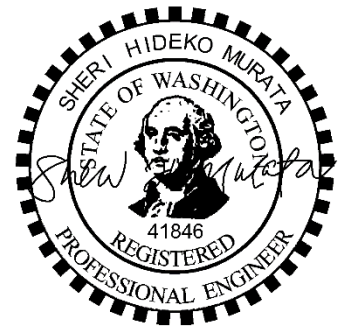


**FINAL**  
**STORM DRAINAGE REPORT**

FOR

**Granbois Property**

**CITY OF MERCER ISLAND, WASHINGTON**



3/31/23

Prepared by: Andrew Oh, E.I.T.  
Approved by: Sheri H. Murata, P.E.  
Date: March 31, 2023  
Core No.: 22293



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## SECTION 1. PROJECT OVERVIEW

The project site is located at 8440 SE 82<sup>nd</sup> Street in the city of Mercer Island. Specifically, the project is located on Section 31, Township 24, Range 5. The site is bordered by single family residential to the north, east, and west SE 82<sup>nd</sup> Street to the south. The King County tax parcel ID number is 3625600120.

Proposed development of the property will include the demolition of an existing home and construction of a new single family home, driveway, and associated utilities. The lot area is 13,806 SF (0.32 ac).

The project will be designed using the guidelines and requirements established in the 2019 Department of Ecology Stormwater Management Manual for Western Washington (2019 SWMMWW). This project will be adding less than 5,000 square feet of new pollution generating impervious surface (PGIS) so water quality treatment will not be required or proposed. See Figure 1.1 Vicinity Map below.

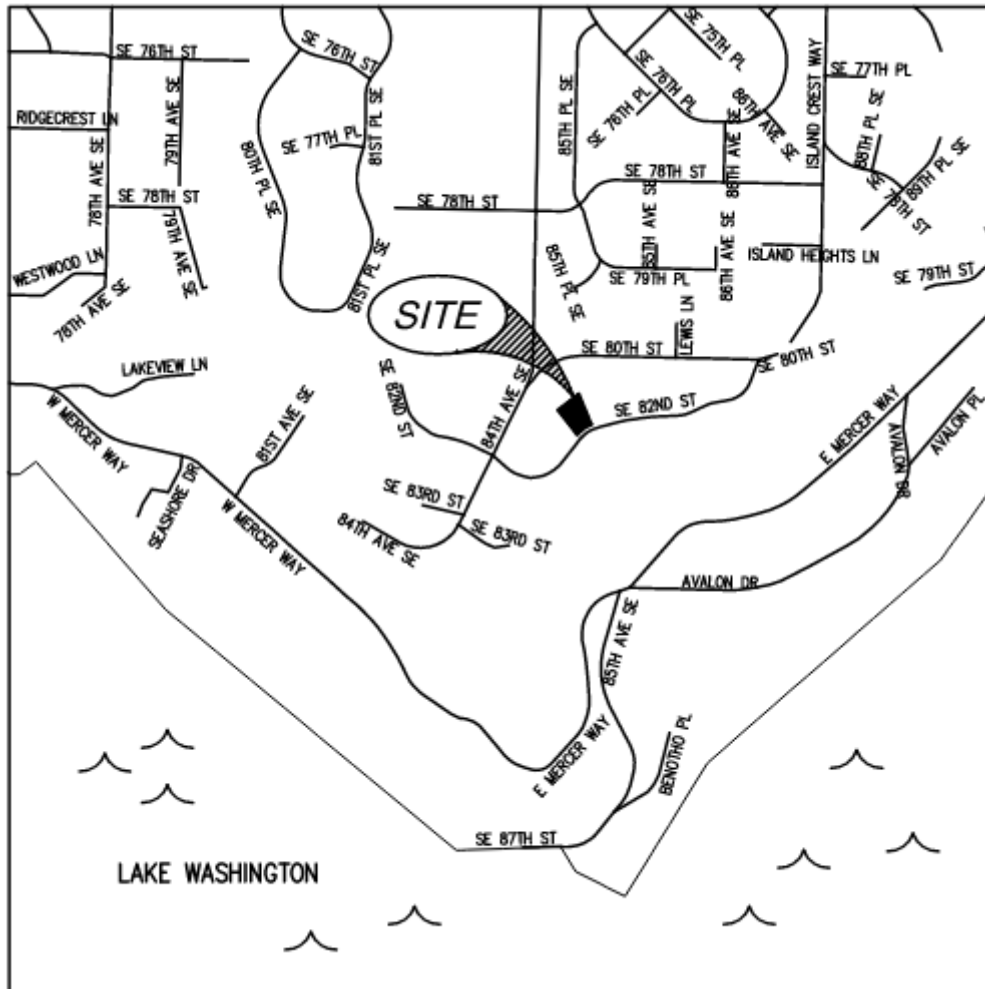


Figure 1.1: Vicinity Map

## SECTION 2. CONDITIONS AND REQUIREMENTS SUMMARY

The project site has greater than 35% of existing impervious coverage, therefore the project is classified as a redevelopment project. Per Figure 2.1 located at the end of this section, the proposed project will only have to address minimum requirements 1 through 9. The applicable minimum requirements and how the project proposes to address each are listed below.

### 2.1 Minimum Requirements

#### 2.1.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

Civil Plans submitted under separate cover and a Drainage Report herein have been prepared for the subject project.

#### 2.1.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention

A SWPPP is not applicable to the project since there is less than 1 acre of land disturbance and the project is not part of a larger common plan of development.

#### 2.1.3 Minimum Requirement #3: Source Control of Pollution

The proposed construction is not a commercial project; therefore, this requirement does not apply.

#### 2.1.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

The project will discharge to the existing conveyance system located on SE 82<sup>nd</sup> Street, maintaining the natural discharge location for the site.

#### 2.1.5 Minimum Requirements #5: On-site Stormwater Management

This project triggers minimum requirement 1 through 9 per the 2019 SWMMWW. The project elects to implement BMPs from List #2. A feasibility discussion of BMPs from list #2 can be found below.

List #2

Lawn and Landscaped areas:

- Post-Construction Soil Quality and Depth:
  - BMP T5.13 will be implemented in accordance with the 2019 SWMMWW.

Roofs:

- Full Dispersion in accordance with BMP T5.30.
  - *Response: A native vegetation flow path of at least 100 feet is required, which cannot be provided on site, so full dispersion is infeasible.*
- Downspout Full Infiltration in accordance with BMP T5.10A
  - *Response: Per the Geotechnical Evaluation performed by Geotech Consultants on February 28 2023, "We do not recommend that concentrated infiltration or dispersion of stormwater be utilized at this site." Therefore, infiltration is considered infeasible.*
- Bioretention in accordance with BMP T7.30

- *Response: Per the Geotechnical Evaluation performed by Geotech Consultants, “We do not recommend that concentrated infiltration or dispersion of stormwater be utilized at this site.” Therefore, infiltration is considered infeasible.*
- Downspout Dispersion Systems in accordance with BMP T5.10B.
  - *Response: Per the Geotechnical Evaluation performed by Geotech Consultants, “We do not recommend that concentrated infiltration or dispersion of stormwater be utilized at this site.” Therefore, dispersion is considered infeasible.*
- Perforated Stub-out Connections:
  - *Response: A perforated stub-out connection is not proposed as it will require removing additional trees.*

Other Hard Surfaces:

- Full Dispersion in accordance with BMP T5.30
  - *Response: Full dispersion requires a native vegetation flow path of at least 100 feet, which cannot be provided on site.*
- Permeable pavement in accordance with BMP T5.15 or Rain Gardens in accordance with BMP T5.14A or Bioretention in accordance with BMP T7.30
  - *Response: Infiltration BMPs have been found infeasible according to the geotechnical report.*
- Sheet Flow Dispersion in accordance with BMP T5.12
  - *Response: Dispersion has been found infeasible according to the geotechnical report due to perched groundwater.*

**Minimum Requirement #6: Runoff Treatment**

The project does not require runoff treatment. See section 4 for details.

**Minimum Requirement #7: Flow Control**

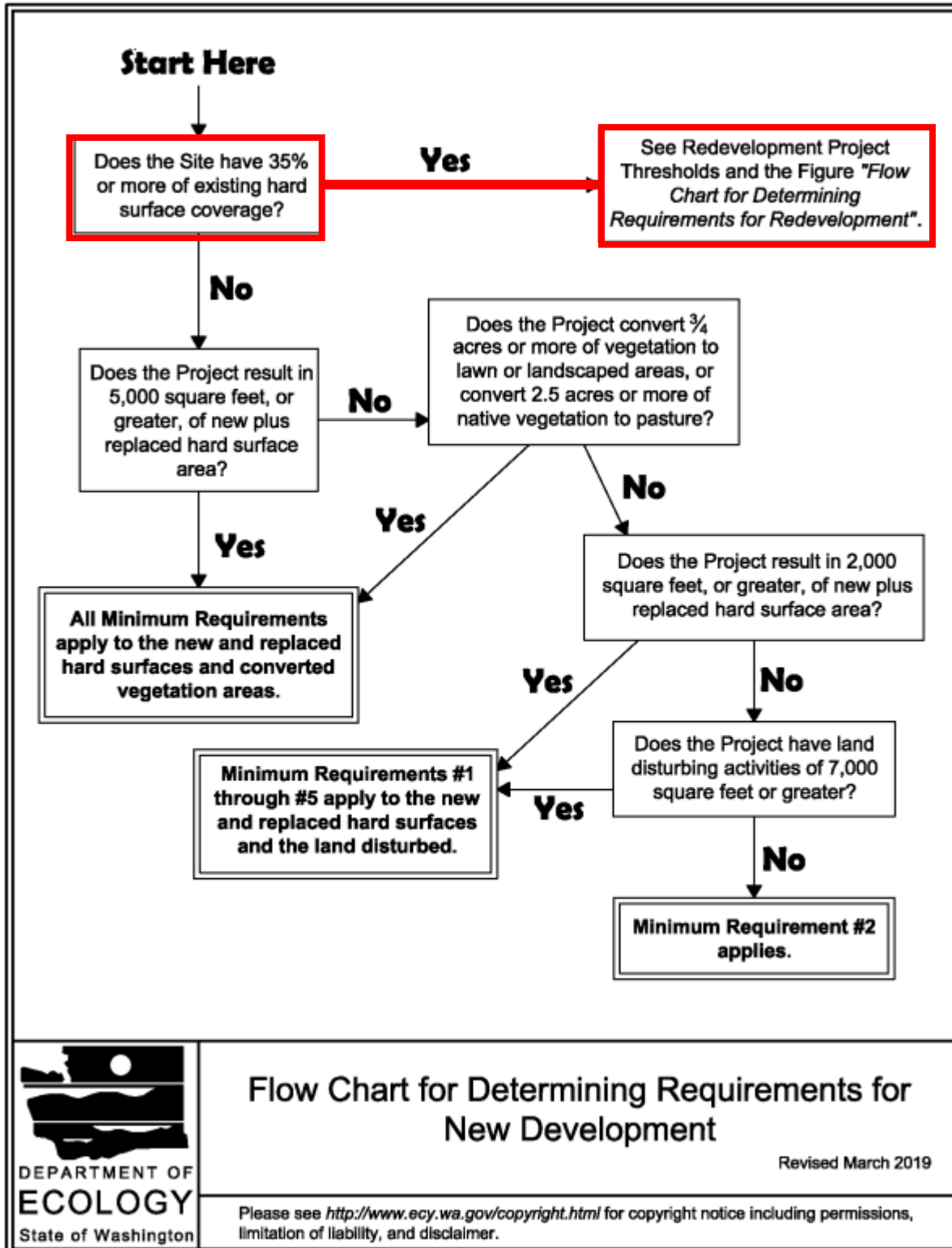
See Section 4 for details.

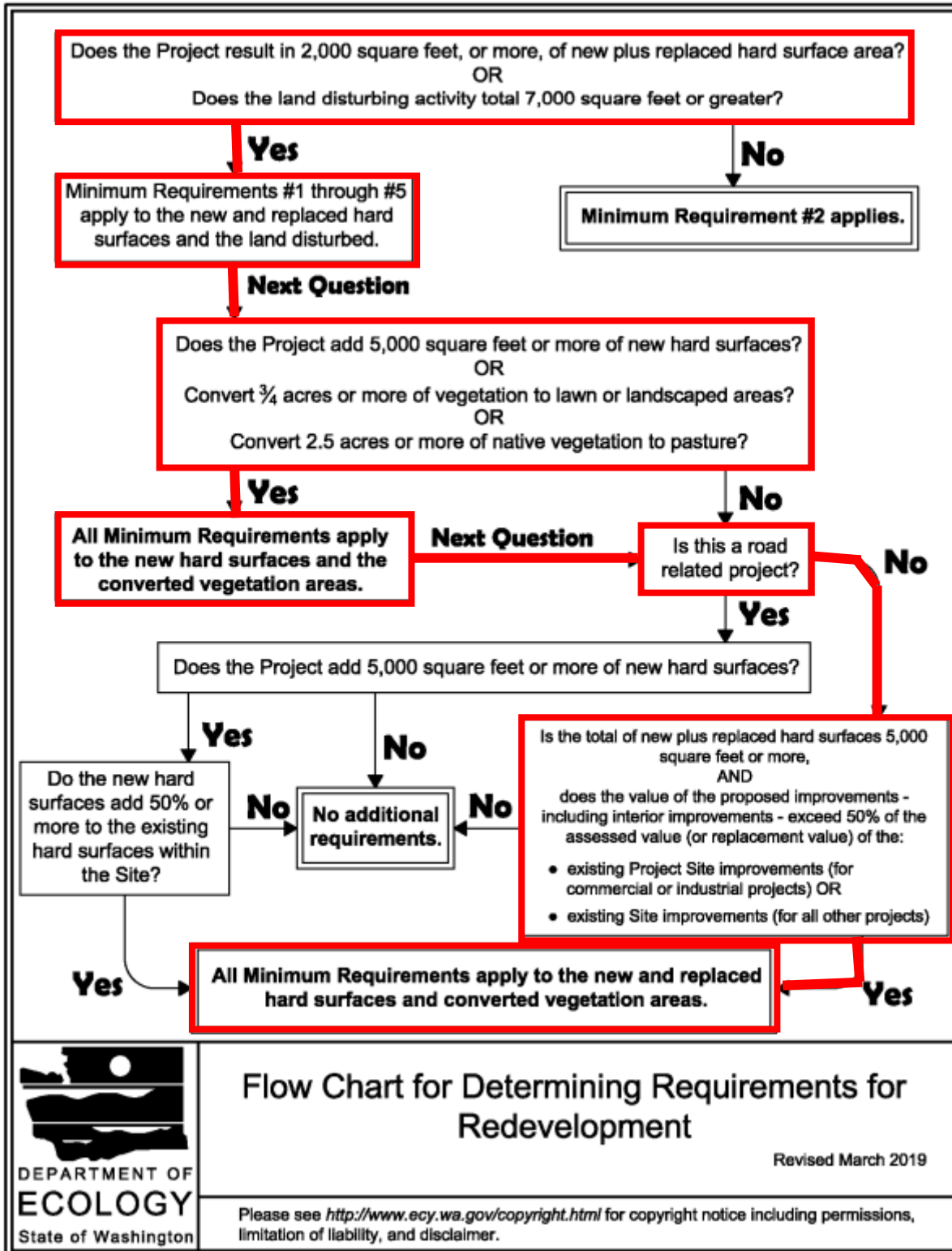
**Minimum Requirement #8: Wetlands Protection**

This requirement only applies to projects that discharge into a wetland. As there are no wetlands located on site or off site in proximity to the project, no additional protection measures are required.

**Minimum Requirement #9: Operation and Maintenance**

A Stormwater Management Facility Operation and Maintenance Manual is provided in Section 8.





## Flow Chart for Determining Requirements for Redevelopment

Revised March 2019

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## **SECTION 3. OFFSITE ANALYSIS**

### **Summary**

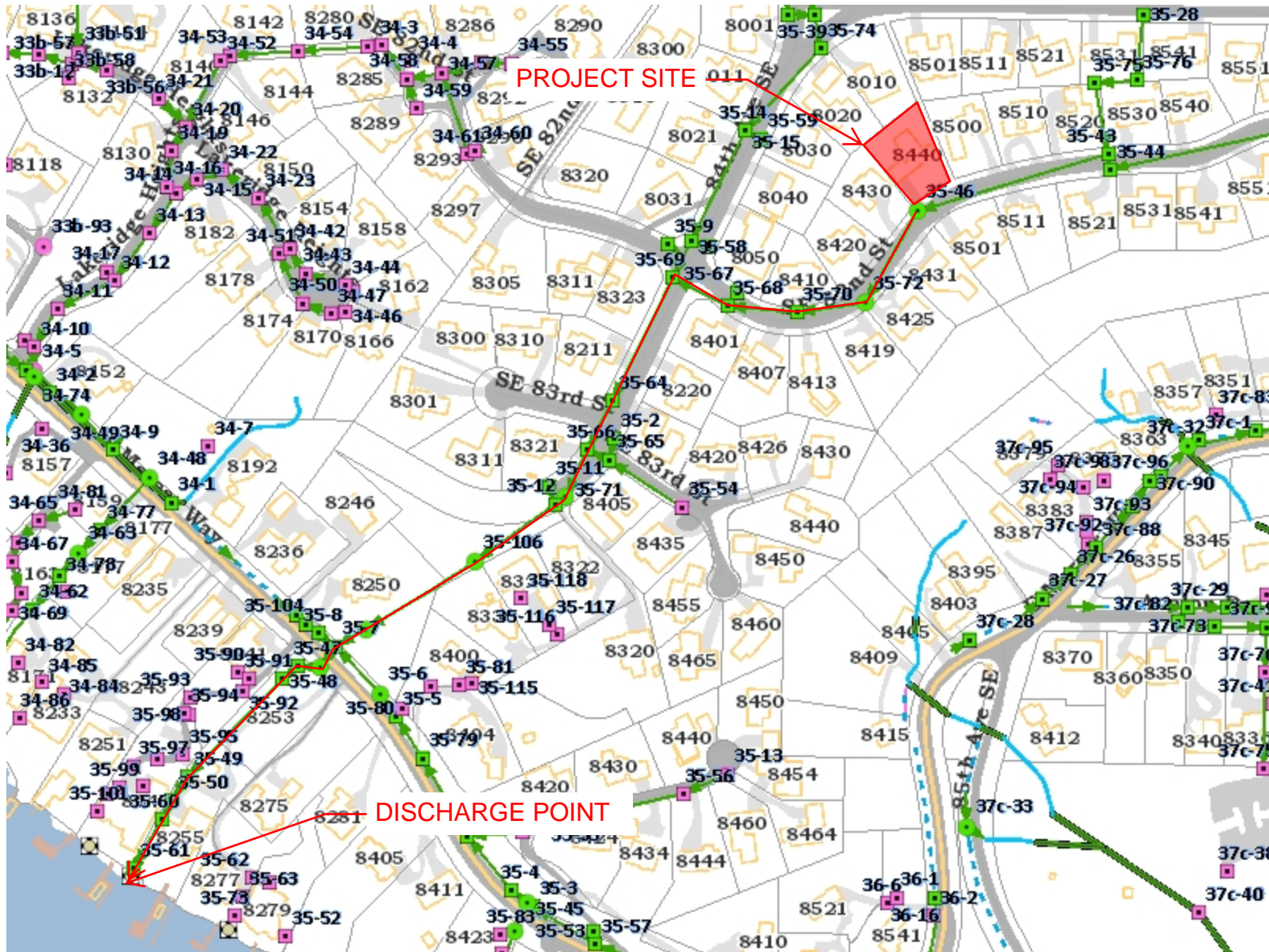
King County iMap was used to verify that the project site is not within a floodplain and that no drainage complaints have been filed along the downstream path. The City of Mercer Island maps for erosion and landslide hazard areas were consulted, and the project is not located within an area of known or suspect to both erosion and landslides. A geotechnical report was consulted for site specific analysis. The site is not located in a landslide hazard area. All resources reviewed can be found in Appendix A.

### **Field Investigation**

The site contains a single-family residence and the rest of the site is covered in grass with scattered trees. Currently, stormwater sheet flows to the south, towards SE 82<sup>nd</sup> Street. Stormwater runoff leaves the site along the south property line and into the flow line along SE 82<sup>nd</sup> Street flowing west. No existing or potential drainage issues were observed on site or along the downstream drainage path. Refer to the drainage description below.

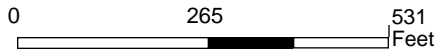
### **Drainage System Description**

The project site consistently drains from north to south. All downstream runoff sheet flows southeast towards SE 82<sup>nd</sup> Street. An existing conveyance system collects all flow at a catch basin located just at the southwest corner of the site. The runoff enters this catch basin and flows west through the existing conveyance system along SE 82<sup>nd</sup> Street. At this point, the conveyance system flows southwest along 84<sup>th</sup> Avenue SE until it discharges into Lake Washington.



### Legend

- Storm Catch Basin**
  - CB, City Owned
  - CB, Private
  - CB, Unknown
  - Type 2, City Owned
  - Type 2, Private
  - Type 2, Unknown
- Storm Main**
  - Pipe
  - Open Watercourse
  - Piped Watercourse
  - - - Ditch
  - - - Culvert
  - - - Other
- Storm Main - Private
- ⊠ Storm Discharge Point
- Address
- Building
- Property Line
- Docks
- Freeway
- Major Street
- Street
- Paved Driveway
- Paved Road
- Paved Parking Area
- Parks
- Lake Washington



1 inch =  
530.787262166667  
feet



Disclaimer: These maps were developed by the City of Mercer Island and are intended to be a general purpose digital reference tool. These maps are not an accepted legal instrument for describing, establishing, recording or maintaining descriptions for property concerns or boundaries. The City makes no representation or warranty with respect to the accuracy or currency of these data sets, especially in regard to labeling of surveyed dimensions, or agreement with official sources such as records of survey, or mapped locations of features.

### Notes

## SECTION 4. FLOW CONTROL AND WATER QUALITY DESIGN

### 4.1 Existing Conditions

The existing site is developed with an existing house, detached garage, and driveway. The pervious area consists of vegetation and trees scattered along the site. The existing areas are summarized below:

**Table 4.1 – Existing Conditions**

| Surface Type            | Area - SF (Acres)    |
|-------------------------|----------------------|
| <b>Total Lot</b>        | <b>13,806 (0.32)</b> |
| <b>Impervious</b>       | <b>5,233 (0.12)</b>  |
| Roof                    | <b>3,469 (0.08)</b>  |
| Uncovered Patio/Walkway | <b>923 (0.02)</b>    |
| Driveway                | <b>841 (0.02)</b>    |
| <b>Pervious</b>         | <b>8,573 (0.20)</b>  |

### 4.2 Developed Conditions

The proposed project will consist of constructing a new single-family residence, associated driveway, walkways, and landscaping. See table 4.2 for a summary of the proposed areas as part of the project.

**Table 4.2 – Developed Conditions**

| Surface Type                       | Area - SF (Acres)    |
|------------------------------------|----------------------|
| <b>Total Lot</b>                   | <b>13,806 (0.32)</b> |
| <b>Impervious</b>                  | <b>5,260 (0.12)</b>  |
| Roof                               | 4,122 (0.09)         |
| Uncovered Patios/Walkways/Driveway | 1,138 (0.03)         |
| <b>Pervious (Landscape)</b>        | <b>8,546 (0.20)</b>  |

From Table 4.2, there will be greater than 2,000 SF of new plus replaced hard surface area and all BMPs for hard surfaces are determined to be infeasible. Therefore, the proposed project requires on-site detention.

### 4.3 Flow Control

Using the predeveloped and developed areas above, the project site was modeled in WWHM. The runoff generated based on both conditions is summarized below:

| Flow Frequency |              |           |
|----------------|--------------|-----------|
| Flow (cfs)     | Predeveloped | Mitigated |
| 2 Year =       | 0.0645       | 0.0503    |
| 5 Year =       | 0.0893       | 0.0656    |
| 10 Year =      | 0.1074       | 0.0765    |
| 25 Year =      | 0.1322       | 0.0910    |
| 50 Year =      | 0.1522       | 0.1025    |
| 100 Year =     | 0.1734       | 0.1146    |

The developed 100-year peak flow is 0.1146 cfs and the pre-developed 100-year peak flow is 0.1734 cfs, therefore the developed flow rate is less than the existing conditions of 0.1734 cfs which is less than 0.15 cfs for 15-minute time step and under the threshold requiring flow control.

### 4.4 Detention Facility Sizing

The project proposes greater than 5,000 square feet of impervious surface, but is exempt from the flow control requirement per Section 4.3 above. According to the City of Mercer Island’s Stormwater Management Standards the project must propose on-site detention to attenuate flows rather than meet flow control standards.

The City of Mercer Island also provides their own guidance for the on-site detention requirement. The following list is used to determine if on-site detention is required:

**On-site detention is required if the project:**

- Results in 2,000 sf, or greater, of new plus replaced hard surface area, or
- Has a land disturbing activity of 7,000 sf or greater, or
- Results in a net increase of impervious surface of 500 sf or greater.

**AND**

- All of the on-site stormwater BMPs included on list #1 and #2 are determined to be infeasible for roofs and/or other hard surfaces, and
- Drainage from the site will be discharged to a storm and surface water system that includes a watercourse or there is a capacity constraint in the system.

The detention tank was sized according to the City of Mercer Island’s Stormwater Management Standards. Due to the site having an impervious area between 5,001 and 6,000 square feet, the tank has a diameter 60-inches and a length of 37 feet. Also, the low orifice diameter was sized to be 0.5 inches, the distance between the outlet invert and second orifice was 3.6 feet with a 1.4-inch diameter for the second orifice. The detention tank sizing worksheet is included at the end of this section.

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# CITY OF MERCER ISLAND

## DEVELOPMENT SERVICES GROUP

9611 SE 36TH STREET | MERCER ISLAND, WA 98040

PHONE: 206.275.7605 | [www.mercergov.org](http://www.mercergov.org)

Inspection Requests: Online: [www.MyBuildingPermits.com](http://www.MyBuildingPermits.com) VM: 206.275.7730

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## ON-SITE DETENTION DESIGN REQUIREMENTS

### General Requirements

This guidance applies only to projects that meet the thresholds specified below in “Is On-site Detention Required for My Project?” if all of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces.

### Is On-site Detention Required For My Project?

**YES**, if my project:

- 1) Results in 2,000 square feet, or greater, of new plus replaced hard surface area, or
- 2) Has a land disturbing activity or 7,000 square feet or greater, or
- 3) Results in a **net increase** of impervious surface of 500 square feet or greater.

AND

- 1) All of the on-site stormwater BMPs included on List #1 and List #2 are determined to be infeasible for roofs and/or other hard surfaces, and
- 2) Drainage from the site will be discharged to a storm and surface water system that includes a watercourse or there is a capacity constraint in the system.

**NO**, if my project:

- 1) Results in less than 2,000 square feet of new plus replaced hard surface area, and
- 2) Has a land disturbing activity less than 7,000 square feet, and
- 3) Results in a **net increase of less than 500 square feet** of impervious surface area.
- 4) The project discharges **directly** to Lake Washington, or findings from a ¼-mile downstream analysis confirm that the downstream system is free of capacity constraints.

### Designing Your On-Site Detention System

All on-site detention system designs must be prepared by a professional engineer registered in the State of Washington. The Standard On-site Detention System worksheet (Attachment 1) must be submitted on 18” x 24” (minimum) size sheets.

**Construction that results in 500 to 9,500 square feet of new plus replaced impervious surfaces:**

Size system according to Table 1. The configuration of the on-site detention system shall be as shown on Attachment 1 (Standard On-Site Detention Systems Worksheet) or as specifically designed by the engineer for the site.

**Note:**

- The applicant may pay a fee-in-lieu-of constructing an on-site detention system when allowed by the City Engineer. The fee will not be an option when in the opinion of the City Engineer, undetained runoff from the development may adversely exacerbate an existing problem (MICC 15.11) or if flow control is required by Minimum Requirement #7.
- **Construction that results in more than 9,500 square feet of new plus replaced impervious surfaces and/or exceeds a 100-year flow frequency of 0.15 cubic feet per second (for moderate and steep sloped sites greater than a 5% slope):** Size system according to Minimum Requirement #7 (Flow Control) in the Stormwater Management Manual for Western Washington (Ecology 2014).

**Table 1**

ON-SITE DETENTION DESIGN FOR PROJECTS BETWEEN 500 SF AND 9,500 SF NEW PLUS REPLACED IMPERVIOUS SURFACE AREA

| New and Replaced Impervious Surface Area (sf) | Detention Pipe Diameter (in) | Detention Pipe Length (ft) |         | Lowest Orifice Diameter (in) <sup>(3)</sup> |         | Distance from Outlet Invert to Second Orifice (ft) |         | Second Orifice Diameter (in) |         |
|---|------------------------------|----------------------------|---------|---|---------|--|---------|------------------------------|---------|
|   |                              | B soils                    | C soils | B soils                                     | C soils | B soils  | C soils | B soils                      | C soils |
| 500 to 1,000 sf                               | 36"                          | 30                         | 22      | 0.5   | 0.5     | 2.2  | 2.0     | 0.5                          | 0.8     |
|   | 48"                          | 18                         | 11      | 0.5   | 0.5     | 3.3  | 3.2     | 0.9                          | 0.8     |
|   | 60"                          | 11                         | 7       | 0.5   | 0.5     | 4.2  | 3.4     | 0.5                          | 0.6     |
| 1,001 to 2,000 sf                             | 36"                          | 66                         | 43      | 0.5   | 0.5     | 2.2  | 2.3     | 0.9                          | 1.4     |
|   | 48"                          | 34                         | 23      | 0.5   | 0.5     | 3.2  | 3.3     | 0.9                          | 1.2     |
|   | 60"                          | 22                         | 14      | 0.5   | 0.5     | 4.3  | 3.6     | 0.9                          | 0.9     |
| 2,001 to 3,000 sf                             | 36"                          | 90                         | 66      | 0.5   | 0.5     | 2.2  | 2.4     | 0.9                          | 1.9     |
|   | 48"                          | 48                         | 36      | 0.5   | 0.5     | 3.1  | 2.8     | 0.9                          | 1.5     |
|   | 60"                          | 30                         | 20      | 0.5   | 0.5     | 4.2  | 3.7     | 0.9                          | 1.1     |
| 3,001 to 4,000 sf                             | 36"                          | 120                        | 78      | 0.5   | 0.5     | 2.4  | 2.2     | 1.4                          | 1.6     |
|   | 48"                          | 62                         | 42      | 0.5   | 0.5     | 2.8  | 2.9     | 0.8                          | 1.3     |
|   | 60"                          | 42                         | 26      | 0.5   | 0.5     | 3.8  | 3.9     | 0.9                          | 1.3     |
| 4,001 to 5,000 sf                             | 36"                          | 134                        | 91      | 0.5   | 0.5     | 2.8  | 2.2     | 1.7                          | 1.5     |
|   | 48"                          | 73                         | 49      | 0.5   | 0.5     | 3.6  | 2.9     | 1.6                          | 1.5     |
|   | 60"                          | 46                         | 31      | 0.5   | 0.5     | 4.6  | 3.5     | 1.6                          | 1.3     |
| 5,001 to 6,000 sf                             | 36"                          | 162                        | 109     | 0.5   | 0.5     | 2.7  | 2.2     | 1.8                          | 1.6     |
|   | 48"                          | 90                         | 59      | 0.5   | 0.5     | 3.5  | 2.9     | 1.7                          | 1.5     |
|   | 60"                          | 54                         | 37      | 0.5   | 0.5     | 4.6  | 3.6     | 1.6                          | 1.4     |
| 6,001 to 7,000 sf                             | 36"                          | 192                        | 128     | 0.5   | 0.5     | 2.7  | 2.2     | 1.9                          | 1.8     |
|   | 48"                          | 102                        | 68      | 0.5   | 0.5     | 3.7  | 2.9     | 1.9                          | 1.6     |
|   | 60"                          | 64                         | 43      | 0.5   | 0.5     | 4.6  | 3.6     | 1.8                          | 1.5     |
| 7,001 to 8,000 sf                             | 36"                          | 216                        | 146     | 0.5   | 0.5     | 2.8  | 2.2     | 2.0                          | 1.9     |
|   | 48"                          | 119                        | 79      | 0.5   | 0.5     | 3.8  | 2.9     | 2.2                          | 1.7     |
|   | 60"                          | 73                         | 49      | 0.5   | 0.5     | 4.5  | 3.6     | 2.0                          | 1.6     |
| 8,001 to 8,500 sf <sup>(1)</sup>              | 36"                          | 228                        | 155     | 0.5   | 0.5     | 2.8  | 2.2     | 2.1                          | 1.9     |
|   | 48"                          | 124                        | 84      | 0.5   | 0.5     | 3.7  | 2.9     | 1.9                          | 1.8     |
|   | 60"                          | 77                         | 53      | 0.5   | 0.5     | 4.6  | 3.6     | 2.0                          | 1.6     |
| 8,501 to 9,000 sf                             | 36"                          | NA <sup>(1)</sup>          | 164     | 0.5   | 0.5     | NA <sup>(1)</sup>                                  | 2.2     | NA <sup>(1)</sup>            | 1.9     |
|   | 48"                          | NA <sup>(1)</sup>          | 89      | 0.5   | 0.5     | NA <sup>(1)</sup>                                  | 2.9     | NA <sup>(1)</sup>            | 1.9     |
|   | 60"                          | NA <sup>(1)</sup>          | 55      | 0.5   | 0.5     | NA <sup>(1)</sup>                                  | 3.6     | NA <sup>(1)</sup>            | 1.7     |
| 9,001 to 9,500 sf <sup>(2)</sup>              | 36"                          | NA <sup>(1)</sup>          | 174     | 0.5   | 0.5     | NA <sup>(1)</sup>                                  | 2.2     | NA <sup>(1)</sup>            | 2.1     |
|   | 48"                          | NA <sup>(1)</sup>          | 94      | 0.5   | 0.5     | NA <sup>(1)</sup>                                  | 2.9     | NA <sup>(1)</sup>            | 2.0     |
|   | 60"                          | NA <sup>(1)</sup>          | 58      | 0.5   | 0.5     | NA <sup>(1)</sup>                                  | 3.7     | NA <sup>(1)</sup>            | 1.7     |

**Notes:**

▪ Minimum Requirement #7 (Flow Control) is required when the 100-year flow frequency causes a 0.15 cubic feet per second increase (when modeled in WWHM with a 15-minute timestep). Breakpoints shown in this table are based on a flat slope (0-5%). The 100-year flow frequency will need to be evaluated on a site-specific basis for projects on moderate (5-15%) or steep (> 15%) slopes.

- Soil type to be determined by geotechnical analysis or soil map.
- Sizing includes a Volume Correction Factor of 120%.
- Upper bound contributing area used for sizing.

<sup>(1)</sup> On Type B soils, new plus replaced impervious surface areas exceeding 8,500 sf trigger Minimum Requirement #7 (Flow Control)

<sup>(2)</sup> On Type C soils, new plus replaced impervious surface areas exceeding 9,500 sf trigger Minimum Requirement #7 (Flow Control)

<sup>(3)</sup> Minimum orifice diameter = 0.5 inches

in = inch

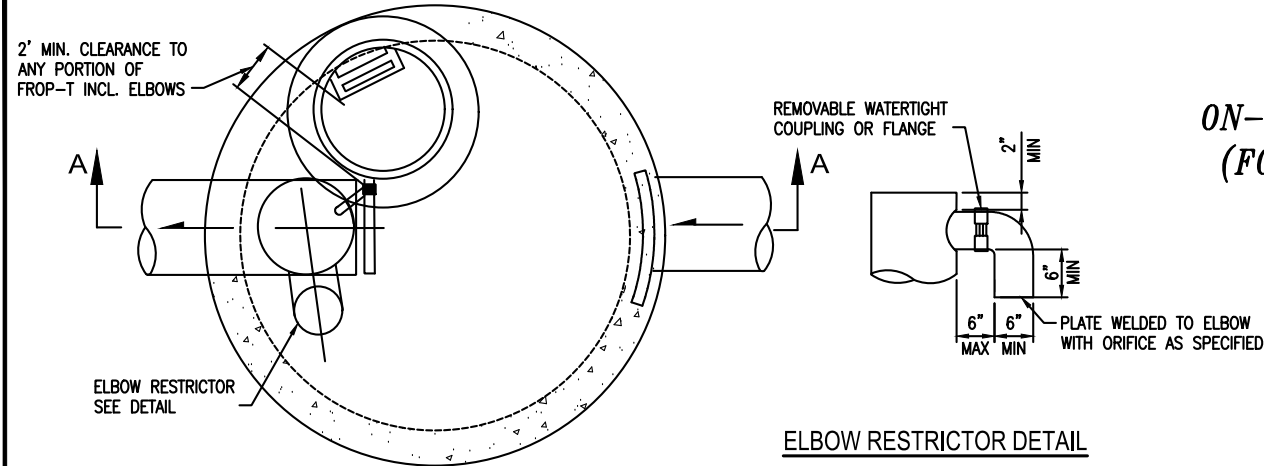
ft = feet

sf = square feet

**Basis of Sizing Assumptions:**

Sized per MR#5 in the Stormwater Management Manual for Puget Sound Basin (1992 Ecology Manual)  
 SBUH, Type 1A, 24-hour hydrograph  
 2-year, 24-hour storm = 2 in; 10-year, 24-hour storm = 3 in; 100-year, 24-hour storm = 4 in  
 Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)  
 Developed = impervious (CN = 98)  
 0.5 foot of sediment storage in detention pipe  
 Overland slope = 5%

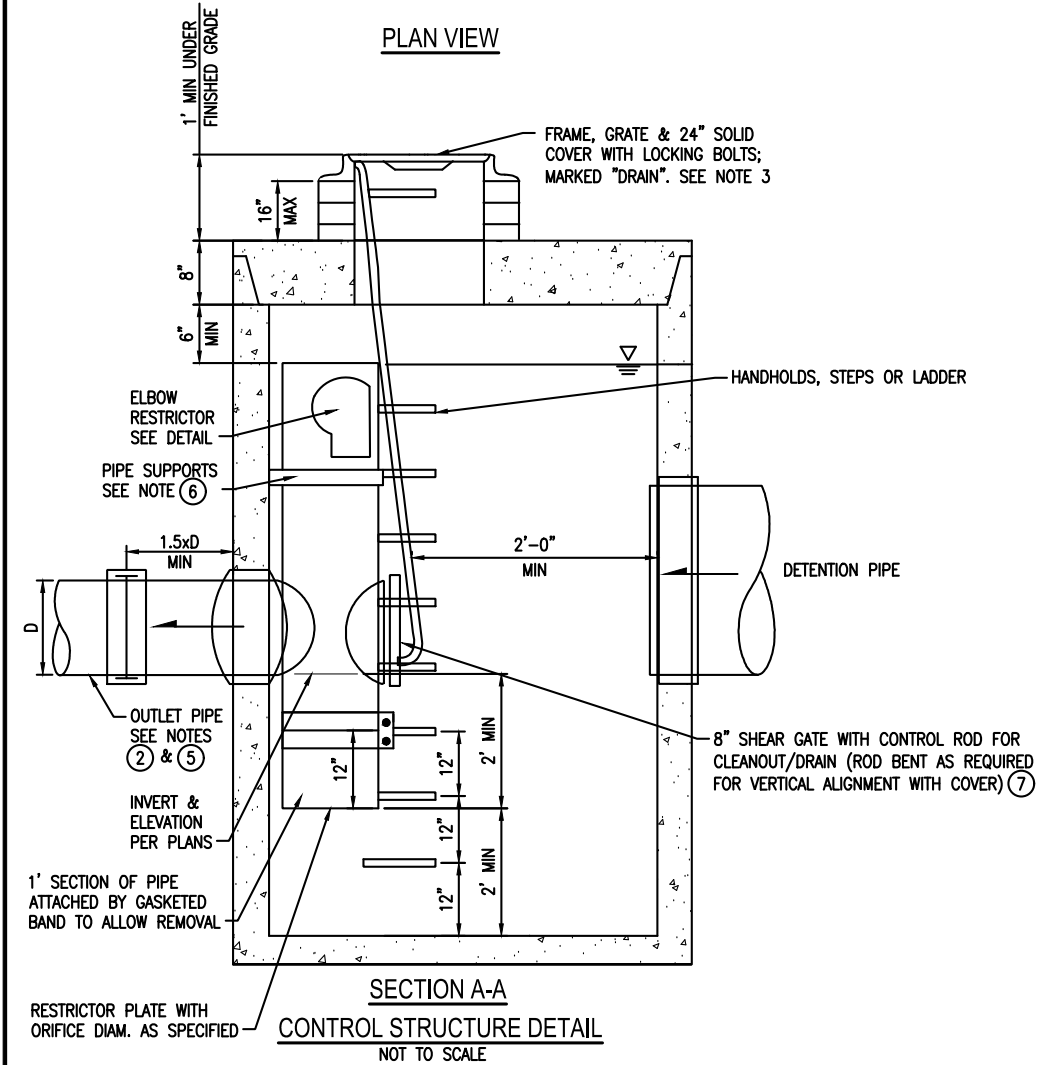
**ATTACHMENT 1**  
**CITY OF MERCER ISLAND**  
**ON-SITE DETENTION SYSTEM WORKSHEET**  
**(FOR NEW PLUS REPLACED IMPERVIOUS**  
**AREA OF 9,500 SF OR LESS)**



PLAN VIEW

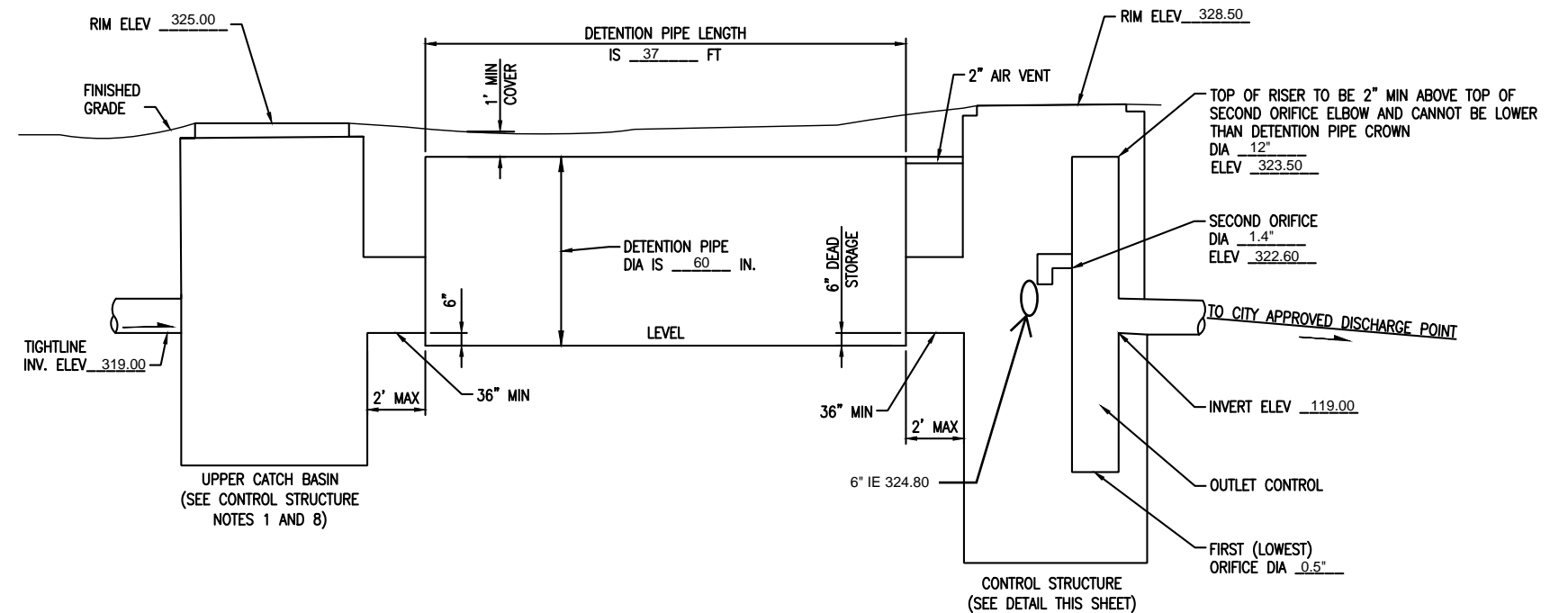
ELBOW RESTRICTOR DETAIL

|  |   |                                       |
|--|---|---------------------------------------|
| OWNER: ANDREW AND TRACI GRANDBOIS                        | ADDRESS: 8440 SE 82ND STREET<br>MERCER ISLAND, WA 98040 | PREPARED BY: SHERI MURATA, P.E.       |
| PERMIT #:  |   | PHONE: 425-885-7877                   |
|  |   | DATE: 3/31/23                         |
| NEW PLUS REPLACED IMPERVIOUS SURFACE AREA (SF): 5,260 SF | DETENTION PIPE DIA (INCH): 60                           | DETENTION PIPE LENGTH (FT): 37        |
| SOIL TYPE: C   | PIPE MATERIAL: CMP                                      | ORIFICE #1 DIA 0.5" INCH, ELEV 317.00 |
|  |   | ORIFICE #2 DIA 1.4" INCH, ELEV 322.60 |



SECTION A-A

CONTROL STRUCTURE DETAIL  
NOT TO SCALE



ON-SITE DETENTION SYSTEM  
NOT TO SCALE (ENGINEER TO FILL IN BLANKS)

**CONTROL STRUCTURE NOTES:**

- ① USE A MINIMUM OF A 54 IN. DIAM. TYPE 2 CATCH BASIN. THE ACTUAL SIZE IS DEPENDENT ON CONNECTING PIPE MATERIAL AND DIAMETER.
- ② OUTLET PIPE: MIN. 6 INCH.
- ③ METAL PARTS: CORROSION RESISTANT. NON-GALVANIZED PARTS PREFERRED. GALVANIZED PIPE PARTS TO HAVE ASPHALT TREATMENT 1.
- ④ FRAME AND LADDER OR STEPS OFFSET SO:
  - A. CLEANOUT GATE IS VISIBLE FROM TOP;
  - B. CLIMB-DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE;
  - C. FRAME IS CLEAR OF CURB.
- ⑤ IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE, OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS 1/4 IN.

- ⑥ PROVIDE AT LEAST ONE 3 X 0.090 GAUGE SUPPORT BRACKET ANCHORED TO CONCRETE WALL WITH 5/8 IN. STAINLESS STEEL EXPANSION BOLTS OR EMBEDDED SUPPORTS 2 IN. INTO CATCH BASIN WALL (MAXIMUM 3'-0" VERTICAL SPACING).
- ⑦ THE SHEAR GATE SHALL BE MADE OF ALUMINUM ALLOY IN ACCORDANCE WITH ASTM B 26M AND ASTM B 275, DESIGNATION ZG32A; OR CAST IRON IN ACCORDANCE WITH ASTM A 48, CLASS 30B. THE LIFT HANDLE SHALL BE MADE OF A SIMILAR METAL TO THE GATE (TO PREVENT GALVANIC CORROSION), IT MAY BE OF SOLID ROD OR HOLLOW TUBING, WITH ADJUSTABLE HOOK AS REQUIRED. A NEOPRENE RUBBER GASKET IS REQUIRED BETWEEN THE RISER MOUNTING FLANGE AND THE GATE FLANGE. INSTALL THE GATE SO THAT THE LEVEL-LINE MARK IS LEVEL WHEN THE GATE IS CLOSED. THE MATING SURFACES OF THE LID AND THE BODY SHALL BE MACHINED FOR PROPER FIT. ALL SHEAR GATE BOLTS SHALL BE STAINLESS STEEL.
- ⑧ THE UPPER CATCH BASIN IS REQUIRED IF THE LENGTH OF THE DETENTION PIPE IS GREATER THAN 50 FT.

**ON-SITE DETENTION SYSTEM NOTES:**

1. CALL DEVELOPMENT SERVICES (206-275-7605) 24 HOURS IN ADVANCE FOR A DETENTION SYSTEM INSPECTION BEFORE BACKFILLING AND FOR FINAL INSPECTIONS.
2. RESPONSIBILITY FOR OPERATION AND MAINTANANCE OF DRAINAGE SYSTEMS ON PRIVATE PROPERTY IS RESPONSIBILITY OF THE PROPERTY OWNER. MATERIAL ACCUMULATED IN THE STORAGE PIPE MUST BE REMOVED FROM CATCH BASINS TO ALLOW PROPER OPERATION. THE OUTLET CONTROL ORIFICE MUST BE KEPT OPEN AT ALL TIMES.
3. PIPE MATERIAL, JOINT, AND PROTECTIVE TREATMENT SHALL BE IN ACCORDANCE WITH SECTION 7.04 AND 9.05 OF THE WSDOT STANDARD SPECIFICATION FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, LATEST VERSION. SUCH MATERIALS INCLUDE THE FOLLOWING, LINED CORRUGATED POLYETHYLENE PIPE (LCPE), ALUMINIZED TYPE 2 CORRUGATED STEEL PIPE AND PIPE ARCH (MEETS AASHTO DESIGNATIONS M274 AND M36), CORRUGATED OR SPIRAL RIB ALUMINUM PIPE, OR REINFORCED CONCRETE PIPE. CORRUGATED STEEL PIPE IS NOT ALLOWED.
4. FOOTING DRAINS SHALL NOT BE CONNECTED TO THE DETENTION SYSTEM.

#### **4.5 Water Quality Exemption**

The project proposes less than 5,000 square feet of pollution-generating impervious surface with a total of 955 SF. Therefore, the project is exempt from providing a water quality treatment facility.



## SECTION 5. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

A conveyance system will be constructed as part of the project to discharge stormwater runoff from the site to the downstream connection point. Manning's equation is used to determine the size of the conveyance pipes.

Using Manning's equation:

$$Q = \frac{k}{n} A R_h^{2/3} S_0^{1/2}$$

Where:

Q = Flowrate (cfs)

V = Velocity (ft/s)

k = 1.49 (BG units)

n = Manning's Coefficient (0.012)

R<sub>h</sub> = Hydraulic Radius

A = Flow Area (sf)

S<sub>0</sub> = Longitudinal Slope (ft/ft)

Using Manning's equation, a 6" pipe at a minimum slope of 0.5% can convey a flowrate of 0.43 cfs. The 100-year flowrate for the developed site is 0.11 cfs, therefore the pipe is sized sufficiently.

## **SECTION 6. SPECIAL REPORTS AND STUDIES**

**The following reports and assessments are provided for reference, under separate cover and for informational purposes only. Core Design takes no responsibility or liability for these reports, assessments, or designs as they were not completed under the direct supervision of Core Design.**

- Geotechnical Engineering Report (Provided under separate cover)
  - February 28, 2023
  - Prepared for:  
Granbois Property
  - Prepared by:  
Geotech Consultants  
2401 10<sup>th</sup> Avenue E  
Seattle, WA 98102

## **SECTION 7. OTHER PERMITS**

There are no other permits required at this time.

## **SECTION 8. CSWPPP ANALYSIS AND DESIGN**

A TESC plan has been prepared and submitted with the civil plans.

The site will utilize Volume II of the 2019 SMMWW for the erosion and sedimentation control design to reduce the discharge of sediment-laden runoff from the site. Clearing limits will be established prior to any earthwork on the project site. Perimeter protection will be provided by silt fencing along the downstream perimeter of the disturbed areas to limit the downstream transport of sediment to streams, wetlands and neighboring properties.

Dust control, if required, will be provided by a water truck. A Certified Erosion and Sediment Control Lead inspector will be present onsite during earthwork activities. The inspector shall determine frequency of watering of the project site and will authorize and direct any additional erosion and sediment control measures as needed during all construction activities.

The erosion control plan will be comprised of temporary measures (stabilized construction entrance, silt fence, etc.) as well as permanent measures (hydroseeding, etc.). In general, construction activities will be sequenced such that the site disturbance is minimized at all times. Runoff from the site will sheet flow across cleared areas and disperse into vegetated, gently sloped areas.

Please refer to the Temporary Erosion and Sediment Control Plan (TESC Plan) that has been prepared for this project, included on the following page as Figure 8-1: TESC Plan.

Insert TESC Plan Exhibit

## **SECTION 9. BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT**

### **9.1 Bond Quantities**

This will be provided prior to final engineering approval if necessary.

### **9.2 Facility Summaries**

Not applicable.

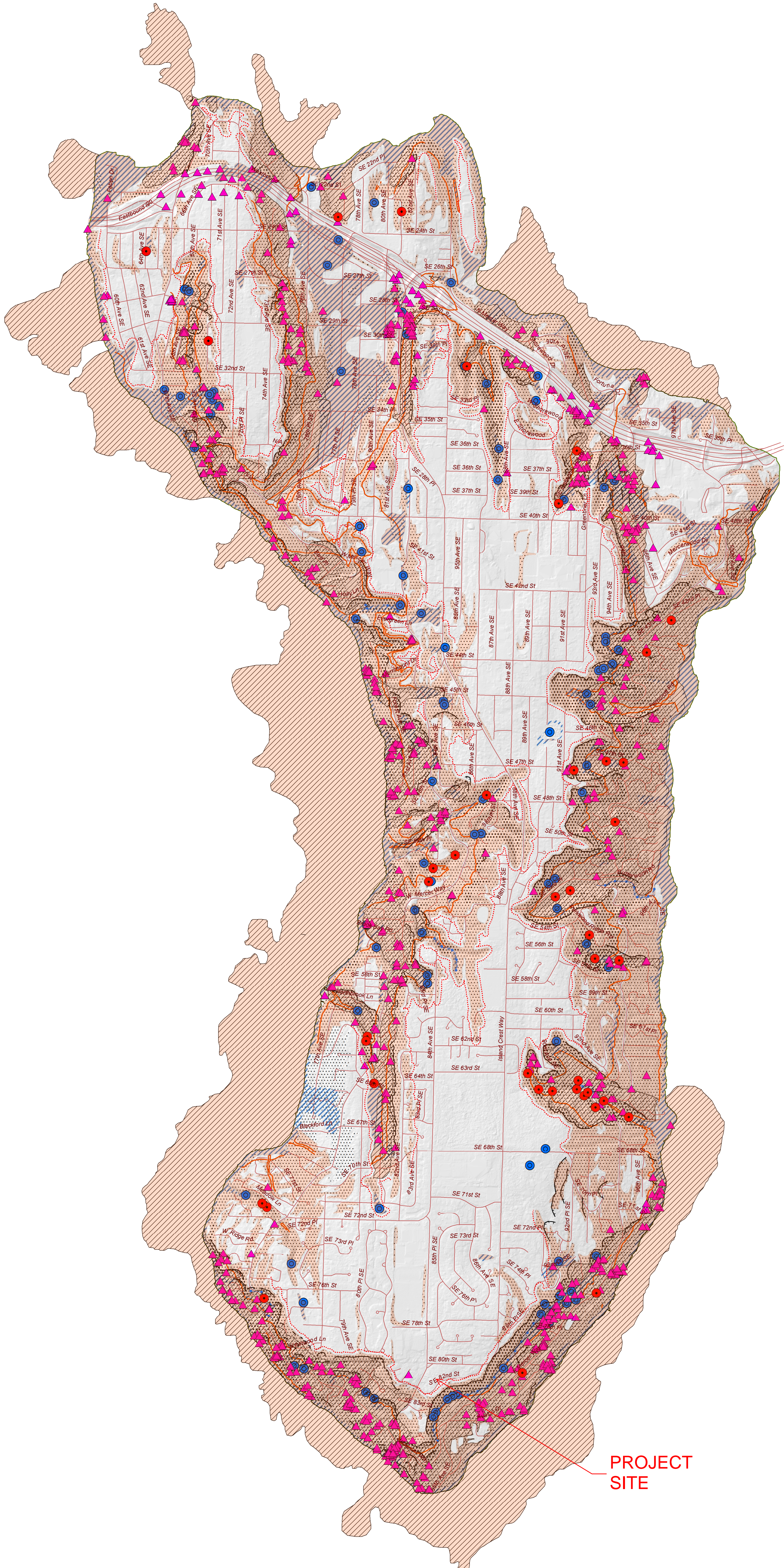
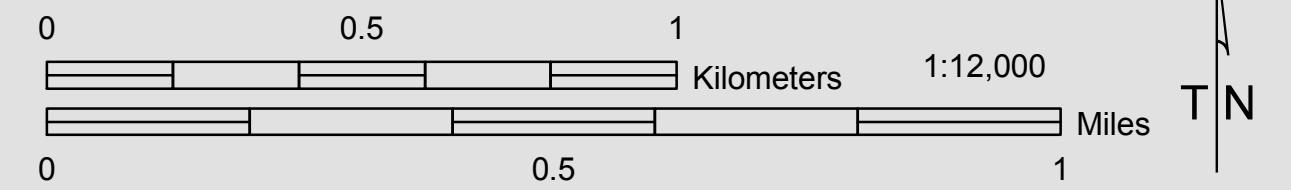
### **9.3 Declaration of Covenant**

Not applicable.

# Appendix A

# Mercer Island Landslide Hazard Assessment

by Kathy G. Troos & Aaron P. Wisher  
April 2009



## LANDSLIDE HAZARD AREAS (WAC 365-190-080 4d and MICC 19.16.010)

Landslide hazard areas include areas potentially subject to landslides based on a combination of geologic, topographic, and hydrologic factors. They include areas susceptible because of any combination of bedrock, soil, slope (gradient), slope aspect, structure, hydrology, or other factors.

Areas susceptible to landsliding on Mercer Island include:

- Areas of historic failure or that have been documented on published maps; *See mapped known landslides below;*
- Slopes steeper than 15%, intersecting a geologic contact of relatively permeable deposits over relatively impermeable deposits, and with springs or groundwater seepage; *See mapped potential slide areas below;*
- Areas that have shown movement during the Holocene epoch (last 10,000 years) or which are covered by Holocene-age mass wasting deposits; *See mapped known landslides below;*
- Slopes parallel or sub-parallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials; *None identified on map, but may be locally present;*
- Slopes having gradients steeper than 80% subject to rockfall during seismic shaking; *See slope classification below;*
- Areas potentially unstable as a result of rapid stream incision, stream bank erosion, and undercutting by wave action; *See mapped erosion locations below;*
- Areas that show evidence of, or are at risk from snow avalanche; *None identified on Mercer Island;*
- Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding; *None identified on Mercer Island;*
- Any area with a slope of 40% or steeper and with a vertical relief of ten or more feet except where composed of consolidated rock; *See slope classification below.*

Landslide hazard areas include the following mapped areas:

- Landslide Hazard**
- Landslide Hazard Area (Known or Suspect)
  - Landslide Hazard Assessment Setback

For all other areas hazard is unknown or unquantified

### Supplemental Data

- Known Landslides (i,iii)**
- Identified Landslide Location
  - Scarp
  - Landslide and Mass Wasting Deposits; subaerial and subaqueous
- Slope (v) Class (ix)**
- Slope 80% and higher
  - Slope 40-79%
  - Slope 15% and higher, and
- Potential Slide Area (ii)**
- Geologic contact of coarse-grained deposits over fine-grained deposits where slope >= 15%, and
  - Area where water less than 10 feet below ground surface based on limited data set (other areas of shallow water present), or
  - Spring Locations, or
  - Spring lines.
- Areas of Rapid Stream Incision (vi)**
- Areas of moderate to rapid stream incision/erosion; may result in unstable slopes and/or stream banks

## GENERAL NOTES FOR GEOLOGICAL HAZARDS MAPS

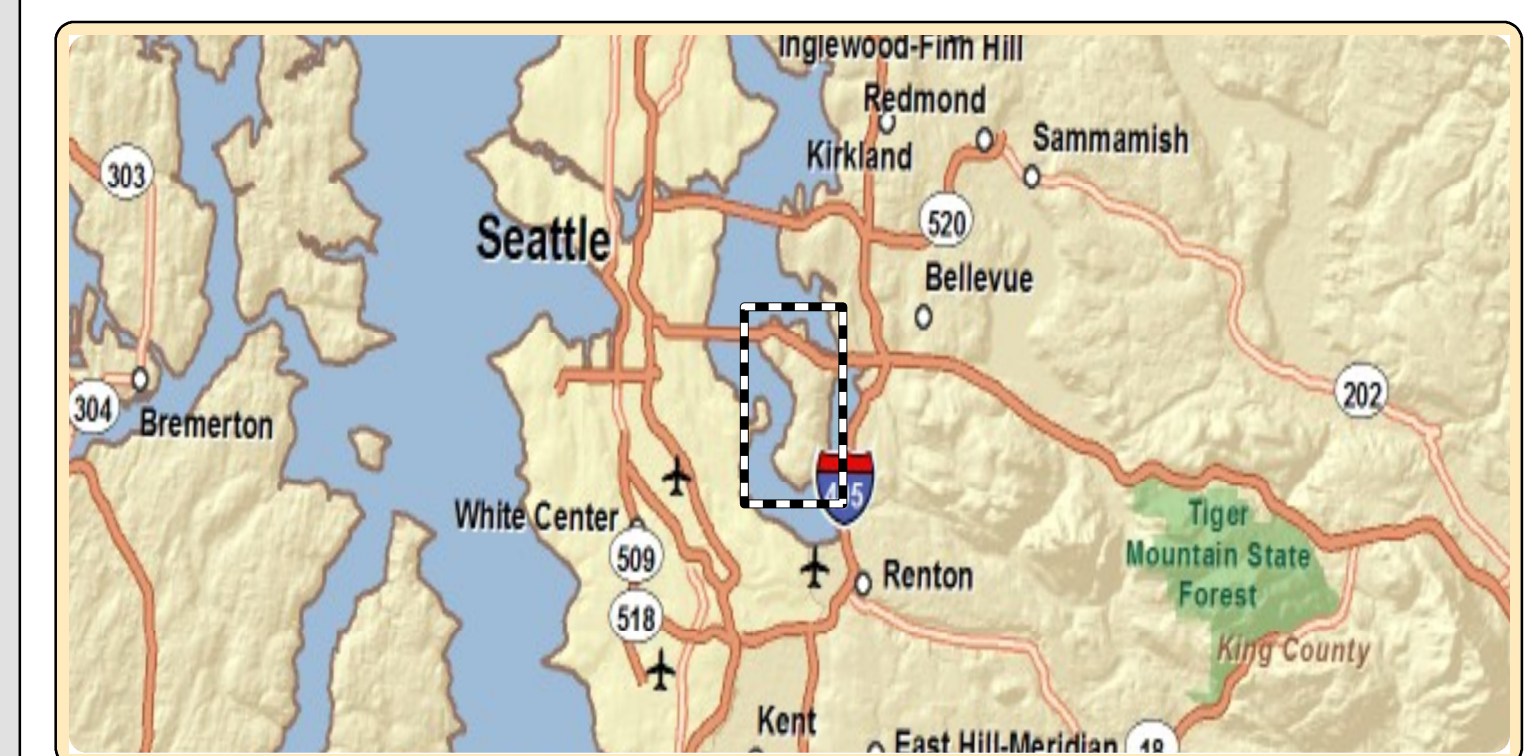
This map is one of a suite of revised Geological Hazard Maps for the City of Mercer Island. This suite includes maps showing Seismic Hazards, Landslide Hazards, and Erosion Hazards.

Other geological and/or natural hazards may exist and geological events may occur on Mercer Island that are not specifically identified on these maps. Examples of geologic hazards and hazardous events that are not identified on these maps include, but are not limited to, tsunamis and seiches in Lake Washington.

These maps are for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. These maps provide DSG staff a general assessment of known or suspect geological hazard areas for which the City will require site and project-specific evaluation by a Washington State-licensed engineer, geologist or engineering geologist prior to issuing a permit for site development. All areas have not been specifically evaluated for geologic hazards and there may be locations that are not correctly represented on these maps. It is the responsibility of individual property owners and map users to evaluate the risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island by these maps.

The City of Mercer Island is using guidance provided by the State of Washington regarding the definition of geologically hazardous areas in accordance with WAC 365-190-080 and the Growth Management Act. "Geologically hazardous areas", by State definition, "include areas susceptible to erosion, sliding, earthquake, or other geological events. They pose a threat to the health and safety of citizens when incompatible commercial, residential, or industrial development is sited in areas of significant hazard."

This new set of maps represents an update of the 2002 Geologic Hazard Map Series and is based on a review of Best Available Science for the Seattle Fault and related events, a new Geological Map of Mercer Island by Troost and Wisher (2006), and a geologic database of Mercer Island compiled by GeoMapNW at the University of Washington. Information about data used for the maps, references, and data limitations are all described in an associated "Read Me" document. The digital version of these maps is accompanied by a meta data file containing pertinent information about map construction. These data and maps are all available on the City of Mercer Island website.

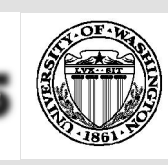


PROJECT SITE

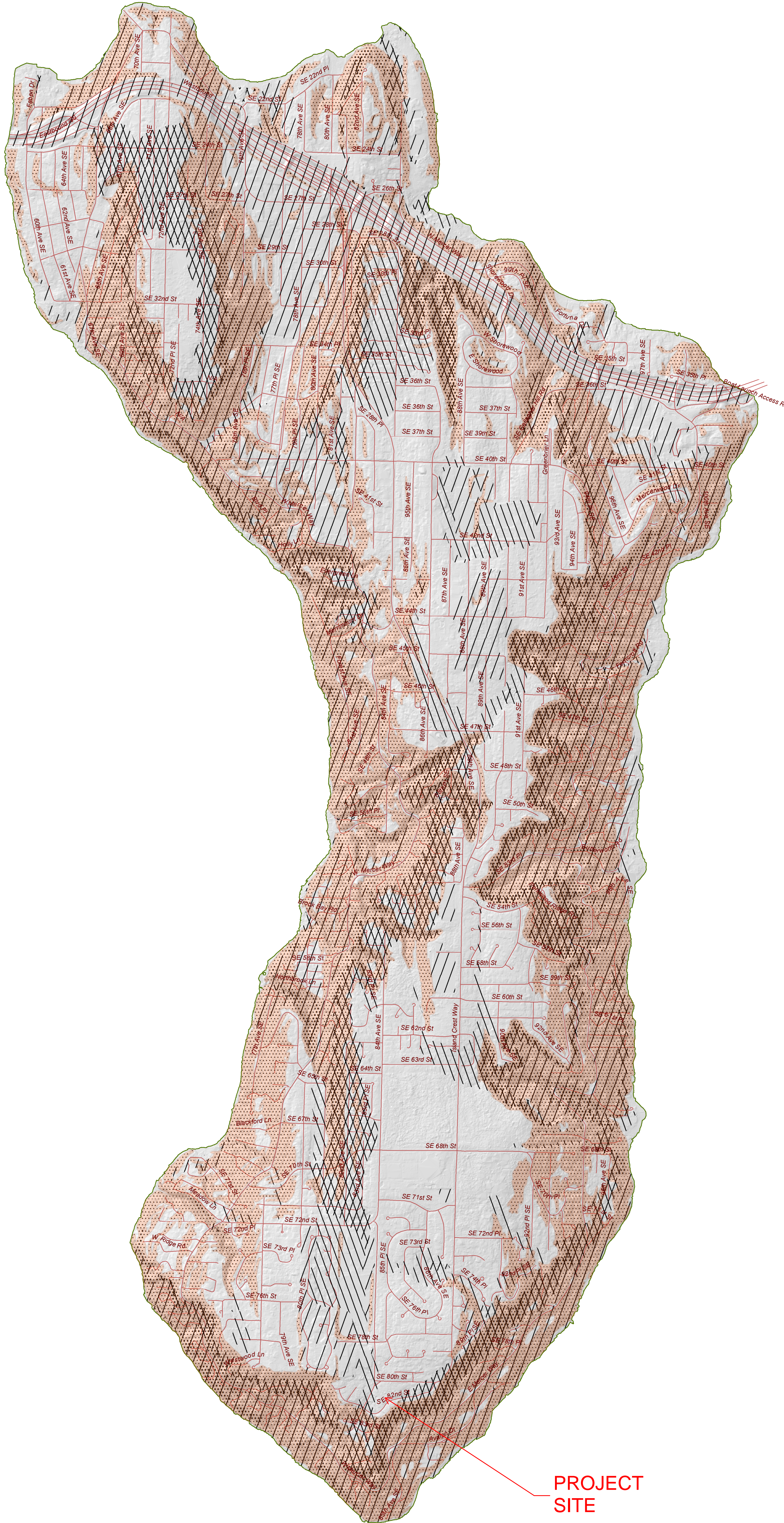


# Mercer Island Erosion Hazard Assessment

by Kathy G. Troost & Aaron P. Wisler  
April 2009



geomapnw.ess.washington.edu



## EROSION HAZARD AREAS (MICC 19.16.010)

Erosion hazards areas include those areas greater than 15% slope and subject to a severe risk of erosion due to wind, rain, water, slope and other natural agents including those soil types and/or areas identified by the U.S. Department of Agriculture's Natural Resource Conservation Service as having a "severe" or "very severe" rill and inter-rill erosion hazard.

Another factor in evaluating erosion potential is infiltration potential. If sandy material is present at the ground surface, rain water can infiltrate and loosen material for removal by erosion. Therefore the areas of sandy material have also been added to this hazard map for consideration along with the slope and erodible soils subclass.

Contributing factors not shown on the map include rainfall, areas of shallow groundwater, ground cover, wind, impervious surfaces, and changes to the ground surface. These factors and all the categories shown on the map should be used together to assess erosion potential. Individual areas less than 0.3 acres in size have been excluded.

**Erosion Hazard** | Erosion Hazard Area (Known or Suspect)

For all other areas, hazard is unknown or unquantified

### Supplemental Data

**Infiltration Potential**

- High - Coarse-grained deposits; e.g. gravel and clean sand
- Medium - Silty, sandy deposits
- Mixed - Interbedded or mixed fine and coarse-grained deposits

**Slope Class**

- Slope 80+%
- Slope 40-79%
- Slope 15-39%

## GENERAL NOTES FOR GEOLOGICAL HAZARDS MAPS

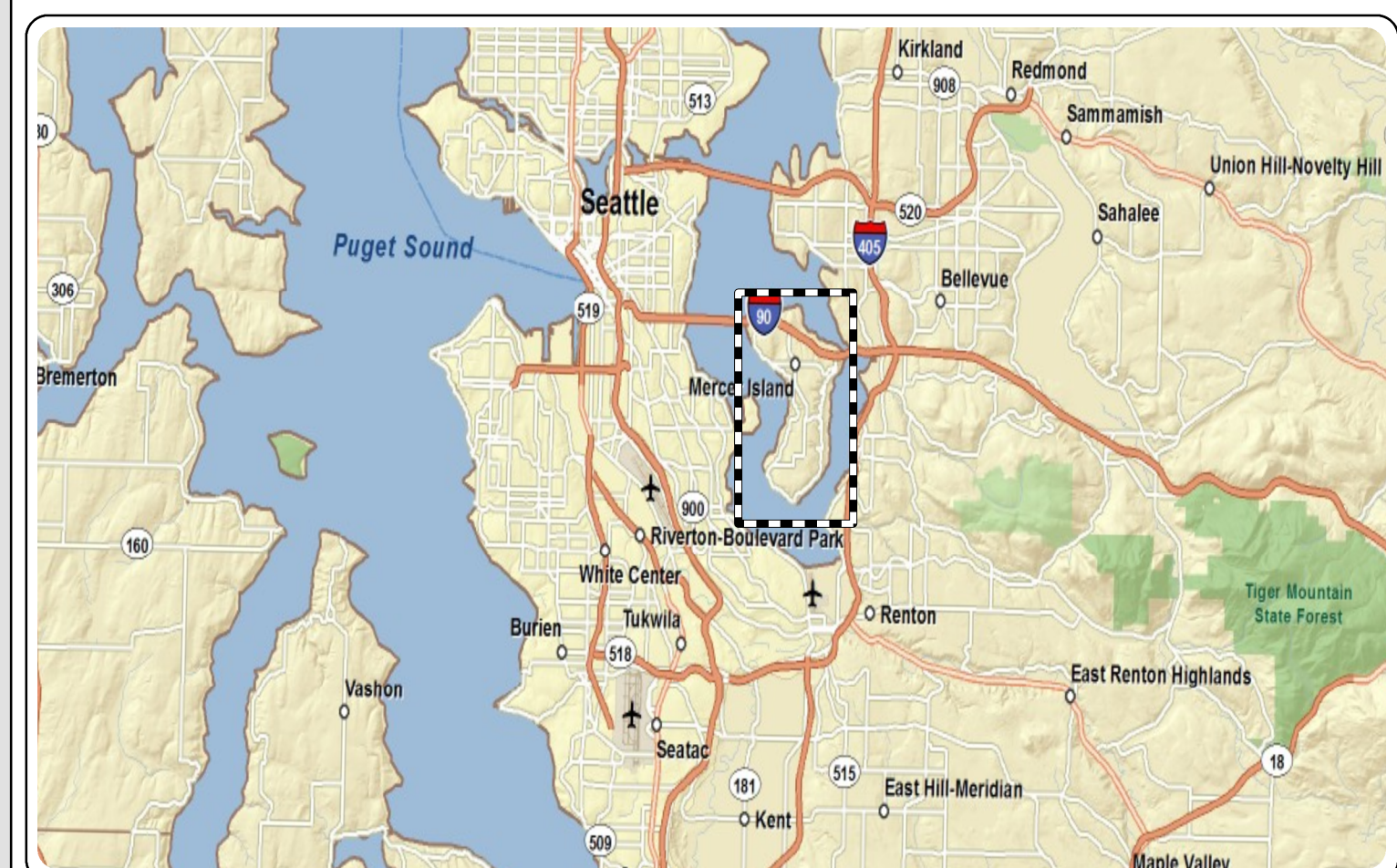
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PROJECT SITE

**WWHM2012**  
**PROJECT REPORT**

## *General Model Information*

Project Name: Flow control exemption  
Site Name:  
Site Address:  
City:  
Report Date: 3/31/2023  
Gage: Seatac  
Data Start: 1948/10/01  
Data End: 2009/09/30  
Timestep: 15 Minute  
Precip Scale: 1.000  
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

### Basin 1

|                                   |             |
|-----------------------------------|-------------|
| Bypass:                           | No          |
| GroundWater:                      | No          |
| Pervious Land Use<br>C, Lawn, Mod | acre<br>0.2 |
| Pervious Total                    | 0.2         |
| Impervious Land Use               | acre        |
| ROOF TOPS FLAT                    | 0.08        |
| DRIVEWAYS MOD                     | 0.04        |
| Impervious Total                  | 0.12        |
| Basin Total                       | 0.32        |

|                   |           |             |
|-------------------|-----------|-------------|
| Element Flows To: |           |             |
| Surface           | Interflow | Groundwater |

## Mitigated Land Use

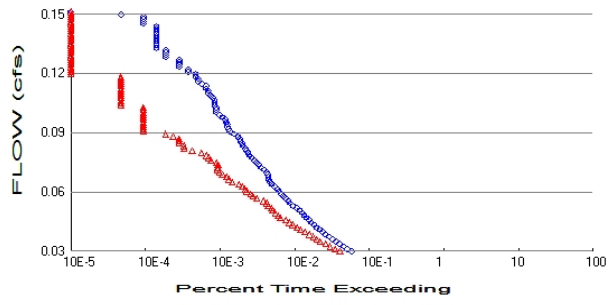
### Basin 1

|                                       |              |
|---------------------------------------|--------------|
| Bypass:                               | No           |
| GroundWater:                          | No           |
| Pervious Land Use<br>C, Pasture, Mod  | acre<br>0.2  |
| Pervious Total                        | 0.2          |
| Impervious Land Use<br>ROOF TOPS FLAT | acre<br>0.12 |
| Impervious Total                      | 0.12         |
| Basin Total                           | 0.32         |

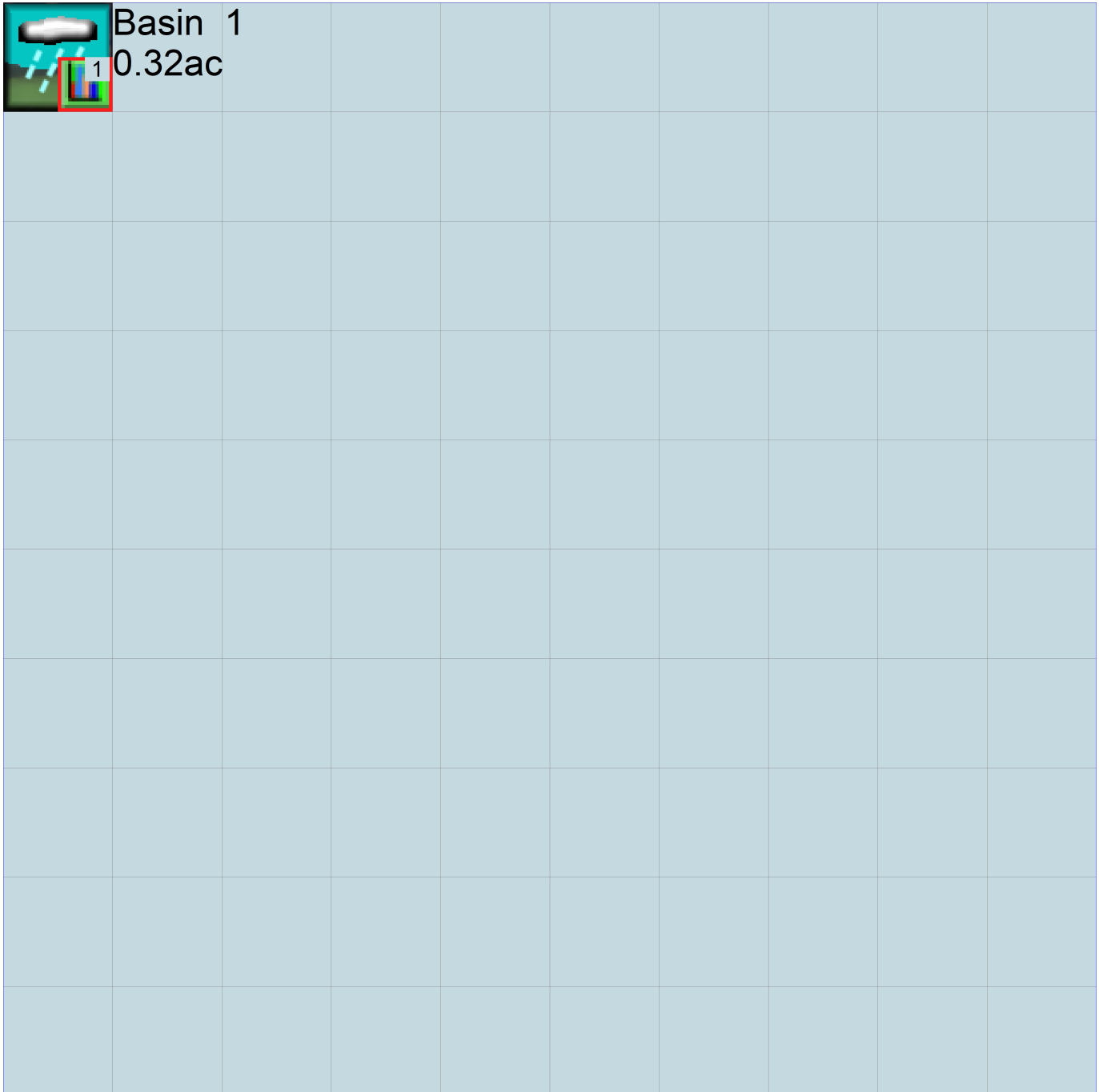
|                   |           |             |
|-------------------|-----------|-------------|
| Element Flows To: |           |             |
| Surface           | Interflow | Groundwater |

# Analysis Results

## POC 1



*Appendix*  
*Predeveloped Schematic*



Mitigated Schematic



Basin 1  
0.32ac

