



MAKING A "WAY" OUT OF "NO WAY"

Smokey Point # 4
XXXX Smokey Point Blvd, Marysville, WA

PN -

1st: July 2022

**Stormwater Site Plan
Report
for
Smokey Point #4 Early
Grading**

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Acronyms

The following acronyms and abbreviations may or may not be called out within the body of this report.

○ ASTM	- American Society for Testing and Materials
○ BMPs	- Best Management Practices
○ CB	- Catch Basin
○ CAO	- Critical Areas Ordinance
○ CESCL	- Certified Erosion and Sediment Control Lead
○ DOE	- Department of Ecology
○ EDDS	- Engineering Design & Development Standards
○ FEMA	- Federal Emergency Management Agency
○ HSPF	- Hydrological Simulation Program—Fortran
○ LiDAR	- Light Detecting And Ranging
○ LDA	- Land disturbing activity
○ LID	- Low Impact Development
○ LID Manual	- DOE 2005 LID Technical Guidance Manual for Puget Sound
○ MRs	- Minimum Requirements (for Stormwater Management)
○ MS4	- Municipal Separate Storm Sewer System
○ MSL	- Mean Sea Level
○ NAVD88	- North American Vertical Datum of 1888
○ NGVD29	- National Geodetic Vertical Datum of 1929
○ NPDES	- National Pollutant Discharge Elimination System
○ NRCS	- Natural Resources Conservation Service
○ NPGIS	- Non-Pollutant Generating Impervious Surface
○ O&M	- Operations and Maintenance
○ PGIS	- Pollutant Generating Impervious Surface
○ PGPS	- Pollutant Generating Pervious Surface
○ PLSS	- Public Land Survey System
○ POC	- Point of Compliance
○ RCW	- Revised Code of Washington
○ ROW	- Right-of-Way
○ SCDM-2010	- Snohomish County 2010 Drainage Manual
○ SMMWW	- DOE 2005 Stormwater Management Manual for Western Washington
○ SWPPP	- Stormwater Pollution Prevention Plan
○ TDA	- Threshold Discharge Area
○ TESC	- Temporary Erosion and Sediment Controls
○ USDA	- United States Department of Agriculture
○ US EPA	- United States Environmental Protection Agency
○ WSDOT	- Washington State Department of Transportation
○ WWHM	- Western Washington Hydrology Model

Section 1 – Report Summary

1.1 Project Description

Smokey Point # 4 is proposing to bring in fill material to their property. The proposed grading permit will be on 10.00-acres of land in northwest Marysville, WA off of Smokey Point Blvd. Future development of the parcel is in the planning phase. Fill material will be required for the future development of the parcel. The grading permit will be to “jump start” the development of the site with needed import material.

The site is currently vacant and vegetated with pasture. There is a Category III depression wetland located partially within the eastern portion of the site.

Fill will be brought into the site from Smokey Point Blvd at the west. A temporary construction entrance will be installed at the western parcel line from an existing driveway. Entrance to the site will be from the west in a one-way loop through the property and exit at the same location. Trucks will leave the site along a temporary gravel driveway and through the entrance location. Fill will be brought into the parcel along this route. The final site will contain no new impervious area. Temporary site will have a construction entrance of 1,770 sf.

The fill will have a maximum slope of 3:1. A 10 foot vegetated buffer will extend from the toe of the slope to the property boundary. A 10 foot vegetated buffer is located along the buffer of the onsite Category III wetland.

The fill slopes will be tracked, seeded, and mulched. The need for plastic covering, or other BMPs, should be anticipated and deployed before stockpiles become unsafe to do so.

The 2014 DOE Stormwater Management Manual for Western Washington will be used for stormwater management.

Per NRCS mappings, type “C/D” Custer fine sandy loam soils are found throughout the site. Sandy, permeable soils are found at depth.

The entire developable project area is in a single natural discharge area with a single discharge location to the onsite wetland. Stormwater BMPs will be employed to mitigate polluted and unpolluted surface water flows.

1.2 Project Data Summary

Existing and proposed project areas are presented for determination of stormwater management requirements based on prescribed thresholds as outlined in the Marysville Municipal Code (MMC 22C) and the 2014 SMMWW Vol-1, Ch-2, Section 2.4 are summarized in the following tables.

Table 1 - Project Parcel Summary

Project Data:	
Applicant	Richard Peterson
Site Owner	Smokey Point # 4
Project Name	Smokey Point #4 Early Grading
Project T.S.R. Location	TwN 31 N, Rng 5 E, Sec 28, Qtr-SW
Project Address	XXXX Smokey Point Blvd, Marysville, WA
Parcel ID(s)	310528-003-016-00, 310528-003-017-00
Watershed	Snohomish
Basin	Snohomish
Sub-Basin	Quilceda Creek
WRIA Number	7
Analysis Standard	2014 DOE SMMWW

Table 2 - Project Area Analysis & Activities Summary

Existing Conditions:		
Total Site Area	435,813	sf (10.00 ac)
Existing Impervious Area	0	sf (0.00 ac) 0%
Proposed Activity:		
Proposed Activity	Grading Import	
Total Proposed Disturbance Area	352,748	sf (8.10 ac)
Proposed Grading Area	352,748	sf (8.10 ac)
Proposed New NPGIS	0	sf (0.00 ac)
Proposed New PGIS	1,770	sf (0.04 ac)
Proposed Replaced Impervious Area	0	sf (0.00 ac)
Native Vegetation convert to Lawn	0	sf (0.00 ac)
Native Vegetation convert to Pasture	352,748	sf (8.10 ac)
Total New Impervious Area	1,770	sf (0.04 ac)

Section 2 - Minimum Requirements

2.1 Assessment of Minimum Requirements and Thresholds

Minimum requirements and thresholds are established by City of Marysville Municipal Code 14.15.050 – Minimum Requirements. Minimum Requirements for new development and Redevelopment are based on a development’s disturbance area. Existing and proposed project areas for determination of stormwater management requirements are presented in Table 2.

The existing impervious area is less than 35% so this project qualifies as ‘new development’. The proposed condition of the fully developed site will have impervious area less than 2,000 sf. The project does convert more than 2.5 acres of native vegetation to pasture. The project does cause more than 7,000 *square feet* of land disturbing activity. This requires construction activities and stormwater management to comply with Minimum Requirements 1 through 9. A full construction SWPPP is also required.

Minimum Requirements per the SMMWW:

- MR-1: Prepare Stormwater Site Plan. MMC 14.15.050 (1)
- MR-2: Stormwater Pollution Prevention Plan (SWPPP). MMC 14.15.050 (2)
- MR-3: Water pollution source control for new development. MMC 14.15.050 (3)
- MR-4: Preservation of natural drainage systems and outfalls. MMC 14.15.050 (4)
- MR-5: On-site stormwater management. MMC 14.15.050 (5)
- MR-6: Runoff treatment. MMC 14.15.050 (6)
- MR-7: Flow control requirements. MMC 14.15.050 (7)
- MR-8: Detention or treatment in wetlands and wetland buffers. MMC 14.15.050 (8)
- MR-9: Inspection, operation and maintenance requirements. MMC 14.15.050 (9)

Each Minimum Requirements is described in the following sections. There are no additional requirements to be met.

2.2 MR #1: Preparation of Stormwater Site Plans

This section presents the portion of the Stormwater Site Plan that includes recommendations, calculations, and procedures required to adhere to Minimum Requirement #1. The evaluation of the existing site conditions follows.

2.2.1 Site Location

The site is located in the SW quarter of Section 28 of Township 31 North, Range 5 East. The street address is XXXX Smokey Point Blvd, Marysville, WA and the parcel is located on the west side of 27th Ave NE. See Figure 1 for a vicinity map.

2.2.2 Site Description, Existing Conditions

The project site has two parcels. These parcels are owned by Smokey Point # 4. The Snohomish County parcel numbers are 310528-003-016-00, 310528-003-017-00. They are zoned General Commercial and are located in Snohomish County.

The site is vacant. The existing drainage system(s) are undetermined but largely surface runoff to an on-site wetland in the southeast corner of the site and some infiltration.

The site is undeveloped and predominantly forested.

All maps and figures are presented in the Support Data section of this document.

A vicinity map that shows the site location is shown as Figure 1.

A site map that shows the property lines is shown in Figure 2.

A topographic map that shows the site boundaries, study area boundaries, and the downstream flow-paths is also presented in Figure 3.

2.2.3 Existing Basin Analysis

The project is defined by the development within the subject parcels. Existing project flow paths are shown in Figure 2.

The study area is located in the Quilceda Creek sub-basin of the Snohomish Basin in the Snohomish watershed (WRIA-7), which drains to the Puget Sound.

All existing flow assessment and site related basin delineations were established by tracing analysis of a LIDAR surface model.

2.2.4 Other Information on the Study Area

The site is not in or adjacent to a USEPA Sole Source Aquifer.

The site is not in a well-head protection area.

The site is not in a floodway or floodplain.

2.2.5 Critical Areas

A large depression Category III wetland is located partially on the southeast portion of the site. Category III wetlands carry 75-ft buffer. The plant community within the wetland is hydrophytic. (Wetland Resources, Inc., 2022)

2.2.6 Topography

The site and surrounding topography was analyzed using survey topographic points provided by the Puget Sound Lidar Consortium. A 3D surface model was generated.

The site has mostly flat slopes with a low point around 115 *feet* MSL. The low point is located within the on-site wetland. The site slopes up from the wetland to a high point of 118 *feet* along the north property boundary.

Slopes average in the range of 0 to 2 percent for the majority of the developable area. The site has an average slope of 0.5%.

2.2.7 Soils

The majority of the site is situated on Custer fine sandy loam soils, a hydrologic Type-C/D soil per the NRCS mapping. Custer fine sandy loam soils have a 0-9 *inch* first layer of fine sandy loam with the remaining profile being sand. Much surface runoff is attributed to the fine sandy loam layer. Infiltration increases significantly with depth.

Detailed physical and chemical properties of these soils are presented in Section 4.1. The NRCS mapping can be seen in Figure 5.

2.2.8 Field Inspection

The site has not been visited recently.

2.2.9 Upstream Analysis

An unregulated ditch flows east along the northern property of the site. A relative high point at 118 MSL is located along west boundary of the site. This ditch and local high point intercept all upstream flows from flowing onto the site.

2.2.10 Downstream Analysis

The downstream area was established by tracing analysis of a LIDAR surface model and evaluation of various GIS data, aerial imagery, and City of Marysville Drainage Inventory. The development area flows to a Category III wetland. The wetland is located partially within the southeast portion of the site. The wetland is bounded by an unregulated ditch to the north, Hayho Creek to the east, and a ditch to the south. Stormwater flows to the wetland and leaves the site at the southeast boundary of the site. Stormwater eventually flows to Hayho creek. Hayho Creek travels south before reaching the Quilceda Creek. Quilceda Creek drains to the Puget Sound.

Figure 3 shows a portion of the downstream flow path.

2.3 MR #2: Stormwater Pollution Prevention Plans (SWPPPs)

MMC 14.15.050 (2) specifies the requirements for development and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into receiving waters. Volume I, Chapter 2.5.2 of the 2014 SMMWW specifies that all new development and redevelopment implement a Stormwater Pollution Prevention Plans (SWPPP), which is a list of 13 elements that present measures and methods for all permanent and temporary erosion and sediment control (TESC), pollution prevention, inspection/monitoring activities, and recordkeeping required during the proposed construction project.

Based on the MR#2 thresholds, this project disturbs more than 7,000 *square feet* of area, so a full SWPPP is required. Required elements for the SWPPP:

- SWPPP element 1: Preserve vegetation/mark clearing limits
- SWPPP element 2: Establish construction access
- SWPPP element 3: Control flow rates
- SWPPP element 4: Install sediment controls
- SWPPP element 5: Stabilize soils
- SWPPP Element 6: Protect slopes
- SWPPP element 7: Protect permanent drain inlets
- SWPPP element 8: Stabilize channels and outlets
- SWPPP element 9: Control pollutants
- SWWP element 10: Control dewatering
- SWPPP element 11: Maintain best management practices
- SWPPP element 12: Manage the project
- SWPPP element 13: Protect On-Site Stormwater Management BMPs for Runoff from Roofs and Other Hard Surfaces

The SWPPP is assembled as a separate document for portability and reproduction purposes. The document is titled “**Stormwater Pollution Prevention Plan for Richard Peterson**”, dated 15 July 2022. This document will be provided with Construction Plan Submittal.

2.4 MR #3: Source Control of Pollution

MMC 14.15.050 (3) specifies the requirements for water pollution source control for new development or redevelopment activities in accordance with Volume IV of the SMMWW. These activities are primarily commercial industrial developments that represent significant pollutant generation potential and the associated source control BMPs are designed to suit those activities.

Per Chapter 2.5.3, MR#3 does not apply to early fill, hence such source controls are not specified for this project.

2.5 MR #4: Preservation of Natural Drainage Systems and Outfalls

MMC 14.15.050 (4) specifies the requirements for preservation of natural drainage systems or outfalls for all new development and redevelopment activities under Minimum Requirement 4 in the 2014 SMMWW.

Natural drainage patterns as they once existed shall be retained. The existing site has a very slight slope to an onsite wetland at the southeast corner of the site. Any rains heavy enough to create runoff and not infiltrate will sheet flow to the wetland.

The top pad of the fill will be graded to direct runoff to the wetland. The site existed as forest, the 'final' configuration of the site will be pasture. The conglomeration of all early grading permits and fills in this area will move water to the existing drainage location at the wetland.

Natural drainage systems and outfalls will be preserved.

2.6 MR #5: On-Site Stormwater Management

MMC 14.15.050 (5) specifies requirements for on-site stormwater BMPs. This requirement mandates that on-site stormwater runoff be infiltrated, dispersed, and/or retained to the maximum extent feasible without causing flooding or erosion impacts. Projects triggering Minimum Requirements 1 through 5 must use On-site stormwater management BMPs from List #1 for all surfaces or demonstrate compliance with the LID Performance Standard. Projects triggering Minimum Requirements 1 through 9 must meet the requirements of Table 2.5.1 in Vol. 1 of the 2014 SMMWW. Table 2.5.1 specifies the requirements for new or redevelopment depending on UGA and parcel size to meet the requirements of the LID Performance Standard and/or List #2. List #1 and List #2 specify stormwater BMPs in order of preference. The first BMP determined feasible is required.

This project trigger MR's 1-9. This project is within the City's UGA. This project is required to adhere to the LID Performance Standard or List #2 per Table 2.5.1.

List #1 and #2 contain appropriate BMPs to mitigate a particular developed surface. The surfaces included in the list are Lawn and Landscaped Areas, Roofs, and other hard surfaces (road/driveway/parking).

Lawn/Landscape is required to utilize BMP T5.13, Post-Construction Soil Quality and Depth. Once the final import material is brought in, amended soils meeting BMP T5.13 requirements will be placed along with seed to formalize the permanent stormwater control. The site is currently in the planning phases of future development. Note that infiltration is not required to be assessed for feasibility for vegetation conversions.

No roofs are proposed. Therefore, no infiltration BMPs, Full Dispersion, or Bioretention is required.

No driveways are proposed. Therefore, no infiltration BMPs, Full Dispersion, or Bioretention is required.

A site plan showing the stormwater management and development can be seen in Figure 4.

2.7 MR #6: Runoff Treatment

Minimum Requirement #6 in MMC 14.15.050 (6) specifies the requirements for providing runoff treatment. The threshold for requiring a treatment BMP is 5,000 *square feet* of PGIS (Pollution Generating Impervious Surface) or a total of more than $\frac{3}{4}$ of an acre of PGPS (Pollution Generating Pervious Surface).

The project is not proposing the installation of PGIS, therefore treatment facility BMPs are not required for this project.

2.8 MR #7: Flow Control

Minimum Requirement #7 in MMC 14.15.050 (7) specifies the requirements for runoff flow control. The threshold for requiring Minimum Requirement #7 is 5,000 *square feet* of impervious surface. Flow control shall be provided if the project creates more than 10,000 *square feet* of effective impervious area in a threshold discharge area, converts $\frac{3}{4}$ of an acre or more of native vegetation to lawn, 2.5 *acres* or more native vegetation is converted to pasture, or a combination of impervious and converted pervious surfaces cause a 0.1 *cfs* increase in the 100-year flow frequency from a continuous simulation runoff model.

The site converts 10.00 acres of native vegetation to pasture. The project exceeds this requirement and is required to provide flow control.

Standard flow control requires that stormwater discharges match pre-developed discharge durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow to the 50-year peak flow. The pre-developed condition shall be matched to the fully-forested condition (soils and vegetation) to which the Western Washington Hydrologic Model (WWHM) is calibrated, unless reasonable, historic information is provided that indicates the site was prairie prior to Euro-American settlement. This requirement may also be met by dispersion and infiltration

The site stormwater management uses a detention pond to temporarily store stormwater generated on site. The site needs a minimum of 0.952 *acre-feet* volume detention pond to store stormwater.

See Section 7 for WWHM modeling parameters. The site is modeled and presented at the end of the report.

2.9 MR #8: Wetlands Protection

MMC 14.15.050 (8) specifies requirements for discharge of stormwater in wetlands and wetland buffers as well as discharge of stormwater to a stream.

Since there is no detention or treatment in the critical areas, MR-8 does not apply to this project.

2.10 MR # 9: Operation and Maintenance

Minimum Requirement #9 specified MMC 14.15.050 (9) contains requirements for inspection, operation and maintenance of stormwater facilities and BMPs. Specific maintenance standards and requirements are outlined in Volume V of the 2014 SMMWW. The 2014 SMMWW requires the regular maintenance and inspection of drainage facilities.

For portability and reproduction purposes, the Operations and Maintenance Manual is presented in a separate stand-alone document titled “**Operations and Maintenance Manual for Smokey Point #4 Early Grading**”, dated **15 July 2022**. This document will be provided with the construction plan submittal.

Section 3 - Maps & Figures

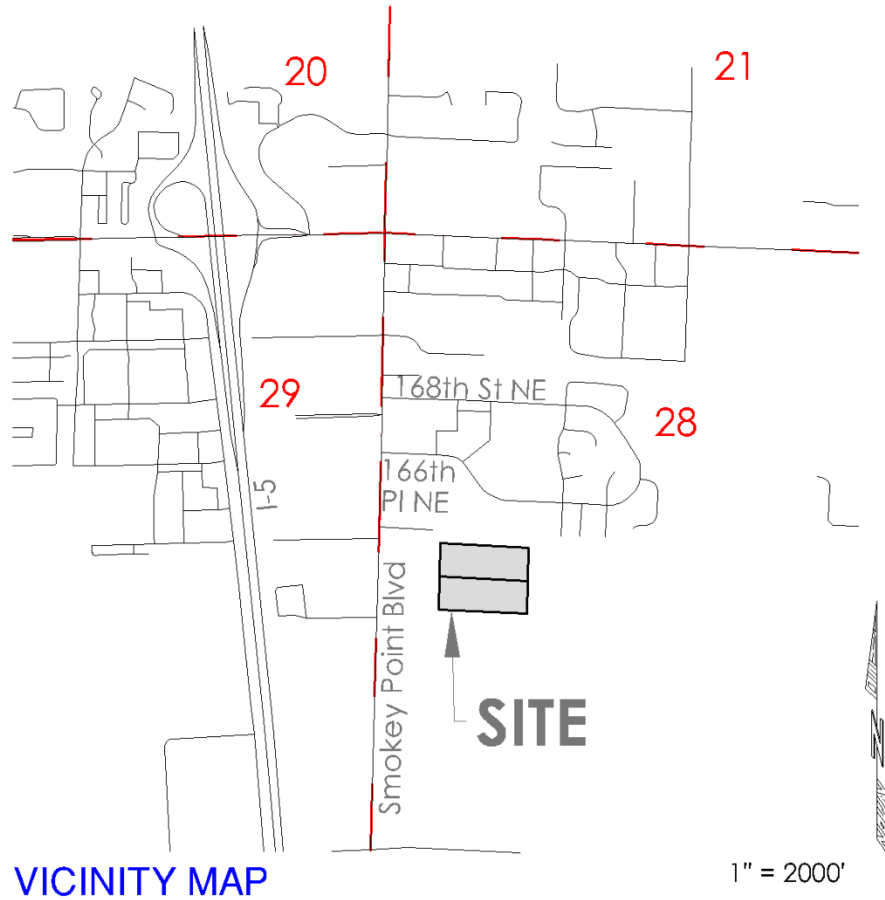


Figure 1 - Vicinity Map



Figure 2 - Existing Conditions (not to scale)

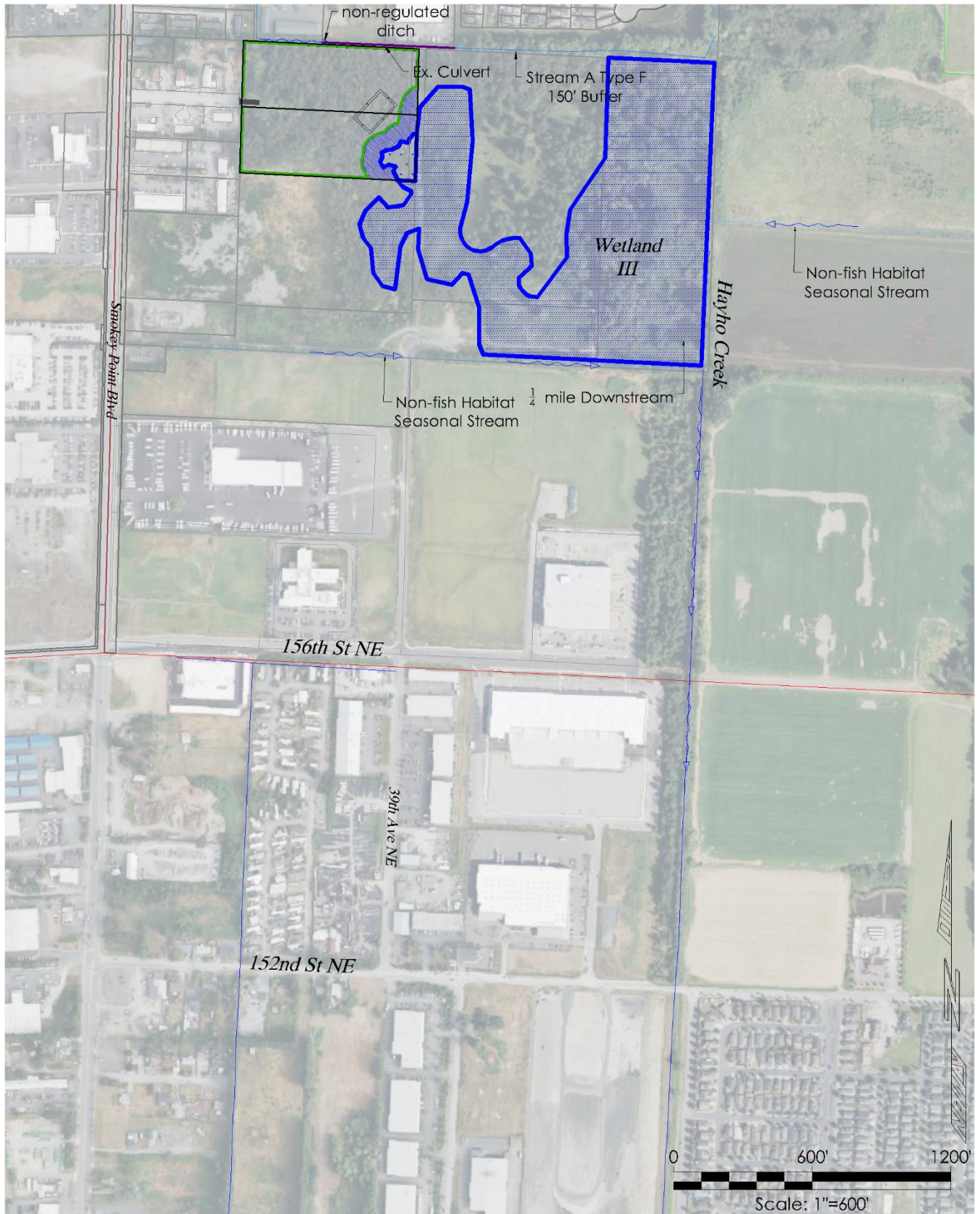


Figure 3 – Downstream Flow Path

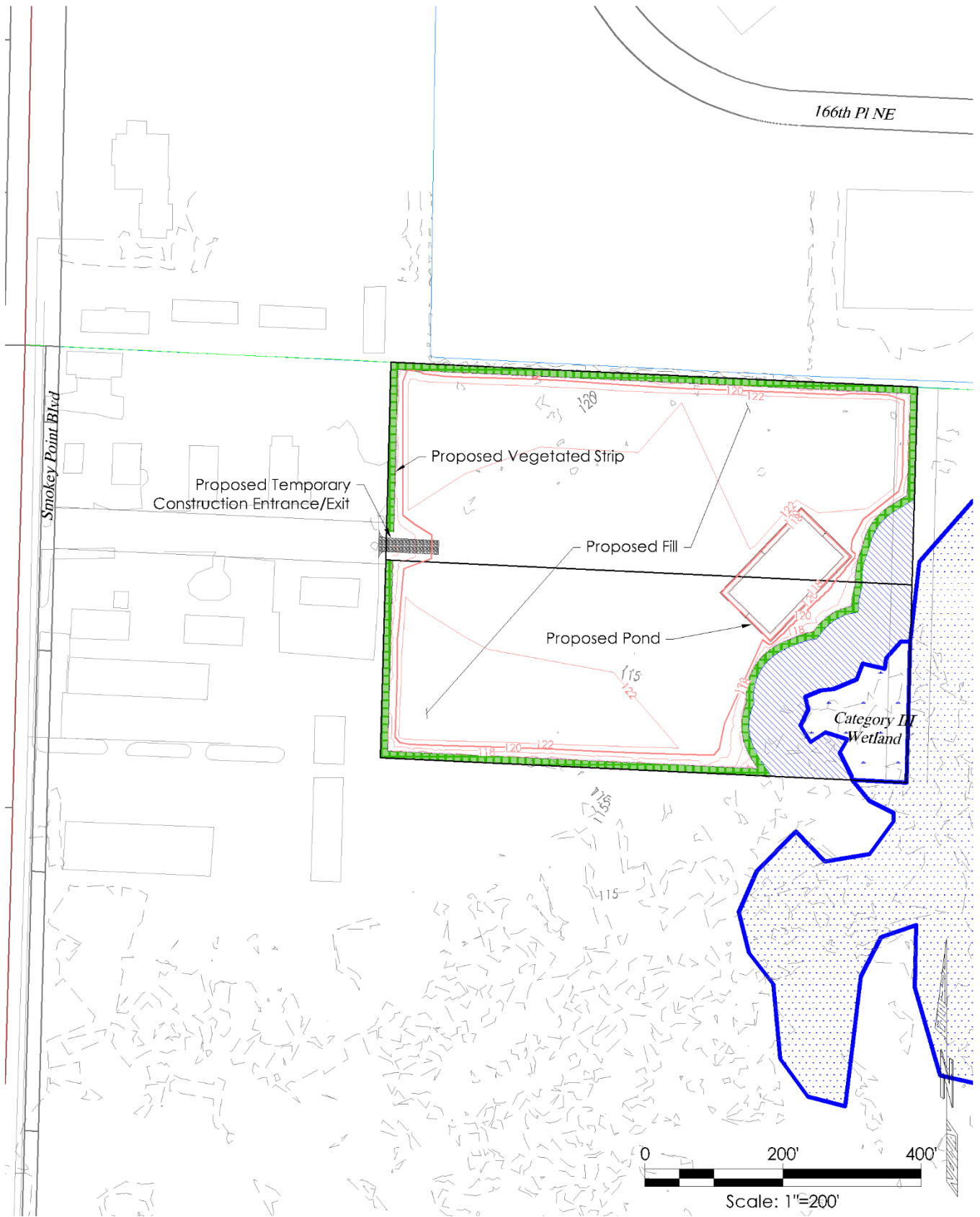


Figure 4 - Site Plan



Figure 5 – Soil Map (Not to Scale)

Section 4 - Support Data

4.1 Soils Data

13—Custer fine sandy loam

Map Unit Setting

National map unit symbol: 2hy0

Elevation: 0 to 150 feet

Mean annual precipitation: 32 to 50 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 150 to 200 days

Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

*Custer, undrained, and similar soils:*85 percent

*Minor components:*15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Custer, Undrained

Setting

*Landform:*Outwash plains

*Parent material:*Glacial outwash

Typical profile

H1 - 0 to 9 inches: fine sandy loam

H2 - 9 to 35 inches: sand

H3 - 35 to 60 inches: sand

Properties and qualities

*Slope:*0 to 2 percent

*Depth to restrictive feature:*20 to 40 inches to strongly contrasting textural stratification

*Drainage class:*Poorly drained

*Capacity of the most limiting layer to transmit water (Ksat):*Moderately high (0.20 to 0.57 in/hr)

*Depth to water table:*About 0 to 12 inches

*Frequency of flooding:*None

*Frequency of ponding:*None

*Maximum salinity:*Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: C/D

Ecological site: F002XA007WA - Puget Lowlands Wet Forest

Forage suitability group: Wet Soils (G002XN102WA)

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Minor Components

Norma, undrained

*Percent of map unit:*5 percent

*Landform:*Depressions

*Other vegetative classification:*Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Indianola

Percent of map unit:5 percent

Hydric soil rating: No

Custer, drained

Percent of map unit:5 percent

Landform:Depressions

Other vegetative classification:Soils with Few Limitations (G002XN502WA)

Hydric soil rating: Yes

39—Norma loam

Map Unit Setting

National map unit symbol: 2hyx

Elevation: 0 to 1,000 feet

Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 150 to 200 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Norma, undrained, and similar soils:85 percent

Minor components:15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Norma, Undrained

Setting

Landform:Drainageways, depressions

Parent material:Alluvium

Typical profile

H1 - 0 to 10 inches: ashy loam

H2 - 10 to 28 inches: sandy loam

H3 - 28 to 60 inches: sandy loam

Properties and qualities

Slope:0 to 3 percent

Depth to restrictive feature:More than 80 inches

Drainage class:Poorly drained

Capacity of the most limiting layer to transmit water (Ksat):Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table:About 0 inches

Frequency of flooding:None

Frequency of ponding:Frequent

Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D
Ecological site: F002XA007WA - Puget Lowlands Wet Forest
Forage suitability group: Wet Soils (G002XN102WA)
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Minor Components

Terric medisaprists, undrained

Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Bellingham, undrained

Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Norma, drained

Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Section 5 Works Cited

- Puget Sound Action Team. (2005, January). Low Impact Development Technical Guidance Manual for Puget Sound. *Publication No. PSAT 05-03*. Washington: Washington State University - Pierce County Extension.
- Puget Sound LIDAR Consortium. (2003, April). LIDAR Bare Earth DEM File. q47121h24be.e00. Snohomish County, Washington. Retrieved May 2013, from <http://pugetsoundlidar.ess.washington.edu/index.htm>
- Snohomish County Planning and Development Services. (2007, October 1). Aquifer Recharge/Wellhead Protection. Everett, WA.
- Snohomish County Surface Water Management Division. (2002, December). Snohomish UGA Drainage Needs Report. Everett, Washington.
- Wetland Resources, Inc. (2022). *Critical Areas Determination Report for LEE & Associates - Smokey Point Blvd*. Everett, WA 98208.

5.1 Topographic Data

- The various on and off site topography, utilities, and drainage elements were professionally surveyed by Pacific Coast Surveying in 2015.
- Snohomish County 2003 LiDAR survey was used to augment the existing site topography and the downstream and surrounding areas.

The modeled coordinate system:

Lateral - Washington State Plan Plane - North, FIPS 4601;

Vertical – NAVD 88

Section 6 Continuous Simulation Modeling

6.1 Continuous Simulation Background

HSPF based continuous simulation modeling was used to evaluate the hydrologic performances of the pre-developed and developed sub-basins in order to accurately assess flow rates.

The currently adopted continuous simulation models use the HSPF (Hydraulic Simulation Program in FORTRAN) software engine. The HSPF model uses a robust and detail accounting of the 'water budget', including evaporation, evapotranspiration, interception, interflow, and groundwater. The modeling accounts for and assesses land segment areas that include vegetation or impervious cover, soil types, and slopes. The modeling also uses utilized over 50 years of continuous rainfall data (precipitation) and evaporation data for the area. The HSPF continuous modeling is considered the best available science for hydrologic analysis.

6.2 Modeling Methodology

HSPF modeling was managed via the Western Washington Hydrology Model (WWHM) interface program. The current professional version of WWHM by Clearcreek Solutions, Inc., WWHM-2012 was used. The current data precipitation and evaporation set provided by DOE with the WWHM-2012 software interface was used that includes quantized data in 15-minute time steps from October 1948 to October 2009.

The WWHM program comes packaged with generic, well considered HSPF modeling parameters. These settings allow for the modeling of the majority of the topological conditions found in the Puget Sound area. Where conditions fall reasonably outside the range of the default HSPF parameters, adjustments should be made to more accurately reflect those conditions. These are generally limited to the pervious land segments (IMPLNDS) and are mostly limited to slopes (SLSUR), infiltration rates (INFILT), and length of flow path (LSUR). For this project, HSPF parameters were not adjusted to reflect site conditions.

6.2.1 Existing Conditions

The surface vegetative cover is assumed fully forested with an average slope of 0.5% in the area of development, based on the LIDAR based TIN analysis. The LIDAR model represents the pre-graded conditions and is in accordance with the predeveloped requirements to be represented as native vegetation and soils that existed at a site prior to the influence of Euro-American settlement.

The NRCS soil mapping of Custer fine sandy loam soils within the modeled area is Type C hydrologic soils.

6.2.2 Developed Conditions

The proposal is to bring in fill material on to the site therefore the site is modeled as Flat, Pasture. The site will use a detention pond to store stormwater.

The following section is the WWHM output for the modeled site.

Section 7 - Software Output

The following WWHM reports in this section represent individual sub-basin analysis for hydrologic flow evaluations. The following heading is common to all reports.

Western Washington Hydrology Model,

PROJECT REPORT

Project Name: EG - Peterson Smokey Point 4 -1
Site Name: Peterson Smokey Point 4
Site Address: XXXX smokey point blvd
City : Marysville, WA
Report Date: 7/15/2022
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Flat	8.1

Pervious Total	8.1
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<u>Impervious Land Use</u>	<u>acre</u>
Impervious Total	0

Basin Total	8.1
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Basin 1
8.10ac

Element Flows To:
Surface

Interflow

Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	8.1
Pervious Total	8.1
<u>Impervious Land Use</u>	<u>acre</u>
Impervious Total	0
Basin Total	8.1

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Name : Trapezoidal Pond 1
Bottom Length: 122.00 ft.
Bottom Width: 105.00 ft.
Depth: 3 ft.
Volume at riser head: 0.9520 acre-feet.
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: 2.8 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 2 in. Elevation: 0 ft.
Orifice 2 Diameter: 2 in. Elevation: 1.5 ft.
Orifice 3 Diameter: 4 in. Elevation: 2 ft.

Element Flows To:

Outlet 1	Outlet 2
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Pond Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.294	0.000	0.000	0.000
0.0333	0.295	0.009	0.019	0.000
0.0667	0.296	0.019	0.028	0.000
0.1000	0.297	0.029	0.034	0.000
0.1333	0.298	0.039	0.039	0.000
0.1667	0.299	0.049	0.044	0.000
0.2000	0.300	0.059	0.048	0.000

0.2333	0.301	0.069	0.052	0.000
0.2667	0.302	0.079	0.056	0.000
0.3000	0.303	0.089	0.059	0.000
0.3333	0.304	0.099	0.062	0.000
0.3667	0.305	0.109	0.065	0.000
0.4000	0.306	0.120	0.068	0.000
0.4333	0.307	0.130	0.071	0.000
0.4667	0.308	0.140	0.074	0.000
0.5000	0.309	0.151	0.076	0.000
0.5333	0.311	0.161	0.079	0.000
0.5667	0.312	0.171	0.081	0.000
0.6000	0.313	0.182	0.084	0.000
0.6333	0.314	0.192	0.086	0.000
0.6667	0.315	0.203	0.088	0.000
0.7000	0.316	0.213	0.090	0.000
0.7333	0.317	0.224	0.093	0.000
0.7667	0.318	0.234	0.095	0.000
0.8000	0.319	0.245	0.097	0.000
0.8333	0.320	0.256	0.099	0.000
0.8667	0.321	0.266	0.101	0.000
0.9000	0.322	0.277	0.103	0.000
0.9333	0.324	0.288	0.104	0.000
0.9667	0.325	0.299	0.106	0.000
1.0000	0.326	0.310	0.108	0.000
1.0333	0.327	0.320	0.110	0.000
1.0667	0.328	0.331	0.112	0.000
1.1000	0.329	0.342	0.113	0.000
1.1333	0.330	0.353	0.115	0.000
1.1667	0.331	0.364	0.117	0.000
1.2000	0.332	0.375	0.118	0.000
1.2333	0.333	0.387	0.120	0.000
1.2667	0.335	0.398	0.122	0.000
1.3000	0.336	0.409	0.123	0.000
1.3333	0.337	0.420	0.125	0.000
1.3667	0.338	0.431	0.126	0.000
1.4000	0.339	0.443	0.128	0.000
1.4333	0.340	0.454	0.130	0.000
1.4667	0.341	0.465	0.131	0.000
1.5000	0.342	0.477	0.132	0.000
1.5333	0.344	0.488	0.154	0.000
1.5667	0.345	0.500	0.163	0.000
1.6000	0.346	0.511	0.171	0.000
1.6333	0.347	0.523	0.178	0.000
1.6667	0.348	0.534	0.184	0.000
1.7000	0.349	0.546	0.190	0.000
1.7333	0.350	0.558	0.195	0.000
1.7667	0.351	0.569	0.200	0.000
1.8000	0.353	0.581	0.205	0.000
1.8333	0.354	0.593	0.209	0.000
1.8667	0.355	0.605	0.214	0.000
1.9000	0.356	0.617	0.218	0.000
1.9333	0.357	0.629	0.222	0.000
1.9667	0.358	0.640	0.226	0.000
2.0000	0.359	0.652	0.230	0.000
2.0333	0.361	0.664	0.313	0.000
2.0667	0.362	0.677	0.349	0.000
2.1000	0.363	0.689	0.378	0.000
2.1333	0.364	0.701	0.403	0.000

2.1667	0.365	0.713	0.425	0.000
2.2000	0.366	0.725	0.446	0.000
2.2333	0.368	0.737	0.464	0.000
2.2667	0.369	0.750	0.482	0.000
2.3000	0.370	0.762	0.499	0.000
2.3333	0.371	0.774	0.515	0.000
2.3667	0.372	0.787	0.531	0.000
2.4000	0.373	0.799	0.545	0.000
2.4333	0.375	0.812	0.560	0.000
2.4667	0.376	0.824	0.573	0.000
2.5000	0.377	0.837	0.587	0.000
2.5333	0.378	0.849	0.600	0.000
2.5667	0.379	0.862	0.612	0.000
2.6000	0.381	0.875	0.625	0.000
2.6333	0.382	0.887	0.637	0.000
2.6667	0.383	0.900	0.649	0.000
2.7000	0.384	0.913	0.660	0.000
2.7333	0.385	0.926	0.671	0.000
2.7667	0.386	0.939	0.682	0.000
2.8000	0.388	0.952	0.693	0.000
2.8333	0.389	0.965	0.769	0.000
2.8667	0.390	0.978	0.897	0.000
2.9000	0.391	0.991	1.058	0.000
2.9333	0.392	1.004	1.245	0.000
2.9667	0.394	1.017	1.448	0.000
3.0000	0.395	1.030	1.662	0.000
3.0333	0.396	1.043	1.879	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:8.1
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:8.1
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.272163
5 year	0.417507
10 year	0.5296
25 year	0.689973
50 year	0.823539
100 year	0.969612

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
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2 year	0.135419
5 year	0.206002
10 year	0.264895
25 year	0.355246
50 year	0.435563
100 year	0.528328

Stream Protection Duration

POC #1

The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1361	19629	6175	31	Pass
0.1430	16996	5625	33	Pass
0.1500	14981	5298	35	Pass
0.1569	12974	4902	37	Pass
0.1639	11131	4496	40	Pass
0.1708	9584	4096	42	Pass
0.1777	8288	3690	44	Pass
0.1847	7176	3208	44	Pass
0.1916	6213	2736	44	Pass
0.1986	5360	2348	43	Pass
0.2055	4699	1970	41	Pass
0.2125	4096	1588	38	Pass
0.2194	3585	1227	34	Pass
0.2264	3144	985	31	Pass
0.2333	2772	788	28	Pass
0.2402	2458	754	30	Pass
0.2472	2156	731	33	Pass
0.2541	1895	711	37	Pass
0.2611	1657	692	41	Pass
0.2680	1508	674	44	Pass
0.2750	1389	658	47	Pass
0.2819	1262	635	50	Pass
0.2888	1165	624	53	Pass
0.2958	1076	616	57	Pass
0.3027	1013	607	59	Pass
0.3097	955	599	62	Pass
0.3166	894	590	65	Pass
0.3236	830	573	69	Pass
0.3305	781	555	71	Pass
0.3375	737	532	72	Pass
0.3444	688	524	76	Pass
0.3513	651	518	79	Pass
0.3583	622	507	81	Pass
0.3652	603	498	82	Pass
0.3722	583	487	83	Pass
0.3791	561	478	85	Pass
0.3861	538	468	86	Pass
0.3930	506	460	90	Pass
0.4000	489	453	92	Pass
0.4069	474	443	93	Pass
0.4138	460	436	94	Pass
0.4208	441	427	96	Pass
0.4277	425	418	98	Pass
0.4347	414	410	99	Pass

0.4416	395	402	101	Pass
0.4486	380	393	103	Pass
0.4555	369	383	103	Pass
0.4625	354	373	105	Pass
0.4694	341	363	106	Pass
0.4763	333	353	106	Pass
0.4833	322	342	106	Pass
0.4902	313	330	105	Pass
0.4972	304	318	104	Pass
0.5041	293	306	104	Pass
0.5111	284	293	103	Pass
0.5180	276	277	100	Pass
0.5249	267	265	99	Pass
0.5319	259	246	94	Pass
0.5388	243	224	92	Pass
0.5458	234	200	85	Pass
0.5527	227	175	77	Pass
0.5597	213	157	73	Pass
0.5666	205	127	61	Pass
0.5736	195	122	62	Pass
0.5805	187	116	62	Pass
0.5874	177	111	62	Pass
0.5944	166	106	63	Pass
0.6013	160	101	63	Pass
0.6083	151	97	64	Pass
0.6152	146	92	63	Pass
0.6222	135	87	64	Pass
0.6291	128	82	64	Pass
0.6361	120	77	64	Pass
0.6430	111	73	65	Pass
0.6499	100	67	67	Pass
0.6569	88	61	69	Pass
0.6638	75	53	70	Pass
0.6708	64	46	71	Pass
0.6777	59	35	59	Pass
0.6847	56	21	37	Pass
0.6916	50	0	0	Pass
0.6985	42	0	0	Pass
0.7055	40	0	0	Pass
0.7124	37	0	0	Pass
0.7194	36	0	0	Pass
0.7263	31	0	0	Pass
0.7333	28	0	0	Pass
0.7402	26	0	0	Pass
0.7472	20	0	0	Pass
0.7541	16	0	0	Pass
0.7610	13	0	0	Pass
0.7680	9	0	0	Pass
0.7749	6	0	0	Pass
0.7819	5	0	0	Pass
0.7888	4	0	0	Pass
0.7958	4	0	0	Pass
0.8027	3	0	0	Pass
0.8097	3	0	0	Pass
0.8166	3	0	0	Pass
0.8235	3	0	0	Pass