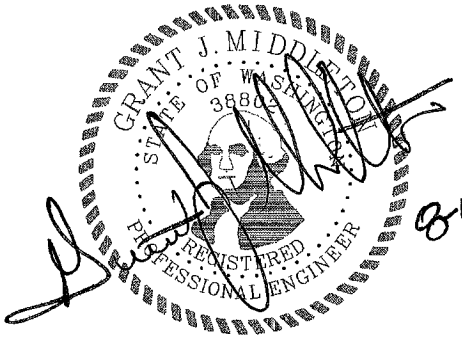
Larson & Associates
surveyors, engineers and planners
9027 Pacific Avenue, Suite 4
Tacoma, WA 98444

VELASQUEZ PROPERTY

STORMWATER SITE PLAN

PROPONENT:

RICK VELASQUEZ
13615 122ND ST E
PUYALLUP, WA. 98374
PH: (253) 224-4428



PREPARED BY:

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(253) 474-3404

March 8, 2023
REVISED: August 4, 2023

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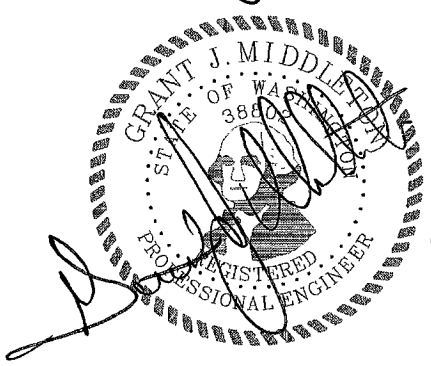
PROJECT ENGINEER'S CERTIFICATION

I hereby state that this Stormwater Site Plan for **Velasquez Property** project has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of storm drainage facilities prepared by me.

Grant J. Middleton, P.E.



8-4-2023

STORMWATER SITE PLAN

CHAPTER 1 – PROJECT OVERVIEW

This Stormwater Site Plan has been prepared to obtain a site development permit for this project proposal. The project scope is to proposed a new building onsite. The project area is approximately 9,950 sf with the roof area of the proposed building at 5,355 sf. A second building, "open" storage shed, is being proposed at 576 sf. The zoning falls under the ML – Limited Manufacturing. The sites parcel number 2105200140. The address of the site is 2315 Inter Ave.

The proposed building will be provided with a roof drain tightline around the perimeter of the building footprint to collect and convey roof drainage to a properly sized infiltration trench where stormwater will be infiltrated into the native soils below. The "open" storage shed will be replacing existing pavement and will release water to the existing pavement via downspouts and stormwater will be conveyed to the existing storm pond with no expansion to existing impervious surface area. All other disturbed pervious areas onsite will be amended per DOE BMP T5.13. Stormwater BMPS have been designed per the 2019 DOE Stormwater Management Manual.

CHAPTER 2 – EXISTING CONDITIONS SUMMARY

Surrounding properties consist of commercial and some residential properties. Inter Ave. is immediately adjacent to the site to the south. There is currently a building with an associated paved parking lot located on the subject property and the majority of the property is currently covered with impervious pavement and building roof surfaces. The existing building and parking lot with remain as is.

The site's existing topography is flat. The whole site has an approximate topographic elevation of ±60.0.

Per the NRCS soils information, the site consists of Briscot loam. This soil is a nearly level soil that is poorly drained. It formed in alluvium. The permeability is moderately high to high. See Appendix "B" of this report for additional existing soils information.

A geotechnical study was completed by GeoResources dated April 8, 2022. They concluded that infiltration of stormwater was feasible and recommended using a design infiltration rate of 2 in/hr. As specified in the geotechnical report prepared by GEORESOURCES, we have proposed to "raise" the building pad area and final grade at the proposed infiltration trench location a minimum of 1 foot by over-excavating a minimum of 2 feet below native grade at building pad and then building the grade back up with structural material 3 feet (min.) to achieve 1 foot (min.) "raise" in pad grade. This increase in grade around the building will also be completed to help facilitate required separation from bottom of stormwater infiltration trench to seasonal groundwater elevation of 1 foot (min.). The project geotechnical engineer shall be onsite during these operations to provide inspection/testing and to ensure suitable material is utilized to "build" the structural pad for the building and that the infiltration trench is "seated" in suitable native soil for infiltration of stormwater. See the geotechnical report located in Appendix "B" for additional information.

No critical areas, 100-year flood hazard zones, or wells are known of or were noted on or in the direct vicinity of the project site.

CHAPTER 3 – OFF-SITE ANALYSIS

We do not expect any offsite stormwater to enter the site from the surrounding properties. Also, all stormwater created with this proposal will be infiltrated onsite without any offsite discharge of "design" storm events.

CHAPTER 4 – PERMANENT STORMWATER CONTROL PLAN

SECTION 1 – PRE-DEVELOPED SITE HYDROLOGY

As previously mentioned, surrounding properties consist of commercial and some residential properties. Inter Ave. is immediately adjacent to the site to the south. There is currently a building with an associated paved parking lot located on the subject property and the majority of the property is currently covered with impervious pavement and building roof surfaces. The existing building and parking lot with remain as is.

The site's existing topography is flat. The whole site has an approximate topographic elevation of ±60.0.

SECTION 2 – DEVELOPED SITE HYDROLOGY

The proposed building will be provided with a roof drain tightline around the perimeter of the building footprint to collect and convey roof drainage to a properly sized infiltration trench where stormwater will be infiltrated into the native soils below. While it is not anticipated that this stormwater proposed infiltration trench will experience overflow discharge any larger than design storm event would "bubble up" through the lowest inlet grate and flow overland to the west onsite towards the existing storm pond. Surface flows would then be intercepted by the pond and routed through the existing storm system out to the public storm system to the south in Inter Avenue. The "open" storage shed will be replacing existing pavement and will release water to the existing pavement via downspouts and stormwater will be conveyed to the existing storm pond with no expansion to existing impervious surface area. All other disturbed pervious areas onsite will be amended per DOE BMP T5.13.

New/Replaced Impervious Surface Total = 5,931 sf.

Developed Area Table	
Total	9,950 sf.
Pervious (Yard/Landscape)	4,019 sf.
Impervious	5,931 sf.
Building Roof (new imp.)	5,355 sf.
"Open" Storage Shed (replaced imp.)	576 sf.

SECTION 3 – PERFORMANCE STANDARDS AND GOALS

Minimum requirements 1-10 apply to this project as written in the 2019 Department of Ecology Stormwater Management Manual for Western Washington as we are proposing more than 5,000 SF of replaced impervious surface. See the attached Flow Chart for

Determining Requirements for Redevelopment in Appendix "B" for additional information. See below for additional information regarding the minimum requirements, which have been addressed.

Discussion of Minimum Requirements 1-10:

a. Minimum Requirement #1: Preparation of Stormwater Site Plan
This report and the associated plan set fulfill this requirement.

b. Minimum Requirement #2: Construction SWPPP
The separate document titled "Construction SWPPP" fulfills this requirement.

c. Minimum Requirement #3: Source Control of Pollution
Appendix "A" of the Construction SWPPP contains information on BMP'S to Consider for all Activities, site specific BMP'S for SFR's as well as Source Control BMP'S that will satisfy this requirement.

d. Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls
This requirement is met since stormwater from all replaced impervious surfaces will be collected on-site with release to its natural downstream direction of flow.

e. Minimum Requirement #5: On-Site Stormwater Management
All stormwater created will be infiltrated onsite within a properly sized infiltration trench designed per the 2019 DOE Stormwater Management Manual.

f. Minimum Requirement #6: Runoff Treatment
This project is only proposing roof runoff which is considered clean by Department of Ecology standards. No formal treatment is required.

g. Minimum Requirement #7: Flow Control
Flow control is being met through infiltration of all stormwater runoff from this proposal. See the calculations in the section titled "Stormwater Calculations".

h. Minimum Requirement #8: Wetlands Protection
While we have no records of any surrounding delineated wetlands within a ¼ mile of the site we have reviewed Figure I-3.5 from the 2019 SWMMWW and plan to employ standard erosion control BMPs such as siltation fencing along the down gradient side of the site and installation of CB inlet protection within all existing catchbasins onsite to ensure this very minimal development proposal does not have any negative impacts on any offsite areas. We would also like note that the proposed impervious surface associated with this project proposal has been designed to fully infiltrate "design" storm events within the proposed underground infiltration trench facility as modeled with an approved continuous runoff model (MGS FLOOD). Further, any disturbed pervious surfaces onsite associated with this project will be properly soil amended following D.O.E. soil amendment BMP T5.13, as required.

i. Minimum Requirement #9: Basin/Watershed Planning
This requirement is met since new impervious surface runoff proposed will be collected and infiltrated onsite.

j. Minimum Requirement #10: Operation and Maintenance
See Appendix "A" Operation and Maintenance Manual for required information.

k. Additional Requirement #1: Financial Liability
At this time no bonding has been required by the City of Puyallup.

l. Additional Requirement #2: Off-Site Analysis and Mitigation
See Chapter 3 for information.

SECTION 4 – FLOW CONTROL SYSTEM

As previously discussed, the proposed building will be provided with a roof drain tightline around the perimeter of the building footprint to collect and convey roof drainage to a properly sized infiltration trench where stormwater will be infiltrated into the native soils below. Emergency overflow will be provided via bubbling up through an inlet grate and flowing overland to the existing storm pond. All other disturbed areas will be amended per DOE BMP T5.13.

SECTION 5 – WATER QUALITY SYSTEM

This project is only proposing roof runoff which is considered clean by Department of Ecology standards. No formal treatment is required.

SECTION 6 – CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Our proposal includes a 6" storm pipe to convey all of the on-site stormwater. A sizing calculation has been provided in the section titled "Stormwater Calculations" which proves the pipe size is adequate.

CHAPTER 5 – CONSTRUCTION SWPPP

See the separate document titled "Construction SWPPP" for additional information.

CHAPTER 6 – SPECIAL REPORT AND STUDIES

A geotechnical study was completed by GeoResources dated April 8, 2022. They concluded that infiltration of stormwater was feasible and recommended using a design infiltration rate of 2 in/hr. As specified in the geotechnical report prepared by GEORESOURCES, we have proposed to "raise" the building pad area and final grade at the proposed infiltration trench location a minimum of 1 foot by over-excavating a minimum of 2 feet below native grade at building pad and then building the grade back up with structural material 3 feet (min.) to achieve 1 foot (min.) "raise" in pad grade. This increase in grade around the building will also be completed to help facilitate required separation from bottom of stormwater infiltration trench to seasonal groundwater elevation of 1 foot (min.). The project geotechnical engineer shall be onsite during these operations to provide inspection/testing and to ensure suitable material is utilized to "build" the structural pad for the building and that the infiltration trench is "seated" in

suitable native soil for infiltration of stormwater. See the geotechnical report located in Appendix "B" for additional information.

CHAPTER 7 – OTHER PERMITS

Other permits for this project are as follows (but not limited to):
SEPA; Site Plan Review; Demolition and Building Permit

CHAPTER 8 – OPERATION AND MAINTENANCE MANUAL

See Appendix "A" Operation and Maintenance Manual for required information.

CHAPTER 9 – BOND QUANTITIES WORKSHEET

No bonds are required at this time, therefore this chapter is not applicable.

STORMWATER CALCULATIONS

LARSON & ASSOCIATES, INC.
SURVEYORS, ENGINEERS AND PLANNERS
9027 PACIFIC AVENUE, SUITE 4
TACOMA, WA 98444 (253) 474-3404

INFILTRATION TRENCH

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.57
Program License Number: 200810005
Project Simulation Performed on: 03/15/2023 2:06 PM
Report Generation Date: 03/15/2023 2:06 PM

Input File Name: Roof Infiltration Trench Calc..fld
Project Name:
Analysis Title: Roof Infiltration trench
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 15

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.123	0.123
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.123	0.123

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------
-------Area (Acres) --------
C, Forest, Flat 0.123

Subbasin Total 0.123

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------
-------Area (Acres) --------
ROOF TOPS/FLAT 0.123

Subbasin Total 0.123

********** LINK DATA **********

8

----------SCENARIO: PREDEVELOPED

Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: New Infilt Trench Lnk1
Link Type: Infiltration Trench
Downstream Link: None

Trench Type	:	Trench at Toe of Embankment
Trench Length (ft)	:	55.00
Trench Width (ft)	:	10.00
Trench Depth (ft)	:	1.50
Trench Bottom Elev (ft)	:	100.00
Trench Rockfill Porosity (%)	:	30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 2.00

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** Link: New Infilt Trench Lnk1 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	4.842E-02
5-Year	6.200E-02
10-Year	7.164E-02
25-Year	9.222E-02
50-Year	0.115
100-Year	0.138 ← USED TO SIZE STORM PIPE
200-Year	0.146
500-Year	0.156

********** Link: New Infilt Trench Lnk1 ********** Link WSEL Stats
WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	100.032
1.11-Year	100.073
1.25-Year	100.122
2.00-Year	100.289
3.33-Year	100.439
5-Year	100.554
10-Year	100.788
25-Year	101.218
50-Year	101.444
100-Year	101.512

**********Groundwater Recharge Summary **********
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	21.216
Total:	21.216

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Link: New Infilt Trench Ln	55.032
Total:	55.032

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.134 ac-ft/year, Post Developed: 0.348 ac-ft/year

**********Water Quality Facility Data **********

----------**SCENARIO: PREDEVELOPED**

Number of Links: 0

----------**SCENARIO: POSTDEVELOPED**

Number of Links: 1

********** Link: New Infilt Trench Lnk1 **********

2-Year Discharge Rate : 0.000 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.02 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.01 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 55.03
Inflow Volume Including PPT-Evap (ac-ft): 55.03
Total Runoff Infiltrated (ac-ft): 55.03, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 0.00
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 100.00%

**********Compliance Point Results **********

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: New Infilt Trench Lnk1

*** **Point of Compliance Flow Frequency Data** ***
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)

2-Year	2.611E-03	2-Year	0.000
5-Year	4.143E-03	5-Year	0.000
10-Year	5.354E-03	10-Year	0.000
25-Year	6.959E-03	25-Year	0.000
50-Year	7.677E-03	50-Year	2.054E-03
100-Year	8.758E-03	100-Year	2.197E-02
200-Year	1.208E-02	200-Year	3.483E-02
500-Year	1.655E-02	500-Year	5.155E-02

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-100.0%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-99.9%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-18.7%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	-100.0%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	-100.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

6" PIPE SIZING

Worksheet

Worksheet for Circular Channel

Project Description	
Worksheet	Pipe Sizing
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.010	
Slope	0.50	%
Diameter	6	in
Discharge	0.14	cfs

Results		
Depth	0.18	ft
Flow Area	0.1	ft²
Wetted Perime	0.64	ft
Top Width	0.48	ft
Critical Depth	0.18	ft
Percent Full	35.3	%
Critical Slope	0.42	%
Velocity	2.23	ft/s
Velocity Head	0.08	ft
Specific Energ	0.25	ft
Froude Numbe	1.09	
Maximum Disc	0.55	cfs
Discharge Full	0.52	cfs
Slope Full	0.04	%
Flow Type	Supercritical	

< 0.5' ∴ OKAY

APPENDIX "A"
OPERATION & MAINTENANCE MANUAL

LARSON & ASSOCIATES, INC.
SURVEYORS, ENGINEERS AND PLANNERS
9027 PACIFIC AVENUE, SUITE 4
TACOMA, WA 98444 (253) 474-3404

Description of "Velasquez Property" Stormwater System.
The proposed building will be provided with a roof drain tightline around the perimeter of the building footprint to collect and convey roof drainage to a properly sized infiltration trench where stormwater will be infiltrated into the native soils below. Emergency overflow will be provided via bubbling up through an inlet grate and flowing overland to the existing storm pond. All other disturbed areas will be amended per DOE BMP T5.13.

RESPONSIBLE PARTY FOR THE MAINTENANCE OF THE PRIVATE STORM DRAINAGE SYSTEM UNTIL WHICH TIME THE HOME OWNER TAKES OVER RESPONSIBILITY:

RICK VELASQUEZ
13615 122ND ST E
PUYALLUP, WA. 98374
PH: (253) 224-4428

ESTIMATED ANNUAL COST OF MAINTENANCE OF THE PRIVATE STORM DRAINAGE SYSTEM AS IDENTIFIED IN ATTACHMENT "A" IS $500 PER YEAR.
NOTE: THIS OPERATION AND MAINTENANCE MANUAL SHALL BE KEPT AT THE PROJECT SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE TO THE CITY OF PUYALLUP FOR INSPECTION UPON REQUEST.

ATTACHMENT "A"

ATTACHMENT "A"

MAINTENANCE PROGRAM

Inspection Period: _____

Number of Sheets Attached: _____

Date Inspected: _____

Name of Inspector: _____

Inspector's Signature: _____

INSTRUCTIONS FOR USE OF MAINTENANCE CHECKLISTS

The following pages contain maintenance needs for most of the components that are part of your drainage system, as well as for some components that you may not have. Let the City know if there are any components that are missing from these pages. Ignore the requirements that do not apply to your system. You should plan to complete a checklist for all system components on the following schedule:

(1) Monthly from November through April
(2) Once in late summer (preferable September)
(3) After any major storm (use 1-inch in 24 hours as a guideline), items marked "S" only.

Using photocopies of these pages, check off the problems you looked for each time you did an inspection. Add comments on problems found and actions taken. Keep these "checked" sheets in your files, as they will be used to write your annual report. Some items do not need to be looked at every time an inspection is done. Use the suggested frequency at the left of each item as a guideline for your inspection.

ATTACHMENT "A" (CONTINUED)

Maintenance Checklist for Fencing/Shrubbery Screen/Other Landscaping

Frequency	Drainage System Feature	♉	Problem	Conditions to Check For	Conditions That Should Exist
M	General		Missing or broken parts/dead shrubbery	Any defect in the fence or screen that permits easy entry to a facility.	Fence is mended or shrubs replaced to form a solid barrier to entry.
M,S			Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.	Replace soil under fence so that no opening exceeds 4 inches in height.
M			Unruly vegetation	Shrubbery is growing out of control or is infested with weeds.	Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.
A	Wire Fences		Damaged parts	Posts out of plumb more than 6 inches.	Posts plumb to within 1-1/2 inches of plumb.
A				Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
A				Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
A				Missing or loose tension wire.	Tension wire in place and holding fabric.
A				Missing or loose barbed wire that is sagging more than 2-1/2 inches between posts.	Barbed wire in place with less than 3/4-inch sag between posts.
A				Extension arm missing, broken, or bent out of shape more than 1-1/2 inches.	Extension arm in place with no bends larger than 3/4 inch.
A			Deteriorated paint or protective coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
M			Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	No openings in fabric.

If you are unsure whether a problem exists, please contact a Professional Engineer.
Comments:
Key:

A=Annual (March or April preferred)
M=Monthly (see schedule)
S=After major storms (use 1-inch in 24 hours as a guideline)

ATTACHMENT "A" (CONTINUED)

Maintenance Checklist for Conveyance Systems (Pipes, Ditches, and Swales)

Frequency	Drainage System Feature	♉	Problem	Conditions to Check For	Conditions That Should Exist
M,S	Pipes		Sediment & debris	Accumulated sediment that exceeds 20% of the diameter of the pipe.	Pipe cleaned of all sediment and debris.
M			Vegetation	Vegetation that reduces free movement of water through pipes.	All vegetation removed so water flows freely through pipes.
A			Damaged (rusted, bent, or crushed)	Protective coating is damaged; rust is causing more than 50% deterioration to any part of pipe.	Pipe repaired or replaced.
M				Any dent that significantly impedes flow (i.e., decreases the cross section area of pipe by more than 20%).	Pipe repaired or replaced.
M				Pipe has major cracks or tears allowing groundwater leakage.	Pipe repaired or replaced.
M,S	Open ditches		Trash & debris	Dumping of yard wastes such as grass clippings and branches into basin. Unsightly accumulation of nondegradable materials such as glass, plastic, metal, foam, and coated paper.	Remove trash and debris and dispose as prescribed by the County.
M			Sediment buildup	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned of all sediment and debris so that it matches design.
A			Vegetation	Vegetation (e.g., weedy shrubs or saplings) that reduces free movements of water through ditches.	Water flows freely through ditches. Grassy vegetation should be left alone.
M			Erosion damage to slopes	See Ponds Checklist.	See Ponds Checklist.
A			Rock lining out of place or missing (if applicable)	Maintenance person can see native soil beneath the rock lining.	Replace rocks to design standard.
Varies	Catch basins			See Catch Basins Checklist.	See Catch Basins Checklist.
M,S	Swales		Trash & debris	See above for Ditches.	See above for Ditches.
M			Sediment buildup	See above for Ditches.	Vegetation may need to be replanted after cleaning.
			Vegetation not	Grass cover is sparse and	Aerate soils and reseed and

M			growing or overgrown	seedy or areas are overgrown with woody vegetation.	mulch bare areas. Maintain grass height at a minimum of 6 inches for best stormwater treatment. Remove woody growth, recontour, and reseed as necessary.
M,S			Erosion damage to slopes	See Ponds Checklist.	See Ponds Checklist.
M			Conversion by homeowner to incompatible use	Swale has been filed in or blocked by shed, woodpile, shrubbery, etc.	If possible, speak with homeowner and request that swale area be restored. Contact the County to report problem if not rectified voluntarily.
A			Swale does not drain	Water stands in swale or flow velocity is very slow. Stagnation occurs.	A survey may be needed to check grades. Grades need to be in 1-5% range if possible. If grade is less than 1% underdrains may need to be installed.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:

A=Annual (March or April preferred)
M=Monthly (see schedule)
S=After major storms (use 1-inch in 24 hours as a guideline)

ATTACHMENT "A" (CONTINUED)

Maintenance Checklist for Grounds (Landscaping)

Frequency	Drainage System Feature	♉	Problem	Conditions to Check For	Conditions That Should Exist
M	General		Weeds (nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
M			Insect hazard	Any presence of poison ivy or other poisonous vegetation or insect nests.	No poisonous vegetation or insect nests present in lanscaped area.
M,S			Trash or litter	See Ponds Checklist.	See Ponds Checklist.
M,S			Erosion of Ground Surface	Noticeable rills are seen in landscaped areas.	Causes of erosion are identified and steps taken to slow down/spread out the water. Eroded areas are filled, contoured, and seeded.
A	Trees and shrubs		Damage	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trim trees/shrubs to restore shape. Replace trees/shrubs with severe damage.
M				Trees or shrubs that have been blown down or knocked over.	Replant tree, inspecting for injury to stem or roots. Replace if severely damaged.
A				Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Place stakes and rubber-coated ties around young trees/shrubs for support.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:

A=Annual (March or April preferred)
M=Monthly (see schedule)
S=After major storms (use 1-inch in 24 hours as a guideline)

~~Table V-A.1: Maintenance Standards - Detention Ponds (continued)~~

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Liner (if Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Ponds Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation If settlement is apparent, measure berm to determine amount of settlement Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms over 4 feet in height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway	Emergency Overflow/Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

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Table V-A.2: Maintenance Standards - Infiltration

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Poisonous/Noxious Vegetation	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Contaminants and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Rodent Holes	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events.	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.

Table V-A.2: Maintenance Standards - Infiltration (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
		(A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway and Berms over 4 feet in height.	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

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~~Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)~~

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability)	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

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ATTACHMENT "B"

INSTRUCTIONS FOR THE OWNER/S IN
Velasquez Property

POLLUTION SOURCE CONTROLS

The attached material includes information on pollution source controls. Pollution source controls are actions taken by a person or person representing a business to reduce the amount of pollution reaching surface and ground waters. Pollution source controls also called "best management practices" (BMP's) include:

Altering the activity (e.g., substitute not-toxic products or recycle)

Enclosing or covering the activity.

Segregating the activity (e.g. diverting surface water runoff away from an area that is contaminated.)

Pollution source controls are needed because of the contamination found in surface water runoff from commercial areas and the effect of this contamination on aquatic life and human health. Research on urban runoff in the Puget Sound area and elsewhere has found oil and grease, nutrients, organic substances, toxic metals, bacteria, viruses, and sediments at unacceptable levels.

Effects of contaminate runoff include closure of shellfish harvesting areas and swimming areas, pollution of wells, mortality of young fish and other aquatic organisms, tumors on fish, and impairment of fish reproduction.

The Velasquez Property project contains impervious surfaces that will collect contaminates from automobiles, garbage, and improperly disposed of chemicals. These materials are conveyed to the storm drainage systems and will enter into the ground water, if not treated properly.

Attachment "B" contains a number of BMP's for various uses within the development site. Each owner shall give a copy of the BMP's suitable to this or her respective activity. If a certain activity is not contained in Attachment "B", please contact Larson and Associates at 253-474-3404 for a specific BMP activity type.

REQUIRED ACTIONS OF ALL OWNERS

The following actions shall be taken by all owners to ensure that pollution generated on The Velasquez Property project is minimized.

1) Warning signs (e.g. "Dump no waste – drains to Stream") shall be stenciled or embossed adjacent to all catch basin inlets. They shall be repainted once a year or more as necessary.

2) Paved roadways shall be swept twice a year. It is recommended that newer high-velocity vacuum sweeper be used.

3) The storm drainage system shall be maintained per Attachment "A"

4) No activities shall be conducted on the property that is likely to result in a short-term high concentration discharge of pollution to the storm system. Such activities shall include, but are not limited to car washes, vehicle maintenance, and cleaning of equipment and or vehicles, unless the project has been properly permitted for such uses and the BMP's for such uses have been received by the owner.

5) Automobile fluids, chemicals etc. shall be disposed of legally and properly.

6) All garbage shall be contained in appropriate containers.

4.3 BMPs TO CONSIDER FOR ALL ACTIVITIES

This is a summary of items that each business/homeowner should consider. As stated before, most of these are common sense, housekeeping types of solutions, but if each business/homeowner would take some action on each of these, the improvement in water quality would be substantial.

1. Avoid the activity or reduce its occurrence

If you can, avoid the activity or do it less frequently. If there a substitute process or a different material you can use to get the job done? Can you do a larger run of a process at one time, thus reducing the number of times per week or month it needs to be repeated? For instance, raw materials could be delivered close to the time of use instead of being stockpiled and exposed to the weather. Perhaps you could avoid one solvent-washing step altogether. The Department of Ecology or the Tacoma-Pierce County Health Department can provide pollution prevention assistance.

2. Move the activity indoors

Sometimes it is fairly easy to move an activity indoors out of the weather. The benefits of this are twofold; you prevent runoff contamination, and you provide for easier, more controlled cleanup if a spill occurs. An example would be unloading and storing barrels of chemicals inside a garage area instead of doing it outside. Please be aware that moving storage areas indoors may require installation of fire suppression equipment or other building modifications as required by the Uniform Building Code, the Uniform Fire Code, or local ordinances.

3. Use less material

Don't buy or use more material than you really need. This not only helps keep potential disposal, storage and pollution problems to a minimum, but will probably save you money, too.

4. Use the least toxic materials available

Investigate the use of materials that are less toxic than what you use now. Perhaps a causic-type detergent or a solvent could be replaced with a more environmentally friendly product. Such a change might allow you to discharge process water to the sanitary sewer instead of paying for expensive disposal (contact Pierce County Utilities @ 565-3013 to find out about allowable sanitary discharges and pretreatment permits). Remember that even if you do switch to a biodegradable product, nothing but uncontaminated water is allowed to enter the storm drain system.

5. Create and maintain vegetated areas near activity locations

Vegetation of various kinds can help filter pollutants out of stormwater, so it is advisable to route stormwater through vegetated areas located near your activity. For instance, many parking lots contain grassy islands, typically formed in a "hump". By creating those islands as depressions instead of humps, they can be used to treat runoff from the parking lot or roof. Also, don't forget the erosion control benefits of vegetation at your site.

6. Locate activities as far as possible from surface drainage paths

Activities located as far as possible from known drainage paths, ditches, streams, and drains will be less likely to pollute, since it will take longer for material to reach the drainage feature. This gives you more time to react in the event of a spill, or if it is a "housekeeping" issue may protect the local waters long enough for you to clean up the area around the activity. Don't forget that groundwater issues are always prominent, no matter where the activity is located so the actions taken on your site on a day-to-day basis are always important, even in dry weather.

7. Keep storm drain systems clean

Pollutants can concentrate over time in storm drainage structures such as catch basins, ditches and storm drains. When a large storm event occurs, it can mobilize these pollutants and carry them to receiving waters. Develop and implement maintenance practices, inspections, and schedules for treatment devices (e.g., detention ponds, oil/water separators, vegetated swales, etc.). Requirements for cleaning catch basins will be discussed later in the specific BMP S.9.

8. Reduce, reuse and recycle as much as possible

Always look for ways to recycle instead of just disposing. This can save money as well as keep both hazardous and non-hazardous materials out of the landfills. You can learn more about other businesses that have made process changes allowing recycling of chemicals by calling the DOE at 1-800-RECYCLE and requesting publication #9245 and 90-22. Another unique recycling opportunity for businesses is available through the "matchmaker", helping one company's waste become another company's asset. For instance, waste peach pits from a cannery become potpourri ingredients to another's business. Call IMEX at 206-625-623 to list your potentially usable solid or chemical waste in their publication.

9. Be an advocate for stormwater pollution prevention

Help friends, partners and business associates find ways to reduce stormwater pollution in their activities. Most people want clean water, and do not pollute intentionally. Share your ideas and the BMPs in this manual to get them thinking about how their everyday activities affect water quality.

10. Report Violators

Allowing anyone to pollute our waters is wrong. We all must do our part to protect water, fish, wildlife and our own health, by employing proper BMPs, and reporting those who are causing pollution. In Pierce County, call Pretreatment Inspections at 565-3013 to report dumping to sewers and Surface Water Management at 798-2725 to report incidents involving storm drains or ditches.

II-5.10 BMPS FOR SMALL PARCELS

A Small Parcel Stormwater Management Plan must be developed which satisfies the Small Parcel Minimum Requirements found in Volume II, Chapter II-2. These in turn may be satisfied by employing a suitable selection from the following list of BMPs.

BMP ES.10 PLANNED CLEARING AND GRADING

Plan and implementation proper clearing and grading of the site. It is most important only to clear the areas needed, thus keeping exposed areas to a minimum. Phase clearing so that only those areas that are actively being worked are uncovered.

Note: Clearing limits should be flagged in the lot or area prior to initiating clearing.

BMP ES.20 EXCAVATING BASEMENT SOIL

Located excavated basement soil a reasonable distance behind the curb, such as in the backyard or side yard area. This will increase the distance eroded soil must travel to reach the storm sewer system. Soil piles should be covered until the soil is either used or removed. Piles should be situated so that sediment does not run into the street or adjoining yards.

BMP ES.30 BACKFILLING

Backfill basement walls as soon as possible and rough grade the lot. This will eliminate large soil mounds which are highly erodible and prepares the lot for temporary cover which will further reduce erosion potential.

BMP ES.40 REMOVAL OF EXCESS SOIL

Remove excess soil from the site as soon as possible after backfilling. This will eliminate any sediment loss from surplus fill.

BMP ES.50 MANAGEMENT OF SOIL BANKS

If a lot has a soil bank higher than the curb, a trench or berm should be installed moving the bank several feet behind the curb. This will reduce the occurrence of gully and hill erosion while providing a storage and settling area for stormwater.

BMP ES.60 CONSTRUCTION ROAD ACCESS

Apply gravel or crushed rock to the driveway area and restrict truck traffic to this one route. Driveway paving can be installed directly over the gravel. This measure will eliminate soil from adhering to tires and stops soil from washing into the street. This measure requires periodic inspection and maintenance including washing, top-dressing with additional stone, reworking and compaction. (For further details see BMP E2.10, Chapter II-5.7.1).

BMP ES.70 SOIL STABILIZATION

Stabilized denuded areas of the site by mulching, seeding, planting, or sodding. For further details on standards and specifications, see BMPs No. E1.10, E1.15, E1.35, E1.40 in Chapter II-5.

BMP ES.80 STREET CLEANING

Provide for periodic street cleaning to remove any sediment that may have been tracked out. Sediment should be removed by shoveling or sweeping and carefully removed to a suitable disposal area where it will not be re-eroded.

II-5.11 References

(1) Goldman, Steven J., Erosion and Sediment Control Handbook, McGraw-Hill, 1986.

(2) Horner, Richard R., Juno Guedry and Michael H. Kortenhof, Highway Construction Site Erosion and Pollution Control Manual, Washington State Department of Transportation with the United States Department of Transportation Federal Highway Administration, WA-RD 200.2, January, 1990.

(3) Metro, Summary of Preliminary Data Analysis – BMP Survey of Single Family Residential Construction Sites, January, 1984.

(4) Brandy, Nile C., The Nature and Properties of Soils, Eight Edition, MacMillan, 1974.

APPENDIX "B"
MISCELLANEOUS INFORMATION

LARSON & ASSOCIATES, INC.
SURVEYORS, ENGINEERS AND PLANNERS
9027 PACIFIC AVENUE, SUITE 4
TACOMA, WA 98444 (253) 474-3404

Google Maps

VICINITY MAP

NRCS SOILS INFORMATION MAP

Map Scale: 1:1,500 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	1.9	100.0%
Totals for Area of Interest		**1.9**	**100.0%**

Pierce County Area, Washington

6A—Briscot loam

Map Unit Setting

National map unit symbol: 2hrc
Elevation: 20 to 250 feet
Mean annual precipitation: 30 to 55 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Briscot, drained, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Briscot, Drained

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 38 inches: stratified fine sand to silt loam
H3 - 38 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 35 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F002XA007WA - Puget Lowlands Wet Forest
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Minor Components

Briscot, undrained

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 18, Sep 8, 2022

Table B.5. Major Soil Groups in Pierce County.

Soil Type[1]	Hydrologic Soil Group
ALDERWOOD (68)	C
ALKIRIDGE (3)	C
AQUIC XEROFLUVENTS (4)	D
BARNESTON (36)	B
BELLICUM (7)	B
BELLINGHAM (5)	D
BOROHEMISTS (4)	D
BOW (25)	D
BRISCOT (5)	C
BUCKLEY (17)	D
CATTCREEK (16)	B
CINEBAR (7)	B
DUPONT (9)	D
ETHANIA (22)	B
EVERETT (48)	A
FOSS (2)	B
GREENWATER (6)	A
GROTTO (4)	A
HARSTINE (78)	C
HAYWIRE (10)	C
HUMAQUEPTS (6)	D
INDEX (2)	A
INDIANOLA (24)	A
JONAS (30)	B
KAPOWSIN (127)	D
KITSAP (11)	C
KLABER (2)	D
LARRUPIN (5)	B
LITTLEJOHN (8)	C
LYNNWOOD (3)	A
MASHEL (15)	B
MCKENNA (5)	D
MOWICH (4)	D
NAGROM (7)	C
NATIONAL (7)	B
NEILTON (8)	A

Soil Type[1]	Hydrologic Soil Group
NIMUE (18)	B
NISQUALLY (2)	A
NORMA (6)	D
OAKES (16)	B
OGARTY (5)	C
OHOP (7)	C
ORTING (6)	D
PHEENEY (12)	C
PILCHUCK (9)	C
PITCHER (22)	B
PLAYCO (22)	B
PUYALLUP (13)	B
RAGNAR (3)	B
REICHEL (7)	B
RIVERWASH (2)	D
ROCK OUTCROP (7)	D
RUGLES (7)	B
SCAMMAN (21)	D
SHALCAR (2)	D
SPANA (2)	D
SPANAWAY (47)	A
STAHL (5)	C
SULSAVAR (2)	B
SULTAN (7)	C
TISCH (4)	D
TUSIP (7)	B
TYPIC UDIFLUVENTS (3)	B
UDIFLUVENTS (2)	B
VAILTON (8)	B
VOIGHT (3)	B
WILKESON (19)	B
WINSTON (4)	B
XEROCHREPTS (19)	B
ZYNBAR (29)	B
ZYNBAR Till Substratum (6)	C

The number in ( ) refers to the approximate total square miles of the soil type within Unincorporated Pierce County excluding federal lands.

National Flood Hazard Layer FIRMette

FEMA

122°16'8"W 47°11'35"N

122°15'31"W 47°11'11"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/3/2023 at 3:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

GEORESOURCES
earth science & geotechnical engineering
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April 8, 2022

CIMCO
13615 – 122nd Street East
Puyallup, Washington 98374
(253) 224-4428

Attn: Rick Valesquez
rick@cimcopnw.com

Soils Report: Stormwater Feasibility
Proposed Commercial Development
2315 Inter Ave
Puyallup, Washington
PN: 2105200140
Doc ID: CIMCO.InterAve.SR

INTRODUCTION

This stormwater *Soils Report* addresses the feasibility of onsite infiltration of stormwater runoff generated by the proposed commercial development to be constructed at 2315 Inter Avenue in Puyallup, Washington. The approximate site location is shown on the attached Site Location Map, Figure 1.

Our understanding of this project is based on our email correspondence with you and representatives from Larson & Associates (Larson); our review of the provided *Topographic Survey* by Larson dated October 7, 2021; our understanding of the City of Puyallup development codes; and our experience in the area. The site consists of a single tax parcel which is currently developed with an existing building, paved parking areas, and utilities. We understand that you propose to construct a new building that will add or replace about 5,000 square feet of hard surfacing.

To provide flexibility in the final design of the site development we proposed a scope of work consistent with creating more than 5,000 square feet of impervious surface. We understand the City of Puyallup (the City) is requiring a *Soils Report* be prepared in accordance with the *2019 Stormwater Management Manual for Western Washington* (SWMMWW), which included in-situ infiltration testing and wet season groundwater monitoring.

SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions at the site as a basis for developing and providing geotechnical stormwater recommendations for the proposed development. Specifically, our scope of services for the project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring surface and subsurface conditions by reconnoitering the site and excavating a series of test pits 3 at select locations across the site and installing 2 shallow (less than 10 feet) piezometers in selected test pits;

3. Performing one small-scale pilot infiltration test (PIT) at the site;
4. Describing surface and subsurface conditions, including soil type, depth to groundwater, if encountered, and an estimate of seasonal high groundwater levels;
5. Monitoring of groundwater levels at the site during the prescriptive wet season;
6. Providing our opinion about the feasibility of onsite infiltration in accordance with the 2019 SWMMWW, including a preliminary design infiltration rate based on in-situ testing, as applicable; and,
7. Preparing a *Soils Report* that satisfies the 2019 SWMMWW requirements and summarizes our site observations and conclusions, our geotechnical recommendations and design criteria, along with the supporting data.

The above scope of work was summarized in our *Proposal for Geotechnical Engineering Services* dated November 29, 2021. We received written authorization to proceed with our scope of work from you on December 3, 2021.

SITE CONDITIONS

Surface Conditions

The site is located at 2315 Inter Avenue in Puyallup, Washington within an area of existing commercial development. Based on information obtained from the Pierce County Public GIS website, the site is generally rectangular in shape, measures approximately 200 feet wide (east to west) by 400 to 405 feet long (north to south) and encompasses about 1.86 acres. The site is bounded by Inter Avenue to the south, single-family residence to the east, and by existing commercial development to the north and west.

The site generally flat with less than 2 feet of topographic relief. The vegetation in the area of the proposed development had been generally cleared and consisted of grasses, brambles, and other low lying native and invasive species. No areas of surficial erosion, seeps, or springs were observed at the time of our reconnaissance. Standing water was not observed in the existing pond/depressions on the northwest and portions of the site at the time of our December 2021 site visit. The existing site topography is shown on the Site Exploration Map, Figure 2.

Site Soils

The USDA Natural Resource Conservation Services (NRCS) Web Soil Survey maps the site as being underlain by Briscot loam soils (6A). The Briscot soil type 6A is derived from alluvium, form on slopes of 0 to 2 percent and has a "slight" potential for erosion when exposed. The upper, weathered soil horizons are listed in hydrologic soils group B, while the deeper soil horizons are listed in hydrologic soils group D. A copy of the referenced NRCS Soils Map for the site area is included as Figure 3.

Site Geology

The draft of the *Geologic Map of the Puyallup 7.5-Minute Quadrangle, Washington* (Troost et al.) maps the site and surrounding area as being underlain by alluvium (Qal). Alluvium generally consists of a poorly sorted, lightly stratified mixture of silts and sands that may contain localized deposits of clay and gravel that were deposited by fluvial processes. The alluvial deposits are considered

normally consolidated and generally have moderate strength and compressibility characteristics where undisturbed. An excerpt of the above referenced map is included as Figure 4.

Subsurface Explorations

On December 21, 2021, we visited the site and monitored the excavation of three test pits to depths of 6.5 to 8.0 feet below the existing ground surface, one of which was completed as a PIT. Our representative logged the subsurface conditions encountered in each test pit and obtained representative soil samples. We also performed in-situ infiltration testing at 2 feet below existing grades in PIT-1. The test pits were excavated by a small track-mounted excavator operated by a licensed earthwork contractor working for GeoResources. Table 1, below, summarizes the approximate functional locations, surface elevations, and termination depths of our explorations.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Exploration Number	Functional Location	Surface Elevation (feet)	Termination Depth (feet)	Termination Elevation[1] (feet)
TP-1	East portion of proposed development	60	6.5	53.5
TP-2	West portion of proposed development	60	8.0	52.0
PIT-1	Central portion of proposed development	60	5.0	55.0

Notes:
1 = Surface elevation estimated from the provided by the Pierce County Public GIS contours based on NAVD 88

The specific number, locations, and depths of our explorations were selected based on the configuration of the proposed development and were adjusted in the field based on consideration for underground utilities, existing site conditions, site access limitations and encountered stratigraphy. Soil densities presented on the logs were based on the difficulty of excavation and our experience. Representative soil samples obtained from the test pits were placed in sealed plastic containers and then taken to our laboratory for further examination and testing as deemed necessary. The test pits were then backfilled with the excavated soils and bucket tamped, but not otherwise compacted.

The subsurface explorations excavated as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun. Based on our experience and extent of prior explorations in the area, it is our opinion that the soils encountered in the explorations are generally representative of the soils at the site.

The approximate locations and numbers of our test pits are shown on the attached Site Exploration Map, Figure 2. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D: 2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our test pits are included as Figure A-2.

Subsurface Conditions

At the locations of our explorations, we encountered generally uniform subsurface conditions that in our opinion confirmed the mapped stratigraphy at the site. In general, our test pit explorations encountered about 1.2 to 1.4 feet of brown topsoil in a loose, moist condition mantling about 3.8 to 4.2 feet of iron-oxide stained brown to dark grey silty sand in a loose, moist condition. These surficial soils were underlain by iron-oxide stained mottled dark grey to black silty sand in a loose and wet condition to the full depth explored. We interpret the soils encountered at the site to be consistent with alluvium deposits. Table 2 below summarizes the soils encountered in our explorations.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF ENCOUNTERED SOIL TYPES

Exploration Number	Thickness of Topsoil (Feet)	Thickness of Surficial Silty Sand (feet)	Depth to Restrictive SILT Layer(s) (feet)	Depth to Deeper Silty Sand (feet)	Elevation[1] of Deeper Silty Sand (feet)
TP-1/P-1	0.5	5.0	5.5	6.0	54.0+
TP-2/P-2	0.5	2.5	3.0	3.5	56.5 – 52.5
PIT-1	0.5	2.5	NE	3.0	57.0

Notes:
1 = Surface elevation estimated from the provided by the Pierce County Public GIS contours based on NAVD 88
NE = Not encountered
+ = Did not encounter silt layer beneath silty sand

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the test pits to estimate index engineering properties of the soils encountered. Laboratory testing included visual soil classification per ASTM D: 2488 and ASTM D: 2489, moisture content determinations per ASTM D: 2216, and grain size analyses per ASTM D: 6913 standard procedures. The results of the laboratory tests are summarized below in Table 3 and graphical outputs are included in Appendix B.

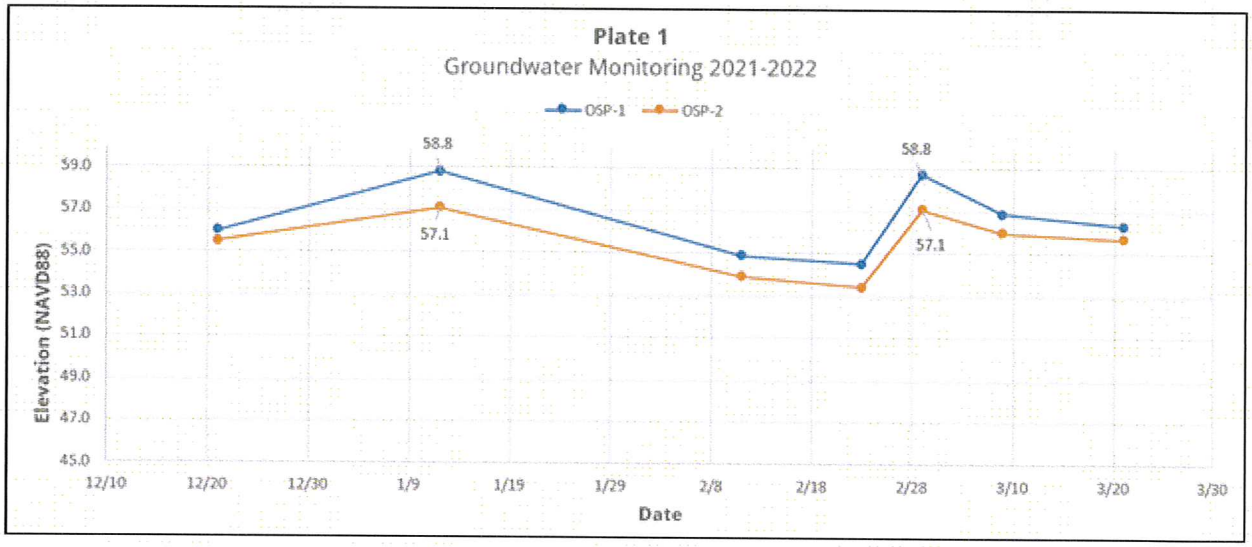
TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Sample	Soil Type	Lab ID	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	D10 Ratio (mm)
PIT-1, S-2, 5'	SM	103087	0	82.1	17.9	>0.075

Groundwater Conditions

At the time of exploration, groundwater seepage was observed at depths of 4 to 4.5 feet below existing grades. Groundwater monitoring wells were installed at the site at the time of exploration. The locations of the observation wells are shown on the Site & Exploration Plan, Figure 2. Groundwater readings for the observation wells were manually measured on a bi-monthly basis from December 21, 2021 to March 21, 2022.

Based on our wet season monitoring, it appears that seasonal high groundwater occurs at about Elevation 59 feet (NAVD 88) at the locations monitored, approximately 1.2 feet below the ground surface. These levels were recorded on January 12, 2022 and March 1, 2022. Plate 1, below, summarizes the groundwater levels recorded as part of our groundwater monitoring program during our monitoring period.



We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off site construction activities, and site utilization. As such, water level observations made at the time of our field investigation may vary from those encountered during the construction phase. Analysis or modeling of anticipated groundwater levels during construction is beyond the scope of this report.

CONCLUSIONS AND RECOMMENDATIONS

Based on our site reconnaissance and subsurface explorations, it is our opinion that shallow onsite infiltration is feasible for the proposed development if grades at the site are raised to protect and maintain the required vertical separation from groundwater. We measured an infiltration rate of 1 inch per hour in the silty sand soils observed at about 2 feet below existing grades at the site. Further conclusions and recommendations are contained herein.

Infiltration Recommendations

Based on our subsurface explorations, infiltration testing, and groundwater monitoring, it is our opinion that stormwater infiltration via permeable pavement is feasible at the site, provided the bottom of the facility is located at elevation 59 (NAVD88) or higher. This elevation is based on the topographic information obtained from the Pierce County Public GIS and should be surveyed in the field.

Permeable Pavement

Per the 2019 SWMMWW, permeable pavement is considered feasible if there is at least 1 foot of clearance from the expected bottom elevation of the infiltration facility to the seasonal high ground water table. For the purposes of this infiltration feasibility evaluation, we have assumed that, at a minimum, the standard permeable pavement section (6 inches of pavement over 6 inches of storage course) would be used. Deeper trenches and thicker storage courses may be designed by a civil engineer where the vertical separation requirements can be met.

As previously stated, we performed one PIT at about 2 feet below existing grades in the silty sand soils and measured 1 inch per hour. After applying appropriate correction factors to this rate, in accordance with the 2019 SWMMWW for site variability ($F_{variability}$), testing method ($F_{testing}$) and maintenance for situation biofouling ($F_{maintenance}$), a long-term design infiltration rate of 0.34 inches for the permeable pavement should be used for this project. Depending on the proposed storage course thickness, site grades will likely need to be raised at least 1 foot to meet the vertical separation requirements for permeable pavement.

Downspout Infiltration

For the purposes of this infiltration feasibility evaluation, we have assumed that, at a minimum, the standard infiltration trench section (6 inches of topsoil over a 2 foot deep trench) would be used. Based on our site observations, groundwater monitoring, and subsurface explorations, it is our opinion that deeper infiltration using trench systems will likely be feasible at the site during the drier months of the year. Because the PIT results indicate limited infiltration in the shallow soils, we completed one soil gradation analyses on the sandier alluvium soils encountered at about 3 to 5 feet below grades the 2019 SWMMWW and in accordance with ASTM D6913. Based on our gradation analysis, a design infiltration rate of 2 inches per hour be used for infiltration facilities located within the sandier soils encountered between elevations 55 to 57 feet (NAVD88) in the areas of test pit TP-2 and PIT-1. The soils in the area of test pit TP-1 at that depth had interlaced layers of mottled silt that would not be conducive to infiltration. Appropriate correction factors for testing have been applied to this value in accordance with the 2019 SWMMWW.

It should be noted that based on our groundwater monitoring, the 1-foot separation will likely not be met during the majority of the winter wet season unless grades are raised about 0.5 to 1.5 feet. Overflows that are directed to an appropriate discharge point should be incorporated into the design of this project. Alternatively, dispersion into the existing system could also be considered for this project and may prove to be more cost effective.

All proposed infiltration facilities should be designed and constructed in accordance with the 2019 SWMMWW. All minimum separations, setback requirements, and infeasibility criteria per 2019 SWMMWW should be considered prior to the selection, design and location of any stormwater facility for the proposed development.

LIMITATIONS

We have prepared this report for use by CIMCO and other members of the design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others

and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. 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.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,
GeoResources, LLC

Andrew E. Schnitger, EIT
Staff Engineer

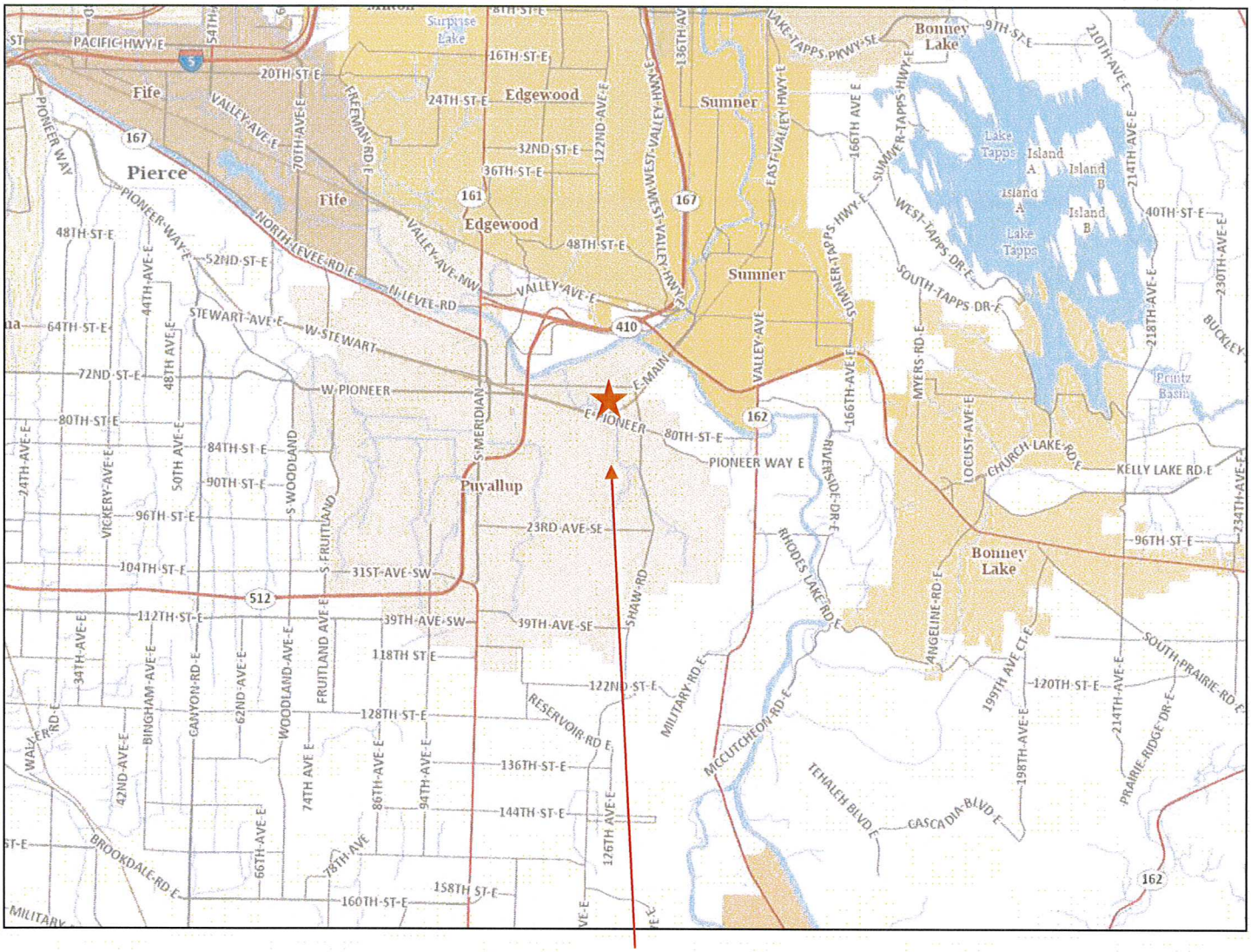
State of Washington
Engineering Geologist
925
Licensed Geologist
KEITH SCOTT SCHEMBS
4/8/2022

Keith S. Schembs, LEG
Principal

ERIC WILLIAM HELLER
STATE OF WASHINGTON
43471
REGISTERED
PROFESSIONAL ENGINEER
4/8/2022

Eric W. Heller, PE
Senior Geotechnical Engineer

AES:KSS:EWH/aes
DocID: CIMCO.InterAve.SR
Attachments:
Figure 1: Site Location Map
Figure 2: Site Exploration Map
Figure 3: NRCS Soils Map
Figure 4: Geologic Map
Appendix A: Subsurface Explorations
Appendix B: Laboratory Results



Approximate Site Location

(map created from Pierce County Public GIS http://matterhorn3.co.pierce.wa.us/publicgis/)

Not to Scale

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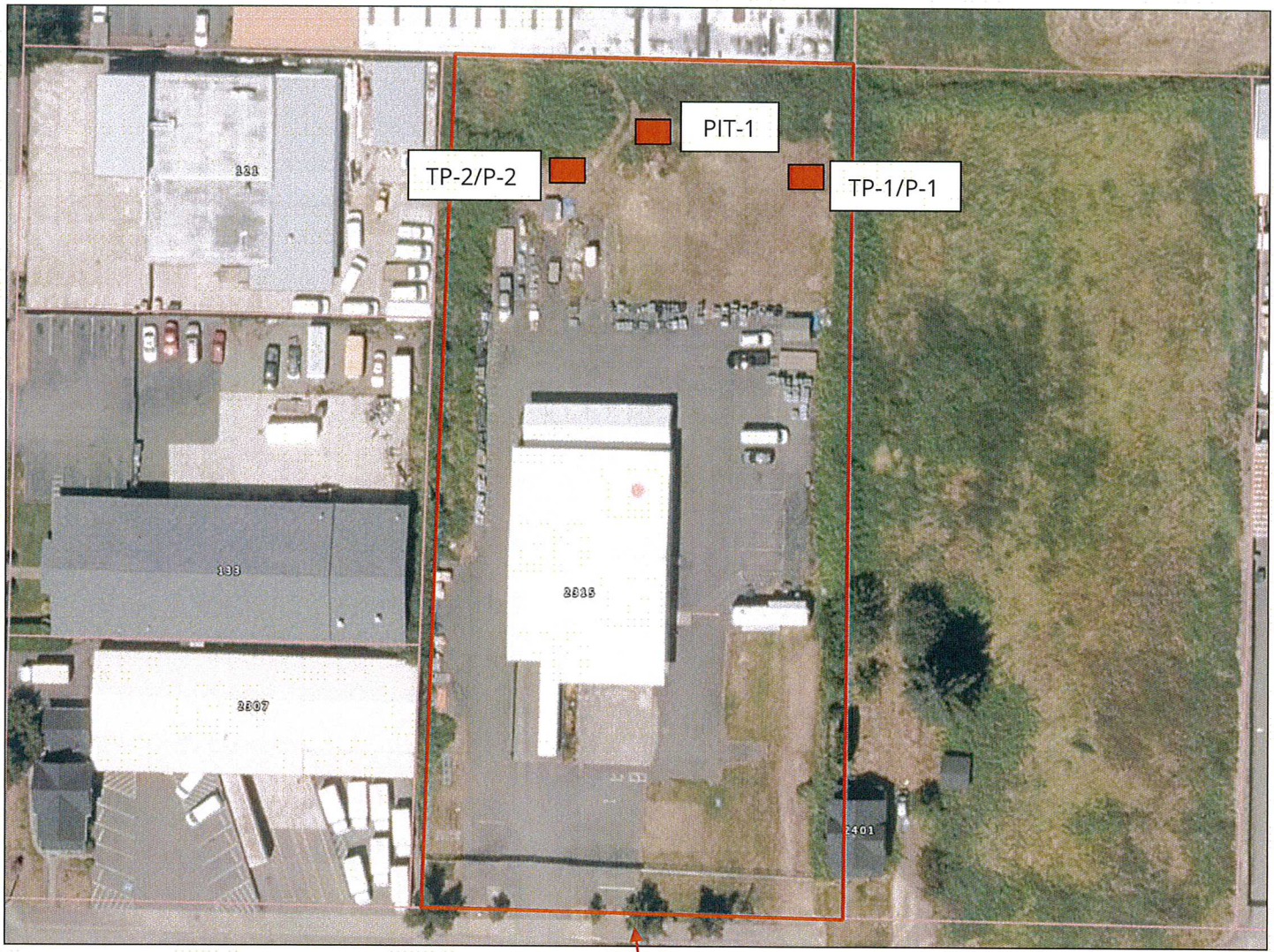
Site Location Map

Proposed Commercial Development
2315 Inter Avenue
Puyallup, Washington
PN: 2105200140

B17

Doc ID: CIMCO.InterAve.F	April 2022	Figure 1



Approximate Site Location

Map created from Pierce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

Number and approximate location of test pit/Pilot Infiltration Test

N
W
E
S

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Site & Exploration Map

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Puyallup, Washington
PN: 2105200140

B18

Doc ID: CIMCO.InterAve.F	April 2022	Figure 2

Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
6A	Briscot loam	Alluvium	-	Slight	D
31A	Puyallup fine sandy loam	Alluvium	0 to 3	Slight	B

N W E S

Not to Scale

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NRCS Soils Map

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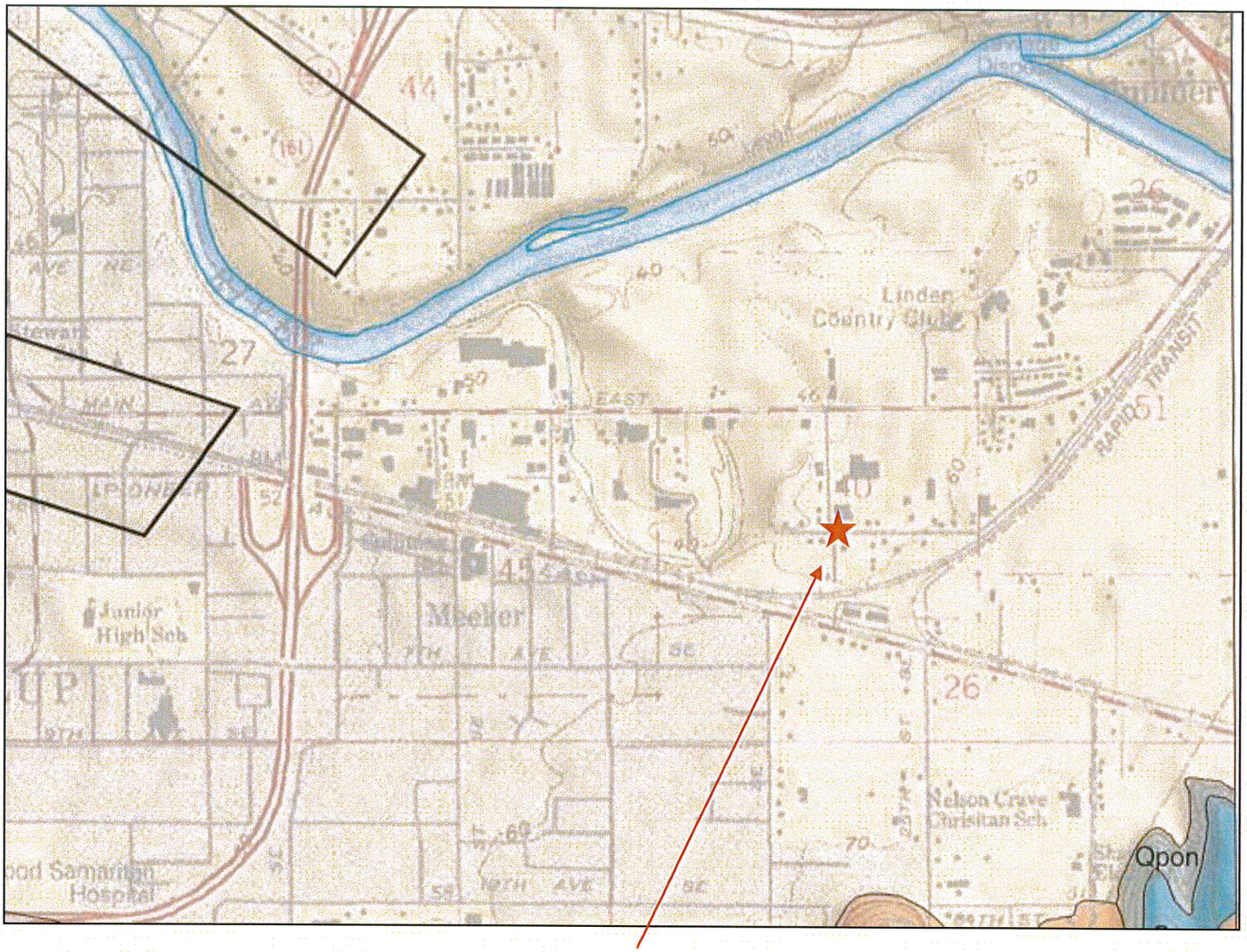
Puyallup, Washington
PN: 2105200140

B19

Doc ID: CIMCO.InterAve.F	April 2022	Figure 3



Approximate Site Location

An excerpt from the draft the *Geologic Map of the Puyallup 7.5-minute Quadrangle, Washington* by Kathy G. Troost (in review)

Qal	Alluvium (Holocene)

N W E S

Not to Scale

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Geologic Map

Proposed Commercial Development
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Puyallup, Washington
PN: 2105200140

B20

Doc ID: CIMCO.InterAve.F	April 2022	Figure 4

Appendix A

Subsurface Explorations

B21

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System
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PN: 2105200140
B22

Test Pit TP-1

Location: West portion of parcel
Approximate Elevation: 60' (NAVD88)

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Topsoil
0.5	-	3.0	SM	Brown silty SAND (loose, moist) (alluvium)
3.0	-	5.5	SM/ML	Gray, orange iron oxide stained silty SAND, interbedded gray mottled silt (medium dense/stiff, moist to wet) (alluvium)
5.5	-	6.0	ML	Gray mottled SILT (stiff, wet) (alluvium)
6.0	-	6.5	SP	Gray SAND (medium dense, wet) (alluvium)

Terminated at 3.2 feet below ground surface.
No caving observed.
Slow groundwater seepage observed at 4 feet below existing grades.

Test Pit TP-2

Location: SW central portion of parcel
Approximate Elevation: 60' (NAVD88)

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Topsoil
0.5	-	3.0	SM	Reddish brown silty SAND (loose to medium dense, moist) (alluvium)
3.0	-	3.5	ML	Light gray SILT (medium stiff, moist) (alluvium)
3.5	-	6.0	SP	Gray mottled SAND (medium dense, wet) (alluvium)
6.0	-	7.5	SM	Gray mottled silty SAND (medium dense, wet) (alluvium)
7.5	-	8.0	ML	Gray SILT (stiff, wet) (alluvium)

Terminated at 8.0 feet below ground surface.
No caving observed.
Slow groundwater observed at 4.5 feet below ground surface

Logged by: AES

Observed on: December 21, 2021

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Test Pit Logs
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Pilot Infiltration Test PIT-1

Location: West portion of parcel
Approximate Elevation: 60' (NAVD88)

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Topsoil
0.5	-	2.0	SM	Reddish brown silty SAND (loose to medium dense, moist) (alluvium)
2.0	-	3.0	SM	Gray silty SAND (medium dense, moist) (alluvium)
3.0	-	5.0	SM	Gray mottled silty SAND (medium dense, moist) (alluvium)

Infiltration testing performed at 2 feet below existing grades.
Measured 1 inch per hour.
Overexcavated to 5 feet below existing grades.
No caving observed.
No groundwater seepage observed.

Logged by: AES

Observed on: December 21, 2021

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Test Pit Logs
Proposed Commercial Development
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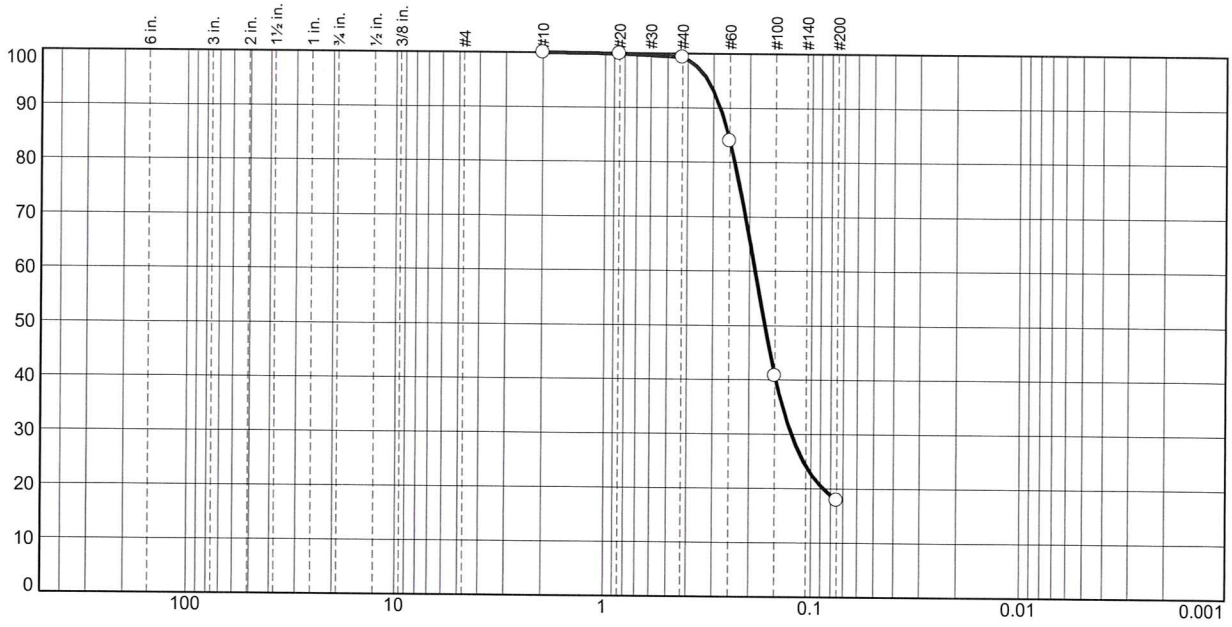
Puyallup, Washington
B24 PN: 2105200140

Appendix B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	81.4	17.9	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.3		
#60	83.9		
#100	40.8		
#200	17.9		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D_{90}= 0.2787 D_{85}= 0.2542 D_{60}= 0.1879
D_{50}= 0.1683 D_{30}= 0.1245 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 22%

Date Received: 12/21/21 **Date Tested:** 3/24/22

Tested By: MAW

Checked By: KSS

Title: PM

Location: PIT-1, S-2, 5'
Sample Number: 103087

Date Sampled: 12/21/21

GeoResources, LLC

Fife, WA

Client: CIMCO
Project: Proposed Commercial Development

Project No: CIMCO.InterAve **Figure** B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

B26