Fused Elements

4525 Forest Avenue Southeast, Mercer Island, WA 98040

Storm Drain Report

September 8, 2023 | Building Permit

kpff Consulting Engineers

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Storm Drain Report

September 8, 2023

Prepared for:

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September 8, 2023

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1. Project Overview

PROJECT DESCRIPTION

Fused Elements is a single-family residential project located at 4525 Forest Avenue Southeast. The site is bounded by Lake Washington to the west, Forest Avenue Southeast to the east, private property to the north, and public right of way to the south. The project will construct a three-story house. Associated site work around the house location will include partially reconstructing the existing driveway, constructing new retaining walls, and new landscaping and grading around the house. Associated utility work will consist of installing a new water service that runs from Forest Avenue Southeast down to the house and new storm drainage for the site.

Figure 1 shows the approximate location of the Fused Elements site.

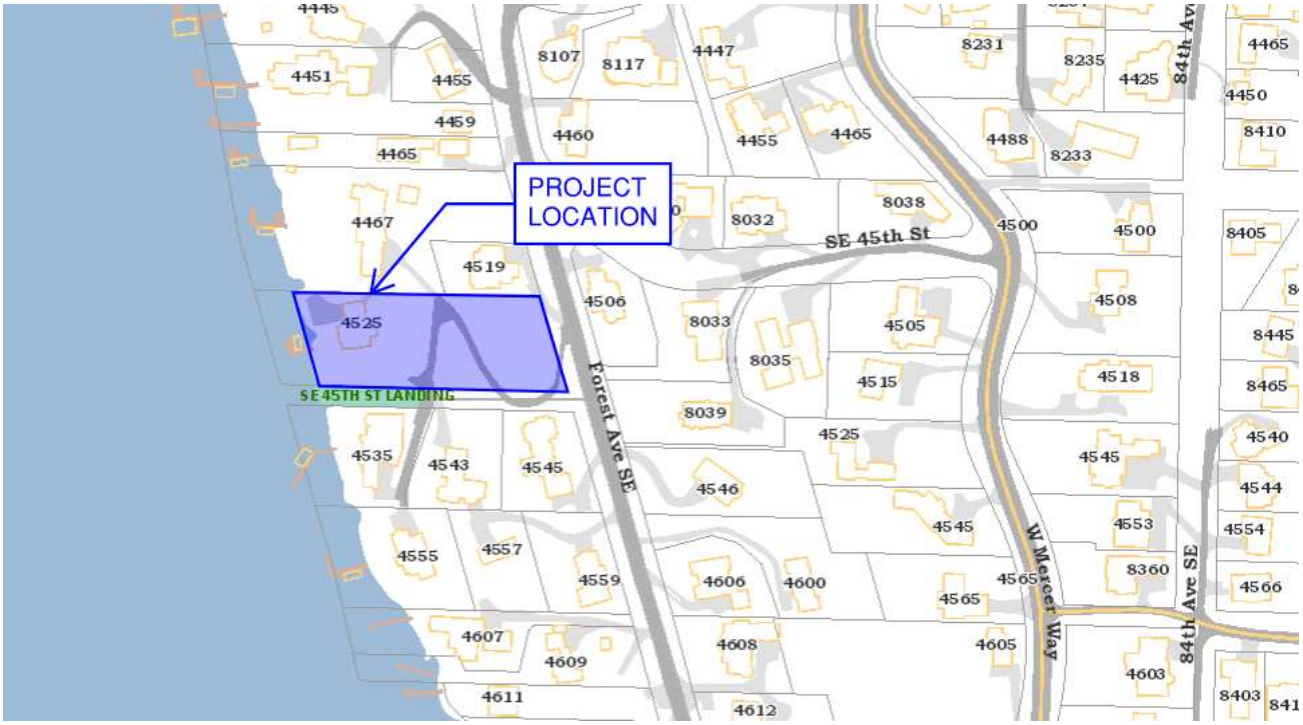

Figure 1: Vicinity Map (Mercer Island GIS Web Map)

EXISTING CONDITIONS

The existing site consists of an asphalt driveway which winds down from Forest Avenue Southeast to an existing single-family home located near the lake on the west side of the site. The driveway has several branching-off points which serve adjacent homes to the north and south. The areas around the house and driveway contain a variety of trees, lawn, and landscape areas. The parcel contains a watercourse which runs through the site from near the northeast corner to the middle of the southern edge of the parcel. The watercourse is primarily piped, with one open segment adjacent to the existing driveway. The topography is steep, dropping approximately 90 feet from the high side on the east to the lake's edge on the west.

Stormwater runoff generally appears to sheet flow down the slope. The upper portion of the site generally drains to the open section of the watercourse and the lower portion of the site generally drains to the lake. The watercourse discharges to Lake Washington within a quarter mile of the site and therefore the entire parcel is a single Threshold Discharge Area (TDA)

PROPOSED CONDITIONS

The proposed development includes demolition of the existing house and construction of a new single-family house. The lower portion of the existing asphalt driveway will be demolished and replaced with a concrete driveway to provide access to the new house. Retaining walls will be constructed along the driveway. Associated grading work will occur around the house and the replaced portion of the driveway. Work will occur primarily in the western portion of the site. Work on the eastern portion of the parcel is limited to the installation of a new two-inch water service which will run from Forest Avenue Southeast to the proposed house. Installation of the water service will not change the grading or surface coverage of the site.

Stormwater from the untouched portions of the site will continue to follow their current drainage pattern, with the upper portion of the site draining to the watercourse. Stormwater from the replaced portion of the driveway, the house, and upstream areas tributary to the disturbed portion of the site will be directed to a dispersion trench located in the landscaped area between the house and Lake Washington. The dispersion trench will allow runoff to be discharged to Lake Washington as unconcentrated sheet flow.

Refer to Appendix A, Figure A1, for the Proposed Conditions map with further detail on the post-developed condition surface types and Appendix A, Figure A2 for a delineation of the areas draining to the dispersion trench.

APPLICABLE STORMWATER DESIGN MANUAL

Per the Mercer Island Municipal Code (BMC), Chapter 15.09, the 2012 Department of Ecology Stormwater Management Manual for Western Washington, as amended in 2014 (SWMMWW) is adopted as the governing manual for stormwater system requirements.

2. Minimum Requirements

The proposed Fused Elements site as defined in the SWMMWW, has less than 35% existing hard surface coverage and results in more than 5,000 square feet of new plus replaced hard surface areas; therefore, all Minimum Requirements apply to new and replaced hard surfaces and converted vegetation areas.

Table 2-1 shows the applicable Minimum Requirements. See below for further discussion of Minimum Requirements.

Table 2-1: Summary of Applicable Minimum Requirements

Minimum Requirement	Bay Bowl Apartments
MR No. 1 – Preparation of Stormwater Site Plans	Followed in accordance with SWMMWW
MR No. 2 – Construction Stormwater Pollution Prevention	Followed in accordance with SWMMWW
MR No. 3 – Source Control of Pollution	Not Applicable
MR No. 4 – Preservation of Natural Drainage System and Outfalls	Followed in accordance with SWMMWW
MR No. 5 – On-Site Stormwater Management	Followed in accordance with SWMMWW
MR No. 6 – Runoff Treatment	Followed in accordance with SWMMWW
MR No. 7 – Flow Control	Followed in accordance with SWMMWW
MR No. 8 – Wetlands Protection	Not Applicable
MR No. 9 – Operation and Maintenance	Followed in accordance with SWMMWW

Minimum Requirement No. 1: Preparation of Stormwater Site Plans

This Storm Drain Report has been prepared in accordance with the SWMMWW to fulfill MR No. 1.

Minimum Requirement No. 2: Construction Stormwater Pollution Prevention (SWPP)

The project adds more than 2,000 square feet of new and replaced hard surfaces; therefore, a Construction SWPP Plan (SWPPP) has been prepared in conjunction with the building permit submittal. The SWPPP depicts locations and sizes of Best Management Practices (BMPs) used to meet National Pollution Discharge Elimination System (NPDES) requirements. Refer to the Construction SWPPP (submitted under separate cover) for further detail on BMPs.

Minimum Requirement No. 3: Source Control of Pollution

The proposed project does not contain any known specific sources of pollution such as fuel tanks, chemical storage, or vehicle maintenance yards. No specific source control BMPs or spill prevention plans are proposed for permanent installation. For information on temporary BMPs, see the SWPPP submitted under separate cover.

Minimum Requirement No. 4: Preservation of Natural Drainage Systems and Outfalls

Existing natural drainage patterns will be maintained, and discharges from the project site will occur at the natural location. Stormwater runoff from the site will continue to sheet flow to Lake Washington. Refer to Section 3 “Permanent Stormwater Control” for further information on proposed drainage patterns.

Minimum Requirement No. 5: On-Site Stormwater Management

This project is flow control exempt; see the “Minimum Requirement No. 7: Flow Control” section for more information. Therefore, the project does not have to achieve the LID performance standard, however, the following BMPs must be evaluated for all surfaces per the SWMMWW Volume 1 Section 2.5.5, and implemented to the extent feasible.

- Post-Construction Soil Quality and Depth (BMP T5.13)
- Downspout Full Infiltration Systems (BMP T5.10A)

- Downspout Dispersion Systems (BMP T5.10B)
- Perforated Stub-out Connections (BMP T5.10C)
- Concentrated Flow Dispersion (BMP T5.11)
- Sheet Flow Dispersion (BMP T5.12)

Post-Construction Soil Quality and Depth (BMP T5.13) will be applied to all proposed pervious landscape areas that are being created as part of this project.

Downspout full infiltration and perforated stub-out connections are infeasible because the project site is infeasible for infiltration per the City of Mercer Island's Infiltration Map. Downspout dispersion systems will be implemented to the maximum extent feasible. See Section 3 for more information.

Sheet flow dispersion and concentrated flow dispersion are infeasible because the minimum flowpaths cannot be met between impervious areas, building, property lines, and the lake. However, impervious surfaces such as the driveway which are uphill of the building will be collected and directed to the dispersion trenches described in Section 3.

Minimum Requirement No. 6: Runoff Treatment

This project proposes less than 5,000 square feet of pollution-generating hard surfaces (PGHS) and less than three-quarters of an acre of pollution-generating pervious surfaces; therefore, per the SWMMWW Volume 1, Section 2.5.6, runoff treatment is not required.

Minimum Requirement No. 7: Flow Control

Flow control is not required for this site because it discharges to Lake Washington, which is a Flow Control Exempt Receiving Water per the SWMMWW Appendix I-E. Per Volume 1, Section 2.5.7, projects discharging to a Flow Control Exempt Receiving Water are not required to provide flow control.

Minimum Requirement No. 8: Wetlands Protection

The project does not discharge to a wetland; therefore, the requirements of Volume I, Section 2.5.8 of the SWMMWW do not apply.

Minimum Requirement No. 9: Operations and Maintenance

An Operations and Maintenance Manual meeting in accordance with the SWMMWW will be provided to the owner prior to project completion.

3. Permanent Stormwater Control

Stormwater from the site will be discharged to Lake Washington. To avoid concentrated discharge to the lake and maintain the natural sheet flow discharge, runoff from the portions of the site that are collected will be sent to a dispersion trench, which will disperse runoff to sheet flow through landscaping west of the building to Lake Washington. As discussed under MR 7, the project is not required to provide flow control and the purpose of this dispersion trench is to avoid concentrated discharge to Lake Washington; the sizing described below will not provide flow control for the site but will serve to disperse runoff.

Due to space constraints at the site, it was not feasible for the dispersion trenches to fully meet the design criteria listed in BMP T5.10B, however, the system was designed to the maximum extent feasible. It was not feasible to size the trenches per the 10-foot of trench per 700 square feet of roof area due to the size of the

roof and space constraints of the site. The trench was sized using the design criteria for BMP C206: Level Spreader, which requires 15 feet of length for 0.1 cfs flow and an additional 10 feet of length per additional 0.1 cfs flow.

See Appendix A Figure A2 for the areas draining to the dispersion trenches and Appendix B for sizing calculations.

Appendix A

Land Use Maps

List of Figures:

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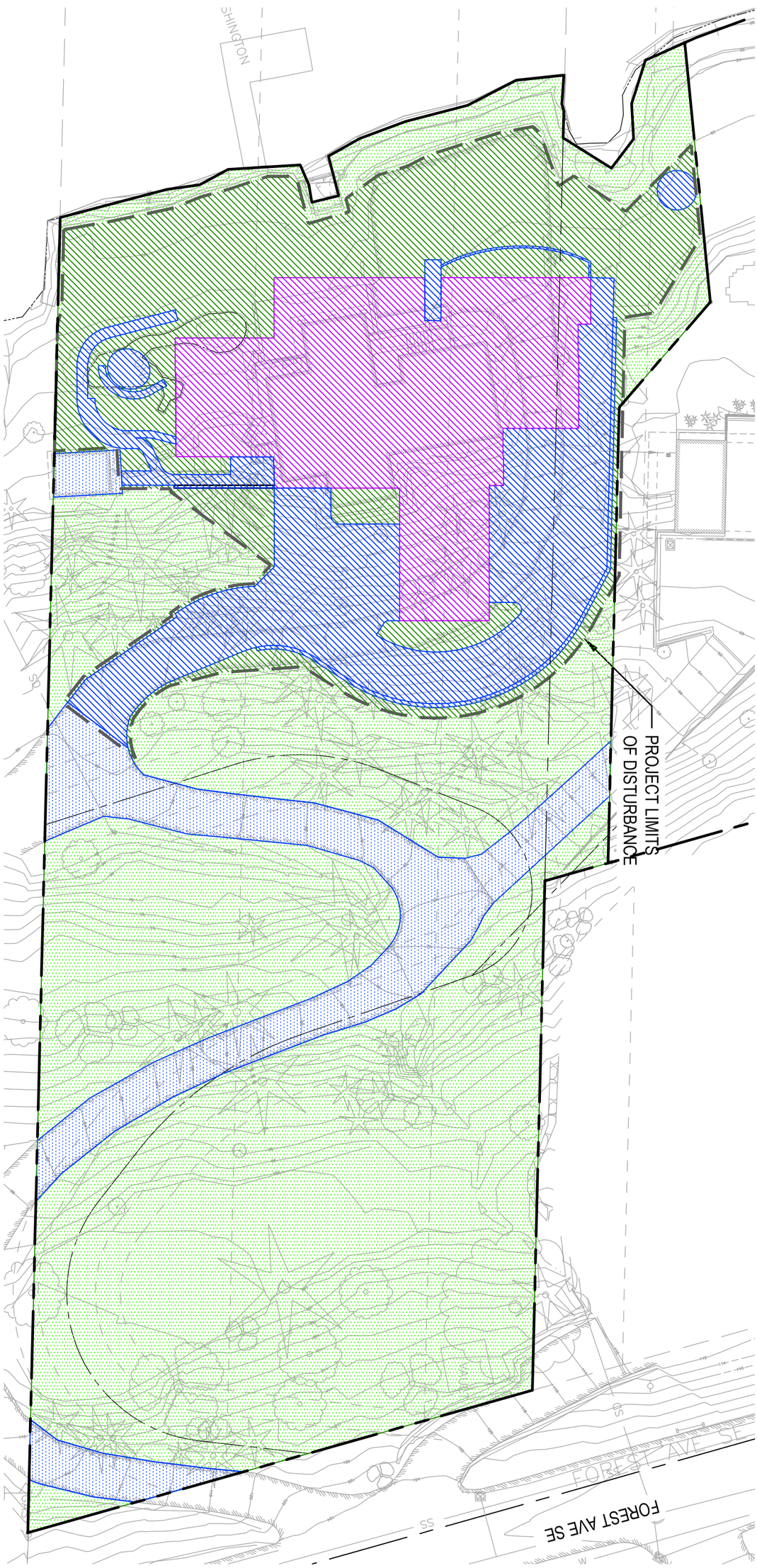


NOT FOR CONSTRUCTION

AREAS

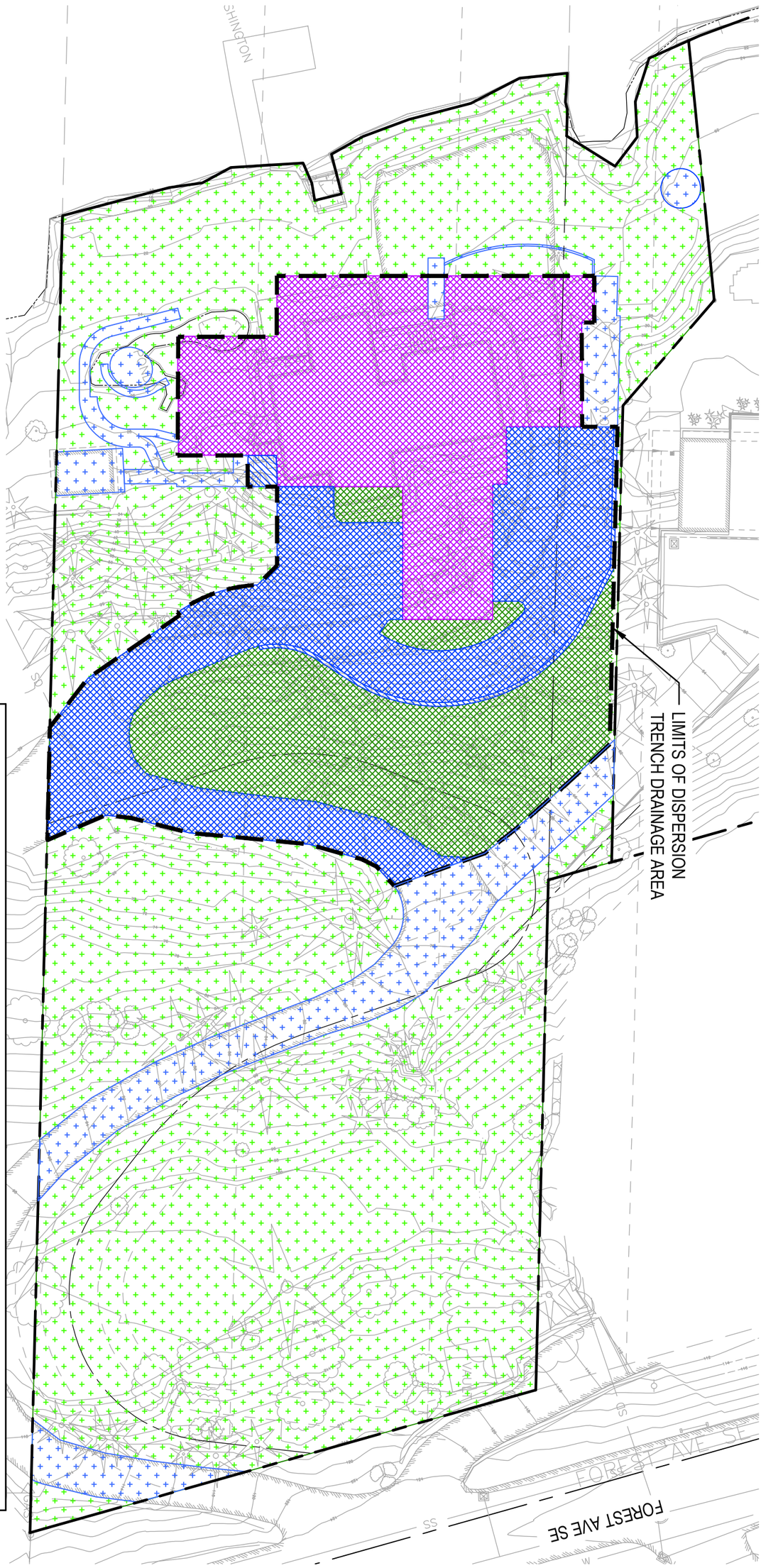
	SQUARE FEET	ACRES
PERVIOUS - UNDISTURBED	30,593	0.70
IMPERVIOUS - UNDISTURBED	5,124	0.12
PERVIOUS	7,961	0.18
IMPERVIOUS	6,251	0.14
BUILDING	6,484	0.15
TOTAL	56,413	1.30

FUSED ELEMENTS
4525 FOREST AVE SE
MERCER ISLAND, WA 98040

PROPOSED CONDITIONS

kpff

SHEET: A1
REVISION:
DATE: 09-08-2023



AREAS

	SQUARE FEET	ACRES
AREA DRAINING TO TRENCH		
PERVIOUS	5,469	0.13
IMPERVIOUS	6,848	0.16
BUILDING	6,484	0.15
AREA NOT DRAINING TO TRENCH		
PERVIOUS	33,085	0.76
IMPERVIOUS	4,527	0.10
TOTAL	56,413	1.30

NOT FOR CONSTRUCTION

FUSED ELEMENTS
4525 FOREST AVE SE
MERCER ISLAND, WA 98040

DISPERSION TRENCH DRAINAGE BASIN

kpff

SHEET: A2
REVISION:
DATE: 09-08-2023

Appendix B

Dispersion Trench Calculations

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MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 200410007
Project Simulation Performed on: 09/05/2023 2:43 PM
Report Generation Date: 09/05/2023 2:44 PM

Input File Name: FE Spreader Sizing.fld
Project Name: Fused Elements
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 10

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 3
Precipitation Station : 95004005 Puget West 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 951040 Puget West 40 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.432	0.432
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.432	0.432

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
C, Forest, Steep	0.432

Subbasin Total 0.432

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin 1 ----------

	-------Area (Acres) --------
C, Lawn, Steep	0.126
ROADS/STEEP	0.157
ROOF TOPS/FLAT	0.149
Subbasin Total	0.432

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

************Groundwater Recharge Summary **************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	72.534
Total:	72.534

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	14.337
Total:	14.337

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.459 ac-ft/year, Post Developed: 0.091 ac-ft/year

*************Water Quality Facility Data **************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Subbasin: Subbasin 1

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.808E-02	2-Year	0.174
5-Year	2.815E-02	5-Year	0.226
10-Year	3.702E-02	10-Year	0.262
25-Year	4.802E-02	25-Year	0.340
50-Year	5.896E-02	50-Year	0.402
100-Year	5.978E-02	100-Year	0.521
200-Year	8.917E-02	200-Year	0.590
500-Year	0.129	500-Year	0.681

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

15' FOR 0.1 CFS AND 10' PER ADDITIONAL CFS ->

40' MIN TRENCH LENGTH FOR 25 YEAR STORM EVENT

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	559.2%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	1695.5%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	89.6%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	559.2%	FAIL

LID DURATION DESIGN CRITERIA: FAIL
