Preliminary Stormwater Site Plan

PREPARED FOR:

Olympia School District
1113 Legion Way SE
Olympia, WA 98501

PROJECT:

Olympia High School Classroom Modernization
1302 North Street SE
Olympia, WA 98501
2180015.10

PREPARED BY:

Trevor J. McDonald, EIT
Project Engineer

REVIEWED BY:

Lucas Johnson, PE, LEED AP
Project Manager

DATE:

January 2019

Preliminary Stormwater Site Plan

PREPARED FOR:

Olympia School District
1113 Legion Way SE
Olympia, WA 98501

PROJECT:

Olympia High School Classroom Modernization
1302 North Street SE
Olympia, WA 98501
2180015.10

PREPARED BY:

Trevor J. McDonald, EIT
Project Engineer

REVIEWED BY:

Lucas Johnson, PE, LEED AP
Project Manager

DATE:

January 2019

1/11/2019

I hereby state that this Preliminary Stormwater Site Plan for the Olympia High School Addition project has been prepared by me or under my supervision, and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that City of Olympia does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

Table of Contents

Appendices

Appendix A

Exhibits

A-1............ *DDECM* Flow Charts
A-2............ Determination of Stormwater Requirements
A-3............ Vicinity Map
A-4............ FEMA Flood Map

Appendix B

Stormwater Calculations

B-1............ Freshman Pond Inlet Basins – Existing
B-2............ Freshman Pond Inlet Basins – Proposed
B-3............ WWHM2012 Wetland Protection Report
B-4............ Water Quality Calculations (to be provided at a later date)
B-5............ Conveyance Calculations (to be provided at a later date)

Appendix C

Geotechnical Engineering Report
Wood Environmental & Infrastructure Solutions, Inc., August 27, 2018

Appendix D

Construction Stormwater Pollution Prevention Plan (SWPPP)
(to be provided at a later date)

Appendix E

Operations and Maintenance Manual
(to be provided at a later date)

1.0 Project Overview

This report accompanies the civil engineering plans and documents for the proposed Olympia High School Addition project located at 1302 North Street Southeast (Parcel No. 09890050000) in the City of Olympia in Thurston County, Washington. The proposed project improvements will occur over approximately 5.00 acres.

The site development includes the construction of one new building and two building additions. The new building will be located between the existing applied arts building and the main building. In addition to building improvements, the project will add a new synthetic turf play field and relocate three tennis courts. New parking and fire access will be provided off of North Street Southeast. Additional pervious concrete surfacing will be used on proposed sidewalk areas.

A majority of the site's runoff is conveyed to a closed depression wetland that is centrally located on the property. From here, runoff infiltrates into native soil. Other areas of runoff include the track and field in the stadium, the baseball field to the north, and the forested wedge of property located across Henderson Blvd SW. Runoff from these areas contribute to the City system, and will not be altered by the proposed improvements.

Stormwater management is to comply with the 2016 City of Olympia *Drainage Design and Erosion Control Manual (DDECM),* as adopted by the City of Olympia.

2.0 Existing Conditions

2.1 Summary

The existing site includes a main high school building, an applied arts building, several portables, stadium and track, and multiple parking lots. The parking lot located in the southeast corner of the site is pervious asphalt, and is considered a hard surface in the *DDEDM*. The site is fully developed, and is currently covered with approximately 46.4% impervious surfaces and 3.4% hard surfaces. Grades across the site range from approximately 2 to 10 percent. The site is bordered to the north by Carlyon Avenue Southeast, to the east by Pioneer Elementary School, to the south by North Street Southeast, and to the west by single-family residences.

The Natural Resources Conservation Service (NRCS) soil type is mapped as Yelm fine sandy loam, hydrologic soil group B, which is considered to be moderately well drained. A draft Geotechnical Report was performed by Wood Environmental & Infrastructure Solutions, Inc. on August 27, 2018, which is included in Appendix C. The report indicates that the site is underlain with Recessional Lacustrine and Recessional Outwash deposits, which generally conform to the NRCS classification.

2.2 Existing Site Hydrology

As mentioned in the project overview, the existing site includes two drainage basins. However, the proposed improvements will only affect the basins contributing to the closed depression wetland (Freshman Pond). Based on site grades and field observations, offsite surface runoff is negligible to the property. However, a portion of the offsite storm network from the north and south sides of the property convey runoff onto the site and into Freshman Pond. The site's runoff is conveyed through a closed-pipe network to the closed depression wetland (Freshman Pond), where it infiltrates. An overflow pipe is located on the eastern bank of Freshman Pond according to record drawings, however the exact location was unable to be located by the survey.

The Western Washington Hydrology Model (WWHM2012) program was utilized to analyze existing hydrology and for the design of the proposed storm drainage facilities on the project site.

Existing site conditions have been modeled as they currently exist, in order to provide wetland protection.

3.0 Offsite Analysis

3.1 Downstream Analysis

As previously mentioned, the site's runoff is contained on site in Freshman Pond, where it infiltrates into native soil. Because the existing drainage characteristics will be maintained, a downstream analysis has not been performed.

3.2 Upstream Analysis

Based on field observations and the survey, offsite surface runoff is considered negligible. A portion of the offsite conveyance system enters the site and discharges to Freshman Pond, where it infiltrates.

4.0 Developed Site Hydrology

4.1 Summary

The project proposes to maintain the current drainage pattern, and will therefore infiltrate all runoff through Freshman Pond. The developed condition will increase the impervious surface coverage to approximately 48.1%, and the hard surface coverage to 3.7%. The proposed improvements create an increase in surface runoff entering the wetland. However, the increase in runoff is within the allowable range, with a maximum increase of approximately 6.2% during July, according to WWHM calculations. Wetland protection will be provided by maintaining existing input volumes in the proposed condition.

The project proposes to provide water quality for all new and replaced pollution-generating surfaces in the form of StormFilter media cartridges. These water quality structures will be placed upstream of the existing storm network and Freshman Pond. Runoff from other areas of the developed site that do not require stormwater treatment, including roofs, sidewalks, and landscaping, will be directed towards Freshman Pond or the detention facility, as necessary.

For this report, stormwater runoff was modeled using WWHM2012. The project site was considered one basin that discharges to Freshman Pond.

4.2 Performance Standard and Goals

Wetland protection will be provided in the proposed project, and will not require flow control. Based on conversations with the City of Olympia, the project will maintain the existing conditions in order to preserve input volumes that contribute to Freshman Pond. This was summarized in a project memo that was reviewed by the City of Olympia, and is included in Appendix A-2. According to the *DDECM*, the maximum tolerance for the developed condition input volume fluctuation is 20% for a daily event, and 15% for a monthly basis.

Water quality treatment will be sized according to Chapter 4, Volume 5 of the *DDECM.* The treatment facilities will be sized based on the 6-month, 24-hour storm event. The project will utilize StormFilter media cartridges to treat any new or replaced pollution-generating surfaces, in accordance to the *DDECM.*

4.3 Low Impact Development Features

The proposed project must adhere to Table 2.5.1 in the *DDECM* regarding on-site stormwater management requirements. Because this is a redevelopment, the project must meet the Low Impact Development Performance Standard and BMP T5.13, or List #2. This project will infiltrate all stormwater runoff by utilizing Freshman Pond and will provide BMP T5.13 – Post Construction Soil Quality and Depth, in order to meet the Low Impact Development Performance Standard.

4.4 Flow Control System

As mentioned, wetland protection will be a priority in regards to stormwater management. As compared to the existing condition, the proposed project produces an increase in runoff that is within the allowable tolerance. A flow control system is not required for the proposed improvements. WWHM2012 was used to model the wetland input volumes in the existing and proposed conditions. The full wetland report is located in Appendix B.

The wetland contains five inlet pipes that convey runoff from the site. Each of these inlet pipes will be protected and maintained in the proposed condition. In addition to these inlet pipes, a portion of the site directly contributes runoff to the pond by sheetflow. In the WWHM2012 model and basin maps, this basin is labeled ‘Direct’. Basin maps that show contributing areas to each of the five inlet pipes and the Direct basin, are located in Appendix B for the existing and proposed condition.

4.5 Water Quality System

Water quality treatment will be achieved with StormFilter media cartridges. Detailed water quality calculations will be provided at a later date.

4.6 Conveyance System Analysis and Design

All conveyance systems will be sized to convey the 25-year, 24-hour, design storm event. Detailed conveyance calculations will be provided at a later date.

5.0 Core Requirements

Based on the *DDECM*, Figure 2.4.2, all nine Core Requirements (CR) are applicable to the project. Refer to Appendix A-1.

5.1 CR 1: Preparation of Drainage Control Plans

The Stormwater Site Plan report is provided to meet this requirement.

5.2 CR 2: Construction Stormwater Pollution Prevention (SWPP)

A Construction Stormwater Pollution Prevention Plan (SWPPP) will be prepared at a later date.

5.3 CR 3: Source Control of Pollution

The Construction SWPPP provides Best Management Practices (BMPs) to manage pollution-generating activities during construction. The BMPs will address preventing erosion and sediment transport. The Construction SWPPP will also contain BMP measures regarding spill prevention.

Trash and debris will be collected regularly. A copy of the Construction SWPPP will be required to be kept onsite during and post construction. The contractor will be required to adhere to the requirements set forth in the Construction SWPPP.

5.4 CR 4: Preservation of Natural Drainage Systems and Outfalls

Stormwater currently infiltrates into Freshman Pond. Following project improvements, stormwater will continue to infiltrate through this closed depression wetland.

5.5 CR 5: On-site Stormwater Management

The project proposes to infiltrate all stormwater runoff through Freshman Pond, and will therefore meet the Low Impact Design Performance Standard. Post-Construction Soil Quality and Depth will also be implemented throughout new and replaced vegetated areas.

5.6 CR 6: Runoff Treatment

Runoff treatment for new and replaced pollution-generating surfaces will be provided by StormFilter media cartridge structures.

5.7 CR 7: Flow Control

Flow control will not be required for the proposed project. Runoff from the proposed improvements will contribute only to the Freshman Pond, where it will infiltrate into the native soil. As previously mentioned, wetland protection will be provided by maintaining input volumes into the pond.

5.8 CR 8: Wetlands Protection

There is a closed-depression wetland (Freshman Pond) that is centrally located on the project site. This wetland infiltrates all stormwater runoff from the site. Based on discussions with the City of Olympia (see Appendix D), wetlands protection will be met by, at a minimum, matching existing input flow rates. The proposed project will provide wetland protection by maintaining input volumes into the pond that are within the allowable tolerance listed in the *DDECM*. Flow control will not be required.

5.9 CR 9: Operations and Maintenance

The proposed storm drainage system will be owned, operated, and maintained by the owner. An Operations and Maintenance Manual (O&M Manual) will be presented to the owner upon completion of the project. This O&M Manual is included in Appendix E.

6.0 Conclusion

This site has been designed to meet the requirements of the *DDECM*, as adopted by the City of Olympia. Stormwater design utilizes an underground chamber detention system to provide flow control and StormFilter structures to provide runoff treatment.

This analysis is based on data and records either supplied to or obtained by AHBL. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry. We conclude that this project, as proposed, will not create any new problems within the existing downstream drainage system. This project will not noticeably aggravate any existing downstream problems due to either water quality or quantity.

AHBL, Inc.

Trevor J. McDonald, EIT
Project Engineer

TJM/

January 2019

Q:\2018\2180015\10_CIV\NON_CAD\REPORTS\Preliminary Storm Report\Rpt (Prelim SSP) 2180015.10.docx

Appendix A

Exhibits

PROJECT MEMO

TO:	Jeff Fant, City of Olympia	**DATE:**	8/1/2018
FROM:	Trevor McDonald Tacoma - (253) 383-2422	**PROJECT NO.:**	2180015.10
		PROJECT NAME:	Olympia High School Addition
SUBJECT:	City of Olympia - Stormwater Requirements		

The purpose of this memo is to document the stormwater requirements that are applicable to the Olympia High School Addition project, with regards to complying with the *2016 City of Olympia Drainage Design and Erosion Control Manual* (DDECM). This manual is closely modeled after the *2014 DOE SWMMWW.* Based on meetings and other correspondences with the City of Olympia, it is our understanding that the proposed project will fulfill code requirements in the following ways:

This project qualifies as a REDEVELOPMENT project based on the thresholds listed in the attached DDECM flowcharts. It is our understanding that improvements will trigger all nine Core Requirements to be applied to ALL NEW AND REPLACED HARD SURFACES AND CONVERTED VEGETATED areas.

The redevelopment flowchart (Figure 2.4.2 in the DDECM) also lists two additional thresholds that, if triggered, would require all core requirements to be applied to all hard surfaces and converted vegetation areas within the site, up to 30% of the project costs. The two thresholds are as follows, along with their application to this project:

(1) Do the new hard surfaces add 50% or more to the existing hard surfaces within the project site?

- The new hard surfaces do not add 50% or more to the existing hard surfaces within the project site.

(2) Does the valuation of proposed improvements – including interior improvements exceed 50% of the assessed value (or replacement value) of the existing site improvements?

- In this case, the replacement value will be used as a valuation of the existing site improvements. The value of the proposed improvements includes proposed project construction costs as well as the value of all construction projects that have taken place on the site since January 1, 2000. Based on information provided by the school district (see attachment), the value of the construction projects that have occurred since January 1, 2000 is roughly $22M. This conservatively includes soft costs. The proposed project has a maximum allowable construction cost of $18,000,000. The total value of proposed improvements is $40M, and the rough replacement value is $100M+. Therefore, the valuation of the proposed improvements does not exceed 50% of the replacement value of the existing site improvements.

The proposed project does not meet either of the two additional thresholds, and will not be required to provide additional improvements to existing hard surfaces.

The project intends to utilize the existing closed depression wetland “Freshman Pond” for full infiltration of runoff. The pond will be modeled to match peak flow rates. Based on coordination with City of Olympia stadd, it is our understanding that stormwater volumes discharging to the wetland in the developed condition do not need to match existing conditions. Additional detention will be provided to match peak flow rates, if necessary. The existing inlet locations will be maintained and used in the proposed improvements, in order to protect the wetland and its buffer.

Attachments:

- DDECM Flow Charts
- Project History from Olympia School District

TM/

c: Lucas Johnson (AHBL)
Kurt Cross and Dwight Hollar (Olympia School District)
Ron Harpel (BLRB)

Q:\2018\2180015\10_CIV\NON_CAD\OUTGOING\OHS_DDECM_Memo.docx

Figure 2.4.1 – Flow Chart for Determining Requirements for New Development

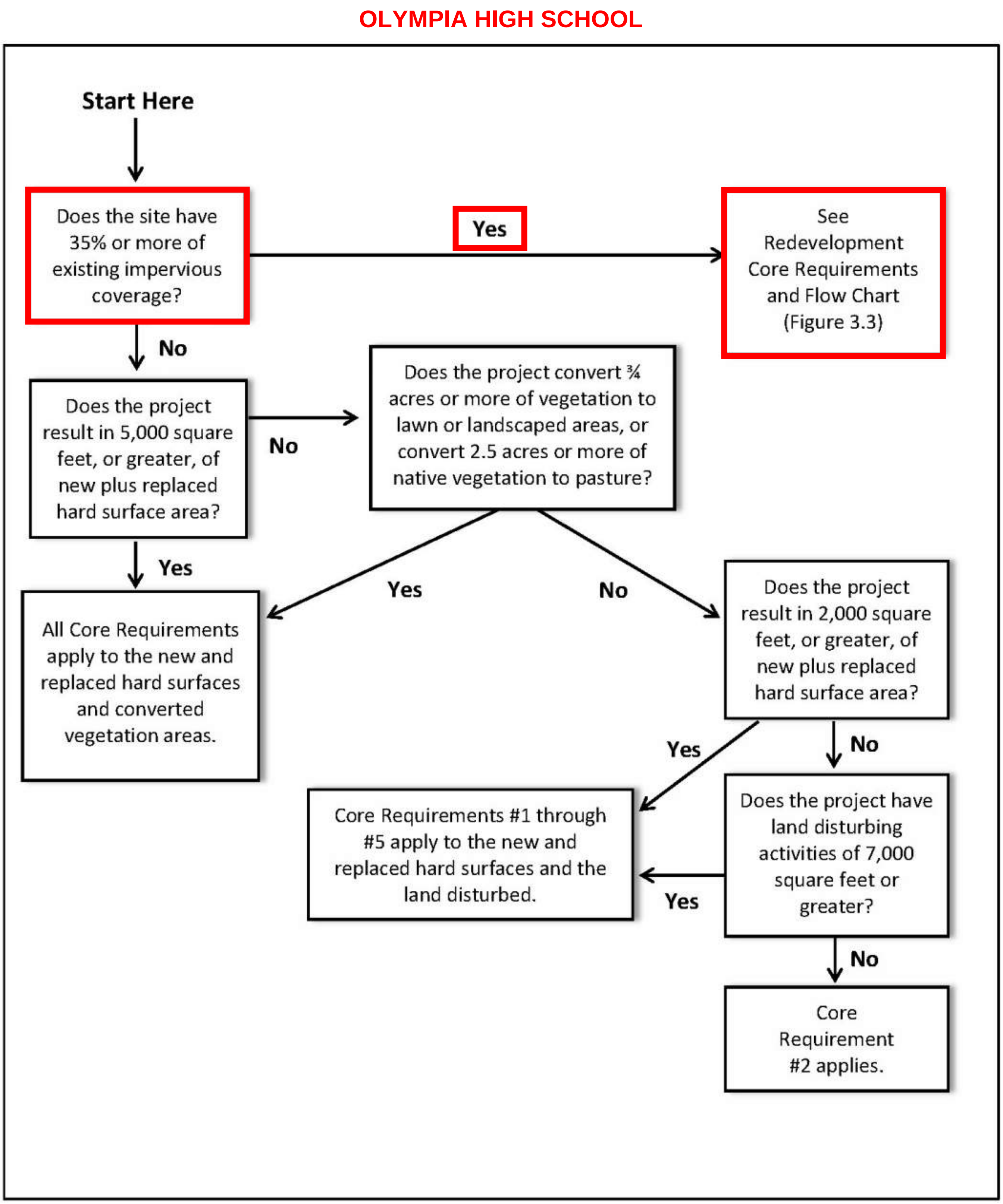
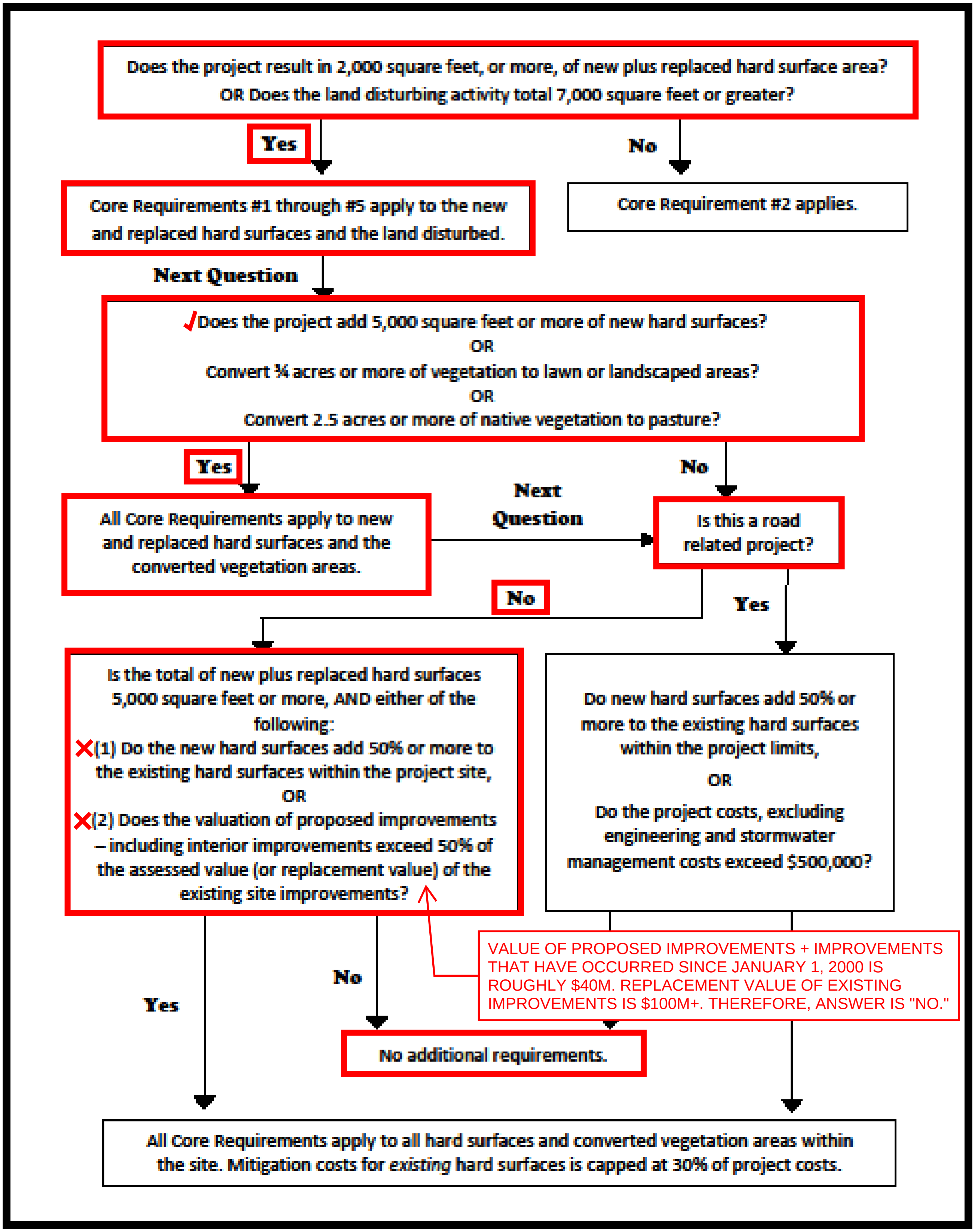


Figure 2.4.2 – Flow Chart for Determining Requirements for Redevelopment

OLYMPIA HIGH SCHOOL



Lucas Johnson

From: Tricia Nicholas <tnicholas@osd.wednet.edu>
Sent: Thursday, July 26, 2018 5:00 PM
To: Lucas Johnson
Cc: Kurtis A. Cross; dhollar@osd.wednet.edu
Subject: Re: OHS - Stormwater Scoping Meeting

Hello Lucas,

Please see below.

I am guessing on the project name/work from 99-00 SY(school year) to 06-07 SY, since I had to go into my ancient files and view reports I had saved from an old system before we stopped using it (the software is no longer available) and moved to modern technology. The old system was something similar to Atari game Pong from the 70's. (I am seriously dating myself here.)

Also, for this current SY I subtracted all A&E/associated fees related to the OHS Addition.

Lastly, and as a reminder, these costs are overall expenditures, and not sorted by soft/hard costs. Not sure how you will take a percentage, since the projects per-year are lumped together. But I suspect you will be creative!

Call or email if you have questions.
tricia

SY	TOTAL AMOUNT	PROJECT NAMES
1999-2000	$12,100,000	OHS REMODEL
2000-2001	$3,300,000	OHS REMODEL
2001-2002	$1,000,000	OHS REMODEL
2002-2003	$500,000	OHS REMODEL
2003-2004	$350,000	OHS REMODEL
2004-2005	$350,000	OHS REMODEL
2005-2006	$218,000	OHS REMODEL
2006-2007	$84,000	OHS REMODEL
2007-2008	$0	
2008-2009	$0	
2009-2010	$0	
2010-2011	$535,000	INGERSOLL STADIUM IMPROV, KITCHEN WALK-IN FREEZER, GYM ROOF
2011-2012	$618,000	INGERSOLL STADIUM IMPROV, KITCHEN WALK-IN FREEEZER, SAFETY SENSORS IN PAC, GYM ROOF, PAINT PORTABLES
2012-2013	$765,000	INGERSOLL STADIUM IMPROV, CCTV OHS THEATER, SAFETY SENSORS IN PAC

2013-2014	$500,000	INGERSOLL STADIUM IMPROV, EMERGENCY GENERATOR, GREENHOUSE
2014-2015	$306,000	INGERSOLL STADIUM IMPROV, OHS FIRE ALARM REPLACEMENT, COMPRESSOR STORAGE/SCIENCE ROOM
2015-2016	$951,000	INGERSOLL STADIUM IMPROV, FIRE ALARM REPLACEMENT, IRRIGATION UPGRADES, COMPRESSOR STORAGE/SCIENCE ROOM, STAIR TREAD REPLACEMENT
2016-2017	$380,000	TENNIS COURTS, GYM IMPROVEMENTS, ROOF REPAIR, HVAC UPGRADES
2017-2018	$150,000	GYM FLOORS, REROOF, HVAC UPGRADES
	$22,107,000	

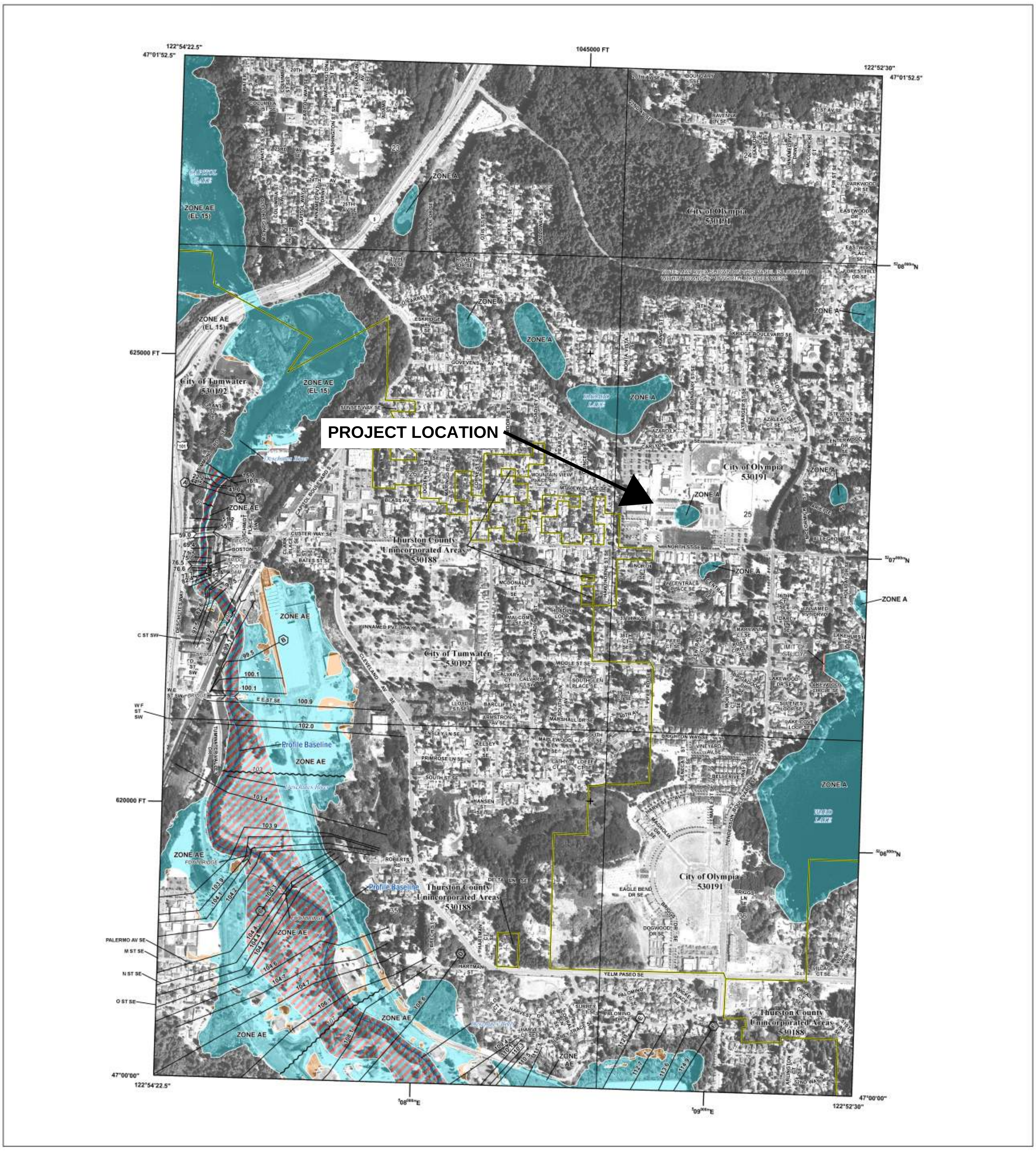
Tricia Nic
holas
Capital Projects Finance Specialist/Facilities Use Supervisor
Olympia School District No. 111
1914 Wilson St. SE
Olympia, WA 98501
360.596.8563
tnicholas@osd.wednet.edu

2215 N. 30th Street, #300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX
www.ahbl.com

OLYMPIA HIGH SCHOOL CLASSROOM MODERNIZATION

VICINITY MAP

A-3



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2 % Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
OTHER AREAS	NO SCREEN Areas of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert or Storm Sewer
	Accredited or Provisionally Acredited Levee, Dike, or Floodwall
	Non-accredited Levee, Dike or Floodwall
	(E) 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevations (BFE)
	(8) Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
OTHER FEATURES	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by the Thurston GeoData Center, Thurston County, WA. This information was derived from digital orthophotography photography dated 2015.

SCALE

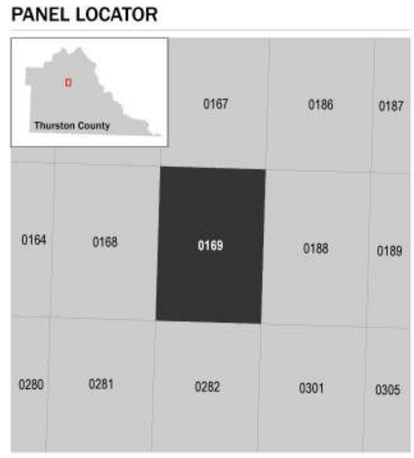
Map Projection:
NAD 1983 State Plane Washington South FIPS 4602 Feet
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

THURSTON COUNTY, WA
And Incorporated Areas

PANEL 169 OF 625

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
OLYMPIA, CITY OF	530191	0169	G
THURSTON COUNTY	530188	0169	G
TUMWATER, CITY OF	530192	0169	G

VERSION NUMBER
2.3.2.1

MAP NUMBER
53067C0169G

MAP REVISED
MAY 15, 2018

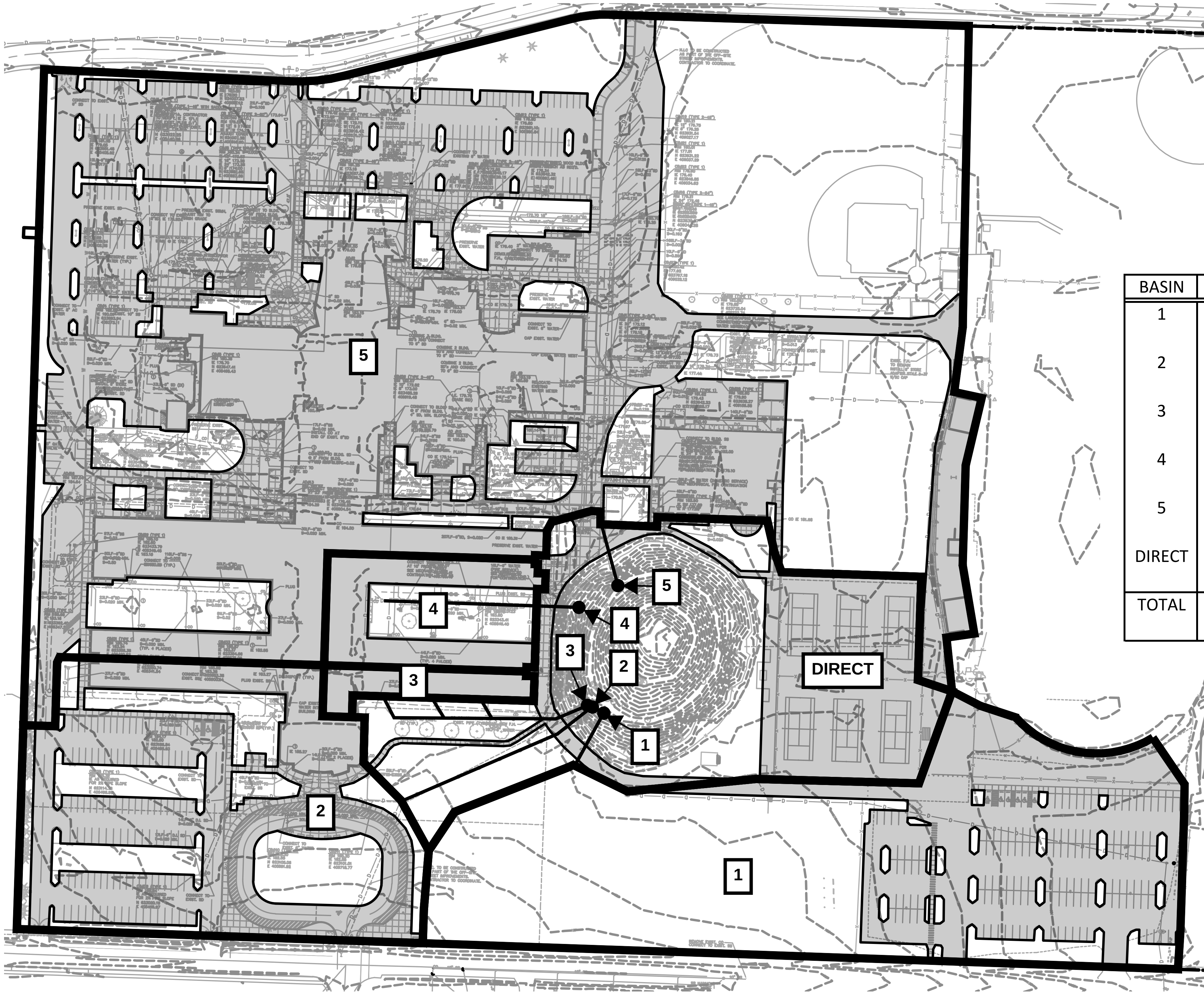
AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

OLYMPIA HIGH SCHOOL CLASSROOM MODERNIZATION

FEMA FLOOD MAP

Appendix B

Stormwater Calculations



EXISTING BASINS

BASIN	IMPERVIOUS		HARD		PERVIOUS		TOTAL	
1	31,765	SF	66,026	SF	123017	SF	220808	SF
	0.73	AC	1.51	AC	2.83	AC	5.07	AC
2	99932	SF	0	SF	53628	SF	153560	SF
	2.29	AC	0.00	AC	1.24	AC	3.53	AC
3	10,549	SF	0	SF	0	SF	10549	SF
	0.24	AC	0.00	AC	0.00	AC	0.24	AC
4	22526	SF	0	SF	14393	SF	36919	SF
	0.52	AC	0.00	AC	0.33	AC	0.85	AC
5	467596	SF	0	SF	324428	SF	792024	SF
	10.73	AC	0.00	AC	7.45	AC	18.18	AC
DIRECT	70480	SF	0	SF	103721	SF	174201	SF
	1.62	AC	0.00	AC	2.38	AC	4.00	AC
TOTAL	702,848	SF	66,026	SF	619187	SF	1388061	SF
	16.13	AC	1.51	AC	14.23	AC	31.87	AC

AHBL

2215 N. 30th Street, #300

Tacoma, WA 98403

253.383.2422 TEL

253.383.2572 FAX

www.ahbl.com

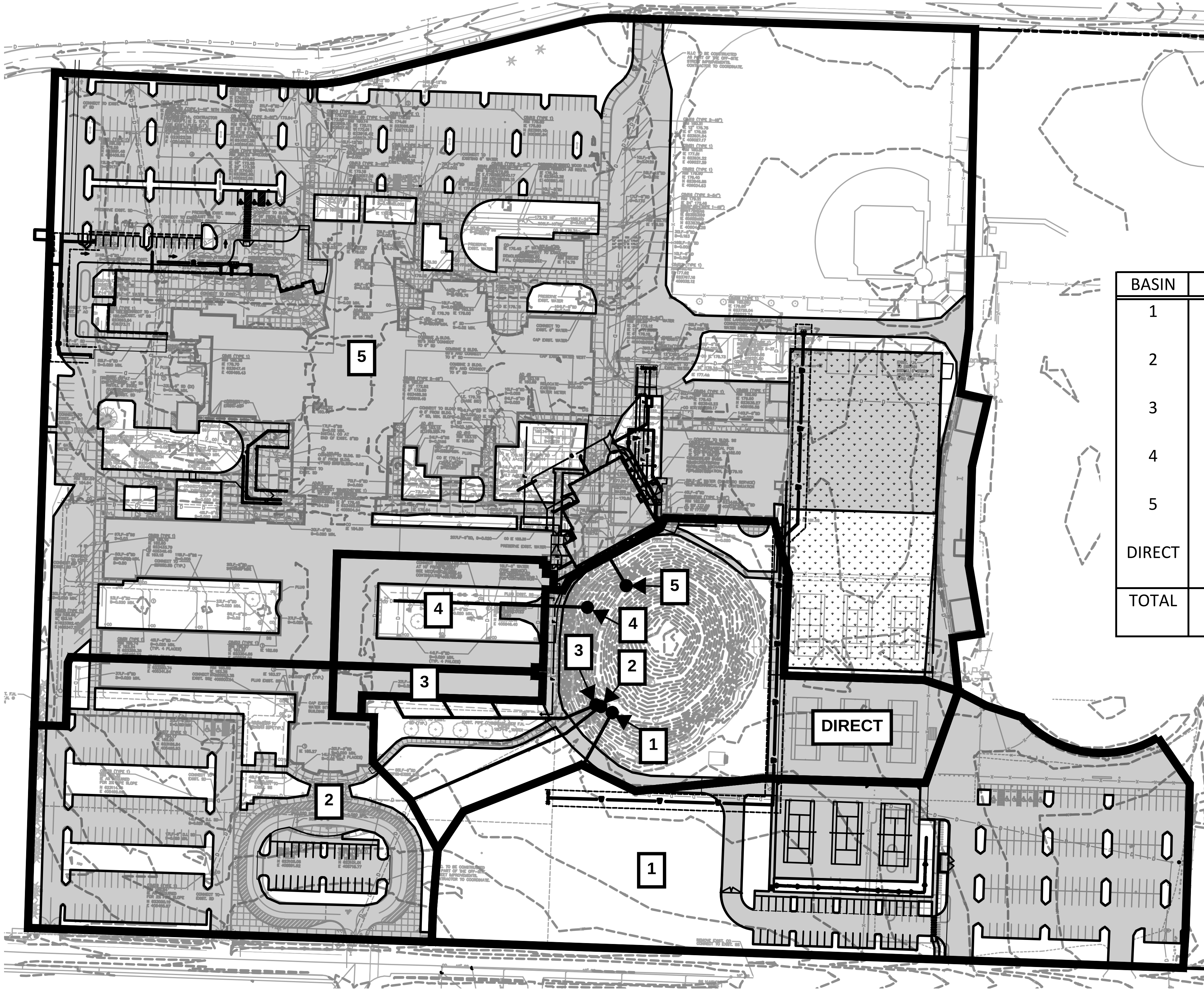
OLYMPIA HIGH SCHOOL ADDITION

FRESHMAN POND INLET BASINS - EXISTING

JOB NO. 2180015.10

DATE: JAN 2019

B-1



PROPOSED BASINS

BASIN	IMPERVIOUS		HARD		PERVIOUS		TOTAL	
1	69,347	SF	54,878	SF	96583	SF	220808	SF
	1.59	AC	1.26	AC	2.22	AC	5.07	AC
2	107876	SF	1371	SF	44313	SF	153560	SF
	2.48	AC	0.03	AC	1.02	AC	3.53	AC
3	10,549	SF	0	SF	0	SF	10549	SF
	0.24	AC	0.00	AC	0.00	AC	0.24	AC
4	24028	SF	0	SF	12842	SF	36870	SF
	0.55	AC	0.00	AC	0.3	AC	0.85	AC
5	511988	SF	2522	SF	306419	SF	820929	SF
	11.75	AC	0.06	AC	7.04	AC	18.85	AC
DIRECT	43921	SF	0	SF	101424	SF	145345	SF
	1.00	AC	0.00	AC	2.33	AC	3.33	AC
TOTAL	767,709	SF	58,771	SF	561581	SF	1388061	SF
	17.61	AC	1.35	AC	12.91	AC	31.87	AC

AHBL
2215 N. 30th Street, #300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX
www.ahbl.com

OLYMPIA HIGH SCHOOL ADDITION

FRESHMAN POND INLET BASINS - PROPOSED

JOB NO. 2180015.10

DATE: JAN 2019

B-2

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Freshman Pond
Site Name:	
Site Address:	
City:	
Report Date:	1/8/2019
Gage:	Courthouse
Data Start:	1955/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	0.900
Version Date:	2018/03/08
Version:	4.2.14

POC Thresholds

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

Landuse Basin Data
Predeveloped Land Use

1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	2.83
Pervious Total	2.83
Impervious Land Use	acre
ROADS FLAT	2.24
Impervious Total	2.24
Basin Total	5.07

Element Flows To:

Surface	Interflow	Groundwater

2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.24
Pervious Total	1.24
Impervious Land Use	acre
ROADS FLAT	2.29
Impervious Total	2.29
Basin Total	3.53

Element Flows To:

Surface	Interflow	Groundwater

3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.24
Impervious Total	0.24
Basin Total	0.24

Element Flows To:

Surface	Interflow	Groundwater

4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.33
Pervious Total	0.33
Impervious Land Use	acre
ROADS FLAT	0.52
Impervious Total	0.52
Basin Total	0.85

Element Flows To:

Surface	Interflow	Groundwater

5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	7.45
Pervious Total	7.45
Impervious Land Use	acre
ROADS FLAT	10.73
Impervious Total	10.73
Basin Total	18.18

Element Flows To:

Surface	Interflow	Groundwater

DIRECT

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	2.38
Pervious Total	2.38
Impervious Land Use	acre
ROADS FLAT	1.62
Impervious Total	1.62
Basin Total	4

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	2.22
Pervious Total	2.22
Impervious Land Use	acre
ROADS FLAT	2.85
Impervious Total	2.85
Basin Total	5.07

Element Flows To:

Surface	Interflow	Groundwater

2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	1.02
Pervious Total	1.02
Impervious Land Use	acre
ROADS FLAT	2.51
Impervious Total	2.51
Basin Total	3.53

Element Flows To:

Surface	Interflow	Groundwater

3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.24
Impervious Total	0.24
Basin Total	0.24

Element Flows To:

Surface	Interflow	Groundwater

4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.3
Pervious Total	0.3
Impervious Land Use	acre
ROADS FLAT	0.55
Impervious Total	0.55
Basin Total	0.85

Element Flows To:

Surface	Interflow	Groundwater

5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	7.04
Pervious Total	7.04
Impervious Land Use	acre
ROADS FLAT	11.81
Impervious Total	11.81
Basin Total	18.85

Element Flows To:

Surface	Interflow	Groundwater

DIRECT

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	2.33
Pervious Total	2.33
Impervious Land Use	acre
ROADS FLAT	1.01
Impervious Total	1.01
Basin Total	3.34

Element Flows To:

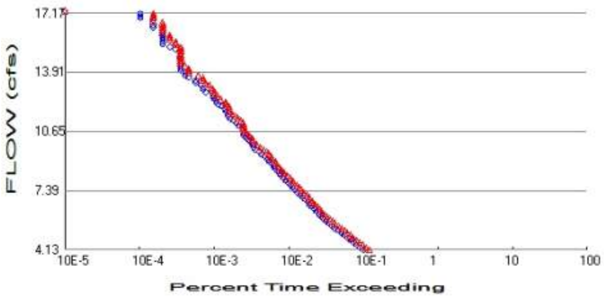
Surface	Interflow	Groundwater

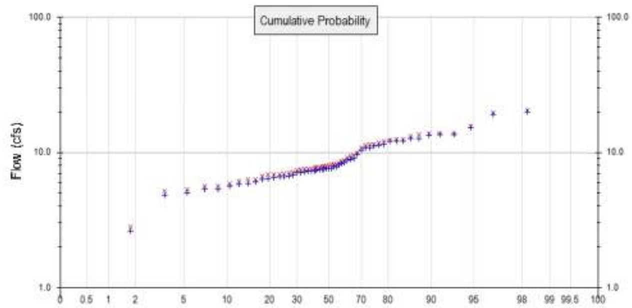
Routing Elements

Predeveloped Routing

Mitigated Routing

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 14.23
Total Impervious Area: 17.64

Mitigated Landuse Totals for POC #1
Total Pervious Area: 12.91
Total Impervious Area: 18.97

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	8.267891
5 year	11.37348
10 year	13.291205
25 year	15.568231
50 year	17.168187
100 year	18.693837

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	8.666017
5 year	11.834894
10 year	13.781434
25 year	16.084423
50 year	17.697961
100 year	19.233366

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	5.911	6.292
1957	13.333	13.730
1958	7.782	8.119
1959	7.579	7.944
1960	19.120	19.649
1961	6.017	6.314
1962	5.762	6.142
1963	15.199	15.634
1964	7.319	7.817
1965	8.074	8.386

1966	5.324	5.651
1967	12.707	13.115
1968	7.287	7.543
1969	5.344	5.646
1970	5.624	5.902
1971	6.611	6.900
1972	12.122	12.451
1973	7.276	7.619
1974	10.352	10.764
1975	7.018	7.382
1976	7.456	7.748
1977	10.841	11.401
1978	7.498	7.948
1979	8.954	9.528
1980	6.551	6.970
1981	11.445	11.793
1982	10.773	11.246
1983	12.711	13.619
1984	12.056	12.362
1985	8.814	9.362
1986	7.841	8.143
1987	7.457	7.734
1988	4.851	5.205
1989	5.059	5.358
1990	12.169	12.557
1991	13.493	13.834
1992	8.423	8.799
1993	6.347	6.671
1994	7.058	7.456
1995	7.350	7.759
1996	13.544	13.835
1997	2.406	2.572
1998	2.620	2.802
1999	7.606	8.011
2000	7.577	8.147
2001	6.666	7.113
2002	8.796	9.086
2003	6.506	6.890
2004	19.795	20.519
2005	6.807	7.144
2006	8.241	8.593
2007	11.111	11.434
2008	9.667	9.975
2009	11.271	12.113
2010	6.395	6.829
2011	7.186	7.592

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	19.7953	20.5191
2	19.1202	19.6488
3	15.1989	15.6335
4	13.5436	13.8350
5	13.4933	13.8339
6	13.3332	13.7299
7	12.7107	13.6192
8	12.7072	13.1146

9	12.1690	12.5573
10	12.1220	12.4508
11	12.0555	12.3620
12	11.4451	12.1130
13	11.2712	11.7926
14	11.1109	11.4341
15	10.8411	11.4010
16	10.7727	11.2459
17	10.3518	10.7644
18	9.6675	9.9745
19	8.9537	9.5276
20	8.8141	9.3620
21	8.7961	9.0859
22	8.4233	8.7988
23	8.2411	8.5933
24	8.0744	8.3858
25	7.8410	8.1472
26	7.7821	8.1435
27	7.6055	8.1187
28	7.5788	8.0108
29	7.5769	7.9482
30	7.4978	7.9443
31	7.4568	7.8170
32	7.4562	7.7594
33	7.3501	7.7475
34	7.3189	7.7337
35	7.2872	7.6193
36	7.2764	7.5917
37	7.1858	7.5434
38	7.0582	7.4563
39	7.0185	7.3819
40	6.8073	7.1436
41	6.6656	7.1133
42	6.6113	6.9698
43	6.5509	6.8998
44	6.5064	6.8901
45	6.3952	6.8290
46	6.3466	6.6712
47	6.0172	6.3137
48	5.9112	6.2921
49	5.7618	6.1421
50	5.6245	5.9019
51	5.3440	5.6511
52	5.3242	5.6463
53	5.0594	5.3580
54	4.8510	5.2055
55	2.6201	2.8022
56	2.4059	2.5722

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
4.1339	1969	2356	119	Fail
4.2656	1777	2132	119	Fail
4.3973	1617	1916	118	Fail
4.5289	1448	1733	119	Fail
4.6606	1322	1589	120	Fail
4.7922	1218	1421	116	Fail
4.9239	1105	1322	119	Fail
5.0556	1006	1209	120	Fail
5.1872	904	1098	121	Fail
5.3189	812	1001	123	Fail
5.4505	747	910	121	Fail
5.5822	680	819	120	Fail
5.7139	628	751	119	Fail
5.8455	576	685	118	Fail
5.9772	532	635	119	Fail
6.1088	504	582	115	Fail
6.2405	468	546	116	Fail
6.3721	435	511	117	Fail
6.5038	398	482	121	Fail
6.6355	372	446	119	Fail
6.7671	357	411	115	Fail
6.8988	331	387	116	Fail
7.0304	302	364	120	Fail
7.1621	280	341	121	Fail
7.2938	260	313	120	Fail
7.4254	237	290	122	Fail
7.5571	223	268	120	Fail
7.6887	211	250	118	Fail
7.8204	196	231	117	Fail
7.9521	180	220	122	Fail
8.0837	167	205	122	Fail
8.2154	155	188	121	Fail
8.3470	147	172	117	Fail
8.4787	139	163	117	Fail
8.6104	129	149	115	Fail
8.7420	125	142	113	Fail
8.8737	115	132	114	Fail
9.0053	107	129	120	Fail
9.1370	102	120	117	Fail
9.2686	95	113	118	Fail
9.4003	84	107	127	Fail
9.5320	80	100	125	Fail
9.6636	70	90	128	Fail
9.7953	67	82	122	Fail
9.9269	64	73	114	Fail
10.0586	60	67	111	Fail
10.1903	56	65	116	Fail
10.3219	52	62	119	Fail
10.4536	49	58	118	Fail
10.5852	48	53	110	Pass
10.7169	48	50	104	Pass
10.8486	47	48	102	Pass
10.9802	42	48	114	Fail
11.1119	39	48	123	Fail

11.2435	36	45	125	Fail
11.3752	32	41	128	Fail
11.5068	30	38	126	Fail
11.6385	30	34	113	Fail
11.7702	28	32	114	Fail
11.9018	27	31	114	Fail
12.0335	25	31	124	Fail
12.1651	22	28	127	Fail
12.2968	21	28	133	Fail
12.4285	20	24	120	Fail
12.5601	19	22	115	Fail
12.6918	19	21	110	Pass
12.8234	15	20	133	Fail
12.9551	14	19	135	Fail
13.0868	14	18	128	Fail
13.2184	13	17	130	Fail
13.3501	11	15	136	Fail
13.4817	11	14	127	Fail
13.6134	9	14	155	Fail
13.7451	8	12	150	Fail
13.8767	8	9	112	Fail
14.0084	7	9	128	Fail
14.1400	7	9	128	Fail
14.2717	7	8	114	Fail
14.4033	7	7	100	Pass
14.5350	7	7	100	Pass
14.6667	7	7	100	Pass
14.7983	7	7	100	Pass
14.9300	7	7	100	Pass
15.0616	7	7	100	Pass
15.1933	6	7	116	Fail
15.3250	5	7	140	Fail
15.4566	4	6	150	Fail
15.5883	4	6	150	Fail
15.7199	4	5	125	Fail
15.8516	4	5	125	Fail
15.9833	4	5	125	Fail
16.1149	4	4	100	Pass
16.2466	4	4	100	Pass
16.3782	3	4	133	Fail
16.5099	3	4	133	Fail
16.6416	3	4	133	Fail
16.7732	3	3	100	Pass
16.9049	2	3	150	Fail
17.0365	2	3	150	Fail
17.1682	2	3	150	Fail

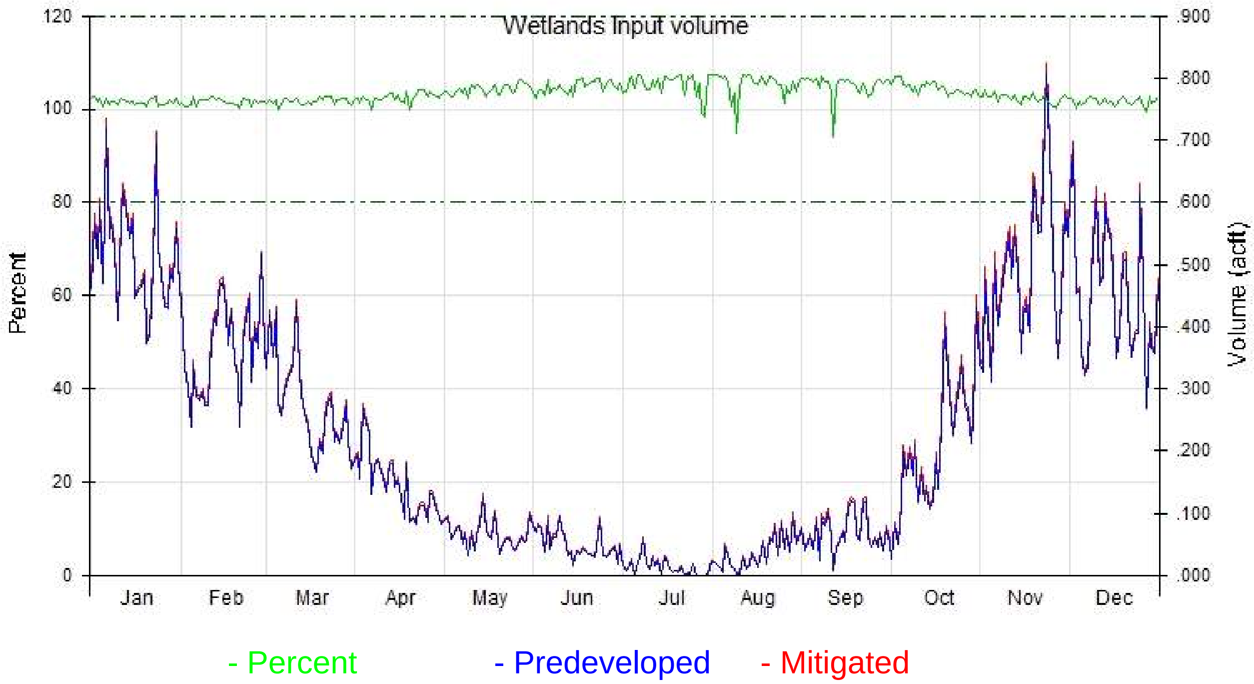
The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

Wetland Input Volumes



Wetlands Input Volume for POC 1
Average Annual Volume (acft)
Series 1: 501 POC 1 Predeveloped flow
Series 2: 801 POC 1 Mitigated flow

Month	**Series 1**	**Series 2**	**Percent**	**Pass/Fail**
Jan	15.9063	16.1755	101.7	Pass
Feb	10.2248	10.3832	101.5	Pass
Mar	8.5788	8.7286	101.7	Pass
Apr	4.4050	4.5147	102.5	Pass
May	2.0128	2.0983	104.2	Pass
Jun	1.4945	1.5663	104.8	Pass
Jul	0.4590	0.4874	106.2	Pass
Aug	1.0822	1.1442	105.7	Pass
Sep	2.0365	2.1493	105.5	Pass
Oct	6.1697	6.4327	104.3	Pass
Nov	14.7006	15.0469	102.4	Pass
Dec	14.2022	14.4454	101.7	Pass

Day	**Predevel**	**Mitigated**	**Percent**	**Pass/Fail**
Jan1	0.4612	0.4713	102.2	Pass
2	0.5670	0.5822	102.7	Pass
3	0.5103	0.5187	101.6	Pass
4	0.5927	0.6061	102.3	Pass
5	0.4683	0.4713	100.6	Pass
6	0.7184	0.7361	102.5	Pass
7	0.5422	0.5469	100.9	Pass
8	0.5683	0.5771	101.6	Pass
9	0.5238	0.5331	101.8	Pass
10	0.4097	0.4136	101.0	Pass
11	0.5702	0.5839	102.4	Pass
12	0.6173	0.6300	102.1	Pass
13	0.5869	0.5959	101.5	Pass
14	0.5418	0.5493	101.4	Pass

15	0.5720	0.5814	101.7	Pass
16	0.4454	0.4493	100.9	Pass
17	0.4591	0.4649	101.3	Pass
18	0.4644	0.4705	101.3	Pass
19	0.4829	0.4900	101.5	Pass
20	0.3724	0.3742	100.5	Pass
21	0.3835	0.3914	102.0	Pass
22	0.4956	0.5076	102.4	Pass
23	0.6935	0.7128	102.8	Pass
24	0.5283	0.5309	100.5	Pass
25	0.4821	0.4861	100.8	Pass
26	0.4325	0.4362	100.9	Pass
27	0.4295	0.4351	101.3	Pass
28	0.4896	0.4999	102.1	Pass
29	0.4724	0.4792	101.4	Pass
30	0.5575	0.5698	102.2	Pass
31	0.4616	0.4652	100.8	Pass
Feb1	0.4400	0.4454	101.2	Pass
2	0.3365	0.3382	100.5	Pass
3	0.3010	0.3024	100.5	Pass
4	0.2394	0.2412	100.8	Pass
5	0.3379	0.3474	102.8	Pass
6	0.2874	0.2895	100.7	Pass
7	0.2815	0.2867	101.8	Pass
8	0.2959	0.3013	101.8	Pass
9	0.2748	0.2800	101.9	Pass
10	0.2727	0.2786	102.2	Pass
11	0.3753	0.3854	102.7	Pass
12	0.4149	0.4242	102.2	Pass
13	0.4027	0.4106	101.9	Pass
14	0.4649	0.4758	102.3	Pass
15	0.4731	0.4808	101.6	Pass
16	0.4269	0.4326	101.3	Pass
17	0.3715	0.3760	101.2	Pass
18	0.4240	0.4299	101.4	Pass
19	0.3427	0.3454	100.8	Pass
20	0.3201	0.3230	100.9	Pass
21	0.2391	0.2398	100.3	Pass
22	0.3752	0.3843	102.4	Pass
23	0.4171	0.4256	102.0	Pass
24	0.4451	0.4538	102.0	Pass
25	0.3106	0.3128	100.7	Pass
26	0.3996	0.4072	101.9	Pass
27	0.3654	0.3701	101.3	Pass
28	0.5140	0.5219	101.5	Pass
29	0.3629	0.3694	101.8	Pass
Mar1	0.3334	0.3381	101.4	Pass
2	0.4189	0.4276	102.1	Pass
3	0.3502	0.3546	101.2	Pass
4	0.4231	0.4311	101.9	Pass
5	0.2784	0.2782	99.9	Pass
6	0.2571	0.2593	100.9	Pass
7	0.2970	0.3038	102.3	Pass
8	0.3165	0.3230	102.1	Pass
9	0.3224	0.3279	101.7	Pass
10	0.3388	0.3447	101.7	Pass
11	0.4327	0.4429	102.4	Pass
12	0.3327	0.3367	101.2	Pass

13	0.2884	0.2912	101.0	Pass
14	0.2600	0.2628	101.1	Pass
15	0.2418	0.2458	101.6	Pass
16	0.1936	0.1956	101.1	Pass
17	0.1855	0.1886	101.7	Pass
18	0.1656	0.1686	101.8	Pass
19	0.2151	0.2208	102.7	Pass
20	0.1961	0.2001	102.0	Pass
21	0.2503	0.2567	102.6	Pass
22	0.2791	0.2865	102.6	Pass
23	0.2869	0.2942	102.6	Pass
24	0.2139	0.2162	101.1	Pass
25	0.2272	0.2318	102.0	Pass
26	0.2107	0.2146	101.9	Pass
27	0.2373	0.2433	102.5	Pass
28	0.2742	0.2808	102.4	Pass
29	0.2179	0.2210	101.4	Pass
30	0.1720	0.1734	100.8	Pass
31	0.1849	0.1883	101.9	Pass
Apr1	0.1927	0.1974	102.4	Pass
2	0.1558	0.1578	101.3	Pass
3	0.2685	0.2761	102.8	Pass
4	0.2447	0.2493	101.9	Pass
5	0.2284	0.2319	101.5	Pass
6	0.1316	0.1316	100.0	Pass
7	0.1759	0.1802	102.5	Pass
8	0.1850	0.1886	102.0	Pass
9	0.1653	0.1688	102.1	Pass
10	0.1592	0.1631	102.4	Pass
11	0.1349	0.1386	102.7	Pass
12	0.1762	0.1823	103.5	Pass
13	0.1798	0.1857	103.3	Pass
14	0.1413	0.1443	102.1	Pass
15	0.1540	0.1585	102.9	Pass
16	0.1252	0.1271	101.5	Pass
17	0.0914	0.0926	101.3	Pass
18	0.1764	0.1833	103.9	Pass
19	0.0858	0.0857	99.9	Pass
20	0.0921	0.0944	102.5	Pass
21	0.0838	0.0863	103.0	Pass
22	0.1045	0.1089	104.3	Pass
23	0.1122	0.1170	104.3	Pass
24	0.1099	0.1145	104.2	Pass
25	0.0864	0.0888	102.8	Pass
26	0.1314	0.1363	103.8	Pass
27	0.1287	0.1328	103.2	Pass
28	0.1072	0.1102	102.8	Pass
29	0.0925	0.0947	102.5	Pass
30	0.0837	0.0863	103.2	Pass
May1	0.0882	0.0916	103.9	Pass
2	0.0937	0.0969	103.5	Pass
3	0.0581	0.0598	102.9	Pass
4	0.0610	0.0626	102.6	Pass
5	0.0743	0.0772	103.9	Pass
6	0.0770	0.0804	104.5	Pass
7	0.0510	0.0526	103.3	Pass
8	0.0668	0.0698	104.5	Pass
9	0.0323	0.0331	102.3	Pass

10	0.0678	0.0712	105.1	Pass
11	0.0407	0.0425	104.6	Pass
12	0.0633	0.0666	105.1	Pass
13	0.0814	0.0854	105.0	Pass
14	0.1264	0.1319	104.3	Pass
15	0.0718	0.0736	102.6	Pass
16	0.0644	0.0666	103.5	Pass
17	0.0597	0.0622	104.1	Pass
18	0.0983	0.1035	105.3	Pass
19	0.0549	0.0565	102.9	Pass
20	0.0345	0.0355	103.0	Pass
21	0.0501	0.0525	104.8	Pass
22	0.0593	0.0625	105.3	Pass
23	0.0575	0.0603	104.8	Pass
24	0.0419	0.0434	103.6	Pass
25	0.0388	0.0403	103.9	Pass
26	0.0485	0.0513	105.8	Pass
27	0.0604	0.0641	106.1	Pass
28	0.0543	0.0572	105.5	Pass
29	0.0565	0.0596	105.4	Pass
30	0.0966	0.1013	104.9	Pass
31	0.0802	0.0832	103.7	Pass
Jun1	0.0682	0.0698	102.3	Pass
2	0.0803	0.0834	103.8	Pass
3	0.0748	0.0778	104.1	Pass
4	0.0384	0.0395	102.9	Pass
5	0.0894	0.0950	106.3	Pass
6	0.0436	0.0451	103.3	Pass
7	0.0627	0.0655	104.5	Pass
8	0.0604	0.0630	104.3	Pass
9	0.0924	0.0972	105.2	Pass
10	0.0752	0.0786	104.5	Pass
11	0.0634	0.0657	103.7	Pass
12	0.0325	0.0335	103.1	Pass
13	0.0372	0.0390	104.9	Pass
14	0.0158	0.0163	102.6	Pass
15	0.0388	0.0412	106.4	Pass
16	0.0338	0.0360	106.4	Pass
17	0.0436	0.0464	106.5	Pass
18	0.0412	0.0432	105.0	Pass
19	0.0333	0.0350	105.3	Pass
20	0.0321	0.0339	105.9	Pass
21	0.0285	0.0301	105.8	Pass
22	0.0431	0.0460	106.6	Pass
23	0.0882	0.0940	106.6	Pass
24	0.0306	0.0318	104.0	Pass
25	0.0297	0.0313	105.4	Pass
26	0.0329	0.0348	106.0	Pass
27	0.0409	0.0435	106.3	Pass
28	0.0451	0.0474	105.0	Pass
29	0.0184	0.0192	104.1	Pass
30	0.0484	0.0512	105.7	Pass
Jul1	0.0154	0.0159	103.5	Pass
2	0.0088	0.0092	103.9	Pass
3	0.0148	0.0157	106.4	Pass
4	0.0243	0.0260	107.0	Pass
5	0.0032	0.0034	104.6	Pass
6	0.0208	0.0223	107.2	Pass

7	0.0374	0.0401	107.1	Pass
8	0.0576	0.0610	106.0	Pass
9	0.0210	0.0219	104.1	Pass
10	0.0108	0.0112	104.0	Pass
11	0.0303	0.0322	106.3	Pass
12	0.0152	0.0160	104.9	Pass
13	0.0238	0.0253	106.5	Pass
14	0.0033	0.0034	103.5	Pass
15	0.0305	0.0327	107.2	Pass
16	0.0274	0.0293	107.2	Pass
17	0.0091	0.0097	106.4	Pass
18	0.0043	0.0046	106.2	Pass
19	0.0075	0.0080	107.1	Pass
20	0.0044	0.0047	107.1	Pass
21	0.0136	0.0146	107.3	Pass
22	0.0006	0.0006	103.0	Pass
23	0.0035	0.0037	107.1	Pass
24	0.0011	0.0012	106.6	Pass
25	0.0178	0.0191	107.4	Pass
26	0.0006	0.0006	102.6	Pass
27	0.0008	0.0008	105.7	Pass
28	0.0001	0.0001	99.2	Pass
29	0.0000	0.0000	98.4	Pass
30	0.0026	0.0028	107.4	Pass
31	0.0213	0.0229	107.4	Pass
Aug1	0.0210	0.0225	107.3	Pass
2	0.0174	0.0187	107.2	Pass
3	0.0122	0.0131	107.0	Pass
4	0.0055	0.0058	106.8	Pass
5	0.0464	0.0497	107.1	Pass
6	0.0331	0.0351	106.1	Pass
7	0.0126	0.0127	100.7	Pass
8	0.0110	0.0114	103.5	Pass
9	0.0017	0.0016	94.8	Pass
10	0.0037	0.0038	104.5	Pass
11	0.0295	0.0316	107.3	Pass
12	0.0110	0.0118	107.1	Pass
13	0.0170	0.0182	107.3	Pass
14	0.0343	0.0367	106.9	Pass
15	0.0270	0.0286	105.7	Pass
16	0.0121	0.0127	105.2	Pass
17	0.0364	0.0389	106.9	Pass
18	0.0526	0.0561	106.7	Pass
19	0.0175	0.0184	105.3	Pass
20	0.0584	0.0625	107.1	Pass
21	0.0524	0.0559	106.8	Pass
22	0.0784	0.0835	106.5	Pass
23	0.0318	0.0334	105.1	Pass
24	0.0832	0.0874	105.1	Pass
25	0.0438	0.0444	101.4	Pass
26	0.0709	0.0744	104.9	Pass
27	0.0363	0.0376	103.5	Pass
28	0.0948	0.1005	106.0	Pass
29	0.0513	0.0532	103.8	Pass
30	0.0578	0.0610	105.6	Pass
31	0.0739	0.0787	106.6	Pass
Sep1	0.0400	0.0425	106.1	Pass
2	0.0510	0.0543	106.6	Pass

3	0.0638	0.0678	106.3	Pass
4	0.0422	0.0447	105.8	Pass
5	0.0868	0.0926	106.7	Pass
6	0.0230	0.0241	104.4	Pass
7	0.0922	0.0986	106.9	Pass
8	0.0803	0.0851	105.9	Pass
9	0.1001	0.1061	106.0	Pass
10	0.0622	0.0646	103.8	Pass
11	0.0091	0.0085	94.0	Pass
12	0.0427	0.0449	105.2	Pass
13	0.0552	0.0586	106.2	Pass
14	0.0686	0.0730	106.5	Pass
15	0.0534	0.0566	106.0	Pass
16	0.1073	0.1141	106.4	Pass
17	0.1200	0.1268	105.6	Pass
18	0.1144	0.1205	105.3	Pass
19	0.0657	0.0688	104.7	Pass
20	0.0562	0.0581	103.4	Pass
21	0.1158	0.1222	105.6	Pass
22	0.1202	0.1249	104.0	Pass
23	0.0615	0.0633	102.8	Pass
24	0.0441	0.0455	103.2	Pass
25	0.0592	0.0626	105.8	Pass
26	0.0447	0.0474	106.2	Pass
27	0.0662	0.0704	106.3	Pass
28	0.0412	0.0436	105.7	Pass
29	0.0759	0.0807	106.3	Pass
30	0.0537	0.0569	105.9	Pass
Oct1	0.0256	0.0269	105.1	Pass
2	0.0794	0.0850	107.0	Pass
3	0.0499	0.0534	107.0	Pass
4	0.1132	0.1211	107.0	Pass
5	0.1985	0.2090	105.3	Pass
6	0.1611	0.1690	104.9	Pass
7	0.1963	0.2066	105.2	Pass
8	0.1600	0.1663	104.0	Pass
9	0.2085	0.2184	104.8	Pass
10	0.1166	0.1201	103.0	Pass
11	0.1643	0.1731	105.3	Pass
12	0.1197	0.1254	104.8	Pass
13	0.1370	0.1451	105.9	Pass
14	0.1063	0.1119	105.3	Pass
15	0.1192	0.1261	105.8	Pass
16	0.1888	0.1994	105.6	Pass
17	0.1388	0.1447	104.2	Pass
18	0.2365	0.2481	104.9	Pass
19	0.4046	0.4234	104.7	Pass
20	0.3248	0.3333	102.6	Pass
21	0.2874	0.2969	103.3	Pass
22	0.2249	0.2322	103.3	Pass
23	0.2749	0.2865	104.3	Pass
24	0.3080	0.3199	103.9	Pass
25	0.3413	0.3542	103.8	Pass
26	0.2744	0.2824	102.9	Pass
27	0.2600	0.2688	103.4	Pass
28	0.2130	0.2191	102.9	Pass
29	0.2504	0.2595	103.7	Pass
30	0.4333	0.4506	104.0	Pass

31	0.3414	0.3505	102.7	Pass
Nov1	0.3271	0.3358	102.6	Pass
2	0.4776	0.4970	104.1	Pass
3	0.4008	0.4120	102.8	Pass
4	0.3105	0.3188	102.7	Pass
5	0.5001	0.5196	103.9	Pass
6	0.4018	0.4091	101.8	Pass
7	0.4257	0.4368	102.6	Pass
8	0.4753	0.4898	103.1	Pass
9	0.5126	0.5277	103.0	Pass
10	0.5471	0.5608	102.5	Pass
11	0.4787	0.4885	102.0	Pass
12	0.5468	0.5628	102.9	Pass
13	0.4881	0.4955	101.5	Pass
14	0.3572	0.3611	101.1	Pass
15	0.4183	0.4303	102.9	Pass
16	0.4354	0.4473	102.7	Pass
17	0.3906	0.3987	102.1	Pass
18	0.6260	0.6464	103.3	Pass
19	0.6279	0.6426	102.3	Pass
20	0.5505	0.5605	101.8	Pass
21	0.5520	0.5629	102.0	Pass
22	0.7239	0.7450	102.9	Pass
23	0.8090	0.8249	102.0	Pass
24	0.6872	0.6963	101.3	Pass
25	0.5188	0.5226	100.7	Pass
26	0.3941	0.3956	100.4	Pass
27	0.3494	0.3537	101.2	Pass
28	0.4435	0.4543	102.4	Pass
29	0.5843	0.6013	102.9	Pass
30	0.5450	0.5577	102.3	Pass
Dec1	0.6037	0.6176	102.3	Pass
2	0.6850	0.6977	101.9	Pass
3	0.4529	0.4531	100.0	Pass
4	0.4581	0.4651	101.5	Pass
5	0.3588	0.3615	100.8	Pass
6	0.3210	0.3256	101.4	Pass
7	0.3365	0.3439	102.2	Pass
8	0.4686	0.4812	102.7	Pass
9	0.5277	0.5410	102.5	Pass
10	0.6105	0.6255	102.5	Pass
11	0.4675	0.4712	100.8	Pass
12	0.4784	0.4856	101.5	Pass
13	0.5994	0.6135	102.4	Pass
14	0.5563	0.5634	101.3	Pass
15	0.5380	0.5467	101.6	Pass
16	0.4182	0.4200	100.4	Pass
17	0.3475	0.3505	100.9	Pass
18	0.3885	0.3966	102.1	Pass
19	0.5032	0.5172	102.8	Pass
20	0.5100	0.5197	101.9	Pass
21	0.4238	0.4291	101.2	Pass
22	0.3506	0.3541	101.0	Pass
23	0.3860	0.3927	101.7	Pass
24	0.3881	0.3961	102.1	Pass
25	0.6146	0.6310	102.7	Pass
26	0.4726	0.4760	100.7	Pass
27	0.2706	0.2690	99.4	Pass

28	0.3965	0.4075	102.8	Pass
29	0.3683	0.3737	101.5	Pass
30	0.3571	0.3632	101.7	Pass
31	0.4685	0.4815	102.8	Pass

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
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 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   Freshman Pond.wdm
MESSU      25   PreFreshman Pond.MES
           27   PreFreshman Pond.L61
           28   PreFreshman Pond.L62
           30   POCFreshman Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1      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  *********
   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         ***
    # -  # ***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#   ***
1***
PERLND  16                        2.83     COPY   501     12
PERLND  16                        2.83     COPY   501     13
IMPLND   1                        2.24     COPY   501     15
2***
PERLND  16                        1.24     COPY   501     12
PERLND  16                        1.24     COPY   501     13
IMPLND   1                        2.29     COPY   501     15
3***
IMPLND   1                        0.24     COPY   501     15
4***
PERLND  16                        0.33     COPY   501     12
PERLND  16                        0.33     COPY   501     13
IMPLND   1                        0.52     COPY   501     15
5***
PERLND  16                        7.45     COPY   501     12
PERLND  16                        7.45     COPY   501     13
IMPLND   1                       10.73     COPY   501     15
DIRECT***
PERLND  16                        2.38     COPY   501     12
PERLND  16                        2.38     COPY   501     13
IMPLND   1                        1.62     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    0.9            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.9            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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 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   Freshman Pond.wdm
MESSU      25   MitFreshman Pond.MES
           27   MitFreshman Pond.L61
           28   MitFreshman Pond.L62
           30   POCFreshman Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1       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  *********
   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         ***
    # -  # ***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#   ***
1***
PERLND  16                        2.22     COPY   501     12
PERLND  16                        2.22     COPY   501     13
IMPLND   1                        2.85     COPY   501     15
2***
PERLND  16                        1.02     COPY   501     12
PERLND  16                        1.02     COPY   501     13
IMPLND   1                        2.51     COPY   501     15
3***
IMPLND   1                        0.24     COPY   501     15
4***
PERLND  16                         0.3     COPY   501     12
PERLND  16                         0.3     COPY   501     13
IMPLND   1                        0.55     COPY   501     15
5***
PERLND  16                        7.04     COPY   501     12
PERLND  16                        7.04     COPY   501     13
IMPLND   1                       11.81     COPY   501     15
DIRECT***
PERLND  16                        2.33     COPY   501     12
PERLND  16                        2.33     COPY   501     13
IMPLND   1                        1.01     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    0.9            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.9            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

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

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


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

Appendix C

Geotechnical Engineering Report
Wood Environmental & Infrastructure Solutions, Inc., August 27, 2018

Appendix D

Construction Stormwater Pollution Prevention Plan (SWPPP)
(to be provided at a later date)

Appendix E

Operations and Maintenance Manual
(to be provided at a later date)