

# Storm Drainage Report

For

Hu Residence

At 30XX 69<sup>th</sup> Avenue SE

Mercer Island, WA



03/06/2022

March, 2022

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## **1.0 Project Overview**

This proposed single-family resident development is a 0.190 acres lot project located in City of Mercer Island, King County, Washington. See Figure 1 for project Vicinity Map.

The subject property address is at 30xx 69<sup>th</sup> Avenue SE in Mercer Island, Washington. The new single-family house will be a two-story wood framed structure in the central portion of the site, accessible from 69<sup>th</sup> Avenue SE.

A primary component of the new development project plans is the satisfaction of current stormwater management requirements commensurate with Department of Ecology 2014 Stormwater Management manual for Western Washington (SWWMM) and/or City of Mercer Island Storm Management Standards. This stormwater report describes the existing drainage characteristics in the project area and presents the proposed On-Site stormwater management within the project to mitigate for the project impacts.



## **2.0 Site Conditions**

### **2.1 Existing Site Conditions**

The existing parcel is a irregularly shaped lot located at 30xx 69<sup>th</sup> Avenue SE Mercer Island, WA. The property is bounded by 69<sup>th</sup> Avenue SE to west, single-family residents to north and east, vacant lot to the south.

The project site covers an area of approximately 0.19 acres and is currently vacant. The ground surface within the site slopes gently to steeply down from the upper eastern portion of the site to the western portion of the site. Vegetation within the site consists of grass yard areas and a few trees. A small concrete slab about 570 sf from an old basketball court occupies the south central portion of the site.

See Appendix A for existing site conditions and photo.

There is currently no stormwater management facilities located on the property. The existing stormwater runoff for the site disposal by infiltration or surface dispersion. The existing land cover is outlined in the Table 1.0.

**Table 1.0: Existing Land Cover**

<b>Summary of Existing Site Conditions</b>			
<b>Surface Type</b>	<b>Area</b>	<b>Units</b>	<b>Notes</b>
<b>Total Lot</b>	8,277	SF	
Concrete Area	570	SF	
<b>Impervious Subtotal</b>	<b>570</b>	<b>SF</b>	
Trees	180	SF	
Lawn/Landscape	7,527	SF	
<b>Pervious Total</b>	<b>7,707</b>	<b>SF</b>	

## **2.2 Existing Hydraulic Features**

At this time, there is no stormwater drainage system on the site to collect stormwater runoff. The site stormwater disperse across the site from east to west direction. No wetlands or stream has been identified on or adjacent to the site.

## **2.3 Soils Information**

The Geologic Map of Mercer Island, WA, by Kathy G Troost & Aaron P. Wisher, et al (USGS, October 2006) was reviewed for the parcel. The parcel is mapped as Vashon Advance Outwash (Qva) with Lawton Clay (Qvlc) mapped in the immediate vicinity downslope of the property. The Advance Outwash is described as well-sorted sand and gravel deposits with local silt lenses, and grades downward into the Lawton Clay with increasing silt content towards the contact. The Lawton Clay is describes as laminated to massive silt, clayey silt, and silty clay with scattered gravel dropstones. In general, we encountered a layer of surficial undocumented fill of varying depths in each of our explorations underlain by oxidized silty fine to medium sand and gravel which we interpreted as native glacial Advance Outwash deposits, slowly grading into a brownish gray to blue silt with fine sand and trace gravel at depth, which we interpreted as native Lawton Clay deposits.

See Appendix F for Geotechnical Engineering Evaluation Report.

## **3.0 Developed Conditions**

### **3.1 Design References**

The following design references were utilized in development of the stormwater design:

- \* Department of Ecology Stormwater Management Manual for Western Washington (SWWMM) 2019

### 3.2 Minimum Requirements

Summary of project information for determining minimum stormwater requirements			
Key	Component	Value	Notes
A	Project Site Area	8,277 SF	
B	Existing Impervious Area	570 SF	
C	Existing Impervious Area Coverage	0.60%	Calculated as B/A100%
D	New Impervious Area	2,330 SF	New roof area – New driveway
E	Replaced Impervious Area	570 SF	Existing concrete pad
F	New Plus Replaced Impervious Area	2,900 SF	Calculated as D+E
G	Proposed Impervious Area	2,900 SF	Existing + Replaced Areas
H	Converted pervious: Native vegetation converted to lawn or landscape	0.00 SF	N/A
I	Converted Pervious: Native vegetation converted to pasture	0.00 SF	N/A
J	Total Area of Land Disturbing Activity	3,337 SF	



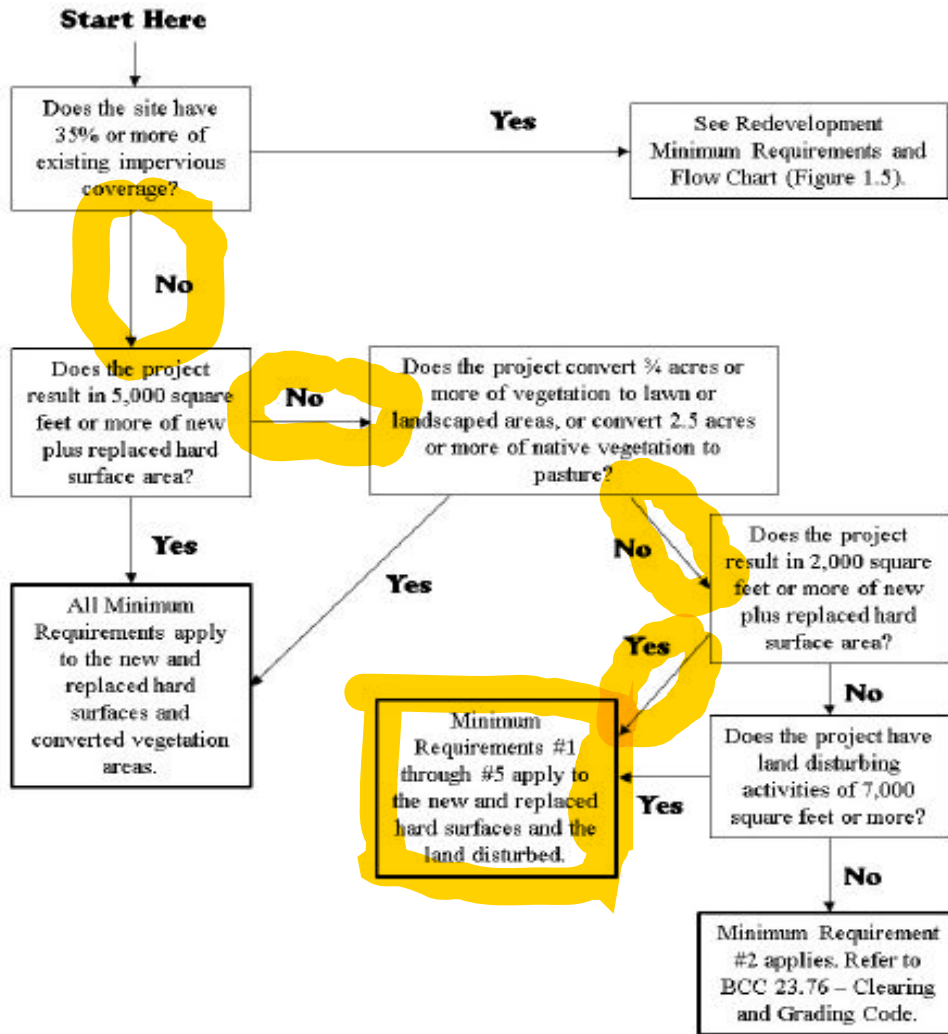


Figure 1.4 – Flow Chart for Determining Minimum Requirements for New Development Projects

Source: Adapted from Figure 2.4.1 of Volume I of the DOE Manual.

According to the above Flow Chart for determining requirements for New Development project, Minimum Requirements #1 - #5 SWWMM 2019 apply to the new and replaced impervious surfaces and the land disturbed.

### 3.3 Proposed Development and On-Site Stormwater Management

The new development proposed to construct a single-family residence on the site. The new residence will be multi-level and utilize a daylight basement deep foundation design, with an underground level and garage. Retaining walls are proposed for the residence foundations and along the driveway for access to the underground garage. A new deck will also be construct for the new residence and associate landscape and front yard improvements.

See Appendix B for the proposed site conditions. The proposed land cover is outlined in Table 2.0.

**Table 2.0: Developed Land Cover**

<b>Summary of Proposed Site Conditions</b>			
<b>Surface Type</b>	<b>Area</b>	<b>Units</b>	<b>Notes</b>
<b>Total Lot</b>	<b>8,277</b>	<b>SF</b>	
New Roof	1,915	SF	
Conc. Driveway	423	SF	
<b>Impervious Subtotal</b>	<b>2,338</b>	<b>SF</b>	
Trees	180	SF	
Existing Lawn/Landscape	5,518	SF	
<b>Pervious Total</b>	<b>5,939</b>	<b>SF</b>	

### **3.4 Design Satisfaction of SMMWW Minimum Requirements**

The following sections outline how the new single-family residential new development project design satisfies the #1 – 5 minimum SMMWW requirements.

#### **MR #1 – Stormwater Site Plans**

Stormwater Site Plans will be prepared for the single- family residential new development. This report and other supporting studies and drawings will comprise the component Stormwater Site Plan.

#### **MR #2 – Construction Stormwater Pollution Prevention**

The single-family residential new development project will include in the contract plans, the TESC plan sheets to address erosion. The SPCC will be a stand alone document prepared by the contractor to address potential mechanical or construction related spills that could potentially contaminate stormwater or soils.

#### **MR #3 – Source Control of Pollutants**

Pollutants will be prevented from coming in contact and mixing with stormwater by using silt fence along the property line to keep stormwater within construction site. Construction entrance will be implemented prior to construction to prevent wheel tracking pollutant from construction site into the roadway.

#### **MR #4 – Maintaining the Natural drainage System**

Drainage patterns will be maintained as a result of the Single-family residential new development project.

#### **MR #5 – On-Site Stormwater Management**

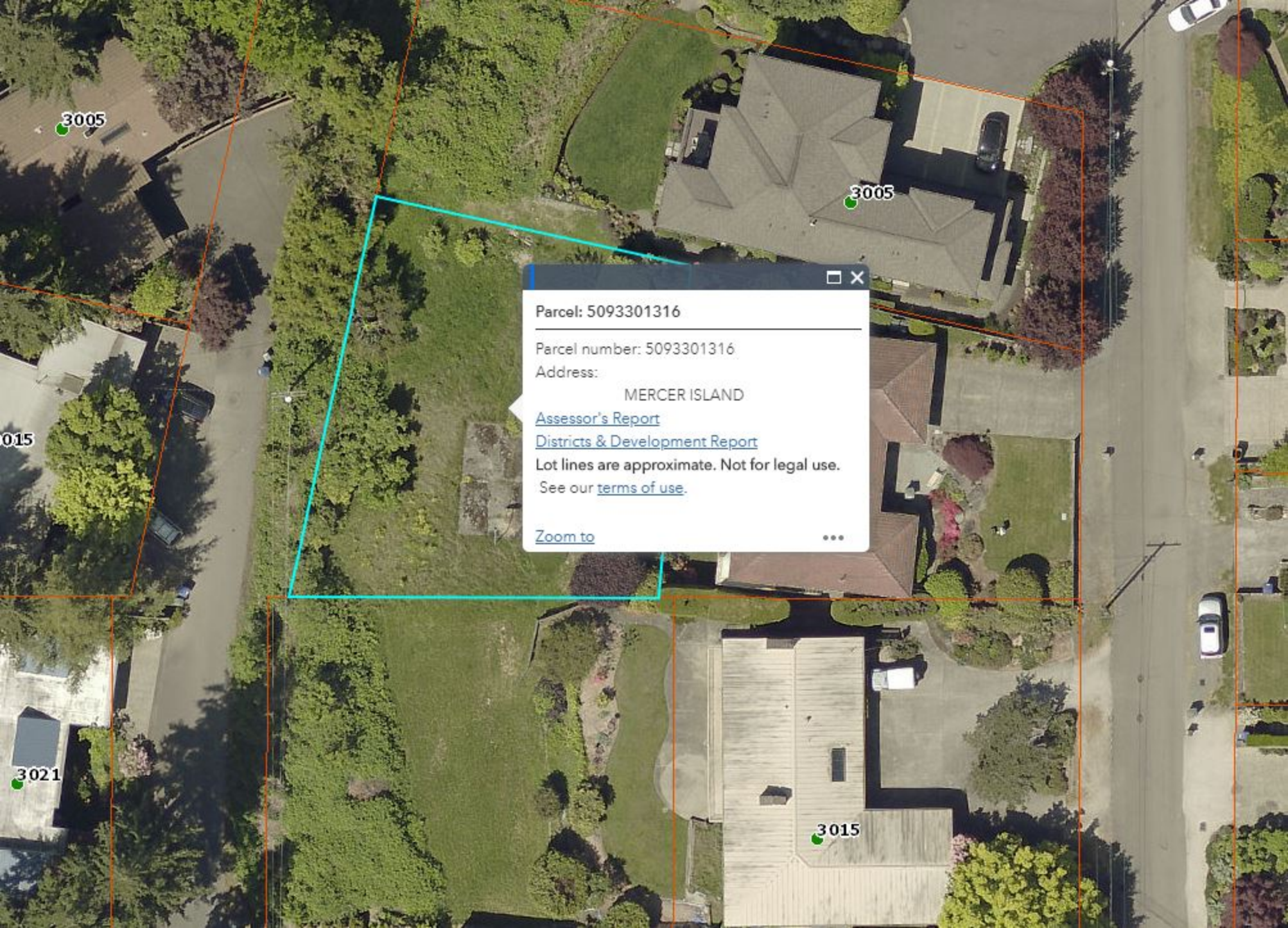
This new developed project does not required to provide flow control due the total new plus replaced surfaces are below the threshold of 5,000 sf. But this project required to install On-Site Stormwater Management due to the new plus replaced surfaces is above the 2,000 SF threshold. This project will utilize List Approach to meet the Minimum Requirement #5 compliance. The project will uses BMPs from List #3 to meet the minimum requirement #5 for the new development project. Lawn and Landscaped Areas will utilize Post-Construction Soil Quality and Depth. According to the Geotechnical Report, infiltration is not feasible for this site. This site also in an erosion hazard sliding area. Therefore, none of the List Approach BMPs are feasible to implement for this project. According to the Geotechnical Report, all runoff from the site needs to tightline into existing drainage system under the roadway. Therefore, the roof runoff and driveway runoff will be collected and convey to a new catch basin type 1 with oil water separator before tide into the existing drainage system under 69<sup>th</sup> Ave. SE. See drainage plan for site conveyance system and tide into public drainage system.

## 4.0 Operations and Maintenance

The owner will need to perform appropriate preventive maintenance steps to ensure that on-site stormwater management facilities are adequately maintained and allow for continued operations according to the maintenance section of the SMMWW 2019.

## **Appendix A**

Existing Site Conditions and Photos



Parcel: 5093301316

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Parcel number: 5093301316  
Address:  
MERCER ISLAND

[Assessor's Report](#)  
[Districts & Development Report](#)

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See our [terms of use](#).

[Zoom to](#) ...

3005

3005

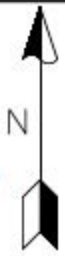
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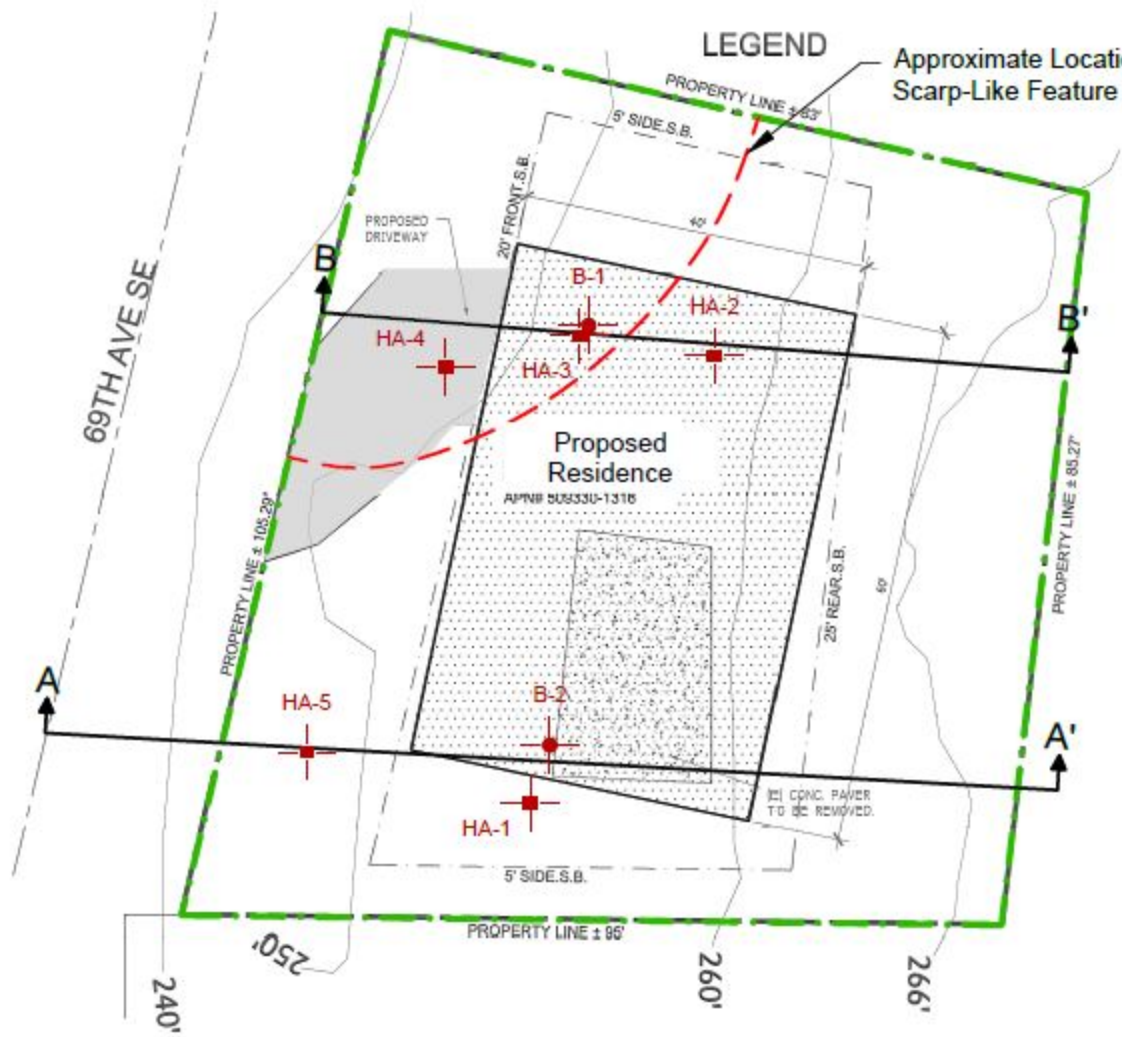


# Site Plan


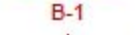

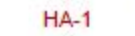





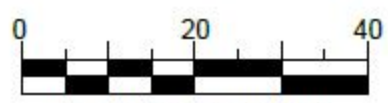
## LEGEND

Approximate Location of Scarp-Like Feature



## LEGEND

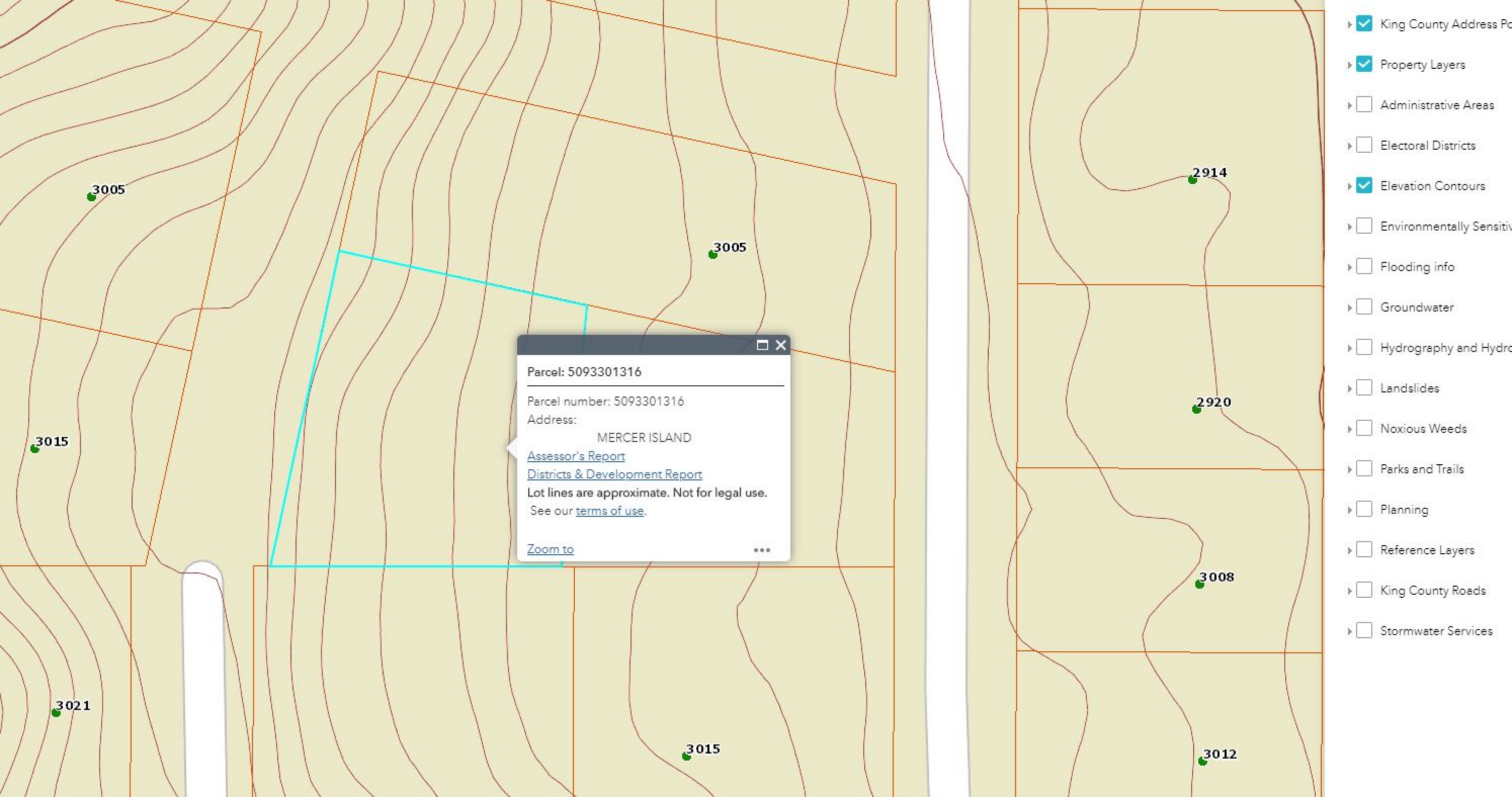
-  Property line
-  B-1
-  Number and approximate location of boring
-  HA-1
-  Number and approximate location of hand auger
-  A A'
-  Approximate location of cross-section



Scale: 1 inch = 20 feet

Reference: Site Plan based on a plan dated June 24, 2018 titled "Site Plan"





Parcel: 5093301316

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Parcel number: 5093301316  
Address:  
MERCER ISLAND

[Assessor's Report](#)  
[Districts & Development Report](#)

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- King County Address Po
- Property Layers
- Administrative Areas
- Electoral Districts
- Elevation Contours
- Environmentally Sensitiv
- Flooding info
- Groundwater
- Hydrography and Hydro
- Landslides
- Noxious Weeds
- Parks and Trails
- Planning
- Reference Layers
- King County Roads
- Stormwater Services

## **Appendix B**

Developed Site  
Conditions and Drainage  
plan & Detail

**SIDE SEWER NOTES**

- ① CUT AND REMOVE THE EXISTING SIDE SEWER LINE, CONTRACTOR SHALL NOTIFY THE ADJACENT PROPERTIES OWNERS PRIOR TO CONDUCT THIS WORK.
2. CONTRACTOR SHALL FIELD VERIFY THE PIPE LOCATION AND INVERT ELEVATION.
3. CONTRACTOR SHALL MAINTAIN THE SIDSEWER IN FULL FUNCTION DURING THE CONSTRUCTION.
4. CONTRACTOR SHALL INSTALL THE RELOCATE SIDE SEWER LINE IN PLACE PRIOR REMOVING THE EXISTING SIDE SEWER LINE.
5. CONNECT RELOCATED SEWER LINE WITH EXISTING SIDE SEWER LINE. SEE CITY OF MERCER ISLAND STD. S-17 FOR DETAILS
- ② REMOVE EXISTING SIDE SEWER LINE. THIS WORK SHALL NOT COMMENCE PRIOR THE NEW SIDE SEWER LINE IN PLACE.
- ③ INSTALL APPROVED MECHANICAL PLUG WITH NON-SHRINK GROUT AT THE END OF THE PIPE. SEE CITY OF MERCER ISLAND STD. S-22, STD. S-22A FOR DETAILS.
- ④ INSTALL 4" PVC SIDE SEWER. SEE CITY OF MERCER ISLAND STD. S-3, S-4, S-17 FOR DETAILS 3" MINIMUM PIPE COVER IS REQUIRED.
- ⑤ 6" PVC SEWER, L=45.0', S=21.7.0%, (ASTM D-3034 PVC), SEE CITY OF MERCER ISLAND STD.S-3, STD.S-4, STD. S-17, STD. S-18.

**LEGEND**

- PROPOSED SIDE SEWER - s - s - s -
- EXISTING SEWER LINE - S - - - S -
- EXISTING EDGE OF PAVEMENT - - - - -
- SPOT ELEVATION +236
- EXISTING STORM LINE - ST - - - ST - - -
- EXISTING WATER LINE - w - - - w - - - w - - - w - - -
- PROPOSED WATER IINE - w - w - w - w - w - w - w - w - w -
- PROPOSED WATER METER [Symbol]
- WALL UNDERDRAIN [Symbol]
- TREE DRIP LINES [Symbol]
- PROPOSED FOOTING DRAIN [Symbol]
- EXISTING LOT LINE - - - - -

**4" PERFORATED FOOTING DRAIN**

POINT	INVERT	LENGTH	S
A	237.0	49.5	1%
B	236.51	31.5	1%
C	236.19	31	1%
D	235.88	13.5	11.5%
E	234.33		
A	237.0	35	1%
F	236.65	24	1%
D	235.88	49	1.6%

**4" PVC ROOF DRAIN**

POINT	INVERT	LENGTH	S
D-5	244	53	15.4%
D-3	235.84	16	11.5%
CB	234.00		
D4	258.00	34	2.94%
D1	257.00	53.5	35.00%
D2	238.28	4	61.38%
D-3	235.82		

**STORM DRAIN NOTES**

- ① 4" FOOTING DRAIN MIN 2% GRADE (ASTM D-3034 PVC)
- ② 4" ROOF DRAIN MIN 2% GRADE (ASTM D-3034 PVC)
- ③ 4" STORM DRAIN, PVC, L=11.0', S=15.5%, (ASTM D-3034 PVC)
- ④ 6" STORM DRAIN, L=11, S=4.1% ((ASTM D-3034 PVC)
- ⑤ 4" PVC STORM DRAIN, L=19.0, S=3.6%, (ASTM D-3034 PVC)
- ⑥ 4" PVC STORM DRAIN, L=10.5 S=40%, (ASTM D-3034 PVC)

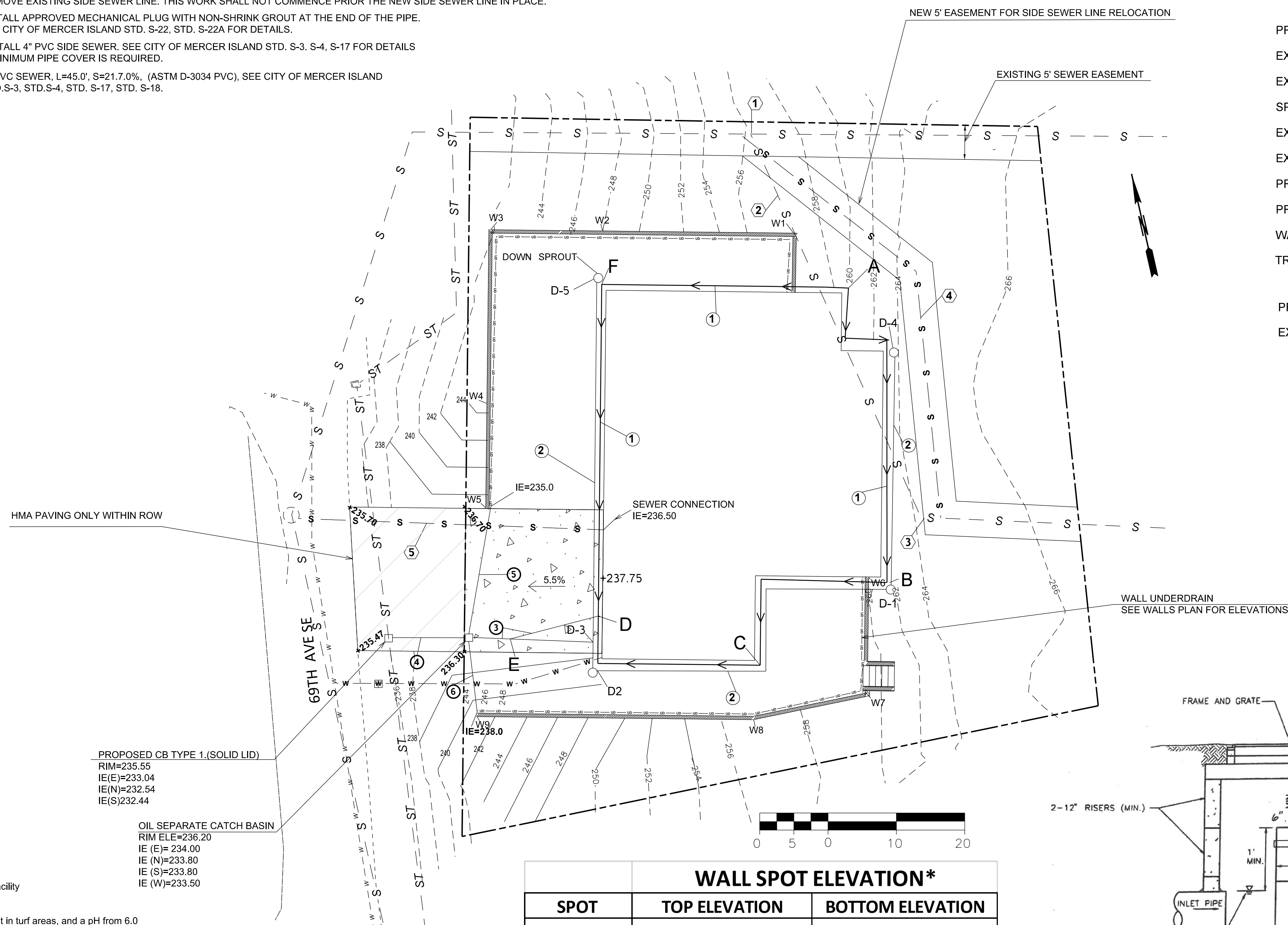
**Post Construction Soil Quality**

All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structure fill or slope shall, at project completion, demonstrate the following:

1. A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.
2. Mulch planting beds with 2 inches of organic material
3. Use compost and other materials that meet these organic content requirements:
  - a. The organic content for "pre-approved" amendment rates can be met only using compost meeting the compost specification for BMP T7.30: Bioretention Cells, Swales, and Planter Boxes (p.959), with the exception- that the compost may have up to 35% biosolids or manure. The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1. The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.
  - b. Calculated amendment rates may be met through use of composted material meeting (a.) above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

**Maintenance**

1. Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
2. Plant vegetation and mulch the amended soil area after installation.
3. Leave plant debris or its equivalent on the soil surface to replenish organic matter.
4. Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

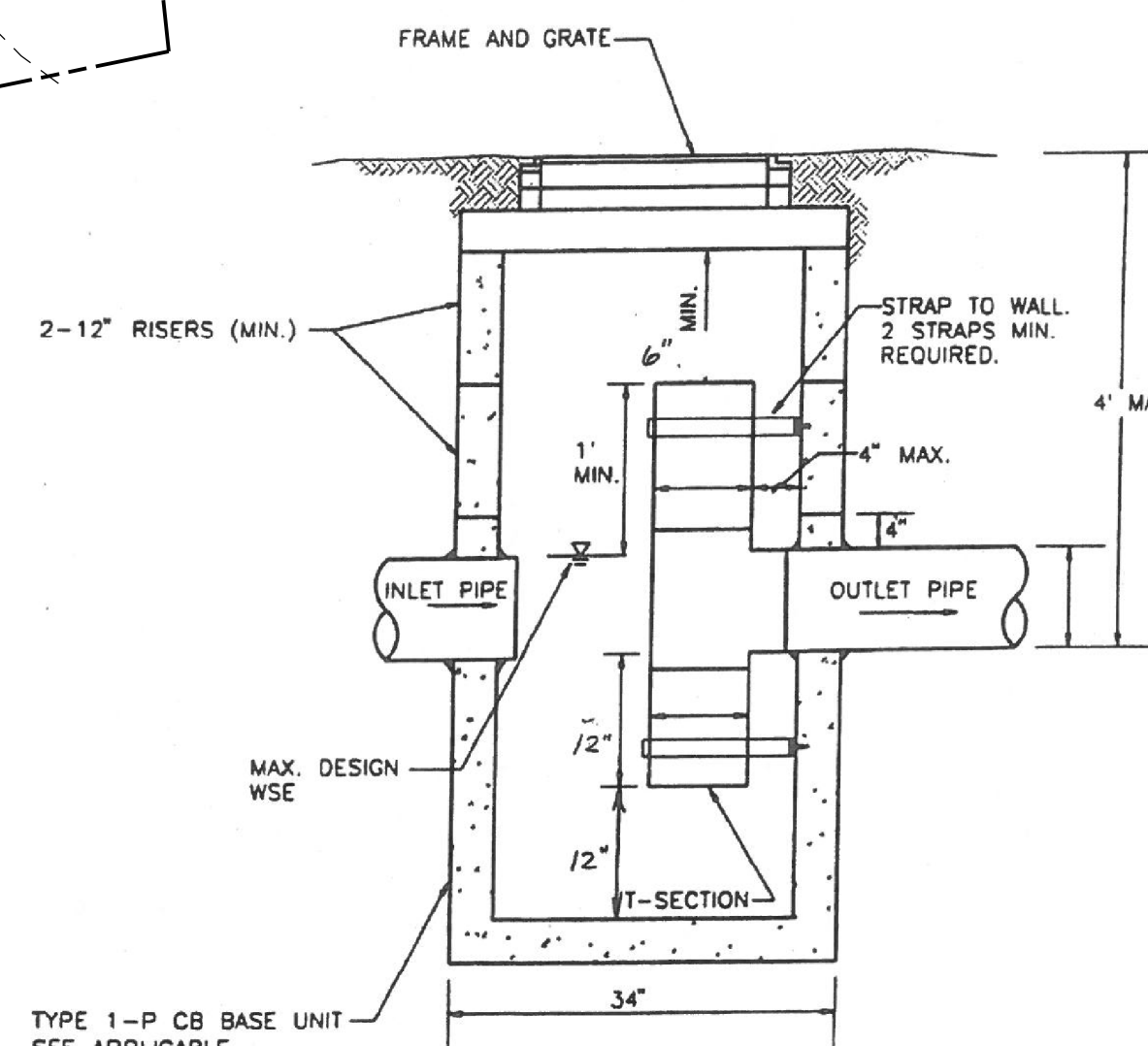


**NOTE**  
NO EXCAVATION ENCRoACHMENT INTO TREE DRIP LINE

**WALL SPOT ELEVATION\***

SPOT	TOP ELEVATION	BOTTOM ELEVATION
W1	258.5	248.0
W2	248.0	244.0
W3	247.0	242.0
W4	244.0	240.0
W5	238.0	236.0
W6	260.5	257.0
W7	260.5	257.0
W8	257.0	252.0
W9	246.0	242.0

WALL SPOTS ELEVATION ARE FOR REFERENCED ONLY  
SEE THE STRUCTURE PLANS FOR ELEVATION AND DETAILS.



CATCH BASIN TYPE I WITH OIL/WATER SEPARATED

NTS



Know what's below.  
Call before you dig.

FIELD BOOK: \_\_\_\_\_  
 SURVEYED: \_\_\_\_\_  
 SURVEY BASE MAP: \_\_\_\_\_  
 DESIGN ENTERED: **J.W**  
 DESIGNED: **S.W**  
 CHECKED: **S.W**



**TANDEM ENGINEERING CONSULTANT INC**  
 8822 NE 178TH ST  
 BOTHELL, WA 98011  
 (206) 795-5674

**DRAINAGE & GRADATION PLAN**

**HU'S RESIDENCE**  
 30XX 69TH AVE SE  
 MERCER ISLAND WA 98040

SHEET  
**3**  
 OF  
**4**  
 SHEETS

**C-3.00**

## **Appendix C**

### TESC Plan and Details

## **Appendix D**

### **Design Guidelines and Maintenance Standards**

# Compliance Methods

## LID Performance Standard

The LID Performance Standard compliance method for Minimum Requirement #5 requires modeling the proposed Flow Control BMPs to demonstrate the flow reduction as described below. Note that in order to meet the LID Performance Standard, the chosen Flow Control BMPs will most likely need to include infiltration.

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Refer to the [Flow Control Performance Standard](#) section in [I-3.4.7 MR7: Flow Control](#) for information about the assignment of the pre-developed condition. Project sites that must also meet [I-3.4.7 MR7: Flow Control](#) must match flow durations between 8% of the 2-year flow through the full 50-year flow.

Designers selecting this option cannot use [BMP T5.14: Rain Gardens](#) to achieve the LID Performance Standard. They may choose to use [BMP T7.30: Bioretention](#) to achieve the LID Performance Standard.



**The text in this box originates from one or more of the following Permits:**  
*Appendix 1 of the Phase I / Phase II Municipal Stormwater Permits*  
*Construction Stormwater General Permit*

## The List Approach

The List Approach compliance method for Minimum Requirement #5 requires evaluating the BMPs in [Table I-3.2: The List Approach for MR5 Compliance](#).

For each surface, evaluate the feasibility of the BMPs in the order listed, and use the first BMP that is considered feasible. The designer must document the site conditions and infeasibility criteria used to deem BMPs infeasible. Once a BMP is deemed feasible and used for a surface, no other BMP from the list is necessary for that surface.

If all BMPs in the list are infeasible, then the designer must document the site conditions and infeasibility criteria used to deem each BMP infeasible. This documentation will demonstrate compliance with Minimum Requirement #5.

Feasibility shall be determined by evaluation against:

- Design criteria, limitations, and infeasibility criteria identified for each BMP in this manual; and
- Competing Needs Criteria as listed below.



**The text in this box originates from one or more of the following Permits:**  
*Appendix 1 of the Phase I / Phase II Municipal Stormwater Permits*  
*Construction Stormwater General Permit*

**Table I-3.2: The List Approach for MR5 Compliance**

List #1 (For MR #1 - #5 Projects That Are Not Flow Control Exempt)	List #2 (For MR #1 - #9 Projects That Are Not Flow Control Exempt)	List #3 (For Flow Control Exempt Projects)
<b>Surface Type: Lawn and Landscaped Areas</b>		
<a href="#">BMP T5.13: Post-Construction Soil Quality and Depth</a>	<a href="#">BMP T5.13: Post-Construction Soil Quality and Depth</a>	<a href="#">BMP T5.13: Post-Construction Soil Quality and Depth</a>
<b>Surface Type: Roofs</b>		
1. <a href="#">BMP T5.30: Full Dispersion</a> or <a href="#">BMP T5.10A: Downspout Full Infiltration</a>	1. <a href="#">BMP T5.30: Full Dispersion</a> or <a href="#">BMP T5.10A: Downspout Full Infiltration</a>	1. <a href="#">BMP T5.10A: Downspout Full Infiltration</a>
2. <a href="#">BMP T5.14: Rain Gardens</a> or <a href="#">BMP T7.30: Bioretention</a>	2. <a href="#">BMP T7.30: Bioretention</a>	2. <a href="#">BMP T5.10B: Downspout Dispersion Systems</a>
3. <a href="#">BMP T5.10B: Downspout Dispersion Systems</a>	3. <a href="#">BMP T5.10B: Downspout Dispersion Systems</a>	3. <a href="#">BMP T5.10C: Perforated Stub-out Connections</a>
4. <a href="#">BMP T5.10C: Perforated Stub-out Connections</a>	4. <a href="#">BMP T5.10C: Perforated Stub-out Connections</a>	
<b>Surface Type: Other Hard Surfaces</b>		
1. <a href="#">BMP T5.30: Full Dispersion</a>	1. <a href="#">BMP T5.30: Full Dispersion</a>	<a href="#">BMP T5.12: Sheet Flow Dispersion</a> or <a href="#">BMP T5.11: Concentrated Flow Dispersion</a>
2. <a href="#">BMP T5.15: Permeable Pavements</a> or <a href="#">BMP T5.14: Rain Gardens</a> or <a href="#">BMP T7.30: Bioretention</a>	2. <a href="#">BMP T5.15: Permeable Pavements</a>	
3. <a href="#">BMP T5.12: Sheet Flow Dispersion</a> or <a href="#">BMP T5.11: Concentrated Flow Dispersion</a>	3. <a href="#">BMP T7.30: Bioretention</a>	
	4. <a href="#">BMP T5.12: Sheet Flow Dispersion</a> or <a href="#">BMP T5.11: Concentrated Flow Dispersion</a>	
Notes for using the List Approach: 1. Size <a href="#">BMP T5.14: Rain Gardens</a> and <a href="#">BMP T7.30: Bioretention</a> used in the List Approach to have a minimum horizontal projected surface area below the overflow which is at least 5% of the area drain-		

**Table I-3.2: The List Approach for MR5 Compliance (continued)**

List #1 (For MR #1 - #5 Projects That Are Not Flow Control Exempt)	List #2 (For MR #1 - #9 Projects That Are Not Flow Control Exempt)	List #3 (For Flow Control Exempt Projects)
<p>ing to it.</p> <p>2. When the designer encounters <a href="#">BMP T5.15: Permeable Pavements</a> in the List Approach, it is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless <a href="#">BMP T5.30: Full Dispersion</a> is employed.</p>		

## Objective

The objective of On-Site Stormwater Management is to use practices distributed across a development that reduce the amount of disruption of the natural hydrologic characteristics of the site.

## Competing Needs Criteria

LID BMPs can be superseded or restricted where they are in conflict with:

- Requirements of the following federal or state laws, rules, and standards:
  - Historic Preservation Laws and Archaeology Laws as listed at <https://dahp.wa.gov/project-review/preservation-laws>,
  - Federal Superfund or Washington State Model Toxics Control Act,
  - Federal Aviation Administration requirements for airports,
  - Americans with Disabilities Act.
- When an LID requirement has been found to be in conflict with special zoning district design criteria adopted and being implemented pursuant to a community planning process. The existing local codes may supersede or reduce the LID requirement.
- Public health and safety standards (e.g. active zone of a skate park, bike park, or sport court where permeable pavement violates safety standards).
- Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way.
- A local Critical Area Ordinance that provides protection of tree species.
- A local code or rule adopted as part of a Wellhead Protection Program established under the Federal Safe Drinking Water Act; or adopted to protect a Critical Aquifer Recharge Area established under the State Growth Management Act.

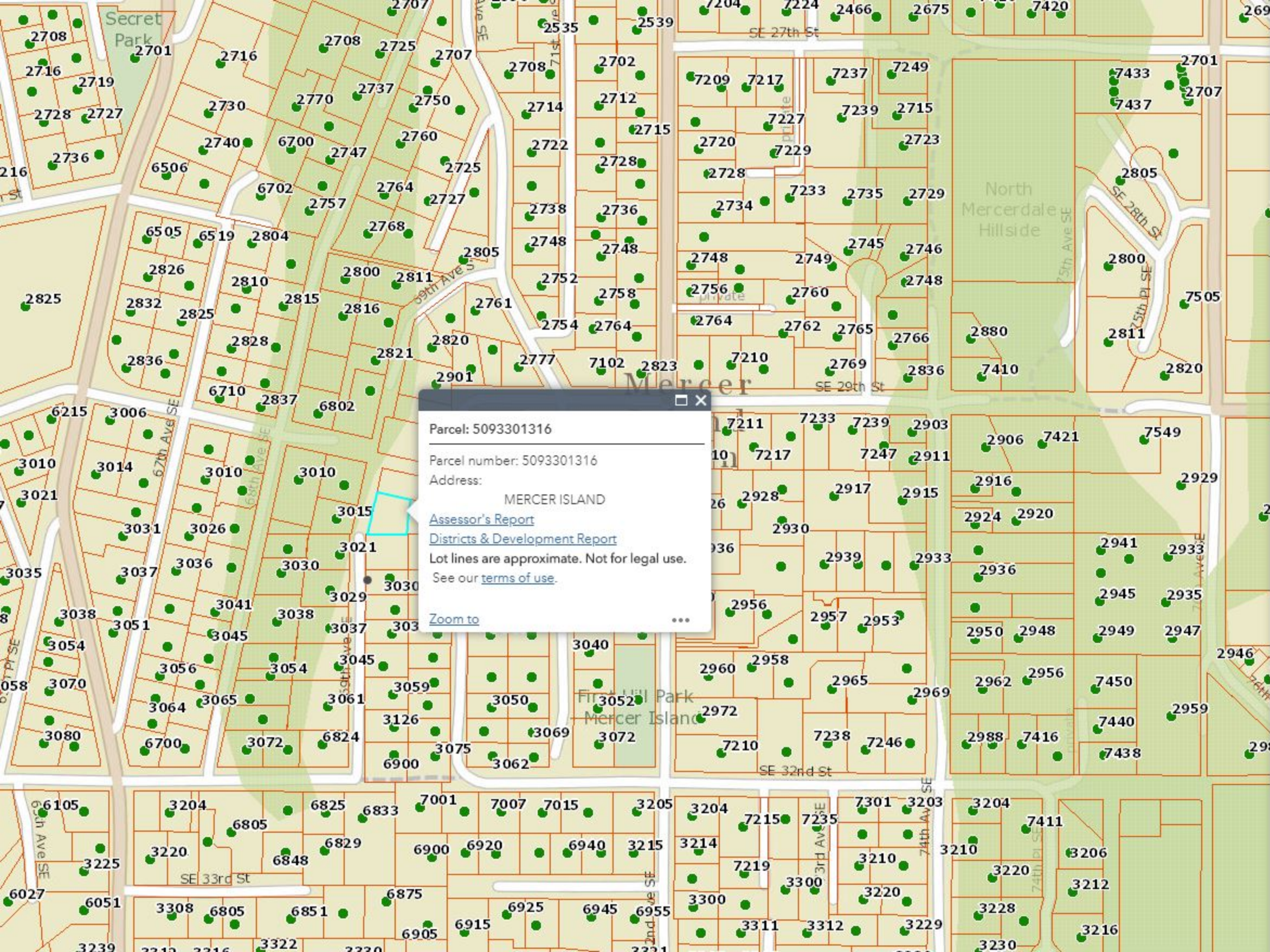
## Supplemental Guidelines

In order to meet the LID Performance Standard, designers may use any Flow Control BMP in the SWMMWW. There are no specific Flow Control BMPs that must be used to meet the LID Performance Standard.



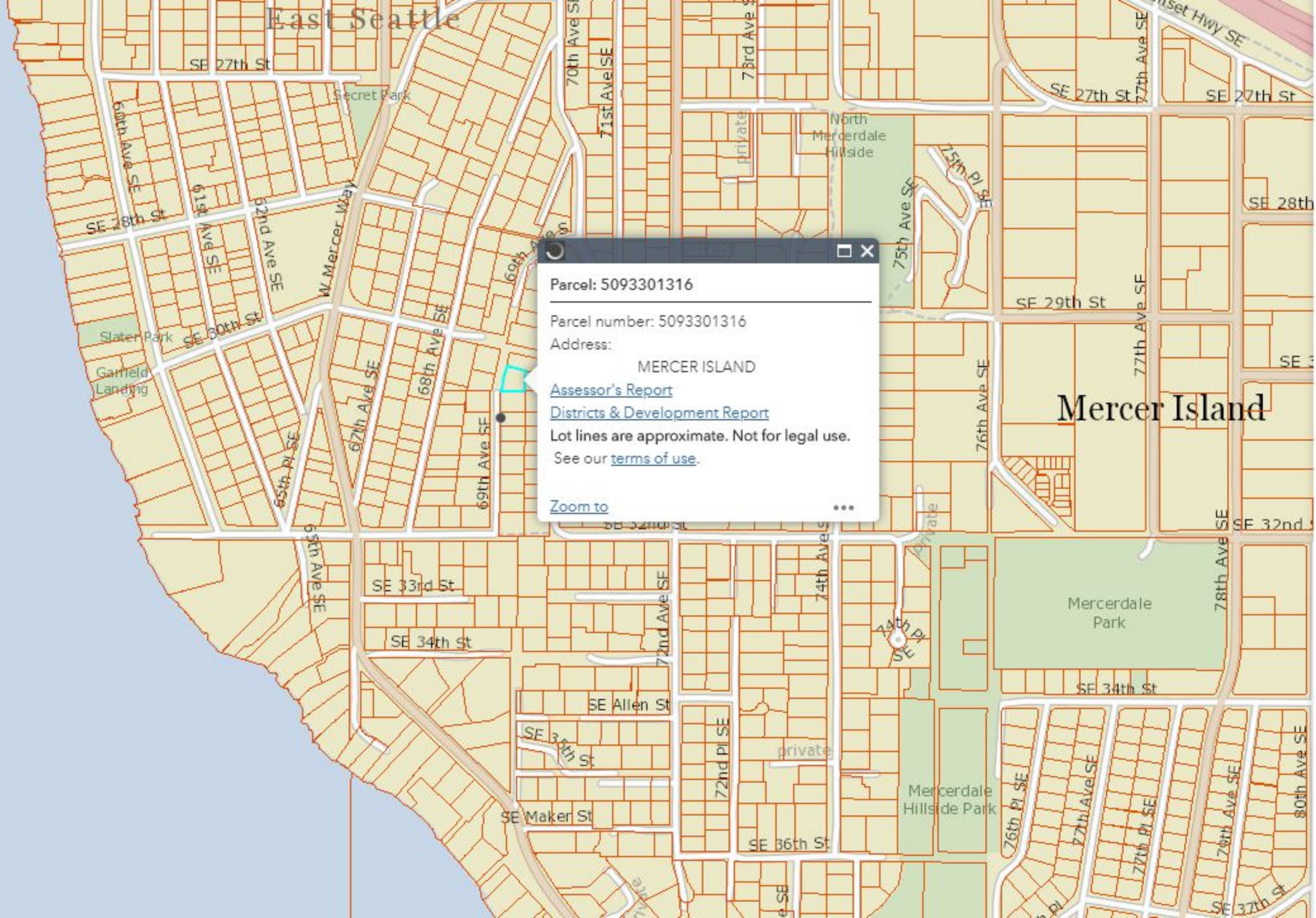
## **Appendix E**

### Sensitive Areas Map



### Layer List

- Elevation Contours ...
- Environmentally Sensitive Areas ...
- Tributary basins (2005 CAO) ...
- Potential landslide hazard areas (2016, see explanation---->) ...
- Potential landslide hazard areas 50-foot buffer (2016) ...
- Landslide hazards, incorporated KC (1990) ...
- Potential steep slope hazard areas (2016, see explanation---->) ...
- Basin condition (2005 CAO) ...
- Shoreline condition (2005 CAO) ...
- Erosion hazard (1990 SAO) ...
- Seismic hazard (1990 SAO) ...
- Coal mine hazard (1990 SAO) ...
- Stream (1990 SAO) ...
  - class 1
  - class 2 perennial
  - class 2 salmonid
  - class 3
  - ... unclassified
- Wetland (1990 SAO) ...
- Sensitive area notice on title ...
- Chinook distribution ...



Parcel: 5093301316

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Parcel number: 5093301316  
Address: MERCER ISLAND

[Assessor's Report](#)  
[Districts & Development Report](#)

Lot lines are approximate. Not for legal use.  
See our [terms of use](#).

[Zoom to](#) ...

- Administrative Areas
- Electoral Districts
- Elevation Contours
- Environmentally Sensitive Areas
- Flooding info
  - River gages
  - Flood photos
  - River facilities
  - Flood phases
  - Elevation certificates
  - Letter of Map Amendment and Revisions
  - FEMA cross-sections
  - FEMA FIRM panels
  - FEMA floodway
  - FEMA 100 year floodplain
  - FEMA 500 year floodplain
  - FEMA area with reduced risk due to levee
- Groundwater

# **Appendix F**

## Geotechnical Report