Geotechnical Engineering Services Report

Weyerhaeuser Way South, 320th Street to SR 18
Weyerhaeuser Campus Property
Federal Way, Washington

for
Federal Way Campus, LLC

August 29, 2017

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services Report

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Weyerhaeuser Way South
320th Street to SR 18
Weyerhaeuser Campus Property
Federal Way, Washington

File No. 22247-004-00

August 29, 2017

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1.0 INTRODUCTION AND PROJECT UNDERSTANDING

GeoEngineers is pleased to present this geotechnical engineering report for the Weyerhaeuser Way Improvement project in support of the Weyerhaeuser Campus Property in Federal Way, Washington. The project will ultimately include roadway improvements on two segments of Weyerhaeuser Way. The southern segment will be from the eastbound State Route (SR) 18 on and off ramps to the roundabout that connects to 33rd Place South. This segment will support the development of Warehouses A and B. The northern segment of the project will be from South 336th Street to South 320th Street. For this phase of the project, only improvements of the southern segment are being analyzed and designed. A Vicinity Map of the approximate project boundaries is provided as Figure 1. A Site Plan is provided as Figure 2. The bridge over SR 18 is not part of this study.

We understand that the City of Federal Way has required that the design team "…perform pavement analysis per AASHTO along the truck route to ensure the existing pavement can accommodate the expected truck load." Based on information provided by ESM and TENW the proposed traffic with the expected truck load will be based on the existing daily traffic volume with an additional 400 truck and trailers per day. The purpose of our services is to evaluate the impact of this additional truck traffic in order to address this comment.

2.0 SCOPE OF SERVICES

The purpose of our services is to investigate the existing condition of the pavement, estimate remaining design life and to provide recommendations for pavement improvements or overlays. Our services have been provided in general accordance our signed Confirming Agreement (dated and signed June 14, 2017). A summary of our specific scope of services is provided below.

1. Reviewing readily available published literature and in-house files regarding soil and groundwater conditions in the project vicinity.
2. Obtaining a street use permit from the City of Federal Way to perform pavement tests within the right-of-way (ROW).
3. Coordinating traffic control services for use during pavement testing.
4. Performing subgrade testing using a Falling Weight Deflectometer (FWD).
5. Performing a visual evaluation of the roadway surface based on the U.S. Department of Transportation Federal Highway Administration (FHWA) *Pavement Moisture Accelerated Distress Identification System* as outlined in the American Association of State Highway and Transportation Officials (AASHTO) *Guide for Design of Pavement Structures*.
6. Providing a general discussion of site conditions based on our review, observations, and testing.
7. Providing an estimate of the expected remaining life of the existing pavement. Estimates will be based on the results of FWD testing and our observation and will be quantified in terms of Equivalent Single Axel Loads (ESALs). We also converted traffic data provided by TENW to estimated ESALs per year in order to estimate remaining life of the existing pavement in terms of years.

8. Developing options for pavement repairs and overlays; including overlays of the existing pavement section, partial removal of the pavement section, and full pavement replacement.

3.0 SITE CONDITIONS

3.1. Geology Review

We reviewed the *Geologic Map of the Poverty Bay 7.5-Minute Quadrangle, King and Pierce Counties, Washington* (Booth, D. B., Waldron, H. H., and Troost, K. G.: U.S. Geological Survey SIM-2854, scale 1:24,000).

The mapped geologic unit across the entire project area is Vashon till (Qvt). Vashon till deposits are considered glacially consolidated soils as they were deposited below glacial ice. Glacially consolidated soils are typically dense to very dense due to being compressed (consolidated) by the weight of the overlaying glaciers. Glacial till typically consists of a homogenous mixture of silt, sand, gravel, cobbles, and boulders.

3.2. Surface Conditions

Weyerhaeuser Way South is in southeastern Federal Way, Washington; the project area discussed in this report is between 33rd Place South on the north side and the SR 18 eastbound on and off ramps. The roadway is two traveled lanes in each direction with a left-turn lane and is bordered with concrete gutters on the east and west edges over a majority of the site. The southern portion of Weyerhaeuser Way South crosses over SR 18 with an approximate 200-foot span overpass. The site is generally level with a slight increase in elevation as the road progresses south near the SR 18 overpass section of the road and the elevation decreases south of the overpass. The overall topography of the surrounding area slopes downward from the southwest to the northeast. The lower side of the slope on the west side of the road is well below the roadway elevation; indicating portions of the west side of the road was constructed on fill.

3.3. Existing Pavement Conditions

3.3.1. Existing Pavement Section

Based on plans from the most recent construction, dated August 25, 1999, on Weyerhaeuser Way South the existing pavement has two different profiles. The inside (left) lanes have 2.5 inches of newer asphalt overlaying the previous asphalt section, while the outer (right) lanes have 6 inches of asphalt underlain by a 2-inch thick base coarse. We did not core the pavement. These thicknesses have not been independently confirmed.

3.3.1. FWD Testing

Deflection testing by means of FWD was completed by Pavement Services Inc. (PSI) on June 7, 2017. Tests were performed in the left and right lanes in the north and southbound directions at approximate 200-foot intervals. Test results were normalized to a 9,000-pound load. A summary of the back-calculated subgrade modulus and pavement structural numbers for each lane in each direction are summarized in Table 1. below. FWD test data and back-calculations are included in Appendix A of this report.

TABLE 1. FWD RESULTS SUMMARY

Travel Direction and Lane	Subgrade Modulus (Mr) (psi)	Effective Structural Number of Existing Pavement Section (SNeff)
Northbound Right Lane	7,600	2.12
Northbound Left Lane	9,100	1.85
Southbound Right Lane	10,000	2.13
Southbound Left Lane	10,000	1.92

3.3.2. Visual Condition Survey

We completed a visual condition survey of the existing pavement generally following the techniques described in the AASHTO/FHWA Pavement Moisture Accelerated Distress Identification System.

The primary types of pavement distress observed in our visual survey included: fatigue (alligator) cracking, depressions, longitudinal cracking, patch deterioration, and potholes. Table B-1 in Appendix B summarizes the severity of distress observed along Weyerhaeuser Way South during our visual survey. Definitions of the different distress types are provided in Table B-2 and photos showing examples of some of the distress types observed are provided as Figure B-1 through Figure B-4 in Appendix B.

Based on our evaluation, it is our opinion that average section of existing pavement is showing signs of "medium" distress severity with some isolated areas showing signs of "high" distress. Based on AASHTO criteria, this is consistent with asphalt that is on average about 60 to 70 percent the strength and resilience of new asphalt. This is consistent with the measurements made from the FWD testing. As a comparison, crushed rock or completely deteriorated asphalt still provides about 30 percent of the strength and resilience of new asphalt.

Little to no rutting was observed with exception of the pavement surrounding a manhole located about 150 feet north of the eastbound off-ramp in the right-hand turn lane. Moderate to severe rutting was observed in this area. The rutting surrounding the manhole is likely due to deeper depths of under compacted fill, leading to isolated settlement of the pavement subgrade in these areas.

4.0 PAVEMENT ANALYSIS AND DESIGN

4.1. Anticipated Vehicle Loading

Traffic volumes were provided by TENW. Existing traffic conditions were based on a field traffic count performed from June 13, 2017 to June 20, 2017. TENW also provided estimated growth rates and the estimated increase in truck traffic as a result of the proposed development. These estimates include the predicted effects of both the Warehouse A and B sites.

The AASHTO design methodology quantifies traffic loading in terms of 18-Kip ESALs. In order to evaluate the pavement and provide a design we converted the traffic estimates to ESALs. We assumed that every automobile (bicycles, cars, and light trucks) applies an average of 0.0013 ESALs. We assumed that the trucks would be carrying standard shipping containers or similarly weighted trailers. We used a typical truck weight and a standard distribution of shipping container weights (developed by Port of Long Beach) to

calculate an average loading per truck. Based on this method, we estimate that every truck applies an average of 1.2 ESALs.

The existing daily traffic counts shows that trucks make up 3.8 percent of the total daily traffic. Based on guidance from TENW we assumed the proposed traffic would increase by an additional 400 trucks (200 each way) per day.

It is common to include a growth rate for existing traffic counts to account for typical increase of traffic over the design life. Because the proposed development will cause additional traffic on top of the additional truck traffic, a higher growth rate was used to determine the ESALs for this case.

The estimated ESALs over the entire design life were determined by calculating the current daily ESAL value, based on the existing traffic counts, and extending the daily value over a 20-year design life with the corresponding growth rates.

The variables provided to us by TENW and the resulting ESAL calculations for a 20-year design period are summarized in Table 2 below.

TABLE 2. DESIGN ESAL SUMMARY

Design Condition	Total Daily Traffic (One Way)	Daily Truck Traffic (One Way)	Growth Rate	Total EASLs (20 years)
Anticipated Traffic without proposed development	11,130	200	2%	2,676,000
Anticipated Traffic with proposed development	11,530	400	4%	7,793,000

4.2. Pavement Analysis and Design Parameters

The pavement design parameters we used in our analyses are summarized below. The parameters we used for our analysis are based on guidance and data from AASHTO Guide for Design of Pavement Structures 1993 (AASHTO), Washington State Department of Transportation (WSDOT) Pavement Policy June 2011 (WSDOT), and the results from the FWD testing (FWD).

4.2.1. Pavement Design Criteria

- Standard Deviation = 0.45 (new pavement); 0.49 (overlay) (AASHTO)
- Reliability = 85 percent (WSDOT)
- Initial Serviceability = 4.2 (AASHTO)
- Terminal Serviceability = 2.5 (AASHTO)

4.2.2. Subgrade and Material Strength Coefficients

- Subgrade Modulus (Mr) = 8,500 pounds per square inch (psi) (FWD)
- Crushed Surfacing Base Course (Mr) = 30,000 psi (WSDOT)
- Crushed Surfacing Base Course Structural Coefficient = 0.13 (WSDOT)
- Existing Asphalt Structural Coefficient = 0.30 (FWD)

- New Asphalt Structural Coefficient =0.45 (WSDOT)

4.3. Estimated Remaining Design Life

We estimate that the pavement currently has a remaining serviceable life of about two to three years, if no rehabilitation of the roadway is performed. This estimate is based on our visual assessment of the surface, the FWD results, and the measured traffic volumes without accounting for additional traffic from the proposed development. This is consistent with a pavement section with a 20-year design life constructed around 1999 or 2000.

5.0 PAVEMENT SECTION RECOMMENDATIONS

5.1. General

We developed pavement sections for three improvement alternatives, for each traffic loading condition and are described briefly below. Detailed recommendations for each alternative are provided in the subsequent sections. Our recommended pavement sections were developed in general accordance with AASHTO 1993 Flexible Pavement Design Standards.

Alternative 1: Remove existing pavement, compact existing subgrade soils in place and construct uniform pavement section across the site (Fully Reconstruct Pavement).

Alternative 2: Repair highly damaged areas and overlay existing pavement (Overlay).

Alternative 3: Remove upper layers of the existing pavement by grinding (cold planing), repair highly damaged areas, and overlay existing pavement. (Grind and Overlay).

It is our opinion that all three alternatives will be required for pavement rehabilitation. Different approaches will be used in different locations. In areas where there are no adjacent curb and gutter or where the curb and gutter will be rebuilt, an overlay is appropriate and likely the most efficient option. In our opinion, an overlay should be used wherever practical. In areas where there are transition to existing infrastructure such as curbs, gutters, and driveways, the overlay will need to be transitioned by first grinding or planing the existing asphalt. These transitions can also be made in low traffic areas, such as bike lanes, without impacting the resilience of the main roadway. In highly damaged areas, newly paved areas, or in areas where the reconstructed pavement must adjoin existing infrastructure and a grind and overlay is impractical due to site grading, a fully reconstructed or new pavement section will be required.

5.2. Alternative 1 – Fully Reconstructed or New Pavement

5.2.1. General

The design pavement section for Alternative 1 assumes that the entire existing pavement section will be removed, the existing subgrade soils will be compacted in place, and a new pavement section will be built on top of the existing subgrade soils.

Alternative 1 Recommended Pavement Section – Existing Traffic Condition

- 5.5 inches AC (Minimum Class ½ inch PG 64-22; WSDOT Standard Specifications 5-04, 9-02, and 9-03).

- 10.0 inches of Crushed Surfacing Base Course (WSDOT Standard Specification 9-03.9(3) compacted to 95 percent of Maximum Dry Density [MDD]. Contractor may choose to use Crushed Surfacing Top Course in the upper 2 inches of the section to assist with grading).

Alternative 1 Recommended Pavement Section – Proposed Traffic Condition

- 6.5 inches AC (Minimum Class ½ inch PG 64-22; WSDOT Standard Specifications 5-04, 9-02, and 9-03).
- 11.5 inches of Crushed Surfacing Base Course (WSDOT Standard Specification 9-03.9(3) compacted to 95 percent of MDD. Contractor may choose to use Crushed Surfacing Top Course in the upper 2 inches of the section to assist with grading).

5.2.2. Alternative 1 Discussion and Construction Considerations

The subgrade soils should be thoroughly compacted to a uniformly firm and unyielding condition prior to constructing the roadway section or placing structural fill. We recommend that subgrades be proof-rolled or probed, as appropriate, to identify areas of yielding or soft soil. Proof-rolling should be accomplished with a heavy piece of wheeled construction equipment such as a loaded dump truck or grader.

If soft or otherwise unsuitable areas are revealed during proof-rolling that cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the unsuitable soils be scarified (e.g., with a ripper or farmer's disc), aerated and recompacted; or (2) the unsuitable soils be overexcavated and replaced with compacted aggregate for gravel base, effectively increasing the pavement section. Overexcavation should extend until uniformly firm soils are encountered as determined by a representative from our firm.

5.3. Alternative 2 – Overlay

5.3.1. General

An overlay could be considered to extend the life of the existing pavement. Following design methodology presented in the AASHTO 1993 Flexible Pavement Design manual we estimate that an asphalt concrete (AC) overlay of 4 inches will be necessary to accommodate the existing traffic volumes and 5.5 inches for the proposed traffic will be necessary to accommodate the design traffic volumes over a 20-year design life. Even with a thicker overlay, there is still a potential for reflective cracking to occur, so ongoing maintenance (crack sealing) of the overlay could be required.

5.3.2. Alternative 2 Discussion and Construction Considerations

Prior to an overlay, we recommend that that highly deteriorated pavement sections and sections with ruts receive a full depth replacement following our recommendations for Alternative 1. Based on our visual assessment we expect that most of these full depth repairs will occur in 2-foot wide segments in the wheel tracks. We recommend that for preliminary budgeting purposes you assume that about 2,500 linear feet of wheel track (about 5,000 square feet) will need to be repaired. Actual repair limits should be based on a more detailed evaluation of the pavement condition just prior to construction.

A relatively thin overlay, on the order of 4 to 5.5 inches as is recommended, will provide short-term improvements to the roadway; however, reflective cracking is likely to occur along existing pavement cracks and in areas where the existing pavement sections are deteriorating. The onset of reflective cracking will be influenced by the thickness of the overlay and the traffic loading. Generally, the thicker the overlay, the longer the duration before reflective cracking begins to occur. We anticipate that some reflective cracking could begin to propagate into the overlay within about a year of placement. Additional roadway strength,

resistance to reflective cracking, and extended service life of the overlay section could be achieved by incorporating a fiberglass reinforcement grid into the overlay. If included, we recommend that the overlay be placed in two or three lifts and the reinforcement grid be installed between the first two lifts. Installation of the fiberglass reinforcement should follow the manufacturer's recommendations. For product reference, we recommend GlassGrid 8511 TF by Tensar International or a similar product. This product has an integral tack film on it that is supposed to eliminate the need for a tack coat and adhere to the new pavement.

Glass grid can also be used to provide pavement strength and reduce the thickness of an overlay. However, more advanced analysis techniques, beyond the standard AASHTO analysis, would be needed to confirm and design this alternative. We can provide additional information on the use of fiberglass reinforcement if requested.

5.4. Alternative 3 – Grind and Overlay

5.4.1. General

Alternative 3 assumes that the existing pavement section will be ground down or planed at least 3 inches, prior to placing the new asphalt overlay. Planing should be performed in accordance with WSDOT Standard Specification 5-04.3(14) Planing Bituminous Pavement.

Alternative 3 Recommended Pavement Section – Existing Traffic Condition

- 6 inches asphalt concrete (Minimum Class ½ inch PG 64-22; WSDOT Standard Specifications 5-04, 9-02, and 9-03)
- 3-inch thick cold plane asphalt pavement removal with full rebuild of isolated areas.

Alternative 3 Recommended Pavement Section – Proposed Traffic Condition

- 7.5 inches AC (Minimum Class ½ inch PG 64-22; WSDOT Standard Specifications 5-04, 9-02, and 9-03)
- 3-inch thick cold plane asphalt pavement removal with full rebuild of isolated areas.

5.4.2. Alternative 3 Discussion and Construction Considerations

Pavement damage, including minor to moderate cracking and sever alligator cracking is expected to be exposed once the upper asphalt layers are removed. These exposed cracks are expected to result in some reflective cracking after rehabilitation. As described in the overlay alternative, glass grid can be used to mitigate these effects or reduce the overlay thickness.

After the grinding and prior to an overlay, we recommend that highly deteriorated pavement sections and sections with ruts receive a full depth replacement following our recommendations for Alternative 1. Based on our visual assessment we expect that most full depth repairs will occur in 2-foot wide segments in the wheel tracks. We recommend that for preliminary budgeting purposes you assume that 3,000 linear feet of wheel track (about 6,000 square feet) will need to be repaired. Actual repair limits should be based on a more detailed evaluation of the pavement condition prior to construction. This is a larger estimate than provided for the overlay. Pavement that is already highly damaged can be further damaged by grinding or planing the surface, accordingly the repair sections could need to be expanded.

6.0 CONCLUSIONS AND DISCUSSION

Based on our observations and analysis, it is our opinion that pavement in the project area is approaching the end of its useable life. It will likely require significant repairs or need to be rebuilt within the next two to five years, depending on the City's tolerance for the condition of the pavement and the ride quality of the road. This repair or replacement will be required even without the increase in traffic from the proposed development.

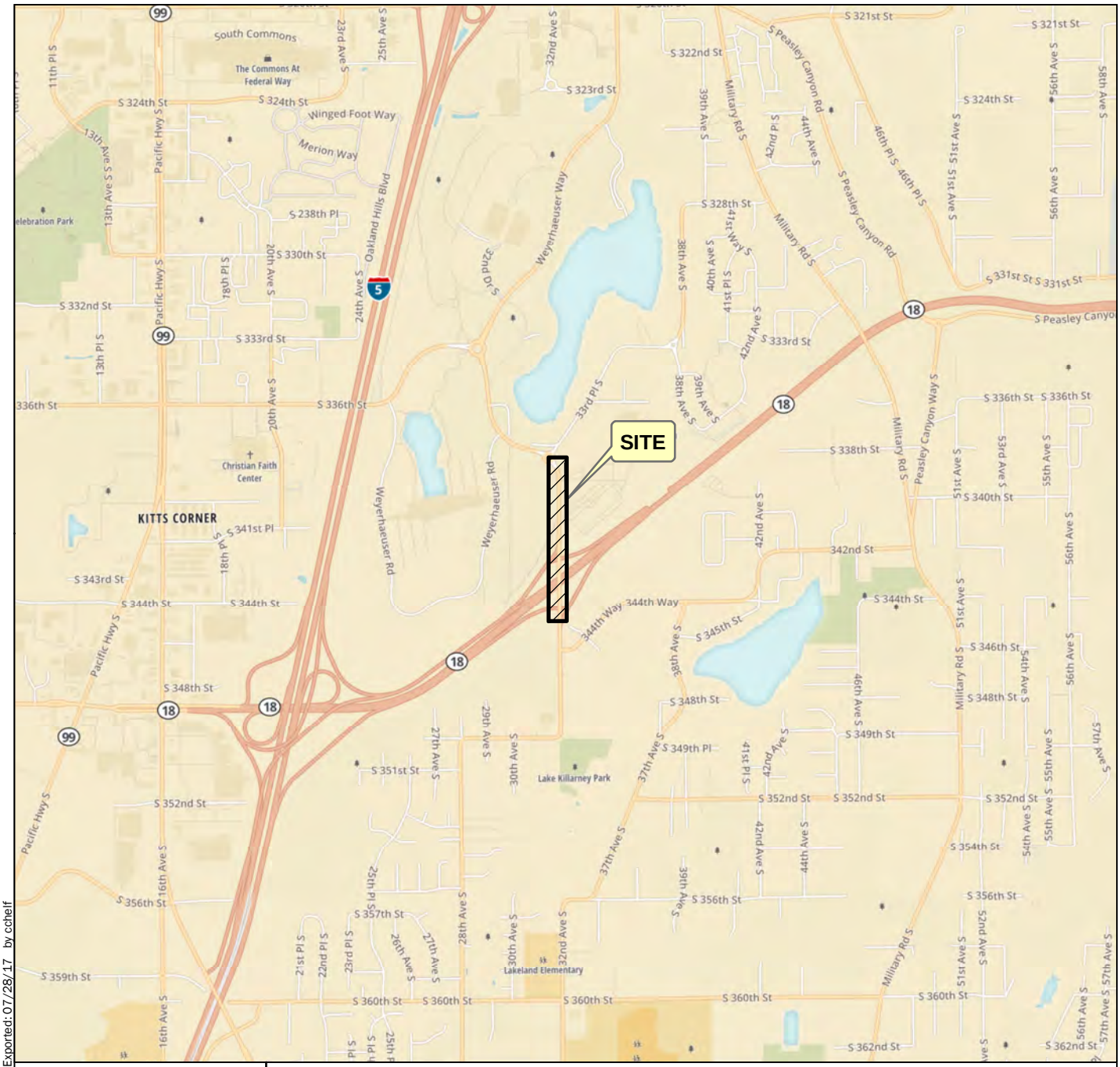
The proposed development is expected to nearly triple the loading on the pavement (in terms of EASLs). However, this additional traffic loading only results in an additional 1 to 2 inches of asphalt than would be required for a repair or replacement to accommodate the existing traffic loading conditions.

7.0 LIMITATIONS

We have prepared this report for Federal Way Campus, LLC, for the Weyerhaeuser Way South, 320th Street to SR 18 Weyerhaeuser Campus Property located in Federal Way, Washington. Federal Way Campus, LLC, may distribute copies of this report to owner's authorized agents and regulatory agencies as may be required for the Project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices for geotechnical engineering in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty, express or implied, applies to the services or this report.

Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.



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Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2017

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Weyerhaeuser Way Pavement Evaluation
Federal Way, Washington

GeoEngineers

Figure 1

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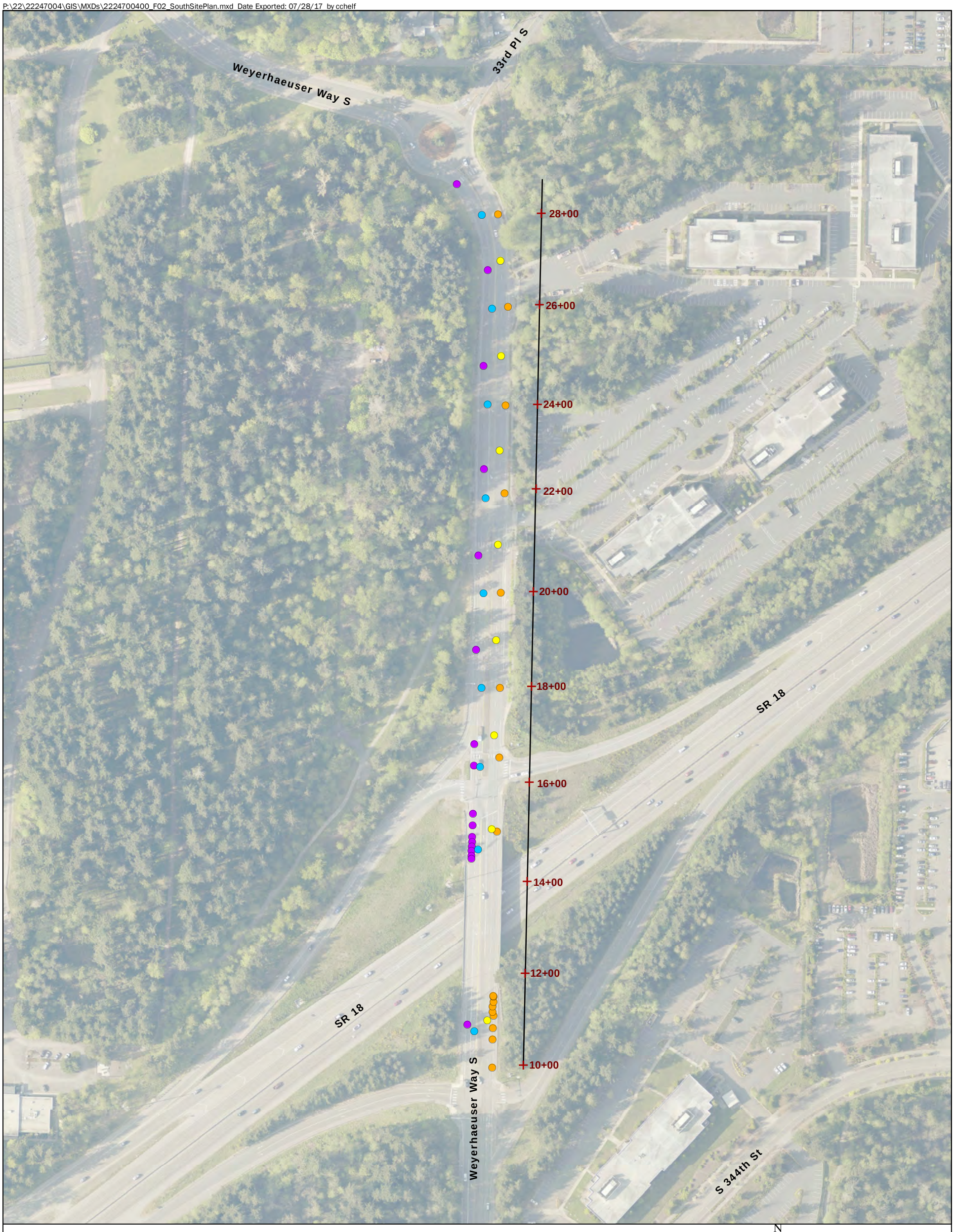

Legend

FWD Analysis Point 10+00 Approximate Project Stationing as Established by Pavement Services, Inc.

- Northbound Left Lane
- Northbound Right Lane
- Southbound Left Lane
- Southbound Right Lane

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial from King County 2015

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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Site Plan

Weyerhaeuser Way Pavement Evaluation
Federal Way, Washington

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Figure 2

APPENDIX A
FWD Results and Data

Weyerhaeuser Way
Federal Way, WA

AASHTO Backcalculation Analysis Results

Project No. 17019

Index No.	Test Station	Lane	Corrected Subgrade Mr, psi	Pavement Modulus (Ep), psi	SN_{eff}
1	11+00	NB LL	13,830	174,905	1.51
2	14+98	NB RL	9,570	643,067	2.33
3	15+02	NB LL	12,714	213,261	1.61
4	16+55	NB RL	7,197	245,503	1.69
5	17+00	NB LL	8,277	204,816	1.59
6	18+00	NB RL	6,450	-28,074	-0.82
7	19+00	NB LL	8,452	163,946	1.48
8	20+00	NB RL	5,700	255,586	1.71
9	21+00	NB LL	8,788	386,580	1.97
10	22+11	NB RL	8,847	1,065,918	2.76
13	25+00	NB LL	9,115	624,415	2.31
15	27+00	NB LL	2,527	762,986	2.47
17	10+76	SB LL	15,870	192,618	1.56
18	11+09	SB RL	13,874	179,966	1.52
19	14+59	SB LL	9,308	424,924	2.03
20	16+33	SB LL	10,165	167,680	1.49
21	17+00	SB RL	10,708	138,457	1.40
22	18+00	SB LL	9,427	216,773	1.62
23	19+00	SB RL	9,848	111,413	1.30
24	20+00	SB LL	8,528	669,194	2.36
26	22+00	SB LL	9,529	341,466	1.89
28	23+99	SB LL	6,836	812,804	2.52
29	25+00	SB RL	8,090	1,369,478	3.00
31	27+00	SB RL	8,190	1,039,743	2.74
33	29+01	SB RL	9,115	1,144,206	2.82

APPENDIX B
Visual Condition Survey Summary

APPENDIX B
VISUAL CONDITION SURVEY SUMMARY

Table B-1 below summarizes the primary pavement distress types we observed during our visual condition survey. Definitions of different distress types for asphalt concrete are provided in Table B-2. The distress definitions are taken from the Federal Highway Administration (FHWA) Distress Identification Manual (Publication No. FHWA-RD-03-031, June 2003). Photographs of some of the distress types are provided as Figure B-1 through Figure B-4.

TABLE B-1. OBSERVED PAVEMENT DISTRESS

Observed Distress
■ Low to severe fatigue cracking*
■ Low depression
■ Low to severe longitudinal and transverse cracking*
■ Low to moderate patch deterioration
■ Low to moderate potholes*
■ Moderate rutting near storm drain*

Note:

* Photos of distress provided in Figure B-1 through Figure B-4 in Appendix B.

TABLE B-2. ASPHALT CONCRETE DISTRESS DEFINITIONS

Distress Type	Definition
Fatigue Cracking	A series of small, jagged, interconnecting cracks caused by failure of the AC surface under repeated traffic loading (also called alligator cracking).
Depression	Localized pavement surface areas with elevation slightly lower than those of the surrounding pavement.
Longitudinal Cracking	Cracking parallel to the centerline of the pavement.
Patch Deterioration	Distress occurring within a previously repaired area.
Potholes	A bowl-shaped hole of various sizes in the pavement surface.
Rutting	Longitudinal surface depressions in the wheel paths.

Pavement Distress Photo:
Fatigue Cracking of AC Pavement

Weyerhaeuser Way South
Federal Way, Washington

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Figure B-1

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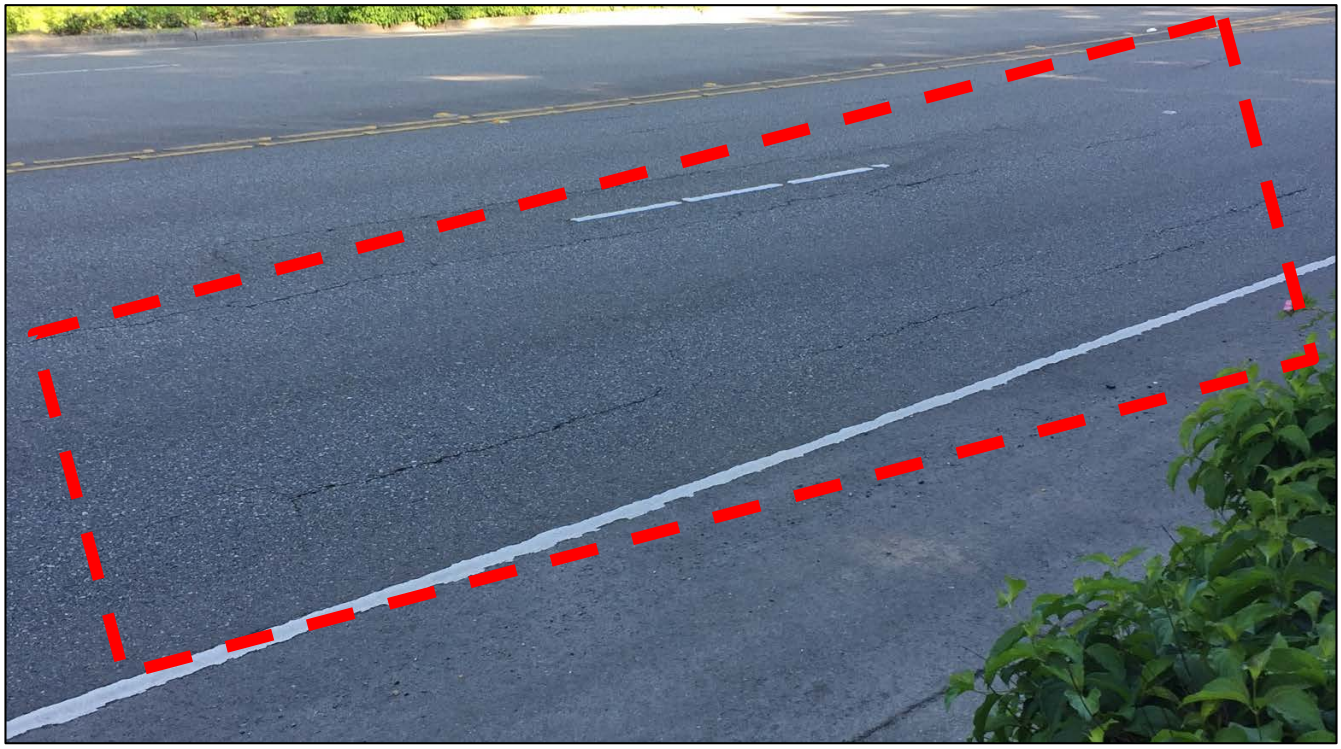

Pavement Distress Photo:
Longitudinal Cracking

Weyerhaeuser Way South
Federal Way, Washington

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Figure B-2

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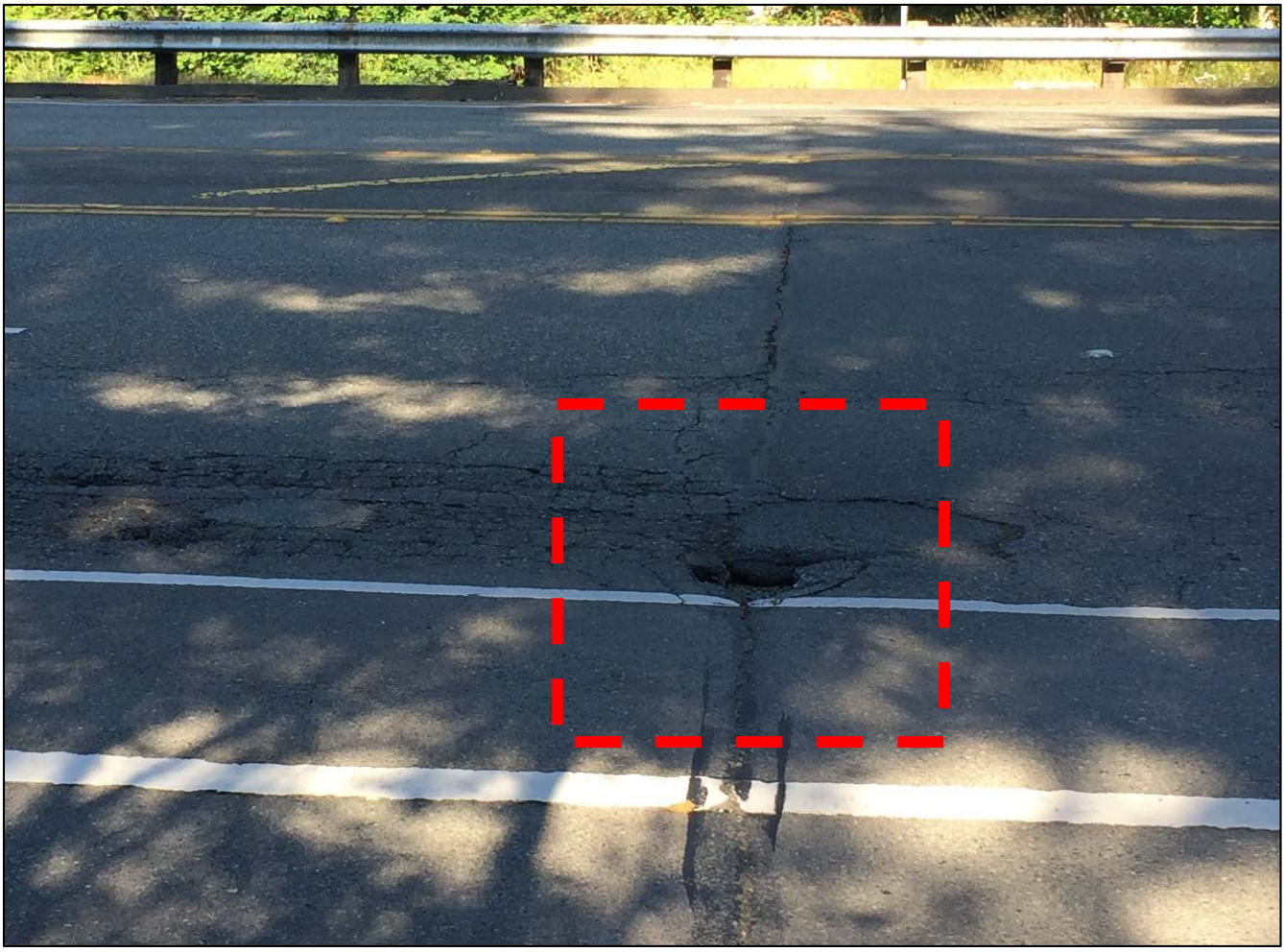

Pavement Distress Photo:
Potholes

Weyerhaeuser Way South
Federal Way, Washington

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Figure B-3

22247-004-00 Date Exported: 080417

Pavement Distress Photo:
Rutting/Settlement

Weyerhaeuser Way South
Federal Way, Washington

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Figure B-4

22247-004-00 Date Exported: 080417

APPENDIX C
Report Limitations and Guidelines for Use

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for Federal Way Campus, LLC and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with Federal Way Campus, LLC dated June 14, 2017 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is based on a Unique Set of Project-Specific Factors

This report has been prepared for the proposed Weyerhaeuser Way improvement project in support of the Weyerhaeuser Way South, 320th Street to SR 18, Weyerhaeuser Campus Property in Federal Way, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical and Geologic Findings are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers

cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable, but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

Contractors are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.