



Stormwater Site Plan

March 19, 2025

PROJECT

MacPherson Residence
5320 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

Almirah Bushnell, EIT
Civil Designer

REVIEWED BY

John Babb, PE
Civil Engineer

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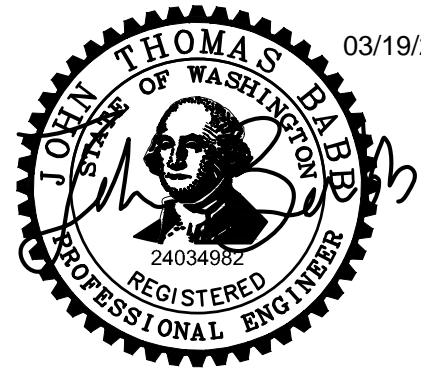
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Civil Designer

REVIEWED BY

John Babb, PE
Civil Engineer



03/19/2025

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

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Section 1 – Project Overview

The MacPherson Residence project is a project that includes the remodel of the existing residence and demolition of site vegetation and existing concrete walkways. The project proposes the construction of home renovations, walkways, and associated utilities.

The site address is 5320 Butterworth Rd in Mercer Island, Washington. The site consists of a single parcel, numbered 8661400040, which is approximately 1.36 acres in size. The parcel is in Township 24 North, Range 05, Section 19 East of the Willamette Meridian in King County, Washington. Refer to Exhibit A-1 in Appendix A for a Vicinity Map.

The parcel is bordered by single-family residential properties to the north and south, by Lake Washington to the east, and by Butterworth Road to the west of the site. The site was recently split into two different parcels under a separate permit. The neighboring parcel with a shared driveway is numbered 8661400045.

This project includes a shared utility easement and utility connections to this second parcel to allow the remodeled residences on both sites to be fully independent of one another.

The site generally slopes from west to east, with a total elevation of about 26 feet. This project proposes connections to the existing stormwater system on site through conveyance pipes.

The project is designed in accordance with the Department of Ecology *2019 Stormwater Management Manual for Western Washington (SMMWW)*, as adopted by the City of Mercer Island.

Section 2 – Existing Conditions Summary

The existing site consists of an existing structure, driveway, and tennis court. In total, the parcel is approximately 1.36 acres in size. There is an existing stormwater system which conveys stormwater throughout the site including existing downspouts to two separate outfalls within Lake Washington along the eastern property line.

There are no other known wetlands or sensitive areas located on or downstream of the site. All work is outside of the shoreline and there are no other known area-specific requirements established in local plans, ordinances, regulations, or in Water Clean-Up Plans approved by the Department of Ecology. Refer to Exhibit A-3 in Appendix A for a Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM).

An NRCS report was also prepared for this project and it defines the soils in the project area as approximately 100% Kitsap silt loam, 15 to 30 percent slopes. Refer to Exhibit A-6 in Appendix A for the NRCS Soil Map.

Section 3 – Offsite Analysis Report

Qualitative Analysis

Define and map the study area

The project site is located on parcel 8661400040 in the City of Mercer Island. Refer to the standalone Civil Engineering Drawings which show the project site and surveyed background.

Study area information review

The following resources were reviewed and the following tasks were performed in order to determine the stormwater flow patterns and to identify any existing or potential problems in the study area:

1. Maps and record drawings from MacPherson Construction & Design were reviewed and show information related to the existing City storm network, discharge location, and any applicable drainage requirements.
2. A topographic survey performed by Cascade Land Surveying was reviewed and provided the basis of design for this project.

Study area field inspection

The project site was field inspected to determine the flow patterns and to identify potential drainage problems. The project area generally sloped from west to east and drains to localized existing yard drains that will be maintained following the completion of this project. No potential drainage problems were identified.

Drainage system description

Based on site observations, the site survey, and other research, stormwater from the project site is collected through roof drains, and yard drains all of which drain to Lake Washington through outfalls within the ordinary high-water mark.

The downstream path was not analyzed because all stormwater runoff is directly discharged into Lake Washington. Based on existing and proposed grades, stormwater does not flow onto the project site from adjacent parcels.

Section 4 – Permanent Stormwater Control Plan

Existing Site Hydrology

Within the project site there is a total elevation change of approximately 26 feet. In general, the site slopes from west to east. Stormwater runoff is collected around the project site and conveyed to outfalls in Lake Washington. Refer to Exhibit A-4 in Appendix A for an existing conditions map.

Developed Site Hydrology

The proposed stormwater project improvements consist of connections to the existing roof drainage systems, a manufactured treatment device, and conveyance connections to the existing outfall near the eastern property line. Refer to Exhibit A-5 in Appendix A for a proposed conditions map detailing the location of the proposed improvements and storm connections. See also Table 1 for a summary of the proposed project improvement areas.

Table 1 – Proposed Area Summary

Surface Type	Proposed Site
Total New Plus Replaced PGIS	0.15 acres
New and Replaced Non-PGIS	0.04 acres
Remodeled Building Roofline	0.17 acres
New and Replaced Pervious	0.23 acres
Neither New nor Replaced	0.06 acres
Total Utility Trenching Area	0.01 acres
Total Site Area	0.66 acres

Performance Standards and Goals

All Minimum Requirements from the *SMMWW* apply to the new hard surfaces and the converted vegetation areas. This is based on Figure I-3.2 in the *SMMWW* as the project falls under redevelopment requirements. Refer to Exhibit A-2 in Appendix A for flow charts including the flowchart for determining MR 5 requirements.

Low Impact Development Features

The project implements BMP T5.13 Post-Construction Soil Quality and Depth for all disturbed landscape areas.

Flow Control System

The project proposes more than 10,000 square feet of new plus replaced hard surfaces and must address Minimum Requirement #7: Flow Control of the *SMMWW*. However, the project discharges directly to Lake Washington, which is listed as a Flow Control Exempt Receiving Water, therefore flow control is not required.

Water Quality System

Project improvements include more than 5,000 sf of pollution generating impervious surface; therefore, a water quality system is required. The project site does not require oil or phosphorus treatment. Enhanced treatment is not required because the project discharges to Lake Washington which is listed as a “Basic Treatment Receiving Water” in Appendix III-A of the *SMMWW*. Refer to Exhibit A-2 in Appendix A for flow charts including the flowchart for determining MR 6 requirements.

Conveyance System

Conveyance calculations are included in Appendix D.

Section 5 – Discussion of Minimum Requirements

MR 1 – Preparation of Preliminary Stormwater Site Plans

This report provides the necessary Preliminary Stormwater Site Plan narrative, exhibits, figures, and calculations. Standalone civil engineering plans are provided in the form of temporary erosion and sedimentation control plans, grading, and drainage plans.

MR 2 – Construction Stormwater Pollution Prevention Plan (SWPPP)

The proposed project is required to provide a Construction Stormwater Pollution Prevention Plan (SWPPP), including a narrative and Erosion Control Plans. The Construction SWPPP complies with the 12 elements identified in the *SMMWW*. The SWPPP is included in Appendix B.

MR 3 – Source Control of Pollution

All applicable, available, and reasonable source control Best Management Practices (BMPs) must be applied to the project. The temporary erosion and sedimentation control (TESC) plans for the project address all necessary BMPs. Source control BMPs must be selected, designed, and maintained according to the *SMMWW*. In addition to the source control BMPs applicable to all sites, other applicable BMPs include S407 BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots, S411 BMPs for Landscaping and Lawn/Vegetation Management, and S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems. For source control BMPs during construction, refer to the Construction SWPPP in Appendix B.

MR 4 – Preservation of Natural Drainage Systems and Outfalls

Following project improvements, stormwater will continue to drain in existing patterns. Project improvements will therefore preserve the natural discharge location and will not cause an adverse impact to downstream receiving waters and downgradient properties.

MR 5 – On-Site Stormwater Management

This project discharges into a flow control exempt waterbody, Lake Washington, through an entirely man-made conveyance system with sufficient hydraulic capacity to convey stormwater for all developments onsite. Therefore, the project is flow control exempt. The project will not aim to meet the LID Performance Standard outlined in the *SMMWW* section I-3.4.5; Therefore, the project is required to consider the BMPs in List #3 and use the first BMP that is considered feasible.

MR 6 – Runoff Treatment

The project proposes 2 manufactured treatment devices as shown in the civil plans to treat stormwater. This project proposes an area swap for stormwater treatment. The first treatment device will collect stormwater from the existing driveway, to allow for the driveway located on the northeast to by-pass treatment. The project site is designated as infeasible for infiltration and there is no feasible location for dispersion of the project stormwater. Therefore, the project will only implement BMP T5.13: Post-Construction Soil Quality And Depth.

Table 2 – Water Quality Area Summary

Treatment Area	Proposed Site
Treatment Device 1	0.11 acres
Treatment Device 2	0.05 acres
Swapped Treatment By-Pass Area	0.06 acres
Total New Plus Replaced PGIS	0.15 acres
Total Area Draining to Treatment Facilities	0.16 acres

Refer to Figure A-7 for water quality basin map and water quality calculations are shown in Appendix D.

MR 7 – Flow Control

As discussed above the project meets requirements to be considered flow control exempt.

MR 8 – Wetlands Protection

There are no known wetlands on the project site or within the vicinity of the project. Therefore, wetland protection measures are not required.

MR 9 – Operation and Maintenance

The operations and maintenance requirements are discussed in Section 9. Refer to Appendix C for the Operations and Maintenance (O&M) manual.

Section 6 – Construction Stormwater Pollution Prevention Plan

A Construction SWPPP has been prepared and is included in Appendix B. The Construction SWPPP will address the 13 Elements outlined by Minimum Requirement 2 of the *SMMWW*. The intent of the Construction SWPPP is to minimize erosion and prevent sediment-laden runoff from discharging off the project site. BMPs outlined in Volume II of the *SMMWW* will be used to prevent or reduce the release of pollutants to the waters of Washington State.

Section 7 – Special Reports and Studies

A critical areas report for the existing Type F stream onsite was completed by Altmann Oliver Associates on June 29, 2024.

An arborist report was completed by Layton Tree Consulting on May 28, 2024.

Both reports have been provided under separate cover.

Section 8 – Other Permits

The permits that are expected to be required for the project include:

- City of Mercer Island Short Subdivision
- City of Mercer Island Shoreline Substantial Development
- City of Mercer Land Use

Section 9 – Operation and Maintenance

Operations and maintenance of onsite stormwater facilities are the responsibility of the owner, MacPherson Construction & Design. Contact information for the owner is provided below:

Dan Buchser
dan@macphersonconstruction.com
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

All stormwater facilities shall be maintained and operated in compliance with the City of Mercer Island and *SMMWW* maintenance standards. An operations and maintenance manual is included in Appendix C.

Section 10 – Conclusion

This project is designed to meet the requirements of the Department of Ecology *2019 Stormwater Management Manual for Western Washington*, as adopted by the City of Mercer Island. This analysis is based on data and records either supplied to or obtained by Ethos Civil. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry.

Appendix A

Exhibits

A-1.....	Vicinity Map
A-2.....	Flow Charts for Determining Minimum Requirements
A-3.....	FEMA FIRM
A-4.....	Existing Conditions Map
A-5.....	Proposed Conditions Map
A-6.....	NRCS Soils Map
A-7.....	Water Quality Basin Map



Project Location



Figure I-3.1: Flow Chart for Determining Requirements for New Development

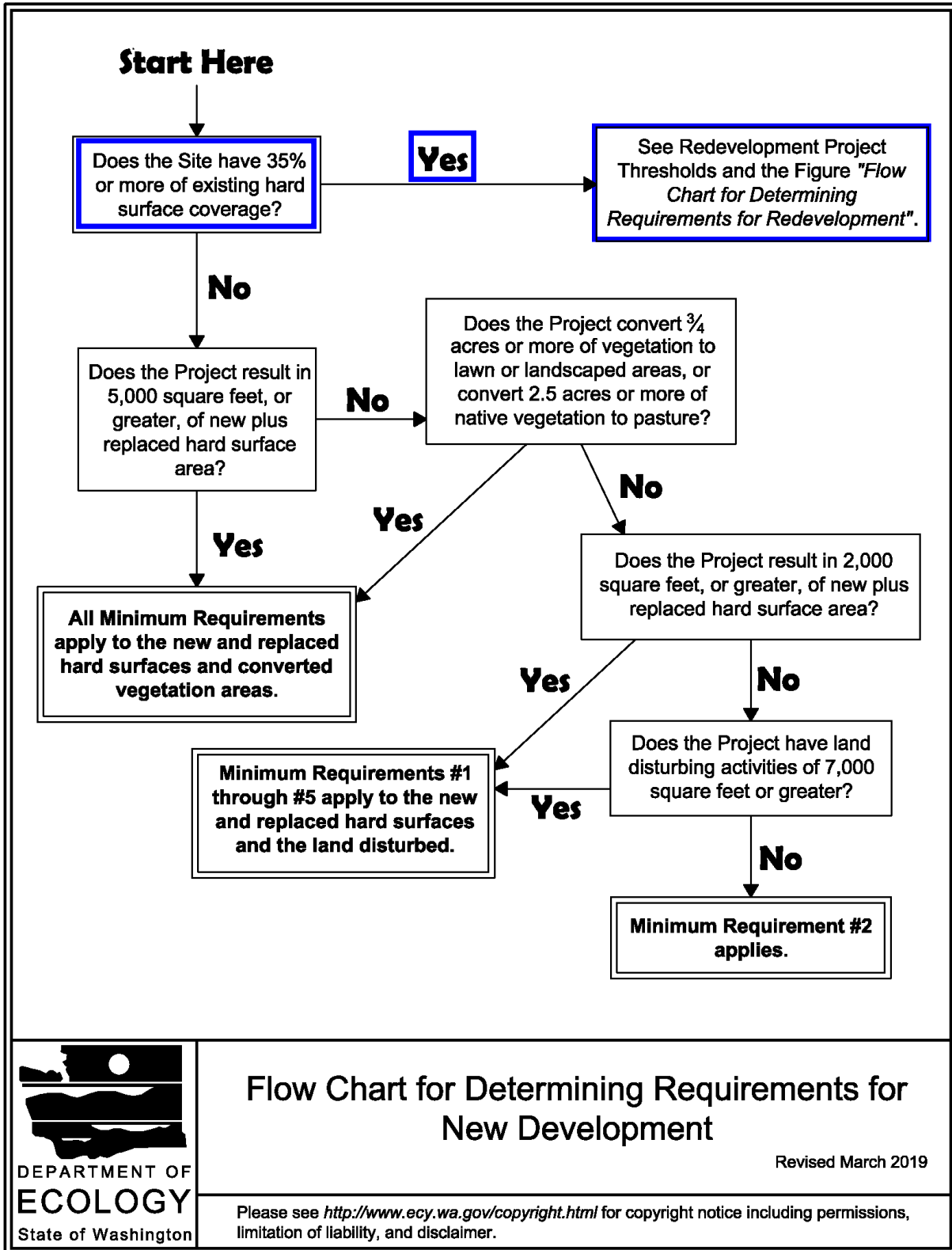
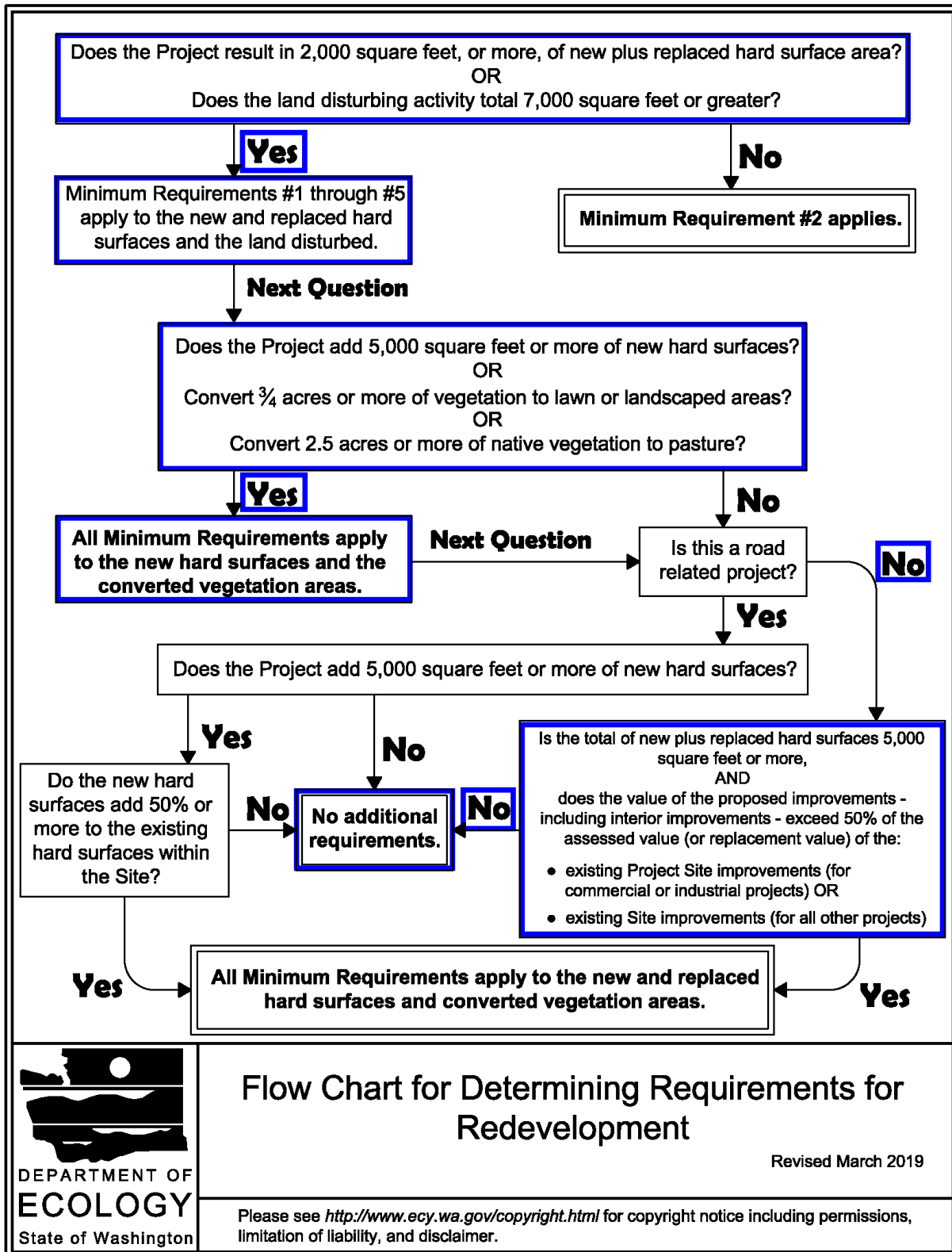


Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment



Flow Chart for Determining Requirements for Redevelopment

Revised March 2019

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Figure I-3.3: Flow Chart for Determining MR #5 Requirements

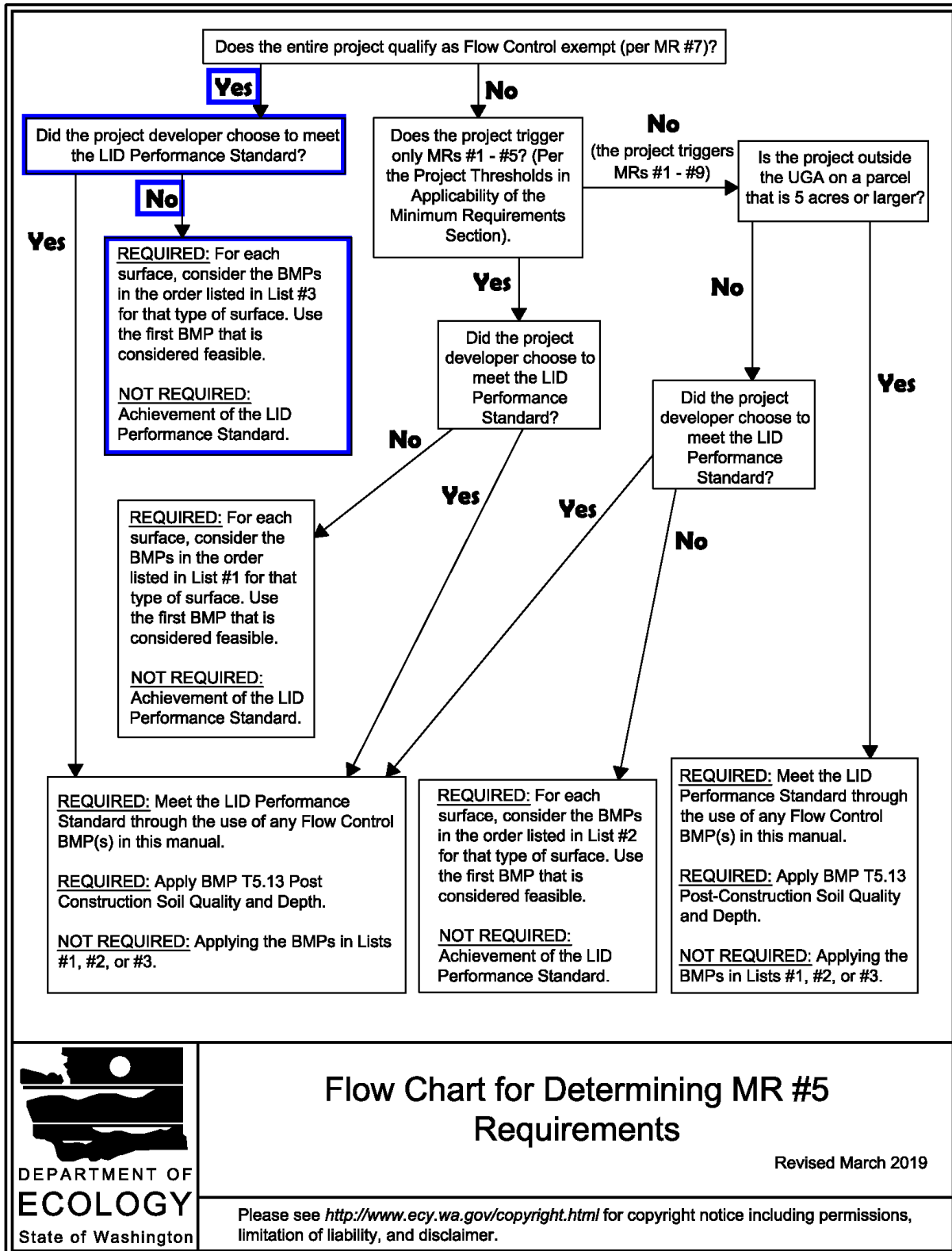
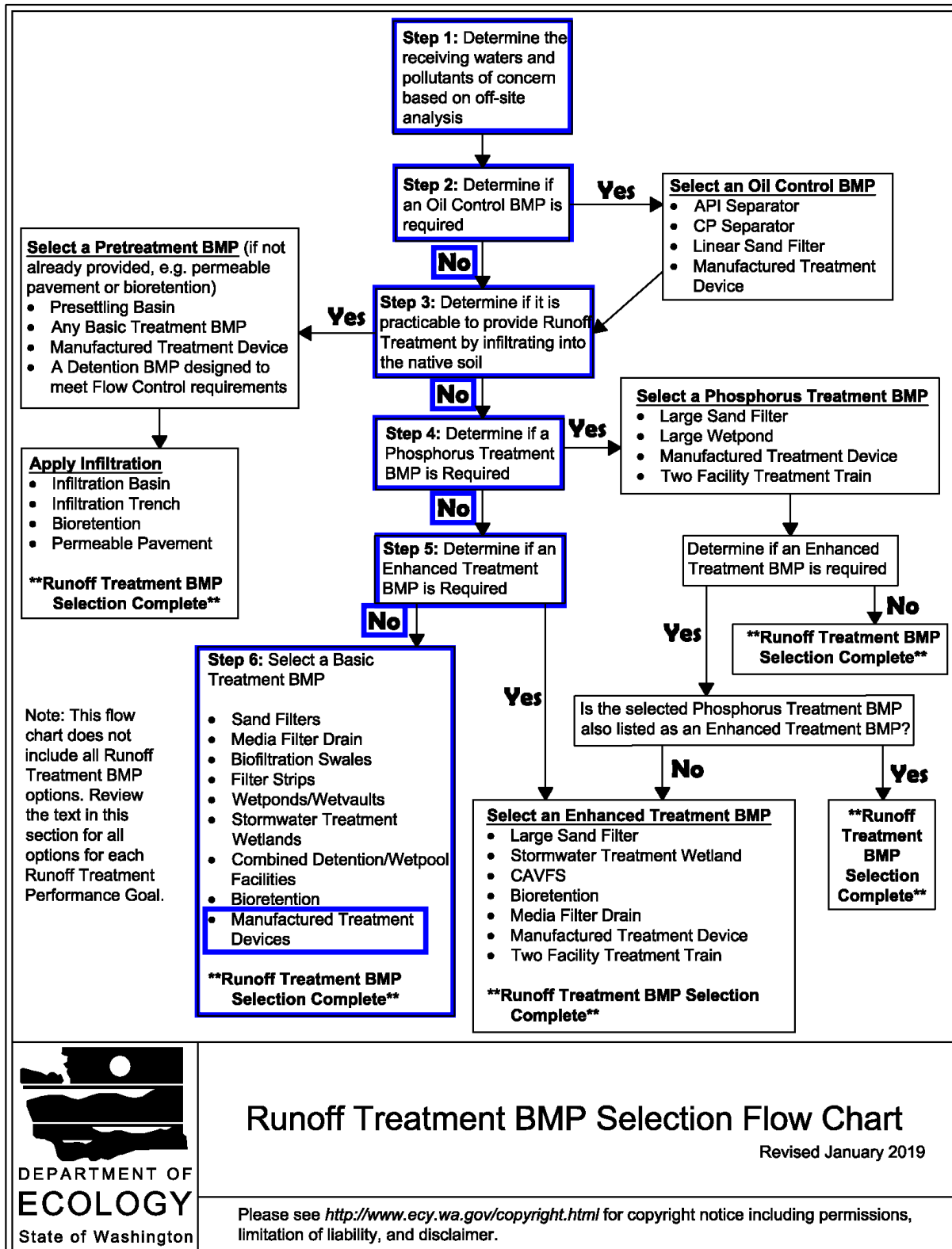


Figure III-1.1: Runoff Treatment BMP Selection Flow Chart

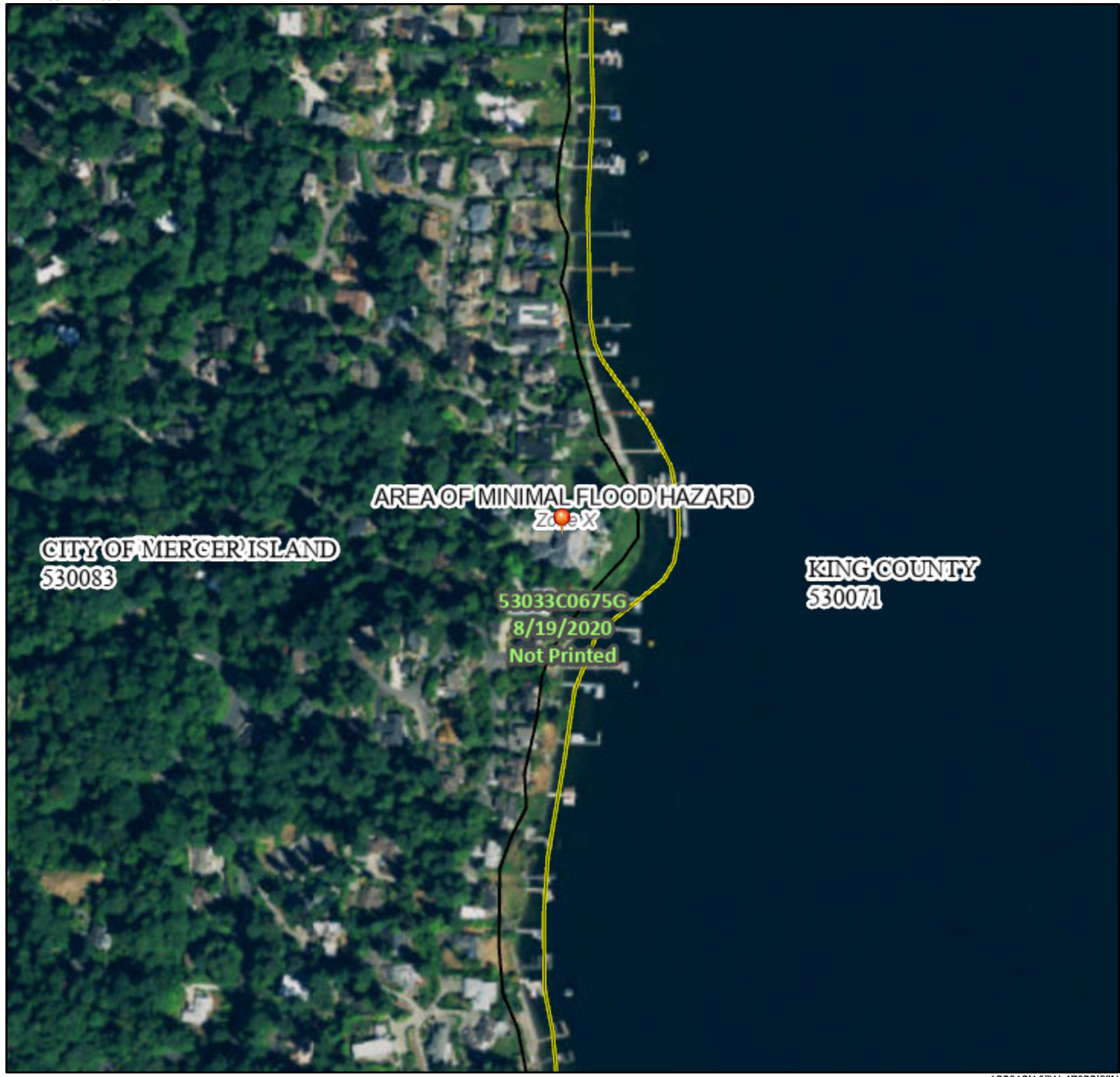


National Flood Hazard Layer FIRMette

A-3



122°12'53"W 47°33'32"N



Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
MAP PANELS		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

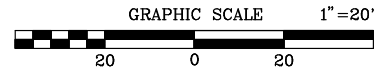
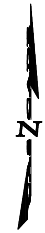
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **5/21/2024 at 5:28 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

0 250 500 1,000 1,500 2,000 Feet 1:6,000

122°12'16"W 47°33'8"N

Basemap Imagery Source: USGS National Map 2023



BASIS OF BEARINGS:

THE CENTERLINE OF BUTTERWORTH ROAD, BEING NORTH 20°10'45" EAST PER THE PLAT OF TONJA ESTATES, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 77 OF PLATS, PAGE 64, IN KING COUNTY, WASHINGTON.

VERTICAL DATUM:

NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

BENCHMARK:

LAKE WASHINGTON WATER SURFACE ELEVATION PER U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT, WATER MANAGEMENT, ELEVATION = 17.17 NAVD 88 ON MARCH 1, 2024 AT 10:30 A.M.

CONTOUR INTERVAL:

2 FEET

LEGAL DESCRIPTION:

(PER CHICAGO TITLE COMPANY OF WASHINGTON COMMITMENT NO. 0246999-ETU, THIRD, DATED JANUARY 11, 2024)

LOTS 3 AND 4, TONJA ESTATES, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 77 OF PLATS, PAGE 64, IN KING COUNTY, WASHINGTON.

EXCEPT THAT PORTION OF SAID LOT 3, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF SAID LOT 3;

THENCE SOUTH 01°35'04" WEST ALONG THE EASTERLY LINE OF LOT 3 A DISTANCE OF 75.31 FEET;

THENCE NORTH 10°03'02" WEST A DISTANCE OF 74.73 FEET;

THENCE NORTH 76°21'57" WEST A DISTANCE OF 10.15 FEET, MORE OR LESS, TO THE NORTH LINE OF SAID LOT 3;

THENCE SOUTH 88°24'56" EAST ALONG SAID NORTH LINE 25.00 FEET TO THE POINT OF BEGINNING, AND THE END OF THIS EXCEPTION;

TOGETHER WITH AN UNDIVIDED 1/7TH INTEREST IN LOT 1 OF SAID PLAT; AND

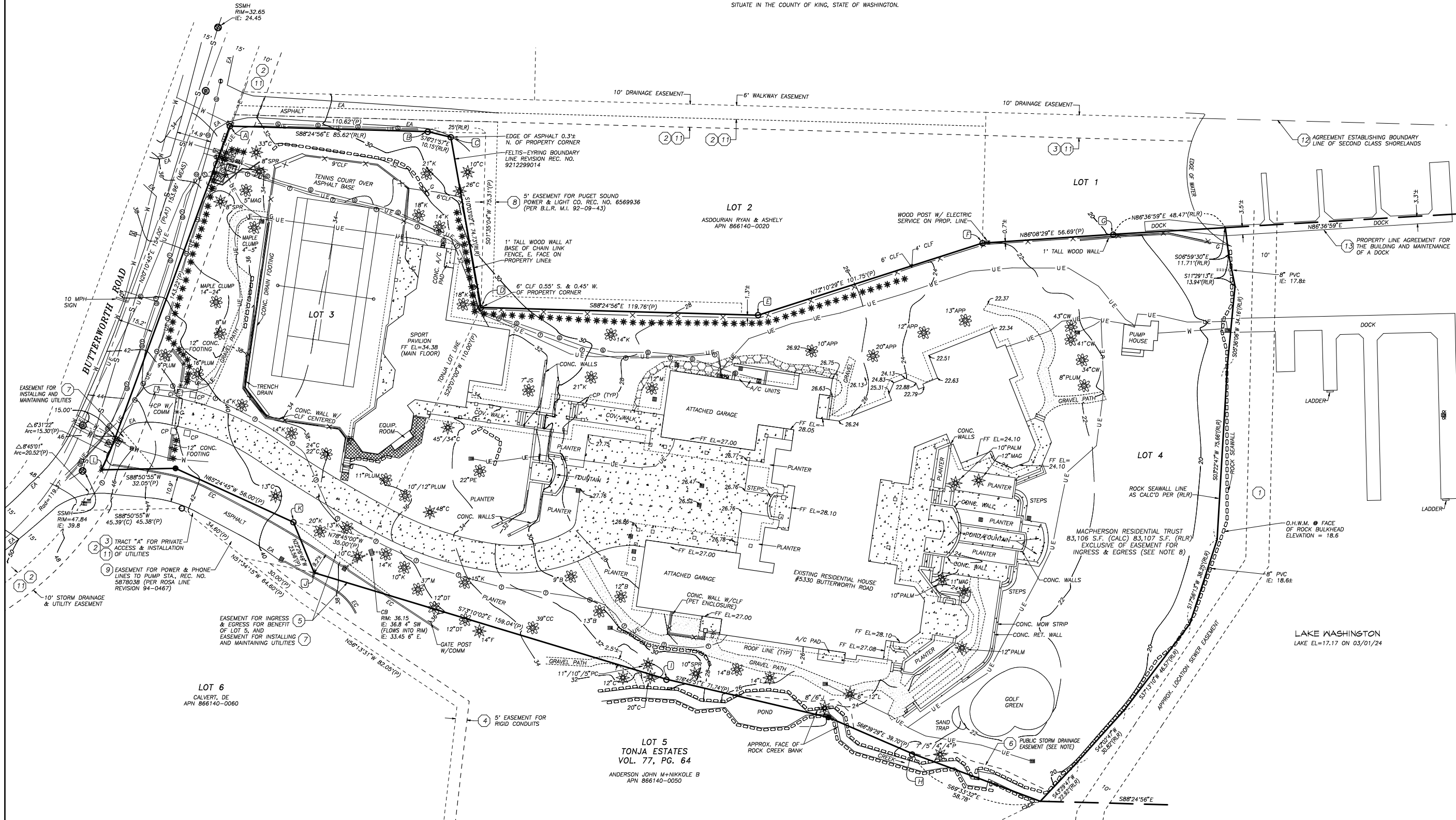
TOGETHER WITH AN UNDIVIDED 1/2 INTEREST IN TRACT A OF SAID PLAT;

(ALSO KNOWN AS THE ROSA LINE REVISION, CITY OF MERCER ISLAND FILE NO. 94-0467, RECORDED UNDER RECORDING NUMBER 9606139004).

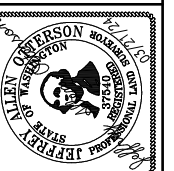
SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON.

FOUND/SET PROPERTY CORNER LEGEND:

- (A) FOUND 3/4" IRON PIPE & CAP "LS 20764" S49°E 0.09'
- (B) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S38°W 0.09'
- (C) FOUND 1/2" REBAR & CAP "TERRANE 15025 56664 52088 57176"
- (D) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S26°W 0.16'
- (E) FOUND 1/2" REBAR & CAP "TERRANE 15025 56664 52088 57176"
- (F) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S51°E 0.08'
- (G) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S4°W 0.17'
- (H) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S34°W 0.41'
- (J) FOUND 3/4" IRON PIPE & CAP W/TACK "LS 20764" S22°W 0.22'
- (U) FOUND MAG NAIL & WASHER "37427" N49°E 0.09'
- (K) FOUND 1/2" REBAR & CAP "TRIAD ASSOC 19620 22335 21402 18094"
- (L) SET MAG NAIL & I.D. WASHER "LS 37540"

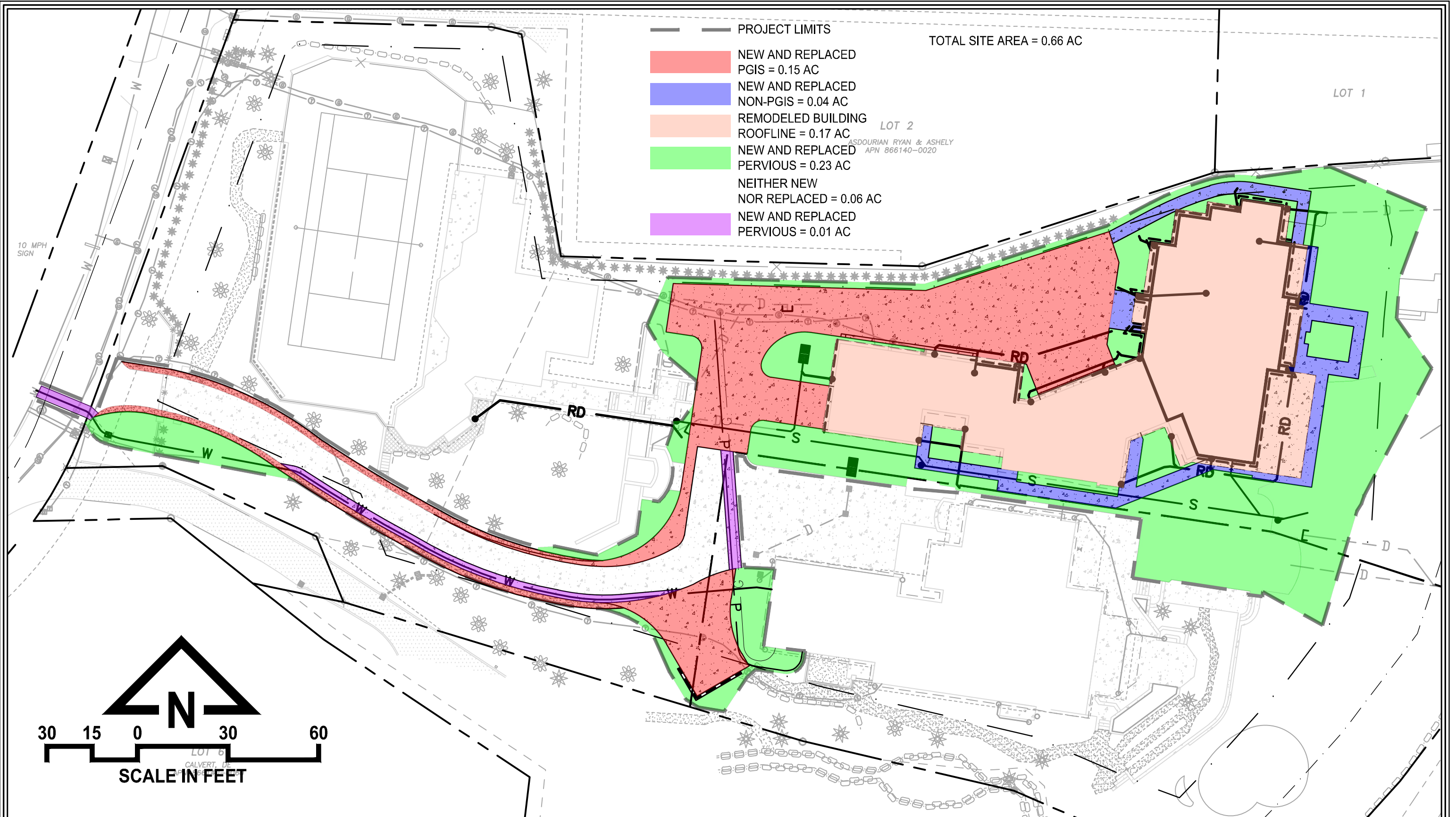


SURVEYOR'S CERTIFICATE
 THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT AT THE REQUEST OF ROGER MACPHERSON RESIDENTIAL TRUST IN Mar. 2024 AND NANCY MACPHERSON RESIDENTIAL TRUST
Jeffrey Allen Otterson
 P.L.S. CERTIFICATE NO. 37540



ALTA/NSPS LAND TITLE SURVEY
FOR: MACPHERSON RESIDENTIAL TRUST
5330 BUTTERWORTH ROAD
MERCER ISLAND, WA 98040

CASCADE LAND SURVEYING
 Complete Land Surveying Services
 16009 AP TUBBS RD E, BUCKLEY, WA 98321
 PHONE: (253) 820-4016
 Email: jeff@cascadelands.com
 CHECKED BY: JAO
 DRAWN BY: JAO
 JOB NO.: 2024-003
 DATE: Thu., Mar. 21, 2024
 SHEET: 2 OF 2
 SCALE: 1"=20'





A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for King County Area, Washington

MacPherson Residence



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

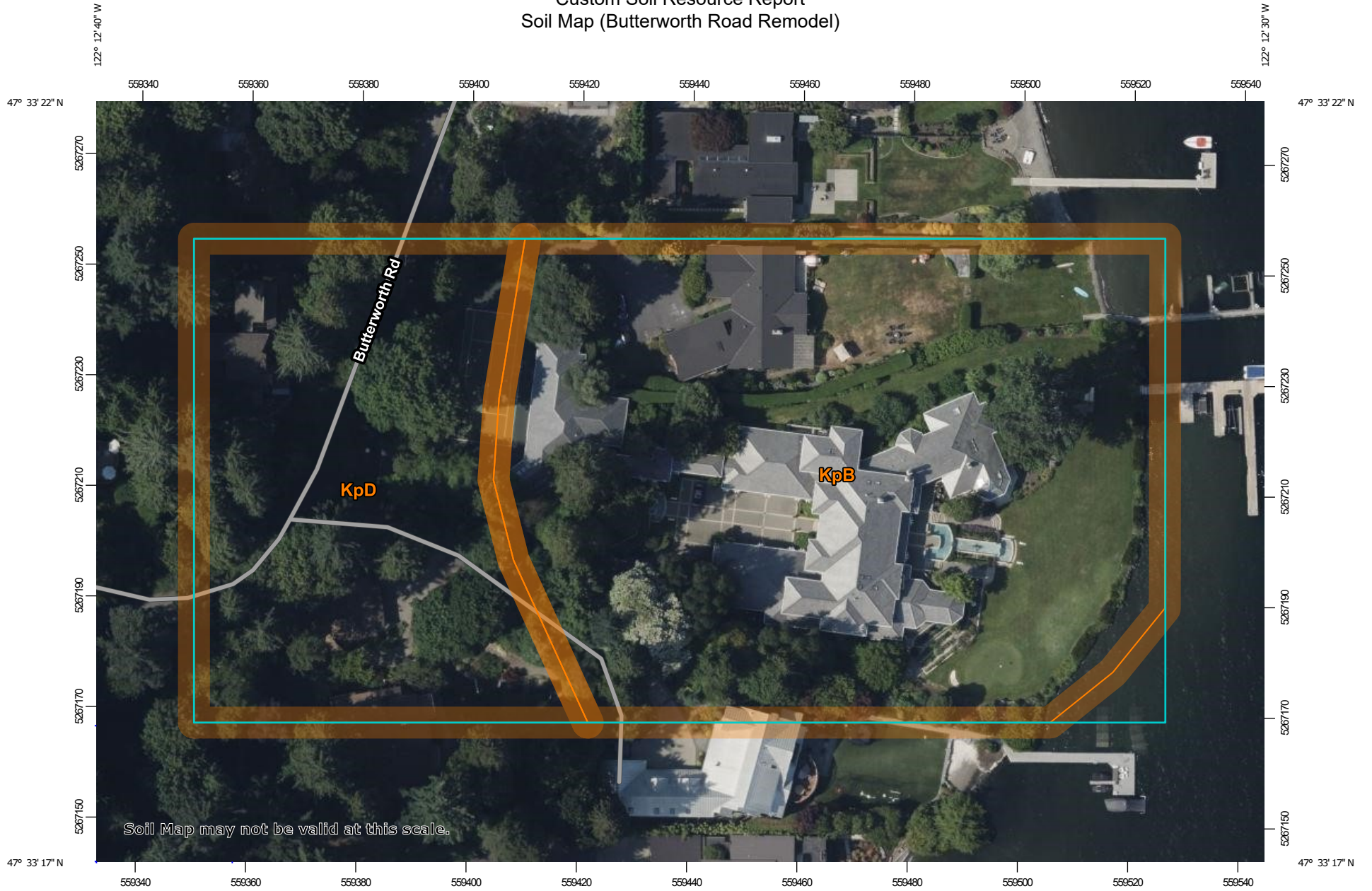
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map (Butterworth Road Remodel)



Map Scale: 1:968 if printed on A landscape (11" x 8.5") sheet.


0 10 20 40 60 Meters

0 45 90 180 270 Feet

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

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


Water Features

 Streams and Canals

Transportation

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

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: King County Area, Washington
 Survey Area Data: Version 19, Aug 29, 2023

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Butterworth Road Remodel)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
KpB	Kitsap silt loam, 2 to 8 percent slopes	2.5	65.1%
KpD	Kitsap silt loam, 15 to 30 percent slopes	1.3	33.7%
Totals for Area of Interest		3.8	100.0%

Map Unit Descriptions (Butterworth Road Remodel)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

Custom Soil Resource Report

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

King County Area, Washington

KpB—Kitsap silt loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1hmt9
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 24 inches: silt loam
H3 - 24 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Soils with Few Limitations (G002XN502WA)
Other vegetative classification: Soils with Few Limitations (G002XN502WA)
Hydric soil rating: No

Minor Components

Alderwood

Percent of map unit: 10 percent
Hydric soil rating: No

Bellingham

Percent of map unit: 3 percent

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Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Tukwila

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Seattle

Percent of map unit: 1 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

KpD—Kitsap silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1hmtc
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 40 inches: silt loam
H3 - 40 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None

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Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: F002XA004WA - Puget Lowlands Forest

Forage suitability group: Sloping to Steep Soils (G002XN702WA)

Other vegetative classification: Sloping to Steep Soils (G002XN702WA)

Hydric soil rating: No

Minor Components

Tukwila

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Bellingham

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

Seattle

Percent of map unit: 1 percent

Landform: Depressions

Other vegetative classification: Wet Soils (G002XN102WA)

Hydric soil rating: Yes

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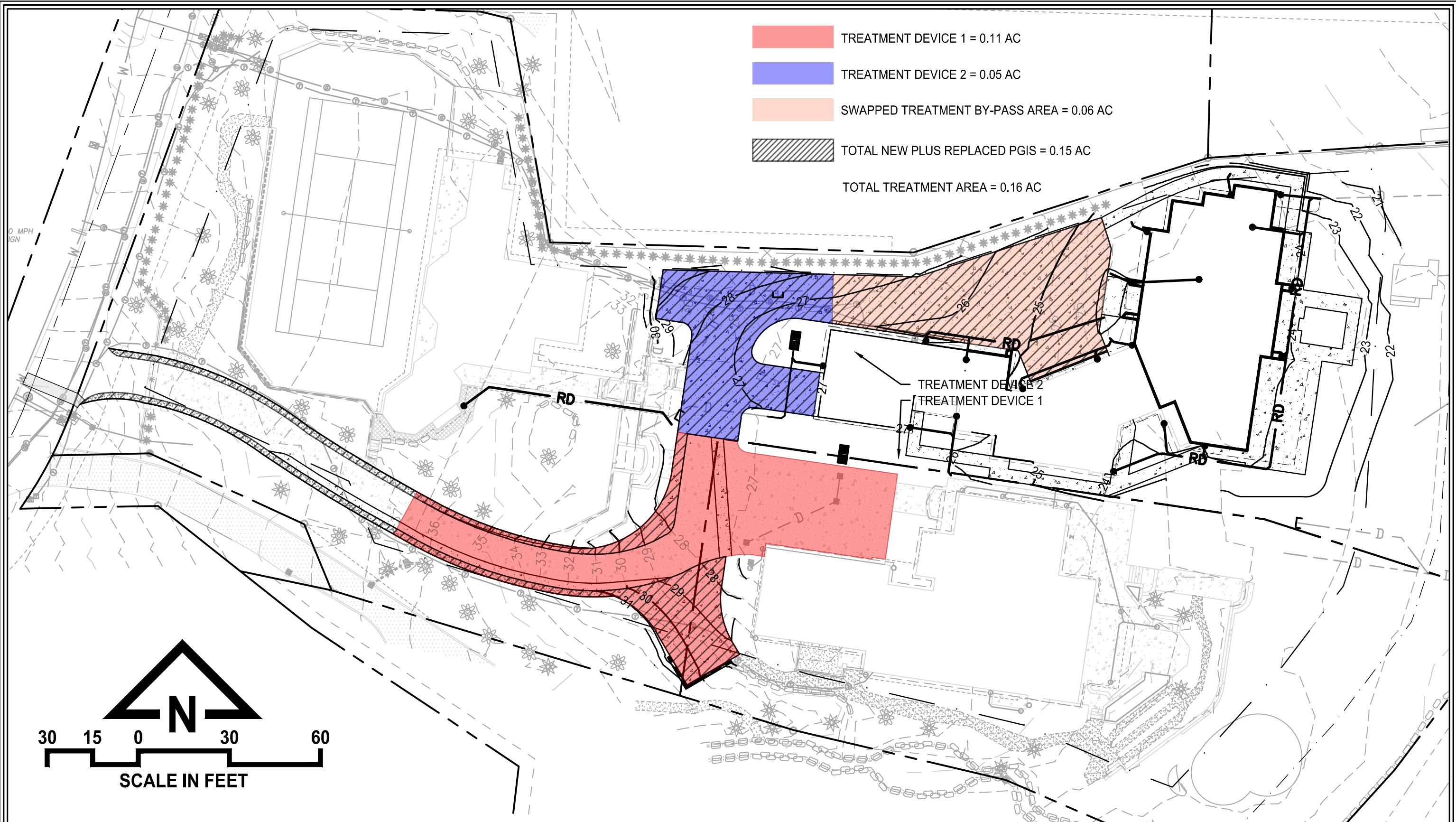
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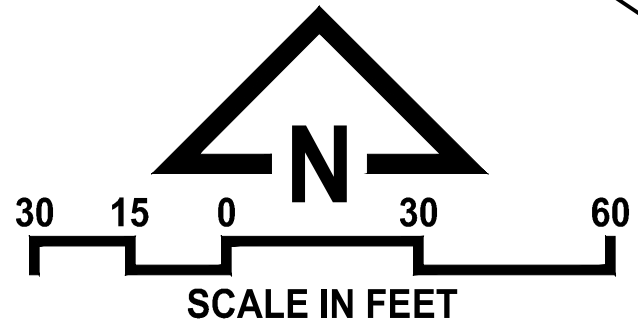
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- TREATMENT DEVICE 1 = 0.11 AC
 - TREATMENT DEVICE 2 = 0.05 AC
 - SWAPPED TREATMENT BY-PASS AREA = 0.06 AC
 - TOTAL NEW PLUS REPLACED PGIS = 0.15 AC
- TOTAL TREATMENT AREA = 0.16 AC



Appendix B

Construction Stormwater Pollution Prevention Plan (CSWPPP)



Construction Stormwater Pollution Prevention Plan

March 19, 2025

PROJECT

MacPherson Residence
5320 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

Almirah Bushnell, EIT
Civil Designer

REVIEWED BY

John Babb, PE
Civil Engineer



Construction Stormwater Pollution Prevention Plan

March 19, 2025

PROJECT

MacPherson Residence
5320 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

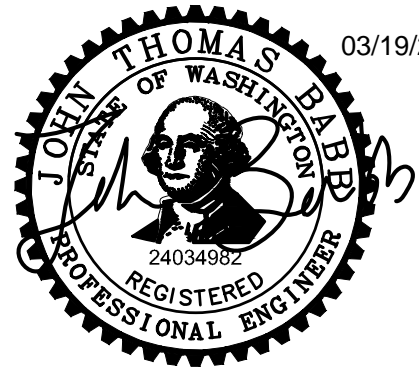
Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

Almirah Bushnell, EIT
Civil Designer

REVIEWED BY

John Babb, PE
Civil Engineer



I hereby state that this [Construction Stormwater Pollution Prevention Plan](#) for the [MacPherson Residence](#) project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that the [City of Mercer Island](#) does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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Exhibit 1

Inspection Logs

Exhibit 2

Best Management Practices (BMPs)

BMP 103 High Visibility Fence

BMP 120 Temporary and Permanent Seeding

BMP 123 Plastic Covering

BMP 140 Dust Control

BMP 220 Inlet Protection

Section 1 – Introduction

In 1972, Congress passed the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act (CWA), to restore and maintain the quality of the nation's waterways. The ultimate goal was to make sure that rivers and streams were fishable, swimmable, and drinkable. In 1987, the Water Quality Act (WQA) added provisions to the CWA that allowed the Environmental Protection Agency (EPA) to govern stormwater discharges from construction sites. The National Pollutant Discharge Elimination System (NPDES) General Permit includes provisions for development of a Stormwater Pollution Prevention Plan (SWPPP) to maximize the potential benefits of pollution prevention, and sediment and erosion control measures at construction sites.

The proposed project will disturb less than 1 acre and is therefore not required to obtain an NPDES General Permit for Stormwater Associated with Construction Activities.

The 2019 Stormwater Management Manual for Western Washington requires a Construction SWPPP for projects that add or replace more than 2,000 square feet of impervious surface. The proposed project will exceed this threshold; therefore, a Construction SWPPP is required.

Development, implementation, and maintenance of the Construction SWPPP will provide the selected General Contractor with the framework for reducing soil erosion and minimizing pollutants in stormwater during construction of the MacPherson Residence project. The SWPPP will:

- Define the characteristics of the site and the type of construction that will occur.
- Describe the practices that will be implemented to control erosion and the release of pollutants in stormwater.
- Create an implementation schedule to ensure that the practices described in this SWPPP are in fact implemented, and to evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in stormwater discharged from the site.
- Describe the final stabilization/termination design to minimize erosion and prevent stormwater impacts after construction is complete.

This Construction SWPPP:

- Identifies the SWPPP Coordinator with a description of this person's duties.
- Identifies the Stormwater Pollution Prevention Team (SWPP Team) that will assist in implementation of the SWPPP during construction.
- Describes the existing site conditions, including existing land use for the site, soil types at the site, as well as the location of surface waters that are located on or next to the site.
- Identifies the body or bodies of water that will receive runoff from the construction site, including the ultimate body of water that receives the stormwater.
- Identifies the drainage areas and potential stormwater contaminants.
- Describes the stormwater management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment, and pollutants in stormwater discharge.
- Describes the facility monitoring plan and how controls will be coordinated with construction activities.
- Describes the implementation schedule and provisions for amendment of the plan.

Section 2 – Project Description

The MacPherson Residence project is a project that includes the remodel of the existing residence and demolition of site vegetation and existing concrete walkways. The project proposes the construction of home renovations, walkways, and associated utilities.

The site address is 5320 Butterworth Rd in Mercer Island, Washington. The site consists of a single parcel, numbered 8661400040, which is approximately 1.36 acres in size. The parcel is in Township 24 North, Range 05, Section 19 East of the Willamette Meridian in King County, Washington. The parcel is bordered by single-family residential properties to the north and south, by Lake Washington to the east, and by Butterworth Road to the west of the site. The site was recently split into two different parcels under a separate permit. The neighboring parcel with a shared driveway is numbered 8661400045. The site generally slopes from west to east, with a total elevation of about 26 feet. This project proposes connections to the existing stormwater system on site through conveyance pipes.

Section 3 – Erosion Control Specialist (ESC)

The General Contractor shall be required to provide an Erosion Control Specialist (ECS) prior to construction. Once this individual is identified, the City Inspector will be notified.

The duties of the ECS include:

- Implement the SWPPP/TESC plan with the aid of the SWPP Team.
- Oversee maintenance practices identified as BMPs in the Construction SWPPP.
- Conduct or provide for inspection and monitoring activities.
- Identify other potential pollutant sources and make sure they are added to the plan.
- Identify any deficiencies in the Construction SWPPP and make sure they are corrected.
- Ensure that any changes in construction plans are addressed in the Construction SWPPP.

To aid in the implementation of the Construction SWPPP, the members of the SWPP Team include the following: General Contractor, ECS, City of Mercer Island Inspector, CPSD facilities, and Ethos Civil LLC. The General Contractor will ensure that all housekeeping and monitoring procedures are implemented, while the ECS will ensure the integrity of the structural BMPs. The SWPP Team will observe construction and erosion control practices and recommend revisions or additions to the Construction SWPPP and drawings.

Section 4 – Existing Site Conditions

The existing site consists of an existing structure, driveway, and tennis court. In total, the parcel is approximately 1.36 acres in size. There is an existing stormwater system which conveys stormwater throughout the site including existing downspouts to two outfalls within Lake Washington along the eastern property line. The existing system will be maintained and modified to connect the proposed improvements to the existing system. A survey of the site was completed by Cascade Land Surveying.

Existing utilities serving the project parcel include power, gas, sewer, water and communication lines. The existing utility services will be maintained.

Section 5 – Adjacent Areas

The parcel is bordered by single-family residential properties to the north and south, by Lake Washington to the east, and by Butterworth Road to the west of the site.

Section 6 – Critical Areas

There are no other known wetlands or sensitive areas located on or downstream of the site. There are no known area-specific requirements established in local plans, ordinances, regulations, or in Water Clean-Up Plans approved by the Department of Ecology.

Section 7 – Soils

An NRCS report was also prepared for this project and it defines the soils in the project area as approximately 100% Kitsap silt loam, 15 to 30 percent slopes. Refer to Exhibit A-6 in Appendix A of the SSP for an NRCS Soil Map.

Section 8 – Erosion Problem Areas

To our knowledge, there are no erosion problems on the project site.

Section 9 – Construction Stormwater Pollution Prevention Plan Elements

The purpose of this section is to describe how each of the 12 Construction SWPPP elements has been addressed, and to identify the type and location of BMPs used in the Temporary Erosion and Sedimentation Control (TESC) and demolition plans to satisfy the required element. If a Construction SWPPP element is not applicable to the project, a reason is provided.

Mark Clearing Limits

Prior to beginning land-disturbing activities, clearing limits will be marked with high visibility plastic or metal fence (BMP C103). Significant vegetation to remain will be marked and protected by fencing.

Establish Construction Access

The contractor shall use the existing site driveway for construction access. Construction vehicle ingress and egress will be limited to this entrance. If sediment tracking should occur, the contractor will be required to sweep the impacted roadways. Dump trucks hauling material to and from the site will be covered by a tarp.

Control Flow Rates

Flow rate control is not required for this project due to the small size of the project area and the project being flow control exempt.

Install Sediment Controls

Inlet Protection (BMP C220) is proposed for existing and proposed catch basins within the project area.

Stabilize Soils

To protect soils from the erosive forces of rainfall, surface runoff flow, and wind, all disturbed areas that are expected to remain exposed and unworked for more than 2 days from October 1 to March 31, or 7 days from April 1 to September 30, will be stabilized with the following BMPs:

- Temporary hydroseeding (C120).
- Topsoil stockpiles will be stabilized with plastic coverings (BMP C123).
- Dust control (BMP C140) will be provided by sprinkling the site with water.
- Permanent erosion control measures will include site paving and seeding or sodding of exposed soils.

Soil stabilization measures shall be appropriate for the time of year, site conditions, estimated duration of use, and potential water quality impacts that stabilization agents may have on downstream waters or groundwater.

Protect Slopes

Slope protection BMPs are unnecessary due to the project area not containing any significant slopes.

Protect Drain Inlets

All storm drain inlets made operable during construction shall be protected so that surface water runoff does not enter the conveyance system without first being filtered. Storm Drain Inlet Protection (BMP C220) is specified in the construction plans and shall be inspected weekly, at a minimum, and daily during storm events for sediment buildup, and shall be cleaned or removed and replaced as appropriate.

Stabilize Channels and Outlets

There are no channels or outlets requiring stabilization.

Control Pollutants

All waste materials will be collected and stored in a securely closed metal dumpster. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of once per week, and the trash will be hauled to the local landfill. No construction materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of three times per week. Good housekeeping and spill control practices will be followed during construction to minimize stormwater contamination from petroleum products, fertilizers, and concrete.

Table 1 below lists several pollutants that are commonly found on construction sites that have the potential to contaminate storm runoff. These pollutants will be present, mainly in areas pavement construction. The Contractor and the SWPPP/TESC coordinator will be responsible for identifying areas where these pollutants are being used and will monitor runoff coming from these areas. Pollutant sources will be covered with plastic if contaminated runoff is observed from these areas. If contaminated runoff is found in sediment traps or soils, the ECS will direct the Contractor to remove the polluted water/soil and dispose of it in an approved area offsite.

Table 1: Potential Construction Site Stormwater Pollutants

Trade Name Material	Chemical/Physical Description⁽¹⁾	Stormwater Pollutants⁽¹⁾
Pesticides (insecticides, fungicides, herbicide, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand
Glue, adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic
Curing compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion	Solid Particles	Soil, Sediment

(1) Data obtained from MSDS when available.

The following BMPs or equivalent measures are required of all businesses and agencies during concrete pouring and asphalt application at temporary sites:

- Employees must be educated on the pollution hazards of concrete and asphalt application and cutting.
- Loose aggregate chunks and dust must be swept or shoveled and collected (not hosed down a storm drain) for recycling or proper disposal at the end of each work day, especially at work sites such as streets, driveways, parking lots, sidewalks, curbs, and gutters where rain can readily pick

up the loose material and carry it to the nearest stormwater conveyance. Small amounts of excess concrete, grout, and mortar can be disposed of in the trash.

- Storm drain covers or similarly effective containment devices must be placed over all nearby drains at the beginning of each day. Shovel or vacuum slurry and remove from the site. All accumulated runoff and solids must be collected and properly disposed at the end of each work day, or more often if necessary.
- Exposed aggregate washing, where the top layer of unhardened concrete is hosed or scraped off to leave a rough finish, must be done with a mechanism for containment and collection of the discarded concrete slurry (such as the storm drain covers mentioned above). The easiest way to contain the wash water will be to direct the washings to a hole in the ground where the water can percolate into the ground and the solids later covered with soil.
- Cleaning of concrete application and mixing equipment or concrete vehicles on the work site must be done in a designated area where the rinse water is controlled. The rinse water must either be collected for proper disposal or put into a hole in the ground where the water can percolate away, and the solids later covered with soil or recovered and disposed or recycled.

The use of any treatment BMP must not result in the violation of groundwater, surface water, or drinking water quality standards.

Control Dewatering

Large volumes of dewatering of construction areas or utility trenches are not anticipated because groundwater is not likely to be encountered at the proposed elevations of proposed utility construction for the project.

Maintain BMPs

Temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure performance of their intended functions.

Sediment control BMPs shall be inspected weekly or after a runoff-producing event. Temporary erosion and sediment control BMPs will be removed within 30 days after final site stabilization is achieved. The following inspection and maintenance practices will be used to maintain erosion and sediment controls:

- Temporary and permanent seeding will be inspected for bare spots, washouts, and healthy growth.
- The Contractor ESC Lead will provide erosion control inspection services and stormwater disposal monitoring through construction. The City of Mercer Island Inspector will be notified of daily construction activities and scheduled meetings between the Erosion Control Inspector and the Contractor.

The maintenance inspection report will be made after each inspection. Copies of the report forms to be completed by the SWPPP coordinator are attached as Exhibit 1 of this Construction SWPPP. Completed forms will be provided to the City Inspector and will also be maintained onsite during the entire construction project. If construction activities or design modifications are made to the site plan that could impact stormwater, or if Ethos Civil determines that the measures are not adequate to prevent

erosion and the discharge of sediment from the site (based on turbidity measurements), this Construction SWPPP will be amended appropriately. The amended Construction SWPPP will have a description of the new activities that contribute to the increased pollutant loading and the planned source control activities.

Manage the Project

The following practices will be required during construction to properly manage activities:

- Identify an Erosion Control Specialist (ECS).
- Comply with seasonal work limitations.
- Inspect, maintain, and repair BMPs.
- Maintain the Construction SWPPP onsite at all times, including narrative, logs, and plans.

Section 10 – Construction Phasing

Phased construction is anticipated for this project. A general sequence for construction is described briefly below:

1. Arrange and attend a pre-construction meeting with the City of Mercer Island.
2. Stake/flag clearing and construction limits.
3. Construct all temporary erosion control BMPs according to the plan.
4. Demolish existing site features indicated for removal.
5. Maintain erosion control measures in accordance with City of Mercer Island standards and manufacturer's recommendations.
6. Adjust temporary erosion control BMPs as necessary to match site conditions as construction progresses.
7. Apply erosion control mulch and seeding, straw mulch or equal, to areas that will not be brought to final grade or permanently vegetated within 2 days of exposure during the dry season, and 7 days of exposure during the wet season.
8. Construct utilities and storm drainage features. Construct storm drain inlet protection for all catch basins subject to onsite runoff.
9. Relocate erosion control measures or install new measures so that, as site conditions change, the erosion and sediment control is always in accordance with the City of Mercer Island Construction SWPPP minimum requirements.
10. Final grade site and construct final surfacing treatments. Ensure that surface water is positively directed toward proposed stormwater control facilities.

11. Remove the remaining temporary erosion control items once site has been stabilized and upon approval.
12. Complete final hydroseeding.

The sequence for the remaining phase(s) of construction will be provided as construction documentation for permit approval is finalized.

Section 11 – Construction Schedule

Construction of the MacPherson Residence project will begin in the Summer of 2025 and is to be completed by Summer of 2026. Based on this schedule, construction will be ongoing during the wet season of 2025, however most all of the work is on the building and it will be roofed prior to the wet season.

Section 12 – Financial/Ownership Responsibilities

The property owner is the party responsible for initiation of bonds and other financial securities required for development of the site.

Exhibit 1

Inspection Logs

**MacPherson Residence
Stormwater Pollution Prevention Plan
Inspection and Maintenance Report Form**

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inch or more

Inspector: _____ Date: _____
Inspector's Qualifications: _____

Days since last rainfall: _____ Amount of last rainfall: _____ inches

Stabilization Measures

Drainage Area	Date Since Last Disturbance	Date of Next Disturbance	Stabilized (yes/No)	Stabilized With	Condition

Stabilization required: _____

To be performed by: _____ On or before: _____

**MacPherson Residence
Stormwater Pollution Prevention Plan
Inspection and Maintenance Report Form**

Changes required to the pollution prevention plan:

Reasons for changes:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: _____

Exhibit 2

Best Management Practices (BMPs)

BMP 103 High Visibility Fence

BMP 120 Temporary and Permanent Seeding

BMP 123 Plastic Covering

BMP 140 Dust Control

BMP 220 Inlet Protection

burying and smothering vegetation.

- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with [BMP C233: Silt Fence](#) to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See [Figure II-3.1: Stabilized Construction Access](#) for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in [Table II-3.2: Stabilized Construction Access Geotextile Standards](#).

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See [BMP C121: Mulching](#) for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See [BMP C121: Mulching](#) for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
 - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
 - Phase 2- Install the rest of the mulch and tackifier over the first lift.

Or, enhance vegetation by:

- Installing the mulch, seed, fertilizer, and tackifier in one lift.
- Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
- Hold straw in place with a standard tackifier.

Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

- Irrigation.
- Reapplication of mulch.
- Repair of failed slope surfaces.

This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).

- Seed may be installed by hand if:
 - Temporary and covered by straw, mulch, or topsoil.
 - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in [Table II-3.4: Temporary and Permanent Seed Mixes](#) include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix				
A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	<i>Festuca rubra var. commutata</i> or <i>Poa anna</i>	40	98	90
Perennial rye	<i>Lolium perenne</i>	50	98	90
Redtop or colonial bentgrass	<i>Agrostis alba</i> or <i>Agrostis tenuis</i>	5	92	85
White dutch clover	<i>Trifolium repens</i>	5	98	90
Landscaping Seed Mix				
A recommended mix for landscaping seed.				
Perennial rye blend	<i>Lolium perenne</i>	70	98	90
Chewings and red fescue blend	<i>Festuca rubra var. commutata</i> or <i>Festuca rubra</i>	30	98	90
Low-Growing Turf Seed Mix				
A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	<i>Festuca arundinacea var.</i>	45	98	90
Dwarf perennial rye (Barclay)	<i>Lolium perenne var. barclay</i>	30	98	90
Red fescue	<i>Festuca rubra</i>	20	98	90
Colonial bentgrass	<i>Agrostis tenuis</i>	5	98	90
Bioswale Seed Mix				
A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	<i>Festuca arundin-</i>	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	<i>acea</i> or <i>Festuca elatior</i>			
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	92	85
Redtop bentgrass	<i>Agrostis alba</i> or <i>Agrostis gigantea</i>	5-10	90	80
Wet Area Seed Mix				
A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	<i>Festuca arundinacea</i> or <i>Festuca elatior</i>	60-70	98	90
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	98	85
Meadow foxtail	<i>Alepocurus pratensis</i>	10-15	90	80
Alsike clover	<i>Trifolium hybridum</i>	1-6	98	90
Redtop bentgrass	<i>Agrostis alba</i>	1-6	92	85
Meadow Seed Mix				
A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	<i>Agrostis alba</i> or <i>Agrostis oregonensis</i>	20	92	85
Red fescue	<i>Festuca rubra</i>	70	98	90
White dutch clover	<i>Trifolium repens</i>	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
 - BFM and MBFMs do not require surface preparation.
 - Helicopters can assist in installing BFM and MBFMs in remote areas.
 - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
 - Installing BFM and MBFMs can save at least \$1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.

- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. However, the relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for applications greater than six months.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional on-site measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill rolled plastic covering products.
- Although the plastic material is inexpensive to purchase, the cost of installation, maintenance, removal, and disposal add to the total costs of this BMP.
- Whenever plastic is used to protect slopes, install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include:
 - Temporary ditch liner.
 - Pond liner in temporary sediment pond.
 - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
 - Emergency slope protection during heavy rains.
 - Temporary drainpipe (“elephant trunk”) used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
 1. Run plastic up and down the slope, not across the slope.
 2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.

3. Provide a minimum of 8-inch overlap at the seams.
 4. On long or wide slopes, or slopes subject to wind, tape all seams.
 5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
 6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
 7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil, which causes extreme erosion.
 8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.
- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
 - If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C124: Sodding

Purpose

The purpose of sodding is to establish turf for immediate erosion protection and to stabilize drainage paths where concentrated overland flow will occur.

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to [BMP C 105: Stabilized Construction Access](#) and [BMP C 106: Wheel Wash](#).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM ([BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#)) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#), but the downstream protections still apply.

Refer to [BMP C 126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#) for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
 - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
 - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
 - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
 - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
 - Encourage the use of alternate, paved routes, if available.
 - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
 - Limit dust-causing work on windy days.
 - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible

thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See [BMP C122: Nets and Blankets](#).
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See [I-2.11 Hydraulic Project Approvals](#).

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

[Table II-3.10: Storm Drain Inlet Protection](#) lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

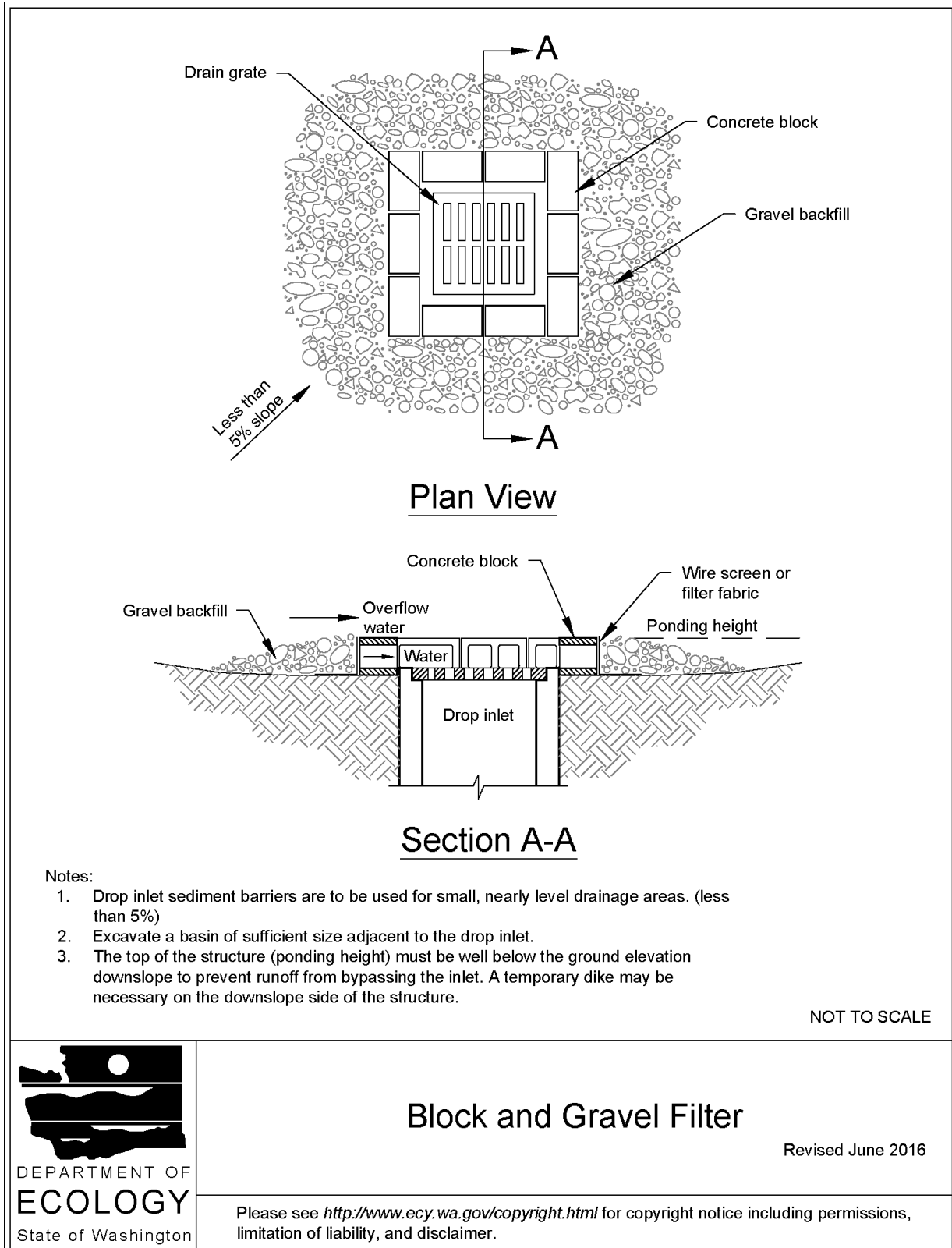
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See [Figure II-3.17: Block and Gravel Filter](#). Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
 - Provide a slope of 3H:1V on the upstream side of the berm.
 - Provide a slope of 2H:1V on the downstream side of the berm.
 - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
 - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
 - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
 - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
 - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
 - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

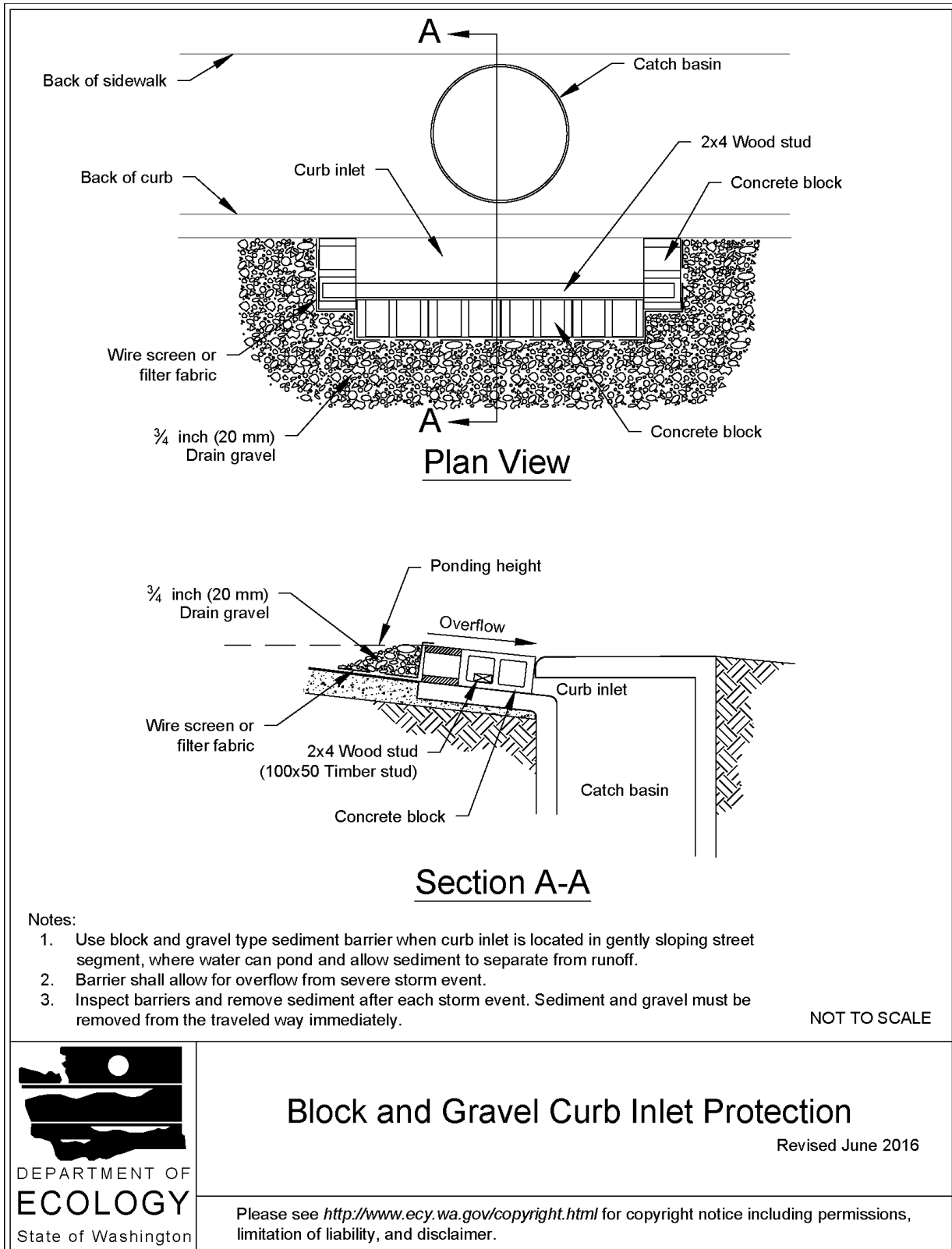
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See [Figure II-3.18: Block and Gravel Curb Inlet Protection](#). Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection

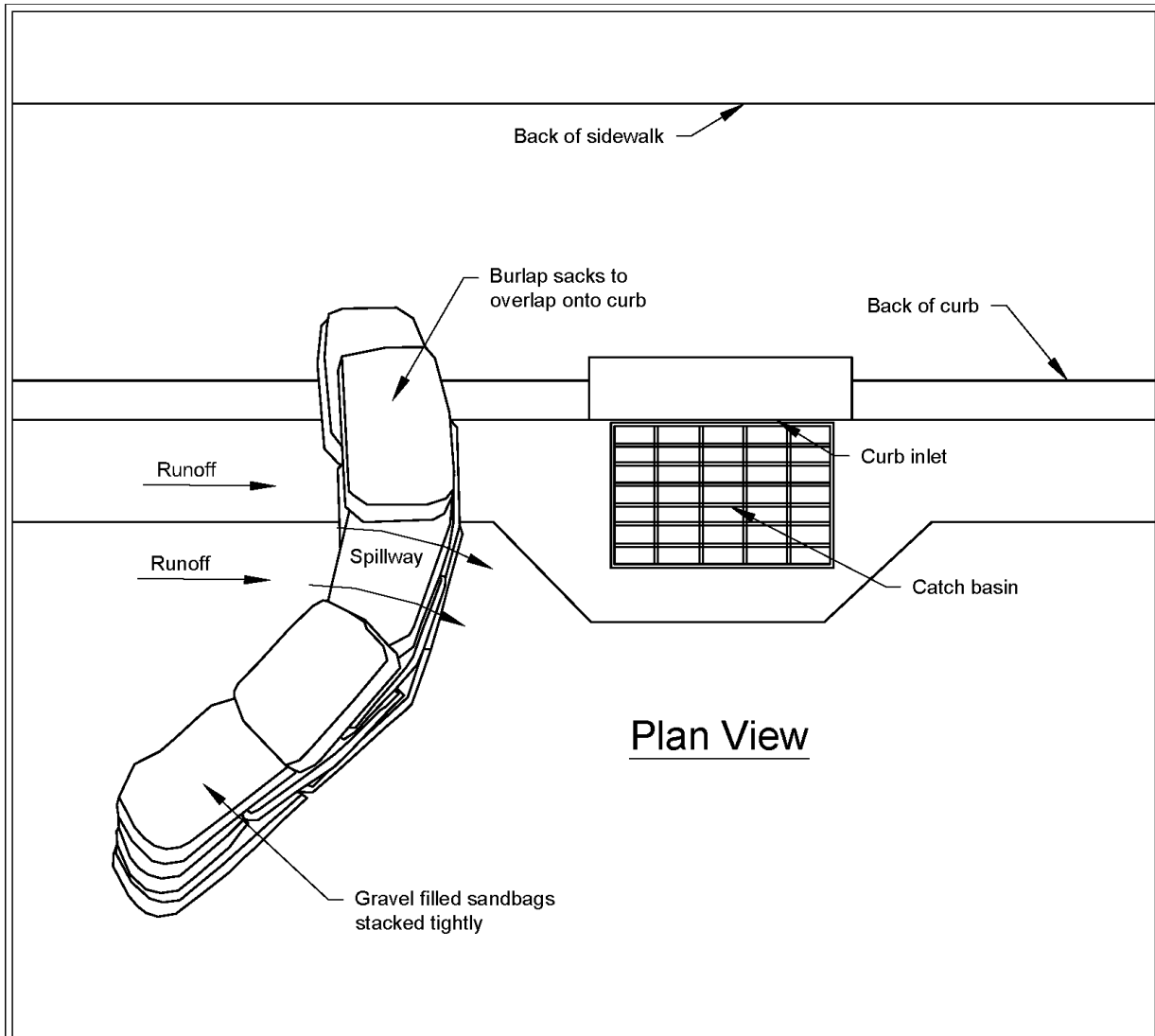


Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See [Figure II-3.19: Curb and Gutter Barrier](#). Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Plan View

Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



Curb and Gutter Barrier

Revised June 2016

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Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C231: Brush Barrier

Purpose

The purpose of brush barriers is to reduce the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Brush barriers may be used downslope of disturbed areas that are less than one-quarter acre.
- Brush barriers are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be directed to a sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a brush barrier, rather than by a sediment trapping BMP, is when the area draining to the barrier is small.
- Brush barriers should only be installed on contours.

Design and Installation Specifications

- Height: 2 feet (minimum) to 5 feet (maximum).
- Width: 5 feet at base (minimum) to 15 feet (maximum).
- Filter fabric (geotextile) may be anchored over the brush berm to enhance the filtration ability of the barrier. Ten-ounce burlap is an adequate alternative to filter fabric.

Appendix C

Operations and Maintenance Manual



Operations and Maintenance Manual

March 19, 2025

PROJECT

MacPherson Residence
5320 Butterworth Rd
Mercer Island, WA 98040
Project No: 24004

OWNER/APPLICANT

Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

Almirah Bushnell, EIT
Civil Designer

REVIEWED BY

John Babb, PE
Civil Engineer



Operations and Maintenance Manual

March 19, 2025

PROJECT

MacPherson Residence
5320 Butterworth Rd
Mercer Island, WA 98040
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OWNER/APPLICANT

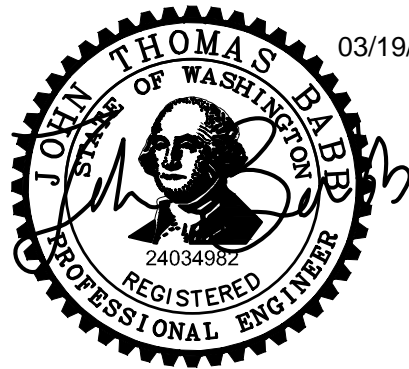
Dan Buchser
MacPherson Construction & Design
21626 SE 28th Street
Sammamish, WA 98075

PREPARED BY

Almirah Bushnell, EIT
Civil Designer

REVIEWED BY

John Babb, PE
Civil Engineer



I hereby state that this [Operations and Maintenance Manual](#) for the [MacPherson Residence](#) project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that the [City of Mercer Island](#) does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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Section 7 – Instructions for Person Maintaining Stormwater System	2
Section 8 – Conclusion	2
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Section 1 – Introduction

The MacPherson Residence project is a project that includes the remodel of the existing residence and demolition of site vegetation and existing concrete walkways. The project proposes the construction of home renovations, walkways, and associated utilities.

The site address is 5320 Butterworth Rd in Mercer Island, Washington. The site consists of a single parcel, numbered 8661400040, which is approximately 1.36 acres in size. The parcel is in Township 24 North, Range 05, Section 19 East of the Willamette Meridian in King County, Washington.

The site generally slopes from west to east, with a total elevation of about 26 feet. This project proposes connections to the existing stormwater system on site through conveyance pipes.

The owner shall be responsible for maintaining the project stormwater facilities.

This report presents a maintenance program that meets the requirements of the Department of Ecology *2019 Stormwater Management Manual for Western Washington (SMMWW)*. It is vitally important that the owner maintains these facilities in a timely and conscientious manner to avoid operational difficulties in the future. If catch basins are not adequately inspected and kept free of debris, it could lead to flooding and surcharging of the stormwater system. Siltation, debris, or lack of maintenance can reduce the capabilities of the system.

Section 2 – Responsibility

The project improvements will be owned and maintained by the property owner.

Section 3 – Maintenance Schedule

Maintenance of the stormwater facilities shall follow the schedule specified in the *SMMWW*. Additional maintenance may be required to respond to unusual storm events or reduced performance of the stormwater treatment system. A copy of the recommended maintenance schedule is included in Appendix C and may be photocopied and used for inspection records. Periodic stormwater facility maintenance should include sediment removal and vegetation management. Permanent erosion and sedimentation controls should be maintained as needed. Inspection records should be kept on file at the project site.

Section 4 – Cost

The following is an estimate of the average annual cost of maintenance for the stormwater facilities within the scope of this project.

Inspection twice a year or after major storm events	\$200
Maintenance / Replacement of Cartridges 1-5 years	\$500
Total Estimated Annual Cost	\$300 (high end \$700)

Section 5 – Vegetation Management Plan

The attached maintenance schedule provides guidance on vegetation control and management. Irrigation and other maintenance shall be provided as necessary to ensure that vegetation remains viable and that a hardy root structure forms in the first year. Vegetation planting shall be provided as described in the construction documents.

Section 6 – Source Control

Source control will be provided and are detailed in the civil plans.

Section 7 – Instructions for Person Maintaining Stormwater System

Appendix C contains a Stormwater Facility Maintenance Schedule. A checklist should be completed for all system components per the following schedule:

- Monthly from November through April
- Once in late summer (preferably September)
- After any major storm event

Using photocopies of the pages in Appendix C, check off the problems that are noted each time the item is inspected. Document comments on problems found and the corrective action taken. The inspection checklist sheets should be kept on file. Use the Department of Ecology suggested inspection frequency at the left of each item as an inspection guide.

For questions, contact the Washington State Department of Ecology.

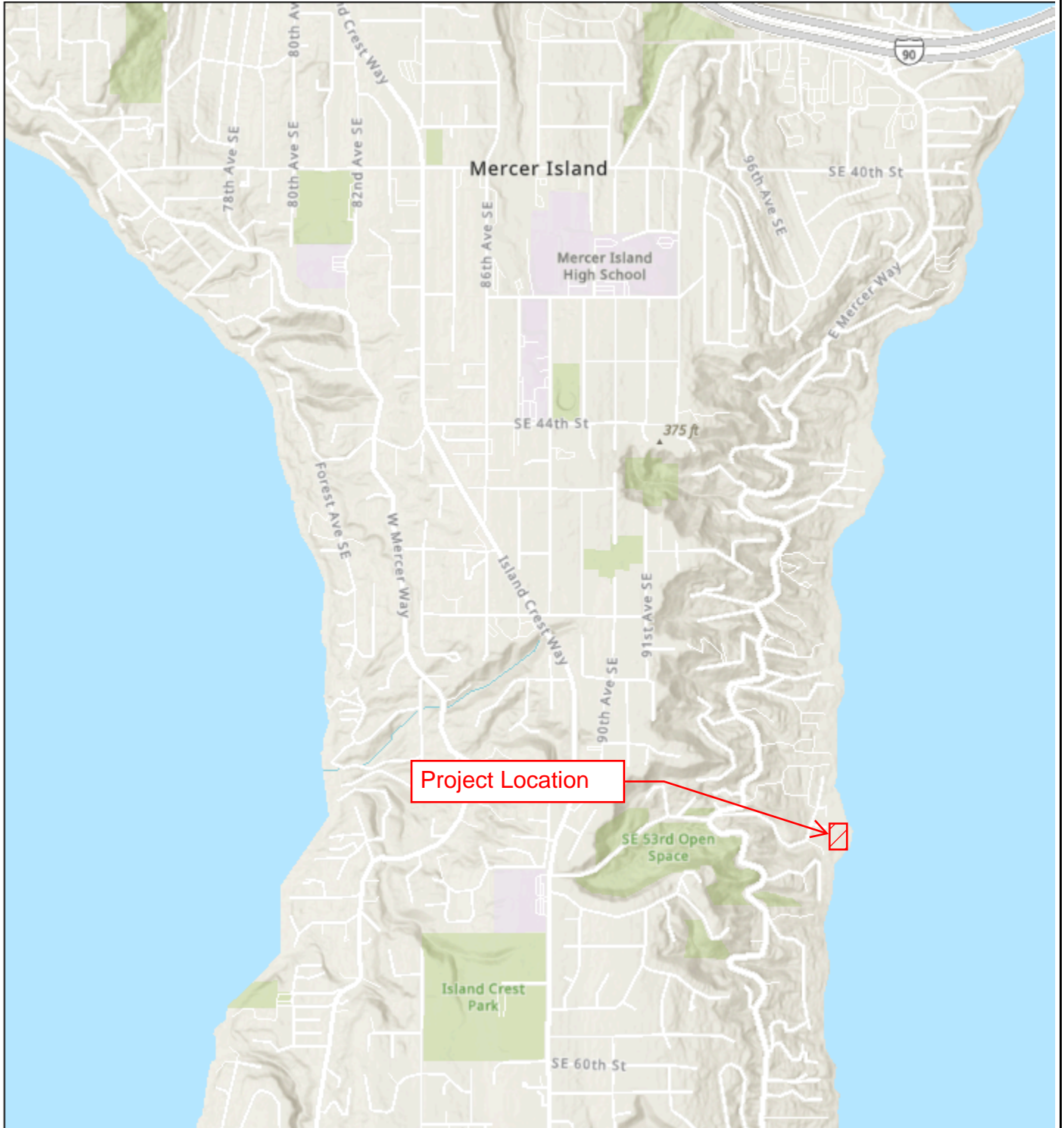
Section 8 – Conclusion

This maintenance plan is developed for the MacPherson Residence project. The maintenance plan has been prepared within the guidelines of the Department of Ecology *2019 Stormwater Management Manual for Western Washington*. IF this plan is implemented, the owner can expect the stormwater conveyance system to function as designed.

This analysis is based on data and records either supplied to or obtained by Ethos Civil. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry.

Appendix A

Vicinity Map

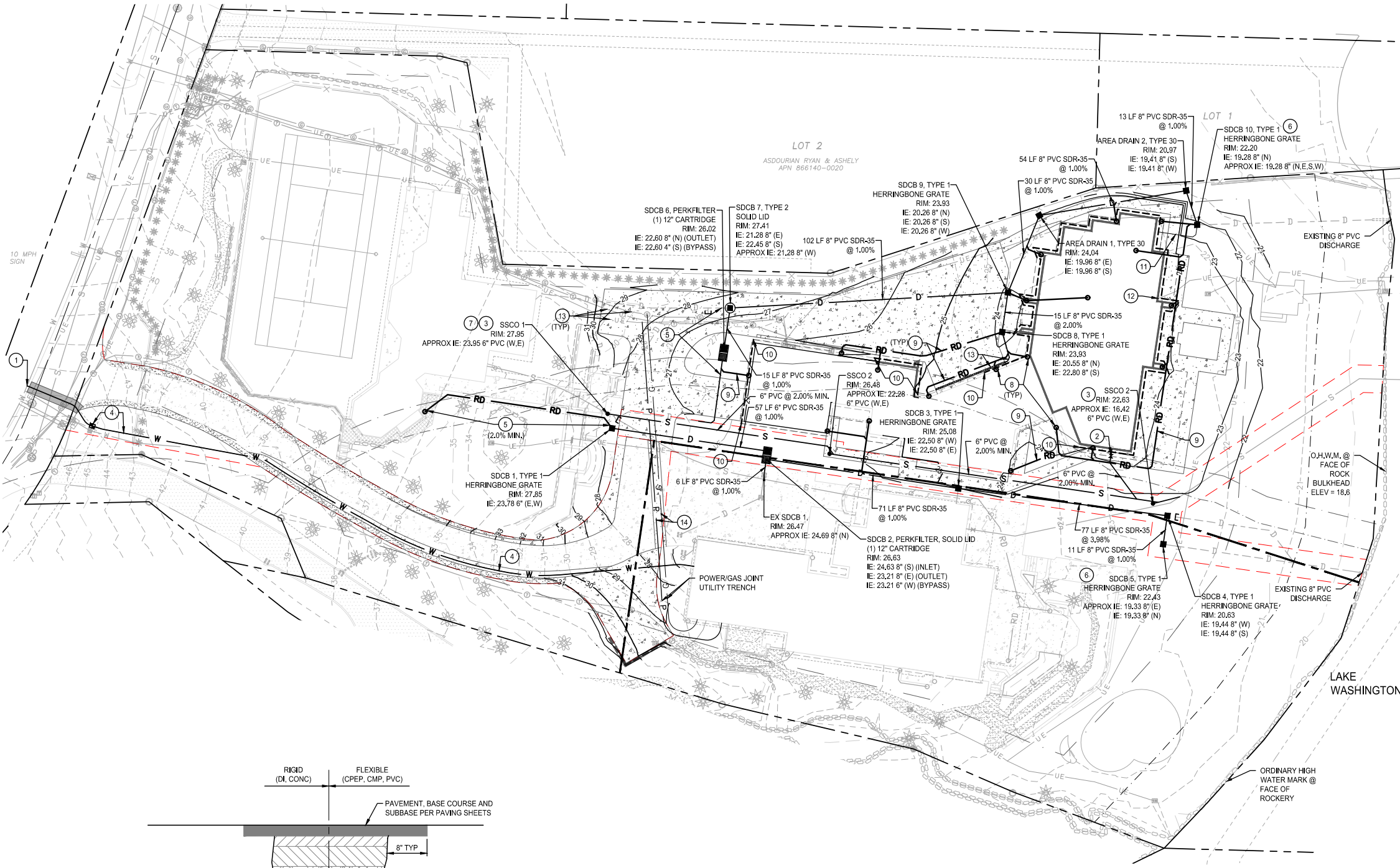


Project Location



Appendix B

Civil Plan Sheets



LEGEND

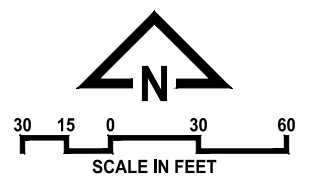
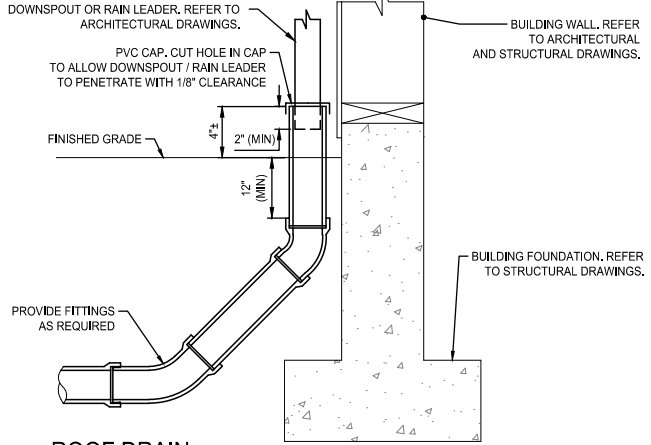
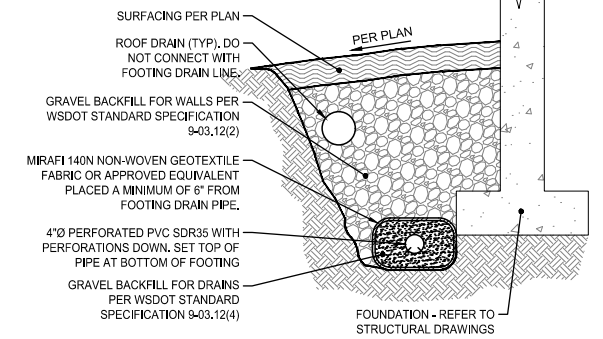
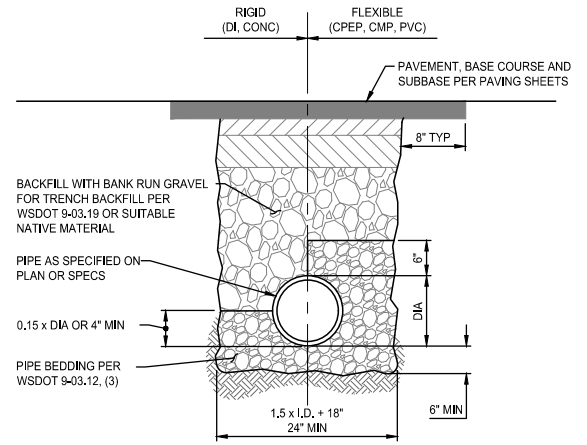
- RIGHT-OF-WAY / PROPERTY LINE
- LOT LINE
- EASEMENT
- PROPOSED BUILDING OUTLINE. REFER TO ARCHITECTURE PLAN
- S --- SANITARY SIDE SEWER
- --- SANITARY SEWER CLEANOUT
- --- CATCH BASIN TYPE 1 OR AREA DRAIN TYPE 30 PER PLAN CALLOUT
- ⊙ --- CATCH BASIN TYPE 2
- D --- STORM DRAINAGE PIPING
- W --- WATER PIPING
- G --- GAS LINE
- P --- UNDERGROUND POWER LINE
- FOOTING DRAIN
- TRENCH DRAIN, ZURN Z886
- RD --- ROOF DRAIN
- --- PERKIFILTER

- ### KEYNOTES
- 1 CONNECT TO WATER MAIN.
 - 2 RELOCATE EXISTING SEWER BACKFLOW PREVENTION VALVE.
 - 3 CONNECTION TO EXISTING SEWER SERVICE LINE. POTHOLE TO LOCATE EXACT LOCATION AND DEPTH OF EXISTING LINE.
 - 4 PROVIDE NEW DOMESTIC WATER SERVICE LINE AND METER.
 - 5 CONNECT EXISTING SPORTS PAVILION STORM DRAIN LINES TO PROPOSED STORM SYSTEM.
 - 6 LOCATE AND CONNECT TO EXISTING 8" PVC DRAINAGE PIPE.
 - 7 CONNECT TO EXISTING SEWER SERVICE LINE TO MAINTAIN SEWER SERVICE FOR SPORTS PAVILION.
 - 8 DOWNSPOUT, TYP. REFER TO ARCHITECTURAL DRAWINGS.
 - 9 ROOF DRAIN LINE. 4" PVC SDR-35 @ 2.0% MIN.
 - 10 CONNECT TO EXISTING FOOTING DRAIN. APPROX IE: 23.37.
 - 11 4" PVC FOOTING DRAIN TIGHTLINE @ 2.0% MIN.
 - 12 RECONNECT POWER LINE TO PROPOSED BUILDING EXPANSION.
 - 13 PROTECT EXISTING UTILITIES.
 - 14 PROVIDE UNDERGROUND GAS AND POWER SERVICE AND CONNECT TO EXISTING SERVICE LINES ON-SITE. TRENCHING, BEDDING, SHADING, AND BACKFILL BY CONTRACTOR PER GAS PURVEYOR STANDARDS. COORDINATE WITH PURVEYOR.
 - 15 PROVIDE 27 LF ZURN Z886 TRENCH DRAIN WITH CAST IRON GATE. 4" PVC DRAIN LINE TO PROPOSED CATCH BASIN @ 1.00% MIN.

MACPHERSON RESIDENCE
 5320 BUTTERWORTH RD
 MERCER ISLAND, WA 98040

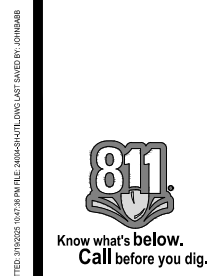
PERMIT SET

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24004
03/19/2025
UTILITY PLAN

C3.0



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Appendix C

Stormwater and Water Quality Facility Maintenance Schedule SMMWW Maintenance Standards

MacPherson Residence Inspection Frequencies

Asset	Preferred Month	Interval
Storm Catch Basins/Yard Drains/Cleanouts		Annually
Storm Drainage Pipes		Annually
Storm Filter		Annually
Landscaping	March – April September – October	Semi-annually

MacPherson Residence Maintenance Activity Log

Storm Drainage Pipes

Date	Initials	Current Condition	Action Taken	Condition After Maintenance

Maintenance to be performed:

- Sediment shall be removed from pipes annually.

Result expected when maintenance performed:

- Pipe contains no sediment.

To be performed by:

On or before:

MacPherson Residence Maintenance Activity Log

Catch Basin

Date	Initials	Current Condition	Action Taken	Condition After Maintenance

Maintenance to be performed:

- Sediment shall be removed from basin annually.
- Trash or debris shall be removed from basin annually.
- Grout cracks and adjust frame to sit flush with surface.
- Remove vegetation growing across or blocking basin opening and inlet/outlet pipes.

Result expected when maintenance performed:

- No sediment in the catch basin.
- No trash or debris in the catch basin.
- Pipes and top slab are secure and free from cracks. Frame is flush with the surface.
- No vegetation blocking opening to basin.

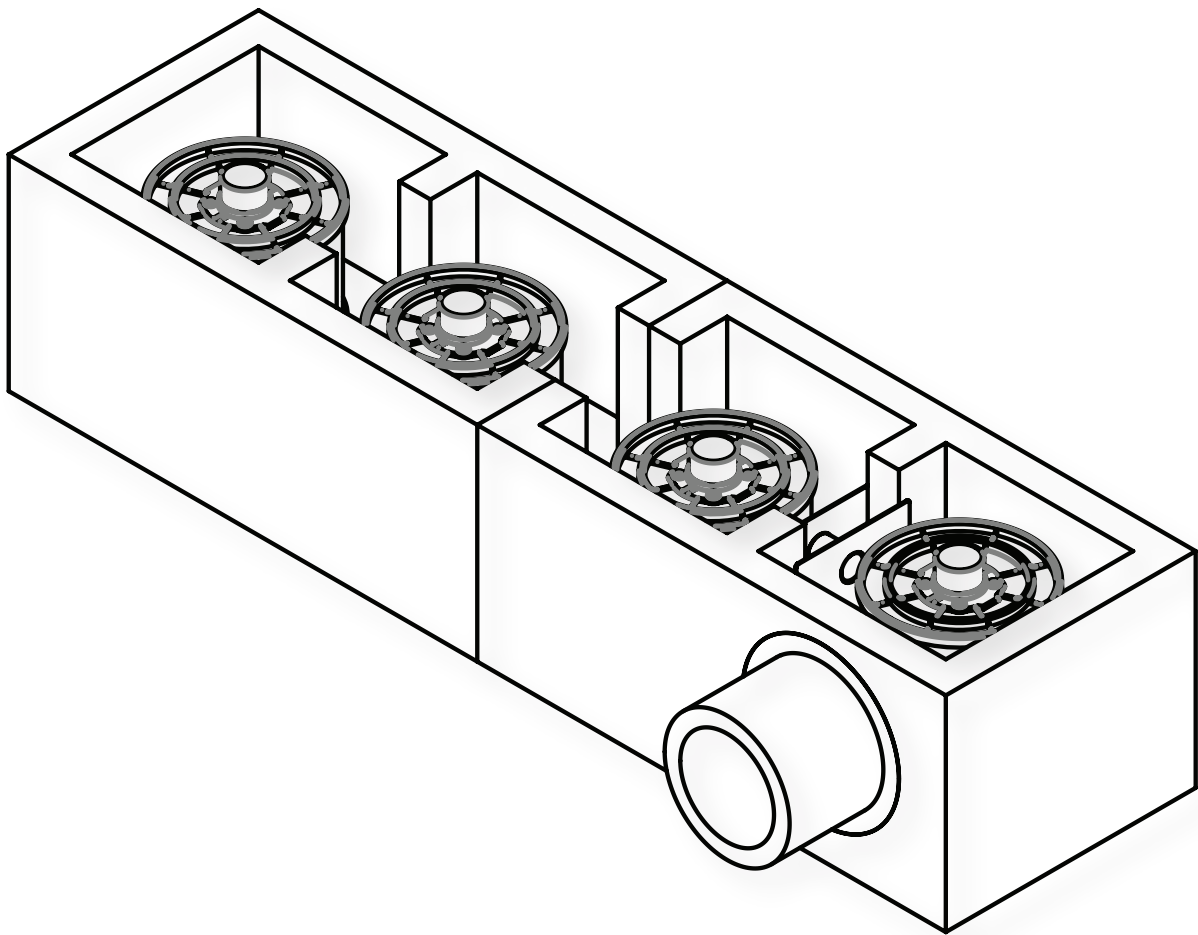
To be performed by:

On or before:

PerkFilter™

Four Cartridge Internal Assembly

Installation Guide

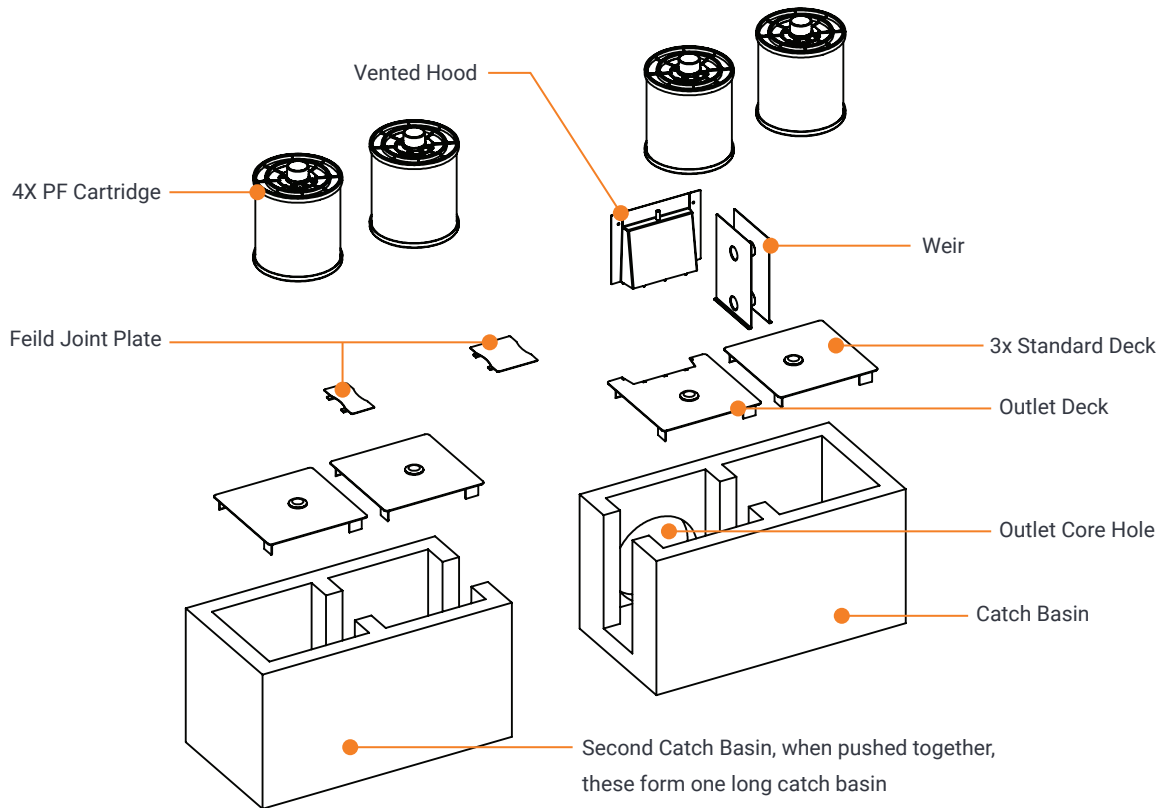


Introduction

This information is valid for PerkFilter™ Catch Basins with any height cartridge.

Parts List

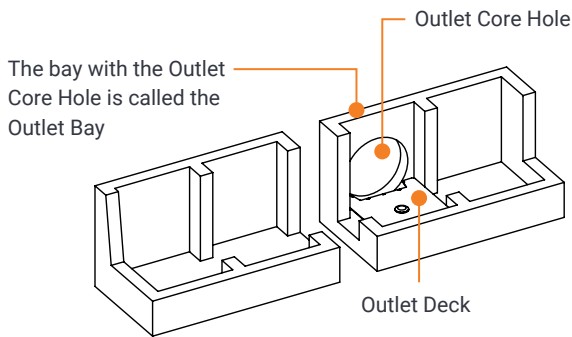
Component	Quantity
PF Cartridge	1-4
Outlet Deck	1
Standard Deck	3
Vented Hood*	1
Weir Assembly	1
Center Wall Deck Plate	1
Feild Joint Plate	1



Every PerkFilter™ Catch Basins system should have only one outlet pipe. Use the project drawing to find the outlet core hole on your system, then start step 1 below at that location.

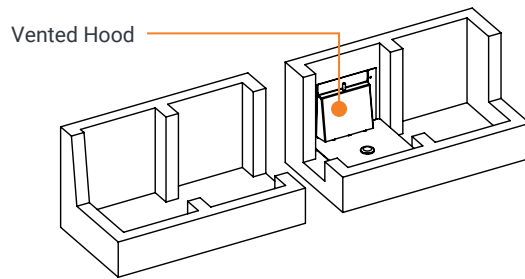
REMOVE DUST, GRAVEL & OTHER DEBRIS FROM CATCH BASIN BEFORE STARTING.

1. Set outlet deck in outlet bay with notch facing the core hole.

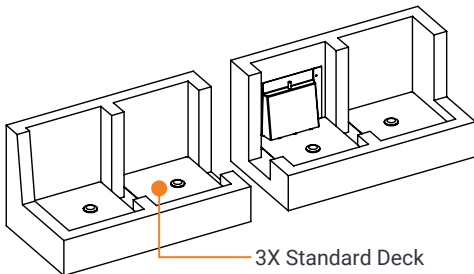


2. Cover the core hole & notch with the vented hood.

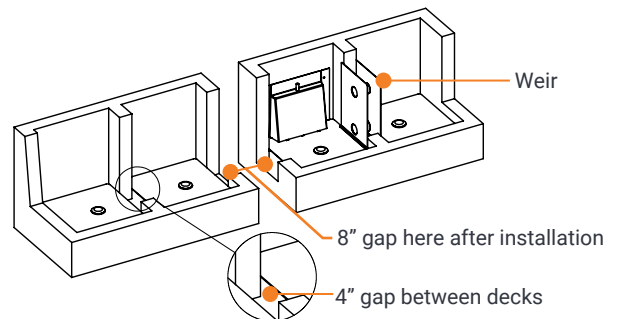
The hood tabs fit in the deck slots. Attach hood to concrete with two stainless concrete anchors thru the upper holes. Attach the vent hose (not shown).



3. Place standard decks in the other three bays.

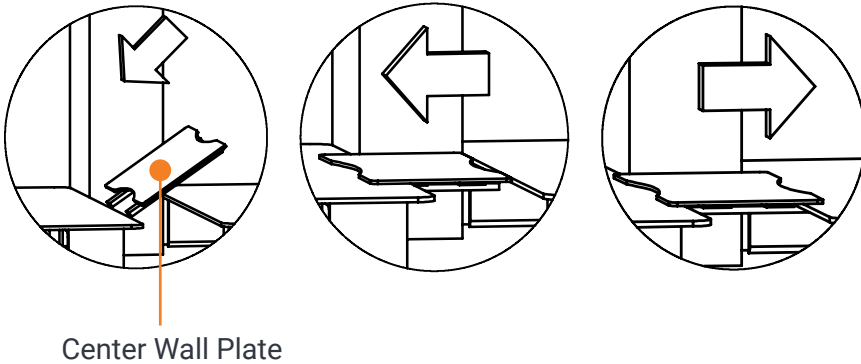


4. With flanges down, slide the weir down centered in the center wall gap until the flanges sit on both decks. If the weir doesn't stay centered, re-install it.



NOTICE There is a 4" gap between the two decks in the catch basin without the weir assembly. When the catch basins are installed, there will be an 8" gap between the units, due to the wall thickness. The precaster will install a center wall deck plate (5"x12") over the 4" gap, seen in step 5. A field joint plate (9" x 12") ships loose and is installed over the 8" gap by the field installer. The procedure to install both plates is the same, see step 5.

5. Install Center Wall Plate. Slide the long tabs of the centerwall plate under one of the decks. Flatten plate as you push as far as it will go in that direction. Pull plate back until it locks on the other deck. Sikaflex the perimeter of the plate to hold it in this position.



6. Install Field Joint Plate. After both catch basins are set and level, slide the long tabs of the field joint plate under one of the decks. Flatten plate as you push as far as it will go in that direction. Pull plate back until it locks on the other deck. Sikaflex the perimeter of the plate to hold it in this position.



Open vault with field joint plate



Standard deck assembly



Field joint plate in position

7. Seal Perimeter Of Each Internal Component With Sikaflex. Make sure to seal all the way to the top of the weir. The result should be a water tight seal between clean water below the decks & dirty water above.



Sikaflex placement

8. Install Cartridges. Center the cartridge with the coupler in the floor and press the cartridge into position. Cartridge should seat firmly against the coupler. Once cartridges are installed, secure them in place with the hold down bar.



Cartridge placement with hold down bar



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Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regouted and secure at basin wall.
	Settlement/ Mis-alignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault.	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.	

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed	
Vault			compost media.	
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.	
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.	
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.	
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.	
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.	
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab		Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
			Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.	
Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.		
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.	
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.	

Appendix D

Engineering Calculations

- D-1.....Water Quality Calculations
- D-2.....Conveyance Calculations

D-1

**WWHM2012
PROJECT REPORT**

General Model Information

WWHM2012 Project Name: Stormfilters

Site Name:

Site Address: 5330 Butterworth Rd

City: Mercer Island

Report Date: 3/19/2025

Gage: Seatac

Data Start: 1948/10/01

Data End: 2009/09/30

Timestep: 15 Minute

Precip Scale: 0.000 (adjusted)

Version Date: 2023/01/27

Version: 4.2.19

POC Thresholds

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

High Flow Threshold for POC1: 50 Year

Low Flow Threshold for POC2: 50 Percent of the 2 Year

High Flow Threshold for POC2: 50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use C, Forest, Flat	acre 0.11
Pervious Total	0.11
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.11

Area draining to PerkFilter 1
(Treatment Device 1)



Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use C, Forest, Flat	acre 0.05
Pervious Total	0.05
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.05

Area draining to PerkFilter 2
(Treatment Device 2)



Mitigated Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre

Pervious Total 0

Impervious Land Use
ROADS MOD acre
0.11

Impervious Total 0.11

Basin Total 0.11

Area draining to PerkFilter 1
(Treatment Device 1)



Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use ROADS MOD	acre 0.05
Impervious Total	0.05
Basin Total	0.05

Area draining to PerkFilter 2
(Treatment Device 2)

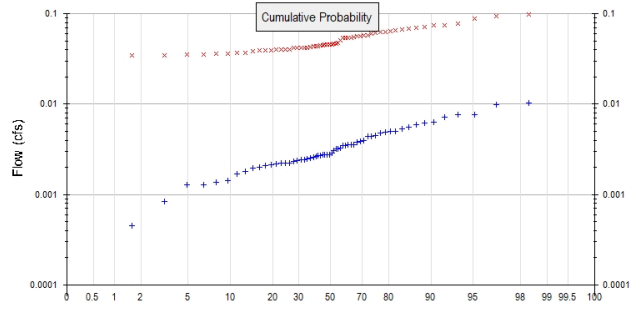
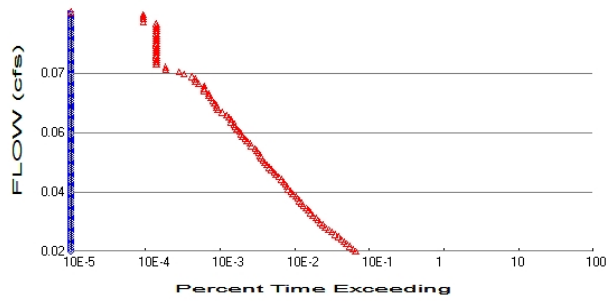


Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 0.11
 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0
 Total Impervious Area: 0.11

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.003234
5 year	0.005079
10 year	0.006125
25 year	0.007233
50 year	0.007918
100 year	0.008501

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.048839
5 year	0.06201
10 year	0.070995
25 year	0.082687
50 year	0.09166
100 year	0.100871

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.003	0.062
1950	0.004	0.064
1951	0.007	0.037
1952	0.002	0.032
1953	0.002	0.038
1954	0.003	0.039
1955	0.004	0.047
1956	0.004	0.044
1957	0.003	0.046
1958	0.003	0.040

1959	0.003	0.044
1960	0.005	0.042
1961	0.003	0.041
1962	0.002	0.035
1963	0.002	0.042
1964	0.003	0.042
1965	0.002	0.048
1966	0.002	0.035
1967	0.004	0.056
1968	0.003	0.075
1969	0.003	0.044
1970	0.002	0.044
1971	0.002	0.054
1972	0.005	0.054
1973	0.002	0.035
1974	0.003	0.050
1975	0.004	0.054
1976	0.003	0.041
1977	0.000	0.041
1978	0.002	0.060
1979	0.001	0.072
1980	0.005	0.075
1981	0.002	0.047
1982	0.004	0.067
1983	0.003	0.056
1984	0.002	0.036
1985	0.001	0.046
1986	0.006	0.040
1987	0.005	0.063
1988	0.002	0.042
1989	0.001	0.066
1990	0.010	0.077
1991	0.006	0.069
1992	0.002	0.036
1993	0.003	0.046
1994	0.001	0.040
1995	0.004	0.042
1996	0.008	0.055
1997	0.006	0.043
1998	0.001	0.046
1999	0.006	0.098
2000	0.003	0.045
2001	0.000	0.056
2002	0.003	0.058
2003	0.003	0.058
2004	0.005	0.095
2005	0.003	0.037
2006	0.004	0.034
2007	0.008	0.089
2008	0.010	0.063
2009	0.005	0.069

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0104	0.0976
2	0.0099	0.0948
3	0.0077	0.0893

4	0.0076	0.0773
5	0.0071	0.0750
6	0.0063	0.0747
7	0.0062	0.0722
8	0.0059	0.0693
9	0.0056	0.0685
10	0.0053	0.0669
11	0.0050	0.0660
12	0.0050	0.0645
13	0.0049	0.0632
14	0.0048	0.0630
15	0.0045	0.0618
16	0.0044	0.0599
17	0.0044	0.0580
18	0.0040	0.0575
19	0.0039	0.0564
20	0.0038	0.0562
21	0.0036	0.0555
22	0.0035	0.0545
23	0.0035	0.0541
24	0.0035	0.0541
25	0.0035	0.0537
26	0.0032	0.0504
27	0.0032	0.0479
28	0.0032	0.0468
29	0.0031	0.0467
30	0.0029	0.0460
31	0.0028	0.0458
32	0.0028	0.0456
33	0.0027	0.0455
34	0.0027	0.0450
35	0.0027	0.0445
36	0.0027	0.0442
37	0.0026	0.0441
38	0.0026	0.0440
39	0.0025	0.0427
40	0.0025	0.0424
41	0.0024	0.0423
42	0.0024	0.0422
43	0.0024	0.0421
44	0.0023	0.0419
45	0.0022	0.0407
46	0.0022	0.0406
47	0.0022	0.0405
48	0.0022	0.0402
49	0.0021	0.0398
50	0.0021	0.0398
51	0.0020	0.0391
52	0.0020	0.0382
53	0.0018	0.0371
54	0.0017	0.0367
55	0.0014	0.0360
56	0.0014	0.0358
57	0.0013	0.0354
58	0.0013	0.0351
59	0.0008	0.0347
60	0.0004	0.0344
61	0.0003	0.0319

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0016	0	1401	n/a	Fail
0.0017	0	1284	n/a	Fail
0.0017	0	1167	n/a	Fail
0.0018	0	1065	n/a	Fail
0.0019	0	980	n/a	Fail
0.0019	0	902	n/a	Fail
0.0020	0	819	n/a	Fail
0.0021	0	739	n/a	Fail
0.0021	0	671	n/a	Fail
0.0022	0	610	n/a	Fail
0.0023	0	552	n/a	Fail
0.0023	0	509	n/a	Fail
0.0024	0	470	n/a	Fail
0.0024	0	435	n/a	Fail
0.0025	0	413	n/a	Fail
0.0026	0	373	n/a	Fail
0.0026	0	345	n/a	Fail
0.0027	0	326	n/a	Fail
0.0028	0	304	n/a	Fail
0.0028	0	279	n/a	Fail
0.0029	0	262	n/a	Fail
0.0030	0	246	n/a	Fail
0.0030	0	234	n/a	Fail
0.0031	0	221	n/a	Fail
0.0031	0	202	n/a	Fail
0.0032	0	191	n/a	Fail
0.0033	0	176	n/a	Fail
0.0033	0	168	n/a	Fail
0.0034	0	160	n/a	Fail
0.0035	0	151	n/a	Fail
0.0035	0	141	n/a	Fail
0.0036	0	131	n/a	Fail
0.0037	0	119	n/a	Fail
0.0037	0	113	n/a	Fail
0.0038	0	104	n/a	Fail
0.0038	0	98	n/a	Fail
0.0039	0	90	n/a	Fail
0.0040	0	84	n/a	Fail
0.0040	0	80	n/a	Fail
0.0041	0	76	n/a	Fail
0.0042	0	74	n/a	Fail
0.0042	0	70	n/a	Fail
0.0043	0	66	n/a	Fail
0.0044	0	63	n/a	Fail
0.0044	0	56	n/a	Fail
0.0045	0	54	n/a	Fail
0.0045	0	49	n/a	Fail
0.0046	0	46	n/a	Fail
0.0047	0	42	n/a	Fail
0.0047	0	41	n/a	Fail
0.0048	0	39	n/a	Fail
0.0049	0	36	n/a	Fail
0.0049	0	34	n/a	Fail

0.0050	0	33	n/a	Fail
0.0051	0	30	n/a	Fail
0.0051	0	30	n/a	Fail
0.0052	0	28	n/a	Fail
0.0052	0	26	n/a	Fail
0.0053	0	23	n/a	Fail
0.0054	0	20	n/a	Fail
0.0054	0	19	n/a	Fail
0.0055	0	19	n/a	Fail
0.0056	0	18	n/a	Fail
0.0056	0	17	n/a	Fail
0.0057	0	16	n/a	Fail
0.0058	0	15	n/a	Fail
0.0058	0	15	n/a	Fail
0.0059	0	13	n/a	Fail
0.0059	0	13	n/a	Fail
0.0060	0	13	n/a	Fail
0.0061	0	11	n/a	Fail
0.0061	0	10	n/a	Fail
0.0062	0	10	n/a	Fail
0.0063	0	9	n/a	Fail
0.0063	0	7	n/a	Fail
0.0064	0	6	n/a	Fail
0.0065	0	4	n/a	Fail
0.0065	0	4	n/a	Fail
0.0066	0	3	n/a	Fail
0.0066	0	3	n/a	Fail
0.0067	0	3	n/a	Fail
0.0068	0	3	n/a	Fail
0.0068	0	3	n/a	Fail
0.0069	0	3	n/a	Fail
0.0070	0	3	n/a	Fail
0.0070	0	3	n/a	Fail
0.0071	0	3	n/a	Fail
0.0072	0	3	n/a	Fail
0.0072	0	3	n/a	Fail
0.0073	0	3	n/a	Fail
0.0073	0	3	n/a	Fail
0.0074	0	3	n/a	Fail
0.0075	0	3	n/a	Fail
0.0075	0	3	n/a	Fail
0.0076	0	3	n/a	Fail
0.0077	0	3	n/a	Fail
0.0077	0	2	n/a	Fail
0.0078	0	2	n/a	Fail
0.0079	0	2	n/a	Fail
0.0079	0	2	n/a	Fail

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

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0.0133 acre-feet

On-line facility target flow: 0.0199 cfs.

Adjusted for 15 min: 0.0199 cfs.

Off-line facility target flow: 0.0112 cfs.

Adjusted for 15 min: 0.0112 cfs.



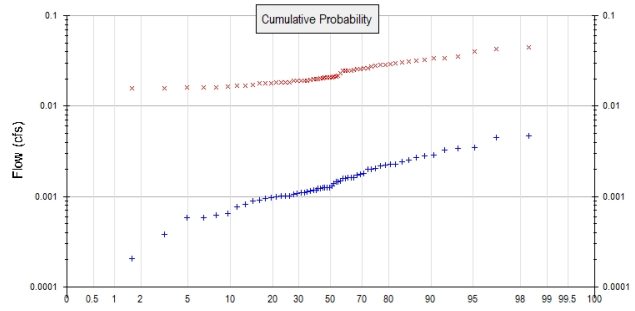
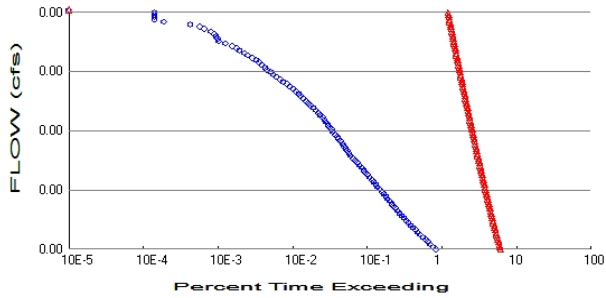
Offline flow for PerkFilter 1
(Treatment Device 1): 0.0112 cfs

Each 12" cartridge in PerkFilter
can treat up to 0.03 cfs. Meaning
only 1 cartridge is needed.

LID Report

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

POC 2



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2

Total Pervious Area: 0.05
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2

Total Pervious Area: 0
Total Impervious Area: 0.05

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.00147
5 year	0.002309
10 year	0.002784
25 year	0.003288
50 year	0.003599
100 year	0.003864

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0.022199
5 year	0.028186
10 year	0.032271
25 year	0.037585
50 year	0.041664
100 year	0.04585

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	Predeveloped	Mitigated
1949	0.001	0.028
1950	0.002	0.029
1951	0.003	0.017
1952	0.001	0.015
1953	0.001	0.017
1954	0.001	0.018
1955	0.002	0.021
1956	0.002	0.020
1957	0.001	0.021
1958	0.001	0.018
1959	0.001	0.020

1960	0.002	0.019
1961	0.001	0.018
1962	0.001	0.016
1963	0.001	0.019
1964	0.001	0.019
1965	0.001	0.022
1966	0.001	0.016
1967	0.002	0.026
1968	0.001	0.034
1969	0.001	0.020
1970	0.001	0.020
1971	0.001	0.025
1972	0.002	0.025
1973	0.001	0.016
1974	0.001	0.023
1975	0.002	0.024
1976	0.001	0.018
1977	0.000	0.018
1978	0.001	0.027
1979	0.001	0.033
1980	0.002	0.034
1981	0.001	0.021
1982	0.002	0.030
1983	0.002	0.025
1984	0.001	0.016
1985	0.001	0.021
1986	0.003	0.018
1987	0.002	0.029
1988	0.001	0.019
1989	0.001	0.030
1990	0.005	0.035
1991	0.003	0.031
1992	0.001	0.016
1993	0.001	0.021
1994	0.000	0.018
1995	0.002	0.019
1996	0.003	0.025
1997	0.003	0.019
1998	0.001	0.021
1999	0.003	0.044
2000	0.001	0.020
2001	0.000	0.026
2002	0.001	0.026
2003	0.002	0.026
2004	0.002	0.043
2005	0.001	0.017
2006	0.002	0.016
2007	0.003	0.041
2008	0.005	0.029
2009	0.002	0.032

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.0047	0.0444
2	0.0045	0.0431
3	0.0035	0.0406
4	0.0034	0.0351

5	0.0032	0.0341
6	0.0029	0.0339
7	0.0028	0.0328
8	0.0027	0.0315
9	0.0025	0.0311
10	0.0024	0.0304
11	0.0023	0.0300
12	0.0023	0.0293
13	0.0022	0.0287
14	0.0022	0.0286
15	0.0021	0.0281
16	0.0020	0.0272
17	0.0020	0.0263
18	0.0018	0.0262
19	0.0018	0.0256
20	0.0017	0.0256
21	0.0016	0.0252
22	0.0016	0.0248
23	0.0016	0.0246
24	0.0016	0.0246
25	0.0016	0.0244
26	0.0015	0.0229
27	0.0015	0.0218
28	0.0014	0.0213
29	0.0014	0.0212
30	0.0013	0.0209
31	0.0013	0.0208
32	0.0013	0.0207
33	0.0012	0.0207
34	0.0012	0.0205
35	0.0012	0.0202
36	0.0012	0.0201
37	0.0012	0.0200
38	0.0012	0.0200
39	0.0011	0.0194
40	0.0011	0.0193
41	0.0011	0.0192
42	0.0011	0.0192
43	0.0011	0.0191
44	0.0011	0.0190
45	0.0010	0.0185
46	0.0010	0.0184
47	0.0010	0.0184
48	0.0010	0.0183
49	0.0010	0.0181
50	0.0010	0.0181
51	0.0009	0.0178
52	0.0009	0.0174
53	0.0008	0.0169
54	0.0008	0.0167
55	0.0007	0.0164
56	0.0006	0.0163
57	0.0006	0.0161
58	0.0006	0.0160
59	0.0004	0.0158
60	0.0002	0.0157
61	0.0001	0.0145

Duration Flows

The Duration Matching **Failed**

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0007	17547	130557	744	Fail
0.0008	16202	127948	789	Fail
0.0008	14994	125296	835	Fail
0.0008	13877	122708	884	Fail
0.0009	12831	120312	937	Fail
0.0009	11828	117938	997	Fail
0.0009	10910	115628	1059	Fail
0.0009	10128	113296	1118	Fail
0.0010	9394	111136	1183	Fail
0.0010	8737	109061	1248	Fail
0.0010	8151	107072	1313	Fail
0.0011	7597	105105	1383	Fail
0.0011	7060	103137	1460	Fail
0.0011	6590	101255	1536	Fail
0.0011	6145	99437	1618	Fail
0.0012	5788	97747	1688	Fail
0.0012	5437	96014	1765	Fail
0.0012	5108	94367	1847	Fail
0.0013	4815	92699	1925	Fail
0.0013	4530	91074	2010	Fail
0.0013	4259	89384	2098	Fail
0.0013	4019	87780	2184	Fail
0.0014	3784	86261	2279	Fail
0.0014	3551	84742	2386	Fail
0.0014	3339	83309	2495	Fail
0.0015	3138	81855	2608	Fail
0.0015	2952	80465	2725	Fail
0.0015	2785	79139	2841	Fail
0.0015	2599	77812	2993	Fail
0.0016	2451	76529	3122	Fail
0.0016	2310	75331	3261	Fail
0.0016	2162	74048	3424	Fail
0.0017	2028	72786	3589	Fail
0.0017	1901	71588	3765	Fail
0.0017	1790	70455	3936	Fail
0.0017	1689	69300	4103	Fail
0.0018	1590	68209	4289	Fail
0.0018	1483	67075	4522	Fail
0.0018	1381	65984	4777	Fail
0.0019	1292	64894	5022	Fail
0.0019	1220	63781	5227	Fail
0.0019	1155	62733	5431	Fail
0.0020	1098	61685	5617	Fail
0.0020	1049	60680	5784	Fail
0.0020	997	59760	5993	Fail
0.0020	930	58819	6324	Fail
0.0021	884	57835	6542	Fail
0.0021	838	56916	6791	Fail
0.0021	789	55974	7094	Fail
0.0022	743	55098	7415	Fail
0.0022	713	54199	7601	Fail
0.0022	669	53408	7983	Fail
0.0022	631	52552	8328	Fail
0.0023	596	51697	8673	Fail

0.0023	566	50884	8990	Fail
0.0023	539	50093	9293	Fail
0.0024	496	49301	9939	Fail
0.0024	473	48553	10264	Fail
0.0024	436	47825	10969	Fail
0.0024	401	47098	11745	Fail
0.0025	369	46350	12560	Fail
0.0025	348	45644	13116	Fail
0.0025	323	44938	13912	Fail
0.0026	296	44275	14957	Fail
0.0026	272	43569	16018	Fail
0.0026	256	42927	16768	Fail
0.0026	235	42243	17975	Fail
0.0027	217	41623	19181	Fail
0.0027	195	40981	21015	Fail
0.0027	180	40382	22434	Fail
0.0028	158	39762	25165	Fail
0.0028	145	39184	27023	Fail
0.0028	129	38585	29910	Fail
0.0028	119	38029	31957	Fail
0.0029	109	37473	34378	Fail
0.0029	97	36853	37992	Fail
0.0029	91	36254	39839	Fail
0.0030	82	35719	43559	Fail
0.0030	76	35185	46296	Fail
0.0030	69	34671	50247	Fail
0.0030	61	34158	55996	Fail
0.0031	54	33687	62383	Fail
0.0031	48	33217	69202	Fail
0.0031	41	32725	79817	Fail
0.0032	38	32233	84823	Fail
0.0032	33	31805	96378	Fail
0.0032	27	31292	115896	Fail
0.0033	22	30821	140095	Fail
0.0033	21	30351	144528	Fail
0.0033	20	29902	149510	Fail
0.0033	19	29474	155126	Fail
0.0034	17	29046	170858	Fail
0.0034	14	28618	204414	Fail
0.0034	12	28190	234916	Fail
0.0035	9	27741	308233	Fail
0.0035	4	27335	683375	Fail
0.0035	3	26971	899033	Fail
0.0035	3	26586	886200	Fail
0.0036	3	26223	874100	Fail
0.0036	3	25859	861966	Fail

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

The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #2

On-line facility volume: 0.006 acre-feet

On-line facility target flow: 0.009 cfs.

Adjusted for 15 min: 0.009 cfs.

Off-line facility target flow: 0.0051 cfs.

Adjusted for 15 min: 0.0051 cfs.



Offline flow for PerkFilter 2
(Treatment Device 2): 0.0051 cfs

Each 12" cartridge in PerkFilter
can treat up to 0.03 cfs. Meaning
only 1 cartridge is needed.

LID Report

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

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 4

POC #4 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 5

POC #5 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 6

POC #6 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 7

POC #7 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 8

POC #8 was not reported because POC must exist in both scenarios and both scenarios must have been run.

POC 9

POC #9 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

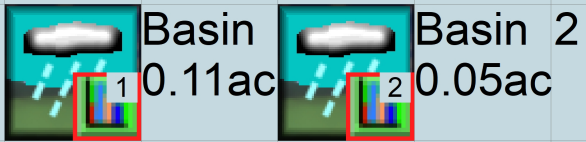
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

```
WVHM4 model simulation
START      1948 10 01      END      2009 09 30
RUN INTERP OUTPUT LEVEL   3      0
RESUME     0 RUN          1
UNIT SYSTEM 1
```

END GLOBAL

FILES

```
<File> <Un#> <-----File Name----->***
<-ID->                                     ***
WDM      26      Stormfilters.wdm
MESSU    25      PreStormfilters.MES
          27      PreStormfilters.L61
          28      PreStormfilters.L62
          30      POCStormfilters1.dat
          31      POCStormfilters2.dat
```

END FILES

OPN SEQUENCE

```
INGRP          INDELT 00:15
  PERLND        10
  COPY          501
  COPY          502
  DISPLY        1
  DISPLY        2
```

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INFO1

```
# - #<-----Title----->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
  1   Basin 1          MAX          1   2   30   9
  2   Basin 2          MAX          1   2   31   9
```

END DISPLY-INFO1

END DISPLY

COPY

TIMESERIES

```
# - # NPT NMN ***
  1   1   1
501   1   1
502   1   1
```

END TIMESERIES

END COPY

GENER

OPCODE

```
# # OPCD ***
```

END OPCODE

PARM

```
# # K ***
```

END PARM

END GENER

PERLND

GEN-INFO

```
<PLS ><-----Name----->NBLKS Unit-systems Printer ***
# - # User t-series Engl Metr ***
          in out ***
  10   C, Forest, Flat  1   1   1   1   27   0
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

```
<PLS > ***** Active Sections *****
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
  10   0   0   1   0   0   0   0   0   0   0   0   0   0
```

END ACTIVITY

PRINT-INFO

```

<PLS > ***** Print-flags ***** PIVL  PYR
# - # ATMP SNOW PWAT  SED  PST  PWG  PQAL MSTL PEST NITR PHOS TRAC  *****
10  - 0  0  4  0  0  0  0  0  0  0  0  0  0  1  9
END PRINT-INFO

```

```

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

```

```

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

```

```

PWAT-PARM3
<PLS > PWATER input info: Part 3          ***
# - # ***PETMAX  PETMIN  INFEXP  INFILD  DEEPFR  BASETP  AGWETP
10  - 0  0  2  2  0  0  0
END PWAT-PARM3

```

```

PWAT-PARM4
<PLS > PWATER input info: Part 4          ***
# - # CEPSC  UZSN  NSUR  INTFW  IRC  LZETP ***
10  - 0.2  0.5  0.35  6  0.5  0.7
END PWAT-PARM4

```

```

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS  SURS  UZS  IFWS  LZS  AGWS  GWVS
10  - 0  0  0  0  2.5  1  0
END PWAT-STATE1

```

END PERLND

IMPLND

```

GEN-INFO
<PLS ><-----Name----->  Unit-systems  Printer ***
# - #  User t-series Engl Metr ***
in out ***

```

```

END GEN-INFO
*** Section IWATER***

```

```

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

```

```

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

```

```

IWAT-PARM1
<PLS > IWATER variable monthly parameter value flags ***
# - # CSNO RTOP  VRS  VNN RTLI  ***
END IWAT-PARM1

```

```

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

```

```

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

```


END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES

<-Volume->	<Member>	SsysSgap	<--Mult-->	Tran	<-Target	vols>	<-Grp>	<-Member->	***	
<Name>	#	<Name>	#	tem strg	<-factor->	strg	<Name>	#	#	***
WDM	2	PREC	ENGL	1	PERLND	1 999	EXTNL	PREC		
WDM	2	PREC	ENGL	1	IMPLND	1 999	EXTNL	PREC		
WDM	1	EVAP	ENGL	0.76	PERLND	1 999	EXTNL	PETINP		
WDM	1	EVAP	ENGL	0.76	IMPLND	1 999	EXTNL	PETINP		

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***	
<Name>	#	<Name>	#	#	<-factor->	strg	<Name>	#	<Name>	tem strg	strg***
COPY	501	OUTPUT	MEAN	1 1	48.4	WDM	501	FLOW	ENGL	REPL	
COPY	502	OUTPUT	MEAN	1 1	48.4	WDM	502	FLOW	ENGL	REPL	

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member->	<--Mult-->	<Target>	<-Grp>	<-Member->	***	
<Name>	#	<Name>	#	<-factor->	<Name>	#	#	***
MASS-LINK		12						
PERLND	PWATER	SURO		0.083333	COPY	INPUT	MEAN	
END MASS-LINK		12						
MASS-LINK		13						
PERLND	PWATER	IFWO		0.083333	COPY	INPUT	MEAN	
END MASS-LINK		13						

END MASS-LINK

END RUN

Mitigated UCI File

RUN

GLOBAL

```
WVHM4 model simulation
START      1948 10 01      END      2009 09 30
RUN INTERP OUTPUT LEVEL   3      0
RESUME     0 RUN         1
UNIT SYSTEM 1
```

END GLOBAL

FILES

```
<File> <Un#> <-----File Name----->***
<-ID->                                     ***
WDM      26      Stormfilters.wdm
MESSU    25      MitStormfilters.MES
          27      MitStormfilters.L61
          28      MitStormfilters.L62
          30      POCStormfilters1.dat
          31      POCStormfilters2.dat
```

END FILES

OPN SEQUENCE

```
INGRP          INDELT 00:15
  IMPLND        2
  COPY          501
  COPY          502
  DISPLY        1
  DISPLY        2
```

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INFO1

```
# - #<-----Title----->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
  1      Basin 1          MAX          1      2      30      9
  2      Basin 2          MAX          1      2      31      9
```

END DISPLY-INFO1

END DISPLY

COPY

TIMESERIES

```
# - # NPT NMN ***
  1      1      1
  501    1      1
  502    1      1
```

END TIMESERIES

END COPY

GENER

OPCODE

```
#      # OPCD ***
```

END OPCODE

PARM

```
#      #          K ***
```

END PARM

END GENER

PERLND

GEN-INFO

```
<PLS ><-----Name----->NBLKS  Unit-systems  Printer ***
# - #          User t-series Engl Metr ***
          in out          ***
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

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

END ACTIVITY

PRINT-INFO

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

END PRINT-INFO

PWAT-PARM1

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

END PWAT-PARM1

PWAT-PARM2

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

END PWAT-PARM2

PWAT-PARM3

<PLS > PWATER input info: Part 3 ***
- # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP

END PWAT-PARM3

PWAT-PARM4

<PLS > PWATER input info: Part 4 ***
- # CEPSC UZSN NSUR INTFW IRC LZETP ***

END PWAT-PARM4

PWAT-STATE1

<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
- # *** CEPS SURS UZS IFWS LZS AGWS GWVS

END PWAT-STATE1

END PERLND

IMPLND

GEN-INFO

<PLS ><-----Name-----> Unit-systems Printer ***
- # User t-series Engl Metr ***
in out ***
2 ROADS/MOD 1 1 1 27 0

END GEN-INFO

*** Section IWATER***

ACTIVITY

<PLS > ***** Active Sections *****
- # ATMP SNOW IWAT SLD IWG IQAL ***
2 0 0 1 0 0 0

END ACTIVITY

PRINT-INFO

<ILS > ***** Print-flags ***** PIVL PYR
- # ATMP SNOW IWAT SLD IWG IQAL *****
2 0 0 4 0 0 4 1 9

END PRINT-INFO

IWAT-PARM1

<PLS > IWATER variable monthly parameter value flags ***
- # CSNO RTOP VRS VNN RTLI ***

END IWAT-PARM1

IWAT-PARM2

<PLS > IWATER input info: Part 2 ***
- # *** LSUR SLSUR NSUR RETSC
2 400 0.05 0.1 0.08

END IWAT-PARM2

IWAT-PARM3

<PLS > IWATER input info: Part 3 ***
- # ***PETMAX PETMIN
2 0 0

END IWAT-PARM3

IWAT-STATE1

<PLS > *** Initial conditions at start of simulation

EXT SOURCES

```

<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> # <Name> # tem strg<-factor->strg <Name> # # <Name> # # ***
WDM 2 PREC ENGL 1 PERLND 1 999 EXTNL PREC
WDM 2 PREC ENGL 1 IMPLND 1 999 EXTNL PREC
WDM 1 EVAP ENGL 0.76 PERLND 1 999 EXTNL PETINP
WDM 1 EVAP ENGL 0.76 IMPLND 1 999 EXTNL PETINP

```

END EXT SOURCES

EXT TARGETS

```

<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name> # <Name> # #<-factor->strg <Name> # <Name> tem strg strg***
COPY 1 OUTPUT MEAN 1 1 48.4 WDM 701 FLOW ENGL REPL
COPY 501 OUTPUT MEAN 1 1 48.4 WDM 801 FLOW ENGL REPL
COPY 2 OUTPUT MEAN 1 1 48.4 WDM 702 FLOW ENGL REPL
COPY 502 OUTPUT MEAN 1 1 48.4 WDM 802 FLOW ENGL REPL

```

END EXT TARGETS

MASS-LINK

```

<Volume> <-Grp> <-Member-><--Mult--> <Target> <-Grp> <-Member->***
<Name> <Name> # #<-factor-> <Name> <Name> # #***
MASS-LINK 15
IMPLND IWATER SURO 0.083333 COPY INPUT MEAN
END MASS-LINK 15

```

END MASS-LINK

END RUN

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

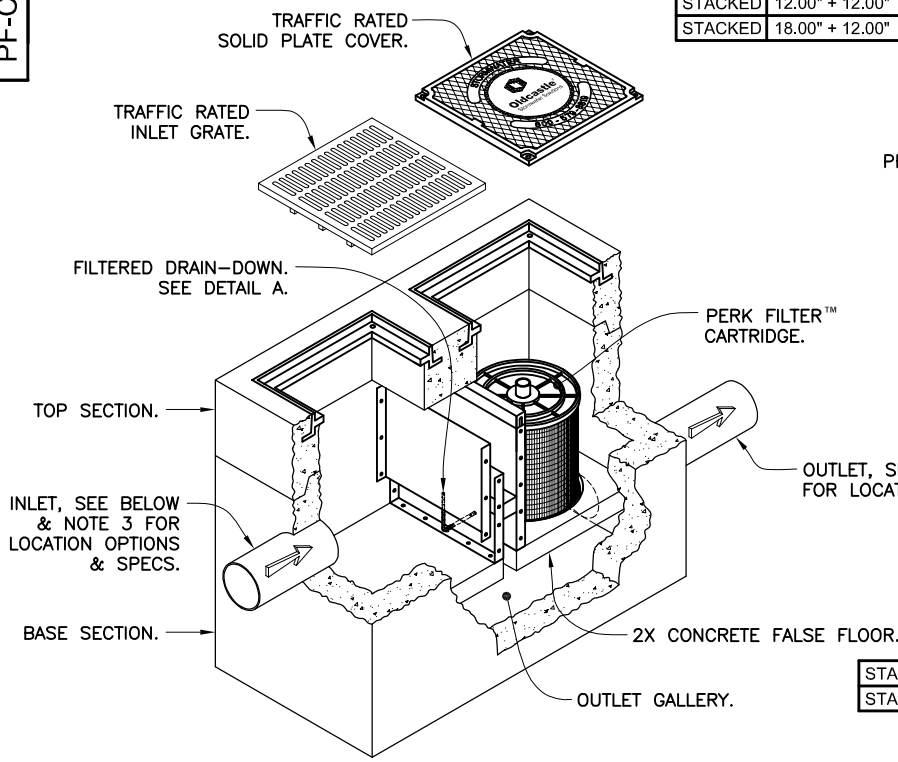
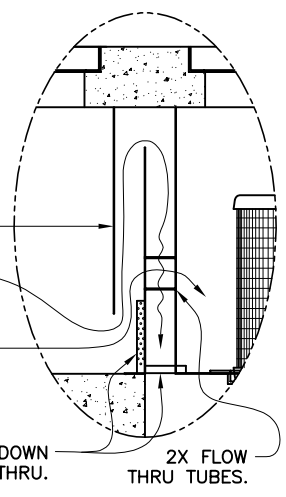
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6200 Capitol Blvd. Ste F
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Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

Cartridge size needed for both treatment devices

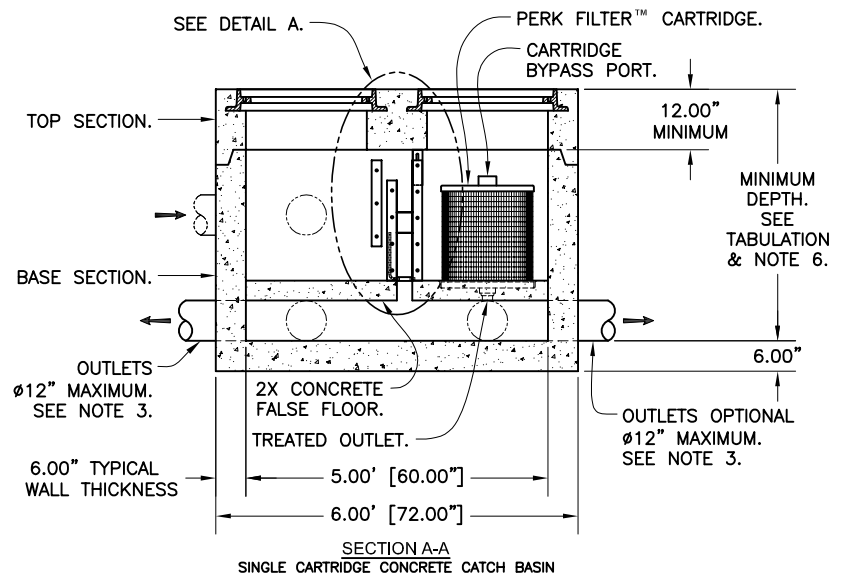
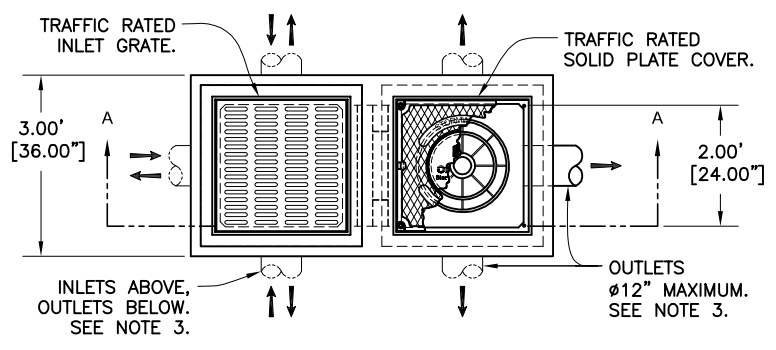
	CARTRIDGE SIZE	TREATMENT FLOW RATE GPM / CFS	TOTAL FLOW CAPACITY CFS
	12.00"	12 / 0.03	1.3
	18.00"	18 / 0.04	1.3
STACKED	12.00" + 12.00"	24 / 0.05	1.3
STACKED	18.00" + 12.00"	30 / 0.07	1.3



DETAIL A
INLET / BYPASS ASSEMBLY & DRAIN-DOWN SCALE: 2X

MINIMUM DEPTHS (SEE NOTE 6)				
CARTRIDGE SIZE	Ø 6.0" OUTLET PIPE (IN INCHES)	Ø 8.0" OUTLET PIPE (IN INCHES)	Ø 10.0" OUTLET PIPE (IN INCHES)	Ø 12.0" OUTLET PIPE (IN INCHES)
12.00"	39	41	43	45
18.00"	46	48	50	52
STACKED 12.00" + 12.00"	56	58	60	62
STACKED 18.00" + 12.00"	63	65	67	69

- Notes:**
1. Precast concrete structure shall be manufactured in accordance with ASTM Designation C857 and C858.
 2. Perk Filter™ Catch basin shall be supplied with traffic rated (H20) bicycle-proof grates and solid plate cover.
 3. Inlet pipe(s) may enter device on three sides of the inlet chamber. Outlet pipe(s) may exit on all four sides. All pipe is Ø 12" maximum.
 4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.
 5. Perk Filter™ cartridge shall be maintained in accordance with manufacturer recommendations.
 6. For depths less than the specified minimum contact Oldcastle® Stormwater Solutions for engineering assistance.



Perk Filter™
Concrete Catch Basin
Single Cartridge



Oldcastle®
Stormwater Solutions

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DRAWING NO. PF-CCB-0001	REV J	ECO ECO-0144	DATE ZHD 8/26/16	DRAWN BY JPR 6/4/08	SHEET 1 OF 1
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Exhibit D-2 Conveyance Calculation for 8-inch Pipe - 10-year, 24-hour Storm – North Outfall

Rational Method

$$Q = CIA$$

I = 3.2 in/hr (Provided by King County Isopluvials – See Attached)

$A_{\text{impervious}} = 22,500$ sf (Proposed and existing impervious areas directed to north outfall - worst case scenario)

$$A_{\text{impervious}} = 0.52 \text{ acres}$$

$C_{\text{impervious}} = 0.8$ (80% pavement/roofs at 0.9 and 20% lawn at 0.3)

$$Q_{\text{impervious}} = (0.80 \times 2.7 \times 0.52)$$

$$Q_{\text{total}} = \mathbf{1.12 \text{ cfs}}$$

Manning's Equation: (for pipe flowing full)

$$Q = (1.49/n)(A)(D/4)^{2/3}(S)^{1/2}$$

8-inch Pipe Conveying Flows From the Entire Site (worst case scenario):

$$A = 8/12 \text{ ft}$$

$$S = 0.01 \text{ (ft/ft)}$$

$$n = 0.011 \text{ (PVC)}$$

$$Q = (1.49/0.011) (\pi/4)(8/12)^2 ((8/12)/4)^{2/3} (0.01)^{1/2}$$

$$Q = 1.43 \text{ cfs}$$

$$Q_{\text{actual}} = \mathbf{1.12 \text{ cfs (sizing is okay)}}$$

Exhibit D-2 Conveyance Calculation for 8-inch Pipe - 10-year, 24-hour Storm – South Outfall

Rational Method

$$Q=CIA$$

I = 3.2 in/hr (Provided by King County Isopluvials – See Attached)

$A_{\text{impervious}} = 15,000$ sf (Proposed and existing impervious areas directed to north outfall - worst case scenario)

$$A_{\text{impervious}} = 0.35 \text{ acres}$$

$C_{\text{impervious}} = 0.8$ (80% pavement/roofs at 0.9 and 20% lawn at 0.3)

$$Q_{\text{impervious}} = (0.80 \times 2.7 \times 0.35)$$

$$Q_{\text{total}} = \mathbf{0.76 \text{ cfs}}$$

Manning's Equation: (for pipe flowing full)

$$Q = (1.49/n)(A)(D/4)^{2/3}(S)^{1/2}$$

8-inch Pipe Conveying Flows From the Entire Site (worst case scenario):

$$A = 8/12 \text{ ft}$$

$$S = 0.01 \text{ (ft/ft)}$$

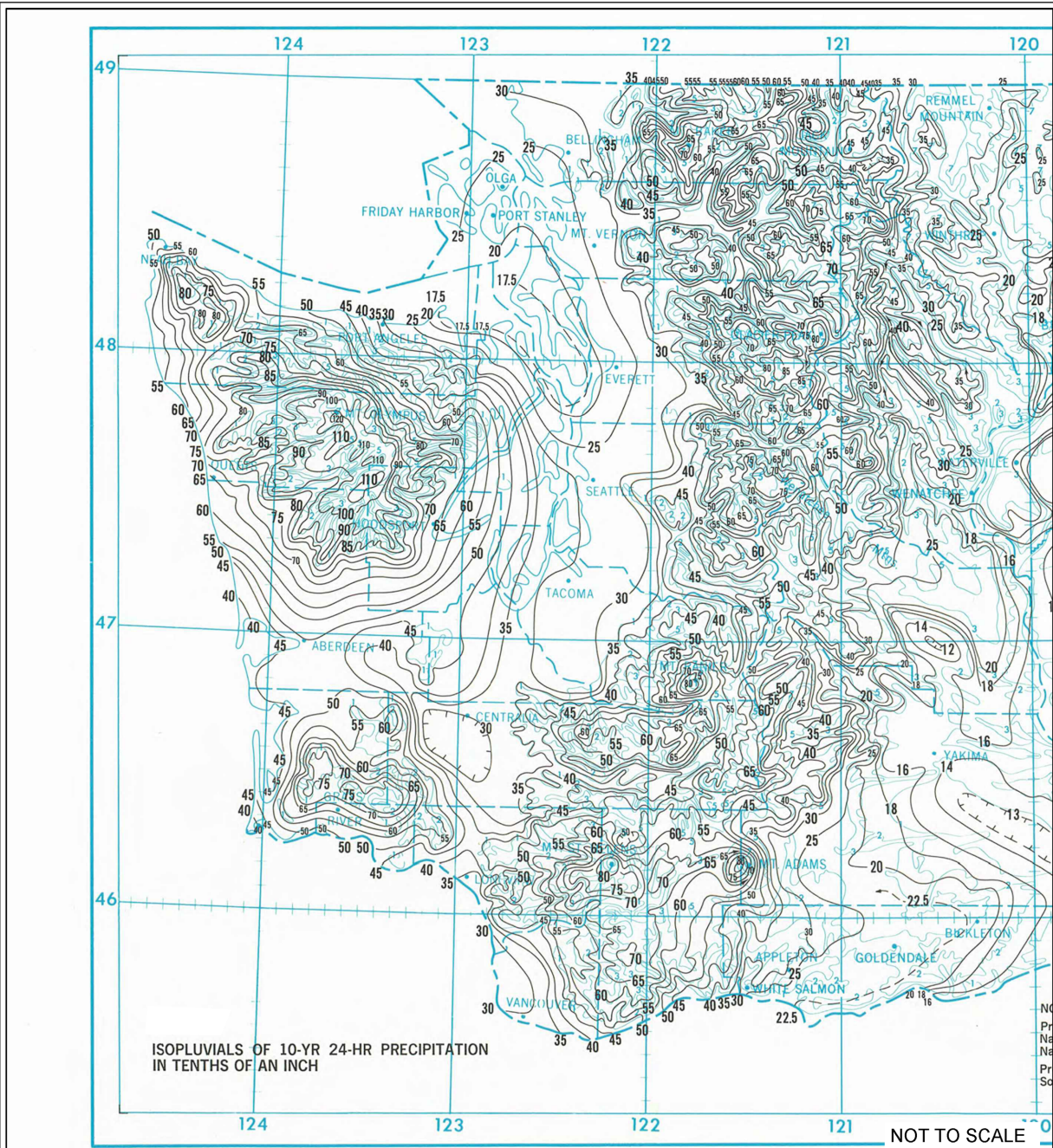
$$n = 0.011 \text{ (PVC)}$$

$$Q = (1.49/0.011) (\pi/4)(8/12)^2 ((8/12)/4)^{2/3} (0.01)^{1/2}$$

$$Q = 1.43 \text{ cfs}$$

$$Q_{\text{actual}} = \mathbf{1.12 \text{ cfs (sizing is okay)}}$$

Figure III-B.2: Western Washington Isopluvial 10-year, 24 hour



Western Washington Isopluvial 10-year, 24 hour

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