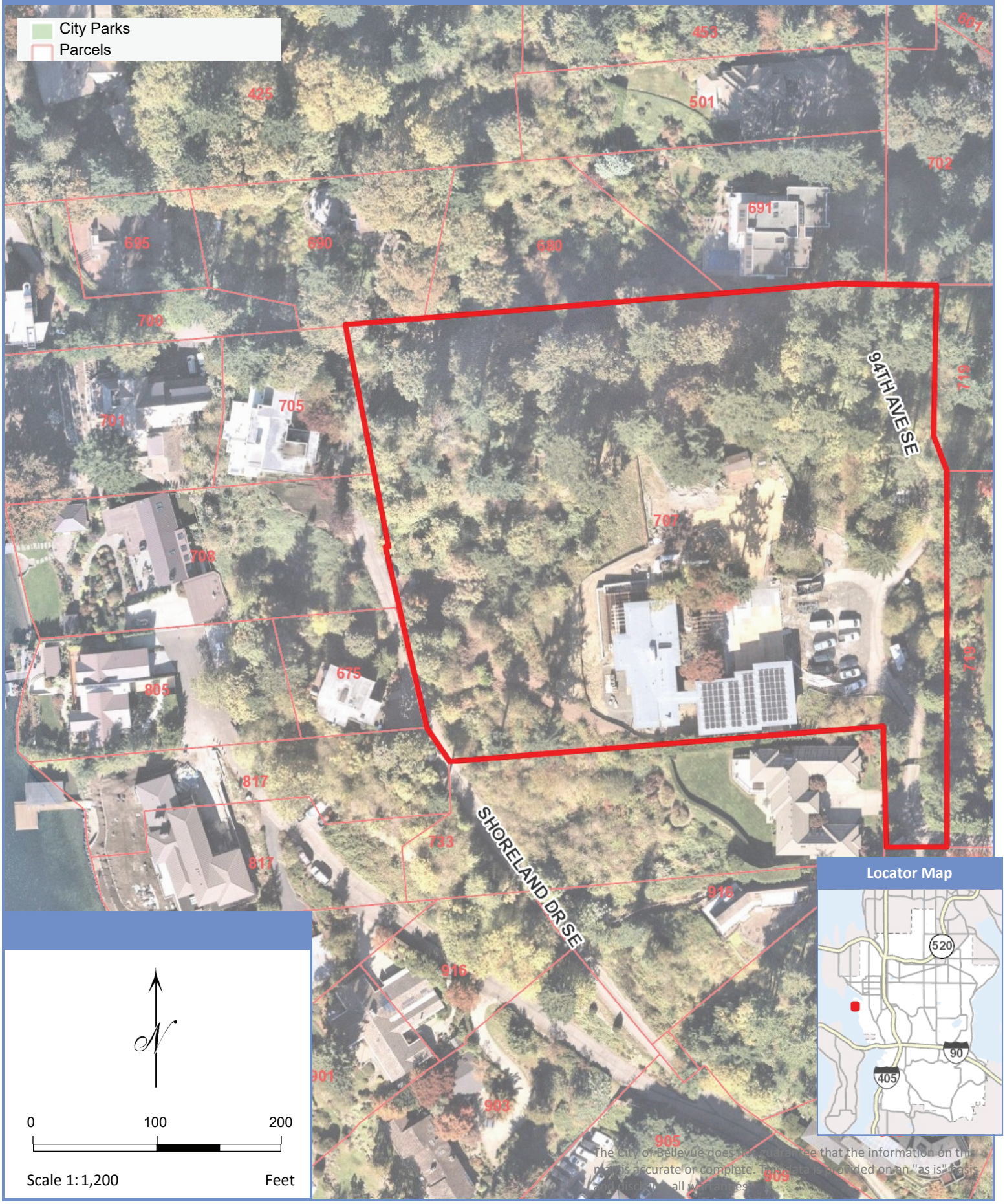


Locator Map

0 100 200

Scale 1:1,200 Feet

Map Generated on: 01/08/2020

GENERAL NOTES

1. EXISTING BOUNDARY, EASEMENT, CRITICAL AREA, AND UTILITIES ARE SHOWN FOR REFERENCE. REFER TO SHEET G1.3 AND G1.4 SITE SURVEY FOR MORE INFORMATION.
2. SEE L0.1 TREE PROTECTION PLAN FOR LIST OF ALL TREES ON SITE, AND THOSE TO BE REMOVED.
3. KEEP OUT OF NGPA LINE FOR ALL WORK INCLUDING BUT NOT LIMITED TO; STAGING, STORING, TEMPORARY SHORING, AND EQUIPMENT ACCESS.
4. RELOCATE EXISTING YARD STORAGE WITHIN THE SITE. CONSULT OWNER FOR LOCATION.
5. DEMOLISH EXISTING UTILITIES AS NEEDED FOR NEW WORK. CONSULT OWNER FOR ITEM TO BE SALVAGED.
6. REMOVE AND DECOMMISSION EXISTING OIL TANKS AS REQUIRED PER AHJ.
7. COORDINATE TRENCHING OF UTILITIES WITH LANDSCAPE TO PRESERVE EXISTING TREES TO REMAIN.

KEY NOTES

01	16' ACCESS AND UTILITIES EASEMENT
02	20' INGRESS AND EGRESS EASEMENT WITH ADDITIONAL 10' BUFFER EACH SIDE OF EASEMENT
03	20' PRIVATE INGRESS AND EGRESS EASEMENT
04	12' PRIVATE INGRESS AND EGRESS EASEMENT
05	5' SEWER EASEMENT
06	10' SEWER EASEMENT
07	40' INGRESS, EGRESS, AND UTILITIES EASEMENT
08	10' PRIVATE STORM DRAIN EASEMENT
09	PRIVATE STORM DRAIN EASEMENT, WIDTH VARIES THIS AREA
10	5' STORM DRAIN EASEMENT
11	UNDERGROUND UTILITIES, REF MECHANICAL AND PLUMBING

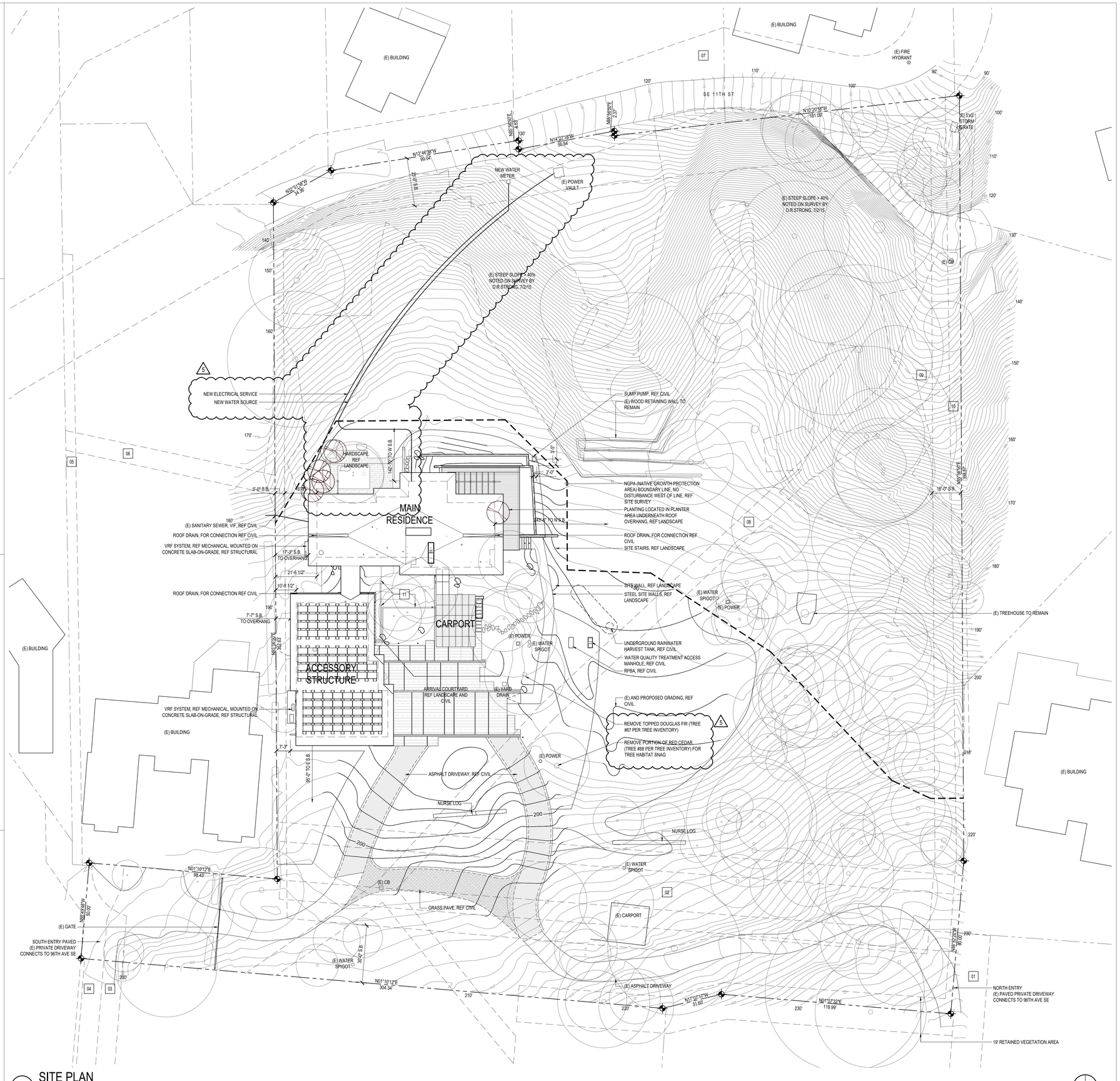
IMPERVIOUS AND HARDSCAPE SURFACES / LEGENDS

IMPERVIOUS SURFACES

EXISTING:		
	CONCRETE	3,237 SF
	ASPHALT	10,363 SF
EXISTING TOTAL:		13,600 SF
EXISTING TO REMAIN:		
	CONCRETE	0 SF
	ASPHALT	6,852 SF
PROPOSED		
	CIP CONCRETE	3,856 SF
	ASPHALT	3,523 SF
PROJECT TOTAL:		14,231 SF

HARDSCAPE SURFACES (PERMEABLE)

EXISTING:		NONE TO REMAIN
PROPOSED		
	WOOD DECK	1,265 SF
	GRAVEL	650 SF
	SAND-SET PAVERS	748 SF
PROJECT TOTAL:		2,663 SF



17 SITE PLAN
1" = 20'-0"

Hoshide Wanzer Architects
P. 206-325.6441
100 NE Northlake Way
Suite 150
Seattle, WA 98105
W. www.hw-architects.com

2580 REGISTERED ARCHITECT
ROBERT I. HOSHIDE
STATE OF WASHINGTON

MEYDENBAUER RESIDENCE

707 94TH AVE SE
BELLEVUE, WA 98004

PROJECT DESCRIPTION:

REMODEL TO AN EXISTING SINGLE-FAMILY RESIDENCE, NEW ACCESSORY STRUCTURES, AND ASSOCIATED SITE WORK AND DRIVEWAY UPGRADES.

DRAWN BY:	YK KH SW DP JL
CHECKED BY:	BH WS
DATE:	05.11.17
REVISIONS:	
1 07.13.17	PERMIT REVISIONS
2 08.18.17	PERMIT REVISIONS
3 09.01.17	CONSTRUCTION SET
4 11.15.17	PLAN REVISION
5 09.12.19	PLAN REVISION

CONSTRUCTION SET

SITE PLAN

A1.1

Hoshide Wanzer Architects

CALUP Submission
Narrative Description

Project: Meydenbauer Residence | #17-113498-BS
Issue Date: January 2, 2020

Project:	Meydenbauer Residence 707 94th Ave SE Bellevue, WA 98004	Owner:	Hans Spiller 707 94th Ave SE Bellevue, WA 98004
Architect:	Hoshide Wanzer Architects 100 NE Northlake Way, Suite 150 Seattle, WA 98105 Bob Hoshide, AIA	Contractor:	Roberts Group 5914 Lake Washington Blvd NE Kirkland, WA 98033 Matt Cantrell

Description:

1. Voluntary submission of utility work within NGPA for CALUP review
   Project Background: please refer to building permit #17-113498-BS for permitted scope of construction and site improvements.

   Refer to Sheet(s) A1.1 for revision area.

   City of Bellevue Development Services Field Inspector Matt Zeller requested we submit a revision to Land-use for the utility work done within the NGPA on 8/29/2019. In subsequent follow up correspondence, he requested we provide an explanation of the work along with a revised site plan for review.

   While reviewing power service to the property, Puget Sound Energy determined that the existing service wire to the project was insufficient. PSE recommended new conduit be trenched and installed, replacing the existing wire and conduit, for PSE to pull larger cabling. The existing electrical service enters the property to the west, coming up the slope within the NGPA and connects to the house at the same location it is currently permitted.

   A concurrent review of water service occurred due to the existing water service being insufficient to meet the demands of the required fire suppression system for the project and it was determined that a new water service line needed to be installed. The existing water service crossed two adjacent properties and was within the NGPA. Land-use Planner Jeremy Hammar reviewed the proposed water line replacement and provided us with notification January of 2018 that we could proceed with trenching within the NGPA for water service. At this time, he did not request this work be submitted to the City when asked via email. We can provide the email correspondence upon request.

   We reviewed a direct path from the west side with considerations to significant vegetation and slope through the NGPA with PSE to trench for both utilities, minimizing the impact of two separate utility pathways by combining both power and water within a single trench while maintaining required spacing. The trenched path is indicated on the attached sheet A1.1 with sufficient backfill, stormwater mitigation and a plan to remediate the vegetation to its prior condition via photo documentation. No trees were impacted and the vegetation within the trenched area is noted in the Arborist Reports, attached.

On 9/12/2019, the requested plan revision documentation as stated above was uploaded per the request from Field Inspector Mark Zeller. On 10/2/2019, Associate Land Use Planner Mark C. Brennan issued a response requiring the utility work be submitted to the City of Bellevue as a formal CALUP submission. His comments are included in this submission for reference.

2. Demolish two additional trees
   Refer to Sheet(s) A1.1, Arborist Report for revision. We are removing two trees as indicated on the plan. Please see attached Arborist Report for description.

Attachments:

1. Submitted Materials
   - A1.1 SITE PLAN including comments from Mark C. Brennan
   - Completed Bill-To Form
   - Boundary and Topographic Survey
   - Critical Areas Report
   - Drainage Report (previously submitted under #17-113498-BS)
   - Geotechnical Report (previously submitted under #17-113498-BS)
   - SEPA Environmental Checklist
   - Existing Tree Inventory List and Protection Plan (previously submitted under #17-113498-BS)
   - Arborist Report(s) with Mitigation Plan

END OF NARRATIVE

Hoshide Wanzer Architects, PLLC. | 100 NE Northlake Way, Suite 150 Seattle, WA 98105 I P. 206.325.6441 W. www.hw-architects.com

PanGEO INCORPORATED
Geotechnical & Earthquake Engineering Consultants

December 2, 2019
File No. 17-325.200

Mr. Spiller Hans
707 94th Avenue Southeast
Bellevue, WA 98004

Subject: **Critical Areas Report**
Utilities in Western Slope
707 94th Avenue Southeast, Bellevue, WA

Dear Mr. Hans,

As requested, PanGEO has completed a geotechnical engineering evaluation for the utilities that have been installed in the mapped Geologic Hazard Areas (i.e. Steep Slope and High Erosion Areas) in the western portion of the property. The purpose of our study is to evaluate the potential impacts of the installed utilities on the slope stability and the residence located to the east of the slope. Our service scope included reviewing readily-available geologic and geotechnical data, conducting a site reconnaissance, drilling one test boring, and developing the conclusions and recommendations presented in this report.

In summary, our site observations on the subject steep slope indicated no evidence of ongoing slope instability. Our test boring drilled within the slope next to the installed utilities encountered about a foot of topsoil overlying native, medium dense to dense silty sand (glacial till). In our opinion, because competent native soils present at shallow depth have a low risk of potential movement and the footprint of the utility trench was limited (i.e. 2 feet in depth and in width), the long-term stability of the slope will not be adversely impacted by the installed pipes, provided that the permanent erosion control such as erosion control nets and blankets are properly established in the subject areas.

3213 Eastlake Ave E, Ste B
Seattle, WA 98102
Tel (206) 262-0370
Fax (206) 262-0374

SITE AND PROJECT DESCRIPTIONS

The subject site is an approximately 3.8-acre lot located at 707 94th Avenue Southeast in Bellevue, Washington (see Vicinity Map, Figure 1). The current building and driveway/parking areas are generally located in the south and east portions of the property. The north, east, and west portions of the site consist of west-facing slopes that are heavily vegetated with ivy, shrubs, and trees. Approximately the western one-third of the site is mapped by the City as Steep Slope Geologic Hazard Areas (40% or steeper slope), as shown in the attached Figures 2 and 3. The property is also mapped by the City as Very Severe Soil Erosion Geologic Hazard Area.

We understand that underground utilities (i.e. a 2-inch polyethylene water service line and a 3-inch PVC electric conduit) have recently been installed to service the current building from the Shoreland Drive Southeast. Portions of the utilities were installed in the Steep Slope areas (see Plate 1 below and Figure 2). Based on the information provided by the contractor (Roberts Group), we understand that the trench excavation to install the utilities was about 2 feet wide and 2 feet in depth. The trench was then backfilled with on-site excavated soils (i.e. silty sand) after the lines were installed. The trench area is currently covered with jute mat and mulch for erosion control. The contractor also noted that bentonite dams were installed in the trench at the top of the slope to prevent water from potentially washing away the backfill in the trench.

Because the subject utility construction occurred within the mapped Geologic Hazard Areas, a critical area report is required by the City. The purpose of this report is to evaluate the impact of the installed utility on the slope stability and the residence located to the east of the slope, as summarized below.

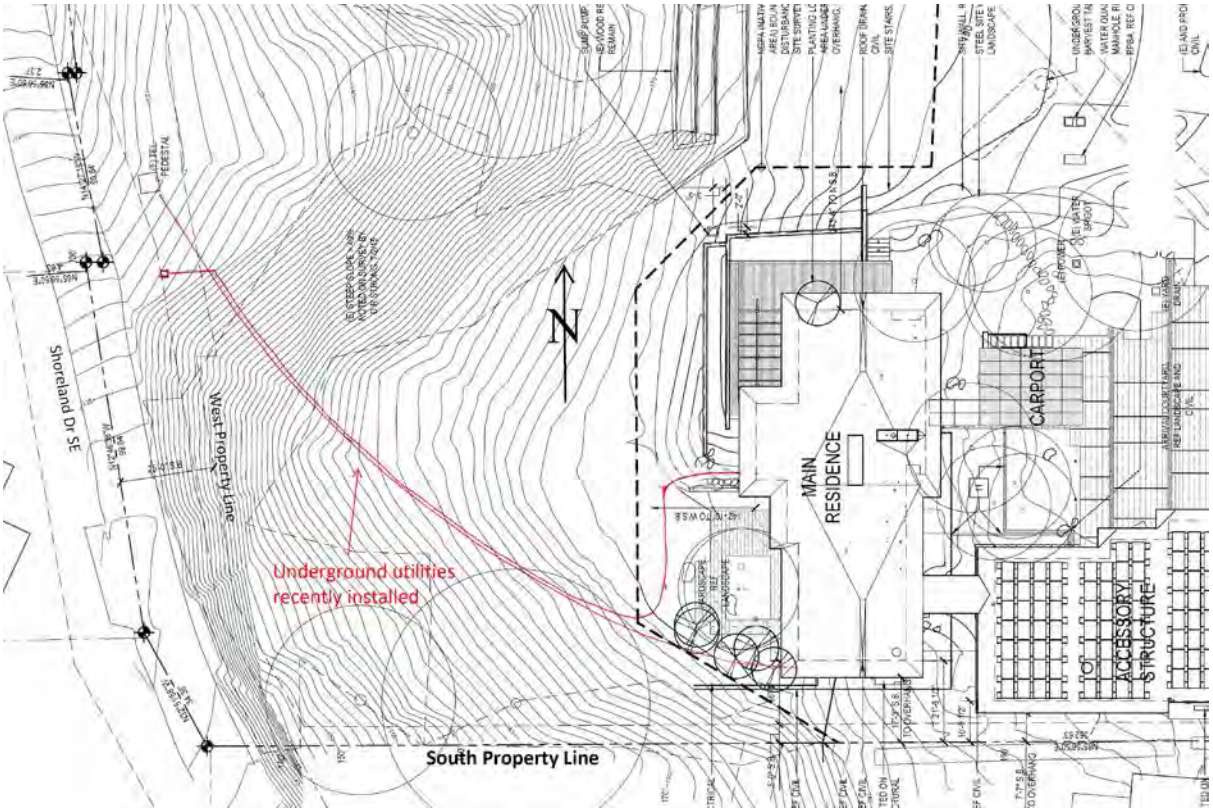


Plate 1. Approximate location of the underground utilities installed between the new building and Shoreland Drive SE

SUBSURFACE EXPLORATIONS

Test Boring

We completed one test boring (PG-1) located in the western slope on October 30, 2019. The approximate test boring location is indicated on the attached Figure 2. PG-1 was drilled to about 15½ feet below the existing grade, using a portable drill rig owned and operated by CN Drilling.

The drill rig was equipped with 4-inch outside diameter hollow stem augers. Soil samples were obtained from the borings at 2½-foot depth intervals in general accordance with Standard Penetration Test (SPT) sampling methods (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 freely 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.

An engineer from our firm was present throughout the field exploration program to observe the drilling, assist in sampling, and to document the soil samples obtained from the borings. The completed borings were backfilled with bentonite chips and drill cuttings.

The soil samples retrieved from the borings were described using the system outlined on Figure A-1 of Appendix A and the summary boring logs are included as Figure A-1.

Previous Subsurface Exploration

In addition to the test boring PG-1, we reviewed previous test pits TP-2 through TP-4 (Geotech Consultants, 2014) excavated in the areas to the west of the existing house. The approximate test pit locations are shown in Figure 2. The logs of previous test pits are included in Appendix B.

SUBSURFACE CONDITIONS

SOILS

According to the Geologic Map of King County area compiled by Troost and others (Troost, 2007), the project site is underlain by Vashon Till (glacial till) and Advance Outwash deposits in the east and west portions of the site. Glacial till typically consists of a very dense, heterogeneous mixture of silt, sand, and gravel laid down at the base of an advancing glacial ice sheet. Advance outwash deposits typically consist of moderately to well sorted, slightly oxidized sand and gravel that had been overridden by glacial ice. This unit is typically dense to very dense in its undisturbed state.

Our test boring PG-1 encountered about 1 foot of topsoil (sandy silt with rootlets, organics, charcoal fragments) over about 3 feet of native, weathered glacial till (medium dense, very silty sand with iron-oxide staining). At/below about 4 feet deep, dense to very dense, native glacial till was encountered (i.e. very silty sand with a varying amount of gravel), which extended to the bottom of the test boring at about 15½ feet below the existing grade. The soils encountered in the test boring are consistent with the mapped geology (i.e. glacial till)

Previous test pits TP-2 through TP-4 (Geotech Consultants, 2014) located near the current residence encountered about 5 feet of fill/topsoil over medium dense sand in TP-2. TP-3 and

TP-4 encountered about 2 to 3 feet of loose to medium dense sand over medium dense to dense silt.

GROUNDWATER

No groundwater was observed in PG-1 at the time of drilling. Previous test pit TP-2 (Geotech Consultants, 2014) encountered groundwater seepage at the bottom of the fill/topsoil at about 5½ feet deep. However, TP-2 also indicates soil conditions below 5½ feet deep were generally moist, suggesting the seepage could be localized at the depth of 5½ feet. No groundwater was noted in TP-3 and TP-4.

It should be noted that groundwater elevations and seepage rates are likely to vary depending on the season, local subsurface conditions, and other factors. Groundwater levels and seepage rates are normally highest during the winter and early spring.

CRITICAL AREAS CONSIDERATIONS

During our site reconnaissance on November 1, 2019, we did not observe obvious signs of instability such as hummocky ground surface, tension cracks, leaning mature trees within the western slope. Our test boring PG-1 encountered competent native soils at shallow depth, which has a low risk for potential soil movements.

In addition to the test boring, we reviewed landslide inventory map from the Washington Department of Natural Resources and the King County LiDAR image (see Figure 3). The landslide inventory map data shows no evidence of landslide activities on the property or immediately adjacent to the property. The LiDAR image also indicates the surface of the western slope appears relatively uniform without signs of obvious ground movement.

Based on a review of LiDAR image and landslide inventory map, our site observations, and test boring PG-1, it is our opinion that the subject slope appears globally stable and has a low risk of potential soil movement.

Impact of Utility on the Slope Stability – Based on the information provided by the contractor, we understand that the utility trench was about 2 feet deep and 2 feet wide, and has been backfilled with onsite excavated soils (i.e. silty sand). In our opinion, because the extent of the utility trench was limited and medium dense to dense native soils present at shallow depth have a low risk for potential soil movement, we do not anticipate the utilities in the slope to

compromise the overall slope stability or adversely impact the current residence. However, the trench excavation and backfill are likely to increase the risk for erosion before the vegetation is re-established. Adequate permanent erosion control measures in the subject slope areas must be properly implemented and established.

It should be noted that water leak (if present) in pressurized water line could increase the risk of soil erosion in the slope. It is our opinion that water leak detection should be performed regularly to identify the leak as early as possible and reduce the impact of potential water leak on the slope.

The following includes our recommendations for permanent erosion control measures in the slope:

Permanent Erosion Control – It is our opinion that adequate permanent erosion control in the subject slope areas can be established using erosion control nets or blankets, in addition to hydromulching. We recommend that the erosion control nets or blankets be installed following the specifications included in Section BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards (attached to the end of the report). Before netting or blankets are installed, ground surface should be properly smoothed and prepared, and seed mix should be applied using hydromulching with tackifier. The above erosion control measures, in combination with the bentonite dams that has been installed in the trench in the upslope area, are anticipated to provide adequate permanent erosion control in the subject slope areas.

Provided that permanent surface erosion measures are properly established, it is our opinion that the risk associated with the utility construction will be adequately mitigated.

Additional discussions regarding relevant land use codes for critical areas report are included in the Appendix B.

CLOSURE

We have prepared this report for Mr. Spiller Hans and your project team. Recommendations contained in this report are based on a site reconnaissance, 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. We are not mold consultants nor are our recommendations to be interpreted as being preventative of mold development. A mold specialist should be consulted for all mold-related issues.

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.

Sincerely,

Yi-Hsun William Chao, P.E.
Senior Project Geotechnical Engineer

Siew L. Tan, P.E.
Principal Geotechnical Engineer

Enclosures:

Figure 1. Vicinity Map
Figure 2. Site and Existing Exploration Plan
Figure 3. LiDAR and Critical Areas

Appendix A Summary Boring Logs

Figure A-1 Terms and Symbols for Boring and Test Pit Logs
Figure A-2 Log of Test Boring PG-1

Appendix B – Previous Test Pit Logs

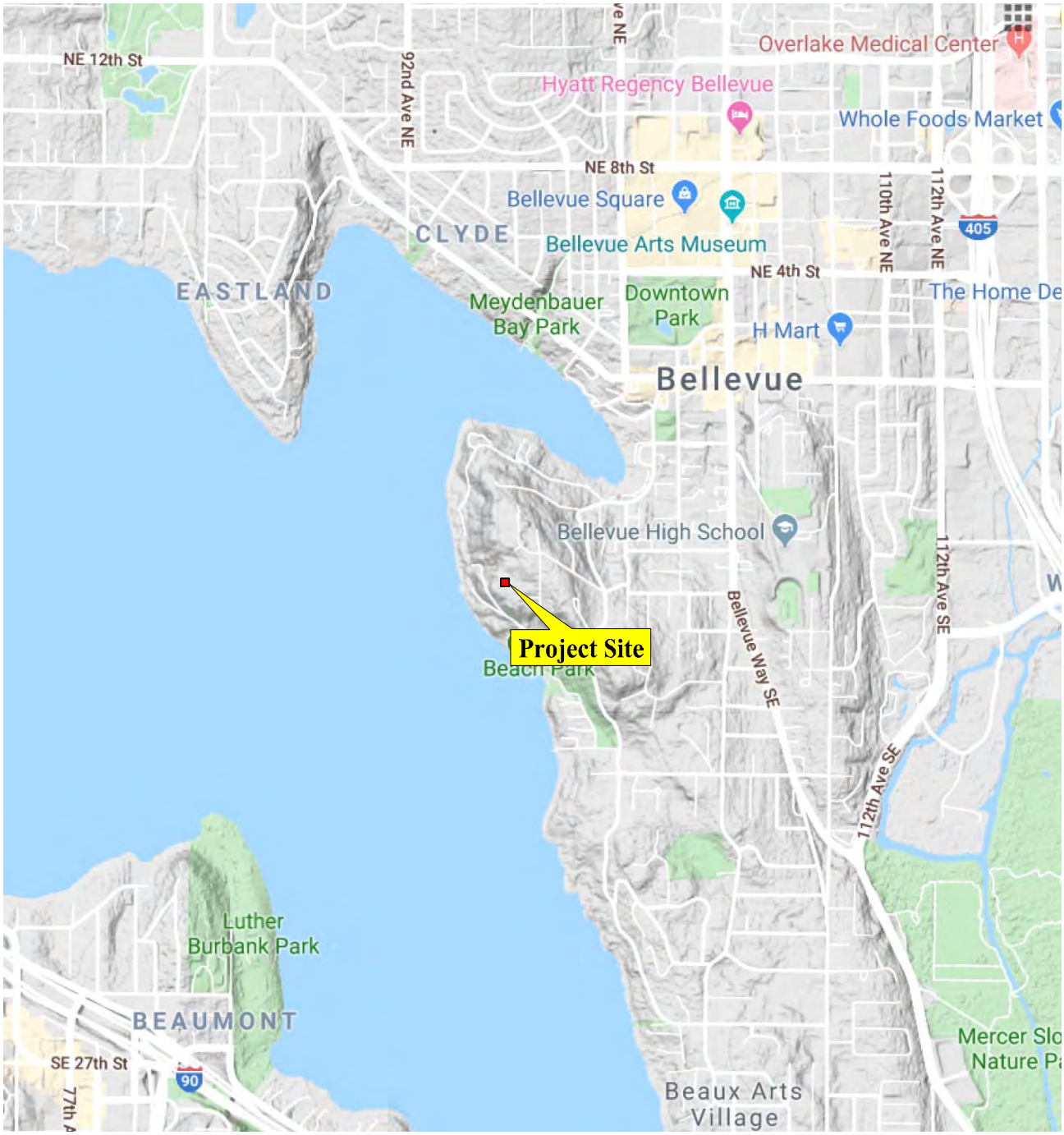
Appendix C – Relevant Codes for Critical Areas Report

REFERENCES

Booth, D. B., Troost, K.G, Wisher, A. P. 2007, *The Geologic Map of King County, Washington, scale 1:100,000.*

City of Bellevue Development Services Department, 2017, Clearing & Grading Development Standards

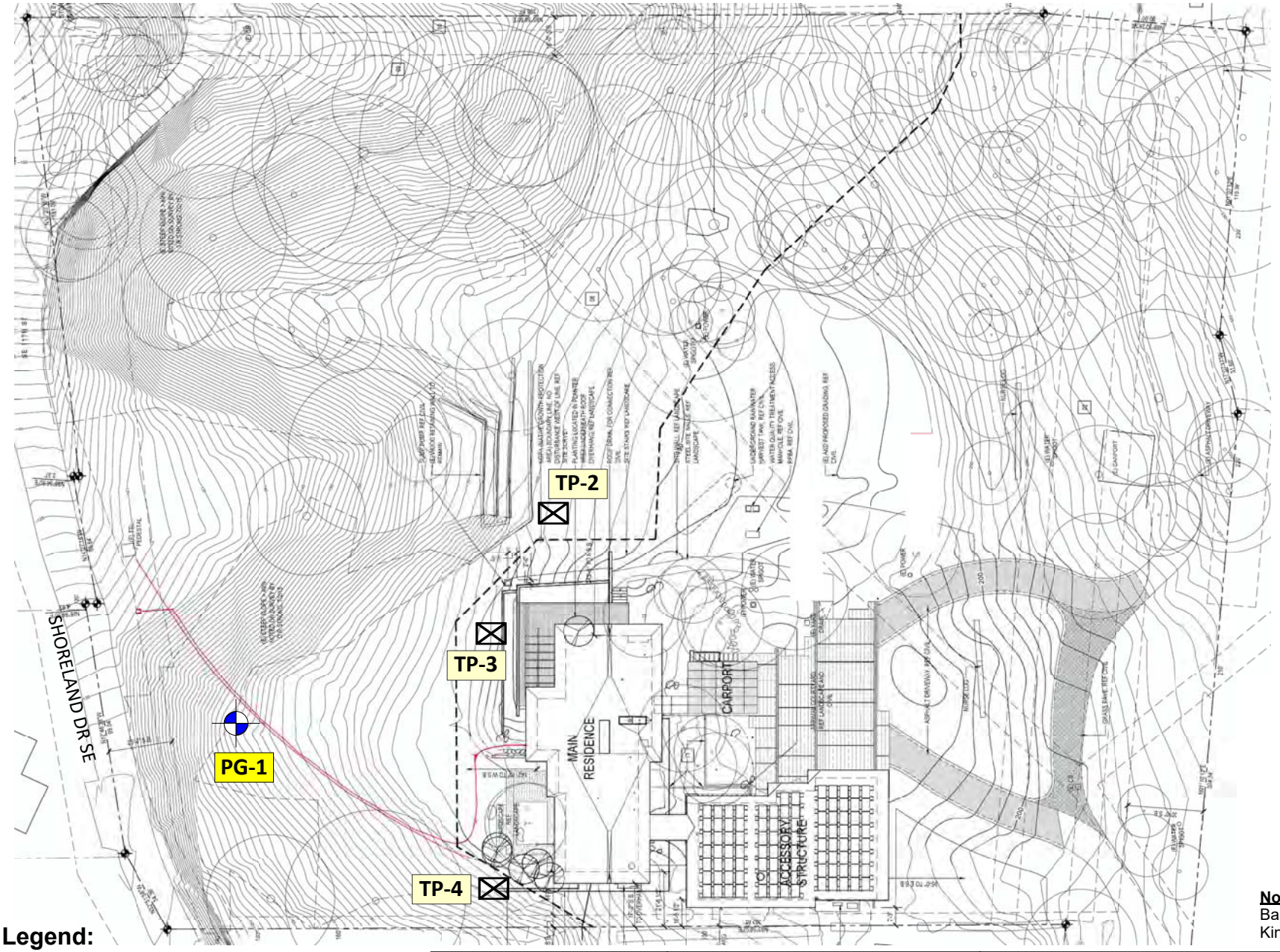
Geotechnical Consultants, Inc., 2014, Transmittal Letter – Geotechnical Engineering Study, Proposed Single-Family Residence, 707 -94th Avenue Southeast, Bellevue Washington, prepared for Tony Prophet



Not to Scale

Base Map: Google Maps

PanGEO INCORPORATED	**Critical Areas Report** **707 94th Ave SE** **Bellevue, Washington**	**VICINITY MAP**	
		Project No. **17-325**	Figure No. **1**



Not to Scale

Notes:
Basemap modified from King County GIS Map.

Legend:

- Recently Installed Underground Utilities
- Approx. Test Boring Location (PanGEO)
- Approx. Previous Test Pit Location (Geotech Consultants, 2014)

PanGEO INCORPORATED

Critical Areas Report
707 94th Ave SE
Bellevue, Washington

SITE AND EXPLORATION PLAN

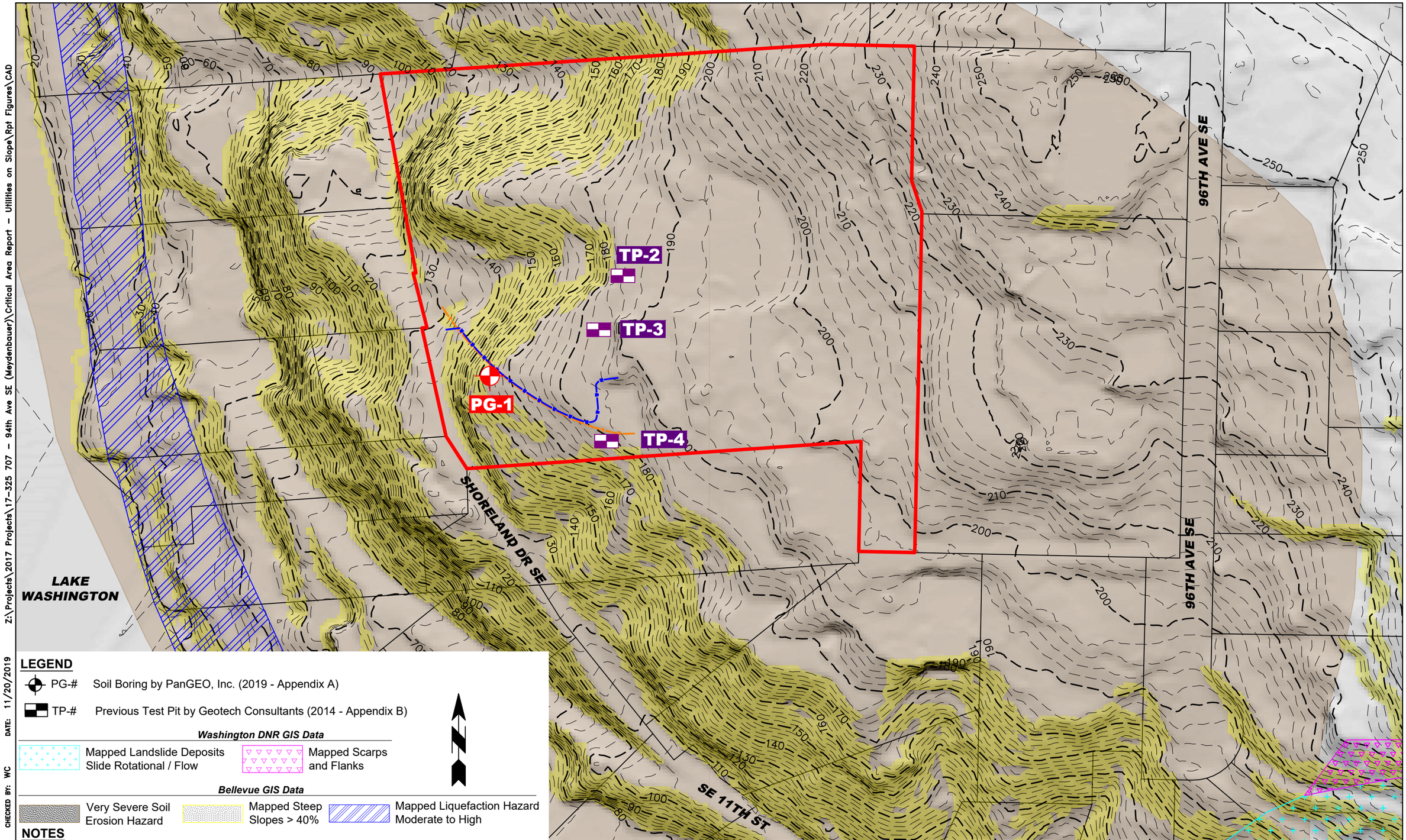
Project No.	Figure No.
17-325	2

Z:\Projects\2017 Projects\17-325 707 - 94th Ave SE (Meydenbauer)\Critical Area Report - Utilities on Slope\Rpt Figures\CAD

DATE: 11/20/2019

CHECKED BY: WC

DRAWN BY: NTW



LEGEND

- PG-# Soil Boring by PanGEO, Inc. (2019 - Appendix A)
- TP-# Previous Test Pit by Geotech Consultants (2014 - Appendix B)

Washington DNR GIS Data

- Mapped Landslide Deposits Slide Rotational / Flow
- Mapped Scarps and Flanks

Bellevue GIS Data

- Very Severe Soil Erosion Hazard
- Mapped Steep Slopes > 40%
- Mapped Liquefaction Hazard Moderate to High

NOTES

1. Base map and features are based on 2016 King County Lidar and GIS data obtained from Washington DNR and City of Bellevue websites. Features are provided for relative information only and are not a substitution for field survey.
2. Locations of borings are approximate and based on the relative locations of known site features.
3. Vertical Datum: NAVD 88

40' 0 40' 80'
scale in feet
Scale: 1" =80'

PanGEO INCORPORATED

Critical Area Report
707 - 94th Avenue SE
Bellevue, Washington

LIDAR AND CRITICAL AREAS

PROJECT NO.	FIGURE NO.
17-325	3

APPENDIX A

SUMMARY TEST BORING LOG

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

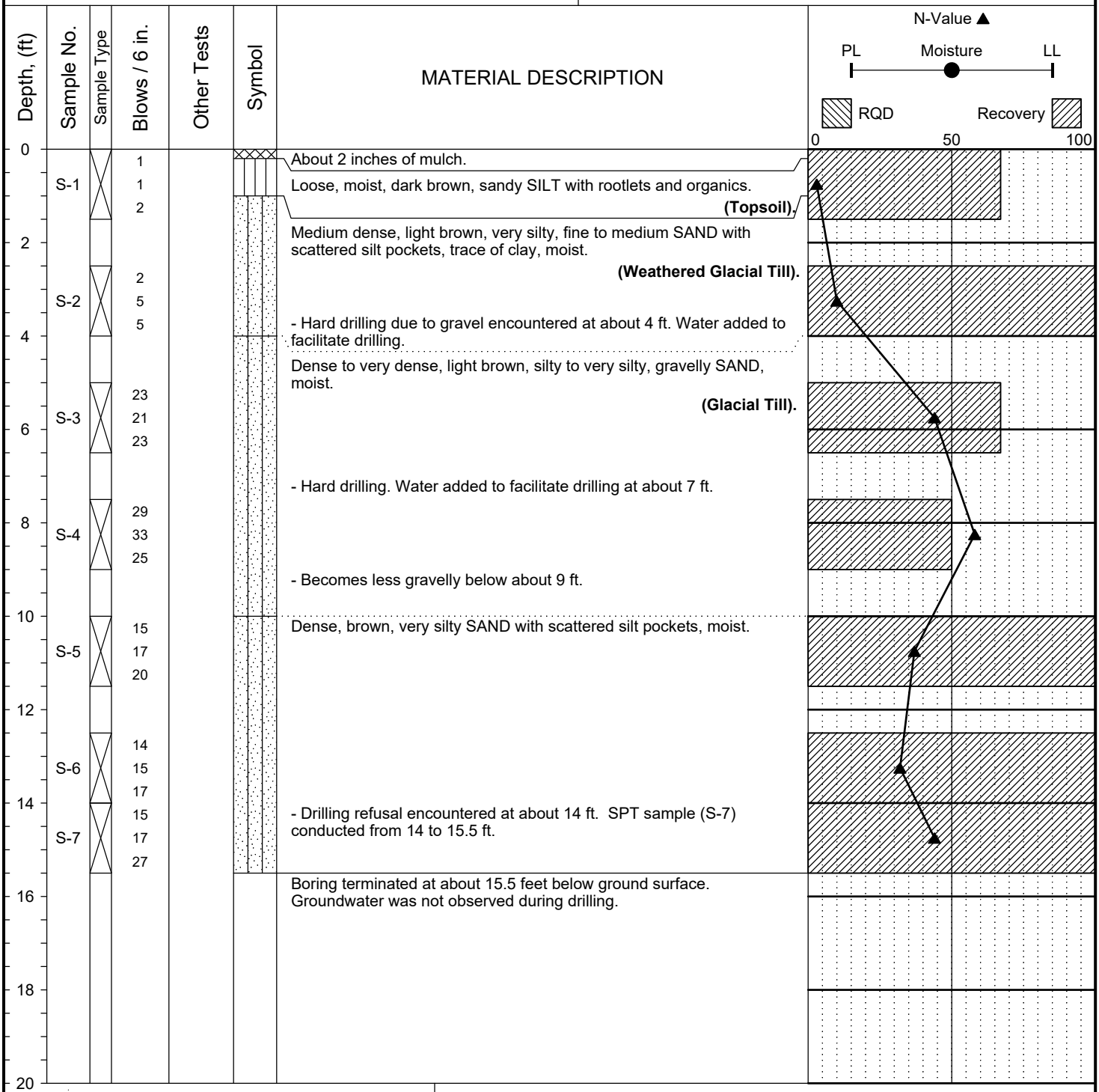
LOG KEY 13-104_LOGS.GPJ PANGEO.GDT 6/18/13

PanGEO INCORPORATED
Phone: 206.262.0370

Terms and Symbols for Boring and Test Pit Logs

Figure A-1

Project:	Critical Areas Report - Meydenbauer Residence	Surface Elevation:	166.0ft
Job Number:	17-325	Top of Casing Elev.:	N/A
Location:	707 94th Ave SE, Bellevue, WA	Drilling Method:	Hollow Stem Auger
Coordinates:	Northing: , Easting:	Sampling Method:	Standard Penetration Test



Completion Depth:	15.5ft
Date Borehole Started:	11/1/19
Date Borehole Completed:	11/1/19
Logged By:	W. Chao
Drilling Company:	CN Drilling

Remarks: Borings drilled using an acker hand portable drill rig. Standard penetration test (SPT) sampler driven with a 140 lb. safety hammer. Hammer operated with a rope and cathead mechanism. Surface elevation based on site topographic survey completed by D. R. Strong (7/2/15)

PanGEO INCORPORATED

LOG OF TEST BORING PG-1

Figure A-4

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

APPENDIX B

PREVIOUS TEST PIT LOGS

TEST PIT 1

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
				Topsoil
			SM	Rust-brown mottled gray-brown silty SAND with zones of sand; fine to coarse-grained, moist, medium-dense
			ML	Rust-brown mottled gray-brown SILT, non-plastic, moist, medium-dense to dense
5				-becomes gray
10				

* **Test Pit terminated at 7.0 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

TEST PIT 2

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
			FILL	Brown silty SAND, fine to coarse-grained, moist, loose to medium-dense **(FILL)**
			FILL	Brown SILT with sand and trace organics, fine to coarse-grained, moist, loose to medium-dense **(FILL)**
				-becomes wet
5		▼		Topsoil
			SM	Gray silty SAND with zones of sand, fine to coarse-grained, moist, medium-dense
				-becomes medium-dense to dense
10				

* **Test Pit terminated at 8.5 feet on October 23, 2014.**
* **Groundwater seepage was observed at 5.5 feet during excavation.**
* **Caving was observed below 4.5 feet during excavation.**

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

707 - 94th Avenue Southeast
Bellevue, Washington

Job	Date:	Logged by:	Plate:
14412	Nov. 2014	TRC	3

TEST PIT 3

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
			SM	Brown silty SAND with gravel, fine to coarse-grained, moist, loose to medium-dense -becomes medium-dense
5			ML	Rust-brown mottled gray-brown SILT with zones of sand and gravel, non-plastic, fine to coarse grained, moist, medium-dense to dense
10				

* **Test Pit terminated at 5.5 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

TEST PIT 4

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
				Topsoil
			SM	Gray-brown silty SAND, fine to coarse-grained, wet, loose -becomes medium-dense
5			ML	Rust-brown mottled gray-brown SILT, non-plastic, moist, medium-dense -becomes medium-dense to dense
10				

* **Test Pit terminated at 5.5 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

707 - 94th Avenue Southeast
Bellevue, Washington

Job	Date:	Logged by:	Plate:
14412	Nov. 2014	TRC	4

APPENDIX C

RELEVANT CODES FOR CRITICAL AREAS REPORT

CRITICAL AREA AFFECTED

The critical area affected by the recent underground utility installation (i.e. a 2-inch polyethylene water service line and a 3-inch PVC electric conduit) consists of a Steep Slope Geologic Hazard Area located between the residence and Shoreland Drive SE (see Figures 2 and 3 in the report).

RELEVANT CODE SECTIONS

Based on Part 20.25H Critical Areas Overlay District of City of Bellevue Land Use Code, new or expanded utility facilities, utility system, or/and stornwater facilities may be allowed in a critical area, critical area buffer, or critical area structure setback, provided that the applicable performance standards below can be met.

20.25H.055.C.2. Performance standards

20.25H.125. Performance standards – Landslide hazards and steep slopes.

The criteria and requirements of these sections have been addressed and justifications given in detail in the following section.

20.25H. *055.C.2* Performance standards

A. New or expanded facilities and systems are allowed within the critical area or critical area buffer only where no technically feasible alternative with less impact on the critical area or critical area buffer exists.

It is our understanding that the water line servicing the residence is located on Shoreland Drive SE along the west side of the property; therefore, the water service line will need to extend to the residence through the slope areas in the western portion of the site.

B. If the applicant demonstrates that no technically feasible alternative with less impact on the critical area or critical area buffer exists, then the applicant shall comply with the following:

i. Location and design shall result in the least impacts on the critical area or critical area buffer;

Based on the results of our geotechnical study, it is our opinion that the existing slope is globally stable. Because the footprint of the utility trench in the slope was limited (i.e. 2 feet in width and in depth) and competent native soils present at shallow depths have a low risk of potential movement, we anticipate the installed utility will not compromise the global stability of the Steep Slope critical areas and its buffer.

We understand the contractor plans to implement and establish permanent erosion control measures in the subject areas following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report. Provided that permanent surface erosion measures are properly established, it is our opinion that the risk associated with the utility construction will be adequately mitigated.

ii. Disturbance of the critical area and critical area buffer, including disturbance of vegetation and soils, shall be minimized;

The footprint of the utility trench in the slope was about 2 feet deep and 2 feet wide, and the trench has been backfilled to match the adjacent existing grade and natural contour of the slope. The trench area is currently covered with jute mat and mulch as temporary erosion control measures. Permanent erosion control measures in the subject areas will be established following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report.

iii. Disturbance shall not occur in habitat used for salmonid rearing or spawning or by any species of local importance unless no other technically feasible location exists;

Not applicable in this case.

iv. Any crossing over of a wetland or stream shall be designed to minimize critical area and critical area buffer coverage and critical area and critical area buffer disturbance, for example by use of bridge, boring, or open cut and perpendicular crossings, and shall be the minimum width necessary to accommodate the intended function or objective; provided, that the Director may require that the facility be designed to accommodate additional facilities where the likelihood of additional facilities exists, and one consolidated corridor would result in fewer impacts to the critical area or critical area buffer than multiple intrusions into the critical area or critical area buffer;

Not applicable in this case.

v. All work shall be consistent with applicable City of Bellevue codes and standards;

We understand the contractor plans to implement and establish permanent erosion control measures in the subject areas following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report.

vi. The facility or system shall not have a significant adverse impact on overall aquatic area flow peaks, duration or volume or flood storage capacity, or hydroperiod;

Not applicable in this case.

vii. Associated parking and other support functions, including, for example, mechanical equipment and maintenance sheds, must be located outside critical area or critical area buffer except where no feasible alternative exists; and
Not applicable in this case.

viii. Areas of new permanent disturbance and all areas of temporary disturbance shall be mitigated and/or restored pursuant to a mitigation and restoration plan meeting the requirements of LUC 20.25H.210.
The trench area is currently covered with jute mat and mulch as temporary erosion control measures. We understand the contractor plans to implement and establish permanent erosion control measures in the subject areas following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report.

20.25H.125 Performance standards – Landslide hazards and steep slopes.

A. Structures and improvements shall minimize alterations to the natural contour of the slope, and foundations shall be tiered where possible to conform to existing topography;
The footprint of the utility trench was about 2 feet deep and 2 feet wide, and the trench has been backfilled to match the adjacent existing grade and natural contour of the slope. No foundation is installed in the slope.

B. Structures and improvements shall be located to preserve the most critical portion of the site and its natural landforms and vegetation;
The utility trench has been backfilled to match the adjacent existing grade and natural contour of the slope. We understand the contractor plans to implement and establish permanent erosion control measures in the subject areas following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report.

C. The proposed development shall not result in greater risk or a need for increased buffers on neighboring properties;
Based on our results of our geotechnical study, it is our opinion that the existing slope appears globally stable. Because the footprint of the utility trench in the slope was limited (i.e. 2 feet in width and in depth) and competent native soils present at shallow depths have a low risk of potential movement, we anticipate the installed utility will not result in greater risk to the neighboring properties, and it will not result in the need for increased buffers on neighboring properties.

We understand the contractor plans to implement and establish permanent erosion control measures in the subject areas following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report. Provided that permanent surface erosion measures are properly

established, it is our opinion that the risk associated with the utility construction will be adequately mitigated.

D. The use of retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes where graded slopes would result in increased disturbance as compared to use of retaining wall;

Not applicable in this case. No retaining structures are proposed.

E. Development shall be designed to minimize impervious surfaces within the critical area and critical area buffer;

No impervious surface is planned within the critical area.

F. Where change in grade outside the building footprint is necessary, the site retention system should be stepped and regrading should be designed to minimize topographic modification. On slopes in excess of 40 percent, grading for yard area may be disallowed where inconsistent with this criteria;

Not applicable in this case.

G. Building foundation walls shall be utilized as retaining walls rather than rockeries or retaining structures built separately and away from the building wherever feasible. Freestanding retaining devices are only permitted when they cannot be designed as structural elements of the building foundation;

Not applicable in this case.

H. On slopes in excess of 40 percent, use of pole-type construction which conforms to the existing topography is required where feasible. If pole-type construction is not technically feasible, the structure must be tiered to conform to the existing topography and to minimize topographic modification;

Not applicable in this case.

I. On slopes in excess of 40 percent, piled deck support structures are required where technically feasible for parking or garages over fill-based construction types; and

Not applicable in this case.

J. Areas of new permanent disturbance and all areas of temporary disturbance shall be mitigated and/or restored pursuant to a mitigation and restoration plan meeting the requirements of LUC 20.25H.210.

We understand the contractor plans to implement and establish permanent erosion control measures in the subject areas following the specifications included in the BMP C122: Nets and Blankets of 2017 City of Bellevue Clearing and Grading Development Standards and our recommendations included in the geotechnical report.

Provided that permanent surface erosion measures are properly established, it is our opinion that the risk associated with the utility construction will be adequately mitigated.

GEOTECH
CONSULTANTS, INC.

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Seattle, Washington 98102
(425) 747-5618 FAX (425) 747-8561

May 11, 2017

JN 17132

Hans Spiller
707 – 94th Avenue Southeast
Bellevue, Washington 98004

via email: hanss@exmsft.com

Subject: **Transmittal Letter – Geotechnical Engineering Study**
Proposed Single-Family Residence
707 – 94th Avenue Southeast
Bellevue, Washington

Dear Mr. Spiller:

We are pleased to present this geotechnical engineering report for the single-family residence to be constructed in Bellevue, Washington. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design criteria for foundations and retaining walls.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or for further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

D. Robert Ward, P.E.
Principal

cc: **Hoshide Wanzer Architects** - Yuko Kunugi
via email: yuko@hw-architects.com

DRW:mw

GEOTECHNICAL ENGINEERING STUDY
Proposed Single-Family Residence
707 – 94th Avenue Southeast
Bellevue, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed single-family residence to be located in Bellevue.

We have been provided with a topographic survey of the site by DR Strong Consulting Engineers dated July 19, 2014. Recently, we were provided with new architectural site plan and civil drainage plan of the project. Based on the architectural plan, we understand that the existing site structures (including a house) will be removed and a new residence will be constructed slightly east of the existing house. The proposed residence will be located in an area that is flat to moderately sloping. The residence will basement that will daylight toward the west; there is a gentle to moderate slope in the new residence area that the residence will follow. The civil plans indicated that stormwater from the project will be collected and then ultimately discharge into an existing stormwater system north of the project area.

A steep slope is located on the western portion of the property. The plans indicate that the new structures of the residence (the residence itself, patios, decks) will be located at close as 10 feet from steep slope, although most of the structures will be located much further than 10 feet.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the irregularly-shaped site in the Meydenbauer area of Bellevue. The site is surrounded by single-family residences and covers approximately 3.8 acres. An existing house is located in the south central portion of the site, and is connected to a nearby carport by a breezeway. The carport is accessed by an asphalt driveway that enters the site at its northeast and southeast corners. A second carport is located in the east central part of the site, and two detached sheds are located southeast of the house.

Overall, the ground surface within the site slopes down toward the west. The eastern and central portions of the site are flat to moderately sloping. However, the western portion of the site slopes steeply to very steeply down to the west. There is a change in elevation of up to about 150 feet across the approximately 400-foot width of the site although most of this change is within the steep slope. It appears that the relatively-level lawn area northeast of the existing house has been flattened by previous grading. The upper end of a ravine is located at the west edge of this lawn, and four tiered timber retaining walls with a total height of 14 feet are located between the ravine and the lawn. It is apparent that fill has been placed in the upper end of the ravine, and is faced by the tiered timber walls, as confirmed by a test pit as described below. Based on its topography and close proximity, it appears likely that the fill originated at the east end of the gently sloping lawn.

We did not observe indications of instability of the slopes within the site, and are not aware of landslides at the site. The site is vegetated with grass lawns, landscaping bushes, and young to mature evergreen and deciduous trees. The western slope is more heavily vegetated than the rest of the site.

SUBSURFACE

The subsurface conditions were explored by excavating six test pits at the approximate locations shown on the Site Exploration Plan, Plate 2. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The test pits were excavated on October 23, 2014 with a rubber-tracked excavator. A geotechnical engineer from our staff observed the excavation process, logged the test pits, and obtained representative samples of the soil encountered. "Grab" samples of selected subsurface soil were collected from the excavator bucket. The Test Pit Logs are attached to this report as Plates 3 through 5.

Soil Conditions

The test pits generally encountered topsoil at the ground surface that was about one foot thick. In Test Pits 3 through 6, the topsoil was underlain by loose to medium-dense silty sand that extended to depths of about 2.5 feet before medium-dense material was encountered. The loose to medium-dense soil in these test pits, and the topsoil in Test Pit 1, was underlain by layers of medium-dense to dense silt to silty sand. These materials extended to the base of the explorations at depths of 5.5 to 9 feet.

Test Pit 2, located upslope of the four tiered timber retaining walls, encountered loose to medium-dense fill that consisted of silty sand and silt with sand and trace organics. It is apparent that the walls were built to support the fill. The fill extended to a depth of 4 feet and was underlain by a foot of buried topsoil. Below the topsoil, we observed medium-dense to dense silty sand that extended to the base of the test pit at a depth of 8.5 feet.

Groundwater Conditions

Perched groundwater seepage was observed at depths of 1 to 5.5 feet in three of the test pits. The test pits were left open for only a short time period. Therefore, the seepage levels on the logs represent the location of transient water seepage and may not indicate the static groundwater level. It should be noted that groundwater levels vary seasonally with rainfall and other factors. It is very likely that groundwater could be found between the near-surface soil and the underlying denser and/or silty soil, especially during the normally wet winter and spring months.

The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information only at the locations tested. The relative densities and moisture descriptions indicated on the test pit logs are interpretive descriptions based on the conditions observed during excavation.

The compaction of test pit backfill was not in the scope of our services. Loose soil will therefore be found in the area of the test pits. If this presents a problem, the backfill will need to be removed and replaced with structural fill during construction.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

The test pits conducted for this study generally encountered medium-dense or denser native soils within a few feet of the ground surface. These competent soils are well-suited to supporting the proposed residence; conventional footings that bear on these competent soils can be used as the residence foundation. However, Test Pit 2, apparently located west of the proposed residence, encountered fill and buried topsoil that extended about 6 feet below the ground surface. This fill appears to have been placed in a ravine with a roughly east-west alignment. We anticipate that the fill thickness decreases toward the east and south, but a small amount of fill may exist at the northwest corner of the planned residence. Some over-excavation may be needed to reach the competent soil in this area.

The native soils have a substantial fines (silt) content, and they can be easily disturbed during wet weather. Unless the residence foundation subgrade is prepared during the dry summer months, a protective layer of a few inches of crushed rock will likely be needed over the footing subgrade to protect the subgrade from disturbance.

As noted earlier in this report, a steep slope is located on the western portion of the property. A discussion of the development in relation to the steep slope is discussed in a subsequent section of this report. We believe that the proposed location of the residence is very suitable from a geotechnical engineering standpoint. However, it is important that no fill soils be placed on or near the steep slope without it being property retained with engineered structures, and also no stormwater should be directed to the slope. The plans we reviewed indicate that this will be the case.

The erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered. We anticipate that a silt fence will be needed around the downslope sides of any cleared areas. Existing pavements, ground cover, and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Rocked staging areas and construction access roads should be provided to reduce the amount of soil or mud carried off the property by trucks and equipment. Wherever possible, the access roads should follow the alignment of planned pavements. Trucks should not be allowed to drive off of the rock-covered areas. Cut slopes and soil stockpiles should be covered with plastic during wet weather. Following clearing or rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

The drainage and/or waterproofing recommendations presented in this report are intended only to prevent active seepage from flowing through concrete walls or slabs. Even in the absence of active seepage into and beneath structures, water vapor can migrate through walls, slabs, and floors from the surrounding soil, and can even be transmitted from slabs and foundation walls due to the concrete curing process. Water vapor also results from occupant uses, such as cooking and bathing. Excessive water vapor trapped within structures can result in a variety of undesirable conditions, including, but not limited to, moisture problems with flooring systems, excessively moist air within occupied areas, and the growth of molds, fungi, and other biological organisms that may be harmful to the health of the occupants. The designer or architect must consider the potential vapor sources and likely occupant uses, and provide sufficient ventilation, either passive or mechanical, to prevent a build up of excessive water vapor within the planned structure.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

STEEP SLOPE CONSIDERATIONS

The City of Bellevue Land Use Code (Chapter 20 of the Bellevue City Code), defines Geologic Hazard Areas in section 20.25H.120. Specifically, a Steep Slope is defined as a slope of 40 percent or more that has a rise of at least 10 feet and exceeds 1,000 square feet in area. Under this definition, the slope on the lower, western portion of the site is classified as a Steep Slope.

The City defines a Landslide Hazard Area as any slope inclined at 15 percent or steeper that exhibits: a) areas of historic landsliding; b) soil movements within the Holocene Epoch (13,000 years ago to present); c) slopes that are parallel to sub-parallel to subsurface planes of weakness; d) slopes with geomorphic features indicating past historic movements; e) areas with spring seeps that indicate a shallow groundwater table on or adjacent to the slope face; and f) areas of potential instability from wave cutting, rapid stream incision, or stream bank erosion. We did not observe any signs of past or potential deep-seated landslide movements on this site. Although we observed seepage upslope of the steep slope area in the lower, eastern portion of the site, we did not observe other City-defined landslide criteria on the slopes of this property. Based on our observations, and the information available from our test pits, the steep slope should not classify as a Landslide Hazard under this section of the City Code.

The Bellevue code includes development restrictions for Geologic Hazard Areas, including a 50-foot buffer drawn from the top of a Steep Slope where no development shall occur. However, Section 20.25H.125 states that development within the Steep Slope buffer may be allowed if all the provisions of this section are met, which identifies performance standards for development in steep slope areas and buffers. Because the core soil at the site is medium-dense to dense, glacially-consolidated soil, and provided that the residence project is constructed as recommended in this report, it is our opinion that constructing the proposed residence at the site, which will in some small areas be located in some areas as close as 10 feet from the steep slope, will not adversely

affect the overall stability of the existing slope and thus meets the provisions of Section 20.25.125 in our opinion.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site class within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Site Class). The site soils are not susceptible to seismic liquefaction because of their medium-dense to dense nature and/or the lack of a near-surface water table.

CONVENTIONAL FOUNDATIONS

The proposed structure can be supported on conventional continuous and spread footings bearing on undisturbed, medium-dense, native soil. We recommend that continuous and individual spread footings have minimum widths of 12 and 16 inches, respectively. Exterior footings should also be bottomed at least 18 inches below the lowest adjacent finish ground surface for protection against frost and erosion. The local building codes should be reviewed to determine if different footing widths or embedment depths are required. Footing subgrades must be cleaned of loose or disturbed soil prior to pouring concrete. Depending upon site and equipment constraints, this may require removing the disturbed soil by hand.

An allowable bearing pressure of 2,500 pounds per square foot (psf) is appropriate for footings supported on competent native soil. A one-third increase in this design bearing pressure may be used when considering short-term wind or seismic loads. For the above design criteria, it is anticipated that the total post-construction settlement of footings founded on competent native soil will be about 3/4-inch, with differential settlements on the order of one-half-inch in a distance of 50 feet along a continuous footing with a uniform load.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level, well-compacted fill. We recommend using the following ultimate values for the foundation's resistance to lateral loading:

PARAMETER	ULTIMATE VALUE
Coefficient of Friction	0.45
Passive Earth Pressure	300 pcf

Where: pcf is Pounds per Cubic Foot, and Passive Earth Pressure is computed using the equivalent fluid density.

If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend maintaining a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above ultimate values.

FOUNDATION AND RETAINING WALLS

Retaining walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended parameters are for walls that restrain level backfill:

PARAMETER	VALUE
Active Earth Pressure *	35 pcf
Passive Earth Pressure	300 pcf
Coefficient of Friction	0.45
Soil Unit Weight	130 pcf

Where: pcf is Pounds per Cubic Foot, and Active and Passive Earth Pressures are computed using the equivalent fluid pressures.

*** For a restrained wall that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 10 psf times the height of the wall should be added to the above active equivalent fluid pressure.**

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharges, such as those caused by slopes, vehicles, or adjacent foundations will be exerted on the walls. If these conditions exist, those pressures should be added to the above lateral soil pressures. Where sloping backfill is desired behind the walls, we will need to be given the wall dimensions and the slope of the backfill in order to provide the appropriate design earth pressures. The surcharge due to traffic loads behind a wall can typically be accounted for by adding a uniform pressure equal to 2 feet multiplied by the above active fluid density. Heavy construction equipment should not be operated behind retaining and foundation walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment.

The values given above are to be used to design only permanent foundation and retaining walls that are to be backfilled, such as conventional walls constructed of reinforced concrete or masonry. It is not appropriate to use the above earth pressures and soil unit weight to back-calculate soil strength parameters for design of other types of retaining walls, such as soldier pile, reinforced earth, modular or soil nail walls. We can assist with design of these types of walls, if desired. The passive pressure given is appropriate only for a shear key poured directly against undisturbed native soil, or for the depth of level, well-compacted fill placed in front of a retaining or foundation wall. The values for friction and passive resistance are ultimate values and do not include a safety factor. We recommend a safety factor of at least 1.5 for overturning and sliding, when using the above values to design the walls. Restrained wall soil parameters should be utilized for a distance of 1.5 times the wall height from corners or bends in the walls. This is intended to reduce the amount of cracking that can occur where a wall is restrained by a corner.

Wall Pressures Due to Seismic Forces

The surcharge wall loads that could be imposed by the design earthquake can be modeled by adding a uniform lateral pressure to the above-recommended active pressure. The recommended surcharge pressure is 7**H** pounds per square foot (psf), where **H** is the

design retention height of the wall. Using this increased pressure, the safety factor against sliding and overturning can be reduced to 1.2 for the seismic analysis.

Retaining Wall Backfill and Waterproofing

Backfill placed behind retaining or foundation walls should be coarse, free-draining structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent. If the native sand soils are used as backfill, a minimum 12-inch width of free-draining gravel or a drainage composite similar to Miradrain 6000 should be placed against the backfilled retaining walls. The on-site silt soil should not be used as wall backfill. The drainage composites should be hydraulically connected to the foundation drain system. For increased protection, drainage composites should be placed along cut slope faces, and the walls should be backfilled entirely with free-draining soil. The later section entitled ***Drainage Considerations*** should also be reviewed for recommendations related to subsurface drainage behind foundation and retaining walls.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. Also, subsurface drainage systems are not intended to handle large volumes of water from surface runoff. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls to reduce the potential for surface water to percolate into the backfill. Water percolating through pervious surfaces (pavers, gravel, permeable pavement, etc.) must also be prevented from flowing toward walls or into the backfill zone. The compacted subgrade below pervious surfaces and any associated drainage layer should therefore be sloped away. Alternatively, a membrane and subsurface collection system could be provided below a pervious surface.

It is critical that the wall backfill be placed in lifts and be properly compacted, in order for the above-recommended design earth pressures to be appropriate. The wall design criteria assume that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction. The section entitled ***General Earthwork and Structural Fill*** contains additional recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof below-grade walls, or to prevent the formation of mold, mildew or fungi in interior spaces. Over time, the performance of subsurface drainage systems can degrade, subsurface groundwater flow patterns can change, and utilities can break or develop leaks. Therefore, waterproofing should be provided where future seepage through the walls is not acceptable. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. There are a variety of different waterproofing materials and systems, which should be installed by an experienced contractor familiar with the anticipated construction and subsurface conditions. Applying a thin coat of asphalt emulsion to the outside face of a wall is not considered waterproofing, and will only help to reduce moisture generated from water vapor or capillary action from seeping through the concrete. As with any project, adequate ventilation of basement and crawl space areas is

important to prevent a build up of water vapor that is commonly transmitted through concrete walls from the surrounding soil, even when seepage is not present. This is appropriate even when waterproofing is applied to the outside of foundation and retaining walls. We recommend that you contact an experienced envelope consultant if detailed recommendations or specifications related to waterproofing design, or minimizing the potential for infestations of mold and mildew are desired.

The ***General***, ***Slabs-On-Grade***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

SLABS-ON-GRADE

The building floors can be constructed as slabs-on-grade atop competent native soil or on structural fill. The subgrade soil must be in a firm, non-yielding condition at the time of slab construction or underslab fill placement. Any soft areas encountered should be excavated and replaced with select, imported structural fill.

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the new constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures,* proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or products. ACI also notes that vapor *retarders* such as 6-mil plastic sheeting have been used in the past, but are now recommending a minimum 10-mil thickness for better durability and long term performance. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection. If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

In the recent past, ACI (Section 4.1.5) recommended that a minimum of 4 inches of well-graded compactable granular material, such as a 5/8-inch-minus crushed rock pavement base, be placed over the vapor retarder or barrier for their protection, and as a "blotter" to aid in the curing of the concrete slab. Sand was not recommended by ACI for this purpose. However, the use of material over the vapor retarder is controversial as noted in current ACI literature because of the potential that the protection/blotter material can become wet between the time of its placement and the installation of the slab. If the material is wet prior to slab placement, which is always possible in the Puget Sound area, it could cause vapor transmission to occur up through the slab in the future,

essentially destroying the purpose of the vapor barrier/retarder. Therefore, if there is a potential that the protection/blotter material will become wet before the slab is installed, ACI now recommends that no protection/blotter material be used. However, ACI then recommends that, because there is a potential for slab curl due to the loss of the blotter material, joint spacing in the slab be reduced, a low shrinkage concrete mixture be used, and "other measures" (steel reinforcing, etc.) be used. ASTM E-1643-98 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs" generally agrees with the recent ACI literature.

We recommend that the contractor, the project materials engineer, and the owner discuss these issues and review recent ACI literature and ASTM E-1643 for installation guidelines and guidance on the use of the protection/blotter material.

The ***General***, ***Permanent Foundation and Retaining Walls***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

EXCAVATIONS AND SLOPES

Excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Temporary cuts to a depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the soil at the subject site would generally be classified as Type B. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand or loose soil can cave suddenly and without warning. Excavation, foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

All permanent cuts into native soil should be inclined no steeper than 2:1 (H:V). Compacted fill slopes should also not be constructed with an inclination steeper than 2:1 (H:V). To reduce the potential for shallow sloughing, fill must be compacted to the face of these slopes. This can be accomplished by overbuilding the compacted fill and then trimming it back to its final inclination. Adequate compaction of the slope face is important for long-term stability and is necessary to prevent excessive settlement of patios, slabs, foundations, or other improvements that may be placed near the edge of the slope.

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

Any disturbance to the existing slope outside of the building limits may reduce the stability of the slope. Damage to the existing vegetation and ground should be minimized, and any disturbed areas should be revegetated as soon as possible. Soil from the excavation should not be placed on the slope, and this may require the off-site disposal of any surplus soil.

DRAINAGE CONSIDERATIONS

Footing drains should be used where (1) crawl spaces or basements will be below a structure, (2) a slab is below the outside grade, or (3) the outside grade does not slope downward from a building. Drains should also be placed at the base of all earth-retaining walls. These drains should be surrounded by at least 6 inches of 1-inch-minus, washed rock that is encircled with non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least 6 inches below the bottom of a slab floor or the level of a crawl space. The discharge pipe for subsurface drains should be sloped for flow to the outlet point. Roof and surface water drains must not discharge into the foundation drain system. A typical drain detail is attached to this report as Plate 6. For the best long-term performance, perforated PVC pipe is recommended for all subsurface drains.

As a minimum, a vapor retarder, as defined in the ***Slabs-On-Grade*** section, should be provided in any crawl space area to limit the transmission of water vapor from the underlying soils. Crawl space grades are sometimes left near the elevation of the bottom of the footings. As a result, an outlet drain is recommended for all crawl spaces to prevent an accumulation of any water that may bypass the footing drains. Providing even a few inches of free draining gravel underneath the vapor retarder limits the potential for seepage to build up on top of the vapor retarder.

Groundwater was observed during our field work. If seepage is encountered in an excavation, it should be drained from the site by directing it through drainage ditches, perforated pipe, or French drains, or by pumping it from sumps interconnected by shallow connector trenches at the bottom of the excavation.

The excavation and site should be graded so that surface water is directed off the site and away from the tops of slopes. Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to a building should slope away at least 2 percent, except where the area is paved. Surface drains should be provided where necessary to prevent ponding of water behind foundation or retaining walls. A discussion of grading and drainage related to pervious surfaces near walls and structures is contained in the ***Foundation and Retaining Walls*** section. Water from roof, storm water, and foundation drains should not be discharged onto slopes; it should be tightlined to a suitable outfall located away from any slopes.

GENERAL EARTHWORK AND STRUCTURAL FILL

All building and pavement areas should be stripped of surface vegetation, topsoil, organic soil, and other deleterious material. It is important that existing foundations be removed before site development. The stripped or removed materials should not be mixed with any materials to be used as structural fill, but they could be used in non-structural areas, such as landscape beds.

Structural fill is defined as any fill, including utility backfill, placed under, or close to, a building, behind permanent retaining or foundation walls, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches. We recommend testing the fill as it is placed. If the fill is not sufficiently compacted, it can be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended relative compactions for structural fill:

LOCATION OF FILL PLACEMENT	MINIMUM RELATIVE COMPACTION
Beneath footings, slabs or walkways	95%
Filled slopes and behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-91 (Modified Proctor).

Structural fill that will be placed in wet weather should consist of a coarse, granular soil with a silt or clay content of no more than 5 percent. The percentage of particles passing the No. 200 sieve should be measured from that portion of soil passing the three-quarter-inch sieve.

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the test pits are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in test

pits. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

The recommendations presented in this report are directed toward the protection of only the proposed structure from damage due to slope movement. Predicting the future behavior of steep slopes and the potential effects of development on their stability is an inexact and imperfect science that is currently based mostly on the past behavior of slopes with similar characteristics. Landslides and soil movement can occur on steep slopes before, during, or after the development of property. At additional cost, we can provide recommendations for reducing the risk of future movement on the steep slopes, which could involve regrading the slopes or installing subsurface drains or costly retaining structures. The owner of any property containing, or located close to steep slopes must ultimately accept the possibility that some slope movement could occur. However, based on a buffer of at least 30 feet, such movement will not affect the proposed residence.

This report has been prepared for the exclusive use of Tony Prophet and his representatives for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

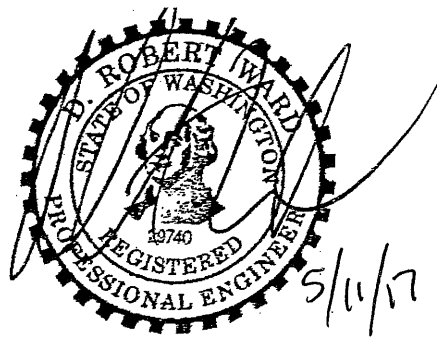
The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 5	Test Pit Logs
Plate 6	Typical Footing Drain Detail

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

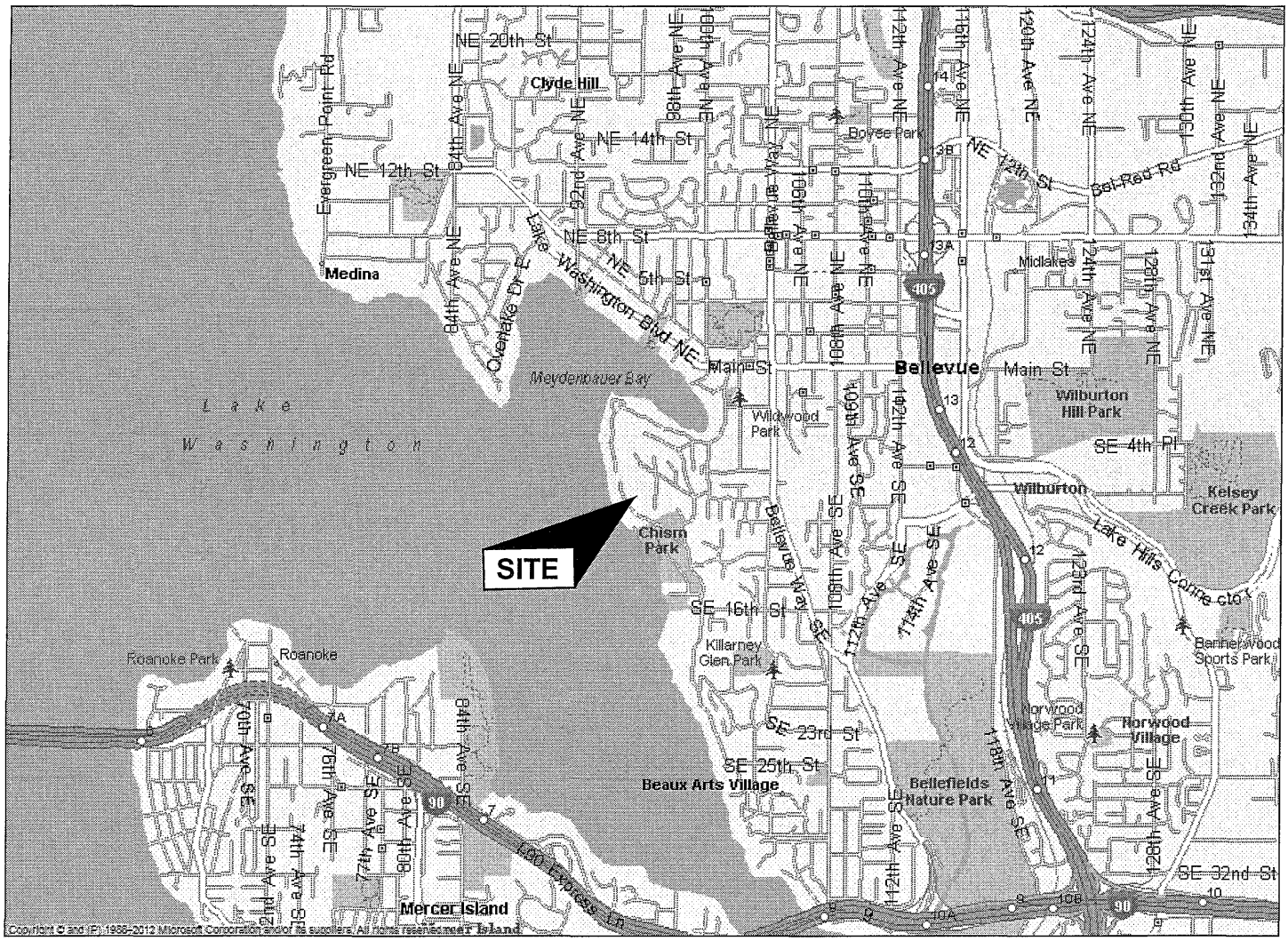
Respectfully submitted,

GEOTECH CONSULTANTS, INC.



D. Robert Ward, P.E.
Principal

DRW:mw



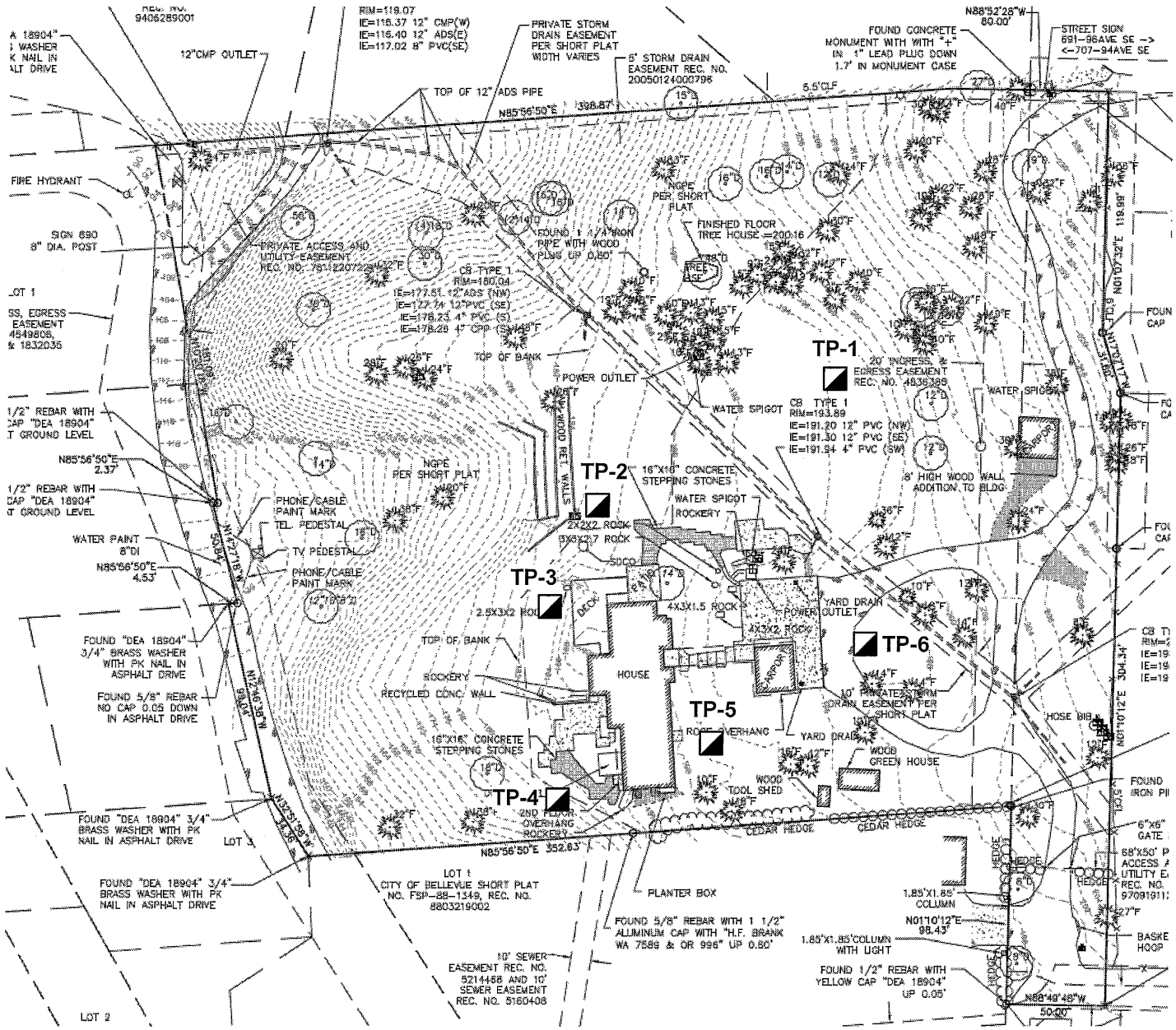
(Source: Microsoft MapPoint, 2013)

GEOTECH CONSULTANTS, INC.

VICINITY MAP

707 - 94th Avenue Southeast
Bellevue, Washington

Job No:	Date:		Plate:
17132	May 2017		1



Legend:

◪ Test Pit Location

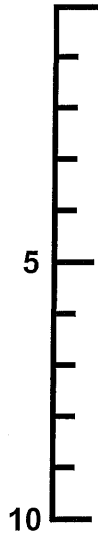
GEOTECH CONSULTANTS, INC.

SITE EXPLORATION PLAN

707 - 94th Avenue Southeast
Bellevue, Washington

Job No:	Date:		Plate:
17132	May 2017	No Scale	2

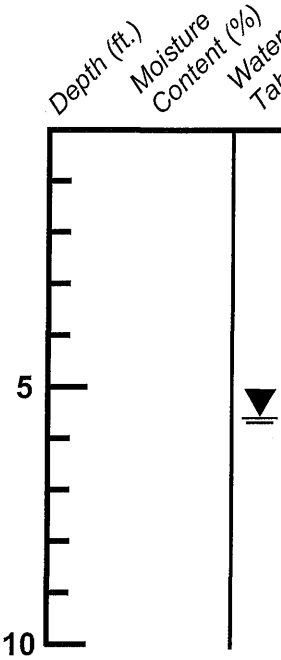
TEST PIT 1



USCS	Description
	Topsoil
SM	Rust-brown mottled gray-brown silty SAND with zones of sand; fine to coarse-grained, moist, medium-dense
ML	Rust-brown mottled gray-brown SILT, non-plastic, moist, medium-dense to dense -becomes gray

* **Test Pit terminated at 7.0 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

TEST PIT 2



USCS	Description
FILL	Brown silty SAND, fine to coarse-grained, moist, loose to medium-dense **(FILL)**
FILL	Brown SILT with sand and trace organics, fine to coarse-grained, moist, loose to medium-dense **(FILL)** -becomes wet
	Topsoil
SM	Gray silty SAND with zones of sand, fine to coarse-grained, moist, medium-dense -becomes medium-dense to dense

* **Test Pit terminated at 8.5 feet on October 23, 2014.**
* **Groundwater seepage was observed at 5.5 feet during excavation.**
* **Caving was observed below 4.5 feet during excavation.**

GEOTECH
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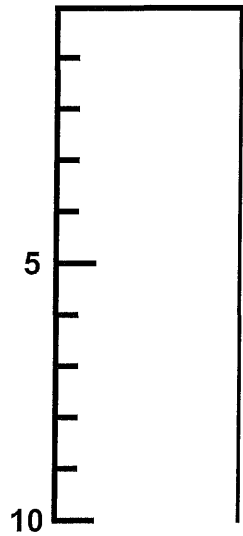
TEST PIT LOG

707 - 94th Avenue Southeast
Bellevue, Washington

Job	Date:	Logged by:	Plate:
17132	May 2017	TRC	3

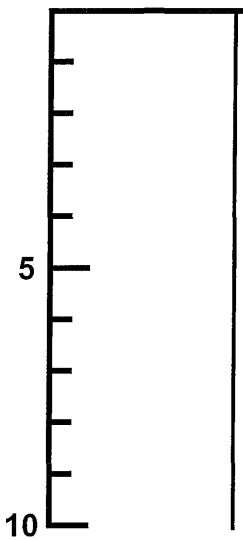
TEST PIT 3



USCS	Description
SM	Brown silty SAND with gravel, fine to coarse-grained, moist, loose to medium-dense -becomes medium-dense
ML	Rust-brown mottled gray-brown SILT with zones of sand and gravel, non-plastic, fine to coarse grained, moist, medium-dense to dense

* **Test Pit terminated at 5.5 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

TEST PIT 4



USCS	Description
	Topsoil
SM	Gray-brown silty SAND, fine to coarse-grained, wet, loose -becomes medium-dense
ML	Rust-brown mottled gray-brown SILT, non-plastic, moist, medium-dense -becomes medium-dense to dense

* **Test Pit terminated at 5.5 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

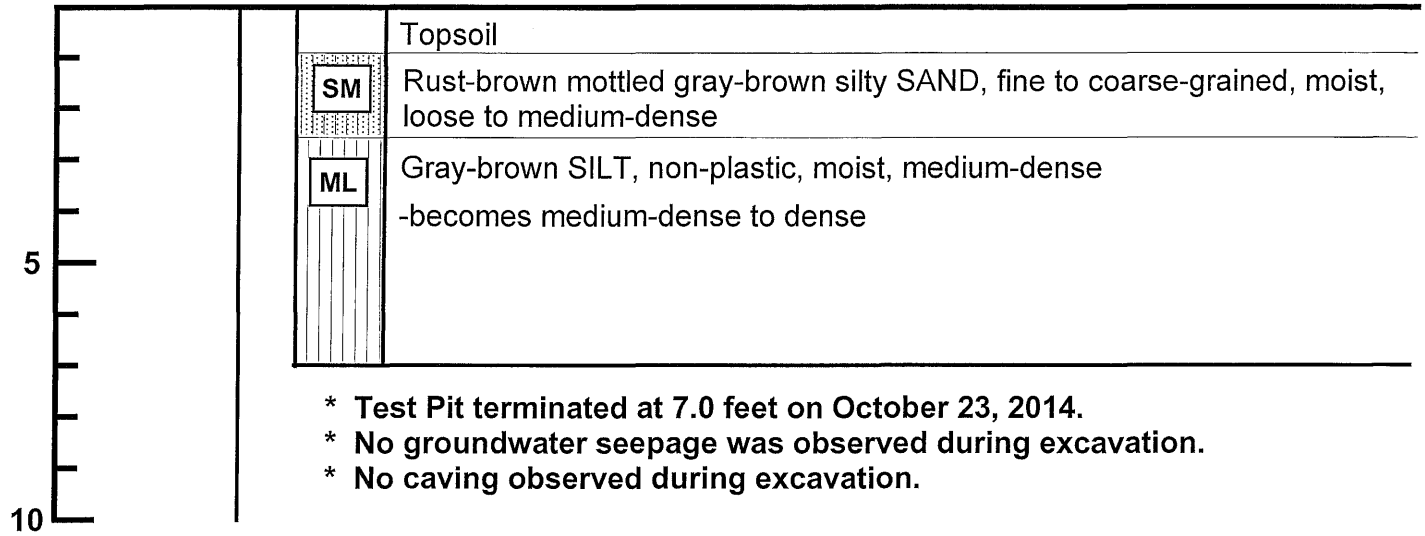
GEOTECH CONSULTANTS, INC.

TEST PIT LOG

707 - 94th Avenue Southeast
Bellevue, Washington

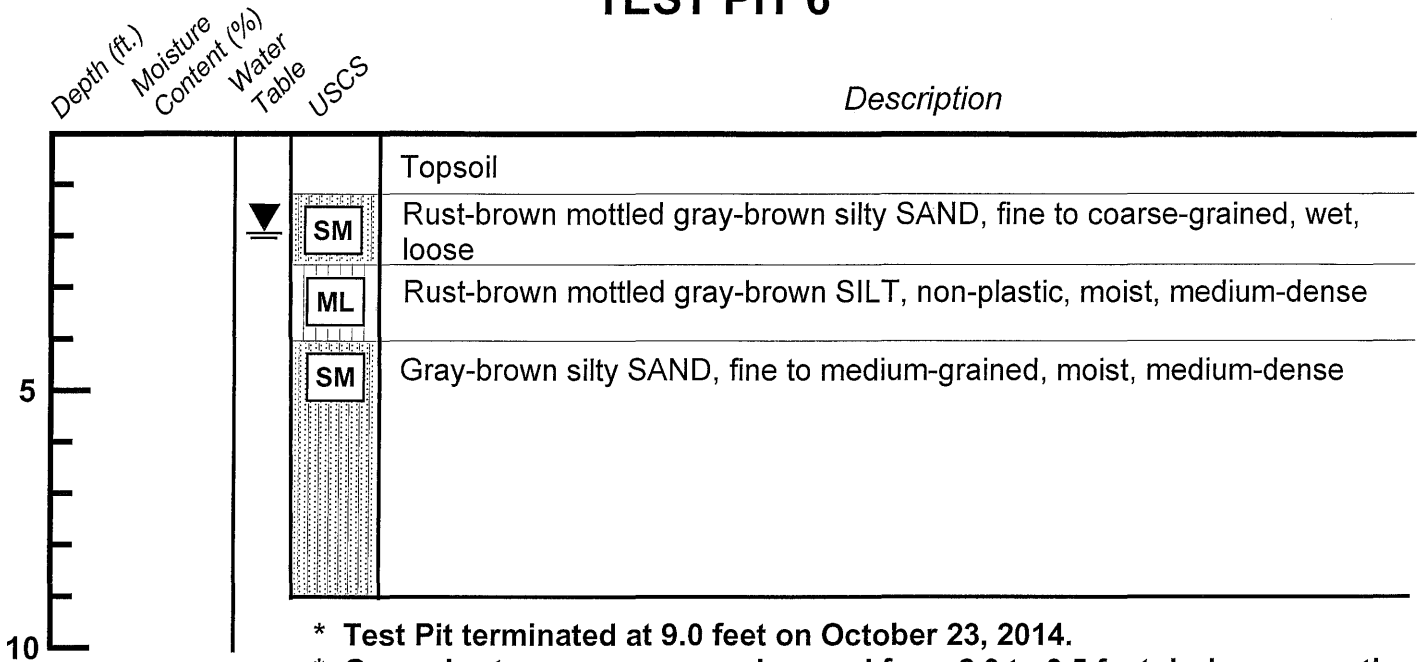
Job	Date:	Logged by:	Plate:
17132	May 2017	TRC	4

TEST PIT 5



* **Test Pit terminated at 7.0 feet on October 23, 2014.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

TEST PIT 6



* **Test Pit terminated at 9.0 feet on October 23, 2014.**
* **Groundwater seepage was observed from 2.0 to 3.5 feet during excavation.**
* **No caving observed during excavation.**

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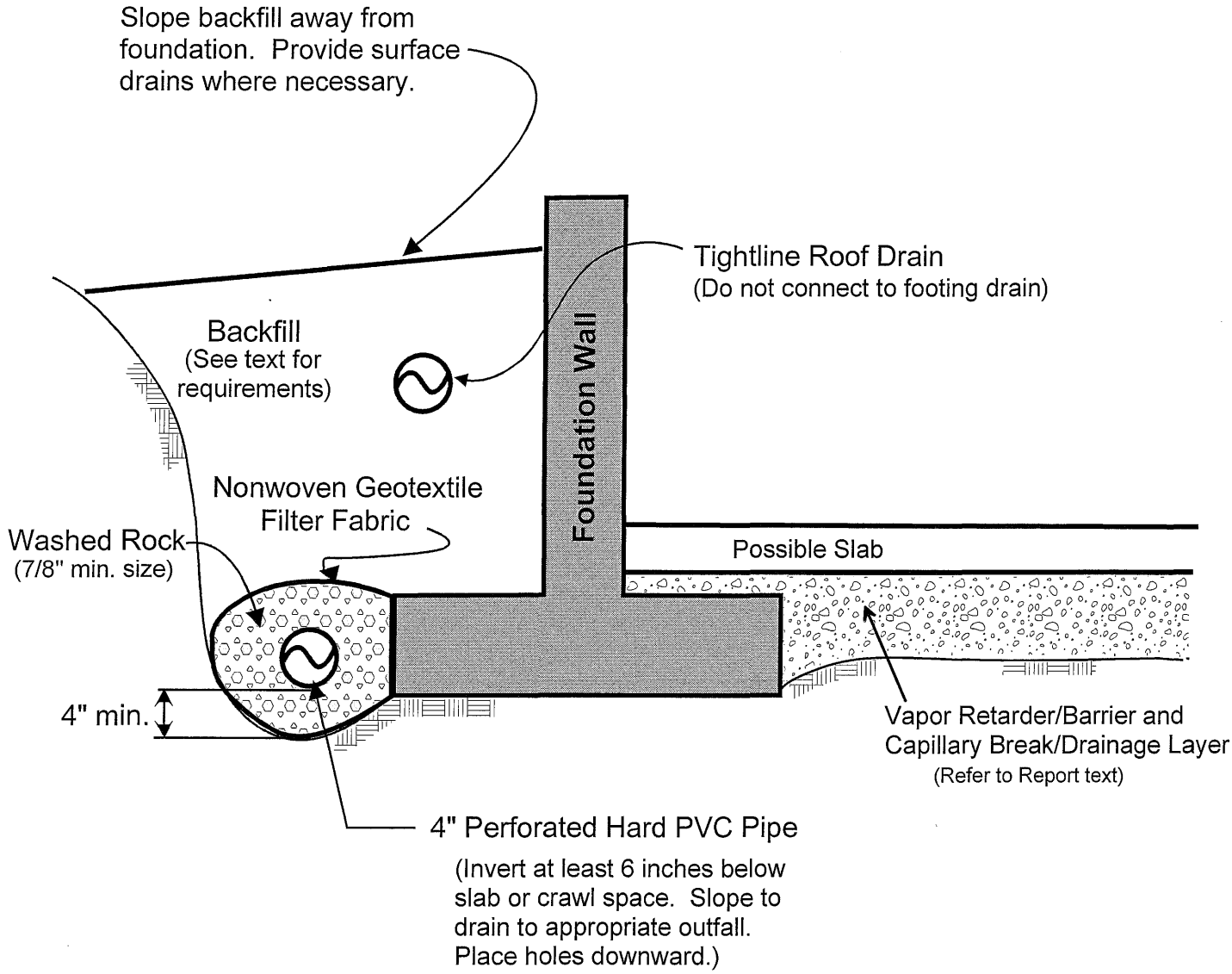
TEST PIT LOG

707 - 94th Avenue Southeast
Bellevue, Washington

Job	Date:	Logged by:	Plate:
17132	May 2017	TRC	5



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

GEOTECH CONSULTANTS, INC.

FOOTING DRAIN DETAIL

707 - 94th Avenue Southeast
Bellevue, Washington

Job No:	Date:		Plate:
17132	May 2017		6

Hoshide Wanzer Architects

Arborist Reports Cover Sheet
CALUP Submission

Project: Meydenbauer Residence | #17-113498-BS
Date: October 10, 2019

Project:	Meydenbauer Residence 707 94th Ave SE Bellevue, WA 98004	Owner:	Hans Spiller 707 94th Ave SE Bellevue, WA 98004
Architect:	Hoshide Wanzer Architects 100 NE Northlake Way, Suite 150 Seattle, WA 98105 Bob Hoshide, AIA	Contractor:	Roberts Group 5914 Lake Washington Blvd NE Kirkland, WA 98033 Matt Cantrell

Description:

1. **Arborist Reports**
   Over the course of design and construction, we have had Urban Forestry Services provide periodic site visits and reports. Attached to this cover letter are all of the Arborist reports to date, in sequential order for your convenience.

Attachments:

1. **Reports by Date**

2017-09.21	Arborist Site Notes
2018-07.12	Arborist Site Notes
2019-01.28	Cedar Tree Assessment Matrix
2019-01.28	Maple and Magnolia Assessment Matrix
2019-07.08	Tree Protection Arborist Notes

Hoshide Wanzer Architects, PLLC. | 100 NE Northlake Way, Suite 150 Seattle, WA 98105 I P. 206.325.6441 W. www.hw-architects.com

Hello Rob,

Attached is the proposal for completing some of the work on this site. I have had Symbiosis Tree Care, LLC., break down the proposal into individual items. I estimate that the total is approximately $5,110 plus tax. Not included in this total is the cost of the dry-vacuum vehicle required to complete the trenching and potholing.

It appears that Symbiosis have not included the cost of compost in their root invigoration treatment. I would estimate $1,800 for delivery of this material and installation, plus tax. I am assuming you will have woodchips / hogfuel on site for mulch.

Retained trees should be treated with Cambistat. This treatment would cost approximately $1,200, plus tax.

Survivability Estimates:

Tree no.4 Entry Magnolia: 40-50%
Tree no.5 NE House Corner Magnolia: 20-30%
Tree no.6 to 8 Magnolia / Maple: 40-60%

Southwest Snowbell: 15-20%

I hope that this adequately address the additional costs of retaining the trees, and that when combined or compared the risk / survivability estimate will provide the owner with adequate information to make an informed choice on tree retention.

Let me know if you have any questions.

Thank you,
Paul.

Paul H. Thompson

Urban Forestry Services, Inc. - www.urbanforestryservices.com
Associate Consulting Arborist
ASCA Registered Consulting Arborist #509
ISA Certified Arborist #PN-1838A
ISA Tree Risk Assessment Qualified

Urban Forest Nursery, Inc. - www.urbanforestnursery.com
15119 McLean Road
Mount Vernon, WA 98273

Office: 360.428.5810 Fax: 360.428.1822 Cell: 360.393.7283

10/11/17

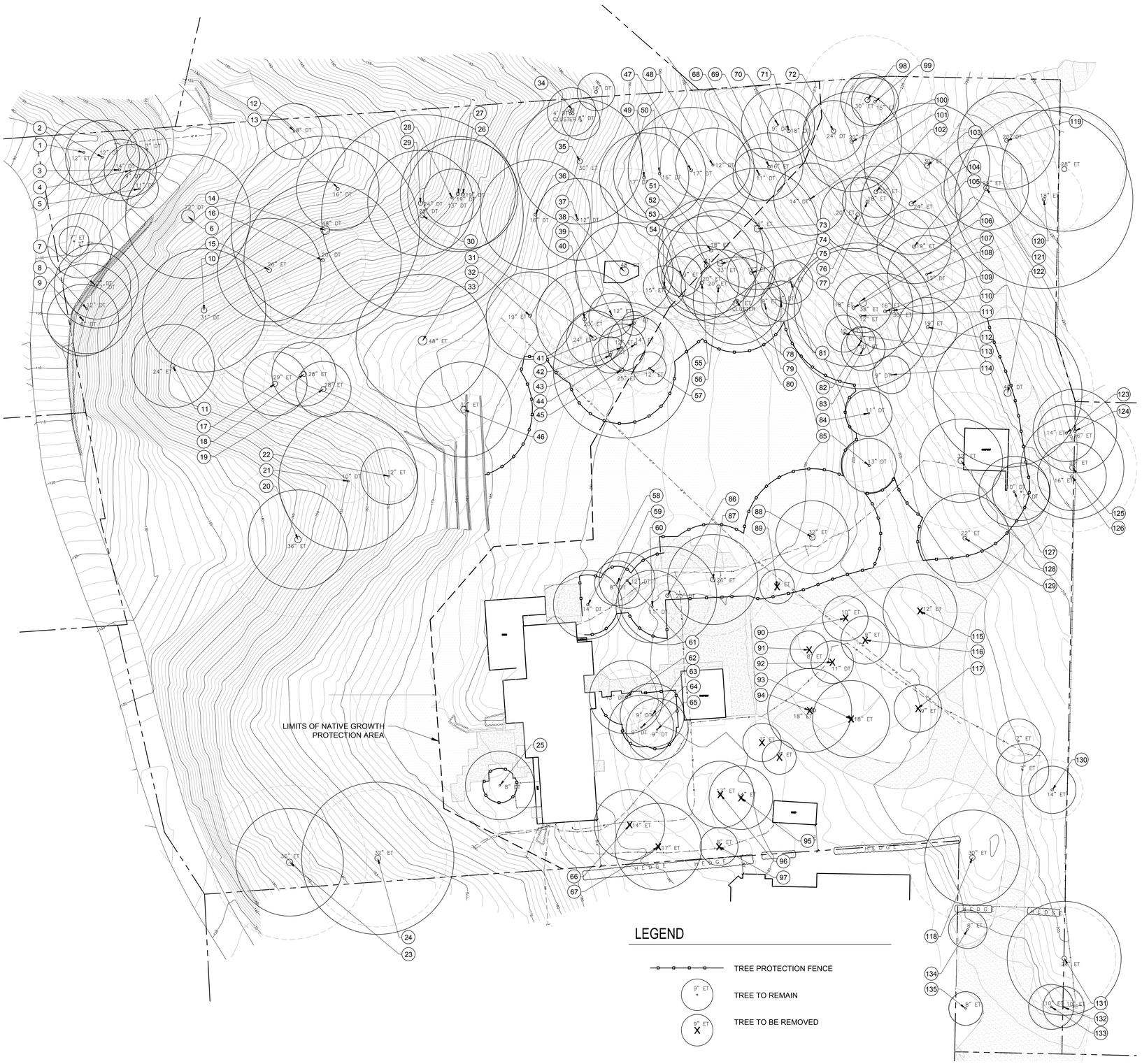
Summary of Arborist Report

- General cost of protecting trees as best as possible $ 8,110.00
  - -Does not include services required of vac-truck
  - -Considerations for further cost analysis of total Cost requires further discussions relating to Vac-truck services, for example finding a place On site to use as a dumping area for vac-truck Vs. the need to send the truck off site in order To empty his load

- Survivability Estimates
  - Tree #4 (Entry Magnolia) 40-50%
  - Tree #5 (NE Corner Magnolia) 20-30%
  - Tree #6-8 (Magnolia/Maple) 40-60%

-Southwest Snowbell 15-20%

Both cost and survivability are estimates. Costs may vary on time required to execute the work. Additional cost not included are the excavators time needed to assist arborist with trenching etc.



LEGEND

- TREE PROTECTION FENCE
- TREE TO REMAIN
- TREE TO BE REMOVED

1 TREE PROTECTION PLAN
1"=20'-0"

TREE PROTECTION NOTES

1. SEE SPECIFICATION SECTION 01 56 39 TEMPORARY TREE AND PLANT PROTECTION.

2. TREE PROTECTION ZONE (TPZ)
   a. DEFINED AS 1' RADIUS FROM THE BASE OF THE TREE'S TRUNK PER 1" OF THE TREE'S DIAMETER AT DBH OR 6' WHICHEVER IS GREATER.
   b. PROTECTIVE FENCING TO REMAIN INSTALLED AT ALL TIMES.
   c. WORKING WITHIN TPZ RESTRICTED TO APPROVED PERSONNEL AND SUPERVISED BY PROJECT ARBORIST.
   d. NO DISTURBANCE ALLOWED WITHOUT SITE-SPECIFIC INSPECTION AND APPROVAL OF METHODS TO MINIMIZE ROOT DAMAGE.
   e. NO CUTTING OF ROOTS LARGER THAN 4" IN DIA.
   f. CUTTING OF ROOTS LARGER THAN 1-1/2" DIA. REQUIRES OWNER'S REPRESENTATIVE'S APPROVAL & MUST BE PERFORMED UNDER THE SUPERVISION OF AN ISA CERTIFIED ARBORIST.
   g. NO STOCKPILING OR STORAGE OF CONSTRUCTION EQUIPMENT, ANY MATERIALS (INCLUDING SOIL & MULCH), VEHICLES, OR DEMOLITION DEBRIS WITHIN 10' OF TPZ. NO DISCARDING OF CONSTRUCTION MATERIALS OR WASHING OUT EQUIPMENT OR TOOLS WITHIN 10' OF TPZ.
   h. TUNNELING REQUIRED TO INSTALL LINES 3'-0" BELOW GRADE OR DEEPER.
   i. MAINTAIN 2/3 OR MORE OF TPZ IN UNDISTURBED CONDITION, OR AS APPROVED BY APPROVED PROJECT ARBORIST.

3. DRIPLINE ZONE
   a. EXTENDS FROM TRUNK TO OUTER CANOPY EDGE- DRIPLINE.
   b. ABSOLUTELY NO STORAGE OF EQUIPMENT OR MATERIALS WITHIN DRIPLINE
   c. ACCESS RESTRICTED BASED ON LA APPROVAL AND PROJECT ARBORIST SUPERVISION REQUIRED.
   d. NO TRENCHING WITHIN DRIPLINE; TUNNELING MUST HAVE APPROVAL FROM ARBORIST.
   e. OPERATION OF HEAVY EQUIPMENT AND/OR STOCKPILING OF MATERIAL PROHIBITED
   f. SURFACE PROTECTION MEASURES REQUIRED FOR ALL WORK.

4. FEEDER ROOT ZONE AND ROOT PROTECTION
   a. USE/ACCESS INTO TPZ SHALL BE UPON APPROVAL FROM LA SUPERVISED BY PROJECT ARBORIST.
   b. ADDITIONAL LAYER OF 3" GRAVEL AND 3/4 PLYWOOD SHALL COVER DRIPLINE WHEN AUTHORIZED WORK BEING PERFORMED IN TPZ.
   c. NO OPERATION OF HEAVY EQUIPMENT AND/OR STOCKPILING MATERIAL IN THIS AREA WITHOUT OWNER'S REPRESENTATIVE'S APPROVAL.
   d. TRENCHING WITH HEAVY EQUIPMENT ALLOWED AS FOLLOWS:
      (i) MINIMIZE TRENCH WIDTH
      (ii) MAINTAIN 2/3 OR MORE OF TPZ IN UNDISTURBED CONDITION.
   e. ALL WOOD CHIPS, GRAVEL AND PLYWOOD TO BE REMOVED BY HAND UPON PROJECT COMPLETION.

5. PLACE TREE PROTECTION FENCE PER APPROVED PROJECT ARBORIST'S LANDSCAPE PROTECTION PLAN. APPROXIMATE LOCATIONS ARE NOTED ON TREE PROTECTION PLAN. THE FENCE SHALL COMPLETELY ENCIRCLE THE TREE OR CLUSTER OF TREES NOTED FOR PROTECTION. TREE PROTECTION FENCING SHOWN ON PLANS IS FOR REFERENCE ONLY.

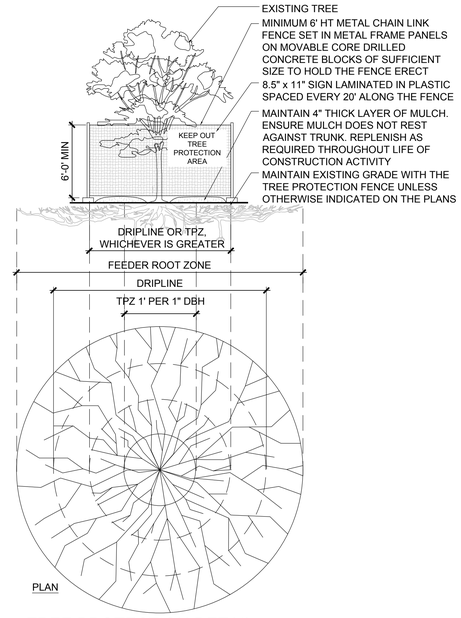
6. TREE PROTECTION FENCE IS LOCATED AT TRZ OR AT THE LIMIT OF EXISTING SITE IMPROVEMENTS AS SHOWN ON PLAN. PROPOSED SITE IMPROVEMENTS WILL REQUIRE TEMPORARY RELOCATION OF THE TREE PROTECTION FENCE DURING CONSTRUCTION AND SHALL BE DONE WITH THE APPROVAL OF PROJECT ARBORIST.

7. NO EXCAVATION, STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING.

8. NO PRUNING SHALL BE PERFORMED EXCEPT BY APPROVED PROJECT ARBORIST.

9. SALVAGE TOPSOIL IN ALL AREAS OF ANTICIPATED WORK OUTSIDE TREE ROOT PROTECTION ZONE WORK INCLUDING STOCKPILE AREAS AND ANTICIPATED STAGING LOCATIONS. STOCKPILE ONSITE, LOCATION TO BE DETERMINED BY OWNER'S REPRESENTATIVE. SEE SPEC.

10. ALL TREES AND VEGETATION NOT NOTED FOR SALVAGE OR REMOVAL SHALL BE CONSIDERED AS TREE TO REMAIN AND SHALL REQUIRE TREE PROTECTION MEASURES TO PROTECT FROM CONSTRUCTION ACTIVITIES.



PLAN

2 TREE PROTECTION DETAIL
NOT TO SCALE

Hoshide Wanzer Architects
P. 206-325.6441
100 NE Northlake Way
Suite 150
Seattle, WA 98105
W. www.hw-architects.com

MEYDENBAUER RESIDENCE

707 94TH AVE SE
BELLEVUE, WA 98004

STATE OF WASHINGTON
LICENSED
LANDSCAPE ARCHITECT
BARBARA ALSTON SWIFT
LICENSE NO. 369
EXPIRES ON 5.29.2018

PROJECT DESCRIPTION:
REMODEL TO AN EXISTING SINGLE-FAMILY RESIDENCE, NEW ACCESSORY STRUCTURES, AND ASSOCIATED SITE WORK AND DRIVEWAY UPGRADES.

DRAWN BY:	SS
CHECKED BY:	BAS
DATE:	05.11.17
REVISIONS:	

PERMIT SET

TREE PROTECTION PLAN

L0.1

ACP-PRINT.PMT

TREE INVENTORY

Tree #	Species	DBH	Trees to be Removed	DBH Trees to be Removed
1	Douglas Fir	12.0		
2	Red Alder	12.0		
3	Red Alder	14.0		
4	Red Alder	9.0		
5	Red Alder	11.0		
6	Big Leaf Maple	72.0		
7	Red Alder	14.0		
8	Big Leaf Maple	12.0		
9	Big Leaf Maple	8.0		
10	Big Leaf Maple	31.0		
11	Douglas Fir	24.0		
12	Big Leaf Maple	8.0		
13	Big Leaf Maple	16.0		
14	Big Leaf Maple	48.0		
15	Douglas Fir	26.0		
16	Big Leaf Maple	20.0		
17	Douglas Fir	29.0		
18	Douglas Fir	28.0		
19	Douglas Fir	28.0		
20	Big Leaf Maple	36.0		
21	Douglas Fir	10.0		
22	Douglas Fir	12.0		
23	Douglas Fir	36.0		
24	Douglas Fir	32.0		
25	Magnolia	8.0		
26	Big Leaf Maple	19.0		
27	Big Leaf Maple	19.0		
28	Big Leaf Maple	13.0		
29	Big Leaf Maple	24.0		
30	Big Leaf Maple	28.0		
31	Douglas Fir	24.0		
32	Douglas Fir	19.0		
33	Douglas Fir	48.0		
34	Hazel Nut	8.0		
35	Douglas Fir	30.0		
36	Big Leaf Maple	16.0		
37	Big Leaf Maple	12.0		
38	Big Leaf Maple	48.0		
39	Douglas Fir	12.0		
40	Douglas Fir	20.0		
41	Douglas Fir	15.0		
42	Douglas Fir	12.0		
43	Douglas Fir	16.0		
44	Douglas Fir	14.0		
45	Douglas Fir	25.0		
46	Douglas Fir	32.0		
47	Madrona	17.0		
48	Madrona	12.0		
49	Madrona	17.0		
50	Madrona	15.0		
51	Douglas Fir	18.0		
52	Douglas Fir	31.0		
53	Douglas Fir	9.0		
54	Douglas Fir	15.0		
55	Douglas Fir	20.0		
56	Douglas Fir	20.0		
57	Douglas Fir	12.0		
58	Magnolia	14.0		
59	Magnolia	8.0		
60	Magnolia	11.0		
61	Magnolia	12.0		
62	Magnolia	13.0		
63	Japanese Maple	9.0		
64	Japanese Maple	9.0		
65	Japanese Maple	9.0		
66	Douglas Fir	14.0	REMOVE	14.0
67	Douglas Fir	17.0	REMOVE	17.0
68	Madrona	11.0		
69	Douglas Fir	16.0		
70	Madrona	9.0		
71	Madrona	18.0		
72	Madrona	24.0		
73	Douglas Fir	36.0		
74	Douglas Fir	33.0		
75	Douglas Fir	17.0		
76	Douglas Fir	20.0		
77	Douglas Fir	18.0		
78	Madrona	9.0		
79	Douglas Fir	9.0		
80	Douglas Fir	24.0		
81	Douglas Fir	9.0		
82	Douglas Fir	8.0		
83	Douglas Fir	10.0		
84	Apple	11.0		
85	Cheery	13.0		
86	Japanese Maple	20.0		
87	Douglas Fir	26.0		
88	Red Cedar	32.0		
89	Douglas Fir	7.0	REMOVE	7.0
90	Douglas Fir	10.0	REMOVE	10.0
91	Red Cedar	8.0	REMOVE	8.0
92	Hazel Nut	11.0	REMOVE	11.0
93	Douglas Fir	18.0	REMOVE	18.0
94	Douglas Fir	18.0	REMOVE	18.0
95	Douglas Fir	14.0	REMOVE	14.0
96	Douglas Fir	17.0	REMOVE	17.0
97	Douglas Fir	8.0	REMOVE	8.0
98	Douglas Fir	30.0		
99	Douglas Fir	15.0		
100	Douglas Fir	20.0		
101	Madrona	14.0		
102	Douglas Fir	22.0		
103	Douglas Fir	30.0		
104	Douglas Fir	24.0		
105	Douglas Fir	19.0		
106	Douglas Fir	38.0		
107	Madrona	18.0		
108	Big Leaf Maple	12.0		
109	Madrona	16.0		
110	Douglas Fir	30.0		
111	Douglas Fir	12.0		
112	Douglas Fir	19.0		
113	Douglas Fir	10.0		
114	Apple	9.0		
115	Douglas Fir	12.0	REMOVE	12.0
116	Douglas Fir	9.0	REMOVE	9.0
117	Douglas Fir	9.0	REMOVE	9.0
118	Douglas Fir	30.0		
119	Big Leaf Maple	20.0		
120	Douglas Fir	18.0		
121	Douglas Fir	29.0		
122	Douglas Fir	40.0		
123	Douglas Fir	14.0		
124	Douglas Fir	16.0		
125	Douglas Fir	30.0		
126	Douglas Fir	16.0		
127	Douglas Fir	10.0		
128	Douglas Fir	32.0		
129	Douglas Fir	22.0		
130	Douglas Fir	14.0		
131	Douglas Fir	24.0		
132	Douglas Fir	10.0		
133	Douglas Fir	10.0		
134	Douglas Fir	8.0		
135	Douglas Fir	8.0		

Code Summary:	
Total DBH of Significant Trees on Property (8"DBH or greater per LUC20.50.046S)	2515
DBH of Significant Trees to be Removed	172
% of Significant Tree DBH to be Retained	93.1
Min.% required to be retained (LUC 20.20.900.D.2	15
Significant Trees to be Removed in the NGPA	0.0

Hoshide Wanzer Architects
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MEYDENBAUER RESIDENCE

707 94TH AVE SE
BELLEVUE, WA 98004

STATE OF WASHINGTON
LICENSED
LANDSCAPE ARCHITECT

BARBARA ALSTON SWIFT
LICENSE NO. 369
EXPIRES ON 2-24-2018

PROJECT DESCRIPTION:

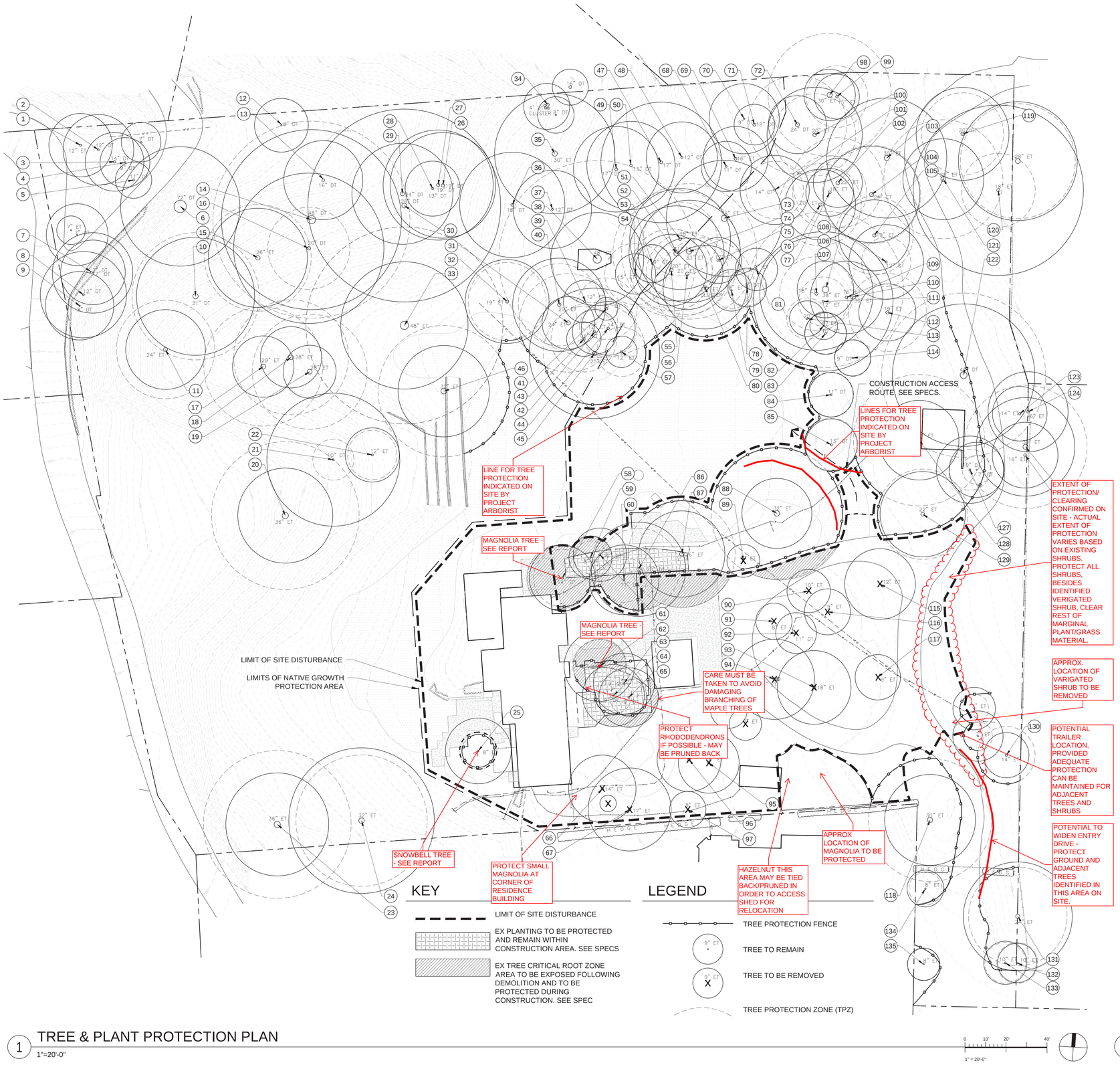
REMODEL TO AN EXISTING SINGLE-FAMILY RESIDENCE, NEW ACCESSORY STRUCTURES, AND ASSOCIATED SITE WORK AND DRIVEWAY UPGRADES.

DRAWN BY:	SS
CHECKED BY:	BAS
DATE:	05.11.17
REVISIONS:	

PERMIT SET

TREE INVENTORY TABLE

L0.2

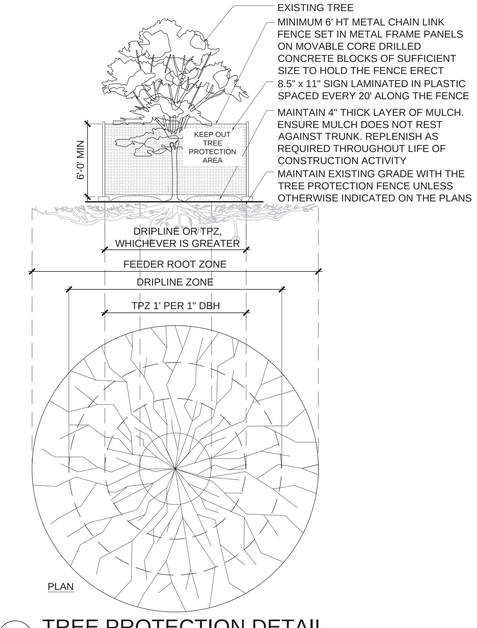


1 TREE & PLANT PROTECTION PLAN

1"=20'-0"

TREE PROTECTION NOTES

1. SEE SPEC SECTION 01 56 39 TEMPORARY TREE AND PLANT PROTECTION.
2. ADDITIONAL TREES EXIST ON SITE WITHIN LIMIT OF SITE DISTURBANCE ZONE. CONTRACTOR TO PRESERVE AND PROTECT UNLESS OTHERWISE DIRECTED BY LA.
3. TREE PROTECTION ZONE (TPZ)
   a. DEFINED AS 1' RADIUS FROM THE BASE OF THE TREE'S TRUNK PER 1" OF THE TREE'S DIAMETER AT DBH OR 6' WHICHEVER IS GREATER.
   b. PROTECTIVE FENCING TO REMAIN INSTALLED AT ALL TIMES.
   c. WORKING WITHIN TPZ RESTRICTED TO APPROVED PERSONNEL AND SUPERVISED BY PROJECT ARBORIST.
   d. NO DISTURBANCE ALLOWED WITHOUT SITE-SPECIFIC INSPECTION AND APPROVAL OF METHODS TO MINIMIZE ROOT DAMAGE.
   e. NO CUTTING OF ROOTS LARGER THAN 4" IN DIA.
   f. CUTTING OF ROOTS LARGER THAN 1-1/2" DIA. REQUIRES LA'S APPROVAL & MUST BE PERFORMED UNDER THE SUPERVISION OF AN ISA CERTIFIED ARBORIST.
   g. NO STOCKPILING OR STORAGE OF CONSTRUCTION EQUIPMENT, ANY MATERIALS (INCLUDING SOIL & MULCH), VEHICLES, OR DEMOLITION DEBRIS WITHIN 10' OF TPZ. NO DISCARDING OF CONSTRUCTION MATERIALS OR WASHING OUT EQUIPMENT OR TOOLS WITHIN 10' OF TPZ.
   h. TUNNELING REQUIRED TO INSTALL LINES 3'-0" BELOW GRADE OR DEEPER.
   i. MAINTAIN 2/3 OR MORE OF TPZ IN UNDISTURBED CONDITION, OR AS APPROVED BY APPROVED PROJECT ARBORIST.
4. DRIPLINE ZONE
   a. EXTENDS FROM TRUNK TO OUTER CANOPY EDGE- DRIPLINE.
   b. ABSOLUTELY NO STORAGE OF EQUIPMENT OR MATERIALS WITHIN
   c. ACCESS RESTRICTED BASED ON LA APPROVAL AND PROJECT ARBORIST SUPERVISION REQUIRED.
   d. NO TRENCHING WITHIN DRIPLINE; TUNNELING MUST HAVE APPROVAL FROM ARBORIST.
   e. OPERATION OF HEAVY EQUIPMENT AND/OR STOCKPILING OF MATERIAL PROHIBITED
   f. SURFACE PROTECTION MEASURES REQUIRED FOR ALL WORK.
5. ROOT PROTECTION
   a. USE/ACCESS INTO TREE PROTECTION ZONE SHALL BE UPON APPROVAL FROM LA SUPERVISED BY PROJECT ARBORIST.
   b. ADDITIONAL LAYER OF 3" GRAVEL AND 3/4 PLYWOOD SHALL COVER DRIPLINE ZONE WHEN AUTHORIZED WORK BEING PERFORMED IN TPZ.
   c. NO OPERATION OF HEAVY EQUIPMENT AND/OR STOCKPILING MATERIAL IN THIS AREA WITHOUT OWNER'S REPRESENTATIVE'S APPROVAL.
   d. TRENCHING WITH HEAVY EQUIPMENT ALLOWED AS FOLLOWS:
      (i) MINIMIZE TRENCH WIDTH
      (ii) MAINTAIN 2/3 OR MORE OF TPZ IN UNDISTURBED CONDITION.
   e. ALL WOOD CHIPS, GRAVEL AND PLYWOOD TO BE REMOVED BY HAND UPON PROJECT COMPLETION.
6. PLACE TREE PROTECTION FENCE PER APPROVED PROJECT ARBORIST'S LANDSCAPE PROTECTION PLAN. APPROXIMATE LOCATIONS ARE NOTED ON TREE PROTECTION PLAN. THE FENCE SHALL COMPLETELY ENCIRCLE THE TREE OR CLUSTER OF TREES NOTED FOR PROTECTION. TREE PROTECTION FENCING SHOWN ON PLANS IS FOR REFERENCE ONLY.
7. TREE PROTECTION FENCE IS LOCATED AT TRZ OR AT THE LIMIT OF EXISTING SITE IMPROVEMENTS AS SHOWN ON PLAN. PROPOSED SITE IMPROVEMENTS WILL REQUIRE TEMPORARY RELOCATION OF THE TREE PROTECTION FENCE DURING CONSTRUCTION AND SHALL BE DONE WITH THE APPROVAL OF PROJECT ARBORIST.
8. NO EXCAVATION, STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE DRIPLINE OR AS DESIGNATED BY THE PROJECT ARBORIST.
9. NO PRUNING SHALL BE PERFORMED EXCEPT BY APPROVED PROJECT ARBORIST.
10. SALVAGE TOPSOIL IN ALL AREAS OF ANTICIPATED WORK OUTSIDE TREE ROOT PROTECTION ZONE WORK INCLUDING STOCKPILE AREAS AND ANTICIPATED STAGING LOCATIONS. STOCKPILE ONSITE, LOCATION TO BE DETERMINED BY OWNER'S REPRESENTATIVE. SEE SPEC.
11. ALL TREES AND VEGETATION NOT NOTED FOR SALVAGE OR REMOVAL SHALL BE CONSIDERED AS TREE TO REMAIN AND SHALL REQUIRE TREE PROTECTION MEASURES TO PROTECT FROM CONSTRUCTION ACTIVITIES.
12. SEE CIVIL FOR DEMOLITION OF EXISTING SITE FEATURES.



PLAN

2 TREE PROTECTION DETAIL

NOT TO SCALE

Hoshide Wanzer Architects
P. 206-325-6441
100 NE Northlake Way
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Seattle, WA 98105
W. www.hw-architects.com

SWIFTCOMPANY LLC
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TEL 206-632-2098 · FAX 206-632-3048
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MEYDENBAUER RESIDENCE

707 94TH AVE SE
BELLEVUE, WA 98004

STATE OF WASHINGTON
LICENSED
LANDSCAPE ARCHITECT
BARBARA ALSTON SWIFT
LICENSE NO. 369
EXPIRES ON 5.29.2018

PROJECT DESCRIPTION:

REMODEL TO AN EXISTING SINGLE-FAMILY RESIDENCE. NEW ACCESSORY STRUCTURES, AND ASSOCIATED SITE WORK AND DRIVEWAY UPGRADES.

DRAWN BY:	CC RV SS
CHECKED BY:	SS BS TN
DATE:	05.11.17
REVISIONS:	
1 07.13.17	PERMIT REVISIONS
2 08.18.17	PERMIT REVISIONS
3 09.01.17	CONSTRUCTION SET

CONSTRUCTION SET

TREE & PLANT PROTECTION PLAN

L0.10

ROBERTS GROUP
CUSTOM BUILDER

Meeting Notes 7/12/2018
Paul Thompson Urban forrestry
On site 12:30 PM
to discuss
Pruning at carport and accessory building
Condition of Magnoia at Entry court of houe
Maintenance of other trees

Magnolia South of entry walkway shows signs of severe stress, yellowing of leaves and some leaves dropped. Leaf canopy very thin. Condition first noted on 7-11-18

Recommended course of action:

Water the tree for 8-12 hours for two consecutive days then let dry for about 5 days. Try to water the entire root area. Stop watering if the ground seems saturated
Discontinue watering if the ground appears saturated
Arborist will provide recommendation for root vigoration (air spading and compost or fertilzer application
Use same procedure for other trees in the entry court
Cedar tree at near the North field will also benefit from watering

Pruning

recommend pruning maples North of the carport 3 branches marked to be pruned to the stem
prune maple North of the AB at the stem of branch previously cut. Other branches could be pruned at junctions to clear the building

Outline of this information communicated to Owner directly. Paul will follow up with a report via email

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
11	Western red cedar *Thuja plicata*	33.5, (33.5)	14.1	33.5	Poor to Fair	Fair	Medium	Government Low	

Notes / Defects

Observations:
The foliage color in this tree is yellow, and this tree appears to be thinning in foliage density. See Photo 1 and Photo 2. Tree protection has been in place throughout the project. The only known encroachment has been to the cutting of the low shrub layer and ground cover within the Critical Root Zone of this tree. At Urban Forestry Services, Inc., we have observed that the species western red cedar has been in decline for several years. The main explanation for this are the 7-years of prolonged summer drought throughout the Pacific Northwest region. In particular this species has lacked rainfall in the fall. This year we are likely to see many western red cedar declared as dead or dying (they have in fact been dying for several years due to the climatic shift.)

Recommendation:
I recommend that this western red cedar be removed and replaced. This would allow the owner to replace this trees with multiple trees and choose one or more species that can tolerate prolonged summer drought through the end of fall. In addition, this will save on construction costs by removing the need for a retaining wall.

Dripline (ft)

N	14.1
S	14.1
E	14.1
W	14.1

Photo 1

Photo 2

Photo 3

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
2	Japanese maple *Acer palmatum*	6.9, 4.1 (8.03)	8.7	8.0	Fair	Fair to Good	Low	Government Medium	

Notes / Defects

Observations:
Tree protection has been in place during project. The Critical Root Zone has not been impacted and this tree appears to be in fair to good condition based on growth extension.
Wood chip mulch has been applied within the tree protection area. The shrub and ground cover layer has been cut. This tree has been watered.
Recommendations:
Continue watering from May through to the end of October.
Maintain wood chip mulch cover over as much of the Critical Root Zone as is practicable.

Dripline (ft)

N	8.7
S	8.7
E	8.7
W	8.7

Photo 1

Photo 2

Photo 3

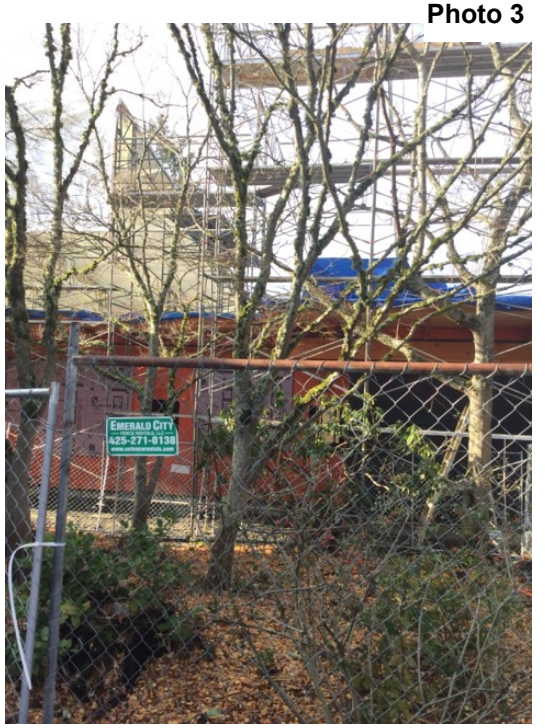

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
1	Japanese maple *Acer palmatum*	9.7, (9.7)	9.6	9.7	Fair	Fair to Good	Low	Government Medium	

Notes / Defects

Observations:
Tree protection has been in place during this project. The Critical Root Zone has not been impacted and this tree appears to be in fair to good condition based on growth extension. Wood chip mulch has been applied within the tree protection area. This tree has been pruned for construction clearance, and clearance from the finished structure. The shrub and ground cover layer within the Critical Root Zone has been cut. This tree has been watered.
Recommendations:
Continue watering from May through to the end of October.
Maintain wood chip mulch cover over as much of the Critical Root Zone as is practicable.

Dripline (ft)

N	9.6
S	9.6
E	9.6
W	9.6

Photo 1

Photo 2

Photo 3

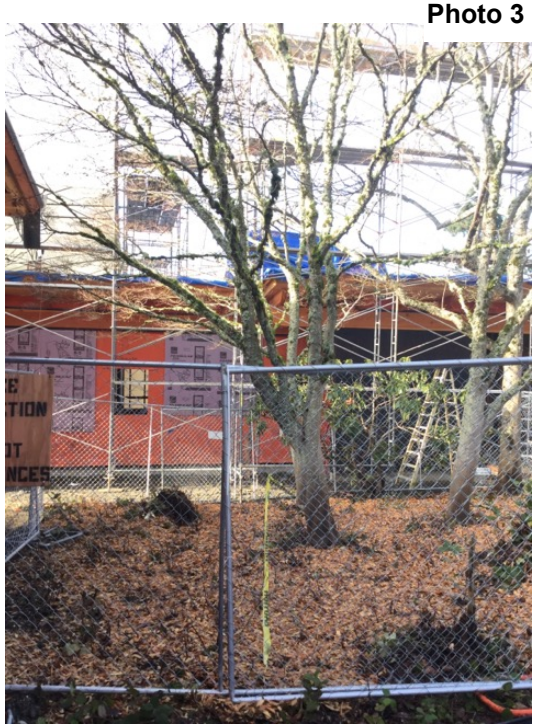

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
4	Magnolia *Magnolia species*	12.9, (12.9)	15.4	12.9	Poor to Fair	Poor to Fair	Low	Government Low	

Notes / Defects

Observations:
This tree has incurred significant root loss due to construction. Preparations were made for this through root pruning. Irrigation during the summer and fall appear to have had a positive effect, with approximately 30% of the crown remaining alive. Evidence for this is visible in the light colored buds on the ends of branches.

Recommendations:
Pruning will be required to removed dead sections of the crown. This should only be completed once it is clear in the summer, which portions of this tree's crown are alive and which are dead. At this point the intent is try and prune to restore some structure to the crown.
Scaffolding through the crown does expose those portions of the crown that are affected to damage. Please have contractors exercise care. Avoid heat close to the branches and trunk.
Continue watering from May through to the end of October.
Maintain wood chip mulch cover over as much of the Critical Root Zone as is practicable.

Dripline (ft)

N	15.4
S	15.4
E	15.4
W	15.4

Photo 1

Photo 2

Photo 3

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
8	Japanese maple *Acer palmatum*	14.6, (14.6)	15.0	14.6	Fair	Fair to Good	Low	Government Medium	

Notes / Defects

Observations:
Landscape shrubs and ground cover has been cut. The tree protection area not covered in impermeable surface has been covered with wood chips. Some pruning for clearance has been completed.

Recommendations:
Continue watering from May through to the end of October.
Maintain wood chip mulch cover.
Retain hardscape (concrete or asphalt) that is over the Critical Root Zone for as long as possible during construction. Contact Urban Forestry Services, Inc., prior to removing this surface.

Dripline (ft)

N	15
S	15
E	15
W	15

Photo 1

Photo 2

Photo 3

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
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Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
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ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
9	Japanese maple *Acer palmatum*	9.8, 9.4 (13.58)	18.4	13.6	Fair	Fair	Low	Government Medium	

Notes / Defects

Observations:
Landscape shrubs and ground cover have been cut within the Critical Root Zone. The tree protection area that is not currently covered in a concrete or asphalt surface has been covered with wood chips. Some pruning for clearance has been completed. This tree has also been watered during the summer.

Recommendation:
Continue watering from May through to the end of October.
Maintain wood chip mulch cover.
Retain hardscape (concrete or asphalt) that is over the Critical Root Zone for as long as possible during construction. Contact Urban Forestry Services, Inc., prior to removing this surface.

Dripline (ft)

N	18.4
S	18.4
E	18.4
W	18.4

Photo 1

Photo 2

Photo 3

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Maydenbauer Project, Tree Protection Monitoring, Bellevue, WA

Tree Assessment Matrix

Inspector: Thompson. Paul H.,
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Cat/Value	Recommendations
5	Magnolia *Magnolia species*	13.7, (13.7)	14.1	13.7	Fair to Good	Fair	Low	Government Medium	

Notes / Defects

Observations:
Despite its location close to construction this tree is currently showing no indications of strain relating to construction impact. Between approximately 15 to 25-feet height is an area of dead bark covering approximately 20 to 30% of the circumference, and measuring an estimated 30x8-inches. This dead area may have been caused by impact or some other construction impact. The dead area of bark and vascular tissue did not exist prior to construction. An explanation for this trees fair to good condition is the lack of root loss.

Recommendations:
Stress the importance to all persons working on the project of not directly impacting (hitting) the tree with material or machinery, and to keep all sources of heat from the branches and trunk.
Continue watering from May through to the end of October.
Maintain wood chip mulch cover over as much of the Critical Root Zone as is practicable.

Dripline (ft)

N	14.1
S	14.1
E	14.1
W	14.1

Photo 1

Photo 2

Photo 3

Photo 4

Date: 1/28/2019
Field Work Completed: 1/28/2019

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
1	Japanese maple *Acer palmatum*	9.7, (9.7)	9.6	9.7	Fair to Good	Fair to Good	Low	Medium	

Notes / Defects

Red form of Japanese maple. At 4.5 feet above grade, trunk diameters are 7.5 and 7.1-inches . Crown has an asymmetrical form, with the majority of the crown located to the south of this tree.

Dripline (ft)

N	4.5
S	14
E	13
W	7

Date: 3/14/2017
Field Work Completed: 2/17/2017

Urban Forestry Services, Inc.
15119 McLean Road
Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
2	Japanese maple *Acer palmatum*	6.9, 4.1 (8.03)	8.7	8.0	Fair to Good	Fair to Good	Low	Medium	

Notes / Defects

Red form of Japanese maple. Crown has an asymmetrical form, with the majority of the crown located to southeast of the trees center.

Dripline (ft)

N	4.5
S	12.5
E	4
W	14

Date: 3/14/2017
Field Work Completed: 2/16/2017

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Mount Vernon, WA 98273
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Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
3	Japanese maple *Acer palmatum*	8.6, (8.6)	10.1	8.6	Fair to Good	Fair to Good	Low	Medium	

Notes / Defects

Red form of Japanese maple. Crown has an asymmetrical form, with the majority of the crown located to the northeast of the crowns center.

Dripline (ft)

N	13
S	4.5
E	15.5
W	8

Date: 3/14/2017
Field Work Completed: 2/16/2017

Urban Forestry Services, Inc.
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Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
4	Magnolia *Magnolia species*	12.9, (12.9)	15.4	12.9	Fair to Good	Fair to Good	Low	Medium	

Notes / Defects

A surface root is growing around and over the concrete stairway, at 7-feet distance from the tree base. The surface root growing over the the pathway is 4-inches diameter. This root will need to cut or retained and protected during demolition. If retained the new stairway path will need to bridge over this root.

Dripline (ft)

N	15
S	20
E	12
W	15

Date: 3/14/2017
Field Work Completed: 2/16/2017

Urban Forestry Services, Inc.
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Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
5	Magnolia *Magnolia species*	13.7, (13.7)	14.1	13.7	Fair to Good	Fair to Good	Low	Medium	

Notes / Defects

A concrete patio surface is within 3-feet, current residential building within 9-feet. If retained caution will need to exercised in demolishing the building. Careful staging of the demolition work will also be required to avoid damaging the soils in this trees Critical Root Zone. Tree protection and possibly pruning and branch tieback may be required.

Dripline (ft)

N	15
S	13.5
E	12
W	16

Date: 3/14/2017
Field Work Completed: 2/16/2017

Urban Forestry Services, Inc.
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Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

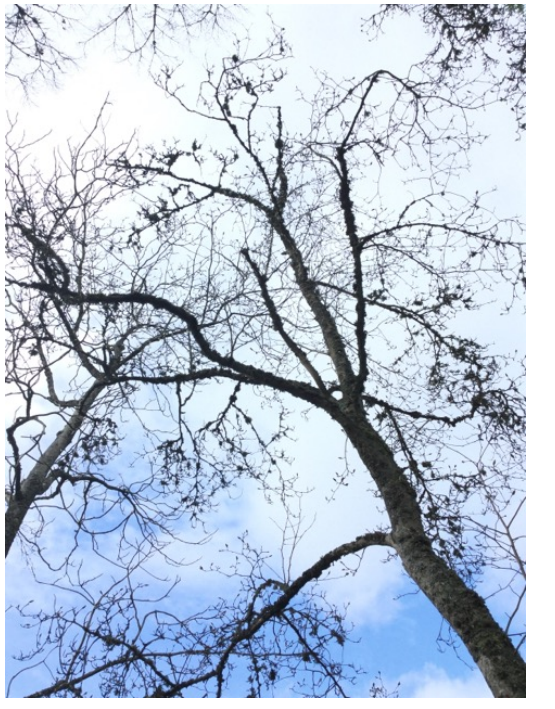
Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
6	Magnolia *Magnolia species*	7.5, (7.5)	7.4	7.5	Fair	Fair	Low	Medium	

Notes / Defects

The crown of this tree has recently failed. I noticed scaring on the trunk possibly the result of a canker disease.

Dripline (ft)

N	7
S	10
E	5
W	8



Date: 3/14/2017
Field Work Completed: 2/16/2017

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Mount Vernon, WA 98273
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Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
7	Magnolia *Magnolia species*	6.2, 6.7 (9.13)	8.9	9.1	Fair	Fair	Low	Medium	

Notes / Defects

I noticed scaring on the trunk, possibly the result of a canker disease.

Dripline (ft)

N	13
S	6
E	7.5
W	9

Date: 3/14/2017
Field Work Completed: 2/16/2017

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Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
8	Japanese maple *Acer palmatum*	7.8, 5.5, 7.7,		14.6	Fair	Fair	Medium	Medium	

Notes / Defects

As per tree #9; Significant surface roots, 3 to 5.5-inches in diameter, 4 to 6-feet from the base of this tree. Bifurcation of codominant trunks at 2-feet height are stable, although it contains included bark. If retained, this structure should be monitored in future for signs of failure.

Dripline (ft)
N
S
E
W

Date: 3/14/2017
Field Work Completed: 2/16/2017

Urban Forestry Services, Inc.
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Mount Vernon, WA 98273
(360) 428-5810

Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
9	Japanese maple *Acer palmatum*	9.8, 9.4 (13.58)	18.4	13.6	Fair	Fair	Medium	Medium	

Notes / Defects

Significant surface roots, 3 to 5.5-inches in diameter, 4 to 6-feet from the base of this tree. Bifurcation at the trunk base has led to the development of a slightly weaker structure due to codominant structure, and the wide spread of the crown to the east.

Dripline (ft)

N	22
S	18
E	21
W	12.8

Date: 3/14/2017
Field Work Completed: 2/16/2017

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Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
10	Douglas fir *Pseudotsuga menziesii*	24.5, (24.5)	14.1	24.5	Fair	Poor to Fair	Low	Low	

Notes / Defects

This tree has been topped, crown reduction has shortened the remaining branches.

Dripline (ft)

N	12
S	17
E	14
W	13.5

Date: 3/14/2017
Field Work Completed: 2/16/2017

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Tree Assessment Matrix

Spiller Residence (Meydenbauer) Project, Bellevue, WA

Inspector: Thompson
ISA Certified Arborist
ISA Tree Risk Assessment Qualified

Tree	Species	DBH (in)	Drip Avg (ft)	CRZ (ft)	Vigor	Structure	Risk	Pres. Value	Recommendations
11	Western red cedar *Thuja plicata*	33.5, (33.5)	14.1	33.5	Fair	Fair	Medium	Medium	

Notes / Defects

This tree has small diameter codominant leaders. It also has a large and prominent swept lower branch on the west side of the tree. (See photographs.)

Dripline (ft)

N	14
S	14
E	13.5
W	15

Date: 3/14/2017
Field Work Completed: 2/16/2017

ARBORIST NOTES

SUBJECT: Hans Spiller Residence Project, Tree Protection and Tree Treatment

FOR: Roberts Group
Attn: Mr. Matt Cantrell, Superintendent
5914 Lake Washington Blvd NE
Kirkland, WA 98033

REGARDING: Hans Spiller Residence Project
707 94th Ave SE, Bellevue, WA 98004

PURPOSE: Provide an ISA Certified Arborist® monitoring and recommendations for tree protection and treatments to improve the condition of retained trees.

FROM: Urban Forestry Services, Inc.
Paul Hans Thompson
International Society of Arboriculture (ISA) Certified Arborist® #PN-1838A
ISA Tree Risk Assessment Qualified
American Society of Consulting Arborists (ASCA) Registered Consulting Arborist® #509
Reviewed By: Jim Barborinas, Principal

DATE: July 8th, 2019

Attachments: Sugar Feeding Enhances Root Vigor of Young Trees Following Containerization, Percival. Glynn C., JOA 30(6), November 2004
Tree Assessment Site Plan
Assumptions and Limiting Conditions

As requested by Matt Cantrell, Roberts Group Superintendent, on June 18th, 2019, I completed a tree protection monitoring visit to the Hans Spiller Residence Project site, in Bellevue, Washington. This site visit was request primarily to discuss the removal of the old concrete driveway that is within the Critical Root Zone of Tree No.8 and 9. While onsite, I also took the time to inspect the protection and condition of the retained trees, specifically the two Magnolia trees; Tree No. 4 and 5.

The following is a summary of my findings and recommendations:

- **Tree No.8 and 9 – Critical Root Zone Concrete Removal**
  1. I recommend that the concrete be removed either:
     a) Manually, using a jackhammer and bars, with labor to move the concrete out of the Critical Root Zone; or
     b) With a mini excavator working atop the existing concrete parking surface and lifting the slabs while working and tracking out of the Critical Root Zone.

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2. Immediately following removal of the concrete parking surface, apply a mulch layer of woodchips, and water as per the watering schedule used on the other retained trees on

Photo 1: Concrete surfacing that is removed from within the Critical Root Zone of Tree No.8 and 9 must be immediately replaced with woodchip mulch, applied to a depth of 4 inches, and the Critical Root Zone watered as per the schedule for the tree protection area.

this site. Watering is critical to maintain the condition of both trees following concrete removal.

- **Tree No.4 and 5 – Additional Magnolia Root Zone Treatment**
  1. I observed that both trees had new growth with a low density of foliage. Tree No.5 had a higher density of foliage, indicating more vigor, but it is still less than I would like to see in this tree.

  2. In addition, both trees have a seam of dead tissue that extends from the soil line up the trunk. Where this seam meets a branch, the branch is dead. This is the first time I have come across this happening in a tree as a result of root cutting or soil damage (although it is known to happen in certain broadleaf species.)

3. I recommend additional treatment toward improving the density of absorbing roots in these trees to offset the reduced vigor in Tree No.4 and 5. Over the next two to three-year period, I expect the root invigoration treatments will aid in this. However, I strongly recommended an additional treatment be applied to possibly accelerate this process. Having discussed this with a researcher and colleagues, I recommend that soil injections of a sugar-water mixture be applied for Tree No.4 and 5. The dose of this application must not exceed 1.8 oz per liter of water. I strongly recommend you use the services of Bartlett Tree Experts to complete this treatment. Bartlett Tree Experts researcher Dr. Glynn C. Percival was the lead researcher on its study of the effects of applying a mixture of sugar and water to increase root density.

   Your point of contact is:

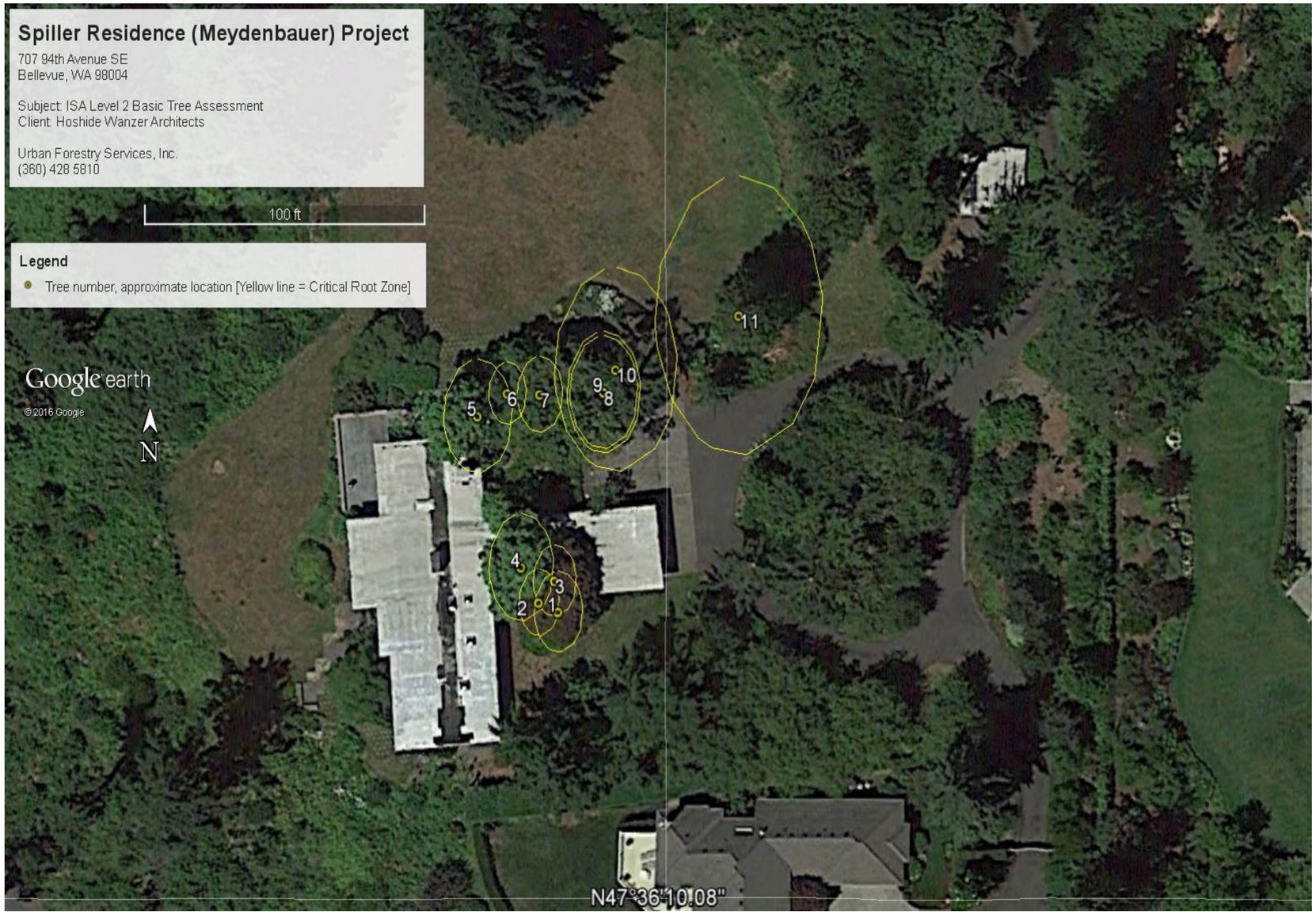
   Sandi Hain, Administrative Assistant
   Bartlett Tree Experts
   PO Box 82097
   Kenmore, WA 98028-0089
   (425) 481-6529 office
   Or (206) 522-5056
   shain@bartlett.com

Photo 2: Tree No.5 has been heavily impacted by construction activity within its Critical Root Zone. However, no root cutting has been observed or reported. Based on the trees condition, I have determined that most of the root system is within the fenced, mulched and irrigated area. I have recommended that woodchip mulch be applied to a depth of 4 inches outside of the fence, and that the mulch within the tree protection area be replenished. This tree, and Tree No.4 will receive the sugar water feeding. A dead vertical seam of trunk tissue indicates that this trees roots have been impacted by soil damage (compaction.)

4. I recommend that all exposed soil surfaces, including those outside of the tree protection fence area be mulched with woodchips to a minimum depth of 4 inches. I also recommend that tree protection areas that are currently mulched with woodchips have a new layer of mulch applied. The woodchip mulch depth should be maintained at 4 inches indefinitely.

5. Continue to irrigate the retained trees as per the current schedule. Watering is critical to maintaining the condition of all the retained trees on this site.

Let us know if you have any questions about these Arborist Notes.



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URBAN FORESTRY SERVICES, INC.
15119 McLean Road
Mount Vernon, WA 98273

Hans Spiller Residence Project
Tree Assessment Site Plan

707 94th Ave SE, Bellevue, Washington

Key

Tree identification is comprised of:

1. Tree Number (Example "1")

Example: "1"

Species Code Key

Not Applicable

Plan Symbol Key

Symbol for inventoried and assessed tree, this is an approximate location only.

July 2019

SUGAR FEEDING ENHANCES ROOT VIGOR OF YOUNG TREES FOLLOWING CONTAINERIZATION

By Glynn C. Percival

Abstract. The influence of sugar (sucrose) applied as a root drench at 25, 50, or 70 g (0.9, 1.8, or 2.7 oz) per liter of water on root and shoot vigor, leaf chlorophyll fluorescence, photosynthetic rates, and chlorophyll content in silver birch (*Betula pendula*), red oak (*Quercus rubra*), cherry, (*Prunus avium*), and rowan, (*Sorbus aucuparia*) was investigated. In silver birch, cherry, and red oak, applications of sugar ≤ 50 g (1.8 oz) per liter of water significantly enhanced root vigor (root length, number of new roots formed, root dry weight) by week 12. Applications of sugar at 70 g (2.7 oz) per liter of water had no significant effect on root vigor except in silver birch where root dry weight at the cessation of the experiment was significantly improved. Irrespective of species, no significant effects on tree vitality as measured by leaf chlorophyll fluorescence, photosynthetic rates, and chlorophyll concentrations were recorded. Effects on shoot growth were variable with a significant enhancement recorded in some, but not all, of the test species. Results indicate application of sugars as a soil drench may be able to aid in the establishment of newly planted trees by improving root vigor post transplanting.

Key Words. Urban trees; carbohydrates; resource allocation; gene expression; transplant shock; *Betula pendula; Quercus rubra*; *Prunus avium*; *Sorbus aucuparia*.

It has long been accepted that drought-related problems are often responsible for poor growth and deaths of newly planted urban trees (Davies 1998). As little as 5% of a tree's root system may be moved with a tree following lifting from the nursery bed, in turn significantly reducing the root: shoot ratio and consequently the tree's ability to uptake sufficient water and nutrients for survival of the newly expanding leaf canopy in spring. This leads to water stress, resulting in "transplant shock" that may be characterized by reduced shoot growth, branch dieback, and, ultimately, tree death. Although tree root systems can be manipulated to reduce the effects of transplant shock by increasing the amount of root to be transplanted by, for example, root pruning, pulling out of the ground (wrenching), or undercutting in the nursery, the effects of these techniques are inconsistent, and a high proportion of the root system may still be lost in the lifting process (Percival and Gerritsen 1998; Davies et al. 2002)

A number of factors have been associated with transplant shock; however, it is now widely believed that survival of newly planted trees is largely dependent on rapid extension of roots that absorb water to replenish transpirational water loss and reduce water stress (Gilbertson and Bradshaw 1990; Watson and Himelick 1997). Ideally an inexpensive, nontoxic, and environmentally friendly compound that can be applied to a tree's root system post-planting to stimulate root vigor and restore the root:shoot ratio is required.

Trees are planted in urban environments for practical, ecological, and psychological benefits; however, survival, establishment, and reproduction (seed set) are critical for the success of the next tree generation (Percival and Hitchmough 1995). These objectives can be achieved only by the production and expenditure of energy by the tree, which, in turn, is achieved by photosynthesis:

$$CO_2 + H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + O_2$$

Previous research has studied alterations to plant growth and development in the presence of high and low concentrations of carbon dioxide, water, and oxygen (Hall and Rao 1999). Surprisingly, the influence of sugar feeding (the end product of photosynthesis) on plant physiological processes has received little scientific investigation. Of the limited literature available, supplementing root systems with sugar in the form of sucrose has been shown to affect root metabolism by significantly increasing lateral root branching and root formation in wheat and barley (Bingham and Stevenson 1993; Bingham et al. 1997; 1998). Work elsewhere (Fuchs 1986) also demonstrated that root regeneration of *Rosa multiflora* 'Kanagawa' was improved more by application of sucrose/auxin combinations compared to auxins alone. This finding indicates that the growth pattern of trees may be altered in favor of enhanced root formation by treating them during or immediately after transplanting with sugar, potentially offering a system for reducing tree mortalities due to transplant shock.

As a prerequisite to larger tree studies, the objectives of this investigation, using small potted trees, were to (1) evaluate the influence of sugar (sucrose) on root and shoot vigor, chlorophyll fluorescence, photosynthesis, and leaf chlorophyll concentrations of four tree species following containerization to simulate transplant conditions; and (2) evaluate three application rates, 25, 50, or 70 g (0.9, 1.8, or 2.7 oz) sugar per liter of water, on those responses.

MATERIALS AND METHODS

The experiment used 4-year-old, cell-grown stock of four commonly planted urban tree species, *Betula pendula* (silver birch), *Quercus rubra* (red oak), *Prunus avium*, (cherry), and *Sorbus aucuparia*, (rowan) approximately 45 cm (18 in.) high, ± 4.5 cm (1.8 in.), obtained from a commercial supplier. Six months prior to experiments (early November), trees were potted into 4.5 L (1 gal.) plastic pots filled with soil [loamy texture, 24% clay, 45% silt, 31% sand, 3.1% organic carbon, pH 6.6, supplemented with the controlled release nitrogen-based (N:P:K 20:8:8) fertilizer 'Enmag' (Salisbury House, Weyside Park, Goldmar, Surrey, UK) at a rate of 1 g/kg (0.04 oz/36 oz) soil]. Following potting, trees remained outdoors subject to natural environmental conditions and watered as required. In early March, trees were moved to a polythene tunnel to protect against possible spring frosts. As soon as the initial symptoms of budburst were observed (i.e., leaf emergence, mid-April), trees were placed under glasshouse conditions [22°C ± 2°C (72°F ± 3.6°F)] and supplemented with 400W, high-pressure sodium lamps (SON/T) providing a photoperiod of 16 h light/8 h dark and minimum 250 μmol m^{-2} s^{-1} photosynthetically active radiation (PAR) at the tree crown. Sugar feeding commenced in early May when all species were in full leaf. Root drenches of sucrose, obtained from a local supermarket, at a concentration of either 25, 50, or 70 g (0.9, 1.8, or 2.7 oz) sugar per liter of water were applied. Each tree received 0.5 L (17 oz) of sugar solution at day 7 and 21 following leaf expansion. A sugar solution of 0.5 L was deemed sufficient to fully saturate the soil because, at that amount, solution was observed emerging from drainage holes. During the period between days 7 and 21 under glass, trees were watered as required (day 11 and 17). Watering with water only served as the control. After day 21 (late May), trees were returned outdoors and subject to natural weather conditions until the cessation of the experiment at week 12. Climatic conditions from day 21 to week 12 were recorded. Mean minimum and maximum air temperatures were 7.4°C (44.5°F) and 28.4°C (83°F), respectively. Daily relative humidity, sunshine hours, and rainfall were 79.7%, 9.45 h, and 2.56 cm (1.02 in.), respectively. The soil surface temperature was 2.4°C (37°F), and soil temperatures at 20 cm (8 in.) depth averaged 8.8°C (48°F) (Reading University Meteorological Department, Whiteknights, Reading, UK). Experiments were undertaken in 2001 and repeated in 2002 using six trees per treatment. Climatic data represents mean of both 2001 and 2002 trials. Under both glasshouse and outdoor conditions, the experimental design used was completely randomized, and trees were re-randomized on a weekly basis.

At weeks 1, 3, 6, 9, and 12 after sugar treatments, leaves were adapted to darkness for 30 min by attaching light-exclusion clips to the leaf surface, and chlorophyll fluorescence was measured using a HandyPEA portable fluorescence spectrometer (Hansatech Instruments Ltd., King's Lynn, UK). Measurements were recorded up to 1 s with a data acquisition rate of 10 μs for the first 2 ms and of 1 ms thereafter. The fluorescence responses were induced by a red (peak at 650 nm) light of 1500 μmol m^{-2} s^{-1} photosynthetically active radiation (PAR) intensity provided by an array of six light-emitting diodes. The ratio of variable (Fv = Fm–Fo) to maximal (Fm) fluorescence (i.e., Fv/Fm where Fo = minimal fluorescence) of dark-adapted leaves were used to quantify any effects on leaf tissue. Fv/Fm is considered a quantitative measure of the maximal or potential photochemical efficiency or optimal quantum yield of photosystem II (Willits and Peet 2001). Likewise, Fv/Fm values are the most popular index used as a measure of plant vitality and early diagnostic of stress (Meinander et al. 1996).

Leaf chlorophyll content was measured at the midpoint of the leaf next to the main leaf vein using a Minolta chlorophyll meter SPAD-502. Calibration was obtained by measurement of absorbance at 663 and 645 nm in a spectrophotometer (PU8800 Pye Unicam) after extraction with 80% v/v aqueous acetone (regression equation = 5.80 + 0.057x; r^2 adj = 0.82, P = < 0.01) (Lichtenthaler 1987).

At the first sampling date, five leaves per tree were used for chlorophyll fluorescence and chlorophyll content measurements randomly selected throughout the crown. Leaves were then tagged to ensure only the same leaf was measured repeatedly throughout the experimental period.

The light-induced CO_2 fixation (Pn) was measured in predarkened (20 min), fully expanded leaves from near the top of the canopy (generally about number four counting down from the apex) using an infrared gas analyzer (LCA-2 ADC). The irradiance on the leaves was 700 to 800 mol m^{-2} photosynthetically active radiation saturating with respect to Pn; the velocity of the airflow was 1 mL s^{-1} cm^{-2} (0.4 in^{-2}) of leaf area. Calculation of the photosynthetic rates was carried out according to von Caemmerer and Farquhar (1981). Readings were taken at weeks 3, 6, and 12. Two leaves per tree were selected for measurements.

Although new leaf formation was observed in all species between weeks 6 and 7 post sugar application, no measurements of newly formed leaf tissue were made.

At the conclusion of the experiment (week 12), trees were destructively harvested. Leaf, shoot, and root dry weight were recorded after oven drying at 85°C (185°F) for 48 h. Leaf areas were quantified using a Delta-T area meter. Compost was gently removed from the root system by washing with water through a 4 mm (0.2 in.) screen. The number of new white roots larger than 1 cm (0.4 in.) was counted as a measure of the root growth potential (RGP), and the root length (the straight line distance from the trunk to the furthest root tip) was measured.

Effects of sugar feeding on chlorophyll fluorescence, photosynthetic rates, chlorophyll concentrations as mea-

sures of tree vitality, growth, and any significant interactions between sugar and species were determined by both two- and one-way analyses of variance (ANOVA) following checks for normality and equal variance distributions. Differences between treatment means were separated by the least significance difference (LSD) at the 95% confidence level ($P > 0.05$) using the Genstat V program. Based on Student's t-test, treatment effects on tree vitality and growth of each species did not significantly differ between years; consequently, values represent pooled data for both 2001 and 2002 experiments.

RESULTS AND DISCUSSION

Tree Vitality

Irrespective of species and concentration of sugar applied, no significant improvements in tree vitality as assessed by leaf chlorophyll fluorescence, photosynthetic rates, and chlorophyll content were recorded (Figures 1, 2, and 3*). Fluorescence values for all four species ranged from 0.6 to 0.8, photosynthetic rates from 5 to 8 CO_2 mmol m^{-2} s^{-1}, and leaf chlorophyll content from 40 to 80 mg/g fresh weight. Significant improvements in tree growth ($P < 0.05$, Table 1) as a result of sugar feeding indicate improvements in tree vitality by alterations to other plant physiological processes not investigated in this experiment, such as synthesis of sugar-induced, stress-protectant metabolites and/or induction of systemic-induced resistance (Herbers et al. 1996; Naidu 1998; Williamson et al. 2002). Results of a two-way ANOVA (species and sugar) also indicates that sugar feeding did not influence chlorophyll fluorescence, photosynthetic rates, or chlorophyll content of the four test species (Table 2). Regardless of species, leaf chlorophyll fluorescence and chlorophyll content values were lowest at week 1 compared to weeks 3, 6, and 9. Research elsewhere

*Figures for this article appear on pp. 362–363.

Table 1. The influence of sugars (sucrose) on growth of silver birch, red oak, cherry, and rowan at week 12 applied as a soil drench.

Tree	Sugar	Leaf area (cm^{-2})	Root length (cm)	Leaf DW (g)	Shoot DW (g)	Root DW (g)	Total plant DW (g)	R:S	RGP
Rowan	Control	484	31.4	3.25	8.98	5.67	17.90	2.22	8.8
	25 g l^{-1}	521^{ns}	39.1^{ns}	3.85^{ns}	9.88^{ns}	6.79^{ns}	20.52^{ns}	2.07^{ns}	11.3^{ns}
	50 g l^{-1}	538^{ns}	37.4^{ns}	4.00*	10.0^{ns}	7.04^{ns}	21.05^{ns}	2.02^{ns}	10.7^{ns}
	70 g l^{-1}	391^{ns}	26.5^{ns}	2.52^{ns}	6.94^{ns}	4.57^{ns}	14.03^{ns}	2.13^{ns}	7.4^{ns}
	LSD	141.8	7.76	0.738	2.11	1.816	4.536	0.424	3.76
Silver birch	Control	303	31.4	1.91	4.82	1.90	8.63	3.65	7.8
	25 g l^{-1}	336^{ns}	41.2*	2.23^{ns}	5.79*	3.16*	11.18*	2.56*	13.1*
	50 g l^{-1}	332^{ns}	39.6*	2.12^{ns}	5.81*	2.99*	10.91*	2.68*	11.1^{ns}
	70 g l^{-1}	313^{ns}	36.6^{ns}	2.15^{ns}	5.48^{ns}	3.24*	10.87*	2.39*	12.5*
	LSD	65.5	7.08	0.526	0.826	0.494	1.342	0.520	4.21
Cherry	Control	339	24.1	2.56	9.35	10.78	22.71	1.14	10.3
	25 g l^{-1}	448^{ns}	33.4*	3.08^{ns}	12.37*	15.78*	31.22*	0.98^{ns}	17.5*
	50 g l^{-1}	469^{ns}	33.8*	3.13^{ns}	13.21*	15.67*	32.00*	1.06^{ns}	15.2*
	70 g l^{-1}	357^{ns}	27.3^{ns}	2.62^{ns}	8.99^{ns}	9.45^{ns}	21.16^{ns}	1.23^{ns}	10.0^{ns}
	LSD	156.6	8.98	0.914	2.88	4.39	7.74	0.209	4.84
Red oak	Control	350	12.0	2.27	2.64	4.65	9.56	1.06	6.7
	25 g l^{-1}	397^{ns}	17.5*	2.85*	2.85^{ns}	7.43*	13.13*	0.77*	8.4*
	50 g l^{-1}	434^{ns}	21.0*	3.31*	2.97^{ns}	8.49*	14.77*	0.74*	8.9*
	70 g l^{-1}	323^{ns}	10.2^{ns}	2.04^{ns}	2.10*	3.93^{ns}	8.07^{ns}	1.05^{ns}	5.4^{ns}
	LSD	93.2	4.48	0.578	0.476	2.70	3.416	0.265	1.33

All values mean of 12 trees. LSD = least significant difference. * = significant at $P < 0.05$. ns = not significant.

Table 2. *P* values for growth and tree vitality of four tree species [*Betula pendula* (silver birch), *Quercus rubra* (red oak), *Prunus avium* (cherry), and *Sorbus aucuparia* (rowan)] following sugar treatments. $P < 0.05$ is considered significant.

	Growth								Vitality		
Factor	Leaf area	Root length	Leaf DW	Shoot DW	Root DW	Total plant DW	R:S	RGP	Fv/Fm	Pn	Chlorophyll content
Species	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.018	0.003	<0.001	<0.001
Sugar	0.038	<0.001	0.004	0.003	<0.001	<0.001	<0.001	<0.008	0.649	0.386	0.107
Species × sugar	0.688	0.625	0.151	0.312	0.016	0.103	0.271	0.402	0.505	0.445	0.098

has shown that, following leaf flush, at least 21 days are required for the photosynthetic apparatus to fully develop and maximum photosynthetic performance to take place, which may account for this recorded effect (Kitao et al. 1998). Results also show a rising chlorophyll content and subsequent increase in photosynthetic activity, mirrored by an increase in chlorophyll fluorescence, in the short term (i.e., weeks 1 through 3). Thereafter, all three tree vitality measurements remain constant until week 12.

In three of the four test species (cherry, red oak, rowan), lowest fluorescence values, photosynthetic rates, and leaf chlorophyll content were recorded following application of sugar at 70 g (2.7 oz) per liter of water (Figure 1). No significant improvements in virtually all growth parameters at this concentration also indicate that sugars applied at 70 g per liter have little benefit in reducing transplant shock (Table 1). Application of sugars at high concentrations can result in osmotic stress that can prove detrimental to tree growth (Salisbury and Ross 1985). Initiation of osmotic stress at a sugar concentration of 70 g per liter of water may account for the nonsignificant effects recorded in this investigation in three of the four test species.

Effect of Sugars on Root and Leaf Growth

Root vigor was significantly affected by sugar feeding (Table 2). Applications of sugar as a root drench at 25 and 50 g (0.9 and 1.8 oz) per liter of water significantly increased ($P < 0.05$) the RGP, root length, and root dry weight by approximately 30% to 70% over controls in birch, cherry, and red oak (Table 1). Likewise, an increase in all three root growth measurements of 25% to 35% was recorded in rowan following applications of sugar at these two concentrations. However, this increase was not significant. Applications of sugars at 70 g (2.7 oz) per liter of water had no significant effect on root vigor with one exception, birch, where root dry weight was significantly higher ($P < 0.05$) than controls. Significant increases in the RGP and root length by week 12 indicate not only short-term enhancement of root vigor but that sugars work by enhancing formation of new roots and increasing the length of existing ones. Similar results have been recorded elsewhere [i.e., increased lateral root branching and new root formation following incubation of wheat root systems in sugar solutions (Bingham and Stevenson 1993; Bingham et al. 1997, 1998)]. Such an effect is desirable in a landscape situation where rapid root promotion is required to restore the root crown ratio post-transplanting and thereby reduce transplant shock. Recent evidence has shown that in plants, sugars such as sucrose, glucose, and fructose function not only as substrates for growth but affect sugar-sensing systems that initiate changes in gene expression and subsequent plant growth (Koch 1996). For example, application of sugars to plants leads to the repression of genes involved with leaf growth and photosynthesis, and enhancement of genes involved with carbon remobilization in favor of root development (Koch 1996; Martin et al. 1997). Alternately, application of sugars derived from seaweed extracts to soils have been shown to induce changes in the naturally occurring soil rhizosphere fungal and bacterial populations, resulting in alterations to plant nutrient uptake patterns. Such changes may also have contributed to improved growth recorded in this investigation (Finnie and van Staden 1985; Walsh 1997). Although not explored in this investigation, alterations in gene expression and rhizosphere populations as a result of sugar application may account for improved root vigor recorded at the whole plant level.

Alterations in gene expression to influence carbon remobilization in favor of root over leaf growth would account for no significant increases in leaf area recorded in this investigation and the majority of nonsignificant effects on leaf dry weight in all test species (Table 1). Differences in carbon remobilization between root and leaf tissue would also enhance the root:shoot ratio—a response recorded in birch and red oak ($P < 0.05$, Table 1). Although an increase in the root:shoot ratio was recorded in cherry and rowan, differences were nonsignificant. Higher root:shoot ratios are generally associated with increased stress tolerance and improved plant health following planting (Watson and Himelick 1997).

Effect of Sugars on Shoot Growth

The effects of sugars on shoot dry weight are variable and inconsistent. Applications of sugars had no significant effect on shoot dry weight of rowan, irrespective of concentration. In the case of birch and cherry, only applications of sugar at 25 and 50 g (0.9 and 1.8 oz) per liter of water significantly enhanced ($P < 0.05$) shoot dry weight. Contrary to this finding, only sugar applied at 70 g (2.7 oz) per liter of water significantly increased shoot dry weight in red oak (Table 1). As well as providing structural and stability functions, roots and shoots are also used to store nutrient reserves. Carbon remobilization in favor of root growth may, in some species, also result in remobilization toward shoot growth. Indeed, sucrose is the major photoassimilate transported from source (leaves) to sink tissues (roots and shoots) in higher plants that are hydrolyzed into glucose and fructose to provide energy via respiration (Salisbury and Ross 1985).

In conclusion, applications of sugars at 25 and 50 g (0.9 and 1.8 oz) per liter of water improved root vigor of the majority of trees tested and may be useful in reducing transplant shock in landscape plantings. Although further studies are required to understand the mechanistic basis by which improvements in root vigor occurred, sugar feeding may be an area worthy of further research given the fact that sugars are water soluble, nontoxic, environmentally safe, and inexpensive to purchase.

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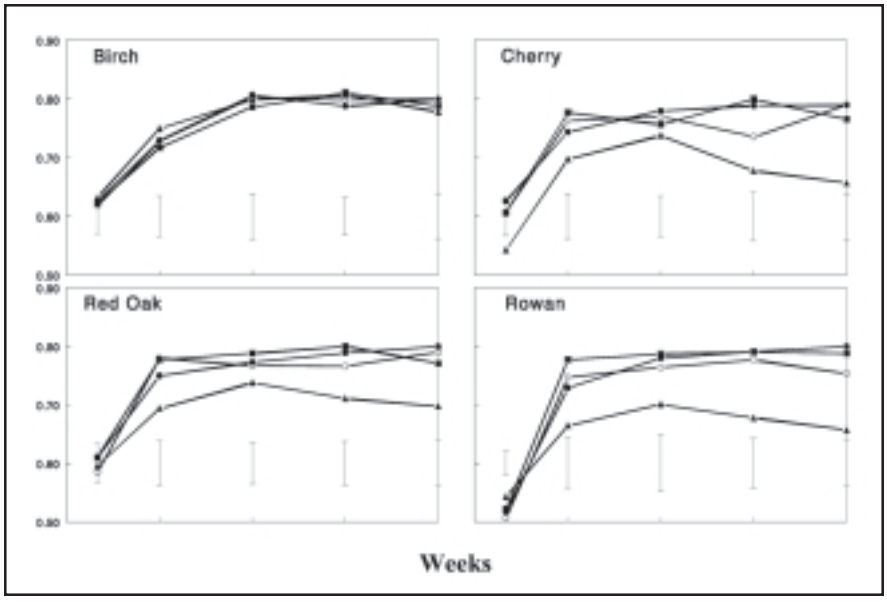

Figure 1. Chlorophyll fluorescence (Fv/Fm; y axis) of four urban trees with time following sugar feeding at 25, 50, and 70 g (0.9, 1.8, and 2.7 oz) per liter. All values are mean of 12 trees, 5 leaves per tree. Error bars represent the least significant difference (LSD) at *P* < 0.05. m = control, n = 25 g sugar, l = 50 g sugar, ▲ = 70 g sugar per liter of water.

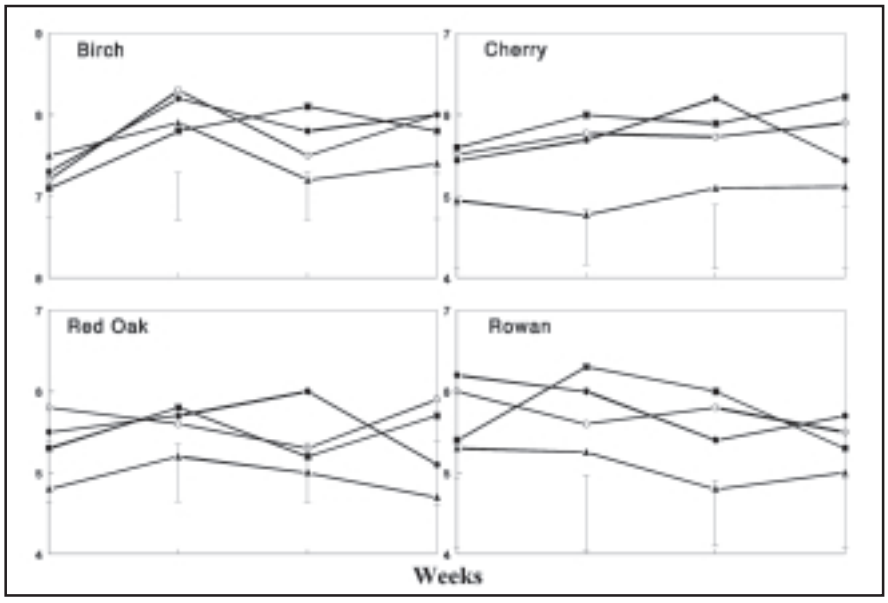

Figure 2. Chlorophyll content (SPAD; y axis) of four urban trees with time following sugar feeding at 25, 50, and 70 g (0.9, 1.8, and 2.7 oz) per liter. All values are mean of 12 trees, 5 leaves per tree. Error bars represent the least significant difference (LSD) at *P* < 0.05. m = control, n = 25 g sugar, l = 50 g sugar, ▲ = 70 g sugar per liter of water. Note variations in the scale of the y axis.

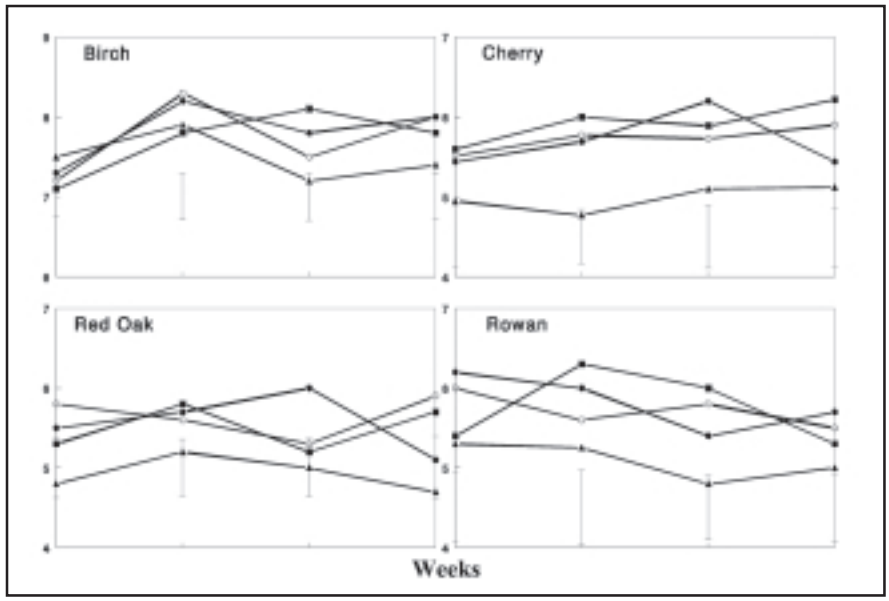

Figure 3. Photosynthetic CO_2 fixation (Pn; y axis) of four urban trees with time following sugar feeding at 25, 50, and 70 g (0.9, 1.8, and 2.7 oz) per liter. All values are mean of 12 trees, 2 leaves per tree. Error bars represent the least significant difference (LSD) at $P < 0.05$. m = control, n = 25 g sugar, l = 50 g sugar, ▲= 70 g sugar per liter of water. Note variations in the scale of the y axis.

Zusammenfassung. Der Einfluß von Zucker, appliziert als Wurzeldirektgabe mit 25 (0.9), 50 (1.8) und 70 g (2.7 oz) pro Liter Wasser auf die Wurzel- und Triebenergie, Blattchlorophyllfluoreszenz, Photosyntheserate und Chlorophyllgehalt in (*Betula pendula* (*Quercus rubra*, (*Prunus avium*) und, (*Sorbus aucuparia*) untersucht. In Silberbirke, Kirsche und Roteiche verstärkte die Applikation von Zucker mit ≤ 50 g (1.8 oz) pro Liter Wasser nach 12 Wochen deutlich die Energie der Wurzeln (Länge, Anzahl neugeformter Wurzeln, Wurzeltrockengewicht). Die Applikationen von 70 g (2.7 oz) Zucker/Liter Wasser hatten keinen signifikanten Effekt auf die Wurzeln, mit Ausnahme der Silberbirke, wo sich das Wurzeltrockengewicht am Ende des Experiments deutlich gesteigert hatte. Unabhängig von der Art wurden keine signifikanten Effekte auf die Baumvitalität aufgezeichnet. Die Einflüsse auf das Triebwachstum variierten mit einer deutlichen Verbesserung in einigen, aber nicht allen getesteten Arten. Die Ergebnisse zeigen, daß eine Applikation von Zucker auf die Wurzeln möglicherweise eine Hilfe sein kann, neue Gehölze am Standort zu etablieren und Wurzelwachstum nach der Verpflanzung anzuregen.

Resumen. Se investigó la influencia del azúcar (sucrosa) aplicada en las raíces a 25, 50 y 70 g por litro de agua para mejorar el vigor de raíces y brotes, fluorescencia de clorofila, tasa fotosintética y contenido de clorofila, en abedul (*Betula pendula*), encino rojo (*Quercus rubra*), cerezo (*Prunus avium*) y rowan (*Sorbus aucuparia*). Aplicaciones de ≤ 50 g (1.8 oz) de azúcar por litro de agua en abedul, cerezo y encino elevaron significativamente el vigor de las raíces (expresado en longitud, cantidad de nuevas raíces y peso seco) por doce semanas. Aplicaciones de azúcar a 70 g (2.7 oz) por litro de agua no tuvieron efecto significativo en el vigor de las raíces, excepto en abedul donde el peso seco de las raíces al cesar el experimento fue significativamente mejorado. Independientemente de las especies, ningún efecto significativo sobre la vitalidad de los árboles fue medido para fluorescencia de clorofila, tasas fotosintéticas y concentraciones de clorofila. Los efectos sobre el crecimiento de los brotes fueron variables con una elevación significativa en algunas, pero no en todas las especies de prueba. Los resultados indican que la aplicación de azúcares como mejoradores de raíces puede ser capaz de ayudar al establecimiento de nuevos árboles plantados para mejorar el vigor de las raíces después del trasplante.

Résumé. L'influence de sucres (sucrose) appliqués par trempage des racines à des taux de 25, 50 et 70 g/litre d'eau a été étudiée en regard de la vigueur sur les racines et les pousses, de la fluorescence de la chlorophylle foliaire, des taux de photosynthèse et du contenu en chlorophylle chez le bouleau pleureur (*Betula pendula*), le chêne rouge (*Quercus rubra*), le cerisier (*Prunus avium*) et le sorbier des oiseaux (*Sorbus aucuparia*). Chez le bouleau pleureur, le cerisier et le chêne rouge, les applications de sucres de d" 50 g/L d'eau ont significativement améliorées la vigueur des racines (longueur des racines, nombre de nouvelles racines, masse racinaire sèche) à la 12^{e} semaine. Les applications de sucres de 70 g/L d'eau n'ont eu aucun effet significatif sur la vigueur des racines, à l'exception du bouleau pleureur où la masse racinaire sèche à la fin de l'expérience était significativement améliorée. Peu importe l'espèce, aucun effet significatif n'a été observé sur la vitalité de l'arbre lorsque mesuré au moyen de la fluorescence de la chlorophylle foliaire, des taux de photosynthèse et des concentrations chlorophylliennes. Les effets sur la croissance des pousses étaient variables, avec une amélioration significative observée sur certains tests d'espèces. Les résultats indiquent que l'application de sucres par trempage des racines peut être utile pour favoriser le rétablissement d'espèces d'arbres nouvellement plantés en améliorant la vigueur des racines post-transplantation.

ASSUMPTIONS AND LIMITING CONDITIONS

Urban Forestry Services, Inc.
15119 McLean Rd.
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1. **Limitations of this Assessment**
   This Assessment is based on the circumstances and observations as they existed at the time of the site inspection of the Client's Property and the trees inspected by Urban Forestry Services, Inc. and upon information provided by the Client to Urban Forestry Services, Inc. The opinions in this Assessment are given based on observations made and using generally accepted professional judgment, however, because trees and plants are living organisms and subject to change, damage, and disease, the results, observations, recommendations, and analysis took place and no guarantee, warranty, representation, or opinion is offered or made by Urban Forestry Services, Inc. as to the length of the validity of the results, observations, recommendations, and analysis contained within this Assessment. As a result, the Client shall not rely upon this Assessment, save and except for representing the circumstances and observations, analysis, and recommendations that were made as at the date of such inspections. It is recommended that the trees discussed in this Assessment should be re-assessed periodically.

   Urban Forestry Services, Inc. shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in our fee schedule and contract of engagement.

   Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.

2. **Reaction of Assessment**
   The Assessment carried out was restricted to the Property. No assessment of any other trees or plants has been undertaken by Urban Forestry Services, Inc. Urban Forestry Services, Inc. is not legally liable for any other trees or plants on the Property except those expressly discussed herein. The conclusions of this Assessment do not apply to any areas, trees, plants, or any other property not covered or referenced in this Assessment.

3. **Professional Responsibility**
   In carrying out this Assessment, Urban Forestry Services, Inc. and any Assessor appointed for and on behalf of Urban Forestry Services, Inc. to perform and carry out the Assessment has exercised a reasonable standard of care, skill, and diligence as would be customarily and normally provided in carrying out this Assessment. The Assessment has been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, discolored foliage, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. Except where specifically noted in the Assessment, none of the trees examined on the property were dissected, cored, probed, or climbed and detailed root crown examinations involving excavation were not undertaken.

   While reasonable efforts have been made to ensure that the trees recommended for retention are healthy, no guarantees are offered, or implied, that these trees, or all parts of them will remain standing. It is professionally impossible to predict with absolute certainty the behavior of any single tree or group of trees, or all their component parts, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential to fall, lean, or otherwise pose a danger to property and persons in the event of adverse weather conditions, and this risk can only be eliminated if the tree is removed.

Without limiting the foregoing, no liability is assumed by Urban Forestry Services, Inc. or its directors, officers, employers, contractors, agents, or Assessors for:

- any legal description provided with respect to the Property;
- issues of title and or ownership respect to the Property;
- the accuracy of the Property line locations or boundaries with respect to the Property; and
- the accuracy of any other information provided to Urban Forestry Services, Inc. by the Client or third parties;
- any consequential loss, injury, or damages suffered by the Client or any third parties, including but not limited to replacement costs, loss of use, earnings, and business interruption; and
- the unauthorized distribution of the Assessment.

The total monetary amount of all claims or causes of action the Client may have as against Urban Forestry Services, Inc. including but not limited to claims for negligence, negligent misrepresentation, and breach of contract, shall be strictly limited to solely to the total amount of fees paid by the Client to Urban Forestry Services, Inc. pursuant to the Contract for Services as dated for which this Assessment was carried out. Further, under no circumstance may any claims be initiated or commenced by the Client against Urban Forestry Services, Inc. or any of its directors, officers, employees, contractors, agents, or Assessors, in contract or in tort, more than 12 months after the date of this Assessment.

4. **Third Party Liability**

This Assessment was prepared by Urban Forestry Services, Inc. exclusively for the Client. The contents reflect Urban Forestry Services, Inc. best assessment of the trees and plants on the Property in light of the information available to it at the time of preparation of this Assessment. Any use which a third party makes of this Assessment, or any reliance on or decisions made based upon this Assessment, are made at the sole risk of any such third parties. Urban Forestry Services, Inc. accepts no responsibility for any damages or loss suffered by any third party or by the Client as a result of decisions made or actions based upon the use of reliance of this Assessment by any such party.

5. **General**

Any plans and/or illustrations in this Assessment are included only to help the Client visualize the issues in this Assessment and shall not be relied upon for any other purpose.

This report and any values expressed herein represent the opinion of Urban Forestry Services, Inc. Our fee is in no way contingent upon any specified value, a result or occurrence of a subsequent event, nor upon any finding reported.

The Assessment report shall be considered as a whole, no sections are severable, and the Assessment shall be considered incomplete if any pages are missing. The right is reserved to adjust tree valuations, if additional relevant information is made available. This Assessment is for the exclusive use of the Client.

Title: **Meydenbauer Residence Project -**
Site Assessment and Planting Mitigation Plan
707 94th Ave. SE, Bellevue, Washington 98004

Prepared for: Roberts Group
c/o Matt Cantrell
5914 Lake Washington Blvd NE
Kirkland, WA 98033

Prepared by: Urban Forestry Services | Bartlett Consulting
Tyler P. Holladay
ISA Certified Arborist® #PN-8100A
ISA Tree Risk Assessment Qualified

Contents:

Date: December 23, 2019

Summary

Utility trenching at the southwest corner of the Meydenbauer Residence at 707 94th Ave SE, Bellevue, Washington has resulted in a roughly 1500 ft^2 (10' x 150') non vegetated mulched corridor. The corridor is located to the north of two significant private property trees and intersects a steep slope critical area, as defined by the city of Bellevue (20.25H.030).

The two trees near and to the south of the trenching area have not been removed and are not significantly impacted by the disturbed trenching area. The trees can be safely retained at this time.

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In accordance with the City of Bellevue's (COB) requirements for critical areas mitigation planting, Roberts Group plans to restore the impacted trenching corridor with a diversity of native plant species. A planting restoration plan has been provided in this report to guide this process.

Introduction

As requested by Matt Cantrell of Roberts Group, I have prepared a site assessment as well as a critical areas replanting plan for a 1500 ft^2 (10' x 150') corridor, disturbed during the installation of underground utilities. The city of Bellevue requires a mitigation plan for disturbances within critical areas, per COB 20.25H.030.

Scope and Purpose of the Report

1. Summarize the findings from my 12/12/19 site visit. Including existing vegetation condition and impacts to significant protected trees onsite included within the development's Tree Protection Plan TPP.
2. Provide a planting mitigation plan for the disturbed trenching corridor onsite.
3. Provide specifications for maintenance and monitoring as per COB land use code 20.25H.030.

Findings

On 12/12/19, I met Matt Cantrell of Roberts Group at the Meydenbauer Residence Project site located at 707 94th Ave SE, Bellevue, Washington. While onsite my focus was the area of trenching disturbance. I observed the level of site disturbance, the character of the surrounding existing vegetation and performed an ISA Level 1 Limited Visual Risk Assessment for two (2) large trees near and to the south of the disturbance area.

Image 1. This view to the west shows the extent of the disturbed area, now covered with a thick layer of woodchip mulch.

The area of disturbance is a roughly 1500 ft^2 (10' x 150') corridor that was previously cleared to allow for the trenching and installation of underground utilities. The corridor travels east-west and intersects a steep geologically critical area as defined by the City of Bellevue. At the time of my visit

the trenching and utilities installation had long been completed. What remains is a well mulched non-vegetated corridor.

The area of disturbance is surrounded by a diversity of native and non-native plant species. The character of these species is very dense and crowded. Many of the taller growing tree species in the area look to have been repeatedly reduced, or cut back, to accommodate the westward view. This has contributed to the over-dense character of the site. Native species observed onsite include - sword fern *(Polystichum munitum)*, salal *(Gaultheria shallon)*, red alder *(Alnus rubra),* beaked hazelnut *(*Corylus cornuta*),* Douglas fir *(Pseudotsuga menziesii)*, and bigleaf maple *(Acer macrophyllum).* Non-native species observed onsite include – red oak *(Quercus rubra),* cherry laurel *(*Prunus laurocerasus*),* and English holly *(Ilex aquifolium).* Some invasive species observed onsite include – English ivy *(Hedera helix),* Himalayan blackberry *(Rubus armeniacus),*

Image 2. Facing east. The two (2) Douglas fir tree *(P. menziesii),* Trees #23 and #24 can be seen in the background. Non-native species like red oak *(Q. rubra)* and cherry laurels *(P. laurocerasus)* can be seen framing the disturbed corridor.

Two (2) large Douglas fir trees (P. menziesii), Trees #23 and #24, located near and to the south of the disturbed trenching area, received an ISA Level 1 Limited visual Tree Risk Assessment. These trees are included in the original Meydenbaure Residence Tree and Plant Protection Plan dated 05-11-17. I can confirm that these two (2) trees have not been removed. The trenching area has negligibly encroached within the Critical Root Zone (CRZ) of Tree#24. The two (2) trees are in good condition, exhibiting fair to good vigor, fair to good structure and present a low risk of failure. At this time, the trees may be safely retained.

Replanting Plan

(See the attached restoration planting detail)

Objectives and Performance Standards

Replanting Plan Objective:

- To comply with COB requirements by replacing the lost vegetated cover within the steep slope critical area with native species. The species chosen should be the largest commonly available size of each species.

Performance Standards:

- Survival of 100% of installed trees during the first and second year of the two (2) year monitoring period.

- Non-native (including naturalized) plant species shall not be present within an area 6-feet radius surrounding each installed plant.

Maintenance and Monitoring

Maintenance

- Removal of non-native weedy species or herbaceous material within six (6) feet radius of the ten planted trees shall take place three (3) times each growing season over 2-years.

- Weed removal shall be manual (hand pulling or digging-out). Non-native trees and native black cottonwood *(Populus trichocarpa)* and red alder (*Alnus rubra)* are not suitable species and should be removed as a weed species within the corridor.

- Mulch shall be applied throughout the corridor and around each plant, following initial weeding in year 1 and subsequently in year 2. The mulch shall be laid to maintain a total depth of four (4) inches.

Table 1 shows the timetable for primary maintenance, including weeding. See the section titled "Monitoring" below for details on this task.

Table 1: Annual schedule of primary maintenance.

Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Weeding												
Monitoring												

Table 2 provides a schedule of maintenance for the tree replanting over the 2-year establishment period.

Table 2: Scheduled maintenance tasks for 2-year establishment period and beyond.

Task	Year 1	2
Monitoring		
Remove stakes and wires		
Implement invasive species and noxious weed control		
Pruning damaged, dead, diseased or dying branching		

Monitoring

Monitoring by either an ISA Certified Arborist®, or COB approved, and qualified biologist or ecological restoration specialist shall occur annually for the two (2) year period after installation.

Urban Forestry Services, Inc., or a similar qualified firm shall provide the monitoring, and monitoring reports for the two 2-year period. A monitoring report shall include:

- Number of trees in place and survival rates.
- Information on volunteer native and invasive non-native species. Natural regeneration of native species may be counted towards the performance standards.
- Reporting on any disturbance or inappropriate activities in the right-of-way.
- Photographic documentation for each component of the monitoring.
- Analysis of the progress toward establishment of the installed trees in the right-of-way based on the performance standards in this plan.
- Recommendations for maintenance, including native species substitutions of failed trees.

Let me know if you have any questions regarding this site assessment and planting mitigation plan.

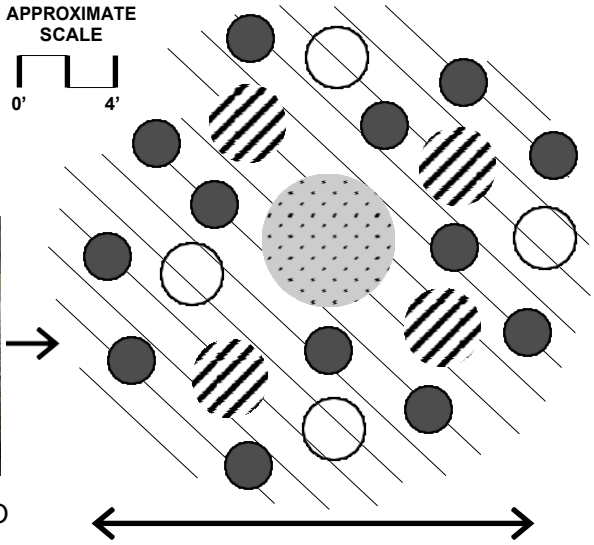
RESTORATION PLANTING DETAIL

NOT TO SCALE

THIS DETAIL SHOWS THE RECOMMENDED PLANTING DESIGN FOR THE ENVIRONMENTALLY CRITICAL AREA (ECA).

INSTALL JUTE MESH EROSION CONTROL MAT OVER PLANTING AREAS ON SLOPES >40%.

FIX JUTE MAT INTO POSITION WITH STEEL GROUND STAPLES.



THIS PLANTING AREA DESIGN COVERS 256 SQUARE FEET.

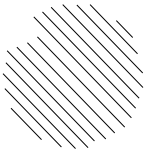
PLANTING LOCATIONS FOR THIS PLANTING DESIGN ARE SHOWN ON THE ENCLOSED SITE PLAN.

THE PURPOSE OF THIS PLANTING IS TO REDUCE THE POTENTIAL FOR EROSION AND RESTORE NATIVE VEGETATION TO THE AREA WHERE UTILITY TRENCHING HAS IMPACTED EXISTING VEGITATION.

NOTES

1. **CLEAR THE PLANTING AREA OF NOXIOUS AND INVASIVE PLANTS AND DISPOSE OFF-SITE.**
2. **INSTALL JUTE MESH EROSION CONTROL MAT AND FIX INTO POSITION ON SLOPES >40% WITH STAPLES.**
3. **INSTALLED PLANT SPACING SHALL BE A MAXIMUM OF 3 FEET ON CENTER.**
4. **INSTALL PLANTS AS PER THE CITY OF BELLEVUE STANDARD AND MAINTAIN AS PER THE CITY OF BELLEVUE ECA STANDARD MITIGATION PLAN INSTRUCTIONS.**
5. **THE DISTURBED TRENCHING AREA MUST BE RESTORED USING THE PLANTING LAYOUT SHOWN ON THE ENCLOSED SITE PLAN. THE DESIGN ABOVE WILL NEED TO BE REPLICATED MULTIPLE TIMES TO ACHIEVE APPROPRIATE COVERAGE (EACH DESIGN COVERS ROUGHLY 256 SQFT)**

KEY



= AREA TO BE CLEARED OF NOXIOUS AND INVASIVE PLANTS. INSTALL A JUTE MESH EROSION CONTROL MAT ON >40% SLOPES. THIS AREA COVERS ~ 256 SQFT (16FT x 16FT or 9 FT RADIUS.)

= **GARRY OAK, *QUERCUS GARRYANA* (AND) BEAKED HAZELNUT, *CORYLUS CORNUTA***

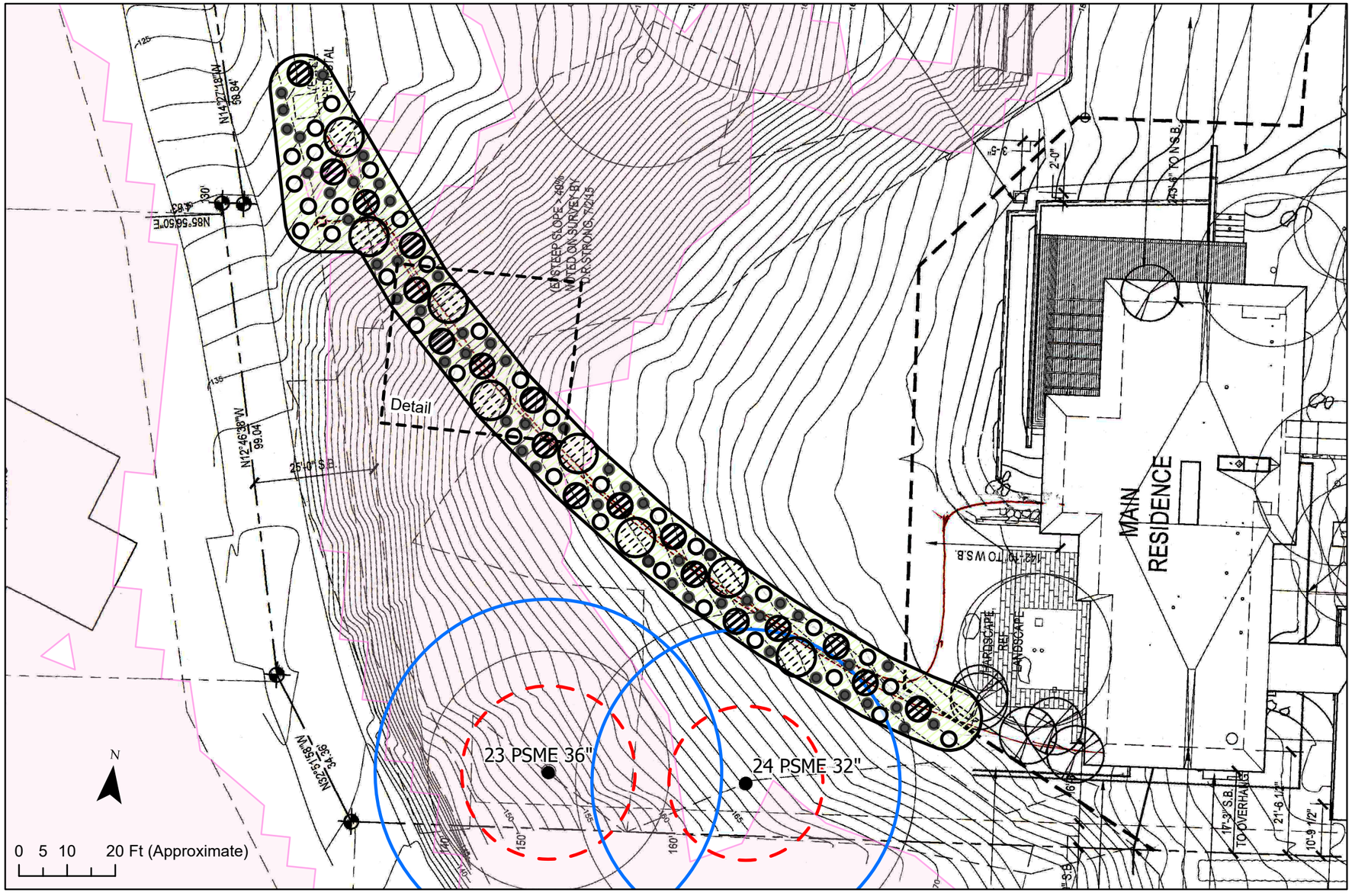
= **SWORD FERN, *POLYSTICHUM MUNITUM***

= **SALAL, *GAULTHERIA SHALLON***

= **SNOWBERRY, SYMPHORICARPOS ALBUS**

Urban Forestry Services
BARTLETT CONSULTING
Divisions of The F.A. Bartlett Tree Expert Company

SHEET TITLE			FOR	
PLANTING PLAN DETAIL			**Meydenbauer Residence Bellevue, WA**	
Sheet 1 of 2	**NOT TO SCALE**	12-23-2019	**URBAN FORESTRY SERVICES | BARTLETT CONSULTING 15119 McLEAN ROAD MOUNT VERNON, WA 98273**	**THOMPSON P.H.** **HOLLADAY T.P.**
SHEET #	SCALE	DATE	PREPARED BY	DRAWN BY



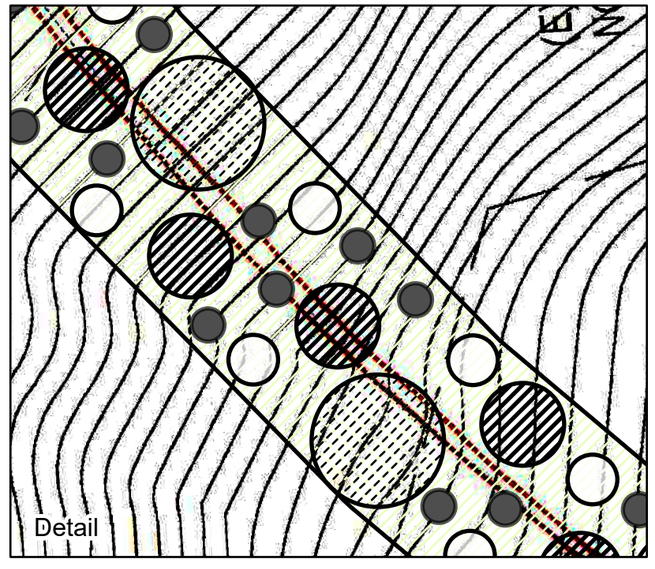
Planting Schedule:

Trees: (alternating)
4 - Garry oak, *Quercus garryana*
4 - beaked hazelnut, *Corylus cornuta*

18 - snowberry, *Symphoricarpos albus*

34 - salal, *Gaultheria shallon*

50 - sword fern, *Polystichum munitum*



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Meydenbauer Residence
707 94th Ave. SE
Site Assessment and Planting Mitigation Plan

Bellevue, WA. 98004

Species Code Description:

Tree identification is comprised of:

1. Tree Number (Example "114")
2. Species Codes (Example "POTR")
3. Diameter (Example "43.6" ")

Example: "114 POTR 43.6"

Species Code:

PSME: Douglas fir *(Pseudotsuga menzeisii)*

Hoshide Wanzer Architects, 2017; City of Bellevue GIS Portal, 2018; UFS|BC - Tyler Holladay, 2019.

Symbols: (Approximate location)

- Critical Root Zone (CRZ)
- Interior Critical Root Zone (ICRZ)
- Disturbance limits
- Steep Slope Critical Areas (Slopes >40%)
- Utilities

December 2019

ASSUMPTIONS AND LIMITING CONDITIONS

Urban Forestry Services | Bartlett Consulting
15119 McLean Rd.
Mount Vernon, Washington 98273

1. **Limitations of this Assessment**
   This Assessment is based on the circumstances and observations as they existed at the time of the site inspection of the Client's Property and the trees inspected by Urban Forestry Services | Bartlett Consulting and upon information provided by the Client to Urban Forestry Services | Bartlett Consulting. The opinions in this Assessment are given based on observations made and using generally accepted professional judgment, however, because trees and plants are living organisms and subject to change, damage, and disease, the results, observations, recommendations, and analysis took place and no guarantee, warranty, representation, or opinion is offered or made by Urban Forestry Services | Bartlett Consulting. as to the length of the validity of the results, observations, recommendations, and analysis contained within this Assessment. As a result, the Client shall not rely upon this Assessment, save and except for representing the circumstances and observations, analysis, and recommendations that were made as at the date of such inspections. It is recommended that the trees discussed in this Assessment should be re-assessed periodically.

   Urban Forestry Services | Bartlett Consulting shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in our fee schedule and contract of engagement.

   Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.

2. **Reaction of Assessment**
   The Assessment carried out was restricted to the Property. No assessment of any other trees or plants has been undertaken by Urban Forestry Services | Bartlett Consulting. Urban Forestry Services | Bartlett Consulting is not legally liable for any other trees or plants on the Property except those expressly discussed herein. The conclusions of this Assessment do not apply to any areas, trees, plants, or any other property not covered or referenced in this Assessment.

3. **Professional Responsibility**
   In carrying out this Assessment, Urban Forestry Services | Bartlett Consulting and any Assessor appointed for and on behalf of Urban Forestry Services | Bartlett Consulting to perform and carry out the Assessment has exercised a reasonable standard of care, skill, and diligence as would be customarily and normally provided in carrying out this Assessment. The Assessment has been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, discolored foliage, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. Except where specifically noted in the Assessment, none of the trees examined on the property were dissected, cored, probed, or climbed and detailed root crown examinations involving excavation were not undertaken.

   While reasonable efforts have been made to ensure that the trees recommended for retention are healthy, no guarantees are offered, or implied, that these trees, or all parts of them will remain

standing. It is professionally impossible to predict with absolute certainty the behavior of any single tree or group of trees, or all their component parts, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential to fall, lean, or otherwise pose a danger to property and persons in the event of adverse weather conditions, and this risk can only be eliminated if the tree is removed.

Without limiting the foregoing, no liability is assumed by Urban Forestry Services | Bartlett Consulting or its directors, officers, employers, contractors, agents, or Assessors for:

- any legal description provided with respect to the Property;
- issues of title and or ownership respect to the Property;
- the accuracy of the Property line locations or boundaries with respect to the Property; and
- the accuracy of any other information provided to Urban Forestry Services, Inc. by the Client or third parties;
- any consequential loss, injury, or damages suffered by the Client or any third parties, including but not limited to replacement costs, loss of use, earnings, and business interruption; and
- the unauthorized distribution of the Assessment.

The total monetary amount of all claims or causes of action the Client may have as against Urban Forestry Services | Bartlett Consulting including but not limited to claims for negligence, negligent misrepresentation, and breach of contract, shall be strictly limited to solely to the total amount of fees paid by the Client to Urban Forestry Services | Bartlett Consulting pursuant to the Contract for services as dated for which this Assessment was carried out. Further, under no circumstance may any claims be initiated or commenced by the Client against Urban Forestry Services | Bartlett Consulting or any of its directors, officers, employees, contractors, agents, or Assessors, in contract or in tort, more than 12 months after the date of this Assessment.

4. **Third Party Liability**

This Assessment was prepared by Urban Forestry Services | Bartlett Consulting exclusively for the Client. The contents reflect Urban Forestry Services | Bartlett Consulting best assessment of the trees and plants on the Property in light of the information available to it at the time of preparation of this Assessment. Any use which a third party makes of this Assessment, or any reliance on or decisions made based upon this Assessment, are made at the sole risk of any such third parties. Urban Forestry Services | Bartlett Consulting accepts no responsibility for any damages or loss suffered by any third party or by the Client as a result of decisions made or actions based upon the use of reliance of this Assessment by any such party.

5. **General**

Any plans and/or illustrations in this Assessment are included only to help the Client visualize the issues in this Assessment and shall not be relied upon for any other purpose.

This report and any values expressed herein represent the opinion of Urban Forestry Services | Bartlett Consulting Our fee is in no way contingent upon any specified value, a result or occurrence of a subsequent event, nor upon any finding reported.

The Assessment report shall be considered as a whole, no sections are severable, and the Assessment shall be considered incomplete if any pages are missing. The right is reserved to adjust tree valuations, if additional relevant information is made available. This Assessment is for the exclusive use of the Client.