PRELIMINARY TECHNICAL INFORMATION REPORT

The Landing at Green Mountain 2

City of Camas, Washington

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CERTIFICATE OF ENGINEER

The Landing at Green Mountain 2

Technical Information Report

The technical information and data contained in this report was prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

This document was prepared by:

Calvin Hillman-Johnson

Section A – Project Overview

Section A.1 – Site Information

This project will comply with current City of Camas Standards from Stormwater and Erosion Control per CMC Title 14. The Final Grading / Erosion Control / Drainage Plans have been prepared by the project civil engineer, PLS Engineering, Inc. The site will be served by public sewer and water provided by the City of Camas. This project phase proposes construction of 34 single-family residential lots with associated structured, access, paved storage areas, sewer, water, and storm drain connections. Access to the site is from N 82nd Ave.

The physical address of the site is currently in two lots, the East most lot being 22111 NE 28th St, Camas 98607 pin number 173177000 and the West most lot is 22015 NE 28th Street, Camas, WA 98607, pin number 173210000. The property is located in the southwest quarter of Section 21, T2N, R3E of the Willamette Meridian. The property is bordered by NE 28th Street on the north side, 5-acre single family lots to the West, an 8.63-acre subdivision to the East, and Clark County Parks to the South. The cumulative property area contains a total of 417,959.36 square feet (9.595 acres) with 2,308 square feet (0.053 acres) of right of way dedication, resulting in 415,651 square feet (9.542 acres) of developed area. This technical information report will address the stormwater runoff associated with the construction which will take place.

The topography of the site is moderately sloped from NE to SW, with elevation ranging from 280’ to 244’. Slopes are generally between 3% and 10%, The site slopes down from the relative high points in the NE corner towards the SW property corner. The site contains a 1,900 square foot manufactured home, a 1,500 square foot manufactured home, a 2,700 square foot home, a 1,300 square foot home, and several sheds of varying size. All structures in lot 34 are to remain, all other existing impervious surfaces on-site and homes are planned to be removed. There is an existing BPA easement along with some electrical power line towers that are that support the power lines that cross the site. This easement and associated structures will remain. The remainder of the stie is filled with grass, weeds, and a variety of trees. There are wetlands mapped on Clark County Maps at the SW corner of the site. Otherwise, there are no known water courses, areas prone to flooding, floodplains, shorelines areas, water bodies, unstable slopes, landslide hazard areas, habitat, critical areas, or historic sites located on the site. Site drainage follows the slope of the land going from the NE corner to the SW corner. Site discharge will not exceed historic rates.

After construction, the site will contain approximately 137,871 square feet of landscaped area. The remainder of the site is anticipated to be covered with impervious surfaces. This will include 188,088 square feet of roof area, 18,491 square feet of sidewalk, and 73,509 square feet of concrete and asphalt for driveways and drive aisles. Site stormwater will be routed to a detention pond that will release the runoff at rates less than existing in accordance with the SWMMWW. Frontage stormwater will route the through a vault and into the same detention pond as the rest of the site. Site stormwater runoff treatment for the site’s pollution generating impervious surfaces will be accomplished with media filter treatment cartridges in a vault before entering the detention pond. An area totaling 51,394 square feet (**1.1867** acres) will bypass the vault and detention pond and instead will be treated with cartridges in manholes which will then outfall through a flow spreader along with discharge from pond.

Section B – Minimum Requirements

Section B.2 – Determination of Applicable Minimum Requirements

After site development, disturbed impervious surfaces will cover approximately 280,088.4 square feet, or 67% of the disturbed project area; projects resulting in more than 5,000 square foot of hard surface area must meet all nine Minimum Requirements of the stormwater manual. The majority of the site will discharge to a detention pond, while the remainder of the site will bypass this pond and be directly discharged through a flow spreader at the same discharge point of the pond. Water flowing off of existing structures on lot 34 will be captured and directed to the pond. These will all be required to meet Minimum Requirements #6 and #7. The stormwater system is designed to comply with all City requirements for stormwater treatment and quantity control the treatment regulation require treatment of 91% of the total runoff volume from pollution generating impervious surfaces while the quantity control regulations require that post-development discharges shall match pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

Existing hard surface	12,797.02 ft^2
New hard surface	280,088.4 ft^2
Replaced hard	12,797.02 ft^2
Native vegetation converted to lawn or landscaping	137,871 ft^2
Native vegetation converted to pasture	0 ft^2
Total land-disturbing activity	9.595 acre
Pollution-generating hard surface	92,000.4 ft^2
Pollution-generating pervious surface	0 ft^2
Total pollution-generating surfaces	92,000.4 ft^2
Total non-pollution-generating surfaces	325,959.4 ft^2

MR #1) Preparation of Stormwater Site Plans

All Stormwater System designs meet City of Camas Requirements for conveyance, quality control and quantity. See final construction documents for more details.

MR #2) Construction Stormwater Pollution Prevention

A Stormwater Pollution Prevention Plan is being included with this report and will be onsite for the duration of the project's construction.

MR #3) Source Control of Pollution

See Section D

MR #4) Preservation of Natural Drainage Systems and Outfalls

Site runoff flows to the SW corner of the site. The proposed development will capture all the existing runoff and release at rates that are in compliance with the SWMMWW. This will maintain and preserve the natural drainage systems.

MR #5) Onsite Stormwater Management

See Section E

MR #6) Runoff Treatment
See Section F

MR #7) Flow Control
See Section G

MR #8) Wetland Protection
Clark County maps show the potential for a Wetland located in the SW corner of the site. Hydroperiod protection modeling will be necessary, See Appendix F and Section H.

MR #9) Operations and Maintenance
See Appendix D

Section C – Soils Evaluation

The soils are mapped by the NRCS as Lauren gravelly loam (LgB) in the South and NE corner of the site, Lauren loam (LeB) along the East border, and McBee silt loam (MIA) along the center and West border if the site. The geotechnical soil investigation found surface soils generally consistent with that soil mapping. The geotechnical report has been included in Appendix C and a soil map is included in Appendix A.

True North Geotechnical, Inc. completed a geotechnical review of the site, dated April 2025. Infiltration testing was performed on the site and was deemed infeasible. Ground water was encountered in test pits 1-5 at depths ranging from 2 feet to 3.5 feet.

Section D – Source Control

The pollution risks involved with this project mainly include the sediment accumulation involved with construction. The Stormwater Pollution Prevention Plan is a document that notes our certain Best Management Practice's (BMP's) that will help prevent sediment laden water from leaving the site during construction. The Erosion Control Plan located in the final construction drawings will provide protection measures involved with minimizing the chance that sediment from the site could enter downstream waterways. After construction is complete, this project does not necessitate any special source control measures due to abnormal risks associated with the project. As this is a single-family home development, appropriate source control responsibilities will fall primarily on popery owner(s). The SWPPP is provided in Appendix E.

Section E – On-site Stormwater Management BMPs

Minimum Requirement 5 requires the applicant to employ On-site Stormwater Management BMPs in accordance with the following project thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. Based on section I-3.4.5 of the Stormwater Management Manuel for Western Washington, the development is within the UGA therefore Low Impact Development Performance Standards and BMP T5.13; or List #2 will apply (applicant option).

To meet Minimum Requirement 5, the applicant proposes that the entire site will comply with the LID BMPs from List #2. All requirements that will be applied to this project are noted below and shown in the final construction drawings. If certain BMP's are infeasible; feasibility criteria per the 2024 Stormwater management Manual for Western Washington are also noted.

List #2;
Lawn and Landscape areas:
BMP T5.13 Post-Construction Soil Quality and Depth:
This requirement will be met during final design and shown on final construction drawings.

Roofs:
BMPT5.30A or T5.30B Full Dispersion:
There is insufficient area and length to provide a 100' flow path to meet the requirements of full dispersion while still maintaining sufficient spacing to prevent overlap.

BMPT5.14A or BMPT5.14B Rain Gardens and Bioretention:
The soil permeability factor above groundwater is less than 0.3 inches per hour (measured by the Geotech at less than 0.06 inches per hours). Because the site soils don't accommodate infiltration, this is not a feasible BMP as part of Minimum requirement #5.

BMPT5.10C Downspout Dispersion Systems:
There is insufficient space to meet the required dispersion lengths and setbacks from the structures and the property lines.

BMP T5.10D Perforated Stub-out Connections
There is insufficient space to meet the required setback of 10' away from the structures and property lines, and infiltration rates are less than 0.3 inches per hour.

Other Hard Surfaces:
BMPT5.30A or T5.30B Full Dispersion:
There is insufficient area and length to provide a 100' flow path to meet the requirements of full dispersion while still maintaining sufficient spacing to prevent overlap.

BMPT5.15 Permeable Pavement:
Permeable pavement is insufficient due to soil infiltration above the groundwater table being less than 0.3 in/hr.

BMPT5.14A or BMPT5.14B Rain Gardens and Bioretention:
The soil permeability above the groundwater table is less than 0.3 inches per hour. This is not a feasible solution.

BMPT5.12 Sheet Flow Dispersion:
There is insufficient area and length to provide a 100' flow path to meet the requirements of full dispersion while still maintaining sufficient spacing to prevent overlap.

None of the List 2 requirements can be met by the project. Consequently, stormwater on the site will be treated and detained in a detention pond prior to discharge as described in Sections F and G of this report.

The following BMPs will be implemented to meet the minimum requirement 5:

- **BMP T5.13: Post-Construction Soil Quality and Depth** for lawn **and landscaped areas.**
- **BMP D.1: Detention Ponds for runoff from the site.**

Section F – Runoff Treatment Analysis and Design

Treatment for the site will be accomplished via media filter cartridges that will be placed in a vault before entering the detention pond. A small area in the SW of the site will be treated with cartridges places in catch basins as they are too low to enter the vault. The filter system will treat the pollution generating surface runoff that is conveyed to it. Runoff from the building roofs and other non-pollution generating areas will be piped to bypass the filter cartridges when possible. The cartridge units will be sized to treat all the runoff that is routed to them.

For this preliminary phase it is assumed that all of the site will be treated. The Treatment Analysis WWHM model contained in Appendix B identifies an off-line WQ flow of 0.5010 CFS. Per Table 1 below, LowDrop PhosphoSorb are designed to treat 0.019 CFS each. So, the most LowDrop PhosphoSorb cartridges that would be used for this project will be 27, all contained in a vault and the south end of the site. A small portion of the site will be treated with the same PhosphoSorb LowDrop in manholes along the southwest end of the site. The final design will evaluate sub basin flows to the vault and manholes and identify where each of the cartridges are located.

Table 1-Contech Sizing Chart

	Perlite 2 GPM/ft²			ZPG 1 GPM/ft²			PhosphoSorb 1.67 GPM/ft²		
StormFilter	Flow (GPM)	Flow (CFS)	Color	Flow (GPM)	Flow (CFS)	Color	Flow (GPM)	Flow (CFS)	Color
LowDrop	10	0.022	Gray (GRY)	5.00	0.011	Blue (BLU)	8.35	0.019	Yellow (YLW)
18"	15	0.033	Black (BLK)	7.50	0.017	Blue (BLU)	12.53	0.028	Red (RED)
27"	22.5	0.05	Gold (GLD)	11.50	0.025	Pink (PNK)	18.79	0.042	White (WHT)

Section G - Flow Control Analysis and Design

The stormwater quantity control system for this site has been designed based on the current stormwater quantity control requirements of the City of Camas. The quantity control standards require that stormwater discharges shall match developed discharge durations to pre-developed durations for the

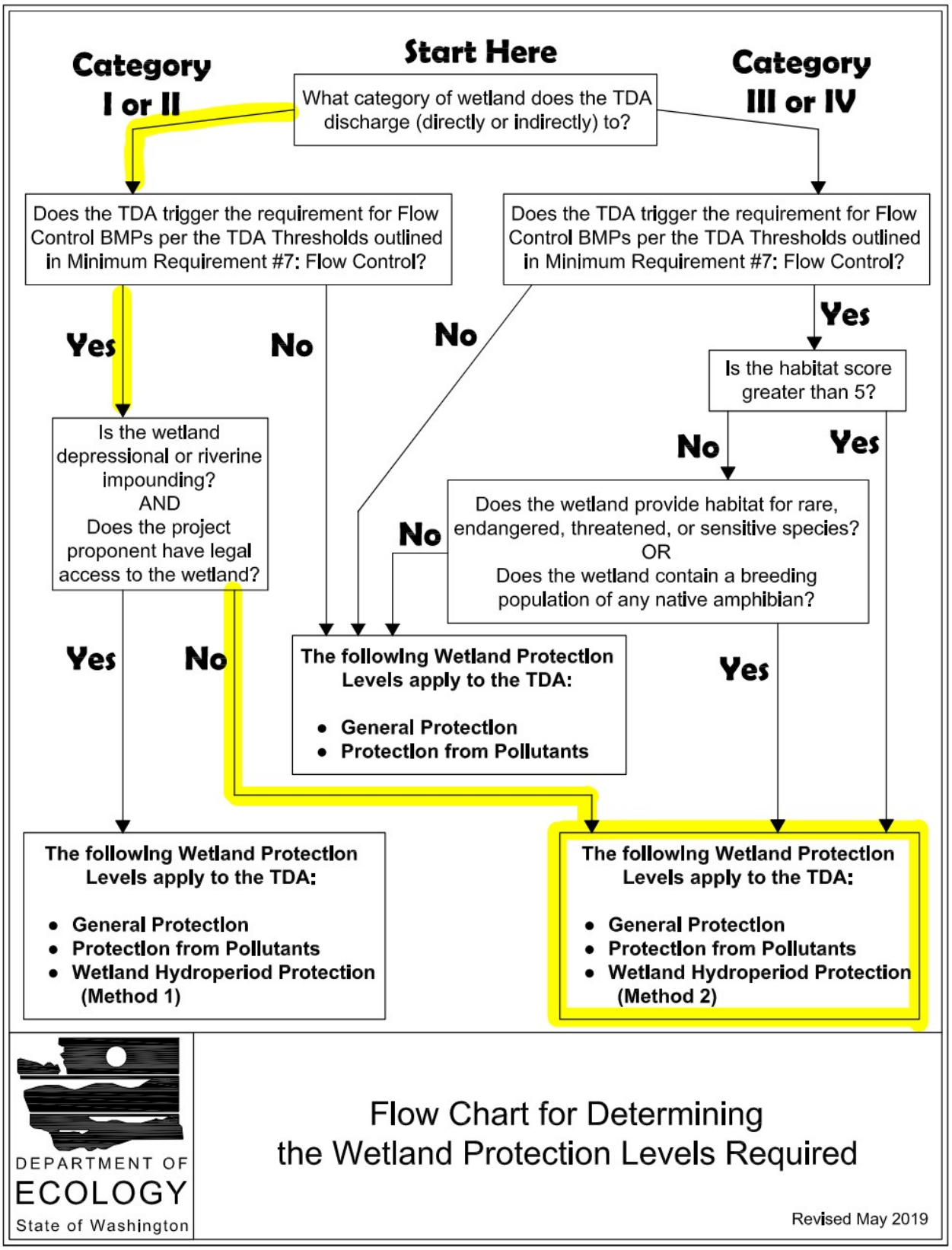
range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

The detention pond mentioned in section F was modelled in WWHM and successfully store and releases al of the stormwater runoff from the site without using infiltration. Modeling basins were calculated as a developed site using Soil Group 3 as the underlying soils per the geotechnical recommendation contained in Appendix C. Calculations and values can be seen in Appendix B.

The detention pond design for Basin one has a bottom area of 4,607 square feet, equivalent square footage was used for WWHM calculations. The basin has an effective depth of 5', with 3:1 slopes on all sides. It has a riser height of 4', diameter 18", notch height of 1.25', width of 1', and an orifice diameter of 4.5'. The WWHM design model in Appendix B shows that this detention pond exceeds the requirements and can be reduced in size. This preliminary TIR is showing that stormwater for the site can meet the requirements of SWMMWW. The sizes of this facility will be fine-tuned in the final design.

Infiltration does not work if the groundwater is too shallow. Consequently, groundwater depth is a significant issue for this project. The geotechnical investigation discovered ground water in all exploration except TP-6.

Section H – Wetland Protection



2024 SWMMWW I-C.2 General Wetland Protection

All wetlands (Categories I, II, III, and IV) must receive the following general protection:

1. Consult regulations issued under federal and state laws that regulate the discharge of pollutants to surface waters, including the Construction Stormwater General NPDES Permit.

   The site stormwater system has been appropriately designed and complies with federal and state laws and discharging to the wetland in the proposed manner is allowed. Refer to section B of this report for compliance with Minimum Requirements 1-9. An NPDES permit will be applied for and obtained during final engineering design.

2. Maintain the wetland buffer required by city and/or state and federal regulations

   The critical Areas Report produced by Ash Eco Solutions identified a standard buffer of 260'. The wetland buffer is located on the edge of the southwest border. No direct impact with the wetland buffer will occur.

3. Retain areas of native vegetation connecting the wetland and its buffer with nearby wetlands and other contiguous areas of native vegetation.

   The Critical Areas Report shows three wetlands next to the site. Two are directly East and neither the wetlands or the buffers touch the site and are unaffected from site development. To the Southwest is where the wetland being modeled is located. Vegetation surrounding the wetlands, and its buffer, will be avoided to the maximum extent possible.

4. Avoid compaction of soil and introduction of invasive plant or animal species in the wetland and its buffer.

   The entire wetland exists off site and will not be constructed on. Compaction and introduction of invasive species within the buffer will be avoided to the maximum extent feasible.

5. Take measures to avoid general physical impacts (e.g., littering and vegetation destruction). Examples are protecting existing buffer zones; discouraging access, especially by vehicles, by planting outside the wetland, and encouragement of stewardship and signage by landowners.

   The wetland is located offsite and physical impacts to the buffer will be avoided to the maximum extent feasible. Silt fencing will be installed along the project grading limits to discourage access to the wetland. Disturbances to the buffer have been accounted for in the critical areas report.

6. Any stormwater management practices, such as Runoff Treatment or Flow Control BMP implementation, must be done outside of the wetland buffer boundary, except limited circumstances where the wetland and/or buffer any be used for additional Runoff Treatment and/or Flow Control of stormwater (See 1-C.6 Compensatory Mitigation of Wetlands)

No stormwater management or flow control BMPs are implemented inside of a wetland buffer.

7. Discharge from a BMP or project site should be dispersed using a method to diffuse the flow before entering the wetland buffer.

   Upon exiting the detention pond, a flow spreader is used at the outflow point to partially diffuse the flow. Due to elevation constraints and site limitation, it is not possible to diffuse runoff prior to entering the wetland buffer.

8. Consider fences to restrict human access, but make sure it doesn't interfere with wildlife movement. They should be used when wildlife passage is not a major issue and the potential for intrusive impacts is high. When wildlife movement and intrusion are both issues, the circumstance will have to weighed to make a decision about fencing. Check with the local and/or state agencies to determine if fencing would be allowed.

   The entire wetland is located offsite with only a small section of the buffer onsite. Fencing is not being proposed around the wetland or buffer. Intrusive impacts to the wetland are not expected.

2024 SWMMWW I-C.3 Wetland Protection from Pollutants

All wetlands (Categories, I, II, III and IV) must receive the following protection from pollutants:

1. Provide Construction Stormwater BMPs as directed in I-3.4.2 MR2: Construction Stormwater Pollution Prevention Plan (SWPPP) to prevent sediment and other pollutants from entering the wetland.

   A Construction Stormwater BMPs as directed in Book 1, Section 1.5.2 MR #2 Construction Stormwater Pollution Prevention Plan (SWPPP) to prevent sediment and other pollutants from entering the wetland.

2. Provide Source Control BMPs as directed in I-3.5.3 MR3: Source Control of Pollution. Refer to Volume IV and local jurisdiction requirements.

   Refer to Minimum Requirement #3 in Section B of this report for the proposed Source Control BMPs.

3. Provide On-Site Stormwater Management and use LID principles as much as practicable for the site, as directed in I-3.5.4 MR5: On-Site Stormwater Management. LID principles and practices will help meet other wetland hydroperiod protection criteria and provide additional habitat.

   Refer to Minimum Requirement #5 and Section E of this report for the proposed stormwater management BMPs. LID principles were incorporated into the design to the extent feasible.

4. Provide Runoff Treatment for I-3.4.6 MR6: Runoff Treatment to treat runoff prior to entering the wetland and its buffer.

   The storm water will be treated in a vault prior to entering any wetland or its buffer.

2024 SWMMWW I-C.4 Wetland Hydroperiod Protection

The intent of the Wetland Hydroperiod Protection is to maintain the wetland's annual fluctuations in water depth and it's timing as closely as possible (Methods 1 and 2) that are dependent on the wetland category and whether the project has legal access to the wetland.

According to Figure 1.4 (Minimum Requirement #8 Flow Chart) of the 2024 Stormwater Management Manual for Western Washington, Method 2 shall be used for this project.

Criteria for Method 2:

The project proponent must ensure both of the following criteria are met to comply with method 2 of the Wetland Hydroperiod Protection.

> Criteria 1: Mean Daily Total Discharge Volumes from the Site. The total volume of water into the wetland on a daily basis should not be more than 20% higher or lower than the pre-project volumes.
>
> Criteria 2: Mean Monthly Total Discharge Volumes from the Site. The total volume flow of water into the wetland on a monthly basis should not be more than 15% higher or lower than the pro-project volumes.

The Western Washing hydrology model (WWHM) was used to complete the Method 2 modeling.

There are three wetlands associated with this site. Two are category III wetland located fully offsite to the west and will not be affected by the development of this site. The last wetland is a category II wetland located southeast of site with a habitat score of 8. Development will impact the discharge area and discharge volumes to the existing wetland. Wetland hydroperiod protection method 2 will be applied as it is a category 2 wetland.

Off-site Wetland A Category II Method 2 Hydroperiod Protection Analysis:

Per I-C.5 Wetland Hydroperiod Protection; Method 2

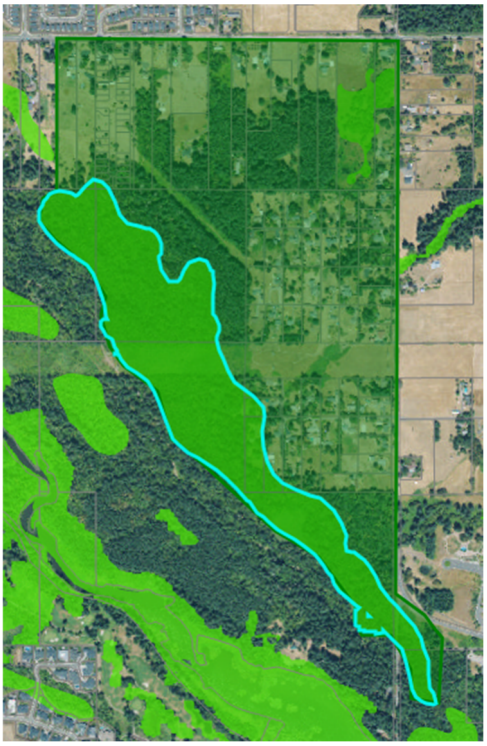
Pre-Project Scenario:

Step 1: Identify existing impervious and pervious surfaces that discharge to the wetland and use the model elements to represent these land areas.

Due to the large contributing basin of the on-site Category II wetland the Clark County GIS software was used to evaluate the existing contours and existing drainage infrastructure to assess the approximate contributing discharge basin that provides hydrology to the wetland both on and off-site. The approximate total area that contributed to the wetland was determined to be 11,106,680 square feet (254.974). The contributing area is shown below.

Area Information	
Sq. Feet:	11,347,443.66
Sq. Yards:	1,260,827.07
Sq. Miles:	0.41
Acres:	260.50
Sq. Meters:	1,054,212.01
Sq. Kilometers:	1.05
Hectares:	105.42

Perimeter Information	
Feet:	16,457.85
Yards:	5,485.95
Miles:	3.12
Meters:	5,016.35
Kilometers:	5.02



After the basin boundary was determined the existing pervious and impervious areas offsite were determined with the use of google arial images, Clark County GIS, and scaled maps with Bluebeam software. The on and off-site pervious and impervious areas are detailed below.

Onsite Pre-Project Areas

Basin	Surface Cover	Area (AC)
1	Forest	8.4083
2	Forest	1.1867

t

Off-site Pre-Project Area

Surface Cover	Area (AC)
Roof	8.983
Road	4.561
Driveway	4.685
Forest	117.672
Fields	119.073
Total	254.974

To represent the pervious and impervious land area in WWHM, lateral flow basin elements were used. For all lawn, field and forested land areas pervious later basins were used. For all roads, roofs and driveways impervious later basin elements were used.

Step 2: Identify the wetland buffer area and use the lateral flow soil basin to represent the wetland buffer.

To determine the area of the wetland buffer, a 260' moderate LUI buffer was measured using Bluebeam, the area was modeled in WWHM with the later flow soil basin.

The Wetland Buffer area was determined to be 136.745 acres.

The determined 260' moderate LUI buffer expands onto the project site. Of the 9.595 acres of onsite area, only 1.416 acres were determined as part of the wetland buffer.

Step 3: Connect the model elements to the wetland buffer ensuring that impervious land areas are connected to surface flows and that for any other model elements all flows are connected.

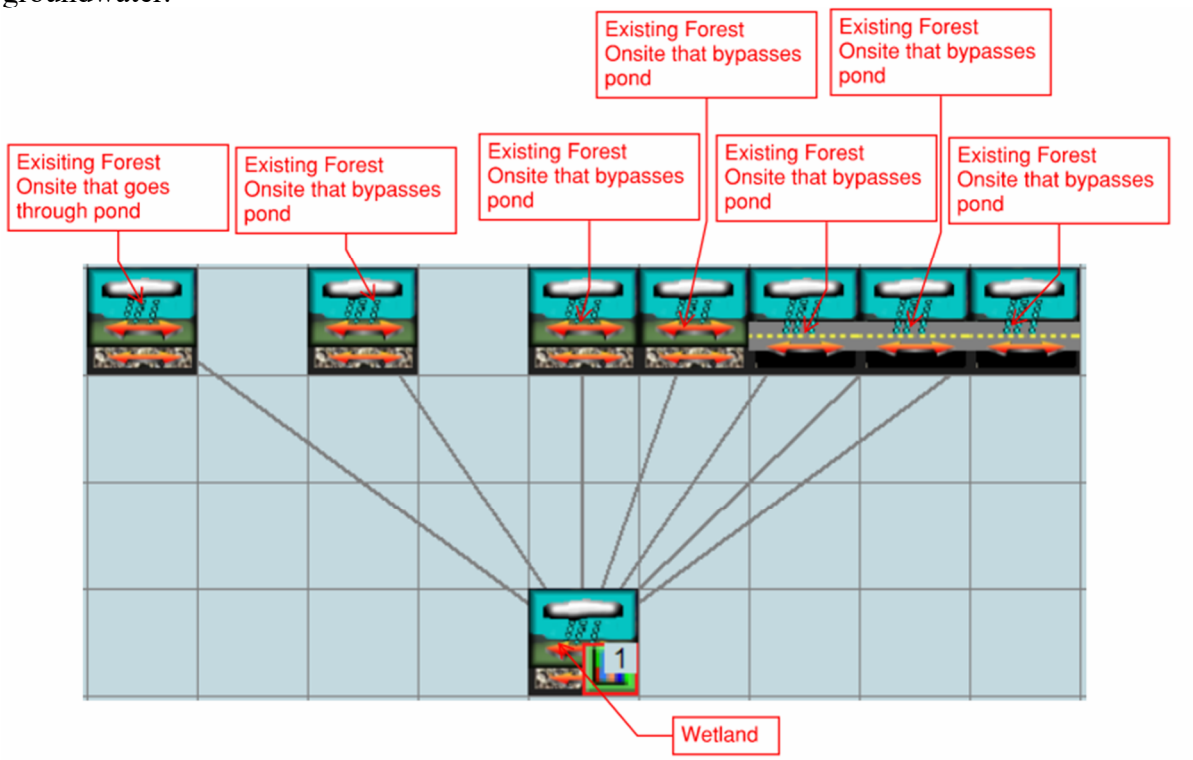
The land use areas determined in steps one and two were associated to the proper lateral basins. The onsite lateral basin and all off-site lateral basins elements were individually connected to the lateral basin representing the wetland buffer.

Step 4: Set the wetland buffer element as the most downstream element:

The later basin representing the wetland buffer is set as the downstream basin, where all other basins are connected to discharge to the wetland basin.

Step 5: Set the POC at the outflow of the wetland buffer element including surface runoff, interflow and groundwater.

Ex Wetland lateral basin element attached to POC 1 including surface runoff, interflow and groundwater.



Post-project Simulation:

Step 1: Identify anticipated post-project impervious and pervious surfaces that discharge to the wetland and use the model elements to represent these land areas.

Of the 9.595 acres of on site, predeveloped land cover, both in and outside of the buffer range, all 9.595 acres will be routed through the wetland buffer. All off-site areas will remain the same post-Project.

Onsite Post-Project Area

Basin	Surface Cover	Area (AC)
1	Lawn	2.6095
1	Road	1.2737
1	Roof	3.8738
1	Driveway	0.2663
1	Sidewalk	0.3849

Onsite Post-Project Area Bypass Pond

Basin	Surface Cover	Area (AC)
2	Lawn	0.5556
2	Road	0.1108
2	Roof	0.4441
2	Driveway	0.0367
2	Sidewalk	0.0396

On-Site Post-Project Area

Surface Cover	Area (AC)
Roof	8.983
Road	4.561
Driveway	4.685
Forest	117.672
Fields	119.073
Total	254.974

Step 2: Identify any Flow Control BMPs and use the appropriate model elements to represent these facilities

The majority of the flow exiting the site will be discharged form a detention pond with a small amount bypassing the pond and leaving through the same flow spreader.

Step 3: Identify the wetland buffer area and use the lateral flow soil basin to represent the wetland buffer.

The wetland buffer area will stay the same 260' LUI buffer.

Step 4: Connect the model elements to the wetland buffer ensuring that impervious land areas are connected to surface flows and that for any other model elements all flows are connected.

Post-project lateral basins are connected to the wetland elements. All basins used are pervious lateral flow basins connected via surface flow, interflow and groundwater.

Step 5: Connect any flow control BMPS elements to the wetland buffer ensuring that surface flows are connected to surface water and any infiltration is connected to ground water.

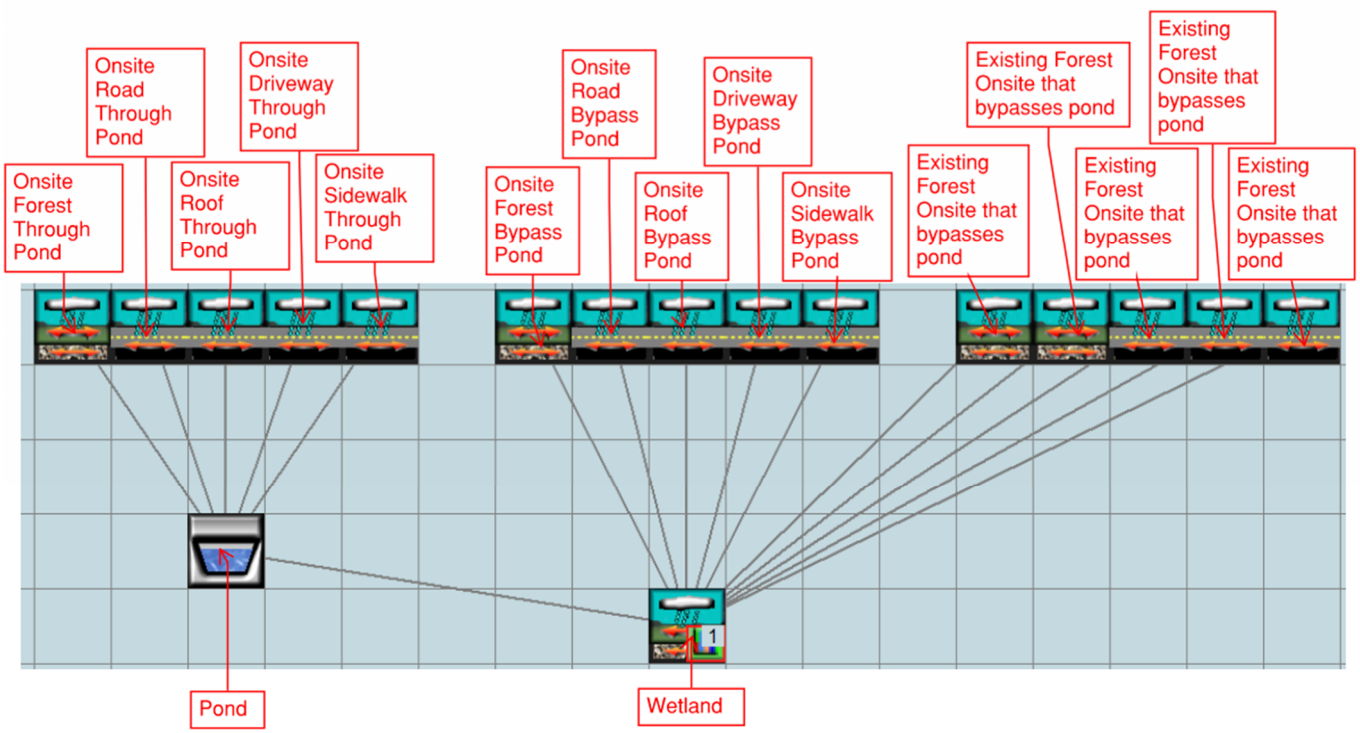
The detention pond is connected to the onsite lateral basins and connected to the wetland out of outlet one and into surface flow.

Step 6: Set the wetland buffer element to the most downstream element.

All lateral basins are set to connect to the wetland element.

Step 7: Set the POC at the outflow of the wetland buffer element including surface runoff, interflow and groundwater.

POC 1 is connected to the wetland element set to be the outflow including surface runoff, interflow, and groundwater.



Both scenarios were run, and then POC 1 was analyzed via the Wetland Input Volumes analysis. The model passed all 365 days of criteria 1 and passed all 12 months of criteria 2.

WWHM Reports can be found in Appendix B.

The model was run and the results were analyzed. The system passed all 365 days of Criterion 1 and passed all 12 months of Criterion 2. The full WWHM report is attached.

Section I – Other Permits

The project will be required to obtain Final Decision issued by Hearing Examiner, civil engineering plan approval, and NPDES construction stormwater permit.

Section J – Conveyance Systems Analysis and Design

Preliminary calculations were done in HydroCAD and a 12" storm pipe for the bypass section and a 15" storm pipe for the rest of the site will be able to convey all water.

Section K – Special Reports and Studies

A Geotechnical Report for the site was prepared by True North, Inc. and is included in Appendix C. A Critical Areas report is included in Appendix F. No other special studies are anticipated to be needed.

Section L –Operations and Maintenance Manual

The stormwater facility located on-site will be maintained by the site owner. An Operations and Maintenance Manual is included as Appendix D of this report.

APPENDIX A

Maps

The Landing at Green Mountain 2

6/30/2025

1:4,523

0 0.03 0.06 0.11 mi

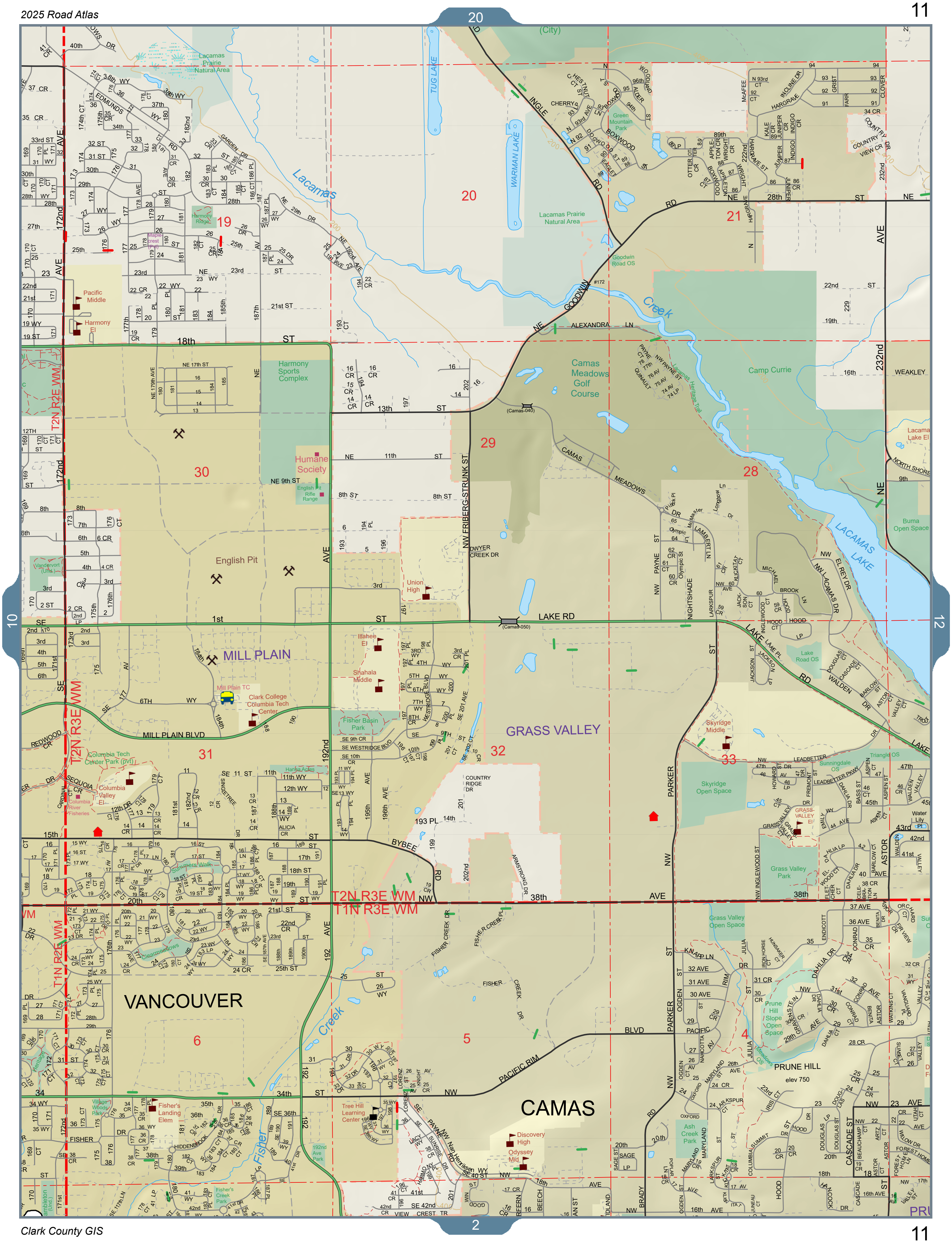
0 0.04 0.09 0.17 km

Taxlots Public

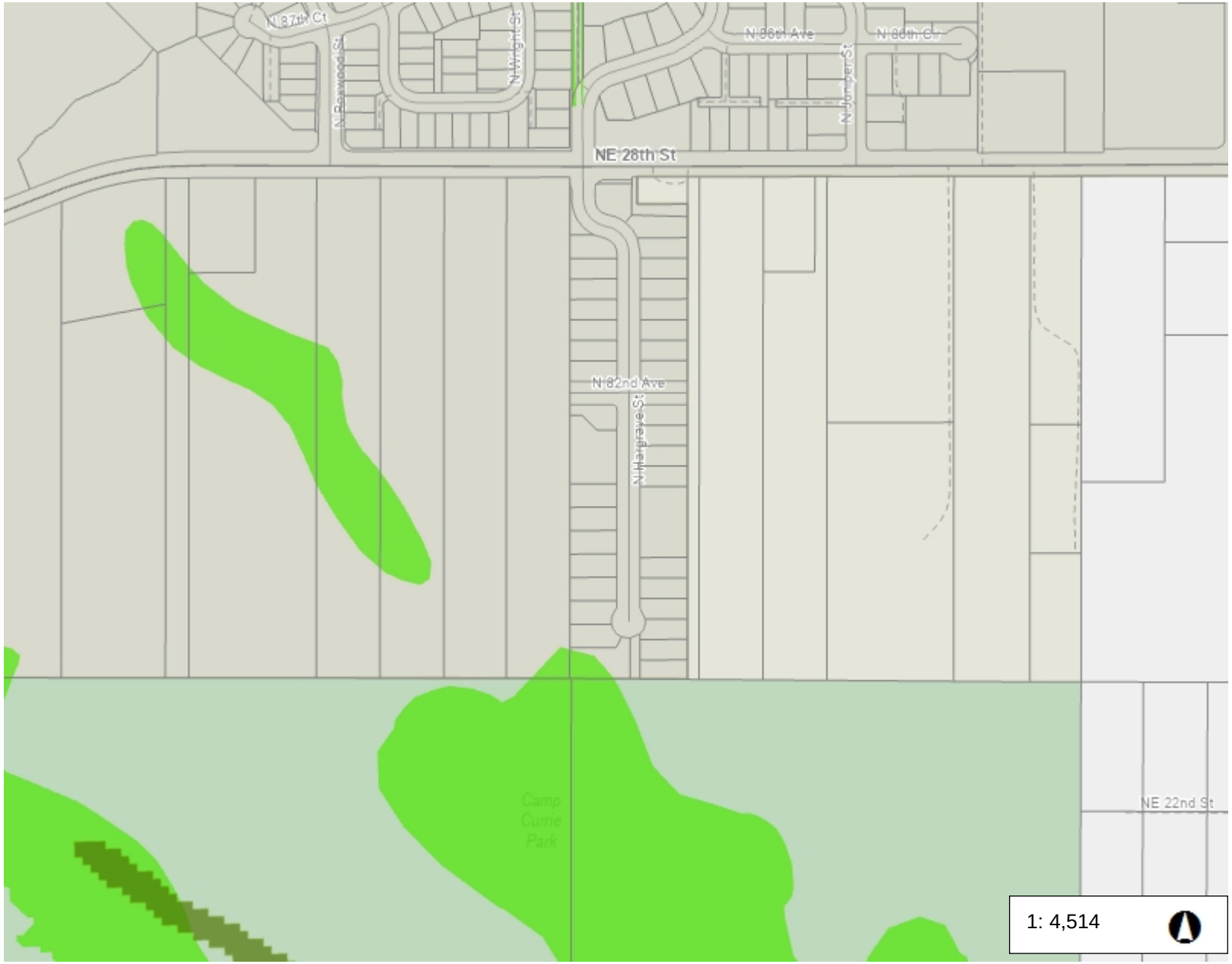
Critical Aquifer Recharge Area

Category 2 Recharge Areas

Light_Gray_Canvas_Base


20
10
12
2
Lacamas Prairie Natural Area
Lacamas Creek
TUG LAKE
WARMAN LAKE
(City)
INGLE RD
Green Mountain Park
Lacamas Prairie Natural Area
Goodwin Road OS
GOODWIN RD
Creek
NE ALEXANDRA LN
Camas Meadows Golf Course
Camp Currie
Lacamas Heritage Trail
CAMAS MEADOWS
Harmony Sports Complex
Humane Society
English Pit Rifle Range
English Pit
NE 9th ST
NE 11th ST
NE 18th ST
13th ST
NE FRIBERG-STRUNK ST
DWYER CREEK DR
Union High
LAKE RD
(Camas-040)
(Camas-050)
LACAMAS LAKE
NW LACAMAS DR
Buma Open Space
Lacamas Lake El
NORTH SHORE
Lake Road OS
WALDEN DR
Pacific Middle
Harmony El
Vancouver (Unk)
MILL PLAIN
MILL PLAIN BLVD
Mill Plain TC
Clark College Columbia Tech Center
Illahee El
Shahala Middle
Fisher Basin Park
Columbia Tech Center Park (pvt)
Columbia Valley El
Columbia River Fisheries
GRASS VALLEY
Skyridge Middle
Skyridge Open Space
Grass Valley Park
Grass Valley Open Space
Sunningdale OS
Triangle OS
COUNTRY RIDGE DR
BYBEE RD
ARMSTRONG DR
NW 38th AVE
T2N R3E WM
T1N R3E WM
T2N R2E WM
T1N R2E WM
VANCOUVER
Fisher Creek
FISHER CREEK DR
PACIFIC RIM BLVD
Prune Hill Slope Open Space
PRUNE HILL
elev 750
CAMAS
Discovery High
Odyssey Mid
Tree Hill Learning Center
Fisher's Landing Elem
Fisher's Creek Park
Ash Creek Park
Cleamwater Park
Summer's Walk
NW PARKER ST
NW PAYNE ST
NIGHTSHADE
CASCADE ST
ASTOR ST
232nd AVE
192nd AVE
172nd AVE
19
20
21
28
29
30
31
32
33
4
5
6

Landing at Green Mountain 2



Legend

- Taxlots
- Severe Erosion Hazard Areas
- Steep Slopes and Landslide H
  - Areas of Historic or Active Landslid
  - Areas of Potential Instability
  - Areas of Older Landslide Debris
  - Slopes > 15%
  - Slopes > 25%
- Potential Wetlands Presence

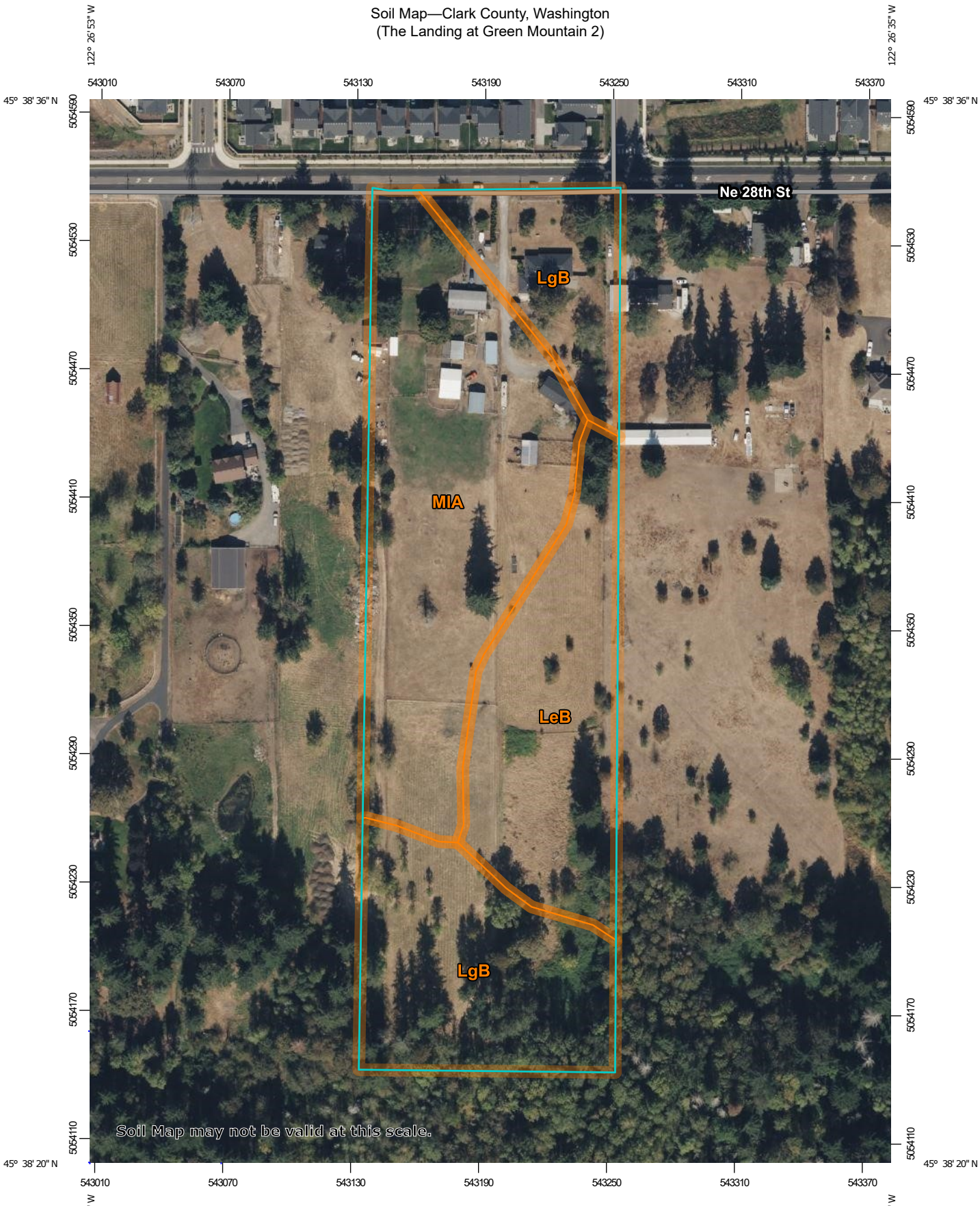
Notes:

1: 4,514

752.3 0 376.17 752.3 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

Soil Map—Clark County, Washington
(The Landing at Green Mountain 2)



Map Scale: 1:2,420 if printed on A portrait (8.5" x 11") sheet.

N

0 35 70 140 210 Meters

0 100 200 400 600 Feet

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clark County, Washington
Survey Area Data: Version 22, Aug 26, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2022—Oct 11, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
LeB	Lauren loam, 0 to 8 percent slopes	2.9	24.0%
LgB	Lauren gravelly loam, 0 to 8 percent slopes	4.2	34.4%
MlA	McBee silt loam, coarse variant, 0 to 3 percent slopes	5.0	41.6%
Totals for Area of Interest		**12.1**	**100.0%**

APPENDIX B

Design Calculations and Modeling

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Hyroperiod Protection Final
Site Name:
Site Address:
City:
Report Date: 6/27/2025
Gage: Lacamas
Data Start: 1948/10/01
Data End: 2008/09/30
Timestep: 15 Minute
Precip Scale: 1.300
Version Date: 2023/01/27
Version: 4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Predeveloped Forest Onsite

Bypass: No

GroundWater: No

Pervious Land Use	acre
SG4, Forest, Mod	8.4083

Predeveloped Field Onsite

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG4, Forest, Mod	1.1867

Predeveloped Roads Offsite

Bypass:	No
Impervious Land Use	acre
ROADS FLAT	3.973

Predeveloped Roofs Offsite

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT	8.983

Predeveloped Driveway Offsite

Bypass:	No
Impervious Land Use	acre
DRIVEWAYS FLAT	4.685

Predeveloped Field Offsite

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG4, Field, Mod	102.329

Predeveloped Forest Offsite

Bypass: No

GroundWater: No

Pervious Land Use	acre
SG4, Forest, Mod	117.672

Wetland

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
SG4, Forest, Mod	136.745

Mitigated Land Use

Mitigated Lawn Onsite

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG4, Lawn, Mod	2.6095

Mitigated Road Onsite Bypass

Bypass:	No
Impervious Land Use	acre
ROADS FLAT	0.1108

Mitigated Roof Onsite Bypass

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT	0.4441

Mitigated Driveway Onsite Bypass

Bypass:	No
Impervious Land Use	acre
DRIVEWAYS FLAT	0.0367

Mitigated Sidewalk Onsite Bypass

Bypass:	No
Impervious Land Use	acre
SIDEWALKS FLAT	0.0396

Mitigated Lawn Onsite Bypass

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG4, Lawn, Mod	.5556

Mitigated Road Onsite

Bypass:	No
Impervious Land Use	acre
ROADS FLAT	1.2737

Mitigated Roof Onsite

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT	3.8738

Mitigated Driveway Onsite

Bypass:	No
Impervious Land Use	acre
DRIVEWAYS FLAT	0.2663

Mitigated Sidewalk Onsite

Bypass:	No
Impervious Land Use	acre
SIDEWALKS FLAT	0.3849

Wetland

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
SG4, Forest, Mod	136.745

Mitigated Forest Offsite

Bypass: No

GroundWater: No

Pervious Land Use	acre
SG4, Forest, Mod	117.672

Mitigated Field Offsite

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG4, Field, Mod	102.329

Mitigated Roads Offsite

Bypass:	No
Impervious Land Use	acre
ROADS FLAT	3.973

Mitigated Roofs Offsite

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT	8.983

Mitigated Driveway Offsite

Bypass:	No
Impervious Land Use	acre
DRIVEWAYS FLAT	4.685

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length: 100.00 ft.
Bottom Width: 46.00 ft.
Depth: 5 ft.
Volume at riser head: 0.6120 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.250 ft.
Notch Height: 1.250 ft.
Orifice 1 Diameter: 4.500 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2
Wetland

Pond Hydraulic Table

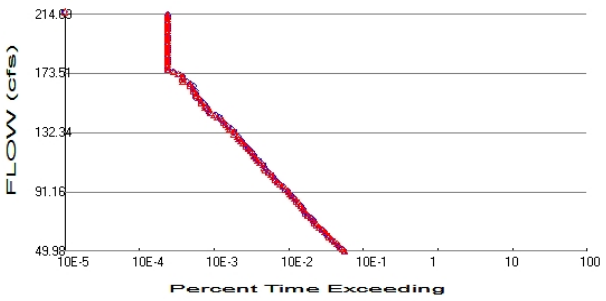
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.105	0.000	0.000	0.000
0.0556	0.106	0.005	0.129	0.000
0.1111	0.107	0.011	0.183	0.000
0.1667	0.109	0.017	0.224	0.000
0.2222	0.110	0.024	0.259	0.000
0.2778	0.111	0.030	0.289	0.000
0.3333	0.112	0.036	0.317	0.000
0.3889	0.113	0.042	0.342	0.000
0.4444	0.114	0.048	0.366	0.000
0.5000	0.115	0.055	0.388	0.000
0.5556	0.117	0.061	0.409	0.000
0.6111	0.118	0.068	0.429	0.000
0.6667	0.119	0.075	0.448	0.000
0.7222	0.120	0.081	0.467	0.000
0.7778	0.121	0.088	0.484	0.000
0.8333	0.122	0.095	0.501	0.000
0.8889	0.124	0.102	0.518	0.000
0.9444	0.125	0.108	0.534	0.000
1.0000	0.126	0.115	0.549	0.000
1.0556	0.127	0.123	0.564	0.000
1.1111	0.129	0.130	0.579	0.000
1.1667	0.130	0.137	0.593	0.000
1.2222	0.131	0.144	0.607	0.000
1.2778	0.132	0.151	0.621	0.000
1.3333	0.133	0.159	0.634	0.000
1.3889	0.135	0.166	0.647	0.000
1.4444	0.136	0.174	0.660	0.000
1.5000	0.137	0.182	0.673	0.000
1.5556	0.138	0.189	0.685	0.000
1.6111	0.140	0.197	0.697	0.000
1.6667	0.141	0.205	0.709	0.000
1.7222	0.142	0.213	0.721	0.000

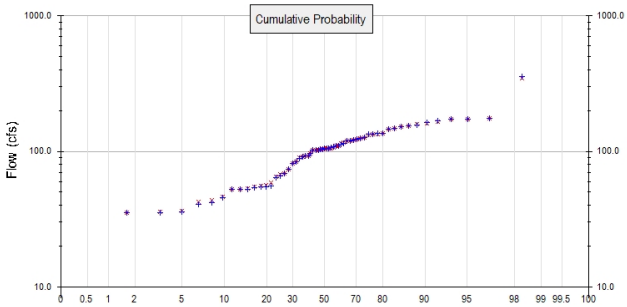
1.7778	0.144	0.221	0.732	0.000
1.8333	0.145	0.229	0.744	0.000
1.8889	0.146	0.237	0.755	0.000
1.9444	0.147	0.245	0.766	0.000
2.0000	0.149	0.253	0.777	0.000
2.0556	0.150	0.261	0.787	0.000
2.1111	0.151	0.270	0.798	0.000
2.1667	0.153	0.278	0.808	0.000
2.2222	0.154	0.287	0.819	0.000
2.2778	0.155	0.296	0.829	0.000
2.3333	0.157	0.304	0.839	0.000
2.3889	0.158	0.313	0.849	0.000
2.4444	0.159	0.322	0.859	0.000
2.5000	0.161	0.331	0.868	0.000
2.5556	0.162	0.340	0.878	0.000
2.6111	0.163	0.349	0.888	0.000
2.6667	0.165	0.358	0.897	0.000
2.7222	0.166	0.367	0.906	0.000
2.7778	0.167	0.376	0.919	0.000
2.8333	0.169	0.386	0.944	0.000
2.8889	0.170	0.395	0.975	0.000
2.9444	0.172	0.405	1.011	0.000
3.0000	0.173	0.414	1.050	0.000
3.0556	0.174	0.424	1.092	0.000
3.1111	0.176	0.434	1.136	0.000
3.1667	0.177	0.444	1.183	0.000
3.2222	0.179	0.453	1.231	0.000
3.2778	0.180	0.463	1.280	0.000
3.3333	0.181	0.473	1.330	0.000
3.3889	0.183	0.484	1.382	0.000
3.4444	0.184	0.494	1.434	0.000
3.5000	0.186	0.504	1.487	0.000
3.5556	0.187	0.515	1.541	0.000
3.6111	0.189	0.525	1.594	0.000
3.6667	0.190	0.536	1.648	0.000
3.7222	0.191	0.546	1.703	0.000
3.7778	0.193	0.557	1.762	0.000
3.8333	0.194	0.568	1.826	0.000
3.8889	0.196	0.578	1.893	0.000
3.9444	0.197	0.589	1.960	0.000
4.0000	0.199	0.600	2.029	0.000
4.0556	0.200	0.612	2.245	0.000
4.1111	0.202	0.623	2.632	0.000
4.1667	0.203	0.634	3.126	0.000
4.2222	0.205	0.645	3.696	0.000
4.2778	0.206	0.657	4.316	0.000
4.3333	0.208	0.668	4.957	0.000
4.3889	0.209	0.680	5.591	0.000
4.4444	0.211	0.692	6.192	0.000
4.5000	0.212	0.703	6.735	0.000
4.5556	0.214	0.715	7.201	0.000
4.6111	0.215	0.727	7.579	0.000
4.6667	0.217	0.739	7.872	0.000
4.7222	0.219	0.751	8.099	0.000
4.7778	0.220	0.764	8.381	0.000
4.8333	0.222	0.776	8.608	0.000
4.8889	0.223	0.788	8.827	0.000
4.9444	0.225	0.801	9.039	0.000

5.0000	0.226	0.813	9.246	0.000
5.0556	0.228	0.826	9.447	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 366.341
Total Impervious Area: 17.641

Mitigated Landuse Totals for POC #1
Total Pervious Area: 359.9111
Total Impervious Area: 24.0709

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	99.968257
5 year	148.509224
10 year	174.079819
25 year	199.662705
50 year	214.685902
100 year	226.947761

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	100.417804
5 year	146.702267
10 year	170.810932
25 year	194.781315
50 year	208.796013
100 year	220.203905

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	73.793	73.973
1950	96.285	96.009
1951	133.163	131.478
1952	90.692	92.482
1953	110.173	110.073
1954	145.010	144.934
1955	83.578	83.404
1956	154.855	155.326
1957	123.759	123.609
1958	113.514	115.535

1959	52.328	52.576
1960	54.685	55.083
1961	135.301	134.284
1962	110.540	110.278
1963	114.123	113.893
1964	102.298	101.692
1965	102.336	102.156
1966	120.966	120.372
1967	104.394	105.468
1968	124.718	124.181
1969	101.761	101.989
1970	353.736	347.942
1971	63.950	64.770
1972	92.127	91.632
1973	103.310	103.480
1974	147.070	147.861
1975	81.860	81.793
1976	119.690	118.725
1977	7.551	9.664
1978	167.966	166.747
1979	132.922	133.736
1980	68.871	68.567
1981	152.835	151.499
1982	106.676	105.730
1983	173.627	171.710
1984	55.403	55.538
1985	45.346	45.910
1986	52.294	52.859
1987	92.530	92.830
1988	35.322	35.991
1989	40.799	42.392
1990	42.053	43.591
1991	105.326	104.920
1992	119.963	120.101
1993	136.548	136.604
1994	104.525	104.030
1995	88.158	89.712
1996	171.717	174.820
1997	175.318	173.992
1998	155.712	157.779
1999	107.933	107.418
2000	52.321	52.106
2001	35.592	36.092
2002	162.355	160.578
2003	126.797	126.162
2004	35.118	35.381
2005	54.588	56.399
2006	105.794	105.211
2007	53.612	58.625
2008	66.236	67.620

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	353.7360	347.9420
2	175.3180	174.8200
3	173.6270	173.9920
4	171.7170	171.7100

5	167.9660	166.7470
6	162.3550	160.5780
7	155.7120	157.7790
8	154.8550	155.3260
9	152.8350	151.4990
10	147.0700	147.8610
11	145.0100	144.9340
12	136.5480	136.6040
13	135.3010	134.2840
14	133.1630	133.7360
15	132.9220	131.4780
16	126.7970	126.1620
17	124.7180	124.1810
18	123.7590	123.6090
19	120.9660	120.3720
20	119.9630	120.1010
21	119.6900	118.7250
22	114.1230	115.5350
23	113.5140	113.8930
24	110.5400	110.2780
25	110.1730	110.0730
26	107.9330	107.4180
27	106.6760	105.7300
28	105.7940	105.4680
29	105.3260	105.2110
30	104.5250	104.9200
31	104.3940	104.0300
32	103.3100	103.4800
33	102.3360	102.1560
34	102.2980	101.9890
35	101.7610	101.6920
36	96.2846	96.0091
37	92.5303	92.8297
38	92.1272	92.4818
39	90.6916	91.6320
40	88.1584	89.7122
41	83.5779	83.4038
42	81.8601	81.7930
43	73.7934	73.9729
44	68.8713	68.5665
45	66.2358	67.6195
46	63.9500	64.7695
47	55.4029	58.6251
48	54.6849	56.3989
49	54.5880	55.5378
50	53.6121	55.0833
51	52.3281	52.8594
52	52.3206	52.5764
53	52.2937	52.1056
54	45.3463	45.9104
55	42.0533	43.5906
56	40.7989	42.3919
57	35.5918	36.0924
58	35.3216	35.9914
59	35.1177	35.3810
60	7.5508	9.6637

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
49.9841	1153	1185	102	Fail
51.6478	1073	1108	103	Fail
53.3114	984	1022	103	Fail
54.9751	918	940	102	Fail
56.6387	839	867	103	Fail
58.3024	780	804	103	Fail
59.9661	718	741	103	Fail
61.6297	678	694	102	Fail
63.2934	628	639	101	Fail
64.9570	582	594	102	Fail
66.6207	529	541	102	Fail
68.2843	494	502	101	Fail
69.9480	463	467	100	Pass
71.6116	444	445	100	Pass
73.2753	411	419	101	Fail
74.9389	371	378	101	Fail
76.6026	350	358	102	Fail
78.2663	333	336	100	Pass
79.9299	320	319	99	Pass
81.5936	304	304	100	Pass
83.2572	286	290	101	Fail
84.9209	264	267	101	Fail
86.5845	247	250	101	Fail
88.2482	229	230	100	Pass
89.9118	218	219	100	Pass
91.5755	205	208	101	Fail
93.2391	188	191	101	Fail
94.9028	176	174	98	Pass
96.5664	159	159	100	Pass
98.2301	147	147	100	Pass
99.8938	137	137	100	Pass
101.5574	129	130	100	Pass
103.2211	122	123	100	Pass
104.8847	110	113	102	Pass
106.5484	106	102	96	Pass
108.2120	99	99	100	Pass
109.8757	96	95	98	Pass
111.5393	89	87	97	Pass
113.2030	84	80	95	Pass
114.8666	75	76	101	Pass
116.5303	73	72	98	Pass
118.1940	68	70	102	Pass
119.8576	65	64	98	Pass
121.5213	59	60	101	Pass
123.1849	56	56	100	Pass
124.8486	51	51	100	Pass
126.5122	49	48	97	Pass
128.1759	45	45	100	Pass
129.8395	44	43	97	Pass
131.5032	41	39	95	Pass
133.1668	39	39	100	Pass
134.8305	36	34	94	Pass
136.4942	33	33	100	Pass
138.1578	30	30	100	Pass

139.8215	28	28	100	Pass
141.4851	26	27	103	Pass
143.1488	25	23	92	Pass
144.8124	22	21	95	Pass
146.4761	18	19	105	Pass
148.1397	17	18	105	Pass
149.8034	17	16	94	Pass
151.4670	16	16	100	Pass
153.1307	15	14	93	Pass
154.7943	14	14	100	Pass
156.4580	12	13	108	Pass
158.1217	12	12	100	Pass
159.7853	12	12	100	Pass
161.4490	12	11	91	Pass
163.1126	11	11	100	Pass
164.7763	11	10	90	Pass
166.4399	10	10	100	Pass
168.1036	9	8	88	Pass
169.7672	8	8	100	Pass
171.4309	8	8	100	Pass
173.0945	7	7	100	Pass
174.7582	6	6	100	Pass
176.4219	5	5	100	Pass
178.0855	5	5	100	Pass
179.7492	5	5	100	Pass
181.4128	5	5	100	Pass
183.0765	5	5	100	Pass
184.7401	5	5	100	Pass
186.4038	5	5	100	Pass
188.0674	5	5	100	Pass
189.7311	5	5	100	Pass
191.3947	5	5	100	Pass
193.0584	5	5	100	Pass
194.7221	5	5	100	Pass
196.3857	5	5	100	Pass
198.0494	5	5	100	Pass
199.7130	5	5	100	Pass
201.3767	5	5	100	Pass
203.0403	5	5	100	Pass
204.7040	5	5	100	Pass
206.3676	5	5	100	Pass
208.0313	5	5	100	Pass
209.6949	5	5	100	Pass
211.3586	5	5	100	Pass
213.0222	5	5	100	Pass
214.6859	5	5	100	Pass

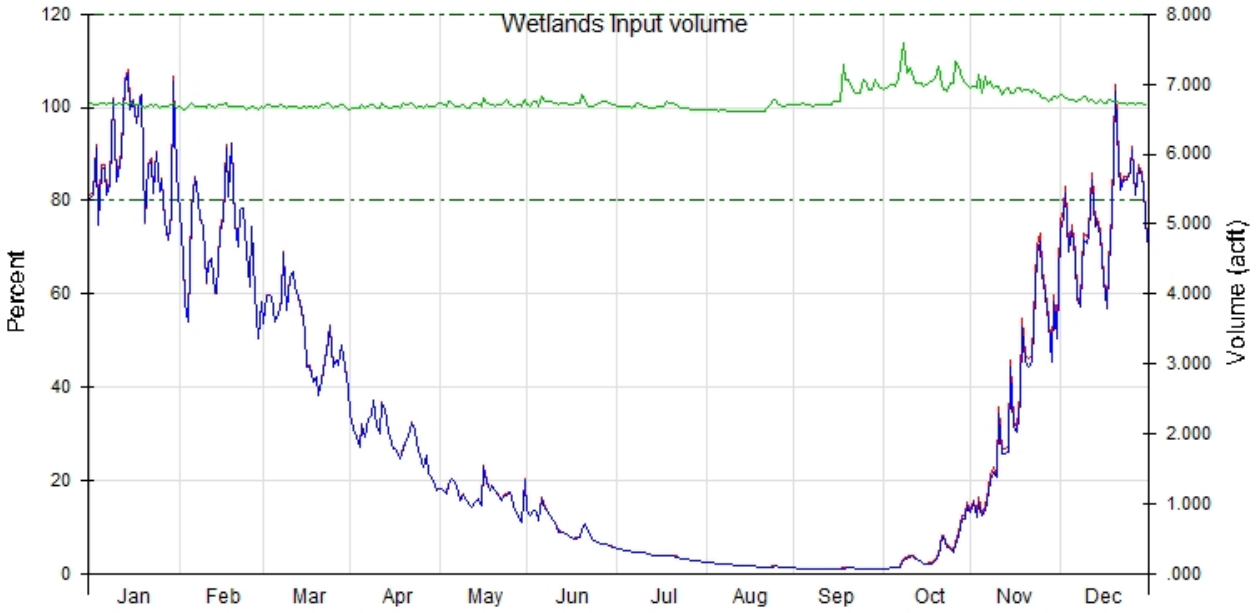
The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	1.1689 acre-feet
On-line facility target flow:	0.811 cfs.
Adjusted for 15 min:	0.811 cfs.
Off-line facility target flow:	0.501 cfs.
Adjusted for 15 min:	0.501 cfs.

Wetland Input Volumes



- Percent - Predeveloped - Mitigated

Wetlands Input Volume for POC 1
Average Annual Volume (acft)
Series 1: 501 POC 1 Predeveloped flow
Series 2: 801 POC 1 Mitigated flow

Month	Series 1	Series 2	Percent	Pass/Fail
Jan	182.1821	183.1683	100.5	Pass
Feb	136.8450	137.0983	100.2	Pass
Mar	107.1081	107.3392	100.2	Pass
Apr	57.8388	57.9557	100.2	Pass
May	34.8609	35.0896	100.7	Pass
Jun	19.2150	19.4069	101.0	Pass
Jul	8.2820	8.2970	100.2	Pass
Aug	3.6806	3.6659	99.6	Pass
Sep	2.0826	2.1358	102.6	Pass
Oct	8.6746	9.2000	106.1	Pass
Nov	71.7522	74.0875	103.3	Pass
Dec	156.4850	158.5522	101.3	Pass

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	5.3794	5.4250	100.8	Pass
2	5.4103	5.4504	100.7	Pass
3	6.0881	6.1247	100.6	Pass
4	4.9976	5.0217	100.5	Pass
5	5.7807	5.8377	101.0	Pass
6	5.7860	5.8336	100.8	Pass
7	5.4273	5.4662	100.7	Pass
8	5.5653	5.6112	100.8	Pass
9	6.7647	6.8104	100.7	Pass
10	5.6059	5.6289	100.4	Pass
11	5.6996	5.7535	100.9	Pass
12	6.0217	6.0549	100.6	Pass
13	7.0109	7.0718	100.9	Pass
14	7.1635	7.1955	100.4	Pass

15	6.6440	6.7033	100.9	Pass
16	6.7579	6.7875	100.4	Pass
17	6.4319	6.4585	100.4	Pass
18	6.7751	6.8115	100.5	Pass
19	6.8400	6.8444	100.1	Pass
20	5.0286	5.0149	99.7	Pass
21	5.8445	5.8566	100.2	Pass
22	5.8951	5.9379	100.7	Pass
23	5.4432	5.4582	100.3	Pass
24	6.0038	6.0389	100.6	Pass
25	5.4725	5.4690	99.9	Pass
26	5.6405	5.6580	100.3	Pass
27	5.0521	5.0629	100.2	Pass
28	4.7620	4.7690	100.1	Pass
29	5.1227	5.1490	100.5	Pass
30	7.0500	7.1174	101.0	Pass
31	5.7417	5.7364	99.9	Pass
Feb1	5.1693	5.1776	100.2	Pass
2	4.5441	4.5245	99.6	Pass
3	3.8881	3.8738	99.6	Pass
4	3.6051	3.6108	100.2	Pass
5	5.1720	5.2246	101.0	Pass
6	5.6604	5.6761	100.3	Pass
7	5.5779	5.5916	100.2	Pass
8	5.0850	5.0982	100.3	Pass
9	4.9568	4.9610	100.1	Pass
10	4.1685	4.1598	99.8	Pass
11	4.4296	4.4570	100.6	Pass
12	4.5008	4.5137	100.3	Pass
13	4.0192	4.0107	99.8	Pass
14	4.0060	4.0189	100.3	Pass
15	4.8989	4.9242	100.5	Pass
16	5.0662	5.1034	100.7	Pass
17	6.0852	6.1322	100.8	Pass
18	5.4022	5.4090	100.1	Pass
19	6.1500	6.1645	100.2	Pass
20	5.0169	5.0248	100.2	Pass
21	4.6726	4.6785	100.1	Pass
22	5.2019	5.2108	100.2	Pass
23	5.2129	5.2269	100.3	Pass
24	4.6128	4.5961	99.6	Pass
25	4.1060	4.0989	99.8	Pass
26	4.9568	4.9677	100.2	Pass
27	4.0379	4.0308	99.8	Pass
28	3.3684	3.3519	99.5	Pass
29	3.8874	3.8984	100.3	Pass
Mar1	3.5832	3.5826	100.0	Pass
2	3.9576	3.9826	100.6	Pass
3	3.9785	3.9947	100.4	Pass
4	3.9592	3.9710	100.3	Pass
5	3.5912	3.5938	100.1	Pass
6	3.6975	3.7068	100.2	Pass
7	3.9023	3.9313	100.7	Pass
8	4.5916	4.6076	100.3	Pass
9	3.7620	3.7566	99.9	Pass
10	4.2325	4.2461	100.3	Pass
11	4.3110	4.3224	100.3	Pass
12	4.1006	4.1063	100.1	Pass

13	3.9515	3.9487	99.9	Pass
14	3.7816	3.7734	99.8	Pass
15	3.4592	3.4608	100.0	Pass
16	2.9584	2.9541	99.9	Pass
17	2.9609	2.9689	100.3	Pass
18	2.7419	2.7408	100.0	Pass
19	2.8099	2.8122	100.1	Pass
20	2.5492	2.5458	99.9	Pass
21	2.7540	2.7671	100.5	Pass
22	3.0213	3.0408	100.6	Pass
23	3.1672	3.1911	100.8	Pass
24	3.5343	3.5533	100.5	Pass
25	2.9595	2.9578	99.9	Pass
26	3.0548	3.0642	100.3	Pass
27	2.9831	2.9844	100.0	Pass
28	3.2561	3.2721	100.5	Pass
29	2.9652	2.9692	100.1	Pass
30	2.6453	2.6360	99.6	Pass
31	2.2876	2.2786	99.6	Pass
Apr1	2.0692	2.0629	99.7	Pass
2	1.9649	1.9652	100.0	Pass
3	1.8204	1.8188	99.9	Pass
4	2.1245	2.1346	100.5	Pass
5	1.9606	1.9589	99.9	Pass
6	2.2064	2.2119	100.2	Pass
7	2.2598	2.2757	100.7	Pass
8	2.4744	2.4870	100.5	Pass
9	2.1156	2.1095	99.7	Pass
10	1.9991	1.9948	99.8	Pass
11	2.4348	2.4547	100.8	Pass
12	2.3514	2.3560	100.2	Pass
13	2.0174	2.0169	100.0	Pass
14	1.8818	1.8797	99.9	Pass
15	1.7852	1.7859	100.0	Pass
16	1.7695	1.7716	100.1	Pass
17	1.6434	1.6423	99.9	Pass
18	1.7894	1.8043	100.8	Pass
19	1.8614	1.8723	100.6	Pass
20	1.9467	1.9561	100.5	Pass
21	2.1403	2.1622	101.0	Pass
22	2.0794	2.0841	100.2	Pass
23	1.8900	1.8869	99.8	Pass
24	1.6896	1.6904	100.0	Pass
25	1.5321	1.5305	99.9	Pass
26	1.6815	1.6939	100.7	Pass
27	1.4325	1.4331	100.0	Pass
28	1.3722	1.3774	100.4	Pass
29	1.2575	1.2599	100.2	Pass
30	1.2014	1.2090	100.6	Pass
May1	1.2146	1.2246	100.8	Pass
2	1.1862	1.1935	100.6	Pass
3	1.1403	1.1442	100.3	Pass
4	1.2608	1.2762	101.2	Pass
5	1.3560	1.3666	100.8	Pass
6	1.3018	1.3026	100.1	Pass
7	1.1592	1.1600	100.1	Pass
8	1.0527	1.0552	100.2	Pass
9	1.1291	1.1357	100.6	Pass

10	1.0513	1.0516	100.0	Pass
11	0.9724	0.9710	99.9	Pass
12	0.9579	0.9633	100.6	Pass
13	1.0182	1.0289	101.1	Pass
14	1.0681	1.0752	100.7	Pass
15	0.9652	0.9668	100.2	Pass
16	1.5273	1.5570	101.9	Pass
17	1.3116	1.3230	100.9	Pass
18	1.1937	1.2022	100.7	Pass
19	1.2655	1.2726	100.6	Pass
20	1.1797	1.1816	100.2	Pass
21	1.1265	1.1324	100.5	Pass
22	1.0482	1.0539	100.5	Pass
23	1.0993	1.1101	101.0	Pass
24	1.1176	1.1340	101.5	Pass
25	1.1664	1.1737	100.6	Pass
26	1.0068	1.0103	100.3	Pass
27	0.8921	0.8952	100.3	Pass
28	0.8355	0.8398	100.5	Pass
29	0.7311	0.7330	100.3	Pass
30	1.3243	1.3463	101.7	Pass
31	0.9151	0.9207	100.6	Pass
Jun1	0.8352	0.8360	100.1	Pass
2	0.8980	0.9099	101.3	Pass
3	0.8776	0.8875	101.1	Pass
4	0.7588	0.7615	100.4	Pass
5	1.0747	1.1018	102.5	Pass
6	0.9273	0.9406	101.4	Pass
7	0.9061	0.9179	101.3	Pass
8	0.8265	0.8358	101.1	Pass
9	0.7657	0.7719	100.8	Pass
10	0.6821	0.6883	100.9	Pass
11	0.6039	0.6075	100.6	Pass
12	0.5828	0.5889	101.0	Pass
13	0.5729	0.5788	101.0	Pass
14	0.5470	0.5508	100.7	Pass
15	0.5175	0.5205	100.6	Pass
16	0.4933	0.4958	100.5	Pass
17	0.5068	0.5114	100.9	Pass
18	0.5154	0.5198	100.8	Pass
19	0.6086	0.6254	102.7	Pass
20	0.7013	0.7128	101.6	Pass
21	0.6082	0.6100	100.3	Pass
22	0.5214	0.5216	100.0	Pass
23	0.4674	0.4676	100.0	Pass
24	0.4425	0.4451	100.6	Pass
25	0.4254	0.4290	100.8	Pass
26	0.4223	0.4280	101.4	Pass
27	0.4155	0.4203	101.1	Pass
28	0.4052	0.4087	100.9	Pass
29	0.3905	0.3932	100.7	Pass
30	0.3792	0.3816	100.6	Pass
Jul1	0.3634	0.3648	100.4	Pass
2	0.3508	0.3517	100.3	Pass
3	0.3397	0.3403	100.2	Pass
4	0.3309	0.3312	100.1	Pass
5	0.3221	0.3223	100.0	Pass
6	0.3141	0.3141	100.0	Pass

7	0.3094	0.3098	100.1	Pass
8	0.3161	0.3189	100.9	Pass
9	0.3107	0.3123	100.5	Pass
10	0.2981	0.2988	100.2	Pass
11	0.2864	0.2865	100.0	Pass
12	0.2765	0.2763	99.9	Pass
13	0.2680	0.2676	99.9	Pass
14	0.2611	0.2607	99.8	Pass
15	0.2609	0.2614	100.2	Pass
16	0.2576	0.2582	100.2	Pass
17	0.2492	0.2493	100.1	Pass
18	0.2518	0.2546	101.1	Pass
19	0.2498	0.2523	101.0	Pass
20	0.2588	0.2609	100.8	Pass
21	0.2471	0.2485	100.6	Pass
22	0.2307	0.2308	100.0	Pass
23	0.2177	0.2173	99.8	Pass
24	0.2082	0.2076	99.7	Pass
25	0.2012	0.2005	99.7	Pass
26	0.1946	0.1939	99.6	Pass
27	0.1891	0.1883	99.6	Pass
28	0.1845	0.1837	99.6	Pass
29	0.1797	0.1790	99.6	Pass
30	0.1745	0.1737	99.5	Pass
31	0.1694	0.1685	99.5	Pass
Aug1	0.1646	0.1636	99.4	Pass
2	0.1601	0.1591	99.4	Pass
3	0.1556	0.1546	99.4	Pass
4	0.1512	0.1502	99.3	Pass
5	0.1471	0.1460	99.3	Pass
6	0.1436	0.1427	99.4	Pass
7	0.1402	0.1393	99.4	Pass
8	0.1360	0.1351	99.3	Pass
9	0.1319	0.1309	99.2	Pass
10	0.1280	0.1270	99.2	Pass
11	0.1243	0.1233	99.2	Pass
12	0.1208	0.1198	99.2	Pass
13	0.1174	0.1163	99.1	Pass
14	0.1152	0.1143	99.2	Pass
15	0.1126	0.1118	99.2	Pass
16	0.1090	0.1081	99.2	Pass
17	0.1055	0.1046	99.1	Pass
18	0.1030	0.1021	99.1	Pass
19	0.1021	0.1014	99.2	Pass
20	0.0989	0.0981	99.2	Pass
21	0.0956	0.0948	99.2	Pass
22	0.0958	0.0957	99.8	Pass
23	0.0975	0.0980	100.6	Pass
24	0.1032	0.1050	101.7	Pass
25	0.1058	0.1072	101.3	Pass
26	0.0995	0.1003	100.7	Pass
27	0.0922	0.0926	100.4	Pass
28	0.0874	0.0877	100.3	Pass
29	0.0850	0.0854	100.6	Pass
30	0.0820	0.0824	100.5	Pass
31	0.0813	0.0818	100.5	Pass
Sep1	0.0793	0.0797	100.5	Pass
2	0.0767	0.0770	100.4	Pass

3	0.0758	0.0764	100.8	Pass
4	0.0743	0.0748	100.7	Pass
5	0.0718	0.0721	100.5	Pass
6	0.0694	0.0696	100.3	Pass
7	0.0674	0.0675	100.2	Pass
8	0.0663	0.0666	100.4	Pass
9	0.0655	0.0659	100.6	Pass
10	0.0645	0.0649	100.7	Pass
11	0.0626	0.0629	100.5	Pass
12	0.0611	0.0614	100.5	Pass
13	0.0606	0.0610	100.7	Pass
14	0.0623	0.0631	101.2	Pass
15	0.0612	0.0620	101.2	Pass
16	0.0601	0.0608	101.3	Pass
17	0.0771	0.0842	109.3	Pass
18	0.0772	0.0817	105.8	Pass
19	0.0829	0.0877	105.8	Pass
20	0.0846	0.0882	104.2	Pass
21	0.0756	0.0780	103.2	Pass
22	0.0689	0.0709	103.0	Pass
23	0.0651	0.0670	103.0	Pass
24	0.0673	0.0712	105.8	Pass
25	0.0688	0.0723	105.1	Pass
26	0.0642	0.0666	103.7	Pass
27	0.0608	0.0630	103.6	Pass
28	0.0648	0.0687	106.0	Pass
29	0.0653	0.0686	105.2	Pass
30	0.0710	0.0739	104.0	Pass
Oct1	0.0697	0.0723	103.7	Pass
2	0.0700	0.0728	104.1	Pass
3	0.0719	0.0751	104.4	Pass
4	0.0809	0.0848	104.8	Pass
5	0.0838	0.0876	104.5	Pass
6	0.0857	0.0906	105.8	Pass
7	0.1017	0.1107	108.8	Pass
8	0.1816	0.2070	114.0	Pass
9	0.2217	0.2381	107.4	Pass
10	0.2321	0.2521	108.6	Pass
11	0.2510	0.2695	107.4	Pass
12	0.2208	0.2321	105.1	Pass
13	0.1870	0.1970	105.4	Pass
14	0.1657	0.1742	105.1	Pass
15	0.1398	0.1462	104.5	Pass
16	0.1342	0.1409	105.0	Pass
17	0.1507	0.1593	105.7	Pass
18	0.1449	0.1531	105.7	Pass
19	0.1778	0.1887	106.1	Pass
20	0.2522	0.2746	108.9	Pass
21	0.5139	0.5388	104.8	Pass
22	0.5222	0.5416	103.7	Pass
23	0.3902	0.4034	103.4	Pass
24	0.3543	0.3727	105.2	Pass
25	0.3110	0.3275	105.3	Pass
26	0.4016	0.4412	109.9	Pass
27	0.5361	0.5838	108.9	Pass
28	0.7916	0.8408	106.2	Pass
29	0.7891	0.8308	105.3	Pass
30	0.9707	1.0191	105.0	Pass

31	0.8877	0.9234	104.0	Pass
Nov1	1.0117	1.0564	104.4	Pass
2	0.8106	0.8454	104.3	Pass
3	1.0136	1.0839	106.9	Pass
4	0.8212	0.8479	103.3	Pass
5	0.9151	0.9763	106.7	Pass
6	1.0168	1.0664	104.9	Pass
7	1.3261	1.4006	105.6	Pass
8	1.4560	1.5140	104.0	Pass
9	1.3748	1.4357	104.4	Pass
10	2.2895	2.3912	104.4	Pass
11	1.7205	1.7702	102.9	Pass
12	1.7168	1.7845	103.9	Pass
13	1.7392	1.8106	104.1	Pass
14	2.9469	3.0411	103.2	Pass
15	2.0944	2.1611	103.2	Pass
16	2.0167	2.0981	104.0	Pass
17	2.4844	2.5912	104.3	Pass
18	3.5358	3.6586	103.5	Pass
19	3.0193	3.1288	103.6	Pass
20	2.9534	3.0653	103.8	Pass
21	3.0196	3.1148	103.2	Pass
22	3.4992	3.6272	103.7	Pass
23	4.5699	4.7110	103.1	Pass
24	4.7522	4.8737	102.6	Pass
25	4.2831	4.3650	101.9	Pass
26	3.9813	4.0660	102.1	Pass
27	3.5992	3.6484	101.4	Pass
28	3.0248	3.0692	101.5	Pass
29	3.8788	3.9737	102.4	Pass
30	3.3611	3.4261	101.9	Pass
Dec1	4.9128	5.0463	102.7	Pass
2	5.0746	5.1993	102.5	Pass
3	5.4338	5.5362	101.9	Pass
4	4.6047	4.6805	101.6	Pass
5	4.9144	4.9974	101.7	Pass
6	4.5146	4.5794	101.4	Pass
7	3.9281	3.9768	101.2	Pass
8	3.8234	3.8899	101.7	Pass
9	4.7679	4.8749	102.2	Pass
10	4.7274	4.8255	102.1	Pass
11	4.8363	4.9005	101.3	Pass
12	5.6419	5.7247	101.5	Pass
13	4.9588	5.0079	101.0	Pass
14	5.0380	5.0912	101.1	Pass
15	4.8381	4.9148	101.6	Pass
16	4.2070	4.2393	100.8	Pass
17	3.7895	3.8221	100.9	Pass
18	4.3385	4.4142	101.7	Pass
19	5.1035	5.1715	101.3	Pass
20	6.8860	6.9864	101.5	Pass
21	5.8747	5.9338	101.0	Pass
22	5.4783	5.5356	101.0	Pass
23	5.6331	5.6866	101.0	Pass
24	5.6301	5.6547	100.4	Pass
25	5.7145	5.7755	101.1	Pass
26	6.0543	6.1109	100.9	Pass
27	5.4042	5.4349	100.6	Pass

28	5.7946	5.8465	100.9	Pass
29	5.6717	5.7179	100.8	Pass
30	5.5212	5.5460	100.4	Pass
31	4.7207	4.7492	100.6	Pass

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1	☐	1372.38			☐	0.00			
Total Volume Infiltrated		1372.38	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

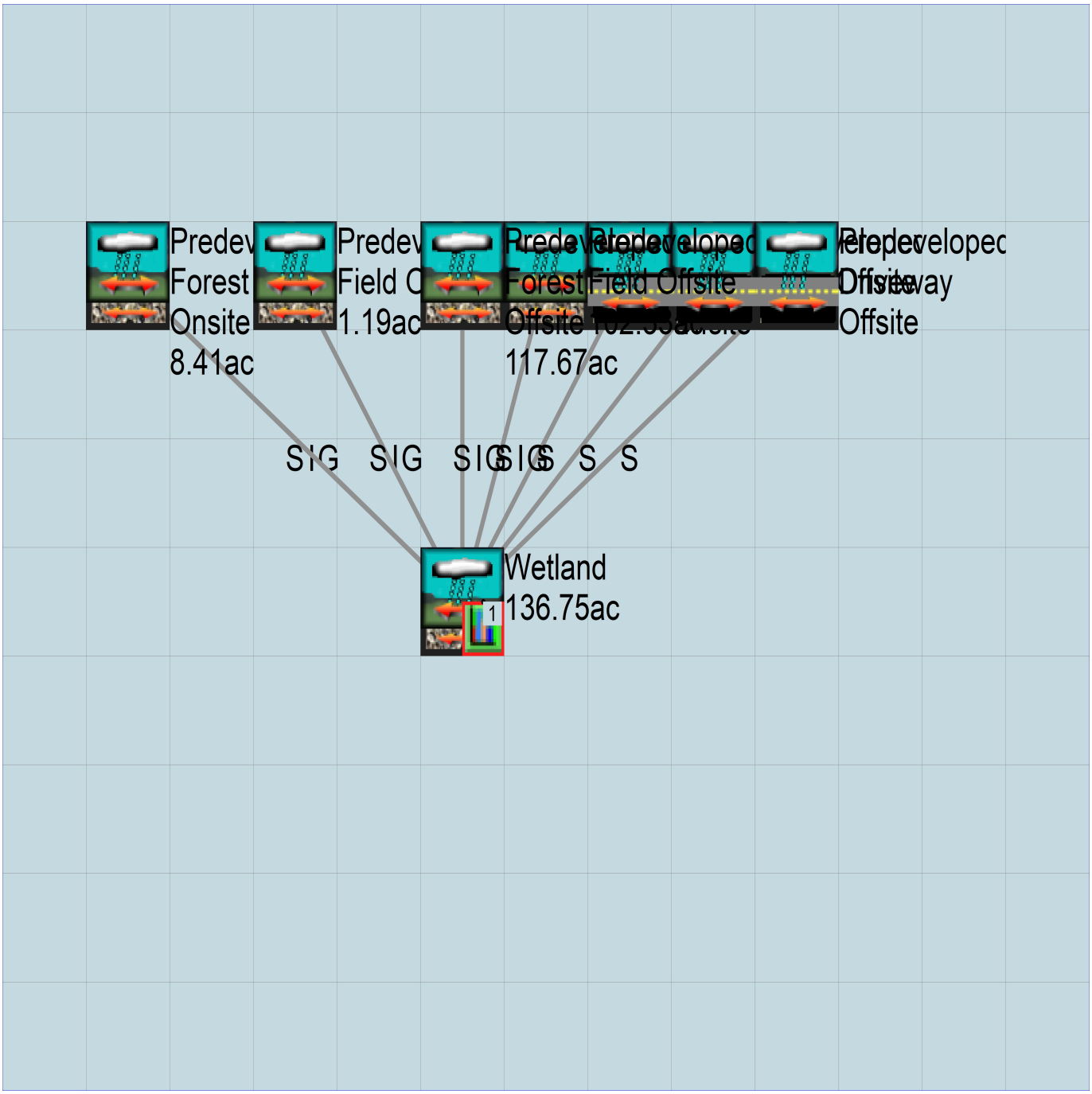
No PERLND changes have been made.

IMPLND Changes

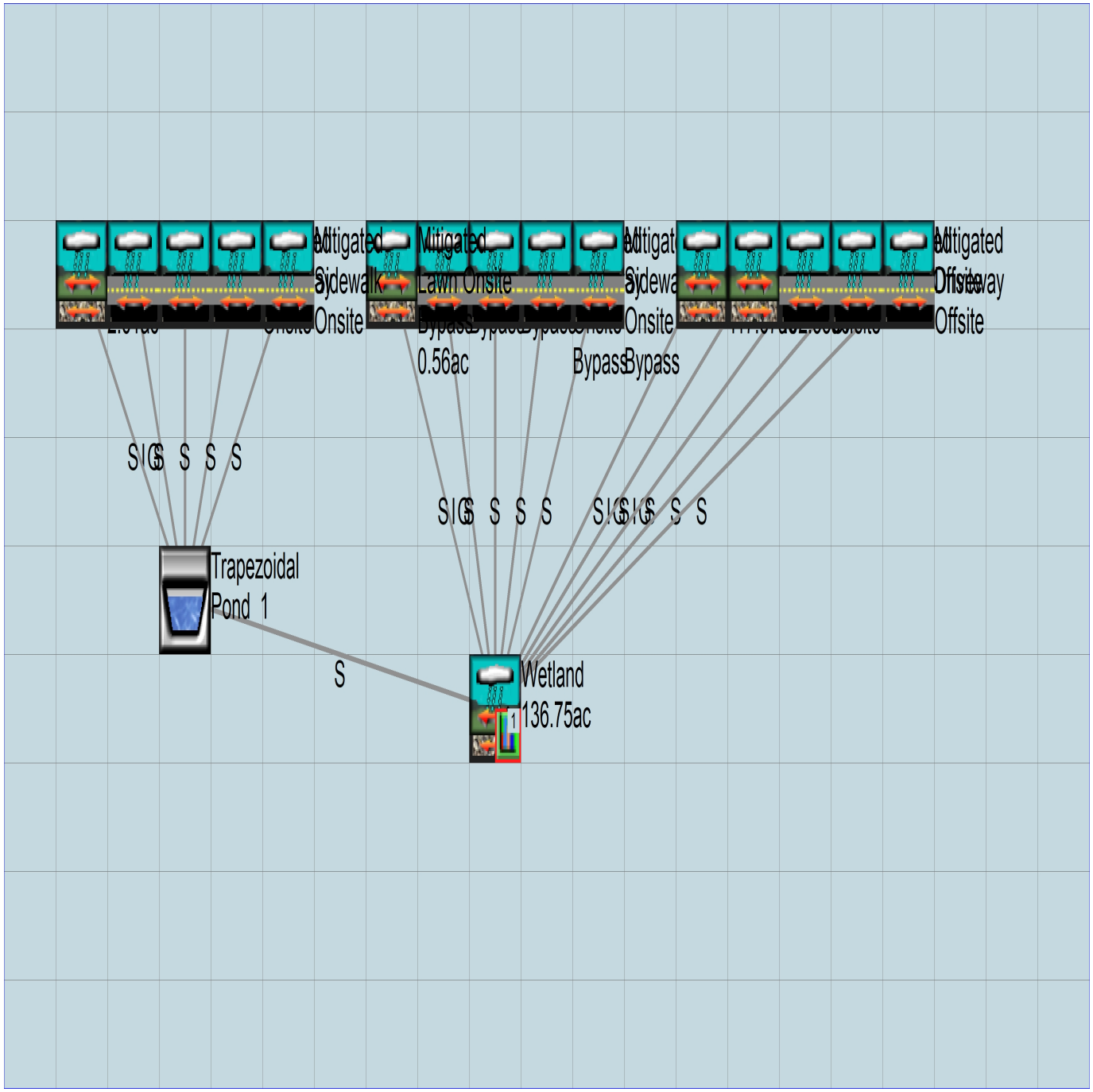
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Hyroperiod Protection Final.wdm
MESSU       25   PreHyroperiod Protection Final.MES
            27   PreHyroperiod Protection Final.L61
            28   PreHyroperiod Protection Final.L62
            30   POCHyroperiod Protection Final1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      47
      PERLND      48
      IMPLND      28
      IMPLND      29
      IMPLND      30
      PERLND      54
      PERLND      55
      PERLND      56
      COPY       501
      COPY         1
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Wetland                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out             ***
   47     SG4, Forest, Mod        1    1    1    1   27    0
   48     SG4, Forest, Mod        1    1    1    1   27    0
   54     SG4, Field, Mod         1    1    1    1   27    0
   55     SG4, Forest, Mod        1    1    1    1   27    0
   56     SG4, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***
```

```
ACTIVITY
  <PLS > ************ Active Sections ******************************
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
 47         0    0    1    0    0    0    0    0    0    0    0    0
 48         0    0    1    0    0    0    0    0    0    0    0    0
 54         0    0    1    0    0    0    0    0    0    0    0    0
 55         0    0    1    0    0    0    0    0    0    0    0    0
 56         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags **************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 47         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 48         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 54         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 55         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 56         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 47         0    0    0    0    0    0    0    0    0    0    0
 48         0    0    0    0    0    0    0    0    0    0    0
 54         0    0    0    0    0    0    0    0    0    0    0
 55         0    0    0    0    0    0    0    0    0    0    0
 56         0    0    0    0    0    0    0    0    0    0    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2          ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 47              0         6      0.04       400       0.1         0      0.96
 48              0         6      0.04       400       0.1         0      0.96
 54              0         6      0.03       400       0.1         0      0.96
 55              0         6      0.04       400       0.1         0      0.96
 56              0         6      0.04       400       0.1         0      0.96
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3          ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 47              0         0         3         2         0         0         0
 48              0         0         3         2         0         0         0
 54              0         0         3         2         0         0         0
 55              0         0         3         2         0         0         0
 56              0         0         3         2         0         0         0
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                              ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 47            0.2       0.4      0.35         2       0.4       0.7
 48            0.2       0.4      0.35         2       0.4       0.7
 54           0.15       0.4       0.3         2       0.4       0.4
 55            0.2       0.4      0.35         2       0.4       0.7
 56            0.2       0.4      0.35         2       0.4       0.7
END PWAT-PARM4

PWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
  # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
 47              0         0         0         0       2.5          1         0
 48              0         0         0         0       2.5          1         0
 54              0         0         0         0       2.5          1         0
 55              0         0         0         0       2.5          1         0
 56              0         0         0         0       2.5          1         0
END PWAT-STATE1
```

```
END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                    in  out           ***
   28      ROADS/FLAT             1    1    1   27    0
   29      ROOF TOPS/FLAT         1    1    1   27    0
   30      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   28         0    0    1    0    0    0
   29         0    0    1    0    0    0
   30         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   28         0    0    4    0    0    0    1    9
   29         0    0    4    0    0    0    1    9
   30         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   28         0    0    0    0    0
   29         0    0    0    0    0
   30         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   28            400      0.01       0.1       0.1
   29            400      0.01       0.1       0.1
   30            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   28              0         0
   29              0         0
   30              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   28              0         0
   29              0         0
   30              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Predeveloped Roads Offsite***
IMPLND  28                    0.0291     PERLND  56     50
Predeveloped Forest Onsite***
PERLND  47                    0.0615     PERLND  56     30
```

```
PERLND  47                      0.0615     PERLND  56     34
PERLND  47                      0.0615     PERLND  56     38
Predeveloped Field Onsite***
PERLND  48                      0.0087     PERLND  56     30
PERLND  48                      0.0087     PERLND  56     34
PERLND  48                      0.0087     PERLND  56     38
Predeveloped Roofs Offsite***
IMPLND  29                      0.0657     PERLND  56     50
Predeveloped Driveway Offsite***
IMPLND  30                      0.0343     PERLND  56     50
Predeveloped Field Offsite***
PERLND  54                      0.7483     PERLND  56     30
PERLND  54                      0.7483     PERLND  56     34
PERLND  54                      0.7483     PERLND  56     38
Predeveloped Forest Offsite***
PERLND  55                      0.8605     PERLND  56     30
PERLND  55                      0.8605     PERLND  56     34
PERLND  55                      0.8605     PERLND  56     38
Wetland***
PERLND  56                     136.745     COPY   501     12
PERLND  56                     136.745     COPY   501     13
PERLND  56                     136.745     COPY   501     14

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------->      ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
```

```
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   14

  MASS-LINK       30
PERLND     PWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   30

  MASS-LINK       34
PERLND     PWATER IFWO                     PERLND         EXTNL  IFWLI
  END MASS-LINK   34

  MASS-LINK       38
PERLND     PWATER AGWO                     PERLND         EXTNL  AGWLI
  END MASS-LINK   38

  MASS-LINK       50
IMPLND     IWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   50


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM         26   Hyroperiod Protection Final.wdm
MESSU       25   MitHyroperiod Protection Final.MES
            27   MitHyroperiod Protection Final.L61
            28   MitHyroperiod Protection Final.L62
            30   POCHyroperiod Protection Final1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      49
      IMPLND      17
      IMPLND      18
      IMPLND      19
      IMPLND      20
      PERLND      50
      IMPLND      21
      IMPLND      22
      IMPLND      23
      IMPLND      24
      PERLND      52
      PERLND      53
      IMPLND      25
      IMPLND      26
      IMPLND      27
      RCHRES       1
      PERLND      51
      COPY        501
      COPY          1
      DISPLY        1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Wetland                    MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
```

```
                                          in  out           ***
 49     SG4, Lawn, Mod          1    1    1    1   27    0
 50     SG4, Lawn, Mod          1    1    1    1   27    0
 52     SG4, Forest, Mod        1    1    1    1   27    0
 53     SG4, Field, Mod         1    1    1    1   27    0
 51     SG4, Forest, Mod        1    1    1    1   27    0
END GEN-INFO
*** Section PWATER***

ACTIVITY
  <PLS > ************ Active Sections ******************************
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
 49         0    0    1    0    0    0    0    0    0    0    0    0
 50         0    0    1    0    0    0    0    0    0    0    0    0
 52         0    0    1    0    0    0    0    0    0    0    0    0
 53         0    0    1    0    0    0    0    0    0    0    0    0
 51         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ***************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 49         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 50         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 52         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 53         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 51         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 49         0    0    0    0    0    0    0    0    0    0    0
 50         0    0    0    0    0    0    0    0    0    0    0
 52         0    0    0    0    0    0    0    0    0    0    0
 53         0    0    0    0    0    0    0    0    0    0    0
 51         0    0    0    0    0    0    0    0    0    0    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2         ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 49              0         6      0.02       400       0.1         0      0.96
 50              0         6      0.02       400       0.1         0      0.96
 52              0         6      0.04       400       0.1         0      0.96
 53              0         6      0.03       400       0.1         0      0.96
 51              0         6      0.04       400       0.1         0      0.96
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 49              0         0         3         2         0         0         0
 50              0         0         3         2         0         0         0
 52              0         0         3         2         0         0         0
 53              0         0         3         2         0         0         0
 51              0         0         3         2         0         0         0
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                              ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 49            0.1       0.2      0.25         2       0.4      0.25
 50            0.1       0.2      0.25         2       0.4      0.25
 52            0.2       0.4      0.35         2       0.4       0.7
 53           0.15       0.4       0.3         2       0.4       0.4
 51            0.2       0.4      0.35         2       0.4       0.7
END PWAT-PARM4

PWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
```

```
            ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS       GWVS
   49             0         0         0          0       2.5          1          0
   50             0         0         0          0       2.5          1          0
   52             0         0         0          0       2.5          1          0
   53             0         0         0          0       2.5          1          0
   51             0         0         0          0       2.5          1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out            ***
   17      ROADS/FLAT             1    1    1   27    0
   18      ROOF TOPS/FLAT         1    1    1   27    0
   19      DRIVEWAYS/FLAT         1    1    1   27    0
   20      SIDEWALKS/FLAT         1    1    1   27    0
   21      ROADS/FLAT             1    1    1   27    0
   22      ROOF TOPS/FLAT         1    1    1   27    0
   23      DRIVEWAYS/FLAT         1    1    1   27    0
   24      SIDEWALKS/FLAT         1    1    1   27    0
   25      ROADS/FLAT             1    1    1   27    0
   26      ROOF TOPS/FLAT         1    1    1   27    0
   27      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    ***
   17         0    0    1    0    0    0
   18         0    0    1    0    0    0
   19         0    0    1    0    0    0
   20         0    0    1    0    0    0
   21         0    0    1    0    0    0
   22         0    0    1    0    0    0
   23         0    0    1    0    0    0
   24         0    0    1    0    0    0
   25         0    0    1    0    0    0
   26         0    0    1    0    0    0
   27         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL     *********
   17         0    0    4    0    0    0     1    9
   18         0    0    4    0    0    0     1    9
   19         0    0    4    0    0    0     1    9
   20         0    0    4    0    0    0     1    9
   21         0    0    4    0    0    0     1    9
   22         0    0    4    0    0    0     1    9
   23         0    0    4    0    0    0     1    9
   24         0    0    4    0    0    0     1    9
   25         0    0    4    0    0    0     1    9
   26         0    0    4    0    0    0     1    9
   27         0    0    4    0    0    0     1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   17         0    0    0    0    0
   18         0    0    0    0    0
   19         0    0    0    0    0
   20         0    0    0    0    0
   21         0    0    0    0    0
```

```
   22         0    0    0    0    0
   23         0    0    0    0    0
   24         0    0    0    0    0
   25         0    0    0    0    0
   26         0    0    0    0    0
   27         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   17            400      0.01       0.1       0.1
   18            400      0.01       0.1       0.1
   19            400      0.01       0.1       0.1
   20            400      0.01       0.1       0.1
   21            400      0.01       0.1       0.1
   22            400      0.01       0.1       0.1
   23            400      0.01       0.1       0.1
   24            400      0.01       0.1       0.1
   25            400      0.01       0.1       0.1
   26            400      0.01       0.1       0.1
   27            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   17              0         0
   18              0         0
   19              0         0
   20              0         0
   21              0         0
   22              0         0
   23              0         0
   24              0         0
   25              0         0
   26              0         0
   27              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   17              0         0
   18              0         0
   19              0         0
   20              0         0
   21              0         0
   22              0         0
   23              0         0
   24              0         0
   25              0         0
   26              0         0
   27              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Mitigated Lawn Onsite***
PERLND  49                     2.6095     RCHRES   1      2
PERLND  49                     2.6095     RCHRES   1      3
PERLND  49                     2.6095     RCHRES   1      4
Mitigated Road Onsite Bypass***
IMPLND  17                     0.0008     PERLND  51     50
Mitigated Roof Onsite Bypass***
IMPLND  18                     0.0032     PERLND  51     50
Mitigated Roofs Offsite***
```

```
IMPLND  26                      0.0657     PERLND  51     50
Mitigated Driveway Onsite Bypass***
IMPLND  19                      0.0003     PERLND  51     50
Mitigated Lawn Onsite Bypass***
PERLND  50                      0.0041     PERLND  51     30
PERLND  50                      0.0041     PERLND  51     34
PERLND  50                      0.0041     PERLND  51     38
Mitigated Sidewalk Onsite Bypass***
IMPLND  20                      0.0003     PERLND  51     50
Mitigated Road Onsite***
IMPLND  21                      1.2737     RCHRES   1      5
Mitigated Forest Offsite***
PERLND  52                      0.8605     PERLND  51     30
PERLND  52                      0.8605     PERLND  51     34
PERLND  52                      0.8605     PERLND  51     38
Mitigated Roof Onsite***
IMPLND  22                      3.8738     RCHRES   1      5
Mitigated Field Offsite***
PERLND  53                      0.7483     PERLND  51     30
PERLND  53                      0.7483     PERLND  51     34
PERLND  53                      0.7483     PERLND  51     38
Mitigated Driveway Onsite***
IMPLND  23                      0.2663     RCHRES   1      5
Mitigated Sidewalk Onsite***
IMPLND  24                      0.3849     RCHRES   1      5
Mitigated Roads Offsite***
IMPLND  25                      0.0291     PERLND  51     50
Mitigated Driveway Offsite***
IMPLND  27                      0.0343     PERLND  51     50
Wetland***
PERLND  51                    136.745      COPY   501     12
PERLND  51                    136.745      COPY   501     13
PERLND  51                    136.745      COPY   501     14

******Routing******
RCHRES   1                       .0073     PERLND  51     60
RCHRES   1                                 COPY     1     16
IMPLND  17                      0.1108     COPY     1     15
IMPLND  18                      0.4441     COPY     1     15
IMPLND  19                      0.0367     COPY     1     15
IMPLND  20                      0.0396     COPY     1     15
PERLND  50                      0.5556     COPY     1     12
PERLND  50                      0.5556     COPY     1     13
PERLND  50                      0.5556     COPY     1     14
PERLND  52                    117.672      COPY     1     12
PERLND  52                    117.672      COPY     1     13
PERLND  52                    117.672      COPY     1     14
PERLND  53                    102.329      COPY     1     12
PERLND  53                    102.329      COPY     1     13
PERLND  53                    102.329      COPY     1     14
IMPLND  25                      3.973      COPY     1     15
IMPLND  26                      8.983      COPY     1     15
IMPLND  27                      4.685      COPY     1     15
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
```

```
                                          in  out                                ***
    1     Trapezoidal Pond-005    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.105601  0.000000  0.000000
  0.055556  0.106721  0.005898  0.129523
  0.111111  0.107846  0.011858  0.183173
  0.166667  0.108976  0.017881  0.224341
  0.222222  0.110111  0.023967  0.259046
  0.277778  0.111251  0.030116  0.289623
  0.333333  0.112397  0.036328  0.317266
  0.388889  0.113547  0.042604  0.342686
  0.444444  0.114703  0.048945  0.366347
  0.500000  0.115863  0.055349  0.388570
  0.555556  0.117029  0.061818  0.409588
  0.611111  0.118200  0.068353  0.429580
  0.666667  0.119376  0.074952  0.448681
  0.722222  0.120557  0.081617  0.467002
  0.777778  0.121743  0.088347  0.484631
  0.833333  0.122934  0.095144  0.501641
  0.888889  0.124130  0.102007  0.518093
  0.944444  0.125332  0.108936  0.534038
  1.000000  0.126538  0.115932  0.549520
  1.055556  0.127750  0.122996  0.564578
  1.111111  0.128966  0.130127  0.579245
  1.166667  0.130188  0.137326  0.593550
  1.222222  0.131415  0.144593  0.607518
  1.277778  0.132647  0.151928  0.621171
```

```
  1.333333  0.133884  0.159331  0.634531
  1.388889  0.135127  0.166804  0.647616
  1.444444  0.136374  0.174345  0.660441
  1.500000  0.137626  0.181957  0.673022
  1.555556  0.138884  0.189637  0.685372
  1.611111  0.140146  0.197388  0.697504
  1.666667  0.141414  0.205209  0.709428
  1.722222  0.142687  0.213101  0.721155
  1.777778  0.143965  0.221064  0.732694
  1.833333  0.145248  0.229097  0.744054
  1.888889  0.146536  0.237202  0.755243
  1.944444  0.147829  0.245379  0.766269
  2.000000  0.149128  0.253628  0.777139
  2.055556  0.150431  0.261949  0.787859
  2.111111  0.151740  0.270343  0.798435
  2.166667  0.153053  0.278809  0.808872
  2.222222  0.154372  0.287349  0.819177
  2.277778  0.155696  0.295962  0.829353
  2.333333  0.157025  0.304648  0.839406
  2.388889  0.158359  0.313409  0.849340
  2.444444  0.159698  0.322244  0.859160
  2.500000  0.161042  0.331153  0.868868
  2.555556  0.162392  0.340138  0.878469
  2.611111  0.163746  0.349197  0.887966
  2.666667  0.165106  0.358332  0.897363
  2.722222  0.166470  0.367542  0.906662
  2.777778  0.167840  0.376829  0.919700
  2.833333  0.169215  0.386191  0.944674
  2.888889  0.170595  0.395631  0.975899
  2.944444  0.171980  0.405147  1.011547
  3.000000  0.173370  0.414740  1.050656
  3.055556  0.174765  0.424410  1.092588
  3.111111  0.176166  0.434158  1.136869
  3.166667  0.177571  0.443984  1.183127
  3.222222  0.178982  0.453888  1.231054
  3.277778  0.180397  0.463871  1.280392
  3.333333  0.181818  0.473933  1.330913
  3.388889  0.183244  0.484073  1.382417
  3.444444  0.184675  0.494293  1.434725
  3.500000  0.186111  0.504593  1.487674
  3.555556  0.187552  0.514972  1.541116
  3.611111  0.188999  0.525432  1.594913
  3.666667  0.190450  0.535972  1.648938
  3.722222  0.191906  0.546593  1.703070
  3.777778  0.193368  0.557295  1.762017
  3.833333  0.194835  0.568079  1.826861
  3.888889  0.196306  0.578944  1.893130
  3.944444  0.197783  0.589891  1.960789
  4.000000  0.199265  0.600920  2.029804
  4.055556  0.200752  0.612032  2.245681
  4.111111  0.202245  0.623226  2.632769
  4.166667  0.203742  0.634503  3.126736
  4.222222  0.205244  0.645864  3.696865
  4.277778  0.206752  0.657308  4.316161
  4.333333  0.208264  0.668837  4.957200
  4.388889  0.209782  0.680449  5.591911
  4.444444  0.211305  0.692146  6.192887
  4.500000  0.212833  0.703928  6.735564
  4.555556  0.214366  0.715794  7.200999
  4.611111  0.215904  0.727746  7.579117
  4.666667  0.217447  0.739784  7.872357
  4.722222  0.218996  0.751907  8.099668
  4.777778  0.220549  0.764117  8.381765
  4.833333  0.222107  0.776413  8.608088
  4.888889  0.223671  0.788795  8.827173
  4.944444  0.225240  0.801265  9.039685
  5.000000  0.226814  0.813822  9.246196
  END FTABLE  1
END FTABLES
```

```
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8           IMPLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8           RCHRES   1     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        4
PERLND     PWATER AGWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    4

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   14

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       30
PERLND     PWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   30

  MASS-LINK       34
PERLND     PWATER IFWO                     PERLND         EXTNL  IFWLI
  END MASS-LINK   34

  MASS-LINK       38
PERLND     PWATER AGWO                     PERLND         EXTNL  AGWLI
  END MASS-LINK   38

  MASS-LINK       50
```

```
IMPLND     IWATER SURO                    PERLND         EXTNL  SURLI
  END MASS-LINK   50

  MASS-LINK       60
RCHRES     ROFLOW            12.00000    PERLND         EXTNL  SURLI
  END MASS-LINK   60


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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APPENDIX C

Geotechnical Report

TRUE NORTH
GEOTECHNICAL

Pacific Lifestyle Homes
Geotechnical Engineering Evaluation

Landing at Green Mountain Phase 2
22111, 22015, & 22007 NE 28th St
Camas, Washington

True North Project No. 24-0431-2

April 2025 (revised June 2025)

219 West 4th Street, Vancouver, WA 98660 - 360-984-6584 - tnorthgeo.com

April 18, 2025 (revised June 17, 2025)

Pacific Lifestyle Homes (PLH)
11815 NE 99th Street, Suite 1200
Vancouver, WA 98682
Attn: Nick Edwards
Email: nicke@buildplh.com

Subject: Geotechnical Engineering Evaluation
Landing at Green Mountain Phase 2
22111, 22015, & 22007 NE 28th St
Camas, Clark County, Washington
Clark County Parcel Nos. 173169000, 173210000, & 173177000
True North Project # 24-0431-2

True North Geotechnical Services (True North) is pleased to submit our finalized Geotechnical Engineering Evaluation for the project noted above. This report was prepared in accordance with "True North Geotechnical - General Services Agreement (GSA) P24-0431-2" dated March 19, 2025, which was authorized by Samantha Zimmer with PLH on March 24, 2025. This report is intended to build off our conclusions summarized in our previously issued report, "Preliminary Geotechnical Engineering Evaluation – Landing at Green Mountain Phase 2", dated January 30, 2025. This report summarizes the entirety of our work accomplished and provides our geotechnical recommendations for development of the property with the proposed Landing at Green Mountain Phase 2 development.

PROJECT UNDERSTANDING

Our current understanding of the project is based on the information provided to True North by Pacific Lifestyle Homes (PLH). We have been provided the following document related to the proposed project:

- **A one-page sketch, untitled, undated, unsigned**. This pre-application drawing shows the layout of the proposed development, including 57 single-family lots, a network of 2-lane local streets, and the proposed stormwater facility. The proposed development is overlain on the site's existing conditions and includes an existing Bonneville Power Administration (BPA) transmission line easement.

Briefly, we understand that the subdivision will be developed with 57 single-family residential lots with concrete driveways. The remainder of the property will be developed with asphalt paved roads, associated utilities, landscape/hardscape, and stormwater management facilities. It is our understanding that the existing residence within the central property will remain, as will approximately an acre of pasture at the south of the residence.

We understand this project is in the preliminary planning stages. As such, we have not been provided any structural drawings or foundation loads other than an indication that the single-family residences will be 1- or 2-story buildings. Preliminarily, we have assumed that maximum building loads will on the order of be 4 kips per linear foot for continuous wall footings, 25 kips per isolated column footing, and 150 psf for floor slabs on grade. As the site is generally flat, or gently sloped, we anticipate cuts and fills no greater than 2 to 4 feet, with the exception of utility trenches, and assuming the proposed new residences are not planned to have basements. Finally, we have assumed that the proposed development will be constructed in accordance with the provisions of the 2021 International Building Code (IBC) as well as any jurisdictional code requirements.

SCOPE OF SERVICES

The purpose of our services was to explore the site surface and subsurface conditions in order to provide preliminary geotechnical recommendations for the proposed development. The following describes our specific scope of services:

- **Geologic Map Review**: We reviewed relevant available geologic maps of the site for information regarding geologic conditions and hazards at or near the site.
- **Subsurface Explorations**: We excavated 2 additional test pits (TP-5 and TP-6), to depths ranging between 8 to 9.5 feet below existing ground surface (bgs) across the existing lot to the far east, at the locations shown on Figure 2. This is in addition to our previously completed work, where we excavated a total of 4 test pits (TP-1 through TP-4) at the locations shown on Figure 2. Soil samples were collected from the major strata encountered in each test pit.
- **Infiltration Testing:** We previously performed infiltration testing at the location of the proposed stormwater detention facility, at a depth determined by the Geotechnical Engineer in the field. Infiltration testing was attempted at the location of IT-1 at a depth of 5.5 feet in the silty sand with gravel layer.
- **Laboratory Testing:** All samples were returned to our office and select samples were subjected to additional laboratory testing, that included: in-situ moisture content and fines content testing.
- **Engineering Analyses:** All data collected during the subsurface exploration, literature research, and laboratory testing was evaluated and used to develop geotechnical design and construction recommendations.
- **Geotechnical Engineering Evaluation:** This document summarizes our geotechnical services, and includes:
  - A site vicinity map and site plan showing the approximate locations of our explorations.
  - A discussion of subsurface conditions encountered including pertinent soil and rock properties as well as the encountered groundwater conditions.
  - Geotechnical related recommendations for foundation design including allowable bearing capacity and estimated settlements.
  - Seismic design parameters in accordance with ASCE 7-16.

- Structural fill recommendations, including an evaluation of whether the in-situ soils can be used as structural fill.
- Floor slab support recommendations.
- General retaining wall design parameter recommendations, including earth pressures, backfill, and drainage.
- Flexible and rigid pavement design recommendations.
- General comments regarding site grading and drainage.
- Discussions on other geotechnical issues that may impact the project.

SITE CONDITIONS

Surface Description

The proposed development is a combined 14.74-acre lot, located at 22111, 22015, and 22007 NE 28th Street, Camas, Clark County, Washington; Clark County Parcel numbers 173177000, 173210000, and 173169000, respectively. The site is bound to the north by NE 28th Street, to the west by a similarly rural single-family residence, and to the east by Phase 1 of the Landing at Green Mountain development, also owned by PLH. The parcel to the south is maintained as an open park space by Clark County Parks.

As mentioned above, the combined property of interest consists of three separate lots, all currently developed with single family residences and all associated utilities. Generally, all existing development is located within the northern portion of the parcels, closer to NE 28th Street. The central and eastern lots have gravel driveways and several outbuildings south of the residences; the western lot has an asphalt-paved driveway and does not have any additional structures. It is our understanding that the existing single-family residence and outbuildings on the central lot will remain, in addition to approximately an acre of pasture south of the outbuildings. We understand that the remaining structures on the east and west parcels are currently planned to be demolished to make way for the new development.

The central and eastern lots are generally maintained as fenced pasture, with some mature evergreen and deciduous trees surrounding the existing residences, along the fence lines, and concentrated at the southern extents of the lots. The northern quarter of the western lot is generally used as storage for fence debris and associated equipment for a fencing contractor operating out of the property, in addition to the existing residence. The central half of the western lot is partially within a wetlands area mapped by the National Wetlands Inventory (NWI), and as such, there is extensive standing water across the ground surface of the central half of this lot. The vegetation in this area is characteristic of wetland plants and mostly consists of dense, tall reeds and mature aspen trees. The southern extent of the western lot is heavily forested with mature evergreen and deciduous trees and low undergrowth.

In terms of topography, the northeastern corner of the property is located at approximately 280 feet AMSL (above median sea level), and the site descends at a gentle 0 to 10 percent gradient to the

southwestern corner of the property, which is located at 222 feet AMSL. Overall, the slope descending from northeast to southwest across the development area is very gentle and consistent, with very few areas that may be considered locally flatter and/or steeper.

Geologic Setting

The map area lies on the eastern margin of the Portland Basin, which is part of the Puget-Willamette Lowland that separates the Cascade Range from the Oregon Coast Range. Since the late Eocene era, the Cascade Range has been the locus of an episodically active volcanic arc associated with underthrusting of oceanic lithosphere beneath the North American continent along the Cascadia Subduction Zone.

The underlying geologic unit at the subject property is mapped by the Washington Geologic Information Portal as "QTc – Quaternary-Tertiary continental sedimentary rocks and deposits – conglomerate with sandy and silty facies. Quaternary-Miocene pebble, cobble, and boulder gravel. Pleistocene-Pliocene gravel, sand, silt, and clay; deposits of the ancestral Columbia River."

According to the USDA Soil Survey, there are a number of surficial soils mapped at the site. Within the eastern lot, there are three mapped soils, which include: Lauren gravelly loam (LgB), 0 to 8 percent slopes, Lauren loam (LeB), 0 to 8 percent slopes, and McBee silt loam (MlA), coarse variant, 0 to 3 percent slopes. The Lauren series is considered to be well drained, with moderately high to high permeability, while the McBee series is a poorly drained, hydric soil, which have shallow depths to the water table and experience regular or extended flooding or ponding.

Subsurface Conditions

On December 16, 2024, we visited the site to excavate four exploratory test pits (TP-1 through TP-4), as part of our preliminary evaluation of the site. On March 21, 2025 we returned to excavate two additional test pits (TP-5 and TP-6). In all, we excavated a total of 6 test pits to depths ranging between 4.5 and 10 feet below existing ground surface (bgs) across the proposed development area. Soil samples were collected from the major strata encountered in each test pit and at the bottom of the infiltration test location, and were returned to our office for examination and index testing. See Figure 2 - Site & Exploration Plan for the locations of our explorations. Descriptions of field and lab procedures and the exploration logs are included in Appendix A. The following is a highly generalized description of the subsurface units encountered:

Native SILT

At the ground surface of all explorations, we encountered various soft, fine-grained soils, ranging from silt with varying amounts of clay at TP-1, TP-3 TP-4, TP-5 and TP-6 to highly organic clay at TP-2. These soft surficial soils extended to depths ranging between 1 to 5 feet bgs. Laboratory tests conducted on soil samples retrieved from this layer returned moisture contents ranging from 24 to 39 percent.

Native Sandy CLAY and Silty CLAY with Sand

Underlying the surficial silt at TP-2, TP-4 and TP-5, we encountered soft to medium stiff Sandy CLAY, which extended to depths of about 5 and 6.5 feet bgs, respectively. Laboratory testing conducted on samples retrieved from this layer returned a moisture content of 31 to 36 percent, and a fines content of 52 to 68 percent.

Native Silty SAND and GRAVEL

Underlying the sandy clay at TP-2 and TP-5 and the surficial silt at TP-1, TP- 3 and TP-6, we encountered dense Silty SAND and dense Silty GRAVEL, extending to depths of 8.5 and 7.5 feet bgs, respectively. Laboratory testing conducted on samples retrieved from this layer returned moisture contents ranging from 29 to 45 percent, and fines content ranging between 30 to 56 percent.

Weathered BEDROCK

Underlying the Silty SAND in and the Silty GRAVEL TP-3, TP-5 and TP-6, and underlying the Silty CLAY in TP-2, we encountered very dense Clayey SAND and GRAVEL with Clay, which we interpreted to be weathered bedrock. This layer extended to the termination depths of both explorations. Laboratory testing conducted on samples retrieved from this layer returned moisture contents ranging from 33 to 54 percent.

Groundwater

Groundwater was encountered in all our explorations except TP-6 at depths ranging from about 2 to 3.5 feet bgs. TP-1, TP-2, TP-4, TP-5 were excavated within or very near to the mapped hydric soils in the west and central areas of the site, TP-3 was excavated in non-hydric soils. Data published on Clark County MapsOnline indicates that overall, groundwater at the site is located between 0 to 20 feet bgs, which corresponds to the groundwater conditions observed during our explorations.

Depending on the time of year of construction, it may be possible that groundwater could be an issue during shallow foundation construction.Utility trenches may encounter perched water during construction, requiring the use of shoring and dewatering methods. Due to the shallow groundwater and hydric soils across the site, infiltration of stormwater is likely not feasible. Groundwater elevations can fluctuate depending on the time of year of construction and changes in land use.

Geologic Hazards Review

The following provides a geologic hazards review for the subject site in accordance with CCC 40.430. The geologic hazard review is based on our site reconnaissance and explorations, as well as a review of publicly available published literature and maps.

Mapped Hazards: As a part of our due diligence, we reviewed the Clark County Property Information Center - MapsOnline website (https://gis.clark.wa.gov/gis/property) for information on geologic

hazards present at this property. No geologic hazards are mapped on this property. The site is mapped as having an NEHRP site class C and very low liquefaction susceptibility. We address the applicable sections of CCC 40.430 below:

Liquefaction: As stated above, the area to be developed is mapped as having a very low liquefaction susceptibility. This corresponds to the conditions observed in our explorations where dense soils with a significant coarse material percentage (eg, sand, gravel, cobbles, or boulders) were encountered at relatively shallow depths ranging between 4.5 and 7 feet bgs. Dense, large-grained soils below the water table (encountered at 5 feet bgs at the shallowest) have a very low potential for liquefaction.

Ground Motion Amplification: In accordance with ASCE 7-16, we recommend a Site Class C (dense soil and soft rock soil profile with an average N-value greater than 50) for this site when considering the average of the upper 100 feet of bearing material beneath the foundations. This recommendation is based on the results of our subsurface investigation as well as our understanding of the local geology.

Inputting our recommended Site Class as well as the site latitude and longitude into the ACSE 7 website (ASCE 7 Hazard Tool), we obtained the seismic design parameters shown in Table 1 below. Note that the values for F_a and F_v in Table 2 were obtained from ASCE's Supplement 3 dated November 5, 2021 and issued for ASCE 7-16 to correct some seismic design issues in the original publication.

Table 1. 2021 IBC (ASCE 7-16, Supplement 3) Seismic Design Parameters

Location	Short Period	1-Second
Maximum Credible Earthquake Spectral Acceleration	S_s = 0.794 g	S_1 = 0.350 g
Site Class	C	
Site Coefficient	F_a = 1.2	F_v= 1.5
Adjusted Spectral Acceleration	S_{MS} = 0.953 g	S_{M1} = 0.525 g*
Design Spectral Response Acceleration Parameters	S_{DS} = 0.635 g	S_{D1} = 0.350 g
MCE_G Peak Ground Acceleration	MCE_G PGA = 0.355 g	
Site Amplification Factor at PGA	F_{PGA} = 1.2	
Site Modified Peak Ground Acceleration	PGA_M = 0.427 g	

g – acceleration due to gravity, * See note below.

The return interval for the ground motions reported in the table above is 2 percent probability of exceedance in 50 years.

Infiltration Testing

We attempted infiltration testing at the location of the proposed infiltration facility, at a depth of approximately 5.5 feet bgs. No reliable data was collected over the course of the test, due to the presence of surface water and potential shallow groundwater.

Based on this and the presence of shallow groundwater at most of our other explorations, as well as the presence of hydric soil indicators across the site, it is our opinion that infiltration is not a feasible method of stormwater management at this site.

CONCLUSIONS AND RECOMMENDATIONS

Geotechnical Design and Construction Considerations

Based on the results of our Preliminary Geotechnical Engineering Evaluation, development of the site with the proposed development is feasible provided the recommendations in this report are included in the project design and implemented during construction. Again, this is a preliminary geotechnical investigation meant to create a “broad brush” understanding of the subsurface conditions across the site. We recommend lot-specific geotechnical explorations and recommendations if more detailed information is required/recommended.

The primary geotechnical concerns associated with the project are:

1. **Presence of soft surficial soils.** As noted above, we encountered variable depths of soft surficial soils across the site, ranging in thickness from 1 to 5 feet below existing ground surface (bgs). During mass grading we expect much of the surficial soils will be removed from the site or stockpiled for later use in landscape areas. Once the subgrade has been approved by True North, mass grading may begin using suitable onsite material or imported structural/engineered fill. We expect that foundations will generally bear on properly placed and compacted structural/engineer fill.

2. **Presence of shallow groundwater and surficial water.** As stated above, we encountered groundwater at nearly all test pit locations over the course of our explorations. TP-1, TP-2, TP-4, and TP-5 were excavated within or very near to mapped hydric soils, and TP-2 was excavated just north of mapped NWI wetlands area, in a location with an excess of surficial water. It is also possible that the standing water at the ground surface may be an issue for mass grading and shallow foundation construction, and the contractor may need to take steps to dewater much of the western lot before beginning grading activities, depending on the time of year.

   Additionally, utility trenches and other embedded structure excavations will likely encounter groundwater during development of the site. The contractor will need to be prepared for this condition.

As discussed previously, based on this and the presence of shallow groundwater at most of our explorations, as well as the presence of hydric soil indicators across the site, it is our opinion that infiltration is not a feasible method of stormwater management at this site.

In summary, provided the recommendations in this report are adhered to, we do not foresee any major issues that would preclude the proposed development. The above-mentioned factors are listed to draw the attention of the reader to the issues to address during design and construction.

Moisture Sensitive Soils/Weather Related Concerns

The fine-grained soils at this site are considered moisture sensitive. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Given the depth of the soft surficial soils encountered across this site, the contractor may need to consider the construction of temporary haul roads depending on the time of year construction takes place. True North can provide more detailed wet weather recommendations if needed. Stormwater should not be allowed to collect on prepared subgrades.

Site Preparation

Site preparation will include clearing, grubbing, etc. to remove the soft upper organic soils to expose the underlying, native, medium-stiff sandy/silty clay. Once the stripping has been approved we recommend proofrolling the site with a fully loaded, tandem axle dump truck to identify any excessively soft spots under the observation of the Geotechnical Engineer during various phases of construction to ensure proper fill placement. Areas not able to be adequately proofrolled (or where not practical) will be evaluated by the Geotechnical Engineer using a ½-inch diameter steel probe rod. Any soft spots identified should be over excavated to expose firm and unyielding soils and replaced with compacted structural fill.

Any utilities present beneath the proposed construction will need to be located and rerouted as necessary and any abandoned pipes or utility conduits should be removed to inhibit the potential for subsurface erosion. Utility trench excavations should be backfilled with properly compacted structural fill in accordance with the structural fill recommendations in this report.

It should be noted that, due to the soft surficial soils observed in the west of the site, construction traffic on these upper soils may have a difficult time moving around on site. We recommend consideration be given to constructing haul roads depending on site conditions at the time of construction.

Subgrade Verification

Following site preparation as described above and compaction of the exposed subgrade prior to placing aggregate base for the foundations, building pad, or pavement section, the exposed subgrade should be evaluated. Subgrades should be evaluated by qualified True North personnel using a steel foundation probe or proofrolling. Unsuitable areas identified during the evaluation should be re-compacted or be excavated and replaced with imported granular structural fill.

Excavations

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document and subsequent updates were issued to better ensure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

Depending on the time of year, and the depth of the excavation, groundwater may be encountered at shallow depths. If groundwater is encountered during excavation, the soils encountered in our subsurface explorations should be classified as Type C soil according to the most recent OSHA regulations. If groundwater is not encountered or dewatering is accomplished in advance of excavation, the soils may be classified as Type B soil. In our opinion, excavations should be safely sloped or shored.

If groundwater is encountered during excavation, positive groundwater control will be required, including the possibility of wells extending below the depth of excavation. Groundwater levels will be lowest in the dry season, and construction during that time will minimize groundwater control problems. The groundwater conditions at the time of construction and the contractor’s ability to control these conditions will control the degree of inclination of temporary slopes. In our opinion, temporary excavation slopes can be constructed as steep as 1.5H:1V, if groundwater levels are maintained at least 2 feet below the bottom of the excavation. Slopes should be flattened if significant seepage or running soils are encountered.

If slopes of this inclination, or flatter, cannot be constructed, or if excavations greater than four feet in depth are required, temporary shoring may be necessary. This shoring would help protect against slope or excavation collapse and would provide protection to workmen in the excavation.

We are providing this information solely as a service to our client. True North does not assume responsibility for construction site safety or the contractor's compliance with local, state, and federal safety or other regulations.

Construction Dewatering

The results of our subsurface investigations indicate that the groundwater seepage at the site is located some 1 to 5 feet below the ground surface, and will fluctuate in response to seasonal precipitation. Excavations that extend below the groundwater level may result in caving, heaving, or running soils, especially if excavations extend into the sandy clay soils encountered in our explorations. The contractor should consider the use of a network of ditches and sumps, into which water can flow to be pumped out of the excavation.

The depth and dewatering time will need to be determined at the time of construction and adjusted depending on site conditions. Unprotected working should not be allowed near temporary un-shored excavations until groundwater levels have been stabilized and shoring, such as trench shields or bracing, has been installed.

Structural Fill

Structural fill should be granular, free of organics or other deleterious materials, have a maximum particle size less than 3 inches, be relatively well graded, and have a liquid limit less than 45 and plasticity index less than 25. In our professional opinion, we anticipate the surficial fine-grained soils stripped from this site may be used only in landscape areas. These soils are moisture sensitive and could be difficult (depending on time of year of construction) to properly moisture condition and place. As such, the contractor will need to account for the need to import material to raise site grades. We recommend crushed rock structural fill be placed beneath footings, slabs, or other structural elements to allow for uniform load distribution, to provide protection from the elements, and to create a clean working surface.

We recommend all structural fill be moisture conditioned to within 3 percentage points below and 2 percentage points above optimum moisture as determined by ASTM D1557 (modified proctor). If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying.

Fill should be placed in relatively uniform horizontal lifts on the prepared subgrade which has been stripped of deleterious materials (i.e. topsoil and fill) and approved by the Geotechnical Engineer or his representative. Each loose lift should be about 1-foot thick. The type of compaction equipment used will ultimately determine the maximum lift thickness. Structural fill should be compacted to at

least 95 percent of modified proctor maximum dry density as determined by ASTM D1557. Each lift of compacted engineered fill should be tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts.

Utility Trench Backfill

Trench backfill for the utility pipe base and pipe zone should consist of well-graded granular material with a maximum particle size of ¾ inch and less than 8 percent by weight passing the U.S. Standard No. 200 Sieve. The material should be free of roots, organic matter, and other unsuitable materials.

Trench backfill should be compacted to at least 90 percent of the maximum dry density at depths greater than 4 feet below finished grade and to 95 percent of the maximum dry density within 4 feet of finished grade. Compaction is based on ASTM D1557/AASHTO T-180, the modified proctor test, or as recommended by the pipe manufacturer.

Foundation Recommendations

Once the site has been properly prepared as discussed above, the planned construction can be supported on a conventional shallow foundation system. All foundations should bear on native, undisturbed, medium stiff silty/sandy clay, or atop compacted granular crushed rock structural fill placed atop the approved subgrade soils. Spread footings for building columns and continuous footings for bearing walls supported on the above-mentioned materials can be designed for an allowable soil bearing pressure of 2,000 psf based on dead load plus design live load and can be increased by one-third when including short-term wind or seismic loads. The above allowable soil bearing pressures can be increased by one-third when including short-term wind or seismic loads. Construction shall be accomplished in accordance with the 2021 International Building Code (IBC).

Lateral frictional resistance between the base of footings and the subgrade can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.33 for concrete foundations bearing directly on the subgrade soils described above or on compacted structural fill placed atop that strata. In addition, lateral loads may be resisted by passive earth pressures based on an equivalent fluid pressure of 250 pounds per cubic foot (pcf) for footings poured “neat” against the above-mentioned soil/rock strata. These are ultimate values—we recommend a factor of safety of 1.5 be applied to the equivalent fluid pressure, which is appropriate due to the amount of movement required to develop full passive resistance.

Exterior footings and foundations in unheated areas should be located at a depth of at least 18 inches below the final exterior grade to provide adequate frost protection. If the construction takes place during the winter months and the foundation soils will likely be subjected to freezing temperatures after foundation construction, then the foundation soils should be adequately protected from freezing. Otherwise, interior foundations can be located at nominal depths compatible with architectural and structural considerations.

The foundation excavations should be observed by a representative of the Geotechnical Engineer prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. Unsuitable soil zones encountered at the bottom of the foundation excavations should be removed and replaced with properly compacted structural fill as directed by the Geotechnical Engineer.

The fine-grained soils at this site are moisture sensitive. As such, they should be kept to as close to their in-situ moisture content. This should be accomplished during construction by covering the soil subgrade the same day it is exposed with crushed rock structural fill. Surface run-off water should be drained away from the excavations and not be allowed to pond.

Based on the known subsurface conditions we anticipate that properly designed and constructed foundations supported on the above-mentioned materials could experience maximum total settlement on the order of 1-inch and differential settlement on the order of 1/2-inch over 30 horizontal feet.

Granular Pads: Granular pads should be used if unsuitable foundation conditions are encountered at the proposed foundation subgrade elevations. Granular pads should extend 6 inches horizontally beyond the margins of the footings for each foot of the pad thickness or to the depth of firm, undisturbed native soil. The granular pads should be a minimum of 6 inches thick, however if embedded structures are encountered in the foundation areas, the embedded structure should be removed down to a minimum 24-inches below the base of footing, and granular pads should be thickened accordingly.

The granular pads should consist of ¾-inch minus crushed rock that is fairly well graded between coarse and fine, contains no organic matter or other deleterious materials, and has less than 5 percent passing the U.S. Standard No. 200 Sieve. The imported crushed rock should be compacted to not less than 92 percent of the maximum dry density, as determined by ASTM D 698.

Retaining Walls

We were not provided any construction drawings that would indicate if site retaining walls are necessary to complete the grading of the site. True North is available to provide a separate retaining wall design for any planned walls. We provide the following recommendations for use by the Structural Engineer in the event additional stem walls or other concrete structural walls are required for the homes.

The foundations for the proposed walls should be designed in accordance with foundation recommendations above. Lateral earth pressures on walls, which are not restrained at the top, may be calculated on the basis of an “active” equivalent fluid pressure of 40 pcf for level backfill, and 60 pcf for sloping backfill with a maximum 2H:1V slope. Lateral earth pressures on walls that are restrained from yielding at the top (i.e. stem walls) may be calculated on the basis of an “at-rest”

equivalent fluid pressure of 60 pcf for level backfill, and 90 pcf for sloping backfill with a maximum 2H:1V slope. The stated equivalent fluid pressures do not include surcharges, such as foundation, vehicle, equipment, etc., behind walls, hydrostatic pressure buildup, or earthquake loading.

For seismic loading on retaining walls with level backfill, new research indicates that the seismic load is to be applied at 1/3 H of the wall instead of 2/3 H, where H is the height of the wall. We recommend that a Mononobe-Okabe earthquake thrust per linear foot of 4.8 psf* H^2 be applied at 1/3 H, where H is the height of the wall measured in feet. For a maximum 2H:1V slope we recommend 6.6 psf*H^2. This assumes a combination of soil and granular backfill retained by the walls within the active wedge.

All backfill for retaining walls should be select granular material, such as sand or crushed rock with a maximum particle size between ¾ and 1 ½ inches, having less than 5 percent material passing the No. 200 sieve. Because of their silt content, the native soils do not meet this requirement, and it will be necessary to import material to the project for wall backfill. Silty soils can be used for the last 18 to 24 inches of backfill, thus acting as a seal to the granular backfill. All backfill behind retaining walls should be moisture conditioned to within ± 2 percent of optimum moisture content and compacted to a minimum of 90 percent of the material's maximum dry density as determined in accordance with ASTM D1557. Fill materials should be placed in layers that, when compacted, do not exceed about 8 inches. Care in the placement and compaction of fill behind retaining walls must be taken in order to ensure that undue lateral loads are not placed on the walls. An adequate subsurface drain system will need to be installed behind retaining walls to prevent hydrostatic buildup.

Slab-on-grade Floors

Support for lightly loaded floor slabs can be obtained on the undisturbed native soil or on engineered structural fill. A minimum 4-inch-thick layer of imported granular material should be placed and compacted over the prepared subgrade to assist as a capillary break and provide uniform load distribution.

A subgrade modulus of 150 pounds per cubic inch may be used to design floor slabs. Imported granular material should be crushed rock or crushed gravel and sand that is well-graded between coarse and fine, contain no deleterious materials, have a maximum particle size of 1½ inches, and have less than 5% by weight passing the U.S. Standard No. 200 Sieve. The imported granular material may be placed in one lift and should be compacted until well-keyed, about 95% of the maximum dry density as determined by ASTM D1557 (AASHTO T-180).

Pavement Recommendations

The following pavement recommendations are presented as preliminary for your consideration. We assume the roads which are to run through the development connecting N 82nd Avenue to the east and NE 28th Street to the north are classified by the City of Camas as “Local Streets”. These roads serve to distribute traffic from collectors and provide direct access for abutting properties. The City of Camas street construction details specify a minimum pavement thickness of 4 inches overlying

2 inches of crushed rock top course overlying 9 inches of crushed rock base course.

Below, we performed a preliminary analysis of the minimum design pavement section for the road noted above based on assumed traffic loading which includes residential traffic, through trips, and regular and miscellaneous heavy-vehicle traffic. The Civil Engineer for the project may have more traffic and project design data available than is presently known as well as more information regarding the County classification of the road noted above and may wish to modify and/or refine our pavement section thickness recommendations. We are available, upon request, to provide a more detailed pavement design if more definitive traffic information is available.

For analysis of the asphaltic concrete pavement section thickness design recommendations, we have assumed the following design parameters: a design life of approximately 20 years, a Terminal Serviceability Index (P_t) of 2 (i.e. poor condition), and a Regional Factor (R) of 3. We assumed an average of 1,184 trips of a passenger car in and out of the neighborhood per day (684 trips generated by residents and 500 miscellaneous through trips). We also assumed miscellaneous heavier traffic such as garbage trucks, school buses, and delivery vans/trucks. This assumed traffic loading results in 388 equivalent 18,000 pound equivalent single axle loads per day (ESALs). Additionally, we used an assumed CBR value of 3 for the existing medium stiff fine grained clayey soils. These parameters result in a required Structural Number of 3.03 for the new road. Based on these parameters, find that the standard pavement section consisting of 4 inches of Asphalt Concrete over 11 inches of aggregate base is anticipated to be sufficient for the local streets within the planned new subdivision and meets the City of Camas Engineering Standards for a two-lane Local Street, as outlined in the City of Camas Design Standards, Standard Detail ST2. Again, we are available to modify our recommendation if provided with more detailed pavement design traffic loadings and/or route classification.

We recommend the subgrade be proofrolled with a fully loaded tandem axle dump truck dump truck to confirm adequate subgrade conditions. It is possible that there will be areas that are observed to yield that will require correction prior to pavement construction (i.e. ripping wet subgrade soils with the teeth of a dozer to dry them out, and/or re-compacting soils that are soft).

We recommend the placement of a woven geotextile fabric (Mirafi HP270 or equivalent) over the native soil subgrade after it has been prepared and approved, to reduce the risk of contaminating the base course with the native fine-grained soil. Asphalt pavement base course material should consist of a well-graded 1½-inch or ¾-inch-minus crushed rock having less than 5 percent material passing the No. 200 sieve. The base course and asphaltic concrete materials should conform to the requirements set forth in the latest edition of the State of Washington, Standard Specifications for Highway Construction. Base course material should be moisture conditioned to within ± 2 percent of optimum moisture content, and compacted to a minimum of 95 percent of the material's maximum dry density as determined in accordance with ASTM D1557 (Modified Proctor). Fill materials should be placed in layers that, when compacted, do not exceed about 8 inches. Asphaltic

concrete material should be compacted to at least 91 percent of the material's theoretical maximum density as determined in accordance ASTM D2041 (Rice Specific Gravity).

In order to achieve the assumed 20 year design life, pavement requires regular maintenance to protect the underlying subgrade from being damaged. The primary concern is subgrade saturation which can cause it to weaken. Proper site drainage should be maintained to protect pavement areas. In addition, cracks that develop in the pavement should be sealed on a regular basis.

Drainage: Permanent, properly installed drainage is also an essential aspect of pavement design and construction. All paved areas should have positive drainage to prevent ponding of surface water and saturation of the base course. This is particularly important in cut sections or at low points within the paved areas, such as around stormwater catch basins. Effective means to prevent saturation of the base course including installing weep holes in the sidewalls to catch basins.

Geotextile Separation Fabric: A geotextile separation fabric will be required at the interface of the native soil and imported subgrade material beneath the proposed roadways. The separation fabric should meet the specificiation provided in WSS 9-33.2(1) – Geotextile Properties (Table 3) for soil separation. The geotextile should be installed in conformance with the specifications provided in WSS 2-12 – Construction Geosynthetic.

Stabilization Material: In the case of unsuitable or unstable pavement subgrade conditions, stabilization material consisting of pit- or quarry-run rock or crushed rock should be placed below the above-described pavement sections. The material should have a maximum particle size of 6-inches and less than 5 percent by dry weight passing the U.S. Standard No. 4 sieve, have at least two mechanically fractured faces, and be free or organic matter or other deleterious material. Material meeting the specification provided in WSS 9-27.3(6) – Stone is generally acceptable for use. Stabilization material should be placed in lifts between 12 and 18 inches thick and compacted to a firm condition with a smooth-drum roller without using vibratory action.

Drainage and Groundwater Considerations

The Contractor should be made responsible for temporary drainage of surface water and groundwater as necessary during construction to prevent standing water and/or erosion at the site.

As a matter of good construction practice, we recommend that perimeter drains be installed for all buildings. Perimeter drains should consist of perforated drainpipe embedded in a zone of free draining fill that is wrapped in a non-woven geotextile filter. The pipe should be connected to a tightline drainpipe leading to storm drain facilities. Foundation and crawl space drainage should be sloped to drain to a sump or low point drain outlet. Water should not be allowed to pond within crawl spaces. Roof drains should be connected to a tightline drainpipe leading to storm drain outlet facilities.

Water should not be allowed to collect in the foundation excavations or on prepared subgrades for the foundations/slabs/roadway during construction. Positive site drainage should be maintained throughout construction activities. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff.

The site grading plan should be developed to provide rapid drainage of surface water away from the building areas and to inhibit infiltration of surface water around the perimeter of the buildings and beneath the floor slabs. The grades should be sloped away from the building area. We anticipate stormwater will be routed to a stormwater management system to be constructed as part of this development.

Soil Erosion

Site-specific erosion control measures should be implemented to address the maintenance of slopes or exposed areas. This may include silt fence, bio-filter bags, straw wattles, or other suitable methods. During construction, all exposed areas should be well compacted and protected from erosion. Temporary slopes or exposed areas may be covered with straw, crushed aggregate, or rip in localized areas to minimize erosion.

CONSTRUCTION OBSERVATIONS

Satisfactory earthwork performance depends on the quality of construction. Sufficient monitoring of the contractor's activities is a key part ensuring that work is completed in accordance with the construction drawings and specifications. We recommend that True North observe that the subsurface conditions observed during our site investigation are consistent with those encountered during construction, and that foundation subgrades are suitable for placement of structural fill, rebar, or concrete for the new structures. True North cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundations if not engaged to also provide construction observation for this project.

The City of Camas will require a final letter of geotechnical compliance before they finalize a permit. If such a letter is required, a representative from True North MUST observe foundation subgrades PRIOR to concrete being poured for the foundation. If True North does not perform this observation, we cannot provide a final letter of geotechnical compliance, and a permit will not be eligible for final sign-off. It is the owner's responsibility to ensure that True North be notified in a timely manner (i.e., at least 48 hours prior to the required observation) of the need for our services during construction.

LIMITATIONS

This report was prepared for the exclusive use of Pacific Lifestyle Homes and members of the design team for specific application to the Landing at Green Mountain Phase 2 development located at the address noted above. It should be made available to prospective contractors for information on the factual data only, and not as a warranty of subsurface conditions such as those interpreted

from the explorations and presented in the discussions of the subsurface conditions included in this report.

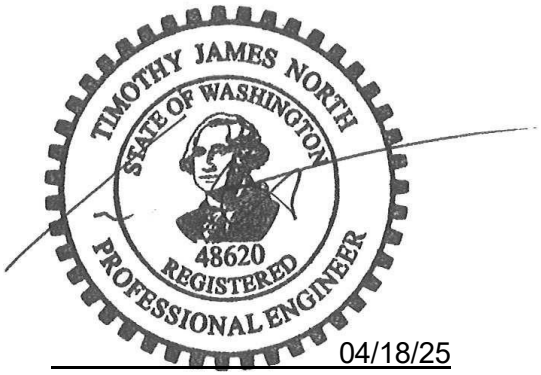
The recommendations contained in this report are based on information derived through subsurface sampling. No matter how effective subsurface sampling may be, variations between exploration location and the presence of unsuitable materials are possible and cannot be determined until exposed during construction. Accordingly, True North's recommendations can be finalized only through True North's observation of the project's earthwork construction. True North accepts no responsibility or liability for any party's reliance on True North's preliminary recommendations.

Within the limitations of the scope, schedule and budget, the analyses, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice in this area at the time this report was prepared. We make no warranty, either express or implied.

CLOSING

We appreciate the opportunity to be of service to you. If you have any questions, or if we can be of further assistance to you, please contact us at (360) 984-6584.

Respectfully Submitted,



04/18/25

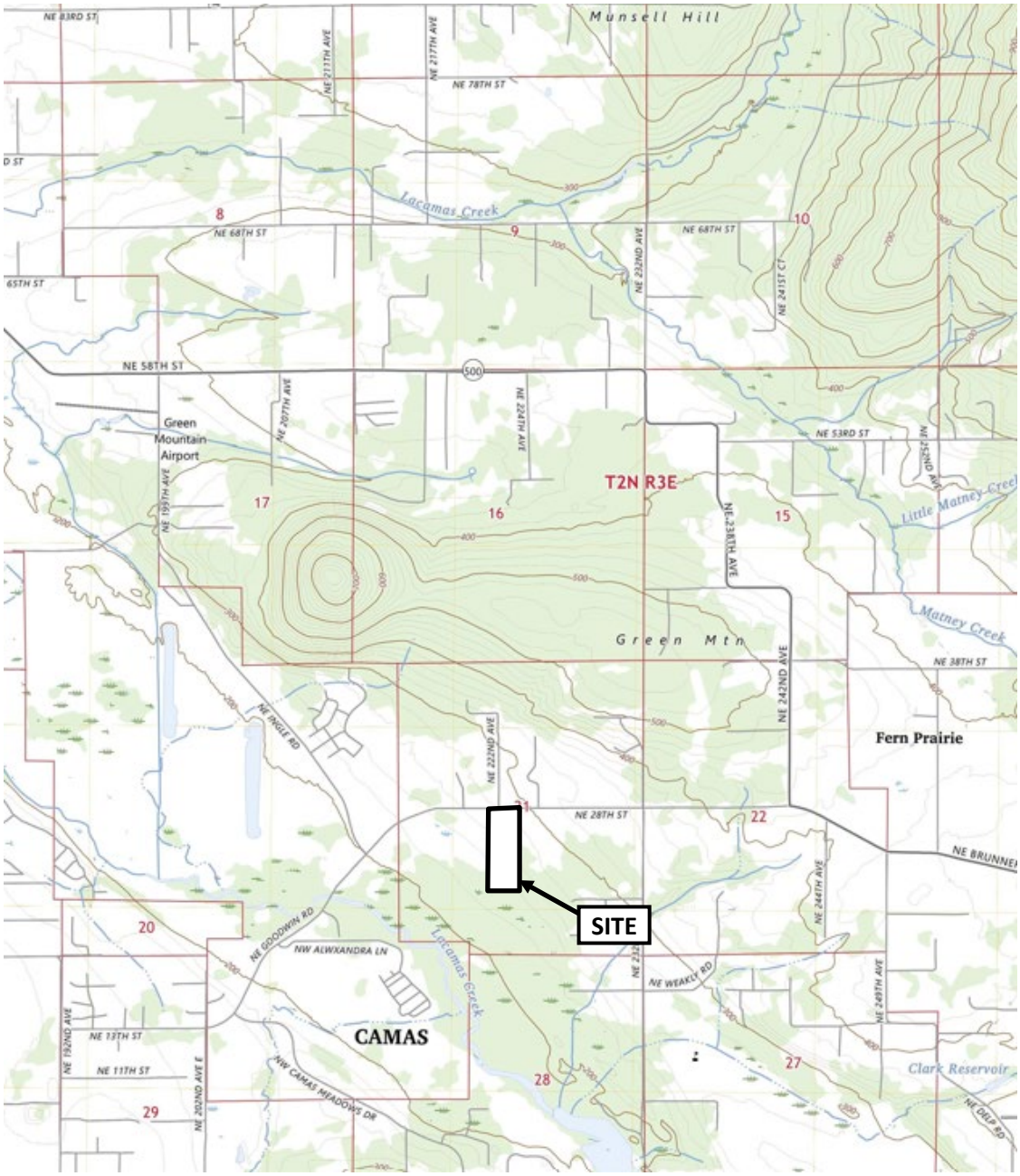
Timothy J. North, P.E.
Principal Geotechnical Engineer

Reviewed By:

Lauren Shepherd, E.I.T.
Staff Geotechnical Engineer

Attachment: Figure 1 – Site Vicinity
Figure 2 – Site Layout and Explorations
Figure 3 – Site Photographs
Appendix A – Field Exploration Methods, Lab Testing Procedures, Exploration Logs

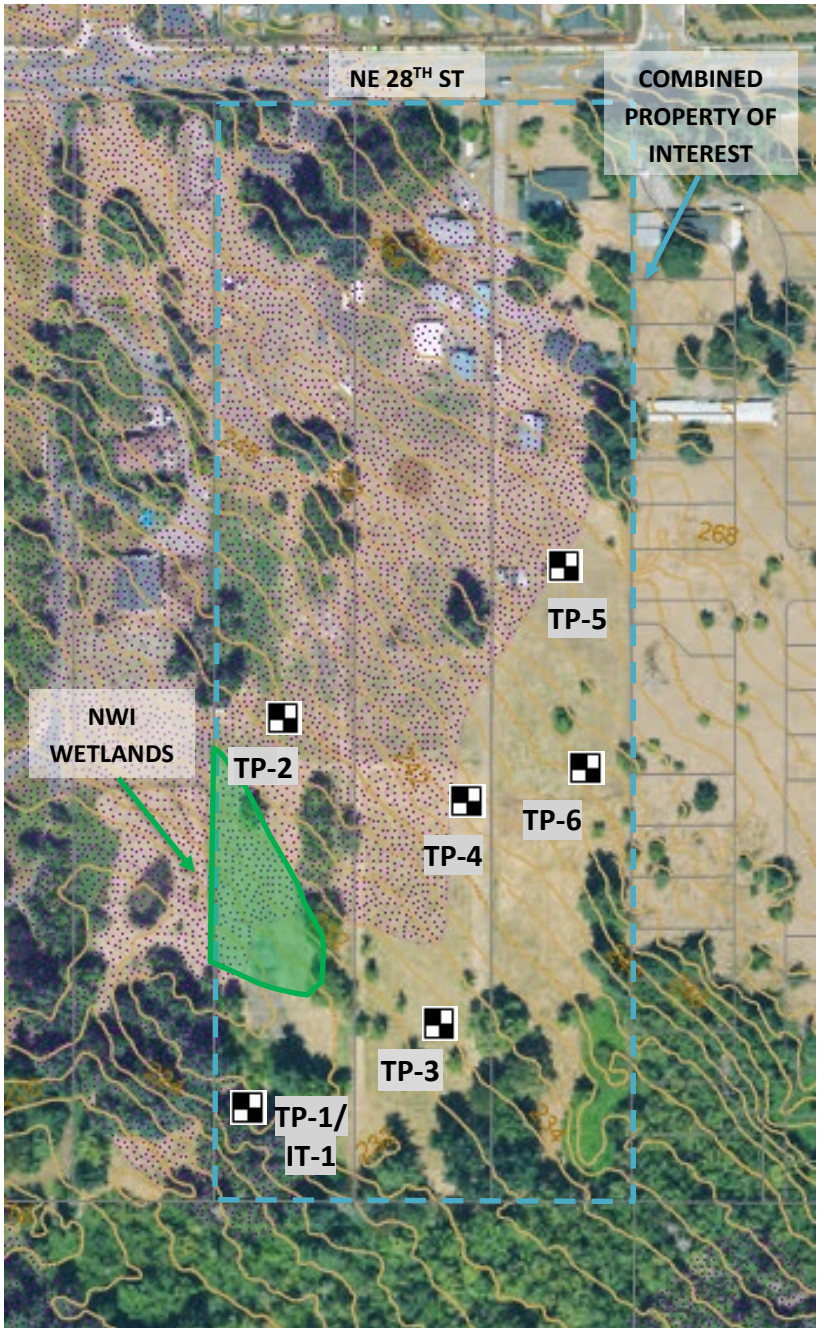
FIGURES



Not to Scale

Source: "Topographic Map of the Lacamas Creek Quadrangle, 7.5 minute series" 2023, United States Geological Survey (USGS).

TRUE NORTH GEOTECHNICAL	Pacific Lifestyle Homes Landing at Green Mountain Ph 2 Camas, Washington	Project # 24-0431-2
219 West 4th Street Vancouver, WA 98660 360-984-6584	April 2025	Figure 1 – Vicinity Map



Scale:
1" ≈ 200'

TP-1 Approximate Exploratory Test Pit Locations, December 16, 2024, and March 21, 2025.

Note: Purple shading indicates hydric soils.

Source: Aerial & Topo – Clark County MapsOnline, accessed January 6, 2025.

TRUE NORTH GEOTECHNICAL	Pacific Lifestyle Homes Landing at Green Mountain Ph 2 Camas, Washington	Project # 24-0431-2
219 West 4th Street Vancouver, WA 98660 360-984-6584	March 2025	Figure 2 – Site & Exploration Plan

Photo 1. From the approximate location of TP-2, looking south at the location of TP-1

Photo 2. From the approximate location of TP-2, looking east across the combined properties

TRUE NORTH GEOTECHNICAL	Pacific Lifestyle Homes Landing at Green Mountain Ph 2 Camas, Washington	Project # 24-0431-2
219 West 4th Street Vancouver, WA 98660 360-984-6584	April 2025	Figure 3A – Site Photographs (1 of 4)

Photo 3. From the approximate center of the eastern lot, looking southwest

Photo 4. From the approximate center of the center lot, looking north at the existing structures on the lots.

TRUE NORTH GEOTECHNICAL	Pacific Lifestyle Homes Landing at Green Mountain Ph 2 Camas, Washington	Project # 24-0431-2
219 West 4th Street Vancouver, WA 98660 360-984-6584	April 2025	Figure 3B – Site Photographs (2 of 4)

Photo 1. TP-6 in progress, looking northwest

Photo 2. TP-6 in progress, looking west

TRUE NORTH GEOTECHNICAL	Pacific Lifestyle Homes Landing at Green Mountain Ph 2 Camas, Washington	Project # 24-0431-2
219 West 4th Street Vancouver, WA 98660 360-984-6584	April 2025	Figure 3C – Site Photographs (3 of 4)

Photo 3. TP-5 in progress, looking southeast

Photo 4. Existing structures on the eastern lot, looking north.

TRUE NORTH GEOTECHNICAL	Pacific Lifestyle Homes Landing at Green Mountain Ph 2 Camas, Washington	Project # 24-0431-2
219 West 4th Street Vancouver, WA 98660 360-984-6584	April 2025	Figure 3D – Site Photographs (4 of 4)

APPENDIX A

Field Exploration Procedures
Laboratory Testing Procedures
Test Pit Logs

FIELD EXPLORATION PROCEDURES

General

We excavated a total of 26test pits (TP-1 and TP-6) to depths ranging between 8 and 10 feet below existing ground surface (bgs) across the proposed development area. The excavations were advanced utilizing a Link-Belt 80 X3 with a 30-inch wide toothed bucket subcontracted from Thompson Brothers Excavating. Soil samples were collected from the major strata encountered in each test pit and at the bottom of each infiltration test pit location The approximate exploration locations are shown in Figure 2.

Soil Sampling

Representative grab samples of the soil observed in the explorations were obtained from the sidewalls or spoils. Samples obtained in the exploration were sealed in airtight, plastic bags to retain moisture and returned to our laboratory for additional examination and testing. The test explorations were loosely backfilled.

Pocket Penetrometer Testing

The undrained shear strength of fine-grained soil (silt and clay) was estimated with a pocket penetrometer applied to the sidewalls of the test pits. A pocket penetrometer is a hand-held device that indicates undrained compressive strength in tons per square foot. The test method is approximate and applicable only to fine-grained soil.

Field Classification

Soil samples were initially classified visually in the field. Consistency, color, relative moisture, degree of plasticity, peculiar odors, and other distinguishing characteristics of the soil samples were noted. The terminology used is described in the key and glossary that follow.

Summary Exploration Logs

Results from the explorations are shown in the summary exploration logs. The left-hand portion of a log provides our interpretation of the soil encountered, sample depths, and groundwater information. The right-hand, graphic portion of a log shows the results of pocket penetrometer and laboratory testing. Soil descriptions and interfaces between soil types shown in summary logs are interpretive, and actual transitions may be gradual.

LABORATORY TESTING PROCEDURES

Soil samples obtained during field explorations are examined in our laboratory, and representative samples may be selected for further testing.

Visual-Manual Classification

Soil samples are classified in general accordance with guidelines presented in ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). The physical characteristics of the samples are noted and the field classifications are modified, where necessary, in accordance with ASTM terminology, though certain terminology that incorporates

current local engineering practice may be used. The term which best described the major portion of the sample is used to describe the soil type.'

Natural Moisture Content

Natural moisture content is determined in general accordance with guidelines presented in ASTM D2216, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass. The natural moisture content is the ratio, expressed as a percentage, of the weight of water in a given amount of soil to the weight of solid particles.

Fines Content

Fines content testing is performed in general accordance with guidelines presented in ASTM D1140, *Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No.200) Sieve in Soils by Washing*. The fines content is the fraction of soil that passes the U.S. Standard Number 200 Sieve. This sieve differentiates fines (silt and clay) from sand and gravel. Soil material that remains on the Number 200 sieve is sand. Material that passes the sieve is fines. The test is used to refine soil type.

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TABLE A1
Key to Exploration Logs - Terminology and Symbols

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTION
			GRAPHIC	GROUP	
Coarse Grained Soils: More Than 50% Material Retained on No. 200 Sieve	Gravel and Gravelly Soils: More Than 50% Coarse Fraction Retained on No. 4 Sieve	Clean Gravels (Little or No Fines)		GW	Well-graded Gravels, Gravel-Sand Mixtures, Little or No Fines
				GP	Poorly-graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		Gravels with Fines (Significant Percentage of FIne)		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sand and Sandy Soils: More Than 50% Coarse Fraction Passing No. 4 Sieve	Clean Sands (Little or No Fines)		SW	Well-graded Sands, Gravelly Sands, Little or No Fines
				SP	Poorly-graded Sands, Gravelly Sands, Little or No Fines
		Sands with Fines (Significant Percentage of FIne)		SM	Silty Sands, Sand-Silt Mixtures
				SC	Clayey Sands, Sand-Clay Mixtures
Fine Grained Soils: More Than 50% Material Passing No. 200 Sieve	Silts and Clays	Liquid Limit Less than 50 percent		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty-Clayey Fine Sands, Clayey Silts
				CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays
				OL	Organic Silts and Organic Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit Greater than 50 percent		MH	Inorganic Silts Micaceous or Diatomaceous Fine Sand or Silty Soils
				CH	Inorganic Clays of High Plasticity, Fat Clays
				OH	Organic Clays of Medium to High Plasticity, Organic Silts
Topsoil				TS	Topsoil, Humus, Duff or Peat (PT) Layers
Fill				F	Highly Variable Constituents
Bedrock				BR	Basalt, Sandstone, Shale, etc.

Relative Density of Coarse-Grained Soils	
Relative Density	**N - Blows per Foot**
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50+

▼	Observed Groundwater Elevation

Consistency of Fine-Grained Soils	
Relative Density	**N - Blows per Foot**
Very Soft	0 - 2
Soft	2 - 4
Medium Stiff	4 -8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	30 - 50
Very Hard	50+

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Geotechnical Log - Test Pit

TP-1

UTM	: 10T	Excavator	: Link-Belt	Job Number	: 24-0431-2
Latitude	: 45.63994	Excavator Supplier	: Thompson Brothers Excavating	Client	: Pacific Lifestyle Homes
Longitude	: -122.44693	Logged By	: LS	Project	: Landing at Green Mountain - Phase II
Ground Elevation	: 224 (ft)	Reviewed By	: TJN	Location	: 22007 NE 28th St, Camas, WA 98607, USA
Total Depth	: 8 ft BGL	Date	: 12/16/2024	Loc Comment	:

Depth (ft)	Sample No.	Graphic Log	USCS Symbol	Soil Description	Water Content (%)	Fines Content (%)	Pocket Pen (TSF)	Notes
1			CL-ML	Soft, dark brown, SILTY CLAY; rooted to 1 foot bgs; very moist.			0.5	
2	S1				24		0.75	
3							1.75	
4			CL-ML	As above, but soft to medium stiff, dark brown with red mottling, wet.				
5			SM	Medium dense, gray brown, SILTY SAND WITH GRAVEL; decreasing fines content with depth; wet.				
6	S2				31	41		Infiltration testing attempted at 5.5 feet bgs
	S3				33	30		
7								
	S4				31	36		
				Terminated due to refusal on boulders. Groundwater first encountered at 3.5 feet bgs. Test pit backfilled with excavated soils and tamped to grade.				

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Geotechnical Log - Test Pit

TP-2

UTM	: 10T	**Excavator**	: Link-Belt	**Job Number**	: 24-0431-2
Latitude	: 45.64119	**Excavator Supplier**	: Thompson Brothers Excavating	**Client**	: Pacific Lifestyle Homes
Longitude	: -122.44682	**Logged By**	: LS	**Project**	: Landing at Green Mountain - Phase II
Ground Elevation	: 240 (ft)	**Reviewed By**	: TJN	**Location**	: 22007 NE 28th St, Camas, WA 98607, USA
Total Depth	: 8 ft BGL	**Date**	: 12/16/2024	**Loc Comment**	:

Depth (ft)	Sample No.	Graphic Log	USCS Symbol	Soil Description	Water Content (%)	Fines Content (%)	Pocket Pen (TSF)	Notes
1	S1		OL	Soft, gray, ORGANIC CLAY; wet.	39		0.5	
2 (▼)			SC	Soft to medium stiff, gray brown with red mottling, SANDY CLAY; wet.			0.5	
3							2.5	
4	S2				36	52		
5			SM	Medium dense, brown with red mottling, SILTY SAND; increasingly coarse with depth; wet.			3.75	
6	S3				33	33		
7								
	S4				32			
				Terminated due to refusal on boulders. Groundwater first encountered at 2 feet bgs. Test pit backfilled with excavated soils and tamped to grade.				

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Geotechnical Log - Test Pit

TP-3

UTM	: 10T	Excavator	: Link-Belt	Job Number	: 24-0431-2
Latitude	: 45.64000	Excavator Supplier	: Thompson Brothers Excavating	Client	: Pacific Lifestyle Homes
Longitude	: -122.44616	Logged By	: LS	Project	: Landing at Green Mountain - Phase II
Ground Elevation	: 234 (ft)	Reviewed By	: TJN	Location	: 22007 NE 28th St, Camas, WA 98607, USA
Total Depth	: 10 ft BGL	Date	: 12/16/2024	Loc Comment	:

Depth (ft)	Sample No.	Graphic Log	USCS Symbol	Soil Description	Water Content (%)	Fines Content (%)	Pocket Pen (TSF)	Notes
0			ML	Soft, dark brown, SILT, some clay; very moist.				
1							0.5	
2			CL-ML	Soft, brown with red mottling, SILTY CLAY WITH SAND; wet.				
	S1				27		0.5	
▼								
3	S2		SC	Soft to medium stiff, brown with red mottling, SANDY CLAY WITH GRAVEL; wet.	32	56	1.0	
4							3.0	
5								
6								
7			SP	Medium dense, gray with red mottling, POORLY GRADED SAND; increasingly coarse with depth; wet.				
8	S3				37			
9								
	S4				37			

Groundwater first encountered at 2.5 feet bgs. Test pit backfilled with excavated soils and tamped to grade.

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Geotechnical Log - Test Pit

TP-4

UTM	: 10T	**Excavator**	: Link-Belt	**Job Number**	: 24-0431-2
Latitude	: 45.64097	**Excavator Supplier**	: Thompson Brothers Excavating	**Client**	: Pacific Lifestyle Homes
Longitude	: -122.44581	**Logged By**	: LS	**Project**	: Landing at Green Mountain - Phase II
Ground Elevation	: 246 (ft)	**Reviewed By**	: TJN	**Location**	: 22007 NE 28th St, Camas, WA 98607, USA
Total Depth	: 9 ft BGL	**Date**	: 12/16/2024	**Loc Comment**	:

Depth (ft)	Sample No.	Graphic Log	USCS Symbol	Soil Description	Water Content (%)	Fines Content (%)	Pocket Pen (TSF)	Notes
1			ML	Soft, dark brown, SILT, some clay; very moist.			0.5	
2				Soft to medium stiff, brown, SILTY CLAY; wet to very moist.			0.5	
3	S1		CL-ML		31	55	1.75	
4							2.25	
5	S2		SP	Gray-brown, POORLY GRADED SAND WITH GRAVEL; medium sized gravel; medium to coarse grained sand; wet.	33			
6								
7								
8	S3				46			
				Groundwater first encountered at 3.5 feet bgs. Test pit backfilled with excavated soils and tamped to grade.				

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Geotechnical Log - Test Pit

TP-5

UTM	: 10T	Excavator	: Link-Belt	Job Number	: 24-0431-2
Latitude	: 45.64172	Excavator Supplier	: Thompson Brothers Excavating	Client	: Pacific Lifestyle Homes
Longitude	: -122.44533	Logged By	: LS	Project	: Landing at Green Mountain - Phase II
Ground Elevation	: 253.58 (ft)	Reviewed By	: TJN	Location	: 22007 NE 28th St, Camas, WA 98607, USA
Total Depth	: 9.5 ft BGL	Date	: 03/21/2025	Loc Comment	:

Depth (ft)	Sample No.	Graphic Log	USCS Symbol	Soil Description	Water Content (%)	Fines Content (%)	Pocket Pen (TSF)	Notes
1			ML	Soft, dark brown, SILT; heavily rooted to 0.5 feet bgs; moist.				
2			SC	Soft to medium stiff, brown with gray and red mottling, Sandy CLAY; moist to wet.				
3 ▼	S1				35	68		
4								
5								
6								
7	S2		SM	Dense, brown with gray and red mottling, Silty SAND with cobbles and boulders; boulders up to 14 inches in diameter; moist to wet.	29	47		
8								
9	S3		GP-GC	Very dense, yellow brown, GRAVEL with Clay (weathered bedrock); moist to wet.	41			
				TP-5 Terminated at 9.5ft (Groundwater encountered at 3 feet bgs. Test pit backfilled with excavated soils and tamped to grade.)				

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Geotechnical Log - Test Pit

TP-6

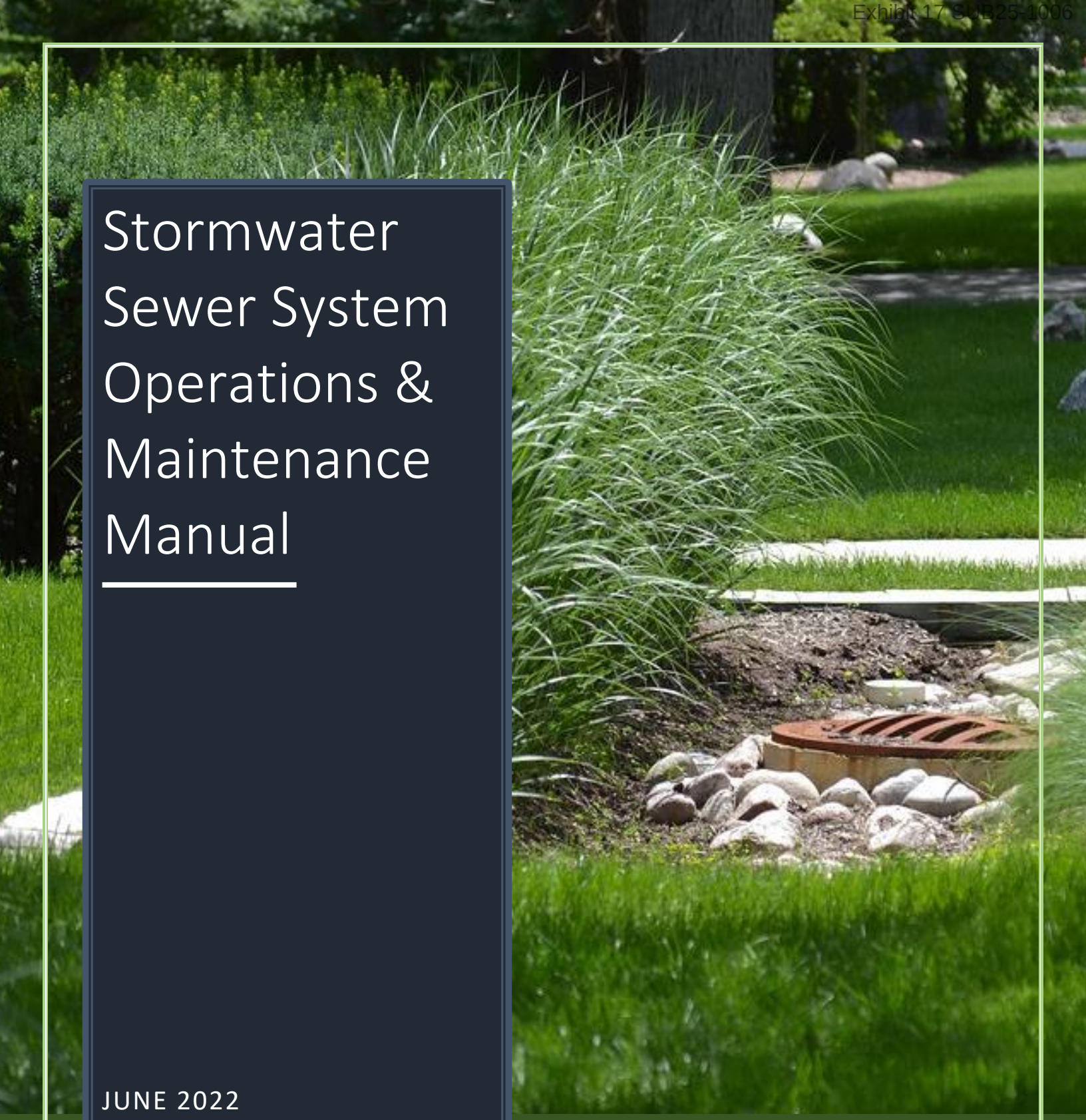
UTM	: 10T	Excavator	: Link-Belt	Job Number	: 24-0431-2
Latitude	: 45.64090	Excavator Supplier	: Thompson Brothers Excavating	Client	: Pacific Lifestyle Homes
Longitude	: -122.44529	Logged By	: LS	Project	: Landing at Green Mountain - Phase II
Ground Elevation	: 245.31 (ft)	Reviewed By	: TJN	Location	: 22007 NE 28th St, Camas, WA 98607, USA
Total Depth	: 8 ft BGL	Date	: 03/21/2025	Loc Comment	:

Depth (ft)	Sample No.	Graphic Log	USCS Symbol	Soil Description	Water Content (%)	Fines Content (%)	Pocket Pen (TSF)	Notes
1–2			ML	Soft, dark brown, SILT; heavily rooted to 0.75 feet bgs; moist.				
2–3	S1		GM	Dense, gray brown, Silty GRAVEL; slightly moist to moist.	45			
3–6			GM	Dense, gray brown, Silty GRAVEL; slightly moist to moist.				
6–7	S2		GM	Dense, gray brown, Silty GRAVEL; slightly moist to moist.	36	49		
7–8	S3		SC	Very dense, yellow gray, Clayey SAND with cobbles and boulders (weathered bedrock); moist to dry.	54			

TP-6 refusal at 8ft (Refusal at 8 feet bgs due to practical equipment failure. Groundwater not encountered. Test pit backfilled with excavated soils and tamped to grade.)

APPENDIX D

Operations and Maintenance Manual



Stormwater Sewer System Operations & Maintenance Manual

JUNE 2022

City of Camas
Stormwater Division | Public Works

City of Camas WASHINGTON

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Table of Contents

Introduction

Background

All public and privately owned, roads, parking lots, residential developments, commercial or industrial developments, or school facilities have various components that make up a storm system. These components consist of conveyance pipes, catch basins, manholes, roadside ditches, stormwater facilities (such as bioswales, detention ponds, wet ponds, treatment filters, etc.), landscaping and any other structure that collects, conveys, controls, and/or treats stormwater. Regardless of the component, all storm systems eventually discharge into 'waters of the state' which are streams, rivers, lakes, and wetlands.

Under the Federal Clean Water Act (FCWA) and in compliance with the Department of Ecology's NPDES Phase II Permit, 'waters of the state' are to be protected from contamination. This in turn protects threatened and endangered species under the Federal Endangered Species Act (FESA).

One way to protect 'waters of the state' is to provide the proper maintenance of all storm system components. It is the responsibility of the City of Camas (City) to ensure that all components of the public storm system be properly maintained and operated. The City is responsible for those components that are located within the City's right-of-way, such as the conveyance pipes, manholes, catch basins, roadside ditches, and stormwater facilities. A large part of the stormwater facilities in the City are privately owned and maintained by the property owners. These property owners include, but are not limited to, Homeowners Associations (HOAs), school district, businesses, and commercial/industrial site owners.

Purpose

This manual is intended to help, both public and private stormwater facility maintenance operators, meet the requirements of City Municipal Code 14.02.090 for proper maintenance and operation of the various storm system components. Proper maintenance will help to assure that:

- Stormwater facilities operate as they were designed;
- Storm systems are cleaned of the pollutants that they trap, such as sediment and oils, so that storm systems are not overwhelmed and become pollutant sources;
- Pollutant sources are removed, or minimized, prior to entering the storm system.

Along with keeping a site from flooding, properly maintained storm system can help reduce surface water and groundwater pollution. Most sites have some type of stormwater control component designed to limit the environmental and flooding damage caused by stormwater runoff. These components require more labor intensive maintenance than a system of pipes and catch basins.

Manual Layout

This manual is broken out into various best management practice (BMP) maintenance components. For each BMP maintenance component, this manual will:

- Briefly describe the component type, e.g. facility or activity.
- Describes potential maintenance issues and/or problems.
- Describes conditions when maintenance is required.
- Minimum performance standards and suggested maintenance methods.

Additional information may be found in other manuals, such as the Washington Department of Ecology's *Stormwater Management Manual for Western Washington (SWMMWW), Vols. V*, and Ecology's LID manual.

Inspection of a stormwater facility will determine if conditions require a maintenance action. The maintenance standard is not the required condition at all times. Exceeding a condition, between inspections and/or maintenance, does not automatically constitute a violation of these standards. The inspection and maintenance schedules should be adjusted to minimize the length of time that a facility is in a condition that requires maintenance.

Emergent Treatment Technologies

Some stormwater treatment facilities are designed and installed with emerging technologies that are not standard at the time of their installation. If not found in this manual, a treatment facility may be an emerging technology approved by Washington Department of Ecology; the maintenance standards can be found at Emerging Stormwater Treatment Technologies.

Mosquito Control

Mosquitoes are annoying and sometimes pose a serious risk to public health. They can transmit diseases such as West Nile Virus and equine encephalitis. Above-ground stormwater facilities should be designed to allow water to flow through or infiltrate in less than 48 hours. Presence of mosquitos in a stormwater facility may indicate a clogged outlet, compromised infiltration capacity, or other defect that should trigger inspection and may require maintenance.

If mosquitos are identified during a stormwater facility maintenance or inspection and are a concern, a request to the Clark County Mosquito Control District for service or information regarding mosquito control can be made online at Mosquito Control District or at the 24-hour request line, 360-397-8430.

Material Disposal and Spills

The disposal of waste, e.g. sediment or standing water, from the maintenance of the stormwater facilities and storm system components shall be conducted in accordance with federal, state, and local regulations, including the Solid Waste Handling Standards chapter 173-350 WAC, Minimum Functional Standards for Solid

Waste Handling chapter 173-304 WAC and Appendix IV-B: Management of Street Waste Solids and Liquids of the SWMMWW. Dangerous waste must be handled following, Dangerous Waste Regulations chapter 173-303 WAC. Vegetation to be recycled and disposed of at local receptacle locations.

For major spills, coordinate removal/cleanup with the City at 360-817-1563 and notify Department of Ecology at 360-407-6300.

Vegetated Facilities

Biofiltration Swale

Biofiltration swales use grass or other dense vegetation to filter sediment and oily materials out of stormwater. Usually, they look like flat-bottomed channels with grass growing in them. As water passes through the vegetation, pollutants are removed through the effects of filtration, infiltration and settling.

See SWMMWW Appendix V-A, Table V-A.8 for biofiltration swale maintenance standards. If available, reference record drawings for seed mix and groundcover replacements, or see SWMMWW BMP T9.10, Tables V-7.3 and V-7.4. Presence of cattails is a sign that that there is water ponding and the facility is not functioning as design. Cattails will need to be removed and further investigation may be required.

Wet Biofiltration Swale

A wet biofiltration swale is a variation of basic biofiltration swale for use where the centerline slope is slight, groundwater table are high, or a continuous low base flow is likely to result in wet soil conditions for long periods of time. Where continuously wet soil exceeds about 2 weeks, typically grasses will die. Thus, vegetation specifically adapted to wet soil conditions is needed. Different vegetation requires modification of several of the design and maintenance requirements from the basic biofiltration swale.

See SWMMWW Appendix V-A, Table V-A.9 for wet biofiltration swale maintenance standards. If available, reference record drawings for seed mix and groundcover replacements, or see SWMMWW BMP T9.20, Table V-7.5. Removal of cattail is required when vegetation is crowded out by very dense clumps of cattails, prevents water flow, or alters the designed functionality.

Filter Strip

Filter strips are linear strips of grass that remove sediment and oils from stormwater by filtering it. Stormwater is treated as it sheet flows across the filter strip. Usually, filter strips are placed along the edge of linear paved areas, such as parking lots and roads. Where designed filter strips are installed; road shoulders should only be graded to maintain level flow off the road.

See SWMMWW Appendix V-A, Table V-A.10 for filter strip maintenance standards. If available, reference record drawings for seed mix replacement, or see SWMMWW BMP T9.10, Table V-7.3.

Detention Pond

Detention pond facilities are designed to hold and slowly release stormwater by use of a pond with a specially designed control structure. Styles vary greatly from well-manicured to natural appearing. Generally, native vegetation is preferred for reduced maintenance and enhance wildlife habitat. Some facilities are designed to appear as natural water bodies or are in a park-like setting.

See SWMMWW Appendix V-A, Table V-A.1 for detention pond maintenance standards. If available, reference record drawings for seed mix replacement, or see SWMMWW BMP D.1, Table V-12.3. Removal of cattail is required when vegetation is crowded out by very dense clumps of cattails, prevents water flow, or alters the designed functionality.

Wet Pond

A wet pond is an open basin that retains a permanent pool of water year-round or only during the wet season. The volume of the wet pond allows sediment and other pollutants to settle out of the runoff. Wetland vegetation is typically planted within the wet pond to provide additional treatment through nutrient removal. Detention quantity control can be provided with additional temporary storage volume above the permanent pool elevation.

See SWMMWW Appendix V-A, Table V-A.11 for wet pond maintenance standards. If available, reference record drawings for seed mix and plants replacement, or see SWMMWW BMP D.1, Table V-12.3 for seed mix and BMP T10.10, Table V-8.1 for plants. Removal of cattail is required when vegetation is crowded out by very dense clumps of cattails, prevents water flow, or alters the designed functionality.

Infiltration Facility

Infiltration facilities dispose of water by holding it in an area where it can soak into the ground. These are open facilities that may either drain rapidly and have grass bases or have perpetual ponds where water levels rise and fall with stormwater flows. Infiltration facilities may be designed to handle all of the runoff from an area or they may overflow and bypass larger storms.

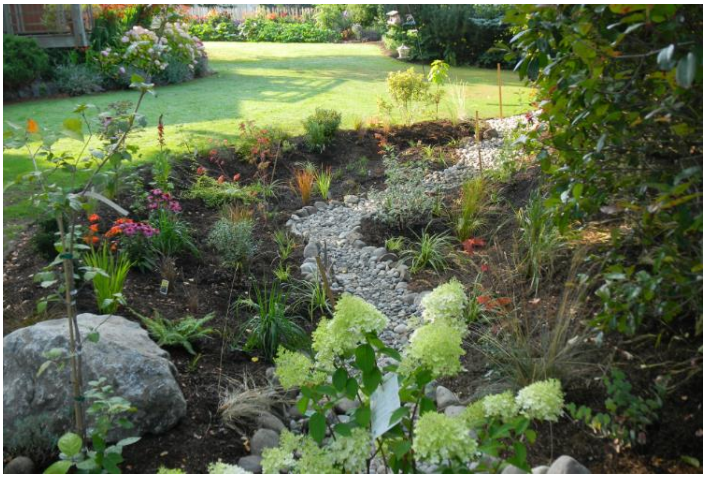
Since the facility is designed to pass water into the ground, generally after passing through a sediment trap/manhole, anything that can cause the base to clog will reduce the performance and is a large concern. Generally, infiltration basins are managed like detention ponds, but with greater emphasis on maintaining the capacity to infiltrate stormwater.

See SWMMWW Appendix V-A, Table V-A.2 for infiltration facility maintenance standards. If available, reference record drawings for seed mix replacement, or see SWMMWW BMP D.1, Table V-12.3. Removal of cattail is required when vegetation is crowded out by very dense clumps of cattails, prevents water flow, or alters the designed functionality.

Rain Garden

Rain gardens are non-engineered, shallow, landscaped depressions with compost-amended soils and adapted plants. The depression temporarily stores stormwater runoff from adjacent areas. Some or all the influent stormwater passes through the amended soil profile and into the underlying native soil. Stormwater that exceeds the storage capacity is designed to overflow to an adjacent drainage system.

If available, reference record drawings for plant replacements, or see Rain Garden Handbook for Western Washington, Appendix A for recommendation on rain garden plants. Presence of cattails is a sign that that there is water ponding and the facility is not functioning as design. Cattails will need to be removed and further investigation may be required.



Rain Garden			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Trash and Debris	Evidence of trash and debris	Remove trash and debris
Side slopes	Erosion	Persistent soil erosion on slopes	Replenish mulch areas throughout rain garden - on the sides and bottom of the rain garden and around the perimeter (and on berm if applicable).
Bottom area	Sediment	Visible sediment that reduces drainage rate	Remove sediment accumulation
		Sediment deposited from water entering the rain garden	Remove sediment, determine the source, and stabilize area
	Leaves	Matted accumulation of leaves reducing drainage rate	Remove leaves
Ponded water	Ponding	Ponded water remains for more than 3 days after the end of a storm	Remove sediment, leaf litter and/or debris accumulation
Pipe inlet/outlet	Pipe	Water is backing up in pipe	Clear pipes of sediment and debris with snake and/or flush with water
		Damaged or cracked drain pipes	Repair or seal cracks, or replace as needed
Inlet rock pad	Erosion	Rock or cobble is removed, missing and flow is eroding soil.	Replace rock and reestablish pad
Weeds	Weeds	Weeds are present	Remove weeds and apply mulch after weeding
Vegetation	Dying Vegetation	Dying, dead or unhealthy plants	Remove diseased plants or plant parts and dispose, then replace
	Sight Distance	Vegetation reduces sight distances and sidewalk	Keep sidewalks and sight distances on roadways clear
	Blockage	Vegetation is crowding inlets and outlets	Remove vegetation crowding inlets and outlets
	Poor Vegetation Growth	Yellowing, poor growth, poor flowering, spotting or curled leaves, weak roofs, or stems	Test soil to identify specific nutrient deficiencies.
			Do not use synthetic fertilizers
			Consider selecting different plant for soil conditions
Mulch	Bare Soil	Bare spots are present or mulch depth less than 2 inches	Supplement mulch with hand tools to a depth of 2 to 3 inches, keep mulch away from woody stems.

Bioretention

Bioretention facilities are engineered facilities that store and treat stormwater by filtering it through a specified soil profile. Water that enters the facility ponds in an earthen depression or other basin (e.g., concrete planter) before it infiltrates into the underlaying bioretention soil. Stormwater that exceeds the surface storage capacity overflow to an adjacent drainage system. Treated water is either infiltrated into the underlying native soil or collected by an underdrain and discharged. An underdrain system can be comprised of perforated or slotted pipe, wrapped in an aggregate blanket.

See SWMMWW Appendix V-A, Table V-A.21 for bioretention maintenance standards. If available, reference record drawings for plant replacements, or see LID Technical Guidance Manual for Puget Sound, Appendix 1 for plant recommendations. Presence of cattails is a sign that that there is water ponding and the facility is not functioning as design. Cattails will need to be removed and further investigation may be required.

Conveyance Ditch

Ditches are often manmade open-channels that convey stormwater runoff. These ditches are maintained to prevent localized flooding.

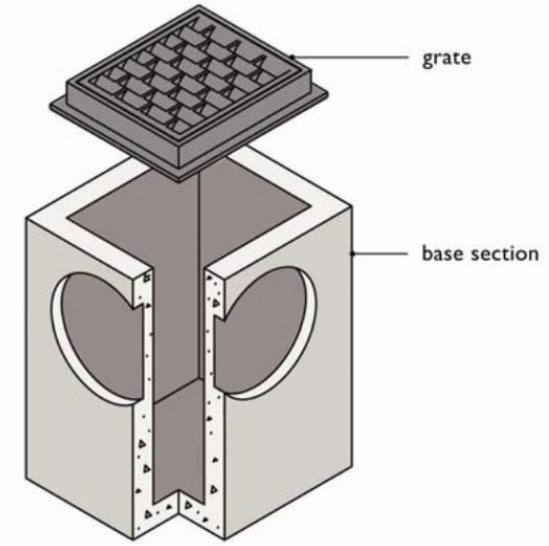
Conveyance Ditch			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Sediment	Sediment exceeds 20% of ditch depth or affects the historic or designed hydraulic capacity.	Remove sediment deposits. When finished, ditch should be level from side to side and drain freely in intended direction.
	Standing Water	Excessive standing water in ditch between storms due to ditch not draining freely	If possible, repair cause of poor drainage. This may include but is not limited to the following activities: remove sediment or trash blockages, improve grade of ditch.
	Eroded or Unstable Side Slopes	When grass is sparse, bare or eroded, patches occur in more than 20% of the ditch	Determine why grass growth is poor and correct that condition. Replant with plugs of grass at eight-inch intervals or reseed. If cause is excessive moisture replace grass with wetland plantings.
	Vegetation	Grass is excessively tall (greater than 15 inches). Nuisance weeds and other vegetation start to take over ditch.	Mow vegetation and/or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 3 to 4 inches.
	Bare Soil	Poor vegetation coverage.	Reseed poor vegetation areas. Reference "Low Grow" seed mix, see SWMMWW BMP C120 Table II-3.4
	Inlet/Outlet Pipes or Culverts	Inlet/outlet area clogged with sediment and/or debris	Remove material so that there is no clogging or blockage in the inlet and outlet area
	Trash and Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping.	Remove trash and debris from ditch.
	Erosion/Scouring	Eroded or scoured ditch bottom	Permanently stabilize ditch bottom

Stormwater Structures

Catch Basin

A catch basin is an underground concrete structure with a slotted grate that collects stormwater runoff and route it through the underground pipes. Catch basins typically provide a sump below the outlet pipe to allow sediment and debris to settle out of the stormwater runoff. Some catch basins are fitted with a spill control device such as an inverted elbow on the outlet pipe to control grease or oils. The most common tool for cleaning catch basins is a vactor truck which is used to remove sediment and debris from the sump. The sediment and oils if not removed from the catch basins have the potential to pollute downstream waterbodies. Unless you have Occupational Safety and Health Administration (OSHA) approved confined space training and equipment, never enter a catch basin. There is a considerable risk of poisonous gas and injury.

See SWMMWW Appendix V-A, Table V-A.5 for catch basin maintenance standards.



Field/Ditch Inlet

An inlet is a concrete, plastic or steel structure fitted with a slotted grate to collect stormwater runoff and route through underground pipes. A field inlet has a flat grate, and a ditch inlet has an angled grate. These inlets typically provide a sump below the outlet pipe to allow sediment and debris to settle out of the stormwater runoff. Some of these inlets are fitted with a spill control device such as an inverted elbow on the outlet pipe to control grease or oils. The most common tool for cleaning out the inlet is a vactor truck which is used to remove sediment and debris from the sump. The sediment and oils if not removed from the inlet has the potential to pollute downstream water bodies. Unless you have OSHA approved confined space training and equipment, never enter an inlet. There is a considerable risk of poisonous gas and injury.

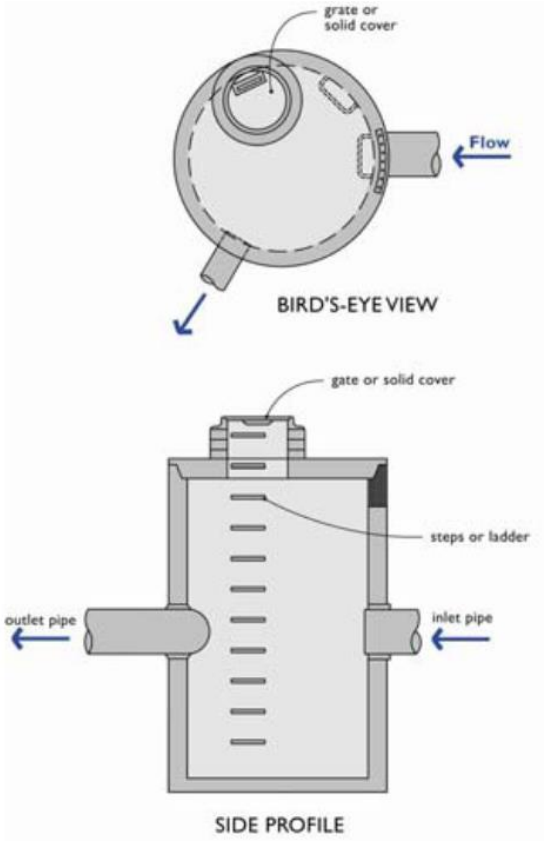
Field Inlet

Ditch Inlet

Field Inlet/Ditch Inlet			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Trash & Debris	Trash or debris blocking inletting capacity by more than 10%.	Remove trash or debris blocking grate opening.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	Remove dead animals or vegetation present within the field/ditch inlet.
	Sediment	Sediment has accumulated to within six inches of the invert of the lowest pipe	Remove sediment
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch.	Repair top slab to be free of holes and cracks.
		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	Make adjustments so that frame is sitting flush on the riser rings or top slab and is firmly attached.
	Fractures or Cracks in Field Inlet Walls/Bottom	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.	Regrout pipe and secure at field inlet wall.
	Settlement/ Misalignment	If failure of field inlet has created a safety, function, or design problem.	Replace or repair field inlet to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the inlet opening.	Remove vegetation blockage from basin opening.
	Contamination and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Identify and remove source. Notify City at (360) 817-1567.
Metal Grates	Grate Not in Place	Grate is missing or only partially in place. Any open field inlet requires maintenance.	Replace missing grate, cover field inlet
	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Repair grate opening
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Replace missing grate or repair broken member(s)

Manhole

Manholes are large cylindrical underground structures usually set at storm sewer pipe connections. Manholes are used in storm sewer system at any change in direction, slope, pipe material or pipe size. Some manholes have sumps and fitted with stormwater flow control structures such as orifices or weirs. Unless you have OSHA approved confined space training and equipment, never enter a manhole. There is a considerable risk of poisonous gas and injury.

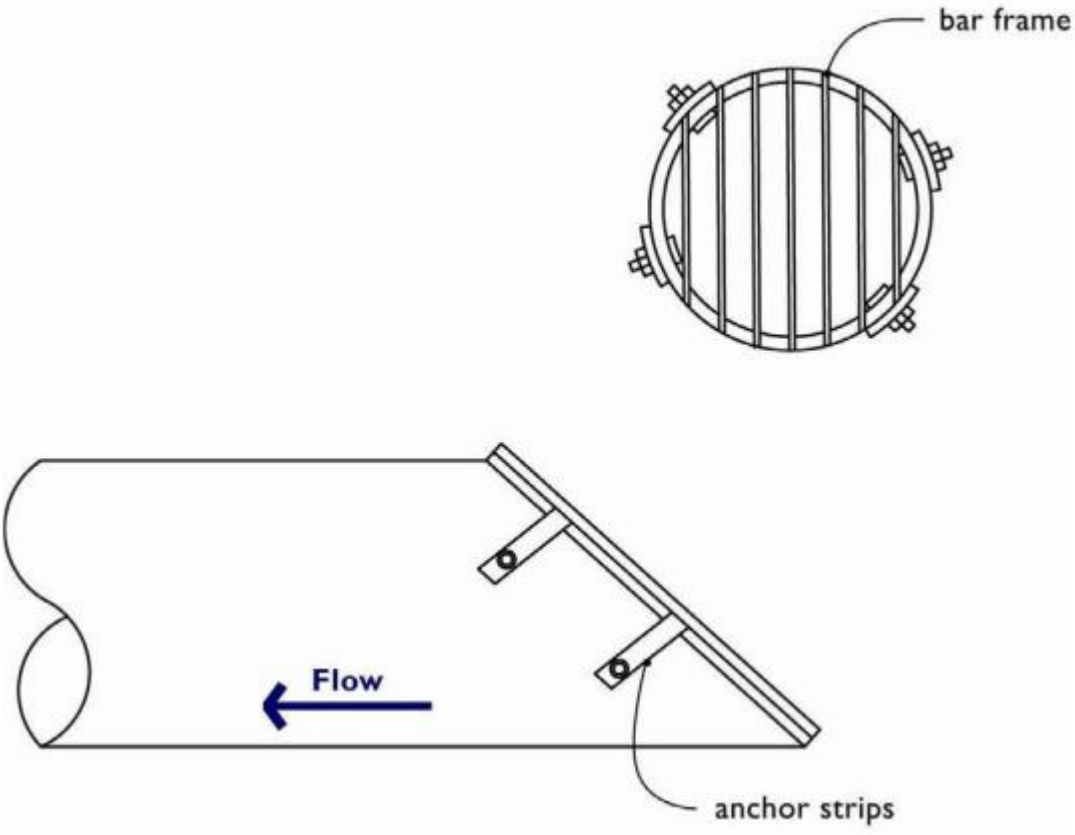


Manhole			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Trash and Debris	Trash or debris has accumulated to within six inches of the invert of the lowest pipe.	Remove all trash or debris from manhole.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Remove trash or debris from inlet and outlet pipes.
	Sediment	Sediment has accumulated to within six inches of the invert of the lowest pipe.	Remove all sediment from manhole
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch.	Repair top slab to be free of holes and cracks.
		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	Make adjustments so that frame is sitting flush on the riser rings or top slab and is firmly attached.
	Fractures or Cracks in Manhole Walls/Bottom	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 manhole through cracks.	Regrout pipe and secure at manhole wall.
	Settlement/ Misalignment	If failure of manhole has created a safety, function, or design problem.	Replace or repair manhole to design standards.
Cover	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Replace missing cover, cover manhole.
	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.	Repair opening mechanism
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure.	Make adjustments so that one maintenance person can remove the manhole cover.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Repair or replace ladder to meet design standards and allow maintenance person safe access.
Control Structure/Flow Restrictor	See Control Structure/Flow Restrictor		

Debris Barrier

Debris barriers and trash racks are barred covers to pipe openings. They prevent large objects from entering pipes and keeps pets and people out of the pipes as well.

See SWMMWW Appendix V-A, Table V-A.6 for debris barrier maintenance standards.



Profile View

Sediment Trap

A sediment trap is a concrete structure typically fitted with slotted grate or multiple slotted grates. The concrete structure provides a storage volume (sump) below the outlet pipe to allow sediment and debris to settle out of the stormwater runoff. A sediment trap can be a fully enclosed concrete structure (above or below ground) with a sump, inlet pipe(s) and outlet pipe.

Sediment Trap			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Trash and Debris	Trash and debris which is located immediately in front of the sediment trap opening or is blocking the inlet capacity of the basin by more than 10%	Remove trash and debris
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	Remove dead animals or vegetation present within the sediment trap.
	Sediment (non-enclosed structure)	Sediment depth exceeds 2 inches.	Remove sediment
	Sediment (enclosed structure)	Sediment depth within 6 inches from lowest invert	Remove sediment
	Fractures or Cracks in Sediment Trap	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 sediment trap through cracks.	Regrout pipe and secure at sediment trap wall.
	Settlement/ Misalignment	If failure of sediment trap has created a safety, function, or design problem.	Replace or repair sediment trap to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the sediment trap opening	Remove vegetation
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Remove contaminants and/or pollutants. (Coordinate removal/cleanup with local water quality response agency)
Slotted Grate	Trash and Debris	Trash and debris that is blocking more than 20% of the grate surface inlet capacity	Remove trash and debris from grate
	Damaged or Missing Grate	Grate missing or broken member(s) of the grate	Replace or repair grate to design standards.
Cover (enclosed structure)	Cover Not in Place	Cover is missing or only partially in place.	Replace missing cover
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure or latch broken	Make adjustments so that one maintenance person can remove the cover and/or repair broken latch.

Energy Dissipater

Energy dissipaters are critical for preventing erosion at storm drain outfalls. There are a variety of designs, including wire gabion baskets, rock splash pads, trenches, and specially designed pools or manholes. They are installed on or near the inlet or outlet to a closed pipe system to prevent erosion at these locations.

See SWMMWW Appendix V-A, Table V-A.7 for energy dissipater maintenance standards.

Discharge Point

Stormwater facility discharge points may convey drainage from the stormwater facility into open channels, ditches, ponds, wetlands, streams, or lakes. Stormwater facility discharge points need to be assessed to make sure stormwater is not causing any negative impacts to these drainage areas.

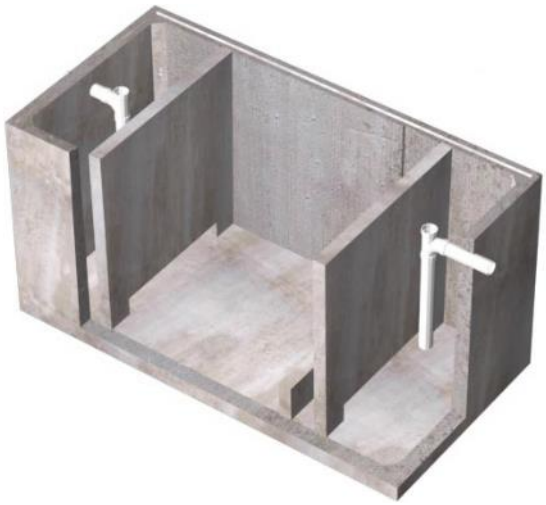
Discharge Point			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
Monitoring	Contaminants and Pollution	Any evidence of oil, gasoline, sewage, contaminants, or other pollutants	Identify and remove source. The effluent discharge should be clear and free of odor. Notify City at (360) 817-1567.
	Ditch or Stream Banks Eroding	Erosion, scouring, or head cuts in ditch or stream banks downstream of facility discharge point due to flow channelization or higher flows.	Stabilize ditch or stream banks. Report to City for engineer evaluation.
General	Missing or Moved Rock	Only one layer of rock exists above native soil in an area five square feet or larger, or any exposure of native soil	Replace or repair rock pad to design standards
	Erosion	Soil erosion in or adjacent to rock pad	Replace or repair rock pad to design standards
	Sediment	Sediment blocking 20% of the pipe diameter	Remove sediment
	Obstructions	Roots or debris enters pipe or deforms pipe, reducing flow	Remove roots from pipe by mechanical methods; do not use root-dissolving chemicals in storm sewer pipes. If necessary, remove vegetation over the line.
	Pipe Rusted or Deteriorated	Any part of the piping that is crushed or deformed excessively or any other failure to the piping	Repair or replace pipe
Energy Dissipater	See Energy Dissipater		

Oil/Water Separators

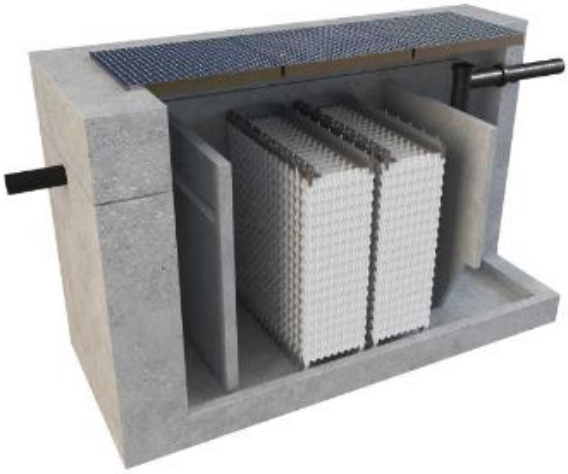
An oil/water separator is an underground vault that treats stormwater by mechanically separating oil from water. The oil rises to the surface and floats on the water and sediment settles to the bottom. Oil/water separators are typically utilized in locations where high oil concentrations in the stormwater runoff are anticipated (e.g., service and fuel stations). Oil/water separators are most commonly used as the first pretreatment facility in a series of stormwater management facilities.

These facilities have special problems for maintenance and should be serviced by contractors. The main issues are working in confined spaces and properly handling any sludge and oil cleaned from vaults or oil/water separators. Manufacturer's recommendations for maintenance should be followed at a minimum.

See SWMMWW Appendix V-A, Table V-A.16 for baffle oil/water separator maintenance standards and Table V-A.17 for coalescing plate oil/water separator maintenance standards.



Baffle Oil/Water Separator

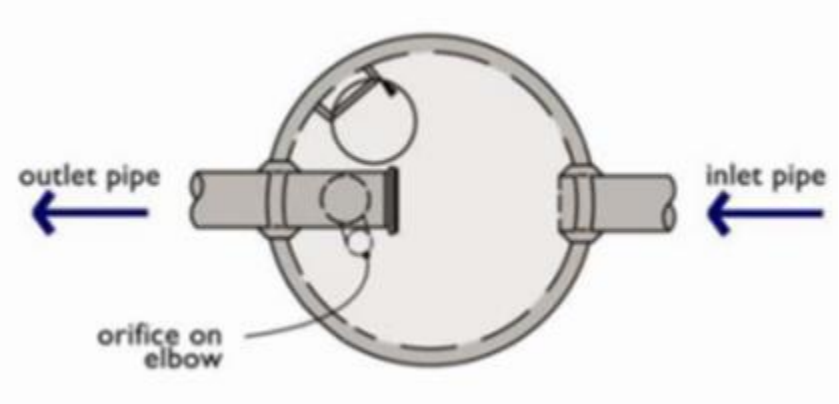


Coalescing Plate Oil/Water Separator

Flow Control Structures/Flow Restrictors

Flow control structures and flow restrictors direct or restrict flow in or out of facility components. Outflow controls on detention facilities are a common example where flow control structures slowly release stormwater at a specific rate. The flow is regulated by a combination of orifices (holes with specifically sized diameters) and weirs (plates with rectangular or 'V' shaped notch). Lack of maintenance of the control structure can result in the plugging of an orifice. If these flow controls are damaged, plugged, bypassed, or not working properly, the facility could overtop or release water too quickly.

See SWMMWW Appendix V-A, Table V-A.4 for control structure/flow restrictor maintenance standards.



Plan View

Storm Sewer Pipe

Storm sewer pipes convey stormwater. Storm pipes are constructed of many different types of materials and are sometimes perforated to allow groundwater to be collected by the storm system. Storm pipes are cleaned to remove sediment or blockages when problems are identified. Storm pipes must be clear of obstructions and breaks to prevent localized flooding.

Storm Sewer Pipe			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Obstructions, Including Roots	Obstruction exists in pipe, reducing flow capacity	Remove obstruction. Use mechanical methods. Do not put root-dissolving chemicals in storm sewer pipes. If necessary, remove the vegetation over the line.
	Pipe Dented or Broken	Inlet/outlet pipe damaged or broken	Repair or replace pipe
	Pipe rusted or deteriorated	Any part of the piping that is crushed or deformed excessively or any other failure to the piping	Repair or replace pipe
	Sediment and Debris	Sediment or debris depth is greater than 15% of the pipe diameter	Clean pipe. Evaluate source of sediment upstream of the pipe and stabilize if possible.
	Broken Trash Screen	Trash screen is broken or missing parts	Repair or replace trash screen
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Identify and remove source. Notify City at (360) 817-1567.

Closed Detention System

A closed detention system functions similarly to a detention pond but with the storage volume provided by an underground structure. The structure is typically constructed of large diameter pipe, plastic chamber structure or a concrete vault. These systems are typically utilized for sites that do not have space available for an above-ground system and are more commonly associated with commercial sites.

Underground detention systems are enclosed spaces where harmful chemicals and vapors can accumulate. Therefore, the maintenance of these facilities should be conducted by an individual trained and certified to work in hazardous confined spaces.

See SWMMWW Appendix V-A, Table V-A.3 for closed detention maintenance standards.

Drywell

Drywells are perforated, open-bottomed manholes used to infiltrate stormwater into the ground. While not the intended use, drywells trap sediment and some of the oil pollutants in stormwater runoff. Drywells are more likely to fill with oily sediment in areas that lack swales or other treatment facilities. Fine oil sediment can clog drywells and lead to localized street flooding. Also, pollutants discharged into drywells can migrate into groundwater. Drywells were often installed in closed topographic depressions, areas with will-drained soils, or areas having inadequate storm sewers. Often, drywells contain groundwater.

Drywell			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Does not Dissipate Stormwater	Does not dissipate stormwater	Replace or repair
	Opening Clogged	Openings are clogged, reducing capacity	Clear openings or convert existing drywell to a sediment trap and install a new drywell or drainage trench. To convert to a sediment trap: grout holes, cover base with concrete, and add piping. Alterations to any storm facility cannot be done without approval from the City of Camas.
	Standing Water	Standing water indicates the drywell is into the groundwater table	Rebuild drywell to prevent stormwater from going directly into groundwater
	Trash and Debris	Trash or debris blocking any inlet or outlet pipe	Remove trash and debris
	Sediment	Sediment in drywell exceeds 60 percent of the depth below the lowest pipe	Remove sediment
	Structure Damage	Structure unsound	Replace or repair drywell to design standards.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Identify and remove source. Notify City at (360) 817-1567.
Cover	Cover Not in Place	Cover is missing or only partially in place.	Replace missing cover
	Cover Difficult to Remove	One maintenance person cannot remove cover after applying normal lifting pressure.	Make adjustments so that one maintenance person can remove the drywell cover.

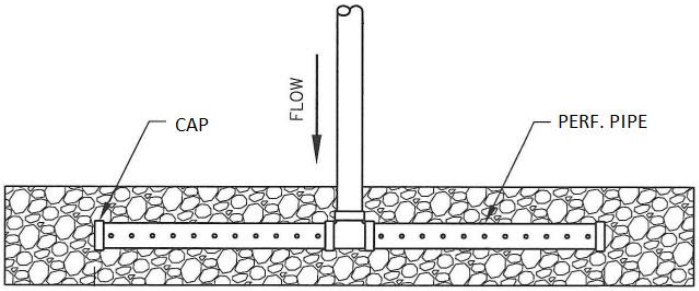
Pond Leveler System

The pond leveler system consists of an intake cage and outlet pipe. This system is used to bypass beaver dams. The pond leveler system creates a permanent leak through the beaver dam that the beavers cannot stop.

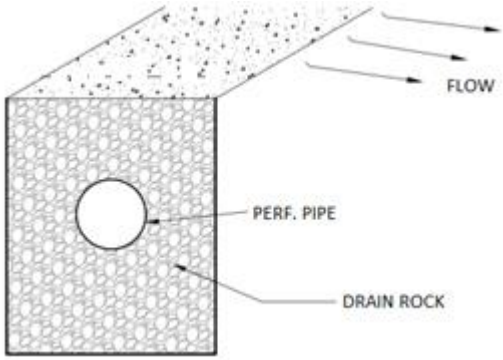
Pond Leveler			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
Intake Cage	Debris and sediment	Debris and sediment build up around cage	Remove debris and sediment build up around cage. Recommended tools: potato rake and a narrow, stiff shop broom.
	Structure	Broken cage, resulting in holes larger than 6" diameter.	Repair hole with similar cage material, attach with hog rings.
	Obstruction to inflow pipe	Debris obstructing pipe flow inside intake cage	Remove obstruction
Outflow Pipe	Obstruction	Debris obstructing outflow	Remove obstruction

Dispersion Trench

Dispersion trench are grave-filled trenches, which serve to spread runoff over vegetated pervious areas. This BMP reduce peak flows, provide some infiltration, and water quality benefits.



Plan View



Cross Section

Dispersion Trench			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Trash and Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping.	Remove trash and debris from site.
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations.	Remove noxious weeds. Compliance with State or local eradication policies required. Apply requirements of adopted IPM policies for the use of herbicides.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Identify and remove source. Notify City at (360) 817-1567.
	Rodent Holes	Any evidence of rodent holes.	Fill holes.
Perforated Pipe	Sediment and/or obstruction	Sediment and/or obstruction impeding the flow, causing backup	Remove sediment and/or obstruction

Special Facilities

Manufactured Media Filter

Manufacture media filters are passive, flow-through, stormwater treatment systems. They are comprised of manholes or vaults that house media-filled filter cartridges. Stormwater passes through a filtering medium, which traps particulates and/or absorb pollutants such as dissolved metals and hydrocarbons. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharge to a pond or open channel drainage way.

The filter media can be housed in cartridge filters enclosed in concrete vaults or catch basins. Structures will have vault doors or manhole lids for maintenance access. Various types of filter media are available from different manufactures. Determine the type of filter media used and consult manufacturer for maintenance recommendations.

See SWMMWW Appendix V-A, Table V-A.15 for manufactured media filters maintenance standards.

Manufactured Media Filter – Additional Maintenance Standards			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
Below Ground Vault or Manhole	Sediment Accumulation in Vault (no first chamber)	Sediment depth exceeds 4-inches on vault floor.	Remove sediment from vault floor. May require replacing media cartridges, consult manufacturer.

Permeable Pavement

Permeable pavement is a paving system which allows rainfall to percolate through the surface into the underlying soil or an aggregate bed, where stormwater is stored and infiltrated to underlying subgrade, or removed by an overflow drainage system.

See SWMMWW Appendix V-A, Table V-A.22 for permeable pavement maintenance standards.

Modular Wetland

Modular wetlands linear is a biofiltration system that utilizes horizontal flow which allows for a smaller footprint, higher treatment capacity and design versatility. This system can be utilized downstream of storage for additional volume control and treatment. The modular wetland is contained in an underground vault that has different chambers containing media. Some modular wetlands can have plants growing out of it, but it is not required for the system to function. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharge to a pond or open channel drainage way.

Modular Wetland			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Missing or damaged components	Missing or damaged internal components or cartridges	Replace missing or repair damaged internal components or cartridges
Inlet or Outlet	Obstruction	Obstruction to inlet or outlet that impedes flow	Remove obstruction
Pretreatment Chamber	Floatables	Excessive accumulation of floatables, in which the length and width of the chamber is fully impacted more than 18"	Remove floatables
	Sediment	Excessive accumulation of sediment, more than 6"in depth	Remove sediment
Filter Cartridges	Sediment	Excessive accumulation of sediment on media, more than 85% clogged (blackish color)	Replace media
Vegetation (if applicable)	Overgrown	Overgrown vegetation	Trim/prune vegetation in accordance with landscaping and safety needs
Structure	Cracks in structure	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through cracks	Repair cracks in vault

Tree Box Filter

Tree box filter is a stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff.

Tree Box Filter			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
Inlet	Excessive sediment or trash accumulation	Accumulated sediments or trash impair free flow of water into system	Remove sediment and/or trash
Mulch cover	Trash and debris	Excessive trash and/or debris accumulation	Remove trash and/or debris.
	Standing water	Ponding of water over mulch due to excessive fine sediment accumulation or spill of petroleum oils	Remove mulch and replace, contact manufacturer for advice
Vegetation	Plant not growing or in poor condition	Soil/mulch too wet, evidence of spill, incorrect plant selection, pest infestation, vandalism to plants	Plants should be healthy and pest free, contact manufacturer for advice
	Plant growth excessive	Plants should be appropriate to the species and location	Trim/prune plants in accordance with landscaping and safety needs
Structure	Cracks in structure	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through cracks	Repair cracks in vault

Miscellaneous Items

Fences, Gates and Water Quality Signs

Fences are installed around the perimeter of stormwater facilities as a means of protecting the public, as they restrict entrance to the facility. Gates are installed to allow for maintenance access. Gates will be secured, typically with a double lock system (daisy chain) that allows access to the City and to the property owner's maintenance crew.

Water Quality Signs are installed on the fences, or on sign poles, within public view as a means of educating the public as to the presence of a stormwater facility. These signs also have a number located in the upper right hand corner that is cross referenced, at the City, to an address and maintenance responsibility. The publicly owned storm facility signs are green and the privately owned storm facility signs are white.

Public Storm Sign (Green) **Private Storm Sign (White)**

Fence, Gate and Water Quality Sign			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Gate or Fence Allows Unauthorized Entry	Openings in fence, missing gate, openings beneath fence allowing unauthorized access	Repaired gate and/or fence to prevent unauthorized access
	Locking Mechanism	Mechanism cannot be opened by one maintenance person with proper tools	Repair/replace lock
		No lock on gate, allows unauthorized entry	Add lock
	Damaged Parts	Posts out of plumb more than six inches	Plumb post
		Top rails of plump more than six inches	Repair top rails so that it is free of bends greater than 1 inch
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets	Replace soil under fence so that no opening exceeds 4 inches in height
	Sign	Sign is leaning more than 8 inches off vertical	Reset sign to plumb
		Sign is missing or 20% of surface is unreadable	Replace sign

Access Roads and Easements

Many stormwater facilities have access roads to bring in heavy equipment for facility maintenance. These roads are typically gravel and should be maintained for inspection access and ease of equipment entry. All facilities should allow access for the inspection process. The easement area should be adequately or otherwise stabilized. Bare soil areas will generate higher levels of stormwater runoff and increase erosion and sedimentation in stormwater facilities.

Access Road and Easements			
Maintenance Component	**Defect or Problem**	**Conditions When Maintenance Is Needed**	**Minimum Maintenance Required**
General	Erosion	Soils are bare or eroded	Seed or use other stabilization BMP
	Road Surface	Conditions of road surface may lead to erosion of the facility or limit access	Repair road
	Erosion of Ground Surface	Noticeable rills are seen in landscaped areas	Identify causes of erosion and implement BMPs to slow down/spread out the water. Fill, contour, and seed eroded areas. If needed, re-grade affected areas.
	Trash and Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping.	Remove trash and debris from site.
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations.	Remove noxious weeds. Compliance with State or local eradication policies required. Apply requirements of adopted IPM policies for the use of herbicides.
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If dead, diseased, or dying trees are identified.	Remove hazardous tree that impede with maintenance access and activities. Remove trees that are damaging the pipe system and/or blocking drain inlet. Remove dead, diseased, or dying trees. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).
	Weeds (Non-poisonous)	Weeds growing in more than 20% of the landscaped area (tree and shrubs only).	Remove weeds
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Destroy or remove insects from site. Apply insecticides in compliance with adopted IPM policies.

Pavement Sweeping

Pavement sweeping is performed as a means of removing sand, dirt, and litter from streets and curb gutters. Sweeping also reduces dust during dry weather. Pavement sweeping plays a large part in stormwater maintenance because it limits the amount of sediment washed into the municipal storm sewer system. The water quality procedure for street sweeping focuses on sediment removal and disposal. Reducing the amount of sediment washed into catch basins, curb inlets, detention facilities, drywells, and other facilities can save money because sweeping is generally cheaper that removing sediment from facilities. Sweeping also helps protect facilities from clogging with sediment.

Typically, the City sweeps the downtown area once a week and the whole city about three times per year. Most of the downtown area does not have water quality treatment. Pavement sweeping is the main source for pollution control.

Repair/Replacement Activities

Minor Culvert Repair (Not in a Stream)

This activity is for the replacement or repair of culverts and inlets. It applies only to structures that are in ditches that are specifically for storm drainage. These are ditches that do not carry water during dry weather. If there is any question about whether the ditch is a storm drain or a stream, consult with the Washington Department of Fish and Wildlife and the City of Camas Public Works Department.

Major Culvert Repair (at a Stream Crossing)

This activity is the replacement or repair of culverts and inlets bridging a stream or ditch with flowing water during dry weather. If there is any question about whether the ditch is a storm drain or a stream, consult the Washington Department of Fish and Wildlife and the City of Camas Public Works Department.

These projects must meet all regulatory requirements such as State Environmental Policy Act (SEPA), Shoreline Permit, Hydraulic Project Approval (HPA) and Flood Plain.

Vegetation Management

The City recognizes the special importance of the rivers, streams, wetlands, ponds, and stormwater control and treatment facilities. The sensitive nature of such habitat, their plant and animal communities, and their direct link with other waterways require that we establish specific policies to ensure their health. All landscape management decisions for controlling unwanted vegetation, diseases, and pests should follow the Integrated Pest Management (IPM) principles and decision-making rationale.

Integrated Pest Management (IPM) Principles

1. Correctly identify the pest problem and understand their life cycle. Refer to online resources such as Washington State Noxious Weed Control Board and Washington Invasive Species Council.
2. Every landscape has a population of some pest insects, weeds, and diseases. Once the pest has been identified and studied, determine if low levels of the pest are tolerable. Small numbers of certain pests may not be harmful. If this is the case, simply continue to monitor the pest population.
3. If pest exceed tolerance thresholds, choose a safe and effective control method.
    a. Cultural methods of vegetation and pest control are preferred and are first employed. Cultural control changes the pest's environment: landscape fabric, mulch, soil amendments, altering the irrigation method of duration, crop rotation, crop covers, etc.
    b. Mechanical means of vegetation and pest control are next in line of preference and are utilized where feasible. Mechanical means consist of digging, hand-pulling, mowing, tilling, trapping, etc.
    c. Biological methods of vegetation and pest control are considered before chemical means, where they are feasible. Biological control uses natural enemies: beneficial insects, managed grazing, bird boxes and perches, etc.
    d. Chemical methods are used only when no other feasible methods exist. Chemical control is the use of pesticides to remove vegetation and pests.
4. Observe and record the results of the control treatment. Evaluate the effectiveness. If necessary, modify maintenance practices to support a healthy landscape and prevent recurrence of the pest.

A licensed pesticide applicator is required for performing any chemical application in stormwater facilities. Applicators must be licensed in Washington State with an aquatic endorsement (WAC 16-228-1545). Applicator must submit a copy of their license to the City prior to starting work. Aquatic pesticide products are recommended. No chemical application shall be applied directly in the water. Do not apply pesticide when it is raining. Check the weather and ensure there are multiple dry days before and after application. Do not apply pesticide on windy days to prevent drift movement of pesticide from target areas.

For vegetated areas outside of stormwater facilities, Washington State pesticide application laws and rules are followed, Chapter 17.21 RCW and Chapter 16-228 WAC.

Plants and Groundcover

Use plants that will thrive in the growing conditions of each facility. Growing conditions are affected by moisture, soil conditions, and light. Plants native to western Washington are preferred. Recommended plants, seed mixes and groundcover list for biofiltration swales, bioretention systems, rain gardens, and other facility types are given in the respective BMP maintenance sections. It is best to reference the stormwater facility record drawings for vegetation replacements, if available. Fertilization of vegetated stormwater facilities should be avoided.

The City has adopted a list of approved plants for use in development projects, and to assist homeowners in choosing appropriate plantings. The list also has prohibited undesirable plants. Only plants approved for use on the City of Camas Plant Materials are allowed within the City's right-of-way.

Mulches and other ground coverings are useful during the installation and restoration of landscapes as well as their ongoing maintenance. Mulches meet a variety of needs. They suppress weeds, help to retain moisture around plants, reduce possible erosion and provide visual enhancement. Possible risk impacts to consider when using mulch are inadvertent introduction of non-native plants or migration of mulch material into waterways.

Possible scenarios where trees should be removed and/or trimmed in a stormwater facility (always check if the stormwater facility has a liner before tree removal):

- Trees that pose a risk to a stormwater structure due to root growth should be removed.
- Trees that are growing on spillways that would impede drainage should be removed.
- Hazardous trees should be removed.
- Trees/shrubs that hinder accessibility to access roads should be trimmed or removed.

References

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Washington State Legislature. (1974). *Revised Code of Washington (RCW)*. https://apps.leg.wa.gov/RCW/default.aspx

Washington State Legislature. (2004). *Washington Administrative Code (WAC)*. https://app.leg.wa.gov/WAC/default.aspx

Washington State Recreation and Conservation Office. *Washington Invasive Species Council*. https://invasivespecies.wa.gov/

APPENDIX E

Stormwater Pollution Prevention Plan

Stormwater Pollution Prevention Plan

For
The Landing at Green Mountain 2

Prepared For
Pacific Lifestyle Homes
11815 NE 99st St
Vancouver, WA 98682

Owner	Developer	Operator/Contractor
Emmert Family III LLC	Pacific Lifestyle Homes	Unknown
10470 SE Hillcrest Dr	11815 NE 99st St	
Happy Valley, OR 97086	Vancouver, WA 98682	

Project Site Location
22111 NE 28th St,
Camas WA, 98607
Parcel #173210000, 173177000

SWPPP Prepared By
PLS Engineering, Inc.
604 W Evergreen Blvd
Vancouver, WA 98660
(360) 944-6519

SWPPP Preparation Date
July 2025

Approximate Project Construction Dates
October 2025

Contents

Appendix A Site plans

- Vicinity map (with all discharge points)
- Site plan with TESC measures

Appendix B Construction BMPs

- Possibly reference in BMPs, but likely it will be a consolidated list so that the applicant can photocopy from the list from the SWMMWW.

Appendix C Alternative Construction BMP list

- List of BMPs not selected, but can be referenced if needed in each of the 12 elements

Appendix D General Permit

Appendix E Site Log and Inspection Forms

Appendix F Engineering Calculations

1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the Landing at Green Mountain 2 construction project in Camas, Washington. The site is located on Parcels 173177000 and 173210000. Current address for the site is 22111 NE 28th Street, Camas, WA 98607 and the existing site is approximately 9.595 acres. Current proposed development associated with this SWPPP includes the construction of 34 single family lots along with the associated infrastructure. The stormwater plan associated with this project provides for stormwater management of all runoff from the site using a detention pond at the south end of the site. Stormwater runoff from the pollution generating surfaces will be treated by a ConTech media cartridge in a vault before being infiltrated.

Construction activities will include excavation, grading, construction of paving and sidewalk to serve the site, construction of an detention pond to mitigate for impacts to stormwater runoff from the new paving, and installation of utilities to serve the site including sanitary sewer, storm sewer, potable water, electrical, phone, and cable TV. The purpose of this SWPPP is to describe the proposed construction activities and all temporary and permanent erosion and sediment control (TESC) measures, pollution prevention measures, inspection/monitoring activities, and recordkeeping that will be implemented during the proposed construction project. The objectives of the SWPPP are to:

1. Implement Best Management Practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.

2. Prevent violations of surface water quality, ground water quality, or sediment management standards.

3. Prevent, during the construction phase, adverse water quality impacts including impacts on beneficial uses of the receiving water by controlling peak flow rates and volumes of stormwater runoff at the Permittee's outfalls and downstream of the outfalls.

This SWPPP was prepared using the Ecology SWPPP Template downloaded from the Ecology website. This SWPPP was prepared based on the requirements set forth in the Construction Stormwater General Permit and the *Stormwater Management Manual for Western Washington* (SWMMWW). The report is divided into seven main sections with several appendices that include stormwater related reference materials. The topics presented in the each of the main sections are:

- Section 1 – INTRODUCTION. This section provides a summary description of the project, and the organization of the SWPPP document.

- Section 2 – SITE DESCRIPTION. This section provides a detailed description of the existing site conditions, proposed construction activities, and calculated stormwater flow rates for existing conditions and post–construction conditions.

- Section 3 – CONSTRUCTION BMPs. This section provides a detailed description of the BMPs to be implemented based on the 12 required elements of the SWPPP (SWMMEW 2004).

- Section 4 – CONSTRUCTION PHASING AND BMP IMPLEMENTATION. This section provides a description of the timing of the BMP implementation in relation to the project schedule.

- Section 5 – POLLUTION PREVENTION TEAM. This section identifies the appropriate contact names (emergency and non-emergency), monitoring personnel, and the onsite temporary erosion and sedimentation control inspector

- Section 6 – INSPECTION AND MONITORING. This section provides a description of the inspection and monitoring requirements such as the parameters of concern to be monitored, sample locations, sample frequencies, and sampling methods for all stormwater discharge locations from the site.

- Section 7 – RECORDKEEPING. This section describes the requirements for documentation of the BMP implementation, site inspections, monitoring results, and changes to the implementation of certain BMPs due to site factors experienced during construction.

Supporting documentation and standard forms are provided in the following Appendices:

Appendix A – Site plans
Appendix B – Construction BMPs
Appendix C – Alternative Construction BMP list
Appendix D – General Permit
Appendix E – Site Log and Inspection Forms
Appendix F – Engineering Calculations

2.0 Site Description

2.1 Existing Conditions

Current Addresses for the site is 22111 NE 28th Street, Camas, WA 98607. The site is approximately 9.595 acres. The property's topography is moderately sloped from a high point at the NE corner of the site to a low point at the SW corner of the site. The site has an existing house, several manufactured homes, a shop, and Chicken coop which will be removed. The remaining area consists of grass, trees, and brush.

The soils are mapped by the NRCS as Lauren gravelly loam (LgB) in the NE corner and South edge of the site, McBee silt Loam (MIA) on the West edge of the site, and Lauren loam (LeB) in the East end of the site.

2.2 Proposed Construction Activities

The project proposes to develop the parcel into 34 single family lots and associated access. Construction activities will include excavation, grading, construction of paving and sidewalk to serve the site, construction of an detention pond to mitigate for impacts to stormwater runoff from the new paving, and installation of utilities to serve the site including sanitary sewer, storm sewer, potable water, electrical, phone, and cable TV.

Temporary erosion and sediment control facilities will be installed prior to site construction to handle construction-phase stormwater runoff. The schedule and phasing of BMPs during construction is provided in Section 4.0.

Stormwater runoff has been calculated using Western Washington Hydrology Model (WWHM). The detention pond was designed to contain and release all runoff generated by the site. ConTech™ vaults will be used to treat runoff before conveying it to detention pond.

After the site has been graded and all new utilities are installed, the building construction will commence. Trees will also be planted in the landscape areas noted in the Landscape Plan. Temporary seeding will occur over the lots to establish vegetative cover until such time as individual buildings are developed and permanent landscaping occurs.

3.0 Construction Stormwater BMPs

3.1 The 13 BMP Elements

3.1.1 Element #1 – Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMPs relevant to marking the clearing limits that will be applied for this project include:

- Preserving Native Vegetation (BMP C101)
- Silt Fence (BMP C233)

Alternate BMPs for marking clearing limits are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.2 Element #2 – Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters. All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that will be used on this project include:

- Stabilized Construction Entrance (BMP C105)

Alternate construction access BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.3 Element #3 – Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. The specific BMPs for flow control that shall be used on this project include:

- Detention Ponds (BMP D.1)

Alternate flow control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, the project must comply with Minimum Requirement 7 (Ecology 2005).

In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

3.1.4 Element #4 – Install Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharged to an infiltration facility. The specific BMPs to be used for controlling sediment on this project include:

- Silt Fence (BMP C233)
- Storm Drain Inlet Protection (BMP C220)

Silt fencing and storm drain inlet protection will be adequate for sediment control during summer months. Alternate sediment control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize washoff of sediments from adjacent streets in runoff.

Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas (BMP C240 paragraph 5, page 4-102).

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or biofiltration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be restabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

The following BMPs will be implemented as end-of-pipe sediment controls as required to meet permitted turbidity limits in the site discharge(s). Prior to the implementation of these technologies, sediment sources and erosion control and soil stabilization BMP efforts will be maximized to reduce the need for end-of-pipe sedimentation controls.

- Construction Stormwater Filtration (BMP C251)
- Construction Stormwater Chemical Treatment (BMP C 250) (implemented only with prior written approval from Ecology).

3.1.5 Element #5 – Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Temporary and Permanent Seeding (BMP C120)
- Mulching (BMP C121)
- Nets and Blankets (BMP C122)
- Plastic Covering (BMP C123)
- Topsoiling (BMP C125)
- Surface Roughening (BMP C130)
- Dust Control (BMP C140)
- Early application of gravel base on areas to be paved

Alternate soil stabilization BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils

shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

3.1.6 Element #6 – Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner that minimizes erosion. The following specific BMPs will be used to protect slopes for this project:

- Temporary and Permanent Seeding (BMP C120)

Alternate slope protection BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.7 Element #7 – Protect Drain Inlets

All storm drain inlets and culverts made operable during construction or inlets near the site that could potentially receive surface runoff from the construction site shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site. The following inlet protection measures will be applied on this project:

Drop Inlet Protection

- Block and Gravel Drop Inlet Protection
- Gravel and Wire Drop Inlet Protection
- Catch Basin Filter

If the BMP options listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D), or if no BMPs are listed above but deemed necessary during construction, the Certified Erosion and Sediment Control Lead shall implement one or more of the alternative BMP inlet protection options listed in Appendix C.

3.1.8 Element #8 – Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion. The specific BMPs for channel and outlet stabilization that shall be used on this project include:

- Outlet Protection (BMP C209)

Alternate channel and outlet stabilization BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, all temporary on-site conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour recurrence interval storm for the developed condition. Alternatively, the 10-year, 1-hour peak flow rate indicated by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

3.1.9 Element #9 – Control Pollutants

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers shall include secondary containment.
- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.
- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.
- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

Chemical storage:

- Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume IV of the Ecology stormwater manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMPC153 for Material Delivery, Storage and Containment in SWMMWW 2005
- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application procedures and rates shall be followed.

Excavation and tunneling spoils dewatering waste:

- Dewatering BMPs and BMPs specific to the excavation and tunneling (including handling of contaminated soils) are discussed under Element 10.

Demolition:

- Dust released from demolished sidewalks, buildings, or structures will be controlled using Dust Control measures (BMP C140).
- Storm drain inlets vulnerable to stormwater discharge carrying dust, soil, or debris will be protected using Storm Drain Inlet Protection (BMP C220 as described above for Element 7).
- Process water and slurry resulting from sawcutting and surfacing operations will be prevented from entering the waters of the State by implementing Sawcutting and Surfacing Pollution Prevention measures (BMP C152).

Concrete and grout:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

Sanitary wastewater:

- Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.
- Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system or to the sanitary sewer as part of Wheel Wash implementation (BMP C106).

Solid Waste:

- Solid waste will be stored in secure, clearly marked containers.

Other:

- Other BMPs will be administered as necessary to address any additional pollutant sources on site.

The facility does not require a Spill Prevention, Control, and Countermeasure (SPCC) Plan under the Federal regulations of the Clean Water Act (CWA).

3.1.10 Element #10 – Control Dewatering

3.1.13 Element #13 – Protect Low Impact Development BMPs

- Protect all bioretention and rain garden BMP's from sedimentation through installation and maintenance of erosion control BMP's on portions of the site that drain into them. Restore the BMP's to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden bioretention/ rain garden soils, and replacing the removed soils with soils meeting the design specification.
- Prevent compacting bioretention and rain garden BMP's by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction by construction equipment.
- Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff into permeable pavements or base materials.
- Pavements fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures from Book 4 of the manufacturer's procedures.
- Keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils

3.2 Site Specific BMPs

Site specific BMPs are shown on the TESC Plan Sheets and Details in Appendix A. These site-specific plan sheets will be updated annually.

3.3 Additional Advanced BMPs

- The following BMPs are advanced and are only recommended if construction activities are complex enough to warrant them; or if the site has the potential for significant impacts to water quality. The following BMPs are directed at "end-of-pipe" treatment for sedimentation issues related to turbid runoff from construction sites. Effective BMPs are most often the simple BMPs and focus on the minimization of erosion before sedimentation is an issue. The following BMPs will most likely be implemented only after other BMP options are exhausted, or if the construction activity is large and off-site sedimentation or turbid runoff occurs or is inevitable.
- For BMP 250, written pre-approval, through Ecology is required (see SWMMWW 2005):
- BMP C250: Construction Stormwater Chemical Treatment
- BMP C251: Construction Stormwater Filtration.

4.0 Construction Phasing and BMP Implementation

The BMP implementation schedule will be driven by the construction schedule. The following provides a sequential list of the proposed construction schedule milestones and the corresponding BMP implementation schedule. The list contains key milestones such as wet season construction.

The BMP implementation schedule listed below is keyed to proposed phases of the construction project and reflects differences in BMP installations and inspections that relate to wet season construction. The project site is located west of the Cascade Mountain Crest. As such, the dry season is considered to be from May 1 to September 30 and the wet season is considered to be from October 1 to April 30.

- Estimate of Construction start date: 10/01/22
- Estimate of Construction finish date: 9/06/25
- Mobilize equipment on site: 10/01/22
- Mobilize and store all ESC and soil stabilization products: 10/01/22
- Install ESC measures: 10/01/22
- Install stabilized construction entrance: 10/01/22
- Begin clearing and grubbing: 10/01/22
- Demolish existing structures: 10/01/22
- Begin site grading 10/01/22
- Site grading ends 10/30/22
- Excavate and install new utilities and services: 11/01/22
- Excavation for building foundations 10/06/22
- Begin building construction: 10/06/22
- Complete utility construction 10/06/22
- Begin implementing soil stabilization and sediment control BMPs throughout the site in preparation for wet season: 10/06/22
- Wet Season starts: 11/01/22
- Site inspections and monitoring conducted weekly and for applicable rain events as detailed in Section 6 of this SWPPP: 10/01/22
- Implement Element #12 BMPs and manage site to minimize soil disturbance during the wet season: 10/01/22
- Complete road paving 11/30/22
- Building construction complete: 9/06/24
- Dry Season starts: 5/01/23

5.0 Pollution Prevention Team

5.1 Roles and Responsibilities

The pollution prevention team consists of personnel responsible for implementation of the SWPPP, including the following:

- Certified Erosion and Sediment Control Lead (CESCL) – primary contractor contact, responsible for site inspections (BMPs, visual monitoring, sampling, etc.); to be called upon in case of failure of any ESC measures.
- Resident Engineer – For projects with engineered structures only (sediment ponds/traps, sand filters, etc.): site representative for the owner that is the project's supervising engineer responsible for inspections and issuing instructions and drawings to the contractor's site supervisor or representative
- Emergency Ecology Contact – individual to be contacted at Ecology in case of emergency.
- Emergency Owner Contact – individual that is the site owner or representative of the site owner to be contacted in the case of an emergency.
- Non-Emergency Ecology Contact – individual that is the site owner or representative of the site owner than can be contacted if required.
- Monitoring Personnel – personnel responsible for conducting water quality monitoring; for most sites this person is also the Certified Erosion and Sediment Control Lead.

5.2 Team Members

Names and contact information for those identified as members of the pollution prevention team are provided in the following table.

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Unknown	
Resident Engineer	Travis Johnson	(360)944-6519
Emergency Ecology Contact	Unknown	
Emergency Owner Contact	Unknown	
Non-Emergency Ecology Contact	Unknown	
Monitoring Personnel	Unknown	

6.0 Site Inspections and Monitoring

Monitoring includes visual inspection, monitoring for water quality parameters of concern, and documentation of the inspection and monitoring findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in this SWPPP include the required information for the site log book. This SWPPP may function as the site log book if desired, or the forms may be separated and included in a separate site log book. However, if separated, the site log book but must be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.1 Site Inspection

All BMPs will be inspected, maintained, and repaired as needed to assure continued performance of their intended function. The inspector will be a Certified Erosion and Sediment Control Lead (CESCL) per BMP C160. The name and contact information for the CESCL is provided in Section 5 of this SWPPP.

Site inspection will occur in all areas disturbed by construction activities and at all stormwater discharge points. Stormwater will be examined for the presence of suspended sediment, turbidity, discoloration, and oily sheen. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. All maintenance and repairs will be documented in the site log book or forms provided in this document. All new BMPs or design changes will be documented in the SWPPP as soon as possible.

6.1.1 Site Inspection Frequency

Site inspections will be conducted at least once a week and within 24 hours following any discharge from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month.

6.1.2 Site Inspection Documentation

The site inspector will record each site inspection using the site log inspection forms provided in Appendix E. The site inspection log forms may be separated from this SWPPP document, but will be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.2 Stormwater Quality Monitoring

The construction site will comply with the requirements set forth in the 2015 Construction Stormwater General Permit (revised 2017) seen in Appendix D. A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.

The following text describes the monitoring for the proposed development.

6.2.1 Turbidity Sampling

The receiving water body, Lacamas Creek Watershed, is impaired for turbidity. Mandatory BMPs (Best Management Practices) and erosion control practices put in place by the permit will appropriately minimize the turbidity of the stormwater discharge. Monitoring requirements for the proposed project will include weekly turbidity sampling to monitor site discharges for water quality compliance as required by the NPDES Construction Stormwater General Permit, provided that site discharges occur. It should be noted that the site is designed such that all site runoff will be infiltrated so it is likely that discharges will be rare or may not occur at all. Sampling will be conducted at all discharge points at least once per calendar week.

Turbidity sampling during construction will be completed weekly in order to confirm that erosion control measures are meeting the water quality standards for turbidity (Where an applicable TMDL has not specified a waste load allocation for construction stormwater discharge, but has not excluded these discharges, compliance with special Conditions S4 (monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL (S8.E.1.c)). Special Conditions S4 establishes that the key benchmark values that require action are 25 NTU for turbidity (equivalent to 32 cm transparency) and 250 NTU for turbidity (equivalent to 6 cm transparency). If the 25 NTU benchmark for turbidity (equivalent to 32 cm transparency) is exceeded, the following steps will be conducted:

1. Ensure all BMPs specified in this SWPPP are installed and functioning as intended.
2. Assess whether additional BMPs should be implemented, and document revisions to the SWPPP as necessary.
3. Sample discharge location daily until the analysis results are less than 25 NTU (turbidity) or greater than 32 cm (transparency).

If the turbidity is greater than 25 NTU (or transparency is less than 32 cm) but less than 250 NTU (transparency greater than 6 cm) for more than 3 days, additional treatment BMPs will be implemented within 24 hours of the third consecutive sample that exceeded the benchmark value. Additional treatment BMPs to be considered will include, but are not limited to, off-site treatment, infiltration, filtration and chemical treatment.

If the 250 NTU benchmark for turbidity (or less than 6 cm transparency) is exceeded at any time, the following steps will be conducted:

1. Notify Ecology by phone within 24 hours of analysis (see Section 5.0 of this SWPPP for contact information).
2. Continue daily sampling until the turbidity is less than 25 NTU (or transparency is greater than 32 cm).

3. Initiate additional treatment BMPs such as off-site treatment, infiltration, filtration and chemical treatment within 24 hours of the first 250 NTU exceedance.
4. Implement additional treatment BMPs as soon as possible, but within 7 days of the first 250 NTU exceedance.
5. Describe inspection results and remedial actions taken in the site log book and in monthly discharge monitoring reports as described in Section 7.0 of this SWPPP.

In the event that Turbidity results are greater than 25 NTUs, or the site is determined to be out of compliance with surface water quality standards for turbidity, the following BMPs should be established, re-established or implemented as determined necessary by the Certified Erosion and Sediment Control lead (CESCL) in order to bring the site back into compliance:

BMP C105: Stabilized Construction Entrance / Exit (repair construction entrance as necessary)

BMP C106: Wheel Wash (repair wheel wash as necessary)

BMP C120: Temporary and permanent Seeding

BMP C124: Sodding

BMP C140: Dust Control

BMP C209: Outlet Protection

BMP C220: Storm Drain Inlet Protection (add more inlet protection, as necessary

BMP C233: Silt Fence (add more silt fencing as necessary)

7.0 Reporting and Recordkeeping

7.1 Recordkeeping

7.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in this SWPPP include the required information for the site log book.

7.1.2 Records Retention

Records of all monitoring information (site log book, inspection reports/checklists, etc.), this Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of three years following the termination of permit coverage in accordance with permit condition S5.C.

7.1.3 Access to Plans and Records

The SWPPP, General Permit, Notice of Authorization letter, and Site Log Book will be retained on site or within reasonable access to the site and will be made immediately available upon request to Ecology or the local jurisdiction. A copy of this SWPPP will be provided to Ecology within 14 days of receipt of a written request for the SWPPP from Ecology. Any other information requested by Ecology will be submitted within a reasonable time. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with permit condition S5.G.

7.1.4 Updating the SWPPP

In accordance with Conditions S3, S4.B, and S9.B.3 of the General Permit, this SWPPP will be modified if the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site or there has been a change in design, construction, operation, or maintenance at the site that has a significant effect on the discharge, or potential for discharge, of pollutants to the waters of the State. The SWPPP will be modified within seven days of determination based on inspection(s) that additional or modified BMPs are necessary to correct problems identified, and an updated timeline for BMP implementation will be prepared.

7.2 Reporting

7.2.1 Discharge Monitoring Reports

Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period, the Permittee shall submit the form as required, with the words "No discharge" entered in the place of monitoring results. The DMR due date is 15 days following the end of each month.

Water quality sampling results will be submitted to Ecology monthly on Discharge Monitoring Report (DMR) forms in accordance with permit condition S5.B. If there was no discharge during a given monitoring period, the form will be submitted with the words "no discharge" entered in place of the monitoring results. If a benchmark was exceeded, a brief summary of inspection results and remedial actions taken will be included. If sampling could not be performed during a monitoring period, a DMR will be submitted with an explanation of why sampling could not be performed.

7.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and it causes a threat to human health or the environment, the following steps will be taken in accordance with permit section S5.F:

1. Ecology will be immediately notified of the failure to comply.
2. Immediate action will be taken to control the noncompliance issue and to correct the problem. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Any time turbidity sampling indicates turbidity is 250 nephelometric turbidity units (NTU) or greater or water transparency is 6 centimeters or less, the Ecology regional office will be notified by phone within 24 hours of analysis as required by permit condition S5.A (see Section 5.0 of this SWPPP for contact information).

In accordance with permit condition S2.A, a complete application form will be submitted to Ecology and the appropriate local jurisdiction (if applicable) to be covered by the General Permit.

Appendix A – Site Plans

Appendix B – Construction BMPs

Stabilized Construction Entrance (BMP C105)

Silt Fence (BMP C233)

Storm Drain Inlet Protection (BMP C220)

Detention Pond (BMP D.1)

Temporary and Permanent Seeding (BMP C120)

Mulching (BMP C121)

Nets and Blankets (BMP C122)

Plastic Covering (BMP C123)

Topsoiling (BMP C125)

Dust Control (BMP C140)

Early application of gravel base on areas to be paved

Outlet Protection (BMP C209)

Appendix C – Alternative BMPs

The following includes a list of possible alternative BMPs for each of the 12 elements not described in the main SWPPP text. This list can be referenced in the event a BMP for a specific element is not functioning as designed and an alternative BMP needs to be implemented.

Element #1 - Mark Clearing Limits
High Visibility Plastic or Metal Fence (BMP C103)
Stake and Wire Fence (BMP C104)
Element #2 - Establish Construction Access
Wheel Wash (BMP C106)
Water Bars (BMP C203)
Element #3 - Control Flow Rates
Wattles (BMP C235)

Element #4 - Install Sediment Controls
Straw Bale Barrier (BMP C230)
Gravel Filter Berm (BMP C232)
Straw Wattles (BMP C235)
Portable Water Storage Tanks (Baker Tanks)
Construction Stormwater Chemical Treatment (BMP C250)
Construction Stormwater Filtration (BMP C251)

Element #5 - Stabilize Soils
Polyacrylamide (BMP C126)

Element #6 - Protect Slopes
Straw Wattles (BMP C235)
Surface Roughening (BMP C240)

Element #8 - Stabilize Channels and Outlets
Level Spreader (BMP C206)
Check Dams (BMP C207)

Element #9 – Control Pollutants
Concrete Handling (BMP C151)
Construction Stormwater Chemical Treatment (BMP C250)
Construction Stormwater Filtration (BMP C251)

Element #10 - Control Dewatering
Vegetated Filtration (BMP C236)
Additional Advanced BMPs to Control Dewatering:

Appendix D – General Permit

Appendix E – Site Inspection Forms (and Site Log)

The results of each inspection shall be summarized in an inspection report or checklist that is entered into or attached to the site log book. It is suggested that the inspection report or checklist be included in this appendix to keep monitoring and inspection information in one document, but this is optional. However, it is mandatory that this SWPPP and the site inspection forms be kept onsite at all times during construction, and that inspections be performed and documented as outlined below.

At a minimum, each inspection report or checklist shall include:

a. Inspection date/times

b. Weather information: general conditions during inspection, approximate amount of precipitation since the last inspection, and approximate amount of precipitation within the last 24 hours.

c. A summary or list of all BMPs that have been implemented, including observations of all erosion/sediment control structures or practices.

d. The following shall be noted:

   i. locations of BMPs inspected,

   ii. locations of BMPs that need maintenance,

   iii. the reason maintenance is needed,

   iv. locations of BMPs that failed to operate as designed or intended, and

   v. locations where additional or different BMPs are needed, and the reason(s) why

e. A description of stormwater discharged from the site. The presence of suspended sediment, turbid water, discoloration, and/or oil sheen shall be noted, as applicable.

f. A description of any water quality monitoring performed during inspection, and the results of that monitoring.

g. General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.

h. A statement that, in the judgment of the person conducting the site inspection, the site is either in compliance or out of compliance with the terms and conditions of the SWPPP and the NPDES permit. If the site inspection indicates that the site is out of compliance, the inspection report shall include a summary of the remedial actions required to bring the site back into compliance, as well as a schedule of implementation.

i. Name, title, and signature of person conducting the site inspection; and the following statement: "I certify under penalty of law that this report is true, accurate, and complete, to the best of my knowledge and belief".

When the site inspection indicates that the site is not in compliance with any terms and conditions of the NPDES permit, the Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

Site Inspection Form

General Information			
Project Name:			
Inspector Name:		**Title:**	
		CESCL # :	
Date:		**Time:**	
Inspection Type:	□ After a rain event □ Weekly □ Turbidity/transparency benchmark exceedance □ Other		
Weather			
Precipitation	Since last inspection	In last 24 hours	
Description of General Site Conditions:			

Inspection of BMPs							
Element 1: Mark Clearing Limits							
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	
Element 2: Establish Construction Access							
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	

Element 3: Control Flow Rates

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 4: Install Sediment Controls

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 5: Stabilize Soils						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 6: Protect Slopes						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 7: Protect Drain Inlets						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 8: Stabilize Channels and Outlets						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 9: Control Pollutants						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
Element 10: Control Dewatering						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Stormwater Discharges From the Site		
	Observed?	Problem/Corrective Action

	Y	N
Location		
Turbidity		
Discoloration		
Sheen		
Location		
Turbidity		
Discoloration		
Sheen		

Water Quality Monitoring
Was any water quality monitoring conducted? □ Yes □ No
If water quality monitoring was conducted, record results here:
If water quality monitoring indicated turbidity 250 NTU or greater; or transparency 6 cm or less, was Ecology notified by phone within 24 hrs? □ Yes □ No
If Ecology was notified, indicate the date, time, contact name and phone number below:
Date:
Time:
Contact Name:
Phone #:
General Comments and Notes
Include BMP repairs, maintenance, or installations made as a result of the inspection.
Were Photos Taken? □ Yes □ No
If photos taken, describe photos below:

Appendix F – Engineering Calculations

Engineering calculations provided in Appendix B of the Technical Information Report

APPENDIX F

Environmental Documentation

CRITICAL AREAS REPORT

& MITIGATION PLAN

Project:

The Landing at Green Mountain – Phase II

Applicant:

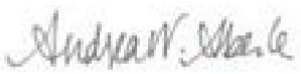
Pacific Lifestyle Homes
11815 NE 99th Street,
Vancouver WA, 98682

Prepared By:

Ash ECO SOLUTIONS, LLC

July 1, 2025

The information in this report was compiled to meet the requirements of the City of Camas Municipal Code (CMC) Sections 16.53 Wetlands and 16.61 Fish and Wildlife Habitat Conservation Areas. This report has been prepared under the supervision and direction of the undersigned, a qualified professional following CMC Section 16.61.020.A.



Andrea W. Aberle, Sr. Biologist
AshEco Solutions, LLC

SITE INFORMATION:

Parcel No(s):	173177000
Acreage:	4.83 acres
Local Jurisdiction:	City of Camas, Washington
Section/Township/Range:	SW¼, S21, T2N, R3E, W.M.
Site Address:	22111 NE 28th Street Camas, WA 98607
Legal Landowner:	Emmert Family III LLC *(Per Current GIS Parcel Info)*

Parcel No(s):	173210000
Acreage:	4.91 acres
Local Jurisdiction:	City of Camas, Washington
Section/Township/Range:	SW¼, S21, T2N, R3E, W.M.
Site Address:	22015 NE 28th Street Camas, WA 98607
Legal Landowner:	Linda Middagh *(Per Current GIS Parcel Info)*

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INTRODUCTION

Project Description

AshEco Solutions, LLC (AES) was contracted by Pacific Lifestyle Homes (PLH) to assess the potential critical areas located within a study area comprised of two subject parcels and areas immediately offsite to the south. This Critical Areas Report and Buffer Plan follows the City of Camas Municipal Code (CMC) Sections 16.53 Wetlands and 16.61 Fish and Wildlife Habitat Conservation Areas. PLH proposes construction of a residential subdivision within two parcels of land totaling 9.74-acres. The existing single-family residences located near NE 28th Avenue will remain and are not part of the proposed project.

Project Location and Background Information

The study area consists of two subject parcels addressed as 22111 NE 28th Street and 22015 NE 28th Street, Camas, Washington (Figure 1). The parcels are under the jurisdiction of the City of Camas and are assigned Parcel Numbers 173177000 and 173210000. East of the subject parcels is The Landing at Green Mountain – Phase I residential subdivision. To the west are large lot residential properties. To the north , north of NE 28th are urban residential lots and south of the property is forest park land owned by Clark County.

EXISTING CONDITIONS

The topography onsite and within the vicinity of the study area, slopes in elevation from the highest point along NE 28th Street in the north to the south/southwest. Seasonal hydrology ultimately flows offsite and southwest to the valley floor to the Lacamas Creek corridor. A maintained overhead BPA powerline easement that is 100 feet in width bisects the study area diagonally east/west.

Since at least the 1970s both subject parcels within the study area have had single-family residential use in the north and agricultural uses in the central and southern areas. The study area is generally dominated by open pasture areas with scattered native and non-native trees. Little native understory exists within the bulk of the study area due to a history of grazing of the open pastures and maintained lawn present surrounding the residences. Trees that are concentrated within the study area are located in the vicinity of the southern parcel boundaries, adjacent to forest land owned by Clark County. It should be noted that a series of trails and a maintained access/logging road is present to the south on the county property with connection ultimately south to Lacamas Lake and Camp Currie park lands.

CRITICAL AREAS MAP RESEARCH

Topography

The localized topography as depicted by Clark County GIS generally depicts a south facing slope on a terrace above the Lacamas Creek valley. The topography elevation contours mapped indicate that elevations drop approximately 50 feet from the highest elevation near NE 28th Street in the north to the lowest elevation in the southwest corner of Parcel 173210000 (Figure 2).

Soil Survey

Soils within the subject parcel are mapped by the NRCS USDA Soil Conservation Service, Soil Survey of Clark County Washington (1972), as Lauren gravelly loam, 0 to 8 percent slopes (LgB), Lauren loam, 0 to 8 percent slopes (LeB), and McBee silt loam, 0 to 3 percent slopes (MIA) (Figure 3).

The Lauren series consists of deep, somewhat excessively drained, nearly level to gently sloping soils on terraces 50 to 300 feet above the Columbia River. In a few places, on terrace fronts, the soils are steep to very steep. These are very gravelly soils that formed in mixed Columbia River alluvium that contained some

volcanic ash. Typically, native vegetation occurring within this soil series is comprised Douglas-fir, grand fir, bigleaf maple, vine maple, salal, and ferns.

Lauren gravelly loam, 0 to 8 percent slopes (LgB) occurs on terraces. The slopes are generally less than 4 percent and approach 8 percent only along the terrace breaks. In a typical profile the surface layer is very dark brown gravelly and very gravelly loam about 20-inches thick. Below the surface layer is friable, dark- brown very gravelly loam about 13-inches thick. The next layer is dark-brown very gravelly coarse sandy loam about 11-inches thick. The underlying material, to a depth of 70-inches, is dark-brown very gravelly loamy coarse sand. Included in mapping were a few small areas where very gravelly loamy coarse sand is within 30-inches of the surface. Permeability generally is moderately rapid, but it is rapid in the substratum. The available water capacity is moderate. Surface runoff is slow, and the erosion hazard is slight. The LgB soil type is not listed on the Washington State Hydric Soils List for Clark County (NRCS 2022).

Lauren loam, 0 to 8 percent slopes (LeB) is similar to Lauren gravelly loam, 0 to 8 percent slopes, except that the surface layer is free of gravel. Surface runoff is slow, and the erosion hazard is slight. Included in mapping were a few small gravelly areas. The LeB soil type is not listed on the Washington State Hydric Soils List for Clark County (NRCS 2022).

The McBee series consists of deep, somewhat poorly drained and moderately well drained, nearly level to gently sloping soils. These are loamy soils in back-bottom positions along streams and rivers. They formed in alluvium derived from quartzite and basalt. Typically, native vegetation is western redcedar, hemlock, vine maple, red alder, Oregon ash, wild rose, spirea, willow, blackberry, grasses, and sedges.

McBee silt loam, 0 to 3 percent slopes (MlA), occurs in drainageways and depressions, and in most places the slope is less than 1 percent. In a typical profile the surface layer is mottled, very dark brown silt loam about 11 inches thick. Below the surface layer is friable, mottled, dark-brown heavy loam about 8 inches thick. The next layer, to a depth of 44 inches, is mottled, very dark grayish-brown gravelly sandy loam. Below this, to a depth of 62 inches, is dark-brown very gravelly loamy sand. Typically, there is no erosion hazard with this soil type. This soil is somewhat poorly drained, surface runoff is very slow, with water standing on the surface much of the winter in undrained areas. The MlA soil type is listed on the Washington State Hydric Soils List for Clark County (NRCS 2022).

Mapped hydric soils do not necessarily mean that the area is a wetland; hydrology and wetland vegetation must be present to classify an area as a wetland. The same is true for soils that are not mapped as hydric. Wetlands can be found in areas without mapped hydric soils.

Wetlands

Clark County GIS Maps Online does not map wetland presence within the study area, nor does the National Wetland Inventory (NWI) (Figure 3). AshEco Solutions (AES) reconnaissance of the subject parcels confirmed that wetlands are not located within the subject parcels as indicated by Clark County GIS and NWI mapping.

WDFW Priority Habitat

Clark County GIS and the Washington Department of Fish and Wildlife (WDFW) map individual Oregon white oak trees within and adjacent to the subject parcels (Figures 4 and 5). AES identified three individual Oregon white oak trees onsite, one within the far northeast corner of the study area and two in the far southeast corner (Figure 6).

WDFW also indicates that “Cave or Cave-rich Areas” occur within the general area surrounding the subject

parcels, though no evidence of caves or rock outcroppings were identified onsite by AES during site reconnaissance.

METHODOLOGY

Wetlands

The study area and immediate offsite vicinity was evaluated for the presence of wetlands using the Routine Determination Method per the U.S. Army Corps of Engineers' (USACE's) *Wetland Delineation Manual* (1987), the *Washington State Wetlands Identification and Delineation Manual* (1997), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, Version 2.0* (USACE 2010). The Routine Determination Method examines three parameters to determine if wetlands exist in a given area: vegetation, hydrology, and soils. The presence of hydrology is critical in identifying wetlands; however, since hydrologic conditions can change periodically (hourly, daily, or seasonally), it is necessary to determine if hydrophytic vegetation and hydric soils are also present. By definition, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are regulated as "Waters of the United States" by the USACE, "Waters of the State" by Washington State Department of Ecology (ECY), and locally by CMC section 16.53 Wetlands.

AES did not identify wetlands within the study area. However, AES did perform reconnaissance offsite from the southern study area limits (for this project and an adjacent project) and identified a forested wetland unit (Potential Wetland #3) offsite to the southwest. Using aerial imagery AES approximated two additional offsite wetlands west of the site (Figure 6). These approximate wetland limits are presented by this report following CMC 16.53.030(B)(2).

WDFW Priority Habitat

The WDFW PHS system maps individual Oregon white oak trees onsite and adjacent to the eastern subject parcel. AES inventoried the Oregon white oaks present onsite.

WDFW defines Oregon white oak Priority Habitat as; Oregon White Oak Woodlands are "*stands of oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%; or where total canopy coverage of the stand is <25%, but oak accounts for at least 50% of the canopy coverage. The latter is often referred to as oak savanna. In non-urbanized areas west of the Cascades, priority oak habitat consists of stands > 0.4 ha (1.0 ac) in size. East of the Cascades, priority oak habitat consists of stands > 2 ha (5 ac) in size. In urban or urbanizing areas, single oaks or stands < 0.4 ha (1 ac) may also be considered a priority when found to be particularly valuable to fish and wildlife (i.e., they contain many cavities, have a large diameter at breast height [dbh]* (generally 20-inches dbh and greater)*, are used by priority species, or have a large canopy). Oak woodlands in western Washington may contain understory plants indicative of Prairie*."

Individual Oregon white oak trees meeting the above definition were identified within or immediately adjacent to the subject parcel (Figure 6). The subject site is within an incorporated city and is urban, therefore the individual Oregon white oak trees are considered Priority Habitat by WDFW. The project does not propose impacts to the onsite oaks, as the project has been designed to retain all onsite oaks (Figure 6).

The WDFW PHS system maps "Cave or Cave-rich Areas" present in areas surrounding the subject parcel (Figure 5).

WDFW defines Caves as, *"A naturally occurring cavity, recess, void, or system of interconnected passages (including associated dendritic tubes, cracks, and fissures) which occurs under the earth in soils, rock, ice, or other geological formations, and is large enough to contain a human. Mine shafts (a human-made excavation in the earth usually used to extract minerals) may mimic caves and abandoned mine shafts with actual or suspected occurrences of priority species should be treated in a manner similar to caves."*

No caves or rock outcroppings meeting the above definition were identified within the study area or immediately offsite.

Habitats of Local Importance
Following CMC Chapter 16.61 - Fish And Wildlife Habitat Conservation Areas, Section: 16.61.010.A.3.a, individual Oregon white oak trees with a twenty-inch diameter at breast height (20-inches dbh), stands of Oregon white oak trees greater than one acre when they are found to be valuable to fish and wildlife (i.e., may include trees with cavities, large diameter breast height, are used by priority species, or have a large canopy), and all Oregon white oak snags unless determined by an arborist to be a hazard, are considered Habitats of Local Importance and therefore are regulated by CMC.

DOCUMENTED VEGETATION

The vegetation onsite has been disturbed by equestrian use and historic mowing activities, with non-native and invasive grasses and herbs dominate throughout areas historically grazed within the northern and central sections of the parcel. A few individual scattered trees are present onsite including Douglas-fir (*Pseudotsuga menzisii,* FACU) and Oregon white oak (*Quercus garryana* ,FACU).

South of the subject parcel is a forested wetland mosaic area owned by Clark County. This area is much more biologically diverse and slightly overlaps with onsite areas along the southern parcel boundary and corners. Upland vegetation identified in this area includes Douglas-fir (*Pseudotsuga menzisii* FACU), Oregon white oak (*Quercus garryana* FACU), and Oregon ash (*Fraxinus latifolia* FACW) in the overstory with vine maple (*Acer circinatum* FAC), beaked hazelnut (*Corylus cornuta* FACU), snowberry (*Symphoricarpos albus* FACU), red osier dogwood (*Cornus sericea* FACW), trailing blackberry (*Rubus ursinus* FACU) and salmonberry (*Rubus spectabilis* FAC) in the shrub stratum and sword fern (*Polystichum munitum* FACU), piggy-back plant (*Tolmiea menzisii* FAC), lanceleaf spring beauty (*Claytonia lanceolata* FAC), dovefoot geranium (*Geranium mole* FACU), large leaf avens (*Geum macrophyllum* FACW), and slough sedge (*Carex obnupta* OBL) in the herbaceous stratum.

The indicator categories following the common and scientific name of each vegetation species indicate the likelihood of the species to be found in wetlands. Listed from most-likely to least-likely to be found in wetlands, the indicator categories are:

- **OBL (obligate wetland) –** Occur almost always under natural conditions in wetlands.
- **FACW (facultative wetland) –** Usually occur in wetlands but occasionally found in non-wetlands.
- **FAC (facultative) –** Equally likely to occur in wetlands or non-wetlands.
- **FACU (facultative upland) –** Usually occur in non-wetlands but occasionally found in wetlands.
- **UPL (obligate upland) –** Occur almost always under natural conditions in non-wetlands.
- **NI (no indicator) –** Insufficient data to assign to an indicator category.

CRITICAL AREA CONCLUSIONS

Wetlands

Offsite wetland reconnaissance by AES identified a high-quality forested wetland (potential wetland #3) offsite and southwest of the study area (Figure 6). Potential wetland #3 was rated under the Depressional Hydrogeomorphic Classification (HGM) and is considered a Category II wetland scoring high for habitat functions with a score of 8 (Appendix B). Potential wetland #3 has both slope and depressional HGM features. Under the Washington wetland rating system, wetlands with both slope and depressional features are rated under the depressional HGM classification. This high functioning wetland will require a buffer width that will encroach into the study area, thus it is the focus wetland for this report. See Wetland Buffer information presented below.

Using aerial imagery, AES approximated the boundaries of two potential offsite wetlands located west of the site (Figure 6). The offsite potential wetland (#1) west of the study area western boundary was rated under the Depressional HGM classification as it appears to consist of a shallow depressional area located on a gentle slope. The offsite potential wetland (2) was also rated under the Depressional HGM as it appears to consist of a depressional pond area. Both offsite potential wetlands resulted in Category III wetland ratings with low habitat function scores of 3 (Figure 6 and Appendix B). These wetlands will not require large buffers that will encroach into the study area.

Wetland Buffers

Under the Camas Municipal Code (CMC), wetland buffer widths are established by comparing the wetland rating habitat function score and overall category, and the intensity of proposed land use. Under CMC Table 16.53.040-4 residential use with density higher than 1-unit per acre is considered High Land Use Intensity (LUI). The proposed single family residential subdivision will match the current zoning, Single-Family Residential (R-7.5) of the subject parcels comprising a total of 9.74 acres. The proposed density of the subdivision meets the definition of High LUI under the CMC. Under CMC Table 16.53.040-2, Category II wetlands with a habitat function score of 8 adjacent to proposed High LUI require 260-foot buffers, 195-foot buffers for Moderate LUI, and 130-foot buffers for Low LUI. Under CMC Table 16.53.040-1, Category III wetlands with a habitat function score of 3 adjacent to proposed High LUI require 80-foot buffers.

The 260-foot buffer of the potential offsite wetland #3 encroaches over the southwestern corner of the site. The 80-foot buffer for the Category III wetlands offsite to the west (#1 and #2) will not encroach over the western boundary of the subject parcel (Figure 6).

WDFW Priority Habitat

A total of five individual Oregon white trees were identified onsite, four of them meeting the jurisdictional criteria (Figure 6, Table 3). Oregon white oaks are protected by WDFW and also jurisdictional under the local CMC habitat code. The understory and herbaceous layer associated with the onsite oak habitat is highly disturbed due to cattle grazing, mowing and areas dominated by Himalayan blackberry. The project has been designed to avoid and retain three of the four jurisdictional Oregon white oaks onsite (Figure 6).

Table 1. Critical Areas Summary.

Critical Area	Buffer Width
Offsite Wetland #3 Category II Wetland (Habitat Score: 8)	260 ft = High LUI Buffer
Individual Oregon White Oak Habitat	N/A *(See Table 3 for Oak Habitat Summary)*

WETLAND BUFFER MITIGATION PLAN

The buffer mitigation plan was developed following Camas Municipal Code CMC) Sections 16.53 Wetlands to offset the project impacts proposed and allow for no net loss of habitat functions onsite. The construction of this residential subdivision within the appropriate zoning location will provide housing for the southwest Washington market, specifically high density residential within the City of Camas where the market demand is high. The project avoids direct impacts to the highest functioning buffer habitat and oak trees while utilizing the historically impacted areas of the subject site for development (existing building footprints, parking and driveway areas, maintained yard areas, and historic agriculture fields that have been highly managed over the history of the site due to livestock use).

Avoidance & Minimization

The proposed single-family residence subdivision has been designed to avoid onsite critical areas to the extent possible while still providing a residential subdivision meeting the density and design requirements required by the City of Camas. The proposed residential lots, roadways and stormwater facility required for the subdivision have been designed to avoid onsite critical areas. Although the stormwater facility has been designed to avoid onsite critical areas, the facility requires a flow spreader outfall that will result in minor encroachment into the wetland buffer in the far southern portion of the study area. The flow spreader outfall has been designed to the minimum required for the structure, avoids direct impacts to mature vegetation, and can be mitigated for onsite for no net loss of habitat function or area for (Figure 6). Additionally, impacts from the flow spreader pipe avoid impacts to mature vegetation and are temporary.

Wetland Buffer Impacts & Mitigation

A small area of buffer impact will be unavoidable to construct the required flow spreader outfall from the stormwater facility within an adjacent area of lower elevation. To allow for the flow spreader outfall within the outer limits of the Category II wetland buffer, mitigation to offset the buffer impact is proposed. Although the offsite portions of the wetland unit provide higher buffer functions, this onsite buffer area where the flow spreader outfall is proposed is degraded and consists of monotypic pasture grasses with no significant vegetation to be impacted. The area of buffer impact imposed by the flow spreader outfall has been kept to the minimum size required and quantified to be 58 sf (Figure 6). The project proposes to offset this buffer impact area at a 1:1 ratio by buffer averaging nearby (and north of the standard 260-foot base buffer width otherwise held by the project along the southern parcel boundaries) over an area totaling 58 sf in size (Figure 6).

Temporary buffer impacts will be associated with the installation of the underground pipe that is required to connect the stormwater facility to the flow spreader outfall. A trench will be excavated within the pipe corridor and will avoid impacts to mature vegetation. The pipe trench will be back-filled with the native soils temporarily removed during construction of the pipe trench. All exposed soils from the trench and pipe installation activities will be re-vegetated using native seed mix appropriate for upland wetland buffer habitat – “Native Riparian seed mix” from Sunmark Seeds (or similar product) is recommended at the standard seeding rate of one pound per 1,000 sf.

Under CMC 16.53.050.2, wetland buffer averaging is allowed to achieve no net loss of functions when the total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging. The proposed mitigation ensures that the construction of the flow spreader outfall within a portion of the Category II buffer will results in no net loss of buffer area or functions.

Table 2. Wetland Buffer Impacts & Mitigation Summary.

Critical Area	Impact	Mitigation (Area)
260-ft Buffer Potential Offsite Wetland #3	Flow Spreader Outfall Impacts to Outer Limits of 260' Buffer **(58 sf)**	Buffer Averaging @ 1:1 Ratio **(58 sf)**

Wetland Conclusions

The above sections outline how the proposed project will meet the CMC 16.53 Wetlands. The proposed residential subdivision has been designed to avoid onsite critical areas to the full extent possible while still providing a residential subdivision meeting the density and design requirements required by the City of Camas. The proposed mitigation ensures that the construction of the flow spreader outfall within a small portion of the outer 260-foot buffer will result in no net loss of buffer area or functions.

WDFW PRIORITY HABITAT

The tree survey identified a total of five individual Oregon white oak trees onsite. These oaks were numbered and mapped by the Tree Plan (Appendix C - Arbor Science Tree Care, June 2025) and depicted on Figure 6. Four of the five oaks were found to have 20-inch diameter at breast height (dbh) trunk measurements (Oak #2, 45, 47, and 54). The fifth oak tree consists of a single tree with a 6-inch dbh trunk measurement located along the eastern parcel boundary (Oak # 28). See Figure 6 and Appendix C for the oak tree locations. The four oak trees inventoried by the tree survey with dbh measurements of 20-inches or larger are considered jurisdictional as they meet the WDFW criteria for "individual oak" Priority Habitat. Oregon white oak Priority Habitat is protected by WDFW and also jurisdictional under the local CMC habitat code. The understory and herbaceous layer associated with the onsite oak habitat is highly disturbed due to grazing or dominated by Himalayan blackberry.

Habitats of Local Importance

As stated above, four of the five individual Oregon white oak trees identified as onsite are over 20-inches dbh and therefore meet the criteria listed under CMC 16.61.010.A.3.a that defines Oregon white oak habitat of local importance:

i. Individual Oregon White Oak trees with a twenty-inch diameter at breast height (twenty inches dbh).
ii. Stands of Oregon White Oak trees greater than one acre, when they are found to be valuable to fish and wildlife (i.e., may include trees with cavities, large diameter breast height (twelve inches dbh), are used by priority species, or have a large canopy.
iii. All Oregon White Oak snags unless determined by an arborist to be a hazard.

The project proposes the removal of one of these jurisdictional Oregon white oak tree (Oak#47). Mitigation to offset the removal of this jurisdictional oak tree is proposed to meet CMC Section 16.61 Fish and Wildlife Habitat Conservation Areas code. The following mitigation plan section details the mitigation measures proposed.

Table 3. Oregon White Oak Summary.

Oak Tree #	DBH	Jurisdictional per WDFW PHS &/or CMC Local Habitats of Importance Criteria *(Individual oak tree >20" dbh)*	Proposed for Removal	Requires Mitigation
2	62"	YES	NO	NO
28	**6"**	**NO**	YES	NO
45	32"	YES	NO	NO
47	**28"**	YES	YES	**YES**
54	20"	YES	NO	NO

Note: Oak #47 will be repurposed as a woody habitat enhancement element within the onsite oak mitigation area.

OREGON WHITE OAK MITIGATION PLAN

The below mitigation plan was developed following Camas Municipal Code (CMC) Section 16.61 Fish and Wildlife Habitat Conservation Areas. The project proposes the removal of one individual oak tree (Oak #47, 28" dbh) as it is intertwined with the adjacent Oregon ash trees which are within the path of the proposed access road to the stormwater facility. The single oak tree impacts will offset onsite with oak mitigation to allow for no net loss of habitat functions onsite.

The onsite oak mitigation will consist of Oregon white oak tree and native shrub enhancement within the southern portion of the site to offset the removal of the single oak tree. The mitigation plan will also incorporate oak mitigation and native enhancement within the wetland buffer also located in the far southern extent of the project and will allow for an extension of the existing treeline in this area. The perimeter of the stormwater facility will also be planted with oak mitigation plantings, as well as the understory of the adjacent large oaks to be preserved in this area (Oak #s 45 and 54). See Figure 6.

Avoidance and Minimization

Following the mitigation sequencing requirements outlined under CMC 16.51.170, the project has avoided and minimized impacts to the full extent practicable while still meeting the required design elements for a subdivision of this size within the city limits of Camas. The unavoidable impacts have been quantified, and appropriate mitigation proposed onsite for no net loss of habitat area or function onsite.

The project has been designed to avoid direct impacts to and retain the three other jurisdictional Oregon white oak trees present onsite, two of these consisting of the largest oak trees inventoried (Oak #2, 62" dbh and Oak #45, 32" dbh), with the third Oak tree to be retained (Oak #54, 20").

Oak #2 is located in the far northeast corner of the project, Oak #45 is located in the far south/central portion of the project just north of the stormwater facility, and Oak #54 is near the eastern property boundary east of the stormwater facility. The dripline of each of these oak trees will be located, staked, and fenced prior to construction to protect the critical root mass of the tree during grading and site construction. Native shrubs will be added as understory plants within the driplines of the retained oaks in the south allowing for a vegetated habitat connection between the onsite and offsite mix oak habitat to the south.

Avoidance of the Oak tree #47 was originally attempted by the project, however it was determined that there was no reasonable location for the access road for the stormwater detention facility access road with less oak impacts. The project arborist also determined that since this oak root system and canopy of this tree are

intertwined with the adjacent Oregon ash trees (Tree #s 48, 49 & 50) that if the ash were removed, that the oak would also need to be removed as its vitality would be compromised and it would ultimately be directly impacted.

The unavoidable impact to Oak #47 is required to meet the stormwater engineering design requirements and its removal was recommended by the arborist. There is sufficient space to mitigate for this tree onsite by providing a habitat corridor extension between the on and off site oak habitat. The existing forested treeline present in the south will be extended with new oak tree installation and the historically impacted understory of the retained oak will be enhanced. Oak #47 will also be repurposed as a woody habitat element within the onsite oak mitigation area, Figure 6.

The majority of the subject parcel is historically disturbed due to cattle grazing with little to no native scrub-shrub understory habitat present onsite. There is no native understory present within the area of the jurisdictional oaks present onsite including the understory of the oak proposed for removal.

Oregon White Oak Impacts and Mitigation

The removal of the single jurisdictional Oregon white oak (Oak # 47) is unavoidable by the project to meet the City development code requirements. The oak habitat impacts were calculated by quantifying the total oak canopy habitat and function to be removed from the site.

The oak habitat mitigation was designed to follow the requirements of CMC 16.51.180 and will sufficiently offset the loss of this specific oak habitat lost onsite. The mitigation has further been designed to offset the temporal loss of the oak habitat onsite, enhance the functions of the oak habitat to be retained on site, provide greater connectivity to the oak habitat present directly offsite, and will be managed by the HOA for perpetuity to ensure maintenance and survival of the habitat into the future. Previously the onsite oak habitat was grazed by horses, which led to a decline in the overall habitat present. The oak habitat to be impacted has no native understory shrub component and the oak habitat present along the perimeter of the site is dominated by Himalayan blackberry. By removing the grazing impacts from the horses, creating, enhancing and restoring areas of the onsite habitat, the proposed mitigation will provide a higher functioning Oregon white oak habitat as the area matures than that present onsite today. Additionally, the single Oregon white oak to be removed will be repurposed within the onsite mitigation areas to provide additional enhancement by the addition of oak habitat woody elements. The total oak habitat canopy loss is 875 square feet, with 9,900 square feet of onsite mitigation proposed, providing an approximate 11:1 mitigation offset ratio, see Figure 6. This mitigation ratio is considered sufficient as it exceeds the WDFW guidance for a 10:1 mitigation ratio and the habitat provided by Oak #47 is of low habitat quality. Additionally, it should be noted that the unavoidable impacts permitted for much larger oaks at the Landing at Green Mountain – Phase I (directly to the east) were mitigated for at a mitigation ratio of 5:1.

The proposed Oregon white oak mitigation area is open and will offer plenty of sunlight and adequate canopy area for the oak trees and native shrub growth post project completion. The mitigation location will also help to provide greater connectivity for wildlife habitat, by providing shade, shelter, and food sources within the extended contiguous habitat corridor connection provided to the offsite forested and mixed oak canopy than currently present. Protection will be put in place around the perimeter of the mitigation areas during site grading and construction activities and after. Compensatory measures will need to be implemented if during construction the critical root mass of the retained oak trees are inadvertently impacted.

The mitigation proposed will offset the Oregon white oak Priority Habitat impacts onsite for no net loss of priority function or area following the CMC guidelines.

Table 4. Oak Impacts & Mitigation Summary.

Oak Label	Impact	Mitigation
Oak #47	Oregon White Oak (28-inch dbh) 875 sf Canopy Loss	Oregon white oak mitigation areas at a 11:1 Ratio (Oak tree and native shrub enhancement onsite) 9,900 sf

OAK MITIGATION PLANTING PLAN

Site Preparation

1. Demarcate the on-site "Protected Oak Habitat" (Oregon white oak retention and mitigation area boundaries) and install tree protection fencing along the proposed planting areas and the perimeter of the existing oak canopy dripline, See Figure 4.
2. Maintain this tree protective fencing for the full duration of the project construction.
3. Mow grasses, herbaceous vegetation and invasive species present within mitigation areas prior to tree installation.

Note: Excavation, fill or compaction of the native soils is not to take place within the protected oak habitat. No lawn or ornamental landscaping is to be located within the protected oak habitat.

Planting Methods

Plant in fall through early spring (October-April) at specified spacing following the planting plan.
Container/Ball and Burlap Stock

1. Dig hole using a tree shovel/auger/mini-excavator or comparable tool 16-inches wide and 4-inches deeper than the root system, scarify sides of hole to 4-inches. Remove plant from container and loosen roots with hand or score vertically on sides and bottom with knife. Set plant upright and plumb in hole so the crown is just above the finish grade. Ensure that roots are extended down entirely and do not bend upward.
2. Replace loose soil around plant and firmly compact the soil around the plant to eliminate air spaces. Do not use frozen soil for backfilling.
3. Firmly compact the soil around the planted species to eliminate air spaces.
4. Install woody mulch around the base of planted and retained Oregon white oak trees to insulate plantings, maintain moisture content of soil and reduce invasive plant competition.
5. Irrigate according to performance standards for the first three summers after planting or as site and weather conditions warrant.

Planting Specifications

Planting will begin in Winter of 2025/Spring of 2026 while onsite soils are more saturated (and stock is dormant). The following tables summarize the native plant selection, spacing, size, and quantity for the on-site mitigation area:

Table 5. Oak Mitigation Planting Plan.

Common Name	*Scientific Name*	*Stock*	*Spacing*	*Quantity*
TREES (9,900 sq. ft.)				
Oregon white oak, FACU	*Quercus garryana*	2-inch caliper	14 ft.	25
Oregon white oak, FACU	*Quercus garryana*	1-gallon container	14 ft.	25
			Total =	50
SHRUBS **(9,900 sq. ft.)**				
Tall Oregon grape, FACU	*Mahonia aquifolium*	1-gallon or 24-36" bare-root	6 ft.	50
Nootka rose, FAC	*Rosa nutkana*	1-gallon or 24-36" bare-root	6 ft.	50
Snowberry, FACU	*Symphorica rpos albus*	1-gallon or 24-36" bare-root	6 ft.	50
Ocean spray, FACU	*Holodiscus discolor*	1-gallon or 24-36" bare-root	6 ft.	50
			Total =	**200**
			Grand Total of Native Shrubs =	**250**

Protective Signage

Post construction, install permanent signs along the boundary of a "Protected Oak Habitat" meeting city standards or conditions outlined under the permit. See Objective 2, Performance Standard 2b below.

Maintenance Plan

Maintenance at the on-site mitigation area covers a minimum of 5-years and will involve removing persisting invasive plant species in addition to watering and re-installing failed species as necessary. The maintenance will include the following activities when necessary:

1. Remove and control non-native/noxious vegetation around all newly installed plants. During years 1 through 5 invasive species will be removed and suppressed as often as necessary to meet a performance standard of no greater than 20 percent cover by invasive species, measured by monitoring plots.
2. Irrigate planted species as necessary during the dry season, approximately July 1 through October 15. Irrigation is recommended to occur on a two-week cycle (minimum) during the dry season for the first three years. Water will be provided by a temporary above-ground irrigation system or a water truck.
3. Replace dead or failed Oregon white oak trees as described for the original installation to meet the minimum annual performance standard of 100% survival over the 5-year monitoring period. See Objective 1 for the full performance standards outlined by year.

Monitoring Plan

The mitigation site will be monitored for a 5-year period following project construction; monitoring will take place in years 1, 2, 3 and 5. Monitoring reports will be submitted to the City of Camas by the end of each monitored year. The goal of monitoring is to determine if the previously stated performance standards are being met. The mitigation area will be monitored once during the growing season, preferably during the same two-week period each year to better compare the data.

During the first annual monitoring event, representative monitoring plot locations and photo points will be selected within the mitigation areas and permanently marked with metal T-posts (or similar). Monitoring plot

and photo point locations will be labeled on the As-built Map and included in the annual monitoring reports.

Monitoring Report Contents

The annual monitoring reports will contain at least the following:

- Location map and as-built drawing of Oregon white oak mitigation and retention areas as depicted on Figure 5 of this mitigation plan.
- Photographs from permanent photo points (10 minimum).
- Historic description of project, including dates of Oregon white oak tree installation, current year of monitoring, and restatement of mitigation goal.
- Documentation of plant survival, cover, and overall development of the plant community from the ten established monitoring plot locations.
- Photo evidence that the protective oak habitat signage is in place and legible along the outer perimeter of the mitigation areas onsite.
- Assessment of non-native, invasive plant species and recommendations for management.
- Summary of maintenance and contingency measures proposed for the next season and those completed over the past season.

Contingency Plan

If the performance standards are not met by the fifth year following project completion, a contingency plan will be developed and implemented. All contingency actions will be undertaken only after consulting and gaining approval from the City of Camas. The applicant will be required to complete a contingency plan that describes (1) the causes of failure, (2) proposed corrective actions, (3) a schedule for completing corrective actions, and (4) whether additional maintenance and monitoring are necessary.

Site Protection

The on-site mitigation area will be owned and managed by the future Homeowners Association (HOA) Associated with the subdivision. The HOA will be responsible for managing and contracting out the annual monitoring of the on-site mitigation area (to AshEco Solutions, LLC or similar entity) for the initial 5-year monitoring period. Additionally, the HOA will be responsible for managing and contracting out the seasonal maintenance required to maintain the onsite mitigation areas in perpetuity, to ensure the onsite Oregon white oak habitat is allowed to thrive. The applicant will establish and record a permanent and irrevocable conservation covenant over the onsite mitigation areas to protect the established habitat in the future.

MITIGATION GOALS, OBJECTIVES AND PERFORMANCE STANDARDS

The mitigation goal of protecting the onsite Oregon white oak habitat for no net loss of functional habitat onsite will be met when the below objectives and performance standards are met.

Objective 1: Mitigate for 875 sf of Oregon white oak habitat with onsite oak mitigation over 9,900 sf.

Performance Standard 1a. Document the removal of invasive species within the mitigation area and install boundary protection fencing around the dripline of the retained oak trees prior to grading activities. Submit photos within the As-built to document the completion of this mitigation site preparation.

Performance Standard 1b. Document the installation of the native Oregon white oak trees, native shrub enhancement and repurposing of oak woody element (Oak #47) as specified by Figure 6 within the defined mitigation area onsite. Within 60 days of project completion, submit As-built Map and documentation to show that the mitigation plan has been implemented according to this plan, or as conditioned by permit. As-built documentation is to include; planting locations on an As-built Map, native nursery receipt showing plant species and quantities, representative photos of the mitigation area from a minimum of ten (4) established

photo point locations.

Performance Standard 1c. In Years 1-5, the Oregon white oak mitigation trees are to achieve 100-percent (100%) survival. (If dead trees are replaced to achieve the 100 percent survival rate, this performance standard will be met).

Performance Standard 1d. By Year 2, native woody shrub species within the onsite mitigation areas are to achieve ninety-percent (90%) survival of. (Native volunteer growth will count towards this cover requirement, as will the installation of new plants to offset mortality.)

Performance Standard 1e. By Year 3, native woody shrub species within the onsite mitigation areas are to achieve eighty-percent (80%) survival of native woody shrub species. (Native volunteer growth will count towards this cover requirement, as will the installation of new plants to offset mortality.)

Performance Standard 1f. By Year 5, native woody shrub species within the onsite mitigation areas are to achieve thirty percent (30%) aerial cover of native woody shrub species, or eighty percent (80%) survival. (Native volunteer growth will count towards this cover requirement, as will the installation of new plants to offset mortality.)

Performance Standard 1g. In All Years, non-native/invasive plant species will not exceed 20-percent (20%) aerial cover across the onsite mitigation area.

Objective 2: <u>Provide long-term protection for the onsite mitigation area.</u>

Performance Standard 2a. Record a conservation covenant with the City of Camas. This performance standard will be met when a copy is submitted with the As-built documentation (or prior as conditioned by the approved permit) .

Performance Standard 2b. Post permanent signage along the outer boundaries of the "Protected Oak Habitat" (oak mitigation and retention areas) . Signs are to read:

"Critical Area– Please Retain in a Natural State"

or as otherwise determined by the City of Camas permit conditions.

Signage will remain in legible condition; if they are missing or illegible, they will be replaced. This performance standard will be met when signs are documented to be in place and of good condition within the final monitoring report.

DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigator. It is correct and complete to the best of our knowledge. It should be considered a preliminary mitigation plan and used at your own risk until it has been reviewed and approved in writing by the local agency with jurisdiction over the site. AES personnel base the above listed conclusions on standard scientific methodology and best professional judgment.

REFERENCES

City of Camas Municipal Code. 2008 (Amended). Section 16.53 Wetlands.

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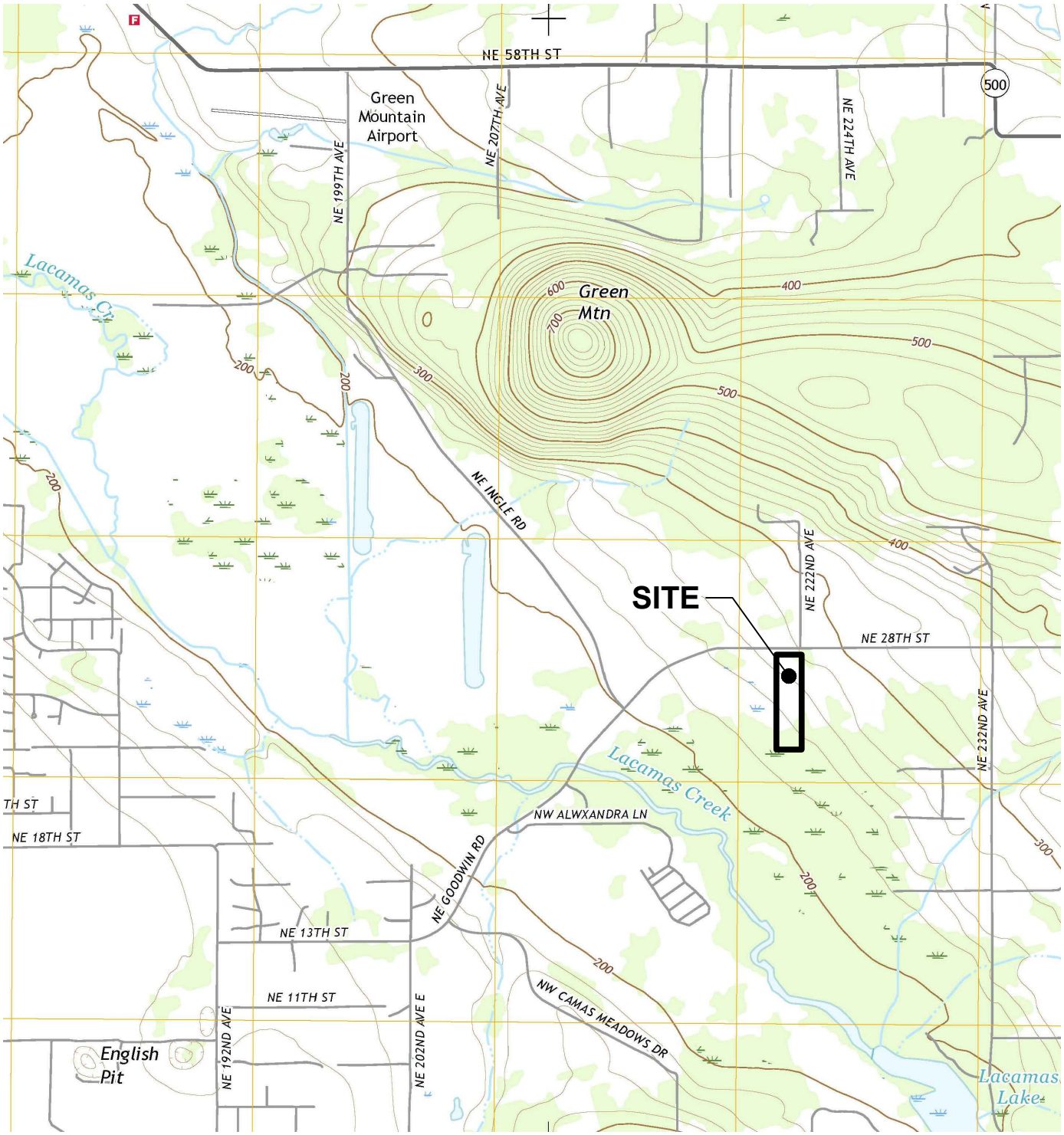

NOTE(S):
USGS, LACAMAS CREEK QUADRANGLE
WASHINGTON-CLARK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Ash ECO SOLUTIONS, LLC

PARCEL(S): 173210000, 173177000 **DATUM:** NAVD 88 **ADJACENT PROPERTY OWNERS:** Adj 1 Adj 2	VICINITY MAP **APPLICANT:** Pacific Lifestyle Homes **PROJECT NAME:** Landing at Green Mountain Ph II **SITE LOCATION ADDRESS:** Parcels East of 2625 NE Goodwin Rd.	**PROPOSED:** XX Add 2 **IN:** Camas **NEAR:** XX **COUNTY:** Clark **STATE:** WA **FIGURE:** 1 **DATE:** 5-27-25

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Legend

- Taxlots
- Contours Lines - 2 ft
- Contour Lines - 10 ft
- Contour Lines - 100 ft

N

0 250 500

SCALE IN FEET
1" = 250'

Ash ECO SOLUTIONS, LLC

PARCEL(S):
173210000, 173177000

DATUM: NAVD 88
ADJACENT PROPERTY OWNERS:
Adj 1
Adj 2

AERIAL PHOTO & TOPO MAP

APPLICANT: Pacific Lifestyle Homes
PROJECT NAME: Landing at Green Mountain
SITE LOCATION ADDRESS:
Parcels East of 2625 NE Goodwin Rd.

PROPOSED: XX
Add 2
IN: Camas
NEAR: XX
COUNTY: Clark **STATE:** WA
FIGURE: 2
DATE: 5-27-25

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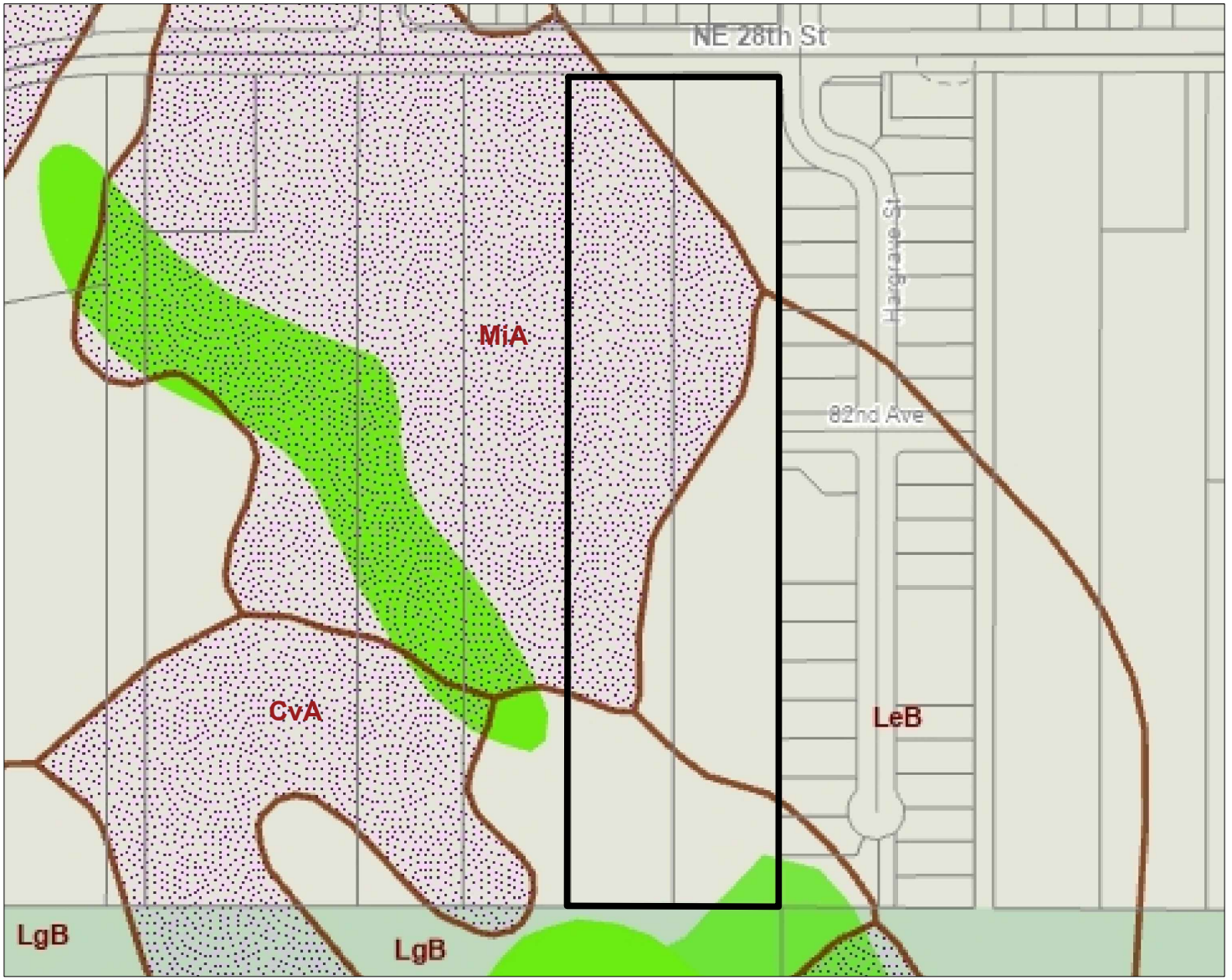

Legend

- Taxlots
- Soil Type
- Hydric Soils
- Potential Wetlands Presence
- Permitted Wetland
- NWI Wetland

CvA -

MiA -

LeB -

LgB -

N

0 250 500

SCALE IN FEET
1" = 250'

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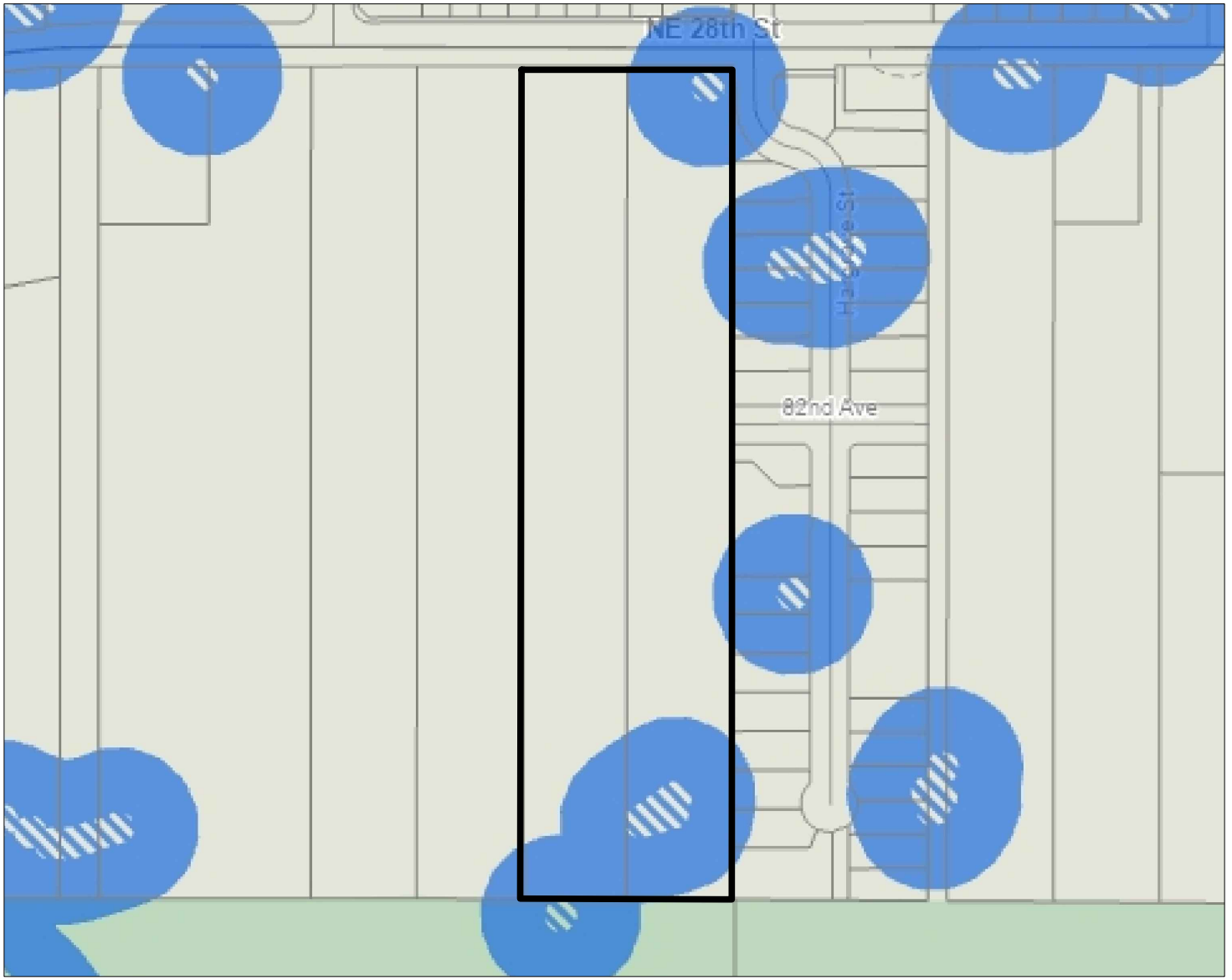
Ash ECO SOLUTIONS, LLC	**PARCEL(S):** 173210000, 173177000 **DATUM:** NAVD 88 **ADJACENT PROPERTY OWNERS:** Adj 1 Adj 2	SOIL SURVEY & NATIONAL WETLANDS INVENTORY MAP **APPLICANT:** Pacific Lifestyle Homes **PROJECT NAME:** Landing at Green Mountain **SITE LOCATION ADDRESS:** Parcels East of 2625 NE Goodwin Rd.	**PROPOSED:** XX Add 2 **IN:** Camas **NEAR:** XX **COUNTY:** Clark **STATE:** WA **FIGURE:** 3 **DATE:** 5-27-25



Legend

- Taxlots
- Species
  - Species Area
  - Adjacent to Species Area
- Habitat
  - Habitat Area
  - Adjacent to Habitat Area
- Riparian Habitat Site Class
- Stream
- Lake

N

0 250 500

SCALE IN FEET
1" = 250'

Ash ECO SOLUTIONS, LLC

PARCEL(S):
173210000, 173177000

DATUM: NAVD 88
ADJACENT PROPERTY OWNERS:
Adj 1
Adj 2

RIPARIAN HABITAT & SPECIES MAP

APPLICANT: Pacific Lifestyle Homes
PROJECT NAME: Landing at Green Mountain
SITE LOCATION ADDRESS:
Parcels East of 2625 NE Goodwin Rd.

PROPOSED: XX
Add 2
IN: Camas
NEAR: XX
COUNTY: Clark **STATE:** WA
FIGURE: 4
DATE: 5-27-25

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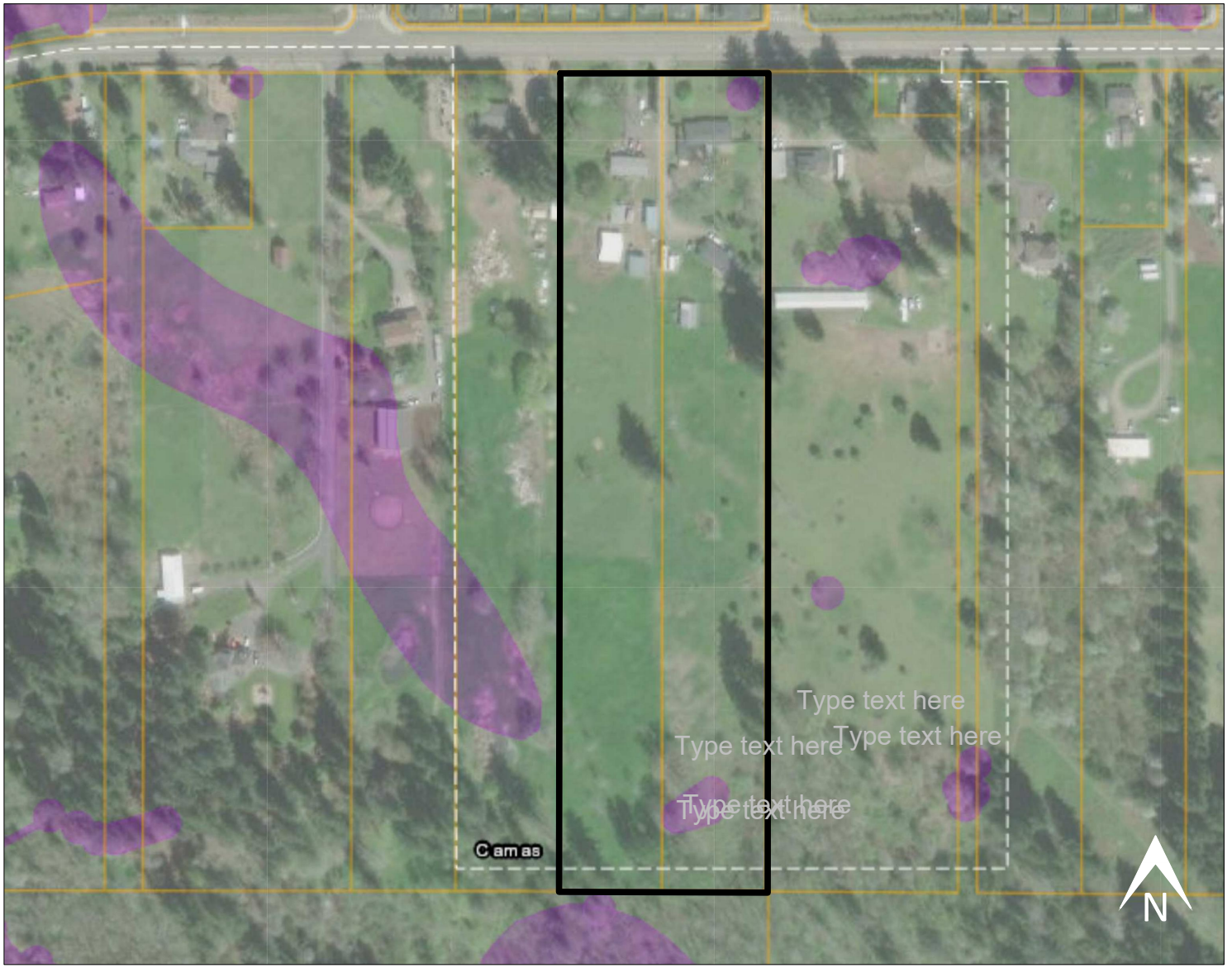

Legend

Parcels

Parcels

PHS on the Web

PHS Public Points

PHS Public Lines

PHS Public Polygon Outlines

AS MAPPED

Masked

PHS Public Polygons

AS MAPPED

SECTION

QTR-TWP

TOWNSHIP

0 250 500

SCALE IN FEET

1" = 250'

Ash ECO SOLUTIONS, LLC

PARCEL(S):
173210000, 173177000

DATUM: NAVD 88
ADJACENT PROPERTY OWNERS:
Adj 1
Adj 2

WDFW PHS MAP

APPLICANT: Pacific Lifestyle Homes
PROJECT NAME: Landing at Green Mountain Ph II
SITE LOCATION ADDRESS:
Parcels East of 2625 NE Goodwin Rd.

PROPOSED: XX
Add 2
IN: Camas
NEAR: XX
COUNTY: Clark **STATE:** WA
FIGURE: 5
DATE: 5-27-25

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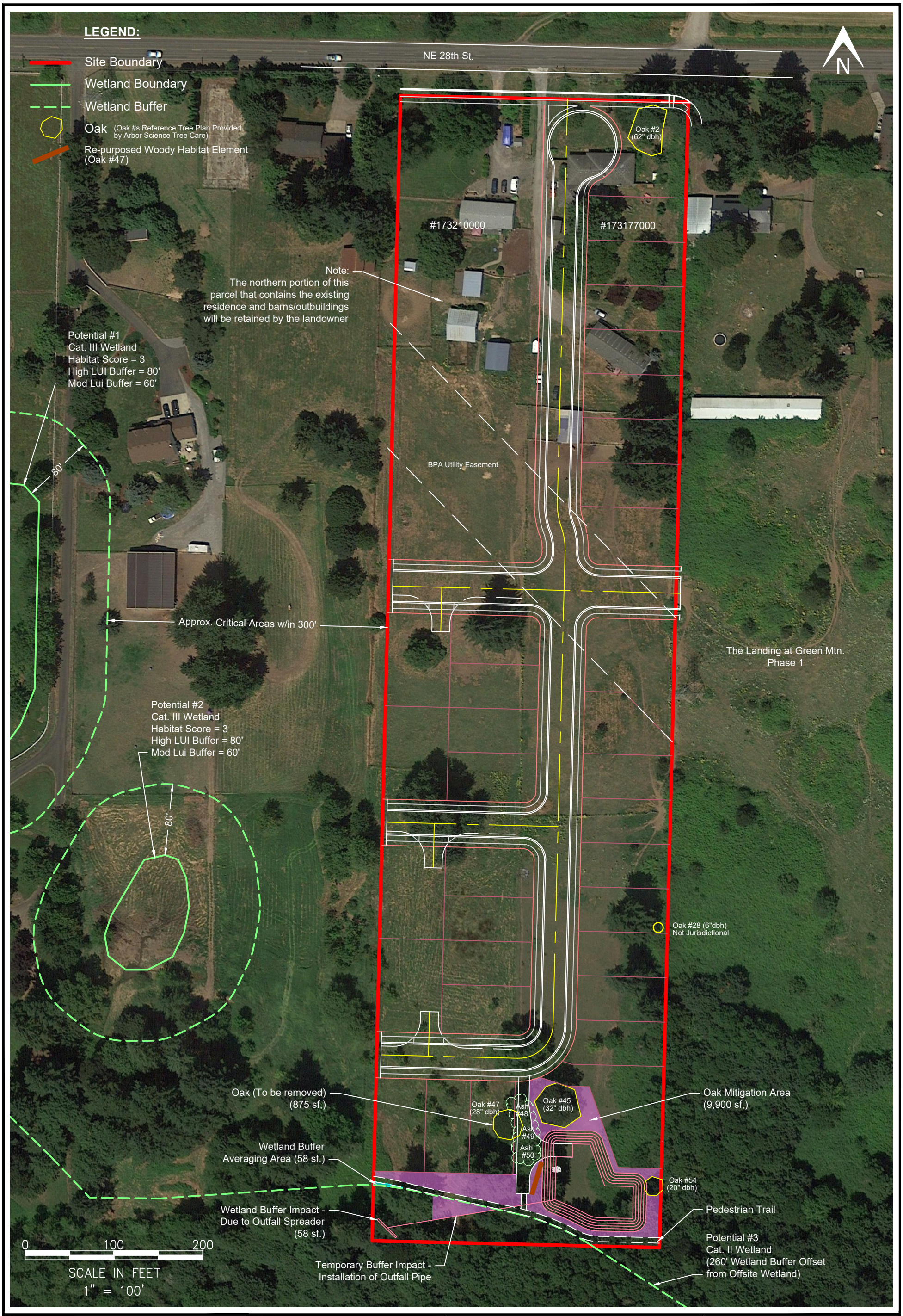

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AshECO SOLUTIONS, LLC	**PARCEL(S):** 173210000, 173177000 **DATUM:** NAVD 88 **ADJACENT PROPERTY OWNERS:** Adj 1 Adj 2	EXISTING CONDITIONS & PROPOSED SITE PLAN **APPLICANT:** Pacific Lifestyle Homes **PROJECT NAME:** Landing at Green Mountain - II **SITE LOCATION ADDRESS:** Parcels East of 2625 NE Goodwin Rd.	**PROPOSED:** XX Add 2 **IN:** Camas **NEAR:** XX **COUNTY:** Clark **STATE:** WA **FIGURE:** 6 **DATE:** 6-16-25

Appendix A

Site Photos

The Landing at Green Mountain - Site Photos

Photo 1.
View of the open pasture area located in the central portion of the study area. This area has historically been used to graze cattle.

Photo 2.
The Oregon white oak located in the far southeast corner of the study area is visible in center of photos (dark green canopy). This tree will be retained. The understory has historically been grazed and mowed.

Photo 3.
View south down the far eastern property line of the study area. The bulk of the area consists of open pasture grasses. The large Douglas-fir tree visible at left of photo is located near the east property line. The forested area visible in back of photo represents the offsite undeveloped park property owned by Clark County.

Appendix B

Wetland Rating Forms

Wetland name or number Offsite Wetland #1

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Offsite Wetland #1 Date of site visit: 6/13/2024

Rated by Andrea Aberle Trained by Ecology? ✓ Yes ___No Date of training 10/16

HGM Class used for rating Depressional Wetland has multiple HGM classes? ✓ Y ____N

NOTE: **Form is not complete without the required figures** (figures can be combined).
Source of base aerial photo/map _____

OVERALL WETLAND CATEGORY ___✓___ (based on functions___ or special characteristics__)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27
_____**Category II** – Total score = 20 - 22
___✓___**Category III** – Total score = 16 - 19
_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			
					Circle the appropriate ratings					
Site Potential	H	(M)	L	H	(M)	L	H	M	(L)	
Landscape Potential	(H)	M	L	H	(M)	L	H	M	(L)	
Value	(H)	M	L	H	(M)	L	H	M	(L)	**TOTAL**
Score Based on Ratings	8			6			3			17

Score for each function based on three ratings (order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I** **II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I** **II**
Interdunal	**I** **II** **III** **IV**
None of the above	✓

Wetland name or number Offsite Wetland #1

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

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 polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
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 polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
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 (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (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 polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
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	

Wetland name or number Offsite Wetland #1

HGM Classification of Wetlands in Western Washington

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

If the 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 water 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 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,
   ___At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   X___The wetland is on a slope (slope can be very gradual),
   X___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,
   ____The water leaves the wetland **without being impounded**. Note: Water is impounded at south

   NO – go to 5 **YES –** The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

Wetland name or number Offsite Wetland #1 Type text here

5. Does the entire wetland unit **meet all** of the following criteria?
   ____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ____The overbank flooding occurs at least once every 2 years.

   NO – go to 6 **YES** – The wetland class is **Riverine**

   NOTE: The Riverine unit can contain depressions 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 some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

   NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional 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 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.

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

Wetland name or number Offsite Wetland #1

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve 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 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	2
D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area points = 5 Wetland has persistent, ungrazed plants > ½ of area points = 3 Wetland has persistent, ungrazed plants ≥ 1/10 of area points = 1 Wetland has persistent, ungrazed plants < 1/10 of area Wetland located within horse pasture that is regularly grazed. points = 0	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 manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is ≥ ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	6

Rating of Site Potential If score is: __**12-16 = H** ✓**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
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	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source Wetland located within horse pasture that is regularly grazed. Yes = 1 No = 0	1
Total for D 2 Add the points in the boxes above	3

Rating of Landscape Potential If score is: ✓**3 or 4 = H** ___**1 or 2 = M** ___**0 = L** *Record the rating on 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, 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 303(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 in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0	1
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: ✓**2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #1

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

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/ditch, OR highly constricted permanently flowing outlet points = 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 is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part. 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 = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
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 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 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	3
Total for D 4 Add the points in the boxes above	8

Rating of Site Potential If score is: __**12-16 = H** ✓**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

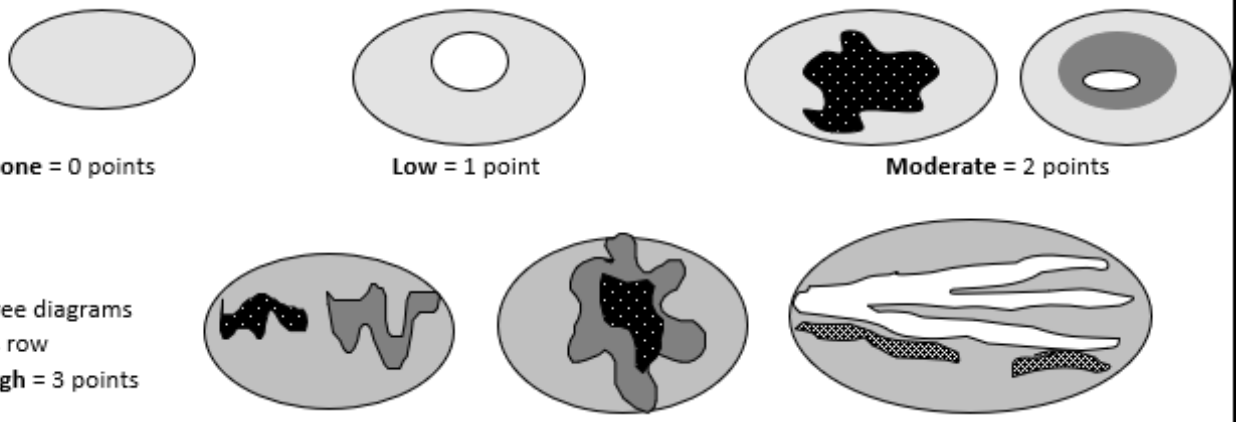
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	2

Rating of Landscape Potential If score is: __**3 = H** ✓**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. Is the unit 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 downgradient 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 downgradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther downgradient. points = 1 • Flooding from groundwater is an issue in the sub-basin. points = 1 • 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. points = 0	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	1

Rating of Value If score is: __**2-4 = H** ✓**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #1

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 if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac. ____Aquatic bed — 4 structures or more: points = 4 _✓_Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) 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 if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods). ____Permanently flooded or inundated — 4 or more types present: points = 3 _✓_Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _✓_Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Intermittently or seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	1
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, Canada thistle** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	1
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 All three diagrams in this row are **High** = 3 points	0

Wetland name or number Offsite Wetland #1

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 extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____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 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	1
Total for H 1 Add the points in the boxes above	4

Rating of Site Potential If score is: __**15-18 = H** ___**7-14 = M** __✓__**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 0% **+** [(18% moderate and low intensity land uses)/2] = 9 % Total accessible habitat is: > 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	0
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 26% **+** [(18% moderate and low intensity land uses)/2] = 22 % Total habitat > 50% of Polygon points = 3 Total habitat 10-50% and in 1-3 patches points = 2 Total habitat 10-50% and > 3 patches points = 1 Total habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is: __**4-6 = H** ___**1-3 = M** __✓__**< 1 = L** *Record the rating on 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? *Choose only 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 Department of Natural Resources data — 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) within 100 m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If score is: __**2 = H** ___**1 = M** __✓__**0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #1

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

— **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. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

— **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.

— **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **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. Do not select if Fresh Deepwater habitat is also present.

— **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

— **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) diameter at breast height (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.

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

Wetland A

Wetland name or number _____

- **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats
- **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- **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) in diameter at the largest end, and > 20 ft (6 m) long.
- **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.
- **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

Water

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

Wetland name or number _____

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine 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**	**Cat. I**
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 chapter 4.8 in the manual. — 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. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Does the wetland overlap with any known or historical rare plant or rare & high-quality ecosystem polygons on the WNHP Data Explorer?[135] Yes **= Category I** No – Go to **SC 2.2** SC 2.2. Does the wetland have a rare plant species, rare ecosystem (e.g., plant community), or high-quality common ecosystem that may qualify the site as a WHCV? Contact WNHP for resources to help determine the presence of these elements. Yes – Submit data to WA Natural Heritage Program for determination,[136] Go to **SC 2.3** No **= Not a WHCV** SC 2.3. Did WNHP review the site within 30 days and determine that it has a rare plant or ecosystem that meets their criteria? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs 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. Does an area within the wetland unit have organic soils, either peats or mucks, that are less 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 = **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 = **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 bog. SC 3.4. 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 = **Category I bog** No **= Not a bog**	**Cat. I**

[135] https://www.dnr.wa.gov/NHPdata

[136] https://www.dnr.wa.gov/Publications/amp_nh_sighting_form.pdf

Wetland name or number _____

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as Priority Habitats? ***If you answer YES, 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) 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). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — 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 (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* — The lagoon retains some of its surface water at low tide during spring tides Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does 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 in H 1.5 in the manual). — 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 is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal 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 and Ocean Shores Blvd SW, including lands west of E. Oceans Shores Blvd SW. 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)? 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. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

Wetland Rating Form Divider Sheet

Wetland name or number Offsite Wetland #2

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Offsite Wetland #2 Date of site visit: _____

Rated by Andrea Aberle Trained by Ecology? ✓ Yes ___No Date of training 10/16

HGM Class used for rating Depressional Wetland has multiple HGM classes? ✓ Y ____N

NOTE: **Form is not complete without the required figures** (figures can be combined).
Source of base aerial photo/map _____

OVERALL WETLAND CATEGORY ___✓___ (based on functions___ or special characteristics__)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

___✓___**Category III** – Total score = 16 - 19

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H (M) L	H M (L)	
Landscape Potential	(H) M L	H (M) L	H M (L)	
Value	(H) M L	H (M) L	H M (L)	**TOTAL**
Score Based on Ratings	8	6	3	17

Score for each function based on three ratings (order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I** **II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I** **II**
Interdunal	**I** **II** **III** **IV**
None of the above	✓

Wetland name or number Offsite Wetland #2

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

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 polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
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 polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
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 (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (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 polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
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	

Wetland name or number Offsite Wetland #2

HGM Classification of Wetlands in Western Washington

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

If the 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 water 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 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,
   ___At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ____The wetland is on a slope (slope can be very gradual),
   ____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,
   ____The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES –** The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

Wetland name or number Offsite Wetland #2

5. Does the entire wetland unit **meet all** of the following criteria?
   ____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ____The overbank flooding occurs at least once every 2 years.

   NO – go to 6 **YES** – The wetland class is **Riverine**
   NOTE: The Riverine unit can contain depressions 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 some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

   NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional 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 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.

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

Wetland name or number Offsite Wetland #2

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve 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 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	2
D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area points = 5 Wetland has persistent, ungrazed plants > ½ of area points = 3 Wetland has persistent, ungrazed plants ≥ 1/10 of area points = 1 Wetland has persistent, ungrazed plants < 1/10 of area Wetland located within horse pasture that is regularly grazed. points = 0	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 manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is ≥ ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	6

Rating of Site Potential If score is: __**12-16 = H** ✓**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
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	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source waterfowl Yes = 1 No = 0	1
Total for D 2 Add the points in the boxes above	3

Rating of Landscape Potential If score is: ✓**3 or 4 = H** ___**1 or 2 = M** ___**0 = L** *Record the rating on 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, 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 303(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 in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0	1
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: ✓**2-4 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #2

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

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/ditch, OR highly constricted permanently flowing outlet points = 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 is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part. 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 = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
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 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 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	3
Total for D 4 Add the points in the boxes above	8

Rating of Site Potential If score is: __**12-16 = H** ✓**6-11 = M** ___**0-5 = L** *Record the rating on the first page*

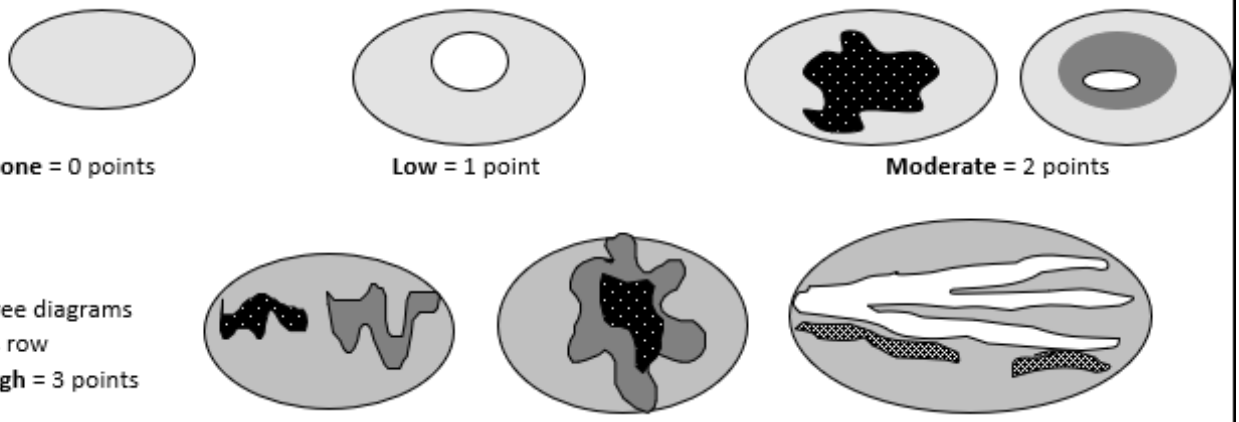
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	2

Rating of Landscape Potential If score is: __**3 = H** ✓**1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. Is the unit 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 downgradient 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 downgradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther downgradient. points = 1 • Flooding from groundwater is an issue in the sub-basin. points = 1 • 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. points = 0	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	1

Rating of Value If score is: __**2-4 = H** ✓**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #2

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 if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac. ____Aquatic bed — 4 structures or more: points = 4 _✓_Emergent — 3 structures: points = 2 ____Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) 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 if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods). ____Permanently flooded or inundated — 4 or more types present: points = 3 _✓_Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _✓_Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Intermittently or seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	1
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, Canada thistle** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	1
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 All three diagrams in this row are **High** = 3 points	0

Wetland name or number Offsite Wetland #2

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 extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____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 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	1
Total for H 1 Add the points in the boxes above	4

Rating of Site Potential If score is: __**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 0% **+** [(18% moderate and low intensity land uses)/2] = 9 % Total accessible habitat is: > 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	0
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 26% **+** [(18% moderate and low intensity land uses)/2] = 22 % Total habitat > 50% of Polygon points = 3 Total habitat 10-50% and in 1-3 patches points = 2 Total habitat 10-50% and > 3 patches points = 1 Total habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is: __**4-6 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on 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? *Choose only 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 Department of Natural Resources data — 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) within 100 m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If score is: __**2 = H** ___**1 = M** ✓ **0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #2

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

— **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. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

— **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.

— **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **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. Do not select if Fresh Deepwater habitat is also present.

— **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

— **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) diameter at breast height (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.

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

Wetland name or number Offsite Wetland #2

- **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats
- **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- **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) in diameter at the largest end, and > 20 ft (6 m) long.
- **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.
- **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

Wetland name or number _____

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine 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**	**Cat. I**
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 chapter 4.8 in the manual. — 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. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Does the wetland overlap with any known or historical rare plant or rare & high-quality ecosystem polygons on the WNHP Data Explorer?[135] Yes **= Category I** No – Go to **SC 2.2** SC 2.2. Does the wetland have a rare plant species, rare ecosystem (e.g., plant community), or high-quality common ecosystem that may qualify the site as a WHCV? Contact WNHP for resources to help determine the presence of these elements. Yes – Submit data to WA Natural Heritage Program for determination,[136] Go to **SC 2.3** No **= Not a WHCV** SC 2.3. Did WNHP review the site within 30 days and determine that it has a rare plant or ecosystem that meets their criteria? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs 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. Does an area within the wetland unit have organic soils, either peats or mucks, that are less 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 = **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 = **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 bog. SC 3.4. 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 = **Category I bog** No **= Not a bog**	**Cat. I**

[135] https://www.dnr.wa.gov/NHPdata

[136] https://www.dnr.wa.gov/Publications/amp_nh_sighting_form.pdf

Wetland name or number _____

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as Priority Habitats? ***If you answer YES, 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) 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). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — 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 (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* — The lagoon retains some of its surface water at low tide during spring tides Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does 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 in H 1.5 in the manual). — 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 is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal 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 and Ocean Shores Blvd SW, including lands west of E. Oceans Shores Blvd SW. 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)? 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. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	

Wetland Rating Form Divider Sheet

Wetland name or number Offsite Wetland #3

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Offsite Wetland #3 Date of site visit: _____
Rated by Andrea Aberle Trained by Ecology? ✓ Yes ___No Date of training 10/06

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y _X_N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map _____

OVERALL WETLAND CATEGORY II (based on functions ✓ or special characteristics___)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27
X **Category II** – Total score = 20 - 22
_____**Category III** – Total score = 16 - 19
_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H (M) L	(H) M L	
Landscape Potential	H (M) L	H (M) L	H (M) L	
Value	(H) M L	H (M) L	(H) M L	**TOTAL**
Score Based on Ratings	7	6	8	21

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	✓

Wetland name or number Potential Wetland #3 - Offsite to south

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

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 polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
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 polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
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 (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (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 polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
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	

Wetland name or number Offsite Wetland #3

HGM Classification of Wetlands in Western Washington

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

If the 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 water 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 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

   NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
   *If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

   NO – go to 3 **YES** – The wetland class is **Flats**
   *If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
   ___At least 30% of the open water area is deeper than 6.6 ft (2 m).

   NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The wetland is on a slope (*slope can be very gradual*),
   ✓ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
   X The water leaves the wetland **without being impounded**.

   NO – go to 5 **YES** – The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?
   ___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ___The overbank flooding occurs at least once every 2 years.

Wetland name or number Offsite Wetland #3

NO – go to 6 **YES** – The wetland class is **Riverine**
NOTE: The Riverine unit can contain depressions 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 some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional 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 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.

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

Wetland name or number Offsite Wetland #3

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve 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 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	2
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*. Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	3
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	4
Total for D 1 Add the points in the boxes above	9

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of 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	0
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 or 4 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on 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, 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 303(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 the unit is found*)? Yes = 2 No = 0	1
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #3

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

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 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 is permanently flowing points = 0	2
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* 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 = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
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 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	3
Total for D 4 Add the points in the boxes above	8

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?

D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	1
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	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.)? Yes = 1 No = 0	0
Total for D 5 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating 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. points = 2 • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 Flooding from groundwater is an issue in the sub-basin. points = 1 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. points = 0	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #3

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.*

X Aquatic bed	4 structures or more: points = 4
X Emergent	3 structures: points = 2
X Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
X Forested (areas where trees have > 30% cover)	1 structure: points = 0

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

4

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	4 or more types present: points = 3
X Seasonally flooded or inundated	3 types present: points = 2
____Occasionally flooded or inundated	2 types present: points = 1
X Saturated only	1 type present: points = 0
____Permanently flowing stream or river in, or adjacent to, the wetland	
X Seasonally flowing stream in, or adjacent to, the wetland	
____**Lake Fringe wetland**	**2 points**
____**Freshwater tidal wetland**	**2 points**

2

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

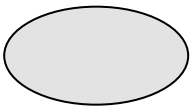
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

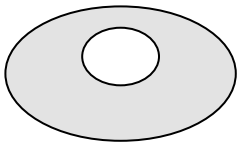
2

H 1.4. Interspersion of habitats

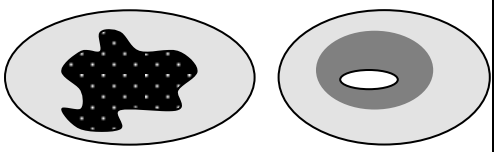
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



None = 0 points

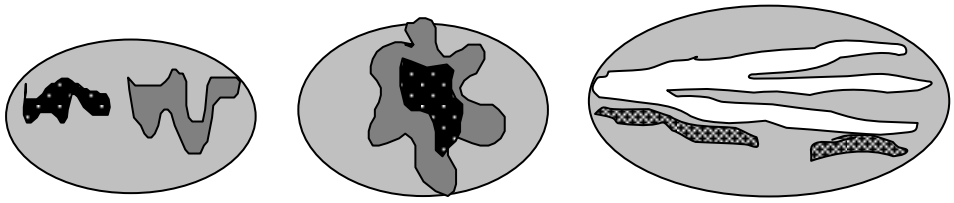


Low = 1 point



Moderate = 2 points

All three diagrams in this row are **HIGH** = 3points



2

Wetland name or number Offsite Wetland #3

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.* X Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). X Standing snags (dbh > 4 in) within the wetland X 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) ___ 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)* X 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)* X Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	5
Total for H 1 Add the points in the boxes above	15

Rating of Site Potential If score is: ✓ **15-18 = H** ___ **7-14 = M** ___ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat___ **+** [(% moderate and low intensity land uses)/2]___ **=** _____% If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon 9% Accessible + (31/2) 15.5% = 24.5% 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	2
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* % undisturbed habitat___ **+** [(% moderate and low intensity land uses)/2]___ **=** _____% Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches 20% Undist + (15.5%) = 35.5 (4 patches) points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use High LUI = 40% points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	0
Total for H 2 Add the points in the boxes above	3

Rating of Landscape Potential If score is: ___ **4-6 = H** ✓ **1-3 = M** ___ **< 1 = L** *Record the rating on 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? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 X 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 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) within 100 m points = 1 Site does not meet any of the criteria above points = 0	2

Rating of Value If score is: ✓ **2 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Offsite Wetland #3

WDFW Priority Habitats

Priority habitats listed by WDFW (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) in diameter at the largest end, and > 20 ft (6 m) long.

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

Wetland name or number _____

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine 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**	**Cat. I**
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. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. 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** No **–** Go to **SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes **= Category I** No **= Not a 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 go to SC 2.4** No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs 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. Does an area within the wetland unit have organic soils, either peats or mucks, that are less 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 bog. SC 3.4. 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**	**Cat. I**

Wetland name or number _____

SC 4.0. Forested Wetlands Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES 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) 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). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — 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 (> 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. Does 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 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 is larger than $^{1}/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal 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 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)? 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. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	N/A

Wetland name or number _____

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Appendix C

Tree Plan

(Arbor Science Tree Care, June 2025)

ARBOR SCIENCE TREE CARE
SPECIALIZING IN SUSTAINABLE TREE CARE SOLUTIONS
arborsciencetreecare.com
360.521.0249
WA# ARBORST838DT OR CCB# 216351

June 28th 2025

Pacific Lifestyle Homes
1815 NE 99th St Vancouver WA 98682

The Landing At Green Mountain 2
22111 NE 28th St Camas WA 98607
Parcel # 173177000, 173210000

Re: Tree Survey per City of Camas CMC 18.13.045

Tree, Vegetation and Soil Protection During Construction.

During construction. Prior to initiating tree removal on the site, soils, vegetated areas and individual trees to be preserved shall be protected from potentially damaging activities pursuant to the following standards.

A. Placing Materials Near Trees. No person may conduct any activity within the protected area of any tree designated to remain, including, but not limited to, parking equipment, placing solvents, storing building material and soil deposits, dumping concrete washout and locating burn holes.

1. During construction, no person shall attach any object to any tree designated for protection.

B. Protective Barrier. Before development, land clearing, filling or any land alteration for which a tree is to be protected. The contractor
1. Shall erect and maintain readily visible protective tree fencing along the outer edge and completely surrounding the protected area of all protected trees or groups of trees that are to remain undisturbed. Fences shall be constructed of chain link and at least four feet high, unless other type of fencing is authorized by the planning official.

2.Shall prohibit excavation or compaction of earth or other potentially damaging activities within the barriers.

3. Shall maintain the protective barriers in place until the planning official authorizes their removal or a final certificate of occupancy is issued, whichever occurs first

4. Shall ensure that any landscaping done in the protected zone subsequent to the removal of the barriers shall be accomplished with light machinery or hand labor. No turf or lawn areas are to be installed within protected area.

5. In addition to the above, the planning official may require the following:

- Cover with mulch to a depth of at least six (6) inches or with plywood or similar material the areas adjoining the critical root zone of a tree in order to protect roots from damage caused by heavy equipment.

- Minimize root damage by excavating a two (2) foot deep trench, at edge of critical root zone, to cleanly sever the roots of trees to be retained.

- Have corrective pruning performed on protected trees in order to avoid damage from machinery or building activity.

- Maintain trees throughout construction period by watering and fertilizing if recommended by Arborist.

C. Grade.

1. The grade shall not be elevated or reduced within the critical root zone of trees to be preserved without the planning official's authorization. The planning official may allow coverage of up to one half of the area of the tree's critical root zone with light soils (no clay) to the minimum depth necessary to carry out grading or landscaping plans, if it will not imperil the survival of the tree. Aeration devices may be required to ensure the tree's survival.

2. If the grade adjacent to a preserved tree is raised such that it could slough or erode into the tree's critical root zone, it shall be permanently stabilized to prevent suffocation of the roots.

3. The applicant shall not install an impervious surface within the critical root zone of any tree to be retained without the authorization of the planning official. The planning official may require specific construction methods and/or use of aeration devices to ensure the tree's survival and to minimize the potential for root induced damage to the impervious surface.

4. To the greatest extent practical, utility trenches shall be located outside of the critical root zone of trees to be retained. The planning official may require that utilities be tunneled under the roots of

trees to be retained if the planning official determines that trenching would significantly reduce the chances of the tree's survival.

5. Trees and other vegetation to be retained shall be protected from erosion and sedimentation. Clearing operations shall be conducted so as to expose the smallest practical area of soil to erosion for the least possible time. To control erosion, shrubs, ground cover and stumps shall be maintained on the individual lots, where feasible. Where not feasible appropriate erosion control practices shall be implemented pursuant to best management practices within industry standards.

D. Directional felling. Directional felling of trees shall be used to avoid damage to trees designated for retention and shall be conducted so as to expose the smallest practical area of soil to erosion for the least possible time. To control erosion, shrubs, ground cover and stumps shall be retained where feasible. Where not feasible, appropriate erosion control practices shall be implemented pursuant to

E. Additional requirements. The planning official or Arborist may require additional tree, vegetation and soil protection measures which are consistent with accepted best management practices.

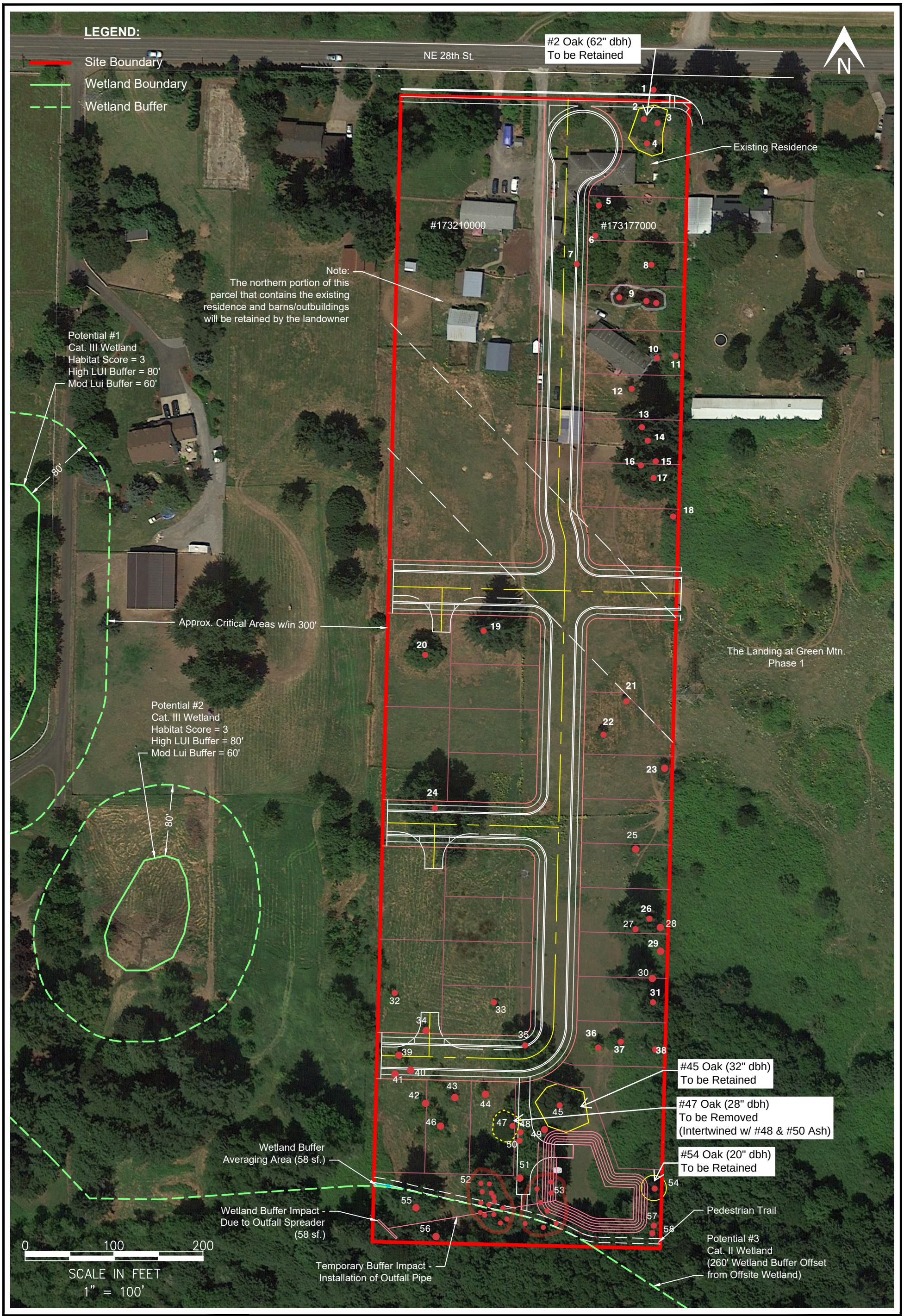
Tree Density Calculations:

Per City of Camas municipal code 18.13.045 this development requires 20 tree units per acre. The existing lot area is 9.59 acres, which has a density requirement of 191.8 tree units per acre. This proposed development retains 206 tree units to be preserved.
See attached map and table for tree detail and locations.

Prepared By Brandon Cheney
ISA Certified Arborist PN #7163A
TRAQ

Tree Number	Species	Common Name	DBH "	Retention Y/N	Condition	Tree Units
1	p. menziesii	Douglas-Fir	8	Y	Satisfactory	2
2	quercus	White Oak (multi stem)	62	Y	Satisfactory	26
3	p. menziesii	Douglas-Fir	52	Y	Satisfactory	22
4	cornus	Dogwood	9	Y	Satisfactory	2
5	acer	Bigleaf Maple	58	N	Fair	25
6	juglands	Black Walnut	31	N	Poor	12
7	juglands	Black Walnut	23	N	Fair	8
8	juglands	Black Walnut	24	N	Fair	8
9	prunus	(3 trees) Purple leaf plum	21	N	Fair	7
10	picea	Blue Spruce	9	N	Satisfactory	2
11	picea	Blue Spruce	9	N	Satisfactory	2
12	betula	(2 trees) Birch	8	N	Poor	2
13	p. menziesii	Douglas-Fir	46	N	Satisfactory	19
14	p. menziesii	Douglas-Fir	50	N	Satisfactory	21
15	p. menziesii	Douglas-Fir	46	N	Satisfactory	19
16	p. menziesii	Douglas-Fir	30	N	Satisfactory	11
17	p. menziesii	Douglas-Fir	41	N	Fair	17
18	acer	Bigleaf Maple (twin stem)	15	N	Poor	4
19	p. menziesii	Douglas-Fir	50	N	Fair	21
20	p. menziesii	Douglas-Fir	30	N	Dead	11
21	crataegus	Hawthorn	8	N	Satisfactory	2
22	fraxinus	Ash	8	N	Satisfactory	2
23	crataegus	Hawthorn	8	N	Satisfactory	2
24	fraxinus	Ash	24	N	Satisfactory	8
25	crataegus	Hawthorn	8	N	Satisfactory	2
26	p. menziesii	Douglas-Fir	46	N	Satisfactory	19
27	crataegus	Hawthorn	6	N	Satisfactory	2
28	quercus	White Oak	6	N	Fair	2
29	crataegus	Hawthorn	6	N	Satisfactory	2
30	p. menziesii	Douglas-Fir	50	N	Satisfactory	21
31	p. menziesii	Douglas-Fir	28	N	Poor	20
32	fraxinus	Ash	6	N	Satisfactory	2
33	fraxinus	Ash	6	N	Satisfactory	2
34	fraxinus	Ash	7	N	Satisfactory	2

Tree Number	Species	Common Name	DBH "	Retention Y/N	Condition	Tree Units
35	fraxinus	Ash (twin stem)	50	N	Satisfactory	21
36	fraxinus	Ash	10	N	Satisfactory	2
37	fraxinus	Ash (twin stem)	19	N	Satisfactory	6
38	salix	Willow	10	N	Poor	2
39	fraxinus	Ash (twin stem)	42	N	Satisfactory	17
40	fraxinus	Ash	7	N	Satisfactory	2
41	fraxinus	Ash	7	N	Satisfactory	2
42	fraxinus	Ash	9	N	Satisfactory	2
43	fraxinus	Ash	8	N	Satisfactory	2
44	fraxinus	Ash	10	N	Satisfactory	2
45	quercus	White Oak	32	Y	Satisfactory	12
46	fraxinus	Ash	7	N	Satisfactory	2
47	quercus	White Oak	28	N	Fair	10
48	fraxinus	Ash (twin stem)	33	N	Satisfactory	13
49	fraxinus	Ash (multi stem)	22	Y	Satisfactory	7
50	fraxinus	Ash (twin stem)	38	N	Fair	15
51	populas	Cottonwood	48	N	Satisfactory	20
52	populas	(14 tree grove) Cottonwood	188	Y	Satisfactory	90
53	populas	(8 tree grove) Cottonwood	116	N	Satisfactory	54
54	quercus	White Oak	20	Y	Fair	6
55	p. menziesii	Douglas-Fir	38	Y	Satisfactory	15
56	p. menziesii	Douglas-Fir	28	Y	Satisfactory	10
57	fraxinus	Ash	18	Y	Fair	5
58	fraxinus	Ash	25	Y	Fair	9



TREE PLAN

EXISTING CONDITIONS &
PROPOSED SITE PLAN

APPLICANT: Pacific Lifestyle Homes
PROJECT NAME: Landing at Green Mountain II
SITE LOCATION: 22015 & 22111 NE Goodwin Rd., Camas, WA

COUNTY: Clark **STATE:** ~~WA~~
FIGURE: 1
DATE: 6-24-25

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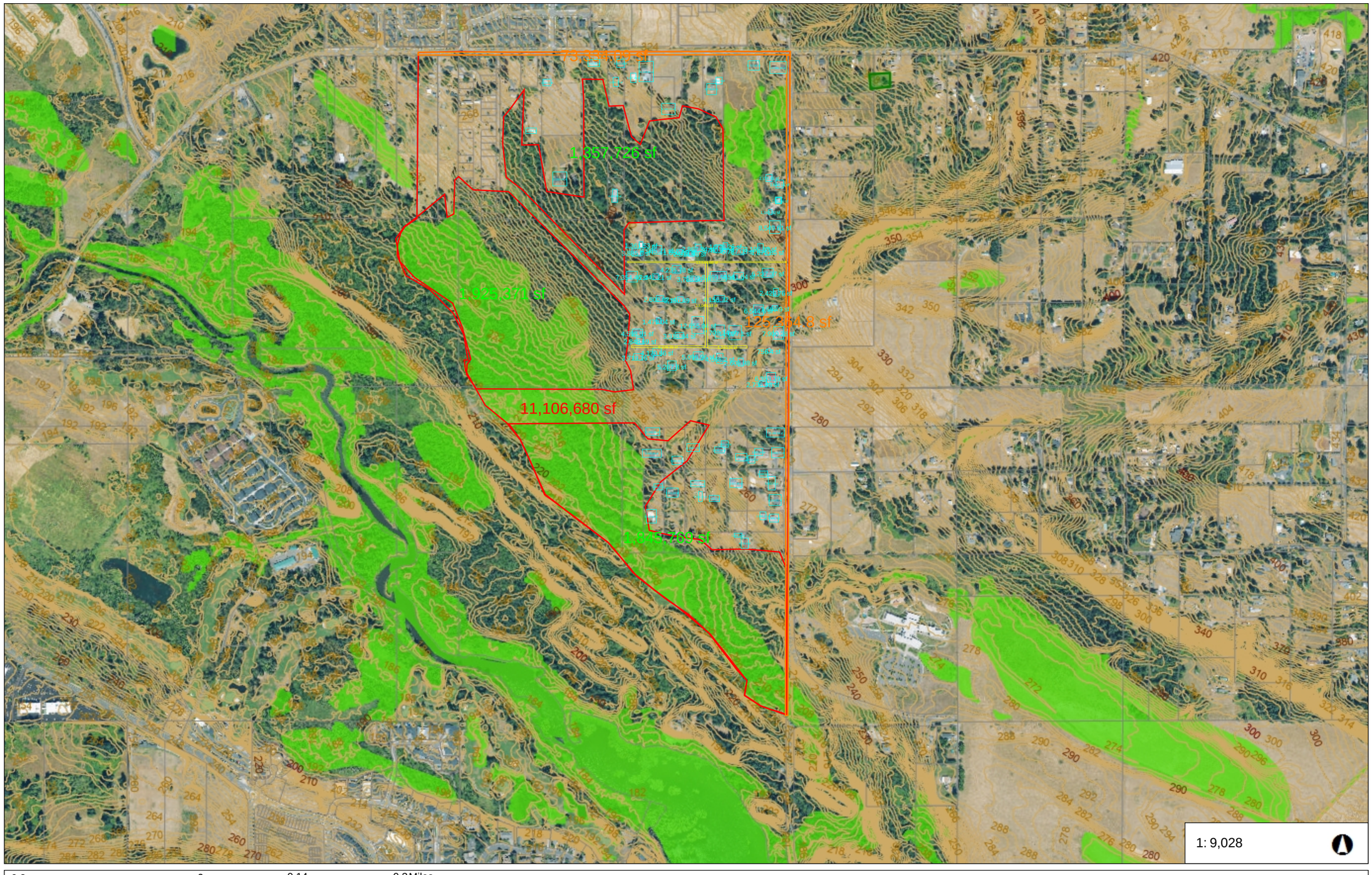

Legend

- Taxlots
- Contours Lines - 2 ft
- Contour Lines - 10 ft
- Contour Lines - 100 ft
- Potential Wetlands Presence

1: 9,028

Notes:

0.3 0 0.14 0.3 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov