Baer Testing Inc.

1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

December 10, 2020

Big Sky Developers, LLC
5426 N. Road 68, Box D-113
Pasco, WA 99301

Attn: Mr. Dave Greeno

RE: ADDENDUM TO GEOTECHNICAL ENGINEERING STUDY; COLUMBIA RIVER ROAD RESIDENTIAL DEVELOPMENT, FRANKLIN COUNTY, WASHINGTON

Dear Mr. Greeno:

At your request, Baer Testing, Inc. conducted a geotechnical engineering study for the proposed Columbia River Road residential development in Franklin County, Washington. The report was issued on November 4, 2020.

In response to post-issue questions from Caleb Stromstad from Aqtera Engineering, we present the following clarifications.

1. The report recommends gravel larger than 3-inches in diameter be removed from the on-site material when it is used for general and structural fill and backfill. For mass grading, the gravel size may be modified to allow rock smaller 6 inches be allowed.
2. We estimate the in-place materials will swell approximately 50 percent from bank to truck. From bank to compacted fill, we anticipate approximately 12 to 15 percent shrink.

We appreciate the opportunity to be of service. If you have any further questions or comments, please contact our office.

Sincerely,

BAER TESTING, INC.

Dee J. Burrie, P.E.
Chief Engineer

COLUMBIA RIVER ROAD
RESIDENTIAL DEVELOPMENT
FRANKLIN COUNTY, WASHINGTON

For:

MR. DAVE GREENO
BIG SKY DEVELOPERS
PASCO, WA 99301

Provided By:

1106 Ledwich Ave.
Yakima, WA 98902
509-469-3068
general@baertesting.com

November 4, 2020
Project No: 20-173

Baer Testing Inc.

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November 4, 2020

Big Sky Developers, LLC
5426 N. Road 68, Box D-113
Pasco, WA 99301

Attn: Mr. Dave Greeno

RE: GEOTECHNICAL ENGINEERING STUDY; COLUMBIA RIVER ROAD RESIDENTIAL DEVELOPMENT, FRANKLIN COUNTY, WASHINGTON

Dear Mr. Greeno:

At your request, Baer Testing, Inc. conducted a geotechnical engineering study for the proposed Columbia River Road residential development in Franklin County, Washington. This report presents the results of the field explorations, laboratory testing, and engineering analyses.

This report presents recommendations for site grading, stormwater disposal, utility construction, and seismic design. The report also provides general recommendations for building foundation design as well as construction recommendations for the various project features.

We appreciate the opportunity to be of service. If you have questions or comments, please contact our office.

Sincerely,

BAER TESTING, INC.

Dee J. Burrie, P.E.
Chief Engineer

Enclosures: Geotechnical Engineering Report

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FIGURES

APPENDICIES

1.0 INTRODUCTION

Baer Testing, Inc. is pleased to present the results of our geotechnical engineering study for the proposed Columbia River Road residential development in Franklin County, Washington. This geotechnical engineering study provides subsurface information to support site grading, drainage, utility design and construction, and recommendations for foundation design and construction**,** paved streets, and IBC seismic design criteria. Our scope of work included:

- Observing 13 test pit excavations and field soil sampling.
- Conducting laboratory testing to determine soil properties.
- Performing engineering analyses.
- Preparing this report.

2.0 PROJECT DESCRIPTION AND PROPOSED DEVELOPMENT

The site is located primarily in the southwest quarter of Section 12, T10N, R28E, WM, in Franklin County, Washington (**Figure 1** – **Site Location**). Approximate mid-site coordinates are 46°21'41.60"N Latitude; 119°15'15.16"W Longitude. The site is currently an active orchard with new plantings on the lower (west) bench.

The approximately 108-acre site slopes from east to west with two distinct benches. The western approximately 600 feet long and 300 feet wide section of property slopes up to the east of Columbia River Road. The next 300 feet slopes up sharply with elevation changes of approximately 30 feet. The upper bench slopes approximately 35 feet across approximately 2,000 feet. An irrigation canal makes up the eastern property boundary.

The proposed development will consist of 74, one-acre residential lots with associated paved streets and on-site stormwater disposal. Each lot will utilize on-site septic systems and private wells. **Figure 2 – Layout and Exploration Plan** shows the proposed lot layout. Proposed residential structures will consist of one- or two-story single-family units.

3.0 FIELD EXPLORATIONS

The exploration plan consisted of excavating 13 test pits designated TP-1 through TP-13 on the Exploration Plan (**Figure 2)**. T-Tap Construction (T-Tap) excavated the test pits on October 6, 2020 using a Deere 85G excavator with a 30-inch bucket.

Where feasible, soil in situ strength was estimated using a dynamic, mini-cone penetrometer (DCP) and our observations of the relative excavation difficulty. The mini cone uses a 15-pound slide hammer dropped 20 inches to drive a conical tip into the soil. The number of hammer blows required to drive the cone 1¾-inch increments is roughly equivalent to a SPT blow count. The blows per increment provide an indication of the relative soil density. The blow counts are recorded on the logs. The mini-cone penetrometer test method is described in ASTM STP399.

Baer Testing's representative counted the blows required to drive the rod into the ground for each 1¾-inch increment over a given depth. The recorded blow count data was evaluated using correlation charts to estimate the soil bearing capacity.

A Baer Testing representative observed the test pits, collected representative soil samples, and prepared test pit logs.

The subsurface conditions are known only at the test pit locations on the date explored and should be considered approximate. Actual subsurface conditions may vary between excavation locations. The test pit locations are presented in **Figure 2** and the test pit logs are presented in Appendix A. Our representative classified the in-situ soil in the field and transported the samples to the laboratory for further examination and testing.

4.0 LABORATORY TESTING

Baer Testing performed the following laboratory tests on selected soil samples from our explorations.

- Moisture Content (American Society for Testing and Materials (ASTM) Designation: D 2216) for material characterization and soil index properties; and
- Particle Distribution (ASTM Designation: D 422 and ASTM Designation: D 1140) for material characterization and soil index properties.

Northwest Agricultural Consultants performed the following laboratory tests on a selected soil sample.

- Cation Exchange Capacity (Environmental Protection Agency (EPA) Designation: 9081) for soil properties.
- Organic Content (ASTM D 2974) for soil properties.

Copies of the laboratory test reports are enclosed in Appendix B.

5.0 SUBSURFACE CONDITIONS

The following discussion is a summary of subsurface conditions encountered during the test pit explorations. Please refer to the enclosed logs (Appendix A) for more detailed information regarding subsurface conditions.

5.1 Regional Geologic Setting

The *Geologic Map of the Richland 1:100,000 Quadrangle, Washington*; Washington Division of Geology and Earth Resources, Open File Report 94-8 (1994), shows near-surface geology on the lower (western) bench mapped as Qfg_4 – Pleistocene Outburst flood deposits. The Qfg_4 unit consists of reworked outburst flood gravel with coarse to fine sand. The upper bench geology is mapped as Qds – Holocene dune sand or stabilized dunes. In our opinion, the materials observed in the test pit excavations are consistent with this mapped geology.

5.2 Soils

The subsurface profile is relatively consistent across the site. The test pits typically encountered 2 to 7.5 feet of medium dense ***Poorly Graded Sand (SP)*** and ***Silty Sandy (SM)*** overlying dense, black, ***Poorly Graded Sand with Gravel (SP)*** or ***Poorly Graded Gravel with Sand (GP).*** The sand and gravel extended to the full exploration depths, 7 to 9 feet below the existing ground surface (bgs). Some of the test pits were terminated because of severe caving in the black sand.

The upper fine-grained silty sand soil was not present in TP-1 in the northwest site corner.

5.3 Groundwater

Groundwater was not encountered in any of the test pits. Based on well logs from nearby locations, groundwater is approximately 60 to 105 feet below the existing surface elevation.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

The existing site is currently undeveloped and will require significant grading to develop building pads for residential structures. The preliminary plat provided by Aqtera Engineering does not include a grading plan. Based on the cross-site elevation change, maximum anticipated cuts are 5 to 10 feet.

6.1.1 Test Pit Backfill

T-Tap used the excavator to backfill each test pit upon completion using excavated materials. The operator compacted the backfill using the excavator bucket. During construction, the test pits should be over-excavated and backfilled with compacted structural fill in accordance with Section "6.2 Earthwork".

6.2 Earthwork

Any existing vegetation and deleterious debris should be removed from the construction area. Stripped soil materials with debris removed may be stockpiled for use in future landscape areas but may not be used as structural fill. Based on the current condition of the site, we anticipate 2 to 3 inches of material will be removed from across the entire site. Additionally, the mature and young trees and roots will need to be removed.

6.2.1 Pre-Wetting Borrow Areas

Soil encountered at the site was typically dry to moist at the time of our explorations. Depending on conditions at the time of construction, the soils may require moisture conditioning, either by adding moisture or drying, prior to being compacted. Our experience indicates adding moisture to the borrow area prior to excavation is an effective way to moisture condition the material. We recommend adding water by sprinkling the borrow area until the wetted front extends approximately 2 feet below the excavation depth. The dry silty sand and poorly graded sand can be expected to take water relatively quickly.

6.2.2 Subgrade Preparation

Exposed subgrade should be moisture conditioned to within 2 percent of optimum in the upper 12 inches and compacted to a minimum 92 percent of the maximum laboratory dry density as determined by ASTM D 1557.

Finished building pads should be constructed with 2H:1V cut and fill slopes. Fill slopes must extend from the building pad elevation until it intercepts the native slopes. Proposed structures must be located with setbacks as required by IBC 2015. If development requires fill placement to create level building pads, fill placement must be constructed in accordance with the requirements presented in IBC Appendix J as shown in **Figure 3 – IBC Benching Requirements**.

6.2.3 Material Reuse

The on-site silty sand and poorly graded sand, free of organics and debris, and with gravel larger than 3-inches in diameter removed, may be used for general and structural fill and backfill. Based on the anticipated grading, the volume of available on-site material may be adequate if the design is balanced. If imported fill is needed, we recommend using a well-graded, 2-inch minus, pit-run sand and gravel with less than 5 percent fines. All fill should be placed in accordance with Section "6.2.4 Placement and Compaction".

6.2.4 Placement and Compaction

Fill and backfill should be moisture conditioned to within 2 percent of optimum, placed in maximum 8-inch loose lifts, and compacted to a minimum 95 percent of ASTM D 1557.

Structural fill under footings, if used, should consist of 5/8-inch minus crushed stone top course (CSTC). Structural fill should be compacted to 95 percent of ASTM D 1557.

6.2.5 Slopes

Occupational Safety and Health Administration (OSHA) Type C soil best describes the on-site silty sand and poorly graded sand. Type C soils may have maximum temporary construction slopes of 1.5 Horizontal to 1 Vertical (1.5H:1V). Permanent cut or fill slopes should be no steeper than 2H:1V and must be protected from both wind and water erosion. Erosion protection may consist of vegetative cover or a minimum 3 inches of coarse concrete aggregate conforming to the requirements of WSDOT Specification 9-03.1(4) c, "Concrete Aggregate AASHTO Grading No. 57."

6.2.6 Utility Trenching

Utility trenching should be accomplished in accordance with American Public Works Association (APWA) Standard Specifications. Based on our explorations, we anticipate excavations may be made using standard excavation equipment. Utility piping should be bedded as recommended in the APWA specifications. Utility trenches should be backfilled using structural fill compacted as specified in section "6.2.4 Placement and Compaction". Enough backfill should be placed over the utility before compacting with heavy compactors to prevent damage. On-site materials with gravels smaller than 3 inches may be used for utility trench backfill.

6.2.7 Wet Weather Construction

The site soils are typically fine- to medium-grained; the stability of the exposed fine soils may deteriorate due to change in moisture content. If construction occurs during wet weather, we recommend:

- Fill materials consist of clean, granular soil with less than 5 percent fines passing the #200 sieve. Fines should be non-plastic.
- The ground surface in the construction area should be sloped to drain and sealed to reduce water infiltration and to prevent water ponding.
- Work areas and stockpiles should be covered with plastic. Geotextile silt fences, straw bales, straw wattles, and/or other measures should be used as needed to control soil erosion.

6.2.8 Infiltration Rate

We estimated infiltration rates based on gradation tests. We assumed the poorly graded silty sand soil encountered in the upper layer will determine the overall infiltration rates. The US Department of Agriculture Natural Resources Conservation Service estimates infiltration rates based on texture. Our visual classifications and laboratory test results for collected site samples indicate the USDA Soil Texture Class for the poorly graded silty sand layer is loamy sand.

Estimated infiltration rates for loamy sand soils are 2 to 6 inches per hour. We recommend using 4 inches per hour for design purposes if infiltration occurs in this layer.

These rates do not include a safety factor. The system designer should incorporate an appropriate factor of safety against slowing rates over time due to biological and sediment clogging.

7.0 FOUNDATION DESIGN RECOMMENDATIONS

7.1 Footings

Typical residential structures may be supported on conventional spread or continuous footings founded on the compacted poorly graded sand subgrade or structural fill. Exterior footings should be embedded a minimum 24 inches below adjacent grades for bearing considerations and frost protection.

To avoid differential settlement, footings should be supported in consistent materials. If footing design depths place footings on both native and fill sections, we recommend over-excavating the native footing areas 12 inches and backfilling with compacted structural fill. The over-excavated areas may be backfilled with excavated materials compacted to 95 percent of ASTM D 1557.

We recommend constructing footings a minimum of 2 feet wide for spread footings and minimum 16 inches wide for continuous footing. Footings constructed with these recommendations can be designed with an allowable bearing pressure of 1,800 pounds per square foot (psf). The allowable bearing pressure may be increased by one-third for short-term transient loading conditions (i.e., seismic and/or wind loads).

We anticipate settlement will be the limiting factor for foundation design. Foundation settlement estimates are based on the soil profile and densities encountered at the site. Foundations designed as outlined above should experience less than ½-inch of settlement. We anticipate differential settlement will be less than half of total settlements between adjacent footings or across approximately 20 feet of continuous footings. Settlement should occur rapidly as loads are applied.

Lateral forces may be resisted using a combination of friction and passive earth pressure against the buried portions of the structure. For design, a 0.35 coefficient of friction may be assumed along the interface between the footing base and the compacted sand. Passive earth pressure from the sand backfill may be calculated using an equivalent fluid weight of 250 psf per foot of embedment depth. The recommended coefficient of friction and passive earth pressure values do not include a safety factor.

7.2 Concrete Slabs-on-Grade

The exposed subgrade in areas to receive a concrete slab-on-grade should be moisture conditioned and compacted to a minimum of 95 percent of the maximum laboratory dry density as determined by ASTM D 1557.

After compacting the subgrade, we recommend placing a minimum 4-inch layer of 5/8-inch CSTC under the concrete slab. The CSTC should be compacted to a firm, non-yielding condition. The geotechnical engineer should observe subgrade preparation prior to gravel placement.

7.3 Retaining Walls

Retaining wall foundations should be designed and constructed in accordance with the footing recommendations. All retaining walls should be designed with a minimum 12-inch wide drainage zone directly behind the wall. The on-site silty sand soil or gravel may be used as backfill behind the drainage zone. The drainage zone should be separated from the backfill using a separation geotextile. Backfill should be placed in maximum 8-inch loose lifts and compacted to 95 percent of ASTM D 1557.

If retaining walls are constructed as recommended above, the values in the following table may be used for design.

Table 7.3-1 Retaining Wall Design

Design Parameter	Value, pcf/ft. depth
Active Earth Pressure (unrestrained walls)	35
At-rest Earth Pressure (restrained walls)	55

7.4 Pavement Sections

We anticipate traffic will consist of automobiles and light trucks, with occasional heavier garbage trucks and school buses. Based on the anticipated traffic, we recommend using the following pavement section.

Table 7.4-1 Recommended Pavement Section

Material Layer	Layer Thickness, inches	Compaction Standard
Asphaltic Concrete Pavement (HMACP)	3	91 percent of Maximum Theoretical Specific Gravity (Rice's)
Crushed Stone Top Course (CSTC) WSDOT 5/8-inch minus Top Course	6	95 percent of ASTM D 1557
Compacted Subgrade	12	95 percent of ASTM D 1557

The upper 12 inches of the pavement subgrade should be moisture conditioned and compacted to 95 percent of ASTM D 1557. The geotechnical engineer should observe the subgrade prior to base course placement. Soft or unstable areas should be stabilized or over-excavated and replaced with compacted structural fill prior to paving.

7.5 Seismic Design

Structures should be designed in accordance with the 2015 International Building Code (IBC). The Site Class is based on the average conditions present within 100 feet of the ground surface. The Site Classification is based on shear wave velocity. To establish a higher site class, additional explorations would be required including deep borings and geophysical measurements. Based on the available information, we recommend using the default classification Site Class D (Stiff Soil). Design values determined for the center coordinates of the site using the United States Geological Survey (USGS) *Earthquake Ground Motion Parameters* utility are summarized in Table 7.5-1 below.

Table 7.5-1 Recommended Earthquake Ground Motion Parameters (2015 IBC)

Parameter	Value
Location (Latitude, Longitude), degrees	46.36156; -119.25421
Mapped Spectral Acceleration Values (MCE, Site Class D):	
Short Period, S_s	0.395 g
1.0 Sec. Period, S_1	0.154 g
Soil Factors for Site Class D:	
F_a	1.484 g
F_v	2.185 g
S_{DS}	0.391 g
S_{D1}	0.224 g

7.5.1 Liquefaction

Soil liquefaction occurs when saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Liquefaction typically occurs in loose, granular soils located in the upper 50 feet and below the water table. The onsite materials are primarily medium dense sand overlying dense gravel. In our opinion, the liquefaction potential at this site is low. Additional exploration and analysis will be required to quantify anticipated settlements due to potential liquefaction.

7.5.2 Fault Rupture Potential

Based on our review of available geologic literature, no faults are located near the site in Franklin County. Several hidden northwest-southeast trending thrust faults are located south of the site across the Columbia River in Benton County. These faults generally follow the alignment of the Horse Heaven Hills, Badger and Candy Mountain, and the Yakima River. We are not aware of any major movement along these faults in the last 10,000 years. We did not observe any evidence of surface rupture or recent faulting during our field observation. Therefore, we conclude the fault rupture potential is low at this site.

7.5.3 Slope stability

The relatively level site slopes downward from east to west. Grading will modify the slopes to create roads and building pads. The geologic map of the area does not show any known landslides in the immediate site area. In our opinion, the potential for slope failure impacting the proposed project site is low if development is completed in accordance with these recommendations.

8.0 ADDITIONAL SERVICES

Baer Testing is available to provide further geotechnical consultation during the project design phase. We should review the final design and specifications to verify earthwork and foundation recommendations have been properly interpreted and incorporated into the project design and construction specifications. We are also available to provide geotechnical engineering and special inspection services during construction. Observation during construction provides the geotechnical engineer the opportunity to assist in making engineering decisions if variations in subsurface conditions become apparent. If Baer Testing is not retained to provide construction phase services, we cannot be responsible for soil related construction errors or omissions.

Construction observation and special inspection services are not part of this geotechnical engineering study scope of work. We will be pleased to provide a separate proposal for the construction phase services, if desired.

9.0 UNCERTAINTIES AND LIMITATIONS

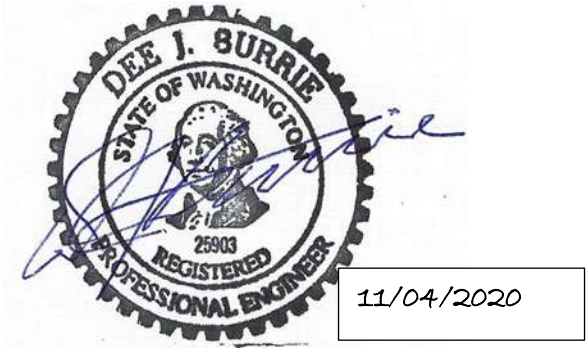
This report was prepared for use the exclusive use of Big Sky Developers, LLC, and the design team for the proposed Columbia River Road residential development in Franklin County, Washington. This report presents the data from observation and field testing and is based on subsurface conditions at the specific locations and depths indicated. No other representation is made. This report should be made available to potential contractors for information on factual data only. Conclusions and interpretations presented in this report should not be construed as a guarantee or warranty of the subsurface conditions. If changes are made to the project components or layout, additional geotechnical data and analyses may be necessary.

Within the limitations of scope, schedule, and budget, Baer Testing attempted to execute these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our services did not include environmental screening of soil samples retrieved from the explorations completed for this project. Further, we did not complete environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic materials in the soil, rock, surface water, or air in the project area.

We appreciate the opportunity to be of service. If you have questions or comments, please contact our office.

Sincerely,

BAER TESTING, INC.



Dee J. Burrie, P.E.
Chief Engineer

Notes:
Location Map developed using Images by Google Earth Pro.

0 1/2 4

Approximate Scale in Miles

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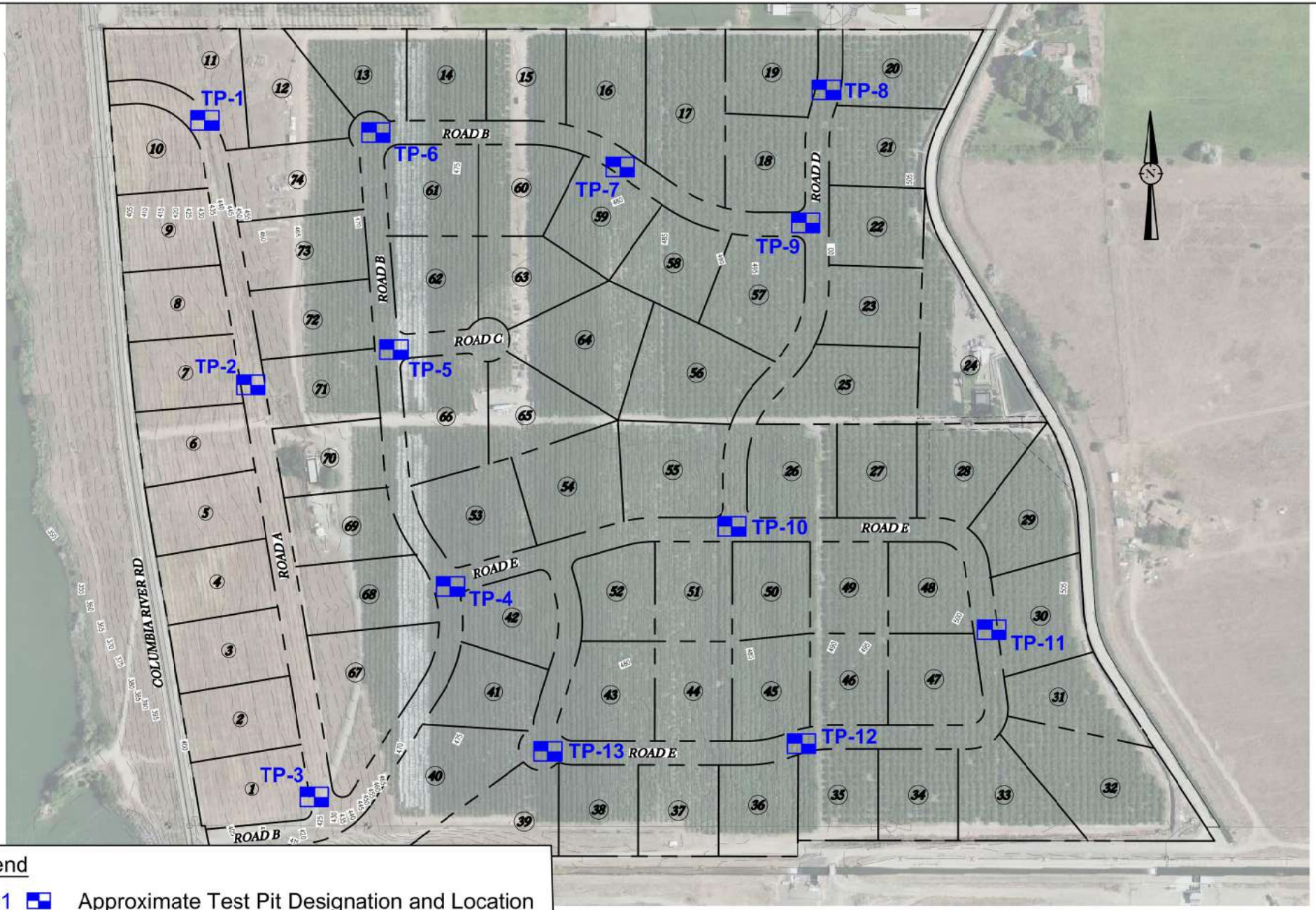
Columbia River Road
Residential Development
Franklin County, Washington

Site Location Map

20-173 | FIG. 1



Legend

TP-1 Approximate Test Pit Designation and Location

Notes:

Location Map developed using Images Developed by AQTERA Engineering.

0 400 800

Approximate Scale in Feet

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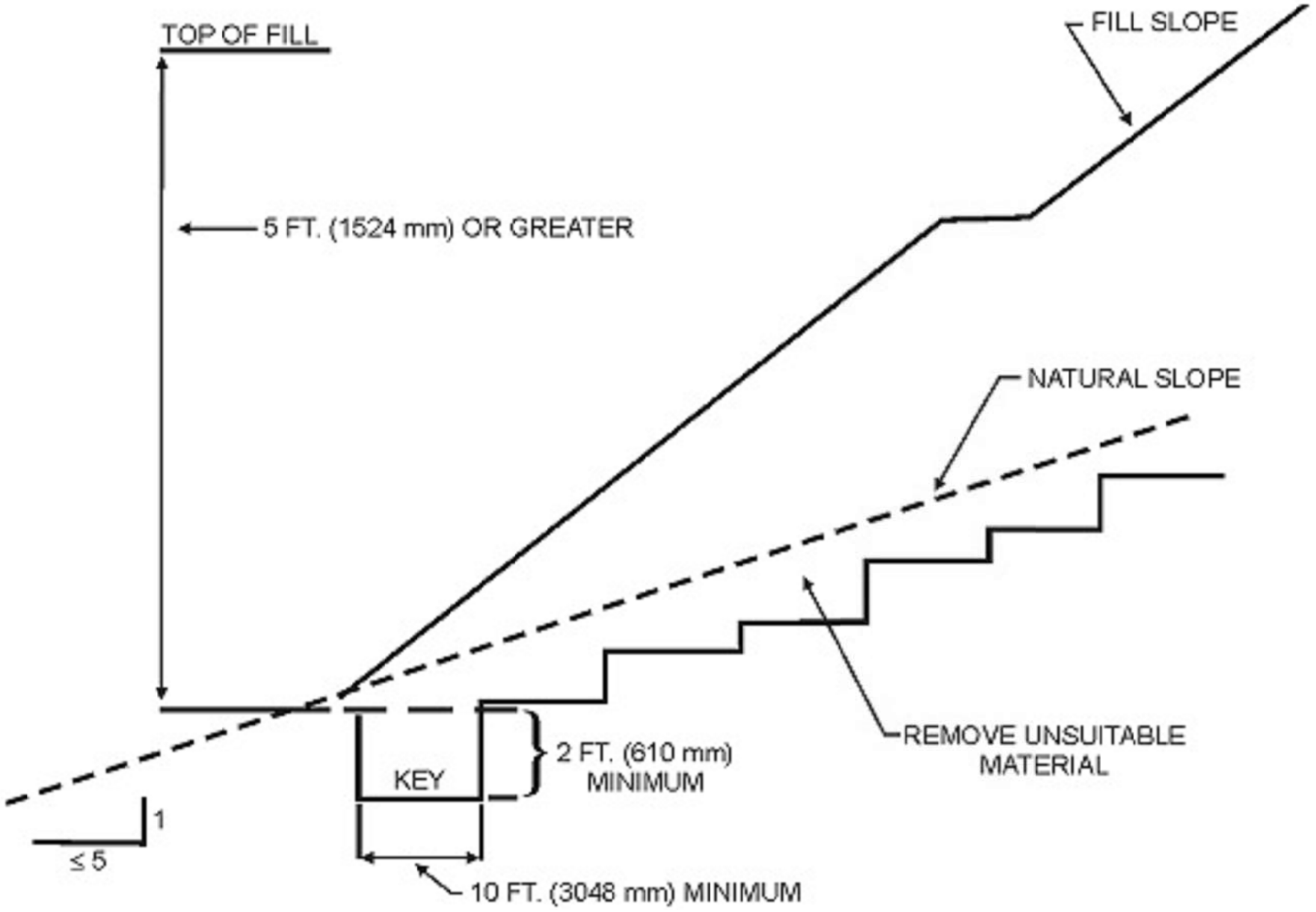
Columbia River Road
Residential Development
Franklin County, Washington

Layout & Exploration Map

20-173 | FIG. 2



Notes:
Image Developed From the 2015 International Building Code (IBC) Appendix J.

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Columbia River Road
Residential Development
Franklin County, Washington

IBC Benching Requirements

20-173 | FIG. 3

APPENDIX A

TEST PIT LOGS

Baer Testing Inc.
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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 10/11

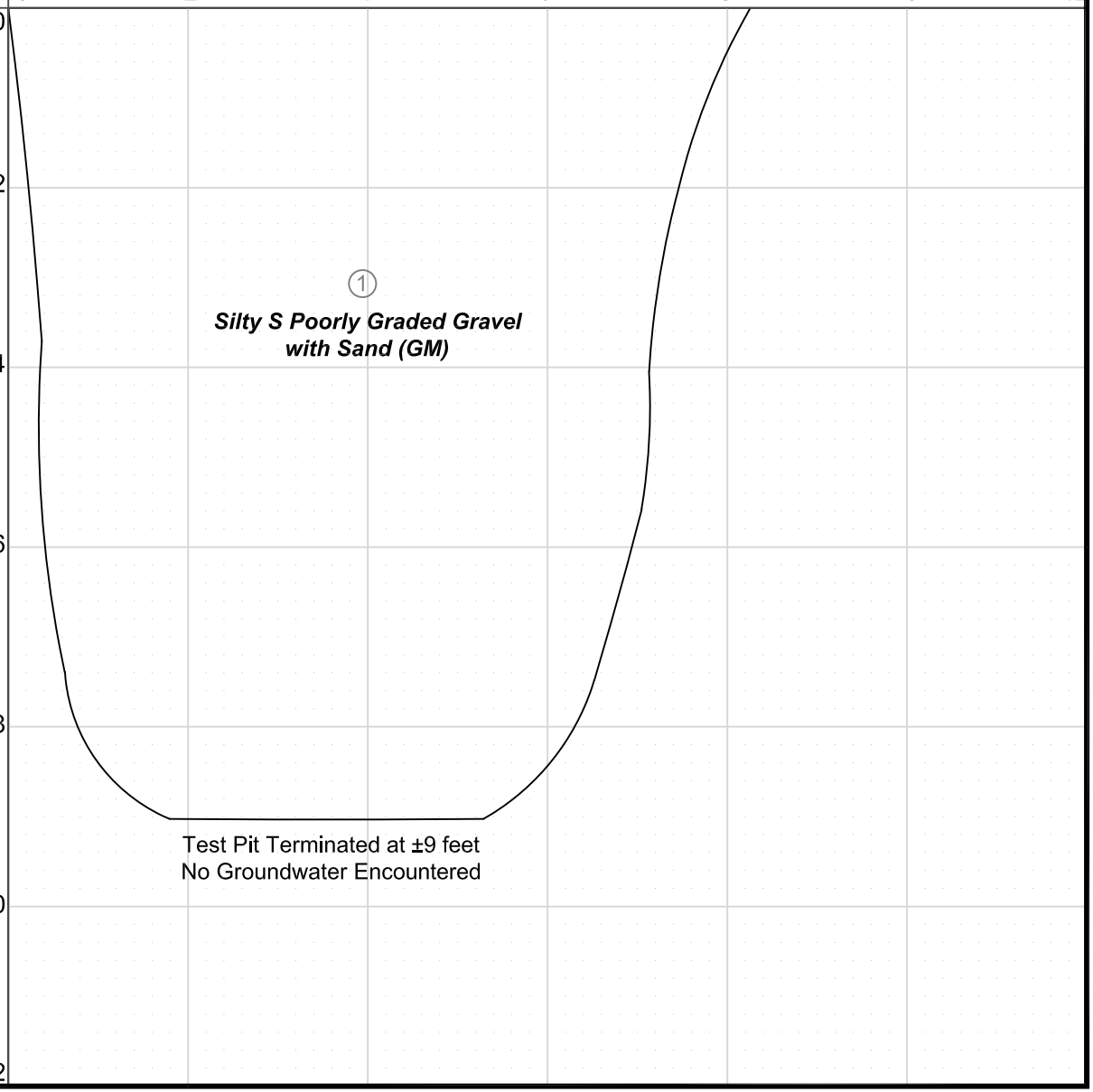
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-1

Logged By: BD GPS Coordinates: N 46.36355, E -119.25735

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Young Orchard (Trees)				
① 0-9.0' Dense, Gray, ***Poorly Graded Gravel with Sand (GP)***; dry to moist; rounded to subrounded gravel, some cobbles, trace boulders, maximum diam. 14 inches; subangular fine to coarse sand; trace nonplastic silt; weakly cemented near approximately 2-2.5 feet.	None Observed		S-1 ☒	0
				2
				4
				6
				8
Test Pit Terminated at ±9 feet No Groundwater Encountered				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 7/71

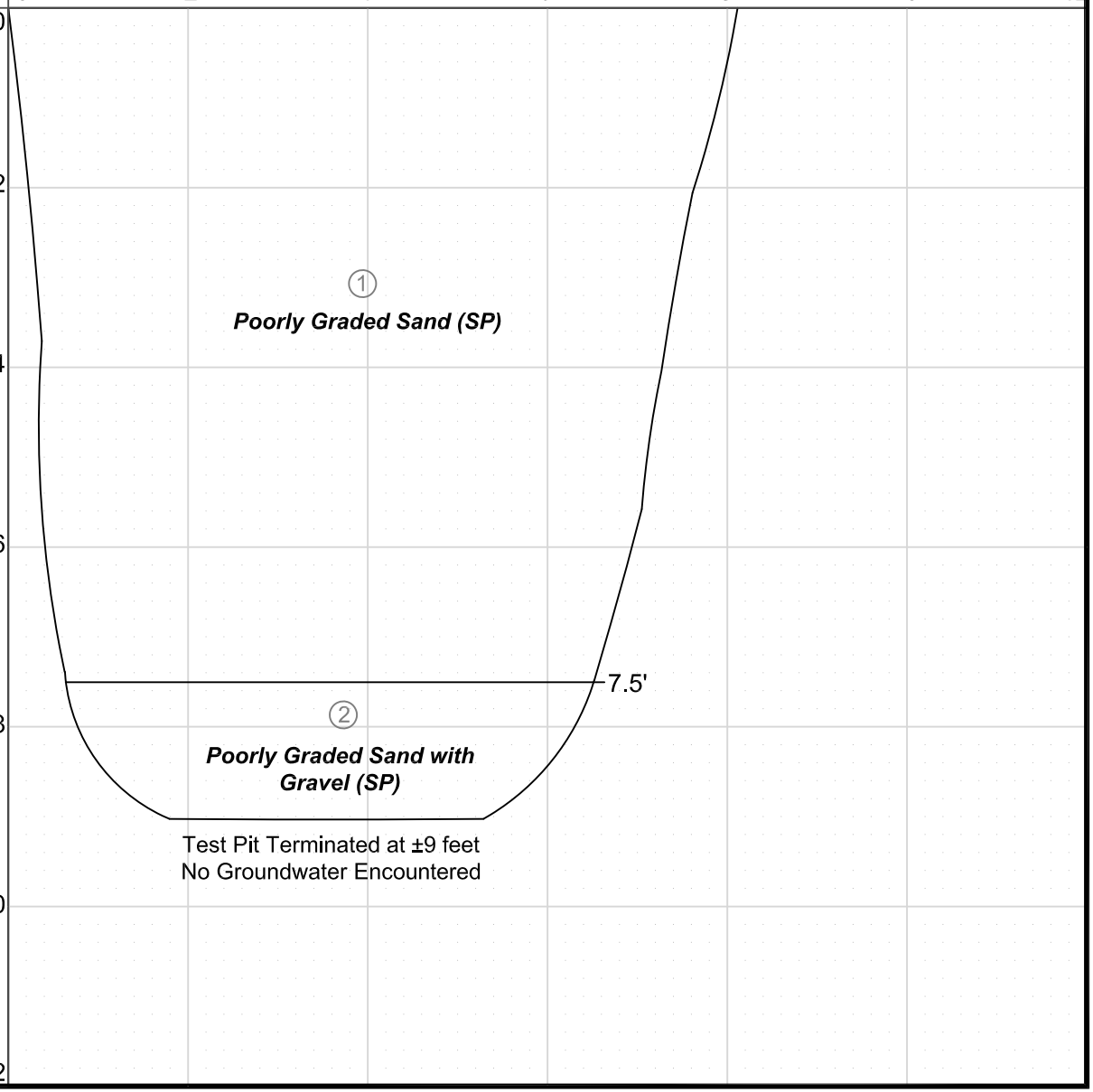
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-2

Logged By: BD GPS Coordinates: N 46.36355, E -119.25735

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Young Orchard (Trees)				
① 0-7.5' Medium dense, light brown, ***Poorly Graded Sand (SP)***; dry to moist; rounded to subrounded gravel, maximum diam. 4 inches; rounded to subangular; fine to medium sand; trace nonplastic silt.	None Observed			0
② 7.5-9.0' Dense, black, ***Poorly Graded Sand with Gravel (SP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 9 inches; rounded to subangular coarse sand; nonplastic silt.				8
Test Pit Terminated at ±9 feet No Groundwater Encountered				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 1

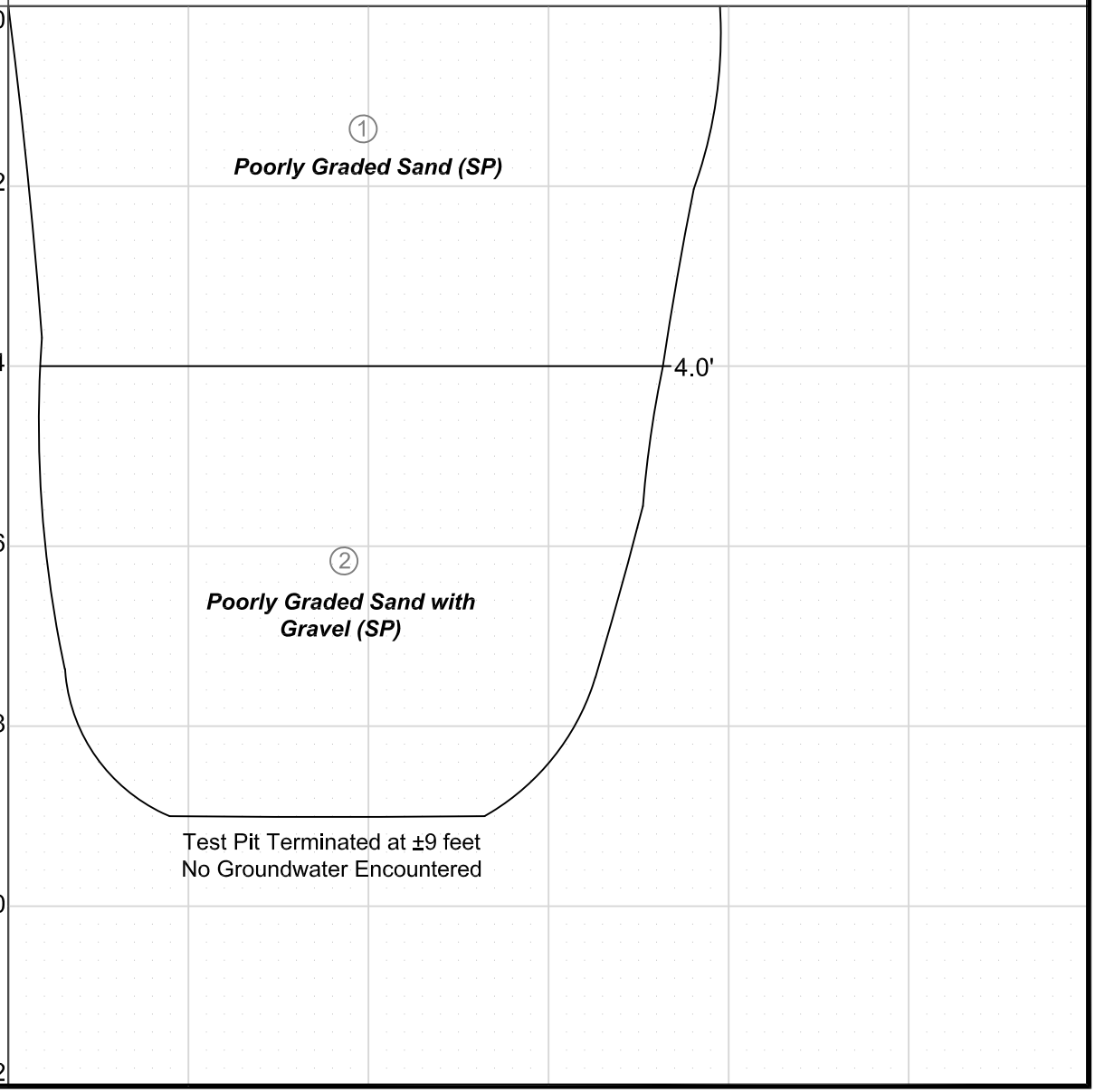
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-3

Logged By: BD GPS Coordinates: N 46.36800, E -119.25639

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-4.0' Medium dense, light brown, ***Poorly Graded Sand (SP)***; Moist; rounded to subrounded gravel, maximum diam. 4 inches; rounded to subangular; fine to medium sand; trace nonplastic silt; .	None Observed	9-50/0.5"	S-1	0
② 4.0-9.0' Dense, gray, ***Poorly Graded Sand with Gravel (SP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 7 inches; rounded to subangular coarse sand; trace nonplastic silt.			S-2	4
Test Pit Terminated at ±9 feet No Groundwater Encountered				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Road E/B Intersection

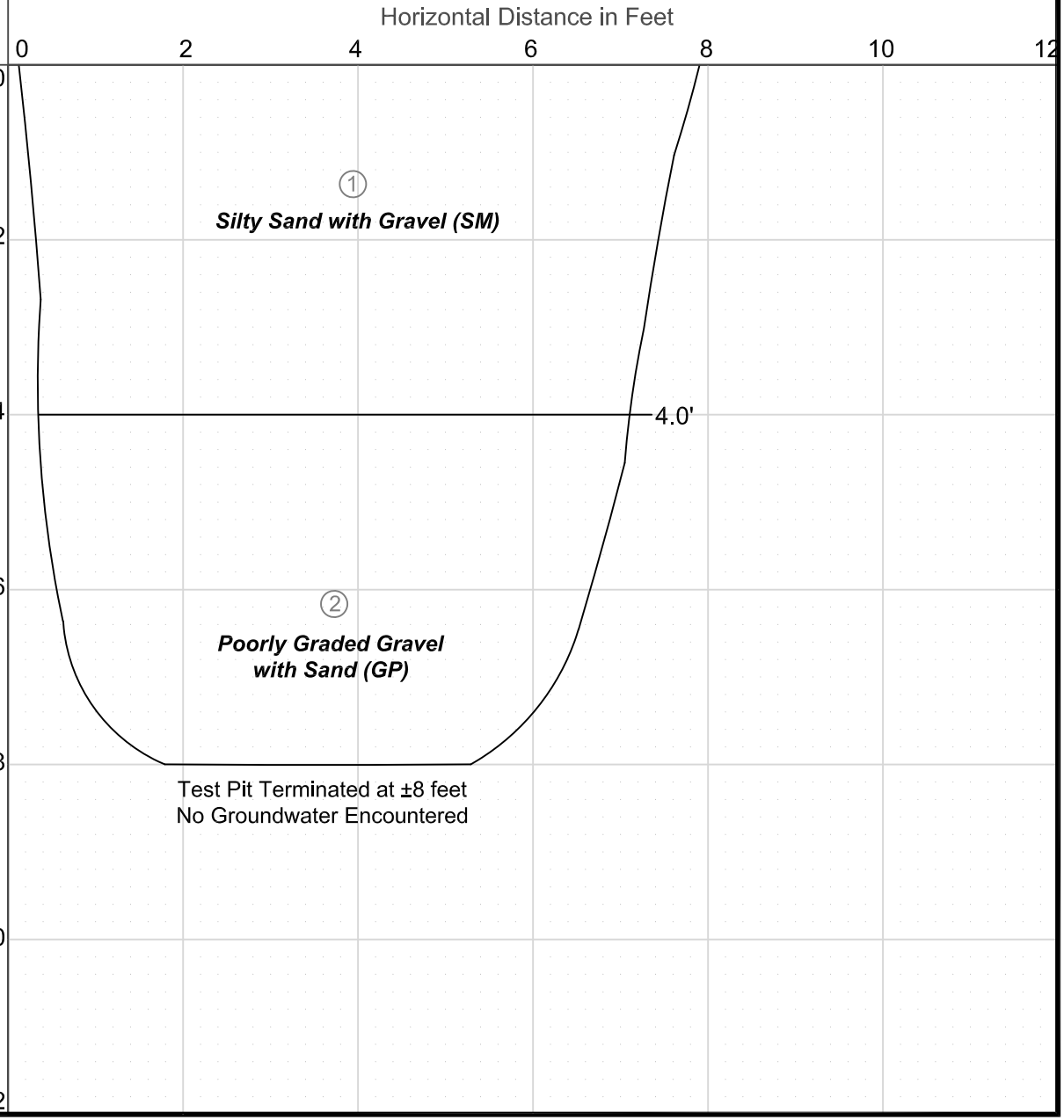
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-4

Logged By: BD GPS Coordinates: N 46.36062, E -119.25516

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-4.0' Medium dense, light brown, ***Silty Sand with Gravel (SM)***; Moist; rounded to subrounded gravel, maximum diam. 3 inches; rounded to subangular; fine to medium sand; nonplastic silt; weakly cemented.	None Observed	21-30-50/1"	S-1 ☒	0
② 4.0-8.0' Dense, gray, ***Poorly Graded Gravel with Sand (GP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 9 inches; rounded to subangular coarse sand; trace nonplastic silt.				4
Test Pit Terminated at ±8 feet No Groundwater Encountered				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Road B/C Intersection

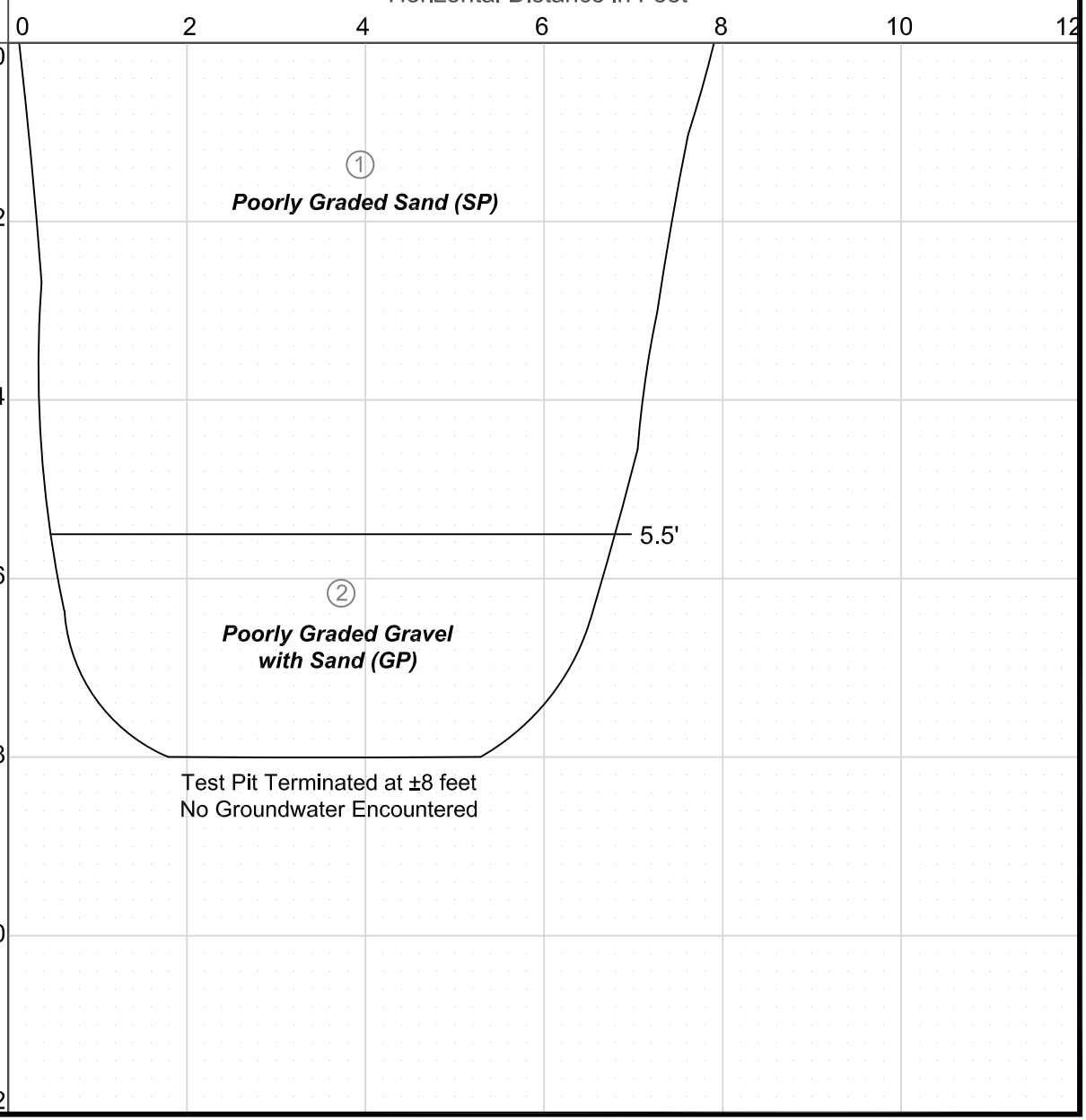
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-5

Logged By: BD GPS Coordinates: N 46.36197, E -119.25546

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-5.5' Medium dense, light brown, ***Poorly Graded Sand (SP)***; Moist; angular medium sand; trace nonplastic silt; roots present to approximately 4 feet.	None Observed	18-20-23	S-1	0
② 5.5-8.0' Dense, black/gray, ***Poorly Graded Gravel with Sand (GP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 9 inches; rounded to subangular coarse sand; trace nonplastic silt.			S-2	6
Test Pit Terminated at ±8 feet No Groundwater Encountered				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 13

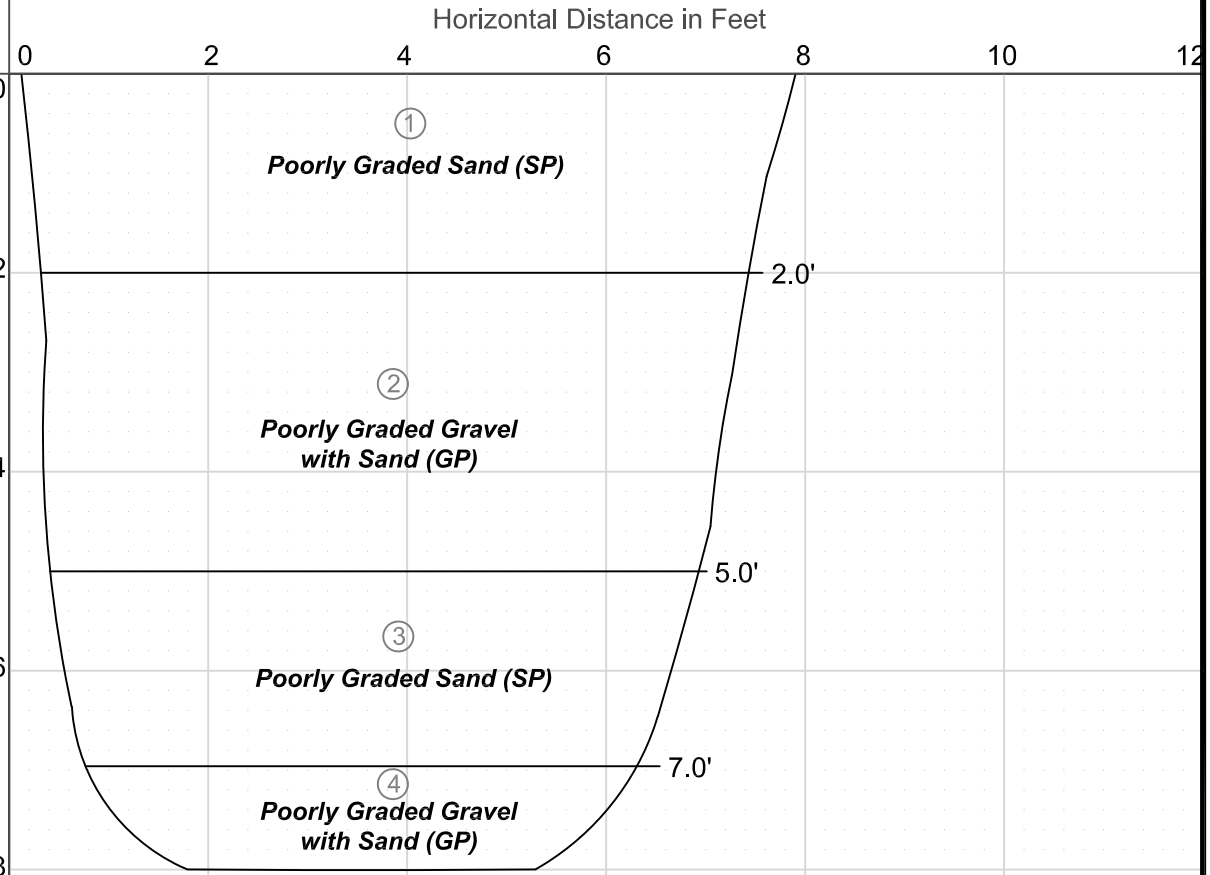
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-6

Logged By: BD GPS Coordinates: N 46.36351, E -119.25563

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-2.0' Medium dense, light brown, ***Poorly Graded Sand (SP)***; Moist; few rounded to subrounded gravel, maximum diam. 1 inches; angular medium sand; trace nonplastic silt.	None Observed			0
② 2.0-5.0' Dense, gray, ***Poorly Graded Gravel with Sand (GP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 8 inches; rounded to subangular medium to coarse sand; trace nonplastic silt.				2
③ 5.0-7.0' Medium dense, light brown, ***Poorly Graded Sand (SP)***; Moist; rounded to subrounded gravel, maximum diam. 1 inches; angular medium sand; trace nonplastic silt.				4
② 7.0-8.0' Dense, gray, ***Poorly Graded Gravel with Sand (GP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 8 inches; rounded to subangular medium to coarse sand; trace nonplastic silt.				6
Test Pit Terminated at ±8 feet No Groundwater Encountered				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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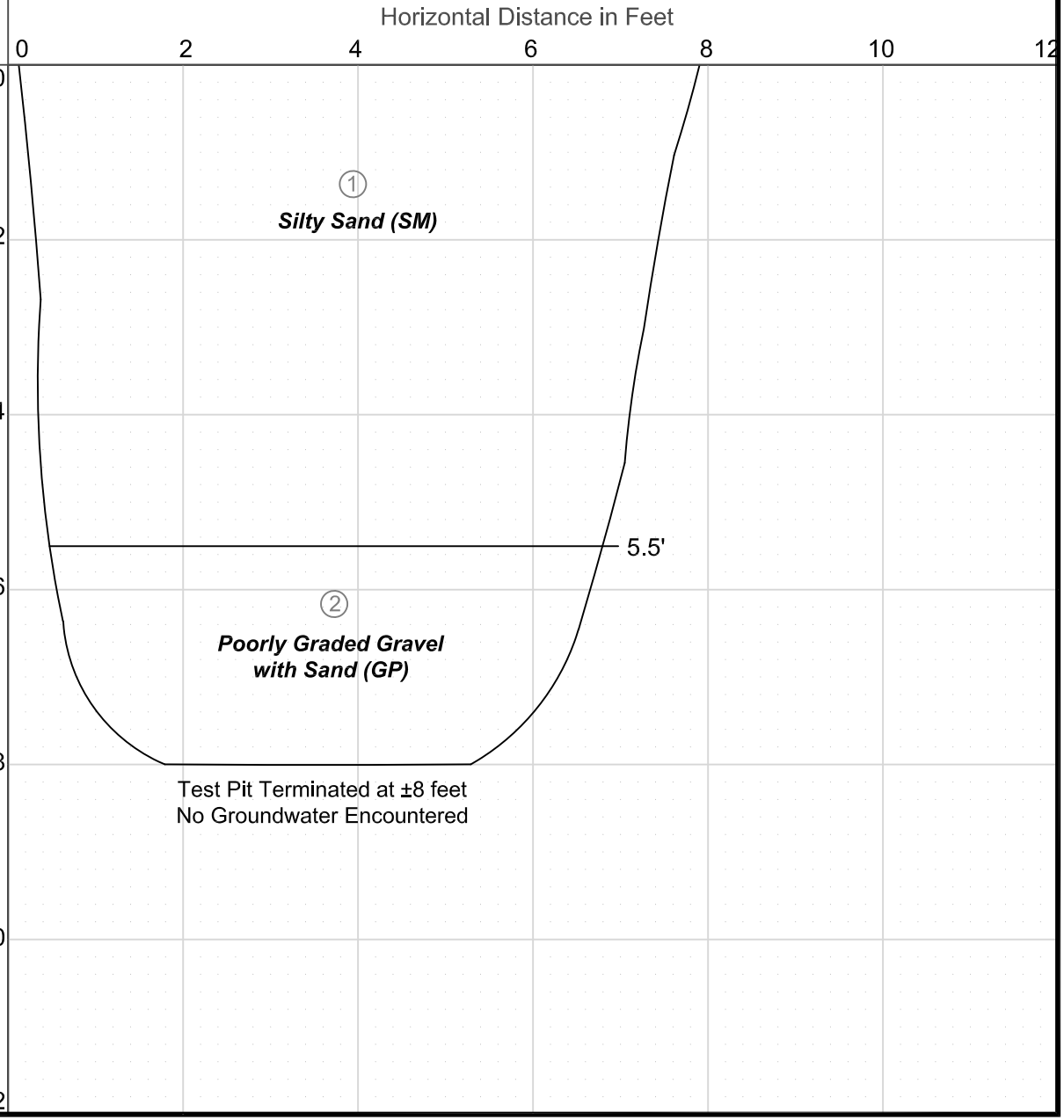
JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: ~Lot 59

PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-7 Logged By: BD GPS Coordinates: N 46.36317, E -119.25320

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-5.5' Medium dense, light brown, ***Silty Sand (SM)***; Moist; few rounded to subrounded gravel, maximum diam. 2 inches; angular medium sand; nonplastic silt; roots present to approximately 4 feet.	None Observed		S-1 ☒	0
② 5.5-8.0' Dense, gray, ***Poorly Graded Gravel with Sand (GP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 7 inches; rounded to subangular coarse sand; trace nonplastic silt.				6
Test Pit Terminated at ±8 feet No Groundwater Encountered				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 19/20

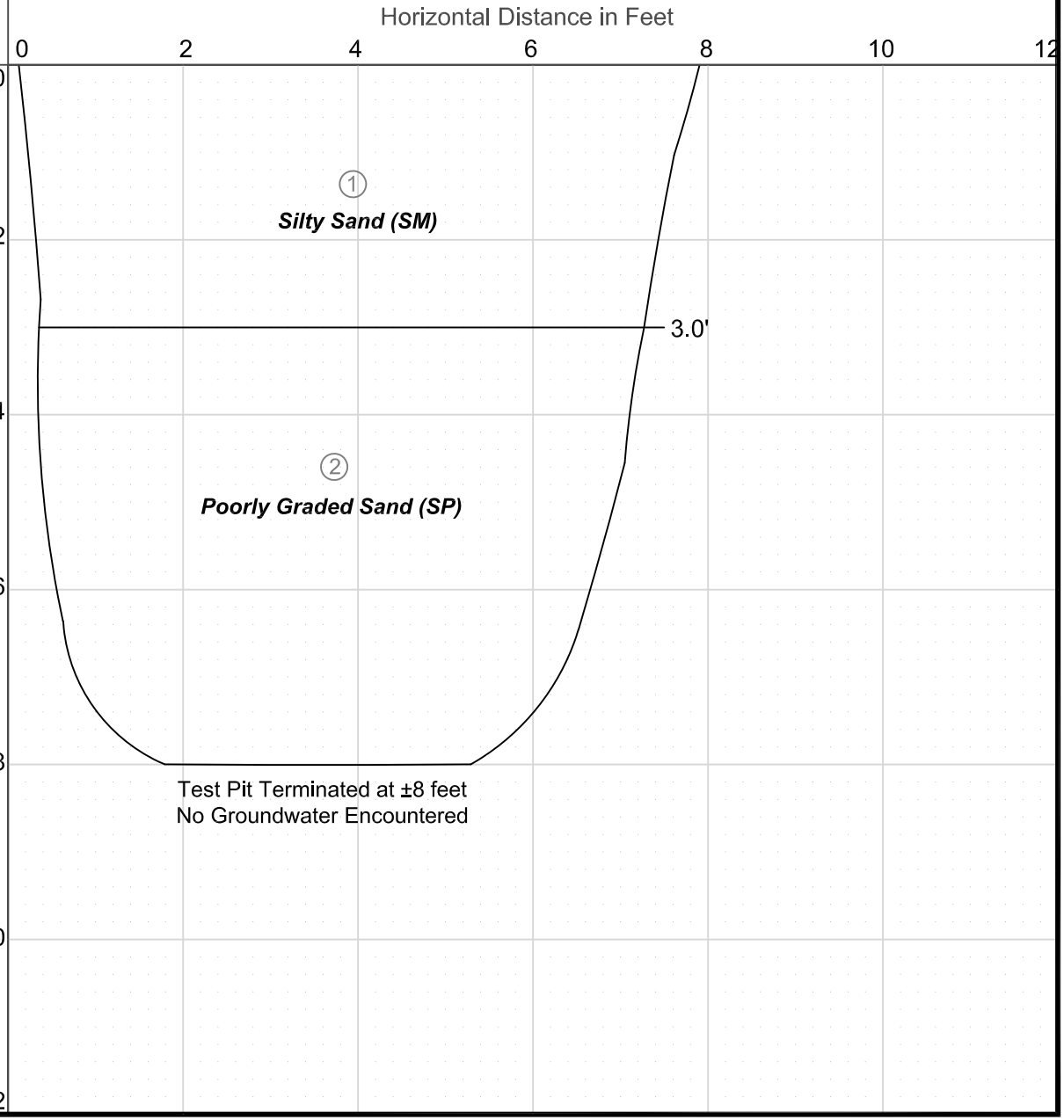
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-8

Logged By: BD GPS Coordinates: N 46.36388, E -119.25111

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-3.0' Medium dense, light brown, ***Silty Sand (SM)***; Moist; angular medium sand; nonplastic silt; roots present to approximately 4 feet.	None Observed			0
② 3.0-8.0' Dense, black/gray, ***Poorly Graded Sand (SP)***; moist; trace rounded to subrounded gravel, maximum diam. 4 inches; rounded to subangular fine to medium sand; trace nonplastic silt; some weak cementation; some sandy cross-bedding.		25-50/1.25"	S-1 ☒	4
Test Pit Terminated at ±8 feet No Groundwater Encountered				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Road D/B Intersection

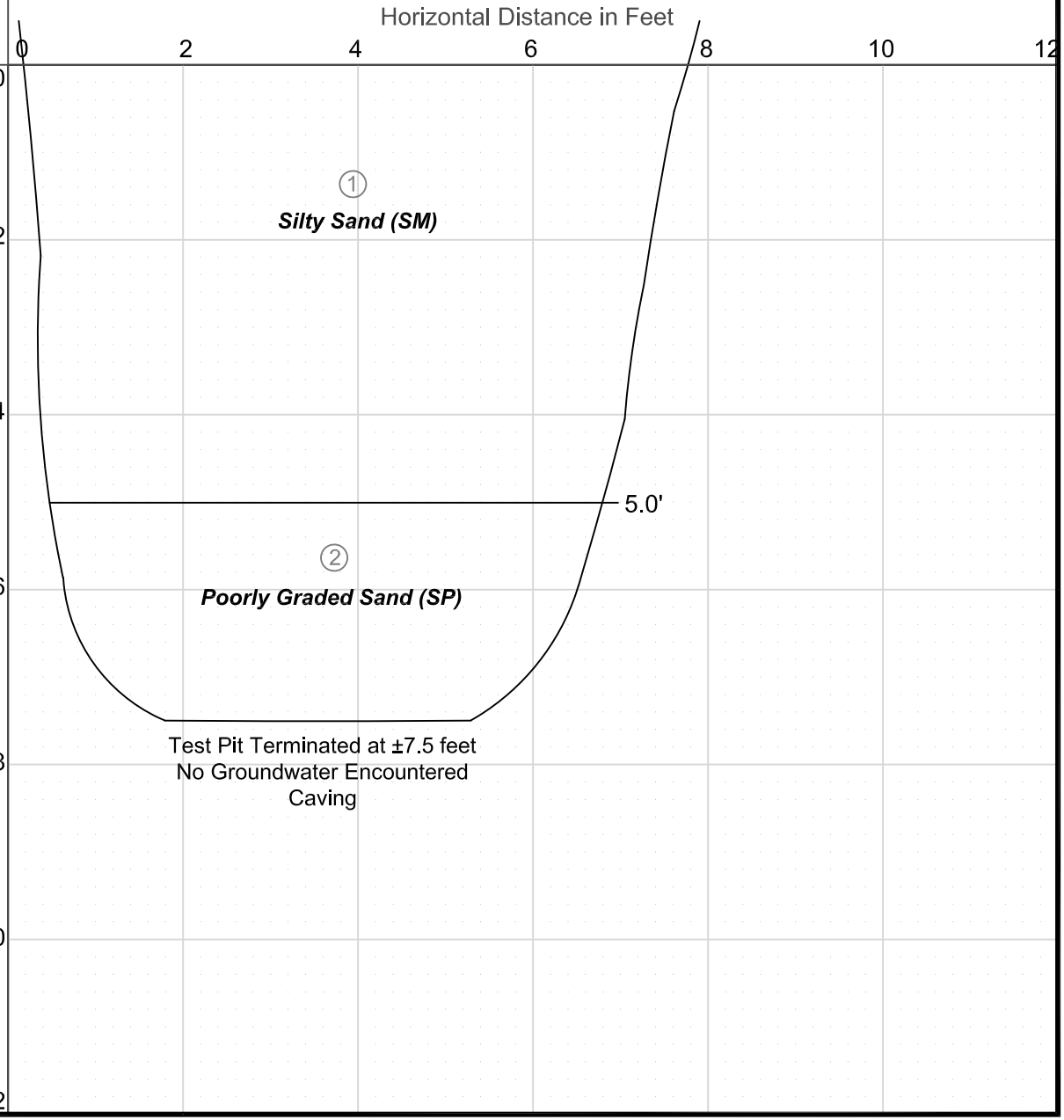
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-9

Logged By: BD GPS Coordinates: N 46.36280, E -119.25140

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-5.0' Medium dense, light brown, ***Silty Sand (SM)***; Moist; angular medium sand; nonplastic silt; weakly cemented.	None Observed			0
② 5.0-7.5' Dense, black/gray, ***Poorly Graded Sand (SP)***; moist; trace rounded to subrounded gravel, maximum diam. 4 inches; rounded to subangular fine to medium sand; trace nonplastic silt.				5.0'
Test Pit Terminated at ±7.5 feet No Groundwater Encountered Caving				12

Sketch of South Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Road E/D Intersection

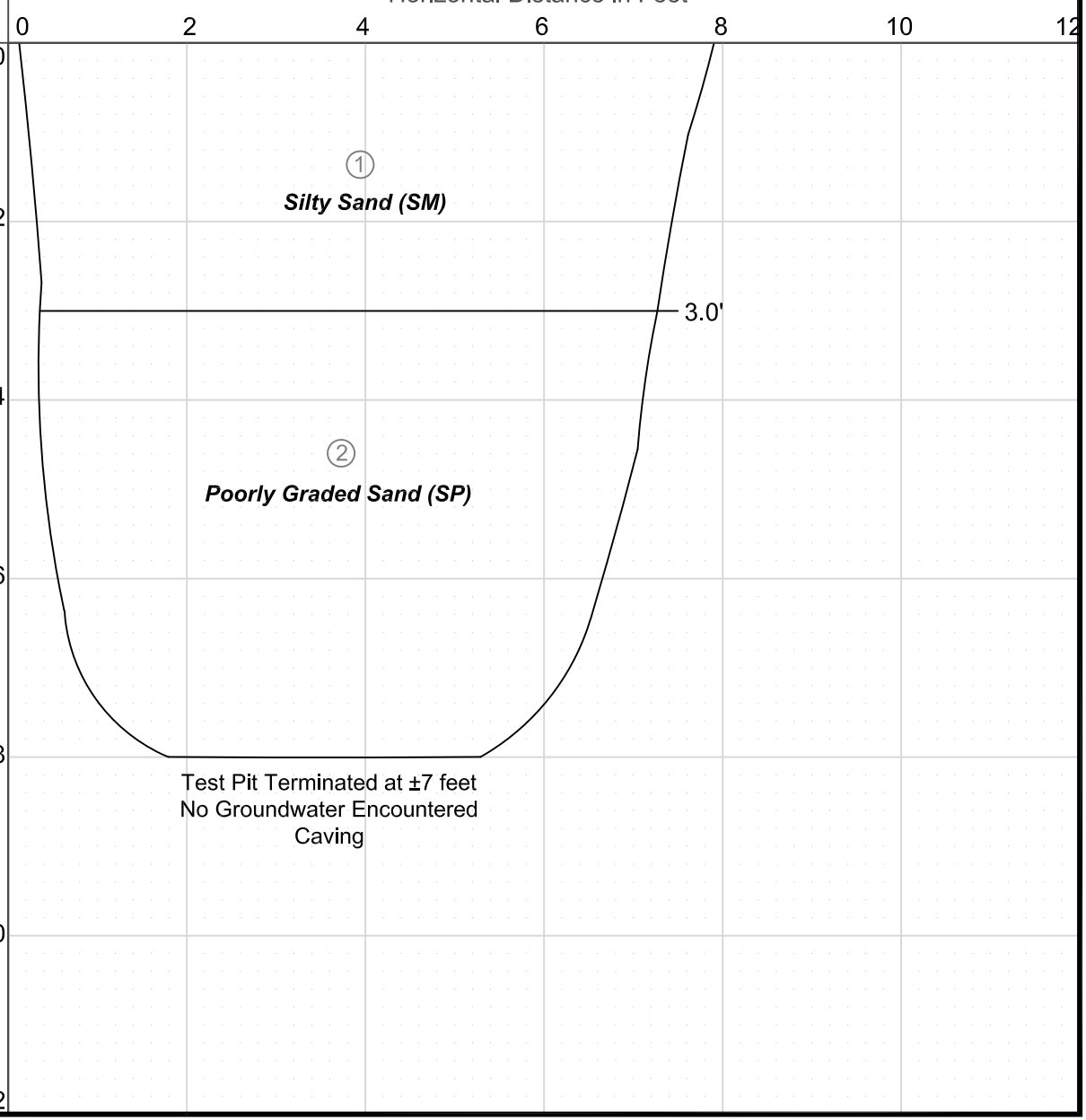
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-10

Logged By: BD GPS Coordinates: N 46.36087, E -119.252273

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-3.0' Medium dense, light brown, ***Silty Sand (SM)***; Moist; angular medium sand; nonplastic silt.	None Observed			0
② 3.0-7.0' Dense, black/gray, ***Poorly Graded Sand (SP)***; moist; trace rounded to subrounded gravel and cobbles, maximum diam. 5 inches; rounded to subangular fine to medium sand; trace nonplastic silt.			S-1 ☒	6
Test Pit Terminated at ±7 feet No Groundwater Encountered Caving				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 30/47

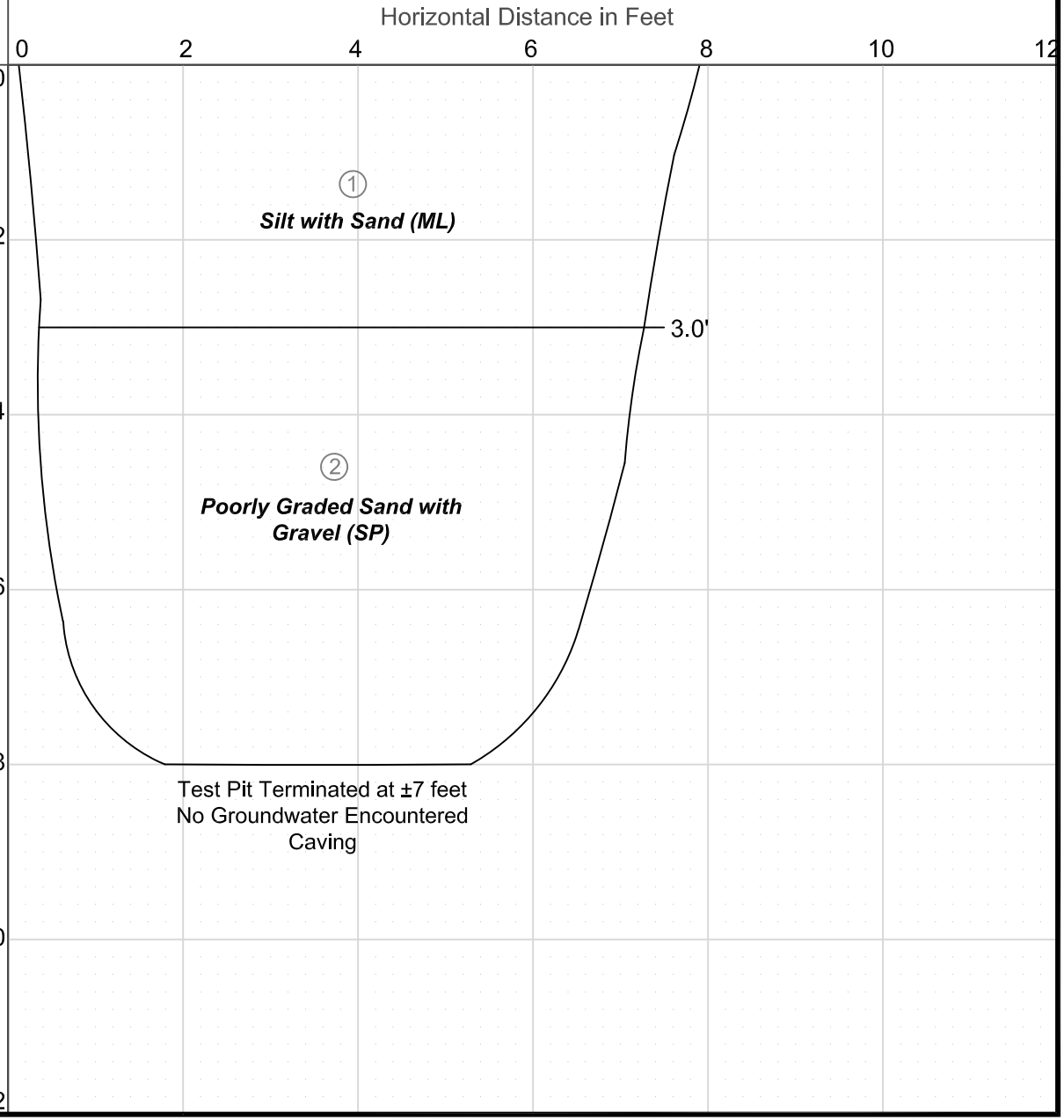
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-11

Logged By: BD GPS Coordinates: N 46.36000, E -119.24963

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-3.0' Stiff, light brown, ***Silt with sand (ML)***; Moist; angular medium sand; nonplastic silt.	None Observed			0
② 3.0-7.0' Dense, black/gray, ***Poorly Graded Sand with Gravel (SP)***; moist; trace rounded to subrounded gravel, maximum diam. 4 inches; rounded to subangular fine to medium sand; trace nonplastic silt.				2, 4, 6
Test Pit Terminated at ±7 feet No Groundwater Encountered Caving				8, 10, 12

Sketch of North Pit Side Surface Elevation:



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JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 36/45

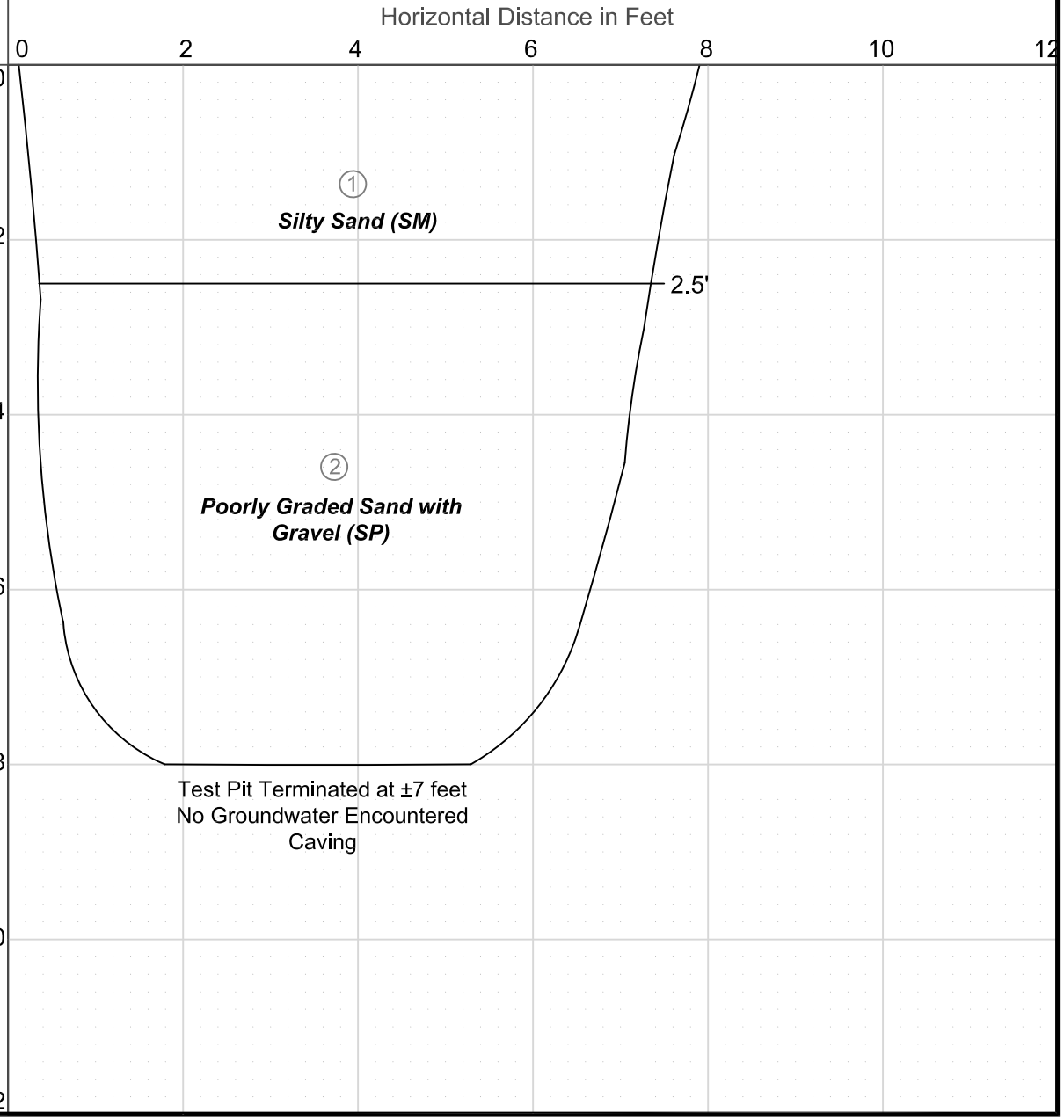
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-12

Logged By: BD GPS Coordinates: N 46.35927, E -119.25130

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-2.5' Medium dense, light brown, ***Silty Sand (SM)***; Moist; angular medium sand; nonplastic silt.	None Observed		S-1 ☒	0
② 2.5-7.0' Dense, black/gray, ***Poorly Graded Sand with Gravel (SP)***; moist; trace rounded to subrounded gravel and cobbles, maximum diam. 8 inches; rounded to subangular fine to medium sand.				2
				4
				6
Test Pit Terminated at ±7 feet No Groundwater Encountered Caving				8
				10
				12

Sketch of North Pit Side Surface Elevation:



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Yakima, WA 98902
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(509) 469-3070 Fax

JOB NO: 20-173 EX. DATE: 10/6/2020 LOCATION: Lot 39

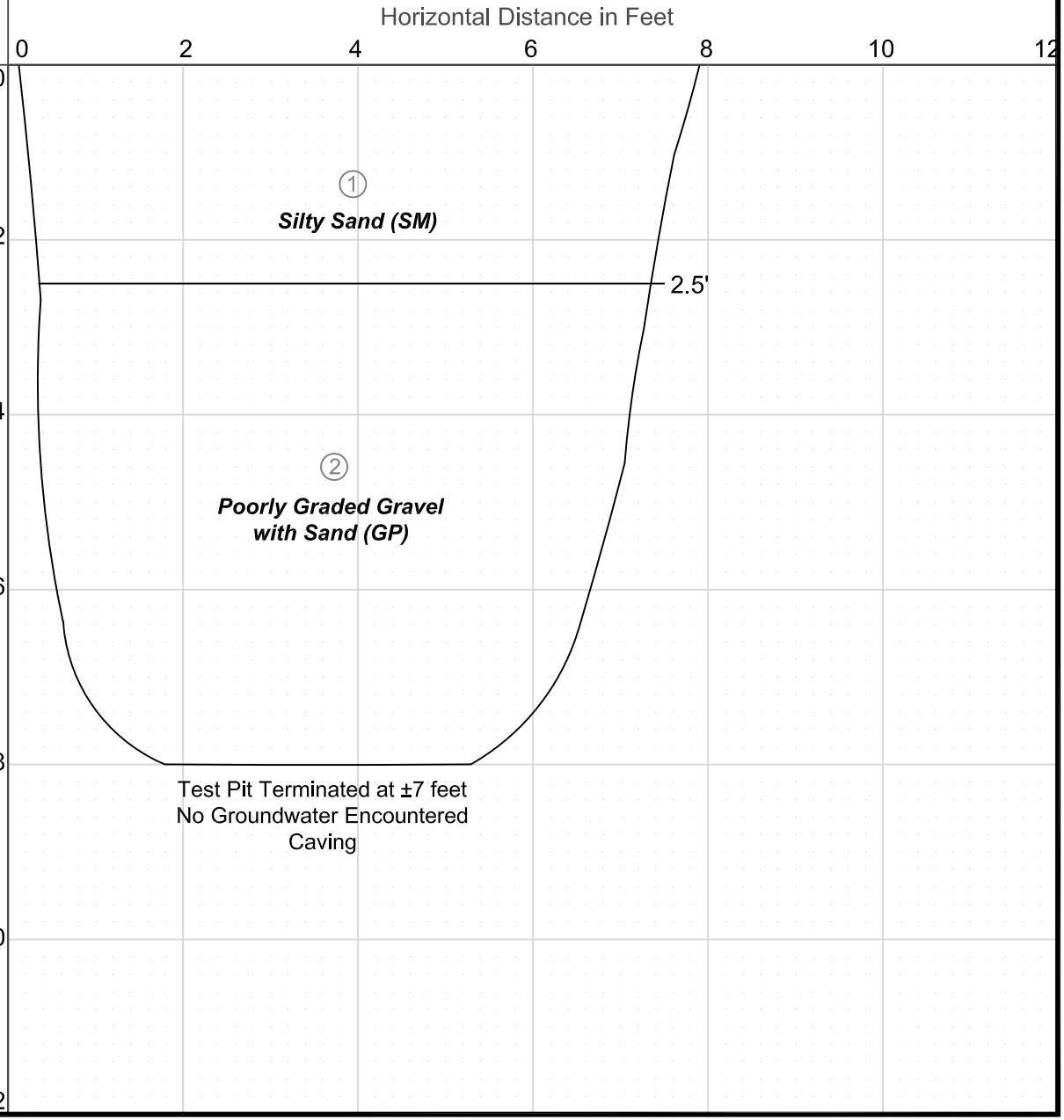
PROJECT: Columbia River Road Residential Development, Franklin County, WA

LOG OF Test Pit TP-13

Logged By: BD GPS Coordinates: N 46.35930, E -119.25405

SOIL DESCRIPTION	Ground Water	Blow Counts ASTM STP399	Samples	Depth, Ft.
Surface Description: Orchard (Trees)				
① 0-2.5' Medium dense, light brown, ***Silty Sand (SM)***; Moist; few rounded to subrounded gravel, maximum diam. 2 inches; angular medium sand; nonplastic silt.	None Observed		S-1	0
② 2.5-7.0' Dense, gray, ***Poorly Graded Gravel with Sand (GP)***; moist; rounded to subrounded gravel, some cobbles, maximum diam. 9 inches; rounded to subangular coarse sand; trace nonplastic silt.				2
				4
				6
Test Pit Terminated at ±7 feet No Groundwater Encountered Caving				8
				10
				12

Sketch of North Pit Side Surface Elevation:



APPENDIX B

LABORATORY TEST RESULTS

Baer Testing Inc.
1106 Ledwich Ave.
Yakima, WA 98902
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(509) 469-3070 Fax

CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP3 @ 2'	**SAMPLE NUMBER:**	20-1950-1
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS
ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4	99%	
3"			#8		
2 1/2"			#10	97%	
2"			#16		
1 1/2"			#20	94%	
1 1/4"			#30		
1"			#40	93%	
3/4"			#50		
5/8"			#60		
1/2"			#80	81%	
3/8"			#100	68%	
1/4"	100%		#200	19.5%	

SOIL MOISTURE DETERMINATION
ASTM D 2216

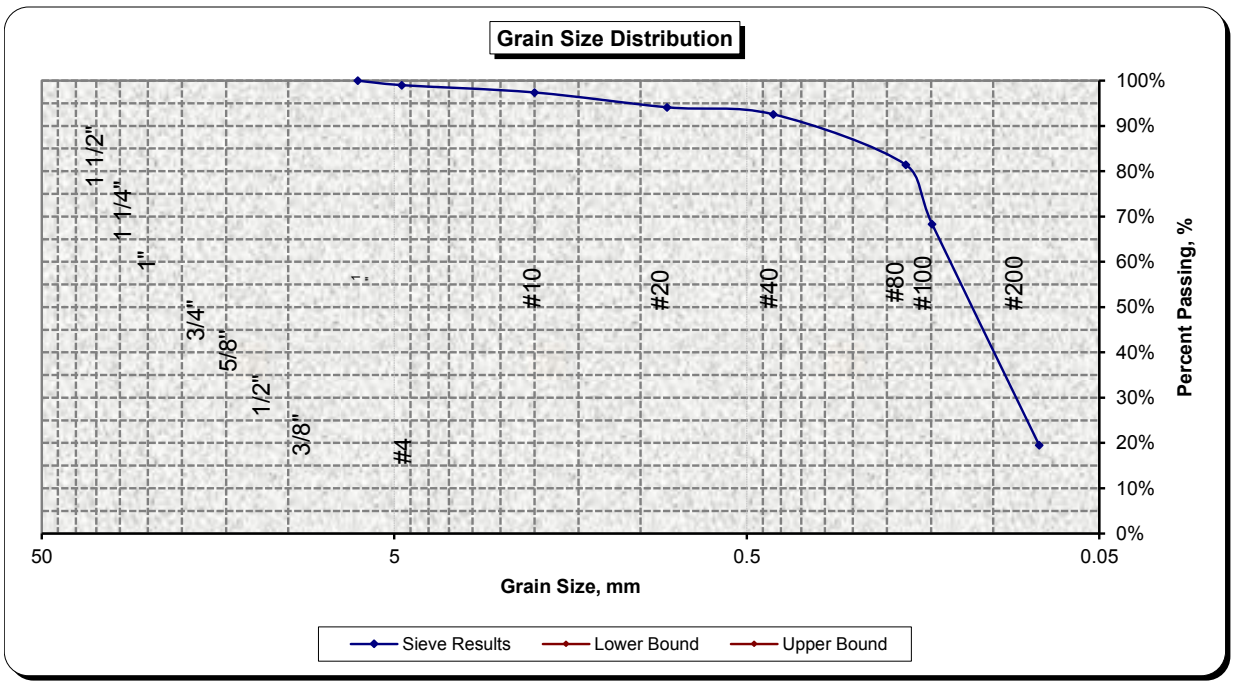
1.7%

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT
ASTM D 5821



REVIEWED BY:

X _____

Dee Burrie
Technical Director

Baer Testing Inc.
1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP7 @ 2.5'	**SAMPLE NUMBER:**	20-1950-2
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4		
3"			#8		
2 1/2"			#10	99%	
2"			#16		
1 1/2"			#20	98%	
1 1/4"			#30		
1"			#40	97%	
3/4"			#50		
5/8"	100%		#60		
1/2"	99%		#80	82%	
3/8"	98%		#100	75%	
1/4"			#200	38.3%	

SOIL MOISTURE DETERMINATION ASTM D 2216

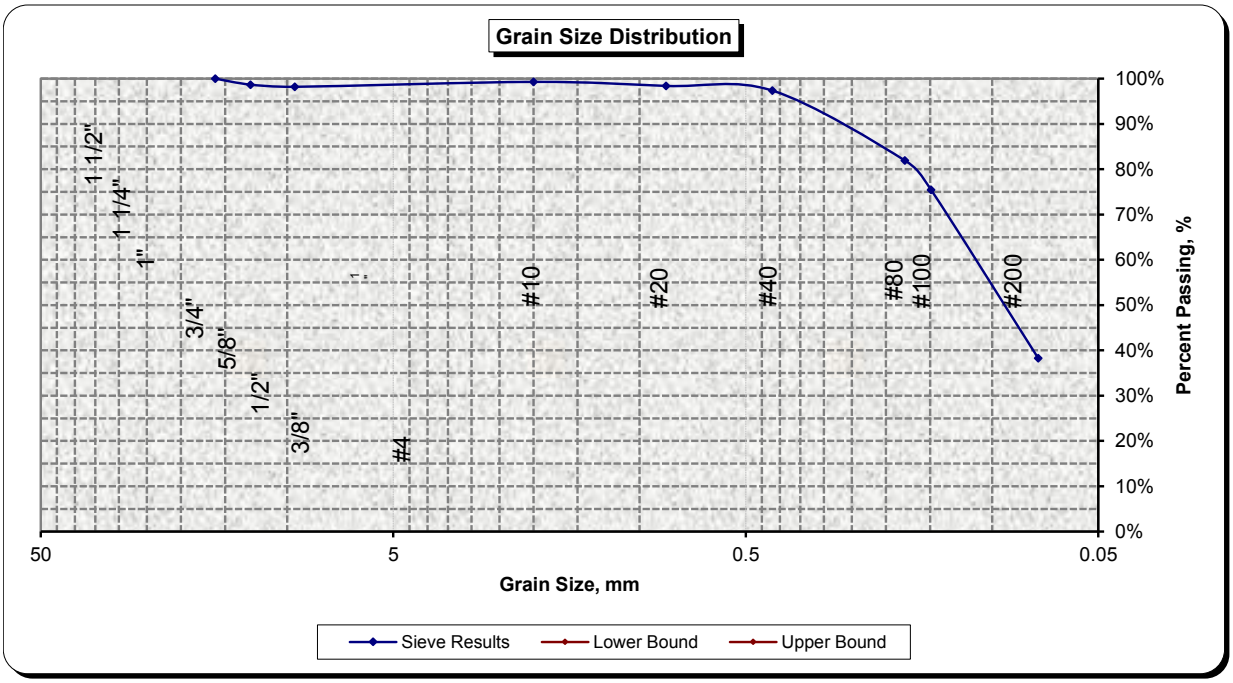
9.9%

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT ASTM D 5821



REVIEWED BY:

X _____

Dee Burrie
Technical Director

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1106 Ledwich Ave.
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CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP8 @ 3'	**SAMPLE NUMBER:**	20-1950-3
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4		
3"			#8		
2 1/2"			#10	99%	
2"			#16		
1 1/2"			#20	65%	
1 1/4"			#30		
1"			#40	15%	
3/4"			#50		
5/8"			#60		
1/2"			#80	9%	
3/8"			#100	8%	
1/4"			#200	5.3%	

SOIL MOISTURE DETERMINATION ASTM D 2216

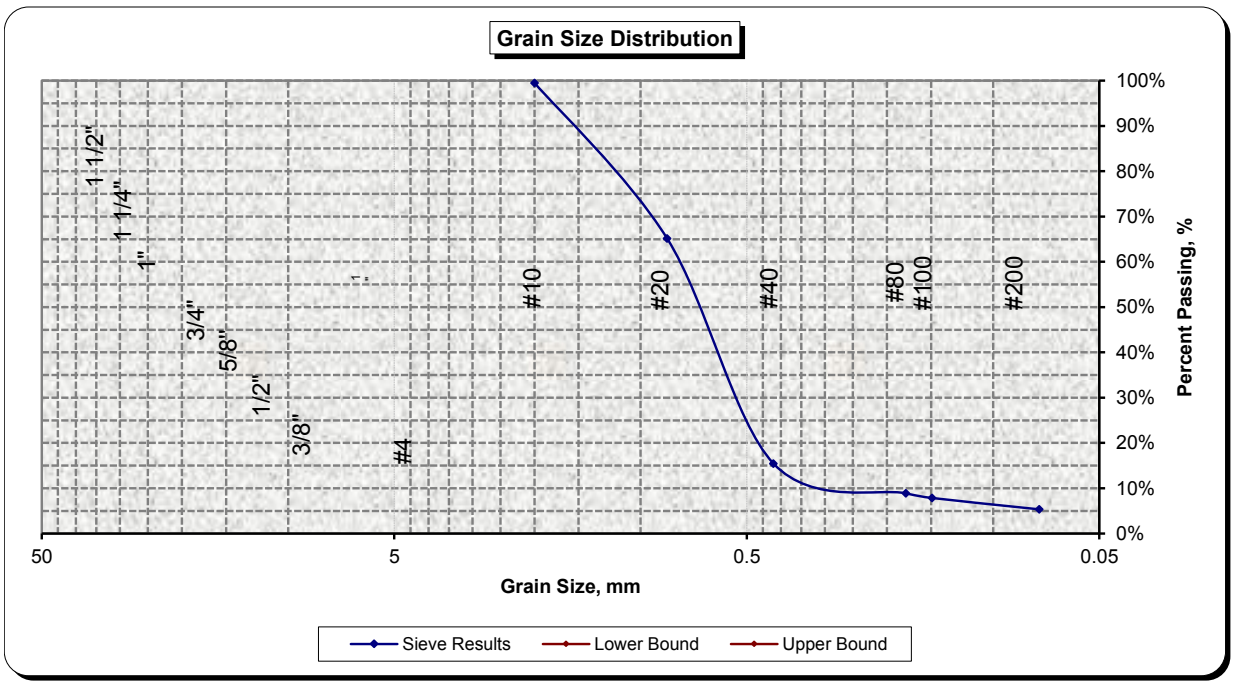
3.9%

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT ASTM D 5821



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Dee Burrie
Technical Director

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Yakima, WA 98902
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(509) 469-3070 Fax

CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP11 @ 2'	**SAMPLE NUMBER:**	20-1950-4
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4	98%	
3"			#8		
2 1/2"			#10	95%	
2"			#16		
1 1/2"			#20	88%	
1 1/4"			#30		
1"			#40	86%	
3/4"			#50		
5/8"	100%		#60		
1/2"	99%		#80	79%	
3/8"	99%		#100	75%	
1/4"			#200	54.3%	

SOIL MOISTURE DETERMINATION ASTM D 2216

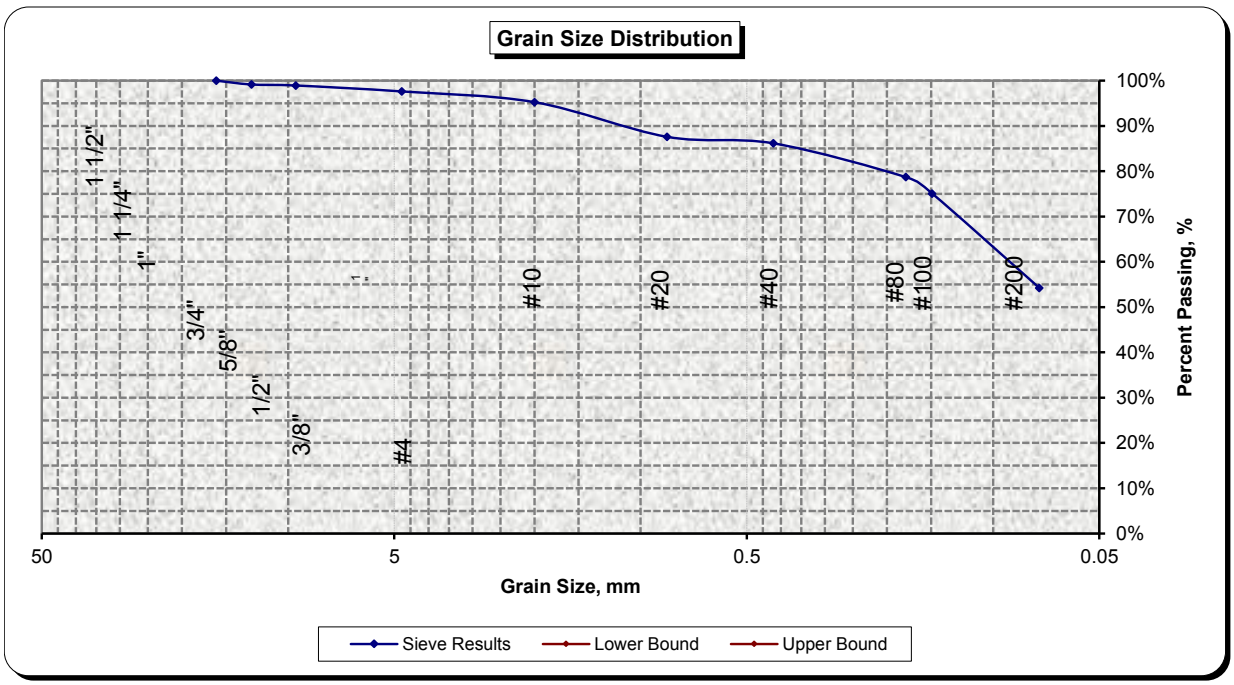
7.4%

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT ASTM D 5821



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Dee Burrie
Technical Director

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1106 Ledwich Ave.
Yakima, WA 98902
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(509) 469-3070 Fax

CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP5 @ 7'	**SAMPLE NUMBER:**	20-1950-5
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4	35%	
3"			#8		
2 1/2"	100%		#10	25%	
2"	96%		#16		
1 1/2"	91%		#20	11%	
1 1/4"			#30		
1"	81%		#40	8%	
3/4"	70%		#50		
5/8"	63%		#60		
1/2"	54%		#80	5%	
3/8"	46%		#100	5%	
1/4"			#200	4.0%	

SOIL MOISTURE DETERMINATION ASTM D 2216

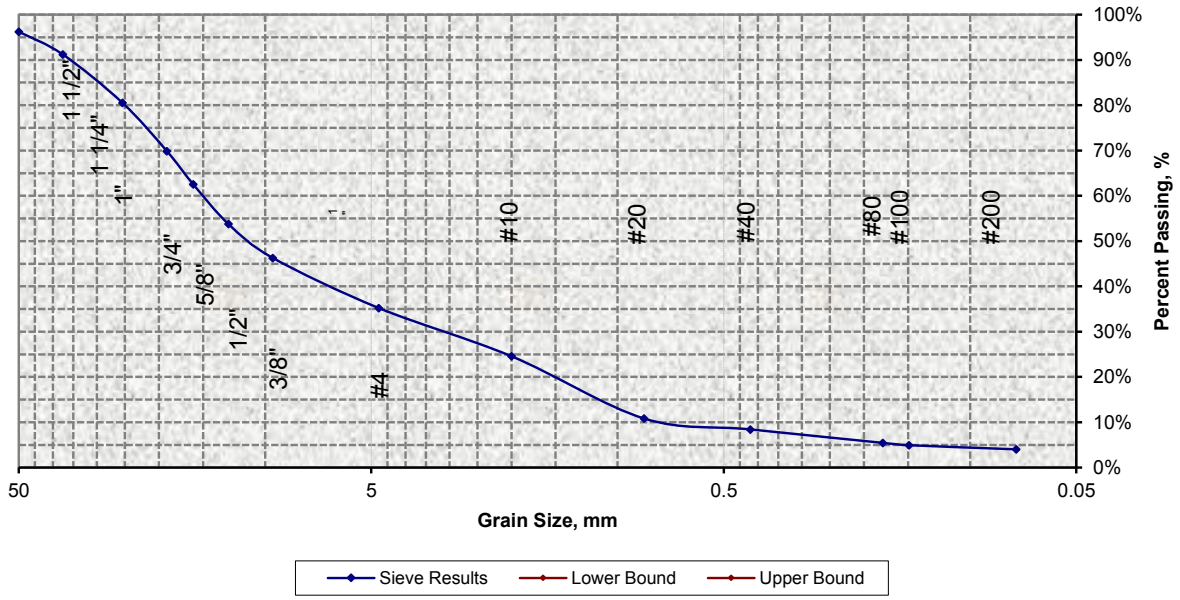
FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT ASTM D 5821

Grain Size Distribution



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Dee Burrie
Technical Director

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Yakima, WA 98902
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CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP10 @ 6'	**SAMPLE NUMBER:**	20-1950-6
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS
ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4	48%	
3"			#8		
2 1/2"	100%		#10	36%	
2"	97%		#16		
1 1/2"			#20	12%	
1 1/4"			#30		
1"	87%		#40	7%	
3/4"	81%		#50		
5/8"	76%		#60		
1/2"	69%		#80	5%	
3/8"	61%		#100	5%	
1/4"			#200	3.0%	

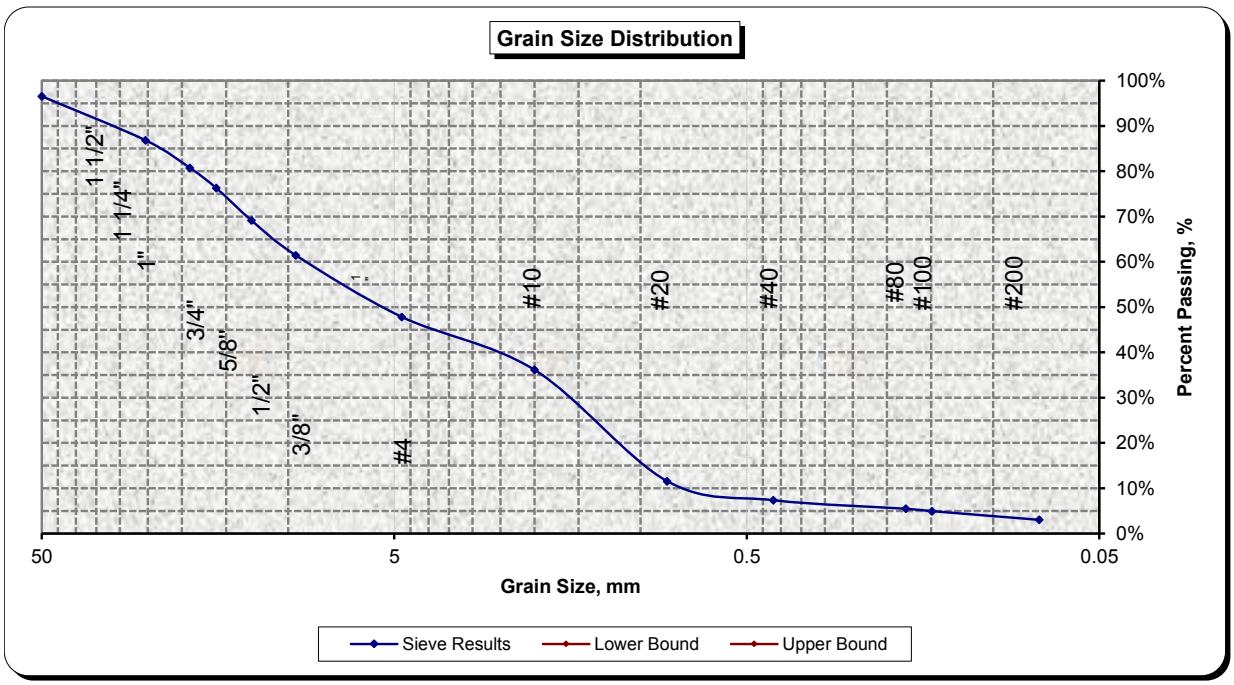
SOIL MOISTURE DETERMINATION
ASTM D 2216

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT
ASTM D 5821



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Dee Burrie
Technical Director

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Yakima, WA 98902
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(509) 469-3070 Fax

CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP4 @ 3'	**SAMPLE NUMBER:**	20-1950-7
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4	94%	
3"			#8		
2 1/2"			#10	93%	
2"			#16		
1 1/2"			#20	92%	
1 1/4"	100%		#30		
1"	98%		#40	91%	
3/4"	98%		#50		
5/8"	97%		#60		
1/2"	96%		#80	74%	
3/8"	95%		#100	59%	
1/4"			#200	18.4%	

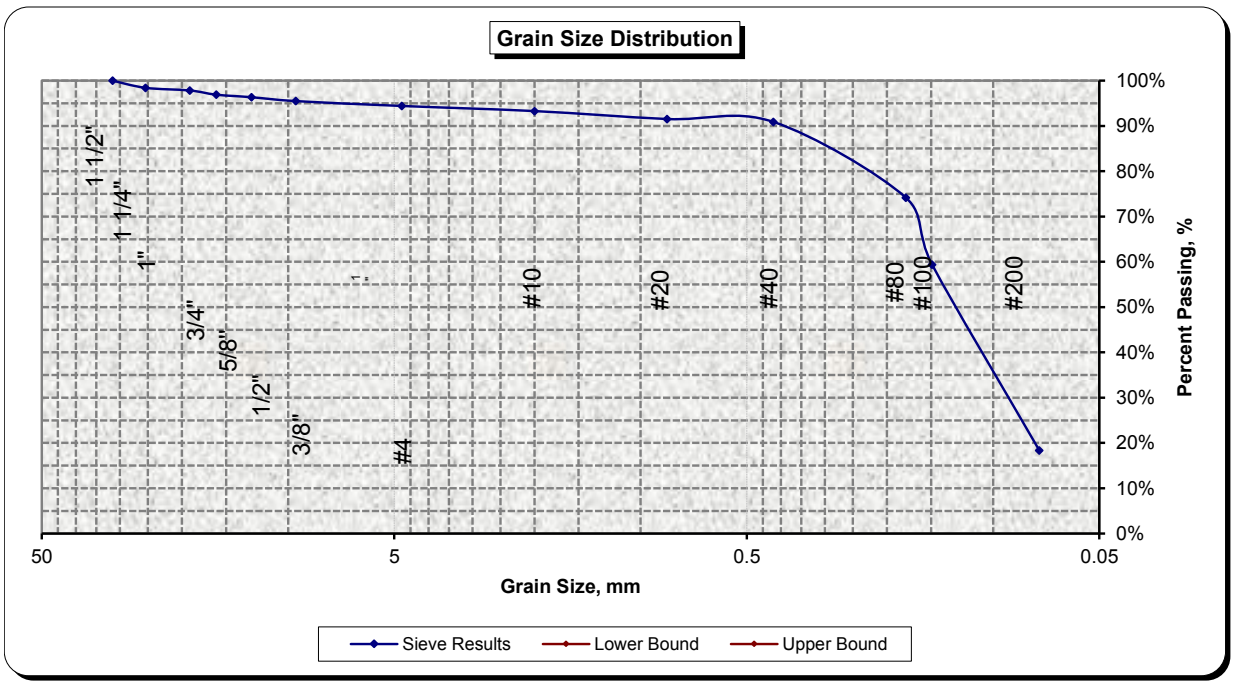
SOIL MOISTURE DETERMINATION ASTM D 2216

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT ASTM D 5821



REVIEWED BY:

X _____

Dee Burrie
Technical Director

Baer Testing Inc.
1106 Ledwich Ave.
Yakima, WA 98902
(509) 469-3068 Office
(509) 469-3070 Fax

CLIENT:	Big Sky Developers, LLC	**PROJECT NUMBER:**	20-173
PROJECT:	Columbia River Rd. Residential Dev.	**WORK ORDER #:**	20-1950
SAMPLE SOURCE:	TP3 @ 7'	**SAMPLE NUMBER:**	20-1950-8
DATE SAMPLED:	10/6/2020	**DATE TESTED:**	10/8/2020
MATERIAL TYPE:	Soil	**TESTED BY:**	AJD

Sampled in Accordance with ASTM D 75 and reduced in accordance with ASTM C 702 or D 421 unless otherwise noted.

SIEVE ANALYSIS OF SOILS ASTM C 136/D 1140

Sieve Size:	Percent Passing:	Specs:	Sieve Size:	Percent Passing:	Specs:
4"			#4	81%	
3"			#8		
2 1/2"			#10	54%	
2"			#16		
1 1/2"			#20	14%	
1 1/4"	100%		#30		
1"	99%		#40	8%	
3/4"	96%		#50		
5/8"	95%		#60		
1/2"	93%		#80	6%	
3/8"	90%		#100	5%	
1/4"			#200	2.8%	

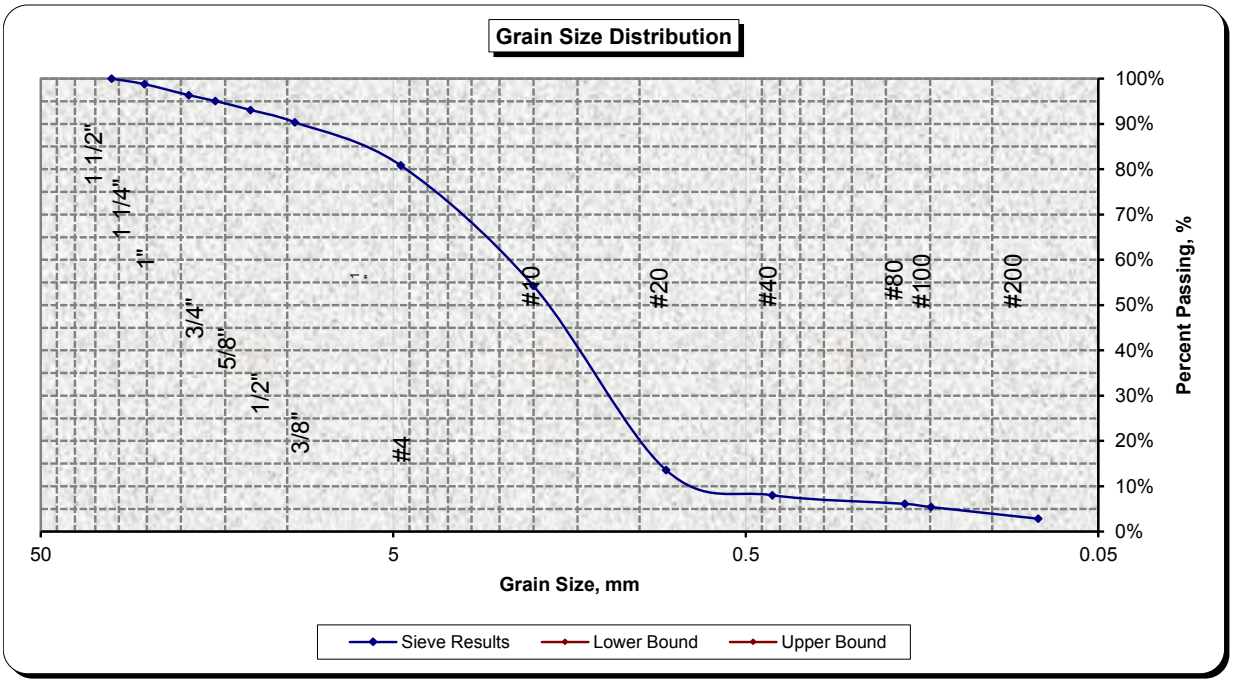
SOIL MOISTURE DETERMINATION ASTM D 2216

FINENESS MODULUS - ASTM C 136

HYDROMETER (.02MM) - D 422

FINER THAN #200 - C 117

FRACTURED FACE COUNT ASTM D 5821



REVIEWED BY:

X _____

Dee Burrie
Technical Director

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lab@nwag.com

PAP-Accredited
NAPT

BAER Testing Inc.
1106 Ledwich Ave.
Yakima, WA 98902

Report: 53331-1-1
Date: October 6, 2020
Project Name: Columbia River Rd
Project Number:

Sample ID	Organic Matter	Cation Exchange Capacity
TP3 @ 7’	1.08%	7.8 meq/100g
TP5 @ 7’	1.04%	11.1 meq/100g
TP10 @ 7’	0.92%	8.3 meq/100g
TP12 @ 7’	0.93%	6.9 meq/100g
Method	**ASTM D2974**	**EPA 9081**

Sample ID	Sand	Silt	Clay	Texture Class
TP3 @ 7’	84.0%	13.0%	3.0%	Loamy Sand
TP5 @ 7’	78.0%	17.0%	5.0%	Loamy Sand
TP10 @ 7’	84.0%	14.0%	2.0%	Loamy Sand
TP12 @ 7’	94.0%	4.0%	2.0%	Sand