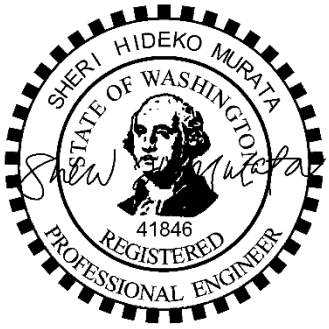
FINAL

STORM DRAINAGE REPORT

FOR

Cheshire Short Plat

CITY OF MERCER ISLAND, WASHINGTON



07/19/2021

Prepared by: **Christian R. Vanderhoeven, E.I.T.**
Approved by: **Sheri H. Murata, P.E.**
Date: **July 19, 2021**
Core No.: **19205**

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SECTION 1. PROJECT OVERVIEW

The project site is located at 7615 E Mercer Way in the city of Mercer Island. Specifically, the project is located on Section 30, Township 24, Range 5. The site is bordered by single family residentials to the north, south, and west and E Mercer Way to the east. The King County tax parcel ID number is 3024059036.

Proposed development of the property will include subdivision of the parcel into two separate lots. The scope of the project will solely include construction activities on the eastern lot. The lot area is 11,154 SF (0.26 ac). Development proposes a new building, driveway, and associated utilities.

The project will be designed using the guidelines and requirements established in the 2012 Department of Ecology Stormwater Management Manual for Western Washington as amended in December 2014 (2014 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.

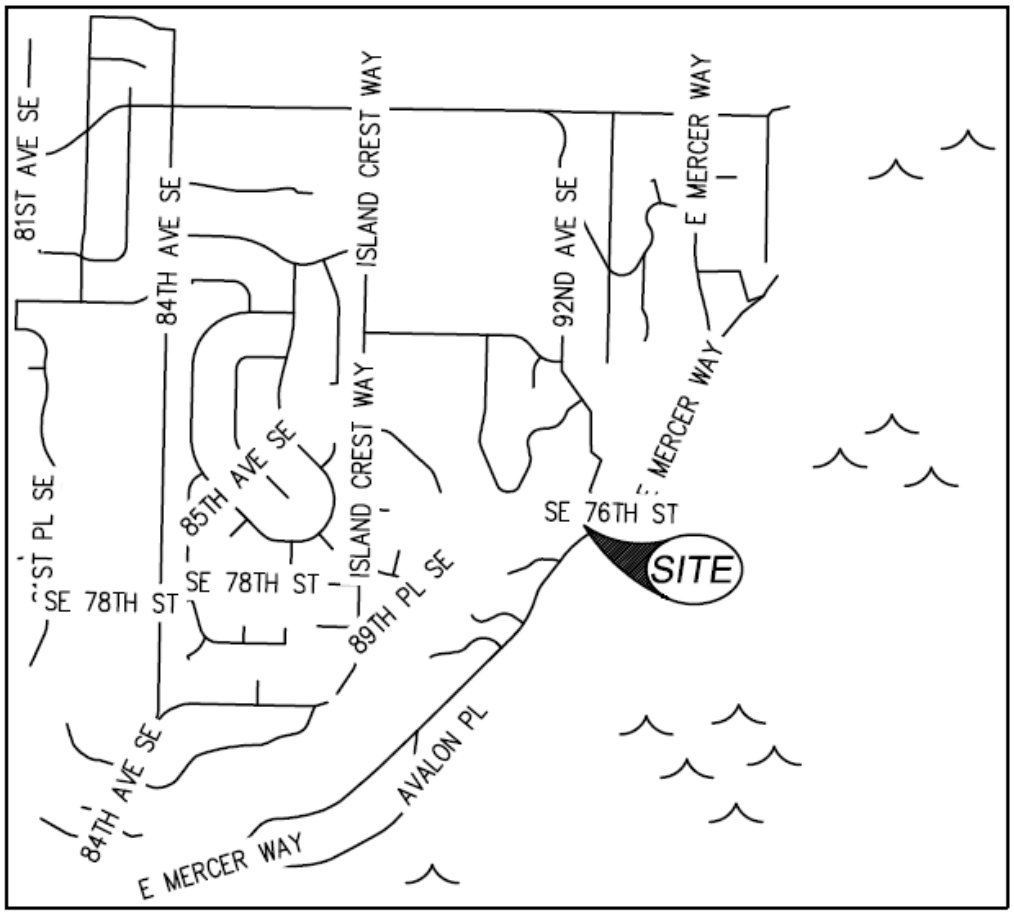


Figure 1.1: Vicinity Map

Department of Assessments

201 South Jackson Street, Room 708
Seattle, WA 98104

Office Hours: Mon - Fri 8:30 a.m. to 4:30 p.m.

TEL: 206-296-7300
FAX: 206-296-5107
TTY: 206-296-7888

Send us mail

- New Search
- Property Tax Bill
- Map This Property
- Glossary of Terms
- Area Report
- Property Detail

PARCEL

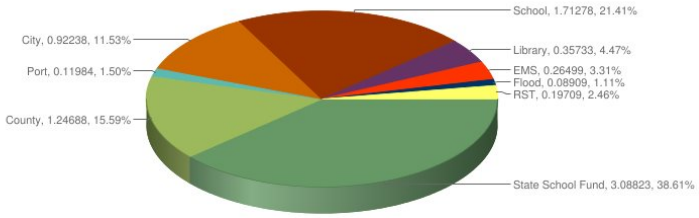
Parcel Number	302405-9036
Name	CHESHIRE DEREK L+EILEEN L
Site Address	7615 E MERCER WAY 98040
Legal	N 148.375 FT OF GL 6 LESS W 1000 FT & N 148.375 FT OF GL 5 LY WLY OF E MERCER WAY

BUILDING 1

Year Built	1970
Total Square Footage	2660
Number Of Bedrooms	4
Number Of Baths	1.75
Grade	8 Good
Condition	Good
Lot Size	92347
Views	No
Waterfront	

TOTAL LEVY RATE DISTRIBUTION

Tax Year: 2021 **Levy Code:** 1031 **Total Levy Rate:** $7.99861 **Total Senior Rate:** $4.86937



47.05% Voter Approved

Click here to see levy distribution comparison by year.

TAX ROLL HISTORY

Valued Year	Tax Year	Appraised Land Value ($)	Appraised Imps Value ($)	Appraised Total ($)	Appraised Imps Increase ($)	Taxable Land Value ($)	Taxable Imps Value ($)	Taxable Total ($)
2021	2022	1,709,000	547,000	2,256,000	0	1,709,000	547,000	2,256,000
2020	2021	1,628,000	411,000	2,039,000	0	1,628,000	411,000	2,039,000
2019	2020	1,536,000	398,000	1,934,000	377,000	1,536,000	398,000	1,934,000
2018	2019	1,506,000	10,000	1,516,000	0	1,506,000	10,000	1,516,000
2017	2018	1,362,000	10,000	1,372,000	0	1,362,000	10,000	1,372,000
2016	2017	1,245,000	10,000	1,255,000	0	1,245,000	10,000	1,255,000
2015	2016	1,127,000	10,000	1,137,000	0	1,127,000	10,000	1,137,000
2014	2015	1,042,000	10,000	1,052,000	0	1,042,000	10,000	1,052,000
2013	2014	955,000	72,000	1,027,000	0	955,000	72,000	1,027,000
2012	2013	881,000	66,000	947,000	0	881,000	66,000	947,000
2011	2012	927,000	8,000	935,000	0	927,000	8,000	935,000
2010	2011	971,000	9,000	980,000	0	971,000	9,000	980,000
2009	2010	1,000,000	9,000	1,009,000	0	1,000,000	9,000	1,009,000
2008	2009	1,240,000	10,000	1,250,000	0	1,240,000	10,000	1,250,000
2007	2008	805,000	90,000	895,000	0	805,000	90,000	895,000
2006	2007	719,000	79,000	798,000	0	719,000	79,000	798,000
2005	2006	719,000	153,000	872,000	0	719,000	153,000	872,000
2004	2005	660,000	134,000	794,000	0	660,000	134,000	794,000
2003	2004	660,000	134,000	794,000	0	660,000	134,000	794,000

Reference Links:

- King County Taxing Districts Codes and Levies (.PDF)
- King County Tax Links
- Property Tax Advisor
- Washington State Department of Revenue (External link)
- Washington State Board of Tax Appeals (External link)
- Board of Appeals/Equalization
- Districts Report
- iMap
- Recorder's Office
- Scanned images of surveys and other map documents

Notice mailing date: 06/03/2021

2002	2003	660,000	134,000	794,000	0	660,000	134,000	794,000
2001	2002	526,000	119,000	645,000	0	526,000	119,000	645,000
2000	2001	458,000	53,000	511,000	0	458,000	53,000	511,000
1999	2000	367,000	119,000	486,000	0	367,000	119,000	486,000
1998	1999	350,000	96,000	446,000	0	350,000	96,000	446,000
1997	1998	0	0	0	0	218,000	134,000	352,000
1996	1997	0	0	0	0	200,000	108,000	308,000
1994	1995	0	0	0	0	200,000	108,000	308,000
1992	1993	0	0	0	0	215,600	128,400	344,000
1990	1991	0	0	0	0	220,000	131,000	351,000
1988	1989	0	0	0	0	129,600	72,500	202,100
1986	1987	0	0	0	0	129,600	65,400	195,000
1984	1985	0	0	0	0	120,000	73,600	193,600
1982	1983	0	0	0	0	120,000	73,600	193,600

Updated: June 24, 2021

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SECTION 2. CONDITIONS AND REQUIREMENTS SUMMARY

The project site has less than 25% of existing impervious coverage, therefore the project is classified as a new development project. Per Figure 2.1 located at the end of this section, the proposed project will only have to address minimum requirements 1 through 5. 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 projects 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 E Mercer Way, 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 5 per the 2014 SWMMWW. The project elects to implement BMPs from List #1. A feasibility discussion of BMPs from list #1 can be found below.

List #1

Lawn and Landscaped areas:

- Post-Construction Soil Quality and Depth:
    - BMP T5.13 will be implemented in accordance with the 2014 SWMMWW.

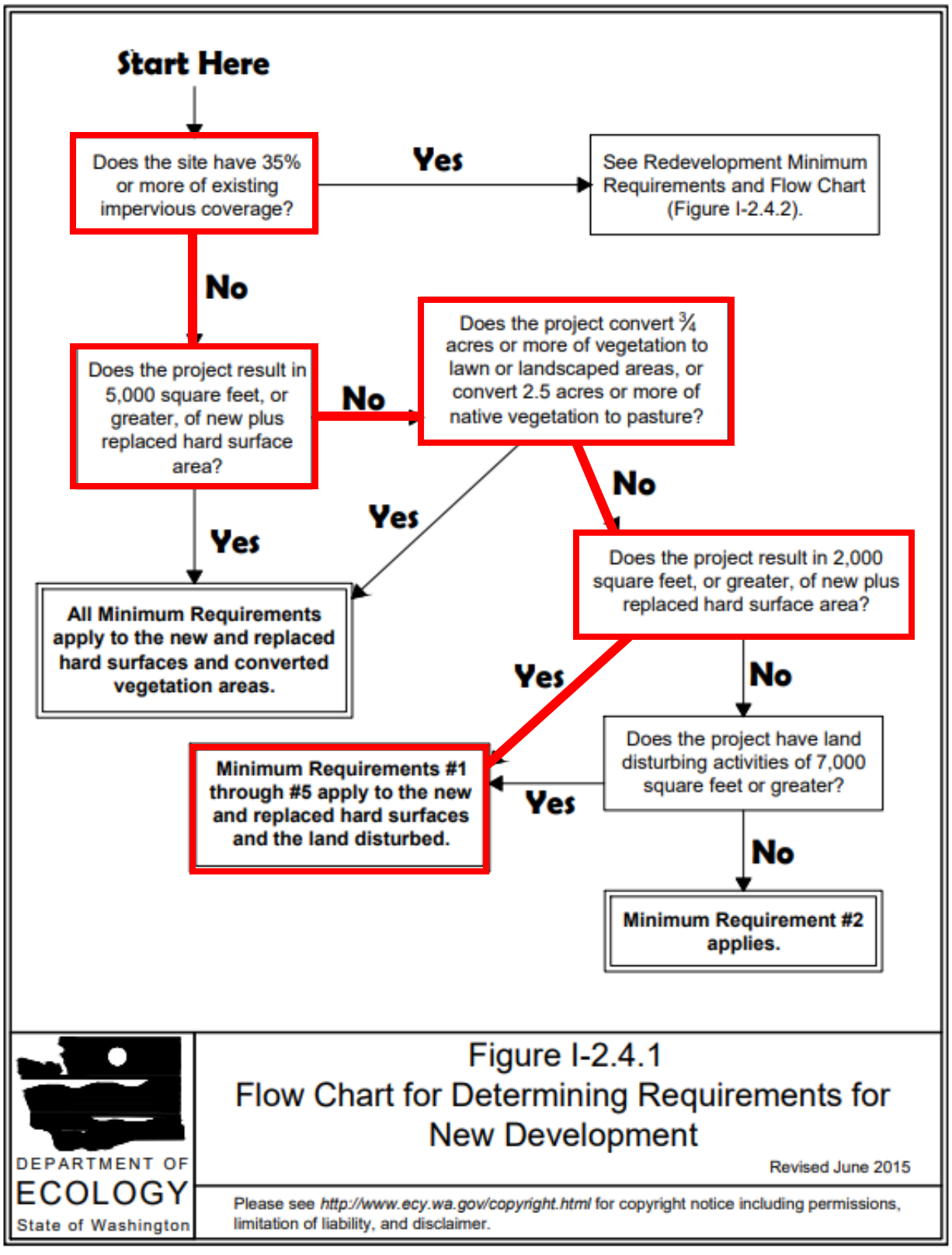
Roofs:

- Full Dispersion:
    - Full dispersion systems are infeasible due to inability to meet the flow path requirement of 100 feet of native vegetation.
- Downspout Full Infiltration:
    - Per the Geotechnical Report, “subsurface conditions are generally not favorable for infiltration of site stormwater. The native soils observed at the site contain a high percentage of soil fines that would impede any downward migration of site stormwater. Even low impact development (LID) techniques would likely fill up and overtop.” Therefore, infiltration is considered infeasible.

- Rain Gardens:
    - Infiltration BMPs have been found infeasible according to the geotechnical report.
- Downspout Dispersion Systems:
    - Downspout dispersion systems are infeasible due to their inability to meet the flow path requirements.
- Perforated Stub-out Connections:
    - A perforated stub-out connection is feasible due to groundwater being found at a typical depth of 10 feet per the geotechnical report. The project will implement 10 feet of perforated pipe in a level 2-foot-wide trench backfilled with washed drain rock.

Other Hard Surfaces:

- Full Dispersion:
    - Full dispersion systems are infeasible due to being unable to meet the flow path requirement of 100 ft of native vegetation.
- Permeable pavement:
    - Infiltration BMPs have been found infeasible according to the geotechnical report.
- Rain gardens:
    - Infiltration BMPs have been found infeasible according to the geotechnical report.
- Bioretention:
    - Infiltration BMPs have been found infeasible according to the geotechnical report.
- Sheet Flow Dispersion:
    - Sheet flow dispersion is not allowed per the pre app notes in the Civil Engineering Comments, “No sheet flow is allowed for this site”.


Start Here
Does the site have 35% or more of existing impervious coverage?
Yes
See Redevelopment Minimum Requirements and Flow Chart (Figure I-2.4.2).
No
Does the project result in 5,000 square feet, or greater, of new plus replaced hard surface area?
No
Does the project convert ¾ acres or more of vegetation to lawn or landscaped areas, or convert 2.5 acres or more of native vegetation to pasture?
Yes
Yes
No
All Minimum Requirements apply to the new and replaced hard surfaces and converted vegetation areas.
Does the project result in 2,000 square feet, or greater, of new plus replaced hard surface area?
Yes
No
Minimum Requirements #1 through #5 apply to the new and replaced hard surfaces and the land disturbed.
Yes
Does the project have land disturbing activities of 7,000 square feet or greater?
No
Minimum Requirement #2 applies.
DEPARTMENT OF ECOLOGY
State of Washington
Figure I-2.4.1
Flow Chart for Determining Requirements for New Development
Revised June 2015
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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 located within an area of known or suspect to both erosion and landslides. A geotechnical report was consulted for site specific analysis. The Geotechnical report confirmed the site is located in an erosion hazard area and provided erosion and sediment control BMPs to implement to prevent and control erosion. 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 long grass with scattered trees. Currently, stormwater sheet flows to the east and southeast, towards E Mercer Way. Stormwater runoff leaves the site along the east property line and into the flow line along E Mercer Way flowing east. 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 west to east at an average slope of 25%. All downstream runoff sheet flows eastward towards E Mercer Way. An existing conveyance system collects all flow at a catch basin located at the northeastern corner of the parcel at SE 76th Street and E Mercer Way. The runoff enters this catch basin and flows northeast for approximately 75 feet through the existing conveyance system along the west side of E Mercer Way. At this point, the flow path enters a catch basin which joins an east flowing unnamed creek via culvert. The flow continues east for approximately 147 feet where it briefly exits into an open water channel which flows southeast for 28 feet. Flow enters another culvert and meanders east by southeast for approximately 120 feet before reaching an outlet into an open water channel for 53 feet. The stream enters a final culvert which continues east for 65 feet until discharging directly into Lake Washington. See downstream map below for detail.

Map Scale: 1:443 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

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: King County Area, Washington
Survey Area Data: Version 16, Jun 4, 2020

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

Date(s) aerial images were photographed: Jul 6, 2020—Jul 20, 2020

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
KpD	Kitsap silt loam, 15 to 30 percent slopes	0.5	100.0%
Totals for Area of Interest		**0.5**	**100.0%**

Downstream Exhibit

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 Poir
- Address
- Building
- Property Line
- Docks
- Freeway
- Street
- Paved Road
- Paved Driveway
- Paved Parking Area
- Parks
- Lake Washington

1: 1,467

187.1 0 93.54 187.1 Feet

Map Printed: May 21, 2020

Notes

SECTION 4. FLOW CONTROL AND WATER QUALITY DESIGN

4.1 Existing Conditions

The existing site is undeveloped with pervious area consisting of forest cover with groups of trees scattered throughout. The overall site generally slopes from west to east at an average of 25% percent towards E Mercer Way. The existing areas are summarized below:

Table 4.1 – Existing Conditions

Surface Type	Area - SF (Acres)
Total Lot	***11,154 (0.26)***
Pervious (Till Forest)	***11,154 (0.26)***

4.2 Developed Conditions

The proposed project will consist of constructing a new single-family residence, associated driveway, walkways, and landscaping. SE 76th Street will serve as access road for the site and will connect to the proposed driveway. Forest cover beyond construction clearing limits will be retained. 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)
Total Lot	***11,154 (0.26)***
Impervious	***2,677 (0.06)***
Roof	1,739 (0.04)
Driveway	787 (0.02)
Walkway	155 (0.00)
Pervious (Landscape)	***8,477 (0.20)***

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. Onsite drainage will be discharged directly to Lake Washington. Therefore, the proposed project requires on-site detention.

4.3 Detention Facility Sizing

The project proposes less than 5,000 square feet of impervious surface and is exempt from the flow control requirement. According to the City of Mercer Island's Stormwater Management Standards. The project proposes 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 2,000 and 3,000 square feet, the tank has a 6-inch diameter and 20-foot length. Also, the low orifice diameter was sized to be 0.5 inches, the distance between the outlet invert and second orifice was 3.7 feet with a 1.1-inch diameter for the second orifice. The detention tank sizing worksheet is included at the end of this section.

4.4 Water Quality Exemption

The project proposes less than 5,000 square feet of pollution-generating impervious surface; therefore, the project is exempt from providing a water quality treatment facility.

CITY OF MERCER ISLAND

DEVELOPMENT SERVICES GROUP
9611 SE 36TH STREET | MERCER ISLAND, WA 98040
PHONE: 206.275.7605 | www.mercergov.org
Inspection Requests: Online: www.MyBuildingPermits.com VM: 206.275.7730

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)[3]		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[1]	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 [1]	164	0.5	0.5	NA [1]	2.2	NA [1]	1.9
	48"	NA [1]	89	0.5	0.5	NA [1]	2.9	NA [1]	1.9
	60"	NA [1]	55	0.5	0.5	NA [1]	3.6	NA [1]	1.7
9,001 to 9,500 sf[2]	36"	NA [1]	174	0.5	0.5	NA [1]	2.2	NA [1]	2.1
	48"	NA [1]	94	0.5	0.5	NA [1]	2.9	NA [1]	2.0
	60"	NA [1]	58	0.5	0.5	NA [1]	3.7	NA [1]	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.

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

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

[3] 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

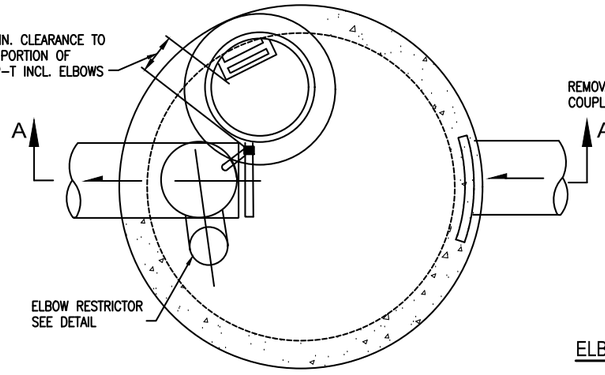
Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)

Developed = impervious (CN = 98)

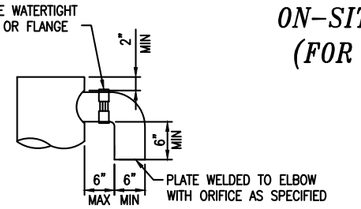
0.5 foot of sediment storage in detention pipe

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)

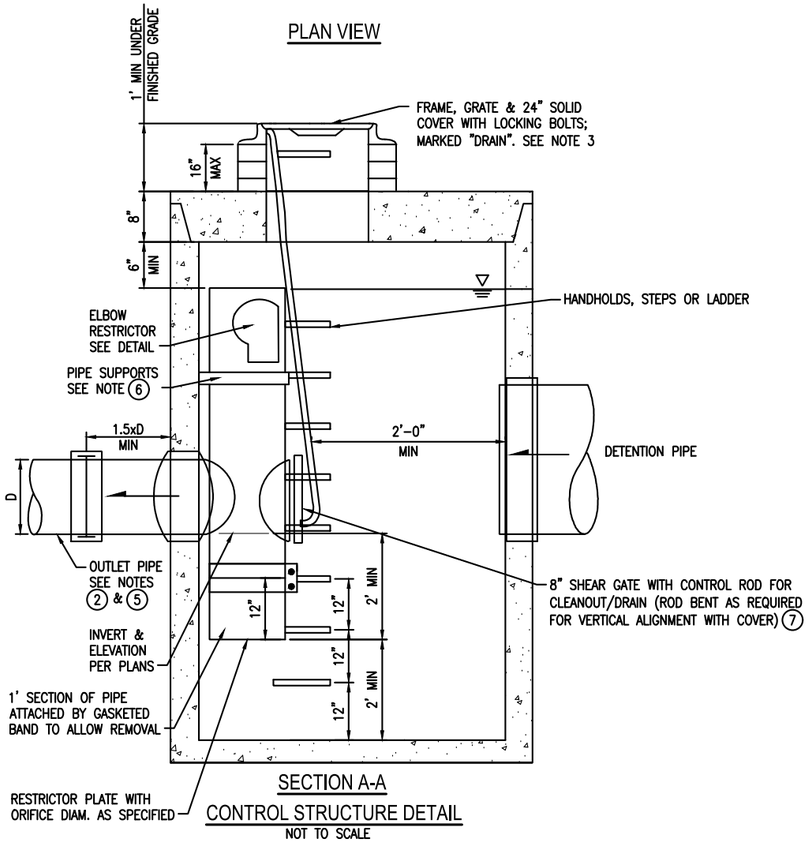


PLAN VIEW



ELBOW RESTRICTOR DETAIL

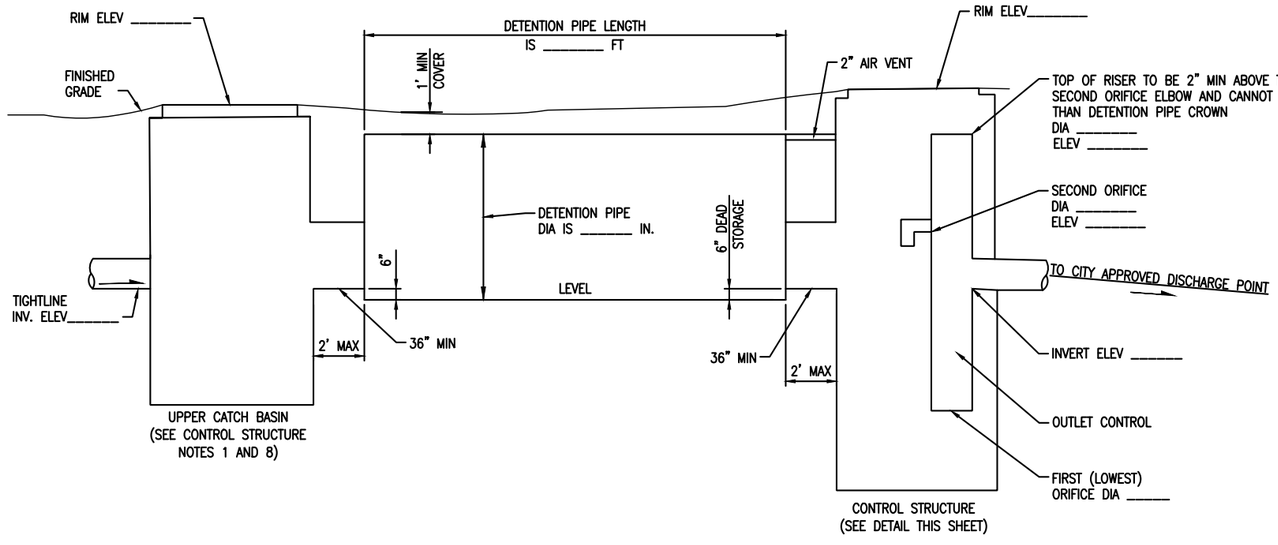
OWNER: _____	ADDRESS: _____	PREPARED BY: _____
PERMIT #: _____	_____	PHONE: _____
		DATE: _____
NEW PLUS REPLACED IMPERVIOUS SURFACE AREA (SF): _____	DETENTION PIPE DIA (INCH): _____	DETENTION PIPE LENGTH (FT): _____
SOIL TYPE: _____	PIPE MATERIAL: _____	



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. STANLESS 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.

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_h = Hydraulic Radius
A = Flow Area (sf)
S_0 = 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 0.139 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)
  May 12, 2020
  Prepared for:
  Cheshire Short Plat
  Prepared by:
  Terra Associates, Inc.
  12220 113th Avenue Ne, Ste. 130
  Kirkland, WA 98034

- Arborist Report (Provided under separate cover)
  April 1, 2020
  Prepared for:
  Cheshire Short Plat
  Prepared by:
  A.B.C Consulting Arborists LLC

SECTION 7. OTHER PERMITS

There are no other permits required at this time.

SECTION 8. CSWPPP ANALYSIS AND DESIGN

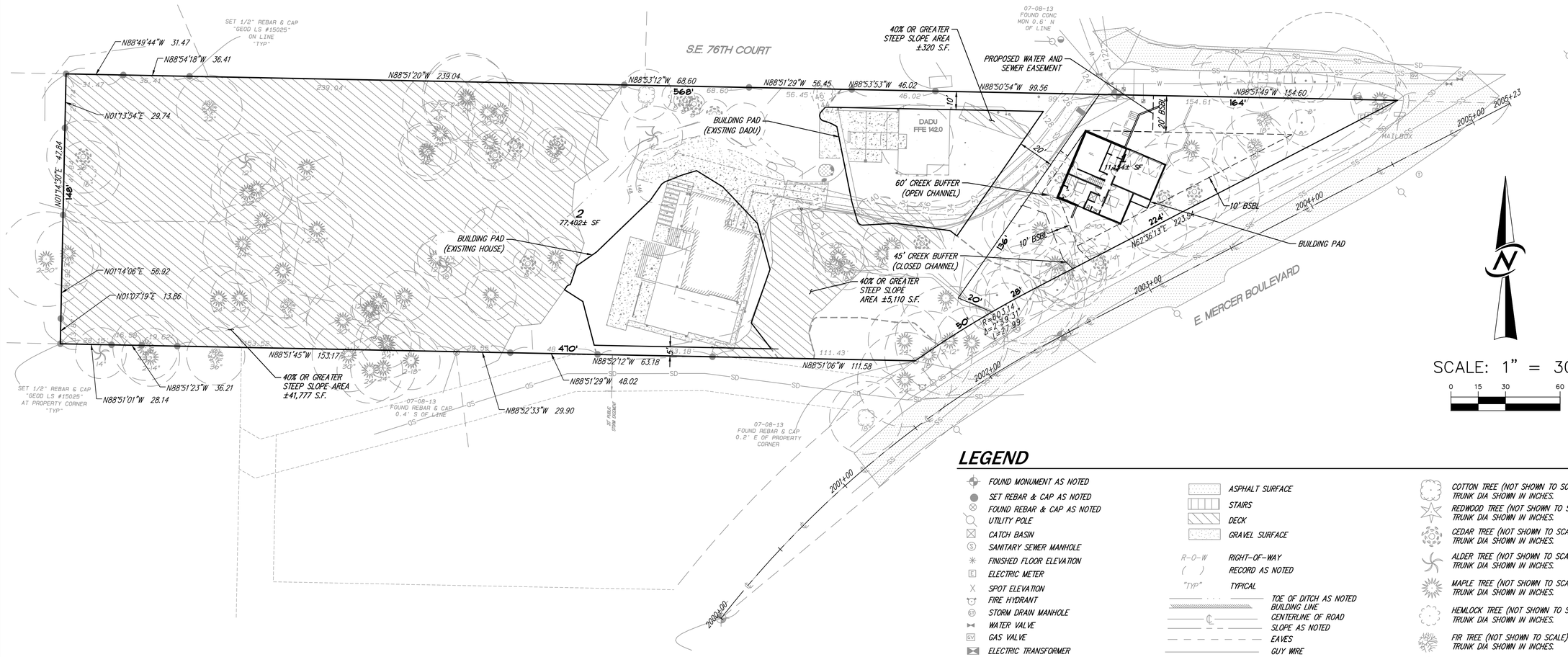
A TESC plan has been prepared and submitted with the civil plans.

The site will utilize Volume II of the 2014 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.



LEGEND

- FOUND MONUMENT AS NOTED
- SET REBAR & CAP AS NOTED
- FOUND REBAR & CAP AS NOTED
- UTILITY POLE
- CATCH BASIN
- SANITARY SEWER MANHOLE
- FINISHED FLOOR ELEVATION
- ELECTRIC METER
- SPOT ELEVATION
- FIRE HYDRANT
- STORM DRAIN MANHOLE
- WATER VALVE
- GAS VALVE
- ELECTRIC TRANSFORMER
- CABLE TV POLE
- TELEPHONE RISER
- TELEPHONE MANHOLE
- ASPHALT SURFACE
- STAIRS
- DECK
- GRAVEL SURFACE
- R-O-W RIGHT-OF-WAY
- ( ) RECORD AS NOTED
- "TYP" TYPICAL
- TOE OF DITCH AS NOTED
- BUILDING LINE
- CENTERLINE OF ROAD
- SLOPE AS NOTED
- EAVES
- GUY WIRE
- COTTON TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- REDWOOD TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- CEDAR TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- ALDER TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- MAPLE TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- HEMLOCK TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- FIR TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.
- DECIDUOUS TREE (NOT SHOWN TO SCALE) TRUNK DIA SHOWN IN INCHES.

VERTICAL DATUM

CITY OF MERCER ISLAND BENCH MARK NO. 2415 (NAVD 88) (VISITED 07/08/2013) FOUND "4""X4"" CONC W/COPPER TACK IN LEAD (DIN 1.0)", LOCATED "250FT S, INTX E MERCER WAY & SE 76TH ST".

ELEVATION = 104.47'

METHOD OF SURVEY

INSTRUMENTATION FOR THIS SURVEY WAS A LEICA ELECTRONIC DISTANCE MEASURING UNIT. PROCEDURES USED IN THIS SURVEY WERE DIRECT AND REVERSE ANGLES, NO CORRECTION NECESSARY. MEETS STATE STANDARDS SET BY WAC 332-130-090.

BEARING MERIDIAN

A BEARING OF S50°21'13"W BETWEEN TWO FOUND MONUMENTS, "A" AND "B", PER THE PLAT OF TARYWOOD PARK, AS RECORED IN VOLUME 127 OF PLATS, PAGES 46-50, RECORDS OF KING COUNTY, WA.

LEGAL DESCRIPTION

NORTH 148.375 FEET OF GOVERNMENT LOT 6; EXCEPT THE WEST 1000 FEET ALSO THE NORTH 148.37 FEET OF A PORTION OF GIVERNMENT LOT 5 LYING WESTERLY OF EAST MERCER WAY; ALL IN SECTION 30, TOWNSHIP 24 NORTH, RANGE 5 EAST, W.M. IN KING COUNTY, WASHINGTON.

SURVEYOR'S NOTES

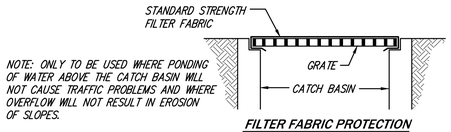
1. THE TOPOGRAPHIC SURVEY SHOWN HEREON WAS PERFORMED IN JULY OF 2013. THE FIELD DATA WAS COLLECTED AND RECORDED ON MAGNETIC MEDIA THROUGH AN ELECTRONIC THEODOLITE. THE DATA FILE IS ARCHIVED ON DISC OR CD. WRITTEN FIELD NOTES MAY NOT EXIST. CONTOURS ARE SHOWN FOR CONVENIENCE ONLY. DESIGN SHOULD RELY ON SPOT ELEVATIONS.
2. SUBJECT PROPERTY TAX PARCEL NO. 3024059036.
3. SUBJECT PROPERTY AREA PER THIS SURVEY IS 88,557 SQ.FT.+/-.
4. A TITLE REPOoRT WAS NOT FURNISHED AND THEREFORE, EASEMENTS IF ANY, ARE NOT SHOWN ON THIS MAP.
5. THE TOP/TOE OF SLOPE SHOWN ON THIS SURVEY IS THE FIELD CREWS INTERPRETATION OF THE TOP/TOE OF SLOPE. THIS DOES NOT REPRESENT THE LIMITS OF A "40%" SLOPE AREA.

LEGEND

SEE SHEET C2.31 FOR DETAILS, NOTES AND CONSTRUCTION SEQUENCE.

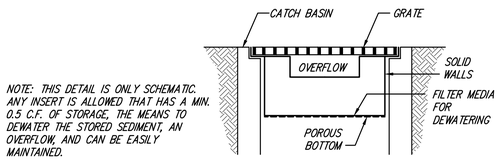
- INLET FILTER (W.S.D.O.T. STD DTL. I-40.20-00)
- FILTER FABRIC FENCE
- CONSTRUCTION ACCESS
- CLEARING LIMITS
- EXISTING CONTOUR 110
- PROPOSED CONTOUR 110
- EX TREE TO BE REMOVED

UNDERGROUND LOCATOR SERVICE
CALL BEFORE YOU DIG!
811



NOTE: ONLY TO BE USED WHERE PONDING OF WATER ABOVE THE CATCH BASIN WILL NOT CAUSE TRAFFIC PROBLEMS AND WHERE OVERFLOW WILL NOT RESULT IN EROSION OF SLOPES.

FILTER FABRIC PROTECTION



NOTE: THIS DETAIL IS ONLY SCHEMATIC. ANY INSERT IS ALLOWED THAT HAS A MIN. 0.5 C.F. OF STORAGE, THE MEANS TO DEWATER THE STORED SEDIMENT, AN OVERFLOW, AND CAN BE EASILY MAINTAINED.

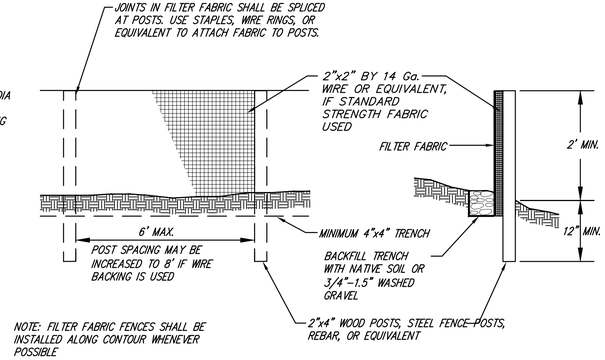
CATCH BASIN INSERT

MAINTENANCE STANDARDS

1. ANY ACCUMULATED SEDIMENT ON OR AROUND THE FILTER FABRIC PROTECTION SHALL BE REMOVED IMMEDIATELY. SEDIMENT SHALL NOT BE REMOVED WITH WATER, AND ALL SEDIMENT MUST BE DISPOSED OF AS FILL ON-SITE OR HAULED OFF-SITE.
2. ANY SEDIMENT IN THE CATCH BASIN INSERT SHALL BE REMOVED WHEN THE SEDIMENT HAS FILLED ONE-THIRD OF THE AVAILABLE STORAGE. THE FILTER MEDIA FOR THE INSERT SHALL BE CLEANED OR REPLACED AT LEAST MONTHLY.
3. REGULAR MAINTENANCE IS CRITICAL FOR BOTH FORMS OF CATCH BASIN PROTECTION. UNLIKE MANY FORMS OF PROTECTION THAT FAIL GRADUALLY, CATCH BASIN PROTECTION WILL FAIL SUDDENLY AND COMPLETELY IF NOT MAINTAINED PROPERLY.

FILTER FABRIC PROTECTION FOR CB's

NO SCALE



NOTE: FILTER FABRIC FENCES SHALL BE INSTALLED ALONG CONTOUR WHENEVER POSSIBLE

FILTER FABRIC FENCE DETAIL

NO SCALE

SUB20-002

CORE DESIGN
CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING
12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

NO.	REVISIONS	DATE

6-2-20

DATE	JULY 2020 (1ST SUB)
DESIGNED	SHERI MURATA, P.E.
DRAWN	SAM D. SIMPSON-GORDON
APPROVED	SHERI MURATA, P.E.
	ROBERT WEST, PLS
	PROJECT MANAGER

SHEET	OF
2	4

PROJECT NUMBER 19205

TESC PLAN
CHESHIRE SHORT PLAT

DEREK CHESHIRE
7615 E MERCER WAY
MERCER ISLAND, WA. 98040

7/7/2021 1:38 PM J:\2019\19205\ENGINEERING\FINAL\SHEETS\19205 C2.01.DWG

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.

SECTION 10. OPERATIONS AND MAINTENANCE

The project is exempt from minimum requirement #9 Operations and Maintenance.

Appendix A

WWHM2012

PROJECT REPORT

General Model Information

Project Name: 19205 - WWHM
Site Name:
Site Address:
City:
Report Date: 7/19/2021
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.00
Version: 2015/06/05

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	Acres
C, Forest, Steep	0.26
Pervious Total	0.26

Impervious Land Use	Acres
Impervious Total	0
Basin Total	0.26

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
C, Lawn, Steep	0.2
Pervious Total	0.2

Impervious Land Use	Acres
ROOF TOPS FLAT	0.04
DRIVEWAYS STEEP	0.02
Impervious Total	0.06
Basin Total	0.26

Element Flows To:

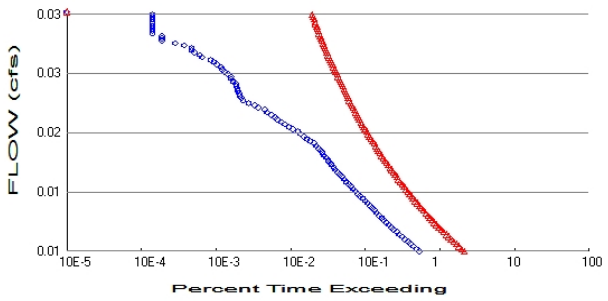
Surface	Interflow	Groundwater

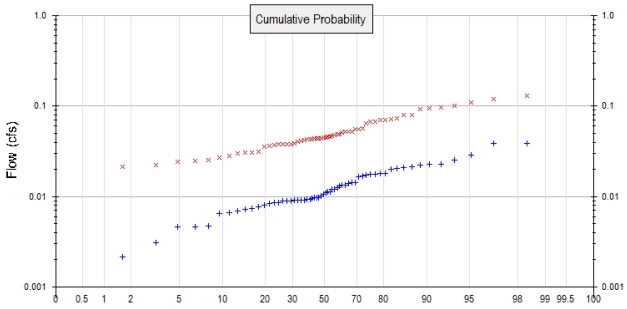
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.26
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.2
Total Impervious Area: 0.06

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.011635
5 year	0.018533
10 year	0.023012
25 year	0.028428
50 year	0.032254
100 year	0.035892

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.046718
5 year	0.068151
10 year	0.08372
25 year	0.104931
50 year	0.121843
100 year	0.139706

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.013	0.080
1950	0.014	0.072
1951	0.023	0.044
1952	0.008	0.027
1953	0.006	0.024
1954	0.009	0.039
1955	0.017	0.038
1956	0.013	0.042
1957	0.012	0.053
1958	0.011	0.031

1959	0.009	0.028
1960	0.017	0.048
1961	0.009	0.038
1962	0.007	0.025
1963	0.008	0.044
1964	0.011	0.038
1965	0.008	0.056
1966	0.007	0.031
1967	0.017	0.074
1968	0.010	0.064
1969	0.010	0.053
1970	0.009	0.045
1971	0.009	0.052
1972	0.018	0.070
1973	0.009	0.025
1974	0.009	0.052
1975	0.014	0.056
1976	0.010	0.041
1977	0.002	0.038
1978	0.009	0.046
1979	0.005	0.044
1980	0.021	0.094
1981	0.007	0.045
1982	0.017	0.079
1983	0.012	0.049
1984	0.008	0.031
1985	0.005	0.043
1986	0.020	0.046
1987	0.018	0.044
1988	0.008	0.021
1989	0.005	0.030
1990	0.038	0.130
1991	0.022	0.096
1992	0.010	0.036
1993	0.009	0.022
1994	0.003	0.019
1995	0.011	0.036
1996	0.026	0.070
1997	0.023	0.047
1998	0.007	0.043
1999	0.020	0.111
2000	0.010	0.049
2001	0.002	0.037
2002	0.011	0.068
2003	0.014	0.067
2004	0.021	0.101
2005	0.013	0.043
2006	0.013	0.041
2007	0.029	0.119
2008	0.038	0.092
2009	0.018	0.057

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0385	0.1299
2	0.0384	0.1194
3	0.0290	0.1110

4	0.0255	0.1009
5	0.0227	0.0964
6	0.0227	0.0939
7	0.0223	0.0920
8	0.0214	0.0795
9	0.0210	0.0793
10	0.0204	0.0740
11	0.0201	0.0721
12	0.0182	0.0703
13	0.0179	0.0699
14	0.0177	0.0677
15	0.0174	0.0669
16	0.0171	0.0643
17	0.0168	0.0573
18	0.0167	0.0559
19	0.0143	0.0556
20	0.0143	0.0526
21	0.0140	0.0525
22	0.0135	0.0522
23	0.0134	0.0515
24	0.0131	0.0493
25	0.0126	0.0491
26	0.0120	0.0485
27	0.0119	0.0473
28	0.0112	0.0458
29	0.0112	0.0456
30	0.0110	0.0452
31	0.0106	0.0447
32	0.0102	0.0444
33	0.0096	0.0444
34	0.0096	0.0443
35	0.0096	0.0439
36	0.0096	0.0435
37	0.0092	0.0429
38	0.0092	0.0428
39	0.0092	0.0419
40	0.0091	0.0413
41	0.0091	0.0409
42	0.0090	0.0387
43	0.0090	0.0381
44	0.0090	0.0381
45	0.0090	0.0380
46	0.0085	0.0379
47	0.0085	0.0371
48	0.0083	0.0360
49	0.0080	0.0358
50	0.0077	0.0313
51	0.0073	0.0308
52	0.0072	0.0306
53	0.0070	0.0300
54	0.0066	0.0283
55	0.0064	0.0268
56	0.0047	0.0255
57	0.0047	0.0246
58	0.0046	0.0243
59	0.0031	0.0222
60	0.0022	0.0211
61	0.0017	0.0193

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0058	11407	45387	397	Fail
0.0061	10365	41730	402	Fail
0.0064	9439	38521	408	Fail
0.0066	8630	35548	411	Fail
0.0069	7940	32832	413	Fail
0.0072	7272	30329	417	Fail
0.0074	6669	28019	420	Fail
0.0077	6098	25966	425	Fail
0.0080	5608	24084	429	Fail
0.0082	5150	22309	433	Fail
0.0085	4770	20777	435	Fail
0.0088	4410	19391	439	Fail
0.0090	4072	18080	444	Fail
0.0093	3764	16859	447	Fail
0.0096	3542	15716	443	Fail
0.0098	3285	14722	448	Fail
0.0101	3065	13787	449	Fail
0.0104	2866	12902	450	Fail
0.0106	2669	12055	451	Fail
0.0109	2479	11319	456	Fail
0.0112	2310	10605	459	Fail
0.0114	2160	9974	461	Fail
0.0117	1971	9355	474	Fail
0.0120	1830	8913	487	Fail
0.0122	1686	8410	498	Fail
0.0125	1573	7925	503	Fail
0.0128	1459	7433	509	Fail
0.0130	1367	7050	515	Fail
0.0133	1269	6654	524	Fail
0.0136	1173	6271	534	Fail
0.0138	1104	5965	540	Fail
0.0141	1030	5668	550	Fail
0.0144	962	5356	556	Fail
0.0146	906	5099	562	Fail
0.0149	851	4815	565	Fail
0.0152	802	4567	569	Fail
0.0154	750	4336	578	Fail
0.0157	715	4111	574	Fail
0.0160	680	3899	573	Fail
0.0162	638	3700	579	Fail
0.0165	606	3525	581	Fail
0.0168	572	3362	587	Fail
0.0170	542	3195	589	Fail
0.0173	503	3056	607	Fail
0.0176	469	2941	627	Fail
0.0178	435	2810	645	Fail
0.0181	391	2674	683	Fail
0.0184	352	2554	725	Fail
0.0186	321	2436	758	Fail
0.0189	293	2323	792	Fail
0.0192	265	2235	843	Fail
0.0194	230	2120	921	Fail
0.0197	203	2023	996	Fail
0.0200	177	1939	1095	Fail

0.0202	161	1859	1154	Fail
0.0205	141	1780	1262	Fail
0.0208	130	1719	1322	Fail
0.0210	117	1651	1411	Fail
0.0213	103	1586	1539	Fail
0.0216	95	1528	1608	Fail
0.0218	79	1471	1862	Fail
0.0221	71	1416	1994	Fail
0.0224	58	1360	2344	Fail
0.0226	49	1302	2657	Fail
0.0229	46	1263	2745	Fail
0.0232	44	1224	2781	Fail
0.0234	43	1190	2767	Fail
0.0237	42	1146	2728	Fail
0.0240	41	1111	2709	Fail
0.0242	40	1073	2682	Fail
0.0245	39	1041	2669	Fail
0.0248	36	1003	2786	Fail
0.0250	34	961	2826	Fail
0.0253	34	927	2726	Fail
0.0256	31	897	2893	Fail
0.0258	28	865	3089	Fail
0.0261	26	827	3180	Fail
0.0264	25	807	3228	Fail
0.0266	22	781	3550	Fail
0.0269	20	749	3745	Fail
0.0272	18	723	4016	Fail
0.0274	14	700	5000	Fail
0.0277	13	674	5184	Fail
0.0280	11	656	5963	Fail
0.0282	10	635	6350	Fail
0.0285	10	620	6200	Fail
0.0288	8	601	7512	Fail
0.0290	6	579	9650	Fail
0.0293	4	556	13900	Fail
0.0296	4	546	13650	Fail
0.0299	4	532	13300	Fail
0.0301	3	516	17200	Fail
0.0304	3	501	16700	Fail
0.0307	3	486	16200	Fail
0.0309	3	477	15900	Fail
0.0312	3	464	15466	Fail
0.0315	3	454	15133	Fail
0.0317	3	440	14666	Fail
0.0320	3	425	14166	Fail
0.0323	3	413	13766	Fail

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

Water Quality

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

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   19205 - WWHM.wdm
MESSU       25   Pre19205 - WWHM.MES
            27   Pre19205 - WWHM.L61
            28   Pre19205 - WWHM.L62
            30   POC19205 - WWHM1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      12
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   12     C, Forest, Steep        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   12         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   12         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   12         0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   12              0       4.5      0.08       400      0.15       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   12              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   12           0.2       0.3      0.35         6       0.3       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS       GWVS
   12              0         0         0          0       2.5          1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------->  Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                    in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

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

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->      <-Target->    MBLK    ***
<Name>    #                 <-factor->      <Name>    #   Tbl#    ***
Basin  1***
PERLND  12                        0.26      COPY    501      12
PERLND  12                        0.26      COPY    501      13

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

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


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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   19205 - WWHM.wdm
MESSU       25   Mit19205 - WWHM.MES
            27   Mit19205 - WWHM.L61
            28   Mit19205 - WWHM.L62
            30   POC19205 - WWHM1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      18
      IMPLND       4
      IMPLND       7
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                  MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   18     C, Lawn, Steep          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   18         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   18         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   18         0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   18              0       4.5      0.03       400      0.15       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   18              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   18            0.1      0.15      0.25         6       0.3      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS       GWVS
   18              0         0         0          0       2.5          1          0
  END PWAT-STATE1

END PERLND

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

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
    7         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    0    1    9
    7         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
    7         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
    7            400       0.1       0.1      0.05
```

```
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
    7              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
    7              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  18                       0.2      COPY   501     12
PERLND  18                       0.2      COPY   501     13
IMPLND   4                      0.04      COPY   501     15
IMPLND   7                      0.02      COPY   501     15

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

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



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

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

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                    ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

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

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


END MASS-LINK

END RUN
```

Disclaimer

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