# PRELIMINARY

## STORM DRAINAGE REPORT

FOR

## WOODSIDE

**CITY OF REDMOND,**
**KING COUNTY, WASHINGTON**

***12/2/2019***

| | |
|---|---|
| **Project Manager:** | **Gary Sharnbroich, P.E.** |
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| **Approved by:** | **Gary Sharnbroich, P.E.** |
| **Date:** | **November 2018** |
| **Revised:** | **February 2019, April 2019, June 2019, August 2019** |
| **Core No.:** | **18122** |

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# WOODSIDE

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**Appendix**

Private Partial Infiltration Vault WWHM Report

Public Partial Infiltration Vault WWHM Report

70th Street Public Detention Pond WWHM Report

SC5 Developed Basin (Lakeside) WWHM Report

Wetland Discharge Basin Model WWHM Report

# SECTION 1. PROJECT OVERVIEW

The Woodside project site consists of one parcel with a total area of 11.94 acres and is located in King County within the City of Redmond. More specifically, the site is located in SE quarter of Section 7, Township 25, Range 6 East, W.M., just east of 188th Ave NE and north of NE 68th Way. The site is bound by single family residences to the south, a wetland area associated with Evans Creek to the east, and property used for a mining operation to the north and west. The project site is currently undeveloped and covered in areas of grass, soil stockpiles and dirt roads. The site has historically been used as a sand and gravel pit over several decades with excavation and fill activities occurring consistently. There are no existing structures located on site. See Figure 1.1 at the end of this section for a vicinity map. The King County tax parcel ID number for the project site is located in Table 1.1 below. (Refer to the King County parcel report included at the end of this section).

**Table 1.1 King County Parcel ID**

| KC Parcel # | Parcel Area (SF) | Parcel Area (acres) |
|---|---|---|
| 0725069033 | 520,190 (+/-) | 11.94 |

The property is located entirely within the Sammamish Watershed. Due to current usage of the site over several decades, the natural drainage path from the site is unclear. The site is located at a boundary of several drainage basins and therefore the natural drainage of the site cannot be determined. Refer to Section 3 of this report for a description of the offsite analysis. The site has been excavated and filled over decades as part of a mining operation, so currently the site is relatively flat with numerous berms and stockpiles and low points from excavation. The west and south property lines contain large berms and a steep slope off the property at the east property line. A wetland area exists immediately east of the site.

The proposed development includes 28 multi-family structures with associated roads and utilities. The project will connect to 191st Ave NE at the southwest corner of the property and extend the road along the west property line up to the northwest corner of the site. The project also proposes to construct a roadway at the northwest corner of the project site that extends west through the neighboring parcel and connects to 188th Ave NE.

The project is located within the City of Redmond and is subject to the requirements presented in the 2012 Stormwater Management Manual for Western Washington (SMMWW) as amended in 2014 and the City of Redmond Stormwater Technical Notebook. The drainage analysis for detention sizing has been modeled using the Western Washington Hydrology Model (WWHM) software, an approved model per the manual.

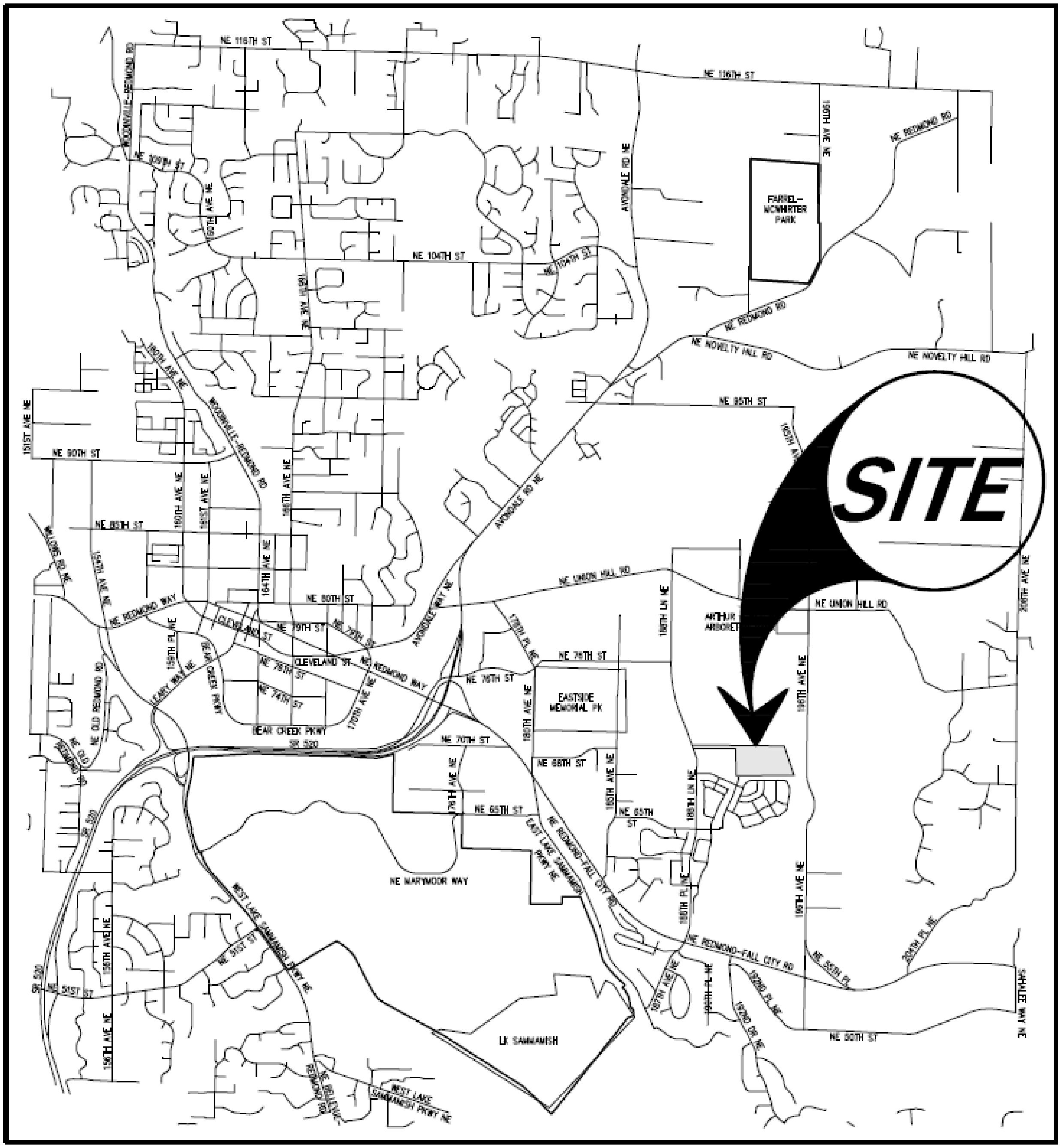


*Figure 1. 1 Vicinity Map*

Department of Assessments

500 Fourth Avenue, Suite ADM-AS-0708, Seattle, WA 98104

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- ?

**PARCEL**

| | |
|---|---|
| **Parcel Number** | 072506-9033 |
| **Name** | CADMAN INC |
| **Site Address** | 7039 196TH AVE NE 98053 |
| **Legal** | LOT 2 OF CITY OF REDMOND BLA# LAND-2017-00391 REC# 20170912900002 SD BLA BEING POR OF S 1/2 OF SW 1/4 STR 06-25- 06 TGW POR OF NE 1/4 STR 07-25-06 TGW POR OF N 1/2 OF NE 1/4 OF SE 1/4 STR 07-25-06 |

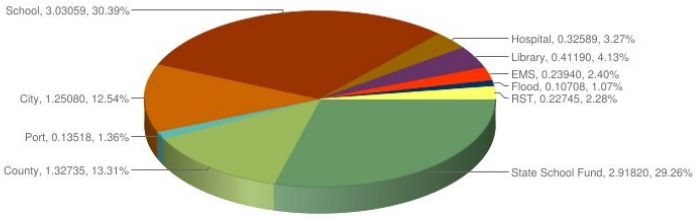
**BUILDING 1**

?

| | |
|---|---|
| **Year Built** | |
| **Building Net Square Footage** | |
| **Construction Class** | |
| **Building Quality** | |
| **Lot Size** | 520190 |
| **Present Use** | Mining/Quarry/Ore Processing |
| **Views** | No |
| **Waterfront** | |

**TOTAL LEVY RATE DISTRIBUTION**

**Tax Year:** 2018 **Levy Code:** 2025 **Total Levy Rate:** $9.97384 **Total Senior Rate:** $5.75297




**50.53% 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 ($) | Taxable Land Value ($) | Taxable Imps Value ($) | Taxable Total ($) |
|---|---|---|---|---|---|---|---|
| 2018 | 2019 | 3,121,100 | 0 | 3,121,100 | 3,121,100 | 0 | 3,121,100 |
| 2017 | 2018 | 3,121,300 | 0 | 3,121,300 | 3,121,300 | 0 | 3,121,300 |
| 2016 | 2017 | 2,601,000 | 0 | 2,601,000 | 2,601,000 | 0 | 2,601,000 |
| 2015 | 2016 | 5,454,000 | 0 | 5,454,000 | 5,454,000 | 0 | 5,454,000 |
| 2014 | 2015 | 5,454,000 | 0 | 5,454,000 | 5,454,000 | 0 | 5,454,000 |
| 2013 | 2014 | 5,454,000 | 0 | 5,454,000 | 5,454,000 | 0 | 5,454,000 |
| 2012 | 2013 | 5,454,000 | 0 | 5,454,000 | 5,454,000 | 0 | 5,454,000 |
| 2011 | 2012 | 5,512,000 | 0 | 5,512,000 | 5,512,000 | 0 | 5,512,000 |
| 2010 | 2011 | 5,512,000 | 0 | 5,512,000 | 5,512,000 | 0 | 5,512,000 |
| 2009 | 2010 | 5,512,000 | 0 | 5,512,000 | 5,512,000 | 0 | 5,512,000 |
| 2008 | 2009 | 5,512,000 | 0 | 5,512,000 | 5,512,000 | 0 | 5,512,000 |
| 2007 | 2008 | 4,641,700 | 0 | 4,641,700 | 4,641,700 | 0 | 4,641,700 |
| 2006 | 2007 | 2,785,000 | 0 | 2,785,000 | 2,785,000 | 0 | 2,785,000 |
| 2005 | 2006 | 2,320,800 | 0 | 2,320,800 | 2,320,800 | 0 | 2,320,800 |
| 2004 | 2005 | 2,320,800 | 0 | 2,320,800 | 2,320,800 | 0 | 2,320,800 |
| 2003 | 2004 | 2,320,800 | 0 | 2,320,800 | 2,320,800 | 0 | 2,320,800 |

**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

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**Notice mailing date: 06/14/2018**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2002 | 2003 | 1,740,600 | 0 | 1,740,600 | 1,740,600 | 0 | 1,740,600 |
| 2001 | 2002 | 1,740,600 | 0 | 1,740,600 | 1,740,600 | 0 | 1,740,600 |
| 2000 | 2001 | 1,241,600 | 0 | 1,241,600 | 1,241,600 | 0 | 1,241,600 |
| 1999 | 2000 | 1,241,600 | 0 | 1,241,600 | 1,241,600 | 0 | 1,241,600 |
| 1998 | 1999 | 1,241,600 | 0 | 1,241,600 | 1,241,600 | 0 | 1,241,600 |
| 1997 | 1998 | 0 | 0 | 0 | 1,241,600 | 0 | 1,241,600 |
| 1996 | 1997 | 0 | 0 | 0 | 1,253,200 | 0 | 1,253,200 |
| 1994 | 1995 | 0 | 0 | 0 | 624,000 | 0 | 624,000 |
| 1992 | 1993 | 0 | 0 | 0 | 465,300 | 0 | 465,300 |
| 1991 | 1992 | 0 | 0 | 0 | 755,000 | 0 | 755,000 |
| 1990 | 1991 | 0 | 0 | 0 | 755,000 | 2,600 | 757,600 |
| 1988 | 1989 | 0 | 0 | 0 | 163,600 | 32,100 | 195,700 |
| 1986 | 1987 | 0 | 0 | 0 | 181,800 | 28,300 | 210,100 |
| 1984 | 1985 | 0 | 0 | 0 | 155,300 | 32,000 | 187,300 |
| 1982 | 1983 | 0 | 0 | 0 | 155,300 | 32,000 | 187,300 |

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# SECTION 2. CONDITIONS AND REQUIREMENTS SUMMARY

The project will be designed using the guidelines and requirements established in the City of Redmond Stormwater Technical Notebook and the 2014 SMMWW. This is a multifamily residential project which proposes greater than 5,000 square feet of new hard surface area, therefore requiring the project to demonstrate compliance with all nine (9) minimum requirements.

## 2.1 Minimum Requirements

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

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

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

All 12 elements to be addressed. This minimum requirement will be addressed during final design.

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

This minimum requirement will be addressed during final design.

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

Due to historic site use, the natural drainage systems on site are unclear, however drainage likely left the site in up to three directions. The project will match the existing drainage systems. Refer to Section 3 for further analysis of the drainage systems.

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

The on-site soils are fill and a geotechnical engineer has determined that the surface soils are not conducive to infiltration applications. Soil beneath the surface fill soils have been found to support infiltration applications. Stormwater BMP design is discussed in Section 4 of this report.

### 2.1.6 Minimum Requirement #6: Runoff Treatment

Preliminary designs for the treatment facilities are described in Section 4 of this report.

### 2.1.7 Minimum Requirement #7: Flow Control

Design of the flow control facilities are described in Section 4 of this report. An infiltration vault has been designed to meet this requirement. An additional detention pond has been designed for offsite flow control of NE 70$^{th}$ St., constructed as part of this project. See Section 4 of this report for design details of the proposed flow control facilities and the Developed Conditions Map for the proposed site and facility layout.

### 2.1.8 Minimum Requirement #8: Wetland Protection

Area along the east property line slopes towards the wetland associated with Evans Creek and cannot be picked up by the flow control facility. Therefore this area is subject to this minimum requirement and is addressed in Section 4.2 of this report.

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

This minimum requirement will be addressed during final engineering.

# SECTION 3. OFFSITE ANALYSIS

A level 1 downstream analysis was performed on the project site. All related tasks are addressed below.

## TASK 1 Study Area Definition and Maps

The proposed project contains parcel number 0725069033. Refer to the property report located at the end of Section 1.

## TASK 2 Resource Review

### Basin Reconnaissance Summary Reports

No Basin Reconnaissance Summary Reports appear to be available for the area that is within one mile of this project site.

### FEMA Maps

A FEMA map dated March 30, 1998 number 53033C0390G was reviewed. The developable site is not located within a floodplain as it is covered by "Zone X – Outside of 500-year floodplain". The FEMA Map is included at the end of this section.

### USDA Natural Resources Conservation Service Soil Survey

The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey covers the project site area and states that the area of interest comprises of Everett very gravelly sandy loam. The Soils Map exhibit is included at the end of this section.

## TASK 3 Field Investigation

### Tributary Area

The existing grade of the site is relatively flat with slight grades sloping to the southwest. Massive berms with steep slopes exist on the west and south property lines. The eastern property line slopes steeply offsite towards Evans Creek.

### Upstream Tributary Analysis

There are small amounts of upstream drainage flowing onto the project site from the north. Refer to the Exhibits in Section 4 for the location and area of the upstream drainage.

## TASK 4 Drainage System Description and Problem Description

A Level 1 downstream analysis was performed on the project site. The site is currently undeveloped and covered in areas of grass, soil stockpiles and dirt roads. The site has historically been used as a sand and gravel pit over several decades with excavation and fill activities occurring consistently. There are no

existing structures located on site. The entire site is located within the Evans Creek drainage basin. Due to use of the site and fill and excavation activities occurring over the course of several decades, the historic drainage is unclear. The site likely drained to the west, east, south, and north at some point in time. The three current drainage paths from the site are discussed below.

West Drainage: A large berm exists along the west property line of the project site that directs a small amount of stormwater runoff to the west. This runoff travels west and north until reaching the private detention pond located on the Cadman property north of the project site. The stormwater runoff is managed on the Cadman site and fully infiltrated.

East Drainage: The current ground slopes steeply off site at the east property line, so at least a portion of the site has historically drained this direction. Any runoff to the east of the site will enter the wetland system immediately east of the property and continue east for approximately 300 feet before reaching Evans Creek. Evans Creek continues in a northerly direction for over 1 mile and the analysis is terminated. A small amount of stormwater will continue in this direction as flows along the east property line will be undetained and flow east.

South Drainage: The development south of the project was designed under the assumption that some stormwater runoff would flow onto the site from this project site. Stormwater runoff flowing south enters the storm system for that development and continues south approximately 1,000 feet before entering a detention pond system. The pond then discharges southeast into the wetland associated with Evans Creek. Stormwater flowing south travels 4,000 feet before meeting up with flows from Drainage A described above. Evans Creek then continues in a northerly direction for over 1 mile and the analysis is terminated. In the developed condition the project will infiltrate over 90% of the stormwater runoff while the remainder will be discharged to the south, matching the current existing conditions.

North Drainage: Runoff flowing north of the site enters a private detention pond on the Cadman site north of the property. Stormwater is then managed on-site under an agreement with Cadman and the City of Redmond where the stormwater is infiltrated. Therefore, the downstream path to the North ends at the Cadman detention pond. The documentation for the agreement with Cadman is provided at the end of this section. The project proposes to infiltrate over 90% of the stormwater runoff on-site, matching the existing condition. The majority of the site (approximately 9 acres) leaves the site to the north.

In summary, the project site has been an active mining and gravel site for many years, thus the natural drainage paths of the site are undetermined. It is likely that the site drained at some point to the south, east, and north. All three of the aforementioned drainage paths are tributary to Evans creek. The project will continue to match the predeveloped discharge locations in the developed condition as shown above for each drainage path. Refer to the Downstream Map at the end of this section.

# Soil Map—King County Area, Washington

Map Scale: 1:1,770 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

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

**Special Point Features**

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

**Water Features**

- Streams and Canals

**Transportation**

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

**Background**

- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: King County Area, Washington
Survey Area Data: Version 14, Sep 10, 2018

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

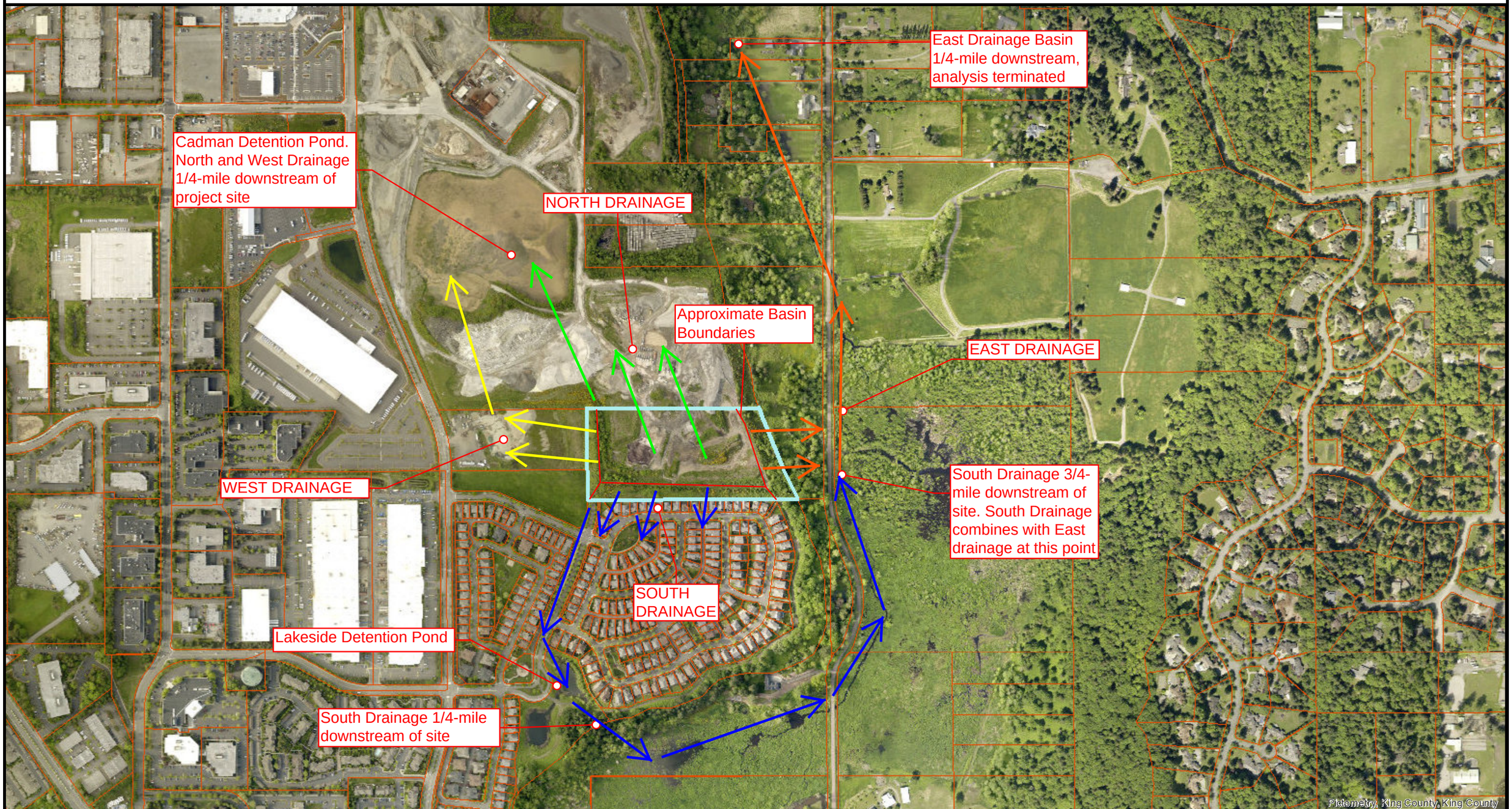
Date(s) aerial images were photographed: Aug 31, 2013—Oct 6, 2013

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 |
|---|---|---|---|
| EvC | Everett very gravelly sandy loam, 8 to 15 percent slopes | 11.9 | 100.0% |
| **Totals for Area of Interest** | | **11.9** | **100.0%** |

# King County iMap




The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a survey product. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

Date: 11/8/2018

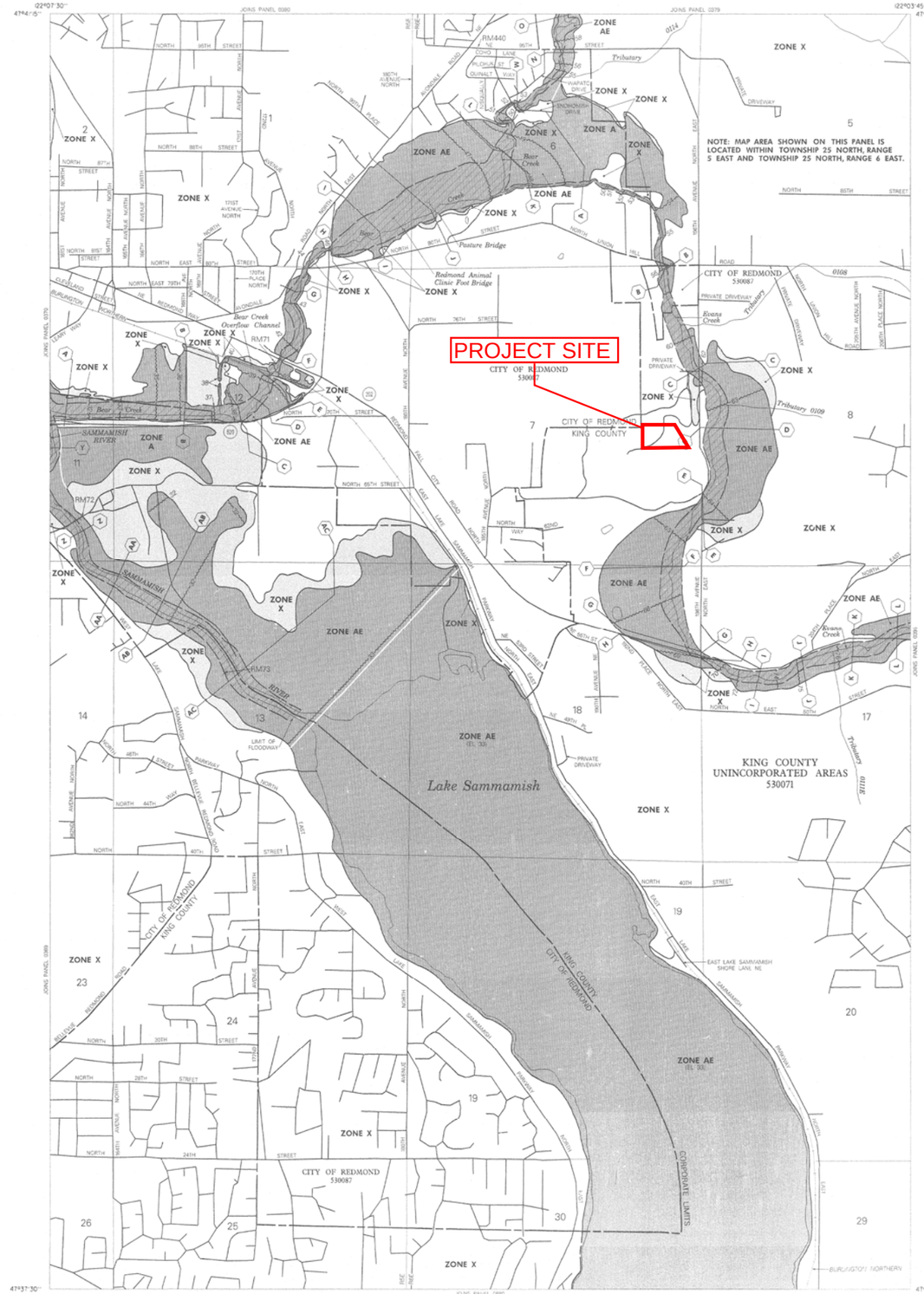
Notes:

N

King County

ELEVATION REFERENCE MARKS

| REFERENCE MARK | ELEVATION (FEET NGVD) | DESCRIPTION OF LOCATION |
|---|---|---|
| RM71 | 45.39 | LD & TK in top of southeast wingwall of bridge over Bear Creek on Redmond Fall [SN 292]. |
| RM72 | 45.29 | PPS-13C - Chiseled square on upstream top of a concrete guard rail wall in center of the bridge at NE 45th Street. |
| RM73 | 34.36 | PPS-14A - Located due east of disposal plant is a painted mark on riverward side of sewer manhole rim. |


JOINS PANEL 0380
JOINS PANEL 0379
JOINS PANEL 0389
JOINS PANEL 0391
JOINS PANEL 0389
122°07'30"
47°47'15"
122°03'45"
47°37'30"
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 25 NORTH, RANGE 5 EAST AND TOWNSHIP 25 NORTH, RANGE 6 EAST.
PROJECT SITE
CITY OF REDMOND
530087
CITY OF REDMOND
KING COUNTY
KING COUNTY
UNINCORPORATED AREAS
530071
Lake Sammamish
Bear Creek
Bear Creek Overflow Channel
Redmond Animal Clinic Foot Bridge
Pasture Bridge
Evans Creek
Tributary 0108
Tributary 0109
Tributary 0110
SAMMAMISH RIVER
ZONE AE
ZONE A
ZONE X
ZONE AE (EL 33)
ZONE AE (EL 32)
RM71
RM72
RM73
RM440
LIMIT OF FLOODWAY
CORPORATE LIMITS
BURLINGTON NORTHERN
EAST LAKE SAMMAMISH SHORE LANE NE
NORTH 85TH STREET
NORTH 76TH STREET
NORTH 65TH STREET
NORTH 40TH STREET
NORTH 44TH STREET
NORTH 46TH STREET
NORTH 24TH STREET
NORTH 28TH STREET
NORTH 30TH STREET
NE 90TH PL
NE 90TH ST
NE 95TH ST
180TH AVENUE NORTH
171ST AVENUE NORTH
190TH PLACE NORTH
PRIVATE DRIVEWAY
BELLEVUE REDMOND ROAD
LAKE SAMMAMISH PARKWAY
LAKE SAMMAMISH PARKWAY NORTH
NORTH UNION HILL ROAD
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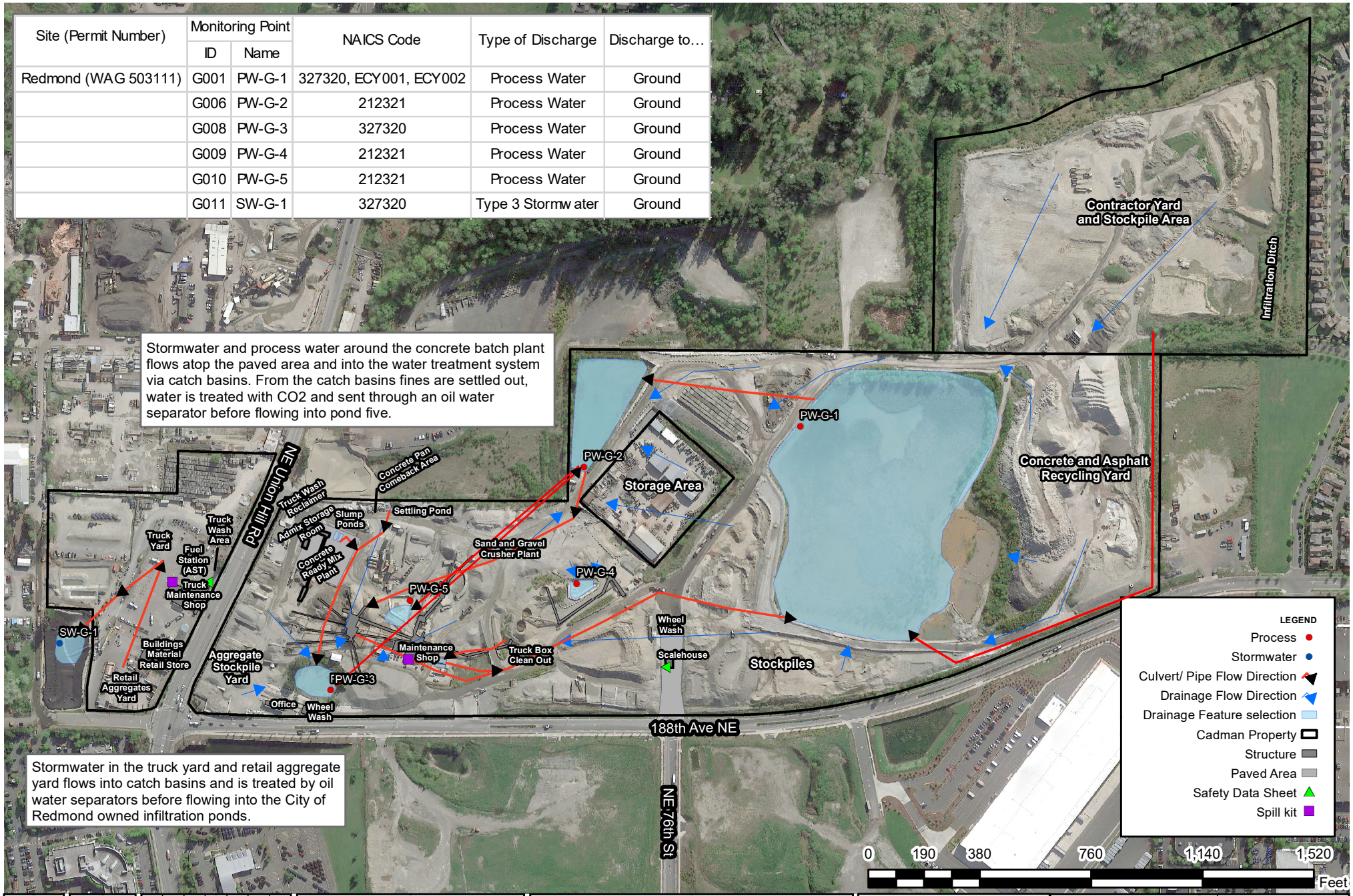
NORTH EAST 1079TH STREET

| Site (Permit Number) | Monitoring Point | | NAICS Code | Type of Discharge | Discharge to… |
|---|---|---|---|---|---|
| | ID | Name | | | |
| Redmond (WAG 503111) | G001 | PW-G-1 | 327320, ECY001, ECY002 | Process Water | Ground |
| | G006 | PW-G-2 | 212321 | Process Water | Ground |
| | G008 | PW-G-3 | 327320 | Process Water | Ground |
| | G009 | PW-G-4 | 212321 | Process Water | Ground |
| | G010 | PW-G-5 | 212321 | Process Water | Ground |
| | G011 | SW-G-1 | 327320 | Type 3 Stormw ater | Ground |

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LOCATION:
REGION: NORTH
DATE:
CHECKED:
DRAWN:
DESIGNED:

**Cadman**
**Redmond Site Map**

**LEHIGH HANSON**
**REGION NORTH**
**REDMOND**
**KING COUNTY, WA**

**Imagery Date: 6\27\16**

Horizontal Scale;1:100

**Projection:NAD_1983_HARN_StatePlane _Washington_North_FIPS_4601_Feet**

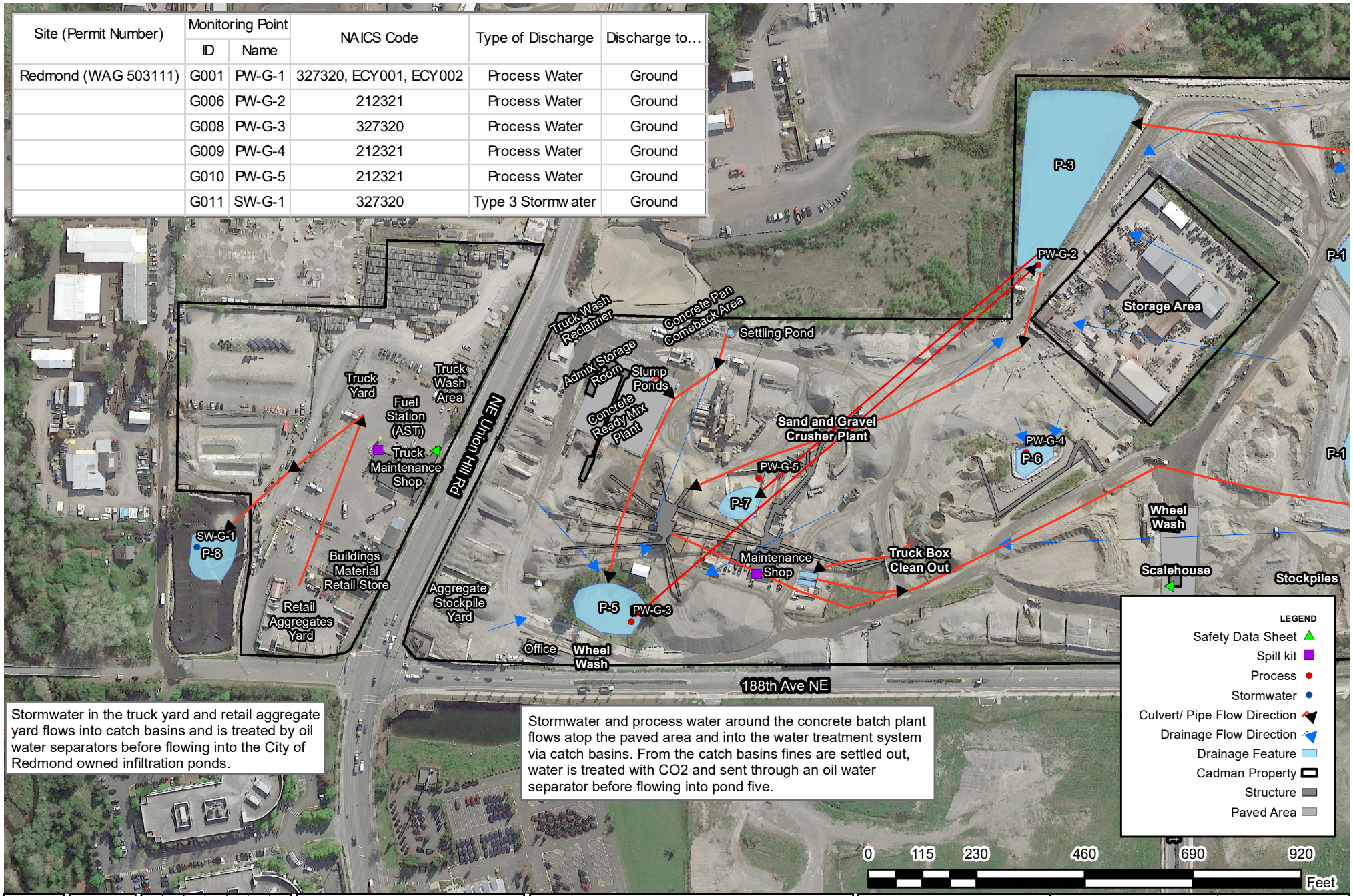
CADMAN
HEIDELBERGCEMENT Group

**Cadman Heidelberg**

**185TH AVENUE NE**
**SUITE 7554**
**REDMOND, WA 98052**

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

| Site (Permit Number) | Monitoring Point | | NAICS Code | Type of Discharge | Discharge to… |
|---|---|---|---|---|---|
| | ID | Name | | | |
| Redmond (WAG 503111) | G001 | PW-G-1 | 327320, ECY001, ECY002 | Process Water | Ground |
| | G006 | PW-G-2 | 212321 | Process Water | Ground |
| | G008 | PW-G-3 | 327320 | Process Water | Ground |
| | G009 | PW-G-4 | 212321 | Process Water | Ground |
| | G010 | PW-G-5 | 212321 | Process Water | Ground |
| | G011 | SW-G-1 | 327320 | Type 3 Stormw ater | Ground |




Stormwater in the truck yard and retail aggregate yard flows into catch basins and is treated by oil water separators before flowing into the City of Redmond owned infiltration ponds.

Stormwater and process water around the concrete batch plant flows atop the paved area and into the water treatment system via catch basins. From the catch basins fines are settled out, water is treated with CO2 and sent through an oil water separator before flowing into pond five.

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LOCATION:
REGION: NORTH
DATE:
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DRAWN:
DESIGNED:

**Cadman**
**Redmond Site Map**

**LEHIGH HANSON**
**REGION NORTH**
**REDMOND**
**KING COUNTY, WA**

**Imagery Date: 6\27\16**

Horizontal Scale;1:100

**Projection:NAD_1983_HARN_StatePlane _Washington_North_FIPS_4601_Feet**

CADMAN HEIDELBERGCEMENT Group

**Cadman Heidelberg**
**185TH AVENUE NE**
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

# SECTION 4. FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

## 4.1 Project LID Feasibility

Per Minimum Requirement #5, the project shall implement on-site stormwater management BMPs in accordance with the 2014 SMMWW. The flow chart below is used to determine the BMP requirements for the project.

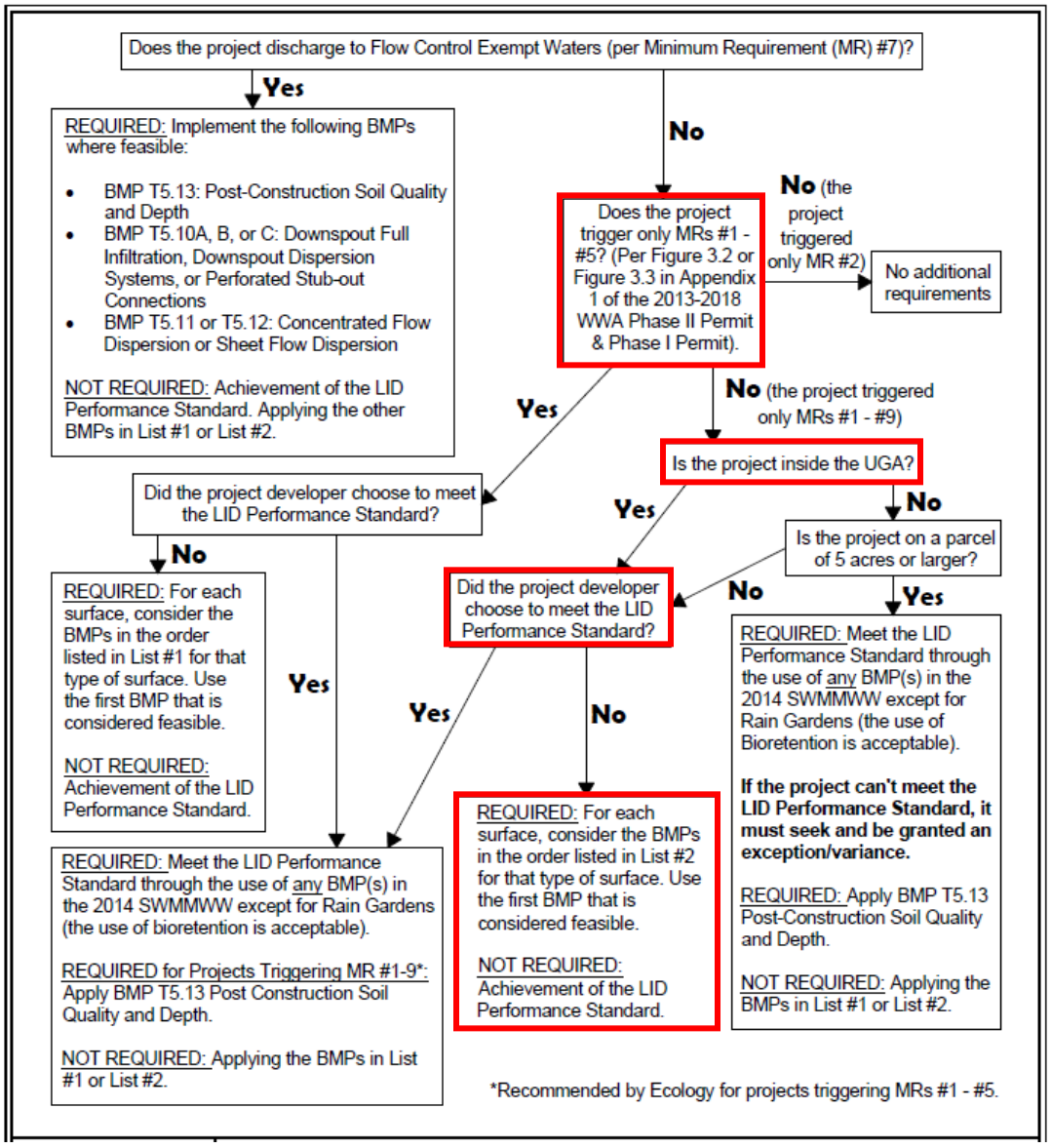



Figure 4.1: Flow Chart for Determining LID MR #5 Requirements

This project triggers all 9 minimum requirements and is classified as a new development project, therefore the project is required to meet the Low Impact Development (LID) Performance Standard or apply List #2 for on-site stormwater management BMPs from the 2014 SMMWW. The project elects to use List #2 to meet this requirement. A discussion considering the feasibility of all stormwater management BMPs from List #2 is included below.

**List #2**

Lawn and landscaped areas:

- Post-Construction Soil Quality and Depth in accordance with BMP T5.13: Post-Construction Soil Quality and Depth.

**Response:** *This BMP will be implemented for all lawn and landscaped areas that are affected by construction and grading activities in accordance with BMP T5.13 in the 2014 SMMWW.*

Roofs:

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion, or Downspout Full Infiltration Systems in accordance with BMP T5.10A: Downspout Full Infiltration

**Response:** *Due to site constraints the project cannot support the flowpath required for full dispersion, therefore this BMP is infeasible for roof stormwater runoff.*

2. Bioretention (See BMP T5.70: Bioretention Cells, Swales, and Planter Boxes) facilities must have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

**Response:** *The soils located at surface level on-site cannot support infiltration facilities, therefore bioretention has been deemed infeasible for this project. Bioretention Swales will be implemented in landscaped areas as landscape features, but the project will not take flow control credits due to soil quality.*

3. Downspout Dispersion Systems in accordance with BMP T5.10B: Downspout Dispersion Systems

**Response:** *The site cannot support the required flow path for downspout dispersion, therefore this BMP is considered infeasible.*

4. Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections

**Response:** *The geotechnical engineer does not recommend infiltration in the upper levels of fill. Therefore perforated connections are not applicable.*

Other Hard Surfaces:

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion

**Response:** *Due to site constraints the project cannot support the flowpath required for full dispersion, therefore this BMP is infeasible.*

2. Permeable pavement in accordance with BMP T5.15: Permeable Pavements

**Response:** *Permeable Pavement is infeasible for this project as the on-site soils cannot support infiltration applications.*

3. Bioretention BMP's (BMP T7.30: Bioretention Cells, Swales, and Planter Boxes) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

**Response:** *Due to site constraints additional bioretention BMP's for other hard surfaces such as roadway are infeasible***.** *Bioretention Swales will be implemented in landscaped areas as landscape features, but the project will not take flow control credits due to soil quality.*

4. Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion, or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated Flow Dispersion

**Response:** *Due to site constraints, sheet flow dispersion of other hard surfaces is infeasible.*

## 4.2 Hydraulic Analysis

All stormwater facilities will be designed in accordance with the 2014 SMMWW and the City of Redmond Stormwater Technical Notebook. The project is located within the SE Redmond Flow Control Custom Area. See the City of Redmond Flow Control Map located at the end of this section. The drainage analysis for detention and water quality sizing was modeled using the WWHM modeling program.

### 4.2.1 Existing Conditions

The 11.94-acre project site is currently an undeveloped vacant lot and is covered in grass and brush with soil stockpiles and dirt roads. The site has been delineated into a single drainage basin as the historic drainage is unclear due to constant changing of the site contours. The drainage basin will account only for the parcel area that is tributary to the proposed infiltration vaults in the developed condition. A portion of the site near the east property line will be left undeveloped and was not included in the vault calculations. There is also area along the south property line that cannot be picked up by the proposed infiltration vault due to existing grade, and is therefore modeled as bypass. Table 4.1 below shows the area totals used to model the predeveloped condition for the project site. This area includes onsite and offsite area tributary to the infiltration vault, bypass area, and excludes onsite area that is left undeveloped along the east property line. The predeveloped condition has been modeled for each of the two proposed infiltration vaults, one for public stormwater, the other for private stormwater. Modeling for the off-site detention pond is included under "70$^{th}$ St Detention Pond" at the end of this section.

| *Table 4-1 Predeveloped Areas* | |
|---|---|
| **GROUND COVER** | **TOTAL (acres)** |
| Public Infiltration Vault Basin | 1.56 |
| Private Infiltration Vault Basin | 11.26 |
| **TOTAL** | **12.82** |

These areas are input into WWHM as shown in the modeling files provided below for each vault basin. Refer to the WWHM reports located in Appendix A of this report.

**Public Partial Infiltration Vault Predeveloped Landuse Basin**

Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Forest, Flat 1.56
Pervious Total 1.56
Impervious Land Use Acres
Impervious Total 0
Basin Total 1.56

**Private Partial Infiltration Vault Predeveloped Landuse Basin**

Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Forest, Flat 11.26
Pervious Total 11.26
Impervious Land Use Acres
Impervious Total 0
Basin Total 11.26

### 4.2.2 Developed Conditions

The project proposes the construction of 28 multi-family residential structures with associated roads and utilities. Access to the site will be provided by a proposed roadway that will connect to 191st Ave NE at the southwest corner of the site and extend north along the west property line. At the northwest corner of the site the project proposes a roundabout and another roadway that will extend west through the neighboring parcel and connect to 188th Ave NE west of the site. Stormwater mitigation for the project includes two on-site infiltration vaults, one for stormwater runoff from the public right-of-way, and one for all stormwater runoff from all area on-site including private roadway. An additional detention pond will be included to collect stormwater runoff along NE 70th St at the northwest corner of

the site running west. The performance standard for the flow control facilities is based on the 2014 SMMWW, which requires the stormwater discharges to match developed discharge durations to predeveloped durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

On-site stormwater runoff will be detained and infiltrated in 2 vaults, one dedicated for public right-of-way and one for all other on-site stormwater runoff including private roadway. The stormwater runoff will then be infiltrated to the maximum extent feasible. Any stormwater runoff that cannot be infiltrated will be discharged into the storm system at the southwest corner of the site. The stormwater discharge will then enter the existing storm system for the Lakeside project. It was found that the Lakeside project accounted for flows from the future extension of 192nd Ave NE. This section includes calculations and supporting documents showing that the Woodside project will not exceed the peak flow rates or runoff volumes that have been accounted for in the Lakeside detention calculations.

**Private Stormwater Partial Infiltration Vault**

Table 4-2 below shows the areas tributary to the private partial infiltration vault. Also refer to the Developed Conditions Exhibit for a visual of these on-site areas.

***Table 4-2: Developed Areas – Private Infiltration Vault***

| | Impervious | Pervious | Total |
|---|---|---|---|
| Roof/Driveway | 179,887 | 0 | 179,887 |
| Road/Sidewalk | 96,965 | 0 | 96,965 |
| Landscaping | 0 | 152,689 | 152,689 |
| **Total Tributary Area (sf)** | 276,852 | 152,689 | 429,541 |
| **Total Tributary Area (ac)** | 6.35 | 3.51 | 9.86 |
| Bypass Area (ac) | 0.23 | 1.17 | 1.40 |
| **Total Including Bypass (ac)** | 6.58 | 4.68 | 11.26 |

The project includes an additional 1.40 acres of that cannot be picked up by the vault and is shown as bypass in the table. This area added to the area tributary to the vault matches the predeveloped condition basin for the private partial infiltration vault. The WWHM input file provided below shows the areas used for modeling of the developed condition determined using the areas from Table 4-2.

*Mitigated Land Use*

Basin 1

Bypass: No
GroundWater: No
Pervious Land Use Acres
Pervious Total 3.51
Impervious Land Use Acres
Impervious Total 6.35
Basin Total 9.86

Basin 2

Bypass: Yes
GroundWater: No
Pervious Land Use Acres
Pervious Total 1.17
Impervious Land Use Acres
Impervious Total 0.23
Basin Total 1.40

The private infiltration vault meets the flow control standard while infiltrating 95.99% of the total volume up to the 50-year storm event per the WWHM report provided in the appendix. The project proposes to discharge a small amount of flow that cannot be infiltrated within the vault. The project proposes to discharge the flows out of the infiltration vault and into the storm system located in 191st Ave NE, at the southwest corner of the project site.

**Public Stormwater Partial Infiltration Vault**

An additional vault is proposed to detain and partially infiltrate stormwater runoff from public right-of-way only. The berm that will be constructed for the interim condition north of the property will direct a small amount of stormwater towards the public road. This temporary berm area is offsite tributary area to the vault in the interim condition. When this berm is removed due to future development this area will no longer be tributary to the public vault, improving the performance of the vault. The vault still meets all flow control requirements with this area included. Refer to the Developed Conditions exhibit at the end of this section. The public partial infiltration vault is located just south of the private partial infiltration vault. Table 4-3 below provides a breakdown of the areas that are tributary to the public partial infiltration vault.

| *Table 4-3: Developed Areas – Public Infiltration Vault* | | | |
|---|---|---|---|
| | Impervious | Pervious | Total |
| Road | 23,115 | 0 | 23,115 |
| Sidewalk | 10,602 | 0 | 10,602 |
| Landscaping | 0 | 34278 | 16,611 |
| **Total (sf)** | 33,717 | 34,278 | 67,995 |
| **Total (ac)** | 0.77 | 0.79 | 1.56 |

The areas shown in the table are used for modeling of the infiltration vault and are shown in the WWHM modeling file provided below.

*Mitigated Land Use*
Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Lawn, Flat 0.79
Pervious Total 0.79
Impervious Land Use Acres
ROADS FLAT 0.53
SIDEWALKS FLAT 0.24
Impervious Total 0.77
Basin Total 1.56

According to the WWHM report provided in the Appendix, the public infiltration vault infiltrates 87.63% of stormwater runoff. Any additional runoff that cannot be infiltrated within the vault will be discharged to the south and into the existing storm system located in 191st Ave NE, the same location as the private infiltration vault. The rest of this section will provide justification for discharging stormwater runoff to the south. Section 4.3 of this report shows that each flow control facility will meet the on-site flow control requirement.

The proposal to discharge overflow stormwater to the south will not create a problem downstream as the development south of the project has accounted for flows from the Woodside project site. The documents attached at the end of this section, obtained from the Lakeside Division 1 Drainage Report dated August 2000, show that developed subbasin SC5 includes 0.89 acres of impervious area from the extension of 191st Ave NE in the flow control calculations. A map of the Lakeside project is also included at the end of this section to show its vicinity to Woodside.

The flow rates shown for developed subbasin SC5 as part of the Lakeside project account for 2.12 acres of offsite area flowing onto the project, 0.89 acres of impervious area and 1.23 acres of pervious landscaped area. The impervious area is assumed to come from the extension of 191st Ave NE, which is part of the Woodside project. Therefore, the flow rates for the 0.89 acres of impervious area were broken out and recreated using Stormshed, an SBUH model which was the standard at the time the

Lakeside calculations were run, to include only the 0.89 acres of impervious area assumed to come from the Woodside project. The results of the SBUH model with the flow rates produced from 0.89 acres of impervious area is included below.

**Appended on: 09:12:18 Thursday, April 18, 2019**

**SC5 DEVELOPED BASIN Event Summary**

| Event | Peak Q (cfs) | Peak T (hrs) | Hyd Vol (acft) | Area (ac) | Method | Raintype |
|---|---|---|---|---|---|---|
| 2 year | 0.3780 | 8.00 | 0.1206 | 0.8900 | SBUH | TYPE1A |
| other | 0.4340 | 8.00 | 0.1390 | 0.8900 | SBUH | TYPE1A |
| 5 year | 0.4875 | 8.00 | 0.1567 | 0.8900 | SBUH | TYPE1A |
| 10 year | 0.5963 | 8.00 | 0.1928 | 0.8900 | SBUH | TYPE1A |
| 25 year | 0.6892 | 8.00 | 0.2239 | 0.8900 | SBUH | TYPE1A |
| 100 year | 0.8059 | 8.00 | 0.2630 | 0.8900 | SBUH | TYPE1A |

**Record Id: SC5 DEVELOPED BASIN**

| | | | |
|---|---|---|---|
| **Design Method** | SBUH | **Rainfall type** | TYPE1A |
| **Hyd Intv** | 15.00 min | **Peaking Factor** | 484.00 |
| | | **Abstraction Coeff** | 0.20 |
| **Pervious Area (AMC 2)** | 0.00 ac | **DCIA** | 0.89 ac |
| **Pervious CN** | 0.00 | **DC CN** | 98.00 |
| **Pervious TC** | 0.00 min | **DC TC** | 5.00 min |

| Directly Connected CN Calc | | |
|---|---|---|
| **Description** | **SubArea** | **Sub cn** |
| Impervious surfaces (pavements, roofs, etc) | 0.89 ac | 98.00 |
| DC Composited CN (AMC 2) | | 98.00 |

| Directly Connected TC Calc | | | | | | |
|---|---|---|---|---|---|---|
| **Type** | **Description** | **Length** | **Slope** | **Coeff** | **Misc** | **TT** |
| Sheet | Smooth Surfaces.: 0.011 | 418.00 ft | 2.00% | 0.0110 | 1.85 in | 5.00 min |
| Directly Connected TC | | | | | | 5.00min |

The flow control design set forth in this report is contingent on the combined flows released from the two vaults being less than the flows accounted for in the Lakeside project and shown above. The flow rates discharged from the infiltration vaults are calculated using WWHM and are included below.

Private Vault

Flow Frequency Return Periods for Mitigated. POC #1
**Return Period Flow(cfs)**
2 year 0.170059
5 year 0.284181
10 year 0.351619
25 year 0.424813
50 year 0.470902
100 year 0.510538

Public Vault

Flow Frequency Return Periods for Mitigated. POC #1
**Return Period Flow(cfs)**
2 year 0.032617
5 year 0.05162
10 year 0.065956
25 year 0.085989
50 year 0.102278
100 year 0.119724

Combined Flows - Both Vaults

Flow Frequency Return Periods for Mitigated. POC #1
**Return Period Flow(cfs)**
2 year 0.202676
5 year 0.335801
10 year 0.417575
25 year 0.510802
50 year 0.57318
100 year 0.630262

These calculations show that the combined flows discharged from both vaults proposed for the woodside project will be less than the flows accounted for as part of the Lakeside project. This is in addition to meeting the onsite flow control standard for each vault. The WWHM reports for each infiltration vault are included in the appendix of this report. Additionally, the 0.89 acres of impervious area have been modeled using WWHM to further illustrate that the combined flows out of the vault will not exceed what has been accounted for in the Lakeside project detention calculations.

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.89

**Flow Frequency Return Periods for Predeveloped. POC #1**

| **Return Period** | **Flow(cfs)** |
|---|---|
| **2 year** | 0.339326 |
| **5 year** | 0.428608 |
| **10 year** | 0.489269 |
| **25 year** | 0.567955 |
| **50 year** | 0.628179 |
| **100 year** | 0.689866 |

Comparing the peak flow rates from 0.89 acres of impervious area above to the combined flows from both vaults, it is shown that the Woodside project will not exceed the previously assumed flows from the Woodside project site.

In addition to the flow rates above, the Woodside Project will not increase the volume of stormwater that is accounted for in the Lakeside project. This is shown in the following data pulled from the WWHM reports included in the appendix.

Vault 1
Width: 82 ft.
Length: 139 ft.
Depth: 11.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 1224.993
**Total Volume Through Riser (ac-ft): 51.193**
Total Volume Through Facility (ac-ft): 1276.186
Percent Infiltrated: 95.99

Vault 1
Width: 82 ft.
Length: 17 ft.
Depth: 10.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 160.926
**Total Volume Through Riser (ac-ft): 22.72**
Total Volume Through Facility (ac-ft): 183.646
Percent Infiltrated: 87.63

The data above shows the volume of stormwater that passes through the two proposed infiltration vaults. The table shows that a total volume of 73.91 acre-feet is released through the risers of the two vaults.

Predeveloped Basin Volume
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 142.113
Total Volume Through Riser (ac-ft): 0
**Total Volume Through Facility (ac-ft): 142.113**
Percent Infiltrated: 100

The above table was produced using the 0.89 acres of impervious area as the basin in order to show that the volume of stormwater released through the proposed infiltration vault is less than the volume that has been accounted for in the flow control calculations for Lakeside Division 1. Note that the basin of 0.89 acres of impervious area produces 142.113 acre-feet of stormwater while the proposed infiltration vaults discharge 73.91 acre-feet of stormwater.

Therefore, it is shown that discharging flows from the infiltration vault into the existing conveyance system at the southwest corner of the project site will not result in adverse conditions to the development south of the project. The findings from this section are summarized in the following table.

***Table 4-4: Vault Discharge Comparison***

| | WWHM – Public Vault | WWHM – Private Vault | WWHM – Combined Flows | WWHM – 0.89 ac Impervious | SBUH – 0.89 ac Impervious |
|---|---|---|---|---|---|
| 2-year peak flow (cfs) | 0.0326 | 0.1701 | 0.2027 | 0.3393 | 0.3780 |
| 10-year peak flow (cfs) | 0.0660 | 0.3516 | 0.4176 | 0.4893 | 0.5963 |
| 25-year peak flow (cfs) | 0.0860 | 0.4248 | 0.5108 | 0.5680 | 0.6892 |
| 100-year peak flow (cfs) | 0.1197 | 0.5105 | 0.6302 | 0.6899 | 0.8059 |
| Discharge Volume (ac-ft) | 22.72 | 51.19 | 73.91 | 142.11 | N/A |

**Infiltration Rate**

The following section describes the method used to determine the design infiltration rate used for modeling of the infiltration vaults for the project. Due to historic use of the site, viable soils for infiltration are located underneath fill soils that are unsuitable for infiltration. A geotechnical engineer has determined a measured infiltration rate of 1.8 inches/hour using a falling head test. Refer to the geotechnical report included in the appendix for more information.

The 2014 SMMWW provides steps to determine the design infiltration rate from the measured infiltration rate using correction factors.

| Issue | Partial Correction Factor |
|---|---|
| Site variability and number of locations tested | $CF_v$ = 0.33 to 1.0 |
| Test Method | |
| • Large-scale PIT<br>• Small-scale PIT<br>• Other small-scale (e.g. Double ring, falling head)<br>• Grain Size Method | • $CF_t$ = 0.75<br>• = 0.50<br>• = 0.40<br>• = 0.40 |
| Degree of influent control to prevent siltation and bio-buildup | $CF_m$ = 0.9 |

Total Correction Factor, $CF_T = CF_v \times CF_t \times CF_m$

$CF_V = 0.8$ A site variability correction factor of 0.8 was selected due to the level of uncertainty from the variable soils across the site.

$CF_t = 0.4$ The falling head test has been utilized for infiltration testing.

$$CF_T = 0.8 * 0.4 * 0.9$$

$$CF_T = 0.288$$

Applying the total correction factor of 0.288 to the measured rate of 1.8 in/hr, the design infiltration rate used for sizing of the infiltration vault is 0.52 in/hr.

**70th Street Public Detention Pond**

In addition to the onsite infiltration vaults, the project proposes to construct a detention pond located off site along NE 70th Street. The pond will detain stormwater runoff from NE 70th Street that cannot be conveyed to the onsite infiltration vault. The detention pond was modeled using two separate conditions. The first condition includes the slopes from the berm on the property to the north included as tributary to the pond. The second condition was modeled to include impervious area from a fully extended ROW that would be constructed as part of future development for the parcel to the north. The most conservative design was used for this proposed project. The total area tributary to the detention pond for each condition is shown in the tables below. Also refer to Figure 4-6 and Figure 4-7 at the end of this section for exhibits showing these tributary areas.

***Table 4-5: Detention Pond Tributary Areas – Proposed Conditions***

| | Impervious | Pervious | Total |
|---|---|---|---|
| Roadway | 21,927 | 0 | 21,927 |
| Sidewalk | 5,098 | 0 | 5,098 |
| Landscaping | 0 | 84,541 | 84,541 |
| Pond Surface | 10,086 | 0 | 10,086 |
| **Total (sf)** | 37,111 | 84,541 | 121,652 |
| **Total (ac)** | 0.85 | 1.94 | 2.79 |

***Table 4-6: Detention Pond Tributary Areas – Future Extended ROW***

| | Impervious | Pervious | Total |
|---|---|---|---|
| Roadway | 27,347 | 0 | 27,347 |
| Sidewalk | 8,923 | 0 | 8,923 |
| Landscaping | 0 | 27,756 | 27,756 |
| Pond Surface | 10,086 | 0 | 10,086 |
| **Total (sf)** | 46,356 | 27,756 | 74,112 |
| **Total (ac)** | 1.06 | 0.64 | 1.70 |

The areas above have been input into WWHM for modeling of the detention pond. The pond will meet the flow control standard as described above for all tributary areas from the table above. The more conservative pond size is modeled using the areas from Table 4-6 which includes impervious area from the future extended ROW. Section 4.3 provides data that shows that the pond meets the flow control standard as required. The WWHM report for each condition shown above is located in the Appendix. The WWHM modeling inputs for the predeveloped and mitigated condition are shown below.

***Detention Pond Model – Proposed Conditions***

*Predeveloped Land Use*
Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Forest, Mod 1.7
C, Lawn, Flat 1.09
Pervious Total 2.79
Impervious Land Use Acres
Impervious Total 0
Basin Total 2.79

*Mitigated Land Use*
Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Lawn, Flat 0.86
C, Lawn, Steep 1.09
Pervious Total 1.95
Impervious Land Use Acres
ROADS FLAT 0.5
SIDEWALKS FLAT 0.12
POND 0.22
Impervious Total 0.84
Basin Total 2.79

***Detention Pond Model – Future Extended ROW***

*Predeveloped Land Use*
Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Forest, Mod 1.7
Pervious Total 1.7
Impervious Land Use Acres
Impervious Total 0
Basin Total 1.7

*Mitigated Land Use*
Basin 1
Bypass: No
GroundWater: No
Pervious Land Use Acres
C, Lawn, Flat 0.64
Pervious Total 0.64
Impervious Land Use Acres
ROADS FLAT 1.06
Impervious Total 1.06
Basin Total 1.7

The detention pond for 70th Street is located within a storm detention pond easement acquired from the adjacent property owner. Refer to the civil plans for more information.

**Wetland Protection**

Area along the east property line of the site slopes towards a wetland offsite associated with Evans Creek. This area is considered a separate threshold discharge area (TDA) as it discharges at a different location than the rest of the project site. This TDA is the only basin on site that drains towards a wetland and is therefore subject to Minimum Requirement #8: Wetlands Protection. According to Minimum Requirement #8 of the 2014 SMMWW, the thresholds identified in Minimum Requirement #6 and Minimum Requirement #7 are also applied to determine applicability of this requirement to discharges to wetlands.

Minimum Requirement #6: Runoff Treatment provides the following thresholds for applicability:

- Projects in which the total of, pollution-generating hard surface (PGHS) is 5,000 square feet or more in a threshold discharge area of the project, or
- Projects in which the total of pollution-generating pervious surfaces (PGPS) – not including permeable pavements – is ¾ of an acre or more in a threshold discharge area, and from which there will be a surface discharge in a natural or man-made conveyance system from the site.

The proposed trail that is tributary to the wetland is not pollution generating and will not provide access to vehicles. The total amount of proposed PGPS discharging to the wetland is equal to 0.53 acres. Therefore, the proposed discharge to the wetland does not meet the thresholds provided for Minimum Requirement #6. The thresholds for Minimum Requirement #7 are evaluated below.

Minimum Requirement #7: Flow Control provides the following thresholds for applicability:

- Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area, or
- Projects that convert ¾ acres or more of vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural conveyance system from the site, or
- Projects that through a combination of effective hard surfaces and converted vegetation areas cause a 0.10 cubic feet per second increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other approved model and on-hour time steps (or a 0.15 cfs increase using 15-minute time steps).

The amount of total impervious area proposed to discharge into the wetland is 9,938 square feet (0.23 acres) which is less than the 10,000 square foot threshold. The project will also convert 0.53 acres of vegetation to pasture within the threshold discharge area tributary to the wetland. Refer to the following tables and exhibits for areas within the threshold discharge area tributary to the wetland.

***Table 4-7: Predeveloped Areas Discharged to Wetland***

| GROUND COVER | TYPE | TOTAL (acres) |
|---|---|---|
| Discharge to Wetland | C – Forest – Steep | 0.46 |
| | C – Lawn – Steep | 0.30 |
| | **TOTAL** | **0.76** |

***Table 4-8: Developed Areas Discharged to Wetland***

| GROUND COVER | TYPE | TOTAL (acres) |
|---|---|---|
| Paved Trail/Sidewalk | Impervious – Flat | 0.23 |
| Landscaping | C – Lawn – Steep | 0.23 |
| | C – Lawn - Moderate | 0.24 |
| Filter Strip | Filter Strip Element | 0.06 |
| | **TOTAL** | **0.76** |

For the 0.15 cfs increase in flow rates, the existing condition (pre-project landcover) is assumed for modeling per the threshold requirement for Minimum Requirement #7: Flow Control of the 2014

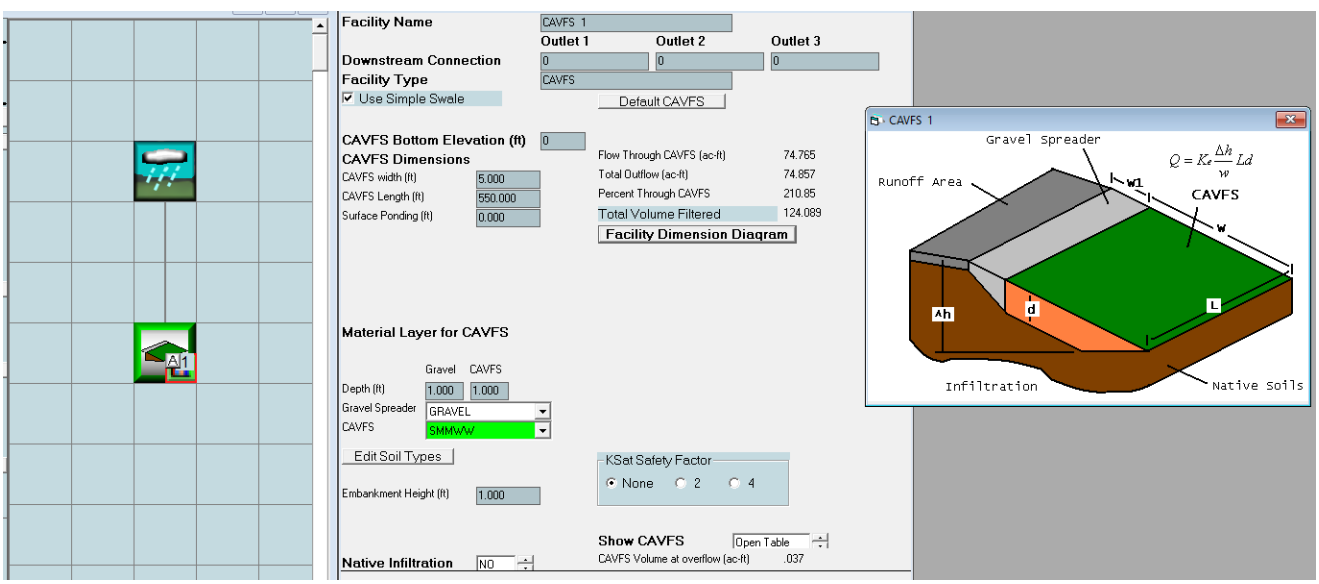
SMMWW. The on-site predeveloped basin is therefore assumed to be 25% Grass and 75% Forest, while the offsite basin is 100% Grass. All of these areas are also assumed to be steep slopes (greater than 15%). For the developed site, the landscaped areas were assumed to be 50% steep slopes and 50% moderate slopes.

A WWHM model has been created to determine if the threshold discharge area tributary to the wetland meets the flow rate threshold described above. The flow frequencies for the predeveloped and developed conditions are shown below.

Flow Frequency Return Periods for Predeveloped. POC #1
**Return Period Flow(cfs)**
100 year 0.212893

Flow Frequency Return Periods for Mitigated. POC #1
**Return Period Flow(cfs)**
100 year 0.324471

A filter strip was included in the model to reduce flows downstream of the proposed trail. Refer to the civil plans for more details. Note that the 100-year flow rate in the developed condition is less than 0.15 cfs greater than the predeveloped condition flow rate using 15-minute time steps. Therefore, the threshold discharge area tributary to the wetland does not meet the thresholds provided for Minimum Requirement #8: Wetlands Protection. The full WWHM Report for discharge to the wetland is located in the appendix of this report. Also refer to Figure 4-8 at the end of this section. A screenshot from WWHM of the filter strip design is provided below.



## 4.3 Detention Calculations

The drainage analysis for sizing of the on-site infiltration vaults and the off-site detention pond have been modeled using WWHM as previously stated. Minimum Requirement #7 states that stormwater discharges shall match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The vaults have been sized to receive runoff from all target surfaces on-site, including all impervious surfaces and pervious landscaped areas. The detention pond has been sized to receive flows from NE 70$^{th}$ St and associated sidewalk and landscaping. The figures below show that the project will meet the on-site flow control requirement. This data has been pulled from the WWHM reports that are located in the Appendix.

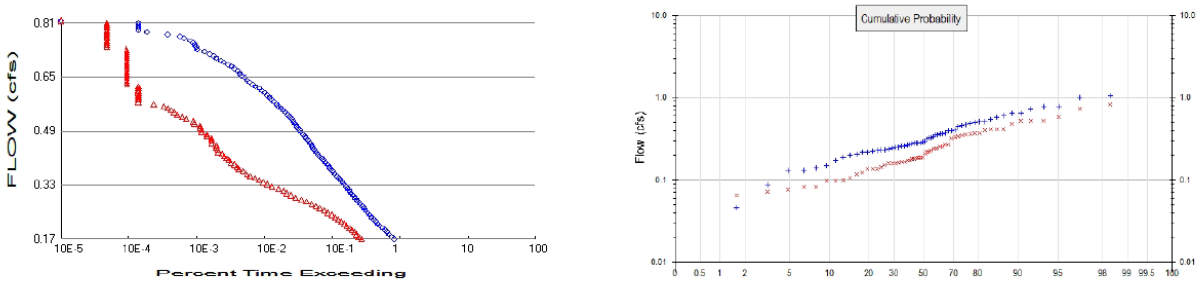
**Private Partial Infiltration Vault Analysis**

## Vault 1

Width: 82 ft.
Length: 139 ft.
Depth: 11.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 1224.993
Total Volume Through Riser (ac-ft): 51.193
Total Volume Through Facility (ac-ft): 1276.186
Percent Infiltrated: 95.99
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 10.5 ft.
Riser Diameter: 18 in.
Orifice 2 Diameter: 1.875 in. Elevation:3.4 ft.

## *Analysis Results*

### *POC 1*




+ Predeveloped x Mitigated

**Public Partial Infiltration Vault Analysis**

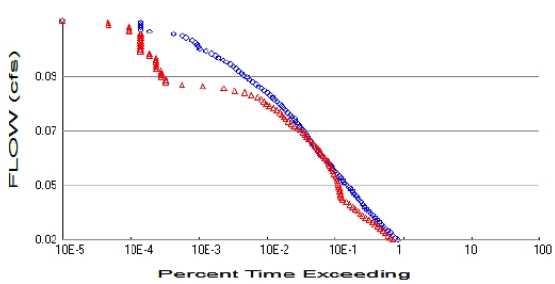
*Mitigated Routing*

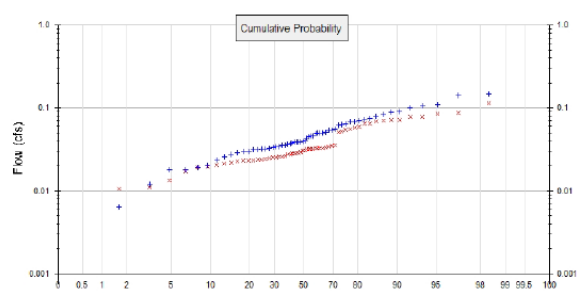
## Vault 1

Width: 82 ft.
Length: 17 ft.
Depth: 10.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 160.926
Total Volume Through Riser (ac-ft): 22.72
Total Volume Through Facility (ac-ft): 183.646
Percent Infiltrated: 87.63
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 9.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.875 in. Elevation:1.9 ft.
Orifice 2 Diameter: 0.75 in. Elevation:5.5 ft.

# *Analysis Results*

## *POC 1*




+ Predeveloped x Mitigated

**70th Street Detention Pond Analysis**

Two conditions of the pond have been modeled, with the proposed pond being the more conservative of the two designs. The size and durations analysis for each condition are provided below.

***Proposed Conditions Model***

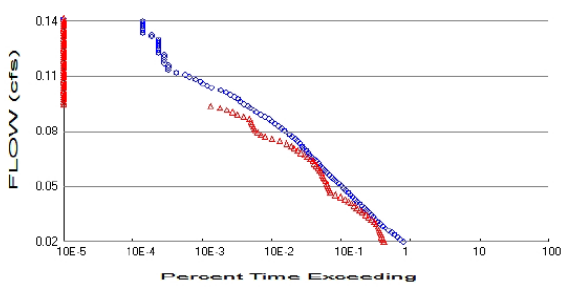
*Mitigated Routing*

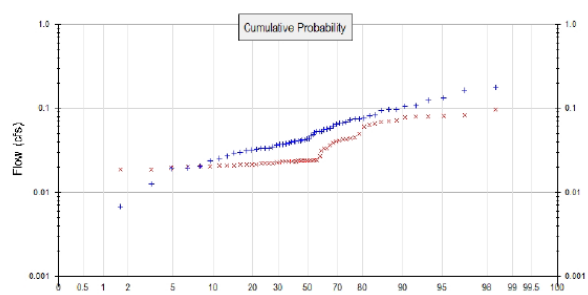
Trapezoidal Pond 1

Bottom Length: 210.00 ft.
Bottom Width: 5.00 ft.
Depth: 6 ft.
Volume at riser head: 0.5251 acre-ft.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.688 in. Elevation:0 ft.
Orifice 2 Diameter: 1.063 in. Elevation:3.6 ft.
Orifice 3 Diameter: 1.188 in. Elevation:4.2 ft.

## *Analysis Results*

### *POC 1*




+ Predeveloped x Mitigated

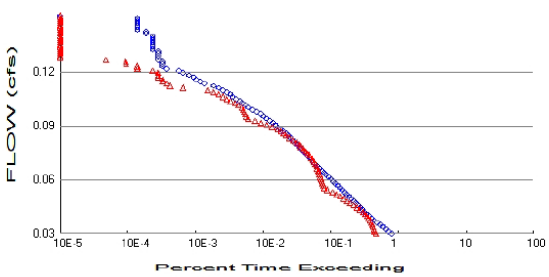
***Future Extended ROW Model***

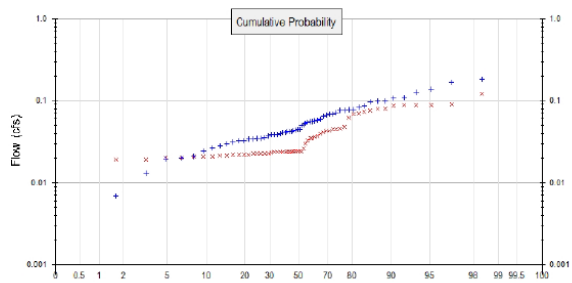
Trapezoidal Pond 1

Bottom Length: 207.00 ft.
Bottom Width: 5.00 ft.
Depth: 6 ft.
Volume at riser head: 0.5183 acre-ft.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.688 in. Elevation:0 ft.
Orifice 2 Diameter: 1.063 in. Elevation:3.6 ft.
Orifice 3 Diameter: 1.313 in. Elevation:4.2 ft.

## *Analysis Results*

### *POC 1*




+ Predeveloped x Mitigated

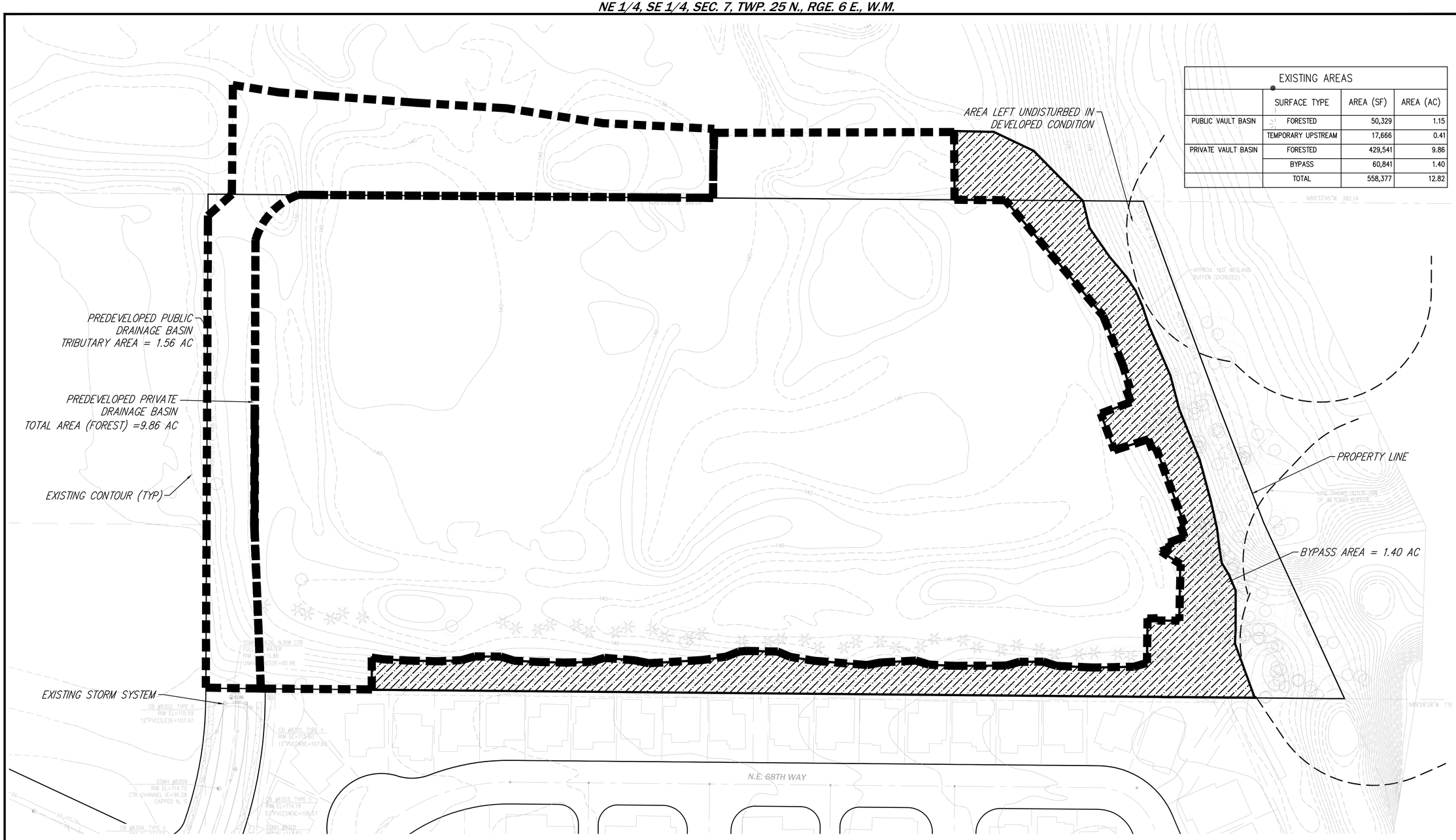
Note that in each facility, the developed conditions durations do not exceed the existing condition durations from 50% of the 2-year to the 50-year flow. Also note that the first condition that models the pond in the current proposed condition results in a slightly larger facility, therefore this is the design that was used.

The table below shows that the provided volume in each facility exceeds the required volume as determined using WWHM.

| LIVE STORAGE VOLUME | | |
|---|---|---|
| Facility | Required volume | Provided volume |
| Public Stormwater Infiltration Vault | 12,160 CF | 12,464 CF |
| Private Stormwater Infiltration Vault | 117,096 CF | 120,540 CF |
| 70th Street Detention Pond | 21,867 CF | 22,869 CF |

Refer to the developed condition exhibits in this section which show all areas tributary to each flow control facility.

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.




| EXISTING AREAS | | | |
|---|---|---|---|
| | SURFACE TYPE | AREA (SF) | AREA (AC) |
| PUBLIC VAULT BASIN | FORESTED | 50,329 | 1.15 |
| | TEMPORARY UPSTREAM | 17,666 | 0.41 |
| PRIVATE VAULT BASIN | FORESTED | 429,541 | 9.86 |
| | BYPASS | 60,841 | 1.40 |
| | TOTAL | 558,377 | 12.82 |

## GENERAL LEGEND

| EXISTING | PROPOSED |
|---|---|
| CATCH BASIN TYPE 1 | CATCH BASIN w/SOLID LID |
| SEWER MANHOLE | CATCH BASIN |
| WATER VALVE | CATCH BASIN w/FLOW THRU GRATE |
| WATER METER | CATCH BASIN w/VANED GRATE |
| LIGHT POLE | CB-TYPE 2 |
| POWER VAULT | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | STORM DRAIN CLEANOUT |
| | YARD DRAIN |

SCALE: 1" = 50'

0 25 50 100

**UNDERGROUND LOCATOR SERVICE**
CALL BEFORE YOU DIG!
811

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |
| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |
| 4 | FINAL PREP. SUBMITTAL | 11/8/19 |

SHARNBROICH ENGINEERING PROFESSIONAL ENGINEER

11-8-2019

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

# FIG 4-1: EXISTING CONDITIONS WOODSIDE

## POLYGON WLH, L.L.C.

11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

PLN_____-

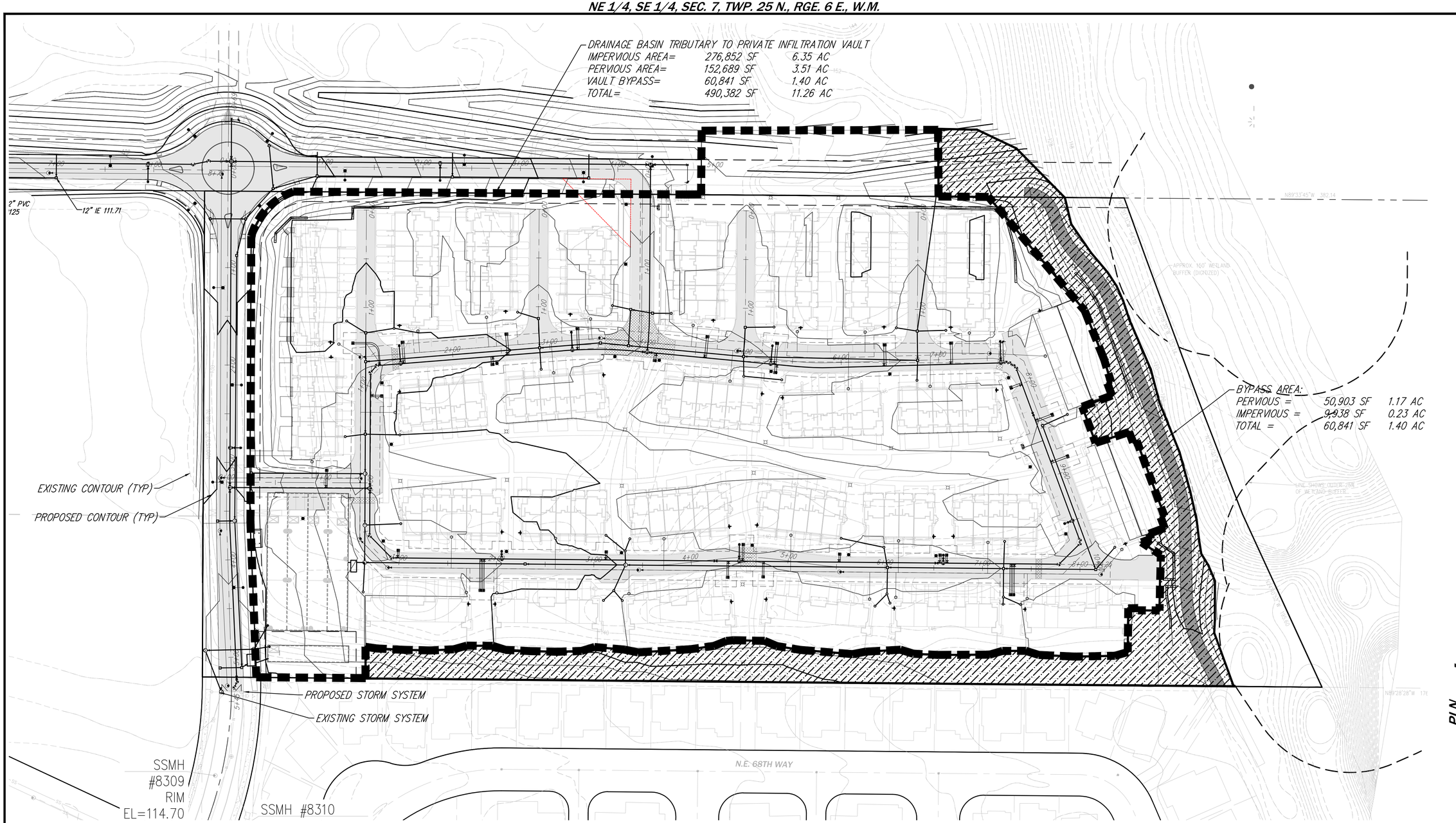
| | |
|---|---|
| DATE | OCTOBER 17, 2019 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET OF

PROJECT NUMBER
18122

12/2/2019 9:54 AM J:\2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDR\PRELIM\SECTION 4\DRAWINGS\18122 EXISTING CONDITIONS.DWG

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.




## GENERAL LEGEND

| EXISTING | PROPOSED |
|---|---|
| CATCH BASIN TYPE 1 | CATCH BASIN w/SOLID LID |
| SEWER MANHOLE | CATCH BASIN |
| WATER VALVE | CATCH BASIN w/FLOW THRU GRATE |
| WATER METER | CATCH BASIN w/VANED GRATE |
| LIGHT POLE | CB-TYPE 2 |
| POWER VAULT | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | STORM DRAIN CLEANOUT |
| | YARD DRAIN |

OFFSITE AREA DRAINING TO SITE

BYPASS AREA

TRIBUTARY AREA TO INFILTRATION VAULT

SCALE: 1" = 50'

0 25 50 100

**UNDERGROUND LOCATOR SERVICE**
CALL BEFORE YOU DIG!
811

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

| NO. | REVISIONS | DATE |
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| 1 | PREP. ROUND 2 | 2/20/19 |
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| 3 | PREP. ROUND 4 | 8/23/19 |
| 4 | FINAL PREP. SUBMITTAL | 11/8/19 |

GARY R. SHARNBROICH STATE OF WASHINGTON 38004 REGISTERED PROFESSIONAL ENGINEER

11-8-2019


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


# FIG 4.2: DEVELOPED CONDITIONS - PRIVATE WOODSIDE

## POLYGON WLH, L.L.C.

11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

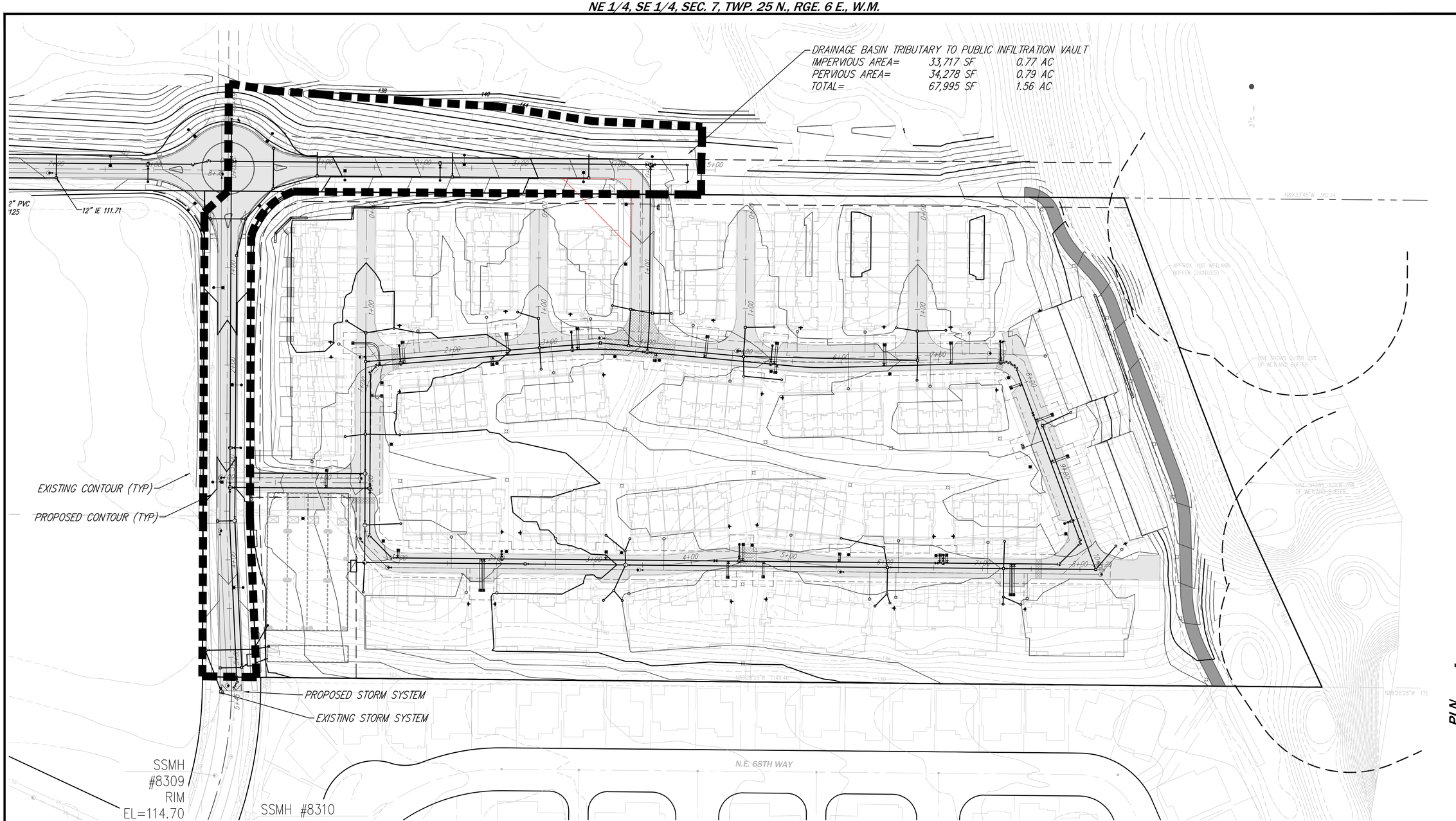
PLN ____ - ____

| | |
|---|---|
| DATE | OCTOBER 17, 2019 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET OF

PROJECT NUMBER
18122

12/2/2019 10:57 AM J:\2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDP\PRELIM\SECTION 4\DRAWINGS\18122 DEVELOPED CONDITIONS REVIEWING




## GENERAL LEGEND

| EXISTING | PROPOSED |
|---|---|
| CATCH BASIN TYPE 1 | CATCH BASIN w/SOLID LID |
| SEWER MANHOLE | CATCH BASIN |
| WATER VALVE | CATCH BASIN w/FLOW THRU GRATE |
| WATER METER | CATCH BASIN w/VANED GRATE |
| LIGHT POLE | CB-TYPE 2 |
| POWER VAULT | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | STORM DRAIN CLEANOUT |
| | YARD DRAIN |

OFFSITE AREA DRAINING TO SITE

BYPASS AREA

TRIBUTARY AREA TO INFILTRATION VAULT

SCALE: 1" = 50'

0 25 50 100

**UNDERGROUND LOCATOR SERVICE**
CALL BEFORE YOU DIG!
811

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

PLN_____-_____

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |
| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |

8-23-2019

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

# FIG 4-3: DEVELOPED CONDITIONS - PUBLIC WOODSIDE

## POLYGON WLH, L.L.C.

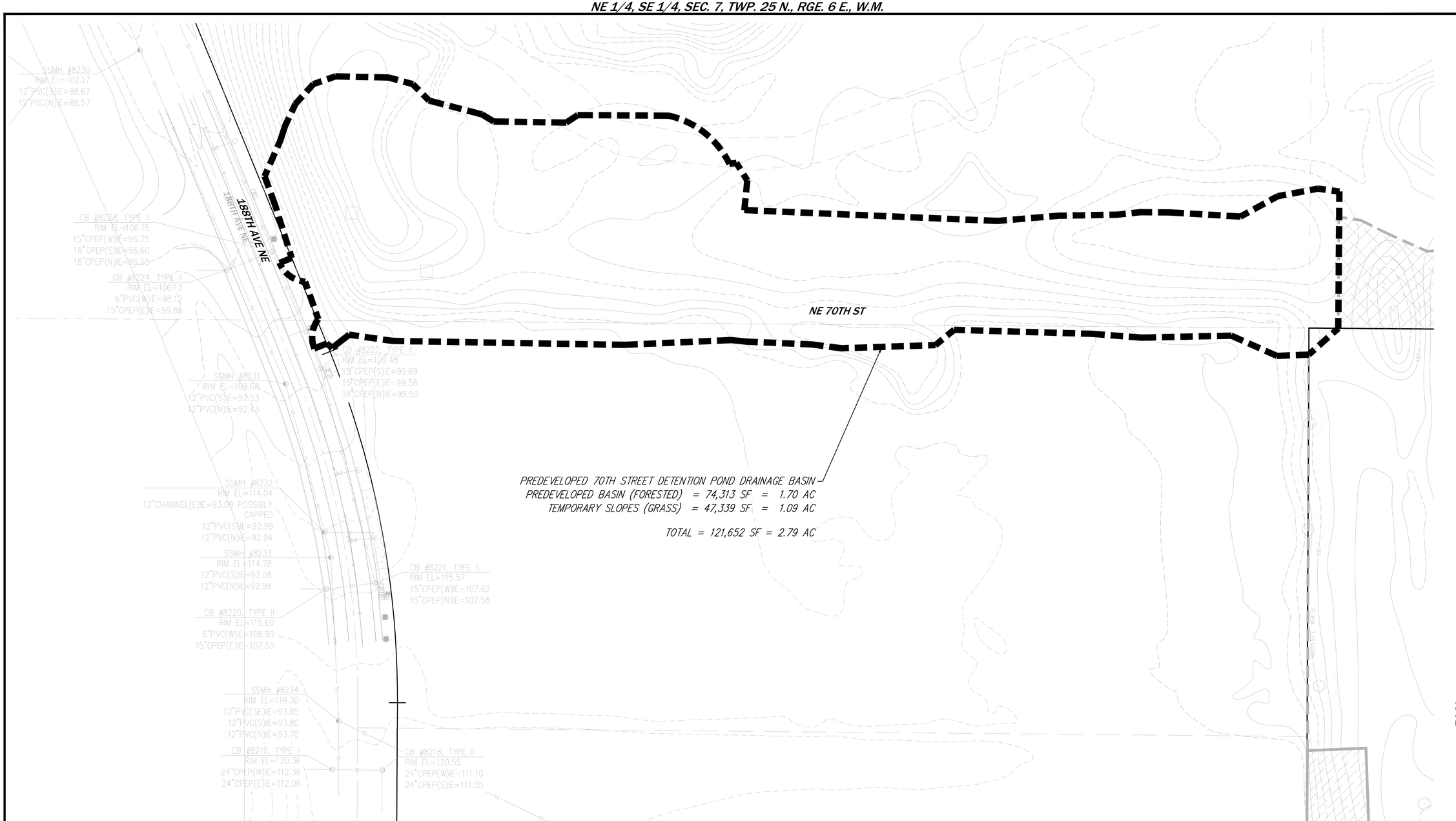
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | NOVEMBER 9, 2018 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. |
| | PROJECT MANAGER |

SHEET OF

PROJECT NUMBER 18122

8/20/2019 1:16 PM: \2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDR\PRELIM\SECTION 4\DRAWINGS\18122 DEVELOPED CONDITIONS-PUBLIC VAULT.DWG




PLN____-

## GENERAL LEGEND

| EXISTING | | PROPOSED | |
|---|---|---|---|
| | CATCH BASIN TYPE 1 | | CATCH BASIN w/SOLID LID |
| | SEWER MANHOLE | | CATCH BASIN |
| | WATER VALVE | | CATCH BASIN w/FLOW THRU GRATE |
| | WATER METER | | CATCH BASIN w/VANED GRATE |
| | LIGHT POLE | | CB-TYPE 2 |
| | POWER VAULT | | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | | | STORM DRAIN CLEANOUT |
| | | | YARD DRAIN |

SCALE: 1" = 40'

0 20 40 80

**UNDERGROUND LOCATOR SERVICE**
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811

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |
| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |

SHARNBROICH
STATE OF WASHINGTON
GARY R. SHARNBROICH
EXPIRES 11/11/19
PROFESSIONAL ENGINEER

8-23-2019

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

# FIG 4-4: 70TH ST. EXISTING CONDITIONS
## WOODSIDE

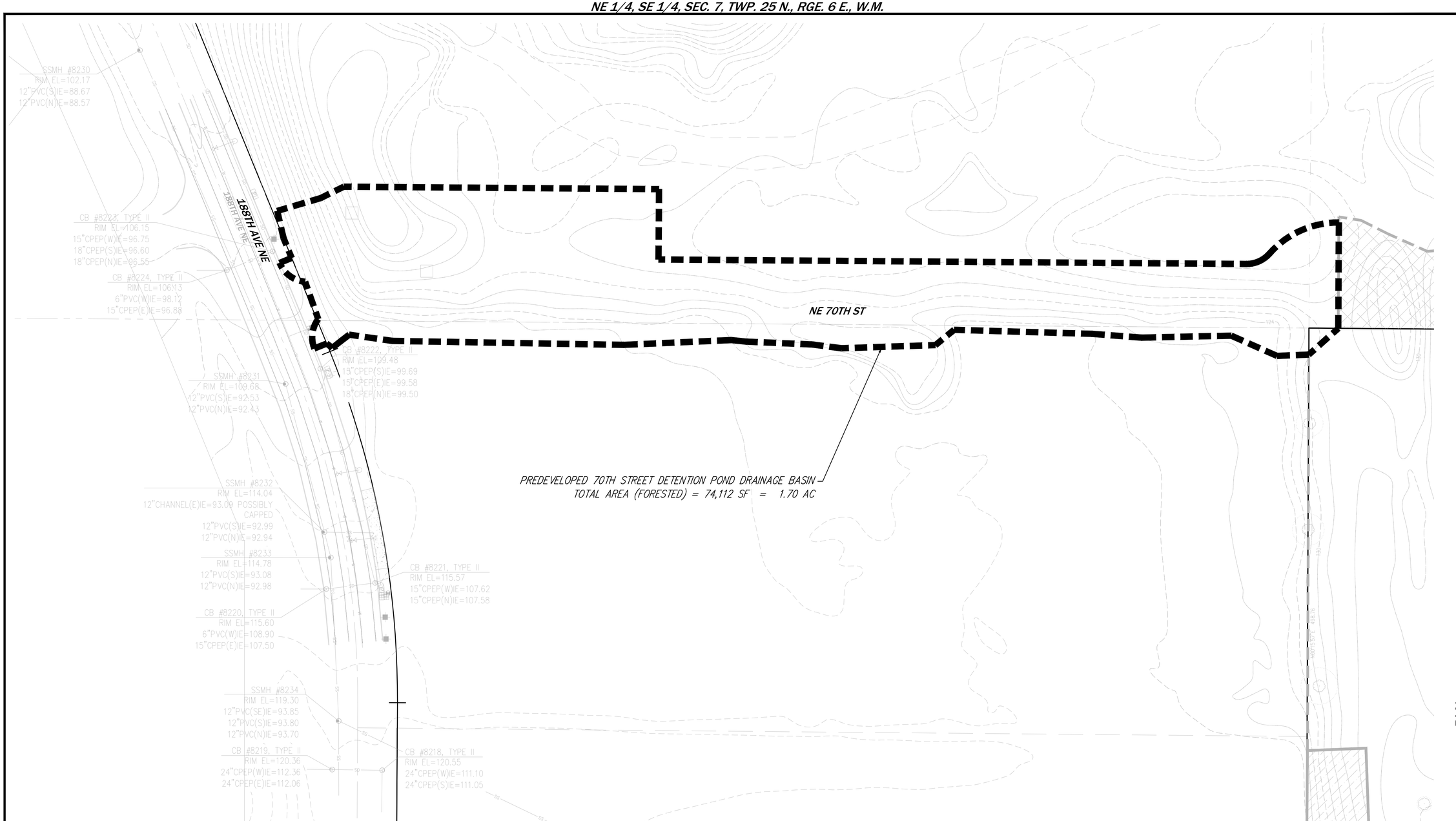
**POLYGON WLH, L.L.C.**
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | NOVEMBER 9, 2018 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G. WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET OF

PROJECT NUMBER
**18122**

8/20/2019 3:07 PM: \2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDR\PRELIM\SECTION 4\DRAWINGS\18122 EXISTING CONDITIONS 70TH ST.DWG




## GENERAL LEGEND

| EXISTING | | PROPOSED | |
|---|---|---|---|
| | CATCH BASIN TYPE 1 | | CATCH BASIN w/SOLID LID |
| | SEWER MANHOLE | | CATCH BASIN |
| | WATER VALVE | | CATCH BASIN w/FLOW THRU GRATE |
| | WATER METER | | CATCH BASIN w/VANED GRATE |
| | LIGHT POLE | | CB-TYPE 2 |
| | POWER VAULT | | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | | | STORM DRAIN CLEANOUT |
| | | | YARD DRAIN |

SCALE: 1" = 40'

0 20 40 80

**UNDERGROUND LOCATOR SERVICE**
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NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

_____

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |
| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |

8-23-2019

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PLANNING
SURVEYING
12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

FIG 4-5: EXISTING CONDITIONS - 70TH ST. FUTURE ROW

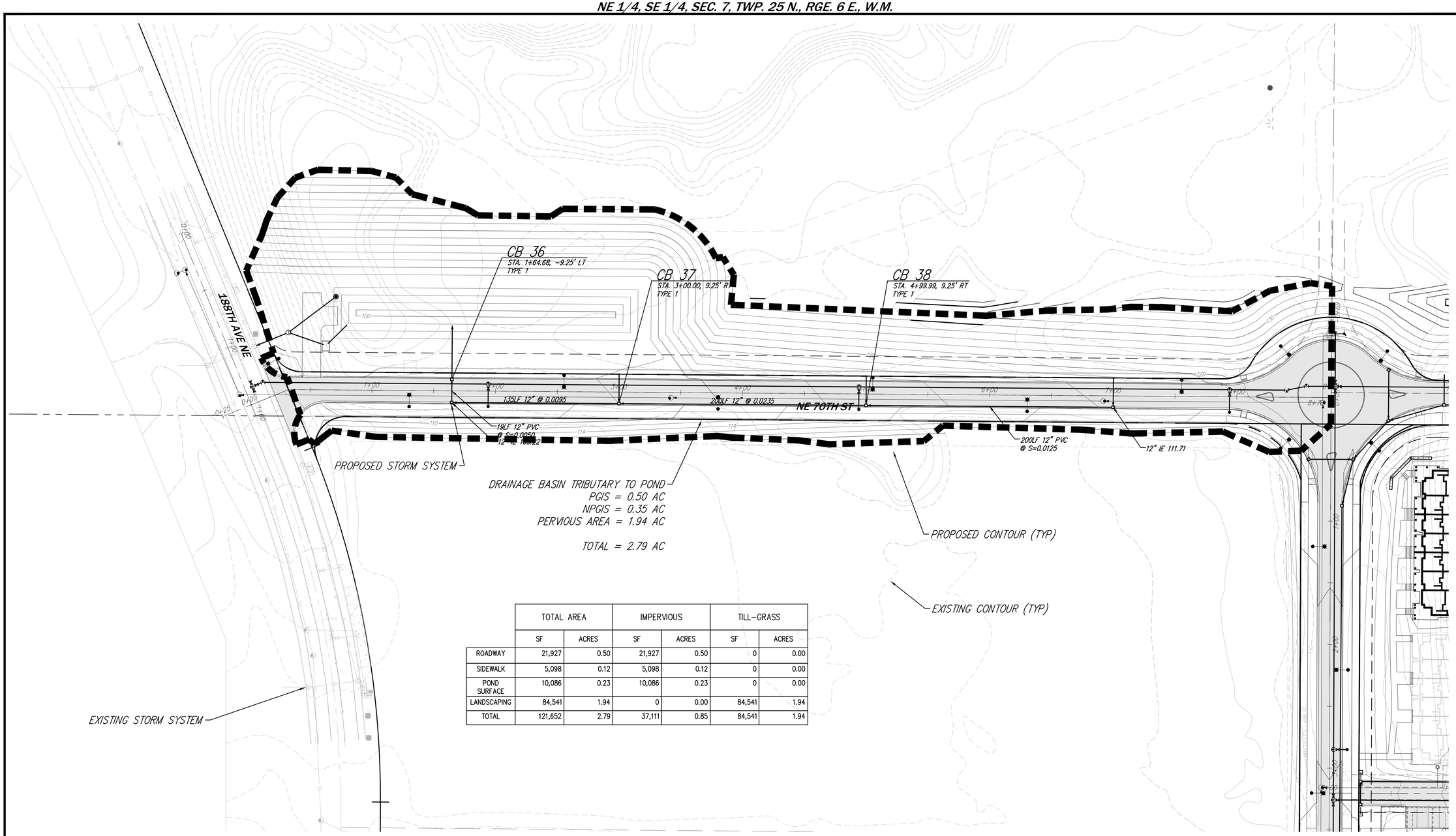
**POLYGON WLH, L.L.C.**
**WOODSIDE**
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | NOVEMBER 9, 2018 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G. WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET OF

PROJECT NUMBER
18122

8/20/2019 3:22 PM: \2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDR\PRELIM\SECTION 4\DRAWINGS\18122 EXISTING COND 70TH ST-FUTURE ROW.DWG




| | TOTAL AREA | | IMPERVIOUS | | TILL-GRASS | |
|---|---|---|---|---|---|---|
| | SF | ACRES | SF | ACRES | SF | ACRES |
| ROADWAY | 21,927 | 0.50 | 21,927 | 0.50 | 0 | 0.00 |
| SIDEWALK | 5,098 | 0.12 | 5,098 | 0.12 | 0 | 0.00 |
| POND SURFACE | 10,086 | 0.23 | 10,086 | 0.23 | 0 | 0.00 |
| LANDSCAPING | 84,541 | 1.94 | 0 | 0.00 | 84,541 | 1.94 |
| TOTAL | 121,652 | 2.79 | 37,111 | 0.85 | 84,541 | 1.94 |

## GENERAL LEGEND

| EXISTING | PROPOSED |
|---|---|
| CATCH BASIN TYPE 1 | CATCH BASIN w/SOLID LID |
| SEWER MANHOLE | CATCH BASIN |
| WATER VALVE | CATCH BASIN w/FLOW THRU GRATE |
| WATER METER | CATCH BASIN w/VANED GRATE |
| LIGHT POLE | CB-TYPE 2 |
| POWER VAULT | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | STORM DRAIN CLEANOUT |
| | YARD DRAIN |

SCALE: 1" = 40'

0 20 40 80

**UNDERGROUND LOCATOR SERVICE**
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NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

FOR: Director of Public Works

City of Redmond

Date: _____

Plan Chk Engr: _____
Storm: _____
Utility: _____
Fire: _____
Trans/Engr: _____
Planning: _____

This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |
| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |

8-23-2019

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

PLN ____-____

# FIG 4-6: 70TH ST. DEVELOPED CONDITIONS

## WOODSIDE

**POLYGON WLH, L.L.C.**
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | NOVEMBER 9, 2018 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET ____ OF ____

PROJECT NUMBER
18122

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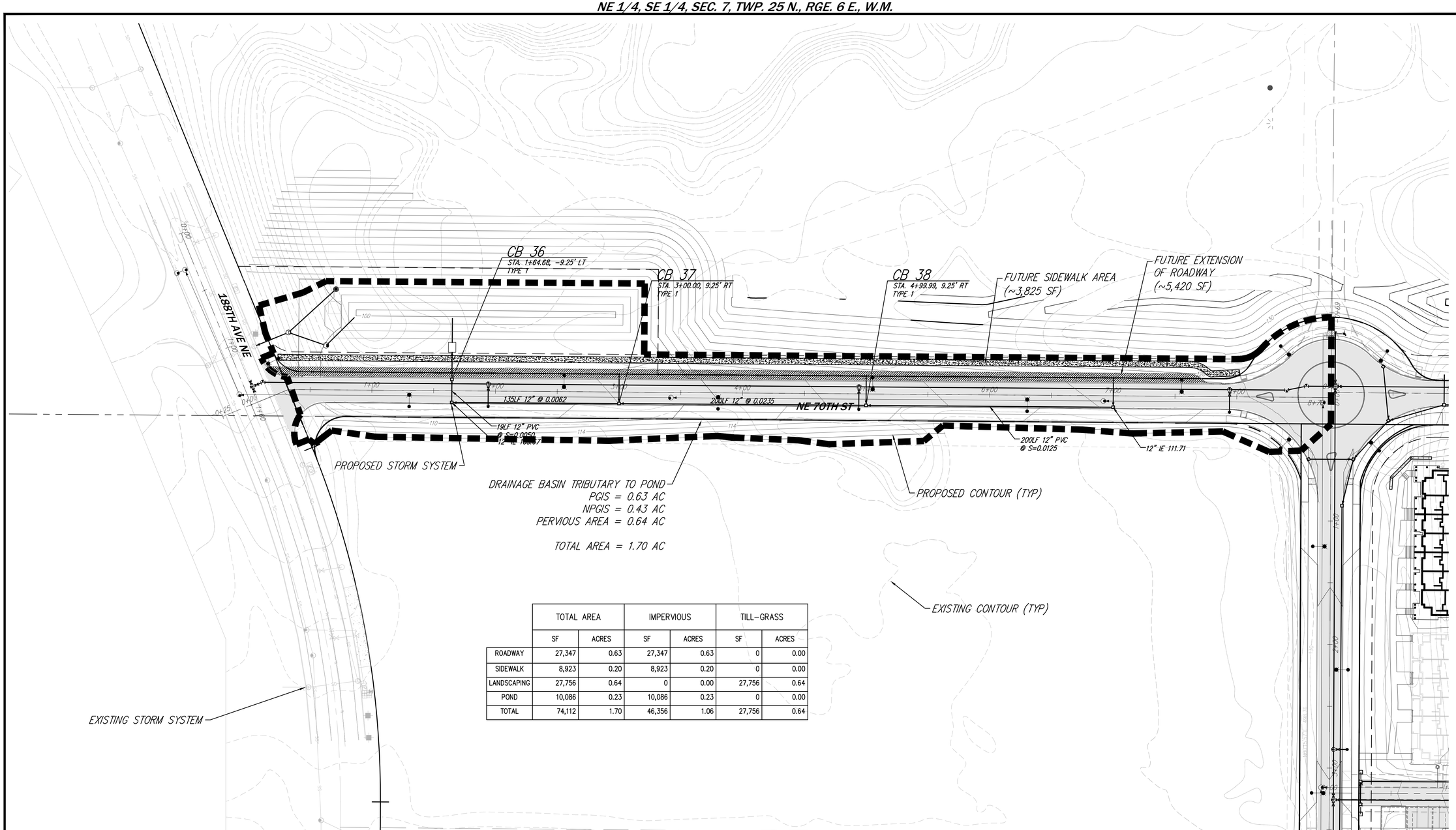


| | TOTAL AREA | | IMPERVIOUS | | TILL-GRASS | |
|---|---|---|---|---|---|---|
| | SF | ACRES | SF | ACRES | SF | ACRES |
| ROADWAY | 27,347 | 0.63 | 27,347 | 0.63 | 0 | 0.00 |
| SIDEWALK | 8,923 | 0.20 | 8,923 | 0.20 | 0 | 0.00 |
| LANDSCAPING | 27,756 | 0.64 | 0 | 0.00 | 27,756 | 0.64 |
| POND | 10,086 | 0.23 | 10,086 | 0.23 | 0 | 0.00 |
| TOTAL | 74,112 | 1.70 | 46,356 | 1.06 | 27,756 | 0.64 |

## GENERAL LEGEND

| EXISTING | PROPOSED |
|---|---|
| CATCH BASIN TYPE 1 | CATCH BASIN w/SOLID LID |
| SEWER MANHOLE | CATCH BASIN |
| WATER VALVE | CATCH BASIN w/FLOW THRU GRATE |
| WATER METER | CATCH BASIN w/VANED GRATE |
| LIGHT POLE | CB-TYPE 2 |
| POWER VAULT | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | STORM DRAIN CLEANOUT |
| | YARD DRAIN |

SCALE: 1" = 40'

0 20 40 80

**UNDERGROUND LOCATOR SERVICE**
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NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

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|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |
| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |
| 4 | FINAL PREP. SUBMITTAL | 11/8/19 |

GARY R. SHARNBROICH, P.E.
STATE OF WASHINGTON
PROFESSIONAL ENGINEER

11-8-2019

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

**FIG 4-7: 70TH ST. FUTURE ROW**
**WOODSIDE**

**POLYGON WLH, L.L.C.**
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

PLN____-____

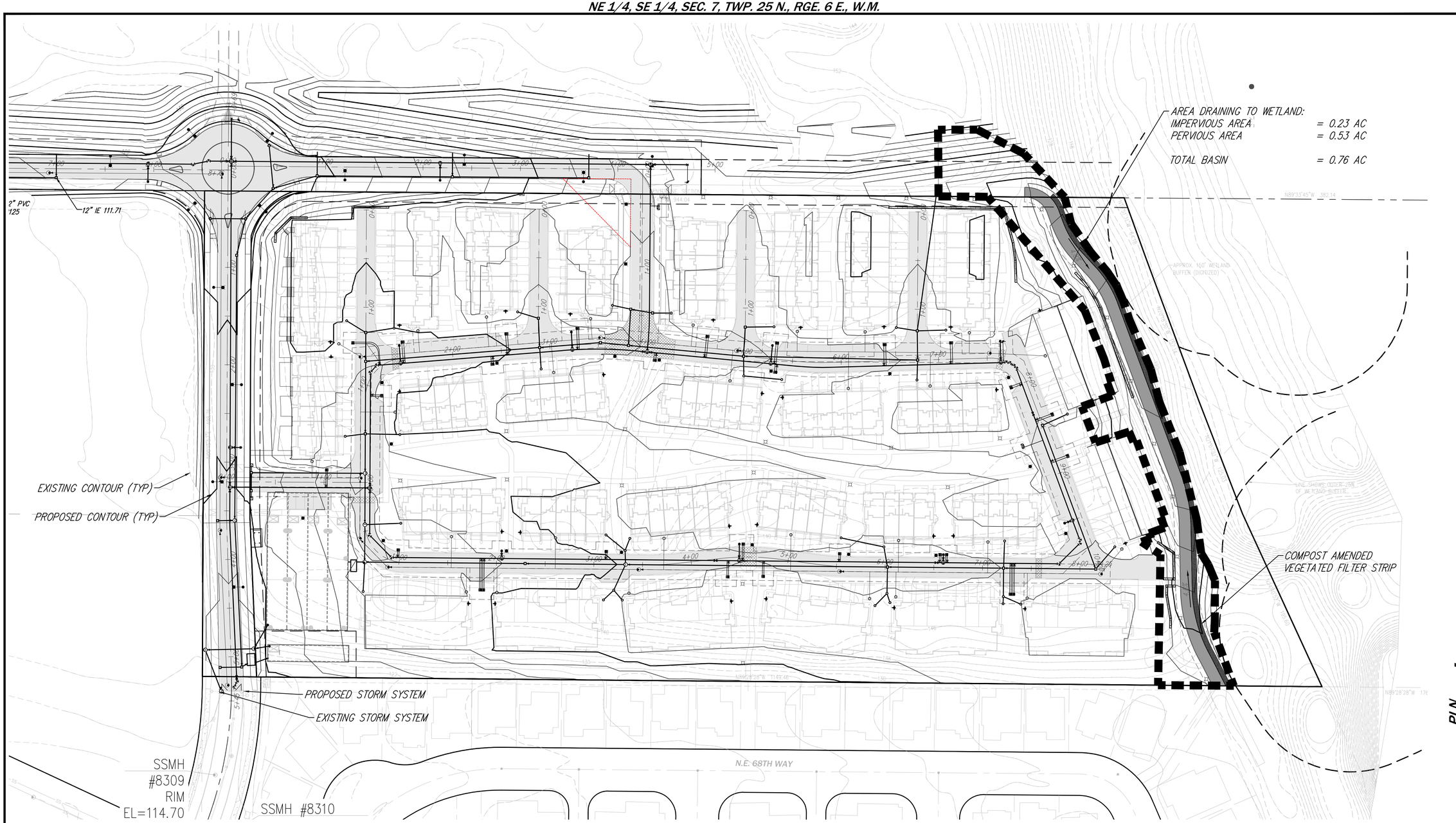
| | |
|---|---|
| DATE | OCTOBER 17, 2019 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. |
| | PROJECT MANAGER |

SHEET OF

PROJECT NUMBER
**18122**

11/06/2019 11:20 AM\\-\2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDR\PRELIM\SECTION 4\DRAWINGS\18122 DEV COND 70TH ST-FUTURE ROW.DWG

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.




## GENERAL LEGEND

| EXISTING | PROPOSED |
|---|---|
| CATCH BASIN TYPE 1 | CATCH BASIN w/SOLID LID |
| SEWER MANHOLE | CATCH BASIN |
| WATER VALVE | CATCH BASIN w/FLOW THRU GRATE |
| WATER METER | CATCH BASIN w/VANED GRATE |
| LIGHT POLE | CB-TYPE 2 |
| POWER VAULT | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | STORM DRAIN CLEANOUT |
| | YARD DRAIN |

OFFSITE AREA DRAINING TO SITE

BYPASS AREA

TRIBUTARY AREA TO INFILTRATION VAULT

SCALE: 1" = 50'

0 25 50 100

**UNDERGROUND LOCATOR SERVICE**
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811

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

FOR: Director of Public Works

City of Redmond

Date: _____

Plan Chk Engr: _____
Storm: _____
Utility: _____
Fire: _____
Trans/Engr: _____
Planning: _____

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| 2 | PREP. ROUND 3 | 6/14/19 |
| 3 | PREP. ROUND 4 | 8/23/19 |
| 4 | FINAL PREP. SUBMITTAL | 11/8/19 |

11-8-2019


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12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877


PLN ____ - ____

# FIG 4.8: WETLAND DISCHARGE AREAS WOODSIDE

## POLYGON WLH, L.L.C.

11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | OCTOBER 17, 2019 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET OF

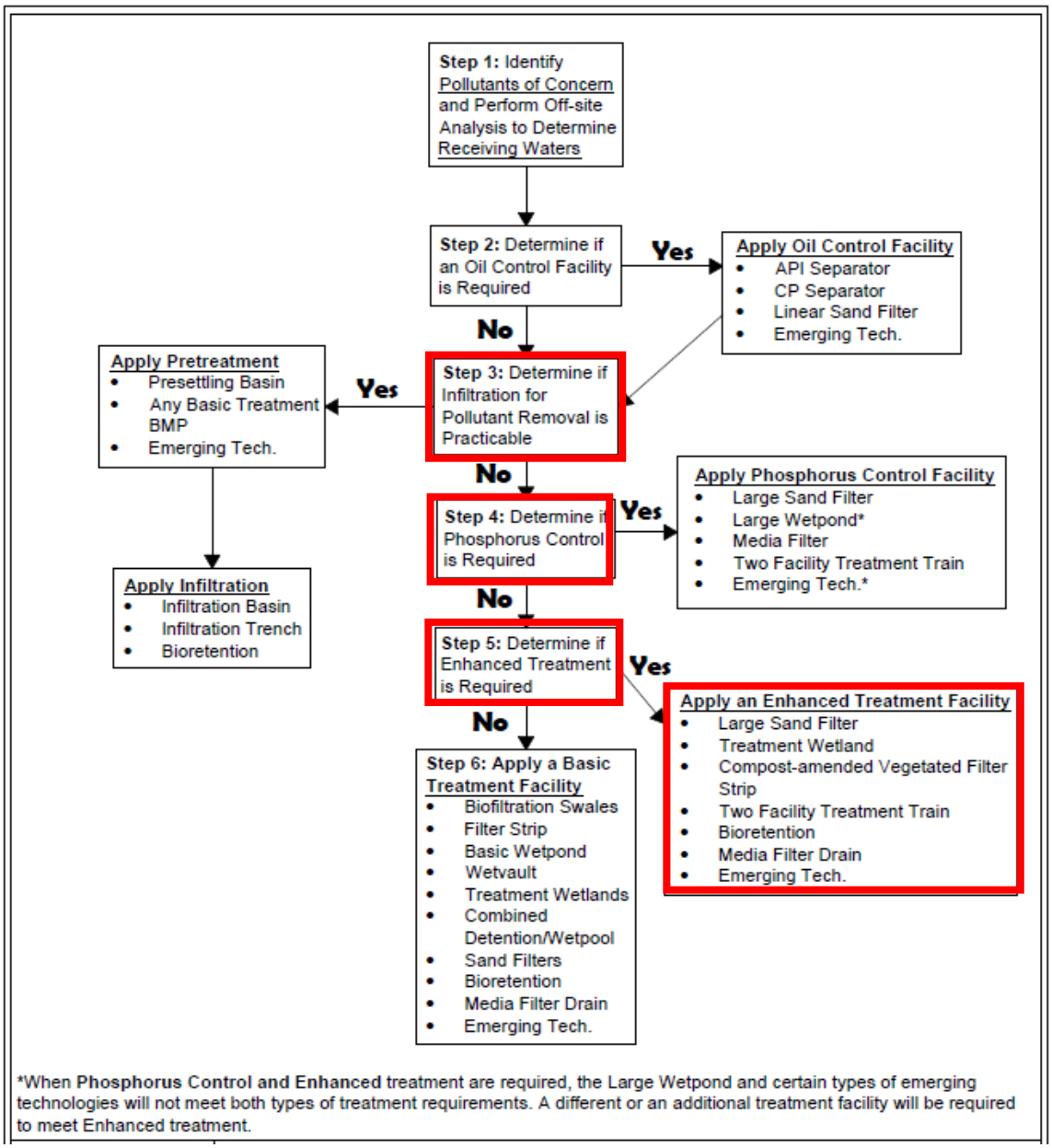
PROJECT NUMBER
18122

12/2/2019 12:49 AM; \2018\18122\DOCUMENTS\ENGINEERING REPORTS\SDP\PRELIM\SECTION 4\DRAWINGS\18122 WETLAND PROTECTION EXHIBIT.DWG

## 4.4 Water Quality

According to Minimum Requirement #6 of the 2014 SMMWW, the project is required to construct a stormwater treatment facility as the project will implement more than 5,000 square feet of pollution-generating hard surfaces. Per the 2014 SMMWW, enhanced treatment is required for multi-family residential and commercial projects. The project is a multi-family residential project and therefore must provide Enhanced Treatment. The flow chart below from the 2014 SMMWW assists in selecting a water quality facility for the site. The project will provide water quality treatment for both the onsite and offsite flow control systems.

**Onsite Water Quality Facility**



Following the flow chart, the project must select an enhanced treatment facility from the list provided for the on-site infiltration vaults. The project elects to implement a Biopod treatment facility to meet the runoff treatment minimum requirement for each of the public and private infiltration vaults. The Biopod has General Use Level Designation (GULD) approval for enhanced treatment from the Department of Ecology.

The media filter will be sized based on the water quality design storm volume, which is the 6-month, 24-hour storm according to the 2014 SMMWW. WWHM was used to determine the design storm volume to meet the runoff treatment requirement. The water quality design flow rate outputs from WWHM are shown for each of the infiltration vaults below.

The media filter will be located just upstream of each infiltration vault and will serve as pretreatment before runoff enters the vault and is infiltrated. Refer to the Developed Conditions Exhibit for the specific location of each media filter.

**Private Infiltration Vault**

## Water Quality

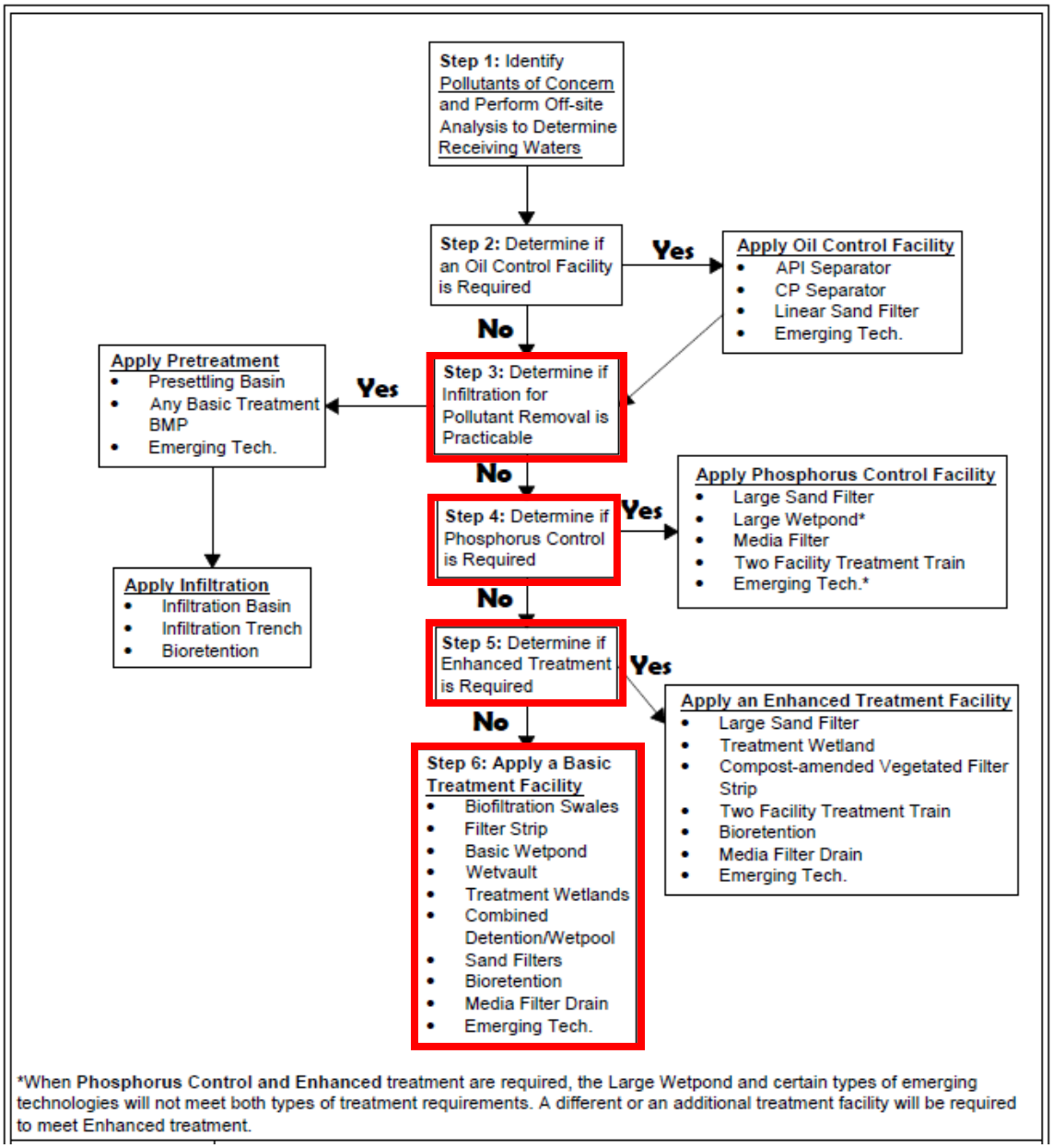
Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.3812 acre-feet
On-line facility target flow: 0.2063 cfs.
Adjusted for 15 min: 0.2063 cfs.
Off-line facility target flow: 0.1078 cfs.
Adjusted for 15 min: 0.1078 cfs.

**Public Infiltration Vault**

## Water Quality

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0636 acre-feet
On-line facility target flow: 0.0336 cfs.
Adjusted for 15 min: 0.0336 cfs.
Off-line facility target flow: 0.0209 cfs.
Adjusted for 15 min: 0.0209 cfs.

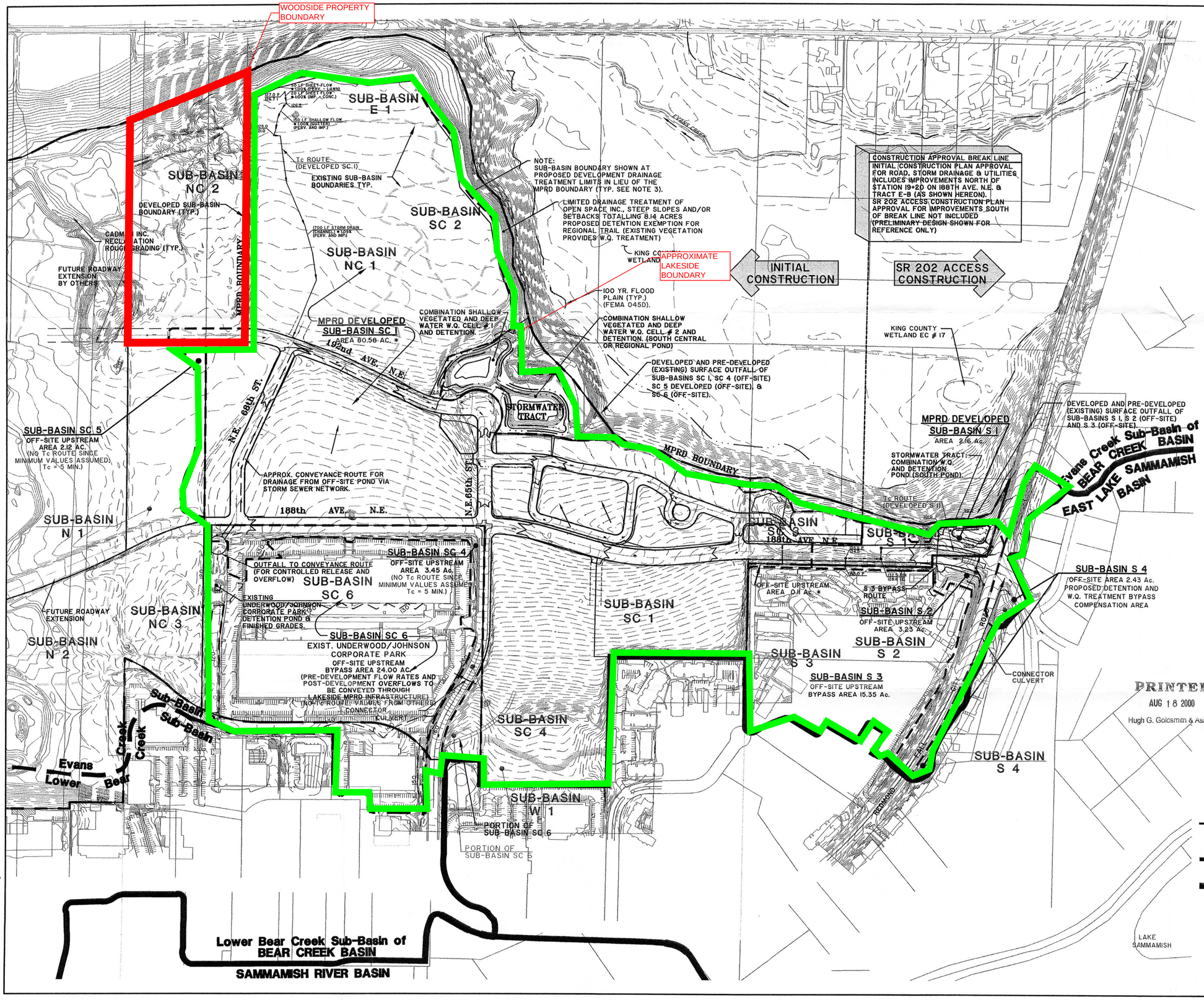
**Offsite Water Quality Facility**




The area tributary to the offsite pond contains NE 70th St. and associated sidewalk and landscaping. The roadway is not considered a high AADT road and will not receive flows from the on-site multifamily residential area and is therefore subject to the basic water quality standard. The project proposes a Biopod facility to meet water quality requirements and will be located downstream of detention. The Biopod filter is located downstream of the detention pond, therefore the water quality design flow rate is equal to the full 2-year release rate from the detention pond. The water quality design flow rate output determined using WWHM is shown on the following page. Refer to the WWHM report for the pond located in the appendix.

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period Flow(cfs)** |
| --- |
| **2 year 0.012711** |
| 5 year 0.020236 |
| 10 year 0.02647 |
| 25 year 0.035958 |
| 50 year 0.044316 |
| 100 year 0.053889 |




Z

100 400
0 200 600

SCALE: 1" = 200'

PRINTED
DEC 12 2000
Hugh G. Goldsmith & Assoc.

DEVELOPED CONDITION NOTES:

1. DETERMINATION OF AN EXISTING BASE CONDITION FOR HYDROLOGIC ANALYSIS WAS AGREED UPON WITH CITY STAFF AS THE 1993 CITY OF REDMOND AERIAL MAPPING SHOWN HEREON. THIS APPROXIMATES CONDITIONS ASSUMED UPON THE EFFECTIVE DATE OF THE SOUTHEAST REDMOND SUBAREA PLAN AMENDMENT (ORDINANCE 1825, FEB. 1995). THE EXISTING SUB-BASIN BOUNDARIES SHOWN CORRESPOND TO THE TOPOGRAPHY AND ARE THEREFORE CONCEPTUAL BY AGREEMENT.

2. SUB-BASIN BOUNDARIES AND DRAINAGE PATTERNS HAVE BEEN ADJUSTED, AT CITY REQUEST, TO INCLUDE THE UNDERWOOD / JOHNSON CORPORATE PARK SITE (SUB-BASINS SC4 & 6) WITHIN THE TRIBUTARY DRAINAGE AREA TO THE REGIONAL POND (PRE-DEVELOPED SURFACE OUTFALL OF SITE SUB-BASIN SC1). PRE-DEVELOPMENT FLOW RATES AND POST-DEVELOPMENT OVERFLOWS ARE TO BE CONVEYED THROUGH LAKESIDE MPRD INFRASTRUCTURE.

3. SUB-BASIN BOUNDARIES ALONG THE SOUTHEASTERN MPRD BOUNDARY ARE SHOWN AT PROPOSED DEVELOPMENT DRAINAGE TREATMENT LIMITS (BASED ON PRELIMINARY DESIGNS, STEEP SLOPES AND/OR SETBACKS) IN LIEU OF THE MPRD BOUNDARY TO EXCLUDE AREAS NOT PROPOSED FOR DEVELOPMENT OR INCLUDED IN HYDROLOGY CALCULATIONS.

4. SUB-BASIN BOUNDARIES FOR OFF-SITE UPSTREAM AREAS ARE SHOWN ASSUMING THE PROPERTY LINE CREATES A SEPARATE OFF-SITE SUB-BASIN EXCEPT FOR SUB-BASIN SC1 WHICH INCLUDES VERY MINOR OFF-SITE AREA WITHIN THE GIVEN SUB-BASIN ACREAGE.*

5. ALL ON-SITE DEVELOPED CONDITION TOPOGRAPHY DEPICTS RECLAMATION ROUGH GRADING, AND DIVISION I FINAL GRADING. THE GRADES SUITABLY INDICATE ULTIMATE CONDITIONS FOR HYDROLOGIC ASSUMPTIONS.

DEVELOPED CONDITION HYDROLOGIC SUMMARY:

TOTAL AREA TRIBUTARY TO SOUTH CENTRAL (REGIONAL) POND SC1+SC4+SC5 = 80.58+3.45+2.12 = 86.15 AC. (DOES NOT INCLUDE BYPASS)

SUB-BASIN SC1
PERV. AREA 29.67 AC., CN = 80; Tc = 17.02 MIN.
IMP. AREA 50.91 AC., CN = 98, Tc = 7.96 MIN.
SEE Tc ROUTE (DEVELOPED SC1) HEREON

SUB-BASIN SC4
PERV. AREA 1.11 AC., CN = 80; Tc = 5.00 MIN.
IMP. AREA 2.34 AC., CN = 98, Tc = 5.00 MIN.
REFER TO REPORT FOR FURTHER DATA

SUB-BASIN SC5
PERV. AREA 1.23 AC., CN = 80; Tc = 5.00 MIN.
IMP. AREA 0.89 AC., CN = 98, Tc = 5.00 MIN.
REFER TO REPORT FOR FURTHER DATA

TOTAL AREA TRIBUTARY TO SOUTH POND
S1 + S2 = 2.16 + 3.23 = 5.39 AC. (DOES NOT INCLUDE BYPASS)

SUB-BASIN S1
PERV. 1.08 AC., CN = 80; Tc = 5.00 MIN.
IMP. AREA 1.08 AC., CN = 98, Tc = 5.00 MIN.
SEE Tc ROUTE (DEVELOPED S1) HEREON

SUB-BASIN S2
PERV. 1.87 AC., CN = 66; Tc = 7.66 MIN.
IMP. AREA 1.36 AC., CN = 98, Tc = 5.86 MIN.
REFER TO REPORT FOR FURTHER DATA

RAINFALL (TYPE IA):
Pwq = 1.22", P2 = 1.90", P10 = 2.80", P100 = 3.80"

LEGEND

- SITE-BASED SUB-BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- MAJOR BASIN BOUNDARY

| NO | DATE | REVISIONS | BY | CHK |
|---|---|---|---|---|

STATE OF WASHINGTON HUGH G. GOLDSMITH 14597 REGISTERED PROFESSIONAL ENGINEER — EXPIRES 2/16/01

STATE OF WASHINGTON HUGH G. GOLDSMITH 6428 REGISTERED PROFESSIONAL ENGINEER — EXPIRES 10/01


Hugh G. Goldsmith & Associates, Inc.
Consulting Engineers • Surveyors • Planners
1215 114th Avenue SE
Bellevue, WA 98004
P.O. Box 3565
Bellevue, WA 98009
TEL. (206) 462-1080
FAX. (206) 462-7719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| DATE: Jan. 1997 | XRF: |
| DRAWN: HWERLINGER | LSF: 98610E15 |
| DESIGNED: G.P. | FLD BK: |
| APPROVED: KJG | PG #: |
| ACAD DWG.: 98610E15 | PSSF: |

AGGREGATED ASSETS

# DEVELOPED DRAINAGE BASIN EXHIBIT FOR LAKESIDE

CITY OF REDMOND WASHINGTON

SHEET
EXHIBIT "B"

JOB NO.: 98610

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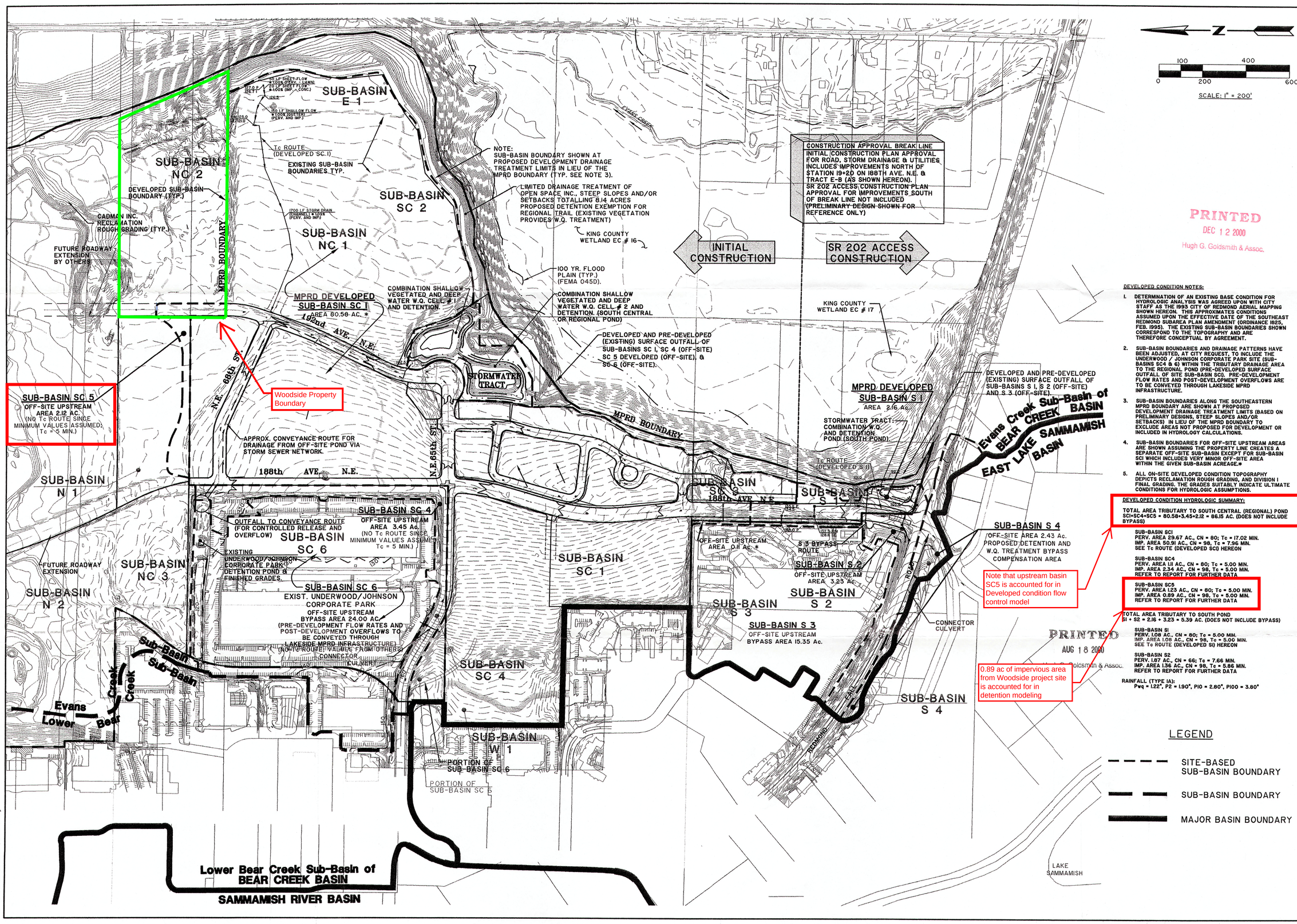


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SCALE: 1" = 200'

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DEC 12 2000
Hugh G. Goldsmith & Assoc.

PRINTED
AUG 18 2000
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DEVELOPED CONDITION NOTES:

1. DETERMINATION OF AN EXISTING BASE CONDITION FOR HYDROLOGIC ANALYSIS WAS AGREED UPON WITH CITY STAFF AS THE 1993 CITY OF REDMOND AERIAL MAPPING SHOWN HEREON. THIS APPROXIMATES CONDITIONS ASSUMED UPON THE EFFECTIVE DATE OF THE SOUTHEAST REDMOND SUBAREA PLAN AMENDMENT (ORDINANCE 1825, FEB. 1995). THE EXISTING SUB-BASIN BOUNDARIES SHOWN CORRESPOND TO THE TOPOGRAPHY AND ARE THEREFORE CONCEPTUAL BY AGREEMENT.
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SEE Tc ROUTE (DEVELOPED SC1) HEREON

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REFER TO REPORT FOR FURTHER DATA

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REFER TO REPORT FOR FURTHER DATA

RAINFALL (TYPE IA):
Pwq = 1.22", P2 = 1.90", P10 = 2.80", P100 = 3.80"

| NO | DATE | REVISIONS | BY | CHK |
|---|---|---|---|---|

STATE OF WASHINGTON HUGH G. GOLDSMITH 6429 REGISTERED PROFESSIONAL ENGINEER — EXPIRES 2/16/01

STATE OF WASHINGTON HUGH G. GOLDSMITH 6428 REGISTERED PROFESSIONAL ENGINEER — EXPIRES 10/01


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P.O. Box 3565
Bellevue, WA 98009
TEL. (206) 462-1080
FAX. (206) 462-7719


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| XREF: | |
| DRAWN: | HWERLINGER |
| LSF: | 98610E15 |
| DESIGNED: | G.P. |
| FLD BK: | |
| APPROVED: | KJG |
| PG #: | |
| ACAD DWG.: | 98610E15 |
| PSSF: | |

AGGREGATED ASSETS

# DEVELOPED DRAINAGE BASIN EXHIBIT FOR LAKESIDE

CITY OF REDMOND WASHINGTON

SHEET
EXHIBIT "B"

JOB NO.: 98610

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# LAND USE DATA FOR SBUH HYDROGRAPHS

SC5 Subbasin from Developed Conditions Map

**Drainage Basin** Evans Creek

**Sub Basin No.** SC5 (off-site upstream tributary), developed condition

| PERVIOUS | | | | |
|---|---|---|---|---|
| **SCS SOIL TYPE** | **LAND USE** | **CN** | **AREA (Ac.)** | **CN x AREA** |
| Modified Land, "Till-fill" (assumed similar to Lakeside conditions; based on geotech data; CN = 78 min.) | Off-site Upstream Tributary | | | |
| | Lawn (good), Landscaping | 80 | 1.23 | 98.40 |
| | Total = | ---- | 1.23 | 98.40 |
| PERVIOUS | Weighted CN = | 80 | ---- | ---- |

| IMPERVIOUS | | | | |
|---|---|---|---|---|
| | Off-site Upstream Tributary | | | |
| | Pavement, Sidewalks | 98 | 0.89 | 87.22 |
| | Total = | ---- | 0.89 | 87.22 |
| IMPERVIOUS | Weighted CN = | 98 | ---- | ---- |

Time of Concentration (P) = 5.00 Min. - See Assumptions for SBUH Hydrographs and WaterWorks printouts

Time of Concentration (IMP) = 5.00 Min. - See Assumptions for SBUH Hydrographs and WaterWorks printouts

Total Area = 2.12 Acres

Data File/Basin ID = N:\ENGDATA\WORKS\95610\SCENT1A.BSN / C5DWQ, C5D02, C5D10, C5DC1

P = pervious; IMP = impervious; CN = curve number

**Allowable Discharges:**

$Q_2 = 1/2\ (Q_{PEAK\ HYD\#1}) + Q_{PEAK\ HYD\ \#2} = Q_{ALLOWABLE\ DISCHARGE}$

$0.5(1.24) + 0.67 = 1.29$ cfs

$Q_{10} = Q_{PEAK\ HYD\#5} + Q_{PEAK\ HYD\ \#6} = Q_{ALLOWABLE\ DISCHARGE}$

$4.00 + 2.10 = 6.10$ cfs

$Q_{100} = Q_{PEAK\ HYD\#9} + Q_{PEAK\ HYD\ \#10} = Q_{ALLOWABLE\ DISCHARGE}$

$8.58 + 4.26 = 12.84$ cfs

## Table 3B
## Sub-basin SC Summary

| Sub-basin Name | Pre-developed | | Developed | | Notes |
|---|---|---|---|---|---|
| | Area (Ac) | Q (cfs) | Area (Ac) | Q (cfs) | |
| SC1 | 40.74 on-site | 1.11 (2-yr)<br>3.50 (10-yr)<br>7.53 (100-yr) | 80.58 on-site | 20.81 (2-yr)<br>34.15 (10-yr)<br>49.72 (100-yr) | Primary sub-basin, this pre-development area & conditions used to set design release rates |
| SC2 | 3.60 on-site | * | --- | --- | Combined with SC1 upon development |
| SC3 | 2.05 on-site | * | --- | --- | Combined with SC1 upon development |
| SC4 | 3.45 off-site | 0.26 (2-yr)<br>0.74 (10-yr)<br>1.39 (100-yr) | 3.45 off-site | 0.98 (2-yr)<br>1.59 (10-yr)<br>2.30 (100-yr) | Off-site upstream |
| SC5 | --- | --- | 2.12 off-site | 0.43 (2-yr)<br>0.78 (10-yr)<br>1.20 (100-yr) | Off-site upstream |
| SC6 | 24.00 off-site | 0.67 (2-yr)<br>2.10 (10-yr)<br>4.26 (100-yr) | 24.00 off-site | 0.67 (2-yr)<br>2.10 (10-yr)<br>4.26 (100-yr) | Underwood Johnson, off-site upstream bypass |

Developed flows from SC5 subbasin

*Pre-developed sub-basins were evaluated for capability to contain storage facilities and safely convey detention release. Some pre-developed basins with small areas and separate discharge points were not evaluated in depth since they had no further role with design.

# SECTION 5. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The tight-lined storm drainage system for the site was designed for the 25-year storm utilizing the Rational Method per the 2017 WSDOT Hydraulics Manual. Backwater Analyses were completed using the flows tabulated in the rational method calculated conveyance spreadsheets. The total site area was delineated into separate basins for each storm structure in order to evaluate the capacity of the system. See the Conveyance Basin Areas Exhibit on the following pages (Figure 5-1 and Figure 5-2) and the conveyance and backwater spreadsheets included at the end of this section.

A weighted runoff coefficient "C" was calculated for each drainage basin based on surface types. This value was determined using the following equation:

$$C = \frac{I(C_I) + P(C_P)}{I + P}$$

Where:

I = Impervious area in acres in the developed condition

P = Pervious area in acres in the developed condition

$C_I$ = Runoff coefficient for impervious area type, Rational Method

$C_I$ = 0.9 for pavement and roofs

$C_P$ = Runoff coefficient for pervious area type, Rational Method

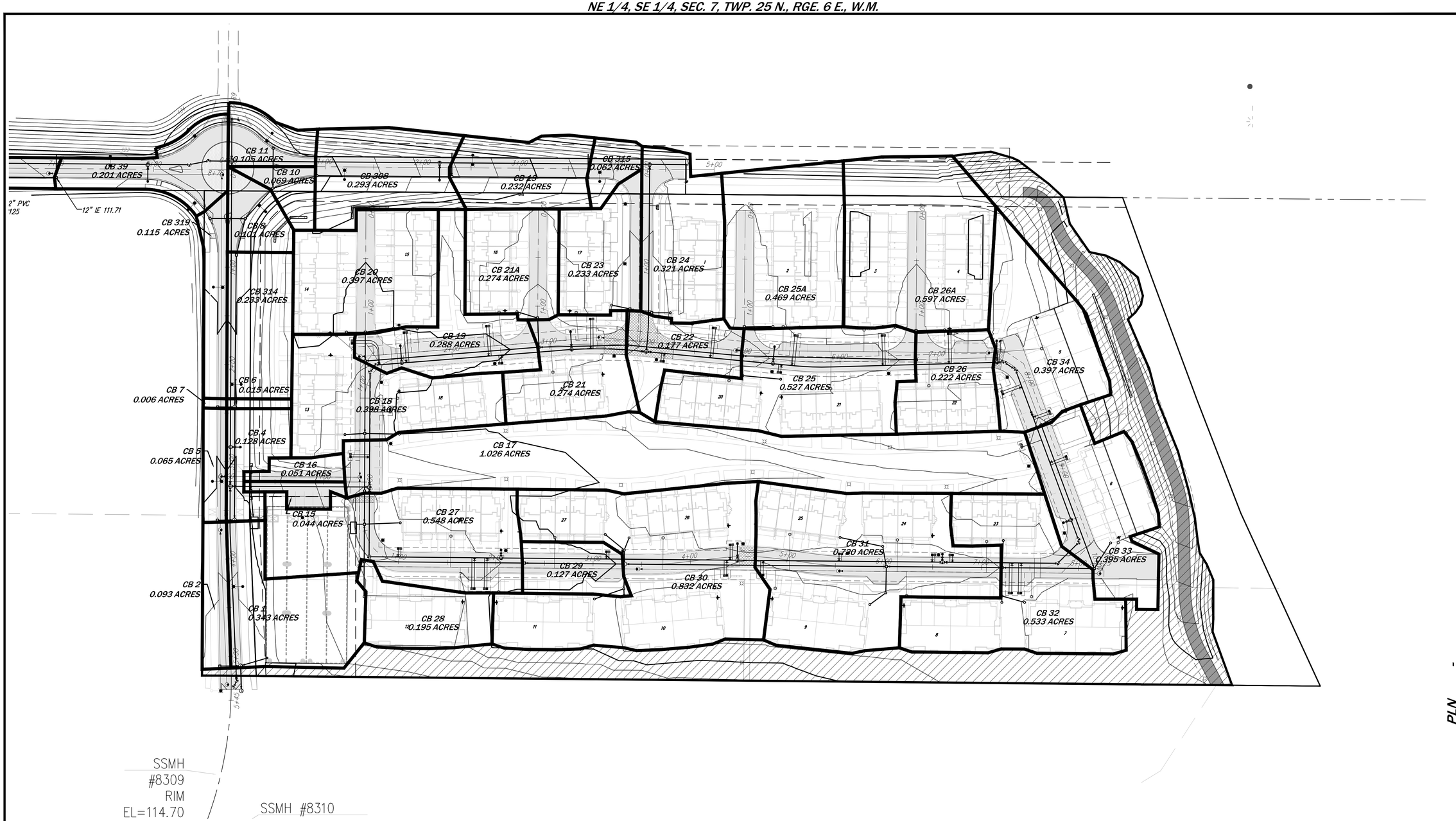
$C_P$ = 0.25 for lawns (Table 3.2.1.A)

$$C = \frac{(7.35 * 0.9) + (4.84 * 0.25)}{7.35 + 4.84}$$

$$\boldsymbol{C = 0.64}$$

The conveyance and backwater calculations can be found in the spreadsheets on the following pages. The calculations show that the conveyance system will safely convey stormwater runoff from the site to the infiltration vault without overtopping or flooding the downstream system.

NE 1/4, SE 1/4, SEC. 7, TWP. 25 N., RGE. 6 E., W.M.




## GENERAL LEGEND

| EXISTING | | PROPOSED | |
|---|---|---|---|
| | CATCH BASIN TYPE 1 | | CATCH BASIN w/SOLID LID |
| | SEWER MANHOLE | | CATCH BASIN |
| | WATER VALVE | | CATCH BASIN w/FLOW THRU GRATE |
| | WATER METER | | CATCH BASIN w/VANED GRATE |
| | LIGHT POLE | | CB-TYPE 2 |
| | POWER VAULT | | SDMH-TYPE 2 (STORM DRAIN MANHOLE) |
| | | | STORM DRAIN CLEANOUT |
| | | | YARD DRAIN |

SCALE: 1" = 50'

0 25 50 100

**UNDERGROUND LOCATOR SERVICE**
CALL BEFORE YOU DIG!
811

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

**This approval is for the design concept only. These plans appear to be in conformance with the City of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revision to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.**

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |

2-19-2019

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

PLN_____-_____

# FIG 5-1: CONVEYANCE EXHIBIT
# WOODSIDE

## POLYGON WLH, L.L.C.
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | NOVEMBER 9, 2018 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHARNBROICH, P.E. PROJECT MANAGER |

SHEET OF

PROJECT NUMBER
18122

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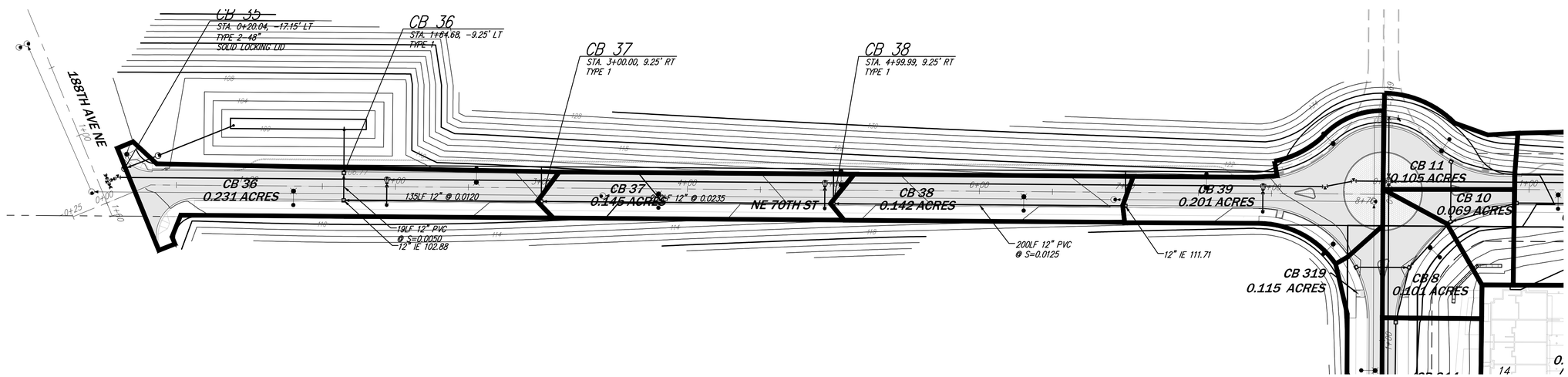


## GENERAL LEGEND

*EXISTING*

- CATCH BASIN TYPE 1
- SEWER MANHOLE
- WATER VALVE
- WATER METER
- LIGHT POLE
- POWER VAULT

*PROPOSED*

- CATCH BASIN w/SOLID LID
- CATCH BASIN
- CATCH BASIN w/FLOW THRU GRATE
- CATCH BASIN w/VANED GRATE
- CB-TYPE 2
- SDMH-TYPE 2 (STORM DRAIN MANHOLE)
- STORM DRAIN CLEANOUT
- YARD DRAIN

**UNDERGROUND LOCATOR SERVICE**
CALL BEFORE YOU DIG!
811

SCALE: 1" = 40'

0 20 40 80

NOTE: THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE YEAR 2018 CITY OF REDMOND STANDARD SPECIFICATIONS AND DETAILS.

**APPROVED FOR CONSTRUCTION**

**FOR: Director of Public Works**

**City of Redmond**

**Date:** _____

**Plan Chk Engr:** _____
**Storm:** _____
**Utility:** _____
**Fire:** _____
**Trans/Engr:** _____
**Planning:** _____

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PLN ____-

| NO. | REVISIONS | DATE |
|---|---|---|
| 1 | PREP. ROUND 2 | 2/20/19 |

2-19-2019

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

# FIG 5-2: 70TH ST CONVEYANCE EXHIBIT
## WOODSIDE

**POLYGON WLH, L.L.C.**
11624 S.E. 5TH STREET
BELLEVUE, WASHINGTON 98005

| | |
|---|---|
| DATE | NOVEMBER 9, 2018 |
| DESIGNED | G.R.S., P.E. |
| DRAWN | L.G.WIGHT |
| APPROVED | G.R.S. |
| | GARY R. SHAPNBROICH, P.E. PROJECT MANAGER |

SHEET C4.01 OF

PROJECT NUMBER 18122

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# STORM CONVEYANCE SYSTEM DESIGN

LOCATION / DESIGN STORM YEAR:

JOB NAME: WOODSIDE | JOB NUMBER: 18122 | PREPARED BY: DJL | SEATTLE / 100 YEAR

| PIPE SEGMENT FROM | PIPE SEGMENT TO | INCREMENTAL AREA (ACRES) | RUNOFF COEFFICIENT "C" | EFFECTIVE AREA (A * C) | SUM OF (A * C) | TIME OF CONC. (MINUTES) | RAINFALL INTENSITY (IN/HR) | TRIBUTARY FLOW (CFS) | MANNING'S "n" | PIPE DIAMETER (INCHES) | PIPE SLOPE (PERCENT) | PIPE LENGTH (FEET) | ACTUAL VELOCITY (FT/SEC) | TRAVEL TIME (MINUTES) | PIPE CAPACITY SUMMARY Q(FULL) (CFS) | V(FULL) (FT/SEC) | Q(ACT)/Q(FULL) (PERCENT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | VAULT | 0.548 | 0.64 | 0.351 | 6.116 | 9.85 | 2.51 | 15.37 | 0.012 | 18 | 2.620 | 8 | 11.67 | 0.01 | 18.420 | 10.42 | 83.4% |
| 28 | 27 | 0.195 | 0.64 | 0.125 | 2.054 | 9.67 | 2.54 | 5.21 | 0.012 | 12 | 0.500 | 38 | 3.47 | 0.18 | 2.729 | 3.47 | 191.1% |
| 29 | 28 | 0.127 | 0.64 | 0.081 | 1.929 | 9.18 | 2.61 | 5.04 | 0.012 | 12 | 1.300 | 165 | 5.60 | 0.49 | 4.401 | 5.60 | 114.5% |
| 30 | 29 | 0.832 | 0.64 | 0.532 | 1.848 | 8.85 | 2.66 | 4.92 | 0.012 | 12 | 1.150 | 103 | 5.27 | 0.33 | 4.139 | 5.27 | 118.9% |
| 31 | 30 | 0.730 | 0.64 | 0.467 | 1.315 | 7.56 | 2.90 | 3.82 | 0.012 | 12 | 0.500 | 269 | 3.47 | 1.29 | 2.729 | 3.47 | 139.9% |
| 32 | 31 | 0.533 | 0.64 | 0.341 | 0.848 | 7.21 | 2.98 | 2.53 | 0.012 | 12 | 1.250 | 119 | 5.71 | 0.35 | 4.315 | 5.49 | 58.5% |
| 33 | 32 | 0.395 | 0.64 | 0.253 | 0.507 | 6.91 | 3.05 | 1.55 | 0.012 | 12 | 1.450 | 95 | 5.24 | 0.30 | 4.648 | 5.92 | 33.2% |
| 34 | 33 | 0.397 | 0.64 | 0.254 | 0.254 | 6.30 | 3.21 | 0.81 | 0.012 | 12 | 1.450 | 157 | 4.29 | 0.61 | 4.648 | 5.92 | 17.5% |
| | | | | | | | | | | | | | | | | | |
| 17 | 27 | 1.026 | 0.64 | 0.657 | 3.712 | 8.30 | 2.76 | 10.24 | 0.012 | 12 | 0.650 | 34 | 3.96 | 0.14 | 3.112 | 3.96 | 329.1% |
| 18 | 17 | 0.398 | 0.64 | 0.255 | 3.055 | 8.12 | 2.79 | 8.53 | 0.012 | 12 | 1.150 | 59 | 5.27 | 0.19 | 4.139 | 5.27 | 206.2% |
| 19 | 18 | 0.288 | 0.64 | 0.184 | 2.801 | 7.93 | 2.83 | 7.92 | 0.012 | 12 | 1.800 | 74 | 6.59 | 0.19 | 5.178 | 6.59 | 153.0% |
| 21 | 19 | 0.274 | 0.64 | 0.175 | 2.362 | 7.40 | 2.94 | 6.94 | 0.012 | 12 | 1.300 | 179 | 5.60 | 0.53 | 4.401 | 5.60 | 157.7% |
| 22 | 21 | 0.177 | 0.64 | 0.113 | 2.012 | 7.14 | 3.00 | 6.02 | 0.012 | 12 | 1.450 | 91 | 5.92 | 0.26 | 4.648 | 5.92 | 129.6% |
| 25 | 22 | 0.527 | 0.64 | 0.337 | 1.544 | 6.85 | 3.06 | 4.73 | 0.012 | 12 | 1.500 | 119 | 6.86 | 0.29 | 4.727 | 6.02 | 100.0% |
| 26 | 25 | 0.222 | 0.64 | 0.142 | 0.906 | 6.38 | 3.18 | 2.89 | 0.012 | 12 | 1.500 | 179 | 6.34 | 0.47 | 4.727 | 6.02 | 61.0% |
| 26A | 26 | 0.597 | 0.64 | 0.382 | 0.382 | 6.30 | 3.21 | 1.23 | 0.012 | 12 | 2.750 | 30 | 6.15 | 0.08 | 6.401 | 8.15 | 19.1% |
| | | | | | | | | | | | | | | | | | |
| 4 | VAULT | 0.128 | 0.64 | 0.082 | 0.911 | 9.84 | 2.51 | 2.29 | 0.012 | 12 | 0.500 | 16 | 3.89 | 0.07 | 2.729 | 3.47 | 84.0% |
| 6 | 4 | 0.015 | 0.64 | 0.010 | 0.788 | 9.33 | 2.59 | 2.04 | 0.012 | 12 | 0.500 | 116 | 3.82 | 0.51 | 2.729 | 3.47 | 74.7% |
| 314 | 6 | 0.233 | 0.64 | 0.149 | 0.774 | 8.65 | 2.70 | 2.09 | 0.012 | 12 | 0.500 | 156 | 3.82 | 0.68 | 2.729 | 3.47 | 76.5% |
| 8 | 314 | 0.101 | 0.64 | 0.065 | 0.625 | 8.47 | 2.73 | 1.71 | 0.012 | 12 | 0.500 | 39 | 3.67 | 0.18 | 2.729 | 3.47 | 62.5% |
| 10 | 8 | 0.069 | 0.64 | 0.044 | 0.487 | 8.33 | 2.75 | 1.34 | 0.012 | 12 | 1.310 | 42 | 4.89 | 0.14 | 4.418 | 5.62 | 30.4% |
| 308 | 10 | 0.293 | 0.64 | 0.188 | 0.376 | 8.16 | 2.78 | 1.05 | 0.012 | 12 | 1.400 | 47 | 4.65 | 0.17 | 4.567 | 5.81 | 22.9% |
| 13 | 308 | 0.232 | 0.64 | 0.148 | 0.188 | 7.71 | 2.87 | 0.54 | 0.012 | 12 | 3.990 | 149 | 5.55 | 0.45 | 7.710 | 9.82 | 7.0% |
| 315 | 13 | 0.062 | 0.64 | 0.040 | 0.040 | 6.30 | 3.21 | 0.13 | 0.012 | 12 | 0.500 | 140 | 1.65 | 1.41 | 2.729 | 3.47 | 4.7% |
| | | | | | | | | | | | | | | | | | |
| 15 | VAULT | 0.044 | 0.64 | 0.028 | 0.061 | 6.51 | 3.15 | 0.19 | 0.012 | 12 | 12.000 | 27 | 5.19 | 0.09 | 13.370 | 17.02 | 1.4% |
| 16 | 15 | 0.051 | 0.64 | 0.033 | 0.033 | 6.30 | 3.21 | 0.10 | 0.012 | 12 | 0.500 | 19 | 1.49 | 0.21 | 2.729 | 3.47 | 3.8% |
| | | | | | | | | | | | | | | | | | |
| 23 | 22 | 0.233 | 0.64 | 0.149 | 0.355 | 6.30 | 3.21 | 1.14 | 0.012 | 12 | 1.700 | 37 | 5.13 | 0.12 | 5.032 | 6.41 | 22.6% |
| 24 | 23 | 0.321 | 0.64 | 0.205 | 0.205 | 6.30 | 3.21 | 0.66 | 0.012 | 12 | 1.150 | 23 | 3.66 | 0.10 | 4.139 | 5.27 | 15.9% |
| | | | | | | | | | | | | | | | | | |
| 20 | 19 | 0.397 | 0.64 | 0.254 | 0.254 | 6.30 | 3.21 | 0.81 | 0.012 | 12 | 2.000 | 30 | 4.83 | 0.10 | 5.458 | 6.95 | 14.9% |
| 21A | 21 | 0.274 | 0.64 | 0.175 | 0.175 | 6.30 | 3.21 | 0.56 | 0.012 | 12 | 3.000 | 30 | 5.02 | 0.10 | 6.685 | 8.51 | 8.4% |
| 25A | 25 | 0.469 | 0.64 | 0.300 | 0.300 | 6.30 | 3.21 | 0.96 | 0.012 | 12 | 2.650 | 30 | 5.56 | 0.09 | 6.283 | 8.00 | 15.3% |
| 26A | 26 | 0.597 | 0.64 | 0.382 | 0.382 | 6.30 | 3.21 | 1.23 | 0.012 | 12 | 2.750 | 30 | 6.15 | 0.08 | 6.401 | 8.15 | 19.1% |
| 11 | 10 | 0.105 | 0.64 | 0.067 | 0.067 | 6.30 | 3.21 | 0.22 | 0.012 | 12 | 0.510 | 41 | 1.98 | 0.34 | 2.756 | 3.51 | 7.8% |
| 319 | 8 | 0.115 | 0.64 | 0.074 | 0.074 | 6.30 | 3.21 | 0.24 | 0.012 | 12 | 0.500 | 36 | 2.05 | 0.29 | 2.729 | 3.47 | 8.6% |
| 7 | 6 | 0.006 | 0.64 | 0.004 | 0.004 | 6.30 | 3.21 | 0.01 | 0.012 | 12 | 5.400 | 18 | 0.00 | 0.00 | 8.969 | 11.42 | 0.1% |
| 5 | 4 | 0.065 | 0.64 | 0.042 | 0.042 | 6.30 | 3.21 | 0.13 | 0.012 | 12 | 0.500 | 18 | 1.65 | 0.18 | 2.729 | 3.47 | 4.9% |
| | | | | | | | | | | | | | | | | | |

**BACKWATER CALCULATIONS**

**JOB NAME:** WOODSIDE **PREPARED BY:** D. LARSON

**JOB NUMBER:** 18122 **DESIGN STORM:** 100 YEAR

| FROM CB | TO CB | FLOW (CFS) | PIPE LENGTH (FEET) | PIPE DIA. (IN) | MANNING'S n VALUE | OUTLET ELEVATION (FEET) | INLET ELEVATION (FEET) | PIPE AREA (SQ FT) | FLOW VELOCITY (FT/SEC) | VELOCITY HEAD (FEET) | TAILWATER ELEVATION (FEET) | FRICTION LOSS (FEET) | ENTRANCE HGL ELEVATION (FEET) | ENTRANCE HEAD LOSS (FEET) | EXIT HEAD LOSS (FEET) | OUTLET CONTROL ELEVATION (FEET) | INLET CONTROL ELEVATION (FEET) | APPROACH VELOCITY HEAD (FEET) | BEND HEAD LOSS (FEET) | JUNCTION HEAD LOSS (FEET) | HEADWATER ELEVATION (FEET) | RIM EL | FREEBOARD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | VAULT | 15.37 | 8 | 18 | 0.012 | 120.45 | 120.66 | 1.77 | 8.70 | 1.18 | 120.55 | 0.15 | 122.16 | 0.59 | 1.18 | 123.92 | 122.91 | 0.64 | 1.53 | 0.00 | 123.80 | 125.41 | 1.61 |
| 28 | 27 | 5.21 | 38 | 12 | 0.012 | 120.66 | 121.35 | 0.79 | 6.63 | 0.68 | 123.80 | 0.69 | 124.49 | 0.34 | 0.68 | 125.52 | 123.35 | 0.61 | 0.89 | 0.56 | 124.19 | 126.38 | 2.19 |
| 29 | 28 | 5.04 | 165 | 12 | 0.012 | 121.35 | 123.49 | 0.79 | 6.42 | 0.64 | 124.19 | 2.78 | 126.97 | 0.32 | 0.64 | 127.93 | 125.49 | 0.37 | 0.00 | 0.00 | 125.12 | 128.40 | 3.28 |
| 30 | 29 | 4.92 | 103 | 12 | 0.012 | 123.49 | 124.68 | 0.79 | 6.26 | 0.61 | 125.12 | 1.66 | 126.78 | 0.31 | 0.61 | 127.70 | 126.68 | 0.16 | 0.00 | 0.00 | 126.52 | 130.15 | 3.63 |
| 31 | 30 | 3.82 | 269 | 12 | 0.012 | 124.68 | 126.01 | 0.79 | 4.86 | 0.37 | 126.52 | 2.61 | 129.13 | 0.18 | 0.37 | 129.68 | 128.01 | 0.06 | 0.00 | 0.00 | 127.95 | 130.59 | 2.64 |
| 32 | 31 | 2.53 | 119 | 12 | 0.012 | 126.01 | 127.50 | 0.79 | 3.22 | 0.16 | 127.95 | 0.51 | 128.50 | 0.08 | 0.16 | 128.74 | 129.50 | 0.02 | 0.00 | 0.00 | 129.48 | 132.04 | 2.56 |
| 33 | 32 | 1.55 | 95 | 12 | 0.012 | 127.50 | 128.87 | 0.79 | 1.97 | 0.06 | 129.48 | 0.15 | 129.87 | 0.03 | 0.06 | 129.96 | 130.87 | 0.00 | 0.00 | 0.00 | 130.87 | 133.46 | 2.59 |
| 34 | 33 | 0.81 | 157 | 12 | 0.012 | 128.87 | 131.15 | 0.79 | 1.03 | 0.02 | 130.87 | 0.07 | 132.15 | 0.01 | 0.02 | 132.17 | 133.15 | 0.52 | 0.02 | 0.00 | 132.65 | 135.87 | 3.22 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | 27 | 10.24 | 34 | 18 | 0.012 | 121.16 | 121.38 | 1.77 | 5.79 | 0.52 | 123.80 | 0.27 | 124.07 | 0.26 | 0.52 | 124.85 | 123.63 | 1.58 | 0.68 | 0.18 | 122.90 | 125.88 | 2.98 |
| 18 | 17 | 8.53 | 59 | 12 | 0.012 | 121.38 | 122.06 | 0.79 | 10.86 | 1.83 | 122.90 | 2.85 | 125.76 | 0.92 | 1.83 | 128.51 | 124.06 | 1.21 | 0.00 | 0.72 | 123.56 | 126.85 | 3.29 |
| 19 | 18 | 7.92 | 74 | 12 | 0.012 | 122.06 | 123.40 | 0.79 | 10.08 | 1.58 | 123.56 | 3.08 | 126.65 | 0.79 | 1.58 | 129.02 | 125.40 | 0.91 | 0.00 | 0.00 | 124.49 | 128.17 | 3.68 |
| 21 | 19 | 6.94 | 179 | 12 | 0.012 | 123.40 | 125.73 | 0.79 | 8.84 | 1.21 | 124.49 | 5.73 | 130.22 | 0.61 | 1.21 | 132.04 | 127.73 | 0.56 | 1.58 | 0.01 | 128.76 | 130.44 | 1.68 |
| 22 | 21 | 6.02 | 91 | 12 | 0.012 | 125.73 | 127.05 | 0.79 | 7.66 | 0.91 | 128.76 | 2.20 | 130.95 | 0.46 | 0.91 | 132.32 | 129.05 | 0.21 | 0.00 | 0.07 | 128.91 | 131.81 | 2.90 |
| 25 | 22 | 4.73 | 119 | 12 | 0.012 | 127.05 | 128.83 | 0.79 | 6.02 | 0.56 | 128.91 | 1.76 | 130.67 | 0.28 | 0.56 | 131.52 | 130.83 | 0.04 | 0.00 | 0.03 | 130.83 | 133.58 | 2.75 |
| 26 | 25 | 2.89 | 179 | 12 | 0.012 | 128.83 | 131.51 | 0.79 | 3.68 | 0.21 | 130.83 | 0.99 | 132.51 | 0.11 | 0.21 | 132.83 | 133.51 | 0.00 | 0.00 | 0.05 | 133.56 | 136.27 | 2.71 |
| 26A | 26 | 1.23 | 30 | 12 | 0.012 | 131.51 | 132.34 | 0.79 | 1.57 | 0.04 | 133.56 | 0.03 | 133.59 | 0.02 | 0.04 | 133.65 | 134.34 | 0.13 | 0.05 | 0.00 | 134.26 | 136.86 | 2.60 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | VAULT | 2.29 | 16 | 12 | 0.012 | 112.76 | 112.84 | 0.79 | 2.92 | 0.13 | 120.55 | 0.06 | 120.61 | 0.07 | 0.13 | 120.80 | 114.84 | 0.11 | 0.00 | 0.00 | 114.73 | 118.97 | 4.24 |
| 6 | 4 | 2.04 | 116 | 12 | 0.012 | 112.84 | 113.42 | 0.79 | 2.60 | 0.10 | 114.73 | 0.32 | 115.05 | 0.05 | 0.10 | 115.21 | 115.42 | 0.07 | 0.14 | 0.01 | 115.49 | 120.39 | 4.90 |
| 314 | 6 | 2.09 | 156 | 12 | 0.012 | 113.42 | 114.20 | 0.79 | 2.66 | 0.11 | 115.49 | 0.45 | 115.94 | 0.06 | 0.11 | 116.11 | 116.20 | 0.05 | 0.00 | 0.00 | 116.16 | 118.57 | 2.41 |
| 8 | 314 | 1.71 | 39 | 12 | 0.012 | 114.20 | 114.39 | 0.79 | 2.18 | 0.07 | 116.16 | 0.08 | 116.23 | 0.04 | 0.07 | 116.34 | 116.39 | 0.03 | 0.01 | 0.00 | 116.38 | 117.89 | 1.51 |
| 10 | 8 | 1.34 | 42 | 12 | 0.012 | 114.39 | 114.94 | 0.79 | 1.71 | 0.05 | 116.38 | 0.05 | 116.43 | 0.02 | 0.05 | 116.49 | 116.94 | 0.01 | 0.01 | 0.01 | 116.95 | 118.44 | 1.49 |
| 308 | 10 | 1.05 | 47 | 12 | 0.012 | 114.94 | 115.60 | 0.79 | 1.34 | 0.03 | 116.95 | 0.03 | 116.98 | 0.01 | 0.03 | 117.02 | 117.60 | 0.00 | 0.01 | 0.00 | 117.61 | 119.11 | 1.50 |
| 13 | 308 | 0.54 | 149 | 12 | 0.012 | 115.60 | 121.15 | 0.79 | 0.69 | 0.01 | 117.61 | 0.03 | 122.15 | 0.00 | 0.01 | 122.16 | 123.15 | 0.00 | 0.00 | 0.00 | 123.15 | 125.61 | 2.46 |
| 315 | 13 | 0.13 | 140 | 12 | 0.012 | 121.15 | 128.15 | 0.79 | 0.17 | 0.00 | 123.15 | 0.00 | 129.15 | 0.00 | 0.00 | 129.15 | 130.15 | 0.00 | 0.00 | 0.00 | 130.15 | 132.61 | 2.46 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | VAULT | 0.06 | 27 | 12 | 0.012 | 113.35 | 116.63 | 0.79 | 0.08 | 0.00 | 120.55 | 0.00 | 120.55 | 0.00 | 0.00 | 120.55 | 118.63 | 0.00 | 0.00 | 0.00 | 118.63 | 123.86 | 5.23 |
| 16 | 15 | 0.03 | 19 | 12 | 0.012 | 116.63 | 116.72 | 0.79 | 0.04 | 0.00 | 118.63 | 0.00 | 118.63 | 0.00 | 0.00 | 118.63 | 118.72 | 0.00 | 0.00 | 0.00 | 118.72 | 120.14 | 1.42 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | 22 | 0.36 | 37 | 12 | 0.012 | 127.05 | 127.68 | 0.79 | 0.45 | 0.00 | 128.91 | 0.00 | 128.91 | 0.00 | 0.00 | 128.92 | 129.68 | 0.00 | 0.00 | 0.00 | 129.69 | 132.49 | 2.80 |
| 24 | 23 | 0.21 | 23 | 12 | 0.012 | 127.68 | 127.94 | 0.79 | 0.26 | 0.00 | 129.69 | 0.00 | 129.69 | 0.00 | 0.00 | 129.69 | 129.94 | 0.00 | 0.00 | 0.00 | 129.94 | 132.42 | 2.48 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 19 | 0.08 | 30 | 12 | 0.012 | 123.40 | 123.99 | 0.79 | 0.10 | 0.00 | 124.49 | 0.00 | 124.99 | 0.00 | 0.00 | 124.99 | 125.99 | 0.02 | 0.00 | 0.00 | 125.97 | 128.89 | 2.92 |
| 21A | 21 | 0.56 | 30 | 12 | 0.012 | 125.73 | 126.63 | 0.79 | 0.71 | 0.01 | 128.76 | 0.01 | 128.76 | 0.00 | 0.01 | 128.77 | 128.63 | 0.04 | 0.01 | 0.01 | 128.61 | 131.15 | 2.54 |
| 25A | 25 | 0.96 | 30 | 12 | 0.012 | 128.83 | 129.62 | 0.79 | 1.22 | 0.02 | 130.83 | 0.02 | 130.84 | 0.01 | 0.02 | 130.88 | 131.62 | 0.00 | 0.03 | 0.02 | 131.67 | 134.20 | 2.53 |
| 26A | 26 | 1.23 | 30 | 12 | 0.012 | 131.51 | 132.34 | 0.79 | 1.57 | 0.04 | 133.56 | 0.03 | 133.59 | 0.02 | 0.04 | 133.65 | 134.34 | 0.00 | 0.05 | 0.00 | 134.39 | 136.86 | 2.47 |
| 11 | 10 | 0.22 | 41 | 12 | 0.012 | 114.94 | 115.15 | 0.79 | 0.28 | 0.00 | 116.95 | 0.00 | 116.95 | 0.00 | 0.00 | 116.95 | 117.15 | 0.00 | 0.00 | 0.00 | 117.15 | 118.33 | 1.18 |
| 319 | 8 | 0.24 | 36 | 12 | 0.012 | 114.39 | 114.57 | 0.79 | 0.31 | 0.00 | 116.38 | 0.00 | 116.38 | 0.00 | 0.00 | 116.38 | 116.57 | 0.00 | 0.00 | 0.00 | 116.57 | 117.90 | 1.33 |
| 7 | 6 | 0.01 | 18 | 12 | 0.012 | 115.92 | 116.87 | 0.79 | 0.01 | 0.00 | 115.49 | 0.00 | 117.87 | 0.00 | 0.00 | 117.87 | 118.87 | 0.00 | 0.00 | 0.00 | 118.87 | 120.37 | 1.50 |
| 5 | 4 | 0.13 | 18 | 12 | 0.012 | 115.36 | 115.45 | 0.79 | 0.17 | 0.00 | 114.73 | 0.00 | 116.45 | 0.00 | 0.00 | 116.45 | 117.45 | 0.00 | 0.00 | 0.00 | 117.45 | 118.95 | 1.50 |
| | | | | | | | | | | | | | | | | | | | | | | | |

# STORM CONVEYANCE SYSTEM DESIGN

LOCATION / DESIGN STORM YEAR:

JOB NAME: WOODSIDE | JOB NUMBER: 18122 | PREPARED BY: DJL | SEATTLE / 100 YEAR

| PIPE SEGMENT FROM | PIPE SEGMENT TO | INCREMENTAL AREA (ACRES) | RUNOFF COEFFICIENT "C" | EFFECTIVE AREA (A * C) | SUM OF (A * C) | TIME OF CONC. (MINUTES) | RAINFALL INTENSITY (IN/HR) | TRIBUTARY FLOW (CFS) | MANNING'S "n" | PIPE DIAMETER (INCHES) | PIPE SLOPE (PERCENT) | PIPE LENGTH (FEET) | ACTUAL VELOCITY (FT/SEC) | TRAVEL TIME (MINUTES) | PIPE CAPACITY SUMMARY Q(FULL) (CFS) | V(FULL) (FT/SEC) | Q(ACT)/Q(FULL) (PERCENT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | POND | 0.000 | 0.64 | 0.000 | 0.460 | 8.64 | 2.70 | 1.24 | 0.012 | 12 | 10.500 | 31 | 9.63 | 0.05 | 12.507 | 15.92 | 9.9% |
| 36A | 36 | 0.231 | 0.64 | 0.148 | 0.460 | 8.55 | 2.72 | 1.25 | 0.012 | 12 | 0.500 | 19 | 3.35 | 0.09 | 2.729 | 3.47 | 45.8% |
| 37 | 36 | 0.145 | 0.64 | 0.093 | 0.312 | 8.01 | 2.81 | 0.88 | 0.012 | 12 | 1.200 | 135 | 4.17 | 0.54 | 4.228 | 5.38 | 20.8% |
| 38 | 37 | 0.142 | 0.64 | 0.091 | 0.220 | 7.30 | 2.96 | 0.65 | 0.012 | 12 | 2.350 | 200 | 4.75 | 0.70 | 5.917 | 7.53 | 11.0% |
| 39 | 38 | 0.201 | 0.64 | 0.129 | 0.129 | 6.30 | 3.21 | 0.41 | 0.012 | 12 | 1.250 | 200 | 3.32 | 1.00 | 4.315 | 5.49 | 9.6% |
| | | | | | | | | | | | | | | | | | |

**BACKWATER CALCULATIONS**

**JOB NAME:** WOODSIDE **PREPARED BY:** D. LARSON

**JOB NUMBER:** 18122 **DESIGN STORM:** 100 YEAR

| FROM CB | TO CB | FLOW (CFS) | PIPE LENGTH (FEET) | PIPE DIA. (IN) | MANNING'S n VALUE | OUTLET ELEVATION (FEET) | INLET ELEVATION (FEET) | PIPE AREA (SQ FT) | FLOW VELOCITY (FT/SEC) | VELOCITY HEAD (FEET) | TAILWATER ELEVATION (FEET) | FRICTION LOSS (FEET) | ENTRANCE HGL ELEVATION (FEET) | ENTRANCE HEAD LOSS (FEET) | EXIT HEAD LOSS (FEET) | OUTLET CONTROL ELEVATION (FEET) | INLET CONTROL ELEVATION (FEET) | APPROACH VELOCITY HEAD (FEET) | BEND HEAD LOSS (FEET) | JUNCTION HEAD LOSS (FEET) | HEADWATER ELEVATION (FEET) | RIM EL | FREEBOARD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | POND | 1.24 | 31 | 12 | 0.012 | 99.51 | 102.79 | 0.79 | 1.58 | 0.04 | 99.50 | 0.03 | 103.79 | 0.02 | 0.04 | 103.85 | 104.79 | 0.02 | 0.05 | 0.00 | 104.82 | 106.76 | 1.94 |
| 36A | 36 | 1.25 | 19 | 12 | 0.012 | 102.79 | 102.88 | 0.79 | 1.59 | 0.04 | 104.82 | 0.02 | 104.84 | 0.02 | 0.04 | 104.90 | 104.88 | 0.01 | 0.05 | 0.00 | 104.92 | 106.38 | 1.46 |
| 37 | 36 | 0.88 | 135 | 12 | 0.012 | 102.88 | 104.51 | 0.79 | 1.12 | 0.02 | 104.92 | 0.07 | 105.51 | 0.01 | 0.02 | 105.54 | 106.51 | 0.00 | 0.00 | 0.00 | 106.51 | 108.01 | 1.50 |
| 38 | 37 | 0.65 | 200 | 12 | 0.012 | 104.51 | 109.21 | 0.79 | 0.83 | 0.01 | 106.51 | 0.06 | 110.21 | 0.01 | 0.01 | 110.23 | 111.21 | 0.00 | 0.01 | 0.00 | 111.22 | 112.68 | 1.46 |
| 39 | 38 | 0.41 | 200 | 12 | 0.012 | 109.21 | 111.71 | 0.79 | 0.52 | 0.00 | 111.22 | 0.02 | 112.71 | 0.00 | 0.00 | 112.72 | 113.71 | 0.00 | 0.00 | 0.00 | 113.71 | 116.17 | 2.46 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

## SECTION 6. SPECIAL REPORTS AND STUDIES

**The following reports and assessments are provided for reference and 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)

  Prepared for: Polygon WLH, LLC
  Prepared by: Stephen H. Avril
  Dated: March 5, 2018
  Earth Solutions NW
  1805 136th Place NE, Suite 201
  Bellevue, WA 98005

## SECTION 7. OTHER PERMITS

To be addressed in the final design phase of this project.

# SECTION 8. ESC ANALYSIS AND DESIGN

Erosion and sediment control analysis to be provided during final engineering.

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

## 9.1 Bond Quantities

A bond quantities worksheet will be provided prior to permit approval.

## 9.2 Facility Summaries

Not applicable.

## 9.3 Declaration of Covenant

Not applicable.

# APPENDIX

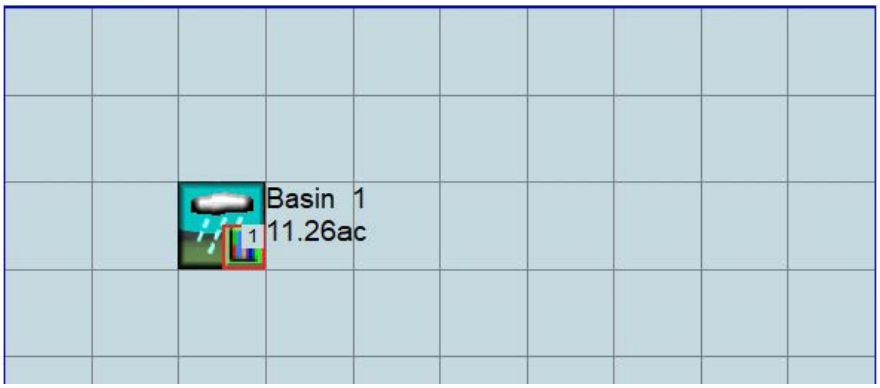
## Private Partial Infiltration Vault WWHM Report Summary

The WWHM Report for the Private Partial Infiltration Vault is included in the following pages. The calculations that follow show that the vault meets the on-site flow control requirement by not exceeding the predeveloped condition flow durations from 50% of the 2-year to the full 50-year peak storm event. The basin schematic is shown below. In the developed conditions, Basin 1 denotes the area tributary to the vault, while Basin 2 is the area on the east side of the site that bypasses the vault.

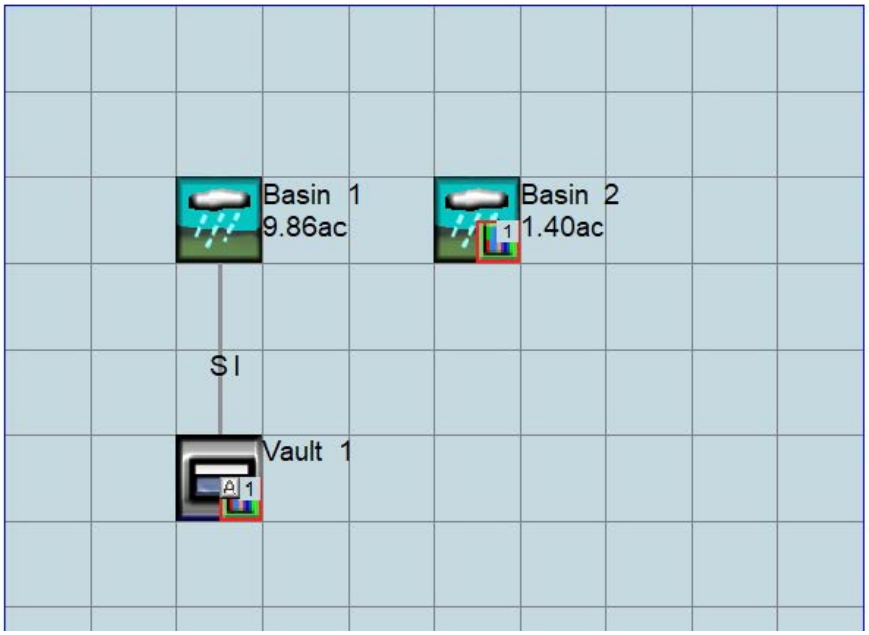
Input:

*Appendix*

*Predeveloped Schematic*




*Mitigated Schematic*




Inputs and analysis of the Private Partial Infiltration Vault included in Section 4.3 of this report have been drawn from the WWHM report on the following pages.

# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE PRIVATE PARTIAL INFILTRATION VAULT. CALCULATIONS SHOW THAT ON SITE FLOW CONTROL STANDARD IS MET FOR THE PRIVATE LAND USE.

# General Model Information

| | |
|---|---|
| Project Name: | Private Infiltration Vault |
| Site Name: | Woodside |
| Site Address: | 7039 196th Ave NE |
| City: | Redmond |
| Report Date: | 12/2/2019 |
| Gage: | Seatac |
| Data Start: | 1948/10/01 |
| Data End: | 2009/09/30 |
| Timestep: | 15 Minute |
| Precip Scale: | 0.00 (adjusted) |
| Version: | 2015/06/05 |

## POC Thresholds

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

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# *Landuse Basin Data*

## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Forest, Flat | 11.26 |
| Pervious Total | 11.26 |
| Impervious Land Use | Acres |
| Impervious Total | 0 |
| Basin Total | 11.26 |

PRIVATE PARTIAL INFILTRATION VAULT - PREDEVELOPED LAND USE BASIN

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Flat | 3.51 |
| Pervious Total | 3.51 |
| Impervious Land Use | Acres |
| ROADS FLAT | 1.4 |
| ROOF TOPS FLAT | 4.13 |
| SIDEWALKS FLAT | 0.82 |
| Impervious Total | 6.35 |
| Basin Total | 9.86 |

PRIVATE PARTIAL INFILTRATION VAULT - MITIGATED LAND USE BASIN

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| Vault 1 | Vault 1 | |

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## Basin 2

| | |
|---|---|
| Bypass: | Yes |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Flat | 1.17 |
| Pervious Total | 1.17 |
| Impervious Land Use | Acres |
| ROADS FLAT | 0.23 |
| Impervious Total | 0.23 |
| Basin Total | 1.4 |

PRIVATE PARTIAL INFILTRATION VAULT - MITIGATED LAND USE BYPASS BASIN

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

## Vault 1

Width: 82 ft.
Length: 139 ft.
Depth: 11.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 1224.993
Total Volume Through Riser (ac-ft): 51.193
Total Volume Through Facility (ac-ft): 1276.186
Percent Infiltrated: 95.99
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 10.5 ft.
Riser Diameter: 18 in.
Orifice 2 Diameter: 1.875 in. Elevation:3.4 ft.
Element Flows To:
Outlet 1 Outlet 2

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Vault Hydraulic Table

| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.261 | 0.000 | 0.000 | 0.000 |
| 0.1278 | 0.261 | 0.033 | 0.000 | 0.136 |
| 0.2556 | 0.261 | 0.066 | 0.000 | 0.136 |
| 0.3833 | 0.261 | 0.100 | 0.000 | 0.136 |
| 0.5111 | 0.261 | 0.133 | 0.000 | 0.136 |
| 0.6389 | 0.261 | 0.167 | 0.000 | 0.136 |
| 0.7667 | 0.261 | 0.200 | 0.000 | 0.136 |
| 0.8944 | 0.261 | 0.234 | 0.000 | 0.136 |
| 1.0222 | 0.261 | 0.267 | 0.000 | 0.136 |
| 1.1500 | 0.261 | 0.300 | 0.000 | 0.136 |
| 1.2778 | 0.261 | 0.334 | 0.000 | 0.136 |
| 1.4056 | 0.261 | 0.367 | 0.000 | 0.136 |
| 1.5333 | 0.261 | 0.401 | 0.000 | 0.136 |
| 1.6611 | 0.261 | 0.434 | 0.000 | 0.136 |
| 1.7889 | 0.261 | 0.468 | 0.000 | 0.136 |
| 1.9167 | 0.261 | 0.501 | 0.000 | 0.136 |
| 2.0444 | 0.261 | 0.535 | 0.000 | 0.136 |
| 2.1722 | 0.261 | 0.568 | 0.000 | 0.136 |
| 2.3000 | 0.261 | 0.601 | 0.000 | 0.136 |
| 2.4278 | 0.261 | 0.635 | 0.000 | 0.136 |
| 2.5556 | 0.261 | 0.668 | 0.000 | 0.136 |
| 2.6833 | 0.261 | 0.702 | 0.000 | 0.136 |
| 2.8111 | 0.261 | 0.735 | 0.000 | 0.136 |
| 2.9389 | 0.261 | 0.769 | 0.000 | 0.136 |
| 3.0667 | 0.261 | 0.802 | 0.000 | 0.136 |
| 3.1944 | 0.261 | 0.835 | 0.000 | 0.136 |
| 3.3222 | 0.261 | 0.869 | 0.000 | 0.136 |
| 3.4500 | 0.261 | 0.902 | 0.021 | 0.136 |
| 3.5778 | 0.261 | 0.936 | 0.040 | 0.136 |
| 3.7056 | 0.261 | 0.969 | 0.052 | 0.136 |
| 3.8333 | 0.261 | 1.003 | 0.062 | 0.136 |

| | | | | |
|---|---|---|---|---|
| 3.9611 | 0.261 | 1.036 | 0.071 | 0.136 |
| 4.0889 | 0.261 | 1.069 | 0.079 | 0.136 |
| 4.2167 | 0.261 | 1.103 | 0.086 | 0.136 |
| 4.3444 | 0.261 | 1.136 | 0.092 | 0.136 |
| 4.4722 | 0.261 | 1.170 | 0.098 | 0.136 |
| 4.6000 | 0.261 | 1.203 | 0.104 | 0.136 |
| 4.7278 | 0.261 | 1.237 | 0.109 | 0.136 |
| 4.8556 | 0.261 | 1.270 | 0.115 | 0.136 |
| 4.9833 | 0.261 | 1.303 | 0.120 | 0.136 |
| 5.1111 | 0.261 | 1.337 | 0.124 | 0.136 |
| 5.2389 | 0.261 | 1.370 | 0.129 | 0.136 |
| 5.3667 | 0.261 | 1.404 | 0.133 | 0.136 |
| 5.4944 | 0.261 | 1.437 | 0.138 | 0.136 |
| 5.6222 | 0.261 | 1.471 | 0.142 | 0.136 |
| 5.7500 | 0.261 | 1.504 | 0.146 | 0.136 |
| 5.8778 | 0.261 | 1.538 | 0.150 | 0.136 |
| 6.0056 | 0.261 | 1.571 | 0.154 | 0.136 |
| 6.1333 | 0.261 | 1.604 | 0.157 | 0.136 |
| 6.2611 | 0.261 | 1.638 | 0.161 | 0.136 |
| 6.3889 | 0.261 | 1.671 | 0.164 | 0.136 |
| 6.5167 | 0.261 | 1.705 | 0.168 | 0.136 |
| 6.6444 | 0.261 | 1.738 | 0.171 | 0.136 |
| 6.7722 | 0.261 | 1.772 | 0.175 | 0.136 |
| 6.9000 | 0.261 | 1.805 | 0.178 | 0.136 |
| 7.0278 | 0.261 | 1.838 | 0.181 | 0.136 |
| 7.1556 | 0.261 | 1.872 | 0.184 | 0.136 |
| 7.2833 | 0.261 | 1.905 | 0.188 | 0.136 |
| 7.4111 | 0.261 | 1.939 | 0.191 | 0.136 |
| 7.5389 | 0.261 | 1.972 | 0.194 | 0.136 |
| 7.6667 | 0.261 | 2.006 | 0.197 | 0.136 |
| 7.7944 | 0.261 | 2.039 | 0.200 | 0.136 |
| 7.9222 | 0.261 | 2.072 | 0.202 | 0.136 |
| 8.0500 | 0.261 | 2.106 | 0.205 | 0.136 |
| 8.1778 | 0.261 | 2.139 | 0.208 | 0.136 |
| 8.3056 | 0.261 | 2.173 | 0.211 | 0.136 |
| 8.4333 | 0.261 | 2.206 | 0.214 | 0.136 |
| 8.5611 | 0.261 | 2.240 | 0.216 | 0.136 |
| 8.6889 | 0.261 | 2.273 | 0.219 | 0.136 |
| 8.8167 | 0.261 | 2.307 | 0.222 | 0.136 |
| 8.9444 | 0.261 | 2.340 | 0.224 | 0.136 |
| 9.0722 | 0.261 | 2.373 | 0.227 | 0.136 |
| 9.2000 | 0.261 | 2.407 | 0.229 | 0.136 |
| 9.3278 | 0.261 | 2.440 | 0.232 | 0.136 |
| 9.4556 | 0.261 | 2.474 | 0.234 | 0.136 |
| 9.5833 | 0.261 | 2.507 | 0.237 | 0.136 |
| 9.7111 | 0.261 | 2.541 | 0.239 | 0.136 |
| 9.8389 | 0.261 | 2.574 | 0.242 | 0.136 |
| 9.9667 | 0.261 | 2.607 | 0.244 | 0.136 |
| 10.094 | 0.261 | 2.641 | 0.246 | 0.136 |
| 10.222 | 0.261 | 2.674 | 0.249 | 0.136 |
| 10.350 | 0.261 | 2.708 | 0.251 | 0.136 |
| 10.478 | 0.261 | 2.741 | 0.253 | 0.136 |
| 10.606 | 0.261 | 2.775 | 0.800 | 0.136 |
| 10.733 | 0.261 | 2.808 | 2.014 | 0.136 |
| 10.861 | 0.261 | 2.841 | 3.459 | 0.136 |
| 10.989 | 0.261 | 2.875 | 4.800 | 0.136 |
| 11.117 | 0.261 | 2.908 | 5.765 | 0.136 |
| 11.244 | 0.261 | 2.942 | 6.319 | 0.136 |

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| | | | | |
|---|---|---|---|---|
| 11.372 | 0.261 | 2.975 | 6.887 | 0.136 |
| 11.500 | 0.261 | 3.009 | 7.358 | 0.136 |
| 11.628 | 0.296 | 3.298 | 7.799 | 0.155 |

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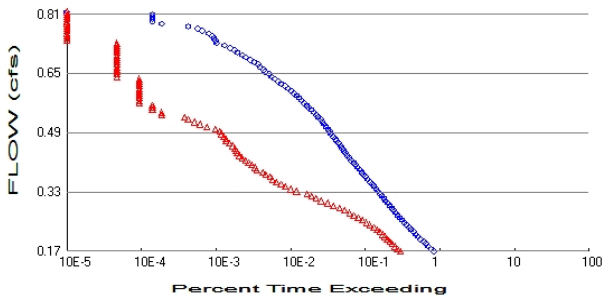
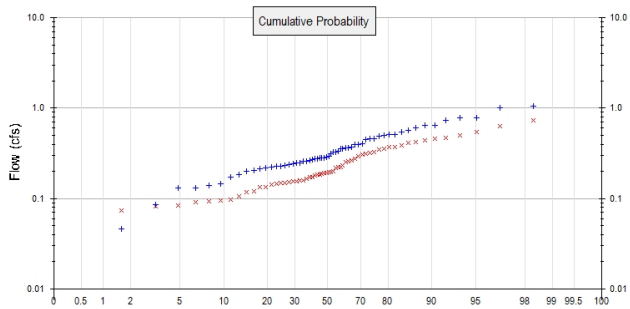
# *Analysis Results*
## *POC 1*




+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 11.26
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.68
Total Impervious Area: 6.58

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.331053 |
| 5 year | 0.519932 |
| 10 year | 0.626973 |
| 25 year | 0.740374 |
| 50 year | 0.810546 |
| 100 year | 0.870231 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.206049 |
| 5 year | 0.334219 |
| 10 year | 0.432687 |
| 25 year | 0.57219 |
| 50 year | 0.686944 |
| 100 year | 0.810935 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.325 | 0.295 |
| 1950 | 0.405 | 0.310 |
| 1951 | 0.729 | 0.359 |
| 1952 | 0.230 | 0.097 |
| 1953 | 0.186 | 0.083 |
| 1954 | 0.285 | 0.141 |
| 1955 | 0.455 | 0.194 |
| 1956 | 0.362 | 0.251 |
| 1957 | 0.292 | 0.202 |
| 1958 | 0.329 | 0.147 |

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| | | |
|---|---|---|
| 1959 | 0.282 | 0.094 |
| 1960 | 0.493 | 0.370 |
| 1961 | 0.278 | 0.259 |
| 1962 | 0.173 | 0.092 |
| 1963 | 0.238 | 0.154 |
| 1964 | 0.313 | 0.134 |
| 1965 | 0.224 | 0.220 |
| 1966 | 0.215 | 0.105 |
| 1967 | 0.450 | 0.314 |
| 1968 | 0.281 | 0.223 |
| 1969 | 0.275 | 0.198 |
| 1970 | 0.227 | 0.155 |
| 1971 | 0.242 | 0.266 |
| 1972 | 0.543 | 0.321 |
| 1973 | 0.247 | 0.185 |
| 1974 | 0.268 | 0.193 |
| 1975 | 0.363 | 0.233 |
| 1976 | 0.262 | 0.158 |
| 1977 | 0.031 | 0.135 |
| 1978 | 0.230 | 0.183 |
| 1979 | 0.139 | 0.146 |
| 1980 | 0.514 | 0.374 |
| 1981 | 0.206 | 0.159 |
| 1982 | 0.395 | 0.499 |
| 1983 | 0.355 | 0.172 |
| 1984 | 0.219 | 0.121 |
| 1985 | 0.130 | 0.164 |
| 1986 | 0.574 | 0.276 |
| 1987 | 0.508 | 0.326 |
| 1988 | 0.200 | 0.074 |
| 1989 | 0.131 | 0.093 |
| 1990 | 1.061 | 0.737 |
| 1991 | 0.639 | 0.474 |
| 1992 | 0.246 | 0.149 |
| 1993 | 0.257 | 0.082 |
| 1994 | 0.086 | 0.066 |
| 1995 | 0.368 | 0.190 |
| 1996 | 0.776 | 0.458 |
| 1997 | 0.648 | 0.423 |
| 1998 | 0.147 | 0.152 |
| 1999 | 0.608 | 0.444 |
| 2000 | 0.256 | 0.172 |
| 2001 | 0.046 | 0.118 |
| 2002 | 0.280 | 0.384 |
| 2003 | 0.358 | 0.224 |
| 2004 | 0.463 | 0.417 |
| 2005 | 0.332 | 0.181 |
| 2006 | 0.392 | 0.192 |
| 2007 | 0.788 | 0.636 |
| 2008 | 1.016 | 0.544 |
| 2009 | 0.499 | 0.348 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 1.0612 | 0.7369 |
| 2 | 1.0161 | 0.6360 |
| 3 | 0.7877 | 0.5439 |

| | | |
|---|---|---|
| 4 | 0.7757 | 0.4986 |
| 5 | 0.7290 | 0.4738 |
| 6 | 0.6484 | 0.4575 |
| 7 | 0.6390 | 0.4437 |
| 8 | 0.6081 | 0.4225 |
| 9 | 0.5738 | 0.4167 |
| 10 | 0.5429 | 0.3844 |
| 11 | 0.5145 | 0.3742 |
| 12 | 0.5076 | 0.3700 |
| 13 | 0.4989 | 0.3592 |
| 14 | 0.4929 | 0.3476 |
| 15 | 0.4633 | 0.3264 |
| 16 | 0.4550 | 0.3212 |
| 17 | 0.4501 | 0.3137 |
| 18 | 0.4055 | 0.3098 |
| 19 | 0.3955 | 0.2946 |
| 20 | 0.3920 | 0.2761 |
| 21 | 0.3681 | 0.2662 |
| 22 | 0.3627 | 0.2585 |
| 23 | 0.3620 | 0.2509 |
| 24 | 0.3578 | 0.2333 |
| 25 | 0.3546 | 0.2235 |
| 26 | 0.3324 | 0.2233 |
| 27 | 0.3291 | 0.2202 |
| 28 | 0.3252 | 0.2020 |
| 29 | 0.3127 | 0.1980 |
| 30 | 0.2922 | 0.1941 |
| 31 | 0.2853 | 0.1932 |
| 32 | 0.2823 | 0.1924 |
| 33 | 0.2808 | 0.1896 |
| 34 | 0.2805 | 0.1851 |
| 35 | 0.2781 | 0.1834 |
| 36 | 0.2747 | 0.1807 |
| 37 | 0.2677 | 0.1722 |
| 38 | 0.2622 | 0.1717 |
| 39 | 0.2567 | 0.1643 |
| 40 | 0.2560 | 0.1591 |
| 41 | 0.2466 | 0.1584 |
| 42 | 0.2464 | 0.1546 |
| 43 | 0.2423 | 0.1540 |
| 44 | 0.2376 | 0.1516 |
| 45 | 0.2300 | 0.1493 |
| 46 | 0.2297 | 0.1471 |
| 47 | 0.2265 | 0.1464 |
| 48 | 0.2239 | 0.1410 |
| 49 | 0.2189 | 0.1345 |
| 50 | 0.2153 | 0.1343 |
| 51 | 0.2056 | 0.1213 |
| 52 | 0.2003 | 0.1177 |
| 53 | 0.1858 | 0.1052 |
| 54 | 0.1730 | 0.0974 |
| 55 | 0.1467 | 0.0945 |
| 56 | 0.1390 | 0.0931 |
| 57 | 0.1307 | 0.0920 |
| 58 | 0.1299 | 0.0829 |
| 59 | 0.0863 | 0.0823 |
| 60 | 0.0459 | 0.0744 |
| 61 | 0.0312 | 0.0660 |

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## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.1655 | 17686 | 6282 | 35 | Pass |
| 0.1720 | 16168 | 5726 | 35 | Pass |
| 0.1786 | 15047 | 5337 | 35 | Pass |
| 0.1851 | 13858 | 4917 | 35 | Pass |
| 0.1916 | 12904 | 4588 | 35 | Pass |
| 0.1981 | 11817 | 4239 | 35 | Pass |
| 0.2046 | 10972 | 3951 | 36 | Pass |
| 0.2111 | 10132 | 3625 | 35 | Pass |
| 0.2176 | 9452 | 3360 | 35 | Pass |
| 0.2242 | 8748 | 3041 | 34 | Pass |
| 0.2307 | 8207 | 2774 | 33 | Pass |
| 0.2372 | 7610 | 2466 | 32 | Pass |
| 0.2437 | 7114 | 2222 | 31 | Pass |
| 0.2502 | 6596 | 1954 | 29 | Pass |
| 0.2567 | 6188 | 1724 | 27 | Pass |
| 0.2633 | 5788 | 1501 | 25 | Pass |
| 0.2698 | 5471 | 1318 | 24 | Pass |
| 0.2763 | 5112 | 1125 | 22 | Pass |
| 0.2828 | 4838 | 968 | 20 | Pass |
| 0.2893 | 4539 | 798 | 17 | Pass |
| 0.2958 | 4284 | 668 | 15 | Pass |
| 0.3023 | 4028 | 551 | 13 | Pass |
| 0.3089 | 3816 | 470 | 12 | Pass |
| 0.3154 | 3557 | 407 | 11 | Pass |
| 0.3219 | 3364 | 354 | 10 | Pass |
| 0.3284 | 3146 | 256 | 8 | Pass |
| 0.3349 | 2973 | 215 | 7 | Pass |
| 0.3414 | 2791 | 180 | 6 | Pass |
| 0.3480 | 2620 | 158 | 6 | Pass |
| 0.3545 | 2455 | 137 | 5 | Pass |
| 0.3610 | 2329 | 122 | 5 | Pass |
| 0.3675 | 2167 | 113 | 5 | Pass |
| 0.3740 | 2025 | 99 | 4 | Pass |
| 0.3805 | 1910 | 90 | 4 | Pass |
| 0.3870 | 1790 | 75 | 4 | Pass |
| 0.3936 | 1699 | 71 | 4 | Pass |
| 0.4001 | 1587 | 64 | 4 | Pass |
| 0.4066 | 1490 | 58 | 3 | Pass |
| 0.4131 | 1381 | 53 | 3 | Pass |
| 0.4196 | 1300 | 48 | 3 | Pass |
| 0.4261 | 1221 | 44 | 3 | Pass |
| 0.4327 | 1160 | 41 | 3 | Pass |
| 0.4392 | 1098 | 40 | 3 | Pass |
| 0.4457 | 1052 | 38 | 3 | Pass |
| 0.4522 | 997 | 36 | 3 | Pass |
| 0.4587 | 936 | 32 | 3 | Pass |
| 0.4652 | 884 | 29 | 3 | Pass |
| 0.4717 | 843 | 29 | 3 | Pass |
| 0.4783 | 790 | 27 | 3 | Pass |
| 0.4848 | 745 | 25 | 3 | Pass |
| 0.4913 | 714 | 24 | 3 | Pass |
| 0.4978 | 673 | 21 | 3 | Pass |
| 0.5043 | 633 | 16 | 2 | Pass |

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| | | | | |
|---|---|---|---|---|
| 0.5108 | 600 | 13 | 2 | Pass |
| 0.5174 | 567 | 11 | 1 | Pass |
| 0.5239 | 541 | 9 | 1 | Pass |
| 0.5304 | 498 | 8 | 1 | Pass |
| 0.5369 | 476 | 4 | 0 | Pass |
| 0.5434 | 437 | 4 | 0 | Pass |
| 0.5499 | 404 | 3 | 0 | Pass |
| 0.5564 | 370 | 3 | 0 | Pass |
| 0.5630 | 351 | 3 | 0 | Pass |
| 0.5695 | 324 | 2 | 0 | Pass |
| 0.5760 | 300 | 2 | 0 | Pass |
| 0.5825 | 275 | 2 | 0 | Pass |
| 0.5890 | 256 | 2 | 0 | Pass |
| 0.5955 | 236 | 2 | 0 | Pass |
| 0.6021 | 217 | 2 | 0 | Pass |
| 0.6086 | 200 | 2 | 1 | Pass |
| 0.6151 | 180 | 2 | 1 | Pass |
| 0.6216 | 158 | 2 | 1 | Pass |
| 0.6281 | 145 | 2 | 1 | Pass |
| 0.6346 | 131 | 2 | 1 | Pass |
| 0.6411 | 119 | 1 | 0 | Pass |
| 0.6477 | 110 | 1 | 0 | Pass |
| 0.6542 | 97 | 1 | 1 | Pass |
| 0.6607 | 92 | 1 | 1 | Pass |
| 0.6672 | 82 | 1 | 1 | Pass |
| 0.6737 | 78 | 1 | 1 | Pass |
| 0.6802 | 69 | 1 | 1 | Pass |
| 0.6868 | 62 | 1 | 1 | Pass |
| 0.6933 | 54 | 1 | 1 | Pass |
| 0.6998 | 48 | 1 | 2 | Pass |
| 0.7063 | 41 | 1 | 2 | Pass |
| 0.7128 | 38 | 1 | 2 | Pass |
| 0.7193 | 33 | 1 | 3 | Pass |
| 0.7258 | 28 | 1 | 3 | Pass |
| 0.7324 | 22 | 1 | 4 | Pass |
| 0.7389 | 21 | 0 | 0 | Pass |
| 0.7454 | 20 | 0 | 0 | Pass |
| 0.7519 | 19 | 0 | 0 | Pass |
| 0.7584 | 17 | 0 | 0 | Pass |
| 0.7649 | 14 | 0 | 0 | Pass |
| 0.7715 | 12 | 0 | 0 | Pass |
| 0.7780 | 9 | 0 | 0 | Pass |
| 0.7845 | 4 | 0 | 0 | Pass |
| 0.7910 | 3 | 0 | 0 | Pass |
| 0.7975 | 3 | 0 | 0 | Pass |
| 0.8040 | 3 | 0 | 0 | Pass |
| 0.8105 | 3 | 0 | 0 | Pass |

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## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.3812 acre-feet |
| On-line facility target flow: | 0.2063 cfs. |
| Adjusted for 15 min: | 0.2063 cfs. |
| Off-line facility target flow: | 0.1078 cfs. |
| Adjusted for 15 min: | 0.1078 cfs. |

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# LID Report

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Vault 1 POC | ☐ | 1161.35 | | | ☐ | 95.99 | | | |
| Total Volume Infiltrated | | 1161.35 | 0.00 | 0.00 | | 95.99 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Passed |
| | | | | | | | | | |

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# *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.

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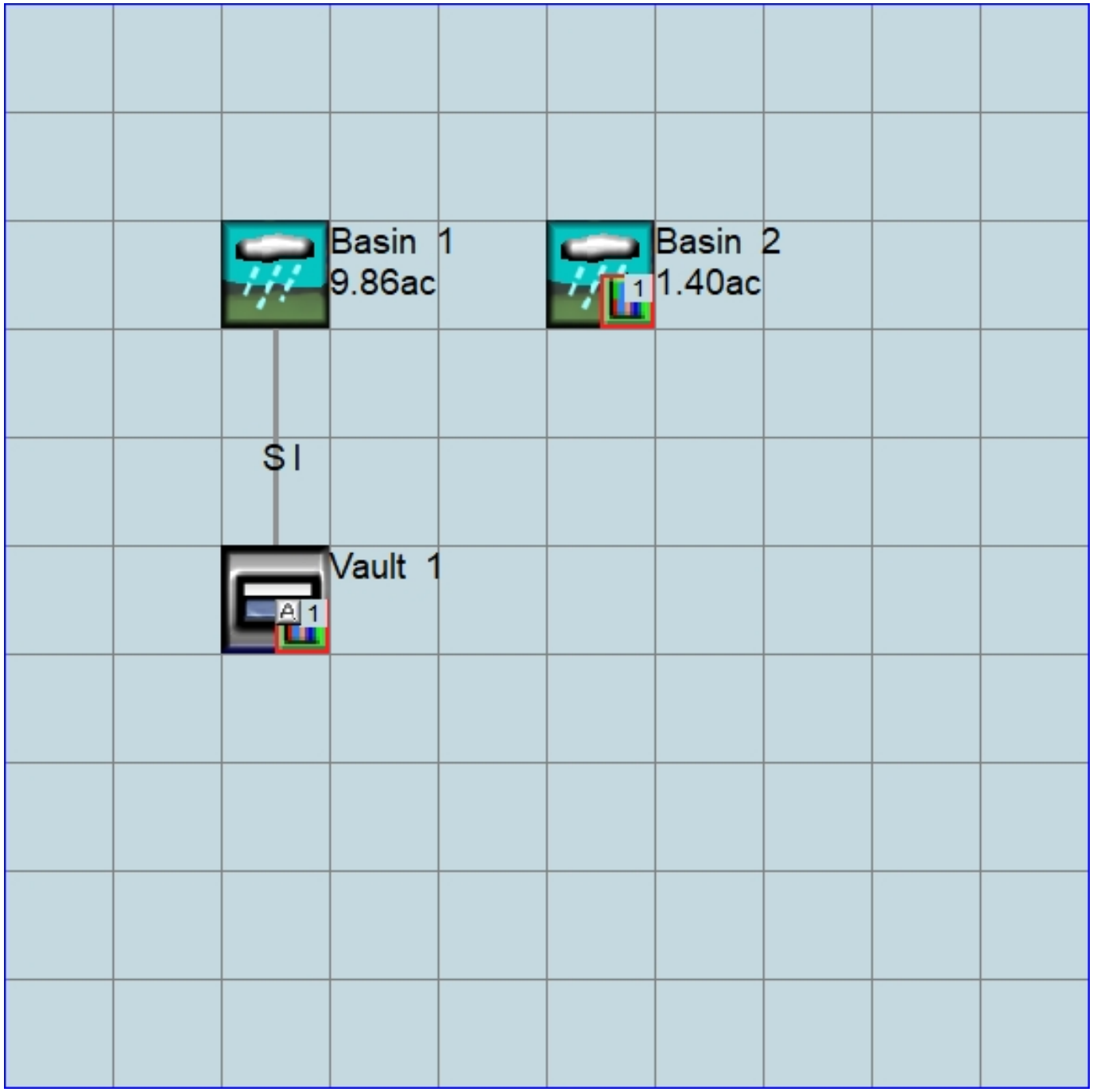
# *Appendix*

## *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   Private Infiltration Vault.wdm
MESSU      25   PrePrivate Infiltration Vault.MES
           27   PrePrivate Infiltration Vault.L61
           28   PrePrivate Infiltration Vault.L62
           30   POCPrivate Infiltration Vault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      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           ***
   10     C, Forest, Flat         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 ***
   10         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  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

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```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10            0.2       0.5      0.35         6       0.5       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
   10              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
```

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```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                       11.26     COPY   501     12
PERLND  10                       11.26     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
```

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```
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
```

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## *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   Private Infiltration Vault.wdm
MESSU      25   MitPrivate Infiltration Vault.MES
           27   MitPrivate Infiltration Vault.L61
           28   MitPrivate Infiltration Vault.L62
           30   POCPrivate Infiltration Vault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       4
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                  MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         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            ***
   16     C, Lawn, Flat           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 ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

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```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         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 ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -   # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      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
   16              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           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    8         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     ***
    1         0    0    0    0    0
```

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```
    4         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK    ***
<Name>   #                  <-factor->     <Name>   #   Tbl#    ***
Basin  1***
PERLND  16                    3.51     RCHRES   1      2
PERLND  16                    3.51     RCHRES   1      3
IMPLND   1                     1.4     RCHRES   1      5
IMPLND   4                    4.13     RCHRES   1      5
IMPLND   8                    0.82     RCHRES   1      5
Basin  2***
PERLND  16                    1.17     COPY   501     12
PERLND  16                    1.17     COPY   601     12
PERLND  16                    1.17     COPY   501     13
PERLND  16                    1.17     COPY   601     13
IMPLND   1                    0.23     COPY   501     15
IMPLND   1                    0.23     COPY   601     15

******Routing******
PERLND  16                    3.51     COPY     1     12
IMPLND   1                     1.4     COPY     1     15
IMPLND   4                    4.13     COPY     1     15
IMPLND   8                    0.82     COPY     1     15
PERLND  16                    3.51     COPY     1     13
RCHRES   1                       1     COPY   501     17
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                 ***
```

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```
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                             ***
    1     Vault  1                2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH      STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1              1      0.03       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->    <---><---><---><---><---> *** <---><---><---><---><--->
    1            0        4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.261662  0.000000  0.000000  0.000000
  0.127778  0.261662  0.033435  0.000000  0.136776
  0.255556  0.261662  0.066869  0.000000  0.136776
  0.383333  0.261662  0.100304  0.000000  0.136776
  0.511111  0.261662  0.133738  0.000000  0.136776
  0.638889  0.261662  0.167173  0.000000  0.136776
  0.766667  0.261662  0.200608  0.000000  0.136776
  0.894444  0.261662  0.234042  0.000000  0.136776
  1.022222  0.261662  0.267477  0.000000  0.136776
  1.150000  0.261662  0.300911  0.000000  0.136776
  1.277778  0.261662  0.334346  0.000000  0.136776
  1.405556  0.261662  0.367781  0.000000  0.136776
  1.533333  0.261662  0.401215  0.000000  0.136776
  1.661111  0.261662  0.434650  0.000000  0.136776
  1.788889  0.261662  0.468084  0.000000  0.136776
  1.916667  0.261662  0.501519  0.000000  0.136776
  2.044444  0.261662  0.534954  0.000000  0.136776
  2.172222  0.261662  0.568388  0.000000  0.136776
  2.300000  0.261662  0.601823  0.000000  0.136776
  2.427778  0.261662  0.635257  0.000000  0.136776
  2.555556  0.261662  0.668692  0.000000  0.136776
  2.683333  0.261662  0.702127  0.000000  0.136776
  2.811111  0.261662  0.735561  0.000000  0.136776
```

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```
  2.938889  0.261662  0.768996  0.000000  0.136776
  3.066667  0.261662  0.802430  0.000000  0.136776
  3.194444  0.261662  0.835865  0.000000  0.136776
  3.322222  0.261662  0.869300  0.000000  0.136776
  3.450000  0.261662  0.902734  0.021333  0.136776
  3.577778  0.261662  0.936169  0.040225  0.136776
  3.705556  0.261662  0.969603  0.052736  0.136776
  3.833333  0.261662  1.003038  0.062802  0.136776
  3.961111  0.261662  1.036473  0.071464  0.136776
  4.088889  0.261662  1.069907  0.079184  0.136776
  4.216667  0.261662  1.103342  0.086215  0.136776
  4.344444  0.261662  1.136776  0.092715  0.136776
  4.472222  0.261662  1.170211  0.098788  0.136776
  4.600000  0.261662  1.203646  0.104509  0.136776
  4.727778  0.261662  1.237080  0.109932  0.136776
  4.855556  0.261662  1.270515  0.115100  0.136776
  4.983333  0.261662  1.303949  0.120046  0.136776
  5.111111  0.261662  1.337384  0.124796  0.136776
  5.238889  0.261662  1.370819  0.129372  0.136776
  5.366667  0.261662  1.404253  0.133791  0.136776
  5.494444  0.261662  1.437688  0.138069  0.136776
  5.622222  0.261662  1.471122  0.142218  0.136776
  5.750000  0.261662  1.504557  0.146250  0.136776
  5.877778  0.261662  1.537992  0.150173  0.136776
  6.005556  0.261662  1.571426  0.153997  0.136776
  6.133333  0.261662  1.604861  0.157728  0.136776
  6.261111  0.261662  1.638295  0.161372  0.136776
  6.388889  0.261662  1.671730  0.164936  0.136776
  6.516667  0.261662  1.705165  0.168425  0.136776
  6.644444  0.261662  1.738599  0.171843  0.136776
  6.772222  0.261662  1.772034  0.175194  0.136776
  6.900000  0.261662  1.805468  0.178482  0.136776
  7.027778  0.261662  1.838903  0.181711  0.136776
  7.155556  0.261662  1.872338  0.184884  0.136776
  7.283333  0.261662  1.905772  0.188002  0.136776
  7.411111  0.261662  1.939207  0.191070  0.136776
  7.538889  0.261662  1.972641  0.194090  0.136776
  7.666667  0.261662  2.006076  0.197063  0.136776
  7.794444  0.261662  2.039511  0.199992  0.136776
  7.922222  0.261662  2.072945  0.202879  0.136776
  8.050000  0.261662  2.106380  0.205725  0.136776
  8.177778  0.261662  2.139814  0.208533  0.136776
  8.305556  0.261662  2.173249  0.211303  0.136776
  8.433333  0.261662  2.206684  0.214037  0.136776
  8.561111  0.261662  2.240118  0.216737  0.136776
  8.688889  0.261662  2.273553  0.219403  0.136776
  8.816667  0.261662  2.306987  0.222038  0.136776
  8.944444  0.261662  2.340422  0.224642  0.136776
  9.072222  0.261662  2.373856  0.227215  0.136776
  9.200000  0.261662  2.407291  0.229760  0.136776
  9.327778  0.261662  2.440726  0.232278  0.136776
  9.455556  0.261662  2.474160  0.234768  0.136776
  9.583333  0.261662  2.507595  0.237232  0.136776
  9.711111  0.261662  2.541029  0.239670  0.136776
  9.838889  0.261662  2.574464  0.242084  0.136776
  9.966667  0.261662  2.607899  0.244475  0.136776
  10.09444  0.261662  2.641333  0.246842  0.136776
  10.22222  0.261662  2.674768  0.249186  0.136776
  10.35000  0.261662  2.708202  0.251509  0.136776
  10.47778  0.261662  2.741637  0.253811  0.136776
  10.60556  0.261662  2.775072  0.800538  0.136776
  10.73333  0.261662  2.808506  2.014602  0.136776
  10.86111  0.261662  2.841941  3.459349  0.136776
  10.98889  0.261662  2.875375  4.800491  0.136776
  11.11667  0.261662  2.908810  5.765624  0.136776
  11.24444  0.261662  2.942245  6.319728  0.136776
  11.37222  0.261662  2.975679  6.887811  0.136776
  11.50000  0.261662  3.009114  7.358189  0.136776
  END FTABLE  1
END FTABLES
```

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```
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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1003 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
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
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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## *Mitigated HSPF Message File*

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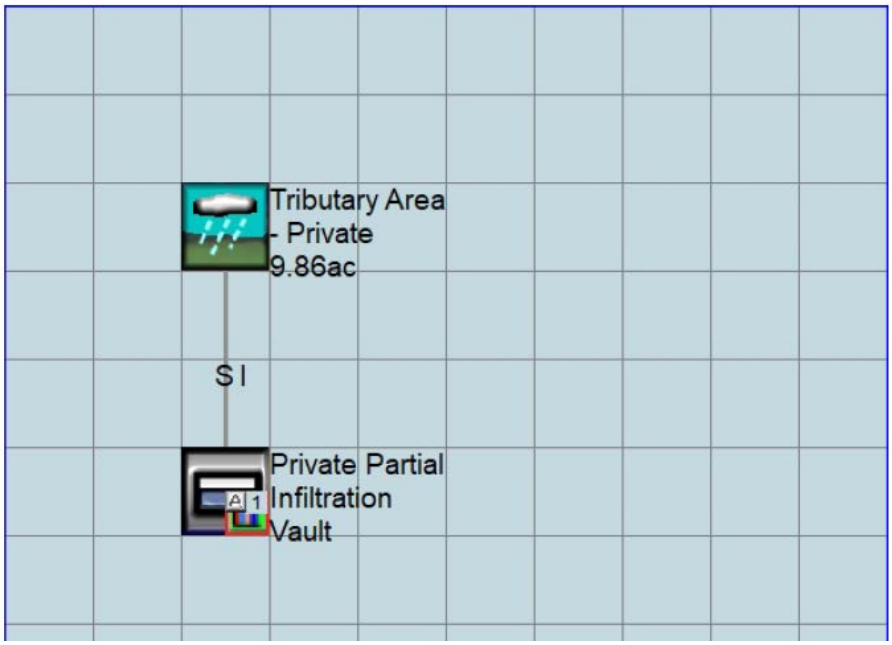
## Private Partial Infiltration Vault WWHM Report Summary – No Bypass

A second condition was modeled for the Private Infiltration Vault with calculations shown in the following report. This model does not include the bypass basin and is modeled in order to determine the flows that are leaving the private partial infiltration vault based only on the basin that is tributary to the vault. The flow rates in the mitigated condition were used to confirm the design that proposed to discharge flows towards the south at flow rates less than were previously expected. Section 4 of this report describes this proposal in detail. The basin schematic is shown below and is the same as the previous model for the private partial infiltration vault but without the bypass.

*Mitigated Schematic*



# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE PRIVATE PARTIAL INFILTRATION VAULT. CALCULATIONS DETERMINE THE PEAK FLOW RATES LEAVING THE PRIVATE INFILTRATION VAULT NOT INCLUDING BYPASS FLOWS.

# General Model Information

| | |
|---|---|
| Project Name: | Private Infiltration Vault No Bypass |
| Site Name: | Woodside |
| Site Address: | 7039 196th Ave NE |
| City: | Redmond |
| Report Date: | 12/2/2019 |
| 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 |

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# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Forest, Flat | 11.26 |
| Pervious Total | 11.26 |
| Impervious Land Use | Acres |
| Impervious Total | 0 |
| Basin Total | 11.26 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

### Tributary Area - Private

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Flat | 3.51 |
| Pervious Total | 3.51 |
| Impervious Land Use | Acres |
| ROADS FLAT | 1.4 |
| ROOF TOPS FLAT | 4.13 |
| SIDEWALKS FLAT | 0.82 |
| Impervious Total | 6.35 |
| Basin Total | 9.86 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| Private Partial Infiltration Vault | Private Partial Infiltration Vault | |

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

## Private Partial Infiltration Vault

Width: 82 ft.
Length: 139 ft.
Depth: 11.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 1224.993
Total Volume Through Riser (ac-ft): 51.193
Total Volume Through Facility (ac-ft): 1276.186
Percent Infiltrated: 95.99
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 10.5 ft.
Riser Diameter: 18 in.
Orifice 2 Diameter: 1.875 in. Elevation:3.4 ft.
Element Flows To:
Outlet 1 Outlet 2

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Vault Hydraulic Table

| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.261 | 0.000 | 0.000 | 0.000 |
| 0.1278 | 0.261 | 0.033 | 0.000 | 0.136 |
| 0.2556 | 0.261 | 0.066 | 0.000 | 0.136 |
| 0.3833 | 0.261 | 0.100 | 0.000 | 0.136 |
| 0.5111 | 0.261 | 0.133 | 0.000 | 0.136 |
| 0.6389 | 0.261 | 0.167 | 0.000 | 0.136 |
| 0.7667 | 0.261 | 0.200 | 0.000 | 0.136 |
| 0.8944 | 0.261 | 0.234 | 0.000 | 0.136 |
| 1.0222 | 0.261 | 0.267 | 0.000 | 0.136 |
| 1.1500 | 0.261 | 0.300 | 0.000 | 0.136 |
| 1.2778 | 0.261 | 0.334 | 0.000 | 0.136 |
| 1.4056 | 0.261 | 0.367 | 0.000 | 0.136 |
| 1.5333 | 0.261 | 0.401 | 0.000 | 0.136 |
| 1.6611 | 0.261 | 0.434 | 0.000 | 0.136 |
| 1.7889 | 0.261 | 0.468 | 0.000 | 0.136 |
| 1.9167 | 0.261 | 0.501 | 0.000 | 0.136 |
| 2.0444 | 0.261 | 0.535 | 0.000 | 0.136 |
| 2.1722 | 0.261 | 0.568 | 0.000 | 0.136 |
| 2.3000 | 0.261 | 0.601 | 0.000 | 0.136 |
| 2.4278 | 0.261 | 0.635 | 0.000 | 0.136 |
| 2.5556 | 0.261 | 0.668 | 0.000 | 0.136 |
| 2.6833 | 0.261 | 0.702 | 0.000 | 0.136 |
| 2.8111 | 0.261 | 0.735 | 0.000 | 0.136 |
| 2.9389 | 0.261 | 0.769 | 0.000 | 0.136 |
| 3.0667 | 0.261 | 0.802 | 0.000 | 0.136 |
| 3.1944 | 0.261 | 0.835 | 0.000 | 0.136 |
| 3.3222 | 0.261 | 0.869 | 0.000 | 0.136 |
| 3.4500 | 0.261 | 0.902 | 0.021 | 0.136 |
| 3.5778 | 0.261 | 0.936 | 0.040 | 0.136 |
| 3.7056 | 0.261 | 0.969 | 0.052 | 0.136 |
| 3.8333 | 0.261 | 1.003 | 0.062 | 0.136 |

| | | | | |
|---|---|---|---|---|
| 3.9611 | 0.261 | 1.036 | 0.071 | 0.136 |
| 4.0889 | 0.261 | 1.069 | 0.079 | 0.136 |
| 4.2167 | 0.261 | 1.103 | 0.086 | 0.136 |
| 4.3444 | 0.261 | 1.136 | 0.092 | 0.136 |
| 4.4722 | 0.261 | 1.170 | 0.098 | 0.136 |
| 4.6000 | 0.261 | 1.203 | 0.104 | 0.136 |
| 4.7278 | 0.261 | 1.237 | 0.109 | 0.136 |
| 4.8556 | 0.261 | 1.270 | 0.115 | 0.136 |
| 4.9833 | 0.261 | 1.303 | 0.120 | 0.136 |
| 5.1111 | 0.261 | 1.337 | 0.124 | 0.136 |
| 5.2389 | 0.261 | 1.370 | 0.129 | 0.136 |
| 5.3667 | 0.261 | 1.404 | 0.133 | 0.136 |
| 5.4944 | 0.261 | 1.437 | 0.138 | 0.136 |
| 5.6222 | 0.261 | 1.471 | 0.142 | 0.136 |
| 5.7500 | 0.261 | 1.504 | 0.146 | 0.136 |
| 5.8778 | 0.261 | 1.538 | 0.150 | 0.136 |
| 6.0056 | 0.261 | 1.571 | 0.154 | 0.136 |
| 6.1333 | 0.261 | 1.604 | 0.157 | 0.136 |
| 6.2611 | 0.261 | 1.638 | 0.161 | 0.136 |
| 6.3889 | 0.261 | 1.671 | 0.164 | 0.136 |
| 6.5167 | 0.261 | 1.705 | 0.168 | 0.136 |
| 6.6444 | 0.261 | 1.738 | 0.171 | 0.136 |
| 6.7722 | 0.261 | 1.772 | 0.175 | 0.136 |
| 6.9000 | 0.261 | 1.805 | 0.178 | 0.136 |
| 7.0278 | 0.261 | 1.838 | 0.181 | 0.136 |
| 7.1556 | 0.261 | 1.872 | 0.184 | 0.136 |
| 7.2833 | 0.261 | 1.905 | 0.188 | 0.136 |
| 7.4111 | 0.261 | 1.939 | 0.191 | 0.136 |
| 7.5389 | 0.261 | 1.972 | 0.194 | 0.136 |
| 7.6667 | 0.261 | 2.006 | 0.197 | 0.136 |
| 7.7944 | 0.261 | 2.039 | 0.200 | 0.136 |
| 7.9222 | 0.261 | 2.072 | 0.202 | 0.136 |
| 8.0500 | 0.261 | 2.106 | 0.205 | 0.136 |
| 8.1778 | 0.261 | 2.139 | 0.208 | 0.136 |
| 8.3056 | 0.261 | 2.173 | 0.211 | 0.136 |
| 8.4333 | 0.261 | 2.206 | 0.214 | 0.136 |
| 8.5611 | 0.261 | 2.240 | 0.216 | 0.136 |
| 8.6889 | 0.261 | 2.273 | 0.219 | 0.136 |
| 8.8167 | 0.261 | 2.307 | 0.222 | 0.136 |
| 8.9444 | 0.261 | 2.340 | 0.224 | 0.136 |
| 9.0722 | 0.261 | 2.373 | 0.227 | 0.136 |
| 9.2000 | 0.261 | 2.407 | 0.229 | 0.136 |
| 9.3278 | 0.261 | 2.440 | 0.232 | 0.136 |
| 9.4556 | 0.261 | 2.474 | 0.234 | 0.136 |
| 9.5833 | 0.261 | 2.507 | 0.237 | 0.136 |
| 9.7111 | 0.261 | 2.541 | 0.239 | 0.136 |
| 9.8389 | 0.261 | 2.574 | 0.242 | 0.136 |
| 9.9667 | 0.261 | 2.607 | 0.244 | 0.136 |
| 10.094 | 0.261 | 2.641 | 0.246 | 0.136 |
| 10.222 | 0.261 | 2.674 | 0.249 | 0.136 |
| 10.350 | 0.261 | 2.708 | 0.251 | 0.136 |
| 10.478 | 0.261 | 2.741 | 0.253 | 0.136 |
| 10.606 | 0.261 | 2.775 | 0.800 | 0.136 |
| 10.733 | 0.261 | 2.808 | 2.014 | 0.136 |
| 10.861 | 0.261 | 2.841 | 3.459 | 0.136 |
| 10.989 | 0.261 | 2.875 | 4.800 | 0.136 |
| 11.117 | 0.261 | 2.908 | 5.765 | 0.136 |
| 11.244 | 0.261 | 2.942 | 6.319 | 0.136 |

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| | | | | |
|---|---|---|---|---|
| 11.372 | 0.261 | 2.975 | 6.887 | 0.136 |
| 11.500 | 0.261 | 3.009 | 7.358 | 0.136 |
| 11.628 | 0.296 | 3.298 | 7.799 | 0.155 |

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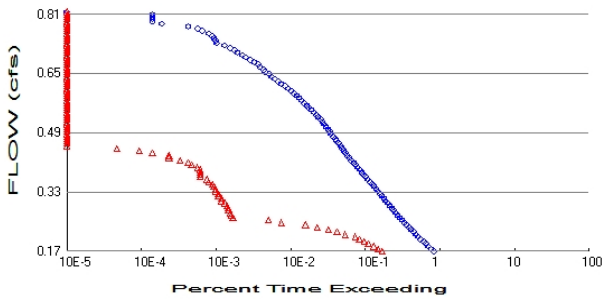
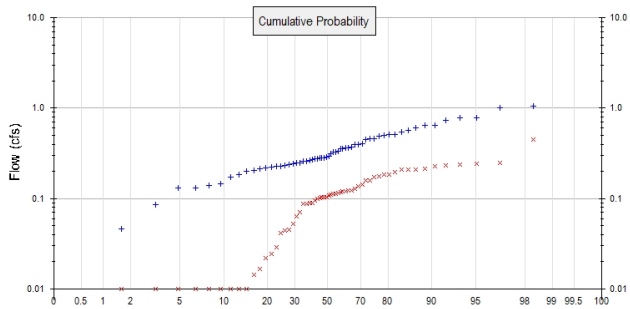
# *Analysis Results*
## *POC 1*




+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 11.26
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.51
Total Impervious Area: 6.35

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.331053 |
| 5 year | 0.519932 |
| 10 year | 0.626973 |
| 25 year | 0.740374 |
| 50 year | 0.810546 |
| 100 year | 0.870231 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.170059 |
| 5 year | 0.284181 |
| 10 year | 0.351619 |
| 25 year | 0.424813 |
| 50 year | 0.470902 |
| 100 year | 0.510538 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.325 | 0.000 |
| 1950 | 0.405 | 0.119 |
| 1951 | 0.729 | 0.228 |
| 1952 | 0.230 | 0.000 |
| 1953 | 0.186 | 0.044 |
| 1954 | 0.285 | 0.087 |
| 1955 | 0.455 | 0.109 |
| 1956 | 0.362 | 0.143 |
| 1957 | 0.292 | 0.095 |
| 1958 | 0.329 | 0.090 |

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| | | |
|---|---|---|
| 1959 | 0.282 | 0.017 |
| 1960 | 0.493 | 0.209 |
| 1961 | 0.278 | 0.116 |
| 1962 | 0.173 | 0.000 |
| 1963 | 0.238 | 0.089 |
| 1964 | 0.313 | 0.086 |
| 1965 | 0.224 | 0.136 |
| 1966 | 0.215 | 0.042 |
| 1967 | 0.450 | 0.103 |
| 1968 | 0.281 | 0.045 |
| 1969 | 0.275 | 0.025 |
| 1970 | 0.227 | 0.071 |
| 1971 | 0.242 | 0.119 |
| 1972 | 0.543 | 0.173 |
| 1973 | 0.247 | 0.128 |
| 1974 | 0.268 | 0.103 |
| 1975 | 0.363 | 0.103 |
| 1976 | 0.262 | 0.108 |
| 1977 | 0.031 | 0.000 |
| 1978 | 0.230 | 0.116 |
| 1979 | 0.139 | 0.000 |
| 1980 | 0.514 | 0.209 |
| 1981 | 0.206 | 0.063 |
| 1982 | 0.395 | 0.184 |
| 1983 | 0.355 | 0.099 |
| 1984 | 0.219 | 0.000 |
| 1985 | 0.130 | 0.053 |
| 1986 | 0.574 | 0.158 |
| 1987 | 0.508 | 0.183 |
| 1988 | 0.200 | 0.000 |
| 1989 | 0.131 | 0.000 |
| 1990 | 1.061 | 0.216 |
| 1991 | 0.639 | 0.210 |
| 1992 | 0.246 | 0.101 |
| 1993 | 0.257 | 0.029 |
| 1994 | 0.086 | 0.000 |
| 1995 | 0.368 | 0.122 |
| 1996 | 0.776 | 0.230 |
| 1997 | 0.648 | 0.248 |
| 1998 | 0.147 | 0.014 |
| 1999 | 0.608 | 0.195 |
| 2000 | 0.256 | 0.113 |
| 2001 | 0.046 | 0.000 |
| 2002 | 0.280 | 0.176 |
| 2003 | 0.358 | 0.022 |
| 2004 | 0.463 | 0.238 |
| 2005 | 0.332 | 0.113 |
| 2006 | 0.392 | 0.122 |
| 2007 | 0.788 | 0.445 |
| 2008 | 1.016 | 0.242 |
| 2009 | 0.499 | 0.158 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 1.0612 | 0.4451 |
| 2 | 1.0161 | 0.2477 |
| 3 | 0.7877 | 0.2419 |

| | | |
|---|---|---|
| 4 | 0.7757 | 0.2382 |
| 5 | 0.7290 | 0.2299 |
| 6 | 0.6484 | 0.2279 |
| 7 | 0.6390 | 0.2155 |
| 8 | 0.6081 | 0.2104 |
| 9 | 0.5738 | 0.2093 |
| 10 | 0.5429 | 0.2087 |
| 11 | 0.5145 | 0.1950 |
| 12 | 0.5076 | 0.1840 |
| 13 | 0.4989 | 0.1831 |
| 14 | 0.4929 | 0.1759 |
| 15 | 0.4633 | 0.1727 |
| 16 | 0.4550 | 0.1585 |
| 17 | 0.4501 | 0.1581 |
| 18 | 0.4055 | 0.1427 |
| 19 | 0.3955 | 0.1364 |
| 20 | 0.3920 | 0.1281 |
| 21 | 0.3681 | 0.1220 |
| 22 | 0.3627 | 0.1219 |
| 23 | 0.3620 | 0.1195 |
| 24 | 0.3578 | 0.1189 |
| 25 | 0.3546 | 0.1164 |
| 26 | 0.3324 | 0.1157 |
| 27 | 0.3291 | 0.1133 |
| 28 | 0.3252 | 0.1132 |
| 29 | 0.3127 | 0.1095 |
| 30 | 0.2922 | 0.1078 |
| 31 | 0.2853 | 0.1035 |
| 32 | 0.2823 | 0.1031 |
| 33 | 0.2808 | 0.1029 |
| 34 | 0.2805 | 0.1010 |
| 35 | 0.2781 | 0.0992 |
| 36 | 0.2747 | 0.0952 |
| 37 | 0.2677 | 0.0899 |
| 38 | 0.2622 | 0.0886 |
| 39 | 0.2567 | 0.0873 |
| 40 | 0.2560 | 0.0864 |
| 41 | 0.2466 | 0.0712 |
| 42 | 0.2464 | 0.0633 |
| 43 | 0.2423 | 0.0529 |
| 44 | 0.2376 | 0.0455 |
| 45 | 0.2300 | 0.0440 |
| 46 | 0.2297 | 0.0418 |
| 47 | 0.2265 | 0.0289 |
| 48 | 0.2239 | 0.0246 |
| 49 | 0.2189 | 0.0217 |
| 50 | 0.2153 | 0.0167 |
| 51 | 0.2056 | 0.0144 |
| 52 | 0.2003 | 0.0000 |
| 53 | 0.1858 | 0.0000 |
| 54 | 0.1730 | 0.0000 |
| 55 | 0.1467 | 0.0000 |
| 56 | 0.1390 | 0.0000 |
| 57 | 0.1307 | 0.0000 |
| 58 | 0.1299 | 0.0000 |
| 59 | 0.0863 | 0.0000 |
| 60 | 0.0459 | 0.0000 |
| 61 | 0.0312 | 0.0000 |

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## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.1655 | 17686 | 3585 | 20 | Pass |
| 0.1720 | 16168 | 3163 | 19 | Pass |
| 0.1786 | 15047 | 2772 | 18 | Pass |
| 0.1851 | 13858 | 2357 | 17 | Pass |
| 0.1916 | 12904 | 2074 | 16 | Pass |
| 0.1981 | 11817 | 1783 | 15 | Pass |
| 0.2046 | 10972 | 1560 | 14 | Pass |
| 0.2111 | 10132 | 1144 | 11 | Pass |
| 0.2176 | 9452 | 890 | 9 | Pass |
| 0.2242 | 8748 | 684 | 7 | Pass |
| 0.2307 | 8207 | 486 | 5 | Pass |
| 0.2372 | 7610 | 338 | 4 | Pass |
| 0.2437 | 7114 | 160 | 2 | Pass |
| 0.2502 | 6596 | 107 | 1 | Pass |
| 0.2567 | 6188 | 36 | 0 | Pass |
| 0.2633 | 5788 | 34 | 0 | Pass |
| 0.2698 | 5471 | 33 | 0 | Pass |
| 0.2763 | 5112 | 31 | 0 | Pass |
| 0.2828 | 4838 | 31 | 0 | Pass |
| 0.2893 | 4539 | 30 | 0 | Pass |
| 0.2958 | 4284 | 28 | 0 | Pass |
| 0.3023 | 4028 | 25 | 0 | Pass |
| 0.3089 | 3816 | 25 | 0 | Pass |
| 0.3154 | 3557 | 23 | 0 | Pass |
| 0.3219 | 3364 | 23 | 0 | Pass |
| 0.3284 | 3146 | 21 | 0 | Pass |
| 0.3349 | 2973 | 21 | 0 | Pass |
| 0.3414 | 2791 | 20 | 0 | Pass |
| 0.3480 | 2620 | 19 | 0 | Pass |
| 0.3545 | 2455 | 17 | 0 | Pass |
| 0.3610 | 2329 | 16 | 0 | Pass |
| 0.3675 | 2167 | 13 | 0 | Pass |
| 0.3740 | 2025 | 13 | 0 | Pass |
| 0.3805 | 1910 | 13 | 0 | Pass |
| 0.3870 | 1790 | 13 | 0 | Pass |
| 0.3936 | 1699 | 12 | 0 | Pass |
| 0.4001 | 1587 | 10 | 0 | Pass |
| 0.4066 | 1490 | 9 | 0 | Pass |
| 0.4131 | 1381 | 7 | 0 | Pass |
| 0.4196 | 1300 | 5 | 0 | Pass |
| 0.4261 | 1221 | 5 | 0 | Pass |
| 0.4327 | 1160 | 3 | 0 | Pass |
| 0.4392 | 1098 | 2 | 0 | Pass |
| 0.4457 | 1052 | 1 | 0 | Pass |
| 0.4522 | 997 | 0 | 0 | Pass |
| 0.4587 | 936 | 0 | 0 | Pass |
| 0.4652 | 884 | 0 | 0 | Pass |
| 0.4717 | 843 | 0 | 0 | Pass |
| 0.4783 | 790 | 0 | 0 | Pass |
| 0.4848 | 745 | 0 | 0 | Pass |
| 0.4913 | 714 | 0 | 0 | Pass |
| 0.4978 | 673 | 0 | 0 | Pass |
| 0.5043 | 633 | 0 | 0 | Pass |

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| | | | | |
|---|---|---|---|---|
| 0.5108 | 600 | 0 | 0 | Pass |
| 0.5174 | 567 | 0 | 0 | Pass |
| 0.5239 | 541 | 0 | 0 | Pass |
| 0.5304 | 498 | 0 | 0 | Pass |
| 0.5369 | 476 | 0 | 0 | Pass |
| 0.5434 | 437 | 0 | 0 | Pass |
| 0.5499 | 404 | 0 | 0 | Pass |
| 0.5564 | 370 | 0 | 0 | Pass |
| 0.5630 | 351 | 0 | 0 | Pass |
| 0.5695 | 324 | 0 | 0 | Pass |
| 0.5760 | 300 | 0 | 0 | Pass |
| 0.5825 | 275 | 0 | 0 | Pass |
| 0.5890 | 256 | 0 | 0 | Pass |
| 0.5955 | 236 | 0 | 0 | Pass |
| 0.6021 | 217 | 0 | 0 | Pass |
| 0.6086 | 200 | 0 | 0 | Pass |
| 0.6151 | 180 | 0 | 0 | Pass |
| 0.6216 | 158 | 0 | 0 | Pass |
| 0.6281 | 145 | 0 | 0 | Pass |
| 0.6346 | 131 | 0 | 0 | Pass |
| 0.6411 | 119 | 0 | 0 | Pass |
| 0.6477 | 110 | 0 | 0 | Pass |
| 0.6542 | 97 | 0 | 0 | Pass |
| 0.6607 | 92 | 0 | 0 | Pass |
| 0.6672 | 82 | 0 | 0 | Pass |
| 0.6737 | 78 | 0 | 0 | Pass |
| 0.6802 | 69 | 0 | 0 | Pass |
| 0.6868 | 62 | 0 | 0 | Pass |
| 0.6933 | 54 | 0 | 0 | Pass |
| 0.6998 | 48 | 0 | 0 | Pass |
| 0.7063 | 41 | 0 | 0 | Pass |
| 0.7128 | 38 | 0 | 0 | Pass |
| 0.7193 | 33 | 0 | 0 | Pass |
| 0.7258 | 28 | 0 | 0 | Pass |
| 0.7324 | 22 | 0 | 0 | Pass |
| 0.7389 | 21 | 0 | 0 | Pass |
| 0.7454 | 20 | 0 | 0 | Pass |
| 0.7519 | 19 | 0 | 0 | Pass |
| 0.7584 | 17 | 0 | 0 | Pass |
| 0.7649 | 14 | 0 | 0 | Pass |
| 0.7715 | 12 | 0 | 0 | Pass |
| 0.7780 | 9 | 0 | 0 | Pass |
| 0.7845 | 4 | 0 | 0 | Pass |
| 0.7910 | 3 | 0 | 0 | Pass |
| 0.7975 | 3 | 0 | 0 | Pass |
| 0.8040 | 3 | 0 | 0 | Pass |
| 0.8105 | 3 | 0 | 0 | Pass |

DRAFT

## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.3812 acre-feet |
| On-line facility target flow: | 0.2063 cfs. |
| Adjusted for 15 min: | 0.2063 cfs. |
| Off-line facility target flow: | 0.1078 cfs. |
| Adjusted for 15 min: | 0.1078 cfs. |

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# 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 |
|---|---|---|---|---|---|---|---|---|---|
| Private Partial Infiltration Vault | ☐ | 1161.35 | | | ☐ | 95.99 | | | |
| Total Volume Infiltrated | | 1161.35 | 0.00 | 0.00 | | 95.99 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Passed |
| | | | | | | | | | |

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# *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.

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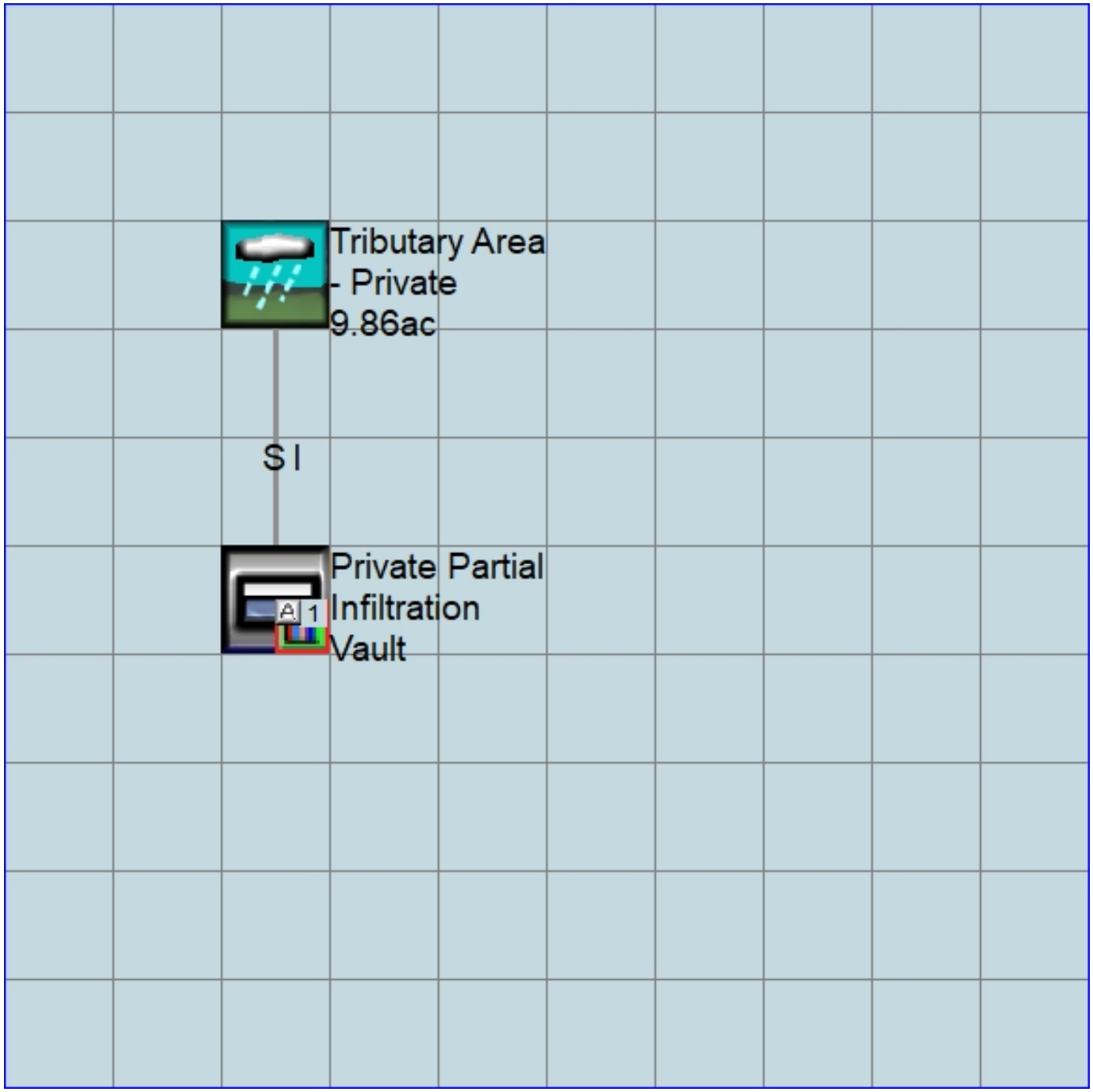
# *Appendix*
## *Predeveloped Schematic*

## *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   Private Infiltration Vault No Bypass.wdm
MESSU      25   PrePrivate Infiltration Vault No Bypass.MES
           27   PrePrivate Infiltration Vault No Bypass.L61
           28   PrePrivate Infiltration Vault No Bypass.L62
           30   POCPrivate Infiltration Vault No Bypass1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      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           ***
   10     C, Forest, Flat         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 ***
   10         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  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

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```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10            0.2       0.5      0.35         6       0.5       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
   10              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
```

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```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                       11.26     COPY   501     12
PERLND  10                       11.26     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
```

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```
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
```

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## *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   Private Infiltration Vault No Bypass.wdm
MESSU      25   MitPrivate Infiltration Vault No Bypass.MES
           27   MitPrivate Infiltration Vault No Bypass.L61
           28   MitPrivate Infiltration Vault No Bypass.L62
           30   POCPrivate Infiltration Vault No Bypass1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       4
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Private Partial Infiltrat   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           ***
   16     C, Lawn, Flat           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 ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
```

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```
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         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 ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM2

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -   # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      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
   16              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           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL    ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL     *********
    1         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    8         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     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
    8         0    0    0    0    0
```

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```
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Tributary Area - Private ***
PERLND  16                    3.51     RCHRES   1      2
PERLND  16                    3.51     RCHRES   1      3
IMPLND   1                     1.4     RCHRES   1      5
IMPLND   4                    4.13     RCHRES   1      5
IMPLND   8                    0.82     RCHRES   1      5

******Routing******
PERLND  16                    3.51     COPY     1     12
IMPLND   1                     1.4     COPY     1     15
IMPLND   4                    4.13     COPY     1     15
IMPLND   8                    0.82     COPY     1     15
PERLND  16                    3.51     COPY     1     13
RCHRES   1                       1     COPY   501     17
END SCHEMATIC

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


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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG           ***
                                          in  out                           ***
    1     Private Partial -010    2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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```
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

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

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                        ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1               1      0.03       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                           ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.261662  0.000000  0.000000  0.000000
  0.127778  0.261662  0.033435  0.000000  0.136776
  0.255556  0.261662  0.066869  0.000000  0.136776
  0.383333  0.261662  0.100304  0.000000  0.136776
  0.511111  0.261662  0.133738  0.000000  0.136776
  0.638889  0.261662  0.167173  0.000000  0.136776
  0.766667  0.261662  0.200608  0.000000  0.136776
  0.894444  0.261662  0.234042  0.000000  0.136776
  1.022222  0.261662  0.267477  0.000000  0.136776
  1.150000  0.261662  0.300911  0.000000  0.136776
  1.277778  0.261662  0.334346  0.000000  0.136776
  1.405556  0.261662  0.367781  0.000000  0.136776
  1.533333  0.261662  0.401215  0.000000  0.136776
  1.661111  0.261662  0.434650  0.000000  0.136776
  1.788889  0.261662  0.468084  0.000000  0.136776
  1.916667  0.261662  0.501519  0.000000  0.136776
  2.044444  0.261662  0.534954  0.000000  0.136776
  2.172222  0.261662  0.568388  0.000000  0.136776
  2.300000  0.261662  0.601823  0.000000  0.136776
  2.427778  0.261662  0.635257  0.000000  0.136776
  2.555556  0.261662  0.668692  0.000000  0.136776
  2.683333  0.261662  0.702127  0.000000  0.136776
  2.811111  0.261662  0.735561  0.000000  0.136776
  2.938889  0.261662  0.768996  0.000000  0.136776
  3.066667  0.261662  0.802430  0.000000  0.136776
  3.194444  0.261662  0.835865  0.000000  0.136776
  3.322222  0.261662  0.869300  0.000000  0.136776
  3.450000  0.261662  0.902734  0.021333  0.136776
  3.577778  0.261662  0.936169  0.040225  0.136776
  3.705556  0.261662  0.969603  0.052736  0.136776
  3.833333  0.261662  1.003038  0.062802  0.136776
  3.961111  0.261662  1.036473  0.071464  0.136776
```

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```
  4.088889  0.261662  1.069907  0.079184  0.136776
  4.216667  0.261662  1.103342  0.086215  0.136776
  4.344444  0.261662  1.136776  0.092715  0.136776
  4.472222  0.261662  1.170211  0.098788  0.136776
  4.600000  0.261662  1.203646  0.104509  0.136776
  4.727778  0.261662  1.237080  0.109932  0.136776
  4.855556  0.261662  1.270515  0.115100  0.136776
  4.983333  0.261662  1.303949  0.120046  0.136776
  5.111111  0.261662  1.337384  0.124796  0.136776
  5.238889  0.261662  1.370819  0.129372  0.136776
  5.366667  0.261662  1.404253  0.133791  0.136776
  5.494444  0.261662  1.437688  0.138069  0.136776
  5.622222  0.261662  1.471122  0.142218  0.136776
  5.750000  0.261662  1.504557  0.146250  0.136776
  5.877778  0.261662  1.537992  0.150173  0.136776
  6.005556  0.261662  1.571426  0.153997  0.136776
  6.133333  0.261662  1.604861  0.157728  0.136776
  6.261111  0.261662  1.638295  0.161372  0.136776
  6.388889  0.261662  1.671730  0.164936  0.136776
  6.516667  0.261662  1.705165  0.168425  0.136776
  6.644444  0.261662  1.738599  0.171843  0.136776
  6.772222  0.261662  1.772034  0.175194  0.136776
  6.900000  0.261662  1.805468  0.178482  0.136776
  7.027778  0.261662  1.838903  0.181711  0.136776
  7.155556  0.261662  1.872338  0.184884  0.136776
  7.283333  0.261662  1.905772  0.188002  0.136776
  7.411111  0.261662  1.939207  0.191070  0.136776
  7.538889  0.261662  1.972641  0.194090  0.136776
  7.666667  0.261662  2.006076  0.197063  0.136776
  7.794444  0.261662  2.039511  0.199992  0.136776
  7.922222  0.261662  2.072945  0.202879  0.136776
  8.050000  0.261662  2.106380  0.205725  0.136776
  8.177778  0.261662  2.139814  0.208533  0.136776
  8.305556  0.261662  2.173249  0.211303  0.136776
  8.433333  0.261662  2.206684  0.214037  0.136776
  8.561111  0.261662  2.240118  0.216737  0.136776
  8.688889  0.261662  2.273553  0.219403  0.136776
  8.816667  0.261662  2.306987  0.222038  0.136776
  8.944444  0.261662  2.340422  0.224642  0.136776
  9.072222  0.261662  2.373856  0.227215  0.136776
  9.200000  0.261662  2.407291  0.229760  0.136776
  9.327778  0.261662  2.440726  0.232278  0.136776
  9.455556  0.261662  2.474160  0.234768  0.136776
  9.583333  0.261662  2.507595  0.237232  0.136776
  9.711111  0.261662  2.541029  0.239670  0.136776
  9.838889  0.261662  2.574464  0.242084  0.136776
  9.966667  0.261662  2.607899  0.244475  0.136776
  10.09444  0.261662  2.641333  0.246842  0.136776
  10.22222  0.261662  2.674768  0.249186  0.136776
  10.35000  0.261662  2.708202  0.251509  0.136776
  10.47778  0.261662  2.741637  0.253811  0.136776
  10.60556  0.261662  2.775072  0.800538  0.136776
  10.73333  0.261662  2.808506  2.014602  0.136776
  10.86111  0.261662  2.841941  3.459349  0.136776
  10.98889  0.261662  2.875375  4.800491  0.136776
  11.11667  0.261662  2.908810  5.765624  0.136776
  11.24444  0.261662  2.942245  6.319728  0.136776
  11.37222  0.261662  2.975679  6.887811  0.136776
  11.50000  0.261662  3.009114  7.358189  0.136776
  END FTABLE  1
END FTABLES

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

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```
END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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## *Mitigated HSPF Message File*

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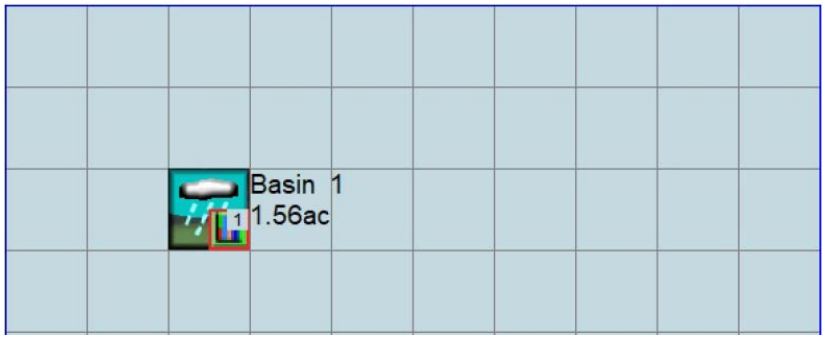
## Public Partial Infiltration Vault WWHM Report Summary

The WWHM Report for the Public Partial Infiltration Vault is included in the following pages. It is shown that the vault meets the on-site flow control requirement by not exceeding the predeveloped condition flow durations from 50% of the 2-year to the full 50-year peak storm event.

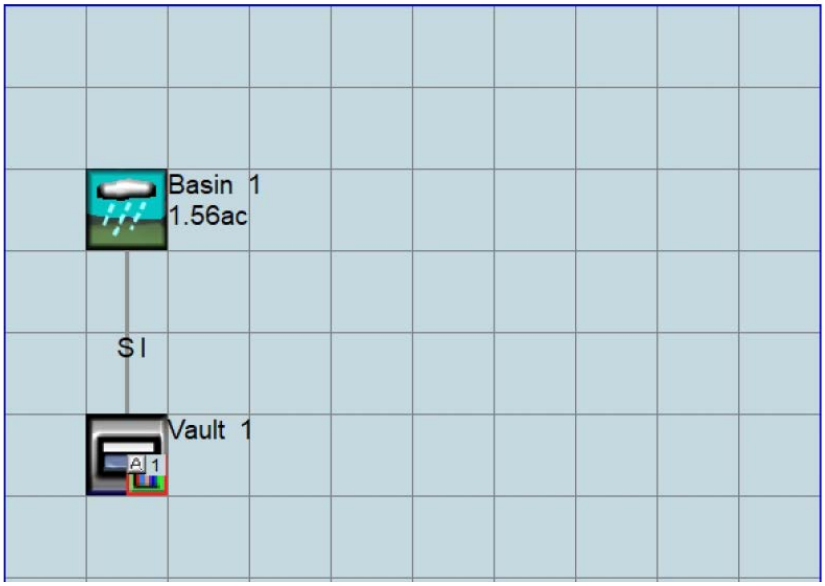
The Public Partial Infiltration Vault has been sized to receive flows from the berm just north of the project site that will be constructed as part of this project. Refer to Figure 4-3: Developed Conditions – Public Vault for the areas tributary to this vault used for modeling in Section 4.

*Appendix*

*Predeveloped Schematic*




*Mitigated Schematic*




Inputs and analysis of the Public Partial Infiltration Vault included in Section 4.3 of this report have been drawn from the WWHM report on the following pages.

# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE PUBLIC PARTIAL INFILTRATION VAULT. CALCULATIONS SHOW THAT ON SITE FLOW CONTROL STANDARD IS MET FOR THE PUBLIC LAND USE BASIN.

# General Model Information

| | |
|---|---|
| Project Name: | Public Infiltration Vault |
| Site Name: | Woodside |
| Site Address: | 7039 196th Ave NE |
| City: | Redmond |
| Report Date: | 11/15/2019 |
| Gage: | Seatac |
| Data Start: | 1948/10/01 |
| Data End: | 2009/09/30 |
| Timestep: | 15 Minute |
| Precip Scale: | 0.00 (adjusted) |
| Version: | 2015/06/05 |

## POC Thresholds

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

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# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Forest, Flat | 1.56 |
| Pervious Total | 1.56 |
| Impervious Land Use | Acres |
| Impervious Total | 0 |
| Basin Total | 1.56 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Flat | 0.79 |
| Pervious Total | 0.79 |
| Impervious Land Use | Acres |
| ROADS FLAT | 0.53 |
| SIDEWALKS FLAT | 0.24 |
| Impervious Total | 0.77 |
| Basin Total | 1.56 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| Vault 1 | Vault 1 | |

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

## Vault 1

Width: 82 ft.
Length: 17 ft.
Depth: 10.5 ft.
Infiltration On
Infiltration rate: 1.8
Infiltration safety factor: 0.288
Total Volume Infiltrated (ac-ft): 160.926
Total Volume Through Riser (ac-ft): 22.72
Total Volume Through Facility (ac-ft): 183.646
Percent Infiltrated: 87.63
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 9.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.875 in. Elevation:1.9 ft.
Orifice 2 Diameter: 0.75 in. Elevation:5.5 ft.
Element Flows To:
Outlet 1 Outlet 2

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Vault Hydraulic Table

| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.032 | 0.000 | 0.000 | 0.000 |
| 0.1167 | 0.032 | 0.003 | 0.000 | 0.016 |
| 0.2333 | 0.032 | 0.007 | 0.000 | 0.016 |
| 0.3500 | 0.032 | 0.011 | 0.000 | 0.016 |
| 0.4667 | 0.032 | 0.014 | 0.000 | 0.016 |
| 0.5833 | 0.032 | 0.018 | 0.000 | 0.016 |
| 0.7000 | 0.032 | 0.022 | 0.000 | 0.016 |
| 0.8167 | 0.032 | 0.026 | 0.000 | 0.016 |
| 0.9333 | 0.032 | 0.029 | 0.000 | 0.016 |
| 1.0500 | 0.032 | 0.033 | 0.000 | 0.016 |
| 1.1667 | 0.032 | 0.037 | 0.000 | 0.016 |
| 1.2833 | 0.032 | 0.041 | 0.000 | 0.016 |
| 1.4000 | 0.032 | 0.044 | 0.000 | 0.016 |
| 1.5167 | 0.032 | 0.048 | 0.000 | 0.016 |
| 1.6333 | 0.032 | 0.052 | 0.000 | 0.016 |
| 1.7500 | 0.032 | 0.056 | 0.000 | 0.016 |
| 1.8667 | 0.032 | 0.059 | 0.000 | 0.016 |
| 1.9833 | 0.032 | 0.063 | 0.006 | 0.016 |
| 2.1000 | 0.032 | 0.067 | 0.009 | 0.016 |
| 2.2167 | 0.032 | 0.070 | 0.011 | 0.016 |
| 2.3333 | 0.032 | 0.074 | 0.013 | 0.016 |
| 2.4500 | 0.032 | 0.078 | 0.015 | 0.016 |
| 2.5667 | 0.032 | 0.082 | 0.017 | 0.016 |
| 2.6833 | 0.032 | 0.085 | 0.018 | 0.016 |
| 2.8000 | 0.032 | 0.089 | 0.019 | 0.016 |
| 2.9167 | 0.032 | 0.093 | 0.020 | 0.016 |
| 3.0333 | 0.032 | 0.097 | 0.022 | 0.016 |
| 3.1500 | 0.032 | 0.100 | 0.023 | 0.016 |
| 3.2667 | 0.032 | 0.104 | 0.024 | 0.016 |
| 3.3833 | 0.032 | 0.108 | 0.025 | 0.016 |

| | | | | |
|---|---|---|---|---|
| 3.5000 | 0.032 | 0.112 | 0.026 | 0.016 |
| 3.6167 | 0.032 | 0.115 | 0.027 | 0.016 |
| 3.7333 | 0.032 | 0.119 | 0.028 | 0.016 |
| 3.8500 | 0.032 | 0.123 | 0.029 | 0.016 |
| 3.9667 | 0.032 | 0.126 | 0.029 | 0.016 |
| 4.0833 | 0.032 | 0.130 | 0.030 | 0.016 |
| 4.2000 | 0.032 | 0.134 | 0.031 | 0.016 |
| 4.3167 | 0.032 | 0.138 | 0.032 | 0.016 |
| 4.4333 | 0.032 | 0.141 | 0.033 | 0.016 |
| 4.5500 | 0.032 | 0.145 | 0.033 | 0.016 |
| 4.6667 | 0.032 | 0.149 | 0.034 | 0.016 |
| 4.7833 | 0.032 | 0.153 | 0.035 | 0.016 |
| 4.9000 | 0.032 | 0.156 | 0.036 | 0.016 |
| 5.0167 | 0.032 | 0.160 | 0.036 | 0.016 |
| 5.1333 | 0.032 | 0.164 | 0.037 | 0.016 |
| 5.2500 | 0.032 | 0.168 | 0.038 | 0.016 |
| 5.3667 | 0.032 | 0.171 | 0.038 | 0.016 |
| 5.4833 | 0.032 | 0.175 | 0.039 | 0.016 |
| 5.6000 | 0.032 | 0.179 | 0.044 | 0.016 |
| 5.7167 | 0.032 | 0.182 | 0.047 | 0.016 |
| 5.8333 | 0.032 | 0.186 | 0.050 | 0.016 |
| 5.9500 | 0.032 | 0.190 | 0.052 | 0.016 |
| 6.0667 | 0.032 | 0.194 | 0.053 | 0.016 |
| 6.1833 | 0.032 | 0.197 | 0.055 | 0.016 |
| 6.3000 | 0.032 | 0.201 | 0.057 | 0.016 |
| 6.4167 | 0.032 | 0.205 | 0.058 | 0.016 |
| 6.5333 | 0.032 | 0.209 | 0.060 | 0.016 |
| 6.6500 | 0.032 | 0.212 | 0.061 | 0.016 |
| 6.7667 | 0.032 | 0.216 | 0.063 | 0.016 |
| 6.8833 | 0.032 | 0.220 | 0.064 | 0.016 |
| 7.0000 | 0.032 | 0.224 | 0.065 | 0.016 |
| 7.1167 | 0.032 | 0.227 | 0.066 | 0.016 |
| 7.2333 | 0.032 | 0.231 | 0.068 | 0.016 |
| 7.3500 | 0.032 | 0.235 | 0.069 | 0.016 |
| 7.4667 | 0.032 | 0.238 | 0.070 | 0.016 |
| 7.5833 | 0.032 | 0.242 | 0.071 | 0.016 |
| 7.7000 | 0.032 | 0.246 | 0.072 | 0.016 |
| 7.8167 | 0.032 | 0.250 | 0.073 | 0.016 |
| 7.9333 | 0.032 | 0.253 | 0.074 | 0.016 |
| 8.0500 | 0.032 | 0.257 | 0.075 | 0.016 |
| 8.1667 | 0.032 | 0.261 | 0.076 | 0.016 |
| 8.2833 | 0.032 | 0.265 | 0.078 | 0.016 |
| 8.4000 | 0.032 | 0.268 | 0.079 | 0.016 |
| 8.5167 | 0.032 | 0.272 | 0.080 | 0.016 |
| 8.6333 | 0.032 | 0.276 | 0.080 | 0.016 |
| 8.7500 | 0.032 | 0.280 | 0.081 | 0.016 |
| 8.8667 | 0.032 | 0.283 | 0.082 | 0.016 |
| 8.9833 | 0.032 | 0.287 | 0.083 | 0.016 |
| 9.1000 | 0.032 | 0.291 | 0.084 | 0.016 |
| 9.2167 | 0.032 | 0.295 | 0.085 | 0.016 |
| 9.3333 | 0.032 | 0.298 | 0.086 | 0.016 |
| 9.4500 | 0.032 | 0.302 | 0.087 | 0.016 |
| 9.5667 | 0.032 | 0.306 | 0.270 | 0.016 |
| 9.6833 | 0.032 | 0.309 | 0.893 | 0.016 |
| 9.8000 | 0.032 | 0.313 | 1.599 | 0.016 |
| 9.9167 | 0.032 | 0.317 | 2.104 | 0.016 |
| 10.033 | 0.032 | 0.321 | 2.391 | 0.016 |
| 10.150 | 0.032 | 0.324 | 2.631 | 0.016 |

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| | | | | |
|---|---|---|---|---|
| 10.267 | 0.032 | 0.328 | 2.851 | 0.016 |
| 10.383 | 0.032 | 0.332 | 3.054 | 0.016 |
| 10.500 | 0.032 | 0.336 | 3.244 | 0.016 |
| 10.617 | 0.032 | 0.339 | 3.424 | 0.016 |
| 10.733 | 0.000 | 0.000 | 3.594 | 0.000 |

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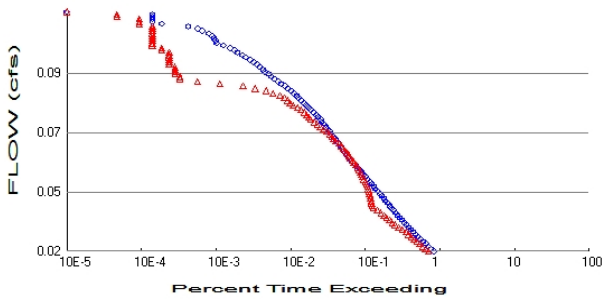
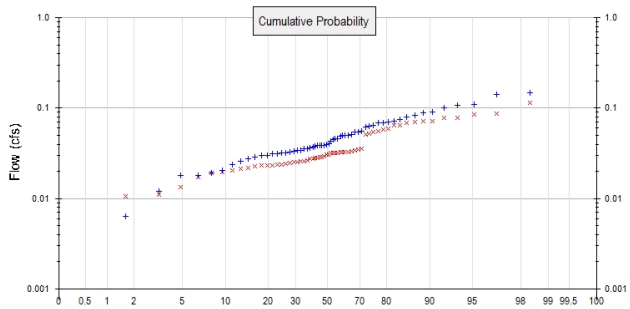
# *Analysis Results*
## *POC 1*




\+ Predeveloped  x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.56
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.79
Total Impervious Area: 0.77

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.045865 |
| 5 year | 0.072033 |
| 10 year | 0.086863 |
| 25 year | 0.102574 |
| 50 year | 0.112296 |
| 100 year | 0.120565 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.032617 |
| 5 year | 0.05162 |
| 10 year | 0.065956 |
| 25 year | 0.085989 |
| 50 year | 0.102278 |
| 100 year | 0.119724 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.045 | 0.024 |
| 1950 | 0.056 | 0.033 |
| 1951 | 0.101 | 0.078 |
| 1952 | 0.032 | 0.017 |
| 1953 | 0.026 | 0.023 |
| 1954 | 0.040 | 0.030 |
| 1955 | 0.063 | 0.035 |
| 1956 | 0.050 | 0.036 |
| 1957 | 0.040 | 0.029 |
| 1958 | 0.046 | 0.032 |

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| | | |
|---|---|---|
| 1959 | 0.039 | 0.025 |
| 1960 | 0.068 | 0.072 |
| 1961 | 0.039 | 0.028 |
| 1962 | 0.024 | 0.014 |
| 1963 | 0.033 | 0.028 |
| 1964 | 0.043 | 0.027 |
| 1965 | 0.031 | 0.031 |
| 1966 | 0.030 | 0.023 |
| 1967 | 0.062 | 0.033 |
| 1968 | 0.039 | 0.024 |
| 1969 | 0.038 | 0.024 |
| 1970 | 0.031 | 0.025 |
| 1971 | 0.034 | 0.032 |
| 1972 | 0.075 | 0.052 |
| 1973 | 0.034 | 0.029 |
| 1974 | 0.037 | 0.028 |
| 1975 | 0.050 | 0.033 |
| 1976 | 0.036 | 0.031 |
| 1977 | 0.004 | 0.019 |
| 1978 | 0.032 | 0.027 |
| 1979 | 0.019 | 0.011 |
| 1980 | 0.071 | 0.056 |
| 1981 | 0.028 | 0.023 |
| 1982 | 0.055 | 0.064 |
| 1983 | 0.049 | 0.032 |
| 1984 | 0.030 | 0.020 |
| 1985 | 0.018 | 0.023 |
| 1986 | 0.079 | 0.055 |
| 1987 | 0.070 | 0.064 |
| 1988 | 0.028 | 0.020 |
| 1989 | 0.018 | 0.021 |
| 1990 | 0.147 | 0.072 |
| 1991 | 0.089 | 0.070 |
| 1992 | 0.034 | 0.026 |
| 1993 | 0.036 | 0.025 |
| 1994 | 0.012 | 0.011 |
| 1995 | 0.051 | 0.034 |
| 1996 | 0.107 | 0.077 |
| 1997 | 0.090 | 0.069 |
| 1998 | 0.020 | 0.026 |
| 1999 | 0.084 | 0.058 |
| 2000 | 0.035 | 0.033 |
| 2001 | 0.006 | 0.010 |
| 2002 | 0.039 | 0.059 |
| 2003 | 0.050 | 0.022 |
| 2004 | 0.064 | 0.085 |
| 2005 | 0.046 | 0.032 |
| 2006 | 0.054 | 0.032 |
| 2007 | 0.109 | 0.086 |
| 2008 | 0.141 | 0.115 |
| 2009 | 0.069 | 0.051 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.1470 | 0.1146 |
| 2 | 0.1408 | 0.0862 |
| 3 | 0.1091 | 0.0846 |

| | | |
|---|---|---|
| 4 | 0.1075 | 0.0780 |
| 5 | 0.1010 | 0.0774 |
| 6 | 0.0898 | 0.0724 |
| 7 | 0.0885 | 0.0721 |
| 8 | 0.0842 | 0.0703 |
| 9 | 0.0795 | 0.0691 |
| 10 | 0.0752 | 0.0643 |
| 11 | 0.0713 | 0.0642 |
| 12 | 0.0703 | 0.0592 |
| 13 | 0.0691 | 0.0581 |
| 14 | 0.0683 | 0.0562 |
| 15 | 0.0642 | 0.0551 |
| 16 | 0.0630 | 0.0519 |
| 17 | 0.0624 | 0.0507 |
| 18 | 0.0562 | 0.0356 |
| 19 | 0.0548 | 0.0346 |
| 20 | 0.0543 | 0.0340 |
| 21 | 0.0510 | 0.0333 |
| 22 | 0.0502 | 0.0329 |
| 23 | 0.0502 | 0.0327 |
| 24 | 0.0496 | 0.0327 |
| 25 | 0.0491 | 0.0324 |
| 26 | 0.0460 | 0.0323 |
| 27 | 0.0456 | 0.0321 |
| 28 | 0.0451 | 0.0317 |
| 29 | 0.0433 | 0.0317 |
| 30 | 0.0405 | 0.0310 |
| 31 | 0.0395 | 0.0309 |
| 32 | 0.0391 | 0.0296 |
| 33 | 0.0389 | 0.0289 |
| 34 | 0.0389 | 0.0289 |
| 35 | 0.0385 | 0.0282 |
| 36 | 0.0381 | 0.0282 |
| 37 | 0.0371 | 0.0277 |
| 38 | 0.0363 | 0.0273 |
| 39 | 0.0356 | 0.0265 |
| 40 | 0.0355 | 0.0257 |
| 41 | 0.0342 | 0.0256 |
| 42 | 0.0341 | 0.0254 |
| 43 | 0.0336 | 0.0251 |
| 44 | 0.0329 | 0.0247 |
| 45 | 0.0319 | 0.0243 |
| 46 | 0.0318 | 0.0239 |
| 47 | 0.0314 | 0.0238 |
| 48 | 0.0310 | 0.0231 |
| 49 | 0.0303 | 0.0231 |
| 50 | 0.0298 | 0.0231 |
| 51 | 0.0285 | 0.0229 |
| 52 | 0.0277 | 0.0218 |
| 53 | 0.0257 | 0.0212 |
| 54 | 0.0240 | 0.0204 |
| 55 | 0.0203 | 0.0197 |
| 56 | 0.0193 | 0.0193 |
| 57 | 0.0181 | 0.0171 |
| 58 | 0.0180 | 0.0135 |
| 59 | 0.0120 | 0.0111 |
| 60 | 0.0064 | 0.0105 |
| 61 | 0.0043 | 0.0099 |

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## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0229 | 17554 | 15038 | 85 | Pass |
| 0.0238 | 16168 | 13593 | 84 | Pass |
| 0.0247 | 14974 | 12380 | 82 | Pass |
| 0.0256 | 13849 | 11345 | 81 | Pass |
| 0.0265 | 12814 | 10470 | 81 | Pass |
| 0.0274 | 11813 | 9601 | 81 | Pass |
| 0.0283 | 10902 | 8819 | 80 | Pass |
| 0.0293 | 10119 | 8130 | 80 | Pass |
| 0.0302 | 9383 | 7473 | 79 | Pass |
| 0.0311 | 8733 | 6669 | 76 | Pass |
| 0.0320 | 8149 | 5957 | 73 | Pass |
| 0.0329 | 7593 | 5358 | 70 | Pass |
| 0.0338 | 7060 | 4898 | 69 | Pass |
| 0.0347 | 6590 | 4513 | 68 | Pass |
| 0.0356 | 6149 | 4122 | 67 | Pass |
| 0.0365 | 5777 | 3799 | 65 | Pass |
| 0.0374 | 5431 | 3484 | 64 | Pass |
| 0.0383 | 5101 | 3097 | 60 | Pass |
| 0.0392 | 4808 | 2727 | 56 | Pass |
| 0.0401 | 4524 | 2637 | 58 | Pass |
| 0.0410 | 4254 | 2592 | 60 | Pass |
| 0.0419 | 4017 | 2558 | 63 | Pass |
| 0.0428 | 3782 | 2522 | 66 | Pass |
| 0.0437 | 3546 | 2479 | 69 | Pass |
| 0.0446 | 3339 | 2438 | 73 | Pass |
| 0.0455 | 3138 | 2396 | 76 | Pass |
| 0.0464 | 2950 | 2338 | 79 | Pass |
| 0.0473 | 2785 | 2280 | 81 | Pass |
| 0.0482 | 2599 | 2212 | 85 | Pass |
| 0.0491 | 2449 | 2133 | 87 | Pass |
| 0.0500 | 2304 | 2053 | 89 | Pass |
| 0.0509 | 2160 | 1967 | 91 | Pass |
| 0.0518 | 2026 | 1899 | 93 | Pass |
| 0.0527 | 1898 | 1839 | 96 | Pass |
| 0.0536 | 1790 | 1768 | 98 | Pass |
| 0.0545 | 1688 | 1682 | 99 | Pass |
| 0.0554 | 1586 | 1598 | 100 | Pass |
| 0.0563 | 1483 | 1498 | 101 | Pass |
| 0.0572 | 1379 | 1438 | 104 | Pass |
| 0.0581 | 1292 | 1354 | 104 | Pass |
| 0.0590 | 1220 | 1285 | 105 | Pass |
| 0.0599 | 1154 | 1219 | 105 | Pass |
| 0.0608 | 1098 | 1153 | 105 | Pass |
| 0.0617 | 1048 | 1075 | 102 | Pass |
| 0.0626 | 997 | 1007 | 101 | Pass |
| 0.0636 | 930 | 943 | 101 | Pass |
| 0.0645 | 883 | 856 | 96 | Pass |
| 0.0654 | 837 | 798 | 95 | Pass |
| 0.0663 | 788 | 761 | 96 | Pass |
| 0.0672 | 743 | 707 | 95 | Pass |
| 0.0681 | 713 | 643 | 90 | Pass |
| 0.0690 | 668 | 584 | 87 | Pass |
| 0.0699 | 630 | 529 | 83 | Pass |

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| | | | | |
|---|---|---|---|---|
| 0.0708 | 595 | 482 | 81 | Pass |
| 0.0717 | 565 | 441 | 78 | Pass |
| 0.0726 | 539 | 393 | 72 | Pass |
| 0.0735 | 496 | 372 | 75 | Pass |
| 0.0744 | 473 | 348 | 73 | Pass |
| 0.0753 | 434 | 323 | 74 | Pass |
| 0.0762 | 399 | 293 | 73 | Pass |
| 0.0771 | 366 | 262 | 71 | Pass |
| 0.0780 | 348 | 230 | 66 | Pass |
| 0.0789 | 323 | 208 | 64 | Pass |
| 0.0798 | 296 | 194 | 65 | Pass |
| 0.0807 | 272 | 176 | 64 | Pass |
| 0.0816 | 256 | 154 | 60 | Pass |
| 0.0825 | 235 | 123 | 52 | Pass |
| 0.0834 | 217 | 100 | 46 | Pass |
| 0.0843 | 195 | 72 | 36 | Pass |
| 0.0852 | 180 | 49 | 27 | Pass |
| 0.0861 | 158 | 24 | 15 | Pass |
| 0.0870 | 145 | 12 | 8 | Pass |
| 0.0879 | 129 | 7 | 5 | Pass |
| 0.0888 | 119 | 7 | 5 | Pass |
| 0.0897 | 109 | 6 | 5 | Pass |
| 0.0906 | 97 | 6 | 6 | Pass |
| 0.0915 | 91 | 6 | 6 | Pass |
| 0.0924 | 82 | 6 | 7 | Pass |
| 0.0933 | 76 | 5 | 6 | Pass |
| 0.0942 | 68 | 5 | 7 | Pass |
| 0.0951 | 61 | 5 | 8 | Pass |
| 0.0960 | 54 | 5 | 9 | Pass |
| 0.0970 | 48 | 5 | 10 | Pass |
| 0.0979 | 41 | 5 | 12 | Pass |
| 0.0988 | 38 | 4 | 10 | Pass |
| 0.0997 | 33 | 4 | 12 | Pass |
| 0.1006 | 27 | 3 | 11 | Pass |
| 0.1015 | 22 | 3 | 13 | Pass |
| 0.1024 | 21 | 3 | 14 | Pass |
| 0.1033 | 20 | 3 | 15 | Pass |
| 0.1042 | 19 | 3 | 15 | Pass |
| 0.1051 | 17 | 3 | 17 | Pass |
| 0.1060 | 14 | 3 | 21 | Pass |
| 0.1069 | 12 | 3 | 25 | Pass |
| 0.1078 | 9 | 3 | 33 | Pass |
| 0.1087 | 4 | 2 | 50 | Pass |
| 0.1096 | 3 | 2 | 66 | Pass |
| 0.1105 | 3 | 2 | 66 | Pass |
| 0.1114 | 3 | 1 | 33 | Pass |
| 0.1123 | 3 | 1 | 33 | Pass |

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## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.0636 acre-feet |
| On-line facility target flow: | 0.0336 cfs. |
| Adjusted for 15 min: | 0.0336 cfs. |
| Off-line facility target flow: | 0.0209 cfs. |
| Adjusted for 15 min: | 0.0209 cfs. |

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# LID Report

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Vault 1 POC | ☐ | 167.14 | | | ☐ | 87.62 | | | |
| Total Volume Infiltrated | | 167.14 | 0.00 | 0.00 | | 87.62 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Passed |
| | | | | | | | | | |

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# *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.

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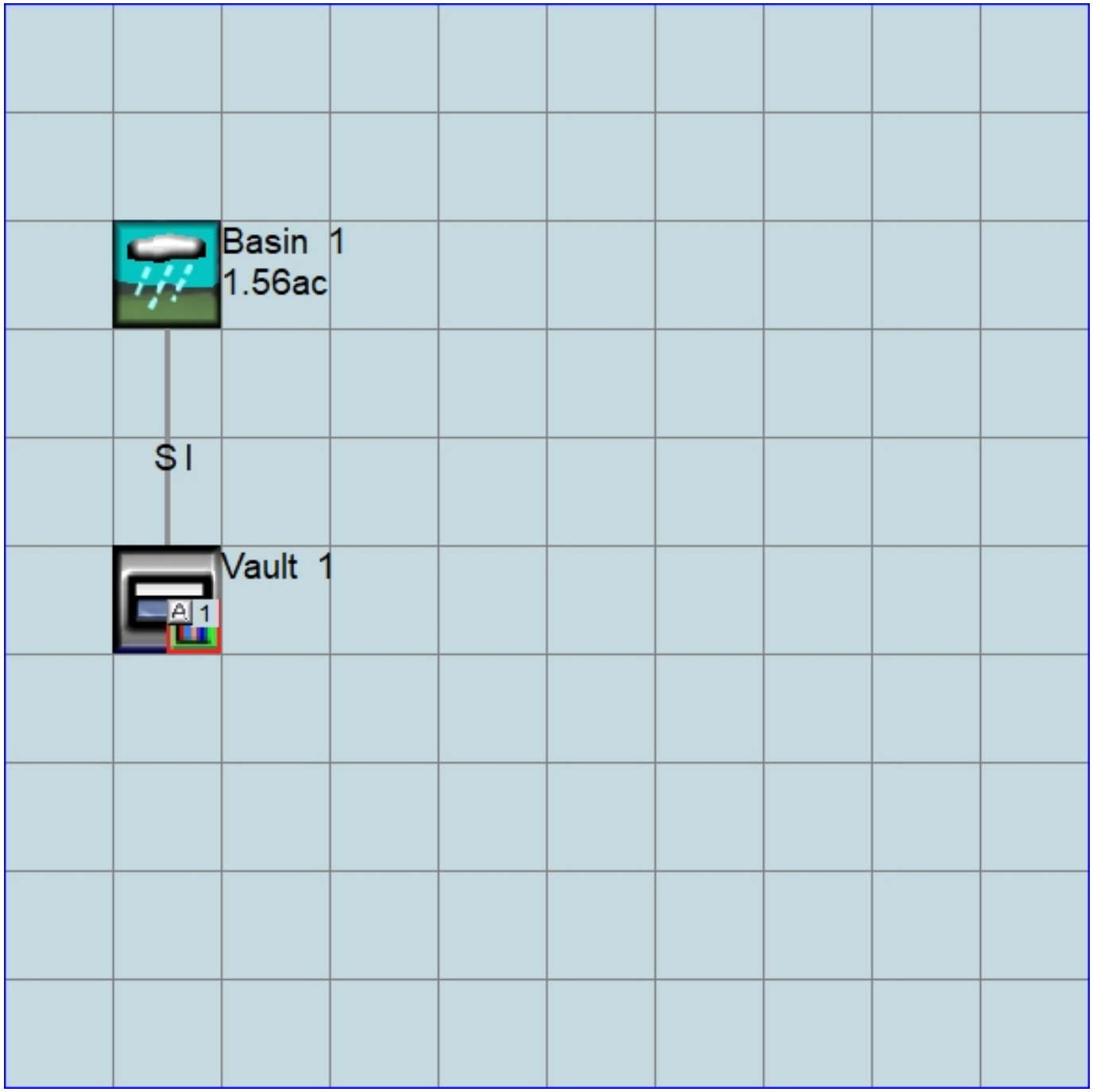
# *Appendix*

## *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   Public Infiltration Vault.wdm
MESSU      25   PrePublic Infiltration Vault.MES
           27   PrePublic Infiltration Vault.L61
           28   PrePublic Infiltration Vault.L62
           30   POCPublic Infiltration Vault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      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           ***
   10     C, Forest, Flat         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 ***
   10         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  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

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```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10            0.2       0.5      0.35         6       0.5       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
   10              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
```

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```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                        1.56     COPY   501     12
PERLND  10                        1.56     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
```

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```
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
```

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## *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   Public Infiltration Vault.wdm
MESSU      25   MitPublic Infiltration Vault.MES
           27   MitPublic Infiltration Vault.L61
           28   MitPublic Infiltration Vault.L62
           30   POCPublic Infiltration Vault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -   #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  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           ***
   16     C, Lawn, Flat           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 ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

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```
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         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 ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16             0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -   # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16            0.1      0.25      0.25         6       0.5      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
   16             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           ***
    1      ROADS/FLAT             1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    8         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     ***
    1         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

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

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```
    1            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                        0.79     RCHRES   1      2
PERLND  16                        0.79     RCHRES   1      3
IMPLND   1                        0.53     RCHRES   1      5
IMPLND   8                        0.24     RCHRES   1      5

******Routing******
PERLND  16                        0.79     COPY     1     12
IMPLND   1                        0.53     COPY     1     15
IMPLND   8                        0.24     COPY     1     15
PERLND  16                        0.79     COPY     1     13
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     Vault  1                2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

  HYDR-PARM1
```

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```
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.032002  0.000000  0.000000  0.000000
  0.116667  0.032002  0.003734  0.000000  0.016728
  0.233333  0.032002  0.007467  0.000000  0.016728
  0.350000  0.032002  0.011201  0.000000  0.016728
  0.466667  0.032002  0.014934  0.000000  0.016728
  0.583333  0.032002  0.018668  0.000000  0.016728
  0.700000  0.032002  0.022401  0.000000  0.016728
  0.816667  0.032002  0.026135  0.000000  0.016728
  0.933333  0.032002  0.029868  0.000000  0.016728
  1.050000  0.032002  0.033602  0.000000  0.016728
  1.166667  0.032002  0.037335  0.000000  0.016728
  1.283333  0.032002  0.041069  0.000000  0.016728
  1.400000  0.032002  0.044803  0.000000  0.016728
  1.516667  0.032002  0.048536  0.000000  0.016728
  1.633333  0.032002  0.052270  0.000000  0.016728
  1.750000  0.032002  0.056003  0.000000  0.016728
  1.866667  0.032002  0.059737  0.000000  0.016728
  1.983333  0.032002  0.063470  0.005998  0.016728
  2.100000  0.032002  0.067204  0.009292  0.016728
  2.216667  0.032002  0.070937  0.011692  0.016728
  2.333333  0.032002  0.074671  0.013677  0.016728
  2.450000  0.032002  0.078404  0.015408  0.016728
  2.566667  0.032002  0.082138  0.016964  0.016728
  2.683333  0.032002  0.085872  0.018389  0.016728
  2.800000  0.032002  0.089605  0.019710  0.016728
  2.916667  0.032002  0.093339  0.020949  0.016728
  3.033333  0.032002  0.097072  0.022118  0.016728
  3.150000  0.032002  0.100806  0.023229  0.016728
  3.266667  0.032002  0.104539  0.024289  0.016728
  3.383333  0.032002  0.108273  0.025304  0.016728
  3.500000  0.032002  0.112006  0.026281  0.016728
  3.616667  0.032002  0.115740  0.027222  0.016728
  3.733333  0.032002  0.119474  0.028132  0.016728
  3.850000  0.032002  0.123207  0.029013  0.016728
  3.966667  0.032002  0.126941  0.029868  0.016728
  4.083333  0.032002  0.130674  0.030700  0.016728
  4.200000  0.032002  0.134408  0.031509  0.016728
  4.316667  0.032002  0.138141  0.032299  0.016728
  4.433333  0.032002  0.141875  0.033069  0.016728
  4.550000  0.032002  0.145608  0.033822  0.016728
  4.666667  0.032002  0.149342  0.034558  0.016728
  4.783333  0.032002  0.153075  0.035279  0.016728
```

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```
  4.900000  0.032002  0.156809  0.035986  0.016728
  5.016667  0.032002  0.160543  0.036679  0.016728
  5.133333  0.032002  0.164276  0.037359  0.016728
  5.250000  0.032002  0.168010  0.038027  0.016728
  5.366667  0.032002  0.171743  0.038684  0.016728
  5.483333  0.032002  0.175477  0.039330  0.016728
  5.600000  0.032002  0.179210  0.044792  0.016728
  5.716667  0.032002  0.182944  0.047695  0.016728
  5.833333  0.032002  0.186677  0.050018  0.016728
  5.950000  0.032002  0.190411  0.052052  0.016728
  6.066667  0.032002  0.194144  0.053901  0.016728
  6.183333  0.032002  0.197878  0.055618  0.016728
  6.300000  0.032002  0.201612  0.057234  0.016728
  6.416667  0.032002  0.205345  0.058770  0.016728
  6.533333  0.032002  0.209079  0.060239  0.016728
  6.650000  0.032002  0.212812  0.061651  0.016728
  6.766667  0.032002  0.216546  0.063014  0.016728
  6.883333  0.032002  0.220279  0.064334  0.016728
  7.000000  0.032002  0.224013  0.065615  0.016728
  7.116667  0.032002  0.227746  0.066862  0.016728
  7.233333  0.032002  0.231480  0.068078  0.016728
  7.350000  0.032002  0.235213  0.069265  0.016728
  7.466667  0.032002  0.238947  0.070426  0.016728
  7.583333  0.032002  0.242681  0.071563  0.016728
  7.700000  0.032002  0.246414  0.072678  0.016728
  7.816667  0.032002  0.250148  0.073771  0.016728
  7.933333  0.032002  0.253881  0.074845  0.016728
  8.050000  0.032002  0.257615  0.075900  0.016728
  8.166667  0.032002  0.261348  0.076937  0.016728
  8.283333  0.032002  0.265082  0.077959  0.016728
  8.400000  0.032002  0.268815  0.078965  0.016728
  8.516667  0.032002  0.272549  0.079956  0.016728
  8.633333  0.032002  0.276283  0.080933  0.016728
  8.750000  0.032002  0.280016  0.081896  0.016728
  8.866667  0.032002  0.283750  0.082847  0.016728
  8.983333  0.032002  0.287483  0.083785  0.016728
  9.100000  0.032002  0.291217  0.084712  0.016728
  9.216667  0.032002  0.294950  0.085627  0.016728
  9.333333  0.032002  0.298684  0.086532  0.016728
  9.450000  0.032002  0.302417  0.087426  0.016728
  9.566667  0.032002  0.306151  0.270544  0.016728
  9.683333  0.032002  0.309884  0.893885  0.016728
  9.800000  0.032002  0.313618  1.599722  0.016728
  9.916667  0.032002  0.317352  2.103990  0.016728
  10.03333  0.032002  0.321085  2.391918  0.016728
  10.15000  0.032002  0.324819  2.631905  0.016728
  10.26667  0.032002  0.328552  2.851224  0.016728
  10.38333  0.032002  0.332286  3.054452  0.016728
  10.50000  0.032002  0.336019  3.244691  0.016728
  10.61667  0.032002  0.339753  3.424160  0.016728
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1003 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
```

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```
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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## *Mitigated HSPF Message File*

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## 70th Street Public Detention Pond WWHM Report Summary

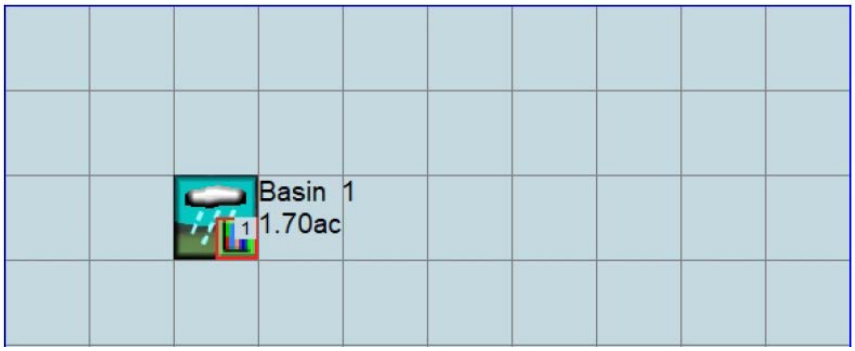
The WWHM Report for the Private Partial Infiltration Vault is included in the following pages. It is shown that the detention pond meets the on-site flow control requirement by not exceeding the predeveloped condition flow durations from 50% of the 2-year to the full 50-year peak storm event.

Two conditions for the Public Detention Pond along NE 70th Street have been evaluated using WWHM. First, the pond has been sized to receive flows from the slopes along the road in the developed condition. In addition, the pond has been sized to receive flows from future extension of the roadway. This includes additional impervious area from increased roadway width and does not include the slopes from the north berm which would be removed to allow for future development. The more conservative pond size from each of these conditions was used for this project. Refer to the 70th Street Public Detention Pond exhibits in Section 4 of this report which show the drainage basins for each modeled condition.

Pond Input including Future ROW:

*Appendix*

*Predeveloped Schematic*

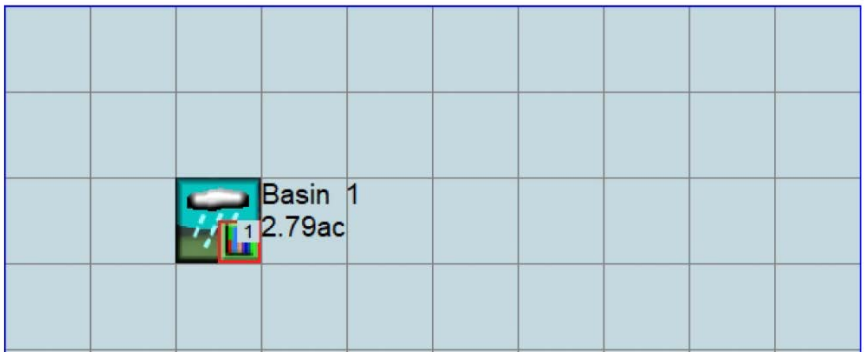



*Mitigated Schematic*

Pond Input Including Slopes from Berm (Proposed Condition):

*Appendix*

*Predeveloped Schematic*




*Mitigated Schematic*

Inputs and analysis of the Detention Pond included in Section 4.3 of this report have been drawn from the WWHM report on the following pages. Screenshots of the basin schematic is shown below and matches the areas shown in the tables and exhibits in Section 4.

# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE 70TH STREET DETENTION POND. CALCULATIONS SHOW THAT FLOW CONTROL STANDARD IS MET FOR THE AREA TRIBUTARY TO THE DETENTION POND ALONG NE 70TH STREET. THIS MODEL IS RUN USING AREAS BASED ON FUTURE BUILD-OUT CONDITIONS WITH FULL RIGHT-OF-WAY AND WITHOUT THE BERM NORTH OF THE SITE.

# General Model Information

| | |
|---|---|
| Project Name: | 18122 NE 70th St Pond |
| Site Name: | Woodside |
| Site Address: | |
| City: | Redmond |
| Report Date: | 11/26/2019 |
| 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 |

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# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Forest, Mod | 1.7 |
| Pervious Total | 1.7 |
| Impervious Land Use | Acres |
| Impervious Total | 0 |
| Basin Total | 1.7 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Flat | 0.64 |
| Pervious Total | 0.64 |
| Impervious Land Use | Acres |
| ROADS FLAT | 1.06 |
| Impervious Total | 1.06 |
| Basin Total | 1.7 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| Trapezoidal Pond 1 | Trapezoidal Pond 1 | |

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

## Trapezoidal Pond 1

| | |
|---|---|
| Bottom Length: | 207.00 ft. |
| Bottom Width: | 5.00 ft. |
| Depth: | 6 ft. |
| Volume at riser head: | 0.5183 acre-ft. |
| Side slope 1: | 3 To 1 |
| Side slope 2: | 3 To 1 |
| Side slope 3: | 3 To 1 |
| Side slope 4: | 3 To 1 |
| Discharge Structure | |
| Riser Height: | 5 ft. |
| Riser Diameter: | 12 in. |
| Orifice 1 Diameter: | 0.688 in. Elevation:0 ft. |
| Orifice 2 Diameter: | 1.063 in. Elevation:3.6 ft. |
| Orifice 3 Diameter: | 1.313 in. Elevation:4.2 ft. |
| Element Flows To: | |
| Outlet 1 | Outlet 2 |

Hydraulic Table

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| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.023 | 0.000 | 0.000 | 0.000 |
| 0.0667 | 0.025 | 0.001 | 0.003 | 0.000 |
| 0.1333 | 0.027 | 0.003 | 0.004 | 0.000 |
| 0.2000 | 0.029 | 0.005 | 0.005 | 0.000 |
| 0.2667 | 0.031 | 0.007 | 0.006 | 0.000 |
| 0.3333 | 0.033 | 0.009 | 0.007 | 0.000 |
| 0.4000 | 0.035 | 0.011 | 0.008 | 0.000 |
| 0.4667 | 0.037 | 0.014 | 0.008 | 0.000 |
| 0.5333 | 0.039 | 0.016 | 0.009 | 0.000 |
| 0.6000 | 0.041 | 0.019 | 0.009 | 0.000 |
| 0.6667 | 0.043 | 0.022 | 0.010 | 0.000 |
| 0.7333 | 0.045 | 0.025 | 0.011 | 0.000 |
| 0.8000 | 0.047 | 0.028 | 0.011 | 0.000 |
| 0.8667 | 0.049 | 0.031 | 0.012 | 0.000 |
| 0.9333 | 0.051 | 0.035 | 0.012 | 0.000 |
| 1.0000 | 0.053 | 0.038 | 0.012 | 0.000 |
| 1.0667 | 0.055 | 0.042 | 0.013 | 0.000 |
| 1.1333 | 0.057 | 0.046 | 0.013 | 0.000 |
| 1.2000 | 0.060 | 0.050 | 0.014 | 0.000 |
| 1.2667 | 0.062 | 0.054 | 0.014 | 0.000 |
| 1.3333 | 0.064 | 0.058 | 0.014 | 0.000 |
| 1.4000 | 0.066 | 0.062 | 0.015 | 0.000 |
| 1.4667 | 0.068 | 0.067 | 0.015 | 0.000 |
| 1.5333 | 0.070 | 0.071 | 0.015 | 0.000 |
| 1.6000 | 0.072 | 0.076 | 0.016 | 0.000 |
| 1.6667 | 0.074 | 0.081 | 0.016 | 0.000 |
| 1.7333 | 0.076 | 0.086 | 0.016 | 0.000 |
| 1.8000 | 0.079 | 0.091 | 0.017 | 0.000 |
| 1.8667 | 0.081 | 0.097 | 0.017 | 0.000 |
| 1.9333 | 0.083 | 0.102 | 0.017 | 0.000 |
| 2.0000 | 0.085 | 0.108 | 0.018 | 0.000 |
| 2.0667 | 0.087 | 0.113 | 0.018 | 0.000 |
| 2.1333 | 0.089 | 0.119 | 0.018 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 2.2000 | 0.092 | 0.125 | 0.019 | 0.000 |
| 2.2667 | 0.094 | 0.132 | 0.019 | 0.000 |
| 2.3333 | 0.096 | 0.138 | 0.019 | 0.000 |
| 2.4000 | 0.098 | 0.144 | 0.019 | 0.000 |
| 2.4667 | 0.100 | 0.151 | 0.020 | 0.000 |
| 2.5333 | 0.103 | 0.158 | 0.020 | 0.000 |
| 2.6000 | 0.105 | 0.165 | 0.020 | 0.000 |
| 2.6667 | 0.107 | 0.172 | 0.021 | 0.000 |
| 2.7333 | 0.109 | 0.179 | 0.021 | 0.000 |
| 2.8000 | 0.112 | 0.187 | 0.021 | 0.000 |
| 2.8667 | 0.114 | 0.194 | 0.021 | 0.000 |
| 2.9333 | 0.116 | 0.202 | 0.022 | 0.000 |
| 3.0000 | 0.118 | 0.210 | 0.022 | 0.000 |
| 3.0667 | 0.121 | 0.218 | 0.022 | 0.000 |
| 3.1333 | 0.123 | 0.226 | 0.022 | 0.000 |
| 3.2000 | 0.125 | 0.234 | 0.023 | 0.000 |
| 3.2667 | 0.128 | 0.243 | 0.023 | 0.000 |
| 3.3333 | 0.130 | 0.251 | 0.023 | 0.000 |
| 3.4000 | 0.132 | 0.260 | 0.023 | 0.000 |
| 3.4667 | 0.134 | 0.269 | 0.023 | 0.000 |
| 3.5333 | 0.137 | 0.278 | 0.024 | 0.000 |
| 3.6000 | 0.139 | 0.287 | 0.024 | 0.000 |
| 3.6667 | 0.141 | 0.297 | 0.032 | 0.000 |
| 3.7333 | 0.144 | 0.306 | 0.036 | 0.000 |
| 3.8000 | 0.146 | 0.316 | 0.038 | 0.000 |
| 3.8667 | 0.149 | 0.326 | 0.041 | 0.000 |
| 3.9333 | 0.151 | 0.336 | 0.043 | 0.000 |
| 4.0000 | 0.153 | 0.346 | 0.045 | 0.000 |
| 4.0667 | 0.156 | 0.356 | 0.046 | 0.000 |
| 4.1333 | 0.158 | 0.367 | 0.048 | 0.000 |
| 4.2000 | 0.161 | 0.377 | 0.050 | 0.000 |
| 4.2667 | 0.163 | 0.388 | 0.063 | 0.000 |
| 4.3333 | 0.165 | 0.399 | 0.070 | 0.000 |
| 4.4000 | 0.168 | 0.410 | 0.075 | 0.000 |
| 4.4667 | 0.170 | 0.422 | 0.079 | 0.000 |
| 4.5333 | 0.173 | 0.433 | 0.084 | 0.000 |
| 4.6000 | 0.175 | 0.445 | 0.087 | 0.000 |
| 4.6667 | 0.178 | 0.456 | 0.091 | 0.000 |
| 4.7333 | 0.180 | 0.468 | 0.094 | 0.000 |
| 4.8000 | 0.183 | 0.480 | 0.098 | 0.000 |
| 4.8667 | 0.185 | 0.493 | 0.101 | 0.000 |
| 4.9333 | 0.187 | 0.505 | 0.104 | 0.000 |
| 5.0000 | 0.190 | 0.518 | 0.106 | 0.000 |
| 5.0667 | 0.192 | 0.531 | 0.291 | 0.000 |
| 5.1333 | 0.195 | 0.544 | 0.621 | 0.000 |
| 5.2000 | 0.198 | 0.557 | 1.022 | 0.000 |
| 5.2667 | 0.200 | 0.570 | 1.435 | 0.000 |
| 5.3333 | 0.203 | 0.583 | 1.803 | 0.000 |
| 5.4000 | 0.205 | 0.597 | 2.082 | 0.000 |
| 5.4667 | 0.208 | 0.611 | 2.262 | 0.000 |
| 5.5333 | 0.210 | 0.625 | 2.427 | 0.000 |
| 5.6000 | 0.213 | 0.639 | 2.568 | 0.000 |
| 5.6667 | 0.215 | 0.653 | 2.703 | 0.000 |
| 5.7333 | 0.218 | 0.668 | 2.830 | 0.000 |
| 5.8000 | 0.220 | 0.682 | 2.952 | 0.000 |
| 5.8667 | 0.223 | 0.697 | 3.069 | 0.000 |
| 5.9333 | 0.226 | 0.712 | 3.182 | 0.000 |
| 6.0000 | 0.228 | 0.727 | 3.291 | 0.000 |

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| | | | | |
|---|---|---|---|---|
| 6.0667 | 0.231 | 0.743 | 3.396 | 0.000 |

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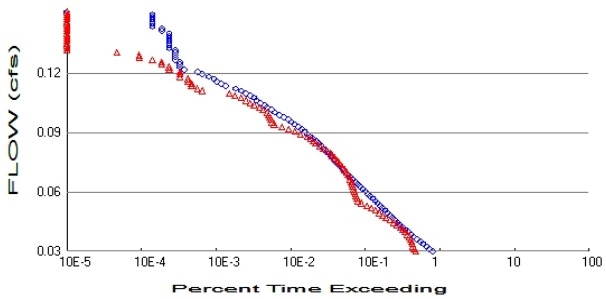
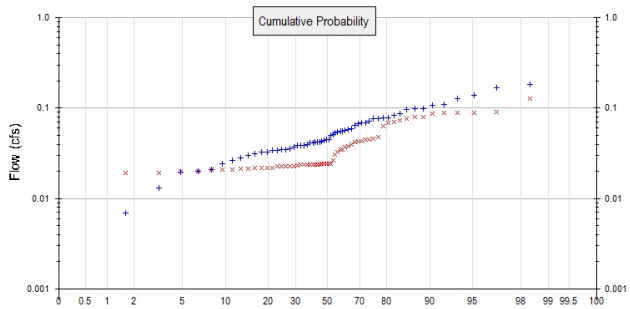
# *Analysis Results*
## *POC 1*




+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.7
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.64
Total Impervious Area: 1.06

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.050618 |
| 5 year | 0.082942 |
| 10 year | 0.103725 |
| 25 year | 0.128449 |
| 50 year | 0.145573 |
| 100 year | 0.161569 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.031869 |
| 5 year | 0.051557 |
| 10 year | 0.068427 |
| 25 year | 0.094864 |
| 50 year | 0.118793 |
| 100 year | 0.14682 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.058 | 0.022 |
| 1950 | 0.069 | 0.033 |
| 1951 | 0.111 | 0.089 |
| 1952 | 0.035 | 0.020 |
| 1953 | 0.028 | 0.024 |
| 1954 | 0.043 | 0.023 |
| 1955 | 0.069 | 0.023 |
| 1956 | 0.055 | 0.046 |
| 1957 | 0.045 | 0.024 |
| 1958 | 0.050 | 0.024 |

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| | | |
|---|---|---|
| 1959 | 0.043 | 0.022 |
| 1960 | 0.076 | 0.076 |
| 1961 | 0.042 | 0.038 |
| 1962 | 0.026 | 0.020 |
| 1963 | 0.036 | 0.024 |
| 1964 | 0.051 | 0.026 |
| 1965 | 0.034 | 0.045 |
| 1966 | 0.032 | 0.023 |
| 1967 | 0.078 | 0.024 |
| 1968 | 0.044 | 0.023 |
| 1969 | 0.043 | 0.023 |
| 1970 | 0.034 | 0.024 |
| 1971 | 0.039 | 0.024 |
| 1972 | 0.084 | 0.074 |
| 1973 | 0.037 | 0.043 |
| 1974 | 0.041 | 0.024 |
| 1975 | 0.057 | 0.023 |
| 1976 | 0.041 | 0.024 |
| 1977 | 0.006 | 0.021 |
| 1978 | 0.035 | 0.035 |
| 1979 | 0.021 | 0.019 |
| 1980 | 0.099 | 0.080 |
| 1981 | 0.031 | 0.024 |
| 1982 | 0.064 | 0.048 |
| 1983 | 0.055 | 0.024 |
| 1984 | 0.033 | 0.021 |
| 1985 | 0.020 | 0.022 |
| 1986 | 0.087 | 0.039 |
| 1987 | 0.077 | 0.063 |
| 1988 | 0.030 | 0.022 |
| 1989 | 0.020 | 0.021 |
| 1990 | 0.183 | 0.080 |
| 1991 | 0.097 | 0.070 |
| 1992 | 0.040 | 0.035 |
| 1993 | 0.039 | 0.021 |
| 1994 | 0.013 | 0.019 |
| 1995 | 0.056 | 0.037 |
| 1996 | 0.128 | 0.090 |
| 1997 | 0.099 | 0.089 |
| 1998 | 0.024 | 0.021 |
| 1999 | 0.109 | 0.068 |
| 2000 | 0.039 | 0.031 |
| 2001 | 0.007 | 0.019 |
| 2002 | 0.045 | 0.044 |
| 2003 | 0.067 | 0.023 |
| 2004 | 0.071 | 0.087 |
| 2005 | 0.053 | 0.024 |
| 2006 | 0.060 | 0.045 |
| 2007 | 0.139 | 0.127 |
| 2008 | 0.169 | 0.089 |
| 2009 | 0.079 | 0.042 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.1833 | 0.1267 |
| 2 | 0.1689 | 0.0899 |
| 3 | 0.1385 | 0.0890 |

| | | |
|---|---|---|
| 4 | 0.1284 | 0.0890 |
| 5 | 0.1106 | 0.0888 |
| 6 | 0.1086 | 0.0867 |
| 7 | 0.0991 | 0.0799 |
| 8 | 0.0988 | 0.0796 |
| 9 | 0.0972 | 0.0764 |
| 10 | 0.0867 | 0.0737 |
| 11 | 0.0840 | 0.0698 |
| 12 | 0.0787 | 0.0684 |
| 13 | 0.0777 | 0.0628 |
| 14 | 0.0766 | 0.0477 |
| 15 | 0.0763 | 0.0463 |
| 16 | 0.0714 | 0.0454 |
| 17 | 0.0692 | 0.0448 |
| 18 | 0.0688 | 0.0436 |
| 19 | 0.0668 | 0.0432 |
| 20 | 0.0641 | 0.0418 |
| 21 | 0.0596 | 0.0393 |
| 22 | 0.0583 | 0.0377 |
| 23 | 0.0574 | 0.0368 |
| 24 | 0.0555 | 0.0347 |
| 25 | 0.0554 | 0.0345 |
| 26 | 0.0548 | 0.0326 |
| 27 | 0.0530 | 0.0308 |
| 28 | 0.0509 | 0.0265 |
| 29 | 0.0497 | 0.0243 |
| 30 | 0.0447 | 0.0243 |
| 31 | 0.0447 | 0.0242 |
| 32 | 0.0438 | 0.0241 |
| 33 | 0.0431 | 0.0241 |
| 34 | 0.0426 | 0.0239 |
| 35 | 0.0426 | 0.0238 |
| 36 | 0.0420 | 0.0236 |
| 37 | 0.0412 | 0.0236 |
| 38 | 0.0410 | 0.0236 |
| 39 | 0.0397 | 0.0235 |
| 40 | 0.0387 | 0.0235 |
| 41 | 0.0386 | 0.0235 |
| 42 | 0.0386 | 0.0232 |
| 43 | 0.0372 | 0.0229 |
| 44 | 0.0358 | 0.0228 |
| 45 | 0.0347 | 0.0228 |
| 46 | 0.0347 | 0.0227 |
| 47 | 0.0342 | 0.0227 |
| 48 | 0.0338 | 0.0218 |
| 49 | 0.0330 | 0.0217 |
| 50 | 0.0325 | 0.0216 |
| 51 | 0.0310 | 0.0216 |
| 52 | 0.0302 | 0.0213 |
| 53 | 0.0280 | 0.0212 |
| 54 | 0.0261 | 0.0210 |
| 55 | 0.0242 | 0.0208 |
| 56 | 0.0210 | 0.0208 |
| 57 | 0.0200 | 0.0202 |
| 58 | 0.0196 | 0.0199 |
| 59 | 0.0130 | 0.0192 |
| 60 | 0.0069 | 0.0190 |
| 61 | 0.0060 | 0.0187 |

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## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0253 | 17088 | 10063 | 58 | Pass |
| 0.0265 | 15488 | 9696 | 62 | Pass |
| 0.0277 | 14074 | 9390 | 66 | Pass |
| 0.0290 | 12797 | 9122 | 71 | Pass |
| 0.0302 | 11569 | 8878 | 76 | Pass |
| 0.0314 | 10515 | 8624 | 82 | Pass |
| 0.0326 | 9565 | 8331 | 87 | Pass |
| 0.0338 | 8750 | 7790 | 89 | Pass |
| 0.0350 | 8036 | 7289 | 90 | Pass |
| 0.0362 | 7347 | 6823 | 92 | Pass |
| 0.0375 | 6733 | 6286 | 93 | Pass |
| 0.0387 | 6190 | 5745 | 92 | Pass |
| 0.0399 | 5730 | 5129 | 89 | Pass |
| 0.0411 | 5309 | 4571 | 86 | Pass |
| 0.0423 | 4924 | 4030 | 81 | Pass |
| 0.0435 | 4569 | 3636 | 79 | Pass |
| 0.0447 | 4235 | 3272 | 77 | Pass |
| 0.0460 | 3951 | 2924 | 74 | Pass |
| 0.0472 | 3643 | 2579 | 70 | Pass |
| 0.0484 | 3390 | 2239 | 66 | Pass |
| 0.0496 | 3133 | 1879 | 59 | Pass |
| 0.0508 | 2915 | 1696 | 58 | Pass |
| 0.0520 | 2706 | 1646 | 60 | Pass |
| 0.0532 | 2490 | 1610 | 64 | Pass |
| 0.0545 | 2314 | 1570 | 67 | Pass |
| 0.0557 | 2136 | 1526 | 71 | Pass |
| 0.0569 | 1972 | 1481 | 75 | Pass |
| 0.0581 | 1824 | 1440 | 78 | Pass |
| 0.0593 | 1702 | 1406 | 82 | Pass |
| 0.0605 | 1577 | 1376 | 87 | Pass |
| 0.0618 | 1442 | 1344 | 93 | Pass |
| 0.0630 | 1325 | 1312 | 99 | Pass |
| 0.0642 | 1232 | 1260 | 102 | Pass |
| 0.0654 | 1147 | 1201 | 104 | Pass |
| 0.0666 | 1083 | 1142 | 105 | Pass |
| 0.0678 | 1020 | 1075 | 105 | Pass |
| 0.0690 | 946 | 1004 | 106 | Pass |
| 0.0703 | 886 | 943 | 106 | Pass |
| 0.0715 | 823 | 893 | 108 | Pass |
| 0.0727 | 760 | 835 | 109 | Pass |
| 0.0739 | 724 | 779 | 107 | Pass |
| 0.0751 | 674 | 732 | 108 | Pass |
| 0.0763 | 623 | 662 | 106 | Pass |
| 0.0775 | 589 | 590 | 100 | Pass |
| 0.0788 | 549 | 528 | 96 | Pass |
| 0.0800 | 506 | 460 | 90 | Pass |
| 0.0812 | 469 | 429 | 91 | Pass |
| 0.0824 | 427 | 394 | 92 | Pass |
| 0.0836 | 388 | 355 | 91 | Pass |
| 0.0848 | 356 | 289 | 81 | Pass |
| 0.0860 | 328 | 243 | 74 | Pass |
| 0.0873 | 297 | 200 | 67 | Pass |
| 0.0885 | 270 | 163 | 60 | Pass |

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| | | | | |
|---|---|---|---|---|
| 0.0897 | 241 | 129 | 53 | Pass |
| 0.0909 | 218 | 120 | 55 | Pass |
| 0.0921 | 197 | 115 | 58 | Pass |
| 0.0933 | 173 | 112 | 64 | Pass |
| 0.0946 | 152 | 107 | 70 | Pass |
| 0.0958 | 130 | 103 | 79 | Pass |
| 0.0970 | 119 | 90 | 75 | Pass |
| 0.0982 | 104 | 81 | 77 | Pass |
| 0.0994 | 95 | 69 | 72 | Pass |
| 0.1006 | 83 | 61 | 73 | Pass |
| 0.1018 | 74 | 54 | 72 | Pass |
| 0.1031 | 69 | 46 | 66 | Pass |
| 0.1043 | 61 | 38 | 62 | Pass |
| 0.1055 | 54 | 32 | 59 | Pass |
| 0.1067 | 46 | 14 | 30 | Pass |
| 0.1079 | 39 | 12 | 30 | Pass |
| 0.1091 | 29 | 10 | 34 | Pass |
| 0.1103 | 25 | 10 | 40 | Pass |
| 0.1116 | 22 | 9 | 40 | Pass |
| 0.1128 | 20 | 9 | 45 | Pass |
| 0.1140 | 17 | 7 | 41 | Pass |
| 0.1152 | 14 | 7 | 50 | Pass |
| 0.1164 | 12 | 7 | 58 | Pass |
| 0.1176 | 8 | 5 | 62 | Pass |
| 0.1188 | 7 | 5 | 71 | Pass |
| 0.1201 | 7 | 4 | 57 | Pass |
| 0.1213 | 7 | 4 | 57 | Pass |
| 0.1225 | 6 | 3 | 50 | Pass |
| 0.1237 | 6 | 2 | 33 | Pass |
| 0.1249 | 6 | 2 | 33 | Pass |
| 0.1261 | 6 | 1 | 16 | Pass |
| 0.1274 | 6 | 0 | 0 | Pass |
| 0.1286 | 5 | 0 | 0 | Pass |
| 0.1298 | 5 | 0 | 0 | Pass |
| 0.1310 | 5 | 0 | 0 | Pass |
| 0.1322 | 5 | 0 | 0 | Pass |
| 0.1334 | 5 | 0 | 0 | Pass |
| 0.1346 | 5 | 0 | 0 | Pass |
| 0.1359 | 5 | 0 | 0 | Pass |
| 0.1371 | 4 | 0 | 0 | Pass |
| 0.1383 | 4 | 0 | 0 | Pass |
| 0.1395 | 3 | 0 | 0 | Pass |
| 0.1407 | 3 | 0 | 0 | Pass |
| 0.1419 | 3 | 0 | 0 | Pass |
| 0.1431 | 3 | 0 | 0 | Pass |
| 0.1444 | 3 | 0 | 0 | Pass |
| 0.1456 | 3 | 0 | 0 | Pass |

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## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.0175 acre-feet |
| On-line facility target flow: | 0.0088 cfs. |
| Adjusted for 15 min: | 0.0088 cfs. |
| Off-line facility target flow: | 0.0061 cfs. |
| Adjusted for 15 min: | 0.0061 cfs. |

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# LID Report

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Trapezoidal Pond 1 POC | ☐ | 197.76 | | | ☐ | 0.00 | | | |
| Total Volume Infiltrated | | 197.76 | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Failed |
| | | | | | | | | | |

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# *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.

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# *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   18122 NE 70th St Pond.wdm
MESSU      25   Pre18122 NE 70th St Pond.MES
           27   Pre18122 NE 70th St Pond.L61
           28   Pre18122 NE 70th St Pond.L62
           30   POC18122 NE 70th St Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      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           ***
   11     C, Forest, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         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  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

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```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11            0.2       0.5      0.35         6       0.5       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
   11              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
```

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```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                        1.7     COPY   501     12
PERLND  11                        1.7     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
```

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```
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
```

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## *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   18122 NE 70th St Pond.wdm
MESSU      25   Mit18122 NE 70th St Pond.MES
           27   Mit18122 NE 70th St Pond.L61
           28   Mit18122 NE 70th St Pond.L62
           30   POC18122 NE 70th St Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  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           ***
   16     C, Lawn, Flat           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 ***
   16         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  *********
```

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```
  16         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 ***
  16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  16            0.1      0.25      0.25         6       0.5      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
  16              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           ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

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```
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                        0.64     RCHRES   1      2
PERLND  16                        0.64     RCHRES   1      3
IMPLND   1                        1.06     RCHRES   1      5

******Routing******
PERLND  16                        0.64     COPY     1     12
IMPLND   1                        1.06     COPY     1     15
PERLND  16                        0.64     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     Trapezoidal Pond-006    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

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

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

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```
    1              1      0.04       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.023760  0.000000  0.000000
  0.066667  0.025711  0.001649  0.003317
  0.133333  0.027669  0.003428  0.004690
  0.200000  0.029634  0.005338  0.005744
  0.266667  0.031606  0.007380  0.006633
  0.333333  0.033586  0.009553  0.007416
  0.400000  0.035573  0.011858  0.008124
  0.466667  0.037567  0.014296  0.008775
  0.533333  0.039569  0.016867  0.009381
  0.600000  0.041579  0.019572  0.009950
  0.666667  0.043595  0.022411  0.010488
  0.733333  0.045619  0.025385  0.011000
  0.800000  0.047650  0.028494  0.011489
  0.866667  0.049689  0.031739  0.011958
  0.933333  0.051735  0.035120  0.012409
  1.000000  0.053788  0.038637  0.012845
  1.066667  0.055848  0.042292  0.013266
  1.133333  0.057916  0.046084  0.013675
  1.200000  0.059992  0.050014  0.014071
  1.266667  0.062074  0.054083  0.014457
  1.333333  0.064164  0.058291  0.014832
  1.400000  0.066262  0.062638  0.015198
  1.466667  0.068366  0.067126  0.015556
  1.533333  0.070478  0.071754  0.015906
  1.600000  0.072598  0.076523  0.016248
  1.666667  0.074725  0.081434  0.016583
  1.733333  0.076859  0.086487  0.016911
  1.800000  0.079000  0.091682  0.017233
  1.866667  0.081149  0.097020  0.017550
  1.933333  0.083305  0.102502  0.017860
  2.000000  0.085468  0.108128  0.018166
  2.066667  0.087639  0.113898  0.018466
  2.133333  0.089817  0.119813  0.018761
  2.200000  0.092003  0.125874  0.019052
  2.266667  0.094196  0.132081  0.019339
  2.333333  0.096396  0.138434  0.019621
  2.400000  0.098603  0.144934  0.019899
  2.466667  0.100818  0.151581  0.020174
  2.533333  0.103040  0.158376  0.020445
  2.600000  0.105270  0.165320  0.020712
  2.666667  0.107507  0.172413  0.020976
  2.733333  0.109751  0.179655  0.021236
  2.800000  0.112003  0.187046  0.021494
  2.866667  0.114262  0.194588  0.021748
  2.933333  0.116528  0.202281  0.022000
  3.000000  0.118802  0.210126  0.022248
  3.066667  0.121083  0.218122  0.022494
  3.133333  0.123371  0.226270  0.022737
  3.200000  0.125667  0.234572  0.022978
  3.266667  0.127970  0.243026  0.023216
  3.333333  0.130280  0.251635  0.023452
  3.400000  0.132598  0.260397  0.023685
```

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```
  3.466667  0.134923  0.269314  0.023916
  3.533333  0.137255  0.278387  0.024145
  3.600000  0.139595  0.287615  0.024372
  3.666667  0.141942  0.297000  0.032514
  3.733333  0.144297  0.306541  0.036016
  3.800000  0.146658  0.316240  0.038753
  3.866667  0.149028  0.326096  0.041093
  3.933333  0.151404  0.336110  0.043179
  4.000000  0.153788  0.346283  0.045084
  4.066667  0.156179  0.356616  0.046851
  4.133333  0.158578  0.367108  0.048508
  4.200000  0.160983  0.377760  0.050077
  4.266667  0.163397  0.388572  0.063649
  4.333333  0.165817  0.399546  0.070081
  4.400000  0.168245  0.410681  0.075292
  4.466667  0.170680  0.421979  0.079852
  4.533333  0.173123  0.433439  0.083983
  4.600000  0.175573  0.445062  0.087801
  4.666667  0.178030  0.456849  0.091377
  4.733333  0.180495  0.468800  0.094756
  4.800000  0.182967  0.480915  0.097971
  4.866667  0.185446  0.493196  0.101046
  4.933333  0.187933  0.505642  0.104000
  5.000000  0.190427  0.518254  0.106848
  5.066667  0.192928  0.531032  0.291836
  5.133333  0.195437  0.543978  0.621932
  5.200000  0.197953  0.557091  1.022537
  5.266667  0.200477  0.570372  1.435462
  5.333333  0.203007  0.583821  1.803307
  5.400000  0.205545  0.597440  2.082272
  5.466667  0.208091  0.611228  2.262906
  5.533333  0.210644  0.625185  2.427037
  5.600000  0.213204  0.639314  2.568809
  5.666667  0.215771  0.653613  2.702978
  5.733333  0.218346  0.668083  2.830656
  5.800000  0.220928  0.682726  2.952708
  5.866667  0.223518  0.697541  3.069821
  5.933333  0.226115  0.712528  3.182553
  6.000000  0.228719  0.727690  3.291364
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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```
  END MASS-LINK    3

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

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

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

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

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


END MASS-LINK

END RUN
```

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# Disclaimer

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# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE 70TH STREET DETENTION POND.
CALCULATIONS SHOW THAT FLOW CONTROL STANDARD IS
MET FOR THE AREA TRIBUTARY TO THE DETENTION POND
ALONG NE 70TH STREET. THIS MODEL IS RUN USING AREAS
BASED ON THE INTERIM CONDITION, INCLUDING GRADING FROM THE
BERM NORTH OF THE SITE AND NE 70TH STREET.

# General Model Information

| | |
|---|---|
| Project Name: | 18122 NE 70th St Pond w Grading |
| Site Name: | Woodside |
| Site Address: | |
| City: | Redmond |
| Report Date: | 11/12/2019 |
| 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 |

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# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Forest, Mod | 1.65 |
| C, Lawn, Flat | 1.14 |
| Pervious Total | 2.79 |
| Impervious Land Use | Acres |
| Impervious Total | 0 |
| Basin Total | 2.79 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Flat | 0.81 |
| C, Lawn, Steep | 1.14 |
| Pervious Total | 1.95 |
| Impervious Land Use | Acres |
| ROADS FLAT | 0.5 |
| SIDEWALKS FLAT | 0.12 |
| POND | 0.22 |
| Impervious Total | 0.84 |
| Basin Total | 2.79 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| Trapezoidal Pond 1 | Trapezoidal Pond 1 | |

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

## Trapezoidal Pond 1

| | |
|---|---|
| Bottom Length: | 210.00 ft. |
| Bottom Width: | 5.00 ft. |
| Depth: | 6 ft. |
| Volume at riser head: | 0.5251 acre-ft. |
| Side slope 1: | 3 To 1 |
| Side slope 2: | 3 To 1 |
| Side slope 3: | 3 To 1 |
| Side slope 4: | 3 To 1 |
| Discharge Structure | |
| Riser Height: | 5 ft. |
| Riser Diameter: | 12 in. |
| Orifice 1 Diameter: | 0.875 in. Elevation:0 ft. |
| Orifice 2 Diameter: | 1.375 in. Elevation:3.75 ft. |
| Orifice 3 Diameter: | 1.313 in. Elevation:4.5 ft. |
| Element Flows To: | |
| Outlet 1 | Outlet 2 |

Hydraulic Table

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| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.024 | 0.000 | 0.000 | 0.000 |
| 0.0667 | 0.026 | 0.001 | 0.005 | 0.000 |
| 0.1333 | 0.028 | 0.003 | 0.007 | 0.000 |
| 0.2000 | 0.030 | 0.005 | 0.009 | 0.000 |
| 0.2667 | 0.032 | 0.007 | 0.010 | 0.000 |
| 0.3333 | 0.034 | 0.009 | 0.012 | 0.000 |
| 0.4000 | 0.036 | 0.012 | 0.013 | 0.000 |
| 0.4667 | 0.038 | 0.014 | 0.014 | 0.000 |
| 0.5333 | 0.040 | 0.017 | 0.015 | 0.000 |
| 0.6000 | 0.042 | 0.019 | 0.016 | 0.000 |
| 0.6667 | 0.044 | 0.022 | 0.017 | 0.000 |
| 0.7333 | 0.046 | 0.025 | 0.017 | 0.000 |
| 0.8000 | 0.048 | 0.028 | 0.018 | 0.000 |
| 0.8667 | 0.050 | 0.032 | 0.019 | 0.000 |
| 0.9333 | 0.052 | 0.035 | 0.020 | 0.000 |
| 1.0000 | 0.054 | 0.039 | 0.020 | 0.000 |
| 1.0667 | 0.056 | 0.042 | 0.021 | 0.000 |
| 1.1333 | 0.058 | 0.046 | 0.022 | 0.000 |
| 1.2000 | 0.060 | 0.050 | 0.022 | 0.000 |
| 1.2667 | 0.062 | 0.054 | 0.023 | 0.000 |
| 1.3333 | 0.065 | 0.059 | 0.024 | 0.000 |
| 1.4000 | 0.067 | 0.063 | 0.024 | 0.000 |
| 1.4667 | 0.069 | 0.068 | 0.025 | 0.000 |
| 1.5333 | 0.071 | 0.072 | 0.025 | 0.000 |
| 1.6000 | 0.073 | 0.077 | 0.026 | 0.000 |
| 1.6667 | 0.075 | 0.082 | 0.026 | 0.000 |
| 1.7333 | 0.077 | 0.087 | 0.027 | 0.000 |
| 1.8000 | 0.080 | 0.093 | 0.027 | 0.000 |
| 1.8667 | 0.082 | 0.098 | 0.028 | 0.000 |
| 1.9333 | 0.084 | 0.103 | 0.028 | 0.000 |
| 2.0000 | 0.086 | 0.109 | 0.029 | 0.000 |
| 2.0667 | 0.088 | 0.115 | 0.029 | 0.000 |
| 2.1333 | 0.091 | 0.121 | 0.030 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 2.2000 | 0.093 | 0.127 | 0.030 | 0.000 |
| 2.2667 | 0.095 | 0.133 | 0.031 | 0.000 |
| 2.3333 | 0.097 | 0.140 | 0.031 | 0.000 |
| 2.4000 | 0.099 | 0.147 | 0.032 | 0.000 |
| 2.4667 | 0.102 | 0.153 | 0.032 | 0.000 |
| 2.5333 | 0.104 | 0.160 | 0.033 | 0.000 |
| 2.6000 | 0.106 | 0.167 | 0.033 | 0.000 |
| 2.6667 | 0.109 | 0.174 | 0.033 | 0.000 |
| 2.7333 | 0.111 | 0.182 | 0.034 | 0.000 |
| 2.8000 | 0.113 | 0.189 | 0.034 | 0.000 |
| 2.8667 | 0.115 | 0.197 | 0.035 | 0.000 |
| 2.9333 | 0.118 | 0.205 | 0.035 | 0.000 |
| 3.0000 | 0.120 | 0.213 | 0.036 | 0.000 |
| 3.0667 | 0.122 | 0.221 | 0.036 | 0.000 |
| 3.1333 | 0.125 | 0.229 | 0.036 | 0.000 |
| 3.2000 | 0.127 | 0.237 | 0.037 | 0.000 |
| 3.2667 | 0.129 | 0.246 | 0.037 | 0.000 |
| 3.3333 | 0.132 | 0.255 | 0.037 | 0.000 |
| 3.4000 | 0.134 | 0.264 | 0.038 | 0.000 |
| 3.4667 | 0.136 | 0.273 | 0.038 | 0.000 |
| 3.5333 | 0.139 | 0.282 | 0.039 | 0.000 |
| 3.6000 | 0.141 | 0.291 | 0.039 | 0.000 |
| 3.6667 | 0.143 | 0.301 | 0.039 | 0.000 |
| 3.7333 | 0.146 | 0.310 | 0.040 | 0.000 |
| 3.8000 | 0.148 | 0.320 | 0.052 | 0.000 |
| 3.8667 | 0.151 | 0.330 | 0.058 | 0.000 |
| 3.9333 | 0.153 | 0.340 | 0.063 | 0.000 |
| 4.0000 | 0.155 | 0.351 | 0.067 | 0.000 |
| 4.0667 | 0.158 | 0.361 | 0.070 | 0.000 |
| 4.1333 | 0.160 | 0.372 | 0.074 | 0.000 |
| 4.2000 | 0.163 | 0.382 | 0.077 | 0.000 |
| 4.2667 | 0.165 | 0.393 | 0.079 | 0.000 |
| 4.3333 | 0.168 | 0.404 | 0.082 | 0.000 |
| 4.4000 | 0.170 | 0.416 | 0.084 | 0.000 |
| 4.4667 | 0.172 | 0.427 | 0.087 | 0.000 |
| 4.5333 | 0.175 | 0.439 | 0.098 | 0.000 |
| 4.6000 | 0.177 | 0.451 | 0.106 | 0.000 |
| 4.6667 | 0.180 | 0.463 | 0.113 | 0.000 |
| 4.7333 | 0.182 | 0.475 | 0.118 | 0.000 |
| 4.8000 | 0.185 | 0.487 | 0.123 | 0.000 |
| 4.8667 | 0.187 | 0.499 | 0.128 | 0.000 |
| 4.9333 | 0.190 | 0.512 | 0.132 | 0.000 |
| 5.0000 | 0.192 | 0.525 | 0.136 | 0.000 |
| 5.0667 | 0.195 | 0.538 | 0.323 | 0.000 |
| 5.1333 | 0.197 | 0.551 | 0.654 | 0.000 |
| 5.2000 | 0.200 | 0.564 | 1.056 | 0.000 |
| 5.2667 | 0.203 | 0.577 | 1.469 | 0.000 |
| 5.3333 | 0.205 | 0.591 | 1.838 | 0.000 |
| 5.4000 | 0.208 | 0.605 | 2.118 | 0.000 |
| 5.4667 | 0.210 | 0.619 | 2.300 | 0.000 |
| 5.5333 | 0.213 | 0.633 | 2.465 | 0.000 |
| 5.6000 | 0.215 | 0.647 | 2.607 | 0.000 |
| 5.6667 | 0.218 | 0.662 | 2.742 | 0.000 |
| 5.7333 | 0.221 | 0.676 | 2.871 | 0.000 |
| 5.8000 | 0.223 | 0.691 | 2.994 | 0.000 |
| 5.8667 | 0.226 | 0.706 | 3.111 | 0.000 |
| 5.9333 | 0.228 | 0.721 | 3.225 | 0.000 |
| 6.0000 | 0.231 | 0.737 | 3.334 | 0.000 |

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| | | | | |
|---|---|---|---|---|
| 6.0667 | 0.234 | 0.752 | 3.440 | 0.000 |

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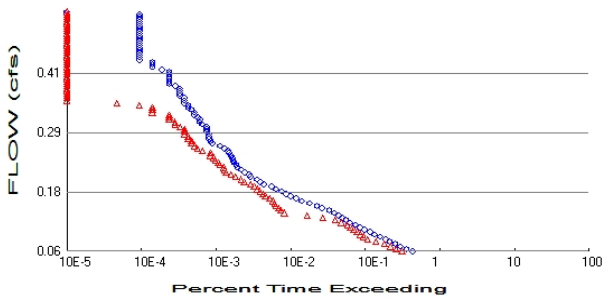
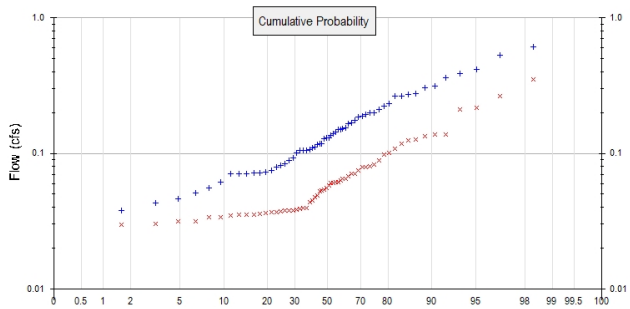
# *Analysis Results*
## *POC 1*




+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.79
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.95
Total Impervious Area: 0.84

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.129643 |
| 5 year | 0.227038 |
| 10 year | 0.306205 |
| 25 year | 0.423264 |
| 50 year | 0.523085 |
| 100 year | 0.633953 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.057211 |
| 5 year | 0.097066 |
| 10 year | 0.132485 |
| 25 year | 0.189701 |
| 50 year | 0.242898 |
| 100 year | 0.306559 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.232 | 0.036 |
| 1950 | 0.271 | 0.070 |
| 1951 | 0.198 | 0.212 |
| 1952 | 0.072 | 0.034 |
| 1953 | 0.055 | 0.038 |
| 1954 | 0.089 | 0.049 |
| 1955 | 0.128 | 0.054 |
| 1956 | 0.139 | 0.079 |
| 1957 | 0.152 | 0.045 |
| 1958 | 0.093 | 0.056 |

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| | | |
|---|---|---|
| 1959 | 0.079 | 0.037 |
| 1960 | 0.185 | 0.126 |
| 1961 | 0.110 | 0.062 |
| 1962 | 0.051 | 0.031 |
| 1963 | 0.106 | 0.044 |
| 1964 | 0.131 | 0.039 |
| 1965 | 0.151 | 0.075 |
| 1966 | 0.071 | 0.038 |
| 1967 | 0.277 | 0.053 |
| 1968 | 0.135 | 0.038 |
| 1969 | 0.117 | 0.037 |
| 1970 | 0.101 | 0.038 |
| 1971 | 0.153 | 0.060 |
| 1972 | 0.223 | 0.098 |
| 1973 | 0.071 | 0.068 |
| 1974 | 0.130 | 0.062 |
| 1975 | 0.174 | 0.040 |
| 1976 | 0.117 | 0.052 |
| 1977 | 0.070 | 0.030 |
| 1978 | 0.084 | 0.065 |
| 1979 | 0.043 | 0.031 |
| 1980 | 0.313 | 0.117 |
| 1981 | 0.082 | 0.039 |
| 1982 | 0.264 | 0.089 |
| 1983 | 0.116 | 0.058 |
| 1984 | 0.071 | 0.035 |
| 1985 | 0.072 | 0.035 |
| 1986 | 0.167 | 0.081 |
| 1987 | 0.166 | 0.101 |
| 1988 | 0.061 | 0.036 |
| 1989 | 0.046 | 0.034 |
| 1990 | 0.606 | 0.133 |
| 1991 | 0.361 | 0.124 |
| 1992 | 0.105 | 0.063 |
| 1993 | 0.075 | 0.036 |
| 1994 | 0.038 | 0.030 |
| 1995 | 0.107 | 0.064 |
| 1996 | 0.307 | 0.263 |
| 1997 | 0.195 | 0.138 |
| 1998 | 0.105 | 0.035 |
| 1999 | 0.418 | 0.109 |
| 2000 | 0.111 | 0.048 |
| 2001 | 0.026 | 0.027 |
| 2002 | 0.187 | 0.082 |
| 2003 | 0.199 | 0.037 |
| 2004 | 0.266 | 0.137 |
| 2005 | 0.143 | 0.061 |
| 2006 | 0.150 | 0.070 |
| 2007 | 0.533 | 0.353 |
| 2008 | 0.388 | 0.217 |
| 2009 | 0.210 | 0.079 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.6065 | 0.3533 |
| 2 | 0.5334 | 0.2632 |
| 3 | 0.4176 | 0.2168 |

| | | |
|---|---|---|
| 4 | 0.3878 | 0.2120 |
| 5 | 0.3613 | 0.1383 |
| 6 | 0.3130 | 0.1368 |
| 7 | 0.3067 | 0.1330 |
| 8 | 0.2772 | 0.1262 |
| 9 | 0.2711 | 0.1243 |
| 10 | 0.2662 | 0.1175 |
| 11 | 0.2637 | 0.1090 |
| 12 | 0.2324 | 0.1009 |
| 13 | 0.2225 | 0.0981 |
| 14 | 0.2100 | 0.0891 |
| 15 | 0.1985 | 0.0825 |
| 16 | 0.1984 | 0.0808 |
| 17 | 0.1948 | 0.0792 |
| 18 | 0.1871 | 0.0790 |
| 19 | 0.1846 | 0.0750 |
| 20 | 0.1742 | 0.0703 |
| 21 | 0.1675 | 0.0702 |
| 22 | 0.1661 | 0.0680 |
| 23 | 0.1533 | 0.0645 |
| 24 | 0.1523 | 0.0645 |
| 25 | 0.1507 | 0.0632 |
| 26 | 0.1495 | 0.0617 |
| 27 | 0.1428 | 0.0615 |
| 28 | 0.1388 | 0.0608 |
| 29 | 0.1353 | 0.0604 |
| 30 | 0.1310 | 0.0578 |
| 31 | 0.1303 | 0.0556 |
| 32 | 0.1282 | 0.0540 |
| 33 | 0.1172 | 0.0531 |
| 34 | 0.1170 | 0.0523 |
| 35 | 0.1159 | 0.0491 |
| 36 | 0.1109 | 0.0478 |
| 37 | 0.1104 | 0.0446 |
| 38 | 0.1073 | 0.0438 |
| 39 | 0.1056 | 0.0397 |
| 40 | 0.1051 | 0.0393 |
| 41 | 0.1048 | 0.0387 |
| 42 | 0.1007 | 0.0383 |
| 43 | 0.0928 | 0.0378 |
| 44 | 0.0892 | 0.0377 |
| 45 | 0.0838 | 0.0377 |
| 46 | 0.0817 | 0.0372 |
| 47 | 0.0793 | 0.0369 |
| 48 | 0.0747 | 0.0369 |
| 49 | 0.0722 | 0.0363 |
| 50 | 0.0721 | 0.0358 |
| 51 | 0.0712 | 0.0355 |
| 52 | 0.0709 | 0.0355 |
| 53 | 0.0709 | 0.0353 |
| 54 | 0.0703 | 0.0350 |
| 55 | 0.0613 | 0.0340 |
| 56 | 0.0552 | 0.0339 |
| 57 | 0.0509 | 0.0314 |
| 58 | 0.0459 | 0.0314 |
| 59 | 0.0428 | 0.0303 |
| 60 | 0.0378 | 0.0298 |
| 61 | 0.0259 | 0.0270 |

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## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0648 | 9210 | 6622 | 71 | Pass |
| 0.0695 | 7559 | 5501 | 72 | Pass |
| 0.0741 | 6224 | 4667 | 74 | Pass |
| 0.0787 | 5401 | 3835 | 71 | Pass |
| 0.0833 | 4545 | 2967 | 65 | Pass |
| 0.0880 | 4004 | 2280 | 56 | Pass |
| 0.0926 | 3360 | 2021 | 60 | Pass |
| 0.0972 | 2810 | 1841 | 65 | Pass |
| 0.1019 | 2458 | 1651 | 67 | Pass |
| 0.1065 | 2088 | 1499 | 71 | Pass |
| 0.1111 | 1809 | 1348 | 74 | Pass |
| 0.1157 | 1584 | 1236 | 78 | Pass |
| 0.1204 | 1320 | 1026 | 77 | Pass |
| 0.1250 | 1177 | 841 | 71 | Pass |
| 0.1296 | 1052 | 573 | 54 | Pass |
| 0.1343 | 930 | 353 | 37 | Pass |
| 0.1389 | 827 | 175 | 21 | Pass |
| 0.1435 | 703 | 157 | 22 | Pass |
| 0.1481 | 560 | 146 | 26 | Pass |
| 0.1528 | 479 | 135 | 28 | Pass |
| 0.1574 | 381 | 130 | 34 | Pass |
| 0.1620 | 297 | 123 | 41 | Pass |
| 0.1667 | 253 | 111 | 43 | Pass |
| 0.1713 | 212 | 98 | 46 | Pass |
| 0.1759 | 187 | 90 | 48 | Pass |
| 0.1805 | 163 | 83 | 50 | Pass |
| 0.1852 | 136 | 76 | 55 | Pass |
| 0.1898 | 119 | 69 | 57 | Pass |
| 0.1944 | 92 | 62 | 67 | Pass |
| 0.1991 | 83 | 51 | 61 | Pass |
| 0.2037 | 75 | 46 | 61 | Pass |
| 0.2083 | 61 | 39 | 63 | Pass |
| 0.2129 | 59 | 34 | 57 | Pass |
| 0.2176 | 52 | 29 | 55 | Pass |
| 0.2222 | 46 | 28 | 60 | Pass |
| 0.2268 | 41 | 27 | 65 | Pass |
| 0.2315 | 40 | 24 | 60 | Pass |
| 0.2361 | 37 | 23 | 62 | Pass |
| 0.2407 | 36 | 21 | 58 | Pass |
| 0.2453 | 35 | 20 | 57 | Pass |
| 0.2500 | 34 | 18 | 52 | Pass |
| 0.2546 | 32 | 18 | 56 | Pass |
| 0.2592 | 31 | 14 | 45 | Pass |
| 0.2639 | 28 | 12 | 42 | Pass |
| 0.2685 | 24 | 11 | 45 | Pass |
| 0.2731 | 19 | 10 | 52 | Pass |
| 0.2778 | 18 | 10 | 55 | Pass |
| 0.2824 | 17 | 9 | 52 | Pass |
| 0.2870 | 17 | 9 | 52 | Pass |
| 0.2916 | 17 | 8 | 47 | Pass |
| 0.2963 | 16 | 8 | 50 | Pass |
| 0.3009 | 16 | 8 | 50 | Pass |
| 0.3055 | 16 | 7 | 43 | Pass |

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| | | | | |
|---|---|---|---|---|
| 0.3102 | 14 | 6 | 42 | Pass |
| 0.3148 | 13 | 6 | 46 | Pass |
| 0.3194 | 13 | 5 | 38 | Pass |
| 0.3240 | 12 | 5 | 41 | Pass |
| 0.3287 | 11 | 5 | 45 | Pass |
| 0.3333 | 11 | 3 | 27 | Pass |
| 0.3379 | 10 | 3 | 30 | Pass |
| 0.3426 | 9 | 3 | 33 | Pass |
| 0.3472 | 9 | 2 | 22 | Pass |
| 0.3518 | 8 | 1 | 12 | Pass |
| 0.3564 | 8 | 0 | 0 | Pass |
| 0.3611 | 8 | 0 | 0 | Pass |
| 0.3657 | 7 | 0 | 0 | Pass |
| 0.3703 | 7 | 0 | 0 | Pass |
| 0.3750 | 7 | 0 | 0 | Pass |
| 0.3796 | 7 | 0 | 0 | Pass |
| 0.3842 | 6 | 0 | 0 | Pass |
| 0.3888 | 5 | 0 | 0 | Pass |
| 0.3935 | 5 | 0 | 0 | Pass |
| 0.3981 | 5 | 0 | 0 | Pass |
| 0.4027 | 5 | 0 | 0 | Pass |
| 0.4074 | 5 | 0 | 0 | Pass |
| 0.4120 | 5 | 0 | 0 | Pass |
| 0.4166 | 4 | 0 | 0 | Pass |
| 0.4212 | 3 | 0 | 0 | Pass |
| 0.4259 | 3 | 0 | 0 | Pass |
| 0.4305 | 3 | 0 | 0 | Pass |
| 0.4351 | 2 | 0 | 0 | Pass |
| 0.4398 | 2 | 0 | 0 | Pass |
| 0.4444 | 2 | 0 | 0 | Pass |
| 0.4490 | 2 | 0 | 0 | Pass |
| 0.4537 | 2 | 0 | 0 | Pass |
| 0.4583 | 2 | 0 | 0 | Pass |
| 0.4629 | 2 | 0 | 0 | Pass |
| 0.4675 | 2 | 0 | 0 | Pass |
| 0.4722 | 2 | 0 | 0 | Pass |
| 0.4768 | 2 | 0 | 0 | Pass |
| 0.4814 | 2 | 0 | 0 | Pass |
| 0.4861 | 2 | 0 | 0 | Pass |
| 0.4907 | 2 | 0 | 0 | Pass |
| 0.4953 | 2 | 0 | 0 | Pass |
| 0.4999 | 2 | 0 | 0 | Pass |
| 0.5046 | 2 | 0 | 0 | Pass |
| 0.5092 | 2 | 0 | 0 | Pass |
| 0.5138 | 2 | 0 | 0 | Pass |
| 0.5185 | 2 | 0 | 0 | Pass |
| 0.5231 | 2 | 0 | 0 | Pass |

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## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.134 acre-feet |
| On-line facility target flow: | 0.0717 cfs. |
| Adjusted for 15 min: | 0.0717 cfs. |
| Off-line facility target flow: | 0.039 cfs. |
| Adjusted for 15 min: | 0.039 cfs. |

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# LID Report

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Trapezoidal Pond 1 POC | ☐ | 264.90 | | | ☐ | 0.00 | | | |
| Total Volume Infiltrated | | 264.90 | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Failed |
| | | | | | | | | | |

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# *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.

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# *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   18122 NE 70th St Pond w Grading.wdm
MESSU      25   Pre18122 NE 70th St Pond w Grading.MES
           27   Pre18122 NE 70th St Pond w Grading.L61
           28   Pre18122 NE 70th St Pond w Grading.L62
           30   POC18122 NE 70th St Pond w Grading1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      PERLND      16
      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            ***
   11     C, Forest, Mod          1    1    1    1   27    0
   16     C, Lawn, Flat           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 ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   16         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  *********
```

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```
  11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  16         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 ***
  11         0    0    0    0    0    0    0    0    0    0    0
  16         0    0    0    0    0    0    0    0    0    0    0
 END PWAT-PARM1

 PWAT-PARM2
   <PLS >      PWATER input info: Part 2         ***
   # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  11              0       4.5      0.08       400       0.1       0.5     0.996
  16              0       4.5      0.03       400      0.05       0.5     0.996
 END PWAT-PARM2

 PWAT-PARM3
   <PLS >      PWATER input info: Part 3         ***
   # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  11              0         0         2         2         0         0         0
  16              0         0         2         2         0         0         0
 END PWAT-PARM3
 PWAT-PARM4
   <PLS >     PWATER input info: Part 4                                  ***
   # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  11            0.2       0.5      0.35         6       0.5       0.7
  16            0.1      0.25      0.25         6       0.5      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
  11              0         0         0         0       2.5         1         0
  16              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
```

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```
    <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  11                        1.65     COPY   501     12
PERLND  11                        1.65     COPY   501     13
PERLND  16                        1.14     COPY   501     12
PERLND  16                        1.14     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
```

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```
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
```

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## *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   18122 NE 70th St Pond w Grading.wdm
MESSU      25   Mit18122 NE 70th St Pond w Grading.MES
           27   Mit18122 NE 70th St Pond w Grading.L61
           28   Mit18122 NE 70th St Pond w Grading.L62
           30   POC18122 NE 70th St Pond w Grading1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      PERLND      18
      IMPLND       1
      IMPLND       8
      IMPLND      14
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  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            ***
   16     C, Lawn, Flat           1    1    1    1   27    0
   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 ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
   18         0    0    1    0    0    0    0    0    0    0    0    0
```

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```
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   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 ***
   16         0    0    0    0    0    0    0    0    0    0    0
   18         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
   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
   16              0         0         2         2         0         0         0
   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 ***
   16            0.1      0.25      0.25         6       0.5      0.25
   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
   16              0         0         0         0       2.5         1         0
   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           ***
    1      ROADS/FLAT             1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
   14      POND                   1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    8         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
```

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```
  14         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     ***
   1         0    0    0    0    0
   8         0    0    0    0    0
  14         0    0    0    0    0
 END IWAT-PARM1

 IWAT-PARM2
   <PLS >      IWATER input info: Part 2         ***
   # -  # ***  LSUR     SLSUR      NSUR     RETSC
   1            400      0.01       0.1       0.1
   8            400      0.01       0.1       0.1
  14            400      0.01       0.1       0.1
 END IWAT-PARM2

 IWAT-PARM3
   <PLS >      IWATER input info: Part 3         ***
   # -  # ***PETMAX    PETMIN
   1              0         0
   8              0         0
  14              0         0
 END IWAT-PARM3

 IWAT-STATE1
   <PLS > *** Initial conditions at start of simulation
   # -  # ***  RETS      SURS
   1              0         0
   8              0         0
  14              0         0
 END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                <--Area-->     <-Target->   MBLK   ***
<Name>   #                <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                      0.81     RCHRES   1      2
PERLND  16                      0.81     RCHRES   1      3
PERLND  18                      1.14     RCHRES   1      2
PERLND  18                      1.14     RCHRES   1      3
IMPLND   1                       0.5     RCHRES   1      5
IMPLND   8                      0.12     RCHRES   1      5
IMPLND  14                      0.22     RCHRES   1      5

******Routing******
PERLND  16                      0.81     COPY     1     12
PERLND  18                      1.14     COPY     1     12
IMPLND   1                       0.5     COPY     1     15
IMPLND   8                      0.12     COPY     1     15
IMPLND  14                      0.22     COPY     1     15
PERLND  16                      0.81     COPY     1     13
PERLND  18                      1.14     COPY     1     13
RCHRES   1                         1     COPY   501     16
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
```

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```
RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                             ***
    1     Trapezoidal Pond-006    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN       DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->         ***
    1              1      0.04       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.024105  0.000000  0.000000
  0.066667  0.026083  0.001673  0.005364
  0.133333  0.028068  0.003478  0.007587
  0.200000  0.030061  0.005416  0.009292
  0.266667  0.032061  0.007486  0.010729
  0.333333  0.034068  0.009691  0.011995
  0.400000  0.036083  0.012029  0.013140
  0.466667  0.038105  0.014502  0.014193
  0.533333  0.040134  0.017110  0.015173
  0.600000  0.042171  0.019853  0.016093
  0.666667  0.044215  0.022733  0.016964
  0.733333  0.046266  0.025749  0.017792
  0.800000  0.048325  0.028902  0.018583
  0.866667  0.050391  0.032192  0.019342
  0.933333  0.052465  0.035621  0.020072
  1.000000  0.054545  0.039188  0.020777
  1.066667  0.056634  0.042894  0.021458
  1.133333  0.058729  0.046739  0.022118
  1.200000  0.060832  0.050725  0.022760
```

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| | | | |
|---|---|---|---|
| 1.266667 | 0.062942 | 0.054851 | 0.023383 |
| 1.333333 | 0.065060 | 0.059117 | 0.023991 |
| 1.400000 | 0.067185 | 0.063525 | 0.024583 |
| 1.466667 | 0.069317 | 0.068075 | 0.025162 |
| 1.533333 | 0.071456 | 0.072768 | 0.025727 |
| 1.600000 | 0.073603 | 0.077603 | 0.026281 |
| 1.666667 | 0.075758 | 0.082582 | 0.026822 |
| 1.733333 | 0.077919 | 0.087704 | 0.027354 |
| 1.800000 | 0.080088 | 0.092971 | 0.027875 |
| 1.866667 | 0.082264 | 0.098383 | 0.028386 |
| 1.933333 | 0.084448 | 0.103940 | 0.028889 |
| 2.000000 | 0.086639 | 0.109643 | 0.029383 |
| 2.066667 | 0.088837 | 0.115492 | 0.029868 |
| 2.133333 | 0.091043 | 0.121488 | 0.030346 |
| 2.200000 | 0.093256 | 0.127632 | 0.030817 |
| 2.266667 | 0.095477 | 0.133923 | 0.031280 |
| 2.333333 | 0.097704 | 0.140362 | 0.031737 |
| 2.400000 | 0.099939 | 0.146950 | 0.032187 |
| 2.466667 | 0.102182 | 0.153688 | 0.032631 |
| 2.533333 | 0.104432 | 0.160575 | 0.033069 |
| 2.600000 | 0.106689 | 0.167612 | 0.033501 |
| 2.666667 | 0.108953 | 0.174800 | 0.033928 |
| 2.733333 | 0.111225 | 0.182139 | 0.034350 |
| 2.800000 | 0.113504 | 0.189630 | 0.034766 |
| 2.866667 | 0.115791 | 0.197274 | 0.035177 |
| 2.933333 | 0.118084 | 0.205069 | 0.035584 |
| 3.000000 | 0.120386 | 0.213018 | 0.035986 |
| 3.066667 | 0.122694 | 0.221121 | 0.036384 |
| 3.133333 | 0.125010 | 0.229378 | 0.036777 |
| 3.200000 | 0.127333 | 0.237789 | 0.037166 |
| 3.266667 | 0.129664 | 0.246356 | 0.037551 |
| 3.333333 | 0.132002 | 0.255078 | 0.037933 |
| 3.400000 | 0.134347 | 0.263956 | 0.038310 |
| 3.466667 | 0.136700 | 0.272991 | 0.038684 |
| 3.533333 | 0.139060 | 0.282183 | 0.039054 |
| 3.600000 | 0.141427 | 0.291533 | 0.039421 |
| 3.666667 | 0.143802 | 0.301040 | 0.039784 |
| 3.733333 | 0.146184 | 0.310707 | 0.040144 |
| 3.800000 | 0.148573 | 0.320532 | 0.051973 |
| 3.866667 | 0.150970 | 0.330517 | 0.058379 |
| 3.933333 | 0.153374 | 0.340661 | 0.063173 |
| 4.000000 | 0.155785 | 0.350967 | 0.067206 |
| 4.066667 | 0.158204 | 0.361433 | 0.070769 |
| 4.133333 | 0.160630 | 0.372061 | 0.074005 |
| 4.200000 | 0.163063 | 0.382851 | 0.076996 |
| 4.266667 | 0.165504 | 0.393803 | 0.079794 |
| 4.333333 | 0.167952 | 0.404918 | 0.082435 |
| 4.400000 | 0.170408 | 0.416197 | 0.084945 |
| 4.466667 | 0.172871 | 0.427639 | 0.087344 |
| 4.533333 | 0.175341 | 0.439246 | 0.098187 |
| 4.600000 | 0.177818 | 0.451018 | 0.106656 |
| 4.666667 | 0.180303 | 0.462956 | 0.113103 |
| 4.733333 | 0.182795 | 0.475059 | 0.118677 |
| 4.800000 | 0.185295 | 0.487329 | 0.123716 |
| 4.866667 | 0.187802 | 0.499765 | 0.128379 |
| 4.933333 | 0.190316 | 0.512369 | 0.132754 |
| 5.000000 | 0.192837 | 0.525141 | 0.136900 |
| 5.066667 | 0.195366 | 0.538081 | 0.323089 |
| 5.133333 | 0.197903 | 0.551190 | 0.654310 |
| 5.200000 | 0.200446 | 0.564468 | 1.055976 |
| 5.266667 | 0.202997 | 0.577916 | 1.469908 |
| 5.333333 | 0.205556 | 0.591535 | 1.838714 |
| 5.400000 | 0.208121 | 0.605324 | 2.118601 |
| 5.466667 | 0.210694 | 0.619284 | 2.300122 |
| 5.533333 | 0.213275 | 0.633417 | 2.465108 |
| 5.600000 | 0.215862 | 0.647721 | 2.607709 |
| 5.666667 | 0.218457 | 0.662199 | 2.742681 |
| 5.733333 | 0.221060 | 0.676849 | 2.871139 |
| 5.800000 | 0.223669 | 0.691674 | 2.993951 |
| 5.866667 | 0.226287 | 0.706672 | 3.111804 |

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```
  5.933333  0.228911  0.721845  3.225259
  6.000000  0.231543  0.737194  3.334778
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

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


END MASS-LINK

END RUN
```

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## *Legal Notice*

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**SC5 Developed Basin (Lakeside) WWHM Report Summary**

The WWHM Report for the SC5 Developed Basin is included in the following pages. This basin was originally from the Lakeside report, referenced in Section 4 and recreated in WWHM. The SC5 developed basin includes only 0.89 acres of impervious area and was modeled to show the peak flow rates and volumes from this basin as calculated using WWHM. These flow rates and volumes were then compared to the flow rates and volumes released from the two proposed vaults to justify discharging stormwater south.

## Basin 1

Bypass: No
GroundWater: No
Pervious Land Use Acres
Pervious Total 0
Impervious Land Use Acres
ROADS FLAT 0.89
Impervious Total 0.89
Basin Total 0.89

Peak flow rates produced from the basin shown above:

Flow Frequency Return Periods for Predeveloped. POC #1
**Return Period Flow(cfs)**
2 year 0.339326
5 year 0.428608
10 year 0.489269
25 year 0.567955
50 year 0.628179
100 year 0.689866

# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE IMPERVIOUS BASIN FROM THE LAKESIDE REPORT. THE 0.89 ACRE BASIN WAS RECREATED IN WWHM TO DETERMINE THE PEAK FLOW RATES.

# General Model Information

| | |
|---|---|
| Project Name: | Impervious Area Basin |
| Site Name: | Woodside |
| Site Address: | 7039 196th Ave NE |
| City: | Redmond |
| Report Date: | 8/22/2019 |
| Gage: | Seatac |
| Data Start: | 1948/10/01 |
| Data End: | 2009/09/30 |
| Timestep: | 15 Minute |
| Precip Scale: | 0.00 (adjusted) |
| Version: | 2015/06/05 |

## POC Thresholds

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

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# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| Pervious Total | 0 |
| Impervious Land Use | Acres |
| ROADS FLAT | 0.89 |
| Impervious Total | 0.89 |
| Basin Total | 0.89 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

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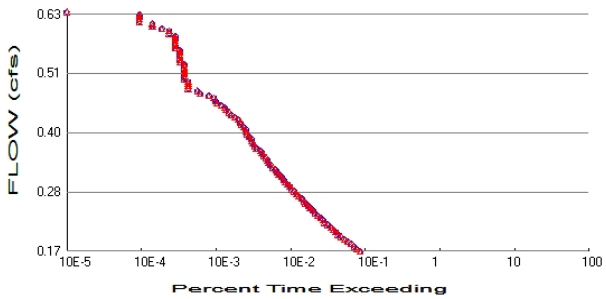
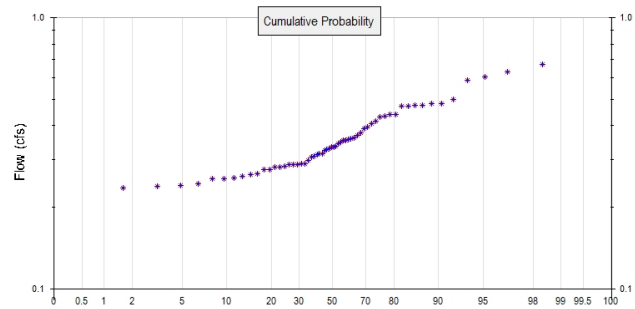
# *Analysis Results*
## *POC 1*




+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.89

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

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.339326 |
| 5 year | 0.428608 |
| 10 year | 0.489269 |
| 25 year | 0.567955 |
| 50 year | 0.628179 |
| 100 year | 0.689866 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.339326 |
| 5 year | 0.428608 |
| 10 year | 0.489269 |
| 25 year | 0.567955 |
| 50 year | 0.628179 |
| 100 year | 0.689866 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.439 | 0.439 |
| 1950 | 0.475 | 0.475 |
| 1951 | 0.275 | 0.275 |
| 1952 | 0.244 | 0.244 |
| 1953 | 0.264 | 0.264 |
| 1954 | 0.276 | 0.276 |
| 1955 | 0.313 | 0.313 |
| 1956 | 0.308 | 0.308 |
| 1957 | 0.349 | 0.349 |
| 1958 | 0.282 | 0.282 |

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| | | |
|---|---|---|
| 1959 | 0.287 | 0.287 |
| 1960 | 0.282 | 0.282 |
| 1961 | 0.298 | 0.298 |
| 1962 | 0.260 | 0.260 |
| 1963 | 0.289 | 0.289 |
| 1964 | 0.283 | 0.283 |
| 1965 | 0.360 | 0.360 |
| 1966 | 0.241 | 0.241 |
| 1967 | 0.415 | 0.415 |
| 1968 | 0.471 | 0.471 |
| 1969 | 0.328 | 0.328 |
| 1970 | 0.316 | 0.316 |
| 1971 | 0.377 | 0.377 |
| 1972 | 0.389 | 0.389 |
| 1973 | 0.236 | 0.236 |
| 1974 | 0.344 | 0.344 |
| 1975 | 0.396 | 0.396 |
| 1976 | 0.266 | 0.266 |
| 1977 | 0.289 | 0.289 |
| 1978 | 0.353 | 0.353 |
| 1979 | 0.483 | 0.483 |
| 1980 | 0.433 | 0.433 |
| 1981 | 0.355 | 0.355 |
| 1982 | 0.500 | 0.500 |
| 1983 | 0.407 | 0.407 |
| 1984 | 0.257 | 0.257 |
| 1985 | 0.354 | 0.354 |
| 1986 | 0.307 | 0.307 |
| 1987 | 0.473 | 0.473 |
| 1988 | 0.287 | 0.287 |
| 1989 | 0.359 | 0.359 |
| 1990 | 0.605 | 0.605 |
| 1991 | 0.483 | 0.483 |
| 1992 | 0.254 | 0.254 |
| 1993 | 0.220 | 0.220 |
| 1994 | 0.240 | 0.240 |
| 1995 | 0.314 | 0.314 |
| 1996 | 0.335 | 0.335 |
| 1997 | 0.325 | 0.325 |
| 1998 | 0.329 | 0.329 |
| 1999 | 0.674 | 0.674 |
| 2000 | 0.335 | 0.335 |
| 2001 | 0.369 | 0.369 |
| 2002 | 0.430 | 0.430 |
| 2003 | 0.334 | 0.334 |
| 2004 | 0.630 | 0.630 |
| 2005 | 0.288 | 0.288 |
| 2006 | 0.254 | 0.254 |
| 2007 | 0.589 | 0.589 |
| 2008 | 0.475 | 0.475 |
| 2009 | 0.439 | 0.439 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.6738 | 0.6738 |
| 2 | 0.6304 | 0.6304 |
| 3 | 0.6047 | 0.6047 |

| | | |
|---|---|---|
| 4 | 0.5892 | 0.5892 |
| 5 | 0.5000 | 0.5000 |
| 6 | 0.4832 | 0.4832 |
| 7 | 0.4831 | 0.4831 |
| 8 | 0.4749 | 0.4749 |
| 9 | 0.4746 | 0.4746 |
| 10 | 0.4731 | 0.4731 |
| 11 | 0.4713 | 0.4713 |
| 12 | 0.4395 | 0.4395 |
| 13 | 0.4386 | 0.4386 |
| 14 | 0.4335 | 0.4335 |
| 15 | 0.4299 | 0.4299 |
| 16 | 0.4145 | 0.4145 |
| 17 | 0.4070 | 0.4070 |
| 18 | 0.3962 | 0.3962 |
| 19 | 0.3892 | 0.3892 |
| 20 | 0.3770 | 0.3770 |
| 21 | 0.3685 | 0.3685 |
| 22 | 0.3597 | 0.3597 |
| 23 | 0.3590 | 0.3590 |
| 24 | 0.3546 | 0.3546 |
| 25 | 0.3538 | 0.3538 |
| 26 | 0.3530 | 0.3530 |
| 27 | 0.3492 | 0.3492 |
| 28 | 0.3439 | 0.3439 |
| 29 | 0.3354 | 0.3354 |
| 30 | 0.3346 | 0.3346 |
| 31 | 0.3340 | 0.3340 |
| 32 | 0.3294 | 0.3294 |
| 33 | 0.3276 | 0.3276 |
| 34 | 0.3249 | 0.3249 |
| 35 | 0.3161 | 0.3161 |
| 36 | 0.3144 | 0.3144 |
| 37 | 0.3129 | 0.3129 |
| 38 | 0.3078 | 0.3078 |
| 39 | 0.3066 | 0.3066 |
| 40 | 0.2984 | 0.2984 |
| 41 | 0.2888 | 0.2888 |
| 42 | 0.2886 | 0.2886 |
| 43 | 0.2881 | 0.2881 |
| 44 | 0.2874 | 0.2874 |
| 45 | 0.2870 | 0.2870 |
| 46 | 0.2832 | 0.2832 |
| 47 | 0.2821 | 0.2821 |
| 48 | 0.2818 | 0.2818 |
| 49 | 0.2759 | 0.2759 |
| 50 | 0.2745 | 0.2745 |
| 51 | 0.2664 | 0.2664 |
| 52 | 0.2637 | 0.2637 |
| 53 | 0.2600 | 0.2600 |
| 54 | 0.2567 | 0.2567 |
| 55 | 0.2545 | 0.2545 |
| 56 | 0.2542 | 0.2542 |
| 57 | 0.2442 | 0.2442 |
| 58 | 0.2405 | 0.2405 |
| 59 | 0.2395 | 0.2395 |
| 60 | 0.2357 | 0.2357 |
| 61 | 0.2202 | 0.2202 |

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## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.1697 | 1827 | 1827 | 100 | Pass |
| 0.1743 | 1649 | 1649 | 100 | Pass |
| 0.1789 | 1506 | 1506 | 100 | Pass |
| 0.1836 | 1361 | 1361 | 100 | Pass |
| 0.1882 | 1229 | 1229 | 100 | Pass |
| 0.1928 | 1125 | 1125 | 100 | Pass |
| 0.1975 | 1007 | 1007 | 100 | Pass |
| 0.2021 | 920 | 920 | 100 | Pass |
| 0.2067 | 864 | 864 | 100 | Pass |
| 0.2113 | 796 | 796 | 100 | Pass |
| 0.2160 | 738 | 738 | 100 | Pass |
| 0.2206 | 674 | 674 | 100 | Pass |
| 0.2252 | 611 | 611 | 100 | Pass |
| 0.2299 | 582 | 582 | 100 | Pass |
| 0.2345 | 539 | 539 | 100 | Pass |
| 0.2391 | 489 | 489 | 100 | Pass |
| 0.2438 | 452 | 452 | 100 | Pass |
| 0.2484 | 420 | 420 | 100 | Pass |
| 0.2530 | 389 | 389 | 100 | Pass |
| 0.2577 | 366 | 366 | 100 | Pass |
| 0.2623 | 339 | 339 | 100 | Pass |
| 0.2669 | 320 | 320 | 100 | Pass |
| 0.2716 | 297 | 297 | 100 | Pass |
| 0.2762 | 272 | 272 | 100 | Pass |
| 0.2808 | 258 | 258 | 100 | Pass |
| 0.2854 | 239 | 239 | 100 | Pass |
| 0.2901 | 221 | 221 | 100 | Pass |
| 0.2947 | 209 | 209 | 100 | Pass |
| 0.2993 | 196 | 196 | 100 | Pass |
| 0.3040 | 181 | 181 | 100 | Pass |
| 0.3086 | 171 | 171 | 100 | Pass |
| 0.3132 | 161 | 161 | 100 | Pass |
| 0.3179 | 148 | 148 | 100 | Pass |
| 0.3225 | 139 | 139 | 100 | Pass |
| 0.3271 | 135 | 135 | 100 | Pass |
| 0.3318 | 123 | 123 | 100 | Pass |
| 0.3364 | 113 | 113 | 100 | Pass |
| 0.3410 | 107 | 107 | 100 | Pass |
| 0.3457 | 105 | 105 | 100 | Pass |
| 0.3503 | 100 | 100 | 100 | Pass |
| 0.3549 | 93 | 93 | 100 | Pass |
| 0.3596 | 88 | 88 | 100 | Pass |
| 0.3642 | 84 | 84 | 100 | Pass |
| 0.3688 | 74 | 74 | 100 | Pass |
| 0.3734 | 71 | 71 | 100 | Pass |
| 0.3781 | 66 | 66 | 100 | Pass |
| 0.3827 | 64 | 64 | 100 | Pass |
| 0.3873 | 63 | 63 | 100 | Pass |
| 0.3920 | 59 | 59 | 100 | Pass |
| 0.3966 | 55 | 55 | 100 | Pass |
| 0.4012 | 54 | 54 | 100 | Pass |
| 0.4059 | 53 | 53 | 100 | Pass |
| 0.4105 | 50 | 50 | 100 | Pass |

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| | | | | |
|---|---|---|---|---|
| 0.4151 | 46 | 46 | 100 | Pass |
| 0.4198 | 45 | 45 | 100 | Pass |
| 0.4244 | 42 | 42 | 100 | Pass |
| 0.4290 | 38 | 38 | 100 | Pass |
| 0.4337 | 34 | 34 | 100 | Pass |
| 0.4383 | 32 | 32 | 100 | Pass |
| 0.4429 | 29 | 29 | 100 | Pass |
| 0.4476 | 28 | 28 | 100 | Pass |
| 0.4522 | 25 | 25 | 100 | Pass |
| 0.4568 | 22 | 22 | 100 | Pass |
| 0.4614 | 21 | 21 | 100 | Pass |
| 0.4661 | 20 | 20 | 100 | Pass |
| 0.4707 | 17 | 17 | 100 | Pass |
| 0.4753 | 13 | 13 | 100 | Pass |
| 0.4800 | 12 | 12 | 100 | Pass |
| 0.4846 | 9 | 9 | 100 | Pass |
| 0.4892 | 9 | 9 | 100 | Pass |
| 0.4939 | 9 | 9 | 100 | Pass |
| 0.4985 | 9 | 9 | 100 | Pass |
| 0.5031 | 8 | 8 | 100 | Pass |
| 0.5078 | 8 | 8 | 100 | Pass |
| 0.5124 | 8 | 8 | 100 | Pass |
| 0.5170 | 8 | 8 | 100 | Pass |
| 0.5217 | 8 | 8 | 100 | Pass |
| 0.5263 | 8 | 8 | 100 | Pass |
| 0.5309 | 8 | 8 | 100 | Pass |
| 0.5355 | 7 | 7 | 100 | Pass |
| 0.5402 | 7 | 7 | 100 | Pass |
| 0.5448 | 7 | 7 | 100 | Pass |
| 0.5494 | 7 | 7 | 100 | Pass |
| 0.5541 | 7 | 7 | 100 | Pass |
| 0.5587 | 7 | 7 | 100 | Pass |
| 0.5633 | 6 | 6 | 100 | Pass |
| 0.5680 | 6 | 6 | 100 | Pass |
| 0.5726 | 6 | 6 | 100 | Pass |
| 0.5772 | 6 | 6 | 100 | Pass |
| 0.5819 | 6 | 6 | 100 | Pass |
| 0.5865 | 6 | 6 | 100 | Pass |
| 0.5911 | 5 | 5 | 100 | Pass |
| 0.5958 | 5 | 5 | 100 | Pass |
| 0.6004 | 4 | 4 | 100 | Pass |
| 0.6050 | 3 | 3 | 100 | Pass |
| 0.6097 | 3 | 3 | 100 | Pass |
| 0.6143 | 2 | 2 | 100 | Pass |
| 0.6189 | 2 | 2 | 100 | Pass |
| 0.6235 | 2 | 2 | 100 | Pass |
| 0.6282 | 2 | 2 | 100 | Pass |

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## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.4587 acre-feet |
| On-line facility target flow: | 0.2581 cfs. |
| Adjusted for 15 min: | 0.2581 cfs. |
| Off-line facility target flow: | 0.139 cfs. |
| Adjusted for 15 min: | 0.139 cfs. |

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# LID Report

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Trapezoidal Pond 1 POC | ☐ | 196.34 | | | ☐ | 0.00 | | | |
| Total Volume Infiltrated | | 196.34 | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Failed |
| | | | | | | | | | |

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# *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.

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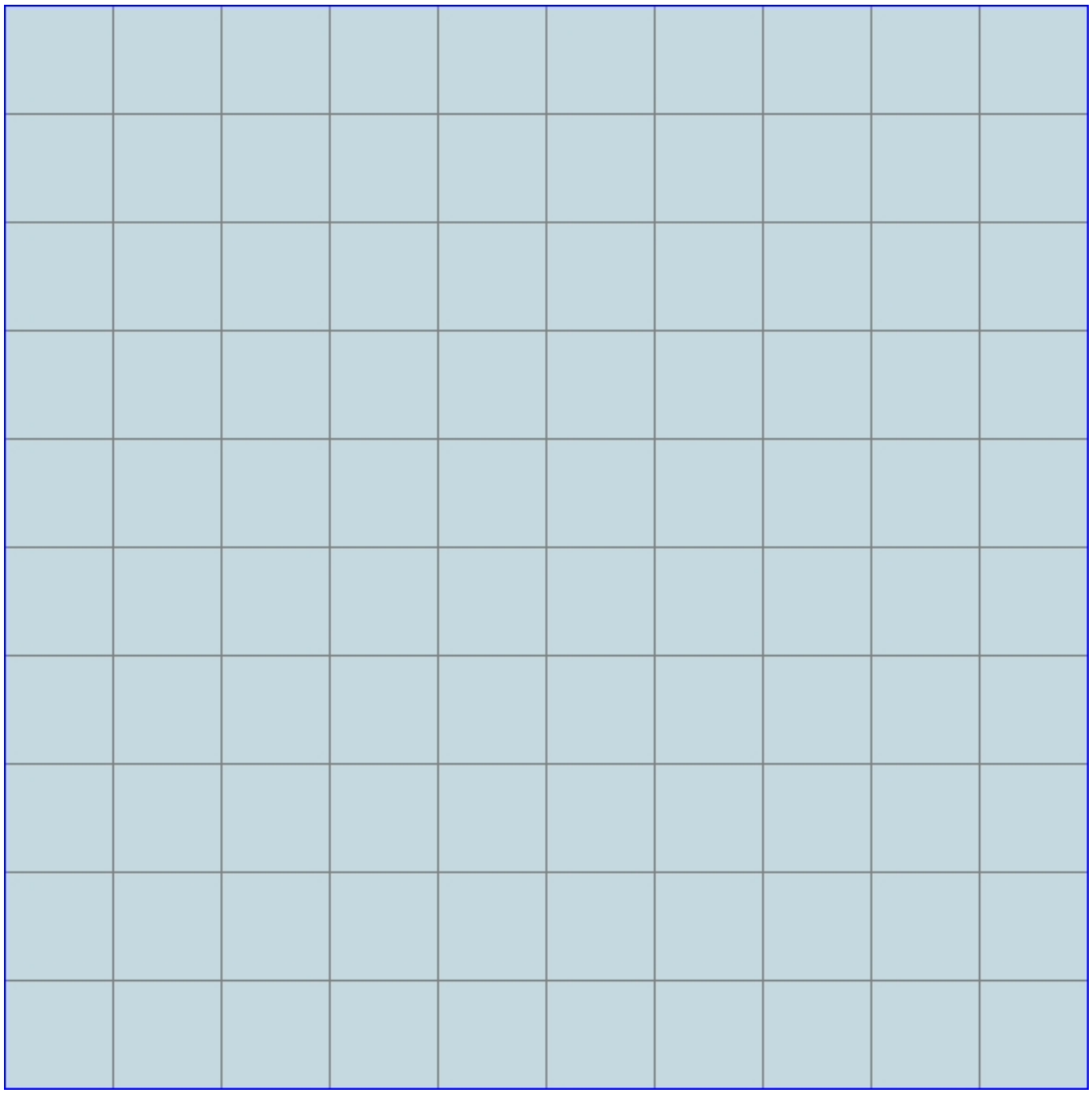
# *Appendix*

## *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   Impervious Area Basin.wdm
MESSU      25   PreImpervious Area Basin.MES
           27   PreImpervious Area Basin.L61
           28   PreImpervious Area Basin.L62
           30   POCImpervious Area Basin1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      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           ***
  END GEN-INFO
  *** Section PWATER***

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

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

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

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```
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  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
  END PWAT-STATE1

END PERLND

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

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND
```

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```
SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
IMPLND   1                        0.89     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
```

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


END MASS-LINK

END RUN
```

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*Mitigated UCI File*

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## *Predeveloped HSPF Message File*

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# Disclaimer

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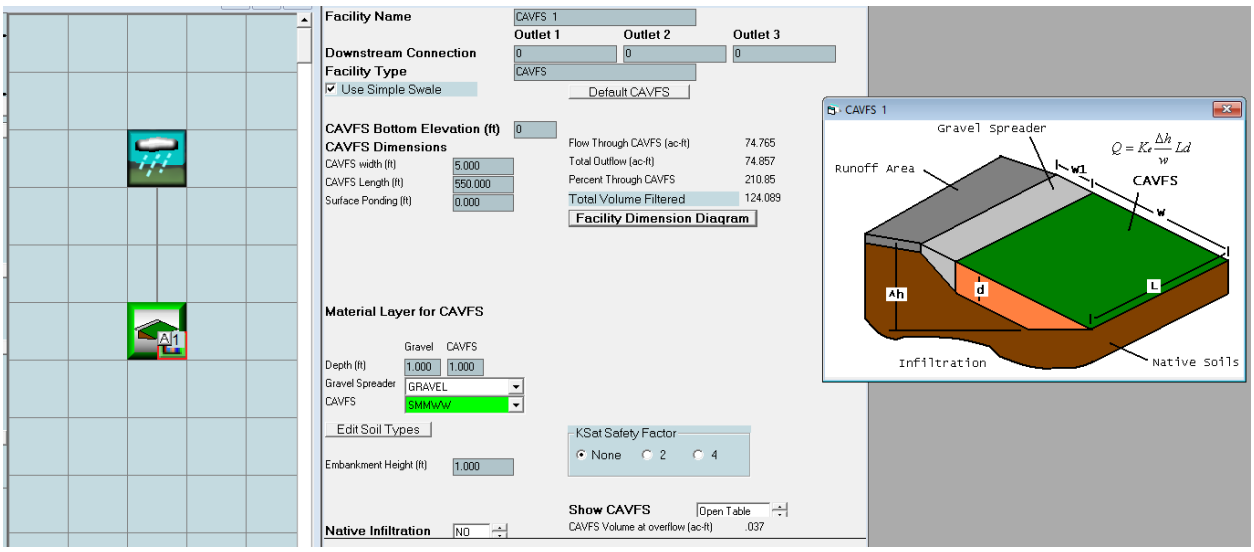
## Wetland Discharge Model Report Summary

A model was created using WWHM to show that the flows entering the wetland in the developed condition are within the 0.15 cfs threshold that would require the project to provide wetland protection via Minimum Requirement #8. The areas used to create the model in the following pages can be seen in Section 4.2 and Figure 4-8 at the end of Section 4. This area is accounted for in the flow control model for the Private Partial Infiltration Vault, therefore it is not necessary for this specific model to meet the flow control standard. The purpose of this model is only to compare the peak flow rates from the predeveloped condition entering the wetland to the developed discharge towards the wetland. Note that the 100-year peak flow increases by 0.09 cfs in the developed condition. The screenshot of the filter strip as designed using WWHM is shown below.




Flow Frequency Return Periods for Predeveloped. POC #1
**Return Period Flow(cfs)**
100 year 0.212893

Flow Frequency Return Periods for Mitigated. POC #1
**Return Period Flow(cfs)**
100 year 0.307246

# WWHM2012

# PROJECT REPORT

CALCULATIONS FOR THE AREA DISCHARGED TOWARDS THE WETLAND. THE CALCULATIONS SHOW THAT THE 100-YEAR PEAK FLOW RATE INCREASES BY LESS THAN 0.15 CFS IN THE DEVELOPED CONDITION, THEREFORE THE PROJECT IS NOT REQUIRED TO PROVIDE WETLAND PROTECTION.

# General Model Information

| | |
|---|---|
| Project Name: | 18122 East Bypass to Wetland |
| Site Name: | Woodside |
| Site Address: | |
| City: | Redmond |
| Report Date: | 12/12/2019 |
| 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 |

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# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Forest, Steep | 0.46 |
| C, Lawn, Steep | 0.3 |
| Pervious Total | 0.76 |
| Impervious Land Use | Acres |
| Impervious Total | 0 |
| Basin Total | 0.76 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

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## *Mitigated Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | Acres |
| C, Lawn, Steep | 0.23 |
| C, Lawn, Mod | 0.24 |
| Pervious Total | 0.47 |
| Impervious Land Use | Acres |
| ROADS FLAT | 0.23 |
| Impervious Total | 0.23 |
| Basin Total | 0.7 |

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| CAVFS 1 Surface 1 | CAVFS 1 Surface 1 | |

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# Routing Elements
## Predeveloped Routing

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## *Mitigated Routing*

## CAVFS 1

| | |
|---|---|
| CAVFS Length: | 550.00 ft. |
| CAVFS Width: | 5.00 ft. |
| Gravel thickness: | 1 ft. |
| Material thickness of CAVFS layer: | 1 ft. |
| Slope of CAVFS layer: | 0.2 ft. |
| | Outlet Control |
| Overflow Height: | 0.5 ft. |
| Overflow width: | 275 in. |
| Element Flows To: | |
| Outlet 1 Outlet 2 | |

CAVFS Hydraulic Table

| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.0126 | 0.0000 | 0.0000 | 0.0000 |
| 0.0714 | 0.0126 | 0.0004 | 0.0000 | 0.0000 |
| 0.1429 | 0.0126 | 0.0007 | 0.0000 | 0.0000 |
| 0.2143 | 0.0126 | 0.0011 | 0.0000 | 0.0000 |
| 0.2857 | 0.0126 | 0.0015 | 0.0000 | 0.0000 |
| 0.3571 | 0.0126 | 0.0019 | 0.0000 | 0.0000 |
| 0.4286 | 0.0126 | 0.0022 | 0.0000 | 0.0000 |
| 0.5000 | 0.0126 | 0.0026 | 0.0001 | 0.0000 |
| 0.5714 | 0.0126 | 0.0030 | 0.0001 | 0.0000 |
| 0.6429 | 0.0126 | 0.0034 | 0.0002 | 0.0000 |
| 0.7143 | 0.0126 | 0.0037 | 0.0003 | 0.0000 |
| 0.7857 | 0.0126 | 0.0041 | 0.0004 | 0.0000 |
| 0.8571 | 0.0126 | 0.0045 | 0.0005 | 0.0000 |
| 0.9286 | 0.0126 | 0.0049 | 0.0007 | 0.0000 |
| 1.0000 | 0.0126 | 0.0052 | 0.0009 | 0.0000 |
| 1.0714 | 0.0126 | 0.0056 | 0.0011 | 0.0000 |
| 1.1429 | 0.0126 | 0.0060 | 0.0014 | 0.0000 |
| 1.2143 | 0.0126 | 0.0063 | 0.0017 | 0.0000 |
| 1.2857 | 0.0126 | 0.0067 | 0.0020 | 0.0000 |
| 1.3571 | 0.0126 | 0.0070 | 0.0024 | 0.0000 |
| 1.4286 | 0.0126 | 0.0074 | 0.0028 | 0.0000 |
| 1.5000 | 0.0126 | 0.0077 | 0.0032 | 0.0000 |
| 1.5714 | 0.0126 | 0.0081 | 0.0037 | 0.0000 |
| 1.6429 | 0.0126 | 0.0084 | 0.0042 | 0.0000 |
| 1.7143 | 0.0126 | 0.0088 | 0.0048 | 0.0000 |
| 1.7857 | 0.0126 | 0.0092 | 0.0054 | 0.0000 |
| 1.8571 | 0.0126 | 0.0095 | 0.0061 | 0.0000 |
| 1.9286 | 0.0126 | 0.0099 | 0.0068 | 0.0000 |
| 2.0000 | 0.0126 | 0.0102 | 0.0075 | 0.0000 |
| 2.0714 | 0.0126 | 0.0106 | 0.0083 | 0.0000 |
| 2.1429 | 0.0126 | 0.0109 | 0.0092 | 0.0000 |
| 2.2143 | 0.0126 | 0.0113 | 0.0101 | 0.0000 |
| 2.2857 | 0.0126 | 0.0117 | 0.0110 | 0.0000 |
| 2.3571 | 0.0126 | 0.0120 | 0.0120 | 0.0000 |
| 2.4286 | 0.0126 | 0.0124 | 0.0130 | 0.0000 |
| 2.5000 | 0.0126 | 0.0127 | 0.0141 | 0.0000 |
| 2.5714 | 0.0126 | 0.0131 | 0.0153 | 0.0000 |
| 2.6429 | 0.0126 | 0.0134 | 0.0165 | 0.0000 |
| 2.7143 | 0.0126 | 0.0138 | 0.0178 | 0.0000 |

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| | | | | |
|---|---|---|---|---|
| 2.7857 | 0.0126 | 0.0141 | 0.0191 | 0.0000 |
| 2.8571 | 0.0126 | 0.0145 | 0.0205 | 0.0000 |
| 2.9286 | 0.0126 | 0.0149 | 0.0219 | 0.0000 |
| 3.0000 | 0.0126 | 0.0152 | 0.0234 | 0.0000 |
| 3.0714 | 0.0126 | 0.0156 | 0.0250 | 0.0000 |
| 3.1429 | 0.0126 | 0.0159 | 0.0266 | 0.0000 |
| 3.2143 | 0.0126 | 0.0163 | 0.0283 | 0.0000 |
| 3.2857 | 0.0126 | 0.0166 | 0.0301 | 0.0000 |
| 3.3571 | 0.0126 | 0.0170 | 0.0319 | 0.0000 |
| 3.4286 | 0.0126 | 0.0174 | 0.0338 | 0.0000 |
| 3.5000 | 0.0126 | 0.0177 | 0.0357 | 0.0000 |
| 3.5714 | 0.0126 | 0.0181 | 0.0377 | 0.0000 |
| 3.6429 | 0.0126 | 0.0184 | 0.0398 | 0.0000 |
| 3.7143 | 0.0126 | 0.0188 | 0.0419 | 0.0000 |
| 3.7857 | 0.0126 | 0.0191 | 0.0441 | 0.0000 |
| 3.8571 | 0.0126 | 0.0195 | 0.0464 | 0.0000 |
| 3.9286 | 0.0126 | 0.0198 | 0.0487 | 0.0000 |
| 4.0000 | 0.0126 | 0.0202 | 0.0511 | 0.0000 |
| 4.0714 | 0.0126 | 0.0206 | 0.0536 | 0.0000 |
| 4.1429 | 0.0126 | 0.0209 | 0.0562 | 0.0000 |
| 4.2143 | 0.0126 | 0.0213 | 0.0588 | 0.0000 |
| 4.2857 | 0.0126 | 0.0216 | 0.0615 | 0.0000 |
| 4.3571 | 0.0126 | 0.0220 | 0.0643 | 0.0000 |
| 4.4286 | 0.0126 | 0.0223 | 0.0671 | 0.0000 |
| 4.5000 | 0.0126 | 0.0227 | 0.0700 | 0.0000 |
| 4.5714 | 0.0126 | 0.0231 | 0.0730 | 0.0000 |
| 4.6429 | 0.0126 | 0.0234 | 0.0761 | 0.0000 |
| 4.7143 | 0.0126 | 0.0238 | 0.0792 | 0.0000 |
| 4.7857 | 0.0126 | 0.0241 | 0.0824 | 0.0000 |
| 4.8571 | 0.0126 | 0.0245 | 0.0857 | 0.0000 |
| 4.9286 | 0.0126 | 0.0248 | 0.0891 | 0.0000 |
| 5.0000 | 0.0126 | 0.0252 | 0.0925 | 0.0000 |
| 5.0714 | 0.0126 | 0.0255 | 0.0960 | 0.0000 |
| 5.1429 | 0.0126 | 0.0259 | 0.0996 | 0.0000 |
| 5.2143 | 0.0126 | 0.0263 | 0.1033 | 0.0000 |
| 5.2857 | 0.0126 | 0.0266 | 0.1681 | 0.0000 |
| 5.3571 | 0.0126 | 0.0270 | 0.1681 | 0.0000 |
| 5.4286 | 0.0126 | 0.0273 | 0.1681 | 0.0000 |
| 5.5000 | 0.0126 | 0.0277 | 0.1681 | 0.0000 |
| 5.5714 | 0.0126 | 0.0280 | 0.1681 | 0.0000 |
| 5.6429 | 0.0126 | 0.0284 | 0.1681 | 0.0000 |
| 5.7143 | 0.0126 | 0.0288 | 0.1681 | 0.0000 |
| 5.7857 | 0.0126 | 0.0291 | 0.1681 | 0.0000 |
| 5.8571 | 0.0126 | 0.0295 | 0.1681 | 0.0000 |
| 5.9286 | 0.0126 | 0.0298 | 0.1681 | 0.0000 |
| 6.0000 | 0.0126 | 0.0302 | 0.1681 | 0.0000 |
| 6.0000 | 0.0126 | 0.0302 | 0.1681 | 0.0000 |

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CAVFS Hydraulic Table

| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | To Amended(cfs) | Infilt(cfs) |
|---|---|---|---|---|---|
| 6.0000 | 0.0126 | 0.0302 | 0.0000 | 0.1681 | 0.0000 |
| 6.0714 | 0.0126 | 0.0311 | 0.0000 | 0.1681 | 0.0000 |
| 6.1429 | 0.0126 | 0.0320 | 0.0000 | 0.1681 | 0.0000 |
| 6.2143 | 0.0126 | 0.0329 | 0.0000 | 0.1681 | 0.0000 |
| 6.2857 | 0.0126 | 0.0338 | 0.0000 | 0.1681 | 0.0000 |
| 6.3571 | 0.0126 | 0.0347 | 0.0000 | 0.1681 | 0.0000 |
| 6.4286 | 0.0126 | 0.0356 | 0.0000 | 0.1681 | 0.0000 |
| 6.5000 | 0.0126 | 0.0365 | 0.0001 | 0.1681 | 0.0000 |

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## CAVFS 1 Surface 1

Element Flows To:

| | |
|---|---|
| Outlet 1 | Outlet 2 |
| | CAVFS 1 |

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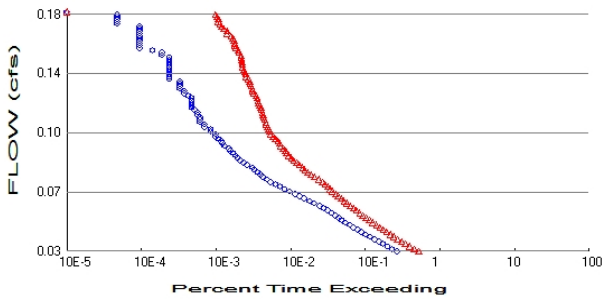
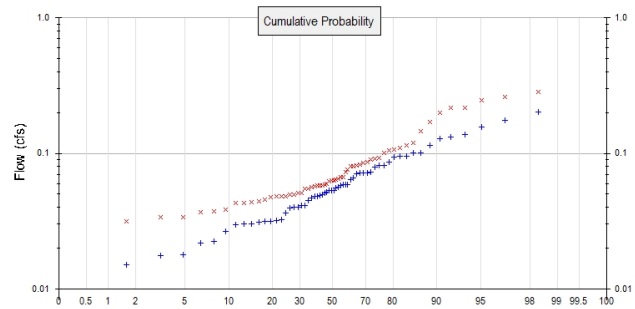
# *Analysis Results*
## *POC 1*




+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.76
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.47
Total Impervious Area: 0.23

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.053385 |
| 5 year | 0.088055 |
| 10 year | 0.114382 |
| 25 year | 0.151184 |
| 50 year | 0.181037 |
| 100 year | 0.212893 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.067145 |
| 5 year | 0.110272 |
| 10 year | 0.147656 |
| 25 year | 0.206805 |
| 50 year | 0.260799 |
| 100 year | 0.324471 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.095 | 0.080 |
| 1950 | 0.095 | 0.120 |
| 1951 | 0.072 | 0.086 |
| 1952 | 0.031 | 0.048 |
| 1953 | 0.022 | 0.037 |
| 1954 | 0.041 | 0.050 |
| 1955 | 0.054 | 0.076 |
| 1956 | 0.058 | 0.063 |
| 1957 | 0.064 | 0.083 |
| 1958 | 0.036 | 0.057 |

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| | | |
|---|---|---|
| 1959 | 0.032 | 0.048 |
| 1960 | 0.071 | 0.080 |
| 1961 | 0.040 | 0.054 |
| 1962 | 0.022 | 0.034 |
| 1963 | 0.048 | 0.045 |
| 1964 | 0.052 | 0.044 |
| 1965 | 0.059 | 0.048 |
| 1966 | 0.032 | 0.048 |
| 1967 | 0.101 | 0.106 |
| 1968 | 0.054 | 0.062 |
| 1969 | 0.053 | 0.064 |
| 1970 | 0.049 | 0.058 |
| 1971 | 0.057 | 0.059 |
| 1972 | 0.082 | 0.106 |
| 1973 | 0.030 | 0.050 |
| 1974 | 0.059 | 0.051 |
| 1975 | 0.073 | 0.085 |
| 1976 | 0.048 | 0.056 |
| 1977 | 0.031 | 0.031 |
| 1978 | 0.039 | 0.066 |
| 1979 | 0.018 | 0.038 |
| 1980 | 0.128 | 0.145 |
| 1981 | 0.040 | 0.065 |
| 1982 | 0.101 | 0.199 |
| 1983 | 0.049 | 0.058 |
| 1984 | 0.030 | 0.043 |
| 1985 | 0.030 | 0.051 |
| 1986 | 0.071 | 0.092 |
| 1987 | 0.066 | 0.092 |
| 1988 | 0.026 | 0.043 |
| 1989 | 0.018 | 0.034 |
| 1990 | 0.201 | 0.285 |
| 1991 | 0.132 | 0.262 |
| 1992 | 0.045 | 0.059 |
| 1993 | 0.031 | 0.044 |
| 1994 | 0.015 | 0.026 |
| 1995 | 0.041 | 0.058 |
| 1996 | 0.115 | 0.110 |
| 1997 | 0.079 | 0.090 |
| 1998 | 0.047 | 0.055 |
| 1999 | 0.138 | 0.171 |
| 2000 | 0.051 | 0.067 |
| 2001 | 0.015 | 0.037 |
| 2002 | 0.072 | 0.115 |
| 2003 | 0.086 | 0.073 |
| 2004 | 0.094 | 0.218 |
| 2005 | 0.058 | 0.082 |
| 2006 | 0.056 | 0.063 |
| 2007 | 0.175 | 0.217 |
| 2008 | 0.157 | 0.246 |
| 2009 | 0.082 | 0.100 |

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## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.2009 | 0.2852 |
| 2 | 0.1746 | 0.2623 |
| 3 | 0.1574 | 0.2463 |

| | | |
|---|---|---|
| 4 | 0.1381 | 0.2180 |
| 5 | 0.1319 | 0.2173 |
| 6 | 0.1278 | 0.1986 |
| 7 | 0.1149 | 0.1705 |
| 8 | 0.1010 | 0.1451 |
| 9 | 0.1010 | 0.1202 |
| 10 | 0.0954 | 0.1148 |
| 11 | 0.0947 | 0.1102 |
| 12 | 0.0941 | 0.1064 |
| 13 | 0.0856 | 0.1057 |
| 14 | 0.0819 | 0.1002 |
| 15 | 0.0815 | 0.0923 |
| 16 | 0.0788 | 0.0917 |
| 17 | 0.0726 | 0.0899 |
| 18 | 0.0719 | 0.0858 |
| 19 | 0.0717 | 0.0850 |
| 20 | 0.0713 | 0.0831 |
| 21 | 0.0707 | 0.0817 |
| 22 | 0.0659 | 0.0803 |
| 23 | 0.0638 | 0.0801 |
| 24 | 0.0590 | 0.0763 |
| 25 | 0.0586 | 0.0728 |
| 26 | 0.0584 | 0.0671 |
| 27 | 0.0576 | 0.0664 |
| 28 | 0.0566 | 0.0651 |
| 29 | 0.0558 | 0.0644 |
| 30 | 0.0535 | 0.0633 |
| 31 | 0.0535 | 0.0629 |
| 32 | 0.0531 | 0.0623 |
| 33 | 0.0515 | 0.0594 |
| 34 | 0.0507 | 0.0587 |
| 35 | 0.0494 | 0.0582 |
| 36 | 0.0486 | 0.0580 |
| 37 | 0.0485 | 0.0580 |
| 38 | 0.0478 | 0.0569 |
| 39 | 0.0468 | 0.0563 |
| 40 | 0.0451 | 0.0549 |
| 41 | 0.0414 | 0.0544 |
| 42 | 0.0414 | 0.0507 |
| 43 | 0.0403 | 0.0507 |
| 44 | 0.0400 | 0.0499 |
| 45 | 0.0394 | 0.0496 |
| 46 | 0.0363 | 0.0485 |
| 47 | 0.0323 | 0.0481 |
| 48 | 0.0321 | 0.0481 |
| 49 | 0.0314 | 0.0475 |
| 50 | 0.0313 | 0.0453 |
| 51 | 0.0310 | 0.0441 |
| 52 | 0.0302 | 0.0437 |
| 53 | 0.0300 | 0.0428 |
| 54 | 0.0296 | 0.0428 |
| 55 | 0.0264 | 0.0385 |
| 56 | 0.0223 | 0.0373 |
| 57 | 0.0218 | 0.0366 |
| 58 | 0.0179 | 0.0339 |
| 59 | 0.0176 | 0.0337 |
| 60 | 0.0150 | 0.0315 |
| 61 | 0.0148 | 0.0261 |

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## Duration Flows

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0267 | 5604 | 11120 | 198 | Fail |
| 0.0283 | 4834 | 9619 | 198 | Fail |
| 0.0298 | 4203 | 8384 | 199 | Fail |
| 0.0314 | 3657 | 7353 | 201 | Fail |
| 0.0329 | 3228 | 6502 | 201 | Fail |
| 0.0345 | 2830 | 5775 | 204 | Fail |
| 0.0360 | 2468 | 5133 | 207 | Fail |
| 0.0376 | 2156 | 4611 | 213 | Fail |
| 0.0392 | 1874 | 4139 | 220 | Fail |
| 0.0407 | 1689 | 3732 | 220 | Fail |
| 0.0423 | 1486 | 3332 | 224 | Fail |
| 0.0438 | 1320 | 3009 | 227 | Fail |
| 0.0454 | 1161 | 2693 | 231 | Fail |
| 0.0470 | 1022 | 2438 | 238 | Fail |
| 0.0485 | 931 | 2186 | 234 | Fail |
| 0.0501 | 839 | 1974 | 235 | Fail |
| 0.0516 | 754 | 1799 | 238 | Fail |
| 0.0532 | 661 | 1620 | 245 | Fail |
| 0.0548 | 586 | 1476 | 251 | Fail |
| 0.0563 | 519 | 1334 | 257 | Fail |
| 0.0579 | 443 | 1206 | 272 | Fail |
| 0.0594 | 381 | 1109 | 291 | Fail |
| 0.0610 | 322 | 1012 | 314 | Fail |
| 0.0626 | 282 | 921 | 326 | Fail |
| 0.0641 | 243 | 848 | 348 | Fail |
| 0.0657 | 206 | 768 | 372 | Fail |
| 0.0672 | 175 | 714 | 408 | Fail |
| 0.0688 | 153 | 671 | 438 | Fail |
| 0.0703 | 134 | 614 | 458 | Fail |
| 0.0719 | 114 | 567 | 497 | Fail |
| 0.0735 | 103 | 506 | 491 | Fail |
| 0.0750 | 89 | 442 | 496 | Fail |
| 0.0766 | 84 | 398 | 473 | Fail |
| 0.0781 | 77 | 359 | 466 | Fail |
| 0.0797 | 69 | 331 | 479 | Fail |
| 0.0813 | 65 | 308 | 473 | Fail |
| 0.0828 | 55 | 279 | 507 | Fail |
| 0.0844 | 50 | 256 | 512 | Fail |
| 0.0859 | 45 | 235 | 522 | Fail |
| 0.0875 | 41 | 219 | 534 | Fail |
| 0.0891 | 39 | 203 | 520 | Fail |
| 0.0906 | 36 | 188 | 522 | Fail |
| 0.0922 | 33 | 182 | 551 | Fail |
| 0.0937 | 32 | 169 | 528 | Fail |
| 0.0953 | 28 | 156 | 557 | Fail |
| 0.0968 | 26 | 152 | 584 | Fail |
| 0.0984 | 25 | 145 | 580 | Fail |
| 0.1000 | 23 | 134 | 582 | Fail |
| 0.1015 | 21 | 124 | 590 | Fail |
| 0.1031 | 21 | 115 | 547 | Fail |
| 0.1046 | 18 | 111 | 616 | Fail |
| 0.1062 | 18 | 109 | 605 | Fail |
| 0.1078 | 15 | 105 | 700 | Fail |
| 0.1093 | 15 | 101 | 673 | Fail |

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| | | | | |
|---|---|---|---|---|
| 0.1109 | 13 | 99 | 761 | Fail |
| 0.1124 | 13 | 95 | 730 | Fail |
| 0.1140 | 13 | 92 | 707 | Fail |
| 0.1156 | 12 | 91 | 758 | Fail |
| 0.1171 | 12 | 89 | 741 | Fail |
| 0.1187 | 11 | 86 | 781 | Fail |
| 0.1202 | 10 | 85 | 850 | Fail |
| 0.1218 | 10 | 81 | 810 | Fail |
| 0.1234 | 10 | 79 | 790 | Fail |
| 0.1249 | 10 | 78 | 780 | Fail |
| 0.1265 | 10 | 76 | 760 | Fail |
| 0.1280 | 9 | 73 | 811 | Fail |
| 0.1296 | 8 | 68 | 850 | Fail |
| 0.1311 | 8 | 67 | 837 | Fail |
| 0.1327 | 7 | 65 | 928 | Fail |
| 0.1343 | 7 | 63 | 900 | Fail |
| 0.1358 | 7 | 61 | 871 | Fail |
| 0.1374 | 7 | 60 | 857 | Fail |
| 0.1389 | 5 | 58 | 1160 | Fail |
| 0.1405 | 5 | 53 | 1060 | Fail |
| 0.1421 | 5 | 53 | 1060 | Fail |
| 0.1436 | 5 | 52 | 1040 | Fail |
| 0.1452 | 5 | 50 | 1000 | Fail |
| 0.1467 | 5 | 48 | 960 | Fail |
| 0.1483 | 5 | 48 | 960 | Fail |
| 0.1499 | 5 | 48 | 960 | Fail |
| 0.1514 | 5 | 47 | 939 | Fail |
| 0.1530 | 5 | 46 | 920 | Fail |
| 0.1545 | 4 | 46 | 1150 | Fail |
| 0.1561 | 4 | 43 | 1075 | Fail |
| 0.1577 | 3 | 42 | 1400 | Fail |
| 0.1592 | 2 | 39 | 1950 | Fail |
| 0.1608 | 2 | 38 | 1900 | Fail |
| 0.1623 | 2 | 38 | 1900 | Fail |
| 0.1639 | 2 | 37 | 1850 | Fail |
| 0.1654 | 2 | 36 | 1800 | Fail |
| 0.1670 | 2 | 34 | 1700 | Fail |
| 0.1686 | 2 | 30 | 1500 | Fail |
| 0.1701 | 2 | 30 | 1500 | Fail |
| 0.1717 | 2 | 27 | 1350 | Fail |
| 0.1732 | 2 | 25 | 1250 | Fail |
| 0.1748 | 1 | 24 | 2400 | Fail |
| 0.1764 | 1 | 23 | 2300 | Fail |
| 0.1779 | 1 | 23 | 2300 | Fail |
| 0.1795 | 1 | 22 | 2200 | Fail |
| 0.1810 | 1 | 21 | 2100 | Fail |

DRAFT

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: | 0.0175 acre-feet |
| On-line facility target flow: | 0.0088 cfs. |
| Adjusted for 15 min: | 0.0088 cfs. |
| Off-line facility target flow: | 0.0061 cfs. |
| Adjusted for 15 min: | 0.0061 cfs. |

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# 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 |
|---|---|---|---|---|---|---|---|---|---|
| CAVFS 1 1 POC | ☐ | 68.12 | | | ☐ | 0.00 | | | |
| Total Volume Infiltrated | | 68.12 | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Failed |
| | | | | | | | | | |

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# *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.

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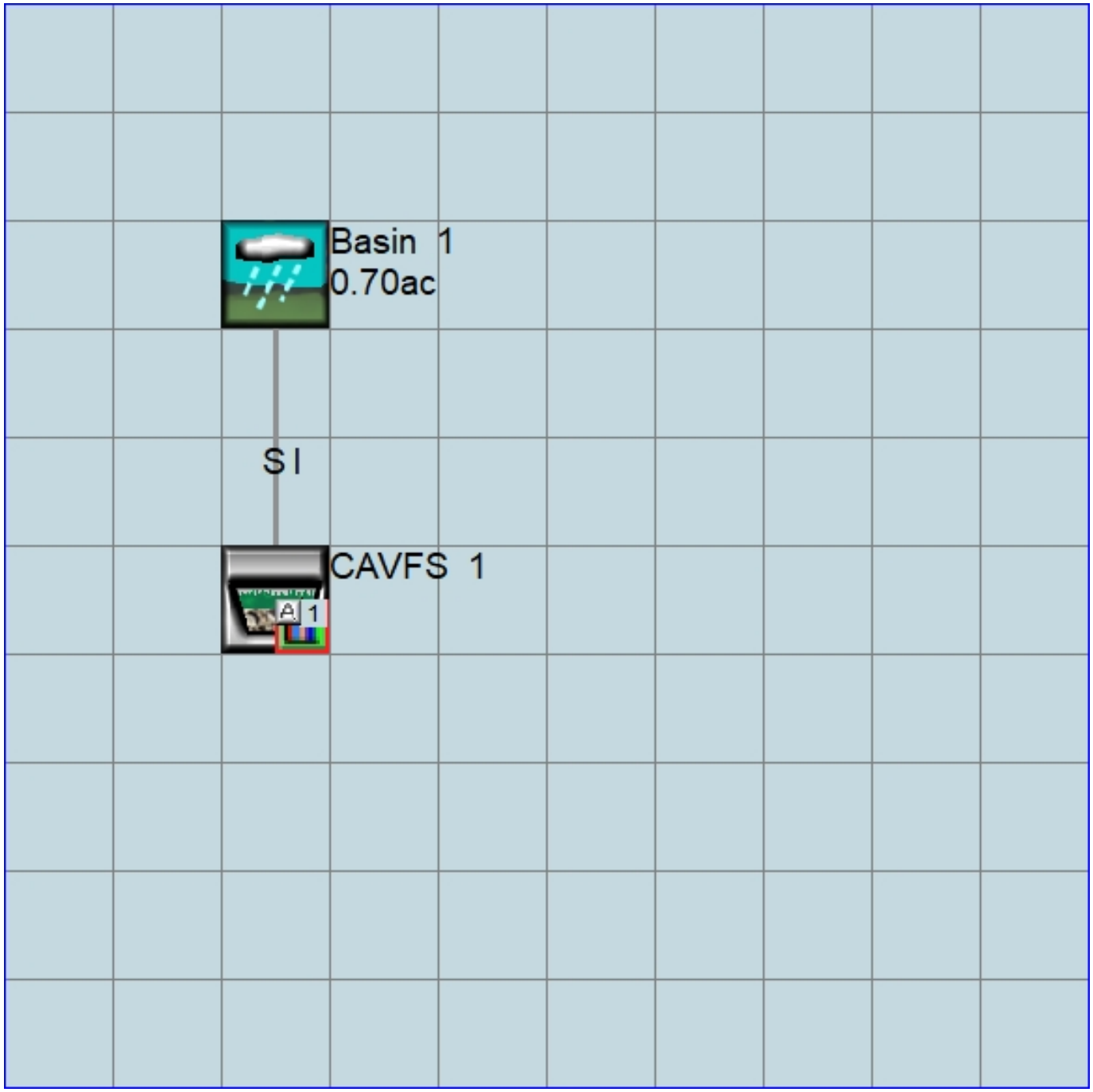
# *Appendix*
## *Predeveloped Schematic*

## *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   18122 East Bypass to Wetland.wdm
MESSU      25   Pre18122 East Bypass to Wetland.MES
           27   Pre18122 East Bypass to Wetland.L61
           28   Pre18122 East Bypass to Wetland.L62
           30   POC18122 East Bypass to Wetland1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      12
      PERLND      18
      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
   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 ***
   12         0    0    1    0    0    0    0    0    0    0    0    0
   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  *********
```

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```
  12         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  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 ***
  12         0    0    0    0    0    0    0    0    0    0    0
  18         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  12              0       4.5      0.08       400      0.15       0.5     0.996
  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
  12              0         0         2         2         0         0         0
  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 ***
  12            0.2       0.3      0.35         6       0.3       0.7
  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
  12              0         0         0         0       2.5         1         0
  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           ***
  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
```

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```
    <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                        0.46     COPY   501     12
PERLND  12                        0.46     COPY   501     13
PERLND  18                         0.3     COPY   501     12
PERLND  18                         0.3     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
```

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```
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
```

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## *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   18122 East Bypass to Wetland.wdm
MESSU      25   Mit18122 East Bypass to Wetland.MES
           27   Mit18122 East Bypass to Wetland.L61
           28   Mit18122 East Bypass to Wetland.L62
           30   POC18122 East Bypass to Wetland1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      18
      PERLND      17
      IMPLND       1
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        CAVFS  1 Surface 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
   17     C, Lawn, Mod            1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   18         0    0    1    0    0    0    0    0    0    0    0    0
   17         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

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```
  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
   17         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    0
   17         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   18              0       4.5      0.03       400      0.15       0.5     0.996
   17              0       4.5      0.03       400       0.1       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
   17              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
   17            0.1      0.25      0.25         6       0.5      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
   17              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           ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

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

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```
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  18                        0.23     RCHRES   1      2
PERLND  18                        0.23     RCHRES   1      3
PERLND  17                        0.24     RCHRES   1      2
PERLND  17                        0.24     RCHRES   1      3
IMPLND   1                        0.23     RCHRES   1      5

******Routing******
PERLND  18                        0.23     COPY     1     12
PERLND  17                        0.24     COPY     1     12
IMPLND   1                        0.23     COPY     1     15
PERLND  18                        0.23     COPY     1     13
PERLND  17                        0.24     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

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


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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     CAVFS  1 Surface-022    3    1    1    1   28    0    1
    2     CAVFS  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

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```
  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                        ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1        0  1  0  0    4  5  6  0  0      0  0  0  0  0        2  2  2  2  2
    2        0  1  0  0    4  0  0  0  0      0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.5       0.0
    2              2       0.1       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                           ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   86    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.012626  0.000000  0.000000
  0.071429  0.012626  0.000374  0.000000
  0.142857  0.012626  0.000749  0.000000
  0.214286  0.012626  0.001123  0.000000
  0.285714  0.012626  0.001497  0.000000
  0.357143  0.012626  0.001871  0.000000
  0.428571  0.012626  0.002246  0.000000
  0.500000  0.012626  0.002620  0.000052
  0.571429  0.012626  0.002994  0.000101
  0.642857  0.012626  0.003369  0.000170
  0.714286  0.012626  0.003743  0.000260
  0.785714  0.012626  0.004117  0.000375
  0.857143  0.012626  0.004491  0.000516
  0.928571  0.012626  0.004866  0.000684
  1.000000  0.012626  0.005240  0.000882
  1.071429  0.012626  0.005596  0.001111
  1.142857  0.012626  0.005952  0.001372
  1.214286  0.012626  0.006309  0.001667
  1.285714  0.012626  0.006665  0.001998
  1.357143  0.012626  0.007021  0.002365
  1.428571  0.012626  0.007377  0.002770
  1.500000  0.012626  0.007734  0.003214
  1.571429  0.012626  0.008090  0.003698
  1.642857  0.012626  0.008446  0.004223
  1.714286  0.012626  0.008802  0.004792
  1.785714  0.012626  0.009159  0.005403
  1.857143  0.012626  0.009515  0.006060
  1.928571  0.012626  0.009871  0.006763
  2.000000  0.012626  0.010227  0.007512
  2.071429  0.012626  0.010584  0.008309
```

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```
  2.142857  0.012626  0.010940  0.009155
  2.214286  0.012626  0.011296  0.010051
  2.285714  0.012626  0.011652  0.010997
  2.357143  0.012626  0.012008  0.011995
  2.428571  0.012626  0.012365  0.013046
  2.500000  0.012626  0.012721  0.014150
  2.571429  0.012626  0.013077  0.015308
  2.642857  0.012626  0.013433  0.016522
  2.714286  0.012626  0.013790  0.017792
  2.785714  0.012626  0.014146  0.019118
  2.857143  0.012626  0.014502  0.020502
  2.928571  0.012626  0.014858  0.021945
  3.000000  0.012626  0.015215  0.023448
  3.071429  0.012626  0.015571  0.025010
  3.142857  0.012626  0.015927  0.026633
  3.214286  0.012626  0.016283  0.028318
  3.285714  0.012626  0.016640  0.030065
  3.357143  0.012626  0.016996  0.031876
  3.428571  0.012626  0.017352  0.033750
  3.500000  0.012626  0.017708  0.035689
  3.571429  0.012626  0.018065  0.037694
  3.642857  0.012626  0.018421  0.039765
  3.714286  0.012626  0.018777  0.041902
  3.785714  0.012626  0.019133  0.044107
  3.857143  0.012626  0.019490  0.046380
  3.928571  0.012626  0.019846  0.048722
  4.000000  0.012626  0.020202  0.051133
  4.071429  0.012626  0.020558  0.053615
  4.142857  0.012626  0.020915  0.056167
  4.214286  0.012626  0.021271  0.058791
  4.285714  0.012626  0.021627  0.061486
  4.357143  0.012626  0.021983  0.064255
  4.428571  0.012626  0.022339  0.067096
  4.500000  0.012626  0.022696  0.070012
  4.571429  0.012626  0.023052  0.073002
  4.642857  0.012626  0.023408  0.076067
  4.714286  0.012626  0.023764  0.079207
  4.785714  0.012626  0.024121  0.082423
  4.857143  0.012626  0.024477  0.085715
  4.928571  0.012626  0.024833  0.089083
  5.000000  0.012626  0.025189  0.092528
  5.071429  0.012626  0.025546  0.096048
  5.142857  0.012626  0.025902  0.099643
  5.214286  0.012626  0.026258  0.103307
  5.285714  0.012626  0.026614  0.168056
  5.357143  0.012626  0.026971  0.168056
  5.428571  0.012626  0.027327  0.168056
  5.500000  0.012626  0.027683  0.168056
  5.571429  0.012626  0.028039  0.168056
  5.642857  0.012626  0.028396  0.168056
  5.714286  0.012626  0.028752  0.168056
  5.785714  0.012626  0.029108  0.168056
  5.857143  0.012626  0.029464  0.168056
  5.928571  0.012626  0.029821  0.168056
  6.000000  0.012626  0.030177  0.168056
  6.000000  0.012626  0.060354  0.168056
  END FTABLE  2
  FTABLE      1
    9    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.012626  0.000000  0.000000  0.000000  0.000000
  0.035715  0.012626  0.000451  0.000000  0.168056  0.000000
  0.071429  0.012626  0.000902  0.000000  0.168056  0.000000
  0.142857  0.012626  0.001804  8.124783  0.168056  0.000000
  0.214286  0.012626  0.002706  35.38057  0.168056  0.000000
  0.285714  0.012626  0.003608  73.29003  0.168056  0.000000
  0.357143  0.012626  0.004509  119.4094  0.168056  0.000000
```

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```
  0.428571  0.012626  0.005411  172.4732  0.168056  0.000000
  0.500000  0.012626  0.006313  231.6685  0.168056  0.000000
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              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
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1011 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1012 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1013 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  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

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK
```

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```
END RUN
```

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## *Predeveloped HSPF Message File*

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## *Mitigated HSPF Message File*

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