silty Sandy Gravel, 12-15% silt
1			Low Moisture, High density.
2			Tan; Sandy Silt, 45 to 50% silt
3			Medium Moisture High density
4	ML	F-4	
5			
6			
7			Grey; Sandy silt, 60% silt
8			High Moisture, High density
9	ML	F-4	
10			
11			
12			Limit of excavation 12Et
13			Note: All classification visual.
14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 3 (7)

LOCATION 51ST AVE. & CORDOVA ST / 10' W. & OF CORDOVA ST & OF E-51ST AVE.

DATE 2/28/80

BY M.E. KRUEGER

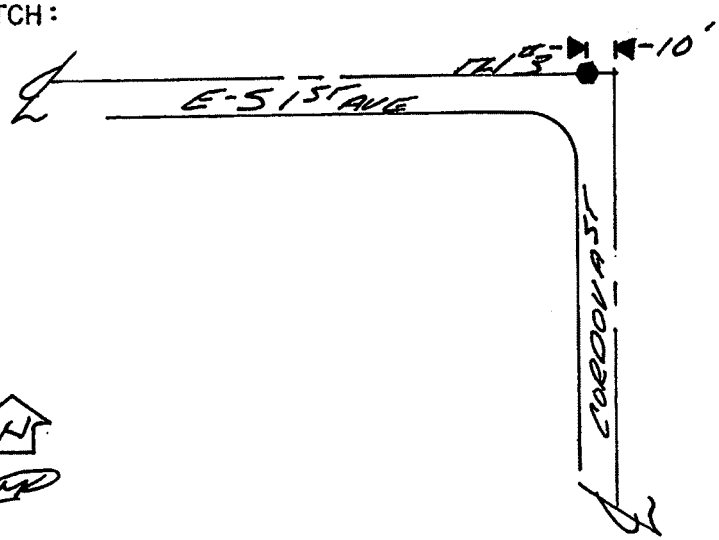
COMMENTS

DEPTH 10'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
EX-239 3-A	0–1	SW-SM	NFS TO F-2	EXIST. GROUND / ROAD SURFACE BRN (41%) SAND (47%) & (9%) SILT / MOIST = 8% / FINE DENSE
EX-240 3-B	2–4	GM	F-1	GR. (15%) SILT (40%) SAND (45%) GRAVEL / MOIST = 6% / FINE MED. DENSE
EX-241 3-C	5–7	ML	F-4	TAN (35%) SAND (55%) SILT & (10%) GRAVEL / MOIST = 16% FINE / DENSE
EX-242 3-D	8–14	ML	F-4	TAN (29%) SAND (65%) SILT & (6%) GRAVEL / MOIST = 15% FINE

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-239

PROJECT 51st Ave & Cordova St. Test Holes DATE Feb. 28, 1980

CONTRACTOR

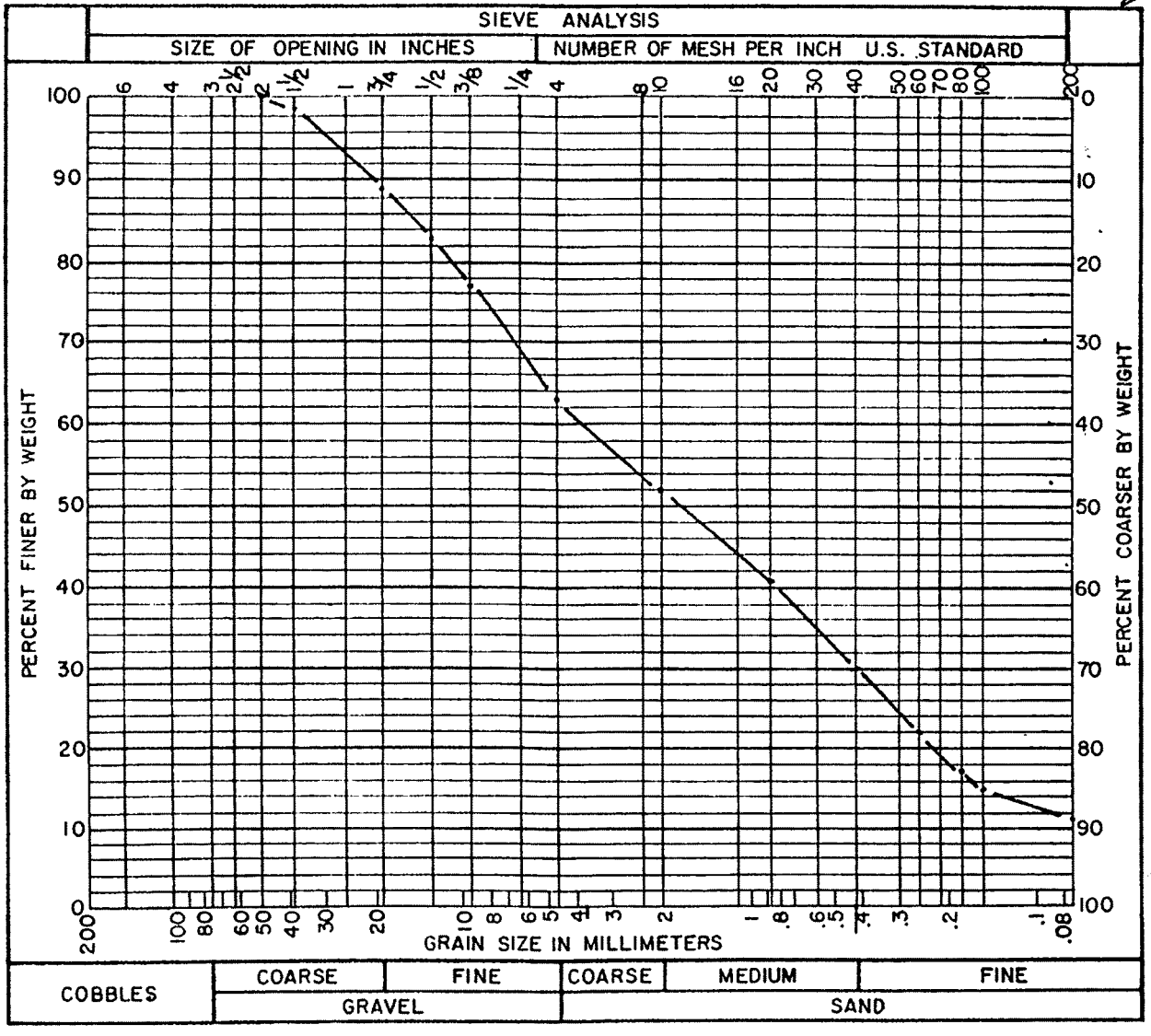
MATERIAL SOURCE 3-A/ 0 to 15' below O.G.

LOCATION SAMPLED 10'W & Cordova St / & E-51st Ave BY M. Krueger

COMMENTS SW-SM/F-2 (borderline) / Gravelly Sandy Silt / 6% Moisture
37% 52% 11%

REPORTED TO

PLOTTED BY GA CHECKED BY BD MATERIALS SUPERVISOR T.O. Pennington



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-240

PROJECT 51st Ave & Cordova St. Test Holes DATE Feb. 28, 1980

CONTRACTOR

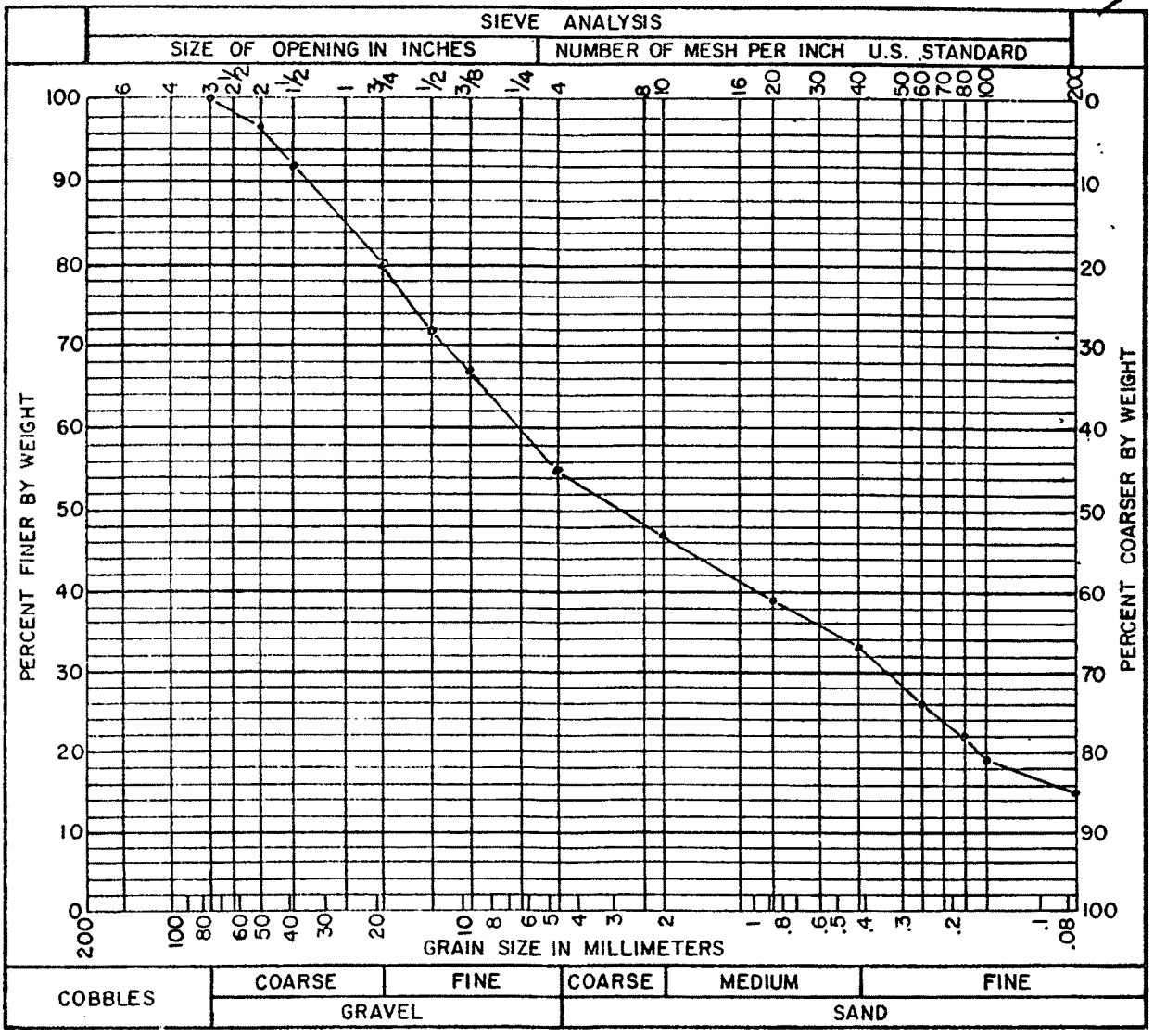
MATERIAL SOURCE 3-B / 15' to 40' below O.G.

LOCATION SAMPLED 10th & Cordova St / & 51st Ave BY M. Krueger

COMMENTS GM/F-1 / 15% Silty 40% Sandy 45% Gravel / 6% Moisture

REPORTED TO

PLOTTED BY AB CHECKED BY BD MATERIALS SUPERVISOR T. O. Lemm Jr.



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EL-241

PROJECT 51st Ave & Cordova St. Test Holes DATE Feb. 28, 1980

CONTRACTOR

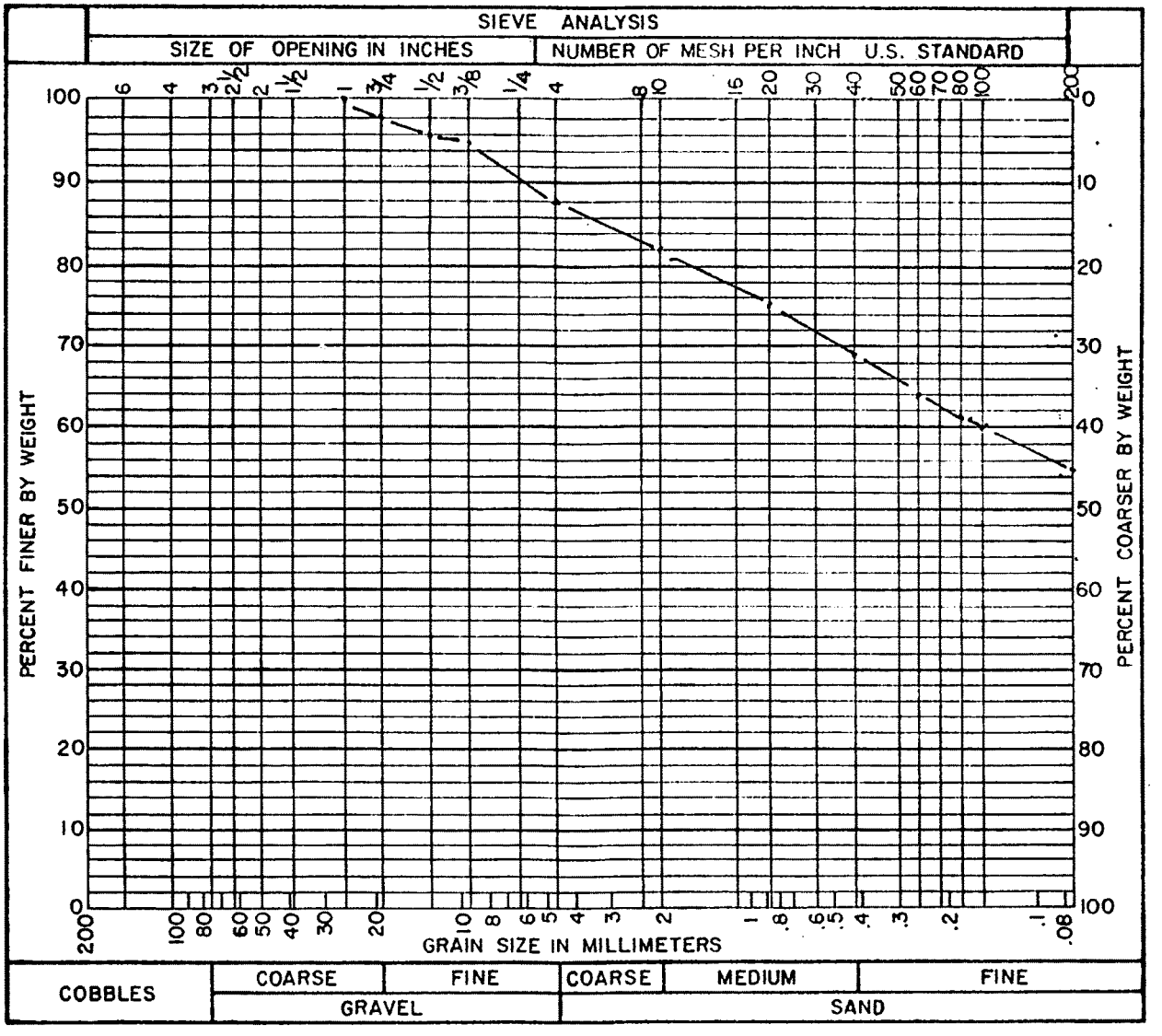
MATERIAL SOURCE 3-C/42' to 75' below O.G.

LOCATION SAMPLED 10' W/℄ Cordova St / 80' N/℄ International Airport Rd. BY M. Krueger

COMMENTS ML/F-4/S 33% Sandy 55% Silt w/G 12% Gravel / 16% Moisture

REPORTED TO

PLOTTED BY SG CHECKED BY BD MATERIALS SUPERVISOR L.O. Lemmons



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-242

PROJECT 51st Ave & Cordova St. Test Hole DATE Feb. 28, 1980

CONTRACTOR

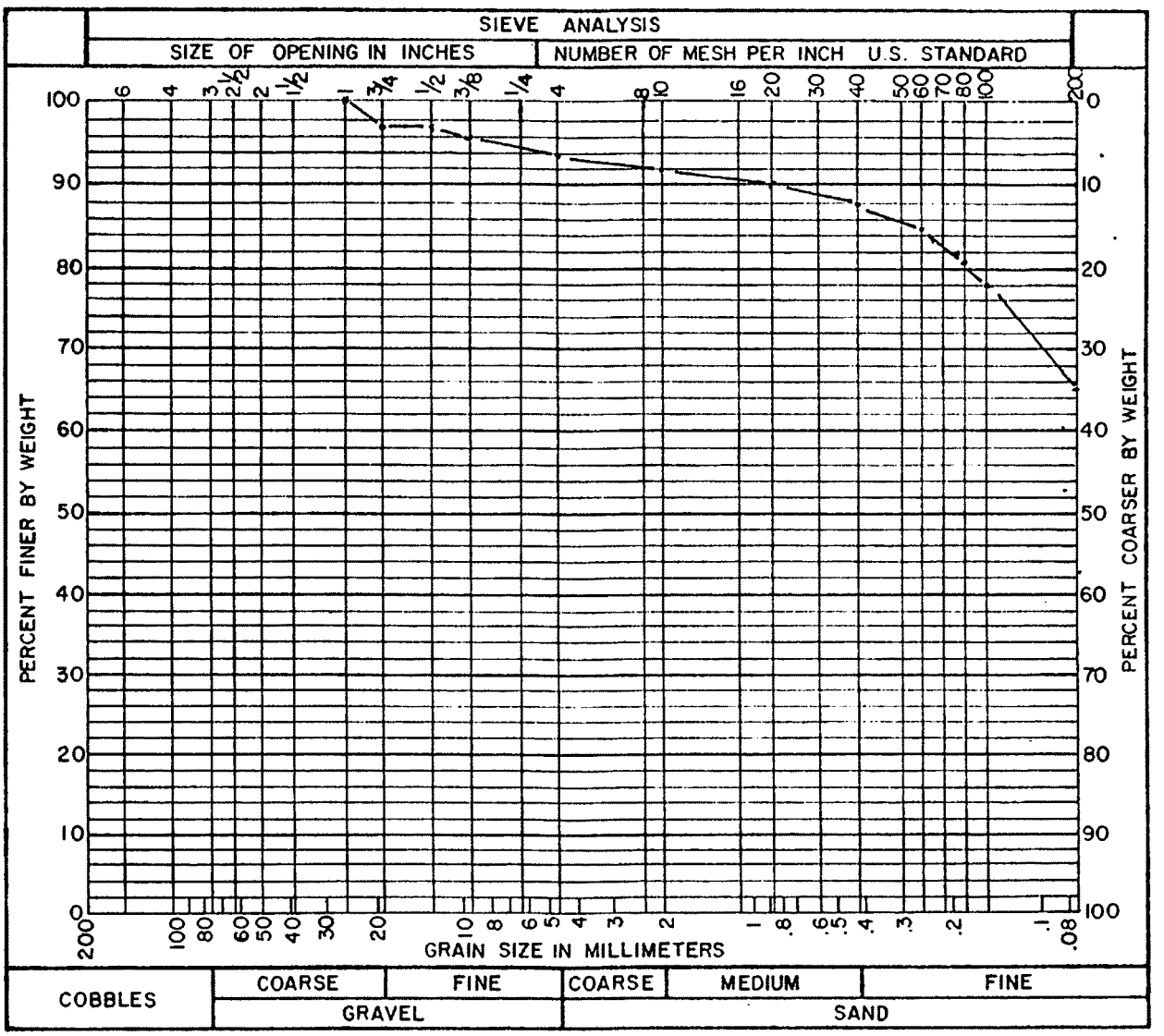
MATERIAL SOURCE 3-D/7±' to 10±' below O.G.

LOCATION SAMPLED 10'W/E Cordova St. / E. 51st Ave BY M. Krueger

COMMENTS ML/F-4/Sandy 29% Silt 6.5% w/Gravel 6% / 15% Moisture

REPORTED TO

PLOTTED BY SF CHECKED BY BD MATERIALS SUPERVISOR T. O. Lemmons



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

LOCATION SL 5TH AVE & CORDOVA ST / 90' N. ℄ OF INTERNATIONAL AIRPORT RD / ℄ OF CORDOVA ST

COMMENTS

HOLE NO. 4 (8)

DATE 2/28/80

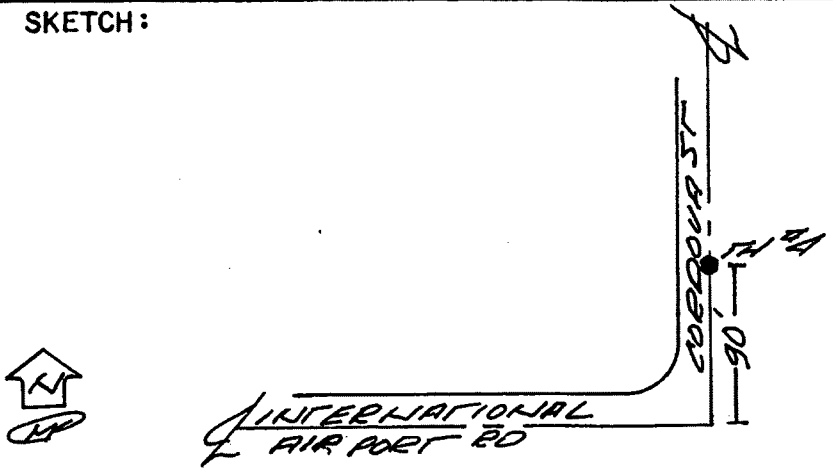
BY M.E. KRUEGER

DEPTH 10'

WATER TABLE CAVED

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
EX-243 4-A	0	SW-SM	NFS TO F-2	EXIST. GROUND / ROAD SURFACE BRN. GR. SAND (60%) W/ SILT (8%) / MOIST = 6% / LIP / MED - DENSE
EX-244 4-B	1	SM	F-2	GR. SILT (21%) - GRAVEL (34%) - SAND (45%) / MOIST = 18% / LIP DENSE
	2			
	3			
EX-245 4-C	4	SM	F-3	GR. SILT (13%) - SAND (79%) W/ GRAVEL (8%) / MOIST = 5% DENSE
	5			
	6			
EX-246 4-D	7	ML	F-4	FAT SAND (24%) - SILT (75%) / MOIST = 16% / GRAVEL = 1% DENSE
	8			
	9			
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

TEST HOLE

WATER TABLE

FROZEN MATERIAL

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-243

PROJECT 51st Ave & Cordova St. Test Holes DATE Feb. 28, 1980

CONTRACTOR

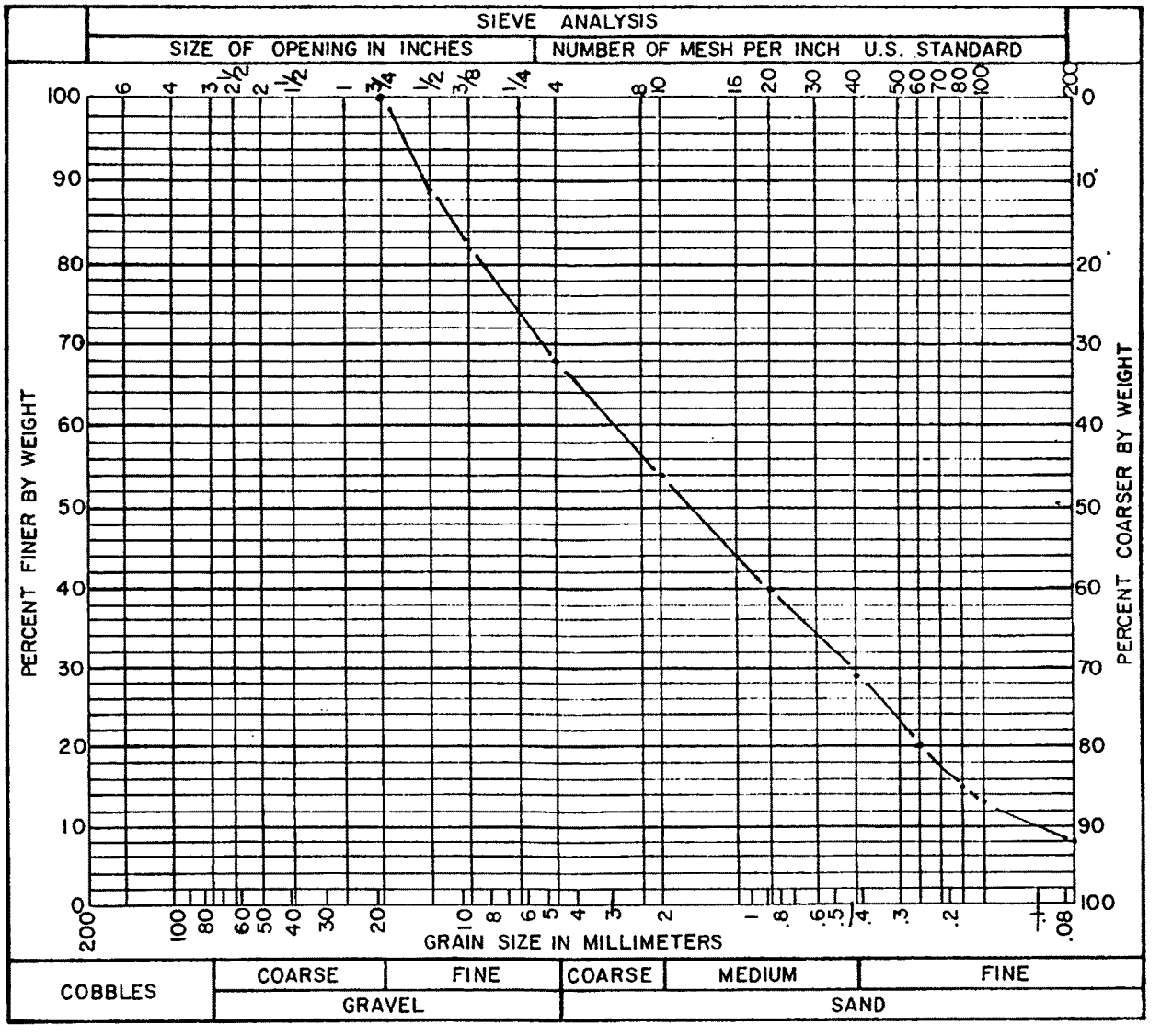
MATERIAL SOURCE 4-A/O 10 12' below O.G.

LOCATION SAMPLED 2 Cordova St. / 90' NE International Airport Rd. BY M. Krueger

COMMENTS SW-SM/NES to F-2 (borderline) / Gravelly 32% Sandy 60% Silt 8% / 6% Moisture

REPORTED TO

PLOTTED BY SL CHECKED BY BD MATERIALS SUPERVISOR T. O. Lennagh



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-244

PROJECT 51st Ave & Cordova Test Holes DATE Feb 28, 1980

CONTRACTOR

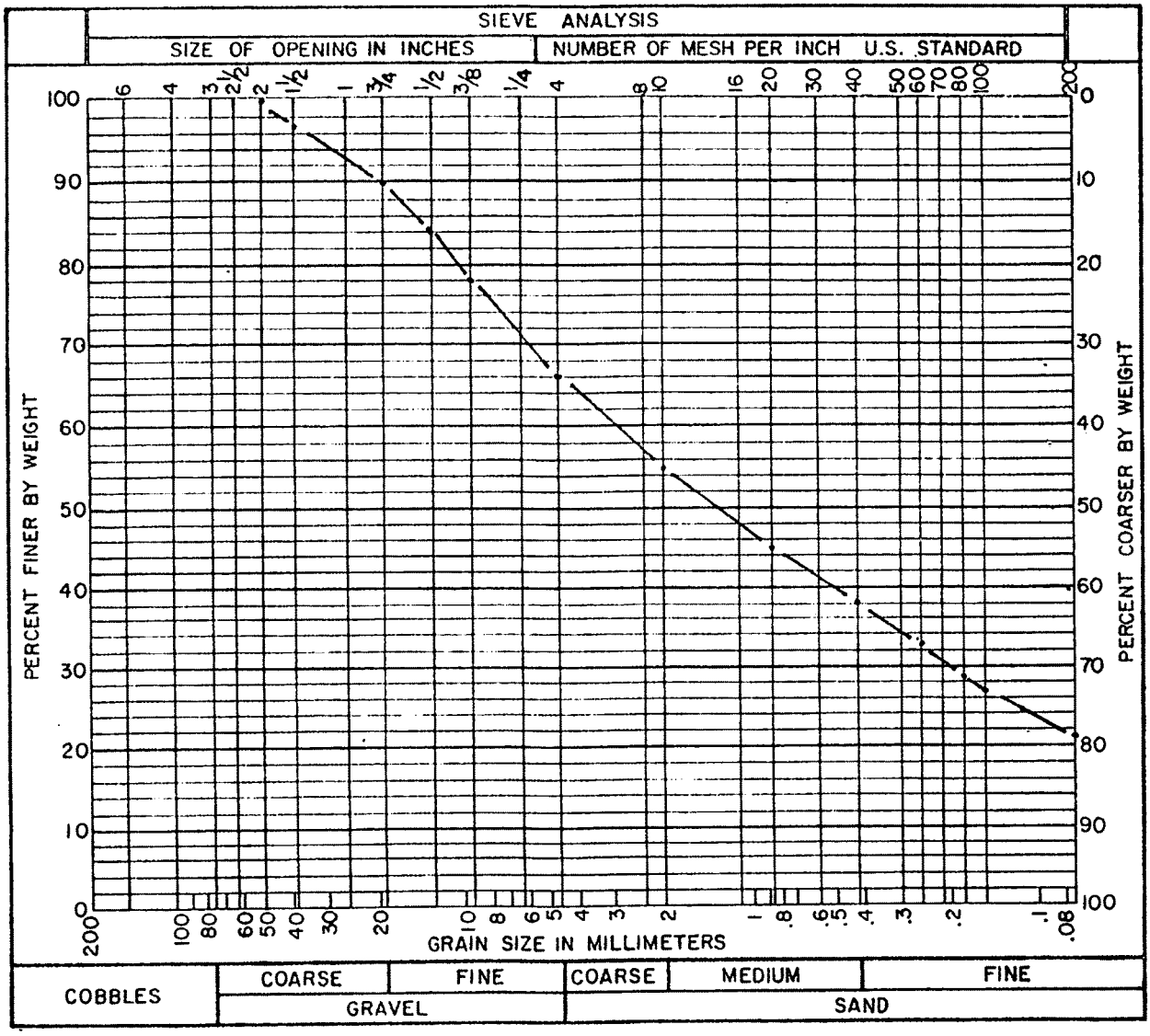
MATERIAL SOURCE 4-B/1' to 2' below O.G.

LOCATION SAMPLED E Cordova St./90' N/E International Airport Rd. BY M. Krueger

COMMENTS SM/F-2/Silty (21%) Gravely (34%) Sand (45%)/18% Moisture

REPORTED TO

PLOTTED BY SG CHECKED BY BD MATERIALS SUPERVISOR T. O. Penn A.



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-245

PROJECT 51st Ave & Cordova St. Test Holes DATE Feb. 28, 1980

CONTRACTOR

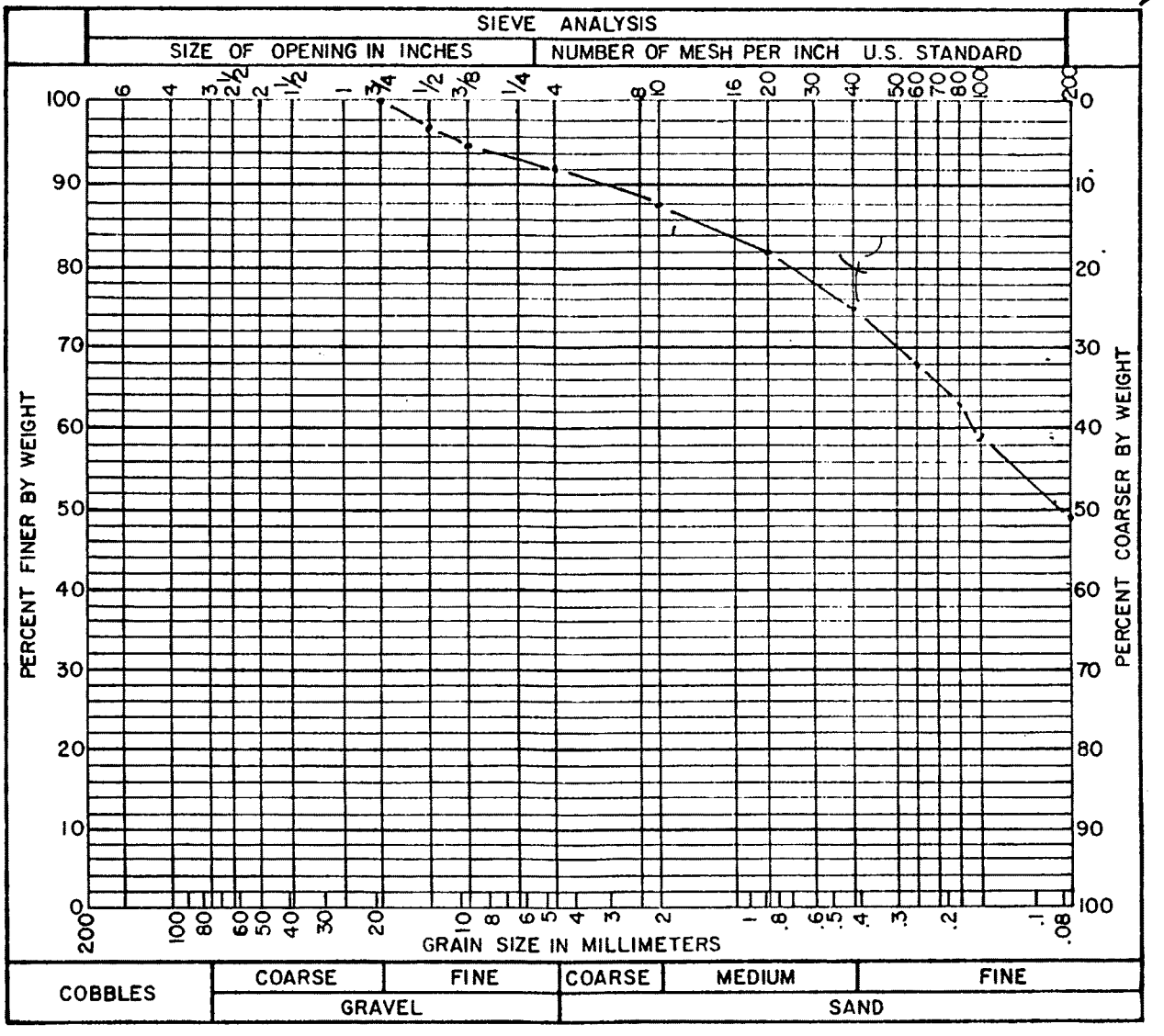
MATERIAL SOURCE 4-C/20' to 55' below O.G.

LOCATION SAMPLED ℄ Cordova St. / 20'N ℄ International Airport Rd. BY M. Krueger

COMMENTS SM/F-4/Silty 43% Sand w/ 49% Gravel / 8% / 53% Moisture

REPORTED TO

PLOTTED BY CF CHECKED BY BD MATERIALS SUPERVISOR T. O. Lemmons



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-246

PROJECT 51st Ave & Cordova St. Test Holes DATE Feb. 28, 1980

CONTRACTOR

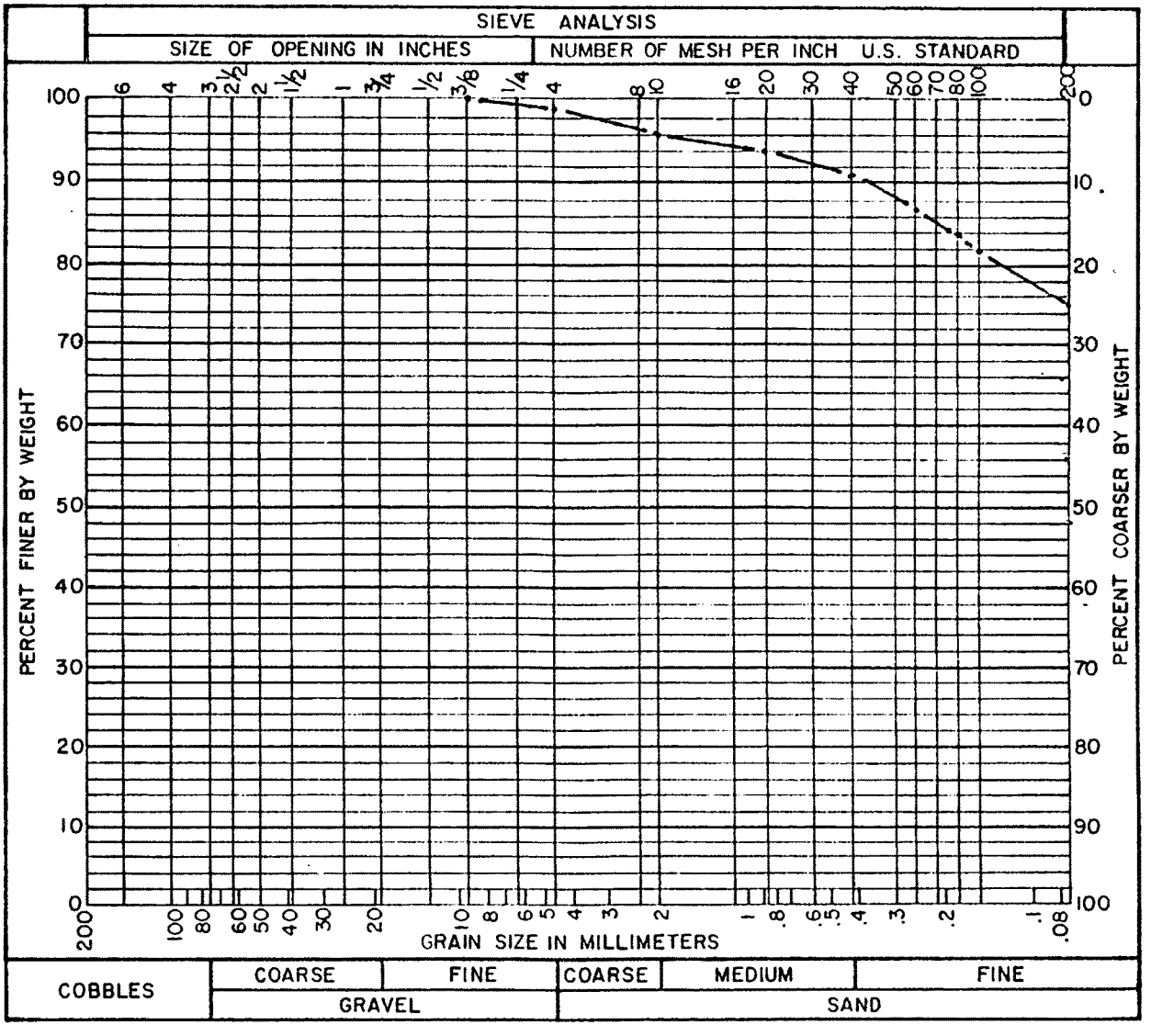
MATERIAL SOURCE 4-D/55' to 102' below O.G.

LOCATION SAMPLED E Cordova St/90'W of International Airport Rd. BY M. Krueger

COMMENTS ML/F-4/Sandy Silt/24% -75#/16% Moisture/1% Gravel

REPORTED TO

PLOTTED BY [illegible] CHECKED BY BD MATERIALS SUPERVISOR T. O. Penny Jr.



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

LOCATION 48TH AVE. R/D / 280' SO. ℄ OF 48TH AVE. ℄ OF CORDOVA ST

COMMENTS

HOLE NO. B (11)

DATE 11/5/81

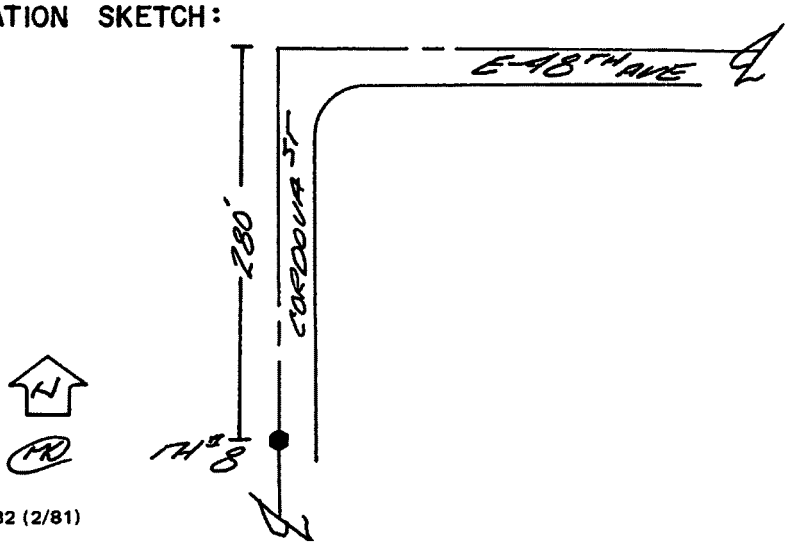
BY M.E. KRUEGER

DEPTH 10'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST. GROUND / ROAD SURFACE
	1			
EX-30 B-A	2	GW-GM	NFS TO F-1	GR (37%) SD (55%) - GRAVEL W / SILT (8%) + ISOLATED COBBLES MOIST. = 4% / LIP / DENSE EST. +3" MAT'L = 10%
	3			
EX-31 B-B	4	GW-GM	NFS TO F-1	GR (30%) SD (64%) - GRAVEL W / SILT (6%) + OCC. COBBLE MOIST. = 3% / NP / DENSE / EST. +3" MAT'L = 15%
EX-32 B-C	5	ML	F-4	FAN SD (8%) SILT (92%) / MOIST. = 12% / GRAVEL = 3%
	6			LIP / DENSE
EX-33 B-D	7	SM	F-3	FAN GRVL (25%) - SD (33%) - SILT (42%) / MOIST. = 10% / LIP DENSE
	8			
EX-34 B-E	9	ML	F-4	FAN SD (3%) SILT (96%) / MOIST. = 20% / GRAVEL = 1% DENSE
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 9 (12)

LOCATION 48TH AVE R/D / ℄ OF 50TH AVE
℄ OF CORDOVA ST

DATE 1/15/81

BY D.E. KRUEGER

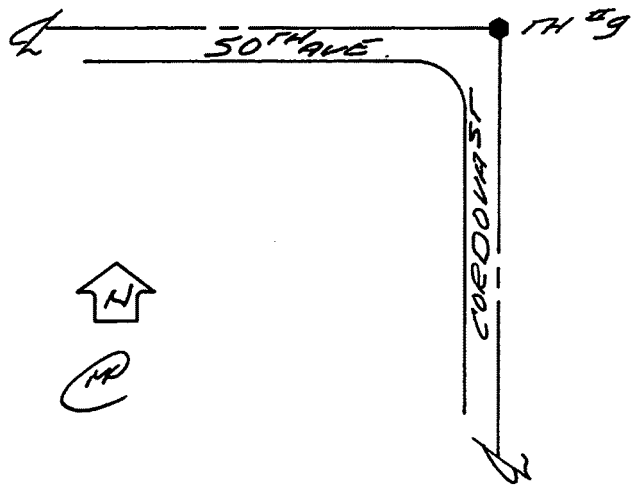
COMMENTS

DEPTH 10'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST. GROUND / ROAD SURFACE
EX-35 9-A	1	GW-GM	F-1	GR SDY (45%) GRAVEL (45%) w/ SILT (10%) + ISOLATED COBBLES MOIST. = 7% / NP / MED. DENSE
	2			EST +3" MAT'L = 10%
EX-36 9-B	3	ML	F-4	GR SDY (35%) SILT (65%) / MOIST = 18% / GRAVEL = 2% DENSE
	4			
EX-37 9-C	5	ML	F-4	FAT SDY (6%) SILT (94%) w/ GRAVEL / MOIST. = 17% / DENSE
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

REVISIONS		
No.	DATE	DESCRIPTION

	PROJECT DESIGNATION	YEAR	SHEET NO	TOTAL SHEETS
ALASKA	F-M-0538(1)	78	8	9

Eagle St.

Fairbanks St.

T.H. 14

T.H. 17

T.H. 30

T.H. 29

T.H. 15

T.H. 16

T.H. 28

March Line Sta 148+00

Match Line Sta 134+00

T.H. 30
STA. 135+00.8 RT. ℄
4-20-78
0'-7.0' BRN. SANDY GRAVEL
@ SFS-15
ELEV. 134.2'
ELEV. 130.5'
7.0'
10.0'
FS-16, A-4 (8) F-4
7.0'-10.0' SANDY CLAYEY SILT

T.H. 14
STA. 136+10.28 LT ℄
12-2-77
0'-4.0' BRN. SILTY SANDY GRAVEL
@ SFS-10
6.0'-10.0' BRN. SILTY SAND
10.0'

T.H. 15
STA. 139+88.5
12-12-77
ELEV. 119.2'
Si Sa Gr.
6.0'
Organics w/ Si
12.5'
Sa Si
15.0'

T.H. 15
STA. 140+30.9 RT. ℄
12-12-77
0'-9.0' GRAVEL
FS-5, A-1-a, NFS
R VALUE = 80
9.0'-10.0' GR. BR. SILTY SANDY GRAVEL

VPI. 142+00.00
ELEV. 114.80'
400' V.C.

T.H. 17
STA. 144+40.32' LT ℄
12-13-77
ELEV. 109.5'
0'-1.5' BRN. SILTY GRAVEL
1.5'-7.5' BRN. SILTY ORGANICS
7.5'-10.0' GRAY SILTY SAND
M=15, M=15%, A-4, F-4

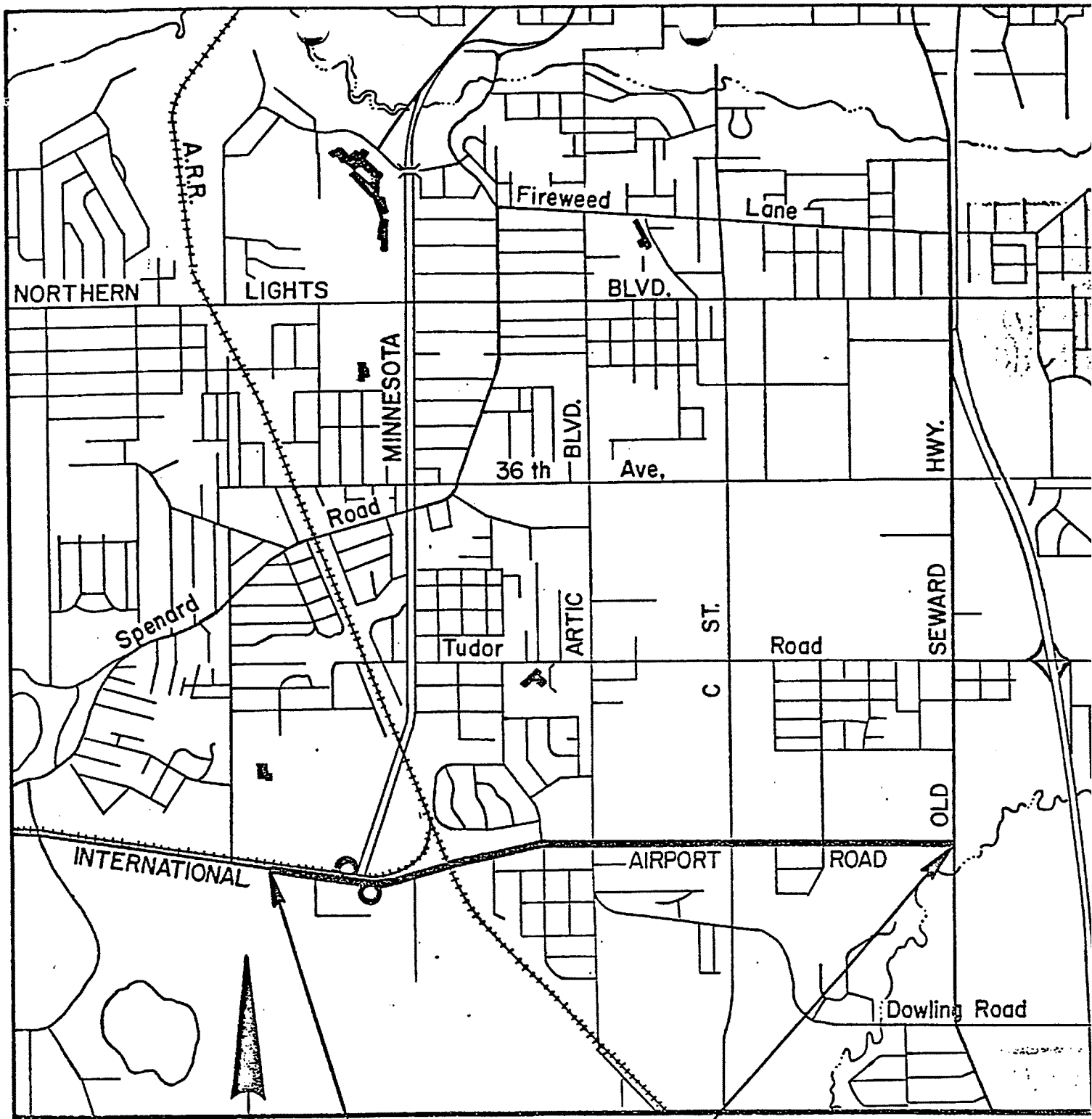
T.H. 16
STA. 145+40.30 RT. ℄
12-12-77
ELEV. 113.6'
0'-4.5' SILTY SANDY GRAVEL
@ SFS-10
4.5'-6.5' BRN. SILTY ORGANICS
6.5'-10.0' GRAY SILT
M=14, M=33%, A-2-4, F-4

T.H. 28
STA. 148+00.8 RT. ℄
4-20-78
ELEV. 112.6'
0'-0.3' ASPHALT
0'-0.3'-7.0' BRN. SANDY GRAVEL
7.0'-8.0 ORGANICS
8.0'-10.0' GR. BRN. SANDY SILT

140
130
120
110
100

134 135 136 137 138 139 140 141 142 143 144 145 146 147 148

TECH INC



PROJECT LOCATION MAP

ENGINEERING GEOLOGY SECTION
MATERIALS DIVISION
ALASKA DEPARTMENT OF TRANSPORTATIO
& PUBLIC FACILITIES

INTERNATIONAL AIRPORT RD.

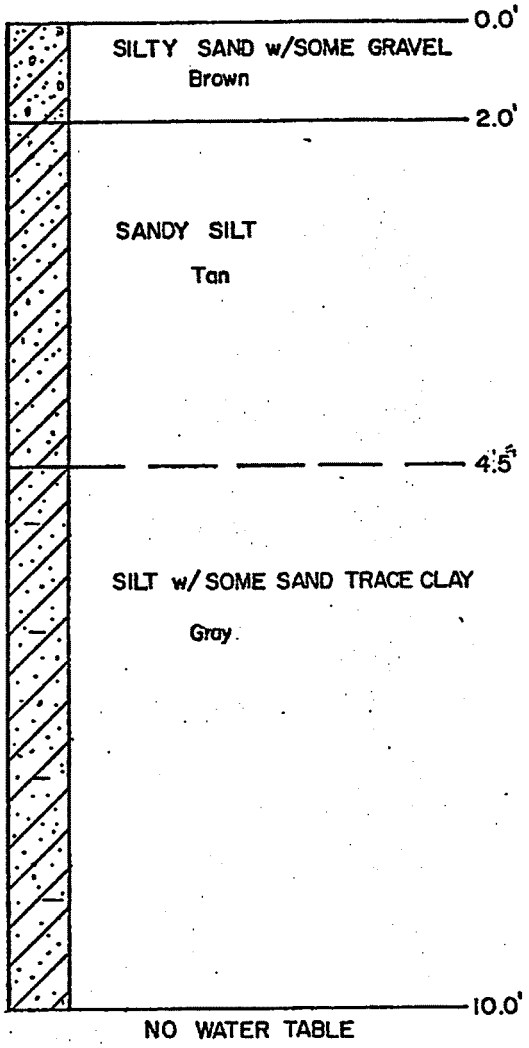
DATA: D.H.	PROJECT no. F-M-0538(1)
DRAWN: P.H.	
APPROVED G.H	SCALE 1:24,000 DATE 5/31/78

1) Historic Borehole Logs

For

48th Avenue

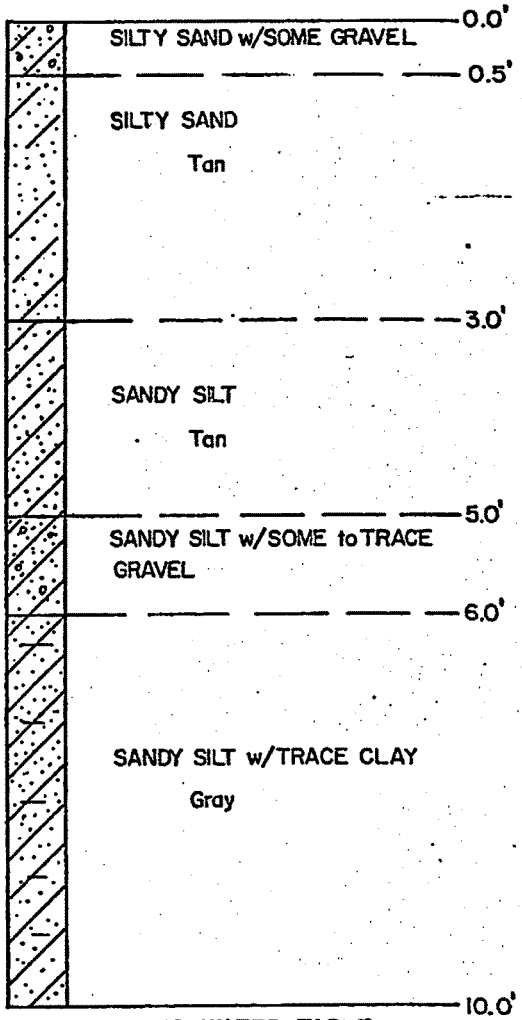
T.H.– 1
9/18/74



NO WATER TABLE

(1)

T.H.–2
9/18/74



NO WATER TABLE

(2)

LOG OF TEST HOLES
GAAB. R.I.D. 50
ANCHORAGE, ALASKA

R&M Engineering & Geological Consultants Inc.
ANCHORAGE FAIRBANKS ALASKA JUNEAU

DATE 9-19-74	SCALE 1" = 2'	DWN BY M.A.M.	CHKD BY W.D.	PROJ. NO. 451061	DWG NO. B – 03

Lab No. 561025
PROJECT NO. 551030
PROJECT NAME GAAB-Heather Meadows

R & M CONSULTANTS, INC.

SUMMARY OF LABORATORY TEST DATA

DATE 6-27-75
PARTY NO. _____ PAGE NO. 1

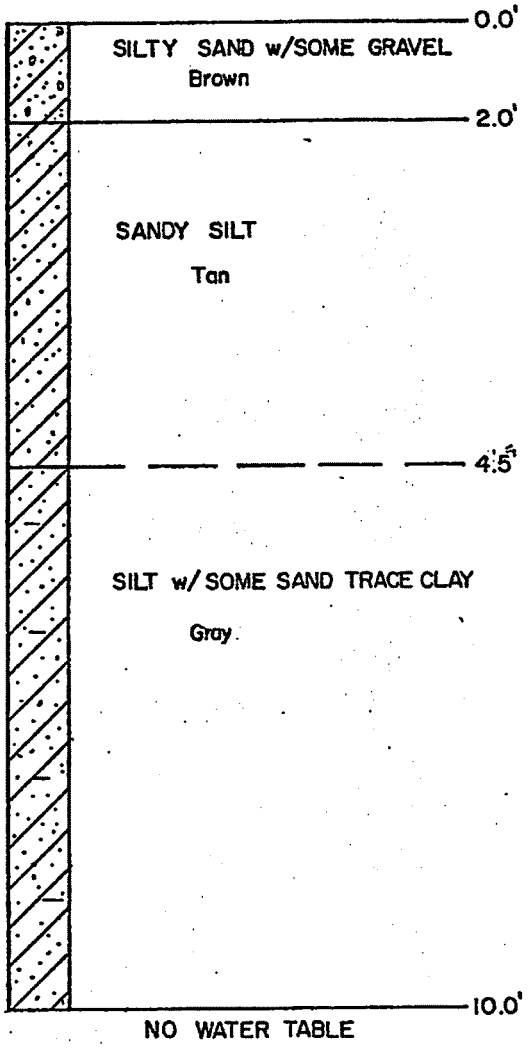
LAB NO.	BORING NO.	SAMPLE NO.	DEPTH	1 1/2"	1"	3/4"	1/2"	3/8"	4	10	40	200	.02	.005	.002	FINE SPG	L.L.	P.I.	WET DENSITY	DRY DENSITY	MOISTURE CONTENT	CLASS
701	1	1	0.2 - 0.5			100	90	81	61	44	17	7										GW-GM
702	1	2	0.5 - 2.0																			
703	1	2B	2.0 - 2.5				100	96	94	89	75	51									28.1	GM
704	1	3	2.5 - 4.5				100	98	96	95	92	82				2.69	26	5	122.7	100.1	22.7	CL-ML
705	1	4	4.5 - 5.5					100	99	98	94	80									27.6	
706	1	5	7.0 - 9.0					100	99	97	92	79	59.0	29.6	13.4		26	8	137.9	120.1	14.8	CL
707	2	1	0.2 - 0.5	100	96	89	89	79	68	58	32	8									7.0	GW-GM
708	2	2	2.0 - 4.0					100	99	97	88	77					26	7			20.0	CL-ML
709	2	3	4.0 - 5.5			100	98	97	96	95	91	77	55.0	29.3	14.0		26	7	132.9	114.6	16.0	CL-ML
710	3	1	0.2 - 0.5	82	82	75	66	58	44	32	15	4										GW
711	3	2	2.0 - 4.0		100	96	96	96	96	96	94	85	67.0	38.1	12.2		27	7	131.7	115.5	14.0	CL-ML
712	3	3	4.0 - 6.0						100	99	98	89	56.0	26.7	11.1	2.68	27	7	131.0	108.4	20.9	CL-ML
713	4	1	2.5 - 4.0					100	99	99	97	90		12.6	2.8	2.68	28	5	120.8	98.0	23.3	CL
714	4	2	4.5 - 6.0				100	99	99	98	95	87	73.3	19.9	8.3		28	3	110.7	80.2	38.2	ML
715	5	1	0.2 - 0.5	83	76	70	62	59	50	40	17	3									4.3	GW
716	5	2	3.5 - 5.0				100	98	97	95	88	66	48.0	15.8	7.8	2.64	24	6	122.3	97.5	25.5	CL-ML
717	5	3	5.0 - 6.5			100	98	97	92	91	67	57	42.0	15.1	4.9		22	5	127.3	107.6	18.3	CL-ML
718	5	4	6.5 - 8.0							100	99	74	47.6	22.0	9.3		21	4			23.9	CL-ML
719	6	1	1.5 - 3.0			100	99	98	97	95	89	76	49.1	24.7	13.0	2.67	23	5	132.2	115.2	14.9	CL-ML
720	6	2	3.0 - 4.5			100	99	99	96	95	92	85	57.0	27.3	13.0		25	7	132.9	112.9	17.7	CL-ML

REMARKS: 75A-715 - 2" = 100% passing

NOTE: SIEVE ANALYSIS = PERCENT PASSING

James W. Toomey
APPROVED

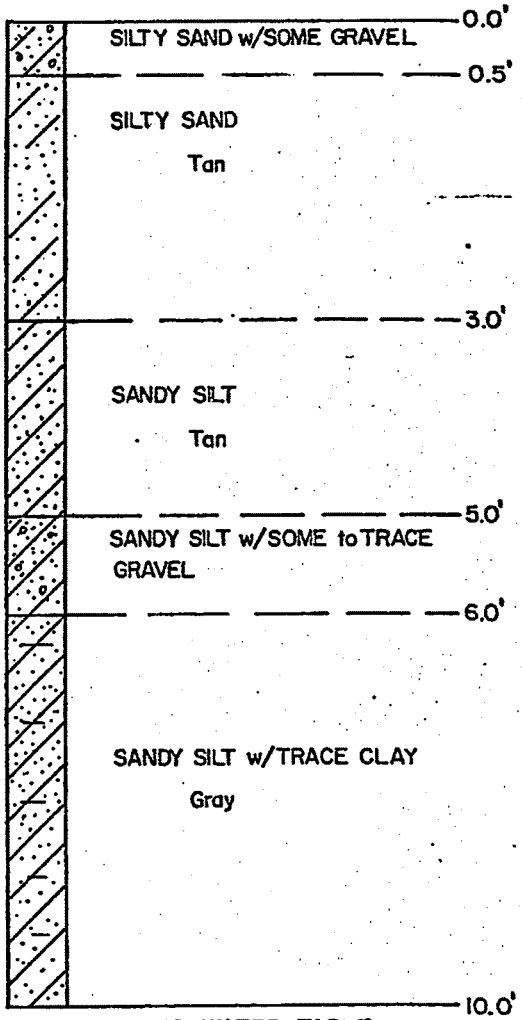
T.H.– 1
9/18/74



NO WATER TABLE

(1)

T.H.–2
9/18/74



NO WATER TABLE

(2)

LOG OF TEST HOLES
GAAB. R.I.D. 50
ANCHORAGE, ALASKA

R&M Engineering & Geological Consultants Inc.
ANCHORAGE FAIRBANKS ALASKA JUNEAU

DATE 9-19-74	SCALE 1" = 2'	DWN BY M.A.M.	CHKD BY W.D.	PROJ. NO. 451061	DWG NO. B – 03

Lab No. 561025
PROJECT NO. 551030
PROJECT NAME GAAB-Heather Meadows

R & M CONSULTANTS, INC.

SUMMARY OF LABORATORY TEST DATA

DATE 6-27-75
PARTY NO. _____ PAGE NO. 1

LAB NO.	BORING NO.	SAMPLE NO.	DEPTH	1 1/2"	1"	3/4"	1/2"	3/8"	4	10	40	200	.02	.005	.002	FINE SPG	L.L.	P.I.	WET DENSITY	DRY DENSITY	MOISTURE CONTENT	CLASS
701	1	1	0.2 - 0.5			100	90	81	61	44	17	7										GW-GM
702	1	2	0.5 - 2.0																			
703	1	2B	2.0 - 2.5				100	96	94	89	75	51									28.1	GM
704	1	3	2.5 - 4.5				100	98	96	95	92	82				2.69	26	5	122.7	100.1	22.7	CL-ML
705	1	4	4.5 - 5.5					100	99	98	94	80									27.6	
706	1	5	7.0 - 9.0					100	99	97	92	79	59.0	29.6	13.4		26	8	137.9	120.1	14.8	CL
707	2	1	0.2 - 0.5	100	96	89	89	79	68	58	32	8									7.0	GW-GM
708	2	2	2.0 - 4.0					100	99	97	88	77					26	7			20.0	CL-ML
709	2	3	4.0 - 5.5			100	98	97	96	95	91	77	55.0	29.3	14.0		26	7	132.9	114.6	16.0	CL-ML
710	3	1	0.2 - 0.5	82	82	75	66	58	44	32	15	4										GW
711	3	2	2.0 - 4.0		100	96	96	96	96	96	94	85	67.0	38.1	12.2		27	7	131.7	115.5	14.0	CL-ML
712	3	3	4.0 - 6.0						100	99	98	89	56.0	26.7	11.1	2.68	27	7	131.0	108.4	20.9	CL-ML
713	4	1	2.5 - 4.0					100	99	99	97	90		12.6	2.8	2.68	28	5	120.8	98.0	23.3	CL
714	4	2	4.5 - 6.0				100	99	99	98	95	87	73.3	19.9	8.3		28	3	110.7	80.2	38.2	ML
715	5	1	0.2 - 0.5	83	76	70	62	59	50	40	17	3									4.3	GW
716	5	2	3.5 - 5.0				100	98	97	95	88	66	48.0	15.8	7.8	2.64	24	6	122.3	97.5	25.5	CL-ML
717	5	3	5.0 - 6.5			100	98	97	92	91	67	57	42.0	15.1	4.9		22	5	127.3	107.6	18.3	CL-ML
718	5	4	6.5 - 8.0							100	99	74	47.6	22.0	9.3		21	4			23.9	CL-ML
719	6	1	1.5 - 3.0			100	99	98	97	95	89	76	49.1	24.7	13.0	2.67	23	5	132.2	115.2	14.9	CL-ML
720	6	2	3.0 - 4.5			100	99	99	96	95	92	85	57.0	27.3	13.0		25	7	132.9	112.9	17.7	CL-ML

REMARKS: 75A-715 - 2" = 100% passing

NOTE: SIEVE ANALYSIS = PERCENT PASSING

James W. Toomey
APPROVED

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 32

LOCATION 48TH AVE R10 / 100' W. ℄ OF THE (OLD) SEWARD HWY ℄ OF 48TH AVE

DATE 1/14/81

BY M.E. KRUEGER

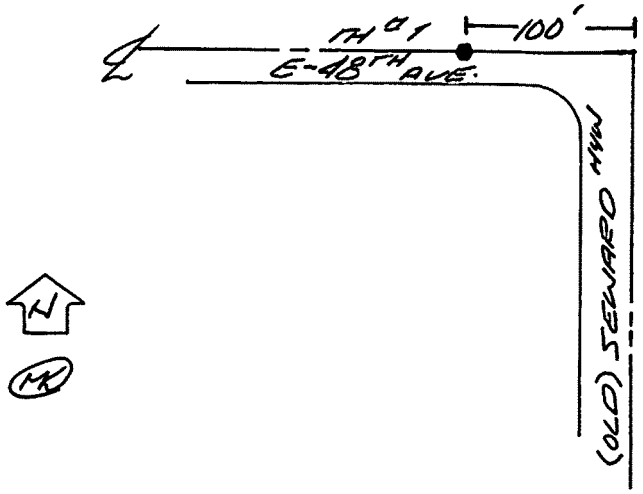
COMMENTS

DEPTH 10'

WATER TABLE CAVE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST. GROUND / ROAD SURFACE
EX-1 1-A	1	GW-GM	NFS	BRN SAND (30%) & GRAVEL (5%) / SILT / MOIST. = 3% / NP / MED. DENSE
	2			
EX-2 1-B	3	SM	F-2	GR SILTY-GRAVELLY-SAND (17%) (28%) (55%) / MOIST. = 6% / NP DENSE
EX-3 1-C	4	SM	F-1	GR SILTY (37%) - (VERY-FINE) - SAND (63%) / MOIST. = 15% GRAVEL = 1% / DENSE
VISUAL	5	PT	N/A	BRN ORG. (PEAT)
	6			
EX-4 1-D	7	SM	F-1	OLIVE SILTY (37%) - (VERY-FINE) SAND (60%) / GRAVEL = 3% NP / DENSE / MOIST. = 3%
	8			
	9			
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-1

PROJECT E-48th Ave RID — Test Holes — DATE Jan. 14, 1981

CONTRACTOR

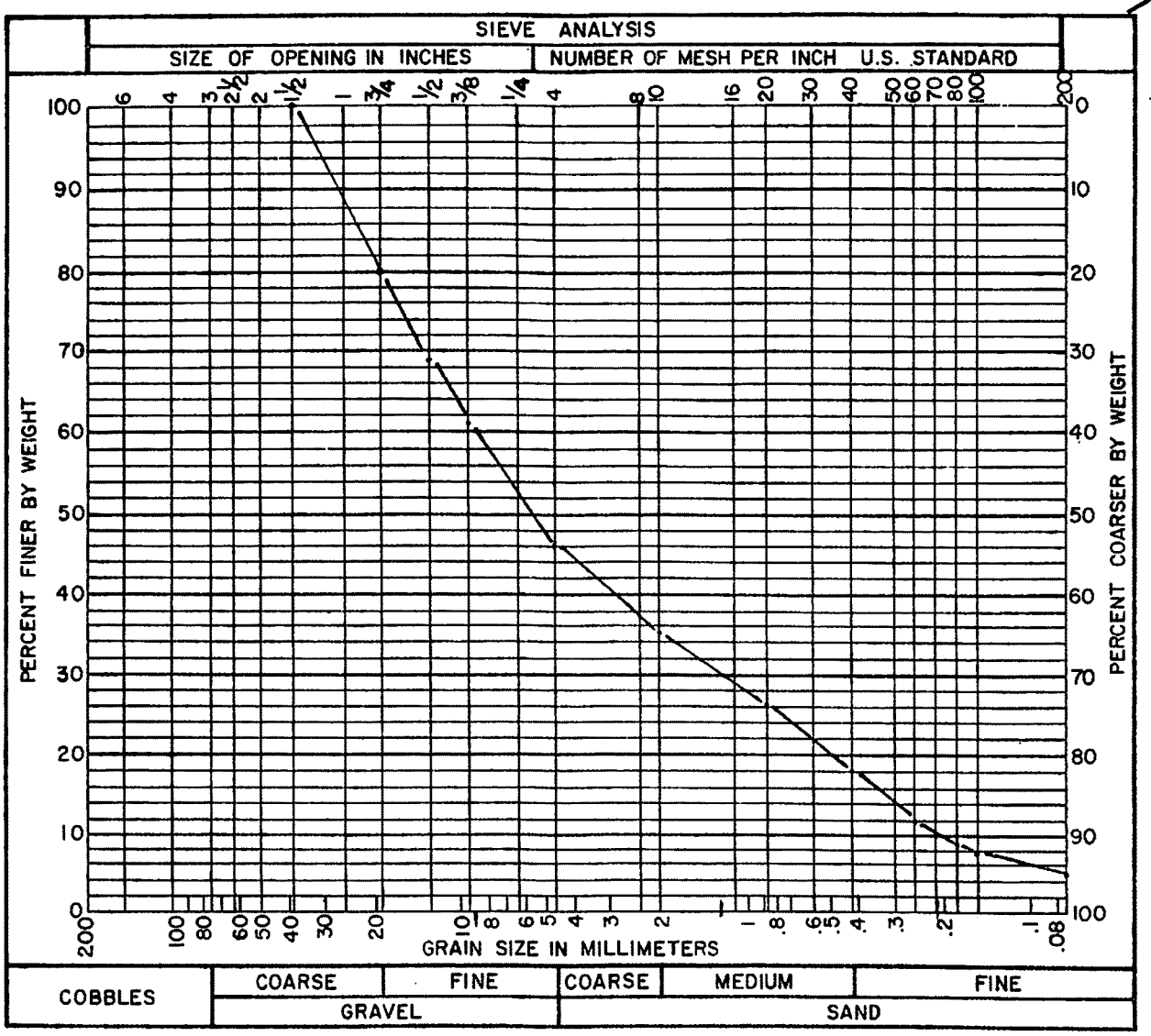
MATERIAL SOURCE 1-A/O to 2° below O.G.

LOCATION SAMPLED 100'± Old Seward Hwy & E-48th Ave — BY M. Krueger

COMMENTS GW-GM/NFS/Sandy Gravel w/Silt/3% Moisture

REPORTED TO

PLOTTED BY EG — CHECKED BY BD — MATERIALS SUPERVISOR L.O.L.



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-2

PROJECT E-48th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR

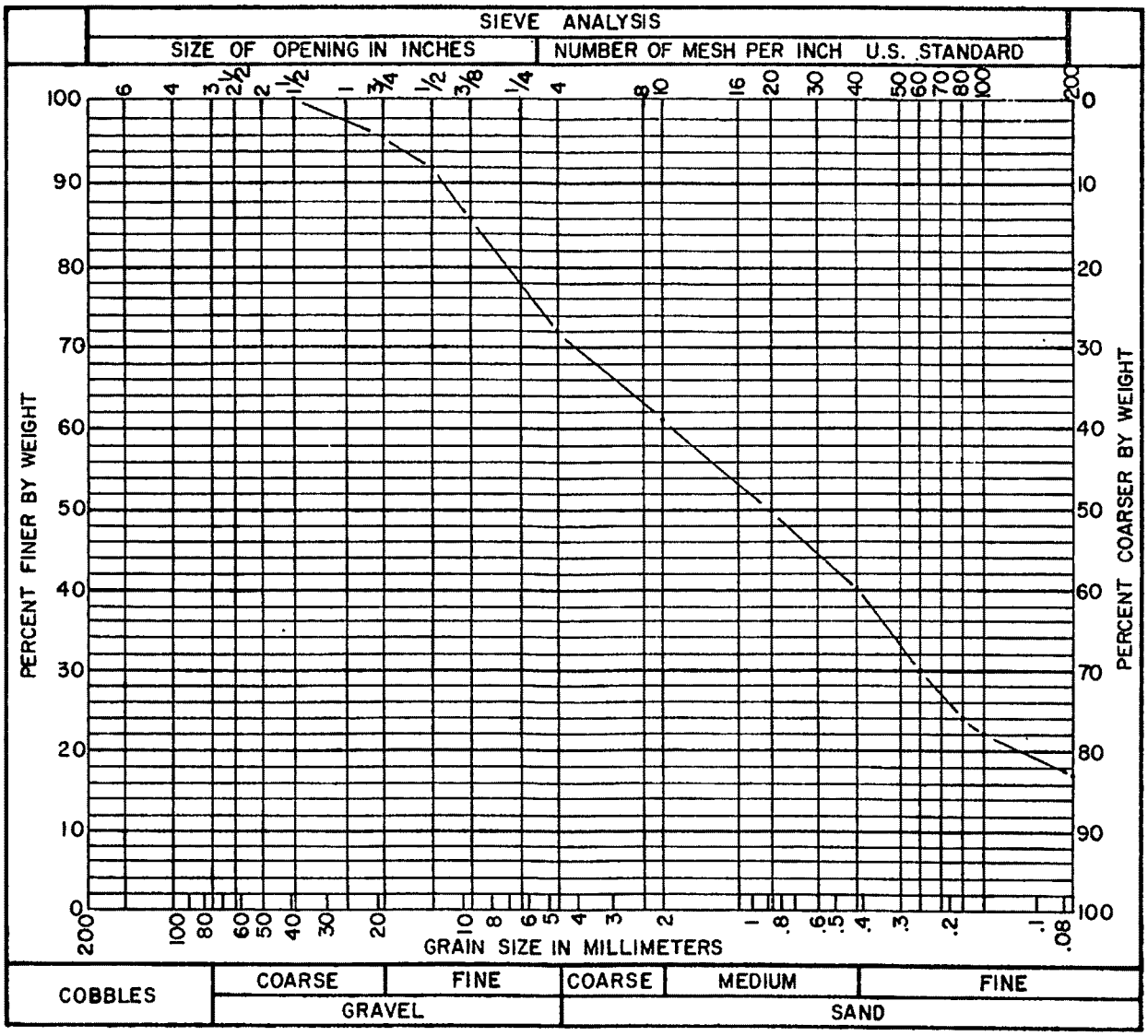
MATERIAL SOURCE 1-B/20' to 35' below O.G.

LOCATION SAMPLED 100' W/C Old Seward Hwy/E-48th Ave BY M. Krueger

COMMENTS SM/E-2/Silty 17% Gravely 28% Sand 55% /6% Moisture

REPORTED TO

PLOTTED BY BD CHECKED BY MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-3

PROJECT E-48th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR

MATERIAL SOURCE 1-C/3.5' to 4.5' below O.G.

LOCATION SAMPLED 100' West of Seward Hwy & E-48th Ave BY M. Krueger

COMMENTS SM/E-4/Very fine Silty Sand/15% Moisture/1% Gravel 34% 65%

REPORTED TO

PLOTTED BY CHECKED BY BD MATERIALS SUPERVISOR T.O. Rea

SIEVE ANALYSIS

SIZE OF OPENING IN INCHES										NUMBER OF MESH PER INCH U.S. STANDARD										
6	4	3	2½	2	1½	1	¾	½	⅜	¼	4	8	10	16	20	30	40	50	60	70	80	100	200

PERCENT FINER BY WEIGHT: 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0

PERCENT COARSER BY WEIGHT: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

GRAIN SIZE IN MILLIMETERS

200	100	80	60	50	40	30	20	10	8	6	5	4	3	2	1	.8	.6	.5	.4	.3	.2	.1	.08

COBBLES	GRAVEL		SAND		
	COARSE	FINE	COARSE	MEDIUM	FINE

INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-4

PROJECT E-48th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR

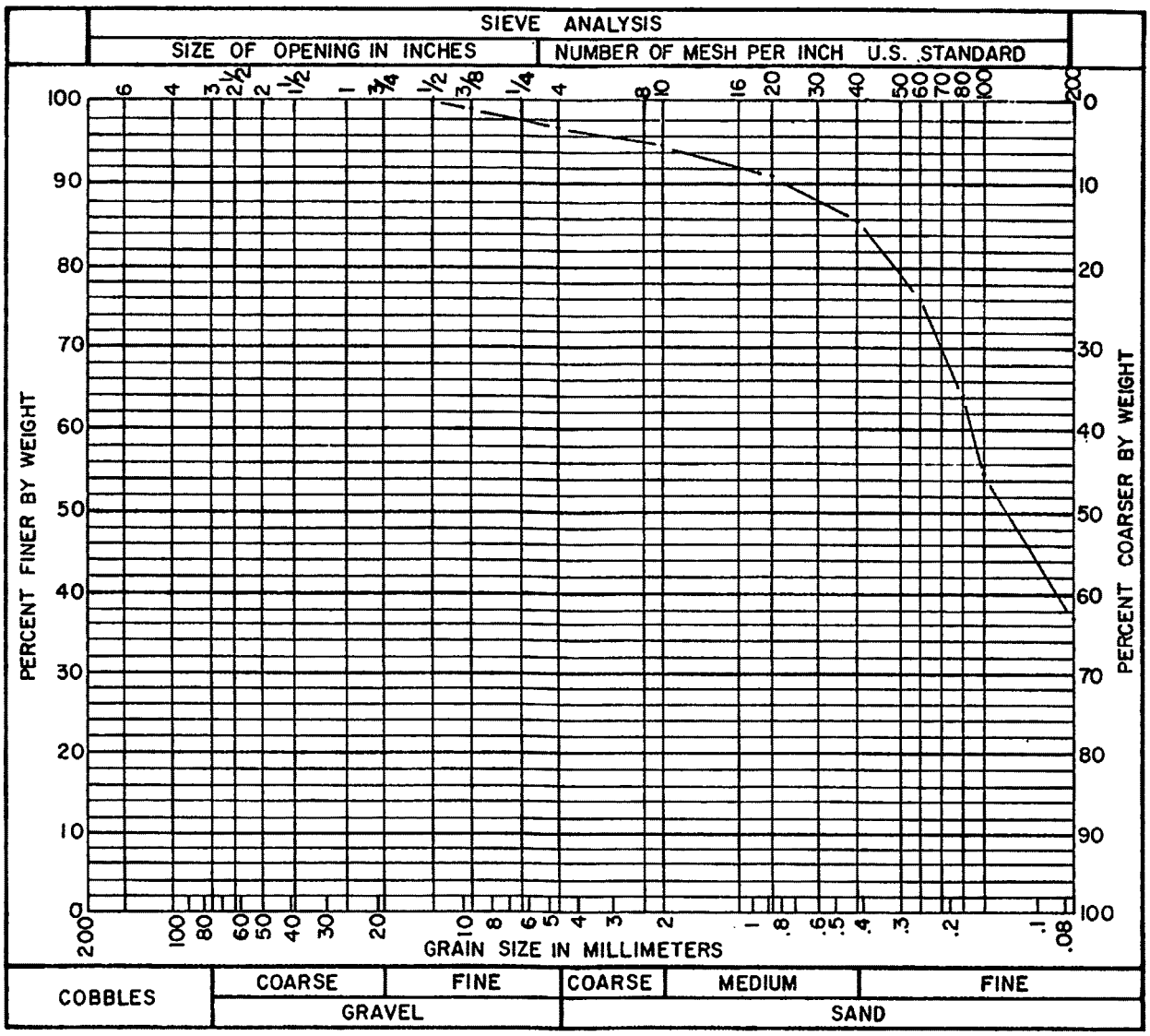
MATERIAL SOURCE 1-D/5' to 10' below O.G.

LOCATION SAMPLED 100' W/C Old Seward Hwy/C E-48th Ave. BY M. Krueger

COMMENTS SM/E-4/Very fine Silty Sand (37%) (60%)/12% Moisture/3% Gravel

REPORTED TO

PLOTTED BY BD CHECKED BY MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 2 (33)

LOCATION 48TH AVE R/D / 65' E. ℄ OF CAMPBELL ST ℄ OF 48TH AVE

DATE 1/14/81

BY M. E. KRUEGER

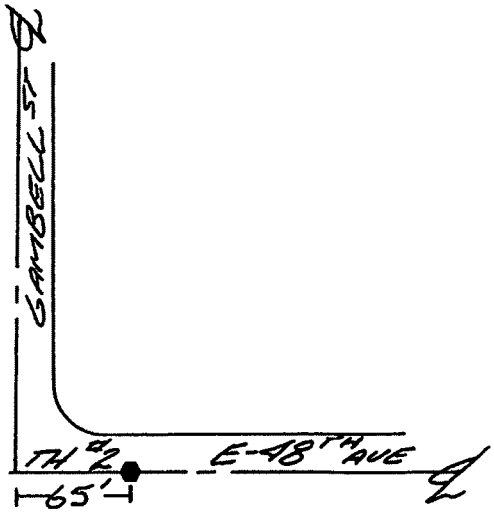
COMMENTS

DEPTH 10'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST. GROUND / ROAD SURFACE
EX-5 2-A	1	SW-SM	F-2	GR (37%) SAND (58%) w/ SILT (5%) / MOIST. = 4% / NP
EX-6 2-B	2	SM	F-3	DENSE GR (27%) - SAND (65%) / MOIST. = 20% / NP / GRAVEL = 1% MED. DENSE
VISUAL	3	PT	4/D	BRN (ORG.) PEAT
	4			
EX-7 2-C	5	ML	F-4	OLIVE SAND (39%) - SILT (57%) / MOIST. = 22% / NP / DENSE (SEMI-ELASTIC)
	6			
EX-8 2-D	7	ML	F-4	OLIVE SAND (39%) - SILT (60%) / MOIST = 16% / GRAVEL = 1% DENSE (SEMI-ELASTIC)
	8			
EX-9 2-E	9	ML	F-4	GR. SAND (38%) - SILT (58%) / MOIST = 15% / NP / MED. DENSE
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-5

PROJECT E-48th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR

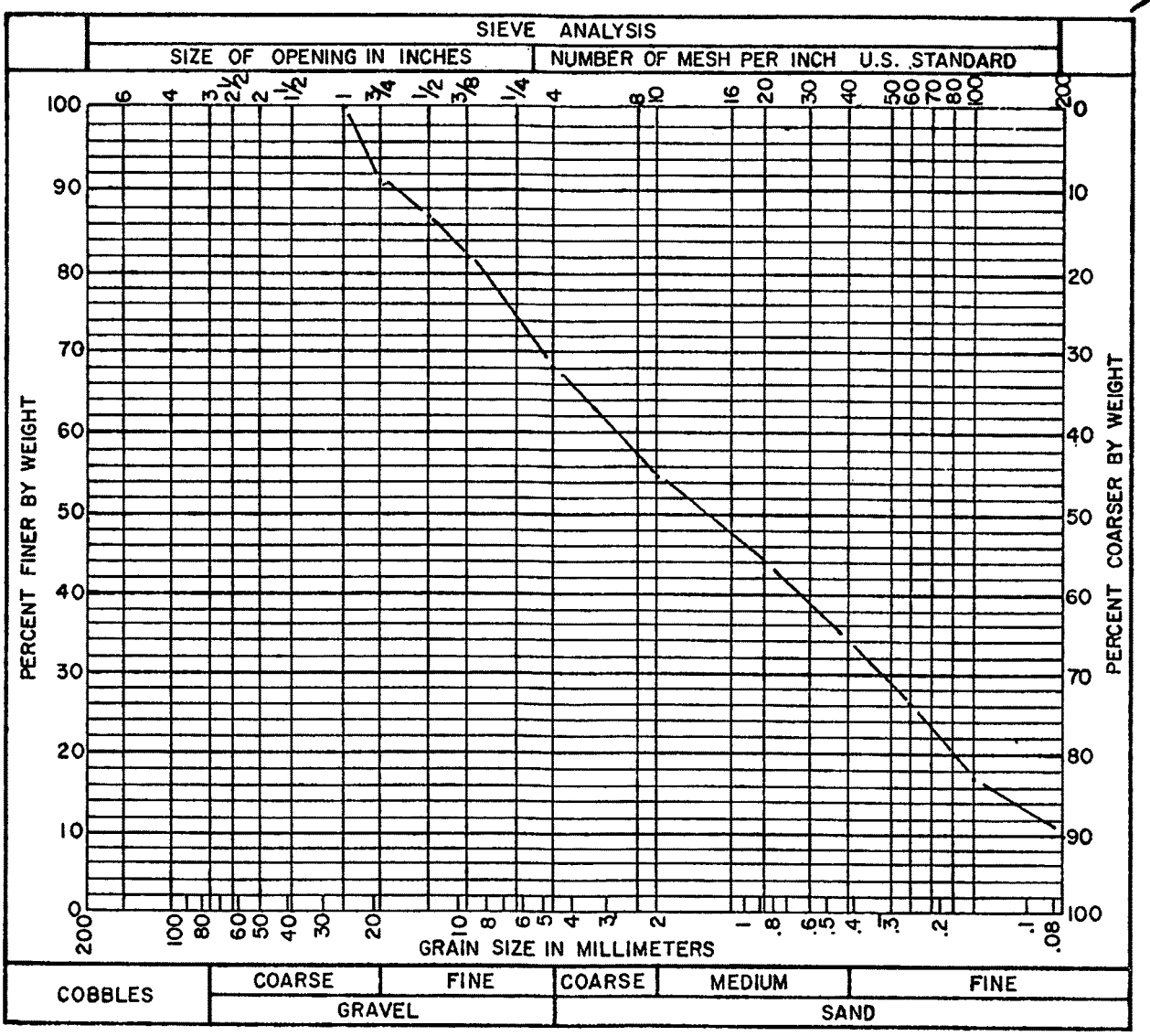
MATERIAL SOURCE 2-A / 0 to 15' below O.G.

LOCATION SAMPLED 65'E & Gambell St. / & 48th Ave BY M. Krueger

COMMENTS SW-SM / F-2 / Gravelly (32%) Sandy (58%) / Silty (10%) / 4% Moisture

REPORTED TO

PLOTTED BY CHECKED BY RD MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-6

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

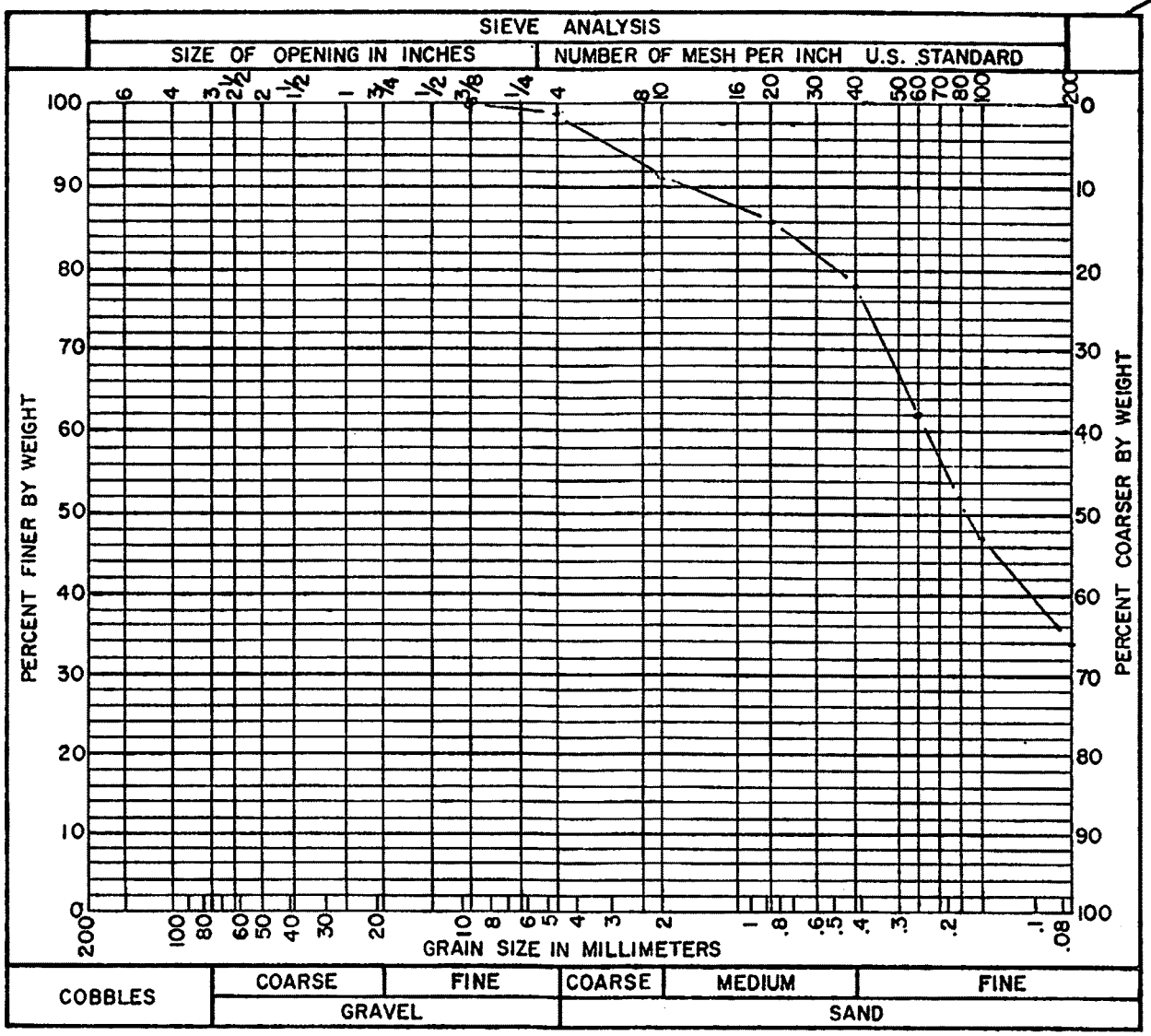
MATERIAL SOURCE 2-B/12' to 25' below O.G.

LOCATION SAMPLED 65' E & Gamball St/E 48th Ave BY M. Krueger

COMMENTS SM/E-3/Silty Sand 34%/Sand 65%/20% Moisture/1% Gravel

REPORTED TO

PLOTTED BY GG CHECKED BY BD MATERIALS SUPERVISOR T.D.R. Jr.



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-7

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

MATERIAL SOURCE 2-C/4'0" to 6'5" below O.G.

LOCATION SAMPLED 65' E & Gamball St/& E-48th Ave BY M. Krueger

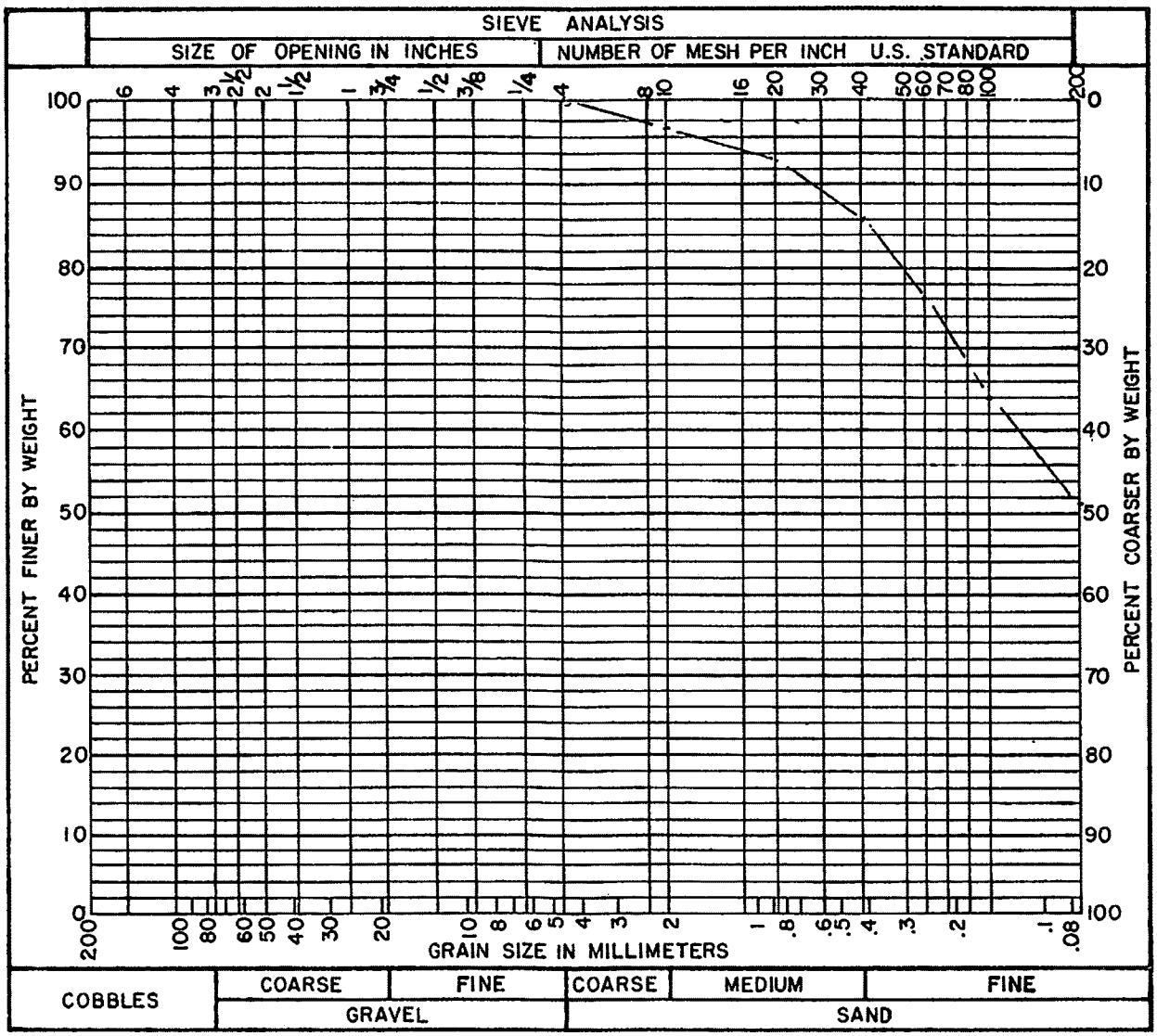
COMMENTS ML/F-4/Sandy 19% Silt/22% Moisture 5%

REPORTED TO

PLOTTED BY ZZ CHECKED BY BD MATERIALS SUPERVISOR

SIEVE ANALYSIS

SIZE OF OPENING IN INCHES | NUMBER OF MESH PER INCH U.S. STANDARD



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-8

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

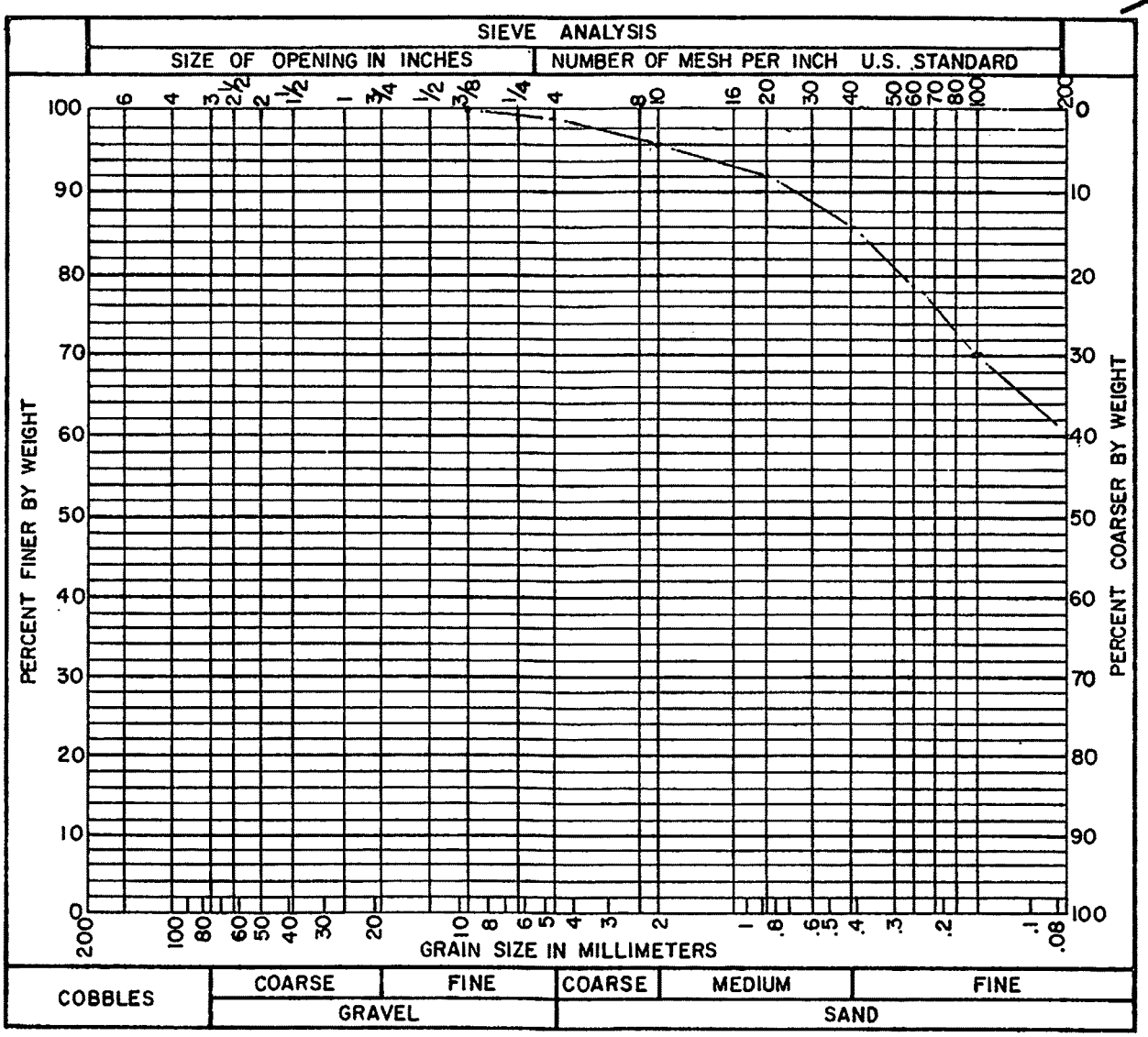
MATERIAL SOURCE 2-D/6' to 8' below O.G.

LOCATION SAMPLED 6516 Gambell St./2 E-48th Ave BY M. Krueger

COMMENTS ML/E-4/Sandy 39% Silt 60%/16% Moisture/1% Gravel

REPORTED TO

PLOTTED BY EJ CHECKED BY BD MATERIALS SUPERVISOR L.D. Peasley



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-9

PROJECT E-48th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR

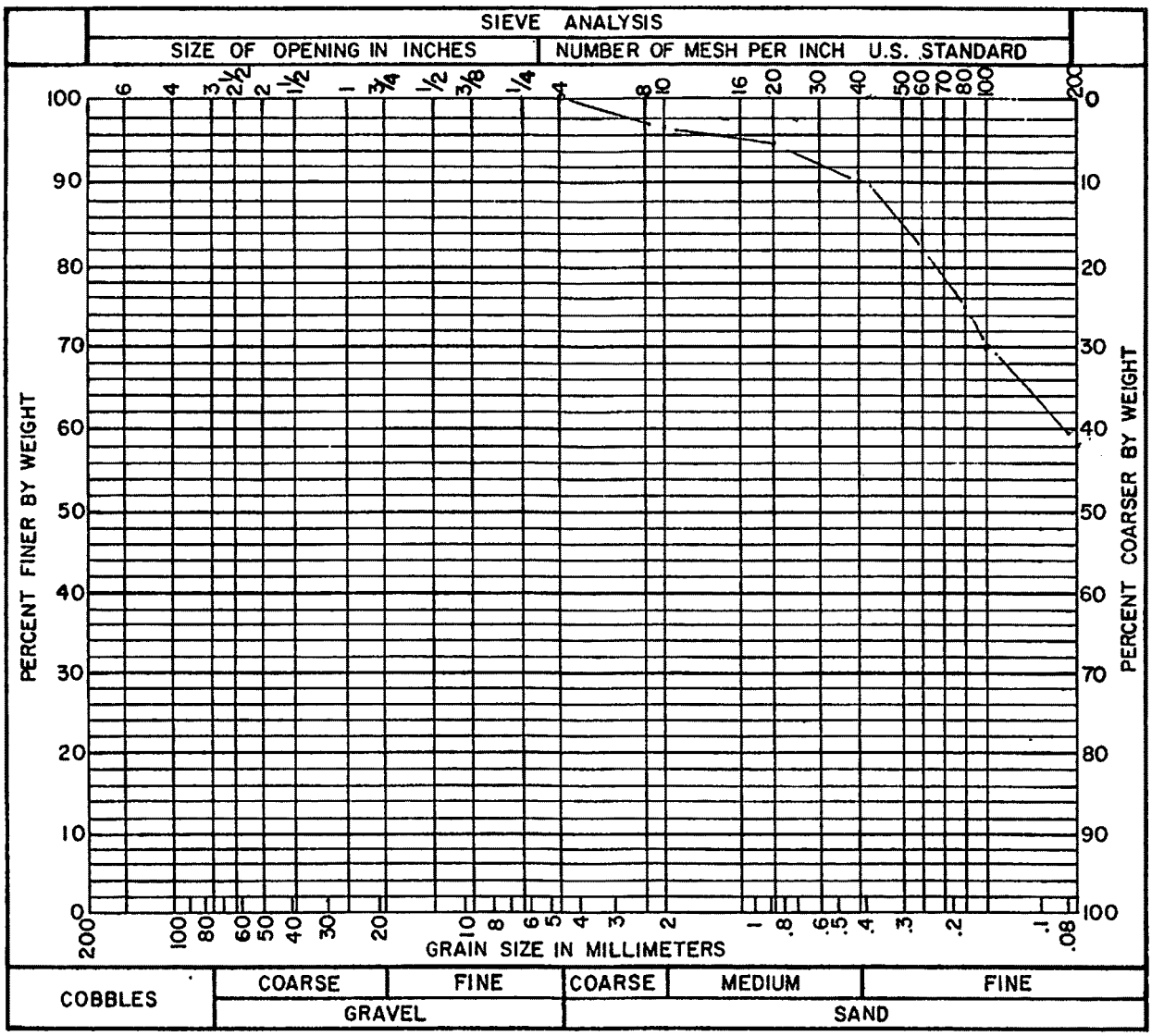
MATERIAL SOURCE 2-E/8'0" to 10'0" below O.G.

LOCATION SAMPLED 65'E & Gambell St/ & 48th Ave. BY M. Krueger

COMMENTS ML/E-4/Sandy Silt/15% Moisture 42% 58%

REPORTED TO

PLOTTED BY CHECKED BY BD MATERIALS SUPERVISOR T.D. Lemm Jr.



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 3 (34)

LOCATION 48TH AVE. E/O / 170' E. ℄ OF FAIRBANKS ST ℄ OF 48TH AVE

DATE 1/14/81

BY M.E. KRUEGER

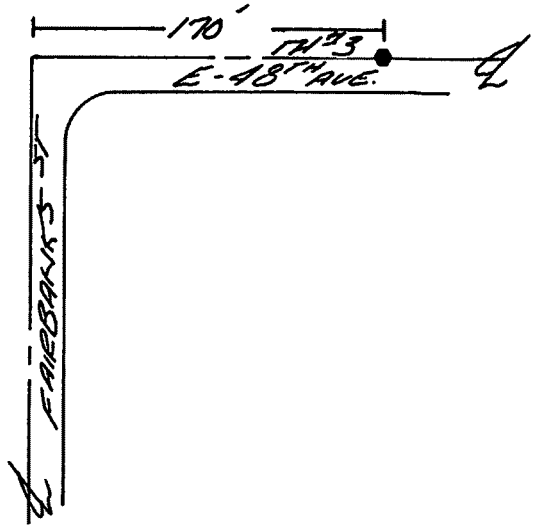
COMMENTS

DEPTH 10'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
				EXIST. GROUND / ROAD SURFACE
EX-10 3-A	0	SM	F-2	BRN SAND (SILTY) - (GRAVELLY) - SAND / MOIST = 6% / MP DENSE
	1			
EX-11 3-B	2	ML	F-4	TAN SAND (SILTY) - SILT / MOIST. = 21% / GRAVEL = 2% MP / MED. DENSE
	3			
EX-12 3-C	4	SM	F-4	TAN SAND (VERY-FINE) - SAND / MOIST = 14% MP / GRAVEL = 1% / MED. DENSE
	5			
EX-13 3-D	6	ML	F-4	TAN SAND (SILTY) - SILT / MOIST. = 19% / MP / GRAVEL = 1% DENSE
EX-14 3-E	7	SM	F-2	BRN. SAND (SILTY) - SAND w / INTERMITTENT
	8			SILT LENS / MOIST = 18% / MP / MED DENSE
	9			
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-10

PROJECT E-48th Ave BID Test Holes DATE Jan 14, 1981

CONTRACTOR

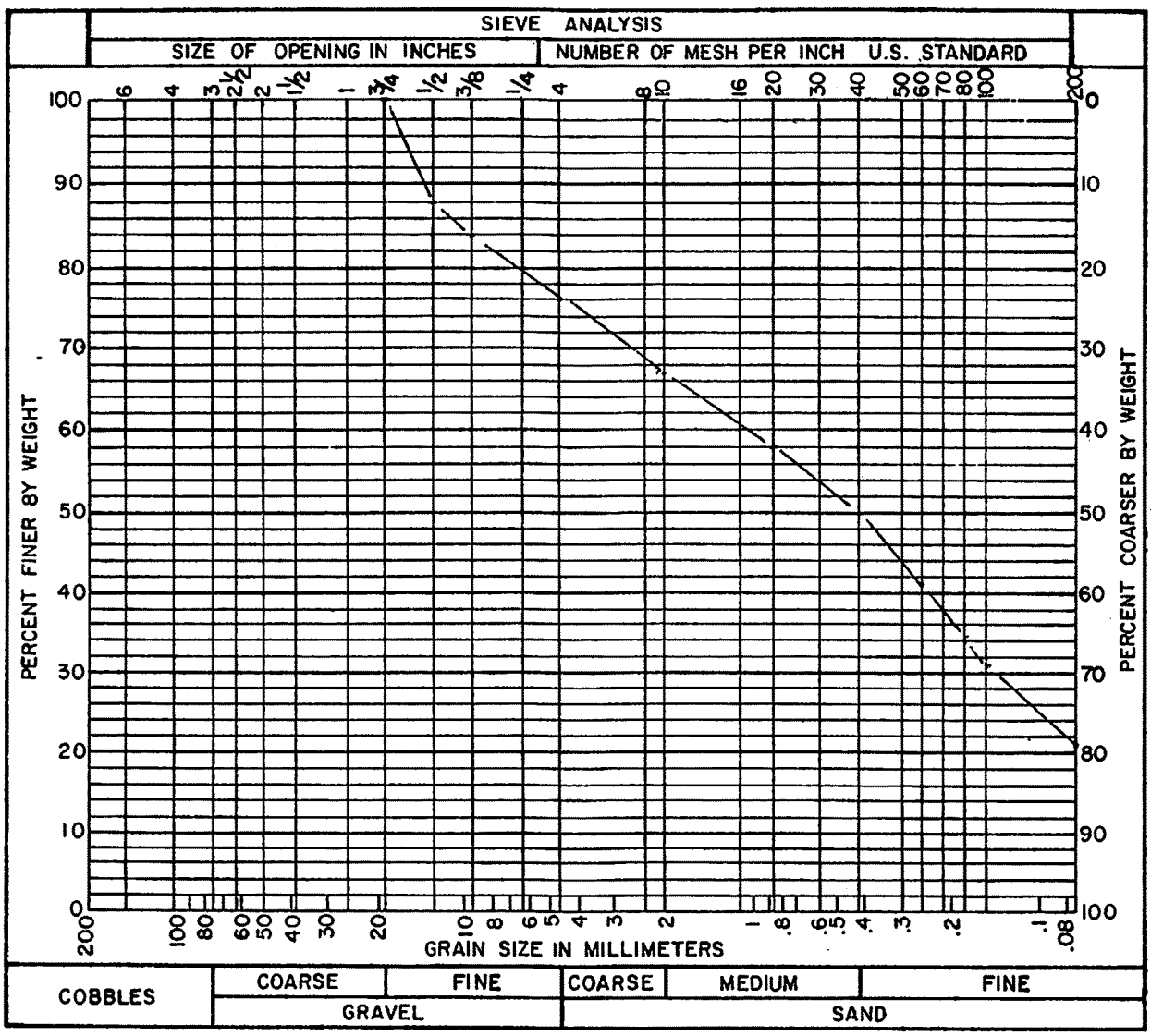
MATERIAL SOURCE 3-A/ 0 to 12' below O.G.

LOCATION SAMPLED 170'Ft Fairbanks St/Ft E-49th Ave BY M. Krueger

COMMENTS SM/F-2/Silty 21% Gravelly 24% Sand 55% / 6% Moisture

REPORTED TO

PLOTTED BY [illegible] CHECKED BY BD MATERIALS SUPERVISOR T.O. Rein



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-11

PROJECT E-48th Ave RID Test Holes DATE Jan. 13, 1981

CONTRACTOR

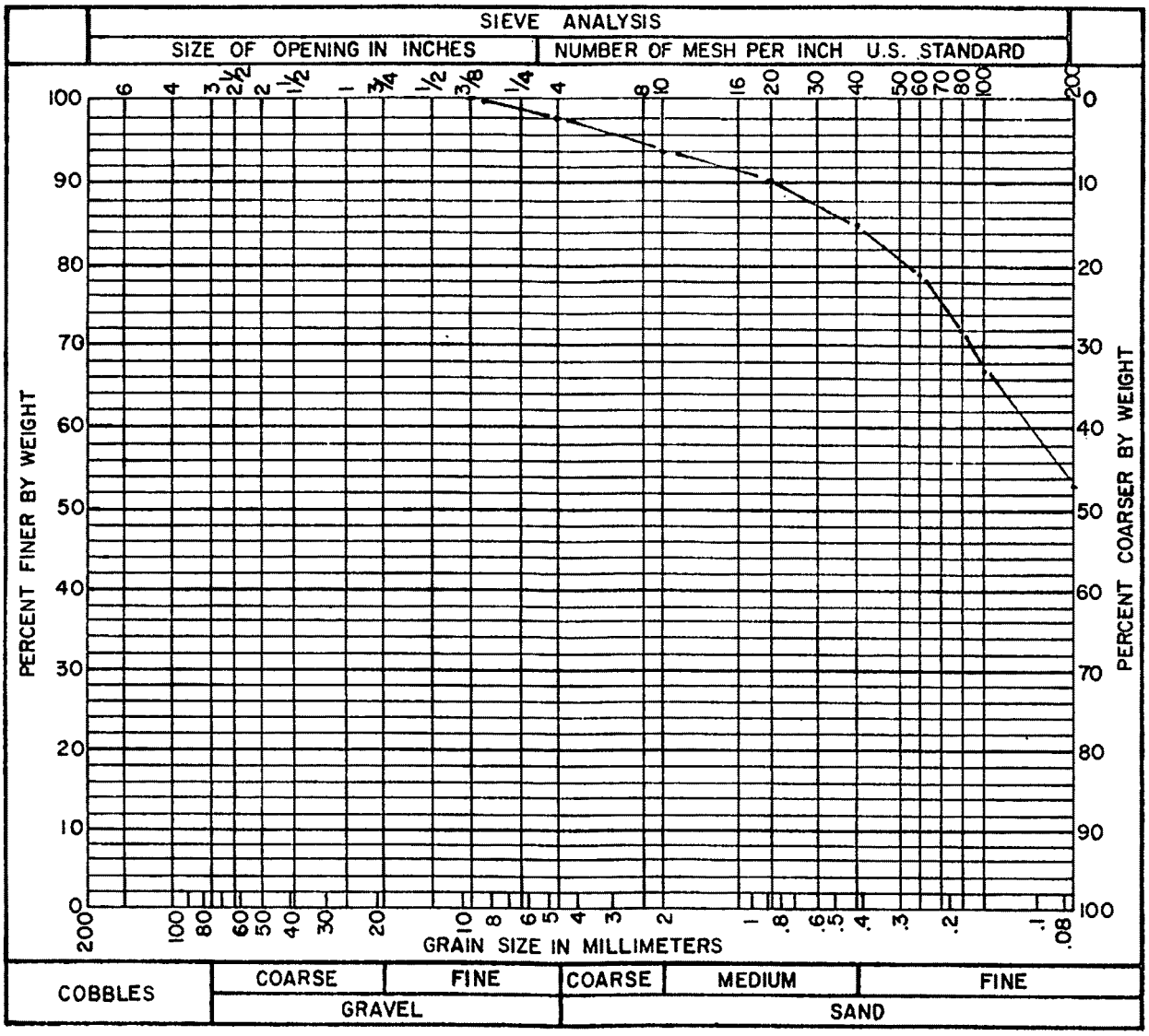
MATERIAL SOURCE 3-B/1'9" to 3'5" below O.G.

LOCATION SAMPLED 170' E. Fairbanks St. & 48th Ave BY M. Krueger

COMMENTS ML/E-4/Sandy Silt/21% Moisture/2% Gravel/45% 53%

REPORTED TO

PLOTTED BY [illegible] CHECKED BY BD MATERIALS SUPERVISOR L.O. Lemmons



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-12

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

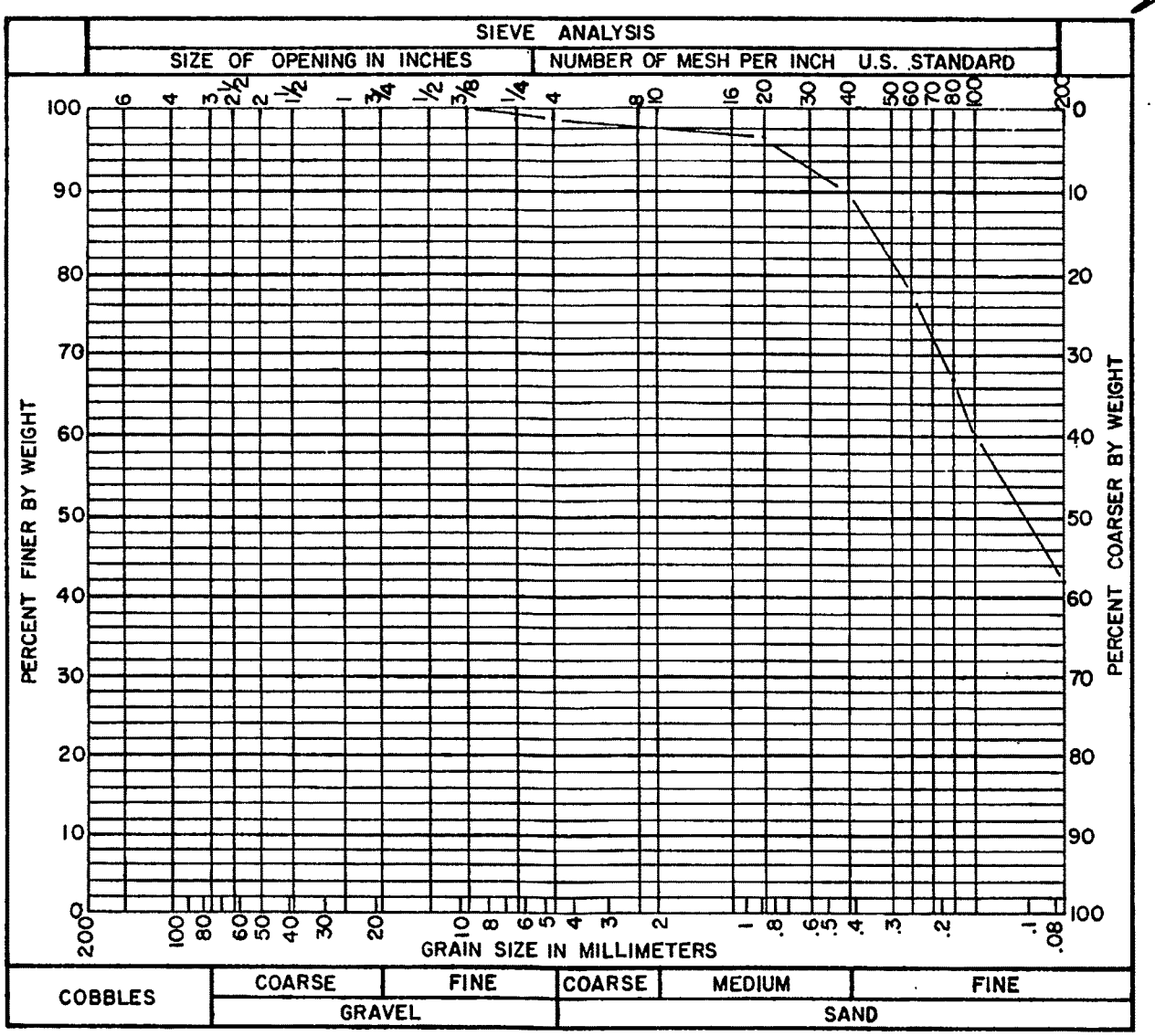
MATERIAL SOURCE 3-C/3½' to 5½' below O.G.

LOCATION SAMPLED 170' E/C Fairbanks St./E 48th Ave. BY M. Krueger

COMMENTS SM/E-4/Very Fine Silty Sand 42% 57%/14% Moisture/1% Gravel

REPORTED TO

PLOTTED BY BD CHECKED BY MATERIALS SUPERVISOR T.O. Pouncy



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-13

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

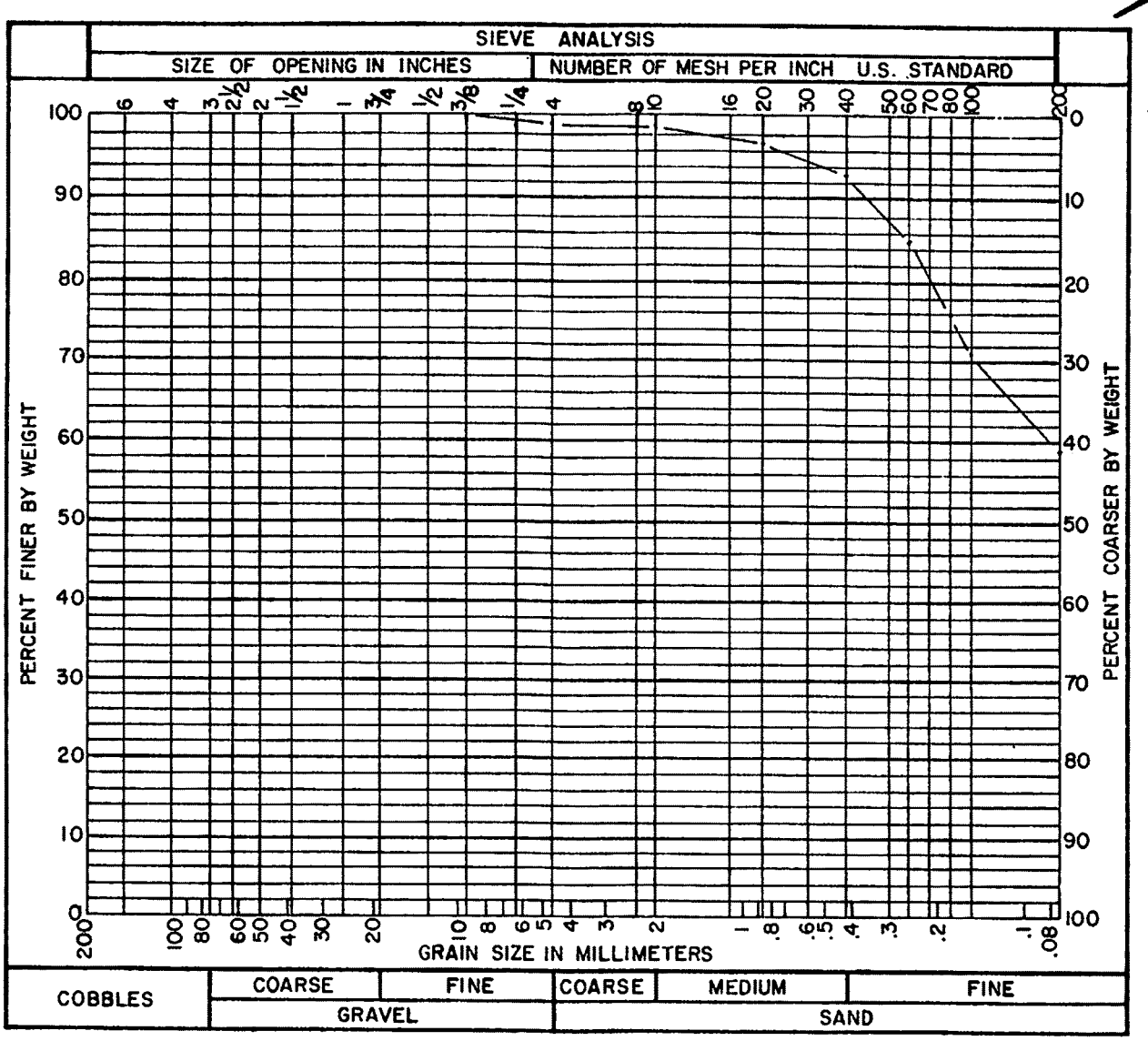
MATERIAL SOURCE 3-D/5'0" to 6'5" below O.G.

LOCATION SAMPLED 170' E/C Fairbanks St./C 48th Ave BY M. Krueger

COMMENTS ML/F-4/Sandy 40% Silt 59%/19% Moisture/1% Gravel

REPORTED TO

PLOTTED BY AD CHECKED BY MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-14

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

MATERIAL SOURCE 3-E/65' to 10' below O.G.

LOCATION SAMPLED 170 E & Fairbanks St/& 48th Ave BY M. Krueger

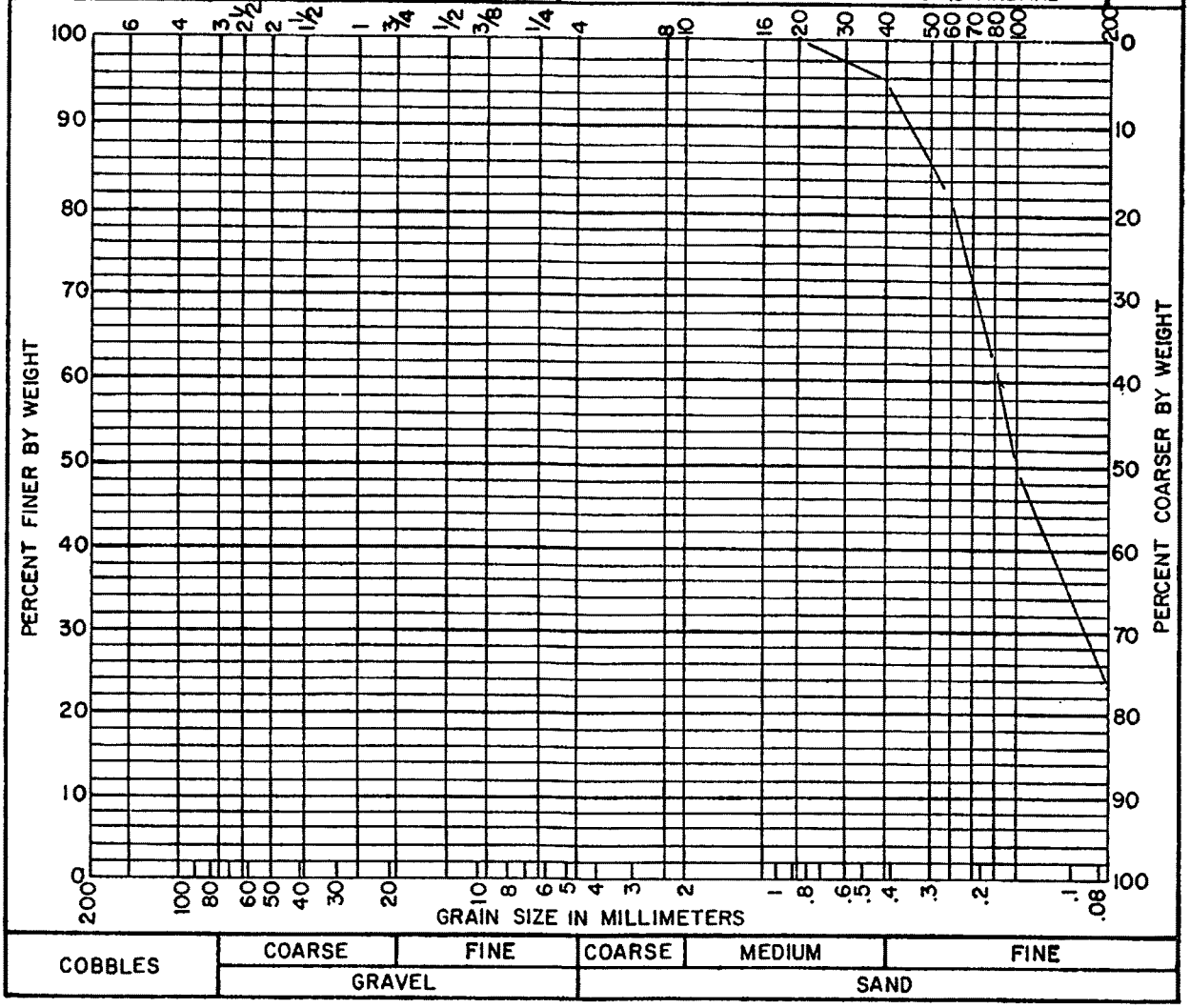
COMMENTS SM/E-2/Silty Sand/23% 77% /18% Moisture

REPORTED TO

PLOTTED BY BD CHECKED BY MATERIALS SUPERVISOR

SIEVE ANALYSIS

SIZE OF OPENING IN INCHES | NUMBER OF MESH PER INCH U.S. STANDARD



COBBLES	GRAVEL: COARSE	GRAVEL: FINE	SAND: COARSE	SAND: MEDIUM	SAND: FINE

INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 4 (35)

LOCATION 48TH AVE E/O / 155' W. ℄ OF FAIRBANKS ST ℄ OF 48TH AVE.

DATE 1/19/81

BY M.E. KRUEGER

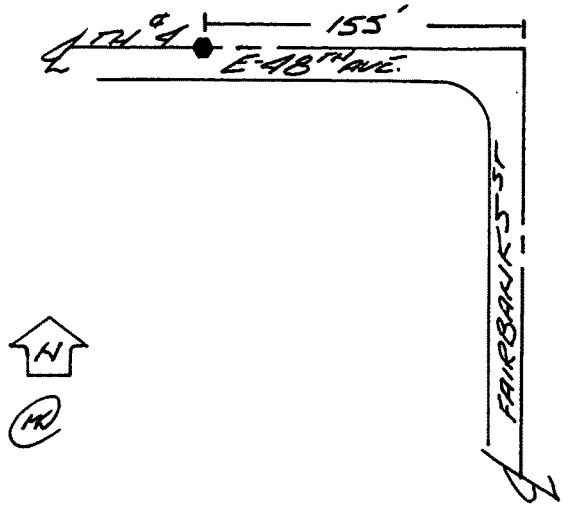
COMMENTS

DEPTH 10.2'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST GROUND / ROAD SURFACE
EX-15 4-A	1	SP-SM	F-2	BRN (39%) GVLY-SAND (99%) / SILT (12%) / MOIST. = 5% / HP MED. DENSE
	2			
EX-16 4-B	3	SM	F-4	TAN (96%) SILTY-SAND (99%) / GRAVEL (5%) / MOIST. = 12% HP / MED. DENSE
	4			
EX-17 4-C	5	ML	F-4	TAN (3%) SAND-SILT (96%) / MOIST. = 29% / GRAVEL = 1% HP / DENSE
	6			
EX-18 4-D	7	ML	F-4	OLIVE (19%) SAND-SILT (80%) / MOIST. = 26% / GRAVEL = 1% SEMI-ELASTIC / DENSE
	8			
	9			
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-15

PROJECT E-49th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR

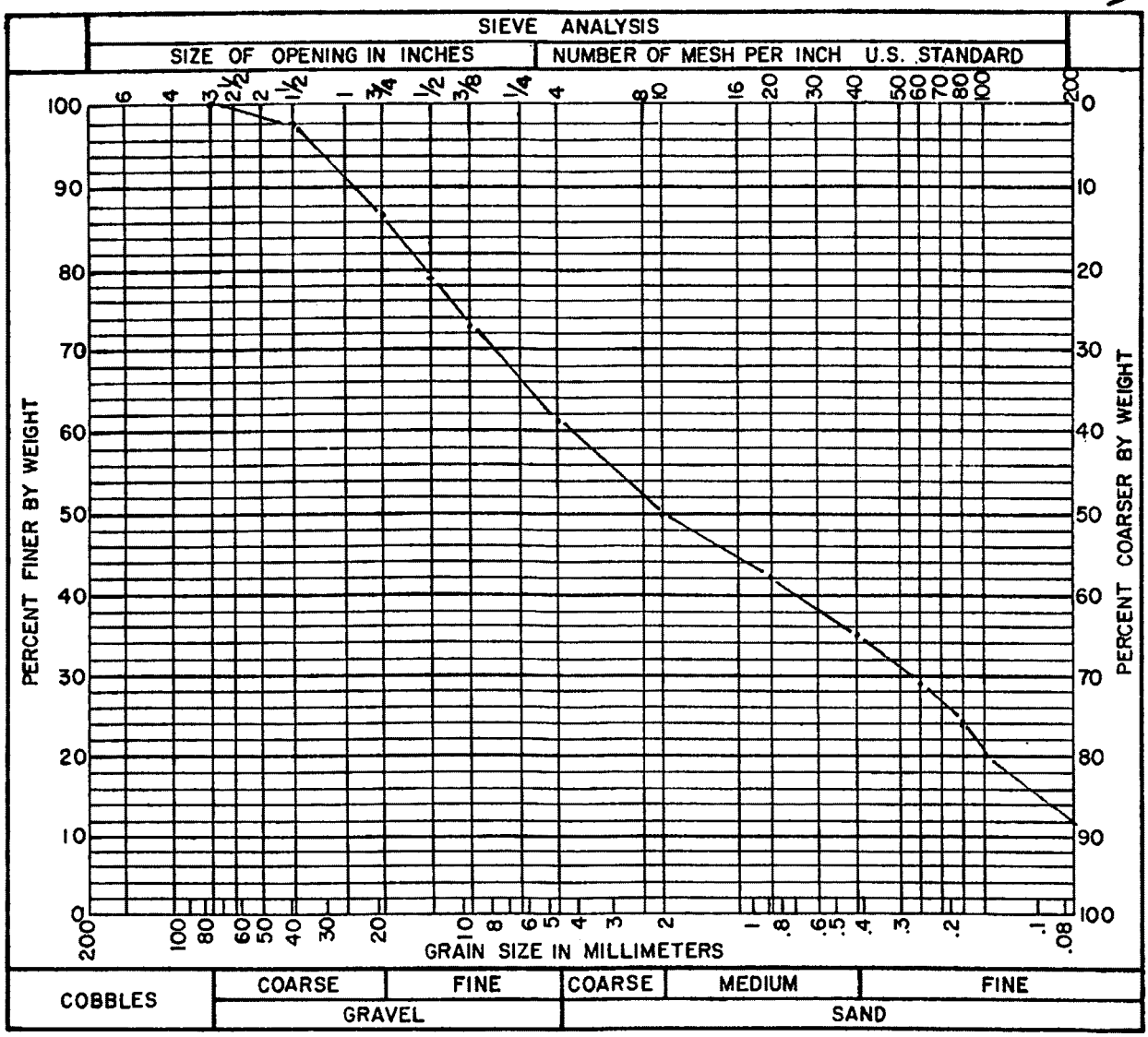
MATERIAL SOURCE 4-A/0 to 10' below O.G.

LOCATION SAMPLED 155' W/E Fairbanks St/E 48th Ave BY M. Krueger

COMMENTS SP-SM/E-2/ Gravelly Sand 39% w/ Silt 49% / 12% / 5% Moisture

REPORTED TO

PLOTTED BY ZZ CHECKED BY BD MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-16

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

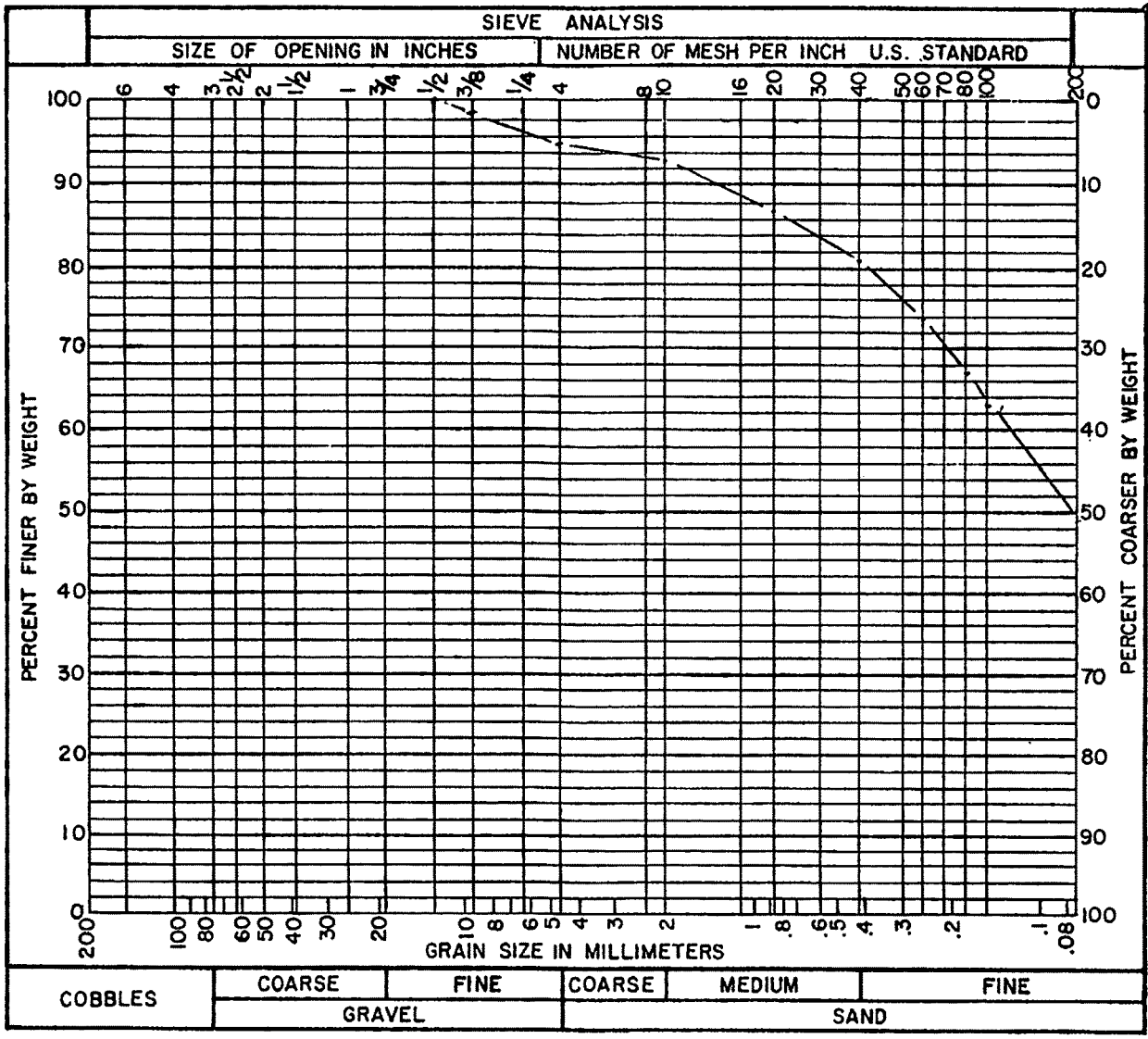
MATERIAL SOURCE 4-B/ 12' to 35' below O.G.

LOCATION SAMPLED 155' W of Fairbanks St./ E 48th Ave BY M. Krueger

COMMENTS SM/F-4/Silty Sand/Gravel/12% Moisture

REPORTED TO

PLOTTED BY CHECKED BY BD MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. Ex-17

PROJECT E-48th Ave RID Test Holes DATE Jan 14, 1981

CONTRACTOR :

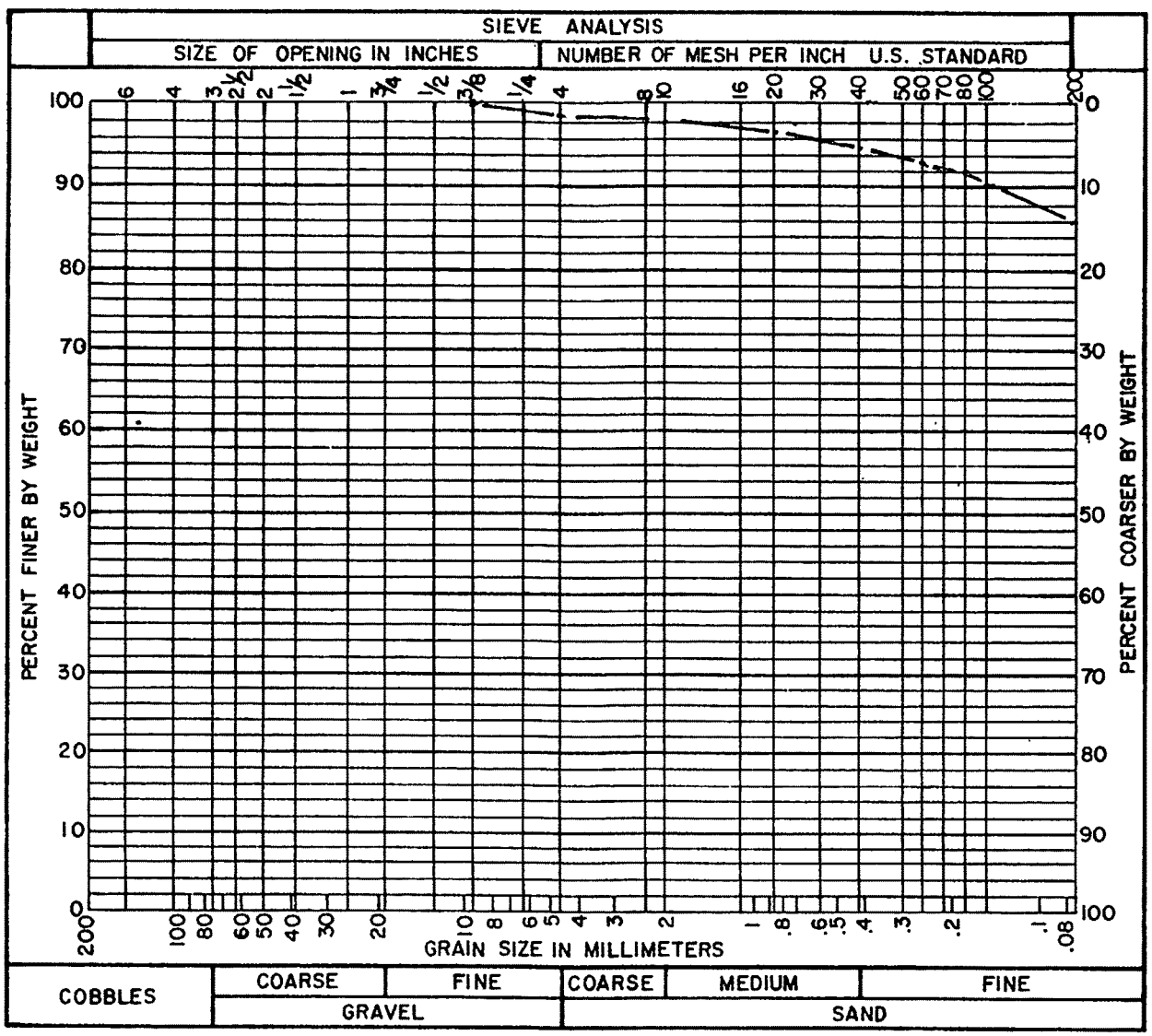
MATERIAL SOURCE 4-C/35' to 60' below O.G.

LOCATION SAMPLED 155 W/ Fairbanks St. / & 48th Ave. BY M. Krueger

COMMENTS ML/E-4/Sandy 13% Silt 86% /29% Moisture / 1% Gravel

REPORTED TO

PLOTTED BY EC CHECKED BY BD MATERIALS SUPERVISOR T. O'Leary



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-18

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

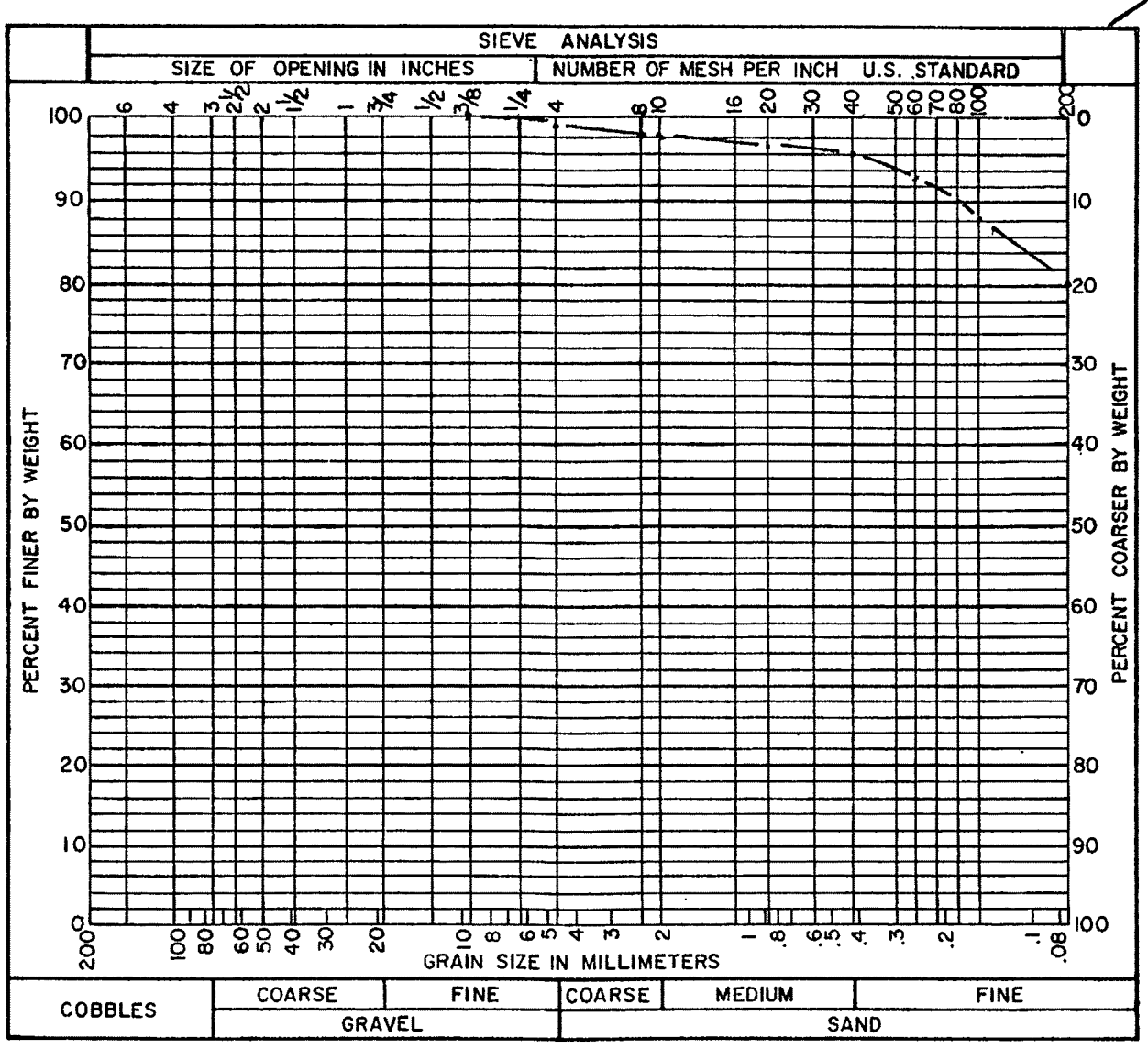
MATERIAL SOURCE 4-D / 6'0" to 10'0" below O.G.

LOCATION SAMPLED 155'W & Fairbanks St / & 48th Ave BY M. Krueger

COMMENTS ML / E-4 / Sandy Silt 30% / 26% Moisture / 1% Gravel 19%

REPORTED TO

PLOTTED BY LF CHECKED BY BD MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. S 36

LOCATION 48TH AVE E/O / 10' WEST ℄ OF EAGLE ST (SO. OF 48TH AVE) ℄ OF 48TH AVE

DATE 1/19/81

BY M.E. KRUEGER

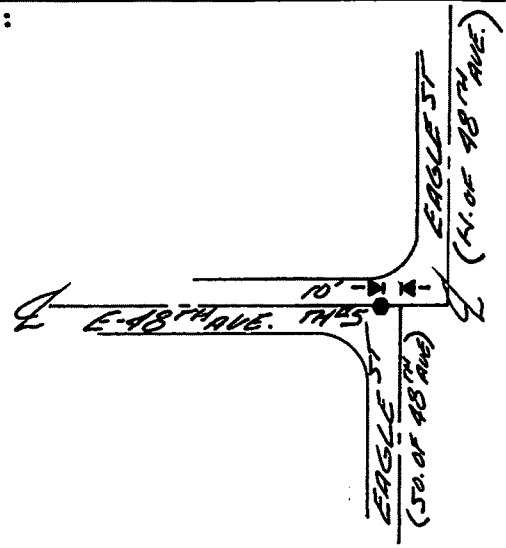
COMMENTS

DEPTH 10.0'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
				EXIST. GROUND / ROAD SURFACE
EX-19 S-A	0–1	GW-GM	F-1	BRN. SDY. GRAVEL (5%) (66%) / SLT (9%) / MOIST. = 4% / HP / MED. DENSE
EX-20 S-B	2–3	ML	F-4	TAN SDY SLT (58%) (53%) / MOIST. = 22% / GRAVEL = 5% / HP / MED. DENSE
EX-21 S-C	4–6	ML	F-4	TAN SDY SLT (37%) (73%) / MOIST. = 18% / HP / DENSE
EX-22 S-D	7–14	ML	F-4	OLIVE SDY SLT (77%) (87%) / MOIST. = 25% / HP / GRAVEL = 1% / DENSE

LOCATION SKETCH:



LEGEND

SYMBOL

TEST HOLE

WATER TABLE

FROZEN MATERIAL

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-19

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

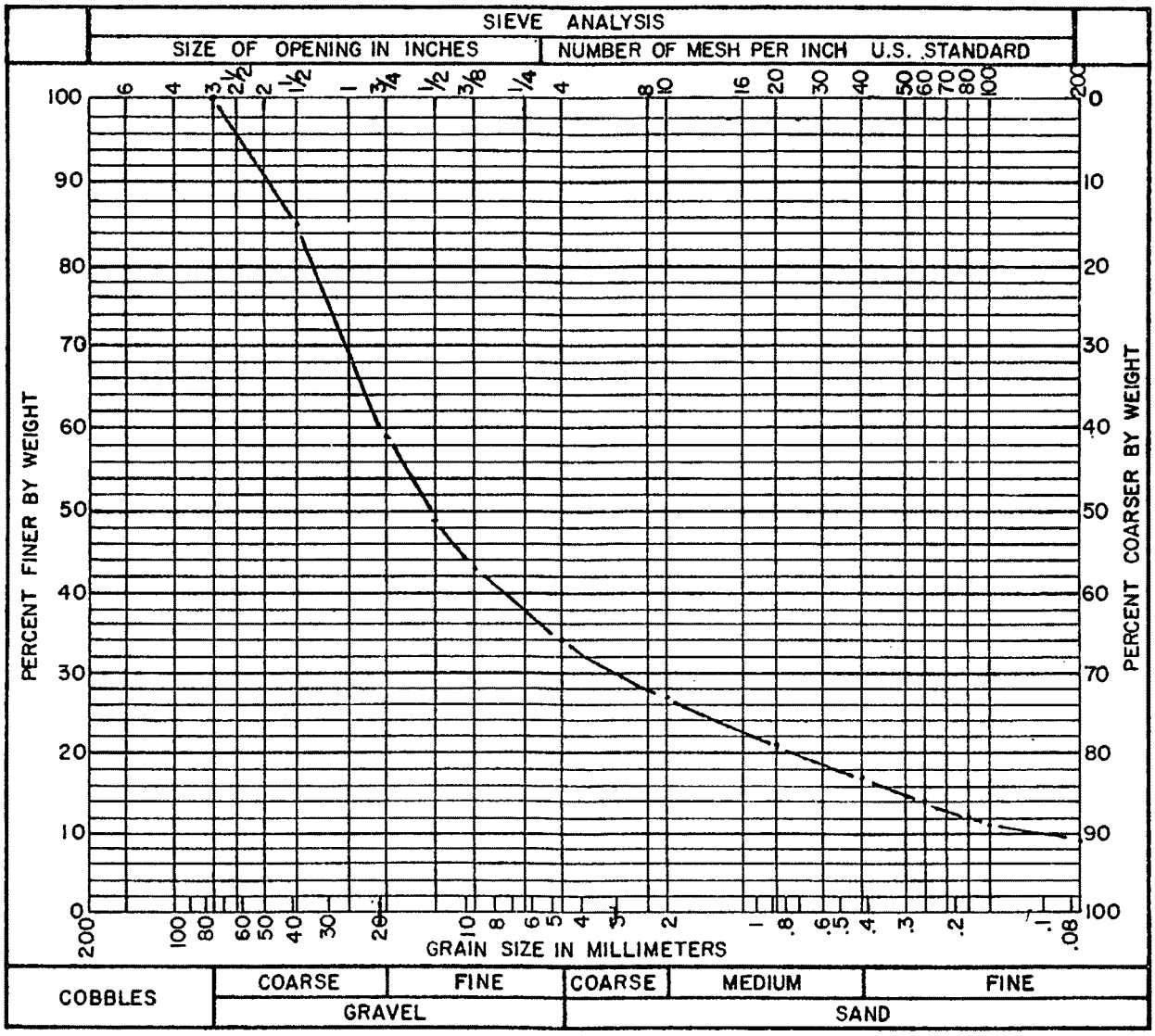
MATERIAL SOURCE 5-A/0 to 15' below O.G.

LOCATION SAMPLED 10' W/E Eagle St. / E 48th Ave. BY M. Krueger

COMMENTS GW-GM/F-1/ 25% Sandy 66% Gravel w/ 9% Silt / 4% Moisture

REPORTED TO

PLOTTED BY [illegible] CHECKED BY BD MATERIALS SUPERVISOR T. D. Lemmons



INSPECTOR'S COMMENTS

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-20

PROJECT E-48th Ave BID Test Holes DATE Jan. 14, 1981

CONTRACTOR

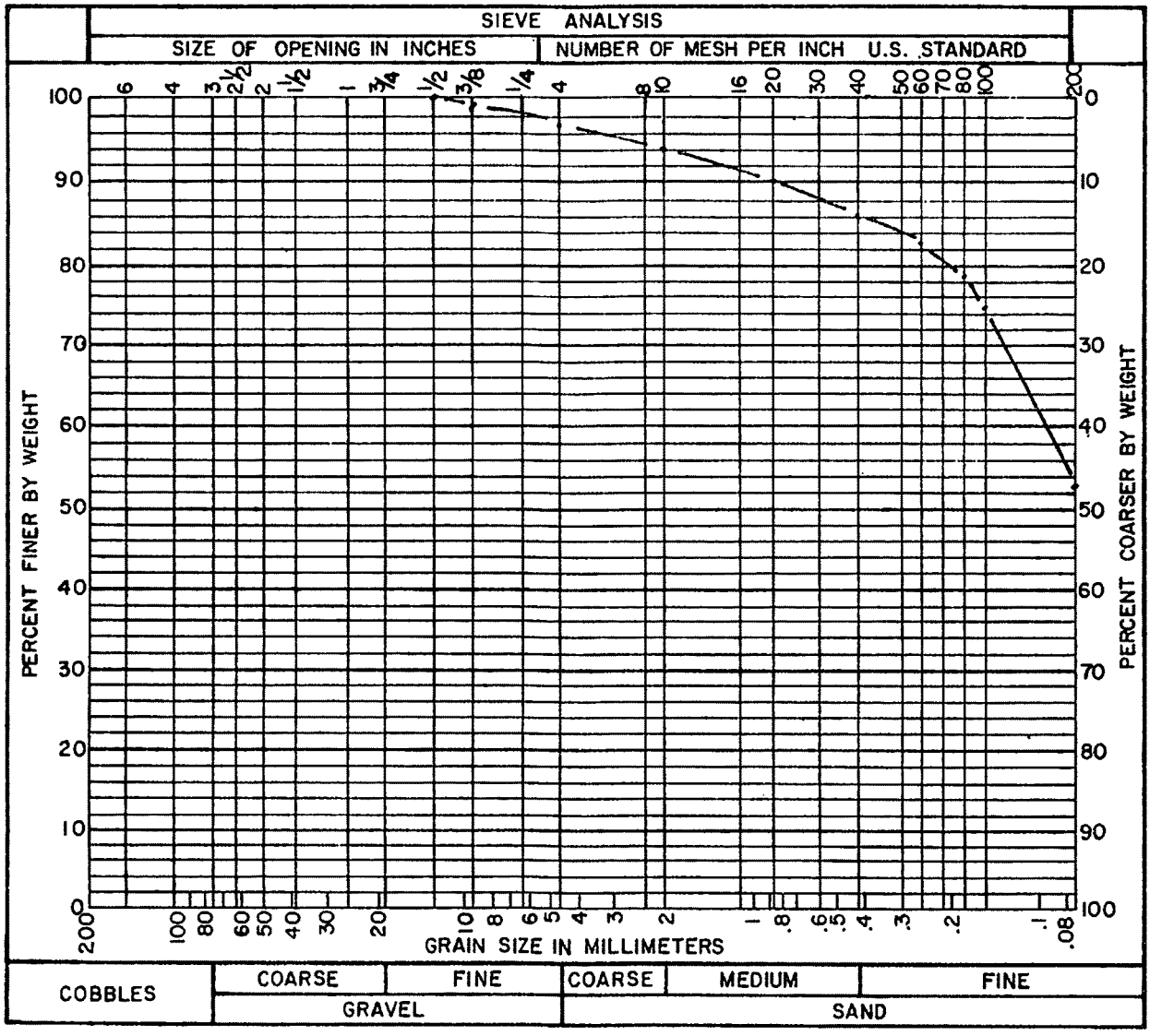
MATERIAL SOURCE 5-B/15' to 30' below O.G.

LOCATION SAMPLED 10' W/E Eagle St./E 48th Ave BY M. Krueger

COMMENTS ML/F-4/Sandy Silt/22% Moisture/3% Gravel (44% 53%)

REPORTED TO

PLOTTED BY CHECKED BY BD MATERIALS SUPERVISOR P.O. Peyton



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-21

PROJECT E-48th Ave. RID Test Holes DATE M. Krueger

CONTRACTOR

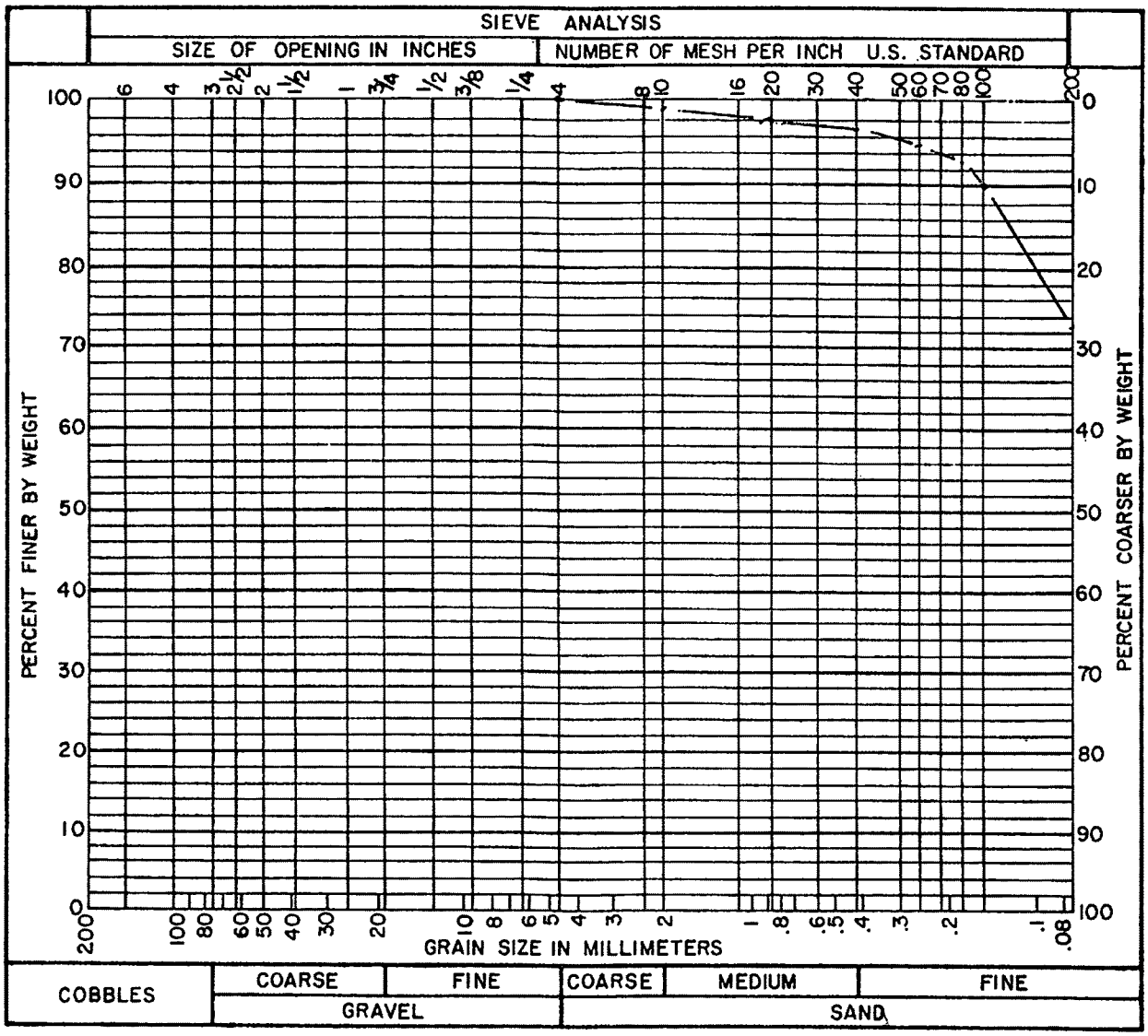
MATERIAL SOURCE S-C/3'0" to 6'5" below O.G.

LOCATION SAMPLED W. of Eagle St. / E 48th Ave. BY M. Krueger

COMMENTS ML/E-4/Sandy 20% Silt 73% / 18% Moisture

REPORTED TO

PLOTTED BY [illegible] CHECKED BY BD MATERIALS SUPERVISOR [signature]



INSPECTOR'S COMMENTS

82·009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-22

PROJECT E-48th Ave RID — Test Holes — DATE Jan. 14, 1981

CONTRACTOR

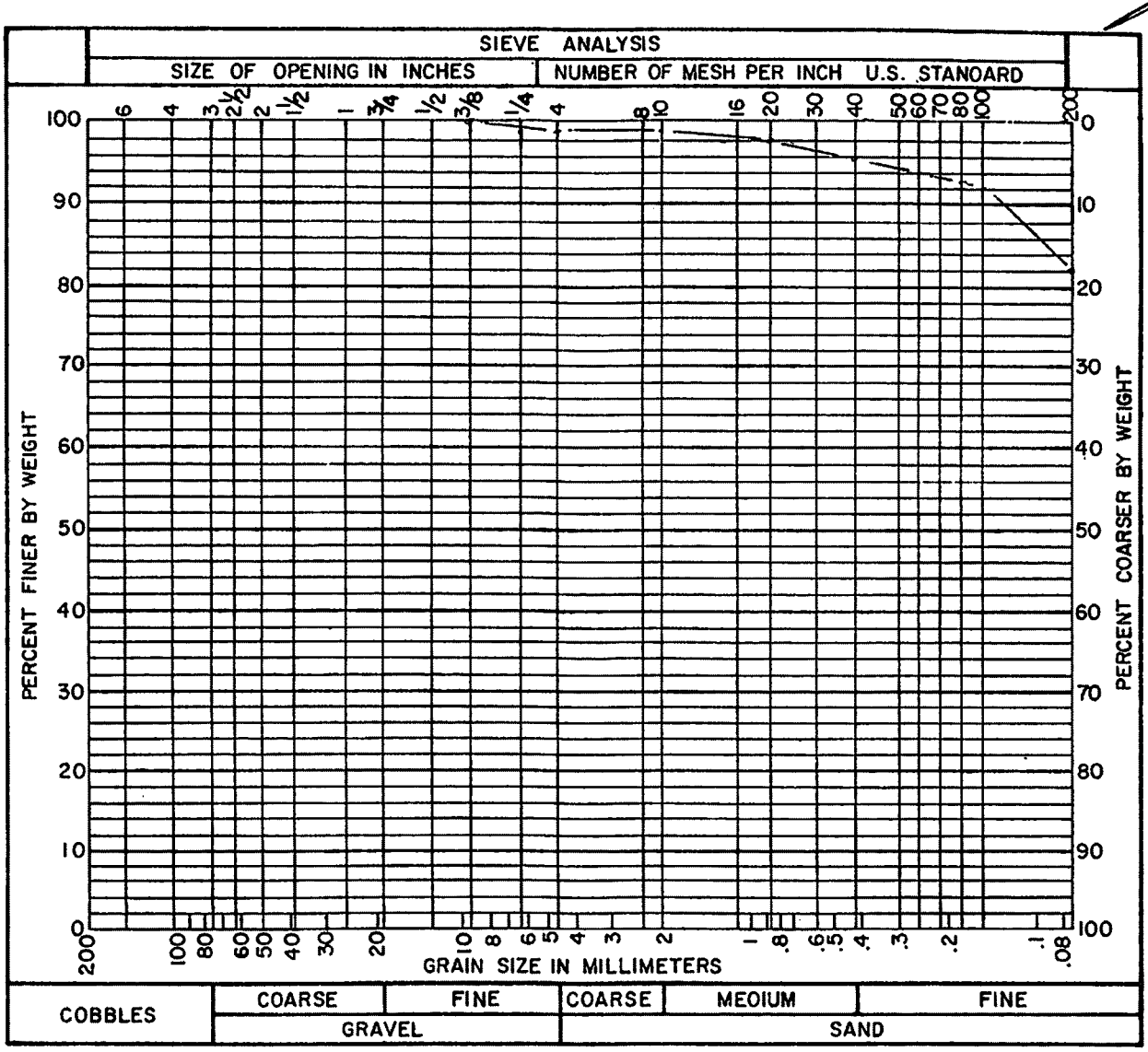
MATERIAL SOURCE 5-D/6.5' to 10.0' below O.G.

LOCATION SAMPLED 10' mid Eagle St/E 48th Ave — BY M. Krueger

COMMENTS ML/F-4/Sandy Silt/17% @ 92%/25% Moisture/1% Gravel

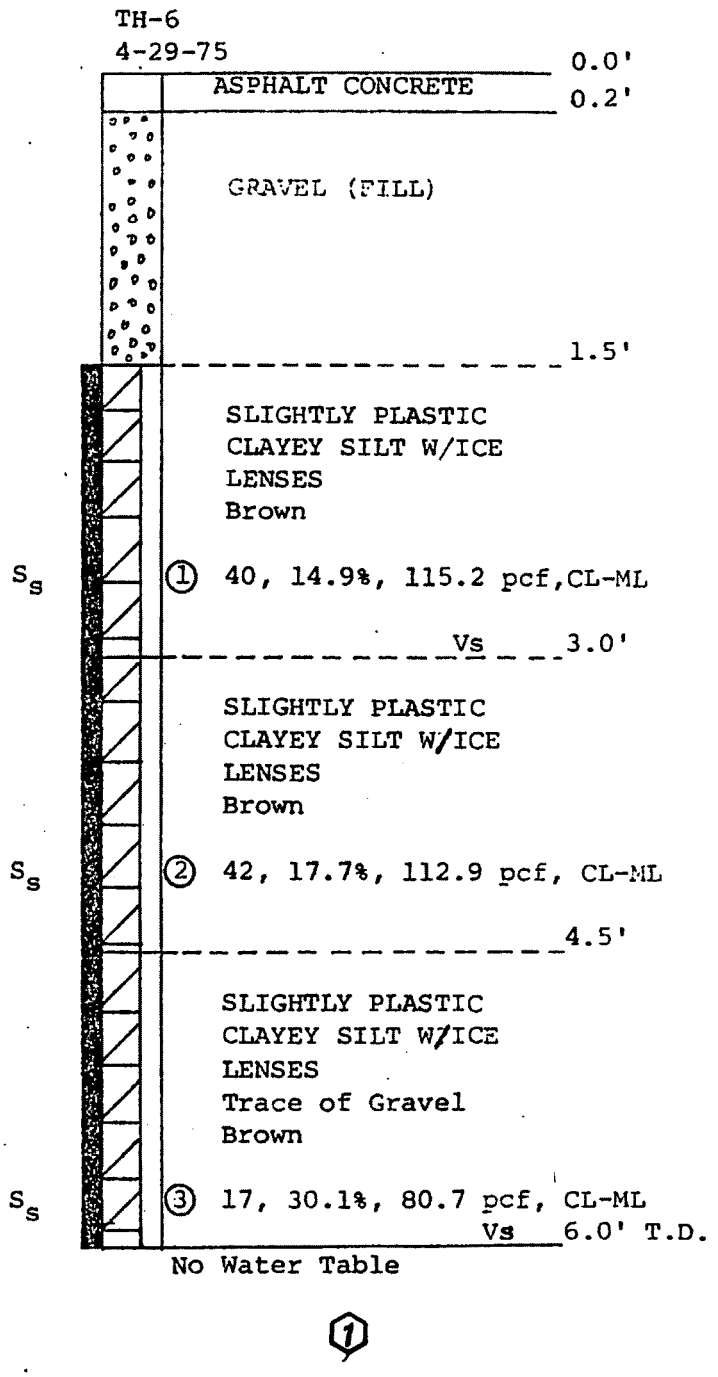
REPORTED TO

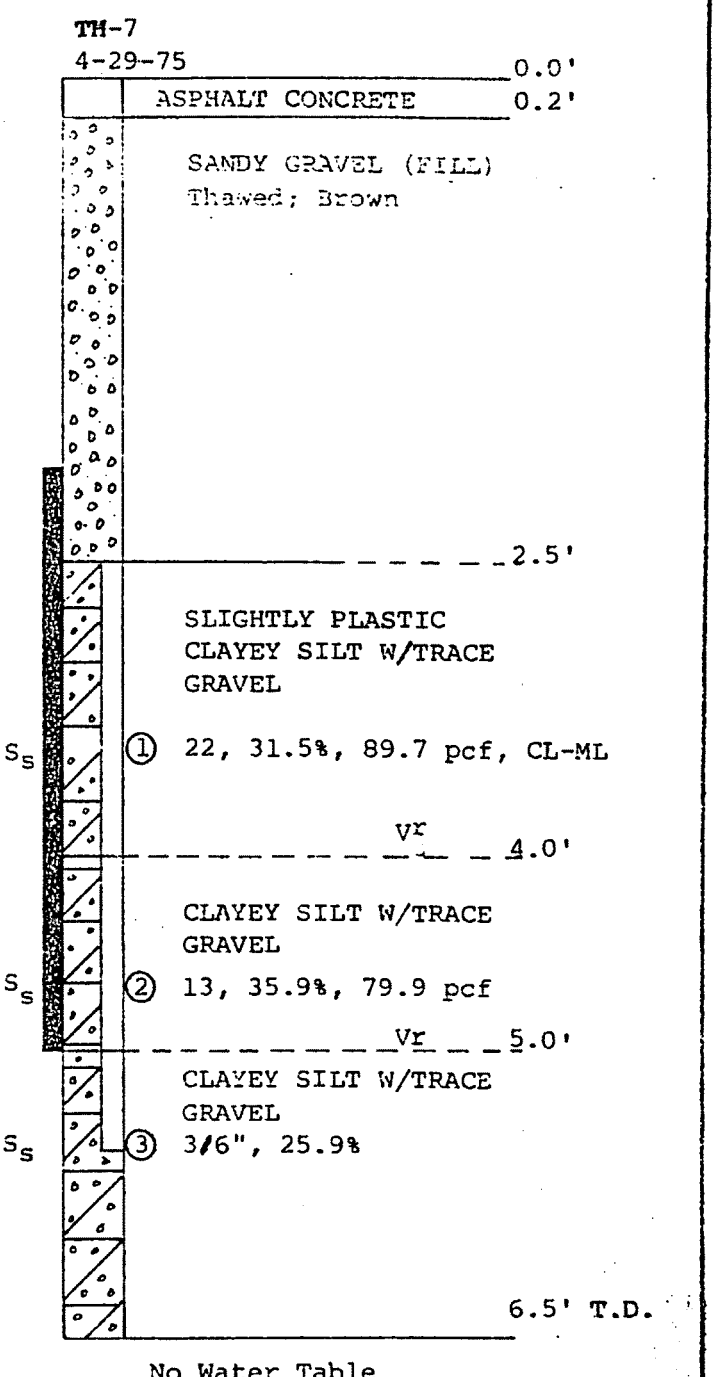
PLOTTED BY ___ CHECKED BY BD MATERIALS SUPERVISOR ___



INSPECTOR'S COMMENTS

82-009 (2/77)

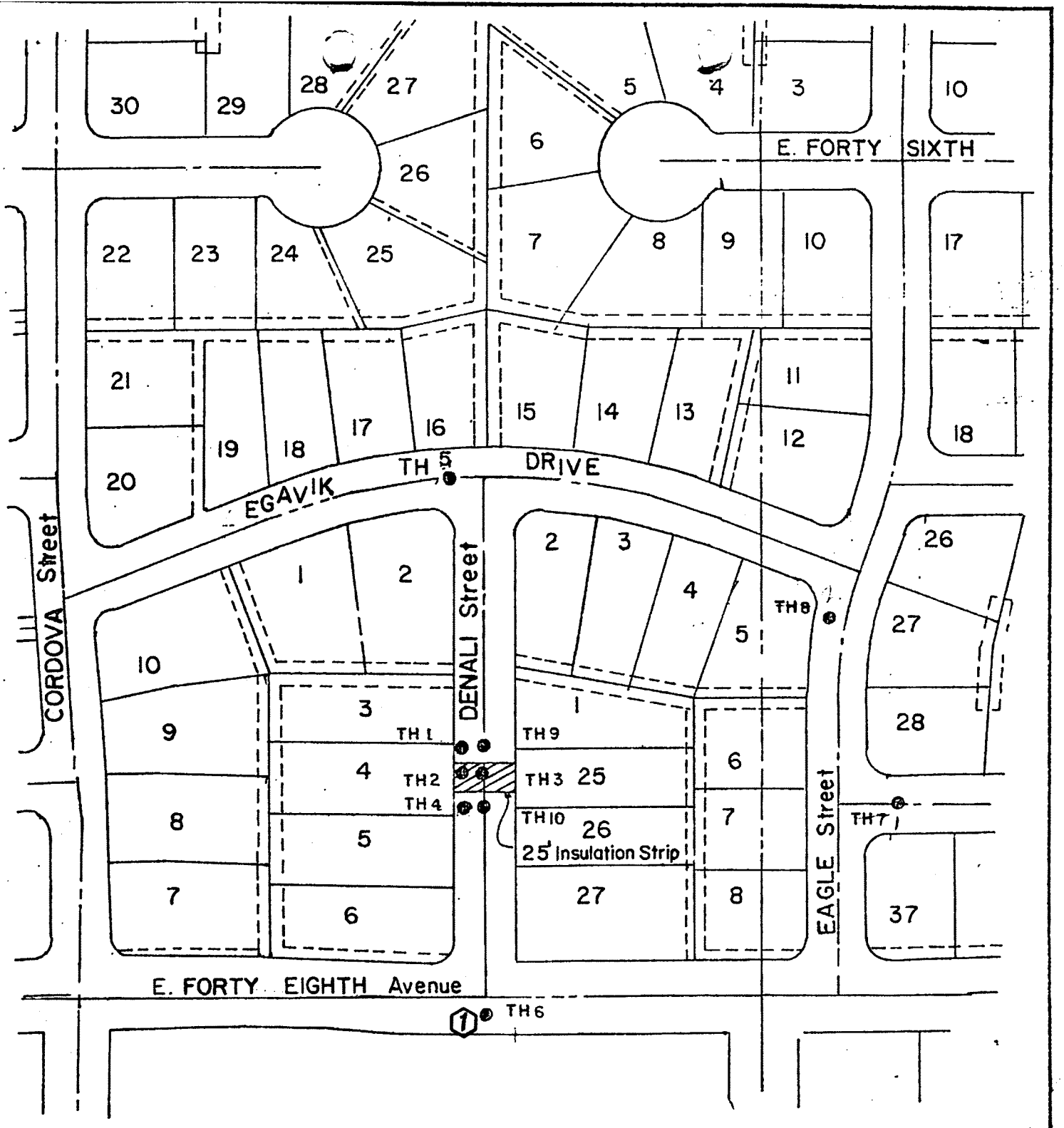




Greater Anchorage Area Borough
Heather Meadows
Log of Test Holes
Anchorage, Alaska

R&M Consultants Inc.
ANCHORAGE FAIRBANKS ALASKA JUNEAU

DATE	SCALE	DWN BY	CHKD BY	PROJ. NO.	DWG NO.
6/25/75	1:1	VRZ		551030	B-07

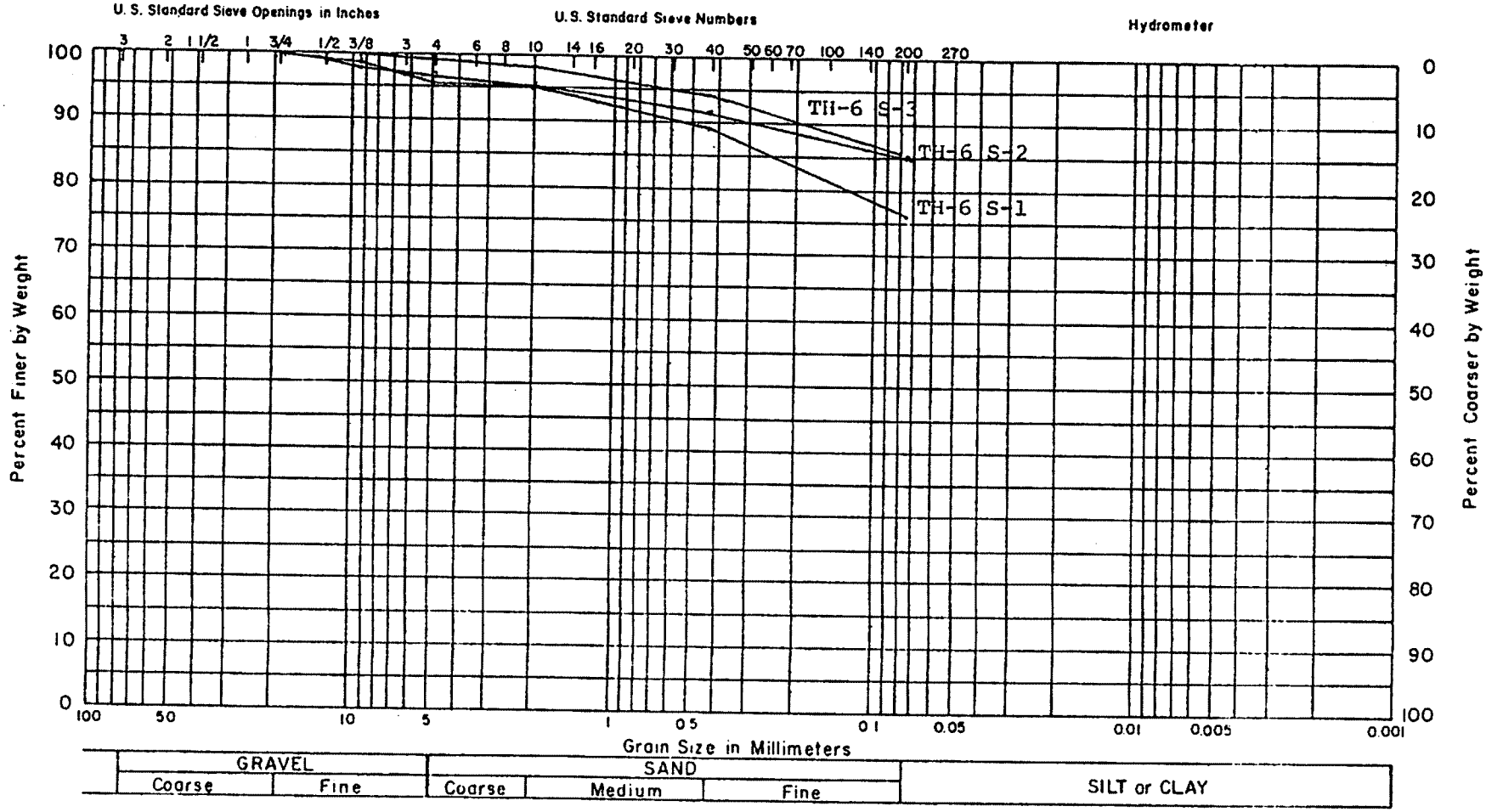


Greater Anchorage Area Borough
Heather Meadows
LOCATION DIAGRAM
Anchorage, Alaska

R&M Consultants Inc.
ANCHORAGE FAIRBANKS ALASKA JUNEAU

DATE	SCALE	DWN BY	CHKD BY	PROJ. NO.	DWG NO.
6/28/75		VRZ	NB	551030	A-1

42273



SAMPLE NO.	MOISTURE CONTENT	DRY DENSITY	LL	PI		CLASSIFICATION & DESCRIPTION
TH-6 S-1	14.9%	115.2	23	5		CL-ML
TH-6 S-2	17.7%	112.9	25	7		CL-ML
TH-6 S-3	30.1%	80.7	28	7		CL-ML

R & M CONSULTANTS, INC.

GRAIN SIZE DISTRIBUTION CURVE
GREATER ANCHORAGE AREA BOROUGH
HEATHER MEADOWS

DRAWN BY MAM
APPROVED BY CLV
DATE 6-26-75
PROJECT NO 551030

C-06

Lab No. 561025
PROJECT NO. 551030
PROJECT NAME GAAB-Heather Meadows

R & M CONSULTANTS, INC.

SUMMARY OF LABORATORY TEST DATA

DATE 6-27-75
PARTY NO. _____ PAGE NO. 1

LAB NO.	BORING NO.	SAMPLE NO.	DEPTH	1 1/2"	1"	3/4"	1/2"	3/8"	4	10	40	200	.02	.005	.002	FINE SPG	L.L.	P.I.	WET DENSITY	DRY DENSITY	MOISTURE CONTENT	CLASS
701	1	1	0.2 - 0.5			100	90	81	61	44	17	7										GW-GM
702	1	2	0.5 - 2.0																			
703	1	2B	2.0 - 2.5				100	96	94	89	75	51									28.1	GM
704	1	3	2.5 - 4.5				100	98	96	95	92	82				2.69	26	5	122.7	100.1	22.7	CL-ML
705	1	4	4.5 - 5.5					100	99	98	94	80									27.6	
706	1	5	7.0 - 9.0					100	99	97	92	79	59.0	29.6	13.4		26	8	137.9	120.1	14.8	CL
707	2	1	0.2 - 0.5	100	96	89	89	79	68	58	32	8									7.0	GW-GM
708	2	2	2.0 - 4.0					100	99	97	88	77					26	7			20.0	CL-ML
709	2	3	4.0 - 5.5			100	98	97	96	95	91	77	55.0	29.3	14.0		26	7	132.9	114.6	16.0	CL-ML
710	3	1	0.2 - 0.5	82	82	75	66	58	44	32	15	4										GW
711	3	2	2.0 - 4.0		100	96	96	96	96	96	94	85	67.0	38.1	12.2		27	7	131.7	115.5	14.0	CL-ML
712	3	3	4.0 - 6.0						100	99	98	89	56.0	26.7	11.1	2.68	27	7	131.0	108.4	20.9	CL-ML
713	4	1	2.5 - 4.0					100	99	99	97	90		12.6	2.8	2.68	28	5	120.8	98.0	23.3	CL
714	4	2	4.5 - 6.0				100	99	99	98	95	87	73.3	19.9	8.3		28	3	110.7	80.2	38.2	ML
715	5	1	0.2 - 0.5	83	76	70	62	59	50	40	17	3									4.3	GW
716	5	2	3.5 - 5.0				100	98	97	95	88	66	48.0	15.8	7.8	2.64	24	6	122.3	97.5	25.5	CL-ML
717	5	3	5.0 - 6.5			100	98	97	92	91	67	57	42,0	15.1	4.9		22	5	127.3	107.6	18.3	CL-ML
718	5	4	6.5 - 8.0							100	99	74	47.6	22.0	9.3		21	4			23.9	CL-ML
719	6	1	1.5 - 3.0			100	99	98	97	95	89	76	49.1	24.7	13.0	2.67	23	5	132.2	115.2	14.9	CL-ML
720	6	2	3.0 - 4.5			100	99	99	96	95	92	85	57.0	27.3	13.0		25	7	132.9	112.9	17.7	CL-ML

MARKS: 75A-715 - 2" = 100% passing

NOTE: SIEVE ANALYSIS = PERCENT PASSING

James W. Feeney
APPROVED

Lab No. 561025
PROJECT NO. 551030
PROJECT NAME GAAB-Heather Meadows

R & M CONSULTANTS, INC.

SUMMARY OF LABORATORY TEST DATA

DATE 6-27-75
PARTY NO. _____ PAGE NO. 2

LAB NO.	BORING NO.	SAMPLE NO.	DEPTH	1 1/2"	1"	3/4"	1/2"	3/8"	4	10	40	200	.02	.005	.002	FINE SPG	L.L.	P.I.	WET DENSITY	DRY DENSITY	MOISTURE CONTENT	CLA
721	6	3	4.5 - 6.0					100	99	98	94	85					28	7	104.9	80.7	30.1	CL-M
722	7	1	2.5 - 4.0					100	99	98	96	93	67.0	18.0	3.6	2.68	28	4	117.9	89.7	31.5	CI
723	7	2	4.0 - 5.0								100	96	75.0	26.8	7.2				108.6	79.9	35.9	
724	7	3	5.0 - 5.5				100	99	97	96	93	85	65.0	30.8	12.9						25.9	
725	8	1	2.5 - 4.0					100	98	98	95	84	60.0	28.3	9.9		27	5	122.9	97.2	26.4	CL-M
726	8	2	4.0 - 5.5																121.9	98.0	24.7	
727	8	3	5.5 - 6.0							100	99	95	70.0	33.2	11.7				117.9	91.3	29.2	
728	9	1	3.0 - 4.5				100	99	98	96	92	81	50.0	25.6	10.4		27	7	127.3	108.8	17.0	CL-M
729	9	2	4.5 - 6.0	100	86	86	84	84	83	82	80	66	42.0	20.0	9.3		23	6	128.9	108.2	19.2	CL-M
730	9	3	6.0 - 7.5					100	99	97	91	75	60.0	31.0	11.6				141.7	127.9	10.8	
731	10	1	2.5 - 4.0						100	99	98	91	50.0	15.4	8.8	2.71	28	5			29.9	CL-M
732	10	2	4.0 - 5.0							100	98	90							110.5	80.5	38.0	
733	10	3	5.0 - 5.5						100	99	98	90	55.0	26.0	10.5						25.8	

REMARKS: _____

NOTE: SIEVE ANALYSIS = PERCENT PASS

James W. Toomey

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 6 (9)

LOCATION 48TH AVE BTD / 5' W/L OF DENALI ST & OF 48TH AVE.

DATE 1/14/81

BY G.C. KRUEGER

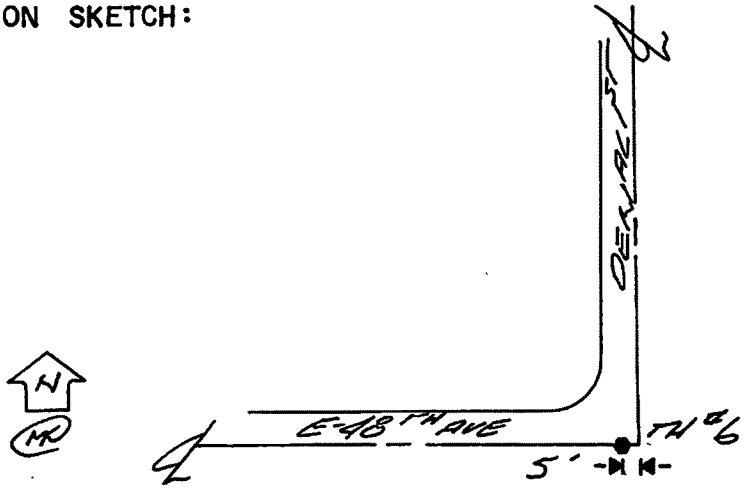
COMMENTS

DEPTH 10'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST. GROUND / ROAD SURFACE
EX-23 6-A	1	SM	F-2	GR. SAND (15%) - SILT (53%) - SAND (32%) / MOIST. = 5% / NP / DENSE
	2			
	3			
EX-24 6-B	4	ML	F-4	FAT. SILT (93%) - SAND (7%) / MOIST. = 14% / NP / GRAVEL = 1% / DENSE
	5			
	6			
	7			
EX-25 6-C	8	ML	F-4	GR. SILT (89%) W/ SAND (10%) / MOIST. = 26% / GRAVEL = 1% / NP / LOW DENSITY / SEMI-ELASTIC
	9			
	10			
	11			
	12			
	13			
	14			

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-23

PROJECT E-48th Ave. B10 Test Holes DATE Jan 14, 1981

CONTRACTOR

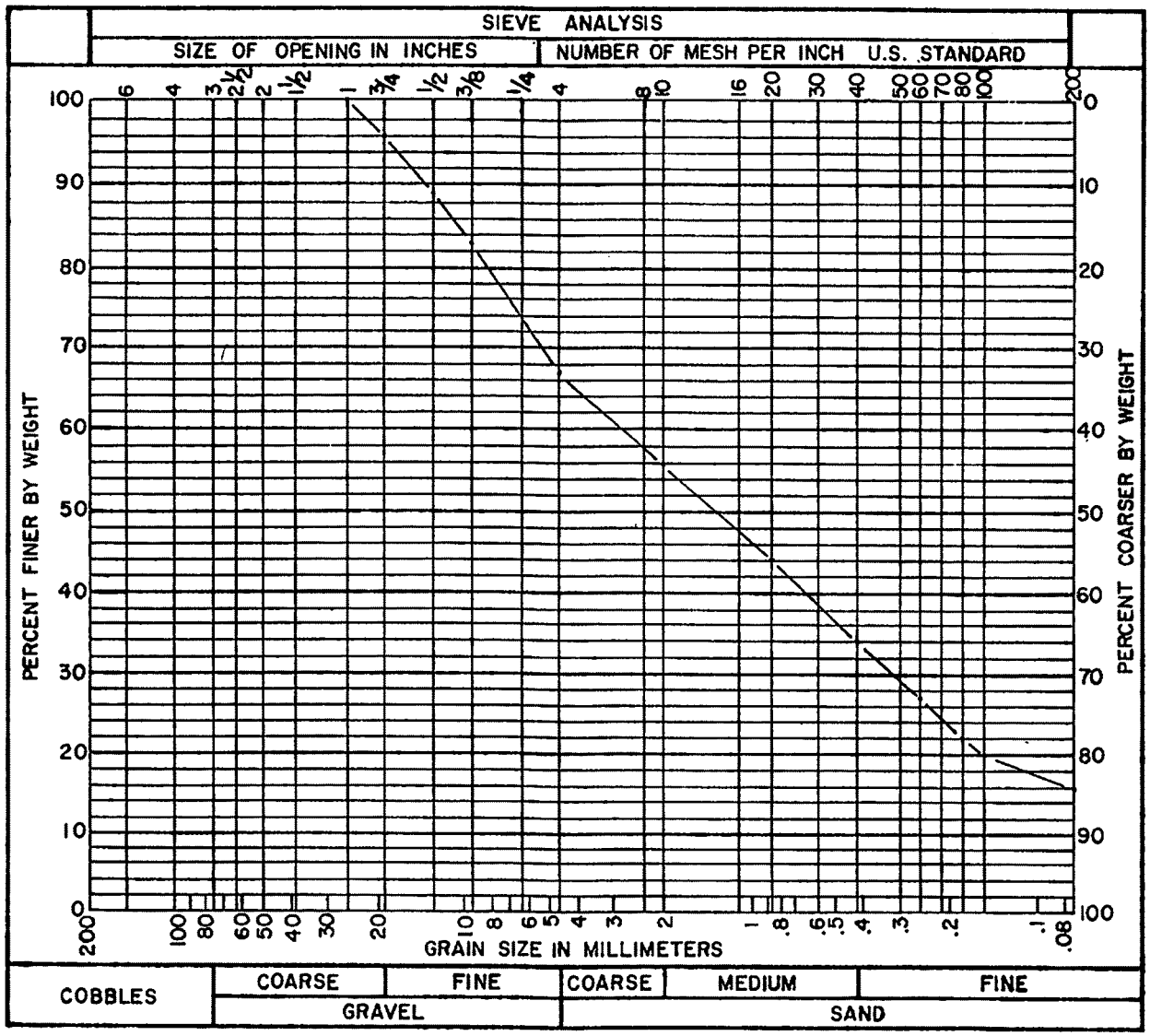
MATERIAL SOURCE 6-A/0 to 29' below O.G.

LOCATION SAMPLED S'ly/E Denali St/E 48th Ave. BY M. Krueger

COMMENTS SM/E-2/Silty 16% Gravely 33% Sand 51%/5% Moisture

REPORTED TO

PLOTTED BY BD CHECKED BY MATERIALS SUPERVISOR



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-24

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

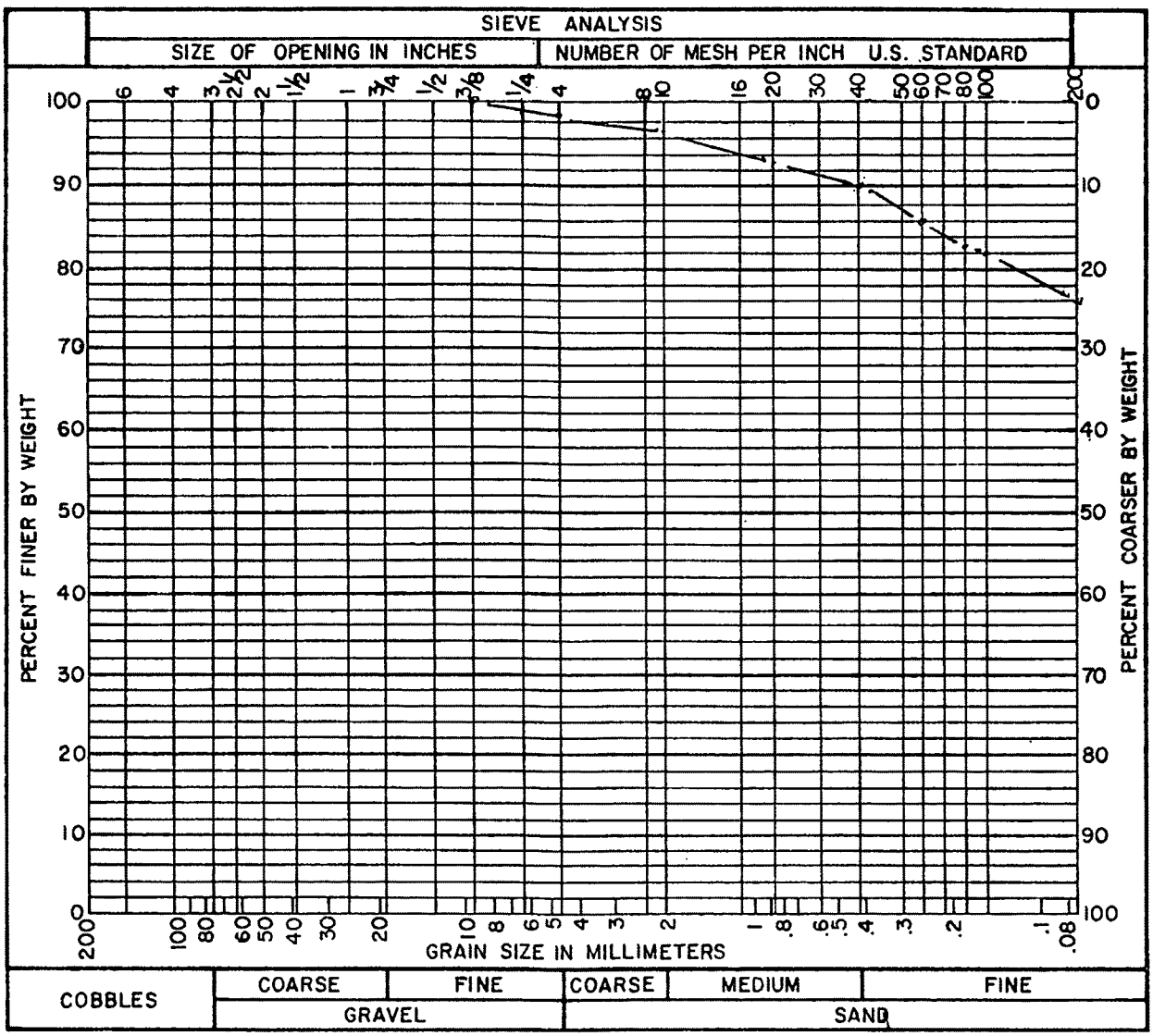
MATERIAL SOURCE 6-B/2⁰' to 6⁵' below O.G

LOCATION SAMPLED 5'W/E Denali St./E 48th Ave. BY M. Krueger

COMMENTS ML/E-4/Sandy Silt (23%) (76%)/14% Moisture/1% Gravel

REPORTED TO

PLOTTED BY [illegible] CHECKED BY BD MATERIALS SUPERVISOR [illegible]



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS
CONSTRUCTION DIVISION

FILE COPY

TEST NO. EX-25

PROJECT E-48th Ave RID Test Holes DATE Jan. 14, 1981

CONTRACTOR

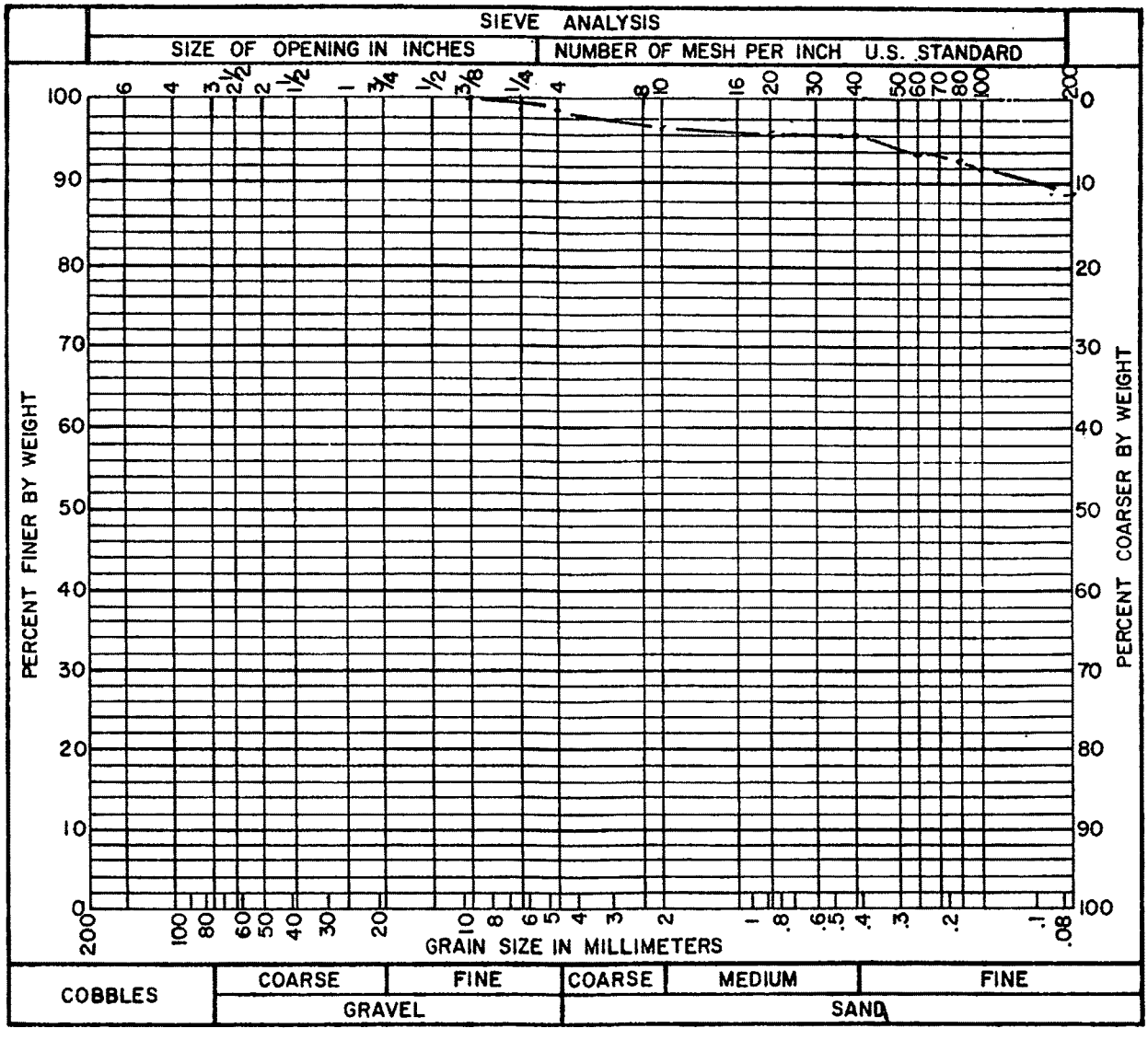
MATERIAL SOURCE 6-C/6.5' to 10.0' below O.G.

LOCATION SAMPLED 5'W/C Denali St. & 48th Ave BY M. Krueger

COMMENTS ML/E-4/Silt/89%/Sand/10%/26% Moisture/1% Gravel

REPORTED TO

PLOTTED BY CHECKED BY BD MATERIALS SUPERVISOR P.O. Peyton Jr.



INSPECTOR'S COMMENTS

82-009 (2/77)

MUNICIPALITY OF ANCHORAGE

DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION DIVISION

SOILS LOG

HOLE NO. 7 (10)

LOCATION 48TH AVE RID / 10' SO. ℄ OF 48TH AVE. ℄ OF GORDON ST

DATE 1/14/81

BY M.E. KRUEGER

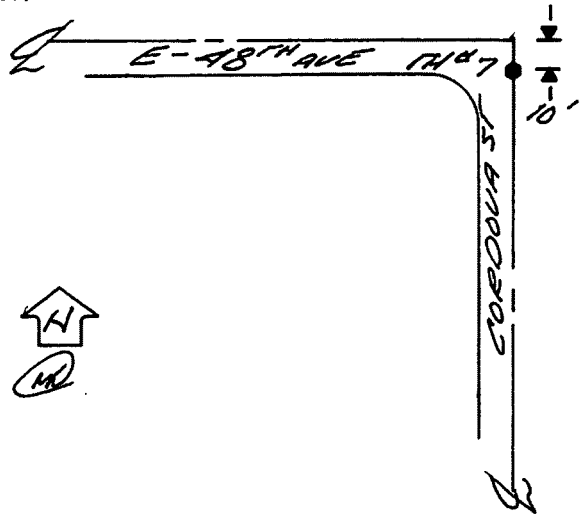
COMMENTS

DEPTH 10.0'

WATER TABLE NONE

	DEPTH	UNIFIED CLASS	FROST GROUP	DESCRIPTION
	0			EXIST GROUND / ROAD SURFACE
EX-26 7-A	1–3	GM	F-1	GR SAND-SILT-GRAVEL + ISOLATED COBBLES (53%-37%-10%) MOIST. = 6% / DRY / DENSE EST. +3" MAT'L = 10%
	4			
EX-27 7-B	5	ML	F-4	FILL SAND-SILT (50%-50%) / MOIST. = 17% / GRAVEL = 2% DENSE
	6			
EX-28 7-C	7–8	ML	F-4	GR. SAND-SILT (39%-60%) / MOIST. = 22% / DRY / GRAVEL = 1% / (SEMI-ELASTIC) DENSE
EX-29 7-D	9–14	SM	F-3	GR SILT-SAND (32%-68%) / MOIST. = 20% / DRY DENSE

LOCATION SKETCH:



LEGEND

SYMBOL

- TEST HOLE
- WATER TABLE
- FROZEN MATERIAL (2, 3, 4, 5)

ALL FROST CLASSIFICATION BASED ON THE .02mm = 50% OF THE -#200 UNLESS OTHERWISE NOTED

GRID NO. 1831

82-032 (2/81)

Appendix D

Site Investigation Photos

Included in this section:

1) Select Site Investigation Photos

48th Avenue and Cordova Street, Anchorage, AK
Site Investigation Photos

Photo	Description
	Marking of BH locations and utility locate meeting.
	BH marking for BH-08.

48th Avenue and Cordova Street, Anchorage, AK
Site Investigation Photos

Photo	Description
	Setting up to drill BH-10.
	Setting up traffic control for BH-10.

48th Avenue and Cordova Street, Anchorage, AK
Site Investigation Photos

Photo	Description
	November 2018 water level measurements.
	November 2018 water level measurements on 48th Ave.

Appendix E

BERG2 Thermal Analysis Output

Included in this section:

1) BERG2 Thermal Analysis Output – 2” Insulated Section
2) BERG2 Thermal Analysis Output – 3” Insulated Section

BERG2 Analysis – Limited Subgrade Frost Penetration Analysis – 2” Insulated Section

LOCATION/CLIMATE:

```
   FAIRBANKS          ANCHORAGE          JUNEAU             McKINLEY PARK
   NORTHWAY           DILLINGHAM         POINT BARROW       BETHEL
   KOTZEBUE           GULKANA            CENTRAL            USER INPUT

  LOCATION NAME..................... ANCHORAGE
  THAW N FACTOR..................... 1.7
  FREEZE N FACTOR................... 1
  DESIGN AIR THAWING INDEX °DAYS.... 4000
  DESIGN AIR FREEZING INDEX °DAYS... 3200
  MEAN AIR THAWING INDEX °DAYS...... 3500
  MEAN AIR FREEZING INDEX °DAYS..... 2300
  MEAN ANNUAL AIR TEMP. °F.......... 35.3
  AMPL. OF AIR TEMP. SINE WAVE...... 24.7

  DESIGN SURFACE THAWING INDEX °DAYS.... 6800
  DESIGN SURFACE FREEZING INDEX °DAYS... 3200
  MEAN SURFACE THAWING INDEX °DAYS...... 5950      THAW SEASON  FREEZE SEASON
  MEAN SURFACE FREEZING INDEX °DAYS..... 2300        LENGTH       LENGTH
  MEAN ANNUAL SURFACE TEMP. °F.......... 42     AIR  198          167
  AMPL. OF SURFACE TEMP. SINE WAVE...... 34     SURF 217.2        147.8

INPUT FIRST LETTER OF DESIRED LOCATION
OR USE CURSOR CONTROL KEYS TO MOVE CURSOR AND CHANGE DATA

F1-COLOR  F2-SAVE  F3-LOAD  F4-DISK     S-SOILS  R-RUN  L-NEW SCREEN  Q-QUIT
```

ANALYSIS RESULTS:

```
LOCATION  THAW N  FREZ N  MAAT THAW °F DAY  FREZ °F DAY  THAW DAYS  FREZ DAYS
ANCHORAG   1.70     1.00    35        4000         3200        198        167

                                        1       2       3       4       5
          FROZEN % MOIS.              0.0     6.0     0.0     6.0    15.0
          FROZEN DENS.              138.0   130.0     1.8   130.0   102.0
          LATENT HEAT                 0    1123       0    1123    2203
          FROZEN HEAT CAP           28.00   26.00    3.00   26.00   24.99
  T C     FROZEN COND.              0.86    1.58    0.02    1.58    0.84
  H Y     THAWED % MOIS.              0.0     6.0     0.0     6.0    15.0
  A C     THAWED DENS.              138.0   130.0     1.8   130.0   102.0
  W L     THAWED HEAT CAP           28.00   29.90    3.00   29.90   32.64
    E     THAWED COND.              0.86    1.57    0.02    1.57    0.75
          INITIAL THICK             0.29    1.50    0.17    1.75    2.20
          AMOUNT THAWED             0.29    1.50    0.17    1.75    2.16
          CONSOLIDATION             ----    ----    ----    ----    ----
          FINAL THICK               0.29    1.50    0.17    1.75    2.20

  F C     LATENT HEAT                 0    1123       0    1123    2203
  R Y     FROZEN DENS.              138.0   130.0     1.8   130.0   102.0
  E C     FROZEN HEAT CAP           28.00   26.00    3.00   26.00   24.99
  E L     FROZEN COND.              0.86    1.58    0.02    1.58    0.84
  Z E     INITIAL THICK             0.29    1.50    0.17    1.75    2.20
  E       AMOUNT FROZEN             0.29    1.50    0.17    1.75    0.34

ESTIMATED THAW= 5.86          FREEZE= 4.05          PRINT LOCATION SOIL QUIT
```

SOIL INPUTS

Layer	Thickness (ft)	Density (pcf)	M.C. (%)	Comment
Asphalt	0.29	138	-	-
Fill (Type II-A)	1.50	130	6.0	
Insulation	0.17	1.8	-	
Fill (Type II)	1.75	130	6.0	
Subgrade	2.20	102	15	Average of all soils

RESULTS

Parameter	Value
Total Section Thickness	3.71 ft
Thaw Depth	5.86 ft
Freeze Depth	4.05 ft
Subgrade Frost Penetration	0.34 ft
Subgrade Frost Percent[1]	9.1%

1. Equal to Subgrade Frost Penetration divided by Total Section Thickness

BERG2 Analysis – Limited Subgrade Frost Penetration Analysis – 3” Insulated Section

LOCATION/CLIMATE:

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   FAIRBANKS          ANCHORAGE          JUNEAU             McKINLEY PARK
   NORTHWAY           DILLINGHAM         POINT BARROW       BETHEL
   KOTZEBUE           GULKANA            CENTRAL            USER INPUT

 LOCATION NAME..................... ANCHORAGE
 THAW N FACTOR..................... 1.7
 FREEZE N FACTOR................... 1
 DESIGN AIR THAWING INDEX °DAYS.... 4000
 DESIGN AIR FREEZING INDEX °DAYS... 3200
 MEAN AIR THAWING INDEX °DAYS...... 3500
 MEAN AIR FREEZING INDEX °DAYS..... 2300
 MEAN ANNUAL AIR TEMP. °F.......... 35.3
 AMPL. OF AIR TEMP. SINE WAVE...... 24.7

 DESIGN SURFACE THAWING INDEX °DAYS..... 6800
 DESIGN SURFACE FREEZING INDEX °DAYS.... 3200
 MEAN SURFACE THAWING INDEX °DAYS....... 5950        THAW SEASON  FREEZE SEASON
 MEAN SURFACE FREEZING INDEX °DAYS...... 2300           LENGTH       LENGTH
 MEAN ANNUAL SURFACE TEMP. °F........... 42       AIR  198          167
 AMPL. OF SURFACE TEMP. SINE WAVE....... 34       SURF 217.2        147.8

INPUT FIRST LETTER OF DESIRED LOCATION
OR USE CURSOR CONTROL KEYS TO MOVE CURSOR AND CHANGE DATA

F1-COLOR  F2-SAVE  F3-LOAD  F4-DISK     S-SOILS  R-RUN  L-NEW SCREEN  Q-QUIT
```

ANALYSIS RESULTS:

```
LOCATION  THAW N  FREZ N  MAAT THAW °F DAY  FREZ °F DAY  THAW DAYS  FREZ DAYS
ANCHORAG   1.70     1.00    35        4000         3200        198        167

                                        1       2       3       4       5
          FROZEN % MOIS.              0.0     6.0     0.0     6.0    15.0
          FROZEN DENS.              138.0   130.0     1.8   130.0   102.0
          LATENT HEAT                 0    1123       0    1123    2203
          FROZEN HEAT CAP           28.00   26.00    3.00   26.00   24.99
T C       FROZEN COND.               0.86    1.58    0.02    1.58    0.84
H Y       THAWED % MOIS.              0.0     6.0     0.0     6.0    15.0
A C       THAWED DENS.              138.0   130.0     1.8   130.0   102.0
W L       THAWED HEAT CAP           28.00   29.90    3.00   29.90   32.64
  E       THAWED COND.               0.86    1.57    0.02    1.57    0.75
          INITIAL THICK              0.29    1.50    0.25    1.00    2.20
          AMOUNT THAWED              0.29    1.50    0.25    1.00    1.59
          CONSOLIDATION              ----    ----    ----    ----    ----
          FINAL THICK                0.29    1.50    0.25    1.00    2.20

F C       LATENT HEAT                 0    1123       0    1123    2203
R Y       FROZEN DENS.              138.0   130.0     1.8   130.0   102.0
E C       FROZEN HEAT CAP           28.00   26.00    3.00   26.00   24.99
E L       FROZEN COND.               0.86    1.58    0.02    1.58    0.84
Z E       INITIAL THICK              0.29    1.50    0.25    1.00    2.20
E         AMOUNT FROZEN              0.29    1.50    0.25    1.00    0.24

ESTIMATED THAW= 4.63          FREEZE= 3.28          PRINT LOCATION SOIL QUIT
```

SOIL INPUTS

Layer	Thickness (ft)	Density (pcf)	M.C. (%)	Comment
Asphalt	0.29	138	-	-
Fill (Type II-A)	1.50	130	6.0	
Insulation	0.25	1.8	-	
Fill (Type II)	1.00	130	6.0	
Subgrade	2.20	102	15	Average of all soils

RESULTS

Parameter	Value
Total Section Thickness	3.04 ft
Thaw Depth	4.63 ft
Freeze Depth	3.28 ft
Subgrade Frost Penetration	0.24 ft
Subgrade Frost Percent[1]	7.9%

1. Equal to Subgrade Frost Penetration divided by Total Section Thickness