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Mukilteo, WA

Preliminary Stormwater Site Plan

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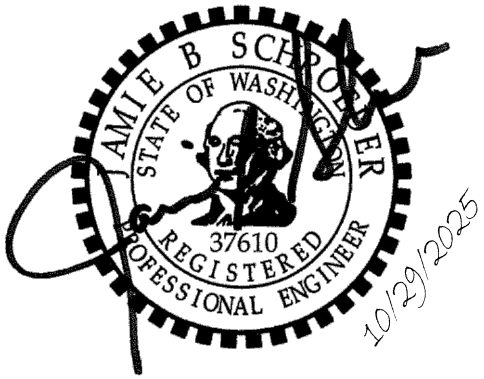

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1.0 Project Description

This Stormwater Site Plan (SSP) describes the engineering analysis of the surface water conditions, proposed development improvements, and required storm drainage facilities for the *Harbour Pointe* project located in Mukilteo, Washington. The project proposes to develop a single parcel located within the City of Mukilteo with 8 single-family buildings for 37 townhouse units in total on an approximately 3.26-acre property. The stormwater requirements for this project are established by the 2024 Department of Ecology Stormwater Management Manual for Western Washington (SWMMWW) and Chapter 3 of the City of Mukilteo Development Standards. Per the charge provided as Figure I-3.1 of the SWMMWW, the project is required to meet minimum requirements #1 through #9. This report is provided to identify the applicable storm drainage standards and to summarize the analysis and design provisions for the project to comply with the city surface water standards.

The vicinity map provided below as Figure 1 illustrates the general location of the subject property. The project site has not been designated as an address but is located along the west site of Harbour Place, just southwest of the intersection of Paine Field Boulevard and Mukilteo Speedway, within the city of Mukilteo, Washington 98275 (Snohomish County tax parcel no. 28042100103200). The subject property has a current zoning of Planned Commercial Business South (PCBs). More generally, the site is located in the SE ¼ pf the SE ¼ of Section 16 and the NE ¼ of the NE ¼ of Section 21, in Township 28 North, Range 4 East in Snohomish County, Washington (see Vicinity Map below).

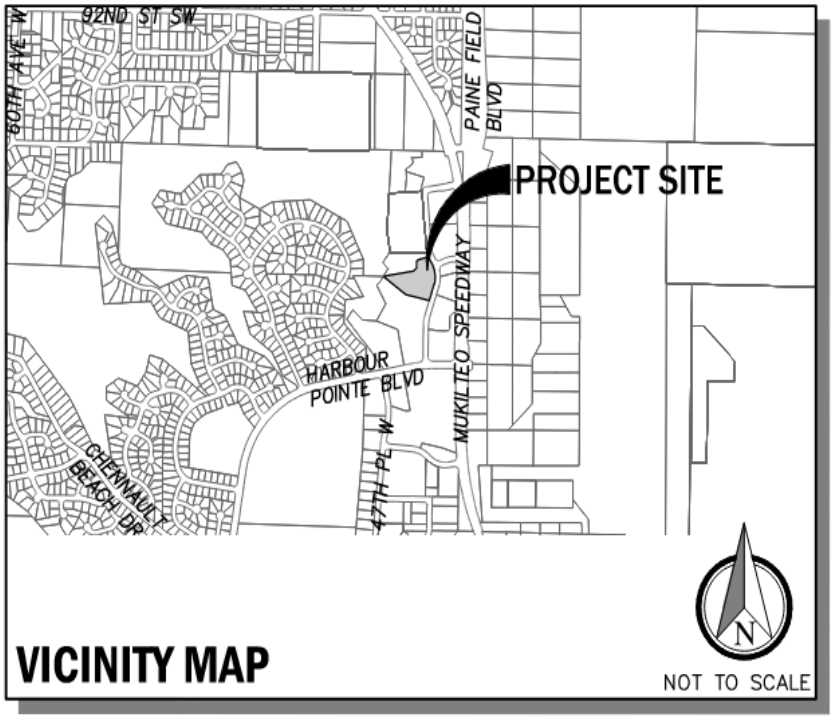


Figure 1–Vicinity Map

The project proposes to develop the single existing parcel, which totals approximately 3.26 acres. The site is currently completely undeveloped and comprised entirely of forest and some grassy areas. The existing trees are proposed to be retained to the maximum extent possible. The development is proposed to take place on the west side of the site along the frontage of Harbour Place while the east half of the site will remain in existing conditions. See Figure 2 of this report for the existing site conditions.

The project site is bordered by public right-of-way to the east (Harbour Place), Harbour Pointe Montessori School to the north, Harbour Point Senior Living Facility to the south and a single-family neighborhood to the west. There are a few commercial buildings to the east across Harbour Place, including a Blu Burgers Restaurant, Starbucks, Walgreens, and Safeway.

Current site zoning of the property is Planned Commercial Business South (PCBs), there is currently no maximum housing density for this zoning designation. The 37 townhouse units are permitted use under the current zoning and all site development and public infrastructure improvements are proposed in accordance with applicable City of Mukilteo Development Standards. See Figure 3 for the proposed site conditions.

The project site is generally sloped from east to west and converges to an westward running valley that continues past the southwest boundary of the site. There are moderate slopes in the east half of the site where the development is proposed and steep slopes in the west half, with a steep slope buffer running between the two that is delineated on Figure 2. A storm drainage system in the form of typical catch basin inlets and below grade pipes exist along the frontage to the project site as well as an existing Type 4 Stream and its associated buffer that runs northeast to southwest and located in the western half of the project site within the valley. Similarly, there is an existing onsite Category IV Wetland and is associated buffer located in the southeast corner of the project site. No contaminants that would affect the stream or wetland are expected to be released with this development.

1.1. On-site Soil Conditions

The soils of the area are generally characterized by the Natural Resource Conservation Service (NRCS) as Alderwood gravelly sandy loam in the east half of the site, with 0-8% slopes, and Everett very gravelly sandy loam in the west half of the site, with 15-30% slopes. A site-specific geotechnical report was prepared by Earth Solutions NW, LLC on June 13, 2025. The report has been provided in Appendix A of this report along with the NRCS soils summary.

2.0 Conditions and Requirements Summary

The storm drainage analysis and facilities design for this project are proposed in accordance with the 2024 Department of Ecology Stormwater Management Manual for Western Washington (SWMMWW). The project is classified as a New Development and will result in greater than 5,000 square-feet of new impervious surface, therefore all nice Minimum requirements for stormwater management specified by the manual are applicable. Compliance and/or applicability of each of these design standards are summarized below. Refer to Figure 2 – Existing Conditions in the Appendix of this report in conjunction with the site assessment. Refer to Appendix G – SWMMWW Excerpts for the minimum requirement analysis.

SWMM SITE ASSESSMENT REQUIREMENTS

1. **Topography:** The existing project site is contained within a single threshold discharge areas (TDA) which comprises the existing drainage basins delineated on Figure 4. The site generally slopes from higher elevations along the east boundary to lower elevations along the west boundary. There are relatively higher elevations along the north and south boundary as well that converge to a valley that runs from the northeast to the southwest. This valley contains a stream that discharges from the southwest boundary of the project site. There is approximately 120 feet of topographic relief across the entire site. Runoff generated from storm events travels as sheet and shallow concentrated flow from the higher elevations in along the eastern boundary of the project site before converging to the stream prior to discharge from the site.
2. **Drainage:** Summarized in Section 8.A – Off-Site Analysis.
3. **Soils:** The soils of the area are characterized generally by the Natural Resource Conservation Services (NRCS) as Alderwood gravelly sandy loam in the east half of the site and Everett very gravelly sandy loam in the west half of the site. The NRCS report is provided in Appendix A for reference. A site specific Geotech report was prepared by Earth Solutions, NW (June 13, 2025) and is also included in Appendix A.
4. **Ground Cover:** The site is completely undeveloped and comprised entirely of forested area and some grassy areas.
5. **Critical Areas:** There is one Category IV wetland in the southeast corner of the site and a westward running Type 4 stream in the west half of the site. In addition, there are steep grades in the west half of the site. These areas have been considered in the analysis and will remain undisturbed with the development and no changes to the existing drainage patters are proposed within these areas. These critical areas and their associated buffers are delineated on Figure 2.
6. **Adjacent Areas:** The project site is bordered by public right-of-way to the east along Harbour Place, Harbour Pointe Montessori School to the north, Harbour Pointe Senior Living Facility to the west and a single-family residential neighborhood to the west with the Big Gulch Creek in between. There are also various commercial business to the east across Harbour Place. The subject property and all surrounding areas are currently zoned as Planned Community Business South.

3.0 Site Development Plan with On-Site Stormwater Management

On-site stormwater management is required to infiltrate, retain, and disperse stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. Per MR#5, Section 1-3.4.5, Volume 1 of the 2024 SWMMWW, projects located inside the UGA of any parcel size shall implement LID BMPs from List #2 for all surfaces within each type of surface. The feasibility of the BMPs must be evaluated in the order listed, the first BMP that is considered feasible must be used. Once a BMP is deemed feasible and used for a surface, no other BMP from the list is necessary for that surface.

3.1. Lawn and Landscaped Areas

BMP T5.13: Post Construction Soil Quality and Depth per Volume V of the 2024 SWMMWW will be implemented to the extent feasible for all target surfaces.

3.2. Roofs

BMP T5.30: Full Dispersion per Volume V of the 2024 SWMMWW has been determined to be infeasible due to site layout and lack of available open space where the topography is feasible for dispersion.

BMP T7.30: Bioretention per Volume V of the 2024 SWMMWW has been determined to be infeasible due to site layout, topography, and lack of available open space.

BMP T5.10B: Downspout Dispersion Systems per Volume V of the 2024 SWMMWW has been determined to be infeasible due to site layout and lack of available open space where the topography is feasible.

BMP T5.10C: Perforated Sub-out Connections per Volume V of the 2024 SWMMWW has been determined to be infeasible due to site layout and lack of available open space where the topography is feasible.

3.3. Other Hard Surfaces

BMP T5.30: Full Dispersion per Volume V of the 2024 SWMMWW has been determined to be infeasible due to site layout and lack of available open space where the topography is feasible for dispersion.

BMP T5.15: Permeable Pavement per Volume V of the 2024 SWMMWW has been determined to be infeasible due to the site layout as well as the expected underlying low permeable soil layers which would create saturated conditions at shallow depths.

BMP T7.30: Bioretention per Volume V of the 2024 SWMMWW has been determined to be infeasible due to lack of available open space and poor soil characteristics as characterized by the geotechnical report.

BMP T5.12: Sheet Flow Dispersion and BMP T5.11: Concentrated Flow Dispersion per Volume V of the 2024 SWMMWW has been determined to be infeasible due to site layout, topography, and lack of available space.

The developed site conditions and proposed storm drainage facilities are described in more detail in Section 8.

4.0 Construction Stormwater Pollution Prevention Plan

Site specific details and provisions for the temporary erosion and sediment control (ESC) facilities are provided with the improvement plans that accompany this SSP. The proposed facilities have been selected and sized in accordance with the recommendations provided in the 2024 SWMMWW. In addition to the site-specific ESC measures, the following general BMPs for sediment control shall also be implemented in accordance with the provisions of the SWMMWW:

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, including the onsite wetland, 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:

   - BMP C101: Preserving Natural Vegetation
   - BMP C102: Buffer Zones
   - BMP C103: High Visibility Plastic Fence
   - BMP C233: Silt Fence

   Tree protection will be provided for all trees to remain, including all trees adjacent to the work and outside the construction limits as noted on the drawings.

2. **Establish Construction Access**

   Construction access shall be stabilized to minimize the tracking of sediment onto public roads; street sweeping shall be employed to prevent sediment from entering state waters. The specified BMPs related to establishing construction access that will be used on the project include:

   - BMP C105: Stabilized Construction Entrance
   - BMP C106: Wheel Wash

   A construction access and wheel wash shall be implemented to prevent tracking any sediment onto City or State roads or onto the adjacent properties.

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 during construction. Flow rates during construction are proposed to be controlled using the proposed permanent storm water facilities, i.e. detention facility and flow control riser. 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. The following specific BMPs will be used to control flow rates for this project:

   - BMP 209: Outlet Protection
   - V-13: Detention Vault and Flow Restrictor

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:

- BMP C152: Sawcutting and Surfacing Pollution Prevention
- BMP C220: Storm Drain Inlet Protection
- BMP C233: Silt Fence
- V-13: Detention Vault and Flow Restrictor

Silt fences will be placed as shown on the plans or as directed by the City inspector.

In addition, sediment will be removed from paved areas in 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 wash off sediments from adjacent streets in runoff.

Whenever possible, sediment laden water shall be discharged into on-site, relatively level, vegetated areas. 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 vaults or detention tanks) can be used during the construction phase.

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:

- BMP C120: Temporary and Permanent Seeding
- BMP C121: Mulching
- BMP C123: Plastic Covering
- BMP C125: Topsoiling
- BMP C140: Dust Control

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 soil shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

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:

- BMP C120: Temporary and Permanent Seeding
- BMP C121: Mulching
- BMP C123: Plastic Covering

Minimal construction is proposed for wet weather season and slope protection can be established with final landscaping.

7. **Protect Drain Inlets**

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. 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:

- BMP C220: Storm Drain Inlet Protection

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:

- BMP C209: Outlet Protection

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 stream banks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

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. 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.
- 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 BMP C153 for Material Delivery, Storage and Containment in SWMMWW 2024

- 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.

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 saw cutting 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 downstream surface waters by implementing Concrete Handling measures (BMP C151).

Sanitary wastewater:

- Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.

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.

As per the Federal regulations of the Clean Water Act (CWA) and according to Final Rule 40 CFR Part 112, as stated in the National Register, a Spill Prevention, Control, and Countermeasure (SPCC) Plan is required for construction activities. The Contractor shall prepare an SPCC Plan according to the Washington State Department of Transportation (WSDOT) Requirements (see the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction 2024) to address an approach to prevent, respond to, and report spills or releases to the environment that could result from construction activities. This Plan must:

- Be well thought out in accordance with good engineering;
- Achieve three objectives - prevent spills, contain a spill that occurs, and clean up the spill;
- Identify the name, location, owner, and type of facility;
- Include the date of initial operation and oil spill history;
- Name the designated person responsible;
- Show evidence of approval and certification by the person in authority; and
- Contain a facility analysis.

10. Control Dewatering

Any potential dewatering water from open cut excavation, tunneling, foundation work, trench, or underground vaults shall be discharged into a controlled conveyance system prior to discharge to a

sediment trap or sediment pond. Channels will be stabilized, per Element #8. Clean, non-turbid dewatering water will not be routed through stormwater sediment ponds and will be discharged directly to downstream systems in a manner that does not cause erosion, flooding, or a violation of State water quality standards in receiving waters. Highly turbid dewatering water from soils known or suspected to be contaminated, or from use of construction equipment, will require additional monitoring and treatment as required for the specific pollutants based on the receiving waters into which the discharge is occurring. Such monitoring is the responsibility of the contractor.

The dewatering of soils known to be free of contamination will trigger BMPs to trap sediment and reduce turbidity. At a minimum, geotextile fabric socks/bags/cells will be used to filter this material.

11. Maintain BMP's

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMP's specifications. Visual monitoring of the BMPs will be conducted at least once every calendar week and within 24 hours of any rainfall event that causes a discharge from the site. If the site becomes inactive, and is temporarily stabilized, the inspection frequency will be reduced to once every month.

All temporary erosion and sediment control BMPs shall be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMP's or vegetation shall be permanently stabilized.

12. Manage the Project

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Design the project to fit the existing topography, soils, and drainage patterns.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of the area exposed.
- Keep runoff velocities low.
- Retain sediment on site.
- Thoroughly monitor site and maintain all ESC measures.
- Schedule major earthwork during the dry season.

In addition, project management will incorporate the key components listed below:

Phasing of Construction:

- The construction project is being phased to the extent practicable in order to prevent excessive soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.
- Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities during each phase of construction, per the Scheduling BMP (C162).

Seasonal Work Limitations

- From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:
  - Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and
  - Limitations on activities and the extent of disturbed areas; and
  - Proposed erosion and sediment control measures.
- Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance.
- The following activities are exempt from the seasonal clearing and grading limitations:
  - Routine maintenance and necessary repair of erosion and sediment control BMPs;
  - Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and
  - Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Coordination with Utilities and Other Jurisdictions:

- Care has been taken to coordinate with utilities, other construction projects, and the local jurisdiction in preparing this SWPPP and scheduling the construction work.

Inspection and Monitoring:

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:
  - Assess the site conditions and construction activities that could impact the quality of stormwater, and
  - Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.
- Whenever inspection and/or monitoring reveals that the BMPs identified in this SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.

Maintaining an Updated Construction SWPPP:

- This SWPPP shall be retained on-site or within reasonable access to the site.

- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following the inspection.

13. Protect Infiltration BMPs

Special provisions shall be taken by the Contractor to protect low impact development BMPs from construction activities as outlined below:

- All infiltration BMPs shall be protected from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the infiltration BMPs. These include, but are not limited to, buffer zones, high-visibility fencing, check dams, and silt fencing. BMPs shall be restored to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment laden soils and replacing the removed soils with soils meeting the design specifications.
- Maintain the infiltration capabilities of LID BMPs by protecting against compaction by construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

5.0 Source Control Plan

MR #3 of the 2024 SWMMWW states that all known, available, and reasonable source control BMP's shall be applied to the project in order to limit potential sources of pollutants in stormwater.

The corresponding activity-specific BMPs are provided in Appendix C of this report.

6.0 Special Reports and Studies

The following special reports and studies have been prepared for the project:

- Geotechnical Engineering Study, Earth Solutions NW, LLC (June 13, 2025)
- Wetland and Stream Reconnaissance Report, Green Earth Operations (June 30, 2025)
- Traffic Impact Analysis Report, Kimley Horn (TBD)

7.0 Other Permits

The project is expected to obtain the following permits prior to final construction permit approval:

- Development Agreement (City of Mukilteo)
- Project Permit (City of Mukilteo)
- SEPA Environmental Review (City of Mukilteo)
- General Construction Stormwater Discharge Permit (Department of Ecology)

8.0 Permanent Stormwater Control Plan

8.1. Off-Site Analysis

A field inspection was performed on May 22, 2025 on an sunny day with a temperature of approximately 60 degrees. The site is completely undeveloped and comprised entirely of forested areas with some grassy areas.

8.1.1. On-site Drainage Basins

The project site is contained within a single threshold discharge area, with runoff generally traveling as sheet and shallow concentrated flow over the site from higher elevations along the east boundary towards lower elevations along the west boundary. The sheet flow concentrates into channel flow in the west half of the site where a valleyed area runs northeast to southwest. The valleyed area contains a Type 5, non-fish inhabiting stream which continues past the southeast boundary of the project site. All runoff generated onsite is contained within a single drainage basin (ie. TDA) which ultimately collects into the stream that flows off site. The existing drainage basin is delineated on Figure 4 – Existing Drainage Basins.

8.1.2. Downstream Basin

All runoff generated onsite is discharged from the southeast boundary of the project site via the Type 5 stream. The stream flows approximately 100 feet west from the project site before connecting to the Big Gulch Creek. The Big Gulch Creek conveys the runoff approximately 1.4 miles west before ultimately discharging to the Puget Sound. The downstream analysis is depicted on Figure 7 – Downstream Analysis

8.1.3. Upstream Basin

The project is bordered by public roadway along the east perimeter, being Harbour Place, and Harbour Pointe Montessori School to the north. While the roadway and school are at higher elevations than the project site, runoff is not expected to flow onto the developable west portion of the site due to existing curb containing the upstream runoff. The west portion of the school property is expected to sheet flow into the west portion of the project site, however, this portion of the site will remain undeveloped and existing drainage patterns will be maintained. Runoff generated by the Harbour Pointe Senior Living facility south of the project site is not expected to flow onto the project site due to the existing topography – there is a crest that runs along the south border of the project site that partially delineates the onsite basin.

When the curb is depressed and an entrance to the site is added along Harbour Place, runoff generated by a portion of the roadway is expected to flow onto the project site and has been accounted for in the WWHM model as the developed conditions.

8.2. Existing Hydrology

The site is currently undeveloped and comprised entirely of forest and some grassy areas. Runoff sheet flows from higher elevations in along the eastern boundary towards lower elevations in the west half of the site. A valley runs from the northeast to the southwest in the west half of the project site and contains a stream in which all onsite runoff is expected to collect into and discharge from the site. All runoff generated onsite is contained within a single threshold discharge area (TDA) and is modelled as such.

The hydrologic analysis of the runoff conditions for this project is based on drainage characteristics such as basin area, soil type, and land use (i.e., pervious vs. impervious). The Western Washington Hydraulic Model 2012 (WWHM) software was used to evaluate the storm water runoff conditions and mitigation measures for the project site and to design the on-site flow control facilities. The following is a summary

of the results of the analysis and the proposed drainage facilities to provide flow control and water quality control for this project site.

The existing site conditions are shown in Figure 2 of the Appendix. WWHM software was used to model the site hydrology and calculate runoff peak rates in accordance with the 2024 SWMMWW and the City's Design and Construction Standards. The existing land use conditions summarized in Table 8.1 were used as the pre-developed site conditions for the WWHM model. Refer to Figure 4 for the existing sub-basin delineation.

Table 8-1: Land Use Cover, Existing Site Conditions

Drainage Subbasin ID	Point-of-Compliance (POC)	Subbasin Land Use Conditions						
		Total Sub-basin Area (ac)	Percent Impervious Area (ac)	Impervious Area			Pervious Area	
				Road + Driveway (ac)	Roof (ac)	Sidewalk (ac)	Forest (ac)	Lawn (ac)
Total Site	1	3.265	0.0%	0.000	0.000	0.000	3.265	0.000

Input and output parameters for the WWHM model are provided in Appendix B of this report.

8.3. Developed Hydrology

The project proposes to construct 8 townhome buildings and supporting infrastructure including roadway, sidewalks, storm improvements, water, and sanitary sewer improvements in support of 37

townhouse units. The onsite area that is proposed to be developed is delineated into a single subbasin (Northeast basin) in which generated runoff will be collected via catch basin inlets and conveyed through subgrade pipes into a detention vault on the west side of the development area. A small portion of runoff generated within Harbour Place is also expected to flow onto the developed project site and is delineated within the Offsite Upstream basin and has been accounted for in the hydraulic analysis. Inside the vault, a standard riser structure with orifices provides flow control before discharging the mitigated runoff to a Type 2-48" Contech Stormfilter Manhole with a single Phosphosorb cartridge for water quality control. From the water quality facility, the treated runoff is directly discharged west down the steep portions of the project site via a tightline. The existing topography consists of a valleyed area in the west half of the site which naturally directs the treated runoff eastward into the onsite stream prior to discharging to the Big Gulch Creek. All treated runoff ultimately discharges to the Puget Sound via the Big Gulch Creek.

The remainder of the site will remain undeveloped forested area and is delineated within the Southwest subbasin. Similar to the development area, all runoff generated within this subbasin ultimately discharges to the Puget Sound via the Big Gulch Creek.

All landscaped areas will be amended per BMP T5.13: Post-Construction Soil Depth and Quality, these areas have been modeled as lawn in the developed condition per Volume III, Chapter 2 of the SWMMWW.

The developed site conditions are shown in Figure 3 of the Appendix. WWHM software was used to model the site hydrology and calculate runoff peak rates in accordance with SWMMWW and the City of Mukilteo Development Standards. The land use conditions summarized in Table 8.2 were used as the developed site conditions for the WWHM model. Refer to Figure 5 of the Appendix for the developed basin delineations.

Table 8-2: Land Use Cover, Developed Site Conditions

Drainage Subbasin ID	Point-of-Compliance (POC)	Subbasin Land Use Conditions						
		Total Sub-basin Area (ac)	Percent Impervious Area (ac)	Impervious Area			Pervious Area	
				Road + Driveway (ac)	Roof (ac)	Sidewalk (ac)	Forest (ac)	Lawn (ac)
Northeast	1	1.905	59%	0.485	0.565	0.066	0.000	0.789
Offsite Upstream	1	0.017	100%	0.017	0.000	0.000	0.000	0.000
Southwest	1	1.338	0%	0.000	0.000	0.000	1.338	0.000
Total		3.260	35%	0.502	0.565	0.066	1.338	0.789

The on-site detention vault located on the west side of the development area is proposed to provide flow control for onsite stormwater runoff discharge. The facility will discharge to valleyed area in the west half of the site where the runoff will naturally convey to the Big Gulch Creek. A detailed summary of the detention vault is provided in Table 8.3 below.

Table 8-3: Detention Vault Design Summary

Detention Vault	
Facility ID	**Detention Vault**
Length	100'
Width	28'
Live Storage Depth (ft)	12.5’
Live Storage Volume (ft^3)	35,000
*Total Depth (ft)	14.0’
Riser Height (ft)	12.5’
Riser Diam. (in)	12”
Orifice 1 Diam., Elev.	0.500”, 495.70’
Orifice 2 Diam., Elev.	1.000”, 498.73’
Orifice 3 Diam., Elev.	0.750”, 499.15’

*Total depth includes live storage depth for the 100-YR design storm, 6” freeboard, and 12” of sediment storage.

The results of the developed site runoff analysis are summarized in Table 8.4 and more detailed results are provided in Appendix B.

8.4. Stormwater Flow Control Plan

The storm drainage analysis and facilities designed for this project are proposed in accordance with the 2024 SWMMWW and Chapter 3 of the City of Mukilteo Development Standards. The hydrologic analysis of the runoff conditions for the project site is based on drainage area characteristics such as basin area, soil type, and land use (i.e., pervious, impervious). WWHM software was used to evaluate the stormwater hydrology/runoff conditions for the detention vault.

All runoff generating areas within the developable portion of the site and the upstream area (ie. the Northwest and Offsite Upstream basins) will be collected into catch basin inlets and conveyed to the detention vault via a series of subgrade pipes. Runoff generated within roof areas will be conveyed to the catch basins via roof drains and lawn areas will sheet flow into the catch basins via the proposed grading of the site promoting positive flow. The release from the detention vault will be controlled by a standard flow control structure designed to control the peak runoff rates and durations of storm runoff from the site in accordance with City surface water design standards. The controlled release from the vault is conveyed west from developed portion of the site to the western forested area via a tightline and will discharged directly to the surface. The topography of this area is comprised of a vallied area which naturally directs the runoff into an onsite Type 5 stream which is tributary to the Big Gulch Creek.

A standard flow control riser/structure assembly is proposed at the outlet of the detention vault to control the release rate of storm water in developed conditions. The size and number of control orifices on these risers have been designed to control the release durations in accordance with the requirements provided in Volume I-3 of the 2024 SWMMWW for stormwater discharge. The pre-developed conditions have been modeled as entirely forested for this hydrologic analysis and the riser has been designed to not exceed existing discharge rates for 50-percent of the 2-year recurrence interval peak flow up to the full 50-year peak flow. All modeling has been performed using a 15-minute timestep. A summary of the pre-developed/existing and mitigated discharge rates are provided in Tables 8.5 below.

Table 8-4: Peak Runoff Rates

Storm Event	POC	Flow (cfs)		Water Level in Vault (Elev.)	Volume (cf)
		Pre-Developed	Developed		
2-yr	1	0.0523	0.0380	495.70’	26,320
50-yr	1	0.1351	0.0842	498.73’	34,804
100-yr	1	0.1500	0.0932	499.15’	35,980

Refer to the WWHM results in Appendix B for more thorough information regarding the pre-developed/existing and developed peak flow rates.

8.5. Stormwater Treatment Plan

The 2024 SWMMWW requires that all proposed projects that create greater than 5,000 sf of pollution-generating impervious surfaces (PGIS) provide water quality facilities to treat runoff of these surfaces. This project is a single-family residential project within Planned Community Business South areas. In total, this project proposes to add or replace approximately 0.49-acres of PGIS and is required water quality treatment to the Basic standard.

Runoff from subbasins Northeast and Offsite Upstream will be collected and conveyed to the detention vault for flow control prior to releasing into a Contech Stomfilter Manhole with a Phosphosorb cartridge filter for water quality treatment. Runoff from the Southeast subbasin will not be collected by the onsite stormwater infrastructure due to this area remaining undeveloped forested area. The Stormfilter Manhole has been sized to provide Basic water quality treatment per Volume III-2.6 of the 2024 SWMMWW. The water quality flow rates have been calculated using the WWHM continuous runoff hydrologic model to treat, at minimum, 91-percent of the entire runoff volume. A summary of the facilities design parameters is provided in Appendix E and the full WWHM results are provide in Appendix B.

In accordance with Volume II-2 of the SMMWW, this project proposes to utilize the permanent detention vault as a temporary sediment pond in conjunction with other necessary temporary BMPs during construction to mitigate erosion and sediment discharge from the site. The minimum surface area for a sediment pond is equal to 2,080 SF per the two-year (Q2) storm cfs. Given a Q2 of 0.0375 cfs for the entire onsite area, the minimum sediment pond size is 78 SF which is exceeded by the vault footprint of 2,800 SF.

8.6. Conveyance Analysis

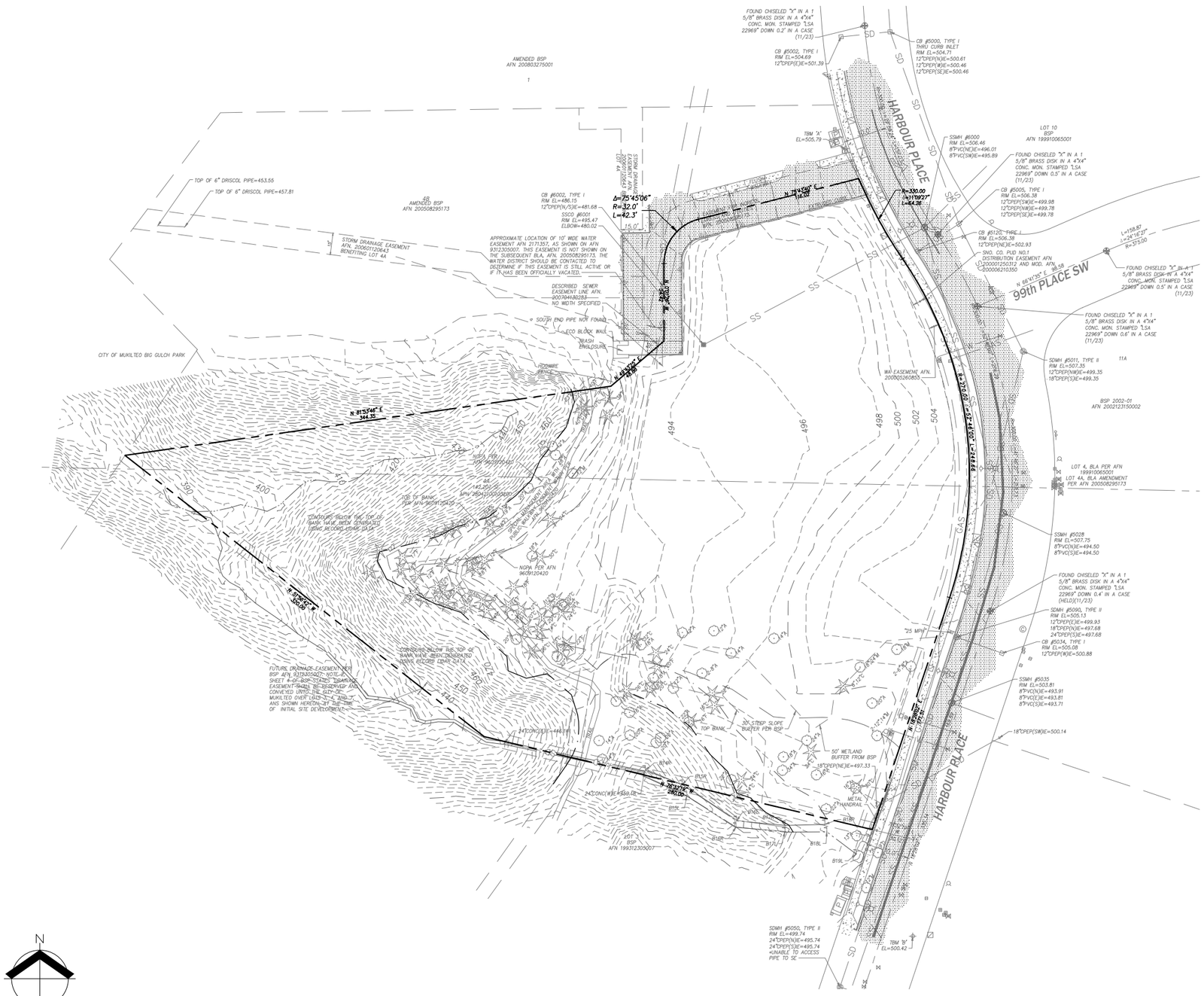
Conveyance analysis for the project will be performed in accordance with Chapter 3 of the City of Mukilteo Development Standards as well as the 2024 SWMMWW. The proposed storm system is required to be designed with sufficient capacity to convey and contain at minimum the 25-year peak flow. This system will be designed to contain runoff rates generated by a 100-year storm event. Rational and backwater calculations for all proposed storm drainage conveyance systems will be provided in Appendix D with the final engineering package.

Surface water collection and conveyance for the project is proposed by means of grading, grated inlets, and below grade pipes. The collection system is comprised of roof drains, catch basins, and piping that discharge to the proposed detention vault. A control structure located inside of the vault discharges controlled runoff to a water quality facility followed by a final catch basin to eastward running tightline which discharges the runoff to the valleyed area of the project site.

8.7. Maintenance and Operation Plan

The on-site storm drainage conveyance facilities for this project are mitigating runoff from public right-of-way and will be publicly maintained. The facility has been designed in accordance with the 2024 SWMMWW and a site–specific Maintenance and Operation Plan is provided in Appendix F.

Figure 2: Existing Site Conditions



SURVEY DATA

EXISTING BOUNDARY, TOPOGRAPHIC, AND PLANIMETRIC INFORMATION SHOWN ON THIS PLAN AND OTHERS IN THIS SET WERE USED AS A BASIS FOR DESIGN AND REPRESENT FIELD SURVEY DATA AND MAPPING PREPARED BY ATWELL, INC., AS PROVIDED BY THE PROJECT OWNER, AND DOES NOT REPRESENT WORK BY CPH CONSULTANTS. THE FOLLOWING SURVEY DATA WAS PROVIDED WITH THE TOPOGRAPHIC MAP BY ATWELL, INC.:

LEGAL DESCRIPTION

PARCEL 4A OF RECORD OF SURVEY AND AMENDED BINDING SITE PLAN RECORDED UNDER AUDITOR'S FILE NO. 200508295173, RECORDS OF SNOHOMISH COUNTY, WASHINGTON, BEING A PORTION OF LOT 4, HARBOUR POINTE BUSINESS CENTER BIG GULCH CAMPUS BINDING SITE PLAN/RECORD OF SURVEY RECORDED UNDER AUDITOR'S FILE NO. 9312305007, BEING A PORTION OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 16, AND THE NORTHEAST QUARTER OF THE NORTHEAST QUARTER OF SECTION 21, ALL IN THE TOWNSHIP 28 NORTH, RANGE 4 EAST OF THE WILLAMETTE MERIDIAN.

SITUATE IN THE COUNTY OF SNOHOMISH, STATE OF WASHINGTON.
SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON.

MERIDIAN

WASHINGTON STATE PLANE COORDINATE SYSTEM – NORTH ZONE NAD83/2011 (2010.00 EPOCH) PER GNSS OBSERVATIONS UTILIZING CORRECTIONS FROM THE WASHINGTON STATE REFERENCE NETWORK (WSRN)

VERTICAL DATUM

VD 88 (PER GNSS OBSERVATIONS UTILIZING CORRECTIONS FROM THE WSRN)

BENCHMARKS

TBM–A

SET REBAR WITH RED 'ATWELL CONTROL' CAP ON THE WEST SIDE OF HARBOUR PLACE, 2.7' WEST OF THE WEST EDGE CONCRETE WALKWAY AND 3.1' NORTH OF THE NORTH EDGE CONCRETE WALKWAY FOR ADDRESS 9850.

ELEVATION=505.79

TBM–B

SET REBAR WITH RED 'ATWELL CONTROL' CAP ON THE EAST SIDE OF HARBOUR PLACE, OPPOSITE THE NORTHERLY DRIVEWAY FOR ADDRESS 10200, CENTERED IN A PLANTER STRIP BETWEEN THE BACK OF CURB AND THE WEST EDGE OF THE CONCRETE WALKWAY AT ± THE WESTERLY EXTENSION OF THE CENTERLINE OF CONCRETE STEPS.

ELEVATION=500.42

NOTES

1. *A 5" ELECTRONIC TOTAL STATION WAS USED FOR THIS FIELD TRAVERSE SURVEY. ALL EQUIPMENT HAS BEEN MAINTAINED IN ACCORDANCE WITH THE MANUFACTURER'S GUIDELINES. ACCURACY MEETS OR EXCEEDS W.A.C. 332–130–090.*
2. *ALL TITLE INFORMATION SHOWN ON THIS SURVEY WAS EXTRACTED FROM CHICAGO TITLE COMPANY COMMITMENT NUMBER 500145247, DATED JULY 24, 2023. ATWELL, LLC HAS CONDUCTED NO INDEPENDENT TITLE RESEARCH, AND HAS RELIED WHOLLY ON THE TITLE COMPANY'S REPRESENTATIONS OF THE TITLE'S CONDITION TO PREPARE THIS SURVEY AND QUALIFIES THE MAP'S ACCURACY AND COMPLETENESS TO THAT EXTENT.*
3. *THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF A SURVEY MADE ON THE DATE INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITION EXISTING AT THAT TIME. ALL CONTROL INDICATED AS "FOUND" WAS RECOVERED FOR THIS PROJECT ON NOVEMBER 2023 UNLESS OTHERWISE NOTED.*
4. *PROPERTY AREA = 142,207± SQUARE FEET.*
5. *ALL DISTANCES ARE IN U.S. SURVEY FEET AND REPRESENT GROUND MEASUREMENTS.*
6. *UNDERGROUND UTILITIES WERE LOCATED BASED ON SURFACE EVIDENCE CLEARLY VISIBLE TO THE FIELD SURVEY CREW. CONNECTING PIPES ARE DRAWN AS STRAIGHT LINES BETWEEN STRUCTURES. SUPPLEMENTAL INFORMATION MAY HAVE BEEN USED TO DEPICT THE UNDERGROUND UTILITIES SHOWN ON THIS SURVEY, SUCH AS PAINT MARKS, SAW CUTS, OR RECORD DRAWING INFORMATION OBTAINED FROM FRANCHISE UTILITIES, PUBLIC UTILITY COMPANIES, AND PUBLIC GIS INFORMATION. ATWELL LLC MAKES NO CLAIM TO THE ACCURACY OF INFORMATION PROVIDED BY OTHERS OR OF UNDERGROUND PIPES, CABLES, STRUCTURES OR OTHER UTILITIES. THE EXACT LOCATION, SIZE, AND ELEVATION OF ALL UNDERGROUND UTILITIES WHICH ARE CRITICAL TO THE DESIGN MUST BE POTHOLED AND VERIFIED BY THE CLIENT.*
7. *TREE SIZES AND SPECIES WERE DETERMINED TO THE BEST OF OUR ABILITY. ATWELL, LLC DOES NOT WARRANT THE ACCURACY OF THE SIZE AND SPECIES OF ANY TREES SHOWN HEREON, ALL TREE SIZES SHOULD BE VERIFIED BY A TRAINED ARBORIST.*

N

DATE: AKS JOB: 12420

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SCALE: 1"= 40 FEET
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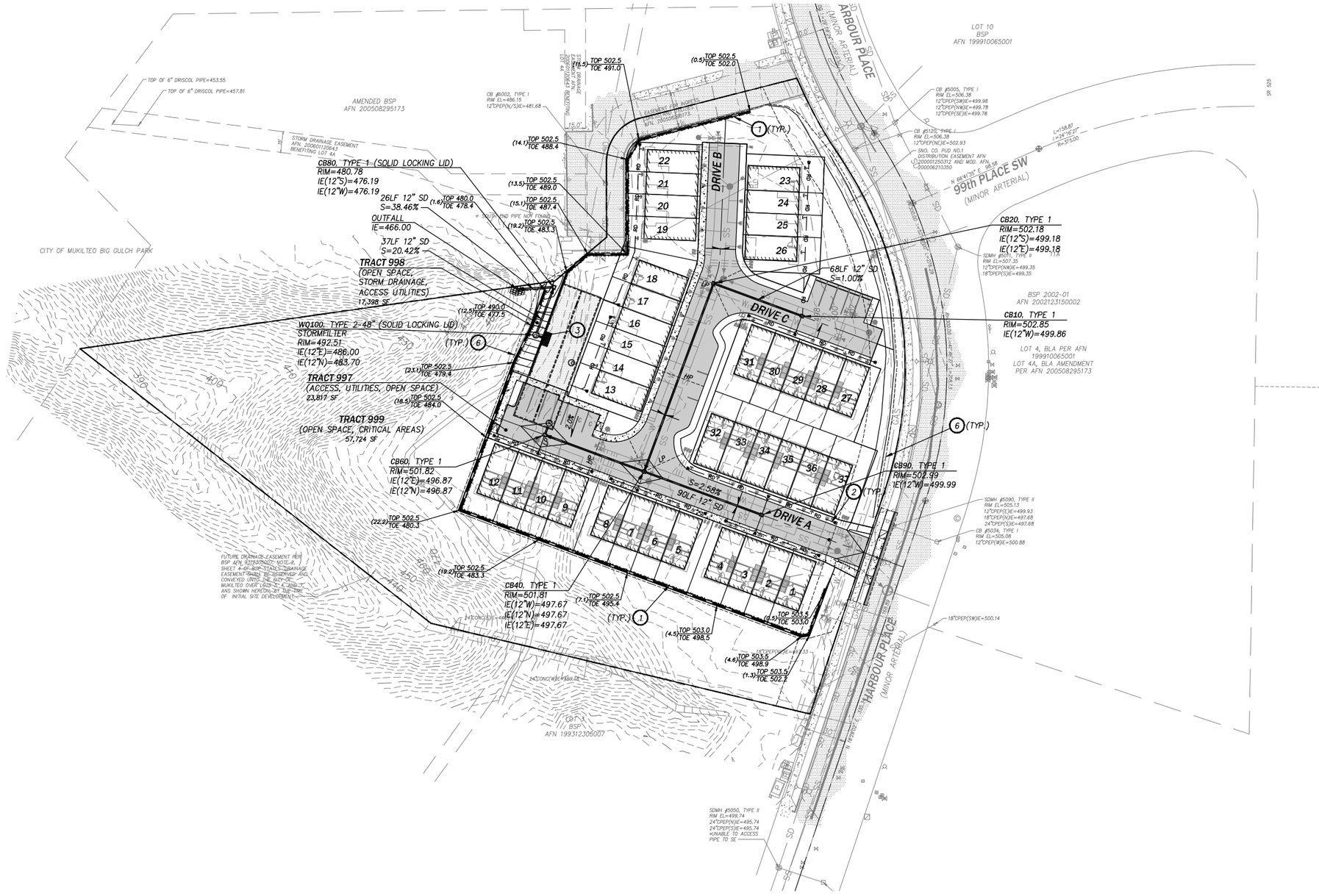
ORIGINAL PAGE SIZE: 11" x 17"

MONTGOMERIE

FIGURE 2 - Existing Site Conditions

CITY OF MUKILTEO
SNOHOMISH COUNTY, WA

Figure 3: Developed Site Conditions



CONSTRUCTION NOTES

1. WALL FOUNDATION DRAIN
2. 6" PVC (UNO) ROOF COLLECTION PIPE W/ CLEANOUT, LENGTH AND UPSTREAM INVERT PER PLAN, MIN. 1% SLOPE; PER COM STD. DET. SW-018
3. INTERIOR CONTROL STRUCTURE, SEE DET. ON SHT. C3.20
4. WATER QUALITY TREATMENT FACILITY PER DET. ON SHT. C3.21
5. PIPE OUTLET PROTECTION PER STD. DET. ON SHT. C3.100
6. APPROX. LIMITS OF GRADING

LEGEND

- XXX.X — FINISHED FLOOR ELEVATION
- MSE WALL, LOCK+LOAD WALL OR EQ.
- TOP 246 / TOE 242 (4) — FINISHED GRADE AT TOP/TOE OF WALL
- WALL DRAIN
- SAWCUT
- 420 — PROPOSED 2 FT CONTOUR
- EXISTING CONTOUR
- × 520.9 — SPOT ELEV. (FINISH GRADE)
- STORM DRAIN PIPE
- SD — SD — EXIST. STORM DRAIN PIPE
- RD — RD — RD — LOT DRAIN COLLECTION PIPE
- AC PAVEMENT VALLEY, FLOWLINE
- SD CATCH BASIN
- CLEANOUT
- ASPHALT PAVEMENT
- CONCRETE PAVEMENT

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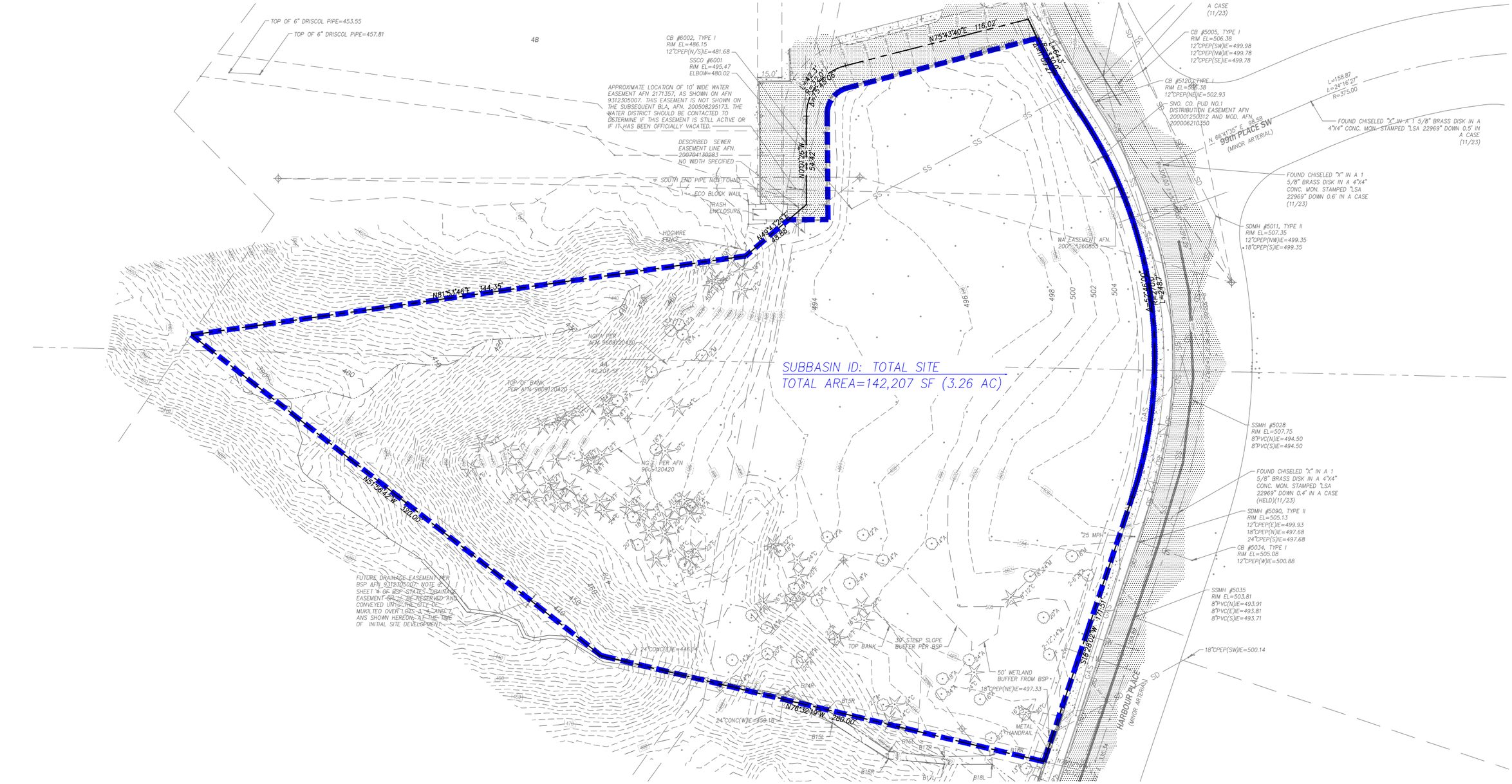
FIGURE 3 - DEVELOPED SITE CONDITIONS

CITY OF MUKILTEO
SNOHOMISH COUNTY, WA

Figure 4: Existing Drainage Subbasins



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ORIGINAL PAGE SIZE: 11" x 17"

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FIGURE 4 - EXISTING DRAINAGE BASINS

CITY OF MUKILTEO
SNOHOMISH COUNTY, WA

Figure 5: Developed Drainage Subbasins

SUBBASIN ID: SOUTHWEST
TOTAL AREA=58,283 SF (1.34 AC)

SUBBASIN ID: NORTHEAST
TOTAL AREA=82,992 SF (1.91 AC)

SUBBASIN ID: OFFSITE UPSTREAM
TOTAL AREA=722 SF (0.02 AC)

N

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FIGURE 5 - DEVELOPED DRAINAGE BASINS

CITY OF MUKILTEO
SNOHOMISH COUNTY, WA

Figure 6: Conveyance Subbasin Catchment Areas

Figure 7: Downstream Analysis

N

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SCALE: 1"= 300 FEET
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ORIGINAL PAGE SIZE: 11" x 17"

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FIGURE 7 - DOWNSTREAM ANALYSIS

CITY OF MUKILTEO
SNOHOMISH COUNTY, WA

Appendix A: NRCS Soils Report, Geotechnical Report, and Critical Areas Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Snohomish County Area, Washington

February 14, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,670 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

MAP 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 1:24,000.

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: Snohomish County Area, Washington
Survey Area Data: Version 26, Aug 27, 2024

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

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 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
1	Alderwood gravelly sandy loam, 0 to 8 percent slopes	4.7	33.9%
4	Alderwood-Everett gravelly sandy loams, 25 to 70 percent slopes	3.2	23.5%
19	Everett very gravelly sandy loam, 15 to 30 percent slopes	5.9	42.6%
Totals for Area of Interest		**13.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Snohomish County Area, Washington

1—Alderwood gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t625
Elevation: 50 to 800 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Alderwood and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alderwood

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XN302WA)

Other vegetative classification: Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XN302WA)
Hydric soil rating: No

Minor Components

Everett
Percent of map unit: 5 percent
Landform: Moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Mckenna
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Shalcar
Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Norma
Percent of map unit: 2 percent
Landform: Drainageways, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

4—Alderwood-Everett gravelly sandy loams, 25 to 70 percent slopes

Map Unit Setting
National map unit symbol: 2hyy
Elevation: 50 to 800 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition
Alderwood and similar soils: 60 percent

Everett and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alderwood

Setting
Landform: Till plains
Parent material: Basal till

Typical profile
H1 - 0 to 7 inches: gravelly ashy sandy loam
H2 - 7 to 35 inches: very gravelly ashy sandy loam
H3 - 35 to 60 inches: gravelly sandy loam

Properties and qualities
Slope: 25 to 70 percent
Depth to restrictive feature: 20 to 40 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F002XA004WA - Puget Lowlands Forest
Hydric soil rating: No

Description of Everett

Setting
Landform: Plains, terraces
Parent material: Glacial outwash

Typical profile
H1 - 0 to 6 inches: gravelly ashy sandy loam
H2 - 6 to 18 inches: very gravelly ashy sandy loam
H3 - 18 to 60 inches: extremely gravelly sand

Properties and qualities
Slope: 25 to 70 percent
Depth to restrictive feature: 14 to 20 inches to strongly contrasting textural stratification
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest
Hydric soil rating: No

Minor Components

Mckenna
Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Norma, undrained
Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Terric medisaprists, undrained
Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

19—Everett very gravelly sandy loam, 15 to 30 percent slopes

Map Unit Setting
National map unit symbol: 2t62c
Elevation: 30 to 900 feet
Mean annual precipitation: 35 to 91 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Everett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Everett

Setting
Landform: Moraines, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glacial outwash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: very gravelly sandy loam
Bw - 3 to 24 inches: very gravelly sandy loam
C1 - 24 to 35 inches: very gravelly loamy sand
C2 - 35 to 60 inches: extremely cobbly coarse sand

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Droughty Soils (G002XS401WA), Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XS401WA), Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Alderwood

Percent of map unit: 10 percent
Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Indianola

Percent of map unit: 10 percent
Landform: Terraces, kames, eskers
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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EARTH SOLUTIONS NW

REDMOND ▪ PASCO ▪ SILVERDALE

GEOTECHNICAL ENGINEERING STUDY
MONTGOMORIE
SOUTHWEST OF HARBOUR PLACE AND 99TH PLACE SOUTHWEST
MUKILTEO, WASHINGTON

ES-9259.03

Geotechnical Engineering

Environmental Services

Earthwork Observation & Testing

CESCL & Stormwater Services

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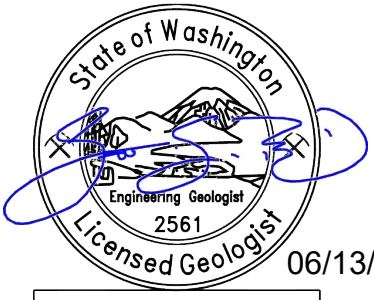
PREPARED FOR

WESTCOTT HOLDINGS & INVESTMENTS, INC.

June 13, 2025



Scott S. Riegel, L.G., L.E.G.
Associate Principal Geologist

Kyle R. Campbell, P.E.
Senior Principal Engineer

GEOTECHNICAL ENGINEERING STUDY
MONTGOMORIE
SOUTHWEST OF HARBOUR PLACE AND 99TH PLACE SOUTHWEST
MUKILTEO, WASHINGTON

ES-9259.03

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
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EARTH SOLUTIONS NW

Geotechnical Engineering ■ Earthwork Observation & Testing
Environmental Services ■ CESCL & Stormwater Services

esnw.com info@esnw.com

June 13, 2025
ES-9259.03

Westcott Holdings & Investments, Inc.
1010 Market Street
Kirkland, Washington 98033

Attention: David Pritchard

Greetings, David:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical engineering study regarding the proposed project. Based on the results of our investigation, construction of the proposed multi-family residential development is feasible from a geotechnical standpoint. This study indicates the site is underlain primarily by glacial till deposits and isolated areas of shallow uncontrolled fill. Groundwater was not encountered at the test pit locations during the December 2024 fieldwork.

In general, competent native soil, suitable for support of the new foundations, will likely be encountered beginning at depths of about two to four feet below the existing ground surface. ESNW should review the final plans to confirm the recommendations in this report remain applicable. Areas of existing fill should be evaluated by ESNW prior to placement or foundation work to confirm it is suitable for either use as structural fill or direct foundation support. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil, and the use of select, all-weather structural fill material will likely be necessary.

In our opinion, infiltration should not be considered a viable means of stormwater management for this project from a geotechnical standpoint. Further discussion and rationale regarding infiltration infeasibility is provided herein.

This report provides analyses and recommendations for the proposed multi-family residential development. The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Scott S. Riegel, L.G., L.E.G.
Associate Principal Geologist

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GEOTECHNICAL ENGINEERING STUDY
MONTGOMORIE
SOUTHWEST OF HARBOUR PLACE AND 99TH PLACE SOUTHWEST
MUKILTEO, WASHINGTON

ES-9259.03

INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed multi-family residential development to be constructed along the west side of Harbour Place in Mukilteo, Washington. Our scope included the following geotechnical services:

- Subsurface exploration to characterize the soil and groundwater conditions.
- Laboratory testing of representative soil samples collected on site.
- Engineering analyses and recommendations for the proposed commercial development.
- Preparation of this report.

Project Description

Based on the referenced site plan, the site will be developed with eight buildings with a total of 36 residential units, garages and interior roadways. Grading plans were not available at the time of this report; however, based on the existing site topography, we anticipate grading will consist of cuts and fills of ten feet or less. Given the geologic setting, we presume detention will be the primary stormwater management strategy.

At the time of report submission, specific building load plans were not available for review; however, based on our experience with similar developments, the proposed structures will likely be two to four stories in height and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be about 3 to 5 kips per linear foot. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

If the above design assumptions are incorrect or change, ESNW should be contacted to review the recommendations in this report. ESNW has reviewed the referenced plans as part of this report preparation.

SITE CONDITIONS

Surface

The subject site is located along the west side of Harbour Place, across from the intersection with 99th Place Southwest in Mukilteo, Washington. The approximate site location is illustrated on the attached Vicinity Map (Plate 1). The site is comprised of one tax parcel (Snohomish Parcel No.: 28042100103200) that is irregularly shaped, with a total area of about 3.26 acres, of which, about 1.96 acres will be included in the development proposal.

The subject site is currently vacant, and vegetation consists of invasive scrub trees, forested areas and field grass. The site topography generally descends gently to the west with post-glacial erosion features that support wetland and surface flows along the west and south property areas. There is a natural drainage feature in the southern property area that contains steep slope hazard areas; otherwise, no regulated geologic hazards encumber the site.

Subsurface

An ESNW representative observed, logged, and sampled five test pits on December 18, 2024. The test pits were excavated within accessible areas of the site using a mini trackhoe and operator retained by ESNW. The test pits were completed to assess soil conditions, classify site soils, and characterize groundwater conditions within the proposed development area. The approximate locations of the test pits are depicted on the attached Plate 2 (Subsurface Exploration Plan). Please refer to the attached test pit logs for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil and Fill

Topsoil, was generally encountered within the upper 6 to 12 inches below the existing ground surface (bgs). The topsoil was characterized by its dark brown color, the presence of fine organic material, and minimal root intrusions.

Fill was encountered during the subsurface exploration at test pit locations TP-2, 4 and 5. The fill consisted primarily of silty sand (USCS: SM) with variable gravel content and extended to depths ranging from about four and one-half to six feet below existing grades. The fill was generally loose to medium dense and did not contain significant amounts of deleterious debris or organics; however, the relic topsoil layer was observed at some of the test pit locations. Based on the texture of the fill, it is likely that the material represents uncontrolled fill placed from nearby development.

Native Soil

The native soil at the test pit locations consisted of silty sand with variable gravel content (USCS: SM). The native soil was observed to generally be in a medium dense condition, becoming dense to very dense at depth where fill was not encountered and within a couple feet below the fill, where exposed. An isolated layer of sand with silt (USCS: SP-SM) was encountered at test pit location TP-3 within the upper approximately four feet before transitioning to a dense glacial till. Typical within glacial till deposits, this weakly cemented layer is commonly referred to as “hardpan”. The in-situ moisture condition of the native soil was characterized as “damp”. The maximum exploration depth was about 10.5 feet bgs and all test pits were terminated in undisturbed native soil.

Geologic Setting

The referenced geologic map identifies ground moraine deposits (Qgt) as the primary geologic unit underlying the site. As described on the geologic map, ground moraine deposits are characterized as ablation till over thick sections of lodgment till. Till is typically comprised of unsorted cobbles, pebbly sand, and sandy silt, with a locally compact layer (referred to as “hardpan”) at depth.

The referenced WSS resource identifies Alderwood gravelly sandy loam, as the primary units underlying the approximate eastern half of the subject site and Everett soils along the western half. The Alderwood series formed in glacial till plains. Based on the field observations, the native depositional environment is characterized as relatively medium dense to dense glacial till, which is consistent with local geologic mapping.

Based on the soil conditions encountered during the fieldwork, it is our opinion the native soil is consistent with glacial till, as locally mapped.

Groundwater

Minor groundwater seepage was observed at test pits TP-3 and TP-5 during the December 2024 subsurface exploration. It should be noted that groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. Groundwater seepage flow rates are typically higher during the winter, spring, and early summer months. Therefore, perched groundwater seepage should be expected in site excavations, particularly if excavations are made during winter, spring, and early summer months.

Geologically Hazardous Areas Assessment

ESNW reviewed Mukilteo Municipal Code (MMC) 17.52A to determine if geologically critical areas recognized by the city (including erosion, landslide, and seismic hazard areas) exist on or near the subject site. Our review indicates portions of the western area of the site are mapped as high landslide hazard. Documents provided to us for review indicate the natural drainage ravine in the southern portion of the site contains slopes inclined at least 40 percent and are about 30 feet in height.

Slope Reconnaissance

During our December 2024 site visit, we completed a reconnaissance across the site to assess indications of potential instability. The sloped areas on the site are generally vegetated with grass and small trees. No obvious signs of recent erosion or soil movement were observed during our slope reconnaissance. Based on our investigation, the site does not exhibit indications of instability.

Steep Slope Setback Recommendations (MMC 17.52A.050)

The native soil near the steep slope area is composed primarily of firm glacial till that is resistant to deep-seated landslide activity. No shallow pervasive groundwater was observed at the test pit locations. In our opinion, these conditions render the steep slopes acceptable for a setback reduction to 25 feet from the top of the slopes inclined at least 40 percent with no adverse impacts to slope stability. The referenced Site plan delineates the top of steep slope areas and the reduced 25-foot setback. No grading or land disturbance is proposed for the steep slope areas on this site.

Erosion Hazard Areas

Based on preliminary site plans, the development envelope will most likely be positioned in an area of the site where slope gradients are relatively gentle, and the USDA classification of erosion potential is slight to moderate. Highly erosive soil units are unlikely to be disturbed during site development, and therefore it is our opinion that the proposed site development should not be impacted by erosion hazard area regulations.

In any case, typical construction stormwater management methods should be adhered to in accordance with the local stormwater manual and are anticipated to be adequate for mitigating erosion potential during the earthwork and construction phases of the project. At a minimum, silt fencing should be placed along the appropriate site margins, and soil stockpiles should be covered with plastic sheeting when not in use. If construction occurs during periods of wet weather, methods to control surface water runoff will be necessary. Construction stormwater should neither be allowed to collect at the top of slope nor flow over steeply sloping areas. Final drainage plans should be designed such that stormwater is collected and diverted away from slopes exceeding 15 percent to an approved discharge location. Erosion control measures should be actively maintained to ensure proper performance.

Based on typical residential project design and construction practices, improved drainage, and engineered grading practices will be included. In this respect, and based on our geotechnical evaluation of the proposed development activity, in our opinion the project as proposed will not increase the potential for slope instability on the site or immediately surrounding properties. Consistent with local standards, ESNW should be requested to observe and document the site mass grading activities and foundation subgrade preparation during construction to confirm suitable conditions are present and to provide additional recommendations, as deemed necessary.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, the proposed multi-family residential development is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed development include site preparation and earthwork, utility installation, foundation support, slab-on-grade subgrade support, drainage, and the suitability of using on-site soils as structural fill.

The site will be graded to create a new roadway and building pads. Areas of existing fill should be evaluated by ESNW prior to placement or foundation work to confirm it is suitable for either use as structural fill or direct foundation support. In any case, existing fill should be free of deleterious debris or organics. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil, and the use of select fill material will likely be necessary. Based on the conditions encountered at the test pit locations, in our opinion, the proposed structures can be supported on conventional spread and continuous foundations bearing on undisturbed, competent native soil, compacted native soil, or new structural fill. In general, competent native soil, suitable for support of the new foundations, will likely be encountered beginning at depths of about two to four feet below the existing ground surface where fill was not encountered and within a couple feet of the transition from fill to native soils. ESNW should review the final plans to confirm the recommendations in this report remain applicable.

In our opinion, infiltration should not be considered a viable means of stormwater management for this project from a geotechnical standpoint. Further discussion and rationale regarding infiltration infeasibility is provided herein.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve site grading and related infrastructure improvements. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (where allowed by the presiding jurisdiction), and/or the use of select fill material will likely be necessary during construction.

Temporary Erosion Control

The following temporary erosion and sediment control (TESC) Best Management Practices (BMPs) should be considered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide stable surfaces at site entrances. Placing geotextile fabric underneath the quarry spalls will provide greater stability, if needed.

- Silt fencing should be placed around the appropriate portions of the site perimeter.

- When not in use, soil stockpiles should be covered or otherwise protected to reduce the potential for soil erosion, especially during periods of wet weather.

- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.

- Dry soils disturbed during construction should be wetted to minimize dust and airborne soil erosion.

Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans and/or as required by the permitting jurisdiction, should be incorporated into construction activities. Temporary erosion control measures may be modified during construction as site conditions require and as recommended by the site erosion control lead (if applicable).

Excavations and Slopes

Based on the soil conditions observed at the test pit locations, excavation activities are likely to expose areas of medium dense existing uncontrolled fill and native soils within the upper two to six feet of existing grades (OSHA/WISHA Type C). Thereafter, native soils are expected to become dense to very dense (OSHA/WISHA Type A). The following Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications and maximum allowable temporary slope inclinations may be used:

- Areas exposing groundwater seepage 1.5H:1V (Type C)

- Loose soil 1.5H:1V (Type C)

- Medium dense soil 1H:1V (Type B)

- Dense to very dense native soil (hardpan) 0.75H:1V (Type A)

Steeper temporary slope inclinations within undisturbed, very dense native soil may be feasible based on the soil and groundwater conditions exposed within the excavations. ESNW can evaluate the feasibility of utilizing steeper temporary slopes at the time of construction.

An ESNW representative should be requested to observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion and should maintain a gradient of 2H:1V or flatter.

The site contains slopes; therefore, fill placed on slopes greater than about 15 percent inclination as part of the project grading plans should include a keyway at the base, excavated into firm native soil and bench system to ensure that fill is placed on a level surface. ESNW should review the grading plans to confirm appropriate methods are utilized for fill placed on a sloping condition.

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

- Moisture Content — At or slightly above optimum
- Relative compaction (minimum) — 95 percent (Modified Proctor)
- Loose lift thickness (maximum) — 12 inches

The existing soil may not be suitable for use as structural fill unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Soil shall not be placed dry of the optimum moisture content and should be evaluated by ESNW during construction.

Concerning underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. Unsuitable material or debris must be removed from structural areas if encountered. It may be feasible to utilize existing fill as structural fill provided the existing fill is free of deleterious material and can achieve adequate compaction at the time of construction. ESNW should be contacted to evaluate existing fill soils before use as structural fill material.

In-situ and Imported Soil

Based on the conditions observed during the subsurface exploration, the in-situ soils are highly moisture sensitive and will degrade rapidly when exposed to precipitation and heavy traffic. Compaction of the soils to the levels necessary for use as structural fill may be difficult to impossible during wet weather conditions. Soils encountered during site excavations that are excessively over the optimum moisture content will likely require aeration or treatment prior to placement and compaction. Conversely, soils that are substantially below the optimum moisture content will require moisture conditioning through the addition of water prior to use as structural fill. An ESNW representative should be requested to determine the suitability of in-situ soils for use as structural fill at the time of construction.

Imported soil intended for use as structural fill should be evaluated by ESNW during construction. The imported soil must be workable to the optimum moisture content, as determined by the Modified Proctor Method (ASTM D1557), at the time of placement and compaction. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Wet-Season Grading

Earthwork activities that occur during the wet season will require additional measures to protect structural subgrades and soil intended for use as structural fill. Site-specific recommendations can be provided at the time of construction and may include leaving cut areas several inches above design subgrade elevations, covering working surfaces with crushed rock, protecting structural fill soil from adverse moisture conditions, and additional TESC recommendations. ESNW can assist in obtaining a wet season grading permit if required by the governing jurisdiction.

Foundations

Based on the results of our study, the proposed structures can be supported on conventional spread and continuous footings bearing on undisturbed, competent native soil, compacted existing fill or native soil, or new structural fill placed directly on a competent native soil subgrade. In general, competent (medium dense or better) native soil suitable for direct foundation support is anticipated beginning at depths between about two to five feet below existing grades across most of the project site. The uncontrolled fill observed at test pits TP-2, 4 and 5 did not contain significant organics or debris, but was generally loose to medium dense and may require additional compaction prior to support of new foundations. Existing fill should be compacted to a minimum depth of two feet below all foundation elements.

Where loose or unsuitable soil conditions are encountered at the design foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with suitable structural fill, will likely be necessary. ESNW should be requested to evaluate the design subgrade conditions to confirm suitable conditions are exposed and to provide additional preparation recommendations, where necessary.

Provided the structures will be supported as described above, the following parameters may be used for design of the new foundations:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf
- Coefficient of friction 0.40

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive earth pressure and coefficient of friction values include a safety factor of 1.5. With structural loading as expected, total settlement in the range of one inch is anticipated, with differential settlement of about one-half inch. Most of the anticipated settlement should occur during construction as dead loads are applied.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for retaining wall design:

- Active earth pressure (unrestrained condition) 35 pcf
- At-rest earth pressure (restrained condition) 55 pcf
- Traffic surcharge (passenger vehicles) 70 psf (rectangular distribution)
- Passive earth pressure 300 pcf
- Coefficient of friction 0.40
- Seismic surcharge 8H psf*

* *Where H equals the retained height (in feet).*

The passive earth pressure and coefficient of friction values include a safety factor of 1.5. Additional surcharge loading from adjacent foundations, sloped backfill, or other loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil, if desired.

Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3.

Seismic Design

The 2021 International Building Code (2021 IBC) recognizes ASCE 7-16 (formally known as the Minimum Design Loads and Associated Criteria for Buildings and Other Structures manual) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, the parameters and values provided below are recommended for seismic design per the 2021 IBC.

Parameter	Value
Site Class	C*
Mapped short period spectral response acceleration, S_S (*g*)	1.401
Mapped 1-second period spectral response acceleration, S_1 (*g*)	0. 5
Short period site coefficient, F_a	1.2
Long period site coefficient, F_v	1.5
Adjusted short period spectral response acceleration, S_{MS} (*g*)	1.681
Adjusted 1-second period spectral response acceleration, S_{M1} (*g*)	0.75
Design short period spectral response acceleration, S_{DS} (*g*)	1.121
Design 1-second period spectral response acceleration, S_{D1} (*g*)	0.5

* *Assumes very dense soil conditions, encountered to a maximum depth of 10.5 feet bgs at the majority of test pit locations during the December 2024 field exploration, remain very dense to at least 100 feet bgs. Based on our experience with the project geologic setting (glacial till deposits) across the Puget Sound region, soil conditions are likely consistent with this assumption.*

Liquefaction

Liquefaction is a phenomenon that can occur within a soil profile as a result of an intense ground shaking or loading condition. Most commonly, liquefaction is caused by ground shaking during an earthquake. Fine sand or silt soil profiles that are loose, cohesionless, and saturated are most susceptible to liquefaction. During the ground shaking, the soil contracts, and porewater pressure increases. The increased porewater pressure occurs quickly and without sufficient time to dissipate, resulting in water flowing upward to the ground surface and a liquefied soil condition. Soil in a liquefied condition possesses very little shear strength in comparison to the drained condition, which can result in a loss of foundation support for structures.

In our opinion, site susceptibility to liquefaction may be considered very low to negligible. The composition and relative density of the native soil are the primary bases for this opinion.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structures should be supported on well-compacted, firm, and unyielding subgrades. Where feasible, the native soil exposed at the slab-on-grade subgrade levels can likely be compacted in situ to the specifications of structural fill if groundwater seepage does not interfere with compaction activities. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break consisting of a minimum of four inches of free-draining crushed rock or gravel should be placed below the slab. The free-draining material should have a fines content of 5 percent or less defined as the percent passing the number 200 sieve, based on the minus three-quarter-inch fraction. In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If used, the vapor barrier should consist of a material specifically designed to function as a vapor barrier and should be installed in accordance with the manufacturer's specifications.

Utility Support and Trench Backfill

In our opinion, the native soil will generally be suitable for the support of utilities. Remedial measures may be necessary for some areas to provide support for utilities, such as overexcavation and replacement with structural fill and/or placement of geotextile fabric. Groundwater should be anticipated within utility excavations, and caving of trench walls may occur where groundwater is encountered. Depending on the time of year and conditions encountered, dewatering or temporary trench shoring may be necessary during utility excavation and installation.

The on-site soil may not be considered suitable for use as structural backfill throughout the utility trench excavations unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soil may be necessary at some locations before use as structural fill. If utility installation occurs during the wet season, site soils will likely be saturated and therefore difficult to use as utility backfill without treatment or aeration. Each section of the utility lines must be adequately supported by the bedding material. Utility trench backfill should be placed and compacted to the structural fill specifications previously detailed in this report or to the applicable specifications of the presiding jurisdiction.

Drainage

The presence of isolated groundwater seepage should be expected in excavations. Where zones of groundwater seepage are encountered, temporary measures to control groundwater seepage may be needed. Temporary measures to control groundwater seepage and surface water runoff during construction will likely involve passive elements such as interceptor trenches and sumps, as necessary. Surface water should not be directed to the top or toe of slopes, modular block walls, or rockeries; wall and rockery drainage should not be used to temporarily control surface water during construction.

Surface grades must be designed to direct water away from buildings, slopes, and retaining walls. The grade adjacent to buildings, slopes, and retaining walls should be sloped away at a gradient of at least 2 percent for a horizontal distance of at least 10 feet or as setbacks allow. In our opinion, perimeter footing drains should be installed at or below the invert of the building footings. A typical footing drain detail is provided on Plate 4 of this report. If footing drains are not installed, footings should be backfilled with a relatively impermeable soil. If footing drains are omitted, there is a higher potential for moisture issues for slabs-on-grade or crawl space areas.

Infiltration Feasibility

The dense, weakly cemented, and unweathered glacial till soils (hardpan) observed at depths beginning at about two to six feet bgs generally exhibit very poor soil infiltration characteristics, which is exhibited by the zones of mottled soil texture. In our opinion, the unweathered glacial till soils should be considered impermeable for stormwater design purposes. The use of full infiltration systems for stormwater control is not recommended for this site.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should exhibit a firm and unyielding condition when subjected to proof rolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as overexcavation and/or placement of thicker crushed rock or structural fill sections, prior to pavement.

Where applicable, we anticipate new pavement sections will be subjected primarily to passenger vehicle traffic. For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

- Two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB), or;

- Two inches of HMA placed over three inches of asphalt-treated base (ATB).

Heavier traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections for occasional truck traffic and access roadways areas may be considered:

- Three inches of HMA placed over six inches of CRB, or;

- Three inches of HMA placed over four-and-one-half inches of ATB.

A representative of ESNW should be requested to observe subgrade conditions prior to placement of CRB or ATB. As necessary, supplemental recommendations for achieving subgrade stability and drainage can be provided. If on-site paved areas will be constructed with an inverted crown, additional drainage measures should be included in the road design to assist in maintaining subgrade and pavement stability. ESNW can provide further consultation and design considerations regarding roadway draining if inverted crowns will be included in the project design, upon request.

Final pavement design recommendations, including recommendations for heavy traffic areas, access roads, and frontage improvement areas, can be provided once final traffic loading has been determined, upon request. Road standards utilized by the governing jurisdiction may supersede the recommendations provided in this report. The HMA, ATB, and CRB materials should conform to WSDOT specifications. All soil base material should be compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by ASTM D1557.

LIMITATIONS

This study has been prepared for the exclusive use of Westcott Holdings & Investments, Inc., and its representatives. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed at the exploration locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this study if variations are encountered.

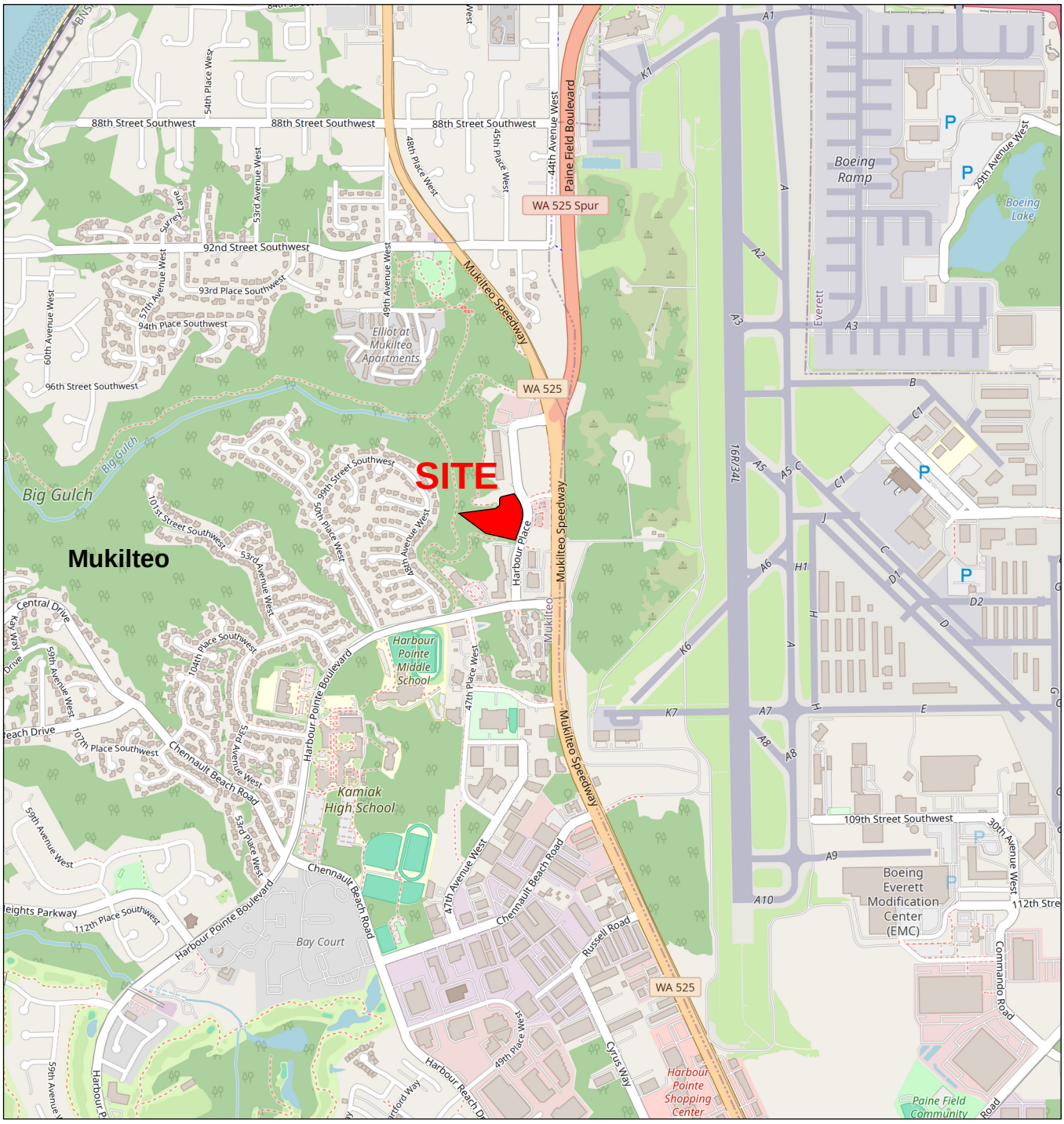
Additional Services

ESNW should have an opportunity to review final project plans with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services as needed during future design and construction phases of the project.

REFERENCES

The following documents and resources were reviewed as part of our report preparation:

- Distribution and Description of Geologic Units in the Mukilteo Quadrangle, Washington, prepared by James P. Minard, dated 1982
- Mukilteo Municipal Code (MMC) Chapter 17.52A – Geologic Sensitive Areas Regulations
- Site Plan – Concept A, prepared by CPH Consultants, dated March 3, 2025
- Web Soil Survey (WSS) resource, maintained by the Natural Resources Conservation Service under the United States Department of Agriculture



Reference:
Snohomish County, Washington
OpenStreetMap.org

NORTH

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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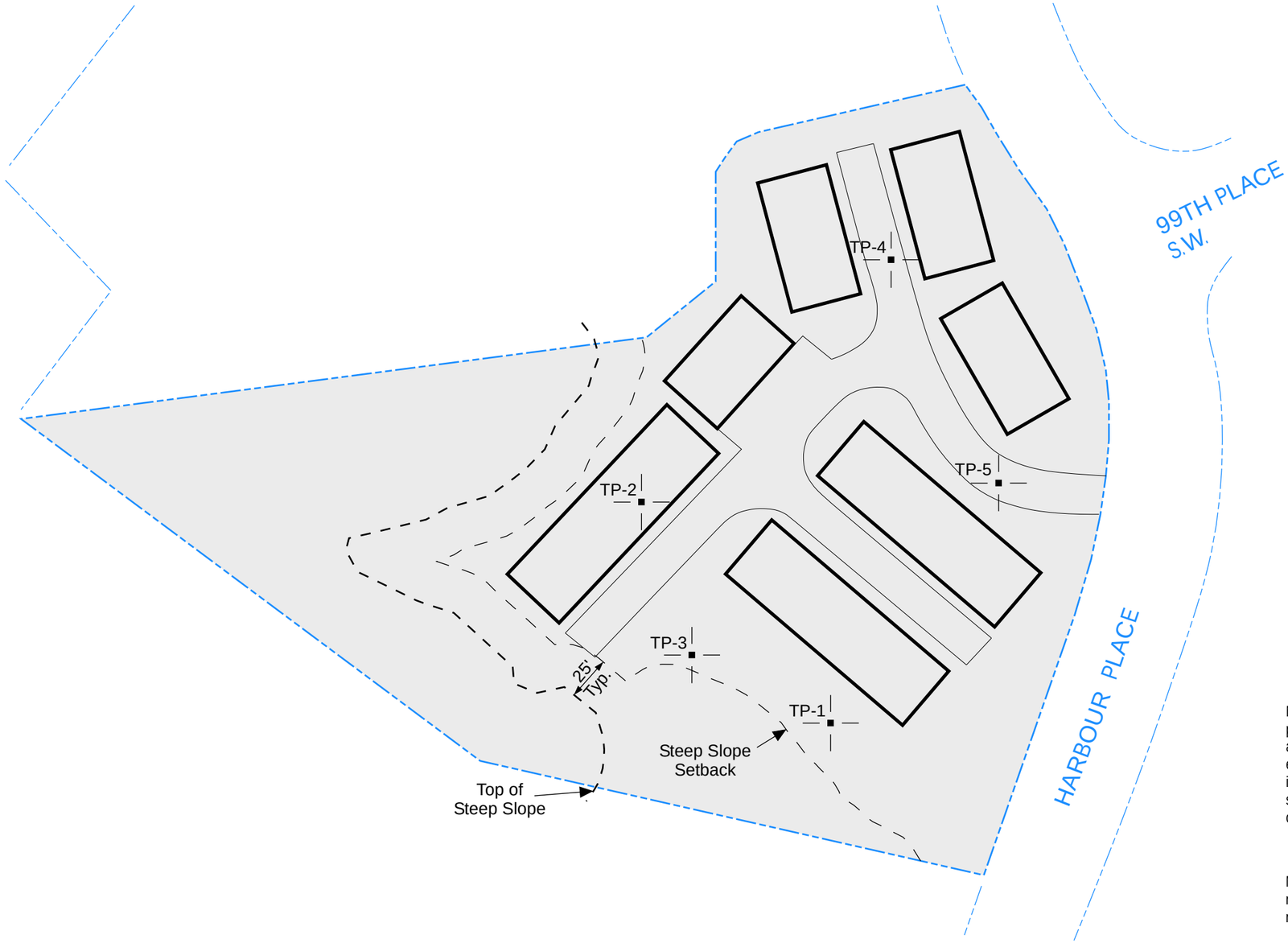
Geotechnical Engineering
Environmental Services
Earthwork Observation & Testing
CESCL & Stormwater Services

Vicinity Map
Montgomorie
Mukilteo, Washington

Drawn MRS	Date 06/12/2025	Proj. No. 9259.03
Checked SKH	Date June 2025	Plate 1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-9259.02, Dec. 2024

Subject Site

Proposed Building

NORTH

NOT - TO - SCALE

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Subsurface Exploration Plan
Montgomorie
Mukilteo, Washington

Geotechnical Engineering
Environmental Services
Earthwork Observation & Testing
CESCL & Stormwater Services

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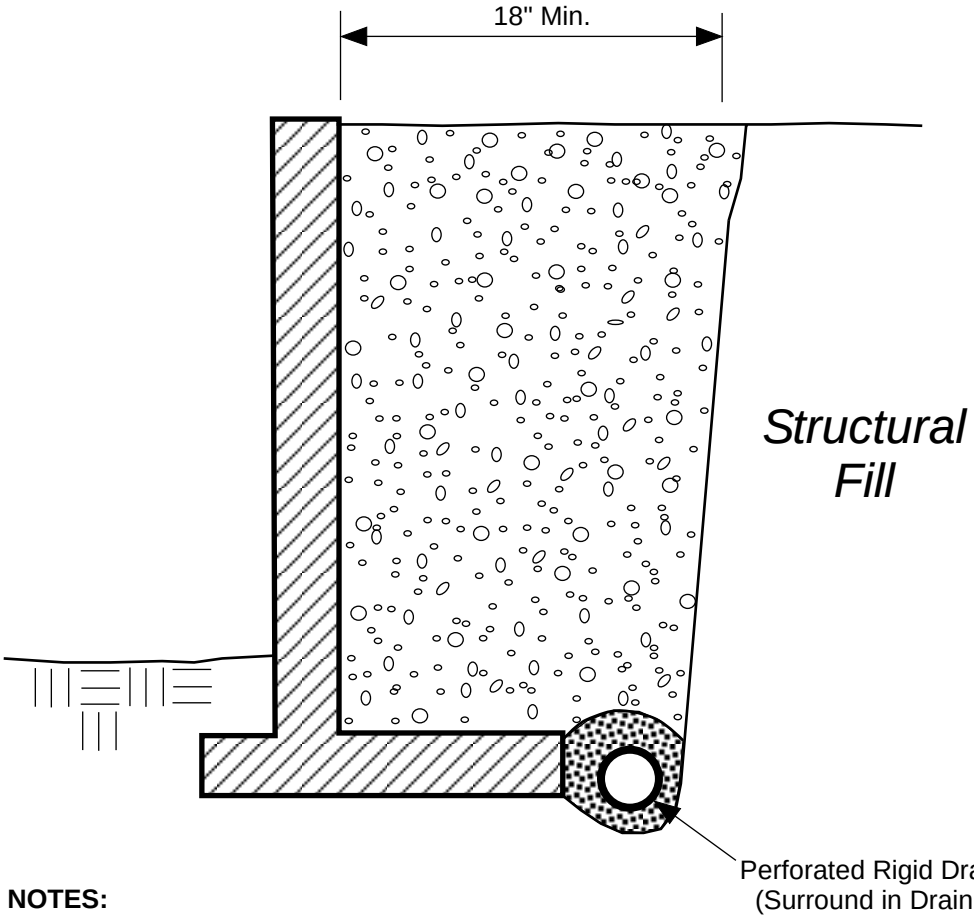
Drawn	MRS
Checked	SKH
Date	06/12/2025
Proj. No.	9259.03
Plate	2



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Free-draining Structural Backfill

1-inch Drain Rock

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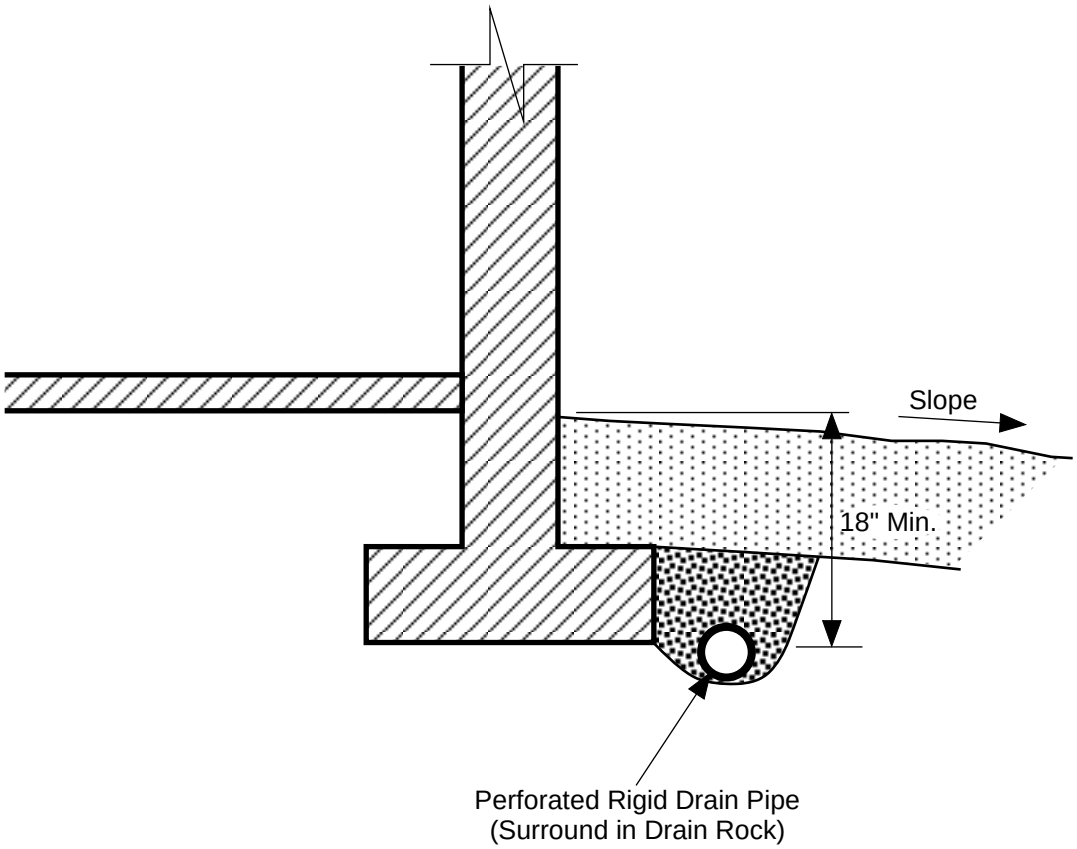
Geotechnical Engineering
Environmental Services
Earthwork Observation & Testing
CESCL & Stormwater Services

Retaining Wall Drainage Detail
Montgomorie
Mukilteo, Washington

Drawn MRS	Date 06/12/2025	Proj. No. 9259.03
Checked SSR	Date June 2025	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal: native soil or other low-permeability material.

1-inch Drain Rock

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Earthwork Observation & Testing
CESCL & Stormwater Services

Footing Drain Detail
Montgomorie
Mukilteo, Washington

Drawn MRS	Date 06/12/2025	Proj. No. 9259.03
Checked SSR	Date June 2025	Plate 4

Appendix A

Subsurface Exploration Logs

ES-9259.03

Subsurface conditions on site were explored on December 18, 2024, by excavating five test pits using a mini-trackhoe and operator retained by ESNW. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pit logs are provided in this Appendix. The test pits were advanced to a maximum depth of about 10.5 feet bgs.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

Coarse-Grained Soils - More Than 50% Retained on No. 4 Sieve	Gravels - More Than 50% of Coarse Fraction Retained on No. 4 Sieve	< 5% Fines	GW	Well-graded gravel with or without sand, little to no fines
			GP	Poorly graded gravel with or without sand, little to no fines
		> 12% Fines	GM	Silty gravel with or without sand
			GC	Clayey gravel with or without sand
	Sands - 50% or More of Coarse Fraction Passes No. 4 Sieve	< 5% Fines	SW	Well-graded sand with or without gravel, little to no fines
			SP	Poorly graded sand with or without gravel, little to no fines
		> 12% Fines	SM	Silty sand with or without gravel
			SC	Clayey sand with or without gravel
Fine-Grained Soils - 50% or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less Than 50		ML	Silt with or without sand or gravel; sandy or gravelly silt
			CL	Clay of low to medium plasticity; lean clay with or without sand or gravel; sandy or gravelly lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt with or without sand or gravel; sandy or gravelly elastic silt
			CH	Clay of high plasticity; fat clay with or without sand or gravel; sandy or gravelly fat clay
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils
Fill			FILL	Made Ground

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch

Damp - Perceptible moisture, likely below optimum MC

Moist - Damp but no visible water, likely at/near optimum MC

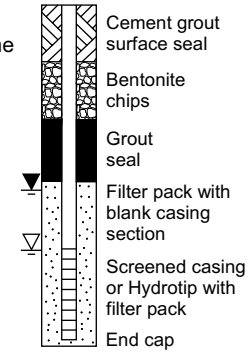
Wet - Water visible but not free draining, likely above optimum MC

Saturated/Water Bearing - Visible free water, typically below groundwater table

Symbols

ATD = At time of drilling

Static water level (date)



Terms Describing Relative Density and Consistency

Coarse-Grained Soils:

Density	SPT blows/foot
Very Loose	< 4
Loose	4 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	≥ 50

Fine-Grained Soils:

Consistency	SPT blows/foot
Very Soft	< 2
Soft	2 to 3
Medium Stiff	4 to 7
Stiff	8 to 14
Very Stiff	15 to 29
Hard	≥ 30

Test Symbols & Units

Fines = Fines Content (%)

MC = Moisture Content (%)

DD = Dry Density (pcf)

Str = Shear Strength (tsf)

PID = Photoionization Detector (ppm)

OC = Organic Content (%)

CEC = Cation Exchange Capacity (meq/100 g)

LL = Liquid Limit (%)

PL = Plastic Limit (%)

PI = Plasticity Index (%)

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

Modifier Definitions

Percentage by Weight (Approx.)	Modifier
< 5	Trace (sand, silt, clay, gravel)
5 to 14	Slightly (sandy, silty, clayey, gravelly)
15 to 29	Sandy, silty, clayey, gravelly
≥ 30	Very (sandy, silty, clayey, gravelly)

Classifications of soils in this geotechnical report and as shown on the exploration logs are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D2487 and D2488 were used as an identification guide for the Unified Soil Classification System.

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EXPLORATION LOG KEY

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TEST PIT NUMBER TP-1

PROJECT NUMBER ES-9259.02 **PROJECT NAME** Harbour Pointe Townhomes

DATE STARTED 12/18/24 **COMPLETED** 12/18/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.90724 **LONGITUDE** -122.29514

LOGGED BY SKH **CHECKED BY** SSR **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Heavy brush **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL, roots to 1'
				0.5	Brown silty SAND, medium dense, moist
	GB	MC = 11.1			-probed 7"
2.5					-becomes gray
	GB	MC = 11.2 Fines = 25.1			[USDA Classification: gravelly sandy LOAM]
5.0			SM		-becomes dense
7.5					-becomes weakly cemented
10.0	GB	MC = 10.3		10.5	

Test pit terminated at 10.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-2

PROJECT NUMBER ES-9259.02 **PROJECT NAME** Harbour Pointe Townhomes

DATE STARTED 12/18/24 **COMPLETED** 12/18/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.90749 **LONGITUDE** -122.29550

LOGGED BY SKH **CHECKED BY** SSR **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Brush **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL, roots to 6" (Fill)
				0.5	Brown silty SAND, loose to medium dense, wet (Fill)
	GB	MC = 12.4 Fines = 29.2			-probed 9"
					[USDA Classification: gravelly sandy LOAM]
2.5			SM		-becomes gray
5.0					
				5.5	
			TPSL		Relic TOPSOIL
				6.0	Brown silty SAND with gravel, medium dense, damp
	GB	MC = 8.1			
7.5			SM		-becomes gray, dense
	GB	MC = 11.9		9.5	

Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-3

PROJECT NUMBER ES-9259.02 **PROJECT NAME** Harbour Pointe Townhomes

DATE STARTED 12/18/24 **COMPLETED** 12/18/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.90730 **LONGITUDE** -122.29542

LOGGED BY SKH **CHECKED BY** SSR **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Brush **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL, roots to 6"
0.5					Brown poorly graded SAND with silt, medium dense, moist
2.5	GB	MC = 22.2	SP-SM		-probed 6"
4.0					-slight perched groundwater seepage -becomes gray, dense
5.0	GB	MC = 14.5			Gray silty SAND with gravel, dense, moist
7.5			SM		
10.0	GB	MC = 13.3 Fines = 31.4			[USDA Classification: slightly gravelly sandy LOAM]

Test pit terminated at 10.0 feet below existing grade. Groundwater seepage encountered at 3.5 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-9259.02 **PROJECT NAME** Harbour Pointe Townhomes

DATE STARTED 12/18/24 **COMPLETED** 12/18/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.90784 **LONGITUDE** -122.29480

LOGGED BY SKH **CHECKED BY** SSR **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Field brush **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL, roots to 6" (Fill)
0.5					Gray silty SAND, loose to medium dense, wet (Fill)
2.5	GB	MC = 13.5	SM		-probed 8"
4.5					Brown silty SAND with gravel, dense, moist
5.0	GB	MC = 11.3 Fines = 31.6			[USDA Classification: slightly gravelly sandy LOAM]
7.5			SM		
9.0	GB	MC = 12.8			Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-5

PROJECT NUMBER ES-9259.02 **PROJECT NAME** Harbour Pointe Townhomes

DATE STARTED 12/18/24 **COMPLETED** 12/18/24 **GROUND ELEVATION**

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.90747 **LONGITUDE** -122.29478

LOGGED BY SKH **CHECKED BY** SSR **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Heavy brush **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			TPSL		Dark brown TOPSOIL, roots to 1' (Fill)
				0.5	Brown silty SAND with gravel, loose to medium dense, moist to wet
2.5			SM		
				4.0	
			TPSL		Relic TOPSOIL
				4.5	-slight perched groundwater seepage
5.0	GB	MC = 12.1			Gray silty SAND with gravel, dense, damp
			SM		-becomes very dense
7.5					
	GB	MC = 10.2		9.0	

Test pit terminated at 9.0 feet below existing grade due to refusal. Groundwater seepage encountered at 4.5 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Appendix B

Laboratory Test Results

ES-9259.03

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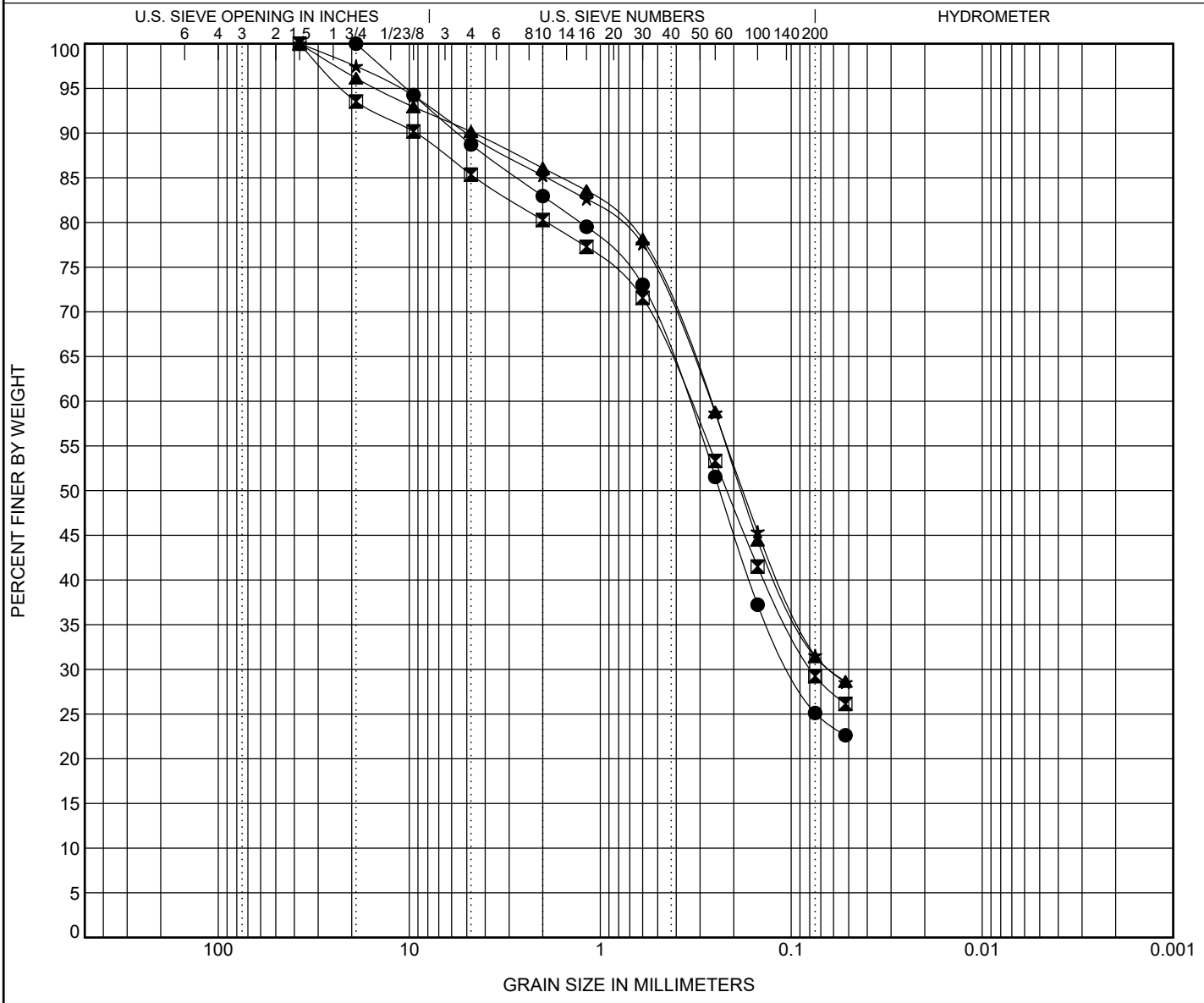
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9259.02 **PROJECT NAME** Harbour Pointe Townhomes



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	Cc	Cu
●	TP-01	4.00ft.	USDA: Gray Gravelly Sandy Loam. USCS: SM.		
⊠	TP-02	1.50ft.	USDA: Brown Gravelly Sandy Loam. USCS: SM.		
▲	TP-03	10.00ft.	USDA: Gray Slightly Gravelly Sandy Loam. USCS: SM.		
★	TP-04	5.00ft.	USDA: Gray Slightly Gravelly Sandy Loam. USCS: SM.		

	Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	TP-01	4.0ft.	19	0.353	0.099					25.1	
⊠	TP-02	1.5ft.	37.5	0.344	0.078					29.2	
▲	TP-03	10.0ft.	37.5	0.264	0.062					31.4	
★	TP-04	5.0ft.	37.5	0.266	0.062					31.6	

GRAIN SIZE USDA ES-9259.02 HARBOUR POINTE TOWNHOMES.GPJ GINT US LAB.GDT 6/13/25

CRITICAL AREA REPORT

MONTGOMERIE
MUKILTEO, WASHINGTON

Prepared for

244-WLD Montgomerie, LLC

Prepared by

Green Earth Operations, Inc
3201 1st Ave. S., Suite 212
Seattle, Washington 98134
Telephone: 206/323-1865

July 1, 2025

TABLE OF CONTENTS

Report Summary

Client:	244-WLD Montgomerie, LLC 1010 Market Street Kirkland, WA 98033
Project site:	3.26-acre site, Parcel No. 28042100103200 located at Harbour Place at the intersection of 99th Place SW, Mukilteo, Washington.
Critical Area Assessed:	Wetland K – Category IV; 0.01 AC; depressional Feature 1 – N/A; 0.48 AC; depressional Drainage 1 – Type 5 Stream
Regulatory Guidance:	MMC 17.52B.100 establishes the following wetland categories and standard buffers: Category I wetland – 75 to 225 feet Category II wetland – 75 to 225feet Category III wetland – 60 to 225 feet Category IV wetland – 40 feet MMC 17.52C.090 establishes the following stream types (based on WAC 222-16-030 water types) and standards buffer widths: Type 3 – 150 feet Type 4 – 50 to 75 feet Type 5 – 50 feet

Introduction

This Critical Area Report was prepared for 244-WLD Montgomerie, LLC., by Green Earth Operations, Inc. (GEO). GEO conducted site investigations to document the occurrence of regulated wetland and streams within and adjacent to the project site. This report is consistent with the requirements of Mukilteo Wetland Regulations (Mukilteo Municipal Code [MMC] 17.52B) and uses the 2014 Updated Version 2.0 *Washington State Wetland Rating System for Western Washington* (Hruby 2014). The report includes characterization of existing site conditions, review of existing information sources, wetland assessment, and drainage survey. The intent of this report is to get confirmation from the City of Mukilteo on the presence of critical areas documented in this report.

Field work and report preparation was led by Mark Merkelbach, GEO principal and professional wetland scientist (PWS - #001837).

Project Location

The project site ("Site") is in Mukilteo, Washington, and consists of one triangular parcel (No. 28042100103200) located at Harbour Place at the intersection of 99th Place SW in Section 16/Section 21 of Township 28N and Range 4E W.M. (**Appendix A/Figure 1**). The parcel is approximately 3.26 acres. This area is in Water Resource Inventory Area (WRIA) 8 (Cedar - Sammamish), in the Shell Creek – Frontal Puget Sound watershed (**Appendix A/Figure 3**).

Project Purpose and Description

Montgomerie is a new residential townhome community that will improve a vacant parcel with paved roadways, utility infrastructure, private yards, and open space areas in support of 36 attached single-family residential units within 8 townhome buildings.

Stormwater will be collected and conveyed to the detention vault for flow control prior to releasing into a Contech Stomfilter Manhole with a Phosphosorb cartridge filter for water quality treatment. Runoff from the Southeast subbasin will not be collected by the onsite stormwater infrastructure due to this area remaining undeveloped forested area. The release from the detention vault will be controlled by a standard flow control structure designed to control the peak runoff rates and durations of storm runoff from the site in accordance with City surface water design standards. The controlled release from the vault is conveyed west from the developed portion of the site to the western forested area via a tightline and will discharge directly at the surface. The topography of this area is comprised of a valleyed area which naturally directs the runoff into an onsite Type 5 stream which is tributary to Big Gulch Creek.

Study Area

The study area for this investigation is limited to the Site (**Appendix A/Figure 1**). The on-site investigation was performed strictly within the site property boundaries; however, this study includes wetlands and stream inventories within a 300-feet radius of the project site, background research on pre-existing critical areas studies, as well as observations of conditions on adjacent properties made from within the project

site. Within the Site, wetlands were flagged and classified by the guidance required by federal, state, and local agencies. See the Methods section below for further details.

Methods

Wetland Delineation, Identification, and Classification

Waters of the United States (U.S.), including wetlands, were delineated within the project site boundaries consistent with the technical approaches outlined in the U.S. Army Corps of Engineers (USACE) *Wetlands Delineation Manual* (Environmental Laboratory 1987), the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), and the *Regional Supplement to USACE Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (Environmental Laboratory 2010). The wetland definition provided in the Mukilteo Municipal Code (MMC) (MMC 17.08.020) was applied throughout the study.

In general, wetland delineation consisted of three main tasks: (1) assessing vegetation, soil, and hydrologic characteristics to identify areas meeting the wetland identification criteria, (2) evaluating constructed drainage features to determine if they would be regulated as wetlands, and (3) marking wetland boundaries.

Sampling locations were selected at sites representative of the area. Dominant plant species in each of the three strata (tree, sapling/shrub, and herb) were identified using northwest flora field guides (Cook 1997 and Pojar 1994). Unless otherwise noted in field data sheets due to local conditions, trees were identified within a 30-foot radius of an established data plot, scrub/shrub vegetation was identified within a 5-foot radius, and herbaceous vegetation was identified within a 5-foot radius. A determination of the presence of hydrophytic vegetation was made at each observation point in accordance with the USACE guidelines (Environmental Laboratory 2010).

The determination of the presence of hydric soils was consistent with the USACE Regional Supplement (Environmental Laboratory 2010). The Soil Survey of Snohomish County Area (NRCS 2020a) provided information regarding the general characterization of the soils in the area, the parent material, as well as series, taxonomy and subgroup information. Soils were examined to a depth of approximately 20 inches, or the depth at which it could be confirmed that positive indicators were either present or absent. Soil colors were described in data forms using the Munsell soil color charts' numbering system (Munsell Color 2000). This numeric color classification system is used by the USACE Regional Supplement in determining if hydric soil indicators are present in a sample.

Hydrology data was collected from field observations and reference documents. Annual climate records and monthly precipitation during the site visits were obtained from nearby weather stations located in Everett, WA (NOAA. 2025). Upon site inspection, the presence of direct and indirect hydrologic indicators was used to infer wetland hydrology. Field indicators of wetland hydrology were determined in accordance with the USACE guidelines (Environmental Laboratory 2010).

The wetland observed on the subject property was classified according to the USFWS classification system (Cowardin et al. 1979). This system is based on an evaluation of attributes such as vegetation class, hydrologic regime, salinity, and substrate. The wetland was also classified according to the hydrogeomorphic (HGM) wetland classification system, which is based on an evaluation of attributes such

as the position of the wetland within the surrounding landscape, the source and location of water just before it enters the wetland, and the pattern of water movement in the wetland (Brinson 1993).

Wetland Rating

MMC 17.52.090 requires the classification of wetlands using the *Washington State Wetland Rating System for Western Washington: 2014 Update Version 2.0* (Hruby 2014). The rating system assesses a wetland's potential to provide water quality, hydrologic, and habitat functions at a site-specific level as well as in relation to existing land use in the surrounding landscape. It also incorporates consideration of the wetland's hydrologic and geomorphic conditions into the system by assigning the wetland an hydrogeomorphic (HGM) classification. This allows for a more accurate rating of how well the wetland functions based on its position in the landscape, water source, and the flow and fluctuation of the water once in the wetland. The 2014 Rating System divides wetlands into four hierarchical categories based on specific attributes such as rarity, sensitivity to disturbance and our ability to replace them. The classification hierarchy ranges from Category I wetlands, which exhibit outstanding features (rare wetland type, relatively undisturbed or a high sensitivity to disturbance, high level of functions) to Category IV wetlands, which have the lowest levels of function and are often heavily disturbed. The rating categories are used to identify permitted uses in the wetland and its buffer, to determine the width of buffers needed to protect the wetland from adjacent development, and to identify the mitigation ratios required to compensate for potential impacts on wetlands.

Ratings forms were completed with information gathered in the field and through online research (**Appendix C**). Following determination of the wetland rating, the wetland buffer width was determined according to that rating, per MMC 17.52B.100.

Stream Classification

Streams were noted within the vicinity of the site. Washington State defines a watercourse, river, or stream as "any portion of a channel, bed, bank, or bottom waterward of the ordinary high-water line of waters of the state, including areas in which fish may spawn, reside, or pass, and tributary waters with defined bed or banks, which influence the quality of fish habitat downstream. This includes watercourses which flow on an intermittent basis or which fluctuate in level during the year and applies to the entire bed of such watercourse whether or not the water is at peak level. This definition does not include irrigation ditches, canals, storm water run-off devices, or other entirely artificial watercourses, except where they exist in a natural watercourse that has been altered by humans" (WAC 2020; 220-660-030 [153]).

An unnamed drainage through the parcel was classified using the stream typing system in MMC 17.52C.080, which states, "Stream types shall be classified according to WAC 222-16-31". No Type 1 or Type 2 streams are located within the City of Mukilteo. Other stream types are described generally below:

> Type 3 Waters that have five or more feet between each bank's ordinary high-water mark, and a moderate to slight use and are moderately important from a water quality standpoint for domestic use, public recreation, and fish and wildlife habitat.

Type 4 Waters that are perennial non-fish habitat streams.

Type 5 Seasonal, non-fish habitat streams in which surface flow is not present for at least some portion of the year and are not located downstream from any stream reach that is a Type 4 water.

Determination of Fish and Wildlife Habitat Conservation Areas

The presence of fish and wildlife habitats of importance on the site were determined based on the following criteria listed in MMC 17.52C.030:

(1) Areas with endangered, threatened, and sensitive species;

(2) Habitats and species of local importance that have been designated by the City;

(3) Waters of the state as defined by WAC 222-16-30;

(4) State natural area preserves and natural resource conservation areas;

(5) State Priority Habitats and Areas Associated with State Priority Species. Priority habitats and species are priorities for conservation and management. Priority species require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element. Priority habitats and species are identified by the state Department of Fish and Wildlife.

(6) Areas of rare plant species and high-quality ecosystems as identified by the Washington State Department of Natural Resources.

Results

Existing Information Review

Aerial photographs and project maps of the area were reviewed. Existing information concerning the project area was reviewed prior to fieldwork to identify vegetation patterns, topography, soils, streams, and other natural resources potentially located within the project boundaries.

Landscape Setting

The Site is located on a bluff overlooking the South Fork of Big Gulch, within the City of Mukilteo in Snohomish County, Washington. The Site occupies a transitional position between the developed urban uplands of Mukilteo and the steeply incised ravine of Big Gulch, a forested natural corridor that drains westward toward Possession Sound. The parcel features moderate to steep slopes along the west edge that descend toward the gulch, with localized areas of fill or surface disturbance likely resulting from past grading or land-clearing activities (described further in this report). Adjacent land uses include residential and commercial developments, with Harbour Place bordering the eastern edge (**Photo 1**).

Photo 1. East edge of the Site, looking north along Harbour Place. Photo taken on 12/11/2024.

Land Use Changes

Historical aerial imagery indicates that prior to 1990, the site was entirely forested (**Appendix A/Figure 2**). Between 1990 and 2002, the northeastern and eastern portions of the site were cleared, except for the steep slope along the west edge of the Site. By 2006, an unimproved access road from Harbour Place had been established along the eastern edge, and construction staging is observed—likely in support of adjacent development to the north. Additional soil disturbance and vegetation clearing

occurred in 2007, likely contributing to the formation of a depression on this bluff terrace. Subsequent aerial imagery from 2019 and 2025 shows gradual natural succession, with woody vegetation becoming reestablished in the previously disturbed area. The soil surface today contains tracks and cut marks from those past clearing and excavation activities (**Photo 2**).

Photo 2. Emergent plants and former scaring of the soil surface from past excavation actvities. Photo taken on 10/4/2024.

Watershed Description

The Site is located east of the South Fork of Big Gulch which lies in the Shell Creek – Frontal Puget Sound watershed (HUC 171100190203) and within the Water Resource Inventory Area (WRIA) 8 Cedar – Sammamish (Ecology 2025) (**Appendix A/Figure 3**). A water vector map was created using GIS and LIDAR data to produce a slope map that illustrates computed surface flow pathways (**Appendix A/Figure 4**). The drainage lines depicted in blue do not represent actual streams; rather, they indicate the general flow of surface water based on the topography. This figure demonstrates that water generally flows east to west towards the South Fork of Big Gulch.

Climate, Precipitation, and Growing Season

The Puget Sound plateaus and lowlands of Snohomish County experience a mild to moderate temperate climate with average annual rainfall that can vary widely with elevation, latitude, and proximity to the Puget Sound shoreline. The local growing season in the Puget Sound Basin (Everett, WA) is approximately 268 days in length using the 5 years in 10 criteria and 28° C. The nearest weather station Everett, WA

recorded 0.01 inches of precipitation in the 14 days preceding the site investigations on October 4, 2024, 2.21 inches of precipitation in the 14 days prior to the site visit on December 11 , 2024, 2.91 inches of precipitation in the 14 days prior to the site visit on December 20, 2024, and 0.00 inches of precipitation in the 14 days preceding June 18, 2025 (NOAA. 2025). Using the Antecedent Precipitation Tool, field work occurred during the wet and dry season, and site conditions were normal during all site visits (Gutenson and Deters 2025).

Critical Areas Overview

Wetland Inventory

The National Wetland Inventory (NWI) is compiled by the U.S. Department of Interior Fish and Wildlife Service (USFWS 2025). NWI relies upon visual aerial photo interpretation of wetland indicators including hydrologic, vegetation and topographic signatures. Wetland areas identified under NWI are also classified in accordance with the Cowardin classification system (Cowardin et al. 1979). The National Wetlands Inventory does not identify any mapped features on site but identified a riverine polygon which is associated with Big Gulch to the west. (**Appendix A/Figure 5a**).

The City of Mukilteo has compiled a map of streams, drainage basins, and potential wetlands (ESA 2011). This map was developed by the city to aid property owners, developers, and biologists with identifying potential critical areas within city limits and identifying appropriate mitigation sites. The map identifies a drainage pattern immediately to the south of the Site with an associated wetland polygon which extends on-site. A portion of this wetland is in the southeast corner of the Site (**Appendix A/Figure 5b**).

A boundary and easement map prepared by Mead Gilman (MG 2025) identifies a 50-foot wetland buffer in the southeast corner of the parcel (**Appendix A/Figure 5c**), no additional information was provided regarding the wetland itself, including its exact location and category. The current code (MMC 17.52B.100) specifies a 50-foot buffer, which exceeds the minimum requirement for a Category IV wetland but does not meet the standards for a Category III wetland. Based solely on this map, it is not possible to determine the rating of this wetland.

Soil Survey of Snohomish County

According to the Natural Resources Conservation Service (NRCS) Soil Survey (2025), soils within the Site are mapped as Alderwood and Everett (**Appendix A/Figure 6**). These soil series formed in glacial till and outwash, respectively, and are characterized by gravelly sandy loam surface horizons underlain by compact glacial till (Alderwood) or stratified sandy and gravelly outwash (Everett). Alderwood soils are moderately well-drained with slow to moderate permeability, while Everett soils are somewhat excessively drained with rapid permeability. Both soil types are classified as non-hydric; however, Alderwood soils may exhibit hydric characteristics in localized depressional areas where water accumulates seasonally. Perched or migrating subsurface water may also occur in low-lying portions of the site, particularly where drainage is impeded by compact till or buried restrictive layers.

Sensitive Plants, Fish, Wildlife, and Habitats

According to the Washington State Department of Natural Resources (WDNR) Washington Natural Heritage Program (WNHP) and Wetlands of High Conservation Value database, there are no known threatened or endangered plant species or high-quality ecosystems within the section, township, and range where the site is located (S16 and S21/T28N/R4E) (WDNR 2025a). The Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database shows no specific PHS records documented for this site.

Site Investigation

Overview of Site Conditions

As discussed above, the Site includes undisturbed natural areas associated with the forested Big Gulch ravine, as well as a vacant lot in the east central portion that was historically used for construction staging and barrow activities. An initial reconnaissance-level site visit was conducted on October 4, 2024, followed by a formal wetland delineation survey on December 11 and 20, 2024, and an additional site visit on June 18, 2025. Site access was obtained from Harbour Place.

Site Topography and Hydrology

The Site contains a previously cleared and generally flat central portion that is flanked by a forested edge to the northwest and southwest. Elevations at the site range from approximately 384 to 508 feet, with a general sloping east to west that becomes a steep slope ravine (**Appendix A/Figure 4**).

Site hydrology is primarily driven by direct precipitation, with no evidence of natural springs or seeps. A drainage (Drainage 1) is fed by an 18-inch corrugated metal pipe (CMP) culvert that discharges at the west edge of Harbour Place. The roadway side bank is armored with riprap along the start to this drainage. This culvert conveys seasonal surface flow westward, discharging into the adjacent ravine, where the topography drops sharply.

Vegetation Community

The disturbed depression in the central-east portion of the parcel contains vegetation which consists of tufted hairgrass (*Deschampsia caepitosa*) and soft rush (*Juncus effusu*s) with scattered young black cottonwoods (*Populus balsamifera*) and a few red alders (*Alnus rubra*). The composition of black cottonwood abruptly changes where it meets the undisturbed forest associated with Big Gulch to the west and south edges of the previously disturbed area. The east and north perimeter of the disturbed area is dominated by Scotch broom (*Cytisus scoparius*) and Himalayan Blackberry (*Rubus armeniacus*) (**Photo 3**). The forested portion of the site is dominated by red alder, salmonberry (*Rubus spectabilis*), western red cedar (*Thuja plicata*), sword fern (*Polystichum munitum*), Oregon grape (*Mahonia aquifolium*), fringe cups (*Tellima grandiflora*), herb-Robert (*Geranium robertianum*), and Himalayan blackberry (**Photo 4**).

	
Photo 3. Looking west from northeastern portion of parcel within Feature 1. Photo taken on 12/11/2024.	**Photo 4.** On-site undisturbed forested area connected to Big Gulch ravine. Photo taken on 12/11/2024.

Critical Area Summary

GEO identified one depressional flow-through Category IV wetland, an artificially created and unregulated depressional feature, and a Type 5 drainage. Normal circumstances were present during the field delineation (USACE 1990 and NRCS 2011). Refer to **Appendix A/Figure 7** for wetland mapping (including soil pit [SP-X] locations); **Appendix B** for wetland data sheets; **Appendix C** for wetland rating forms and figures.

Below is a summary of the wetland and depression feature identified within the project site (**Table 1**) (**Appendix A/Figure 7).**

Table 1. Critical Areas Summary Table

Critical Area	Area (SF)	Area (AC)	Habitat Score	Wetland/Stream Category[1,2]	Standard Buffers[3]
Wetland K	649	0.01	4	IV	40
Feature 1	756	0.48	--	--	--
Drainage 1	--	--	--	Type 5	50

[1]Wetland Categories based on Ecology 2014 wetland rating (2014 Hruby)
[2]Stream Classification (MMC 17.52C.090)
[3]Wetland/Stream Buffer based on MMC standard buffers

Wetland K

Wetland K is a depressional flow-through wetland that receives direct precipitation and seasonal hydrological inputs from flows associated with Drainage 1. This includes surface runoff from adjacent impervious surfaces. Its depressional landscape position is evident both in aerial imagery and during onsite observation, functioning as a collection area for nearby runoff. The wetland was delineated along a topographic break that abruptly ends at a 10-foot waterfall into the Drainage 1 ravine.

The mapped boundary of Wetland K matches a previously mapped wetland polygon in the City's wetland inventory (**Appendix A/Figure 5b**). This also corresponds to a wetland buffer which was identified in the boundary and easement map prepared by Mead Gilman (MG 2025), which included a 50-foot buffer (**Appendix A/Figure 5c**). However, based on the most recent delineation, Wetland K is classified as a Category IV wetland, for which code requires a standard 40-foot buffer (MMC 17.52B.100).

Table 2	Wetland Name	Wetland K
	Location	Southeastern corner of the parcel

***Photo 4**. Wetland K, facing east. (12/20/2024)*

Local jurisdiction	Snohomish County
Water Resource Inventory Area	8 Cedar-Sammamish
Wetland rating	Category IV
County Jurisdictional Buffer Width	40 feet
Cowardin Classification	PEM (Palustrine Emergent Wetland)/ Palustrine Scrub/Shrub (PSS)
Hydrogeomorphic Classification	Depressional flow through
Wetland data form(s)	Appendix B
Upland data form(s)	Appendix B

Size of wetland	**649 SF** (onsite).
Dominant vegetation	Wetland A is classified as a Palustrine Emergent (PEM) and Palustrine Scrub/Shrub (PSS) wetland under the Cowardin system. It is dominated by western red cedar, red alder, Himalayan blackberry, fringe cups, and herb-Robert.
Soils	The soil profile has a 0–9 inch matrix of 10YR 2/1 loam with no visible redox features. Although no individual hydric soil indicator is met, the presence of hydrophytic vegetation and wetland hydrology, combined with low-chroma soil in a concave landform with seasonal saturation, supports a hydric soil determination under the Problematic Hydric Soils procedure outlined in the Regional Supplement (ERDC/EL TR-10-3, 2010).
Hydrology	Surface water was not present during the December 2024 survey. During the June investigation, secondary indicators observed included Drainage Patterns (B10) and Geomorphic Position (D2). As such, the plot meets the wetland hydrology criterion. See data forms for more details (***Appendix B***).
Rationale for delineation	Two wetland indicators—vegetation and hydrology—are present. Although a hydric soil indicator is not met, the soil characteristics align with the criteria for hydric soils under the Problematic Hydric Soils approach described in the Regional Supplement (ERDC/EL TR-10-3, 2010). See wetland data form for details (***Appendix B***).
Rationale for local rating	Wetlands K is classified as Category IV wetland with a habitat score of 4, due to its location in a high land-use area, limited habitat features, and lacking plant diversity when applying the 2014 Wetland Rating System for Western Washington (Hruby 2004). (***Appendix C***).

Feature 1

Feature 1 is a depressional area characterized by vegetation, soils, and hydrological conditions typical of wetlands. This feature resulted from land modifications that took place between 1990 and 2007, as documented in the *Land Use Section* and **Appendix A/Figure 2**. Additionally, the site contours in this area exhibit a sudden elevation change from Harbour Place, followed by a uniform and gradually sloping grade that appears inconsistent with the natural topography, suggesting possible anthropogenic modification, as shown in **Appendix A/Figure 4.**

Evidence of site disturbance remains visible today. As shown in **Photo 2**, patches of exposed soil from tire tracks and presumed excavation activities are still present. Linear impressions on the soil surface—likely made by excavator bucket teeth—are evident throughout the clearing. Soils observed within the disturbed area exhibited a depleted matrix with redoximorphic concentrations (**Appendix B/SP-2W**), and clay was present within the upper 6 inches. Surface saturation was observed in the top 6 inches, with drier conditions beneath. During a follow-up site visit on December 11, 2024, shallow standing water was present in sparsely vegetated portions of the area. According to the Natural Resources Conservation Service (NRCS) soil survey, the eastern half of the property is mapped as Alderwood gravelly sandy loam (0 to 8 percent slopes), a non-hydric soil. However, the sampled soils differ from the mapped series, exhibiting clay content and lacking the sandy texture expected in the upper horizon.

Feature 1 meets all three wetland criteria: hydrophytic vegetation, hydric soils, and wetland hydrology; however, based on GEO's findings and best professional judgment, the on-site disturbed depression was artificially created through prior excavation and grading activities. Both aerial photographs and field observations indicate that this area was originally non-wetland (upland) prior to the clearing and grading activities conducted between 2002 and 2007. Additionally, this feature with wetlands conditions was not identified in the City wetland inventory (**Appendix A/Figure 5b**) nor in the boundary and easement map (**Appendix A/Figure 5c**). Most wetlands in the city inventory area are associated with ravine drainages rather than upland bluff terraces with well-drained soils where Feature 1 is situated.

The City of Mukilteo regulates wetlands under the Mukilteo Municipal Code (MMC) 17.52 – Critical Areas and defines them under MMC 17.08 – Definitions.

Wetlands are defined per MMC 17.08:

"…**Wetlands do not include those artificial wetlands intentionally created from non-wetland sites**, including but not limited to, irrigation and drainage ditches, grass-lined swales, canals, **detention facilities**, wastewater treatment facilities, farm ponds, and landscape amenities."

Site observations and land use changes since 2002 support that this is an artificially created wetland that was unintentionally created in a previously non-wetland area because of clearing, excavation, and/or grading construction activities. This wetland does not meet the definition of a regulated wetland and would therefore ***not*** be subject to the rules and restrictions of MMC 17. 52 nor subject to application of a wetland buffer.

Drainage 1

Drainage 1 is a seasonal, non-fish bearing stream, located offsite along the southern boundary of the parcel and flows through Wetland K. Flow was present during the December 2024 field visit but was absent during the June 2025 follow up visit. It is a feeder stream that flows into the South Fork of Big Gulch (**Appendix A/Figure 7**). The ordinary high-water mark (OHWM) was not flagged as the channel width was very narrow (**Photo 5**). A 50-foot standard buffer width is required for Type 5 streams (MMC 17.52C.090).

Photo 5. Drainage 1 is a narrow, confined channel overgrown with Himalayan blackberry. Photo taken on 12/20/2024.

This drainage feature, originating from the 18-inch culvert upstream of Wetland K, has a defined bed and bank with visible signs of bedload transport. The bed width generally remains under 2 feet. Due to steep slopes on both sides of this drainage west of Wetland K, access to the channel was restricted. LIDAR (**Appendix A/Figure 4**) was used to map the channel center line.

Buffer Conditions

Onsite *wetland* buffers **(Appendix A/Figure 7)** are forested and consist of western red cedar, red alder, sword fern, and Oregon grape. The *stream* buffer is densely vegetated with upland emergent, shrub, and forested vegetation communities present. It contains stands dominated by red alder and western red cedar, along with a woody understory of salmonberry and Himalayan blackberry. Sword fern was present along the channel side banks.

This forested buffer plays a key role in water quality protection by filtering sediment, nutrients, and pollutants from upland runoff before it enters the wetland and stream system. The dense vegetation promotes infiltration, reducing surface runoff and peak flows during storm events. Additionally, the forest provides high-quality wildlife habitat and movement corridors, supporting species that rely on both upland and aquatic environments. Litterfall and large woody debris from stream and wetland buffers contribute organic material and structural complexity to the Big Gulch ravine system, enhancing habitat downstream and maintaining ecological connectivity to Puget Sound.

Conclusions of Investigation

Wetland K met two key wetland parameters—hydrophytic vegetation and wetland hydrology. Although no single hydric soil indicator was conclusively identified, the presence of a low-chroma matrix within a seasonally saturated concave landform, along with the observed hydrology and vegetation indicators, supports a hydric soil determination using the Problematic Hydric Soils approach outlined in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual (ERDC/EL TR-10-3, 2010). Based on this analysis, a positive wetland determination is appropriate. Wetland K received a total score of 15 points using the Washington State Department of Ecology Wetland Rating System (2014), classifying it as a Category IV wetland with low habitat function, which requires a standard buffer width of 40 feet under Mukilteo Municipal Code (MMC) 17.52B.100.

Feature 1, while exhibiting some wetland characteristics in the field, contains altered soils and vegetation as a result of past excavation activities. Due to its anthropogenic origin and lack of sustained ecological function, Feature 1 does not meet the definition of a regulated wetland under the City of Mukilteo's critical areas code.

Drainage 1 has been classified as a Type 5 stream, which requires a standard buffer of 50 feet.

Under MMC 17.52B.100(D), wetland buffer widths may be reduced through the implementation of mitigation measures such as buffer averaging, enhancement, or reduction with increased protection functions—provided that it can be demonstrated the overall buffer functions and values will be maintained or improved. For Category IV wetlands, buffer reductions of up to 25% may be allowed where site constraints or proposed mitigation justify the modification and where the buffer reduction will not result in a loss of wetland functions. Any proposed buffer reduction would require approval from the City and must be supported by a mitigation plan that meets the performance standards set forth in the municipal code.

Disclaimer

Green Earth Operations, Inc. (GEO) has prepared this Critical Area Report at the request of 244-WLD Montgomerie, LLC. The information contained herein is, to the best of our knowledge, accurate and reliable. It is important to recognize that establishing wetland boundaries is an imprecise science. Wetlands are, by definition, transition areas, and their boundaries can change over time. The presence of wetland indicators may also vary depending on the season. Furthermore, individual professionals may have differing opinions on the exact location of wetland boundaries and/or the functions and values of a wetland. All stream and wetland boundaries, classifications, and buffer widths should be considered subject to change until reviewed and approved by the appropriate regulatory agencies with jurisdiction. GEO recommends obtaining jurisdictional approval before finalizing site plans and/or commencing construction activities. The final determination of U.S. federal jurisdiction rests with the U.S. Army Corps of Engineers (Corps), Seattle District. Wetlands classified as "Waters of the State" are regulated by Washington State, with jurisdiction determined by the Washington State Department of Ecology (WDOE). Based on the final determinations of the Corps and WDOE, wetland buffer and mitigation requirements must adhere to Mukilteo Municipal Code (MMC) regulations. This report can be used in applying for state and/or federal permits. GEO is not liable for the accuracy of information provided by third parties.

Within the constraints of schedule, budget, and scope of work, GEO assures that this study was conducted in accordance with generally accepted environmental science practices, including the technical guidelines and criteria in effect at the time of this study. The results and conclusions of this report reflect the author's best professional judgment based on information provided by the project proponent and data collected during this study. No other warranty, expressed or implied, is provided.

Should there be any changes in the nature, design, or location of the project site features, the conclusions and recommendations in this report will not remain valid unless the changes are reviewed and the conclusions of this report are verified in writing by GEO. GEO is not responsible for any claims, damages, or liabilities arising from the interpretation of these findings or the reuse of the analysis without GEO's express written authorization.

GEO and project staff are not attorneys, and this report should not be interpreted as a legal representation or interpretation of environmental laws, rules, or regulations.

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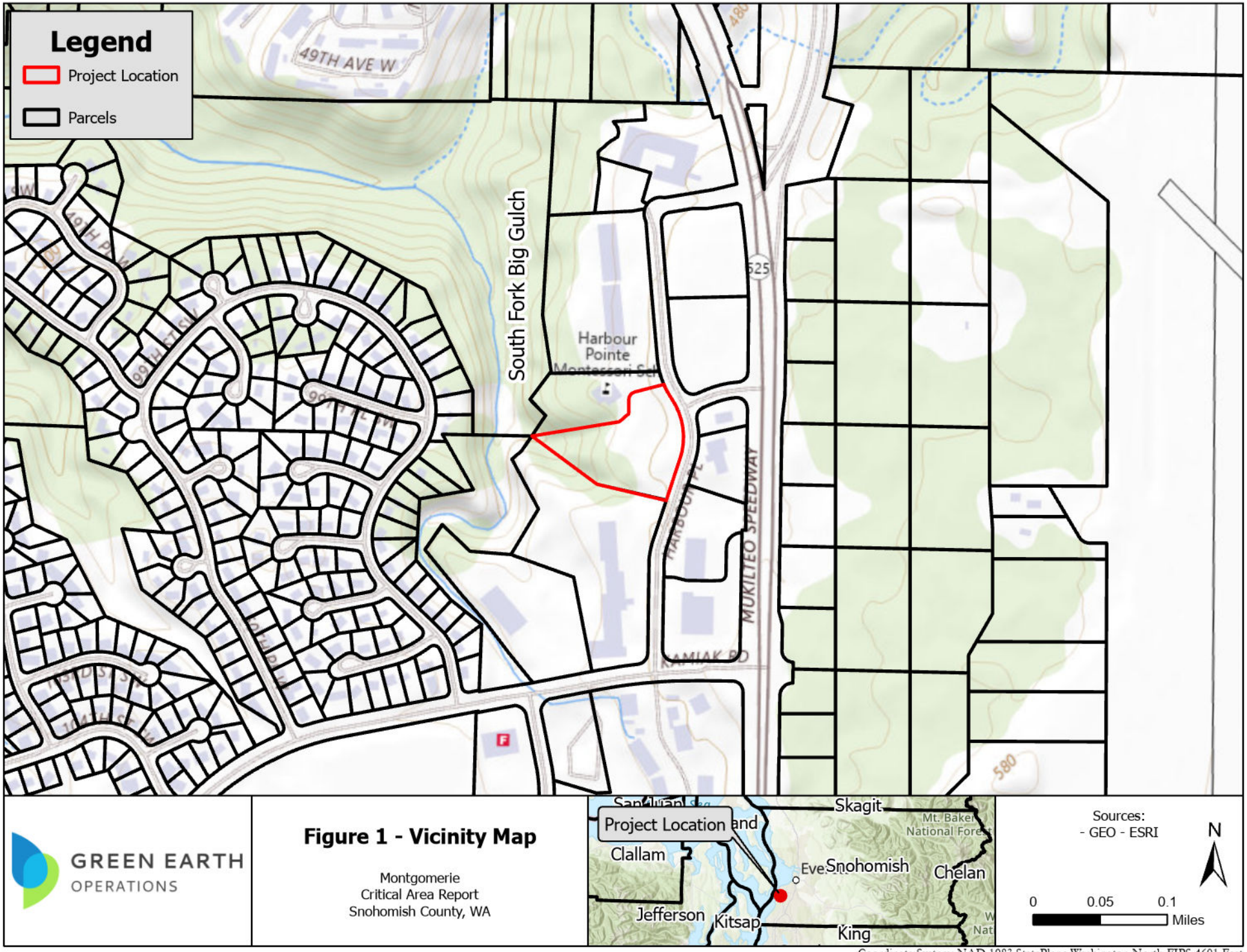
Appendix A – Report Figures

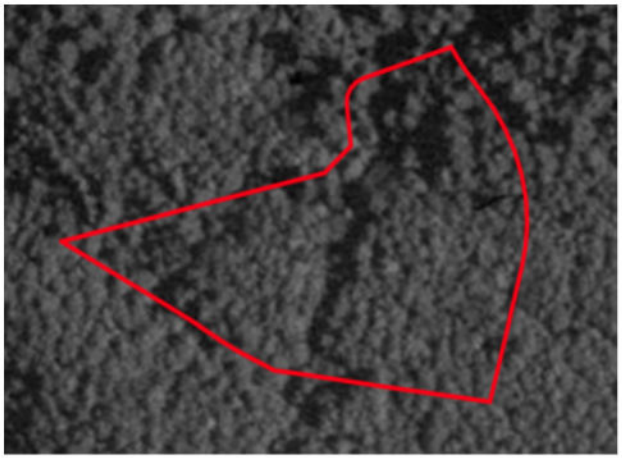


GREEN EARTH OPERATIONS

Figure 1 - Vicinity Map

Montgomerie
Critical Area Report
Snohomish County, WA

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet



07/1990

06/2002

07/2006

07/2007

05/2019

04/2025

GREEN EARTH OPERATIONS

Figure 2 - Historical Aerials

Montgomerie
Critical Area Report
Snohomish County, WA

Sources:
- GEO - Google Earth

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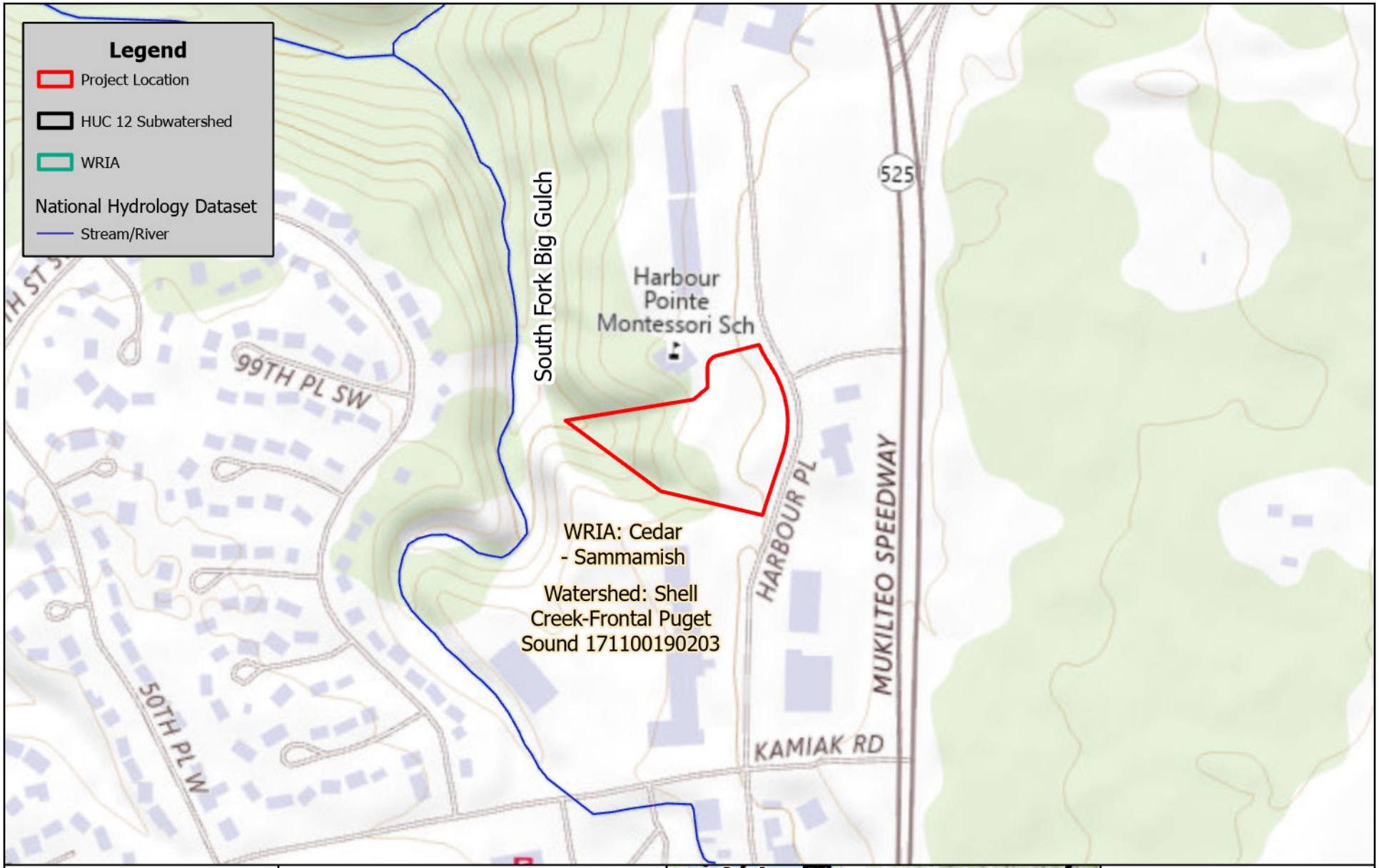
Miles

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet

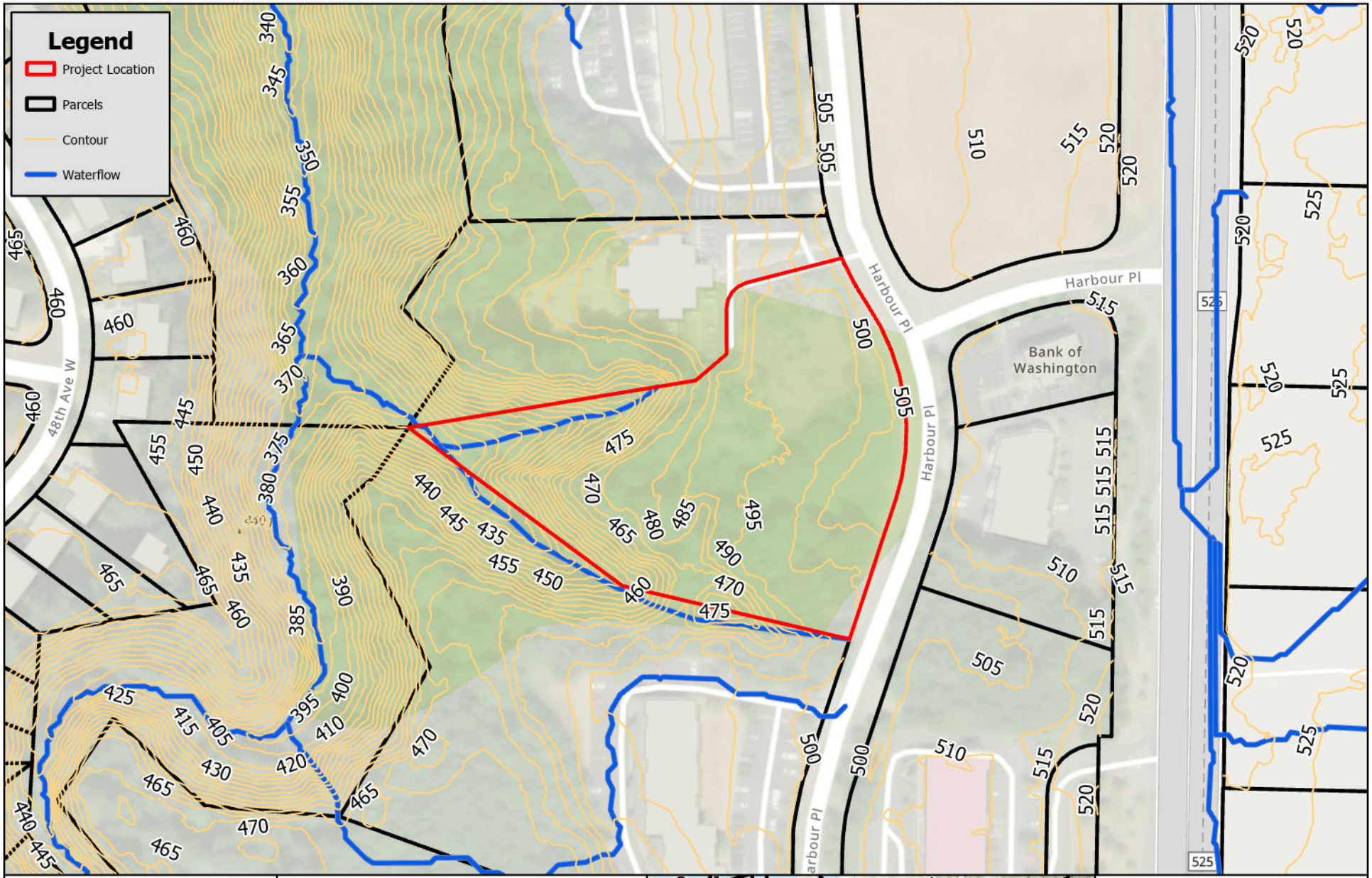


GREEN EARTH OPERATIONS

Figure 3 - Watershed Map

Montgomerie
Critical Area Report
Snohomish County, WA

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet



GREEN EARTH OPERATIONS

Figure 4 - Water Vector Map

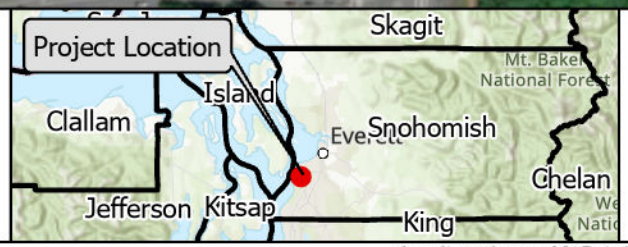
Montgomerie
Critical Area Report
Snohomish County, WA

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet

GREEN EARTH OPERATIONS

Figure 5a - NWI Wetland Inventory Map

Montgomerie
Critical Area Report
Snohomish County, WA



Sources:
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- NWI

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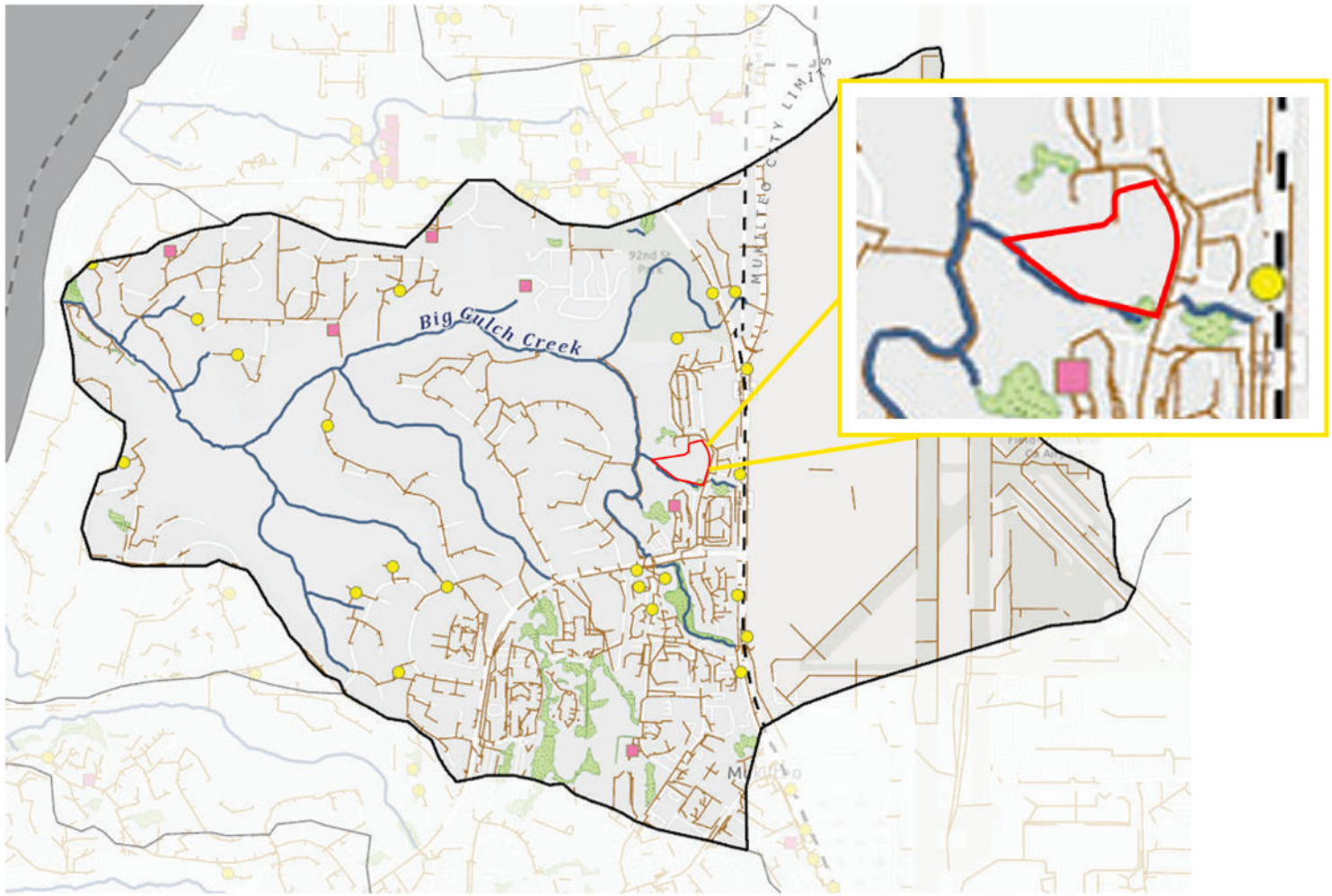

GREEN EARTH OPERATIONS

Figure 5b - City of Mukilteo Wetland Inventory Map

Montgomerie
Critical Area Report
Snohomish County, WA

Sources:
- GEO - ESRI
- Mukilteo 2025

N

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet

GREEN EARTH OPERATIONS

Figure 5c - Boundary and Easement Map

Montgomerie
Critical Area Report
Snohomish County, WA

Sources:
- GEO - ESRI
- MG 2025

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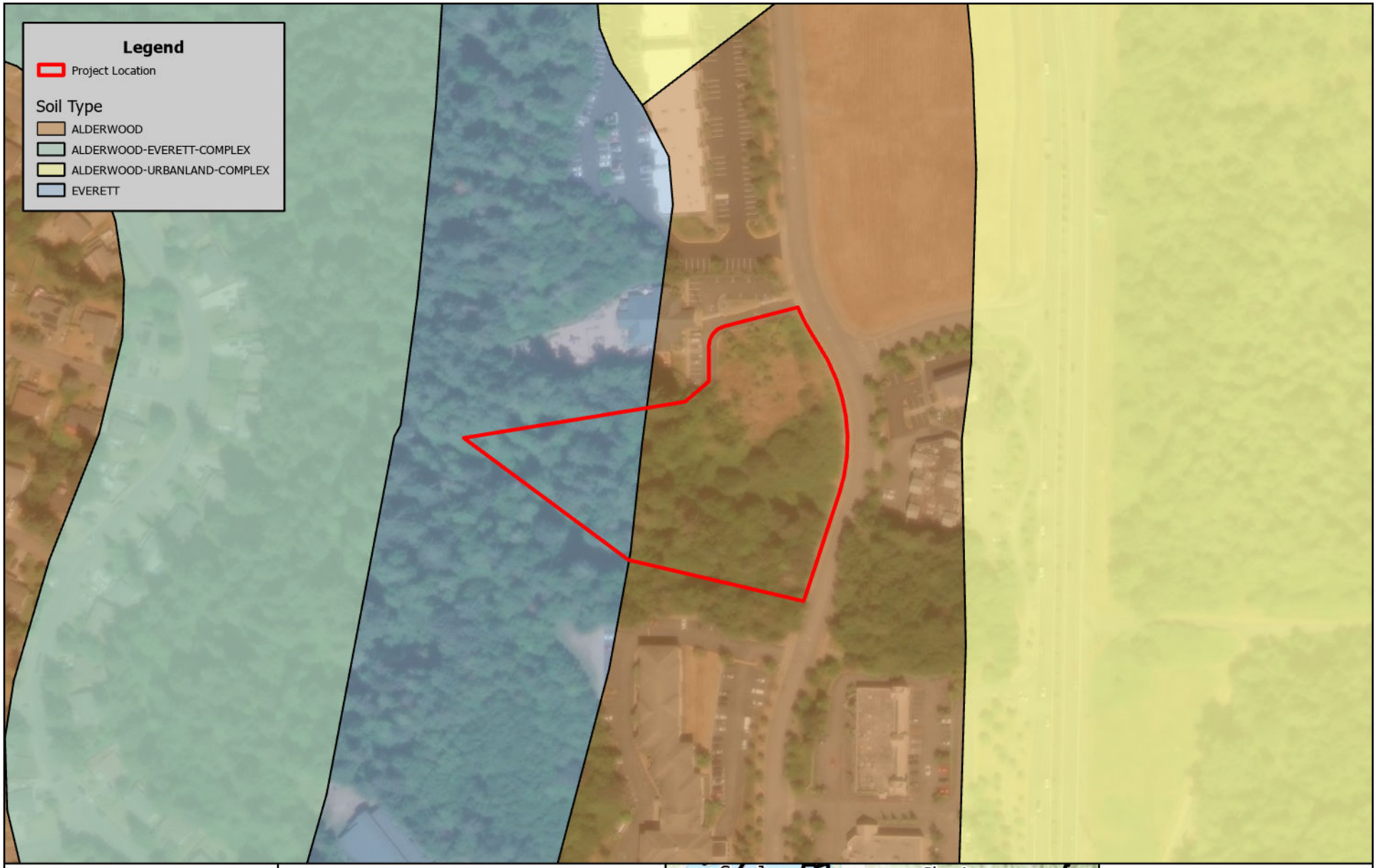
Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet



GREEN EARTH OPERATIONS

Figure 6 - Soil Survey Map

Montgomerie
Critical Area Report
Snohomish County, WA

Sources:
- GEO - ESRI
- NRCS

N

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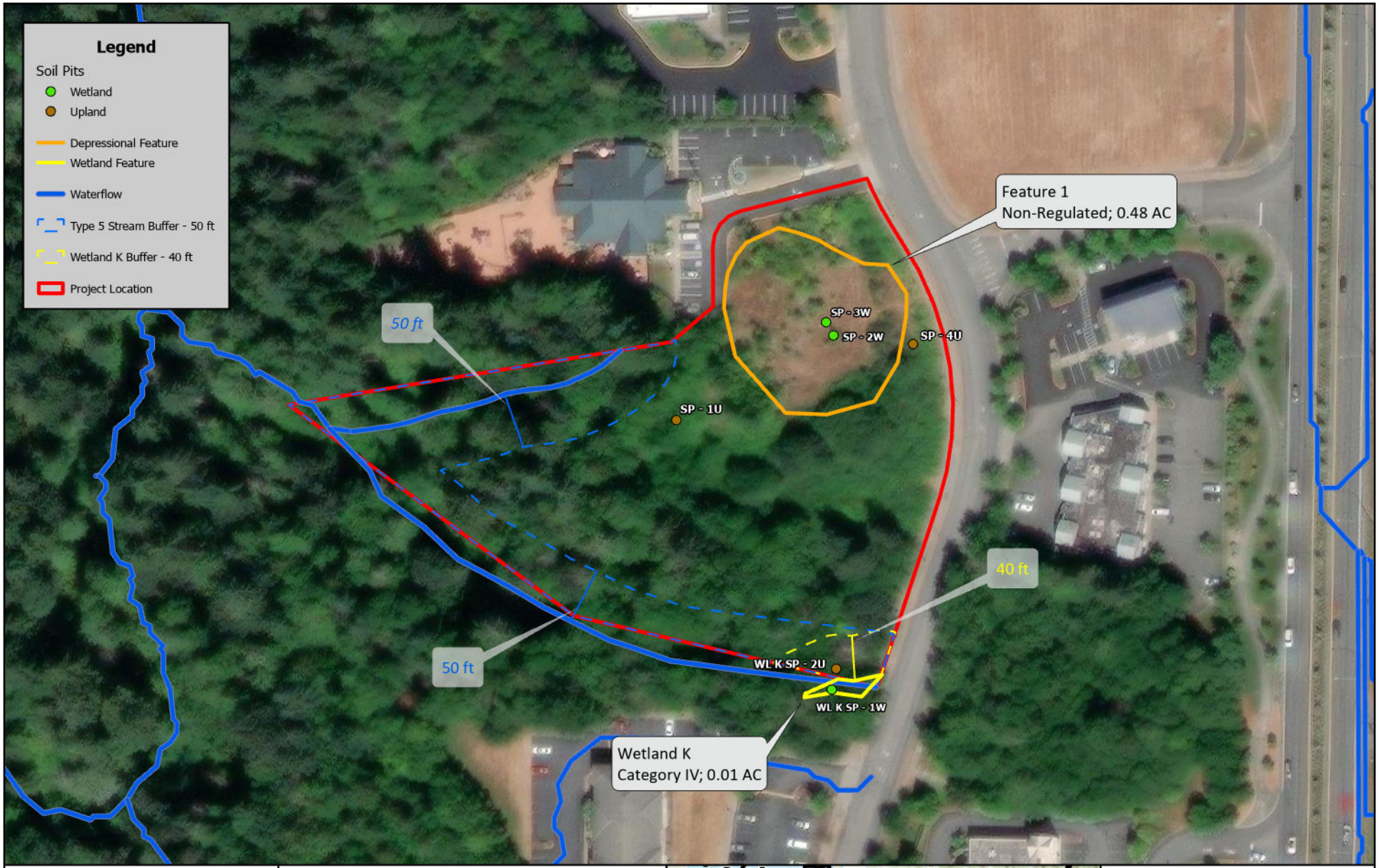
Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet



GREEN EARTH OPERATIONS

Figure 7 - Critical Areas Map

Montgomerie
Critical Area Report
Snohomish County, WA

Sources:
- GEO - ESRI
- DNR - MMC 17.52B.100
- MMC 17.52C.090

N

0 0.01 0.03 Miles

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Appendix B – Field Data Sheets

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Harbour Pointe City/County: Mukilteo Sampling Date: 12/11/2024
Applicant/Owner: Westcott Homes State: WA Sampling Point: SP-1U
Investigator(s): Sihong Zhu Section, Township, Range:
Landform (hillslope, terrace, etc.): Top of Ravine Local relief (concave, convex, none): convex Slope (%): 2%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

2/10

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Thuja plicata	40	✓	FAC
2. Alnus rubra	10	✓	FAC
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Rubus parviflorus	20	✓	FACU
2. Sala(Gaultheria Shallon)	20	✓	FACU
3.			
4.			
5.			
	40 = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polystichum munitum	30	✓	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	30 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
__ 1 - Rapid Test for Hydrophytic Vegetation
__ 2 - Dominance Test is >50%
__ 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ 5 - Wetland Non-Vascular Plants[1]
__ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks: Does not meet dominance test

SOIL

Sampling Point: SP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/2	100					Sdlm	- A HORIZON
4-16	10YR 4/6	100					Sdlm	w/gravels.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

crumbly with red cedar chunks

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology present

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Harbour Pointe City/County: Mukilteo Sampling Date: 12/11/2024
Applicant/Owner: Westcott Homes State: WA Sampling Point: SP-2W
Investigator(s): Sihong Zhu Section, Township, Range:
Landform (hillslope, terrace, etc.): depressional Local relief (concave, convex, none): concave Slope (%): 1%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ✓, Soil ✓, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks: AREA has been cleared and graded from past landuse activities

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	10	✓	FAC
2.			
3.			
4.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus effusus	20	✓	FACW
2. Tufted hairgrass (Deschampsia cespitosa)	30	✓	FAC
3.			
4. Phalaris arundinacea	20	✓	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
__ 1 - Rapid Test for Hydrophytic Vegetation
__ 2 - Dominance Test is >50%
__ 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ 5 - Wetland Non-Vascular Plants[1]
__ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Meets dominance test

SOIL

Sampling Point: SP-2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	5Y 6/1	90	10YR 5/4	10	C	M	Sd cly	No sand
6-14	10YR 6/1	80	10YR 5/2	20	D	M	Sd lm	w/ gravels

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Redox features present w/ depleted matrix

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3) (surface saturation)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 6

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Saturation present in the top 6 inches and dry below. Hydrology primarily from surface precipitation

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Harbour Point City/County: Mukilteo Sampling Date: 6/18/25

Applicant/Owner: Westcott State: WA Sampling Point: WLKSP1 WL

Investigator(s): AC / SZ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 1%

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: PEM/PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil ✓, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks: Narrow depressional flow through wetland. Wetland Starts @ 18" CMP culvert along Harbour Place

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Western Cedar Thuja plicata	20	✓	FAC
2. Alnus rubra	30	✓	FAC
3.			
4.			
	50 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15)			
1. Himalayan blackberry (Rubus armeniacus)	10	✓	FAC
2.			
3.			
4.			
5.			
	10 = Total Cover		

Herb Stratum (Plot size: 5)			
1.			
2. Oregon grape (Mahonia aquifolium)	5		FACU
3. Sword fern (Polystichum munitum)	5		FACU
4. Herb geranium (Geranium Robertianum)	10	✓	FACU
5. Tellima grandiflora (fringe cup)	25	✓	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: Dominance test met

SOIL

Sampling Point: Wetland SP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 2/1	100					loam	
9-16	10YR 4/6	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ____

Remarks:

Hydrophytic vegetation and wetland hydrology present. Dark soil w/ low chroma lacks redox features but field conditions support saturation as observed on 12/11/24

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Harbour Point City/County: Mukilteo Sampling Date: 6/18/25

Applicant/Owner: Westcott State: WA Sampling Point: WLK SD2U

Investigator(s): AC/SZ Section, Township, Range:

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Convex Slope (%): 1%

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks: Upland area north of the wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Western cedar (Thuja plicata)	10		FAC
2. Alnus rubra	40	✓	FAC
3.			
4.			
	50 = Total Cover		

25/10

Sapling/Shrub Stratum (Plot size: ____)			
1. Himalayan Blackberry (Rubus armeniacus)	30	✓	FAC
2.			
3.			
4.			
5.			
	30 = Total Cover		

Herb Stratum (Plot size: ____)			
1. Dicentra formosa	20	✓	FACU
2. Geranium Robertianum.	20	✓	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40 = Total Cover		

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 50%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: Wetland KSP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/3						loamy	tree debris / roots
5-10	10YR 4/4						Sandy loam	
10-16	10YR 6/6						Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No ✓

Remarks:

Small to large gravels throughout / high chroma

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology observed today and in previous field trips.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Harbour Point City/County: Mukilteo Sampling Date: 6/18/25

Applicant/Owner: Westcott State: WA Sampling Point: WLC SP-3W

Investigator(s): AC / SZ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Concave Slope (%): 0%

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: PEM / PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ✓, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes _____	No _____	
Wetland Hydrology Present?	Yes _____	No _____	

Remarks: Area has been cleared and excavated. Soil scars / tracks from equipment present. No A horizon present.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus spp.	25	✓	FAC
2. Salix scouleriana	10	✓	FAC
3.			
4.			
	35 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Leontodon saxatilis	<5		FACU
2. Yellow Glandweed (Bellardia viscosa)	5	weed	
3. White clover (Trifolium repens)	15	✓	FAC
4. Velvet grass (Holcus lanatus)	40	✓	FAC
5. oxeye Daisy	<5		FACU
6.			
7.			
8.			
9.			
10.			
11.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: wetland SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					Sandy	
5-10	10YR 4/2	90	10YR 4/6	10			Sandy	
Restricted layer with packed gravels at 10 inch								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ____

Remarks: - Soils are disturbed from previous grading / excavation 5 inch, - mottling start. / very compact soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✗ Surface Water (A1) (12/11/24)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Observed water ponding in small pockets throughout depression on 12/11/24

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Harbour Pointe City/County: Mukilteo Sampling Date: 6/18/25

Applicant/Owner: Westcott State: WA Sampling Point: WLC SP-4U

Investigator(s): ACIST Section, Township, Range: _____

Landform (hillslope, terrace, etc.): slope Local relief (concave, convex, none): Convex Slope (%): 5

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Scotch broom (Cytisus scoparius)	25	✓	UPL
2. Himalayan Blackberry	15	✓	FAC
3.			
4.			
5.			
	40 = Total Cover		
Herb Stratum (Plot size: _____)			
1. oxeye Daisy (Leucanthemum vulgare)	60	✓	FACU
2. Velvet grass (Holcus lanatus)	20		FAC
3. Rumex acetosella	25	✓	FACU
4. Centaurium erythraea	5		FAC
5. Yellow Glandweed	<5	weed	
6.			
7.			
8.			
9.			
10.			
11.			
	110 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

20/8

110/22

SOIL

Sampling Point: Wetland C SP-4.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2						Sandy loam	sprayed with water. W/O water 10YR 5/2
5-9.	10YR 4/2.		10YR 5/6	2%	C	M	Sandy loam	only around rocks, roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No ✓

Remarks:

- root penetration at 5 In

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C – Wetland Rating Forms

Wetland name or number wetland K.

RATING SUMMARY – Western Washington

Name of wetland (or ID #): wetland K. Date of site visit: _____

Rated by Mark Merkelbach Trained by Ecology? ✓ Yes ___ No Date of training 2019

HGM Class used for rating _____ 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 Google Earth 2025

OVERALL WETLAND CATEGORY IV (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	5	5	4	14

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 K

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	K1
Hydroperiods	D 1.4, H 1.2	K1
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D 4.1	K1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	K1
Map of the contributing basin	D 4.3, D 5.3	K1
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	K2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	R1
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	R2

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 K

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 K

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 K

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	5
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	0
Total for D 1 Add the points in the boxes above	7

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	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not 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	0
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	0
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	0
Total for D 3 Add the points in the boxes above	0

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

Wetland name or number K

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: — **2**

- 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

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. — **3**

- 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

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. — **0**

- 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

Total for D 4 — Add the points in the boxes above — **5**

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	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	3

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. — **0**

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

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 — **0**

Rating of Value If score is: ___2-4 = H ___1 = M ✓ 0 = L — *Record the rating on the first page*

Wetland name or number K

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
X Emergent	3 structures: points = 2
X 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
X 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	
X 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**

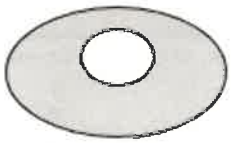
If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

1

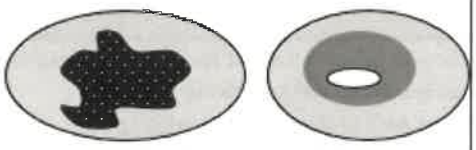
H 1.4. Interspersion of habitats

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

1

Wetland name or number K

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) X 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	5

Rating of Site Potential If score is: __**15-18 = H** ___**7-14 = M** X**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 14 + [(% moderate and low intensity land uses)/2] 0 = 14 % 14 0 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	1
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 26 + [(% moderate and low intensity land uses)/2] 3 = 29 % 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	0

Rating of Landscape Potential If score is: __**4-6 = H** ___**1-3 = M** X**< 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	1

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

An aquatic habitat is mapped approximately 740 feet south of wetland K. based on PHS online tool. But a ravine begins about 70 feet west of the wetland

Wetland name or number K

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).

X **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.

X **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. A Type 5 stream past through wetland K.

— **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 K

— **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

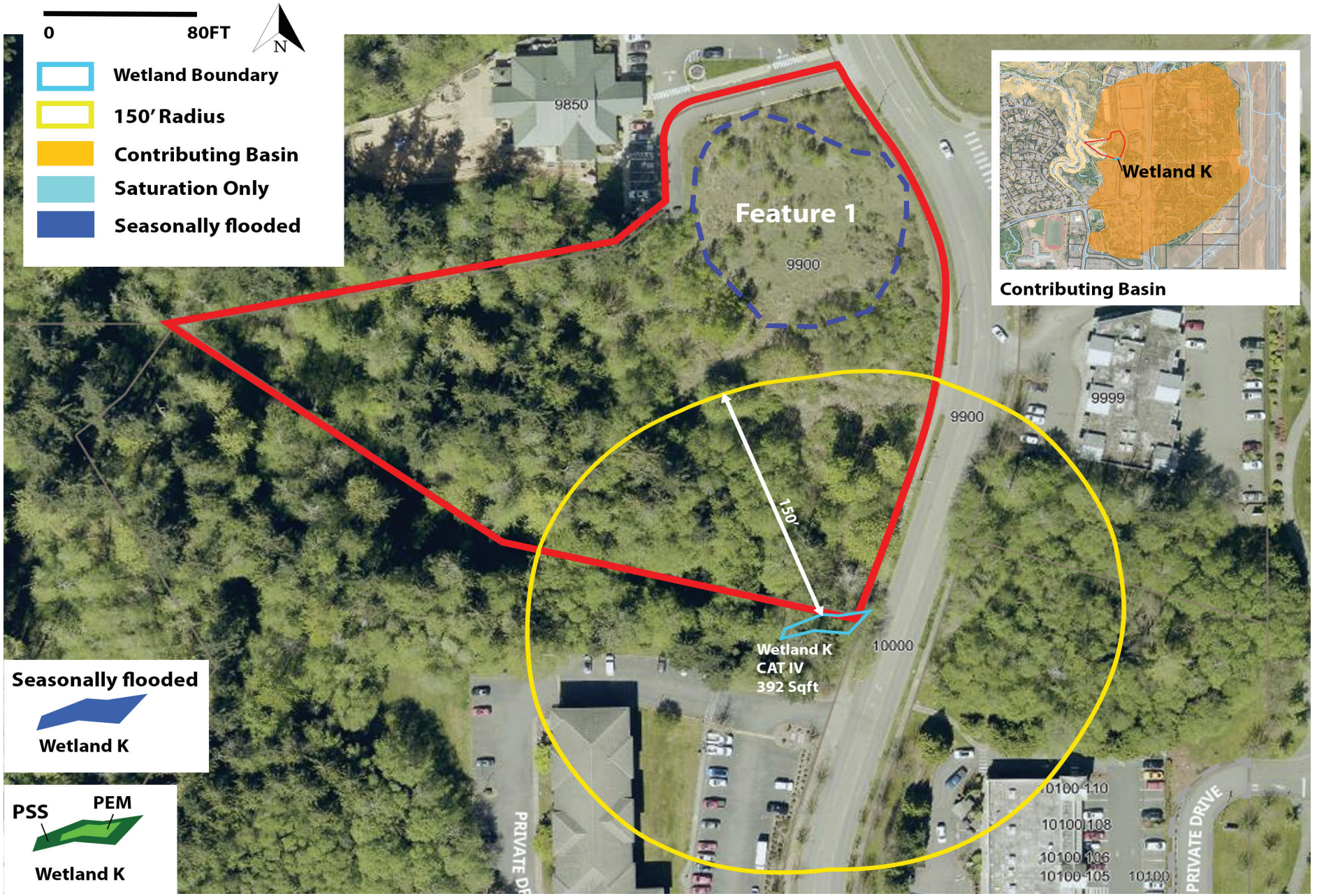
— **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **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

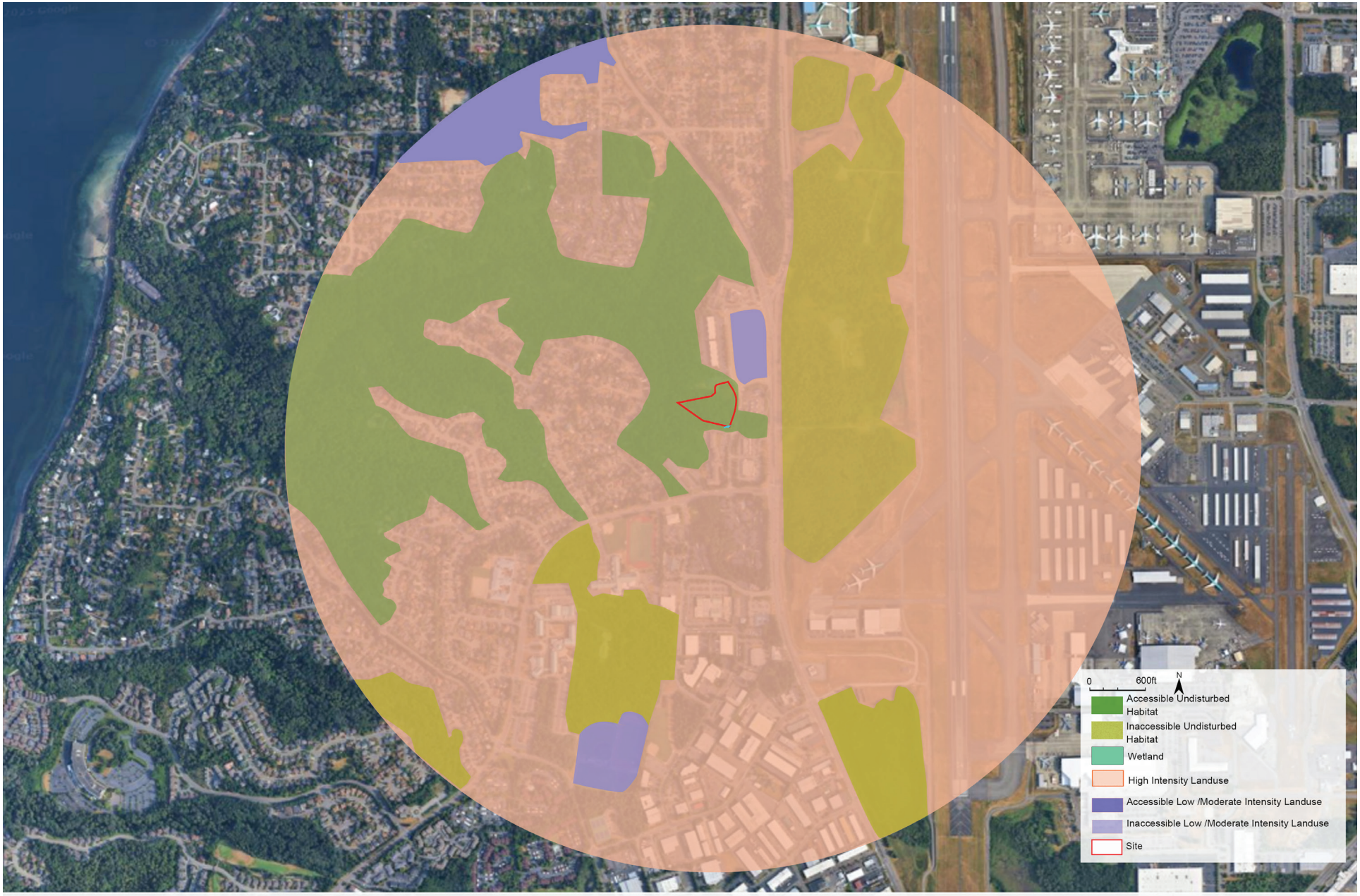


GREEN EARTH
OPERATIONS

RATING FIGURE K1: WETLAND K

150' RADIUS / PLANT CLASS / HYDROPERIOD

Montgomerie, Mukilteo,Snohomish County



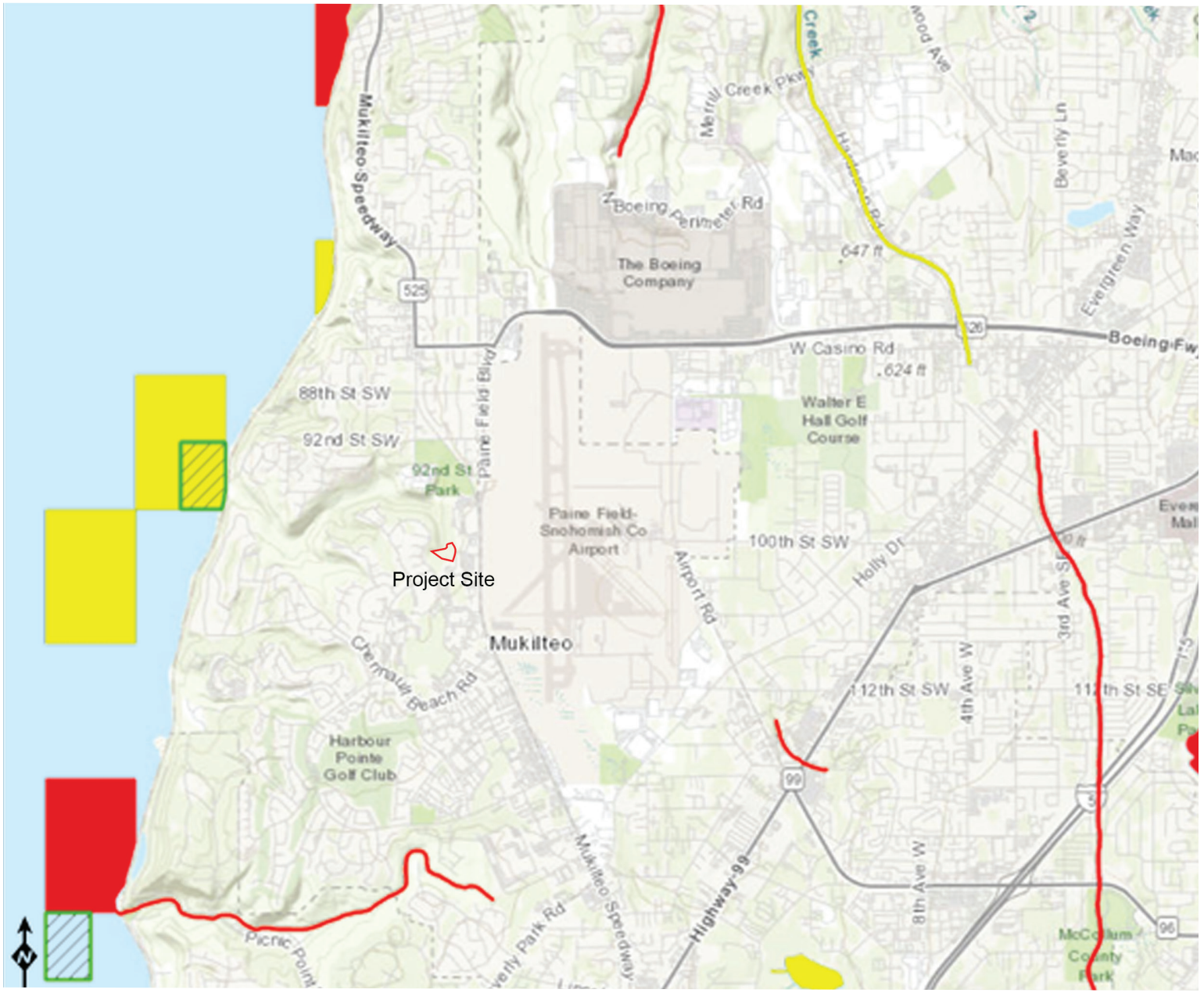
Source: Google Earth Image 2025

GREEN EARTH OPERATIONS

68 % High Intensity Landuse
6% Inaccessible Low / Moderate Intensity Landuse
0 % Accessible Low / Moderate Intensity Landuse
14 % Inaccessible Undisturbed Habitat
12% Accessible Undisturbed Habitat
0 % Wetland
1km Area (Orange cicrle) =34,179,811Sq ft

RATING FIGURE K2: WETLAND K

Montgomerie, Mukilteo,Snohomish County



Assessed Water/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

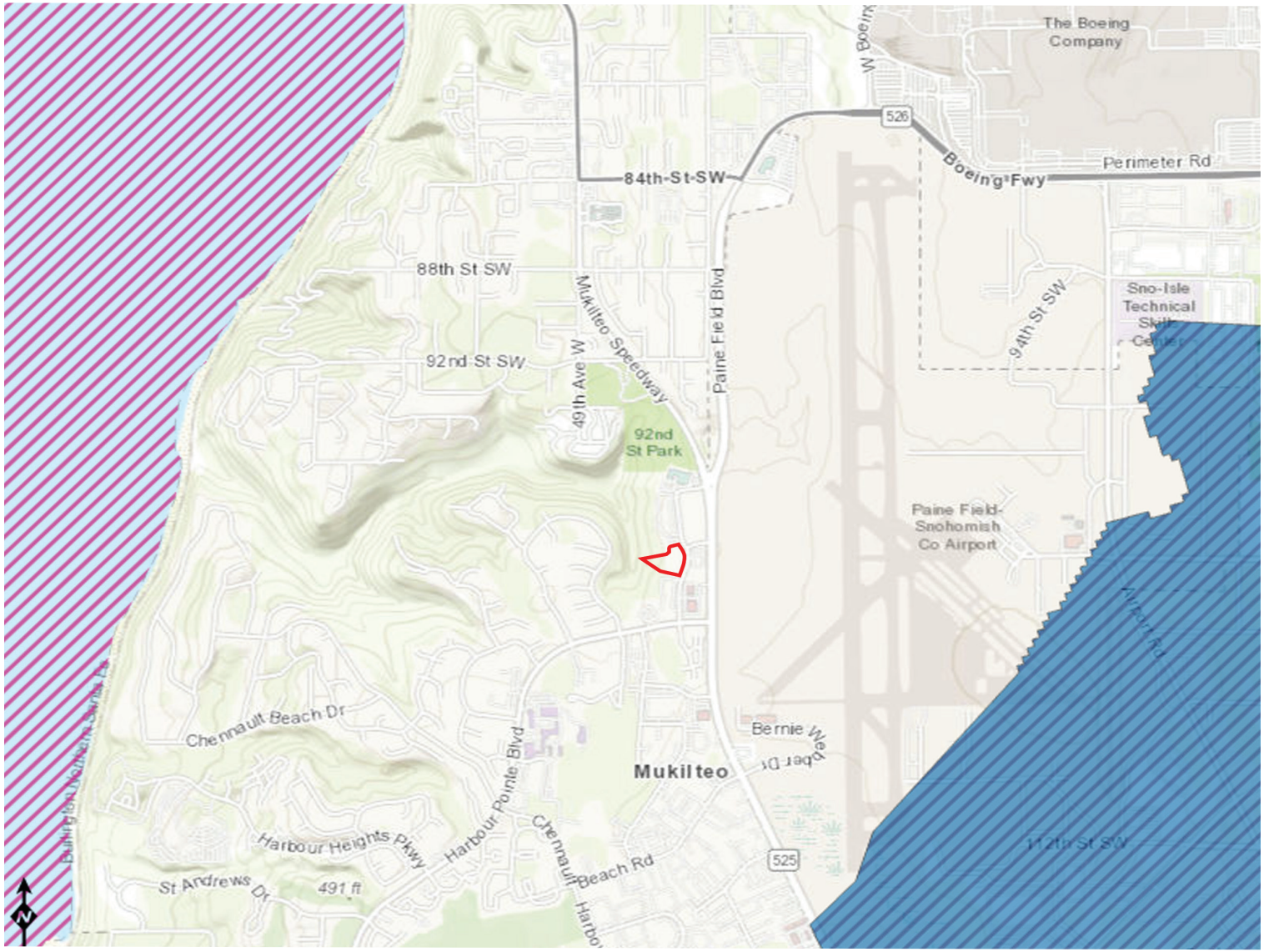
Project Site

Source: WA Department of Ecology Water Altas Map 2025

Miles
0 0.5 1 2

GREEN EARTH OPERATIONS

RATING FIGURE 1
WATER/SEDIMENT ASSESSMENT
Montgomerie, Mukilteo,Snohomish County



WQ Improvement Projects

- TMDL - Approved
- 4B - Approved
- STI - Approved
- ARP - Approved
- TMDL - In Development
- STI - In Development
- ARP - In Development

Project Site

Source: WA Department of Ecology Water Altas Map 2025

Miles
0 0.23 0.45 0.9

GREEN EARTH
OPERATIONS

RATING FIGURE 2
WATER QUALITY IMPROVEMENT PROJECTS
Montgomerie, Mukilteo,Snohomish County

Appendix B: WWHM Reports and Stormwater Design Data

WWHM2012

PROJECT REPORT

Montgomerie
AKS Project No. 12420

Detention Vault Sizing

General Model Information

Project Name:	Montgomerie_Vault Sizing
Site Name:	
Site Address:	
City:	
Report Date:	10/27/2025
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2021/08/18
Version:	4.2.18

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

Total Site

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Mod	1.59
C, Forest, Steep	1.67
Pervious Total	3.26

Impervious Land Use	acre
Impervious Total	0
Basin Total	3.26

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

NORTEAST

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.789
Pervious Total	0.789

Impervious Land Use	acre
ROADS FLAT	0.485
ROOF TOPS FLAT	0.565
SIDEWALKS FLAT	0.066
Impervious Total	1.116
Basin Total	1.905

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

OFFSITE UPSTREAM

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.017
Impervious Total	0.017
Basin Total	0.017

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

SOUTHWEST

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Forest, Steep	1.338
Pervious Total	1.338

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.338

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 28 ft.
Length: 100 ft.
Depth: 13 ft.
Discharge Structure
Riser Height: 12.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.5 in. Elevation:0 ft.
Orifice 2 Diameter: 1 in. Elevation:9 ft.
Orifice 3 Diameter: 0.75 in. Elevation:12 ft.
Element Flows To:
Outlet 1 Outlet 2

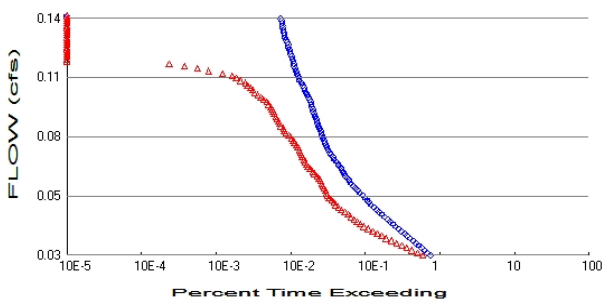
Vault Hydraulic Table

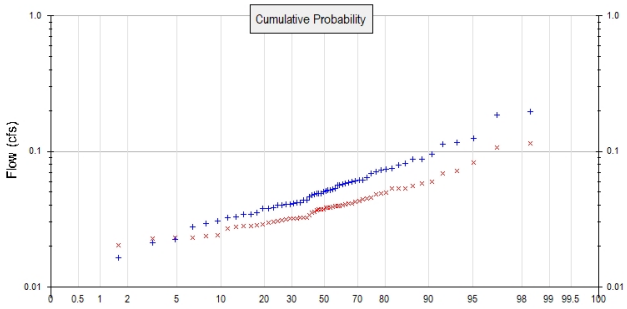
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.064	0.000	0.000	0.000
0.1444	0.064	0.009	0.002	0.000
0.2889	0.064	0.018	0.003	0.000
0.4333	0.064	0.027	0.004	0.000
0.5778	0.064	0.037	0.005	0.000
0.7222	0.064	0.046	0.005	0.000
0.8667	0.064	0.055	0.006	0.000
1.0111	0.064	0.065	0.006	0.000
1.1556	0.064	0.074	0.007	0.000
1.3000	0.064	0.083	0.007	0.000
1.4444	0.064	0.092	0.008	0.000
1.5889	0.064	0.102	0.008	0.000
1.7333	0.064	0.111	0.008	0.000
1.8778	0.064	0.120	0.009	0.000
2.0222	0.064	0.130	0.009	0.000
2.1667	0.064	0.139	0.010	0.000
2.3111	0.064	0.148	0.010	0.000
2.4556	0.064	0.157	0.010	0.000
2.6000	0.064	0.167	0.010	0.000
2.7444	0.064	0.176	0.011	0.000
2.8889	0.064	0.185	0.011	0.000
3.0333	0.064	0.195	0.011	0.000
3.1778	0.064	0.204	0.012	0.000
3.3222	0.064	0.213	0.012	0.000
3.4667	0.064	0.222	0.012	0.000
3.6111	0.064	0.232	0.012	0.000
3.7556	0.064	0.241	0.013	0.000
3.9000	0.064	0.250	0.013	0.000
4.0444	0.064	0.260	0.013	0.000
4.1889	0.064	0.269	0.013	0.000
4.3333	0.064	0.278	0.014	0.000
4.4778	0.064	0.287	0.014	0.000
4.6222	0.064	0.297	0.014	0.000
4.7667	0.064	0.306	0.014	0.000
4.9111	0.064	0.315	0.015	0.000
5.0556	0.064	0.325	0.015	0.000
5.2000	0.064	0.334	0.015	0.000
5.3444	0.064	0.343	0.015	0.000

5.4889	0.064	0.352	0.015	0.000
5.6333	0.064	0.362	0.016	0.000
5.7778	0.064	0.371	0.016	0.000
5.9222	0.064	0.380	0.016	0.000
6.0667	0.064	0.390	0.016	0.000
6.2111	0.064	0.399	0.016	0.000
6.3556	0.064	0.408	0.017	0.000
6.5000	0.064	0.417	0.017	0.000
6.6444	0.064	0.427	0.017	0.000
6.7889	0.064	0.436	0.017	0.000
6.9333	0.064	0.445	0.017	0.000
7.0778	0.064	0.455	0.018	0.000
7.2222	0.064	0.464	0.018	0.000
7.3667	0.064	0.473	0.018	0.000
7.5111	0.064	0.482	0.018	0.000
7.6556	0.064	0.492	0.018	0.000
7.8000	0.064	0.501	0.018	0.000
7.9444	0.064	0.510	0.019	0.000
8.0889	0.064	0.519	0.019	0.000
8.2333	0.064	0.529	0.019	0.000
8.3778	0.064	0.538	0.019	0.000
8.5222	0.064	0.547	0.019	0.000
8.6667	0.064	0.557	0.020	0.000
8.8111	0.064	0.566	0.020	0.000
8.9556	0.064	0.575	0.020	0.000
9.1000	0.064	0.584	0.029	0.000
9.2444	0.064	0.594	0.034	0.000
9.3889	0.064	0.603	0.037	0.000
9.5333	0.064	0.612	0.040	0.000
9.6778	0.064	0.622	0.043	0.000
9.8222	0.064	0.631	0.045	0.000
9.9667	0.064	0.640	0.048	0.000
10.111	0.064	0.649	0.050	0.000
10.256	0.064	0.659	0.052	0.000
10.400	0.064	0.668	0.054	0.000
10.544	0.064	0.677	0.055	0.000
10.689	0.064	0.687	0.057	0.000
10.833	0.064	0.696	0.059	0.000
10.978	0.064	0.705	0.060	0.000
11.122	0.064	0.714	0.062	0.000
11.267	0.064	0.724	0.063	0.000
11.411	0.064	0.733	0.065	0.000
11.556	0.064	0.742	0.066	0.000
11.700	0.064	0.752	0.067	0.000
11.844	0.064	0.761	0.069	0.000
11.989	0.064	0.770	0.070	0.000
12.133	0.064	0.779	0.077	0.000
12.278	0.064	0.789	0.080	0.000
12.422	0.064	0.798	0.084	0.000
12.567	0.064	0.807	0.269	0.000
12.711	0.064	0.817	1.066	0.000
12.856	0.064	0.826	1.878	0.000
13.000	0.064	0.835	2.297	0.000
13.144	0.064	0.844	2.624	0.000
13.289	0.000	0.000	2.895	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.26
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.127
Total Impervious Area: 1.133

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.052312
5 year	0.079882
10 year	0.097752
25 year	0.119525
50 year	0.135078
100 year	0.150042

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.03795
5 year	0.052953
10 year	0.06279
25 year	0.07509
50 year	0.08416
100 year	0.093155

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.016	0.023
1950	0.068	0.045
1951	0.046	0.032
1952	0.040	0.032
1953	0.034	0.028
1954	0.095	0.058
1955	0.088	0.060
1956	0.071	0.048
1957	0.081	0.053
1958	0.061	0.042

1959	0.059	0.041
1960	0.053	0.037
1961	0.056	0.040
1962	0.038	0.031
1963	0.052	0.037
1964	0.052	0.037
1965	0.048	0.036
1966	0.028	0.024
1967	0.075	0.049
1968	0.079	0.053
1969	0.038	0.028
1970	0.038	0.032
1971	0.061	0.046
1972	0.059	0.041
1973	0.034	0.030
1974	0.062	0.043
1975	0.041	0.031
1976	0.042	0.029
1977	0.022	0.023
1978	0.041	0.032
1979	0.073	0.044
1980	0.049	0.035
1981	0.042	0.030
1982	0.058	0.039
1983	0.057	0.040
1984	0.049	0.038
1985	0.074	0.053
1986	0.186	0.107
1987	0.064	0.049
1988	0.044	0.034
1989	0.035	0.028
1990	0.052	0.039
1991	0.056	0.039
1992	0.040	0.033
1993	0.029	0.024
1994	0.021	0.020
1995	0.050	0.039
1996	0.116	0.068
1997	0.197	0.115
1998	0.031	0.028
1999	0.051	0.038
2000	0.032	0.023
2001	0.006	0.008
2002	0.049	0.040
2003	0.033	0.027
2004	0.047	0.037
2005	0.044	0.032
2006	0.113	0.071
2007	0.087	0.056
2008	0.126	0.083
2009	0.041	0.032

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1974	0.1150
2	0.1863	0.1072
3	0.1255	0.0825

4	0.1165	0.0715
5	0.1130	0.0683
6	0.0951	0.0599
7	0.0879	0.0582
8	0.0870	0.0558
9	0.0811	0.0533
10	0.0791	0.0531
11	0.0750	0.0530
12	0.0739	0.0493
13	0.0729	0.0487
14	0.0710	0.0484
15	0.0684	0.0456
16	0.0638	0.0446
17	0.0615	0.0441
18	0.0610	0.0433
19	0.0609	0.0425
20	0.0592	0.0412
21	0.0588	0.0411
22	0.0578	0.0405
23	0.0569	0.0402
24	0.0562	0.0396
25	0.0561	0.0395
26	0.0533	0.0393
27	0.0523	0.0389
28	0.0519	0.0386
29	0.0515	0.0382
30	0.0508	0.0381
31	0.0504	0.0373
32	0.0492	0.0371
33	0.0491	0.0371
34	0.0486	0.0371
35	0.0483	0.0360
36	0.0472	0.0351
37	0.0462	0.0338
38	0.0438	0.0326
39	0.0437	0.0324
40	0.0420	0.0324
41	0.0415	0.0320
42	0.0412	0.0319
43	0.0406	0.0318
44	0.0405	0.0317
45	0.0402	0.0308
46	0.0402	0.0305
47	0.0383	0.0303
48	0.0381	0.0300
49	0.0381	0.0291
50	0.0354	0.0284
51	0.0343	0.0282
52	0.0341	0.0281
53	0.0326	0.0277
54	0.0324	0.0268
55	0.0305	0.0239
56	0.0291	0.0236
57	0.0276	0.0231
58	0.0224	0.0229
59	0.0213	0.0226
60	0.0165	0.0203
61	0.0065	0.0085

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0262	15997	12574	78	Pass
0.0273	14534	10688	73	Pass
0.0284	13272	9058	68	Pass
0.0295	12121	7689	63	Pass
0.0306	11079	6592	59	Pass
0.0317	10168	5604	55	Pass
0.0328	9287	4761	51	Pass
0.0339	8506	4081	47	Pass
0.0350	7760	3561	45	Pass
0.0361	7127	3101	43	Pass
0.0372	6521	2704	41	Pass
0.0383	5963	2357	39	Pass
0.0394	5458	2054	37	Pass
0.0405	5016	1817	36	Pass
0.0416	4616	1652	35	Pass
0.0427	4250	1514	35	Pass
0.0438	3891	1371	35	Pass
0.0449	3563	1255	35	Pass
0.0460	3292	1132	34	Pass
0.0471	3048	1014	33	Pass
0.0482	2802	929	33	Pass
0.0493	2579	856	33	Pass
0.0504	2413	811	33	Pass
0.0515	2254	758	33	Pass
0.0526	2125	698	32	Pass
0.0537	1979	661	33	Pass
0.0548	1827	640	35	Pass
0.0559	1696	621	36	Pass
0.0570	1567	598	38	Pass
0.0581	1465	576	39	Pass
0.0592	1380	556	40	Pass
0.0603	1302	538	41	Pass
0.0614	1225	513	41	Pass
0.0625	1154	485	42	Pass
0.0636	1104	446	40	Pass
0.0647	1067	420	39	Pass
0.0658	1021	391	38	Pass
0.0669	979	362	36	Pass
0.0680	925	346	37	Pass
0.0691	884	335	37	Pass
0.0702	826	319	38	Pass
0.0713	785	306	38	Pass
0.0724	745	297	39	Pass
0.0735	710	290	40	Pass
0.0746	680	278	40	Pass
0.0757	654	267	40	Pass
0.0768	634	255	40	Pass
0.0779	611	241	39	Pass
0.0790	597	231	38	Pass
0.0801	579	219	37	Pass
0.0812	560	202	36	Pass
0.0823	547	184	33	Pass
0.0834	536	176	32	Pass

0.0845	522	171	32	Pass
0.0856	510	158	30	Pass
0.0867	491	151	30	Pass
0.0878	479	146	30	Pass
0.0889	468	140	29	Pass
0.0900	453	135	29	Pass
0.0911	443	128	28	Pass
0.0922	429	124	28	Pass
0.0933	424	120	28	Pass
0.0944	414	115	27	Pass
0.0955	401	108	26	Pass
0.0966	394	102	25	Pass
0.0977	383	92	24	Pass
0.0988	372	85	22	Pass
0.0999	359	78	21	Pass
0.1010	342	70	20	Pass
0.1021	328	66	20	Pass
0.1032	320	62	19	Pass
0.1043	310	56	18	Pass
0.1054	297	53	17	Pass
0.1065	283	45	15	Pass
0.1076	274	40	14	Pass
0.1087	265	35	13	Pass
0.1098	257	26	10	Pass
0.1109	251	17	6	Pass
0.1120	246	12	4	Pass
0.1131	238	8	3	Pass
0.1142	234	5	2	Pass
0.1153	231	0	0	Pass
0.1164	225	0	0	Pass
0.1175	220	0	0	Pass
0.1186	214	0	0	Pass
0.1197	209	0	0	Pass
0.1208	206	0	0	Pass
0.1219	200	0	0	Pass
0.1230	197	0	0	Pass
0.1241	190	0	0	Pass
0.1252	184	0	0	Pass
0.1263	180	0	0	Pass
0.1274	176	0	0	Pass
0.1285	173	0	0	Pass
0.1296	170	0	0	Pass
0.1307	167	0	0	Pass
0.1318	166	0	0	Pass
0.1329	164	0	0	Pass
0.1340	160	0	0	Pass
0.1351	156	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

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
Vault 1 POC	☐	154.79			☐	0.00			
Total Volume Infiltrated		154.79	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 = Failed

Model Default Modifications

Total of 0 changes have been made.

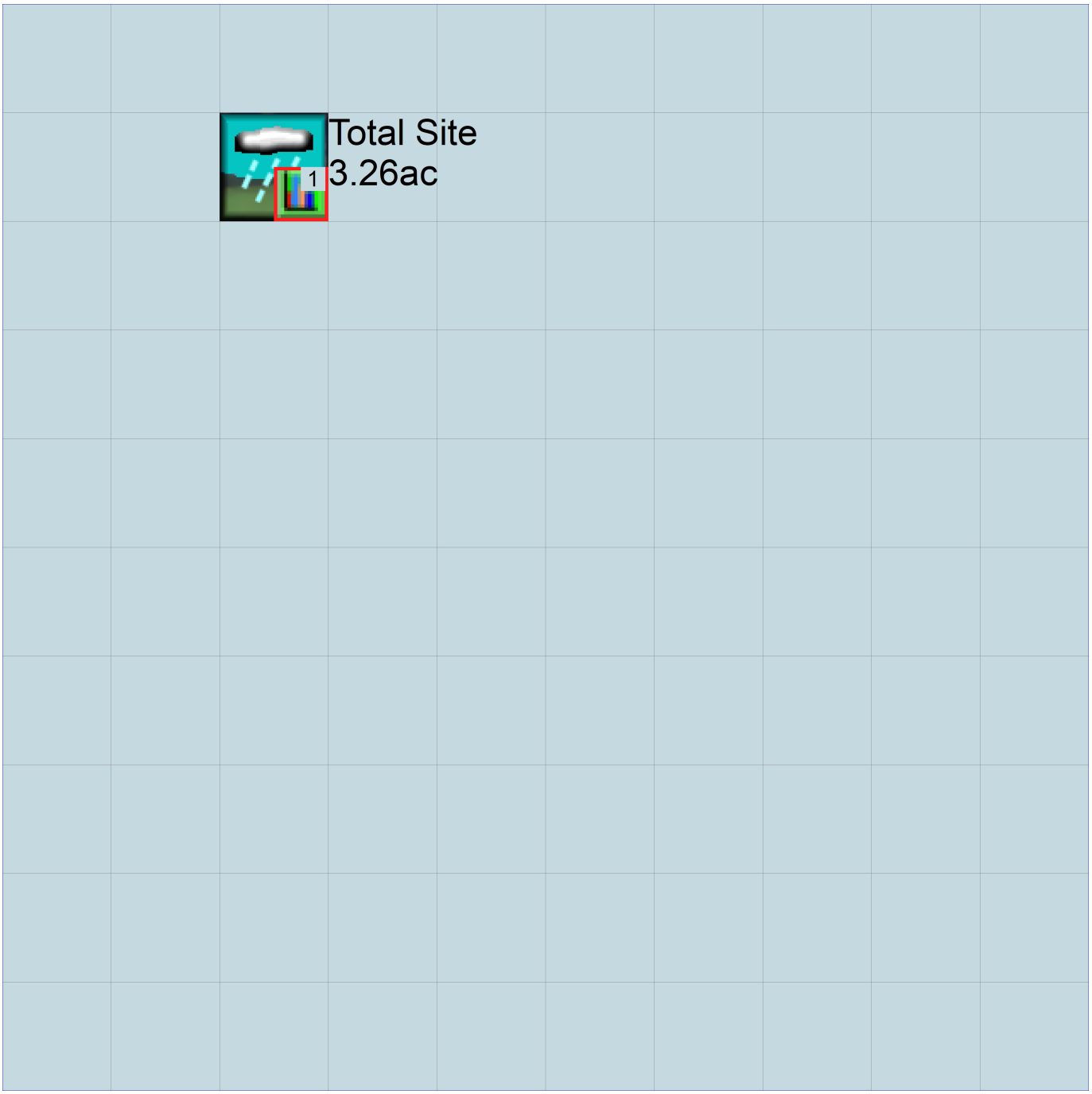
PERLND Changes

No PERLND changes have been made.

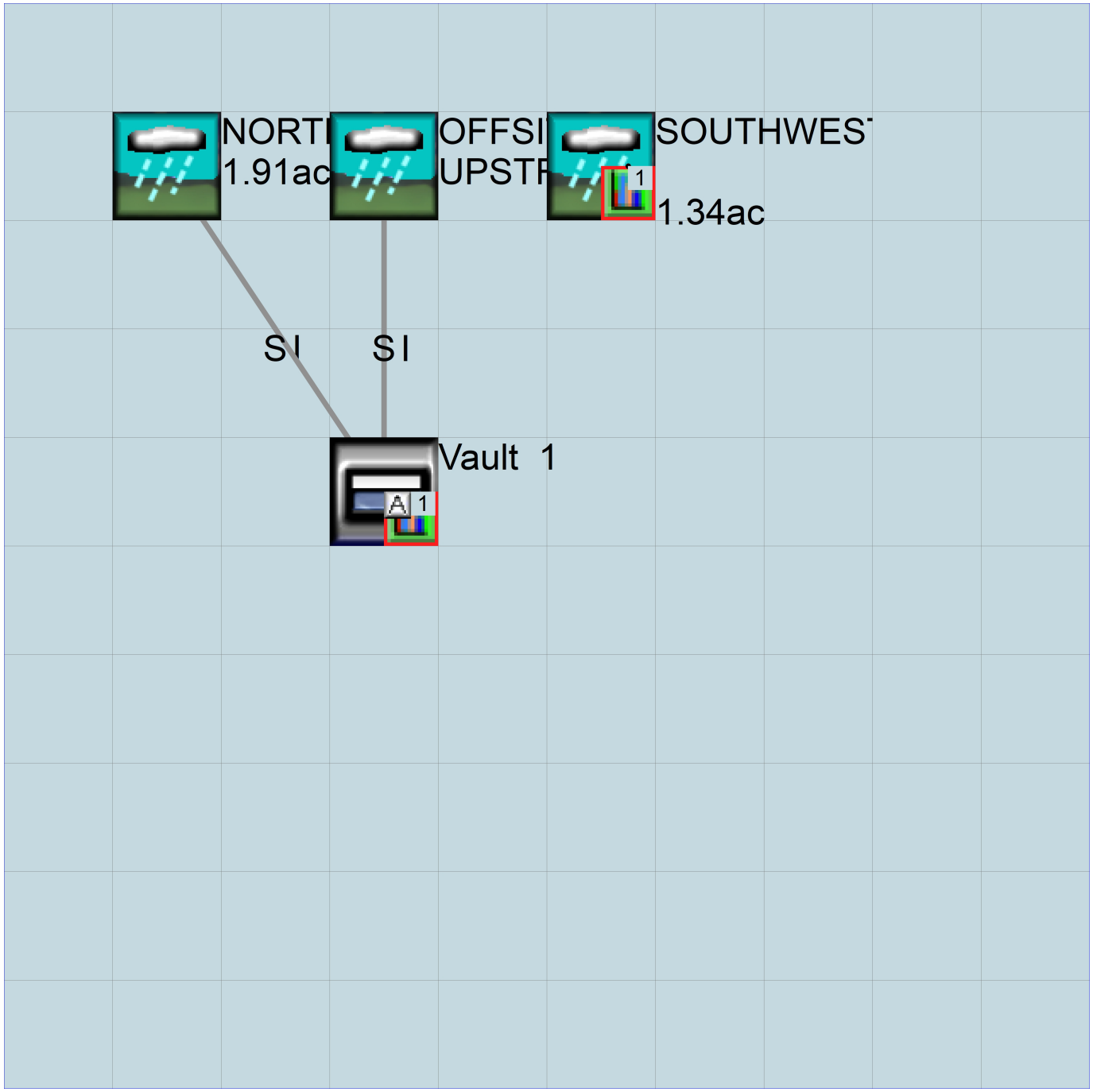
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

Montgomerie
AKS Project No. 12420

Water Quality Facility Sizing

General Model Information

Project Name:	Montgomerie_WQ Sizing
Site Name:	
Site Address:	
City:	
Report Date:	10/27/2025
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2021/08/18
Version:	4.2.18

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

Total Site

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Mod	1.59
C, Forest, Steep	1.67
Pervious Total	3.26

Impervious Land Use	acre
Impervious Total	0
Basin Total	3.26

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

NORTEAST

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.789
Pervious Total	0.789

Impervious Land Use	acre
ROADS FLAT	0.485
ROOF TOPS FLAT	0.565
SIDEWALKS FLAT	0.066
Impervious Total	1.116
Basin Total	1.905

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

OFFSITE UPSTREAM

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.017
Impervious Total	0.017
Basin Total	0.017

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 28 ft.
Length: 100 ft.
Depth: 13 ft.
Discharge Structure
Riser Height: 12.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.5 in. Elevation:0 ft.
Orifice 2 Diameter: 1 in. Elevation:9 ft.
Orifice 3 Diameter: 0.75 in. Elevation:12 ft.
Element Flows To:
Outlet 1 Outlet 2

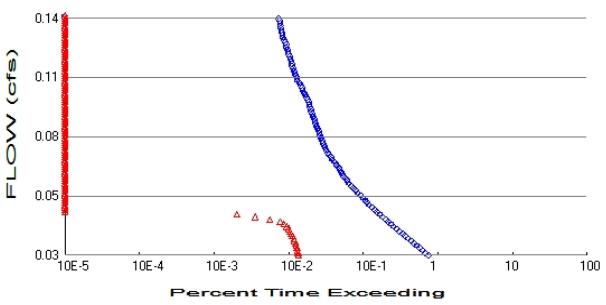
Vault Hydraulic Table

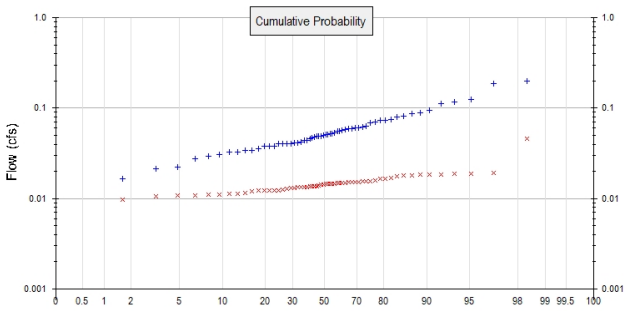
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.064	0.000	0.000	0.000
0.1444	0.064	0.009	0.002	0.000
0.2889	0.064	0.018	0.003	0.000
0.4333	0.064	0.027	0.004	0.000
0.5778	0.064	0.037	0.005	0.000
0.7222	0.064	0.046	0.005	0.000
0.8667	0.064	0.055	0.006	0.000
1.0111	0.064	0.065	0.006	0.000
1.1556	0.064	0.074	0.007	0.000
1.3000	0.064	0.083	0.007	0.000
1.4444	0.064	0.092	0.008	0.000
1.5889	0.064	0.102	0.008	0.000
1.7333	0.064	0.111	0.008	0.000
1.8778	0.064	0.120	0.009	0.000
2.0222	0.064	0.130	0.009	0.000
2.1667	0.064	0.139	0.010	0.000
2.3111	0.064	0.148	0.010	0.000
2.4556	0.064	0.157	0.010	0.000
2.6000	0.064	0.167	0.010	0.000
2.7444	0.064	0.176	0.011	0.000
2.8889	0.064	0.185	0.011	0.000
3.0333	0.064	0.195	0.011	0.000
3.1778	0.064	0.204	0.012	0.000
3.3222	0.064	0.213	0.012	0.000
3.4667	0.064	0.222	0.012	0.000
3.6111	0.064	0.232	0.012	0.000
3.7556	0.064	0.241	0.013	0.000
3.9000	0.064	0.250	0.013	0.000
4.0444	0.064	0.260	0.013	0.000
4.1889	0.064	0.269	0.013	0.000
4.3333	0.064	0.278	0.014	0.000
4.4778	0.064	0.287	0.014	0.000
4.6222	0.064	0.297	0.014	0.000
4.7667	0.064	0.306	0.014	0.000
4.9111	0.064	0.315	0.015	0.000
5.0556	0.064	0.325	0.015	0.000
5.2000	0.064	0.334	0.015	0.000
5.3444	0.064	0.343	0.015	0.000

5.4889	0.064	0.352	0.015	0.000
5.6333	0.064	0.362	0.016	0.000
5.7778	0.064	0.371	0.016	0.000
5.9222	0.064	0.380	0.016	0.000
6.0667	0.064	0.390	0.016	0.000
6.2111	0.064	0.399	0.016	0.000
6.3556	0.064	0.408	0.017	0.000
6.5000	0.064	0.417	0.017	0.000
6.6444	0.064	0.427	0.017	0.000
6.7889	0.064	0.436	0.017	0.000
6.9333	0.064	0.445	0.017	0.000
7.0778	0.064	0.455	0.018	0.000
7.2222	0.064	0.464	0.018	0.000
7.3667	0.064	0.473	0.018	0.000
7.5111	0.064	0.482	0.018	0.000
7.6556	0.064	0.492	0.018	0.000
7.8000	0.064	0.501	0.018	0.000
7.9444	0.064	0.510	0.019	0.000
8.0889	0.064	0.519	0.019	0.000
8.2333	0.064	0.529	0.019	0.000
8.3778	0.064	0.538	0.019	0.000
8.5222	0.064	0.547	0.019	0.000
8.6667	0.064	0.557	0.020	0.000
8.8111	0.064	0.566	0.020	0.000
8.9556	0.064	0.575	0.020	0.000
9.1000	0.064	0.584	0.029	0.000
9.2444	0.064	0.594	0.034	0.000
9.3889	0.064	0.603	0.037	0.000
9.5333	0.064	0.612	0.040	0.000
9.6778	0.064	0.622	0.043	0.000
9.8222	0.064	0.631	0.045	0.000
9.9667	0.064	0.640	0.048	0.000
10.111	0.064	0.649	0.050	0.000
10.256	0.064	0.659	0.052	0.000
10.400	0.064	0.668	0.054	0.000
10.544	0.064	0.677	0.055	0.000
10.689	0.064	0.687	0.057	0.000
10.833	0.064	0.696	0.059	0.000
10.978	0.064	0.705	0.060	0.000
11.122	0.064	0.714	0.062	0.000
11.267	0.064	0.724	0.063	0.000
11.411	0.064	0.733	0.065	0.000
11.556	0.064	0.742	0.066	0.000
11.700	0.064	0.752	0.067	0.000
11.844	0.064	0.761	0.069	0.000
11.989	0.064	0.770	0.070	0.000
12.133	0.064	0.779	0.077	0.000
12.278	0.064	0.789	0.080	0.000
12.422	0.064	0.798	0.084	0.000
12.567	0.064	0.807	0.269	0.000
12.711	0.064	0.817	1.066	0.000
12.856	0.064	0.826	1.878	0.000
13.000	0.064	0.835	2.297	0.000
13.144	0.064	0.844	2.624	0.000
13.289	0.000	0.000	2.895	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.26
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.789
Total Impervious Area: 1.133

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.052312
5 year	0.079882
10 year	0.097752
25 year	0.119525
50 year	0.135078
100 year	0.150042

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.013824
5 year	0.017133
10 year	0.019531
25 year	0.022795
50 year	0.025401
100 year	0.028159

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.016	0.012
1950	0.068	0.015
1951	0.046	0.012
1952	0.040	0.012
1953	0.034	0.011
1954	0.095	0.013
1955	0.088	0.019
1956	0.071	0.019
1957	0.081	0.015
1958	0.061	0.014

1959	0.059	0.014
1960	0.053	0.014
1961	0.056	0.016
1962	0.038	0.011
1963	0.052	0.013
1964	0.052	0.011
1965	0.048	0.014
1966	0.028	0.012
1967	0.075	0.013
1968	0.079	0.015
1969	0.038	0.014
1970	0.038	0.013
1971	0.061	0.019
1972	0.059	0.012
1973	0.034	0.015
1974	0.062	0.015
1975	0.041	0.011
1976	0.042	0.014
1977	0.022	0.011
1978	0.041	0.012
1979	0.073	0.011
1980	0.049	0.012
1981	0.042	0.011
1982	0.058	0.015
1983	0.057	0.014
1984	0.049	0.018
1985	0.074	0.018
1986	0.186	0.019
1987	0.064	0.018
1988	0.044	0.015
1989	0.035	0.011
1990	0.052	0.015
1991	0.056	0.015
1992	0.040	0.015
1993	0.029	0.010
1994	0.021	0.015
1995	0.050	0.016
1996	0.116	0.016
1997	0.197	0.046
1998	0.031	0.013
1999	0.051	0.015
2000	0.032	0.016
2001	0.006	0.008
2002	0.049	0.017
2003	0.033	0.013
2004	0.047	0.015
2005	0.044	0.013
2006	0.113	0.018
2007	0.087	0.017
2008	0.126	0.018
2009	0.041	0.014

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1974	0.0459
2	0.1863	0.0191
3	0.1255	0.0189

4	0.1165	0.0188
5	0.1130	0.0185
6	0.0951	0.0185
7	0.0879	0.0183
8	0.0870	0.0179
9	0.0811	0.0178
10	0.0791	0.0176
11	0.0750	0.0170
12	0.0739	0.0167
13	0.0729	0.0164
14	0.0710	0.0158
15	0.0684	0.0157
16	0.0638	0.0155
17	0.0615	0.0154
18	0.0610	0.0152
19	0.0609	0.0151
20	0.0592	0.0151
21	0.0588	0.0150
22	0.0578	0.0150
23	0.0569	0.0149
24	0.0562	0.0149
25	0.0561	0.0148
26	0.0533	0.0147
27	0.0523	0.0146
28	0.0519	0.0146
29	0.0515	0.0145
30	0.0508	0.0144
31	0.0504	0.0143
32	0.0492	0.0141
33	0.0491	0.0139
34	0.0486	0.0138
35	0.0483	0.0137
36	0.0472	0.0137
37	0.0462	0.0135
38	0.0438	0.0135
39	0.0437	0.0135
40	0.0420	0.0133
41	0.0415	0.0132
42	0.0412	0.0132
43	0.0406	0.0130
44	0.0405	0.0129
45	0.0402	0.0124
46	0.0402	0.0124
47	0.0383	0.0123
48	0.0381	0.0122
49	0.0381	0.0122
50	0.0354	0.0122
51	0.0343	0.0120
52	0.0341	0.0114
53	0.0326	0.0113
54	0.0324	0.0112
55	0.0305	0.0111
56	0.0291	0.0110
57	0.0276	0.0107
58	0.0224	0.0107
59	0.0213	0.0105
60	0.0165	0.0098
61	0.0065	0.0080

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0262	15997	288	1	Pass
0.0273	14534	284	1	Pass
0.0284	13272	280	2	Pass
0.0295	12121	275	2	Pass
0.0306	11079	270	2	Pass
0.0317	10168	264	2	Pass
0.0328	9287	257	2	Pass
0.0339	8506	251	2	Pass
0.0350	7760	241	3	Pass
0.0361	7127	230	3	Pass
0.0372	6521	222	3	Pass
0.0383	5963	215	3	Pass
0.0394	5458	203	3	Pass
0.0405	5016	184	3	Pass
0.0416	4616	164	3	Pass
0.0427	4250	119	2	Pass
0.0438	3891	76	1	Pass
0.0449	3563	43	1	Pass
0.0460	3292	0	0	Pass
0.0471	3048	0	0	Pass
0.0482	2802	0	0	Pass
0.0493	2579	0	0	Pass
0.0504	2413	0	0	Pass
0.0515	2254	0	0	Pass
0.0526	2125	0	0	Pass
0.0537	1979	0	0	Pass
0.0548	1827	0	0	Pass
0.0559	1696	0	0	Pass
0.0570	1567	0	0	Pass
0.0581	1465	0	0	Pass
0.0592	1380	0	0	Pass
0.0603	1302	0	0	Pass
0.0614	1225	0	0	Pass
0.0625	1154	0	0	Pass
0.0636	1104	0	0	Pass
0.0647	1067	0	0	Pass
0.0658	1021	0	0	Pass
0.0669	979	0	0	Pass
0.0680	925	0	0	Pass
0.0691	884	0	0	Pass
0.0702	826	0	0	Pass
0.0713	785	0	0	Pass
0.0724	745	0	0	Pass
0.0735	710	0	0	Pass
0.0746	680	0	0	Pass
0.0757	654	0	0	Pass
0.0768	634	0	0	Pass
0.0779	611	0	0	Pass
0.0790	597	0	0	Pass
0.0801	579	0	0	Pass
0.0812	560	0	0	Pass
0.0823	547	0	0	Pass
0.0834	536	0	0	Pass

0.0845	522	0	0	Pass
0.0856	510	0	0	Pass
0.0867	491	0	0	Pass
0.0878	479	0	0	Pass
0.0889	468	0	0	Pass
0.0900	453	0	0	Pass
0.0911	443	0	0	Pass
0.0922	429	0	0	Pass
0.0933	424	0	0	Pass
0.0944	414	0	0	Pass
0.0955	401	0	0	Pass
0.0966	394	0	0	Pass
0.0977	383	0	0	Pass
0.0988	372	0	0	Pass
0.0999	359	0	0	Pass
0.1010	342	0	0	Pass
0.1021	328	0	0	Pass
0.1032	320	0	0	Pass
0.1043	310	0	0	Pass
0.1054	297	0	0	Pass
0.1065	283	0	0	Pass
0.1076	274	0	0	Pass
0.1087	265	0	0	Pass
0.1098	257	0	0	Pass
0.1109	251	0	0	Pass
0.1120	246	0	0	Pass
0.1131	238	0	0	Pass
0.1142	234	0	0	Pass
0.1153	231	0	0	Pass
0.1164	225	0	0	Pass
0.1175	220	0	0	Pass
0.1186	214	0	0	Pass
0.1197	209	0	0	Pass
0.1208	206	0	0	Pass
0.1219	200	0	0	Pass
0.1230	197	0	0	Pass
0.1241	190	0	0	Pass
0.1252	184	0	0	Pass
0.1263	180	0	0	Pass
0.1274	176	0	0	Pass
0.1285	173	0	0	Pass
0.1296	170	0	0	Pass
0.1307	167	0	0	Pass
0.1318	166	0	0	Pass
0.1329	164	0	0	Pass
0.1340	160	0	0	Pass
0.1351	156	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

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
Vault 1 POC	☐	154.79			☐	0.00			
Total Volume Infiltrated		154.79	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 = Failed

Model Default Modifications

Total of 0 changes have been made.

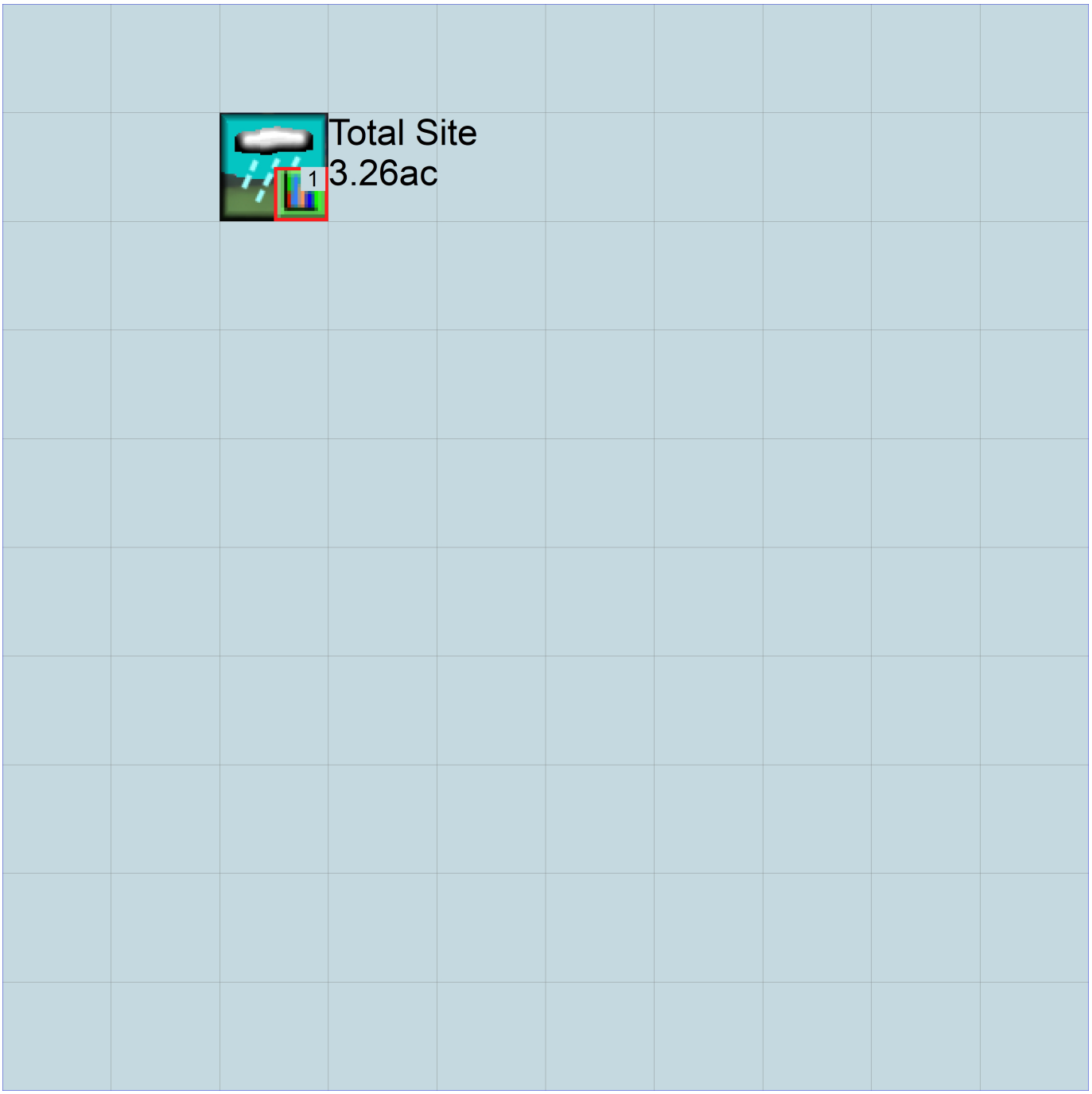
PERLND Changes

No PERLND changes have been made.

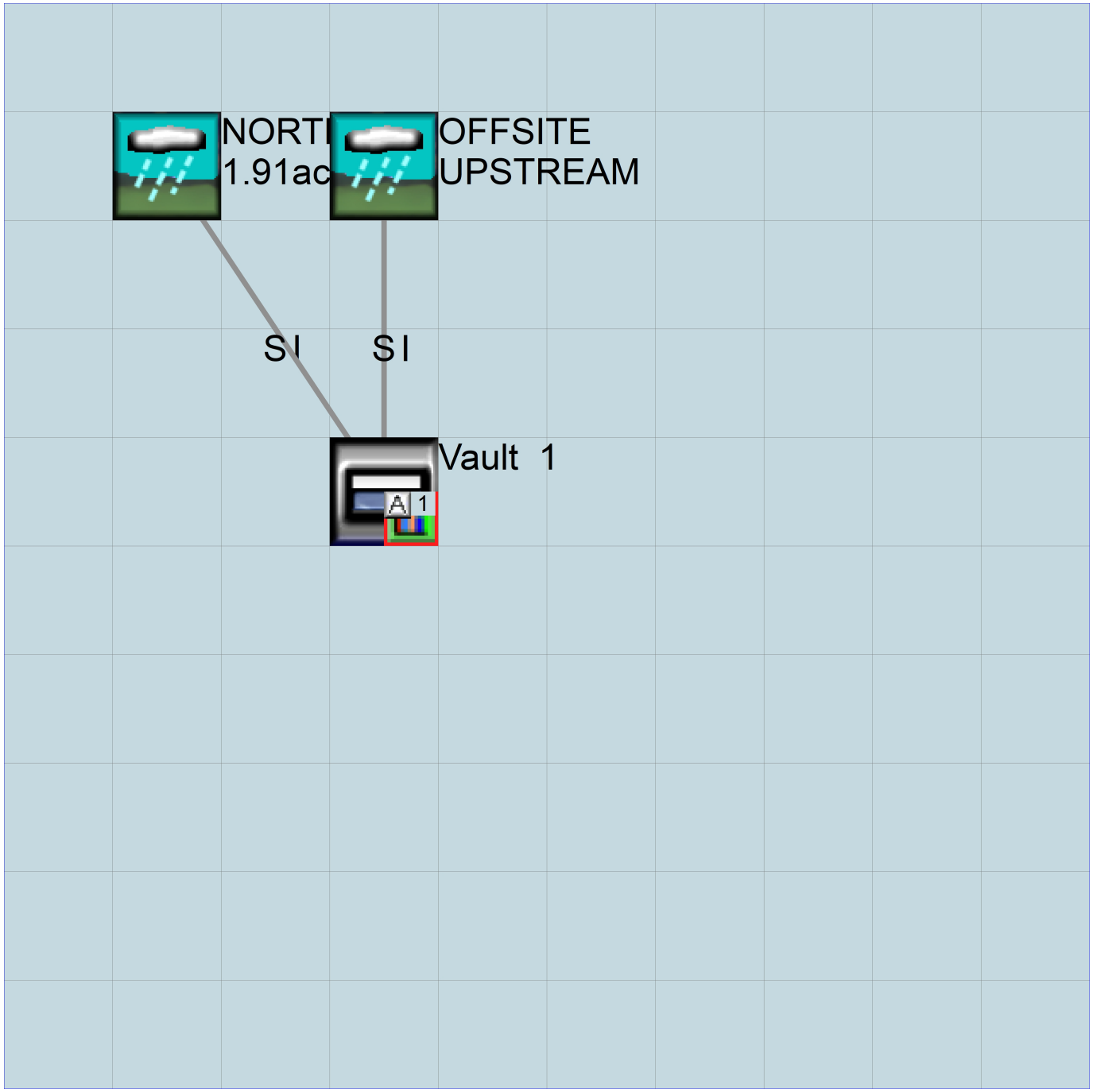
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



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Local (360)943-0304

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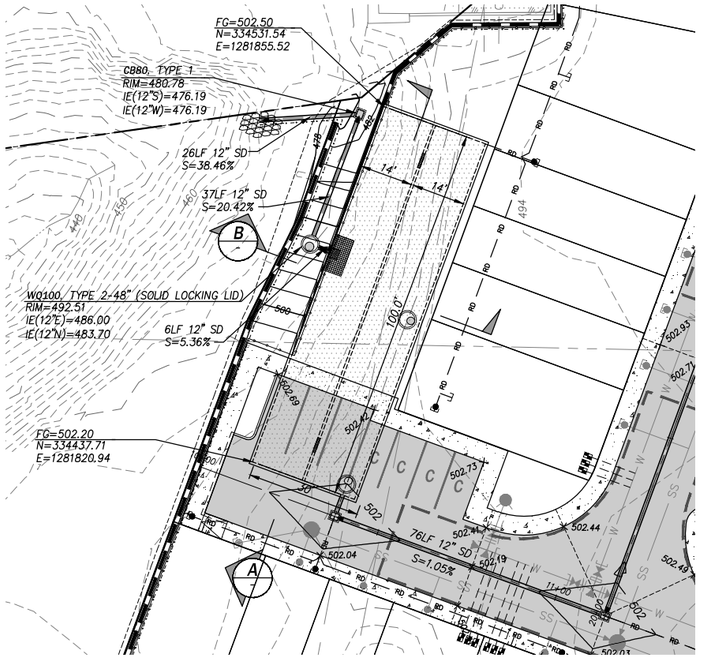
Appendix C: Source Control Plan (BMPs)

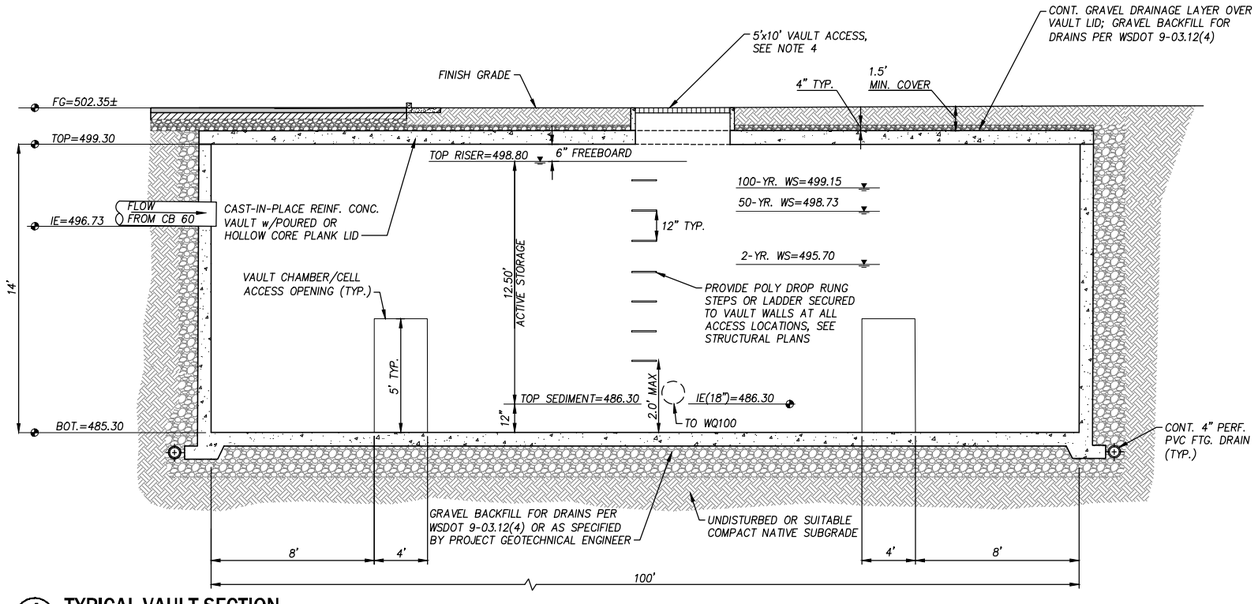
Appendix D: Conveyance Calculations

Appendix E: Stormwater Facility Details



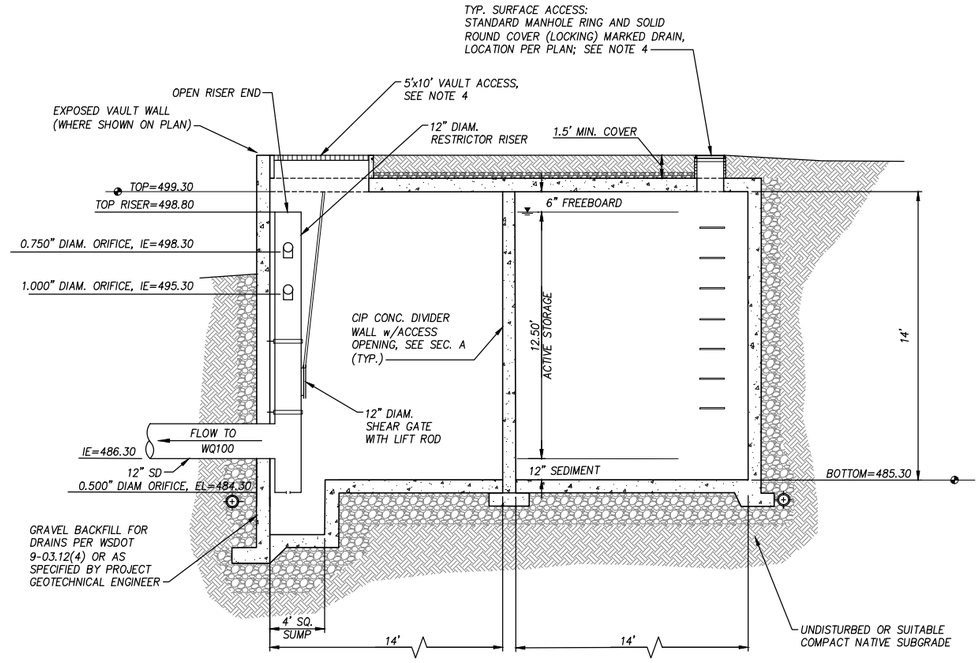
VAULT PLAN

SCALE: AS NOTED



A TYPICAL VAULT SECTION

NOT TO SCALE



B TYPICAL VAULT SECTION

NOT TO SCALE

DETENTION VAULT DATA						
STORM EVENT	LIVE STORAGE VOLUME (CF)			RELEASE RATE (CFS)		
	REQUIRED	DESIGNED (VAULT)	AS-BUILT	REQUIRED	DESIGNED	AS-BUILT
2-YR	26,320	26,320		0.0523	0.0380	
50-YR	34,804	34,804		0.1351	0.0842	
100-YR	35,980	35,980		0.1500	0.0932	

NOTES:

1. VAULTS AND ALL APPURTENANCES SHALL MEET THE STRUCTURAL REQUIREMENTS FOR OVERBURDEN SUPPORT UNDER A MINIMUM HS-25 TRAFFIC LOADING WITH ANY SPECIAL PROVISIONS OF THE STRUCTURAL PLANS AND DETAILS.
2. ALL METAL PARTS SHALL BE CORROSION RESISTANT STEEL PARTS SHALL BE STAINLESS STEEL, OR EQUIVALENT.
3. A CONTINUOUS PVC OR HYDROPHILIC WATER STOP SHALL BE INSTALLED AT ALL CAST-IN-PLACE CONCRETE CONSTRUCTION OR EXPANSION JOINTS. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH MANUFACTURER DATA FOR THE SPECIFIC TYPE AND MODEL OF WATER STOP PROPOSED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
4. THE 5'x10' VAULT ACCESS OPENING SHALL BE INSTALLED AT THE LOCATION SHOWN ON THIS PLAN IN ACCORDANCE WITH ANY ADDITIONAL PROVISIONS OF THE ACCOMPANYING STRUCTURAL PLANS AND DETAILS. THIS OPENING SHALL HAVE A PRE-MANUFACTURED LID INSTALLED FLUSH WITH ADJACENT FINISHED GRADES. THE TYPE OF COVER MAY BE A REMOVABLE GRATE, SPRING-LOADED HATCH, SOLID, OR EQUIVALENT COMBINATION THAT PROVIDES A CLEAR OPENING OF 5'X10'. THE LID SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS FOR THE SAME STRUCTURAL LOADING CONDITIONS AS THE ASSOCIATED VAULT AS PROVIDED ON THE STRUCTURAL PLANS. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH MANUFACTURER AND SUPPORTING STRUCTURAL DESIGN DATA TO CONFIRM THESE DESIGN PARAMETERS FOR THE ACTUAL TYPE AND MODEL OF THE VAULT ACCESS PROPOSED FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
5. RIM ELEVATIONS SHALL BE ADJUSTED AS REQUIRED TO ACCOMMODATE ACTUAL ACCESS LOCATIONS AND FINISHED GRADE CONDITIONS.
6. ALL UNSUITABLE SOILS SHALL BE REMOVED FROM FOOTPRINT OF VAULT AND TO A DISTANCE BEYOND THE VAULT EQUAL TO THE DEPTH OF OVER EXCAVATED MATERIAL IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, AND AS DIRECTED BY THE ENGINEER. ALL UNSUITABLE MATERIAL SHALL BE REPLACED WITH SUITABLE COMPACT STRUCTURAL FILL MATERIAL
7. VAULT LOCATION COORDINATES AND DIMENSIONS REFERENCE FINISHED INSIDE WALL UNLESS NOTED OTHERWISE.

AKS ENGINEERING & FORESTRY, LLC
11321 B, NE 120TH ST
KIRKLAND, WA 98034
425.285.2390
WWW.AKS-ENG.COM

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

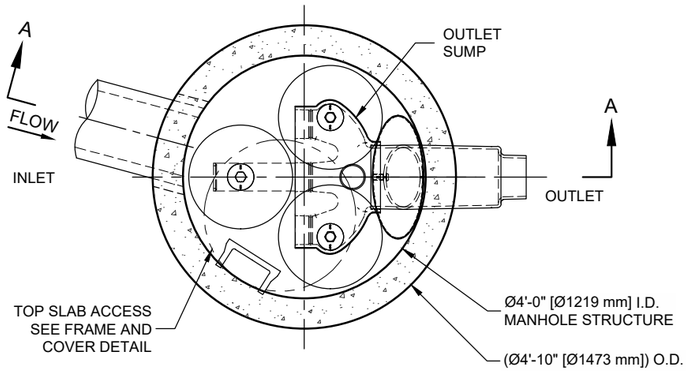
VAULT DETAILS
MONTGOMERIE
MUKILTEO, WASHINGTON

AMIE B SCHOOLEY
STATE OF WASHINGTON
37610
REGISTERED PROFESSIONAL ENGINEER
10/29/2025

JOB NUMBER:	12420
DATE:	10/29/2025
DESIGNED BY:	KMM
DRAWN BY:	MKM
CHECKED BY:	JBS

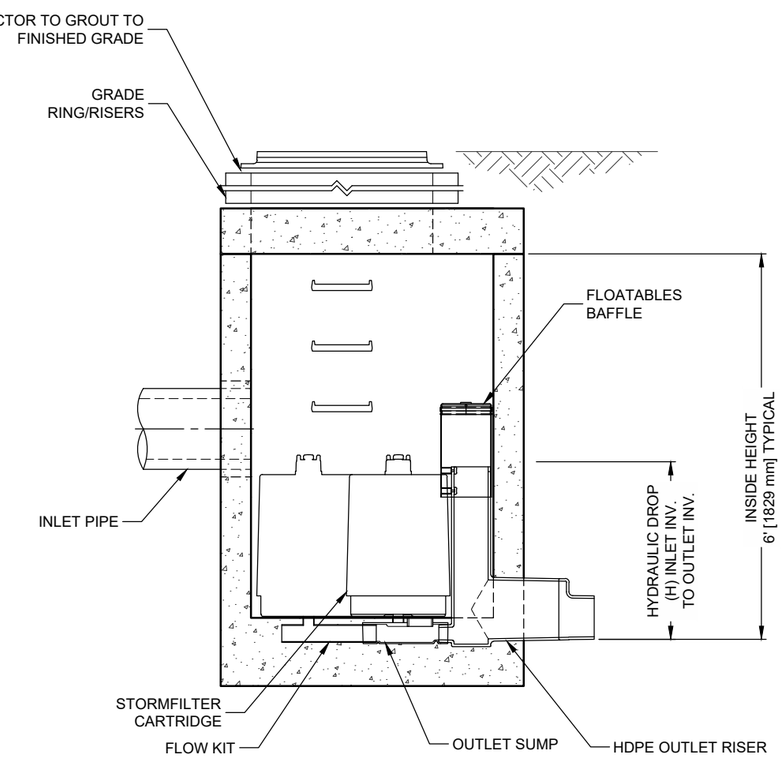
C3.20

AKS DRAWING FILE: C3.20.DWG | LAYOUT: 10 VAULT DETAILS



PLAN VIEW

STANDARD OUTLET RISER
FLOWKIT: 40A



SECTION A-A

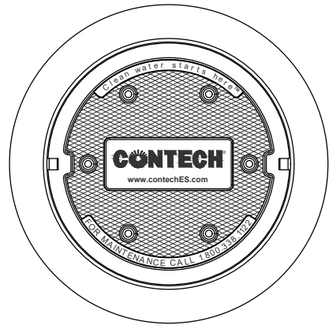
STORMFILTER DESIGN NOTES

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

CARTRIDGE SELECTION

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

* 1.67 gpm/sf [1.08 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	WQ100
WATER QUALITY FLOW RATE (cfs) [L/s]	0.0134
PEAK FLOW RATE (cfs) [L/s]	0.0282
RETURN PERIOD OF PEAK FLOW (yrs)	100-yr
CARTRIDGE HEIGHT (SEE TABLE ABOVE)	2.3'
NUMBER OF CARTRIDGES REQUIRED	1
CARTRIDGE FLOW RATE	12.53 gpm
MEDIA TYPE (PERLITE, ZPG, PSORB)	PSORB

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	486.00	CPP	12"
INLET PIPE #2			
OUTLET PIPE	483.70	CPP	12"

RIM ELEVATION	502.10

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

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

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

The Stormwater Management StormFilter®

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SFMH48
STORMFILTER
STANDARD DETAIL

Appendix F: O&M Manual

V-A.5 Maintenance Standards - Tanks and Vaults

Table V-A.4: Maintenance Standards - Tanks and Vaults

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point, or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for one-half the length of the storage vault, or any point depth exceeds 15% of the diameter. (Example: 72-inch diameter storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 the length of the tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into the tank/vault. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound. Cracks wider than 0.5-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than 0.25-inch wide at the joint of the inlet/outlet pipe.
Access Opening(s)	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 0.5-inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See V-A.7 Maintenance Standards - Catch Basins		

V-A.6 Maintenance Standards - Control Structures

Table V-A.5: Maintenance Standards - Control Structures

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (includes sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.

Table V-A.5: Maintenance Standards - Control Structures (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Clean-out Gate	Damaged or Missing	Clean-out gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Access Opening	See V-A.5 Maintenance Standards - Tanks and Vaults		
Catch Basin	See V-A.7 Maintenance Standards - Catch Basins		

V-A.7 Maintenance Standards - Catch Basins

Table V-A.6: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g. methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e. separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached.	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pol-	See V-A.2 Maintenance Standards - Detention Ponds	No pollution present.

Table V-A.6: Maintenance Standards - Catch Basins (continued)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
	lution		
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (if applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

V-A.8 Maintenance Standards - Debris Barriers (e.g. Trash Racks)

Table V-A.7: Maintenance Standards - Debris Barriers (e.g. Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars	Bars are bent out of shape more than 3 inches. Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	Bars in place with no bends more than 3/4 inch. Bars in place according to design. Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

V-A.9 Maintenance Standards - Energy Dissipators

Table V-A.8: Maintenance Standards - Energy Dissipators

Maintenance Components	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
External			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.

Table V-A.15: Maintenance Standards - Sand Filters (Belowground/Enclosed) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	let pipe.
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

V-A.17 Maintenance Standards - Manufactured Media Filters

Table V-A.16: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault	Sediment Accumulation on Media	Sediment depth exceeds 0.25 inches.	No sediment deposits that would impede permeability of the media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6 inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on filter bed.	Trash and debris removed from the filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and/or misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Filter Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

V-A.19 Maintenance Standards - Coalescing Plate (CP) Oil/Water Separators

Table V-A.18: Maintenance Standards - Coalescing Plate (CP) Oil/Water Separators

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Oil Accumulation	Oil accumulation that exceeds 1 inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 0.5 inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 0.25 inch at the joint of the inlet/outlet pipe.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

V-A.20 Maintenance Standards - Catch Basin Inserts

Table V-A.19: Maintenance Standards - Catch Basin Inserts

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

Table V-A.27: Maintenance Standards - Downspout Full Infiltration (continued)

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Source: (Herrera and WSC, 2013)				

V-A.29 Maintenance Standards - Post-Construction Soil Quality and Depth

Table V-A.28: Maintenance Standards - Post-Construction Soil Quality and Depth

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Soil media (maintain high organic soil content)	A		Vegetation not fully covering ground surface or vegetation health is poor	• Maintain 2 to 3 inches of mulch over bare areas in landscape beds • Add plants if sufficient space • Re-seed bare turf areas until the vegetation fully covers ground surface
		Ongoing	None (routine maintenance)	Return leaf fall and shredded woody materials from the landscape to the site when possible in order to replenish soil nutrients and structure
		Ongoing	None (routine maintenance)	On turf areas, “grasscycle” (mulch-mow or leave the clippings) to build turf health
		Ongoing	None (routine maintenance)	Avoiding use of pesticides (bug and weed killers), like “weed & feed”, which damage the soil
		A	None (routine maintenance)	• Where fertilization is needed (mainly turf and annual flower beds), a moderate fertilization program should be used which relies on compost, natural fertilizers or slow-release synthetic balanced fertilizers • Follow IPM protocols for fertilization procedures
Soil media (maintain infiltration)	A[b]		Soils become waterlogged, do not appear to be infiltrating	• To remediate compaction, aerate soil, till to at least 8-inch depth, or further amend soil with compost and re-till • If areas are turf, aerate compacted areas and topdress them with 1/4 to 1/2 inch of compost to renovate them • If drainage is still slow, consider investigating alternative causes (e.g. high wet season groundwater levels, low permeability soils) • Also consider site use and protection from compacting activities
Erosion / Scouring	A, W, S		Areas of potential erosion are visible	• Identify and address cause of erosion (e.g. concentrate flow entering area, channelization of runoff) and stabilize damaged area (regrade, rock, vegetation, erosion control matting) • For deep channels or cuts (over 3 inches in ponding depth), temporary erosion control measures should be put in place until permanent repairs can be made.
Grass / Vegetation		A	Less than 75% of planted vegetation is healthy with a generally	• Take appropriate maintenance actions (e.g. remove/ replace plants)

Table V-A.28: Maintenance Standards - Post-Construction Soil Quality and Depth (continued)

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
			good appearance	• If problem persists, evaluate if vegetation is appropriate for the location (e.g. exposure, soil, soil moisture)
Noxious weeds		M (March – October, preceding seed dispersal)	Listed noxious vegetation is present (refer to current county noxious weed list)	• By law, class A & B noxious weeds must be removed, bagged and disposed as garbage immediately • Reasonable attempts must be made to remove and dispose of class C noxious weeds • Watch for and respond to new occurrences of especially aggressive weeds such as Himalayan blackberry, Japanese knotweed, morning glory, English ivy, and reed canary grass to avoid invasions • It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality; use of herbicides and pesticides may be prohibited in some jurisdictions
Weeds		M (March – October, preceding seed dispersal)	Weeds are present	• Remove weeds with their roots manually with pincer-type weeding tools, flame weeders, or hot water weeders as appropriate • Follow IPM protocols for weed management

Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".

a) Frequency: A = Annually; B = Biannually (twice per year); M = Monthly; W = At least one visit should occur during the wet season (for debris/clog related maintenance, this visit should occur in the early fall, after deciduous trees have lost their leaves); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).

b) Inspection should occur during a storm event.

IPM - Integrated Pest Management

Source: (Herrera and WSC, 2013)

CONTECH®
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StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit and the unit's role, relative to detention or retention facilities onsite.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered).

Please note Stormwater Management StormFilter devices installed downstream of, or integrated within, a stormwater storage facility typically have different operational parameters (i.e. draindown time). In these cases, the inspector must understand the relationship between the retention/detention facility and the treatment system by evaluating site specific civil engineering plans, or contacting the engineer of record, and make adjustments to the below guidance as necessary. Sediment deposition depths and patterns within the StormFilter are likely to be quite different compared to systems without upstream storage and therefore shouldn't be used exclusively to evaluate a need for maintenance.

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. While not required in all cases, inspection of the media within the cartridge may provide valuable additional information.
   b. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

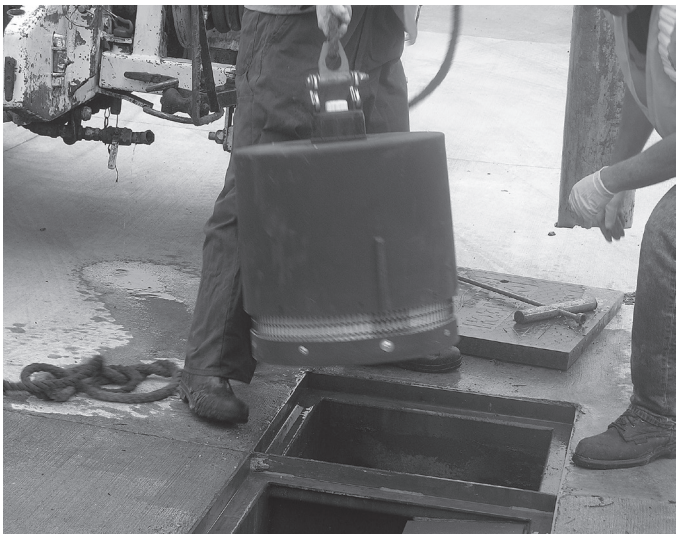
Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.



Inspection Report

Date: _____ Personnel: _____

Location: _____ System Size: _____ Months in Service: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: _____

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Sediment Depth on Cartridge Top(s): _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: _____

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service: _____

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Sediment Depth on Cartridge Top(s): _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

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Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

Appendix G: 2024 SWMMWW Excerpts

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

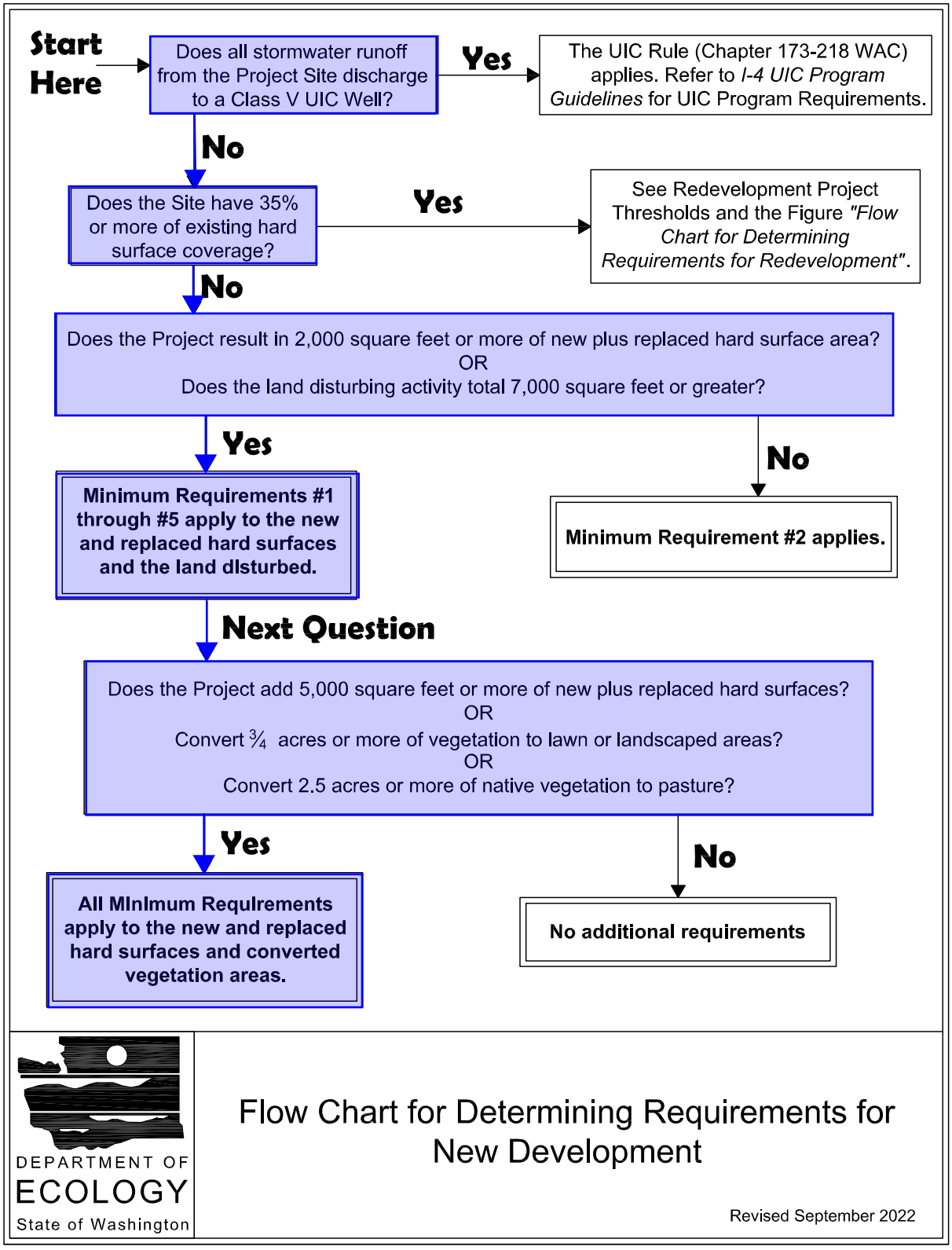

Figure I-3.5: Flow Chart for Determining Wetland Protection Level Requirements