Appendix A

Master Drainage Plan

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Snoqualmie Mill Planned Commercial-Industrial Plan

Master Drainage Plan (Draft)

February / April 2020

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Snoqualmie Mill Planned Commercial-Industrial Plan

Master Drainage Plan (Draft)

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1. Introduction & Purpose and Scope

Introduction

Snoqualmie Mill Ventures, LLC is proposing to develop the Snoqualmie Mill site in accordance with the City of Snoqualmie Planned Commercial/Industrial (PCI) Plan requirements of SMC 17.20.050(J); together with the inclusion of PCIP application materials required for a Planned Unit Development (PUD) under SMC 17.50.090(B).

The Snoqualmie Mill Planned Commercial-Industrial Plan (PCIP) ("Snoqualmie Mill") development project has stipulated to preparation of an Environmental Impact Statement (the "EIS"). The intent of this Master Drainage Plan (the "MDP") is to provide for programmatic level planning and engineering for the overall project and project level planning and engineering for Planning Area 1 (Phase I). This report is prepared as a Master Drainage Plan for *Large Project Drainage Review* in accordance with the *2016 King County Surface Water Design Manual* (KCSWDM) and accompanies the EIS for the PCIP.

Snoqualmie Mill intends to comply with Snoqualmie Municipal Code **15.18 Surface Water and Stormwater Management**. This is better outlined in **Chapter 3 Regulatory Framework and includes reference to** the 2012/2014 Stormwater Manual for Western Washington (Department of Ecology); Appendix I-E, Flow Control Exempt Surface Waters, of the Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2012, amended in 2014; City of Snoqualmie Addendum to the 2016 King County Surface Water Design Manual; and 2016 KCSWDM. These are referred to herein as KCSWDM and the Ecology Manual, respectively.

Background and General Site Conditions

The Snoqualmie Mill Property was an important source of employment in the Snoqualmie area for almost 100 years. Weyerhaeuser Timber Company owned and operated the lumber mill site between 1914 and 2003 when the mill was closed. Snoqualmie Mill Ventures, LLC purchased the site in 2010. See the Regional Vicinity Map (**Figure 1-1**) and Aerial Site Plan (**Figure 1-2**) for regional references to the location of the project.

The Snoqualmie Mill site (approximately 261 acres) was annexed into the City of Snoqualmie in 2012; however, a 15.7 acre area in the northeastern portion of the site remains within unincorporated King County. It should be noted that Borst Lake (Mill Pond) is not included in the Snoqualmie Mill project site, nor is it owned or controlled by Snoqualmie Mill Ventures, LLC. See the Snoqualmie Mill Overall PCIP Site Plan **(Figure 2-2)** in Chapter 2.

The Snoqualmie Mill site is a redevelopment site. Several current uses will continue on-site until being displaced by planned development over time. Ultimate Rally LLC (aka Dirtfish Rally School) utilizes the site's network of paved and unpaved roads, primarily in the central portion of the site, and associated facilities for operation of the rally school. Ongoing Dirtfish operations have been factored into the MDP analysis where relevant. Other current activities include storage of wood recycling materials, production and storage of topsoil for local construction projects, a beehive operation, temporary construction staging, and truck storage.

The Snoqualmie Mill site is flat, which reflects the extensive grading and fill that was placed on the site in conjunction with construction and operation of the Weyerhaeuser sawmill. Depths of fill across the site vary from approximately 5 feet to more than 20 feet (See **Figure 4-4** in Chapter 4). The deepest fill soils are generally located in Planning Area 1 and the northern central portion of the site (Planning Area 2); both areas were used historically for log storage. The remnants of several earth berms are located along the north and west perimeters of the site. These are required by Annexation Agreement and the Annexation Implementation Plan to be graded and removed.

Virtually the entire site is within the floodplain of the Snoqualmie River. The site also contains areas of wetlands, streams, and a system of man-made drainage ditches that are regulated as critical areas by the City. The U.S. Army Corps of Engineers also has jurisdiction of some of the site's wetlands. The site is primarily bare of undisturbed natural vegetation except along some perimeter areas. Existing vegetation, including the regulated buffer areas of wetlands and streams is generally degraded and of poor quality. Detailed soils and geology, and wetlands studies have been prepared as part of the project Sensitive Areas Study (SAS).

Purpose and Scope

The purpose of this report is to provide a Master Drainage Plan for the Snoqualmie Mill Planned Commercial/Industrial Plan (PCIP) Application submitted to the City of Snoqualmie on March 22, 2017 (File # PCI17-001) and to support the Environmental Impact Statement (EIS). Some elements of the initial PCIP Application proposal have been revised as a result of ongoing planning and analysis (e.g., mix of uses, more detailed site plan); the PCIP application will be revised accordingly.

Due to the size of the Snoqualmie Mill project, this drainage plan is being prepared as an MDP consistent with *Large Site Drainage Review* requirements in accordance with Section 1.1.2.5 and Appendix B of the 2016 King County Surface Water Design Manual ("KCSWDM"). However, as discussed further below, the project does not technically meet King County's thresholds for Large Site Drainage Review nor are many of the technical elements applicable. Therefore, this MDP targets applicable elements of stormwater management for Snoqualmie Mill. The MDP will nevertheless facilitate environmental analysis and subsequent detailed project design and engineering.

Criteria for Large Site Drainage Review

King County's Large Site Drainage Review threshold criteria and KCSWM Appendix B Master Drainage Plan components are described and evaluated below.

> *"….Large site Drainage Review is required for any proposed project that is subject to drainage review as determined in Section 1.1.1…, AND that meets any one of the following criteria:*
>
> - *The project is designated for an Urban Planned Development (UPD) on the King County Comprehensive Plan Land Use Map, OR*
> - *The project would at full buildout, result in 50 acres or more of new impervious surface within a single subbasin or multiple subbasins that are hydraulically connected across subbasin boundaries, OR*

- *The project is on a site of 50 acres or more (including open space, sensitive areas, and growth reserve) within the recharge area of a sole source aquifer as designated by the IPA and depicted as such on the Areas Highly Susceptible to Groundwater Contamination Map adopted as part of the King County Comprehensive Plan…."*

Snoqualmie Mill does not technically meet any of these criteria. The site is assumed to meet the second of these criteria as it will result in greater than 50 acres of impervious surface within a single subbasin. However, as stated, the criterion stipulates *"new impervious surface."* The site in its current condition is considered by the City of Snoqualmie (and in King County prior to annexation) to contain between **92.0 Ac and 122.5 Ac of existing impervious surfaces** This is assumed by the current assessment of surface water management fees which are based on 135 Ac at the fee rate for land containing 65% to 85% impervious surface and 38.7 Ac at the fee rate for 10% to 20% impervious surface. These are for tax parcels 2924089009 and 3024089004, respectively.

The project program provided in the original Snoqualmie Mill PCIP Application shows that **full development will result in approximately 110 Ac. of impervious surface**. Therefore, based on the most conservative assumption of existing conditions, project full build-out would include approximately 18 Ac of *"new impervious surface."* The remainder of the project's impervious surfaces would be considered *"replaced impervious surface."*

However, per the KCSWDM, *"…New impervious surface means the addition of a hard or compacted surface like roofs, pavement, gravel, or dirt, or the addition of a more compacted surface,* ***like paving over pre-existing dirt or gravel****…"* [emphasis added], and Planning Area 1 currently contains little or no "paved" surfaces. Nearly all of the existing impervious surfaces lie in Planning Areas 2 and 3. Therefore, all proposed impervious surfaces in Planning Area 1 would be considered as *"new impervious surface."*

As shown in **Chapter 2 – Snoqualmie Mill PCI Area Summary by Use**, a breakdown of the proposed land use of the revised PCI Plan for this EIS the total anticipated impervious area for Planning Area 1 totals approximately 33.1 Ac. This is below the 50 Ac. threshold for a Large Site Drainage Review. It is not anticipated that Planning Areas 2 and 3 will develop significantly outside of the existing impervious footprint of the site, but this is not known at this time. This is additionally the rationale for considering this a Large Site Drainage Review.

The EIS will also demonstrate that the total project site, albeit much greater than 50 Ac., does not lie within the recharge area of a sole source aquifer or an area designated as highly susceptible to groundwater contamination.

Although this report will be prepared like a Master Drainage Plan in accordance with Appendix B of the KCSWDM, a great deal of the objectives and technical elements per Appendix B are intended for large developments on upland greenfield properties that require a very high level of protection of natural downstream systems, streams, wetlands and properties. The approach to the Snoqualmie Mill MDP is predicated greatly on the designation of the site as a *"Direct Discharge Site"* (see Chapter 3 – **Regulatory Framework** for direct discharge qualification). This designation renders many of these Appendix B objectives not applicable to Snoqualmie Mill.

As part of this purpose and scope, below is an evaluation of the applicability of KCSWDM Appendix B Objectives and Components (shown ***bold and italic***) to Snoqualmie Mill.

OBJECTIVE

The objective of the Master Drainage Plan (MDP) is to propose specific drainage control systems that will prevent significant adverse impacts to the site's natural hydrologic system and to existing and planned off-site drainage systems and resources. Although this is also the objective of the Surface Water Design Manual generally, the County allows smaller-scale projects to rely more heavily on the "cookbook" approach of the Core and Special Requirements specified in the Manual... These larger projects are required to take a more detailed, site-specific look at drainage resources and associated management issues. As stated above, MDP requirements target large sites typically in upland greenfield settings to prevent significant impacts to sensitive natural hydrologic systems and resources. Scoping for an MDP cited in the KCSWDM is typically in consideration of sites where there is a *"...higher potential to result in resources and flooding impacts if the 'cookbook' standards miss their mark."* This is the primary reason that MDP scoping contains potential requirements such as *"Core Requirement #3, Flow Control, may [emphasis added] be modified to require more sophisticated hydrologic modeling..."* and *"...often require a more definitive approach to drainage requirements than prescribed by the core and special requirements..."*

But the KCSWDM goes on to state, *"the hydrologic and hydraulic analysis of the site, basin and downstream system shall be done using the methods described in this Manual. Exceptions are for plans required to prepare hydrologic models using rainfall and stream gage data."* For Snoqualmie Mill the analysis contained herein uses the methods described in the Manual and does not warrant a calibrated model of streamflow data.

Notwithstanding that Snoqualmie Mill does not meet the criteria for Large Site Drainage Review and warrants the standard methods of analysis in the Manual without calibration. The usefulness of preparing this drainage report as an MDP is the inclusion of flood flow and floodplain modeling of the Snoqualmie River which is outside of standard Manual methods. Because the site lies within the Snoqualmie River floodplain and is designated as a Direct Discharge site, there is less emphasis on simply demonstrating compliance with the Core Requirements, specifically Core Requirement #3 Flow Control, and #9 Flow Control BMP's. The primary emphasis is on floodplain management and on-site wetland hydrology and demonstrating compliance with direct discharge qualification criteria.

Larger projects are seen to entail more risk to receiving waters (including groundwater).....

In the case of Snoqualmie Mill, there is little risk to receiving waters with Direct Discharge to the Snoqualmie River. It will also be shown through the project EIS that there is little risk to groundwater.

Some of the impacts that MDP's would be expected to address include the following:

1. ***Increase in flow rates and/or volumes that would result in flooding along the natural and/or constructed drainage systems....***

   Snoqualmie Mill lies within the floodplain of the Snoqualmie River and is exempt from flow control as a direct discharge site. Proposed development will not result in flooding along natural drainage systems. It will not impact natural downstream receiving waters by demonstrating the protection of on-site and off-site wetland hydrology.

2. ***Increase in flow rates and/or volumes, both on- and off-site that would de-stabilize the existing geomorphic balance of the natural drainage systems....***

   This is primarily for sites draining to natural upland streams for protection against bank erosion and/or future flooding and is not applicable to Snoqualmie Mill.

3. ***Alteration of natural topography and/or native vegetation that would result in unstable soil conditions, slopes or embankments….***

   Again, this is more applicable to upland greenfield property with natural vegetation as opposed to an altered site such as Snoqualmie Mill; however, the proposed development would not create unstable slopes or soil conditions.

4. ***Alteration of natural hydrologic features or provisions of site improvements that would reduce the functional ability of the sub-basin to preserve water quality…and aquatic values….***

   The objective of Snoqualmie Mill's master plan, certainly in Planning Area 1, is to avoid alteration of the natural hydrologic features (wetlands and streams), demonstrate minimized hydrologic impacts and provide water quality control for pollutant generating impervious surfaces **(PGIS)** or pollutant generating pervious surfaces **(PGPS)**. Future plans for Planning Areas 2 and 3 could but is not certain to pursue some alterations of existing wetlands to use them as part of the drainage control system.

5. ***Alteration of groundwater/interflow that would adversely change downstream base flows and/or impair existing water rights….***

   The Earth element of the EIS demonstrates that this is not applicable as a concern or potential impact from Snoqualmie Mill.

COMPONENTS OF MASTER DRAINAGE PLANS

The MDP consists of several components. These components are typically presented in a drainage plan developed using an approved hydrological model, special reports and studies to identify impacts, mitigation measures to reduce impacts, a technical report containing engineering analyses such as the off- site and flood plain analyses, and a post-development monitoring plan. The drainage plan shall provide a comprehensive analysis of existing and proposed surface and subsurface water quantity and quality conditions for both on and offsite systems. Offsite systems may include upstream and downstream hydrology. Upstream analysis shall include the total drainage area contributing to the site. Downstream analysis shall extend to an acceptable receiving body of water.

This report contains analysis of on-site hydrology using WWHM and floodplain impact analysis using the FEMA HEC-RAS model from the City of Snoqualmie's 2012 LOMR for the Snoqualmie River. References to other studies are provided which utilize or support the hydrologic models as part of the comprehensive analysis of the control of impacts to the floodplain and wetland critical areas.

Technical elements

At a minimum, specific technical elements of the MDP include the following:

a) ***A conceptual or preliminary plan of the proposed drainage collection and flow control systems, based upon accurate field topographic mapping and geologic data, should be provided, along with appropriate cross-sections and details necessary to identify drainage system elements.***

   This report evaluates grading and associated impacts to floodplain and wetlands, and a conceptual evaluation of stormwater conveyance for purposes of locating and sizing a direct discharge outfall to the Snoqualmie River. Mapping and geologic data are discussed in **Chapters 4 and 5**. Conceptual grading plans and cross sections are provided to depict the grading the preliminary grading plan for Planning Area 1, and a grading concept for the remainder of the site consistent with the City's Flood Hazard Regulations. These are provided in **Chapters 6 and 8**.

b) ***All assumptions, parameters, and input data used in the hydrologic model. Input and output files from hydrologic and/or hydraulic computer models shall be included as an appendix.***

Hydrologic and hydraulic analysis are provided in **Chapters 6 and 8**.

c) ***Hydraulic performance data (stage, storage, discharge) for all elements of the hydrologic system, whether existing or proposed, including lakes, ponds, and wetlands. This data shall be used to route inflow hydrographs to produce outflow hydrographs.***

This information is not as applicable to a site such as Snoqualmie Mill where direct discharge exempts the site from Flow Control requirements and the primary focus is floodplain development and consistency with Flood Hazard Regulations. Hydraulic performance information for on-site wetlands is provided by analysis consistent with Wetland Hydrology Protection Guidelines (KCSWDM Reference 5) of the 2016 KCSWDM and evaluation by the wetland biologist.

d) ***Flow data for all existing and proposed conveyance facilities, including streams, swales, pipes, and ditches which will support the proposed system.***

Flow data is provided at a level for conceptual representation of proposed conveyance facilities and sizing; however, this plan is conceptual and not a final design, therefore such information is limited to the feasibility and reasonable sizing for the direct discharge outfall.

e) ***Floodplain analysis identifying flows, velocities, and extent of flooding for the existing and proposed conditions. Other backwater analysis required to determine existing and proposed conveyance capacity within the MDP and downstream of the MDP.***

Floodplain analysis and consistency with Snoqualmie's Flood Hazard Regulations are of primary importance to the Snoqualmie Mill Master Drainage Plan. This is discussed in detail in Chapters 6 and 8. Chapter 8 provides flood impact analysis to demonstrate a "no net rise" impact on the 100-year floodplain as part of compliance with the City's Flood Hazard Regulations as well as an evaluation of downstream impacts that is consistent with recent studies by King County of downstream affects from recent flood reduction projects.

f) ***Erosion analysis of on-site and downstream open-drainage systems, identifying flows, velocities, areas of existing and future deposition and channel erosion, and characterization of sediment.***

This is primarily for sites draining to natural upland streams for protection against bank erosion and/or downstream flooding and is not applicable to Snoqualmie Mill.

g) ***Geotechnical analysis of the site and proposed improvements which specifically addresses soils and slope stability for proposed lakes/ponds, road alignments, channel/ravine conditions, building setbacks from steep slopes, vegetative preservation and controls, existing and proposed drainage facilities, and downstream system stability.***

This information is primarily discussed in the *Earth* section of the EIS; however, as applicable to the MDP, the site does not contain any steep slopes, or ravine conditions for such setback or vegetation control consideration.

h) ***Ecological analysis to include the physical and biological features of the streams, lakes, wetlands and swales.***

An independent Biological Evaluation (BE) will be performed for the site for purposes of development within the Snoqualmie River Floodplain. The EIS will also address impacts to wetlands, wildlife, fisheries and water resources from the proposed drainage plan contained herein.

i) ***Method and conceptual design for maintaining existing flow regimes in any swales/ravines that may be altered by the development.***

Maintenance of flow regimes and hydraulic performance information for on-site wetlands is provided by analysis consistent with Wetland Hydrology Protection Guidelines (KCSWDM Reference 5) of the 2016 KCSWDM and evaluation by the wetland biologist. Conceptual design of stormwater and grading is shown on the **Planning Area 1 Stormwater Plan (Figure 6-1) and Mass Grade Concept (Figure 6-13)** in **Chapter 6**. The method of wetland hydrology analysis is provided in Chapter 8.

j) ***Method, conceptual design, and location of water quality compensating facilities that may be necessary to replace naturally occurring "biofiltration" functions of site vegetation, i.e. provision and/or preservation of vegetated swales.***

There are two key elements to this component for Snoqualmie Mill;

1) Based on site-specific studies, there are very few areas with "naturally occurring 'biofiltration' functions" on the site for the existing wetlands and streams. Part of the proposed plan (conceptual design) is to regrade areas adjacent to wetlands to eliminate existing scrub vegetation or pavement (or gravel), create better uniform positive overland flow into the wetland, and revegetate to create a functional buffer; and

2) New water quality facilities will be constructed to treat newly created PGIS prior to discharge into on-site natural features.

k) ***Description of maintenance design features and provisions that will ensure reliable and long-term facility operation.***

Long term maintenance will be addressed in conjunction with future site development permits.

l) ***Provide construction phasing plan that will ensure stormwater/erosion control during development of individual subbasins.***

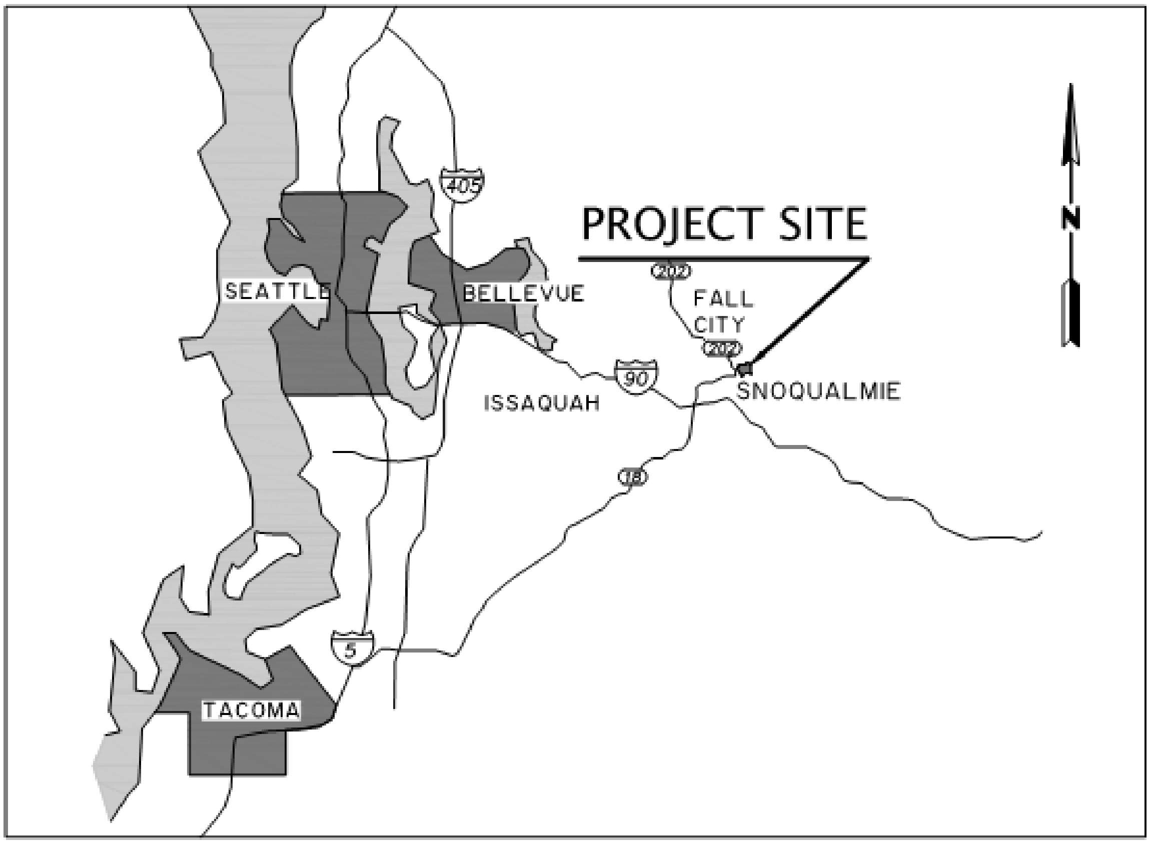
This level of detail is somewhat beyond the scope of planning required for a PCIP, this MDP and EIS, since erosion and sedimentation control plans will be prepared to support future development permits. However, consideration of phasing of construction is inherent in the separation and sequencing of Planning Areas 1, 2 and 3.

m) ***Establish a stream flow/rainfall gauging and stream cross section monitoring plan that will document any changes in the levels of flooding, erosion, and sedimentation, and identify responsible parties for necessary mitigation.***

This is primarily for sites draining to natural upland streams for protection against bank erosion and/or downstream flooding. Not applicable to Snoqualmie Mill.

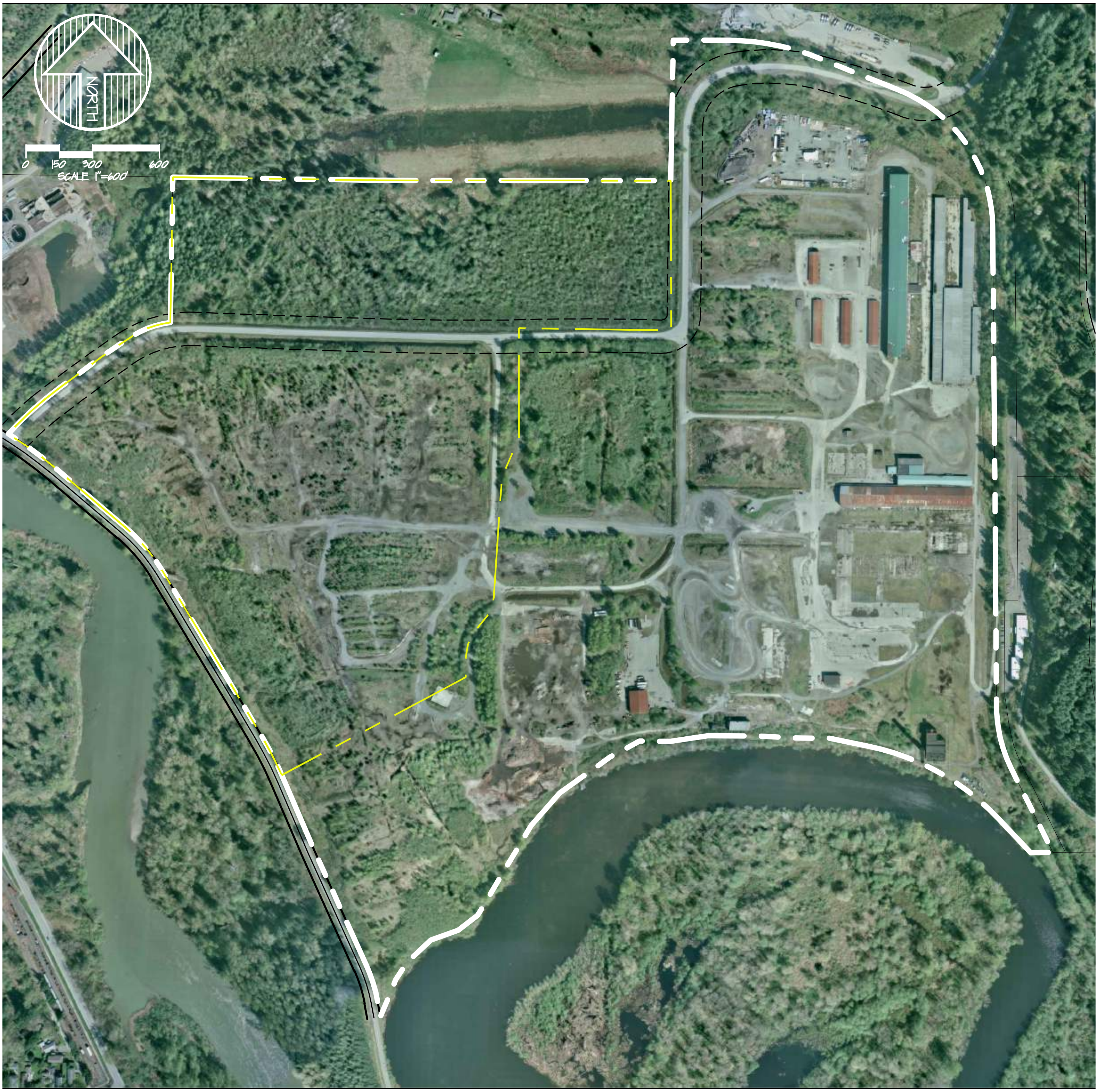
Master Drainage Plans per Appendix B of the KCSWDM have a specific review process defined by King County. Since Snoqualmie Mill is neither in King County review jurisdiction, nor technically meets the threshold criteria specifically requiring a Master Drainage Plan, it is assumed that the review of this plan will be through the EIS process and City review of the PCIP, with the City of Snoqualmie as Lead Agency, not the review process outlined in Appendix B.

Regional Vicinity Map Figure 1-1



REGIONAL VICINITY MAP

N.T.S.



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SNOQUALMIE MILL VENTURES, LLC
CITY OF SNOQUALMIE

AERIAL SITE PLAN
FOR
SNOQUALMIE MILL

17500
OCT. 2018
FIG. 1-2

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2. Project Description

PCI Plan

Snoqualmie Mill Planned Commercial Industrial (PCI) development proposal is approximately 245 acres in the City of Snoqualmie lying in portions of Sections 29 and 30, Township 24, Range 8 East, W.M. in King County, Washington. The "site" referred to in this Master Drainage Plan and for purposes of SEPA is the total Snoqualmie Mill Ventures property which is approximately 261 acres lying generally between SE Mill Pond Road and the Snoqualmie River on the west, Borst Lake (Mill Pond) on the south, the inclusion of approximately 16 acres outside of the City limit to the north, and the "hillside" area owned by King County along 396th Avenue SE on the east. Other nearby features and uses include the City's sewer treatment plant and an existing gravel mining operation to the north. See Vicinity Map (**Figure 2-1**).

In general, Snoqualmie Mill proposes approximately 1.85 Million square feet of commercial, industrial and related land uses over a 10-to-15 -year period. Development is anticipated to occur in multiple phases of development. The PCI Plan proposes three separate development districts, identified as Planning Area "1", Planning Area "2", and Planning Area "3". Planning areas are based on existing site conditions, including the locations of environmental constraints, proximity to existing urban development and facilities. For the EIS, the Planning Areas represent the proposed phasing sequence. However, beyond Planning Area 1, the sequencing and development program could change based on market demand.

The planned development program is shown below. The Overall Snoqualmie Mill PCI Plan is shown on **Figure 2-2**.

Open Space and Critical Areas

One of the predominant requirements of the City's *Planned Commercial/Industrial District (PCI) Code- SMC 17.20.050.G* is the requirement to provide 35% of the site in Open Space. A fundamental concept of the PCI Plan is its open space, proposing approximately 141 Ac (58%) of the PCI Plan as open space, and ultimately as much as 153 acres (59%) of the entire site as open space.

Site planning has carefully considered these opportunities and incorporated a network of open spaces that connect the large wetland in the northwest portion of the site, with the central open space of the site, with Borst Lake, and with the Snoqualmie River. The central open space area provides a unique opportunity for constructed wetlands to serve as stormwater treatment as well as merging and enhancing existing degraded wetland buffer areas. Open space areas excavated for constructed wetlands, enhanced buffers and graded surface overflow to the Snoqualmie River would serve as compensatory storage for proposed fill to be placed within the floodplain. These excavated areas could also serve as mitigation areas for any wetland alteration that may be proposed and deemed to be beneficial to these resources.

Open spaces proposed within Snoqualmie Mill are described as three types:

- **Natural Open Spaces** – including; sensitive area wetlands and streams, buffers, regraded and revegetated buffers,
- **Passive Open Spaces** – including; stormwater treatment areas (stormwater wetlands), passive recreation grasslands, active and passive trails,

- **Active Landscape Open Spaces** – including; landscape areas incorporated into the site design, soft surface pubic gathering areas.

The proposed development is a very low density relative to what could be considered as an ultimate capacity of the site. As such, upland developable land would be underutilized leaving extensive open spaces where, together with critical area wetlands and buffers, opportunities are created for:

- Habitat connections and wildlife corridors,
- Perimeter screening and landscape
- Active / Passive open spaces,
- Stormwater treatment and conveyance,
- Flood storage,
- Trails.

Natural open space, as discussed, consists primarily of critical areas and critical area buffers. Also included are compensating buffer areas mitigating areas of buffer reductions and degraded areas of existing buffers that will be enhanced and revegetated. Therefore, all of the natural open space areas will be designated as critical area buffers containing restrictions of future uses consistent with NMC 19.12.

A summary of site areas, by use, is shown below. These areas include approximately 3.8 acres of impervious area and 11.9 acres of open space in Planning Area 2 which are outside of the City limit and outside of the current PCI Plan application.

Snoqualmie Mill PCI Area Summary by Use

	Planning Area 1 Mill Street (Ac.)	Planning Area 2 Warehouse District (Ac.)	Planning Area 3 Campus District (Ac.)	Total Area (Ac.)	*Total % Site Area*
Development Area	**37.7**	**25.4**	**44.8**	**107.9**	***41%***
Building Area	**10.8**	**9.2**	**18.9**	**39.0**	***15%***
Retail (Incl: Tasting rooms/restaurants) (sf)	*80,000*		*25,000*		
Light Industrial (sf)	*110,000*				
Residential (sf)	*160 DU*				
Warehouse/Manufacturing (sf)	*282,000*	*400,000*			
Office/Campus (sf)	*0*		*800,000*		
Other Impervious Area	**22.3**	13.1	**21.0**	**56.4**	***22%***
Roads (sf)	*130,000*		*48,000*		
Parking, Plaza's Sidewalks, etc. (sf)	*842,000*	*569,600*	*868,500*		
Active Landscape Open Space *Including Active Manicured Lawns, Ornamental Planting and Parking Landscape Islands*	4.6	3.1	4.8	**12.5**	***5%***
Open Space	**64.4**	**30.7**	**57.8**	**152.9**	***59%***
Natural Open Space ***- Critical Areas & Buffers both Natural and Mitigated***	*57.0*	*29.7*	*54.4*	*141.1*	***54%***
Passive Open Space *Including Open or Vegetated Open Space outside Critical Area Buffer including Trails & Stormwater Management*	*7.4*	*1.0*	*3.4*	*11.8*	***5%***
Total Snoqualmie Mill PCI	***102.1***	***56.1***	***102.6***	***260.8***	***100%***

Notes:

1 ***Upper Story - Included in Program Area - Not included in Building Area***

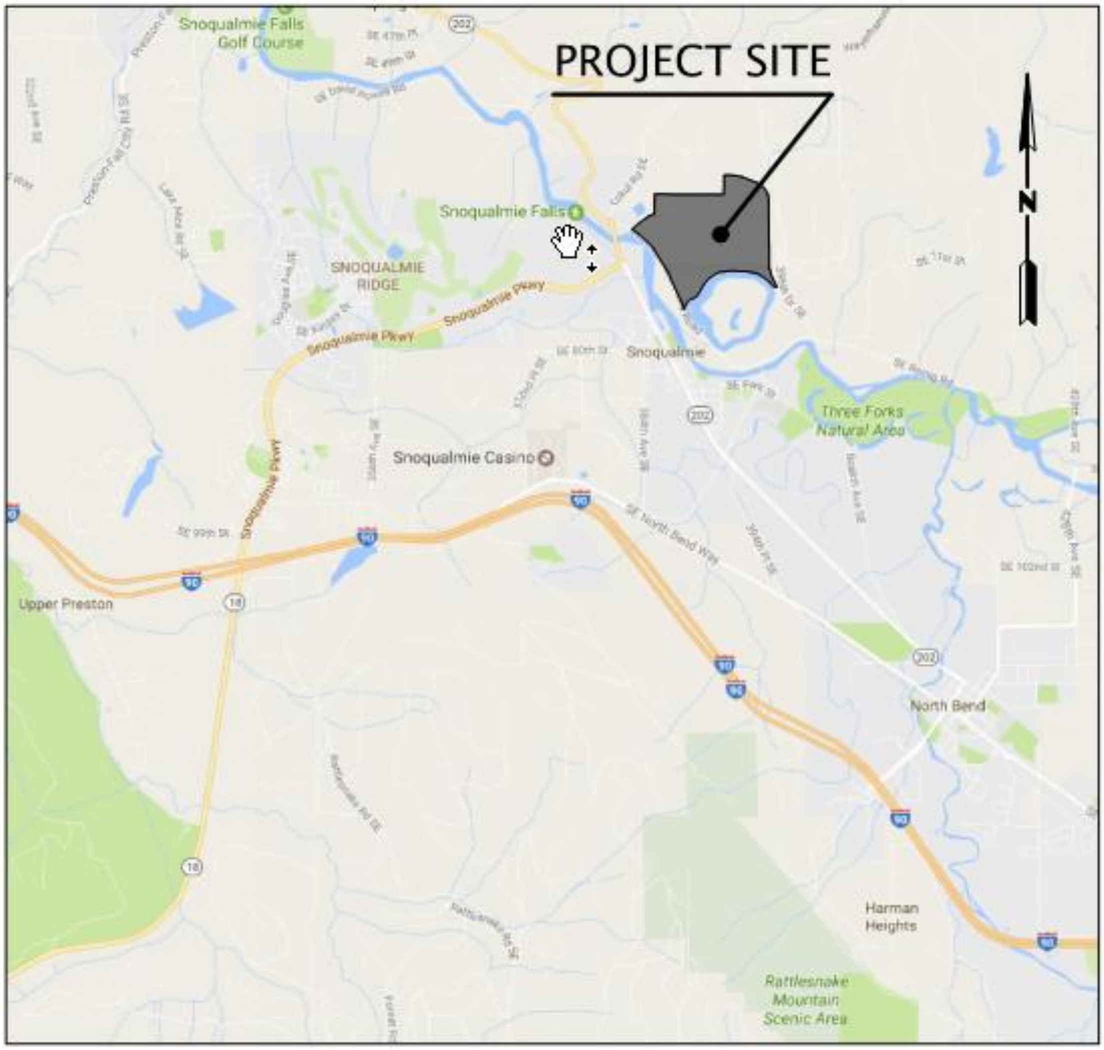
2 PA 1 Ratio of parking to Bldg Area = approx. 1.78:1. PA 2 parking esstimated at 80% - no retail or residential

3 PA 1 Ratio of Active Landscape to parking area = 0.24:1 used to estimate PA 2 and 3 landscape

4 Total Developed area = Building + Other Impervious + Landscape

5 Planning Area 3 parking estimted by PA 1 ratio to bldg area - subtracting 75% Bldg Area for under bldg parking

Vicinity Map Figure 2-1



VICINITY MAP

PCI Plan - Planning Areas 1, 2 and 3

Planning Area 1

Planning Area 1 contains approximately 102 acres and is located in the northwest portion of the site. It is proposed to be comprised of a combination of warehouse/manufacturing, light industrial, upper story residential, and destination retail uses. This area is identified as the "Village". The Village center will be aligned along an east-west pedestrian-oriented corridor and main private drive known as Mill Street. This will be the primary gateway for the entire Snoqualmie Mill PCI developed site, directing future visitors' views toward the existing Weyerhaeuser Planer Building located along the east portion of the site as depicted on the PCIP Site Plan (**Figure 2-3**).

The site plan for Snoqualmie Mill proposes an integrated trail system throughout the entire site. The trails will include passive and active recreation opportunities within open spaces, wetland and stream buffers and provide educational opportunities for visitors and future employees of the Planned Commercial Industrial site (PCI).

Planning Area 1 does not propose any alterations to wetlands or streams; however, initial mass grading to construct site infrastructure is intended to enhance natural open space including existing wetland buffers. This would involve:

- Grading the existing "berms," as required by the 2011 Pre-Annexation Agreement, along the north boundary of the site and with the realignment of a "new" Mill Pond Road and direct discharge stormwater outfall along the riverbank,
- Over-excavating these "berms" and revegetating perimeter areas as well as other degraded wetland buffer areas as enhanced open spaces and compensating flood storage,
- Excavating and planting areas of open space for water quality treatment and conveyance to the river which would also serve as compensating flood storage, and
- Grading open space areas for the proposed trail system network.

An Overall Landscape Plan (**Figure 2-4**) depicts a conceptual rendering of Planning Area 1 detailing the developed areas, open spaces and trail alignments, streetscapes, parking, trails, stormwater plan elements, and the main entry roundabout to Snoqualmie Mill Planning Area 1. **Figures 2-5 through 2-11** provide sections and details of various plan elements such as; a Mill Street profile and cross sections through Planning Area 1 and the relationship of site fill to the FEMA Base Flood Elevation, as well as typical sections or trails and Mill Street.

Planning Area 2

Planning Area 2 is approximately 56 acres in size and is located in the northeastern portion of Snoqualmie Mill. This area includes approximately 15.7 acres lying outside of the City limit. Albeit site planning for this area is at a programmatic level, it is anticipated that Planning Area 2 would consist of Warehouse/Manufacturing uses.

Large scale industrial spaces / warehouses for a variety of light industrial uses with associated parking are envisioned in this northern planning area. The large blocks of industrial warehouse construction will accommodate light industrial production spaces, assuming homogeneous buildings spaced equally apart and docking areas between. The finished floor (FF) of the warehouses assumed to be at or above the BFE, while the docking and parking areas are assumed to be approximately 4.0’ lower in elevation.

The large central open space and constructed wetlands would be anticipated for development of Planning Areas 2 and/or 3 to serve as water quality treatment, wildlife connectors, compensating storage and mitigation for wetlands for those future areas of development.

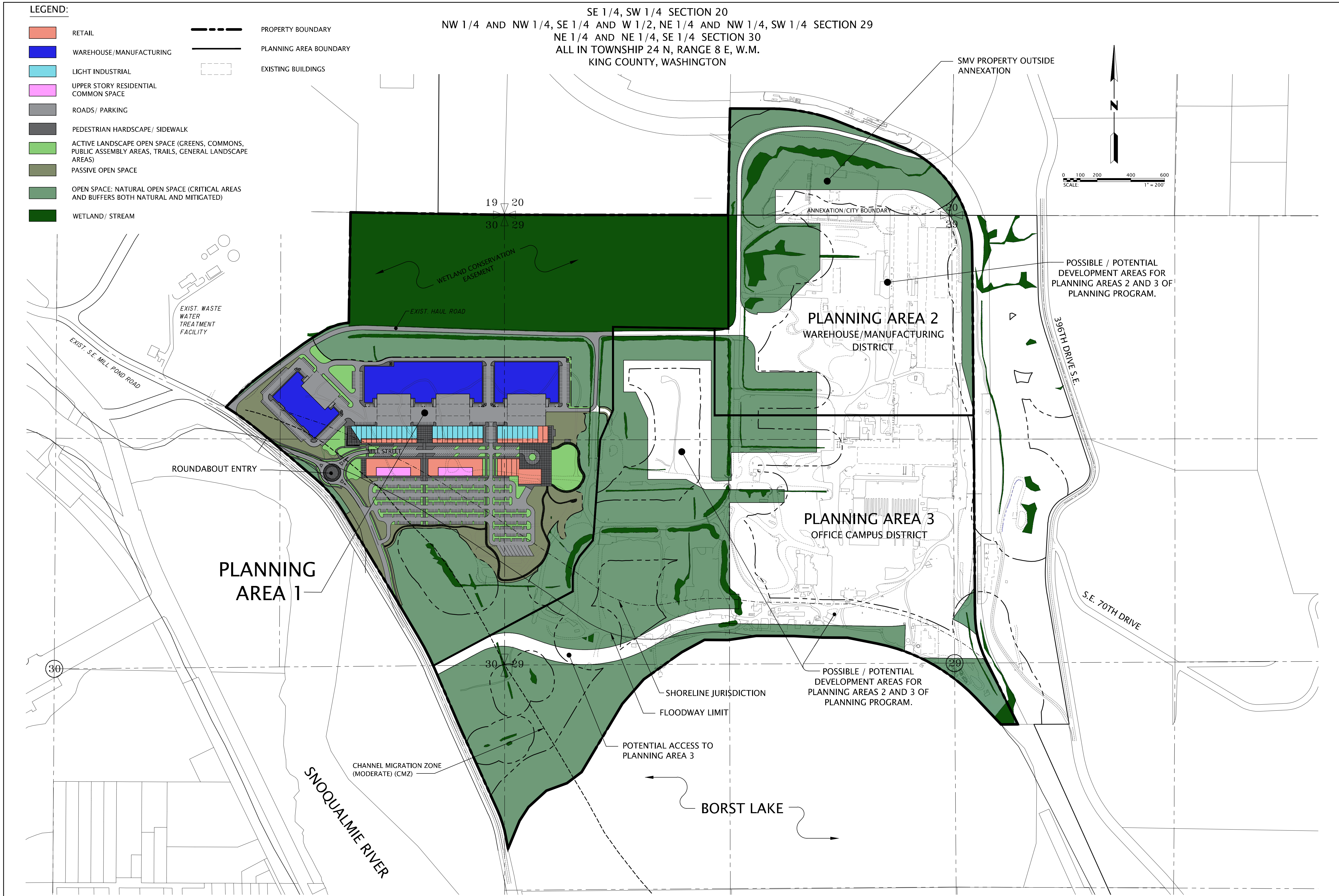
Planning Area 3

Planning Area 3, the Office/Campus District, is approximately 103 acres in size. It includes significant areas of the open space in the center and southeast portions of the site. It has the potential to be developed as a corporate or institutional campus, possibly by a single large user. Additional site analysis and planning will be required prior to development of this planning area.

Development within Planning Area 3 is assumed to require enhanced stormwater treatment. Stormwater wetlands constructed in or near wetland buffers with discharges to targeted locations within the main wetland system would provide sufficient hydrology into the system.

It is anticipated that site development within Planning Area 3 may require significant transportation improvements. The extent and timing of such improvements is unknown at this time. Project level analysis will be required for this area when development plans proceed.

The Overall Landscape Plan **(Figure 2-4)** conceptually shows the future pedestrian trail system extending into Planning Areas 2 and 3. The trail alignment will be determined as development plans are prepared for these planning areas.



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PLOTTED: 2020/02/11 07:05 HWERLINGER
DRAWN: LCA
DESIGNED:
APPROVED: KJG
FIELD BOOK:
PAGE #:

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SNOQUALMIE MILL VENTURES, LLC

OVERALL PCI SITE PLAN
FOR
SNOQUALMIE MILL

CITY OF SNOQUALMIE KING COUNTY WASHINGTON

JOB NO. 17500
SHEET
FIG. 2-2

FIG 2-3

GOLDSMITH
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SNOQUALMIE MILL VENTURES, LLC

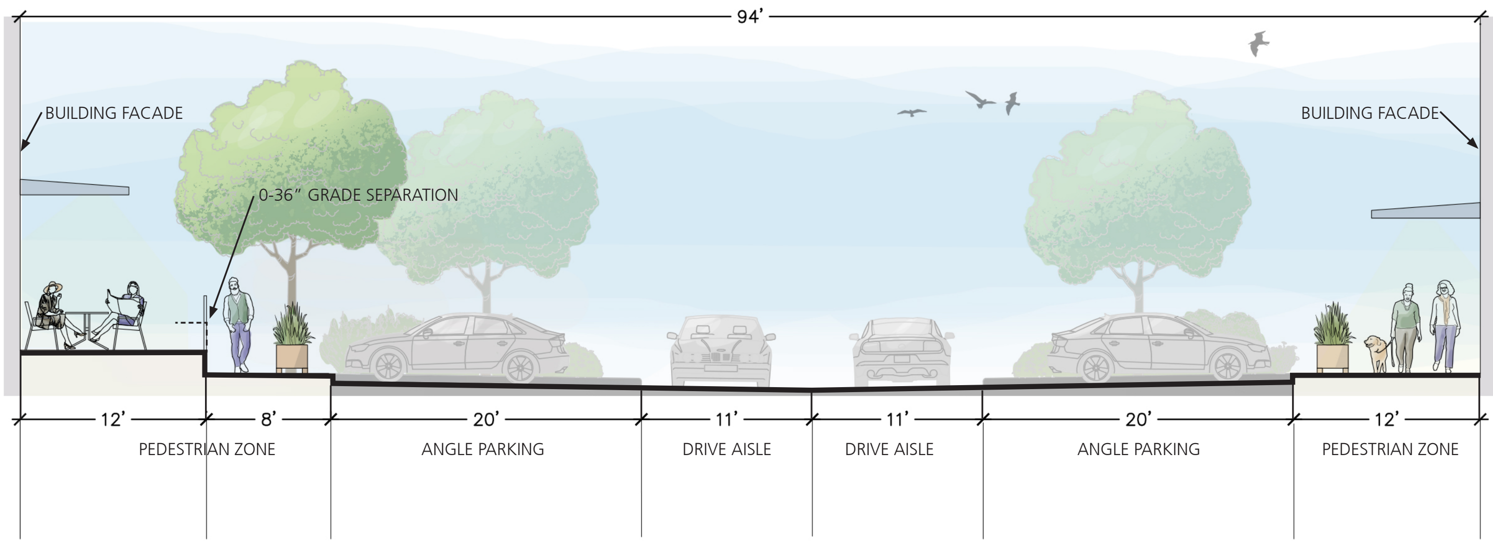
SITE PLAN PCI
PLANNING AREA 1
SNOQUALMIE MILL

CITY OF SNOQUALMIE KING COUNTY WASHINGTON

JOB NO. 17500
SHEET SP-1


PLANNING AREA 1
WETLAND 11
WETLAND 12
PLANNING AREA 2
VINE AVE.
HOPS AVE.
MILL STREET
PLAZA
LAWN
SNOQUALMIE RIVER
PARKING LOT
FUTURE PEDESTRIAN CONNECTION TO PLANNING AREA 2 & 3
MILL POND ROAD
PLANNING AREA 3
STORMWATER OUTFALL
WETLAND 12
WETLAND 28
WETLAND 29
FUTURE ROAD CONNECTION TO PLANNING AREA 2 & 3
FUTURE CONNECTIONS TO SNOQUALMIE RIVER TRAIL
FUTURE JAPANESE GARDEN (POTENTIAL)
BORST LAKE

FIGURE 2-4


94’
BUILDING FACADE
BUILDING FACADE
0-36” GRADE SEPARATION
12’
8’
PEDESTRIAN ZONE
20’
ANGLE PARKING
11’
DRIVE AISLE
11’
DRIVE AISLE
20’
ANGLE PARKING
12’
PEDESTRIAN ZONE

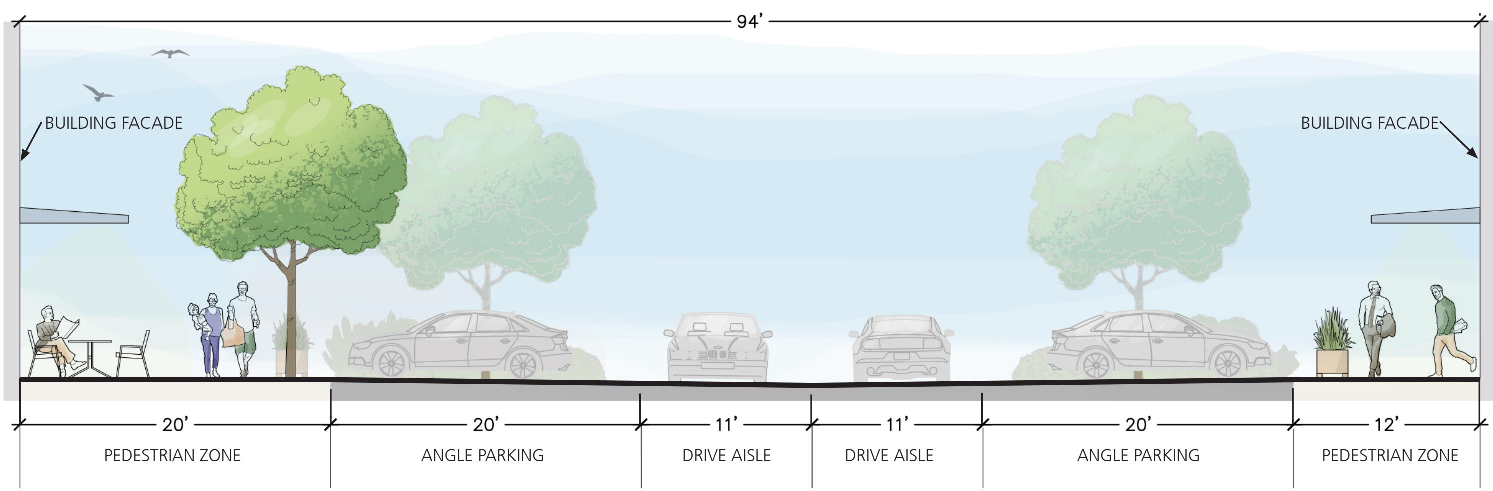
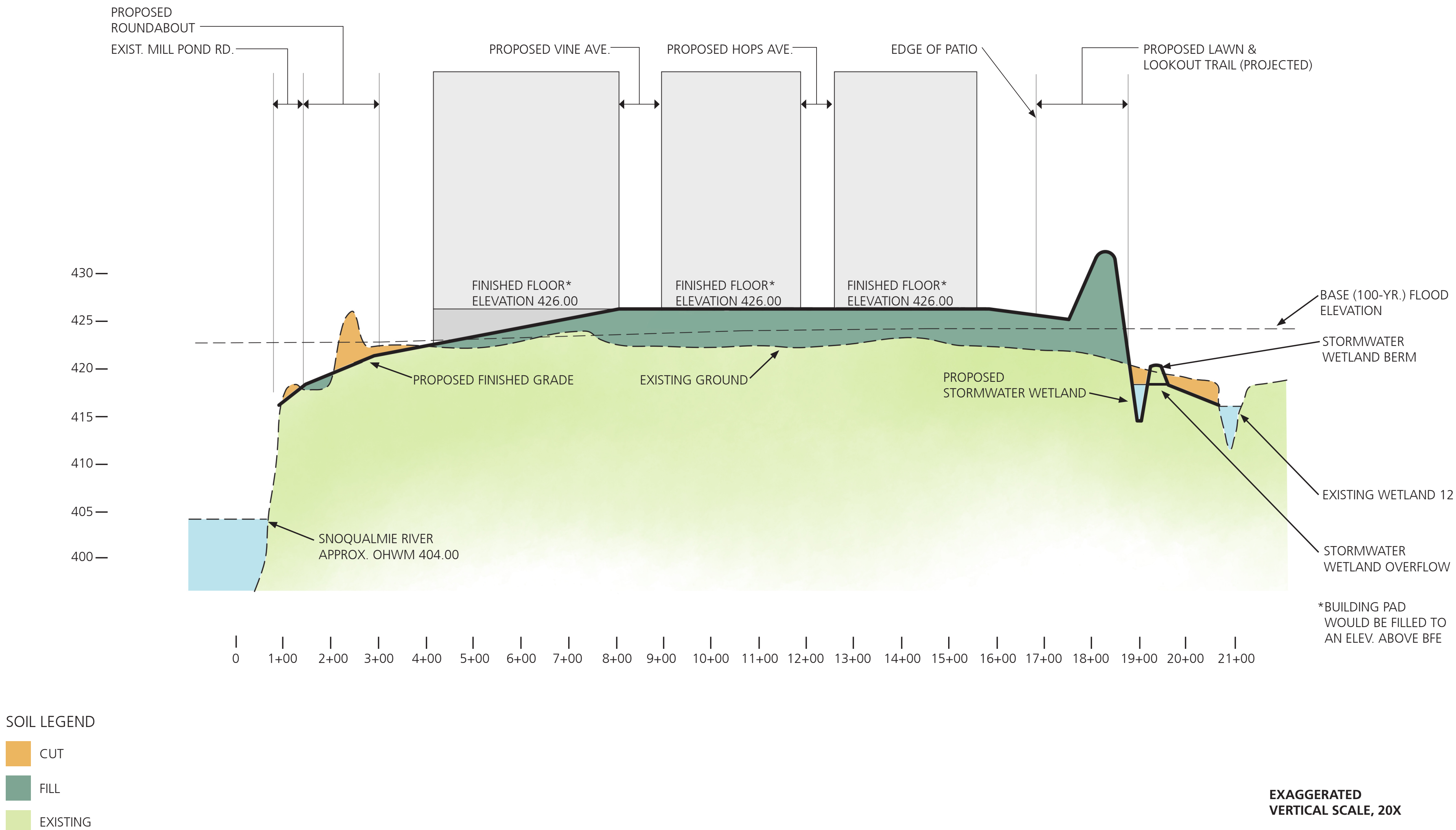

94’
BUILDING FACADE
BUILDING FACADE
20’
PEDESTRIAN ZONE
20’
ANGLE PARKING
11’
DRIVE AISLE
11’
DRIVE AISLE
20’
ANGLE PARKING
12’
PEDESTRIAN ZONE

FIGURE 2-5



EXAGGERATED VERTICAL SCALE, 20X

FIGURE 2-6

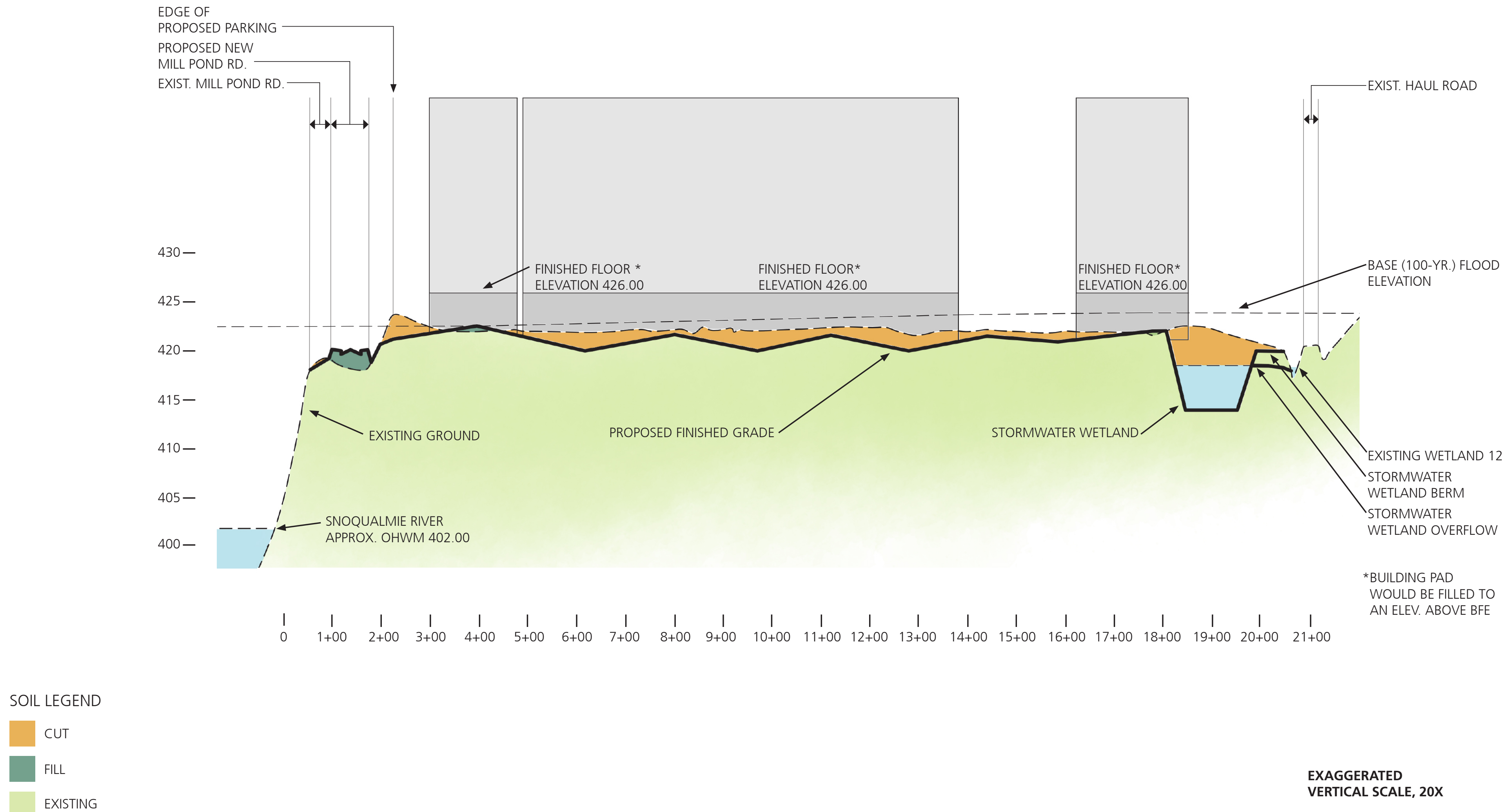

EDGE OF
PROPOSED PARKING
PROPOSED NEW
MILL POND RD.
EXIST. MILL POND RD.
EXIST. HAUL ROAD
430
425
420
415
410
405
400
FINISHED FLOOR *
ELEVATION 426.00
FINISHED FLOOR*
ELEVATION 426.00
FINISHED FLOOR*
ELEVATION 426.00
BASE (100-YR.) FLOOD
ELEVATION
EXISTING GROUND
PROPOSED FINISHED GRADE
STORMWATER WETLAND
EXISTING WETLAND 12
STORMWATER
WETLAND BERM
STORMWATER
WETLAND OVERFLOW
SNOQUALMIE RIVER
APPROX. OHWM 402.00
*BUILDING PAD
WOULD BE FILLED TO
AN ELEV. ABOVE BFE
0
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
SOIL LEGEND
CUT
FILL
EXISTING
EXAGGERATED
VERTICAL SCALE, 20X

FIGURE 2-7

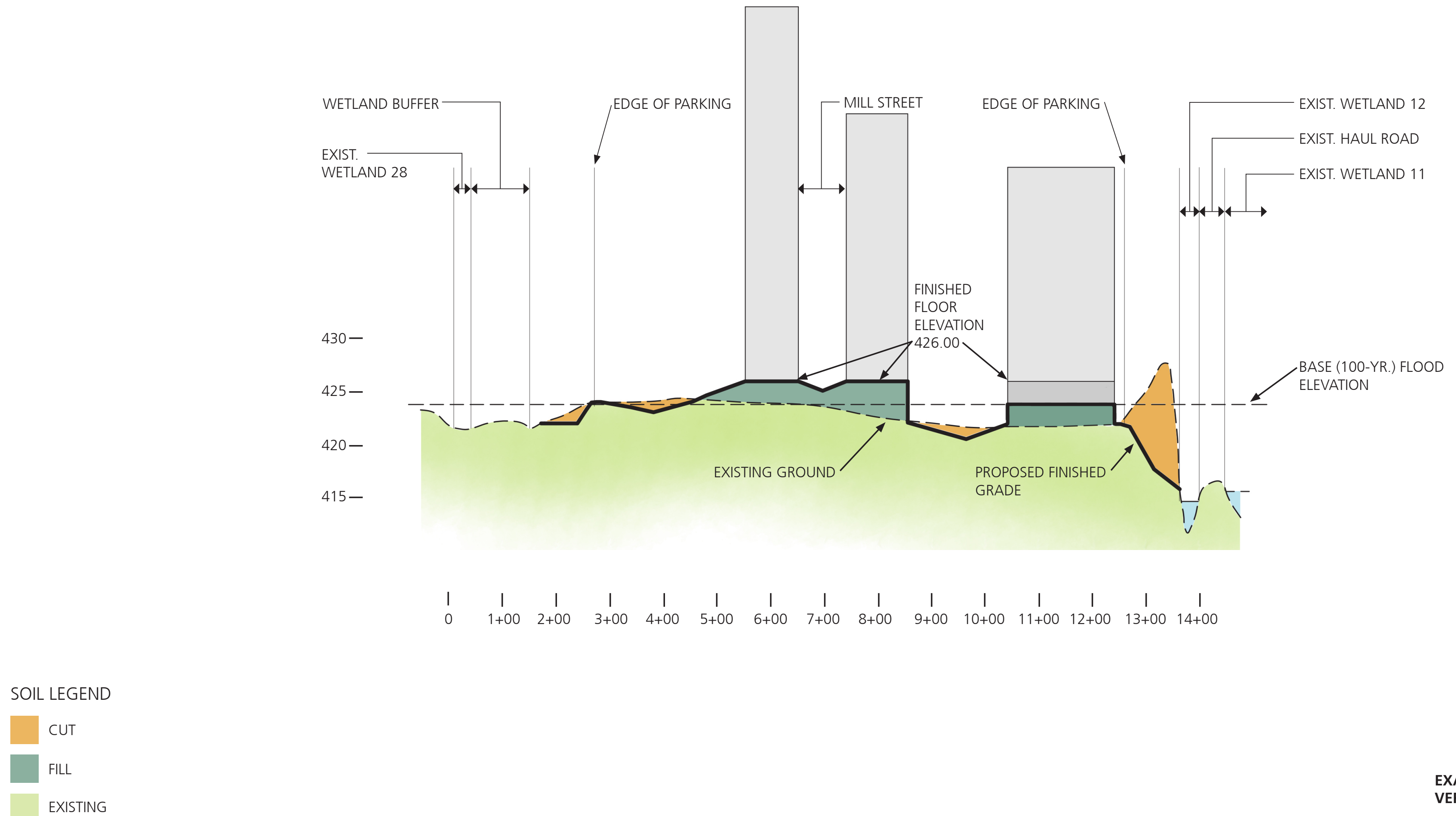


FIGURE 2-8

SNOQUALMIE MILL

S-N SECTION

WEISMANDESIGNGROUP

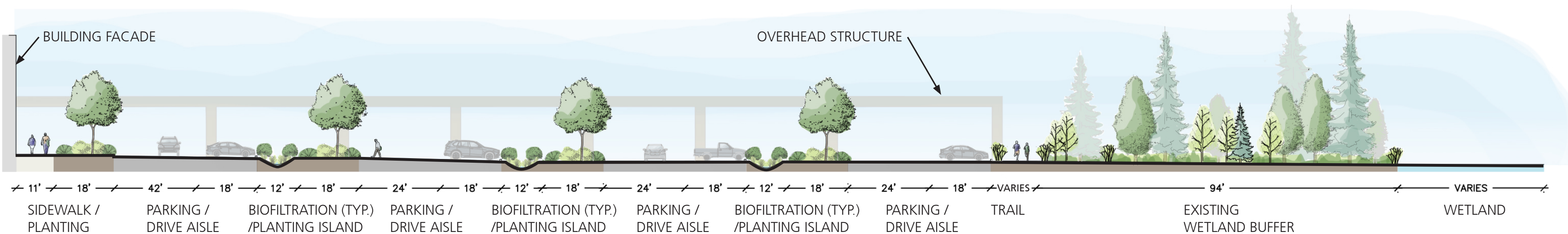


FIGURE 2-9

SOUTH PARKING LOT SECTION

FIGURE 2-10

SNOQUALMIE MILL

TRAIL SECTION

WEISMANDESIGNGROUP

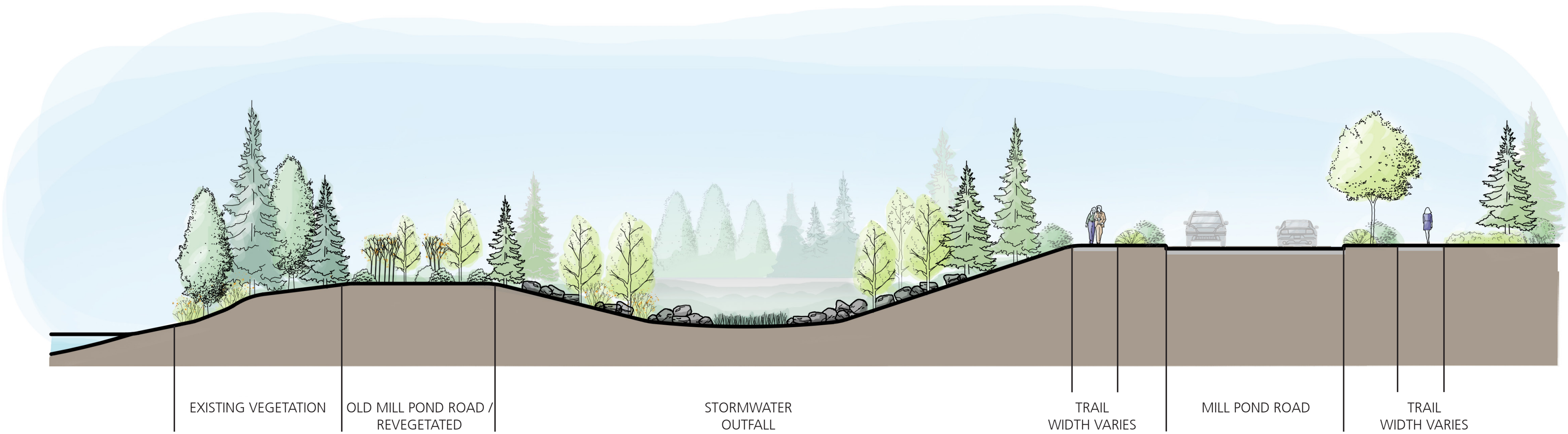


FIGURE 2-11

MILL POND ROAD SECTION

E. Utilities

Snoqualmie Mill is currently within the service area of the City of Snoqualmie for water and sanitary sewer. The City of Snoqualmie currently serves the Snoqualmie Mill Site with domestic water and sanitary sewer service, and will continue to serve the pre-existing, legal non-conforming uses. As stated in the Annexation Implementation Plan (AIP), future development or redevelopment of the site will be predicated upon adequate capacity to serve proposed uses at the time of formal Site Development application.

Below are evaluations of the City's capacity to serve Snoqualmie Mill with water and sewer based on the City's utility system plans in place at the time of the application and preparation of the DEIS. These include the **Water System Plan** (Gray & Osborn 2013), and the **General Sewer/Wastewater Facility Plan** (Gray & Osborn 2012). These are followed by discussions and understandings of the current efforts to update these system plans which are on-going and expected sometime in 2020. These discussions are based on the City's review comments of the Snoqualmie Mill DEIS and clarifications made thereafter.

1. Water System

The City completed an update to its Water System Plan (WSP) in 2013. The WSP evaluates the current City domestic water system capacity and the capacity to serve the projected growth for 20 years (i.e. approximate Year 2032) for the City and its service area, which includes the Mill Planning Area.

Summary of System and WSP:

Per the 2013 WSP, the projected system demand based on anticipated growth is as follows:

	2010 Baseline	2032 Projected	Buildout
Average Daily Demand (ADD)	1,173,817 gpd	1,908,729 gpd	2,350,371 gpd
Number of ERUs	4,722 ERU	7,589 ERU	9,550 ERU

The WSP cites both a 2032 projection and a buildout projection. The 2032 projection specifically excludes projected demand from both the Mill Planning Area and the Snoqualmie Hills West area. The additional growth assumed to reach the buildout scenario anticipates approximately 945 residential dwelling units and 190 acres of commercial development resulting in approximately 1,300 new employees, beyond what is included in the 2032 plan projections.

The evaluation of available system capacity in the WSP is summarized as follows:

	Available	2018 Demand	2032 Demand
Storage Capacity	4,413,750 MG	1,709,364 MG	2,278,664 MG
Treatment Capacity	2,993 gpm	3,048 gpm	3,218 gpm
Annual Water Right	2,172 ac-ft/yr	1,998 ac-ft/yr	2,110 ac-ft/yr
Instantaneous Water Right	3,148 gpm	3,048 gpm	3,218 gpm

As shown, there is more than ample storage capacity for the City's projected demand as well as the projected buildout scenario. Although the WSP separates the Canyon Springs area from the Snoqualmie

Ridge area and concludes that there is inadequate storage capacity within Canyon Springs, the WSP cites in the system description:

> *"The two areas are connected by an intertie . . . The two areas used to operate fairly independently of each other, but with continued growth and demand requirement in both areas, the system is operated more holistically." (Ref. 2013 WSP pg. 1-4)*

As shown above, there is insufficient instantaneous water rights and treatment capacity for the projected 2032 growth.

According to the WSP, the City is taking measures to develop well claim sources and redevelop decommissioned wells, which would prolong the need for additional water rights or source capacity to beyond the 20-year plan. This would indicate that with these measures taken, the water system is adequate to serve the projected demands in the WSP.

<u>2015 Water System Capacity Analysis Update for the Mill Planning Area</u>

The 2013 Water System Plan evaluated the water system demands at a 2010 base year with "projected" growth together with committed service by contract or agreement to Snoqualmie Ridge and Snoqualmie Ridge II, and a reserve for service to the Lake Alice Community Association, pending a need through monitoring. Between 2010 and 2015, the City has experienced actual growth and has entered into additional commitments for service to Kimball Creek Development, the Salish Lodge Expansion, and the Mt. Si High School Renovation project.

Gray & Osborne, Inc., Consulting Engineers to the City of Snoqualmie, prepared a Technical Memorandum dated June 2, 2016 (Revision 1 dated June 27, 2016) that provides an updated capacity analysis of the City's water system in order to determine how much excess capacity currently exists beyond current uses and current commitments. The conclusion states:

> *The City has adequate annual water rights to provide all allocated water. However, the City currently lacks developed instantaneous water rights and source capacity to serve all customers to whom water has already been allocated. If the two groundwater claims are considered, the City has adequate instantaneous water rights to serve the allocated water and approximately 290 additional ERUs.*
>
> *The City's capacity to serve additional connections could be increased by the following measures:*
>
> - *If the City uses the two groundwater right claims and fully develops sources for those rights, the City could serve 290 ERUs in addition to existing demands and the demands already allocated for current development.*
> - *If the City were to curtail the augmentation of potable water to Eagle Lake and the reclaimed Class A irrigation systems, the City could regain up to approximately 315 ERUs of maximum day demand (corresponding to instantaneous withdrawal, Qi).*
> - *The construction of a backwash decant and recycle facility at the North Wellfield will allow the City to more efficiently use the existing water rights by decreasing the amount of wasted backwash water. If the backwash recycle system is able to recycle at least 50 percent of the backwash, the City could regain up to approximately 285 ERUs of maximum day demand (corresponding to instantaneous withdrawal, Qi).*

According to the Technical Memorandum, the City has over-committed, or has over-allocated water service to planned development projects by approximately 152 ERUs over developed source capacity and, therefore, must implement one or more of the recommended measures to increase available capacity. The least of these being developing source capacity up to the maximum groundwater right claims providing approximately 290 ERUs of excess capacity in the system.

Anticipated results from implementing the recommended measures:

Groundwater Right Claims	+290 ERUs
Eagle Lake (Reclaimed Class A Irrigation)	+315 ERUs
Recycle Backwash Water	+285 ERUs
Total Anticipated Increase in Capacity	**+890 ERUs**

Implementation of the recommended measures, therefore, could potentially yield approximately 890 ERUs of excess capacity within the system for development within the Mill Planning Area or other growth areas within the City before additional water rights would become necessary for additional service.

City of Snoqualmie Capital Facilities Plan

Although the 2013 water system plan is the City's most recent plan, the current 2017 – 2022 Capital Facilities Plan indicates that the completion of the Water Reclamation and Wastewater Treatment Facility Improvement project is scheduled to occur between 2017 and 2018. By 2017, the City had issued public works contracts for Phase 2 of the project and appears to be on schedule.

As of the time of this MDP and EIS publication it is assumed that the backwash water facility has been completed, and all new water rights claims have been granted to the City ***(Ecology Report of Examination for Water Right Change CG1-20316C, CG1-00059S and CG100060S issued December 2018).***

Anticipated Demand for Snoqualmie Mill

The following discussion provides 2 estimates of water demand based on varying methodologies and assumptions about land uses and employment. The first estimate is derived from the methodology used in the adopted Comprehensive Plan (2014) and the 2013 WSP. It was prepared prior to submittal of the PCI application, and without specific knowledge of the proposed mix and amount of various land uses. It assumes generalized and hypothetical commercial/industrial land uses and estimates employment based on an average of employees per acre to calculate ERUs and demand.

The second methodology is more project-specific and is based on information in the PCI Plan application. It is based on the types and amounts of commercial and industrial land uses anticipated to locate in the project, and estimates of the number of employees per 1,000 square feet of developed area for each use to estimate water demand. The estimate also addresses the specific demands of winery production, which is anticipated to be a primary use in Planning Area 1.

An early evaluation was made in the Annexation Implementation Plan (AIP) for Snoqualmie Mill relating the size and uses of Snoqualmie Mill to the estimated demand for similar uses within Snoqualmie Ridge contained in the WSP. The AIP estimated the ADD for non-residential development at Snoqualmie Ridge to be approximately 5.5 ERU/Ac. The total ERU estimated for Snoqualmie Mill using that assumption and the total developed area would yield approximately 594 ERU.

The following table shows an estimate of total demand similar to what was included in the initial PCI application (March 2017) utilizing the Comprehensive Plan generalized calculations of employees per acre. This resulted in a total demand estimate of approximately, 698 ERU and a Planning Area 1 demand of approx. 267 ERU. This MDP for the EIS has updated the evaluation of water demand using the current land use program assumptions, includes winery production estimates, and provides an analysis Planning Area 1 detail. This has resulted in a project demand of approx. 799 ERU and a Planning Area 1 demand of approximately 239 ERU.

Snoqualmie Mill Water Usage Estimate

Residential							***Total ERU***
		Bldg Area (sf)		Num of Units	Est. ERU's	ADD (gpd)	
P.A 1		N/A		160	112	22,400	***112***
Light Industrial / Retail							
	Gross Area (Ac)	Bldg Area (sf) L.I.	Retail	Estimated Employees		ADD (gpd)	
P.A 1	26	120,000	70,000	237		20,100	***101***
P.A 2 - 3	5	0	25,000	42		3,750	***19***
Industrial Warehouse							
	Gross Area (Ac)	Bldg Area (sf)		Estimated Employees		ADD (gpd)	
P.A 1	12	280,000		280		10,860	***54***
P.A 2 - 3	25	400,000		400		17,000	***85***
Business Park Campus							
	Gross Area (Ac)	Bldg Area (sf)		Estimated Employees		ADD (gpd)	
P.A 2 - 3	40	800,000		1,600		65,440	***327***
P.A 1 Total	38	470,000		517		53,360	***267***
P.A 2 - 3 Total	70	1,225,000		2,042		86,190	***431***
Total	***108***	***1,695,000***		***2,559***		***139,550***	***698***

Assumptions:

Residential		
ERU's per Apt. Unit	0.7	
ADD (gpd per ERU)	200	2013 Snoqualmie Chapt. 2 (Gray & Osborn, Inc. Update Memorandum; June 27, 2016)
Water Use per Employee (gpd)	30	2013 Snoqualmie WSP
Light Industrial / Retail		
Light Industrial / Retail (gpd/Ac)	500	2013 Snoqualmie WSP for Commercial 1,000 gpd per acre) - applied to 50% Dev't Area
Light Industrial / Employee (sf)	1000	Per Snoqualmie 2032 - Snoqualmie Comprehensive Plan Element 7 Land use.
Retail / Restaurant / Employee (sf)	600	Per Snoqualmie 2032 - Snoqualmie Comprehensive Plan Element 7 Land use.
Business Park Campus		
Business Park Campus	436	2013 Snoqualmie WSP for Business Park
Business Park Campus / Employee (sf)	500	Per Snoqualmie 2032 - Snoqualmie Comprehensive Plan Element 7 Land use.
Heavy Industrial Warehouse		
Heavy Industrial (gpd/Ac)	200	2013 Snoqualmie WSP for Commercial (1,000 gpd per acre) - applied to 20% Dev't Area
Heavy Industrial / Employee	1000	Per Snoqualmie 2032 - Snoqualmie Comprehensive Plan Element 7 Land use.

Planning Area I Detail

Through the process of preparing this MDP and Snoqualmie Mill EIS, a greater level of detail is known about the development that is planned to occur within Planning Area 1. The development concept as a wine village requires that estimates of water demand include an estimate of wine production and unique water demand for that production. Also, the project program for the EIS includes specific estimates of employment that should be used to estimate demand as opposed to the Comprehensive Plan methods discussed above.

Winery Water Demand Estimate:

The Department of Ecology as part of their *draft* **Winery General Permit** has performed a great deal of research in recent years regarding water demand and the volumes and concentrations of wastewater from the production of wine in the State of Washington. Summaries of this research can be found in the **FACT SHEET for the Formal Winery General Permit** *(Formal Draft released on November 1, 2017)*.

The anticipated water demand from an estimated number and size range of wineries expected as part of the Snoqualmie Mill Planning Area 1 is shown below.

Snoqualmie Mill

Estimated Winemaking Water Demand

Range of Wineries anticipated at Snoqualmie Mill

(This is an estimated number and size for purposes of anticipated water demand. It is an estimate for EIS purposes only)

	No. of Wineries	Cases of Wine per Year	Volume of Wine[1] (gal)	Water Demand[2]	Daily Demand Sept. - Nov. (gpd)	ADD (gpd)
2,000 Cases per Year	4	8,000	19,040	114,240	1,269	313
3,500 Cases per Year	5	17,500	41,650	249,900	2,777	685
6,000 Cases per Year	2	12,000	28,560	171,360	1,904	469
10,000 Cases per Year	1	10,000	23,800	142,800	1,587	391
Totals	**12**	**47,500**	**113,050**	**678,300**	**7,537**	**1,858**

Notes:

1 2.38 gal of wine per case of wine
2 6 gal water demand per gal of wine - Per Ecology research under Winery General Permit
3 4 gal wastewater per gal of wine - Per Ecology research under Winery General Permit
4 Water Demand and Wastewater Flow (Sept. - Nov.) = total volume / 90 days
5 ADD Water Demand = total volume / 365 days

From this information and based on the project program specific estimates of employment, the Snoqualmie Mill Water Usage Estimate table is revised as shown below to represent a more realistic water demand for the project accounting for these employment levels and Winery production within Planning Area 1. See revised table below.

Snoqualmie Mill Water Usage Estimate

(Employee estimates per Snoqualmie Mill Land Use Program and Winery Demand Estimate)

Residential		Bldg Area (sf)		Num of Units	Est. ERU's		ADD (gpd)	***Total ERU***
P.A 1		N/A		160	112		22,400	***112***
Light Industrial / Retail								
	Gross Area (Ac)	Bldg Area (sf) L.I.	Retail	Estimated **Retail** Employees	L.I Winery ADD (gpd)	Gross Area / Retail ADD (gpd)	Total ADD (gpd)	
P.A 1	26	120,000	70,000	140	1,858	17,200	19,058	***95***
P.A. 2 - 3	5	0	25,000	40		3,700	3,700	***19***
Industrial Warehouse								
	Gross Area (Ac)	Bldg Area (sf)		Estimated Employees			Total ADD (gpd)	
P.A 1	12	280,000		130			6,360	***32***
P.A 2 - 3	25	400,000		190			10,700	***54***
Business Park Campus								
	Gross Area (Ac)	Bldg Area (sf)		Estimated Employees			Total ADD (gpd)	
P.A 2 - 3	40	800,000		2,670			97,540	***488***
P.A 1 Total	38	470,000		270			45,960	***239***
P.A 2 - 3 Total	70	1,225,000		2,900			111,940	***560***
Total	***108***	***1,695,000***		***3,170***			***157,900***	***799***

Assumptions:

Residential		
ERU's per Apt. Unit	0.7	
ADD (gpd per ERU)	200	2013 Snoqualmie Chapt. 2 (Gray & Osborn, Inc. Update Memorandum; June 27, 2016)
Commercial		
Water Use per Employee (gpd)	30	2013 Snoqualmie WSP
Light Industrial / Retail		
Retail / Restaurant (gpd/Ac)	500	2013 Snoqualmie WSP for Commercial 1,000 gpd per acre) - applied to 50% Dev't Area
Light Industrial Winery Water Use	678,300	Gal of water (based on 6 gal of water/gal of wine and 2.38 gal of wine/case of wine produced - September through November ***See Estimated Winemaking Water Demand Table***
Retail / Restaurant / Employee (sf)		Per Snoqualmie Mill Land Use Program and EIS
Business Park Campus		
Business Park Campus	436	2013 Snoqualmie WSP for Business Park
Business Park Campus / Employee (sf)		Per Snoqualmie Mill Land Use Program and EIS
Heavy Industrial Warehouse		
Heavy Industrial (gpd/Ac)	200	2013 Snoqualmie WSP for Commercial (1,000 gpd per acre) - applied to 20% Dev't Area
Heavy Industrial / Employee		Per Snoqualmie Mill Land Use Program and EIS

As shown by the table above, the total estimated water demand for full build out of Snoqualmie Mill is 799 ERU as opposed to the 699 ERU estimated in the initial PCI application (utilizing Comprehensive Plan methods for estimating demand). However, this increase is not due to the anticipated demand associated with wineries and wine production. Rather, it is due primarily to the methodology for estimating employment (i.e., employees per square foot of building area per land use category.

The estimated demand from Planning Area 1, including estimated wine production demand, is believed to be more accurate; as shown on the above table, demand is estimated to be 239 ERU as opposed to the original PCI estimates of 268 ERU. This estimate is on an annual basis. Wine production involves a significant increase in short term demand during the processing months, approximately September through November.

2020 Water System Plan Update

The City is in the process of updating the Water System Plan. This updated plan was a work in progress during the City's review of the DEIS for Snoqualmie Mill. The following are some clarifications and refinements to the above evaluation based on that review.

The updated Water System Plan will include Snoqualmie Mill, as well as the entire 2011 annexation area, within the retail service area of the City. Snoqualmie Mill development will not require updates to the System Plan unless and until such time that a level of development exceeds the service capacity determined by the 2020 update. The expanded capacity from the 2013 system plan will include, but not be limited to:

- Completed capital facilities as discussed in the above evaluation of the 2013 Plan,
- Expanded Source and Supply from the recently granted water rights claims ***(Ecology Report of Examination for Water Right Change CG1-20316C, CG1-00059S and CG100060S issued December 2018).***

The system plan will address the system capacity as it relates to projected growth identified in the Comprehensive Plan. It will acknowledge that Snoqualmie Mill is zoned Planned Commercial/Industrial (PCI) District and development of the PCI district is a part of the projected growth of the City.

Based on the direction of the City's water system plan update, as communicated by the City to the PCI Plan engineering consultant (RH2 Engineering, August 22, 2019 letter to City of Snoqualmie Wastewater Superintendent; and meeting with City staff and engineering consultants on October 10, 2019), the initial PCI Plan water system proposal, as described in the Master Drainage Plan (Goldsmith Engineering, 2020), would be modified as follows.

- To serve Snoqualmie Mill Planning Area 1, primary water supply to the site will be provided directly from the City's 599 Zone. This may be accomplished by installing one of the connections as described below.

    1. Water main from the site may be extended south along SE Mill Pond Road, along existing haul roads or along other alignments in order to connect to the City's existing 599 Zone water main near the intersection of Meadowbrook Way SE and SE Reining Road.

2. New 599 Zone water main may be extended north along Railroad Avenue from Snoqualmie Parkway, crossing the Snoqualmie River (either on the State Route (SR) 202 bridge or under the river) to the Tokul Roundabout, then heading southeast on SE Mill Pond Road to the site.

- A proposed pressure reducing valve from the 705 Zone water main in SE Mill Pond Road near the Water Reclamation Facility may be installed to provide redundancy and backup water supply for Planning Area 1.

- To serve Snoqualmie Mill Planning Areas 2 and 3, both alternative water main alignments may be necessary.

- All proposed water main will be sized by hydraulic analyses, and the conceptual water plan will be confirmed in the City's water model once more detailed information on the proposed development plan becomes available.

- The development of Planning Area 2 and 3 may necessitate additional storage to support normal operational demands. As such, a new water storage facility may be required on or adjacent to the site to serve this extension of the 599 Zone under the Snoqualmie Mill Planning Areas 2 and 3 scenario. Although there is excess storage in the Snoqualmie Ridge area that may be transferred to the site under an emergency condition, there are storage limitations in the 599 Zone which affect the ability of the zone to fully support the Mill site under normal conditions. The water storage needs will be reviewed during the 2020 WSP Update and as more detailed information on the proposed development plan becomes available.

- The City's water system currently has water right and water source capacity to support the development of Planning Area 1, but not for the full buildout of Planning Areas 2 and 3. Of the mitigation measures discussed in *the 2016 Water System Capacity Analysis Update* by Grey & Osborn, Inc., one has been completed and the other two are currently being evaluated. The City is also considering implementation of an Aquifer Storage and Recovery (ASR) program to address future water right shortfalls. It is not yet known if these measures, once complete, will add sufficient capacity to support projected growth beyond Planning Area 1 development. If not, additional water supply improvements may need to be identified to support full development under the Proposed Action.

- The water plan for Snoqualmie Mill will conform to the system plan in effect or direction provided by the City at the time of project approval.

As noted, this discussion is based on the direction in the emerging 2020 plan update, and could be modified based on subsequent changes in direction.

2. Sanitary Sewer System

The AIP provided a summary of the City's General Sewer/Wastewater Facilities Plan (WWP) from 2012 and concluded that there is likely residual capacity within the wastewater treatment plant beyond the anticipated 2032 "Buildout" of perhaps as much as 1500 ERU of development. Excerpts from that summary are included in the discussion below.

With this PCI application, it is anticipated that the City will review the current actual growth and facility loading since the 2012 WWP as it relates to the Snoqualmie Mill PCI plan buildout, and Snoqualmie Mill Phase I.

Summary of System

The City completed an update to its General Sewer/Wastewater Facilities Plan (WWP) in 2012. The WWP evaluates the current City sewer system and Wastewater Treatment Plant (WWTP) capacity and the capacity to serve the projected growth in the City for 20 years (i.e. approximate Year 2032) for the City and its service area. This included current service for the existing pump station within the Mill Planning Area and the current use (Dirt Fish), however, did not include Snoqualmie Mill, or growth within the Mill Planning Area in projected wastewater flows in the 2012 WWP.

The capacity of the WWTP is limited by the approved design criteria contained in the 2011 modification to the NPDES Permit for the City of Snoqualmie's Wastewater Treatment and Water Reclamation Facility (PERMIT # WA-002240-3).

The analysis of projected loading from anticipated growth is as follows:

	Permitted	2032 Projected	Residual Capacity
Max. Month Loading	2.15 MGD	1.95 MGD	.20 MGD
Number of ERUs*	8,052 ERU	7,286 ERU	766 ERU

** Projected ERUs based only on flow with constant Infiltration and Inflow (I&I) measured at the time of the WWP. I&I is variable and significantly different for new systems vs the historic city system. Significant actions are being taken by the City to reduce I&I over time.*

Like the Water System Plan (WSP), the WWP assumes a level of continued development beyond the 20-year projection (2032) that was considered in the design and the rating of the WWTP.

Also, like the WSP, the WWP assumes a significant rate of growth between the 2010 baseline and year 2018 coincident with anticipated completion of Snoqualmie Ridge and Snoqualmie Ridge II, after which the growth factors are significantly reduced.

A number of assumptions are included in the analysis and projections of the 2012 WWP which are of importance in anticipating the City's ability to serve the Mill Planning Area:

- When evaluating the residual capacity of the WWTP by the above projections it would indicate that there is approximately 0.20 MGD of maximum month residual capacity (2.15 MGD – 1.95 MGD).

- Based solely on the ERU analysis in the WWP this would equate to approximately 766 ERU of residual capacity assuming all projected growth at year 2032. However, as noted, the ERU analysis in the WWP does not consider efforts to make significant reductions in system I&I.

- It appears that the ultimate capacity of the WWTP will be the max. month flow limitation and be dependent on continued efforts of I&I reduction.

<u>Snoqualmie Mill Sewer System</u>

The proposed sewer system for Snoqualmie Mill will be a combination of gravity collection systems and lift stations to convey sewage to the City's WWTP.

As mentioned previously, it is estimated that the City's wastewater treatment facility may not have sufficient BOD_5 treatment capacity to serve the full buildout of Snoqualmie Mill Planning Area 1 or Planning Areas 2 and 3 under the Proposed Action based on the 2020 GSP update. Additional improvements to increase the wastewater treatment facility's rated BOD_5 loading capacity are necessary to support full development of Snoqualmie Mill Planning Area 1 under the Proposed Action.

<u>Planning Area 1</u>

The sewer system for Planning Area 1 is planned to collect wastewater from Planning Area 1 and extend to the east boundary of PA 1 for future flows from Planning Area 2. See **Conceptual Water and Sewer Plan** (**Figure 2-12**). The gravity sewer for Planning Area 1 would be designed to accommodate flows from Planning Area 1 and future flows from Planning Area 2.

Lift Station #1 would be located in the northwestern corner of the site per the recommendations of the *Draft Soils, Geology, Groundwater and Geologic Hazards Report for the Draft Environmental Impact Statement, Earth and Groundwater* (AESI June 2018). It would be designed to serve Planning Area 1 with ability to increase capacity in the future for Planning Area 2. Lift Station #1 would pump to the north under Mill Pond Road and discharge into a gravity manhole which flows directly into the City's wastewater treatment plant (WWTP).

<u>Planning Area 2 and 3</u>

Planning Area 2 sewer would collect wastewater and flow to Lift Station #2 which would be located on the far eastern boundary of Planning Area 2 per soil conditions described by the *Draft Soils, Geology, Groundwater and Geologic Hazards Report for the Draft Environmental Impact Statement, Earth and Groundwater* (AESI June 2018). Lift Station #2 would pump to the Planning Area 1 gravity sewer stubbed at the Planning Area 1 east boundary which would flow to Lift Station #1. Development of Planning Area 2 would require upgrading the pumping capacity of Lift Station #1.

Planning Area 3 sewer would collect wastewater and flow to Lift Station #3 which would be located on the far eastern boundary of Planning Area 3 per soil conditions described by the Geotechnical Engineer (AESI 2018). Lift Station #3 would be pumped independently to the City's WWTP by force main to the west under the Planning Area 3 future access road and to the north under Mill Pond Road. The Planning Area 3 force main would then discharge into a manhole draining directly to the WWTP.

The plan to serve Snoqualmie Mill Planning Areas 2 and 3 will be reevaluated when the proposed development for both these areas are more certain but prior to design of the utilities for both these areas.

At that time, it should be evaluated if one lift station could be used to serve both Snoqualmie Mill Planning Areas 2 and 3 or if both these lift stations could pump to the lift station that will serve Snoqualmie Mill Planning Area 1. The City's objective is to minimize additional maintenance from new developments where feasible, which includes limiting the number of lift stations owned and operated by the City.

Preplanning and Engineering for Utilities

There are three aspects of the utility design and extensions which need careful preplanning and engineering for the development of Snoqualmie Mill beyond typical design standards set forth by the City and the Department of Ecology;

1. Stability and minimizing settlement of utilities in unconsolidated soil conditions,
2. Utility design within the floodplain,
3. Pre-planning and design for future development phases to minimize disruption of existing or new facilities, roadways or cause of re-work.

The development of Planning Area 1 and construction of the Mill Pond Road realignment would need to pre-plan and pre-design for the future extension of the Lift Station #3 force main from Planning Area 3. The construction of the Mill Pond Road realignment and entry into Planning Area 1 would need to either construct a portion of the Lift Station #3 force main, or provide an easement and future installation alignment that would not require disruption of a newly constructed Mill Pond Road. The receiving manhole for the force mains from Lift Station #1 and Lift Station #3 would need to be designed and constructed in a manner that would accommodate the current connection from Planning Area 1 but would not require disruption of Mill Pond Road for the future connection from Planning Area 3.

Lying within the 100-year floodplain of the Snoqualmie River, it is essential, and required by SMC 15.12.150 and 19.12.150 (Flood Hazard Regulations and Critical Areas Regulations), that utilities be protected from floodwaters or potential contamination of floodwaters. This will require that materials and pipe connection methods minimize potential for leak or infiltration and inflow of groundwater, specifically for sanitary sewer extensions. The two primary protections proposed for Snoqualmie Mill are:

- Materials and pipe connections to be specified and reviewed by the City with development plans, and,
- Manholes and lift stations be designed such that the top elevation (access elevation) be designed above the 100-year base flood elevation.

As the site is underlain with unconsolidated fill soils susceptible to settlement, it is essential that the proposed Lift stations be placed in locations recommended by the Geotechnical Engineer. Thus, the locations for Lift station #1 in the northwest corner of the site and Lift Station #2 and #3 in the far eastern portion of the site provide the ability to design stable foundations for these critical facilities. The utility extensions would be placed within over-excavated utility trenches backfilled with a combination of geotextile fabric and/or rip-rap or compacted import soil to provide a firm unyielding trench bed. However, the design of gravity flow utilities would be provided with a conservative (additional) minimum slope to accommodate modest settlement overtime while maintaining a positive grade and gravity flow.

Planning Area 1 Winery Wastewater and Pretreatment

Part of the project program for Snoqualmie Mill is the Wine Village concept for Planning Area 1. Winery production generates wastewater with uniquely high concentrations of Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS). The Department of Ecology as part of their *draft* **Winery General Permit** has performed a great deal of research in recent years regarding water demand and the volumes and concentrations of wastewater from the production of wine in the State of Washington and following implementation by Ecology, individual wineries within Snoqualmie Mill which plan to produce 7,500 cases or more of wine per year will be required to apply and obtain a Winery General Permit.

One of the conditions of the Winery General Permit is for winery producing activity draining to a public wastewater treatment plant (WWTP). In such cases where the WWTP is a "Listed Facility" by Ecology for receiving winery wastewater, no other measures are necessary by the winery. However, if the WWTP is not a Listed Facility, such as the City of Snoqualmie WWTP, the requirements under the permit is to follow restrictions or pretreatment measures required by the WWTP.

City of Snoqualmie Code **SMC 13.04.460** requires notifying the City where discharges to the public sewer will likely contain a 5-day BOD of greater than 300 parts per million (ppm) or more than 350 parts per gallon by weight of suspended solids, or other toxins prohibited by law. Where necessary as determined by the Director (of Public Works), discharges may be required to provide pretreatment to:

- **Reduce BOD to 300 ppm,**
- **Reduce Suspended Solids (TSS) to 350 parts per million by weight.**

Typical winery wastewater (according to ecology) can consist of BOD_5 of 3,000ppm or more and TSS of 800ppm or more. The total estimated wastewater flow is shown below. If required by the City, wineries within Snoqualmie Mill could provide individual pretreatment facilities within each winery production space, or pretreatment could be provided in one consolidated facility for all winery production for Snoqualmie Mill. Package pretreatment facilities for small wineries are available from various manufacturers and operators. However, it is assumed that one consolidated facility would be more cost effective and provide better monitoring of total daily flow and concentration consistent with a Group 2 facility (See **FACT SHEET for the Formal Winery General Permit)**.

Snoqualmie Mill

Estimated Winemaking Wastewater Flow

Range of Wineries anticipated at Snoqualmie Mill

(This estimated winery number and size and anticipated wastewater flow is for EIS purposes only)

	No. of Wineries	Cases of Wine per Year	Volume of Wine[1] (gal)	Wastewater Flow[3] Sept. - Nov. (gal)	Wastewater Flow Sept. - Nov. (gpd)
2,000 Cases per Year	4	8,000	19,040	76,160	846
3,500 Cases per Year	5	17,500	41,650	166,600	1,851
6,000 Cases per Year	2	12,000	28,560	114,240	1,269
10,000 Cases per Year	1	10,000	23,800	95,200	1,058
Totals	**12**	**47,500**	**113,050**	**452,200**	**5,024**

Notes:

1 2.38 gal of wine per case of wine
2 6 gal water demand per gal of wine - Per Ecology research under Winery General Permit
3 4 gal wastewater per gal of wine - Per Ecology research under Winery General Permit
4 Water Demand and Wastewater Flow (Sept. - Nov.) = total volume / 90 days
5 ADD Water Demand = total volume / 365 days

Figure 2-13 shows a schematic sanitary sewer system for Planning Area 1. The system would consist of collection of domestic sewage discharging to Lift Station #1. The system also shows separate collection of winery wastewater discharging first to a Pretreatment Facility, then to Lift Station #1. Lift Station #1 would then pump raw domestic sewage and pretreated winery wastewater to the headworks of the WWTP.

SMC 14.01.470 states… *"Where preliminary treatment facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation and by the owner at his expense…"* However, as shown on Figure 2-13, Snoqualmie Mill proposes to locate both the pretreatment facility and Lift Station #1 essentially in the same location as a unique combined facility in which the pretreatment facility could be dedicated to, owned and operated by the City along with the Lift Station.

The level of pretreatment of the winery wastewater before discharge to the City's sewer system needs to be finalized with the City as plans for the wineries are further developed. Some pretreatment is likely required, but a higher level of pretreatment including biological treatment may be better accomplished at the City's WRF. One option would be for these wineries to acquire sufficient treatment capacity in the City's WRF through appropriate connection fees and sewer service charges to have the winery wastewater treated at the WRF. This could be in the best interest of both the wineries and the City, especially if the City is already planning to increase the capacity of the WRF through conversion of existing treatment processes.

<u>2020 Wastewater System Plan Update (WWP)</u>

The City is in the process of updating the Wastewater System Plan. This updated plan was a work in progress during the City's review of the DEIS for Snoqualmie Mill. The following are some clarifications and refinements to the above evaluation based on that review.

The updated GSP will include Snoqualmie Mill, as well as the entire 2011 annexation area, within the service area of the City. Therefore, subject to the following, capacity within the wastewater system identified in the GSP would be available to Snoqualmie Mill, since it is part of 2040 projected growth.

Because of Department of Ecology requirements for wastewater growth planning, the 2020 GSP update already includes an evaluation of alternatives for increasing the wastewater treatment facility's rated BOD_5 loading capacity, as this will be required to continue to serve other planned growth in the City. The City will incorporate the estimated BOD_5 and TSS loads to be generated by Snoqualmie Mill Planning Areas 1, 2, and 3 under the Proposed Action in the analyses to increase capacity of the WRF.

Based on the preliminary analyses conducted to date for the 2020 GSP update, it is estimated that the City's wastewater treatment facility may not have sufficient BOD_5 treatment capacity to serve the full buildout of Snoqualmie Mill Planning Area 1 under the Proposed Action, or sufficient BOD_5 loading capacity to serve Snoqualmie Mill Planning Areas 2 and 3 under the Proposed Action. Depending on final estimates of winery production wastewater flows and strength, additional improvements to increase the wastewater treatment facility's rated BOD_5 loading capacity appear necessary to support full development of Snoqualmie Mill Planning Area 1 under the Proposed Action. It is anticipated that the updated GSP will include a proposed upgrade to the wastewater treatment plant to increase the capacity for flow, BOD5 (i.e., BOD as measured over a 5-day period), and Total Suspended Solids (TSS) treatment. As a result, the City may not want Snoqualmie Mill to provide the proposed level of pretreatment discussed previously for the winery wastewater. The amount of and level of pretreatment for the winery wastewater from the Snoqualmie Mill is uncertain at this time and will be reevaluated when the proposed development for winery production is more certain but prior to design of the utilities for Planning Area 1.

Following PCI Plan approval and as part of the first development application, all proposed and existing affected sewer mains will be sized and their hydraulic capacities will be determined. These will be determined consistent with flows and peaking factors promulgated in the 2020 GSP update and included in the engineering review for the first Snoqualmie Mill development project.

SE 1/4, SW 1/4 SECTION 20
NW 1/4 AND NW 1/4, SE 1/4 AND W 1/2, NE 1/4 AND NW 1/4, SW 1/4 SECTION 29
NE 1/4 AND NE 1/4, SE 1/4 SECTION 30
ALL IN TOWNSHIP 24 N, RANGE 8 E, W.M.
KING COUNTY, WASHINGTON

LEGEND - WATER AND SANITARY SEWER:

- EXISTING SANITARY SEWER FORCE MAIN TO REMAIN IN OPERATION UNTIL PLANNING AREA 2/3 DEVELOPMENT
- PROPOSED GRAVITY SEWER COLLECTION SYSTEM
- PROPOSED GRAVITY SEWER COLLECTION SYSTEM
- PROPOSED SANITARY SEWER LIFTSTATION
- PROPOSED WATER DISTRIBUTION SYSTEM

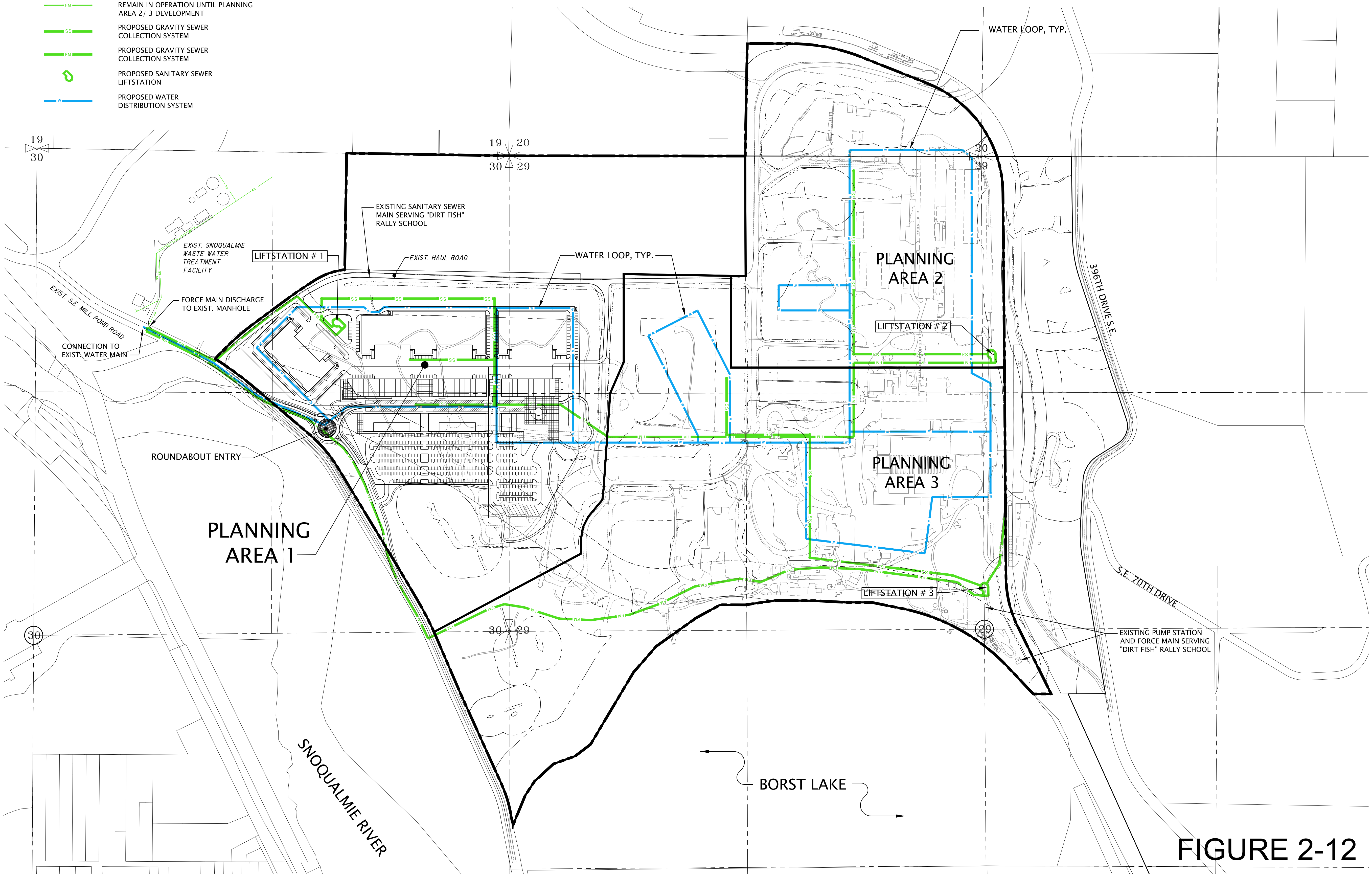


FIGURE 2-12

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SNOQUALMIE MILL VENTURES, LLC

CONCEPTUAL WATER AND SANITARY SEWER PLAN
FOR
SNOQUALMIE MILL

CITY OF SNOQUALMIE KING COUNTY WASHINGTON

JOB NO. 17500
SHEET WS-1

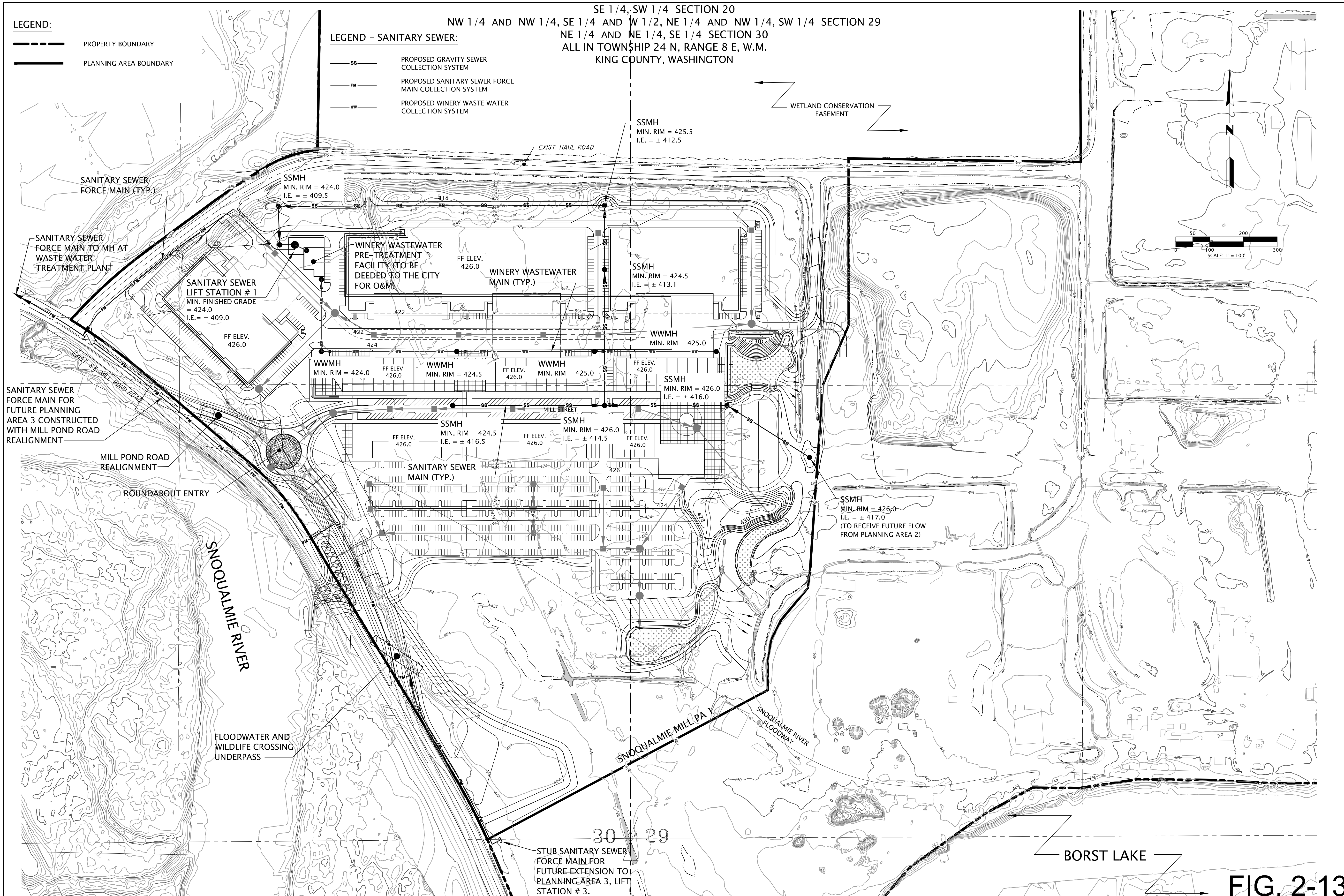

FIG. 2-13

GOLDSMITH
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SNOQUALMIE MILL VENTURES, LLC

JOB NO. 17500

SHEET

PLANNING AREA 1 CONCEPTUAL SANITARY SEWER PLAN
FOR
SNOQUALMIE MILL

CITY OF SNOQUALMIE WASHINGTON

EIS Alternatives

1. Proposed PCI Plan: This alternative would be substantially similar to the submitted PCIP application, with the exception of the outdoor performance space. The outdoor performance space would be eliminated in this alternative at the request of the applicant.

Proposed PCI Plan

Land Use	Planning Areas 1	2	3	Site Totals [1]	
Warehouse/Manufacturing	280,000 sf	400,000 sf		680,000 sf	[37%]
Light Industrial	120,000 sf			120,000 sf	[7%]
Retail/Restaurant[2]	70,000 sf		25,000 sf	95,000 sf	[5%]
Residential (Mixed-Use)[3]	134,000 sf			134,000 sf	[7%]
Office/Campus	--	--	800,000 sf	800,000 sf	[44%]
Total	604,000 sf	400,000 sf	825,000 sf	1,829,000 sf	
Building Footprint Area (Gross)	11 acres [11%]	9 acres	19 acres	39 acres	[15%]
Open Space[4]	69 acres [68%]	34 acres	63 acres	166 acres	[64 %]
Roads/Other Impervious[5]	22 acres [22%]	13 acres	21 acres	56 acres	[22 %]
Total Area	**102 acres**	**56 acres [6]**	**103 acres**	**261 acres**	

[1]Numbers are rounded.

[2]Includes restaurant uses (approximately 15,000 sf), specialty retail and indoor event center spaces (31,000 sf).

[3]Assumes 160 residential units@835sf located on the 2nd floor through 4th or 5th floors of mixed-use buildings in Planning Area 1. Units would be rental, market rate, in a mix of 1- and 2-bedroom apartments.

[4]Total open space includes *natural open space*, comprised of wetlands, streams and their associated buffers; constructed wetlands; landscaped areas; undeveloped land used for compensatory flood storage, habitat, trails and passive open space (135 acres total); active open spaces including landscaped areas, public plazas and lawn areas, small outdoor spaces adjacent to individual buildings, ornamental plantings and parking area landscaping (19 acres total); and the portion of Planning Area 1 subject to a conservation easement (53 acres of proposed Lot 5). Planning Area 1 contains approximately 64 acres of natural open space, and 5 acres of landscaped open space area.

[5]Includes roads, sidewalks, parking areas, plazas, etc.

2. Redevelopment Plan : Compared to the Proposed PCI Plan, this alternative would increase warehouse use and have an outdoor performance space similar to the original PCIP application; and reduce the retail and office, and residential uses. Total development amount (square footage) and site coverage would remain approximately the same. Development in Planning Areas 1 and 2 would be slightly less than the Proposed PCI Plan alternative (approximately 16,000 sf for Planning Area 1 and 10,000 sf for Planning Area 2), while development in Planning Area 3 would be slightly more (approximately 45,000 sf). The general footprint of the Planning Areas would remain the same. Changing the land use mix to emphasize warehouse would reduce total employment, which is anticipated to reduce impacts to transportation, water consumption, public service demands and several other elements of the environment. Including the outdoor performance space is anticipated to increase impacts to transportation, noise and other elements of the environment.

Redevelopment Plan (Gross Leasable Area)

	Planning Areas			
Land Use	**1**	**2**	**3**	**Total [1]**
Warehouse/Mfg	291,000	390,000	715,000	1,396,000
Lt. Industrial	96,000			96,000
Retail/Restaurant	82,000	0	0	82,000
Office	0	0	156,000	156,700
Residential [2]	104,000	0	0	104,000
Outdoor Performance Space [3]	0	0	2,000 (stage)	2,000
Event Center	15,000	0	0	15,000
Totals	**588,000**	**390,000**	**873,000**	**1,851,700**

[1]Numbers rounded.

[2]Assumes 120 market rate rental units in a mix of 1- and 2-bedroom units, averaging 835 sf.

[3]Assumes a 3.7-acre landscaped/grass open space area with a permanent stage (2,000 sf), and a capacity for approximately 5,000. An average of 2 concerts per week are assumed to occur primarily on weekend evenings from June through September.

3. No Action Alternative: In this alternative, the proposed action would not occur, and the site would remain as it presently exists with its current use(s). This alternative is required to be analyzed under the State Environmental Policy Act, Chapter 43.21C RCW, and its implementing rules, Chapter 197-11 WAC.

3. Regulatory Framework for Storm Water Management

As noted previously in Chapter 1, the Master Drainage Plan (MDP) for Snoqualmie Mill is intended to support programmatic level planning, preliminary engineering and environmental analysis for the overall PCI Plan and provides project level planning and engineering for proposed development of Planning Area 1.

Future site development and engineering permits for the Snoqualmie Mill development project will require the submittal of more detailed stormwater design to the City in accordance with the PCIP Approval, Development Agreement, and applicable *Snoqualmie Municipal Code (SMC)* development regulations.

The MDP for Snoqualmie Mill is subject to the City of Snoqualmie *Stormwater Regulations SMC 15.18.* The City has adopted the *2016 King County Surface Water Design Manual (KCSWDM)* which is deemed equivalent to the *2012/2014 Stormwater Manual for Western Washington (Department of Ecology).* Regulations for stormwater management that are applicable to the project include (but are not limited to):

A. SMC 15.18 Surface Water and Stormwater Management Regulations in hierarchal order;

1. Appendix I of the Western Washington Phase II Municipal Stormwater Permit,
2. Appendix I-E, Flow Control Exempt Surface Waters, of the Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2012, amended in 2014,
3. The City of Snoqualmie Addendum to the 2016 King County Surface Water Design Manual, and
4. The 2016 King County Surface Water Design Manual.

B. Critical Areas (SMC 19.12)

C. Shoreline Management Regulations (SMC 19.08)

D. Flood Hazard Regulations (SMC 15.12 and SMC 19.12.150)

E. FEMA Flood Regulations (44 CFR)

F. Washington Department of Fish and Wildlife (WDFW) Hydraulics Project Approval (HPA)

G. U.S. Army Corps of Engineers Clean Water Act Sec. 404

H. Department of Ecology Construction National Pollutant Discharge Elimination System (NPDES) Permit

A. SMC 15.18 Surface Water and Stormwater Management Regulations

Appendix I of the Western Washington Phase II Municipal Stormwater Permit will be met by complying with the stormwater management standards required by Snoqualmie Code 15.18. Snoqualmie Mill intends to comply with the 2016 King County Surface Water Design Manual **("KCSWDM")** and City of Snoqualmie Addendum. However, the stormwater management design and compliance is first dependent on demonstrating qualification as a Direct Discharge site based on Appendix I-E of the Ecology Manual and Section 1.2.3.1 of the KCSWDM.

Direct Discharge Flow Control Exemption Qualification

The Snoqualmie River is a "Major Receiving Water" as listed in Table 1.2.3.B of the KCSWDM as well as being designated as a Direct Discharge Receiving Water per the 2012/2014 Ecology Manual. However, the exemption only applies if the criteria for direct discharge are met. It could be assumed that since Appendix I-E from Ecology is a higher regulatory priority that if these criteria are met then the site, in fact qualifies as a Direct Discharge exemption. Nonetheless, both sets of criteria are outlined below together with applicability to Snoqualmie Mill and justification of compliance.

<u>Ecology Manual Appendix I-E, Flow Control Exempt Surface Waters</u>

Flow Control Exemption criteria per Ecology Manual Appendix I-E and their applicability to Snoqualmie Mill are as follows:

Direct discharge to the exempt receiving water does not result in the diversion of drainage from any perennial stream classified as Types 1,2,3, or 4 in the State of Washington Interim Water Typing System, or Types "S", "F", or "Np" in the Permanent Water Typing System, or from any Category I, II, or III wetland; and

- *Flow splitting devices or drainage BMP's are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or category IV wetland;*

- *Design of flow splitting devices or drainage BMP's will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow;*

- *Flow splitting devices or drainage BMP's that deliver flow to Category IV wetlands will also be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction; and*

- *The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water mark of the exempt receiving water; and*

- *The conveyance system between the project site and the exempt receiving water shall have a hydraulic capacity sufficient to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected; and*

- *Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.*

By the way this criteria is written, with a statement followed by the list of bullets, the interpretation of this criteria is that the overall statement is to prohibit diversion of major basin boundaries and to demonstrate maintenance of hydrology to those wetlands and streams most sensitive to hydrologic changes in the manner outlined in the bullet list of criteria. As such, below is a response to how Snoqualmie Mill will comply with each of these criteria in the order of the bullets listed above;

- The primary method of flow splitting is draining portions of the development directly to the Snoqualmie River such that portions that drain to the on-site resources demonstrate compliance with the hydrologic criteria used below,

- There are only two (2) streams on-site and Stream 2 is the only on-site stream potentially impacted by development of Planning Area 1. Analysis (modeling) is provided in Chapter 6 which demonstrates compliance with this criterion. The method of analysis is consistent with flow duration analysis in the KCSWDM,

- There are numerous wetlands on-site. For wetlands that are potentially impacted by development of Planning Area 1, analysis (modeling) is provided in Chapter 8 and results are described in Chapter 6 which demonstrates compliance with this criterion. The method of analysis is consistent with KCSWDM Reference 5 Guide Sheet 3B (discussed in KCSWDM Core Requirement 3# below) together with an impact evaluation by the wetland biologist.

- Stormwater flows conveyed to the Snoqualmie River ordinary high water mark (OHWM) will be by either constructed conveyance pipe or manmade open channel. Other runoff draining to wetlands for hydrology maintenance will also flow through manmade overland channels or dispersal.

- This criterion was established to limit the number of direct discharge conveyance systems of upland sites and optimize any direct discharge systems by requiring that they be designed for regional use. This is not applicable to Snoqualmie Mill.

- This is a given and will be considered in the design of any conveyance or discharge system for Snoqualmie Mill.

<u>KCSWDM Section 1.2.3.1 Direct Discharge Exemption</u>

Flow Control Exemption criteria per KCSWDM Section 1.2.3.1 and their applicability to Snoqualmie Mill are as follows:

a) *The **flowpath** from the **project site** discharge point to the edge of the 100 year floodplain of the major receiving water will be **no longer than a quarter mile**…*

   Snoqualmie Mill lies <u>within</u> the 100 year floodplain of the Snoqualmie River. Discharges from the site will either be conveyed to the ordinary high water mark (OHWM) of the river or discharged to on-site and off-site wetland(s) or water bodies also lying within the 100 year floodplain of the river. See discussion of minimizing hydrologic impacts to wetlands, criteria e) below.

b) *The conveyance system between the **project site** and the major receiving water will extend to the ordinary high water mark and will be **comprised of manmade conveyance elements**….*

   Stormwater flows conveyed to the river ordinary high water mark (OHWM) will be by either constructed conveyance pipe or manmade open channel. Other runoff draining to wetlands for hydrology maintenance will also flow through manmade overland channels or dispersal.

c) *The conveyance system will have **adequate capacity** per Core Requirement #4… for the entire contributing drainage areas, assuming **build-out conditions** to current zoning…*

   This criterion was established to limit the number of direct discharge conveyance systems of upland sites and optimize any direct discharge systems by requiring that they be designed for regional use. This is not applicable to Snoqualmie Mill.

d) *The conveyance system will be adequately **stabilized to prevent erosion**…*

   This is a given and will be considered in the design of any conveyance or discharge system for Snoqualmie Mill.

e) *The direct discharge proposal will not **divert flows** from or increase flows to an **existing wetland or stream** sufficient to cause a significant adverse impact…*

   This criterion will be met but also is one of the key elements of the Snoqualmie Mill Master Drainage Plan proposal. Although eligible for direct discharge, not all runoff from Snoqualmie Mill will be directly conveyed to the OHWM of the river. Runoff from the site will also discharge to on-site and off-site wetlands, consistent with “flow splitting” criterion by Ecology Appendix I-E, to minimize impacts or changes to existing hydrology. For wetlands that are potentially impacted by development of Planning Area 1, analysis (modeling) is provided in Chapter 8 and results are described in Chapter 6 which demonstrates compliance with this criterion. The method of analysis is consistent with KCSWDM Reference 5 Guide Sheet 3B (discussed in KCSWDM Core Requirement 3# below) together with an impact evaluation by the wetland biologist.

<u>2016 King County Surface Water Design Manual</u>

As described in Chapter 1, this MDP has been prepared for Snoqualmie Mill to provide the approach to and analysis of stormwater management and control of impacts to site specific water resources. This is provided at a project specific level for Planning Area 1 and a programmatic level for Planning Areas 2 and 3. The site lies within the Snoqualmie River floodplain and is designated as a Direct Discharge site. Therefore, there is less emphasis on simply demonstrating compliance with the Core Requirements specifically, Core Requirement #3 Flow Control, and #9 Flow Control BMP’s. There will be more emphasis on floodplain management and on-site wetland hydrology.

Snoqualmie Mill anticipates compliance with the 2016 King County Surface Water Design Manual **(“KCSWDM”)**. Future permitting for development will be required to prepare a Technical Information Report (TIR) per the KCSWDM that addresses each of the nine (9) Core Requirements in the manual. The outline below anticipates establishing applicability or interpretation of how future development will be reviewed against the core requirements:

Core Requirement #1 – Discharge at Natural Location

Chapters 4 and 5 of this MDP defines Snoqualmie Mill as having three (3) discharge locations to the Snoqualmie River. The KCSWDM defines Threshold Discharge Area **(TDA)** as *"an onsite area draining to a single natural location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath)…"*

The confluence of the three site discharge locations, the direct site runoff to the River, the flowpath from the site discharge location into Borst Lake to the River, and the site discharge from Stream 1 and Wetland 11 to the River, occurs at the Stream 1 confluence with the River. The shortest flowpath is the direct runoff from the site. From the above definition, all three discharge locations lie within one (1) TDA. However, technically the downstream flowpath from the Borst Lake outfall to the Stream 1 confluence with the river is greater than ¼ mile. Therefore, the site is considered to be within two (2) TDA's.

The Direct Discharge Exemption in the KCSWDM states that, *"Any onsite natural drainage area is exempt from the flow control facility requirement…"* also that to qualify for Direct Discharge that, *"…a) The flowpath from the project site discharge point to the 100-year floodplain of the major receiving water will be no longer than a quarter mile…"*

Future permitting should only need to reference the MDP when addressing compliance with Core Requirement #1 provided that such future development proposals are consistent with this MDP.

Core Requirement #2 – Offsite Analysis

This MDP provides the Off-Site Analysis for Snoqualmie Mill. Future development permitting will provide project specific design and Project Technical Information Reports (TIR) per the KCSWDM. The Off-Site or Downstream Analysis as part of a specific project TIR will demonstrate compliance with Core Requirement #2 by evaluating consistency with the MDP and capacity and function of any previously constructed downstream infrastructure from a prior project. This will include tabulation and tracking of infrastructure capacity through project phases.

Core Requirement #3 - Flow Control

Snoqualmie Mill qualifies as a **Direct Discharge Site** and is therefore **exempt** from Flow Control requirements of Core Requirement #3 (See Direct Discharge Flow Control Exemption below).

Compliance with the qualifications for direct discharge with Ecology Manual Appendix I-E and with Table 1.2.3.A of the KCSWDM (Type 4 downstream conditions potential impact to wetland hydrology), requires assessment of and sufficient maintenance of wetland hydrology so as not to cause a significant adverse impact. Such assessment includes evaluation of the wetland by the project geologist and wetland biologist of the primary source of hydrology and use of **KCSWDM Reference 5 <u>Wetland Hydrology Protection Guidelines</u>** for surface water impacts. This analysis is provided for Planning Area 1 at a project level analysis and for Planning Areas 2 and 3 at a programmatic or qualitative level. This is discussed later in **Chapters 6, and 7**.

The key element of the Wetland Hydrology Protection Guidelines for surface water dependent wetlands is **Guide Sheet 3B: Protecting wetlands from impacts of changes in water flows**. Guide Sheet 3B states; *"…The risk of impacts to functions and values increases as the changes in water regime deviate more from* *the **existing conditions**…"* [emphasis added]. The criteria for demonstrating a level of impact and minimizing impacts per Guide Sheet 3B is comparing anticipated total statistical volumes of runoff into a wetland on a monthly and daily basis to the pre-project volumes. Consistency with this guideline is either shown to be met or analyses is made by the wetland biologist to determine if any inconsistencies are likely to cause a significant impact.

As a direct discharge site, the requirement for Snoqualmie Mill is to 1) convey runoff directly to the river, 2) maintain levels of runoff to on-site and off-site wetlands at **pre-project levels.** Per KCSWDM Ref. 5, this means *"Existing Conditions"* as opposed to *"Historic Site Conditions"* that would typically be applied for Flow Control analysis.

Core Requirement #4 – Conveyance System

Analysis of conveyance is applicable to the final design of a development proposal for permitting. Such analysis will be included in project specific **TIR**'s for any proposed conveyance system.

For this MDP, conveyance is addressed to the extent of demonstrating feasibility for the direct discharge to the Snoqualmie River and the conceptual sizing of water quality treatment systems and their associated discharge methods.

Core Requirement #5 – Construction Stormwater Pollution Prevention

This Core Requirement element is more appropriately addressed in conjunction with review of a development permit and is not addressed at an MDP level for overall Snoqualmie Mill SEPA review.

Core Requirement #6 – Maintenance and Operations

This Core Requirement element is more appropriately addressed in conjunction with review of a development permit and is not addressed at an MDP level for overall Snoqualmie Mill SEPA review. Each future development project which includes an element of stormwater infrastructure will contain an O & M Manual or information consistent with Core Requirement #6 as part of the project Technical Information Report (TIR).

Core Requirement #7 – Financial Guarantees and Liability

This Core Requirement element is more appropriately addressed in conjunction with review of a development permit and is not addressed in this MDP.

Core Requirement #8 – Water Quality

This MDP addresses the Water Quality Treatment that will be required for future Pollutant Generating Impervious Surfaces **("PGIS")** and Pollutant Generating Pervious Surfaces **("PGPS")** on Snoqualmie Mill and provides a conceptual design for water quality treatment facilities for Planning Area 1. Other elements of water quality control will be addressed with future development permits specifically in the preparation of project specific Stormwater Pollution Prevention Plans (SWPPP) for source controls, spill control and temporary erosion and sedimentation control.

Enhanced water quality treatment is required for commercial, industrial or multifamily residential development. However, per Core Requirement #8, the Snoqualmie River qualifies as a ***Basic Treatment Receiving Water***, therefore, future PGIS draining to a direct discharge outfall requires only Basic Water Quality treatment. Runoff from PGIS draining to on-site or off-site wetlands for purposes of hydrology maintenance requires that Enhanced Treatment be provided (**See Chapter 6 – Drainage Control Plan**).

Core Requirement #9 – Flow Control BMP's

Application of Core Requirement #9 for Snoqualmie Mill is based on the following from KCSWDM Section 1.2.9.1(A);

> *"Projects or* ***threshold discharge areas*** [emphasis added] *of projects qualifying as exempt from the flow control facility requirement using the Direct Discharge Exemption in accordance with Section 1.2.3.1 do not have to achieve the Low Impact Development (LID) performance standard…, nor consider bioretention, permeable pavement, and full dispersion. However, the moisture holding capacity of new pervious surfaces on those projects… must be protected…"*

This section further states that infiltration and dispersion of roof areas must be implemented, if feasible.

For Snoqualmie Mill, it is demonstrated in the geologic and geotechnical reports supporting the Earth section of the EIS that infiltration is not feasible. Dispersion will be considered on the site where feasible or reasonable and is proposed within Planning Area 1 along some of the perimeter areas of wetland buffer enhancement as well as preservation/enhancement of moisture holding soils with buffer enhancement and landscaping. Otherwise, Snoqualmie Mill is exempt from Core Requirement #9.

B. Critical Areas (SMC 19.12)

Development of the site is subject to the provisions of SMC 19.12 which includes preparation and review of a Critical Areas Study (aka Sensitive Areas Study). According to SMC 19.12.060 a critical areas study may be ***waived*** if the director finds that:

1. *There will be no alteration of the critical area or areas and associated buffers, or that the use, activity or development proposal is located in a portion of a… buffer adjacent to… an existing road and/or other existing development, such that the development site does not provide significant buffer functions;*
2. *The development proposal will not impact the critical areas or buffers in a manner contrary to the goals, intent and requirements of this chapter, and*
3. *The development proposal meets the minimum standards of this chapter.*

Implication is that if all minimum standards of this chapter are met, there would be no need for a critical areas study. A critical areas study is required where a proposal may impact critical areas or conditions on the site may not be consistent with meeting all the minimum standards which shall be identified by the study. Specific to wetlands in 19.12.170, it is stated that no alteration of wetland or buffer is allowed except those covered by the chapter and those specifically identified in subsection 19.12.170(H) ***Permitted Uses and Alterations***. This includes ***19.12.170(H)(6) Other Uses***, which states;

> *"Other uses may be permitted by the city only following review and approval of a critical area study and upon determination that such use can be developed in a manner which would not degrade the quantitative and qualitative functioning of the wetland or stream…"*

The Snoqualmie Mill Sensitive Area Study was submitted to the City of Snoqualmie in 2012. It was reviewed by City staff and qualified subconsultants and an updated study was submitted as prerequisite to the Snoqualmie Mill Annexation Implementation Plan (AIP). The AIP was submitted in March 2016 and received complete application status and a SEPA Determination of Non-Significance with adoption of existing environmental documentation.

The sensitive area study addressed the presence or proximity of Wetlands, Channel Migration Zone, Critical Aquifer Recharge Areas, Floodplain, Floodway, Shorelines, and Streams. Specifically addressed was the currently developed condition of the site and the significantly altered and poor quality of critical areas buffers as well as areas of "non-functional" buffers.

It was determined that the assessment of non-functional buffers was reasonable and generally accepted that for the future permitting of the site:

- Buffers are reduced to where there are minimal functions due to disturbance or obstruction,
- Future evaluations of wetland buffer dimensions and buffer impacts will be made in consideration of the "non-functional" buffer analysis in the Sensitive Areas Study,
- Therefore, alterations of or uses within may not precisely meet minimum standards of the chapter, such as, buffer reductions greater than outer 25% of standard buffer widths,
- Buffer mitigation may include restoration of non-functional buffer areas.

The City adopted an update to the Critical Areas Code SMC 19.12 in June 2016. In general, wetland and stream buffers were modified and all information in this MDP and in the Snoqualmie Mill EIS is based on the new 2016 SMC 19.12 Critical Areas Code. The City approved the SAS as part of the AIP Approval on November 28, 2018.

The primary purpose for discussing the previous SAS herein is to demonstrate the extent to which the disturbed nature of the site has been studied providing the basis of proposed modifications to the precise standards of SMC 19.12 as allowed under the PCI code. This is reflected in the code in three areas:

- The PCI zoning district regulations applicable to the site encourage "imaginative well-designed master planned commercial -industrial development" proposals (SMC 17.20.050 A), and provides flexibility from fixed, quantitative standards. The district authorizes the City Council to approve deviations from general standards where they determine that the deviation will not threaten health, safety or the environment. (SMC 17.20.050 I).
- The Planned Unit Development (PUD) regulations, which determine the application and procedural requirements for PCI projects, permit flexibility and variation in design, and modifications in requirement and standards (except within shoreline districts) to accomplish planned developments that are as good or better than traditional lot-by-lot projects (SMC 17.50.060 A). These flexibilities as applied to critical areas may not be allowed within the shoreline jurisdiction.
- The critical area regulations authorize enhancement of habitat within wetlands and their buffers based on approval of a habitat enhancement plan (SMC 19.12.170 H.2). The regulations further permit "other uses" in wetlands and buffers if the city determines they can be developed in a manner that does not degrade the functioning of the wetland (SMC 19.12.170 H.6).

C. Shoreline Management Regulations (SMC 19.08)

Development within shoreline environs will require compliance with City Shoreline Management Regulations and approval of a Shoreline Permit. The Master Drainage Plan and EIS shoreline environs analysis are based on the City of Snoqualmie's UPDATED Shoreline Management Plan (August 26, 2019), officially adopted by the City and currently in the review and approval process at Washington State Department of Ecology. Approval is anticipated in June/July 2020.

The shoreline environments applicable to Snoqualmie Mill are the **Urban Riverfront Environment** and the **Urban Floodplain Environment**.

Exhibits in the MDP and in the EIS depict the applicable Shoreline environ areas and the consistency of the PCI Plan.

D. Flood Hazard Regulations (SMC 15.12 and SMC 19.12.030)

Most of the Snoqualmie Mill Site is mapped by FEMA as lying within the 100 year floodplain Zone AE of the Snoqualmie River, below the base flood elevation. (Ref. February 2010 Letter of Map Revision **(LOMR)**, FIRM Panel 0737F.)

Proposed development within the Floodplain or Floodway within the City of Snoqualmie will be governed by the City's Flood Hazard Regulations found at SMC 15.12 as well as FEMA regulations found in the Code of Federal Regulations **(CFR)** 44. As such, any site disturbing activities within a Floodplain or Floodway will require an approved Flood Improvement Permit. Along with the project EIS, Snoqualmie Mill is preparing a Biological Evaluation (BE) to be reviewed as part of the floodplain development permit application.

Compliance with Flood Hazard Regulations includes those provisions related to construction of buildings and future submission for appropriate Letters of Map Amendments or Revisions **(LOMA or LOMR)**. This Master Drainage Plan is intended to demonstrate the feasibility of future compliance and proposed compliance for development of Planning Area 1 for:

- 15.12.150(A) Finished Grade After Construction and Floodplain Compensating Storage,
- 15.12.150(D) Utilities – new and replacement water and sanitary sewer systems
- 15-12.160(E) Critical Facilities – feasibility of critical utilities (specifically sanitary sewer) for future development,
- 15.12.160(F) Fill – Demonstration of no increase in the base flood discharge,
- 15.12.160(G) Clearing and Grading – Feasibility grading and proposed Planning Area 1 grading for the analysis of compliance with 15.12.150(A) and 15.12.170.
- 15.12.170 Floodways – Hydrologic and hydraulic analyses demonstrating no increase in flood levels during the occurrence of the base flood discharge.

E. FEMA Flood Regulations

Any future proposed development of the Snoqualmie Mill site will be required to comply with and be consistent with the Floodplain Management Regulations of the National Flood Insurance Program (NFIP) found in Chapter 44 of the Code of Federal Regulations (44 CFR).

A primary element of such compliance is a "zero-rise" floodway analysis. Snoqualmie Mill intends to exceed this provision by providing demonstration that there will be no increase in flood levels during the occurrence of the base flood discharge (i.e. the **floodplain**) consistent with SMC 15.12 and SMC 19.12. This analysis will ensure that there is no impact to the City of Snoqualmie, or other surrounding properties, by any rise in the 100 year flood elevation of the Snoqualmie River.

F. Washington Department of Fish and Wildlife (WDFW)

The proposal for a constructed outfall to the OHWM of the Snoqualmie River for direct stormwater discharge will require a Hydraulics Project Approval (HPA) from WDFW. The conceptual design of this direct discharge outfall is provided as part of this MDP for inclusion in the project SEPA review. Final design and construction permitting will require obtaining an HPA.

G. U.S. Army Corps of Engineers Clean Water Act Sec. 404

The U.S. Army Corps of Engineers (COE) issued a Jurisdictional Determination (JD) for Snoqualmie Mill on May 3, 2017. The jurisdictional determination was issued as a result of review and site inspection(s) based on thorough site analysis prepared and submitted by the Applicant's Wetland Biologist Raedeke Associates, Inc. The Corps review included wetlands, ditches and streams located on the Snoqualmie Mill site.

The Approved Jurisdictional Determination is valid for a period of five (5) years from the date of the letter(s) noted above. The Snoqualmie Mill PCIP application site plan has been planned in accordance with the boundaries of the jurisdictional wetlands, ditches, streams, and associated buffers from the JD and the Snoqualmie Mill SAS. Future development permits will comply with the wetlands, streams, and associated buffers approved per the jurisdictional determination.

There is no proposed fill or alteration of a water of the U.S. that would require a permit under Sec. 404. If such a permit is sought for future ultimate build-out and mass grading, appropriate applications and consultation would be required. Snoqualmie Mill is, however, preparing a Biological Evaluation (BE) as part of the Flood Hazard Development Permit.

H. Department of Ecology Construction National Pollutant Discharge Elimination System (NPDES) Permit

For all new construction activity exceeding 1 acre in size, a Notice of Intent (NOI) must be filed for a National Pollutant Discharge Elimination System (NPDES) Permit (General or Individual) with Ecology for discharge of stormwater. The NPDES permit requires preparation of a Stormwater Pollution Prevention Plan (SWPPP).

4. Baseline Data Collection and Site Base Mapping

Site Mapping Base Data

Vertical Datum

City of Snoqualmie requires that the vertical datum for land use applications be based on the North American Vertical Datum of 1988 (NAVD 88).

Vertical Datum: NAVD 1988
Master Benchmark: King County GPS Survey Control Point 5997 (aka BM P8)- found 3" brass disk set in the northwest corner of power vault at the southwest corner of intersection of Tokol Road and Stearn Road stamped "King County KC-P-8 1995". Elevation = 479.73 feet.

Site BM: Goldsmith Survey Control Point #108- set concrete nail and scribed "X" in "H" of helipad north of main office. Nail was set at the west leg at the cross bar. Elevation = 450.99 feet.

Site BM: Goldsmith Survey Control Point #104- set rebar and cap +/- 25 feet S 85° W of fire hydrant #10 and +/- 50 feet north of a shed near the northeast corner of property. Elevation = 423.97 feet.

Site BM: Goldsmith Survey Control Point #113- set rebar and cap on the east side of Mill Pond Road +/- 7.4 feet easterly of the fog line and +/- 7.9 feet southerly of the southerly end of ecology block wall/barricade across from utility pole labeled 219774/175499. Elevation = 417.70 feet.

FEMA mapping is currently based on the National Geodetic Vertical Datum of 1929 (NGVD 29).

All project mapping for Snoqualmie Mill and any references to elevations in this plan will be based on NAVD 88 datum. References to FEMA floodplain elevations or Base Flood Elevations have been converted from NGVD 29 to NAVD 88.

Horizontal Datum: NAD 83/91, Washington State Plane, North Zone.

Survey held the monumented south quarter corner of Section 30, Township 24 North, Range 8 East also known as King County GPS Survey Control Point No. KC*2594 (N 194515.962, E 1393227.800 grid) and the bearing between said south quarter corner and the found north quarter corner of Section 29, Township 24 North, Range 8 East, W.M., as N 45°37'25" E per direct inverse as calculated from the Amended Subdivision Survey for King County BLA No. L10L0024 recorded under Recording No. 20120702900002.

Topographic Mapping – Site and Site Vicinity

A two-foot contour interval map has been prepared of approximately 500 acres of Snoqualmie Mill Annexation Area (AIP) and the vicinity. The Site (approximately 260.8 Ac.) is a combination of field survey together with aerial photogrammetric mapping from "low level" aerial photography in 2012. The surrounding area is based on latest available LIDAR data available from the Puget Sound LIDAR Consortium See Existing Conditions (**Figure 4-1**).

References to elevations of wetland or other water levels are based on field survey reference points such as wetland edge surveys or well casing of monitoring wells.

Floodplain Mapping – FEMA Base Flood Elevation

The Floodplain for the site is assumed to be the Base Flood Elevation (BFE) as determined by the Letter of Map Revision (LOMR) issued by FEMA to the City of Snoqualmie and King County (Effective date; February 26, 2010). The BFE across the site is considered to be the flood elevations on the revised FIRM Panel 737 for cross-sections W, X, Y, and Z. See FEMA FIRM Panel (**Figure 4-2).**

The floodplain mapping represented for this MDP is from a series of cross sections from the flood study used as the basis for the 2010 LOMR as well as the flood study contained herein, which was not limited to the locations of FEMA sections W, X, Y and Z. The elevation at each cross section was used to create a "floodplain surface" in Civil 3D by Autodesk for purposes of mapping and demonstrating compensating flood storage and is shown on Existing Floodplain **(Figure 6-14)** and is further detailed in **Chapter 6**.

For purposes of Floodplain impact and "no net rise" analysis, **Chapter 8** discusses the procedure set forth by FEMA for analysis of:

- Effective Model
- Duplicate Effective Model
- Corrected Effective Model
- Existing Conditions Model, and
- Proposed Conditions Model.

FIG 4-1

GOLDSMITH
LAND DEVELOPMENT SERVICES

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SNOQUALMIE MILL VENTURES, LLC

EXISTING CONDITIONS
FOR
SNOQUALMIE MILL

CITY OF SNOQUALMIE — WASHINGTON

JOB NO. 17500

SHEET EX-06

***Post Annexation Sensitive Areas Study**:*

As part of the Annexation Agreement, a Sensitive Areas Study (SAS) was required to be prepared and submitted to the City for acceptance. The SAS was prepared and reviewed by the City between September 28, 2013, February 2016 and June 20, 2016. This document contains the predominance of "Existing Conditions" on the site relative to:

- Topography
- Soils
- Critical Area Wetlands and Streams
- Shorelines
- Floodplain and Floodway
- Hazardous or Contaminated Soils (described further below)

The following are excerpts and descriptions from the Snoqualmie Mill Planning Area Sensitive Area Study (June 20, 2016) on file at the City of Snoqualmie related to the evaluations of the site wetland and stream sensitive areas and site geology. Approved in conjunction with the AIP Approval and Adopting Resolution 1370 November 2016.

> "Prior to on-site investigations, Raedeke Associates, Inc. collected and analyzed background information available for the Subject Site, including historical photos made available by the Snoqualmie Valley Historical Museum. Raedeke's "Wetland Delineation & Wildlife Reconnaissance" dated October 2012, (Appendix D *[of Sensitive Area Study]*) provides an overview of past uses on the Subject Site as follows.
>
>> Historic photos indicate that the original mill facilities in the central portion of the site and mill town encompassing the eastern slope were constructed from approximately 1916 to 1920 (See Appendix C *[of Sensitive Area Study]* for historic aerial and other photos of the project site, courtesy of the University of Washington Library and Snoqualmie Valley Historical Museum). Stormwater management for the mill facilities was provided by an elaborate system of surface ditches and underground pipes and catch basins. Many of the ditches and underground system remain throughout the site. The mill town was vacated during the 1960's and all homes and buildings were either removed or demolished by the mid-1970's. [Site-wide,] however, most of the old building foundations and paved roads remain (Wilma 2012). Mill operations were gradually curtailed during the 1990's and had ceased by 2001 (Wilma 2012).
>>
>> Old aerial photos (Appendix C *[of Sensitive Area Study]*) show that the central portion of the site, where the mill buildings and processing yards were located, was filled prior to 1920. Lumber storage areas were expanded to include the western portion of the site after 1944. Most of the western portion of the site had been filled by 1983, and the entire area, with the exception of the westernmost perimeter of the property, had been filled by 1990. Soil excavation pits examined by Associated Earth Sciences, Inc. (AESI, 2012) show that the majority of the central portion of the site in the vicinity of the lumber processing areas and other mill buildings was filled to depths ranging from 3 to 4 feet. The western portion of the site was filled to depth of more than 10 feet in most areas.

Site investigations, including test pit logs, groundwater elevation data, and topographic data results have substantiated the presence of man-made fill placed across the site at depths up to 20 feet in some places.

Based on the Topographic Survey, AESI's exploration pits (Appendix B *[of Sensitive Area Study]*), and DeGross Aerial Mapping (April 2012), Goldsmith prepared a Historic Fill Exhibit depicting approximate depths of historic fill that was placed on the mill site during the lumber mill operations (See Figure 5 below *[in Sensitive Area Study]*). Depth of fill is measured from an approximation of pre-mill (natural) ground elevation to the current existing grade of the site. Cut areas shown represent areas of the site in which today's ground (current grade) is actually lower or has been cut into pre-mill (natural) grade."

The Historic Fill Map referenced in the Sensitive Areas Study is provided herein as **Figure 4-3**.

Further excerpts from the Sensitive Areas Study are as follows:

"The presence of man-made fill has made evaluation of the presence and/or absence of sensitive areas more difficult. Cedarock's "Fisheries Technical Information Report", dated October 2012 (Ref. Appendix C *[of Sensitive Area Study]*) cites historical mapping of the site related to streams and watercourses as follows:

> Most existing public maps of the project area contain stream routing errors. These include DNR water typing maps, WDFW Priority Habitat and Species maps, King County and City of Snoqualmie stream and shoreline maps, and public mapping references such as Google©. The primary error is the routing of a watercourse that enters the site from the north and is typically shown running south through the site to the mill pond. While this watercourse routing was present for a short period between about 1916 and the early to mid-1960's, under existing conditions, flow is diverted to the west approximately 1,500 feet north of the mill pond and instead runs along the haul road to the confluence with the Snoqualmie River approximately 500 feet upstream of the SR 202 bridge (Figure 1). There are no surface connections with the ditch system to the south (including culverts under the haul road) which is important because it separates the southern ditch system from a natural surface source of flow."

Wetland/Stream Resource Mapping – Verification and Classification

The wetlands and streams on the site were summarized in the SAS Appendix by Raedeke Associates (and Cedar Rock Consultants for stream typing). The studies to map and type the wetland critical areas included over two years of monitoring and data plots and coordination with the Corps of Engineers and the City of Snoqualmie leading to a completed Jurisdictional Determination **(JD)** and acceptance by all parties as to the mapping and typing.

Site investigations were conducted on the Subject Site beginning in April of 2012, which included land surveying, wetland staking, stream staking, subsurface explorations, soil sampling/testing and well monitoring, and an aerial flight (DeGross).

Site specific reports have been prepared by the Professional Consultants to identify, delineate, and assess the function and value of the various sensitive areas and their associated buffers. These reports provide detailed documentation, photographs, test pit logs, and data forms to substantiate their findings and to support their professional recommendations.

Additional ongoing wetland monitoring activities occurred during 2013 and 2014 under the guidelines established under a Memorandum for the Record issued by the US Army Corps of Engineers. A Technical Memorandum dated December 15, 2015, by Raedeke Associates, Inc. provides the wetland and stream ratings and buffers for the Snoqualmie Mill properties based upon the Jurisdictional Determination issued by the Corps in August 2015. The Memorandum was updated and finalized in June 2016 (Appendix D *[of Sensitive Area Study]*) as part of the October 2016 approval of the SAS.

A summary of findings of the Wetland and Stream typing are summarized below. Wetlands, Streams and Buffers are shown on **Figure 4-4**.

Sensitive Areas Constraints Mapping

As part of the Sensitive Area Study for Snoqualmie Mill an evaluation was made to determine the extent of encroachments of past activities into the associated sensitive area buffers defined by code. This was done utilizing the site survey data collected on the ground in conjunction with the DeGross aerial mapping data and site observations of what would be considered an existing functional buffer vs a "non-functional" buffer in the sites current condition (See Functional Buffer Analysis below, and **Figure 4-4**). This was done in part to quantify existing functional buffers that would need to be mitigated in the event of disturbance. Non-functional buffers would not require mitigation but would serve as quantifiable mitigation if enhanced to be a functional buffer.

One important finding from these studies (and further through the soils and groundwater studies for the PCI EIS) is the relationship of most of these wetlands to the shallow groundwater aquifer in the vicinity of Snoqualmie Mill. The wetland systems on-site, except for a few perched water wetlands on the ground surface, are essentially an expression of the shallow groundwater (See Geology and Hydrogeology, below). This shallow groundwater provides these wetlands with their primary source of hydrology making them less susceptible to moderate increases or decreases from surface runoff causing an adverse impact.

Another **important finding** from the studies and the JD by the Corps of Engineers is the determination that certain site features are considered as "jurisdictional" by the Corps, however, do not meet the definition of "wetland" by Snoqualmie city code. Therefore, these features are shown as a constraint to the extent of the feature itself in that disturbance would require approval by the Corps, but with **no "regulated buffer"** since there is no regulated feature to require a buffer per City regulations.

Prior to any proposed land disturbing activities, the scope of activities near streams will need to be identified and potentially include consultation with the Washington Department of Fish and Wildlife for construction of outfalls to streams or bridging. This would also include a more precise evaluation of the ordinary high water mark of streams and edges of wetland in proximity to this activity.

Functional Buffer Analysis

As described above, the Subject Site was lawfully developed to serve the lumber mill operations. In addition to the mill, development included the old Mill Town on the eastern slopes with homes, a community center, a school, construction of a Milwaukee rail line through the eastern portion of the site, and a network of internal haul roads for the transport of lumber. The rail line has been vacated, but the berm that was constructed to support the rail line remains.

One of the most unique characteristics of these onsite critical areas is the extremely poor quality of the regulated buffers promulgated by SMC 19.12. As discussed above, the site contains no natural forest or vegetation as much of the site contains impervious surfaces (paving, gravel roads and buildings), and the western portion that is not covered in impervious surfaces is the area of significant fill and earth berms used to store inventory of logs.

The entire site has been significantly disturbed over the past 100± years, with much of the site being filled to meet the elevation of the rail line (berm). This has impacted the level of function of sensitive areas identified on the Subject Site. In many instances, existing hardscapes encroaching into sensitive area buffers preclude any benefit associated with riparian buffers, such as temperature and shade, beneficial nutrient sources, sediment and pollutant control, bank stability, and woody debris recruitment.

Utilizing the DeGross aerial mapping data in conjunction with the Topographic Survey, Goldsmith then considered existing site features such as constructed roadways, parking areas, foundations, and buildings to depict encroachments where buffer function has been compromised or simply does not exist. This exercise resulted in the "Functional Buffer Analysis" provided as Exhibit 2 in the Sensitive Areas Study.

The City of Snoqualmie reviewed the Functional Buffer Exhibit as provided in the 2012 Sensitive Area Study and provided the following conclusion:

> *"The mapping of functional buffers is consistent with the criteria listed for buffer reduction. The wetland study used functional buffer analysis to show where buffers should be reduced because of roadways and other physical obstructions. Therefore, buffers are reduced to the edge of pavement or when minimal functions are provided by other obstructions." - - Doug Gresham, Gresham Environmental Services, September 25, 2013*

The result and conclusion of the Sensitive Areas Study was that where it is evident that the buffer area has either been degraded or is non-existent, a determination was made that the buffer areas do not perform "*any biological, geological, or hydrological buffer functions to undisturbed portions of the sensitive area or buffers".*

The original intent of this analysis was a provision of SMC 19.12 that allowed for buffer reductions based on this type of functional assessment. However, the revised SMC 19.12 adopted in 2016 eliminated this provision for buffer reductions. Therefore, the evaluation in the SAS of "Functional" vs "Non-functional" buffers will be used to determine a quantity or quality of impact to critical areas based on proposed buffer reductions, and quality of mitigation by re-vegetation enhancement of non-functional buffers.

Geology – Hydrogeology

The understanding of geology and hydrogeology for Snoqualmie Mill and this MDP is based on reports and monitoring by Associated Earth Sciences, Inc. as described in the ***Soils, Geology, Groundwater, and Geologic Hazards Report for the Draft Environmental Impact Statement – Earth and Groundwater, Snoqualmie Mill Site; AESI 2020)***. For this MDP, the primary groundwater element of concern is the Snoqualmie Shallow Aquifer, as described by AESI.

Seasonal groundwater lies below Snoqualmie Mill and within existing fill material placed on the property at various times in the past to accommodate mill operations. This seasonal groundwater is a reflection of the Snoqualmie River Shallow Aquifer. In general, a groundwater divide is present in the central portion of the Mill site. In the south and western portions of the site, groundwater flows towards the Snoqualmie River and the Mill Pond. In the northern portion of the site, groundwater flows to the north toward the Tokul Creek Delta. This shallow aquifer is hydraulically connected to the Snoqualmie River and to a lesser degree to the "Mill Pond"/Borst Lake.

The understanding of the relationship between this shallow aquifer and the Borst lake was gained from groundwater monitoring by AESI from 2008 to 2011 as part of studies for Trust Water Right Temporary Donation Report for Tokul Creek (AESI 2010).

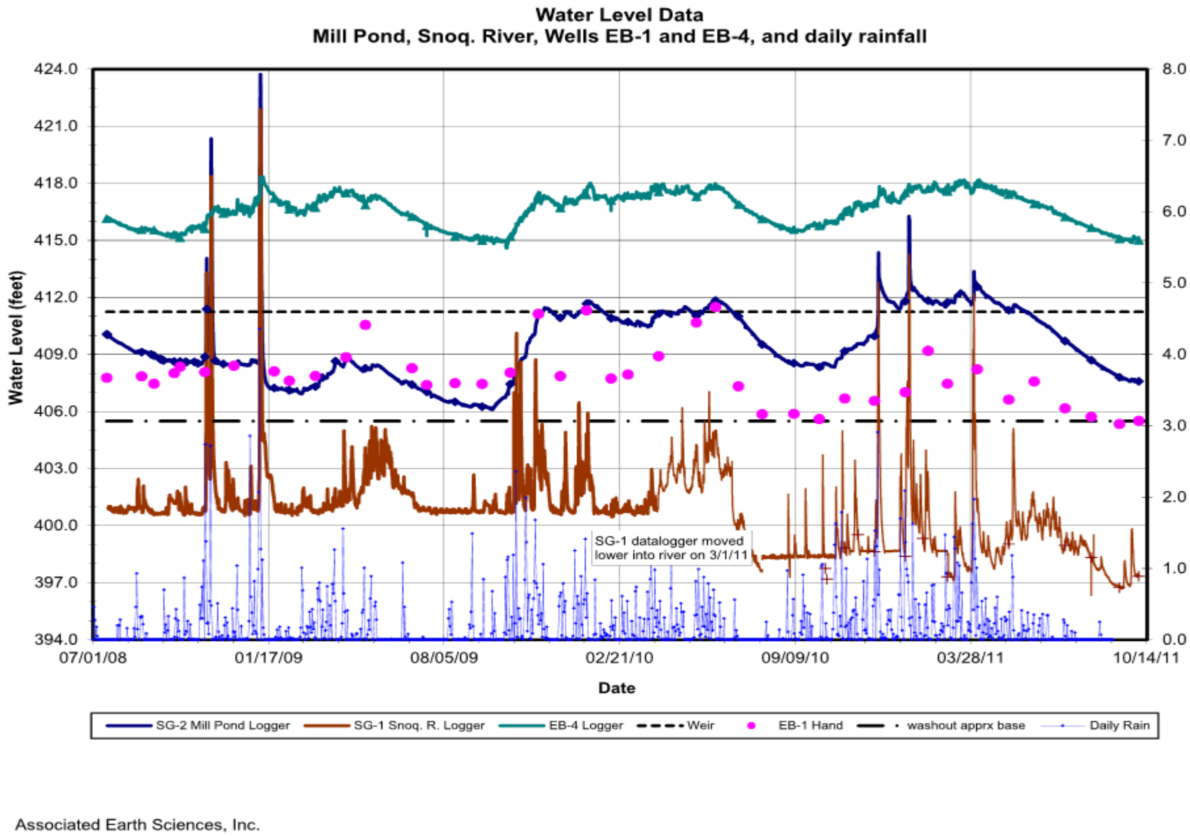
During the operation of the Mill, water level in the mill pond (Borst Lake) were held artificially high by a diversion of Tokul Creek surface water. From July 2008 to September 2009, the Tokul Creek diversion pumps operated on a limited basis to allow the Borst Lake water level to drop to a more "natural" level. The water level data showed that Borst Lake was directly influenced by the Tokul Creek diversion and in general showed no direct response to the Snoqualmie River, except under extreme flood events.

AESI findings also included that differing water level elevations and response timing trends between the Mill Pond and shallow aquifer suggest the hydraulic connection between the shallow aquifer and Borst Lake is somewhat limited. Although some component of flow in the shallow aquifer on the southern end of the site likely discharges to Borst Lake, the quantity of discharge into the lake from the Snoqualmie River Shallow Aquifer cannot maintain the Mill Pond water level at the higher historic levels.

A depiction of AESI findings of groundwater elevations in the region, including the Snoqualmie Shallow Aquifer is shown on AESI (2020) Figure 13; Well Locations Groundwater Elevations, provided herein as **Figure 4-5**.

A separate depiction of relevant points of monitoring specific to the Snoqualmie shallow aquifer monitoring was provided by AESI for this MDP and is shown as **Figure 4-6**. The relevant points are; the "Mill Pond" water levels and the EB-4 data logger is the central shallow aquifer monitoring well. Highlights of the results of some of the groundwater monitoring are provided below on **Figure 4-7** and **Figure 4-8**:

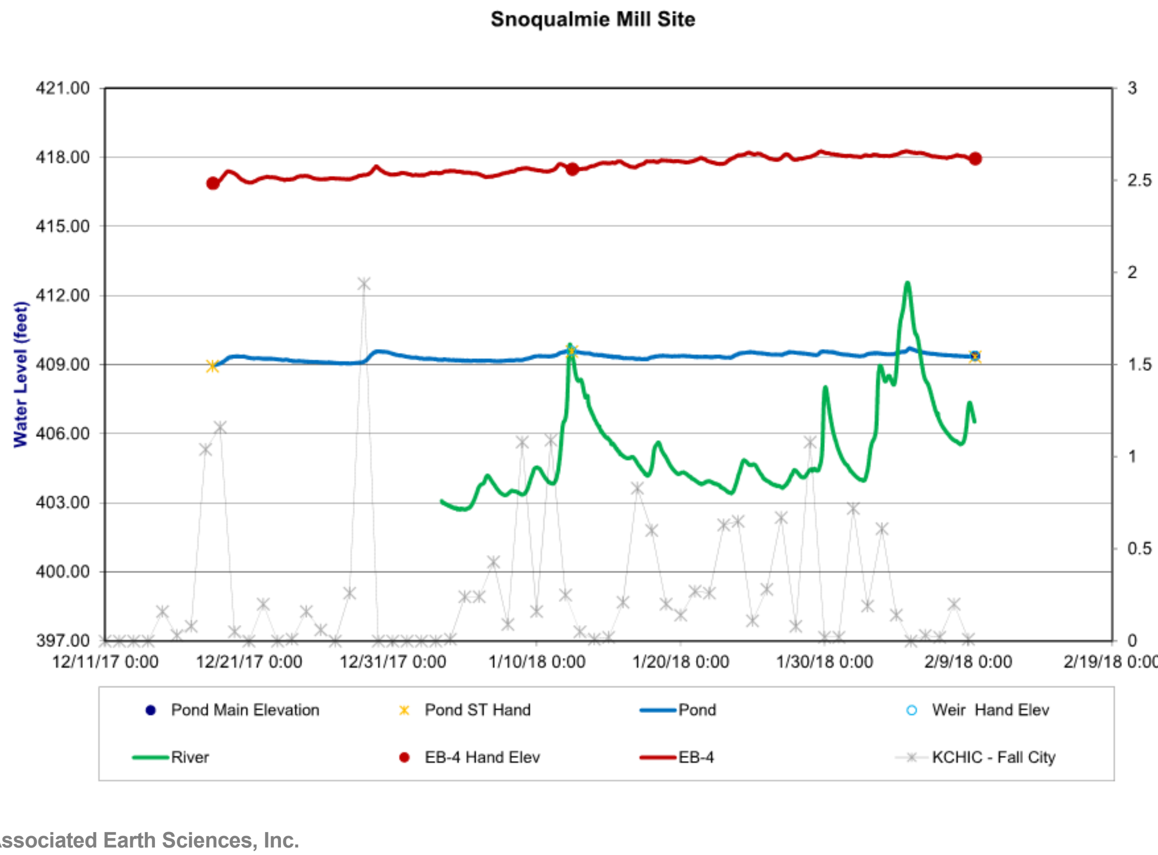
Figure 4 - 7 Ground Water Level Data (2008-2011)



An example (per AESI, 2020) is "*the water level rise in EB-4 as the regional Snoqualmie River Shallow Aquifer is recharged by the October 2008 rains. This rise does not occur in the Mill Pond surface water level. Mill Pond water levels remain flat to very slightly declining, unaffected by the rise in water level in the Snoqualmie River Shallow Aquifer. This difference in water level trend demonstrates the Snoqualmie River Shallow Aquifer does not maintain surface water levels in the Mill Pond above about elevation 406 feet in the summer and elevation 409 feet in the winter (AESI, 2010)*."

The depiction of water levels in the Borst Lake rising back to elevation 412 feet is a reflection of the reactivation of the Tokul Creek diversion. The Tokul Creek diversion was ceased by Weyerhaeuser in approximately 2011, as shown by the Mill Pond water levels on **Figure 4-6**.

Figure 4 - 8 Ground Water Level Data (Current)



The monitoring of water levels in Borst Lake together with the shallow groundwater aquifer and the cessation of the Tokul Creek diversion has also resulted in an understanding that lake levels have limited influence on the shallow groundwater levels. Groundwater levels rise and fall with rainfall and river stage but are not greatly influenced by artificially high lake levels.

Monitoring shown in **Figure 4-7** (between 2008 and 2011) and **Figure 4-8** (2017/2018 winter), in part, represents the following:

- In 2008 a failure in the weir berm caused the lake water level to drop to approximately 409.0 until it was repaired in 2009. The new lake water weir reestablished lake levels at approximately elevation 412.0,

- Between 2008 and 2009, the Tokul Creek diversion was stopped (or very limited). Lake levels were shown to drop below its weir control level (approximately 412.0 or 409.0 during weir failure), then rose and fell with rainfall and/or river stage.

- Groundwater levels in the shallow aquifer appeared to rise and fall seasonally regardless of the augmented or un-augmented Borst Lake levels, this is shown in EB-4 seasonally between approx.

415.0 (summer) and 418.0 (winter) and past EB-1 data near the River approx. 406.0 (summer) and 409.0 (winter) with higher spikes to 412.0 influenced by river stage,

- In 2009, the Tokul Creek diversion was reactivated, and lake levels rose and stabilized at approximately 412.0 (the reestablished weir elevation), while groundwater levels remained relatively unchanged,

- Following 2011, the Tokul Creek diversion has been deactivated permanently, and sometime prior to 2017 another failure or breach of the lake berm has occurred whereby lake levels do not reach the constructed weir elevation of 412.0 but show a fairly consistent level of 409.0 in winter 2017/2018.

- In winter 2017/2018, for purposes of this MDP and the Snoqualmie Mill EIS, monitoring of lake levels and groundwater levels were reactivated,

- Current winter water levels in Borst Lake show a very consistent and stable level at approximately 409.0 with very little variation with significant rainfall,

- Groundwater levels in EB-4 indicate a very consistent and stable level at 418.0 – which would indicate a very consistent and stable groundwater level near the river at approximately 409.0.

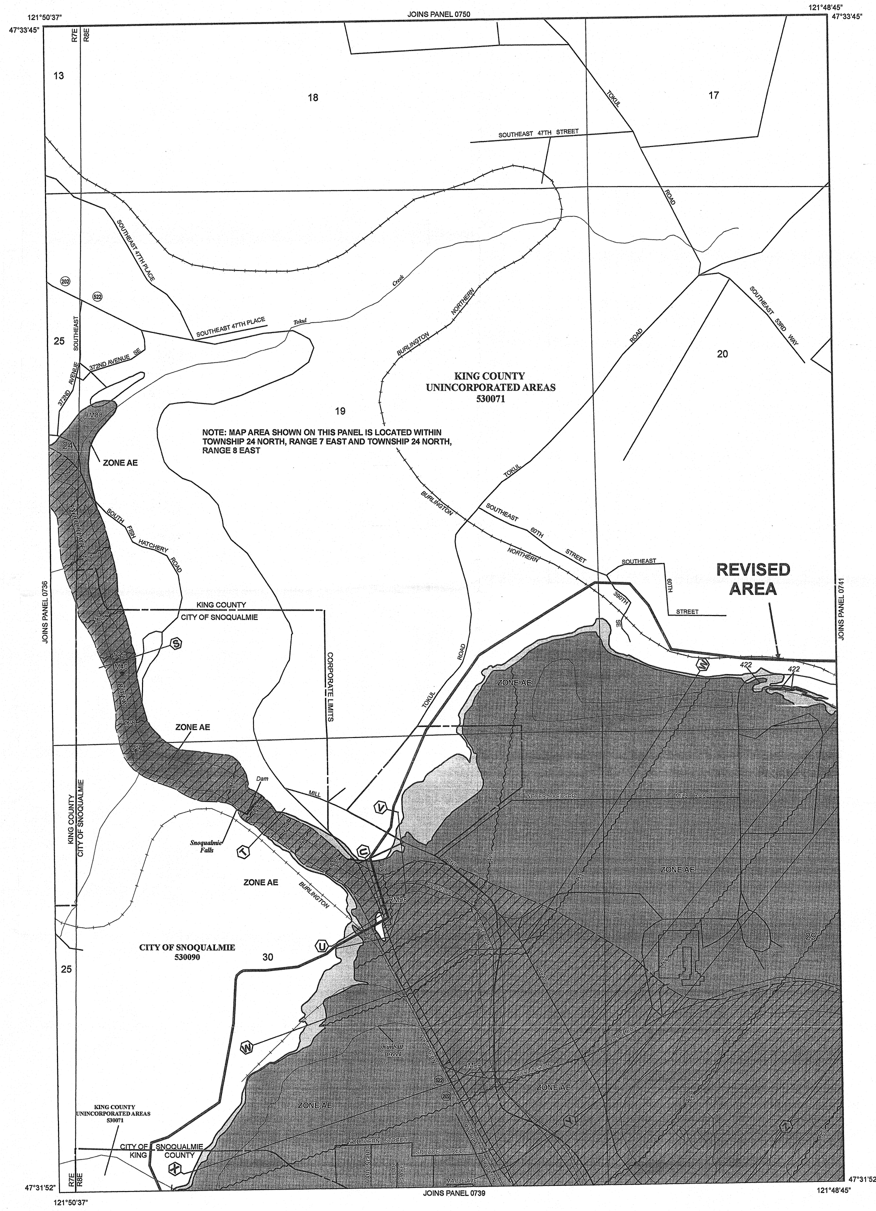
Conclusions derived from these studies for purposes of this MDP are as follows:

- The shallow aquifer is supported by rainfall and affected by the water levels in the Snoqualmie River,
- Water levels in the Mill Pond above very low levels (above approx. elev. 406.0) are not supported by the shallow aquifer. Historic water levels in the Mill Pond were a result of the actively managed diversion of surface water from Tokul Creek together with the elevation of the pond outfall/weir,
- Groundwater levels have been monitored for years documenting seasonal high groundwater before levels are influenced by river stage,
- These shallow groundwater levels are reflected in most of the on-site wetlands providing these wetlands with their primary source of hydrology,
- This documented seasonal high groundwater represents the elevation above which would be considered **Flood Storage** for purposes of analyzing floodplain storage or compensating storage.

As shown on **Figures 4-7 and 4-8** above, this seasonal high groundwater varies between approximately 418.0 in AESI's monitoring well EB-4, and 409.0 in well EB-1 closer to the Snoqualmie River. The locations of these wells are shown on **Figure 4-5** referenced previously and provided on the following pages.

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM 88	107 . 16	Chiseled square on top of curb at bridge on Fisher Hatchery Road over Tokul Creek.
RM 98	429 . 76	A chiseled square on top of landward corner of left bank end of landward corner of left bank end of concrete guardrail on State Route 202 bridge over Snoqualmie River at Snoqualmie. Established by the U. S. Army Corps of Engineers.
RM 99	420 . 76	A boat spike 2 feet above ground in riverward face of left bank , downstream corner of bridge piling at abutment of Burlington Northern Railroad bridge over Snoqualmie River, about 0.4 mile downstream from Snoqualmie Railroad Depot. Established by the U. S. Army Corps of Engineers.

ELEVATION REFERENCE MARKS



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A No base flood elevation determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood event.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevations line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

(A)——(A) Cross Section line

(23)- - - - -(23) Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1927 (NAD 27)

4275000 M — 1000-meter Universal Transverse Mercator grid values, zone 12

6000000 FT — 5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator projection.

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

MAP REPOSITORY

Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DATE: September 29, 1989
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in 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.

MAP SCALE 1" = 500'

500 250 0 500 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0737F

FIRM
FLOOD INSURANCE RATE MAP
KING COUNTY, WASHINGTON
AND INCORPORATED AREAS

PANEL 737 OF 1725
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KING COUNTY, UNINCORPORATED AREAS	530071	0737	F
SNOQUALMIE, CITY OF	530090	0737	F

REVISED TO
REFLECT LOMR
EFFECTIVE: February 26, 2010

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

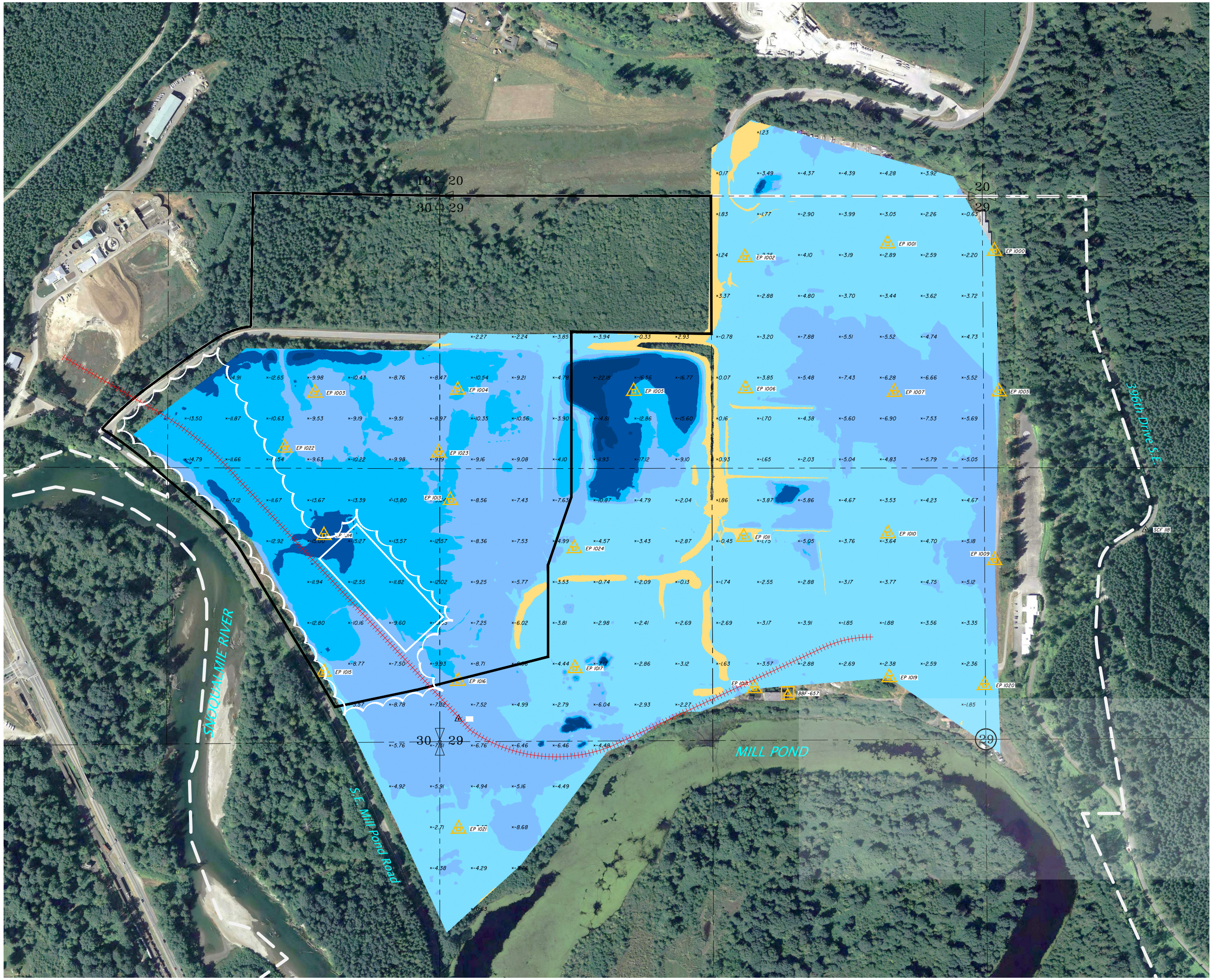
MAP NUMBER
53033C0737 F

EFFECTIVE DATE
MAY 16, 1995

Federal Emergency Management Agency

FIGURE 4-2

SE ¼, SW ¼ & SW ¼, SE ¼ SEC. 20, NW ¼ & NW ¼, SE ¼ & W ½, NE ¼ & N ½, SW ¼ SEC. 29, NE ¼ & NE ¼, SE ¼ SEC. 30, ALL IN TWP. 24 N, R. 8 E., W.M., KING COUNTY



N

0 100 200 400 600
SCALE: 1" = 200'

NOTES:

1. THIS EXHIBIT REPRESENTS AN APPROXIMATION OF THE DEPTH OF HISTORICAL FILL PLACED OVER THE SITE DURING THE OPERATIONS OF THE SNOQUALMIE MILL.

2. THE DEPTH OF FILL IS MEASURED FROM AN APPROXIMATION OF PRE-MILL (NATURAL) GROUND ELEVATION TO THE EXISTING GRADE OF THE SITE TODAY.

3. THE APPROXIMATION OF PRE-MILL (NATURAL) GROUND WAS DETERMINED BY EXPLORATION PITS (AS SHOWN) BY ASSOCIATED EARTH SCIENCES, INC. (2012).

4. THE CURRENT TOPOGRAPHY (TODAY'S GROUND) ELEVATIONS ARE FROM A 2012 SITE SURVEY BY GOLDSMITH AND DeGROSS AERIAL MAPPING SERVICES.

5. THE "CUT" AREAS SHOWN REPRESENT AREAS OF THE SITE IN WHICH TODAY'S GROUND (CURRENT GRADE) IS ACTUALLY LOWER, OR HAS BEEN CUT INTO PRE-MILL GRADE, OR NATURAL GROUND.

LEGEND

TEST PIT
MONITOR WELL
CENTERLINE OF DITCH

FILL > 20'
FILL 15' TO 20'
FILL 10' TO 15'
FILL 5' TO 10'
FILL 0 TO 5'
CUT 0 TO 5'

NOTE: FILL/CUT DEPTH RELATIVE TO PRE-MILL CONSTRUCTION GROUND SURFACE ELEVATION

GOLDSMITH
LAND DEVELOPMENT SERVICES

PLOTTED: 2017/09/21 14:34 HWERLINGER
DRAWN:
DESIGNED:
APPROVED: LNYQUIST
FIELD BOOK:
PAGE #:
L:\2017\17500\3 DEVELOPMENT\CAD\HOST DRAWINGS\GRADING EXHIBITS\17500G02.DWG

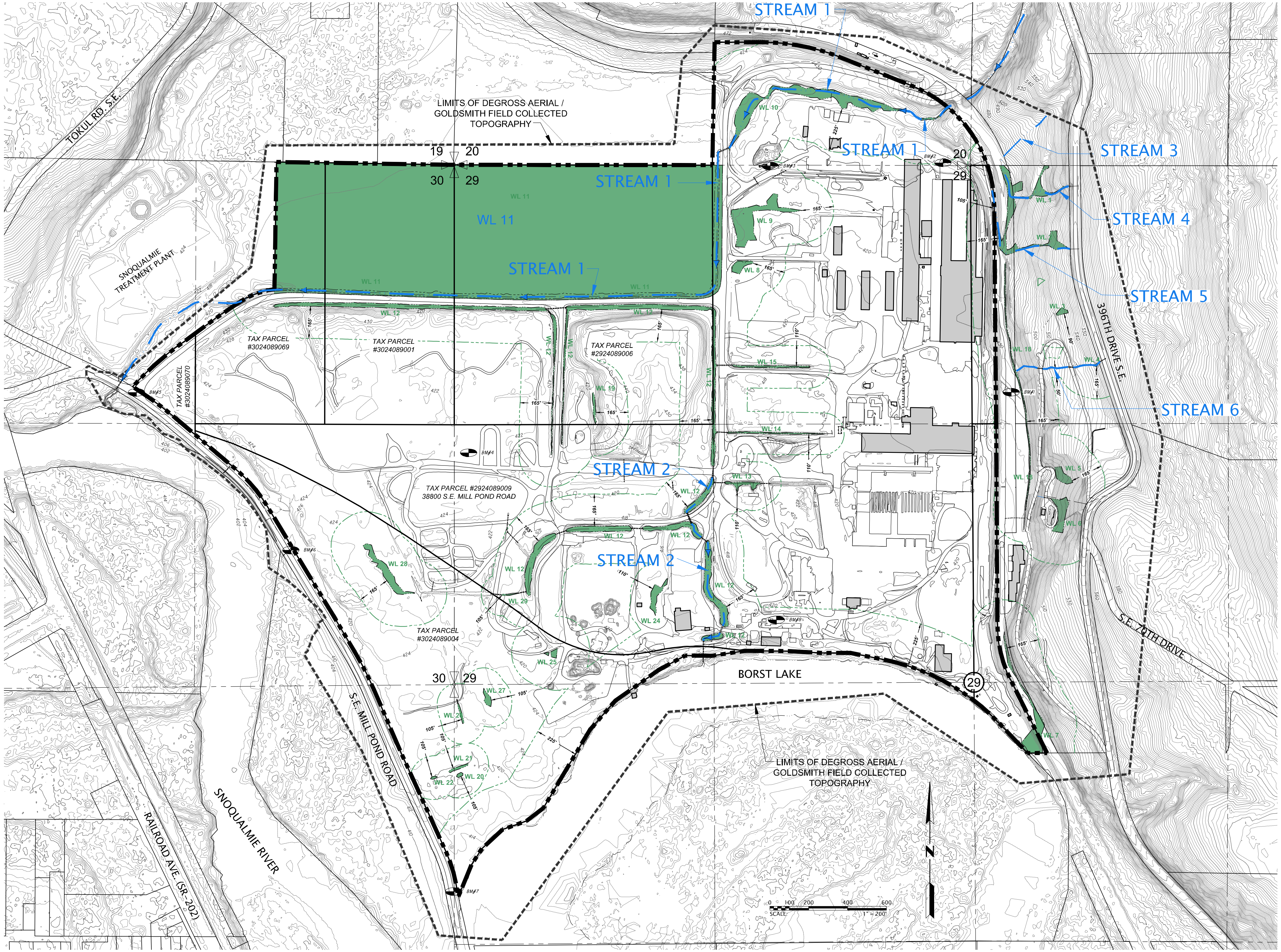
SNOQUALMIE MILL VENTURES, LLC

ESTIMATED HISTORICAL FILL
PRE-1890 NATIVE GROUND
SNOQUALMIE MILL

CITY OF SNOQUALMIE KING COUNTY, WASHINGTON

JOB NO. 17500
FIGURE
FIG 4-3

SE 1/4, SW 1/4 SECTION 20
NW 1/4 AND NW 1/4, SE 1/4 AND W 1/2, NE 1/4 AND NW 1/4, SW 1/4 SECTION 29
NE 1/4 AND NE 1/4, SE 1/4 SECTION 30
ALL IN TOWNSHIP 24 N, RANGE 8 E, W.M.
KING COUNTY, WASHINGTON

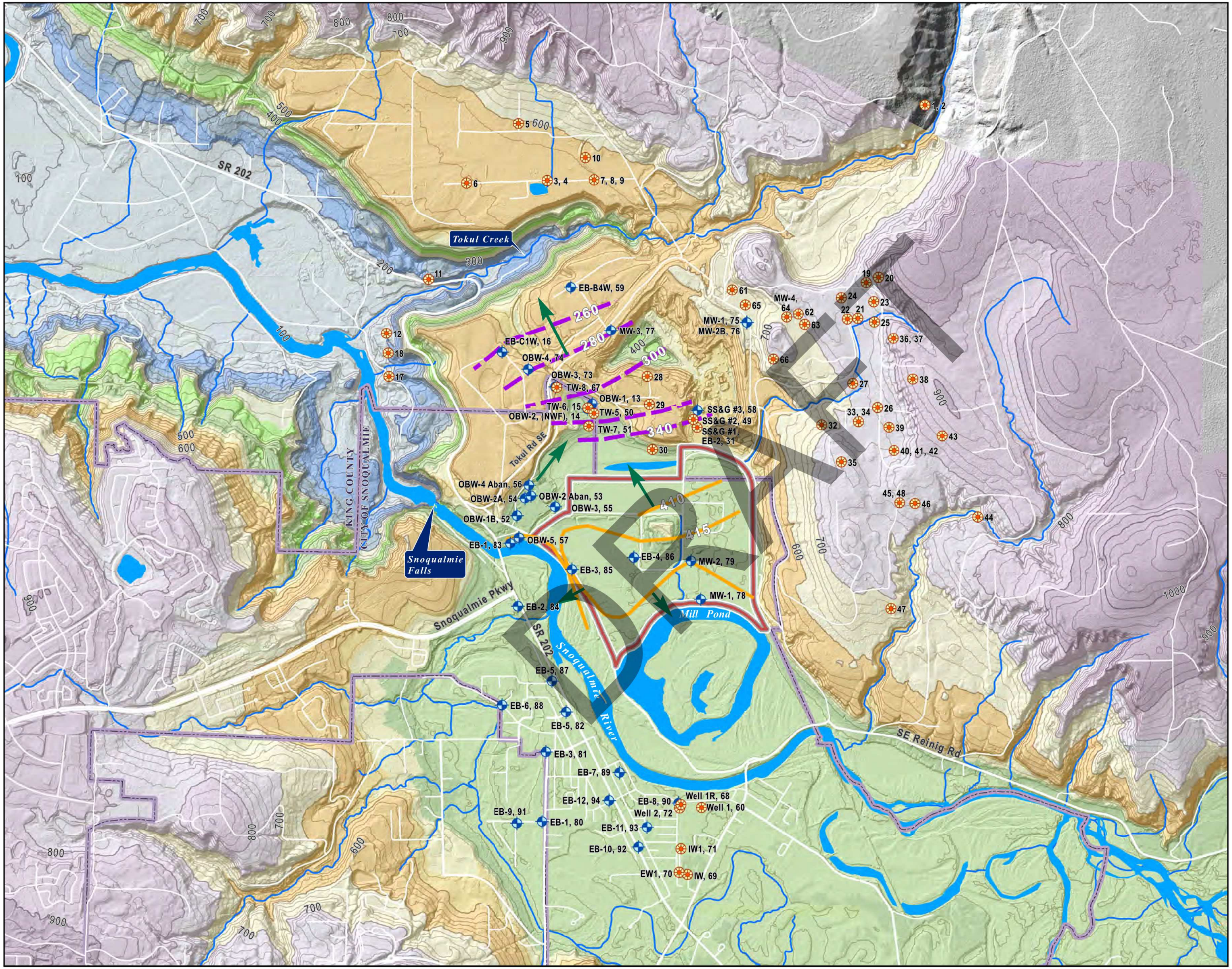


GOLDSMITH
LAND DEVELOPMENT SERVICES

WETLANDS AND STREAMS EXHIBIT
FOR
SNOQUALMIE MILL SITE

FIG. 4-4

SNOQUALMIE MILL VENTURES, LLC
CITY OF SNOQUALMIE
OCTOBER 2018



LEGEND:

- GROUNDWATER FLOW DIRECTION
- WATER SUPPLY WELL, AESI LABEL FOR WELL REPORT
- MONITORING WELL, AESI LABEL FOR WELL LOG
- TOKUL CREEK DELTA AQUIFER
- SNOQUALMIE RIVER SHALLOW AQUIFER
- CITY BOUNDARY
- CONTOUR 100 FT
- CONTOUR 20 FT

NOTE: MUCH OF MILL SITE IS AT ELEVATION 415 - 425'
NO WELL REPORTS AVAILABLE FOR 61 - 66

DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3'. CONTOURS FROM LIDAR
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
KING CO: PARCELS, STREETS, HYDRO 1/18
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 850 1700
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

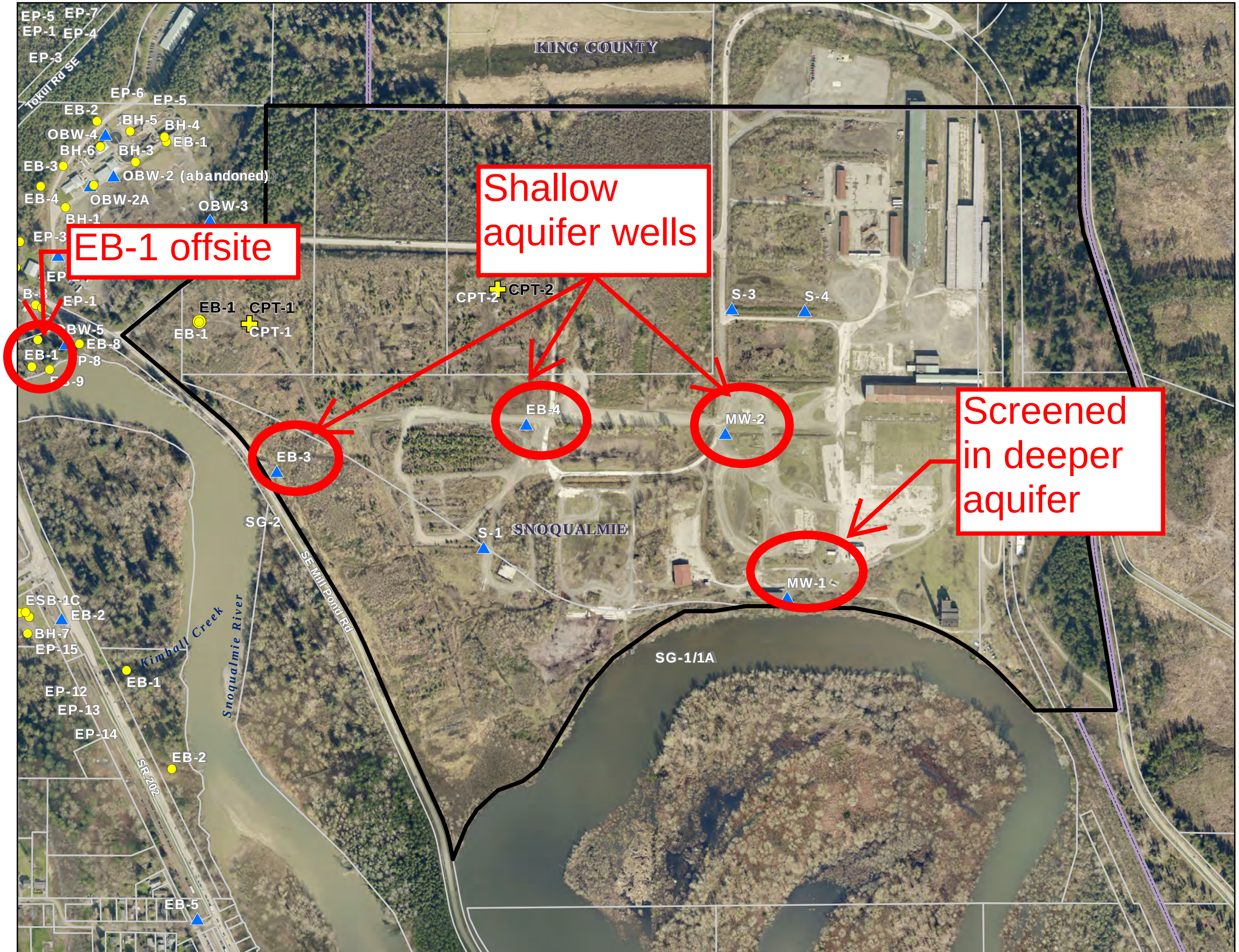
WELL LOCATIONS GROUNDWATER ELEVATION

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	4/18	13

FIGURE 4-5

Document Path: G:\GIS_Projects\aY12post0716\120126 Sno Mill Site\mxd\H012EIS\120126H012 F13 Wells_GWCont_SMS.mxd



Document Path: G:\GIS_Projects\aY12post07\t120126 Sno Mill Site\mxd\120126H012 Fx SM_Explo_SMS0118.mxd

LEGEND:

AESI_ExplorationLocs

EXPLOTYPE

- PROPOSED INCLINOMETER
- WELL
- EXPLORATION BORING
- AESI_PL_poly
- CONE PENETRATION TEST
- EXPLORATION BORING
- CITY BOUNDARY

draft - working

DATA SOURCES / REFERENCES:
KING CO: PARCELS, STREETS, HYDRO 1/17,
AERIAL PICTOMETRY INT. 2015

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 250 500
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

MONITORING STATIONS

SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
120126H012	1/18	2

FIGURE 4-6

5. Existing Site Conditions and Downstream Analysis

The following Site History section was prepared as part of the Snoqualmie Mill Annexation Implementation Plan (AIP), Approved by City of Snoqualmie Resolution 1370 in November 2016.

A. Site History

The Mill Planning Area has been actively developed and utilized for commercial, industrial, and residential purposes for nearly 100 years, beginning in 1916 when construction began on the Snoqualmie Falls Lumber Company Mill. Following is a chronological summary of the site's historical development and uses.

1912: Weyerhaeuser Timber Co. and Grandin-Coast Lumber Co. begin investigations to identify a suitable site for a sawmill in the Snoqualmie Valley. The Subject Site is chosen for several benefits, including proximity to two transcontinental railroads, The Northern Pacific, and The Chicago, Milwaukee, St. Paul and Pacific ("The Milwaukee Road").

1914: Plans for a new mill are announced; Weyerhaeuser with 2/3 ownership and Grandin-Coast with 1/3 ownership interest. Site clearing and grading activities begin.

1916: Construction of mill facilities begins. Fill material is imported for use in filling swales, building foundations, and to match rail line grades.

1918: Dredging activities occur along Mill Pond for handling and sorting logs.

1916-1920: The eastern sloped portion of the site is developed for employee residences of the mill, referred to as the Mill Town, which included a store, hospital, community services, roads, and housing for workers and management.

1920: Construction of the sawmill is complete, and operations begin.

1930s - 1970s: Continued expansion of mill facilities; ongoing grading and fill is placed across the site.

2003: The sawmill closes, and demolition of buildings begins.

2010: DirtFish Rally School begins operating on-site utilizing existing impervious surfaces and exposed fill material as rally car course/track. Snoqualmie Mill Ventures, LLC, purchases the Mill Site. The Mill Pond (Borst Lake), however, remains in Weyerhaeuser ownership.

Historic Snoqualmie Mill:

During construction and operation of the mill, a Milwaukee rail line was constructed along the eastern portion of the site for hauling lumber from the mill. In addition, development included the old Mill Town on the eastern slopes with a company store, hospital, boarding house, a community center, and homes.

The Mill Planning Area was cleared, graded, and filled over the course of its use as a lumber mill that included a network of internal haul roads for the transport of lumber. The main haul road through the site connects 396th Drive SE to Mill Pond Road and is still used to serve the site, referred to as the

Weyerhaeuser Haul Road. There is a reservation across this roadway for Weyerhaeuser to maintain and use and the road, which is currently used to serve the gravel quarry located north of the Mill Planning Area. (Ref. A.F. #20080514000800). Current uses on the site continue to use the haul road and the internal network of roads, as well as other impervious surfaces for parking, storage, and instructional driving course.

There remains some legacy infrastructure from the Weyerhaeuser Timber Co., such as vacant buildings, building foundation remnants, paved and gravel roads, culverts, trails and foot bridges, docks associated with Mill Pond, broken concrete, parking areas, wood piles, compacted fill areas, and vacated railway. Additionally, the site has an historical site associated with the former brick powerhouse and smokestack.

The existing network of roadways (paved, gravel, concrete), and some of the buildings are currently being utilized by the on-site operations listed below. Periodic site maintenance activities include ditch cleaning, brush cutting, mowing, and other infrastructure maintenance.

DirtFish Rally School: Ultimate Rally, LLC, operates a specialized driving instruction school on the site, which is comprised of a series of paved and unpaved roadways. Activities associated with the DirtFish Rally School include vehicle and equipment storage, vehicle maintenance, oil and fuel storage, and tire storage. The course lies mainly in the central area of the site, with classrooms and offices located on the easternmost portion of the site, commonly referred to as the “hillside”.

Other Uses: The northern portion of the site is used by several parties, including Northfork Enterprises, which currently utilizes surface area for storage of wood recycling materials as well as production of topsoil. Other activities on-site include soil and gravel storage, a beehive operation, temporary construction staging, and truck storage.

B. Site Conditions

Existing conditions are a required element and are described in the project EIS but are also summarized below for purposes of relating to site stormwater the drainage control plan.

In general; the site is extremely flat due to past placement of fill and lumber mill operations and lies almost entirely within the floodplain of the Snoqualmie River. The site is bordered on the North by a very large wetland (currently in a recorded conservation easement), on the west by the Snoqualmie River, on the South by the Mill Pond (aka Borst Lake), and on the east by steep slopes which were part of the Mill Planning Area annexation but has since been sold to King County Parks.

Critical Area Wetlands and Streams

There are nearly 12,000 linear feet of man-made channels across Snoqualmie Mill that have been constructed over time for drainage purposes. Approximately twenty-one (21) watercourses were initially identified on-site as either meeting the City’s definition of a Stream or a Drainage Ditch (Ref. Sensitive Areas Study Appendix C, Fisheries Technical Information Report, June 2016), however, this was prior to the purchase of the eastern “hillside” by King County Parks.

Many of these channels and ditches were excavated through the site fill into underlying hydric soils. As such, these have been determined to meet wetland and stream regulations and thus are treated as critical areas on the site. As discussed in Baseline Data Collection and Site Mapping **Chapter 4**, these critical areas underwent extensive, multi-year evaluation by the City and the US Army Corps of Engineers for Jurisdictional Determination. The final determination of wetlands, streams and their associated buffers is reflected in the approved Sensitive Areas Study (June 2016 Technical Memorandum, Raedeke Associates). These Critical Areas are shown in Chapter 4 on Wetlands and Streams (**Figure 4-4**) and outlined in the following table:

Wetland	***WDOE Rating***	***Habitat Score***	***SMC 19.12 Buffer for Snoqualmie Mill (ft)***
Borst Lake	**I/II**	**9**	**225**
7	**II**	**7**	**165**
8	**II**	**6**	**165**
9	**II**	**7**	**165**
10/6 Off-Site	**II**	**8**	**225**
11	**I**	**8**	**225**
12	**II**	**6**	**165**
13	**II**	**5**	**105**
14	**II**	**5**	**105**
15	**II**	**5**	**105**
19	**II**	**7**	**165**
20/21/22 Mosaic	**III**	**5**	**105**
24	**II**	**5**	**105**
25	**III**	**6**	**165**
26	**III**	**5**	**105**
27	**III**	**5**	**105**
28	**II**	**6**	**165**
29	**III**	**5**	**105**

Stream	***Classification***		***SMC 19.12 Buffer for Snoqualmie Mill (ft)***
1	**2 - w/Salmonids**	**(Type F *)**	**100**
2	**2 - w/Salmonids**	**(Type F**	**100**

<u>* Per the State of Washington Permanent Water Typing System, Streams 1 and 2 are classified as Type F Streams. See Chapter 6 for additional analysis.</u>

<u>Vegetation</u>

The Snoqualmie Mill site has been significantly disturbed by past land uses since development began in the early 1900's. Very little native, undisturbed areas exist on the site. According to Raedeke's investigations, vegetation that does exist on the site is limited to the following:

Central: Deciduous forest encompasses perennial stream along northern perimeter (King County jurisdiction). Blackberry, willows, red alder, cattails, and canary grass dominate central ditch network.

Southern: Narrow band of deciduous forest.

Western: Mosaic of shrub-lands and sparsely vegetated areas dominated by grasses; Scotch broom and blackberry.

Aerial mapping of the site together with this description was used to determine treed pervious areas from open pasture pervious areas outside of pavement and compacted effective impervious areas for purposes of hydrologic modeling.

Site Soils and Hydrogeology

The site is subject to seasonal high groundwater which supports most of the on-site wetlands with year-round hydrology rendering many of these wetlands not as dependent on or as susceptible to changes in surface water hydrology. The evaluation of groundwater conditions and on-site wetlands is discussed in detail in Chapter 4 as well as the Earth and Water sections of the EIS. Based on the Earth and Water sections of the EIS the following describes the primary source of hydrology for the site the wetlands:

Known to be dependent of surface water

Wetlands 20 – 23, 25, 27, 28 and 29.
Likely to be dependent of surface water based on available data

Wetlands 19 and 24.

Not likely to be dependent of surface water based on available data

All other site wetlands.

C. Existing Site Hydrology and Downstream Conditions

Drainage Basin and Threshold Discharge Area

The site lies within the Snoqualmie River Drainage Basin. The site lies within two ***Threshold Discharge Areas*** both draining to the Snoqualmie River (see Direct Discharge qualification in Chapter 3 - Regulatory Framework) but leaves the site at three (3) locations; directly to the river via overland flow, via Borst Lake (aka, the Mill Pond), and the Northeast portion of the site that drains to the river via wetland 9 and wetland 11. Wetland 11 is part of a large wetland complex extending north of the property and drains west to the Snoqualmie River. The entire site (with the exception of small portions of the site above the Base Flood Elevation) as well as all downstream areas lie within the 100 year floodplain of the river.

The site shown within the regional hydrology setting is shown on **Figure 5-1**. **Figure 5-1** shows the regional drainage basins in the site vicinity, the site's proximity to the Snoqualmie River and the location of FEMA cross sections used to determine the 100 year, base flood elevation **(BFE)** of the river.

Because the site and downstream areas lie within the 100 year floodplain, runoff from the site to these on-site and off-site water resources occurs during lower flows or more frequent rainfall events before flowing to the river. The elevation of the major on-site and off-site resources, Wetland 12, Wetland 11 and Borst

Lake all lie below the elevation of the 10 year flood stage of the Snoqualmie River. The river stages as published by FEMA (2010 LOMR) are shown on the table below in comparison to the elevations of the two major off-site downstream hydrologic features. The FEMA Cross Sections shown are those that affect any portion of the site.

2010 LOMR Supporting Data - 10yr – 100yr Snoqualmie River Elevations

FEMA Cross Section	Wetland 11 Elev	Borst Lake Elev	10-Year	50-year	100-Year
V	410-412		417.6	421.9	423.6
W	412-414		418.5	422.8	424.5
Z		409.0	420.6	424.1	425.7
AA		409.0	421.5	424.6	426.2

Major Hydrologic Features Limited Dependency on Surface Water

On-site Wetland 12 System

The major hydrologic feature on-site is the wetland/ditch system through the site, which conveys runoff to Borst Lake during periods of rainfall. Wetland 12 is a long linear system of flat ditches. Surface water flowing through the ditch system is predominantly controlled by a culvert elevation in the southern portion of the site at the head of Stream 2 (See site sub-basin boundary definition on Figures 6-3 and 6-4 in Chapter 6). As discussed in **Chapter 4**, it has been determined through monitoring that the major hydrology source of the site's Wetland 12 system is the variation in groundwater levels in the shallow groundwater aquifer, until river flood stages cause saturation and flooding of the floodplain.

Over years of operations of the Mill, these ditches have been created and relocated but all served the same function, which was to drain the surface water runoff from the site. The ditches are excavated into the Snoqualmie River Shallow Aquifer which rises and falls as a groundwater reaction to recharge and not primarily by surface water runoff. Surface water runoff essentially moves very quickly off the existing impervious surfaces through the Wetland 12 drainage system to the River via Borst Lake. Therefore, these wetlands are not dependent on nor susceptible to significant impact from changes in surface water hydrology within their respective basins.

Borst Lake

Borst Lake has also been the subject of extensive monitoring in the past, as discussed in **Chapter 4**. Borst Lake is a manmade lake by the old Snoqualmie Lumber Company operations whereby water levels were artificially raised and maintained for milling operation. The lake level was created, and water levels maintained by constructing berms and an overland outfall (weir) with hydrology fed by a diversion of surface water from Tokul Creek. The weir-controlled outfall from the lake experienced past failures which significantly changed the managed water levels. This weir was reconstructed in 2009 raising the lake level again. The diversion and source of hydrology ceased in approximately 2011.

The newly constructed weir control has experienced additional breach failures both of which have lowered lake levels and has likely changed the characteristic of the outfall stream to the River. Past and current monitoring of groundwater and water levels in Borst Lake indicate that it is likely that without an artificially raised outlet and an augmented source of hydrology, the lake levels will likely rise and fall with rainfall and river flood stages but would likely not sustain a consistent water level as has been the case historically. This renders the lake particularly susceptible to changes in drainage basin area or changes in levels of impervious surfaces from existing conditions. These levels are unknown at this point in time, the lake is currently unable to rise higher than approx. 409.0 due to a breach in the control weir constructed in 2009.

<u>Wetland 11</u>

Wetland 11 is a very large floodplain saturated area that receives most of its hydrology from either groundwater from the shallow aquifer or tributary drainage from its upstream basin. The tributary area from Snoqualmie Mill to Wetland 11 (not including the site area of Wetland 11), represents approximately only 3.0 % of the surface water basin and may not have always been tributary to this drainage in the past. Old photographs of the Mill operations indicate that drainage and drainage ditches were located and re-located as necessary as operations expanded and the site was filled.

What was or was not tributary to this area of the River floodplain prior to the Mill operation is not known. However, it is evident that this area of drainage to the river and this large wetland area has very limited dependence on surface water runoff from the Snoqualmie Mill site, nor would it likely be susceptible to significant impacts due to moderate to changes in runoff from Snoqualmie Mill.

The evaluations above assert that, with the exception of Borst Lake, these major hydrologic features are not susceptible to significant impact due to potential changes in runoff from Snoqualmie Mill. However, it is the intent of the development of Snoqualmie Mill to maintain surface runoff discharges from the site to these features consistent with current existing conditions. As discussed in the Regulatory Framework, analysis consistent with KCSWDM Reference 5 Guide Sheet 3B, together with evaluations by a wetland biologist, is used to determine sufficient levels of hydrology that need to be maintained to prevent wetland impacts. The analysis of impacts and mitigations is discussed in **Chapter 6** and **Chapter 8** both qualitatively for the PCI Plan, and quantitatively for Phase 1.

Snoqualmie River

The downstream receiving water for Snoqualmie Mill is the Snoqualmie River. Approximately 1000 ft downstream of Snoqualmie Mill the Snoqualmie River drops 268 ft over Snoqualmie Falls before flowing through the Snoqualmie River Valley downstream of the falls.

The reach of the river between the falls and the SR-202 Bridge has recently been subject to two flood improvement projects; 1) The Snoqualmie Flood Damage Reduction Project (known as the 205 project) by the US Army Corps of Engineers, King County and the City of Snoqualmie, and 2) The PSE Weir Extension Project just upstream of the falls. The 205 project widened the right bank of the river just downstream of the SR-202 bridge and removed an old railroad trestle that partly spanned the channel about 0.5 mile upstream from the SR-202 bridge. The PSE project extended (lengthened) the PSE weir spanning the river just upstream of the falls and lowered the crest of the weir by approximately 2.0 ft.

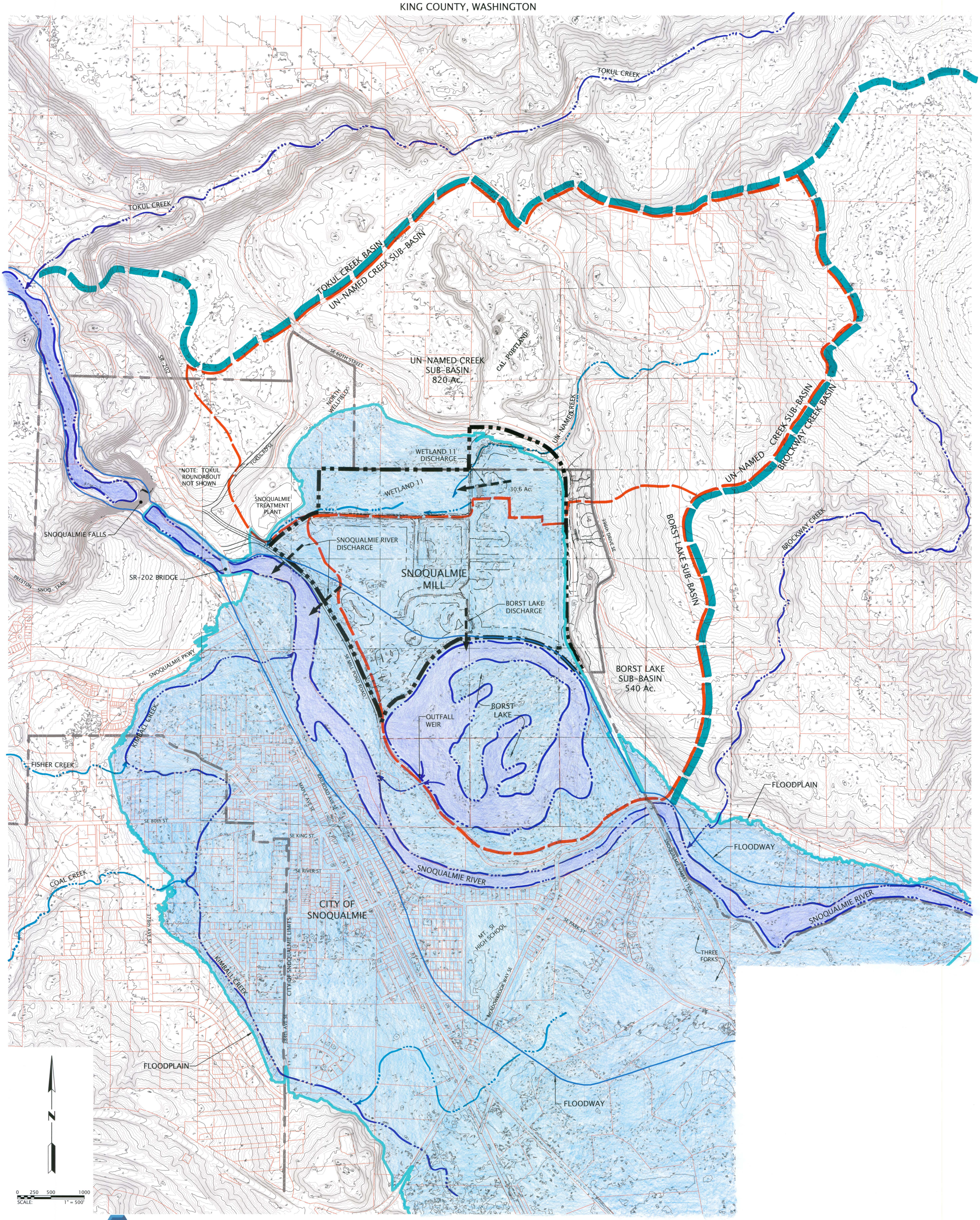
The 205 project was the subject and the basis of the LOMR issued to the City of Snoqualmie in 2010 to establish a new Base Flood Elevation (BFE) for the River between the falls and the City of Snoqualmie. The PSE project **<u>was not</u>** included in the river model for the 2010 LOMR as this work was completed between 2010 and 2012. **The 2010 LOMR as issued by FEMA is the basis for all evaluations of floodplain and BFE impact contained herein.** If in the future, there is a LOMR issued by FEMA based on current projects and current data, future permitting of Snoqualmie Mill would include updated evaluations of impact and levels of mitigation consistent with SMC 15.12 and SMC 19.12.

Following the completion of the two river projects King County evaluated flooding impacts on downstream properties in the Snoqualmie River Valley. The following is from the King County website;

> *"Many residents of the lower Snoqualmie Valley say they've seen greater flooding in the basin in recent years. In response, the King County Flood Control District initiated the Snoqualmie River Hydraulic and Hydrologic (H&H) Study to investigate reported changes and concerns. By doing so, the district hopes to create a shared understanding of flooding changes that can inform future dialogue and action in the Snoqualmie Basin.*
>
> *The Snoqualmie H&H Study was conducted in two phases. The first phase, the* ***Snoqualmie River Hydraulic Study*** *("Phase 1 Study"), was completed in April 2016. It evaluated the downstream impacts of two large flood reduction projects that were constructed at Snoqualmie Falls between 2004 and 2012 (Army Corps 205 project and PSE Snoqualmie Falls project). According to the study, the projects increased the peak 100-year water level downstream of the falls by 0.1 feet and decreased the upstream 100-year water level in the City of Snoqualmie by 1.4 feet.*
>
> *The second phase, the* ***Snoqualmie River Hydrologic Study*** *("Phase 2 Study"), is a broader investigation into a variety of issues related to river gages, historical trends, basin hydrology, and recent flood events. The study looked for annual and seasonal trends in basin flood hydrology and evaluated possible causes of change, such as land use, forestry practices, increased sedimentation, and climate change. It also included a review of the USGS gaging program in the Snoqualmie basin and recommendations to improve the system for flood warning. The Phase 2 Study did not find that flooding has gotten significantly worse in the Snoqualmie basin but found some evidence of increasing frequency of flood events and upward trends in fall and spring precipitation and high flows. The analysis concludes that much of the change in flooding reported by residents is likely due to variations in how precipitation falls across the basin during a storm and how this shapes the floodwave as it moves through the river system.*
>
> *Both phases were conducted by Watershed Science & Engineering on behalf of King County. Dr. Ed McCarthy conducted an independent technical review on behalf of Snoqualmie Valley residents and stakeholders to verify the integrity of the methods and to ensure the study addressed community concerns."*

This Watershed Science & Engineering river model was reexamined for the proposed Snoqualmie Mill as described in **Chapter 8**.

SE 1/4, SW 1/4 SECTION 20
NW 1/4 AND NW 1/4, SE 1/4 AND W 1/2, NE 1/4 AND NW 1/4, SW 1/4 SECTION 29
NE 1/4 AND NE 1/4, SE 1/4 SECTION 30
ALL IN TOWNSHIP 24 N, RANGE 8 E, W.M.
KING COUNTY, WASHINGTON



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REGIONAL HYDROLOGY EXHIBIT
FOR
SNOQUALMIE MILL SITE

SNOQUALMIE MILL VENTURES, LLC
CITY OF SNOQUALMIE
SEPT. 2018

FIG. 5-1

6. Drainage Control Plan

A. Stormwater Management Description

As discussed in **Chapter 3**, the primary regulatory framework for stormwater management for Snoqualmie Mill (notwithstanding flood regulations) is the 2016 King County Stormwater Management Manual, City of Snoqualmie Addendum to the 2016 King County Surface Water Design Manual; and the 2012/2014 Stormwater Manual for Western Washington (Dept. of Ecology) specifically, Appendix I-E criteria for direct discharge exemption from flow control. These are referred to herein as *KCSWDM* and the *Ecology Manual*, respectively.

As determined in **Chapter 5 Existing Conditions**, the site lies entirely within the Snoqualmie River Basin and currently drains to the Snoqualmie River from two (2) Threshold Discharge Areas. Drainage leaves the site at three (3) locations: directly to the river via overland flow, through Borst Lake (or the old Snoqualmie Mill Pond) via on-site ditches (Borst Lake drains over a manmade outlet weir and culvert under Mill Pond Road to the Snoqualmie River), and through the Northeast portion of the site that drains to the river via a large off-site wetland complex lying north of the property. The entire site (with the exception of some areas of the site above the Base Flood Elevation) as well as immediate downstream areas lie within the 100 year floodplain of the river.

The stormwater management strategy for development of Snoqualmie Mill is primarily flood control and compliance with Flood Hazard Regulations. But during normal rainfall, it is a combination of collection, treatment and direct discharge to the Snoqualmie River, and collection, treatment and discharge to on-site and off-site wetlands to maintain wetland hydrology. As discussed in the Regulatory Framework, the Snoqualmie River is designated as a *Direct Discharge Receiving Water Body* by the KCSWDM and the Ecology Manual, thus the site is exempt from flow control Core Requirement #3. Post developed drainage to on-site and off-site wetlands will be evaluated by the wetland biologist for consistency with current conditions. This applies to all wetlands and drainages between the site and the Snoqualmie River.

Therefore, the Stormwater Management Plan for Snoqualmie Mill can be described in four (4) primary components:

1) Direct Discharge to the Snoqualmie River,
2) Maintenance of Wetland Hydrology,
3) Runoff Treatment of Pollutant Generating Impervious and Pervious Surfaces (**PGIS and PGPS**),
4) Flood Control and Compliance with Flood Hazard Regulations.

B. Stormwater Management Plan

1) Direct Discharge to the Snoqualmie River

The qualification as a Direct Discharge site has been demonstrated in **Chapter 3** – Regulatory Framework. This allows that any runoff from the site directly discharging to the Snoqualmie River is exempt from flow control (per KCSWDM Core Requirement #3), provided that hydrology to wetlands is maintained approximating "*existing conditions*". Uniquely, Snoqualmie Mill currently contains a vast amount of existing impervious surface (see discussion in Chapter 1). Therefore, in those areas heavily covered by effective impervious surface, the stormwater plan must direct most or all the future runoff to the on-site wetlands even though direct discharge is allowed, and flow control requirements are exempt (See **Maintenance of Existing Flows for Wetland Hydrology Mitigation**, below).

Planning Area 1 Detail

Planning Area 1 will establish the initial grading of the site and is discussed in detail below under Flood Control and Compliance with Flood Hazard Regulations. Planning Area 1 grading and infrastructure development will include the initial relocation of Mill Pond Road for site entry, and the construction of a direct discharge outfall to the Snoqualmie River.

The outfall is proposed as a broad surface swale along portions of the realigned Mill Pond Road to provide surface flow to the OHWM of the river. Clean and/or treated runoff from the western portion of the site would be conveyed (through storm pipes) to the broad swale. The swale will be constructed to provide positive drainage to the river by excavating a portion of the existing (to be abandoned) Mill Pond Road a portion of which may be part of a King County maintained Revetment. Design of the channel and the banks of the swale will include necessary stabilizing rock, Rip-Rap and vegetation to prevent destabilization of the existing Mill Pond Road embankment over time and may require stabilization review by King County.

Runoff from the eastern portion of the site would be conveyed to the river through on-site and off-site wetlands to maintain wetland hydrology as required by the Direct Discharge criteria. This is described in detail under **Maintenance of Existing Flows for Wetland Hydrology Mitigation**, in sub-section 2) on the following pages. These wetlands are the existing conveyance paths for runoff from these site areas.

A preliminary engineering plan for grading and stormwater control for Planning Area 1 is depicted on **Figure 6-1.** Other depictions of the concept of fill for Planning Area 1 and compensating storage are shown in Chapter 2 (**Figures 2-6 through 2-9**). Figure 6-1 shows the concept for collection and conveyance of runoff, treatment areas and treatment types and discharge locations. It includes the location, based on preliminary design, of an outfall to the Snoqualmie River for direct discharge stormwater and for improved control of receding floodwater. A detailed Snoqualmie River Outfall Concept is shown on **Figure 6-2.**

Future design and permitting will provide actual analysis and appropriate sizing of storm conveyance facilities. However, preliminary estimates of the direct discharge flows are contained in the analysis Appendix B-5 to Chapter 8 for future assistance in sizing of basic treatment facilities for Planning Area 1 shown on **Figure 6-1**.

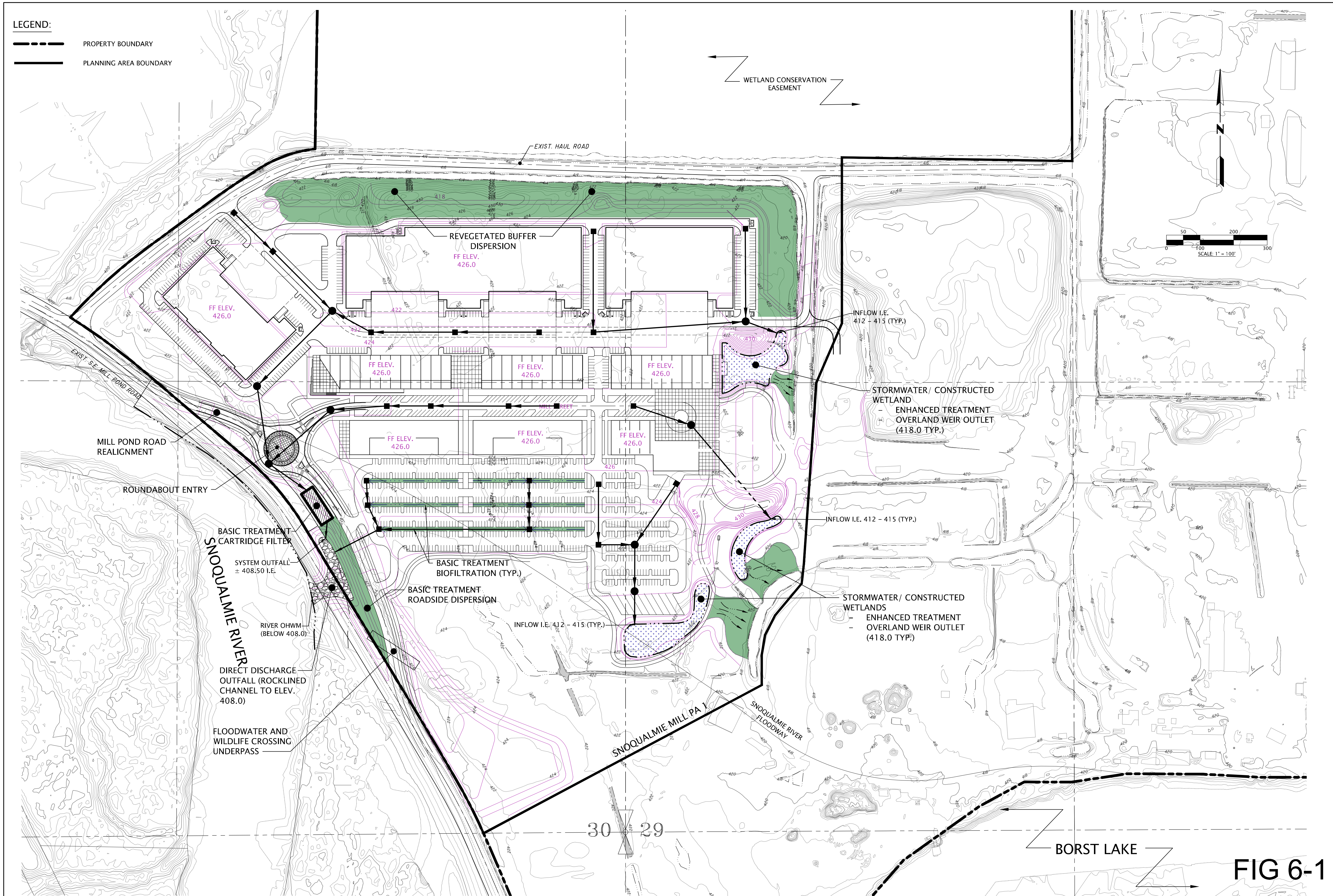

FIG 6-1

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SNOQUALMIE MILL VENTURES, LLC

JOB NO. 17500

PLANNING AREA 1 STORMWATER PLAN
FOR
SNOQUALMIE MILL

CITY OF SNOQUALMIE WASHINGTON

SHEET EX-03


MILL POND ROAD
MILL STREET
FUTURE CONNECTION TO SNOQUALMIE RIVER TRAIL
OLD MILL POND ROAD REVEGETATED
EXISTING VEGETATION
PARKING
OUTFALL LOOKOUT
STORMWATER OUTFALL
MILL POND ROAD
SNOQUALMIE RIVER
OLD MILL POND ROAD, REVEGETATED
DRAINAGE UNDERPASS
EXISTING VEGETATION
FUTURE CONNECTION TO SNOQUALMIE RIVER TRAIL
0' 15' 30' 60'

FIGURE 6-2

Planning Areas 2 and 3 Concept

It is explained below (in **Maintenance of Wetland Hydrology** subsection 2) that future development for all on-site Planning Areas will be required to maintain surface water hydrology levels to wetlands and streams. The concept for Planning Areas 2 and 3 direct discharge would be to demonstrate appropriate treatment and hydrology levels flowing through any on-site wetlands, with a mass grading plan to provide bypass and overflow drainage to the river. This mass grade concept is shown on **Figure 6-13.**

Open space grading for compensating storage will provide direct conveyance paths to the river for overflow and receding floodwaters. This is described in more detail in sub-section 4 below under **Flood Control and Compliance with Flood Hazard Regulation.**

2) Maintenance Wetland Hydrology

Wetland Hydrology Existing Conditions

The evaluations in **Existing Conditions** discuss that a major source of hydrology to many of the on-site and off-site hydrologic features is groundwater and may not be susceptible to significant impact from changes in surface water runoff from Snoqualmie Mill. However, it is the intent of the development of Snoqualmie Mill to maintain surface runoff discharges from the site to these features consistent with current existing conditions. As discussed in the Regulatory Framework, an acceptable level of hydrology maintenance sufficient to prevent wetland impact is defined in the KCSWDM Reference 5 Guide Sheet 3B.

The site has been separated into three (3) site discharge sub-basins; On-site Wetland 12 system and Borst Lake, northeastern discharge to Wetland 11 and the Snoqualmie River, and the western discharge to the Snoqualmie River as shown on **Figure 5-1**. For this MDP, hydrology modeling analysis is provided for impacts associated with Planning Area 1, but evaluation of impacts for future Planning Areas 2 and 3 is provided at a programmatic level of probable changes to effective impervious surfaces within the sub-basin.

Hydrologic Analysis for Planning Area 1

Studies referenced in Chapter 4 **Baseline Data Collection and Site Mapping** show that most of the site runoff is collected by the Wetland 12 system which is a long linear wetland from the south end of the site where it discharges into Borst Lake, extending through the site to the north and west. Other drainage areas of small wetlands that collect runoff ultimately drain to Wetland 12. For purposes of evaluating impacts, the Wetland 12 System and Borst Lake Drainage site discharge sub-basin is divided into smaller sub-basins and modeled by the Ecology Manual Western Washington Hydrology Model (WWHM). Wetlands that could be impacted with increased or decreased hydrology by the development of Planning Area 1 are modeled to demonstrate consistency with Ecology Appendix I-E and KCSWDM Reference 5 Guide Sheet 3B. These sub-basins are depicted on Existing Conditions On-Site Sub-Basin Drainage **(Figure 6-3)** and Developed Conditions Sub-Basin Drainage for Wetland **Hydrology (Figure 6-4)**.

The Appendix I-E criteria for maintenance of wetland hydrology is proposed to be met by a WWHM analysis of the KCSWDM Reference 5 Guide Sheet 3B. The Appendix I-E criteria for maintenance of hydrology to Stream 2 is proposed to be met by a WWHM analysis of flow durations in Stream 2 from these Wetland 12 system sub-basins.

Site Sub-Basins for Modeling

For evaluation of wetland hydrology per Guide Sheet 3B sub-basin delineations are primarily based on a downstream controlling elevation for the wetland or wetland system being modeled, such as Wetland 28. In the case of Wetland 12 on Snoqualmie Mill, the controlling elevation for most of the wetland system is the invert of the culvert shown as the downstream point of Sub-Basin 12 C. This elevation controls the hydrology for Wetland 12 throughout Sub-basin 12C and Sub-basin 12 NW as well as Sub-basin Wetland 12 W at higher stages. However, separate sub-basins have been created for Wetland 12 NW and 12 W (**Reference Figure 6-3**). The purpose of this is as follows:

- Sub-basin WL 12 NW has been isolated for purposes of future design of a proposed Stormwater Wetland water quality treatment facility,
- Sub-basin WL 12 W isolates the wetland hydrologic analysis of lower volume storm flows when the hydrology of this west portion of Wetland 12 may be separated from control elevation of Sub-basin 12 C,
- Sub-basin WL 12 W is also isolated for purposes of future design of proposed Stormwater Wetland water quality treatment facilities.

The analysis of wetland hydrology per Guide Sheet 3B is provided for:

- Wetland 28 (runoff from Sub-basin WL 28),
- Wetland 12 within Sub-basin WL 12 W (including runoff from Sub-basin WL 12 W and tributary flow from Sub-basin WL 28),
- Wetland 12 within Sub-basin WL 12 C (including runoff from Sub-basin WL 12 C, runoff from Sub-basin WL 12 NW, runoff from Sub-basin WL 12 E, and tributary flow from Sub-basin WL 12 W).

Stream flow hydrology per Ecology Appendix I-E is provided for:

- Stream 2 within Sub-basin 12 (including runoff from Sub-basin 12 and tributary flow from Sub-basin WL 12 C).

The Existing Site Discharge Sub-Basin Table following on the pages below represents the area and the land use characteristics of each site discharge sub-basin. The areas shown in the table as “not measured” are those areas that either:

- Drain directly to the Snoqualmie River, or
- Are not relevant to the analysis for Planning Area 1 for maintenance of wetland hydrology or stormwater wetland preliminary design, or
- Are not relevant to the programmatic evaluation of impervious surface impacts for Planning Areas 2 and 3.

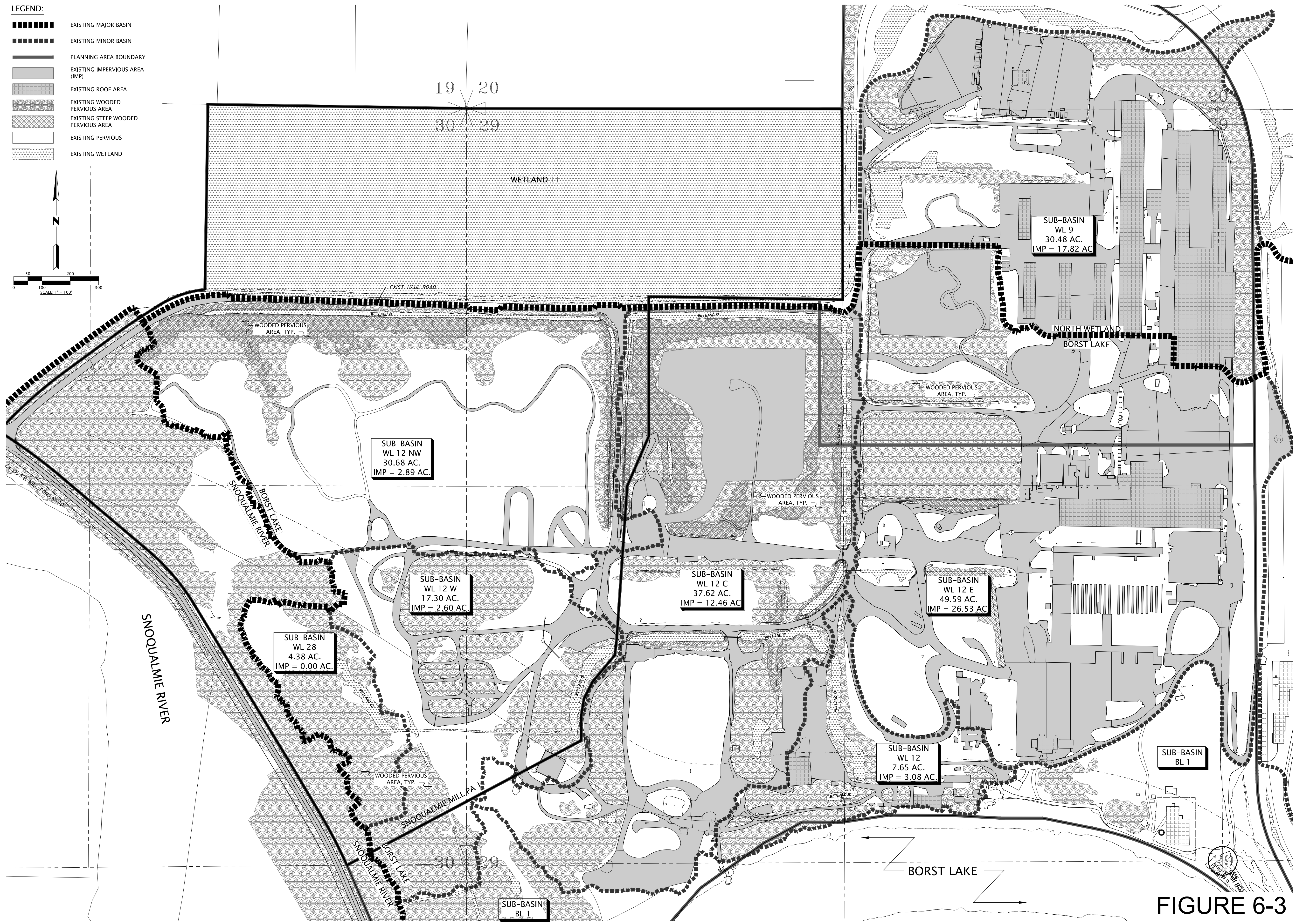

FIGURE 6-3

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KEITH J. GOLDSMITH STATE OF WASHINGTON 24597 REGISTERED PROFESSIONAL ENGINEER PRELIMINARY

MARK A. BARBER STATE OF WASHINGTON 36000 REGISTERED PROFESSIONAL ENGINEER PRELIMINARY

SNOQUALMIE MILL VENTURES, LLC

EXISTING CONDITIONS ON-SITE
SUB-BASIN DRAINAGE

SNOQUALMIE MILL

CITY OF SNOQUALMIE WASHINGTON

JOB NO. 17500

SHEET EX-07

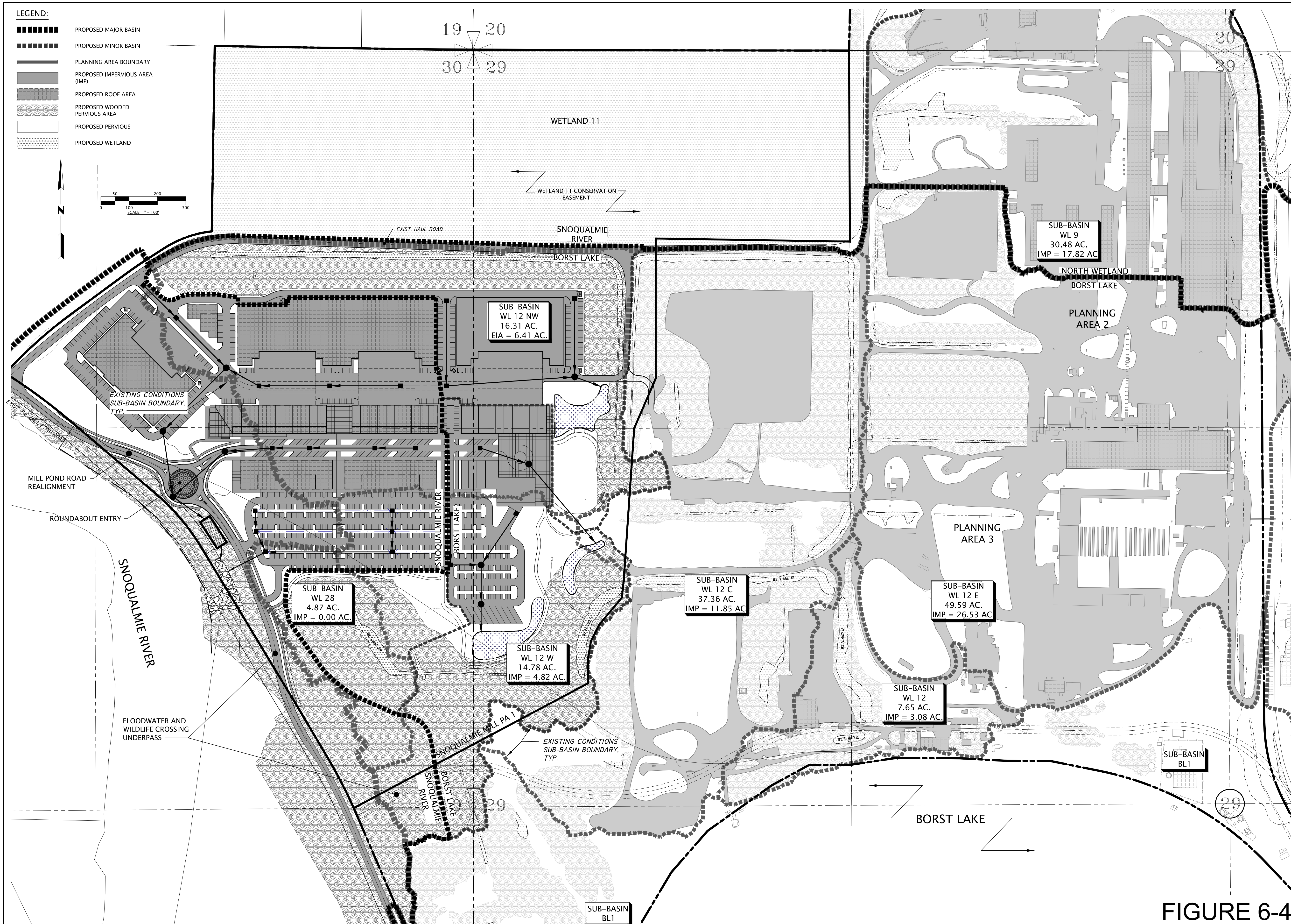

FIGURE 6-4

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PRELIMINARY

SNOQUALMIE MILL VENTURES, LLC

DEVELOPED CONDITIONS SUB-BASIN DRAINAGE
FOR WETLAND HYDROLOGY

SNOQUALMIE MILL

CITY OF SNOQUALMIE WASHINGTON

JOB NO. 17500
SHEET
EX-05

Existing Site Discharge Sub-Basins

Sub-Basin	Description	Total Area (Ac)	EIA (Ac)	Wetlands (Ac)	Pervious Wooded (Ac)	Pervious Other (Ac)
Wetland 12 and Borst Lake		**147.22**	**47.55**	**3.68**	**45.12**	**50.88**
WL 28	Runoff to Wetland 28 - tributary to Sub-Basin 12 W	***4.38***	*0.00*	*0.25*	*3.70*	*0.43*
WL 12 W	Runoff to the westernmost lobe of Wetland 12 - tributary to Sub-Basin 12 C	***17.30***	*2.60*	*0.39*	*8.62*	*5.70*
WL 12 NW	Runoff to the northwest extension of Wetland 12 - tributary to Sub-Basin 12C	***30.68***	*2.89*	*0.74*	*7.97*	*19.07*
WL 12 E	Runoff to the eastern extensions of Wetland 12 - tributary to Sub-Basin 12C	***49.59***	*26.53*	*0.35*	*6.96*	*15.76*
WL 12 C	Runoff tributary to the central portion of Wetland 12 - Headwater to Stream 2	***37.62***	*12.46*	*1.53*	*14.86*	*8.77*
WL 12	Runoff directly to Stream 2 - Stream 2 is tributary to Borst Lake	***7.65***	*3.08*	*0.43*	*3.01*	*1.14*
BL 1	Runoff directly to Borst Lake not tributary to the Wetland 12 system	**Not Measured**				
Northeastern to Wetland 11		**30.48**	**17.82**	**0.61**	**5.80**	**6.26**
WL 9	Runoff tributary to Wetland 9 in the northeastern portion of the site and discharge to Wetland 11	***30.48***	*17.82*	*0.61*	*5.80*	*6.26*
Western to Snoqualmie River		**Not Measured**				
Totals		**177.70**	**65.37**	**4.29**	**50.91**	**57.14**

Wetland Hydrology Developed Conditions

Hydrologic modeling, using Ecology's Western Washington Hydrologic Model (WWHM) or other applicable model, will be conducted at the time of development of each Planning Area to demonstrate that on-site and off-site wetlands will be provided with equivalent hydrology after development. This modeling will be provided for any development permit involving an area altering the watershed of a wetland.

Modeling for Planning Area 1 has been conducted based on the PCI Plan and is included in this MDP; results are provided in the Planning Area 1 Detail subsection below. For Planning Areas 2 and 3, this MDP performed an empirical evaluation based on anticipated pre- and post-development impervious area of the basins; modeling would not be practical or meaningful for these Planning Areas at this time as there are no specific site plans to model at this time.

Planning Area 1 Detail

Planning Area 1 involves converting areas that are currently pervious to impervious surfaces and converting areas of little vegetation and compacted earth to vegetated pervious surfaces and restored critical area buffers. Significant portions of stormwater runoff from Planning Area 1 would be routed directly to the proposed direct discharge outfall. Remaining areas are intended to provide a balance of impervious and pervious areas to minimize changes in volume of runoff to wetlands and streams. Evaluations of groundwater by Associated Earth Sciences (AESI; 2020) and evaluations of the on-site wetlands by Raedeke Associates (2012 –2018) have determined that the main Wetland 12 system across the site is supported primarily by groundwater and not sensitive or susceptible to modest changes to surface water hydrology. However, it is the intent of the development of Snoqualmie Mill to maintain surface runoff discharges from the site to these features consistent with current existing conditions. As discussed in the Regulatory Framework, an acceptable level of hydrology maintenance sufficient to prevent wetland impact is defined in the KCSWDM Reference 5 Guide Sheet 3B.

The previous subsection defined the wetlands and streams to be analyzed with this MDP as those potentially impacted by changes in hydrology from the development of Planning Area 1. These are; Wetland 28, the western lobe of Wetland 12 within Sub-basin WL 12 W, the central and northwestern lobes of Wetland 12 within Sub-basins WL 12 C and 12 NW, and Stream 2 within Sub-basin 12 receiving tributary flow from Sub-basin 12 C.

For purposes of modeling and reporting of these Sub-basin analyses for critical area hydrology, the results and graphics are referred to as:

- **Wetland 28,**
- **Wetland 12 W,**
- **Wetland 12 C,**
- **Stream 2.**

The following table represents the proposed land use parameters for these sub-basins as shown on **Figures 6-3** and **Figure 6-4** *(existing and developed sub-basin figures)* for purposes of analysis:

Developed (PA 1) Site Discharge Sub-Basins

Sub-Basin	Description	Total Area (Ac)	EIA (Ac)	Wetlands (Ac)	Pervious Wooded (Ac)	Pervious Other (Ac)
Wetland 12 and Borst Lake		**130.55**	**52.68**	**4.71**	**41.95**	**31.21**
WL 28	Runoff to Wetland 28 - tributary to Sub-Basin 12 W	***4.87***	*0.00*	*0.25*	*3.80*	*0.82*
WL 12 W	Runoff to the westernmost lobe of Wetland 12 - tributary to Sub-Basin 12 C	***14.78***	*4.82*	*1.01*	*6.58*	*2.37*
WL 12 NW	Runoff to the northwest extension of Wetland 12 - tributary to Sub-Basin 12C	***16.31***	*6.41*	*1.15*	*6.74*	*2.01*
WL 12 E	Runoff to the eastern extensions of Wetland 12 - tributary to Sub-Basin 12C	***49.59***	*26.53*	*0.35*	*6.96*	*15.75*
WL 12 C	Runoff tributary to the central portion of Wetland 12 - Headwater to Stream 2	***37.36***	*11.85*	*1.53*	*14.86*	*9.12*
WL 12	Runoff directly to Stream 2 - Stream 2 is tributary to Borst Lake	***7.65***	*3.08*	*0.43*	*3.01*	*1.13*
BL 1	Runoff directly to Borst Lake not tributary to the Wetland 12 system			**Not Measured**		
Northeastern to Wetland 11		**30.48**	**17.82**	**0.61**	**5.80**	**6.25**
WL 9	Runoff tributary to Wetland 9 in the northeastern portion of the site and discharge to Wetland 11	***30.48***	*17.82*	*0.61*	*5.80*	*6.25*
Western to Snoqualmie River				**Not Measured**		
Totals		**161.03**	**70.50**	**5.32**	**47.74**	**37.46**

Note: *Faded Sub-Basins remain undisturbed with PA 1 Development*

Analysis results for wetland and stream hydrology consistent with Ecology Appendix I-E and KCSWDM Reference 5 Guide Sheet 3B are shown on **Figures 6-5A through 6-10** below.

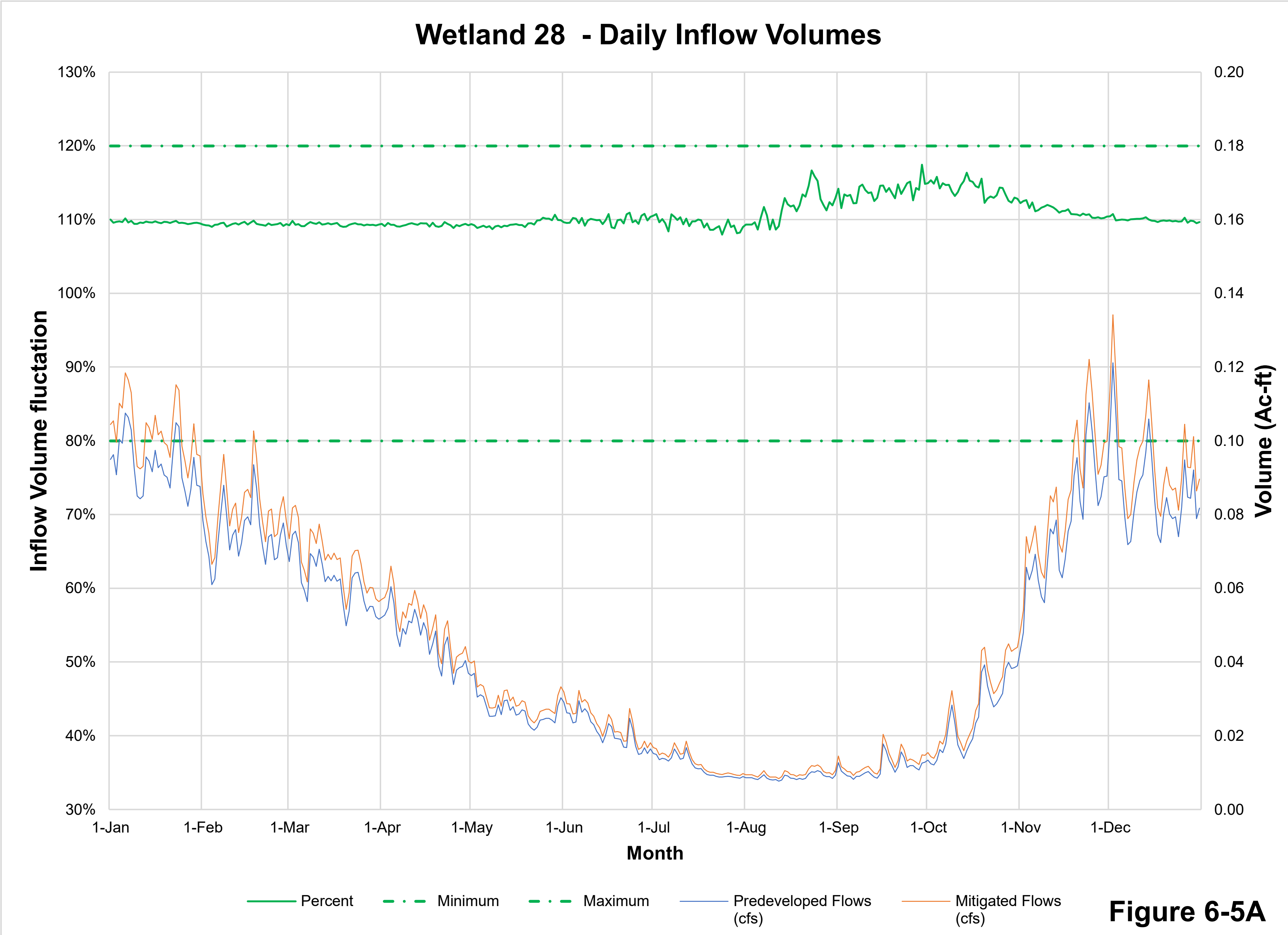

Wetland 28 - Daily Inflow Volumes
Inflow Volume fluctuation
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Volume (Ac-ft)
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-5A

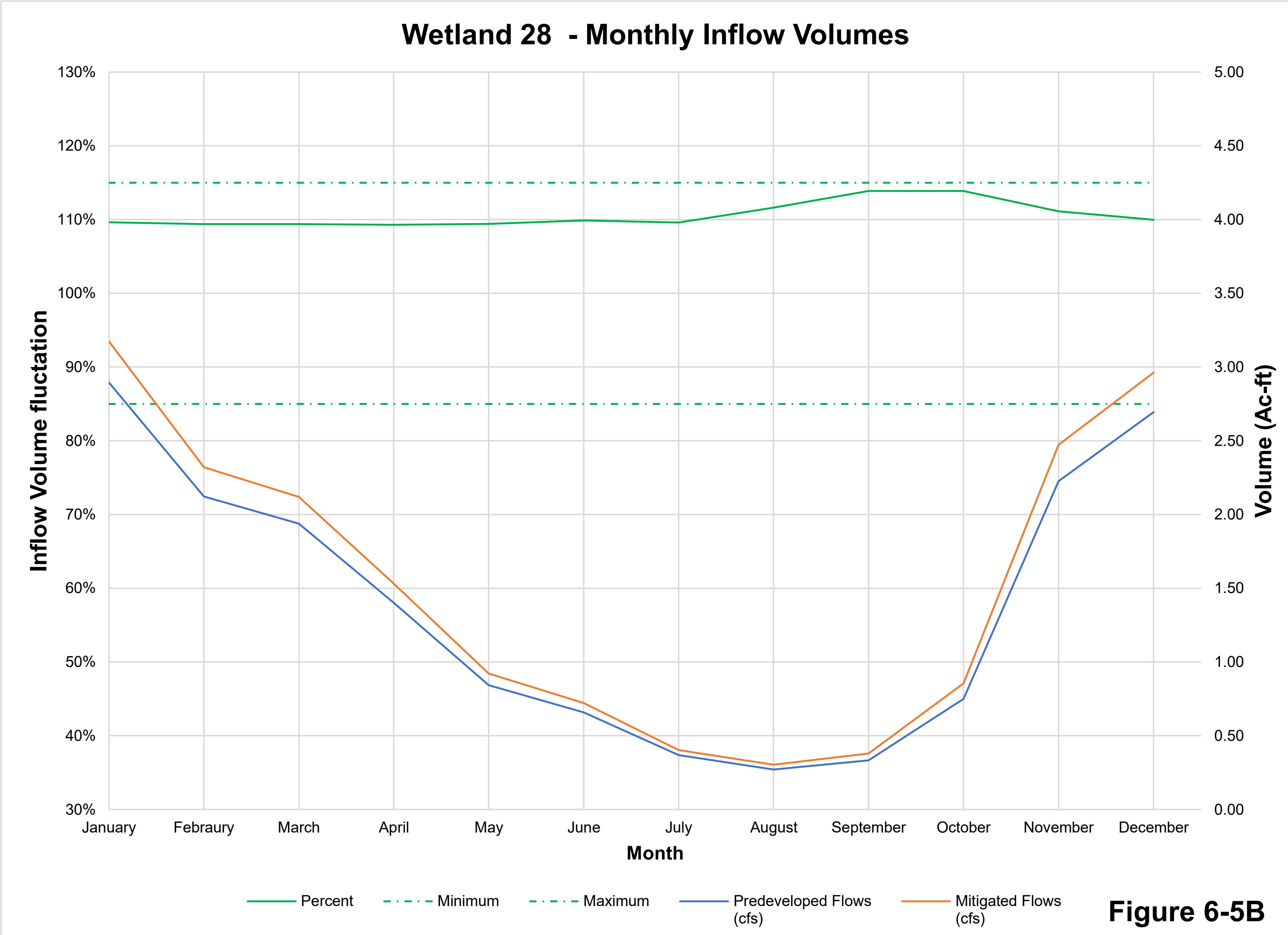
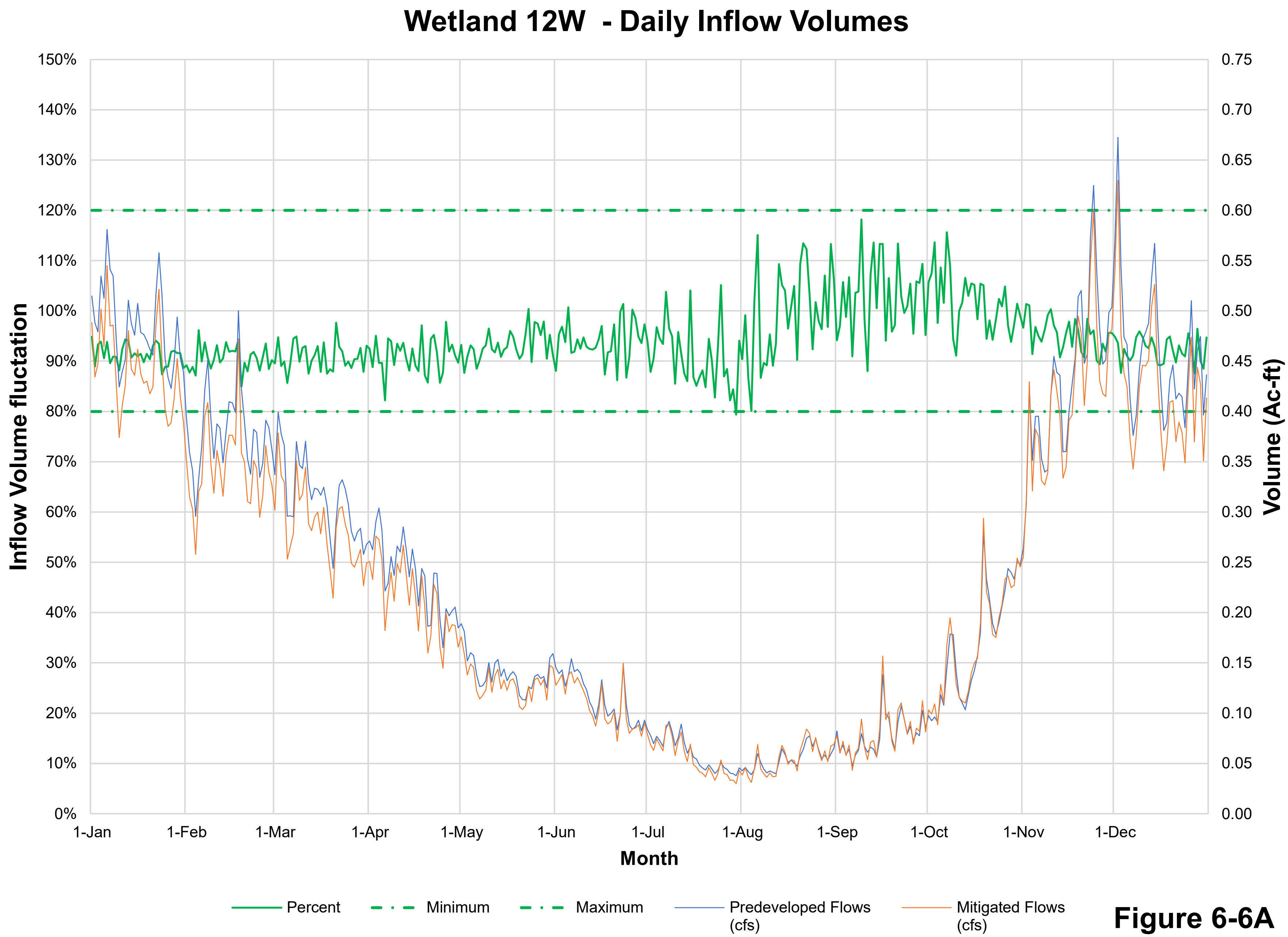

Wetland 28 - Monthly Inflow Volumes
Inflow Volume fluctation
Volume (Ac-ft)
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
January
Febraury
March
April
May
June
July
August
September
October
November
December
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-5B



Wetland 12W - Daily Inflow Volumes
Inflow Volume fluctation
150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Volume (Ac-ft)
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-6A

2/7/2020

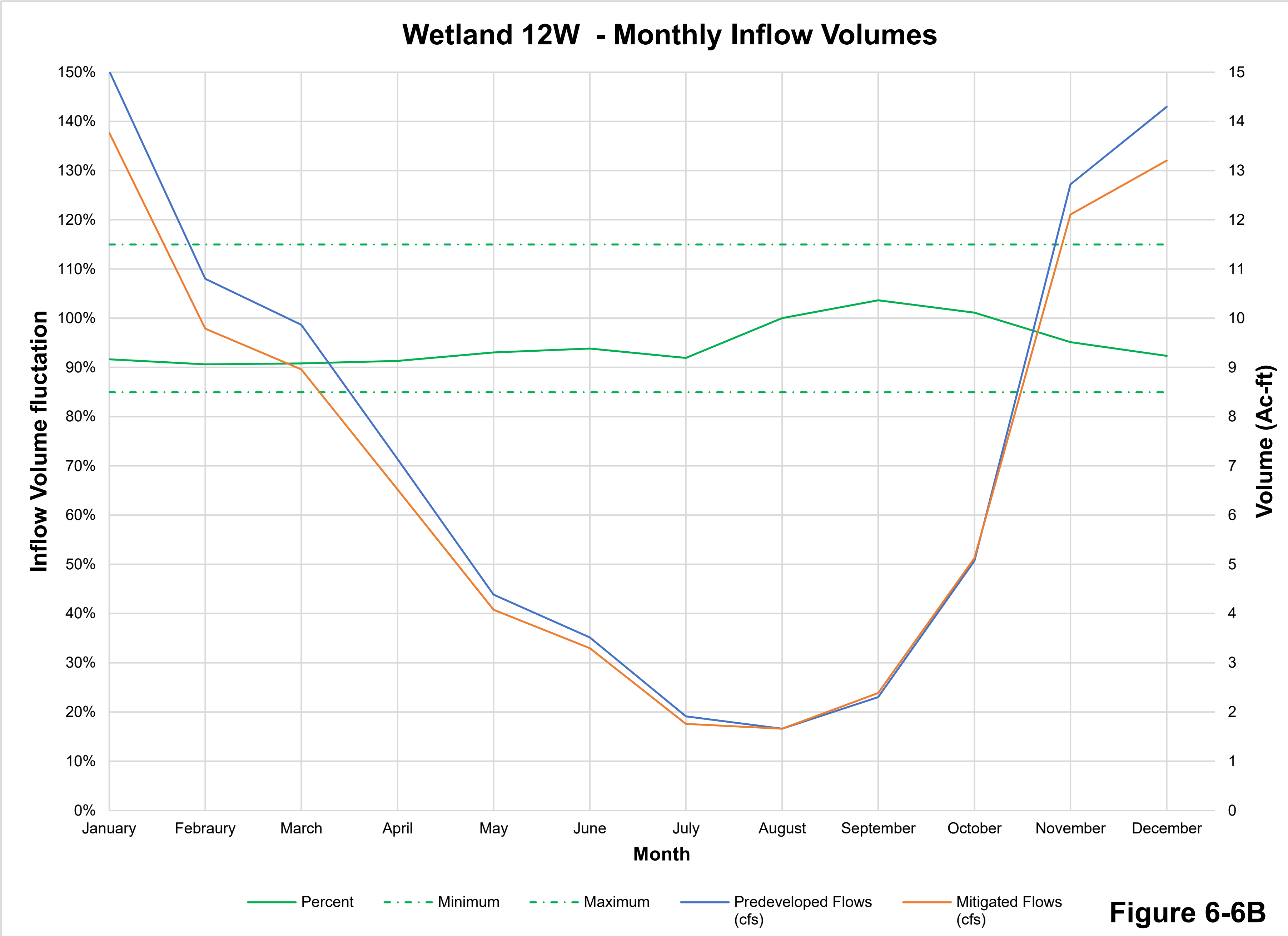


Figure 6-6B

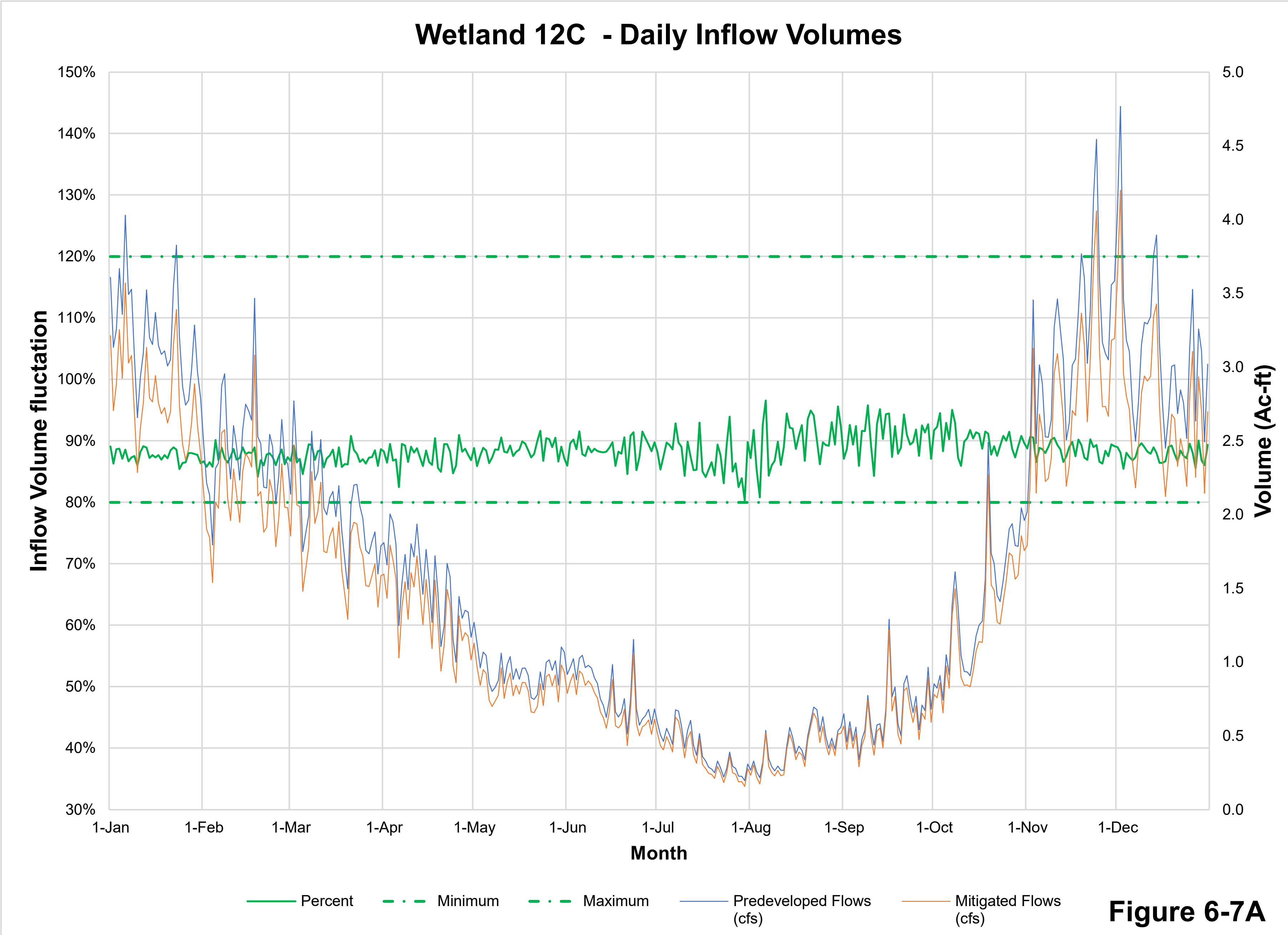

Wetland 12C - Daily Inflow Volumes
Inflow Volume fluctuation
150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
Volume (Ac-ft)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-7A

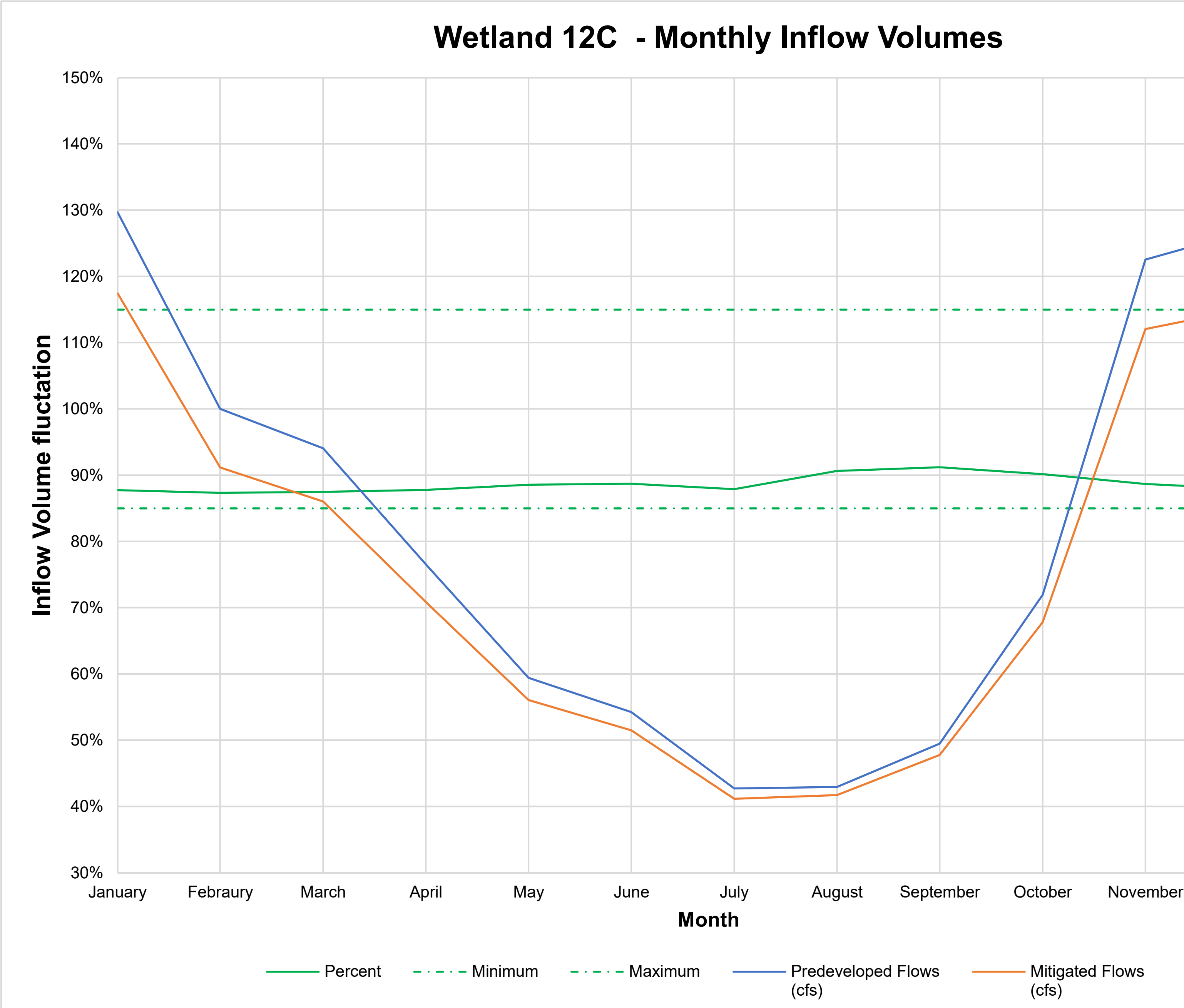

Wetland 12C - Monthly Inflow Volumes
Inflow Volume fluctation
Volume (Ac-ft)
150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
120
110
100
90
80
70
60
50
40
30
20
10
0
January
Febraury
March
April
May
June
July
August
September
October
November
December
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-7B

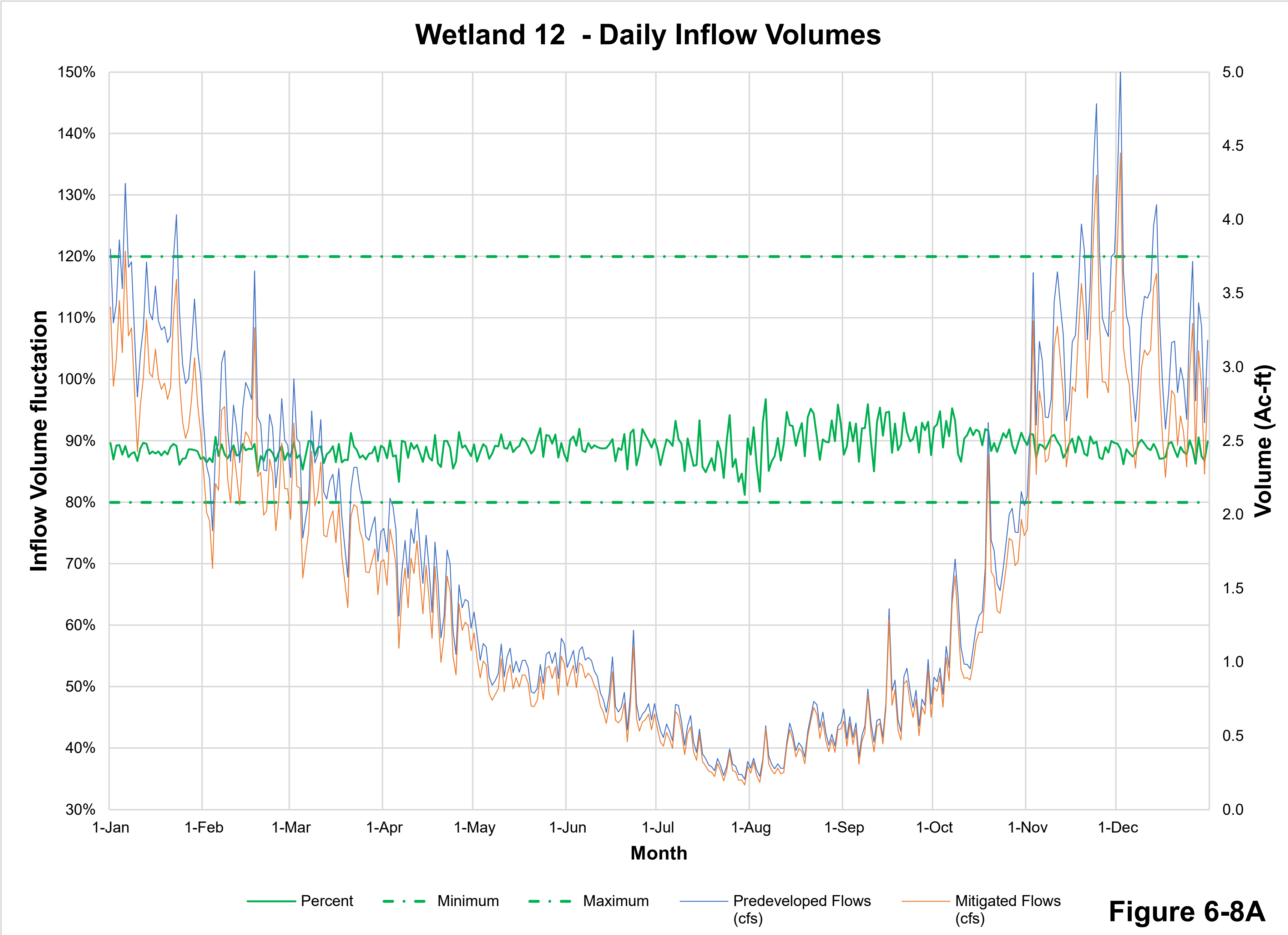
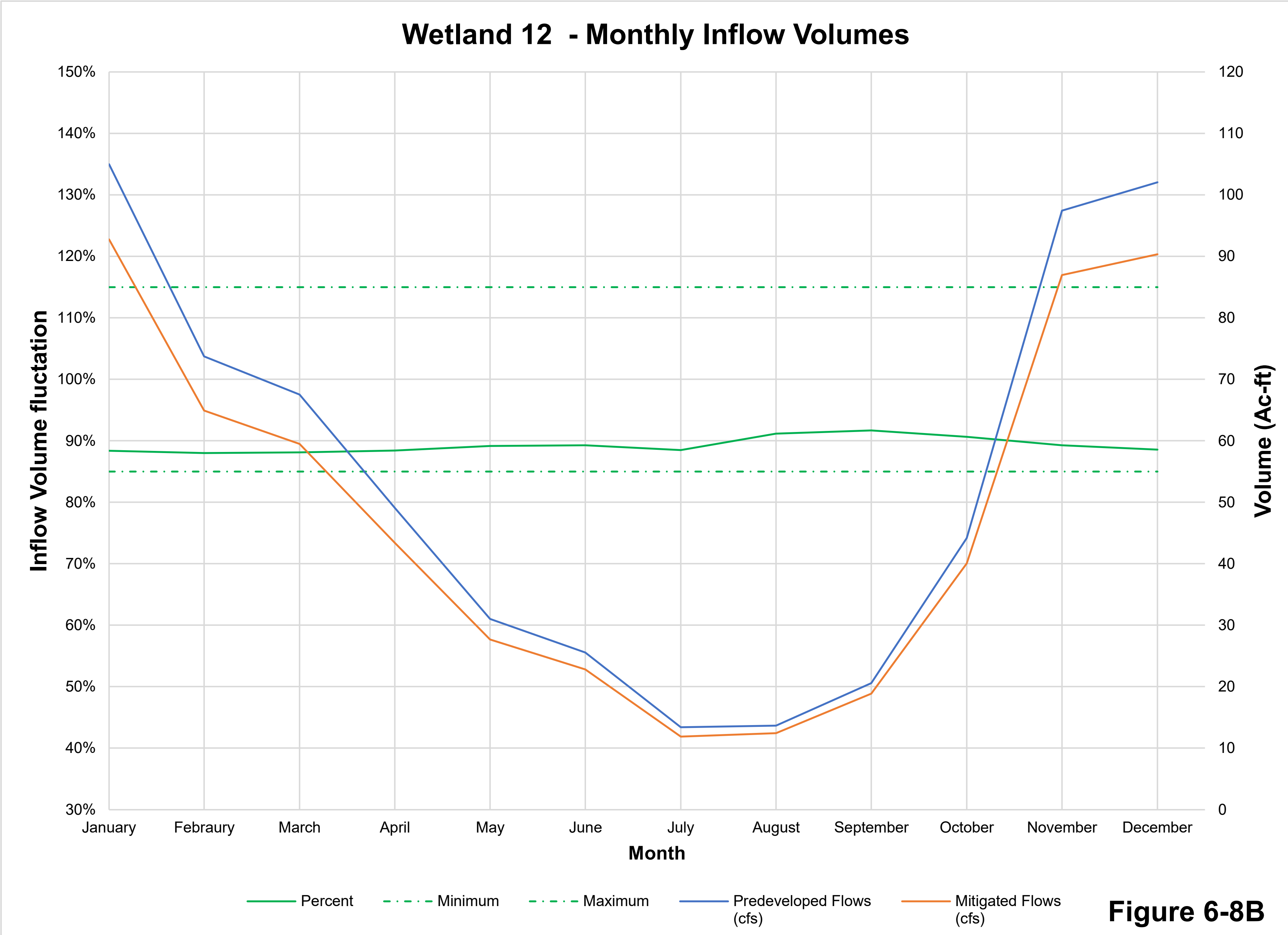

Wetland 12 - Daily Inflow Volumes
Inflow Volume fluctation
Volume (Ac-ft)
150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-8A



Wetland 12 - Monthly Inflow Volumes
Inflow Volume fluctation
Volume (Ac-ft)
150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
40%
30%
120
110
100
90
80
70
60
50
40
30
20
10
0
January
Febraury
March
April
May
June
July
August
September
October
November
December
Month
Percent
Minimum
Maximum
Predeveloped Flows (cfs)
Mitigated Flows (cfs)

Figure 6-8B

Stream 2 - Return Periods Summary

Flow Frequency Return Periods (CFS)

Storm Event	Pre-Developed	Mitigated
2-year	40.745	38.151
5-year	63.608	58.142
10-year	81.872	74.161
25-year	108.801	97.883
50-year	131.855	118.291
100-year	157.641	141.225

Annual Peakflows (CFS)

Year	Pre-Dev.	Mitigated	Year	Pre-Dev.	Mitigated	Year	Pre-Dev.	Mitigated
1949	47.023	43.023	**1970**	25.431	24.841	**1991**	83.838	75.171
1950	68.535	61.477	**1971**	45.029	42.858	**1992**	63.438	56.047
1951	45.129	40.696	**1972**	56.215	53.006	**1993**	23.634	22.797
1952	24.3	25.034	**1973**	21.266	20.886	**1994**	81.428	76.315
1953	30.064	28.825	**1974**	31.339	30.292	**1995**	41.215	39.098
1954	42.921	40.001	**1975**	45.981	41.744	**1996**	63.237	56.028
1955	26.89	25.413	**1976**	32.087	29.99	**1997**	185.966	163.593
1956	30.296	28.584	**1977**	38.754	38.816	**1998**	44.19	41.631
1957	32.54	29.858	**1978**	32.164	30.619	**1999**	117.644	105.693
1958	20.35	20.59	**1979**	19.344	19.393	**2000**	46.107	42.363
1959	31.894	30.609	**1980**	28.536	27.097	**2001**	42.277	40.445
1960	28.674	27.358	**1981**	52.164	47.641	**2002**	70.926	64.419
1961	21.324	20.732	**1982**	22.802	23.037	**2003**	52.483	48.03
1962	19.973	19.817	**1983**	37.948	36.508	**2004**	112.654	100.754
1963	32.333	30.095	**1984**	61.412	55.555	**2005**	41.95	38.63
1964	73.972	64.786	**1985**	29.966	29.432	**2006**	39.07	35.729
1965	37.156	34.407	**1986**	42.15	41.417	**2007**	108.313	95.689
1966	22.048	22.346	**1987**	81.404	72.367	**2008**	91.234	80.508
1967	51.341	54.817	**1988**	26.586	26.1	**2009**	54.819	53.033
1968	24.908	24.237	**1989**	25.696	24.623			
1969	63.412	58.161	**1990**	52.543	47.918			

Figure 6-9

2/11/2020

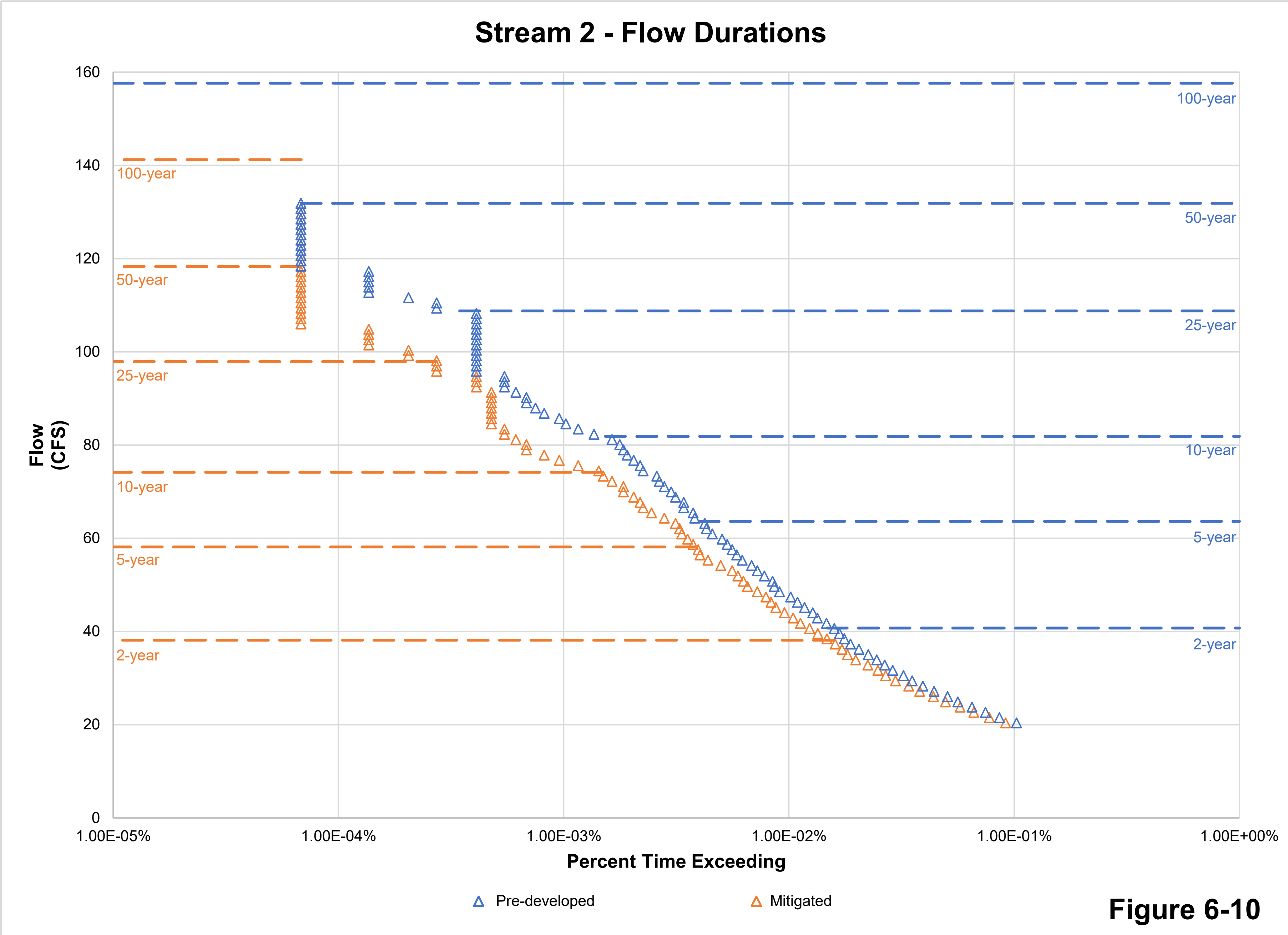


Figure 6-10

Summary of Results for Planning Area 1

Figures 6-5A through 6-10 show that Snoqualmie Mill Planning Area 1 can be developed with a large portion of the site discharging directly to the Snoqualmie River while maintaining hydrology to existing on-site wetland and stream critical areas. This is shown by demonstrating consistency with wetland hydrology criteria in KCSWDM Reference 5 Guide Sheet 3B, and the stream flow criteria in the Ecology Manual Appendix I-E Direct Discharge criteria.

The description and details of the WWHM analysis are provided in Chapter 8 and Appendix B-1 through B-5 to Chapter 8.

As discussed in the **Regulatory Framework**, Chapter 3, this level of analysis for maintenance or consistency with existing hydrology of these on-site resources assures avoidance or mitigation of any probable impacts from Snoqualmie Mill to these resources or to Borst Lake. Future variations or changes in hydrology or water levels may be evidenced in the future through causes outside of impacts from Snoqualmie Mill. Potential causes of these such as weir failures and the elimination of augmentation from the Tokel Creek diversion have been well documented.

Planning Areas 2 and 3 Programmatic Analysis

Planning Area 3 and southern portions of Planning Area 2 drain primarily to the on-site Wetland 12 system, then to the Snoqualmie River via Borst Lake in what is shown as **Sub-basin WL 12 C, and Sub-basin WL 12 E**. The northern portion of Planning Area 2 drains to on-site Wetland 9, then toward the river through the large Wetland 11 complex in what is shown as **Sub-basin WL 9**.

The **Existing Site Discharge Sub-basins** table shows that the land use characteristics for Sub-basins WL 12 C, WL 12 E and WL 9 include approximately **60.0 Ac. of existing impervious surfaces**.

The PCI Plan does not define detailed site plan configurations or building footprints for Planning Areas 2 and 3, because planning for these portions of the site is ongoing. However, the PCI application and EIS do define and evaluate a maximum level of buildout for these later phases of development. The **PCI Area Summary By Use** table in Chapter 2 estimates the total development area of impervious surfaces for Planning Areas 2 and 3 to be **approximately 62.2 Ac.** which includes the 15.7 Ac. portion of the property that is currently outside of the City limit and outside of the current PCI application.

The future total impervious surfaces for Planning Areas 2 and 3 may be slightly higher or slightly lower than existing with total roads, trails and stormwater wetlands for treatment. Other areas that are currently impervious may or may not be planted and landscaped which would affect the total future effective impervious area (EIA).

Development planning for Planning Areas 2 and 3 is not sufficiently advanced at this time to determine what areas would drain to which wetland. This would be planned and analyzed similar to Planning Area 1 at the time of development application and further environmental review for Planning Areas 2 and 3. However, the analysis of Planning Area 1 has shown that this is achievable. Therefore, there is no anticipated significant impact that would occur to these wetlands from site runoff.

3) Runoff Treatment of PGIS and PGPS

Treatment requirements for Snoqualmie Mill identified in the KCSWDM and the Ecology Manual depend on the receiving waters of developed PGIS. As discussed in Regulatory Framework, the PCI zone uses would ordinarily necessitate Enhanced Treatment per Core Requirement #8 of the KCSWDM, however, the Snoqualmie River is designated by Ecology and KCSWDM as a *Basic Treatment Receiving Water*. Therefore, treatment of runoff from PGIS draining directly to the Snoqualmie River would be provided with Basic Treatment only. Development runoff from PGIS draining into any of the on-site or off-site wetlands or streams prior to discharging to the Snoqualmie River would be provided with Enhanced Treatment.

- Basic Treatment – per the Basic Treatment Menu in Chapter 6 of the KCSWDM,
- Enhanced Treatment - per the Enhanced Treatment Menu in Chapter 6 of the KCSWDM.

The strategy of draining treated runoff through the on-site wetlands and streams is integral to the Open Space component of the PCIP master plan. Natural Open Space areas, consisting of treatment facilities, existing wetlands with restored or enhanced buffers, and created lowlands for flood storage and flood flow conveyance, would all provide corridors through the site for unique aquatic or other wildlife habitat opportunities.

The efficacy, or treatment goals of Basic Treatment per the KCSWD Manual are described as follows:

> *"**Treatment Goal**: The Basic Water Quality menu facility choices are designed to remove 80% of total suspended solids (TSS) for flows or volumes up to and including the WQ design flow or volume (defined in Section 6.2.1, p. 6-17). Flows and volumes in excess of the WQ design flow or volume may be routed around the WQ facility or may be passed through untreated.*
>
> ***Basis:***
>
> *The use of TSS as an 'indicator' pollutant for sediment is well established.*
>
> *The control of TSS leads to indirect control of other pollutants of concern that can adhere to suspended solids in stormwater runoff.*
>
> *80% TSS removal level is reasonably attainable using properly designed, constructed and maintained structural stormwater BMPs (for typical ranges of TSS concentration found in stormwater runoff.*
>
> *For higher removal rates, there are diminishing returns, and relatively less treatment is gained for incremental increases in facility size.*
>
> *WA Ecology TAPE guidance finds 80% removal to be achievable by and a suitable criterion for proprietary 'emerging' technologies."*

The efficacy, or treatment goals of Enhanced Treatment per the Manual are described as follows:

> *"Treatment Goal: The Enhanced Basic WQ menu is designed to achieve >30% dissolved copper removal and >60% dissolved zinc removal; in addition to the Basic treatment (80% TSS removal) for flows up to and including the WQ design flow or volume (defined in Section*

6.2.1, p. 6-17). The goal assumes that dissolved copper concentrations for untreated runoff are between 5 and 20 micrograms per liter, and that dissolved zinc concentrations for untreated runoff are between 20 and 300 micrograms per liter.

Basis: The treatment goal is expressed in terms of dissolved copper and zinc removal. Copper and zinc are reliable indicators of a wider range of heavy metals and are typically found in stormwater runoff from industrial, commercial, and high density residential land uses at levels that are toxic to fish and other aquatic biota. Many metals are readily absorbed onto particulates in the runoff, usually the finer fraction of the particulates. Facility combinations that remove more of the particulate load than the Basic menu, including the finer fraction, are specified by the Enhanced Basic menu. Facilities providing organic binding sites that enhance metal adsorption are also specified. The treatment goals have been found by WA Ecology to be achievable."

These are the types and levels of treatment that will be implemented and achieved on The Snoqualmie Mill PCIP site for purposes of control of water quality impacts to wetlands and wildlife.

The proposed option for Snoqualmie Mill is described in the Planning Area 1 Detail below.

<u>Planning Area 1 Detail</u>

Planning Area 1 entails the implementation of both basic and enhanced treatment. **Planning Area 1 Stormwater Plan (Figure 6-1)** shows a concept plan for storm drainage collection, treatment facility areas and discharge locations.

Large **basic treatment** areas, which are areas draining to the Snoqualmie River direct discharge outfall, would primarily utilize a proprietary media filter. As shown, though, Planning Area 1 may also utilize some parking lot landscaping to provide basic biofiltrations swales. The project is exempt from the Core Requirement #9 Flow Control BMPs; however, this may serve to enhance the parking area and reduce the size of the media filter. **Figure 6-1** also shows that basic filter strips may be used for road runoff from the new Mill Pond Road.

For the **enhanced treatment** areas, it is proposed that Stormwater Wetlands be used (See **Figures 6-11 and 6-12** for conceptual plans). The Snoqualmie Mill site is very flat and has very little topographic fall between the developed areas and locations of discharge into the on-site wetlands. **All facilities** in the Enhanced Treatment menu, **with the exception of a stormwater wetland**, require some form of sand filter.

Sand filters function by gravity, flowing through the sand from above and discharging from below. This requires enough topography for the inflow storm drains below the surface to discharge at the top of the sand filter and the outflow at the bottom of the sand filter with adequate head for the treatment function. This further requires that the outflow elevation be above the receiving resource. As discussed above, Snoqualmie Mill lacks sufficient topography to make the use of sand filters practical.

Stormwater wetlands can function whereby the inflow can enter the facility below the outflow elevation, rise through the facility and overflow at the top, which would then flow to the receiving water. Snoqualmie Mill would design these facilities with overland surface flow outlets (surface weirs) at or above the elevation of the receiving wetland. This allows storm drains to enter the facility as much as 8.0' below the outlet and the receiving wetland elevation.

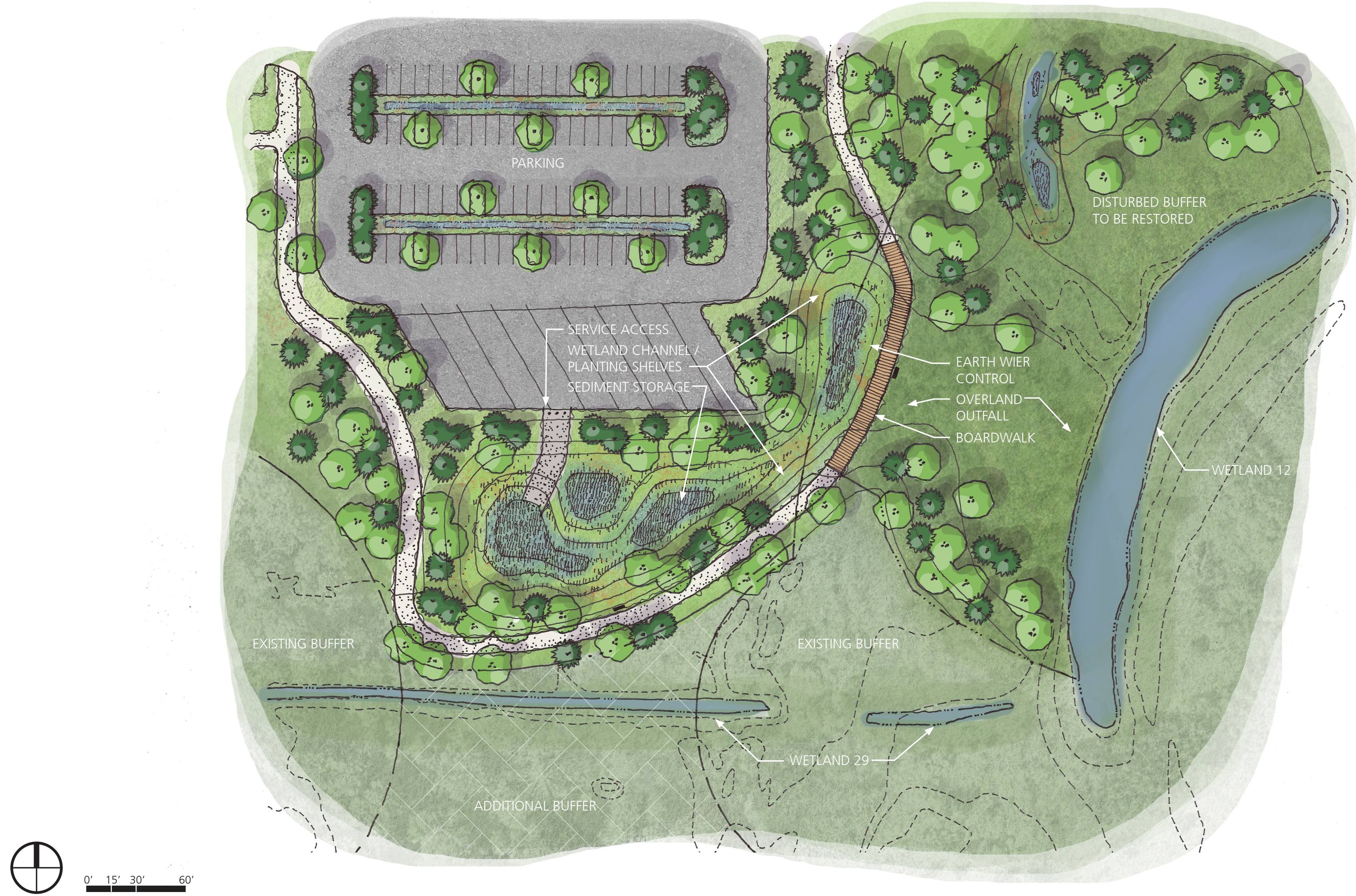


FIGURE 6-11

STORMWATER WETLAND PLAN

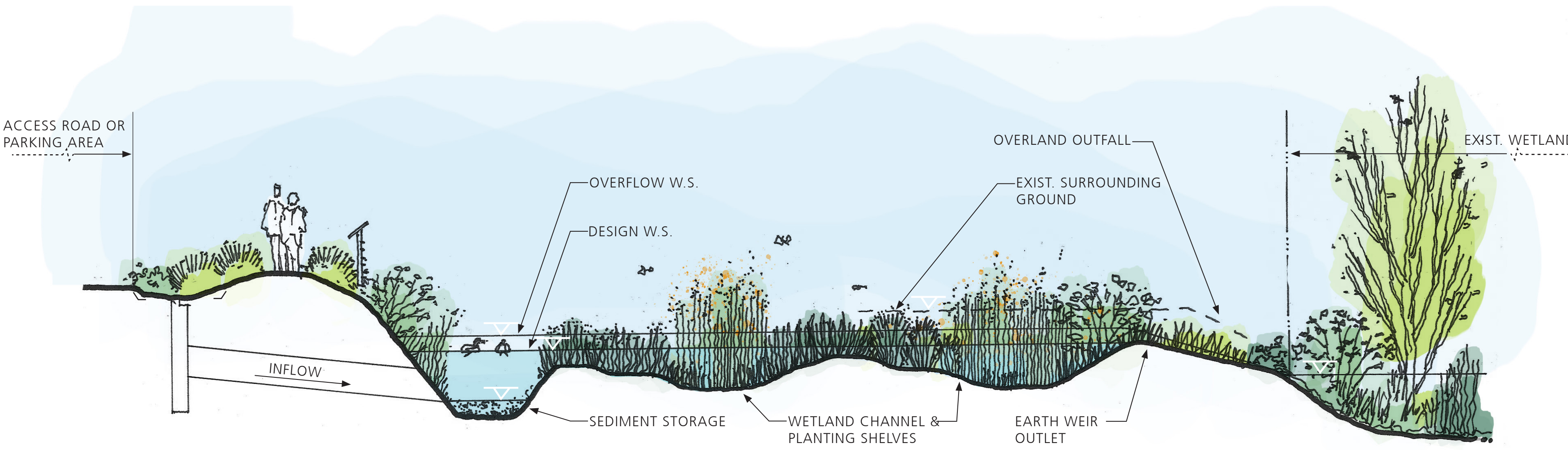


FIGURE 6-12

STORMWATER WETLAND SECTION

During design and permitting of the first mass grade plan for Planning Area 1, the design parameters of the Stormwater Wetlands will be provided in the form of a Tracking Matrix of tributary area and pollutant generating impervious surface contribution to the facilities. This would be used in the event Planning Area 1 is developed in phases to ensure the appropriate levels of runoff to any particular treatment facility is maintained.

Planning Area 2 and 3 Concept

It is assumed that all development within Planning Areas 2 and 3 would require enhanced treatment. The concept is the same as Planning Area 1: stormwater wetlands would be constructed in or near wetland buffers and discharge to the main wetland system in targeted locations to provide sufficient hydrology to the system broadly, and where limitations on 8.0' depths of storm drains may occur.

Planning Areas 2 and 3 have not been planned at sufficient detail at this time to show the proposed locations of stormwater wetlands . This design feature would be planned and analyzed, similar to that for Planning Area 1 to maintain a balance of surface water hydrology for those wetlands not primarily supported by the shallow aquifer, as discussed above. Such analysis and design would occur at the time of future permitting and supplemental environmental review for Planning Areas 2 and 3.

4) Flood Control and Compliance with Flood Hazard Regulation

There are many elements to flood hazard regulations which will require compliance such as building flood proofing and restricted uses. The three (3) elements of Flood Hazard Regulation addressed in this MDP are:

- **Site Grading and Compensating Storage (per SMC 15.12.150 and 19.12.150), and,**
- **No increase in the Base Flood Elevation (BFE), i.e., the 100 year floodplain (per SMC 15.12.160 and 15.12.170),**
- **Downstream Flooding Effects**

Site Grading and Compensating Storage

Proposed site grading at Snoqualmie Mill includes filling portions of the site within the floodplain, including raising some site areas and building pads above the BFE, and excavating compensating storage. To analyze compensating storage for the overall site, and to recognize the different levels of planning that has occurred for the site’s 3 planning areas, different assumptions were required for Planning Areas 2 and 3 vs Planning Area 1, where more project specific detail is known.

From the monitoring and evaluations of groundwater provided in Chapter 4, it is assumed that for the vast majority of the site, the lowest elevation that can be considered as compensating storage during a flood is elevation 418.0. The exception to this is near the river, south and west of Planning Area 1. Proximate to the river, the seasonal high groundwater has been shown to be no higher than 412.0.

Flood storage is assumed as available storage volume, therefore, between the BFE elevation and elevation 418.0 for most of the site, and 412.0 near the river. Compensating storage is provided if analysis of equal available flood storage will exist when considering proposed grades with storage lost (due to fill) or storage gained (due to excavation) between elevation 418.0 (or 412.0 near the river) and the BFE.

Planning Area 1 Detailed Grading Concept

Planning Area 1 proposes to contain a mix of commercial/retail, light industrial, warehouse and second story residential development. Planning for this mixed commercial/retail is geared predominantly to wineries, wine making, tasting sales and hospitality. The area would be bisected by **"Mill Street"** with retail/restaurant associated with the street front, and production occurring behind the retail, in light industrial portions of the buildings.

For purposes of calculating flood storage across the site, digital terrain model (DTM) surfaces have been created for:

1) The current topography of the site,
2) The proposed grading plan for Planning Area 1,
3) The proposed grading plan including the Planning Area 2 and 3 grading concept (described below),
4) The floodplain water surface utilizing the BFE elevations from FEMA cross sections proximate to the site.

A grading plan for Planning Area 1 is shown on **Figure 6-1** along with various Planning Area 1 cross-sections **(Figures 2-5 through 2-11)** in Chapter 2; it is provided to facilitate grading analysis for compensating storage. The plan is assumed to be a rough grade plan representing maximum displacement from fill and is not a detailed plan of pavement grades, curbs and storm drainage low points.

The proposed grading would raise the main central portion of Mill Street above the Base Flood Elevation (BFE). It also proposes to raise grades for all finished floors (FF) of buildings to be at least 1.0′ above the BFE. Currently, building finished floors are proposed to be elevation 426.0. Access areas to loading docks of buildings are proposed to be 4.0′ lower than the FF at elevation 422.0. Grades of parking areas and drive aisles would range from 420.0 to 424.0.

Compensating storage for areas filled would be accomplished by excavating below current grade, primarily:

- Lowering grades of existing berms for the construction of the relocated Mill Pond Road,
- Significantly lowering grades of existing berms along the north margin of Planning Area 1 to restore the Wetland 12 buffer with uniform drainage and vegetation,
- The construction of stormwater wetlands for stormwater treatment.

Planning Areas 2 and 3 Grading Concept

Planning Area 2 is proposed to contain light industrial warehouse uses. The assumption is that the finished floor (FF) of the warehouses would be at or above the BFE. Finished floor has been assumed to be elevation 426.0. Docking and parking areas have been assumed to be 4.0' lower at elevation 422.0. However, Planning Area 2 does not have a preliminary site plan at this time. Therefore, an approximate development area, assuming homogeneous buildings equally spaced apart, with docking areas between, is shown on the Mass Grade Concept (**Figure 6-13**) to be filled to elevation 424.0. All other potential development of Planning Area 2 for access and parking, is assumed to be filled to elevation 422.0. This approximates the amount of flood storage displacement that would occur with a future buildout of Planning Area 2 regardless of building layout or specific plan.

Planning Area 3 southern area is assumed to be developed as a corporate or institutional campus. Planning Area 3 has no preliminary site plan at this time. It is assumed that buildings would be raised above the BFE and provided with one level of ground level/below building parking. It is unknown at this time whether any restrictions will be placed on excavation in Planning Area 3 for environmental reasons, therefore, it has **not** been assumed that a parking level can be lowered to elevation 418.0 to maximize compensating storage. Therefore, most of this development area has been assumed to remain at its existing ground elevation of approximately 420.0. The northern area of Planning Area 3 is assumed to remain above the BFE. This provides a conservative estimate of potential flood storage displacement for Planning Area 3 to be compensated.

Compensating storage for Planning Areas 2 and 3 would be accomplished by excavating for future stormwater wetlands for runoff treatment similar to Planning Area 1, and the Open Space Grading Concept discussed below.

A Mass Grade Concept including Planning Areas 2 and 3, and Open Space is shown on **Figure 6-13.**

The floodplain water surface was overlaid with each of the three topographic surfaces to analyze the intervening volume to derive a volume of flood storage over the site for each topographic condition. The results of this analysis of floodplain storage is provided in the Table below. The existing Floodplain and Developed Floodplain for Planning Area 1 are shown on **Figures 6-14 and 6-15.** These figures show the floodplain surface over the site for the existing and developed condition of the site, and the location and elevations of the FEMA cross-sections used for this analysis.

Snoqualmie Mill

Floodplain Compensating Storage Analysis

Current Site Conditions	**Flood Storage Below Base Flood (BFE)**	**Increase or *(Decrease)***
Current *(Existing)*	**931.3 Ac-Ft**	
Planning Area 1 Mass Grade	**1016.8 Ac-Ft**	**85.5 Ac-Ft**
Total Site Mass Grade[1]	**946.0 Ac-Ft**	**14.7 Ac-Ft**

1. The Floodplain storage shown on the Full Development Mass Grading Concept Plan and the Floodplain Inundation Exhibit assumes that Planning Area 3 be provided with below building parking in lieu of "fill" above the BFE.

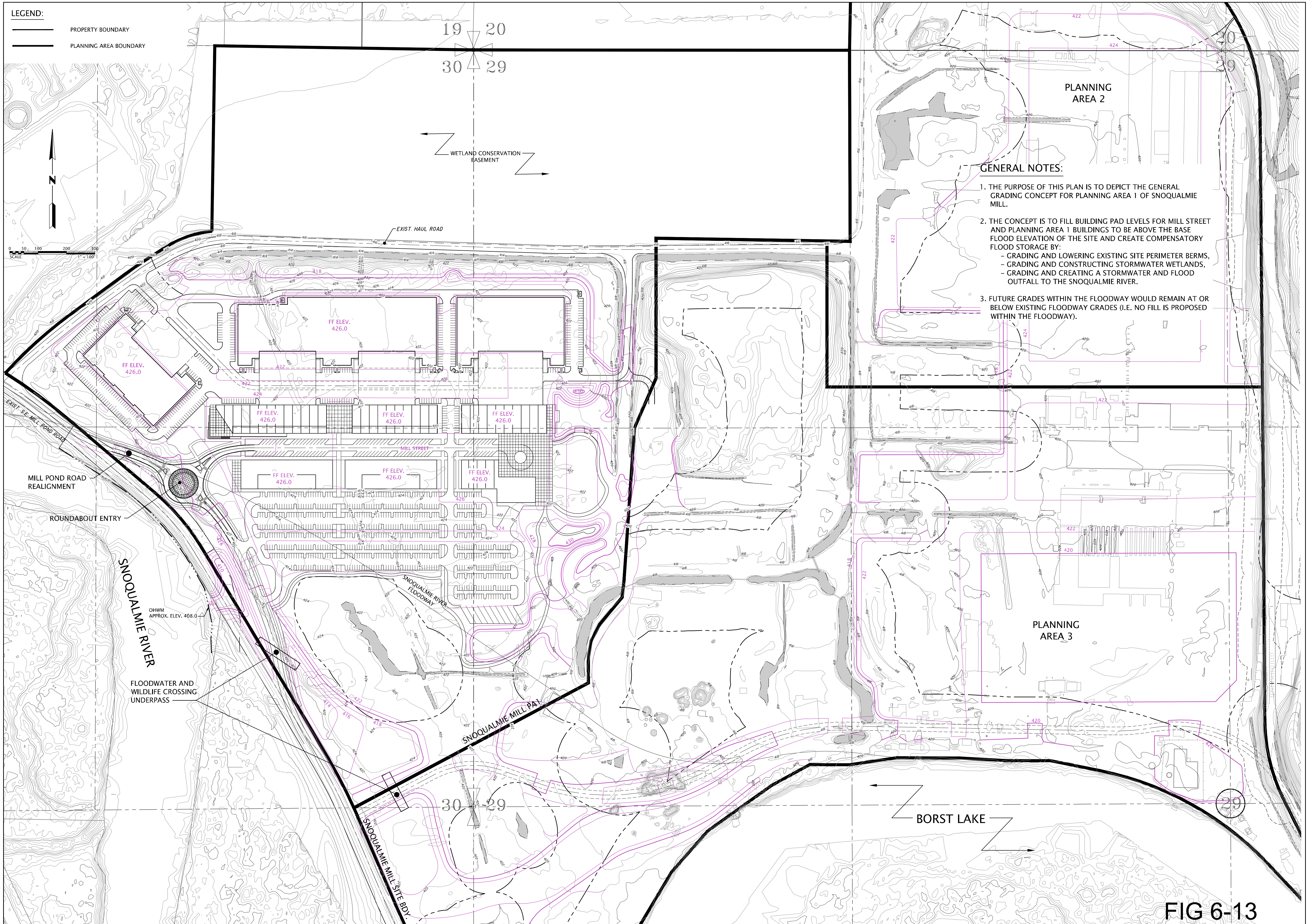


FIG 6-13

GOLDSMITH
LAND DEVELOPMENT SERVICES
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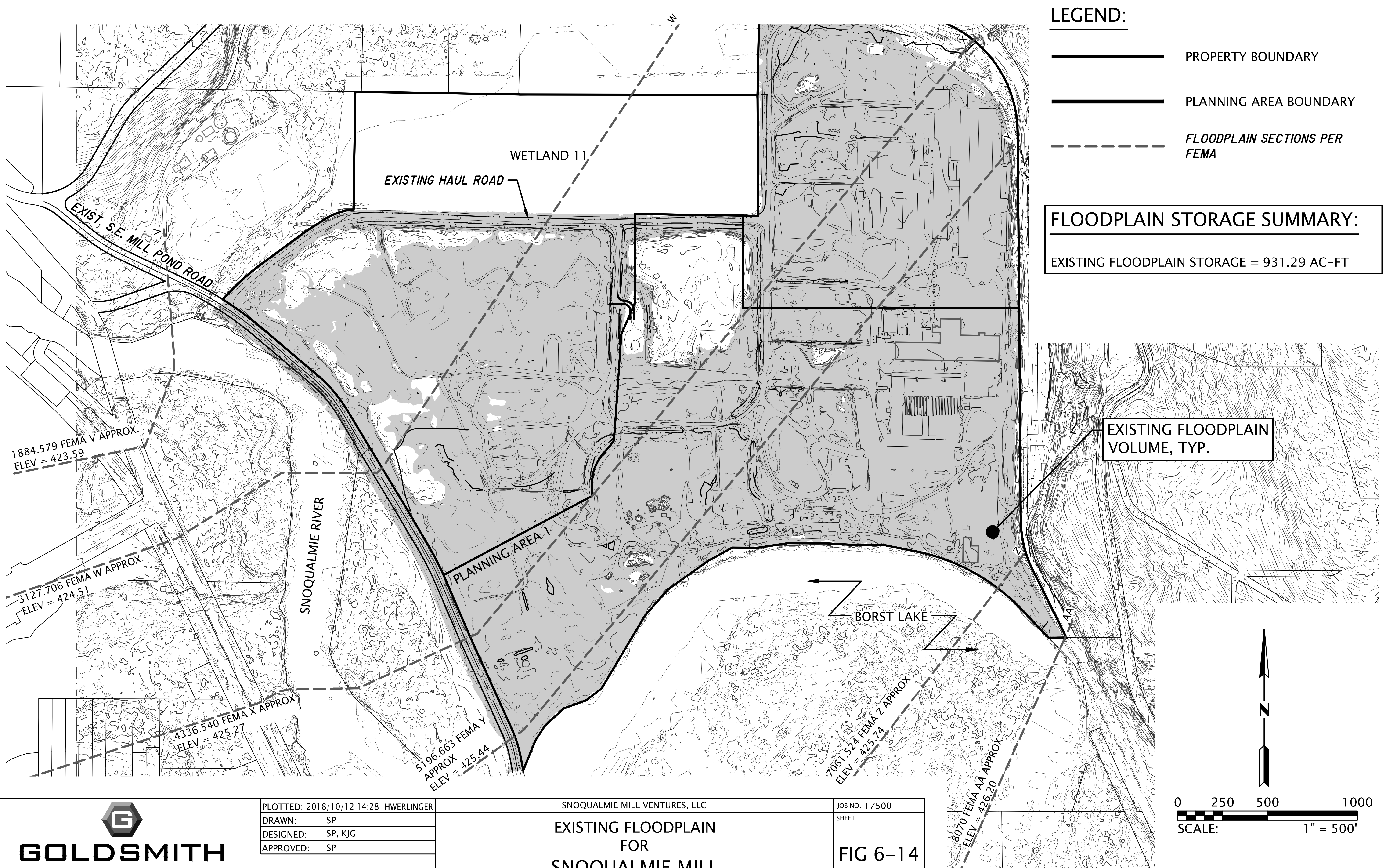
SNOQUALMIE MILL VENTURES, LLC

MASS GRADE CONCEPT
FOR
SNOQUALMIE MILL

CITY OF SNOQUALMIE WASHINGTON

JOB NO. 17500
SHEET
EX-04



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DRAWN: SP	EXISTING FLOODPLAIN FOR SNOQUALMIE MILL		SHEET FIG 6-14
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APPROVED: SP	CITY OF SNOQUALMIE	WASHINGTON	

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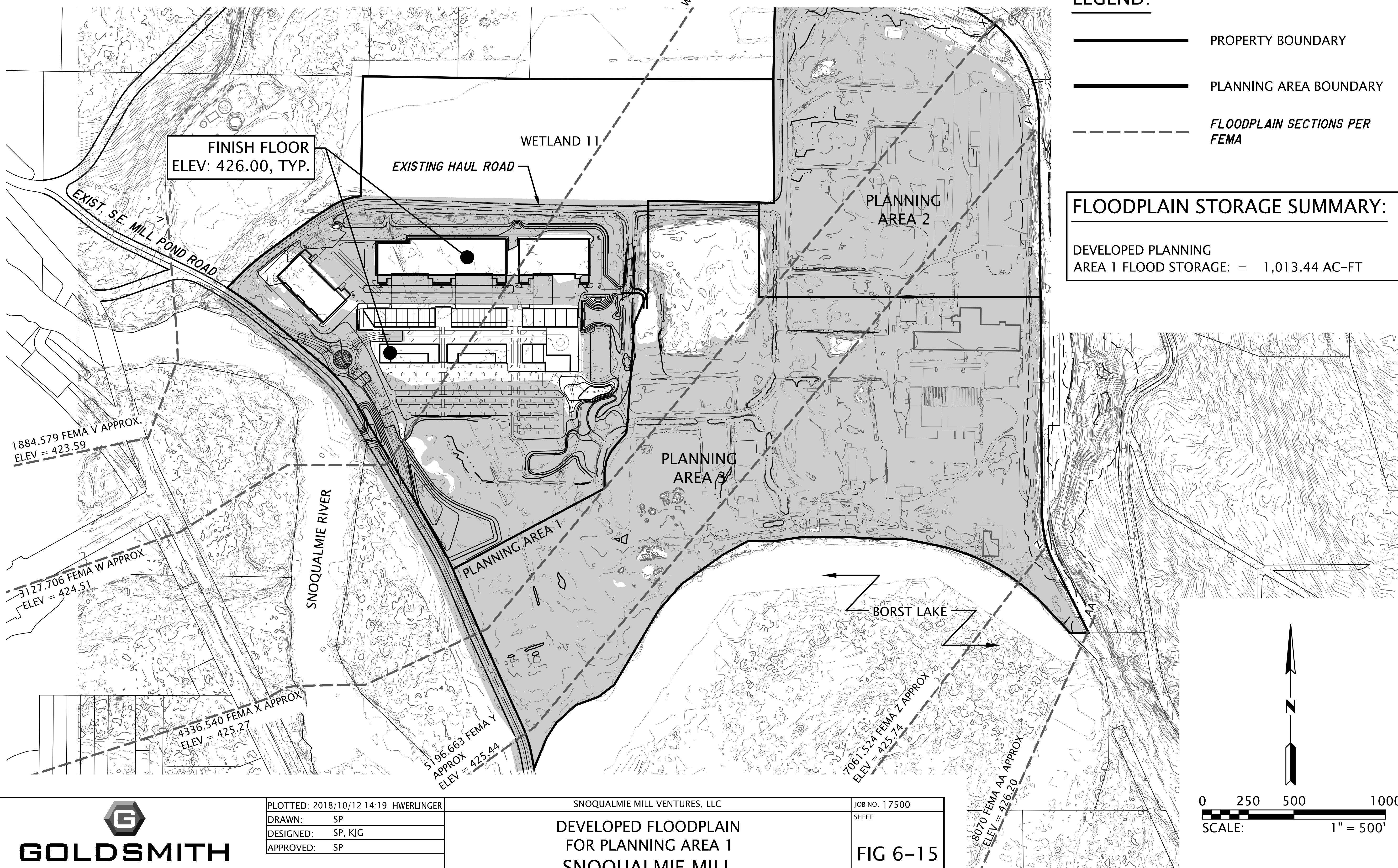

LEGEND:

PROPERTY BOUNDARY

PLANNING AREA BOUNDARY

FLOODPLAIN SECTIONS PER FEMA

FLOODPLAIN STORAGE SUMMARY:

DEVELOPED PLANNING
AREA 1 FLOOD STORAGE: = 1,013.44 AC-FT

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DESIGNED:	SP, KJG
APPROVED:	SP

SNOQUALMIE MILL VENTURES, LLC

DEVELOPED FLOODPLAIN FOR PLANNING AREA 1 SNOQUALMIE MILL

CITY OF SNOQUALMIE WASHINGTON

JOB NO. 17500

SHEET

FIG 6-15

Open Space Grading Concept

Grading concept in the central open space is proposed to provide compensating flood storage for proposed fill in Planning Areas 2 and 3. The ultimate plan for mass grading includes more than simply demonstrating that equivalent compensating storage has been provided in the floodplain. The open space grading is proposed in a manner to improve the path of floodwaters back to the river as the flood recedes.

Proposed grades for the future access to Planning Area 3 are such that low points are provided to allow flood waters to flow over the road whether a flood is rising or receding. Floodwater would enter the site from Borst Lake utilizing flood storage volumes on the site, then recede back over the road. However, in addition to receding back through Borst Lake, a drainage path / floodwater path is provided through the open space to the river discharge outfall to be constructed with Planning Area 1, as shown on **Figure 6-1 and Figure 6-13**.

Normal flows from site runoff provide hydrology to the site wetlands and drain through Borst Lake, but once 10 year river stages, or above, are reached, the flood level exceeds elevation 418.0 and would inundate and utilize the open space flood storage and flow path for receding waters.

Conclusion

The project level grading proposed for **Planning Area 1 will meet or exceed the requirements for compensating storage** required by SMC 15.12 and SMC 19.12. Minor adjustments in the "Finished Grade" of future development permitting should not require new analysis provided that these approximate grades are achieved.

The analysis demonstrates that **compensating storage can be achieved** for the planned development and the mass grading concept shown for Planning Areas 2 and 3 future development of Snoqualmie Mill.

During future permitting of site grading and building, analysis of consistency with the provision of compensating storage will be provided. One concept would be the creation of a tracking matrix with the initial mass grade plan with Planning Area 1 which would be used throughout the project.

No increase in Base Flood Elevation (BFE), i.e., the 100 year floodplain

The demonstration of no increase in base flood levels, or "no net rise" requires a Hydrologic and Hydraulic analysis performed for the Snoqualmie River base flood for both pre-development and post-development project conditions. This analysis was performed by ***Watershed Sciences and Engineering*** (WSE) and is provided in Chapter 8.

Flood flow models following FEMA protocol were created for:

- A Duplicate Effective Model – a duplicate model run from existing FEMA Models through this reach of the Snoqualmie River,
- A Corrected Effective Model – a model with modest corrections to ineffective flow areas or other geospatial data to achieve the reported BFE by FEMA,

- An Existing Conditions Model – with minor corrections to the Corrected Effective Model representing more accurate topographic information from 2016 King County LiDAR (PSLC 2017),
- Proposed Conditions Models – modifying the Existing Conditions Model to represent the Snoqualmie Mill PCIP, one model for Planning Area 1 proposed grading, and one model for the proposed Mass Grade Concept.

The detailed results are presented in Chapter 8, but it is clear that with the provision of compensating storage together with consideration of effective and non-effective flood flow areas the location of compensating storage, the effect on the floodplain would **not** result in any rise, i.e. **"no net rise"** in the FEMA Base Flood Elevation.

It should be noted, however, that the Proposed Conditions Model for the Mass Grade Concept **(Figure 6-13)** utilized the site grading concept discussed above under **Site Grading and Compensating Storage**. This provides an approximation of displacement of storage due to assumed fill conditions primarily in Planning Area 2 and minimal fill in Planning Area 3 with assumed raised buildings and ground floor parking. But it is demonstrated at this time that with the level of additional storage proposed for Planning Area 1, future application for development of Planning Areas 2 and 3 and through subsequent environmental review, achieving compensating storage and "no net rise" will be feasible.

It should be further noted that all the analysis and reporting of Base Flood Elevations (BFE) discussed above and in **Chapter 8** are based on the river conditions in the 2010 LOMR issued by FEMA. As such, all flood models for the "no net rise" analysis included only the channel improvements by the Corps of Engineers 205 project in the Duplicate and Corrected Effective models from which to analyze impacts from Snoqualmie Mill. This results in reporting base flood elevations consistent with the FEMA published BFE from the 2010 LOMR. As discussed in Chapter 5, the channel improvements and lowering of the PSE weir at Snoqualmie Falls are not included in these models.

Downstream Flooding Effects

As discussed in **Chapter 5** – **Existing Conditions and Downstream Analysis**, the King County Flood Control District initiated a Hydraulic and Hydrologic Study to investigate reported changes in flood conditions in the lower Snoqualmie Valley. In April of 2015 the **Snoqualmie River Hydraulic Study** was issued which included an evaluation the downstream impacts of both the Corps of Engineers 205 project as well as the PSE weir project.

The Snoqualmie River Hydraulic Study was prepared for King County by ***Watershed Sciences and Engineering*** (WSE). Therefore, for this MDP, WSE was asked to utilize King County's downstream river model to evaluate whether proposed grade changes on Snoqualmie Mill and any affects on the upstream floodplain could cause any probable adverse impact on the lower river valley.

The result is discussed in Chapter 8. It concludes that there would be no impact or measurable change in any flood event or the Base Flood in the lower river valley as a result of the development of Snoqualmie Mill in the manner proposed by the PCIP.

7. Summary of Mitigation Measures

Mitigating measures for water resources for purposes of the Environmental Impact Statement is divided between three separate reports and appendices: this MDP, the Soils and Geotechnical studies (AESI 2020) and the Critical Areas studies (Raedeke 2020).

Surface Water

Mitigation and control of surface water impacts provides the basis of mitigation and control of impacts to various other elements of the environment such as, groundwater, wetlands and streams and protection of water quality. A summary of the proposed drainage control measures which can be viewed as mitigation are as follows:

- Relatively low density of impervious surface coverage for the site creating a very low impact with approximately 59% open space (if landscaped, open space is excluded) and creating the ability to promote groundwater recharge,
- Treatment of runoff prior to discharge back to natural areas or receiving waters consistent with the 2016 KCSWDM to protect surface and groundwater quality,
- Utilizing stormwater wetlands for water quality treatment and dispersion, where feasible, to promote wildlife habitat and groundwater recharge,
- Maintaining hydrology to surface water dependent wetlands consistent with the 2016 KCSWDM Guide Sheet 3B,
- Control of flooding impacts by providing compensating flood storage in excess of existing flood storage across the site to insure a zero-rise impact on 100-year flood elevations,
- Creating a stormwater and flood flow outfall to the Snoqualmie River to promote a flow path of receding floodwaters back to the river to reduce potential property or roadway damage in future flood conditions,

Groundwater

Impacts and mitigations for protection of groundwater are primarily discussed in the Soils, Geology, Groundwater and Geologic Hazards report (AESI 2020) and include but are not limited to:

- Maintaining consistency of existing drainage patterns following development,
- Relatively low-density coverage of impervious surfaces with approximately 59% open space,
- Maintaining flows to surface water dependent wetlands and streams which provide recharge to the shallow aquifer,
- Additional recharge opportunities from constructed stormwater wetlands as part of the runoff treatment system for the site.

Critical Utilities

An element of the Flood Hazard Regulations and frequently flooded areas (SMC 15.12.150 and 19.12.150) is protection of critical utility infrastructure from flooding. Measures which will be taken in the design of utilities for Snoqualmie Mill include, but are not limited to:

- Design of water main facilities to minimize potential leaking or inflow from groundwater inundation. Materials and pipe connection systems would be reviewed by the City with development plans,

- Design of sanitary sewer systems to minimize potential infiltration and inflow from groundwater. Materials and pipe connection methods would be reviewed by the City with development plans,

- Site grading and sanitary sewer systems designed in such a manner that rim's (or tops) of manholes would lie above the 100-year base flood elevation of the Snoqualmie River and the moderate Channel Migration Zone (CMZ),

- Critical facilities (Lift Stations) would be located in areas recommended by the geotechnical engineer that can provide stable foundations, and would lie above the 100-year base flood elevation of the Snoqualmie River,

- Critical gravity utilities, primarily sanitary sewer, will be place on an engineered subgrade per the recommendation of the geotechnical engineer. This will likely consist of over-excavating utility trenches and preparing an engineered pipe bed foundation of geotextile fabric and/or rock or compacted imported bed material. Additionally, minimum pipe grades would be increased to a more conservative slope to account for potential settlement to ensure positive gravity drainage,

- Mill Pond Road realignment of critical infrastructure needed for ingress and egress to the site, and ensuring long term stability.

Construction Stormwater

Mitigation measures to avoid erosion during construction are listed below. These measures are not intended to replace or supersede other construction mitigation measures that may be identified by the during project design:

- An NPDES Permit for Stormwater Discharges Associated with Construction Activities would be obtained from Ecology.

- A Stormwater Pollution Prevention Plan (SWPPP) would be prepared as required by the NPDES permit and would be used and updated on-site as warranted, including monitoring requirements determined by Ecology for the permit.

- The major TESC measures (King County 2016 – CSWPP Plan) likely to occur in the NPDES permit would include (but are not limited to) the following:

- Marking the clearing limits (i.e., marking limits, critical areas and buffers on plans and in the field using plastic, metal, or stake wire fence);
- Installation of temporary construction access (stabilized entrances) and staging areas (i.e., limiting construction vehicles to points stabilized with quarry spall or rock with wheel wash;
- Road cleaning (i.e., street sweeping);
- Perimeter protection such as silt fencing when necessary (i.e., all perimeter areas no upslope of construction clearing) to intercept fine sediments and fencing or flagging of clearing limits;
- Soil stabilization: temporary or permanent cover such as seeding, mulching, sodding, plastic covering, erosion control fabrics and matting, to the soil, or gravel base, over disturbed areas or stockpiles to prevent erosion;
- Utilize an on-site TESC inspector;
- Treat runoff to remove sediment (e.g. sediment traps or ponds);
- Stabilize channels and outlets (i.e. armoring as necessary to prevent erosion or scour);
- Control of all pollutants on-site, including removal and legal disposal of construction waste or soils contaminated by construction activity or accidental spills;
- Accidental spill response plans, on-site clean-up materials storage, and worker training;
- Use of BMPs to prevent adverse pH affect from concrete work on the site or cause violation of water quality standards for pH in the receiving water (See section 3.2.2 below);
- Control of dewatering (flow rate and sediment control) into a controlled conveyance system to receiving waters (if clean and non-turbid), or retention for other purposes (i.e., dust control);
- Dust control: preventative measures to minimize wind transport of soil; and
- Maintenance and inspection of BMPs and TESC measures.

- Limiting work within existing functional wetland or stream buffer boundaries to the dry season avoiding November through February for this work where feasible.

Future Operations and Maintenance (O&M) Manuals

To ensure coordinated planning and operation of stormwater facilities, an O&M Manual should be provided to the City at the completion of each Phase of development and at the completion of the overall site, that summarizes the stormwater system operation and maintenance requirements.

8. Hydrologic Analysis

Chapter 8 provides details on the hydrologic analyses performed for Snoqualmie Mill related to the evaluations of impacts for:

- **The Maintenance of Wetland Hydrology, and**
- **Compliance with Flood Hazard Regulations**

Maintenance of Wetland Hydrology

Hydrology modeling was completed using the Western Washington Hydrologic Model (**WWHM**). The model used is WWHM 2012 released with the 2012/2014 Stormwater Manual for Western Washington, Washington State Dept of Ecology (Ecology Manual). WWHM uses the Environmental Protection Agency's (EPA) Hydrologic Simulation Program – FORTRAN (HSPF) software program for the continuous simulation of surfaces as well as a variety of water features (i.e. streams, wetlands and ponds). The program simulates the movement of water through a watershed allowing for the output of various time series including surface runoff, interflow, stream flows, water levels, etc. WWHM allows for detailed modeling of land surface types, the modeling of dispersed impervious areas. The model allows for the accounting of groundwater flows, however, for Snoqualmie Mill analysis only considers surface water and interflow to represent the maximum surface water impact.

The WWHM model structure (via HSPF) uses a complex lumped parameter approach to modeling hydrologic processes. Parameters are assigned based on the land surface types, i.e. forest, grass, impervious area, etc., along with soil characteristics and ground slopes. These surface types are then combined based on the area of each type within the watershed to describe a watersheds overall runoff characteristic. These parameters are used together with hydrometric data for the continuous simulation over a 50 year period of record.

Modeling has been performed for the following sub-basins; WL 28, WL 12W, WL 12NW, WL 12E, and WL 12C all draining to Wetland 12 and ultimately Stream 2 and Borst Lake. Pre-developed (existing) conditions and Post-developed conditions models were simulated using the sub-basin data on the Tables shown in Chapter 6.

The Ecology Manual and KCSWDM Guide Sheet 3B provide that additional volumes of water can flow into wetlands without causing a significant impact. The evaluation criteria, which are based on risk to the wetland, establish approximate limits on inflow volumes:

> ***Criteria 1:*** *Total volume of water into a wetland during a single precipitation event should not be more than 20% higher or lower than the pre-project volumes. Daily volumes are calculated over 50 years for pre-and post-project conditions*

> ***Criteria 2:*** *Total volume of water into a wetland on a monthly basis should not be more than 15% higher or lower than the pre-project volumes. This is calculated based on the average precipitation for each month of the year. This criterion is especially important for the summer months when a development may reduce monthly flows rather than increase them because of reduced infiltration and recharging of groundwater.*

Ecology Manual Appendix I-E criteria for maintenance of stream flow Hydrology states that:

> *The design will assure that flows delivered to Type 5* [in this case Stream 2] *stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow.*

Data provided in Appendices B-1 through B-5 provides the WWHM analysis for these wetlands and Stream 2 producing the results presented in Chapter 6 **Figures 6-5** through **Figure 6-10**.

Compliance with Flood Hazard Regulations

Hydrologic and Hydraulic Modeling of the Snoqualmie River Base Flood was performed by Watershed Science and Engineering and is presented in their March 2018 Technical Memorandum below:

Technical Memorandum

To: Keith Goldsmith, Goldsmith Engineering

From: Colin Butler & Larry Karpack, Watershed Science & Engineering

Date: March 28, 2018

Re: Snoqualmie Mill PCIP – No Net Rise Hydraulic Analysis

Introduction

Watershed Science & Engineering (WSE) was retained by Goldsmith Engineering (Goldsmith) to evaluate the impacts of a proposed development of Snoqualmie Mill near Borst Lake in the City of Snoqualmie (City) on base flood elevations (BFEs) within the 100-year floodplain of the Snoqualmie River. This analysis will be used to ensure project compliance with the Flood Hazard Regulations and Critical Areas chapters of the Snoqualmie Municipal Code (SMC 15.12 and SMC 19.12, respectively), both of which state that:

> *"No encroachment, including fill, new construction, substantial improvement or other development shall be permitted within the floodway unless certification by a registered professional engineer is provided demonstrating through hydrologic and hydraulic analysis performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels during the occurrence of the base flood discharge."* – SMC 15.12.170 (A), SMC 19.12.150 (B)

The following memo describes the hydraulic analysis completed by WSE to evaluate the effects of topographic changes associated with the proposed development on Snoqualmie River BFEs. Results of the analysis demonstrate that neither the Planning Area 1 phase, nor the Mass Grading assumptions of the full development of the PCIP will cause a rise in BFEs.

Hydraulic Analysis

The effective FEMA hydraulic models for the Mill Pond project site consist of two separate HEC-RAS 1D steady state models: One covering the reach from SR-202 upstream of Snoqualmie Falls to just downstream of Meadowbrook Bridge (XS 8760) and a second covering the reach from just downstream of Meadowbrook Bridge to the confluence of the South Fork Snoqualmie River (see Figure 1). The SR-202 to Meadowbrook model was updated by Northwest Hydraulic Consultants (NHC) for a Letter of Map Revision (LOMR) request on behalf of the City in 2010. That model originally extended up to the South Fork, but the model was truncated due to issues tying the modeling in to the upstream effective FEMA mapping (cross sections in the truncated model are shown in red in Figure 1). The Meadowbrook to South Fork model (blue cross sections in Figure 1) was developed by Harper Hauf Righellis (HHR) for King County in the late 1990s, became effective in 2005, and was not updated by NHC in 2010. Hydrologic inputs from the 2010 NHC modeling were maintained for this modeling effort. The topographic surface for baseline existing conditions modeling (without the proposed project) was obtained from 2016 King County LiDAR data Delivery 4 Block 2 (PSLC, 2017). Topographic surfaces for the Planning Area 1 and full Mass Grading assumptions were provided by Goldsmith in LandXML format and converted to ESRI raster grid for use in the hydraulic analysis.

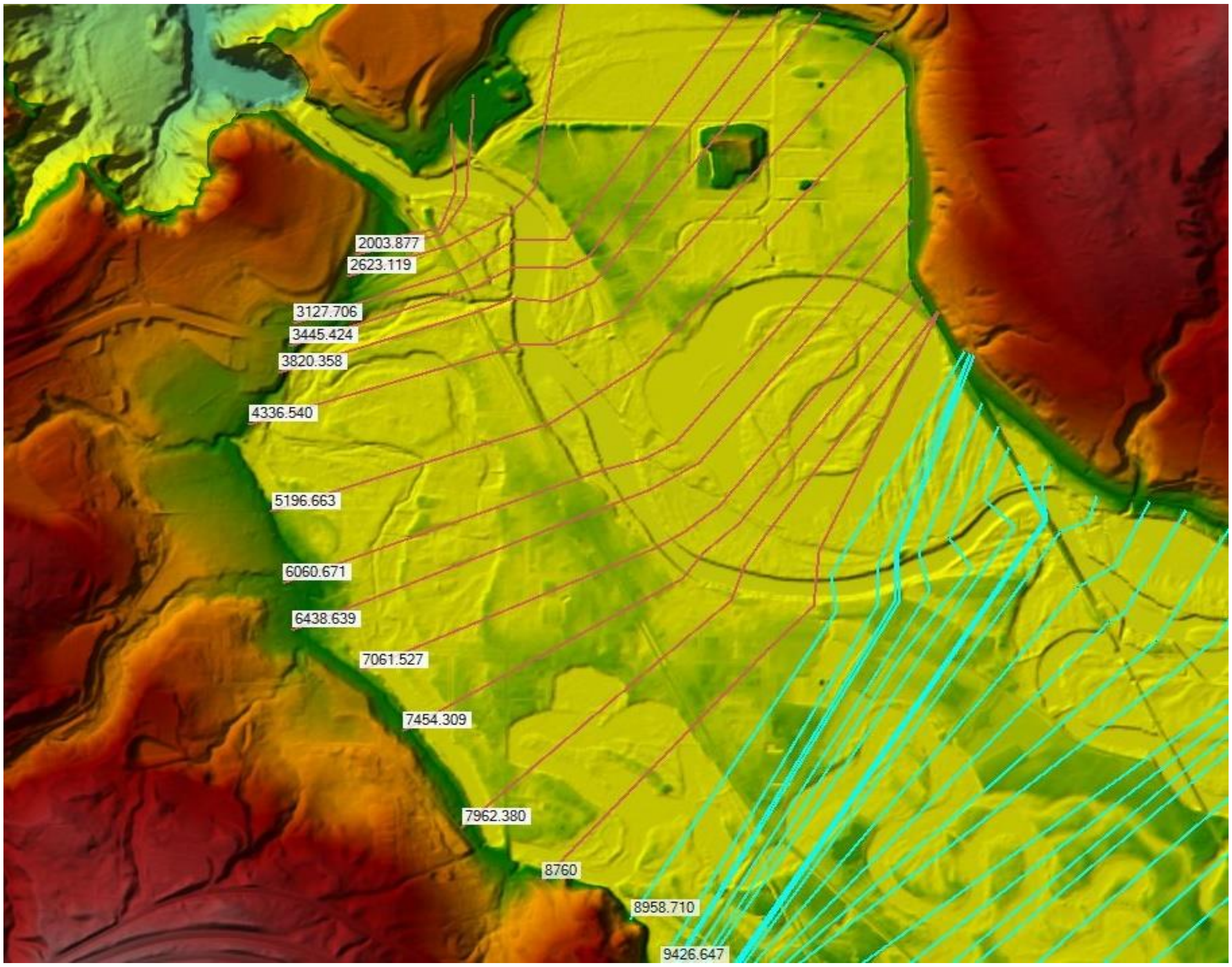

Figure 1 - HEC-RAS cross section layout from combined 2010 downstream NHC model (Red) and 1990s upstream HHR model (Blue)

Model Revisions

The "Duplicate Effective" FEMA model was created for this project by merging the two effective FEMA hydraulic models described above into a single HEC-RAS 1D model covering the Snoqualmie River from SR-202 to the South Fork. During the process of merging these models it was found that the cross section stationing in the HEC-RAS model geometry file differed by up to 15% from the length of the cross section cut lines, the ineffective flow areas were not always properly specified, and the river bank stations had not been properly located. Correcting these issues produced the "Corrected Effective" model with cross section stationing and geospatial cut lines adjusted to be consistent, and ineffective flow areas and river bank stations corrected.

An Existing Conditions model was then developed to facilitate comparisons with the proposed development conditions. The overbank topography used in the Duplicate and Corrected Effective models was updated using more recent and higher resolution topographic data from the 2016 King County LiDAR (PSLC, 2017). No new bathymetric survey data were available, so the overbank data were merged with channel data from the Corrected Effective model (between the bank stations) to represent current pre-project conditions using the best available information. Minor updates to the ineffective flow areas and bank stations from the Corrected Effective model were also made to accurately represent the new topography in the Existing Conditions model.

Proposed Conditions models were then created for the Planning Area 1 and full Mass Grading conditions following a similar process as the Existing Conditions model creation. Topographic surfaces for the Planning Area 1 and Mass Grading conditions were provided by Goldsmith, and cross section station/elevation data were cut from the surfaces in the overbank (i.e. outside the active river channel) for each condition while maintaining the previous channel geometry. Figures showing model cross sections with the existing and proposed condition geometries are provided in Appendix A. Minor updates to ineffective flow areas from the Existing Conditions model were made to account for topographic changes in the proposed development.

No Net Rise Results

The Duplicate and Corrected Effective models were run for the 100-year flood event under steady state conditions. The results of these runs are compared to the published effective FEMA BFEs in Table 1 below (FEMA, 2010). Note that the comparisons shown in Table 1 are limited to differences of tenths of a foot because the FEMA BFEs were published at that resolution. The comparisons in Table 1 show that the Duplicate effective model matches the FEMA BFEs exactly and the Corrected Effective Model matches the effective model within +/- 0.1 feet. The no net rise comparisons shown later in this document are made at a higher resolution of 0.01 feet as is typical of net rise analyses.

Table 1 – HEC-RAS results from Duplicate and Corrected Effective models compared to published FEMA BFEs (FEMA, 2010)

Location	Cross Section	FEMA LOMR BFEs (ft - NAVD88)	Duplicate Effective Elevation (ft - NAVD88)	Duplicate Effective Rise (ft)	Corrected Effective Elevation (ft - NAVD88)	Corrected Effective Rise (ft)
FEMA V Approx	1884.579	423.6	423.6	0.0	423.6	0.0
	2003.877		423.8		423.8	
	2623.119		423.7		423.7	
FEMA W	3127.706	424.5	424.5	0.0	424.5	0.0
	3445.424		425.0		425.0	
	3820.358		425.2		425.2	
FEMA X Approx	4336.54	425.3	425.3	0.0	425.3	0.0
FEMA Y Approx	5196.663	425.5	425.5	0.0	425.4	-0.1
	6060.671		425.6		425.6	
	6438.639		425.7		425.7	
FEMA Z Approx	7061.527	425.8	425.8	0.0	425.7	-0.1
	7454309		425.8		425.8	
	7962.38		426.0		426.0	
FEMA AA	8760	426.2	426.2	0.0	426.2	0.0
	8958.71		426.1		426.0	
	9426.647		426.1		426.1	
	9619.686		426.2		426.2	
FEMA AB/KC	9655.878	426.5	426.5	0.0	426.4	-0.1

The Existing Conditions, Planning Area 1 Proposed Condition, and Mass Grading Proposed Condition models were then run for the 100-year flood event under steady state conditions. The results of these runs are summarized in Table 2, and an example model output for the 100-year flood event under Existing Conditions can be seen in Figure 2. As shown in Table 2, simulated water surface elevations from the two Proposed Condition models are equal to those from the Existing Conditions model at all locations/conditions except one. The only deviation from the Existing Conditions water surface elevations is a 0.01 foot decrease in water surface elevation at Cross Section 6438.639 when comparing the proposed Mass Grading condition to Existing Conditions.

Table 2 - HEC-RAS results for all conditions and No Net Rise comparisons for the proposed conditions

Location	Cross Section	Existing Conditions (ft - NAVD88)	Planning Area 1 Condition		Mass Grading Condition	
			Proposed (ft - NAVD88)	Rise (ft)	Proposed (ft - NAVD88)	Rise (ft)
FEMA V Approx	1884.579	423.59	423.59	0.00	423.59	0.00
	2003.877	424.11	424.11	0.00	424.11	0.00
	2623.119	424.09	424.09	0.00	424.09	0.00
FEMA W Approx	3127.706	424.64	424.64	0.00	424.64	0.00
	3445.424	424.95	424.95	0.00	424.95	0.00
	3820.358	424.94	424.94	0.00	424.94	0.00
FEMA X Approx	4336.54	425.20	425.20	0.00	425.20	0.00
FEMA Y Approx	5196.663	425.35	425.35	0.00	425.35	0.00
	6060.671	425.58	425.58	0.00	425.58	0.00
	6438.639	425.62	425.62	0.00	425.61	-0.01
FEMA Z Approx	7061.527	425.72	425.72	0.00	425.72	0.00
	7454309	425.83	425.83	0.00	425.83	0.00
	7962.38	426.11	426.11	0.00	426.11	0.00
FEMA AA Approx	8760	426.33	426.33	0.00	426.33	0.00
	8958.71	426.32	426.32	0.00	426.32	0.00
	9426.647	426.39	426.39	0.00	426.39	0.00
	9619.686	426.39	426.39	0.00	426.39	0.00
FEMA AB/KC 278	9655.878	426.58	426.58	0.00	426.58	0.00

Downstream Assessment

Cross sections from the Existing Conditions, Proposed Planning Area 1 and Mass Grading Condition models representing the project area were then used to update the model geometry of a HEC-RAS 1D unsteady state split-flow model of the Snoqualmie River, previously developed by WSE for King County to evaluate the effects of projects upstream of Snoqualmie Falls on downstream flooding (WSE, 2016). This downstream model extends from upstream of the confluence of the South Fork Snoqualmie River at its upstream end to approximately NE 124th St in Duvall at its downstream end. This additional modeling was conducted to ensure that the proposed development did not have any impact on downstream flooding. The results of the downstream modeling, shown in Table 3 below, indicate that there will be no increase in downstream flooding and, in fact, the Planning Area 1 Condition will lower water surface elevations by approximately 0.01 feet at three of the five locations evaluated in the earlier WSE study. The proposed mass grading condition results in no change in downstream water levels.

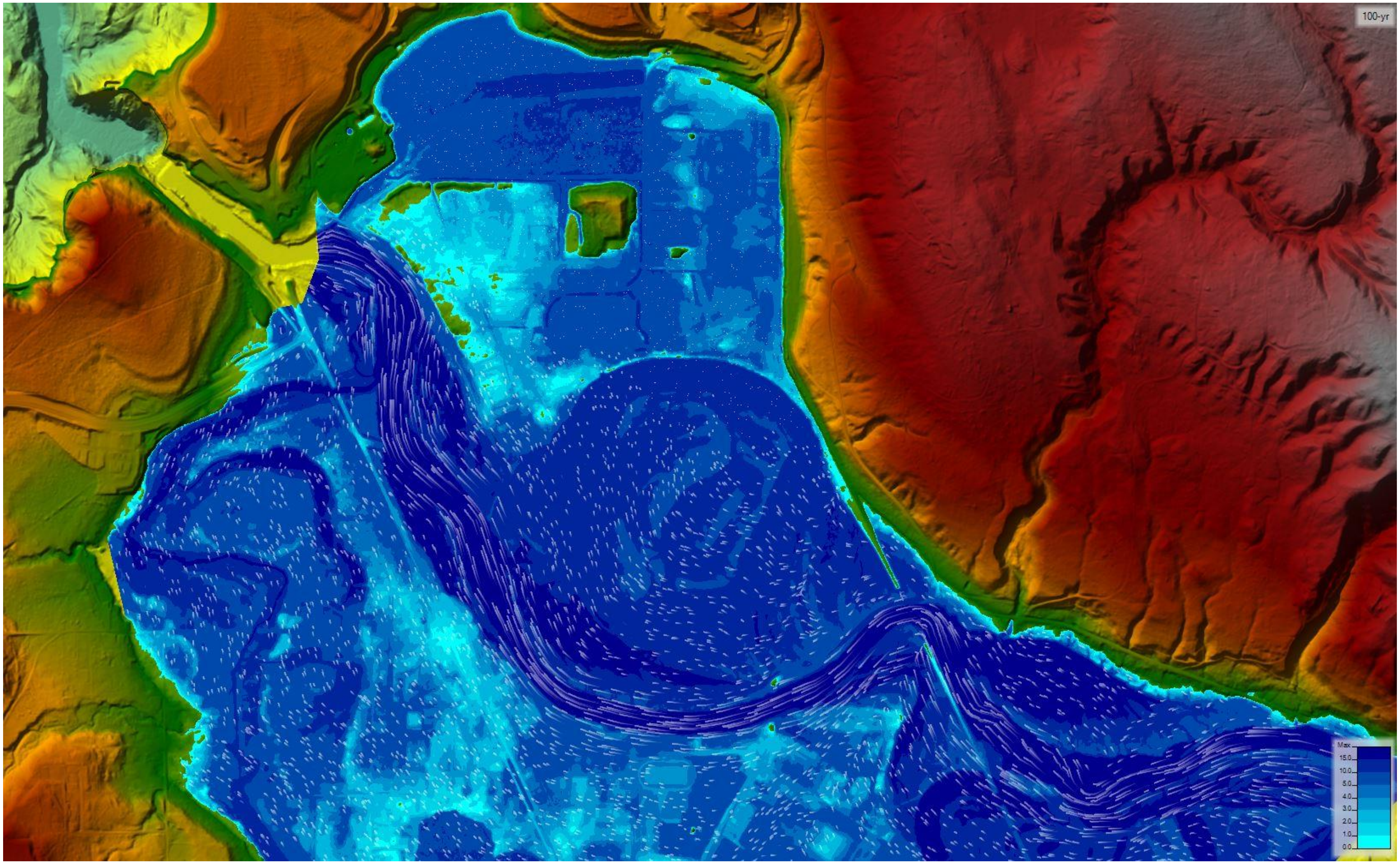

Figure 2 - 100-year Existing Conditions flood depth with flow velocity vectors shown in white

Table 3 - HEC-RAS results for all conditions from the WSE split-flow 1D HEC-RAS Snoqualmie River Model at previously evaluated locations and No Net Rise comparisons for the proposed conditions (WSE, 2016)

Location	River Mile	Existing Conditions (ft - NAVD 88)	Planning Area 1 Condition		Mass Grading Condition	
			Proposed (ft - NAVD 88)	Rise (ft)	Proposed (ft - NAVD 88)	Rise (ft)
PSE Weir	39.14	414.16	414.15	-0.01	414.16	0.00
Fall City Near Golf Courses	35.23	103.70	103.70	0.00	103.70	0.00
Patterson Creek	28.00	81.02	81.02	0.00	81.02	0.00
Below Tolt River Confluence	23.21	74.19	74.18	-0.01	74.19	0.00
City of Duvall	12.40	52.57	52.56	-0.01	52.57	0.00

Summary

HEC-RAS steady state hydraulic modeling was conducted to demonstrate that the proposed Snoqualmie Mill development will not cause a rise in upstream water surface elevations in the Snoqualmie River. Duplicate Effective, Corrected Effective, Existing Conditions, and Proposed Condition models were developed and run for the 100-year flood event with results shown in Table 1 and Table 2. The Proposed Planning Area 1 and Mass Grading Condition model results did not show a rise in water surface elevation at any cross section when compared to the Existing Conditions model results.

WSE also updated and ran an unsteady state HEC-RAS model of the Snoqualmie River to evaluate potential downstream water level impacts. The proposed Phase 1 and Mass Grading Condition model results showed no increase in downstream water levels at any of the specified cross sections when compared to the Existing Conditions model results.

References

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PSLC & QSI Corvallis (2017). *PSLC King County 2016-2017 LiDAR* [Raster]. Seattle: Puget Sound LiDAR Consortium (PSLC).

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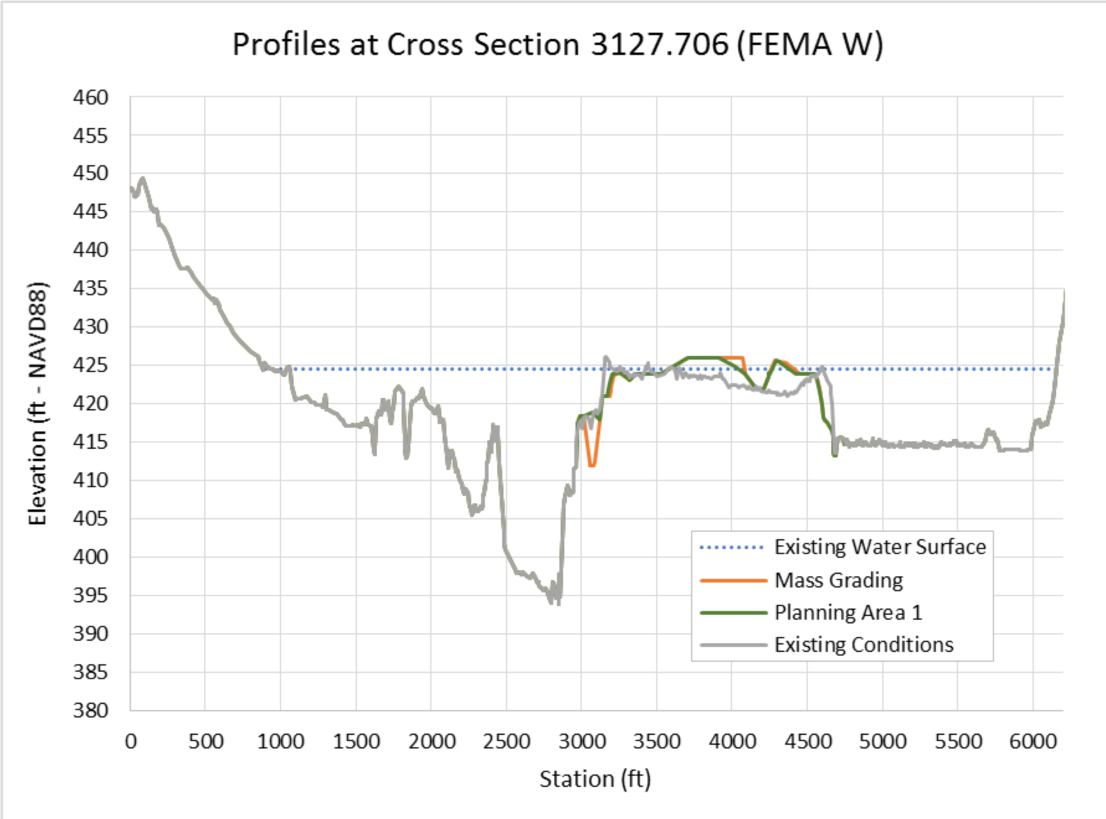
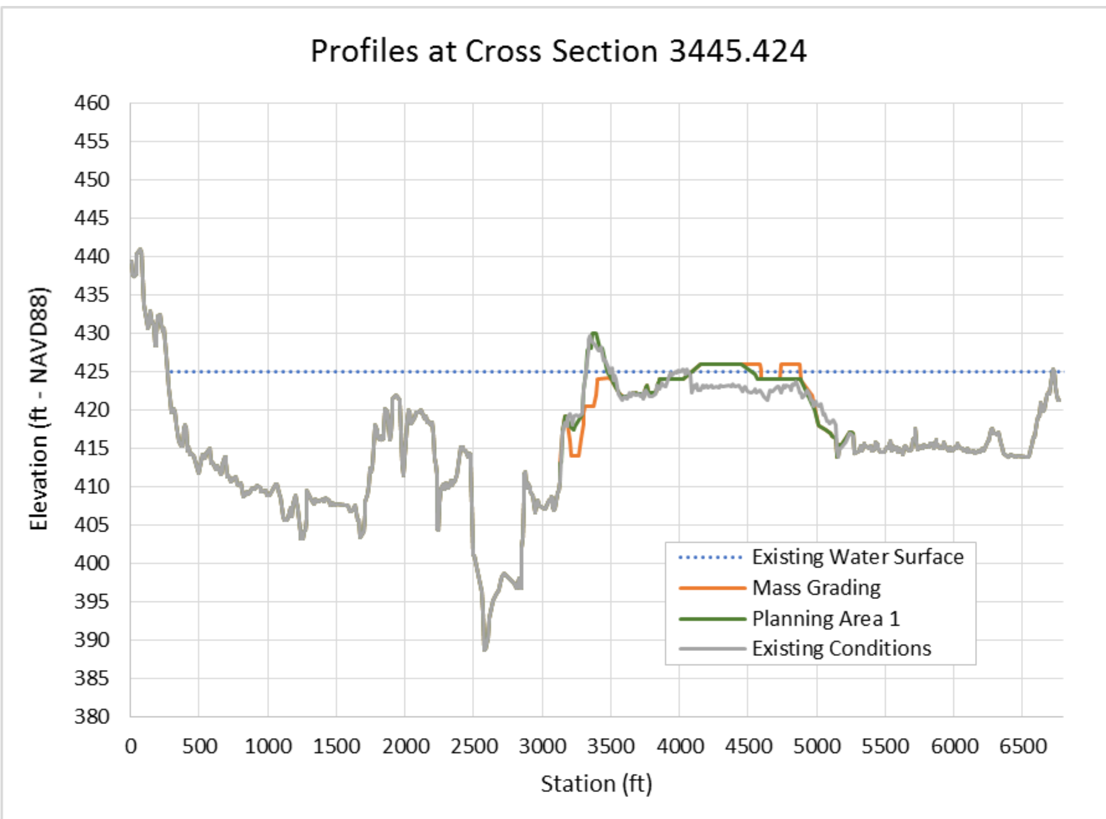
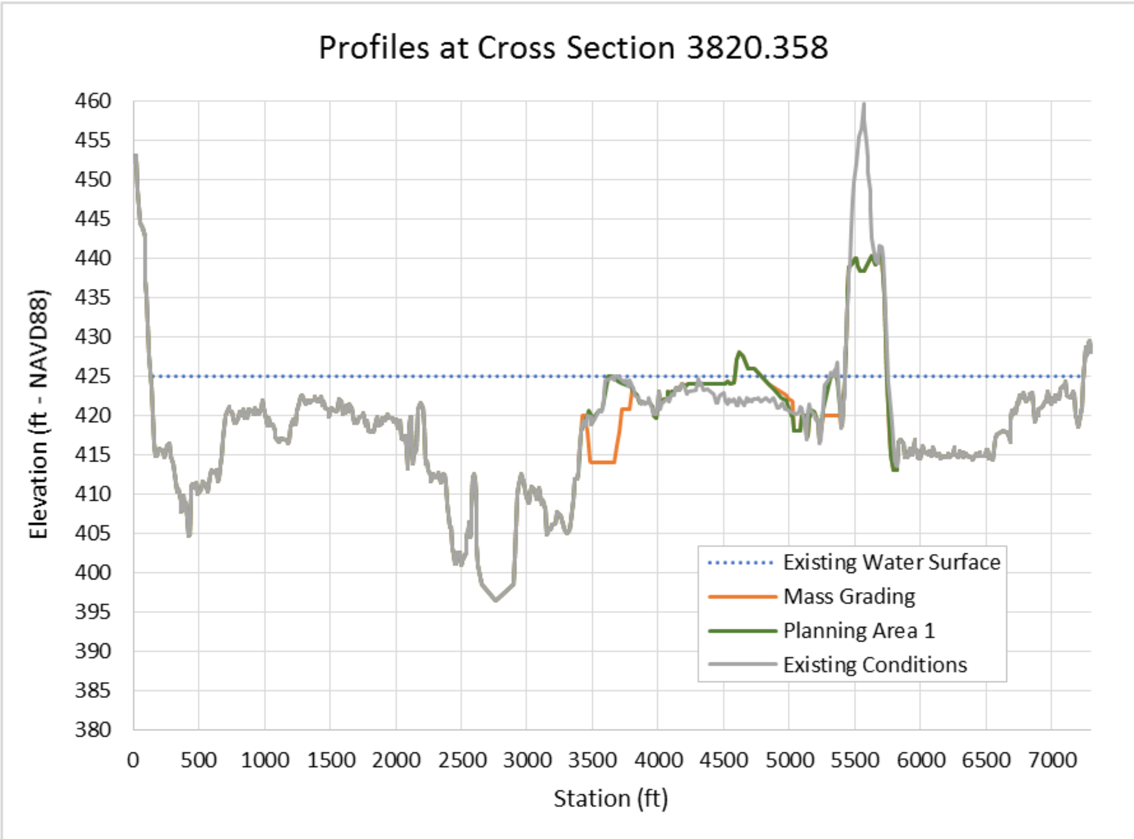
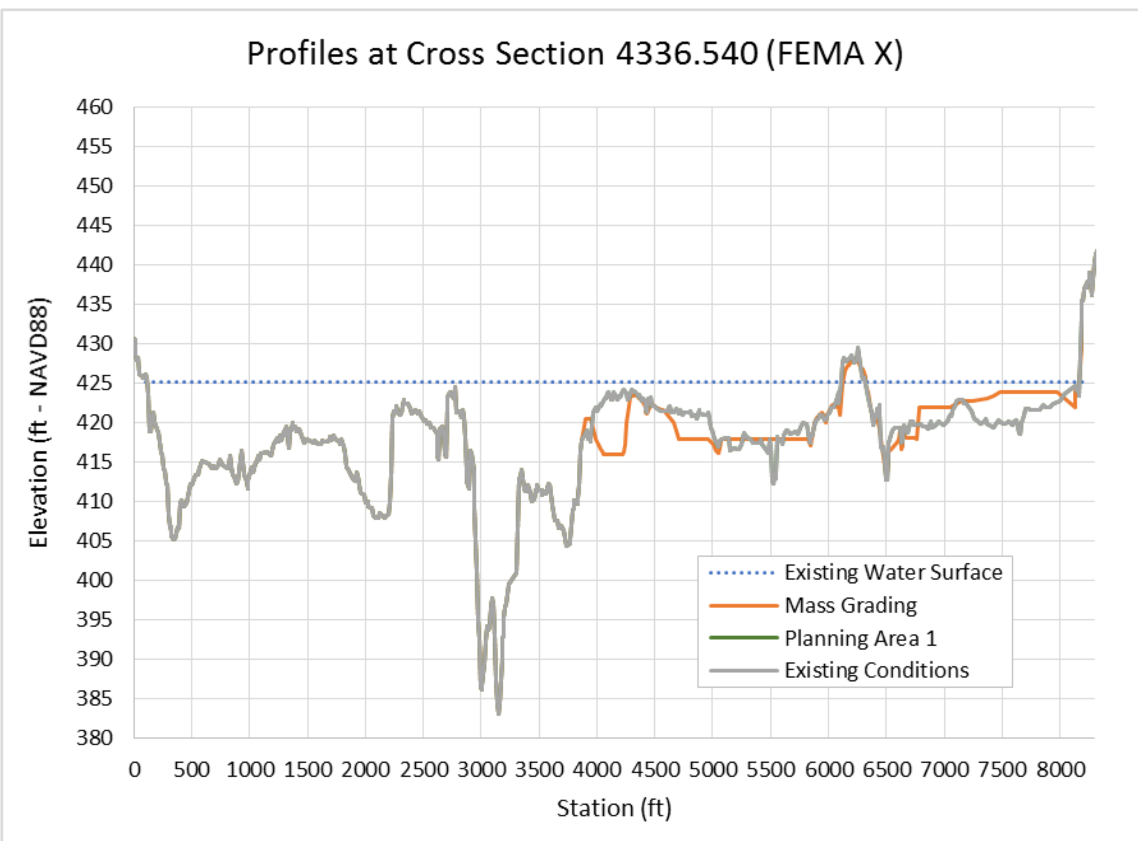
Appendix A

Figures showing terrain profiles for Existing Conditions, Planning Area 1, and Mass Grading models with Existing Conditions water surface elevation overlaid for Cross Sections 3127.706, 3445.424, 3820.358, and 4336.540.


Profiles at Cross Section 3127.706 (FEMA W)
Elevation (ft - NAVD88)
Station (ft)
Existing Water Surface
Mass Grading
Planning Area 1
Existing Conditions


Profiles at Cross Section 3445.424
Elevation (ft - NAVD88)
Station (ft)
Existing Water Surface
Mass Grading
Planning Area 1
Existing Conditions


Profiles at Cross Section 3820.358
Elevation (ft - NAVD88)
460
455
450
445
440
435
430
425
420
415
410
405
400
395
390
385
380
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
Station (ft)
Existing Water Surface
Mass Grading
Planning Area 1
Existing Conditions


Profiles at Cross Section 4336.540 (FEMA X)
Elevation (ft - NAVD88)
460
455
450
445
440
435
430
425
420
415
410
405
400
395
390
385
380
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
Station (ft)
Existing Water Surface
Mass Grading
Planning Area 1
Existing Conditions

Appendix B-1

Wetland 28 WWHM Analysis

WWHM2012
PROJECT REPORT

Project Name: 17500 WL 28
Site Name:
Site Address:
City :
Report Date: 1/24/2020
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.29
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 : Exist. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.702
C, Lawn, Flat	.423
Pervious Total	4.125

Impervious Land Use	acre
Impervious Total	0
Basin Total	4.125

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1

Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000
0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000

0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

MITIGATED LAND USE

Name : Dev. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	**3.802**
C, Lawn, Flat	**.715**
Pervious Total	**4.517**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**4.517**

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1
Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000

0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000
0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000
0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000

0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

ANALYSIS RESULTS

Stream Protection Duration

NOTE: FLOW DURATION ANALYSIS IDENTIFIES EXISTING AND MITIGATED FLOWS BUT IS NOT INDICATIVE OF THE PROJECT'S COMPLIANCE WITH FLOW DURATION REQUIREMENTS INTO BORST LAKE. DURATIONS ARE ONLY INCLUDED TO IDENTIFY FLOW RATES

Predeveloped Landuse Totals for POC #1
Total Pervious Area:4.125
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:4.517
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.405265
5 year	0.790285
10 year	1.162269
25 year	1.80454
50 year	2.436316
100 year	3.226448

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.48702
5 year	0.943196
10 year	1.381652
25 year	2.135452
50 year	2.874178
100 year	3.795312

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.443	0.560
1950	1.110	1.308
1951	0.552	0.671
1952	0.235	0.278
1953	0.185	0.243
1954	0.398	0.509
1955	0.355	0.412
1956	0.352	0.418
1957	0.307	0.362
1958	0.197	0.220
1959	0.273	0.315
1960	0.338	0.378
1961	0.270	0.298
1962	0.163	0.193
1963	0.314	0.396
1964	1.579	1.827
1965	0.343	0.428
1966	0.138	0.166
1967	0.229	0.268
1968	0.279	0.317
1969	0.735	0.915
1970	0.207	0.246
1971	0.427	0.516
1972	0.441	0.511
1973	0.213	0.243
1974	0.258	0.323
1975	0.454	0.573
1976	0.371	0.444
1977	0.109	0.140
1978	0.337	0.375
1979	0.194	0.214
1980	0.357	0.396
1981	0.649	0.782
1982	0.246	0.289
1983	0.344	0.382
1984	0.869	1.036
1985	0.218	0.253
1986	0.296	0.331
1987	1.550	1.800
1988	0.253	0.281
1989	0.238	0.288
1990	0.638	0.773
1991	1.338	1.569
1992	0.998	1.200

1993	0.230	0.264
1994	0.198	0.376
1995	0.371	0.461
1996	1.030	1.208
1997	3.107	3.661
1998	0.449	0.555
1999	1.511	1.838
2000	0.414	0.530
2001	0.145	0.214
2002	1.011	1.218
2003	0.672	0.811
2004	1.330	1.654
2005	0.552	0.661
2006	0.511	0.607
2007	2.255	2.588
2008	1.554	1.801
2009	0.744	0.898

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	3.1066	3.6606
2	2.2555	2.5880
3	1.5789	1.8379
4	1.5540	1.8266
5	1.5496	1.8008
6	1.5106	1.8002
7	1.3379	1.6539
8	1.3298	1.5695
9	1.1101	1.3076
10	1.0297	1.2176
11	1.0109	1.2082
12	0.9982	1.2003
13	0.8692	1.0357
14	0.7441	0.9147
15	0.7346	0.8982
16	0.6716	0.8114
17	0.6493	0.7817
18	0.6384	0.7728
19	0.5519	0.6714
20	0.5518	0.6608
21	0.5114	0.6068
22	0.4536	0.5728
23	0.4494	0.5604
24	0.4432	0.5553
25	0.4414	0.5298
26	0.4268	0.5159
27	0.4141	0.5108
28	0.3984	0.5085
29	0.3709	0.4606
30	0.3708	0.4440
31	0.3573	0.4279
32	0.3549	0.4181
33	0.3523	0.4119
34	0.3437	0.3957
35	0.3426	0.3957

36	0.3380	0.3817
37	0.3368	0.3781
38	0.3137	0.3761
39	0.3073	0.3753
40	0.2961	0.3622
41	0.2791	0.3315
42	0.2728	0.3233
43	0.2696	0.3175
44	0.2576	0.3149
45	0.2526	0.2978
46	0.2462	0.2891
47	0.2378	0.2882
48	0.2348	0.2807
49	0.2302	0.2782
50	0.2286	0.2679
51	0.2185	0.2641
52	0.2127	0.2533
53	0.2074	0.2455
54	0.1978	0.2432
55	0.1973	0.2429
56	0.1940	0.2202
57	0.1854	0.2141
58	0.1633	0.2140
59	0.1449	0.1931
60	0.1385	0.1658
61	0.1091	0.1398

Stream Protection Duration
POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2026	10004	13588	135	Fail
0.2252	6968	9764	140	Fail
0.2478	5080	7114	140	Fail
0.2703	3692	5279	142	Fail
0.2929	2680	3985	148	Fail
0.3154	1968	2988	151	Fail
0.3380	1523	2203	144	Fail
0.3606	1213	1754	144	Fail
0.3831	993	1402	141	Fail
0.4057	794	1164	146	Fail
0.4283	649	971	149	Fail
0.4508	505	800	158	Fail
0.4734	410	662	161	Fail
0.4959	354	537	151	Fail
0.5185	277	445	160	Fail
0.5411	229	381	166	Fail
0.5636	191	322	168	Fail
0.5862	170	268	157	Fail
0.6088	147	221	150	Fail
0.6313	129	193	149	Fail
0.6539	118	170	144	Fail
0.6764	108	154	142	Fail

0.6990	96	137	142	Fail
0.7216	86	129	150	Fail
0.7441	74	126	170	Fail
0.7667	67	117	174	Fail
0.7893	66	109	165	Fail
0.8118	63	105	166	Fail
0.8344	60	94	156	Fail
0.8569	56	82	146	Fail
0.8795	50	74	148	Fail
0.9021	47	71	151	Fail
0.9246	42	68	161	Fail
0.9472	39	65	166	Fail
0.9698	35	62	177	Fail
0.9923	34	59	173	Fail
1.0149	28	56	200	Fail
1.0374	27	53	196	Fail
1.0600	26	50	192	Fail
1.0826	26	48	184	Fail
1.1051	23	45	195	Fail
1.1277	22	40	181	Fail
1.1503	21	38	180	Fail
1.1728	21	36	171	Fail
1.1954	21	30	142	Fail
1.2179	21	28	133	Fail
1.2405	20	26	130	Fail
1.2631	17	25	147	Fail
1.2856	16	24	150	Fail
1.3082	14	23	164	Fail
1.3308	13	22	169	Fail
1.3533	11	21	190	Fail
1.3759	11	21	190	Fail
1.3984	11	21	190	Fail
1.4210	11	21	190	Fail
1.4436	11	21	190	Fail
1.4661	10	20	200	Fail
1.4887	9	17	188	Fail
1.5113	7	16	228	Fail
1.5338	7	13	185	Fail
1.5564	5	13	260	Fail
1.5789	5	12	240	Fail
1.6015	4	12	300	Fail
1.6241	4	12	300	Fail
1.6466	4	12	300	Fail
1.6692	4	11	275	Fail
1.6918	4	11	275	Fail
1.7143	4	10	250	Fail
1.7369	4	10	250	Fail
1.7594	3	8	266	Fail
1.7820	3	8	266	Fail
1.8046	3	6	200	Fail
1.8271	3	5	166	Fail
1.8497	3	4	133	Fail
1.8723	3	4	133	Fail
1.8948	3	4	133	Fail
1.9174	3	4	133	Fail
1.9399	3	4	133	Fail
1.9625	3	4	133	Fail

1.9851	3	3	100	Pass
2.0076	3	3	100	Pass
2.0302	3	3	100	Pass
2.0528	3	3	100	Pass
2.0753	3	3	100	Pass
2.0979	3	3	100	Pass
2.1204	3	3	100	Pass
2.1430	3	3	100	Pass
2.1656	3	3	100	Pass
2.1881	3	3	100	Pass
2.2107	3	3	100	Pass
2.2333	3	3	100	Pass
2.2558	3	3	100	Pass
2.2784	2	3	150	Fail
2.3009	2	3	150	Fail
2.3235	2	3	150	Fail
2.3461	2	3	150	Fail
2.3686	2	3	150	Fail
2.3912	2	3	150	Fail
2.4138	2	3	150	Fail
2.4363	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 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.**

Wetlands Input Volume
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	2.8947	3.1736	109.6	Pass
Feb	2.1220	2.3212	109.4	Pass
Mar	1.9378	2.1194	109.4	Pass
Apr	1.4013	1.5316	109.3	Pass
May	0.8424	0.9217	109.4	Pass
Jun	0.6575	0.7224	109.9	Pass
Jul	0.3680	0.4033	109.6	Pass
Aug	0.2719	0.3035	111.6	Pass
Sep	0.3326	0.3787	113.9	Pass
Oct	0.7504	0.8546	113.9	Pass
Nov	2.2260	2.4731	111.1	Pass
Dec	2.6936	2.9623	110.0	Pass

Day	Series 1	Series 2	Percent	Pass/Fail
Jan1	0.0949	0.1044	110.0	Pass
2	0.0962	0.1054	109.7	Pass
3	0.0908	0.0996	109.7	Pass
4	0.1004	0.1102	109.7	Pass
5	0.0993	0.1089	109.7	Pass
6	0.1075	0.1184	110.1	Pass
7	0.1063	0.1165	109.6	Pass
8	0.1029	0.1130	109.8	Pass
9	0.0926	0.1013	109.4	Pass
10	0.0850	0.0930	109.5	Pass
11	0.0843	0.0924	109.6	Pass
12	0.0850	0.0931	109.6	Pass
13	0.0956	0.1049	109.8	Pass
14	0.0945	0.1036	109.7	Pass
15	0.0916	0.1004	109.7	Pass
16	0.0974	0.1069	109.8	Pass
17	0.0927	0.1016	109.5	Pass
18	0.0937	0.1026	109.6	Pass
19	0.0907	0.0995	109.6	Pass
20	0.0901	0.0988	109.6	Pass
21	0.0872	0.0955	109.5	Pass
22	0.0969	0.1063	109.7	Pass
23	0.1049	0.1152	109.8	Pass
24	0.1038	0.1137	109.5	Pass
25	0.0899	0.0985	109.5	Pass
26	0.0864	0.0946	109.4	Pass
27	0.0822	0.0899	109.4	Pass
28	0.0868	0.0950	109.5	Pass
29	0.0955	0.1046	109.6	Pass
30	0.0879	0.0963	109.5	Pass
31	0.0876	0.0959	109.4	Pass
Feb1	0.0783	0.0856	109.3	Pass
2	0.0726	0.0793	109.3	Pass
3	0.0686	0.0749	109.2	Pass
4	0.0610	0.0665	109.0	Pass
5	0.0625	0.0683	109.3	Pass
6	0.0720	0.0787	109.4	Pass
7	0.0801	0.0877	109.5	Pass

8	0.0879	0.0963	109.6	Pass
9	0.0796	0.0868	109.1	Pass
10	0.0704	0.0769	109.1	Pass
11	0.0744	0.0814	109.4	Pass
12	0.0759	0.0831	109.4	Pass
13	0.0687	0.0751	109.4	Pass
14	0.0723	0.0792	109.5	Pass
15	0.0784	0.0860	109.7	Pass
16	0.0794	0.0868	109.4	Pass
17	0.0772	0.0846	109.5	Pass
18	0.0935	0.1027	109.8	Pass
19	0.0871	0.0953	109.4	Pass
20	0.0772	0.0844	109.4	Pass
21	0.0714	0.0780	109.3	Pass
22	0.0665	0.0726	109.2	Pass
23	0.0739	0.0809	109.5	Pass
24	0.0746	0.0815	109.4	Pass
25	0.0677	0.0740	109.2	Pass
26	0.0683	0.0747	109.4	Pass
27	0.0744	0.0815	109.5	Pass
28	0.0777	0.0848	109.2	Pass
29	0.0715	0.0782	109.4	Pass
Mar1	0.0672	0.0734	109.3	Pass
2	0.0745	0.0818	109.7	Pass
3	0.0755	0.0825	109.3	Pass
4	0.0724	0.0792	109.4	Pass
5	0.0615	0.0671	109.1	Pass
6	0.0594	0.0648	109.2	Pass
7	0.0564	0.0617	109.2	Pass
8	0.0694	0.0761	109.6	Pass
9	0.0684	0.0749	109.5	Pass
10	0.0659	0.0721	109.5	Pass
11	0.0706	0.0774	109.6	Pass
12	0.0666	0.0728	109.4	Pass
13	0.0618	0.0676	109.3	Pass
14	0.0632	0.0692	109.4	Pass
15	0.0620	0.0678	109.4	Pass
16	0.0635	0.0695	109.5	Pass
17	0.0619	0.0678	109.4	Pass
18	0.0625	0.0682	109.2	Pass
19	0.0555	0.0605	109.1	Pass
20	0.0498	0.0543	109.1	Pass
21	0.0538	0.0588	109.4	Pass
22	0.0628	0.0687	109.5	Pass
23	0.0641	0.0702	109.5	Pass
24	0.0643	0.0703	109.4	Pass
25	0.0610	0.0667	109.4	Pass
26	0.0565	0.0617	109.3	Pass
27	0.0537	0.0587	109.3	Pass
28	0.0551	0.0602	109.4	Pass
29	0.0550	0.0601	109.3	Pass
30	0.0523	0.0571	109.2	Pass
31	0.0516	0.0564	109.4	Pass
Apr1	0.0521	0.0570	109.5	Pass
2	0.0527	0.0575	109.3	Pass
3	0.0546	0.0598	109.5	Pass
4	0.0604	0.0660	109.4	Pass

5	0.0561	0.0613	109.3	Pass
6	0.0474	0.0517	109.1	Pass
7	0.0442	0.0482	109.1	Pass
8	0.0491	0.0536	109.3	Pass
9	0.0475	0.0519	109.2	Pass
10	0.0511	0.0559	109.3	Pass
11	0.0506	0.0554	109.4	Pass
12	0.0543	0.0594	109.5	Pass
13	0.0517	0.0565	109.4	Pass
14	0.0473	0.0518	109.3	Pass
15	0.0507	0.0555	109.4	Pass
16	0.0486	0.0532	109.4	Pass
17	0.0421	0.0459	109.1	Pass
18	0.0449	0.0492	109.5	Pass
19	0.0484	0.0528	109.2	Pass
20	0.0389	0.0424	109.0	Pass
21	0.0362	0.0395	109.0	Pass
22	0.0446	0.0489	109.7	Pass
23	0.0468	0.0512	109.2	Pass
24	0.0401	0.0438	109.1	Pass
25	0.0339	0.0369	109.0	Pass
26	0.0378	0.0413	109.3	Pass
27	0.0385	0.0420	109.2	Pass
28	0.0388	0.0424	109.4	Pass
29	0.0404	0.0442	109.3	Pass
30	0.0369	0.0403	109.2	Pass
May1	0.0363	0.0397	109.4	Pass
2	0.0369	0.0403	109.2	Pass
3	0.0305	0.0332	108.9	Pass
4	0.0311	0.0339	109.2	Pass
5	0.0306	0.0334	109.3	Pass
6	0.0280	0.0305	109.1	Pass
7	0.0253	0.0276	109.0	Pass
8	0.0253	0.0275	108.9	Pass
9	0.0254	0.0277	109.4	Pass
10	0.0284	0.0310	109.1	Pass
11	0.0257	0.0280	109.1	Pass
12	0.0295	0.0322	109.1	Pass
13	0.0297	0.0324	109.2	Pass
14	0.0269	0.0294	109.3	Pass
15	0.0279	0.0305	109.4	Pass
16	0.0256	0.0280	109.4	Pass
17	0.0259	0.0283	109.4	Pass
18	0.0270	0.0295	109.2	Pass
19	0.0267	0.0291	109.2	Pass
20	0.0232	0.0254	109.3	Pass
21	0.0221	0.0242	109.4	Pass
22	0.0215	0.0235	109.2	Pass
23	0.0223	0.0245	109.8	Pass
24	0.0242	0.0266	109.7	Pass
25	0.0244	0.0269	110.0	Pass
26	0.0247	0.0272	110.2	Pass
27	0.0247	0.0272	110.0	Pass
28	0.0242	0.0266	110.2	Pass
29	0.0235	0.0260	110.4	Pass
30	0.0282	0.0310	110.2	Pass
31	0.0303	0.0333	110.0	Pass

Jun1	0.0291	0.0319	109.4	Pass
2	0.0262	0.0287	109.5	Pass
3	0.0261	0.0286	109.8	Pass
4	0.0235	0.0259	110.0	Pass
5	0.0237	0.0261	110.1	Pass
6	0.0295	0.0323	109.8	Pass
7	0.0264	0.0291	110.3	Pass
8	0.0273	0.0298	109.4	Pass
9	0.0263	0.0289	110.0	Pass
10	0.0238	0.0262	109.9	Pass
11	0.0230	0.0253	110.1	Pass
12	0.0212	0.0233	109.7	Pass
13	0.0201	0.0221	109.7	Pass
14	0.0181	0.0198	109.5	Pass
15	0.0202	0.0222	109.8	Pass
16	0.0233	0.0258	110.7	Pass
17	0.0224	0.0244	108.9	Pass
18	0.0193	0.0210	109.0	Pass
19	0.0192	0.0211	109.5	Pass
20	0.0190	0.0209	109.7	Pass
21	0.0169	0.0185	109.6	Pass
22	0.0168	0.0186	110.8	Pass
23	0.0247	0.0274	110.8	Pass
24	0.0218	0.0239	109.6	Pass
25	0.0172	0.0189	109.5	Pass
26	0.0149	0.0163	109.7	Pass
27	0.0152	0.0168	110.3	Pass
28	0.0167	0.0185	110.6	Pass
29	0.0152	0.0167	110.3	Pass
30	0.0164	0.0181	110.5	Pass
Jul1	0.0152	0.0168	110.5	Pass
2	0.0149	0.0165	110.4	Pass
3	0.0135	0.0148	109.8	Pass
4	0.0139	0.0153	110.1	Pass
5	0.0137	0.0150	109.5	Pass
6	0.0131	0.0142	109.0	Pass
7	0.0140	0.0155	110.5	Pass
8	0.0164	0.0181	110.3	Pass
9	0.0151	0.0166	109.8	Pass
10	0.0136	0.0150	109.8	Pass
11	0.0139	0.0152	109.9	Pass
12	0.0168	0.0185	110.1	Pass
13	0.0143	0.0156	109.4	Pass
14	0.0123	0.0135	109.3	Pass
15	0.0113	0.0124	109.9	Pass
16	0.0110	0.0121	110.2	Pass
17	0.0111	0.0122	109.5	Pass
18	0.0101	0.0110	108.8	Pass
19	0.0095	0.0104	108.5	Pass
20	0.0093	0.0101	108.6	Pass
21	0.0093	0.0101	109.2	Pass
22	0.0090	0.0098	108.8	Pass
23	0.0088	0.0096	108.4	Pass
24	0.0088	0.0095	108.3	Pass
25	0.0089	0.0097	109.0	Pass
26	0.0090	0.0099	110.2	Pass
27	0.0089	0.0097	109.3	Pass

28	0.0087	0.0095	108.9	Pass
29	0.0086	0.0093	108.5	Pass
30	0.0085	0.0092	108.5	Pass
31	0.0089	0.0097	108.9	Pass
Aug1	0.0086	0.0094	108.8	Pass
2	0.0086	0.0094	108.9	Pass
3	0.0086	0.0094	109.2	Pass
4	0.0083	0.0091	109.3	Pass
5	0.0081	0.0088	108.8	Pass
6	0.0087	0.0096	110.8	Pass
7	0.0094	0.0105	111.7	Pass
8	0.0085	0.0094	110.2	Pass
9	0.0081	0.0088	109.5	Pass
10	0.0080	0.0088	109.4	Pass
11	0.0081	0.0088	109.8	Pass
12	0.0077	0.0084	109.1	Pass
13	0.0080	0.0089	110.8	Pass
14	0.0093	0.0105	113.6	Pass
15	0.0091	0.0102	112.3	Pass
16	0.0085	0.0095	112.0	Pass
17	0.0084	0.0094	112.4	Pass
18	0.0081	0.0090	111.1	Pass
19	0.0084	0.0094	111.7	Pass
20	0.0082	0.0093	112.9	Pass
21	0.0084	0.0095	113.9	Pass
22	0.0096	0.0110	114.6	Pass
23	0.0102	0.0119	116.3	Pass
24	0.0101	0.0117	115.4	Pass
25	0.0105	0.0121	115.2	Pass
26	0.0102	0.0115	112.6	Pass
27	0.0092	0.0103	111.8	Pass
28	0.0089	0.0099	111.8	Pass
29	0.0089	0.0100	111.9	Pass
30	0.0084	0.0094	111.9	Pass
31	0.0093	0.0105	113.5	Pass
Sep1	0.0127	0.0145	114.5	Pass
2	0.0104	0.0116	111.8	Pass
3	0.0097	0.0110	113.7	Pass
4	0.0091	0.0103	113.3	Pass
5	0.0090	0.0102	113.9	Pass
6	0.0082	0.0092	112.3	Pass
7	0.0090	0.0101	112.3	Pass
8	0.0090	0.0103	114.0	Pass
9	0.0095	0.0109	114.9	Pass
10	0.0100	0.0114	114.4	Pass
11	0.0103	0.0117	113.4	Pass
12	0.0095	0.0108	113.2	Pass
13	0.0088	0.0099	112.6	Pass
14	0.0085	0.0096	113.6	Pass
15	0.0096	0.0110	114.3	Pass
16	0.0178	0.0204	114.3	Pass
17	0.0160	0.0182	113.4	Pass
18	0.0133	0.0152	114.0	Pass
19	0.0118	0.0134	113.6	Pass
20	0.0101	0.0114	113.2	Pass
21	0.0115	0.0132	114.9	Pass
22	0.0156	0.0177	113.9	Pass

23	0.0141	0.0161	114.0	Pass
24	0.0114	0.0131	114.6	Pass
25	0.0119	0.0137	114.8	Pass
26	0.0119	0.0134	112.7	Pass
27	0.0112	0.0128	114.1	Pass
28	0.0107	0.0122	114.8	Pass
29	0.0126	0.0148	116.8	Pass
30	0.0128	0.0147	115.2	Pass
Oct1	0.0134	0.0154	114.6	Pass
2	0.0124	0.0143	114.9	Pass
3	0.0121	0.0139	114.9	Pass
4	0.0133	0.0154	115.0	Pass
5	0.0162	0.0185	113.9	Pass
6	0.0154	0.0177	114.7	Pass
7	0.0177	0.0203	115.0	Pass
8	0.0238	0.0273	114.5	Pass
9	0.0283	0.0322	113.6	Pass
10	0.0235	0.0266	113.2	Pass
11	0.0175	0.0199	113.7	Pass
12	0.0157	0.0180	114.8	Pass
13	0.0138	0.0159	115.1	Pass
14	0.0159	0.0185	116.0	Pass
15	0.0177	0.0204	115.5	Pass
16	0.0192	0.0221	115.4	Pass
17	0.0234	0.0268	114.3	Pass
18	0.0251	0.0287	114.4	Pass
19	0.0373	0.0431	115.6	Pass
20	0.0392	0.0440	112.2	Pass
21	0.0335	0.0378	113.0	Pass
22	0.0305	0.0345	113.3	Pass
23	0.0278	0.0314	113.3	Pass
24	0.0286	0.0324	113.2	Pass
25	0.0300	0.0343	114.3	Pass
26	0.0315	0.0360	114.0	Pass
27	0.0381	0.0432	113.5	Pass
28	0.0399	0.0449	112.6	Pass
29	0.0382	0.0429	112.2	Pass
30	0.0385	0.0435	112.8	Pass
31	0.0390	0.0440	112.8	Pass
Nov1	0.0433	0.0486	112.3	Pass
2	0.0480	0.0540	112.5	Pass
3	0.0657	0.0740	112.8	Pass
4	0.0623	0.0695	111.6	Pass
5	0.0649	0.0729	112.2	Pass
6	0.0692	0.0769	111.2	Pass
7	0.0622	0.0692	111.2	Pass
8	0.0577	0.0644	111.5	Pass
9	0.0561	0.0627	111.8	Pass
10	0.0668	0.0748	112.0	Pass
11	0.0761	0.0851	111.7	Pass
12	0.0747	0.0834	111.6	Pass
13	0.0785	0.0874	111.4	Pass
14	0.0649	0.0720	110.9	Pass
15	0.0628	0.0698	111.1	Pass
16	0.0680	0.0756	111.2	Pass
17	0.0755	0.0841	111.3	Pass
18	0.0782	0.0866	110.8	Pass

19	0.0905	0.1002	110.8	Pass
20	0.0954	0.1056	110.7	Pass
21	0.0836	0.0924	110.5	Pass
22	0.0787	0.0872	110.8	Pass
23	0.1017	0.1125	110.7	Pass
24	0.1103	0.1221	110.7	Pass
25	0.1026	0.1131	110.3	Pass
26	0.0921	0.1015	110.3	Pass
27	0.0824	0.0909	110.3	Pass
28	0.0848	0.0934	110.1	Pass
29	0.0902	0.0994	110.2	Pass
30	0.0904	0.0998	110.4	Pass
Dec1	0.1027	0.1134	110.4	Pass
2	0.1212	0.1342	110.7	Pass
3	0.1073	0.1179	109.9	Pass
4	0.0895	0.0984	109.9	Pass
5	0.0891	0.0980	109.9	Pass
6	0.0793	0.0872	110.0	Pass
7	0.0718	0.0789	110.0	Pass
8	0.0727	0.0800	110.1	Pass
9	0.0806	0.0887	110.0	Pass
10	0.0861	0.0948	110.1	Pass
11	0.0892	0.0982	110.1	Pass
12	0.0907	0.0999	110.2	Pass
13	0.0969	0.1069	110.3	Pass
14	0.1059	0.1165	110.1	Pass
15	0.0954	0.1048	109.8	Pass
16	0.0837	0.0919	109.8	Pass
17	0.0746	0.0818	109.7	Pass
18	0.0724	0.0795	109.9	Pass
19	0.0801	0.0880	109.8	Pass
20	0.0846	0.0929	109.9	Pass
21	0.0801	0.0880	109.8	Pass
22	0.0789	0.0866	109.8	Pass
23	0.0794	0.0872	109.8	Pass
24	0.0740	0.0812	109.8	Pass
25	0.0820	0.0900	109.8	Pass
26	0.0948	0.1045	110.2	Pass
27	0.0847	0.0928	109.5	Pass
28	0.0844	0.0927	109.8	Pass
29	0.0921	0.1011	109.8	Pass
30	0.0789	0.0864	109.5	Pass
31	0.0817	0.0896	109.7	Pass

LID Report

```
LID Technique                  Used for    Total Volume   Volume    Infiltration  Cumulative
Percent     Water Quality  Percent      Comment
                              Treatment?  Needs          Through   Volume        Volume
Volume                     Water Quality
                                          Treatment      Facility  (ac-ft.)       Infiltration
Infiltrated                Treated
                                          (ac-ft)        (ac-ft)                 Credit
WL 28 Channel POC                  N      1008.38                                      N
0.00
Total Volume Infiltrated                  1008.38        0.00      0.00
0.00        0.00           0%            No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Failed
```

Perlnd and Implnd Changes

No changes have been made.

Appendix B-2

Wetland 12W WWHM Analysis

WWHM2012
PROJECT REPORT

Project Name: 17500 WL 12W
Site Name:
Site Address:
City :
Report Date: 1/24/2020
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.29
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 : Exist. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.702
C, Lawn, Flat	.423
Pervious Total	**4.125**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**4.125**

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1
Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12W Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000

0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000
0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

Name : Exist. WL 12W
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**8.616**
C, Lawn, Flat	**5.698**
Pervious Total	**14.314**

Impervious Land Use	**acre**
ROADS FLAT	**2.601**
Impervious Total	**2.601**
Basin Total	**16.915**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12W Channel	WL 12W Channel	WL 12W Channel

Name : WL 12W Channel
Bottom Length: 830.00 ft.
Bottom Width: 2.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.012 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:

Outlet 1	**Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.038	0.000	0.000	0.000
0.0222	0.039	0.000	0.019	0.000
0.0444	0.041	0.001	0.061	0.000
0.0667	0.043	0.002	0.121	0.000
0.0889	0.044	0.003	0.196	0.000
0.1111	0.046	0.004	0.287	0.000
0.1333	0.048	0.005	0.392	0.000
0.1556	0.050	0.006	0.510	0.000
0.1778	0.051	0.008	0.642	0.000
0.2000	0.053	0.009	0.788	0.000

0.2222	0.055	0.010	0.947	0.000
0.2444	0.056	0.011	1.119	0.000
0.2667	0.058	0.012	1.305	0.000
0.2889	0.060	0.014	1.504	0.000
0.3111	0.061	0.015	1.716	0.000
0.3333	0.063	0.016	1.942	0.000
0.3556	0.065	0.018	2.182	0.000
0.3778	0.066	0.019	2.436	0.000
0.4000	0.068	0.021	2.704	0.000
0.4222	0.070	0.022	2.985	0.000
0.4444	0.072	0.024	3.281	0.000
0.4667	0.073	0.026	3.592	0.000
0.4889	0.075	0.027	3.916	0.000
0.5111	0.077	0.029	4.256	0.000
0.5333	0.078	0.031	4.610	0.000
0.5556	0.080	0.032	4.980	0.000
0.5778	0.082	0.034	5.364	0.000
0.6000	0.083	0.036	5.764	0.000
0.6222	0.085	0.038	6.180	0.000
0.6444	0.087	0.040	6.611	0.000
0.6667	0.088	0.042	7.058	0.000
0.6889	0.090	0.044	7.522	0.000
0.7111	0.092	0.046	8.001	0.000
0.7333	0.094	0.048	8.497	0.000
0.7556	0.095	0.050	9.009	0.000
0.7778	0.097	0.052	9.538	0.000
0.8000	0.099	0.054	10.08	0.000
0.8222	0.100	0.057	10.64	0.000
0.8444	0.102	0.059	11.22	0.000
0.8667	0.104	0.061	11.82	0.000
0.8889	0.105	0.064	12.44	0.000
0.9111	0.107	0.066	13.07	0.000
0.9333	0.109	0.068	13.72	0.000
0.9556	0.110	0.071	14.39	0.000
0.9778	0.112	0.073	15.08	0.000
1.0000	0.114	0.076	15.79	0.000
1.0222	0.116	0.078	16.51	0.000
1.0444	0.117	0.081	17.25	0.000
1.0667	0.119	0.084	18.02	0.000
1.0889	0.121	0.086	18.80	0.000
1.1111	0.122	0.089	19.60	0.000
1.1333	0.124	0.092	20.42	0.000
1.1556	0.126	0.094	21.26	0.000
1.1778	0.127	0.097	22.12	0.000
1.2000	0.129	0.100	23.00	0.000
1.2222	0.131	0.103	23.90	0.000
1.2444	0.133	0.106	24.82	0.000
1.2667	0.134	0.109	25.77	0.000
1.2889	0.136	0.112	26.73	0.000
1.3111	0.138	0.115	27.71	0.000
1.3333	0.139	0.118	28.72	0.000
1.3556	0.141	0.121	29.74	0.000
1.3778	0.143	0.124	30.79	0.000
1.4000	0.144	0.128	31.86	0.000
1.4222	0.146	0.131	32.95	0.000
1.4444	0.148	0.134	34.06	0.000
1.4667	0.149	0.137	35.19	0.000

1.4889	0.151	0.141	36.35	0.000
1.5111	0.153	0.144	37.53	0.000
1.5333	0.155	0.148	38.73	0.000
1.5556	0.156	0.151	39.95	0.000
1.5778	0.158	0.155	41.20	0.000
1.6000	0.160	0.158	42.46	0.000
1.6222	0.161	0.162	43.76	0.000
1.6444	0.163	0.165	45.07	0.000
1.6667	0.165	0.169	46.41	0.000
1.6889	0.166	0.173	47.77	0.000
1.7111	0.168	0.176	49.16	0.000
1.7333	0.170	0.180	50.57	0.000
1.7556	0.171	0.184	52.01	0.000
1.7778	0.173	0.188	53.46	0.000
1.8000	0.175	0.192	54.95	0.000
1.8222	0.177	0.196	56.46	0.000
1.8444	0.178	0.199	57.99	0.000
1.8667	0.180	0.203	59.54	0.000
1.8889	0.182	0.208	61.13	0.000
1.9111	0.183	0.212	62.73	0.000
1.9333	0.185	0.216	64.37	0.000
1.9556	0.187	0.220	66.02	0.000
1.9778	0.188	0.224	67.71	0.000
2.0000	0.190	0.228	69.42	0.000
2.0222	0.192	0.232	71.15	0.000

MITIGATED LAND USE

Name : Dev. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.802
C, Lawn, Flat	.715
Pervious Total	4.517

Impervious Land Use	acre
Impervious Total	0
Basin Total	4.517

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : Dev. WL 12W
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	6.585
C, Lawn, Flat	2.469
Pervious Total	9.054

Impervious Land Use	acre
ROADS FLAT	5.423
Impervious Total	5.423
Basin Total	14.477

Element Flows To:

Surface	Interflow	Groundwater
WL 12W Channel	WL 12W Channel	WL 12W Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1
Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12W Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000

0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000
0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

Name : WL 12W Channel
Bottom Length: 830.00 ft.
Bottom Width: 2.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.012 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.038	0.000	0.000	0.000
0.0222	0.039	0.000	0.019	0.000
0.0444	0.041	0.001	0.061	0.000
0.0667	0.043	0.002	0.121	0.000
0.0889	0.044	0.003	0.196	0.000
0.1111	0.046	0.004	0.287	0.000
0.1333	0.048	0.005	0.392	0.000
0.1556	0.050	0.006	0.510	0.000
0.1778	0.051	0.008	0.642	0.000
0.2000	0.053	0.009	0.788	0.000
0.2222	0.055	0.010	0.947	0.000
0.2444	0.056	0.011	1.119	0.000
0.2667	0.058	0.012	1.305	0.000
0.2889	0.060	0.014	1.504	0.000
0.3111	0.061	0.015	1.716	0.000
0.3333	0.063	0.016	1.942	0.000
0.3556	0.065	0.018	2.182	0.000
0.3778	0.066	0.019	2.436	0.000
0.4000	0.068	0.021	2.704	0.000
0.4222	0.070	0.022	2.985	0.000
0.4444	0.072	0.024	3.281	0.000
0.4667	0.073	0.026	3.592	0.000
0.4889	0.075	0.027	3.916	0.000
0.5111	0.077	0.029	4.256	0.000
0.5333	0.078	0.031	4.610	0.000
0.5556	0.080	0.032	4.980	0.000
0.5778	0.082	0.034	5.364	0.000
0.6000	0.083	0.036	5.764	0.000
0.6222	0.085	0.038	6.180	0.000
0.6444	0.087	0.040	6.611	0.000
0.6667	0.088	0.042	7.058	0.000
0.6889	0.090	0.044	7.522	0.000
0.7111	0.092	0.046	8.001	0.000
0.7333	0.094	0.048	8.497	0.000
0.7556	0.095	0.050	9.009	0.000
0.7778	0.097	0.052	9.538	0.000
0.8000	0.099	0.054	10.08	0.000

0.8222	0.100	0.057	10.64	0.000
0.8444	0.102	0.059	11.22	0.000
0.8667	0.104	0.061	11.82	0.000
0.8889	0.105	0.064	12.44	0.000
0.9111	0.107	0.066	13.07	0.000
0.9333	0.109	0.068	13.72	0.000
0.9556	0.110	0.071	14.39	0.000
0.9778	0.112	0.073	15.08	0.000
1.0000	0.114	0.076	15.79	0.000
1.0222	0.116	0.078	16.51	0.000
1.0444	0.117	0.081	17.25	0.000
1.0667	0.119	0.084	18.02	0.000
1.0889	0.121	0.086	18.80	0.000
1.1111	0.122	0.089	19.60	0.000
1.1333	0.124	0.092	20.42	0.000
1.1556	0.126	0.094	21.26	0.000
1.1778	0.127	0.097	22.12	0.000
1.2000	0.129	0.100	23.00	0.000
1.2222	0.131	0.103	23.90	0.000
1.2444	0.133	0.106	24.82	0.000
1.2667	0.134	0.109	25.77	0.000
1.2889	0.136	0.112	26.73	0.000
1.3111	0.138	0.115	27.71	0.000
1.3333	0.139	0.118	28.72	0.000
1.3556	0.141	0.121	29.74	0.000
1.3778	0.143	0.124	30.79	0.000
1.4000	0.144	0.128	31.86	0.000
1.4222	0.146	0.131	32.95	0.000
1.4444	0.148	0.134	34.06	0.000
1.4667	0.149	0.137	35.19	0.000
1.4889	0.151	0.141	36.35	0.000
1.5111	0.153	0.144	37.53	0.000
1.5333	0.155	0.148	38.73	0.000
1.5556	0.156	0.151	39.95	0.000
1.5778	0.158	0.155	41.20	0.000
1.6000	0.160	0.158	42.46	0.000
1.6222	0.161	0.162	43.76	0.000
1.6444	0.163	0.165	45.07	0.000
1.6667	0.165	0.169	46.41	0.000
1.6889	0.166	0.173	47.77	0.000
1.7111	0.168	0.176	49.16	0.000
1.7333	0.170	0.180	50.57	0.000
1.7556	0.171	0.184	52.01	0.000
1.7778	0.173	0.188	53.46	0.000
1.8000	0.175	0.192	54.95	0.000
1.8222	0.177	0.196	56.46	0.000
1.8444	0.178	0.199	57.99	0.000
1.8667	0.180	0.203	59.54	0.000
1.8889	0.182	0.208	61.13	0.000
1.9111	0.183	0.212	62.73	0.000
1.9333	0.185	0.216	64.37	0.000
1.9556	0.187	0.220	66.02	0.000
1.9778	0.188	0.224	67.71	0.000
2.0000	0.190	0.228	69.42	0.000
2.0222	0.192	0.232	71.15	0.000

ANALYSIS RESULTS

Stream Protection Duration

NOTE: FLOW DURATION ANALYSIS IDENTIFIES EXISTING AND MITIGATED FLOWS BUT IS NOT INDICATIVE OF THE PROJECT'S COMPLIANCE WITH FLOW DURATION REQUIREMENTS INTO BORST LAKE. DURATIONS ARE ONLY INCLUDED TO IDENTIFY FLOW RATES

Predeveloped Landuse Totals for POC #1
Total Pervious Area:18.439
Total Impervious Area:2.601

Mitigated Landuse Totals for POC #1
Total Pervious Area:13.571
Total Impervious Area:5.423

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	4.454194
5 year	7.48758
10 year	10.050146
25 year	14.001958
50 year	17.519283
100 year	21.576263

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	5.205366
5 year	8.136009
10 year	10.479193
25 year	13.936749
50 year	16.898547
100 year	20.213059

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	4.834	5.276
1950	8.611	8.640
1951	5.140	5.357
1952	2.409	3.054
1953	2.859	3.588
1954	5.175	5.896
1955	3.002	3.389
1956	3.273	3.794
1957	3.723	4.214
1958	1.925	2.683
1959	3.164	4.017
1960	2.825	3.370
1961	2.300	2.913
1962	1.977	2.663

1963	3.886	4.407
1964	11.358	11.072
1965	3.987	4.532
1966	1.980	2.825
1967	3.791	6.780
1968	2.453	2.897
1969	7.911	8.353
1970	2.295	2.941
1971	4.274	5.228
1972	5.725	7.116
1973	2.221	2.787
1974	3.584	4.373
1975	5.044	5.466
1976	3.591	3.993
1977	3.340	4.680
1978	3.213	3.805
1979	1.943	2.600
1980	2.852	3.494
1981	5.844	6.314
1982	2.421	2.903
1983	3.975	4.986
1984	7.371	8.222
1985	3.057	3.986
1986	3.751	5.087
1987	11.590	11.662
1988	3.097	3.759
1989	2.783	3.560
1990	5.882	6.349
1991	11.171	11.552
1992	8.964	9.211
1993	2.623	3.276
1994	7.887	9.677
1995	4.200	4.971
1996	8.368	8.360
1997	23.611	23.395
1998	5.412	6.306
1999	13.530	13.835
2000	5.387	5.975
2001	4.001	5.171
2002	9.157	9.385
2003	6.302	6.722
2004	12.915	13.315
2005	5.300	5.668
2006	4.588	4.970
2007	15.086	14.547
2008	10.967	10.780
2009	6.683	6.829

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	23.6105	23.3952
2	15.0860	14.5466
3	13.5302	13.8345
4	12.9150	13.3151
5	11.5904	11.6620

6	11.3581	11.5518
7	11.1711	11.0722
8	10.9672	10.7802
9	9.1572	9.6765
10	8.9639	9.3850
11	8.6108	9.2106
12	8.3681	8.6404
13	7.9112	8.3596
14	7.8866	8.3533
15	7.3713	8.2223
16	6.6827	7.1163
17	6.3019	6.8288
18	5.8825	6.7804
19	5.8443	6.7219
20	5.7247	6.3491
21	5.4118	6.3136
22	5.3866	6.3062
23	5.3000	5.9749
24	5.1751	5.8955
25	5.1403	5.6682
26	5.0437	5.4662
27	4.8343	5.3572
28	4.5878	5.2765
29	4.2738	5.2279
30	4.1997	5.1712
31	4.0009	5.0870
32	3.9869	4.9856
33	3.9753	4.9712
34	3.8856	4.9703
35	3.7913	4.6802
36	3.7509	4.5323
37	3.7225	4.4069
38	3.5906	4.3732
39	3.5844	4.2143
40	3.3397	4.0169
41	3.2731	3.9931
42	3.2127	3.9861
43	3.1640	3.8048
44	3.0972	3.7938
45	3.0569	3.7591
46	3.0024	3.5880
47	2.8591	3.5595
48	2.8515	3.4942
49	2.8249	3.3893
50	2.7832	3.3705
51	2.6233	3.2758
52	2.4527	3.0544
53	2.4213	2.9408
54	2.4090	2.9127
55	2.2995	2.9031
56	2.2947	2.8975
57	2.2207	2.8247
58	1.9805	2.7870
59	1.9775	2.6835
60	1.9426	2.6633
61	1.9247	2.6004

Stream Protection Duration
POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.2271	1408	2340	166	Fail
2.3816	1101	1882	170	Fail
2.5360	903	1542	170	Fail
2.6905	747	1252	167	Fail
2.8450	624	1043	167	Fail
2.9994	524	878	167	Fail
3.1539	460	734	159	Fail
3.3084	407	621	152	Fail
3.4628	362	537	148	Fail
3.6173	328	469	142	Fail
3.7718	293	419	143	Fail
3.9262	269	374	139	Fail
4.0807	244	334	136	Fail
4.2352	220	304	138	Fail
4.3896	199	274	137	Fail
4.5441	183	247	134	Fail
4.6986	173	222	128	Fail
4.8530	161	208	129	Fail
5.0075	153	194	126	Fail
5.1620	147	177	120	Fail
5.3164	137	166	121	Fail
5.4709	123	151	122	Fail
5.6254	115	144	125	Fail
5.7798	104	128	123	Fail
5.9343	99	117	118	Fail
6.0888	93	112	120	Fail
6.2432	87	103	118	Fail
6.3977	82	97	118	Fail
6.5522	79	96	121	Fail
6.7066	75	92	122	Fail
6.8611	74	81	109	Pass
7.0156	71	80	112	Fail
7.1700	63	75	119	Fail
7.3245	61	72	118	Fail
7.4790	54	67	124	Fail
7.6334	54	66	122	Fail
7.7879	51	61	119	Fail
7.9424	47	56	119	Fail
8.0968	43	55	127	Fail
8.2513	39	50	128	Fail
8.4058	38	45	118	Fail
8.5602	38	40	105	Pass
8.7147	35	38	108	Pass
8.8692	31	34	109	Pass
9.0236	27	34	125	Fail
9.1781	26	33	126	Fail
9.3326	26	31	119	Fail
9.4870	25	29	116	Fail
9.6415	25	26	104	Pass

9.7960	22	25	113	Fail
9.9504	19	23	121	Fail
10.1049	18	22	122	Fail
10.2594	15	20	133	Fail
10.4138	15	20	133	Fail
10.5683	14	17	121	Fail
10.7228	13	16	123	Fail
10.8772	12	13	108	Pass
11.0317	11	13	118	Fail
11.1862	10	10	100	Pass
11.3406	10	10	100	Pass
11.4951	9	10	111	Fail
11.6496	7	9	128	Fail
11.8040	6	7	116	Fail
11.9585	5	7	140	Fail
12.1130	5	6	120	Fail
12.2674	5	6	120	Fail
12.4219	5	6	120	Fail
12.5764	5	6	120	Fail
12.7308	5	5	100	Pass
12.8853	5	5	100	Pass
13.0398	4	5	125	Fail
13.1942	4	5	125	Fail
13.3487	4	4	100	Pass
13.5032	4	4	100	Pass
13.6576	3	4	133	Fail
13.8121	3	4	133	Fail
13.9666	3	3	100	Pass
14.1210	3	3	100	Pass
14.2755	3	3	100	Pass
14.4300	3	3	100	Pass
14.5844	3	2	66	Pass
14.7389	3	2	66	Pass
14.8934	3	2	66	Pass
15.0478	3	2	66	Pass
15.2023	2	2	100	Pass
15.3568	2	2	100	Pass
15.5112	2	2	100	Pass
15.6657	2	2	100	Pass
15.8202	2	2	100	Pass
15.9746	2	2	100	Pass
16.1291	2	2	100	Pass
16.2836	2	2	100	Pass
16.4380	2	2	100	Pass
16.5925	2	2	100	Pass
16.7470	2	2	100	Pass
16.9014	2	2	100	Pass
17.0559	2	2	100	Pass
17.2103	2	2	100	Pass
17.3648	2	2	100	Pass
17.5193	2	2	100	Pass

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 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.**

Wetlands Input Volume
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	15.0285	13.7720	91.6	Pass
Feb	10.7991	9.7888	90.6	Pass
Mar	9.8668	8.9605	90.8	Pass
Apr	7.1408	6.5197	91.3	Pass
May	4.3809	4.0756	93.0	Pass
Jun	3.5142	3.2974	93.8	Pass
Jul	1.9108	1.7564	91.9	Pass
Aug	1.6597	1.6599	100.0	Pass
Sep	2.3010	2.3855	103.7	Pass
Oct	5.0699	5.1269	101.1	Pass
Nov	12.7214	12.1046	95.2	Pass
Dec	14.2936	13.2017	92.4	Pass

Day	Series 1	Series 2	Percent	Pass/Fail
Jan1	0.5148	0.4882	94.8	Pass
2	0.4882	0.4343	89.0	Pass
3	0.4792	0.4472	93.3	Pass
4	0.5344	0.5017	93.9	Pass
5	0.5127	0.4645	90.6	Pass
6	0.5807	0.5449	93.8	Pass
7	0.5411	0.4849	89.6	Pass
8	0.5346	0.4859	90.9	Pass
9	0.4727	0.4294	90.8	Pass
10	0.4243	0.3740	88.1	Pass
11	0.4393	0.4059	92.4	Pass
12	0.4514	0.4258	94.3	Pass
13	0.5104	0.4802	94.1	Pass
14	0.4873	0.4420	90.7	Pass
15	0.4760	0.4359	91.6	Pass
16	0.5073	0.4617	91.0	Pass
17	0.4785	0.4376	91.5	Pass
18	0.4767	0.4281	89.8	Pass
19	0.4703	0.4302	91.5	Pass
20	0.4619	0.4176	90.4	Pass
21	0.4560	0.4243	93.1	Pass
22	0.5159	0.4853	94.1	Pass
23	0.5578	0.5214	93.5	Pass
24	0.5155	0.4503	87.3	Pass
25	0.4529	0.4024	88.9	Pass
26	0.4335	0.3853	88.9	Pass
27	0.4230	0.3887	91.9	Pass

28	0.4489	0.4132	92.0	Pass
29	0.4938	0.4524	91.6	Pass
30	0.4533	0.4153	91.6	Pass
31	0.4390	0.3891	88.6	Pass
Feb1	0.3925	0.3501	89.2	Pass
2	0.3588	0.3149	87.8	Pass
3	0.3408	0.3028	88.9	Pass
4	0.2959	0.2579	87.1	Pass
5	0.3334	0.3206	96.2	Pass
6	0.3647	0.3280	89.9	Pass
7	0.4216	0.3952	93.7	Pass
8	0.4510	0.4087	90.6	Pass
9	0.3929	0.3479	88.6	Pass
10	0.3531	0.3189	90.3	Pass
11	0.3875	0.3610	93.2	Pass
12	0.3835	0.3441	89.7	Pass
13	0.3489	0.3158	90.5	Pass
14	0.3797	0.3561	93.8	Pass
15	0.4097	0.3765	91.9	Pass
16	0.4086	0.3762	92.1	Pass
17	0.3989	0.3666	91.9	Pass
18	0.5001	0.4715	94.3	Pass
19	0.4220	0.3585	85.0	Pass
20	0.3896	0.3494	89.7	Pass
21	0.3530	0.3105	88.0	Pass
22	0.3377	0.3084	91.3	Pass
23	0.3823	0.3510	91.8	Pass
24	0.3791	0.3435	90.6	Pass
25	0.3346	0.2948	88.1	Pass
26	0.3482	0.3160	90.8	Pass
27	0.3913	0.3659	93.5	Pass
28	0.3840	0.3396	88.4	Pass
29	0.3622	0.3268	90.2	Pass
Mar1	0.3372	0.3019	89.5	Pass
2	0.3995	0.3786	94.8	Pass
3	0.3774	0.3360	89.0	Pass
4	0.3663	0.3294	89.9	Pass
5	0.2957	0.2532	85.6	Pass
6	0.2963	0.2655	89.6	Pass
7	0.2950	0.2787	94.5	Pass
8	0.3700	0.3511	94.9	Pass
9	0.3467	0.3116	89.9	Pass
10	0.3431	0.3179	92.7	Pass
11	0.3703	0.3443	93.0	Pass
12	0.3293	0.2882	87.5	Pass
13	0.3122	0.2813	90.1	Pass
14	0.3237	0.2951	91.2	Pass
15	0.3225	0.2999	93.0	Pass
16	0.3167	0.2783	87.9	Pass
17	0.3246	0.3043	93.7	Pass
18	0.3062	0.2679	87.5	Pass
19	0.2735	0.2417	88.4	Pass
20	0.2439	0.2145	88.0	Pass
21	0.2913	0.2844	97.7	Pass
22	0.3268	0.3034	92.9	Pass
23	0.3321	0.3054	91.9	Pass
24	0.3228	0.2876	89.1	Pass

25	0.3079	0.2769	89.9	Pass
26	0.2810	0.2490	88.6	Pass
27	0.2711	0.2451	90.4	Pass
28	0.2800	0.2532	90.4	Pass
29	0.2836	0.2627	92.6	Pass
30	0.2579	0.2267	87.9	Pass
31	0.2678	0.2493	93.1	Pass
Apr1	0.2711	0.2507	92.5	Pass
2	0.2625	0.2331	88.8	Pass
3	0.2905	0.2761	95.0	Pass
4	0.3040	0.2725	89.6	Pass
5	0.2816	0.2524	89.6	Pass
6	0.2215	0.1821	82.2	Pass
7	0.2292	0.2167	94.5	Pass
8	0.2555	0.2401	94.0	Pass
9	0.2370	0.2115	89.3	Pass
10	0.2661	0.2487	93.5	Pass
11	0.2603	0.2396	92.0	Pass
12	0.2851	0.2670	93.6	Pass
13	0.2622	0.2371	90.4	Pass
14	0.2355	0.2075	88.1	Pass
15	0.2630	0.2434	92.6	Pass
16	0.2439	0.2174	89.1	Pass
17	0.2065	0.1818	88.0	Pass
18	0.2437	0.2367	97.1	Pass
19	0.2366	0.2064	87.2	Pass
20	0.1864	0.1598	85.7	Pass
21	0.1872	0.1768	94.5	Pass
22	0.2394	0.2280	95.2	Pass
23	0.2388	0.2191	91.8	Pass
24	0.1932	0.1656	85.7	Pass
25	0.1650	0.1448	87.8	Pass
26	0.2037	0.1993	97.9	Pass
27	0.1968	0.1809	92.0	Pass
28	0.2016	0.1880	93.2	Pass
29	0.2053	0.1870	91.1	Pass
30	0.1847	0.1657	89.7	Pass
May1	0.1888	0.1760	93.2	Pass
2	0.1813	0.1589	87.6	Pass
3	0.1520	0.1381	90.8	Pass
4	0.1600	0.1490	93.1	Pass
5	0.1572	0.1452	92.4	Pass
6	0.1379	0.1220	88.5	Pass
7	0.1264	0.1141	90.3	Pass
8	0.1274	0.1178	92.4	Pass
9	0.1321	0.1230	93.1	Pass
10	0.1502	0.1449	96.5	Pass
11	0.1308	0.1208	92.3	Pass
12	0.1498	0.1374	91.8	Pass
13	0.1534	0.1437	93.6	Pass
14	0.1365	0.1240	90.9	Pass
15	0.1439	0.1328	92.3	Pass
16	0.1322	0.1226	92.7	Pass
17	0.1379	0.1324	96.0	Pass
18	0.1413	0.1341	95.0	Pass
19	0.1367	0.1263	92.4	Pass
20	0.1176	0.1064	90.5	Pass

21	0.1135	0.1037	91.4	Pass
22	0.1129	0.1076	95.3	Pass
23	0.1261	0.1266	100.4	Pass
24	0.1242	0.1116	89.9	Pass
25	0.1364	0.1334	97.8	Pass
26	0.1385	0.1350	97.5	Pass
27	0.1346	0.1281	95.2	Pass
28	0.1364	0.1335	97.9	Pass
29	0.1250	0.1131	90.5	Pass
30	0.1549	0.1475	95.2	Pass
31	0.1592	0.1452	91.2	Pass
Jun1	0.1451	0.1278	88.1	Pass
2	0.1395	0.1330	95.3	Pass
3	0.1430	0.1385	96.9	Pass
4	0.1268	0.1189	93.7	Pass
5	0.1368	0.1378	100.8	Pass
6	0.1541	0.1412	91.7	Pass
7	0.1413	0.1298	91.9	Pass
8	0.1435	0.1354	94.4	Pass
9	0.1396	0.1291	92.5	Pass
10	0.1291	0.1223	94.7	Pass
11	0.1234	0.1146	92.9	Pass
12	0.1112	0.1028	92.5	Pass
13	0.1051	0.0970	92.4	Pass
14	0.0940	0.0871	92.7	Pass
15	0.1082	0.1021	94.4	Pass
16	0.1331	0.1291	97.0	Pass
17	0.1081	0.0944	87.4	Pass
18	0.0971	0.0891	91.8	Pass
19	0.0997	0.0917	92.0	Pass
20	0.1041	0.1013	97.3	Pass
21	0.0835	0.0720	86.1	Pass
22	0.0985	0.0983	99.7	Pass
23	0.1477	0.1497	101.4	Pass
24	0.1086	0.0942	86.7	Pass
25	0.0881	0.0800	90.8	Pass
26	0.0839	0.0841	100.2	Pass
27	0.0864	0.0852	98.6	Pass
28	0.0930	0.0882	94.8	Pass
29	0.0825	0.0772	93.6	Pass
30	0.0929	0.0904	97.2	Pass
Jul1	0.0836	0.0785	93.8	Pass
2	0.0776	0.0682	88.0	Pass
3	0.0696	0.0630	90.6	Pass
4	0.0769	0.0744	96.8	Pass
5	0.0726	0.0686	94.5	Pass
6	0.0670	0.0626	93.4	Pass
7	0.0848	0.0880	103.8	Pass
8	0.0918	0.0886	96.5	Pass
9	0.0814	0.0773	95.0	Pass
10	0.0676	0.0578	85.6	Pass
11	0.0756	0.0724	95.8	Pass
12	0.0889	0.0813	91.5	Pass
13	0.0708	0.0620	87.6	Pass
14	0.0601	0.0517	86.1	Pass
15	0.0666	0.0693	104.0	Pass
16	0.0561	0.0487	86.8	Pass

17	0.0543	0.0462	85.1	Pass
18	0.0483	0.0419	86.7	Pass
19	0.0456	0.0402	88.2	Pass
20	0.0434	0.0368	84.8	Pass
21	0.0485	0.0458	94.4	Pass
22	0.0445	0.0401	90.1	Pass
23	0.0400	0.0331	82.8	Pass
24	0.0433	0.0402	92.9	Pass
25	0.0508	0.0534	105.0	Pass
26	0.0460	0.0400	86.8	Pass
27	0.0442	0.0391	88.4	Pass
28	0.0405	0.0333	82.2	Pass
29	0.0397	0.0335	84.4	Pass
30	0.0379	0.0301	79.5	Fail
31	0.0456	0.0429	94.1	Pass
Aug1	0.0427	0.0386	90.5	Pass
2	0.0460	0.0456	99.0	Pass
3	0.0418	0.0362	86.4	Pass
4	0.0387	0.0310	80.0	Pass
5	0.0442	0.0451	102.2	Pass
6	0.0598	0.0688	115.0	Pass
7	0.0511	0.0443	86.7	Pass
8	0.0444	0.0398	89.5	Pass
9	0.0407	0.0363	89.1	Pass
10	0.0425	0.0405	95.3	Pass
11	0.0412	0.0367	89.0	Pass
12	0.0398	0.0372	93.4	Pass
13	0.0516	0.0564	109.3	Pass
14	0.0645	0.0678	105.1	Pass
15	0.0590	0.0614	104.0	Pass
16	0.0509	0.0491	96.4	Pass
17	0.0532	0.0536	100.7	Pass
18	0.0504	0.0529	104.9	Pass
19	0.0471	0.0425	90.3	Pass
20	0.0577	0.0631	109.4	Pass
21	0.0639	0.0725	113.5	Pass
22	0.0750	0.0842	112.4	Pass
23	0.0773	0.0798	103.2	Pass
24	0.0668	0.0617	92.4	Pass
25	0.0744	0.0757	101.7	Pass
26	0.0633	0.0620	98.0	Pass
27	0.0548	0.0528	96.5	Pass
28	0.0584	0.0625	107.1	Pass
29	0.0535	0.0518	96.8	Pass
30	0.0594	0.0673	113.3	Pass
31	0.0650	0.0691	106.4	Pass
Sep1	0.0823	0.0775	94.2	Pass
2	0.0619	0.0601	97.0	Pass
3	0.0682	0.0721	105.8	Pass
4	0.0585	0.0578	98.8	Pass
5	0.0640	0.0683	106.8	Pass
6	0.0474	0.0431	91.0	Pass
7	0.0582	0.0603	103.5	Pass
8	0.0629	0.0653	103.9	Pass
9	0.0796	0.0941	118.2	Pass
10	0.0670	0.0659	98.4	Pass
11	0.0610	0.0537	88.0	Pass

12	0.0663	0.0711	107.2	Pass
13	0.0641	0.0728	113.5	Pass
14	0.0564	0.0567	100.5	Pass
15	0.0744	0.0843	113.3	Pass
16	0.1382	0.1566	113.3	Pass
17	0.0995	0.0936	94.0	Pass
18	0.0952	0.1014	106.5	Pass
19	0.0748	0.0717	95.8	Pass
20	0.0640	0.0622	97.2	Pass
21	0.0912	0.1034	113.3	Pass
22	0.1071	0.1102	102.9	Pass
23	0.0942	0.0938	99.6	Pass
24	0.0792	0.0799	100.9	Pass
25	0.0871	0.0918	105.4	Pass
26	0.0725	0.0692	95.6	Pass
27	0.0803	0.0850	105.9	Pass
28	0.0777	0.0820	105.5	Pass
29	0.1027	0.1123	109.3	Pass
30	0.0854	0.0813	95.2	Pass
Oct1	0.0975	0.1031	105.8	Pass
2	0.0924	0.0993	107.4	Pass
3	0.0962	0.1093	113.6	Pass
4	0.0908	0.0886	97.6	Pass
5	0.1183	0.1285	108.6	Pass
6	0.1081	0.1098	101.6	Pass
7	0.1446	0.1672	115.7	Pass
8	0.1786	0.1946	109.0	Pass
9	0.1781	0.1682	94.5	Pass
10	0.1416	0.1290	91.1	Pass
11	0.1160	0.1160	100.1	Pass
12	0.1101	0.1119	101.7	Pass
13	0.1033	0.1101	106.6	Pass
14	0.1181	0.1216	102.9	Pass
15	0.1326	0.1398	105.5	Pass
16	0.1425	0.1499	105.2	Pass
17	0.1568	0.1542	98.3	Pass
18	0.1802	0.1899	105.4	Pass
19	0.2796	0.2938	105.1	Pass
20	0.2330	0.2200	94.4	Pass
21	0.2127	0.2087	98.1	Pass
22	0.1891	0.1782	94.2	Pass
23	0.1782	0.1751	98.3	Pass
24	0.1902	0.1947	102.4	Pass
25	0.2061	0.2079	100.9	Pass
26	0.2224	0.2332	104.9	Pass
27	0.2437	0.2365	97.1	Pass
28	0.2397	0.2249	93.8	Pass
29	0.2334	0.2270	97.3	Pass
30	0.2508	0.2543	101.4	Pass
31	0.2478	0.2454	99.0	Pass
Nov1	0.2637	0.2549	96.7	Pass
2	0.3078	0.3120	101.3	Pass
3	0.4248	0.4294	101.1	Pass
4	0.3513	0.3212	91.4	Pass
5	0.3950	0.3823	96.8	Pass
6	0.3952	0.3754	95.0	Pass
7	0.3529	0.3313	93.9	Pass

8	0.3396	0.3269	96.3	Pass
9	0.3421	0.3392	99.1	Pass
10	0.4154	0.4168	100.3	Pass
11	0.4548	0.4415	97.1	Pass
12	0.4388	0.4200	95.7	Pass
13	0.4359	0.3956	90.8	Pass
14	0.3600	0.3337	92.7	Pass
15	0.3601	0.3441	95.5	Pass
16	0.4002	0.3916	97.8	Pass
17	0.4270	0.3964	92.8	Pass
18	0.4533	0.4459	98.4	Pass
19	0.5142	0.4946	96.2	Pass
20	0.5202	0.4780	91.9	Pass
21	0.4477	0.4059	90.7	Pass
22	0.4571	0.4500	98.4	Pass
23	0.5721	0.5455	95.4	Pass
24	0.6246	0.6004	96.1	Pass
25	0.5407	0.4872	90.1	Pass
26	0.4816	0.4303	89.3	Pass
27	0.4471	0.4178	93.4	Pass
28	0.4514	0.4148	91.9	Pass
29	0.4981	0.4765	95.7	Pass
30	0.5035	0.4813	95.6	Pass
Dec1	0.5686	0.5394	94.9	Pass
2	0.6726	0.6298	93.6	Pass
3	0.5445	0.4772	87.7	Pass
4	0.4738	0.4380	92.5	Pass
5	0.4664	0.4245	91.0	Pass
6	0.4126	0.3718	90.1	Pass
7	0.3761	0.3427	91.1	Pass
8	0.3955	0.3747	94.7	Pass
9	0.4427	0.4247	95.9	Pass
10	0.4703	0.4460	94.8	Pass
11	0.4785	0.4453	93.1	Pass
12	0.4874	0.4513	92.6	Pass
13	0.5322	0.5040	94.7	Pass
14	0.5670	0.5264	92.8	Pass
15	0.4887	0.4362	89.3	Pass
16	0.4281	0.3818	89.2	Pass
17	0.3810	0.3410	89.5	Pass
18	0.3888	0.3668	94.3	Pass
19	0.4314	0.4093	94.9	Pass
20	0.4461	0.4109	92.1	Pass
21	0.4124	0.3701	89.7	Pass
22	0.4181	0.3893	93.1	Pass
23	0.4145	0.3792	91.5	Pass
24	0.3839	0.3491	90.9	Pass
25	0.4448	0.4250	95.5	Pass
26	0.5100	0.4739	92.9	Pass
27	0.4224	0.3696	87.5	Pass
28	0.4603	0.4439	96.4	Pass
29	0.4746	0.4275	90.1	Pass
30	0.3965	0.3508	88.5	Pass
31	0.4364	0.4134	94.7	Pass

LID Report

LID Technique Used for Total Volume Volume Infiltration Cumulative
Percent Water Quality Percent Comment
Treatment? Needs Through Volume Volume
Volume Water Quality
Treatment Facility (ac-ft.) Infiltration
Infiltrated Treated
(ac-ft) (ac-ft) Credit

WL 12W Channel POC N 4587.79 N
0.00
WL 28 Channel N 1008.38 N
0.00
Total Volume Infiltrated 5596.18 0.00 0.00
0.00 0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes

No changes have been made.

Appendix B-3

Wetland 12C WWHM Analysis

WWHM2012
PROJECT REPORT

Project Name: 17500 WL 12C
Site Name:
Site Address:
City :
Report Date: 1/24/2020
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.29
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 : Exist. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.702
C, Lawn, Flat	.423
Pervious Total	**4.125**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**4.125**

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1

Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12W Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000
0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000

0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

Name : Exist. WL 12W
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**8.616**
C, Lawn, Flat	**5.698**

Pervious Total **14.314**

Impervious Land Use	**acre**
ROADS FLAT	**2.601**

Impervious Total **2.601**

Basin Total **16.915**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12W Channel	WL 12W Channel	WL 12W Channel

Name : WL 12W Channel
Bottom Length: 830.00 ft.
Bottom Width: 2.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.012 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:

Outlet 1	**Outlet 2**
WL 12C Channel	

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.038	0.000	0.000	0.000
0.0222	0.039	0.000	0.019	0.000
0.0444	0.041	0.001	0.061	0.000
0.0667	0.043	0.002	0.121	0.000
0.0889	0.044	0.003	0.196	0.000
0.1111	0.046	0.004	0.287	0.000
0.1333	0.048	0.005	0.392	0.000
0.1556	0.050	0.006	0.510	0.000
0.1778	0.051	0.008	0.642	0.000
0.2000	0.053	0.009	0.788	0.000

0.2222	0.055	0.010	0.947	0.000
0.2444	0.056	0.011	1.119	0.000
0.2667	0.058	0.012	1.305	0.000
0.2889	0.060	0.014	1.504	0.000
0.3111	0.061	0.015	1.716	0.000
0.3333	0.063	0.016	1.942	0.000
0.3556	0.065	0.018	2.182	0.000
0.3778	0.066	0.019	2.436	0.000
0.4000	0.068	0.021	2.704	0.000
0.4222	0.070	0.022	2.985	0.000
0.4444	0.072	0.024	3.281	0.000
0.4667	0.073	0.026	3.592	0.000
0.4889	0.075	0.027	3.916	0.000
0.5111	0.077	0.029	4.256	0.000
0.5333	0.078	0.031	4.610	0.000
0.5556	0.080	0.032	4.980	0.000
0.5778	0.082	0.034	5.364	0.000
0.6000	0.083	0.036	5.764	0.000
0.6222	0.085	0.038	6.180	0.000
0.6444	0.087	0.040	6.611	0.000
0.6667	0.088	0.042	7.058	0.000
0.6889	0.090	0.044	7.522	0.000
0.7111	0.092	0.046	8.001	0.000
0.7333	0.094	0.048	8.497	0.000
0.7556	0.095	0.050	9.009	0.000
0.7778	0.097	0.052	9.538	0.000
0.8000	0.099	0.054	10.08	0.000
0.8222	0.100	0.057	10.64	0.000
0.8444	0.102	0.059	11.22	0.000
0.8667	0.104	0.061	11.82	0.000
0.8889	0.105	0.064	12.44	0.000
0.9111	0.107	0.066	13.07	0.000
0.9333	0.109	0.068	13.72	0.000
0.9556	0.110	0.071	14.39	0.000
0.9778	0.112	0.073	15.08	0.000
1.0000	0.114	0.076	15.79	0.000
1.0222	0.116	0.078	16.51	0.000
1.0444	0.117	0.081	17.25	0.000
1.0667	0.119	0.084	18.02	0.000
1.0889	0.121	0.086	18.80	0.000
1.1111	0.122	0.089	19.60	0.000
1.1333	0.124	0.092	20.42	0.000
1.1556	0.126	0.094	21.26	0.000
1.1778	0.127	0.097	22.12	0.000
1.2000	0.129	0.100	23.00	0.000
1.2222	0.131	0.103	23.90	0.000
1.2444	0.133	0.106	24.82	0.000
1.2667	0.134	0.109	25.77	0.000
1.2889	0.136	0.112	26.73	0.000
1.3111	0.138	0.115	27.71	0.000
1.3333	0.139	0.118	28.72	0.000
1.3556	0.141	0.121	29.74	0.000
1.3778	0.143	0.124	30.79	0.000
1.4000	0.144	0.128	31.86	0.000
1.4222	0.146	0.131	32.95	0.000
1.4444	0.148	0.134	34.06	0.000
1.4667	0.149	0.137	35.19	0.000

1.4889	0.151	0.141	36.35	0.000
1.5111	0.153	0.144	37.53	0.000
1.5333	0.155	0.148	38.73	0.000
1.5556	0.156	0.151	39.95	0.000
1.5778	0.158	0.155	41.20	0.000
1.6000	0.160	0.158	42.46	0.000
1.6222	0.161	0.162	43.76	0.000
1.6444	0.163	0.165	45.07	0.000
1.6667	0.165	0.169	46.41	0.000
1.6889	0.166	0.173	47.77	0.000
1.7111	0.168	0.176	49.16	0.000
1.7333	0.170	0.180	50.57	0.000
1.7556	0.171	0.184	52.01	0.000
1.7778	0.173	0.188	53.46	0.000
1.8000	0.175	0.192	54.95	0.000
1.8222	0.177	0.196	56.46	0.000
1.8444	0.178	0.199	57.99	0.000
1.8667	0.180	0.203	59.54	0.000
1.8889	0.182	0.208	61.13	0.000
1.9111	0.183	0.212	62.73	0.000
1.9333	0.185	0.216	64.37	0.000
1.9556	0.187	0.220	66.02	0.000
1.9778	0.188	0.224	67.71	0.000
2.0000	0.190	0.228	69.42	0.000
2.0222	0.192	0.232	71.15	0.000

Name **:** WL 12C Channel
Bottom Length: 2550.00 ft.
Bottom Width: 12.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.003 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.702	0.000	0.000	0.000
0.0222	0.707	0.015	0.057	0.000
0.0444	0.712	0.031	0.182	0.000
0.0667	0.718	0.047	0.358	0.000
0.0889	0.723	0.063	0.579	0.000
0.1111	0.728	0.079	0.841	0.000
0.1333	0.733	0.095	1.140	0.000
0.1556	0.738	0.112	1.476	0.000
0.1778	0.744	0.128	1.845	0.000
0.2000	0.749	0.145	2.247	0.000

0.2222	0.754	0.161	2.681	0.000
0.2444	0.759	0.178	3.146	0.000
0.2667	0.764	0.195	3.640	0.000
0.2889	0.770	0.212	4.163	0.000
0.3111	0.775	0.229	4.715	0.000
0.3333	0.780	0.247	5.294	0.000
0.3556	0.785	0.264	5.901	0.000
0.3778	0.790	0.282	6.535	0.000
0.4000	0.796	0.299	7.195	0.000
0.4222	0.801	0.317	7.881	0.000
0.4444	0.806	0.335	8.593	0.000
0.4667	0.811	0.353	9.331	0.000
0.4889	0.817	0.371	10.09	0.000
0.5111	0.822	0.389	10.88	0.000
0.5333	0.827	0.408	11.69	0.000
0.5556	0.832	0.426	12.53	0.000
0.5778	0.837	0.445	13.39	0.000
0.6000	0.843	0.463	14.27	0.000
0.6222	0.848	0.482	15.18	0.000
0.6444	0.853	0.501	16.11	0.000
0.6667	0.858	0.520	17.07	0.000
0.6889	0.863	0.539	18.05	0.000
0.7111	0.869	0.558	19.05	0.000
0.7333	0.874	0.578	20.08	0.000
0.7556	0.879	0.597	21.13	0.000
0.7778	0.884	0.617	22.20	0.000
0.8000	0.889	0.636	23.29	0.000
0.8222	0.895	0.656	24.41	0.000
0.8444	0.900	0.676	25.55	0.000
0.8667	0.905	0.696	26.72	0.000
0.8889	0.910	0.716	27.90	0.000
0.9111	0.915	0.737	29.11	0.000
0.9333	0.921	0.757	30.34	0.000
0.9556	0.926	0.778	31.59	0.000
0.9778	0.931	0.798	32.87	0.000
1.0000	0.936	0.819	34.17	0.000
1.0222	0.941	0.840	35.49	0.000
1.0444	0.947	0.861	36.83	0.000
1.0667	0.952	0.882	38.19	0.000
1.0889	0.957	0.903	39.58	0.000
1.1111	0.962	0.925	40.99	0.000
1.1333	0.967	0.946	42.42	0.000
1.1556	0.973	0.968	43.87	0.000
1.1778	0.978	0.989	45.35	0.000
1.2000	0.983	1.011	46.85	0.000
1.2222	0.988	1.033	48.37	0.000
1.2444	0.993	1.055	49.91	0.000
1.2667	0.999	1.077	51.47	0.000
1.2889	1.004	1.099	53.06	0.000
1.3111	1.009	1.122	54.66	0.000
1.3333	1.014	1.144	56.29	0.000
1.3556	1.019	1.167	57.94	0.000
1.3778	1.025	1.190	59.62	0.000
1.4000	1.030	1.212	61.31	0.000
1.4222	1.035	1.235	63.03	0.000
1.4444	1.040	1.259	64.77	0.000
1.4667	1.045	1.282	66.53	0.000

1.4889	1.051	1.305	68.32	0.000
1.5111	1.056	1.328	70.12	0.000
1.5333	1.061	1.352	71.95	0.000
1.5556	1.066	1.376	73.80	0.000
1.5778	1.071	1.399	75.67	0.000
1.6000	1.077	1.423	77.57	0.000
1.6222	1.082	1.447	79.48	0.000
1.6444	1.087	1.471	81.42	0.000
1.6667	1.092	1.496	83.38	0.000
1.6889	1.098	1.520	85.37	0.000
1.7111	1.103	1.544	87.37	0.000
1.7333	1.108	1.569	89.40	0.000
1.7556	1.113	1.594	91.45	0.000
1.7778	1.118	1.618	93.52	0.000
1.8000	1.124	1.643	95.62	0.000
1.8222	1.129	1.668	97.73	0.000
1.8444	1.134	1.694	99.87	0.000
1.8667	1.139	1.719	102.0	0.000
1.8889	1.144	1.744	104.2	0.000
1.9111	1.150	1.770	106.4	0.000
1.9333	1.155	1.795	108.6	0.000
1.9556	1.160	1.821	110.9	0.000
1.9778	1.165	1.847	113.1	0.000
2.0000	1.170	1.873	115.4	0.000
2.0222	1.176	1.899	117.8	0.000

Name : Exist. WL 12C
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	10.062
C, Lawn, Flat	7.856
C, Forest, Steep	4.799
C, Lawn, Steep	.917
Pervious Total	**23.634**

Impervious Land Use	acre
ROADS FLAT	12.463
Impervious Total	**12.463**
Basin Total	**36.097**

Element Flows To:

Surface	Interflow	Groundwater
WL 12C Channel	WL 12C Channel	WL 12C Channel

Name : Exist. WL 12NW
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	4.81
C, Lawn, Flat	19.084
C, Forest, Steep	3.157

Pervious Total 27.051

Impervious Land Use	acre
ROADS FLAT	2.887

Impervious Total 2.887

Basin Total 29.938

Element Flows To:

Surface	Interflow	Groundwater
WL 12NW Channel	WL 12NW Channel	WL 12NW Channel

Name : WL 12NW Channel
Bottom Length: 1415.00 ft.
Bottom Width: 8.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 1 To 1
Channel right side slope 2: 1 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:

Outlet 1	Outlet 2
WL 12C Channel	

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.259	0.000	0.000	0.000
0.0444	0.262	0.011	0.140	0.000
0.0889	0.265	0.023	0.443	0.000
0.1333	0.268	0.035	0.871	0.000
0.1778	0.271	0.047	1.406	0.000
0.2222	0.274	0.059	2.039	0.000
0.2667	0.277	0.071	2.761	0.000
0.3111	0.280	0.084	3.568	0.000
0.3556	0.283	0.096	4.455	0.000

0.4000	0.285	0.109	5.419	0.000
0.4444	0.288	0.121	6.457	0.000
0.4889	0.291	0.134	7.567	0.000
0.5333	0.294	0.147	8.747	0.000
0.5778	0.297	0.161	9.994	0.000
0.6222	0.300	0.174	11.30	0.000
0.6667	0.303	0.187	12.68	0.000
0.7111	0.306	0.201	14.12	0.000
0.7556	0.309	0.214	15.63	0.000
0.8000	0.311	0.228	17.20	0.000
0.8444	0.314	0.242	18.82	0.000
0.8889	0.317	0.256	20.51	0.000
0.9333	0.320	0.270	22.26	0.000
0.9778	0.323	0.285	24.06	0.000
1.0222	0.326	0.299	25.93	0.000
1.0667	0.329	0.314	27.85	0.000
1.1111	0.332	0.328	29.83	0.000
1.1556	0.334	0.343	31.86	0.000
1.2000	0.337	0.358	33.95	0.000
1.2444	0.340	0.373	36.10	0.000
1.2889	0.343	0.388	38.30	0.000
1.3333	0.346	0.404	40.56	0.000
1.3778	0.349	0.419	42.88	0.000
1.4222	0.352	0.435	45.25	0.000
1.4667	0.355	0.451	47.67	0.000
1.5111	0.358	0.466	50.15	0.000
1.5556	0.360	0.482	52.68	0.000
1.6000	0.363	0.499	55.27	0.000
1.6444	0.366	0.515	57.92	0.000
1.6889	0.369	0.531	60.61	0.000
1.7333	0.372	0.548	63.37	0.000
1.7778	0.375	0.564	66.17	0.000
1.8222	0.378	0.581	69.03	0.000
1.8667	0.381	0.598	71.95	0.000
1.9111	0.384	0.615	74.91	0.000
1.9556	0.386	0.632	77.94	0.000
2.0000	0.389	0.649	81.01	0.000
2.0444	0.392	0.667	84.14	0.000
2.0889	0.395	0.684	87.33	0.000
2.1333	0.398	0.702	90.57	0.000
2.1778	0.401	0.720	93.86	0.000
2.2222	0.404	0.737	97.21	0.000
2.2667	0.407	0.755	100.6	0.000
2.3111	0.410	0.774	104.0	0.000
2.3556	0.412	0.792	107.5	0.000
2.4000	0.415	0.810	111.1	0.000
2.4444	0.418	0.829	114.7	0.000
2.4889	0.421	0.848	118.4	0.000
2.5333	0.424	0.866	122.1	0.000
2.5778	0.427	0.885	125.9	0.000
2.6222	0.430	0.904	129.7	0.000
2.6667	0.433	0.924	133.6	0.000
2.7111	0.436	0.943	137.6	0.000
2.7556	0.438	0.962	141.6	0.000
2.8000	0.441	0.982	145.6	0.000
2.8444	0.444	1.002	149.8	0.000
2.8889	0.447	1.021	153.9	0.000

2.9333	0.450	1.041	158.2	0.000
2.9778	0.453	1.061	162.4	0.000
3.0222	0.456	1.082	166.8	0.000
3.0667	0.459	1.102	171.2	0.000
3.1111	0.462	1.122	175.6	0.000
3.1556	0.464	1.143	180.1	0.000
3.2000	0.467	1.164	184.7	0.000
3.2444	0.470	1.185	189.3	0.000
3.2889	0.473	1.206	194.0	0.000
3.3333	0.476	1.227	198.7	0.000
3.3778	0.479	1.248	203.5	0.000
3.4222	0.482	1.269	208.3	0.000
3.4667	0.485	1.291	213.2	0.000
3.5111	0.488	1.312	218.2	0.000
3.5556	0.490	1.334	223.2	0.000
3.6000	0.493	1.356	228.3	0.000
3.6444	0.496	1.378	233.4	0.000
3.6889	0.499	1.400	238.6	0.000
3.7333	0.502	1.423	243.9	0.000
3.7778	0.505	1.445	249.2	0.000
3.8222	0.508	1.467	254.5	0.000
3.8667	0.511	1.490	260.0	0.000
3.9111	0.514	1.513	265.5	0.000
3.9556	0.516	1.536	271.0	0.000
4.0000	0.519	1.559	276.6	0.000
4.0444	0.522	1.582	282.3	0.000

Name : Exist. WL 12E
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	**6.705**
C, Lawn, Flat	**15.148**
C, Forest, Steep	**.256**
C, Lawn, Steep	**.61**
Pervious Total	**22.719**

Impervious Land Use	acre
ROADS FLAT	**26.527**
Impervious Total	**26.527**
Basin Total	**49.246**

Element Flows To:

Surface	Interflow	Groundwater
WL 12C Channel	WL 12C Channel	WL 12C Channel

MITIGATED LAND USE

Name : Dev. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.802
C, Lawn, Flat	.815

Pervious Total 4.617

Impervious Land Use	acre

Impervious Total 0

Basin Total 4.617

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : Dev. WL 12W
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	6.585
C, Lawn, Flat	2.369

Pervious Total 8.954

Impervious Land Use	acre
ROADS FLAT	4.823

Impervious Total 4.823

Basin Total 13.777

Element Flows To:

Surface	Interflow	Groundwater
WL 12W Channel	WL 12W Channel	WL 12W Channel

Name : Dev. 12NW
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**6.741**
C, Lawn, Flat	**2.005**

Pervious Total **8.746**

Impervious Land Use	**acre**
ROADS FLAT	**6.41**

Impervious Total **6.41**

Basin Total **15.156**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12NW-A Channel	WL 12NW-A Channel	WL 12NW-A Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1
Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:

Outlet 1	**Outlet 2**
WL 12W Channel	

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000

0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000
0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000
0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000

0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

Name : WL 12W Channel
Bottom Length: 830.00 ft.
Bottom Width: 2.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.012 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12C Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.038	0.000	0.000	0.000
0.0222	0.039	0.000	0.019	0.000
0.0444	0.041	0.001	0.061	0.000
0.0667	0.043	0.002	0.121	0.000
0.0889	0.044	0.003	0.196	0.000
0.1111	0.046	0.004	0.287	0.000
0.1333	0.048	0.005	0.392	0.000
0.1556	0.050	0.006	0.510	0.000
0.1778	0.051	0.008	0.642	0.000
0.2000	0.053	0.009	0.788	0.000

0.2222	0.055	0.010	0.947	0.000
0.2444	0.056	0.011	1.119	0.000
0.2667	0.058	0.012	1.305	0.000
0.2889	0.060	0.014	1.504	0.000
0.3111	0.061	0.015	1.716	0.000
0.3333	0.063	0.016	1.942	0.000
0.3556	0.065	0.018	2.182	0.000
0.3778	0.066	0.019	2.436	0.000
0.4000	0.068	0.021	2.704	0.000
0.4222	0.070	0.022	2.985	0.000
0.4444	0.072	0.024	3.281	0.000
0.4667	0.073	0.026	3.592	0.000
0.4889	0.075	0.027	3.916	0.000
0.5111	0.077	0.029	4.256	0.000
0.5333	0.078	0.031	4.610	0.000
0.5556	0.080	0.032	4.980	0.000
0.5778	0.082	0.034	5.364	0.000
0.6000	0.083	0.036	5.764	0.000
0.6222	0.085	0.038	6.180	0.000
0.6444	0.087	0.040	6.611	0.000
0.6667	0.088	0.042	7.058	0.000
0.6889	0.090	0.044	7.522	0.000
0.7111	0.092	0.046	8.001	0.000
0.7333	0.094	0.048	8.497	0.000
0.7556	0.095	0.050	9.009	0.000
0.7778	0.097	0.052	9.538	0.000
0.8000	0.099	0.054	10.08	0.000
0.8222	0.100	0.057	10.64	0.000
0.8444	0.102	0.059	11.22	0.000
0.8667	0.104	0.061	11.82	0.000
0.8889	0.105	0.064	12.44	0.000
0.9111	0.107	0.066	13.07	0.000
0.9333	0.109	0.068	13.72	0.000
0.9556	0.110	0.071	14.39	0.000
0.9778	0.112	0.073	15.08	0.000
1.0000	0.114	0.076	15.79	0.000
1.0222	0.116	0.078	16.51	0.000
1.0444	0.117	0.081	17.25	0.000
1.0667	0.119	0.084	18.02	0.000
1.0889	0.121	0.086	18.80	0.000
1.1111	0.122	0.089	19.60	0.000
1.1333	0.124	0.092	20.42	0.000
1.1556	0.126	0.094	21.26	0.000
1.1778	0.127	0.097	22.12	0.000
1.2000	0.129	0.100	23.00	0.000
1.2222	0.131	0.103	23.90	0.000
1.2444	0.133	0.106	24.82	0.000
1.2667	0.134	0.109	25.77	0.000
1.2889	0.136	0.112	26.73	0.000
1.3111	0.138	0.115	27.71	0.000
1.3333	0.139	0.118	28.72	0.000
1.3556	0.141	0.121	29.74	0.000
1.3778	0.143	0.124	30.79	0.000
1.4000	0.144	0.128	31.86	0.000
1.4222	0.146	0.131	32.95	0.000
1.4444	0.148	0.134	34.06	0.000
1.4667	0.149	0.137	35.19	0.000

1.4889	0.151	0.141	36.35	0.000
1.5111	0.153	0.144	37.53	0.000
1.5333	0.155	0.148	38.73	0.000
1.5556	0.156	0.151	39.95	0.000
1.5778	0.158	0.155	41.20	0.000
1.6000	0.160	0.158	42.46	0.000
1.6222	0.161	0.162	43.76	0.000
1.6444	0.163	0.165	45.07	0.000
1.6667	0.165	0.169	46.41	0.000
1.6889	0.166	0.173	47.77	0.000
1.7111	0.168	0.176	49.16	0.000
1.7333	0.170	0.180	50.57	0.000
1.7556	0.171	0.184	52.01	0.000
1.7778	0.173	0.188	53.46	0.000
1.8000	0.175	0.192	54.95	0.000
1.8222	0.177	0.196	56.46	0.000
1.8444	0.178	0.199	57.99	0.000
1.8667	0.180	0.203	59.54	0.000
1.8889	0.182	0.208	61.13	0.000
1.9111	0.183	0.212	62.73	0.000
1.9333	0.185	0.216	64.37	0.000
1.9556	0.187	0.220	66.02	0.000
1.9778	0.188	0.224	67.71	0.000
2.0000	0.190	0.228	69.42	0.000
2.0222	0.192	0.232	71.15	0.000

Name : WL 12NW-A Channel
Bottom Length: 1415.00 ft.
Bottom Width: 8.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 1 To 1
Channel right side slope 2: 1 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12C Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.259	0.000	0.000	0.000
0.0444	0.262	0.011	0.140	0.000
0.0889	0.265	0.023	0.443	0.000
0.1333	0.268	0.035	0.871	0.000
0.1778	0.271	0.047	1.406	0.000
0.2222	0.274	0.059	2.039	0.000
0.2667	0.277	0.071	2.761	0.000
0.3111	0.280	0.084	3.568	0.000
0.3556	0.283	0.096	4.455	0.000
0.4000	0.285	0.109	5.419	0.000

0.4444	0.288	0.121	6.457	0.000
0.4889	0.291	0.134	7.567	0.000
0.5333	0.294	0.147	8.747	0.000
0.5778	0.297	0.161	9.994	0.000
0.6222	0.300	0.174	11.30	0.000
0.6667	0.303	0.187	12.68	0.000
0.7111	0.306	0.201	14.12	0.000
0.7556	0.309	0.214	15.63	0.000
0.8000	0.311	0.228	17.20	0.000
0.8444	0.314	0.242	18.82	0.000
0.8889	0.317	0.256	20.51	0.000
0.9333	0.320	0.270	22.26	0.000
0.9778	0.323	0.285	24.06	0.000
1.0222	0.326	0.299	25.93	0.000
1.0667	0.329	0.314	27.85	0.000
1.1111	0.332	0.328	29.83	0.000
1.1556	0.334	0.343	31.86	0.000
1.2000	0.337	0.358	33.95	0.000
1.2444	0.340	0.373	36.10	0.000
1.2889	0.343	0.388	38.30	0.000
1.3333	0.346	0.404	40.56	0.000
1.3778	0.349	0.419	42.88	0.000
1.4222	0.352	0.435	45.25	0.000
1.4667	0.355	0.451	47.67	0.000
1.5111	0.358	0.466	50.15	0.000
1.5556	0.360	0.482	52.68	0.000
1.6000	0.363	0.499	55.27	0.000
1.6444	0.366	0.515	57.92	0.000
1.6889	0.369	0.531	60.61	0.000
1.7333	0.372	0.548	63.37	0.000
1.7778	0.375	0.564	66.17	0.000
1.8222	0.378	0.581	69.03	0.000
1.8667	0.381	0.598	71.95	0.000
1.9111	0.384	0.615	74.91	0.000
1.9556	0.386	0.632	77.94	0.000
2.0000	0.389	0.649	81.01	0.000
2.0444	0.392	0.667	84.14	0.000
2.0889	0.395	0.684	87.33	0.000
2.1333	0.398	0.702	90.57	0.000
2.1778	0.401	0.720	93.86	0.000
2.2222	0.404	0.737	97.21	0.000
2.2667	0.407	0.755	100.6	0.000
2.3111	0.410	0.774	104.0	0.000
2.3556	0.412	0.792	107.5	0.000
2.4000	0.415	0.810	111.1	0.000
2.4444	0.418	0.829	114.7	0.000
2.4889	0.421	0.848	118.4	0.000
2.5333	0.424	0.866	122.1	0.000
2.5778	0.427	0.885	125.9	0.000
2.6222	0.430	0.904	129.7	0.000
2.6667	0.433	0.924	133.6	0.000
2.7111	0.436	0.943	137.6	0.000
2.7556	0.438	0.962	141.6	0.000
2.8000	0.441	0.982	145.6	0.000
2.8444	0.444	1.002	149.8	0.000
2.8889	0.447	1.021	153.9	0.000
2.9333	0.450	1.041	158.2	0.000

2.9778	0.453	1.061	162.4	0.000
3.0222	0.456	1.082	166.8	0.000
3.0667	0.459	1.102	171.2	0.000
3.1111	0.462	1.122	175.6	0.000
3.1556	0.464	1.143	180.1	0.000
3.2000	0.467	1.164	184.7	0.000
3.2444	0.470	1.185	189.3	0.000
3.2889	0.473	1.206	194.0	0.000
3.3333	0.476	1.227	198.7	0.000
3.3778	0.479	1.248	203.5	0.000
3.4222	0.482	1.269	208.3	0.000
3.4667	0.485	1.291	213.2	0.000
3.5111	0.488	1.312	218.2	0.000
3.5556	0.490	1.334	223.2	0.000
3.6000	0.493	1.356	228.3	0.000
3.6444	0.496	1.378	233.4	0.000
3.6889	0.499	1.400	238.6	0.000
3.7333	0.502	1.423	243.9	0.000
3.7778	0.505	1.445	249.2	0.000
3.8222	0.508	1.467	254.5	0.000
3.8667	0.511	1.490	260.0	0.000
3.9111	0.514	1.513	265.5	0.000
3.9556	0.516	1.536	271.0	0.000
4.0000	0.519	1.559	276.6	0.000
4.0444	0.522	1.582	282.3	0.000

Name : WL 12C Channel
Bottom Length: 2550.00 ft.
Bottom Width: 12.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.003 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.702	0.000	0.000	0.000
0.0222	0.707	0.015	0.057	0.000
0.0444	0.712	0.031	0.182	0.000
0.0667	0.718	0.047	0.358	0.000
0.0889	0.723	0.063	0.579	0.000
0.1111	0.728	0.079	0.841	0.000
0.1333	0.733	0.095	1.140	0.000
0.1556	0.738	0.112	1.476	0.000
0.1778	0.744	0.128	1.845	0.000
0.2000	0.749	0.145	2.247	0.000

0.2222	0.754	0.161	2.681	0.000
0.2444	0.759	0.178	3.146	0.000
0.2667	0.764	0.195	3.640	0.000
0.2889	0.770	0.212	4.163	0.000
0.3111	0.775	0.229	4.715	0.000
0.3333	0.780	0.247	5.294	0.000
0.3556	0.785	0.264	5.901	0.000
0.3778	0.790	0.282	6.535	0.000
0.4000	0.796	0.299	7.195	0.000
0.4222	0.801	0.317	7.881	0.000
0.4444	0.806	0.335	8.593	0.000
0.4667	0.811	0.353	9.331	0.000
0.4889	0.817	0.371	10.09	0.000
0.5111	0.822	0.389	10.88	0.000
0.5333	0.827	0.408	11.69	0.000
0.5556	0.832	0.426	12.53	0.000
0.5778	0.837	0.445	13.39	0.000
0.6000	0.843	0.463	14.27	0.000
0.6222	0.848	0.482	15.18	0.000
0.6444	0.853	0.501	16.11	0.000
0.6667	0.858	0.520	17.07	0.000
0.6889	0.863	0.539	18.05	0.000
0.7111	0.869	0.558	19.05	0.000
0.7333	0.874	0.578	20.08	0.000
0.7556	0.879	0.597	21.13	0.000
0.7778	0.884	0.617	22.20	0.000
0.8000	0.889	0.636	23.29	0.000
0.8222	0.895	0.656	24.41	0.000
0.8444	0.900	0.676	25.55	0.000
0.8667	0.905	0.696	26.72	0.000
0.8889	0.910	0.716	27.90	0.000
0.9111	0.915	0.737	29.11	0.000
0.9333	0.921	0.757	30.34	0.000
0.9556	0.926	0.778	31.59	0.000
0.9778	0.931	0.798	32.87	0.000
1.0000	0.936	0.819	34.17	0.000
1.0222	0.941	0.840	35.49	0.000
1.0444	0.947	0.861	36.83	0.000
1.0667	0.952	0.882	38.19	0.000
1.0889	0.957	0.903	39.58	0.000
1.1111	0.962	0.925	40.99	0.000
1.1333	0.967	0.946	42.42	0.000
1.1556	0.973	0.968	43.87	0.000
1.1778	0.978	0.989	45.35	0.000
1.2000	0.983	1.011	46.85	0.000
1.2222	0.988	1.033	48.37	0.000
1.2444	0.993	1.055	49.91	0.000
1.2667	0.999	1.077	51.47	0.000
1.2889	1.004	1.099	53.06	0.000
1.3111	1.009	1.122	54.66	0.000
1.3333	1.014	1.144	56.29	0.000
1.3556	1.019	1.167	57.94	0.000
1.3778	1.025	1.190	59.62	0.000
1.4000	1.030	1.212	61.31	0.000
1.4222	1.035	1.235	63.03	0.000
1.4444	1.040	1.259	64.77	0.000
1.4667	1.045	1.282	66.53	0.000

1.4889	1.051	1.305	68.32	0.000
1.5111	1.056	1.328	70.12	0.000
1.5333	1.061	1.352	71.95	0.000
1.5556	1.066	1.376	73.80	0.000
1.5778	1.071	1.399	75.67	0.000
1.6000	1.077	1.423	77.57	0.000
1.6222	1.082	1.447	79.48	0.000
1.6444	1.087	1.471	81.42	0.000
1.6667	1.092	1.496	83.38	0.000
1.6889	1.098	1.520	85.37	0.000
1.7111	1.103	1.544	87.37	0.000
1.7333	1.108	1.569	89.40	0.000
1.7556	1.113	1.594	91.45	0.000
1.7778	1.118	1.618	93.52	0.000
1.8000	1.124	1.643	95.62	0.000
1.8222	1.129	1.668	97.73	0.000
1.8444	1.134	1.694	99.87	0.000
1.8667	1.139	1.719	102.0	0.000
1.8889	1.144	1.744	104.2	0.000
1.9111	1.150	1.770	106.4	0.000
1.9333	1.155	1.795	108.6	0.000
1.9556	1.160	1.821	110.9	0.000
1.9778	1.165	1.847	113.1	0.000
2.0000	1.170	1.873	115.4	0.000
2.0222	1.176	1.899	117.8	0.000

Name : Exist. 12C
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**10.062**
C, Lawn, Flat	**8.205**
C, Forest, Steep	**4.799**
C, Lawn, Steep	**.917**

Pervious Total **23.983**

Impervious Land Use	**acre**
ROADS FLAT	**11.851**

Impervious Total **11.851**

Basin Total **35.834**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12C Channel	WL 12C Channel	WL 12C Channel

Name : Exist. 12E
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	6.705
C, Lawn, Flat	15.235
C, Forest, Steep	.256
C, Lawn, Steep	.61

Pervious Total **22.806**

Impervious Land Use	acre
ROADS FLAT	26.527

Impervious Total **26.527**

Basin Total **49.333**

Element Flows To:

Surface	Interflow	Groundwater
WL 12C Channel	WL 12C Channel	WL 12C Channel

ANALYSIS RESULTS

Stream Protection Duration

NOTE: FLOW DURATION ANALYSIS IDENTIFIES EXISTING AND MITIGATED FLOWS BUT IS NOT INDICATIVE OF THE PROJECT'S COMPLIANCE WITH FLOW DURATION REQUIREMENTS INTO BORST LAKE. DURATIONS ARE ONLY INCLUDED TO IDENTIFY FLOW RATES AND IDENTIFY THE PROJECT'S COMPLIANCE (AND MAINTENANCE) OF EXISTING FLOWS FOR THE INTERCONNECTED WETLANDS 12NW & 12C.

Predeveloped Landuse Totals for POC #1
Total Pervious Area:91.843
Total Impervious Area:44.478

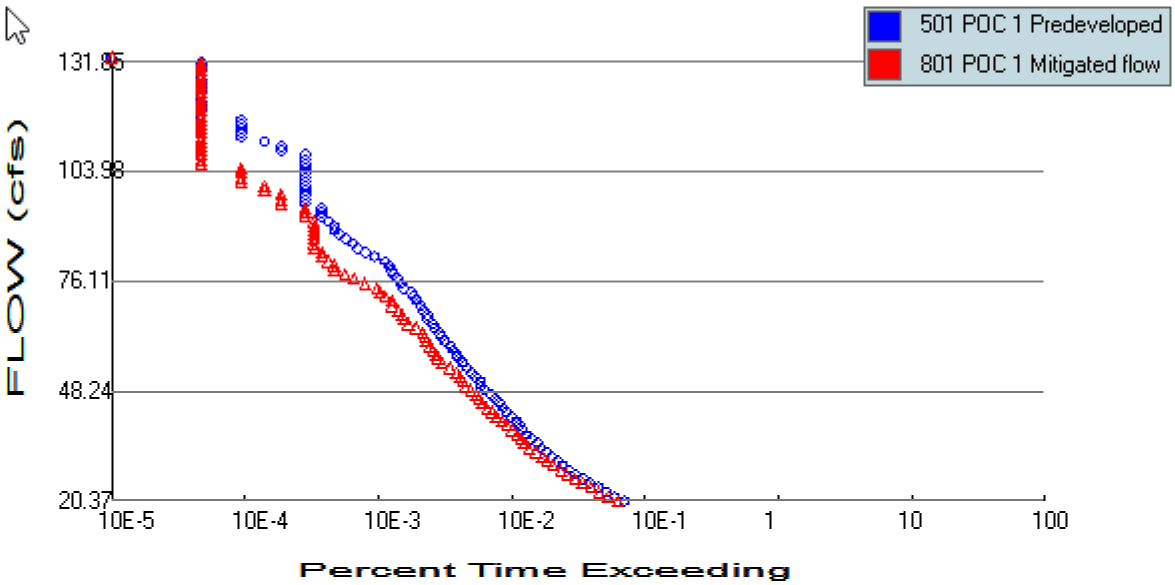
Mitigated Landuse Totals for POC #1
Total Pervious Area:69.106
Total Impervious Area:49.611

Flow Frequency Return Periods for Predeveloped. POC #1

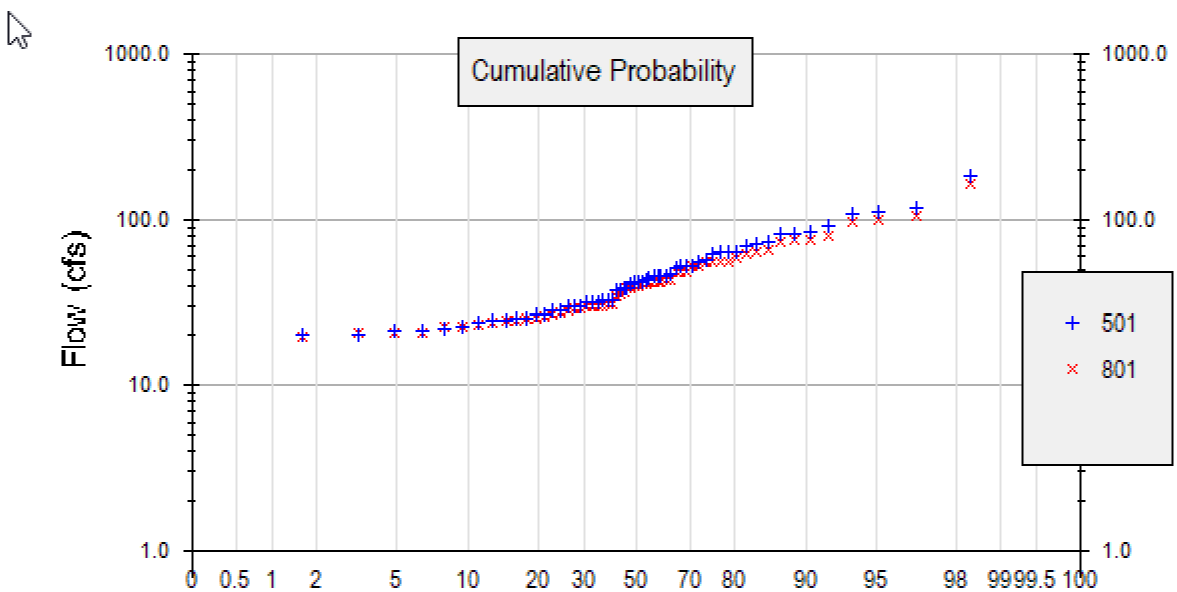
Return Period	Flow(cfs)
2 year	40.745373
5 year	63.608482
10 year	81.871888
25 year	108.801341
50 year	131.854901
100 year	157.640947

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	38.15129
5 year	58.141801
10 year	74.160569
25 year	97.882811
50 year	118.290729
100 year	141.224732



501 POC 1 Predeveloped
801 POC 1 Mitigated flow
131.85
103.98
76.11
48.24
20.37
10E-5
10E-4
10E-3
10E-2
10E-1
1
10
100
FLOW (cfs)
Percent Time Exceeding



Cumulative Probability
1000.0
100.0
10.0
1.0
Flow (cfs)
0
0.5
1
2
5
10
20
30
50
70
80
90
95
98
99
99.5
100
501
801

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	47.023	43.023
1950	68.535	61.477
1951	45.129	40.696
1952	24.300	25.034
1953	30.064	28.825
1954	42.921	40.001
1955	26.890	25.413
1956	30.296	28.584
1957	32.540	29.858
1958	20.350	20.590
1959	31.894	30.609
1960	28.674	27.358
1961	21.324	20.732
1962	19.973	19.817
1963	32.333	30.095
1964	73.972	64.786
1965	37.156	34.407
1966	22.048	22.346
1967	51.341	54.817
1968	24.908	24.237
1969	63.412	58.161
1970	25.431	24.841
1971	45.029	42.858
1972	56.215	53.006
1973	21.266	20.886
1974	31.339	30.292
1975	45.981	41.744
1976	32.087	29.990
1977	38.754	38.816
1978	32.164	30.619
1979	19.344	19.393
1980	28.536	27.097
1981	52.164	47.641
1982	22.802	23.037
1983	37.948	36.508
1984	61.412	55.555
1985	29.966	29.432
1986	42.150	41.417
1987	81.404	72.367
1988	26.586	26.100
1989	25.696	24.623
1990	52.543	47.918
1991	83.838	75.171
1992	63.438	56.047
1993	23.634	22.797
1994	81.428	76.315
1995	41.215	39.098
1996	63.237	56.028
1997	185.966	163.593
1998	44.190	41.631
1999	117.644	105.693
2000	46.107	42.363
2001	42.277	40.445
2002	70.926	64.419

2003	52.483	48.030
2004	112.654	100.754
2005	41.950	38.630
2006	39.070	35.729
2007	108.313	95.689
2008	91.234	80.508
2009	54.819	53.033

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	185.9660	163.5930
2	117.6440	105.6930
3	112.6540	100.7540
4	108.3130	95.6894
5	91.2339	80.5084
6	83.8384	76.3148
7	81.4284	75.1709
8	81.4037	72.3669
9	73.9723	64.7861
10	70.9255	64.4186
11	68.5349	61.4772
12	63.4376	58.1605
13	63.4116	56.0466
14	63.2369	56.0282
15	61.4116	55.5549
16	56.2146	54.8168
17	54.8191	53.0332
18	52.5431	53.0062
19	52.4827	48.0298
20	52.1635	47.9180
21	51.3414	47.6405
22	47.0225	43.0232
23	46.1068	42.8577
24	45.9807	42.3627
25	45.1291	41.7438
26	45.0286	41.6307
27	44.1902	41.4165
28	42.9214	40.6956
29	42.2768	40.4452
30	42.1495	40.0009
31	41.9499	39.0984
32	41.2152	38.8156
33	39.0702	38.6296
34	38.7537	36.5076
35	37.9475	35.7285
36	37.1561	34.4067
37	32.5402	30.6189
38	32.3327	30.6093
39	32.1642	30.2922
40	32.0869	30.0945
41	31.8939	29.9895
42	31.3388	29.8582
43	30.2961	29.4324
44	30.0641	28.8246
45	29.9662	28.5843

46	28.6741	27.3578
47	28.5362	27.0965
48	26.8903	26.1004
49	26.5855	25.4131
50	25.6962	25.0338
51	25.4314	24.8409
52	24.9080	24.6227
53	24.2995	24.2369
54	23.6344	23.0369
55	22.8018	22.7971
56	22.0484	22.3464
57	21.3242	20.8857
58	21.2656	20.7319
59	20.3501	20.5896
60	19.9727	19.8167
61	19.3437	19.3930

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
20.3727	1500	1341	89	Pass
21.4988	1260	1136	90	Pass
22.6249	1094	969	88	Pass
23.7509	953	844	88	Pass
24.8770	824	727	88	Pass
26.0031	741	641	86	Pass
27.1292	646	558	86	Pass
28.2553	577	499	86	Pass
29.3814	516	436	84	Pass
30.5074	473	394	83	Pass
31.6335	424	364	85	Pass
32.7596	390	328	84	Pass
33.8857	360	290	80	Pass
35.0118	330	267	80	Pass
36.1378	300	252	84	Pass
37.2639	275	235	85	Pass
38.3900	258	216	83	Pass
39.5161	246	197	80	Pass
40.6422	233	181	77	Pass
41.7683	215	165	76	Pass
42.8943	196	153	78	Pass
44.0204	187	140	74	Pass
45.1465	172	128	74	Pass
46.2726	160	122	76	Pass
47.3987	149	116	77	Pass
48.5248	133	106	79	Pass
49.6508	126	96	76	Pass
50.7769	124	92	74	Pass
51.9030	114	87	76	Pass
53.0291	106	82	77	Pass
54.1552	100	73	73	Pass
55.2813	91	64	70	Pass

56.4073	86	59	68	Pass
57.5334	82	58	70	Pass
58.6595	78	55	70	Pass
59.7856	74	52	70	Pass
60.9117	67	49	73	Pass
62.0378	63	48	76	Pass
63.1638	62	46	74	Pass
64.2899	56	41	73	Pass
65.4160	55	36	65	Pass
66.5421	50	33	66	Pass
67.6682	50	32	64	Pass
68.7943	46	30	65	Pass
69.9203	44	27	61	Pass
71.0464	41	27	65	Pass
72.1725	39	24	61	Pass
73.2986	38	22	57	Pass
74.4247	33	21	63	Pass
75.5508	32	17	53	Pass
76.6768	30	14	46	Pass
77.8029	28	12	42	Pass
78.9290	27	10	37	Pass
80.0551	26	10	38	Pass
81.1812	24	9	37	Pass
82.3073	20	8	40	Pass
83.4333	17	8	47	Pass
84.5594	15	7	46	Pass
85.6855	14	7	50	Pass
86.8116	12	7	58	Pass
87.9377	11	7	63	Pass
89.0637	10	7	70	Pass
90.1898	10	7	70	Pass
91.3159	9	7	77	Pass
92.4420	8	6	75	Pass
93.5681	8	6	75	Pass
94.6942	8	6	75	Pass
95.8202	6	4	66	Pass
96.9463	6	4	66	Pass
98.0724	6	4	66	Pass
99.1985	6	3	50	Pass
100.3246	6	3	50	Pass
101.4507	6	2	33	Pass
102.5767	6	2	33	Pass
103.7028	6	2	33	Pass
104.8289	6	2	33	Pass
105.9550	6	1	16	Pass
107.0811	6	1	16	Pass
108.2072	6	1	16	Pass
109.3332	4	1	25	Pass
110.4593	4	1	25	Pass
111.5854	3	1	33	Pass
112.7115	2	1	50	Pass
113.8376	2	1	50	Pass
114.9637	2	1	50	Pass
116.0897	2	1	50	Pass
117.2158	2	1	50	Pass
118.3419	1	1	100	Pass
119.4680	1	1	100	Pass

120.5941	1	1	100	Pass
121.7202	1	1	100	Pass
122.8462	1	1	100	Pass
123.9723	1	1	100	Pass
125.0984	1	1	100	Pass
126.2245	1	1	100	Pass
127.3506	1	1	100	Pass
128.4767	1	1	100	Pass
129.6027	1	1	100	Pass
130.7288	1	1	100	Pass
131.8549	1	1	100	Pass

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.**

Wetlands Input Volume
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	99.6828	87.4597	87.7	Pass
Feb	69.9978	61.1549	87.4	Pass
Mar	64.0650	56.0417	87.5	Pass
Apr	46.5589	40.8666	87.8	Pass
May	29.4125	26.0521	88.6	Pass
Jun	24.2432	21.5022	88.7	Pass
Jul	12.7309	11.1874	87.9	Pass
Aug	12.9378	11.7277	90.6	Pass
Sep	19.5031	17.7919	91.2	Pass
Oct	41.9493	37.8204	90.2	Pass
Nov	92.5276	82.0449	88.7	Pass
Dec	96.8750	85.1672	87.9	Pass

Day	Series 1	Series 2	Percent	Pass/Fail
Jan1	3.6075	3.2136	89.1	Pass
2	3.1342	2.7044	86.3	Pass
3	3.2542	2.8840	88.6	Pass
4	3.6671	3.2537	88.7	Pass
5	3.3563	2.9230	87.1	Pass
6	4.0296	3.5692	88.6	Pass
7	3.4917	3.0264	86.7	Pass
8	3.5269	3.0784	87.3	Pass
9	3.0692	2.6858	87.5	Pass
10	2.6575	2.2855	86.0	Pass
11	2.9312	2.5851	88.2	Pass
12	3.0961	2.7589	89.1	Pass
13	3.5230	3.1318	88.9	Pass
14	3.1994	2.7906	87.2	Pass
15	3.1532	2.7639	87.7	Pass

16	3.3701	2.9420	87.3	Pass
17	3.1462	2.7578	87.7	Pass
18	3.0865	2.6828	86.9	Pass
19	3.1085	2.7252	87.7	Pass
20	3.0075	2.6206	87.1	Pass
21	3.0506	2.6980	88.4	Pass
22	3.5485	3.1556	88.9	Pass
23	3.8272	3.3891	88.6	Pass
24	3.2074	2.7393	85.4	Pass
25	2.8645	2.4747	86.4	Pass
26	2.7417	2.3706	86.5	Pass
27	2.7748	2.4418	88.0	Pass
28	2.9781	2.6210	88.0	Pass
29	3.2844	2.8856	87.9	Pass
30	2.9689	2.6041	87.7	Pass
31	2.7857	2.4053	86.3	Pass
Feb1	2.4831	2.1522	86.7	Pass
2	2.2142	1.8991	85.8	Pass
3	2.1313	1.8438	86.5	Pass
4	1.7935	1.5383	85.8	Pass
5	2.3124	2.0840	90.1	Pass
6	2.3499	2.0413	86.9	Pass
7	2.8754	2.5545	88.8	Pass
8	2.9548	2.5747	87.1	Pass
9	2.4459	2.1138	86.4	Pass
10	2.2420	1.9594	87.4	Pass
11	2.6023	2.3077	88.7	Pass
12	2.4632	2.1410	86.9	Pass
13	2.2344	1.9481	87.2	Pass
14	2.5741	2.2890	88.9	Pass
15	2.7478	2.4134	87.8	Pass
16	2.7028	2.3816	88.1	Pass
17	2.6397	2.3230	88.0	Pass
18	3.4650	3.0817	88.9	Pass
19	2.5260	2.1249	84.1	Pass
20	2.4817	2.1553	86.8	Pass
21	2.1863	1.8803	86.0	Pass
22	2.1797	1.9131	87.8	Pass
23	2.5433	2.2376	88.0	Pass
24	2.4579	2.1474	87.4	Pass
25	2.0726	1.7830	86.0	Pass
26	2.2638	1.9799	87.5	Pass
27	2.6449	2.3437	88.6	Pass
28	2.3786	2.0501	86.2	Pass
29	2.3440	2.0472	87.3	Pass
Mar1	2.1384	1.8550	86.7	Pass
2	2.7694	2.4709	89.2	Pass
3	2.3883	2.0656	86.5	Pass
4	2.3594	2.0536	87.0	Pass
5	1.7489	1.4793	84.6	Pass
6	1.8751	1.6318	87.0	Pass
7	1.9914	1.7809	89.4	Pass
8	2.5642	2.2908	89.3	Pass
9	2.2319	1.9392	86.9	Pass
10	2.2887	2.0212	88.3	Pass
11	2.5077	2.2186	88.5	Pass
12	2.0434	1.7505	85.7	Pass

13	1.9987	1.7420	87.2	Pass
14	2.1139	1.8517	87.6	Pass
15	2.1568	1.9097	88.5	Pass
16	1.9863	1.7043	85.8	Pass
17	2.1946	1.9518	88.9	Pass
18	1.8863	1.6174	85.7	Pass
19	1.6905	1.4576	86.2	Pass
20	1.4964	1.2893	86.2	Pass
21	2.0656	1.8757	90.8	Pass
22	2.2004	1.9473	88.5	Pass
23	2.2038	1.9366	87.9	Pass
24	2.0575	1.7806	86.5	Pass
25	1.9741	1.7172	87.0	Pass
26	1.7589	1.5177	86.3	Pass
27	1.7336	1.5128	87.3	Pass
28	1.8169	1.5869	87.3	Pass
29	1.8827	1.6652	88.5	Pass
30	1.5973	1.3727	85.9	Pass
31	1.7876	1.5843	88.6	Pass
Apr1	1.8089	1.5963	88.2	Pass
2	1.6580	1.4333	86.5	Pass
3	2.0026	1.7922	89.5	Pass
4	1.9505	1.6929	86.8	Pass
5	1.7976	1.5633	87.0	Pass
6	1.2478	1.0289	82.5	Pass
7	1.5326	1.3713	89.5	Pass
8	1.7288	1.5424	89.2	Pass
9	1.4905	1.2903	86.6	Pass
10	1.8025	1.6048	89.0	Pass
11	1.7140	1.5096	88.1	Pass
12	1.9347	1.7177	88.8	Pass
13	1.6940	1.4791	87.3	Pass
14	1.4590	1.2528	85.9	Pass
15	1.7632	1.5590	88.4	Pass
16	1.5524	1.3439	86.6	Pass
17	1.2693	1.0926	86.1	Pass
18	1.7195	1.5550	90.4	Pass
19	1.4642	1.2532	85.6	Pass
20	1.1051	0.9389	85.0	Pass
21	1.2454	1.1140	89.5	Pass
22	1.6687	1.4925	89.4	Pass
23	1.5777	1.3920	88.2	Pass
24	1.1529	0.9766	84.7	Pass
25	1.0001	0.8596	86.0	Pass
26	1.4439	1.3131	90.9	Pass
27	1.2970	1.1443	88.2	Pass
28	1.3512	1.1985	88.7	Pass
29	1.3388	1.1744	87.7	Pass
30	1.1686	1.0148	86.8	Pass
May1	1.2691	1.1272	88.8	Pass
2	1.1257	0.9669	85.9	Pass
3	0.9602	0.8410	87.6	Pass
4	1.0669	0.9482	88.9	Pass
5	1.0444	0.9234	88.4	Pass
6	0.8569	0.7402	86.4	Pass
7	0.8004	0.6984	87.3	Pass
8	0.8281	0.7337	88.6	Pass

9	0.8744	0.7740	88.5	Pass
10	1.0605	0.9601	90.5	Pass
11	0.8543	0.7538	88.2	Pass
12	0.9823	0.8652	88.1	Pass
13	1.0368	0.9252	89.2	Pass
14	0.8812	0.7713	87.5	Pass
15	0.9550	0.8422	88.2	Pass
16	0.8835	0.7825	88.6	Pass
17	0.9578	0.8612	89.9	Pass
18	0.9598	0.8594	89.5	Pass
19	0.9102	0.8052	88.5	Pass
20	0.7579	0.6615	87.3	Pass
21	0.7476	0.6567	87.8	Pass
22	0.7773	0.6993	90.0	Pass
23	0.9325	0.8544	91.6	Pass
24	0.8125	0.7046	86.7	Pass
25	0.9971	0.9016	90.4	Pass
26	1.0156	0.9169	90.3	Pass
27	0.9428	0.8388	89.0	Pass
28	1.0081	0.9123	90.5	Pass
29	0.8433	0.7304	86.6	Pass
30	1.1020	0.9814	89.1	Pass
31	1.0679	0.9307	87.2	Pass
Jun1	0.9150	0.7864	85.9	Pass
2	0.9639	0.8638	89.6	Pass
3	1.0222	0.9221	90.2	Pass
4	0.8788	0.7788	88.6	Pass
5	1.0251	0.9382	91.5	Pass
6	1.0463	0.9187	87.8	Pass
7	0.9617	0.8418	87.5	Pass
8	0.9784	0.8716	89.1	Pass
9	0.9587	0.8447	88.1	Pass
10	0.8918	0.7912	88.7	Pass
11	0.8553	0.7554	88.3	Pass
12	0.7495	0.6609	88.2	Pass
13	0.7064	0.6225	88.1	Pass
14	0.6250	0.5514	88.2	Pass
15	0.7457	0.6627	88.9	Pass
16	0.9817	0.8809	89.7	Pass
17	0.6623	0.5691	85.9	Pass
18	0.6271	0.5533	88.2	Pass
19	0.6592	0.5794	87.9	Pass
20	0.7515	0.6806	90.6	Pass
21	0.5133	0.4342	84.6	Pass
22	0.7456	0.6772	90.8	Pass
23	1.1523	1.0531	91.4	Pass
24	0.6813	0.5806	85.2	Pass
25	0.5725	0.5003	87.4	Pass
26	0.6135	0.5613	91.5	Pass
27	0.6351	0.5746	90.5	Pass
28	0.6791	0.6069	89.4	Pass
29	0.5769	0.5094	88.3	Pass
30	0.6819	0.6120	89.8	Pass
Jul1	0.5852	0.5158	88.1	Pass
2	0.5060	0.4317	85.3	Pass
3	0.4619	0.4038	87.4	Pass
4	0.5501	0.4936	89.7	Pass

5	0.5025	0.4488	89.3	Pass
6	0.4413	0.3910	88.6	Pass
7	0.6750	0.6267	92.8	Pass
8	0.6686	0.5998	89.7	Pass
9	0.5655	0.5033	89.0	Pass
10	0.4153	0.3500	84.3	Pass
11	0.5378	0.4832	89.8	Pass
12	0.6045	0.5284	87.4	Pass
13	0.4351	0.3708	85.2	Pass
14	0.3676	0.3135	85.3	Pass
15	0.5151	0.4788	93.0	Pass
16	0.3599	0.3059	85.0	Pass
17	0.3290	0.2767	84.1	Pass
18	0.2871	0.2450	85.3	Pass
19	0.2751	0.2380	86.5	Pass
20	0.2498	0.2107	84.4	Pass
21	0.3285	0.2936	89.4	Pass
22	0.2821	0.2473	87.7	Pass
23	0.2202	0.1830	83.1	Pass
24	0.2774	0.2478	89.3	Pass
25	0.3883	0.3646	93.9	Pass
26	0.2925	0.2486	85.0	Pass
27	0.2792	0.2410	86.3	Pass
28	0.2269	0.1871	82.5	Pass
29	0.2251	0.1889	83.9	Pass
30	0.1966	0.1579	80.3	Pass
31	0.3084	0.2769	89.8	Pass
Aug1	0.2673	0.2330	87.2	Pass
2	0.3288	0.3017	91.7	Pass
3	0.2556	0.2181	85.3	Pass
4	0.2148	0.1735	80.8	Pass
5	0.3205	0.2969	92.6	Pass
6	0.5356	0.5173	96.6	Pass
7	0.3460	0.2917	84.3	Pass
8	0.2912	0.2504	86.0	Pass
9	0.2619	0.2272	86.8	Pass
10	0.2944	0.2646	89.9	Pass
11	0.2659	0.2289	86.1	Pass
12	0.2654	0.2360	88.9	Pass
13	0.4306	0.4066	94.4	Pass
14	0.5557	0.5119	92.1	Pass
15	0.4882	0.4490	92.0	Pass
16	0.3802	0.3371	88.7	Pass
17	0.4286	0.3892	90.8	Pass
18	0.4027	0.3726	92.5	Pass
19	0.3357	0.2912	86.7	Pass
20	0.5013	0.4689	93.5	Pass
21	0.5958	0.5655	94.9	Pass
22	0.6944	0.6536	94.1	Pass
23	0.6764	0.6094	90.1	Pass
24	0.5267	0.4539	86.2	Pass
25	0.6287	0.5642	89.7	Pass
26	0.4946	0.4417	89.3	Pass
27	0.4145	0.3697	89.2	Pass
28	0.4839	0.4501	93.0	Pass
29	0.4088	0.3654	89.4	Pass
30	0.5350	0.5114	95.6	Pass

31	0.5584	0.5155	92.3	Pass
Sep1	0.6487	0.5649	87.1	Pass
2	0.4592	0.4070	88.6	Pass
3	0.5948	0.5506	92.6	Pass
4	0.4654	0.4159	89.4	Pass
5	0.5571	0.5148	92.4	Pass
6	0.3377	0.2902	85.9	Pass
7	0.4758	0.4359	91.6	Pass
8	0.5383	0.4930	91.6	Pass
9	0.7735	0.7407	95.8	Pass
10	0.5546	0.4949	89.2	Pass
11	0.4373	0.3685	84.3	Pass
12	0.5726	0.5309	92.7	Pass
13	0.5812	0.5530	95.2	Pass
14	0.4640	0.4190	90.3	Pass
15	0.6859	0.6469	94.3	Pass
16	1.2890	1.2173	94.4	Pass
17	0.7636	0.6673	87.4	Pass
18	0.8308	0.7676	92.4	Pass
19	0.5795	0.5093	87.9	Pass
20	0.5005	0.4450	88.9	Pass
21	0.8544	0.8056	94.3	Pass
22	0.9086	0.8262	90.9	Pass
23	0.7663	0.6849	89.4	Pass
24	0.6571	0.5901	89.8	Pass
25	0.7668	0.7041	91.8	Pass
26	0.5411	0.4738	87.6	Pass
27	0.7077	0.6545	92.5	Pass
28	0.6702	0.6121	91.3	Pass
29	0.9630	0.8926	92.7	Pass
30	0.6803	0.5923	87.1	Pass
Oct1	0.8517	0.7812	91.7	Pass
2	0.8222	0.7584	92.2	Pass
3	0.9075	0.8578	94.5	Pass
4	0.7421	0.6554	88.3	Pass
5	1.0495	0.9749	92.9	Pass
6	0.9124	0.8232	90.2	Pass
7	1.3847	1.3157	95.0	Pass
8	1.6114	1.4973	92.9	Pass
9	1.3741	1.1988	87.2	Pass
10	1.0437	0.8968	85.9	Pass
11	0.9356	0.8407	89.9	Pass
12	0.9331	0.8438	90.4	Pass
13	0.9067	0.8318	91.7	Pass
14	1.0364	0.9367	90.4	Pass
15	1.1769	1.0753	91.4	Pass
16	1.2497	1.1387	91.1	Pass
17	1.2765	1.1326	88.7	Pass
18	1.5585	1.4259	91.5	Pass
19	2.4899	2.2702	91.2	Pass
20	1.7362	1.5235	87.7	Pass
21	1.6671	1.4859	89.1	Pass
22	1.4518	1.2713	87.6	Pass
23	1.4099	1.2570	89.2	Pass
24	1.5581	1.4147	90.8	Pass
25	1.7257	1.5530	90.0	Pass
26	1.9023	1.7398	91.5	Pass

27	1.9388	1.7195	88.7	Pass
28	1.7887	1.5615	87.3	Pass
29	1.7840	1.5892	89.1	Pass
30	2.0443	1.8563	90.8	Pass
31	1.9595	1.7559	89.6	Pass
Nov1	2.0180	1.7910	88.8	Pass
2	2.4755	2.2439	90.6	Pass
3	3.4546	3.1277	90.5	Pass
4	2.4802	2.1461	86.5	Pass
5	3.0153	2.6798	88.9	Pass
6	2.8871	2.5590	88.6	Pass
7	2.5272	2.2244	88.0	Pass
8	2.5235	2.2455	89.0	Pass
9	2.6424	2.3833	90.2	Pass
10	3.2709	2.9600	90.5	Pass
11	3.4608	3.0911	89.3	Pass
12	3.2484	2.8780	88.6	Pass
13	3.0517	2.6409	86.5	Pass
14	2.5056	2.1922	87.5	Pass
15	2.6234	2.3338	89.0	Pass
16	3.0110	2.7049	89.8	Pass
17	3.0557	2.6727	87.5	Pass
18	3.3774	3.0468	90.2	Pass
19	3.7673	3.3644	89.3	Pass
20	3.6013	3.1424	87.3	Pass
21	3.0253	2.6289	86.9	Pass
22	3.3902	3.0590	90.2	Pass
23	4.1448	3.6870	89.0	Pass
24	4.5444	4.0584	89.3	Pass
25	3.6009	3.1176	86.6	Pass
26	3.1655	2.7319	86.3	Pass
27	3.0929	2.7335	88.4	Pass
28	3.0482	2.6662	87.5	Pass
29	3.5575	3.1808	89.4	Pass
30	3.5838	3.1937	89.1	Pass
Dec1	4.0635	3.6147	89.0	Pass
2	4.7681	4.1997	88.1	Pass
3	3.4594	2.9561	85.5	Pass
4	3.1814	2.8011	88.0	Pass
5	3.1040	2.7119	87.4	Pass
6	2.7073	2.3498	86.8	Pass
7	2.4975	2.1816	87.4	Pass
8	2.7662	2.4629	89.0	Pass
9	3.1516	2.8240	89.6	Pass
10	3.3036	2.9393	89.0	Pass
11	3.2921	2.9040	88.2	Pass
12	3.3433	2.9380	87.9	Pass
13	3.7578	3.3415	88.9	Pass
14	3.8939	3.4272	88.0	Pass
15	3.1557	2.7264	86.4	Pass
16	2.7494	2.3760	86.4	Pass
17	2.4490	2.1223	86.7	Pass
18	2.6839	2.3890	89.0	Pass
19	3.0034	2.6797	89.2	Pass
20	3.0147	2.6486	87.9	Pass
21	2.6850	2.3265	86.6	Pass
22	2.8439	2.5147	88.4	Pass

23	**2.7569**	**2.4138**	**87.6**	**Pass**
24	**2.5156**	**2.1926**	**87.2**	**Pass**
25	**3.1232**	**2.7966**	**89.5**	**Pass**
26	**3.5262**	**3.1057**	**88.1**	**Pass**
27	**2.6333**	**2.2529**	**85.6**	**Pass**
28	**3.2583**	**2.9335**	**90.0**	**Pass**
29	**3.1098**	**2.6999**	**86.8**	**Pass**
30	**2.4921**	**2.1444**	**86.0**	**Pass**
31	**3.0188**	**2.6967**	**89.3**	**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
WL 12C Channel POC	N	29907.85			N	0.00			
WL 12W Channel	N	4418.12			N	0.00			
WL 12NW-A Channel	N	3781.10			N	0.00			
WL 28 Channel	N	1032.49			N	0.00			
Total Volume Infiltrated		39139.57	0.00	0.00		0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

Appendix B-4

Wetland 12 WWHM Analysis

WWHM2012
PROJECT REPORT

Project Name: 17500 WL 12
Site Name:
Site Address:
City :
Report Date: 1/24/2020
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.29
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 : Exist. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.702
C, Lawn, Flat	.423
Pervious Total	4.125

Impervious Land Use	acre
Impervious Total	0
Basin Total	4.125

Element Flows To:

Surface	Interflow	Groundwater
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1
Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12W Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000

0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000
0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000
0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

Name : Exist. WL 12W
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**8.616**
C, Lawn, Flat	**5.698**
Pervious Total	**14.314**

Impervious Land Use	**acre**
ROADS FLAT	**2.601**
Impervious Total	**2.601**
Basin Total	**16.915**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12W Channel	WL 12W Channel	WL 12W Channel

Name : WL 12W Channel
Bottom Length: 830.00 ft.
Bottom Width: 2.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.012 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:

Outlet 1	**Outlet 2**
WL 12C Channel	

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.038	0.000	0.000	0.000
0.0222	0.039	0.000	0.019	0.000
0.0444	0.041	0.001	0.061	0.000
0.0667	0.043	0.002	0.121	0.000
0.0889	0.044	0.003	0.196	0.000
0.1111	0.046	0.004	0.287	0.000
0.1333	0.048	0.005	0.392	0.000
0.1556	0.050	0.006	0.510	0.000
0.1778	0.051	0.008	0.642	0.000
0.2000	0.053	0.009	0.788	0.000
0.2222	0.055	0.010	0.947	0.000
0.2444	0.056	0.011	1.119	0.000
0.2667	0.058	0.012	1.305	0.000
0.2889	0.060	0.014	1.504	0.000
0.3111	0.061	0.015	1.716	0.000
0.3333	0.063	0.016	1.942	0.000
0.3556	0.065	0.018	2.182	0.000
0.3778	0.066	0.019	2.436	0.000
0.4000	0.068	0.021	2.704	0.000
0.4222	0.070	0.022	2.985	0.000
0.4444	0.072	0.024	3.281	0.000
0.4667	0.073	0.026	3.592	0.000
0.4889	0.075	0.027	3.916	0.000
0.5111	0.077	0.029	4.256	0.000
0.5333	0.078	0.031	4.610	0.000
0.5556	0.080	0.032	4.980	0.000
0.5778	0.082	0.034	5.364	0.000
0.6000	0.083	0.036	5.764	0.000
0.6222	0.085	0.038	6.180	0.000
0.6444	0.087	0.040	6.611	0.000
0.6667	0.088	0.042	7.058	0.000
0.6889	0.090	0.044	7.522	0.000
0.7111	0.092	0.046	8.001	0.000
0.7333	0.094	0.048	8.497	0.000
0.7556	0.095	0.050	9.009	0.000
0.7778	0.097	0.052	9.538	0.000
0.8000	0.099	0.054	10.08	0.000
0.8222	0.100	0.057	10.64	0.000
0.8444	0.102	0.059	11.22	0.000
0.8667	0.104	0.061	11.82	0.000
0.8889	0.105	0.064	12.44	0.000
0.9111	0.107	0.066	13.07	0.000
0.9333	0.109	0.068	13.72	0.000
0.9556	0.110	0.071	14.39	0.000
0.9778	0.112	0.073	15.08	0.000
1.0000	0.114	0.076	15.79	0.000
1.0222	0.116	0.078	16.51	0.000
1.0444	0.117	0.081	17.25	0.000
1.0667	0.119	0.084	18.02	0.000
1.0889	0.121	0.086	18.80	0.000
1.1111	0.122	0.089	19.60	0.000
1.1333	0.124	0.092	20.42	0.000
1.1556	0.126	0.094	21.26	0.000
1.1778	0.127	0.097	22.12	0.000
1.2000	0.129	0.100	23.00	0.000

1.2222	0.131	0.103	23.90	0.000
1.2444	0.133	0.106	24.82	0.000
1.2667	0.134	0.109	25.77	0.000
1.2889	0.136	0.112	26.73	0.000
1.3111	0.138	0.115	27.71	0.000
1.3333	0.139	0.118	28.72	0.000
1.3556	0.141	0.121	29.74	0.000
1.3778	0.143	0.124	30.79	0.000
1.4000	0.144	0.128	31.86	0.000
1.4222	0.146	0.131	32.95	0.000
1.4444	0.148	0.134	34.06	0.000
1.4667	0.149	0.137	35.19	0.000
1.4889	0.151	0.141	36.35	0.000
1.5111	0.153	0.144	37.53	0.000
1.5333	0.155	0.148	38.73	0.000
1.5556	0.156	0.151	39.95	0.000
1.5778	0.158	0.155	41.20	0.000
1.6000	0.160	0.158	42.46	0.000
1.6222	0.161	0.162	43.76	0.000
1.6444	0.163	0.165	45.07	0.000
1.6667	0.165	0.169	46.41	0.000
1.6889	0.166	0.173	47.77	0.000
1.7111	0.168	0.176	49.16	0.000
1.7333	0.170	0.180	50.57	0.000
1.7556	0.171	0.184	52.01	0.000
1.7778	0.173	0.188	53.46	0.000
1.8000	0.175	0.192	54.95	0.000
1.8222	0.177	0.196	56.46	0.000
1.8444	0.178	0.199	57.99	0.000
1.8667	0.180	0.203	59.54	0.000
1.8889	0.182	0.208	61.13	0.000
1.9111	0.183	0.212	62.73	0.000
1.9333	0.185	0.216	64.37	0.000
1.9556	0.187	0.220	66.02	0.000
1.9778	0.188	0.224	67.71	0.000
2.0000	0.190	0.228	69.42	0.000
2.0222	0.192	0.232	71.15	0.000

Name : WL 12C Channel
Bottom Length: 2550.00 ft.
Bottom Width: 12.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.003 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
Exist. WL 12

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.702	0.000	0.000	0.000
0.0222	0.707	0.015	0.057	0.000
0.0444	0.712	0.031	0.182	0.000
0.0667	0.718	0.047	0.358	0.000
0.0889	0.723	0.063	0.579	0.000
0.1111	0.728	0.079	0.841	0.000
0.1333	0.733	0.095	1.140	0.000
0.1556	0.738	0.112	1.476	0.000
0.1778	0.744	0.128	1.845	0.000
0.2000	0.749	0.145	2.247	0.000
0.2222	0.754	0.161	2.681	0.000
0.2444	0.759	0.178	3.146	0.000
0.2667	0.764	0.195	3.640	0.000
0.2889	0.770	0.212	4.163	0.000
0.3111	0.775	0.229	4.715	0.000
0.3333	0.780	0.247	5.294	0.000
0.3556	0.785	0.264	5.901	0.000
0.3778	0.790	0.282	6.535	0.000
0.4000	0.796	0.299	7.195	0.000
0.4222	0.801	0.317	7.881	0.000
0.4444	0.806	0.335	8.593	0.000
0.4667	0.811	0.353	9.331	0.000
0.4889	0.817	0.371	10.09	0.000
0.5111	0.822	0.389	10.88	0.000
0.5333	0.827	0.408	11.69	0.000
0.5556	0.832	0.426	12.53	0.000
0.5778	0.837	0.445	13.39	0.000
0.6000	0.843	0.463	14.27	0.000
0.6222	0.848	0.482	15.18	0.000
0.6444	0.853	0.501	16.11	0.000
0.6667	0.858	0.520	17.07	0.000
0.6889	0.863	0.539	18.05	0.000
0.7111	0.869	0.558	19.05	0.000
0.7333	0.874	0.578	20.08	0.000
0.7556	0.879	0.597	21.13	0.000
0.7778	0.884	0.617	22.20	0.000
0.8000	0.889	0.636	23.29	0.000
0.8222	0.895	0.656	24.41	0.000
0.8444	0.900	0.676	25.55	0.000
0.8667	0.905	0.696	26.72	0.000
0.8889	0.910	0.716	27.90	0.000
0.9111	0.915	0.737	29.11	0.000
0.9333	0.921	0.757	30.34	0.000
0.9556	0.926	0.778	31.59	0.000
0.9778	0.931	0.798	32.87	0.000
1.0000	0.936	0.819	34.17	0.000
1.0222	0.941	0.840	35.49	0.000
1.0444	0.947	0.861	36.83	0.000
1.0667	0.952	0.882	38.19	0.000
1.0889	0.957	0.903	39.58	0.000
1.1111	0.962	0.925	40.99	0.000
1.1333	0.967	0.946	42.42	0.000
1.1556	0.973	0.968	43.87	0.000
1.1778	0.978	0.989	45.35	0.000
1.2000	0.983	1.011	46.85	0.000

1.2222	0.988	1.033	48.37	0.000
1.2444	0.993	1.055	49.91	0.000
1.2667	0.999	1.077	51.47	0.000
1.2889	1.004	1.099	53.06	0.000
1.3111	1.009	1.122	54.66	0.000
1.3333	1.014	1.144	56.29	0.000
1.3556	1.019	1.167	57.94	0.000
1.3778	1.025	1.190	59.62	0.000
1.4000	1.030	1.212	61.31	0.000
1.4222	1.035	1.235	63.03	0.000
1.4444	1.040	1.259	64.77	0.000
1.4667	1.045	1.282	66.53	0.000
1.4889	1.051	1.305	68.32	0.000
1.5111	1.056	1.328	70.12	0.000
1.5333	1.061	1.352	71.95	0.000
1.5556	1.066	1.376	73.80	0.000
1.5778	1.071	1.399	75.67	0.000
1.6000	1.077	1.423	77.57	0.000
1.6222	1.082	1.447	79.48	0.000
1.6444	1.087	1.471	81.42	0.000
1.6667	1.092	1.496	83.38	0.000
1.6889	1.098	1.520	85.37	0.000
1.7111	1.103	1.544	87.37	0.000
1.7333	1.108	1.569	89.40	0.000
1.7556	1.113	1.594	91.45	0.000
1.7778	1.118	1.618	93.52	0.000
1.8000	1.124	1.643	95.62	0.000
1.8222	1.129	1.668	97.73	0.000
1.8444	1.134	1.694	99.87	0.000
1.8667	1.139	1.719	102.0	0.000
1.8889	1.144	1.744	104.2	0.000
1.9111	1.150	1.770	106.4	0.000
1.9333	1.155	1.795	108.6	0.000
1.9556	1.160	1.821	110.9	0.000
1.9778	1.165	1.847	113.1	0.000
2.0000	1.170	1.873	115.4	0.000
2.0222	1.176	1.899	117.8	0.000

Name : Exist. WL 12C
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	10.062
C, Lawn, Flat	7.856
C, Forest, Steep	4.799
C, Lawn, Steep	.917
Pervious Total	**23.634**

Impervious Land Use	acre
ROADS FLAT	12.463
Impervious Total	**12.463**
Basin Total	**36.097**

Element Flows To:

Surface	Interflow	Groundwater
WL 12C Channel	WL 12C Channel	WL 12C Channel

Name : Exist. WL 12NW
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	4.81
C, Lawn, Flat	19.084
C, Forest, Steep	3.157
Pervious Total	**27.051**

Impervious Land Use	acre
ROADS FLAT	2.887
Impervious Total	**2.887**
Basin Total	**29.938**

Element Flows To:

Surface	Interflow	Groundwater
WL 12NW Channel	WL 12NW Channel	WL 12NW Channel

Name : WL 12NW Channel
Bottom Length: 1415.00 ft.
Bottom Width: 8.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 1 To 1
Channel right side slope 2: 1 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12C Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.259	0.000	0.000	0.000
0.0444	0.262	0.011	0.140	0.000
0.0889	0.265	0.023	0.443	0.000
0.1333	0.268	0.035	0.871	0.000
0.1778	0.271	0.047	1.406	0.000
0.2222	0.274	0.059	2.039	0.000
0.2667	0.277	0.071	2.761	0.000
0.3111	0.280	0.084	3.568	0.000
0.3556	0.283	0.096	4.455	0.000
0.4000	0.285	0.109	5.419	0.000
0.4444	0.288	0.121	6.457	0.000
0.4889	0.291	0.134	7.567	0.000
0.5333	0.294	0.147	8.747	0.000
0.5778	0.297	0.161	9.994	0.000
0.6222	0.300	0.174	11.30	0.000
0.6667	0.303	0.187	12.68	0.000
0.7111	0.306	0.201	14.12	0.000
0.7556	0.309	0.214	15.63	0.000
0.8000	0.311	0.228	17.20	0.000
0.8444	0.314	0.242	18.82	0.000
0.8889	0.317	0.256	20.51	0.000
0.9333	0.320	0.270	22.26	0.000
0.9778	0.323	0.285	24.06	0.000
1.0222	0.326	0.299	25.93	0.000
1.0667	0.329	0.314	27.85	0.000
1.1111	0.332	0.328	29.83	0.000
1.1556	0.334	0.343	31.86	0.000
1.2000	0.337	0.358	33.95	0.000
1.2444	0.340	0.373	36.10	0.000
1.2889	0.343	0.388	38.30	0.000
1.3333	0.346	0.404	40.56	0.000
1.3778	0.349	0.419	42.88	0.000
1.4222	0.352	0.435	45.25	0.000
1.4667	0.355	0.451	47.67	0.000
1.5111	0.358	0.466	50.15	0.000
1.5556	0.360	0.482	52.68	0.000
1.6000	0.363	0.499	55.27	0.000

1.6444	0.366	0.515	57.92	0.000
1.6889	0.369	0.531	60.61	0.000
1.7333	0.372	0.548	63.37	0.000
1.7778	0.375	0.564	66.17	0.000
1.8222	0.378	0.581	69.03	0.000
1.8667	0.381	0.598	71.95	0.000
1.9111	0.384	0.615	74.91	0.000
1.9556	0.386	0.632	77.94	0.000
2.0000	0.389	0.649	81.01	0.000
2.0444	0.392	0.667	84.14	0.000
2.0889	0.395	0.684	87.33	0.000
2.1333	0.398	0.702	90.57	0.000
2.1778	0.401	0.720	93.86	0.000
2.2222	0.404	0.737	97.21	0.000
2.2667	0.407	0.755	100.6	0.000
2.3111	0.410	0.774	104.0	0.000
2.3556	0.412	0.792	107.5	0.000
2.4000	0.415	0.810	111.1	0.000
2.4444	0.418	0.829	114.7	0.000
2.4889	0.421	0.848	118.4	0.000
2.5333	0.424	0.866	122.1	0.000
2.5778	0.427	0.885	125.9	0.000
2.6222	0.430	0.904	129.7	0.000
2.6667	0.433	0.924	133.6	0.000
2.7111	0.436	0.943	137.6	0.000
2.7556	0.438	0.962	141.6	0.000
2.8000	0.441	0.982	145.6	0.000
2.8444	0.444	1.002	149.8	0.000
2.8889	0.447	1.021	153.9	0.000
2.9333	0.450	1.041	158.2	0.000
2.9778	0.453	1.061	162.4	0.000
3.0222	0.456	1.082	166.8	0.000
3.0667	0.459	1.102	171.2	0.000
3.1111	0.462	1.122	175.6	0.000
3.1556	0.464	1.143	180.1	0.000
3.2000	0.467	1.164	184.7	0.000
3.2444	0.470	1.185	189.3	0.000
3.2889	0.473	1.206	194.0	0.000
3.3333	0.476	1.227	198.7	0.000
3.3778	0.479	1.248	203.5	0.000
3.4222	0.482	1.269	208.3	0.000
3.4667	0.485	1.291	213.2	0.000
3.5111	0.488	1.312	218.2	0.000
3.5556	0.490	1.334	223.2	0.000
3.6000	0.493	1.356	228.3	0.000
3.6444	0.496	1.378	233.4	0.000
3.6889	0.499	1.400	238.6	0.000
3.7333	0.502	1.423	243.9	0.000
3.7778	0.505	1.445	249.2	0.000
3.8222	0.508	1.467	254.5	0.000
3.8667	0.511	1.490	260.0	0.000
3.9111	0.514	1.513	265.5	0.000
3.9556	0.516	1.536	271.0	0.000
4.0000	0.519	1.559	276.6	0.000
4.0444	0.522	1.582	282.3	0.000

Name : Exist. WL 12E
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**6.705**
C, Lawn, Flat	**15.148**
C, Forest, Steep	**.256**
C, Lawn, Steep	**.61**

Pervious Total **22.719**

Impervious Land Use	**acre**
ROADS FLAT	**26.527**

Impervious Total **26.527**

Basin Total **49.246**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12C Channel	WL 12C Channel	WL 12C Channel

Name : Exist. WL 12
Bottom Length: 574.00 ft.
Bottom Width: 12.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.0036 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.158	0.000	0.000	0.000
0.0222	0.159	0.003	0.062	0.000
0.0444	0.160	0.007	0.199	0.000
0.0667	0.161	0.010	0.392	0.000
0.0889	0.162	0.014	0.634	0.000
0.1111	0.164	0.017	0.921	0.000
0.1333	0.165	0.021	1.249	0.000
0.1556	0.166	0.025	1.617	0.000
0.1778	0.167	0.028	2.021	0.000
0.2000	0.168	0.032	2.462	0.000
0.2222	0.169	0.036	2.937	0.000
0.2444	0.171	0.040	3.446	0.000
0.2667	0.172	0.044	3.987	0.000
0.2889	0.173	0.047	4.560	0.000
0.3111	0.174	0.051	5.165	0.000
0.3333	0.175	0.055	5.800	0.000
0.3556	0.176	0.059	6.464	0.000
0.3778	0.178	0.063	7.159	0.000
0.4000	0.179	0.067	7.882	0.000
0.4222	0.180	0.071	8.634	0.000
0.4444	0.181	0.075	9.414	0.000
0.4667	0.182	0.079	10.22	0.000
0.4889	0.183	0.083	11.05	0.000
0.5111	0.185	0.087	11.92	0.000
0.5333	0.186	0.091	12.81	0.000
0.5556	0.187	0.096	13.72	0.000
0.5778	0.188	0.100	14.67	0.000
0.6000	0.189	0.104	15.63	0.000
0.6222	0.190	0.108	16.63	0.000
0.6444	0.192	0.112	17.65	0.000
0.6667	0.193	0.117	18.70	0.000
0.6889	0.194	0.121	19.77	0.000
0.7111	0.195	0.125	20.87	0.000
0.7333	0.196	0.130	21.99	0.000
0.7556	0.198	0.134	23.14	0.000
0.7778	0.199	0.138	24.32	0.000
0.8000	0.200	0.143	25.52	0.000
0.8222	0.201	0.147	26.74	0.000
0.8444	0.202	0.152	27.99	0.000
0.8667	0.203	0.156	29.27	0.000
0.8889	0.205	0.161	30.57	0.000
0.9111	0.206	0.165	31.89	0.000
0.9333	0.207	0.170	33.24	0.000
0.9556	0.208	0.175	34.61	0.000
0.9778	0.209	0.179	36.01	0.000
1.0000	0.210	0.184	37.43	0.000
1.0222	0.212	0.189	38.88	0.000
1.0444	0.213	0.193	40.35	0.000
1.0667	0.214	0.198	41.84	0.000
1.0889	0.215	0.203	43.36	0.000
1.1111	0.216	0.208	44.90	0.000
1.1333	0.217	0.213	46.47	0.000
1.1556	0.219	0.217	48.06	0.000
1.1778	0.220	0.222	49.68	0.000
1.2000	0.221	0.227	51.32	0.000

1.2222	0.222	0.232	52.98	0.000
1.2444	0.223	0.237	54.67	0.000
1.2667	0.224	0.242	56.38	0.000
1.2889	0.226	0.247	58.12	0.000
1.3111	0.227	0.252	59.88	0.000
1.3333	0.228	0.257	61.67	0.000
1.3556	0.229	0.262	63.48	0.000
1.3778	0.230	0.267	65.31	0.000
1.4000	0.231	0.273	67.17	0.000
1.4222	0.233	0.278	69.05	0.000
1.4444	0.234	0.283	70.95	0.000
1.4667	0.235	0.288	72.88	0.000
1.4889	0.236	0.293	74.84	0.000
1.5111	0.237	0.299	76.82	0.000
1.5333	0.239	0.304	78.82	0.000
1.5556	0.240	0.309	80.85	0.000
1.5778	0.241	0.315	82.90	0.000
1.6000	0.242	0.320	84.97	0.000
1.6222	0.243	0.325	87.07	0.000
1.6444	0.244	0.331	89.19	0.000
1.6667	0.246	0.336	91.34	0.000
1.6889	0.247	0.342	93.51	0.000
1.7111	0.248	0.347	95.71	0.000
1.7333	0.249	0.353	97.93	0.000
1.7556	0.250	0.358	100.1	0.000
1.7778	0.251	0.364	102.4	0.000
1.8000	0.253	0.370	104.7	0.000
1.8222	0.254	0.375	107.0	0.000
1.8444	0.255	0.381	109.4	0.000
1.8667	0.256	0.387	111.7	0.000
1.8889	0.257	0.392	114.1	0.000
1.9111	0.258	0.398	116.5	0.000
1.9333	0.260	0.404	119.0	0.000
1.9556	0.261	0.410	121.4	0.000
1.9778	0.262	0.415	123.9	0.000
2.0000	0.263	0.421	126.5	0.000
2.0222	0.264	0.427	129.0	0.000

Name : Exist. WL 12
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**3.009**
C, Lawn, Flat	**1.133**

Pervious Total **4.142**

Impervious Land Use	**acre**
ROADS FLAT	**3.076**

Impervious Total **3.076**

Basin Total **7.218**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Exist. WL 12	Exist. WL 12	Exist. WL 12

MITIGATED LAND USE

Name : Dev. WL 28
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	3.802
C, Lawn, Flat	.815
Pervious Total	**4.617**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**4.617**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 28 Channel	WL 28 Channel	WL 28 Channel

Name : Dev. WL 12W
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	6.585
C, Lawn, Flat	2.369
Pervious Total	**8.954**

Impervious Land Use	**acre**
ROADS FLAT	4.823
Impervious Total	**4.823**
Basin Total	**13.777**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12W Channel	WL 12W Channel	WL 12W Channel

Name : Dev. 12NW
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**6.741**
C, Lawn, Flat	**2.005**
Pervious Total	**8.746**

Impervious Land Use	**acre**
ROADS FLAT	**6.41**
Impervious Total	**6.41**
Basin Total	**15.156**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12NW-A Channel	WL 12NW-A Channel	WL 12NW-A Channel

Name : WL 28 Channel
Bottom Length: 398.00 ft.
Bottom Width: 30.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 0 To 1
Channel right side slope 2: 0 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:

Outlet 1	**Outlet 2**
WL 12W Channel	

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.274	0.000	0.000	0.000
0.0056	0.274	0.001	0.016	0.000
0.0111	0.274	0.003	0.052	0.000
0.0167	0.274	0.004	0.102	0.000
0.0222	0.274	0.006	0.165	0.000
0.0278	0.274	0.007	0.239	0.000
0.0333	0.274	0.009	0.324	0.000
0.0389	0.274	0.010	0.419	0.000
0.0444	0.274	0.012	0.524	0.000
0.0500	0.274	0.013	0.638	0.000
0.0556	0.274	0.015	0.760	0.000
0.0611	0.274	0.016	0.891	0.000
0.0667	0.274	0.018	1.029	0.000
0.0722	0.274	0.019	1.176	0.000
0.0778	0.274	0.021	1.330	0.000
0.0833	0.274	0.022	1.492	0.000
0.0889	0.274	0.024	1.661	0.000
0.0944	0.274	0.025	1.838	0.000
0.1000	0.274	0.027	2.021	0.000
0.1056	0.274	0.028	2.211	0.000
0.1111	0.274	0.030	2.408	0.000
0.1167	0.274	0.032	2.611	0.000
0.1222	0.274	0.033	2.821	0.000
0.1278	0.274	0.035	3.037	0.000
0.1333	0.274	0.036	3.260	0.000
0.1389	0.274	0.038	3.488	0.000
0.1444	0.274	0.039	3.723	0.000
0.1500	0.274	0.041	3.964	0.000
0.1556	0.274	0.042	4.210	0.000
0.1611	0.274	0.044	4.463	0.000
0.1667	0.274	0.045	4.721	0.000
0.1722	0.274	0.047	4.985	0.000
0.1778	0.274	0.048	5.255	0.000
0.1833	0.274	0.050	5.530	0.000
0.1889	0.274	0.051	5.811	0.000
0.1944	0.274	0.053	6.097	0.000
0.2000	0.274	0.054	6.389	0.000
0.2056	0.274	0.056	6.685	0.000
0.2111	0.274	0.057	6.988	0.000
0.2167	0.274	0.059	7.295	0.000
0.2222	0.274	0.060	7.608	0.000
0.2278	0.274	0.062	7.925	0.000
0.2333	0.274	0.064	8.248	0.000
0.2389	0.274	0.065	8.576	0.000
0.2444	0.274	0.067	8.909	0.000
0.2500	0.274	0.068	9.246	0.000
0.2556	0.274	0.070	9.589	0.000
0.2611	0.274	0.071	9.937	0.000
0.2667	0.274	0.073	10.29	0.000
0.2722	0.274	0.074	10.64	0.000
0.2778	0.274	0.076	11.00	0.000
0.2833	0.274	0.077	11.37	0.000
0.2889	0.274	0.079	11.74	0.000
0.2944	0.274	0.080	12.12	0.000
0.3000	0.274	0.082	12.50	0.000

0.3056	0.274	0.083	12.88	0.000
0.3111	0.274	0.085	13.27	0.000
0.3167	0.274	0.086	13.67	0.000
0.3222	0.274	0.088	14.07	0.000
0.3278	0.274	0.089	14.47	0.000
0.3333	0.274	0.091	14.88	0.000
0.3389	0.274	0.092	15.29	0.000
0.3444	0.274	0.094	15.71	0.000
0.3500	0.274	0.095	16.13	0.000
0.3556	0.274	0.097	16.55	0.000
0.3611	0.274	0.099	16.98	0.000
0.3667	0.274	0.100	17.41	0.000
0.3722	0.274	0.102	17.85	0.000
0.3778	0.274	0.103	18.29	0.000
0.3833	0.274	0.105	18.74	0.000
0.3889	0.274	0.106	19.19	0.000
0.3944	0.274	0.108	19.64	0.000
0.4000	0.274	0.109	20.10	0.000
0.4056	0.274	0.111	20.57	0.000
0.4111	0.274	0.112	21.03	0.000
0.4167	0.274	0.114	21.50	0.000
0.4222	0.274	0.115	21.98	0.000
0.4278	0.274	0.117	22.46	0.000
0.4333	0.274	0.118	22.94	0.000
0.4389	0.274	0.120	23.43	0.000
0.4444	0.274	0.121	23.92	0.000
0.4500	0.274	0.123	24.41	0.000
0.4556	0.274	0.124	24.91	0.000
0.4611	0.274	0.126	25.41	0.000
0.4667	0.274	0.127	25.92	0.000
0.4722	0.274	0.129	26.43	0.000
0.4778	0.274	0.131	26.94	0.000
0.4833	0.274	0.132	27.46	0.000
0.4889	0.274	0.134	27.98	0.000
0.4944	0.274	0.135	28.51	0.000
0.5000	0.274	0.137	29.04	0.000
0.5056	0.274	0.138	29.57	0.000

Name : WL 12W Channel
Bottom Length: 830.00 ft.
Bottom Width: 2.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.012 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12C Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.038	0.000	0.000	0.000
0.0222	0.039	0.000	0.019	0.000
0.0444	0.041	0.001	0.061	0.000
0.0667	0.043	0.002	0.121	0.000
0.0889	0.044	0.003	0.196	0.000
0.1111	0.046	0.004	0.287	0.000
0.1333	0.048	0.005	0.392	0.000
0.1556	0.050	0.006	0.510	0.000
0.1778	0.051	0.008	0.642	0.000
0.2000	0.053	0.009	0.788	0.000
0.2222	0.055	0.010	0.947	0.000
0.2444	0.056	0.011	1.119	0.000
0.2667	0.058	0.012	1.305	0.000
0.2889	0.060	0.014	1.504	0.000
0.3111	0.061	0.015	1.716	0.000
0.3333	0.063	0.016	1.942	0.000
0.3556	0.065	0.018	2.182	0.000
0.3778	0.066	0.019	2.436	0.000
0.4000	0.068	0.021	2.704	0.000
0.4222	0.070	0.022	2.985	0.000
0.4444	0.072	0.024	3.281	0.000
0.4667	0.073	0.026	3.592	0.000
0.4889	0.075	0.027	3.916	0.000
0.5111	0.077	0.029	4.256	0.000
0.5333	0.078	0.031	4.610	0.000
0.5556	0.080	0.032	4.980	0.000
0.5778	0.082	0.034	5.364	0.000
0.6000	0.083	0.036	5.764	0.000
0.6222	0.085	0.038	6.180	0.000
0.6444	0.087	0.040	6.611	0.000
0.6667	0.088	0.042	7.058	0.000
0.6889	0.090	0.044	7.522	0.000
0.7111	0.092	0.046	8.001	0.000
0.7333	0.094	0.048	8.497	0.000
0.7556	0.095	0.050	9.009	0.000
0.7778	0.097	0.052	9.538	0.000
0.8000	0.099	0.054	10.08	0.000
0.8222	0.100	0.057	10.64	0.000
0.8444	0.102	0.059	11.22	0.000
0.8667	0.104	0.061	11.82	0.000
0.8889	0.105	0.064	12.44	0.000
0.9111	0.107	0.066	13.07	0.000
0.9333	0.109	0.068	13.72	0.000
0.9556	0.110	0.071	14.39	0.000
0.9778	0.112	0.073	15.08	0.000
1.0000	0.114	0.076	15.79	0.000
1.0222	0.116	0.078	16.51	0.000
1.0444	0.117	0.081	17.25	0.000
1.0667	0.119	0.084	18.02	0.000
1.0889	0.121	0.086	18.80	0.000
1.1111	0.122	0.089	19.60	0.000
1.1333	0.124	0.092	20.42	0.000
1.1556	0.126	0.094	21.26	0.000
1.1778	0.127	0.097	22.12	0.000
1.2000	0.129	0.100	23.00	0.000

1.2222	0.131	0.103	23.90	0.000
1.2444	0.133	0.106	24.82	0.000
1.2667	0.134	0.109	25.77	0.000
1.2889	0.136	0.112	26.73	0.000
1.3111	0.138	0.115	27.71	0.000
1.3333	0.139	0.118	28.72	0.000
1.3556	0.141	0.121	29.74	0.000
1.3778	0.143	0.124	30.79	0.000
1.4000	0.144	0.128	31.86	0.000
1.4222	0.146	0.131	32.95	0.000
1.4444	0.148	0.134	34.06	0.000
1.4667	0.149	0.137	35.19	0.000
1.4889	0.151	0.141	36.35	0.000
1.5111	0.153	0.144	37.53	0.000
1.5333	0.155	0.148	38.73	0.000
1.5556	0.156	0.151	39.95	0.000
1.5778	0.158	0.155	41.20	0.000
1.6000	0.160	0.158	42.46	0.000
1.6222	0.161	0.162	43.76	0.000
1.6444	0.163	0.165	45.07	0.000
1.6667	0.165	0.169	46.41	0.000
1.6889	0.166	0.173	47.77	0.000
1.7111	0.168	0.176	49.16	0.000
1.7333	0.170	0.180	50.57	0.000
1.7556	0.171	0.184	52.01	0.000
1.7778	0.173	0.188	53.46	0.000
1.8000	0.175	0.192	54.95	0.000
1.8222	0.177	0.196	56.46	0.000
1.8444	0.178	0.199	57.99	0.000
1.8667	0.180	0.203	59.54	0.000
1.8889	0.182	0.208	61.13	0.000
1.9111	0.183	0.212	62.73	0.000
1.9333	0.185	0.216	64.37	0.000
1.9556	0.187	0.220	66.02	0.000
1.9778	0.188	0.224	67.71	0.000
2.0000	0.190	0.228	69.42	0.000
2.0222	0.192	0.232	71.15	0.000

Name : WL 12NW-A Channel
Bottom Length: 1415.00 ft.
Bottom Width: 8.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.004 To 1
Channel Left side slope 0: 1 To 1
Channel right side slope 2: 1 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12C Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.259	0.000	0.000	0.000
0.0444	0.262	0.011	0.140	0.000
0.0889	0.265	0.023	0.443	0.000
0.1333	0.268	0.035	0.871	0.000
0.1778	0.271	0.047	1.406	0.000
0.2222	0.274	0.059	2.039	0.000
0.2667	0.277	0.071	2.761	0.000
0.3111	0.280	0.084	3.568	0.000
0.3556	0.283	0.096	4.455	0.000
0.4000	0.285	0.109	5.419	0.000
0.4444	0.288	0.121	6.457	0.000
0.4889	0.291	0.134	7.567	0.000
0.5333	0.294	0.147	8.747	0.000
0.5778	0.297	0.161	9.994	0.000
0.6222	0.300	0.174	11.30	0.000
0.6667	0.303	0.187	12.68	0.000
0.7111	0.306	0.201	14.12	0.000
0.7556	0.309	0.214	15.63	0.000
0.8000	0.311	0.228	17.20	0.000
0.8444	0.314	0.242	18.82	0.000
0.8889	0.317	0.256	20.51	0.000
0.9333	0.320	0.270	22.26	0.000
0.9778	0.323	0.285	24.06	0.000
1.0222	0.326	0.299	25.93	0.000
1.0667	0.329	0.314	27.85	0.000
1.1111	0.332	0.328	29.83	0.000
1.1556	0.334	0.343	31.86	0.000
1.2000	0.337	0.358	33.95	0.000
1.2444	0.340	0.373	36.10	0.000
1.2889	0.343	0.388	38.30	0.000
1.3333	0.346	0.404	40.56	0.000
1.3778	0.349	0.419	42.88	0.000
1.4222	0.352	0.435	45.25	0.000
1.4667	0.355	0.451	47.67	0.000
1.5111	0.358	0.466	50.15	0.000
1.5556	0.360	0.482	52.68	0.000
1.6000	0.363	0.499	55.27	0.000
1.6444	0.366	0.515	57.92	0.000
1.6889	0.369	0.531	60.61	0.000
1.7333	0.372	0.548	63.37	0.000
1.7778	0.375	0.564	66.17	0.000
1.8222	0.378	0.581	69.03	0.000
1.8667	0.381	0.598	71.95	0.000
1.9111	0.384	0.615	74.91	0.000
1.9556	0.386	0.632	77.94	0.000
2.0000	0.389	0.649	81.01	0.000
2.0444	0.392	0.667	84.14	0.000
2.0889	0.395	0.684	87.33	0.000
2.1333	0.398	0.702	90.57	0.000
2.1778	0.401	0.720	93.86	0.000
2.2222	0.404	0.737	97.21	0.000
2.2667	0.407	0.755	100.6	0.000
2.3111	0.410	0.774	104.0	0.000
2.3556	0.412	0.792	107.5	0.000
2.4000	0.415	0.810	111.1	0.000

2.4444	0.418	0.829	114.7	0.000
2.4889	0.421	0.848	118.4	0.000
2.5333	0.424	0.866	122.1	0.000
2.5778	0.427	0.885	125.9	0.000
2.6222	0.430	0.904	129.7	0.000
2.6667	0.433	0.924	133.6	0.000
2.7111	0.436	0.943	137.6	0.000
2.7556	0.438	0.962	141.6	0.000
2.8000	0.441	0.982	145.6	0.000
2.8444	0.444	1.002	149.8	0.000
2.8889	0.447	1.021	153.9	0.000
2.9333	0.450	1.041	158.2	0.000
2.9778	0.453	1.061	162.4	0.000
3.0222	0.456	1.082	166.8	0.000
3.0667	0.459	1.102	171.2	0.000
3.1111	0.462	1.122	175.6	0.000
3.1556	0.464	1.143	180.1	0.000
3.2000	0.467	1.164	184.7	0.000
3.2444	0.470	1.185	189.3	0.000
3.2889	0.473	1.206	194.0	0.000
3.3333	0.476	1.227	198.7	0.000
3.3778	0.479	1.248	203.5	0.000
3.4222	0.482	1.269	208.3	0.000
3.4667	0.485	1.291	213.2	0.000
3.5111	0.488	1.312	218.2	0.000
3.5556	0.490	1.334	223.2	0.000
3.6000	0.493	1.356	228.3	0.000
3.6444	0.496	1.378	233.4	0.000
3.6889	0.499	1.400	238.6	0.000
3.7333	0.502	1.423	243.9	0.000
3.7778	0.505	1.445	249.2	0.000
3.8222	0.508	1.467	254.5	0.000
3.8667	0.511	1.490	260.0	0.000
3.9111	0.514	1.513	265.5	0.000
3.9556	0.516	1.536	271.0	0.000
4.0000	0.519	1.559	276.6	0.000
4.0444	0.522	1.582	282.3	0.000

Name : WL 12C Channel
Bottom Length: 2550.00 ft.
Bottom Width: 12.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.003 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**
WL 12 Channel

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.702	0.000	0.000	0.000
0.0222	0.707	0.015	0.057	0.000
0.0444	0.712	0.031	0.182	0.000
0.0667	0.718	0.047	0.358	0.000
0.0889	0.723	0.063	0.579	0.000
0.1111	0.728	0.079	0.841	0.000
0.1333	0.733	0.095	1.140	0.000
0.1556	0.738	0.112	1.476	0.000
0.1778	0.744	0.128	1.845	0.000
0.2000	0.749	0.145	2.247	0.000
0.2222	0.754	0.161	2.681	0.000
0.2444	0.759	0.178	3.146	0.000
0.2667	0.764	0.195	3.640	0.000
0.2889	0.770	0.212	4.163	0.000
0.3111	0.775	0.229	4.715	0.000
0.3333	0.780	0.247	5.294	0.000
0.3556	0.785	0.264	5.901	0.000
0.3778	0.790	0.282	6.535	0.000
0.4000	0.796	0.299	7.195	0.000
0.4222	0.801	0.317	7.881	0.000
0.4444	0.806	0.335	8.593	0.000
0.4667	0.811	0.353	9.331	0.000
0.4889	0.817	0.371	10.09	0.000
0.5111	0.822	0.389	10.88	0.000
0.5333	0.827	0.408	11.69	0.000
0.5556	0.832	0.426	12.53	0.000
0.5778	0.837	0.445	13.39	0.000
0.6000	0.843	0.463	14.27	0.000
0.6222	0.848	0.482	15.18	0.000
0.6444	0.853	0.501	16.11	0.000
0.6667	0.858	0.520	17.07	0.000
0.6889	0.863	0.539	18.05	0.000
0.7111	0.869	0.558	19.05	0.000
0.7333	0.874	0.578	20.08	0.000
0.7556	0.879	0.597	21.13	0.000
0.7778	0.884	0.617	22.20	0.000
0.8000	0.889	0.636	23.29	0.000
0.8222	0.895	0.656	24.41	0.000
0.8444	0.900	0.676	25.55	0.000
0.8667	0.905	0.696	26.72	0.000
0.8889	0.910	0.716	27.90	0.000
0.9111	0.915	0.737	29.11	0.000
0.9333	0.921	0.757	30.34	0.000
0.9556	0.926	0.778	31.59	0.000
0.9778	0.931	0.798	32.87	0.000
1.0000	0.936	0.819	34.17	0.000
1.0222	0.941	0.840	35.49	0.000
1.0444	0.947	0.861	36.83	0.000
1.0667	0.952	0.882	38.19	0.000
1.0889	0.957	0.903	39.58	0.000
1.1111	0.962	0.925	40.99	0.000
1.1333	0.967	0.946	42.42	0.000
1.1556	0.973	0.968	43.87	0.000
1.1778	0.978	0.989	45.35	0.000
1.2000	0.983	1.011	46.85	0.000

1.2222	0.988	1.033	48.37	0.000
1.2444	0.993	1.055	49.91	0.000
1.2667	0.999	1.077	51.47	0.000
1.2889	1.004	1.099	53.06	0.000
1.3111	1.009	1.122	54.66	0.000
1.3333	1.014	1.144	56.29	0.000
1.3556	1.019	1.167	57.94	0.000
1.3778	1.025	1.190	59.62	0.000
1.4000	1.030	1.212	61.31	0.000
1.4222	1.035	1.235	63.03	0.000
1.4444	1.040	1.259	64.77	0.000
1.4667	1.045	1.282	66.53	0.000
1.4889	1.051	1.305	68.32	0.000
1.5111	1.056	1.328	70.12	0.000
1.5333	1.061	1.352	71.95	0.000
1.5556	1.066	1.376	73.80	0.000
1.5778	1.071	1.399	75.67	0.000
1.6000	1.077	1.423	77.57	0.000
1.6222	1.082	1.447	79.48	0.000
1.6444	1.087	1.471	81.42	0.000
1.6667	1.092	1.496	83.38	0.000
1.6889	1.098	1.520	85.37	0.000
1.7111	1.103	1.544	87.37	0.000
1.7333	1.108	1.569	89.40	0.000
1.7556	1.113	1.594	91.45	0.000
1.7778	1.118	1.618	93.52	0.000
1.8000	1.124	1.643	95.62	0.000
1.8222	1.129	1.668	97.73	0.000
1.8444	1.134	1.694	99.87	0.000
1.8667	1.139	1.719	102.0	0.000
1.8889	1.144	1.744	104.2	0.000
1.9111	1.150	1.770	106.4	0.000
1.9333	1.155	1.795	108.6	0.000
1.9556	1.160	1.821	110.9	0.000
1.9778	1.165	1.847	113.1	0.000
2.0000	1.170	1.873	115.4	0.000
2.0222	1.176	1.899	117.8	0.000

Name : Exist. 12C
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	10.062
C, Lawn, Flat	8.205
C, Forest, Steep	4.799
C, Lawn, Steep	.917

Pervious Total 23.983

Impervious Land Use	acre
ROADS FLAT	11.851

Impervious Total 11.851

Basin Total 35.834

Element Flows To:

Surface	Interflow	Groundwater
WL 12C Channel	WL 12C Channel	WL 12C Channel

Name : WL 12 Channel
Bottom Length: 574.00 ft.
Bottom Width: 12.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 0.0036 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.158	0.000	0.000	0.000
0.0222	0.159	0.003	0.062	0.000
0.0444	0.160	0.007	0.199	0.000
0.0667	0.161	0.010	0.392	0.000
0.0889	0.162	0.014	0.634	0.000
0.1111	0.164	0.017	0.921	0.000
0.1333	0.165	0.021	1.249	0.000
0.1556	0.166	0.025	1.617	0.000

0.1778	0.167	0.028	2.021	0.000
0.2000	0.168	0.032	2.462	0.000
0.2222	0.169	0.036	2.937	0.000
0.2444	0.171	0.040	3.446	0.000
0.2667	0.172	0.044	3.987	0.000
0.2889	0.173	0.047	4.560	0.000
0.3111	0.174	0.051	5.165	0.000
0.3333	0.175	0.055	5.800	0.000
0.3556	0.176	0.059	6.464	0.000
0.3778	0.178	0.063	7.159	0.000
0.4000	0.179	0.067	7.882	0.000
0.4222	0.180	0.071	8.634	0.000
0.4444	0.181	0.075	9.414	0.000
0.4667	0.182	0.079	10.22	0.000
0.4889	0.183	0.083	11.05	0.000
0.5111	0.185	0.087	11.92	0.000
0.5333	0.186	0.091	12.81	0.000
0.5556	0.187	0.096	13.72	0.000
0.5778	0.188	0.100	14.67	0.000
0.6000	0.189	0.104	15.63	0.000
0.6222	0.190	0.108	16.63	0.000
0.6444	0.192	0.112	17.65	0.000
0.6667	0.193	0.117	18.70	0.000
0.6889	0.194	0.121	19.77	0.000
0.7111	0.195	0.125	20.87	0.000
0.7333	0.196	0.130	21.99	0.000
0.7556	0.198	0.134	23.14	0.000
0.7778	0.199	0.138	24.32	0.000
0.8000	0.200	0.143	25.52	0.000
0.8222	0.201	0.147	26.74	0.000
0.8444	0.202	0.152	27.99	0.000
0.8667	0.203	0.156	29.27	0.000
0.8889	0.205	0.161	30.57	0.000
0.9111	0.206	0.165	31.89	0.000
0.9333	0.207	0.170	33.24	0.000
0.9556	0.208	0.175	34.61	0.000
0.9778	0.209	0.179	36.01	0.000
1.0000	0.210	0.184	37.43	0.000
1.0222	0.212	0.189	38.88	0.000
1.0444	0.213	0.193	40.35	0.000
1.0667	0.214	0.198	41.84	0.000
1.0889	0.215	0.203	43.36	0.000
1.1111	0.216	0.208	44.90	0.000
1.1333	0.217	0.213	46.47	0.000
1.1556	0.219	0.217	48.06	0.000
1.1778	0.220	0.222	49.68	0.000
1.2000	0.221	0.227	51.32	0.000
1.2222	0.222	0.232	52.98	0.000
1.2444	0.223	0.237	54.67	0.000
1.2667	0.224	0.242	56.38	0.000
1.2889	0.226	0.247	58.12	0.000
1.3111	0.227	0.252	59.88	0.000
1.3333	0.228	0.257	61.67	0.000
1.3556	0.229	0.262	63.48	0.000
1.3778	0.230	0.267	65.31	0.000
1.4000	0.231	0.273	67.17	0.000
1.4222	0.233	0.278	69.05	0.000

1.4444	0.234	0.283	70.95	0.000
1.4667	0.235	0.288	72.88	0.000
1.4889	0.236	0.293	74.84	0.000
1.5111	0.237	0.299	76.82	0.000
1.5333	0.239	0.304	78.82	0.000
1.5556	0.240	0.309	80.85	0.000
1.5778	0.241	0.315	82.90	0.000
1.6000	0.242	0.320	84.97	0.000
1.6222	0.243	0.325	87.07	0.000
1.6444	0.244	0.331	89.19	0.000
1.6667	0.246	0.336	91.34	0.000
1.6889	0.247	0.342	93.51	0.000
1.7111	0.248	0.347	95.71	0.000
1.7333	0.249	0.353	97.93	0.000
1.7556	0.250	0.358	100.1	0.000
1.7778	0.251	0.364	102.4	0.000
1.8000	0.253	0.370	104.7	0.000
1.8222	0.254	0.375	107.0	0.000
1.8444	0.255	0.381	109.4	0.000
1.8667	0.256	0.387	111.7	0.000
1.8889	0.257	0.392	114.1	0.000
1.9111	0.258	0.398	116.5	0.000
1.9333	0.260	0.404	119.0	0.000
1.9556	0.261	0.410	121.4	0.000
1.9778	0.262	0.415	123.9	0.000
2.0000	0.263	0.421	126.5	0.000
2.0222	0.264	0.427	129.0	0.000

Name : Exist. 12E
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Forest, Flat	**6.705**
C, Lawn, Flat	**15.235**
C, Forest, Steep	**.256**
C, Lawn, Steep	**.61**

Pervious Total **22.806**

Impervious Land Use	**acre**
ROADS FLAT	**26.527**

Impervious Total **26.527**

Basin Total **49.333**

Element Flows To:

Surface	**Interflow**	**Groundwater**
WL 12C Channel	WL 12C Channel	WL 12C Channel

Name : Exist. 12
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	3.009
C, Lawn, Flat	1.133
Pervious Total	**4.142**

Impervious Land Use	acre
ROADS FLAT	3.076
Impervious Total	**3.076**

Basin Total **7.218**

Element Flows To:

Surface	Interflow	Groundwater
WL 12 Channel	WL 12 Channel	WL 12 Channel

ANALYSIS RESULTS

Stream Protection Duration

NOTE: FLOW DURATION ANALYSIS IDENTIFIES EXISTING AND MITIGATED FLOWS BUT IS NOT INDICATIVE OF THE PROJECT'S COMPLIANCE WITH FLOW DURATION REQUIREMENTS INTO BORST LAKE. DURATIONS ARE ONLY INCLUDED TO IDENTIFY FLOW.

Predeveloped Landuse Totals for POC #1
Total Pervious Area:95.985
Total Impervious Area:47.554

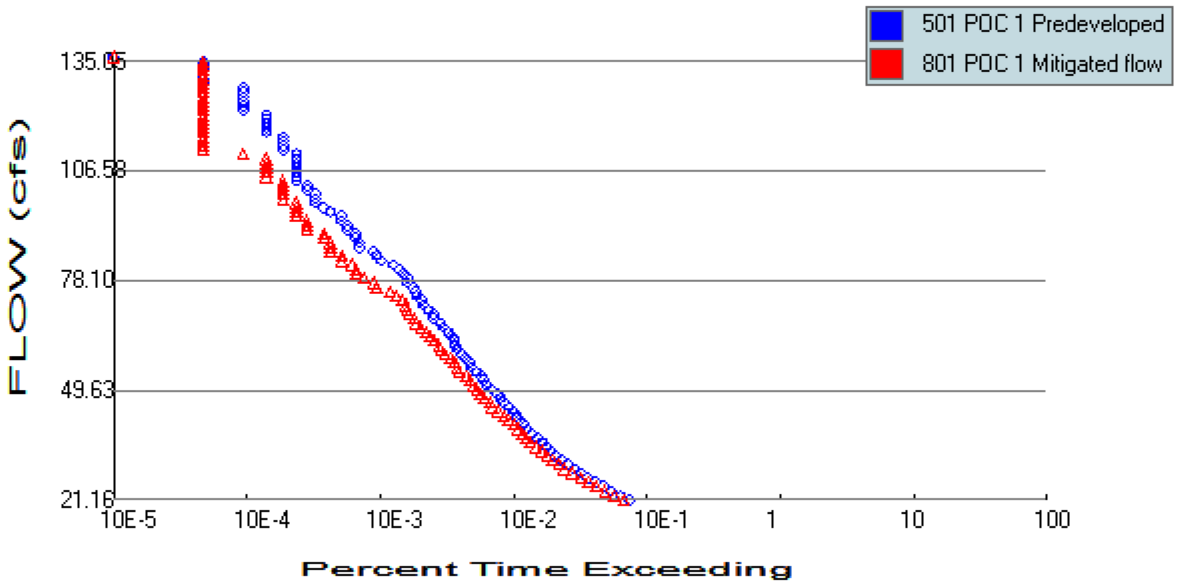
Mitigated Landuse Totals for POC #1
Total Pervious Area:73.248
Total Impervious Area:52.687

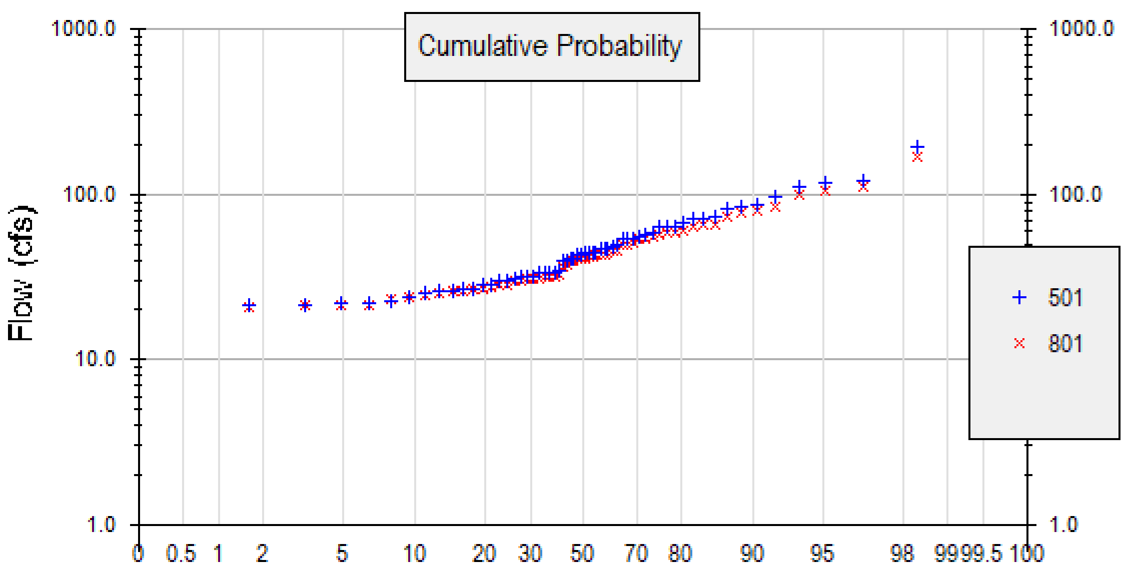
Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	42.32577
5 year	65.722394
10 year	84.336147
25 year	111.693203
50 year	135.046775
100 year	161.110298

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	39.813993
5 year	60.454633
10 year	76.948203
25 year	101.318212
50 year	122.24165
100 year	145.717746


501 POC 1 Predeveloped
801 POC 1 Mitigated flow
135.05
106.58
78.10
49.63
21.16
FLOW (cfs)
10E-5
10E-4
10E-3
10E-2
10E-1
1
10
100
Percent Time Exceeding


Cumulative Probability
1000.0
100.0
10.0
1.0
Flow (cfs)
0
0.5
1
2
5
10
20
30
50
70
80
90
95
98
99
99.5
100
501
801

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	49.106	45.242
1950	70.828	64.050
1951	46.755	42.446
1952	25.747	26.528
1953	31.586	30.470
1954	43.002	40.380
1955	28.014	26.608
1956	31.688	30.082
1957	34.016	31.412
1958	21.263	21.616
1959	33.800	32.602
1960	29.880	28.689
1961	21.727	21.180
1962	21.220	21.083
1963	33.806	31.331
1964	74.024	65.375
1965	39.249	36.608
1966	22.786	23.138
1967	53.698	57.038
1968	26.076	25.490
1969	64.110	59.323
1970	26.826	26.276
1971	46.244	44.264
1972	56.575	53.690
1973	21.953	21.644
1974	31.552	30.688
1975	47.530	43.213
1976	33.172	31.172
1977	39.964	40.155
1978	33.347	31.920
1979	20.618	20.540
1980	30.064	28.674
1981	54.573	50.237
1982	23.875	24.131
1983	40.636	39.290
1984	63.979	58.398
1985	30.497	30.064
1986	43.873	43.321
1987	82.318	73.767
1988	28.466	27.794
1989	26.739	25.741
1990	55.003	50.570
1991	86.401	78.825
1992	63.085	56.130
1993	25.105	24.303
1994	83.131	78.410
1995	42.994	41.075
1996	67.099	59.958
1997	192.127	170.775
1998	44.263	41.943
1999	122.098	110.717
2000	48.864	45.046
2001	44.437	42.762
2002	72.093	66.028

2003	53.776	49.600
2004	116.392	104.936
2005	44.192	40.926
2006	40.829	37.592
2007	111.535	99.307
2008	95.866	85.157
2009	58.017	54.443

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	192.1270	170.7750
2	122.0980	110.7170
3	116.3920	104.9360
4	111.5350	99.3072
5	95.8662	85.1567
6	86.4006	78.8249
7	83.1306	78.4095
8	82.3177	73.7672
9	74.0236	66.0283
10	72.0926	65.3749
11	70.8279	64.0495
12	67.0994	59.9576
13	64.1099	59.3230
14	63.9789	58.3979
15	63.0851	57.0379
16	58.0166	56.1299
17	56.5753	54.4425
18	55.0026	53.6898
19	54.5732	50.5700
20	53.7757	50.2369
21	53.6981	49.6002
22	49.1057	45.2420
23	48.8641	45.0461
24	47.5297	44.2639
25	46.7546	43.3209
26	46.2437	43.2127
27	44.4373	42.7617
28	44.2626	42.4455
29	44.1919	41.9433
30	43.8730	41.0754
31	43.0017	40.9259
32	42.9940	40.3801
33	40.8293	40.1554
34	40.6356	39.2903
35	39.9641	37.5919
36	39.2488	36.6075
37	34.0160	32.6024
38	33.8062	31.9195
39	33.8002	31.4115
40	33.3469	31.3310
41	33.1720	31.1717
42	31.6878	30.6881
43	31.5857	30.4697
44	31.5523	30.0819
45	30.4966	30.0641

46	30.0635	28.6893
47	29.8800	28.6742
48	28.4659	27.7944
49	28.0137	26.6080
50	26.8257	26.5283
51	26.7385	26.2756
52	26.0756	25.7412
53	25.7466	25.4900
54	25.1048	24.3034
55	23.8747	24.1307
56	22.7856	23.1384
57	21.9530	21.6441
58	21.7266	21.6156
59	21.2631	21.1803
60	21.2197	21.0832
61	20.6182	20.5398

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
21.1629	1579	1436	90	Pass
22.3132	1342	1218	90	Pass
23.4636	1143	1036	90	Pass
24.6139	1008	878	87	Pass
25.7643	871	778	89	Pass
26.9146	765	683	89	Pass
28.0649	685	586	85	Pass
29.2153	607	516	85	Pass
30.3656	537	467	86	Pass
31.5160	486	419	86	Pass
32.6663	441	381	86	Pass
33.8167	411	346	84	Pass
34.9670	374	312	83	Pass
36.1173	352	282	80	Pass
37.2677	322	264	81	Pass
38.4180	288	247	85	Pass
39.5684	272	231	84	Pass
40.7187	254	214	84	Pass
41.8690	237	196	82	Pass
43.0194	223	179	80	Pass
44.1697	212	165	77	Pass
45.3201	197	148	75	Pass
46.4704	181	142	78	Pass
47.6208	169	128	75	Pass
48.7711	160	120	75	Pass
49.9214	147	114	77	Pass
51.0718	134	106	79	Pass
52.2221	126	100	79	Pass
53.3725	121	94	77	Pass
54.5228	112	83	74	Pass
55.6732	104	80	76	Pass
56.8235	100	77	77	Pass

57.9738	93	72	77	Pass
59.1242	87	65	74	Pass
60.2745	81	61	75	Pass
61.4249	79	59	74	Pass
62.5752	77	54	70	Pass
63.7256	73	50	68	Pass
64.8759	69	47	68	Pass
66.0262	64	43	67	Pass
67.1766	60	40	66	Pass
68.3269	54	38	70	Pass
69.4773	53	35	66	Pass
70.6276	49	34	69	Pass
71.7779	45	33	73	Pass
72.9283	43	31	72	Pass
74.0786	40	28	70	Pass
75.2290	39	25	64	Pass
76.3793	38	20	52	Pass
77.5297	34	19	55	Pass
78.6800	34	16	47	Pass
79.8303	32	14	43	Pass
80.9807	30	14	46	Pass
82.1310	27	13	48	Pass
83.2814	22	11	50	Pass
84.4317	20	11	55	Pass
85.5821	19	9	47	Pass
86.7324	15	9	60	Pass
87.8827	15	9	60	Pass
89.0331	14	8	57	Pass
90.1834	14	8	57	Pass
91.3338	12	6	50	Pass
92.4841	12	6	50	Pass
93.6345	11	6	54	Pass
94.7848	11	5	45	Pass
95.9351	9	5	55	Pass
97.0855	8	5	62	Pass
98.2358	7	5	71	Pass
99.3862	7	4	57	Pass
100.5365	7	4	57	Pass
101.6868	6	4	66	Pass
102.8372	6	4	66	Pass
103.9875	5	4	80	Pass
105.1379	5	3	60	Pass
106.2882	5	3	60	Pass
107.4386	5	3	60	Pass
108.5889	5	3	60	Pass
109.7392	5	3	60	Pass
110.8896	5	2	40	Pass
112.0399	4	1	25	Pass
113.1903	4	1	25	Pass
114.3406	4	1	25	Pass
115.4910	4	1	25	Pass
116.6413	3	1	33	Pass
117.7916	3	1	33	Pass
118.9420	3	1	33	Pass
120.0923	3	1	33	Pass
121.2427	3	1	33	Pass
122.3930	2	1	50	Pass

123.5434	2	1	50	Pass
124.6937	2	1	50	Pass
125.8440	2	1	50	Pass
126.9944	2	1	50	Pass
128.1447	2	1	50	Pass
129.2951	1	1	100	Pass
130.4454	1	1	100	Pass
131.5957	1	1	100	Pass
132.7461	1	1	100	Pass
133.8964	1	1	100	Pass
135.0468	1	1	100	Pass

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.**

Wetlands Input Volume
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	104.9908	92.7698	88.4	Pass
Feb	73.7265	64.8841	88.0	Pass
Mar	67.4862	59.4622	88.1	Pass
Apr	49.0543	43.3626	88.4	Pass
May	31.0009	27.6392	89.2	Pass
Jun	25.5471	22.8056	89.3	Pass
Jul	13.4110	11.8669	88.5	Pass
Aug	13.6374	12.4276	91.1	Pass
Sep	20.5511	18.8393	91.7	Pass
Oct	44.1646	40.0317	90.6	Pass
Nov	97.4204	86.9425	89.2	Pass
Dec	102.0226	90.3199	88.5	Pass

Day	Series 1	Series 2	Percent	Pass/Fail
Jan1	3.8002	3.4064	89.6	Pass
2	3.2999	2.8700	87.0	Pass
3	3.4293	3.0593	89.2	Pass
4	3.8628	3.4494	89.3	Pass
5	3.5324	3.0990	87.7	Pass
6	4.2445	3.7842	89.2	Pass
7	3.6767	3.2113	87.3	Pass
8	3.7138	3.2653	87.9	Pass
9	3.2337	2.8502	88.1	Pass
10	2.7982	2.4261	86.7	Pass
11	3.0881	2.7421	88.8	Pass
12	3.2630	2.9258	89.7	Pass
13	3.7123	3.3215	89.5	Pass
14	3.3691	2.9603	87.9	Pass
15	3.3204	2.9309	88.3	Pass

16	3.5490	3.1209	87.9	Pass
17	3.3131	2.9245	88.3	Pass
18	3.2519	2.8485	87.6	Pass
19	3.2741	2.8907	88.3	Pass
20	3.1672	2.7803	87.8	Pass
21	3.2122	2.8595	89.0	Pass
22	3.7391	3.3464	89.5	Pass
23	4.0326	3.5947	89.1	Pass
24	3.3750	2.9067	86.1	Pass
25	3.0161	2.6261	87.1	Pass
26	2.8875	2.5164	87.1	Pass
27	2.9222	2.5891	88.6	Pass
28	3.1375	2.7802	88.6	Pass
29	3.4614	3.0631	88.5	Pass
30	3.1249	2.7598	88.3	Pass
31	2.9349	2.5547	87.0	Pass
Feb1	2.6156	2.2846	87.3	Pass
2	2.3301	2.0148	86.5	Pass
3	2.2444	1.9568	87.2	Pass
4	1.8894	1.6343	86.5	Pass
5	2.4376	2.2093	90.6	Pass
6	2.4733	2.1646	87.5	Pass
7	3.0302	2.7096	89.4	Pass
8	3.1113	2.7310	87.8	Pass
9	2.5761	2.2439	87.1	Pass
10	2.3617	2.0790	88.0	Pass
11	2.7426	2.4482	89.3	Pass
12	2.5948	2.2727	87.6	Pass
13	2.3510	2.0644	87.8	Pass
14	2.7128	2.4277	89.5	Pass
15	2.8947	2.5606	88.5	Pass
16	2.8479	2.5267	88.7	Pass
17	2.7812	2.4646	88.6	Pass
18	3.6509	3.2678	89.5	Pass
19	2.6578	2.2566	84.9	Pass
20	2.6130	2.2864	87.5	Pass
21	2.3021	1.9960	86.7	Pass
22	2.2954	2.0285	88.4	Pass
23	2.6803	2.3750	88.6	Pass
24	2.5889	2.2784	88.0	Pass
25	2.1818	1.8920	86.7	Pass
26	2.3849	2.1010	88.1	Pass
27	2.7851	2.4838	89.2	Pass
28	2.5033	2.1744	86.9	Pass
29	2.4709	2.1744	88.0	Pass
Mar1	2.2513	1.9677	87.4	Pass
2	2.9181	2.6197	89.8	Pass
3	2.5145	2.1918	87.2	Pass
4	2.4861	2.1803	87.7	Pass
5	1.8399	1.5700	85.3	Pass
6	1.9757	1.7325	87.7	Pass
7	2.0991	1.8886	90.0	Pass
8	2.7024	2.4292	89.9	Pass
9	2.3502	2.0575	87.5	Pass
10	2.4106	2.1431	88.9	Pass
11	2.6433	2.3543	89.1	Pass
12	2.1515	1.8585	86.4	Pass

13	2.1052	1.8484	87.8	Pass
14	2.2263	1.9641	88.2	Pass
15	2.2726	2.0255	89.1	Pass
16	2.0912	1.8092	86.5	Pass
17	2.3128	2.0701	89.5	Pass
18	1.9864	1.7175	86.5	Pass
19	1.7797	1.5467	86.9	Pass
20	1.5760	1.3689	86.9	Pass
21	2.1785	1.9887	91.3	Pass
22	2.3191	2.0662	89.1	Pass
23	2.3206	2.0534	88.5	Pass
24	2.1671	1.8903	87.2	Pass
25	2.0792	1.8221	87.6	Pass
26	1.8519	1.6106	87.0	Pass
27	1.8252	1.6043	87.9	Pass
28	1.9145	1.6846	88.0	Pass
29	1.9841	1.7667	89.0	Pass
30	1.6818	1.4571	86.6	Pass
31	1.8835	1.6802	89.2	Pass
Apr1	1.9055	1.6929	88.8	Pass
2	1.7464	1.5217	87.1	Pass
3	2.1105	1.9002	90.0	Pass
4	2.0543	1.7967	87.5	Pass
5	1.8941	1.6599	87.6	Pass
6	1.3123	1.0932	83.3	Pass
7	1.6149	1.4534	90.0	Pass
8	1.8233	1.6370	89.8	Pass
9	1.5685	1.3681	87.2	Pass
10	1.9020	1.7046	89.6	Pass
11	1.8052	1.6008	88.7	Pass
12	2.0387	1.8216	89.4	Pass
13	1.7848	1.5699	88.0	Pass
14	1.5341	1.3277	86.5	Pass
15	1.8593	1.6553	89.0	Pass
16	1.6355	1.4269	87.2	Pass
17	1.3366	1.1597	86.8	Pass
18	1.8119	1.6475	90.9	Pass
19	1.5430	1.3318	86.3	Pass
20	1.1642	0.9980	85.7	Pass
21	1.3120	1.1805	90.0	Pass
22	1.7582	1.5821	90.0	Pass
23	1.6647	1.4793	88.9	Pass
24	1.2136	1.0371	85.5	Pass
25	1.0526	0.9120	86.6	Pass
26	1.5231	1.3923	91.4	Pass
27	1.3675	1.2150	88.8	Pass
28	1.4238	1.2711	89.3	Pass
29	1.4110	1.2466	88.4	Pass
30	1.2302	1.0762	87.5	Pass
May1	1.3385	1.1967	89.4	Pass
2	1.1859	1.0272	86.6	Pass
3	1.0113	0.8917	88.2	Pass
4	1.1252	1.0065	89.5	Pass
5	1.1015	0.9805	89.0	Pass
6	0.9025	0.7858	87.1	Pass
7	0.8430	0.7408	87.9	Pass
8	0.8728	0.7784	89.2	Pass

9	0.9196	0.8192	89.1	Pass
10	1.1213	1.0210	91.1	Pass
11	0.8996	0.7990	88.8	Pass
12	1.0352	0.9182	88.7	Pass
13	1.0944	0.9829	89.8	Pass
14	0.9283	0.8182	88.1	Pass
15	1.0062	0.8934	88.8	Pass
16	0.9318	0.8308	89.2	Pass
17	1.0095	0.9128	90.4	Pass
18	1.0116	0.9111	90.1	Pass
19	0.9604	0.8555	89.1	Pass
20	0.7983	0.7018	87.9	Pass
21	0.7882	0.6973	88.5	Pass
22	0.8206	0.7427	90.5	Pass
23	0.9830	0.9049	92.1	Pass
24	0.8555	0.7475	87.4	Pass
25	1.0516	0.9562	90.9	Pass
26	1.0713	0.9728	90.8	Pass
27	0.9922	0.8881	89.5	Pass
28	1.0638	0.9681	91.0	Pass
29	0.8874	0.7744	87.3	Pass
30	1.1604	1.0400	89.6	Pass
31	1.1238	0.9865	87.8	Pass
Jun1	0.9638	0.8352	86.7	Pass
2	1.0162	0.9160	90.1	Pass
3	1.0780	0.9780	90.7	Pass
4	0.9261	0.8261	89.2	Pass
5	1.0802	0.9931	91.9	Pass
6	1.1036	0.9762	88.5	Pass
7	1.0126	0.8927	88.2	Pass
8	1.0308	0.9239	89.6	Pass
9	1.0108	0.8969	88.7	Pass
10	0.9377	0.8369	89.2	Pass
11	0.9024	0.8027	89.0	Pass
12	0.7900	0.7014	88.8	Pass
13	0.7446	0.6607	88.7	Pass
14	0.6582	0.5845	88.8	Pass
15	0.7852	0.7020	89.4	Pass
16	1.0346	0.9339	90.3	Pass
17	0.6984	0.6052	86.7	Pass
18	0.6611	0.5872	88.8	Pass
19	0.6938	0.6140	88.5	Pass
20	0.7935	0.7228	91.1	Pass
21	0.5400	0.4608	85.3	Pass
22	0.7856	0.7171	91.3	Pass
23	1.2147	1.1156	91.8	Pass
24	0.7177	0.6171	86.0	Pass
25	0.6032	0.5308	88.0	Pass
26	0.6463	0.5939	91.9	Pass
27	0.6688	0.6083	90.9	Pass
28	0.7178	0.6459	90.0	Pass
29	0.6076	0.5401	88.9	Pass
30	0.7180	0.6482	90.3	Pass
Jul1	0.6156	0.5461	88.7	Pass
2	0.5323	0.4579	86.0	Pass
3	0.4874	0.4294	88.1	Pass
4	0.5792	0.5226	90.2	Pass

5	0.5303	0.4766	89.9	Pass
6	0.4643	0.4139	89.1	Pass
7	0.7130	0.6649	93.2	Pass
8	0.7049	0.6362	90.3	Pass
9	0.5954	0.5331	89.5	Pass
10	0.4368	0.3716	85.1	Pass
11	0.5676	0.5131	90.4	Pass
12	0.6366	0.5606	88.1	Pass
13	0.4572	0.3928	85.9	Pass
14	0.3877	0.3337	86.1	Pass
15	0.5432	0.5069	93.3	Pass
16	0.3789	0.3250	85.8	Pass
17	0.3461	0.2938	84.9	Pass
18	0.3022	0.2600	86.0	Pass
19	0.2898	0.2527	87.2	Pass
20	0.2628	0.2237	85.1	Pass
21	0.3463	0.3114	89.9	Pass
22	0.2977	0.2630	88.3	Pass
23	0.2316	0.1944	83.9	Pass
24	0.2928	0.2632	89.9	Pass
25	0.4100	0.3861	94.2	Pass
26	0.3076	0.2637	85.7	Pass
27	0.2944	0.2562	87.0	Pass
28	0.2384	0.1986	83.3	Pass
29	0.2366	0.2003	84.7	Pass
30	0.2060	0.1673	81.2	Pass
31	0.3259	0.2945	90.4	Pass
Aug1	0.2812	0.2467	87.8	Pass
2	0.3473	0.3202	92.2	Pass
3	0.2692	0.2317	86.1	Pass
4	0.2255	0.1843	81.7	Pass
5	0.3377	0.3140	93.0	Pass
6	0.5666	0.5484	96.8	Pass
7	0.3637	0.3095	85.1	Pass
8	0.3062	0.2654	86.7	Pass
9	0.2763	0.2417	87.5	Pass
10	0.3107	0.2810	90.4	Pass
11	0.2796	0.2426	86.8	Pass
12	0.2798	0.2504	89.5	Pass
13	0.4541	0.4300	94.7	Pass
14	0.5863	0.5426	92.6	Pass
15	0.5151	0.4759	92.4	Pass
16	0.3996	0.3564	89.2	Pass
17	0.4524	0.4131	91.3	Pass
18	0.4242	0.3939	92.9	Pass
19	0.3543	0.3099	87.5	Pass
20	0.5283	0.4958	93.9	Pass
21	0.6299	0.5997	95.2	Pass
22	0.7324	0.6916	94.4	Pass
23	0.7111	0.6439	90.6	Pass
24	0.5540	0.4813	86.9	Pass
25	0.6606	0.5960	90.2	Pass
26	0.5212	0.4682	89.8	Pass
27	0.4371	0.3923	89.8	Pass
28	0.5097	0.4757	93.3	Pass
29	0.4313	0.3879	90.0	Pass
30	0.5660	0.5426	95.9	Pass

31	0.5881	0.5453	92.7	Pass
Sep1	0.6821	0.5984	87.7	Pass
2	0.4821	0.4295	89.1	Pass
3	0.6287	0.5848	93.0	Pass
4	0.4899	0.4404	89.9	Pass
5	0.5873	0.5449	92.8	Pass
6	0.3548	0.3072	86.6	Pass
7	0.5013	0.4612	92.0	Pass
8	0.5679	0.5227	92.0	Pass
9	0.8161	0.7832	96.0	Pass
10	0.5850	0.5255	89.8	Pass
11	0.4593	0.3905	85.0	Pass
12	0.6037	0.5619	93.1	Pass
13	0.6139	0.5857	95.4	Pass
14	0.4892	0.4443	90.8	Pass
15	0.7227	0.6836	94.6	Pass
16	1.3599	1.2883	94.7	Pass
17	0.8034	0.7073	88.0	Pass
18	0.8767	0.8136	92.8	Pass
19	0.6094	0.5390	88.5	Pass
20	0.5271	0.4716	89.5	Pass
21	0.9011	0.8523	94.6	Pass
22	0.9576	0.8753	91.4	Pass
23	0.8062	0.7247	89.9	Pass
24	0.6914	0.6243	90.3	Pass
25	0.8090	0.7466	92.3	Pass
26	0.5675	0.4999	88.1	Pass
27	0.7482	0.6953	92.9	Pass
28	0.7046	0.6463	91.7	Pass
29	1.0161	0.9460	93.1	Pass
30	0.7145	0.6263	87.7	Pass
Oct1	0.8972	0.8268	92.1	Pass
2	0.8666	0.8028	92.6	Pass
3	0.9583	0.9087	94.8	Pass
4	0.7803	0.6936	88.9	Pass
5	1.1063	1.0315	93.2	Pass
6	0.9607	0.8716	90.7	Pass
7	1.4612	1.3923	95.3	Pass
8	1.6987	1.5847	93.3	Pass
9	1.4442	1.2689	87.9	Pass
10	1.0977	0.9506	86.6	Pass
11	0.9850	0.8899	90.4	Pass
12	0.9839	0.8947	90.9	Pass
13	0.9541	0.8790	92.1	Pass
14	1.0917	0.9922	90.9	Pass
15	1.2395	1.1380	91.8	Pass
16	1.3145	1.2034	91.5	Pass
17	1.3424	1.1985	89.3	Pass
18	1.6398	1.5071	91.9	Pass
19	2.6227	2.4033	91.6	Pass
20	1.8260	1.6132	88.3	Pass
21	1.7534	1.5720	89.7	Pass
22	1.5289	1.3485	88.2	Pass
23	1.4837	1.3307	89.7	Pass
24	1.6393	1.4958	91.2	Pass
25	1.8176	1.6451	90.5	Pass
26	2.0022	1.8396	91.9	Pass

27	2.0415	1.8226	89.3	Pass
28	1.8804	1.6531	87.9	Pass
29	1.8774	1.6824	89.6	Pass
30	2.1549	1.9673	91.3	Pass
31	2.0620	1.8583	90.1	Pass
Nov1	2.1235	1.8965	89.3	Pass
2	2.6060	2.3743	91.1	Pass
3	3.6390	3.3124	91.0	Pass
4	2.6077	2.2734	87.2	Pass
5	3.1732	2.8377	89.4	Pass
6	3.0415	2.7136	89.2	Pass
7	2.6597	2.3567	88.6	Pass
8	2.6567	2.3786	89.5	Pass
9	2.7837	2.5245	90.7	Pass
10	3.4442	3.1333	91.0	Pass
11	3.6459	3.2766	89.9	Pass
12	3.4177	3.0470	89.2	Pass
13	3.2126	2.8021	87.2	Pass
14	2.6356	2.3217	88.1	Pass
15	2.7630	2.4735	89.5	Pass
16	3.1716	2.8656	90.4	Pass
17	3.2160	2.8331	88.1	Pass
18	3.5568	3.2262	90.7	Pass
19	3.9696	3.5668	89.9	Pass
20	3.7903	3.3314	87.9	Pass
21	3.1858	2.7894	87.6	Pass
22	3.5695	3.2379	90.7	Pass
23	4.3662	3.9087	89.5	Pass
24	4.7859	4.3002	89.9	Pass
25	3.7907	3.3071	87.2	Pass
26	3.3324	2.8989	87.0	Pass
27	3.2584	2.8989	89.0	Pass
28	3.2075	2.8252	88.1	Pass
29	3.7497	3.3732	90.0	Pass
30	3.7717	3.3814	89.7	Pass
Dec1	4.2828	3.8344	89.5	Pass
2	5.0195	4.4512	88.7	Pass
3	3.6406	3.1372	86.2	Pass
4	3.3505	2.9699	88.6	Pass
5	3.2699	2.8780	88.0	Pass
6	2.8506	2.4929	87.5	Pass
7	2.6303	2.3143	88.0	Pass
8	2.9145	2.6112	89.6	Pass
9	3.3216	2.9942	90.1	Pass
10	3.4791	3.1148	89.5	Pass
11	3.4678	3.0797	88.8	Pass
12	3.5202	3.1149	88.5	Pass
13	3.9586	3.5425	89.5	Pass
14	4.1006	3.6337	88.6	Pass
15	3.3225	2.8930	87.1	Pass
16	2.8945	2.5209	87.1	Pass
17	2.5791	2.2523	87.3	Pass
18	2.8284	2.5335	89.6	Pass
19	3.1647	2.8411	89.8	Pass
20	3.1756	2.8096	88.5	Pass
21	2.8269	2.4683	87.3	Pass
22	2.9966	2.6674	89.0	Pass

23	**2.9034**	**2.5602**	**88.2**	**Pass**
24	**2.6467**	**2.3233**	**87.8**	**Pass**
25	**3.2909**	**2.9645**	**90.1**	**Pass**
26	**3.7148**	**3.2944**	**88.7**	**Pass**
27	**2.7716**	**2.3911**	**86.3**	**Pass**
28	**3.4351**	**3.1105**	**90.5**	**Pass**
29	**3.2742**	**2.8644**	**87.5**	**Pass**
30	**2.6224**	**2.2744**	**86.7**	**Pass**
31	**3.1826**	**2.8608**	**89.9**	**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
WL 12 Channel POC	N	31708.88			N	0.00			
WL 12C Channel	N	29907.85			N	0.00			
WL 12W Channel	N	4418.12			N	0.00			
WL 12NW-A Channel	N	3781.10			N	0.00			
WL 28 Channel	N	1032.49			N	0.00			
Total Volume Infiltrated		70848.44	0.00	0.00		0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

Appendix B-5

Snoqualmie River WWHM Analysis

WWHM2012

PROJECT REPORT

Project Name: 17500 Snoqualmie River
Site Name:
Site Address:
City :
Report Date: 1/29/2020
Gage : Landsburg
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.29
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

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

High Flow Threshold for POC 2: 50 year

PREDEVELOPED LAND USE

Name : Exist. Snoqualmie River
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	20.859
C, Lawn, Flat	2.658
Pervious Total	23.517

Impervious Land Use	acre
ROADS FLAT	1.901
Impervious Total	1.901
Basin Total	25.418

Element Flows To:

Surface	Interflow	Groundwater

Name : Exist. Snoqualmie River (for WQ sizing)
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	20.859
C, Lawn, Flat	2.658

Pervious Total 23.517

Impervious Land Use	acre
ROADS FLAT	1.901

Impervious Total 1.901

Basin Total 25.418

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Exist. Snoqualmie River 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	.905

Pervious Total 0.905

Impervious Land Use	acre
ROADS FLAT	3.646

Impervious Total 3.646

Basin Total 4.551

Element Flows To:

Surface	Interflow	Groundwater

Name : Exist. Snoqualmie River 2
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	16.253
C, Lawn, Flat	4.012

Pervious Total 20.265

Impervious Land Use	acre
ROADS FLAT	18.968

Impervious Total 18.968

Basin Total 39.233

Element Flows To:

Surface	Interflow	Groundwater

Name : Exist. Snoqualmie River 2 (for WQ sizing)
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	16.253
C, Lawn, Flat	4.012

Pervious Total 20.265

Impervious Land Use	acre
ROADS FLAT	18.968

Impervious Total 18.968

Basin Total 39.233

Element Flows To:

Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

NOTE: FLOW DURATION ANALYSIS IDENTIFIES EXISTING AND MITIGATED FLOWS BUT IS NOT INDICATIVE OF THE PROJECT'S COMPLIANCE WITH FLOW DURATION REQUIREMENTS INTO SNOQUALMIE RIVER PARTICULARLY AS IT PERTAINS TO DIRECT DISCHARGE REQUIREMENTS.. DURATIONS ARE ONLY INCLUDED TO IDENTIFY FLOW RATES AND IDENTIFY THE PROJECT'S COMPLIANCE (AND MAINTENANCE) OF WATER QUALITY FLOWS.

Predeveloped Landuse Totals for POC #1
Total Pervious Area:23.517
Total Impervious Area:1.901

Mitigated Landuse Totals for POC #1
Total Pervious Area:21.17
Total Impervious Area:22.614

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	4.125476
5 year	7.541996
10 year	10.686083
25 year	15.900586
50 year	20.853582
100 year	26.877048

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	18.818069
5 year	28.687223
10 year	36.597431
25 year	48.313931
50 year	58.395176
100 year	69.725793

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	4.716	20.380
1950	8.303	24.617
1951	4.548	17.255
1952	2.375	12.041
1953	2.414	13.694
1954	5.652	22.438
1955	3.129	12.159
1956	3.285	13.909
1957	3.345	15.561
1958	1.817	10.497
1959	2.382	14.290
1960	2.461	13.444
1961	2.280	11.646

1962	1.741	9.790
1963	4.131	17.152
1964	14.081	35.126
1965	3.574	16.376
1966	1.653	11.942
1967	3.404	34.990
1968	2.402	11.998
1969	6.397	25.090
1970	2.178	10.517
1971	3.557	19.297
1972	4.090	30.328
1973	2.144	10.346
1974	3.817	16.912
1975	4.046	17.884
1976	3.018	12.991
1977	2.161	17.968
1978	2.536	12.794
1979	1.680	9.927
1980	2.594	13.706
1981	6.396	23.305
1982	2.055	11.129
1983	2.950	16.753
1984	9.161	31.626
1985	2.316	13.384
1986	3.384	22.875
1987	14.916	39.650
1988	2.513	14.572
1989	2.796	14.376
1990	6.432	23.495
1991	14.379	42.528
1992	11.197	32.470
1993	2.356	11.956
1994	5.771	43.537
1995	4.387	19.928
1996	8.417	24.372
1997	33.070	89.362
1998	6.388	25.074
1999	13.278	44.714
2000	4.571	20.185
2001	3.027	21.767
2002	8.356	27.338
2003	7.091	24.556
2004	11.128	42.060
2005	4.693	17.479
2006	4.363	16.044
2007	16.284	39.865
2008	11.346	32.619
2009	6.440	25.196

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	33.0700	89.3617
2	16.2844	44.7140
3	14.9156	43.5370
4	14.3794	42.5277

5	14.0809	42.0603
6	13.2775	39.8647
7	11.3463	39.6496
8	11.1973	35.1259
9	11.1278	34.9896
10	9.1612	32.6191
11	8.4173	32.4696
12	8.3555	31.6261
13	8.3034	30.3277
14	7.0905	27.3384
15	6.4398	25.1955
16	6.4324	25.0895
17	6.3969	25.0742
18	6.3959	24.6169
19	6.3878	24.5559
20	5.7709	24.3724
21	5.6518	23.4946
22	4.7163	23.3053
23	4.6928	22.8753
24	4.5710	22.4379
25	4.5477	21.7665
26	4.3871	20.3796
27	4.3633	20.1849
28	4.1305	19.9278
29	4.0902	19.2970
30	4.0459	17.9676
31	3.8166	17.8839
32	3.5735	17.4790
33	3.5571	17.2546
34	3.4041	17.1518
35	3.3836	16.9124
36	3.3450	16.7530
37	3.2851	16.3756
38	3.1286	16.0437
39	3.0270	15.5607
40	3.0175	14.5722
41	2.9502	14.3761
42	2.7957	14.2897
43	2.5936	13.9085
44	2.5364	13.7060
45	2.5129	13.6936
46	2.4611	13.4436
47	2.4137	13.3843
48	2.4022	12.9914
49	2.3820	12.7941
50	2.3753	12.1590
51	2.3562	12.0408
52	2.3160	11.9978
53	2.2796	11.9560
54	2.1783	11.9424
55	2.1611	11.6460
56	2.1445	11.1286
57	2.0551	10.5165
58	1.8172	10.4973
59	1.7412	10.3457
60	1.6796	9.9265
61	1.6531	9.7900

Stream Protection Duration
POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.0627	1908	55654	2916	Fail
2.2525	1376	48232	3505	Fail
2.4424	1035	42050	4062	Fail
2.6322	790	36789	4656	Fail
2.8220	610	32318	5298	Fail
3.0118	487	28447	5841	Fail
3.2016	391	24961	6383	Fail
3.3914	313	22009	7031	Fail
3.5812	249	19492	7828	Fail
3.7710	208	17310	8322	Fail
3.9608	185	15389	8318	Fail
4.1506	168	13785	8205	Fail
4.3404	154	12305	7990	Fail
4.5302	143	11075	7744	Fail
4.7200	125	9948	7958	Fail
4.9098	113	8968	7936	Fail
5.0996	104	8089	7777	Fail
5.2894	97	7328	7554	Fail
5.4793	89	6626	7444	Fail
5.6691	80	6002	7502	Fail
5.8589	75	5452	7269	Fail
6.0487	70	4984	7119	Fail
6.2385	64	4558	7121	Fail
6.4283	60	4134	6890	Fail
6.6181	58	3792	6537	Fail
6.8079	55	3461	6292	Fail
6.9977	49	3159	6446	Fail
7.1875	42	2885	6869	Fail
7.3773	40	2648	6619	Fail
7.5671	37	2432	6572	Fail
7.7569	35	2257	6448	Fail
7.9467	33	2066	6260	Fail
8.1365	33	1887	5718	Fail
8.3264	32	1729	5403	Fail
8.5162	28	1585	5660	Fail
8.7060	26	1473	5665	Fail
8.8958	25	1367	5468	Fail
9.0856	24	1260	5250	Fail
9.2754	20	1177	5885	Fail
9.4652	20	1117	5585	Fail
9.6550	20	1049	5245	Fail
9.8448	19	984	5178	Fail
10.0346	18	916	5088	Fail
10.2244	18	853	4738	Fail
10.4142	17	792	4658	Fail
10.6040	17	744	4376	Fail
10.7938	13	687	5284	Fail
10.9836	13	653	5023	Fail

11.1735	12	630	5250	Fail
11.3633	10	596	5960	Fail
11.5531	10	567	5670	Fail
11.7429	10	531	5310	Fail
11.9327	10	509	5090	Fail
12.1225	10	476	4760	Fail
12.3123	8	459	5737	Fail
12.5021	8	436	5450	Fail
12.6919	7	417	5957	Fail
12.8817	7	398	5685	Fail
13.0715	6	371	6183	Fail
13.2613	6	353	5883	Fail
13.4511	5	328	6560	Fail
13.6409	5	316	6320	Fail
13.8307	5	306	6120	Fail
14.0205	5	291	5820	Fail
14.2104	4	287	7175	Fail
14.4002	3	271	9033	Fail
14.5900	3	265	8833	Fail
14.7798	3	256	8533	Fail
14.9696	2	244	12200	Fail
15.1594	2	233	11650	Fail
15.3492	2	227	11350	Fail
15.5390	2	221	11050	Fail
15.7288	2	213	10650	Fail
15.9186	2	207	10350	Fail
16.1084	2	201	10050	Fail
16.2982	1	191	19100	Fail
16.4880	1	188	18800	Fail
16.6778	1	179	17900	Fail
16.8676	1	171	17100	Fail
17.0575	1	163	16300	Fail
17.2473	1	155	15500	Fail
17.4371	1	154	15400	Fail
17.6269	1	148	14800	Fail
17.8167	1	146	14600	Fail
18.0065	1	141	14100	Fail
18.1963	1	138	13800	Fail
18.3861	1	135	13500	Fail
18.5759	1	134	13400	Fail
18.7657	1	130	13000	Fail
18.9555	1	125	12500	Fail
19.1453	1	121	12100	Fail
19.3351	1	116	11600	Fail
19.5249	1	113	11300	Fail
19.7147	1	113	11300	Fail
19.9045	1	109	10900	Fail
20.0944	1	106	10600	Fail
20.2842	1	104	10400	Fail
20.4740	1	102	10200	Fail
20.6638	1	100	10000	Fail
20.8536	1	98	9800	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 BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #2
Total Pervious Area:23.517
Total Impervious Area:1.901

Mitigated Landuse Totals for POC #2
Total Pervious Area:20.265
Total Impervious Area:18.968

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	4.125476
5 year	7.541996
10 year	10.686083
25 year	15.900586
50 year	20.853582
100 year	26.877048

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	15.979111
5 year	24.490115
10 year	31.339759
25 year	41.519185
50 year	50.303516
100 year	60.199464

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #2

Year	Predeveloped	Mitigated
1949	4.716	17.332
1950	8.303	21.248
1951	4.548	14.630
1952	2.375	10.133
1953	2.414	11.558
1954	5.652	19.139
1955	3.129	10.346
1956	3.285	11.851
1957	3.345	13.191
1958	1.817	8.831
1959	2.382	12.033
1960	2.461	11.345
1961	2.280	9.858
1962	1.741	8.290
1963	4.131	14.612
1964	14.081	30.617
1965	3.574	13.892
1966	1.653	10.051
1967	3.404	29.325
1968	2.402	10.089
1969	6.397	21.404

1970	2.178	8.928
1971	3.557	16.190
1972	4.090	25.378
1973	2.144	8.791
1974	3.817	14.395
1975	4.046	15.175
1976	3.018	10.964
1977	2.161	15.053
1978	2.536	10.814
1979	1.680	8.326
1980	2.594	11.557
1981	6.396	19.941
1982	2.055	9.345
1983	2.950	14.165
1984	9.161	27.155
1985	2.316	11.312
1986	3.384	19.239
1987	14.916	34.449
1988	2.513	12.211
1989	2.796	12.174
1990	6.432	20.097
1991	14.379	36.715
1992	11.197	28.060
1993	2.356	10.137
1994	5.771	36.418
1995	4.387	16.932
1996	8.417	21.059
1997	33.070	77.496
1998	6.388	21.127
1999	13.278	38.223
2000	4.571	17.133
2001	3.027	18.253
2002	8.356	23.475
2003	7.091	21.064
2004	11.128	35.886
2005	4.693	14.937
2006	4.363	13.728
2007	16.284	34.786
2008	11.346	28.188
2009	6.440	21.094

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	**Predeveloped**	**Mitigated**
1	33.0700	77.4957
2	16.2844	38.2230
3	14.9156	36.7152
4	14.3794	36.4175
5	14.0809	35.8857
6	13.2775	34.7863
7	11.3463	34.4494
8	11.1973	30.6169
9	11.1278	29.3252
10	9.1612	28.1884
11	8.4173	28.0603
12	8.3555	27.1550

13	8.3034	25.3776
14	7.0905	23.4748
15	6.4398	21.4043
16	6.4324	21.2479
17	6.3969	21.1266
18	6.3959	21.0941
19	6.3878	21.0637
20	5.7709	21.0585
21	5.6518	20.0971
22	4.7163	19.9408
23	4.6928	19.2390
24	4.5710	19.1386
25	4.5477	18.2531
26	4.3871	17.3317
27	4.3633	17.1328
28	4.1305	16.9320
29	4.0902	16.1903
30	4.0459	15.1751
31	3.8166	15.0534
32	3.5735	14.9372
33	3.5571	14.6298
34	3.4041	14.6121
35	3.3836	14.3948
36	3.3450	14.1654
37	3.2851	13.8918
38	3.1286	13.7279
39	3.0270	13.1913
40	3.0175	12.2106
41	2.9502	12.1744
42	2.7957	12.0333
43	2.5936	11.8514
44	2.5364	11.5577
45	2.5129	11.5567
46	2.4611	11.3450
47	2.4137	11.3119
48	2.4022	10.9643
49	2.3820	10.8139
50	2.3753	10.3461
51	2.3562	10.1373
52	2.3160	10.1330
53	2.2796	10.0890
54	2.1783	10.0511
55	2.1611	9.8581
56	2.1445	9.3453
57	2.0551	8.9275
58	1.8172	8.8314
59	1.7412	8.7909
60	1.6796	8.3260
61	1.6531	8.2899

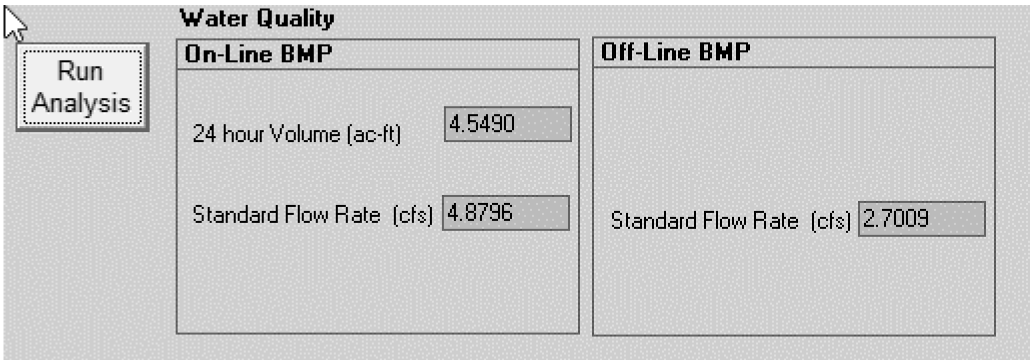
Stream Protection Duration
POC #2
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.0627	1908	43013	2254	Fail
2.2525	1376	36746	2670	Fail
2.4424	1035	31506	3044	Fail
2.6322	790	27035	3422	Fail
2.8220	610	23357	3829	Fail
3.0118	487	20167	4141	Fail
3.2016	391	17511	4478	Fail
3.3914	313	15216	4861	Fail
3.5812	249	13327	5352	Fail
3.7710	208	11725	5637	Fail
3.9608	185	10335	5586	Fail
4.1506	168	9122	5429	Fail
4.3404	154	8079	5246	Fail
4.5302	143	7202	5036	Fail
4.7200	125	6393	5114	Fail
4.9098	113	5689	5034	Fail
5.0996	104	5114	4917	Fail
5.2894	97	4590	4731	Fail
5.4793	89	4105	4612	Fail
5.6691	80	3698	4622	Fail
5.8589	75	3307	4409	Fail
6.0487	70	2977	4252	Fail
6.2385	64	2680	4187	Fail
6.4283	60	2423	4038	Fail
6.6181	58	2207	3805	Fail
6.8079	55	2005	3645	Fail
6.9977	49	1802	3677	Fail
7.1875	42	1621	3859	Fail
7.3773	40	1483	3707	Fail
7.5671	37	1356	3664	Fail
7.7569	35	1238	3537	Fail
7.9467	33	1145	3469	Fail
8.1365	33	1073	3251	Fail
8.3264	32	989	3090	Fail
8.5162	28	909	3246	Fail
8.7060	26	841	3234	Fail
8.8958	25	770	3080	Fail
9.0856	24	717	2987	Fail
9.2754	20	666	3330	Fail
9.4652	20	630	3150	Fail
9.6550	20	592	2960	Fail
9.8448	19	559	2942	Fail
10.0346	18	520	2888	Fail
10.2244	18	491	2727	Fail
10.4142	17	461	2711	Fail
10.6040	17	434	2552	Fail
10.7938	13	414	3184	Fail
10.9836	13	384	2953	Fail
11.1735	12	366	3050	Fail
11.3633	10	334	3340	Fail

11.5531	10	317	3170	Fail
11.7429	10	303	3030	Fail
11.9327	10	293	2930	Fail
12.1225	10	283	2830	Fail
12.3123	8	268	3350	Fail
12.5021	8	259	3237	Fail
12.6919	7	246	3514	Fail
12.8817	7	235	3357	Fail
13.0715	6	223	3716	Fail
13.2613	6	217	3616	Fail
13.4511	5	211	4220	Fail
13.6409	5	201	4020	Fail
13.8307	5	192	3840	Fail
14.0205	5	185	3700	Fail
14.2104	4	175	4375	Fail
14.4002	3	167	5566	Fail
14.5900	3	163	5433	Fail
14.7798	3	154	5133	Fail
14.9696	2	150	7500	Fail
15.1594	2	145	7250	Fail
15.3492	2	141	7050	Fail
15.5390	2	138	6900	Fail
15.7288	2	133	6650	Fail
15.9186	2	128	6400	Fail
16.1084	2	126	6300	Fail
16.2982	1	120	12000	Fail
16.4880	1	118	11800	Fail
16.6778	1	114	11400	Fail
16.8676	1	111	11100	Fail
17.0575	1	107	10700	Fail
17.2473	1	105	10500	Fail
17.4371	1	102	10200	Fail
17.6269	1	101	10100	Fail
17.8167	1	97	9700	Fail
18.0065	1	94	9400	Fail
18.1963	1	92	9200	Fail
18.3861	1	91	9100	Fail
18.5759	1	90	9000	Fail
18.7657	1	85	8500	Fail
18.9555	1	84	8400	Fail
19.1453	1	81	8100	Fail
19.3351	1	77	7700	Fail
19.5249	1	76	7600	Fail
19.7147	1	74	7400	Fail
19.9045	1	73	7300	Fail
20.0944	1	72	7200	Fail
20.2842	1	71	7100	Fail
20.4740	1	66	6600	Fail
20.6638	1	62	6200	Fail
20.8536	1	61	6100	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 BMP Flow and Volume for POC #2
On-line facility volume: 4.5496 **acre-feet**
On-line facility target flow: 4.8913 **cfs.**
Adjusted for 15 min: 4.8913 **cfs.**
Off-line facility target flow: 2.701 **cfs.**
Adjusted for 15 min: 2.701 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes

No changes have been made.
