

**Preliminary
Drainage Report**

for

Ellsworth Residential Plat

Prepared for

Quadrant Homes
14725 SE 36th, Suite 200
Bellevue, WA 98006

Prepared by

Land Development Consultants, Inc
14201 NE 200th Street
Suite 100
Woodinville, WA 98072
(425) 806-1869



July 2015

Job No: 13-171

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8	Erosion and Sediment Control Analysis and Design
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1.0 PROJECT OVERVIEW

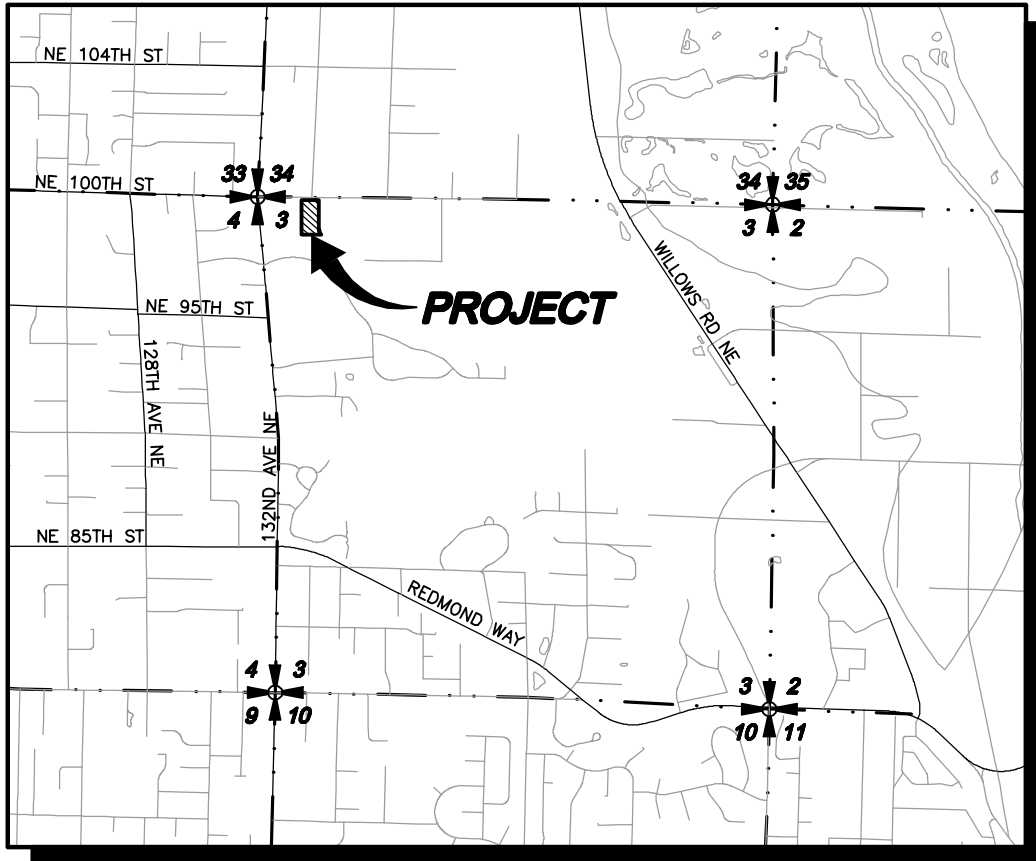
The Ellsworth Residential Plat project is located at 13398 NE 100th St Redmond, WA, within the Rose Hill neighborhood and lies within the northwest quarter of the northwest quarter of Section 3, Township 25 N, Range 5 E, W.M. See Figure 1, Vicinity Map, for the exact location of the site.

The Ellsworth project is comprised of 1.54 acres on parcel #0325059100 of which approximately 1.32 acres will be disturbed during development. The remaining 0.22 acres will be undisturbed as a buffer surrounding the unnamed stream that flows north-south along the eastern property boundary of the subject property. All onsite flows drain into an unnamed tributary, which eventually outlets into the Sammamish River. The project proposes to develop 8 lots with single-family homes and associated driveways and utilities, $\frac{3}{4}$ with public right-of-way road and frontage improvements along NE 100th St. Open swales along the internal roadway and frontage improvements will be used for the purpose of stormwater collection and conveyance, per Rustic Roads Sheet Requirements.

According to the King County Soil Survey and independent geotechnical investigation, the site is underlain with Alderwood Gravelly Sandy Loam, 0 to 8 percent slopes and Alderwood Gravelly Sandy Loam, 8 to 15 percent slopes (Refer to Figure 5.0, Soils Map, in Appendix 3-B for detailed soil information). Site soils are classified as hydrologic soil group type C and have slow to moderate runoff potential with a slight to moderate erosion potential. Slopes on the areas to be developed range from 0 to 15 percent. Current runoff exits the site via overland flow into the unnamed stream that flows north to south from NE 100th St along the eastern property boundary and is tributary to the Sammamish River. According to the Redmond Watershed map the site is within Watershed 060. No specific watershed management plans were found for that basin.

Flow control will be achieved by means of a detention wetvault for this project. The flow control will comply with the City of Redmond 2012 Stormwater Management Technical Notebook and the 2005 DOE Manual. Water quality treatment will be provided by a settlement dead storage pond in the wetvault.

It should be noted that the frontage basin area along NE 100th St will not be considered as part of this project. Per City of Redmond standards, and due to the nature of this basin's hydrology, the frontage basin will be evaluated as an isolated and separate project.



VICINITY MAP

SCALE: 1"=2000'

Drawing: P:\2013\13-171 Ellsworth\Exhibits\13171E-VM.dwg Plotted: Oct 15, 2014 - 1:42pm

LDC

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Engineering
Structural
Planning
Survey

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Woodinville, WA 98072

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QUADRANT HOMES

ELLSWORTH

VICINITY MAP



LEGEND

- Subject Property
- ~ Storm Pipe
- ~ Watercourse
- Parcel Boundary

Contours

- ~ 50 Foot Contour
- ~ 10 Foot Contour

0 100 200
Scale in Feet

VICINITY MAP

QUADRANT HOMES
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EXISTING SITE INFORMATION

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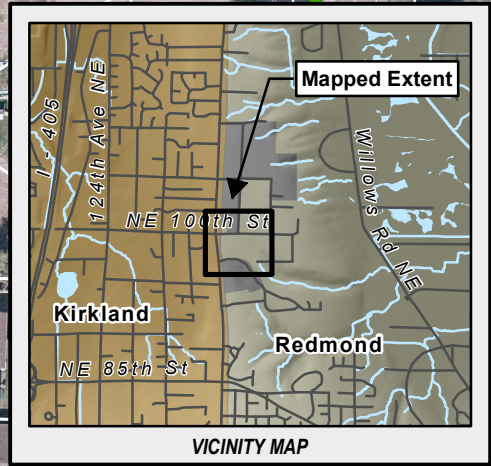
SOURCE AGENCY	DESCRIPTION
USDA	COLOR AERIAL PHOTOGRAPHY (2006)
KING COUNTY GIS	TEN FOOT CONTOUR - GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
CITY OF REDMOND	HYDROLOGY
KING COUNTY GIS	PARCEL BOUNDARIES

PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET

REVISION:

JOB NUMBER:	13-171
DRAWING NAME:	13-171F01
DESIGNER:	TABBOTT
DRAWING BY:	I. MIERAU
DATE:	10-30-14
SCALE:	AS SHOWN
JURISDICTION:	REDMOND

FIGURE:
1.0



LEGEND

- Detention Vault
- Subject Property
- French Drain Pipe
- Storm Pipe
- Watercourse
- Parcel Boundary

Contours

- 50 Foot Contour
- 10 Foot Contour

0 100 200
Scale in Feet

QUADRANT HOMES
ELLSWORTH
PROPOSED LAYOUT MAP

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CITY OF REDMOND	HYDROLOGY
KING COUNTY GIS	PARCEL BOUNDARIES

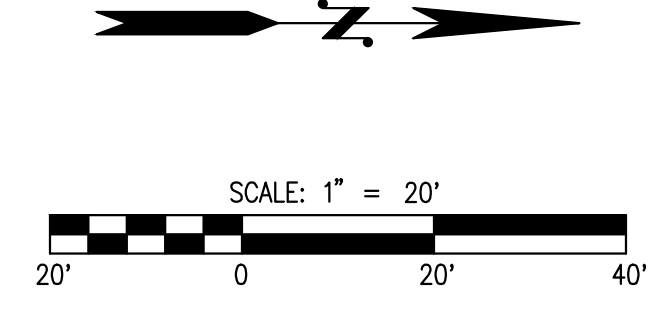
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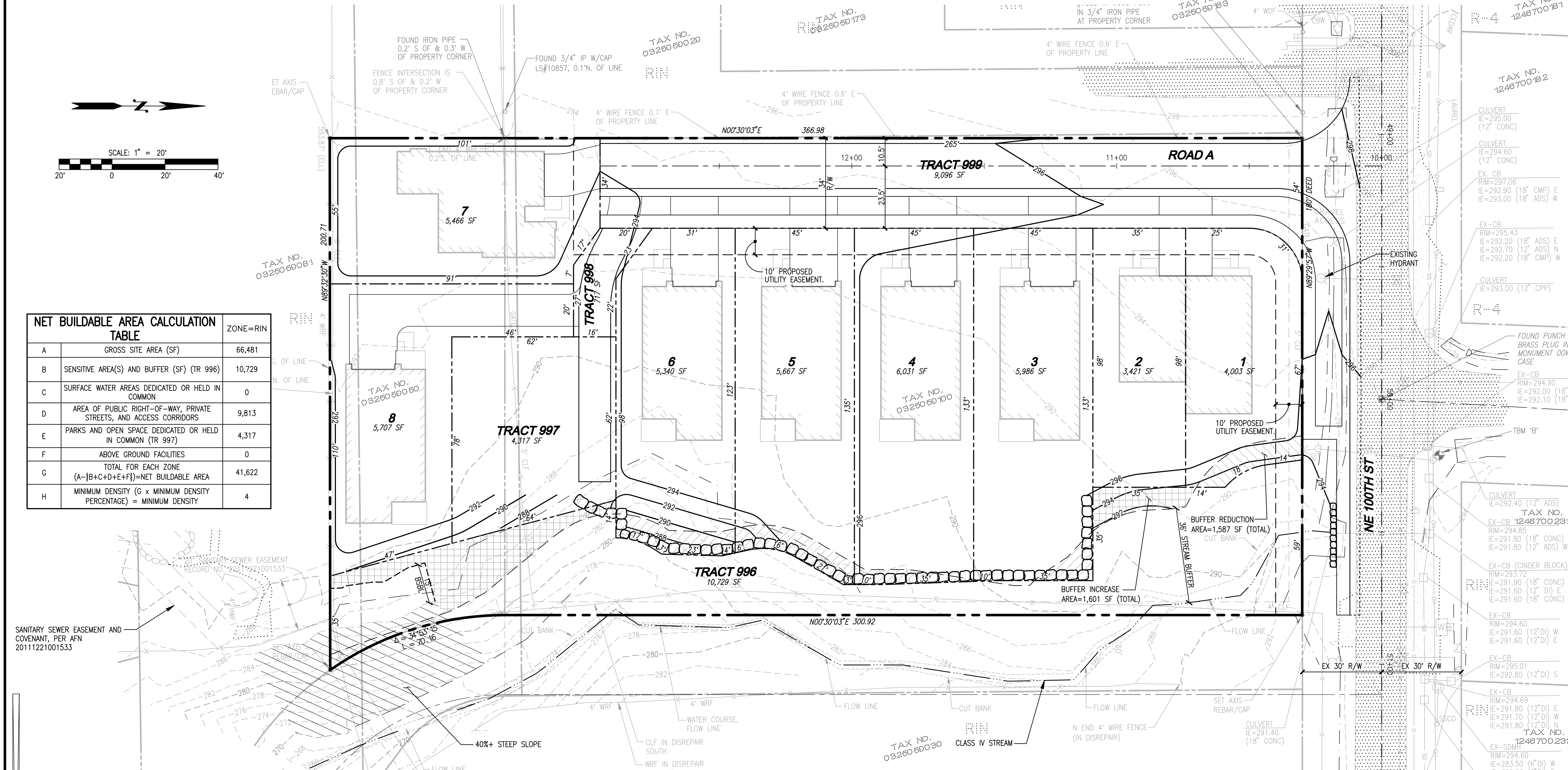
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DRAWING NAME:	13-171F02
DESIGNER:	TABBOTT
DRAWING BY:	I. MIERAU
DATE:	10-29-14
SCALE:	AS SHOWN
JURISDICTION:	REDMOND

FIGURE:
2.0

NW 1/4, NW 1/4 OF SEC 3, TWN 25 N, RGE 5 E, W.M., CITY OF REDMOND, KING COUNTY, WASHINGTON



	ZONE=RIN	
A	GROSS SITE AREA (SF)	66,481
B	SENSITIVE AREA(S) AND BUFFER (SF) (TR 996)	10,729
C	SURFACE WATER AREAS DEDICATED OR HELD IN COMMON	0
D	AREA OF PUBLIC RIGHT-OF-WAY, PRIVATE STREETS, AND ACCESS CORRIDORS	9,813
E	PARKS AND OPEN SPACE DEDICATED OR HELD IN COMMON (TR 997)	4,317
F	ABOVE GROUND FACILITIES	0
G	TOTAL FOR EACH ZONE (A-B+C+D+E+F)=NET BUILDABLE AREA	41,622
H	MINIMUM DENSITY (G x MINIMUM DENSITY PERCENTAGE) = MINIMUM DENSITY	4



SANITARY SEWER EASEMENT AND COVENANT, PER AFN 20111221001533

Open Space Calculations

		(SF)
REQUIRED OPEN SPACE	20% SITE	13,296
REQUIRED DEVELOPMENT WIDE OPEN SPACE	10% SITE	6,648
PROVIDED DEVELOPMENT WIDE OPEN SPACE	TRACTS 996 & 997	15,046
LOT BY LOT OPEN SPACE REQUIRED	10% SITE	6,648
LOT BY LOT OPEN SPACE PROVIDED	LOT 1; 43'x15'	645
	LOT 2; 35'x30'	1050
	LOT 3; 45'x20'	900
	LOT 4; 45'x20'	900
	LOT 5; 45'x20'	900
	LOT 6; 45'x20'	900
	LOT 7; 55'x15'	825
	LOT 8; 15'x47'	705
TOTAL OPEN SPACE PROVIDED	TOTAL LOT BY LOT OPEN SPACE PROVIDED	6,825
TOTAL OPEN SPACE PROVIDED		21,871 (33% OF SITE)

PROJECT INFORMATION

SITE ADDRESS: 10044 134TH AVE NE, REDMOND, WA 98033, 0325059100

TAX PARCELS: GROSS SITE AREA: 1.53 AC, 66,481 SF; NET SITE AREA: 1.33 AC, 57,745 SF; ZONING: RIN (RESIDENTIAL INNOVATIVE); NUMBER OF UNITS ALLOWABLE: 8 UNITS

NUMBER OF UNITS PROPOSED: 8 UNITS

OPEN SPACE/LANDSCAPING REQUIRED: 20% SMALLER DWELLING = 2 UNITS (1 & 2); AFFORDABLE = NO AFFORDABLE HOUSING IS REQUIRED IN PROJECTS LESS THAN 10 UNITS

OPEN SPACE/LANDSCAPING PROVIDED: 21.08.070 RIN-ZONE, 5,288 SF

PARKING SPACES REQUIRED: 16; **PARKING SPACES PROVIDED:** 16 - 2 PARKING SPACES WILL BE PROVIDED ON EACH LOT (GARAGES AND/OR DRIVEWAYS)

CODE SECTION: 21.08.070 RIN-ZONE

AVERAGE LOT SIZE: 5,288 SF

LOT CIRCLE: 35 FEET

LOT FRONTAGE: 20 FEET MINIMUM

FRONT SETBACK: 15 FEET BLDG/18 FT GARAGE

SIDE SETBACK: 5/10 FEET

REAR SETBACK: 10 FEET

SIDE STREET SETBACK: 15 FEET

MAX LOT COVERAGE: 35%

MAX IMPERV. SURFACE: 65% 0.99 AC, 43,213 SF; 54% 0.82 AC, 35,719 SF

PROPOSED IMPERVIOUS SURFACE: 25 FEET

MAX HEIGHT ALLOWED: < 25 FEET

MAX HEIGHT PROPOSED: < 25 FEET

UBC CONSTRUCTION TYPE: V-A (PROTECTED COMBUSTIBLE)

PROJECT SUMMARY TABLE

	ZONE=RIN
GROSS SITE AREA (SF)	66,481
NET BUILDABLE AREA (SF)	41,622
MINIMUM DENSITY	4
MAXIMUM DENSITY	8
AVERAGE LOT SIZE	5,222
LARGEST PROPOSED LOT	6,031
SMALLEST PROPOSED LOT	3,535
SENSITIVE AREA(S) AND BUFFER (SF)	10,571
AREA OF PUBLIC RIGHT-OF-WAY, PRIVATE STREETS, AND ACCESS CORRIDORS	9,813
TOTAL OPEN SPACE (SF)	14,888
TOTAL ACTIVE RECREATION OPEN SPACE, IF PROVIDED (SF) TR 997	4,317

CONTACT LIST

APPLICANT: QUADRANT HOMES, 14725 SE 36TH ST, #200, BELLVUE, WA 98006, CONTACT: COREY WATSON, PHONE: (425) 646-4139, EMAIL: corey.watson@quadranthomes.com

OWNER: THOMAS & MELISSA ELLSWORTH, 305 289TH PL NE, CARNATION, WASHINGTON 98014

ENGINEER: LDC, INC., 14201 NE 200TH ST #100, WOODINVILLE, WASHINGTON 98072, CONTACT: MARK VILLOCK, PE, PHONE: (425) 806-1869, FAX: (425) 482-2893, EMAIL: mvillock@ldccorp.com

SURVEYOR: AXIS SURVEY & MAPPING, 13005 NE 126TH PL, KIRKLAND, WASHINGTON 98034, CONTACT: COREY WATSON, PHONE: (425) 823-5700, FAX: (425) 823-6700

ARBORIST: CREATIVE LANDSCAPE SOLUTIONS, REDMOND, WASHINGTON 98032, CONTACT: SUSAN PRINCE, PHONE: (425) 890-3808, EMAIL: sprince202@aol.com

PROJECT PLANNER: LDC, INC., 14201 NE 200TH ST #100, WOODINVILLE, WASHINGTON 98072, CONTACT: STEVEN ANDERSON, PHONE: (425) 806-1869, FAX: (425) 482-2893, EMAIL: sanderson@ldccorp.com

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Call 2 Business Days Before You Dig
1-800-424-5555
 Utilities Underground Location Center
 (ID, MT, ND, OR, WA)

THIS DEVELOPMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE 2014 CITY OF REDMOND STANDARD SPECIFICATION AND DETAILS.

APPROVED FOR CONSTRUCTION:

FOR: DIRECTOR OF PUBLIC WORKS CITY OF REDMOND

DATE: _____

PLAN CHK ENGR: _____

UTILITY: _____

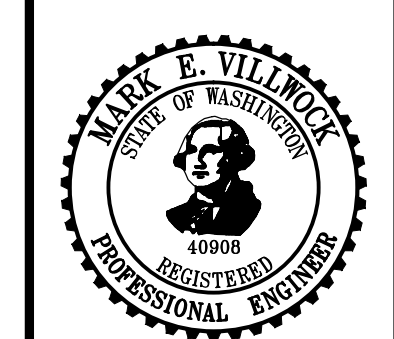
FIRE DEPT: _____

PLANNING DEPT: _____

NO.	DATE	REVISIONS DESCRIPTION

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QUADRANT HOMES
ELLSWORTH
 SITE PLAN



JOB NUMBER: 13-171
 DRAWING NAME: 13171P-SP-01
 DESIGNER: MEV
 DRAFTING BY: RCR
 DATE: 10-6-14
 SCALE: 1"=20'
 JURISDICTION: REDMOND

2.0 CONDITIONS AND REQUIREMENTS SUMMARY

This project is vested under the Redmond Municipal Code (RMC), Redmond Zoning Code (RZC) and Redmond Stormwater Technical Notebook. The 2005 Ecology Manual as modified by the Western Washington Phase II Municipal Stormwater Permit regulates issues not addressed by the RMC, RZC and Stormwater Notebook. This project will be considered a “new development”. Figure 3.2 of the Redmond Stormwater Technical Notebook was utilized to determine the minimum requirements for the project which will add more than 10,000 square feet of new impervious surface and more than 5,000 SF of new PGIS. All minimum requirements apply to the new impervious surfaces and converted pervious surfaces. The minimum requirements are addressed as follows.

Requirement #1: Preparation of Stormwater Site Plans

This drainage report contains all of information and requirements for Stormwater Site Plans listed in Chapter 3, Volume I of the 2005 Ecology Manual.

Requirement #2: Construction Stormwater Pollution Prevention Plan (SWPPP)

See Section 8 of this report for how this minimum requirement is addressed.

Requirement #3: Source Control of Pollution

Source control BMPs are not required for residential development per the 2005 Ecology Manual.

Requirement #4: Preservation of Natural Drainage System and Outfalls

Natural drainage patterns will be maintained and discharges from the project site will occur at the natural location. Existing drainage from onsite flows are conveyed east into the unnamed stream that runs from north to south along the eastern property boundary of the subject property. The proposed discharge of the site’s runoff will not cause significant adverse impact to the stream and will not cause the potential for downstream erosion along the stream channel. See Section 3.0, Offsite Analysis, for detailed discussion on the potential for downstream erosion. The proposed facility will provide the required flow control and water quality treatment for discharges into this stream.

Requirement #5: On-Site Stormwater Management

See Section 4 of this report for how this minimum requirement is addressed.

Requirement #6: Runoff Treatment

See Section 4 of this report for how this minimum requirement is addressed.

Requirement #7: Flow Control

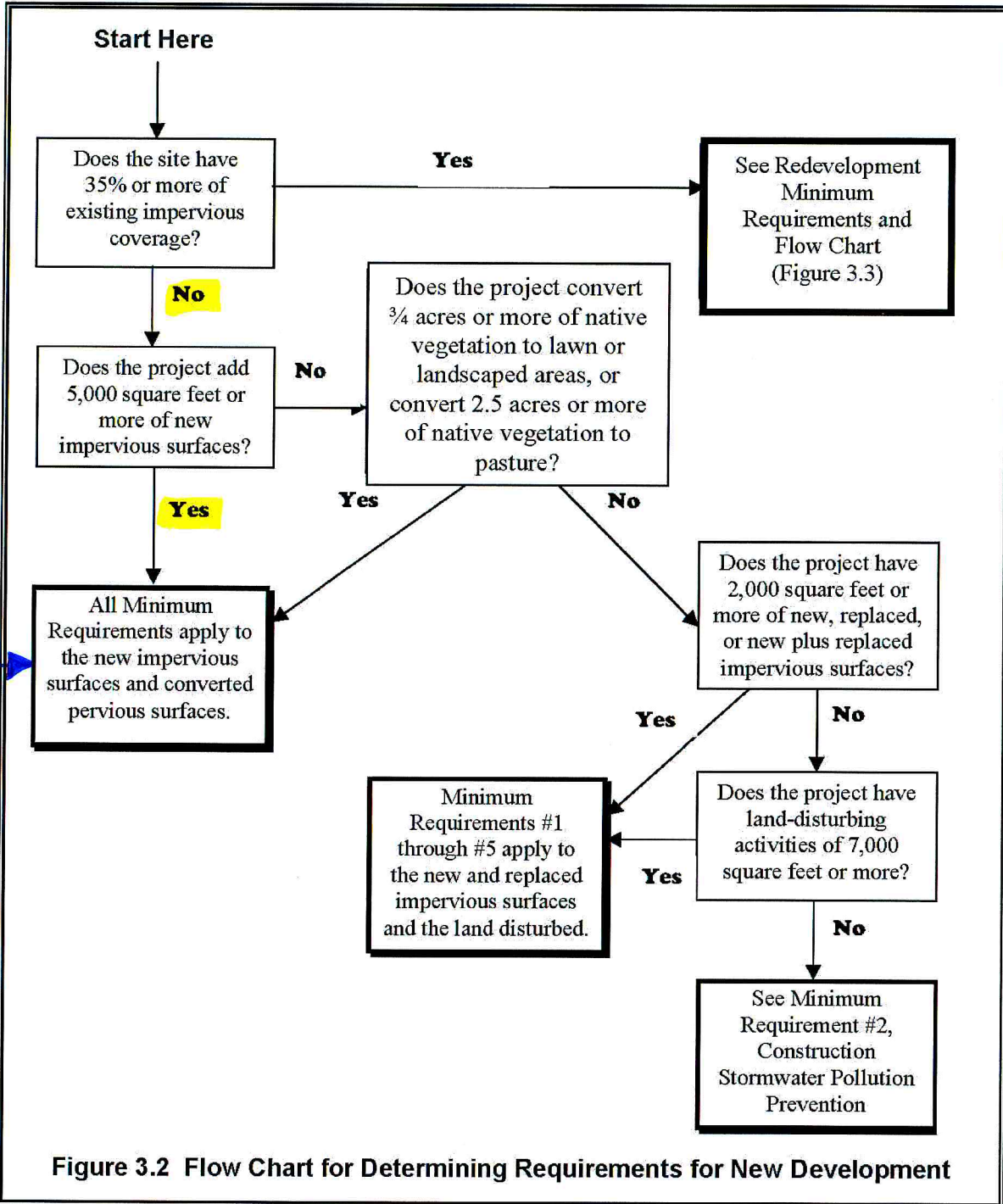
See Section 4 of this report for how this minimum requirement is addressed.

Requirement #8: Wetlands Protection

Per the City's Critical Areas Mapping, there are no wetlands on the project site.

Requirement #9: Operations and Maintenance

A Maintenance and Operations Manual has been created for this project. Please refer to Appendix 10-A in Section 10.0 for this document.



3.0 OFF-SITE ANALYSIS

On Friday November 2, 2012, Upstream and Downstream Analyses were performed at the site. The weather was cloudy with light rain and approximately 50°F. The ground was saturated due to continual rain over the previous days, no overland flow or pooling was observed. The following observations were verified during this visit.

Upstream Analysis

From the site observation, King County LiDAR and aerial photography, an upgradient area is located east of the site on parcels #0325059029, #0325059050, #0325059094, #0325059095, #0325059097, #0325059101, #0325059126, #0325059131, #0325059163, #0325059173 drains over/onto the subject property. Runoff from these upstream areas enters the site via overland sheet flow from easterly adjacent parcels. Approximately 1.89 acres of total area off-site is contributing runoff as sheet flow to the property. An additional 1.05 acres upgradient and east of the subject property contributes to flow within the NE 100th St roadside ditch within the site ROW, which will be collected and conveyed to the creek. See Figure 3.0, Upstream Analysis Map, for a visual representation of these upstream areas.

Field Inspection/Downstream Analysis

Stormwater onsite generally flows east towards an existing unnamed stream (see Figure 3.1, Downstream Analysis Map). Existing site flows drain overland across the eastern property boundary and deposit into this unnamed tributary that flows south from NE 100th St ①. Stormwater travels in this channel for approximately 1,400 feet before passing beyond the 0.25 mile boundary of analysis ②. Flows from the site eventually reach the Sammamish River via this unnamed tributary.

Natural channel condition downstream of existing NE 100th St. discharge:

The unnamed tributary that receives flows from the site was visually inspected for signs of erosion and channel degradation that might be a cause for concern. The channel meanders through a heavily forested and wide valley floor. The channel is heavily vegetated with high grass and brush growing on both the channel sides and bottom.



Visual inspection identified few locations where the channel sides are incised or where topography and vegetation have created localized areas or plunge erosion.



The few locations of incision and erosion are minor (less than three vertical feet of exposed soils), and isolated to not more than a few feet from the creek edge. The creek, and all minor points of erosion, is a significant distance from the steeper valley side-slopes and pose no discernible threat to private property or public infrastructure. **The creek channel downstream of the site discharge should be considered stable.**



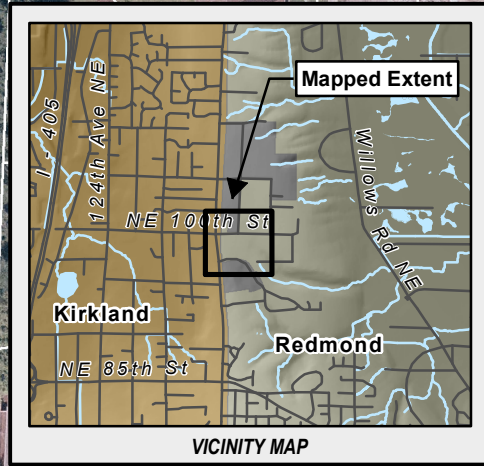
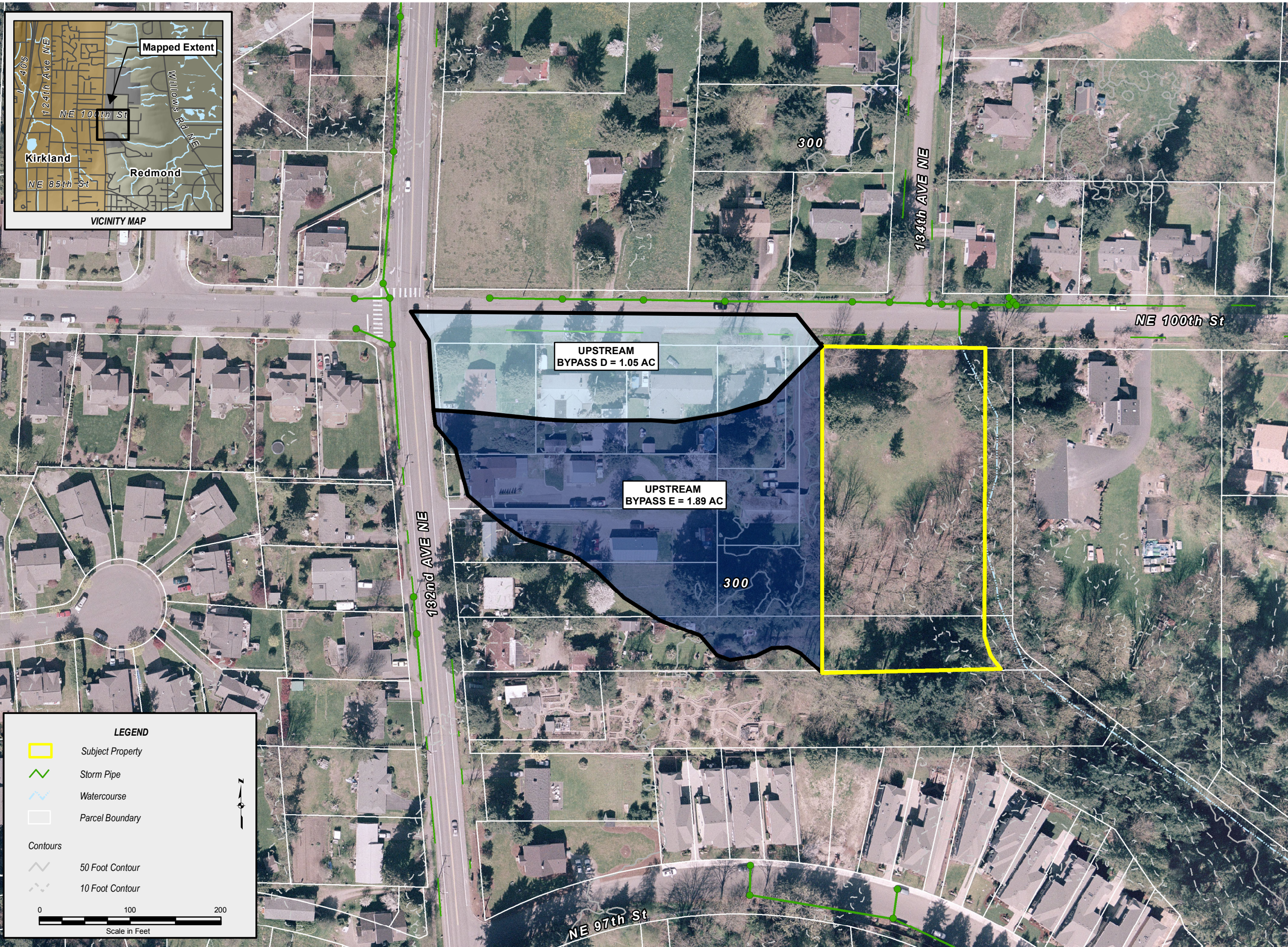
The natural drainage channel on the south side of NE 100th St. ❶



The channel, viewed from the power line easement, just beyond the quarter mile buffer. ❷

APPENDIX 3-A
UPSTREAM AND DOWNSTREAM
ANALYSIS & MAPPING

13-171UpstreamHydrology.mxd | MOD: 10/21/2014 | TPA



LEGEND

- Subject Property
- ~ Storm Pipe
- ~ Watercourse
- Parcel Boundary

Contours

- ~ 50 Foot Contour
- ~ 10 Foot Contour

Scale in Feet

QUADRANT HOMES

ELLSWORTH

UPSTREAM ANALYSIS MAP

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SOURCE AGENCY	DESCRIPTION
USDA	COLOR AERIAL PHOTOGRAPHY (2006)
KING COUNTY GIS	TEN FOOT CONTOUR - GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
CITY OF REDMOND	HYDROLOGY
KING COUNTY GIS	PARCEL BOUNDARIES

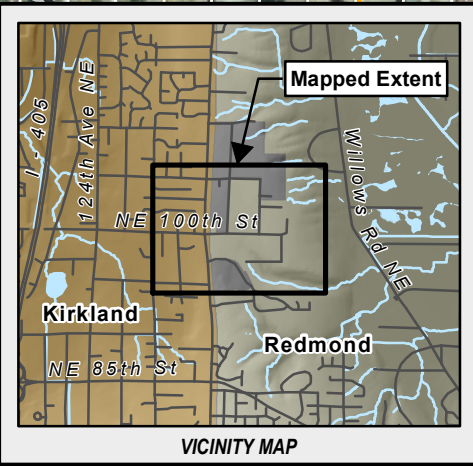
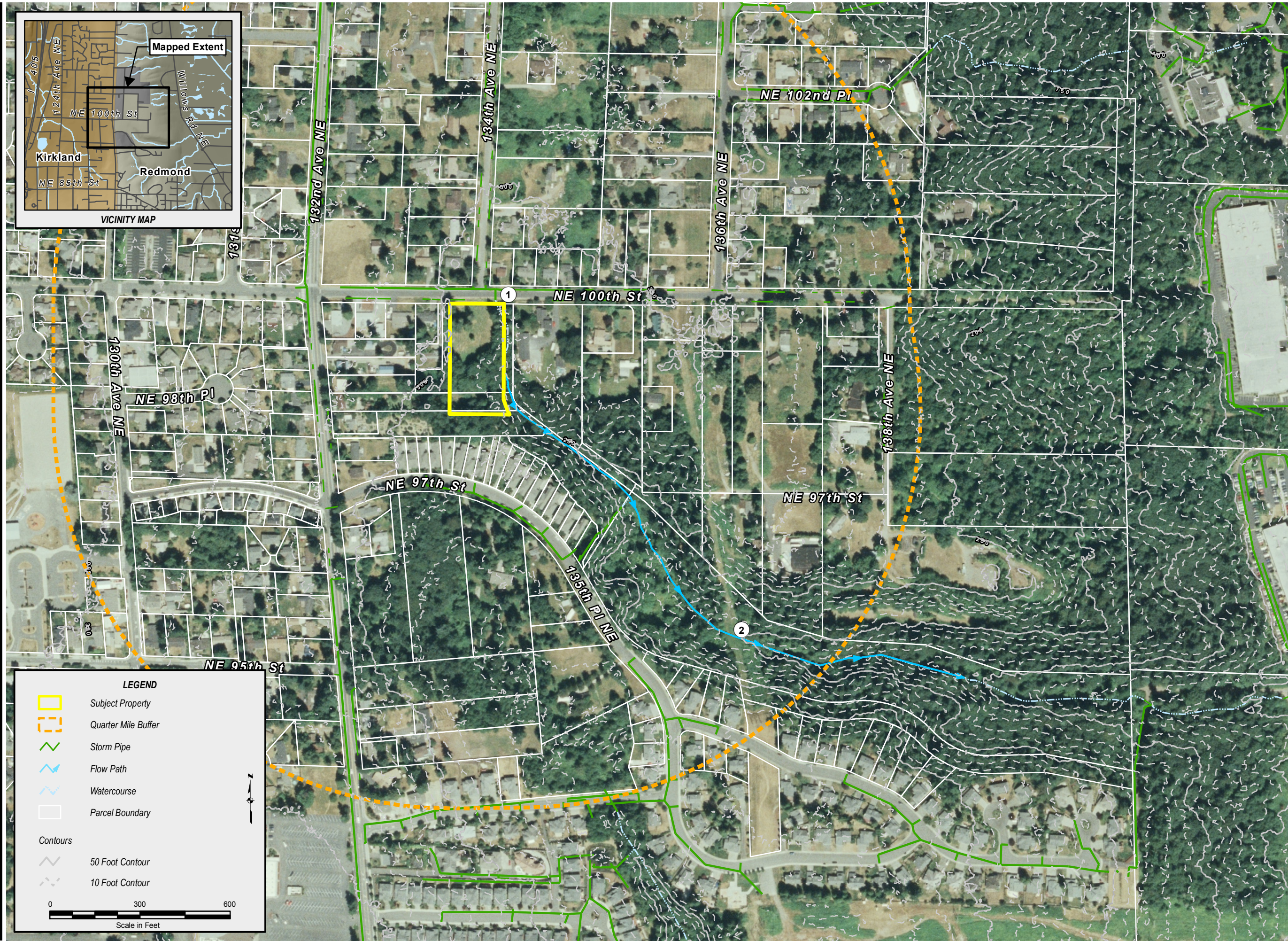
PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET

REVISION:

JOB NUMBER:	13-171
DRAWING NAME:	13-171F03
DESIGNER:	TABBOTT
DRAWING BY:	I. MIERAU
DATE:	10-21-14
SCALE:	AS SHOWN
JURISDICTION:	REDMOND

FIGURE:

3.0



LEGEND

- Subject Property
- Quarter Mile Buffer
- Storm Pipe
- Flow Path
- Watercourse
- Parcel Boundary

Contours

- 50 Foot Contour
- 10 Foot Contour

0 300 600
Scale in Feet

QUADRANT HOMES
ELLSWORTH
DOWNSTREAM ANALYSIS MAP

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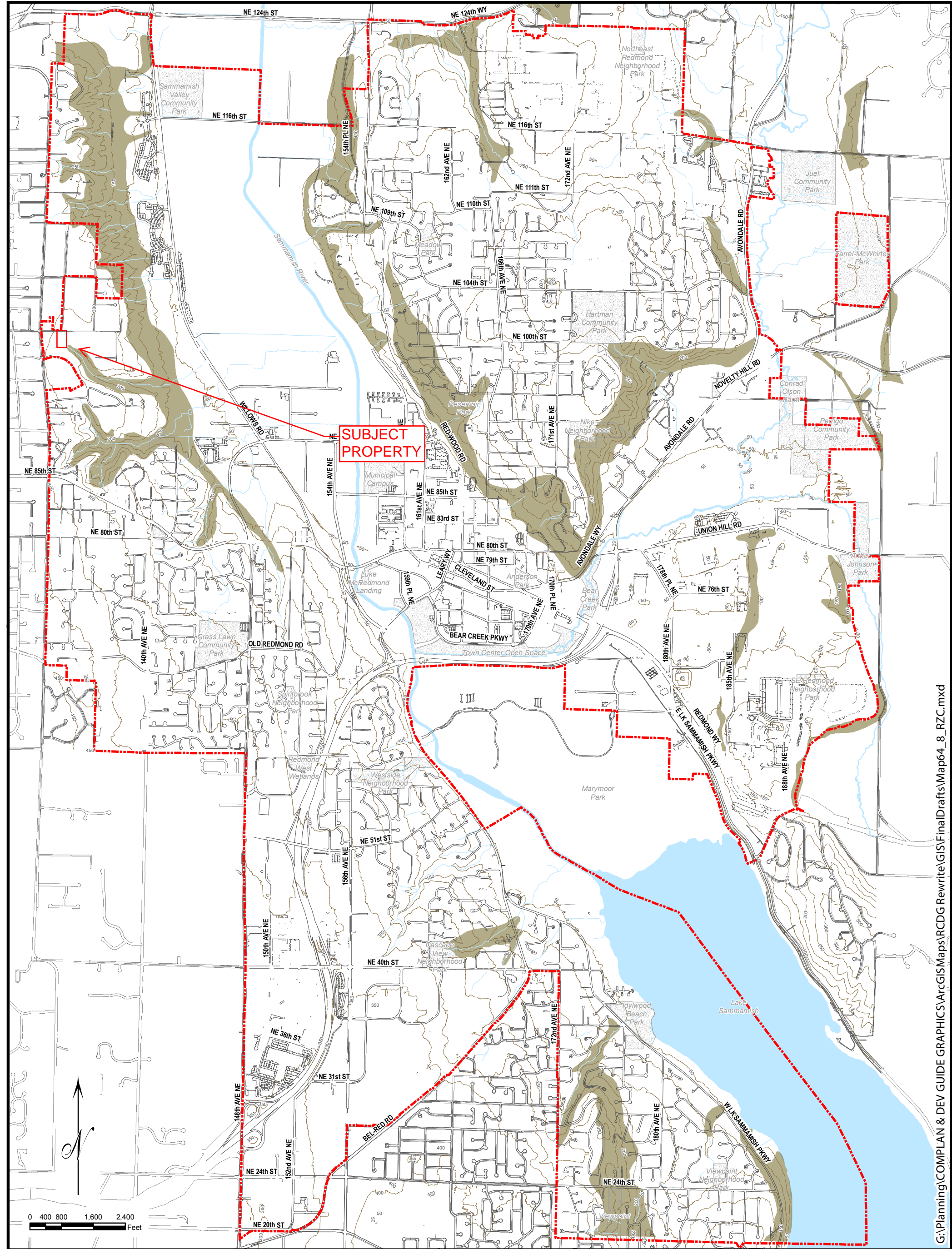
SOURCE INFORMATION	
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CITY OF REDMOND	HYDROLOGY
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PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET

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SCALE:	AS SHOWN
JURISDICTION:	REDMOND

FIGURE:
3.1

APPENDIX 3-A
CRITICAL AREAS MAPPING



0 400 800 1,600 2,400 Feet



City of Redmond

Critical Areas Map
 Effective: April 16, 2011

Map 64.8 Erosion Hazard Areas

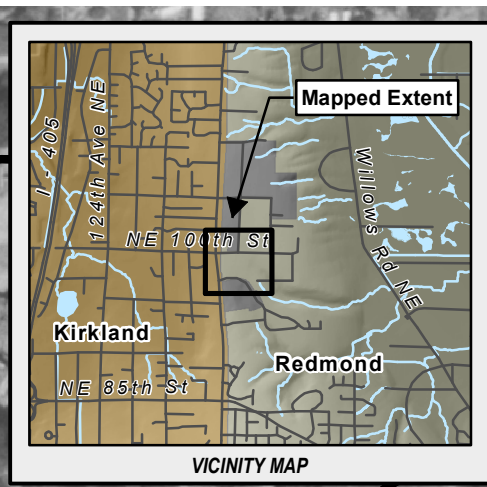
Legend:

- Erosion Hazard Areas
- Contours
- Redmond City Limits

Sources:
 SCS Soil Survey

Note:
 This map shall be used as a general guide. It represents approximate locations. Consult the Critical Areas Ordinance (CAO) for reporting requirements. In the event there is a conflict between the map and the criteria or standards of the CAO, the criteria shall prevail.

APPENDIX 3-B
SCS SOIL SURVEY MAPPING



LEGEND

- Subject Property
- Soil Type Boundary

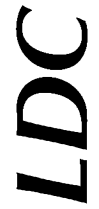
0 200 400
Scale in Feet



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DESIGNER:	TABBOTT
DRAWING BY:	I. MIERAU
DATE:	10-30-14
SCALE:	AS SHOWN
JURISDICTION:	REDMOND

FIGURE:

5.0

SOURCE INFORMATION

SOURCE AGENCY	DESCRIPTION
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CITY OF REDMOND	HYDROLOGY
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King County Area, Washington

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

Map Unit Setting

National map unit symbol: 2t626

Elevation: 0 to 1,000 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: 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: Hills, ridges

Landform position (two-dimensional): Shoulder

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

Down-slope shape: Convex, linear

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

Other vegetative classification: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA)

Minor Components

Everett

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Droughty Soils (G002XN402WA)

Indianola

Percent of map unit: 5 percent
Landform: Hillslopes, kames, eskers, terraces
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: Thuja plicata-pseudotsuga menziesii/gaultheria shallon/polystichum munitum (F002XN903WA)
Other vegetative classification: Droughty Soils (G002XN402WA)

Shalcar

Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Wet Soils (G002XN102WA)

Norma

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Other vegetative classification: Wet Soils (G002XS101WA)

Data Source Information

Soil Survey Area: King County Area, Washington
Survey Area Data: Version 10, Sep 30, 2014

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: Hills, ridges

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Crest, tal

Down-slope shape: Convex, linear

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

Other vegetative classification: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XS301WA), Limited Depth Soils (G002XF303WA)

Minor Components

Mckenna

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave, linear
Across-slope shape: Concave
Other vegetative classification: Wet Soils (G002XF103WA)

Everett

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Droughty Soils (G002XN402WA)

Shalcar

Percent of map unit: 3 percent
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Wet Soils (G002XN102WA)

Norma

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Other vegetative classification: Wet Soils (G002XS101WA)

Data Source Information

Soil Survey Area: King County Area, Washington

Survey Area Data: Version 10, Sep 30, 2014

APPENDIX 3-C
DRAINAGE COMPLAINTS

4.0 FLOW CONTROL AND WATER QUALITY FACILITY

ANALYSIS AND DESIGN

The flow control and water quality requirements are vested under the Redmond Municipal Code (RMC), Redmond Zoning Code (RZC) and Redmond Stormwater Technical Notebook. The 2005 Ecology Manual as modified by the Western Washington Phase II Municipal Stormwater Permit regulates issues not addressed by the RMC, RZC and Stormwater Notebook.

4.1 Existing Site Hydrology

The existing site to be developed is comprised of a single basin, Basin A, containing 1.26 acres. All existing Basin A flows convey overland across the eastern property boundary and deposit into an unnamed tributary to the Sammamish River that flows south from NE 100th St. The site is not developed and all existing Basin A area is considered to be in the forested condition. In addition, there is a small frontage basin (0.02 AC) along NE 100th St that is tributary to the proposed stormwater detention facility and is therefore considered in the predeveloped condition (see below). Modeling of the following areas was performed in Western Washington Continuous Simulation Hydrology Model (WWHM). In addition to the modeled basins, there is also a 0.22 acre basin that will remain undisturbed in the developed condition.

Basin A

Basin A is approximately 1.26 acres and flows easterly across the subject property. In the existing condition, it has been modeled as follows:

Forested = 1.30 acres

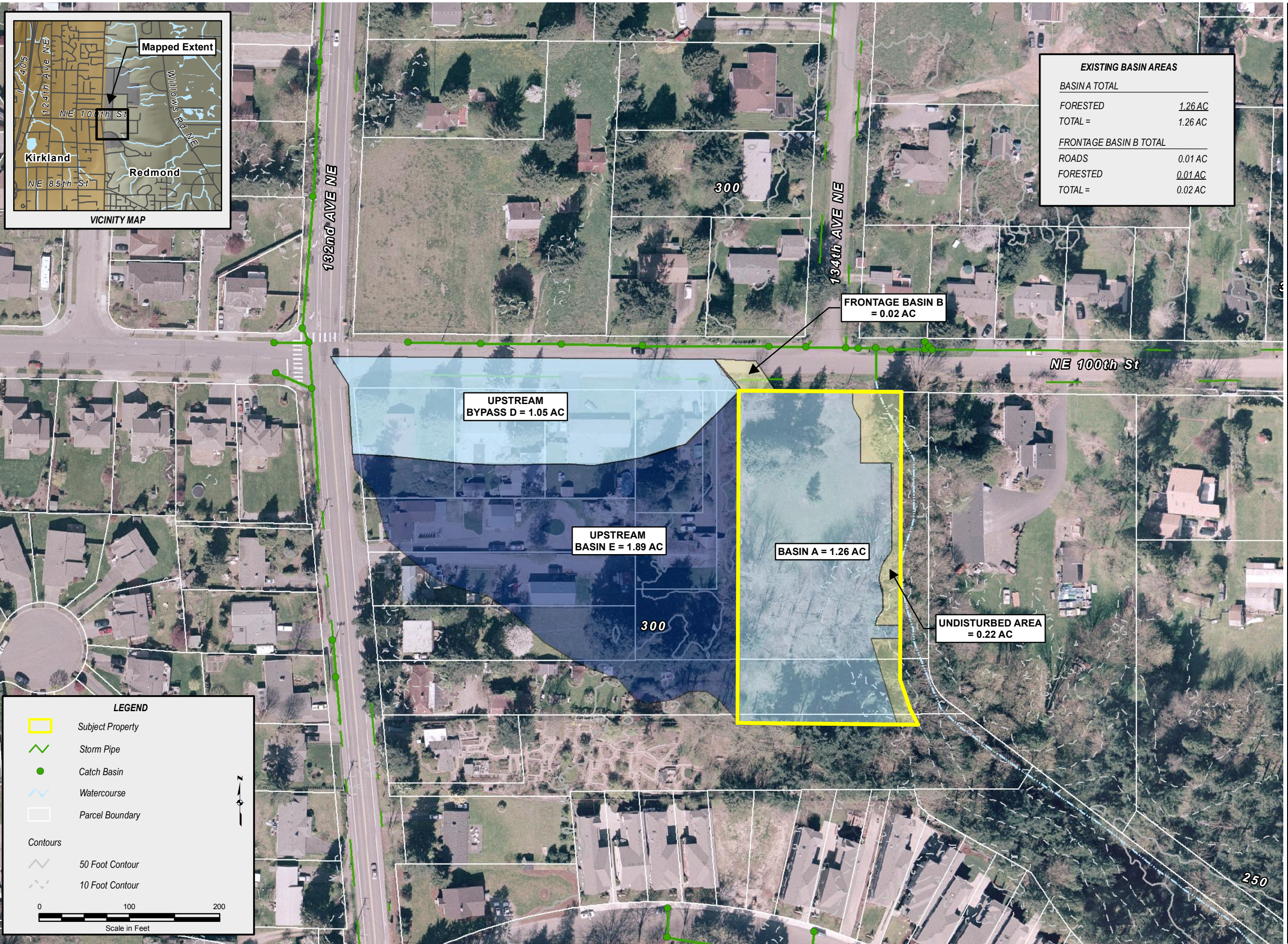
Frontage Basin B

The Frontage Basin B is located within NE 100th St ROW and is approximately 0.02 acres. It flows over the northern property boundary onto the subject property. In the existing condition, it has been modeled as follows:

Forested (ROW) = 0.01 Acres

Roads (ROW) = 0.01 Acres

13-171Existinghydrology.mxd | MOD: 3/3/2015 | TPA



EXISTING BASIN AREAS	
BASIN A TOTAL	
FORESTED	1.26 AC
TOTAL =	1.26 AC
FRONTAGE BASIN B TOTAL	
ROADS	0.01 AC
FORESTED	0.01 AC
TOTAL =	0.02 AC

FRONTAGE BASIN B
= 0.02 AC

UPSTREAM
BYPASS D = 1.05 AC

UPSTREAM
BASIN E = 1.89 AC

BASIN A = 1.26 AC

UNDISTURBED AREA
= 0.22 AC

LEGEND

- Subject Property
- Storm Pipe
- Catch Basin
- Watercourse
- Parcel Boundary

Contours

- 50 Foot Contour
- 10 Foot Contour

0 100 200
Scale in Feet

QUADRANT HOMES
ELLSWORTH
EXISTING HYDROLOGY MAP

LDC
THE CIVIL ENGINEERING GROUP
14201 NE 200th St., #100
Woodinville, WA 98072
Ph. 425.806.1869
Fx. 425.482.2893
www.LDCcorp.com

Commercial
Infrastructure
Residential

SOURCE AGENCY	DESCRIPTION
USDA	COLOR AERIAL PHOTOGRAPHY (2006)
KING COUNTY GIS	TEN FOOT CONTOUR - GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT
CITY OF REDMOND	HYDROLOGY STORM DRAINAGE NETWORK
KING COUNTY GIS	PARCEL BOUNDARIES

PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET

REVISION:

JOB NUMBER:	13-171
DRAWING NAME:	13-171F06
DESIGNER:	D.WESTLEY
DRAWING BY:	D.WESTLEY
DATE:	3-3-15
SCALE:	AS SHOWN
JURISDICTION:	REDMOND

FIGURE:
6.0

Basin Calcs	<i>LDC, Inc.</i>	
	142201 NE 200th St. # 100 Woodinville, WA 98072	Tel: (425) 806-1869 Fax: (425) 482-2893

Project Name: Ellsworth Project No.: 13-171
Description: Basin Calculations Date: 3/3/2015
Calc. By: DEW

Existing Basins

Basin A

Subject Property	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Forested	1.30	0%	0.000	0.00	1.30

Offsite Frontage Basin B	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Pavment/PGIS	0.01	100%	0.01	0.00	0.00
Lawn	0.01	0%	0.00	0.00	0.01
Total	0.02	50%	0.01	0.00	0.01

Undisturbed Area	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Forested	0.22	0%	0.000	0.00	0.22

Total Onsite + Frontage	1.54	1%	0.01	0.00	1.53
--------------------------------	-------------	-----------	-------------	-------------	-------------

Upstream Site Bypass (not routed to vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Upstream Bypass Basin D	1.05	50%	0.53	0.53	0

Upstream Site Bypass (not routed to vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Upstream Basin E	1.89	50%	0.95	0.95	0

4.2 Upstream Site Hydrology

There are two basins that are located upstream of the site, Upstream Bypass Basin D and Upstream Bypass Basin E. Both basins bypass the site in the developed condition and so are not considered for purposes of modeling. For visual representation of these upstream basins in the existing condition, see Figure 3.0, Upstream Analysis Map.

4.3 Developed Site Hydrology

The developed site will consist of impervious surface, landscaped areas and the undisturbed forested area of 0.22 acres located on the eastern portion of the subject property (see Figure 7.0). Runoff from the proposed access route will be collected and conveyed in roadside swales adjacent and east of the drive width. Roof drains located on lots 1 through 6 are routed directly into a tightline system which conveys to the proposed detention vault structure. This tightline system inlets on the northern side of the vault. A roof drain on lot 7 discharges to a catch basin along the drive aisle and a roof drain on lot 8 collects runoff and deposits directly into the southern side of the vault. All stormwater runoff will be detained on-site in the proposed detention wetvault. Stormwater is treated by use of a settlement dead storage pond in the wetvault. Flows will exit the wetvault control structure and discharge directly into the unnamed tributary that runs south from NE 100th St along the eastern boundary of the subject property.

The developed site and frontage area along NE 100th St is divided into 3 distinct basins for the purposes of collection, conveyance and modeling. Frontage Basin B and Basin A will be collected and conveyed to proposed on-site detention. Due to site topography, a manhole access road will bypass detention (Onsite Bypass - Manhole Access Road). In the developed condition, there remains an undisturbed area of 0.22 acres along the eastern property boundary, coincident with the existing creek and its buffer.

In addition to these basins, two upstream basins are identified. In the developed condition these basins will bypass on-site collection and detention systems via two separate proposed tightline systems. Upstream Bypass D, which includes 1.05 acres of developed residential structures and associated landscaping, will be collected and conveyed by a proposed system located beneath the proposed frontage swale and discharge with flows from Frontage Bypass C into the unnamed stream approximately 50 feet east of the frontage swale. Upstream Bypass E, consisting of 1.89 acres of developed residential structures and associated landscaping, will be collected in a trench drain running the length of the western subject property boundary. Flows from Upstream Bypass E will enter a bypass line and travel east for approximately 170 feet

through a series of pipe and catch basins before being deposited into the unnamed stream. Flows from both upstream bypass basins will be modeled for conveyance considerations and documented in the Final Drainage Report. For visual representation of all drainage basins, including bypass basins, and proposed on-site hydrology see Figure 6.0, Existing Hydrology Map.

The following is a summary of the Developed Site basin areas and land covers modeled in WWHM:

Basin A:

Basin A is approximately 1.26 acres. Flows are collected and conveyed via the proposed drainage system including catch basins, roof drains, storm drain pipe and roadside swales. In the developed condition, it has been modeled as follows:

Roofs =	0.63 acres
Roads =	0.19 acres
Lawn =	0.44 acres

Frontage Basin B:

Frontage Basin B is approximately 0.02 acres. Flows are collected into a roadside swale. In the developed condition, it has been modeled as follows:

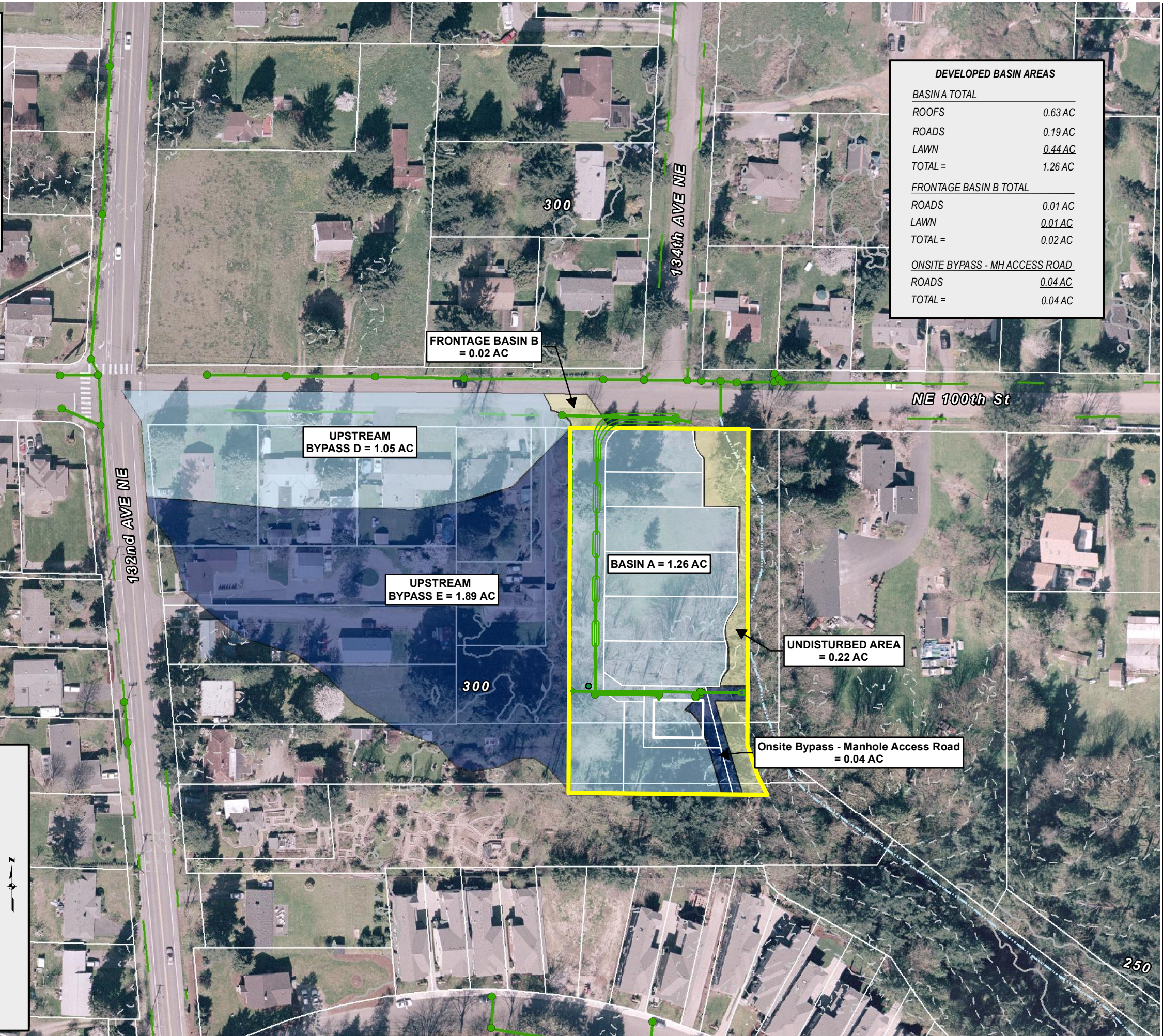
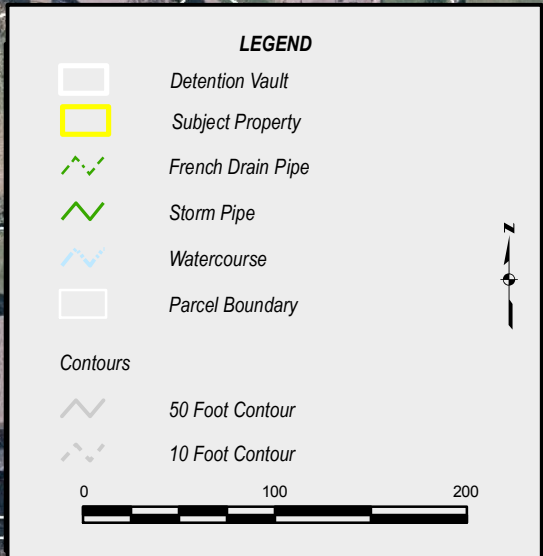
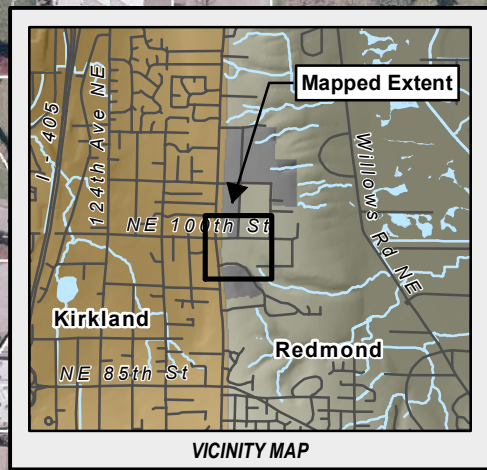
Roads (ROW) =	0.01 acres
Lawn (ROW) =	0.01 acres

Onsite Bypass - Manhole Access Road:

Onsite Bypass - Manhole Access Road will bypass detention due to developed site topography. Runoff will be collected within the retaining wall foundation drain and will outlet into the site's natural discharge location on the southeast portion of the site. This bypass basin has been modeled as follows:

Roads (ROW) =	0.04 acres
---------------	------------

13-1717DevelopedHydrology.mxd | MOD: 3/03/2015 | DEW



DEVELOPED BASIN AREAS	
BASIN A TOTAL	
ROOFS	0.63 AC
ROADS	0.19 AC
LAWN	0.44 AC
TOTAL =	1.26 AC
FRONTAGE BASIN B TOTAL	
ROADS	0.01 AC
LAWN	0.01 AC
TOTAL =	0.02 AC
ONSITE BYPASS - MH ACCESS ROAD	
ROADS	0.04 AC
TOTAL =	0.04 AC

SOURCE INFORMATION	
SOURCE AGENCY	DESCRIPTION
USDA	COLOR AERIAL PHOTOGRAPHY (2006)
KING COUNTY GIS	TEN FOOT CONTOUR - GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT
CITY OF REDMOND	HYDROLOGY STORM DRAINAGE NETWORK
KING COUNTY GIS	PARCEL BOUNDARIES

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Commercial
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Fx. 425.482.2893
www.LDCcorp.com

QUADRANT HOMES

ELLSWORTH
DEVELOPED HYDROLOGY MAP

PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET
REVISION:
JOB NUMBER: 13-171
DRAWING NAME: 13-171F07
DESIGNER: TABBOTT
DRAWING BY: I. MIERAU
DATE: 3-03-15
SCALE: AS SHOWN
JURISDICTION: REDMOND

FIGURE:
7.0

Basin Calcs	<i>LDC, Inc.</i>	
	142201 NE 200th St. # 100 Woodinville, WA 98072	Tel: (425) 806-1869 Fax: (425) 482-2893

Project Name: Ellsworth Project No.: 13-171
Description: Basin Calculations Date: 3/2/2015
Calc. By: DEW

Developed Basin

Basin A (routed to Vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)	
Lots	0.97	100%	0.63	0.34	0.00	
ROW	0.21	100%	0.18	0.03	0.00	
Tracts/Open Space	0.08	0%	0.01	0.07	0.00	<-----
Total	1.26	65%	0.82	0.44	0.00	

Frontage Basin B (routed into Vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Pavment/PGIS	0.01	100%	0.01	0.00	0.00
Sidewalk	0.01	100%	0.01	0.00	0.00
Lawn/Landscape	0.00	0%	0.00	0.00	0.00
Total	0.02	100%	0.02	0.00	0.00

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Total (routed to Vault)	1.28	65%	0.84	0.44	0.00

Onsite Bypass - Manhole Access Road (not routed to vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Roads	0.04	100%	0.04	0.00	0.00
Total	0.04	100%	0.04	0.00	0.00

Undisturbed Area (not routed to vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Forested	0.22	0%	0.00	0.00	0.22

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Total Onsite + Frontage Basin B	1.54	57%	0.88	0.44	0.22

Upstream Site Bypass (not routed to vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Upstream Bypass Basin D	1.05	50%	0.53	0.53	0

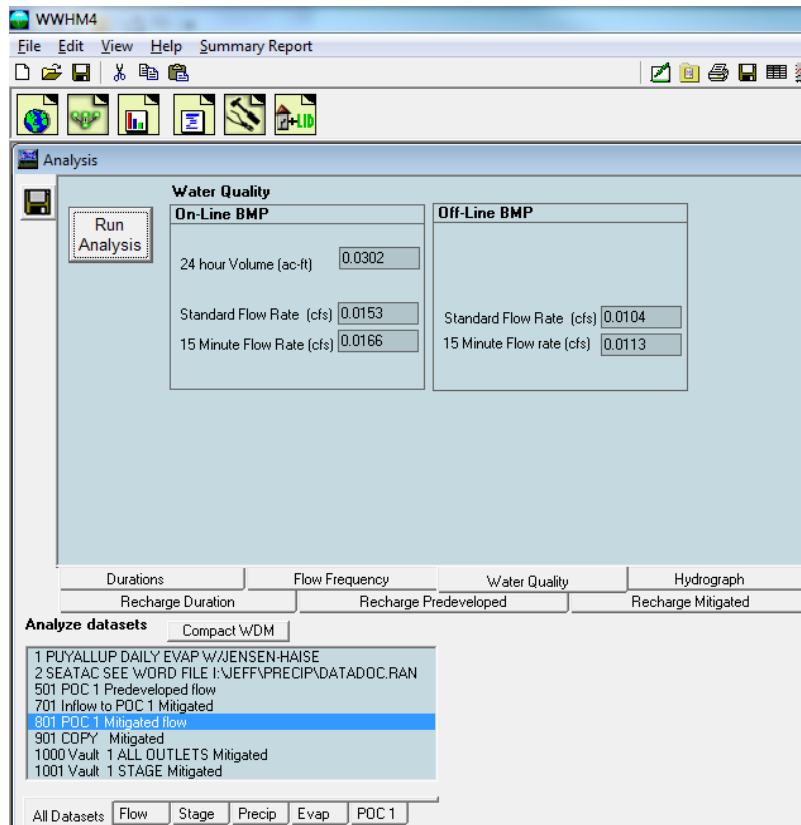
Upstream Site Bypass (not routed to vault)

	Area (Acres)	Impervious (%)	Impervious (Acres)	Lawn (Acres)	Forested (Acres)
Upstream Basin E	1.89	50%	0.95	0.95	0

4.4 Design Standards for Water Quality

The flow control and water quality requirements are vested under the 2012 Redmond Stormwater Technical Notebook and the 2005 DOE Manual.

Water quality treatment of developed condition flows will include treatment of PGIS runoff from Basin A and Frontage Basin B along NE 100th St. Basic treatment will be achieved through use of a wetvault, as selected from the Treatment Facility Selection Flow Chart, Figure 4.1 of the Treatment Facility Selection Flow Chart. The wetpool volume was calculated using the 91st percentile, 24-hour runoff volume indicated by approved continuous runoff model WWHM. See below for wetpool minimum volume calculation.



Required Min. Wetpool Volume = 0.0302 ac-ft = 1,315 cf

Proposed Wetpool Volume as indicated = 35' x 48' x 5' = 8,400 cf

The wetpool volume as indicated exceeds the required minimum wetpool volume, based on the following assumptions: 1) the wetpool dead storage volume utilizes the entire vault footprint proposed, and 2) the wetpool depth is the standard 5' minimum depth per Inlet and Outlet Design Criteria, BMP T10.20 Wetvaults.

Alternatively, we proposed options such as a StormFilter media filtration cartridge structure to be explored during the CCR. Additional sizing information has been provided below and in appendix 4-A, in the event that StormFilter is utilized as basic water quality treatment.

Per the requirements of the 2005 DOE Manual and the 2012 Redmond Stormwater Technical Notebook, the Water Quality Design Flow Rate (WQDFR) for the Stormfilter structure (located downstream of the detention) is equal to the full 2-year peak release rate from the detention facility (as the StormFilter is downstream of the vault control structure):

StormFilter 1: WQDFR = 0.0255 cfs

4.5 Flow Control System

Flow control for the project site will be achieved through the use of a detention vault located at the south end of the site. The flow control was designed as a stand-alone detention facility, meeting the release rates required for the proposed development. The detention facility was sized using WWHM and the total site areas and land covers identified in the Existing and Developed Hydrology. For detailed discussion regarding these areas see sections 4.1 and 4.2 above. For visual representation of these areas, see Figure 6.0, Existing Hydrology Map, and Figure 7.0, Developed Hydrology Map.

Flows entering the vault are conveyed through the proposed drainage system consisting of swales, catch basins and storm drain pipe and inlet on the north side of the vault. The critical detention vault statistics as modeled in WWHM are as follows:

Modeled Vault

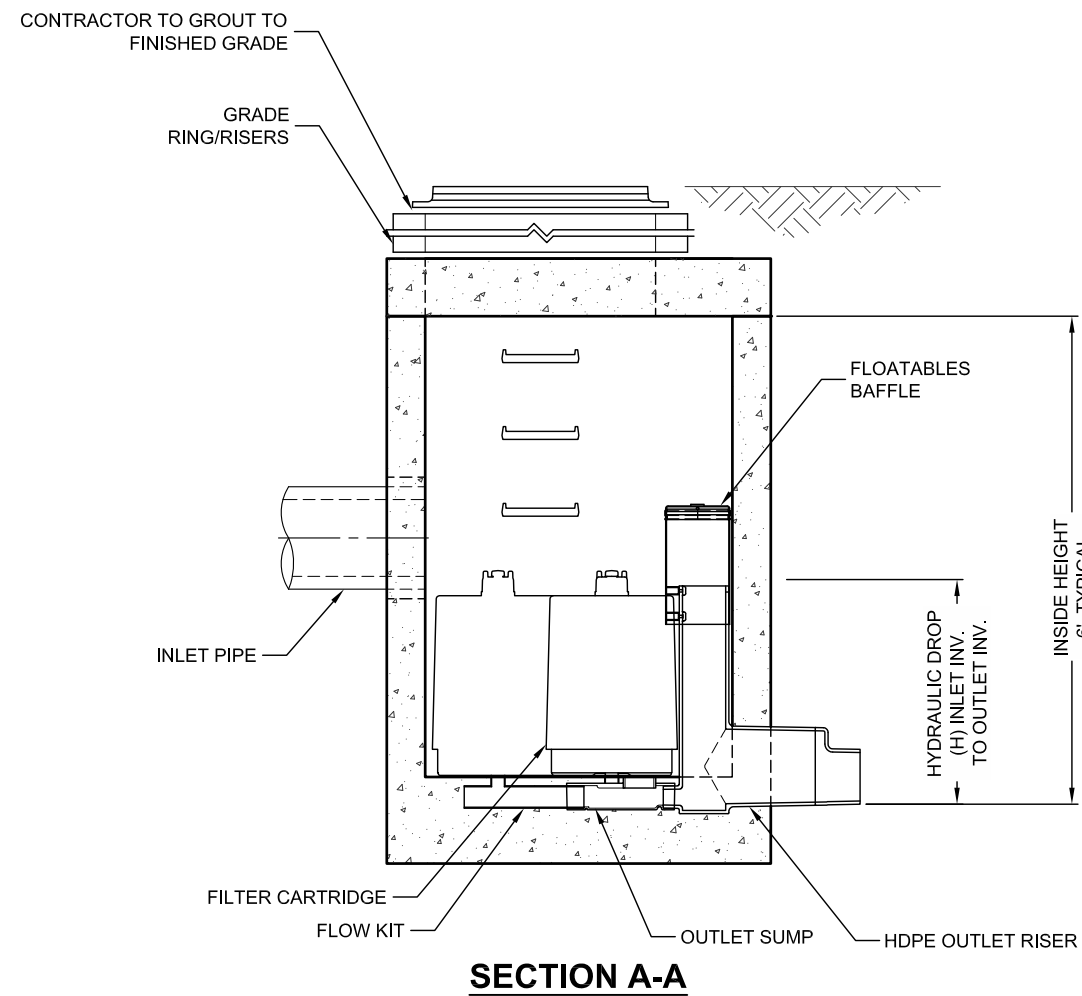
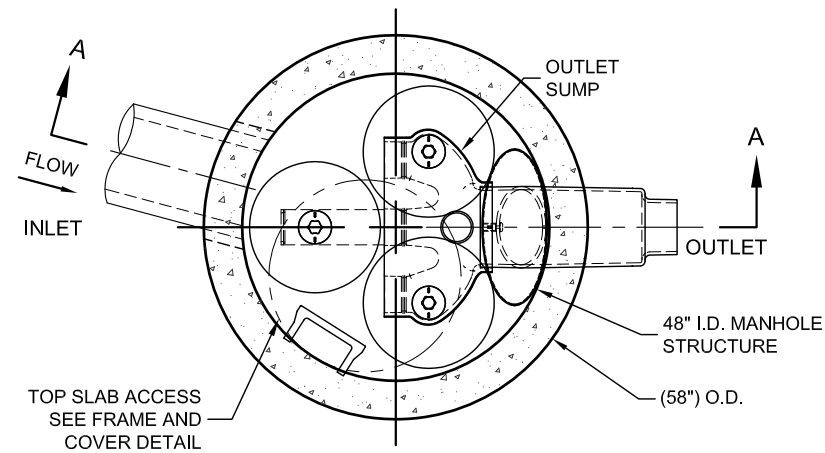
Vault Dimensions:	35' x 48' (Internal)
Vault Bottom Area:	1,680 ft ²
Vault Internal Sides:	Vertical
Vault Bottom:	-0.5'
Begin Live Storage:	0.0'
Freeboard:	1.0'
Effective Storage Depth:	13.0'
Riser Height:	12.0'
2yr depth:	8.41'
10yr depth:	10.11'
50yr depth:	11.99'
100yr depth:	11.99'

The contributing flow control and storage calculations are available in the WWHM4 output in Appendix 4-B.

APPENDIX 4-A

**WATER QUALITY FACILITY DESIGN AND
SUPPORTING DOCUMENTS**

I:\STORMWATER\COMMP\OPS\10 STORMFILTER\40 STANDARD DRAWINGS\MANHOLE\SFMH48-DTL.DWG 1/23/2014 10:02 AM

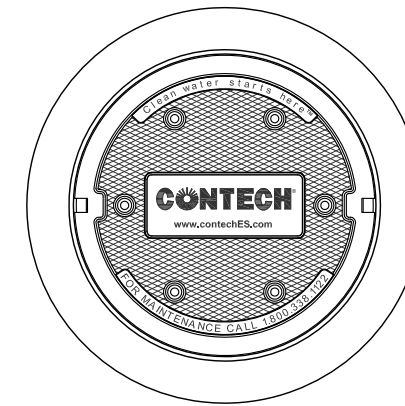


STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (3). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 3 CARTRIDGES. Ø48" MANHOLE STORMFILTER PEAK HYDRAULIC CAPACITY IS 1.0 CFS. IF THE SITE CONDITIONS EXCEED 1.0 CFS AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
RECOMMENDED HYDRAULIC DROP (H)	3.05'		2.3'		1.8'	
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/ft ²	1 gpm/ft ²	2 gpm/ft ²	1 gpm/ft ²	2 gpm/ft ²	1 gpm/ft ²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*		
WATER QUALITY FLOW RATE (cfs)	*		
PEAK FLOW RATE (cfs)	*		
RETURN PERIOD OF PEAK FLOW (yrs)	*		
# OF CARTRIDGES REQUIRED	*		
CARTRIDGE FLOW RATE	*		
MEDIA TYPE (CSF, PERLITE, ZPG, GAC, PHS)	*		
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION	*		
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT	
	*	*	
NOTES/SPECIAL REQUIREMENTS:			
* PER ENGINEER OF RECORD			

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
- STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
- STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 39 SECONDS.
- SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
- CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES, CONTRACTOR TO REMOVE THE 8 INCH OUTLET STUB AT MOLDED IN CUT LINE. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.



CONTECH
ENGINEERED SOLUTIONS LLC

www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SFMH48
STORMFILTER
STANDARD DETAIL

Drainage Systems Cleaning

P.O. Box 46876
Seattle, WA 98146

Estimate

Date	Estimate #
2/18/2015	0383

Name / Address
Travis Wolfe 710 sw Armco ave Hills boro, Or

Phone # (206) 242-7280

Fax # (206) 257-1529

E-mail

drainagesystems@gmail.com

Project

Description	Qty	Rate	Total
scope of work jet vac out 35foot by 48foot storm water wet vault of the sediment, estimate will show for 1st cell dimention's at 1 foot in depth and caculated into square tons and will be disposed of at Cedar Hills land fill@ \$142.50 per ton,wash down the interior of vault , include a repair list if needed with the invoice and an estimate for that work.			
Jet/Vac Hours depending on where the dump site will be.	12	169.75	2,037.00T
Disposal Fees (Cedar Hills)	26.5	142.50	3,776.25T
Labor (per man hour) extra man needed	12	52.50	630.00T
Support Vehicle/Equipment	12	57.50	690.00T
Environ/Fuel Surcharge		33.00	33.00T
Decant Fee - Renton Decant Station	4	81.00	324.00T
Tax Code 1726		9.50%	711.57
<div style="border: 1px solid red; padding: 5px; color: red;"> Estimate based on Heather's Ridge South Vault dimensions assumed to be "wet-vault". Vault maintenance cycle expected to be 5-8 years (from ProVac and Drainage System Cleaning) . </div>			
not to exceed will bill actual hours and costs		Total	\$8,201.82

Drainage Systems Cleaning

P.O. Box 46876
Seattle, WA 98146

Estimate

Date	Estimate #
2/18/2015	0382

Name / Address
Travis Wolfe 710 sw Armco ave Hills boro, Or

Phone # (206) 242-7280

Fax # (206) 257-1529

E-mail

drainagesystems@gmail.com

Project

Description	Qty	Rate	Total
scope of work: pull out old canister type stormwater filters, empty old media for dissposal, clean sediment form stardard 48" type two catch basin, install three new canister in basin, dispose of debri's per county reg's, include with invoice a list of any repairs that may need to be done, estimate for repairs will also be sent.			
Jet/Vac Hours min (charges will be portal to portal)	2	169.75	339.50T
Labor (per man hour) two men needed	4	52.50	210.00T
Materials plus 25% c/c		937.50	937.50T
Support Vehicle/Equipment	2	57.50	115.00T
Environ/Fuel Surcharge		33.00	33.00T
Decant Fee - Renton Decant Station		81.00	81.00T
Tax Code 1726		9.50%	163.02
<div style="border: 1px solid red; padding: 5px; color: red;"> Estimate based on 3-canister system proposed at HEather's Ridge South, downstream of vault - maintnenace cycle every 3-years </div>		<div style="border: 1px solid red; padding: 5px; color: red;"> Over 50 year design life - Stormfilter maintenance require 39% less (assuming 8-year wetvault maint. cycle) than wet-vault maintenance. </div>	
not to exceed will bill actual hours and costs			Total \$1,879.02

APPENDIX 4-B

**HYDROLOGIC MODELING
CALCULATIONS and DETENTION POND SIZING OUTPUT FROM
WWHM4**

**WWHM4
PROJECT REPORT**

Project Name: 13-171_PreliminarySizing_20150302
Site Name: Ellsworth
Site Address:
City : Redmond
Report Date: 7/1/2015
Gage : Seatac
Data Start : 1948/10/01
Data End : 1998/09/30
Precip Scale: 1.00
Version : 2015/06/19

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin A
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>Acres</u>
C, Forest, Flat	1.25

Pervious Total	1.25
-----------------------	------

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

Basin Total	1.25
--------------------	------

Element Flows To:

Surface	Interflow	Groundwater
---------	-----------	-------------

Name : Frontage Basin B
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>Acres</u>
C, Lawn, Flat	.02

Pervious Total	0.02
<u>Impervious Land Use</u>	<u>Acres</u>
ROADS FLAT	0.01
Impervious Total	0.01
Basin Total	0.03

Element Flows To:		
Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Onsite Bypass - Manhole Access Road
 Bypass: Yes

GroundWater: No

<u>Pervious Land Use</u>	<u>Acres</u>
C, Lawn, Flat	.01
Pervious Total	0.01
<u>Impervious Land Use</u>	<u>Acres</u>
ROADS FLAT	0.03
Impervious Total	0.03
Basin Total	0.04

Element Flows To:		
Surface	Interflow	Groundwater

Name : Onsite and Frontage
 Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>Acres</u>
C, Lawn, Flat	.44
Pervious Total	0.44
<u>Impervious Land Use</u>	<u>Acres</u>

ROADS FLAT	0.4
ROOF TOPS FLAT	0.39
SIDEWALKS FLAT	0.02
Impervious Total	0.81
Basin Total	1.25

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Name : Vault 1
Width : 30 ft.
Length : 48 ft.
Depth: 13 ft.
Discharge Structure
Riser Height: 11.7 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.005 ft.
Notch Height: 1.400 ft.
Orifice 1 Diameter: 0.475 in. Elevation: 0 ft.
Orifice 2 Diameter: 0.75 in. Elevation: 7.55 ft.
Orifice 3 Diameter: 0.46875 in. Elevation: 9 ft.

Element Flows To:

Outlet 1	Outlet 2
----------	----------

Vault Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.033	0.000	0.000	0.000
0.1444	0.033	0.004	0.002	0.000
0.2889	0.033	0.009	0.003	0.000
0.4333	0.033	0.014	0.004	0.000
0.5778	0.033	0.019	0.004	0.000
0.7222	0.033	0.023	0.005	0.000
0.8667	0.033	0.028	0.005	0.000
1.0111	0.033	0.033	0.006	0.000
1.1556	0.033	0.038	0.006	0.000
1.3000	0.033	0.043	0.007	0.000
1.4444	0.033	0.047	0.007	0.000
1.5889	0.033	0.052	0.007	0.000
1.7333	0.033	0.057	0.008	0.000
1.8778	0.033	0.062	0.008	0.000
2.0222	0.033	0.066	0.008	0.000
2.1667	0.033	0.071	0.009	0.000
2.3111	0.033	0.076	0.009	0.000

2.4556	0.033	0.081	0.009	0.000
2.6000	0.033	0.086	0.009	0.000
2.7444	0.033	0.090	0.010	0.000
2.8889	0.033	0.095	0.010	0.000
3.0333	0.033	0.100	0.010	0.000
3.1778	0.033	0.105	0.010	0.000
3.3222	0.033	0.109	0.011	0.000
3.4667	0.033	0.114	0.011	0.000
3.6111	0.033	0.119	0.011	0.000
3.7556	0.033	0.124	0.011	0.000
3.9000	0.033	0.128	0.012	0.000
4.0444	0.033	0.133	0.012	0.000
4.1889	0.033	0.138	0.012	0.000
4.3333	0.033	0.143	0.012	0.000
4.4778	0.033	0.148	0.013	0.000
4.6222	0.033	0.152	0.013	0.000
4.7667	0.033	0.157	0.013	0.000
4.9111	0.033	0.162	0.013	0.000
5.0556	0.033	0.167	0.013	0.000
5.2000	0.033	0.171	0.014	0.000
5.3444	0.033	0.176	0.014	0.000
5.4889	0.033	0.181	0.014	0.000
5.6333	0.033	0.186	0.014	0.000
5.7778	0.033	0.191	0.014	0.000
5.9222	0.033	0.195	0.014	0.000
6.0667	0.033	0.200	0.015	0.000
6.2111	0.033	0.205	0.015	0.000
6.3556	0.033	0.210	0.015	0.000
6.5000	0.033	0.214	0.015	0.000
6.6444	0.033	0.219	0.015	0.000
6.7889	0.033	0.224	0.016	0.000
6.9333	0.033	0.229	0.016	0.000
7.0778	0.033	0.234	0.016	0.000
7.2222	0.033	0.238	0.016	0.000
7.3667	0.033	0.243	0.016	0.000
7.5111	0.033	0.248	0.016	0.000
7.6556	0.033	0.253	0.021	0.000
7.8000	0.033	0.257	0.024	0.000
7.9444	0.033	0.262	0.026	0.000
8.0889	0.033	0.267	0.028	0.000
8.2333	0.033	0.272	0.030	0.000
8.3778	0.033	0.277	0.031	0.000
8.5222	0.033	0.281	0.032	0.000
8.6667	0.033	0.286	0.034	0.000
8.8111	0.033	0.291	0.035	0.000
8.9556	0.033	0.296	0.036	0.000
9.1000	0.033	0.300	0.039	0.000
9.2444	0.033	0.305	0.041	0.000
9.3889	0.033	0.310	0.043	0.000
9.5333	0.033	0.315	0.044	0.000
9.6778	0.033	0.319	0.046	0.000
9.8222	0.033	0.324	0.047	0.000
9.9667	0.033	0.329	0.048	0.000
10.111	0.033	0.334	0.050	0.000
10.256	0.033	0.339	0.051	0.000
10.400	0.033	0.343	0.053	0.000
10.544	0.033	0.348	0.055	0.000

10.689	0.033	0.353	0.058	0.000
10.833	0.033	0.358	0.061	0.000
10.978	0.033	0.362	0.064	0.000
11.122	0.033	0.367	0.067	0.000
11.267	0.033	0.372	0.071	0.000
11.411	0.033	0.377	0.074	0.000
11.556	0.033	0.382	0.078	0.000
11.700	0.033	0.386	0.082	0.000
11.844	0.033	0.391	0.952	0.000
11.989	0.033	0.396	2.459	0.000
12.133	0.033	0.401	4.074	0.000
12.278	0.033	0.405	5.342	0.000
12.422	0.033	0.410	6.062	0.000
12.567	0.033	0.415	6.685	0.000
12.711	0.033	0.420	7.214	0.000
12.856	0.033	0.425	7.707	0.000
13.000	0.033	0.429	8.170	0.000
13.144	0.033	0.434	8.608	0.000
13.289	0.000	0.000	9.025	0.000

ANALYSIS RESULTS

Predeveloped Landuse Totals for POC #1
Total Pervious Area:1.27
Total Impervious Area:0.01

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.45
Total Impervious Area:0.84

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.032936
5 year	0.051648
10 year	0.062964
25 year	0.07577
50 year	0.084247
100 year	0.091883

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.025417
5 year	0.039004
10 year	0.04995
25 year	0.066229
50 year	0.080286
100 year	0.096131

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.039	0.019
1950	0.069	0.031
1951	0.082	0.083
1952	0.026	0.016
1953	0.020	0.025
1954	0.029	0.019
1955	0.051	0.020
1956	0.043	0.043
1957	0.034	0.020
1958	0.036	0.020
1959	0.030	0.020
1960	0.052	0.053
1961	0.030	0.035
1962	0.018	0.016
1963	0.024	0.020
1964	0.030	0.032
1965	0.022	0.037
1966	0.023	0.021
1967	0.050	0.027
1968	0.031	0.019
1969	0.030	0.018
1970	0.025	0.025
1971	0.022	0.020
1972	0.060	0.055
1973	0.027	0.037
1974	0.029	0.019
1975	0.044	0.022
1976	0.028	0.018
1977	0.004	0.019
1978	0.025	0.028
1979	0.014	0.014
1980	0.040	0.054
1981	0.021	0.020
1982	0.042	0.047
1983	0.037	0.019
1984	0.024	0.016
1985	0.013	0.016
1986	0.063	0.027
1987	0.054	0.049
1988	0.020	0.018
1989	0.013	0.017
1990	0.087	0.057
1991	0.075	0.055
1992	0.026	0.027
1993	0.028	0.015
1994	0.007	0.015
1995	0.040	0.035
1996	0.077	0.074
1997	0.071	0.067
1998	0.015	0.018

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0866	0.0828
2	0.0817	0.0737

3	0.0774	0.0673
4	0.0748	0.0568
5	0.0714	0.0551
6	0.0686	0.0546
7	0.0634	0.0541
8	0.0604	0.0526
9	0.0544	0.0494
10	0.0521	0.0472
11	0.0507	0.0432
12	0.0504	0.0368
13	0.0435	0.0367
14	0.0430	0.0353
15	0.0415	0.0345
16	0.0401	0.0321
17	0.0398	0.0314
18	0.0394	0.0282
19	0.0369	0.0272
20	0.0357	0.0272
21	0.0339	0.0271
22	0.0305	0.0251
23	0.0304	0.0248
24	0.0299	0.0215
25	0.0296	0.0205
26	0.0295	0.0205
27	0.0292	0.0205
28	0.0288	0.0203
29	0.0283	0.0201
30	0.0278	0.0201
31	0.0274	0.0197
32	0.0263	0.0195
33	0.0261	0.0194
34	0.0247	0.0193
35	0.0246	0.0192
36	0.0242	0.0190
37	0.0236	0.0186
38	0.0232	0.0185
39	0.0224	0.0181
40	0.0215	0.0181
41	0.0214	0.0180
42	0.0204	0.0180
43	0.0203	0.0175
44	0.0176	0.0164
45	0.0152	0.0162
46	0.0141	0.0162
47	0.0130	0.0161
48	0.0127	0.0152
49	0.0075	0.0146
50	0.0038	0.0144

POC #1

The Facility PASSED

The Facility **PASSED.**

Flow(cfs) Predev Mit Percentage Pass/Fail
0.0165 3878 3497 90 Pass

0.0172	3537	2833	80	Pass
0.0178	3274	2482	75	Pass
0.0185	3029	2265	74	Pass
0.0192	2819	2114	74	Pass
0.0199	2599	2002	77	Pass
0.0206	2405	1915	79	Pass
0.0213	2216	1839	82	Pass
0.0219	2058	1768	85	Pass
0.0226	1925	1703	88	Pass
0.0233	1809	1637	90	Pass
0.0240	1688	1566	92	Pass
0.0247	1584	1490	94	Pass
0.0254	1482	1411	95	Pass
0.0261	1387	1334	96	Pass
0.0267	1303	1266	97	Pass
0.0274	1219	1193	97	Pass
0.0281	1149	1135	98	Pass
0.0288	1074	1066	99	Pass
0.0295	1014	1003	98	Pass
0.0302	960	935	97	Pass
0.0308	909	876	96	Pass
0.0315	861	820	95	Pass
0.0322	815	765	93	Pass
0.0329	773	714	92	Pass
0.0336	734	661	90	Pass
0.0343	684	610	89	Pass
0.0350	654	572	87	Pass
0.0356	623	529	84	Pass
0.0363	593	510	86	Pass
0.0370	568	494	86	Pass
0.0377	538	477	88	Pass
0.0384	503	464	92	Pass
0.0391	482	443	91	Pass
0.0397	445	432	97	Pass
0.0404	428	419	97	Pass
0.0411	403	390	96	Pass
0.0418	377	372	98	Pass
0.0425	356	348	97	Pass
0.0432	334	321	96	Pass
0.0439	322	297	92	Pass
0.0445	301	280	93	Pass
0.0452	286	260	90	Pass
0.0459	265	240	90	Pass
0.0466	255	225	88	Pass
0.0473	238	206	86	Pass
0.0480	229	190	82	Pass
0.0486	215	178	82	Pass
0.0493	207	162	78	Pass
0.0500	195	146	74	Pass
0.0507	190	136	71	Pass
0.0514	178	124	69	Pass
0.0521	172	113	65	Pass
0.0528	163	99	60	Pass
0.0534	158	83	52	Pass
0.0541	153	75	49	Pass
0.0548	145	66	45	Pass
0.0555	142	55	38	Pass

0.0562	136	48	35	Pass
0.0569	127	42	33	Pass
0.0575	120	41	34	Pass
0.0582	114	36	31	Pass
0.0589	109	35	32	Pass
0.0596	101	34	33	Pass
0.0603	94	33	35	Pass
0.0610	85	32	37	Pass
0.0617	77	30	38	Pass
0.0623	72	29	40	Pass
0.0630	69	27	39	Pass
0.0637	62	27	43	Pass
0.0644	56	24	42	Pass
0.0651	50	23	46	Pass
0.0658	48	21	43	Pass
0.0664	45	19	42	Pass
0.0671	38	19	50	Pass
0.0678	37	17	45	Pass
0.0685	32	15	46	Pass
0.0692	28	15	53	Pass
0.0699	26	14	53	Pass
0.0706	24	12	50	Pass
0.0712	21	11	52	Pass
0.0719	19	11	57	Pass
0.0726	18	9	50	Pass
0.0733	18	9	50	Pass
0.0740	16	7	43	Pass
0.0747	14	7	50	Pass
0.0753	12	5	41	Pass
0.0760	11	5	45	Pass
0.0767	10	5	50	Pass
0.0774	7	4	57	Pass
0.0781	7	4	57	Pass
0.0788	5	4	80	Pass
0.0795	4	4	100	Pass
0.0801	4	3	75	Pass
0.0808	3	2	66	Pass
0.0815	3	2	66	Pass
0.0822	2	1	50	Pass
0.0829	2	0	0	Pass
0.0836	1	0	0	Pass
0.0842	1	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0302 acre-feet
On-line facility target flow: 0.0153 cfs.
Adjusted for 15 min: 0.0166 cfs.
Off-line facility target flow: 0.0104 cfs.
Adjusted for 15 min: 0.0113 cfs.

Perlnd and Implnd Changes
 No changes have been made.

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5.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Full conveyance analysis and design will be submitted during the Final Drainage Report.

6.0 SPECIAL REPORTS AND STUDIES

- Geotechnical Engineering Report; Proposed Ellsworth Estates, dated October 18, 2011, prepared by Geotech Consultants.
- Critical Area Study; Ellsworth - 134th Avenue, dated September 24, 2013, prepared by Wetland Resources, Inc.

7.0 OTHER PERMITS

Other permits required for the proposed development are as follows:

- Clearing and Grading Permit
- National Pollution Discharge Elimination System (NPDES)
- Right-of-Way permit
- Utility Permit
- Building Permits

8.0 EROSION AND SEDIMENT CONTROL ANALYSIS AND DESIGN

The Stormwater Pollution Prevention Plan for the project, is submitted as a separate document and is modeled under the guidelines of Volume II, Section 3 of the Stormwater Management Manual for Western Washington, issued by the Washington State Department of Ecology in 2005 and the requirements of the 2012 Redmond Stormwater Technical Notebook.

9.0 BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

A Bond Quantities Worksheet will be completed with the Final Drainage Report.

10.0 OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual is included in Appendix 10-A. A final Operations and Maintenance Manual per the City of Redmond template will be submitted with the Final Drainage Report

NO. 1 - DETENTION PONDS

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Poisonous Vegetation	Any poisonous or nuisance vegetation which may constitute a hazard to County personnel or the public.	No danger of poisonous vegetation where County personnel or the public might normally be. (Coordination with Seattle-King County Health Department)
	Pollution	Oil, gasoline, or other contaminants of one gallon or more or any amount found that could: 1) cause damage to plant, animal, or marine life; 2) constitute a fire hazard; or 3) be flushed downstream during rain storms.	No contaminants present other than a surface film. (Coordination with Seattle/King County Health Department)
	Unmowed Grass/ Ground Cover	If facility is located in private residential area, mowing is needed when grass exceeds 18 inches in height. In other areas, the general policy is to make the pond site match adjacent ground cover and terrain as long as there is no interference with the function of the facility.	When mowing is needed, grass/ground cover should be mowed to 2 inches in height. Mowing of selected higher use areas rather than the entire slope may be acceptable for some situations.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordination with Seattle/King County Health Department)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site.
	Tree Growth	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access, leave trees alone.	Trees do not hinder maintenance activities. Selectively cultivate trees such as alders for firewood.
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized by using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
Pond Dikes	Settlements	Any part of dike which has settled 4 inches lower than the design elevation.	Dike should be built back to the design elevation.
Emergency Overflow/Spillway	Rock Missing	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. Rip-rap on inside slopes need not be replaced.	Replace rocks to design standards.

NO. 4 - CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Distance between debris build-up and bottom of orifice plate is less than 1-1/2 feet.	All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall and outlet pipe structure should support at least 1,000 lbs of up or down pressure.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards..
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole		See "Closed Detention Systems" Standards No. 3	See "Closed Detention Systems" Standards No. 3
Catch Basin		See "Catch Basins" Standards No. 5	See "Catch Basins" Standards No. 5

NO. 5 - CATCH BASINS

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed	
General	Trash & Debris (Includes Sediment)	Trash or debris of more than 1/2 cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the basin by more than 10%	No Trash or debris located immediately in front of catch basin opening.	
		Trash or debris (in the basin) that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.	
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.	
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.	
		Deposits of garbage exceeding 1 cubic foot in volume	No condition present which would attract or support the breeding of insects or rodents.	
	Structure Damage to Frame and/or Top Slab	Corner of frame extends more than 3/4 inch past curb face into the street (If applicable).	Frame is even with curb.	
		Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (intent is to make sure all material is running into basin).	Top slab is free of holes and cracks.	
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab.	Frame is sitting flush on top slab.	
		Cracks in Basin Walls/ Bottom	Cracks wider than 1/2 inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
			Cracks wider than 1/2 inch and longer than 1 foot at the joint of any inlet/ outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than 1/4 inch wide at the joint of inlet/outlet pipe.
Sediment/ Misalignment	Basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.		

NO. 5 - CATCH BASINS (CONTINUED)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
	Fire Hazard	Presence of chemicals such as natural gas, oil and gasoline.	No flammable chemicals present.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Pollution	Nonflammable chemicals of more than 1/2 cubic foot per three feet of basin length.	No pollution present other than surface film.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by on maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying 80 lbs. of lift; intent is keep cover from sealing off access to maintenance.	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)		Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

NO. 10 - CONVEYANCE SYSTEMS (PIPES & DITCHES)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & Debris	Accumulated sediment that exceeds 20% of the diameter of the pipe.	Pipe cleaned of all sediment and debris.
	Vegetation	Vegetation that reduces free movement of water through pipes.	All vegetation removed so water flows freely through pipes.
	Damaged	Protective coating is damaged; rust is causing more than 50% deterioration to any part of pipe.	Pipe repaired or replaced.
		Any dent that decreases the cross section area of pipe by more than 20%.	Pipe repaired or replaced.
Open Ditches	Trash & Debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment	Accumulated sediment that exceeds 20 % of the design depth.	Ditch cleaned/ flushed of all sediment and debris so that it matches design.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion Damage to Slopes	See "Ponds" Standard No. 1	See "Ponds" Standard No. 1
	Rock Lining Out of Place or Missing (If Applicable).	Maintenance person can see native soil beneath the rock lining.	Replace rocks to design standards.
Catch Basins		See "Catch Basins: Standard No. 5	See "Catch Basins" Standard No. 5
Debris Barriers (e.g., Trash Rack)		See "Debris Barriers" Standard No.6	See "Debris Barriers" Standard No. 6

NO. 11 - GROUNDS (LANDSCAPING)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Weeds (Nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
	Safety Hazard	Any presence of poison ivy or other poisonous vegetation.	No poisonous vegetation present in landscaped area.
	Trash or Litter	Paper, cans, bottles, totaling more than 1 cubic foot within a landscaped area (trees and shrubs only) of 1,000 square feet.	Area clear of litter.
Trees and Shrubs	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	Tree or shrub in place free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; remove any dead or diseased trees.

NO. 12 - ACCESS ROADS/ EASEMENTS

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet i.e., trash and debris would fill up one standards size garbage can.	Roadway free of debris which could damage tires.
	Blocked Roadway	Debris which could damage vehicle tires (glass or metal).	Roadway free of debris which could damage tires.
		Any obstruction which reduces clearance above road surface to less than 14 feet.	Roadway overhead clear to 14 feet high.
		Any obstruction restricting the access to a 10 to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width.	Obstruction removed to allow at least a 12 foot access.
Road Surface	Settlement, Potholes, Mush Spots, Ruts	When any surface defect exceeds 6 inches in depth and 6 square feet in area. In general, any surface defect which hinders or prevents maintenance access.	Road surface uniformly smooth with no evidence of settlement, potholes, mush spots, or ruts.
	Vegetation in Road Surface	Weeds growing in the road surface that are more than 6 inches tall and less than 6 inches tall and less than 6 inches apart within a 400-square foot area.	Road surface free of weeds taller than 2 inches.
	Modular Grid Pavement	Build-up of sediment mildly contaminated with petroleum hydrocarbons.	Removal of sediment and disposal in keeping with Health Department recommendations for mildly contaminated soils or catch basin sediments.
Shoulders and Ditches	Erosion Damage	Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Shoulder free of erosion and matching the surrounding road.
	Weeds and Brush	Weeds and brush exceed 18 inches in height or hinder maintenance access.	Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access.