

Stormwater Site Plan/Report

PUYALLUP MEDICAL OFFICES

1617 S Merdian

Puyallup, WA 98371 - City of Puyallup

Permit #: PLPRE20220159

Parcel #7790000140

For: Dr. Fadi Alhafez

Courtesy of: PFHC Puyallup, LLC

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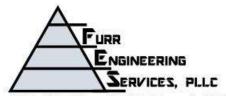
FES Project #23062





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1.0 PROJECT OVERVIEW

This project proposes the construction of a new five-story medical building and associated frontage improvements on a 30,513 sf (0.780 ac) parcel (no. 7790000140) located at 1617 S Meridian, Puyallup, WA 98371. This parcel is located in City of Puyallup Zone CG – General Commercial; the development standards for this zone may be found in Puyallup Municipal Code (PMC) 20.30.030. The site is bordered to the east and south by commercial properties; to the north, by 17th Ave SE; and to the west by S Meridian. Currently, the site is undeveloped, with a gravel driveway entrance along 17th Ave SE. The topography generally slopes down from southeast to northwest, at rates of approximately 8%.

Per the geotechnical report, the site is generally underlain Lacustrine Deposits consisting of silts and fine grained sands with small amounts of gravel. Vegetation generally consists of a mixture of hardwood and deciduous trees, shrubs, and groundcover.

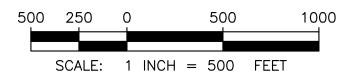
Currently, stormwater runoff sheet-flows northwest towards S Meridian and enters into the City of Puyallup municipal storm system through a catch basin. Flows are conveyed north and discharged to a vegetated slope across S Meridian, eventually flowing into Meeker Creek. Under the developed condition, site stormwater runoff will be collected into a detention vault under the building. Under flow conditions below the 2-year storm flows, stormwater will be discharged via pump into a control structure which discharges into the municipal storm system, following the existing pattern. In flow conditions exceeding the 2-year storm flow, stormwater will be discharged from the riser in the detention vault and gravity drained into the municipal storm system.

Onsite Stormwater Management BMPs/LIDs will be evaluated and used to the maximum extent feasible. Proposed stormwater mitigation will comply with Section 200 of the City of Puyallup Design Standards (PDS) and the 2019 Department of Ecology (DOE) Stormwater Management Manual for Western Washington (SWMMWW), which has been adopted as the governing manual within the City.



FIGURE 1: VICINITY MAP







2.0 CONDITIONS AND REQUIREMENTS SUMMARY

This project is considered New Development, as the existing impervious area is less than 35% of the total parcel area; see Table 1, below.

Eviating Conditions	Ar	Area	
Existing Conditions	SF	AC	
Parcel area	30,513	0.780	
Hard surface coverage	29	0.001	0.1%
Pervious (LS)	34,500	34,500	

Table 1: Existing hard surface coverage.

Therefore, the flowchart for New Development (Figure 2 below) will be used to determine the applicability of the Minimum Requirements to this project.



ECOLOGY

Development Start Here See Redevelopment Project Yes Does the Site have 35% Thresholds and the Figure "Flow or more of existing hard Chart for Determining surface coverage? Requirements for Redevelopment". No Does the Project convert 3/4 acres or more of vegetation to Does the Project result in lawn or landscaped areas, or 5,000 square feet, or convert 2.5 acres or more of No greater, of new plus replaced hard surface native vegetation to pasture? No Yes Yes Does the Project result in 2,000 square feet, or greater, of new plus replaced hard surface area? **All Minimum Requirements** apply to the new and replaced hard surfaces and converted Yes No vegetation areas. Does the Project have land disturbing activities of 7,000 Minimum Requirements #1 square feet or greater? through #5 apply to the new Yes and replaced hard surfaces and the land disturbed. No Minimum Requirement #2 applies. Flow Chart for Determining Requirements for **New Development** DEPARTMENT OF

Figure I-3.1: Flow Chart for Determining Requirements for New Development

Figure 2: Flow chart for Determining Requirements for New Development

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Therefore, all Minimum Requirements apply to all new and replaced hard surfaces and vegetation areas, as this project will result in 5,000 sf or greater of new and replaced hard surface area. See Section 4.2: Developed Site Hydrology.



2.1 ANALYSIS OF THE MINIMUM REQUIREMENTS

2.1.1 MR #1: Preparation of Stormwater Site Plans

This report will serve as the Stormwater Site Plan, prepared per Puyallup Municipal Code and the SWMMWW.

2.1.2 MR #2: Construction Stormwater Pollution Prevention

Construction Stormwater Pollution Prevention Plans are prepared per 2019 SWMMWW and City of Puyallup Stormwater Management Standards to address the 13 elements. A SWPPP will be provided as a separate document for approval.

2.1.3 MR #3: Source Control of Pollution

Per SWMMWW Volume II, Section 3.2, the following Construction Source Control BMPs will be used as necessary:

BMP C103	High-Visibility Fence
BMP C105	Stabilized Construction Access
BMP C120	Temporary and Permanent Seeding
BMP C121	Mulching
BMP C122	Nets and Blankets
BMP C123	Plastic Covering
BMP C125	Topsoiling/Composting
BMP C140	Dust Control
BMP C150	Materials on Hand
BMP C151	Concrete Handling
BMP C152	Sawcutting and Surfacing Pollution Prevention
BMP C153	Material Delivery, Storage, and Containment
BMP C154	Concrete Washout Area
BMP C160	Certified Erosion and Sediment Control Lead
BMP C162	Scheduling

2.1.4 MR #4: Preservation of Natural Drainage Systems and Outfalls

This project comprises a single threshold discharge area (TDA) within the State Highway Drainage Basin, which currently drains to the NW corner and discharges into the municipal storm system in S Meridian. Under the developed condition, stormwater will be conveyed north and into the municipal storm system. Therefore, the existing drainage pattern will be maintained.

2.1.5 MR #5: On-site Stormwater Management

Table I-2.5.1 from the SWMMWW (Figure 3, below) was used to determine the onsite stormwater management requirements for this project. Because this project is considered new development, and is situated on a parcel within the urban growth area (UGA), List #2 will be evaluated for feasibility.



Table I-2.5.1 On-Site Stormwater Management Requirements for Projects Triggering Minimum Requirements #1 - #9

Projects Triggering Minimum Requirements #1 - #9			
Project Type and Location	Requirement		
New development on any parcel inside the UGA, or new development outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911); or List #2 (applicant option).		
New development outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911).		
Redevelopment on any parcel inside the UGA, or redevelopment outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911); or List #2 (applicant option).		
Redevelopment outside the UGA on a par- cel of 5 acres or larger	Soil Quality and Depth (p.911).		
Note: This table refers to the Urban Growth Area (UGA) as designated under the Growth Management Act (GMA) (Chapter 36.70A RCW) of the State of Washington. If the Permittee is located in a county that is not subject to planning under the GMA, the city limits shall be used.			

Figure 3: Table I-2.5.1 from the SWMMWW

2.1.5(a) List #2: Onsite Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9

For each surface consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. No other onsite stormwater management BMP is necessary for that surface. Feasibility shall be determined by evaluation against:

- Design criteria, limitations, and infeasibility criteria identified for each BMP in the SWMMWW: and
- Competing Needs Criteria listed in Chapter V-5 of the SWMMWW.

Lawn and landscaped areas:

 Post-Construction Soil Quality and Depth in accordance with BMP T5.13: Post-Construction Soil Quality and Depth

This BMP will be implemented to the maximum extent feasible.

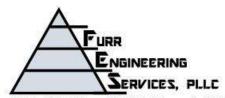
Roofs:

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion; or

This project does not meet the 65% minimum requirement for native growth protection area (NGPA) for full dispersion.

Downspout Full Infiltration Systems in accordance with BMP T5.10A: Downspout Full Infiltration.

Infiltration BMPs are not proposed due to the high water table.



- 2. Bioretention (BMP T5.30: Bioretention Cells, Swales, and Planter Boxes) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.
 - The area and setback requirements of this BMP cannot be met.
- 3. Downspout Dispersion Systems in accordance with BMP T5.10: Downspout Dispersion Systems.
 - The minimum required flowpath for this BMP cannot be met.
- 4. Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections.

Perforated connections will not be used due to the high water table.

Other Hard Surfaces:

- 1. **Full Dispersion in accordance with BMP T.30: Full Dispersion**This project does not meet the 65% minimum requirement for native growth protection area (NGPA) for full dispersion.
- 2. Permeable Pavement in accordance with BMP T5.15: Permeable Pavements
 This BMP will be used to the greatest extent possible for offsite sidewalks. Permeable pavements are considered feasible; see Appendix A: Geotechnical report
- 3. Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion; or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated Flow Dispersion

The minimum required vegetated flow path for dispersion BMPs cannot be met.

2.1.6 MR #6: Runoff Treatment

Runoff treatment is required, as this project exceeds the requirements for the construction of stormwater facilities, as shown in Table 2, below:

Criteria	Threshold	Project
Pollution-generating hard surface	≥5,000 sf	11,637 sf
Pollution-generating pervious surface (not including permeable pavements) from which there will be a surface discharge in a natural or man-made conveyance from the site	≥0.75 ac	0 ac

Table 2: Analysis of thresholds requiring runoff treatment.

Water quality treatment shall be provided by a detention/wetvault and a StormFilter Manhole; see Section 4.2.2: Water Quality Treatment.

2.1.7 MR #7: Flow control

Flow control is required, as this project does exceed 10,000 sf of total effective impervious surface proposed in the threshold discharge area. The required level of flow control shall be provided by a combined detention/wetvault; see Section 4.2.1: Flow Control.



2.1.8 MR #8: Wetlands Protection

This project discharges to a Cat. III wetland northwest of the site. The wetland has a habitat score of 5 and contains a breeding population of native amphibians; see Appendix C: Critical Area Report. The flow control and water quality provided by the vault and StormFilter catch basin will be sufficient to ensure protection of this wetland. Wetland hydroperiod modeled in WWHM2012, see section 4.3

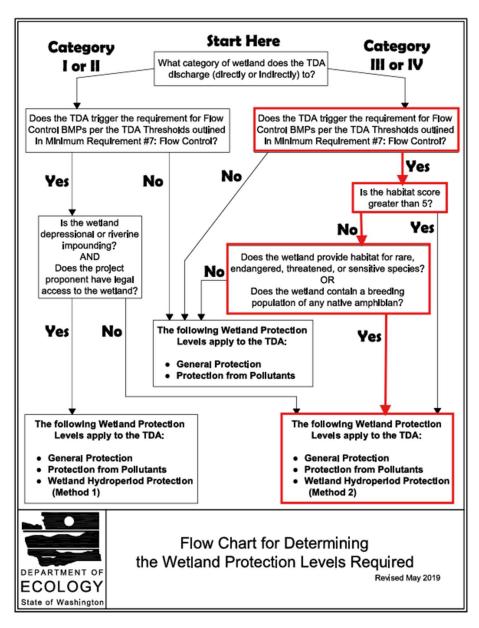


Figure 4: Flow Chart for Determining the Wetland Protection Levels Required



2.1.9 MR #9: Operation and Maintenance

Operation and Maintenance guidelines from the SWMMWW will be included in Section 9.0 of this report.

2.2 Financial Liability

A bond quantities worksheet for construction and landscaping will be provided, if required.

2.3 Conditions of Approval

Reserved.



3.0 OFF-SITE ANALYSIS

3.1 UPSTREAM TRIBUTARY AREA

This site may receive run-on from upstream properties to the east that is not captured by those properties storm management systems; these amounts are unlikely to contribute significantly to site runoff.

3.2 DOWNSTREAM ANALYSIS

In the existing condition, stormwater from the site generally sheet-flows northwest into a catch basin on S Meridian and enters the municipal storm system. Flows are conveyed north, then west across S Meridian, discharging onto a vegetated slope and eventually entering into Meeker Creek and its associated wetland. Under the developed condition, stormwater will generally follow this same pattern.

Review of City of Puyallup GIS assets shows that the municipal storm system to which this site drains discharges to a wetland approximately 400 ft. downstream; see Appendix B: Critical Areas Maps.



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FIGURE 5: PUYALLUP MEDICAL OFFICES DOWNSTREAM FLOWPATH

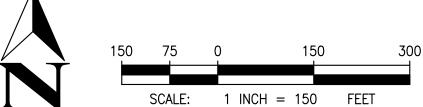
RCE 2/7/2025 FES Project No: 23062 Reference Sheet: Drawing No:

STORM STRUCTURE



STORM PIPE







4.0 FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

The City of Puyallup has adopted the 2019 SWMMWW as the governing document for stormwater management within the city. Drainage review requires preparation of engineering site improvement plans, a Technical Information Report, and Erosion/Sedimentation Controls and related information.

Review of the Geotech Report (See Appendix A) suggests a shallow water table; therefore, infiltration is not considered feasible on this site. Onsite stormwater management shall be provided by a combination detention/wetvault.

4.1 Existing Site Hydrology

Currently, the site is undeveloped, with vegetation consisting of evergreen and deciduous trees, shrubs, grasses, and groundcover. The topography generally slopes down from southeast to northwest at rates of approximately 8%. Offsite improvements will be included as a part of this project in order to provide sidewalk improvements along S Meridian and 17th Ave SE.

Table 4, below, shows a breakdown of the existing site area:

EXISTING CONDITIONS	sf	ac
PARCEL AREA	30,513	0.700
DISTURBED AREA	33,994	0.780
ON-SITE	30,513	0.700
OFF-SITE	3,481	0.080
ON-SITE	sf	ac
IMPERVIOUS	29	0.001
GRAVEL	29	0.001
PERVIOUS (LS)	30,484	0.700
OFF-SITE	sf	ac
IMPERVIOUS	880	0.020
GRAVEL	880	0.020
CONCRETE SIDEWALK	184	0.004
PERVIOUS (LS)	2,601	0.060

Table 4: Existing conditions area breakdown.

See Figure 8: Puyallup Medical Offices Existing Conditions at the end of this section.



4.2 Developed Site Hydrology

This project proposes the construction of a medical building and associated parking, driveways, walkways, utilities, etc.; Table 5, below, shows a breakdown of the developed areas.

PROPOSED ON-SITE DEVELOPED	sf	ac
PARCEL AREA	30,513	0.700
DISTURBED AREA	30,513	0.700
IMPERVIOUS	26,586	0.610
TOTAL PGHS	10,509	0.241
BUILDING ROOF	12,481	0.287
WALKWAYS	3,596	0.083
CONCRETE DRIVEWAY (PGHS)	587	0.013
ASPHALT PARKING (PGHS)	9,921	0.228
PERVIOUS (LS)	3,927	0.090
PROP. OFF-SITE DEVELOPMENT	sf	ac
DISTURBED AREA	3,481	0.080
IMPERVIOUS	3,257	0.075
Ï		0.031
TOTAL PGHS	1,329	0.051
ASPHALT ROADWAY/GUTTER (PGHS)	1,329 708	0.031
101111111111111111111111111111111111111		
ASPHALT ROADWAY/GUTTER (PGHS)	708	0.016

Table 5: Developed conditions area breakdown.

Stormwater runoff shall be conveyed into a combined detention/wet vault onsite, then conveyed to a vault control structure from which it will gravity drain into the municipal storm system, following the same pattern as under the existing condition. Due to elevation constraints, this will be a hybrid pump/gravity system. The construction and operation of the detention vault and control structures is discussed in the remainder of this section. Off-site stormwater will bypass the vault. The vault it sized to compensate this bypass area. A portion of the off-site disturbed area is to be mitigated by constructing the proposed sidewalk with permeable pavement.

See Figure 9: Puyallup Medical Offices Developed Conditions at the end of this section.



The site was modelled in WWHM using the inputs in Table 6, below. The predeveloped condition was modelled as "forest," and hydrologic soil group "C" was used.

WWHM INPUTS - MITIGATED (W/BYPASS)	ac
PREDEVELOPED	0.780
C, FOREST, MOP	0.780
DEVELOPED	0.700
C PASTURE, FLAT	0.093
ROOF TOPS/FLAT	0.287
SIDEWALKS/MOD	0.083
DRIVEWAY/FLAT	0.011
PARKING/FLAT	0.228
BYPASS	0.035
C PASTURE, FLAT	0.006
ROADS/MOD	0.016
DRIVEWAY/FLAT	0.013
PERMEABLE PAVEMENT	0.045
160' X 12' SIDEWALK	0.045

Table 6: WWHM inputs.

The following flow rates were calculated:

Flow Frequency				
Flow (cfs)	Predeveloped	Developed (Unmitigated)	Mitigated	
2-year	0.016	0.214	0.016	
5-year	0.025	0.288	0.023	
10-year	0.029	0.341	0.029	
25-year	0.034	0.414	0.038	
50-year	0.037	0.473	0.046	
100-year	0.040	0.535	0.056	
Δ 100-year		0.496		

Table 7: Calculated flow rates.



4.2.2 Flow Control

Flow control will be provided by a combined detention/wetvault. WWHM modelling was used to determine that 16,240 cf of live storage vault with the dimensions of 116'x20'x7' and a 7', 18" riser containing a 0.351" orifice and 0.01' X 1.2' rectangular notch weir will be adequate to mitigate site stormwater; see section 4.4.1.

Due to elevation constraints, it is not possible to gravity drain from the detention vault, through the modeled riser, and into the municipal storm system. As a result, an equivalent design is proposed involving using a duplex pump system and a 2 chamber control vault that mimics the operation of the riser modeled in WWHM for flows at or below the 2-year storm event (see section 4.2.2.2) and above the 2-year storm event (see section 4.2.2.3).

4.2.2.1 Control Vault

A two chamber control vault located downstream of the vault is designed to discharge equivalent flows to those from the riser modeled in WWHM (see section 4.4.1). The inner dimensions of the control structure are as follows:

Chamber 1: 7.66'x5'x4.50' with 2.50' of "Live Storage"

Chamber 2: 2'x5'x4.50'

4" thick baffle separating Chamber 1 and Chamber 2.

A 0.60" orifice is located at the low water level elevation in the 4" baffle wall that allows flow from Chamber 1 to Chamber 2

These dimensions were chosen in order to be compatible with a prefabricated 5' x 10' access hatch.

4.2.2.2 Chamber 1 Design

Update chamber depth and associated calcuations for consistency.

Chamber 1 is designed to model flows from the designed riser at or below the 2 year storm event. A duplex pump system will convey stormwater into Chamber 1, not to exceed the high water level of the chamber. Pump operation is described in section 4.2.4. Due to site elevation constraints, the static head from 2.73' of water would not provide the appropriate flow through an orifice size of 0.351 inches (orifice size modeled in WWHM; see Section 4.2.4) In order to compensate for this, the flow rate for the 2 year storm(0.016 cfs) and the available static head (2.73') was used in the following equation from the SWMMWW V-13.2:

$$d = \sqrt{\frac{36.88Q}{\sqrt{h}}}$$

where

d= orifice diameter (inches)

Q=flow (cfs)

h=hydraulic head (ft)

This results in an orifice diameter of 0.060". Water pumped into Chamber 1 will flow through this orifice, at a flow rate equivalent to that modeled in WWHM, into Chamber 2.



This report is discussing how the constructed orifice and sizing provides equivalence to the modeled orifice/part of the notch flow for the 2-year flow frequency. Although the modeled system and actual system have an equivalent 2-year flow, this does not necessarily provide equivalence for all flow control situations (i.e. the durational flow). Additional information and calculations are required to show that the constructed notch and orifice with the pump design will meet the durational flow standard. This report will 4.2.2.3 Chamber 2 Desig also need to account for how the head varies with time in both of the actual vaults, and how this is equivalent to the modeled scenario.

Chamber 2 is an open chamber that gravity drains directly to the municipal storm system via a 12" PVC pipe. When flow exceeds the staging level in the detention vault at the 2 year flow, it enters the riser in the vault through a rectangular notch weir and is conveyed to chamber 2, where it combines with the flow from chamber 1 and gravity drains into the municipal storm system.

4.2.2.4 Detention Vault

The detention vault is a 20' x 116' rectangular vault with 7' of live storage. The vault includes a pump system that pumps to a chamber 1 and a riser with rectangular notch that gravity drains to Chamber 2. The WWHM model includes a 1.2' notch at the top of the riser, however, the staging level of stormwater within the vault of the 2-year storm (6.22') is above where the notch begins. Since the hypothetical flow from that notch is already accounted for by the orifice connecting chambers 1 and 2, that portion of the notch was removed from the riser, leaving a corrected notch height of 0.778'.

4.2.3 Water Quality

Water quality will be provided by a two-treatment train and by a single-cartridge StormFilter manhole using auto-vault feature was used in WWHM to determine 4 feet will be required. PGIS surfaces will drain thro vault. The filter is sized based on the water quality impervious surfaces; see section 4.4.3 Pollution Gen a 1.8' hydraulic drop; see Appendix D: StormFilter de

If the modeled notch/orifice is equivalent to the actual notch/orifice being pumped to, why does the notch need to change? Either provide a design where the notch is the same between the modeled and actual design, or provide further rational for why this needs to be in the design, and how it still provides equivalence.

4.2.4 Pump System

The proposed pump system consists of two Goulds WE05HH pumps and be housed within the sump on the west side of the detention vault. Operation of the pumps will be automated by 5 switches. Switch 1, 2, and 5 are located within the detention yault, SW 1 is at elevation of 101,75' and is placed to turn on the lead pump when water is at or above its level (engaged). SW 2 is at 10.75' and is placed to turn off all pumps when water is below its level (disengaged). Switch 5 is at 107.55' and is placed to turn on the lag pump when engaged. Switch 3 and 4 are located in Chamber 1 of the control vault. SW 3 is at an elevation of 108.75' and is placed to turn off all pumps when engaged. SW 4 is at elevation 106.02 and is placed to turn pumps on when disengaged. Pump logic is as follows:

Lead pump ON: SW 1 engaged AND SW 4 disengaged Lag pump **ON**: SW 5 engaged **AND** SW 4 disengaged All pumps OFF: SW 3 engaged OR SW 2 disengaged



Pump sizing was performed based upon the performance curve supplied by the manufacturer; see Appendix F: WE Series Model 3885 Brochure.

4.3 Wetland Hydroperiods

The proposed development's impact on the downstream wetland was modeled in WWHM 2012. A basin draining into the category 3 wetland around Meeker Creek was determined to be 308 acres; see Appendix C: Critical Area Report. An average slope across the basin was estimated by taking the elevation distance between the high point at the south eastern corner, 440', and the low point in the north western corner, 50', and dividing that by the linear distance between them, 7,000', resulting in an average slope of 5.6%; see Figure 6. This slope was considered when developing WWHM inputs.

Using the City of Puyallup's zoning map (Figure 7), table 9 below was developed, showing the estimated impervious area of the basin entering the downstream wetland. This table assumes max allowable coverage for each zone, and 100% coverage for roadways, an average of 67% impervious area within the basin was determined as the predeveloped condition. Impervious area was modeled in WWHM as ROADS/MOD.

BASIN IMPERVIOUS			
TOTAL AREA	308		
ZONE	AREA(AC)	MAX COVERAGE	IMPERVIOUS(AC)
CCX	57.5	85%	48.9
RS-10	29.4	40%	11.8
RM-10	13.7	60%	8.2
RM-20	97.9	55%	53.8
RM CORE	36.2	90%	32.6
MED	29.0	50%	14.5
CG	14.8	75%	11.1
OP	8.5	50%	4.3
ROAD	21.1	100%	21.1
IMPERVIOUS			206.1
PERVIOUS			101.9

Table 9: Basin Impervious

For the developed condition, the new impervious area from the project found in Table 6 were added as additional impervious surface. The proposed vault is not included in this analysis as a conservative measure. WWHM analysis of the wetland basin confirms that the hydroperiod is maintained; see section 4.4.2 Wetlands Modeling

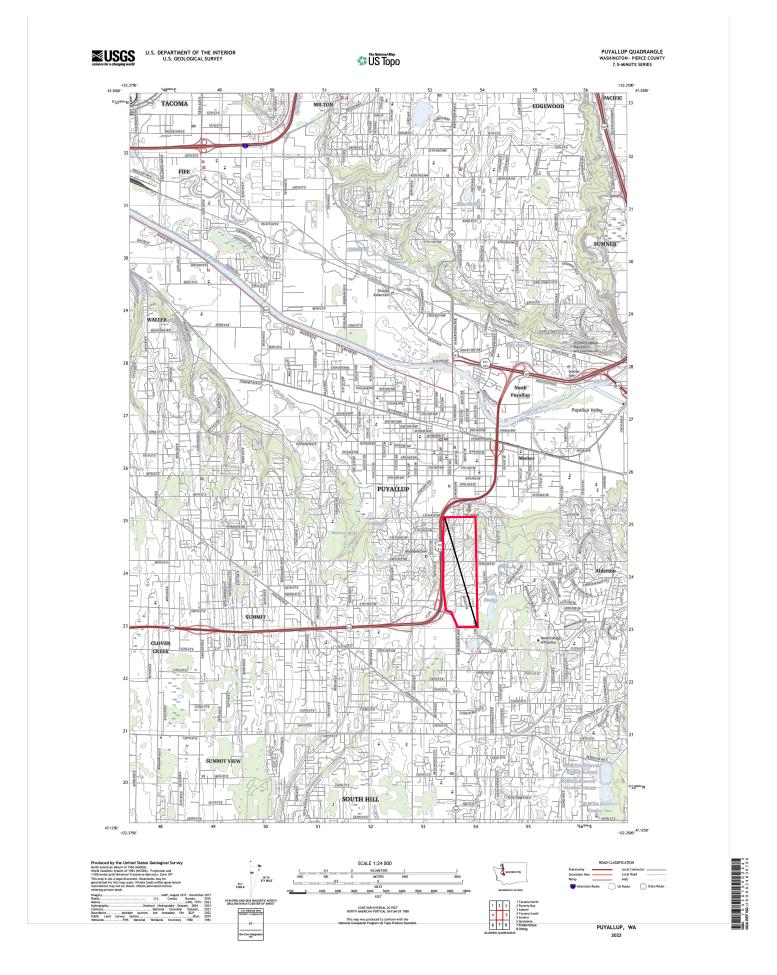
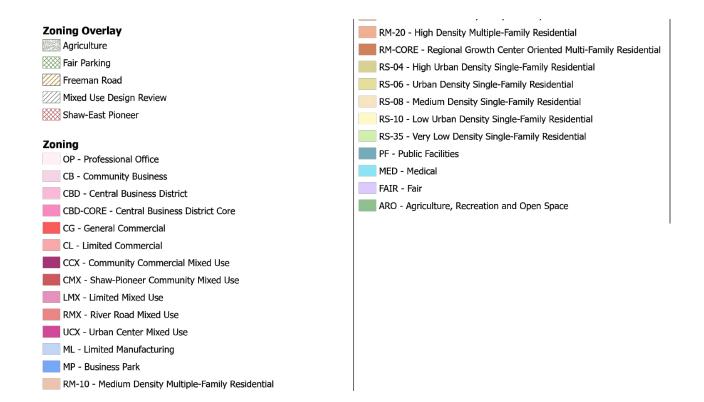


Figure 6 Sub Basin Map



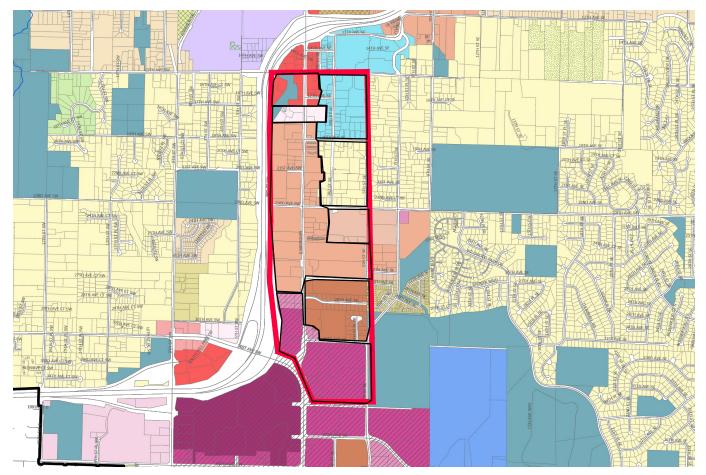
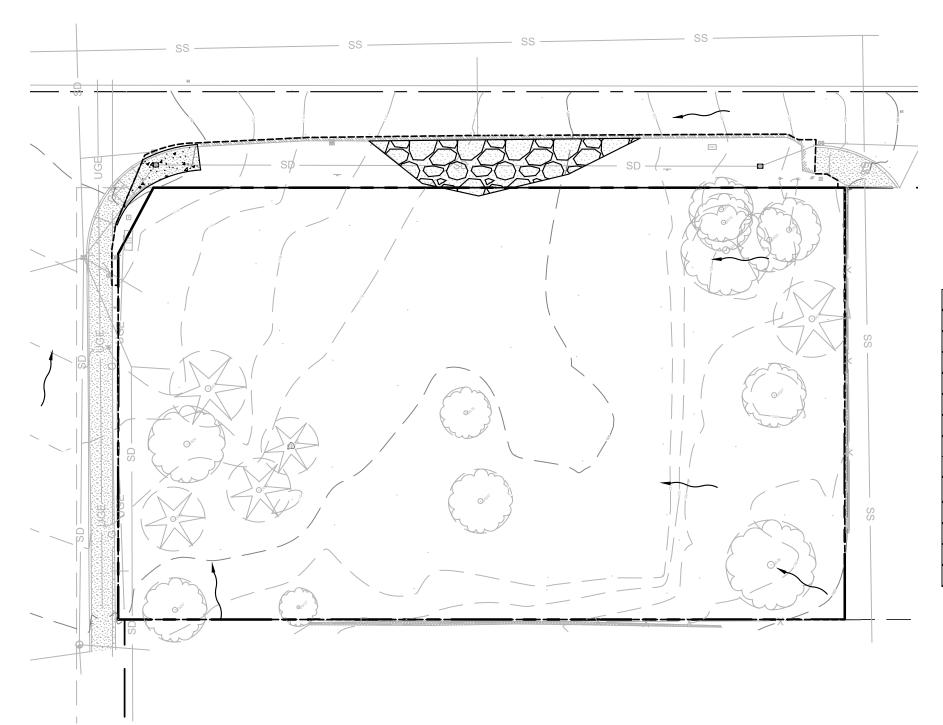


Figure 7 Zoning Map





EXISTING CONDITIONS sf ac PARCEL AREA 30,513 0.700 **DISTURBED AREA** 33,994 0.780 30,513 **ON-SITE** 0.700 OFF-SITE 3,481 0.080 ON-SITE sf ac **IMPERVIOUS** 29 0.001 GRAVEL 29 0.001 PERVIOUS (LS) 30,484 0.700 OFF-SITE sf ac **IMPERVIOUS** 880 0.020 GRAVE 880 0.020 CONCRETE SIDEWALK 184 0.004 PERVIOUS (LS) 2,601 0.060

FIGURE 8: PUYALLUP MEDICAL OFFICES EXISTING CONDITIONS

LEGEND - EXISTING



CONCRETE

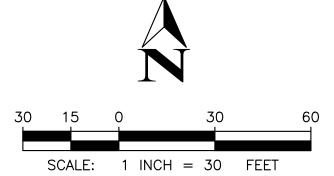


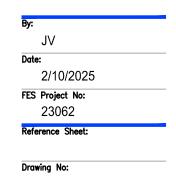
GRAVEL

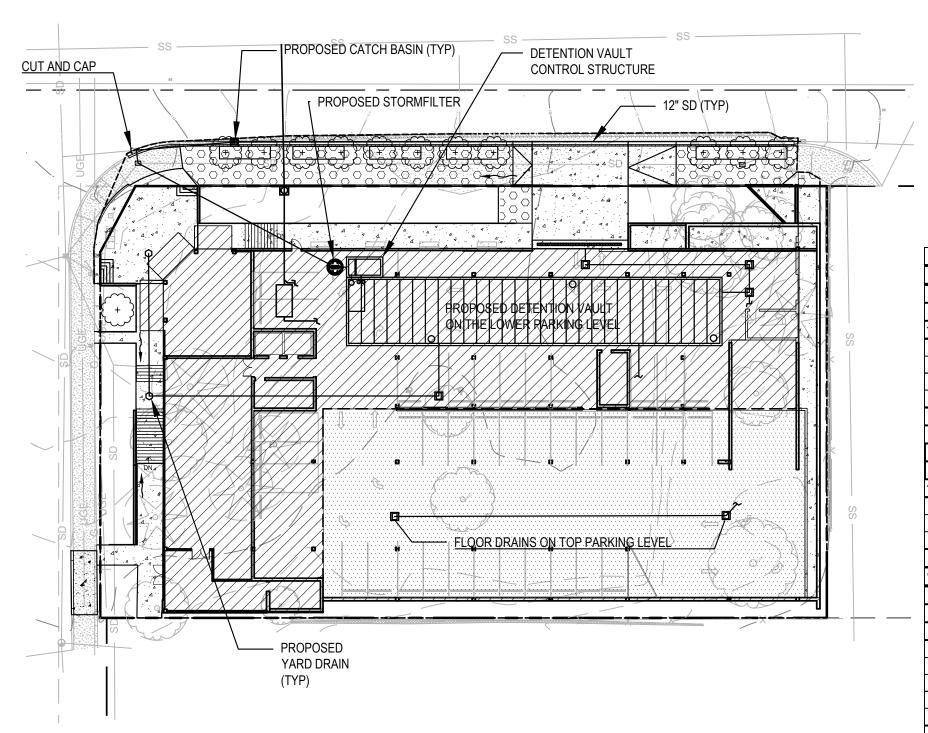


DISTURBED AREA









LEGEND - DEVELOPED

ROOF



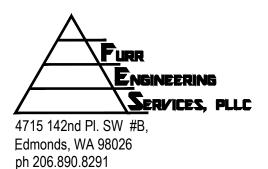
CONCRETE



PERMEABLE CONCRETE



DISTURBED AREA



OFFICES

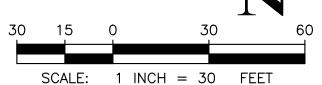
PUYALLUP MEDICAL

FIGURE 9:

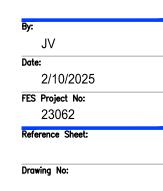
PROPOSED ON-SITE DEVELOPED sf ac PARCEL AREA 30,513 0.700 **DISTURBED AREA** 30,513 0.700 **IMPERVIOUS** 26,586 0.610 TOTAL PGHS 10,509 0.241 **BUILDING ROOF** 12,481 0.287 WALKWAYS 3,596 0.083 CONCRETE DRIVEWAY (PGHS 587 0.013 ASPHALT PARKING (PGHS) 0.228 9,921 PERVIOUS (LS) 3,927 0.090 PROP. OFF-SITE DEVELOPMENT sf ac **DISTURBED AREA** 3,481 0.080 **IMPERVIOUS** 3,257 0.075 TOTAL PGHS 1,329 0.031 ASPHALT ROADWAY/GUTTER (PGHS 708 0.016 PERMEABLE CONCRETE SIDEWALK 0.044 1,928 CONCRETE DRIVEWAY (PGHS) 621 0.014 PERVIOUS (LS) 224 0.005 WWHM INPUTS - MITIGATED (W/BYPASS) ac PREDEVELOPED 0.780 C, FOREST, MOD 0.780 DEVELOPED 0.700 C PASTURE, FLAT 0.090 **ROOF TOPS/FLAT** 0.287 SIDEWALKS/MOD 0.083 DRIVEWAY/FLAT 0.013 PARKING/FLAT 0.228 BYPASS 0.035 C PASTURE, FLAT 0.005 ROADS/MOD 0.016 DRIVEWAY/FLAT 0.014 PERMEABLE PAVEMENT 0.045

160' X 12' SIDEWALK





0.045





4.4 WWHM Reports

4.4.1 Vault Modeling

WWHM2012 PROJECT REPORT

Project Name: 23062 - full site
Site Name: Puyallup Medical Center
Site Address: 1617 S Meridian

City : Puyallup, WA 98371

Report Date: 1/8/2025
Gage : 38 IN CENTRAL
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00

Version Date: 2021/08/18

Version : 4.2.18

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1

 $\textbf{Bypass:} \ \texttt{No}$

GroundWater: No

Pervious Land Use acre
C, Forest, Mod .78

Pervious Total 0.78

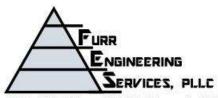
Impervious Land Use acre

Impervious Total 0

Basin Total 0.78

Element Flows To:

Surface Interflow Groundwater



MITIGATED LAND USE

Name : Basin 1

Bypass: No

GroundWater: No

Pervious Land	d Use	acre
C, Pasture,	Flat	.091

Pervious Total 0.091

Impervious Land Use	acre
ROOF TOPS FLAT	0.287
DRIVEWAYS FLAT	0.011
SIDEWALKS FLAT	0.083
PARKING FLAT	0.228

Impervious Total 0.609

Basin Total 0.7

Element Flows To:

Surface Interflow Groundwater

Vault 1 Vault 1

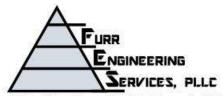
Name : Vault 1
Width : 20 ft.
Length : 116 ft.
Depth: 8 ft.
Discharge Structure
Riser Height: 7 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.010 ft.
Notch Height: 1.200 ft.

Orifice 1 Diameter: 0.351 in. Elevation: 0 ft.

Element Flows To:

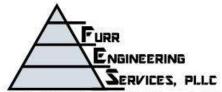
Outlet 1 Outlet 2

Page 26



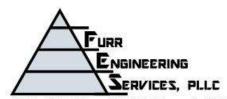
Vault Hydraulic Table

Stage(feet)	Area (ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.053	0.000	0.000	0.000
0.0889	0.053	0.004	0.001	0.000
0.1778	0.053	0.009	0.001	0.000
0.2667	0.053	0.014	0.001	0.000
0.3556	0.053	0.018	0.002	0.000
0.4444	0.053	0.023	0.002	0.000
0.5333	0.053	0.028	0.002	0.000
0.6222	0.053	0.033	0.002	0.000
0.7111	0.053	0.037	0.002	0.000
0.8000	0.053	0.042	0.003	0.000
0.8889	0.053	0.047	0.003	0.000
0.9778	0.053	0.052	0.003	0.000
1.0667	0.053	0.056	0.003	0.000
1.1556	0.053	0.061	0.003	0.000
1.2444	0.053	0.066	0.003	0.000
1.3333	0.053	0.071	0.003	0.000
1.4222	0.053	0.075	0.004	0.000
1.5111	0.053	0.080	0.004	0.000
1.6000	0.053	0.085	0.004	0.000
1.6889	0.053	0.090	0.004	0.000
1.7778	0.053	0.094	0.004	0.000
1.8667	0.053	0.099	0.004	0.000
1.9556	0.053	0.104	0.004	0.000
2.0444	0.053	0.108	0.004	0.000
2.1333	0.053	0.113	0.004	0.000
2.2222	0.053	0.118	0.005	0.000
2.3111	0.053	0.123	0.005	0.000
2.4000	0.053	0.127	0.005	0.000
2.4889	0.053	0.132	0.005	0.000
2.5778	0.053	0.137	0.005	0.000
2.6667	0.053	0.142	0.005	0.000
2.7556	0.053	0.146	0.005	0.000
2.8444	0.053	0.151	0.005	0.000
2.9333	0.053	0.156	0.005	0.000
3.0222	0.053	0.161	0.005	0.000
3.1111	0.053	0.165	0.005	0.000
3.2000	0.053	0.170	0.006	0.000
3.2889	0.053	0.175	0.006	0.000
3.3778	0.053	0.179	0.006	0.000
3.4667	0.053	0.184	0.006	0.000
3.5556	0.053	0.189	0.006	0.000
3.6444	0.053	0.194	0.006	0.000
3.7333	0.053	0.198	0.006	0.000
3.8222	0.053	0.203	0.006	0.000
3.9111	0.053	0.208	0.006	0.000



4.0000 4.0889	0.053 0.053	0.213 0.217	0.006	0.000
4.1778	0.053	0.222	0.006	0.000
4.2667 4.3556	0.053 0.053	0.227 0.232	0.006 0.007	0.000
4.4444	0.053	0.236	0.007	0.000
4.5333	0.053	0.241	0.007	0.000
4.6222	0.053	0.246	0.007	0.000
4.7111 4.8000	0.053 0.053	0.250 0.255	0.007	0.000
4.8889	0.053	0.260	0.007	0.000
4.9778	0.053	0.265	0.007	0.000
5.0667	0.053	0.269	0.007	0.000
5.1556 5.2444	0.053 0.053	0.274 0.279	0.007	0.000
5.3333	0.053	0.284	0.007	0.000
5.4222	0.053	0.288	0.007	0.000
5.5111	0.053	0.293	0.007	0.000
5.6000 5.6889	0.053 0.053	0.298	0.007	0.000
5.7778	0.053	0.303	0.008	0.000
5.8667	0.053	0.312	0.008	0.000
5.9556	0.053	0.317	0.010	0.000
6.0444	0.053	0.321	0.012	0.000
6.1333 6.2222	0.053 0.053	0.326 0.331	0.014	0.000
6.3111	0.053	0.336	0.019	0.000
6.4000	0.053	0.340	0.022	0.000
6.4889	0.053	0.345	0.024	0.000
6.5778 6.6667	0.053 0.053	0.350 0.355	0.027	0.000
6.7556	0.053	0.359	0.033	0.000
6.8444	0.053	0.364	0.037	0.000
6.9333	0.053	0.369	0.040	0.000
7.0222	0.053	0.374	0.096	0.000
7.1111 7.2000	0.053 0.053	0.378 0.383	0.631 1.448	0.000
7.2889	0.053	0.388	2.418	0.000
7.3778	0.053	0.392	3.430	0.000
7.4667	0.053	0.397	4.370	0.000
7.5556 7.6444	0.053 0.053	0.402	5.141 5.693	0.000
7.7333	0.053	0.411	6.058	0.000
7.8222	0.053	0.416	6.470	0.000
7.9111	0.053	0.421	6.808	0.000
8.0000 8.0889	0.053 0.053	0.426	7.131 7.439	0.000
8.1778	0.000	0.000	7.735	0.000

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: BYPASS Name Bypass: Yes

GroundWater: No

Pervious 1	Land Use	acre
C, Pastu	re, Flat	.006

0.006 Pervious Total

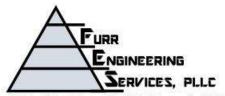
Impervious	Land Use	acre
ROADS MOD	<u>.</u>	0.016
DRIVEWAYS	FLAT	0.013
Impervious	Total	0.029

Basin Total 0.035

Element Flows To:

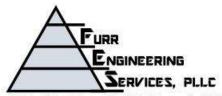
Surface Interflow Groundwater

```
Name
     : Permeable Pavement 1
Pavement Area: 0.0440 ft.
Pavement Length: 159.72 ft.
Pavement Width: 12.00 ft.
Pavement slope 1: 0 To 1
Pavement thickness: 0.5
Pour Space of Pavement: 0
Material thickness of second layer: 0.5
Pour Space of material for second layer: 0.3
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 0.3
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 16.475
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 16.475
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 1.189
Element Flows To:
Outlet 1
                     Outlet 2
```

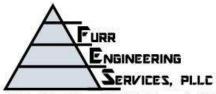


	Permeab	ole Pavement	Hydraulic Ta	able
Stage (feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.044	0.000	0.000	0.000
0.0111	0.044	0.000	0.000	0.013
0.0222	0.044	0.000	0.000	0.013
0.0333	0.044	0.000	0.000	0.013
0.0444	0.044	0.000	0.000	0.013
0.0556	0.044	0.000	0.000	0.013
0.0667	0.044	0.000	0.000	0.013
0.0778	0.044	0.001	0.000	0.013
0.0889	0.044	0.001	0.000	0.013
0.1000	0.044	0.001	0.000	0.013
0.1111	0.044	0.001	0.000	0.013
0.1222	0.044	0.001	0.000	0.013
0.1333	0.044	0.001	0.000	0.013
0.1444	0.044	0.001	0.000	0.013
0.1556	0.044	0.002	0.000	0.013
0.1667	0.044	0.002	0.000	0.013
0.1778	0.044	0.002	0.000	0.013
0.1889	0.044	0.002	0.000	0.013
0.2000	0.044	0.002	0.000	0.013
0.2111	0.044	0.002	0.000	0.013
0.2222	0.044	0.002	0.000	0.013
0.2333	0.044	0.003	0.000	0.013
0.2444	0.044	0.003	0.000	0.013
0.2556	0.044	0.003	0.000	0.013
0.2667	0.044	0.003	0.000	0.013
0.2778	0.044	0.003	0.000	0.013
0.2889	0.044	0.003	0.000	0.013
0.3000	0.044	0.004	0.000	0.013
0.3111	0.044	0.004	0.000	0.013
0.3222	0.044	0.004	0.000	0.013
0.3333	0.044	0.004	0.000	0.013
0.3444	0.044	0.004	0.000	0.013
0.3556	0.044	0.004	0.000	0.013
0.3667	0.044	0.004	0.000	0.013
0.3778	0.044	0.005	0.000	0.013
0.3889	0.044	0.005	0.000	0.013
0.4000	0.044	0.005	0.000	0.013
0.4111	0.044	0.005	0.000	0.013
0.4222	0.044	0.005	0.000	0.013
0.4333	0.044	0.005	0.000	0.013
0.4444	0.044	0.005	0.000	0.013
0.4556	0.044	0.006	0.000	0.013
0.4667	0.044	0.006	0.000	0.013
0.4778	0.044	0.006	0.000	0.013



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ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1

Total Pervious Area:0.78 Total Impervious Area:0

Mitigated Landuse Totals for POC #1

Total Pervious Area:0.097 Total Impervious Area:0.682

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.016598
5 year	0.025961
10 year	0.031067
25 year	0.036275
50 year	0.039375
100 year	0.041926

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.015622
5 year	0.021801
10 year	0.026818
25 year	0.03433
50 year	0.040867
100 year	0.048289

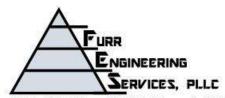
Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #1

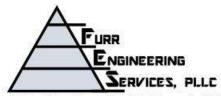
Milluar	reaks I	or rredeve	stoped and Micig
Year	P	redevelope	ed Mitigated
1902		0.012	0.015
1903		0.010	0.017
1904		0.019	0.020
1905		0.008	0.013
1906		0.004	0.012
1907		0.025	0.016
1908		0.019	0.013
1909		0.018	0.013
1910		0.025	0.016
1911		0.017	0.016
1912		0.063	0.026



	000	
1913	0.026	0.012
1914	0.006	0.037
1915	0.011	0.013
		0.013
1916	0.016	
1917	0.005	0.010
1918	0.018	0.021
1919	0.013	0.011
1920	0.017	0.014
1921	0.019	0.015
1922	0.019	0.017
1923	0.015	0.014
1924	0.007	0.017
1925	0.009	0.011
1926	0.016	0.014
1927	0.010	0.013
1928	0.013	0.013
1929	0.027	0.014
1930	0.017	0.019
1931	0.016	0.014
1932	0.012	0.012
1933	0.012	0.014
1934	0.034	0.080
1935	0.016	0.012
1936	0.014	0.015
1937	0.023	0.017
1938	0.014	0.012
1939	0.001	0.013
1940	0.015	0.019
1941	0.007	0.019
1942	0.023	0.028
1943	0.012	0.016
1944	0.023	0.023
1945	0.019	0.016
	0.019	
1946		0.014
1947	0.006	0.011
1948	0.035	0.016
1949	0.030	0.019
1950	0.009	0.011
1951	0.011	0.018
1952	0.047	0.023
1953	0.042	0.025
1954	0.015	0.013
1955	0.012	0.011
1956	0.006	0.010
1957	0.021	0.013
1958	0.044	0.050
1959	0.027	0.039
1960	0.007	0.012
1961	0.028	0.012
1962	0.015	0.028
エクひと	0.010	0.014



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1963	0.007	0.010
1964	0.008	0.028
1965	0.031	0.042
1966	0.009	0.012
1967	0.014	0.016
1968	0.014	0.015
1969	0.014	0.014
1970	0.021	0.014
1971	0.033	0.016
1972	0.022	0.035
1973	0.028	0.022
1974	0.016	0.018
1975	0.035	0.036
1976	0.019	0.020
1977	0.006	0.010
1978	0.031	0.029
1979	0.009	0.014
1980	0.018	0.017
1981	0.017	0.015
1982	0.007	0.012
1983	0.028	0.018
1984	0.011	0.016
1985	0.018	0.018
1986	0.016	0.013
1987	0.032	0.013
1988	0.020	0.013
1989	0.018	0.011
1990	0.020	0.013
1991	0.016	0.018
1992	0.023	0.025
1993	0.022	0.016
1994	0.033	0.015
1995	0.006	0.013
1996	0.037	0.034
1997	0.014	0.014
1998	0.016	0.016
1999	0.001	0.014
	0.013	
2000		0.014
2001	0.006	0.010
2002	0.026	0.020
2003	0.020	0.015
2004	0.019	0.016
2005	0.039	0.030
2006	0.010	0.014
2007	0.010	0.017
2008	0.017	0.015
2009	0.012	0.012
2010	0.010	0.015
2010	0.008	0.013
		0.013
2012	0.012	0.014



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2013	0.009	0.012
	0.007	0.012
2014		
2015	0.013	0.019
2016	0.005	0.013
2017	0.025	0.020
2018	0.047	0.041
2019	0.045	0.040
2020	0.014	0.016
2021	0.023	0.016
2022	0.009	0.018
2023	0.019	0.022
2024	0.046	0.026
2025	0.017	0.012
2026	0.028	0.017
2027	0.010	0.016
2028	0.009	0.009
2029	0.019	0.014
2030	0.035	0.018
2031	0.011	0.009
2032	0.006	0.011
2033	0.010	0.013
2034	0.010	0.011
2035	0.039	0.032
2036	0.021	0.013
2037	0.005	0.016
2038	0.017	0.015
2039	0.002	0.024
		0.013
2040	0.009	
2041	0.012	0.014
2042	0.039	0.027
2043	0.018	0.015
2044	0.025	0.016
2045	0.017	0.012
		0.012
2046	0.020	
2047	0.015	0.013
2048	0.019	0.012
2049	0.017	0.015
2050	0.012	0.013
2051	0.018	0.019
2052	0.010	0.014
2053	0.018	0.028
2054	0.023	0.021
2055	0.007	0.014
2056	0.008	0.016
	0.000	
2057		0.011
2058	0.016	0.016
2059	0.028	0.020

Stream Protection Duration



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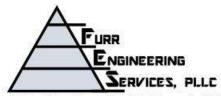
Ranked	Annual Peaks for	Predeveloped and Mitigated. POC #1
Rank	Predeveloped	Mitigated Mitigated. 100 #1
1	0.0627	0.0802
2	0.0467	0.0502
3	0.0466	0.0423
4	0.0460	0.0412
5	0.0449	0.0402
6	0.0444	0.0388
7	0.0416	0.0374
8	0.0393	0.0359
9	0.0392	0.0347
10	0.0386	0.0340
11	0.0368	0.0339
12	0.0353	0.0324
13	0.0349	0.0300
14	0.0348	0.0293
15	0.0344	0.0281
16	0.0333	0.0277
17	0.0330	0.0277
18	0.0319	0.0275
19	0.0312	0.0273
20	0.0309	0.0262
21	0.0303	0.0256
22	0.0278	0.0247
23	0.0276	0.0246
24	0.0276	0.0243
25	0.0276	0.0230
26	0.0276	0.0229
27	0.0275	0.0224
28	0.0267	0.0224
29	0.0262	0.0212
30	0.0259	0.0208
31	0.0254	0.0204
32	0.0253	0.0203
33	0.0252	0.0201
34	0.0248	0.0199
35	0.0230	0.0196
36	0.0230	0.0194
37	0.0228	0.0192
38	0.0227	0.0190
39	0.0226	0.0190
40	0.0225	0.0188
41	0.0220	0.0187
42	0.0216	0.0186
43	0.0213	0.0183
44	0.0212	0.0182
45	0.0207	0.0180
46	0.0202	0.0179
47	0.0199	0.0179
48	0.0199	0.0177



49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65	0.0198 0.0193 0.0192 0.0189 0.0188 0.0187 0.0187 0.0187 0.0187 0.0185 0.0185 0.0185 0.0184 0.0183 0.0181 0.0179	0.0177 0.0176 0.0174 0.0173 0.0172 0.0172 0.0170 0.0168 0.0168 0.0164 0.0164 0.0164 0.0162 0.0161 0.0161
66 67 68	0.0177 0.0176 0.0176 0.0174	0.0160 0.0160 0.0159
69	0.0174	0.0158
70	0.0169	0.0158
71	0.0169	0.0157
72	0.0169	0.0157
73	0.0169	0.0157
74	0.0168	0.0156
75	0.0167	0.0156
76	0.0166	0.0155
77	0.0165	0.0155
77 78 79 80 81	0.0164 0.0163 0.0161	0.0155 0.0155 0.0151 0.0150
82	0.0160	0.0149
83	0.0158	0.0147
84	0.0157	0.0147
85	0.0155	0.0147
86	0.0151	0.0146
87	0.0150	0.0146
88	0.0150	0.0146
89	0.0148	0.0145
90	0.0146	0.0145
91	0.0140	0.0144
92	0.0139	0.0144
93	0.0138	0.0143
94	0.0136	0.0143
96	0.0135	0.0143
97	0.0135	0.0143
98	0.0133	0.0143



99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144	0.0130 0.0127 0.0125 0.0124 0.0123 0.0122 0.0121 0.0121 0.0121 0.0120 0.0119 0.0117 0.0116 0.0115 0.0115 0.0103 0.0102 0.0102 0.0102 0.0102 0.0102 0.0101 0.0101 0.0101 0.0101 0.0101 0.0101 0.0101 0.0101 0.0101 0.01099 0.0099 0.0099 0.0099 0.0099 0.0086 0.0086 0.0086 0.0086 0.0086 0.0086 0.0086 0.0087 0.00880 0.0079 0.0071 0.0071 0.0071 0.0071 0.0069 0.0069	0.0140 0.0140 0.0140 0.0139 0.0139 0.0137 0.0137 0.0136 0.0135 0.0135 0.0135 0.0135 0.0132 0.0132 0.0132 0.0130 0.0130 0.0130 0.0130 0.0129 0.0129 0.0129 0.0129 0.0129 0.0129 0.0129 0.0129 0.0129 0.0129 0.0129 0.0121 0.0125 0.0125 0.0125 0.0125 0.0125 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121 0.0121
141	0.0071	0.0116
142	0.0069	0.0116
143	0.0069	0.0115



149	0.0062	0.0110
150	0.0062	0.0109
151	0.0060	0.0107
152	0.0055	0.0104
153	0.0053	0.0104
154	0.0049	0.0100
155	0.0035	0.0099
156	0.0016	0.0098
157	0.0013	0.0090
158	0.0008	0.0085

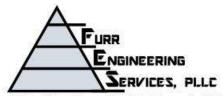
Stream Protection Duration

POC #1

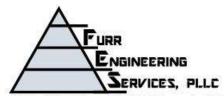
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit Perc	entage	Pass/Fail
0.0083	53118	36415	68	Pass
0.0086	49091	29163	59	Pass
0.0089	45489	23950	52	Pass
0.0092	42265	19900	47	Pass
0.0096	39246	16814	42	Pass
0.0099	36470	14371	39	Pass
0.0102	33972	12504	36	Pass
0.0105	31639	11064	34	Pass
0.0108	29379	9895	33	Pass
0.0111	27396	8986	32	Pass
0.0114	25628	8249	32	Pass
0.0118	24005	7573	31	Pass
0.0121	22570	7019	31	Pass
0.0124	21230	6543	30	Pass
0.0127	19922	6144	30	Pass
0.0130	18736	5789	30	Pass
0.0133	17623	5459	30	Pass
0.0136	16554	5158	31	Pass
0.0139	15468	4906	31	Pass
0.0143	14537	4660	32	Pass
0.0146	13673	4452	32	Pass
0.0149	12881	4228	32	Pass
0.0152	12099	4043	33	Pass
0.0155	11401	3864	33	Pass
0.0158	10692	3685	34	Pass
0.0161	10066	3540	35	Pass
0.0165	9451	3368	35	Pass
0.0168	8914	3225	36	Pass
0.0171	8388	3106	37	Pass
0.0174	7889	2982	37	Pass
0.0177	7485	2877	38	Pass



0.0180	7053	2772	39	Pass
0.0183	6615	2673	40	Pass
0.0187	6271	2584	41	Pass
0.0190	5961	2493	41	Pass
0.0193	5695	2405	42	Pass
0.0196	5418	2316	42	Pass
0.0199	5174	2238	43	Pass
0.0202	4906	2158	43	Pass
0.0205	4668	2064	44	Pass
0.0209	4481	1986	44	Pass
0.0212	4303	1898	44	Pass
0.0215	4118	1818	44	Pass
0.0218	3913	1745	44	Pass
0.0221	3710	1685	45	Pass
0.0224	3528	1615	45	Pass
0.0227	3371	1560	46	Pass
0.0231	3210	1499	46	Pass
0.0234	3094	1435	46	Pass
0.0237	2982	1383	46	Pass
0.0237	2878	1327	46	Pass
0.0240	2757	1274	46	
				Pass
0.0246	2614	1212	46	Pass
0.0249	2503	1160	46	Pass
0.0252	2399	1105	46	Pass
0.0256	2302	1058	45	Pass
0.0259	2197	1010	45	Pass
0.0262	2074	958	46	Pass
0.0265	1995	914	45	Pass
0.0268	1898	865	45	Pass
0.0271	1808	814	45	Pass
0.0274	1718	768	44	Pass
0.0278	1637	728	44	Pass
0.0281	1585	699	44	Pass
0.0284	1502	669	44	Pass
0.0287	1428	641	44	Pass
0.0290	1359	616	45	Pass
0.0293	1285	590	45	Pass
0.0296	1229	553	44	Pass
0.0230	1175	533	45	Pass
0.0303				
	1112	509	45	Pass
0.0306	1066	481	45	Pass
0.0309	1018	453	44	Pass
0.0312	973	424	43	Pass
0.0315	929	407	43	Pass
0.0318	877	388	44	Pass
0.0322	819	364	44	Pass
0.0325	780	344	44	Pass
0.0328	736	329	44	Pass
0.0331	691	313	45	Pass
0.0334	635	301	47	Pass



0.0337	597	277	46	Pass
0.0340	553	262	47	Pass
0.0344	509	249	48	Pass
0.0347	471	234	49	Pass
0.0350	423	218	51	Pass
0.0353	392	205	52	Pass
0.0356	361	194	53	Pass
0.0359	337	180	53	Pass
0.0362	312	169	54	Pass
0.0365	297	159	53	Pass
0.0369	274	149	54	Pass
0.0372	254	142	55	Pass
0.0375	240	131	54	Pass
0.0378	221	122	55	Pass
0.0381	207	115	55	Pass
0.0384	194	111	57	Pass
0.0387	176	103	58	Pass
0.0391	156	97	62	Pass
0.0394	142	93	65	Pass

Water Quality BMP Flow and Volume for POC #1 On-line facility volume: 0.0135 acre-feet On-line facility target flow: 0.0069 cfs.

Adjusted for 15 min: 0.0069 cfs.

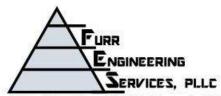
Off-line facility target flow: 0.0046 cfs.

Adjusted for 15 min: 0.0046 cfs.

LID Report

LID Technique Water Ouality Percent	Used for Comment	Total Volume	Volume	Infiltration	Cumulative	Percent
water Quality Percent	Treatmen	t? Needs	Through	Volume	Volume	Volume
Water Quality						
		Treatment	Facili	ty (ac-ft.)	Inf:	iltration
Infiltrated	Treated					
		(ac-ft)	(ac-ft)		Credit	
Vault 1 POC	N	231.48			N	0.00
Permeable Pavement 1 POC	N	14.99			N	100.00
Total Volume Infiltrated		246.47	0.00	0.00		6.08
0.00 0%	No Treat.	Credit				
Compliance	with	LID		Standa	rd	8
Duration Analysis Result =	Passed					

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.**Perlnd and Implnd Changes**No changes have been made.



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4.4.2 Wetlands Modeling

WWHM2012 PROJECT REPORT

Project Name: 23062 - wetlands

Site Name:

Site Address: 1617 S. Meridian

City: Puyallup
Report Date: 2/4/2025
Gage: 38 IN CENTRAL
Data Start: 10/01/1901
Data End: 09/30/2059
Precip Scale: 1.00

Version Date: 2021/08/18

Version : 4.2.18

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1

Bypass: No

GroundWater: No

Pervious Land Use
C, Lawn, Mod

acre
101.9

Pervious Total 101.9

Impervious Land Use acre
ROADS MOD 206.1

Impervious Total 206.1



Basin Total 308

Element Flows To:

Surface Interflow Groundwater

MITIGATED LAND USE

Name : Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre
C, Lawn, Mod 101.259

Pervious Total 101.259

| Impervious Land Use | acre | 206.116 | ROADS MOD | 0.287 | DRIVEWAYS FLAT | 0.027 | SIDEWALKS MOD | 0.083 | PARKING MOD | 0.228 |

Impervious Total 206.741

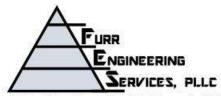
Basin Total 308

Element Flows To:

Surface Interflow Groundwater

ANALYSIS RESULTS

Stream Protection Duration



Predeveloped Landuse Totals for POC #1

Total Pervious Area:101.9
Total Impervious Area:206.1

Mitigated Landuse Totals for POC #1

Total Pervious Area:101.259
Total Impervious Area:206.741

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	84.940512
5 year	117.751504
10 year	142.705615
25 year	178.143427
50 year	207.53902
100 year	239.640677

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	85.144646
5 year	118.016813
10 year	143.014543
25 year	178.510912
50 year	207.952578
100 year	240.102367

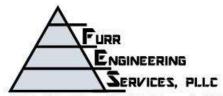
Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #1

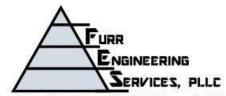
Year	Predeveloped	Mitigated
1902	92.490	92.764
1903	101.482	101.784
1904	135.392	135.610
1905	57.461	57.607
1906	63.317	63.496
1907	83.311	83.475
1908	65.777	65.939
1909	77.830	78.055
1910	85.141	85.297
1911	91.119	91.323
1912	184.845	185.049
1913	77.473	77.669
1914	312.108	312.779
1915	53.484	53.623
1916	103.161	103.443
1917	44.673	44.791



1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948	77.647 53.138 79.120 58.628 101.908 63.389 110.837 49.079 88.454 80.960 56.017 117.918 121.039 61.714 67.808 64.202 110.108 51.974 78.130 113.447 58.532 65.086 131.645 130.948 95.187 86.497 136.369 91.313 87.089 56.753 78.997	77.881 53.266 79.277 58.758 102.085 63.532 111.142 49.205 88.716 81.170 56.163 118.188 121.379 61.865 67.970 64.351 110.287 52.109 78.322 113.779 58.660 65.274 132.005 131.311 95.374 86.716 136.641 91.568 87.264 56.906 79.204
1944	136.369	136.641
1947 1948	56.753 78.997	56.906 79.204
1949	116.476 76.819	116.825
1950 1951	136.930	77.037 137.293
1952 1953	148.070 123.440	148.258 123.610
1954	65.463	65.624
1955 1956	79.580 67.670	79.775 67.858
1957	64.516	64.666
1958 1959	98.799 99.207	98.983 99.382
1960	68.838	69.023
1961	208.220 81.698	208.659 81.931
1962 1963	55.465	55.632
1964	230.211	230.614
1965 1966	94.508 61.480	94.688 61.642
1967	97.025	97.208



1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979	82.126 66.379 81.301 77.243 286.899 140.125 103.387 119.713 123.461 52.578 92.318 87.949 102.846 91.921	82.327 66.543 81.459 77.398 287.512 140.541 103.639 119.867 123.677 52.712 92.480 88.162 103.026 92.130
1982	68.560	68.738
1983 1984	90.754 90.555	90.952 90.751
1985	121.119	121.324
1986	55.028	55.164
1987	91.658	91.805
1988	52.835	52.961
1989 1990	57.095 71.766	57.233 71.925
1991	130.823	131.055
1992	120.500	120.817
1993	96.881	97.175
1994	75.857	76.022
1995	56.017	56.161
1996	82.012	82.185
1997 1998	71.080 84.280	71.244 84.452
1999	100.790	101.064
2000	74.186	74.370
2001	75.646	75.846
2002	124.831	124.997
2003	83.240	83.437
2004	98.353	98.608
2005	239.106 85.354	239.691 85.602
2006 2007	102.246	102.489
2008	80.973	81.185
2009	62.083	62.231
2010	80.253	80.462
2011	83.411	83.627
2012	73.716 81.120	73.906 81.289
2013 2014	76.819	77.036
2015	137.302	137.514
2016	86.747	86.962
2017	111.332	111.642



4715 142nd Place SW #B, Edmonds, WA 98026 FurrEngineering@gmail.com

Stream Protection Duration

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	312.1080	312.7790
2	286.8990	287.5120
3	239.1060	239.6910



4 5	230.2110 208.2200	230.6140 208.6590
6	206.0940	206.3810
7 8	184.8450	185.0490
9	178.3530 157.4420	178.8270 157.6630
10	155.8590	156.2710
11	148.0700	148.2580
12	140.1250	140.5410
13	137.3020	137.5140
14	136.9300	137.2930
15	136.3690	136.6410
16 17	135.3920 134.7730	135.6100 135.0970
18	131.6450	132.0050
19	131.1480	131.5240
20	130.9480	131.3110
21	130.8230	131.0550
22	124.8310	124.9970
23	123.5030	123.6770
24	123.4610	123.6690
25 26	123.4400 122.9290	123.6100 123.2900
27	121.1190	123.2300
28	121.0390	121.3240
29	120.5000	120.8170
30	120.2740	120.5930
31	119.7130	119.8670
32	118.8590	119.1830
33	117.9180	118.1880
34 35	116.4760 113.4470	116.8250 113.7790
36	112.2270	113.7790
37	111.3320	111.6420
38	110.8370	111.1420
39	110.1080	110.2870
40	108.6330	108.8320
41	105.5060	105.7930
42	103.3870	103.6390
43	103.1610	103.4430
4 4 4 5	102.8460 102.2460	103.0260 102.4890
46	101.9080	102.1460
47	101.8420	102.0850
48	101.4820	101.7840
49	100.7900	101.0640
50	99.2074	99.3815
51	98.7991	98.9834
52 53	98.3530 97.0252	98.6084 97.2082
55	31.0434	91.2002



54 55	96.8805 96.5612	97.1751 96.8441
56	95.1868	95.3741
57	94.5080	94.6879
58	94.1523	94.2907
59	93.3613	93.6402
60	92.4895	92.7644
61	92.3177	92.4802
62	92.2679	92.4493
63	91.9212	92.1298
64 65	91.6578 91.3126	91.8052 91.5675
66	91.1188	91.3673
67	90.7540	90.9517
68	90.5548	90.7511
69	89.7973	89.9528
70	89.5126	89.7578
71	88.9372	89.1161
72	88.4544	88.7162
73	87.9489	88.1619
74	87.0945	87.3160
75	87.0894	87.2638
76	86.7471	86.9621
77 78	86.4966 85.7350	86.7159 85.8877
79	85.3537	85.6018
80	85.1405	85.2968
81	84.2797	84.4516
82	83.4114	83.6274
83	83.3108	83.4746
84	83.2401	83.4369
85	82.2834	82.4996
86	82.1257	82.3269
87	82.0337	82.2424
88	82.0122	82.1851
89 90	81.6982 81.3005	81.9308 81.5178
91	81.2750	81.4594
92	81.1201	81.2886
93	80.9731	81.1847
94	80.9600	81.1702
95	80.2526	80.4617
96	79.5797	79.7746
97	79.1197	79.2770
98	78.9973	79.2042
99	78.1299	78.3218
100	77.8301	78.0554
101 102	77.6473 77.4731	77.8806 77.6691
102	77.2432	77.8691
100	11.434	11.3304



104 105 106 107 108 109 110 111 112 113 114 115 116	76.8186 76.8185 75.8565 75.6459 74.9849 74.1859 73.7160 73.3829 73.3767 71.9488 71.8791 71.7663 71.0797 70.1594	77.0366 77.0361 76.0219 75.8464 75.1556 74.3701 73.9064 73.6025 73.5702 72.1167 72.0618 71.9247 71.2438 70.3268
118 119	68.8377 68.5602	69.0233 68.7384
120	67.8075	67.9696
121 122	67.7566 67.6701	67.9253 67.8584
123	66.3793	66.5428
124	66.1007	66.2758
125	65.7769	65.9391
126 127	65.4628 65.1002	65.6241 65.2928
128	65.0860	65.2743
129	64.5156	64.6657
130	64.2024	64.3505
131	63.3888	63.5317
132	63.3172	63.4958
133	62.9182	63.1030
134 135	62.0825 61.7139	62.2305 61.8649
136	61.4801	61.6415
137	61.2538	61.3970
138	60.3225	60.5072
139	58.6278	58.7578
140	58.5317	58.6602
141	57.4612	57.6074
142 143	57.2408 57.0947	57.3839 57.2325
143	56.7534	56.9063
145	56.0173	56.1625
146	56.0167	56.1611
147	55.4651	55.6324
148	55.0279	55.1644
149	53.4838 53.1381	53.6234
150 151	52.8350	53.2660 52.9608
152	52.5783	52.7121
153	51.9743	52.1087

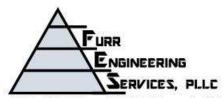


154	50.0004	50.1469
155	49.0790	49.2045
156	44.6726	44.7914
157	38.1984	38.3024
158	34.5835	34.6896

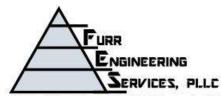
Stream Protection Duration POC #1
The Facility PASSED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Perc	entage	Pass/Fail
42.4703	3608	36	535	100	Pass
44.1376	3086	31	L13	100	Pass
45.8050	2724	27	746	100	Pass
47.4723	2439	24	163	100	Pass
49.1397	2167	21	L83	100	Pass
50.8071	1948	19	965	100	Pass
52.4744	1740	17	755	100	Pass
54.1418	1550	15	564	100	Pass
55.8091	1364		377	100	Pass
57.4765	1201	12	217	101	Fail
59.1439	1089	11	L01	101	Fail
60.8112	992	10	001	100	Pass
62.4786	902		7	100	Pass
64.1460	826	83	30	100	Pass
65.8133	744	75	52	101	Fail
67.4807	671	67	76	100	Pass
69.1480	622	62	25	100	Pass
70.8154	568	57	71	100	Pass
72.4828	514	51	L 9	100	Pass
74.1501	458		50	100	Pass
75.8175	420		26	101	Fail
77.4848	375	37	77	100	Pass
79.1522	333	34	11	102	Fail
80.8196	307	30	9	100	Pass
82.4869	269	27	72	101	Fail
84.1543	253		55	100	Pass
85.8216	229	23		101	Pass
87.4890	213	21	L 4	100	Pass
89.1564	193		95	101	Pass
90.8237	173	17	78	102	Pass
92.4911	162	16	53	100	Pass
94.1585	159		50	100	Pass
95.8258	149	15		100	Pass
97.4932	140	14		100	Pass
99.1605	130	13		100	Pass
100.8279	125	1	L27	101	Pass



102.4953	115	116	100	Pass
104.1626	109	109	100	Pass
105.8300	104	105	100	
				Pass
107.4973	101	102	100	Pass
109.1647	90	90	100	Pass
110.8321	84	84	100	Pass
112.4994	77	78	101	Pass
114.1668	72	73	101	Pass
115.8342	70	70	100	Pass
117.5015	68	68	100	Pass
119.1689	63	64	101	Pass
120.8362	59	61	103	Pass
122.5036	56	56	100	Pass
124.1710	47	48	102	Pass
125.8383	44	44	100	Pass
127.5057	43	43	100	Pass
		43		
129.1730	43		100	Pass
130.8404	40	40	100	Pass
132.5078	36	36	100	Pass
134.1751	34	34	100	Pass
135.8425	31	31	100	Pass
137.5098	28	29	103	Pass
139.1772	27	27	100	Pass
140.8446		25	100	
	25			Pass
142.5119	25	25	100	Pass
144.1793	24	24	100	Pass
145.8467	24	24	100	Pass
147.5140	24	24	100	Pass
149.1814	23	23	100	Pass
150.8487	22	22	100	Pass
152.5161	22	22	100	Pass
		21		
154.1835	20		104	Pass
155.8508	20	20	100	Pass
157.5182	17	18	105	Pass
159.1855	17	17	100	Pass
160.8529	16	16	100	Pass
162.5203	15	15	100	Pass
164.1876	15	15	100	Pass
165.8550	14	14	100	Pass
167.5223		14		
	14		100	Pass
169.1897	13	13	100	Pass
170.8571	12	13	108	Pass
172.5244	12	12	100	Pass
174.1918	12	12	100	Pass
175.8592	11	11	100	Pass
177.5265	11	11	100	Pass
179.1939	10	10	100	Pass
180.8612	10	10	100	Pass
182.5286	10	10	100	Pass
184.1960	10	10	100	Pass



185.8633	9	9	100	Pass
187.5307	9	9	100	Pass
189.1980	9	9	100	Pass
190.8654	9	9	100	Pass
192.5328	9	9	100	Pass
194.2001	9	9	100	Pass
195.8675	9	9	100	Pass
197.5349	9	9	100	Pass
199.2022	9	9	100	Pass
200.8696	9	9	100	Pass
202.5369	9	9	100	Pass
204.2043	9	9	100	Pass
205.8717	9	9	100	Pass
207.5390	8	8	100	Pass

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet On-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Off-line facility target flow: 0 cfs.

Adjusted for 15 min: $\mbox{0}$ cfs.

LID Report

LID Technique		Used for	Total Volume	Volume	Infiltration	Cumulative	Percent
Water Quality	Percent	Comment					
		Treatment	? Needs	Through	Volume	Volume	Volume
Water Quality							
			Treatment	Facil:	ity (ac-ft.)	Inf	iltration
Infiltrated		Treated					
			(ac-ft)	(ac-ft)		Credit	
Total Volume In	nfiltrated		0.00	0.00	0.00		0.00
0.00	0%	No Treat.	Credit				
Compliance		with	LID		Standa	rd	8
Duration Analys	sis Result =	Passed					

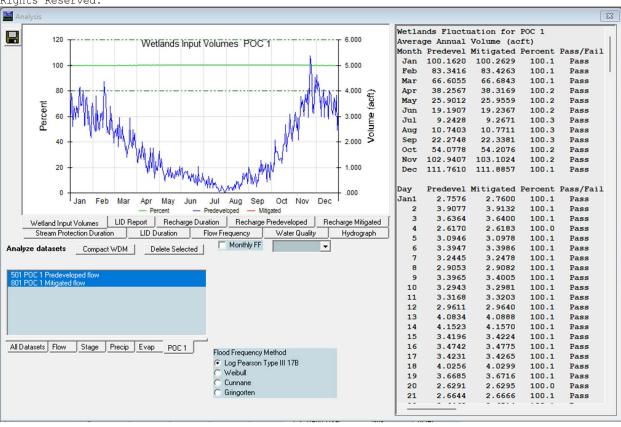
Perlnd and Implnd Changes

No changes have been made.

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FurrEngineering@gmail.com

4.4.3 Pollution Generating Surfaces

WWHM2012 PROJECT REPORT

Project Name: 23062 - PGIS only Site Name: Puyallup Medical Center

Site Address: 1617 S Meridian City : Puyallup, WA 98371

Report Date: 1/13/2025 : 38 IN CENTRAL Gage **Data Start** : 10/01/1901 Data End: 09/30/2059 Precip Scale: 1.00

Version Date: 2021/08/18

Version : 4.2.18

Low Flow Threshold for POC 1: 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre .241 C, Forest, Mod

0.241 Pervious Total

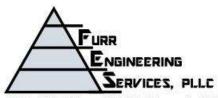
Impervious Land Use acre

0 Impervious Total

Basin Total 0.241

Element Flows To:

Surface Interflow Groundwater



MITIGATED LAND USE

Name : Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre

Pervious Total 0

Impervious Total 0.241

Basin Total 0.241

Element Flows To:

Surface Interflow Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1

Total Pervious Area:0.241 Total Impervious Area:0

Mitigated Landuse Totals for POC #1

Total Pervious Area:0

Total Impervious Area:0.241

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period Flow(cfs)



2 year	0.005128
5 year	0.008021
10 year	0.009599
25 year	0.011208
50 year	0.012166
100 year	0.012954

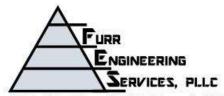
Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.084459
5 year	0.113371
10 year	0.134385
25 year	0.163145
50 year	0.186227
100 year	0.210775

Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #1

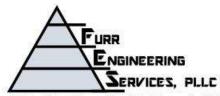
Year	Predeveloped	Mitigated
1902	0.004	0.100
1903	0.003	0.111
1904	0.006	0.125
1905	0.002	0.056
1906	0.001	0.063
1907	0.008	0.084
1908	0.006	0.069
1909	0.006	0.085
1910	0.008	0.081
1911	0.005	0.091
1912	0.019	0.152
1913	0.008	0.066
1914	0.002	0.277
1915	0.003	0.057
1916	0.005	0.106
1917	0.002	0.040
1918	0.005	0.085
1919	0.004	0.052
1920	0.005	0.069
1921	0.006	0.059
1922	0.006	0.093
1923	0.005	0.065
1924	0.002	0.123
1925	0.003	0.051
1926	0.005	0.100
1927	0.003	0.082
1928	0.004	0.061
1929	0.008	0.121
1930	0.005	0.126
1931	0.005	0.061



1932	0.004	0.066
1933	0.004	0.065
1934	0.011	0.106
1935	0.005	0.056
1936	0.004	0.079
1937	0.007	0.117
1938	0.004	0.057
1939	0.000	0.072
1940	0.005	0.127
1941	0.002	0.125
1942	0.007	0.094
1943	0.004	0.093
1944	0.007	0.134
1945	0.006	0.102
1946	0.004	0.079
1947	0.002	0.062
1948	0.011	0.085
1949	0.009	0.131
1950	0.003	0.074
1951	0.003	0.112
1952	0.014	0.125
1953	0.013	0.116
1954	0.015	0.069
1955	0.003	0.064
1956	0.004	0.063
		0.068
1957	0.007	
1958	0.014	0.085
1959	0.008	0.085
1960	0.002	0.067
1961	0.009	0.192
1962	0.005	0.083
1963	0.002	0.061
1964	0.002	0.178
1965	0.010	0.080
1966	0.003	0.067
1967	0.004	0.093
1968	0.004	0.079
1969	0.004	0.071
1970	0.007	0.081
1971	0.010	0.078
1972	0.007	0.259
1973	0.009	0.150
1974	0.005	0.109
1975	0.011	0.112
1976	0.006	0.120
1977	0.002	0.051
1978	0.010	0.087
1979	0.003	0.091
1980	0.005	0.090
1981	0.005	0.085
		3.000



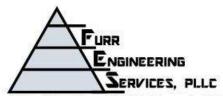
	000	
1982	0.002	0.069
1983	0.009	0.093
1984	0.003	0.093
1985	0.006	0.106
1986	0.005	0.054
1987	0.010	0.094
1988	0.006	0.056
1989	0.006	0.051
1990	0.006	0.068
1991	0.005	0.101
1992	0.007	0.096
1993	0.007	0.110
1994	0.010	0.075
1995	0.002	0.059
1996	0.011	0.079
1997	0.004	0.070
1998	0.005	0.084
1999	0.000	0.091
2000	0.004	0.080
2001	0.002	0.064
2002	0.008	0.116
	0.006	0.068
2003		
2004	0.006	0.102
2005	0.012	0.195
2006	0.003	0.091
2007	0.003	0.102
2008	0.005	0.084
2009	0.004	0.064
2010	0.003	0.083
2011	0.003	0.087
2012	0.004	0.081
2013	0.003	0.076
2014	0.002	0.074
2015	0.002	0.124
2016	0.002	0.077
2017	0.008	0.124
2018	0.014	0.074
2019	0.014	0.110
2020	0.004	0.090
2021	0.007	0.076
2022	0.003	0.129
2023	0.006	0.159
2024	0.014	0.170
2025	0.005	0.083
2026	0.009	0.091
2027	0.003	0.102
2028	0.003	0.040
2029	0.006	0.065
2030	0.011	0.131
2031	0.004	0.041



Stream Protection Duration

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0194	0.2771
2	0.0144	0.2587
3	0.0144	0.1948
4	0.0142	0.1919
5	0.0139	0.1777
6	0.0137	0.1754
7	0.0129	0.1703
8	0.0121	0.1593
9	0.0121	0.1515
10	0.0119	0.1503
11	0.0114	0.1400
12	0.0109	0.1342
13	0.0108	0.1308
14	0.0107	0.1307
15	0.0106	0.1298
16	0.0103	0.1289
17	0.0102	0.1268



18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 53 54 55 56 57 58 58 59 59 59 59 59 59 59 59 59 59 59 59 59	0.0099 0.0096 0.0096 0.0094 0.0086 0.0085 0.0085 0.0085 0.0085 0.0082 0.0081 0.0080 0.0079 0.0078 0.0077 0.0071 0.0071 0.0071 0.0070 0.0070 0.0070 0.0066 0.0065 0.0066 0.0065 0.0064 0.0063 0.0062 0.0061 0.0061 0.0060 0.0059 0.0058 0.0058 0.0058 0.0058 0.0058 0.0057 0.0057	0.1264 0.1254 0.1253 0.1253 0.1239 0.1236 0.1230 0.1208 0.1197 0.1169 0.1161 0.1122 0.1119 0.1112 0.1107 0.1106 0.103 0.1087 0.1087 0.1087 0.1063 0.1060 0.1057 0.1041 0.1057 0.1041 0.1057 0.1016 0.1015 0.1017 0.1016 0.1015 0.1017 0.1016 0.1015 0.1005 0.10999 0.0942 0.0942 0.0934 0.0933 0.0933 0.0929 0.0914 0.0914
59 60	0.0057 0.0057	0.0929 0.0920



68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 100 100 100 100 100 100	0.0054 0.0052 0.0052 0.0052 0.0052 0.0052 0.0052 0.0051 0.0051 0.0051 0.0050 0.0050 0.0049 0.0049 0.0049 0.0048 0.0047 0.0046 0.0046 0.0046 0.0046 0.0045 0.0043 0.0043 0.0043 0.0042 0.0042 0.0042 0.0042 0.0042 0.0042 0.0042 0.0040 0.0039 0.0038 0.0038 0.0037	0.0875 0.0873 0.0871 0.0868 0.0867 0.0857 0.0853 0.0851 0.0847 0.0846 0.0846 0.0845 0.0843 0.0842 0.0840 0.0837 0.0830 0.0829 0.0825 0.0825 0.0816 0.0807 0.0806 0.0807 0.0797 0.0789 0.0788 0.0797 0.0788 0.0786 0.0786 0.0786 0.0786 0.0758 0.0754 0.0758
101 102 103 104 105	0.0039 0.0038 0.0038 0.0038 0.0038	0.0772 0.0771 0.0764 0.0760 0.0758 0.0754
110 111 112 113 114 115 116 117	0.0036 0.0036 0.0035 0.0035 0.0035 0.0033 0.0033	0.0710 0.0705 0.0704 0.0698 0.0696 0.0693 0.0691 0.0689



4715 142nd Place SW #B, Edmonds, WA 98026 FurrEngineering@gmail.com

Stream Protection Duration POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

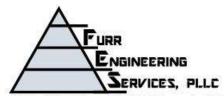
Flow(cfs) Predev Mit Percentage Pass/Fail

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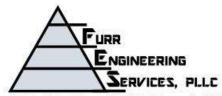
0.0026	53129	407804	767	Fail
0.0027	49113	400380	815	Fail
0.0028	45517	392901	863	Fail
0.0029	42293	385865	912	Fail
0.0030	39274	379051	965	Fail
0.0030	36492	372459	1020	Fail
0.0031	33983	366087	1077	Fail
0.0032	31623	360104	1138	Fail
0.0033	29407	354065	1204	Fail
0.0034	27390	348248	1271	Fail
0.0035	25606	342653	1338	Fail
0.0036	24011	337224	1404	Fail
0.0037	22565	332071	1471	Fail
0.0038	21202	326919	1541	Fail
0.0039	19917	322044	1616	Fail
0.0040	18714	317002	1693	Fail
0.0041	17628	312183	1770	Fail
0.0042	16543	307474	1858	Fail
0.0042	15457	302986	1960	Fail
0.0043	14537	298554	2053	Fail
0.0045	13662	294399	2154	Fail
0.0046	12892	290299	2251	Fail
0.0047	12099	286144	2365	Fail
0.0047	11390	282100	2476	Fail
0.0040	10692	278222	2602	Fail
0.0050	10052	274344	2726	Fail
0.0051	9451	270577	2862	Fail
0.0051	8908	266920	2996	Fail
0.0053	8382	263264	3140	Fail
0.0054	7889	259718	3292	Fail
0.0055	7479	256339	3427	Fail
0.0056	7041	252959	3592	Fail
0.0057	6609	249580	3776	Fail
0.0058	6271	246367	3928	Fail
0.0059	5961	243098	4078	Fail
0.0060	5695	239940	4213	Fail
0.0061	5414	236838	4374	Fail
0.0062	5173	233735	4518	Fail
0.0062	4903	230744	4706	Fail
0.0063	4669	227697	4876	Fail
0.0064	4478	224816	5020	Fail
0.0065	4303	221935	5157	Fail
0.0066	4118	219165	5322	Fail
0.0067	3909	216395	5535	Fail
0.0068	3712	213625	5754	Fail
0.0069	3527	210910	5979	Fail
0.0070	3368	208362	6186	Fail
0.0070	3210	205302	6411	Fail
0.0071	3094	203265	6569	Fail
0.0072	2983	203203	6732	Fail
0.00/3	2000	200021	0/32	rall

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0.0074	2877	198334	6893	Fail
0.0075	2749	195897	7126	Fail
0.0076	2614	193459	7400	Fail
0.0077	2503	191077	7633	Fail
0.0078	2395	188750	7881	Fail
0.0079	2301	186534	8106	Fail
0.0080	2196	184207	8388	Fail
0.0081	2074	182047	8777	Fail
0.0082	1992	179830	9027	Fail
0.0083	1897	177670	9365	Fail
0.0084	1807	175509	9712	Fail
0.0085	1717	173404	10099	Fail
0.0086	1637	171299	10464	Fail
0.0087	1583	169304	10695	Fail
0.0088	1502	167255	11135	Fail
0.0089	1428	165260	11572	Fail
0.0090	1358	163376	12030	Fail
0.0091	1285	161382	12558	Fail
0.0092	1228	159498	12988	Fail
0.0093	1174	157559	13420	Fail
0.0094	1112	155731	14004	Fail
0.0095	1066	153903	14437	Fail
0.0095	1015	152130	14988	Fail
0.0096	973	150302	15447	Fail
0.0097	929	148529	15988	Fail
0.0098	877	146812	16740	Fail
0.0099	817	145094	17759	Fail
0.0100	780	143377	18381	Fail
0.0101	737	141826	19243	Fail
0.0102	692	140053	20238	Fail
0.0103	636	138335	21750	Fail
0.0104	594	136673	23008	Fail
0.0105	554	135178	24400	Fail
0.0106	511	133571	26139	Fail
0.0107	471	131964	28017	Fail
0.0108	427	130524	30567	Fail
0.0109	392	128973	32901	Fail
0.0110	361	127421	35296	Fail
0.0111	338	126036	37288	Fail
0.0112	312	124541	39916	Fail
0.0113	297	122989	41410	Fail
0.0114	272	121438	44646	Fail
0.0115	255	120109	47101	Fail
0.0116	240	118724	49468	Fail
0.0117	221	117283	53069	Fail
0.0118	208	116009	55773	Fail
0.0119	194 176	114569	59056	Fail
0.0120	176 157	113294	64371	Fail
0.0121 0.0122	157	112075	71385 77990	Fail
0.0122	142	110746	11990	Fail

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The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #1 On-line facility volume: 0.0258 acre-feet On-line facility target flow: 0.0356 cfs. Adjusted for 15 min: 0.0356 cfs. Off-line facility target flow: 0.0205 cfs. Adjusted for 15 min: 0.0205 cfs.

LID Report

LID Technique Water Ouality Percent	Used for T	otal Volume	Volume	Infiltration	Cumulative	Percent
water guarrey rereeme	Treatment?	Needs	Through	Volume	Volume	Volume
Water Quality						
		Treatment	Facil:	ity (ac-ft.)	Infi	ltration
Infiltrated	Treated					
		(ac-ft)	(ac-ft)		Credit	
Total Volume Infiltrated		0.00	0.00	0.00		0.00
0.00 0%	No Treat. Cr	redit				
Compliance	with	LID		Standa	rd	8
Duration Analysis Result =	Failed					

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.**Perlnd and Implnd Changes**No changes have been made.

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5.0 SPECIAL REPORTS AND STUDIES

Geotechnical Report: Proposed Medical Building 11504 NE 21st St. Bellevue WA, by PanGeo Inc., dated September 9, 2020, File No. 20-294



6.0 OTHER PERMITS

Grading Permit

Building Permit



7.0 ESC ANALYSIS AND DESIGN

SWPPP is submitted under separate cover.

Design of the ESC plan was completed in conformance with Core Requirement per the 2019 SMMWW. Compliance with the 13 minimum requirements is summarized below.

- 1. Clearing Limits: Clearing limits have been delineated BMP C233 on sheets of the civil plans.
- 2. Construction Access: An armored construction entrance BMP C105 is shown on the plan.
- 3. Control Flow Rates: Silt Fence will be used to reduce the flow.
- 4. Install Sediment Controls: A construction entrance will be installed at the entrance to the project site. See TESC plan for location of construction entrance and detail.
- 5. Stabilize Soils: The proposed sediment ponds will be used for sediment retention. Sediment retention will be designed per the stormwater manual.
- 6. Protect Slopes: Not Required for this project.
- 7. Protect Drain Inlets: Inlets are sufficiently far away from the construction and don't need protection.
- 8. Stabilize Channels and Outlets: There are no channels or outlets.
- 9. Control Pollutants: Flow Control: BMP C151, BMP C152, BMP C153 and BMP C154.
- 10. Control Dewatering: Dewatering is not expected for this project
- 11. Maintain BMP's: CESCL
- 12. Manage the Project: CESCL
- 13. Protect LID BMP's: Silt Fence will be placed around the infiltration areas to protect them from compaction.

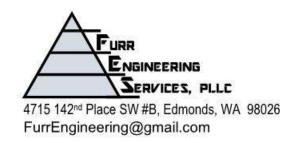
During the wet season (October 1 to April 30) any site with exposed soils shall be subject to the "Wet Season Requirements" contained in the ESC Standards. In addition to the ESC cover measures, these provisions include covering any newly-seeded areas with mulch and seeding as much disturbed area as possible during the first week of October to provide grass cover for the wet season.

Prior to obtaining final construction approval, the site shall be stabilized, structural ESC measures (such as silt fences and sediment traps) shall be removed, and drainage facilities shall be cleaned as specified in the ESC Standards.



8.0 BOND QUANTITIES

To be provided at final approval if required



9.0 OPERATIONS AND MAINTENANCE MANUAL

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

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Per- formed
		(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 <u>Table V-A.1</u> : Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See <u>Table V-A.1: Maintenance Standards - Detention Ponds</u>
and Berms over 4 feet in height.	Piping	See <u>Table V-A.1: Maintenance Standards - Detention Ponds</u>	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See <u>Table V-A.1: Maintenance Standards - Detention Ponds</u>	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overnow Spiliway	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.

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.	All sediment and debris removed from storage
		(Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility.	All joint between tank/pipe sections are sealed.
		(Will require engineering analysis to determine structural stability).	
	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.	Vault replaced or repaired to design specifications and is 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.	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

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

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
	Cover Not in Place Cover is missing or only partially in place. Any open manhole requires maintenance.		Manhole is closed.
Manhole Locking Mechanism Not Working Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than thread (may not apply to self-locking lids).		Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See <u>Table V-A.5: Maintenance Standards - Catch Basins</u>	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Com- ponent	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
General	Structure is not securely attached to mannole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure		Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tank-s/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

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

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is per- formed
	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
General	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/ Mis- alignment	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 <u>Table V-A.1: Maintenance Standards - Detention Ponds</u>	No pollution present.
	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
Catch Basin Cover	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.
	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
Metal Grates	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
(If Applicable)	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.

Table V-A.12: Maintenance Standards - Wetvaults (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		and non-floatables).	
	Sediment Accumulation in Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	Remove sediment from vault.
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened or removed, especially by one person.	Cover repaired or replaced to proper working specifications.
	Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection staff.	Baffles repaired or replaced to specifications.
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Sediment Accu- mulation on top layer	Sediment depth exceeds 1/2-inch.	No sediment deposit on grass layer of sand filter that would impede permeability of the filter section.
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.	Sediment removed from clean-outs.
Above Ground (open sand fil-	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently.	Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).
ter)	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities.	Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.
	Short Circuiting	When flows become concentrated over one section of the sand filter rather than dispersed.	Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area.
	Erosion Damage to Slopes	Erosion over 2-inches deep where cause of damage is prevalent or potential for continued erosion is evident.	Slopes stabilized using proper erosion control measures.
	Rock Pad Miss- ing or Out of Place	Soil beneath the rock is visible.	Rock pad replaced or rebuilt to design specifications.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed	
	Flow Spreader Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.		Spreader leveled and cleaned so that flows are spread evenly over sand filter.	
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.	

Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed	
	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.	
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.	
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.	
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.	
	I Short i irculting I Whale seenade/tiow occurs along the Value and corners. Sand eroding hear intiow area. I		Sand filter media section re-laid and compacted along perimeter of vault to form a semi- seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.	
	Damaged Pipes Inlet or outlet piping damaged or broken and in need of repair.		Pipe repaired and/or replaced.	
Below Ground	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.	
Vault.	Access Cover Damageu/Not Working	Maintenance person cannot remove cover using normal lifting pressure.		
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).	
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.	
	Slab. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.		Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.	
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.	
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.	

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
			compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
Vault	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
1 a =	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.



APPENDIX A: GEOTECHNICAL REPORT



February 20, 2023

Purity Medical Spa of Washington, LLC C/O Imad Bahbah imad@ihbarchitects.com

RE: Geotechnical Evaluation

Proposed Six Story Building 1617 S. Meridian Avenue Puyallup, Washington

In accordance with your authorization, Cobalt Geosciences, LLC has prepared this letter to discuss the results of our geotechnical evaluation at the referenced site.

The purpose of our evaluation was to provide recommendations for foundation design, grading, and earthwork.

Site Description

The site is located at 1617 S. Meridian Avenue in Puyallup, Washington. The site consists of one nearly rectangular shaped parcel (No. 7790000140) with a total area of 0.79 acres.

The property is undeveloped and vegetated with trees, grasses, blackberry vines, other understory, and sparse trees. There is evidence of historic grading based on our observations.

Most of the site slopes downward from east to west and northwest at magnitudes of 0 to 20 percent and relief of about 20 feet. There is an apparent cut slope in the eastern quarter of the site sloping downward to the west. This slope is about 5 feet in height with magnitudes of 100 to 150 percent. There are local areas of standing water west of the slope along with an exposed 4-inch diameter pipe. There is a short modular block wall near the northeast property corner facing into the property. The wall is about 2 feet tall.

The site is bordered to the east and south by commercial developments, to the north by 17th Avenue SE, and to the west by S. Meridian Avenue.

The proposed development includes a six-story wood-framed structure with at-grade or slightly below grade parking areas. We anticipate that the building will encompass much of the site area.

Stormwater will include infiltration or other systems depending on feasibility. Site grading may include cuts and fills of 6 feet or less and foundation loads are expected to be light to moderate. We should be provided with the final plans to verify that our recommendations remain valid and do not require updating.

Area Geology

The site lies within the Puget Lowland. The lowland is part of a regional north-south trending trough that extends from southwestern British Columbia to near Eugene, Oregon. North of Olympia, Washington, this lowland is glacially carved, with a depositional and erosional history including at least four separate glacial advances/retreats.

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The Puget Lowland is bounded to the west by the Olympic Mountains and to the east by the Cascade Range. The lowland is filled with glacial and non-glacial sediments consisting of interbedded gravel, sand, silt, till, and peat lenses.

The <u>Geologic Map of Washington – Southwest Quadrant</u>, indicates that the site is underlain by Lacustrine Deposits (Drift). These materials include silts and fine grained sands with minor amounts of gravel. These deposits become denser with depth below a weathered zone.

Soil & Groundwater Conditions

The geotechnical field investigation program was completed in February 2023 and included excavation of three test pits, where accessible.

The soils encountered were logged in the field and are described in accordance with the Unified Soil Classification System (USCS).

A Cobalt Geosciences field representative conducted the explorations, collected disturbed soil samples, classified the encountered soils, kept a detailed log of the explorations, and observed and recorded pertinent site features.

Test Pits TP-1 and TP-3 encountered approximately 6 inches of topsoil and vegetation underlain by about 1.5 to 3.5 feet of loose to medium dense, silty-fine to fine grained sand (Weathered Drift). This layer was underlain by dense to very dense, silty-fine to fine grained sand (Drift) which continued to the termination depths of the test pit.

Test Pit TP-2encountered approximately 6 inches of topsoil and vegetation underlain by about 3.5 feet of loose to medium dense, silty-fine to fine grained sand trace gravel (Fill). This layer was underlain by approximately 3 feet of loose to medium dense, silty-fine to fine grained sand (Weathered Drift). This layer was underlain by dense to very dense, silty-fine to fine grained sand (Drift) which continued to the termination depths of the test pit.

Groundwater was encountered in TP-2 at about 6 inches below grade. Groundwater was not encountered in the other test pits; however, the shallow soils were locally mottled. Light volumes of groundwater could be present at multiple depths during the wet season.

Water table elevations often fluctuate over time. The groundwater level will depend on a variety of factors that may include seasonal precipitation, irrigation, land use, climatic conditions and soil permeability. Water levels at the time of the field investigation may be different from those encountered during the construction phase of the project.

Erosion Hazard

The <u>Natural Resources Conservation Services</u> (NRCS) maps for Pierce County indicate that the site is underlain by Kapowsin gravelly ashy loam (15 to 30 percent slopes) and Kitsap silt loam (8 to 30 percent slopes). These soils would have a slight to severe erosion potential in a disturbed state depending on the slope magnitude.

It is our opinion that soil erosion potential at this project site can be reduced through landscaping and surface water runoff control. Typically, erosion of exposed soils will be most noticeable during periods of rainfall and may be controlled by the use of normal temporary erosion control measures, such as silt fences, hay bales, mulching, control ditches and diversion trenches. The typical wet weather season, with regard to site grading, is from October 31st to April 1st. Erosion control measures should be in place before the onset of wet weather.

Seismic Hazard

The overall subsurface profile corresponds to a Site Class *D* as defined by Table 1613.5.2 of the International Building Code (IBC). A Site Class *D* applies to an overall profile consisting of medium dense to very dense soils within the upper 100 feet.

We referenced the U.S. Geological Survey (USGS) Earthquake Hazards Program Website to obtain values for S_S , S_I , F_a , and F_v . The USGS website includes the most updated published data on seismic conditions. The following tables provide seismic parameters from the USGS web site with referenced parameters from ASCE 7-16.

Seismic Design Parameters (ASCE 7-16)

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		GF		Design PGA
			F_{a}	$F_{\rm v}$	$\mathbf{S}_{ ext{DS}}$	S_{D_1}	
D	1.276	0.439	1.0	Null	0.85	Null	0.5

Additional seismic considerations include liquefaction potential and amplification of ground motions by soft/loose soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. The site has a low likelihood of liquefaction. For items listed as "Null" see Section 11.4.8 of the ASCE.

Conclusions and Recommendations

General

The site area is underlain by areas of fill and at depth by weathered to unweathered fine grained glacial drift which become generally becomes denser with depth. The proposed commercial structure may be supported on a shallow foundation system bearing on medium dense or firmer native soils or on structural fill placed on the native soils. Fill and loose soils below new foundation elements must be removed and replaced with structural fill.

Note that this could include significant depths of overexcavation due to the presence of fill (7 feet or more). The fill appears to be mostly prevalent in the western half of the site. Please notify us if you would like us to provide deep foundation options for the structure.

Infiltration of stormwater runoff is not feasible due to the presence of an aquitard and presence of seasonal groundwater at shallow depths. We anticipate that stormwater will be routed to detention systems and/or to City infrastructure.

Local permeable pavements may be feasible for light duty drive and parking areas depending on their locations and elevations. We can provide additional input upon request and once civil plans have been prepared. These would be suitable for flow control only.

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Site Preparation

Based on observations from the site investigation program, it is anticipated that the stripping depth will be 6 to 18 inches. Deeper excavations will be necessary in any areas underlain by undocumented fill.

The native soil consists of sandy silt trace gravel. Some of the native soils may be used as structural fill provided, they achieve compaction requirements and are within 3 percent of the optimum moisture. This soil will likely only be suitable for use as fill during the summer months, as it will be above the optimum moisture levels in their current state. These soils are HIGHLY moisture sensitive and will degrade during periods of wet weather and under equipment traffic. The use of imported granular fill should be anticipated.

Imported structural fill should consist of a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill should be placed in maximum lift thicknesses of 12 inches and should be compacted to a minimum of 95 percent of the modified proctor maximum dry density, as determined by the ASTM D 1557 test method.

Temporary Excavations

Based on our understanding of the project, we anticipate that the grading could include local cuts on the order of approximately 6 feet or less for foundation and most of the utility placement. Temporary excavations should be sloped no steeper than 1.5H:1V (Horizontal:Vertical) in loose native soils and fill and 1H:1V in medium dense/stiff native soils.

Local steeper temporary cuts could be feasible in the denser soils at depth; however, we recommend site verification by the geotechnical engineer. If an excavation is subject to heavy vibration or surcharge loads, we recommend that the excavations be sloped no steeper than 2H:1V, where room permits.

Temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. Temporary slopes should be visually inspected daily by a qualified person during construction activities and the inspections should be documented in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and reducing slope erosion during construction.

Temporary cut slopes should be covered with visqueen to help reduce erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

Soil conditions may not be completely known from the geotechnical investigation. In the case of temporary cuts, the existing soil conditions may not be completely revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of temporary slopes will need to be re-evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed and required deadlines can be met.

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If any variations or undesirable conditions are encountered during construction, we should be notified so that supplemental recommendations can be made. If room constraints or groundwater conditions do not permit temporary slopes to be cut to the maximum angles allowed by the WAC, temporary shoring systems may be required. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Cobalt Geosciences and the project structural engineer review temporary shoring designs prior to installation, to verify the suitability of the proposed systems.

Temporary Shoring

Soldier Piles

Depending on the location and elevations of new finish floor areas, temporary shoring and/or permanent retaining walls may be required along some sides of the new building and/or any deeper detention system.

Soldier piles typically consist of steel W or H-beams inserted into oversized drilled shafts, which are backfilled with structural concrete, lean mix {Controlled Density Fill (CDF)}, or a combination of lean mix to the base of the excavation and structural concrete below the excavation to anchor the soldier piles.

Due to the potential for local caving during drilling operations for the soldier pile holes due to soft soil conditions and shallow groundwater, consideration should be given to using slurry or drilling fluid to reduce the risk of caving of the pile holes during installation. If water is present within the pile hole at the time of soldier pile concrete placement, the concrete should be placed starting at the bottom of the hole with a tremie pipe and the column of concrete should be raised slowly to displace the water.

We recommend that soldier piles have a maximum spacing of eight feet on center. To account for arching effects, lateral loading on the lagging can be reduced by 50 percent. Unlagged excavation heights should not exceed three feet. No portion of the excavation should remain unsupported overnight. Lagging sections may be up to 6 feet in height depending on stability.

Cantilever soldier pile walls for this site may be designed based on an active lateral earth pressure of 35 pcf for level backslope conditions, provided the wall is unrestrained (not fixed; permitted to move at least 0.2 percent of the wall height). If the wall is restrained, we recommend a lateral earth pressure of 55 pcf. The pressure will act on the soldier pile width below the base of the excavation as well. All applicable surcharge pressures should be included, where anticipated or shown (buildings, construction traffic). An increase in the above pressures is necessary if sloping backslope conditions will be present. This increase can be calculated using an increase of 0.75 pcf per degree of slope.

A lateral uniform seismic pressure of 7H is recommended for seismic conditions (active). An atrest pressure of 14H may be used if the wall is restrained. Note that seismic conditions may not be required for a temporary system.

In front of the soldier piles, resistive pressure can be estimated using an allowable passive earth pressure of 300 pcf acting over 2 times the soldier pile diameter, neglecting the upper 2 feet below the base of the excavation. A factor of safety of 1.5 has been incorporated into the passive pressure value. We can provide updated pressures once a site plan with elevations has been prepared.

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A lateral pressure reduction of 50 percent may be used for design of the lagging for a pile spacing of three diameters. Lagging should be backfilled with 5/8 inch clean angular rock to minimize void spaces.

Block Shoring

There may be adequate space to place Ultra blocks or ecology block walls for temporary shoring as single walls. The following are general recommendations for temporary block shoring placement. We should review the final plans to determine if these recommendations remain valid or require updating.

For the temporary cuts during shoring placement, cuts may be near vertical provided blocks are on site and will be placed immediately (same day).

We must be on site to verify the excavation stability, block wall placement, backfill of the temporary wall, and periodically during construction until the basement walls are in place and in process of being backfilled. Note that this is a temporary system and is not designed under seismic conditions.

Ecology blocks are interlocking concrete blocks with dimensions of 2 feet tall, 2 feet deep, and 6 feet long.

Walls may be up to 8.75 feet tall for Ultra blocks and 6 feet for ecology blocks. Any wall should have a batter of 6 to 9 degrees. This assumes a backslope of 3 feet or less and a magnitude of 3H:1V or less. This also assumes a stable cut is created in glacial till.

Based course rock and embedment are not required for the temporary condition; however, the keyway must be medium dense or firmer.

Blocks to be used only in a typical alternating brick pattern. No vertical seams. Voids behind the blocks should be filled with 5/8 inch clean angular rock.

Any cut of 5 feet or taller must be faced with the block shoring on the same day. We recommend a maximum 10 feet length of area to be excavated provided blocks can be placed on the same day or within the time frame above.

We should be on site during temporary excavation work, block placement, shoring backfill placement and daily if workers will be located within a 1H:1V zone from the toe of the wall. Weekly visits until blocks are removed and wall backfill is placed

Foundation Design

The proposed structure may be supported on a shallow spread footing foundation system bearing on undisturbed medium dense or firmer native soils or on properly compacted structural fill placed on the suitable native soils. Any undocumented fill and/or loose native soils should be removed and replaced with structural fill below foundation elements. Structural fill below footings should consist of clean angular rock 5/8 to 4 inches in size. We should verify soil conditions during foundation excavation work.

Note that bearing soils may be more than 7 feet below existing elevations, mostly within the western half of the property. All of these soils will need to be removed unless a deep foundation system is utilized. We can provide additional input once a site plan with elevations has been prepared.

For shallow foundation support, we recommend widths of at least 16 and 24 inches, respectively, for continuous wall and isolated column footings supporting the proposed structure. Provided that the footings are supported as recommended above, a net allowable bearing pressure of 3,000 pounds per square foot (psf) may be used for design. If detention vaults are required, they may be designed using a bearing pressure of 5,000 psf if they are set at least 8 feet below site elevations and in dense soils.

A 1/3 increase in the above value may be used for short duration loads, such as those imposed by wind and seismic events. Structural fill placed on bearing, native subgrade should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Footing excavations should be inspected to verify that the foundations will bear on suitable material.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower.

If constructed as recommended, the total foundation settlement is not expected to exceed 1 inch. Differential settlement, along a 25-foot exterior wall footing, or between adjoining column footings, should be less than ½ inch. This translates to an angular distortion of 0.002. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. All footing excavations should be observed by a qualified geotechnical consultant.

Resistance to lateral footing displacement can be determined using an allowable friction factor of 0.30 acting between the base of foundations and the supporting subgrades. Lateral resistance for footings can also be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglect the upper 12 inches below grade in exterior areas). The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance.

Care should be taken to prevent wetting or drying of the bearing materials during construction. Any extremely wet or dry materials, or any loose or disturbed materials at the bottom of the footing excavations, should be removed prior to placing concrete. The potential for wetting or drying of the bearing materials can be reduced by pouring concrete as soon as possible after completing the footing excavation and evaluating the bearing surface by the geotechnical engineer or his representative.

Concrete Retaining Walls

The following table, titled **Wall Design Criteria**, presents the recommended soil related design parameters for retaining walls with a level backslope. Contact Cobalt if an alternate retaining wall system is used. This has been included for new cast in place walls, if proposed.

Wall Design Criteria				
"At-rest" Conditions (Lateral Earth Pressure – EFD+)	60 pcf (Equivalent Fluid Density)			
"Active" Conditions (Lateral Earth Pressure – EFD+)	40 pcf (Equivalent Fluid Density)			
Seismic Increase for "At-rest" Conditions (Lateral Earth Pressure)	14H* (Uniform Distribution)			

Seismic Increase for "Active" Conditions (Lateral Earth Pressure)	7H* (Uniform Distribution)
Passive Earth Pressure on Low Side of Wall (Allowable, includes F.S. = 1.5)	Neglect upper 2 feet, then 275 pcf EFD+
Soil-Footing Coefficient of Sliding Friction (Allowable; includes F.S. = 1.5)	0.30

*H is the height of the wall; Increase based on one in 500 year seismic event (10 percent probability of being exceeded in years),

+EFD - Equivalent Fluid Density

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls. Uniform horizontal lateral active and at-rest pressures on the retaining walls from vertical surcharges behind the wall may be calculated using active and at-rest lateral earth pressure coefficients of 0.3 and 0.5, respectively. A soil unit weight of 125 pcf may be used to calculate vertical earth surcharges.

To reduce the potential for the buildup of water pressure against the walls, continuous footing drains (with cleanouts) should be provided at the bases of the walls. The footing drains should consist of a minimum 4-inch diameter perforated pipe, sloped to drain, with perforations placed down and enveloped by a minimum 6 inches of pea gravel in all directions.

The backfill adjacent to and extending a lateral distance behind the walls at least 2 feet should consist of free-draining granular material. All free draining backfill should contain less than 3 percent fines (passing the U.S. Standard No. 200 Sieve) based upon the fraction passing the U.S. Standard No. 4 Sieve with at least 30 percent of the material being retained on the U.S. Standard No. 4 Sieve. The primary purpose of the free-draining material is the reduction of hydrostatic pressure. Some potential for the moisture to contact the back face of the wall may exist, even with treatment, which may require that more extensive waterproofing be specified for walls, which require interior moisture sensitive finishes.

We recommend that the backfill be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. In place density tests should be performed to verify adequate compaction. Soil compactors place transient surcharges on the backfill. Consequently, only light hand operated equipment is recommended within 3 feet of walls so that excessive stress is not imposed on the walls.

Stormwater Management Feasibility

The site is underlain by fill and very fine grained glacially consolidated soils. These soils were mottled and act as an aquitard, restricting vertical infiltration of runoff. We observed groundwater 6 inches below grade in TP-1 and anticipate that shallow groundwater will develop throughout the site during a typical wet season.

Infiltration is not feasible due to the presence of very fine grained, glacially consolidated soils which are mottled as well as shallow groundwater.

In general, permeable pavements are feasible for use in the upper, weathered glacial soils, only for flow control. We recommend that these systems be located in areas with cuts of 1.5 feet or less. Areas should be stripped of topsoils and fill, verified by the geotechnical engineer to be stable, and then prepared with clean angular rock and finished pavements.

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These areas must not be compacted by traffic, equipment, or surcharge loads. These areas should be left natural until ready for completion. A typical infiltration rate (factored) for the weathered native soils ranges from 0.2 to 0.3 inches per hour. We must review a site plan to verify if these systems are feasible and suitable for use.

We anticipate that most of the runoff will be routed to one or more detention systems with overflow to City infrastructure. We can provide additional input once a civil plan has been prepared.

We should be provided with final plans for review to determine if the intent of our recommendations has been incorporated or if additional modifications are needed.

Slab-on-Grade

We recommend that the upper 12 inches of the native soils within slab areas be re-compacted to at least 95 percent of the modified proctor (ASTM D1557 Test Method). If this is not feasible/possible, the upper 12 inches of soil below new slab on grade areas should consist of clean angular rock or other specific structural fill confirmed to be suitable by the geotechnical engineer.

Often, a vapor barrier is considered below concrete slab areas. However, the usage of a vapor barrier could result in curling of the concrete slab at joints. Floor covers sensitive to moisture typically requires the usage of a vapor barrier. A materials or structural engineer should be consulted regarding the detailing of the vapor barrier below concrete slabs. Exterior slabs typically do not utilize vapor barriers.

The American Concrete Institutes ACI 360R-06 Design of Slabs on Grade and ACI 302.1R-04 Guide for Concrete Floor and Slab Construction are recommended references for vapor barrier selection and floor slab detailing.

Slabs on grade may be designed using a coefficient of subgrade reaction of 180 pounds per cubic inch (pci) assuming the slab-on-grade base course is underlain by structural fill placed and compacted as outlined above. A 4- to 6-inch-thick capillary break layer should be placed over the prepared subgrade. This material should consist of pea gravel or 5/8 inch clean angular rock.

A perimeter drainage system is recommended unless interior slab areas are elevated a minimum of 12 inches above adjacent exterior grades. If installed, a perimeter drainage system should consist of a 4-inch diameter perforated drain pipe surrounded by a minimum 6 inches of drain rock wrapped in a non-woven geosynthetic filter fabric to reduce migration of soil particles into the drainage system. The perimeter drainage system should discharge by gravity flow to a suitable stormwater system.

Exterior grades surrounding buildings should be sloped at a minimum of one percent to facilitate surface water flow away from the building and preferably with a relatively impermeable surface cover immediately adjacent to the building.

Erosion and Sediment Control

Erosion and sediment control (ESC) is used to reduce the transportation of eroded sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be implemented, and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features for the site:

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- Schedule the soil, foundation, utility, and other work requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be completed during the wet season (generally October through April).
- All site work should be completed and stabilized as quickly as possible.
- Additional perimeter erosion and sediment control features may be required to reduce the
 possibility of sediment entering the surface water. This may include additional silt fences, silt
 fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration
 systems.
- Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

Utilities

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The contractor is responsible for the safety of open trenches. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

In general, silty soils were encountered at shallow depths in the explorations at this site. These soils have low cohesion and density and will have a tendency to cave or slough in excavations. Shoring or sloping back trench sidewalls is required within these soils in excavations greater than 4 feet deep.

All utility trench backfill should consist of imported structural fill or suitable on site soils. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. Depending on the depth and location of the proposed utilities, we anticipate the need to re-compact existing fill soils below the utility structures and pipes. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction procedures.

Pavements

The near surface subgrade soils generally consist of silt with fine grained sand. These soils are rated as fair to good for pavement subgrade material (depending on silt content and moisture conditions). We estimate that the subgrade will have a California Bearing Ratio (CBR) value of 10 and a modulus of subgrade reaction value of k = 200 pci, provided the subgrade is prepared in general accordance with our recommendations.

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We recommend that at a minimum, 12 inches of the existing subgrade material be moisture conditioned (as necessary) and re-compacted to prepare for the construction of pavement sections. Deeper levels of recompaction or overexcavation and replacement may be necessary in areas where fill and/or very poor (soft/loose) soils are present.

We note that the surface soils are very fine grained and will severely degrade if exposed to wet weather. Additional overexcavation will likely be required if work occurs outside of the dry season.

The subgrade should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. In place density tests should be performed to verify proper moisture content and adequate compaction.

The recommended flexible and rigid pavement sections are based on design CBR and modulus of subgrade reaction (k) values that are achieved, only following proper subgrade preparation. It should be noted that subgrade soils that have relatively high silt contents will likely be highly sensitive to moisture conditions. The subgrade strength and performance characteristics of a silty subgrade material may be dramatically reduced if this material becomes wet.

Based on our knowledge of the proposed project, we expect the traffic to range from light duty (passenger automobiles) to heavy duty (delivery trucks). The following tables show the recommended pavement sections for light duty and heavy duty use.

ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT LIGHT DUTY

Asphaltic Concrete	Aggregate Base*	Compacted Subgrade* **
2.5 in.	6.o in.	12.0 in.

HEAVY DUTY

Asphaltic Concrete	Aggregate Base*	Compacted Subgrade* **
3.5 in.	6.o in.	12.0 in.

PORTLAND CEMENT CONCRETE (RIGID) PAVEMENT

Min. PCC Depth	Aggregate Base*	Compacted Subgrade* **
6.0 in.	6.0 in.	12.0 in.

^{* 95%} compaction based on ASTM Test Method D1557

^{**} A proof roll may be performed in lieu of in place density tests

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The asphaltic concrete depth in the flexible pavement tables should be a surface course type asphalt, such as Washington Department of Transportation (WSDOT) ½ inch HMA. The rigid pavement design is based on a Portland Cement Concrete (PCC) mix that has a 28 day compressive strength of 4,000 pounds per square inch (psi). The design is also based on a concrete flexural strength or modulus of rupture of 550 psi.

CONSTRUCTION FIELD REVIEWS

Cobalt Geosciences should be retained to provide part time field review during construction in order to verify that the soil conditions encountered are consistent with our design assumptions and that the intent of our recommendations is being met. This will require field and engineering review to:

- Monitor and test structural fill placement and soil compaction
- Observe bearing capacity at foundation locations
- Verify soil conditions at stormwater system locations, if utilized
- Observe slab-on-grade preparation
- Verify pavement subgrade conditions prior to paving
- Monitor foundation drainage placement
- Observe excavation stability

Geotechnical design services should also be anticipated during the subsequent final design phase to support the structural design and address specific issues arising during this phase. Field and engineering review services will also be required during the construction phase in order to provide a Final Letter for the project.

CLOSURE

This report was prepared for the exclusive use of Purity Medical Spa of Washington, LLC and their appointed consultants. Any use of this report or the material contained herein by third parties, or for other than the intended purpose, should first be approved in writing by Cobalt Geosciences, LLC.

The recommendations contained in this report are based on assumed continuity of soils with those of our test holes and assumed structural loads. Cobalt Geosciences should be provided with final architectural and civil drawings when they become available in order that we may review our design recommendations and advise of any revisions, if necessary.

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Purity Medical Spa of Washington, LLC who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Cobalt Geosciences should any of these not be satisfied.

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Sincerely,

Cobalt Geosciences, LLC



2/20/2023 Phil Haberman, PE, LG, LEG Principal

Statement of General Conditions

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Cobalt Geosciences and the Client. Any use which a third party makes of this report is the responsibility of such third party.

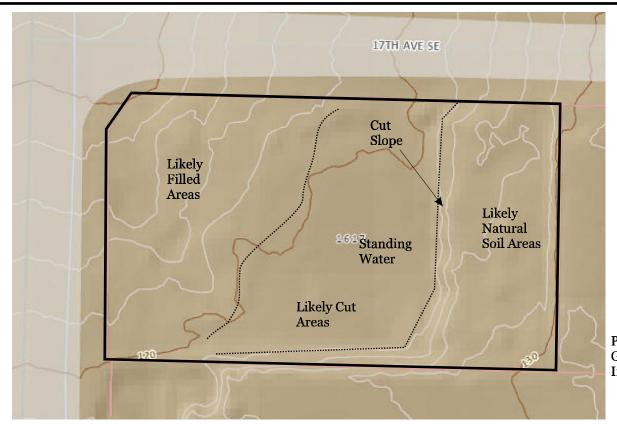
BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Cobalt Geosciences present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Cobalt Geosciences is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Cobalt Geosciences at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Cobalt Geosciences must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Cobalt Geosciences will not be responsible to any party for damages incurred as a result of failing to notify Cobalt Geosciences that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Cobalt Geosciences, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Cobalt Geosciences cannot be responsible for site work carried out without being present.



Pierce Co. GIS Image



Pierce County GIS Image Not to Scale

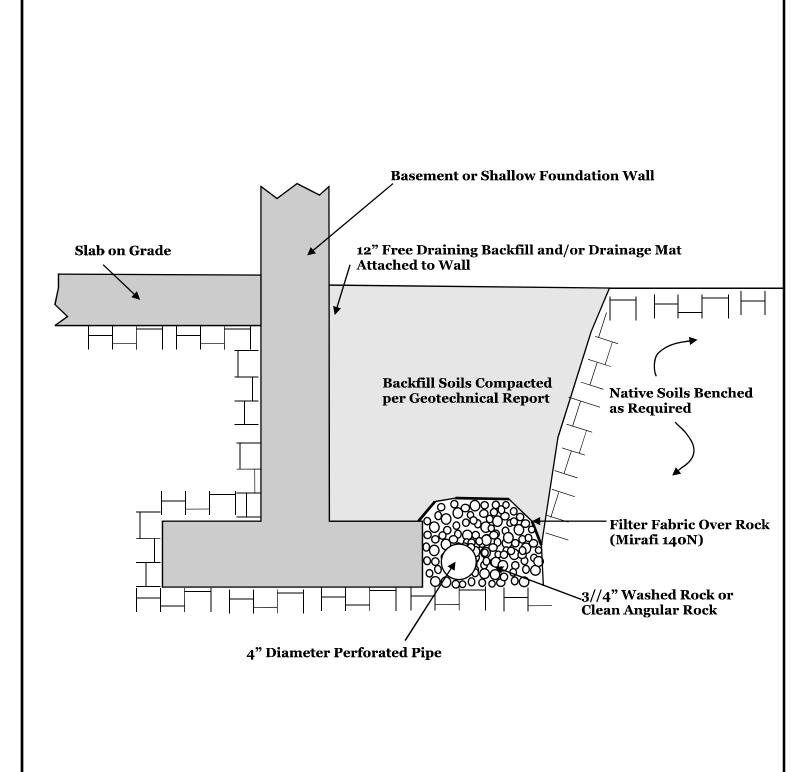
TP-1 Approximate

Test Pit
Location





Proposed Development 1617 S. Meridian Avenue Puyallup, Washington Site Map Figure 1 Cobalt Geosciences, LLC P.O. Box 1792 North Bend, WA 98045 (206) 331-1097 www.cobaltgeo.com cobaltgeo@gmail.com



Not to Scale



Unified Soil Classification System (USCS)									
I	MAJOR DIVISIONS		SYMBO	DL TYPICAL DESCRIPTION					
		Clean Gravels	GV	Well-graded gravels, gravels, gravel-sand mixtures, little or no fines					
	Gravels (more than 50% of coarse fraction	(less than 5% fines)	GI	Poorly graded gravels, gravel-sand mixtures, little or no fines					
COARSE	retained on No. 4 sieve)	Gravels with Fines	GI GI	Silty gravels, gravel-sand-silt mixtures					
GRAINED SOILS	ŕ	(more than 12% fines)	G	Clayey gravels, gravel-sand-clay mixtures					
(more than 50% retained on No. 200 sieve)	Sands	Clean Sands (less than 5%	SV	Well-graded sands, gravelly sands, little or no fines					
110. 200 sieve)	(50% or more of coarse fraction passes the No. 4 sieve)	fines)	SF	Poorly graded sand, gravelly sands, little or no fines					
		Sands with Fines	SM	Silty sands, sand-silt mixtures					
		(more than 12% fines)	SO	Clayey sands, sand-clay mixtures					
	Silts and Clays	Inorganic	MI	Inorganic silts of low to medium plasticity, sandy silts, gravelly silts or clayey silts with slight plasticity					
FINE GRAINED	(liquid limit less than 50)	morganic	Cl	Inorganic clays of low to medium plasticity, gravelly clays, sandy classilty clays, lean clays					
SOILS (50% or more		Organic	OI	Organic silts and organic silty clays of low plasticity					
passes the No. 200 sieve)	C:lt l Cl	Inorganic	MI	Inorganic silts, micaceous or diatomaceous fine sands or silty soils, elastic silt					
	Silts and Clays (liquid limit 50 or more)	morganic	CH	H Inorganic clays of medium to high plasticity, sandy fat clay, or gravelly fat clay					
	,	Organic	OH W	Organic clays of medium to high plasticity, organic silts					
HIGHLY ORGANIC SOILS	Primarily organic ma and organic odor	atter, dark in color,	<u> </u>	Peat, humus, swamp soils with high organic content (ASTM D4427)					

Classification of Soil Constituents

MAJOR constituents compose more than 50 percent, by weight, of the soil. Major constituents are capitalized (i.e., SAND).

Minor constituents compose 12 to 50 percent of the soil and precede the major constituents (i.e., silty SAND). Minor constituents preceded by "slightly" compose 5 to 12 percent of the soil (i.e., slightly silty SAND).

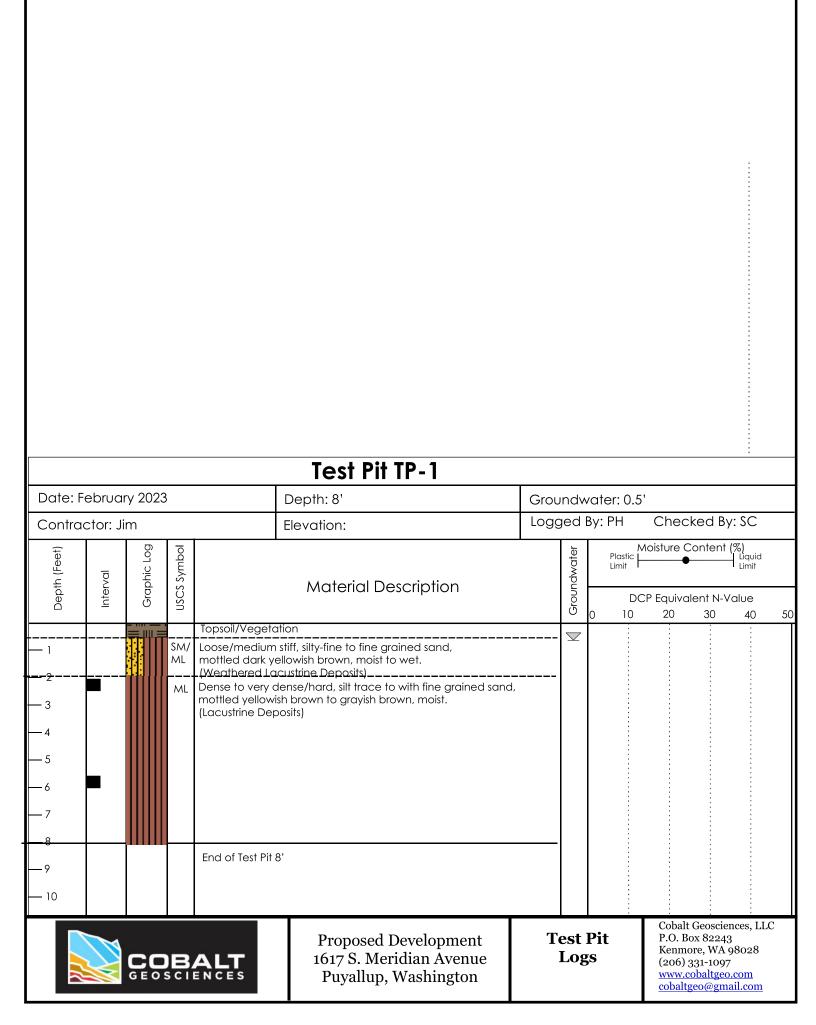
Trace constituents compose o to 5 percent of the soil (i.e., slightly silty SAND, trace gravel).

	ve Density rained Soils)	Consistency (Fine Grained Soils)			
N, SPT, Blows/FT 0 - 4 4 - 10 10 - 30 30 - 50 Over 50	Relative <u>Density</u> Very loose Loose Medium dense Dense Very dense	N, SPT, Blows/FT Under 2 2 - 4 4 - 8 8 - 15 15 - 30 Over 30	Relative Consistency Very soft Soft Medium stiff Stiff Very stiff Hard		

Grain Size Definitions								
Description	Sieve Number and/or Size							
Fines	<#200 (0.08 mm)							
Sand -Fine -Medium -Coarse	#200 to #40 (0.08 to 0.4 mm) #40 to #10 (0.4 to 2 mm) #10 to #4 (2 to 5 mm)							
Gravel -Fine -Coarse	#4 to 3/4 inch (5 to 19 mm) 3/4 to 3 inches (19 to 76 mm)							
Cobbles	3 to 12 inches (75 to 305 mm)							
Boulders	>12 inches (305 mm)							

	Moisture Content Definitions
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table





				Test Pit TP-2							•	
Date: Febr	ruary 2023	3]	Depth: 8'				r: Nor				
Contracto			E	ilevation:	Logg	ged	By: I			ked B		[
Depth (Feet)	Interval Graphic Log	USCS Symbol		Material Description		Groundwater	0		P Equivo			50
		ML ML	dark yellowish bro (Fill) Loose/medium stif mottled dark yello (Weathered Lacuse) -Possible perched Dense to very der	f, silty-fine to fine grained sand, wn, moist to very moist. f to stiff, silty-fine to fine grained sand, wish brown, moist to wet.								
	G E O S	B ,	ALT ENCES	Proposed Development 1617 S. Meridian Avenue Puyallup, Washington		est Log	Pit 38		P.O. E Kenm (206)	t Geoscie ox 8224 ore, WA 331-109 cobaltgeo geo@gm	98028 7	3

					Test Pit TP-3					:	
Date: Fe	ebruar	y 2023	1		Depth: 6'	Grou	ındw	vater: No	ne		
Contrac	tor: Ji	m			Elevation:	Logg	ged	By: PH	Check	ed By: SC	
Depth (Feet)	Interval	Graphic Log	USCS Symbol		Material Description	·	Groundwater			ent N-Value	50
— 1 — 2 — 3 — 4 — 5			SM/ ML	mottled dark yell (Weathered Lace Dense to very de mottled yellowish (Lacustrine Depo	riff, silty-fine to fine grained sand, owish brown, moist. ustrine Deposits) ense/hard, silt trace to with fine grained sand brown to grayish brown, moist.	, , , , , , , , , , , , , , , , , , ,					
— 7 — 8 — 9 — 10		CO GEOS		End of Test Pit 6'	Proposed Development 1617 S. Meridian Avenue		est i		P.O. Box	e, WA 98028	LC



APPENDIX B: CITY OF PUYALLUP CRITICAL AREA MAPS

Earthquake Hazard

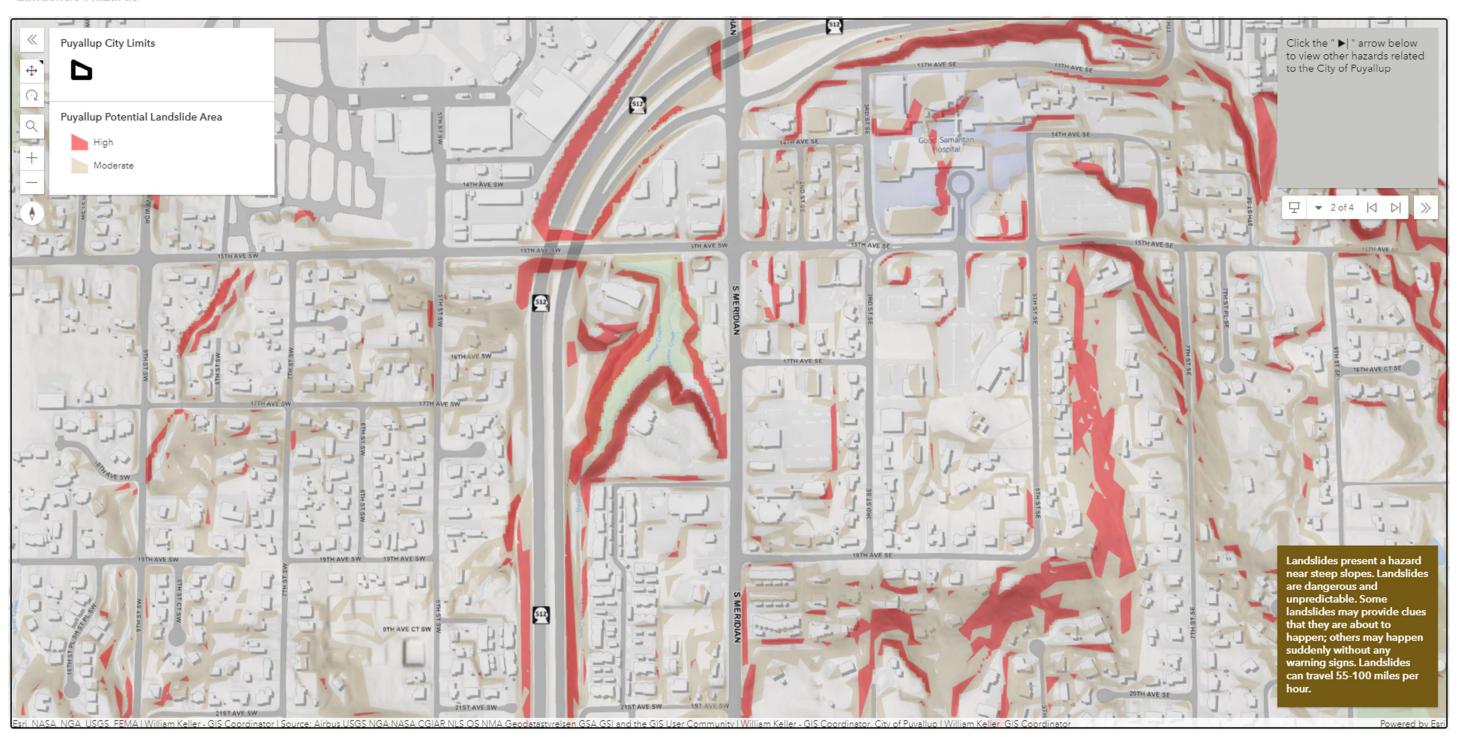


Lahar Hazards

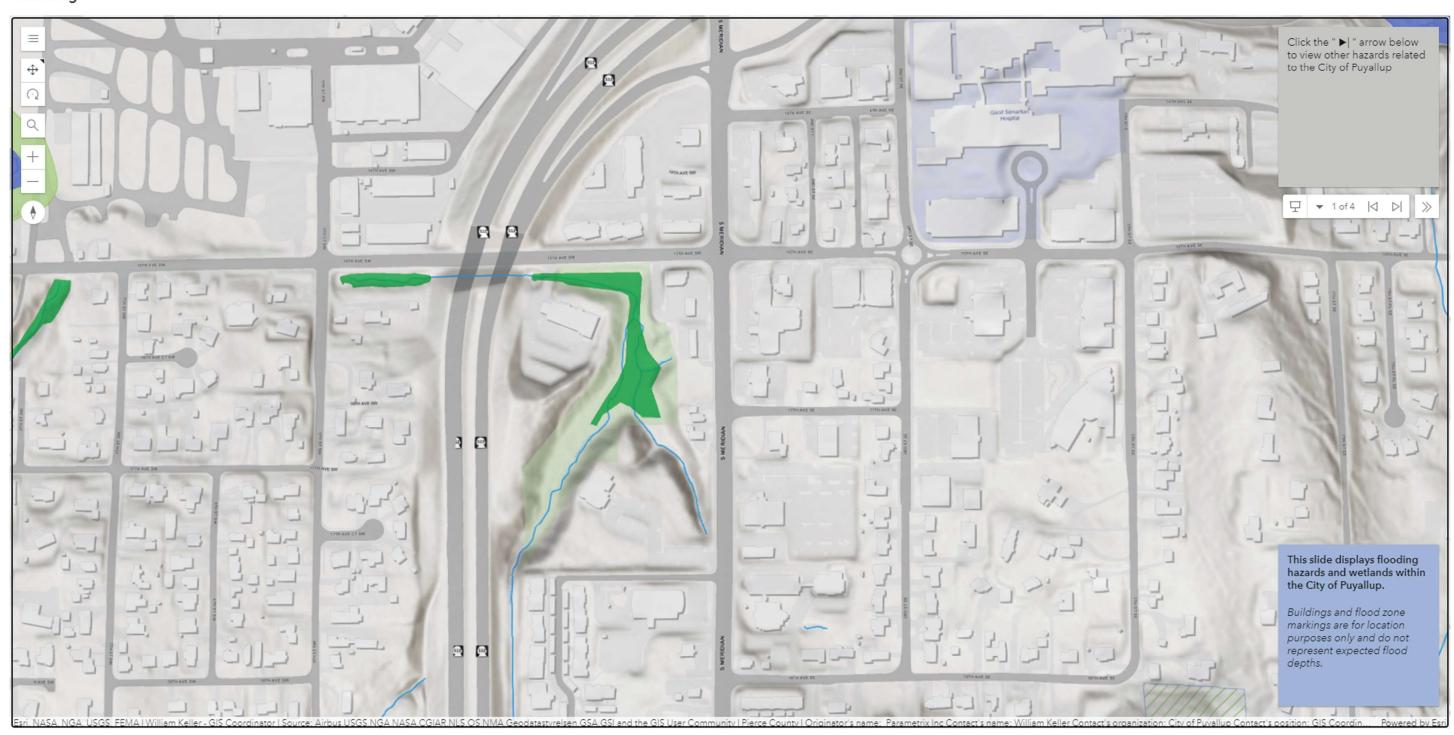




Landslide Hazards



Flooding





APPENDIX C: CRITICAL AREA REPORT

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Wetlands Northwest LLC

February 3, 2025

Fadi Alhafez Purity Medical Spa of Washington LLC 117 15th Avenue SE Puyallup, WA 98372-3753.

Re: Pierce County Tax Parcel, 779000-0-140

1617 South Meridian Avenue

Dear Mr. Alhafez:

Based on my site visit on January 21, 2025 to the off-site wetland across from S. Meridian Avenue, I have determined it is Category III with 5 habitat points (see attached). The wetland was rated as a depressional wetland with sloped components.

Wetlands Northwest LLC upheld professional industry standards when completing this review. The information included in this report constitutes a professional opinion and does not guarantee approval by any federal, state, and/or local permitting agencies.

If you have any further questions, feel free to contact me on my mobile phone at 206-554-1628.

Sincerely,

Robert King, PWS President/Owner

RZH

Attachments

RATING SUMMARY – Western Washington

Name of w	etland (or I	O #):	Wetland A					Date of site visit:	1/21/25
Rated by	R. King			_ T	rained by E	cology? 🗸	Yes No	Date of training	Dec-14
HGM Clas	s used for	rating	Depression	nal & Flats		Wetla	nd has multi	ple HGM classes? 🕡	Yes ∏No
OVERALI	NOTE: Fo	Source	of base aeria	with out the fall photo/map	Google Ear	th Aerial		combined).	
1. Cate	gory of we	etland b	Category I Category I Category I	JNCTIONS - Total score = II - Total score II - Total score IV - Total score	= 20 - 22 = 16 - 19			Score for each function based on three ratings (order of ratings	
FUNC	CTION		roving r Quality	Hydrologic	Habitat			is not important)	
			List ap	propriate rating	g (H, M, L)			, ,	
Site Potent	ial		Н	ĺĹĮ	M			9 = H, H, H	
andscape	Potential		M	Н	L			8 = H, H, M	
/alue			М	L	М	Total		7 = H, H, L	
Score Bas Ratings	ed on		7	5	5	17		7 = H, M, M 6 = H, M, L	
_							-	6 = M, M, M 5 = H, L, L 5 = M, M, L 4 = M I I	

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	Category
Estuarine	
Wetland of High Conservation Value	
Bog	
Mature Forest	
Old Growth Forest	
Coastal Lagoon	
Interdunal	
None of the above	Х

3 = L, L, L

Maps and Figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #		
Cowardin plant classes	D 1.3, H 1.1, H 1.4	Α		
Hydroperiods	D 1.4, H 1.2	В		
Location of outlet (can be added to map of hydroperiods)	D 1.1, D 4.1	В		
Boundary of area within 150 ft of the wetland (can be added to another figure)	D 2.2, D 5.2	С		
Map of the contributing basin	D 4.3, D 5.3	D		
1 km Polygon: Area that extends 1 km from entire wetland edge - including H 2.1, H 2.2, H 2.3				
polygons for accessible habitat and undisturbed habitat		E,F		
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	G		
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	G		

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland (can be added to another figure)	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream (can be added to another figure)	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including	H 2.1, H 2.2, H 2.3	
polygons for accessible habitat and undisturbed habitat		
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland (can be added to another figure)	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including	H 2.1, H 2.2, H 2.3	
polygons for accessible habitat and undisturbed habitat		
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of dense trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of dense, rigid trees, shrubs, and herbaceous plants	S 4.1	
(can be added to another figure)		
Boundary of area within 150 ft of the wetland (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including	H 2.1, H 2.2, H 2.3	
polygons for accessible habitat and undisturbed habitat		
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetland in Western Washington

For questions 1 -7, the criteria described must apply to the entire unit being rated.

If hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1 - 7 apply, and go to Question 8.

1. Are the wa	ater levels in the entire unit usually	controlled by tides except during floods?	
√ NO) - go to 2	YES - the wetland class is Tidal Fringe - go to 1.1	
1.1 ls th	he salinity of the water during perio	ods of annual low flow below 0.5 ppt (parts per thousand)?	
lf yo Sal		Freshwater Tidal Fringe use the forms for Riverine wetlands. I ine wetland and is not scored. This method cannot be used to	
	wetland unit is flat and precipitation vater runoff are NOT sources of wa	n is the only source (>90%) of water to it. Groundwater ter to the unit.	
	our wetland can be classified as a	YES - The wetland class is Flats Flats wetland, use the form for Depressional wetlands.	
☐ The	ntire wetland unit meet all of the for e vegetated part of the wetland is of the surface at any time of the year) east 30% of the open water area is	n the shores of a body of permanent open water (without any pot at least 20 ac (8 ha) in size;	lants
√ NO) - go to 4	☐ YES - The wetland class is Lake Fringe (Lacustrine Fringe	;)
√ The √ The ma	ntire wetland unit meet all of the force wetland is on a slope (<i>slope can</i> e water flows through the wetland it y flow subsurface, as sheetflow, or e water leaves the wetland without	be very gradual), n one direction (unidirectional) and usually comes from seeps. in a swale without distinct banks.	It
∏ NO) - go to 5	YES - The wetland class is Slope	
		pe of wetlands except occasionally in very small and shallow are usually <3 ft diameter and less than 1 ft deep).	
☐ The that	ntire wetland unit meet all of the for e unit is in a valley, or stream chan t stream or river, e overbank flooding occurs at least	nel, where it gets inundated by overbank flooding from	
√ NO) - go to 6	☐ YES - The wetland class is Riverine	
NOTE: The Ri	iverine unit can contain depression	ns that are filled with water when the river is not flooding.	

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at som time during the year? <i>This means that any outlet, if present, is higher than the interior of the wetland.</i>				
☐ NO - go to 7	YES - The wetland class is Depressional			
7. Is the entire wetland unit located in a very flat area with unit does not pond surface water more than a few inches the area. The wetland may be ditched, but has no obviou	. The unit seems to be maintained by high groundwater in			
NO - go to 8	YES - The wetland class is Depressional			
8. Your wetland unit seems to be difficult to classify and p example, seeps at the base of a slope may grade into a r	robably contains several different HGM classes. For iverine floodplain, or a small stream within a Depressional			

decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit;

classify the wetland using the class that represents more than 90% of the total area.

wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you

HGM classes within the wetland unit	HGM class to		
being rated	use in rating		
Slope + Riverine	Riverine		
Slope + Depressional	Depressional		
Slope + Lake Fringe	Lake Fringe		
Depressional + Riverine along stream	Depressional		
within boundary of depression			
Depressional + Lake Fringe	Depressional		
Riverine + Lake Fringe	Riverine		
Salt Water Tidal Fringe and any other	Treat as		
class of freshwater wetland	ESTUARINE		

If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.

NOTES and FIELD OBSERVATIONS:

DEPRESSIONAL AND FLATS WETLAN		
Water Quality Functions - Indicators that the site functions to impro	ove water quality	
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland is a depression or flat depression (QUESTION 7 on key) with		
no surface water leaving it (no outlet).	points = 3	
Wetland has an intermittently flowing stream or ditch, OR highly		
constricted permanently flowing outlet.	points = 2	2
Wetland has an unconstricted, or slightly constricted, surface outlet that		
is permanently flowing	points = 1	
Wetland is a flat depression (QUESTION 7 on key), whose outlet is a		
permanently flowing ditch.	points = 1	
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic		0
(use NRCS definitions).	Yes = 4 No = 0	
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub,	and/or Forested	
Cowardin classes):	٠, ج	
Wetland has persistent, ungrazed, plants > 95% of area	points = 5	5
Wetland has persistent, ungrazed, plants > ½ of area	points = 3	Ü
Wetland has persistent, ungrazed plants > 1/10 of area	points = 1	
Wetland has persistent, ungrazed plants < 1/10 of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation:		
This is the area that is ponded for at least 2 months. See description in m	anual.	
Area seasonally ponded is > 1/2 total area of wetland	points = 4	2
Area seasonally ponded is > 1/4 total area of wetland	points = 2	
Area seasonally ponded is < 1/4 total area of wetland	points = 0	
Total for D 1 Add the points	in the boxes above	9
Rating of Site Potential If score is: $\square 2 - 16 = H$ $\square 11 = M$ $\square 1 = L$	Record the rating or	the first page
D 2.0. Does the landscape have the potential to support the water quality function o	f the site?	
D 2.1. Does the wetland unit receive stormwater discharges?	Yes = 1 No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate		•
pollutants?	Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not	100 1 110 0	
listed in questions D 2.1 - D 2.3?		0
Source	Yes = 1 No = 0	
Total for D 2 Add the points	in the boxes above	2
Rating of Landscape Potential If score is: or 4 = H or 2 = M L	Record the rating or	the first page
D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river,		4
lake, or marine water that is on the 303(d) list?	Yes = 1 No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 30)3(d) list?	
·	Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for		
maintaining water quality (answer YES if there is a TMDL for the basin in which		2
the unit is found)?	Yes = 2 No = 0	
Total for D 3 Add the points	in the boxes above	4
Rating of Value If score is:	Record the rating or	the first page

DEPRESSIONAL AND FLATS WETLANDS				
Hydrologic Functions - Indicators that the site functions to reduce flooding and stream deg	radation			
D 4.0. Does the site have the potential to reduce flooding and erosion?				
D 4.1. Characteristics of surface water outflows from the wetland:				
Wetland is a depression or flat depression with no surface water				
leaving it (no outlet) points	= 4			
Wetland has an intermittently flowing stream or ditch, OR highly				
constricted permanently flowing outlet points	= 2 2			
Wetland is a flat depression (QUESTION 7 on key), whose outlet is a				
permanently flowing ditch points	= 1			
Wetland has an unconstricted, or slightly constricted, surface outlet that	- 0			
is permanently flowing points D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the	= 0			
outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepe	oet			
part.	31			
Marks of ponding are 3 ft or more above the surface or bottom of outlet points	= 7			
Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points				
Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points				
The wetland is a "headwater" wetland points				
Wetland is flat but has small depressions on the surface that trap water points				
Marks of ponding less than 0.5 ft (6 in) points				
D 4.3. Contribution of the wetland to storage in the watershed: Estimate the ratio of the area of				
upstream basin contributing surface water to the wetland to the area of the wetland unit itself.				
The area of the basin is less than 10 times the area of the unit points	= 5			
The area of the basin is 10 to 100 times the area of the unit points	= 3 0			
The area of the basin is more than 100 times the area of the unit points	= 0			
Entire wetland is in the Flats class points	= 5			
Total for D 4 Add the points in the boxes abo	ve 5			
Rating of Site Potential If score is: 2 - 16 = H	g on the first page			
D 5.0. Does the landscape have the potential to support hydrologic function of the site?				
D 5.1. Does the wetland unit receive stormwater discharges? Yes = 1 No	= 0 1			
D 5.2. ls > 10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	. 1			
Yes = 1 No	= 0			
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land				
uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	1			
Yes = 1 No				
Total for D 5 Add the points in the boxes about the points about the point about the points about the point about the point about the points about the	-			
	g on the first page			
D 6.0. Are the hydrologic functions provided by the site valuable to society?				
D 6.1. The unit is in a landscape that has flooding problems. Choose the description that best				
matches conditions around the wetland unit being rated. Do not add points. Choose the highest				
Score if more than one condition is met.				
The wetland captures surface water that would otherwise flow down-gradient into areas				
where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-				
gradient of unit.	- 2			
Surface flooding problems are in a sub-basin farther down-	0			
gradient. points	= 1			
Flooding from groundwater is an issue in the sub-basin.				
The existing or potential outflow from the wetland is so constrained by]			
human or natural conditions that the water stored by the wetland				
cannot reach areas that flood. Explain why points	= 0			
There are no problems with flooding downstream of the wetland.				
D 6.2. Has the site been identified as important for flood storage or flood	1			
conveyance in a regional flood control plan? Yes = 2 No	= 0			
Total for D 6 Add the points in the boxes about	ove 0			
Rating of Value If score is: 2 - 4 = H	g on the first page			

These questions apply to wetlands of all HGM classes.	
HABITAT FUNCTIONS - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: Indicators are Cowardin classes and strata within the Forested class. Check the Cowardin plant classes in the wetland. Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.	
Aquatic bed Emergent Scrub-shrub (areas where shrubs have > 30% cover) Forested (areas where trees have > 30% cover) If the unit has a Forested class, check if: The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	1
H 1.2. Hydroperiods	
Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (see text for descriptions of hydroperiods).	
Permanently flooded or inundated Seasonally flooded or inundated Occasionally flooded or inundated Occasionally flooded or inundated Saturated only Permanently flowing stream or river in, or adjacent to, the wetland Seasonally flowing stream in, or adjacent to, the wetland	2
☐ Lake Fringe wetland 2 points	
Freshwater tidal wetland 2 points H 1.3. Richness of plant species	
Count the number of plant species in the wetland that cover at least 10 ft ² . Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle	1
If you counted: > 19 species points = 2	
5 - 19 species points = 1	
< 5 species points = 0 H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. If you have four or more plant classes or three classes and open water, the rating is always high.	
None = 0 points Low = 1 point Moderate = 2 points	2
All three diagrams in this row are HIGH = 3 points	

H 1.5. Special habitat features:	
Check the habitat features that are present in the wetland. The number of checks is the number of	
points	
Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long)	
Standing snags (dbh > 4 in) within the wetland	
Undercut banks are present for at least 6.6 ft (2 m) and/or overhanging plants extends at	
least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft	_
(10 m)	2
Stable steep banks of fine material that might be used by beaver or muskrat for denning (>	
30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that	
have not yet weathered where wood is exposed)	
At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that	
are permanently or seasonally inundated (structures for egg-laying by amphibians)	
Invasive plants cover less than 25% of the wetland area in every stratum of plants (see H	
1.1 for list of strata) Add the points in the boyes shows	8
Total for H 1 Add the points in the boxes above Rating of Site Potential If Score is: 5 - 18 = H 7 14 = M 0 = L Record the rating or	
Rating of Site Potential if Score is	i tile ili st page
H 2.0. Does the landscape have the potential to support the habitat function of the site?	
H 2.1 Accessible habitat (include only habitat that directly abuts wetland unit).	
Calculate:	
1 % undisturbed habitat + (27 % moderate & low intensity land uses / 2) = 14.5%	
,	
If total accessible habitat is:	1
$> \frac{1}{3}$ (33.3%) of 1 km Polygon points = 3	
20 - 33% of 1 km Polygon points = 2	
10 - 19% of 1 km Polygon points = 1	
< 10 % of 1 km Polygon points = 0	
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland.	
Calculate:	
11 % undisturbed habitat + (27 % moderate & low intensity land uses / 2) = 24.5%	
	1
Undisturbed habitat > 50% of Polygon points = 3	'
Undisturbed habitat 10 - 50% and in 1-3 patches points = 2	
Undisturbed habitat 10 - 50% and > 3 patches points = 1	
Undisturbed habitat < 10% of 1 km Polygon points = 0	
H 2.3 Land use intensity in 1 km Polygon: If	
> 50% of 1 km Polygon is high intensity land use points = (-2)	-2
≤ 50% of 1km Polygon is high intensity points = 0	
Total for H 2 Add the points in the boxes above	0
Rating of Landscape Potential If Score is:	n the first page
H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? <i>Choose only</i>	
the highest score that applies to the wetland being rated.	
Site meets ANY of the following criteria: points = 2	
It has 3 or more priority habitats within 100 m (see next page)	
It provides habitat for Threatened or Endangered species (any plant or	
animal on the state or federal lists)	
It is mapped as a location for an individual WDFW priority species	_
It is a Wetland of High Conservation Value as determined by the	1
Department of Natural Resources	
It has been categorized as an important habitat site in a local or	
regional comprehensive plan, in a Shoreline Master Plan, or in a	
watershed plan	
Site has 1 or 2 priority habitats (listed on next page) with in 100m points = 1	
Site does not meet any of the criteria above points = 0	
Rating of Value If Score is:	n the first page

WDFW Priority Habitats

<u>Priority habitats listed by WDFW</u> (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.

http://wdfw.wa.gov/publications/00165/wdfw00165.pdf_or access the list from here: http://wdfw.wa.gov/conservation/phs/list/

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: NOTE: This question is independent of the land use between the wetland unit and the priority habitat. **Aspen Stands**: Pure or mixed stands of aspen greater than 1 ac (0.4 ha). Biodiversity Areas and Corridors: Areas of habitat that are relatively important to various species of native fish and wildlife (full descriptions in WDFW PHS report). Herbaceous Balds: Variable size patches of grass and forbs on shallow soils over bedrock. Old-growth/Mature forests: Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests - Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest. Oregon White Oak: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (full descriptions in WDFW PHS report p. 158 - see web link above). Riparian: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. Westside Prairies: Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (full descriptions in WDFW PHS report p. 161 - see web link above). Instream: The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. Nearshore: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page). Caves: A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human. Cliffs: Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation. Talus: Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. Snags and Logs: Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm)

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

in diameter at the largest end, and > 20 ft (6 m) long.

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland	Туре	Category
Check off	any criteria that apply to the wetland. List the category when the appropriate criteria are met.	
	stuarine Wetlands	
	Does the wetland meet the following criteria for Estuarine wetlands?	
	The dominant water regime is tidal,	
	Vegetated, and	
	With a salinity greater than 0.5 ppt	
	Yes - Go to SC 1.1 No = Not an estuarine wetland	
SC 1.1.	Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve,	
	Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve	
	designated under WAC 332-30-151? Yes = Category I No - Go to SC 1.2	
SC 1.2.	Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions?	
	The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing,	
	and has less than 10% cover of non-native plant species. (If non-native species are	
	Spartina, see page 25)	
	At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-	
	grazed or un-mowed grassland.	
	The wetland has at least two of the following features: tidal channels, depressions with	
	open water, or contiguous freshwater wetlands.	
SC 2 0 V	Yes = Category I	
SC 2.0. V	Has the WA Department of Natural Resources updated their website to include the list of	
	Wetlands of High Conservation Value?	
	☐ Yes - Go to SC 2.2	
SC 2.2.	Is the wetland listed on the WDNR database as a Wetland of High Conservation Value?	
	☐ Yes = Category I ☐ No = Not WHCV	
SC 2.3.	Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland?	
	http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes - Contact WNHP/WDNR and to SC 2.4 No = Not WHCV	
SC 2.4.	☐ Yes - Contact WNHP/WDNR and to SC 2.4 ☐ No = Not WHCV Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation	
30 2.4.	Value and listed it on their website?	
	Yes = Category I No = Not WHCV	
SC 3.0. E		
	Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in	
	bogs? Use the key below. If you answer YES you will still need to rate the wetland based	
	on its functions.	
SC 3.1.	Does an area within the wetland unit have organic soil horizons, either peats or mucks, that	
	compose 16 in or more of the first 32 in of the soil profile? Yes - Go to SC 3.3 No - Go to SC 3.2	
SC 3.2.	Yes - Go to SC 3.3 √ No - Go to SC 3.2 Does an area within the wetland unit have organic soils, either peats or mucks, that are less	
00 0.2.	than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or	
	that are floating on top of a lake or pond?	
	Yes - Go to SC 3.3 No = Is not a bog	
SC 3.3.	Does an area with peats or mucks have more than 70% cover of mosses at ground level,	
	AND at least a 30% cover of plant species listed in Table 4?	
	☐ Yes = Is a Category I bog ☐ No - Go to SC 3.4	
	NOTE: If you are uncertain about the extent of mosses in the understory, you may substitute	
	that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in	
	deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a	
SC 3.4.	bog. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir,	
	western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce,	
	or western white pine, AND any of the species (or combination of species) listed in Table 4	
	provide more than 30% of the cover under the canopy?	
	Yes = Is a Category I bog No = Is not a bog	

SC 4.0. F	orested Wetlands	
	Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria	
l	for the WA Department of Fish and Wildlife's forests as priority habitats? <i>If you answer YES</i>	
	you will still need to rate the wetland based on its functions.	
	Old-growth forests (west of Cascade crest): Stands of at least two tree species, forming a	
' '	multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha)	
	that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm)	
I	or more.	
	Mature forests (west of the Cascade Crest): Stands where the largest trees are 80- 200	
' '	years old OR the species that make up the canopy have an average diameter (dbh)	
	exceeding 21 in (53 cm).	
	exceeding 21 in (55 cm).	
	Yes = Category I No = Not a forested wetland for this section	
SC 5.0. W	Vetlands in Coastal Lagoons	
	Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? The workened lies in a depression adjacent to marine waters that is wholly or partially	[
	The wetland lies in a depression adjacent to marine waters that is wholly or partially	
	separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently,	
	rocks The lagoon in which the wetland is located contains ponded water that is saline or brackish	
1 1	(> 0.5 ppt) during most of the year in at least a portion of the lagoon (needs to be measured	
	near the bottom)	
	Yes - Go to SC 5.1 No = Not a wetland in a coastal lagoon	
SC 5.1. D	oes the wetland meet all of the following three conditions?	
	The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing),	
' '	and has less than 20% cover of aggressive, opportunistic plant species (see list of species	
	on p. 100).	
	At least 3/4 of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-	
	grazed or un-mowed grassland.	
	The wetland is larger than $^{1}/_{10}$ ac (4350 ft ²)	
	Yes = Category I No = Category II	
SC 6.0. In	nterdunal Wetlands	
	Is the wetland west of the 1889 line (also called the Western Boundary of Upland	
	Ownership or WBUO)? If you answer yes you will still need to rate the wetland based on	
	its habitat functions.	
	In practical terms that means the following geographic areas:	
[_]	Long Beach Peninsula: Lands west of SR 103	
	Grayland-Westport: Lands west of SR 105	
	Ocean Shores-Copalis: Lands west of SR 115 and SR 109	
22.24	Yes - Go to SC 6.1 No = Not an interdunal wetland for rating	
SC 6.1.	Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates	
	H,H,H or H,H,M for the three aspects of function)?	
00.63	Yes = Category I No - Go to SC 6.2	
SC 6.2.	Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = Category II No - Go to SC 6.3	
SC 6.3.	Yes = Category II No - Go to SC 6.3 Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1	
SC 0.5.	ac?	
	Yes = Category III No = Category IV	
Category	of wetland based on Special Characteristics	
	swered No for all types, enter "Not Applicable" on Summary Form	

Figure A - Cowardin Classes Google Earth Aerial







Figure B- Hydroperiods and Outlet Google Earth Aerial

0 100 200 ft



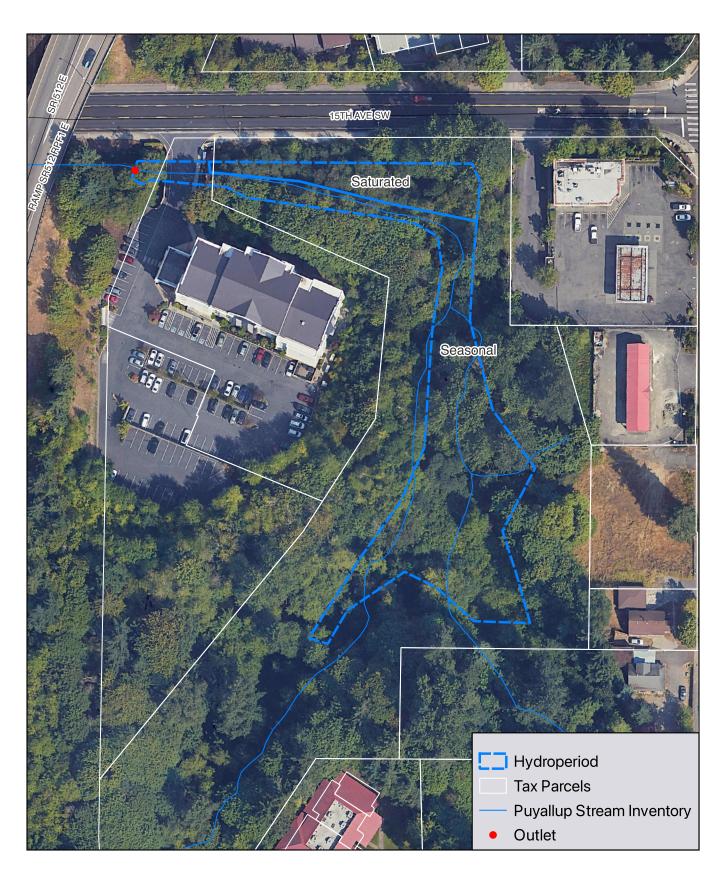


Figure C - 150-foot Boundary From Wetland Google Earth Aerial

0 150 300 ft



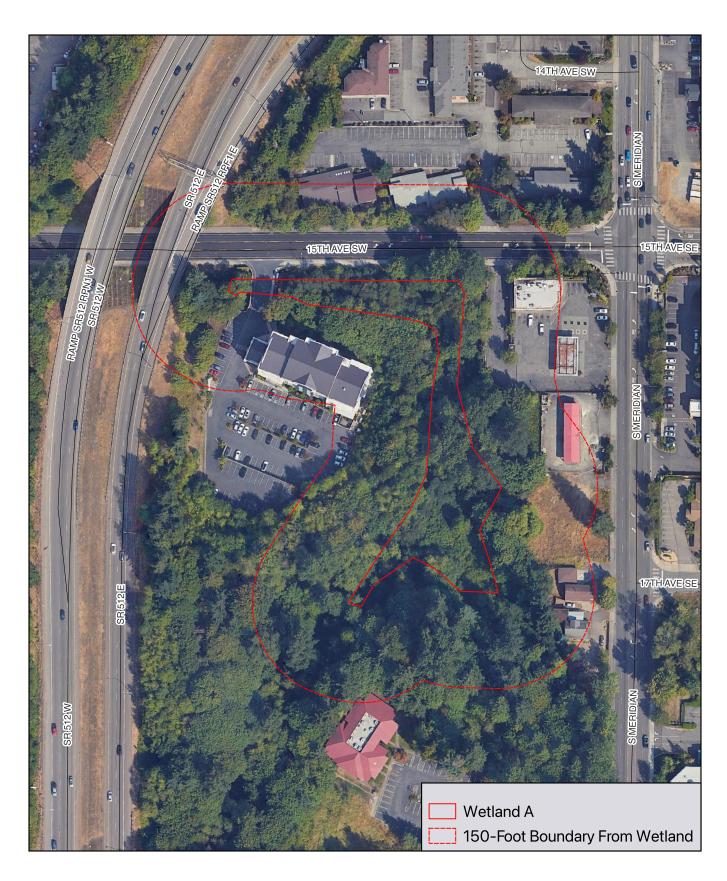


Figure D - Contributing Basin Google Earth Aerial

0 1,400 2,800 ft





Figure E - Accessible and Undisturbed Habitat

0 1,100 2,200 ft



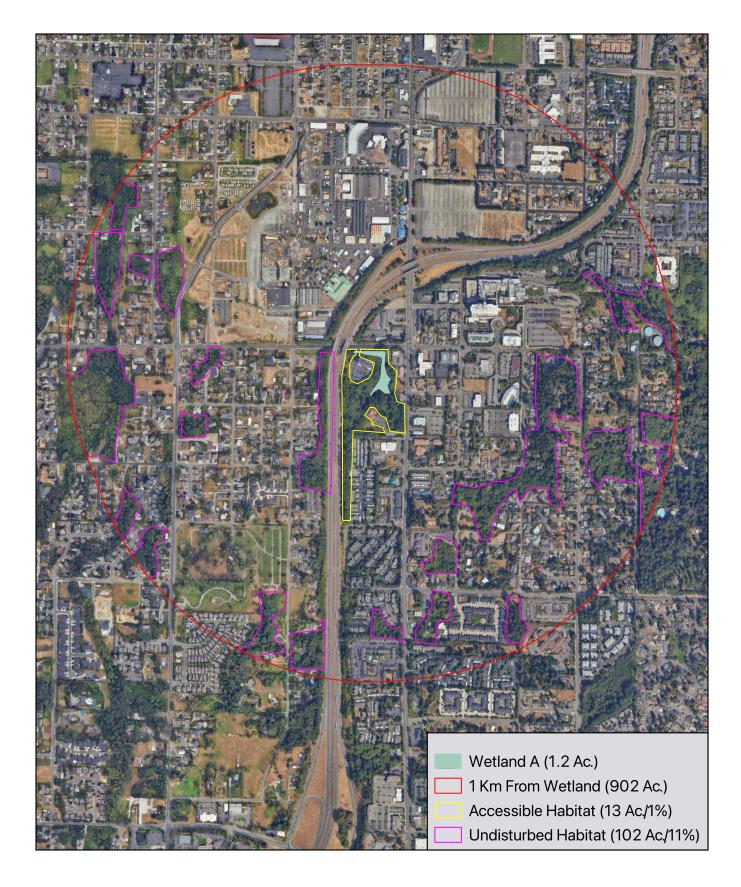


Figure F - Moderate Tax Parcels Within 1 Km.

0 1,100 2,200 ft



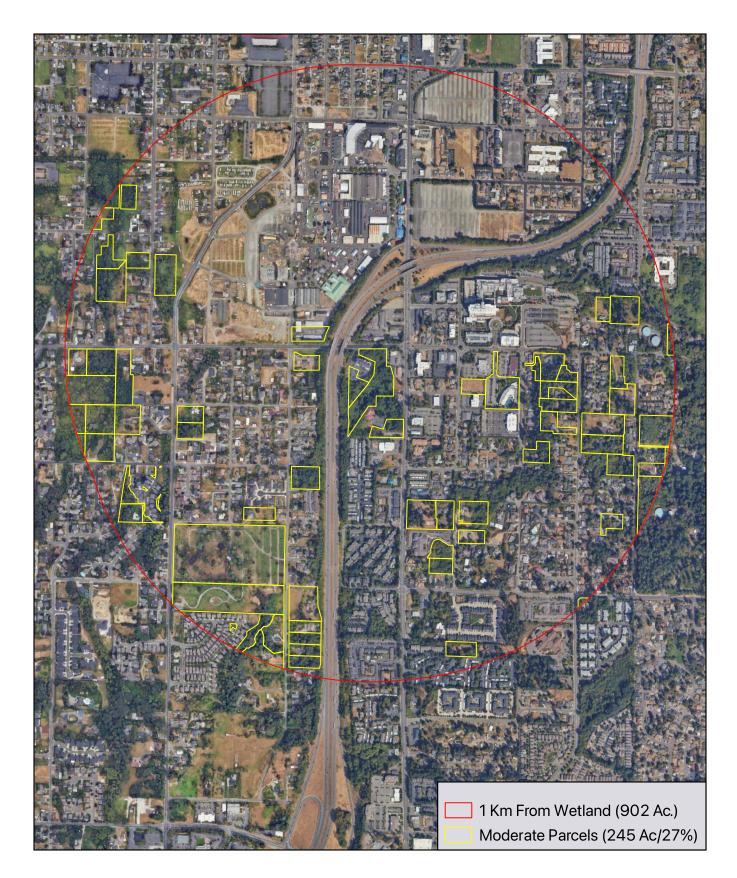
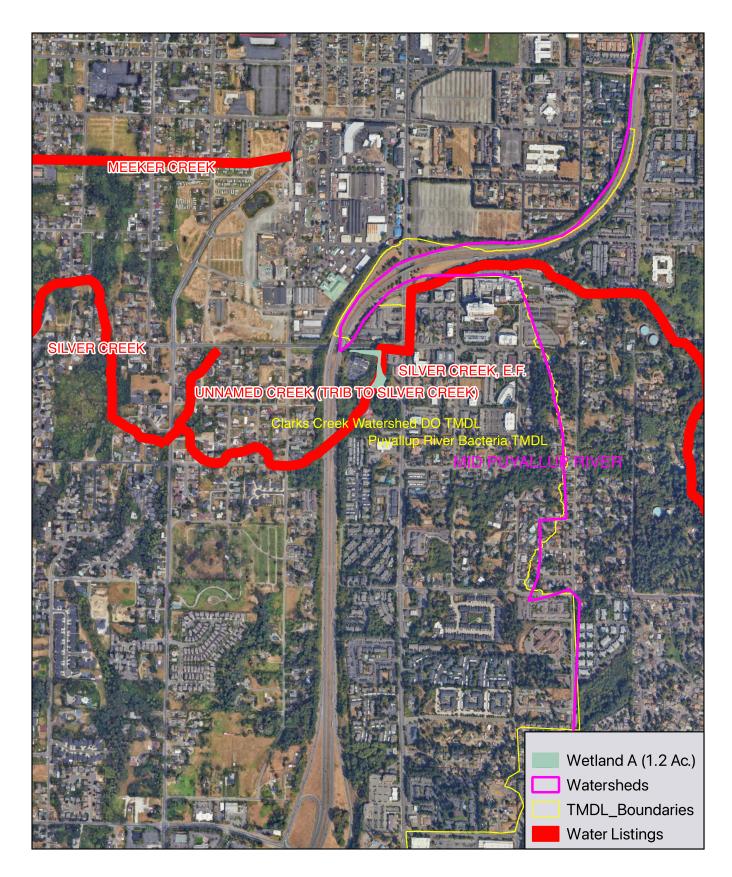


Figure G - 303D Waters and TMDL's

0 1,100 2,200 ft



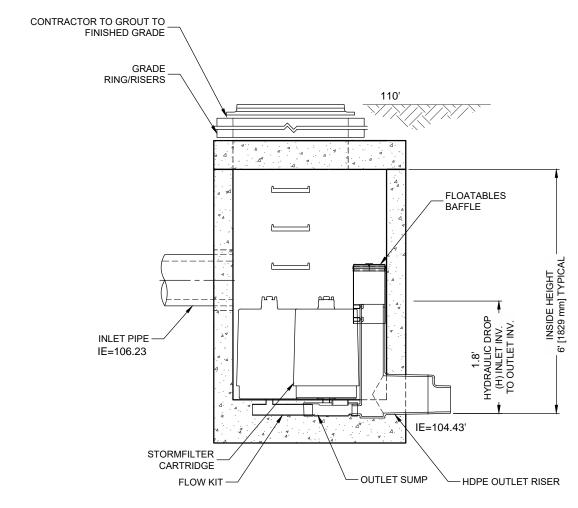




APPENDIX D: STORMFILTER DETAIL

PLAN VIEW

STANDARD OUTLET RISER FLOWKIT: 40A



SECTION A-A



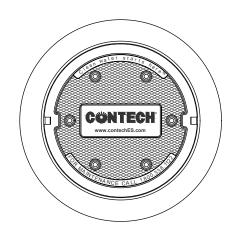
STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (3). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 3 CARTRIDGES. Ø4 [1219 mm] MANHOLE STORMFILTER PEAK HYDRAULIC CAPACITY IS 1.0 CFS [28.3 L/s] . IF THE SITE CONDITIONS EXCEED 1.0 CFS [28.3 L/s] AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27" [686 mm]		18" [458 mm]		LOW DROP				
RECOMMENDED HYDRAULIC DROP (H)	;	3.05' [930 mm	1]		2.3' [700 mm]			1.8' [550 mm]	
SPECIFIC FLOW RATE (gpm/sf) [L/s/m²]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]
CARTRIDGE FLOW RATE (gpm) [L/s]	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.44]	10 [0.63]	8.35 [0.54]	5 [0.32]

^{* 1.67} gpm/sf [1.08 L/s/m²] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND COVER (DIAMETER VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS						
STRUCTURE ID	SFMH-1					
WATER QUALITY	FLOW RAT	E (cfs) [L/s]		0.0356		
PEAK FLOW RAT	E (cfs) [L/s]			0.016		
RETURN PERIOD	100					
CARTRIDGE HEIGHT (SEE TABLE ABOVE) LD						
NUMBER OF CARTRIDGES REQUIRED 1						
CARTRIDGE FLO	8.53					
MEDIA TYPE (PE	PSORB					
DIDE DATA		MATERIAL				
PIPE DATA:	I.E.	MATERIAL	D	IAMETER		
INLET PIPE #1	106.23'	PVC		12"		
INLET PIPE #2						
OUTLET PIPE	104.43'	PVC	12"			
RIM ELEVATION 110'						
ANTI-FLOTATION BALLAST WIDTH HEIGHT						
ANTI-FLOTATION	BALLAST	WIDTH		HEIGHT		

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- 2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
- 3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
- 4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS
- 5. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' 5' [1524 mm] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES [178 mm]. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
- 7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) [L/s] DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft)[m²].
- 8. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
- C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
- E. CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES [200 mm], CONTRACTOR TO REMOVE THE 8 INCH [200 mm] OUTLET STUB AT MOLDED-IN CUT LINE. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
- F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.



800-338-1122 513-645-7000 513-645-7993 FAX

SFMH48 STORMFILTER STANDARD DETAIL



APPENDIX E: PUMP CALCULATIONS

Peak Wet Weather Flow (gpm) Force Main size (inches) Peak Wet Weather Flow (cfs) Peak Velocity (fps)	50.0 2 0.11 5.11
receiving MH invert	111.65
wet well invert	99.25
static head	12.40
force main length	64.39
Minor Losses equivalent length	53.5
total equivalent length	117.9
dynamic head	7.199047

total head		19.59905 sum eq			
Minor losses	number	eq L ft	L		
regular 90 elbow	1	13	13.0		
long radius 90 elbow	0	4.6	0.0		
regular 45 elbow	0	5.5	0.0		
tee, flow through line					
(run)	0	17	0.0		
tee, flow through stem	0	21	0.0		
180 return bend	0	13	0.0		
globe valve	0	110	0.0		
gate valve	1	2.5	2.5		
angle valve	0	18	0.0		
swing check valve	1	38	38.0		
coupling or union	0	0.65	0.0		
			53.5		



APPENDIX F: WE SERIES MODEL 3885 BROCHURE



FEATURES

Impeller: Cast iron, semi-open, non-clog with pump-out vanes for mechanical seal protection. Balanced for smooth operation. Silicon bronze impeller available as an option.

Casing: Cast iron volute type for maximum efficiency. 2" NPT discharge.

Mechanical Seal: Silicon Carbide vs. Silicon Carbide sealing faces. Stainless steel metal parts, BUNA-N elastomers.

Shaft: Corrosion-resistant, stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.

Fasteners: 300 series stainless steel.

Capable of running dry without damage to components.

Designed for continuous operation when fully submerged.

EXTENDED WARRANTY AVAILABLE FOR RESIDENTIAL APPLICATIONS.

WE Series Model 3885

SUBMERSIBLE EFFLUENT PUMPS



Wastewater

APPLICATIONS

Specifically designed for the following uses:

 Homes, Farms, Trailer Courts, Motels, Schools, Hospitals, Industry, Effluent Systems

SPECIFICATIONS

Pump

- Solids handling capabilities: ¾" maximum.
- Discharge size: 2" NPT.
- Capacities: up to 140 GPM.
- Total heads: up to 128 feet TDH.
- Temperature: 104°F (40°C) continuous, 140°F (60°C) intermittent.
- See order numbers on reverse side for specific HP, voltage, phase and RPM's available.

MOTORS

- Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.
- Class B insulation on 1/3 11/2 HP models.
- Class F insulation on 2 HP models.

Single phase (60 Hz):

- Capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.

- SJTOW or STOW severe duty oil and water resistant power cords.
- 1/3 1 HP models have NEMA three prong grounding plugs.
- 1½ HP and larger units have bare lead cord ends.

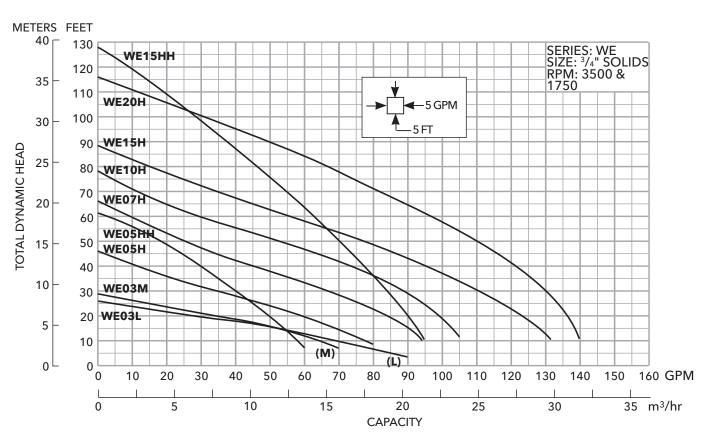
Three phase (60 Hz):

- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.
- Designed for Continuous Operation: Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- Bearings: Upper and lower heavy duty ball bearing construction.
- Power Cable: Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- O-ring: Assures positive sealing against contaminants and oil leakage.

AGENCY LISTINGS



Tested to UL 778 and CSA 22.2 108 Standards By Canadian Standards Association File #LR38549



Goulds Water Technology

Wastewater

MODELS

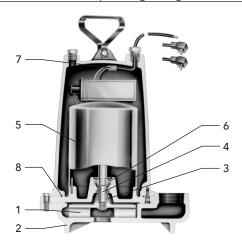
Order	НР	Phase	Volts	DDM	Impeller		Locked Rotor		Full Load		istance	Power	Weight	
Number	пг	rnase	voits	KFIVI	Diameter (in.)	Amps	Amps	Code	Efficiency %	Start	Line-Line	Cable Size	(lbs.)	
WE0311L			115			10.7	30.0	M	54	11.9	1.7			
WE0318L	0.33		208	1		6.8	19.5	K	51	9.1	4.2			
WE0312L			230	1750	F 20	4.9	14.1	L	53	14.5	8.0	1.//2		
WE0311M			115	1750	5.38	10.7	30.0	М	54	11.9	1.7	16/3	56	
WE0318M	1	1	208	1		6.8	19.5	K	51	9.1	4.2			
WE0312M	1		230	1		4.9	14.1	L	53	14.5	8.0			
WE0511H		1	115			14.5	46.0	М	54	7.5	1.0	14/3	60	
WE0518H			208			8.1	31.0	К	68	9.7	2.4			
WE0512H	1		230	- - -		7.3	34.5	М	53	9.6	4.0	16/3	60	
WE0538H	1		200		3.56	4.9	22.6	R	68	NA	3.8			
WE0532H	1		230		3.50	3.3	18.8	R	70	NA	5.8			
WE0534H	1	3	460	1		1.7	9.4	R	70	NA	23.2		60	
WE0537H	1		575	-		1.4	7.5	R	62	NA	35.3			
WE0511HH	0.5		115			14.5	46.0	M	54	7.5	1.0	14/3	60	
WE0518HH		1	208	-		8.1	31.0	K	68	9.7	2.4	14/3		
WE0512HH	-	'	230	-		7.3	34.5	M	53	9.6	4.0	16/3	60	
WE0538HH	-		200	-	3.88	4.9	22.6	R	68	NA	3.8			
WE0532HH	-			-	3.00	3.6	18.8	R	70	NA	5.8	-		
	-	3	230 460	-		1.8		R	70	NA	23.2	14/4	60	
WE0534HH WE0537HH			575			1.5	9.4 7.5	R	62	NA				
				-							35.3			
WE0718H		1	208			11.0	31.0	K	68	9.7	2.4	14/3	70	
WE0712H			230		10.0	27.5	J	65	12.2	2.7				
WE0738H	0.75		200		4.06	6.2	20.6	L	64	NA	5.7	14/4	70	
WE0732H		· · · · · · · · · · · · · · · · · · ·	230			5.4	15.7	K	68	NA	8.6			
WE0734H			460			2.7	7.9	K	68	NA	34.2			
WE0737H			575			2.2	9.9	L	78	NA	26.5			
WE1018H			1	208			14.0	59.0	K	68	9.3	1.1	14/3	70
WE1012H			230 3		0	12.5	36.2	J	69	10.3	2.1	1 1/0		
WE1038H	1		200		4.44	8.1	37.6	М	77	NA	2.7			
WE1032H		3	230			7.0	24.1	L	79	NA	4.1	14/4	70	
WE1034H			460			3.5	12.1	L	79	NA	16.2			
WE1037H			575			2.8	9.9	L	78	NA	26.5			
WE1518H		1	208			17.5	59.0	K	68	9.3	1.1	14/3	80	
WE1512H	'		230			15.7	50.0	Н	68	11.3	1.6	1475	00	
WE1538H			200		4.56	10.6	40.6	K	79	NA	1.9			
WE1532H		3	230		4.30	9.2	31.7	K	78	NA	2.9	14/4	80	
WE1534H			460			4.6	15.9	K	78	NA	11.4	14/4	00	
WE1537H	1 5		575			3.7	13.1	K	75	NA	16.9			
WE1518HH	1.5	1.5 208 230	208]		17.5	59.0	K	68	9.3	1.1	14/3	90	
WE1512HH	1]		15.7	50.0	Н	68	11.3	1.6	14/3	80		
WE1538HH	1		200]	F F0	10.6	40.6	K	79	NA	1.9			
WE1532HH	1] 3 2	230]	5.50	9.2	31.7	K	78	NA	2.9	1 444	00	
	1		4/0	1		4.6	15.9	K	78	NA	11.4	14/4	80	
WE1534HH			460]		
WE1534HH WE1537HH			575	-		3.7	13.1	K	/5	NA	16.9			
		1				3.7 18.0	13.1 49.6	F	75 78	3.2	16.9	14/3	83	
WE1537HH		1	575									14/3	83	
WE1537HH WE2012H	2		575 230 200		5.38	18.0 12.0	49.6 42.4	F	78 78	3.2	1.2			
WE1537HH WE2012H WE2038H	2	1 3	575 230		5.38	18.0	49.6	F K	78	3.2 NA	1.2 1.7	14/3	83	

PERFORMANCE RATINGS (gallons per minute)

	der lo.	WE- 03L	WE- 03M	WE- 05H	WE- 07H	WE- 10H	WE- 15H	WE- 05HH	WE- 15HH	WE- 20H
	НР	1/3	1/3	1/2	3/4	1	1½	1/2	1½	2
	RPM	1750	1750	3500	3500	3500	3500	3500	3500	3500
	5	86	-	-	-	-	-	-	-	-
	10	70	63	78	94	-	-	58	95	-
	15	52	52	70	90	103	128	53	93	138
	20	27	35	60	83	98	123	49	90	136
-	25	5	15	48	76	94	117	45	87	133
Total Head Feet of Water	30	-	-	35	67	88	110	40	83	130
of V	35	-	-	22	57	82	103	35	80	126
eet	40	-	-	-	45	74	95	30	77	121
d F	45	-	-	-	35	64	86	25	74	116
Hea	50	-	-	-	25	53	77	-	70	110
otal	55	-	-	-	-	40	67	-	66	103
ř	60	-	-	-	-	30	56	-	63	96
	65	-	-	-	-	20	45	-	58	89
	70	-	-	-	-	-	35	-	55	81
	75	-	-	-	-	-	25	-	51	74
	80	-	-	-	-	-	-	-	47	66
	90	_	-	-	-	-	-	-	37	49
	100	-	-	-	-	-	-	-	28	30

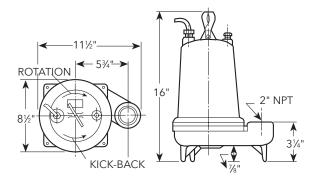
COMPONENTS

Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring



DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)





Xylem, Inc.

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Seneca Falls, NY 13148 Phone: (866) 325-4210 Fax: (888) 322-5877

www.xyleminc.com/brands/gouldswatertechnology

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