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APPENDICES

A  Important Information About Your Geotechnical/Environmental Report

Laurel Street Pavements, Anchorage, Alaska 32-1-02155-001
GEOTECHNICAL DATA REPORT
LAUREL STREET PAVEMENTS
LOUNSBURY & ASSOCIATES
ANCHORAGE, ALASKA

1.0 INTRODUCTION

This report presents the results of subsurface explorations and laboratory testing conducted by Shannon & Wilson, Inc. along Laurel Street in Anchorage, Alaska. The purpose of this geotechnical study was to gather geotechnical data for an evaluation of the road prism materials. To accomplish this, we advanced two geotechnical borings and soil samples recovered from the borings were tested in our Anchorage laboratory. Presented in this report are descriptions of the site and project, subsurface exploration and laboratory test procedures, and an interpretation of subsurface conditions.

Authorization to proceed with this work was received in the form of a signed proposal from Mr. Loren Becia of Lounsbury & Associates on January 19, 2011. Our work was conducted in general accordance with our January 14, 2011 proposal.

2.0 SITE AND PROJECT DESCRIPTION

The project is located near 3950 Laurel Street, along an approximately 150-foot long section of the roadway, in Anchorage, Alaska. The west side of Laurel Street is largely developed with medical/office complexes. The east side of Laurel Street is largely undeveloped. At the time of our explorations, the road surface was covered by snow and ice. The general topography slopes gently down toward the west, although Laurel Street is relatively flat-lying. A vicinity map indicating the general project location is presented as Figure 1. A site plan, included as Figure 2, shows prominent site features and the approximate boring locations.

Laurel Street is a two-lane road with curb and gutter along either side of the road. A sidewalk has been constructed along the western edge of the roadway. We understand that the current pavements in the area are experiencing distress and/or heaving and settlement and that these studies are intended to provide geotechnical data that will be used to evaluate whether there are soil conditions that may be contributing to the observed distress.
3.0 SUBSURFACE EXPLORATIONS

Subsurface explorations consisted of drilling and sampling two borings, designated Borings B-1 and B-2, at the site on February 10, 2011. The general boring locations were selected by Lounsbury & Associates to evaluate if conditions encountered by a previous study to the south on Laurel Street were persistent in the road section to the north. The boring locations, shown on Figure 2, were estimated using survey wheel measurements from existing site features. The surface elevations shown on the boring logs were estimated from the Municipality of Anchorage mapping website. Therefore the boring locations and the elevations reported on the boring logs should be considered approximate.

Drilling services for this project were provided by Denali Drilling of Anchorage, Alaska, using a truck mounted CME 55 drill rig. A geologist from our firm was present during drilling to locate the borings, observe drill action, collect samples, log subsurface conditions, and observe groundwater conditions.

The borings were advanced with 41/4-inch inner diameter (ID), continuous flight, hollow-stem augers to approximately 15.5 feet below ground surface (bgs). As the borings were advanced, samples were typically recovered using Standard Penetration Test (SPT) methods at 2.5-foot intervals to 10 feet bgs followed by a final sample at the bottom of the boring. In the SPT method, samples are recovered by driving a 2-inch outer diameter (OD) split-spoon sampler into the bottom of the advancing hole with blows of a 140-pound hammer free falling 30 inches onto the drill rods. For each sample, the number of blows required to drive the sampler the final 12 inches of an 18-inch penetration into undisturbed soil is recorded. Blow counts are shown graphically on the boring log figures as “penetration resistance” and are displayed adjacent to sample depth. The penetration resistance values give a measure of the relative density (compactness) or consistency (stiffness) of cohesionless or cohesive soils, respectively. A grab sample of the near-surface soils was collected from the auger cuttings in the upper 1.5 to 2 feet of each boring.

Samples recovered during drilling were visually classified in the field using the Unified Soil Classification System, presented on Figure 3. The field soil classifications were verified through laboratory analysis for selected samples. Frozen soil classifications (consistent with the Corps of Engineers frozen soil classification system) based on visual evaluations were also estimated for frozen soils encountered in our borings. The frozen soil classification system is presented in
Figure 4. Frost classifications were estimated for samples based on laboratory testing (sieve analyses and hydrometers). Frost classifications shown on the boring logs are followed by the method of testing which was used to estimate them [percent finer than 0.02 millimeters (0.02Mil) for samples with hydrometer testing and percent passing the No.200 sieve (P-200) for the mechanical sieve results]. The frost classification system is presented in Figure 5. Summary logs of the borings are presented in Figures 6 and 7. The borings were backfilled with auger cuttings and the asphalt was repaired with asphalt “cold patch.”

4.0 LABORATORY TESTING

Laboratory tests were performed on selected samples recovered from the borings to confirm field classifications and to estimate the index properties of the typical materials encountered. The laboratory testing was formulated with emphasis on estimating the material gradation, in-situ water content, and corrosion properties.

Water content tests were performed in general accordance with ASTM International (ASTM) D2216. The results of the water content measurements are presented graphically on the boring logs in Figures 6 and 7.

Grain size classification (gradation) testing was performed to estimate the particle size distribution of selected samples from the borings. The gradation testing generally followed the procedures described in ASTM C117/C136 and D422 for gradations with hydrometer testing. The test results are presented in Figure 8 and summarized on the boring logs as percent gravel, percent sand, and percent fines. Percent fines on the boring logs are equal to the sum of the silt and clay fractions indicated by the percent passing the No. 200 sieve. Note that hydrometer testing indicates particle size only and visual classification under USCS designates the entire fraction of soil finer than the No. 200 sieve as silt. Furthermore, plasticity characteristics (Atterberg Limits results) are required to differentiate between silt and clay soils under USCS.

5.0 SUBSURFACE CONDITIONS

The subsurface conditions encountered by our borings are presented graphically on the boring logs in Figures 6 and 7. In general, our borings encountered 2.5 to 3.2 feet of granular fill material overlying native silts and sands. Approximately 2 to 2.5 inches of asphalt underlain by about 2 inches of what appeared to be asphalt treated base was found at the ground surface.
At the time of drilling, the ground was frozen from the surface to approximately 6 feet bgs. Therefore penetration resistance values, shown on the boring logs, for the materials encountered in the frost zone are likely biased high due to frost bonding. The fill materials encountered consisted of frozen, slightly silty to silty, sandy gravel to gravelly sand with approximately 9.5 to 12.1 percent fines, based on laboratory testing. Beneath the fill in Boring B-1, the boring generally encountered silty sand with occasional gravelly zones to about 12.5 feet bgs. Based on penetration resistance values ranging from 21 to 23 blows per foot (bpf), the native soils encountered between the bottom of the frost zone to 12.5 feet bgs were typically medium dense. Beneath the fill in Boring B-2, the native soils generally comprise slightly sandy to sandy silt to about 8.5 feet bgs, followed by silty sand grading to gravelly, silty sand to 12.5 feet bgs. Penetration resistance values of 13 bpf were recorded below the frost zone and above 12.5 feet bgs in Boring B-2. These soils would be considered stiff for predominantly fine-grained soils and medium dense for the granular soils. In each boring, a dense layer of silty, gravelly sand was encountered from about 12.5 feet bgs to the bottom of the boring. Based on laboratory testing, fines contents in the native soils encountered ranged from approximately 42 to 76.5 percent. We also observed visible ice in samples recovered in the frost zone below the fill materials. The visible ice was segregated in the form of random crystals, nodules and thin seams. Groundwater

was encountered not encountered during drilling.

6.0 CLOSURE AND LIMITATIONS

This report was prepared for the exclusive use of our client and their representatives for evaluating the site as it relates to the geotechnical aspects discussed herein. The conclusions contained in this report are based on site conditions as they were observed on the drilling date. It is assumed that the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the explorations.

Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples or advancing borings. Shannon & Wilson has prepared the attachments in Appendix A Important Information About Your Geotechnical/Environmental Report to assist you and others in understanding the use and limitations of the reports.

Copies of documents that may be relied upon by our client are limited to the printed copies (also known as hard copies) that are signed or sealed by Shannon & Wilson with a wet, blue ink.
signature. Files provided in electronic media format are furnished solely for the convenience of the client. Any conclusion or information obtained or derived from such electronic files shall be at the user’s sole risk. If there is a discrepancy between the electronic files and the hard copies, or you question the authenticity of the report please contact the undersigned.

We appreciate this opportunity to be of service. Please contact the undersigned at (907) 561-2120 with questions or comments concerning the contents of this report.

SHANNON & WILSON, INC.

Ryan Collins
Geologist IV

Kyle Brennan, P.E.
Associate

RDC:KLB/sjg
LEGEND

B-1  Approximate location of Boring B-1, advanced by Shannon & Wilson, Inc., February 2011
## Unified Soil Classification System

### GROUP NAME
Criteria for Assigning Group Names and Group Symbols

<table>
<thead>
<tr>
<th>GROUP NAME</th>
<th>Soil Classification Group Symbol with Generalized Group Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAVELS 50% or more of coarse fraction retained on No. 4 sieve</td>
<td>GW Well-graded Gravels</td>
</tr>
<tr>
<td>GRAVELS with fines More than 12% fines</td>
<td>GP Poorly-graded Gravels</td>
</tr>
<tr>
<td>SANDS More than 50% of coarse fraction passes No. 4 sieve</td>
<td>GM Gravel &amp; Silt Mixtures</td>
</tr>
<tr>
<td>SANDS with fines More than 12% fines</td>
<td>GC Gravel &amp; Clay Mixtures</td>
</tr>
<tr>
<td>SILTS AND CLAYS Liquid limit 50% or less</td>
<td>SW Well-graded Sands</td>
</tr>
<tr>
<td>INORGANIC</td>
<td>SP Poorly-graded Sands</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>SM Sand &amp; Silt Mixtures</td>
</tr>
<tr>
<td>INORGANIC</td>
<td>SC Sand &amp; Clay Mixtures</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>ML Non-plastic &amp; Low-plasticity Silts</td>
</tr>
<tr>
<td>SILTS AND CLAYS Liquid limit greater than 50%</td>
<td>CL Low-plasticity Clays</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>OL Non-plastic and Low-plasticity Organic Clays</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>CH High-plasticity Clays</td>
</tr>
<tr>
<td>ORGANIC</td>
<td>MH High-plasticity Silts</td>
</tr>
<tr>
<td>HIGHLY ORGANIC SOILS</td>
<td>OH High-plasticity Organic Clays</td>
</tr>
<tr>
<td>PRIMARY ORGANIC MATTER, dark in color, and organic odor</td>
<td>PT Peat</td>
</tr>
</tbody>
</table>

### Descriptive Terminology Denoting Component Proportions

<table>
<thead>
<tr>
<th>Description</th>
<th>Range of Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add the adjective &quot;slightly&quot;</td>
<td>5 - 12%</td>
</tr>
<tr>
<td>Add soil adjective(6)</td>
<td>12 - 50%</td>
</tr>
<tr>
<td>Major proportion in upper case, (e.g., SANDO)</td>
<td>&gt;50%</td>
</tr>
</tbody>
</table>

(6) Use gravelly, sandy, or silty as appropriate

### Organic Content

<table>
<thead>
<tr>
<th>Adjective</th>
<th>Percent by Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasional</td>
<td>0.1</td>
</tr>
<tr>
<td>Scattered</td>
<td>1-5</td>
</tr>
<tr>
<td>Numerous</td>
<td>10-99</td>
</tr>
<tr>
<td>Organic</td>
<td>30-80, minor constituent</td>
</tr>
<tr>
<td>Peat</td>
<td>90-100, MAJOR constituent</td>
</tr>
</tbody>
</table>

### Plasticity Chart

**PLASTICITY CHART**

Laurel Street Pavements
Anchorage, Alaska

**SOIL CLASSIFICATION LEGEND**

February 2011 32-1-02155-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

FIG. 3
### DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

<table>
<thead>
<tr>
<th>Part</th>
<th>Description of Frozen Soils</th>
<th>Description (4)</th>
<th>Designation (5)</th>
<th>Field Identification (6)</th>
<th>Particular Properties of Frozen Materials which may be measured by physical tests to supplement field identification (7)</th>
<th>True Characteristics (9)</th>
<th>Criteria (9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part I</td>
<td>Segregated ice is visible by eye (a)</td>
<td>N</td>
<td>H</td>
<td>Identify by visual examination. To determine presence of ice, use procedure under note (b) below and hand magnifying lens as necessary. For soils not fully saturated, estimate degree of ice saturation by: Medium, Low, or No presence of crystals or ice coatings around larger particles.</td>
<td>In-place Temperature</td>
<td>Usually Time Solved</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V</td>
<td>VS</td>
<td>For ice phase, read the following as appropriate: Location, Site, Orientation, Shape, Thickness, Spacing, Pattern or arrangement, Length, Hardness.</td>
<td>Elastic Properties</td>
<td>Usually Time Solved</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Va</td>
<td>Crystal Structure (using optional instruments)</td>
<td>Plastic Properties</td>
<td>Usually Time Solved</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vb</td>
<td>Freezing Rate</td>
<td>Thermal Properties</td>
<td>Usually Time Solved</td>
<td></td>
</tr>
<tr>
<td>Part II</td>
<td>Ice with soil inclusions</td>
<td>Ice + Soil Type</td>
<td>Designate material as Ice (4) and use descriptive terms as follows: usually one item from each group, as appropriate.</td>
<td>Ice Content, Mass, Size, Distribution</td>
<td>Usually Time Solved</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Color</td>
<td>Usually Time Solved</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ice without soil inclusions</td>
<td>Ice</td>
<td>Same as in Part I above, as appropriate, with special emphasis on Ice Crystal Structure</td>
<td>Usually Time Solved</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Definitions:**
- Ice Coatings on Particles are discernable layers of ice found on or below the larger solid particles or a frozen soil mass. They are sometimes associated with frost-bonded crystals which have grown into voids produced by the freezing action.
- Segregated ice is very small individual ice particles visible in the face of a soil mass. Crystals may be present or not in a combination with other ice forms. Ice is transparent and contains only a moderate number of air bubbles. (a) Ice formation is instant and contains no meltwater or meltwater incubation. (b) Ice formation contains numerous voids, usually interconnected and usually resulting from melting of an ice coating or along crystal boundaries. (c) Ice formation is present on the freezing of saturated snow. Through periods, the mass retains its structural unity. (d) Ice is a mixture which has been divided or otherwise formed in long circular crystals, very closely bonded together. (e) Ice is the mass composed of coarse, more or less equidimensional, ice crystals weakly bonded together. (f) Ice formation is a mixture of ice occurring as an assembly parallel to each other, generally normal to the surface of no less than one layer. Ice segregation is the growth of ice as distinct layers, volume and mass at least, commonly but not always oriented normal to pressure of heat loss.

**Notes:**
- (a) When rock is encountered, standard rock classification terminology should be used.
- (b) Flexural strength of the ice is determined by a test for the determination of flexural strength of the ice.
- (c) The ice is assumed to be non-freeze-critical (NF) under the above criteria or visually to occur without significant ice segregation.
- (d) Ice segregation is automatically present when the soil is frozen.
- (e) Ice segregation is automatically present when the soil is frozen.
- (f) Ice segregation is automatically present when the soil is frozen.
- (g) Ice segregation is automatically present when the soil is frozen.
- (h) Ice segregation is automatically present when the soil is frozen.
- (i) Ice segregation is automatically present when the soil is frozen.
- (j) Ice segregation is automatically present when the soil is frozen.
- (k) Ice segregation is automatically present when the soil is frozen.
- (l) Ice segregation is automatically present when the soil is frozen.
- (m) Ice segregation is automatically present when the soil is frozen.
- (n) Ice segregation is automatically present when the soil is frozen.
- (o) Ice segregation is automatically present when the soil is frozen.
- (p) Ice segregation is automatically present when the soil is frozen.
- (q) Ice segregation is automatically present when the soil is frozen.
- (r) Ice segregation is automatically present when the soil is frozen.
- (s) Ice segregation is automatically present when the soil is frozen.
- (t) Ice segregation is automatically present when the soil is frozen.
- (u) Ice segregation is automatically present when the soil is frozen.
- (v) Ice segregation is automatically present when the soil is frozen.
- (w) Ice segregation is automatically present when the soil is frozen.
- (x) Ice segregation is automatically present when the soil is frozen.
- (y) Ice segregation is automatically present when the soil is frozen.
- (z) Ice segregation is automatically present when the soil is frozen.

**Classification of Frozen Soils**

February 2011

32-1-02155-001

Shannon & Wilson, Inc.
Geotechnical & Environmental Consultants

---

Laurel Street Pavements
Anchorage, Alaska

**FIG. 4**
## FROST CLASSIFICATION

*(after Municipality of Anchorage)*

<table>
<thead>
<tr>
<th>GROUP</th>
<th>0.02 Mil.</th>
<th>P-200</th>
<th>USC SYSTEM (based on P-200 results)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS</td>
<td>Sandy Soils 0 to 3</td>
<td>0 to 6</td>
<td>SW, SP, SW-SM, SP-SM</td>
</tr>
<tr>
<td></td>
<td>Gravelly Soils 0 to 3</td>
<td>0 to 6</td>
<td>GW, GP, GW-GM, GP-GM</td>
</tr>
<tr>
<td>F1</td>
<td>Gravelly Soils 3 to 10</td>
<td>6 to 13</td>
<td>GM, GW-GM, GP-GM</td>
</tr>
<tr>
<td>F2</td>
<td>Sandy Soils 3 to 15</td>
<td>6 to 19</td>
<td>SP-SM, SW-SM, SM</td>
</tr>
<tr>
<td></td>
<td>Gravelly Soils 10 to 20</td>
<td>13 to 25</td>
<td>GM</td>
</tr>
<tr>
<td>F3</td>
<td>Sands, except very fine silty sands** Over 15</td>
<td>Over 19</td>
<td>SM, SC</td>
</tr>
<tr>
<td></td>
<td>Gravelly Soils Over 20</td>
<td>Over 25</td>
<td>GM, GC</td>
</tr>
<tr>
<td></td>
<td>Clays, PI&gt;12</td>
<td></td>
<td>CL, CH</td>
</tr>
<tr>
<td>F4</td>
<td>All Silts Over 15</td>
<td>Over 19</td>
<td>ML, MH</td>
</tr>
<tr>
<td></td>
<td>Very fine silty sands** Over 15</td>
<td>Over 19</td>
<td>SM, SC</td>
</tr>
<tr>
<td></td>
<td>Clays, PI&lt;12</td>
<td></td>
<td>CL, CL-ML</td>
</tr>
<tr>
<td></td>
<td>Varved clays and other finely grained, banded sediments</td>
<td></td>
<td>CL and ML</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CL, ML, and SM; SL, SH, and ML; CL, CH, ML, and SM</td>
</tr>
</tbody>
</table>

P-200 = Percent passing the number 200 sieve  
0.02 Mil. = Percent material below 0.02 millimeter grain size

*Approximate P-200 value equivalent for frost classification. Value range based on typical, well-graded soil curves.

** Very fine sand : greater than 50% of sand fraction passing the number 100 sieve

---

Laurel Street Pavements  
Anchorage, Alaska

---

FROST CLASSIFICATION LEGEND

February 2011 32-1-02155-001

SHANNON & WILSON, INC.  Gecotechnical & Environmental Consultants FIG. 5
**MATERIAL DESCRIPTION**

**Approx. Elevation:** 148 Ft.

**Depth, Ft.**  
0.2  
0.4  
3.2

**Symbol:**  
[Diagram showing symbols and their meanings]

**Samples**  
S1  
S2  
S3  
S4

**Ground Water Depth, Ft.**  
0  
25  
50  
75  
100

**Penetration Resistance**  
(140 lb. weight, 30" drop)  
[Diagram showing penetration resistance data]

- ▲ Blows per foot  
- ● Water Content (%)

**Asphalt (2 to 2.5 inches)**

**Asphalt treated base? (2 inches)**

S1: 45% Gravel, 43% Sand, 12% Fines (F: 0.02 MI)

Frozen (W/Wn), tan, silty, sandy GRAVEL to silty, gravelly SAND; moist [FILL]

Occasional cobbles based on drill action and auger cuttings

S2: 25% Gravel, 47% Sand, 28% Fines (F3 P200)

Frozen (Vs/Vr) to medium dense, tan, silty SAND to gravelly, silty SAND; moist to wet; occasional visible random ice crystals and seams in the frost zone; thawed from approximately 3.5 to 4 feet

S4: 16% Gravel, 42% Sand, 42% Fines (F3 P200)

Lower gravel content from 10.5 to 12.5 feet

Dense, gray, silty, gravelly SAND; moist

**Bottom of Boring**  
Boring Completed February 10, 2011

---

**LEGEND**

- *: Sample Not Recovered
- ▲: Grab Sample
- □: 2" O.D. Split Spoon Sample
- ■: Frozen

**NOTES**

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

**Laurel Street Pavements**  
**Anchorage, Alaska**

**LOG OF BORING B-1**

February 2011  
32-1-02155

**SHANNON & WILSON, INC.**  
Geotechnical and Environmental Consultants

**FIG. 6**
### MATERIAL DESCRIPTION

**Approx. Elevation:** 144 Ft.

<table>
<thead>
<tr>
<th>Depth, Ft.</th>
<th>Symbol</th>
<th>Samples</th>
<th>Ground Water Depth, Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>S3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5</td>
<td>S4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>S5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.5</td>
<td>S6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Penetration Resistance (140 lb. weight, 30" drop)**

- ▲ Blows per foot
- ● Water Content (%)

**Asphalt (2.5 inches)**

Asphalt treated base? (2 inches)

Frozen (Nf/Nbn), tan, slightly silty, gravelly SAND; moist [FILL]

S1: 44% Gravel, 47% Sand, 10% Fines (F1 (0.02 Mf))

**Frozen (Vs/Vr) to stiff, tan, slightly sandy to sandy SLT; moist to wet; frequent visible random ice crystals and seams in the frost zone**

S3: 76.5% Fines (F4 (P200))

**Medium dense, tan, silty SAND to gravelly, silty SAND; moist**

Interbedded with frequent 0.5 to 1-inch silt layers from 8.5 to 10.3 feet

Higher gravel content from 10.3 feet to 12.5 feet

**Dense, gray, silty, gravelly SAND; moist**

**Bottom of Boring**

Boring Completed February 10, 2011

---

**LEGEND**

- * Sample Not Recovered
- II Grab Sample
- † 2" O.D. Split Spoon Sample

- Frozen

**NOTES**

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.

---

**Laurel Street Pavements**

Anchorage, Alaska

**LOG OF BORING B-2**

February 2011 32-1-02155

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 7
The image contains a grain size distribution curve with data points labeled as follows:

**COBBLES**
- Sample: B-1 S1, Depth: 0.4 - 2.0 ft
- Classification: Silty, sandy GRAVEL [GM]

**GRAVEL**
- Sample: B-1 S2, Depth: 2.5 - 4.0 ft
- Classification: Silty, gravelly SAND [SM]

**SAND**
- Sample: B-1 S4, Depth: 7.5 - 9.0 ft
- Classification: Gravely, silty SAND [SM]

**SILT OR CLAY**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Depth, Ft</th>
<th>Classification</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Cc</th>
<th>Cu</th>
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<tbody>
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<td>2.3</td>
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<td>Silty, gravelly SAND [SM]</td>
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<td>43</td>
<td>12</td>
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<td></td>
</tr>
<tr>
<td>B-1 S4</td>
<td>7.5 - 9.0</td>
<td>Gravely, silty SAND [SM]</td>
<td>25</td>
<td>47</td>
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<td></td>
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</table>

The table includes additional data for each sample:

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<th>Depth, Ft</th>
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<th>D60</th>
<th>D30</th>
<th>D10</th>
<th>%Gravel</th>
<th>%Sand</th>
<th>%Silt</th>
<th>%Clay</th>
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<tr>
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<td>25</td>
<td>1.18</td>
<td>0.09</td>
<td>0.03</td>
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<td>47</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>B-1 S4</td>
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<td>0.34</td>
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</table>
### Grain Size Classification

**Laurel Street Pavements, Anchorage, Alaska**

**Figure 8**

<table>
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<th>Classification</th>
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<th>PI</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2 S1</td>
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<td>Slightly silty, gravelly SAND [SW-SM]</td>
<td>1.5</td>
<td>67</td>
<td>3</td>
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<table>
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<th>Depth, Ft</th>
<th>D100</th>
<th>D60</th>
<th>D30</th>
<th>D10</th>
<th>%Gravel</th>
<th>%Sand</th>
<th>%Silt</th>
<th>%Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2 S1</td>
<td>0.4 - 2.0</td>
<td>37.5</td>
<td>5.6</td>
<td>0.84</td>
<td>0.08</td>
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<td>47</td>
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APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT
Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT’S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project 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, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors, which were considered in the development of the report, have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

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/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.
A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final 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.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold 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 that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental 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 consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not excusable clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's 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 report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

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3/2004