96233.02
GEOTECH REPORT

Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants
Telefax No. 586-2099
3220 Hospital Dr. Suite 200 • Juneau, Alaska 99801 • 907-586-2093

January 27, 1997

PN&D 96233.02
R

Mr. Tim Montgomery
City and Borough of Juneau
155 South Seward Street
Juneau, Alaska 99801

Re: Geotechnical findings for Juneau Cruise Ship Dock Transfer Bridge Restoration.

Dear Mr. Montgomery:

This letter presents the findings of Peratrovich, Nottingham & Drage, Inc.'s. (PN&D's) recent geotechnical investigation for the restoration of the Juneau cruise ship dock transfer bridge in downtown Juneau. The scope of the geotechnical work is summarized under Amendment No. 1, Phase II-Item No. 2 of our contract for Cruise Ship Transfer Bridge Restoration Project with the City and Borough of Juneau (CBJ).

## INVESTIGATION SCOPE

Our geotechnical activities consisted of a field drilling investigation which was conducted on December 9-11, 1996 and review of existing geotechnical information for the near vicinity of the transfer bridge.

The existing transfer bridge is located near the south end of the cruise ship dock. It is nearing the end of it's useful life and is in need of replacement. The existing structure consists of a steel transfer bridge utilizing a timber tower/reinforced concrete counter weight system to adjust the ramp for varying vessel elevations.

The transfer bridge restoration will replace the existing system with a new transfer bridge which includes a shore abutment, a float system to support it's seaward end and other related components. The investigation was conducted to provide foundation information for the reconstruction of the bridge abutment and for the float system retention piles.

## GEOTECHNICAL INVESTIGATION

Our drilling investigation was conducted under the direction of PN&D with drilling assistance by R&M Engineering of Juneau. Our test holes were identified as TH-1 and TH-2 and were advanced through access holes which were cut through the deck grating at the east and west ends of the existing transfer bridge at the locations shown on attached Figure 1. The transfer bridge was adjusted to a level position, at an elevation of approximately +26' MLLW, at the time of the investigation.

PN&D utilizes the Unified Soil Classification System (USCS) to identify and classify soil samples as summarized in Figures 2 and 3. Test hole logs for TH-1 and TH-2 are presented as Figures 4 and 5.

Both test holes were drilled with a truck mounted Mobile B40 drill rig. TH-1 was drilled with a combination of hollow stem auger equipment with split spoon sampling and with rock coring equipment. TH-2 was drilled with rotary wash techniques utilizing a bi-cone bit and split spoon sampling.

Split spoon sampling was conducted in accordance with the standard penetration test (SPT) utilizing a 1.4" I.D. split spoon sampler and a 140 pound drive hammer falling 30 inches for each blow. The sampler was driven for 18 inches at each sampling location with blow counts being recorded for each 6" interval. In accordance with the SPT sampling procedure blow count data presented on the soil logs corresponds to the number of blows to drive the sampler from 6 to 18 inches at each sampling location (e.g. blows/ft.). Split spoon sampling locations are identified with the symbol "Ss" on the test hole logs.

Bedrock sampling in TH-1 was conducted using small diameter 1" I.D. single barrel coring equipment powered by chain saw power head. Rock coring samples are identified with the symbol "Cs" on the test hole logs. Bedrock conditions at location TH-2 were investigated by drilling a bi-cone bit 9.5 feet into bedrock.

## LABORATORY TESTING

Three soil samples were submitted to Alaska Test Lab for laboratory gradation tests to supplement and refine the field visual classifications. The field visual classifications of the remaining four soil samples and the rock samples were reviewed by a senior PN&D geotechnical engineer. The results of the laboratory testing are summarized on the test hole logs and a copy of the laboratory test results is attached.

## SOIL AND BEDROCK CONDITIONS

Soil and rock conditions at the shore end of the transfer bridge include near surface fill materials (locally known as AJ-fill), underlying native materials consisting of silt, sands and gravels, with occasional cobbles and boulders, and a relatively shallow bedrock surface. Test hole TH-1 was drilled along the existing transfer bridge centerline approximately 15 feet west of it's onshore end. AJ-fill materials consisting of approximately equal amounts of sand, gravel and cobbles to 12 inches in size were encountered from the surface to a depth of 12' (elev. +18' to elev. +6' MLLW). Smaller grained fill material consisting of sandy gravel with trace to some silt and occasional cobbles were encountered from 12' to 19 feet deep (elev. +6' to -1' MLLW). Finer-grained sediments consisting of sandy silt with trace gravel were encountered from depths of 19' to 26' (elev. -1' to elev. -8' MLLW). A layer of sand with some silt and trace gravel was encountered from 26' to 31 deep (elev. -8' to -13' MLLW). Bedrock, composed of gray slatey phyllite with occasional quartz intrusions to 1/4", was encountered at a depth of 31' (elev. -13' MLLW) and was investigated to a depth of 41' (elev. -23' MLLW). Bedrock recovery was relatively low (ranging from 25% to 60%) due to the generally weak nature of the rock and as a result of being drilled with the small 1 inch I.D. coring equipment. SPT blow count resistance varied dramatically in TH-1 from a high of 67 blows/ft in the AJ-fill materials to a low of 3 blows/ft. in the soft underlying native soils. The higher blow counts noted should not be considered representative of density due to the size of material encountered.

Test hole TH-2 was drilled near the outer end of the existing transfer bridge near it's centerline. An abandoned wood piling was encountered during the initial attempt to set the drill casing at this location and the casing was pulled and reset on a slightly different angle. The abandoned pile was again encountered and the casing was pulled and reset a third time. The pile was avoided on the third attempt and the basing was successfully embedded in sediment. Marine sediments consisting of organic material with trace silt, trace to some sand, trace gravel and shell fragments were encountered from the ground surface to a depth of approximately 15' (elev. -16' to -31' MLLW). A second layer of marine sediment, consisting of sand with some silt, trace gravel and shell fragments grading to silt with some sand, trace gravel and shell fragments was encountered from 15' to 25.5' deep (elev. -31' to -41.5' MLLW). A layer of sandy silt with trace gravel was encountered from 25.5' to 37' (elev. -41.5' to -53' MLLW). Bedrock was encountered from 37' to 46.5' deep (elev. -53' to -62.5' MLLW). Bedrock conditions in this test hole were investigated with a bi-cone bit and observation of wash cuttings indicated that bedrock conditions are similar to the slatey phyllite observed in TH-1. SPT blow counts in TH-2 varied from 4 to 8 blows/ft. and indicate soft and loose soil conditions throughout the soil strata.

## ADDITIONAL GEOTECHNICAL INFORMATION

Additional geotechnical information for the near vicinity of the transfer bridge is presented in design and construction documents for a reconstruction of the cruise ship-dock which was constructed in the early 1990's. This information is presented in an October 1990 geotechnical report by R&M Engineers[1] and December 1991 pile driving records by PN&D[2] for piles driven near the west end of the transfer bridge.

Our review of the R&M report noted that their soil classifications at two test holes drilled within 30 to 40 feet to the northeast of PN&D's TH-2 varied from ours as a result of differing drilling methods. The R&M report notes that:

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1 South Franklin Cruise Dock, Subsurface Exploration, Phases I and II, R&M Project 901768, October 4, 1990 letter report from R&M Engineering, Inc. to Peratrovich, Nottingham & Drage, Inc., Juneau, Alaska.

2 Pile driving records for CBJ Project E 91-137, Cruise Ship Dock Improvements, by Peratrovich, Nottingham & Drage, Inc., Juneau, Alaska, December, 1991.

> "The soil type interpretation indicated on the boring logs is a product of blow count/depth trends, review of boring logs by R&M, others, and from soils from the casing shoe, or the flushing water from the returns was also utilized. The soil descriptions are intended to be generalizations due to the imprecise nature of identification; however, we feel they are fairly accurate."

The site plan in the R&M report also indicates they drilled two nearby test holes on the southwest side of the transfer bridge, but, we were unable to locate the corresponding logs. The bedrock elevations encountered by R&M are generally consistent with our findings at our test hole location TH-2.

PN&D pile driving records from the 1991 construction of two dolphins (shown on Figure 1 as Dolphin NF-1 and Dolphin SF-1) and a small dock extension (shown on Figure 1 as S. Ferry Dock Addition #1) were also reviewed. The piles for these structures were driven to bedrock refusal and summarized in Table 1.

**Table 1: Summary 1991 driving records.**

| Structure (See Figure 1) | Range of Bedrock Elevations | Remarks |
|---|---|---|
| Dock Dolphin NF-1 | -49' - -61' MLLW | 3 batter, 1 vertical pile(s) driven to bedrock |
| Dock Dolphin NF-2 | -63' to -74' MLLW | 3 batter, 1 vertical pile(s) driven to bedrock |
| South Ferry Dock Addition #1 | -57' to '63' MLLW | 4 vertical piles driven to bedrock |

## DISCUSSION OF RESULTS

The results of the geotechnical investigation indicate that soil depths at two points along the transfer bridge alignment vary from 31 feet at TH-1 to 37' at TH-2. The underlying bedrock is relatively soft and slopes downward toward the center of Gastineau Channel on an angle of approximately 18° from horizontal. Comparison of the bedrock information obtained during this investigation and previous records indicates that the elevation of the bedrock surface can vary over short distances and potential contractor's will be notified of these conditions in the construction documents.

We understand that the dock structure has been modified at various times throughout it's life. This and the fact that an abandoned wood pile was encountered during the first two attempts to set casing at location TH-2 indicates that abandoned piling is likely to be present throughout the project area.

Pipe piles are expected to be used for the project because of their superior corrosion and fouling resistance in comparison to H-piles. Pile driving methods, loading and seismic design requirements will be determined by our design staff.

## LIMITATIONS

This letter report was prepared by PN&D for use on this project only. The proposed improvements, which are discussed in this document, are also being designed by PN&D and as such continuing communication and review is on-going among the design team. We have also attached an article titled "Important Information About Your Geotechnical Engineering Report" to assist in understanding the appropriate use and limitations of the geotechnical information of this letter.

We look forward to the successful completion of the cruise ship transfer bridge restoration and encourage you to contact us at your convenience if you have questions or comments regarding our findings.

Sincerely,

PERATROVICH, NOTTINGHAM & DRAGE, INC.

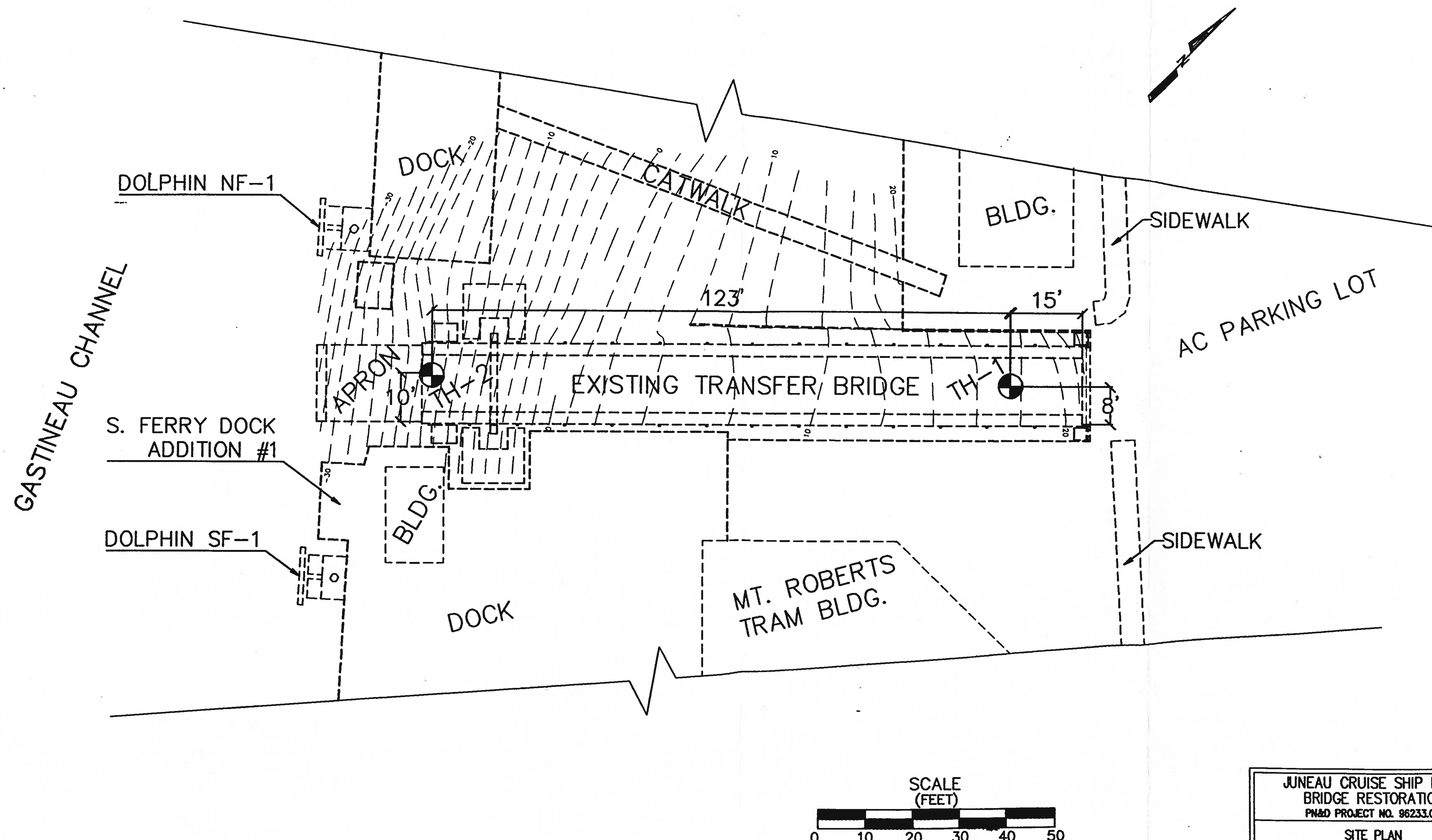
James Heumann, P.E.
Senior Engineer

Michael C. Hartley, P.E.
Vice President

Attachments:

- Figures 1-5
- Laboratory Test Results
- Article: "Important Information About Your Geotechnical Engineering Report"

STATE OF ALASKA
49TH
Michael C. Hartley
CE 5794
REGISTERED PROFESSIONAL ENGINEER




JUNEAU CRUISE SHIP DOCK
BRIDGE RESTORATION
PN&D PROJECT NO. 96233.02

SITE PLAN

FIGURE 1

Peratrovich, Nottingham & Drage, Inc.

# SOILS
# CLASSIFICATION, CONSISTENCY AND SYMBOLS

CLASSIFICATION: Identification and classification of the soil is accomplished in accordance with the Unified Soil Classification System. Normally, the grain size distribution determines classification of the soil. The soil is defined according to major and minor constituents with the minor elements serving as modifiers of the major elements. For cohesive soils, the clays becomes the principal noun with the other major soil constituents used as modifier; i.e. silty clay, when the clay particles are such that the clay dominates soil properties. Minor soil constituents may be added to the classification breakdown in accordance with the particle proportion listed below; i.e. silt w/some gravel, trace clay.

no call – 0 –3%  trace – 3 – 12%  some – 13 – 30%

SOIL CONSISTENCY – CRITERIA: Soil consistency as defined below and determined by normal field and laboratory methods applies only to non-frozen material. For these materials, the influence of such factors as soil structure,, i.e. fissure systems, shrinkage cracks, slickensides, etc., must be taken into consideration in making any correlation with the the consistency values listed below. In permafrost zones, the consistency and strength of frozen soils may vary significantly and unexplainably with ice content, thermal regime and soil type.

| Cohesionless | N*(blows/ft) | Relative Density |
|---|---|---|
| Loose | 0 - 10 | 0 - 40% |
| Medium Dense | 10 - 30 | 40 - 70% |
| Dense | 30 - 60 | 70 - 90% |
| Very Dense | >60 | 90 - 100% |

* Standard Penetration, "N": Blows per foot of a 140–pound hammer falling 30 inches on a 1.4" ID split–spoon sampler except where noted.

| Cohesive | T – (tsf) |
|---|---|
| Very Soft | 0 - 0.25 |
| Soft | 0.25 - 0.5 |
| Stiff | 0.5 - 1.0 |
| Firm | 1.0 - 2.0 |
| Very Firm | 2.0 - 4.0 |
| Hard | > 4.0 |

## DRILLING SYMBOLS

| | | | |
|---|---|---|---|
| WO: | Wash Out | WD: | While Drilling |
| WL: | Water Level | BCR: | Before Casing Removal |
| WCI: | Wet Cave In | ACR: | After Casing Removal |
| DCI: | Dry Cave In | AB: | After Boring |
| WS: | While Sampling | TD: | Total Depth |

Note: Water levels indicated on the boring logs are the levels measured in the boring at the time(s) indicated. In pervious unfrozen soils, the indicated elevations are considered to represent actual ground water conditions. In impervious and frozen soils, accurate determinations of ground water elevations cannot be obtained within a limited period of observation and other evidence of ground water elevations and conditions are required.

JUNEAU CRUISE SHIP DOCK
BRIDGE RESTORATION
PN&D PROJECT NO. 96233.02

TEST HOLE LOGS

FIGURE 2

Peratrovich, Nottingham & Drage, Inc.

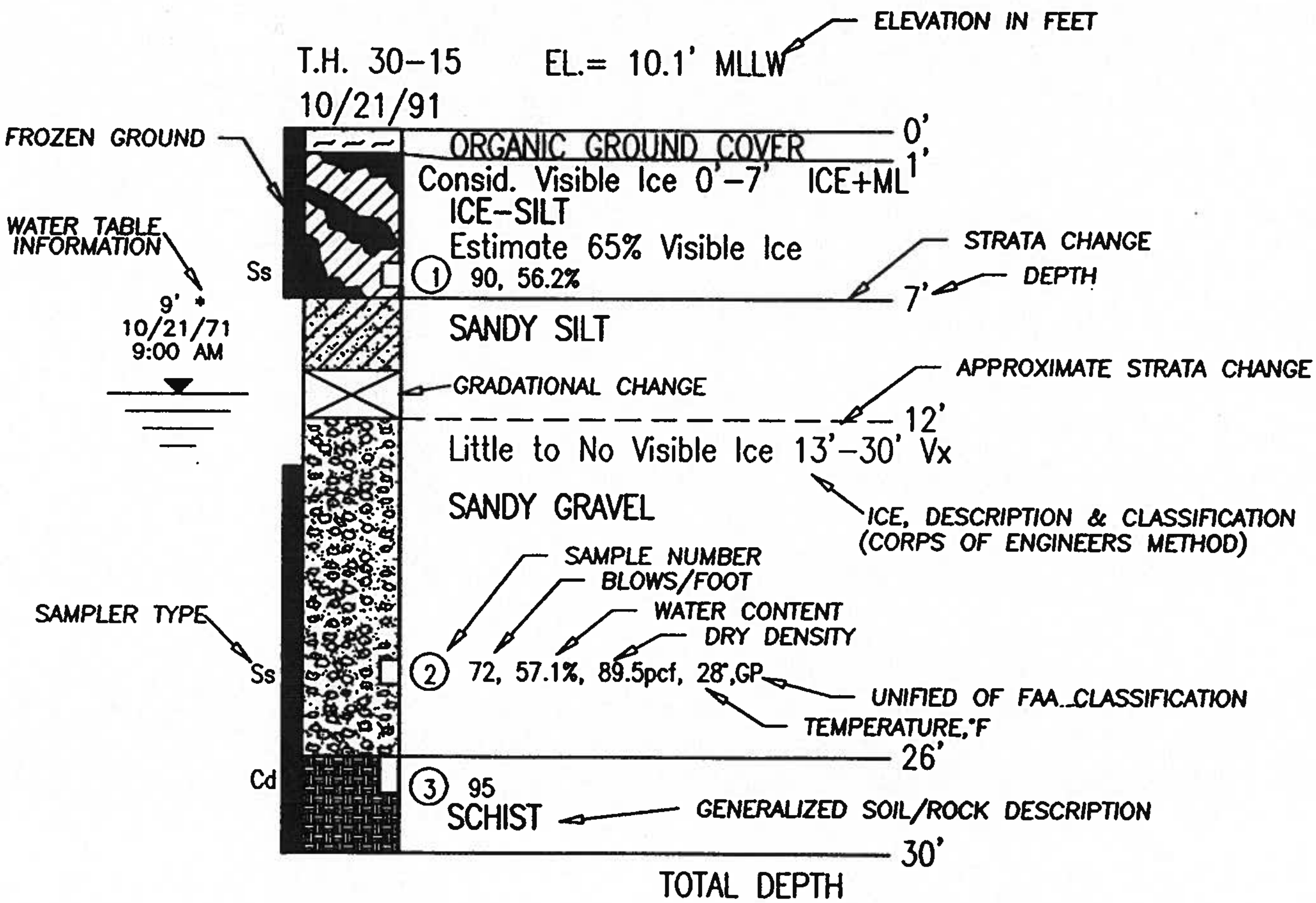
# SAMPLER TYPE SYMBOLS

St . . . . 1.4' SPLIT SPOON W/ 47# HAMMER
Ss . . . . 1.4' SPLIT SPOON W/ 140# HAMMER
Sl . . . . 2.5' SPLIT SPOON W/ 140# HAMMER
Sm . . . . 2.5' SPLIT SPOON W/ 300# HAMMER
Sh . . . . 2.5' SPLIT SPOON W/ 340# HAMMER
Sp . . . . 2.5' SPLIT SPOON, PUSHED
Hs . . . . 1.4' SPLIT SPOON DRIVEN W/ AIR HAMMER
Hl . . . . 2.5' SPLIT SPOON DRIVEN W/ AIR HAMMER
Sx . . . . 2' SPLIT SPOON DRIVEN W/ 140# HAMMER

Ts . . . . SHELBY TUBE
Tm . . . . MODIFIED (2.5' O.D.) SHELBY TUBE
Pb . . . . PITCHER BARREL
Cs . . . . CORE BARREL W/ SINGLE TUBE
Cd . . . . CORE BARREL W/ DOUBLE TUBE
Bs . . . . BULK SAMPLE
A . . . . AUGER SAMPLE
G . . . . GRAB SAMPLE

NOTES: 1. SAMPLER TYPES ARE EITHER NOTED ABOVE THE BORING LOG OR ADJACENT TO IT AT THE RESPECTIVE DEPTH.
2. SPLIT SPOON SAMPLER SIZES PRESENTED ABOVE REFER TO THE INSIDE DIAMETER OF THE SAMPLER.

## TYPICAL BORING LOG




* W.D. – WHILE DRILLING, A.B. – AFTER DRILLING

| |
|---|
| JUNEAU CRUISE SHIP DOCK BRIDGE RESTORATION<br>PN&D PROJECT NO. 96233.02 |
| TEST HOLE LOGS |
| FIGURE 3 |

Peratrovich, Nottingham & Drage, Inc.

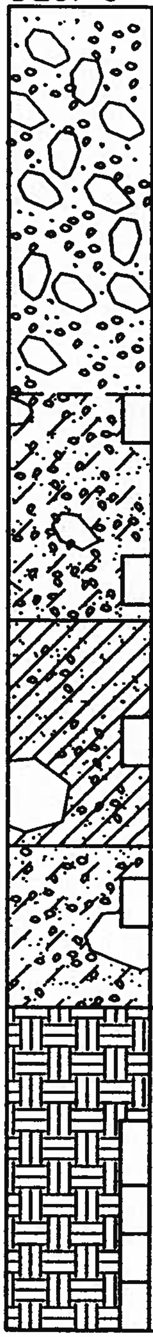
# TH-1

DEC. 9–10, 1996

ELEV. = +18' MLLW

SAMPLING METHODS: Ss & Cs

DEPTH (ELEV.)



0' (+18' MLLW)

COBBLES, GRAVEL & SAND (AJ–ROCK FILL), <12"

12' (+6' MLLW)

Ss (1) 67 BLOWS/FT.

SANDY GRAVEL W/ TRACE TO SOME SILT & OCCASIONAL COBBLES (SMALLER FILL MATERIAL)

Ss (2) 12 BLOWS/FT.

19' (–1' MLLW)

SANDY SILT W/ TRACE GRAVEL

Ss (3) 3 BLOWS/FT., ML

23.5'–25' BOULDER

26' (–8' MLLW)

SAND W/ SOME SILT & TRACE GRAVEL

Ss (4) 35 BLOWS/FT.

27'–28.5' DRILLED PAST BOULDER

31' (–13' MLLW)

GRAY SLATEY PHYLLITE W/ QUARTZ INTRUSIONS TO 1/4" (BEDROCK)

Cs (5) 25% RECOVERY

Cs (6) 60% RECOVERY

Cs (7) 30% RECOVERY

Cs (8) 30% RECOVERY

41' (–23' MLLW)

COMPLETION OF DRILLING

NOTE(S)

1. TEST HOLE DRILLED WITH 3 1/8" I.D., 6 1/2" O.D. HOLLOW STEM AUGER AND 1" I.D. SINGLE BARREL ROCK CORING EQUIPMENT.

JUNEAU CRUISE SHIP DOCK BRIDGE RESTORATION
PN&D PROJECT NO. 96233.02

TEST HOLE LOGS

FIGURE 4

Peratrovich, Nottingham & Drage, Inc.

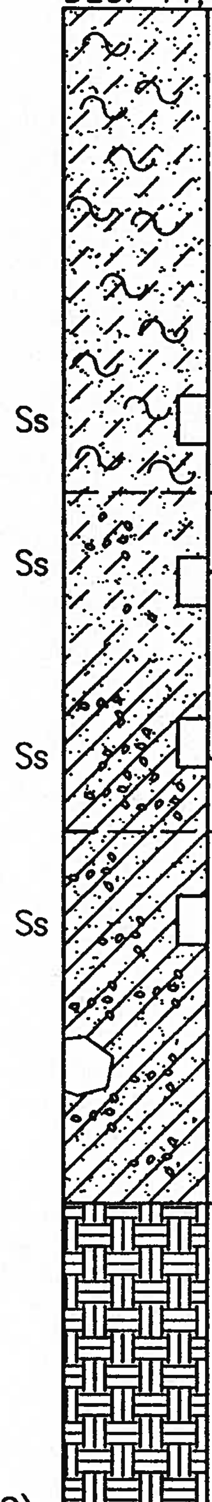
TH-2

DEC. 11, 1996

ELEV. = −16' MLLW

SAMPLING METHOD: Ss

DEPTH (ELEV.)




0' (−16' MLLW)

ORGANIC MATERIAL W/ TRACE SILT, TRACE TO SOME SAND, TRACE GRAVEL, & SHELL FRAGMENTS (MARINE SEDIMENT)

(1) 4 BLOWS/FT.

15' (−31' MLLW)

(2) 7 BLOWS/FT., SM

SAND W/ SOME SILT, TRACE GRAVEL & SHELL FRAGMENTS GRADING TO SILT W/ SOME SAND, TRACE GRAVEL & SHELL FRAGMENTS (MARINE SEDIMENT)

(3) 8 BLOWS/FT.

25.5' (−41.5' MLLW)

(4) 8 BLOWS/FT., ML

SANDY SILT W/ TRACE GRAVEL

32'−33.5' BOULDER

37' (−53' MLLW)

BEDROCK
INVESTIGATED W/ BI−CONE BIT

COMPLETION OF DRILLING 46.5' (−62.5' MLLW)

NOTE(S)

1. TEST HOLE DRILLED WITH ROTARY WASH & CASING EQUIPMENT.
2. AN ABANDONED PILING WAS ENCOUNTERED DURING FIRST TWO ATTEMPTS TO SET CASING. SOIL WAS ENCOUNTERED ON THIRD ATTEMPT AND CASING WAS INITALLY SET TO 12' DEEP.

Peratrovich, Nottingham & Drage, Inc.

| JUNEAU CRUISE SHIP DOCK BRIDGE RESTORATION PN&D PROJECT NO. 96233.02 |
| --- |
| TEST HOLE LOGS |
| FIGURE 5 |

ALASKA TESTLAB
A Division of DOWL, Incorporated

AASHTO ACCREDITED
CONSTRUCTION
MATERIALS TESTING
LABORATORY

Peratrovich Nottingham & Drage
1506 W. 36th Ave. Suite 101
Anchorage, Alaska 99503

W.O.#A27127
January 21, 1997

RECEIVED
JAN 23 1997
PERATROVICH, NOTTINGHAM & DRAGE, INC.

Attention: Mr. Jim Heumann

Subject: Particle-Size Analysis
Project 96233.02, Juneau Cruise Ship Bridge

Dear Mr. Heumann:

The particle-size distribution of your soil was measured in the laboratory. The published methods for this test are:

- ASTM C 117, "Material Finer Than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing;"
- ASTM C 136, "Sieve Analysis of Fine and Coarse Aggregates;"
- ASTM D 422, "Particle Size-Analysis of Soils;"
- AASHTO T-11, "Material Finer Than 75-μm Sieve in Mineral Aggregates;"
- AASHTO T-27, "Sieve Analysis of Fine and Coarse Aggregates;"
- AASHTO T-30, "Mechanical Analysis of Extracted Aggregate;"
- AASHTO T -88, "Particle Size Analysis of Soils;" and
- AK DOT/PF ATM T-7, "Sieve Analysis of Fine and Coarse Aggregates."

Alaska Testlab's standard procedure is in conformance with these standards, with the following descriptions:

- The coarse fraction of non-extracted soils is not washed unless the coarse particles appear to be significantly coated with fines;
- The fine fraction of the soil is *always* washed;
- The plus 3-inch fraction is not routinely included in the test due to the large sample mass required for a representative sample; The estimated percentage of plus 3 inch material in the sample is shown on the test report; and
- The mass of the coarse and fine test fractions are reported.

The soil is classified in accordance with ASTM D 2487, "Classification of Soils for Engineering Purposes (Unified Soil Classification System)." The frost classification is identified in accordance with Corps of Engineers and Municipality of Anchorage (MOA) procedures.

The test results are attached. If you have any questions regarding the test procedures or the results, please call me.

Sincerely,
ALASKA TESTLAB

Howard K. Weston, P.E., or
David L. Andersen, P.E.

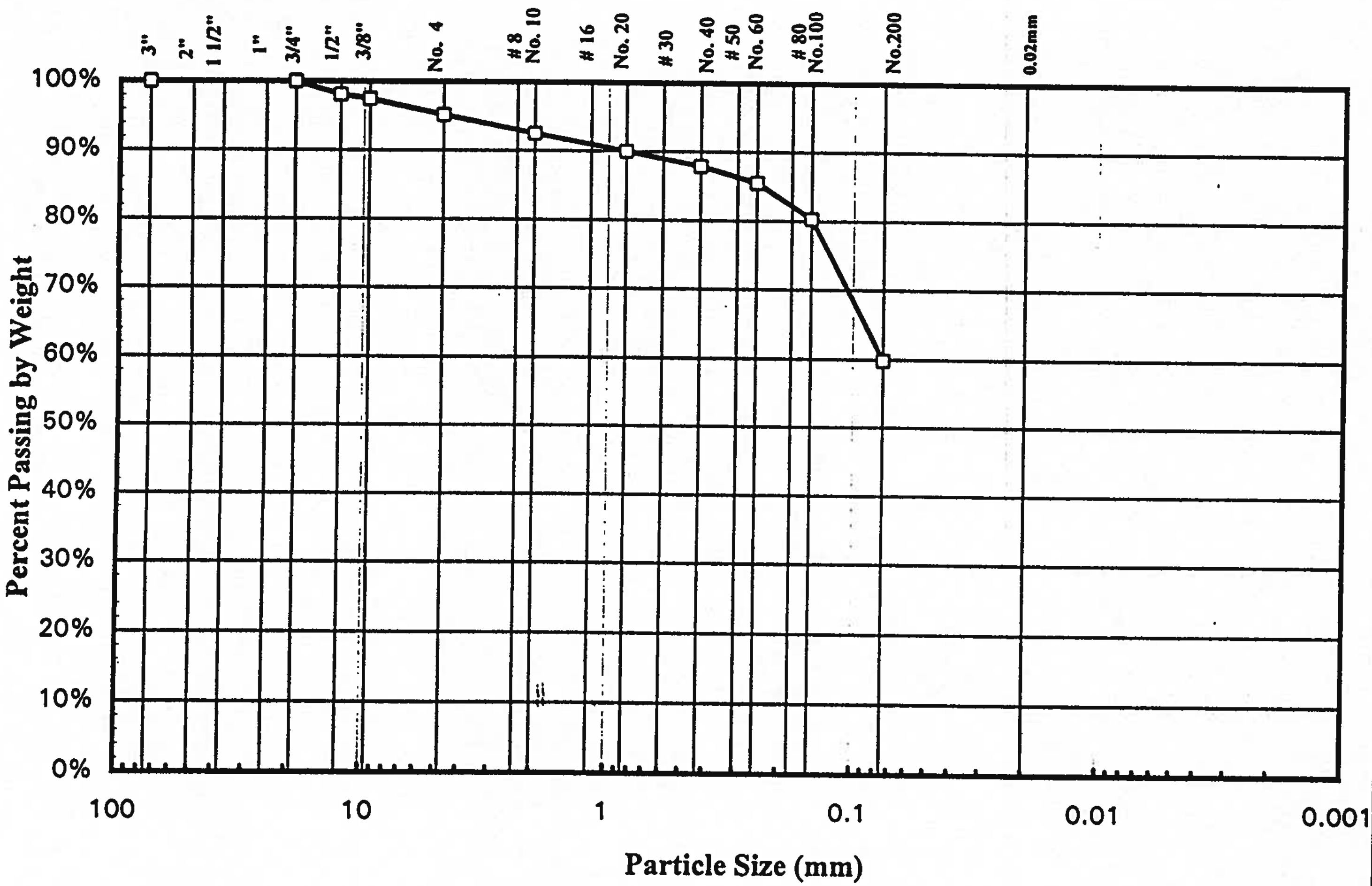
ALASKA TESTLAB
A Division of DOWL, Incorporated
4040 B Street Anchorage, Alaska 99503
(907) 562-2000 FAX (907) 563-3953

Client: Peratrovich Nottingham & Drage
Project: Project 96233.02, Juneau Cruise Ship Bridge
Location: TH-1, SA-3 @ 22'-23.5'
Submitted by Client

# PARTICLE-SIZE DISTRIBUTION

W.O. A27127
Lab No. 44
Received: January 20, 1997

Engineering Classification: Sandy SILT, ML
Frost Classification: F4




| SIZE | PASSING | SPECIFICATION |
|---|---|---|
| +3 in Not Included in Test = ~0% | | |
| 3" | | |
| 2" | | |
| 1 1/2" | | |
| 1" | | |
| 3/4" | 100% | |
| 1/2" | 98% | |
| 3/8" | 97% | |
| No. 4 | 95% | |
| Total Wt. of Coarse Fraction = 866.9g | | |
| No. 8 | | |
| No. 10 | 93% | |
| No. 16 | | |
| No. 20 | 90% | |
| No. 30 | | |
| No. 40 | 88% | |
| No. 50 | | |
| No. 60 | 85% | |
| No. 80 | | |
| No.100 | 80% | |
| No.200 | 60% | |
| Total Wt. of Fine Fraction = 372.6g | | |
| 0.02 mm | | |

ALASKA TESTLAB
A Division of DOWL, Incorporated
4040 B Street Anchorage, Alaska 99503
(907) 562-2000 FAX (907) 563-3953

Client: Peratrovich Nottingham & Drage

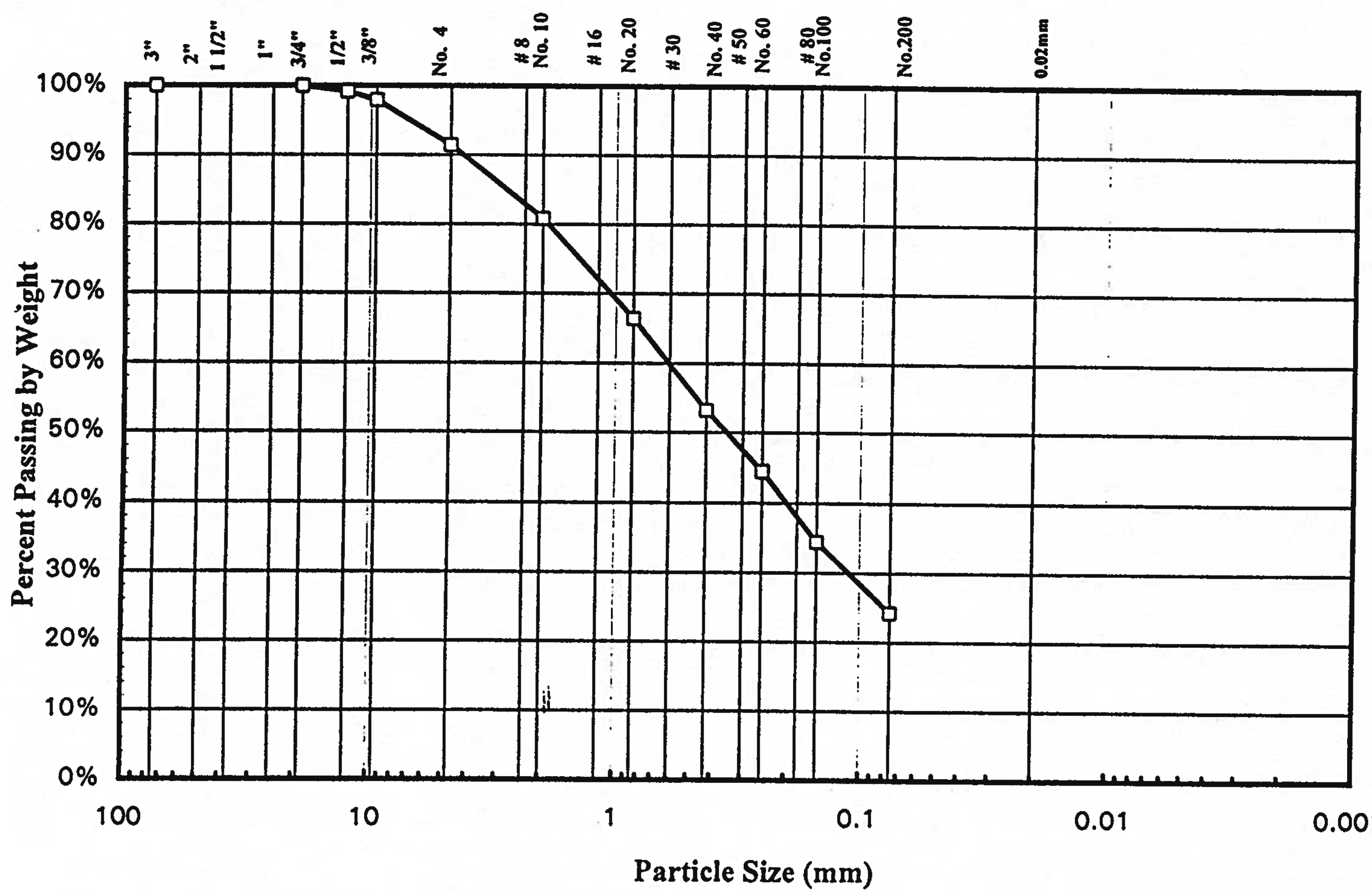
Project: Project 96233.02, Juneau Cruise Ship Bridge

Location: TH-2, SA-2 @ 17'-18'
Submitted by Client

# PARTICLE-SIZE DISTRIBUTION

W.O. A27127
Lab No. 45
Received: January 20, 1997

Engineering Classification: Silty SAND , SM
Frost Classification: Not Measured




| SIZE | PASSING | SPECIFICATION |
|---|---|---|
| +3 in Not Included in Test = ~0% | | |
| 3" | | |
| 2" | | |
| 1 1/2" | | |
| 1" | | |
| 3/4" | 100% | |
| 1/2" | 99% | |
| 3/8" | 98% | |
| No. 4 | 91% | |
| Total Wt. of Coarse Fraction = 446g | | |
| No. 8 | | |
| No. 10 | 81% | |
| No. 16 | | |
| No. 20 | 66% | |
| No. 30 | | |
| No. 40 | 53% | |
| No. 50 | | |
| No. 60 | 45% | |
| No. 80 | | |
| No.100 | 34% | |
| No.200 | 24% | |
| Total Wt. of Fine Fraction = 407.8g | | |
| 0.02 mm | | |

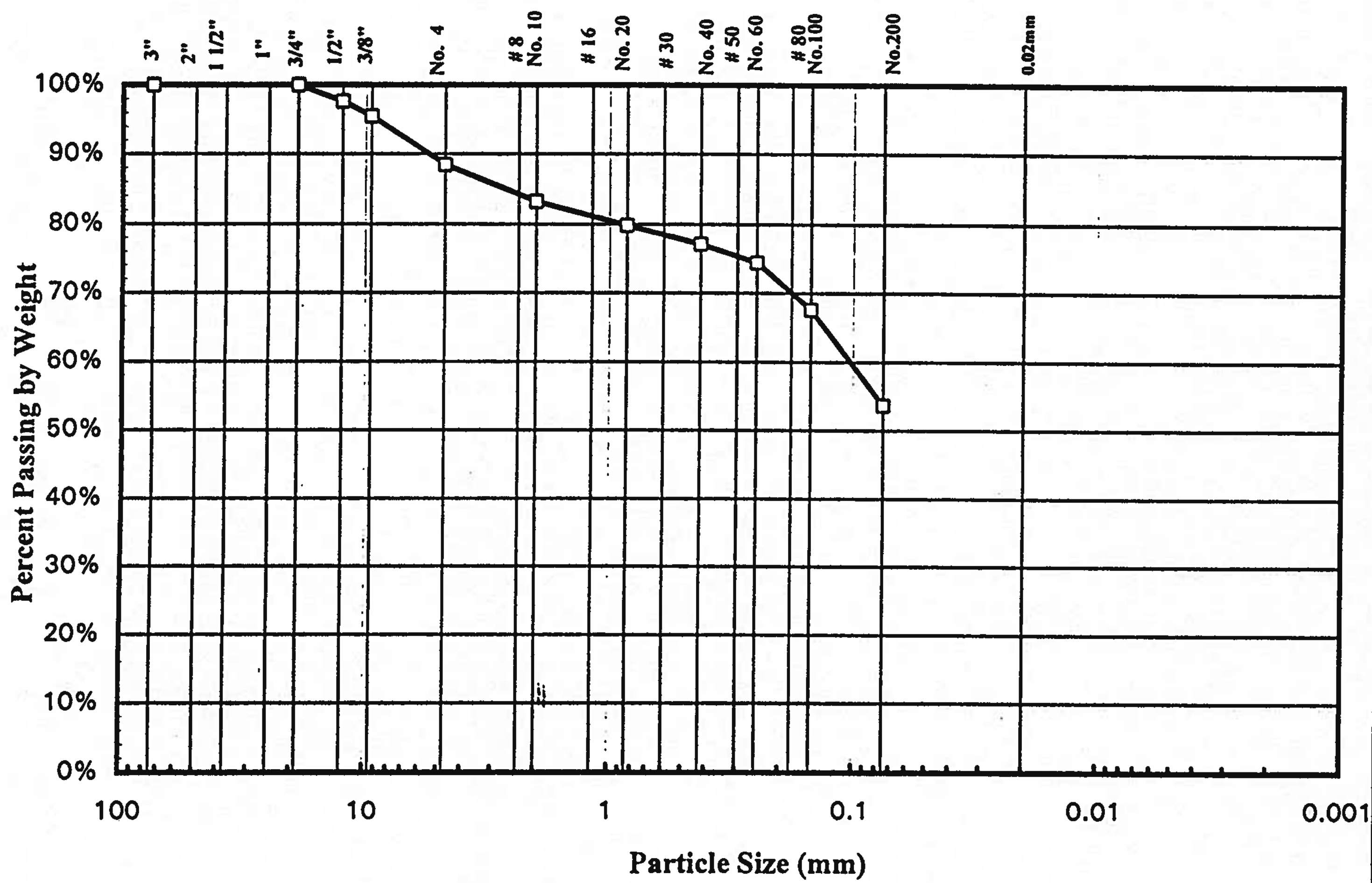
ALASKA TESTLAB
A Division of DOWL, Incorporated
4040 B Street Anchorage, Alaska 99503
(907) 562-2000 FAX (907) 563-3953

Client: Peratrovich Nottingham & Drage
Project: Project 96233.02, Juneau Cruise Ship Bridge
Location: TH-2, SA-4 @ 27.5'-29'
Submitted by Client

# PARTICLE-SIZE DISTRIBUTION

W.O. A27127
Lab No. 46
Received: January 20, 1997

Engineering Classification: Sandy SILT, ML
Frost Classification: F4




| SIZE | PASSING | SPECIFICATION |
|---|---|---|
| +3 in Not Included in Test = ~0% | | |
| 3" | | |
| 2" | | |
| 1 1/2" | | |
| 1" | | |
| 3/4" | 100% | |
| 1/2" | 98% | |
| 3/8" | 95% | |
| No. 4 | 88% | |
| Total Wt. of Coarse Fraction = 864.3g | | |
| No. 8 | | |
| No. 10 | 83% | |
| No. 16 | | |
| No. 20 | 80% | |
| No. 30 | | |
| No. 40 | 77% | |
| No. 50 | | |
| No. 60 | 74% | |
| No. 80 | | |
| No.100 | 68% | |
| No.200 | 54% | |
| Total Wt. of Fine Fraction = 381.7g | | |
| 0.02 mm | | |

# IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

## A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used*:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

*Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.*

## MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage*, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

## SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

## GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

## A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

## BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

## READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

## OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

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8811 Colesville Road/Suite G106/Silver Spring, Maryland 20910/(301) 565-2733