



Lot 19, LLC.

19XXX 74th Ave, Arlington, WA 98223

PFN # _____

1st Submittal: December 2022

2nd Submittal: April 2023

**Stormwater Site Plan Report
for
Lot 19, LLC.**

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04/17/2023

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Section 1 – Summary and Minimum Requirements

1.1 Project Description

Ambers Grove, is a proposed townhome development that will reside on a 14.36-*acre* lot in the City of Arlington. The parcel is owned by Lot 19, LLC. The development is located on Parcel Number 31051400101800 and bears the address 19XXX 74th Ave, Arlington, WA 98223. The development will contain 3.99-*acres* impervious surface of which 2.47-*acres* will be pollution generating and 1.52-*acres* will be non-pollution generating impervious surface.

The development of the vacant parcel will consist of townhomes, roads, drive aisles, parking, driveways, and recreational park features. The development will also be accessed by a bridge-type culvert structure. The townhome neighborhood will include LID stormwater management features and conform to the requirements set forth in Arlington Municipal Code (AMC).

The project will incorporate the preferred options for On-site Stormwater Management to the maximum extent feasible in accordance with the 2019 Stormwater Management Manual for Western Washington (SMMWW). The most preferred option from the Manual is Full Dispersion, BMP T5.30. A portion of the site will incorporate Full Dispersion. The second preferred option for non-pollution generating impervious surface is Rooftop Infiltration BMPs. Rooftops will be routed to Downspout Infiltration Trenches (BMP T5.10A) where applicable. Pollution Generating Impervious Surfaces are managed with Bioretention Cells (BMP T7.30) to expose stormwater to the native soil column to preserve natural infiltration pathways to the broadest application possible. This is the second preferred option for PGHS.

Stormwater managed with the On-site stormwater BMPs will comply with the Wetlands Protection Criteria of Minimum Requirement #8 for stormwater discharges to the on-site wetland.

1.2 Project Data Summary

Existing and proposed project areas are presented in Table 2 for determination of stormwater management requirements based on prescribed thresholds as outlined in the AMC Section 13.28.

1.3 Construction Activities

The site is steep and extensive grading will be required. Townhome designs will be configured to blend to the existing topography to the maximum extent feasible in an effort to reduce perimeter walls and provide a more natural aesthetic. Gravel base and asphalt will be imported to create roads, aisles, parking, and driveways. The organic stripping's stockpiled on site will be reused/recycled for soil amendments within vegetated areas.

Project disturbance area is 7.25-*acres*. A separate document titled **Stormwater Pollution Prevention Plan for Ambers Grove** will detail construction methods for eliminating pollution.

Table 1 – Project Location Data

Project Data:	
Applicant	Lot 19, LLC.
Project Name	Ambers Grove
Project T.S.R. Location	SW ¼ of NE ¼ of Section 14, Township 31 N, Range 5 W
Project Address	19XXX 74th Ave, Arlington, WA 98223
Parcel ID(s)	31051400101800
Watershed	Stillaguamish
WRIA number	5
Basin	Portage Creek of Lower Stillaguamish
Sub-Basin	West Fork Portage Creek of Upper Portage Creek

Table 2 - Project Theshhold Data Summary

Project Data:	
Project Name	Ambers Grove
Existing Conditions:	
Total Site Area	625,560 sf (14.36ac)
Existing Impervious Area	0 sf (0.00 ac)
Proposed Activity:	
Proposed Activity	Townhome Neighborhood
Proposed Clearing Area (Total)	315,976 sf (7.25 ac)
Proposed Grading Area (Total)	315,976 sf (7.25 ac)
Proposed New NPGIS (Total)	66,275 sf (1.52 ac)
Proposed New PGIS (Total)	107,594 sf (2.47 ac)
Proposed Replaced Impervious Area	0 sf (0.0000 ac)
Native Vegetation convert to Lawn	0 sf (0.0000 ac)
Native Vegetation convert to Pasture	0 sf (0.0000 ac)
Total New Impervious Area (Total)*	173,869 sf (3.99 ac)
Proposed Disturbance Area	315,976 sf (7.25 ac)
Project Qualification:	
Development Type	New Development
Minimum Requirements	1 thru 9

1.4 Minimum Requirements and Thresholds

The project qualifies as new development under Volume I, Chapter 2 of the 2019 DOE Stormwater Management Manual for Western Washington (SMMWW). The SMMWW is specified as the governing document for stormwater management per AMC 13.28.150. This specifies compliance with Minimum Requirements 1-10 of the SMMWW.

Ambers Grove requires a full stormwater site plan and compliance with the minimum requirements set forth in the SMMWW.

A full construction SWPPP is required. The SWPPP is provided as a separate stand-alone document titled **Construction Stormwater Pollution Prevention Plan for Ambers Grove**

Minimum Requirements

1. Preparation of Stormwater Site Plans
2. Construction Stormwater Pollution Prevention
3. Source Control of Pollution
4. Preservation of Natural Drainage Systems and Outfalls
5. On-site Stormwater Management
6. Runoff Treatment
7. Flow Control
8. Wetlands Protection
9. Operation and Maintenance

These are addressed sequentially in this document.

Section 2 - MR-1: PREPARE STORMWATER SITE PLAN

2.1 Existing Site Conditions

2.1.1 Site Location

The project is located in the Southwest quarter of the Northeast quarter of Section 14 in Township 31 North, Range 5 West. The site's address is 19XXX 74th Ave, Arlington, WA 98223.

The location of the site is shown in Figure 1 below. The parcel is located at the approximate address of 19XXX 74th Ave, Arlington, WA 98223 between Arlington Valley Road and Highway 9. Access to the site will be from Right-of-way connecting to Arlington Valley Road. Emergency access to Highway 9 will be provided but closed except during emergencies. The project is located in the Stillaguamish watershed (WRIA-5), in the West Fork (Lower) Portage Creek Sub-Basin.

2.1.2 Site Description

The site has a total area of *625,560-square feet (14.36-acres)*. The property is zoned Residential High Capacity (RHC) and its current use is listed as 'Vacant'.

2.1.3 Vegetative Cover

The development area is forested with trees scattered throughout the site. An aerial photo can be seen in Section 11.1 as Figure 2. Mitigation of removed trees within the development area will be replanted at the rate required in City of Arlington Municipal Code. Tree Calculations are presented on the Planning Sheets.

2.1.4 Topography

The pre-developed existing topography both onsite and offsite was evaluated using survey drone LiDAR, survey point files, and augmented with DNR LiDAR for areas outside of the project area. The surfaces were combined to create one large conglomerate surface. The average slope as indicated by the LiDAR model is 7% throughout the parcel.

The site topography is generally moderate to steep.

2.1.5 Critical Areas

An existing wetland is located to the north and extending through the adjacent northern parcel. A stream is located to the west of the development area. See Critical Areas report by Sewall Wetland Consulting, Inc. (Sewall, 2022) See Minimum Requirement 8 for wetland hydroperiod protection and discussion.

An existing conditions map is presented in Figure 2.

2.1.6 Soils

The NRCS Soil mappings for the site consist of Norma Loam, Everett very gravelly sandy loam, and Tokul-Winstom gravelly loams. NRCS aerial photograph of the soil mappings can be seen in Figure 3. USGS maps indicate the site is underlain by Advance Outwash and Recessional Outwash soils.

Soil log locations are shown in Figure 4. Analysis of the site indicates a large portion of the site as medium sand underlain by coarse to medium sand and then gravel. This is typical of geologic studies of the site which define the site as the Marysville Sand Member consisting of well-drained outwash sand.

Soil explorations of the area corroborate with the NRCS soil mappings. A geotechnical report by Cobalt Geosciences indicate medium to coarse sand at a depth of about 2-7 feet. (Cobalt Geosciences, LLC., 2022)

Groundwater elevation was found to be 3-7 *feet* below grade throughout the site. Soils were consistent throughout the site. A preliminary long-term infiltration rate of 1.5- inches/hour was used for the preliminary design of stormwater facilities onsite. Further testing and groundwater monitoring will be provided with Construction Plan submittal. Preliminary data discussed with Land Technologies has been more favorable for the incorporation of infiltration facilities on site.

2.1.7 Existing Basin Analysis

The project falls within the Lower Portage Creek Basin that is a portion of the Stillaguamish Watershed. The project falls within the West Fork Portage Creek Sub-Basin. The development area is adjacent to what is colloquially called the Marysville Trough. The trough runs north to south and encompasses flat terrain west of Highway 9 and East of the Lakewood/Tulalip areas. The Marysville trough consists of the Marysville Sand member Vashon Recessional Outwash. These soils are mapped on the project site.

It is assumed and highly likely that the entirety of this area is drained through groundwater and the groundwater gradient to these stream systems. Surface flow from the site is to the north – north west. The site will drain to the onsite wetland and stream. The West Fork Portage Creek is downstream from the connected stream (Prairie Creek) which flows through the parcel. Portage Creek drains to the Stillaguamish River before reaching Puget Sound. There are no known drainage deficiencies or published drainage complaints downstream from the project site.

The existing site itself is split in half between two on-site basins. The northern basin is associated with the onsite wetland whereas the southern portion of the site drains to the on-site stream.

Stormwater management design is reflective of the discharges to each basin in an effort to maintain natural hydrologic patterns.

2.1.8 Upstream Analysis

There is a significant upstream area to the site. The upstream area consists of Highway 9 and portions of land along both sides. The upstream area includes a portion of the Arlington High School and extends several hundred feet to the south. All Upstream area is ultimately picked up in the Highway 9 drainage ditches and conveyed to the site. A portion of the upstream is routed to the stream system that runs through the site. This upstream is assessed for flow beneath the bridge/culvert. A separate portion of the upstream (associated with the Crown Ridge neighborhood) is routed to the onsite wetland. This portion of the upstream is assessed for the Wetlands Protection guidelines of the 2019 SMMWW. The upstream wetland contribution area measures 6.79 *acres* composed primarily of Steep, Forest with 1.21 *acres* of Road (Hwy 9).

The upstream - stream contribution area is around 300 *acres* which drains through several small routes and passages before combining on-site and flowing through the proposed bridge/culvert.

2.1.9 Existing Drainage

The site topography trends northward. Due to the presence of “A” type soils, surface runoff is not expected to occur. There is no existing discrete drainage onsite or offsite.

2.1.10 Downstream Analysis

The site will largely infiltrate most stormwater except for extremely large storms following storm events that have already saturated groundwater systems.

Stormwater discharged to the wetland system and stream system ultimately drain to the same receiving body of water. Following the stream leaving the site, the stream flows for 1,100-*feet* before crossing Arlington Valley Road. It appears this crossing was just refurbished under the City of Arlington 74th Ave Trail Project in 2022. The stream at this crossing is named Prairie Creek. Prairie Creek meanders through several industrial properties for 2,050 *feet* before crossing 204th St and then beneath the BNSF RailRoad ROW through a 20- *foot* box culvert. The stream continues another 4,400 *feet* towards the West before reaching the Stillaguamish River Floodplain and Portage Creek.

Portage Creek has no known drainage issues immediately downstream of the parcel.

There are no known flooding or erosion concerns adjacent to the site.

Section 3 – MR-2: Stormwater Pollution Prevention Plan

3.1 Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan (SWPPP) has been prepared for this project and presented as a separate document titled “**Stormwater Pollution Prevention Plan for Ambers Grove**”, 17-Apr-2023

Section 4 - MR-3: Source Control of Pollution

The 2019 SMWW Volume-I, Ch-2.5.3 require source control BMPs for all development projects for the intended purpose to prevent stormwater from coming in contact with pollutants. The activities and the associated source control BMPs are listed in Volume-IV of the manual. These are primarily commercial industrial developments that involve significant pollutant generation potential. The proposed stormwater facilities addressed in this report manage stormwater generated from passenger vehicle parking and non-pollution generating rooftop. No source control BMPs apply to these facilities controlling stormwater from these surfaces.

No Volume-IV source control BMPs are specified.

For construction activities, source control BMPs prescribed in Volume-II are specified and described in the construction SWPPP per MR#2.

Section 5 - MR-4: Preserve Natural Drainage Systems and Outfalls

All drainage courses are to be preserved to the maximum extent feasible. All outfalls will remain in their current locations. Natural drainage patterns as they once existed shall be retained. Pre-developed conditions experience a sheet flow drainage pattern to the west and north along with infiltration. The developed site is designed to disperse flows to maintain the existing pattern to the west through Full Dispersion. Wetland hydrology will be managed with Bioretention cells and discharged to the wetland system with an expanded level spreader dispersion trench. The level spreader dispersion trench will deposit stormwater to the natural soil column allowing water to diffuse below ground. Higher flows will express stormwater across the surface. Aside from the areas managed through Full Dispersion and Bioretention, the remaining areas are Fully Infiltrated with BMP T5.10A – Infiltration Trenches.

The combination of implemented BMP controls for stormwater generated from the development will mimic the natural stormwater routes and mechanisms though all known, available, and reasonable methods of control and treatment. (Full Dispersion, Bioretention, Downspout Infiltration, etc.)

Section 6 - MR-5: On-site Stormwater Management

Minimum Requirement #5 specifies requirements for on-site stormwater BMPs. This requirement mandates that on-site stormwater runoff be infiltrated, dispersed, and/or retained to the maximum extent feasible without causing flooding or erosion impacts. Projects triggering Minimum Requirements 1 through 5 must use On-site stormwater management BMPs from List #1 for all surfaces or demonstrate compliance with the LID Performance Standard. Projects triggering Minimum Requirements 1 through 9 must meet the requirements of Table 2.5.1 in Vol. 1 of the 2019 SMMWW. Table 2.5.1 specifies the requirements for new or redevelopment depending on UGA and parcel size to meet the requirements of the LID Performance Standard and/or List #2. List #1 and List #2 specify stormwater BMPs in order of preference. The first BMP determined feasible is required.

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

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

Lawn/Landscape is required to utilize BMP T5.13, Post-Construction Soil Quality and Depth.

Roofs are required to employ BMP T5.30 Full Dispersion or Downspout Infiltration, Rain Gardens or Bioretention, BMP T5.10A Downspout Dispersion Systems, or perforated stub-out connections. The first feasible BMP in this list must be used.

Other Hard surfaces (Roads, Driveways, Parking Lots, Etc.) must utilize BMP T5.30 Full Dispersion, BMP T5.15 Permeable Pavement, Bioretention, Sheet Flow Dispersion, or Concentrated Flow Dispersion. The first feasible BMP in this list must be used.

Roofs adjacent to the stream buffer will be able to provide some BMP T5.30 Full Dispersion. Full Dispersion requires 100 *foot* flow paths within native areas. The dispersion route through the buffer area and basin area satisfy the Full Dispersion criteria.

Full Dispersion requires native open space to be retained at a ratio of 65 to 10. The project will be able to maintain the 65:10 open space to impervious surface ratio within the portion of the site defined as the "Full Dispersion Project Site". Not all urban developments are capable of achieving Full Dispersion. Unfortunately, the entire site cannot be accommodated with Full Dispersion but as much of the site will be managed with this primary preferred method. The impervious area discharged to the Full Dispersion native vegetation area is 30,956 *square feet*. The native vegetation preserved is 275,824 *square feet* but only 201,209 *square feet* is required. Rooftop dispersion within the Full Dispersion area follow BMP T5.10B, splash block dispersion to directly hydrate the buffers throughout the length of buffer. Road, Driveway, and Parking area are routed to a level spreader dispersion trench for discharge to the buffer with more than 100- *feet* of dispersion length. Road dispersion may be discharged with no more than 0.5 *cfs* of flow per dispersion trench. The 0.5 *cfs* threshold equates to approximately 16,000 *square feet* of PGHS area. Only 14,973 *square feet* of road, driveway, parking, and sidewalk are conveyed to the dispersion trench.

The remaining rooftops on-site are managed primarily through BMP T5.10A downspout infiltration trenches. Infiltration trenches are sized for Medium Sand with 30-*lineal feet* of trench for every 1,000 *square feet* of rooftop draining to them.

The remaining impervious surfaces consisting of parking, driveways, road, and sidewalks are routed to the cul-de-sac bioretention cell. Bioretention is the next preferred alternative for stormwater management. The bioretention cell has an expanded rock chamber beneath to initiate infiltration to the native soils below. An overflow standpipe carries stormwater from high-flows to another bioretention cell north of the cul-de-sac. This cell also encompasses infiltration within its footprint. Overflows from this cell are discharged to the onsite wetland to comply with the Wetland Hydrology requirement of MR #8.

Bioretention used to meet MR #5 is designed in accordance with BMP T7.30 per Page 7-3 of Vol. V of the 2019 SMMWW. Stormwater is released to the bioretention cells through sheet flow or a bubble-up conveyance system. The bubble-up system is designed to reduce erosion of the bioretention soil media at the surface of the cell.

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

Section 7 - MR-6: Runoff Treatment

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

This project is expected to generate 107,594 *square feet* (2.47 *acres*) of PGIS based on road and driveway areas, therefore treatment facility BMPs are required for this project.

Runoff treatment facility selection is outlined in Vol. I, Ch. 4.2, Step V of the 2019 SMMWW. Step V outlines the treatment facility selection flow chart based on the intended use of a project. Treatment selection is based on if the site is a high-use site, if the downstream receiving waters are phosphorous sensitive, and/or if the site is required to provide enhanced treatment. The definitions of high-use, phosphorous control, and enhanced treatment can be found in Step V in Section 4.2 of the 2019 SMMWW.

The project is not a high use site.

The project is not required to treat for phosphorous.

Enhanced treatment is not required for the project.

Basic treatment is required per Vol. I, Ch. 2 & 4 of the 2019 SMMWW.

Enhanced and Basic treatment is provided through the use of a bioretention facility per Vol. III Section 3.3.12 of the 2019 SMMWW. The bioretention specified will provide the additional enhanced treatment of stormwater influent. The bio-cell treats stormwater through the infiltration of stormwater through soils and their ability to absorb pollutants. Soils have a CEC of greater than 5 meg/100g to a depth of 12 *inches*. On-site soils are suitable for use. See Vol III. Section 3.3.12 of the 2019 SMMWW for specific soil design criteria.

Road, Driveway, and Parking Area

The project has PGIS areas exceeding the threshold for simple treatment BMPs. Therefore, the development is required to employ treatment for its respective road, driveway, and parking areas. The project utilizes bio-retention cells for treatment. The bio-cell mitigates polluted stormwater through physical, chemical, and biological treatment processes. The treatment process reduces pollutant loads to downstream receiving waters. Pretreatment (flow entrance and presettling) is handled by the 5/8" clean chip rock filter that is adjacent the edge of asphalt along its entire length. Stormwater then percolates through compost amended soils and plantings to obtain treatment. Stormwater flows through this part of the cell at a rate of 12.0 *inches/hour*. Infiltration is accounted for below the bio-cell at a rate of 1.5 *inches/hour*. This infiltration rate accounts for stormwater that will rehydrate and restore pre-developed groundwater channels and accurately reflect the built condition. The total percolated runoff through the bio-cell's amended soils is well over the 91% total runoff volume treatment requirement, with a combined efficiency of 93%. See Section 12.6.

Section 8 - MR-7: Flow Control

8.1 Flow Control

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

The project exceeds this requirement and is required to provide flow control.

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

Rooftops infiltrated by BMP T5.10A are discounted from the model.

Rooftop, driveway, and roadway that are managed with BMP T5.30 Full Dispersion are also discounted from the model. Both of these discounts are defined within the Stormwater Manual.

The site stormwater management practices combine traditional detention, infiltration and bio-retention for the remaining surfaces. The project uses bioretention cells to manage and treat all incoming impervious surface generated stormwater (PGIS and NPGIS).

The bioretention cells consist of 1.5 *feet* of amended soils, 0.5 *feet* of filter, and 3 *feet* of Rock within the cul-de-sac. The bioretention swale infiltrates nearly 90% of stormwater design and maintains wetland hydrology through subsurface routes and surface discharge.

See Figure 5 for basin map of contributing stormwater areas to proposed facilities.

Hydrologic Analysis was conducted using the latest version of the WWHM software. Software reports are in Section 12.6. Supplementary information for the continuous simulation models is presented in Section 12.4. A site plan showing the location of bioretention swale can be seen in Section 11.1.

Section 9 - MR-8: Wetlands Protection

AMC 13.28.150 (MR 8) specifies requirements for detention or treatment in wetlands and wetland buffers as well as discharge of stormwater to a stream or wetland. A portion of the site discharges to the stream, and a portion of the site discharges to the wetland. The portion of the project that discharges to the wetland is defined within this section of the report. Stream discharge is conducted through Full Dispersion. Any project that is defined within a contributing Threshold Discharge Area which discharges to a critical wetland, Wetlands Protection per MR #8 must be applied.

Minimum Requirement #8 requires that stormwater discharges to wetlands within a projects TDA shall meet a specified Level of Wetland Protection. There are four Wetland Protection Levels that apply to the TDA: General Protection, Protection from Pollutants, Wetland Hydroperiod protection Method 1, and Method 2.

Both General Protection and Protection from Pollutants wetland protection levels are satisfied with the proper implementation of Minimum Requirement #2 and Minimum Requirement #5 & #6, respectively.

Wetland Hydroperiod Protection Methods require monitoring of wetland discharges to maintain existing wetland input volumes. The wetland input volume is a different analysis than the flow rate control of the Stream Protection Duration requirement of Minimum Requirement #7. Minimum Requirement #8 does take precedence over satisfying Minimum Requirement #7. (See Vol. I, Ch.3, Section 3.4.8 of the SMMWW)

MR #7: Flow control modeling requires all contributing land coverages within the project site to be assessed as Forest to replicate the Pre-Euro-American land coverage. The forested land segment within the WWHM contains a significant infiltration and evapotranspiration component that reduces the volume of water generated in forest and ultimately reaching the downstream. MR #7 compliance is assessed as the flow rate discharge to the downstream.

MR 8: Maintaining current wetland input volumes requires closely monitoring the land coverage of the current condition reaching the wetland within the TDA. The 'current' condition often encompasses existing roads, neighborhoods, and open space tracts.

Therefore, the flow rate requirement and wetland volume requirements are often mutually exclusive. In addition, many existing developments within the urban environment drain through conveyance systems to a detention facility prior to discharge to a wetland. These developments are designed to replicate the existing flow rate of the forested environment. However, these developments do not replicate the same infiltration and evapotranspiration volume components of forest. These existing developments draining to wetlands are assessed at their current land coverages for both pre-development and post-development scenarios. Flow control does not have any effect on volume.

Wetland Hydroperiod Protection Method:

Ambers Grove is within the TDA of a downstream wetland located on the subject site. A significant portion of the surrounding area flows through the site or a network of conveyance systems to this wetland system. The wetland is the result of a consent decree with no established buffers. The consent decree was recorded on April 3, 2001 (Case# C99-1711C). The wetland is rated under the WADOE Wetland Rating system to be a Category III.

Ambers Grove is required to meet Wetlands Protection requirements of Method 2. Method 2 requires daily flow volumes not to deviate by more than 20% and Monthly volumes by 15%.

The flow volume accounting is an existing (current) condition comparison with the future (developed) condition of the added project and associated improvements. The existing and developed basin contributing to the wetland is in Figure 5 and Figure 6. The basin contributions are divided between the project site and (upstream) neighboring properties. The project sites existing areas (forest) are entered into the WWHM in the Existing and Developed (Mitigated) WWHM scenarios. The neighboring upstream areas are broken down into road and forest. These areas are fairly significant, (almost 7-acres) and largely consist of Highway 9.

The representative land segments in the WWHM all discharge directly to the same wetland.

As mentioned, the volume and flow rate metering difference between MR#8 and MR#7 will yield different results for “flow control” facilities. We are now providing “volume control” facilities while also incorporating ‘flow control’ to the best of our abilities under the heading “Reconciling the Flow Control Performance Standard from MR7 with MR8” – Pp. 137, Vol.I, Section 3.4.8, 2019 SMMWW.

Multiple modeling examples of this project site show that decreasing the facility size will meet the Wetlands Protection scenario, which is counterintuitive. A balancing of facilities to provide compliance with both MR7 and MR8 was conducted to provide the best environmental benefits.

The project model in Section 12.6 shows compliance with MR8. However, and this is true for most projects modeling scenarios, maintaining summer wetland volumes is often the most difficult and limiting circumstance for compliance with MR8. For instance, the pre-developed August 5th summer volumes amount to 0.0061 ac-ft and the developed site contributes 0.0087 ac-ft. This is an increase of 0.0026 ac-ft, or 113.3 cubic ft of water. This is an insignificant volume of water over a 10-acre basin and should be considered outside of the level of accuracy of the model. This amounts to 0.00033 inches of rainfall over the basin, (morning dew may amount to more). However, because of the thresholds set with the model, this results in Fail for that particular volume day.

Likewise, there was an increased effort to ‘feed’ the wetland volumes in the wet season. The project site is required to increase areas discharging to the wetland to maintain the winter wet season volumes. Therefore, the Developed basin area exceeds the Predeveloped-Existing area draining to the wetland.

There was a fine balance to meet the monthly wet season volume requirements without providing too much volume during the summer months. Similar to the summer volumes described above, the wet season daily volumes were reduced below the predeveloped volume for a handful of days. March 5th calculated a predeveloped volume of 0.0295ac-ft and a developed volume of 0.0232ac-ft. A reduction of -0.0063ac-ft on the day. This is a decrease in the wet season volume supplied to the

wetland. Increasing the area to eliminate this reduction in the wet season volumes exacerbates the summer volume increases and limits the overall stormwater control of the development.

The overall monthly volume requirements of the Wetlands Protection Method 2 are satisfied with only a small amount of exceedances in daily volumes. It is understood that these are acceptable due to the miniscule deviations in volume and the overall protection of the wetland post-development is provided. It is also rationalized that the reduction in volume during the wet season and the increase volume in the summer months are preferred. These deviations will maintain wetland hydrology throughout the year within acceptable limits of the manual.

Section 10 - MR-9: Operation and Maintenance

Minimum Requirement #9 contains requirements for inspection, operation and maintenance of stormwater facilities and BMPs. Specific maintenance standards and requirements are outlined in Volume V of the 2019 SMMWW. The 2019 SMMWW requires the regular maintenance and inspection of drainage facilities.

The Operations and Maintenance manual will be supplied with Construction Plans for this project and presented as a separate document titled **“Operations and Maintenance manual for Ambers Grove”, 17-Apr-2023.**

Section 11 - Support Data

11.1 Maps & Figures

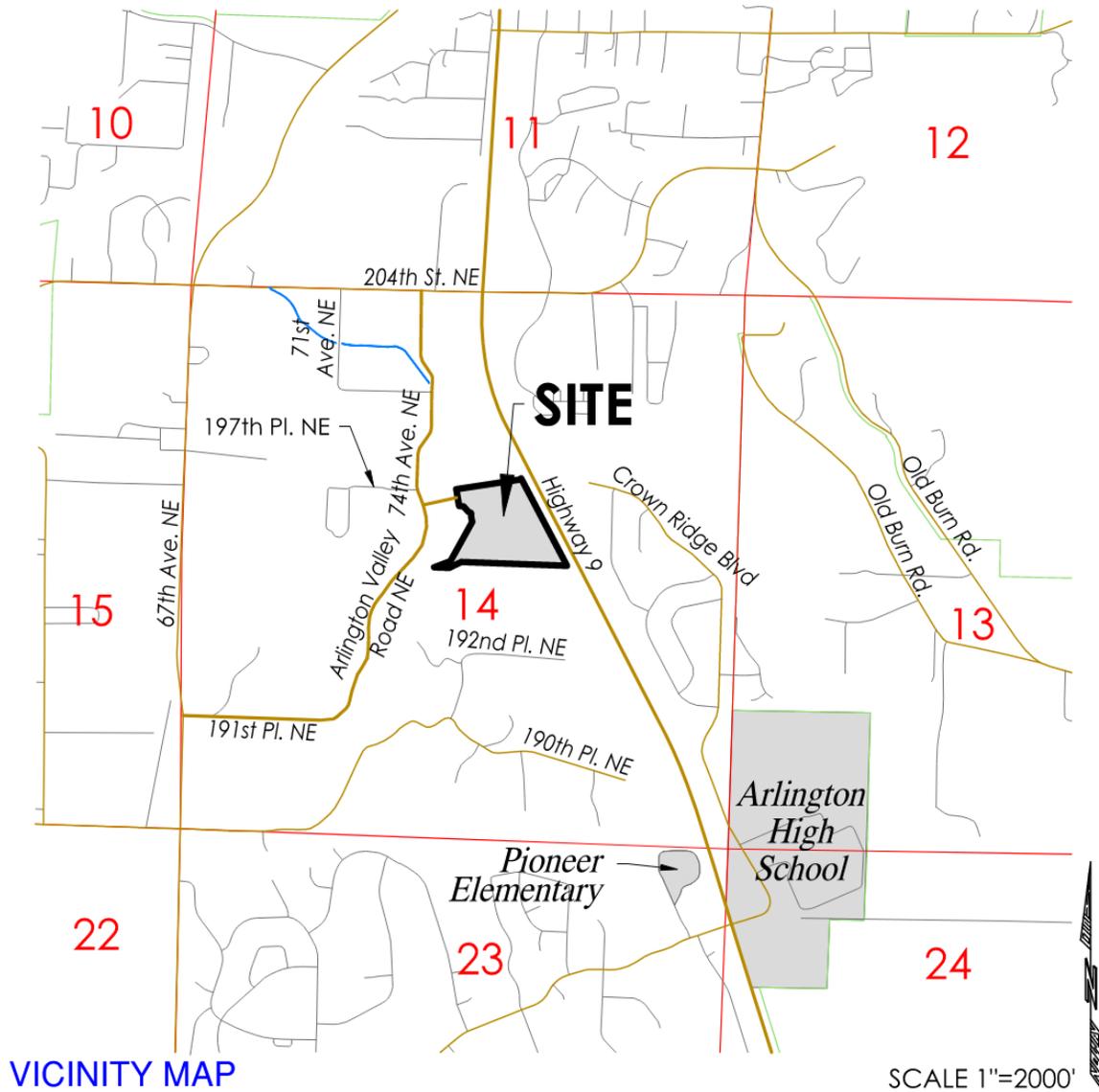


Figure 1 - Vicinity Map



Figure 2 - Existing Conditions



Figure 3 - NRCS Soil Map (Not to Scale)

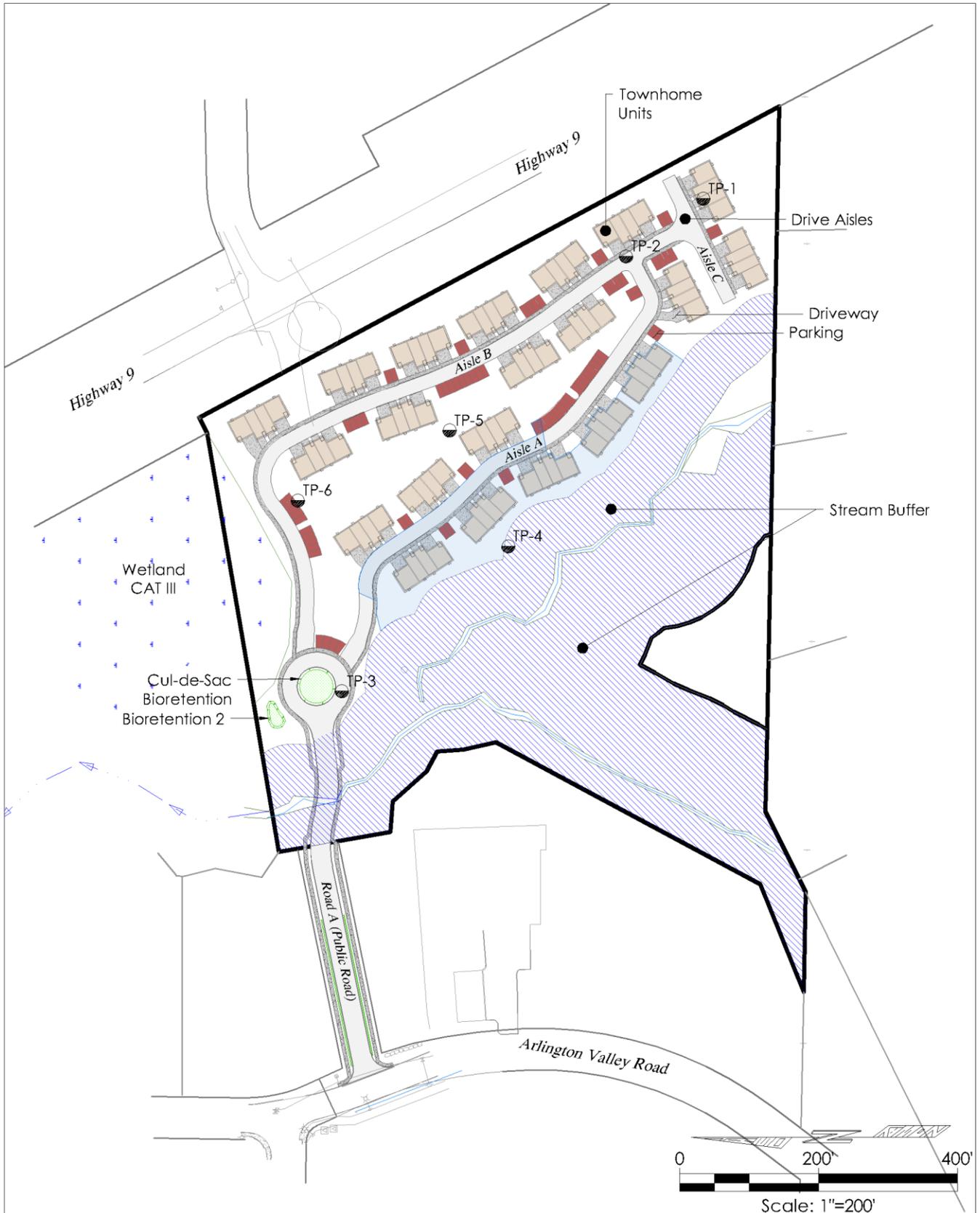


Figure 4 - Site Plan

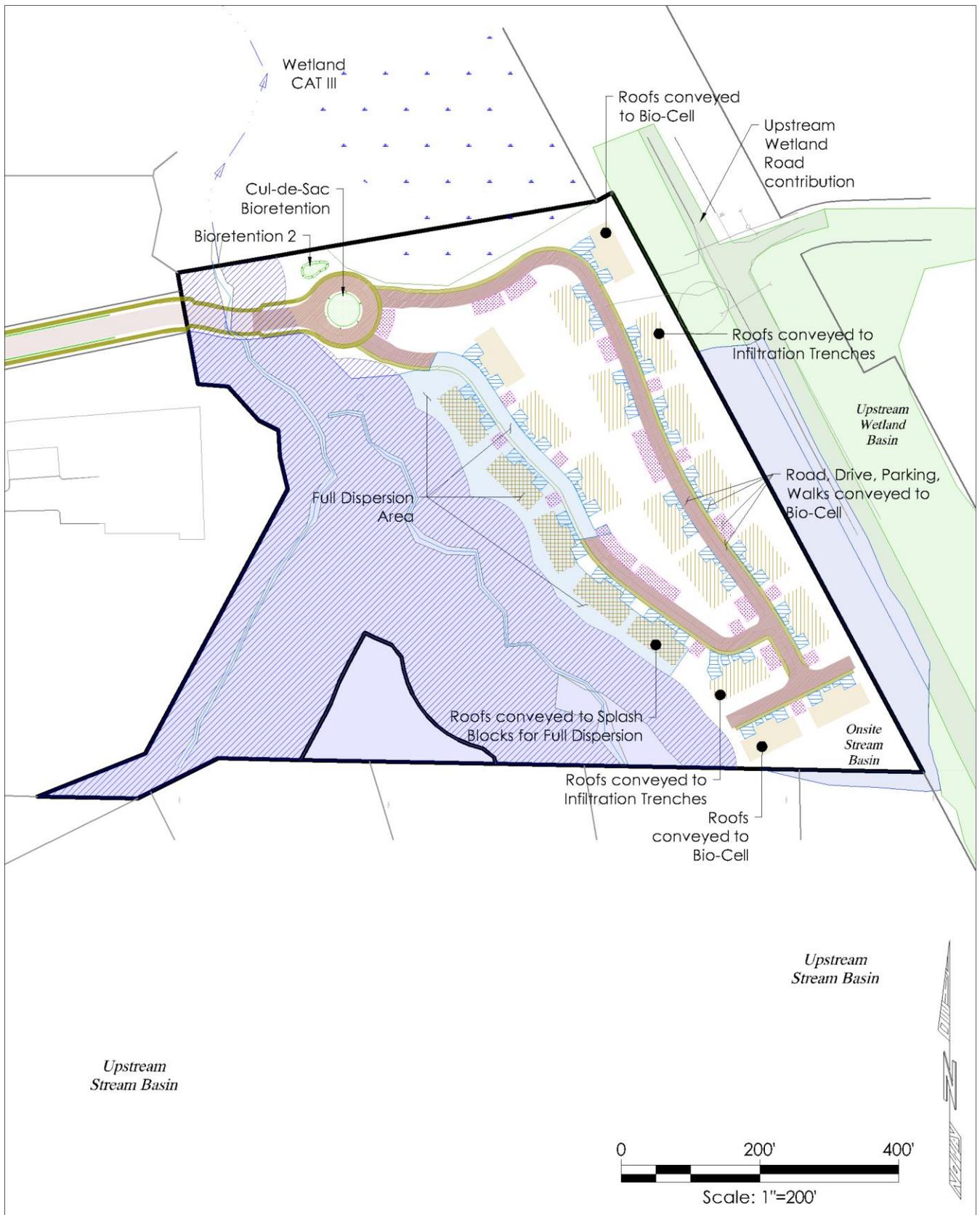


Figure 5 - Stormwater Basin Map for Proposed Facilities

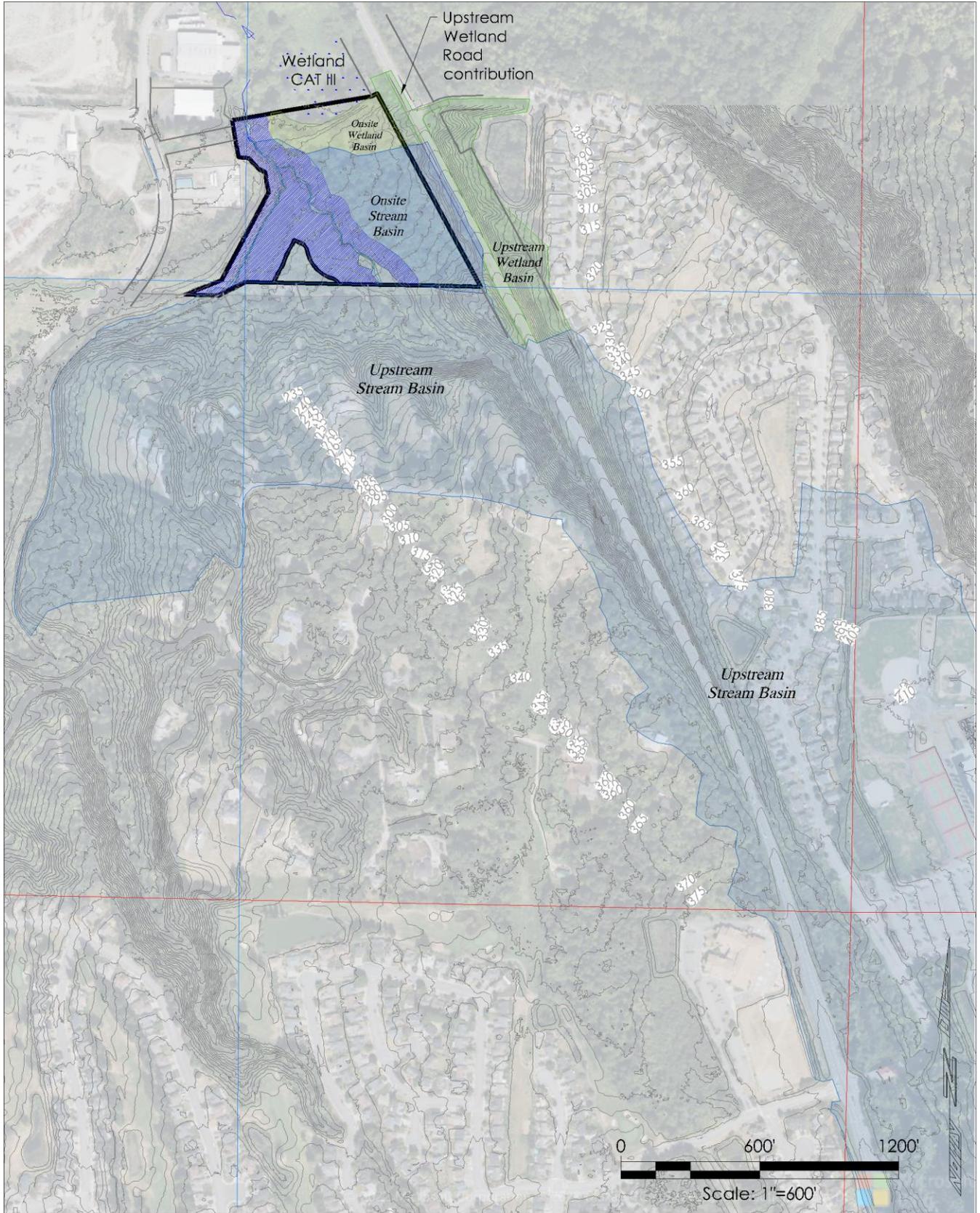


Figure 6 – Existing PreDeveloped Basin Map

Section 12 **Support Data**

This appendix contains the following support data as applicable to this report:

- Soils Data
- Reference Documents
- Topographic Data
- Continuous Simulation Modeling
- Software Output

12.1 Soils

The following data was extracted from Web Soil Survey, National Cooperative Soil Survey:

Table 3 - Soil Table

17—Everett very gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t629

Elevation: 30 to 900 feet

Mean annual precipitation: 35 to 91 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 180 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Everett and similar soils: 80 percent

Minor components: 20 percent

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

Description of Everett

Setting

Landform: Eskers, moraines, kames

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Crest, interfluve

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Sandy and gravelly glacial outwash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

A - 1 to 3 inches: very gravelly sandy loam

Bw - 3 to 24 inches: very gravelly sandy loam

C1 - 24 to 35 inches: very gravelly loamy sand

C2 - 35 to 60 inches: extremely cobbly coarse sand

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Forage suitability group: Droughty Soils (G002XN402WA), Droughty Soils (G002XF403WA), Droughty Soils (G002XS401WA)

Hydric soil rating: No

39—Norma loam

Map Unit Setting

National map unit symbol: 2hyx

Elevation: 0 to 1,000 feet

Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 150 to 200 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Norma, undrained, and similar soils: 85 percent

Minor components: 15 percent

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

Description of Norma, Undrained

Setting

Landform: Depressions, drainageways

Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: ashy loam

H2 - 10 to 28 inches: sandy loam

H3 - 28 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

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

Depth to water table: About 0 inches

Frequency of flooding: None

Frequency of ponding: Frequent

Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Forage suitability group

74—Tokul gravelly medial loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2t61m

Elevation: 160 to 1,640 feet

Mean annual precipitation: 45 to 70 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 140 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Tokul and similar soils: 70 percent

Minor components: 30 percent

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

Description of Tokul

Setting

Landform: Hillslopes, till plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Side slope, tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Volcanic ash mixed with loess over glacial till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

Oa - 1 to 2 inches: highly decomposed plant material

A - 2 to 6 inches: gravelly medial loam

Bs1 - 6 to 9 inches: gravelly medial loam

Bs2 - 9 to 17 inches: gravelly medial loam

Bs3 - 17 to 24 inches: gravelly medial loam

BC - 24 to 33 inches: gravelly medial fine sandy loam

2Bsm - 33 to 62 inches: cemented material

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 20 to 39 inches to cemented horizon; 20 to 39 inches to densic material

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Forage suitability group: Limited Depth Soils (G002XF303WA), Unnamed (G002XN303WA)

Hydric soil rating: No

77—Tokul-Winston gravelly loams, 25 to 65 percent slopes

Map Unit Setting

National map unit symbol: 2j08

Elevation: 150 to 1,900 feet

Mean annual precipitation: 40 to 80 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Tokul and similar soils: 60 percent

Winston and similar soils: 30 percent

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

Description of Tokul

Setting

Landform: Till plains, escarpments

Parent material: Volcanic ash over basal till

Typical profile

H1 - 0 to 4 inches: gravelly medial loam

H2 - 4 to 22 inches: gravelly medial loam

H3 - 22 to 31 inches: gravelly medial fine sandy loam

H4 - 31 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 25 to 65 percent

Depth to restrictive feature: 20 to 40 inches to densic material

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Winston

Setting

Landform: Escarpments

Parent material: Volcanic ash and glacial outwash

Typical profile

H1 - 0 to 3 inches: gravelly ashy loam

H2 - 3 to 25 inches: gravelly fine sandy loam

H3 - 25 to 60 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 25 to 65 percent

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

Natural drainage class: Somewhat excessively drained

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

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Hydric soil rating: No

Data Source Information

Natural Resources Conservation Service

Web Soil Survey, National Cooperative Soil Survey

7/23/2014

Soil Survey Area: Arlington, Washington (Snohomish County)

12.2 Reference Documents

Cobalt Geosciences, LLC. (2022). *Geotechnical Evaluation Proposed Development Parcel No.31051400101800*. Kenmore: Haberman, Philip A.

Sewall, E. (2022). *Lot 19 - Revised Critical Area Report*. Sewall Wetland Consulting, Inc.

12.3 Topographic Data

- Snohomish County 2005 LiDAR survey was used to augment the existing site topography and the downstream and surrounding areas. Citation: LiDAR Bare Earth DEM Files: be_48122b22.zip. Available: Puget Sound LiDAR Consortium, Seattle, WA
- Modeled coordinate system: Lateral - Washington State Plan Plane - North, FIPS 4601; Vertical – NAVD 88

12.4 Continuous Simulation Modeling

12.4.1 Continuous Simulation Background

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

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

12.5 Modeling Methodology

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

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

12.5.1 Existing Conditions

The surface vegetative cover is assumed forested with steep slope. The NRCS soil maps indicate A,B,D soils throughout the project area. For hydrologic modeling, C-type soils are used as the site is mapped by USGS to be Advance outwash with the upstream basin primarily mapped as C, Till. Both of these geologic units have been glacially consolidated. Consolidated soils are mapped as C-type soils. Outside of the disturbance area, there is no land conversion.

12.5.2 Developed Conditions

The site is steep and grading will consist of stripping existing soils and importing some structural soils to establish building pads. All areas are accounted for and used in the WHMM program except for the Areas dispersed with Full Dispersion (Rooftop, Driveway, parking, road, and remaining percentage of associated yards areas) and the rooftops that are fully infiltrated. The remaining area of the site is used for stormwater management. The stormwater bio-retention cells will be excavated down below the sealed surface layer to allow stormwater to readily infiltrate. The bio-cell areas are accounted for in the WWHM bio-retention element and are therefore discounted from the basin area. The preceding section contains input and output of parameters relevant to the existing and developed site to achieve the Wetland Protection guideline of Method 2 under the current DOE standards.

12.6 Software Output

**WWHM2012
PROJECT REPORT**

Project Name: Wetland Basin Discharge
Site Name:
Site Address:
City :
Report Date: 11/7/2022
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2021/08/18
Version : 4.2.18

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Upstream
Bypass: No
GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Steep	5.58
Pervious Total	5.58



Upstream
6.79ac



Onsite
PreDev
2.04ac

<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	1.21
Impervious Total	1.21

Basin Total **6.79**

Element Flows To:

Surface	Interflow	Groundwater
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Name : Onsite PreDev
Bypass: No
GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Steep	2.04

Pervious Total **2.04**

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

Basin Total **2.04**

1.5110	0.0310	0.0188	0.0469	0.0469
1.5797	0.0310	0.0197	0.0469	0.0469
1.6484	0.0310	0.0205	0.0469	0.0469
1.7170	0.0310	0.0214	0.0469	0.0469
1.7857	0.0310	0.0222	0.0469	0.0469
1.8544	0.0310	0.0231	0.0469	0.0469
1.9231	0.0310	0.0239	0.0469	0.0469
1.9918	0.0310	0.0248	0.0469	0.0469
2.0604	0.0310	0.0257	0.0469	0.0469
2.1291	0.0310	0.0265	0.0469	0.0469
2.1978	0.0310	0.0274	0.0469	0.0469
2.2665	0.0310	0.0283	0.0469	0.0469
2.3352	0.0310	0.0292	0.0469	0.0469
2.4038	0.0310	0.0301	0.0469	0.0469
2.4725	0.0310	0.0310	0.0469	0.0469
2.5412	0.0310	0.0318	0.0469	0.0469
2.6099	0.0310	0.0327	0.0469	0.0469
2.6786	0.0310	0.0336	0.0469	0.0469
2.7473	0.0310	0.0345	0.0469	0.0469
2.8159	0.0310	0.0354	0.0469	0.0469
2.8846	0.0310	0.0363	0.0469	0.0469
2.9533	0.0310	0.0371	0.0469	0.0469
3.0220	0.0310	0.0380	0.0469	0.0469
3.0907	0.0310	0.0389	0.0469	0.0469
3.1593	0.0310	0.0398	0.0469	0.0469
3.2280	0.0310	0.0407	0.0469	0.0469
3.2967	0.0310	0.0416	0.0469	0.0469
3.3654	0.0310	0.0424	0.0469	0.0469
3.4341	0.0310	0.0433	0.0469	0.0469
3.5027	0.0310	0.0442	0.0469	0.0469
3.5714	0.0310	0.0451	0.0469	0.0469
3.6401	0.0310	0.0460	0.0469	0.0469
3.7088	0.0310	0.0469	0.0469	0.0469
3.7775	0.0310	0.0477	0.0469	0.0469
3.8462	0.0310	0.0486	0.0469	0.0469
3.9148	0.0310	0.0495	0.0469	0.0469
3.9835	0.0310	0.0504	0.0469	0.0469
4.0522	0.0310	0.0513	0.0469	0.0469
4.1209	0.0310	0.0522	0.0469	0.0469
4.1896	0.0310	0.0530	0.0469	0.0469
4.2582	0.0310	0.0539	0.0469	0.0469
4.3269	0.0310	0.0548	0.0469	0.0469
4.3956	0.0310	0.0557	0.0469	0.0469
4.4643	0.0310	0.0566	0.0469	0.0469
4.5330	0.0310	0.0575	0.0469	0.0469
4.6016	0.0310	0.0583	0.0469	0.0469
4.6703	0.0310	0.0592	0.0469	0.0469
4.7390	0.0310	0.0601	0.0469	0.0469
4.8077	0.0310	0.0610	0.0469	0.0469
4.8764	0.0310	0.0619	0.0469	0.0469
4.9451	0.0310	0.0628	0.0469	0.0469
5.0000	0.0310	0.0635	0.0469	0.0469

Surface retention 1 Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Wetted Surface
5.0000	0.0310	0.0635	0.0000	0.1876	0.0000
5.0687	0.0317	0.0656	0.0000	0.1876	0.0000
5.1374	0.0324	0.0678	0.0000	0.2048	0.0000

5.2060	0.0331	0.0701	0.0000	0.2133	0.0000
5.2747	0.0338	0.0724	0.0000	0.2219	0.0000
5.3434	0.0346	0.0747	0.0000	0.2305	0.0000
5.4121	0.0353	0.0771	0.0000	0.2391	0.0000
5.4808	0.0361	0.0796	0.0000	0.2477	0.0000
5.5495	0.0368	0.0821	0.0000	0.2563	0.0000
5.6181	0.0376	0.0846	0.0000	0.2649	0.0000
5.6868	0.0383	0.0872	0.0000	0.2735	0.0000
5.7555	0.0391	0.0899	0.0000	0.2821	0.0000
5.8242	0.0399	0.0926	0.0000	0.2906	0.0000
5.8929	0.0407	0.0954	0.0000	0.2992	0.0000
5.9615	0.0415	0.0982	0.0000	0.3078	0.0000
6.0302	0.0423	0.1011	0.0000	0.3164	0.0000
6.0989	0.0431	0.1040	0.0000	0.3250	0.0000
6.1676	0.0440	0.1070	0.0000	0.3336	0.0000
6.2363	0.0448	0.1101	0.0000	0.3422	0.0000
6.2500	0.0450	0.1107	0.0000	0.3439	0.0000

Name : Surface retention 1

Element Flows To:

Outlet 1		Outlet 2
Surface retention 3		Bioretention 1

Name : Basin 2

Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Pasture, Flat	1.51
C, Forest, Flat	.2

Pervious Total	1.71
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<u>Impervious Land Use</u>	<u>acre</u>
ROADS FLAT	0.92
ROOF TOPS FLAT	0.35
DRIVEWAYS FLAT	0.27
SIDEWALKS FLAT	0.19
PARKING FLAT	0.26

Impervious Total	1.99
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Basin Total	3.7
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Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Name : Upstream Areas

Bypass: Yes

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
C, Forest, Steep	5.58

Pervious Total 5.58

Impervious Land Use acre

ROADS FLAT 1.21

Impervious Total 1.21

Basin Total 6.79

Element Flows To:

Surface Interflow Groundwater

Name : Bioretention 3

Bottom Length: 20.00 ft.

Bottom Width: 19.00 ft.

Material thickness of first layer: 1.5

Material type for first layer: SMMWW

Material thickness of second layer: 0.5

Material type for second layer: Sand

Material thickness of third layer: 0

Material type for third layer: GRAVEL

Infiltration On

Infiltration rate: 1.5

Infiltration safety factor: 1

Total Volume Infiltrated (ac-ft.): 14.739

Total Volume Through Riser (ac-ft.): 68.244

Total Volume Through Facility (ac-ft.): 82.983

Percent Infiltrated: 17.76

Total Precip Applied to Facility: 0.383

Total Evap From Facility: 0.324

Underdrain not used

Discharge Structure

Riser Height: 0.1 ft.

Riser Diameter: 48 in.

Notch Type: Rectangular

Notch Width: 4.000 ft.

Notch Height: 0.090 ft.

Element Flows To:

Outlet 1 Outlet 2

Bioretention 3 Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0087	0.0000	0.0000	0.0000
0.0286	0.0087	0.0001	0.0000	0.0000
0.0571	0.0087	0.0002	0.0000	0.0000
0.0857	0.0087	0.0003	0.0000	0.0000
0.1143	0.0087	0.0004	0.0000	0.0000
0.1429	0.0087	0.0005	0.0000	0.0000
0.1714	0.0087	0.0006	0.0000	0.0000
0.2000	0.0087	0.0007	0.0000	0.0000
0.2286	0.0087	0.0008	0.0000	0.0003
0.2571	0.0087	0.0009	0.0000	0.0004
0.2857	0.0087	0.0010	0.0000	0.0005
0.3143	0.0087	0.0011	0.0000	0.0007
0.3429	0.0087	0.0012	0.0000	0.0008
0.3714	0.0087	0.0013	0.0000	0.0010
0.4000	0.0087	0.0014	0.0000	0.0013

0.4286	0.0087	0.0015	0.0000	0.0016
0.4571	0.0087	0.0016	0.0000	0.0019
0.4857	0.0087	0.0017	0.0000	0.0019
0.5143	0.0087	0.0018	0.0000	0.0022
0.5429	0.0087	0.0019	0.0000	0.0026
0.5714	0.0087	0.0020	0.0000	0.0030
0.6000	0.0087	0.0021	0.0000	0.0032
0.6286	0.0087	0.0022	0.0000	0.0035
0.6571	0.0087	0.0023	0.0000	0.0040
0.6857	0.0087	0.0024	0.0000	0.0045
0.7143	0.0087	0.0025	0.0000	0.0050
0.7429	0.0087	0.0026	0.0000	0.0051
0.7714	0.0087	0.0027	0.0000	0.0058
0.8000	0.0087	0.0028	0.0000	0.0064
0.8286	0.0087	0.0029	0.0000	0.0072
0.8571	0.0087	0.0030	0.0000	0.0073
0.8857	0.0087	0.0031	0.0000	0.0079
0.9143	0.0087	0.0032	0.0000	0.0087
0.9429	0.0087	0.0033	0.0000	0.0096
0.9714	0.0087	0.0034	0.0000	0.0102
1.0000	0.0087	0.0035	0.0000	0.0105
1.0286	0.0087	0.0036	0.0000	0.0115
1.0571	0.0087	0.0037	0.0000	0.0125
1.0857	0.0087	0.0038	0.0000	0.0132
1.1143	0.0087	0.0039	0.0000	0.0132
1.1429	0.0087	0.0040	0.0000	0.0132
1.1714	0.0087	0.0041	0.0000	0.0132
1.2000	0.0087	0.0042	0.0000	0.0132
1.2286	0.0087	0.0043	0.0000	0.0132
1.2571	0.0087	0.0044	0.0000	0.0132
1.2857	0.0087	0.0045	0.0000	0.0132
1.3143	0.0087	0.0046	0.0000	0.0132
1.3429	0.0087	0.0047	0.0000	0.0132
1.3714	0.0087	0.0048	0.0000	0.0132
1.4000	0.0087	0.0049	0.0000	0.0132
1.4286	0.0087	0.0050	0.0000	0.0132
1.4571	0.0087	0.0051	0.0000	0.0132
1.4857	0.0087	0.0052	0.0000	0.0132
1.5143	0.0087	0.0053	0.0000	0.0132
1.5429	0.0087	0.0054	0.0000	0.0132
1.5714	0.0087	0.0055	0.0000	0.0132
1.6000	0.0087	0.0056	0.0000	0.0132
1.6286	0.0087	0.0057	0.0000	0.0132
1.6571	0.0087	0.0058	0.0000	0.0132
1.6857	0.0087	0.0059	0.0000	0.0132
1.7143	0.0087	0.0060	0.0000	0.0132
1.7429	0.0087	0.0061	0.0000	0.0132
1.7714	0.0087	0.0062	0.0000	0.0132
1.8000	0.0087	0.0063	0.0000	0.0132
1.8286	0.0087	0.0064	0.0000	0.0132
1.8571	0.0087	0.0065	0.0000	0.0132
1.8857	0.0087	0.0066	0.0000	0.0132
1.9143	0.0087	0.0067	0.0000	0.0132
1.9429	0.0087	0.0068	0.0000	0.0132
1.9714	0.0087	0.0069	0.0000	0.0132
2.0000	0.0087	0.0070	0.0000	0.0132
2.0000	0.0087	0.0070	0.0000	0.0132

Surface retention 3 Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>To Amended(cfs)</u>	<u>Wetted Surface</u>
2.0000	0.0087	0.0070	0.0000	0.0528	0.0000
2.0286	0.0087	0.0072	0.0337	0.0528	0.0000
2.0571	0.0087	0.0075	0.1363	0.0548	0.0000
2.0857	0.0087	0.0077	0.2775	0.0558	0.0000
2.1143	0.0087	0.0080	0.4322	0.0568	0.0000
2.1429	0.0087	0.0082	0.7364	0.0578	0.0000
2.1714	0.0087	0.0085	1.1699	0.0588	0.0000
2.2000	0.0087	0.0087	1.7015	0.0598	0.0000
2.2286	0.0087	0.0090	2.3154	0.0608	0.0000
2.2571	0.0087	0.0092	3.0015	0.0618	0.0000
2.2857	0.0087	0.0095	3.7528	0.0628	0.0000
2.3143	0.0087	0.0097	4.5637	0.0638	0.0000
2.3429	0.0087	0.0100	5.4299	0.0648	0.0000
2.3714	0.0087	0.0102	6.3475	0.0658	0.0000
2.4000	0.0087	0.0105	7.3133	0.0669	0.0000
2.4286	0.0087	0.0107	8.3243	0.0679	0.0000
2.4571	0.0087	0.0110	9.3778	0.0689	0.0000
2.4857	0.0087	0.0112	10.471	0.0699	0.0000
2.5143	0.0087	0.0115	11.602	0.0709	0.0000
2.5429	0.0087	0.0117	12.769	0.0719	0.0000
2.5714	0.0087	0.0120	13.968	0.0729	0.0000
2.6000	0.0087	0.0122	15.198	0.0739	0.0000

Name : Surface retention 3

Element Flows To:

Outlet 1 **Outlet 2**
 Bioretention 3

ANALYSIS RESULTS

Wetland Volume Protection

Predeveloped Landuse Totals for POC #1

Total Pervious Area:7.62
Total Impervious Area:1.21
Total Areas: 8.83 ac

Mitigated Landuse Totals for POC #1

Total Pervious Area:7.29
Total Impervious Area:3.2
Total Areas: 10.49 ac ← The increase in Area is to 'feed' the wetland volume required during the wet season.

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.918855
5 year	1.360069
10 year	1.713107
25 year	2.235844

50 year 2.685842
 100 year 3.192081

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	1.459731
5 year	2.150762
10 year	2.690357
25 year	3.472855
50 year	4.133727
100 year	4.865596

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	← Monthly volumes
Jan	2.1340	1.9122	89.6	Pass	
Feb	1.5212	1.3035	85.7	Pass	
Mar	1.4508	1.2336	85.0	Pass	
Apr	0.9640	0.8233	85.4	Pass	
May	0.4883	0.4425	90.6	Pass	
Jun	0.4474	0.4182	93.5	Pass	
Jul	0.1393	0.1427	102.4	Pass	
Aug	0.1304	0.1499	114.9	Pass	
Sep	0.2165	0.2464	113.8	Pass	
Oct	0.5442	0.5712	104.9	Pass	
Nov	1.6208	1.5579	96.1	Pass	
Dec	2.2261	2.0481	92.0	Pass	

Day	Series 1	Series 2	Percent	Pass/Fail	← Daily Volumes
Jan1	0.0818	0.0718	87.8	Pass	
2	0.0684	0.0575	84.1	Pass	
3	0.0623	0.0521	83.6	Pass	
4	0.0836	0.0781	93.4	Pass	
5	0.0742	0.0664	89.6	Pass	
6	0.0737	0.0662	89.8	Pass	
7	0.0911	0.0856	94.0	Pass	
8	0.0800	0.0723	90.4	Pass	
9	0.0639	0.0552	86.4	Pass	
10	0.0506	0.0420	82.9	Pass	
11	0.0538	0.0465	86.5	Pass	
12	0.0557	0.0478	85.9	Pass	
13	0.0807	0.0754	93.5	Pass	
14	0.0784	0.0693	88.4	Pass	
15	0.0718	0.0641	89.3	Pass	
16	0.0712	0.0595	83.5	Pass	
17	0.0864	0.0858	99.3	Pass	
18	0.0782	0.0694	88.9	Pass	
19	0.0620	0.0535	86.4	Pass	
20	0.0547	0.0475	86.9	Pass	
21	0.0582	0.0491	84.4	Pass	
22	0.0696	0.0618	88.8	Pass	
23	0.0818	0.0786	96.0	Pass	
24	0.0572	0.0469	82.1	Pass	

25	0.0491	0.0423	86.1	Pass
26	0.0428	0.0359	83.8	Pass
27	0.0560	0.0533	95.2	Pass
28	0.0733	0.0710	96.8	Pass
29	0.0726	0.0666	91.7	Pass
30	0.0624	0.0544	87.3	Pass
31	0.0571	0.0485	84.9	Pass
Feb1	0.0508	0.0423	83.4	Pass
2	0.0394	0.0335	84.8	Pass
3	0.0541	0.0506	93.4	Pass
4	0.0540	0.0483	89.3	Pass
5	0.0556	0.0460	82.7	Pass
6	0.0468	0.0396	84.6	Pass
7	0.0636	0.0611	96.0	Pass
8	0.0420	0.0336	80.0	Pass
9	0.0339	0.0288	85.0	Pass
10	0.0392	0.0326	83.2	Pass
11	0.0547	0.0480	87.8	Pass
12	0.0566	0.0481	85.0	Pass
13	0.0525	0.0424	80.8	Pass
14	0.0531	0.0437	82.4	Pass
15	0.0561	0.0483	86.0	Pass
16	0.0644	0.0536	83.2	Pass
17	0.0631	0.0517	81.8	Pass
18	0.0605	0.0489	80.8	Pass
19	0.0477	0.0389	81.5	Pass
20	0.0582	0.0523	89.8	Pass
21	0.0561	0.0463	82.6	Pass
22	0.0505	0.0432	85.5	Pass
23	0.0728	0.0704	96.8	Pass
24	0.0658	0.0562	85.4	Pass
25	0.0576	0.0511	88.8	Pass
26	0.0479	0.0391	81.7	Pass
27	0.0534	0.0454	84.9	Pass
28	0.0520	0.0421	80.9	Pass
29	0.0587	0.0499	84.9	Pass
Mar1	0.0576	0.0503	87.4	Pass
2	0.0592	0.0540	91.2	Pass
3	0.0564	0.0482	85.4	Pass
4	0.0444	0.0387	87.1	Pass
5	0.0295	0.0232	78.8	Fail
6	0.0425	0.0378	88.7	Pass
7	0.0416	0.0352	84.7	Pass
8	0.0655	0.0579	88.4	Pass
9	0.0524	0.0435	83.1	Pass
10	0.0562	0.0475	84.6	Pass
11	0.0511	0.0423	82.8	Pass
12	0.0463	0.0406	87.7	Pass
13	0.0413	0.0341	82.6	Pass
14	0.0453	0.0379	83.7	Pass
15	0.0447	0.0371	83.0	Pass
16	0.0448	0.0372	83.0	Pass
17	0.0485	0.0438	90.3	Pass
18	0.0444	0.0392	88.2	Pass
19	0.0455	0.0375	82.3	Pass
20	0.0332	0.0276	83.1	Pass
21	0.0482	0.0427	88.6	Pass
22	0.0534	0.0441	82.5	Pass

Fail ← 0.0063ac-ft less volume in Wet Season
 (this is 274 cu.ft of water, the size of a forklift pallet tote tank (4'x4'x4) in the 'rainy season')

23	0.0479	0.0398	83.0	Pass
24	0.0451	0.0374	82.8	Pass
25	0.0520	0.0455	87.5	Pass
26	0.0397	0.0327	82.3	Pass
27	0.0440	0.0360	81.7	Pass
28	0.0385	0.0319	82.8	Pass
29	0.0340	0.0285	83.9	Pass
30	0.0390	0.0319	81.9	Pass
31	0.0384	0.0313	81.4	Pass
Apr1	0.0355	0.0310	87.4	Pass
2	0.0367	0.0320	87.2	Pass
3	0.0440	0.0407	92.6	Pass
4	0.0422	0.0362	85.9	Pass
5	0.0367	0.0310	84.6	Pass
6	0.0279	0.0228	81.9	Pass
7	0.0412	0.0342	83.0	Pass
8	0.0329	0.0268	81.6	Pass
9	0.0313	0.0252	80.6	Pass
10	0.0377	0.0307	81.3	Pass
11	0.0414	0.0362	87.6	Pass
12	0.0358	0.0290	81.0	Pass
13	0.0268	0.0215	80.2	Pass
14	0.0314	0.0264	84.3	Pass
15	0.0451	0.0396	87.7	Pass
16	0.0352	0.0279	79.1	Fail
17	0.0257	0.0210	81.4	Pass
18	0.0390	0.0354	90.8	Pass
19	0.0364	0.0301	82.9	Pass
20	0.0147	0.0113	76.9	Fail ← 0.0034 ac-ft difference in Wet Season
21	0.0152	0.0127	83.6	Pass
22	0.0339	0.0348	102.6	Pass
23	0.0337	0.0279	82.6	Pass
24	0.0230	0.0197	85.6	Pass
25	0.0154	0.0125	81.0	Pass
26	0.0246	0.0224	90.7	Pass
27	0.0320	0.0295	92.1	Pass
28	0.0247	0.0217	87.8	Pass
29	0.0255	0.0218	85.5	Pass
30	0.0182	0.0146	80.5	Pass
May1	0.0171	0.0149	87.4	Pass
2	0.0209	0.0194	92.7	Pass
3	0.0192	0.0160	83.7	Pass
4	0.0230	0.0199	86.9	Pass
5	0.0163	0.0148	90.5	Pass
6	0.0086	0.0068	79.1	Fail
7	0.0086	0.0079	92.0	Pass
8	0.0090	0.0089	98.7	Pass
9	0.0231	0.0225	97.6	Pass
10	0.0277	0.0266	95.9	Pass
11	0.0161	0.0134	83.5	Pass
12	0.0169	0.0144	85.1	Pass
13	0.0174	0.0164	94.3	Pass
14	0.0166	0.0146	88.2	Pass
15	0.0166	0.0140	84.7	Pass
16	0.0084	0.0071	84.0	Pass
17	0.0112	0.0098	87.3	Pass
18	0.0151	0.0140	93.0	Pass
19	0.0157	0.0135	86.1	Pass

20	0.0124	0.0108	87.1	Pass
21	0.0092	0.0079	86.0	Pass
22	0.0097	0.0093	96.5	Pass
23	0.0121	0.0108	89.6	Pass
24	0.0109	0.0099	90.5	Pass
25	0.0146	0.0136	93.1	Pass
26	0.0195	0.0185	94.8	Pass
27	0.0166	0.0144	86.8	Pass
28	0.0144	0.0149	103.9	Pass
29	0.0140	0.0128	91.6	Pass
30	0.0295	0.0299	101.4	Pass
31	0.0203	0.0162	80.1	Pass
Jun1	0.0210	0.0205	97.4	Pass
2	0.0267	0.0273	102.0	Pass
3	0.0187	0.0156	83.5	Pass
4	0.0132	0.0112	84.8	Pass
5	0.0139	0.0120	86.2	Pass
6	0.0212	0.0230	108.7	Pass
7	0.0161	0.0136	84.7	Pass
8	0.0146	0.0128	87.5	Pass
9	0.0278	0.0286	102.7	Pass
10	0.0247	0.0216	87.3	Pass
11	0.0180	0.0159	88.7	Pass
12	0.0104	0.0106	101.7	Pass
13	0.0042	0.0036	85.3	Pass
14	0.0053	0.0050	93.9	Pass
15	0.0134	0.0139	103.6	Pass
16	0.0221	0.0226	102.5	Pass
17	0.0184	0.0163	88.8	Pass
18	0.0176	0.0153	86.8	Pass
19	0.0084	0.0069	82.0	Pass
20	0.0083	0.0071	84.7	Pass
21	0.0096	0.0090	93.5	Pass
22	0.0093	0.0084	90.4	Pass
23	0.0183	0.0188	102.4	Pass
24	0.0142	0.0141	99.7	Pass
25	0.0121	0.0102	84.0	Pass
26	0.0112	0.0108	96.3	Pass
27	0.0067	0.0058	87.1	Pass
28	0.0129	0.0130	100.2	Pass
29	0.0086	0.0085	98.6	Pass
30	0.0137	0.0145	105.7	Pass
Jul1	0.0192	0.0179	92.9	Pass
2	0.0110	0.0100	91.3	Pass
3	0.0049	0.0043	88.2	Pass
4	0.0068	0.0081	118.8	Pass
5	0.0028	0.0025	90.0	Pass
6	0.0026	0.0025	96.3	Pass
7	0.0058	0.0055	96.4	Pass
8	0.0085	0.0083	96.8	Pass
9	0.0042	0.0034	81.8	Pass
10	0.0044	0.0049	110.8	Pass
11	0.0024	0.0029	120.1	Fail
12	0.0061	0.0071	117.3	Pass
13	0.0039	0.0042	108.1	Pass
14	0.0019	0.0018	91.1	Pass
15	0.0092	0.0109	118.5	Pass
16	0.0038	0.0041	108.9	Pass

17	0.0015	0.0013	87.9	Pass
18	0.0044	0.0050	112.4	Pass
19	0.0031	0.0030	97.6	Pass
20	0.0006	0.0005	83.0	Pass
21	0.0029	0.0031	105.1	Pass
22	0.0008	0.0008	97.9	Pass
23	0.0009	0.0009	99.3	Pass
24	0.0020	0.0020	99.8	Pass
25	0.0045	0.0049	108.6	Pass
26	0.0018	0.0018	102.9	Pass
27	0.0028	0.0037	131.7	Fail
28	0.0020	0.0020	99.1	Pass
29	0.0002	0.0002	96.2	Pass
30	0.0006	0.0006	99.5	Pass
31	0.0005	0.0005	99.8	Pass
Aug1	0.0009	0.0009	99.6	Pass
2	0.0015	0.0015	99.5	Pass
3	0.0018	0.0018	99.5	Pass
4	0.0016	0.0016	99.1	Pass
5	0.0061	0.0087	140.9	Fail
6	0.0058	0.0078	134.7	Fail
7	0.0005	0.0004	92.8	Pass
8	0.0015	0.0017	112.9	Pass
9	0.0008	0.0008	99.2	Pass
10	0.0012	0.0012	99.8	Pass
11	0.0020	0.0020	99.8	Pass
12	0.0053	0.0054	101.3	Pass
13	0.0028	0.0028	100.2	Pass
14	0.0069	0.0077	112.8	Pass
15	0.0045	0.0046	102.2	Pass
16	0.0029	0.0041	137.6	Fail
17	0.0054	0.0072	134.7	Fail
18	0.0080	0.0098	122.6	Fail
19	0.0030	0.0029	94.1	Pass
20	0.0019	0.0019	97.1	Pass
21	0.0082	0.0092	112.5	Pass
22	0.0104	0.0149	143.8	Fail
23	0.0067	0.0069	102.5	Pass
24	0.0045	0.0044	97.1	Pass
25	0.0091	0.0127	140.0	Fail
26	0.0088	0.0085	97.0	Pass
27	0.0049	0.0049	101.4	Pass
28	0.0037	0.0037	98.1	Pass
29	0.0037	0.0040	107.9	Pass
30	0.0054	0.0054	99.8	Pass
31	0.0077	0.0094	121.9	Fail
Sep1	0.0035	0.0044	125.2	Fail
2	0.0038	0.0040	103.9	Pass
3	0.0041	0.0040	97.5	Pass
4	0.0040	0.0039	97.6	Pass
5	0.0083	0.0112	134.3	Fail
6	0.0043	0.0061	139.8	Fail
7	0.0061	0.0087	143.2	Fail
8	0.0081	0.0094	115.9	Pass
9	0.0100	0.0134	134.0	Fail
10	0.0094	0.0108	114.5	Pass
11	0.0018	0.0015	87.7	Pass
12	0.0046	0.0048	103.7	Pass

← Increasing volume contribution in summer by 0.0026ac-ft. Increased Summer volumes will help replenish wetland hydrology and establish late summer stream flow. The 0.0026 ac-ft increase is 113.3 cu-ft of water over a 10-acre developed basin. Summer dew accounts for a higher volume.

13	0.0074	0.0084	114.5	Pass
14	0.0060	0.0073	122.1	Fail
15	0.0090	0.0110	122.0	Fail
16	0.0138	0.0178	128.7	Fail
17	0.0047	0.0044	92.8	Pass
18	0.0068	0.0070	102.4	Pass
19	0.0076	0.0083	108.7	Pass
20	0.0045	0.0061	134.2	Fail
21	0.0126	0.0160	126.5	Fail
22	0.0165	0.0176	106.8	Pass
23	0.0111	0.0100	90.2	Pass
24	0.0063	0.0064	100.8	Pass
25	0.0066	0.0071	108.3	Pass
26	0.0055	0.0056	100.9	Pass
27	0.0057	0.0058	101.7	Pass
28	0.0071	0.0070	98.7	Pass
29	0.0094	0.0091	96.9	Pass
30	0.0105	0.0108	102.9	Pass
Oct1	0.0078	0.0074	95.3	Pass
2	0.0085	0.0090	106.8	Pass
3	0.0114	0.0150	131.4	Fail
4	0.0098	0.0118	121.2	Fail
5	0.0225	0.0269	119.6	Pass
6	0.0147	0.0137	93.6	Pass
7	0.0160	0.0180	112.7	Pass
8	0.0123	0.0125	101.8	Pass
9	0.0114	0.0128	111.7	Pass
10	0.0121	0.0127	105.6	Pass
11	0.0090	0.0085	93.8	Pass
12	0.0098	0.0097	98.7	Pass
13	0.0108	0.0111	101.9	Pass
14	0.0089	0.0096	107.1	Pass
15	0.0129	0.0135	104.9	Pass
16	0.0202	0.0241	119.6	Pass
17	0.0187	0.0185	98.7	Pass
18	0.0229	0.0249	108.6	Pass
19	0.0298	0.0339	113.9	Pass
20	0.0229	0.0233	101.8	Pass
21	0.0200	0.0197	98.5	Pass
22	0.0239	0.0257	107.9	Pass
23	0.0268	0.0268	100.1	Pass
24	0.0263	0.0245	93.1	Pass
25	0.0288	0.0357	123.9	Fail
26	0.0280	0.0287	102.3	Pass
27	0.0290	0.0280	96.8	Pass
28	0.0184	0.0160	87.1	Pass
29	0.0230	0.0230	99.8	Pass
30	0.0173	0.0154	88.9	Pass
31	0.0248	0.0269	108.7	Pass
Nov1	0.0306	0.0317	103.6	Pass
2	0.0328	0.0359	109.4	Pass
3	0.0439	0.0434	98.9	Pass
4	0.0289	0.0274	94.7	Pass
5	0.0278	0.0260	93.6	Pass
6	0.0293	0.0297	101.4	Pass
7	0.0286	0.0257	89.8	Pass
8	0.0350	0.0354	101.1	Pass
9	0.0416	0.0427	102.6	Pass

10	0.0493	0.0481	97.5	Pass
11	0.0668	0.0679	101.7	Pass
12	0.0611	0.0574	93.9	Pass
13	0.0523	0.0479	91.7	Pass
14	0.0512	0.0500	97.6	Pass
15	0.0532	0.0474	89.1	Pass
16	0.0512	0.0452	88.3	Pass
17	0.0518	0.0508	98.0	Pass
18	0.0724	0.0721	99.6	Pass
19	0.0898	0.0935	104.1	Pass
20	0.0726	0.0651	89.6	Pass
21	0.0487	0.0437	89.7	Pass
22	0.0591	0.0589	99.8	Pass
23	0.0931	0.0901	96.7	Pass
24	0.0994	0.0975	98.1	Pass
25	0.0616	0.0511	83.0	Pass
26	0.0667	0.0640	95.9	Pass
27	0.0530	0.0473	89.2	Pass
28	0.0675	0.0623	92.3	Pass
29	0.0768	0.0730	95.1	Pass
30	0.0784	0.0714	91.0	Pass
Dec1	0.0716	0.0652	91.0	Pass
2	0.0971	0.0995	102.4	Pass
3	0.0845	0.0765	90.6	Pass
4	0.0813	0.0733	90.1	Pass
5	0.0793	0.0746	94.1	Pass
6	0.0559	0.0477	85.4	Pass
7	0.0561	0.0507	90.3	Pass
8	0.0606	0.0543	89.6	Pass
9	0.0698	0.0653	93.6	Pass
10	0.0762	0.0712	93.4	Pass
11	0.0863	0.0798	92.4	Pass
12	0.0708	0.0620	87.5	Pass
13	0.0740	0.0732	99.0	Pass
14	0.1031	0.0961	93.2	Pass
15	0.0822	0.0746	90.8	Pass
16	0.0697	0.0610	87.5	Pass
17	0.0574	0.0492	85.9	Pass
18	0.0669	0.0639	95.5	Pass
19	0.0747	0.0674	90.3	Pass
20	0.0725	0.0652	89.8	Pass
21	0.0614	0.0549	89.5	Pass
22	0.0656	0.0585	89.3	Pass
23	0.0735	0.0654	89.0	Pass
24	0.0747	0.0701	93.9	Pass
25	0.0672	0.0590	87.8	Pass
26	0.0748	0.0715	95.5	Pass
27	0.0541	0.0472	87.2	Pass
28	0.0657	0.0632	96.1	Pass
29	0.0626	0.0567	90.6	Pass
30	0.0584	0.0597	102.2	Pass
31	0.0889	0.0863	97.1	Pass

Perlnd and Implnd Changes

No changes have been made.

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