GEOTECHNICAL REPORT

CANTON ALLEY AND NIHONMACHI ALLEY IMPROVEMENTS
SEATTLE INTERNATIONAL DISTRICT
SEATTLE, WASHINGTON

Project No. 19-260
December 2019

Prepared for:

SCIDpda

PanGEO INCORPORATED
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Geotechnical & Earthquake Engineering Consultants

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December 6, 2019
Project No. 19-260

Seattle Chinatown International District
Preservation and Development Authority (SCIDpda)
409 Maynard Ave S suite p2
Seattle, WA 98104
Attn: An Huynh

Subject: **Geotechnical Report**
Canton Alley and Nihonmachi Alley Improvements
Seattle International District, Seattle, Washington

Dear Ms. Huynh,

As requested, PanGEO Inc. completed a geotechnical engineering study to support the design and construction of the proposed Canton Alley and Nihonmachi Alley Improvements in the City of Seattle. The results of our study and our recommendations are summarized in the attached report.

In summary, based on the results of our study, it is our opinion that the existing alley pavement in the project area is in a poor condition, and should be removed and reconstructed with new pavement. The new alley pavement should consist of 8 inches of Portland Cement Concrete (PCC) over 10 inches of Crushed Surfacing Base Course (CSBC). Details of our recommendations are discussed in the attached report.

We appreciate the opportunity to work on this project. Please call if there are any questions.

Sincerely,

H. Michael Xue, P.E.
Senior Geotechnical Engineer

Encl.: Geotechnical Report

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SEATTLE INTERNATIONAL DISTRICT
SEATTLE, WASHINGTON

1.0 INTRODUCTION

This report presents the results of a geotechnical engineering study that was undertaken to support the design effort for the proposed Canton Alley and Nihonmachi Alley Improvements project in the City of Seattle, Washington. Our study was performed in general accordance with our mutually agreed scope of work as outlined in our proposal dated July 17, 2019, which was subsequently approved by you on August 2, 2019. Our service scope included conducting a site reconnaissance along the project alignments, advancing five test borings along the project alignments, and developing the conclusions and recommendations presented in this report.

2.0 SITE AND PROJECT DESCRIPTION

The project sites consist of Canton Alley and Nihonmachi Alley located in the International District neighborhood of Seattle, Washington. Canton Alley is located between 7th Avenue South and 8th Avenue South, and extends from South Weller Street to S King Street. Nihonmachi Alley is located approximately one block to the northwest of Canton Alley, and is located between 6th Avenue South and Maynard Avenue South, and extends from South Jackson Street to South Main Street. The site vicinity map and the approximate project alignments are shown in Figure 1.

The alleys are one-lane road with concrete and brick surfacing. The existing conditions along both alleys are shown in Plates 1 through Plate 5, on pages 2 through 4 of this report. As shown in Plates 1 through 5 on Pages 2 through 4, the surface grade along majority of the alignment generally slopes to the south. Along Canton Alley the gradient is about 4 percent, and along Nihonmachi Alley the gradient is about 12 percent.

We understand that the proposed improvements consist of reconstructing the southern half of Canton Alley and all of Nihonmachi Alley, to improve the safety and walkability. We understand the proposed project may also include surface and surface drainage improvements, if needed.

Plate 1. The southern portion of the Canton Alley, looking north from South Weller Street

Plate 2. Middle and northern portions of the Canton Alley, looking north near Weller Street

Plate 3. Southern portion of Nihonmachi Alley, looking north just north of South Jackson Street

Plate 4. Middle portion of Nihonmachi Alley, looking north

Plate 5. Northern portion of Nihonmachi Alley, looking north

3.0 SUBSURFACE EXPLORATIONS

Five test borings (PG-1 through PG-5) were drilled along the project alignments on October 4 and 15, 2019. The approximate boring locations were measured from existing site features and are indicated on Figures 2 and 3 of this report. The borings were drilled to depths ranging from about 8 to 8½ feet using a portable drill rig owned and operated by CN Drilling of Seattle, Washington. The drill rig was equipped with 6-inch outside diameter hollow stem augers.

Soil samples were obtained from the borings at 2½- and 5-foot depth intervals in conjunction with Standard Penetration Test (SPT) sampling method in general accordance with ASTM test method D-1586, in which the samples are obtained using a 2-inch outside diameter split-spoon sampler. The sampler was driven into the soil a distance of 18 inches using a 140-pound weight falling a distance of 30 inches. The number of blows required for each 6-inch increment of sampler penetration was recorded. The number of blows required to achieve the last 12 inches of sample penetration is defined as the SPT N-value. The N-value provides an empirical measure of the relative density of cohesionless soil, or the relative consistency of fine-grained soils.

A geologist from PanGEO was present during the field exploration to observe the drilling, to assist in sampling, and to describe and document the soil samples obtained from the borings.

The summary boring logs are included in Appendix A, Figures A-2 through A-6. The soil samples were described using the system outlined on Figure A-1 in Appendix A.

4.0 EXISTING ALLEY SURFACE CONDITION

The project alignments consist of two one-lane concrete/brick alleys. The current alley surfacing conditions along the project alignments are considered to be very poor along Nihonmachi Alley, and to be poor to fair along Canton Alley. We observed longitude cracks along most of the alignment with localized traverse and alligator cracks. We also observed narrow patches, which appeared to be the results of utility installations and repairs, along most of the project alignment. Signs of surface settlement are also observed along Nihonmachi Alley. Typical surface conditions along the alley alignments are shown in Plates 1 through 5 on Pages 2 through 4 of this report. The alley surface material and thickness encountered in each boring are summarized in Table 1, below:

Table 1 – Summary of Existing Alley Surfacing Thickness

Location	Alley Surfacing Material and Thickness	Road Base	Subgrade
PG-1	5 inches of concrete	7 inches of sandy gravel	Medium dense interlayered sand and silt (Glacial Drift)
PG-2	6 inches of concrete	2-3 inches of sandy gravel	Loose interlayered sand and silt (Glacial Drift)
PG-3	10 inches of concrete	3 inches of sandy gravel	Medium dense interlayered sand and silty sand (Glacial Drift)
PG-4	9 inches of concrete	12 inches of sandy gravel	Loose interlayered sand and silty sand (Glacial Drift)
PG-5	12 inches of layered asphalt, brick, and concrete	7 inches of sandy gravel	Medium stiff interlayered clay and sandy silt (Glacial Drift)

5.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

5.1 SITE GEOLOGY

Based on our review of *The Geologic Map of Seattle – A Progress Report* (Troost, et al., 2005) the surficial geology in the vicinity of the site is mapped as pre-Olympia glacial deposits (Geologic Map Unit: Qpog).

Troost describes pre-Olympia glacial deposits as silt, sand, gravel, and till of glacial origin. Pre-Olympia deposits have been overridden by glacial ice and are typically very dense and hard.

5.2 SOIL CONDITIONS

Based on the results of our test borings, the soils below the alley surface in the project area generally consisted of road base material overlying loose to medium dense silty sand and medium stiff to hard silt and clay. A description of the generalized soil units encountered in our test borings is presented below. Please refer to the test boring logs in Appendix A for additional details.

Unit 1: Fill – Below the alley surfacing consisted of asphalt, brick, and concrete, each boring encountered about 3 to 12 inches of sandy gravel, which we interpret as road base material.

Unit 2: Glacial Drift – Below Unit 1, all five test borings generally encountered loose to dense and medium stiff to hard interlayered sand, silty sand, silt, and clay. This unit was encountered to the termination depths of all of the borings at 8 to 8½ feet below the surface. We interpret this unit as glacial drift based on its interlayered soil structure and generally medium dense to dense condition. The upper portion of this unit is weathered to a loose to medium dense condition.

5.3 GROUNDWATER

Groundwater was not encountered within the drilling depths during drilling. It should be noted that groundwater levels are likely to vary depending on the season, local subsurface conditions, and other factors. Groundwater levels are normally highest during the winter and early spring.

6.0 CONCLUSIONS AND RECOMMNEDATIONS

6.1 ALLEY PAVEMENT

Based on our observations of the current alley surface conditions and the subsurface conditions encountered in our borings, it is our opinion that existing alley pavement distress is likely caused by a combination of surface wearing, inappropriate base course material type and and inadequate compaction of the base course material, loose condition of the subgrade soils, and lack of underdrain below the alley pavement. In our opinion, the alleys within the proposed improvement limits should be removed and reconstructed with new alley pavement surface.

We understand that vehicular traffic for both alleys will primarily consist of passenger cars, delivery trucks, and garage and recycle trucks. Based on this and the site soil conditions in the borings, we recommend the new alley pavement section to consist of 8 inches of Portland Cement Concrete (PCC) over 10 inches of crushed surfacing base course (CSBC). The PCC construction and material should conform to the section 5-05 and 9-01 of the 2017 City of Seattle *Standard Specifications*. The pavement surface should be slightly sloped toward to the alley center to improve the surface water collection and disposal. Crushed surfacing base course (CSBC) should conform to section 9-03 of the 2017 City of Seattle *Standard Specifications*.

The pavement section recommended above is based on the assumption the existing pavement subgrade will be properly compacted. As a minimum, prior to placing the crushed rock base, the upper 12 inches of the subgrade should be compacted to at least 95% of its maximum dry density (Modified Proctor, ASTM D1557).

6.2 ALLEY PAVEMENT SUBGRADE PREPARATION

Based on the results of our test borings, we anticipate that silty sand to silt will be present at the bottom of the base course level. Following removal of the existing alley pavement, the exposed subgrade should be moisture conditioned, if necessary, and compacted to a dense condition. The upper 12 inches of material should be compacted to at least 95 percent of the maximum dry density, as determined by test method ASTM D 1557 (Modified Proctor).

Any soft, yielding, and pumping areas identified during the compaction process should be over-excavated and backfilled with properly compacted CSBC (crushed surfacing base course), as described in Section 9-03 of the 2017 City of Seattle *Standard Specifications*. A layer of filter

fabric, such as Mirafi 600X or approved equivalent, may need to be placed on the native soil prior to placement of additional structural fill to improve the long-term subgrade performance .

6.3 UNDERDRAINS BELOW ALLEY PAVEMENT

Due to the silty nature of the subgrade soils, we recommend installing a pavement underdrain system below the base course to improve the long-term performance of the subgrade soils. The pavement underdrain drainage system should be located along the approximate center line of the alley, and should consist of 4-inch diameter perforated drainpipes placed in narrow (one foot or less), approximately 12-inch deep trenches (measured from the bottom of base course). The pavement underdrain trenches should be backfilled with clean, free-draining clean crushed rocks. The clean crushed rocks should be wrapped within a layer of non-woven filter fabric, such as Mirafi 140N or approved equivalent. The underdrain piles should be connected and tight lined and discharged to an appropriate outlet. We also recommend that clean outs be installed at strategic locations to provide easy maintenance.

6.4 MATERIAL REUSE

Excavated on-site soils cannot be used as CSBC or structural fill. City of Seattle Type 2 material should be used as structural fill, if needed.

6.5 STRUCTURAL FILL PLACEMENT AND COMPACTION

Structural fill should be moisture conditioned to within about 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 8 inches in thickness, and systematically compacted to a dense and relatively unyielding condition and to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557.

Depending on the type of compaction equipment used and depending on the type of fill material, it may be necessary to decrease the thickness of each lift in order to achieve adequate compaction. PanGEO can provide additional recommendations regarding structural fill and compaction during construction.

6.6 TEMPORARY EROSION CONTROL CONSIDERATIONS

Most soil types are subject to erosion when the pavement surface and vegetative cover is removed and the soils are exposed to inclement weather conditions. During construction, all

exposed slopes should be protected from runoff by berms or swales. The swales should be routed to existing drainage facilities to divert runoff from the bare soil slope. Straw bales staked in the swales, perpendicular to the swales' centerlines, may be used to reduce water velocities to minimize erosion.

6.7 WET WEATHER EARTHWORK

In our opinion, the proposed alley improvements construction may be accomplished during wet weather. However, earthwork construction performed during the drier summer months likely will be more economical. Winter construction will require the implementation of best management erosion and sedimentation control practices to reduce the chance of off-site sediment transport. The on-site subgrade soils may become saturated and spongy, and difficult to compact due to rain in the wet season. Soft subgrade soil due to inclement weather, disturbance, and poor drainage will require removal and replacement with well-compacted structural fill.

General recommendations relative to earthwork performed in wet weather or in wet conditions are presented below. These recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soil should be followed promptly by the placement and compaction of clean structural fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic.

- During wet weather conditions, the allowable fines content of the gravel borrow should be reduced to no more than 5 percent by weight based on the portion passing ¾-inch sieve. The fines should be non-plastic.

- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water.

- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should soil be left uncompacted and exposed to moisture.

- Geotextile silt fences should be strategically located to control erosion and the movement of soil.

7.0 ADDITIONAL SERVICES

We anticipate the City of Seattle will require a plan review and geotechnical special inspections to confirm that our recommendations are properly incorporated into the design and construction of the proposed development. Specifically, we anticipate that the following construction support services may be needed:

- Review final project plans and specifications;
- Verify implementation of erosion control measures;
- Verify adequacy of alley subgrade conditions;
- Confirm the adequacy of the compaction of base course and structural backfill;
- Observe installation of subsurface drainage provisions, and;
- Other consultation as may be required during construction.

Modifications to our recommendations presented in this report may be necessary, based on the actual conditions encountered during construction.

8.0 LIMITATIONS

We have prepared this report for the Seattle Chinatown International District Preservation and Development Authority and the project design team. Recommendations contained in this report are based on a site reconnaissance, a subsurface exploration program, review of pertinent subsurface information, and our understanding of the project. The study was performed using a mutually agreed-upon scope of work.

Variations in soil conditions may exist between the locations of the explorations and the actual conditions underlying the site. The nature and extent of soil variations may not be evident until construction occurs. If any soil conditions are encountered at the site that are different from those described in this report, we should be notified immediately to review the applicability of

our recommendations. Additionally, we should also be notified to review the applicability of our recommendations if there are any changes in the project scope.

The scope of our work does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractors' methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design. Additionally, the scope of our work specifically excludes the assessment of environmental characteristics, particularly those involving hazardous substances.

This report has been prepared for planning and design purposes for specific application to the proposed project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issuance. PanGEO should be notified if the project is delayed by more than 24 months from the date of this report so that we may review the applicability of our conclusions considering the time lapse.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

We appreciate the opportunity to be of service to you on this project. Please feel free to contact our office with any questions you have regarding our study, this report, or any geotechnical engineering related project issues.

Sincerely,

Bart Weitering

Bart Weitering, G.I.T.
Staff Geologist

H. Michael Xue, P.E.
Senior Geotechnical Engineer

9.0 LIST OF REFERENCES

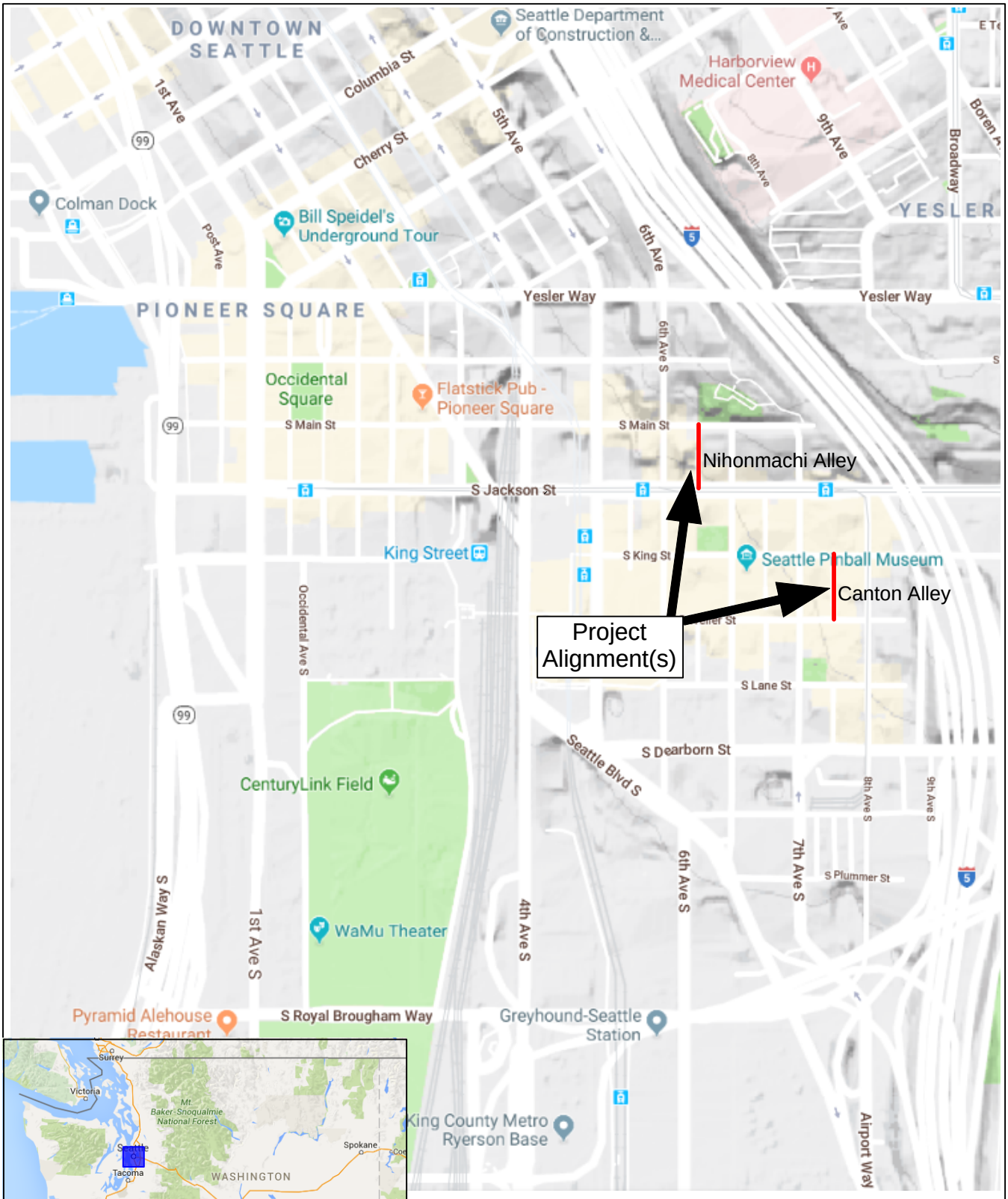
ASTM D1586-11, *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*, ASTM International, West Conshohocken, PA, 2011, www.astm.org.

ASTM D2488-17, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, ASTM International, West Conshohocken, PA, 2017, www.astm.org.

City of Seattle, 2016, Standard Specifications for Road, Bridges, and Municipal Construction, Seattle, Washington.

Troost, Kathy Goetz, Booth, Derek B., Wisher, Aaron P., and Shimel, Scott A. *The Geologic Map of Seattle – a Progress Report***,** USGS, Open-File Report 2005-1252, 2005.

Washington State Department of Transportation (WSDOT), 2016, *Standard Specifications for Road, Bridges, and Municipal Construction*, Olympia, Washington.



NORTH

Approx. Scale: Not to Scale

Base Map: Google Maps

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Canton & Nihonmachi Alley Improvements Seattle, Washington

VICINITY MAP

Project No. **19-260**

Figure No. **1**

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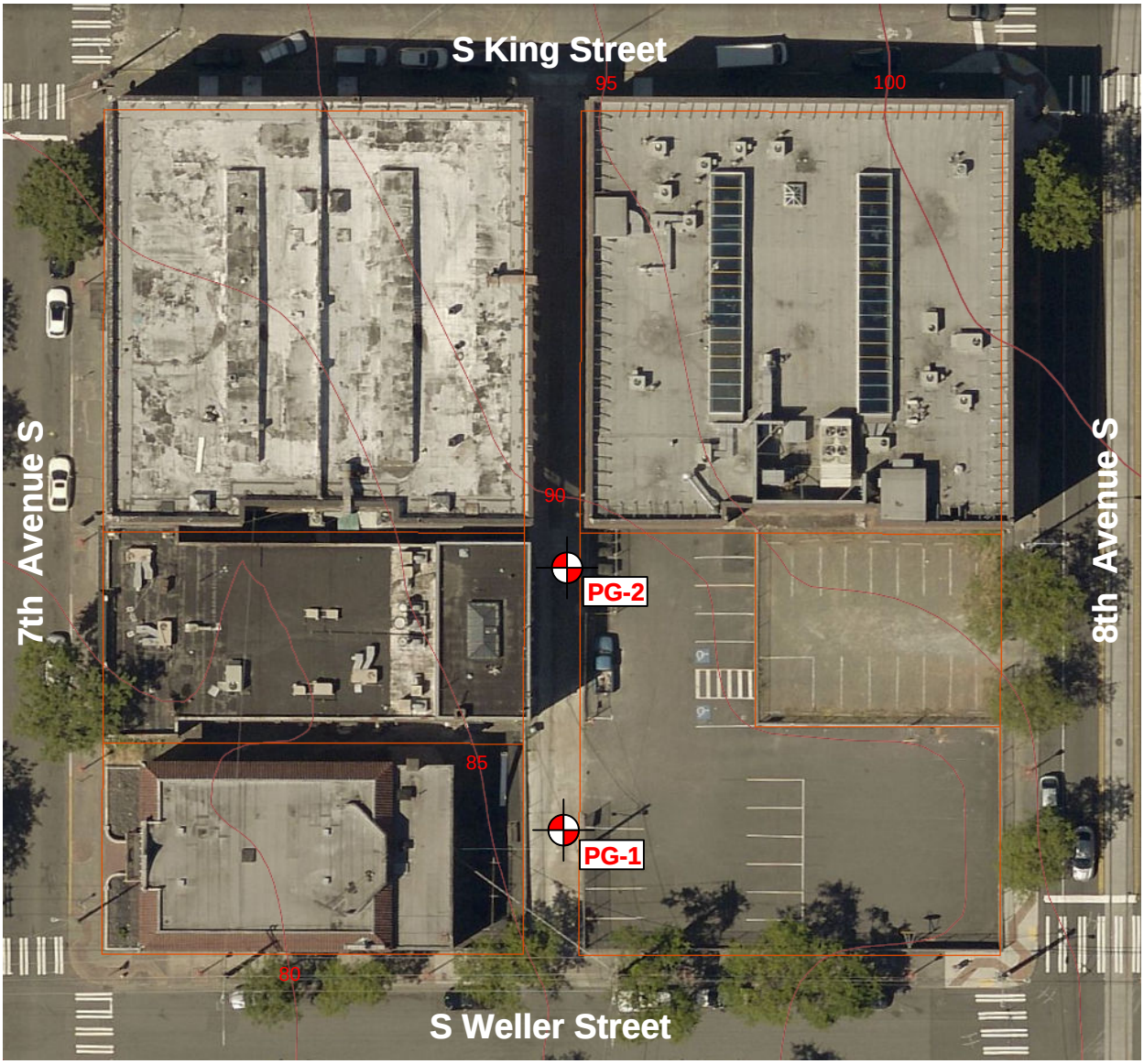


Legend:

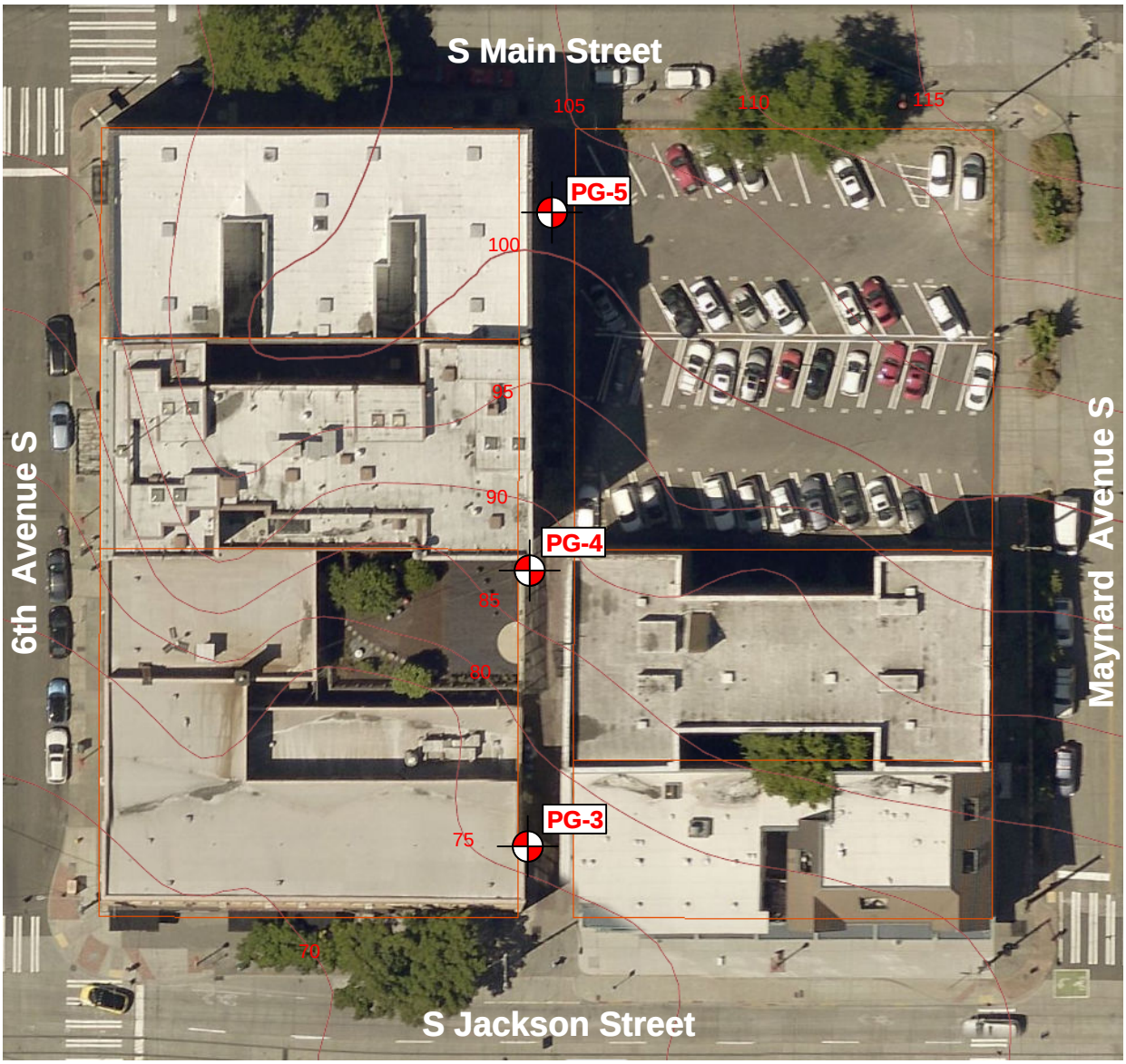
Approx. Boring Location

100 Elevation Contour

Approx. Scale
1" = 50'

Note: Base map modified from King County iMap

PanGEO INCORPORATED	**Canton & Nihonmachi Alley Improvements Seattle, Washington**	**SITE AND EXPLORATION PLAN CANTON ALLEY**	
		Project No. **19-260**	Figure No. **2**



Legend:

Approx. Boring Location

100 Elevation Contour

Approx. Scale
1" = 50'

Note: Base map modified from King County iMap

PanGEO INCORPORATED	**Canton & Nihonmachi Alley Improvements Seattle, Washington**	**SITE AND EXPLORATION PLAN NIHONMACHI ALLEY**	
		Project No. **19-260**	Figure No. **3**

APPENDIX A

SUMMARY BORING LOGS

RELATIVE DENSITY / CONSISTENCY

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Med. Dense	10 to 30	35 - 65	Med. Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)	GW	Well-graded GRAVEL
		GP	Poorly-graded GRAVEL
	GRAVEL (>12% fines)	GM	Silty GRAVEL
		GC	Clayey GRAVEL
Sand 50% or more of the coarse fraction passing the #4 sieve. Use dual symbols (eg. SP-SM) for 5% to 12% fines.	SAND (<5% fines)	SW	Well-graded SAND
		SP	Poorly-graded SAND
	SAND (>12% fines)	SM	Silty SAND
		SC	Clayey SAND
Silt and Clay 50%or more passing #200 sieve	Liquid Limit < 50	ML	SILT
		CL	Lean CLAY
		OL	Organic SILT or CLAY
	Liquid Limit > 50	MH	Elastic SILT
		CH	Fat CLAY
		OH	Organic SILT or CLAY
Highly Organic Soils		PT	PEAT

Notes: 1. Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.

2. The graphic symbols given above are not inclusive of all symbols that may appear on the borehole logs. Other symbols may be used where field observations indicated mixed soil constituents or dual constituent materials.

DESCRIPTIONS OF SOIL STRUCTURES

Layered: Units of material distinguished by color and/or composition from material units above and below

Laminated: Layers of soil typically 0.05 to 1mm thick, max. 1 cm

Lens: Layer of soil that pinches out laterally

Interlayered: Alternating layers of differing soil material

Pocket: Erratic, discontinuous deposit of limited extent

Homogeneous: Soil with uniform color and composition throughout

Fissured: Breaks along defined planes

Slickensided: Fracture planes that are polished or glossy

Blocky: Angular soil lumps that resist breakdown

Disrupted: Soil that is broken and mixed

Scattered: Less than one per foot

Numerous: More than one per foot

BCN: Angle between bedding plane and a plane normal to core axis

COMPONENT DEFINITIONS

COMPONENT	SIZE / SIEVE RANGE	COMPONENT	SIZE / SIEVE RANGE
Boulder:	> 12 inches	Sand	
Cobbles:	3 to 12 inches	Coarse Sand:	#4 to #10 sieve (4.5 to 2.0 mm)
Gravel		Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
Coarse Gravel:	3 to 3/4 inches	Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Fine Gravel:	3/4 inches to #4 sieve	Silt	0.074 to 0.002 mm
		Clay	<0.002 mm

TEST SYMBOLS

for In Situ and Laboratory Tests listed in "Other Tests" column.

ATT	Atterberg Limit Test
Comp	Compaction Tests
Con	Consolidation
DD	Dry Density
DS	Direct Shear
%F	Fines Content
GS	Grain Size
Perm	Permeability
PP	Pocket Penetrometer
R	R-value
SG	Specific Gravity
TV	Torvane
TXC	Triaxial Compression
UCC	Unconfined Compression

SYMBOLS

Sample/In Situ test types and intervals

- 2-inch OD Split Spoon, SPT (140-lb. hammer, 30" drop)
- 3.25-inch OD Spilt Spoon (300-lb hammer, 30" drop)
- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

MONITORING WELL

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

MOISTURE CONTENT

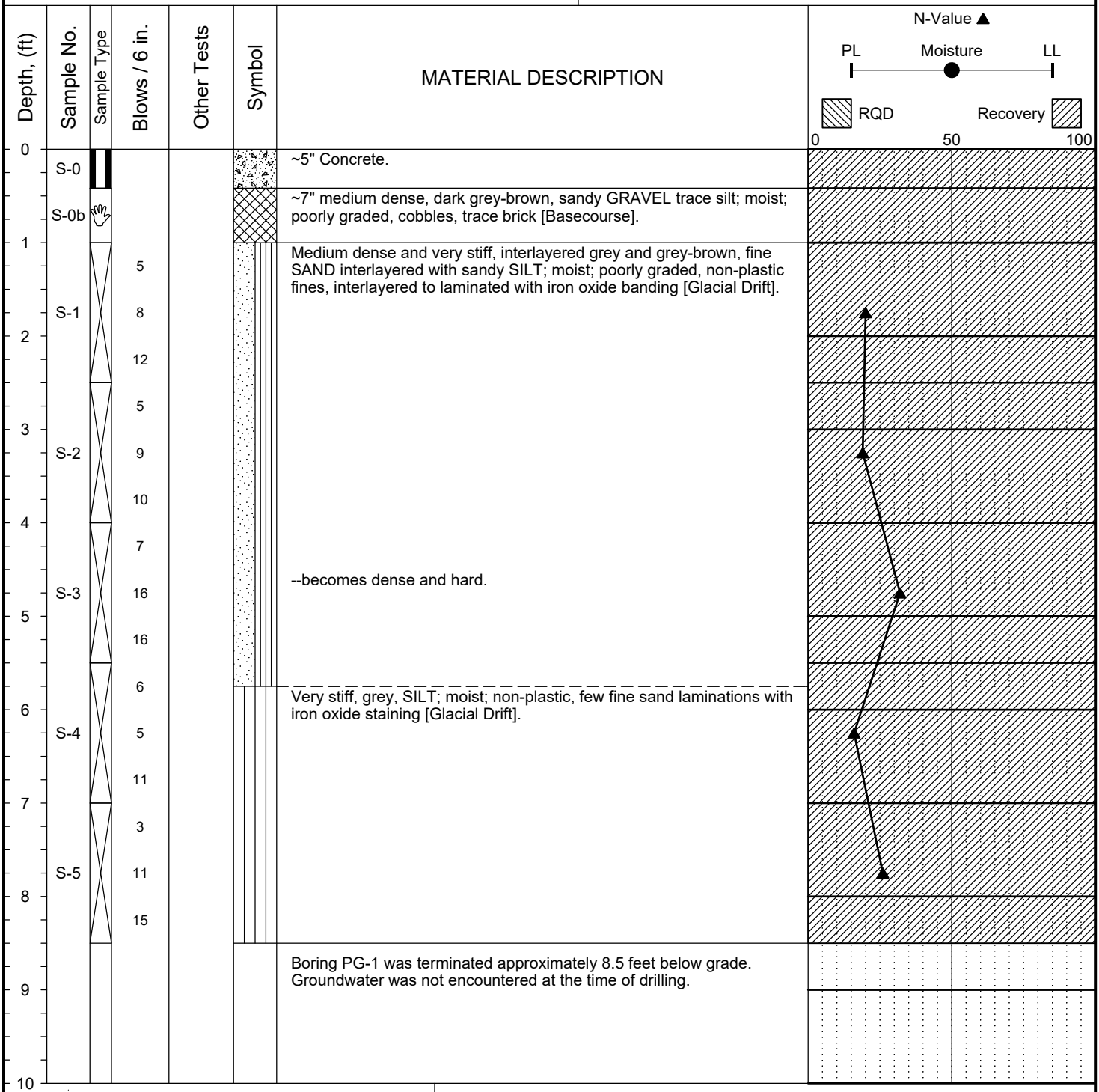
Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

PanGEO INCORPORATED
Phone: 206.262.0370

Terms and Symbols for Boring and Test Pit Logs

Figure A-1

Project:	Canton and Nihonmachi Alley Improvements	Surface Elevation:	87.0ft
Job Number:	19-260	Top of Casing Elev.:	N/A
Location:	Canton Alley and Nihonmachi Alley	Drilling Method:	HSA
Coordinates:	Northing: 47.59769, Easting: -122.32311	Sampling Method:	SPT



Completion Depth:	8.5ft
Date Borehole Started:	10/15/19
Date Borehole Completed:	10/15/19
Logged By:	Bart Weitering
Drilling Company:	CN Drilling

Remarks: Drilling was performed using an Acker Portable Drill with hollow-stem augers. Standard Penetration Test (SPT) sampler driven with a 140-lb safety hammer using a rope and cat-head dropping 30 inches per stroke. Ground elevations estimated from King County iMap.

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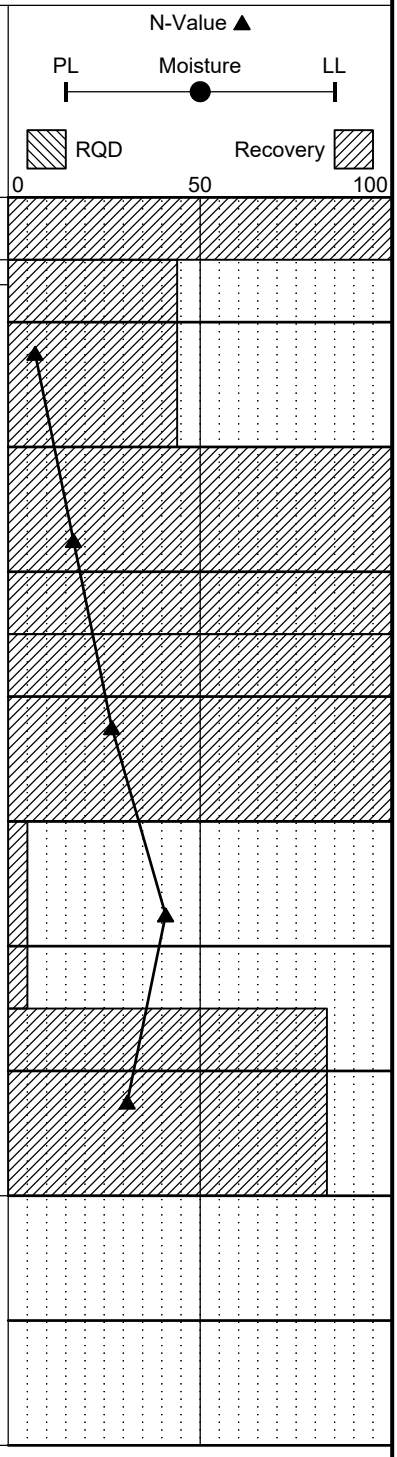
LOG OF TEST BORING PG-1

Figure A-2

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Canton and Nihonmachi Alley Improvements	Surface Elevation:	88.0ft
Job Number:	19-260	Top of Casing Elev.:	N/A
Location:	Canton Alley and Nihonmachi Alley	Drilling Method:	HSA
Coordinates:	Northing: 47.5979, Easting: -122.32311	Sampling Method:	SPT

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION
0	S-0					~6" Concrete.
			3			~2-3" loose, dark grey-brown, slightly gravelly, silty SAND; moist; poorly graded, trace brick [Basecourse].
1	S-1		3			Loose to dense and medium stiff to hard, interlayered grey and grey-brown, fine SAND interlayered with sandy SILT; moist; poorly graded, non-plastic fines, interlayered to laminated with iron oxide banding [Glacial Drift].
			4			
2			4			
	S-2		7			--becomes medium dense and very stiff.
3			10			
			4			
4	S-3		12			
			15			
5			7			
	S-4		13			--poor to no recovery; gravel in tip - blow count is likely inflated.
6			28			
			10			
7	S-5		15			--becomes dense and hard.
			16			
8						Boring PG-2 was terminated approximately 8 feet below grade. Groundwater was not encountered at the time of drilling.
9						
10						



Completion Depth:	8.0ft
Date Borehole Started:	10/15/19
Date Borehole Completed:	10/15/19
Logged By:	Bart Weitering
Drilling Company:	CN Drilling

Remarks: Drilling was performed using an Acker Portable Drill with hollow-stem augers. Standard Penetration Test (SPT) sampler driven with a 140-lb safety hammer using a rope and cat-head dropping 30 inches per stroke. Ground elevations estimated from King County iMap.

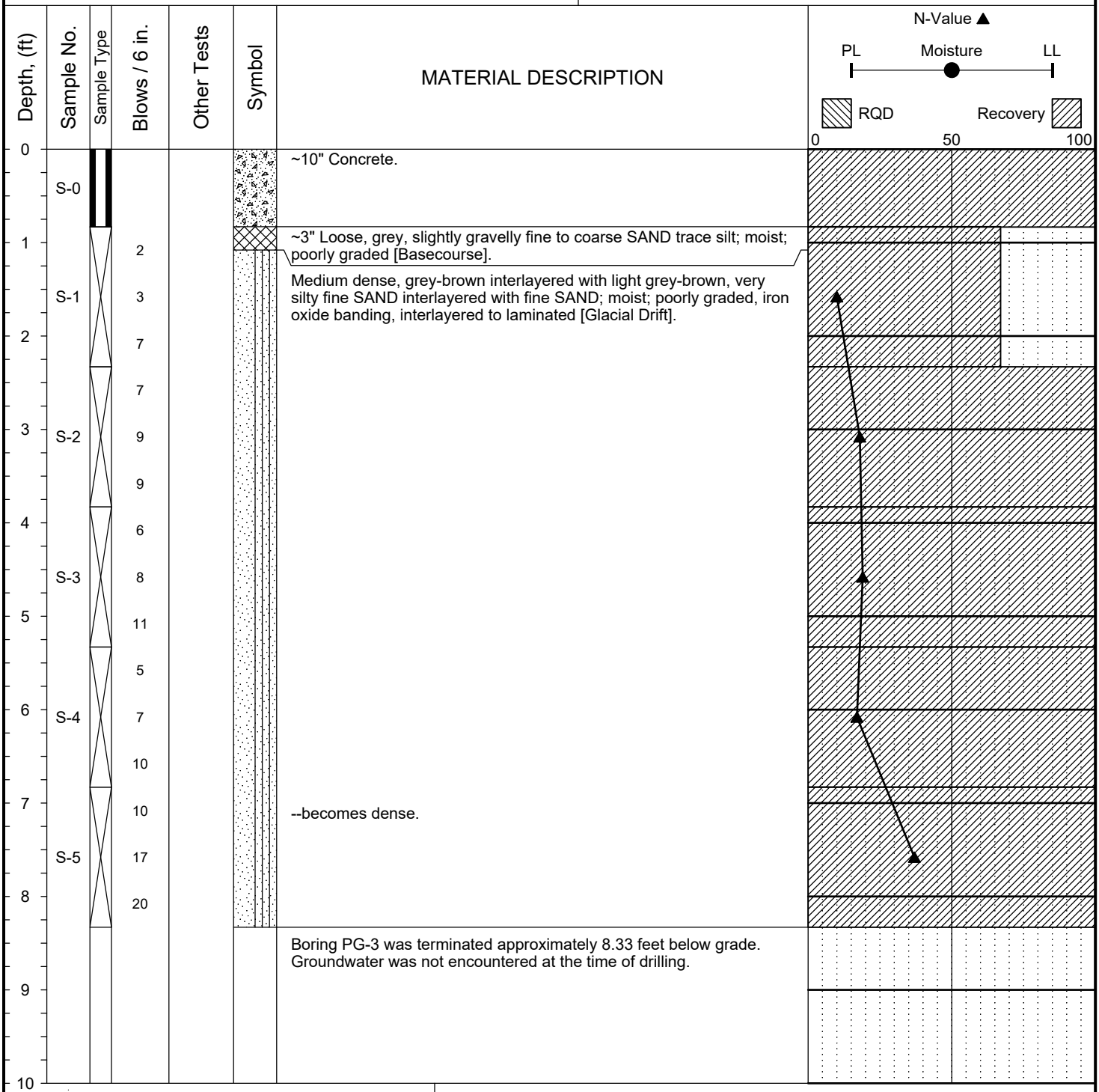
PanGEO INCORPORATED

LOG OF TEST BORING PG-2

Figure A-3

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Canton and Nihonmachi Alley Improvements	Surface Elevation:	77.0ft
Job Number:	19-260	Top of Casing Elev.:	N/A
Location:	Canton Alley and Nihonmachi Alley	Drilling Method:	HSA
Coordinates:	Northing: 47.5994, Easting: -122.32575	Sampling Method:	SPT



Completion Depth:	8.3ft
Date Borehole Started:	10/4/19
Date Borehole Completed:	10/4/19
Logged By:	Bart Weitering
Drilling Company:	CN Drilling

Remarks: Drilling was performed using an Acker Portable Drill with hollow-stem augers. Standard Penetration Test (SPT) sampler driven with a 140-lb safety hammer using a rope and cat-head dropping 30 inches per stroke. Ground elevations estimated from King County iMap.

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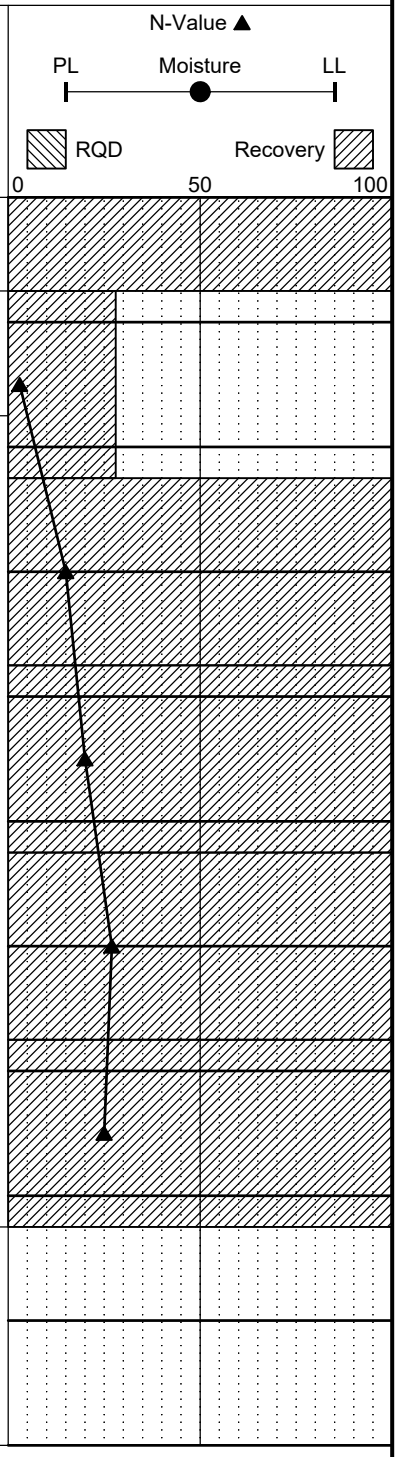
LOG OF TEST BORING PG-3

Figure A-4

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Canton and Nihonmachi Alley Improvements	Surface Elevation:	88.0ft
Job Number:	19-260	Top of Casing Elev.:	N/A
Location:	Canton Alley and Nihonmachi Alley	Drilling Method:	HSA
Coordinates:	Northing: 47.59961, Easting: -122.32575	Sampling Method:	SPT

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION
0	S-0					~9" Concrete.
1	S-1		1 1			~12" Very loose, grey, slightly gravelly fine to coarse SAND trace silt; moist; poorly graded [Basecourse].
2			2 2			Loose to medium dense, grey-brown interlayered with light grey-brown, silty fine SAND interlayered with fine SAND; moist; poorly graded, iron oxide banding, interlayered to laminated [Glacial Drift].
3	S-2		6 9			--becomes medium dense.
4			4			
5	S-3		9 11			
6	S-4		5 10 17			
7	S-5		7 12			--becomes interlayered with very stiff sandy silt.
8			13			
9						Boring PG-4 was terminated approximately 8.25 feet below grade. Groundwater was not encountered at the time of drilling.
10						



Completion Depth:	8.3ft
Date Borehole Started:	10/4/19
Date Borehole Completed:	10/4/19
Logged By:	Bart Weitering
Drilling Company:	CN Drilling

Remarks: Drilling was performed using an Acker Portable Drill with hollow-stem augers. Standard Penetration Test (SPT) sampler driven with a 140-lb safety hammer using a rope and cat-head dropping 30 inches per stroke. Ground elevations estimated from King County iMap.

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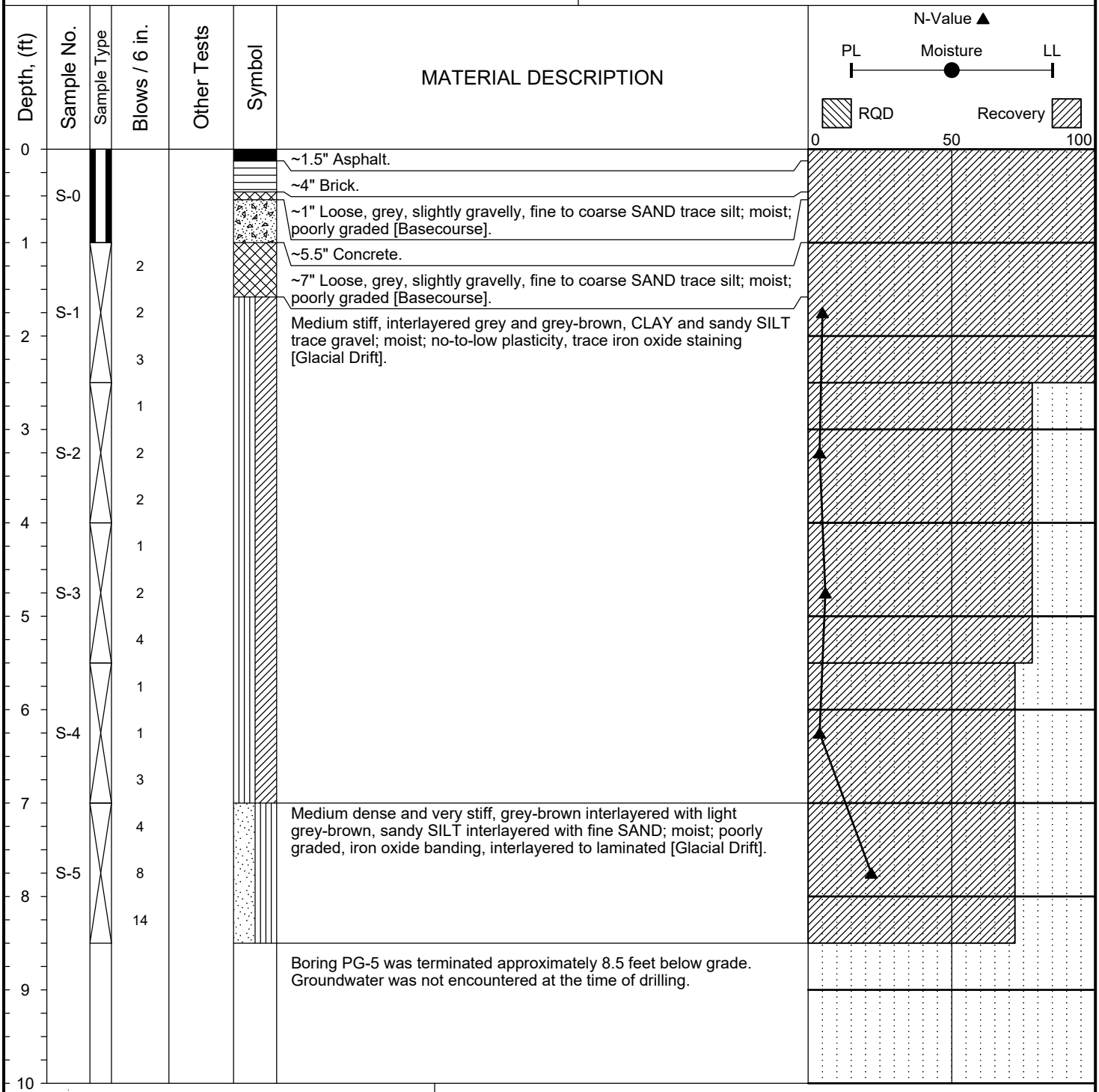
LOG OF TEST BORING PG-4

Figure A-5

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Canton and Nihonmachi Alley Improvements	Surface Elevation:	101.0ft
Job Number:	19-260	Top of Casing Elev.:	N/A
Location:	Canton Alley and Nihonmachi Alley	Drilling Method:	HSA
Coordinates:	Northing: 47.59989, Easting: -122.32572	Sampling Method:	SPT



Completion Depth:	8.5ft
Date Borehole Started:	10/4/19
Date Borehole Completed:	10/4/19
Logged By:	Bart Weitering
Drilling Company:	CN Drilling

Remarks: Drilling was performed using an Acker Portable Drill with hollow-stem augers. Standard Penetration Test (SPT) sampler driven with a 140-lb safety hammer using a rope and cat-head dropping 30 inches per stroke. Ground elevations estimated from King County iMap.

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LOG OF TEST BORING PG-5

Figure A-6

The stratification lines represent approximate boundaries. The transition may be gradual.