

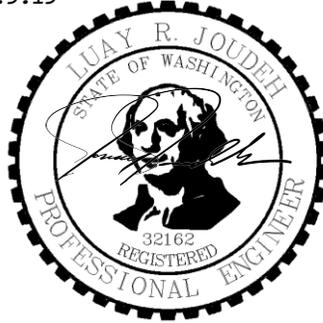
REDMOND 9 SHORT PLAT

Preliminary Short Plat

STORMWATER REPORT

13437 & 13441 NE 100th Street, Redmond, Washington

4.9.19



DRS Project No. 18037
Redmond File No. LAND 2018-00405

Owner/Applicant



Harbour Homes, LLC
400 North 34th Street, Suite 300
Seattle, WA 98103

Report Prepared by



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Issued: April 4, 2019

REDMOND 9 SHORT PLAT

Preliminary Short Plat

STORMWATER REPORT

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SECTION I DRAINAGE REPORT SUMMARY

A. DRAINAGE INFORMATION SUMMARY FORM

Project Name: Redmond 9 Short Plat
City Project Number: LAND 2018-00405
Project Engineer: D.R. STRONG Consulting Engineers Inc.
Project Applicant: Harbour Homes, LLC
Project Site Area: 2.638 acres
Project Development Area: 1.857 acres
Number of Lots: 9

Summary Table

Drainage Basin Information	Basin Information
Project Basin Area (acres)	1.857 ac
Type of Storage Proposed	Vault
Approx. Total Storage Volume (cu. ft.)	28,611
Soil Type(s) Alderwood (AgB) 0-8% Alderwood (AgC) 8-15% Alderwood (AgD)15-30%	
Pre-developed Runoff Rates	
Q (cfs.) 2 yr.	0.054597
10 yr.	0.1034
100 yr.	0.143519
Post-dev. Runoff Rates	
Q (cfs.) 2 yr.	0.02707
10 yr.	0.073399
100 yr.	0.187247
Off-Site Upstream Area	
Number of acres (included in runoff analysis)	0.227

SECTION II EXECUTIVE SUMMARY

A. DRAINAGE PLAN DESCRIPTION

The Project proposes to short plat 2.64 acres (tax parcels 0325059035, 0325059208 and 0325059211) into nine lots for single family residences. The Project will be required to improve the south half of the right of way of NE 100th Street. Tracts B and C will be placed in NGPA for steep slopes, wetland and stream buffers as well tree preservation. Runoff from the east may enter the site as sheet flow from an area that is mostly lawn. The Project Development Area will be 1.857 acres (Project).

B. DRAINAGE BASINS

Pre-Developed Basin

The Project is located in one Threshold Discharge Area (TDA) and two Natural Discharge Areas (NDA). Vegetation consists of scattered trees, lawn, shrubs and blackberry bushes. There are existing structures which are scheduled to be removed.

NDA 1:

Runoff from the Project Development Area sheet flows across the Site in a southwesterly direction and exits Site at the Natural Discharge Location (NDL 1) near the southwest corner of said NDA where it becomes more of a concentrated flow off site. NDA 1 is mostly flat with areas of slopes reaching 15%.

NDA 2:

Tracts B and C comprise this NDA. Runoff sheet flows across the steep slopes in a southerly direction before it exists near the southeast corner where a Category III and a Class II stream exist (NDL 2). NDA 2 has slopes in excess of 40% in some places. Runoff from both NDAs converge shortly after exiting Site as demonstrated in the offsite analysis.

Post-Developed Basin(s)

NDA 1:

The offsite improvements will include pavement widening, a planter strip and a concrete sidewalk. On site, there will be a subdivision road with 20 feet of pavement, a drainage swale, and a sidewalk along with a cul-de-sac, future homes, their driveways, and lawn. Tract A, recreation space and storm drainage tract, will be developed with a subsurface vault and recreation space equipment along with an access road. The following table and Figure further illustrate the preliminary area breakdown.

NDA 1

Lot	Lot Area (SF)	Max Coverage 35%	Proposed Driveway/patio	Proposed Impervious (SF)	Proposed Impervious* (%)
1	4,757.00	1,664.95	800.00	2,464.95	51.82%
2	4,290.00	1,501.50	800.00	2,301.50	53.65%
3	5,630.00	1,970.50	800.00	2,770.50	49.21%
4	4,888.00	1,710.80	800.00	2,510.80	51.37%
5	4,064.00	1,422.40	800.00	2,222.40	54.69%
6	3,731.00	1,305.85	800.00	2,105.85	56.44%
7	3,162.00	1,106.70	800.00	1,906.70	60.30%
8	4,573.00	1,600.55	800.00	2,400.55	52.49%
9	4,989.00	1,746.15	800.00	2,546.15	51.04%
Road A	18,007.37			14,270.25	
NE 100th	2,780.13			2,037.13	
Tract A	10,018.00			1,787.00	
Upstream	10,000.00			0.00	
Total	80,889.50	14,029.40	7,200.00	39,323.77	53.44%
ACRE	1.86	0.32	0.17	0.90	

NDA 2:

This NDA will remain undeveloped except for the construction of the above ground discharge system from NDA 1.

NDA 2

TRACT B	6,134.000	0.141
TRACT C	42,191.000	0.969
TOTAL	48,325.000	1.109

C. OFFSITE IMPROVEMENTS

Adjacent Offsite Improvements

NE 100th Street will be improved by widening pavement, installing a planter strip and a concrete sidewalk.

Proposed Water Quality Measures

The Project creates more than 5,000 square feet of new pollution generating impervious surface. Basic water quality treatment will be provided in a wetvault or equal.

Downstream Analysis

NDA 1:

Concentrated runoff flows in an overgrown steep channel in a southerly direction for approximately 140 feet. This flow is then intercepted by the main channel of the Class II Stream. Runoff travels in said stream channel, which is also steep and overgrown, for a distance of approximately 250 feet where it converges with runoff from NDA 2.

NDA 2:

Southeasterly shallow concentrated flow from this NDA exits the Site at ND 2 at the Category III wetland and aforementioned stream. The confluence of both NDAs flows in the steep creek channel, in an easterly direction for the remainder of the one quarter mile downstream study.

Post-Developed Conditions

NDA 1:

A storm drainage conveyance system will be constructed in the subdivision road. Runoff from pavement in NE 100th Street, lots and road A will sheet flow into the drainage swale before it enters the catchbasin and conveyance pipes. Runoff from roof will be tightlined into the same conveyance system. A storm drainage vault for runoff control and treatment will be installed in Tract A. The outfall from vault will be in an above ground 12-inch HDPE and an above ground HDPE dispersal pipe.

Upstream Analysis

The Project receives some runoff from approximately 10,000 s.f. of lawn area along the east property line. This runoff will most likely enter the proposed conveyance system via sheet flow across Road A pavement. Vault sizing will account for said runoff.

SECTION III

MR 1 – PREPARATION OF STORMWATER SITE PLANS

A. PROJECT DESCRIPTION

The Project is a nine-lot short plat for seven detached single family homes and one duplex.

B. PROPOSED DEVELOPMENT

Project will provide Basic Water Quality treatment and Flow Control per the DOE Manual. All surface water runoff from impervious surfaces will be collected in an underground vault. Water quality treatment will be provided in a wetvault.

While Site as a whole is located in R1 and RIN zonings, the Project itself will be in RIN zoning while the area to remain undeveloped (Tracts B and C) will be located in R1.

RIN zoning allows 65% maximum impervious surface and 35% lot coverage. Due to restriction on lot coverage, reduced impervious surface will be proposed on per lot basis as a “restricted footprint BMP”. The following is a breakdown of lots and their proposed impervious surfaces.

Maximum and Proposed Impervious Comparison

Lot	Lot Area (SF)	Max Coverage 35%	Proposed Driveway/ patio	Proposed Impervious (SF)	Proposed Impervious * (%)	Proposed Pervious	Required 10% Open Space Per Lot (SF)	Provided Open Space Per Lot (SF)
1	4,757	1,664.95	800.00	2,464.95	51.82%	2,292.05	475.70	825.00
2	4,290	1,501.50	800.00	2,301.50	53.65%	1,988.50	429.00	825.00
3	5,630	1,970.50	800.00	2,770.50	49.21%	2,859.50	563.00	750.00
4	4,888	1,710.80	800.00	2,510.80	51.37%	2,377.20	488.80	1,044.00
5	4,064	1,422.40	800.00	2,222.40	54.69%	1,841.60	406.40	675.00
6	3,731	1,305.85	800.00	2,105.85	56.44%	1,625.15	373.10	600.00
7	3,162	1,106.70	800.00	1,906.70	60.30%	1,255.30	316.20	490.00
8	4,573	1,600.55	800.00	2,400.55	52.49%	2,172.45	457.30	750.00
9	4,989	1,746.15	800.00	2,546.15	51.04%	2,442.85	498.90	750.00

C. PROJECT MINIMUM REQUIREMENTS

The Minimum Requirements that apply to this Project were determined using the Flow Chart for New Development.

Per Figure 5, all Minimum Requirements apply to all new impervious surfaces and converted pervious surfaces. The Minimum Requirements, as identified by the 2017 DOE Manual, and a brief discussion of how they are met follows:

Minimum Requirement #1: Preparation of Stormwater Site Plans

The Preliminary Short Plat Drawings and this Report constitute the Stormwater Site Plans.

Minimum Requirement #2: Construction Stormwater Pollution Prevention

The SWPPP is provided in Section IV.

Minimum Requirement #3: Source Control of Pollution

Source Control of Pollution is addressed in the SWPPP.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

The Project discharges stormwater at the natural discharge point of the Site.

Minimum Requirement #5: On-site Stormwater Management

On-site stormwater management BMPs are discussed in Item F of this Section.

Minimum Requirement #6: Runoff Treatment

The Project proposes to provide basic water quality treatment using a wetvault.

Minimum Requirement #7: Flow Control

The Project proposes to provide flow control using a vault.

Minimum Requirement #8: Wetlands Protection

Project proposes to provide wetland and stream buffers as show on plans and per Project biologist recommendation.

Minimum Requirement #9: Operation and Maintenance

An Operations and Maintenance Manual will be prepared during the final engineering phase of this Project.

D. EXISTING CONDITIONS

Total existing Site area is approximately, 114,920 s.f. (2.638 ac). Vegetation consists of Maple, Pine, Douglas Fir, and Cedar trees as well as lawn, shrubs, and black berry bushes. The Site is currently used as two single family homes with multiple structures on each parcel.

For the purpose of hydrologic calculations, the entire Project Development Area is modeled as till forest.

E. DOWNSTREAM ANALYSIS

See Appendix A for a detailed Level One Downstream Analysis.

F. STORMWATER QUANTITY CONTROL MEASURES

NDA 1 runoff will be conveyed into a storm drainage vault located in Tract A. Releases from vault will be via an above ground discharge system.

Per City of Redmond Stormwater Notebook section 8.7.4, the Project is required to implement on-site/LID BMP's (Low Impact Development Best Management Practices) to the greatest extent possible. The Project proposes to implement footprints restricting impervious surfaces on each lot to an average of 55% instead of the allowed 65%. The following table is a conceptual breakdown.

Lot	Lot Area (SF)	Max Coverage 35%	Proposed Driveway/patio	Proposed Impervious (SF)	Proposed Impervious* (%)
1	4,757.00	1,664.95	800.00	2,464.95	51.82%
2	4,290.00	1,501.50	800.00	2,301.50	53.65%
3	5,630.00	1,970.50	800.00	2,770.50	49.21%
4	4,888.00	1,710.80	800.00	2,510.80	51.37%
5	4,064.00	1,422.40	800.00	2,222.40	54.69%
6	3,731.00	1,305.85	800.00	2,105.85	56.44%
7	3,162.00	1,106.70	800.00	1,906.70	60.30%
8	4,573.00	1,600.55	800.00	2,400.55	52.49%
9	4,989.00	1,746.15	800.00	2,546.15	51.04%
Road A	18,007.37			14,270.25	
NE 100th	2,780.13			2,037.13	
Tract A	10,018.00			1,787.00	
Upstream	10,000.00			0.00	
Total	80,889.50	14,029.40	7,200.00	39,323.77	53.44%
ACRE	1.86	0.32	0.17	0.90	

G. STORMWATER CONVEYANCE CALCULATIONS

To be completed at construction plan preparation.

H. STORMWATER QUALITY CONTROL MEASURES

The Project will add pollution generating surfaces (PGIS) in NE 100th Street, Road A, Driveways, and Tract A access road. For purpose of this Report, sidewalks, and other impervious non PGIS surfaces will counted as PGIS. This runoff will be treated in a Basic water quality cell in the wetvault proposed in Tract A.

Lot	Lot Area (SF)	Max Coverage 35%	Proposed Driveway/patio
1	4,757.00	1,664.95	800.00
2	4,290.00	1,501.50	800.00
3	5,630.00	1,970.50	800.00
4	4,888.00	1,710.80	800.00
5	4,064.00	1,422.40	800.00
6	3,731.00	1,305.85	800.00
7	3,162.00	1,106.70	800.00
8	4,573.00	1,600.55	800.00
9	4,989.00	1,746.15	800.00
Road A	18,007.37		
NE 100th	2,780.13		
Tract A	10,018.00		
Upstream	10,000.00		
Total	80,889.50	14,029.40	7,200.00
ACRE	1.86	0.32	0.17

**FIGURE 1
VICINITY MAP**

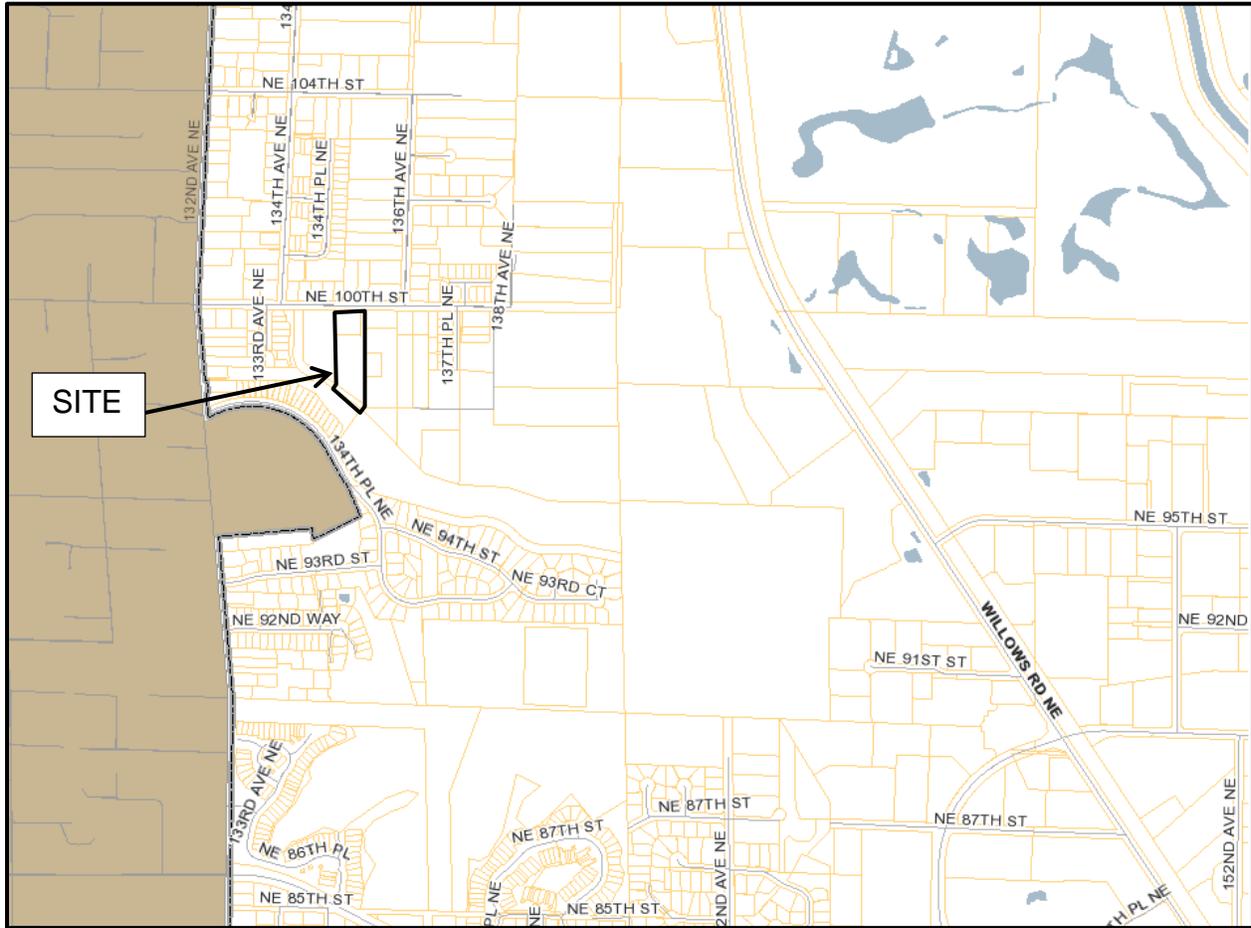
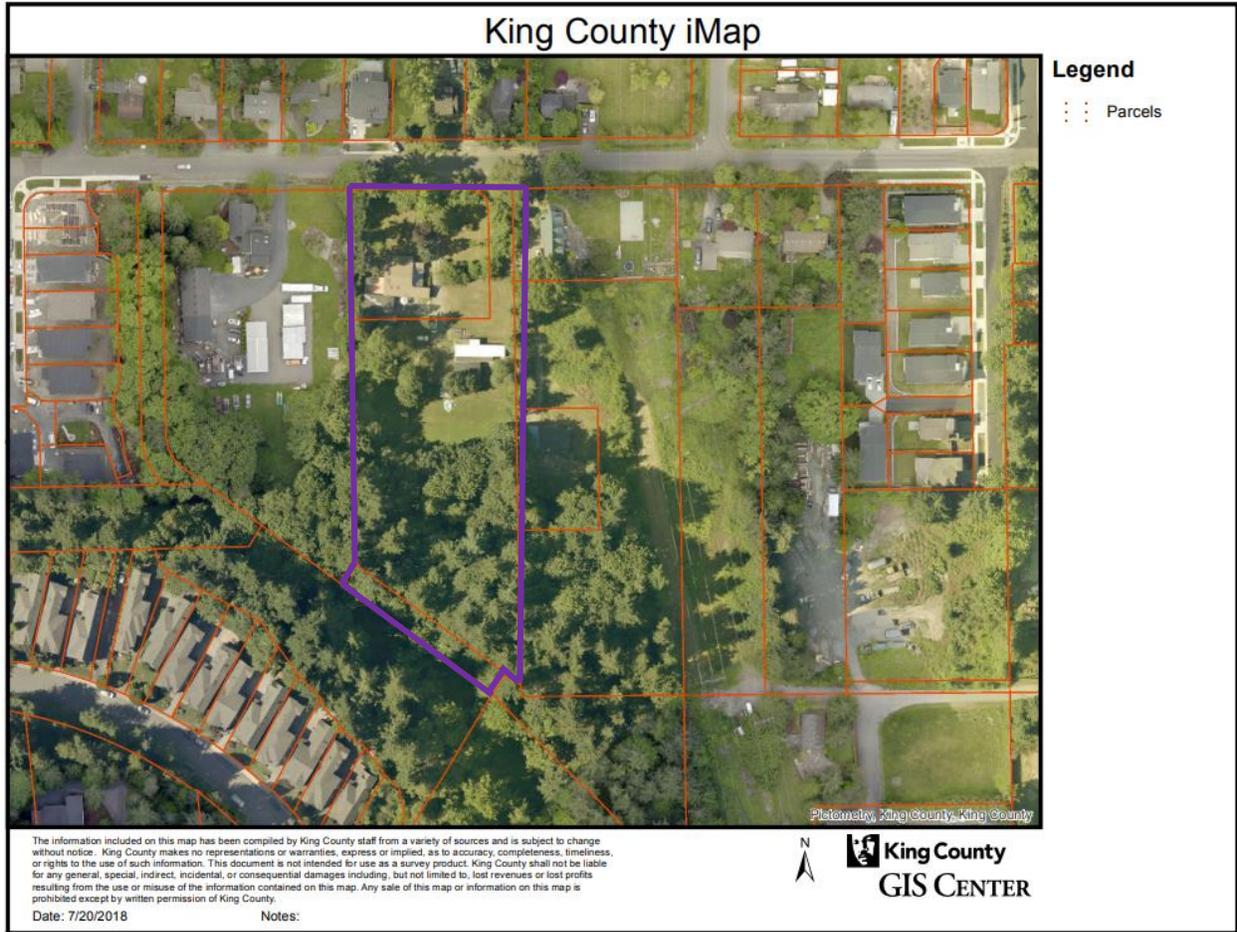
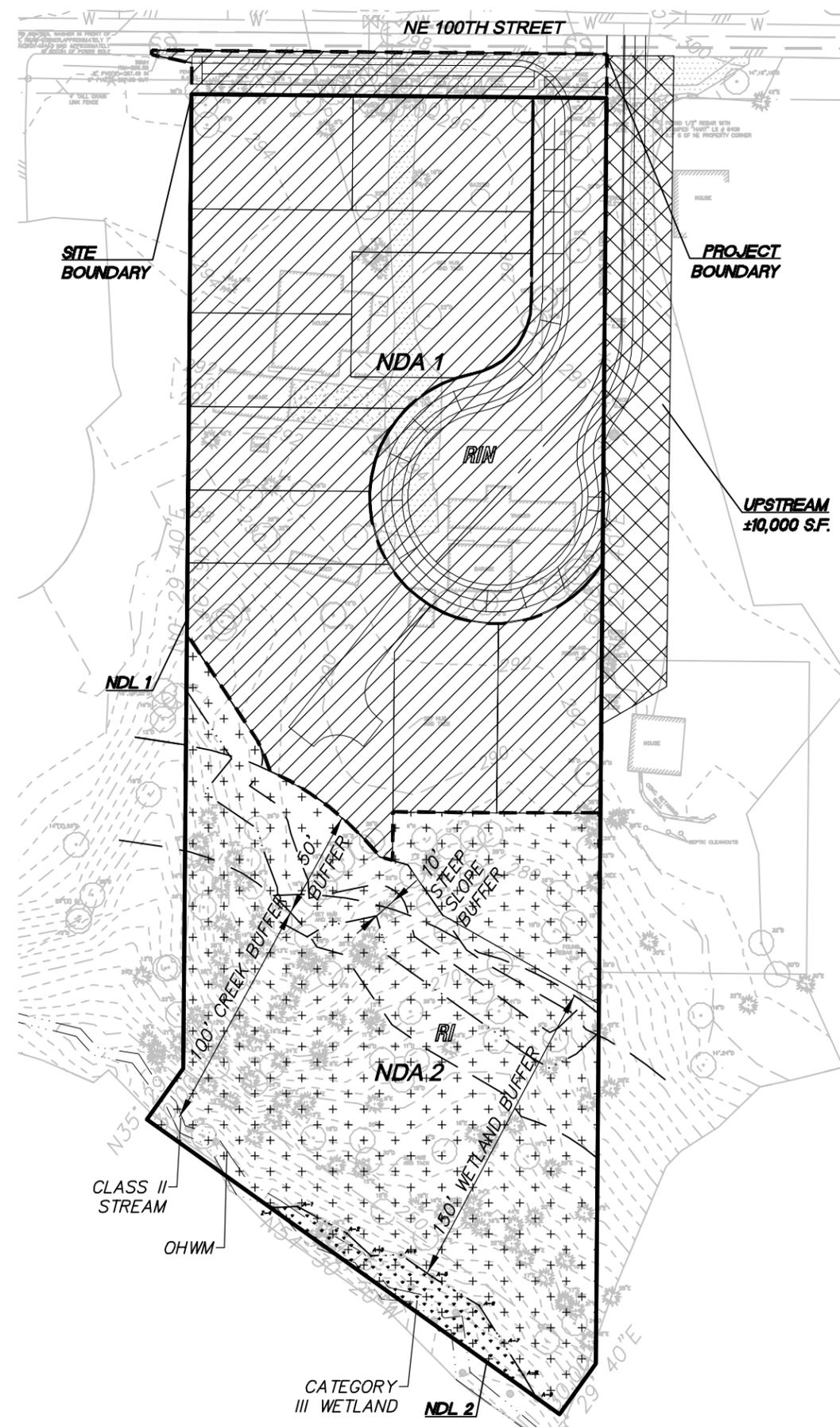


FIGURE 2 AERIAL MAP



**FIGURE 3
EXISTING SITE CONDITIONS**



LEGEND:

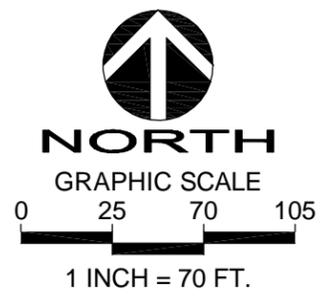
<hr/>	
TOTAL PROJECT AREA:	80,889 S.F. (1.857 AC)
NDA 1	80,889 S.F. (1.857 AC)
NDA 2	48,324 S.F. (1.109 AC)
UPSTREAM AREA	10,000 S.F. (0.230 AC)
PROJECT BOUNDARY	
SITE BOUNDARY	

PREDEVELOPED AREA BREAKDOWN:

<hr/>	
SITE AREA:	114,920 S.F. (2.638 AC)
PROJECT DEVELOPMENT AREA:	80,889 S.F. (1.857 AC)
(INCLUDES FRONTAGE IMPROVEMENTS ON NE 100TH STREET, UPSTREAM AREA AND EXCLUDES TRACTS B AND C)	

WHM2012 INPUT:

<hr/>	
PREDEVELOPED AREA:	
C, FOREST, MOD:	80,889 S.F. (1.857 AC)
IMPERVIOUS:	0 S.F. (0 AC)
TOTAL:	80,889 S.F. (1.857 AC)



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FIGURE 3
EXISTING SITE CONDITIONS MAP
REDMOND 9

DRAFTED BY: ZLJ
DESIGNED BY: LRJ
PROJECT ENGINEER: LRJ
DATE: 08-31-18
PROJECT NO.: 18037

FIGURE 4 USDA KING COUNTY SOILS SURVEY MAP



King County Area, Washington

AgB—Alderwood gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t625
Elevation: 50 to 800 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Alderwood

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest, talf
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA)

Hydric soil rating: No

Minor Components

Mckenna

Percent of map unit: 5 percent

Landform: Depressions, drainageways

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Everett

Percent of map unit: 5 percent

Landform: Kames, eskers, moraines

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Crest, interfluvium

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Shalcar

Percent of map unit: 3 percent

Landform: Depressions

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Norma

Percent of map unit: 2 percent

Landform: Depressions, drainageways

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

AgC—Alderwood gravelly sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2t626

Elevation: 50 to 800 feet

Mean annual precipitation: 20 to 60 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 160 to 240 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Alderwood and similar soils: 85 percent

Minor components: 15 percent

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

Description of Alderwood

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope, talus
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA)
Hydric soil rating: No

Minor Components

Everett

Percent of map unit: 5 percent
Landform: Kames, eskers, moraines
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Crest, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Indianola

Percent of map unit: 5 percent
Landform: Eskers, kames, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Hydric soil rating: No

Shalcar

*Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes*

Norma

*Percent of map unit: 2 percent
Landform: Depressions, drainageways
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes*

AgD—Alderwood gravelly sandy loam, 15 to 30 percent slopes

Map Unit Setting

*map unit symbol: 2t627
Elevation: 0 to 1,000 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance*

Map Unit Composition

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

Description of Alderwood

Setting

*Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, nose slope, talf
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits*

Typical profile

*A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam*

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA)
Hydric soil rating: No

Minor Components

Everett

Percent of map unit: 5 percent
Landform: Kames, eskers, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Indianola

Percent of map unit: 5 percent
Landform: Kames, terraces, eskers
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

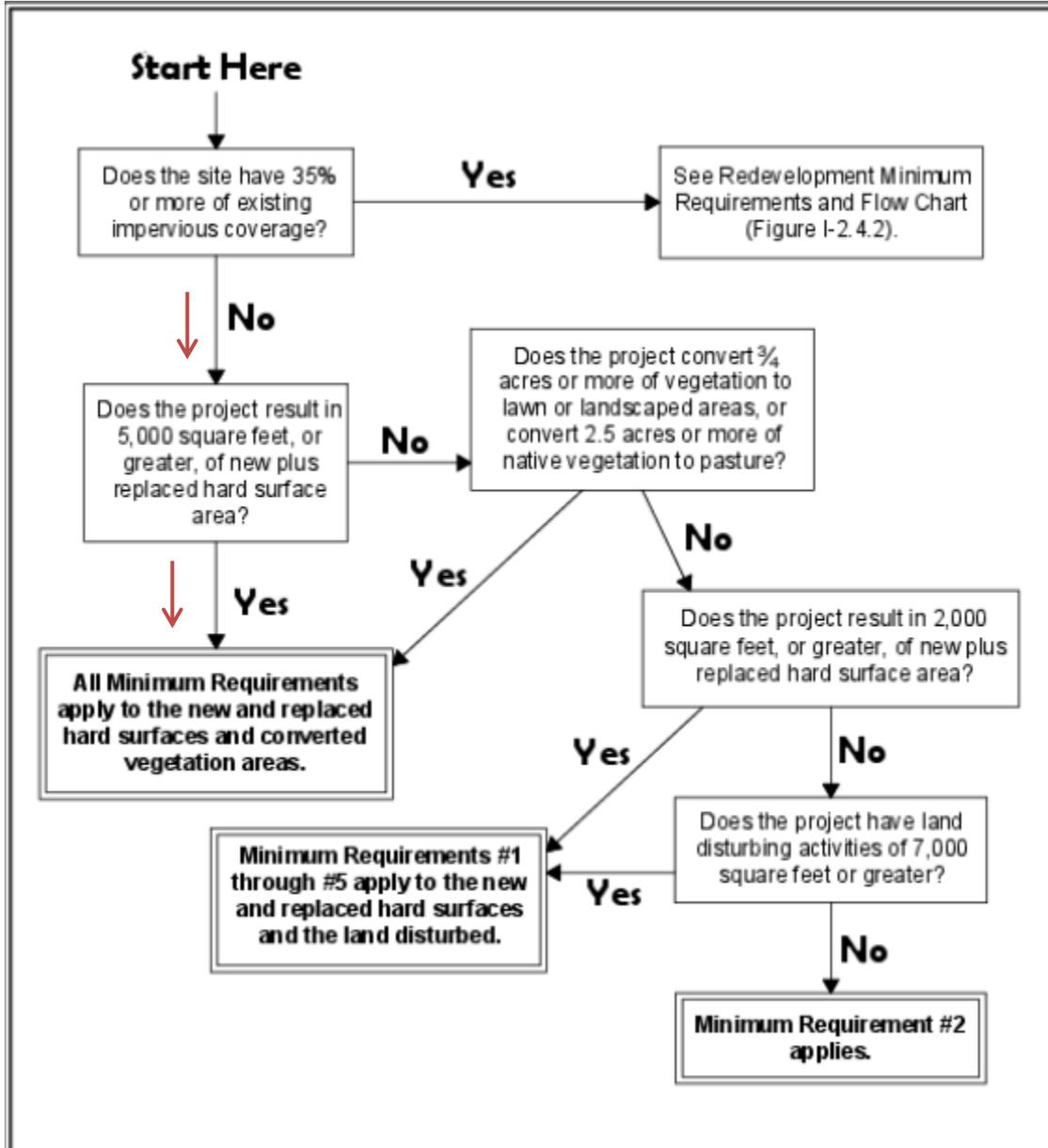
Shalcar

Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Norma

Percent of map unit: 2 percent
Landform: Drainageways, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

**FIGURE 5
MINIMUM REQUIREMENTS FLOW CHART**



SECTION IV MR 2 - PRELIMINARY STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A preliminary SWPPP is included in Appendix B. A complete SWPPP will be included with the engineering phase of this project.

SECTION V

MR 3 – SOURCE CONTROL OF POLLUTION

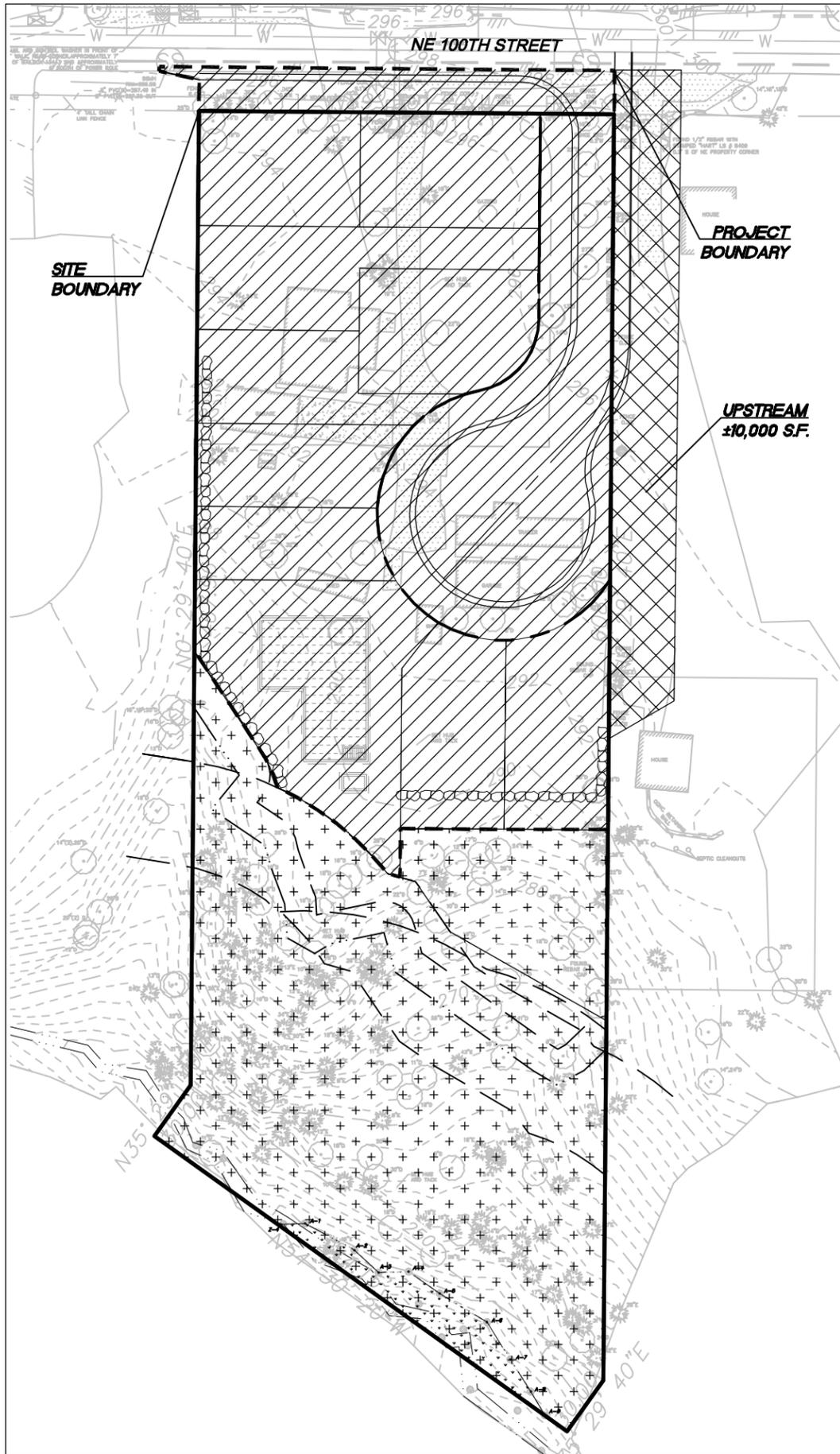
To be prepared as a part of the SWPPP document found in Appendix B.

SECTION VI

MR 4 – PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

The Site has one TDA and two NDAs as described throughout the Report. Discharge from the vault is designed to simulate the predeveloped conditions to the maximum extent feasible. Discharge will be dispersed over a large area utilizing an above ground dispersal system. Considering that runoff from NDA 1 and NDA 2 converged almost immediately after exiting the Site (within 390 feet or less), locating said dispersal system in NDA 2 should preserve the natural drainage systems and outfalls.

**FIGURE 6
DEVELOPED CONDITIONS MAP**



LEGEND:

TOTAL PROJECT AREA: 80,889 S.F. (1.857 AC)	
	NDA 1 80,889 S.F. (1.857 AC)
	NDA 2 48,325 S.F. (1.109 AC)
	UPSTREAM AREA 10,000 S.F. (0.230 AC)
	PROJECT BOUNDARY

WWHM INPUT:

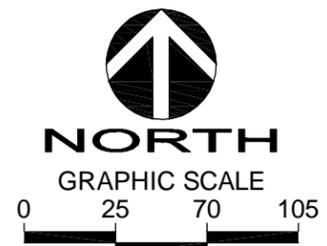
ROOFS:	14,029 S.F. (0.322 AC)
DRIVEWAYS:	7,200 S.F. (0.165 AC)
SIDEWALKS:	5,713 S.F. (0.131 AC)
ROADS:	12,381 S.F. (0.284 AC)
LAWN:	41,566 S.F. (0.954 AC)
TOTAL:	80,889 S.F. (1.857 AC)

DEVELOPED AREA BREAKDOWN:

SITE AREA:	114,920 S.F. (2.638 AC)
PROJECT DEVELOPMENT AREA: (INCLUDES FRONTAGE IMPROVEMENTS ON NE 100TH STREET, UPSTREAM, AND EXCLUDES TRACTS B AND C)	80,889 S.F. (1.857 AC)

DEVELOPED SITE CONDITIONS

LOT	LOT AREA (SF)	MAX COVERAGE 35%	PROPOSED DRIVEWAY/PATIO	PROPOSED IMPERVIOUS (SF)	PROPOSED IMPERVIOUS (%)	PROPOSED PERVIOUS (SF)	REQUIRED 10% OPEN SPACE PER LOT	PROVIDED OPEN SPACE PER LOT (SF)
1	4,757	1,665	800	2,465	52%	2,292	476	825
2	4,290	1,502	800	2,302	54%	1,989	429	825
3	5,630	1,971	800	2,771	49%	2,860	563	750
4	4,888	1,711	800	2,511	51%	2,377	489	1,044
5	4,064	1,422	800	2,222	55%	1,842	406	675
6	3,731	1,306	800	2,106	56%	1,625	373	600
7	3,162	1,107	800	1,907	60%	1,255	316	490
8	4,573	1,601	800	2,401	52%	2,172	457	750
9	4,989	1,746	800	2,546	51%	2,443	499	750
ROAD A	18,007			14,270		3,737		
NE 100TH ST	2,780			2,037		743		
TRACT A	10,018			1,787		8,231		
UPSTREAM	10,000			10,000		10,000		
TOTAL	80,889	14,029	7,200	39,234	53%	41,566	4,008	6,709
ACRE	1.857	0.32	0.17	0.90		0.95	0.09	0.15



1 INCH = 70 FT.

D.R. STRONG
 CONSULTING ENGINEERS

 ENGINEERS PLANNERS SURVEYORS
 620 - 7th AVENUE KIRKLAND, WA 98033
 O 425.827.3063 F 425.827.2423

FIGURE 6
 DEVELOPED AREA MAP
 REDMOND 9

DRAFTED BY: ZLJ
 DESIGNED BY: LRJ
 PROJECT ENGINEER: LRJ
 DATE: 02-13-19
 PROJECT NO.: 18037

SECTION VII

MR 5 – ON-SITE STORMWATER MANAGEMENT

Per City of Redmond Stormwater Notebook section 8.7.4, the Project is required to implement on-site/LID BMP's (Low Impact Development Best Management Practices) to the greatest extent possible. The project will implement restricted footprints as stated earlier in this report. Project will restrict impervious surface to around 52% instead of the 65% allowed. (No development activities are proposed in the portion of the Site zoned R1).

The 2014 SWMMWW lists On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9:

Lawn and landscaped areas:

- *Post-Construction Soil Quality and Depth in accordance with BMP T5.13*
Post-Construction Soil Quality and Depth will be implemented to the maximum extent feasible.

Roofs:

1. *Full Dispersion in accordance with BMP T5.30: Full Dispersion, or Downspout Full Infiltration Systems in accordance with BMP T5.10A: Downspout Full Infiltration*
Due to size of lots and soils limited infiltration capacity, this BMP is deemed unfeasible for most lots.
2. *Bioretention facilities that have minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it (BMP T5.15)*
This BMP is not feasible due to poor infiltration of native soils and potential high water table.
3. *Downspout Dispersion Systems in accordance with BMP T5.10B: Downspout Dispersion Systems*
Due to size of lots and soils limited infiltration capacity, this BMP is deemed unfeasible.
4. *Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections*
The Project will implement this BMP for all lots.

Other Hard Surfaces:

1. *Full Dispersion in accordance with BMP T5.30: Full Dispersion (p.939)*
Due to size of lots and soils limited infiltration capacity, this BMP is deemed unfeasible.

2. Permeable pavement in accordance with BMP T5.15

Due to soils limited infiltration capacity, this BMP is deemed unfeasible.

- **Bioretention BMP's (BMP T7.30: Bioretention Cells, Swales, and Planter Boxes, page 959) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it**
 - **This BMP is not feasible due to poor infiltration of native soils and potential high water table.**
3. Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion (page 908), or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated Flow Dispersion (page 905)

This BMP will not be used due to lot size and proximity of neighboring structures to property lines.

MR 6 – RUNOFF TREATMENT

This project is required to provide basic water quality treatment. Basic water quality will be provided in a modular wetland or equivalent proprietary device. The sizing and selection of the device will be completed at the time of engineering.

SECTION VIII MR 7 – FLOW CONTROL

A. DESIGN APPROACH

The continuous simulation model, the Western Washington Hydrology Model, WWHM, was used to analyze the pre and post developed runoff rates. Per Table 3.2.2.b of the Manual, the soil type is modeled as “Till” for the Alderwood gravelly sandy loam SCS classification as shown in Figure 6: Soils. While the existing Site conditions are mostly lawn and groves of mature trees, DOE requires that the Site be modeled as “Forest”. The soil types are unchanged from the pre-developed conditions. The portions of the Site within the proposed clearing limits tributary to the proposed detention tank were modeled as “Till Grass” and Impervious as appropriate.

Results of the WWHM analysis are included in Appendix C of this report.

B. FULL SITE AREA ANALYSIS

The Site is analyzed as one Threshold Discharge area (TDA). The following table represents the Site areas breakdown for existing and design input in WWHM.

	Developed Area	Impervious Pavment, SW, DWS	Roof	Lawn	Forest
PreDev	1.857				1.857
Dev	1.857	0.581	0.322	0.954	0.00

SECTION IX

MR 8 – WETLANDS PROTECTION

Site is home to a Category III wetland and a Class II stream both located along the south property line. The Project will maintain standard buffers for both critical areas, 150 feet each respectively. Tract C will be set aside as a native growth protection area (NGPA) to provide permanent protection for those critical areas. In addition, a tree preservation open space tract (Tract B) will provide additional protection since it will be positioned contiguous with Tract C. Runoff from Project will be controlled through the vault for both release and water quality.

SECTION X

MR 9 – BASIN/WATERSHED PLANNING

There are no known basin or watershed plans that affect this Project.

SECTION XI

MR 10 – OPERATIONS AND MAINTENANCE

A stand-alone O&M manual will be prepared during the final engineering phase of this Project.

APPENDICES

APPENDIX A OFFSITE ANALYSIS

An Offsite Analysis prepared by D.R. STRONG Consulting Engineers Inc. is included in this Appendix.

REDMOND 9
Preliminary Short Plat
OFFSITE ANALYSIS



DRS Project No. 18037
Redmond File No. LAND-2018-00405

Owner/Applicant

Harbour Homes, LLC
400 North 34th St, Suite 300
Seattle, WA 98103
(206) 315-8130

Report Prepared by



D.R. STRONG Consulting Engineers, Inc.
607 - 7th Avenue
Kirkland WA 98033
(425) 827-3063

Issued: April 2, 2019

REDMOND 9

Preliminary Short Plat

OFFSITE ANALYSIS

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TASK 1 DEFINE AND MAP THE STUDY AREA

This Offsite Analysis was prepared in accordance with Volume 1, Section 2.6.2 of the 2014 Stormwater Management Manual for Western Washington (Manual) and the City of Redmond 2017 Stormwater Notebook. The Site (tax parcels 0325059035, 0325059208, and 0325059211) is located at 13437 and 13441 NE 100th Street in Redmond, Washington.

See Figure 1, Figure 2, and Figure 3 for maps of the study area.

**FIGURE 2
SITE MAP**

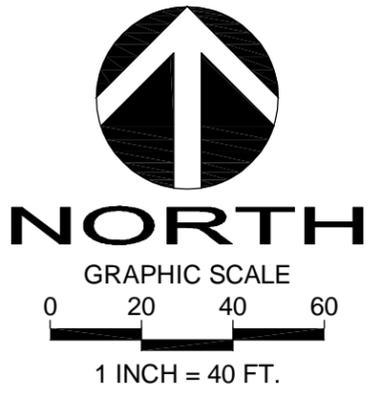
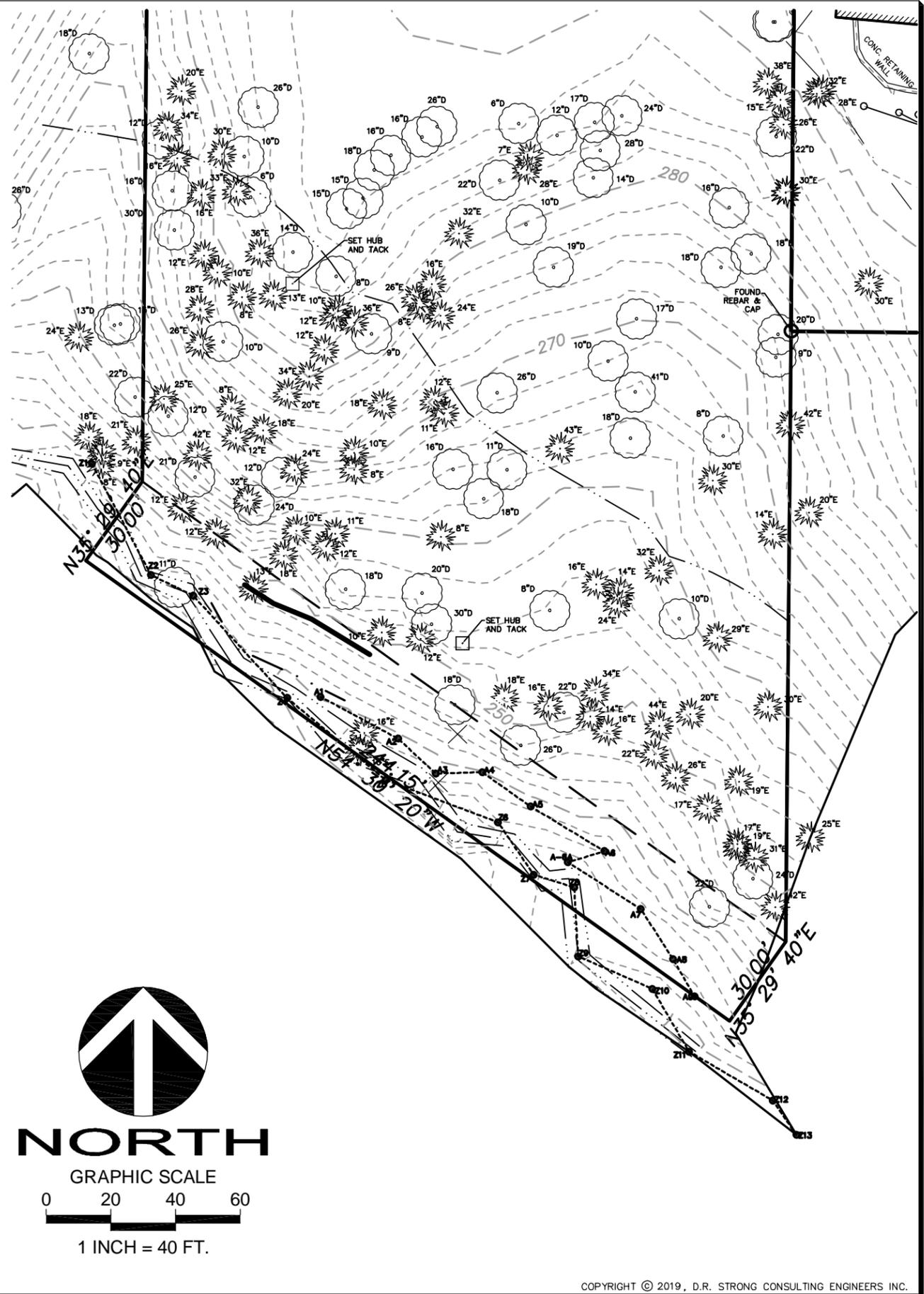
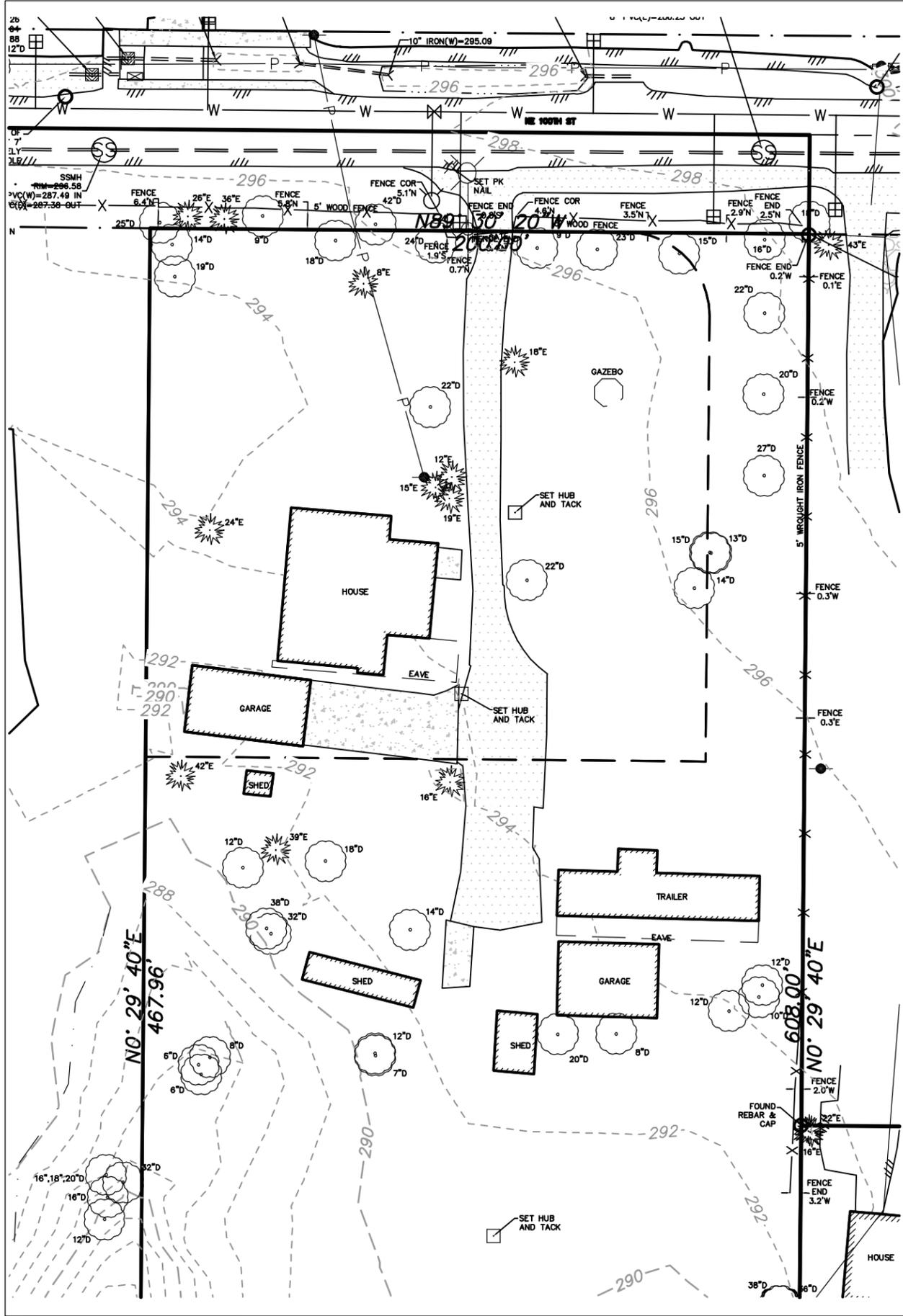
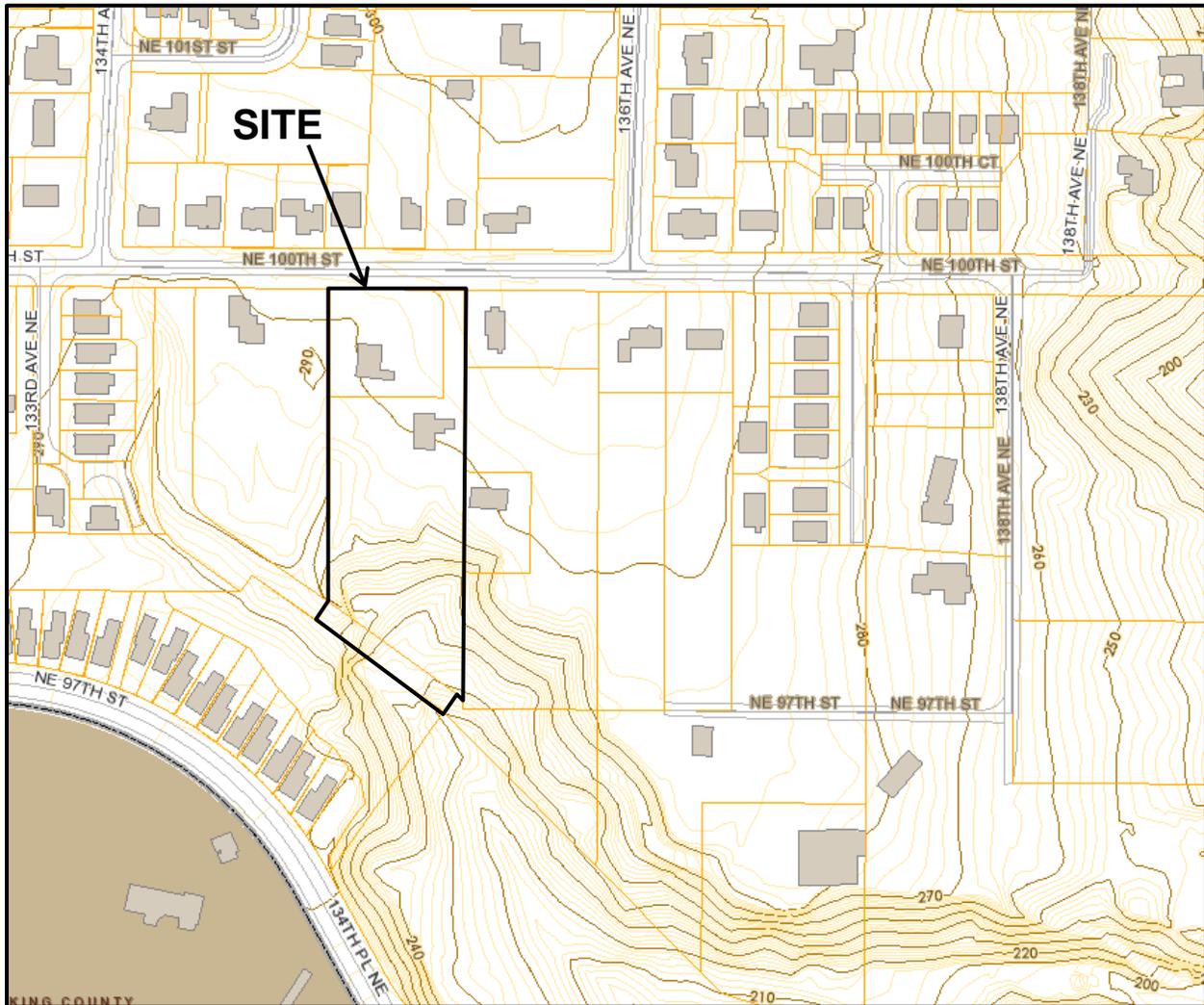


FIGURE 2
SITE MAP
REDMOND 9

DRAFTED BY: ZLJ
DESIGNED BY: LRJ
PROJECT ENGINEER: LRJ
DATE: 02-13-19
PROJECT NO.: 18037

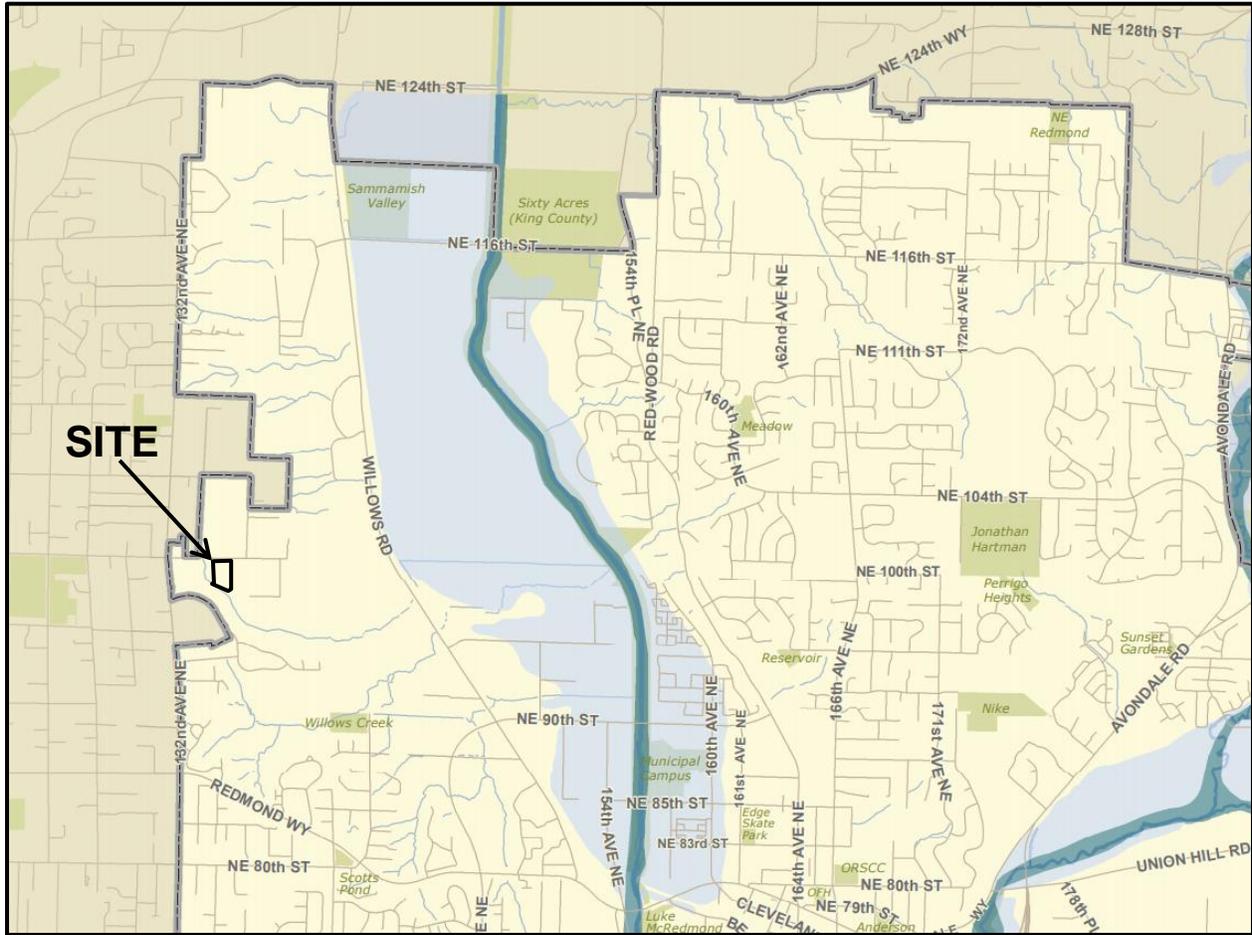
FIGURE 3
TOPOGRAPHY
COR Maps



TASK 2 RESOURCE REVIEW

- Adopted Basin Plans: *No basin plans available.*
- Floodplain/Floodway (FEMA) Map: *There are no FEMA maps available for the Site area.*
- Other Offsite Analysis Reports *None.*
- Sensitive Areas Folio Maps: *See Figures 4-9 for documentation of the distance downstream from the proposed project to the nearest critical areas. Included, are sections of the King County Sensitive Areas Folio which indicate the following:*
 - **Figure 4 100-Year Floodplains and Floodway:** *There is a 100 year floodplain within one mile of the Site along the downstream path. There is a Class II stream along the south property line.*
 - **Figure 5 Stream Classifications:** *There is a stream south of the Site that is classified IV and III.*
 - **Figure 6 Wetlands:** *A Category III Wetland is found along the south property line of the Site.*
 - **Figure 7 Erosion Hazard:** *The south portion of the Site is mapped as an Erosion Hazard Area per King County IMAP.*
 - **Figure 8 Landslide Hazard:** *The south portion of the Site is mapped as an Erosion Hazard Area per King County IMAP.*
 - **Figure 9 Seismic Hazard:** *There are no mapped Seismic Hazard Areas within one mile of the Site along the downstream path.*
- City of Redmond Drainage Complaints: *As shown in Figure 10, there are no open drainage complaints within 1 mile of the Site along the downstream paths within the past 10 years. Mapped drainage complaints have been closed prior to this date.*
- Road Drainage Problems: *None noted.*
- USDA King County Soils Survey: *See Figure 11.*
- Wetlands Inventory: *Vol. 1 North (1990) – The wetland inventory revealed no additional wetlands within the downstream path.*
- Migrating River Studies: *Bear Creek Watershed Management Study.*
- Washington State Department of Ecology's latest published Clean Water Act Section 303d list of polluted waters: *Sammamish River has 3 listings for Category 5 water: Dissolved Oxygen, Bacteria, and Temperature.*
- King County Designated Water Quality Problems: *None at this time.*

FIGURE 4
FREQUENTLY FLOODED AREA
 COR Standard Maps



<p align="center">Frequently Flooded Areas Critical Areas Map City of Redmond, Washington Effective: 05/28/2005</p>													
	<table border="0"> <tr> <td></td> <td>100 Year Floodplain</td> <td></td> <td>Park and Open Space</td> </tr> <tr> <td></td> <td>FEMA Floodway</td> <td></td> <td>Water</td> </tr> <tr> <td></td> <td>City Limit</td> <td></td> <td></td> </tr> </table>		100 Year Floodplain		Park and Open Space		FEMA Floodway		Water		City Limit		
	100 Year Floodplain		Park and Open Space										
	FEMA Floodway		Water										
	City Limit												
<p><small>Disclaimer: This map is created and maintained by GIS Services Group, Finance and Information Services, City of Redmond, Washington, for reference purposes only. The City makes no guarantee as to the accuracy of the features shown on this map.</small></p>													

**FIGURE 6
WETLANDS
COR Standard Maps**

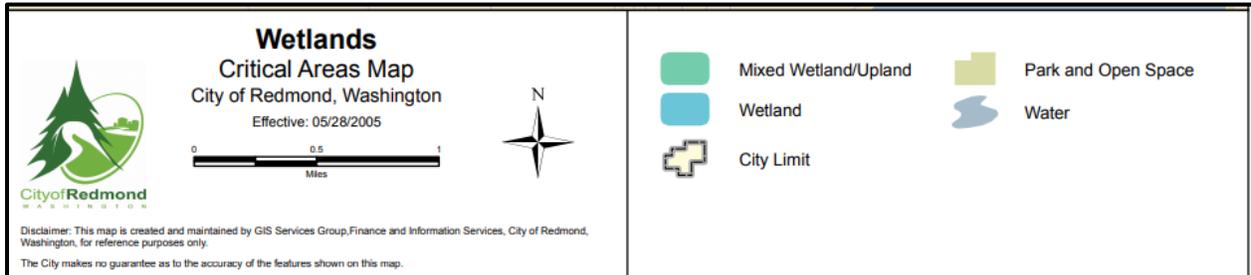
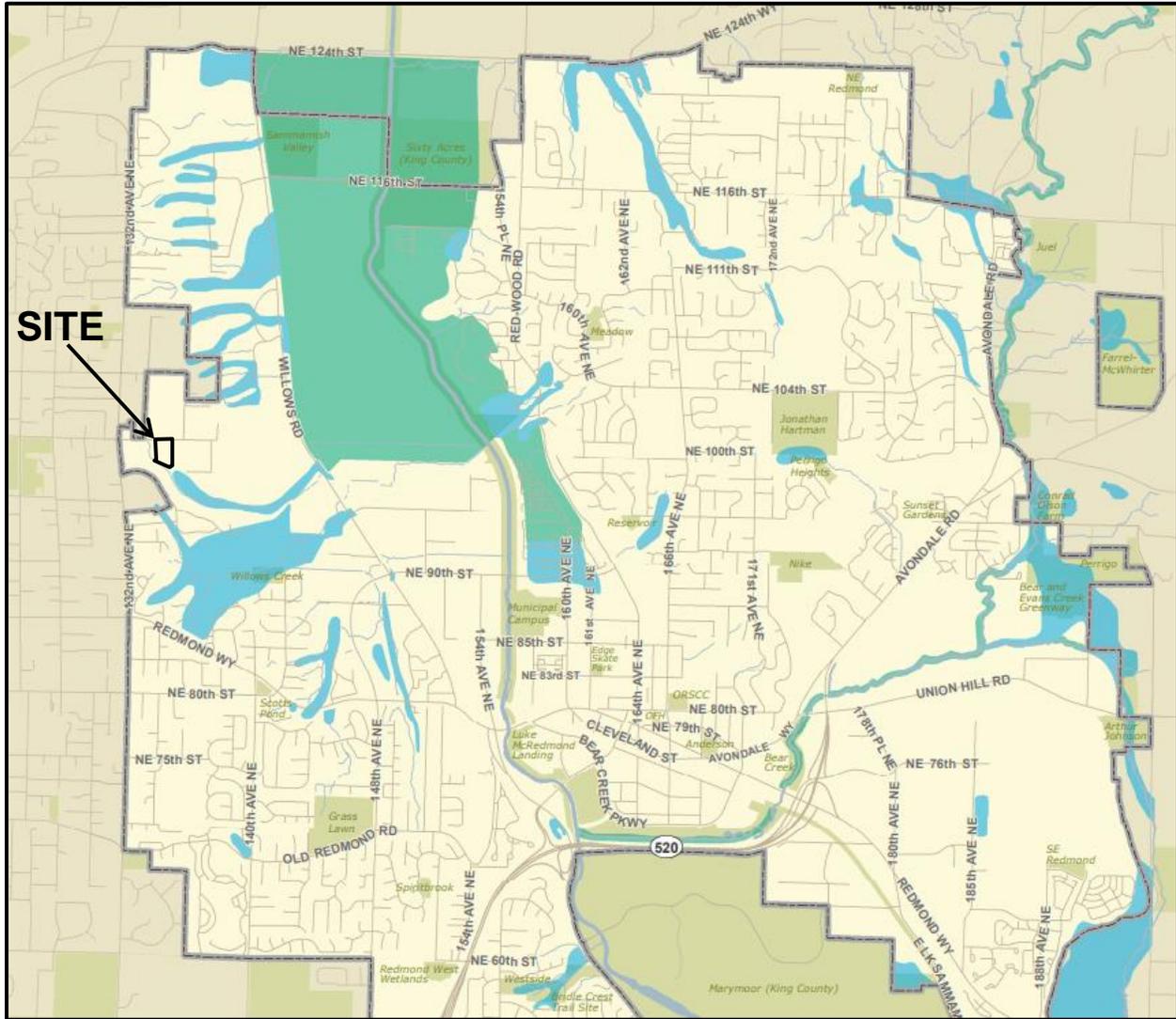
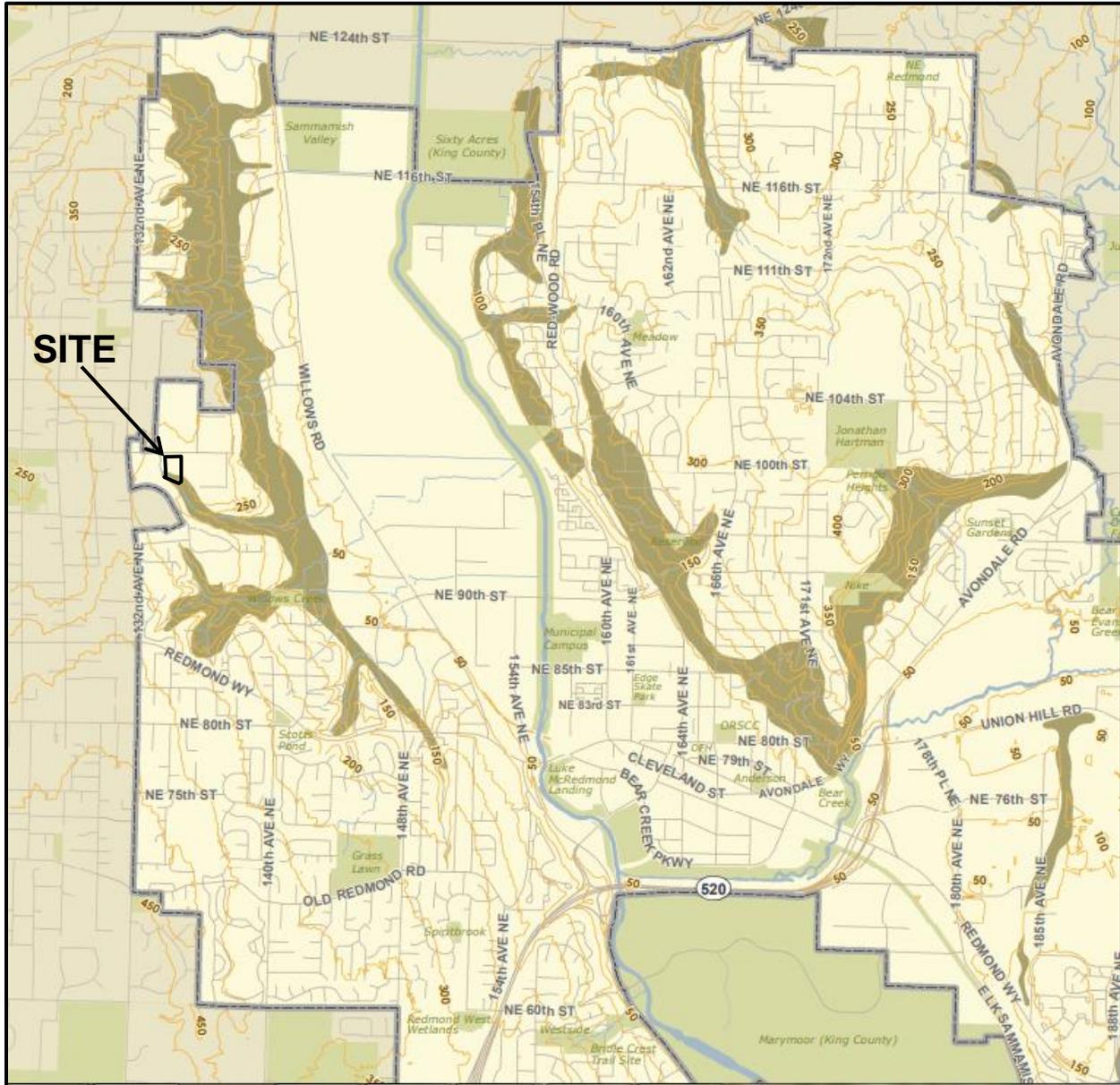


FIGURE 7
EROSION HAZARD AREAS
 COR Standard Maps



<p>City of Redmond WASHINGTON</p>	<p>Erosion Hazard Areas Critical Areas Map City of Redmond, Washington Effective: 05/28/2005</p>		<table border="0"> <tr> <td></td> <td>Contour</td> <td></td> <td>Park and Open Space</td> </tr> <tr> <td></td> <td>Erosion Hazard Area</td> <td></td> <td>Water</td> </tr> <tr> <td></td> <td>City Limit</td> <td></td> <td></td> </tr> </table>		Contour		Park and Open Space		Erosion Hazard Area		Water		City Limit		
	Contour		Park and Open Space												
	Erosion Hazard Area		Water												
	City Limit														
		<p><small>Disclaimer: This map is created and maintained by GIS Services Group, Finance and Information Services, City of Redmond, Washington, for reference purposes only. The City makes no guarantee as to the accuracy of the features shown on this map.</small></p>													

FIGURE 8
LANDSLIDE HAZARD AREAS
 COR Standard Maps

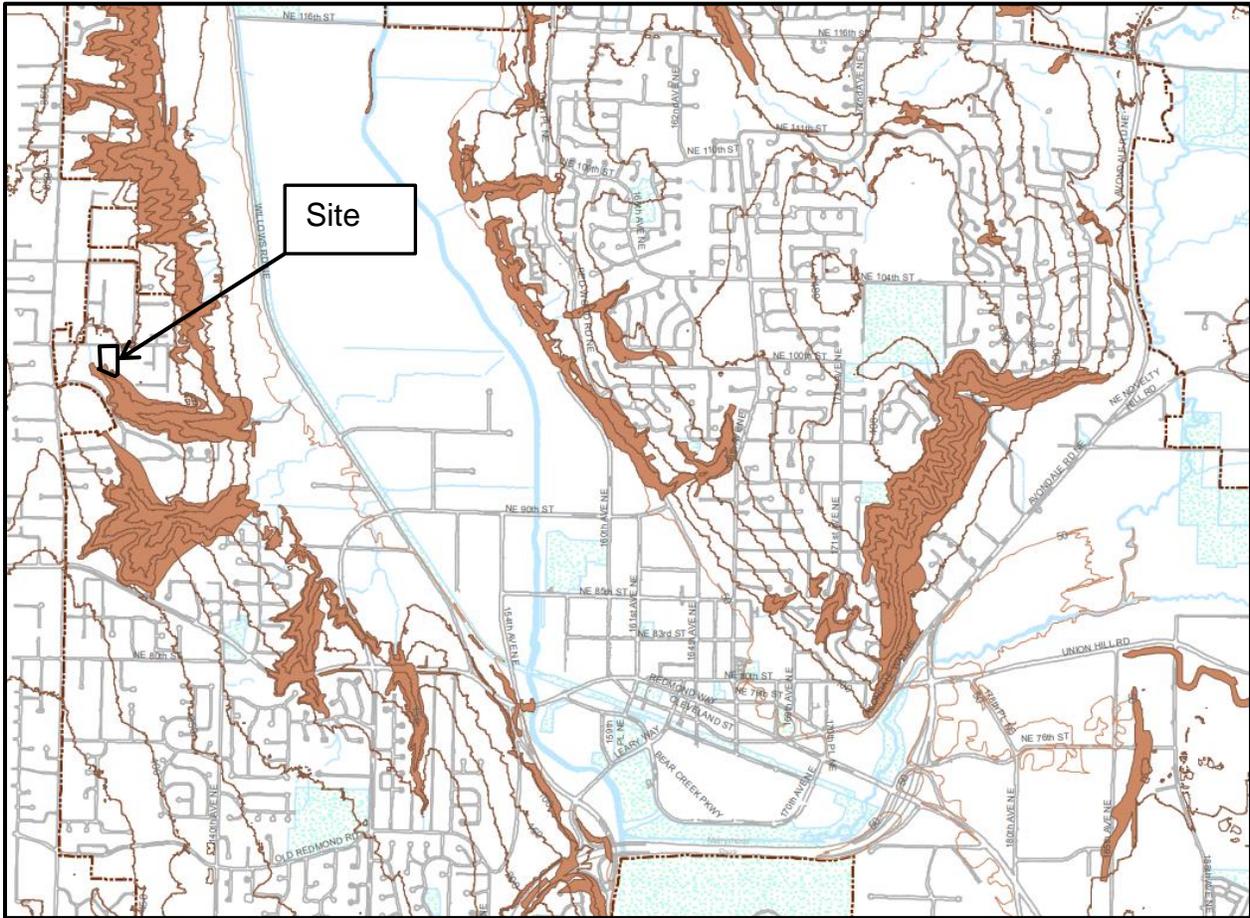
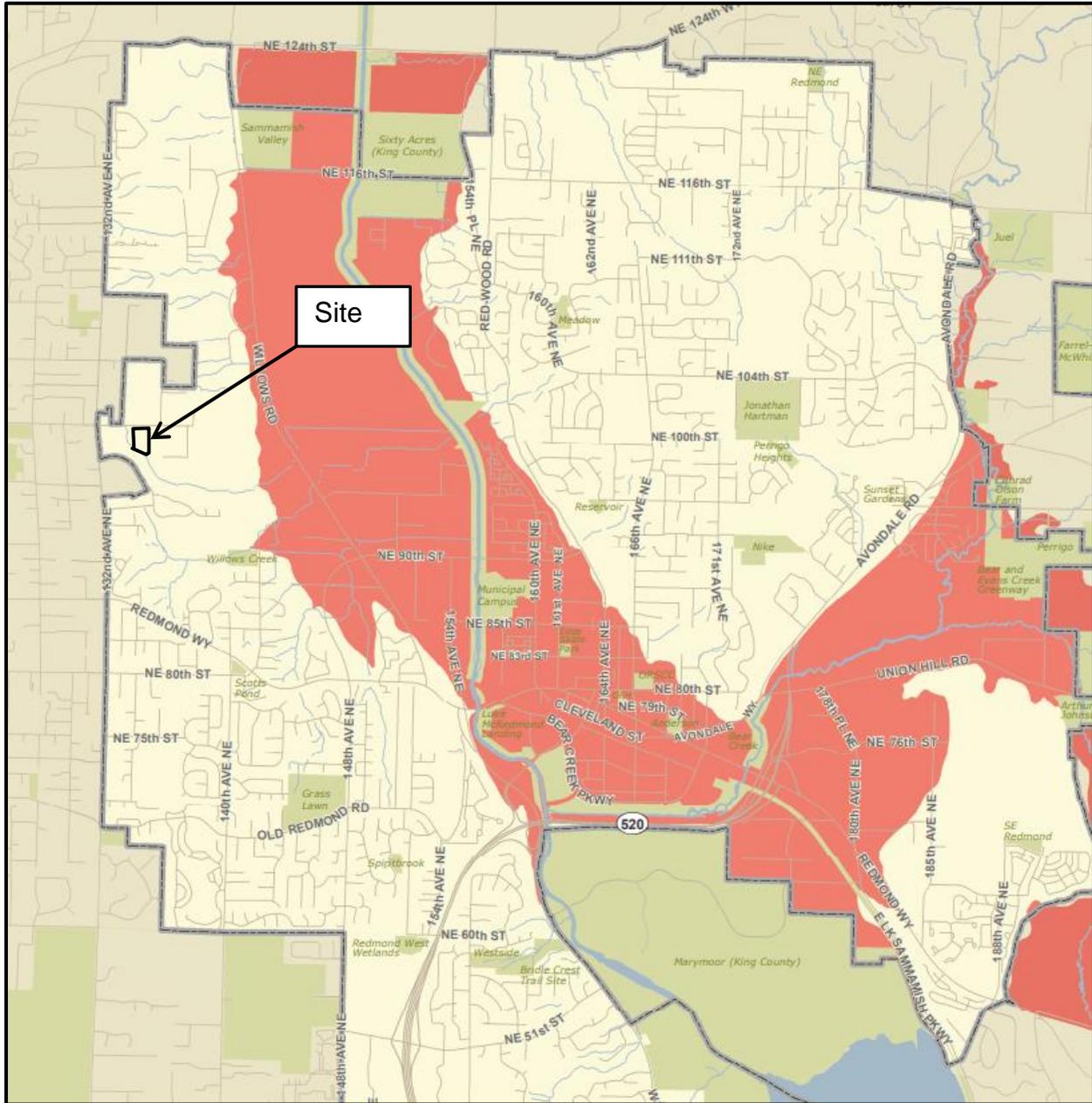


FIGURE 9
SEISMIC HAZARD AREAS
 COR Standard Maps



<p>City of Redmond</p>	<p>Seismic Hazard Areas Critical Areas Map City of Redmond, Washington Effective: 05/28/2005</p>		<p> Seismic Hazard Area</p> <p> City Limit</p>	<p> Park and Open Space</p> <p> Water</p>
		<p><small>Disclaimer: This map is created and maintained by GIS Services Group, Finance and Information Services, City of Redmond, Washington, for reference purposes only. The City makes no guarantee as to the accuracy of the features shown on this map.</small></p>		

**FIGURE 10
CITY OF REDMOND DRAINAGE COMPLAINTS**

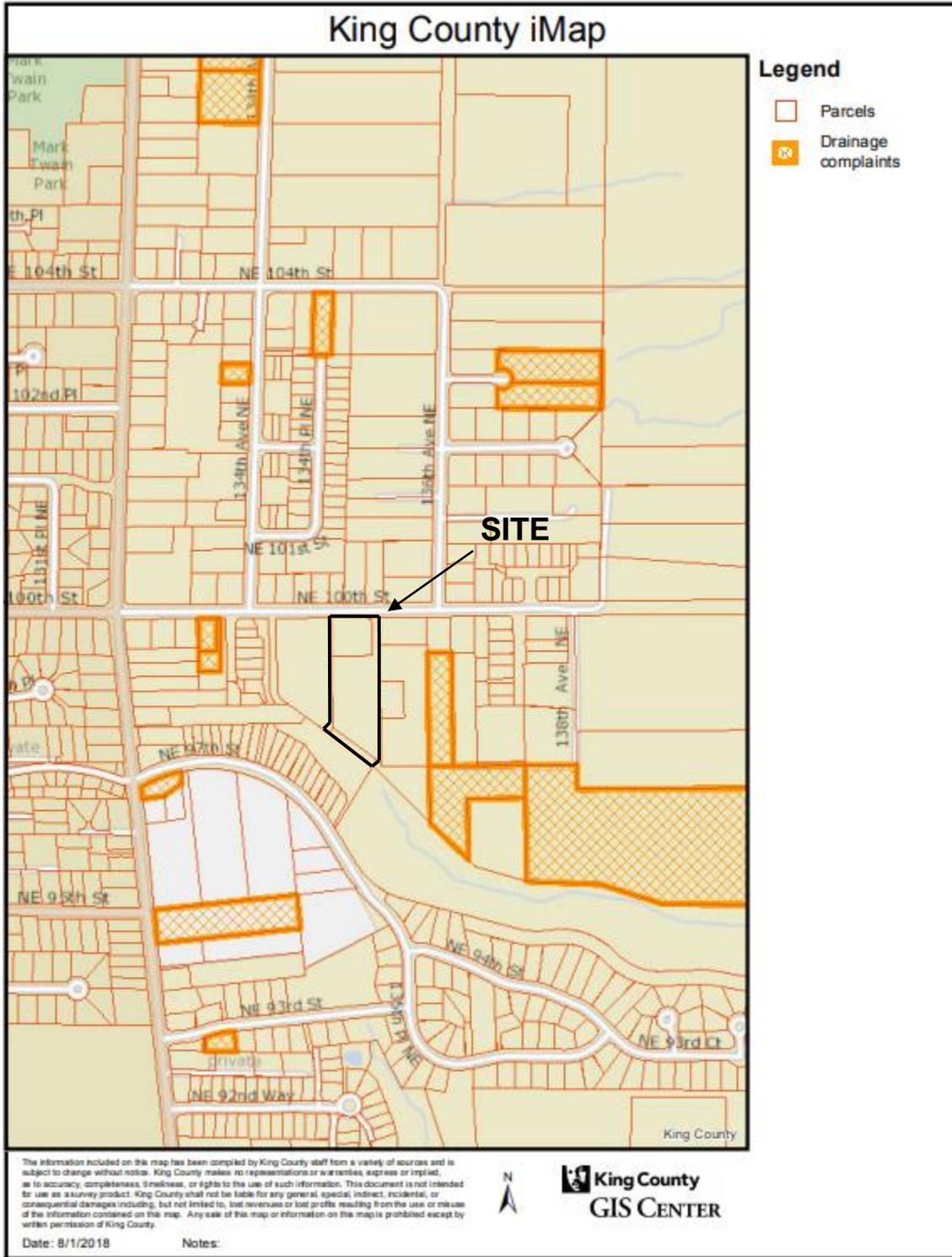


FIGURE 11 USDA KING COUNTY SOILS SURVEY MAP



King County Area, Washington

AgB—Alderwood gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t625
Elevation: 50 to 800 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Alderwood

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest, talf
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA)

Hydric soil rating: No

Minor Components

Mckenna

Percent of map unit: 5 percent

Landform: Depressions, drainageways

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Everett

Percent of map unit: 5 percent

Landform: Kames, eskers, moraines

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Crest, interfluvium

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Shalcar

Percent of map unit: 3 percent

Landform: Depressions

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Norma

Percent of map unit: 2 percent

Landform: Depressions, drainageways

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

AgC—Alderwood gravelly sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2t626

Elevation: 50 to 800 feet

Mean annual precipitation: 20 to 60 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 160 to 240 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Alderwood and similar soils: 85 percent

Minor components: 15 percent

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

Description of Alderwood

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Nose slope, talus

Down-slope shape: Linear, convex

Across-slope shape: Convex

Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam

Bw1 - 7 to 21 inches: very gravelly sandy loam

Bw2 - 21 to 30 inches: very gravelly sandy loam

Bg - 30 to 35 inches: very gravelly sandy loam

2Cd1 - 35 to 43 inches: very gravelly sandy loam

2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 39 inches to densic material

Natural drainage class: Moderately well drained

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

Depth to water table: About 18 to 37 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: B

Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA)

Hydric soil rating: No

Minor Components

Everett

Percent of map unit: 5 percent

Landform: Kames, eskers, moraines

Landform position (two-dimensional): Shoulder, footslope

Landform position (three-dimensional): Crest, base slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Indianola

Percent of map unit: 5 percent

Landform: Eskers, kames, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Shalcar

Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Norma

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

AgD—Alderwood gravelly sandy loam, 15 to 30 percent slopes

Map Unit Setting

map unit symbol: 2t627
Elevation: 0 to 1,000 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Alderwood

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, nose slope, talf
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA)
Hydric soil rating: No

Minor Components

Everett

Percent of map unit: 5 percent
Landform: Kames, eskers, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Indianola

Percent of map unit: 5 percent
Landform: Kames, terraces, eskers
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Shalcar

Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Norma

Percent of map unit: 2 percent
Landform: Drainageways, depressions
Landform position (three-dimensional): Dip
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

TASK 3 FIELD INSPECTION

UPSTREAM TRIBUTARY AREA

In evaluating the upstream area, we reviewed King County IMAP aerial topography, City of Redmond Property Viewer aerial topography, imagery and conducted field reconnaissance. The local topography is for general slopes from north to south and southwest across the Site. The entire Site is surrounded by single family residences. The northerly property line is bordered by NE 100th Street, which contains an existing conveyance system that collects runoff. Runoff from the east may enter the Site. Said runoff will enter Project collection and detention system.

GENERAL ONSITE AND OFFSITE DRAINAGE DESCRIPTION

Site area is approximately 114,920 s.f. (2.638 acres). Vegetation consists of douglas, fir and cedar trees, as well as lawn, shrubs and bushes. There is currently one single family residence, garage, and driveway.

The development area has slopes from 1 to 15%. The south half of the Site has slopes in excess of 40%.

The Site is located in one Threshold Discharge Area (TDA) and two distinct Natural Discharge Areas (NDA).

Pre-Developed Basin

The Project is located in one Threshold Discharge Area (TDA) and two Natural Discharge Areas (NDA). Vegetation consists of scattered trees, lawn, shrubs and blackberry bushes. There are existing structures which are scheduled to be removed.

NDA 1:

Runoff from the Project Development Area sheet flows across the Site in a southwesterly direction and exits Site at the Natural Discharge Location (NDL 1) near the southwest corner of said NDA where it becomes more of a concentrated flow off site. NDA 1 is mostly flat with areas of slopes reaching 15%.

NDA 2:

Tracts B and C comprise this NDA. Runoff sheet flows across the steep slopes in a southerly direction before it exists near the southeast corner where a Category III and a Class II stream exist (NDL 2). NDA 2 has slopes in excess of 40% in some places. Runoff from both NDAs converge shortly after exiting Site as demonstrated in the offsite analysis.

Post-Developed Basin(s)

NDA 1:

The offsite improvements will include pavement widening, a planter strip and a concrete sidewalk. On site, there will be a subdivision road with 20 feet of pavement, a drainage swale, and a sidewalk along with a cul-de-sac, future homes, their driveways, and lawn. Tract A, recreation space and storm drainage tract, will be developed with a subsurface vault and recreation space equipment along with an access road. The following table and Figure further illustrate the preliminary area breakdown.

NDA 2:

This NDA will remain undeveloped except for the construction of the above ground discharge system from NDA 1.

TASK 4

DRAINAGE SYSTEM DESCRIPTION AND POTENTIAL PROBLEMS

DRAINAGE SYSTEM DESCRIPTION

The downstream analysis (Analysis) is further illustrated and detailed in the Downstream Map (Figure 11) and the Downstream Table (Figure 12). The site visit was completed on 9/11/2018 under cloudy and rainy conditions.

NDA 1:

Concentrated runoff flows in an overgrown and steep channel in a southerly direction for approximately 140 feet. This flow is then intercepted by the main channel of the Class II Stream. Runoff travels in said stream channel, which is also steep and overgrown, for a distance of approximately 250 feet where it converges with runoff from NDA 2.

NDA 2:

Southeasterly shallow concentrated flow from this NDA exits the Site at NDL 2 at the Category III wetland and the aforementioned stream. The confluence of both NDAs flows in the steep creek channel, in an easterly direction, for the remainder of the one quarter mile downstream study.

**FIGURE 12
DOWNSTREAM MAP**



LEGEND

- SITE BOUNDARY
- - - PROJECT BOUNDARY

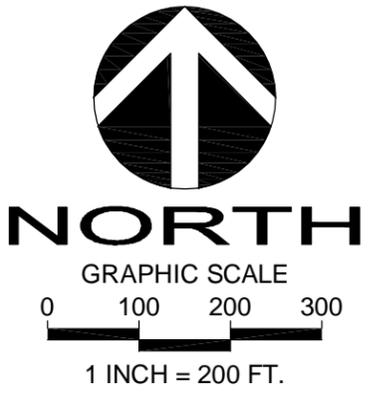


FIGURE 12
DOWNSTREAM MAP
REDMOND 9

DRAFTED BY: **ZLJ**
 DESIGNED BY: **LRJ**
 PROJECT ENGINEER: **LRJ**
 DATE: **02-13-19**
 PROJECT NO.: **18037**

FIGURE: 12

FIGURE 13 DOWNSTREAM TABLES

NDA Northeast

Basin: Sammamish

Subbasin Name: Bear Creek

Subbasin Number: N/A

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; Size: diameter Surface area	drainage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 mi=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.
A1	Natural Discharge Point for NDA 1		%	±0'	None Observed	None Anticipated	
A1-A2	Southern Stream Flow	Overgrown steep channel flow			None Observed	None Anticipated	
A2	Class II Stream			±140'	None Observed	None Anticipated	
A2-A3	Southeasterly Stream Flow	Stream flow via Class II stream			None Observed	None Anticipated	
A3	Class II Stream	Runoff converges with NDA 2 in a stream		±390'	None Observed	None Anticipated	
B1	Natural Discharge Point for NDA 2			±0'	None Observed	None Anticipated	
B1-B2	Shallow Concentrated Flow				None Observed	None Anticipated	
B2	Stream	Category III Wetland and Class II stream. NDL 1 and NDL 2 converge			None Observed	None Anticipated	
B2 & A3	Stream Flow	Both NDL 1 and NDL 2 continue southerly via stream flow for remainder of ¼ mile downstream study			None Observed	None Anticipated	

TASK 5 MITIGATION OF EXISTING OR POTENTIAL PROBLEMS

A review of the documented drainage complaints available from the City of Redmond within one mile of the downstream flow path revealed no open complaints within the last ten years.

The Site is located in an erosion hazard area. The Class II stream acts as a stormwater conveyance for runoff from this Site as well as other parcels abutting this creek. As stated earlier, the channel of this creek is relatively steep. Therefore there is always a potential for erosion in its channel. The Project is implementing several measures to reduce its impact:

1. During construction the Project will implement standard temporary erosion control while permanent measures will be put in place after construction is complete.
2. The Project is proposing to control developed runoff to predeveloped rates assuming forested conditions. In other words, developed runoff will be controlled to rates below what is currently being discharged over the steep slopes. Discharge from the vault will be via an above ground pipe with an above ground dispersal pipe.
3. The Project will be providing the required buffers for the stream and the wetland.
4. Project is providing additional buffer by dedicating additional open space that is contiguous to the buffers.
5. No construction activities are proposed on steep slopes.

These measures exceed the Minimum Requirements per City codes. There should be no adverse impacts as a result of this development.

APPENDIX B CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

A preliminary SWPPP is included in this Appendix. A complete SWPPP will be included during the engineering phase of this project.

APPENDIX C WWHM2012 REPORT

WWHM2012
PROJECT REPORT

General Model Information

Project Name: 18037
Site Name: Redmond 9
Site Address: 13437 NE 100th ST
City: Redmond
Report Date: 4/1/2019
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.000
Version Date: 2018/07/12
Version: 4.2.15

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

predev

Bypass: No

GroundWater: No

Pervious Land Use acre
C, Forest, Flat 1.857

Pervious Total 1.857

Impervious Land Use acre

Impervious Total 0

Basin Total 1.857

Element Flows To:
Surface Interflow Groundwater

Mitigated Land Use

developed

Bypass: No

GroundWater: No

Pervious Land Use acre
C, Lawn, Flat 0.9542

Pervious Total 0.9542

Impervious Land Use acre
ROADS FLAT 0.2842
ROOF TOPS FLAT 0.3221
DRIVEWAYS FLAT 0.1653
SIDEWALKS FLAT 0.1312

Impervious Total 0.9028

Basin Total 1.857

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 51 ft.
 Length: 51 ft.
 Depth: 12 ft.
 Discharge Structure
 Riser Height: 11 ft.
 Riser Diameter: 18 in.
 Orifice 1 Diameter: 0.48 in. Elevation:0 ft.
 Orifice 2 Diameter: 0.72 in. Elevation:7.557 ft.
 Orifice 3 Diameter: 1.36 in. Elevation:8.597916666666669 ft.
 Element Flows To:
 Outlet 1 Outlet 2

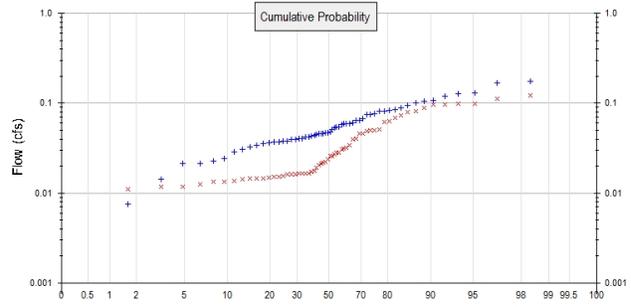
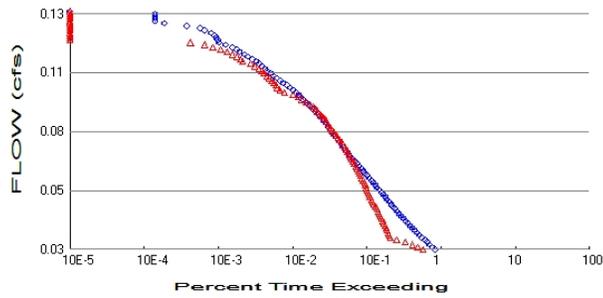
Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.059	0.000	0.000	0.000
0.1333	0.059	0.008	0.002	0.000
0.2667	0.059	0.015	0.003	0.000
0.4000	0.059	0.023	0.004	0.000
0.5333	0.059	0.031	0.004	0.000
0.6667	0.059	0.039	0.005	0.000
0.8000	0.059	0.047	0.005	0.000
0.9333	0.059	0.055	0.006	0.000
1.0667	0.059	0.063	0.006	0.000
1.2000	0.059	0.071	0.006	0.000
1.3333	0.059	0.079	0.007	0.000
1.4667	0.059	0.087	0.007	0.000
1.6000	0.059	0.095	0.007	0.000
1.7333	0.059	0.103	0.008	0.000
1.8667	0.059	0.111	0.008	0.000
2.0000	0.059	0.119	0.008	0.000
2.1333	0.059	0.127	0.009	0.000
2.2667	0.059	0.135	0.009	0.000
2.4000	0.059	0.143	0.009	0.000
2.5333	0.059	0.151	0.010	0.000
2.6667	0.059	0.159	0.010	0.000
2.8000	0.059	0.167	0.010	0.000
2.9333	0.059	0.175	0.010	0.000
3.0667	0.059	0.183	0.010	0.000
3.2000	0.059	0.191	0.011	0.000
3.3333	0.059	0.199	0.011	0.000
3.4667	0.059	0.207	0.011	0.000
3.6000	0.059	0.215	0.011	0.000
3.7333	0.059	0.222	0.012	0.000
3.8667	0.059	0.230	0.012	0.000
4.0000	0.059	0.238	0.012	0.000
4.1333	0.059	0.246	0.012	0.000
4.2667	0.059	0.254	0.012	0.000
4.4000	0.059	0.262	0.013	0.000
4.5333	0.059	0.270	0.013	0.000
4.6667	0.059	0.278	0.013	0.000
4.8000	0.059	0.286	0.013	0.000
4.9333	0.059	0.294	0.013	0.000

5.0667	0.059	0.302	0.014	0.000
5.2000	0.059	0.310	0.014	0.000
5.3333	0.059	0.318	0.014	0.000
5.4667	0.059	0.326	0.014	0.000
5.6000	0.059	0.334	0.014	0.000
5.7333	0.059	0.342	0.015	0.000
5.8667	0.059	0.350	0.015	0.000
6.0000	0.059	0.358	0.015	0.000
6.1333	0.059	0.366	0.015	0.000
6.2667	0.059	0.374	0.015	0.000
6.4000	0.059	0.382	0.015	0.000
6.5333	0.059	0.390	0.016	0.000
6.6667	0.059	0.398	0.016	0.000
6.8000	0.059	0.406	0.016	0.000
6.9333	0.059	0.414	0.016	0.000
7.0667	0.059	0.422	0.016	0.000
7.2000	0.059	0.429	0.016	0.000
7.3333	0.059	0.437	0.016	0.000
7.4667	0.059	0.445	0.017	0.000
7.6000	0.059	0.453	0.020	0.000
7.7333	0.059	0.461	0.023	0.000
7.8667	0.059	0.469	0.025	0.000
8.0000	0.059	0.477	0.027	0.000
8.1333	0.059	0.485	0.028	0.000
8.2667	0.059	0.493	0.029	0.000
8.4000	0.059	0.501	0.031	0.000
8.5333	0.059	0.509	0.032	0.000
8.6667	0.059	0.517	0.046	0.000
8.8000	0.059	0.525	0.056	0.000
8.9333	0.059	0.533	0.064	0.000
9.0667	0.059	0.541	0.070	0.000
9.2000	0.059	0.549	0.075	0.000
9.3333	0.059	0.557	0.080	0.000
9.4667	0.059	0.565	0.085	0.000
9.6000	0.059	0.573	0.089	0.000
9.7333	0.059	0.581	0.093	0.000
9.8667	0.059	0.589	0.097	0.000
10.000	0.059	0.597	0.101	0.000
10.133	0.059	0.605	0.104	0.000
10.267	0.059	0.613	0.108	0.000
10.400	0.059	0.621	0.111	0.000
10.533	0.059	0.629	0.114	0.000
10.667	0.059	0.636	0.117	0.000
10.800	0.059	0.644	0.120	0.000
10.933	0.059	0.652	0.123	0.000
11.067	0.059	0.660	0.399	0.000
11.200	0.059	0.668	1.533	0.000
11.333	0.059	0.676	3.013	0.000
11.467	0.059	0.684	4.460	0.000
11.600	0.059	0.692	5.537	0.000
11.733	0.059	0.700	6.153	0.000
11.867	0.059	0.708	6.738	0.000
12.000	0.059	0.716	7.230	0.000
12.133	0.059	0.724	7.690	0.000
12.267	0.000	0.000	8.124	0.000

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 1.857
 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.9542
 Total Impervious Area: 0.9028

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.054597
5 year	0.085747
10 year	0.1034
25 year	0.122102
50 year	0.133675
100 year	0.143519

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.02707
5 year	0.051168
10 year	0.073399
25 year	0.110211
50 year	0.145054
100 year	0.187247

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.054	0.015
1950	0.067	0.046
1951	0.120	0.122
1952	0.038	0.014
1953	0.031	0.031
1954	0.047	0.017
1955	0.075	0.015
1956	0.060	0.080
1957	0.048	0.017
1958	0.054	0.018

1959	0.047	0.019
1960	0.081	0.049
1961	0.046	0.050
1962	0.029	0.013
1963	0.039	0.026
1964	0.052	0.041
1965	0.037	0.040
1966	0.036	0.021
1967	0.074	0.034
1968	0.046	0.016
1969	0.045	0.021
1970	0.037	0.028
1971	0.040	0.017
1972	0.090	0.098
1973	0.041	0.050
1974	0.044	0.026
1975	0.060	0.016
1976	0.043	0.016
1977	0.005	0.011
1978	0.038	0.027
1979	0.023	0.012
1980	0.085	0.089
1981	0.034	0.017
1982	0.065	0.032
1983	0.058	0.024
1984	0.036	0.015
1985	0.021	0.013
1986	0.095	0.022
1987	0.084	0.051
1988	0.033	0.015
1989	0.022	0.015
1990	0.175	0.062
1991	0.105	0.098
1992	0.041	0.022
1993	0.042	0.013
1994	0.014	0.012
1995	0.061	0.046
1996	0.128	0.112
1997	0.107	0.097
1998	0.024	0.015
1999	0.100	0.081
2000	0.042	0.016
2001	0.008	0.009
2002	0.046	0.032
2003	0.059	0.015
2004	0.076	0.064
2005	0.055	0.014
2006	0.065	0.068
2007	0.130	0.099
2008	0.168	0.074
2009	0.082	0.028

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1750	0.1215
2	0.1676	0.1117
3	0.1299	0.0990

4	0.1279	0.0978
5	0.1202	0.0975
6	0.1069	0.0972
7	0.1054	0.0893
8	0.1003	0.0811
9	0.0946	0.0800
10	0.0895	0.0742
11	0.0849	0.0684
12	0.0837	0.0636
13	0.0823	0.0618
14	0.0813	0.0509
15	0.0764	0.0504
16	0.0750	0.0502
17	0.0742	0.0494
18	0.0669	0.0460
19	0.0652	0.0456
20	0.0646	0.0409
21	0.0607	0.0397
22	0.0598	0.0343
23	0.0597	0.0321
24	0.0590	0.0315
25	0.0585	0.0308
26	0.0548	0.0284
27	0.0543	0.0283
28	0.0536	0.0269
29	0.0516	0.0260
30	0.0482	0.0256
31	0.0471	0.0237
32	0.0466	0.0222
33	0.0463	0.0219
34	0.0463	0.0214
35	0.0459	0.0206
36	0.0453	0.0192
37	0.0441	0.0177
38	0.0432	0.0174
39	0.0423	0.0167
40	0.0422	0.0166
41	0.0407	0.0165
42	0.0406	0.0164
43	0.0400	0.0163
44	0.0392	0.0161
45	0.0379	0.0161
46	0.0379	0.0154
47	0.0374	0.0152
48	0.0369	0.0150
49	0.0361	0.0147
50	0.0355	0.0146
51	0.0339	0.0146
52	0.0330	0.0146
53	0.0306	0.0143
54	0.0285	0.0137
55	0.0242	0.0135
56	0.0229	0.0134
57	0.0216	0.0125
58	0.0214	0.0119
59	0.0142	0.0118
60	0.0076	0.0111
61	0.0051	0.0089

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0273	17567	12132	69	Pass
0.0284	16164	10365	64	Pass
0.0294	14970	8780	58	Pass
0.0305	13851	7037	50	Pass
0.0316	12816	5384	42	Pass
0.0327	11807	4421	37	Pass
0.0337	10900	4282	39	Pass
0.0348	10119	4145	40	Pass
0.0359	9383	4002	42	Pass
0.0370	8733	3882	44	Pass
0.0380	8145	3749	46	Pass
0.0391	7595	3617	47	Pass
0.0402	7060	3474	49	Pass
0.0413	6590	3347	50	Pass
0.0423	6145	3238	52	Pass
0.0434	5777	3133	54	Pass
0.0445	5431	3035	55	Pass
0.0456	5097	2926	57	Pass
0.0466	4808	2778	57	Pass
0.0477	4524	2646	58	Pass
0.0488	4254	2541	59	Pass
0.0499	4017	2445	60	Pass
0.0509	3784	2353	62	Pass
0.0520	3546	2289	64	Pass
0.0531	3339	2224	66	Pass
0.0542	3138	2150	68	Pass
0.0552	2952	2098	71	Pass
0.0563	2785	2048	73	Pass
0.0574	2599	1985	76	Pass
0.0585	2449	1899	77	Pass
0.0595	2304	1831	79	Pass
0.0606	2162	1764	81	Pass
0.0617	2025	1697	83	Pass
0.0628	1898	1638	86	Pass
0.0638	1790	1564	87	Pass
0.0649	1688	1512	89	Pass
0.0660	1583	1447	91	Pass
0.0671	1483	1394	93	Pass
0.0681	1381	1323	95	Pass
0.0692	1292	1271	98	Pass
0.0703	1219	1229	100	Pass
0.0714	1154	1177	101	Pass
0.0724	1098	1134	103	Pass
0.0735	1048	1077	102	Pass
0.0746	997	1017	102	Pass
0.0757	930	974	104	Pass
0.0767	883	915	103	Pass
0.0778	837	876	104	Pass
0.0789	789	833	105	Pass
0.0799	743	776	104	Pass
0.0810	713	727	101	Pass
0.0821	668	689	103	Pass
0.0832	630	663	105	Pass

0.0842	596	635	106	Pass
0.0853	565	602	106	Pass
0.0864	539	571	105	Pass
0.0875	496	534	107	Pass
0.0885	473	499	105	Pass
0.0896	434	461	106	Pass
0.0907	399	436	109	Pass
0.0918	366	402	109	Pass
0.0928	348	366	105	Pass
0.0939	323	324	100	Pass
0.0950	296	285	96	Pass
0.0961	272	255	93	Pass
0.0971	256	216	84	Pass
0.0982	235	166	70	Pass
0.0993	217	144	66	Pass
0.1004	198	133	67	Pass
0.1014	180	127	70	Pass
0.1025	158	119	75	Pass
0.1036	146	112	76	Pass
0.1047	130	104	80	Pass
0.1057	119	96	80	Pass
0.1068	109	88	80	Pass
0.1079	97	82	84	Pass
0.1090	91	75	82	Pass
0.1100	82	66	80	Pass
0.1111	76	58	76	Pass
0.1122	69	45	65	Pass
0.1133	61	42	68	Pass
0.1143	54	38	70	Pass
0.1154	48	33	68	Pass
0.1165	41	28	68	Pass
0.1176	38	23	60	Pass
0.1186	33	18	54	Pass
0.1197	27	14	51	Pass
0.1208	22	9	40	Pass
0.1219	21	0	0	Pass
0.1229	20	0	0	Pass
0.1240	19	0	0	Pass
0.1251	17	0	0	Pass
0.1262	14	0	0	Pass
0.1272	12	0	0	Pass
0.1283	8	0	0	Pass
0.1294	4	0	0	Pass
0.1305	3	0	0	Pass
0.1315	3	0	0	Pass
0.1326	3	0	0	Pass
0.1337	3	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0.1356 acre-feet

On-line facility target flow: 0.1481 cfs.

Adjusted for 15 min: 0.1481 cfs.

Off-line facility target flow: 0.0827 cfs.

Adjusted for 15 min: 0.0827 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	<input type="checkbox"/>	197.97			<input type="checkbox"/>	0.00			
Total Volume Infiltrated		197.97	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

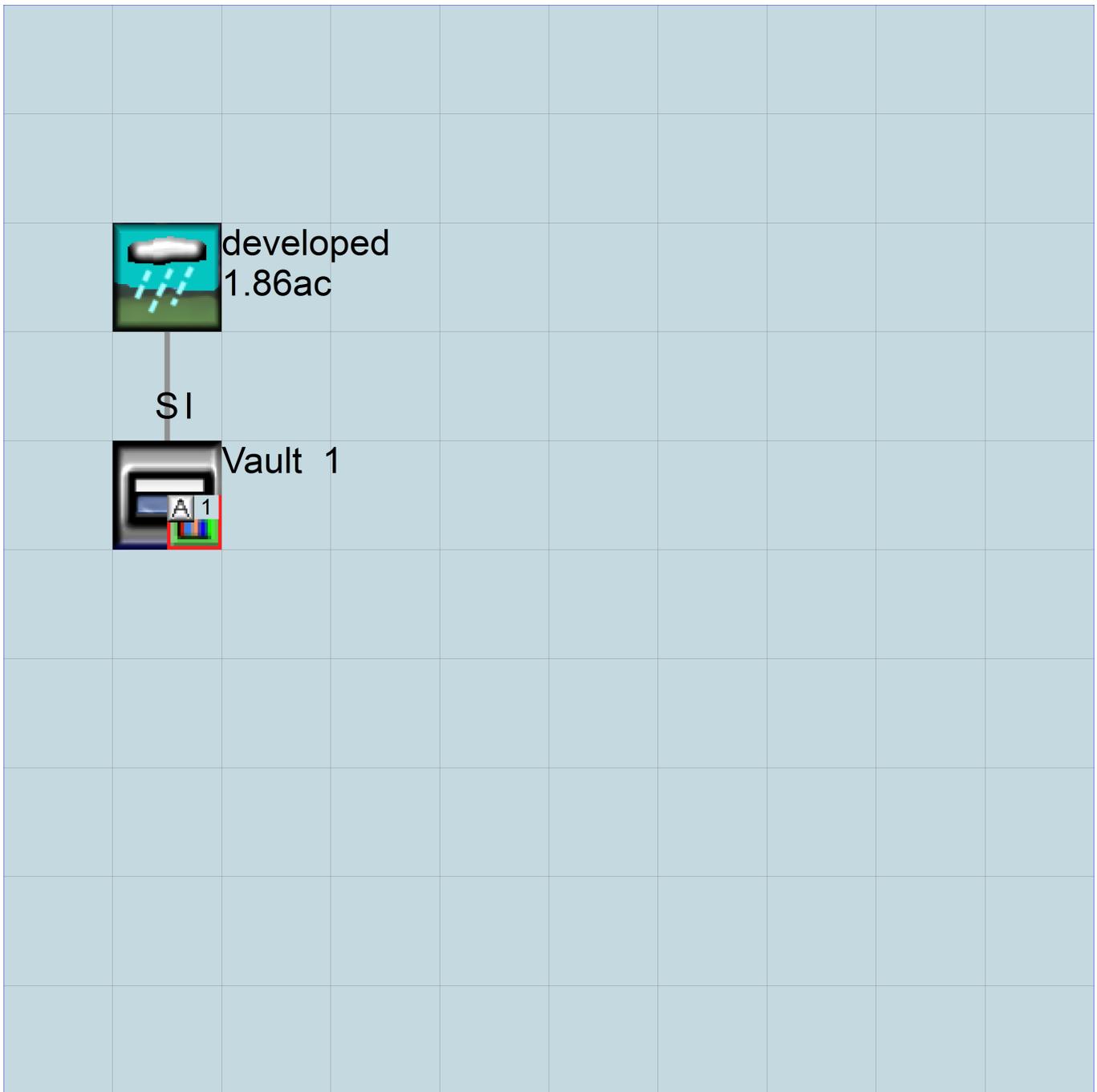
No IMPLND changes have been made.

Appendix
Predeveloped Schematic



predev
1.86ac

Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

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

END GLOBAL

FILES

```
<File> <Un#> <-----File Name----->***
<-ID->                                     ***
WDM      26      18037.wdm
MESSU    25      Pre18037.MES
          27      Pre18037.L61
          28      Pre18037.L62
          30      POC180371.dat
```

END FILES

OPN SEQUENCE

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

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INFO1

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

END DISPLY-INFO1

END DISPLY

COPY

TIMESERIES

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

END TIMESERIES

END COPY

GENER

OPCODE

```
#      # OPCODE ***
```

END OPCODE

PARAM

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

END PARAM

END GENER

PERLND

GEN-INFO

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

```
10      C, Forest, Flat      1      1      1      1      27      0
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

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

END ACTIVITY

PRINT-INFO

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

END PRINT-INFO

```

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

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

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

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

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

END PERLND

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

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

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

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

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

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

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

IWAT-STATE1
<PLS > *** Initial conditions at start of simulation
# - # *** RETS SURS
END IWAT-STATE1

```

END IMPLND

SCHEMATIC

<-Source->	<Name> #	<--Area-->	<-factor-->	<-Target->	MBLK	***
predev***					Tbl#	***
PERLND	10		1.857	COPY	501	12
PERLND	10		1.857	COPY	501	13

*****Routing*****
END SCHEMATIC

NETWORK

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Target vols>	<-Grp>	<-Member->	***
<Name>	#	<Name> #	#	<-factor-->strg	<Name> #	#	<Name> #	***
COPY	501	OUTPUT	MEAN	1 1	48.4	DISPLY	1	INPUT
								TIMSER
								1

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Target vols>	<-Grp>	<-Member->	***
<Name>	#	<Name> #	#	<-factor-->strg	<Name> #	#	<Name> #	***

END NETWORK

RCHRES

GEN-INFO	RCHRES	Name	Nexits	Unit	Systems	Printer	***
# - #	<----->	<---->	User	T-series	Engl	Metr	LKFG
				in	out		***

END GEN-INFO
*** Section RCHRES***

ACTIVITY

<PLS >	*****	Active Sections	*****
# - #	HYFG	ADFG	CNFG
		HTFG	SDFG
		GQFG	OXFG
		NUFG	PKFG
		PHFG	***

END ACTIVITY

PRINT-INFO

<PLS >	*****	Print-flags	*****	PIVL	PYR	*****
# - #	HYDR	ADCA	CONS	HEAT	SED	GQL
		OXRX	NUTR	PLNK	PHCB	PIVL
						PYR

END PRINT-INFO

HYDR-PARM1

RCHRES	Flags for each HYDR Section	***	ODGTFG for each	FUNCT for each	***
# - #	VC A1 A2 A3	ODFVFG for each	***	ODGTFG for each	FUNCT for each
	FG FG FG FG	possible exit	***	possible exit	possible exit
	* * * *	* * * * *		* * * * *	***

END HYDR-PARM1

HYDR-PARM2

# - #	FTABNO	LEN	DELTH	STCOR	KS	DB50	***
<----->	<----->	<----->	<----->	<----->	<----->	<----->	***

END HYDR-PARM2

HYDR-INIT

RCHRES	Initial conditions for each HYDR section	***
# - #	*** VOL	Initial value of COLIND
	*** ac-ft	for each possible exit
		Initial value of OUTDGT
		for each possible exit
<----->	<----->	<----->
		*** <----->

END HYDR-INIT

END RCHRES

SPEC-ACTIONS

END SPEC-ACTIONS

FTABLES

END FTABLES

EXT SOURCES

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

```
WDM      1 EVAP      ENGL      0.76          PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP      ENGL      0.76          IMPLND   1 999 EXTNL  PETINP
```

END EXT SOURCES

EXT TARGETS

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

MASS-LINK

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

```
  MASS-LINK 13
PERLND     PWATER IFWO           0.083333      COPY           INPUT  MEAN
  END MASS-LINK 13
```

END MASS-LINK

END RUN

Mitigated UCI File

RUN

GLOBAL

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

FILES

<File>	<Un#>	<-----File Name----->	***
<-ID->			***
WDM	26	18037.wdm	
MESSU	25	Mit18037.MES	
	27	Mit18037.L61	
	28	Mit18037.L62	
	30	POC180371.dat	

END FILES

OPN SEQUENCE

INGRP INDELT 00:15
PERLND 16
IMPLND 1
IMPLND 4
IMPLND 5
IMPLND 8
RCHRES 1
COPY 1
COPY 501
DISPLY 1

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INFO1

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

END DISPLY-INFO1

END DISPLY

COPY

TIMESERIES

#	-	#	NPT	NMN	***
1			1	1	
501			1	1	

END TIMESERIES

END COPY

GENER

OPCODE

#	#	OPCD	***
---	---	------	-----

END OPCODE

PARM

#	#	K	***
---	---	---	-----

END PARM

END GENER

PERLND

GEN-INFO

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

16	C, Lawn, Flat	1	1	1	1	27	0
----	---------------	---	---	---	---	----	---

END GEN-INFO

*** Section PWATER***

ACTIVITY

<PLS >	***** Active Sections *****														
#	-	#	ATMP	SNOW	PWAT	SED	PST	PWG	PQAL	MSTL	PEST	NITR	PHOS	TRAC	***
16			0	0	1	0	0	0	0	0	0	0	0	0	

END ACTIVITY

```

PRINT-INFO
<PLS > ***** Print-flags ***** PIVL  PYR
# - # ATMP SNOW PWAT  SED  PST  PWG  PQAL MSTL PEST NITR PHOS TRAC  *****
16   0   0   4   0   0   0   0   0   0   0   0   0   0   1   9
END PRINT-INFO

```

```

PWAT-PARM1
<PLS > PWATER variable monthly parameter value flags ***
# - # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRG  VLE INFC  HWT ***
16   0   0   0   0   0   0   0   0   0   0   0   0
END PWAT-PARM1

```

```

PWAT-PARM2
<PLS > PWATER input info: Part 2          ***
# - # ***FOREST  LZSN  INFILT  LRSUR  SLSUR  KVARY  AGWRC
16   0   4.5  0.03  400   0.05  0.5   0.996
END PWAT-PARM2

```

```

PWAT-PARM3
<PLS > PWATER input info: Part 3          ***
# - # ***PETMAX  PETMIN  INFEXP  INFILD  DEEPFR  BASETP  AGWETP
16   0   0   2   2   0   0   0
END PWAT-PARM3

```

```

PWAT-PARM4
<PLS > PWATER input info: Part 4          ***
# - # CEPSC  UZSN  NSUR  INTFW  IRC  LZETP ***
16   0.1  0.25  0.25  6   0.5  0.25
END PWAT-PARM4

```

```

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS  SURS  UZS  IFWS  LZS  AGWS  GWVS
16   0   0   0   0   2.5  1   0
END PWAT-STATE1

```

END PERLND

IMPLND

```

GEN-INFO
<PLS ><-----Name----->  Unit-systems  Printer ***
# - # User t-series Engl Metr ***
# - # in out ***
1   ROADS/FLAT  1  1  1  27  0
4   ROOF TOPS/FLAT  1  1  1  27  0
5   DRIVEWAYS/FLAT  1  1  1  27  0
8   SIDEWALKS/FLAT  1  1  1  27  0

```

```

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

```

```

ACTIVITY
<PLS > ***** Active Sections *****
# - # ATMP SNOW IWAT  SLD  IWG IQAL  ***
1   0   0   1   0   0   0
4   0   0   1   0   0   0
5   0   0   1   0   0   0
8   0   0   1   0   0   0
END ACTIVITY

```

```

PRINT-INFO
<ILS > ***** Print-flags ***** PIVL  PYR
# - # ATMP SNOW IWAT  SLD  IWG IQAL  *****
1   0   0   4   0   0   0   1   9
4   0   0   4   0   0   0   1   9
5   0   0   4   0   0   0   1   9
8   0   0   4   0   0   0   1   9
END PRINT-INFO

```

```

IWAT-PARM1
<PLS > IWATER variable monthly parameter value flags ***

```

```

# - # CSNO RTOP VRS VNN RTLI ***
1      0 0 0 0 0
4      0 0 0 0 0
5      0 0 0 0 0
8      0 0 0 0 0

```

END IWAT-PARM1

IWAT-PARM2

```

<PLS > IWATER input info: Part 2 ***
# - # *** LSUR SLSUR NSUR RETSC
1      400 0.01 0.1 0.1
4      400 0.01 0.1 0.1
5      400 0.01 0.1 0.1
8      400 0.01 0.1 0.1

```

END IWAT-PARM2

IWAT-PARM3

```

<PLS > IWATER input info: Part 3 ***
# - # ***PETMAX PETMIN
1      0 0
4      0 0
5      0 0
8      0 0

```

END IWAT-PARM3

IWAT-STATE1

```

<PLS > *** Initial conditions at start of simulation
# - # *** RETS SURS
1      0 0
4      0 0
5      0 0
8      0 0

```

END IWAT-STATE1

END IMPLND

SCHEMATIC

```

<-Source-> <--Area--> <-Target-> MBLK ***
<Name> # <-factor-> <Name> # Tbl# ***
developed***
PERLND 16 0.9542 RCHRES 1 2
PERLND 16 0.9542 RCHRES 1 3
IMPLND 1 0.2842 RCHRES 1 5
IMPLND 4 0.3221 RCHRES 1 5
IMPLND 5 0.1653 RCHRES 1 5
IMPLND 8 0.1312 RCHRES 1 5

```

*****Routing*****

```

PERLND 16 0.9542 COPY 1 12
IMPLND 1 0.2842 COPY 1 15
IMPLND 4 0.3221 COPY 1 15
IMPLND 5 0.1653 COPY 1 15
IMPLND 8 0.1312 COPY 1 15
PERLND 16 0.9542 COPY 1 13
RCHRES 1 1 COPY 501 16

```

END SCHEMATIC

NETWORK

```

<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> # <Name> # #<-factor->strg <Name> # # <Name> # # ***
COPY 501 OUTPUT MEAN 1 1 48.4 DISPLY 1 INPUT TIMSER 1

```

```

<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> # <Name> # #<-factor->strg <Name> # # <Name> # # ***
END NETWORK

```

RCHRES

GEN-INFO

```

RCHRES      Name      Nexits  Unit Systems  Printer      ***
# - #<-----><----> User T-series  Engl Metr LKFG  ***
              in out
1      Vault  1      1      1      1      28      0      1
END GEN-INFO
*** Section RCHRES***

```

```

ACTIVITY
<PLS > ***** Active Sections *****
# - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUGF PKFG PHFG ***
1      1      0      0      0      0      0      0      0      0      0
END ACTIVITY

```

```

PRINT-INFO
<PLS > ***** Print-flags ***** PIVL  PYR
# - # HYDR ADCA CONS HEAT  SED  GOL  OXRX NUTR  PLNK PHCB  PIVL  PYR  *****
1      4      0      0      0      0      0      0      0      0      0      1      9
END PRINT-INFO

```

```

HYDR-PARM1
RCHRES  Flags for each HYDR Section      ***
# - # VC A1 A2 A3  ODFVFG for each *** ODGTFG for each  FUNCT for each
      FG FG FG FG  possible exit *** possible exit  possible exit
      * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
1      0 1 0 0      4 0 0 0 0      0 0 0 0 0      2 2 2 2 2
END HYDR-PARM1

```

```

HYDR-PARM2
# - # FTABNO      LEN      DELTH      STCOR      KS      DB50      ***
<---><-----><-----><-----><-----><----->
1      1      0.01      0.0      0.0      0.5      0.0
END HYDR-PARM2

```

```

HYDR-INIT
RCHRES  Initial conditions for each HYDR section      ***
# - # *** VOL      Initial value of COLIND      Initial value of OUTDGT
      *** ac-ft      for each possible exit      for each possible exit
<-----><-----> <---><---><---><---> *** <---><---><---><--->
1      0      4.0 0.0 0.0 0.0 0.0      0.0 0.0 0.0 0.0 0.0
END HYDR-INIT
END RCHRES

```

```

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES

```

```

FTABLE      1
92      4
Depth      Area      Volume      Outflowl Velocity      Travel Time***
(ft)      (acres) (acre-ft) (cfs)      (ft/sec) (Minutes)***
0.000000  0.059711  0.000000  0.000000
0.133333  0.059711  0.007961  0.002283
0.266667  0.059711  0.015923  0.003229
0.400000  0.059711  0.023884  0.003954
0.533333  0.059711  0.031846  0.004566
0.666667  0.059711  0.039807  0.005105
0.800000  0.059711  0.047769  0.005592
0.933333  0.059711  0.055730  0.006040
1.066667  0.059711  0.063691  0.006457
1.200000  0.059711  0.071653  0.006849
1.333333  0.059711  0.079614  0.007220
1.466667  0.059711  0.087576  0.007572
1.600000  0.059711  0.095537  0.007909
1.733333  0.059711  0.103499  0.008232
1.866667  0.059711  0.111460  0.008542
2.000000  0.059711  0.119421  0.008842
2.133333  0.059711  0.127383  0.009132
2.266667  0.059711  0.135344  0.009413
2.400000  0.059711  0.143306  0.009686
2.533333  0.059711  0.151267  0.009951
2.666667  0.059711  0.159229  0.010210
2.800000  0.059711  0.167190  0.010462

```

2.933333	0.059711	0.175152	0.010708
3.066667	0.059711	0.183113	0.010949
3.200000	0.059711	0.191074	0.011184
3.333333	0.059711	0.199036	0.011415
3.466667	0.059711	0.206997	0.011641
3.600000	0.059711	0.214959	0.011863
3.733333	0.059711	0.222920	0.012081
3.866667	0.059711	0.230882	0.012294
4.000000	0.059711	0.238843	0.012505
4.133333	0.059711	0.246804	0.012711
4.266667	0.059711	0.254766	0.012915
4.400000	0.059711	0.262727	0.013115
4.533333	0.059711	0.270689	0.013312
4.666667	0.059711	0.278650	0.013507
4.800000	0.059711	0.286612	0.013698
4.933333	0.059711	0.294573	0.013887
5.066667	0.059711	0.302534	0.014074
5.200000	0.059711	0.310496	0.014257
5.333333	0.059711	0.318457	0.014439
5.466667	0.059711	0.326419	0.014618
5.600000	0.059711	0.334380	0.014796
5.733333	0.059711	0.342342	0.014971
5.866667	0.059711	0.350303	0.015144
6.000000	0.059711	0.358264	0.015315
6.133333	0.059711	0.366226	0.015484
6.266667	0.059711	0.374187	0.015652
6.400000	0.059711	0.382149	0.015817
6.533333	0.059711	0.390110	0.015981
6.666667	0.059711	0.398072	0.016143
6.800000	0.059711	0.406033	0.016304
6.933333	0.059711	0.413994	0.016463
7.066667	0.059711	0.421956	0.016621
7.200000	0.059711	0.429917	0.016777
7.333333	0.059711	0.437879	0.016931
7.466667	0.059711	0.445840	0.017085
7.600000	0.059711	0.453802	0.020154
7.733333	0.059711	0.461763	0.023294
7.866667	0.059711	0.469725	0.025365
8.000000	0.059711	0.477686	0.027047
8.133333	0.059711	0.485647	0.028511
8.266667	0.059711	0.493609	0.029827
8.400000	0.059711	0.501570	0.031037
8.533333	0.059711	0.509532	0.032164
8.666667	0.059711	0.517493	0.046386
8.800000	0.059711	0.525455	0.056795
8.933333	0.059711	0.533416	0.064260
9.066667	0.059711	0.541377	0.070475
9.200000	0.059711	0.549339	0.075942
9.333333	0.059711	0.557300	0.080894
9.466667	0.059711	0.565262	0.085460
9.600000	0.059711	0.573223	0.089724
9.733333	0.059711	0.581185	0.093742
9.866667	0.059711	0.589146	0.097555
10.00000	0.059711	0.597107	0.101192
10.13333	0.059711	0.605069	0.104677
10.26667	0.059711	0.613030	0.108029
10.40000	0.059711	0.620992	0.111262
10.53333	0.059711	0.628953	0.114389
10.66667	0.059711	0.636915	0.117420
10.80000	0.059711	0.644876	0.120363
10.93333	0.059711	0.652837	0.123227
11.06667	0.059711	0.660799	0.399713
11.20000	0.059711	0.668760	1.533204
11.33333	0.059711	0.676722	3.013919
11.46667	0.059711	0.684683	4.460027
11.60000	0.059711	0.692645	5.537767
11.73333	0.059711	0.700606	6.153031
11.86667	0.059711	0.708567	6.738817
12.00000	0.059711	0.716529	7.230557
12.13333	0.059711	0.724490	7.690582

END FTABLE 1
 END FTABLES

EXT SOURCES

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

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member->	<--Mult-->	Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***
<Name>	#	<Name>	#	#<-factor-->	strg	<Name>	#	<Name>	tem strg	strg
RCHRES	1	HYDR	RO	1 1	1	WDM	1000	FLOW	ENGL	REPL
RCHRES	1	HYDR	STAGE	1 1	1	WDM	1001	STAG	ENGL	REPL
COPY	1	OUTPUT	MEAN	1 1	48.4	WDM	701	FLOW	ENGL	REPL
COPY	501	OUTPUT	MEAN	1 1	48.4	WDM	801	FLOW	ENGL	REPL

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member->	<--Mult-->	<Target>	<-Grp>	<-Member->	***
<Name>	#	<Name>	#	<-factor-->	strg	<Name>	# #
PERLND	2	PWATER	SURO	0.083333		RCHRES	INFLOW IVOL
END MASS-LINK 2							
PERLND	3	PWATER	IFWO	0.083333		RCHRES	INFLOW IVOL
END MASS-LINK 3							
IMPLND	5	IWATER	SURO	0.083333		RCHRES	INFLOW IVOL
END MASS-LINK 5							
PERLND	12	PWATER	SURO	0.083333		COPY	INPUT MEAN
END MASS-LINK 12							
PERLND	13	PWATER	IFWO	0.083333		COPY	INPUT MEAN
END MASS-LINK 13							
IMPLND	15	IWATER	SURO	0.083333		COPY	INPUT MEAN
END MASS-LINK 15							
RCHRES	16	ROFLOW				COPY	INPUT MEAN
END MASS-LINK 16							

END MASS-LINK

END RUN

Predeveloped HSPF Message File

Mitigated HSPF Message File

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:

DATE/TIME: 1967/ 8/31 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-1.937E-01	0.00000	0.0000E+00	0.00000	-4.961E-10

Where:

RELERR is the relative error (ERROR/REFVAL).

ERROR is (STOR-STORS) - MATDIF.

REFVAL is the reference value (STORS+MATIN).

STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.

STORS is the storage of material in the pu at the start of the present printout reporting period.

MATIN is the total inflow of material to the pu during the present printout reporting period.

MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:

DATE/TIME: 2002/ 8/31 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-1.717E-03	0.00000	0.0000E+00	0.00000	-6.947E-08

Where:

RELERR is the relative error (ERROR/REFVAL).

ERROR is (STOR-STORS) - MATDIF.

REFVAL is the reference value (STORS+MATIN).

STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.

STORS is the storage of material in the pu at the start of the present printout reporting period.

MATIN is the total inflow of material to the pu during the present printout reporting period.

MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

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