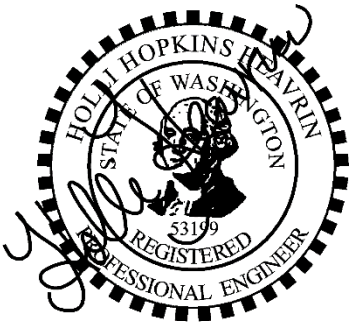
PRELIMINARY

TECHNICAL INFORMATION REPORT

FOR

STC - Phase I - UZDP

CITY OF SAMMAMISH, WASHINGTON



6/19/2020

Project Manager: **Lafe Hermansen**
Approved by: **Holli Heavrin, P.E.**
Prepared by: **Matthew Stefansson, E.I.T.**
Date: **June 19, 2020**
Revised:
Core No.: **15125C**

City of Sammamish project number: UZDP2019-00562
Vesting Date: 11/4/2019

CORE DESIGN
12100 NE 195th Street, Suite 300
Bothell, Washington 98011
Ph 425.885.7877
www.coredesigninc.com

STC - Phase I - UZDP

Table of Contents

1. PROJECT OVERVIEW

The STC - Phase I - UZDP project is located in the City of Sammamish and is a portion of the larger overall plan for Sammamish Town Center. This project includes 5 underlying existing parcels and provides the overall plan and engineering design for the combined developed area of the Brownstones East Plat and the STC BSP Blocks 5-7. A stand-alone TIR for the Brownstones East Plat has been prepared as well. The entire project area is zoned TC-A. This project is required to comply with all standards and requirements associated with Sammamish Town Center including the Town Center Development Code in Title 21.B of the Sammamish Municipal Code. Parcels included in the STC - Phase I - UZDP project are shown in Table 1-1 below.

Table 1-1: Existing Parcel Information

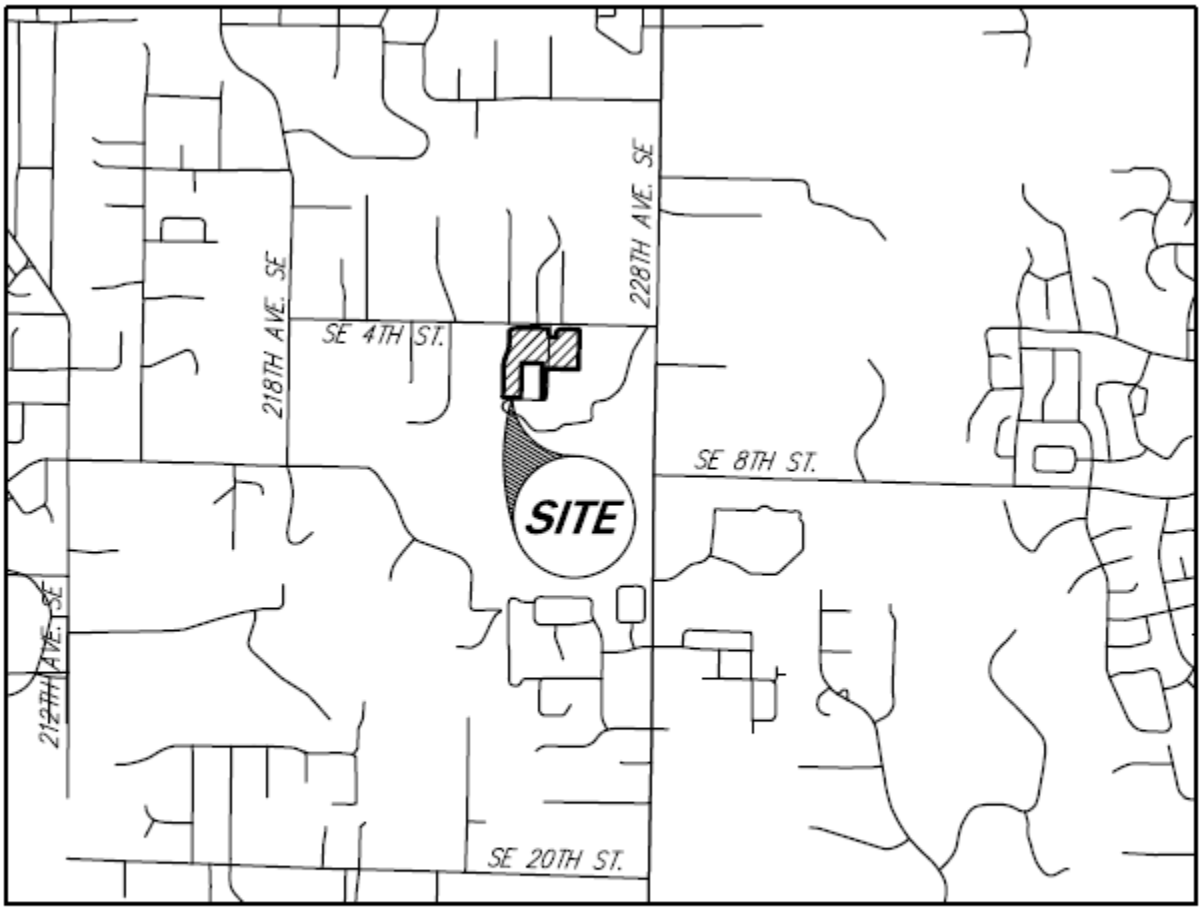
KC Parcel #	Site Address	Area (SF)
332506-9024	223150 SE 4th St	86,873
332506-9085	22407 SE 4th St	128,801
332506-9016	22417 SE 4th St	60,698
332506-9138	22527 SE 4th St	97,915
332506-9091	22515 SE 4th St	14,999

Based on the existing topography, the STC - Phase 1 - UZDP project has a ridge that separates the overall project site into an East Basin and West Basin. Each of these basins has a separate natural discharge location and the downstream flow paths do not meet within ¼ mile creating two separate Threshold Discharge Areas (TDAs) for the project. The West Basin drains south and west and eventually enters the conveyance system located along 222nd Place SE flowing south. The East Basin drains south into the city owned park and then enters a stream tributary to Ebright Creek that flows southwest through the park. Both Basins are tributary to Ebright creek and both basins are located within the larger Thompson Basin per City of Sammamish Drainage Maps. No significant upstream area exists for the project site.

In addition to the STC - Phase I - UZDP (which includes the Brownstones East Plat and the STC BSP Blocks 5-7), The Brownstones West Plat is also being developed directly west of the STC - Phase I - UZDP. Stormwater flow control and water quality facilities located in the Brownstones West Plat will also serve a portion of the STC - Phase I - UZDP development. This project will also construct its own private and public stormwater facilities to provide flow control and water quality treatment for the rest of the project area.

Proposed development of the project area will include construction of 48 townhome units (Brownstones East Plat), 300 apartment units (Blocks 5-7 BSP) and 82,000 square feet of commercial space (Blocks 5-7 BSP).

Stormwater requirements for the project include Level 3 Flow Control and Sensitive Lake Water Quality Treatment. The subject project's drainage facilities were designed using the guidelines and requirements established in the 2016 King County Surface Water Design Manual (2016 KCSWDM) and the City of Sammamish Addendum to the 2016 KCSWDM.



VICINITY MAP

1" = 2,000'

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner: STCA, LLC
Phone: (503) 849-4233
Address: 5335 Meadows Rd, Suite 108
Lake Oswego, OR 97035
Project Engineer: Holli Heavrin, P.E.
Company: Core Design, Inc.
Phone: (425) 885-7877

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name: STC Phase I UZDP
DPER Permit #: UZDP2019-00562
Location Township: 25 N.
Range: 6 E.
Section: 33
Site Address: 22315 SE 4th St

Part 3 TYPE OF PERMIT APPLICATION

- [x] Landuse (e.g.,Subdivision / Short Subd. / UPD)
- [ ] Building (e.g.,M/F / Commercial / SFR)
- [ ] Clearing and Grading
- [ ] Right-of-Way Use
- [ ] Other _____

Part 4 OTHER REVIEWS AND PERMITS

- [ ] DFW HPA
- [ ] COE 404
- [ ] DOE Dam Safety
- [ ] FEMA Floodplain
- [ ] COE Wetlands
- [ ] Other _____
- [ ] Shoreline Management
- [x] Structural Rockery/Vault/_____
- [ ] ESA Section 7

Part 5 PLAN AND REPORT INFORMATION

Technical Information Report

Type of Drainage Review (check one):
- [x] Full
- [ ] Targeted
- [ ] Simplified
- [ ] Large Project
- [ ] Directed

Date (include revision dates): _____
Date of Final: _____

Site Improvement Plan (Engr. Plans)

Plan Type (check one):
- [x] Full
- [ ] Modified
- [ ] Simplified

Date (include revision dates): _____
Date of Final: _____

Part 6 SWDM ADJUSTMENT APPROVALS NONE

Type (circle one): Standard / Experimental / Blanket

Description: (include conditions in TIR Section 2)

_____

_____

_____

Approved Adjustment No. _____ Date of Approval: _____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 7 MONITORING REQUIREMENTS NONE

Monitoring Required: Yes / No

Start Date: _____

Completion Date: _____

Describe: _____

Re: KCSWDM Adjustment No. _____

Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan : None found

Special District Overlays: None found

Drainage Basin: Thompson sub-basin (per C.O.S. Maps)

Stormwater Requirements: Level 3 Flow Control and Sensitive Lake Water Quality Treatment

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS NONE

- ☐ River/Stream _____
- ☐ Lake _____
- ☐ Wetlands _____
- ☐ Closed Depression _____
- ☐ Floodplain _____
- ☐ Other _____
- ☐ Steep Slope _____
- ☐ Erosion Hazard _____
- ☐ Landslide Hazard _____
- ☐ Coal Mine Hazard _____
- ☐ Seismic Hazard _____
- ☐ Habitat Protection _____
- ☐ _____

Part 10 SOILS

Soil Type	Slopes	Erosion Potential
AgC	8% to 15%	Low

- ☐ High Groundwater Table (within 5 feet)
- ☐ Other _____
- ☐ Sole Source Aquifer
- ☐ Seeps/Springs

☐ Additional Sheets Attached

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 11 DRAINAGE DESIGN LIMITATIONS

REFERENCE	LIMITATION / SITE CONSTRAINT
☐ Core 2 – Offsite Analysis	
☐ Sensitive/Critical Areas	
☐ SEPA	
☒ LID Infeasibility	Soils not suitable for infiltration
☐ Other	
☐	

☐ Additional Sheets Attached

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)

Threshold Discharge Area: (name or description) Two TDA for project (East & West)

Core Requirements (all 8 apply):

Discharge at Natural Location	Number of Natural Discharge Locations: 2
Offsite Analysis	Level: (1) / 2 / 3 dated: 9/24/19
Flow Control (include facility summary sheet)	Level: 1 / 2 / (3) or Exemption Number _____ Flow Control BMPs Permeable Pavement
Conveyance System	Spill containment located at: NA
Erosion and Sediment Control / Construction Stormwater Pollution Prevention	CSWPP/CESCL/ESC Site Supervisor: TBD Contact Phone: TBD After Hours Phone: TBD
Maintenance and Operation	Responsibility (circle one): (Private) / (Public) If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: Yes / No Provided at final Design
Water Quality (include facility summary sheet)	Type (circle one): Basic / (Sens. Lake) / Enhanced Basic / Bog or Exemption No. _____ Landscape Management Plan: Yes / (No)

Special Requirements (as applicable):

Area Specific Drainage Requirements NA	Type: CDA / SDO / MDP / BP / LMP / Shared Fac. / None Name: _____
Floodplain/Floodway Delineation NA	Type (circle one): Major / Minor / Exemption / None 100-year Base Flood Elevation (or range): _____ Datum:
Flood Protection Facilities NA	Describe:

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)

Source Control (commercial / industrial land use)

Describe land use: To be evaluated at Final Design

Describe any structural controls:

Oil Control

NA

High-use Site: Yes / (No)

Treatment BMP: _____

Maintenance Agreement: Yes / No

with whom? _____

Other Drainage Structures

Describe:

Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION

- ■ Clearing Limits
- ■ Cover Measures
- ■ Perimeter Protection
- ■ Traffic Area Stabilization
- ■ Sediment Retention
- ■ Surface Water Collection
- ■ Dewatering Control
- ■ Dust Control
- ■ Flow Control
- ■ Protection of Flow Control BMP Facilities (existing and proposed)
- ■ Maintain BMPs / Manage Project

MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION

- ■ Stabilize exposed surfaces
- ■ Remove and restore Temporary ESC Facilities
- ■ Clean and remove all silt and debris, ensure operation of Permanent Facilities, restore operation of Flow Control BMP Facilities as necessary
- ■ Flag limits of SAO and open space preservation areas
- ☐ Other _____

Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch)

Flow Control	Type/Description		Water Quality	Type/Description
■ Detention	Vault		☐ Vegetated Flowpath	
☐ Infiltration			☐ Wetpool	
☐ Regional Facility			☐ Filtration	
☐ Shared Facility			☐ Oil Control	
■ Flow Control BMPs	Permeable Pavement		☐ Spill Control	
☐ Other			☐ Flow Control BMPs	
			■ Other	Modular Wetland

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 15 EASEMENTS/TRACTS		Part 16 STRUCTURAL ANALYSIS
■ Drainage Easement ■ Covenant ☐ Native Growth Protection Covenant ■ Tract ☐ Other _____		■ Cast in Place Vault ☐ Retaining Wall ☐ Rockery > 4' High ☐ Structural on Steep Slope ☐ Other _____

Part 17 SIGNATURE OF PROFESSIONAL ENGINEER

I, or a civil engineer under my supervision, have visited the site. Actual site conditions as observed were incorporated into this worksheet and the attached Technical Information Report. To the best of my knowledge the information provided here is accurate.

Holli Heavrin 6/19/20

Signed/Date

STC BROWNSTONES EAST
VAULT A TRIBUTARY AREA
1.01 AC

S.E. 4TH STREET

SE 4TH STREET

S.E. 4TH STREET

ALLEY A

ALLEY C

ALLEY D

VAULT A

224TH AVE SE

BSP BLOCK 5 & 6 COMMERCIAL
& RESIDENTIAL AREA (PRIVATE)
2.38 AC

225TH AVE SE

BSP BLOCK 7 COMMERCIAL &
RESIDENTIAL AREA (PRIVATE)
1.10 AC

226TH AVE SE

BLOCK 5 & 6 PRIVATE VAULT

BLOCK 7 PRIVATE VAULT

SE 5TH ST

SE 6TH ST

VAULT B

ALLEY B

224TH AVE SE

VAULT C

BSP BLOCK 5 & 6 ROW
VAULT B TRIBUTARY AREA
0.43 AC

BSP BLOCK 7 ROW VAULT
C TRIBUTARY AREA
0.95 AC

MODULAR WETLAND
UNIT

STC BROWNSTONES EAST
VAULT B TRIBUTARY AREA
1.93 AC

SE 6TH ST

UZDP2019-00562

NO.	REVISIONS	DATE
1	REVISED PER CITY COMMENTS	6/19/20

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

DEVELOPED CONDITIONS EXHIBIT
STC -PHASE I - UZDP

STC JV 1, LLC & STCA, LLC
5335 MEADOWS RD, SUITE 108
LAKE OSWEGO, OR 97035

DATE SEE STAMP DATE
DESIGNED
DRAWN
APPROVED LAFE B. HERMANSEN
PROJECT MANAGER

SHEET 1 OF 1

PROJECT NUMBER
15125C

Custom Soil Resource Report
Soil Map

2. CONDITIONS AND REQUIREMENTS SUMMARY

The proposed project is classified as requiring "Full Drainage Review" per Section 1.1.2 of the 2016 KCSWDM. See Figure 1.1.2.A of the 2016 KCSWDM (Flow Chart for Determining Type of Drainage Review Required) provided on the following pages. All nine Core Requirements and five Special Requirements will be addressed.

2.1 Core Requirements

2.1.1 Core Requirement #1: Discharge at the Natural Location

This project will maintain the existing natural discharge location of the project property and comply with the requirements in Section 1.2.1 of the 2016 KCSWDM. The project site has two natural discharge locations and the downstream flow paths do not meet within ¼ mile. This means the project site has two separate TDAs that will be known as the East Basin and the West Basin in this report. The East Basin drains south into the city owned park and enters a stream tributary to Ebright Creek. The West Basin drains south and west and then enters the conveyance system along 222nd Place SE flowing south. Separate stormwater management facilities will serve each of the two TDAs and each TDA will discharge runoff to the natural location.

2.1.2 Core Requirement #2: Offsite Analysis

This project will comply with Section 1.2.2 of the 2016 KCSWDM. A Level 1 downstream analysis has been completed both the East and West TDAs. A field inspection was completed for both downstream flow paths to a distance of ¼ mile downstream of the project site. Resource review has also been completed for both TDAs for a distance of 1 mile downstream of the project site. See Section 3 of this report for all offsite analysis information.

2.1.3 Core Requirement #3: Flow Control

Per the City of Sammamish Flow Control Map (provided on the following pages), the project will meet the requirements of Flood Problem (Level 3) Flow Control per the 2016 KCSWDM. This means the developed condition discharge durations will meet Level 2 Flow Control Requirements (match the predeveloped condition discharge durations from 50% of the 2-year peak flow up to the 50-year peak flow. In addition, the developed 2-year and 10-year peak discharge rates will not exceed the pre-developed 2-year and 10-year peak, respectively) and match the developed 100-year peak discharge rate to the predeveloped 100-year peak discharge rate.

The Brownstones East Plat area, within the STC - Phase I - UZDP, is entirely within the West basin. The Brownstones East Plat area will all drain to Vault A and Vault B for flow control. Vault A and Vault B will be constructed under the Brownstones West Plat and have been oversized to accommodate area from the STC - Phase I - UZDP.

Blocks 5 and 6 commercial and residential area is located in the West Basin and will drain to its own private detention vault for flow control. Blocks 5 and 6 ROW area is located in the West Basin and will drain to Vault B for flow control. Vault B will be constructed under the Brownstones West Plat and has been oversized to accommodate area from the STC - Phase I - UZDP.

Block 7 commercial and residential (private) area is located in the East Basin and will drain to its own private detention vault for flow control. Block 7 ROW area is located in the East Basin and will drain to Vault C for flow control.

MGSFlood was used to size all flow control facilities. See Section 4 of this report for all flow control design information. See Appendix A for MGSFlood Reports.

2.1.4 Core Requirement #4: Conveyance System

Conveyance system analysis and information will be provided during final design.

2.1.5 Core Requirements #5: Erosion and Sediment Control

This project is required to comply with Section 1.2.5 AND Appendix D of the 2016 KCSWDM along with the 13 Elements from the 2014 Western Washington DOE Manual. See Section 8 of this report for ESC analysis and design.

2.1.6 Core Requirement #6: Maintenance and Operations

Maintenance and Operations information will be provided during final design.

2.1.7 Core Requirement #7: Financial Guarantees and Liability

Financial Guarantees and Liability information will be provided during final design.

2.1.8 Core Requirement #8: Water Quality

Per the City of Sammamish Water Quality Map (provided on the following pages), this project will meet the requirements of Sensitive Lake Water Quality Treatment per the 2016 KCSWDM. The treatment goal of Sensitive Lake Water Quality Treatment is 50% annual average total phosphorus (TP) removal assuming typical pollutant concentrations in urban runoff. Sensitive Lake Water Quality Treatment will be provided by a combination of large sand filters (for Vault A and B) and a modular wetland for Vault C.

The Block 5 and 6 commercial and residential area and the Block 7 commercial and residential area has zero pollutant generating impervious surface area. Therefore, no water quality treatment is being provided for these areas.

2.1.9 Core Requirement #9: Flow Control BMPs

Flow control BMPs will be applied to individual lots per section 1.2.9.2 of the 2016 KCSWDM. All lots are smaller than 22,000 square feet, and therefore fall under the Small Lot BMP requirements. BMPs have been evaluated for impervious area in the order specified in section 1.2.9.2.1 of the 2016 KCSWDM. See the Subsurface Exploration, Geologic Hazards, and Preliminary Geotechnical Engineering Report completed by Associated Earth Sciences, referenced in section 6 and provided under separate cover, for more information on soils on site. BMPs must be implemented to the maximum extent feasible and at a minimum, to impervious area equal to 10 percent of the total lot area. See feasibility evaluation below:

1. Full dispersion is **not feasible** because the required length of naturally vegetated flow path cannot be provided.

2. Full infiltration of roof runoff is **not feasible** because soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

3. Full infiltration of other impervious area is **not feasible** because soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

   Limited infiltration is **not feasible** because soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

   Bioretention is **not feasible** due to site plan constraints and soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

   Permeable pavement is **feasible** and will be implemented on private tracts and driveways. Permeable pavement design will be reviewed by a Geotechnical Engineer during final design to determine if an underdrain will be required or not due to soils on site having low infiltration capabilities.

4. Basic dispersion is **not feasible** because the required length of vegetated flow path cannot be provided.

5. Impervious area equal to more than 10% of the total lot area will be mitigated using permeable pavement on private tracts and driveways. No reduced impervious surface credit or native growth retention credit is proposed.

BMPs have been implemented to the maximum extent feasible and mitigate impervious area equal to greater than 10% of the total lot area. Therefore, Core Requirement #9 for individual lots is met.

Feasibility of Flow control BMPs for the site infrastructure (ROW area) has been also been evaluated. This project is a small sub-division because it is located within the Urban Growth Area boundary. The project will meet the BMP requirements outlined in Section 1.2.9.3.1 of the 2016 KCSWDM. See the Subsurface Exploration, Geologic Hazards, and Preliminary Geotechnical Engineering Report completed by Associated Earth Sciences, referenced in section 6 and provided under separate cover, for more information on soils on site.

1. Full dispersion is **not feasible** because the required length of naturally vegetated flow path cannot be provided.

2. Full infiltration is **not feasible** because soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

Limited infiltration is **not feasible** because soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

Bioretention is **not feasible** due to site plan constraints and soils on site are not suitable for stormwater infiltration per the Preliminary Geotechnical Engineering Report provided by Associated Earth Sciences.

Permeable pavement is **not feasible** because the City of Sammamish does not allow permeable pavement to be used in their ROW area.

3. Basic dispersion is **not feasible** because the required length of vegetated flow path cannot be provided.

   Flow control BMPs have been evaluated as described in Section 1.2.9.3.1 of the 2016 KCSWDM. No BMPs are feasible for plat infrastructure as described above. Therefore, Core Requirement #9 for plat infrastructure has been met.

2.2 Special Requirements

2.2.1 Special Requirement #1: Other Adopted Area-Specific Requirements

There are no known additional requirements for the subject project.

2.2.2 Special Requirement #2: Floodplain / Floodway Delineation

Not applicable.

2.2.3 Special Requirement #3: Flood Protection Facilities

Not applicable.

2.2.4 Special Requirement #4: Source Controls

Source Control requirements will be evaluated during final design.

2.2.5 Special Requirement #5: Oil Control

Not applicable because the project is not a high use site.

FIGURE 1.1.2.A FLOW CHART FOR DETERMINING TYPE OF DRAINAGE REVIEW REQUIRED

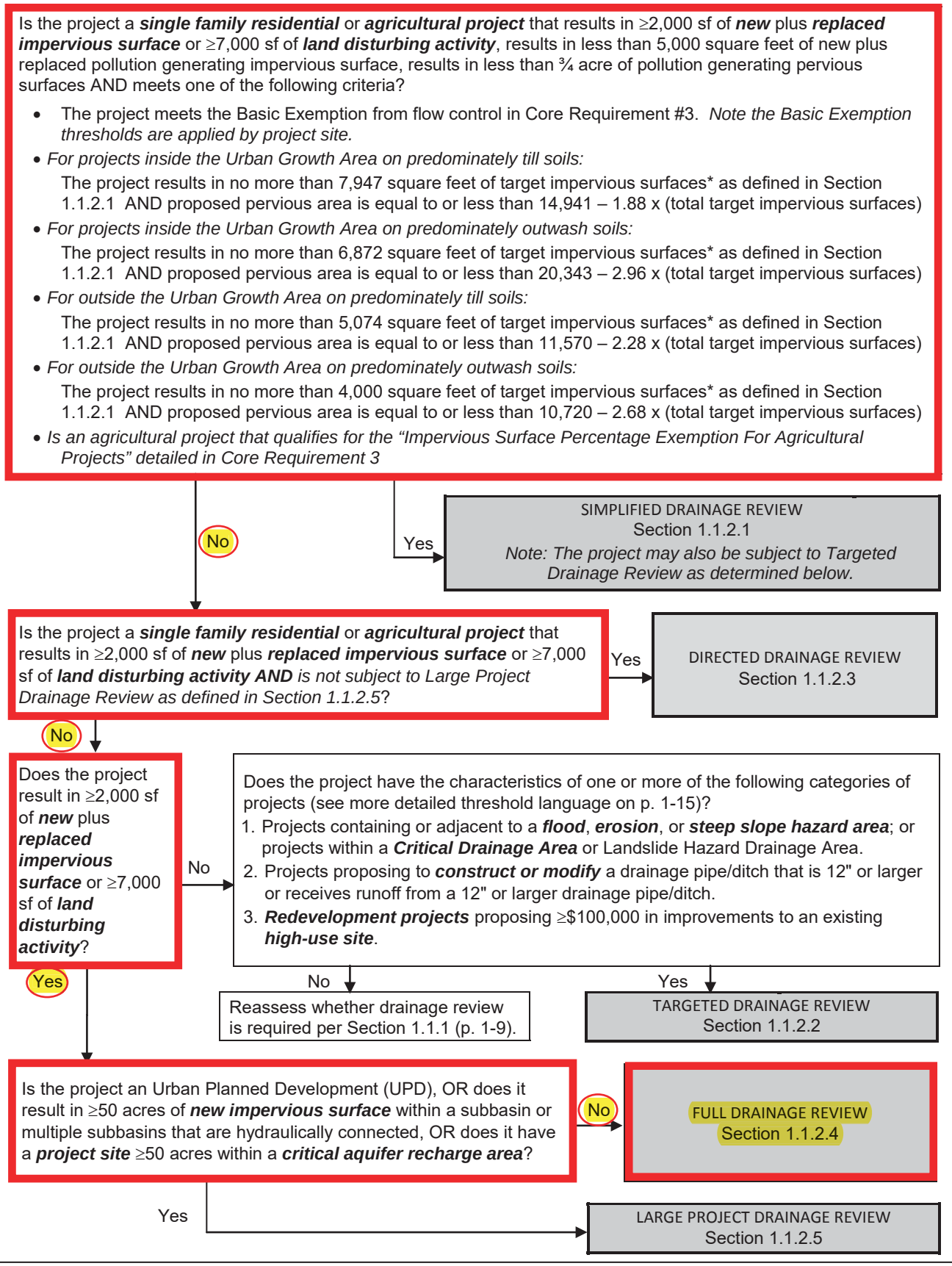


TABLE 1.1.2.A REQUIREMENTS APPLIED UNDER EACH DRAINAGE REVIEW TYPE

Simplified	***Single family residential projects*** and ***agricultural projects*** that result in ≥2,000 sf of ***new*** plus ***replaced impervious surface*** or ≥7,000 sf of ***land disturbing activity*** but do not exceed the new plus replaced PGIS, new PGPS, and ***new pervious surface*** thresholds specified in Sec. 1.1.2.1; OR is an agricultural project that qualifies for the "Impervious Surface Percentage Exemption For Agricultural Projects".
Directed	***Single family residential projects*** and ***agricultural projects*** that result in ≥2,000 sf of ***new*** plus ***replaced impervious surface*** or ≥7,000 sf of ***land disturbing activity*** that are not subject to Simplified Drainage Review or Large Project Drainage Review
Targeted	Projects that **are not** subject to Directed, Full or Large Project Drainage Review, AND have characteristics of **one or more** of the following categories of projects: 1. Projects containing or adjacent to a ***flood***, ***erosion***, or ***steep slope hazard area***; projects within a ***Critical Drainage Area*** or Landslide Hazard Drainage Area. 2. Projects that ***construct or modify*** a drainage pipe/ditch that is 12" or larger or receive runoff from a 12" or larger drainage pipe/ditch. 3. ***Redevelopment projects*** with ≥$100,000 in improvements to a ***high-use site.***(1)
Full	All projects that result in ≥2,000 sf of ***new*** plus ***replaced impervious surface*** or ≥7,000 sf of ***land disturbing activity*** but are not subject to Simplified Drainage Review, Directed Drainage Review , OR Large Project Drainage Review.
Large Project	UPDs, OR projects that result in ≥50 acres of ***new impervious*** within a sub-basin or multiple sub- basins that are hydraulically connected, OR ***project sites*** ≥50 acres within a ***critical aquifer recharge area***.

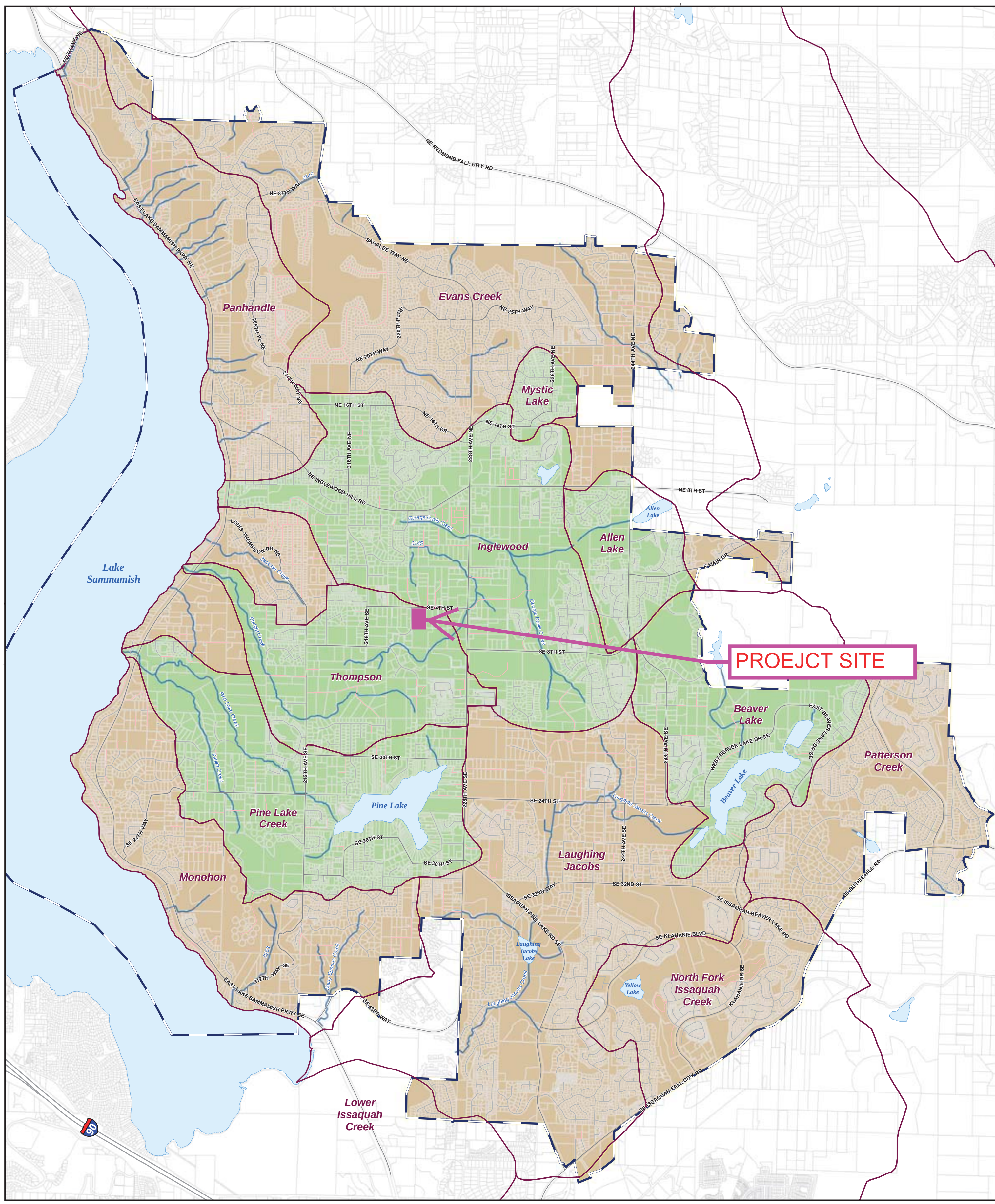
	DRAINAGE REVIEW TYPE						
	Simplified	Directed	Targeted			Full	Large Project
			Categ 1	Categ 2	Categ 3		
SIMPLIFIED DRAINAGE REQUIREMENTS	SEE NOTE 4						
CORE REQUIREMENT #1 Discharge at Natural Location	✓(4)	✓(2,3)	*(2)	✓		✓	✓
CORE REQUIREMENT #2 Offsite Analysis	✓(4)	✓(2,3)	*(2)	✓(3)		✓(3)	✓(3)
CORE REQUIREMENT #3 Flow Control	✓(4)	✓(2,3)	*(2)			✓(3)	✓(3)
CORE REQUIREMENT #4 Conveyance System	✓(4)	✓(2,3)	*(2)	✓		✓	✓
CORE REQUIREMENT #5 Erosion & Sediment Control	✓(4)	✓(2,3)	✓	✓	✓	✓	✓
CORE REQUIREMENT #6 Maintenance & Operations	✓(4)	✓(2,3)	*(2)	✓	✓	✓	✓
CORE REQUIREMENT #7 Financial Guarantees & Liability	✓(4)	✓(2,3)	*(2)	✓(3)	✓(3)	✓(3)	✓(3)
CORE REQUIREMENT #8 Water Quality	✓(4)	✓(2,3)	*(2)			✓(3)	✓(3)
CORE REQUIREMENT #9 Flow Control BMPs	✓(4)	✓				✓	✓
SPECIAL REQUIREMENT #1 Other Adopted Requirements	✓(4)	✓(2,3)	✓(3)			✓(3)	✓(3)
SPECIAL REQUIREMENT #2 Flood Hazard Area Delineation	✓(4)	✓(2,3)	✓(3)			✓(3)	✓(3)
SPECIAL REQUIREMENT #3 Flood Protection Facilities	✓(4)	✓(2,3)	✓(3)			✓(3)	✓(3)
SPECIAL REQUIREMENT #4 Source Control	✓(4)	✓(2,3)	✓(3)	✓(3)	✓(3)	✓(3)	✓(3)
SPECIAL REQUIREMENT #5 Oil Control	✓(4)	✓(2,3)			✓(3)	✓(3)	✓(3)

(1) Category 3 projects installing oil controls that construct or modify a 12-inch pipe/ditch are also Category 2 projects.

(2) May be applied by DPER based on project or ***site***-specific conditions. Documentation of compliance required.

(3) These requirements have exemptions or thresholds that may preclude or limit their application to a specific project.

(4) A proposed project subject to Simplified Drainage Review that complies with the Simplified drainage requirements detailed in Appendix C is presumed to comply with all the core and special requirements in Sections 1.2 and 1.3 except those requirements that would apply to the project if it is subject to Targeted Drainage Review as specified in Section 1.1.2.2.



Conservation Flow Control (Level 2)

Flood Problem Flow Control (Level 3)

Drainage Basins

Sammamish City Limits

Streets - Public

Streets - Private

Basin boundaries expressed on this map are approximate, and will need to be verified during the Downstream Analysis to determine the approximate flow control standard.

N

0 1,000 2,000 3,000 4,000 5,000 6,000 Feet

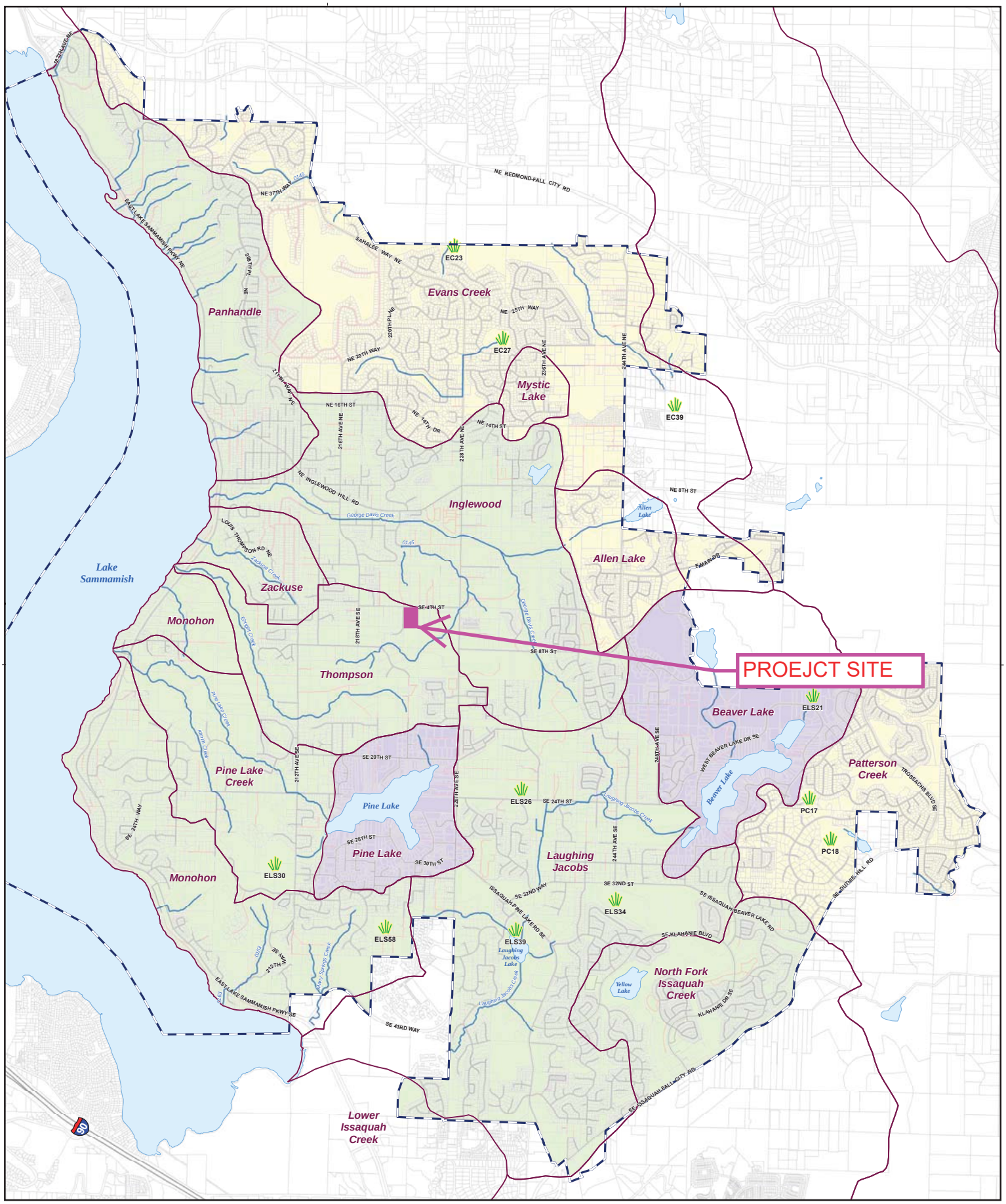
0 0.25 0.5 0.75 1 Miles

Flow Control Map

City of Sammamish

The information included on this map has been compiled from a variety of sources and is subject to change without notice.

1_FlowControl.mxd 12-31-2015



Basin boundaries expressed on this map are approximate, and will need to be verified during the Downstream Analysis to determine the approximate water quality standards.

Water Quality Map

City of Sammamish

Map Revision Date: 12-04-2017
Previous Map Dates: 08-26-2016
12-31-2015

3. OFFSITE ANALYSIS

3.1 Task 1, Study Area Definition and Maps

The proposed project is located within the Thompson sub-basin according to City of Sammamish maps. The study area for resource review extends one mile downstream of the project site for both the East Basin and West Basin. The study area for the field investigation extends ¼ mile downstream of the project site. Resources listed on the City's website, a FIRM map, and King County iMap were reviewed for existing/potential problems within the study area. A field investigation was also completed and is detailed below. Maps mentioned in the resource review are provided at the end of section 3.2.

3.2 Task 2, Resource Review

3.2.1 Sensitive Areas

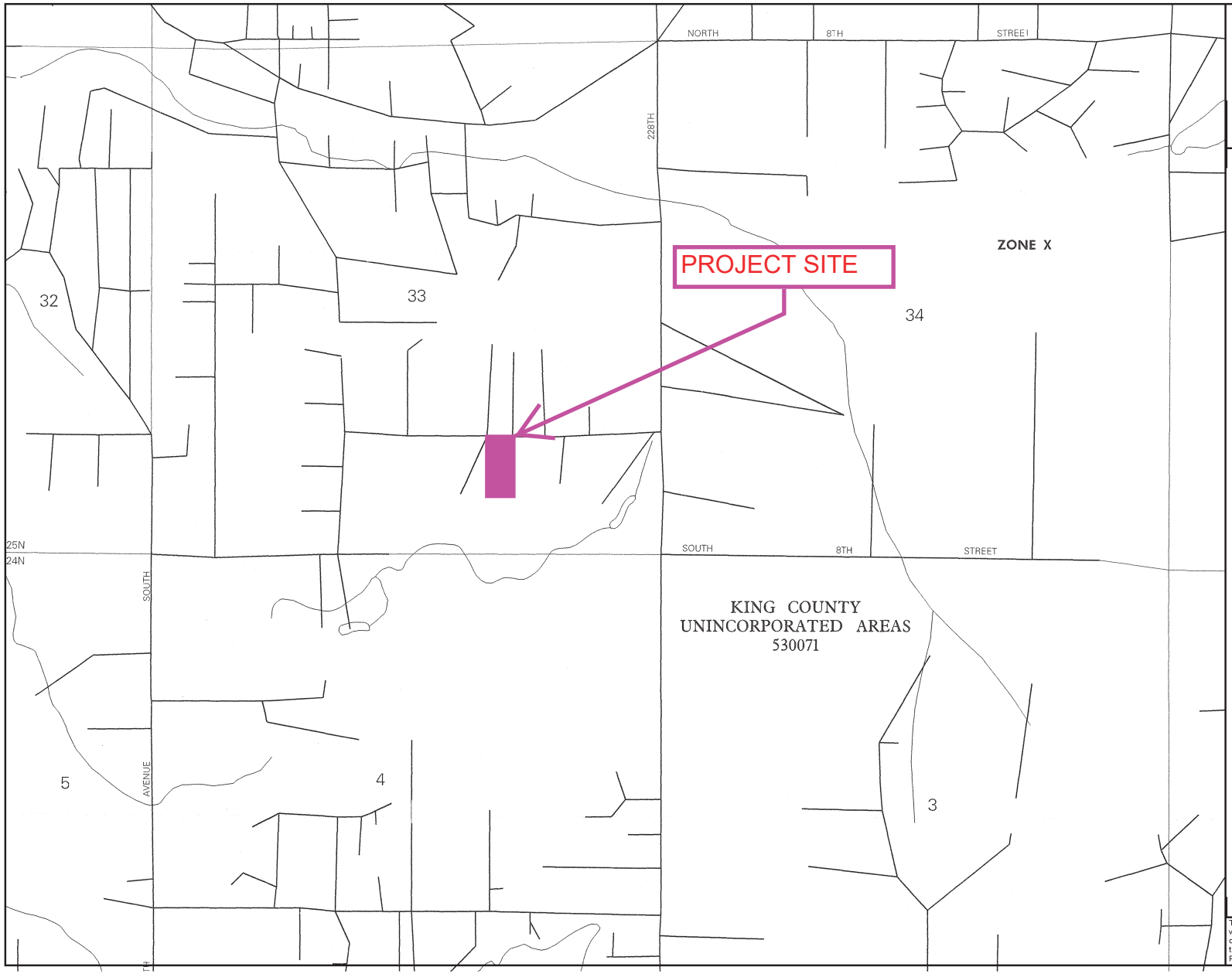
Sensitive area maps on the City of Sammamish website, the Sammamish Property Tool, and King County iMap were all reviewed to identify sensitive areas on the project site and 1 mile downstream of the project site. No sensitive areas exist on the project site. The project site is not located with a CARA. Within ¼ mile downstream of the project site, runoff flows through a small area marked as Erosion Hazard area on the Sammamish Property Tool. Within ¼ mile downstream runoff also flows into a stream tributary to Ebright Creek. No other sensitive areas exist within ¼ mile downstream. Within 1 mile downstream, runoff flows through a wetland before entering Ebright Creek. No other sensitive areas were identified within 1 mile downstream of the project site.

3.2.2 FIRM Map

A FIRM map dated May 16, 1995 numbered 53033C0395F was reviewed. The project site is entirely in Zone X. The site is not located within a floodplain. See FIRM map on the following pages.

3.2.3 Downstream Drainage Complaints

Drainage complaints were researched on King County iMap and the City of Sammamish Drainage Complaints map within 1 mile downstream of the project site. No drainage complaints were found on King County iMap that were closed within the last ten years. Drainage complaint F-22 was found on the City of Sammamish Drainage Complaint Map within ¼ mile downstream of the project site near the downstream flow path. The complaint description states the ditch along the north side of SE 8th Street flowing east, overtops the road before reaching the two culverts that flow south under SE 8th Street. Runoff from the project site flows through the two culverts under SE 8th Street without entering the ditch along the north side of SE 8th Street. Therefore, no mitigation for this problem is required or proposed. In addition, Level 3 Flow Control is already being provided.



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

KING COUNTY, WASHINGTON AND INCORPORATED AREAS

PANEL 685 OF 1725

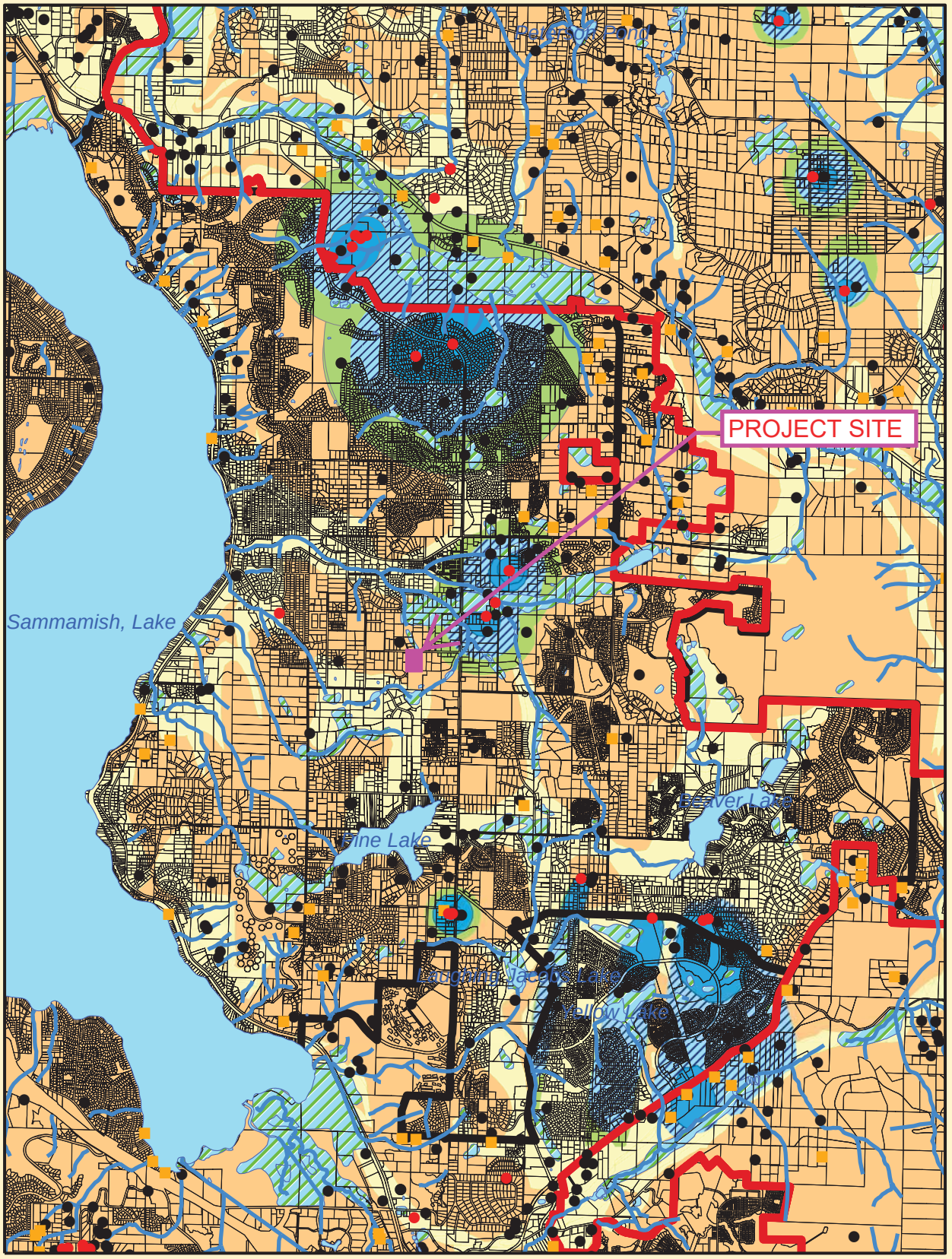
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
KING COUNTY, UNINCORPORATED AREAS	530071	0685	F

MAP NUMBER
53033C0685 F

MAP REVISED:
MAY 16, 1995

Federal Emergency Management Agency



Legend

- City Limits
- UBG
- Lakes
- Water Supply Wells, Group A
- Water Supply Wells, Group B
- Other Water Supply Wells

Wellhead Protection Zones

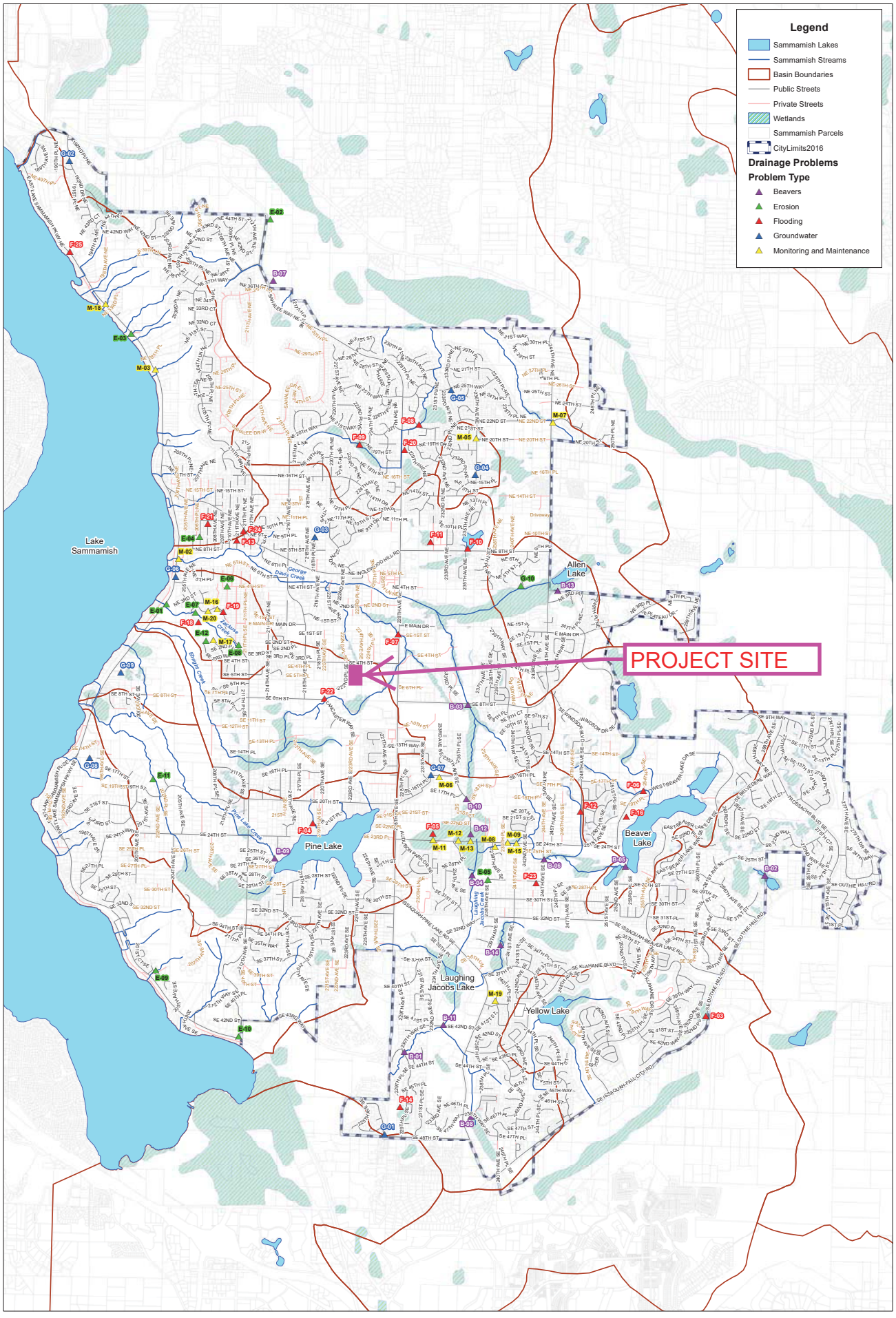
- Class 1 - 1 Year TOT
- Class 1 - 5 Year TOT
- Class 2 - 10 Year TOT
- Class 3

Critical Aquifer Recharge Areas

ArcGIS 9 Development Team
February 2006

Source: Sammamish Plateau Water/Sewer District, NE Sammamish Plateau Water/Sewer District and King County Data & Maps

Created in ArcGIS 9 using ArcMap



City of Sammamish Washington

Miles
0 0.25 0.5 1 1.5 2

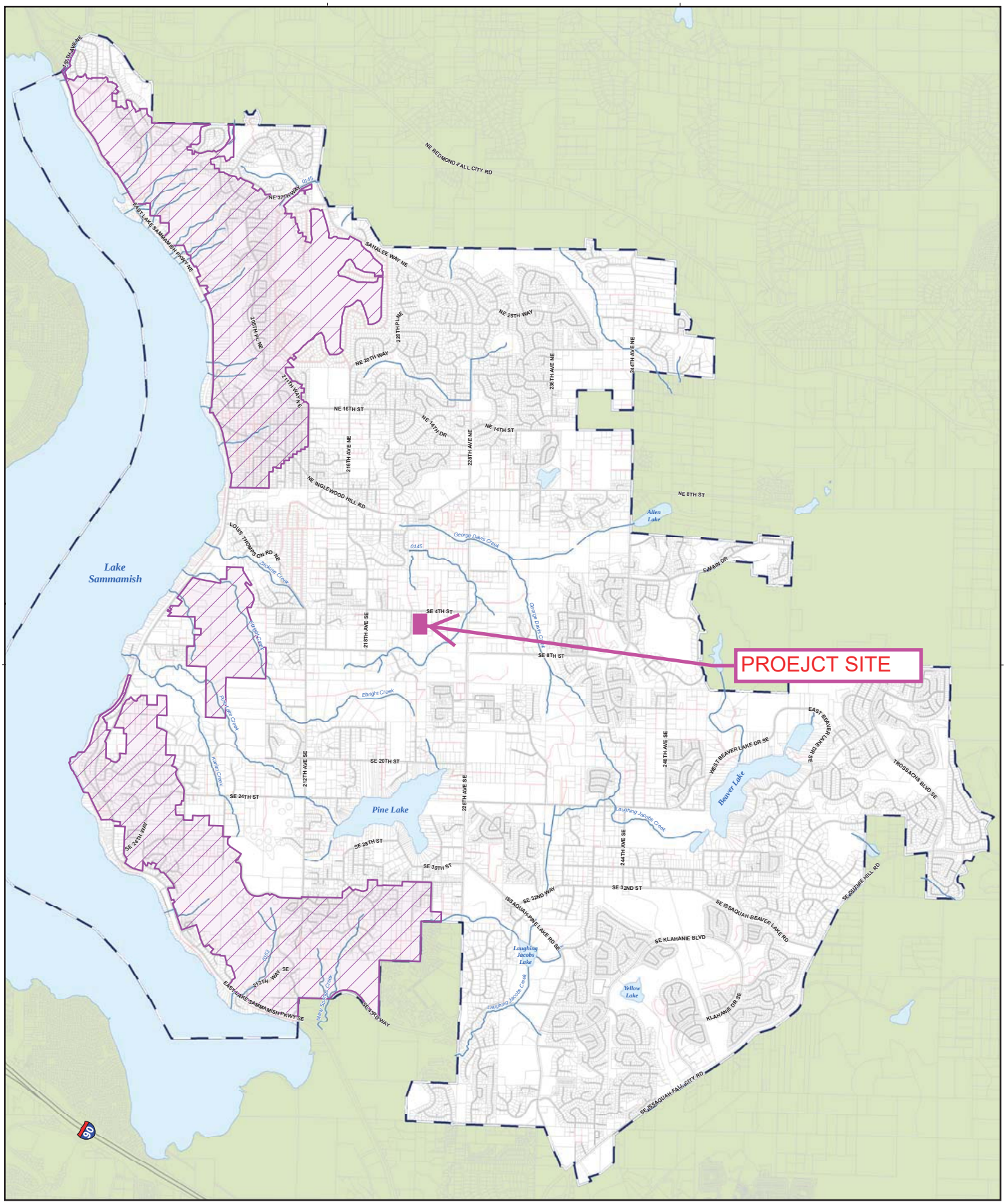
Feet
0 1,250 2,500 5,000 7,500 10,000

N W E S

DRAINAGE COMPLAINTS

Use in conjunction with the City's excel sheet of drainage complaints

Date Saved: 9/18/2018



Erosion Hazards Near Sensitive Water Bodies

Sammamish City Limits

Streets - Public

Streets - Private

N

Basin boundaries expressed on this map are approximate, and will need to be verified during the Downstream Analysis to determine the approximate flow control standard.

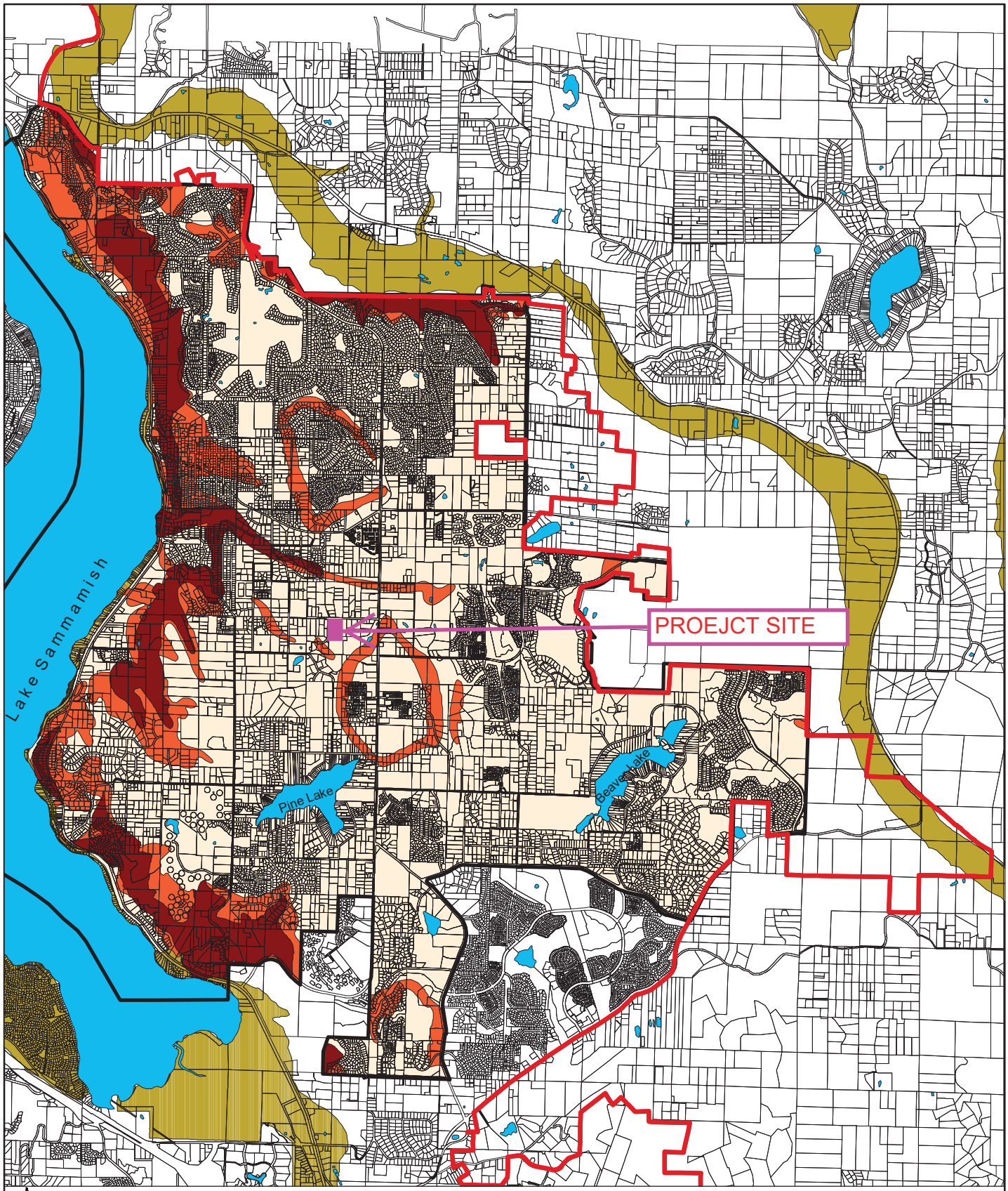
0 1,000 2,000 3,000 4,000 5,000 6,000 Feet

0 0.25 0.5 0.75 1 Miles

Erosion Hazards Near Sensitive Water Bodies

City of Sammamish

4_ErosionHazardNearSensitiveWaterBodies.mxd Revision Date: 12-31-2015



Environmentally Sensitive Areas

Geologic Hazards

Legend:

UGA | Lake | City Limits | City Tax Lots

Erosion | Landslide | Seismic

100 0 100 Feet

Scale 1" = 416 Ft.

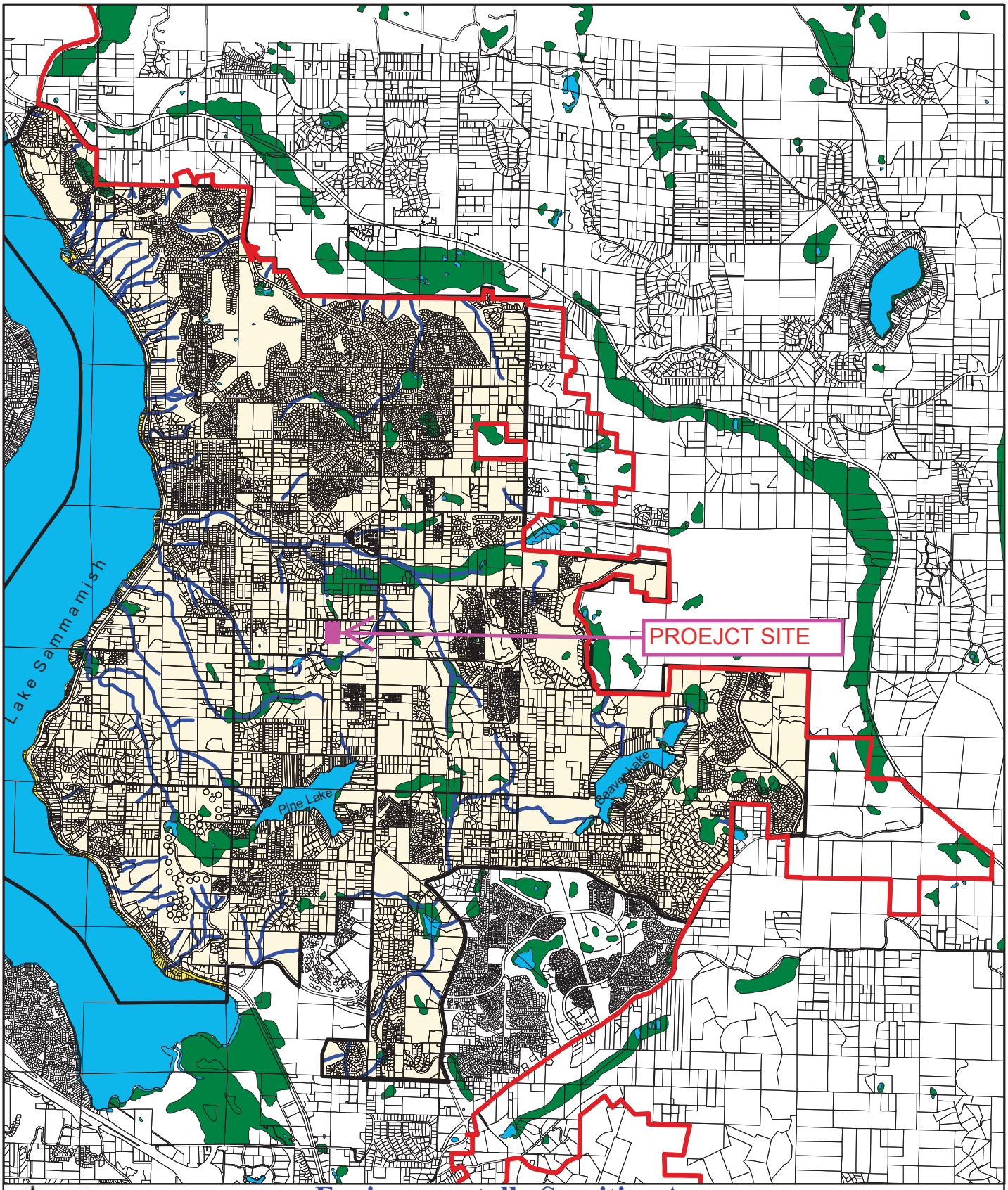
N W E S

Plot Date: 02/03

SOURCES: King County GIS CD #3 "Standard Data" dated March 2002.

DISCLAIMER: This map is derived from various data sources. While care has been taken to ensure the accuracy of the information shown on this page the City of Sammamish assumes no responsibility or liability for any errors or ommissions in this information. This map is provided, "as is".

Figure 3.1-9



Environmentally Sensitive Areas

Surface Waters and Wetlands

Legend: UGA, City Limits, City Tax Lots, Lakes, Wetlands, Flood, Streams

100 0 100 Feet

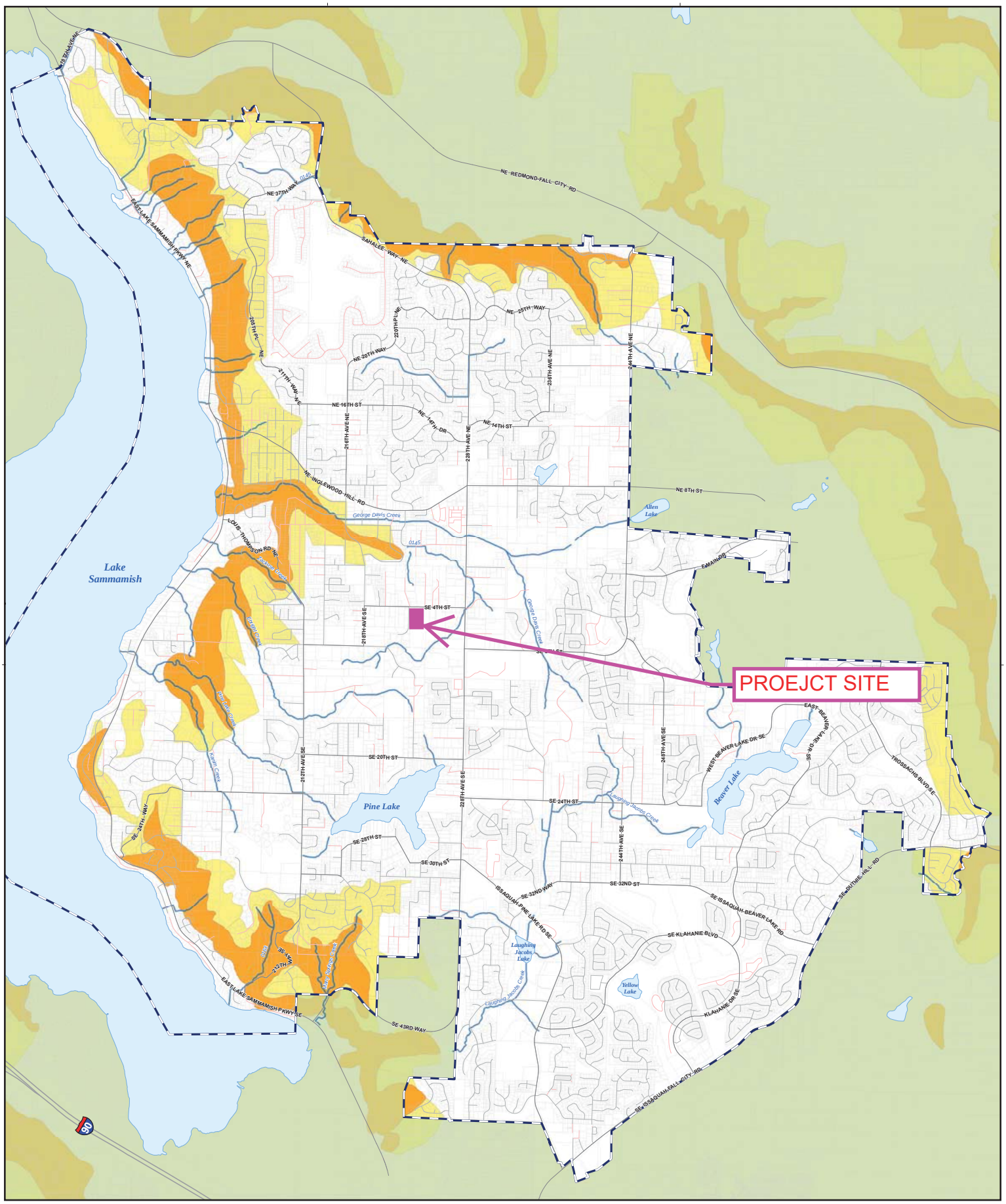
Scale 1" = 416 Ft.

Plot Date: 2/03

SOURCES: King County GIS CD #3 "Standard Data" dated March 2002.

DISCLAIMER: This map is derived from various data sources. While care has been taken to ensure the accuracy of the information shown on this page the City of Sammamish assumes no responsibility or liability for any errors or ommissions in this information. This map is provided, "as is".

Figure 3.1-2



Landslide Drainage Hazards Map

City of Sammamish

LandslideHazardsDrainage.mxd 7-6-2017

3.3 Task 3, Field Inspection

West Basin:

The field investigation was for the West Basin was completed on January 16, 2017. The weather was cloudy and the temperature was approximately 50 degrees. The field investigation for the West Basin was verified during an additional site visit on September 24, 2019. The weather was partly cloudy, and the temperature was approximately 60 degrees.

East Basin

The field investigation for the East Basin was completed on May 20, 2020. The weather was cloudy, and the temperature was approximately 60 degrees.

3.3.1 Upstream Tributary Area

No significant or notable upstream area exists for both the East and West Basin.

3.3.2 Downstream Analysis

West Basin

See Photos and Downstream Drainage Exhibit on the following pages. Photo locations and points referenced in the downstream analysis are shown on the Downstream Drainage Exhibit for reference and clarity.

Runoff on site in the West Basin currently moves across the project site via sheet flow to the southwest. When flow reaches the southern property line it enters a natural drainage swale that directs flow west along the southern property line, leaving the project site and continuing west along the southern property line of the parcels to the west. Flow then enters a 12-inch ductile iron culvert pipe that flows south under the driveway that leads to parking for Sammamish Commons Park (Point A). This culvert outlets into a grass lined ditch that continues to flow south along the east side of 222nd Place SE. As 222nd Place SE heads south it begins to curve to the west. The road side ditch mirrors the road curving to the west. Flow passes through another culvert made of 12-inch concrete pipe under a driveway (Point B). Runoff then outlets into a rock lined ditch. This rock lined ditch continues to curve to the west with 222nd Place SE. Just as the ditch begins to flow directly to the west, runoff enters a 12-inch concrete culvert (Point C) with a CMP cover on the end that directs flow to the north side of 222nd Place SE.

Once on the north side of 222nd Place SE the flow continues west in a vegetated ditch. Flows travels through the ditch, wraps around the cul-de-sac at the end of 222nd Place SE, and passes under a driveway through a 12-inch concrete culvert heading south (Point D). Right after exiting the culvert, runoff turns and heads west in a rock lined channel on the north side of a paved driveway. Near the end of the driveway, flows turns and heads south again through a 18-inch CPEP culvert under the driveway (Point E). After the culvert runoff enters a rock lined ditch that flows south until entering a small detention pond (Point F).

Based on as-builts, runoff exits the detention pond and flows south, first through an 18-inch pipe and then through a grass lined ditch. Runoff then enters a well-established stream (Point G). After entering the stream, flow heads southwest passing under Lancaster Way SE through two CMP culverts that are approximately 36-inches in diameter (Point H). Runoff continues in this stream until reaching the ¼ mile downstream mark where the downstream analysis is terminated (Point I).

Based on information from King County iMap, after the ¼ mile downstream mark the runoff continues to head generally southwest. This stream appears to end and, based on contours, runoff slowly works its way south and eventually enters Ebright Creek. Ebright Creek flows west and then turns and flows northwest. Ebright Creek flows into the east side of Lake Sammamish.

In summary, no signs of erosion or significant sedimentation were noted. There was minor sedimentation within the catch basins themselves. The downstream system appears, in general, to be stable.

1 – Looking south at 12-inch culvert pipe

2 – Looking south roadside ditch on the east side of 222nd Pl SE

3 – Looking at 12-inch culvert pipe

4 – Looking south at roadside ditch

5 – Looking southwest at culvert flowing to the other side of 222nd Pl SE

6 – Looking northeast at outlet end of 12-inch culvert pipe running underneath 222nd Pl SE

7 – Looking southwest at roadside ditch along 222nd Pl SE.

8 – Looking southwest at 12-inch culvert pipe

9 – Looking west at rock lined ditch running alongside driveway.

10 – Looking west at culvert pipe running underneath driveway.

11 – Looking south at ditch flowing to detention pond.

12 – Looking southwest at stream flowing south of Lancaster Way SE

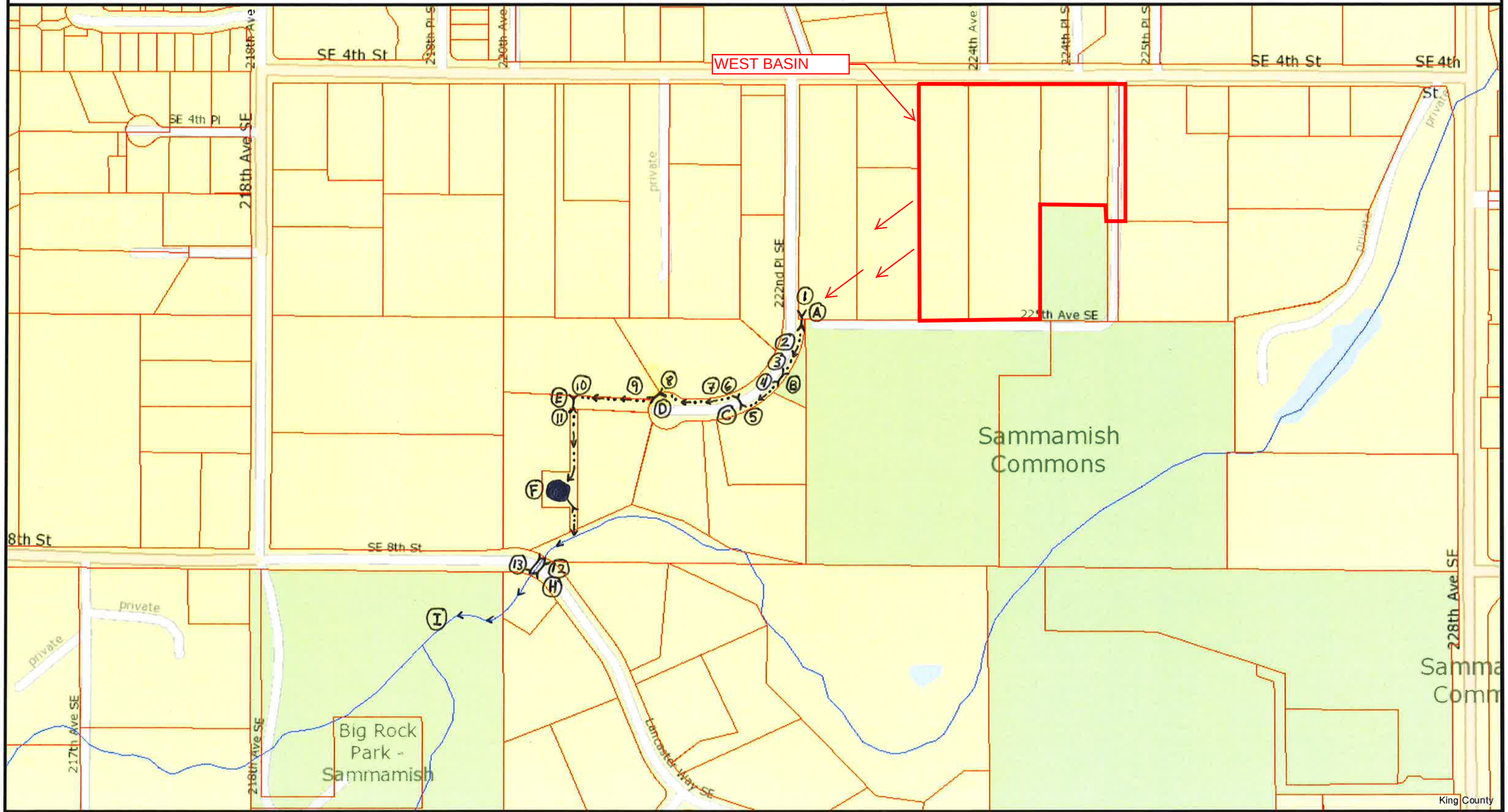
13 – Looking southwest at culverts carrying stream south under Lancaster Way SE.

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE
KING COUNTY SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin:	Thompson	Subbasin Name:	West Basin	Subbasin Number:		Date	9/24/19

Symbol	Drainage Component Type, Name, and Size	Drainage Component Description	Slope	Distance from site discharge	Existing Problems	Potential Problems	Observations of field inspector, resource reviewer, or resident
see map	Type: sheet flow, swale, stream, channel, pipe, pond, flow control/wq BMP; Size: diameter, surface area	drainage basin, vegetation, cover, depth, type of sensitive area, volume	%	¼ ml = 1,320 ft.	constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion		tributary area, likelihood of problem, overflow pathways, potential impacts
	12-inch Pipe	Ductile Iron		50	None	None	
	Ditch	Grass Lined		120	None	None	
	12-inch Pipe	Concerete		150	None	None	
	Ditch	Rock Lined		280	None	None	
	12-inch Pipe	Concrete		320	None	None	
	Ditch	Vegetated		575	None	None	
	12-inch Pipe	Concrete		605	None	None	
	Channel	Rock Lined		817	None	None	
	18-inch Pipe	CPEP		847	None	None	
	Ditch	Rock Lined		1117	None	None	
	Pond			1167	None	None	
	18-inch Pipe			1197	None	None	
	Ditch	Grass Lined		1287	None	None	
	Stream	Ebright Creek Tributary		1320	None	None	

WEST BASIN DOWNSTREAM DRAINAGE EXHIBIT



Date: 1/27/2017

N

King County
GIS Center

East Basin

See Photos and Downstream Drainage Exhibit on the following pages. Photo locations and points referenced in the downstream analysis are shown on the Downstream Drainage Exhibit for reference and clarity.

Runoff in the east basin currently sheet flows south and exits the project site (Point A). Runoff continues to sheet flow south through a field with tall grass and eventually flows into the city owned park (Point B). Once in the park, runoff sheet flows over grass and an asphalt walkway. Runoff continues to sheet flow south through the park and eventually reaches the stream tributary to Ebright creek (Point C) that flows southwest through the park. The stream flows through a densely vegetated area of the park as it continues southwest. Runoff reaches the ¼ mile downstream point (Point D) near where the stream reaches the western property line of the park.

Based on information from King County iMap, after the ¼ mile downstream mark the runoff continues within the Ebright Creek Tributary stream as it heads south and turns to flow northwest. The streams turns again to flow southwest, crossing under SE 8th Street and meeting the flow path from the West Basin. This stream appears to end and, based on contours, runoff slowly works its way south and eventually enters Ebright Creek. Ebright Creek flows west and then turns and flows northwest. Ebright Creek flows into the east side of Lake Sammamish.

In summary, no signs of erosion or significant sedimentation were noted. The downstream system appears, in general, to be stable.

1 – Looking north at field runoff flows through before entering city park.

2 – Looking south where runoff sheet flows through city park.

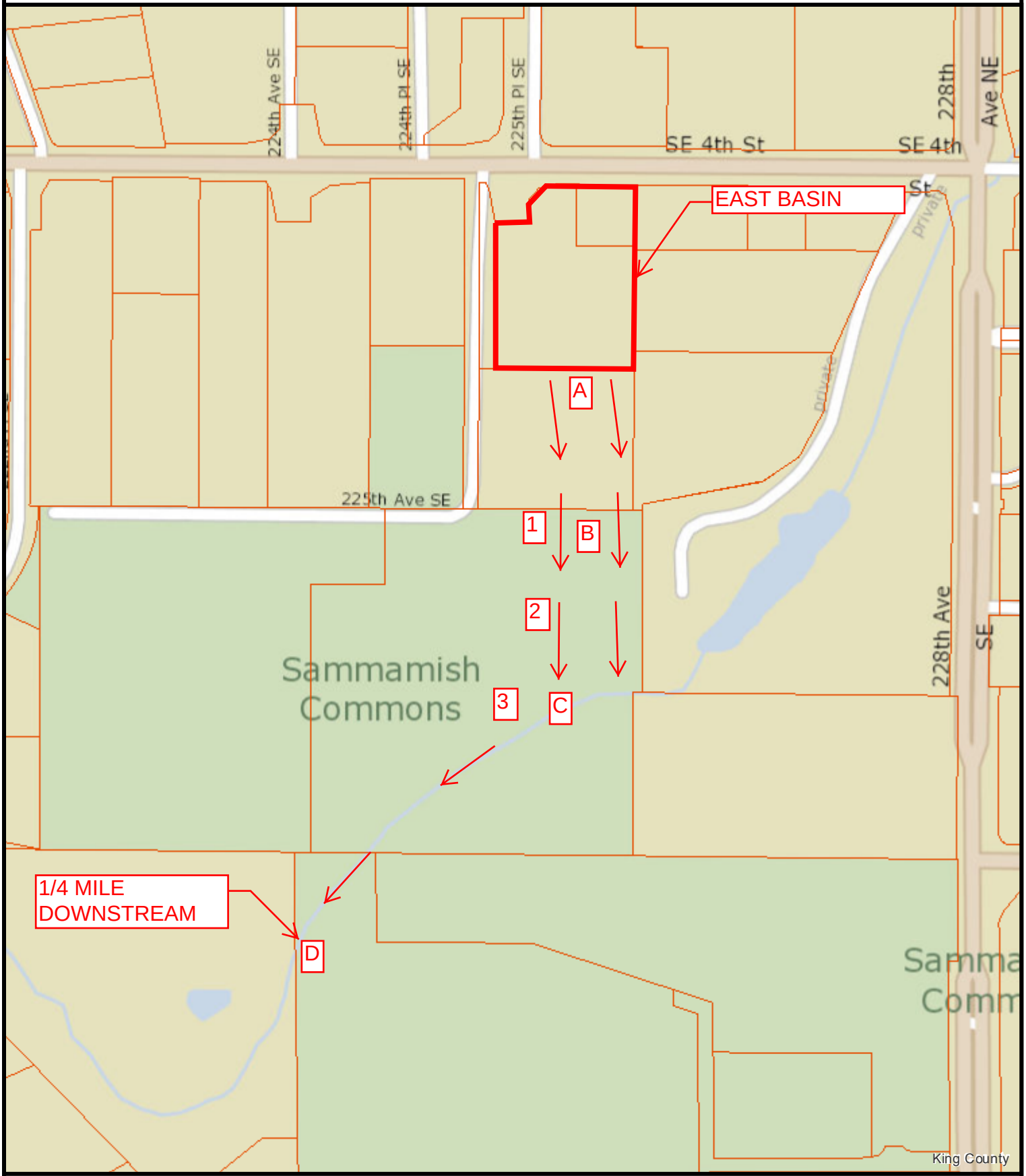
3 – Looking south where runoff enters the stream tributary to Ebright Creek.

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE
KING COUNTY SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin:	Thompson	**Subbasin Name:**	East Basin	**Subbasin Number:**		**Date**	6/14/20

Symbol	**Drainage Component Type, Name, and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems**	**Potential Problems**	**Observations of field inspector, resource reviewer, or resident**
see map	Type: sheet flow, swale, stream, channel, pipe, pond, flow control/wq BMP; Size: diameter, surface area	drainage basin, vegetation, cover, depth, type of sensitive area, volume	%	¼ ml = 1,320 ft.	constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion		tributary area, likelihood of problem, overflow pathways, potential impacts
	Sheet Flow	Grass/Pasture		270 ft	None	None	
	Sheet Flow	Grass		700 ft	None	None	
	Stream	Ebright Creek Tributary		1320 ft	None	None	

EAST BASIN DOWNSTREAM DRAINAGE EXHIBIT



Date: 6/14/2020 Notes:

N

King County

3.4 Task 4, Drainage System Description and Problem Description

A description of the existing drainage system for the East and West Basin has been included in the Downstream Analysis of Task 3. Drainage complaint research has been included in Task 2.

3.5 Task 5, Mitigation of Potential or Existing Problems

Downstream Drainage Problems Requiring Special Attention

Type 1 – Conveyance System Nuisance Problems

There are no known, reported or observed current downstream conveyance nuisance problems.

Type 2 – Severe Erosion Problems

There are no known, reported or observed current downstream severe erosion problems

Type 3-Severe Flooding Problems

There are no known, reported or observed current downstream severe flooding problems.

Downstream Water Quality Problems Requiring Special Attention

The State of Washington Department of Ecology Water Quality Atlas was reviewed for each of the seven downstream water quality problem types to a distance of one mile downstream of the project site.

Type 1 – Bacteria Problems

There are no known or reported downstream bacteria problems.

Type 2 – Dissolved Oxygen (DO) Problems

A Category 2 DO issue does exist along the downstream path (beyond ¼ mile downstream). Category 2 indicates a concern and the need for continued testing. No mitigation is required.

Type 3 – Temperature Problems

There are no known or reported downstream temperature problems.

Type 4 – Metals Problems

A Category 2 Mercury issue does exist along the downstream path (beyond ¼ mile downstream). Category 2 indicates a concern and the need for continued testing. No mitigation is required.

Type 5 – Phosphorous Problems

There are no known or reported downstream phosphorous problems.

Type 6 – Turbidity Problems

There are no known or reported downstream turbidity problems.

Type 7 – High pH Problems

There are no known or reported downstream pH problems.

A Category 5 Bioassessment problem is also listed within one mile downstream of the project site. No mitigation measures for Bioassessment are presented or required by the 2016 KCSWDM or the City of Sammamish Addendum.

4. FLOW CONTROL, FLOW CONTROL BMP AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

Drainage design for the STC - Phase I - UZDP has been broken up into four separate areas that will all drain to separate flow control and water quality facilities. These four areas are sub-basins within the East and West Basins for the project. See the developed condition exhibit for more information on the drainage areas and facility locations. Three flow control facilities and one water quality facility will be constructed through this project. The following sections detail the design of these facilities. Please see the STC Brownstones West and STC Brownstones East TIRs for details on the designs of flow control and water quality facilities that serve the rest of the UZDP area.

The Brownstones East area and the Block 5 and 6 ROW area are both within the West Basin for this project. Both of these areas will all drain to Vaults A and B which will be constructed as part of the Brownstones West project. The facilities designed for the Brownstones West project are oversized to accommodate additional area from the STC - Phase I - UZDP. Vaults A and B each provide live storage for flow control and a large sand filter, downstream of the live storage, for water quality treatment. The sizing of the Vault A and Vault B flow control and water quality facilities is shown in both the STC Brownstones West TIR and STC Brownstones East TIR. Please refer to these reports for more information.

The Block 5 and 6 residential and commercial (private) area is located in the West Basin for this project. This area will drain to its own private flow control vault. This area does not include any PGIS area, therefore now water quality facility is proposed to serve this area.

The Block 7 ROW area is located in the East Basin for this project. This area will drain to Vault C. Vault C will provide a detention vault for flow control and a Modular Wetland located downstream of the detention vault will provide water quality treatment.

The Block 7 residential and commercial (private) area is located in the East basin for this project. This area will also drain to its own private flow control facility. This area does not include any PGIS area, therefore now water quality facility is proposed to serve this area.

All flow control facilities will provide Level 3 Flow Control and all water quality facilities will provide Sensitive lake Water Quality Treatment.

The site soils map shows that the site is entirely comprised of Alderwood Gravelly Sandy Loam (AgC), King County hydrologic soils group “C”, or Till soil.

The MGSFlood generated reports are provided in Appendix A.

Custom Soil Resource Report
Soil Map

TABLE 3.2.2.A EQUIVALENCE BETWEEN SCS SOIL TYPES AND TYPICAL CONTINUOUS MODELING SOIL TYPES

SCS Soil Type	SCS Hydrologic Soil Group	Soil Group for Continuous Model	Notes
Alderwood (AgB, AgC, AgD)	C	Till	
Arents, Alderwood Material (AmB, AmC)	C	Till	
Arents, Everett Material (An)	B	Outwash	1
Beausite (BeC, BeD, BeF)	C	Till	2
Bellingham (Bh)	D	Till	3
Briscot (Br)	D	Till	3
Buckley (Bu)	D	Till	4
Earlmont (Ea)	D	Till	3
Edgewick (Ed)	C	Till	3
Everett (EvB, EvC, EvD, EwC)	A/B	Outwash	1
Indianola (InC, InA, InD)	A	Outwash	1
Kitsap (KpB, KpC, KpD)	C	Till	
Klaus (KsC)	C	Outwash	1
Neilton (NeC)	A	Outwash	1
Newberg (Ng)	B	Till	3
Nooksack (Nk)	C	Till	3
Norma (No)	D	Till	3
Orcas (Or)	D	Wetland	
Oridia (Os)	D	Till	3
Ovall (OvC, OvD, OvF)	C	Till	2
Pilchuck (Pc)	C	Till	3
Puget (Pu)	D	Till	3
Puyallup (Py)	B	Till	3
Ragnar (RaC, RaD, RaC, RaE)	B	Outwash	1
Renton (Re)	D	Till	3
Salal (Sa)	C	Till	3
Sammamish (Sh)	D	Till	3
Seattle (Sk)	D	Wetland	
Shalcar (Sm)	D	Till	3
Si (Sn)	C	Till	3
Snohomish (So, Sr)	D	Till	3
Sultan (Su)	C	Till	3
Tukwila (Tu)	D	Till	3
Woodinville (Wo)	D	Till	3

Notes:

1. Where outwash soils are saturated or underlain at shallow depth (<5 feet) by glacial till, they should be treated as till soils.
2. These are bedrock soils, but calibration of HSPF by King County DNRP shows bedrock soils to have similar hydrologic response to till soils.
3. These are alluvial soils, some of which are underlain by glacial till or have a seasonally high water table. In the absence of detailed study, these soils should be treated as till soils.
4. Buckley soils are formed on the low-permeability Osceola mudflow. Hydrologic response is assumed to be similar to that of till soils.

4.1 Existing Site Hydrology

The existing basin areas are defined as that area that will be improved through development of the subject property. Historic site conditions are assumed for all existing basin areas per Section 1.2.3.1.B of the 2016 KCSWDM meaning all basin area is modeled as Till Forest. Tables below shows the inputs to MGSFlood to model the existing condition for each of the project basins.

Block 5 and 6 Commercial and Residential (Private)

This existing basin area is located in the West Basin for this project. Table 4-1 below shows the existing basin area that has been used to size the Block 5 and 6 Private flow control detention vault.

Table 4-1: Block 5 and 6 Commercial and Residential (Private) Existing Basin

PREDEVELOPED CONDITION	
GROUND COVER	AREA (acres)
Till Forest	2.38

Block 7 Commercial and Residential (Private)

This existing basin area is located in the East Basin for this project. Table 4-2 below shows the existing basin area that has been used to size the Block 7 Private flow control detention vault.

Table 4-2: Block 7 Commercial and Residential (Private) Existing Basin

PREDEVELOPED CONDITION	
GROUND COVER	AREA (acres)
Till Forest	1.10

Block 7 ROW (Vault C)

This existing basin area is located in the East Basin for this project. Table 4-3 below shows the existing basin area that has been used to size the Block 7 ROW flow control detention vault. This vault is referred to Vault C on the Civil Plans.

Table 4-3: Block 7 ROW (Vault C) Existing Basin

PREDEVELOPED CONDITION	
GROUND COVER	AREA (acres)
Till Forest	0.95

SE 4TH STREET

S.E. 4TH STREET

LOT 3 KCSP 577022
REC. NO. 7803130563
TPN 332506-9024
SW-39

UNPLATTED
TPN 332506-9085
SW-40

UNPLATTED
TPN 332506-9016
SW-41

LOT 1
TPN 332506-9091
SW-44

LOT 2
TPN 332506-9138
SW-43

WEST BASIN
5.75 AC

EAST BASIN
2.05 AC

SCALE: 1" = 80'

0 40 80 160

UZDP2019-00562

NO.	REVISIONS	DATE
1	REVISED PER CITY COMMENTS	6/19/20

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

EXISTING CONDITIONS EXHIBIT
STC-PHASE I - UZDP

STC JV 1, LLC & STCA, LLC
5335 MEADOWS RD, SUITE 108
LAKE OSWEGO, OR 97035

DATE	SEE STAMP DATE
DESIGNED	
DRAWN	
APPROVED	LAFE B. HERMANSEN, PROJECT MANAGER

SHEET	OF
1	1

PROJECT NUMBER
15125C

4.2 Developed Site Hydrology

Lot Impervious Coverage

Based on the preliminary architectural plan and landscape plans, impervious area for Block 5 and 6 commercial and residential (private) area was assumed to be 90%. Impervious area for the Block 7 commercial and residential (private) area was assumed to be 100%.

Flow Control BMPs

See Section 2.1.9 of this report for a discussion of Flow Control BMP feasibility. Permeable pavement will be utilized to the maximum extent feasible on the Lot area and private development area. Extent of Permeable Pavement use will be evaluated further during final design. No flow control BMP credit has been taken for the preliminary detention vault sizing.

Block 5 and 6 Commercial and Residential (Private)

The developed basin for the Block 5 and 6 Private Vault will match the extents and size of the existing basin boundary. Table 4-4 below shows the developed coverage areas used to size the detention vault. See Developed Conditions Exhibit on the following pages. Also refer to the MGSFlood Report provided in Appendix A.

Table 4-4: Block 5 and 6 Commercial and Residential (Private) Developed Basin

DEVELOPED CONDITION	Total Area = 2.38 acres
GROUND COVER	AREA (acres)
Impervious	2.14
Till Grass	0.24

Block 7 Commercial and Residential (Private)

The developed basin for the Block 7 Private Vault will match the extents and size of the existing basin boundary. Table 4-5 below shows the developed coverage areas used to size the detention vault. See Developed Conditions Exhibit on the following pages. Also refer to the MGSFlood Report provided in Appendix A.

Table 4-5: Block 7 Commercial and Residential (Private) Developed Basin

DEVELOPED CONDITION	Total Area = 1.11 acres
GROUND COVER	AREA (acres)
Impervious	1.11

Block 7 ROW (Vault C)

The developed basin for the Bock 7 ROW vault (Vault C) will match the extents and size of the existing basin boundary. Table 4-6 below shows the developed coverage areas used to size the detention vault. See Developed Conditions Exhibit on the following pages. Also refer to the MGSFlood Report provided in Appendix A.

Table 4-6: Block 7 ROW (Vault C)

DEVELOPED CONDITION	Total Area = 0.95 acres
GROUND COVER	AREA (acres)
Impervious	0.84
Till Grass	0.11

STC BROWNSTONES EAST
VAULT A TRIBUTARY AREA
1.01 AC

S.E. 4TH STREET

SE 4TH STREET

S.E. 4TH STREET

ALLEY A

ALLEY C

ALLEY D

VAULT A

224TH AVE SE

BSP BLOCK 5 & 6 COMMERCIAL
& RESIDENTIAL AREA (PRIVATE)
2.38 AC

225TH AVE SE

BSP BLOCK 7 COMMERCIAL &
RESIDENTIAL AREA (PRIVATE)
1.10 AC

226TH AVE SE

BLOCK 5 & 6 PRIVATE VAULT

BLOCK 7 PRIVATE VAULT

SE 5TH ST

SE 6TH ST

VAULT B

ALLEY B

224TH AVE SE

VAULT C

BSP BLOCK 5 & 6 ROW
VAULT B TRIBUTARY AREA
0.43 AC

BSP BLOCK 7 ROW VAULT
C TRIBUTARY AREA
0.95 AC

MODULAR WETLAND
UNIT

STC BROWNSTONES EAST
VAULT B TRIBUTARY AREA
1.93 AC

SE 6TH ST

UZDP2019-00562

NO.	REVISIONS	DATE
1	REVISED PER CITY COMMENTS	6/19/20

CIVIL ENGINEERING
LANDSCAPE ARCHITECTURE
PLANNING
SURVEYING

CORE DESIGN

12100 NE 195th St, Suite 300 Bothell, Washington 98011 425.885.7877

DEVELOPED CONDITIONS EXHIBIT
STC -PHASE I - UZDP

STC JV 1, LLC & STCA, LLC
5335 MEADOWS RD, SUITE 108
LAKE OSWEGO, OR 97035

DATE SEE STAMP DATE
DESIGNED
DRAWN
APPROVED LAFE B. HERMANSEN
PROJECT MANAGER

SHEET 1 OF 1

PROJECT NUMBER
15125C

4.3 Performance Standards

This project is subject to Level 3 Flow Control requirements and Sensitive Lake Water Quality treatment requirements.

Level 3 Flow Control

This standard requires that the developed condition discharge durations will meet Level 2 Flow Control Requirements (match the predeveloped condition discharge durations from 50% of the 2-year peak flow up to the 50-year peak flow. In addition, the developed 2-year and 10-year peak discharge rates will not exceed the pre-developed 2-year and 10-year peak, respectively) and match the developed 100-year peak discharge rate to the predeveloped 100-year peak discharge rate.

Sensitive Lake Water Quality Treatment

The treatment goal of Sensitive Lake Water Quality Treatment is 50% annual average total phosphorus (TP) removal assuming typical pollutant concentrations in urban runoff.

4.4 Flow Control Analysis and Design

Flow control for the project will be provided by detention vaults. Three separate detention vaults have been designed for this project using the existing and developed areas provided in the previous sections. All vaults have been sized with MGSFlood to meet Level 3 flow control requirements. See the MGSFlood generated reports provided in Appendix A. Information for detention vaults that serve the Brownstones East area and the Block 5 and 6 ROW area is provided in the STC Brownstones West and STC Brownstones East TIRs.

Block 5 and 6 Commercial and Residential (Private)

The Block 5 and 6 Private Vault will serve the Block 5 and 6 Commercial and Residential Area. Per MGSFlood, the required volume of this vault is 51,667 cubic feet. The provided volume of this vault is 51,667 cubic feet. The provided volume is equal to the required volume, therefore this vault is adequately sized.

Block 7 Commercial and Residential (Private)

The Block 7 Private Vault will serve the Block 7 Commercial and Residential Area. Per MGSFlood, the required volume of this vault is 26,488 cubic feet. The provided volume of Vault B is 26,488 cubic feet. The provided volume is equal to the required volume, therefore this vault is adequately sized.

Block 7 ROW (Vault C)

Vault C will serve all area included in the developed condition of the Block 7 ROW area. Per MGSFlood, the required volume of Vault C is 19,699 cubic feet. The provided volume of Vault B is 19,699 cubic feet. The provided volume is equal to the required volume, therefore Vault C is adequately sized.

4.5 Water Quality System

Sensitive Lake water quality treatment is required for this project. Only one water quality facility will be constructed as part of the UZDP project. Water Quality Treatment is provided for the Brownstones East area and the Block 5 and 6 ROW area by facilities that are designed in the STC Brownstones West and STC Brownstones East TIRs. No PGIS area exists that is tributary to the Block 5 and 6 Private Vault or the Block 7 Private Vault so no water quality facilities are proposed to serve these areas.

Block 7 ROW (Vault C)

Water quality treatment for the Block 7 ROW area will be provided by a Modular Wetland unit. This unit has been sized based on the 2-year outflow of Vault C. The 2-year outflow of Vault C is 0.01728 cubic feet per second. Based on the Modular Wetland sizing information available online, this flow rate corresponds to a modular wetland size of 4 feet wide by 4 feet long.

The Modular Wetland system has GULD Approval from the Washington State Department of Ecology that meets the treatment requirements for Sensitive Lake Water Quality Treatment. GULD Approval information from Washington State DOE is provided on the following pages.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

December 2019

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

    - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
    - Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
    - Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

    - Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
    - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
    - Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	5796 Armada Drive, Suite 250 Carlsbad, CA 92008

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

<u>Laboratory Testing</u>

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

Applicant: Zach Kent
BioClean A Forterra Company.
5796 Armada Drive, Suite 250
Carlsbad, CA 92008
zach.kent@forterrabp.com

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	**Revision**
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)
December 2019	Revised Manufacturer Contact Address

5. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Conveyance System Analysis and Design will be provided during final design.

6. SPECIAL REPORTS AND STUDIES

The following reports have been prepared for this project and are submitted under separate covers.

The following reports and assessments are provided for reference and informational purposes only. Core Design takes no responsibility or liability for these reports, assessments or designs as they were not completed under the direct supervision of Core Design.

- Subsurface Exploration, Geologic Hazards, and Preliminary Geotechnical Engineering Report
  August 29, 2018
  Associated Earth Sciences, Inc.
  911 5th Avenue
  Kirkland, WA 98033
  (425) 827-7701

- Critical Area Study
  September 3, 2019
  Wetland Resources, Inc.
  9505 19th Avenue SE, Suite 106
  Everett, WA 98208
  (425) 337-3174

7. OTHER PERMITS

- NPDES Permit
- Building Permits
- ROW Use Permit
- Water and Sewer Extension Agreements

8. CSWPP ANALYSIS AND DESIGN

The project is required to comply with Core Requirement #5 and Appendix D of the 2016 KCSWDM along with the 13 Elements of the Construction Stormwater Pollution Prevention Plan (CSWPPP) per the 2014 Western Washington DOE manual. A separate SWPPP report addressing the 13 Elements has been prepared as part of the UZDP process.

The overall goal of the ESC plan is to minimize the erosion and transport of sediment to the maximum extent practicable during construction. Clearing limits will be marked by filter fabric fence or orange safety fence in places where filter fabric fence is not shown on the erosion control plan. Temporary and permanent seeding and plastic covering will be used as cover measures to protect disturbed soils during construction. Net and blankets will be used protect 2:1 slopes. Perimeter protection will be provided by filter fabric or silt fence. Traffic area stabilization will be provided by a stabilized construction entrance. Sediment removal and flow control will be provided by temporary sediment ponds. Surface water collection will be provided by interceptor swales which will direct runoff to the temporary sediment pond for sediment removal.

Design calculations and sizing of the proposed erosion and sediment control features will be completed during final design.

9. BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

9.1 Bond Quantities

A Site Improvement Bond Quantity Worksheet will be included during final design.

9.2 Facility Summaries

A Facility Summary Information Form and attachments will be included during final design.

9.3 Declaration of Covenant

A declaration of covenant will be provided at time of Building Permits.

10. OPERATIONS AND MAINTENANCE MANUAL

Operations and Maintenance information will be provided during final design.

APPENDIX A

MGSFlood Reports

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.50
Program License Number: 200210008
Project Simulation Performed on: 06/02/2020 1:56 PM
Report Generation Date: 06/02/2020 1:57 PM

Input File Name: 15125C Block 5 and 6 Private.fld
Project Name: 15125C Block 5 and 6 Private
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 17

Full Period of Record Available used for Routing
Precipitation Station : 96004805 Puget East 48 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961048 Puget East 48 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	2.380	2.380
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	2.380	2.380

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

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

	-------Area (Acres) --------
Till Forest	2.380
Subbasin Total	2.380

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

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

	-------Area (Acres) --------
Till Grass	0.240
Impervious	2.140
Subbasin Total	2.380

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

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

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

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

Link Name: Vault
Link Type: Structure
Downstream Link: None

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 100.00
Riser Crest Elevation (ft) : 107.00
Max Pond Elevation (ft) : 108.00
Storage Depth (ft) : 7.00
Pond Bottom Length (ft) : 121.0
Pond Bottom Width (ft) : 61.0
Pond Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 7381.
Area at Riser Crest El (sq-ft) : 7,381.
(acres) : 0.169
Volume at Riser Crest (cu-ft) : 51,667.
(ac-ft) : 1.186
Area at Max Elevation (sq-ft) : 7381.
(acres) : 0.169
Vol at Max Elevation (cu-ft) : 59,048.
(ac-ft) : 1.356

Massmann Infiltration Option Used
Hydraulic Conductivity (in/hr) : 0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry

Riser Structure Type : Circular
Riser Diameter (in) : 18.00
Common Length (ft) : 0.000
Riser Crest Elevation : 107.00 ft

Hydraulic Structure Geometry

Number of Devices: 5

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 0.81
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 103.45
Diameter (in) : 0.62
Orientation : Vertical
Elbow : No

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 104.00
Diameter (in) : 0.75
Orientation : Horizontal
Elbow : Yes

---Device Number 4 ---
Device Type : Circular Orifice
Control Elevation (ft) : 104.80
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : Yes

---Device Number 5 ---
Device Type : Circular Orifice
Control Elevation (ft) : 105.55
Diameter (in) : 1.25
Orientation : Horizontal
Elbow : Yes

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

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

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

********** Link: Vault ********** Link WSEL Stats

WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	102.470
1.11-Year	102.588
1.25-Year	103.020
2.00-Year	103.843
3.33-Year	104.518
5-Year	104.953
10-Year	105.693
25-Year	106.068
50-Year	106.398
100-Year	106.511

*************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	488.865
Total:	488.865

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	32.148
Link: Vault	0.000
Total:	32.148

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 3.094 ac-ft/year, Post Developed: 0.203 ac-ft/year

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

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

Number of Links: 0

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

Number of Links: 1

********** Link: Vault **********

Basic Wet Pond Volume (91% Exceedance): 11400. cu-ft

Computed Large Wet Pond Volume, 1.5*Basic Volume: 17100. cu-ft

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 1260.82
Inflow Volume Including PPT-Evap (ac-ft): 1260.82
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 1260.57
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: Vault

***** 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	7.256E-02	2-Year	4.088E-02
5-Year	0.117	5-Year	7.557E-02
10-Year	0.146	10-Year	0.115
25-Year	0.219	25-Year	0.138
50-Year	0.270	50-Year	0.153
100-Year	0.281	100-Year	0.158
200-Year	0.472	200-Year	0.207
500-Year	0.730	500-Year	0.273

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-2.0%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-2.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	4.3%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	5.8%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.50
Program License Number: 200210008
Project Simulation Performed on: 06/02/2020 1:57 PM
Report Generation Date: 06/02/2020 1:58 PM

Input File Name: 15125C Block 7 Private.fld
Project Name: 15125C Block 7 Private
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 17

Full Period of Record Available used for Routing
Precipitation Station : 96004805 Puget East 48 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961048 Puget East 48 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	1.110	1.110
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	1.110	1.110

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

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

	-------Area (Acres) --------
Till Forest	1.110
Subbasin Total	1.110

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

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

	-------Area (Acres) --------
Impervious	1.110
Subbasin Total	1.110

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

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

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

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

Link Name: Vault
Link Type: Structure
Downstream Link: None

Prismatic Pond Option Used
Pond Floor Elevation (ft) : 100.00
Riser Crest Elevation (ft) : 107.00
Max Pond Elevation (ft) : 108.00
Storage Depth (ft) : 7.00
Pond Bottom Length (ft) : 86.0
Pond Bottom Width (ft) : 44.0
Pond Side Slopes (ft/ft) : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft) : 3784.
Area at Riser Crest El (sq-ft) : 3,784.
(acres) : 0.087
Volume at Riser Crest (cu-ft) : 26,488.
(ac-ft) : 0.608
Area at Max Elevation (sq-ft) : 3784.
(acres) : 0.087
Vol at Max Elevation (cu-ft) : 30,272.
(ac-ft) : 0.695

Massmann Infiltration Option Used
Hydraulic Conductivity (in/hr) : 0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry
Riser Structure Type : Circular

Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 107.00 ft

Hydraulic Structure Geometry

Number of Devices: 5

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 0.56
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 103.55
Diameter (in) : 0.50
Orientation : Horizontal
Elbow : Yes

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 104.25
Diameter (in) : 0.62
Orientation : Horizontal
Elbow : Yes

---Device Number 4 ---
Device Type : Circular Orifice
Control Elevation (ft) : 105.50
Diameter (in) : 1.00
Orientation : Horizontal
Elbow : Yes

---Device Number 5 ---
Device Type : Circular Orifice
Control Elevation (ft) : 106.50
Diameter (in) : 0.50
Orientation : Horizontal
Elbow : Yes

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

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

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

********** Link: Vault ********** Link WSEL Stats

WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	102.460
1.11-Year	102.568
1.25-Year	103.047
2.00-Year	103.781
3.33-Year	104.482
5-Year	104.915
10-Year	105.685
25-Year	106.072
50-Year	106.310
100-Year	106.478

*************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	228.000
Total:	228.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	0.000
Link: Vault	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 1.443 ac-ft/year, Post Developed: 0.000 ac-ft/year

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

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

Number of Links: 0

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

Number of Links: 1

********** Link: Vault **********

Basic Wet Pond Volume (91% Exceedance): 5750. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 8626. cu-ft

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 617.67
Inflow Volume Including PPT-Evap (ac-ft): 617.67
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 617.55
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: Vault

***** 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	3.384E-02	2-Year	1.949E-02
5-Year	5.437E-02	5-Year	3.423E-02
10-Year	6.798E-02	10-Year	5.205E-02
25-Year	0.102	25-Year	6.342E-02
50-Year	0.126	50-Year	6.878E-02
100-Year	0.131	100-Year	7.222E-02
200-Year	0.220	200-Year	8.115E-02
500-Year	0.340	500-Year	9.308E-02

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-6.7%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-0.2%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	1.4%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.50
Program License Number: 200210008
Project Simulation Performed on: 06/02/2020 2:22 PM
Report Generation Date: 06/02/2020 2:23 PM

Input File Name: 15125C Block 7 ROW Vault C.fld
Project Name: 15125C Block 7 ROW Vault C
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 17

Full Period of Record Available used for Routing
Precipitation Station : 96004805 Puget East 48 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961048 Puget East 48 in MAP
Evaporation Scale Factor : 0.750

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

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

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

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.950	0.950
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.950	0.950

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

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

	-------Area (Acres) --------
Till Forest	0.950
Subbasin Total	0.950

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

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

	-------Area (Acres) --------
Till Grass	0.110
Impervious	0.840
Subbasin Total	0.950

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

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

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

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

Link Name: Vault
Link Type: Structure
Downstream Link: None

Prismatic Pond Option Used

Pond Floor Elevation (ft)	:	100.00
Riser Crest Elevation (ft)	:	107.20
Max Pond Elevation (ft)	:	108.20
Storage Depth (ft)	:	7.20
Pond Bottom Length (ft)	:	228.0
Pond Bottom Width (ft)	:	12.0
Pond Side Slopes (ft/ft)	:	L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00
Bottom Area (sq-ft)	:	2736.
Area at Riser Crest El (sq-ft)	:	2,736.
(acres)	:	0.063
Volume at Riser Crest (cu-ft)	:	19,699.
(ac-ft)	:	0.452
Area at Max Elevation (sq-ft)	:	2736.
(acres)	:	0.063
Vol at Max Elevation (cu-ft)	:	22,435.
(ac-ft)	:	0.515

Massmann Infiltration Option Used
Hydraulic Conductivity (in/hr) : 0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft) : 100.00
Bio-Fouling Potential : Low
Maintenance : Average or Better

Riser Geometry

Riser Structure Type : Circular
Riser Diameter (in) : 12.00
Common Length (ft) : 0.000
Riser Crest Elevation : 107.20 ft

Hydraulic Structure Geometry

Number of Devices: 5

---Device Number 1 ---
Device Type : Circular Orifice
Control Elevation (ft) : 100.00
Diameter (in) : 0.53
Orientation : Horizontal
Elbow : No

---Device Number 2 ---
Device Type : Circular Orifice
Control Elevation (ft) : 103.53
Diameter (in) : 0.44
Orientation : Horizontal
Elbow : Yes

---Device Number 3 ---
Device Type : Circular Orifice
Control Elevation (ft) : 104.10
Diameter (in) : 0.50
Orientation : Horizontal
Elbow : Yes

---Device Number 4 ---
Device Type : Circular Orifice
Control Elevation (ft) : 104.80
Diameter (in) : 0.62
Orientation : Horizontal
Elbow : Yes

---Device Number 5 ---
Device Type : Circular Orifice
Control Elevation (ft) : 105.90
Diameter (in) : 0.75
Orientation : Horizontal
Elbow : Yes

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

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

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

********** Link: Vault ********** Link WSEL Stats

WSEL Frequency Data(ft)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	WSEL Peak (ft)
1.05-Year	102.429
1.11-Year	102.539
1.25-Year	102.966
2.00-Year	103.815
3.33-Year	104.480
5-Year	104.957
10-Year	105.769
25-Year	106.138
50-Year	106.468
100-Year	106.588

*************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	195.135
Total:	195.135

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1	14.735
Link: Vault	0.000
Total:	14.735

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 1.235 ac-ft/year, Post Developed: 0.093 ac-ft/year

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

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

Number of Links: 0

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

Number of Links: 1

********** Link: Vault **********

Basic Wet Pond Volume (91% Exceedance): 4495. cu-ft

Computed Large Wet Pond Volume, 1.5*Basic Volume: 6743. cu-ft

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 499.51
Inflow Volume Including PPT-Evap (ac-ft): 499.51
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 499.42
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

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

Scenario Predeveloped Compliance Subbasin: Subbasin 1

Scenario Postdeveloped Compliance Link: Vault

***** 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	2.896E-02	2-Year	1.728E-02
5-Year	4.653E-02	5-Year	3.222E-02
10-Year	5.818E-02	10-Year	4.328E-02
25-Year	8.726E-02	25-Year	5.392E-02
50-Year	0.108	50-Year	6.074E-02
100-Year	0.112	100-Year	6.287E-02
200-Year	0.188	200-Year	6.895E-02
500-Year	0.291	500-Year	7.705E-02

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

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

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-2.7%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-0.6%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	8.3%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	13.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS
