Edgewood West Preliminary Plat

Preliminary Stormwater Report
Final PREP Submittal

Revised June 2015
Job Number 14123

GOLDSMITH
LAND DEVELOPMENT SERVICES

Attachment 21

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Final PREP Submittal

Prepared for:
Quadrant Homes

Revised June 2015
Job Number 14123

GOLDSMITH
LAND DEVELOPMENT SERVICES

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1.0 Introduction

The purpose of this preliminary drainage report provides preliminary design data and assessment for the proposed Edgewood West preliminary plat located within the North Redmond neighborhood. This report presents our preliminary findings and sizing regarding the stormwater quantity and quality control measures per the City of Redmond's requirements. During the design development phase, this report will include a summary of existing on-site and downstream conditions in detail and finalized stormwater control including site specific on-site BMPs.

1.1 Project Overview and Description

The proposed Edgewood West Plat site is located on the east side of 172nd Avenue NE at its intersection with 122nd Street NE, Redmond, WA 98052; Tax lot: 252605-9033. The project site is located in the Southeast quarter of Section 25, Township 26 North, Range 5E, W.M. The site is one tax parcel approximately 11.5 acres in size. The property is zoned R4 and lies within the North Redmond planning subarea of the City of Redmond. Specific North Redmond design requirements including but not limited to landscaping, open space and setbacks are applicable to the site. The site location as shown on the Vicinity Map (Figure 1).

The site is currently vacant land covered with thick vegetation including mature trees, understory, blackberries and brush. More specifically, the site varies in composition from very densely wooded stands of small trees, forested with large trees and dense understory, and open areas dominated by blackberry. A partially constructed house foundation is located in approximately the center of the site and will be demolished as part of site development. A Protection Covenant (Recording # 9103291137) for a well was found during property title research. The covenant is shown graphically on the existing conditions plans in the preliminary plat. During field survey topography, verification and reconnaissance by Goldsmith, no well was physically located on the site. See the Existing Conditions Map (Figure 2). If a well is found to exist, it will be decommissioned per applicable City and/or State regulations as part of the proposed site development.

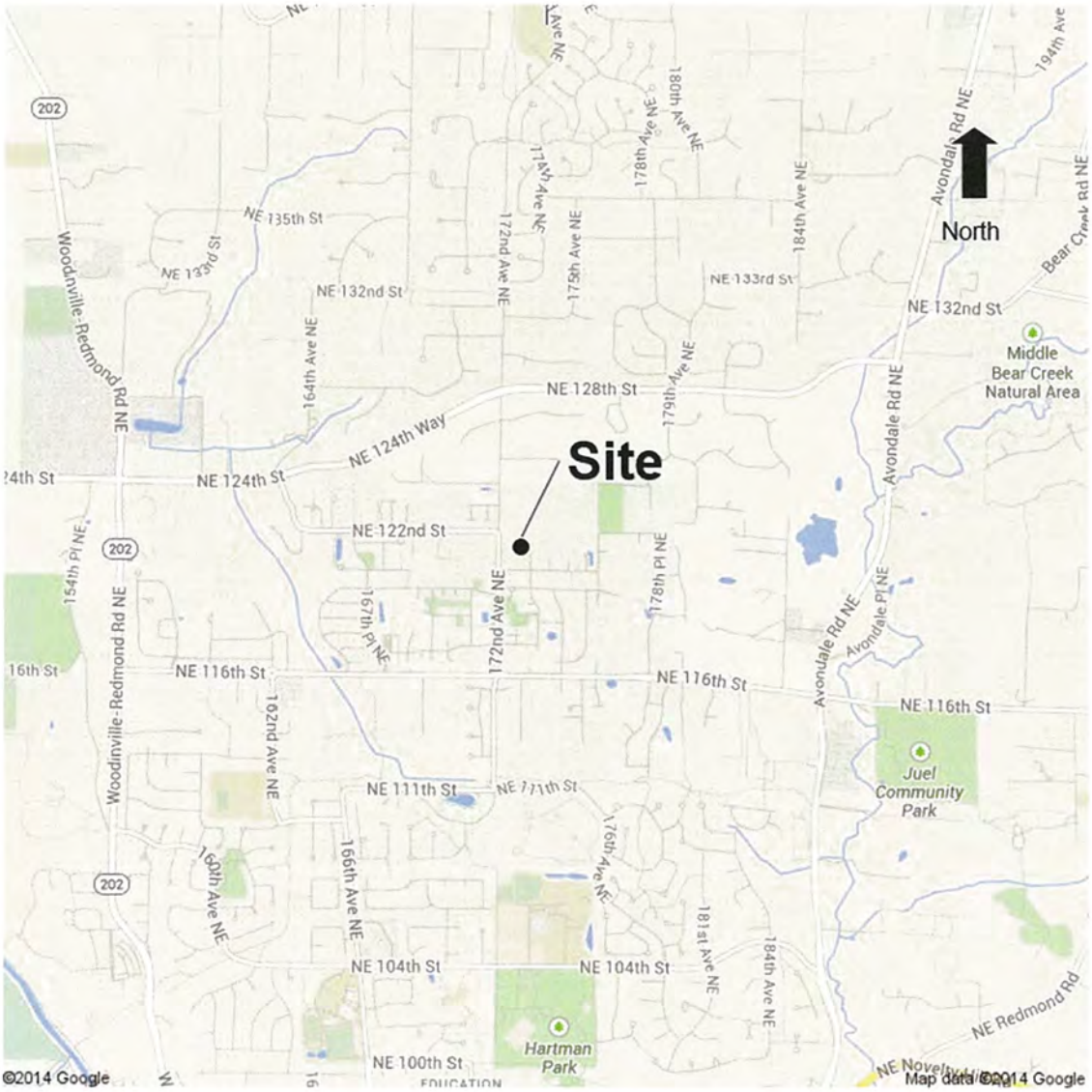
A Category IV Wetland with an associated 50 foot buffer is located on the west side of the site. It was delineated by Raedeke Associates, Inc. in May 2014 and field surveyed by Apex Surveying in June 2014. It is proposed to be set aside in a sensitive area tract (Tract C). No direct impacts are proposed to the wetland. A minor amount of buffer averaging to the wetland buffer is proposed to accommodate roadway and lot clearing and grading. The proposed buffer encroachment totals 425 square feet primarily along the northern and southern portions of the wetland buffer for roadways. As compensation, an additional 425 square feet of buffer is proposed to be provided along the western side of the wetland, meeting the 1:1 ratio buffer averaging requirements of the City Code. The proposed buffer reduction and buffer averaging areas are shown on the preliminary plat plans. No net loss of wetland buffer is proposed. Wetland hydrology monitoring was initiated in February 2015 and wetland hydrology will be maintained in compliance with the City of Redmond 2012 Stormwater Technical Notebook requirements.

The site is surrounded by single family development (either existing, under construction or under development review); a vacant parcel zoned R4 west of 172nd Avenue NE; and the unimproved NE Redmond Neighborhood Park at the northeast corner of the site.

The Preliminary Plat proposes 50 lots, comprised of 47 single family market rate lots and 3 affordable housing lots which includes the 5 required affordable housing units per City requirements. The proposed affordable housing units consist of one cottage unit and a duplex with two (2) 50% market

rate units for a total of five affordable housing units. Project will include: lots, public roads with curbs, gutters, and sidewalks; a private road (Tract) with an access easement (serving 8-9 lots); six roadway connections to adjacent existing or proposed public rights-of-ways to neighboring subdivisions and roadway systems; frontage improvements; open space (combination of development wide and lot-by-lot); a sensitive area tract (including buffer reduction and buffer averaging of 425 square feet); a five foot landscape areas/buffers along the perimeter of the site (per North Redmond Neighborhood requirements); and a stormwater tract with an underground stormwater vault. See the *Developed Conditions Map* (Figure 3).

Green Building Incentives are proposed per Redmond Zoning Code (RZC) 21.67.040.A to achieve a 15% reduction in the required minimum lot size. The proposed Green Building Techniques (per RZC 21.67.040.B) include drought tolerant landscaping, and a 10% reduction in lot impervious areas. See Table 4.1 in Section 4.

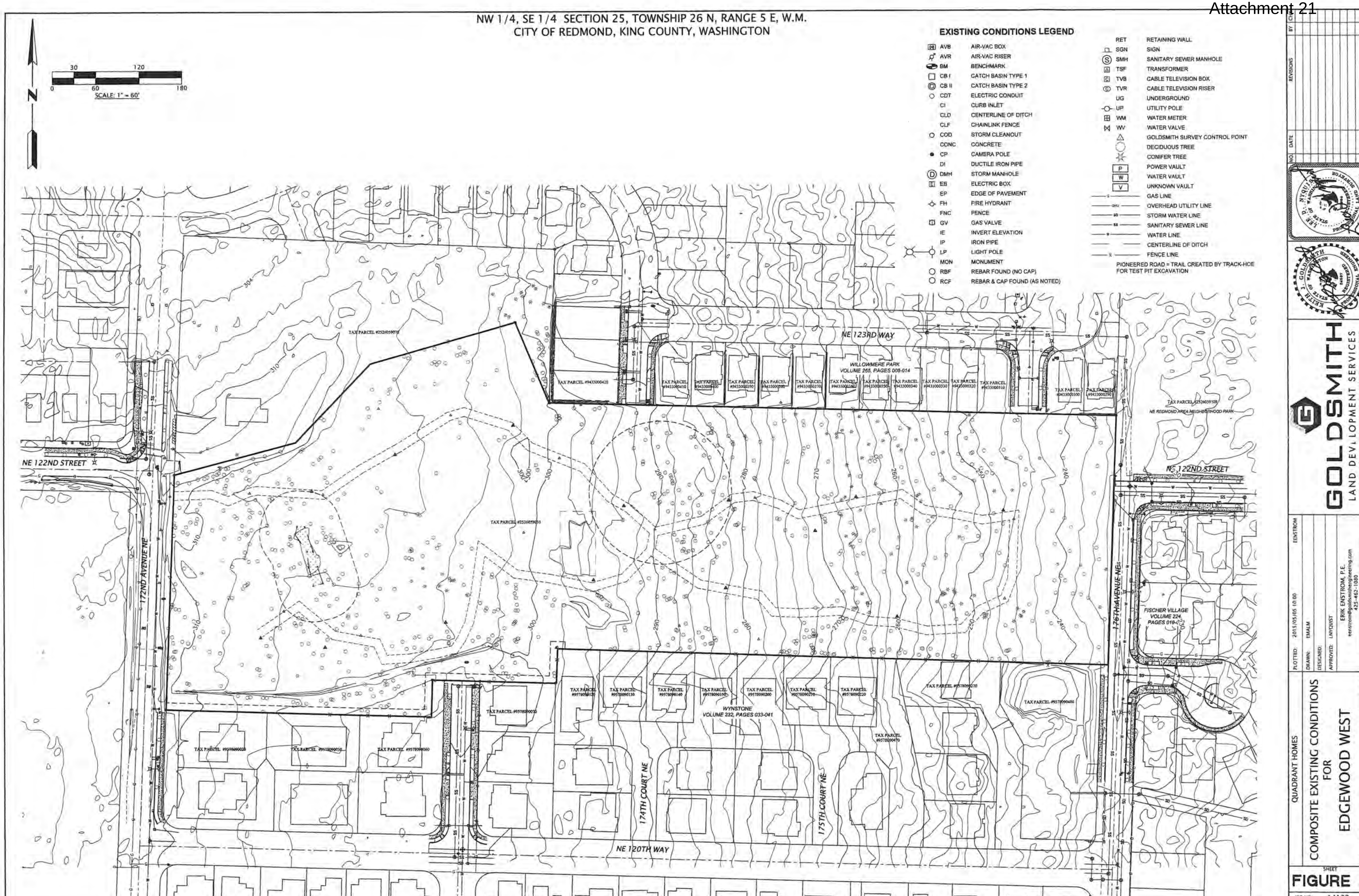


Vicinity Map

Not to Scale

FIGURE 1

Attachment 21



NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON

SURVEY NOTES:

1. HORIZONTAL DATUM: NAD 83/91, HARN, WASHINGTON STATE COORDINATES - NORTH ZONE. THIS SURVEY HAS HELD THE CITY OF REDMOND COORDINATE LOCATIONS FOR THE SOUTH QUARTER CORNER AND SOUTHEAST CORNER OF SECTION 25, TOWNSHIP 26 NORTH, RANGE 5 EAST, WM AS SHOWN IN THE REDMOND CITY HORIZONTAL CONTROL NOTEBOOK, PUBLISHED IN 1993.

2. BASIS OF POSITION: HELD EXISTING MONUMENT IN CASE AT THE SOUTH QUARTER CORNER OF SAID SECTION 25 (ALSO KNOWN AS CITY OF REDMOND SURVEY CONTROL POINT GLO-4CS (N 259,343.33, E 1,325,873.11 GRID)).

3. BASIS OF BEARING: HELD BEARING OF SOUTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 25 BETWEEN THE ABOVE NOTED BASIS OF POSITION AND FOUND SOUTHEAST CORNER OF SAID SECTION 25 (ALSO KNOWN AS GLO-6CSW = GPS90-6C3 (N 259,265.666, E 1,328,599.055 GRID, 259,265.858, 1,328,598.141 GROUND)) TO BE N 88°20'57" W PER DIRECT INVERSE OF CITY OF REDMOND COORDINATES. SEE MAP FOR PLOTTED LOCATION AND DESCRIPTION.

4. VERTICAL DATUM: NAVD 1988 PER CITY OF REDMOND BENCHMARK MONUMENT RECORDS DATED JUNE 2009.

MASTER BENCHMARK #1: CITY OF REDMOND BM NO. COR 9196 - FOUND CONCRETE MONUMENT WITH 1 3/4" BRASS DISK WITH "X" IN CASE AT THE INTERSECTION OF NE 12TH WAY AND 172ND AVENUE NE, STAMPED "LS 18102", DOWN 0.6 FEET. ELEVATION =312.11 FEET (NAVD 1988).

LEGAL DESCRIPTION:

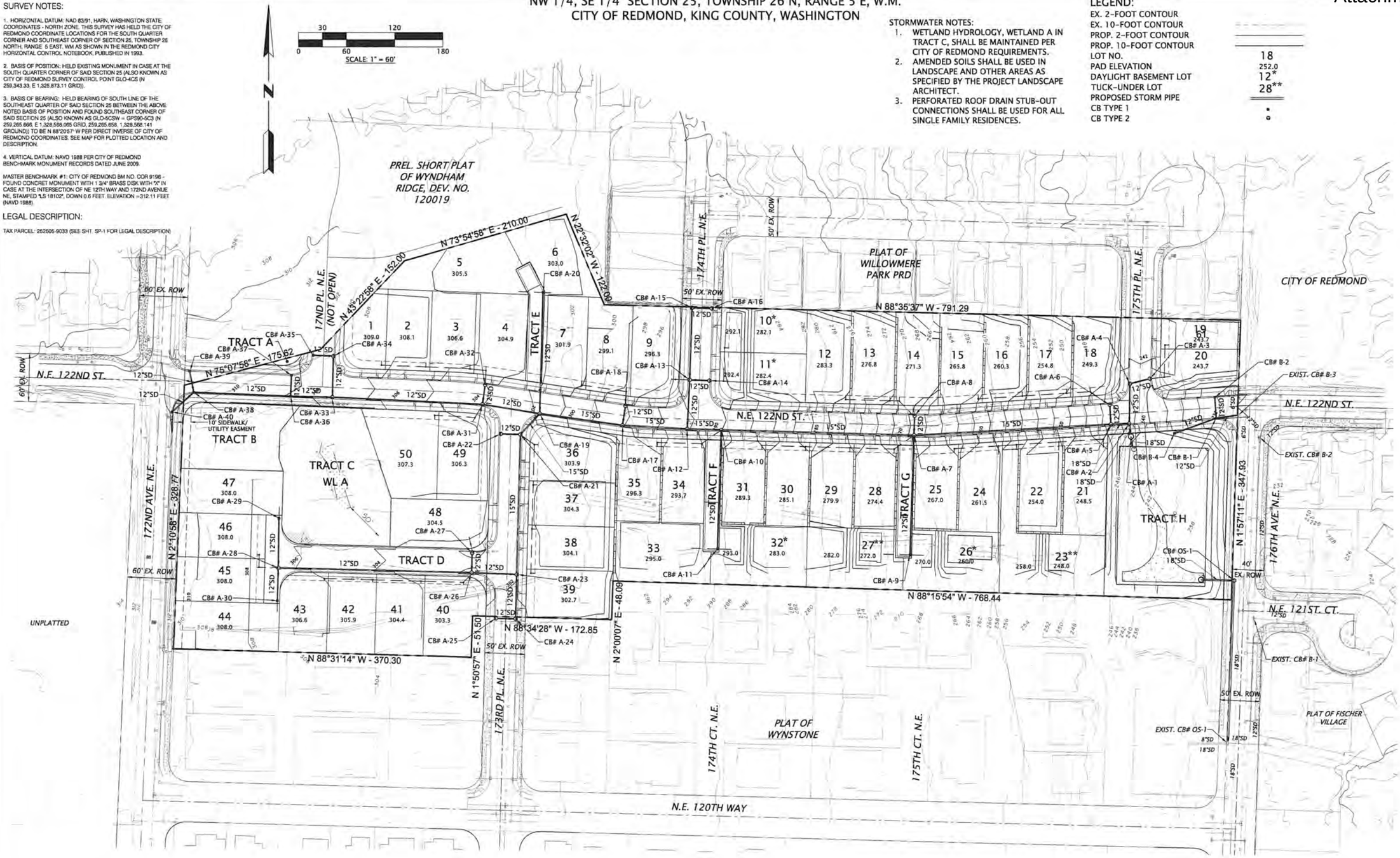
TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)

SCALE: 1" = 60'

STORMWATER NOTES:
1. WETLAND HYDROLOGY, WETLAND A IN TRACT C, SHALL BE MAINTAINED PER CITY OF REDMOND REQUIREMENTS.
2. AMENDED SOILS SHALL BE USED IN LANDSCAPE AND OTHER AREAS AS SPECIFIED BY THE PROJECT LANDSCAPE ARCHITECT.
3. PERFORATED ROOF DRAIN STUB-OUT CONNECTIONS SHALL BE USED FOR ALL SINGLE FAMILY RESIDENCES.

LEGEND:

EX. 2-FOOT CONTOUR	
EX. 10-FOOT CONTOUR	
PROP. 2-FOOT CONTOUR	
PROP. 10-FOOT CONTOUR	
LOT NO.	18
PAD ELEVATION	252.0
DAYLIGHT BASEMENT LOT	12*
TUCK-UNDER LOT	28**
PROPOSED STORM PIPE	
CB TYPE 1	▪
CB TYPE 2	○



DEVELOPED CONDITIONS

GOLDSMITH LAND DEVELOPMENT SERVICES
1215 116th Ave NE, Bellevue, WA 98004 | PO Box 3363, Bellevue, WA 98009
T: 425-462-1080 | F: 425-462-1081 | www.goldsmithengineering.com

ERIK ENSTROM, P.E.
eenstrom@goldsmithengineering.com
425-462-1080
PROJECT MANAGER

PLOTTED: 2015/06/01 15:17 EENSTROM
DRAWN: HWERLINGER
DESIGNED: EENSTROM
APPROVED: KGOLDSMITH

QUADRANT HOMES

COMPOSITE TRANSPORTATION PLAN FOR EDGEWOOD WEST

REDMOND WASHINGTON

SHEET FIGURE 3

JOB NO.: 14123

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REVISIONS | NO. | DATE | BY


Soil Map—King County Area, Washington
(EDGEWOOD WEST PRELIMINARY PLAT SOILS MAP)
NE 125th St
NE 124th St
172nd Ave NE
AgD
AgC
Driveway
566500
566600
566700
566800
566900
567000
567100
567200
567300
567400
567500
47° 42' 45" N
47° 42' 22" N
122° 6' 51" W
122° 5' 58" W
Map Scale: 1:5,050 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
N
Feet
0 200 400 800 1200
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84
USDA Natural Resources Conservation Service
Web Soil Survey
National Cooperative Soil Survey
11/20/2014
Page 1 of 3

FIGURE 4

Soil Map—King County Area, Washington
(EDGEWOOD WEST PRELIMINARY PLAT SOILS MAP)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

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

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

Date(s) aerial images were photographed: Aug 31, 2013—Oct 6, 2013

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

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

11/20/2014
Page 2 of 3

Map Unit Legend

King County Area, Washington (WA633)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes	127.6	99.2%
AgD	Alderwood gravelly sandy loam, 15 to 30 percent slopes	1.1	0.8%
Totals for Area of Interest		128.6	100.0%

2.0 Existing Conditions

The site contains two drainage basins identified on the Redmond Watershed Map as Watershed 490080 and Watershed 680. Both drainage basins are ultimately tributary to Bear Creek and the Sammamish River.

The area of disturbance necessary to construct the proposed site improvements is approximately 10.8 acres. One (1) Category IV Wetland with an associated 50 foot buffer is located on the west side of the site, and will be retained in a Sensitive Area Tract. See the *Critical Area Report by Raedeke Associates, Inc.* dated November 19, 2014 (Appendix A).

Geotechnical investigations were conducted on the Project site by Terra Associates, Inc. in April 2014. The on-site soils are classified as Alderwood gravelly sandy loam 6 to 15 percent slopes by The United Sates Department of Agriculture Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service. There are no steep slopes on site. See The U.S.D.A. Natural Resource Conservation Service (NRCS 2014) on line soil survey USGS Soil Map included as Figure 2.

The preliminary geotechnical report, indicates that surface drainage be collected and directed into a controlled discharge which is consistent with this proposed stormwater plan. A copy of the *Preliminary Geotechnical Report, Terra Associates, Inc. dated April 21, 2014* and an Updated report dated January 15, 2015 with references to the Redmond Zoning Code are both located in Appendix B.

The site is currently covered with thick vegetation including mature trees, understory, blackberries and brush. More specifically, the site varies in composition from very densely wooded stands of small trees, forested with large trees and dense understory, and open areas dominated by blackberry. A Category IV Wetland was delineated by Raedeke Associates, Inc. in May 2014, and field surveyed by Apex Surveying in June 2014. It is proposed with an associated 50 foot buffer and will be located in a Sensitive Area Tract (Tract C). No direct impacts are proposed to the wetland. A minor amount of buffer averaging to the wetland buffer, consisting of 425 square feet (1:1 ration per City Code) is proposed along the western side of the wetland buffer within Tract C. Both the proposed buffer averaging area and the reduced buffer area are shown on the preliminary plat plans. No net loss of wetland buffer is proposed. Wetland hydrology monitoring was initiated in February 2015 and wetland hydrology will be maintained in compliance with the City of Redmond 2012 Stormwater Technical Notebook requirements. A Pre- Development Hydrologic Modeling Plan –Technical Memorandum, was prepared by Raedeke and Associates, Inc., on March 31, 2015 and is included in Appendix E.

The site is surrounded by single family development (either existing, under construction or under development review); a vacant parcel zoned R4 west of 172nd Avenue NE; and the unimproved NE Redmond Neighborhood Park at the northeast corner of the site.

2.1 Off-Site Analysis

There are no significant off-site upstream areas draining to the site.

The project is located in the Bear Creek and Sammamish River basins.

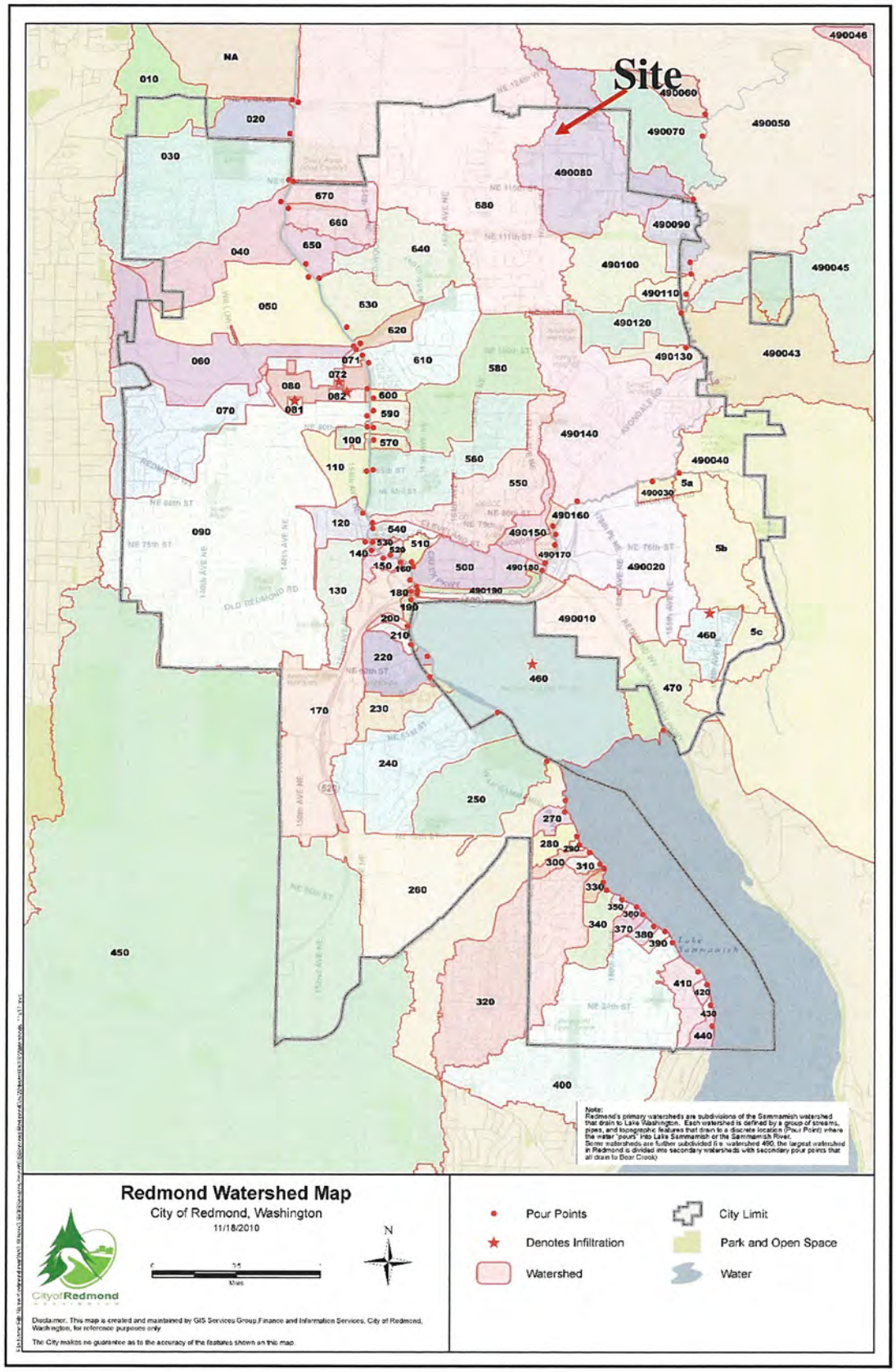
Existing stormwater runoff from the site currently sheet flows across the site un-detained from the west to the east to a closed stormwater conveyance system located within 176th Ave. N.E. From this location stormwater is conveyed in 12" storm pipe to a stormwater quality and quantity treatment facility located in Tract K of Fischer Village (Pond 1), approximately 1,300 feet to the southeast. The stormwater

facility discharges to the north, approximately 600 ft., to an unnamed Class 2 stream (Final Report, Project: Fischer Village PPL-006, September, 2003). The Class 2 stream is situated at the bottom of a deep wide natural ravine that varies in width along its length. The slopes are blanketed with thick underbrush, which contain a mix of mature deciduous and evergreen trees. The creek topography descends to the southeast at a slope that ranges between 2% and 15%. The Class 2 stream flows east, towards Avondale Road, approximately 5,000 ft., to its confluence with Bear Creek.

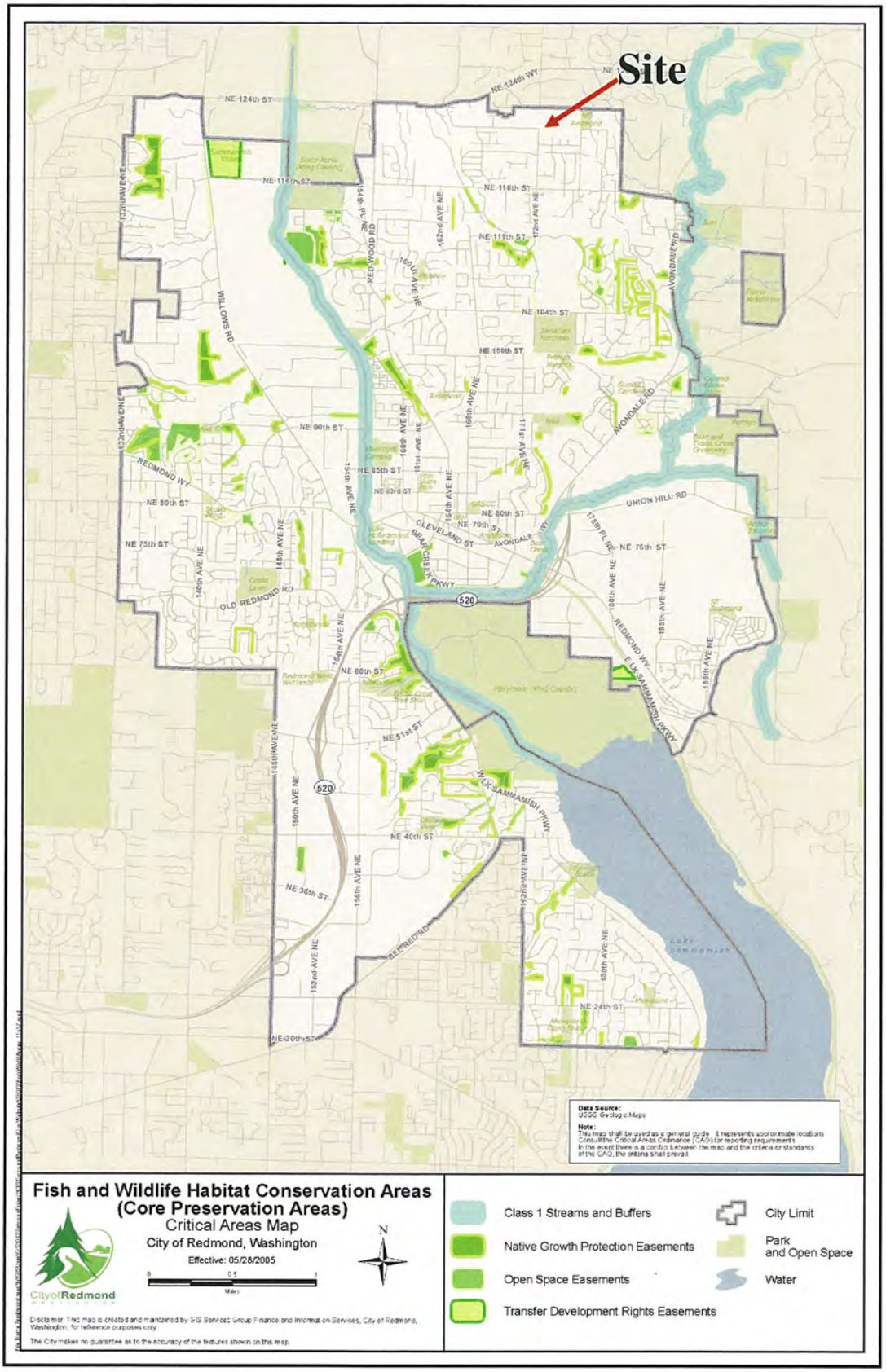
The following is a summary of the best available information used to identify existing or potential problems associated with the onsite or downstream drainage system. The information was collected from the City of Redmond Maps:

- According to the *Preliminary Geotechnical Report* (Terra and Associates, Inc., dated April 24, 2014), onsite soils are Ovt (Till)
- The site is located in the Bear Creek and Sammamish River Drainage Basins
- The site contains 1 Class 2 Wetland
- The site is not located within a floodplain
- The site is not located in an Erosion Hazard Area
- The site is not located in a Landslide/Liquefaction Hazard Area
- The site is not located in a Seismic Hazard Area
- The site is not located in a Fish and Wildlife Habitat Conservation Area
- The site is located in a Wellhead Protection Zone 3

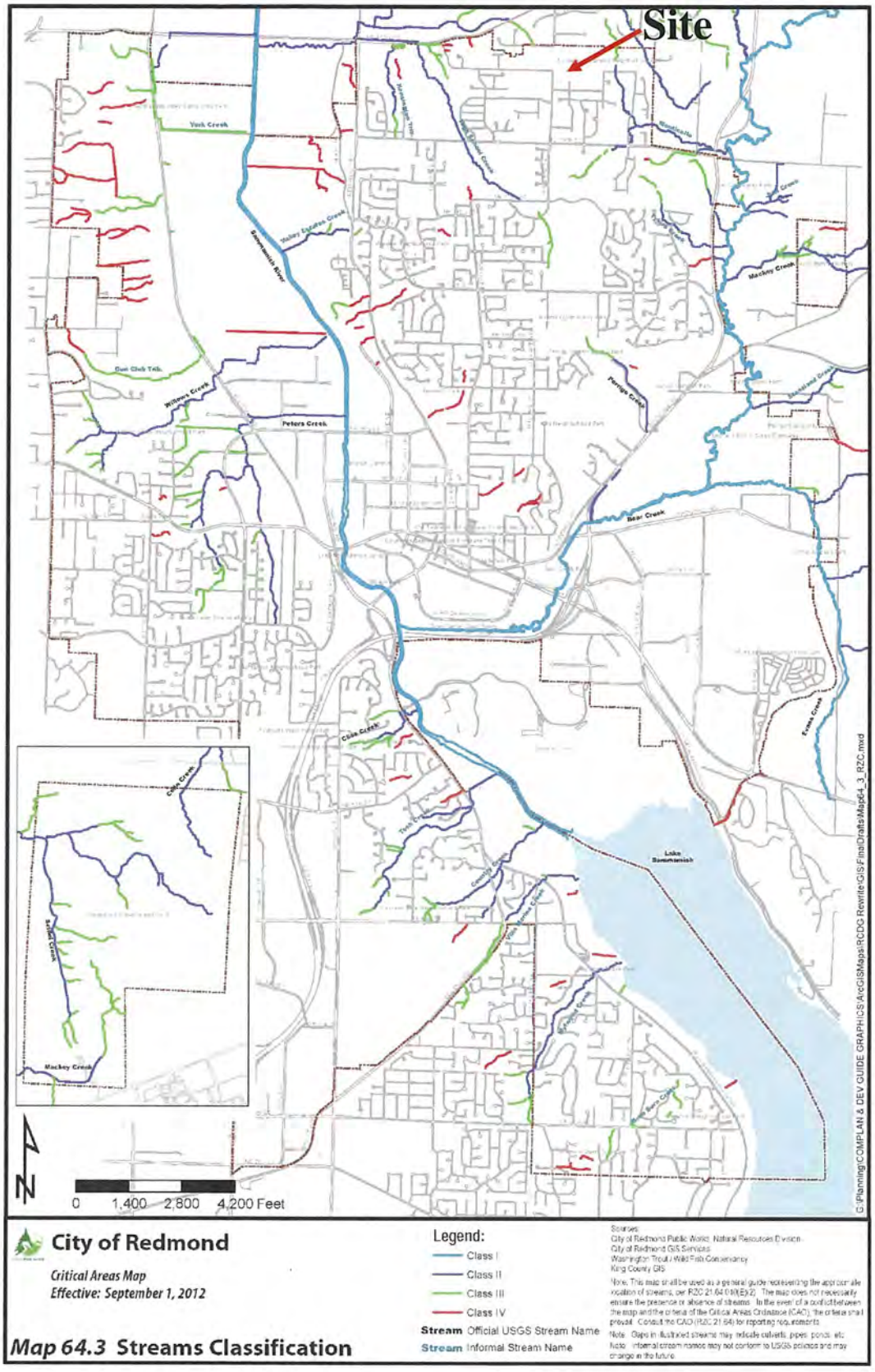
City of Redmond Watershed Map



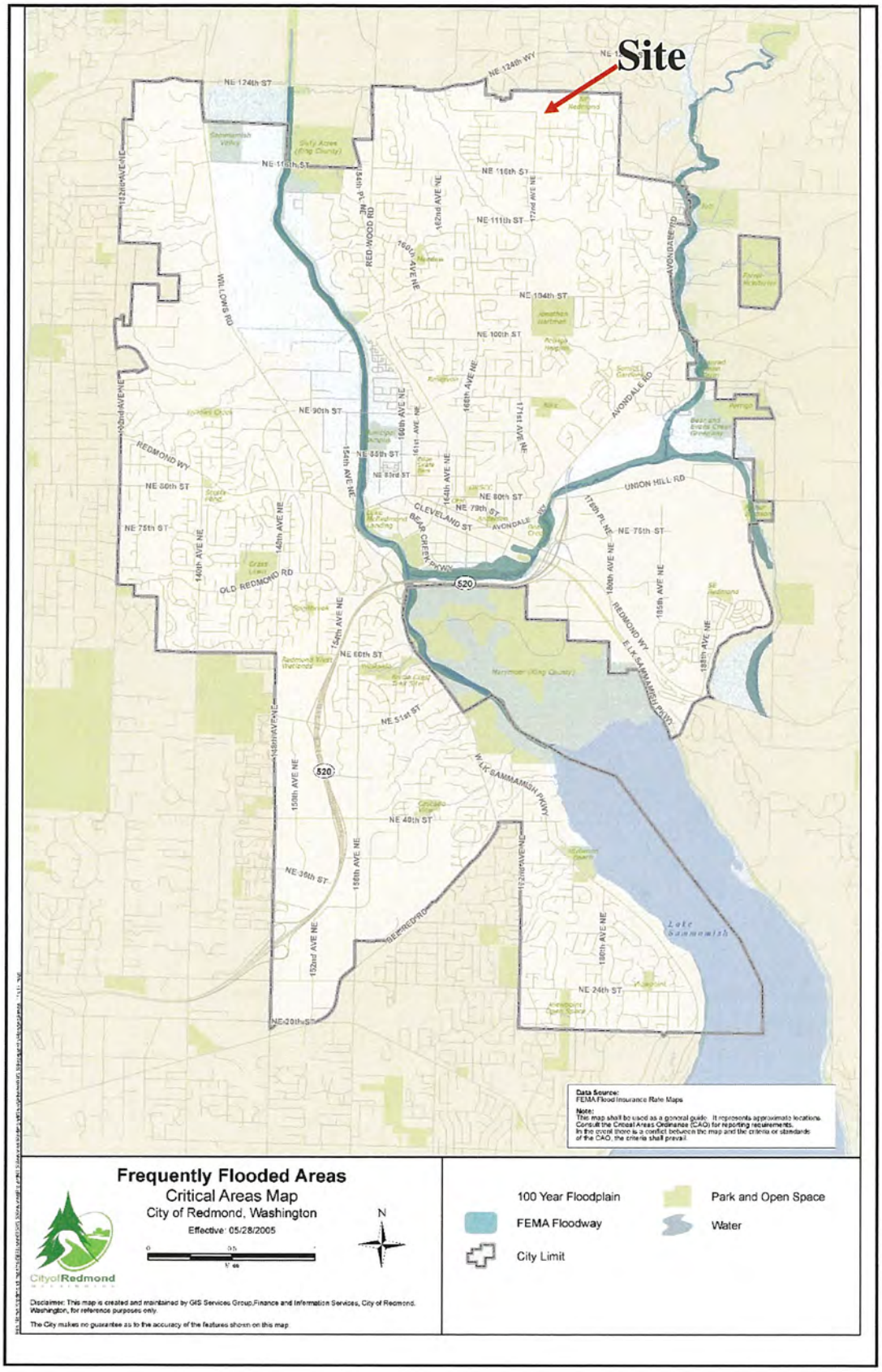
City of Redmond Fish and Wildlife Conservation Areas Map



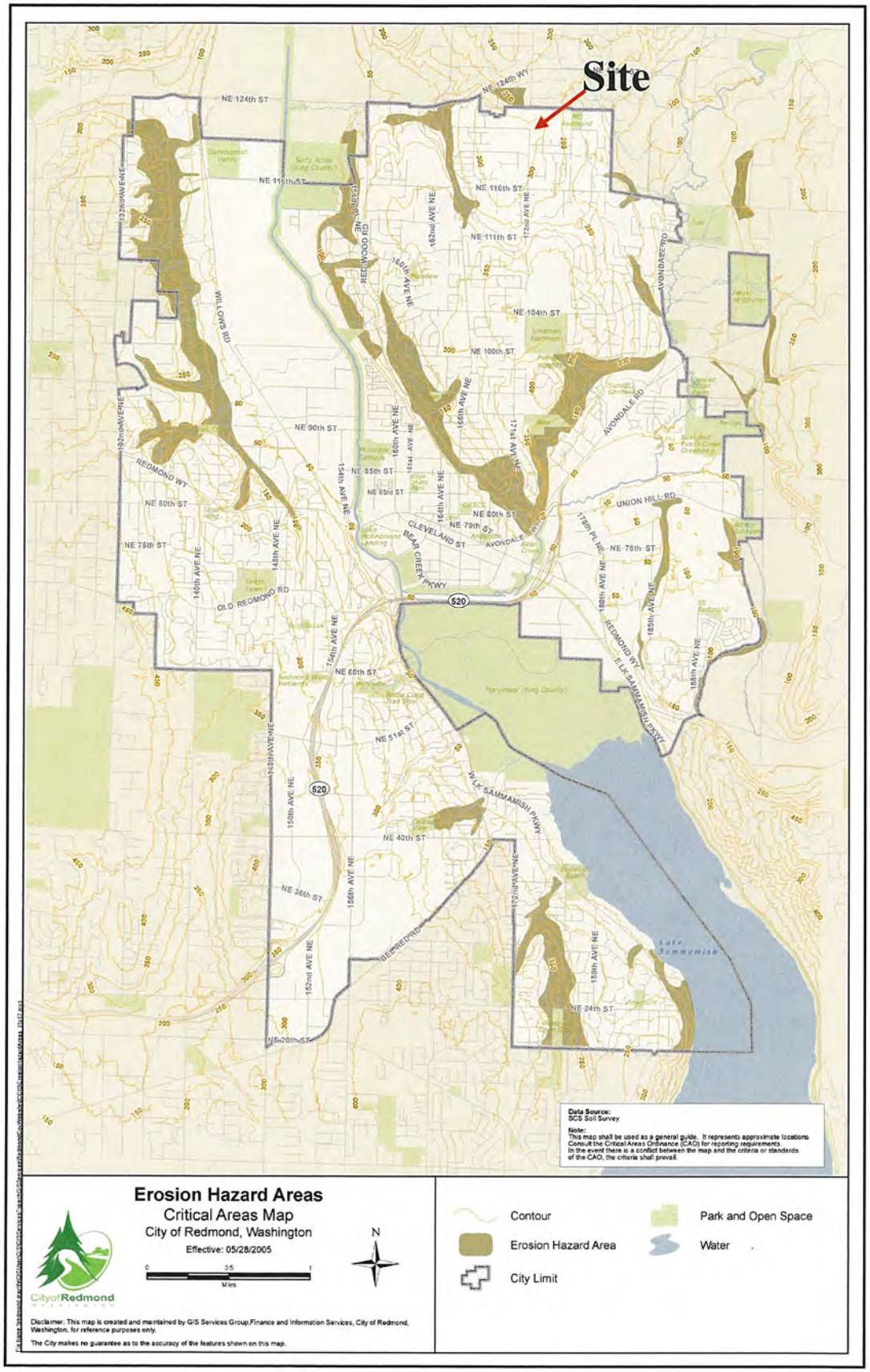
City of Redmond Stream Classification Map



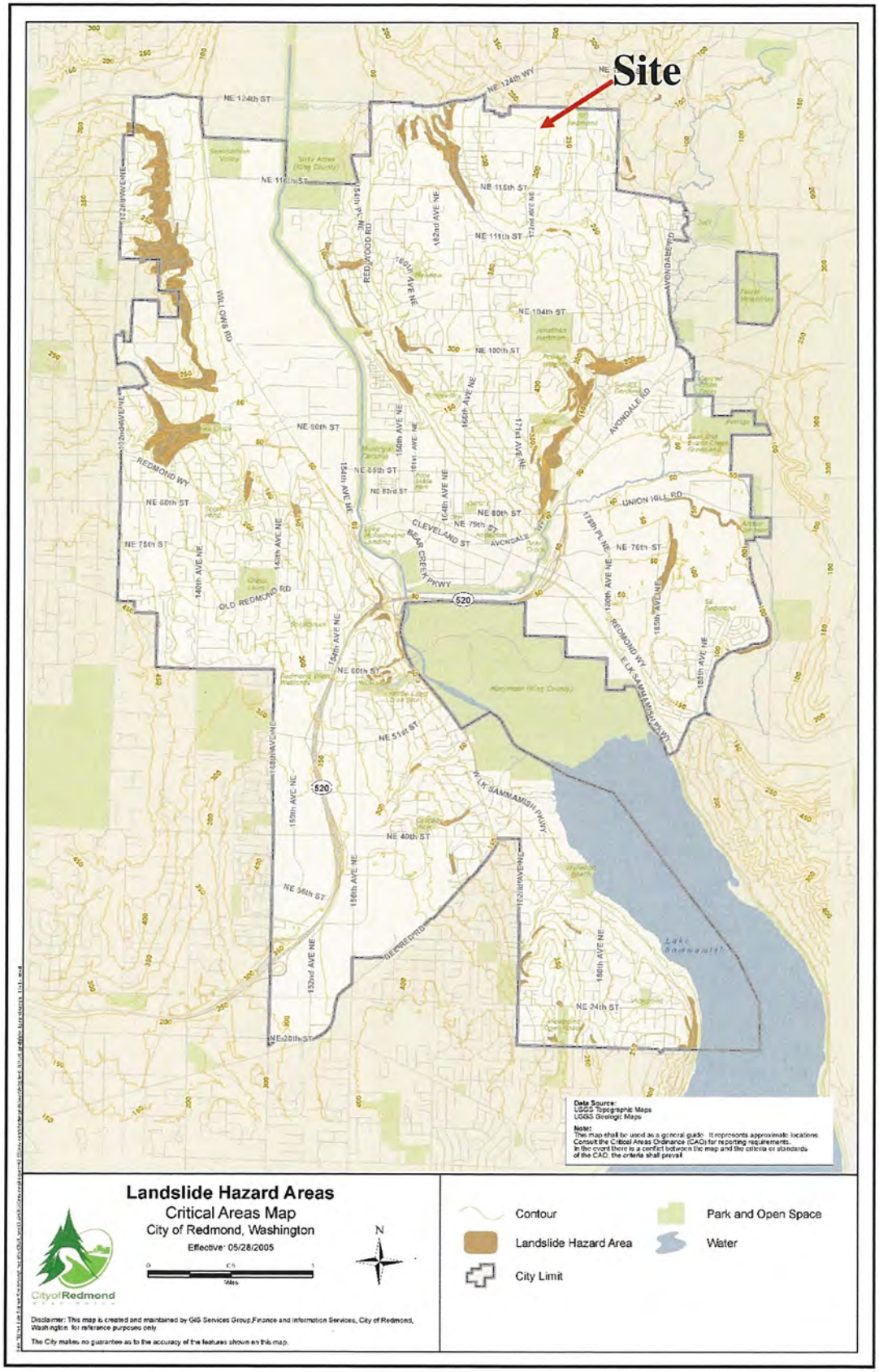
City of Redmond Frequently Flooded Areas



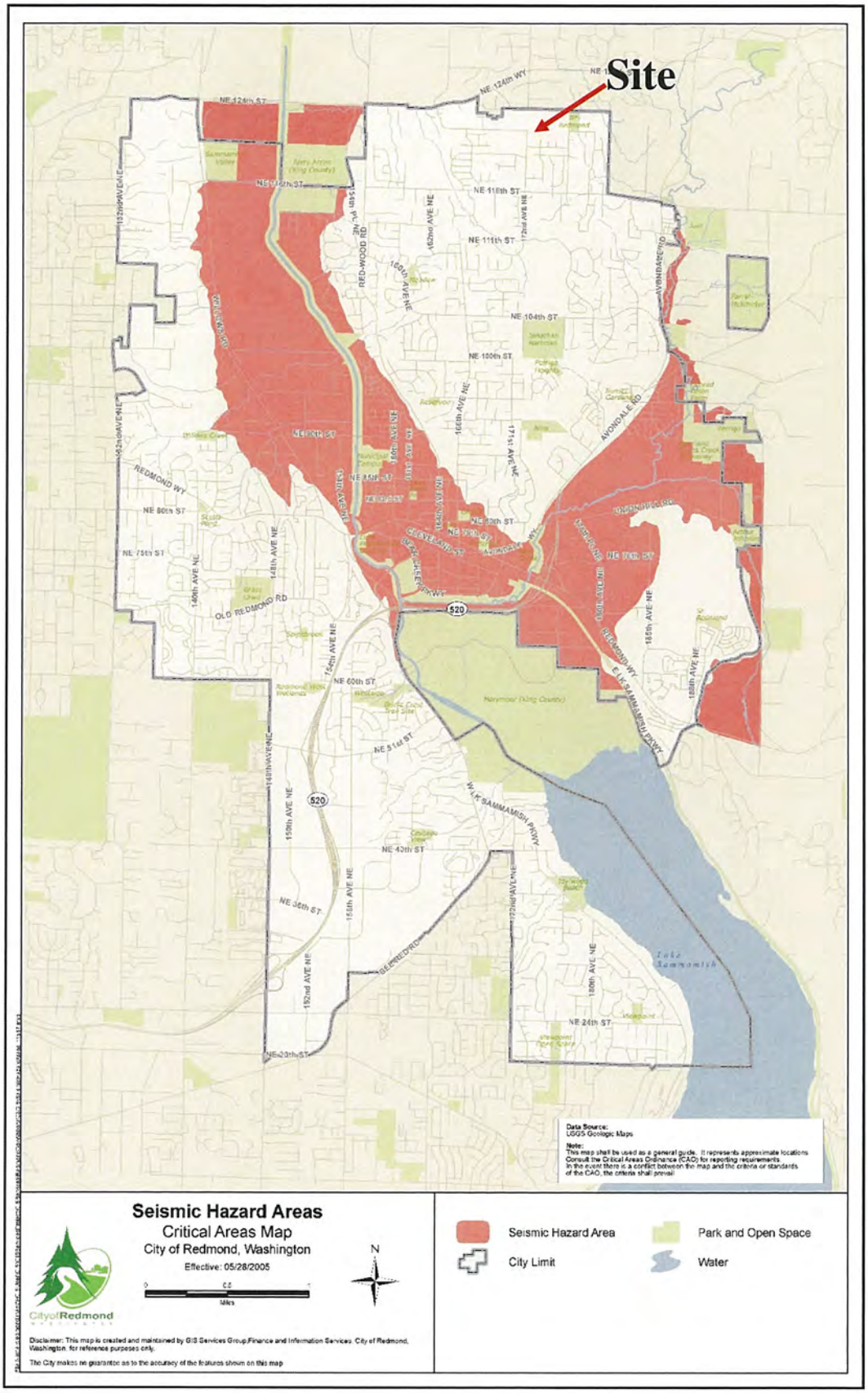
City of Redmond Erosion Hazard Areas



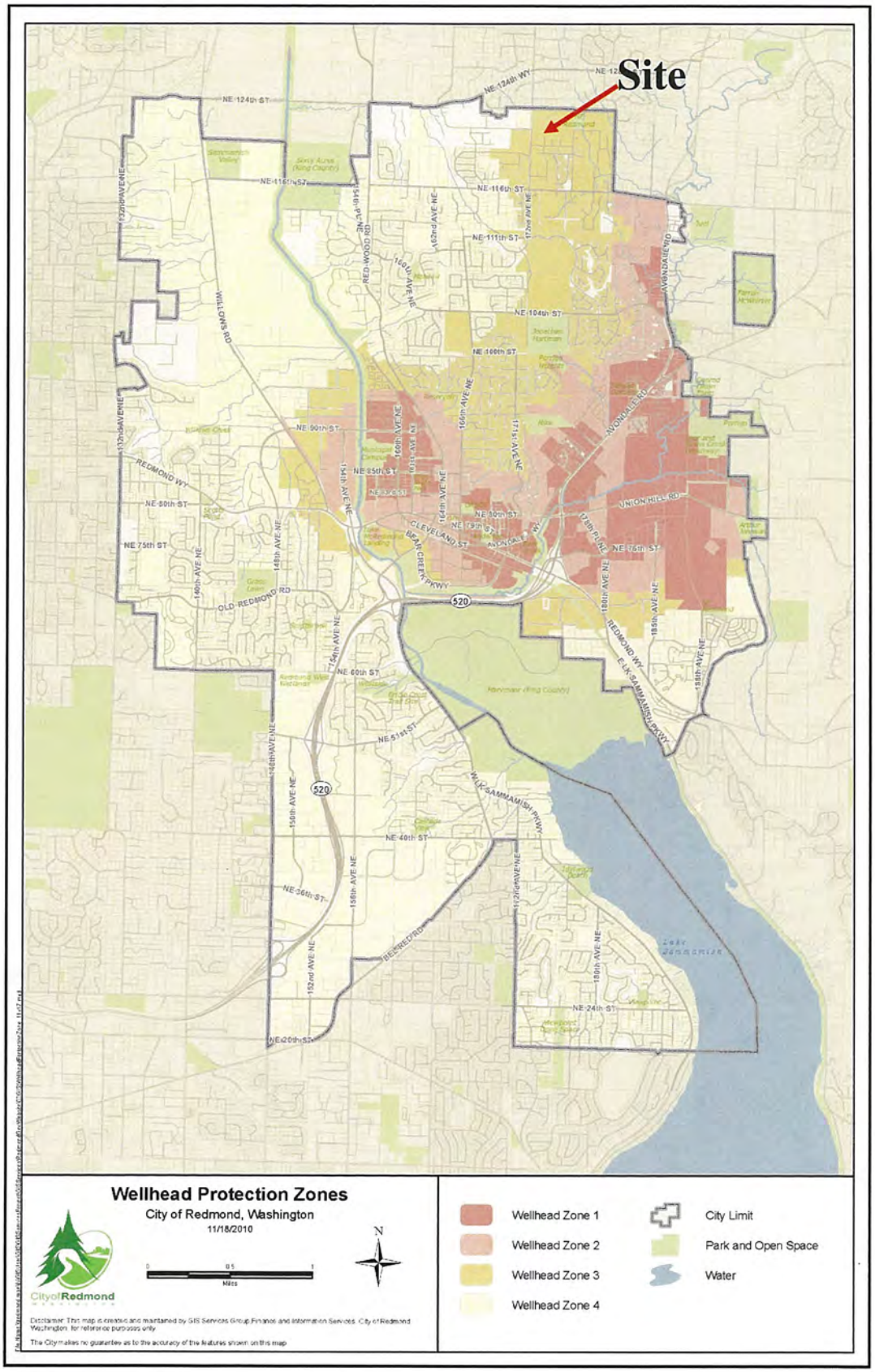
City of Redmond Landslide Hazard Areas



City of Redmond Seismic Hazard Areas



City of Redmond Wellhead Protection Zones



3.0 Minimum Requirements

The project must comply with the City of Redmond's 2012 Stormwater Technical Notebook (STN), which adopts the Washington State Department of Ecology's 2005 Stormwater Management Manual for Western Washington. The following analysis complies with these requirements.

- Flow Chart for Determining Requirements for New Development (Figure 2.2 of the Addendum) is included as Figure 4.

  The Flow chart indicates that Minimum Requirements #1 through #9 apply to the new and replaced impervious surfaces.

  - Minimum Requirement #1: Preparation of Stormwater Site Plans

    A description of the proposed stormwater plan is described in Section 1.0 and Section 4.0 of this report.

  - Minimum Requirement #2: Construction Stormwater Pollution Prevention

    A detailed SWPPP plan will be provided in Section 5.0 of this report at design review.

  - Minimum Requirement #3: Source Control of Pollution

    No additional source control BMP's are required for this project beyond the BMP's proposed as part of the SWPP Plan (Section 5.0).

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

    Existing drainage patterns will be maintained as runoff will leave the site at the existing natural discharge location.

  - Minimum Requirement #5: On-Site Stormwater Management

    In the City of Redmond, projects are required to implement on-site stormwater management BMPs to infiltrate, disperse, and retain stormwater runoff on-site to the maximum extent feasible without causing flooding, groundwater contamination, or erosion impacts. An underground detention vault is proposed for the project to provide water quality and quantity control.

  - Minimum Requirement #6: Runoff Treatment

    Design of the flow control facility is described in Section 4 of this report. Placement of the treatment facility is shown on the Preliminary Plat plans under separate cover and on the *Developed Conditions Exhibit* (Figure 3).

  - Minimum Requirement #7: Flow Control

    Design of the flow control facility is described in Section 5 of this report. Placement of the flow control facility is shown on the Preliminary Plat plans under separate cover, and on the *Developed Conditions Exhibit* (Figure 3).

- Minimum Requirement #8: Wetland Protection

  The site contains one (1) Category IV wetland with a 50' buffer. The wetland and buffer are proposed to be contained in a Sensitive Area Tract (Tract C). Minimal buffer reduction with proposed buffer averaging compensation is proposed in compliance with RZC Code. Proposed buffer encroachment totals 425 square feet. Compensation of an additional 425 square feet is proposed in compliance with RZC Code 1:1 ratio, with no resultant impacts to the wetland.

  Wellhead 3 Protection Zone... The site is located within the City of Redmond's Wellhead Protection Zone 3. *A Critical Aquifer Recharge Area report prepared by Terra and Associates, Inc.* (October 2014), and is included in Appendix C.

- Minimum Requirement #9: Basin/Watershed Paving

  Not applicable to this site.

- Minimum Requirement #10: Operation and Maintenance

  An Operation and Maintenance manual will be prepared and submitted with design review plans.

  A copy of the O&M manual shall be retained on-site or within reasonable access to the site during construction.

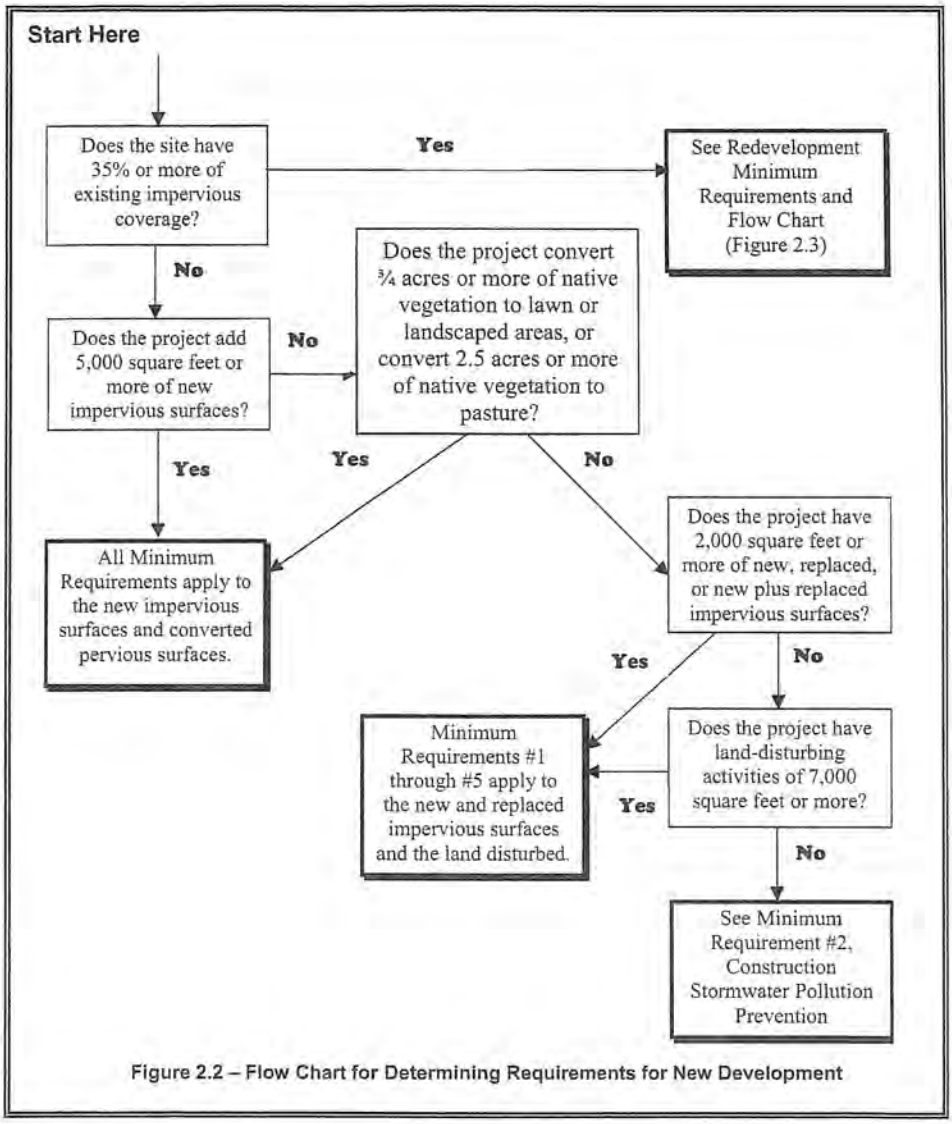


Figure 2.2 – Flow Chart for Determining Requirements for New Development

FIGURE 5

4.0 Stormwater Control Plan

The Project proposes 50 lots, comprised of 47 single family market rate lots and 3 affordable housing lots which includes the 5 required affordable housing units per City requirements. The proposed affordable housing units consist of one cottage unit and a duplex with two (2) 50% market rate units for a total of five affordable housing units. Project will include: lots, public roads with curbs, gutters, and sidewalks; a private road (Tract) with an access easement (serving 8-9 lots); six roadway connections to adjacent existing or proposed public rights-of-ways to neighboring subdivisions and roadway systems; frontage improvements; open space (combination of development wide and lot-by-lot); a sensitive area tract (including buffer reduction and buffer averaging of 425 square feet); a five foot landscape areas/buffers along the perimeter of the site (per North Redmond Neighborhood requirements); and a stormwater tract with an underground stormwater vault. See the *Developed Conditions Map* (Figure 3).

Stormwater flow control for the proposed project will be provided by an underground detention vault. Runoff from the site will be directed to the proposed detention vault for water quality and quantity treatment prior to discharge to the existing stormwater conveyance system within 176th Ave. N.E. Stormwater discharge rates will be maintained at the existing rates, as required by Minimum Requirement #5. Wetland hydrology will be maintained as required per the *City of Redmond Stormwater Management Technical Notebook (Feb 2012)* which may include stormwater runoff from adjacent roofs being directed to the sensitive area tract.

The following is a summary of the design parameters and required detention volumes based on the proposed development plan as shown on the *Developed Conditions Drainage Basin Plan Exhibit 3.* As required the stormwater control plan has been developed using the *City of Redmond Clearing, Grading, and Stormwater Management Technical Notebook (Feb 2012)* and by reference the 2005 WADOE Stormwater Management Manual for Western Washington.

Existing Site Conditions

The following is a summary of the existing state hydrologic input parameters and basin areas. These values are used for calculating allowable release rates and flow durations used in the sizing of the proposed stormwater control facility. A detailed description of the existing on-site basin surface conditions is given in Section 2 of this report. Consistent with the City's requirements and the existing site conditions, the existing basin has been modeled using the historic forested site condition. The basin area includes the project site, off-site upstream run-on areas, and downstream off-site disturbed areas.

Existing Basin Area	**= 11.73 Ac.**
Till Forest	= 11.73 Ac.

Developed Site Conditions

The following is a summary of the developed condition sub-basin surface areas used for calculating peak runoff rates and durations. Impervious areas are based on the maximum impervious area allowed by zoning (60%) and per the proposed road design within the right-of-way. Note, lot impervious areas have been reduced by 10% to meet the requirements of the Green Building and Green Infrastructure

Incentives for impervious area reduction of the Redmond Zoning Code (RZC) 21.67.050(E) as proposed by the applicant for a 15% reduction in lot size, see Table 4.1.

Basin Summary (60% Lot Impervious)

Developed Basin Area to Vault	**= 11.29 Ac.**
Impervious	= 6.51 Ac.
• Lot Area	= 4.48 Ac.
• ROW	= 2.03 Ac.
Wetland Soils	= 0.48 Ac.
Till Grass (Landscaped Areas)	= 4.75 Ac.
Developed Basin Bypass Area	**= 0.44 Ac.**
Impervious (ROW)	= 0.18 Ac.
Till Grass (Landscaped Areas)	= 0.26 Ac.

Basin Summary (with 10% Reduction)

Developed Basin Area to Vault	**= 11.29 Ac.**
Impervious	= 6.06 Ac.
• Lot Area	= 4.03 Ac.
• ROW	= 2.03 Ac.
Wetland Soils	= 0.48 Ac.
Till Grass (Landscaped Areas)	= 4.75 Ac.
Developed Basin Bypass Area	**= 0.44 Ac.**
Impervious (ROW)	= 0.18 Ac.
Till Grass (Landscaped Areas)	= 0.26 Ac.

TABLE 4.1				
Lot #	Area, SF	Allowed Impervious Area (60%), SF	10% Reduction, SF	Allowed Impervious Area w/ 10% Reduction, SF
1	4,208	2,525	252	2,272
2	5,500	3,300	330	2,970
3	5,504	3,302	330	2,972
4	6,738	4,043	404	3,639
5	8,868	5,321	532	4,789
6	7,053	4,232	423	3,809
7	6,182	3,709	371	3,338
8	6,189	3,713	371	3,342
9	6,737	4,042	404	3,638
10	5,900	3,540	354	3,186
11	6,348	3,809	381	3,428
12	6,344	3,806	381	3,426
13	6,352	3,811	381	3,430
14	6,354	3,812	381	3,431
15	6,190	3,714	371	3,343
16	5,922	3,553	355	3,198
17	5,655	3,393	339	3,054
18	5,755	3,453	345	3,108
19	3,658	2,195	219	1,975
20	4,658	2,795	279	2,515
21	6,765	4,059	406	3,653
22	6,479	3,887	389	3,499
23	12,036	7,222	722	6,499
24	6,091	3,655	365	3,289
25	5,832	3,499	350	3,149
26	8,650	5,190	519	4,671
27	8,650	5,190	519	4,671
28	5,766	3,460	346	3,114
29	5,757	3,454	345	3,109
30	5,747	3,448	345	3,103
31	5,738	3,443	344	3,099
32	8,650	5,190	519	4,671
33	8,650	5,190	519	4,671
34	5,725	3,435	344	3,092
35	5,764	3,458	346	3,113
36	6,947	4,168	417	3,751
37	5,886	3,532	353	3,178
38	5,886	3,532	353	3,178
39	6,411	3,847	385	3,462
40	6,682	4,009	401	3,608
41	6,000	3,600	360	3,240
42	6,000	3,600	360	3,240
43	5,866	3,520	352	3,168
44	7,796	4,678	468	4,210
45	6,007	3,604	360	3,244

TABLE 4.1				
Lot #	Area, SF	Allowed Impervious Area (60%), SF	10% Reduction, SF	Allowed Impervious Area w/ 10% Reduction, SF
46	5,970	3,582	358	3,224
47	7,033	4,220	422	3,798
48	7,146	4,288	429	3,859
49	6,949	4,169	417	3,752
50	8,404	5,042	504	4,538
Total, SF	325,398	195,239	19,524	175,715
Total, AC	7.47	4.48	0.45	4.03

4.1 Flow Control Analysis

This section gives detailed design level data and hydrologic analysis for the sizing of the proposed stormwater flow control vault for the Plat of Edgewood West. This data verifies that the proposed stormwater control plan meets the required flow control standards. Also included are preliminary vault size dimensions and control structure designs.

Vault Design Summary

Required Detention Volume	=152,405 cu.ft. (3.50 ac.-ft.)
Vault Dimensions	= 110 ft x 170 ft
100 yr WS	= 8.15 ft (not incl. water quality depth)

Orifice Sizing Table:

Orifice	Diameter	Height
1	1.64 in.	0.00 ft.
2	2.75 in.	6.67 ft.
3	1.68 in.	7.50 ft.

Riser Height	=	10 ft.
Riser Diameter	=	18 inches

WWHM2012
PROJECT REPORT

Project Name: 14123pplat
Site Name:
Site Address:
City :
Report Date: 1/4/2015
Gage : Seatac
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.00
Version : 2014/12/10

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 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	11.73
Pervious Total	11.73

Impervious Land Use	Acres
Impervious Total	0
Basin Total	11.73

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	.48

C, Lawn, Mod	4.75
Pervious Total	5.23

Impervious Land Use	Acres
ROADS MOD	6.06
Impervious Total	6.06
Basin Total	11.29

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Name : Basin 2
Bypass: Yes

GroundWater: No

Pervious Land Use	Acres
C, Lawn, Mod	.26
Pervious Total	0.26

Impervious Land Use	Acres
ROADS MOD	0.18
Impervious Total	0.18
Basin Total	0.44

Element Flows To:

Surface	Interflow	Groundwater

Name : Vault 1
Width : 110 ft.
Length : 170 ft.
Depth: 11 ft.
Discharge Structure
Riser Height: 7.5 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.77 in. **Elevation:** 0 ft.
Orifice 2 Diameter: 2.99 in. **Elevation:** 4.95 ft.
Orifice 3 Diameter: 1.75 in. **Elevation:** 5.57 ft.

Element Flows To:

Outlet 1 **Outlet 2**

Vault Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.429	0.000	0.000	0.000
0.1222	0.429	0.052	0.028	0.000
0.2444	0.429	0.104	0.040	0.000
0.3667	0.429	0.157	0.049	0.000
0.4889	0.429	0.209	0.057	0.000
0.6111	0.429	0.262	0.064	0.000
0.7333	0.429	0.314	0.070	0.000
0.8556	0.429	0.367	0.076	0.000
0.9778	0.429	0.419	0.081	0.000
1.1000	0.429	0.472	0.086	0.000
1.2222	0.429	0.524	0.091	0.000
1.3444	0.429	0.577	0.095	0.000
1.4667	0.429	0.629	0.099	0.000
1.5889	0.429	0.682	0.103	0.000
1.7111	0.429	0.734	0.107	0.000
1.8333	0.429	0.787	0.111	0.000
1.9556	0.429	0.839	0.115	0.000
2.0778	0.429	0.892	0.118	0.000
2.2000	0.429	0.944	0.122	0.000
2.3222	0.429	0.996	0.125	0.000
2.4444	0.429	1.049	0.128	0.000
2.5667	0.429	1.101	0.131	0.000
2.6889	0.429	1.154	0.134	0.000
2.8111	0.429	1.206	0.138	0.000
2.9333	0.429	1.259	0.140	0.000
3.0556	0.429	1.311	0.143	0.000
3.1778	0.429	1.364	0.146	0.000
3.3000	0.429	1.416	0.149	0.000
3.4222	0.429	1.469	0.152	0.000
3.5444	0.429	1.521	0.154	0.000
3.6667	0.429	1.574	0.157	0.000
3.7889	0.429	1.626	0.160	0.000
3.9111	0.429	1.679	0.162	0.000
4.0333	0.429	1.731	0.165	0.000
4.1556	0.429	1.784	0.167	0.000
4.2778	0.429	1.836	0.170	0.000
4.4000	0.429	1.888	0.172	0.000
4.5222	0.429	1.941	0.175	0.000
4.6444	0.429	1.993	0.177	0.000
4.7667	0.429	2.046	0.179	0.000
4.8889	0.429	2.098	0.181	0.000
5.0111	0.429	2.151	0.242	0.000
5.1333	0.429	2.203	0.287	0.000
5.2556	0.429	2.256	0.318	0.000
5.3778	0.429	2.308	0.344	0.000
5.5000	0.429	2.361	0.367	0.000
5.6222	0.429	2.413	0.406	0.000
5.7444	0.429	2.466	0.440	0.000
5.8667	0.429	2.518	0.467	0.000
5.9889	0.429	2.571	0.492	0.000

6.1111	0.429	2.623	0.515	0.000
6.2333	0.429	2.675	0.536	0.000
6.3556	0.429	2.728	0.557	0.000
6.4778	0.429	2.780	0.576	0.000
6.6000	0.429	2.833	0.594	0.000
6.7222	0.429	2.885	0.612	0.000
6.8444	0.429	2.938	0.629	0.000
6.9667	0.429	2.990	0.645	0.000
7.0889	0.429	3.043	0.661	0.000
7.2111	0.429	3.095	0.677	0.000
7.3333	0.429	3.148	0.692	0.000
7.4556	0.429	3.200	0.706	0.000
7.5778	0.429	3.253	1.038	0.000
7.7000	0.429	3.305	2.041	0.000
7.8222	0.429	3.358	3.420	0.000
7.9444	0.429	3.410	5.090	0.000
8.0667	0.429	3.463	7.006	0.000
8.1889	0.429	3.515	9.140	0.000
8.3111	0.429	3.567	11.47	0.000
8.4333	0.429	3.620	13.98	0.000
8.5556	0.429	3.672	16.66	0.000
8.6778	0.429	3.725	19.51	0.000
8.8000	0.429	3.777	22.50	0.000
8.9222	0.429	3.830	25.63	0.000
9.0444	0.429	3.882	28.91	0.000
9.1667	0.429	3.935	32.31	0.000
9.2889	0.429	3.987	35.84	0.000
9.4111	0.429	4.040	39.50	0.000
9.5333	0.429	4.092	43.27	0.000
9.6556	0.429	4.145	47.16	0.000
9.7778	0.429	4.197	51.15	0.000
9.9000	0.429	4.250	55.26	0.000
10.022	0.429	4.302	59.47	0.000
10.144	0.429	4.354	63.79	0.000
10.267	0.429	4.407	68.20	0.000
10.389	0.429	4.459	72.72	0.000
10.511	0.429	4.512	77.32	0.000
10.633	0.429	4.564	82.03	0.000
10.756	0.429	4.617	86.83	0.000
10.878	0.429	4.669	91.71	0.000
11.000	0.429	4.722	96.69	0.000
11.122	0.429	4.774	101.7	0.000
11.244	0.000	0.000	106.9	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:11.73
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:5.49
Total Impervious Area:6.24

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.349263
5 year	0.572298
10 year	0.715706
25 year	0.886295
50 year	1.004456
100 year	1.114824

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.254583
5 year	0.379764
10 year	0.48053
25 year	0.630473
50 year	0.760118
100 year	0.906481

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.402	0.247
1950	0.477	0.261
1951	0.763	0.647
1952	0.239	0.165
1953	0.194	0.194
1954	0.297	0.186
1955	0.475	0.195
1956	0.382	0.342
1957	0.309	0.227
1958	0.343	0.199
1959	0.294	0.190
1960	0.526	0.530
1961	0.290	0.255
1962	0.180	0.148
1963	0.247	0.202
1964	0.351	0.216
1965	0.233	0.302
1966	0.224	0.193
1967	0.536	0.260
1968	0.302	0.230
1969	0.294	0.201
1970	0.236	0.190
1971	0.266	0.238
1972	0.579	0.536
1973	0.257	0.299
1974	0.285	0.217
1975	0.396	0.235
1976	0.283	0.204
1977	0.041	0.184
1978	0.239	0.217
1979	0.145	0.177

1980	0.682	0.548
1981	0.214	0.202
1982	0.442	0.391
1983	0.378	0.206
1984	0.228	0.178
1985	0.135	0.183
1986	0.598	0.240
1987	0.528	0.440
1988	0.209	0.183
1989	0.138	0.170
1990	1.265	0.597
1991	0.671	0.480
1992	0.274	0.208
1993	0.267	0.160
1994	0.090	0.156
1995	0.383	0.223
1996	0.886	0.637
1997	0.683	0.618
1998	0.167	0.221
1999	0.749	0.472
2000	0.266	0.199
2001	0.048	0.195
2002	0.309	0.279
2003	0.461	0.244
2004	0.492	0.585
2005	0.365	0.206
2006	0.411	0.317
2007	0.956	0.752
2008	1.165	0.651
2009	0.543	0.283

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.2647	0.7523
2	1.1652	0.6514
3	0.9559	0.6470
4	0.8857	0.6374
5	0.7631	0.6176
6	0.7495	0.5966
7	0.6835	0.5847
8	0.6820	0.5480
9	0.6708	0.5364
10	0.5985	0.5297
11	0.5793	0.4805
12	0.5433	0.4717
13	0.5363	0.4395
14	0.5283	0.3914
15	0.5265	0.3416
16	0.4924	0.3172
17	0.4771	0.3021
18	0.4747	0.2994
19	0.4609	0.2833
20	0.4423	0.2790
21	0.4110	0.2615
22	0.4020	0.2605
23	0.3962	0.2546

24	0.3831	0.2473
25	0.3824	0.2440
26	0.3783	0.2399
27	0.3654	0.2382
28	0.3509	0.2352
29	0.3427	0.2296
30	0.3087	0.2270
31	0.3086	0.2233
32	0.3019	0.2207
33	0.2971	0.2170
34	0.2940	0.2167
35	0.2938	0.2157
36	0.2896	0.2084
37	0.2846	0.2061
38	0.2831	0.2057
39	0.2739	0.2043
40	0.2673	0.2019
41	0.2662	0.2017
42	0.2662	0.2006
43	0.2567	0.1992
44	0.2473	0.1991
45	0.2395	0.1955
46	0.2392	0.1947
47	0.2358	0.1937
48	0.2332	0.1931
49	0.2279	0.1901
50	0.2241	0.1896
51	0.2141	0.1858
52	0.2086	0.1841
53	0.1935	0.1830
54	0.1802	0.1825
55	0.1673	0.1783
56	0.1448	0.1772
57	0.1381	0.1701
58	0.1353	0.1653
59	0.0898	0.1604
60	0.0478	0.1560
61	0.0415	0.1481

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1746	17222	15622	90	Pass
0.1830	15481	9950	64	Pass
0.1914	14121	7045	49	Pass
0.1998	12895	6104	47	Pass
0.2082	11584	5555	47	Pass
0.2165	10572	5197	49	Pass
0.2249	9666	4900	50	Pass
0.2333	8778	4650	52	Pass
0.2417	8094	4464	55	Pass
0.2501	7349	4267	58	Pass
0.2585	6761	4042	59	Pass

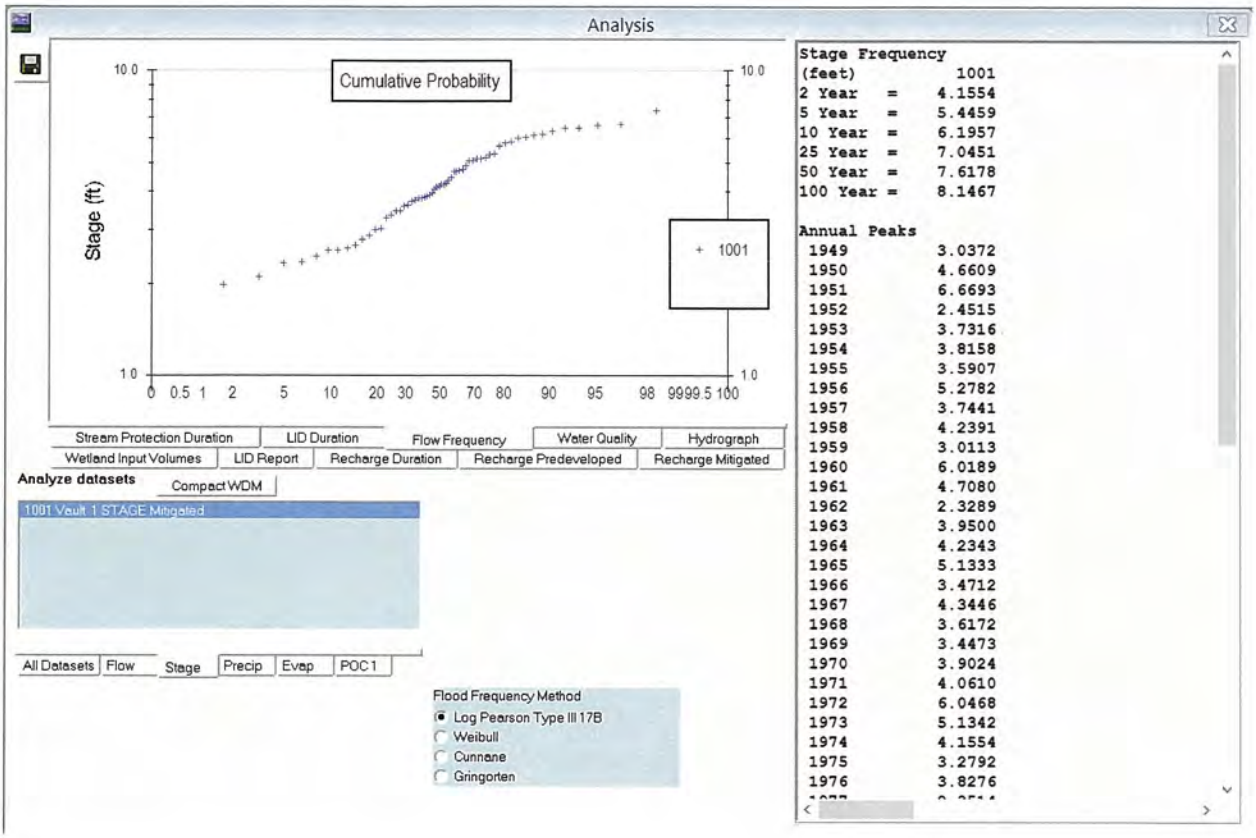
0.2668	6237	3848	61	Pass
0.2752	5741	3653	63	Pass
0.2836	5332	3486	65	Pass
0.2920	4966	3358	67	Pass
0.3004	4584	3206	69	Pass
0.3087	4267	3059	71	Pass
0.3171	3955	2881	72	Pass
0.3255	3653	2748	75	Pass
0.3339	3418	2612	76	Pass
0.3423	3140	2434	77	Pass
0.3507	2935	2291	78	Pass
0.3590	2706	2131	78	Pass
0.3674	2494	2024	81	Pass
0.3758	2334	1929	82	Pass
0.3842	2136	1832	85	Pass
0.3926	1984	1767	89	Pass
0.4009	1840	1665	90	Pass
0.4093	1706	1572	92	Pass
0.4177	1586	1500	94	Pass
0.4261	1443	1421	98	Pass
0.4345	1331	1355	101	Pass
0.4429	1243	1290	103	Pass
0.4512	1149	1219	106	Pass
0.4596	1088	1160	106	Pass
0.4680	1020	1073	105	Pass
0.4764	950	1007	105	Pass
0.4848	890	954	107	Pass
0.4931	825	899	108	Pass
0.5015	765	836	109	Pass
0.5099	726	779	107	Pass
0.5183	675	717	106	Pass
0.5267	629	647	102	Pass
0.5351	589	583	98	Pass
0.5434	554	521	94	Pass
0.5518	507	457	90	Pass
0.5602	469	394	84	Pass
0.5686	428	340	79	Pass
0.5770	389	292	75	Pass
0.5854	356	247	69	Pass
0.5937	329	218	66	Pass
0.6021	298	179	60	Pass
0.6105	272	158	58	Pass
0.6189	245	140	57	Pass
0.6273	219	126	57	Pass
0.6356	199	114	57	Pass
0.6440	173	99	57	Pass
0.6524	153	88	57	Pass
0.6608	132	81	61	Pass
0.6692	119	67	56	Pass
0.6776	105	61	58	Pass
0.6859	95	55	57	Pass
0.6943	84	49	58	Pass
0.7027	75	42	56	Pass
0.7111	69	39	56	Pass
0.7195	61	29	47	Pass
0.7278	54	15	27	Pass
0.7362	46	3	6	Pass
0.7446	39	2	5	Pass

0.7530	31	1	3	Pass
0.7614	25	0	0	Pass
0.7698	22	0	0	Pass
0.7781	20	0	0	Pass
0.7865	17	0	0	Pass
0.7949	14	0	0	Pass
0.8033	12	0	0	Pass
0.8117	10	0	0	Pass
0.8201	7	0	0	Pass
0.8284	7	0	0	Pass
0.8368	7	0	0	Pass
0.8452	6	0	0	Pass
0.8536	6	0	0	Pass
0.8620	6	0	0	Pass
0.8703	6	0	0	Pass
0.8787	6	0	0	Pass
0.8871	5	0	0	Pass
0.8955	5	0	0	Pass
0.9039	5	0	0	Pass
0.9123	5	0	0	Pass
0.9206	5	0	0	Pass
0.9290	5	0	0	Pass
0.9374	5	0	0	Pass
0.9458	4	0	0	Pass
0.9542	4	0	0	Pass
0.9625	3	0	0	Pass
0.9709	3	0	0	Pass
0.9793	3	0	0	Pass
0.9877	3	0	0	Pass
0.9961	3	0	0	Pass
1.0045	3	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.898 **acre-feet**
On-line facility target flow: 1.0732 **cfs.**
Adjusted for 15 min: 1.0732 **cfs.**
Off-line facility target flow: 0.5946 **cfs.**
Adjusted for 15 min: 0.5946 **cfs.**

Perlnd and Implnd Changes

No changes have been made.



Stage Frequency (feet)	1001
2 Year =	4.1554
5 Year =	5.4459
10 Year =	6.1957
25 Year =	7.0451
50 Year =	7.6178
100 Year =	8.1467

Annual Peaks	
1949	3.0372
1950	4.6609
1951	6.6693
1952	2.4515
1953	3.7316
1954	3.8158
1955	3.5907
1956	5.2782
1957	3.7441
1958	4.2391
1959	3.0113
1960	6.0189
1961	4.7080
1962	2.3289
1963	3.9500
1964	4.2343
1965	5.1333
1966	3.4712
1967	4.3446
1968	3.6172
1969	3.4473
1970	3.9024
1971	4.0610
1972	6.0468
1973	5.1342
1974	4.1554
1975	3.2792
1976	3.8276

4.2 Water Quality Treatment Design Analysis

A combined detention and wet vault is proposed for the treatment of runoff from pollution generating surfaces (PGIS). As shown in Section 4.1 the WWHM analysis indicates a required wet vault volume of 0.90 ac.ft.

4.3 Conveyance System Analysis & Design

See attached Conveyance System calculations.

CONVEYANCE SYSTEM ANALYSIS AND SIZING TABLE USING THE RATIONAL METHOD - 25 YR (UPSTREAM)

Location		Pervious		Impervious		Area	C	C*A	Sum	T_C	i_{100}	I_{100}	Q_{100}	Pipe	Typ.	Slope	Q_F	V	V	L	T_t	Depth	d/Diam	Tc Sub
From	To	(AC)	C	(AC)	C	(ac)			C*A	(Min.)			(c.f.s.)	(in.)	n	(ft./ft.)	(Full)	(Full)	(at Q_{100})	(ft.)	(Min.)			
A40	A38	0.12	0.6	0.00	0.6	0.12	0.60	0.07	---	5.0	0.9	3.07	0.21	12	0.014	0.0389	6.5	8.3	3.8	37	0.2	0.12	0.12	5.00
A39	A38	0.04	0.6	0.00	0.6	0.04	0.60	0.02	---	5.0	0.9	3.07	0.06	12	0.014	0.0223	5.0	6.3	2.1	25	0.2	0.08	0.08	5.00
A38	A36	0.04	0.6	0.00	0.6	0.04	0.60	0.02	0.11	5.2	0.9	3.00	0.33	12	0.014	0.0210	4.8	6.1	3.5	121	0.6	0.18	0.18	5.00
A37	A36	0.07	0.6	0.00	0.6	0.07	0.60	0.04	---	5.0	0.9	3.07	0.12	12	0.014	0.0191	4.6	5.8	2.5	25	0.2	0.11	0.11	5.00
A36	A33	0.31	0.6	0.00	0.6	0.31	0.60	0.19	0.34	5.8	0.9	2.81	0.96	12	0.014	0.0230	5.0	6.4	4.9	52	0.2	0.30	0.30	5.00
A35	A34	0.05	0.6	0.00	0.6	0.05	0.60	0.03	---	5.0	0.9	3.07	0.09	12	0.014	0.0076	2.9	3.7	1.7	25	0.3	0.12	0.12	5.00
A34	A33	0.02	0.6	0.00	0.6	0.02	0.60	0.01	0.04	5.3	0.9	2.97	0.12	12	0.014	0.0077	2.9	3.7	1.8	51	0.5	0.14	0.14	5.00
A33	A31	0.03	0.6	0.00	0.6	0.03	0.60	0.02	0.4	6.0	0.8	2.74	1.10	12	0.014	0.0197	4.7	5.9	4.9	187	0.6	0.33	0.33	5.00
A32	A31	0.67	0.6	0.00	0.6	0.67	0.60	0.40	---	5.0	0.9	3.07	1.23	12	0.014	0.0118	3.6	4.6	4.2	25	0.1	0.40	0.40	5.00
A31	A19	0.46	0.6	0.00	0.6	0.46	0.60	0.28	1.08	6.6	0.8	2.57	2.78	12	0.014	0.0843	9.6	12.3	10.6	72	0.1	0.37	0.37	5.00
A30	A28	0.21	0.6	0.00	0.6	0.21	0.60	0.13	---	5.0	0.93	3.07	0.40	12	0.014	0.0489	7.3	9.3	5.0	41	0.1	0.16	0.16	5.00
A29	A28	0.19	0.6	0.00	0.6	0.19	0.60	0.11	---	5.0	0.9	3.07	0.34	12	0.014	0.0161	4.2	5.4	3.2	62	0.3	0.19	0.19	5.00
A28	A26	0.28	0.6	0.00	0.6	0.28	0.60	0.17	0.41	5.3	0.90	2.97	1.22	12	0.014	0.0199	4.7	6.0	5.0	241	0.8	0.35	0.35	5.00
A27	A26	0.31	0.6	0.00	0.6	0.31	0.60	0.19	---	5.0	0.93	3.07	0.58	12	0.014	0.0122	3.7	4.7	3.4	25	0.1	0.27	0.27	5.00
A26	A23	0.68	0.6	0.00	0.6	0.68	0.60	0.41	1.01	6.1	0.82	2.71	2.74	12	0.014	0.0142	4.0	5.0	5.4	56	0.2	0.61	0.61	5.00
A25	A24	0.03	0.6	0.00	0.6	0.03	0.60	0.02	---	5.0	0.93	3.07	0.06	12	0.014	0.0061	2.6	3.3	1.4	25	0.3	0.11	0.11	5.00
A24	A23	0.03	0.6	0.00	0.6	0.03	0.60	0.02	0.04	5.3	0.90	2.97	0.12	12	0.014	0.0054	2.4	3.1	1.6	55	0.6	0.15	0.15	5.00
A23	A21	0.33	0.6	0.00	0.6	0.33	0.60	0.20	1.25	6.3	0.80	2.64	3.30	15	0.014	0.0052	4.3	3.5	3.9	174	0.7	0.82	0.65	5.00
A22	A21	0.09	0.6	0.00	0.6	0.09	0.60	0.05	---	5.0	0.93	3.07	0.15	12	0.014	0.0611	8.2	10.4	4.0	25	0.1	0.09	0.09	5.00
A21	A19	0.35	0.6	0.00	0.6	0.35	0.60	0.21	1.51	7.0	0.75	2.48	3.74	15	0.014	0.0085	5.5	4.5	4.8	35	0.1	0.75	0.60	5.00
A20	A19	0.35	0.6	0.00	0.6	0.35	0.60	0.21	---	5.0	0.93	3.07	0.64	12	0.014	0.0406	6.7	8.5	5.4	151	0.5	0.21	0.21	5.00
A19	A17	0.04	0.6	0.00	0.6	0.04	0.60	0.02	2.82	7.1	0.74	2.44	6.88	15	0.014	0.0382	11.8	9.6	10.0	104	0.2	0.69	0.55	5.00
A18	A17	0.43	0.6	0.00	0.6	0.43	0.60	0.26	---	5.0	0.93	3.07	0.80	12	0.014	0.0794	9.3	11.9	7.3	25	0.1	0.20	0.20	5.00
A17	A12	0.06	0.6	0.00	0.6	0.06	0.60	0.04	3.12	7.3	0.73	2.41	7.52	15	0.014	0.0750	16.5	13.4	13.1	80	0.1	0.59	0.47	5.00
A16	A15	0.03	0.6	0.00	0.6	0.03	0.60	0.02	---	5.0	0.93	3.07	0.06	12	0.014	0.0122	3.7	4.7	1.7	25	0.2	0.09	0.09	5.00
A15	A13	0.03	0.6	0.00	0.6	0.03	0.60	0.02	0.04	5.2	0.91	3.00	0.12	12	0.014	0.0050	2.3	3.0	1.6	90	1.0	0.15	0.15	5.00
A14	A13	0.33	0.6	0.00	0.6	0.33	0.60	0.20	---	5.0	0.93	3.07	0.61	12	0.014	0.0102	3.4	4.3	3.2	25	0.1	0.29	0.29	5.00
A13	A12	0.25	0.6	0.00	0.6	0.25	0.60	0.15	0.39	6.2	0.81	2.67	1.04	12	0.014	0.0049	2.3	3.0	2.9	61	0.4	0.47	0.47	5.00

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A12	A10	0.05	0.6	0.00	0.6	0.05	0.60	0.03	3.54	7.4	0.72	2.38	8.43	15	0.014	0.0470	13.0	10.6	11.3	43	0.1	0.73	0.59	5.00
A11	A10	0.36	0.6	0.00	0.6	0.36	0.60	0.22	---	5.0	0.93	3.07	0.68	12	0.014	0.0333	6.1	7.7	5.1	158	0.5	0.23	0.23	5.00
A10	A7	0.37	0.6	0.00	0.6	0.37	0.60	0.22	3.98	7.5	0.72	2.38	9.47	15	0.014	0.0867	17.7	14.4	14.7	240	0.3	0.65	0.52	5.00
A9	A7	0.36	0.6	0.00	0.6	0.36	0.60	0.22	---	5.0	0.93	3.07	0.68	12	0.014	0.0319	5.9	7.5	5.0	159	0.5	0.23	0.23	5.00
A8	A7	0.59	0.6	0.00	0.6	0.59	0.60	0.35	---	5.0	0.93	3.07	1.07	12	0.014	0.0428	6.9	8.7	6.4	25	0.1	0.27	0.27	5.00
A7	A5	0.77	0.6	0.00	0.6	0.77	0.60	0.46	5.01	7.8	0.70	2.31	11.57	15	0.014	0.0976	18.8	15.3	16.1	245	0.3	0.71	0.57	5.00
A6	A5	0.68	0.6	0.00	0.6	0.68	0.60	0.41	---	5.0	0.93	3.07	1.26	12	0.014	0.0407	6.7	8.5	6.5	25	0.1	0.29	0.29	5.00
A5	A2	1.02	0.6	0.00	0.6	1.02	0.60	0.61	6.03	8.1	0.68	2.24	13.51	15	0.014	0.1104	20.0	16.3	17.5	23	0.0	0.75	0.60	5.00
A3	A4	0.23	0.6	0.00	0.6	0.23	0.60	0.14	---	5.0	0.93	3.07	0.43	12	0.014	0.0118	3.6	4.6	3.1	26	0.1	0.23	0.23	5.00
A4	A2	0.08	0.6	0.00	0.6	0.08	0.60	0.05	0.19	5.1	0.92	3.04	0.6	12	0.014	0.0061	2.6	3.3	2.7	50	0.3	0.32	0.32	5.00
A2	A1	0.01	0.6	0.00	0.6	0.01	0.60	0.01	6.23	8.1	0.68	2.24	13.96	24	0.014	0.0092	20.2	6.4	6.9	16	0.0	1.22	0.61	5.00
A1	VAULT	0.00	0.6	0.00	0.6	0.00	0.90	0.01	6.24	8.1	0.68	2.24	13.98	24	0.014	0.0144	25.3	8.0	8.2	12	0.0	1.06	0.53	5.00
SUBBASIN AREA =		10.35 ACRES						R	25	P_{25}	3.3	**Calcs. by: MB**												

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4.4 On-Site Stormwater Management

The proposal is for a Preliminary Plat to provide 50 lots, including 47 single family lots, and five (5) affordable housing units (two 50% market rate duplexes and one cottage unit) on three of the lots, for a total of 50 units. Project will include: lots, public roads with curbs, gutters, and sidewalks; a private road (Tract) with an access easement (serving 8-9 lots); six roadway connections to adjacent existing or proposed public rights-of-ways to neighboring subdivisions and roadway systems; frontage improvements; open space (combination of development wide and lot-by-lot); a sensitive area tract (including buffer reduction and buffer averaging of 425 square feet); a five foot landscape areas/buffers along the perimeter of the site (per North Redmond Neighborhood requirements); and a stormwater tract with an underground stormwater vault. See the *Developed Conditions Map* (Figure 3).

Stormwater flow control for the proposed project will be provided by an underground detention vault. Runoff from the site will be directed to the proposed detention vault for water quality and quantity treatment prior to discharge to the existing stormwater conveyance system within 176th Ave. N.E. Stormwater discharge rates will be maintained at the existing rates, as required by Minimum Requirement #5.

4.5 Site Assessment for LID

The following project specific information is provided in association with the Edgewood West Preliminary Plat.

Site Assessment is a component of project design review and therefore, any additional design considerations and / or additional information will be provided during Combined Civil Engineering Design Review, subsequent to preliminary plat approval. Site Assessment for LID is not a required element of the PREP Subdivision process for Preliminary Plats.

Site Assessment elements as described in the *City of Redmond Stormwater Technical Notebook (2012)* are listed below with references to technical support documents, plans and other project specific materials:

1. A survey prepared by a registered land surveyor showing existing public and private development, including utility infrastructure, on and adjacent to the site, major and minor hydrologic features, including seeps, springs, closed depression areas, drainage swales, and 2 foot contours up to 10 percent slope and 5 foot contours for slopes above 10 percent.
   Spot elevations shall be at 25 foot intervals.
   - See the Existing Conditions Map (Exhibit 2) contained in this report; AND the Existing Conditions and Site Plan Survey Notes and Control plan sheets (EC-1 thru EC-7 and SP-1) in the subject Edgewood West Preliminary Plat PREP plan set dated February 2015 submitted under separate cover.

2. Location of all existing lot lines, lease areas and easements.
   - See the Site Plan – Survey Notes and Control (SP-1) in the subject Edgewood West Preliminary Plat PREP plan set dated February 2015 submitted under separate cover.

3. A soils report prepared by a licensed geotechnical engineer or licensed engineering geologist. The report shall identify:

   a. Underlying soils on the site utilizing soil pits and soil grain analysis to assess infiltration capability on site. The frequency and distribution of test pits shall be adequate to direct placement of the roads and structures away from soils that can most effectively infiltrate stormwater;
   - See the Preliminary Geotechnical Report prepared by Terra Associates, Inc. dated April 21, 2014 – Revised January 15, 2015 contained in Appendix B of this report

   b. Percolation tests if appropriate or requested by the Stormwater Engineer;
   - Not Applicable

   c. Topographic and geologic features that may act as natural stormwater storage or conveyance and underlying soils that provide opportunities for storage and partial infiltration;
   - See the Preliminary Geotechnical Report prepared by Terra Associates, Inc. dated April 21, 2014 – Revised January 15, 2015 contained in Appendix B of this report. Specifically, Page 9, Section 5.8. Infiltration.
   - See the Terra Associates Inc. Response to Review Comments – Stormwater Review comment dated February 4, 2015 (Appendix C).
   - Based on native glacial till soils composed of silty sand that characteristically exhibit low permeability, the soils on this site would not be suitable receptor soil for infiltration.

d. Depth to wet season high groundwater;
   - See the Preliminary Geotechnical Report prepared by Terra Associates, Inc. dated April 21, 2014 – Revised January 15, 2015 contained in Appendix B of this report. Specifically, Page 2, Section 3.3 –Groundwater.
   - See the Test Pit TP-10 Fill Area Delineation Memo prepared by Terra Associates, Inc. dated December 30, 2014.
   - See response to review comments by Terra Associates, Inc. dated February 4, 2015 (Appendix C).

e. Geologic hazard areas and associated buffer requirements as defined in RZC 21.64.060;
   - See the Preliminary Geotechnical Report prepared by Terra Associates, Inc. dated April 21, 2014 – Revised January 15, 2015 contained in Appendix B of this report.
   - See the attached City of Redmond Maps including Erosion, Landslide, and Seismic Hazard Areas (Chapter 2 of this report).

f. Distance from site boundaries to any areas within 200 feet of the site identified as landslide hazard areas or having a slope of 40 percent or steeper with a vertical relief of 10 feet or more;
   - No landslide hazard areas are located within 200 feet of the site according to the City of Redmond Landslide Hazard Areas Maps (see Chapter 2 of this report).
   - None of the geologic, topographic or hydrogeologic factors associated with landslide hazard areas are present on the Project Site. See the Preliminary Geotechnical Report prepared by Terra Associates, Inc. dated April 21, 2014 – Revised January 15, 2015 contained in Appendix B of this report.

g. Identification of Wellhead Protection Zone(s); and
   - See the Critical Aquifer Recharge Area Report prepared by Terra Associates, Inc dated October 17, 2014 contained in Appendix C of this report.

h. For previously cleared or graded sites, analysis of topsoil according to the soil requirements in the City of Redmond Standard Specifications, Section 9.14.1.
   - Not Applicable.

4. A survey of existing native vegetation cover and wildlife habitat by a qualified biologist identifying any forest areas on the site, species and condition of ground cover and shrub layer, and tree species, seral stage, and canopy cover.
   - See the Critical Area Report prepared by Raedeke dated November 19, 2014.
   - A Supplemental Tree Assessment Report is in the process of being prepared by Susan Prince, ISA Certified Arborist, and will be submitted with the 90% plan submittal.

5. A streams, wetland, and water body survey and classification report by a qualified biologist showing wetland and buffer boundaries consistent with the requirements of RZC 21.64.030 and Critical Areas Reporting Requirements (RZC Appendix 1).
   - See the Critical Area Report prepared by Raedeke dated November 19, 2014.

6. Flood hazard areas on or adjacent to the site.
   - No flood hazard areas exist on site.
   - See the attached City of Redmond Map - Frequently Flooded Areas (Chapter 2 of this report).

7. A preliminary drainage report providing analysis of the existing site hydrologic conditions on the site and recommendations for type, location, and restrictions on LID BMPs.
   - See Chapter 4 of this Preliminary Stormwater Report.

8. Other studies as deemed necessary by the Stormwater Engineer.
   - See the Terra Associates, Inc. Response to Review Comments dated February 4, 2015 including a water balance, and Phase I Environmental Site Assessment (May 8, 2014).

5.0 Construction Stormwater Pollution Prevention - SWPPP

The Stormwater Pollution Prevention Plan (SWPPP) will be submitted during the Coordinated Civil Design Review phase in compliance with the City standards.

Stormwater LID BMPs
Redmond North Neighborhood
PREP – Subdivision 90% Submittal

The City of Redmond Stormwater Technical Notebook Chapter 8.7.4 identifies seven On-Site Stormwater LID BMPs for consideration during development. The Stormwater LID BMPs below have been evaluated for application on the Edgewood West project site. See the individual evaluation responses to each LID BMP provided below:

ON-SITE STORMWATER LID BMPs:

1. **Permeable Pavement**
   Permeable pavement is not a feasible option for this project due to the site soils condition which consist of glacial till soils composed of silty sand which characteristically exhibit low permeability.

2. **Dispersion**
   Dispersion of stormwater is not feasible for the project due to site topography and the required road layout for neighborhood connectivity. These site constraints limit the availability of required flow path length to be considered for dispersion.

3. **Vegetated Rooftops**
   Vegetated rooftops may be considered at the time of home construction.

4. **Rainwater Harvesting**
   Per the Washington State DOE Stormwater Management Manual for Western Washington, the required design criteria for rainwater harvesting is 100% reuse of the average annual runoff volume. The extremely large required storage volume is financially infeasible.

5. **Reverse Slope Sidewalks**
   Reverse slope sidewalks, which would discharge stormwater onto adjacent lots is not feasible due the site soil conditions, see Item No. 1.

6. **Minimal Excavation Foundations**
   The site is proposed to be mass-grading to provide buildable lot pads, therefore minimal excavation foundations would not provide any benefit.

7. **Biorention**
   Biorention on the proposed lots is not feasible due to the site soil conditions, see Item No. 1.

Section 6.0 Special Reports and Studies

Special studies prepared and submitted in association with the PREP Preliminary Plat process include:

- Wetland Report, Raedeke and Associates, Inc., November 19, 2014
- Wetland Report, Raedeke and Associates, Inc., November 19, 2014
  (Updated Wetland Determination forms included - January 6, 2015)
- Preliminary Geotechnical Report, Terra Associates, Inc., April 21, 2014
- Preliminary Geotechnical Report, Terra Associates, Inc., April 21, 2014
  (Revised January 15, 2015)
- Memo – Test Pit TP-10 Fill Area Delineation, Terra Associates, Inc., December 30, 2014.
- Critical Aquifer Recharge Area Report, Terra Associates, Inc., October 17, 2014
- Response to Review Comments, Terra Associates, Inc., February 4, 2015.
- Phase I Environmental Site Assessment, Terra Associates, Inc., May 8, 2014.
- Pre- Development Hydrologic Modeling Plan - Technical Memorandum, Raedeke and Associates, Inc., March 30, 2015.

Section 7.0 Other Permits

Other Permits anticipated with this project include but are not limited to:

- Preliminary Plat Approval
- Final Plat Approval
- Individual Building Permits
- Right-of-Way Use Permits
- NPDES
- Forest Practice Permit (if applicable)
- Road Variances (if applicable)

Section 8.0 Temporary Erosion and Sediment Control

The Temporary Erosion and Sediment Control plans will be prepared and submitted during the Coordinated Civil Design Review phase in compliance with the City standards.

Section 9.0 Operations and Maintenance Manual

An Operations and Maintenance Manual will be submitted during the Coordinated Civil Design Review phase in compliance with the City standards.

APPENDIX A

Wetland Report, Raedeke and Associates, Inc., November 19, 2014

Updated Wetland Determination forms were included at the front of Appendix A (January 6, 2015). The report date remained the same.

Attachment 21

CRITICAL AREAS REPORT

Edgewood West Preliminary Plat

Redmond, Washington

November 19, 2014

RAEDEKE ASSOCIATES, INC.

Report To:	Mr. Corey Watson Quadrant Homes 14725 SE 36th Suite 100 Bellevue WA 98006
Title:	Critical Areas Report Edgewood West Preliminary Plat Redmond, Washington
Project Number:	2013-036-002
Prepared by:	RAEDEKE ASSOCIATES, INC. 9510 Stone Avenue North Seattle, Washington, 98103 (206) 525-8122
Date:	November 19, 2014

Project Manager:	Christopher W. Wright, B.S. Principal / Wetland Ecologist
Project Personnel:	Richard W. Lundquist, M.S. Vice President/ Wildlife Biologist
	Anne Cline, P.L.A. Landscape Architect

Submitted by:

_____
Signature

Christopher W. Wright
Printed Name

November 19, 2014

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1.0 INTRODUCTION

1.1 PURPOSE

Raedeke Associates, Inc. was retained by Quadrant Homes to provide a critical areas evaluation of the proposed Edgewood West project site, including a wetland delineation and wildlife habitat evaluation. The report presents the findings of our background information review, June 6, 2013 April 2, 2014, and May 28, 2014 site investigations of the project site, and associated avoidance, minimization and mitigation measures related to the site wetland and buffer. The report follows the City of Redmond critical areas reporting requirements (City of Redmond 2014). The report also provides a summary of mitigation measures that are to be implemented to compensate for identified impacts to the wetland buffer.

1.2 PROJECT LOCATION

The Edgewood West project area is an approximately 11.5-acre irregularly shaped parcel located along the east side of 172nd Avenue NE, north of NE 120th Way in the City of Redmond, Washington. This places the property in a portion of Section 25, Township 26 North, Range 5 East, W.M. (Figure 1). Parcel maps retrieved from King County (2014) iMap depict the property boundaries.

1.3 PROJECT DESCRIPTION

The proposed Edgewood West project would involve developing the parcel into 51 single-family residential lots. Primary access to the lots would be provided by extending NE 122nd Street between 172nd Avenue NE and 176th Avenue NE. Buffer averaging is proposed along the margins of the wetland located in the western portion of the site. The proposed site plan and buffer averaging plan are provided in Figure 4.

2.0 METHODS

2.1 DEFINITIONS AND METHODOLOGIES

Wetlands and streams are protected by federal law as well as by state and local regulations. Federal law (Section 404 of the Clean Water Act) prohibits the discharge of dredged or fill material into "Waters of the United States," including certain wetlands, without a permit from the U.S. Army Corps of Engineers (COE 2012). The COE makes the final determination as to whether an area meets the definition of a wetland and whether the wetland is under their jurisdiction.

2.1.1 Wetland Investigation

The COE wetland definition was used to determine if any portions of the project area could be classified as wetland. A wetland is defined as an area "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Register 1986:41251).

We based our investigation upon the guidelines of the U. S. Army Corps of Engineers (COE) Wetlands Delineation Manual (Environmental Laboratory 1987) and subsequent amendments and clarifications provided by the COE (1991a, 1991b, 1992, 1994), as updated for this area by the regional supplement to the COE wetland delineation manual for the Western Mountains, Valleys, and Coast Region (COE 2010). The COE wetlands manual is required by state law (WAC 173-22-035, as revised) for all local jurisdictions, including the City of Redmond. Hydrophytic vegetation is defined as "macrophytic plant life growing in water, soil or substrate that is at least periodically deficient in oxygen as a result of excessive water content" (Environmental Laboratory 1987). The U.S. Army Corps of Engineers National Wetland Plant List wetland indicator status (WIS) ratings were used to make this determination (Lichvar and Kartesz 2009). The WIS ratings "reflect the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in wetland versus non-wetland across the entire distribution of the species" (Reed 1988:8). Plants are rated, from highest to lowest probability of occurrence in wetlands, as obligate (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and upland (UPL), respectively. In general, hydrophytic vegetation is present when the majority of the dominant species are rated OBL, FACW, and FAC.

A hydric soil is defined as "a soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register 1995: 35681). The morphological characteristics of the soils in the study area were examined to determine whether any could be classified as hydric.

According to the 1987 methodology, wetland hydrology could be present if the soils were saturated (sufficient to produce anaerobic conditions) within the majority of the rooting zone (usually the upper 12 inches) for at least 5% of the growing season, which in this area is usually at least 2 weeks (COE 1991a). It should be noted, however, that areas having saturation to the surface between 5% and 12% of the growing season may or may not be wetland (COE 1991b). Depending on soil type and drainage characteristics, saturation to the surface would occur if

water tables were shallower than about 12 inches below the soil surface during this time period. Positive indicators of wetland hydrology include direct observation of inundation or soil saturation, as well as indirect evidence such as drift lines, watermarks, surface encrustations, and drainage patterns (Environmental Laboratory 1987). Hydrology was further investigated by noting drainage patterns and surface water connections between wetlands and streams within and adjacent to the project area.

2.2 BACKGROUND RESEARCH

2.2.1 Wetlands

In preparation for our site investigation, we collected and analyzed background information available for the site prior to the on-site investigation. We collected maps and information from the U.S.D.A Natural Resources Conservation Service (2014) Web Soil Survey and U.S. Fish and Wildlife Service (USFWS 2014) National Wetland Inventory on-line mapper, and the King County (2014) iMap.

The King County (2013) iMap revealed a mapped palustrine, forested wetland occupying the western one-third of the Edgewood West property, based on previous mapping by the USFWS National Wetland Inventory (Figure 2). The USDA NRCS (2014) Soil maps list the entirety of the property as having Alderwood series soil, a non-hydric soil.

2.2.2 Wildlife

We also accessed the online priority habitats and species (PHS) database maintained by Washington Department of Fish and Wildlife (WDFW 2014a) for documented information on the potential occurrence of federal- or state-listed endangered, threatened, sensitive, candidate, other priority, or monitor wildlife species (hereafter "species of concern"), or priority habitats on the project site and vicinity. State priority species are defined as those fish and wildlife species "requiring protective measures and/or management actions to ensure their survival", and State priority habitats are defined as habitat types "with unique or significant value to many species" (WDFW 2008). We also reviewed database information maintained by the Washington Natural Heritage Program (2014) for occurrence of endangered, threatened, and sensitive plants in the vicinity of the project site.

Reference lists maintained by WDFW (2008) were consulted for information on the status of wildlife species of concern that could use the site during at least some part of the year. Species accounts and management recommendations provided by WDFW (e.g., Rodrick and Milner 1991, Larsen 1997, Azerrad 2004, Larsen et al. 2004) were consulted to determine habitat associations of such species and to evaluate the likelihood of their occurrence on the project site. During the field investigation, we searched for the presence of these species, or signs thereof, which could be found on the property.

The WDFW (2014) PHS database map shows no occurrences of species of concern, including endangered, threatened, sensitive, or other priority species or habitats on or adjacent to the project site. The City of Redmond's (2005) map of core preservation areas shows no mapped fish and wildlife habitat conservation areas on the project site or immediate vicinity. The Washington Natural Heritage Program (2014) database contains no records of Natural Heritage

Features (e.g., listed plant species or Natural Heritage wetlands) in the section in which the project site occurs.

2.3 FIELD RECONNAISSANCE

2.3.1 Wetlands

An initial field reconnaissance was conducted on June 6, 2013 to search the site for the presence of wetlands and streams and characterize general site conditions. A second visit was conducted on April 2, 2014 in response to City of Redmond concerns that there were wetland areas on the site that had not been identified. A third visit to the site with City and WDOE staff, on May 28, 2014 resulted in the delineation of a small wetland located in the western portion of the site.

Vegetation, soils, and hydrology were examined in representative portions of the study area according to the procedures described in the Regional Supplement (COE 2010). Plant communities were inventoried, classified, and described during our field investigation. We estimated the percent coverage of each species. Plant identifications were made according to standard taxonomic procedures described in Hitchcock and Cronquist (1976), with nomenclature as updated by the U.S. Army Corps of Engineers National Wetland Plant List (Lichvar and Kartesz 2009). Wetland classification follows the USFWS wetland classification system (Cowardin et al. 1992). We determined the presence of a hydrophytic vegetation community using the procedure described in the Regional Supplement (COE 2010), which requires the use of the dominance test, unless positive indicators of hydric soils and wetland hydrology are also present, in which case the prevalence index or the use of other indicators of a hydrophytic vegetation community as described in the Regional Supplement (COE 2010) may also be required.

We excavated pits to at least 18 inches below the soil surface, where possible, in order to describe the soil and hydrologic conditions throughout the study area. We sampled soil at locations that corresponded with vegetation sampling areas and potential wetland areas. Soil colors were determined using the Munsell Soil Color Chart (Munsell Color 2009). We used the indicators described in the Regional Supplement (COE 2010) to determine the presence of hydric soils and wetland hydrology.

2.3.2 Wildlife

During the field investigations, we documented wildlife presence, sign, and habitat while inventorying and describing plant communities. We recorded information regarding reproduction, habitat use, and activities of all wildlife species observed. In addition, we noted special habitat features such as large and/or hollow trees, snags [standing dead or partly dead trees at least 4 inches diameter at breast height (dbh) and 6 feet tall], and large down logs. Historic and present land-use of the site and immediate vicinity were noted from direct observations in the field and analysis of aerial photographs.

During our field surveys, we also searched specifically for the presence, sign, or habitats of any wildlife species of concern that may occur on the project site or vicinity. In particular, we

searched for the presence of large stick-type nests, hollow trees, tree cavities, and pileated woodpecker foraging sign. Large stick nests are built and used by several species of concern, including bald eagles and great blue herons. Tree cavities are created and used by woodpeckers, including species of concern such as the pileated woodpecker, and can provide habitat for a host of bird and mammal species, including species of concern such as purple martins, various cavity-nesting duck species, and various bats. Hollow trees are used as daytime roost for priority species including various bat species, as well as Vaux's swifts.

3.0 EXISTING CONDITIONS

3.1 GENERAL SITE DESCRIPTION

The Edgewood West property is an undeveloped parcel that appears to have been previously used as a single family home and possibly pasture. An access drive enters the site from the northwest corner into a deciduous forest vegetation community. Central portions of the site are primarily shrub community and contain what appears to be a building foundation. The eastern portion of the site contains a mixed coniferous and deciduous forest plant community.

During our site investigation on May 28, 2014 we identified and delineated a wetland on the property.

3.2 WETLAND

Raedeke Associates, Inc. delineated a closed depressional wetland in the western portion of the site on May 28, 2014. The wetland has a black cottonwood (*Populus balsamifera*) canopy over a black hawthorn (*Creatagus douglasii*) shrub layer. Soils are very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) loam and sandy loam with distinct dark yellowish brown (10YR 4/6) mottles. The areas was inundated during our April 2014 site visit and was saturated at 10 inches below the ground surface on May 28, 2014. Sample plot data is presented in Appendix A.

The wetland is a Category IV system according to the Washington Department of Ecology's (WDOE) Wetland Rating System for Western Washington (publication #04-06-025) (Hruby 2004, as revised 2006, and WDOE 2008). The wetland received 27 total points, 9 points for habitat functions.

3.3 SITE HABITAT CONDITIONS

Vegetation in the western part of the site consists of a red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera*) canopy over a shrub layer of Himalayan blackberry (*Rubus ameniacus*), Indian plum (*Oemleria cerasiformis*), and Douglas spirea (*Spirea douglasii*). The central portion of the site has a few scattered red alder trees and is dominated by Himalayan blackberry. The easter portion of the site is a mixed deciduous and coniferous forest dominated by big-leaf maple (*Acer macrophyllum*) and Douglas fir (*Psuedotsuga menzesii*). The understory consisted of dense tall shrub cover that varied in composition, ranging from dense stands of vine maple (*Acer circinatum*) and salmon raspberry (*Rubus spectabilis*), to areas dominated almost exclusively by Himalayan blackberry (*Rubus ameniacus*). Low cover included stinging nettle (*Urtica dioica*), reed canarygrass (*Phalaris arundinacea*), trailing blackberry (*Rubus ursinus*), sword fern (*Polystichum munitum*), and lady fern (*Athyrium filix-femina*).

The soils observed on the site are generally consistent with the Alderwood series mapped for the site, with brown to dark brown (10YR 4/3 to 10YR 4/2) subsoil and without redoximorphic features or any indicators of hydric soil conditions.

We observed at least one snag 30 feet tall and greater than 8 inches in diameter in the eastern portion of the site, as well as a number of downed logs of greater than 6 inches diameter. Woodpecker foraging excavations were also noted on at least one of these features.

3.4 WILDLIFE

3.4.1 Wildlife Use and Observations

A wide variety of wildlife species may be expected to inhabit lowland deciduous or mixed forest communities in the Pacific Northwest, such as that found on the project site. Of the more than 300 vertebrate wildlife species expected to occur in west side forests of Oregon and Washington, over 230 species occur within west side lowland mixed coniferous and deciduous forests (Johnson and O'Neil 2001). A more limited number of species are expected to occur within lowland deciduous or mixed forests of western Washington, particularly King County: over 80 species, nearly 60% of which are birds, about 25% are mammals, and the rest are amphibians and reptiles (King County 1987). The number of species expected to inhabit a particular forest stand depends on its size, landscape context, and surrounding uses. Relatively small stands such as that on the Edgewood West property that are surrounded by urban residential uses, would be expected to support a more limited number of wildlife species. Those that do occur there may be further adversely affected by surrounding human activity and predation or other influences from urban-adapted species (such as crows and starlings), or other invasive species.

We observed relatively few wildlife species or their sign during our field reconnaissance visits. Our field visits were conducted during summer and spring (June, April, and May), during the breeding season for birds. As noted above, we also saw sign of past foraging activity by pileated woodpeckers and other small woodpecker species (likely hairy or downy woodpeckers). The number of species that we observed is also likely limited by the relatively small size of the site and the surrounding suburban land uses. Species observed primarily include those adapted to Puget Sound lowland mixed forest, as well as those that can persist in fragmented forest habitat and/or residential areas.

A variety of other bird species are likely to inhabit the site and vicinity at different times of the year. Many of these are spring and summer residents that migrate out of the area for the fall and winter, as well as year-round residents. We observed no raptors (eagles, hawks, falcons, or owls) during our field reconnaissance, and no raptor nests were found on any of the trees within the site. Most of the larger trees had intact tops and lacked appropriate branching structures to support large raptor nests such as bald eagles.

We observed no mammals or their sign during our field reconnaissance. Several species of small and medium-sized mammals likely use the site, though many are secretive and/or nocturnal and are therefore unlikely to be observed during a general site reconnaissance. The down woody debris was widely scattered the site, and although limited in extent, along with areas of dense areas of shrub and ground cover, provide potential cover and breeding habitat for small mammals. In addition, on-site trees and snags provide potential cover and breeding locations for medium-sized mammals such as raccoons and squirrels. The presence of domestic dogs and cats in the area may limit the suitability of the forest on site, as they can act as highly effective predators on native wildlife species in urban and suburban areas, particularly those that nest or inhabit the ground (Penland 1984, Maestas et al. 2003, Odell and Knight 2001, Leu et al. 2008).

We did not observe any reptiles, amphibians, or their sign during our field reconnaissance, though a small number of species of each group is likely to be present. The minimal amount of down woody debris on the site may limit the number of Puget Sound lowland terrestrial-breeding amphibians that could occupy the site. Amphibians would most likely be expected to center activities to the wetland on site. Potential cover and foraging habitat is present on the site for some reptiles, including garter snakes, and some amphibians.

3.4.2 Endangered, Threatened, Sensitive, or Other Priority Species

We observed no species listed as endangered, threatened, or sensitive within the project site or immediate vicinity, nor are any of these species considered to have a primary association with the project site. As noted above, sign of previous foraging by pileated woodpecker, a state candidate species, was observed in snags on site, but none of this sign appeared to be fresh (i.e., occur since at least this last fall or winter). No snags appeared to be large and tall enough to provide suitable nesting or roosting habitat for pileated woodpeckers. No other priority or other species of concern were observed or likely to occur within the project site.

3.4.3 Wildlife Habitat Movement Corridors and Networks

Wildlife habitat networks or corridors can take different forms, depending on the landscape. Corridors can be in the form of hedgerows or fencerows connecting woodlots in an agricultural landscape. In a fragmented forested landscape, corridors are linear patches of forest or forested riparian zones connecting larger patches of forest. They can also be non-forested linear patches, such as utility easements, or wetland and stream systems, in a landscape that is forested. In an urbanizing environment, open space or native forestland can act as corridors connecting otherwise disjunct habitat for wildlife species.

Corridors can provide (1) habitat for certain species; (2) movement pathways; (3) extensions of foraging ranges for large, wide-ranging species; and (4) escape from predators (Harris 1984, Levenson 1981, Noss 1987, Noss and Harris 1986, Simberloff and Cox 1987). Corridors may also have disadvantages, such as (1) providing conduits for disease, fire, pests, and exotic species; (2) increasing exposure to predation; and, (3) potentially having negative genetic impacts on a population (Noss 1987, Simberloff and Cox 1987).

The Edgewood West property is situated generally within a larger area of residential development. The forested habitat of the site is contiguous with similar forest stands that extend off site to the east, and for a short distance to the north, but are highly fragmented by existing development in the area. Because of the surrounding development, these habitats are relatively isolated from other native habitats within the City of Redmond and therefore do not provide unbroken linkages to other such habitats. This also is evident on the City of Redmond (2005) Fish and Wildlife Habitat Conservation Areas (Core Preservation Areas) map, none of which are located near the site. The site scored a total of 15 points on the City of Redmond Habitat Unit Assessment Form (attached in Appendix C).

4.0 REGULATORY CONSIDERATIONS

4.1 WETLANDS

Wetlands are protected by Section 404 of the Federal Clean Water Act and other state and local policies and ordinances including the City of Redmond (2014) code.

The City of Redmond (2014) regulates wetlands under Chapter 21.64 of its Zoning Code (RZC). The city classifies wetlands as Category I, II, III, or IV based on the Washington Department of Ecology's (WDOE) Wetland Rating System for Western Washington (publication #04-06-025) (Hruby 2004, as revised 2006, and WDOE 2008). The City of Redmond (2014) determines wetland buffer widths based on their classifications. Standard buffer widths may be modified by averaging or be increased, on a case by case basis by the City of Redmond.

The wetland met criteria for Category IV rating based on a total score for wetland functions of 27 total points. The wetland also had a score of 9 points for habitat functions. The wetland did not meet criteria for Category I rating because it had a total function score of less than 70 points, and it did not have special characteristics such as the presence of old growth or mature forest greater than 1 acre in area or the presence of a bog vegetation community. The WDOE rating form is found in Appendix B.

Under City of Redmond (2014) regulations, Category IV wetlands are provided a buffer of 50, 40 or 25 feet depending upon the intensity of adjoining land use. Because the proposal is to develop the site as a subdivision with density greater than 1 unit per acre the intensity of the adjoining land use is high and a standard 50-foot-wide buffer would be required.

4.2 WILDLIFE

4.2.1 State of Washington

State law provides protections for wildlife species listed as endangered (WAC 232-12-014), as well as threatened, sensitive, or "other protected" species (WAC 232-232-011). Recently, bald eagles have been down-listed to "sensitive" at the State and de-listed at the federal level. However, in Washington, bald eagles are still protected by the Bald Eagle Protection Act of 1984 (RCW 77.12.655), and the Bald Eagle Protection Rules (WAC 232-12-292). The Bald Eagle Protection rules have been recently amended such that state bald eagle management plans are no longer required unless bald eagles are listed as Threatened or Endangered in Washington State.

The WDFW (2012) PHS and HRTG databases show no known nest or roost sites of eagles or other listed raptor species (such as hawks or owls) in the vicinity of the project site. In addition, we found no raptor nests or potentially suitable nest trees on the project site or in the vicinity.

In addition, the WDFW (2008) has developed management recommendations for "species of concern," which include state listed and other priority species, as well as priority habitats. Occurrences or signs of priority species or habitats in the vicinity of the project site are noted above.

4.2.2 City of Redmond

Redmond (2014) regulates wildlife habitat as "Fish and Wildlife Habitat Conservation Areas" (hereafter, FWHCA's) under Chapter 21.64 of its Zoning Code (RZC). The Redmond Zoning Code generally identifies the following as FWHCA's: (1) federal endangered and threatened species, (2) state endangered, threatened, sensitive, and state candidate species, (3) WDFW priority habitats and species, (4) Habitats and Species of Local Importance, which in Redmond are identified as great blue herons, (5) natural ponds less than 20 acres in size, (6) waters of the state, (7) lakes, ponds, streams, and rivers planted with game fish, and (8) land essential for preserving connections between habitat blocks and open spaces.

As noted above, no federal or state endangered, threatened, or sensitive species were observed on site, nor are they considered to inhabit or have a primary association with the site. The only terrestrial priority species known to occur on site was the pileated woodpecker (a state candidate species), primarily from foraging excavations that appeared to be relatively old. No fresh sign was observed, and none of the snags found on site appeared to be large enough to provide suitable nesting habitat for this species. We found no evidence of use of the site by great blue herons, which are identified as a species of local importance by the City.

5.0 IMPACTS

The following discussion of wetland impacts below is based on our review of site plans provided to us by H.G. Goldsmith and Associates, Inc, received September 29, 2014.

5.1 IMPACTS TO VEGETATION

Residential housing and an associated access road would be developed across the property. The proposed development would remove most of the forest habitat, as well as the open shrub area, on the site. The wetland and averaged buffer would be retained in the western portion of the property. Thus, no direct impact to the wetland would occur as a result of the proposed development. The proposed development would thus increase fragmentation of the remaining forest habitat and increase the amount of artificial edges with adjoining single-family residential areas.

5.2 IMPACTS TO WILDLIFE

Direct alteration (reduction) to the distribution, composition, and amount of native vegetation resulting from the proposed residential development would affect the distribution and composition of native wildlife on the property. In addition, indirect impacts to habitat retained on-site would make it less suitable for some species of wildlife currently inhabiting the site.

Upon completion, the proposed residential development would reduce the forest habitat available for native wildlife on the site. This would reduce the local populations of most native species on the property. Grading and construction activities associated with the proposed development, as well as increased levels of human activity on-site, would also result in increased short- and long-term disturbance to wildlife species using the retained habitat areas. This would further reduce the suitability of the on-site habitats to some wildlife species, particularly those vulnerable to predation by domestic cats and dogs (Penland 1984). Some species adapted to urban environments and fringes, including many non-native plant and animal species, would find suitable habitat on-site, and may become established and/or increase in numbers. Some species less adapted for urban environments, however, would be expected to decrease in numbers, and some wildlife species may be eliminated from the site entirely.

Impacts to Endangered, Threatened, Sensitive, or Other Priority Species or Habitats

Because endangered, threatened, and sensitive wildlife species are not known or likely to occur on or in the site or have a primary association with any impacted habitats, no impacts to these species are expected. The proposed development is not expected to have a substantial adverse impact on pileated woodpeckers, however, as they do not appear to be foraging there currently, and none of the snags on site appear to be suitable for nesting or roosting. In addition, the Edgewood West property is small compared to the large home ranges (more than a square mile) typically occupied by pileated woodpeckers (Lewis and Azerrad 2004), and thus does not likely represent a significant portion of the habitat areas used by pileated woodpeckers in the vicinity. No other terrestrial priority species, or species of local importance, are known or likely to inhabit the site. Thus, the proposed development would not adversely affect such species.

The proposed site plan would retain the Category IV wetland and buffer as native open space. The site contains no other habitats designated as fish and wildlife conservation areas, so the proposed development would not affect such habitats. Consequently, no habitats or habitat features known or suspected to be used by other priority species or species of local importance would be affected by the proposed site plan.

5.3 Impacts to the Wetland Buffer

The wetland and an averaged buffer would be retained in the western portion of the property. Thus, no direct impact to the wetland would occur as a result of the proposed development.

The proposed site plan includes a minor amount of buffer averaging to the required wetland buffers to accommodate lot clearing and grading (Figure 4). The proposed buffer encroachment totals 425 square feet primarily along the northern and southern portions of the wetland for roadways. As compensation, an additional 425 square feet of buffer would be provided along the western side of the wetland (Figure 4).

The City of Redmond (2014) allows wetland buffer averaging, subject to the following criteria:

> 7. *Wetland Buffer Width Averaging. Wetland buffer widths may be modified by averaging buffer widths as set forth herein. The Department may allow modification of the standard wetland buffer width in accordance with the best available science on a case-by-case basis by averaging buffer widths. Averaging buffer widths may only be allowed where a qualified wetland professional demonstrates that:*
>
> a. *It will not reduce the functions or values;*
>
> b. *The wetland contains variations in sensitivity due to existing physical characteristics or the character of the buffer varies in slope, soils, or vegetation, and the wetland would benefit from a wider buffer in places and would not be adversely impacted by a narrower buffer in other places;*
>
> c. *The total area contained in the buffer area after averaging is no less than that which would be contained within the standard buffer; and*
>
> d. *The buffer width is not reduced more than 25 percent of the width or 50 feet, whichever is less, except for buffers between Category IV wetlands and low- or moderate-intensity land uses.*

Specifically, the proposed buffer averaging plan meets the City of Redmond (2014) requirements listed above in the following ways:

a. The buffer width averaging will not reduce the functions or values of the wetland as it largely retains the forest and shrub cover that provides screening to the wetland, provides additional functional buffer to the northwest of the wetland, and is limited to less than 500 square feet.
b. The buffer areas to be encroached upon have previously been cleared and do not provide the same level of buffer function as the areas to be retained.
c. The total area of functional buffer within the averaged buffer exceeds the area contained in the standard buffer.
d. The buffer width is not reduced by 25% or 50 feet.
e. With formal designation of the wetland and associated buffers in an open space tract with covenants restricting allowed uses, we would expect an equivalent to incremental increase in ecological functioning, compared with standard buffers. The buffer compensation area consists of deciduous forest of comparable functioning as the encroachment area.

6.0 MITIGATION

Mitigation has been defined by the State Environmental Policy Act (SEPA) (WAC 197-11-768; cf. Cooper 1987), and more recently in a Memorandum of Agreement between the Environmental Protection Agency and the U.S. Army Corps of Engineers (Anonymous 1989). In order of desirability, mitigation may include:

1. ***Avoidance*** - avoiding impacts by not taking action or parts of an action;

2. ***Minimization*** - minimizing impacts by limiting the degree or magnitude of the action and its implementation;

3. ***Compensation*** - which may involve:

    a) repairing, rehabilitating, or restoring the affected environment;

    b) replacing or creating substitute resources or environments;

    c) mitigation banking.

6.1 AVOIDANCE AND MINIMIZATION

Conversion of the Edgewood West property to a residential development would incorporate one or more mitigating measures that would avoid or reduce impacts to on-site habitat.

The proposed development plan for the Edgewood West property would establish an open space tract encompassing the Category IV wetland and buffer (Figure 4). The proposed development plan incorporates a number of other design features that would avoid or minimize impacts to the retained areas and off-site habitats:

- Direct impacts to the on-site Category IV wetland would be avoided;
- The forested buffer would retain a portion of the forested habitat on site; The limits of the buffer tract would be clearly marked with fencing and critical area signage per City of Redmond requirements;
- No residential structures, impervious surfaces, or trails would be located within the designated open space tract;
- The proposed development would route the majority of stormwater runoff to a detention facility to provide water quality treatment;
- Temporary erosion and sediment control (TESC) measures would be installed during construction and would utilize appropriate best management practices (BMPs) designed to prevent sediment deposition to on-site open space tracts and off-site areas;

6.2 COMPENSATORY MITIGATION

As outlined above, the proposed site plan includes buffer averaging on the Category IV wetland. The buffer averaging includes additional buffer area to compensate for proposed buffer encroachments. The buffer compensation is discussed more fully in Section 5 above (see Figure 4).

Additional areas of buffer would be left in their natural condition, providing screening to the wetland.

7.0 LIMITATIONS

We have prepared this report for the exclusive use of Quadrant Homes and its consultants. No other person or agency may rely upon the information, analysis, or conclusions contained herein without permission from Quadrant Homes.

The determination of ecological system classifications, functions, values, and boundaries is an inexact science, and different individuals and agencies may reach different conclusions. With regard to wetlands, the final determination of their boundaries for regulatory purposes is the responsibility of the various agencies that regulate development activities in wetlands. We cannot guarantee the outcome of such determinations. Therefore, the conclusions of this report should be reviewed by the appropriate regulatory agencies.

We warrant that the work performed conforms to standards generally accepted in our field, and prepared substantially in accordance with then-current technical guidelines and criteria. The conclusions of this report represent the results of our analysis of the information provided by the project proponent and their consultants, together with information gathered in the course of the study. No other warranty, expressed or implied, is made.

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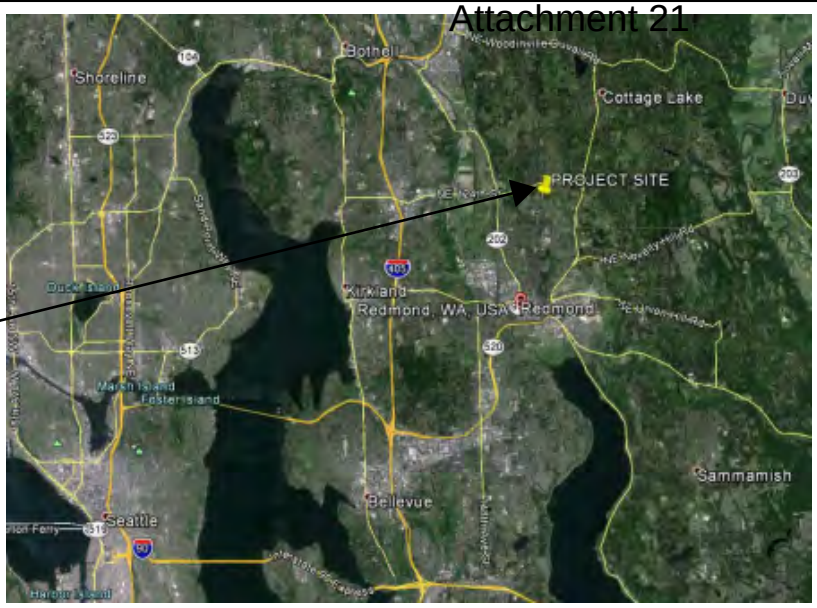
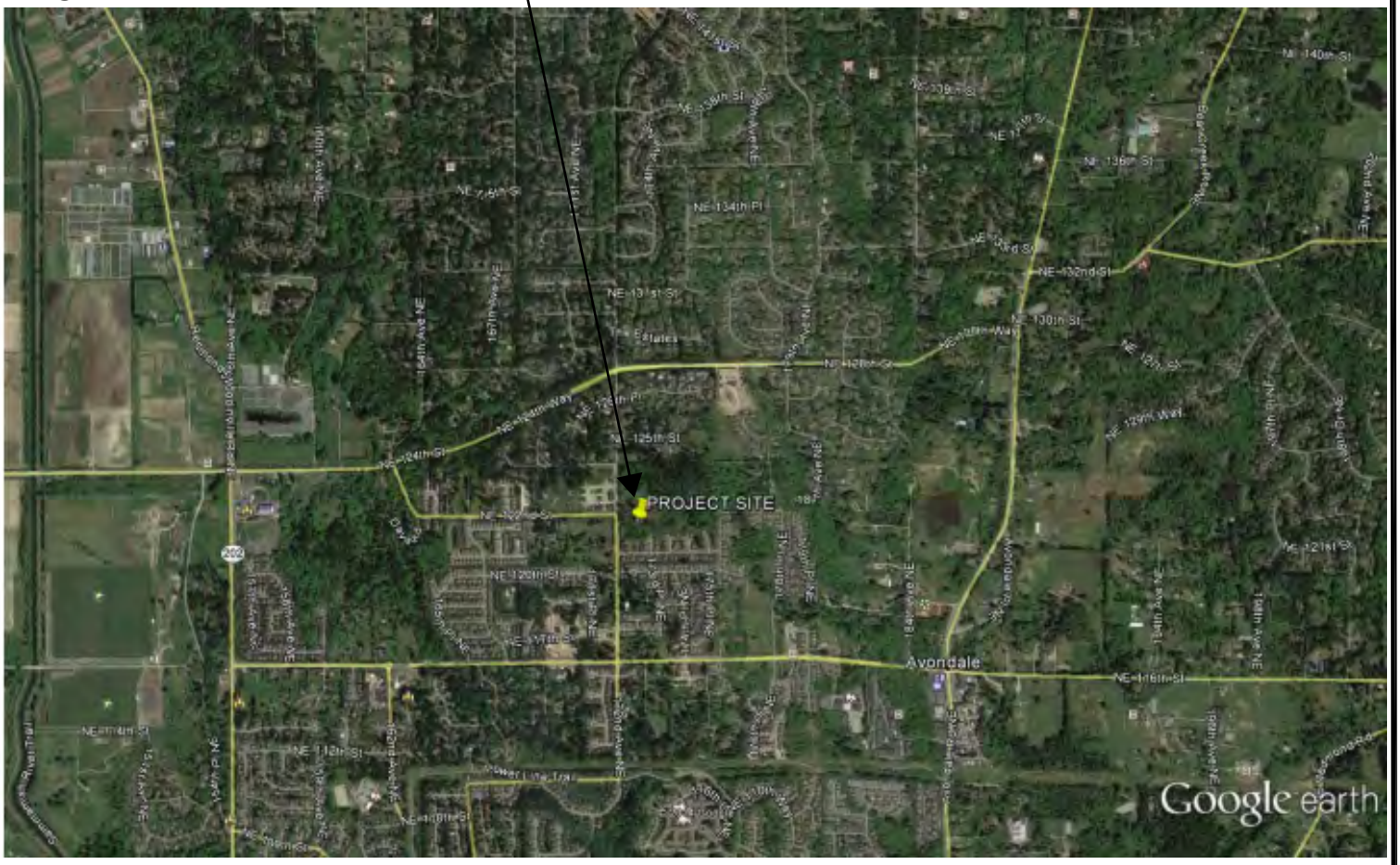
FIGURES



PROJECT LOCATION

REGIONAL MAP

VICINITY MAP



Source for Regional map & Vicinity map: Google Earth (Version 5.1.3533.1731) [Software]. Mountain View, CA: Google Inc. (2009). Available from http://earth.google.com. (Accessed 2012-11-26).

N

FIGURE 1

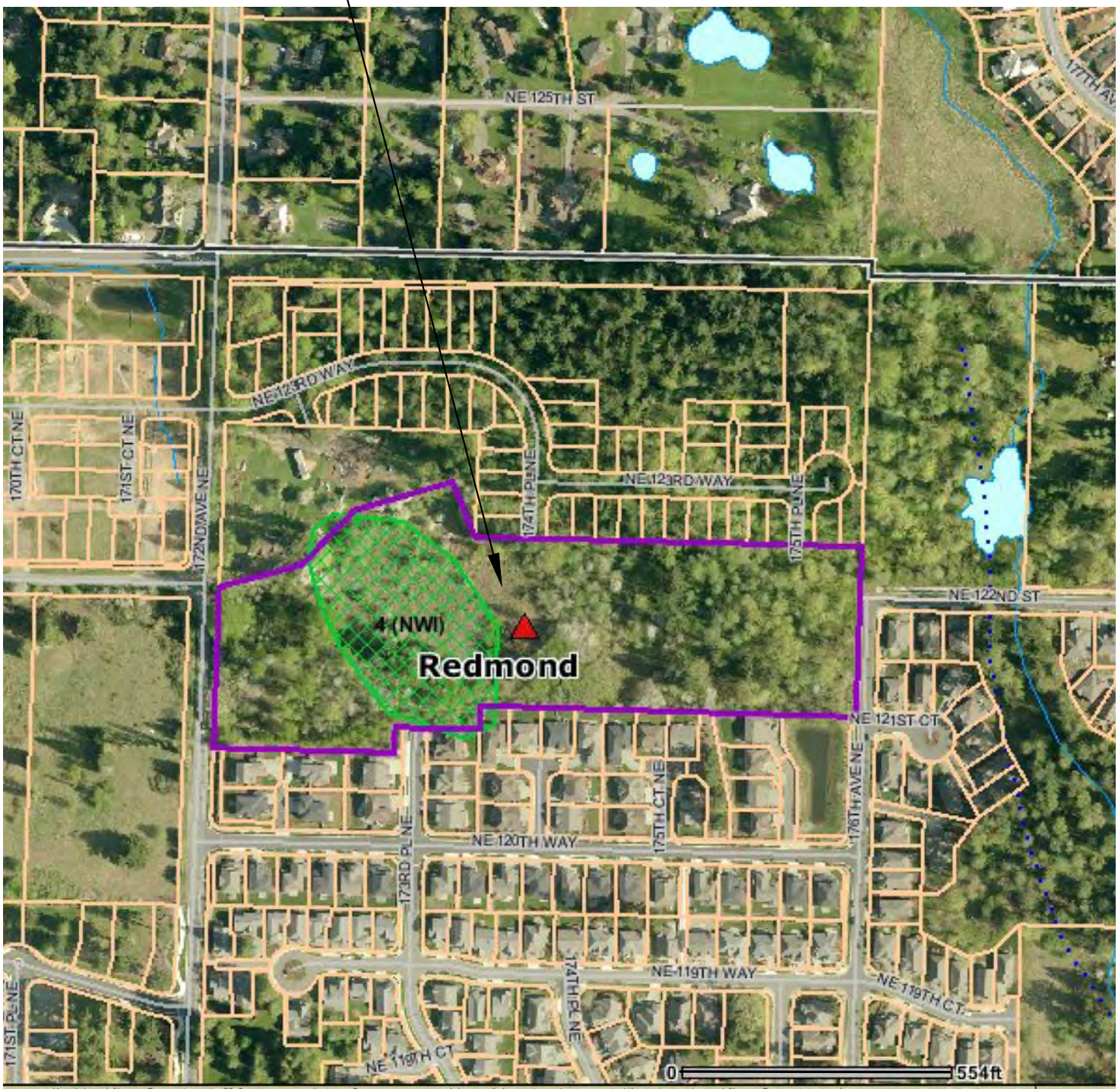
REGIONAL & VICINITY MAP

EDGEWOOD WEST

REDMOND, WA

Raedeke Associates, Inc.
9510 Stone Avenue North
Seattle, WA 98103

RAI # 2013-036



T:\2013\2013-036-Edgewood West (Mansoori)\2011-036 Figures EW.dwg

Source: King County IMAP. King County, WA. Available at http://www5.kingcounty.gov/iMAP/viewer.htm?mapset=hazards. (Accessed on 11/7/14).

FIGURE 2
KING COUNTY IMAP
EDGEWOOD WEST
REDMOND, WA

Raedeke Associates, Inc.
9510 Stone Avenue North
Seattle, WA 98103

RAI # 2011-036

FIGURE 3

Quadrant Homes

Edgewood West

CRITICAL AREAS REPORT

EXISTING CONDITIONS

LEGEND

- PROJECT BOUNDARY
- EXISTING WETLAND
- SP-# SAMPLE PLOT LOCATIONS
- A-# WETLAND FLAG LOCATION
- EXISTING TREES & DRIPLINES

0 50' 100' 200'

SCALE: 1" = 100'

Raedeke Associates, Inc.
9510 Stone Avenue North
Seattle, WA 98103

RAI PROJECT: 2013-036

DATE: October 24, 2014

DRAWN BY:AC | PM:CW

BASE INFORMATION: SURVEY AND SITE PLAN: Goldsmith
1215 114th Ave. S. E., Bellevue, WA 98004 | Ph: 425.462.1080

Attachment 21

F:\2013\2013-036-Edgewood West (Mansoori)\2013-036 Edgewood West.dwg

FIGURE 4

Quadrant Homes

Edgewood West

WETLAND ASSESSMENT

PROPOSED SITE PLAN

LEGEND

- 50' WETLAND BUFFER
- BUFFER REDUCTION 425 SF
- BUFFER ADDITION 425 SF

0 50' 100' 200'

SCALE: 1" = 100'

NORTH

Raedeke Associates, Inc.
9510 Stone Avenue North
Seattle, WA 98103

RAI PROJECT: 2013-036

DATE: October 24, 2014

DRAWN BY:AC | PM:CW

BASE INFORMATION: GOLDSMITH
1215 114th Ave. S. E., Bellevue, WA 98004 | Ph: 425.462.1080
Email: tclements@goldsmithengineering.com |Web: www.goldsmithengineering.com

Attachment 21

T:\2013\2013-036-Edgewood West (Mansoori)\2013-036 Edgewood West.dwg

APPENDIX A:

Sample Plot Data Sheets

Print Form

Attachment 21

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or
1987 Corps Wetland Delineation Manual)

Project/Site: Mansoori	Date: May 28, 2014
Applicant/owner: Quadrant	County: King State: Washington
Investigator(s): C. Wright, P. McGrander, P. Anderson	S/T/R: S25, T26N, R5E
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot #1

VEGETATION (For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Populus balsamifera	T	60	FAC				
Crataegus douglasii	S	25	FAC				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 100%

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation	_____	Physiological/reproductive adaptations	_____
		Wetland plant database	_____
Morphological adaptations	_____	Personal knowledge of regional plant communities	_____
Technical Literature	_____	Other (explain)	_____

Hydrophytic vegetation present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐	Water Marks: yes ☐ no ☒ on _____	Sediment Deposits: yes ☒ no ☐
Based on: _____ soil temp (record temp _____) _____ other (explain)	Drift Lines: yes ☐ no ☒	Drainage Patterns: yes ☐ no ☒
Dept. of inundation: 0 inches	Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒	Local Soil Survey: yes ☐ no ☒
Depth to free water in pit: 0 inches Depth to saturated soil: 10 inches	FAC Neutral: yes ☐ no ☒	Water-stained Leaves yes ☒ no ☐
Check all that apply & explain below: Stream, Lake or gage data: _____ Aerial photographs: _____ Other: ____	Other (explain):	

Wetland hydrology present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

No saturation present above 16 inches on 5/28/2014. Soils were damp, not moist or glistening.

SOILS Attachment 21

Map Unit Name (Series & Phase) Alderwood 6 to 15% slope

Drainage Class _____

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☐ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-10		10YR3/2	7.5YR 4/6	C, M, 7-10%	Loam	
10-16		10YR 4/2			Sandy Loam	
16+		2.5Y 5/3			Sandy Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
X_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
_____ Other (explain in remarks)

Hydric soils present? **yes** ☐ **no** ☒

Rationale for decision/Remarks:

Redox Dark Surface indicator F6

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☒ no ☐
Hydric soils present? yes ☒ no ☐
Wetland hydrology present? yes ☒ no ☐

Is the sampling point within a wetland? yes ☒ no ☐

Rationale/Remarks:

NOTES:

Revised 4/97

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____

Characterized By: _____

Print Form

Attachment 21

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or
1987 Corps Wetland Delineation Manual)

Project/Site: Mansoori	Date: May 15, 2014
Applicant/owner: Quadrant	County: King State: Washington
Investigator(s): C. Wright	S/T/R: S25, T26N, R5E
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot #2

VEGETATION (For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Populus balsamifera	T	25	FAC	Tiarella trifoliata	H	2	FAC
Salix scouleriana	T	25	FAC				
Prunus emarginata	T	20	FACU				
Spiraea douglasii	S	40	FACW				
Polystichum munitum	H	5	FACU				
Carex deweyana	H	2	FACU				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 57%

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation	_____	Physiological/reproductive adaptations	_____
		Wetland plant database	_____
Morphological adaptations	_____	Personal knowledge of regional plant communities	_____
Technical Literature	_____	Other (explain)	_____

Hydrophytic vegetation present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐	Water Marks: yes ☒ no ☐ on _____	Sediment Deposits: yes ☒ no ☐
Based on: _____ soil temp (record temp _____) _____ other (explain)	Drift Lines: yes ☐ no ☒	Drainage Patterns: yes ☐ no ☒
Dept. of inundation: 0 inches	Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒	Local Soil Survey: yes ☐ no ☒
Depth to free water in pit: 0 inches Depth to saturated soil: 16 inches	FAC Neutral: yes ☐ no ☒	Water-stained Leaves yes ☒ no ☐
Check all that apply & explain below: Stream, Lake or gage data: _____ Aerial photographs: _____ Other: ____	Other (explain):	

Wetland hydrology present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

Areas of ponding were observed during the site visit. Soils were saturated at the sample location starting at 16 inches.

SOILS Attachment 21

Map Unit Name (Series & Phase) Alderwood 6 to 15% slope

Drainage Class _____

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☐ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-16		10YR3/1			Loam	
16-18+		10YR 3/2			Gravely Sandy Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
_____ Other (explain in remarks)

Hydric soils present? **yes** ☐ **no** ☒

Rationale for decision/Remarks:

The upper portion of the soils profile lacks redox features that are indicative of a hydric soil.

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☒ no ☐
Hydric soils present? yes ☐ no ☒
Wetland hydrology present? yes ☒ no ☐

Is the sampling point within a wetland? yes ☐ no ☒

Rationale/Remarks:

NOTES:

Revised 4/97

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____

Characterized By: _____

Print Form

Attachment 21

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or
1987 Corps Wetland Delineation Manual)

Project/Site: Mansoori	Date: May 15, 2014
Applicant/owner: Quadrant	County: King State: Washington
Investigator(s): C. Wright	S/T/R: S25, T26N, R5E
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot #3

VEGETATION (For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Salix scouleriana	T	30	FAC				
Populus balsamifera	T	10	FAC				
Rubus armeniacus	S	10	FACU				
Rubus laciniatus	S	5	FACU				
Phalaris arundinacea	H	50	FACW				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 60%

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation _____
Morphological adaptations _____
Technical Literature _____
Physiological/reproductive adaptations _____
Wetland plant database _____
Personal knowledge of regional plant communities _____
Other (explain) _____

Hydrophytic vegetation present? **yes** ☒ **no** ☐
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐

Based on: _____ soil temp (record temp _____)
_____ other (explain)

Dept. of inundation: None inches
Depth to free water in pit: None inches
Depth to saturated soil: None inches

Check all that apply & explain below:
Stream, Lake or gage data: _____
Aerial photographs: _____ Other: ____

Water Marks: yes ☒ no ☐ on _____	Sediment Deposits: yes ☐ no ☒
Drift Lines: yes ☐ no ☒	Drainage Patterns: yes ☐ no ☒
Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒	Local Soil Survey: yes ☐ no ☒
FAC Neutral: yes ☐ no ☒	Water-stained Leaves yes ☐ no ☒
Other (explain):	

Wetland hydrology present? **yes** ☐ **no** ☒
Rationale for decision/Remarks:

No indicators of hydrology were observed during our spring 2014 site visit. This is indicative of non wetland conditions.

SOILS Attachment 21

Map Unit Name (Series & Phase) Alderwood 6 to 15% slope

Drainage Class _____

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☐ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-12		10YR3/2			Gravely Sandy Loam	
12-16+		10YR 4/4			Sandy Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
_____ Other (explain in remarks)

Hydric soils present? **yes** ☐ **no** ☒

Rationale for decision/Remarks:

No redox or other indicators of hydric soil conditions was observed in the soil profile.

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☒ no ☐
Hydric soils present? yes ☐ no ☒
Wetland hydrology present? yes ☐ no ☒

Is the sampling point within a wetland? yes ☐ no ☒

Rationale/Remarks:

NOTES:

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____

Characterized By: _____

Print Form

Attachment 21

DATA FORM 1 *(Revised)*
Routine Wetland Determination
(WA State Wetland Delineation Manual or
1987 Corps Wetland Delineation Manual)

Project/Site: Mansoori	Date: May 15, 2014
Applicant/owner: Quadrant	County: King State: Washington
Investigator(s): C. Wright	S/T/R: S25, T26N, R5E
Do Normal Circumstances exist on the site? yes ☒ no ☐ Is the site significantly disturbed (atypical situation)? yes ☐ no ☒ Is the area a potential Problem Area? yes ☐ no ☒ Explanation of atypical or problem area:	Community ID: Transect ID: Plot ID: Sample Plot #4

VEGETATION (For strata, indicate T = tree; S = shrub; H = herb; V = vine)

Dominant Plant Species	Stratum	% cover	Indicator	Dominant Plant Species	Stratum	% cover	Indicator
Prunus emarginata	T	10	FACU				
Rubus armeniacus	S	5	FACU				
Phalaris arundinacea	H	50	FACW				
Urtica dioica	H	40	FAC				

HYDROPHYTIC VEGETATION INDICATORS:

% of dominants OBL, FACW, & FAC 50%

Check all indicators that apply & explain below:

Visual observation of plant species growing in areas of prolonged inundation/saturation	_____	Physiological/reproductive adaptations	_____
		Wetland plant database	_____
Morphological adaptations	_____	Personal knowledge of regional plant communities	_____
Technical Literature	_____	Other (explain)	_____

Hydrophytic vegetation present? **yes** ☐ **no** ☒
Rationale for decision/Remarks:

HYDROLOGY

Is it the growing season? yes ☒ no ☐	Water Marks: yes ☐ no ☒ on _____	Sediment Deposits: yes ☐ no ☒
Based on: _____ soil temp (record temp _____) _____ other (explain)	Drift Lines: yes ☐ no ☒	Drainage Patterns: yes ☐ no ☒
Dept. of inundation: None inches	Oxidized Root (live roots) Channels <12 in. yes ☐ no ☒	Local Soil Survey: yes ☐ no ☒
Depth to free water in pit: None inches Depth to saturated soil: None inches	FAC Neutral: yes ☐ no ☒	Water-stained Leaves yes ☐ no ☒
Check all that apply & explain below: Stream, Lake or gage data: _____ Aerial photographs: _____ Other: ____	Other (explain):	

Wetland hydrology present? **yes** ☐ **no** ☒
Rationale for decision/Remarks:

Lack of indicators fo hydrology were observed during our spring 2014 site visit is indicative of non wetland conditions.

SOILS Attachment 21

Map Unit Name (Series & Phase) Alderwood 6 to 15% slope

Drainage Class _____

Taxonomy (subgroup) _____

Field observations confirm mapped type? Yes ☐ No ☐

Profile Description

Depth (inches)	Horizon	Matrix color (Munsell moist)	Mottle colors (Munsell moist)	Mottle abundance size & contrast	Texture, concretions, structure, etc.	Drawing of soil profile (match description)
0-12		10YR3/2			Gravely Sandy Loam	
12-16+		10YR 4/4			Sandy Loam	

Hydric Soil Indicators: (check all that apply)

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma (=1) matrix
_____ Matrix chroma ≤ 2 with mottles
_____ Mg or Fe Concretions
_____ High Organic Content in Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on National/Local Hydric Soils List
_____ Other (explain in remarks)

Hydric soils present? **yes** ☐ **no** ☒

Rationale for decision/Remarks:

No redox or other indicators of hydric soil conditions was observed in the soil profile.

Wetland Determination (circle)

Hydrophytic vegetation present? yes ☐ no ☒
Hydric soils present? yes ☐ no ☒
Wetland hydrology present? yes ☐ no ☒

Is the sampling point within a wetland? yes ☐ no ☒

Rationale/Remarks:

NOTES:

Data Form 2: Atypical Situations

Applicant Name: _____ Applicant Number: _____ Project Name: _____
Location: _____ Plot Number: _____ Date: _____

A. **Vegetation:**

1. Type of Alteration: _____
_____
_____

2. Effect on Vegetation: _____
_____
_____

3. Previous Vegetation: _____
(Attach documentation)_____
_____

4. Hydrophytic Vegetation? Yes_____No_____

B. **Soils:**

1. Type of Alteration: _____
_____
_____

2. Effect on Soils: _____
_____
_____

3. Previous Soils:_____
(Attach documentation)_____
_____

4. Hydric Soils? Yes_____No_____

C. **Hydrology:**

1. Type of Alteration: _____
_____
_____

2. Effect on Hydrology: _____
_____
_____

3. Previous Hydrology: _____
(Attach documentation) _____
_____

4. Wetland Hydrology? Yes_____No_____

Characterized By: _____

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Manoori City/County: Redmond/King Sampling Date: May 15, 2014

Applicant/Owner: Quadrant State: WA Sampling Point: SP#1

Investigator(s): C. Wright Section, Township, Range: S25, T26N, R5E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): Northwest Forests and Coasts (LRR A) Lat: 47 42'31.81" N Long: 122 06'31.49" W Datum: unknown

Soil Map Unit Name: Alderwood 6 to 15% slope NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Area lacks hydric soils and definitive hydrophytic vegetation community (FAC)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m diam)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera (black cottonwood)	60	Y	FAC
2.			
3.			
4.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 3m diam)			
1. Crataegus douglasii (Dougls hawthorn)	25	Y	FAC
2.			
3.			
4.			
5.			
	25 = Total Cover		
Herb Stratum (Plot size: 1m diam)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 70

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					L	no redox
10-16	10YR 4/2	100					SL	no redox
16+	2.5Y 5/3	100					SL	no redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☒ Water Marks (B1)
- ☒ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 10

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area of ponding

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Manoori City/County: Redmond/King Sampling Date: May 15, 2014

Applicant/Owner: Quadrant State: WA Sampling Point: SP#2

Investigator(s): C. Wright Section, Township, Range: S25, T26N, R5E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): Northwest Forests and Coasts (LRR A) Lat: 47 42'31.81" N Long: 122 06'31.49" W Datum: unknown

Soil Map Unit Name: Alderwood 6 to 15% slope NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Area lacks hydric soils and definitive hydrophytic vegetation community (FAC)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m diam)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera (black cottonwood)	25	Y	FAC
2. Salix scouleriana (Scoulers willow)	25	Y	FAC
3. Prunus emarginata (bitter cherry)	20	N	FACU
4.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 3m diam)			
1. Spiraea douglasii (Douglas spirea)	40	Y	FACW
2.			
3.			
4.			
5.			
	40	= Total Cover	
Herb Stratum (Plot size: 1m diam)			
1. Polystichum munitum (sword fern)	5	N	FACU
2. Carex deweyana (Deweys sedge)	2	N	FACU
3. Tiarella trifoliata (foamflower)	2	N	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	9	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 30

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/1	100					L	no redox
16 - 18+	10YR 3/2	95	10YR 4/6	5	C	PL	grSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks: lack of redox in upper portion of profile, not inidicative of hydric soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☒ Water Marks (B1)
- ☒ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 16

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area of ponding

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Manoori City/County: Redmond/King Sampling Date: May 15, 2014

Applicant/Owner: Quadrant State: WA Sampling Point: SP#3

Investigator(s): C. Wright Section, Township, Range: S25, T26N, R5E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): Northwest Forests and Coasts (LRR A) Lat: 47 42'31.81" N Long: 122 06'31.49" W Datum: unknown

Soil Map Unit Name: Alderwood 6 to 15% slope NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Area lacks hydric soils and definitive hydrophytic vegetation community (FAC)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m diam)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera (black cottonwood)	10	N	FAC
2. Salix scouleriana (Scoulers willow)	30	Y	FAC
3.			
4.			
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size: 3m diam)			
1. Rubus armeniancus (Himalayan blackberry)	10	N	FACU
2. Rubus laciniatus (cut-leaf blackberry)	5	N	FACU
3.			
4.			
5.			
	15	= Total Cover	
Herb Stratum (Plot size: 1m diam)			
1. Polystichum munitum (sword fern)	10	N	FACU
2. Phalaris arundinacea (reed canarygrass)	50	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 10

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100					grSL	no redox
12-16+	10YR 4/4	100					SL	no redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks: lack of redox in upper portion of profile, not inidicative of hydric soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☒ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: lack of hydrology in spring 2014 indicative of non wetland conditions

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Manoori City/County: Redmond/King Sampling Date: May 15, 2014

Applicant/Owner: Quadrant State: WA Sampling Point: SP#4

Investigator(s): C. Wright Section, Township, Range: S25, T26N, R5E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): Northwest Forests and Coasts (LRR A) Lat: 47 42'31.81" N Long: 122 06'31.49" W Datum: unknown

Soil Map Unit Name: Alderwood 6 to 15% slope NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks: Area lacks hydric soils and definitive hydrophytic vegetation community (FAC)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m diam)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus emarginata (bitter cherry)	10	N	FACU
2.			
3.			
4.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: 3m diam)			
1. Rubus armeniancus (Himalayan blackberry)	5	N	FACU
2.			
3.			
4.			
5.			
	15 = Total Cover		
Herb Stratum (Plot size: 1m diam)			
1. Urtica dioica (stinging nettle)	40	Y	FAC
2. Phalaris arundinacea (reed canarygrass)	50	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100					grSL	no redox
12-18	10YR 4/4	100					SL	no redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks: lack of redox not inidicative of hydric soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☒ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: lack of hydrology in spring 2014 indicative of non wetland conditions

Ecology site visit corrections to SP1

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

5/28/14

Project/Site: Manoori City/County: Redmond/King Sampling Date: May 15, 2014

Applicant/Owner: Quadrant State: WA Sampling Point: SP#1

Investigator(s): C. Wright P. McGranor, P. Anderson Section, Township, Range: S25, T26N, R5E

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): <5

Subregion (LRR): Northwest Forests and Coasts (LRR A) Lat: 47 42'31.81" N Long: 122 06'31.49" W Datum: unknown

Soil Map Unit Name: Alderwood 6 to 15% slope NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☒
Hydric Soil Present?	Yes ☒ No ☒	
Wetland Hydrology Present?	Yes ☒ No ☐	

Remarks: Area lacks hydric soils and definitive hydrophytic vegetation community (FAC)

Soils determined to meet hydric soils indicator F6

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m diam)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera (black cottonwood)	60	Y	FAC
2.			
3.			
4.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 3m diam)			
1. Crataegus douglasii (Dougls hawthorn)	25	Y	FAC
2.			
3.			
4.			
5.			
	25 = Total Cover		
Herb Stratum (Plot size: 1m diam)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 70

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-10	10YR 3/2	100	7.5YR 4/6	7-10	C	M	L	~~no redox~~ distinct
10-16	10YR 4/2	100					SL	no redox
16+	2.5Y 5/3	100					SL	no redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

PRR WSDOE 5/28/14

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☒ Water Marks (B1)
- ☒ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 10

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area of ponding

No saturation present above 16" on 5/28/14

Soils were damp - not moist or glistening

APPENDIX B:

WDOE Wetland Rating Form

Wetland name or number _____

WETLAND RATING FORM – WESTERN WASHINGTON
Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): Manor 1 Date of site visit: 6/6/13, 5/15/14, 5/30/14

Rated by C. WRIGHT Trained by Ecology? Yes__ No___ Date of training 10/07

SEC: ___ TWNSHP: ____ RNGE: ____ Is S/T/R in Appendix D? Yes___ No___

Map of wetland unit: Figure ____ Estimated size _____

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	8
Score for Hydrologic Functions	10
Score for Habitat Functions	9
TOTAL score for Functions	27

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply ✓

Final Category (choose the "highest" category from above) IV

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		Depressional	
Natural Heritage Wetland		Riverine	
Bog		Lake-fringe	
Mature Forest		Slope	
Old Growth Forest		Flats	
Coastal Lagoon		Freshwater Tidal	
Interdunal			
None of the above		Check if unit has multiple HGM classes present	

Wetland name or number _____

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered **animal or plant** species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		✓
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered **animal** species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		✓
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		✓
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		✓

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number _____

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides (i.e. except during floods)?
NO – go to 2 ✓ **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.
NO – go to 3 ✓ **YES** – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;
___At least 30% of the open water area is deeper than 6.6 ft (2 m)?
NO – go to 4 ✓ **YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the entire wetland unit **meet all** of the following criteria?
____The wetland is on a slope (*slope can be very gradual*),
____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.
____The water leaves the wetland **without being impounded**?
NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than 1 foot deep).*
NO - go to 5 ✓ **YES** – The wetland class is **Slope**

Wetland name or number _____

5. Does the entire wetland unit **meet all** of the following criteria?

____ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

____ The overbank flooding occurs at least once every two years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

NO - go to 6 ✓ **YES** – The wetland class is **Riverine**

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM clases. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or if you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number _____

	Depressional and Flats Wetlands **WATER QUALITY FUNCTIONS** - Indicators that the wetland unit functions to improve water quality	**Points** (only 1 score per box)
D	**D 1. Does the wetland unit have the potential to improve water quality?**	*(see p.38)*
D	D 1.1 Characteristics of surface water flows out of the wetland: Unit is a depression with no surface water leaving it (no outlet) points = 3 ✓ Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 1 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 (*If ditch is not permanently flowing treat unit as "intermittently flowing"*) Provide photo or drawing	Figure ___ 3
D	S 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES points = 4 NO points = 0 ✓	0
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) Wetland has persistent, ungrazed, vegetation > = 95% of area points = 5 Wetland has persistent, ungrazed, vegetation > = 1/2 of area points = 3 Wetland has persistent, ungrazed vegetation > = 1/10 of area points = 1 ✓ Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	Figure ___ 1
D	D1.4 Characteristics of seasonal ponding or inundation. *This is the area of the wetland unit that is ponded for at least 2 months, but dries out sometime during the year. Do not count the area that is permanently ponded. Estimate area as the average condition 5 out of 10 yrs.* Area seasonally ponded is > ½ total area of wetland points = 4 ✓ Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0 Map of Hydroperiods	Figure ___ 4
D	**Total for D 1** *Add the points in the boxes above*	8
D	**D 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150 ft — Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 ft of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging — Residential, urban areas, golf courses are within 150 ft of wetland — Wetland is fed by groundwater high in phosphorus or nitrogen — Other_____ **YES** multiplier is **2** **NO** multiplier is **1** ✓	*(see p. 44)* multiplier 1
D	**TOTAL - Water Quality Functions** Multiply the score from D1 by D2 ***Add score to table on p. 1***	8

Wetland name or number _____

D	**Depressional and Flats Wetlands** HYDROLOGIC FUNCTIONS - Indicators that the wetland unit functions to reduce flooding and stream degradation	**Points** (only 1 score per box)
	D 3. Does the wetland unit have the potential to reduce flooding and erosion?	*(see p.46)*
D	D 3.1 Characteristics of surface water flows out of the wetland unit Unit is a depression with no surface water leaving it (no outlet) points = 4 ✓ Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 *(If ditch is not permanently flowing treat unit as "intermittently flowing")* Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 0	4
D	D 3.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 The wetland is a "headwater" wetland" points = 5 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 ✓ Unit is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft points = 0	3
D	D 3.3 Contribution of wetland unit to storage in the watershed *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 ✓ The area of the basin is more than 100 times the area of the unit points = 0 Entire unit is in the FLATS class points = 5	3
D	**Total for D 3** *Add the points in the boxes above*	10
D	**D 4. Does the wetland unit have the opportunity to reduce flooding and erosion?** *(see p. 49)* Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. Answer NO if the water coming into the wetland is controlled by a structure such as flood gate, tide gate, flap valve, reservoir etc. OR you estimate that more than 90% of the water in the wetland is from groundwater in areas where damaging groundwater flooding does not occur. *Note which of the following indicators of opportunity apply.* — Wetland is in a headwater of a river or stream that has flooding problems — Wetland drains to a river or stream that has flooding problems — Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems — Other_____ **YES** multiplier is **2** **NO** multiplier is **1** ✓	multiplier 1
D	**TOTAL - Hydrologic Functions** Multiply the score from D 3 by D 4 ***Add score to table on p. 1***	10

Wetland name or number _____

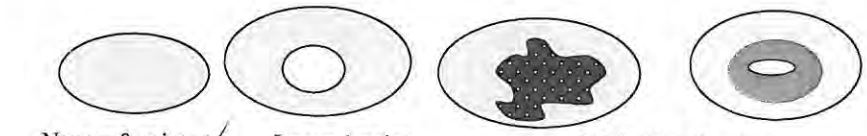
These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)***	Figure ___
Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres. ____Aquatic bed ____Emergent plants ____Scrub/shrub (areas where shrubs have >30% cover) __✓__Forested (areas where trees have >30% cover) *If the unit has a forested class check if:* ____The forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon *Add the number of vegetation structures that qualify. If you have:* 4 structures or more points = 4 3 structures points = 2 2 structures points = 1 1 structure points = 0 ✓ Map of Cowardin vegetation classes	0
H 1.2. Hydroperiods ***(see p. 73)***	Figure ___
Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (see text for descriptions of hydroperiods) ____Permanently flooded or inundated __✓__Seasonally flooded or inundated ____Occasionally flooded or inundated ____Saturated only ____ Permanently flowing stream or river in, or adjacent to, the wetland ____ Seasonally flowing stream in, or adjacent to, the wetland ____ ***Lake-fringe wetland*** **= 2 points** ____ ***Freshwater tidal wetland*** **= 2 points** 4 or more types present points = 3 3 types present points = 2 2 types present point = 1 1 type present points = 0 ✓ Map of hydroperiods	0
H 1.3. Richness of Plant Species ***(see p. 75)*** Count the number of plant species in the wetland that cover at least 10 ft². (*different patches of the same species can be combined to meet the size threshold)* *You do not have to name the species.* *Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle* If you counted: > 19 species points = 2 5 - 19 species points = 1 < 5 species points = 0 ✓ *List species below if you want to:*	0

Total for page 0

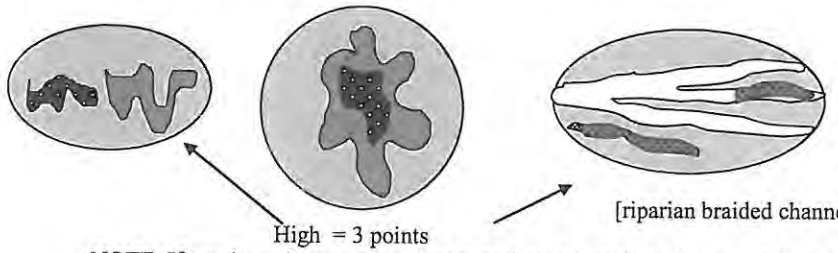
Wetland name or number _____

H 1.4. Interspersion of habitats *(see p. 76)* — Figure ___

Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.



None = 0 points ✓ Low = 1 point Moderate = 2 points



[riparian braided channels]

High = 3 points

NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes

0

H 1.5. Special Habitat Features: *(see p. 77)*

Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.

____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long).

____Standing snags (diameter at the bottom > 4 inches) in the wetland

____Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m)

____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)*

____At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated.*(structures for egg-laying by amphibians)*

__✓__ Invasive plants cover less than 25% of the wetland area in each stratum of plants

NOTE: The 20% stated in early printings of the manual on page 78 is an error.

1

H 1. TOTAL Score - potential for providing habitat
Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5

1

Comments

Wetland name or number _____

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers *(see p. 80)* *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** ✓ — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0.** — Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	Figure ___ 4
H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 ✓ H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 ✓ H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? YES = **1 point** NO = **0 points** ✓	0

Total for page 4

Wetland name or number _____

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)***

Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.*

____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre).

____**Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report p. 152*).

____**Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

____**Old-growth/Mature forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest.

____**Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158*).

____**Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

____**Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161*).

____**Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

____ **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report: pp. 167-169 and glossary in Appendix A).*

____**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

____**Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft.

____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

__✓__ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long.

If wetland has **3 or more** priority habitats = **4 points**
If wetland has **2** priority habitats = **3 points**
If wetland has **1** priority habitat = **1 point** ✓ No habitats = 0 points

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

Wetland name or number _____

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 ✓ The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	8
TOTAL for H 1 from page 14	1
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	9

Wetland name or number _____

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	**Category**
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland unit meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt. YES = Go to SC 1.1 NO ✓	
SC 1.1 Is the wetland unit within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? YES = Category I NO go to SC 1.2	**Cat. I**
SC 1.2 Is the wetland unit at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

Wetland name or number _____

SC 2.0 Natural Heritage Wetlands *(see p. 87)* Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ___ or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO ✓___ SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO ____not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs *(see p. 87)* Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 ✓ 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating ✓ 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No___ Is not a bog for purpose of rating	**Cat. I**

Wetland name or number _____

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.* — **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO ✓ not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* YES = Go to SC 5.1 NO ✓ not a wetland in a coastal lagoon SC 5.1 Does the wetland meets all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than 1/10 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

Wetland name or number _____

SC 6.0 Interdunal Wetlands *(see p. 93)* Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO √ not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula- lands west of SR 103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	

APPENDIX C

Wetland and Habitat Assessment Forms

WETLAND SUMMARY SHEET

Wetland Summary			Buffer Summary				Wetland Impacts		Mitigation Summary		
Label[1]	Category[2]	Size[3]	Required[4]	Proposed[5]	Increase[6] Reduce[7]	Averaging[8]	Fill[9]	Paper Fill[10]	Ratio[11]	Area[12]	Location[13]
A	IV	1021sq ft	50	50 - >60		50					

[1] Wetland A, B, C, etc.
[2] Wetland category per City wetland classification system.
[3] Area of wetland.
[4] Required buffer width in feet per RCDG.
[5] Proposed buffer width in feet.
[6] Does the uniqueness of the wetland require an increased buffer? If so, what is the width in feet.
[7] Is there a request to reduce the buffer width? If so, what is the width in feet.
[8] Is buffer averaging being used? If so, what is the average buffer width in feet.
[9] Amount of wetland fill.
[10] Amount of paper fill.
[11] Required ratio for wetland mitigation per RCDG.
[12] Size of mitigation area.
[13] Note location of mitigation area (keyed to the mitigation map).

Attachment 21

CITY OF REDMOND
HABITAT UNIT ASSESSMENT FORM

HABITAT UNIT: Edgewood West Preliminary Plat
LOCATION: S 25, T 26 N, R 5 E
TOTAL SCORE: 15

Habitat Parameter	Scoring Criteria	Habitat Unit Score
Size	• >50 acres = 3 points • 10-50 acres = 2 points • 0-10 acres = 1 point	2
Vegetation Community Types	≥ 4 types = 3 points • 2-3 types = 2 points • 1 type = 1 point • None = 0 points	2
Community Interspersion	• High = 3 points • Medium = 2 points • Low = 1 point • None = 0 points	1
Priority Species Presence	• Threatened & Endangered Species = 3 points • Candidate Species = 2 points • Monitor Species = 1 point • None = 0 points	2
Priority Species Habitat Use	• Breeding = 3 points • Roosting = 2 points • Foraging = 1 point • None = 0 points	1
Habitat Continuity	• Links protected habitats = 3 points • Links unprotected habitats = 2 points • Extends habitat corridor = 1 point • None = 0 points	1
Forest Vegetation Layers	• 3 layers = 3 points • 2 layers = 2 points • 1 layers = 1 point • None = 0 points	3
Forest Age	• Mature = 3 points • Pole = 2 points • Seedling/Shrub = 1 point • None = 0 points	2
Invasive Species Presence	• 0-25% = 3 points • 26-50% = 2 points • 51-75% = 1 point • 75-100% = 0 points	1

CITY OF REDMOND
HABITAT UNIT ASSESSMENT FORM

VEGETATION COMMUNITY TYPES:

Deciduous forest, open shrub

INVASIVE PLANTS:

Himalayan and cutleaf blackberry, reed canarygrass

HABITAT FEATURES (snags, perches, downed logs, etc):

Few small snags (less than 10 inches dbh). Downed logs widely scattered, mostly less than 10 inches diameter.

WILDLIFE OBSERVATIONS (direct or indirect):

Foraging excavations by pileated woodpecker in one snag. Otherwise, a few species of breeding and resident small birds typical of lowland forests were observed. No reptiles or amphibians were observed.

THREATS TO HABITAT INTEGRITY:

Invasive species, particularly Himalayan blackberry and reed canarygrass.
Human and domestic pet activity from surrounding residences.

OTHER NOTES:

APPENDIX D

CITY OF REDMOND MAPS

U.S. Fish and Wildlife Service
National Wetlands Inventory

Edgewood West

Nov 17, 2014

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

Riparian

- Herbaceous
- Forested/Shrub

Riparian Status

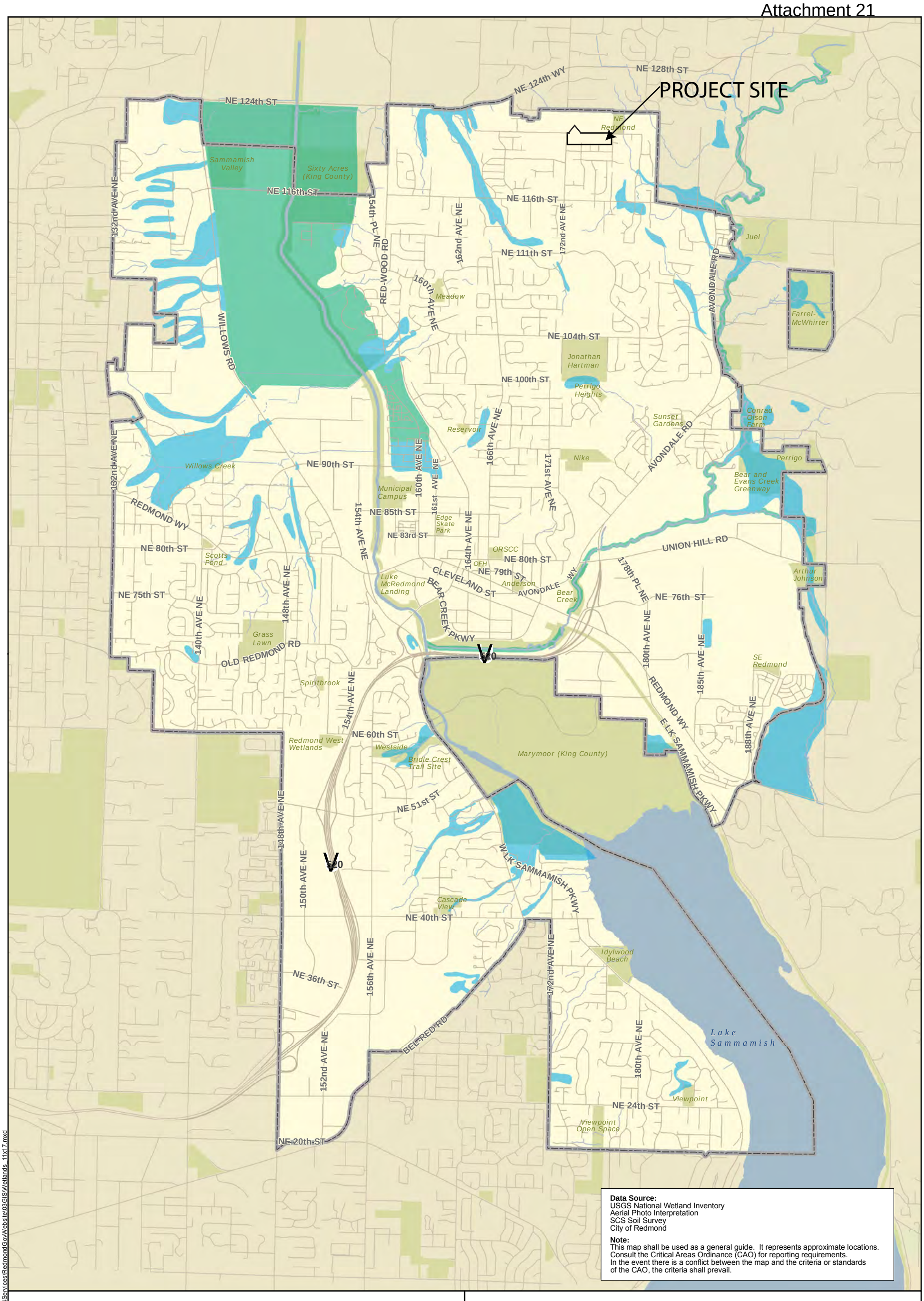
- Digital Data

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Attachment 21

Attachment 21



Data Source:
USGS National Wetland Inventory
Aerial Photo Interpretation
SCS Soil Survey
City of Redmond

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.

Wetlands

Critical Areas Map

City of Redmond, Washington

Effective: 05/28/2005

0 0.5 1
Miles

Ü

CityofRedmond
WASHINGTON

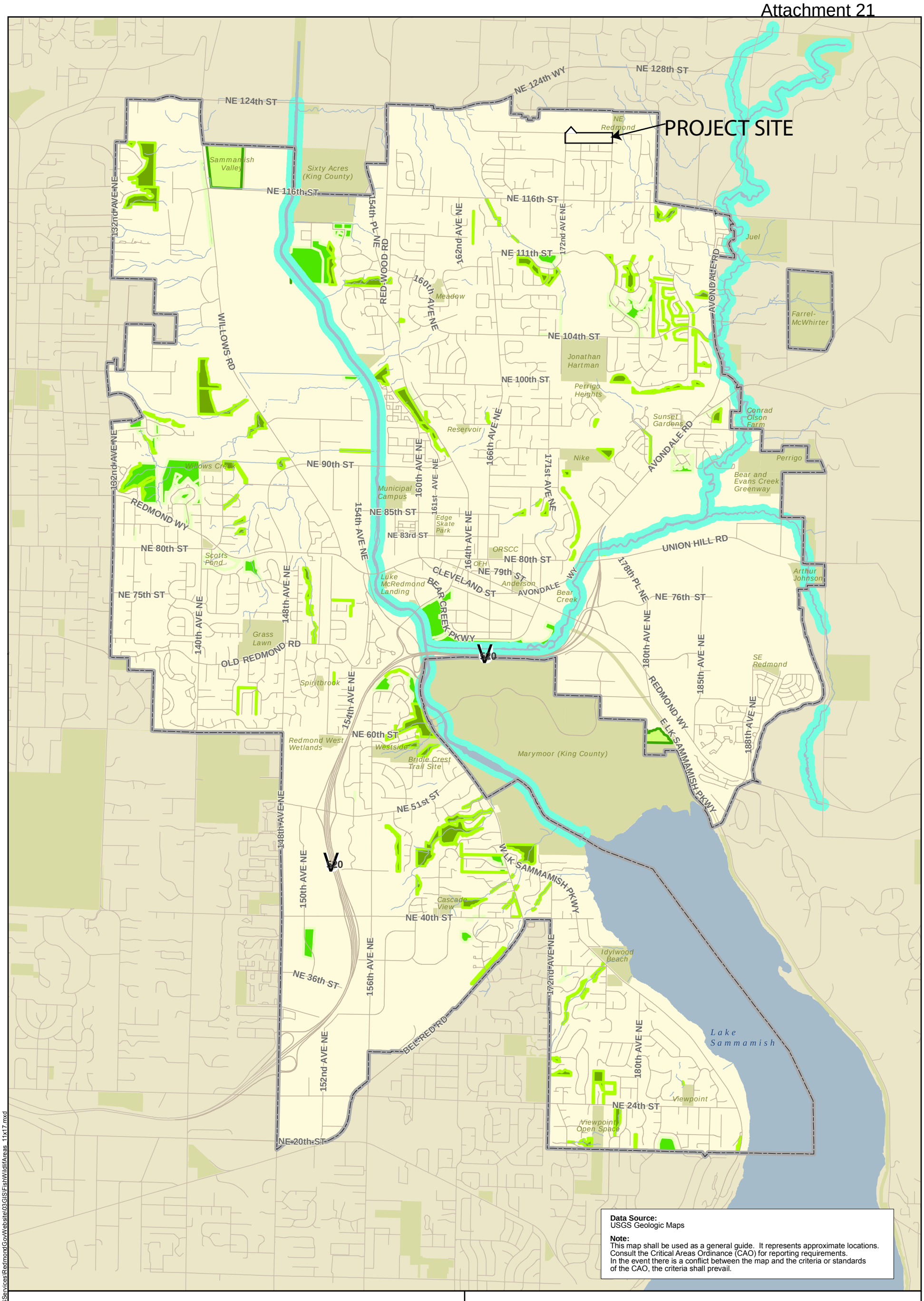
Mixed Wetland/Upland
Wetland
City Limit
Park and Open Space
Water

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.

File Name:\\redmond.man\fs\GIS\User\GIS\GISServicesProject\GISServices\RedmondGovWebsite\03GIS\Wetlands_11x17.mxd

Attachment 21



Data Source:
USGS Geologic Maps

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.

Fish and Wildlife Habitat Conservation Areas (Core Preservation Areas)

Critical Areas Map

City of Redmond, Washington

Effective: 05/28/2005

0 0.5 1
Miles

Ü

CityofRedmond
WASHINGTON

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.

- Class 1 Streams and Buffers
- Native Growth Protection Easements
- Open Space Easements
- Transfer Development Rights Easements
- City Limit
- Park and Open Space
- Water

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APPENDIX B

Preliminary Geotechnical Report, Terra Associates, Inc., April 21, 2014, Revised January 15, 2015

Updated report with revised Redmond Zoning Code references included - January 15, 2015.

PRELIMINARY GEOTECHNICAL REPORT

Mansoori Parcel
172nd Avenue NE and NE 122nd Street
Redmond, Washington

Project No. T-7037

Terra Associates, Inc.

Prepared for:

Quadrant Homes
Bellevue, Washington

April 21, 2014
Updated January 15, 2015

TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

April 21, 2014
Updated January 15, 2015
Project No. T-7037

Mr. Mike Behn
Quadrant Homes
14725 SE 36th Street, Suite 200
Bellevue, Washington 98006

Subject: Preliminary Geotechnical Report
Mansoori Parcel
172nd Avenue NE and NE 122nd Street
Redmond, Washington

Dear Mr. Behn:

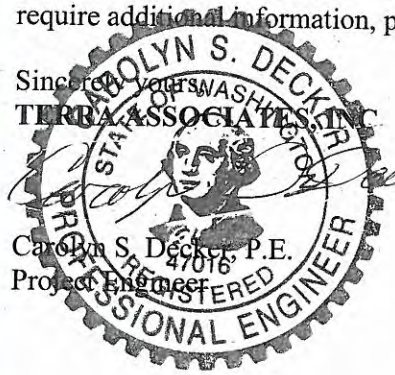
As requested, we have conducted a preliminary geotechnical engineering study for the subject project. The attached report presents our findings and recommendations for the geotechnical aspects of project design and construction.

Our field exploration indicates the site is generally underlain by 6 to 18 inches of organic topsoil overlying 1 to 4 feet of loose to medium dense silty sand with gravel (weathered till) overlying medium dense to very dense silty sand with gravel (unweathered glacial till). There were two exceptions to this general condition. One was observed at Test Pit TP-1 where we observed a one-foot medium stiff silt layer between the weathered and unweathered glacial till soils. The other was observed at test pit TP-10 where we observed approximately eight feet of loose, wet, organic fill material overlying the very dense native soils. We observed minor to heavy groundwater seepage in 9 of the 12 test pits between approximately 1 and 8 feet below current site grades.

In our opinion, soil conditions observed at the site will be suitable for support of the proposed development provided the recommendations present in this report are incorporated into project design and construction.

We trust the information presented in this report is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.



1/15/15

Carolyn S. Decker, P.E.
Project Engineer

TABLE OF CONTENTS

Preliminary Geotechnical Report
Mansoori Parcel
172nd Avenue NE and NE 122nd Street
Redmond, Washington

1.0 PROJECT DESCRIPTION

The project consists of developing the approximately 11-acre site with residential building lots and associated access, utilities, and stormwater facilities. Grading and development plans were not available at the time of this report. However, based on our knowledge of the site, we would expect cuts and fills up to ten feet will be required to achieve level building lots with site retaining walls used to support vertical grade transitions.

We expect that the residential structures constructed on the lots will be two- to three-story wood-framed buildings constructed over a crawl space with garages attached and constructed at grade. Structural loading should be relatively light; with bearing walls carrying loads of one to three kips per foot and isolated columns carrying maximum loads of 30 to 60 kips.

The recommendations in the following sections of this report are based on our understanding of the preceding design features. We should review design drawings as they become available to verify that our recommendations have been properly interpreted and to supplement them, if required.

2.0 SCOPE OF WORK

On April 11, 2014, we observed soil conditions at 12 test pits excavated between 6.5 and 9 feet below existing site grades. Using the information obtained from the subsurface exploration and laboratory testing, we performed analyses to develop preliminary geotechnical recommendations for project design and construction. Specifically, this report addresses the following:

- Soil and groundwater conditions
- Seismic design parameters per 2012 International Building Code (IBC)
- Geologic hazards per the Redmond Zoning Code (RZC)
- Site preparation and grading
- Embankments and slopes
- Excavation
- Foundations
- Floor slabs at grade
- Site retaining walls
- Drainage
- Utilities
- Pavement

It should be noted that recommendations outlined in this report regarding drainage are associated with soil strength, design earth pressures, erosion, and stability. Design and performance issues with respect to moisture as it relates to the structure environment (i.e., humidity, mildew, mold) is beyond Terra Associates' purview. A building envelope specialist or contractor should be consulted to address these issues, as needed.

3.0 SITE CONDITIONS

3.1 Surface

The project site is located at and east of the intersection of 172nd Avenue NE and NE 122nd Street in Redmond, Washington. The approximate site location is shown on Figure 1.

The site is currently covered with thick vegetation in the form of mature trees, understory, blackberries, and brush. There is a wooden fence in the south-central portion of the site that is associated with the former residence. Site topography in the western half of the site is relatively flat with a slight slope that descends to the east with an overall relief of approximately ten feet. Site topography in the eastern half of the site consists of a moderate slope that descends to the east with an overall relief of approximately 60 feet.

3.2 Subsurface

Soil conditions observed indicate the site is generally underlain by 6 to 18 inches of organic topsoil overlying 1 to 4 feet of loose to medium dense silty sand with gravel (weathered till) overlying medium dense to very dense silty sand with gravel (unweathered glacial till). There were two exceptions to this general condition. One was observed at Test Pit TP-1 where we observed a one-foot medium stiff silt layer between the weathered and unweathered glacial till soils. The other was observed at Test Pit TP-10 where we observed approximately eight feet of loose, wet, organic fill material overlying the very dense native soils.

The *Geologic Map of Redmond Quadrangle, King County, Washington,* by J.P. Minard and D.B. Booth (1988) maps the site as till (Qvt). This mapped description is consistent with the native soil we observed in the test pits.

The preceding discussion is intended to be a general review of the soil conditions encountered. For more detailed descriptions, please refer to the Test Pit Logs in Appendix A.

3.3 Groundwater

Light to heavy groundwater seepage was observed in 9 of the 12 test pits including TP-1, TP-3, TP-4, TP-6, TP-8, TP-9, TP-10, TP-11, and TP-12 between 1 and 8 feet below current site grades. Typically, we noted seepage at the contact between the upper weathered and unweathered till horizons. This condition is very common within till geology and we expect that this seepage will diminish when we move into the drier summer and fall months. Deeper zones of seepage observed in the test pits appear to be flowing from sandier layers contained within the till stratum such as at a depth of 8 feet at Test Pit TP-9. This groundwater seepage would not be significantly affected by seasonal weather variations and will be present during the drier summer and fall months. However, once exposed by excavation, we would anticipate the rate and volume of flow will diminish as storage from the isolated sandier zones is depleted.

4.0 GEOLOGICAL HAZARDS

4.1 Seismic Considerations

Section 21.64.060A.1.c of the Redmond Zoning Code (RZC) defines seismic hazard areas as "...lands subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction, or surface faulting."

Based on the soil and groundwater conditions we observed at the site, it is our opinion that the risk for damage resulting from earthquake induced slope failure, ground settlement, surface faulting, or soil liquefaction is negligible. Therefore, in our opinion, unusual seismic hazard areas do not exist at the site, and design in accordance with local building codes for determining seismic forces would adequately mitigate impacts associated with ground shaking.

Based on soil conditions observed in the test pits and our knowledge of the area geology, per Chapter 16 of the 2012 International Building Code (IBC), site class "C" should be used in structural design. Based on this site class, in accordance with the 2012 IBC, the following parameters should be used in computing seismic forces:

Seismic Design Parameters (IBC 2012)

Spectral response acceleration (Short Period), S_{Ms}	1.257
Spectral response acceleration (1 – Second Period), S_{M1}	0.636
Five percent damped .2 second period, S_{Ds}	0.838
Five percent damped 1.0 second period, S_{D1}	0.424

Values determined using the United States Geological Survey (USGS) Ground Motion Parameter Calculator accessed on April 8, 2014 at the web site http://earthquake.usgs.gov/designmaps/us/application.php.

4.2 Erosion Hazard Areas

Section 21.64.060A.1.a of the RZC defines erosion hazard areas as "...lands or areas underlain by soils identified by the U.S. Department of Agriculture Soil Conservation Service (SCS) as having "severe" or "very severe" rill and inter-rill erosion hazards. This includes, but is not limited to, the following group of soils when they occur on slopes of 15 percent or greater: Alderwood-Kitsap (AkF), Alderwood gravelly sandy loam (AgD), Kitsap silt loam (KpD), Everett (EvD), and Indianola (InD)."

The soils observed on-site are classified as Alderwood gravelly sandy loam 6 to 15 percent slopes by the United States Department of Agriculture Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service. Over most of the site with the existing slope gradients, these soils will have a slight to moderate potential for erosion when exposed. Therefore, the site is not considered an erosion hazard area by the City of Redmond. Regardless, erosion protection measures as required by the City of Redmond will need to be in place prior to starting grading activities on the site. This would include perimeter silt fencing to contain erosion on-site and cover measures to prevent or reduce soil erosion during and following construction.

4.3 Landslide Hazard Areas

Section 21.64.060A.1.b of the RZC defines landslide hazard areas as "...areas potentially subject to significant or severe risk of landslides based on a combination of geologic, topographic, and hydrogeologic factors.

They include areas susceptible because of any combination of bedrock, soil, slope, slope aspect, structure, hydrology, or other factors. They are areas of the landscape that are at a high risk of failure or that presently exhibit downslope movement of soil and/or rocks and that are separated from the underlying stationary part of the slope by a definite plane of separation. The plane of separation may be thick or thin and may be composed of multiple failure zones depending on local conditions, including soil type, slope gradient, and groundwater regime." Landslide hazard areas include the following:

i. Areas of historic failures, such as:

   a. Areas designated as quaternary slumps or landslides on maps published by the United States Geologic Survey (USGS).

   b. Those areas designated by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) as having a "severe" limitation for building site development.

ii. Areas containing a combination of slopes steeper than 15 percent, springs or groundwater seepage, and hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock.

iii. Areas that have shown movement during the Holocene epoch (from 10,000 years ago to the present) or which are underlain or covered by mass wastage debris of that epoch.

iv. Slopes that are parallel or subparallel to planes of weakness in subsurface materials.

v. Slopes having gradients steeper than 80 percent subject to rockfall during seismic shaking.

vi. Areas potentially unstable as a result of rapid stream incision, stream bank erosion, and undercutting by wave action.

vii. Any area with a slope 40 percent or steeper with a vertical relief of 10 feet or more.

None of the above conditions exist at the site, therefore, in our opinion; the site does not contain any landslide hazard areas as defined by the RZC.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

Based on our study, there are no geotechnical considerations that would preclude continued development of the site as currently planned. Residential buildings can be supported on conventional spread footings bearing on inorganic competent native soils or on structural fill placed and compacted above competent mineral native soils. Pavement and floor slabs can be similarly supported. The exception to this is in the vicinity of Test Pit TP-10 where we observed loose, wet, organic fill material that would not be suitable for support of building foundations, floor slabs, or pavements. We recommend removing the existing fill from below new building elements and replacing the material with new structural fill.

The native soils that will be encountered at the site contain a significant amount of soil fines and will be difficult to compact as structural fill when too wet. The ability to use native soil from site excavations as structural fill will depend on its moisture content and the prevailing weather conditions at the time of construction. If grading activities will take place during winter, the owner should be prepared to import clean granular material for use as structural fill and backfill. The existing fill material would not be suitable for reuse as structural fill.

The following sections provide detailed recommendations regarding the preceding issues and other geotechnical design considerations. These recommendations should be incorporated into the final design drawings and construction specifications.

5.2 Site Preparation and Grading

To prepare the site for construction, all vegetation, organic surface soils, and other deleterious material should be stripped and removed from the site. Surface stripping depths of about 6 to 18 inches should be expected to remove the organic surface soils except in the area of Test Pit TP-10 where the wet organic fill was observed. In this area, excavation depths of eight feet should be expected. Organic topsoil will not be suitable for use as structural fill, but may be used for limited depths in nonstructural areas.

Once clearing and stripping operations are complete, cut and fill operations can be initiated to establish desired grades. Prior to placing fill, all exposed bearing surfaces should be observed by a representative of Terra Associates to verify soil conditions are as expected and suitable for support of new fill. Our representative may request a proofroll using heavy rubber-tired equipment to determine if any isolated soft and yielding areas are present. If excessively yielding areas are observed, and they cannot be stabilized in place by compaction, the affected soils should be excavated and removed to firm bearing and grade restored with new structural fill. Beneath embankment fills or roadway subgrade if the depth of excavation to remove unstable soils is excessive, the use of geotextile fabrics, such as Mirafi 500X, or an equivalent fabric, can be used in conjunction with clean granular structural fill. Our experience has shown that, in general, a minimum of 18 inches of a clean, granular structural fill placed and compacted over the geotextile fabric should establish a stable bearing surface.

The native soils encountered at the site contain a sufficient amount of soil fines that will make them difficult to compact as structural fill when too wet or too dry. The ability to use native soils from site excavations as structural fill will depend on its moisture content and the prevailing weather conditions at the time of construction. If wet soils are encountered, the contractor will need to dry the soils by aeration during dry weather conditions. Alternatively, the use of an additive such as Portland cement, cement kiln dust (CKD), or lime to stabilize the soil moisture can be considered. If the soil is amended, additional Best Management Practices (BMPs) addressing the potential for elevated pH levels will need to be included in the Storm Water Pollution Prevention Program (SWPPP) prepared with the Temporary Erosion and Sedimentation Control (TESC) plan.

If grading activities are planned during the wet winter months, or if they are initiated during the summer and extend into fall and winter, the owner should be prepared to import wet weather structural fill. For this purpose, we recommend importing a granular soil that meets the following grading requirements:

U.S. Sieve Size	Percent Passing
6 inches	100
No. 4	75 maximum
No. 200	5 maximum*

* Based on the 3/4-inch fraction.

Prior to use, Terra Associates, Inc. should examine and test all materials imported to the site for use as structural fill.

Structural fill should be placed in uniform loose layers not exceeding 12 inches and compacted to a minimum of 95 percent of the soil's maximum dry density, as determined by American Society for Testing and Materials (ASTM) Test Designation D-698 (Standard Proctor). The moisture content of the soil at the time of compaction should be within two percent of its optimum, as determined by this ASTM standard. In nonstructural areas, the degree of compaction can be reduced to 90 percent.

5.3 Slopes and Embankments

All permanent cut and fill slopes should be graded with a finished inclination of no greater than 2:1. Upon completion of grading, the slope face should be appropriately vegetated or provided with other physical means to guard against erosion. Final grades at the top of the slope must promote surface drainage away from the slope crest. Water must not be allowed to flow uncontrolled over the slope face. If surface runoff must be directed towards the slope, the runoff should be controlled at the top of the slope, piped in a closed conduit installed on the slope face, and taken to an appropriate point of discharge beyond the toe.

All fill placed for embankment construction should meet the structural fill requirements in Section 5.2 of this report. In addition, if the new fills will be placed over existing slopes of 20 percent or greater, the structural fill should be keyed and benched into competent native slope soils. Figure 3 presents a typical slope key and bench configuration. At minimum, a toe drain should be installed in the key cut as shown on Figure 3. Depending on seepage conditions, drains may also be required along individual benches excavated on the slope face especially along the pond slopes. The need for drains along the upper benches will be best determined in the field at the time of construction.

5.4 Excavations

All excavations at the site associated with confined spaces, such as utility trenches, must be completed in accordance with local, state, and federal requirements. Based on regulations outlined in the Washington Industrial Safety and Health Act (WISHA), the upper one to four feet of weathered till and the upper eight feet of fill material would be classified as Type C soil. The native dense till soils would be classified as Type A soil.

Temporary slopes for excavations in Type C soils should be laid back at an inclination of 1.5:1 (Horizontal:Vertical) or flatter, from the toe to the crest of the slope. Excavation slopes in Type A soils can be laid back at a slope inclination of 0.75:1 or flatter. For temporary excavation slopes less than eight feet in height in Type A soils, the lower 3.5 feet can be cut to a vertical condition with a 0.75:1 slope graded above. For temporary excavation slopes of greater than eight feet, the slope above the 3.5-foot vertical portion should be laid back at a minimum slope inclination of 1:1. All temporary excavation slopes that will remain open for an extended time period should be covered with a durable reinforced plastic membrane during construction to prevent slope raveling and rutting during periods of precipitation.

In general, groundwater seepage should be anticipated within excavations that extend to depths of greater than three feet below site grades particularly during and shortly following the normally wet winter season. We anticipate that the volume of water and rate of flow into the excavation will be relatively minor and are not expected to impact the stability of the excavations when completed, as described. Conventional sump pumping procedures, along with a system of collection trenches, if necessary should be capable of maintaining a relatively dry excavation for construction purposes.

The above information is provided solely for the benefit of the owner and other design consultants, and should not be construed to imply that Terra Associates, Inc. assumes responsibility for job site safety. It is understood that job site safety is the sole responsibility of the project contractor.

5.5 Foundation Support

Residential buildings can be supported on conventional spread footing foundations bearing on undisturbed surfaces consisting of inorganic competent native soils or on structural fills placed above competent soils. Foundation subgrade should be prepared as recommended in Section 5.2 of this report. As noted above, the foundations in the vicinity of Test Pit TP-10 will need to be founded on new structural fill that replaces the existing loose, wet, organic material or the foundations can be lowered to bear on the native soils. Perimeter foundations exposed to the weather should bear a minimum depth of 1.5 feet below final exterior grades for frost protection. Interior foundations can be constructed at any convenient depth below the floor slab.

Foundations can be dimensioned for a net allowable bearing capacity of 2,500 pounds per square foot (psf). For short-term loads, such as wind and seismic, a one-third increase in this allowable capacity can be used. With structural loading as anticipated and this bearing stress applied, estimated total settlements are less than one-half inch.

For designing foundations to resist lateral loads, a base friction coefficient of 0.35 can be used. Passive earth pressures acting on the side of the footing and buried portion of the foundation stem wall can also be considered. We recommend calculating this lateral resistance using an equivalent fluid weight of 300 pcf. We recommend not including the upper 12 inches of soil in this computation because they can be affected by weather or disturbed by future grading activity. This value assumes the foundation will be constructed neat against competent native soil or backfilled with structural fill as described in Section 5.2 of this report. The values recommended include a safety factor of 1.5.

5.6 Floor Slab-on-Grade

Slab-on-grade floors may be supported on subgrade prepared as recommended in Section 5.2 of this report. Immediately below the floor slab, we recommend placing a four-inch thick capillary break layer composed of clean, coarse sand or fine gravel that has less than three percent passing the No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab. As noted above, the existing fill material in the vicinity of Test Pit TP-10 will need to be removed from below slab-on-grade floors and replaced with new structural fill.

The capillary break layer will not prevent moisture intrusion through the slab caused by water vapor transmission. Where moisture by vapor transmission is undesirable, such as covered floor areas, a common practice is to place a durable plastic membrane on the capillary break layer and then cover the membrane with a layer of clean sand or fine gravel to protect it from damage during construction, and to aid in uniform curing of the concrete slab. It should be noted that if the sand or gravel layer overlying the membrane is saturated prior to pouring the slab, it will not be effective in assisting uniform curing of the slab and can actually serve as a water supply for moisture bleeding through the slab, potentially affecting floor coverings. Therefore, in our opinion, covering the membrane with a layer of sand or gravel should be avoided if floor slab construction occurs during the wet winter months and the layer cannot be effectively drained. We recommend floor designers and contractors refer to the 2003 American Concrete Institute (ACI) Manual of Concrete Practice, Part 2, 302.1R-96, for further information regarding vapor barrier installation below slab-on-grade floors.

5.7 Site Retaining Walls

Based on the existing topography of the site, site retaining walls will likely be required to achieve flat building lots. For design of conventional cast-in-place concrete walls or gravity block walls, the magnitude of earth pressure development will partly depend on the quality of the wall backfill. We recommend placing and compacting wall backfill as structural fill as described in Section 5.2 of this report. To guard against hydrostatic pressure development, wall drainage must also be installed. A typical recommended wall drainage detail is shown on Figure 4.

With wall backfill placed and compacted as recommended, and drainage properly installed, we recommend designing unrestrained walls for an active earth pressure equivalent to a fluid weighing 35 pounds per cubic foot (pcf). For restrained walls, an additional uniform load of 100 psf should be included in the wall design. To account for typical traffic surcharge loading, the walls can be designed for an additional imaginary height of two feet (two-foot soil surcharge). For evaluation of wall performance under seismic loading, a uniform pressure equivalent to 8H psf, where H is the height of the below-grade portion of the wall should be applied in addition to the static lateral earth pressure. These values assume a horizontal backfill condition and that no other surcharge loading, sloping embankments, or adjacent buildings will act on the wall. If such conditions exist, then the imposed loading must be included in the wall design. Friction at the base of foundations and passive earth pressure will provide resistance to these lateral loads. Values for these parameters are provided in Section 5.5 of this report.

For design of mechanically stabilized earth (MSE) walls faced with precast segmental block units, we recommend using a soil unit weight of 125 pcf and an internal friction angle of 34 degrees for both the reinforced and retained soil zones.

5.8 Drainage

Surface

Final exterior grades should promote free and positive drainage away from the building sites at all times. Water must not be allowed to pond or collect adjacent to foundations or within the immediate building areas. We recommend providing a positive drainage gradient away from the building perimeters. If this gradient cannot be provided, surface water should be collected adjacent to the structures and disposed to appropriate storm facilities.

Surface water must not be allowed to flow uncontrolled over the crest of the site slopes and embankments. Surface water should be directed away from the slope crests to a point of collection and controlled discharge. If site grades do not allow for directing surface water away from slopes, then water should be collected and tightlined down the slope face in a controlled manner.

Subsurface

We recommend installing perimeter foundation drains adjacent to shallow foundations. The drains can be laid to grade at an invert elevation equivalent to the bottom of footing grade. The drains can consist of four-inch diameter perforated PVC pipe that is enveloped in washed pea gravel-sized drainage aggregate. The aggregate should extend six inches above and to the sides of the pipe. Roof and foundation drains should be tightlined separately to the storm drains. All drains should be provided with cleanouts at easily accessible locations.

Infiltration

The native glacial till soils composed of silty sand characteristically exhibit low permeability's and would not be a suitable receptor soil for discharge of development stormwater using infiltration/retention facilities. Conventional stormwater detention with controlled release to the drainage basin should be used to manage development stormwater.

5.9 Utilities

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) or the City of Redmond specifications. As a minimum, trench backfill should be placed and compacted as structural fill, as described in Section 5.2 of this report. As noted, depending on the soil moisture when excavated most inorganic native soils on the site should be suitable for use as backfill material during dry weather conditions. The contractor should be prepared to aerate soils to reduce moisture and facilitate proper compaction. However, if utility construction takes place during the wet winter months, it will likely be necessary to import suitable wet weather fill for utility trench backfilling.

5.10 Pavement

Pavement subgrades should be prepared as described in the Section 5.2 of this report. Regardless of the degree of relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. The subgrade should be proofrolled with heavy rubber-tire construction equipment such as a loaded 10-yard dump truck to verify this condition.

The pavement design section is dependent upon the supporting capability of the subgrade soils and the traffic conditions to which it will be subjected. For residential access, with traffic consisting mainly of light passenger vehicles with only occasional heavy traffic, and with a stable subgrade prepared as recommended, we recommend the following pavement sections:

- Two inches of hot mix asphalt (HMA) over six inches of crushed rock base (CRB)
- Four inches of full depth HMA

The paving materials used should conform to the Washington State Department of Transportation (WSDOT) specifications for ½-inch class HMA and CRB.

Long-term pavement performance will depend on surface drainage. A poorly-drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability. For optimum pavement performance, we recommend surface drainage gradients of at least two percent. Some degree of longitudinal and transverse cracking of the pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

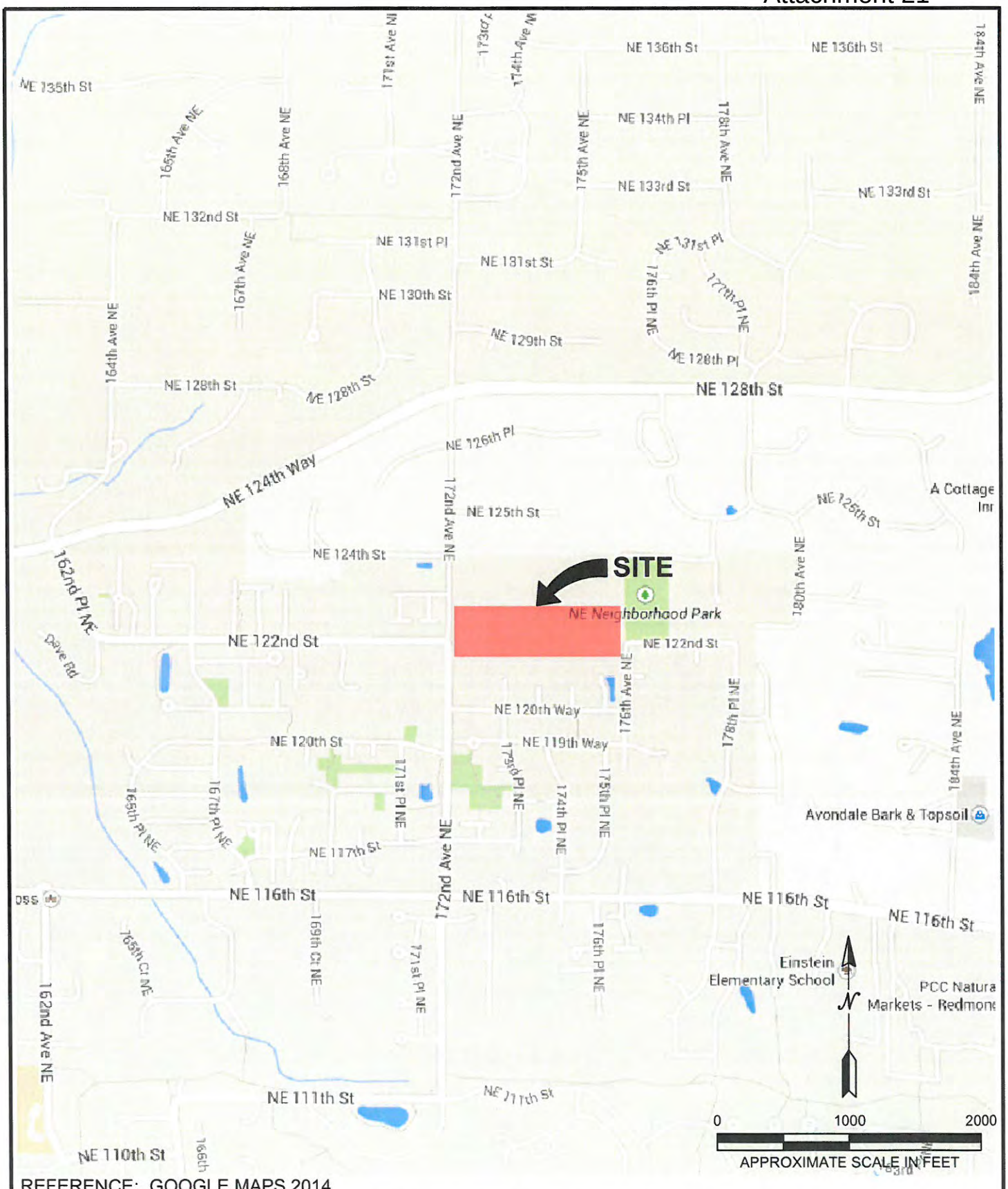
6.0 ADDITIONAL SERVICES

Terra Associates, Inc. should review the final design drawings and specifications in order to verify that earthwork and foundation recommendations have been properly interpreted and implemented in project design. We should also provide geotechnical service during construction to observe compliance with our design concepts, specifications, and recommendations. This will allow for design changes if subsurface conditions differ from those anticipated prior to the start of construction.

7.0 LIMITATIONS

We prepared this report in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made. This report is the copyrighted property of Terra Associates, Inc. and is intended for specific application to the Mansoori Parcel project. This report is for the exclusive use of Quadrant Homes and its authorized representatives.

The analyses and recommendations present in this report are based on data obtained from the test pits and borings done on site. Variations in soil conditions can occur, the nature and extent of which may not become evident until construction. If variations appear evident, Terra Associates, Inc. should be requested to reevaluate the recommendations in this report prior to proceeding with construction.



REFERENCE: GOOGLE MAPS 2014

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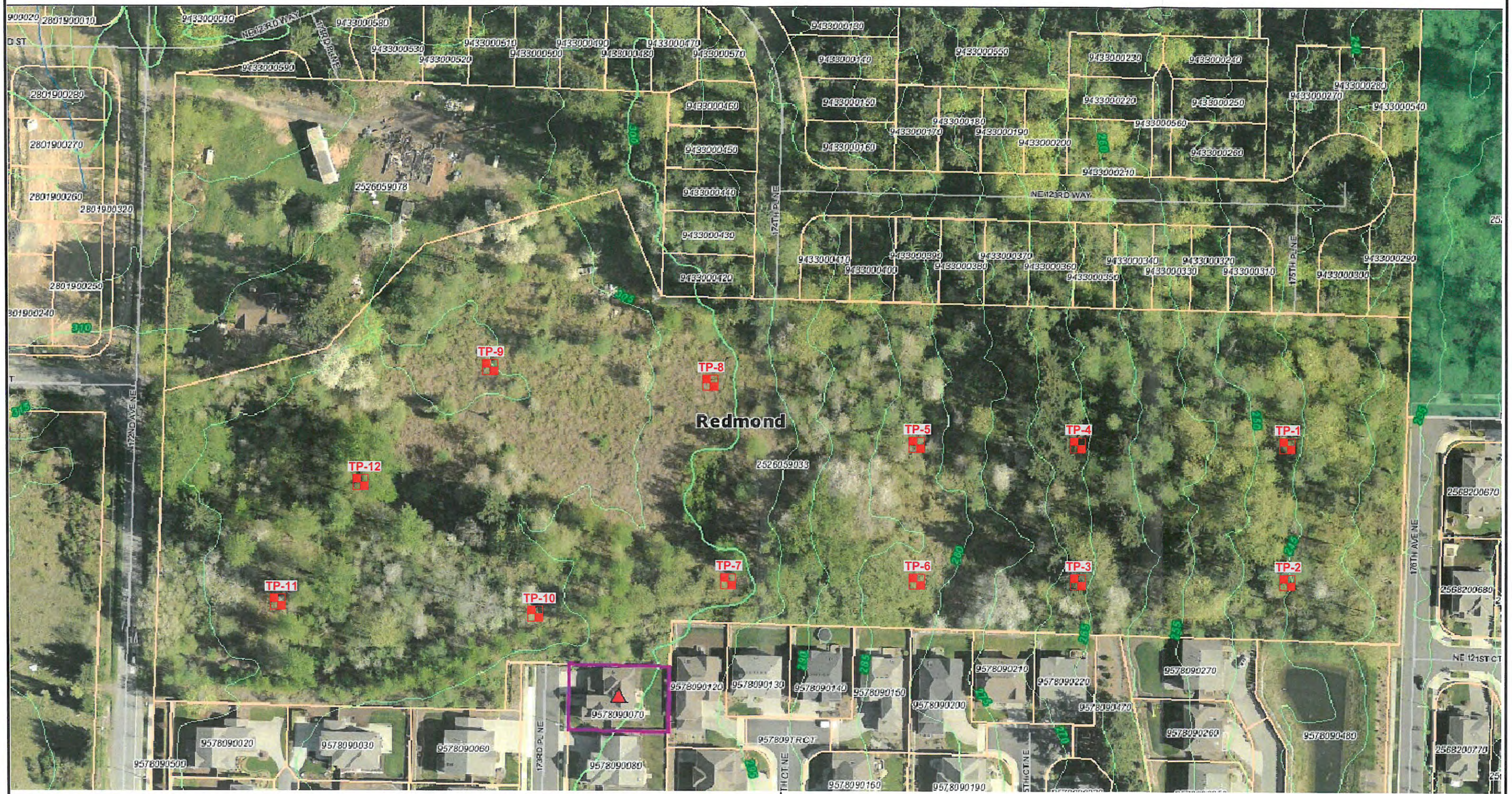
VICINITY MAP
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037	Date APRIL 2014	Figure 1



NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE: SITE PLAN PROVIDED BY KING COUNTY IMAP.

LEGEND:

APPROXIMATE TEST PIT LOCATION

0 100 200

APPROXIMATE SCALE IN FEET

N

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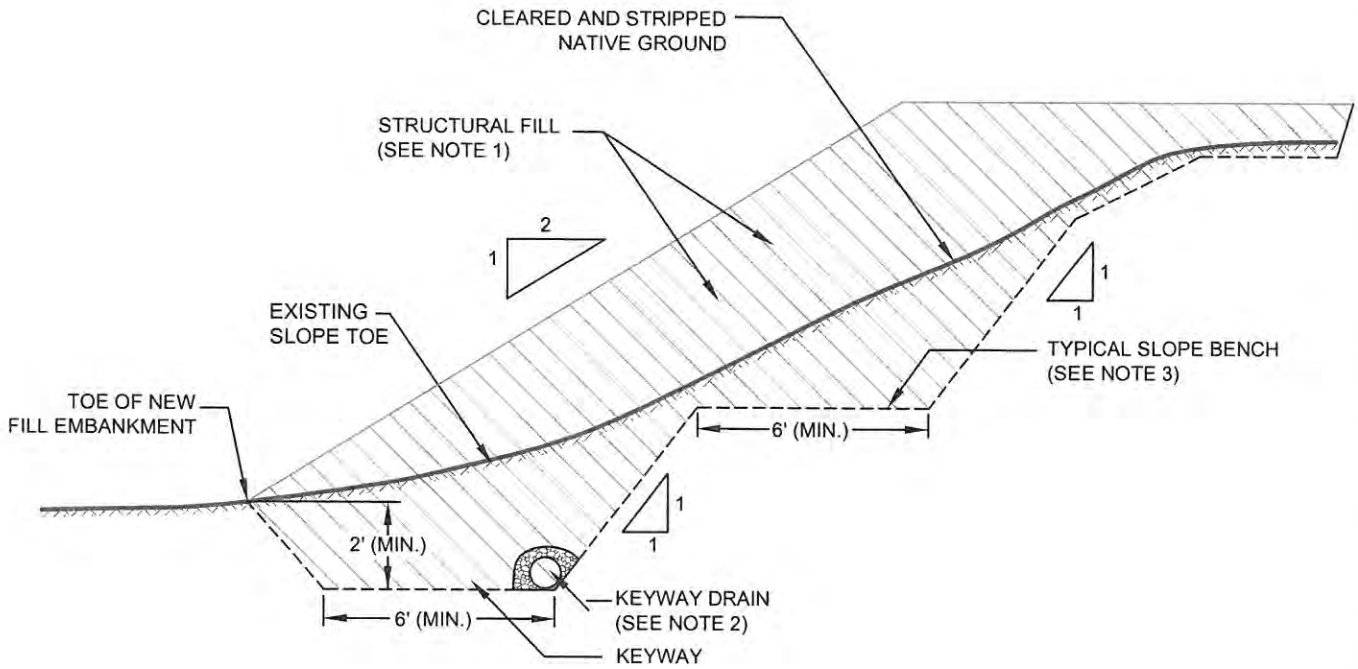
EXPLORATION LOCATION PLAN
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037	Date APRIL 2014	Figure 2



NOT TO SCALE

NOTES:

1) STRUCTURAL FILL SHALL BE COMPACTED TO A MINIMUM OF 95% OF ASTM D 698 MAXIMUM DRY DENSITY VALUE.
2) DRAINS SHALL CONSIST OF 6" DIA. PERFORATED PVC PIPE ENVELOPED IN 1 cu ft OF 3/4" WASHED GRAVEL. DRAIN PIPE SHALL BE DIRECTED TO THE STORM DRAIN SYSTEM OR APPROVED POINT OF DISCHARGE.
3) ADDITIONAL BENCHES AND BENCH DRAINS MAY BE REQUIRED BASED ON FIELD EVALUATION BY THE GEOTECHNICAL ENGINEER.

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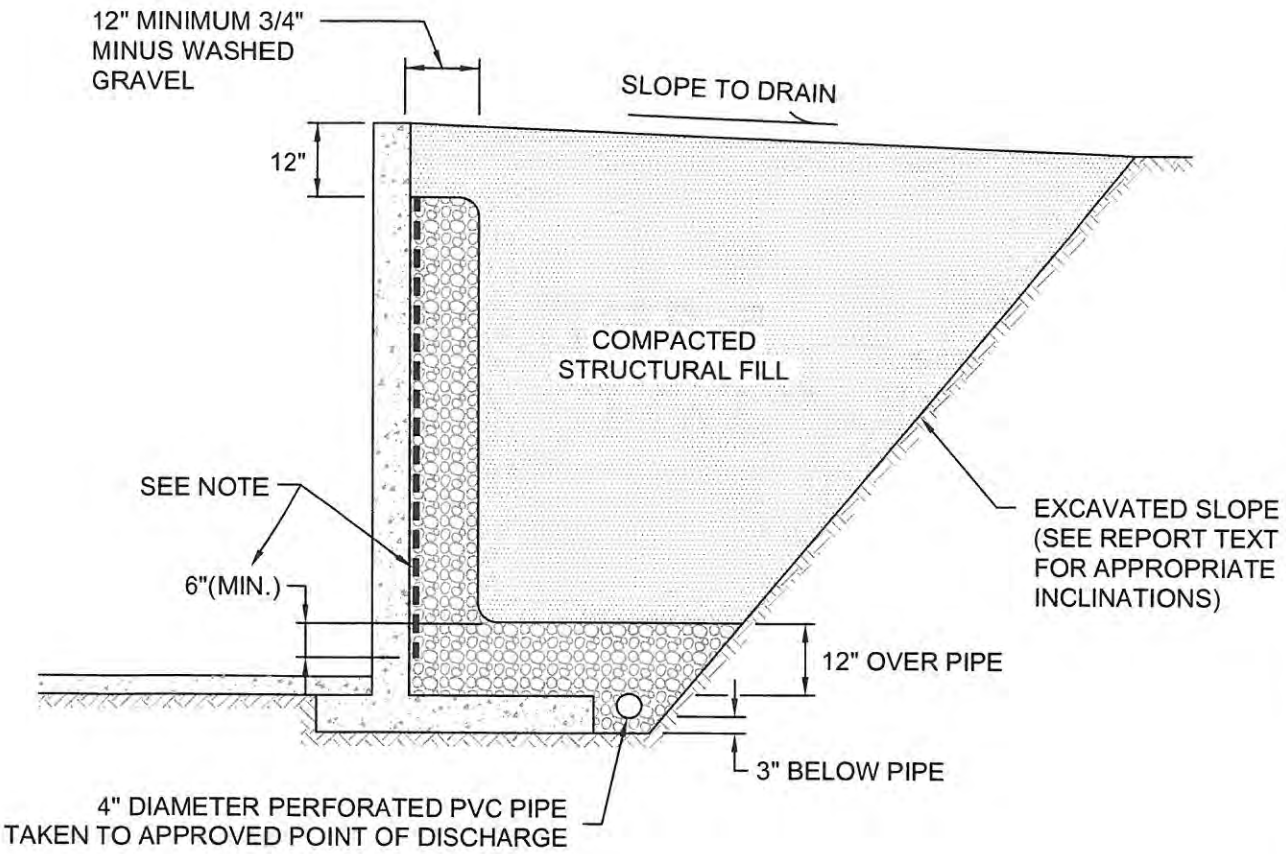
TYPICAL SLOPE KEY AND BENCH DETAIL
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037	Date APRIL 2014	Figure 3



NOT TO SCALE

NOTE:

MIRADRAIN G100N PREFABRICATED DRAINAGE PANELS OR SIMILAR PRODUCT CAN BE SUBSTITUTED FOR THE 12-INCH WIDE GRAVEL DRAIN BEHIND WALL. DRAINAGE PANELS SHOULD EXTEND A MINIMUM OF SIX INCHES INTO 12-INCH THICK DRAINAGE GRAVEL LAYER OVER PERFORATED DRAIN PIPE.

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TYPICAL WALL DRAINAGE DETAIL
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No. T-7037	Date APRIL 2014	Figure 4

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

Mansoori Parcel
Redmond, Washington

On April 11, 2014, we completed our site exploration by observing soil conditions at 12 test pits. The test pits were excavated using a trackhoe to a maximum depth of nine feet below existing site grades. Test pit locations were determined in the field by measurements from existing site features. The approximate location of the test pits is shown on the attached Exploration Location Plan, Figure 2. Test Pit Logs are attached as Figures A-2 through A-13.

A geotechnical engineer from our office conducted the field exploration. Our representative classified the soil conditions encountered, maintained a log of each test pit, obtained representative soil samples, and recorded water levels observed during excavation. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS) described on Figure A-1.

Representative soil samples obtained from the test pits were placed in closed containers and taken to our laboratory for further examination and testing. The moisture content of each sample was measured and is reported on the individual Test Pit Logs.

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS (More than 50% material larger than No. 200 sieve size)	**GRAVELS** More than 50% of coarse fraction is larger than No. 4 sieve	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS More than 50% of coarse fraction is smaller than No. 4 sieve	Clean Sands (less than 5% fines)	SW	Well-graded sands, sands with gravel, little or no fines.
			SP	Poorly-graded sands, sands with gravel, little or no fines.
		Sands with fines	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS (More than 50% material smaller than No. 200 sieve size)	**SILTS AND CLAYS** Liquid Limit is less than 50%		ML	Inorganic silts, rock flour, clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity. (Lean clay)
			OL	Organic silts and organic clays of low plasticity.
	SILTS AND CLAYS Liquid Limit is greater than 50%		MH	Inorganic silts, elastic.
			CH	Inorganic clays of high plasticity. (Fat clay)
			OH	Organic clays of high plasticity.
HIGHLY ORGANIC SOILS			PT	Peat.

DEFINITION OF TERMS AND SYMBOLS

COHESIONLESS

Density	Standard Penetration Resistance in Blows/Foot
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	>50

COHESIVE

Consistancy	Standard Penetration Resistance in Blows/Foot
Very Soft	0-2
Soft	2-4
Medium Stiff	4-8
Stiff	8-16
Very Stiff	16-32
Hard	>32

I	2" OUTSIDE DIAMETER SPILT SPOON SAMPLER
‖	2.4" INSIDE DIAMETER RING SAMPLER OR SHELBY TUBE SAMPLER
▼	WATER LEVEL (Date)
Tr	TORVANE READINGS, tsf
Pp	PENETROMETER READING, tsf
DD	DRY DENSITY, pounds per cubic foot
LL	LIQUID LIMIT, percent
PI	PLASTIC INDEX
N	STANDARD PENETRATION, blows per foot

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UNIFIED SOIL CLASSIFICATION SYSTEM
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037	Date APRIL 2014	Figure A-1

LOG OF TEST PIT NO. TP-1

FIGURE A-2

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 5 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense	26.3		
3	2	Gray SILT, fine grained, saturated, mottled. (ML)	Medium Stiff	29.8		
4			Medium Dense			
5 ▽	3			14.3		
6		Gray silty SAND with gravel, fine to medium grained, wet to moist. (SM) (Unweathered Till)				
7			Dense			
8		Test pit terminated at approximately 8 feet. Minor groundwater seepage observed at 5 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

Terra Associates, Inc.
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LOG OF TEST PIT NO. TP-2

FIGURE A-3

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** N/A **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2		Red-brown to brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3	1			32.8		
4			Medium Dense			
5	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4 feet. (SM) (Unweathered Till)	Dense	13.2		
6						
7			Very Dense			
		Test Pit terminated at approximately 7 feet. No groundwater seepage observed.				
8						
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-3

FIGURE A-4

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Underbrush APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: 4 Feet DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
	1			27.0		
2		Brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
			Medium Dense			
▼ 4			Dense			
	2			14.8		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4 feet. (SM) (Unweathered Till)				
6			Very Dense			
7						
8		Test pit terminated at approximately 8 feet. Moderate groundwater seepage observed at 4 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-4

FIGURE A-5

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 4 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
	1			24.7		
2		Brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
▼ 4						
			Dense			
	2			16.3		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation. (SM) (Unweathered Till)				
6			Very Dense			
7		Test pit terminated at approximately 6.5 feet. Minor groundwater seepage observed at 4 feet.				
8						
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-5

FIGURE A-6

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Underbrush APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: N/A DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
	1			21.3		
2		Brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
4						
5						
6	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation. (SM) (Unweathered Till)	Dense	13.5		
7						
8		Test pit terminated at approximately 8 feet. No groundwater seepage observed.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-6

FIGURE A-7

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Tall Blackberries APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: 3 Feet DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense	23.0		
3 ▼						
4			Dense			
5	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 3 feet. (SM) (Unweathered Till)		13.7		
6			Very Dense			
7						
8		Test pit terminated at approximately 8 feet. Minor groundwater seepage observed at 3 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-7

FIGURE A-8

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Tall Blackberries APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: N/A DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1	1	Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose	14.7		
2		Brownish gray silty SAND with gravel, fine to medium grained, moist. (SM) (Weathered Till)	Medium Dense			
3						
4	2			13.8		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4 feet. (SM) (Unweathered Till)	Dense			
6						
7						
8		Test pit terminated at approximately 8 feet. No groundwater seepage observed.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-8

FIGURE A-9

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 4 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist to wet, heavy organics. (SM) (TOPSOIL)	Loose	28.1		
2	1	Red-brown silty SAND with gravel, fine to medium grained, moist, roots. (SM) (Weathered Till)	Medium Dense			
3						
4 ▼						
5	2	Gray silty SAND with gravel, fine to medium grained, moist, mottled to 4 feet, some cementation. (SM) (Unweathered Till)	Dense	16.2		
6						
7						
8		Test pit terminated at approximately 8 feet. Minor groundwater seepage observed at 4 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-9

FIGURE A-10

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Tall Blackberries APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: 8 Feet DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist to wet, heavy organics. (SM) (TOPSOIL)	Loose			
	1			22.5		
2		Red-brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
4						
5		Gray silty SAND with gravel, fine to medium grained, wet to moist, mottled to 4 feet. (SM) (Unweathered Till)	Dense			
6	2			14.6		
7						
▼ 8		Test pit terminated at approximately 8 feet. Moderate groundwater seepage observed at 8 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-10

FIGURE A-11

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries/Brush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 0 to 8 Feet **DEPTH TO CAVING:** 0 to 8 Feet

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		(6 inches ORGANICS)				
2						
3						
4		FILL: gray and brown silty sand with gravel, fine to medium grained, saturated, highly organic, bricks, pvc, plastic.	Loose			
5						
6						
7						
8						
	1	Gray silty SAND with gravel, fine to medium grained, moist, pieces of weathered bedrock. (SM) (Unweathered Till)	Very Dense	11.2		
9		Test pit terminated at approximately 9 feet. Heavy groundwater seepage observed from 0 to 8 feet. Moderate caving observed from 0 to 8 feet.				
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-11

FIGURE A-12

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Brush, Weeds, Grass APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: 3 Feet DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, wet, roots. (SM) (Weathered Till)	Medium Dense	33.5		
3 ▼						
4	2			17.2		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4.5 feet, occasional cobble. (SM) (Unweathered Till)	Dense			
6						
7	3	Test pit terminated at approximately 7 feet. Minor groundwater seepage observed at 3 feet.		11.6		
8						
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

Terra Associates, Inc.
Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences

LOG OF TEST PIT NO. TP-12

FIGURE A-13

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries/Brush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 3 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist to wet, heavy organics. (SM) (TOPSOIL)	Loose			
	1			34.7		
2		Red-brown silty SAND with gravel, fine to medium grained, wet to saturated, roots. (SM) (Weathered Till)	Loose			
▼ 3						
	2			19.9		
4						
5		Gray silty SAND with gravel, fine to medium grained, wet to moist, mottled to 5 feet. (SM) (Unweathered Till)	Dense			
6	3			15.9		
7						
8		Test pit terminated at approximately 8 feet. Moderate groundwater seepage observed at 3 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

Terra Associates, Inc.
Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences

APPENDIX C

Critical Aquifer Recharge Area Report,
Terra Associates, Inc., October 17, 2014

Response to Review Comments,
Terra Associates, Inc., February 4, 2015

Test Pit TP-10 Fill Areas Delineation,
Terra Associates, Inc., December 30, 2014

TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

October 17, 2014
Project No. T-7037

Mr. Corey Watson
Quadrant Homes
14725 SE 36th Street, Suite 200
Bellevue, Washington 98006

Subject: Critical Aquifer Recharge Areas Report
Edgewood West
172nd Avenue NE and NE 122nd Street
Redmond, Washington

Dear Mr. Watson:

As requested by Ms. Trish Clements of Goldsmith Land Development Services (Goldsmith), we performed a hydrogeologic assessment of the subject site. The purpose of our study was to evaluate potential impacts that the planned development may have on domestic water wells located in the vicinity of the site, and to prepare a written Critical Aquifer Recharge Areas (CARA) report in accordance with the requirements of Appendix 1 (Critical Areas Reporting Requirements) of the City of Redmond Zoning Code (RZC). The position of the site relative to the City of Redmond Wellhead Protection Zones is shown on Figure 1. General project information required by Appendix 1 of the RZC is provided in Appendix A.

Because the subject property is located within the City of Redmond's Wellhead Protection Zone 3 and the planned site development includes the creation of 5,000 feet or more impervious site area, the CARA report is required to include both Level 1 and Level 2 hydrogeologic assessments.

SITE DESCRIPTION

The site is an 11.5-acre vacant property (King County Tax Parcel No. 2526059033) located southeast of and adjacent to the intersection of 172nd Avenue NE and NE 122nd Street in Redmond, Washington. The site location is shown on Figure 2. Property use adjacent to the site and in the surrounding areas is predominantly residential.

The site is located on the eastern side of a linear, regional physiographic feature called the Avondale Drift Upland, which is an approximately 5-mile long, north/northwest-trending highland bound by the Sammamish Trough on the west and the Bear Creek Channel on the east. Existing surface gradients are relatively flat in the western approximately 500 feet of the site, and then slope gently down toward the east property margin. A topographic survey by Goldsmith dated September 11, 2014 indicates that surface gradients generally range between about 2 percent and 10 percent. Site relief is about 76 feet from a topographic high of about Elev. 310 near the west site margin to about Elev. 234 near the east site margin. Site vegetation generally consists of deciduous forest with brush undergrowth.

Review of historical aerial photographs indicates that a residence occupied the western portion of the site for a period of time. Remnants of the residential foundation remain on-site.

We did not observe any surface water at the subject site. A Class II stream identified as Monticello Creek (City of Redmond Critical Areas Map 64.3 [Streams Classification]) flows from north to south approximately 320 feet east of the site.

PROJECT DESCRIPTION

The proposed project is a 51-lot residential development. A conceptual grading plan by Goldsmith dated September 30, 2014 indicates grading to achieve building pad and roadway elevations will consist of cuts and fills. Maximum cut depths and fill thicknesses are generally about six feet and ten feet, respectively. Planned site development is shown on Figure 3.

We expect that site utilities will generally be located within the road prism, with a maximum average depth that is not expected to exceed eight feet. Site stormwater will be collected and routed in an enclosed system to a buried detention vault located in the southeastern corner of the site. Preliminary dimensions shown on the conceptual grading plan indicate the vault will be 170 feet long, 110 feet wide, and 14 feet deep.

We understand that the vault will release controlled discharge to an existing closed system located off-site to the south that ultimately discharges to the Monticello Creek drainage. Water quality requirements are proposed to be met by wetpool storage within the vault.

SUBSURFACE CONDITIONS

Soils

The native soils observed in our site explorations are glacial till consisting primarily of silty sand with gravel and scattered cobbles. The upper approximately two to four feet of till has typically weathered to a medium dense condition. The underlying unweathered till is typically dense to very dense and weakly cemented. All 12 test pits were terminated in dense to very dense till.

Detailed descriptions of the subsurface conditions we observed in our site explorations are presented on the Test Pit Logs in Appendix B. The approximate locations of the test pits are shown on Figure 3.

The *Geologic Map of the Redmond Quadrangle, King County, Washington* by J. P. Minard and D. B. Booth (1988) shows site geology mapped as Vashon till (Qvt). The dense to very dense soils observed at depth in the test pits are generally consistent with this geologic map unit. The referenced geologic map is attached as Figure 4.

Groundwater

We observed groundwater seepage in 9 of the 12 test pits excavated at the site. The observed seepage was generally light to moderate and was typically perched above the dense to very dense till between depths of about three and five feet below the ground surface. We also observed light to moderate seepage from a localized sandy layer within the dense till at a depth of about eight feet at one test pit location. The sandy zone appears to be both laterally and vertically discontinuous, as we did not observe similar zones within the till at other locations.

The occurrence of shallow perched groundwater is typical for sites underlain by till. We expect that perched groundwater levels and flow rates will fluctuate seasonally and will typically reach their highest levels during and shortly following the wet winter months (October through May). Considering that our test pits were excavated in April, we expect that the observed groundwater levels and seepage flow rates are near their seasonal high.

In general, during the winter and spring months, a portion of the rainfall infiltrates through the upper weathered soil zone and becomes perched on the underlying, dense to very dense till or till-like soils, which have a relatively low permeability that impedes the downward migration of the infiltrated surface water. As a result, groundwater seepage will develop and tend to flow laterally along the surface of the till until emerging as seeps and springs at lower elevations in topographic features such as ravines and closed depressions. Locally, such seepage is referred to as interflow.

The gradient of the till surface and the permeability of the upper weathered till horizon governs the rate and direction of the interflow. The surface of the dense to very dense till typically parallels the existing surface topography. Therefore, the direction and gradient of shallow perched groundwater flow will generally be similar to that of surface water flow.

Based on our study, it appears that the surface of the till generally conforms to the ground surface. Therefore, we expect that the general direction of shallow groundwater interflow at the site is generally to the east. This is consistent with direction of flow indicated by the groundwater potentiometric surface elevations for alluvial and upland aquifers shown on Figure 4.4(a) (Alluvial and Upland Aquifers) of the City of Redmond Wellhead Protection Report.

Hydrogeology

The City of Redmond Wellhead Protection Report recognizes three aquifers within the wellhead protection area. These include the Alluvial Aquifer, which is where the Redmond municipal wells produce from; the Local Upland Aquifer, which occurs within Vashon advance outwash (Qva) deposits that stratigraphically underlie Qvt in upland areas; and the Sea Level Aquifer, which underlies the Qva and a regional aquitard formed by transitional bed (Qtb) silt and clay.

Based on our study, three primary groundwater regimes are present in the site vicinity. These include shallow seasonal perched groundwater above the relatively-impermeable, dense to very dense till, groundwater within the Qva deposits underlying the till, and deep groundwater occurring within pre-Vashon sediments that underlie the Qtb.

As discussed, groundwater observed in our site explorations was perched above the unweathered till or in localized, apparently discontinuous, sandy zones within the till. Documented wells in the vicinity of the site are completed within the Qva, and within sediments underlying deeper silt and clay deposits consistent with Qtb.

WATER WELL REVIEW

We reviewed well log records available on the Washington State Department of Ecology (Ecology) Water Resources Program web site for existing water wells located within 1,300 feet of the site. We identified three domestic water wells located within this search radius. Brief summaries of the three wells are given below:

Dezotell Well (NE ¼ of SW ¼ of Section 25, Township 26N, Range 5E):

Domestic water well located at 16919 NE 122nd Street, approximately 750 to 800 feet west-southwest and upgradient from the subject site. The total drilled depth of the well is 118 feet. The well is finished in sand and gravel interpreted to be Qva deposits at a depth of 113 feet. The Qva aquifer is at this location is separated from the ground surface by about 70 feet of till.

V. Van Dyke Well (SE ¼ of NE ¼ of Section 25, Township 26N, Range 5E):

Domestic water well located approximately 550 to 1,300 feet northeast and crossgradient from the subject site. No well address is given. The total drilled depth of the well is 208 feet. The well is finished in sand and gravel interpreted to be pre-Vashon outwash deposits at a depth of 208 feet. The sand and gravel unit underlies approximately 144 feet of silt and clay that we have interpreted to be Qtb deposits. The sand and gravel aquifer at this location is separated from the ground surface by several soil units, including approximately 35 feet of till and about 144 feet of Qtb.

Uffens/Murray Well (SE ¼ of SE ¼ of Section 25, Township 26N, Range 5E):

Domestic water well located at 11712 176th Avenue NE, approximately 1,300 feet southeast and crossgradient from the subject site. The total drilled depth of the well is 38 feet. The well is finished in sand and gravel interpreted to be Qva deposits at a depth of 38 feet. The sand and gravel underlies approximately 27 feet of soil described as "hardpan", which we have interpreted to be Vashon till.

Documented well details and driller's logs are attached as Appendix C. The approximate well locations relative to the subject site are shown on Figure 5.

WELL WATER QUALITY REVIEW

We researched available water quality data for wells located within 1,300 feet of the site on the Washington State Department of Health, Office of Drinking Water (ODW) web site (https://fortress.wa.gov/doh/eh/portal/odw/si/FindWaterSystem.aspx), and the King County Groundwater Well Viewer (http://green.kingcounty.gov/groundwater/map.aspx). We identified one well within the search radius with water quality data. This well appears to be the previously discussed Dezotell Well located approximately 750 to 800 feet west-southwest and upgradient from the subject site, and identified as Well 1 on Figure 5.

Sample results are documented between April 1993 and May 2014 for inorganic contaminants, nitrate, and total coliform. Drinking water standards were exceeded for iron and color in a sample collected in April of 1993. No exceedances have been observed since that time. The well water quality data is attached as Appendix D.

DISCUSSION

Based on our study, it is our opinion that the proposed project will have no adverse impact on the quantity or quality of water in the 3 identified water wells located within 1,300 feet of the site. The identified wells are located either upgradient or crossgradient from the site, and are completed within aquifers protected from the ground surface by significant thicknesses of till (estimated thicknesses ranging between about 27 and 70 feet) and/or Qtb (estimated thickness of about 144 feet) aquitards. The proposed site development includes measures for water quality protection during site development in the form of appropriate application and maintenance of Best Management Practices (BMPs) for erosion prevention and sedimentation control, and pre-release treatment of collected stormwater runoff post development.

The proposed project is a residential development. Considering this, we expect that the use and storage of any hazardous materials or deleterious substances would be limited to quantities typical for residential use. In our opinion, no specific recommendations for storage and use of these materials would be required.

Potential impacts to surface water and shallow perched groundwater at the site would be in the form of trace petroleum hydrocarbons and trace metals from roadway runoff, and typical residential landscape products in the form of fertilizers, pesticides, and other landscaping chemicals. However, trace petroleum products and many common pesticides are readily degradable in the natural environment when dilute, and metals and pesticides are typically filtered by sorption in the upper portion of the soil column.

In our opinion, the proposed project will not result in adverse impacts to existing groundwater recharge of downgradient surface water features. As discussed, Monticello Creek is located approximately 320 feet east and downgradient from the site. However, any shallow interflow currently migrating off-site to the east would be intercepted by the existing deep sewer trench constructed adjacent to the east site margin in the 176th Avenue NE right-of-way. Pipe invert elevations shown on the topographic survey by Goldsmith indicate that the sewer is constructed approximately 17 to 22 feet below existing surface grades along the east property margin and an estimated 7 to 9 feet below the bottom elevation of the proposed stormwater detention vault.

Because the development stormwater vault will ultimately discharge to the Monticello Creek drainage, shallow groundwater intercepted by on-site building and yard drains and surface water runoff collected by the development storm sewer system would enhance recharge to the natural drainage that may have been reduced incidental to the sewer construction and the associated Fischer Village residential development.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

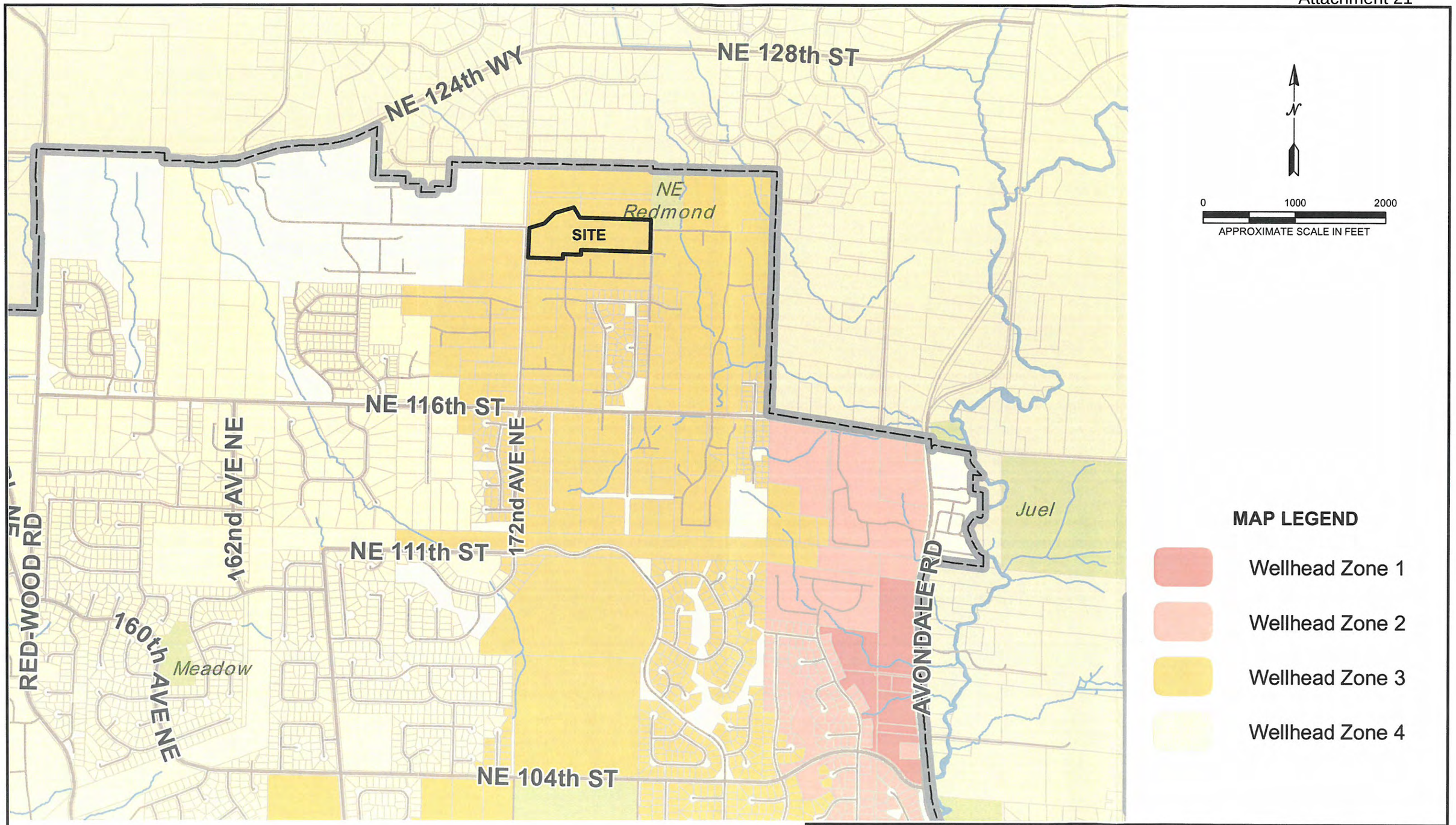
State of Washington
Hydrogeologist
1218
Licensed Geologist
JOHN C. SADLER

John C. Sadler 10-17-14

John C. Sadler, L.E.G., L.H.G.
Project Manager

Encl: Figure 1 – Wellhead Protection Zones Map
Figure 2 – Vicinity Map
Figure 3 – Exploration Location Plan
Figure 4 – Surficial Geologic Map
Figure 5 – DOE Well Location Map
Appendix A – General Information for Critical Areas Report
Appendix B – Test Pit Logs
Appendix C – DOE Well Details and Driller's Logs
Appendix D – Well Water Quality Data
Appendix E – Bibliography

cc: Ms. Trish Clements, Goldsmith Land Development Services
Mr. Erik Enstrom, Goldsmith Land Development Services

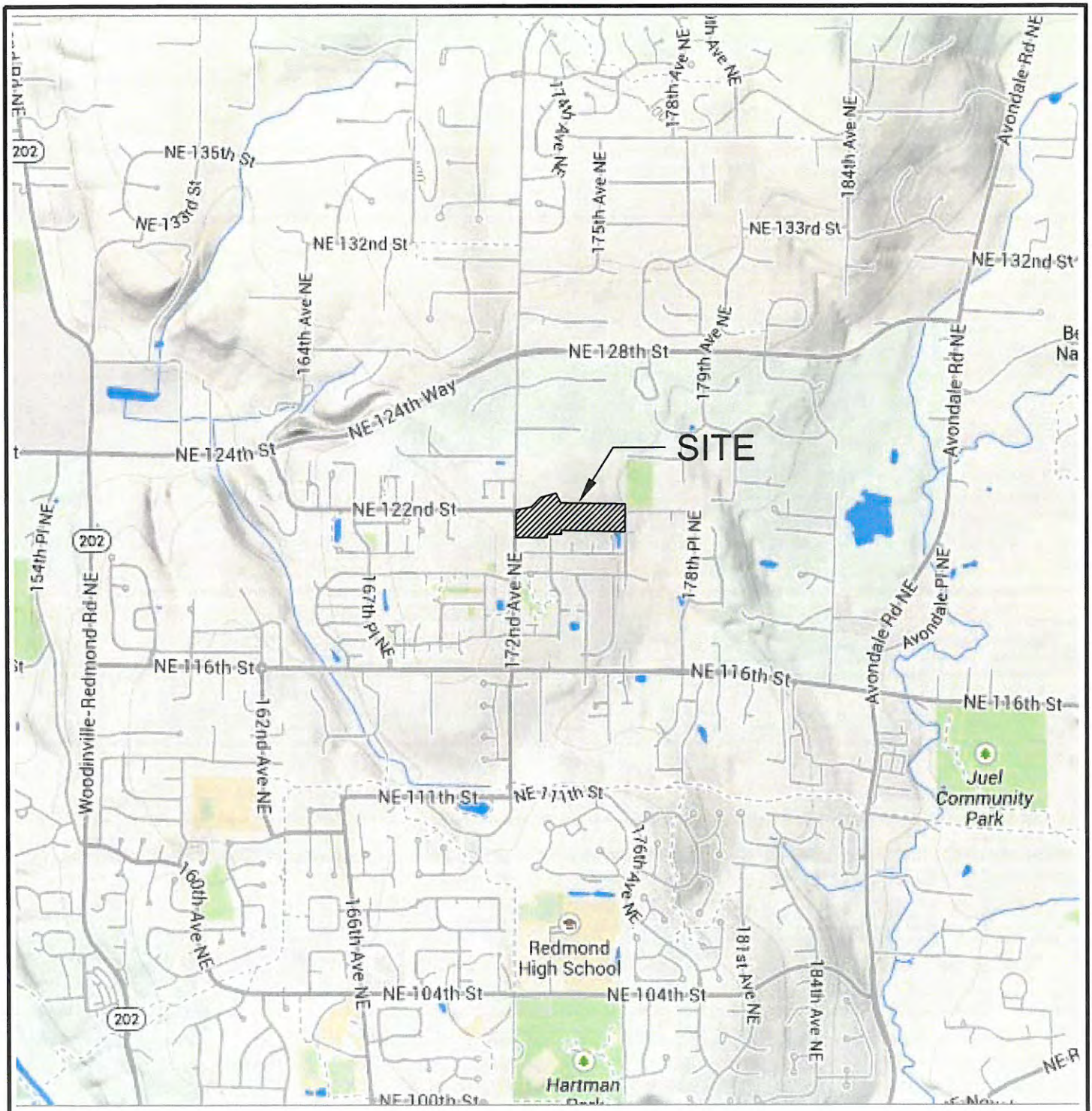


REFERENCE: CITY OF REDMOND

Terra Associates, Inc.
Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences

WELLHEAD PROTECTION ZONES MAP
EDGEWOOD WEST
REDMOND, WASHINGTON

Proj. No.T-7037	Date OCT 2014	Figure 1



REFERENCE: GOOGLE MAPS (2014)

NOT TO SCALE

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VICINITY MAP
EDGEWOOD WEST
REDMOND, WASHINGTON

Proj. No.T-7037	Date OCT 2014	Figure 2

NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE:

GOLDSMITH LAND DEVELOPMENT SERVICES

LEGEND:

TP-1 APPROXIMATE TEST PIT LOCATION

0 100 200

APPROXIMATE SCALE IN FEET

N

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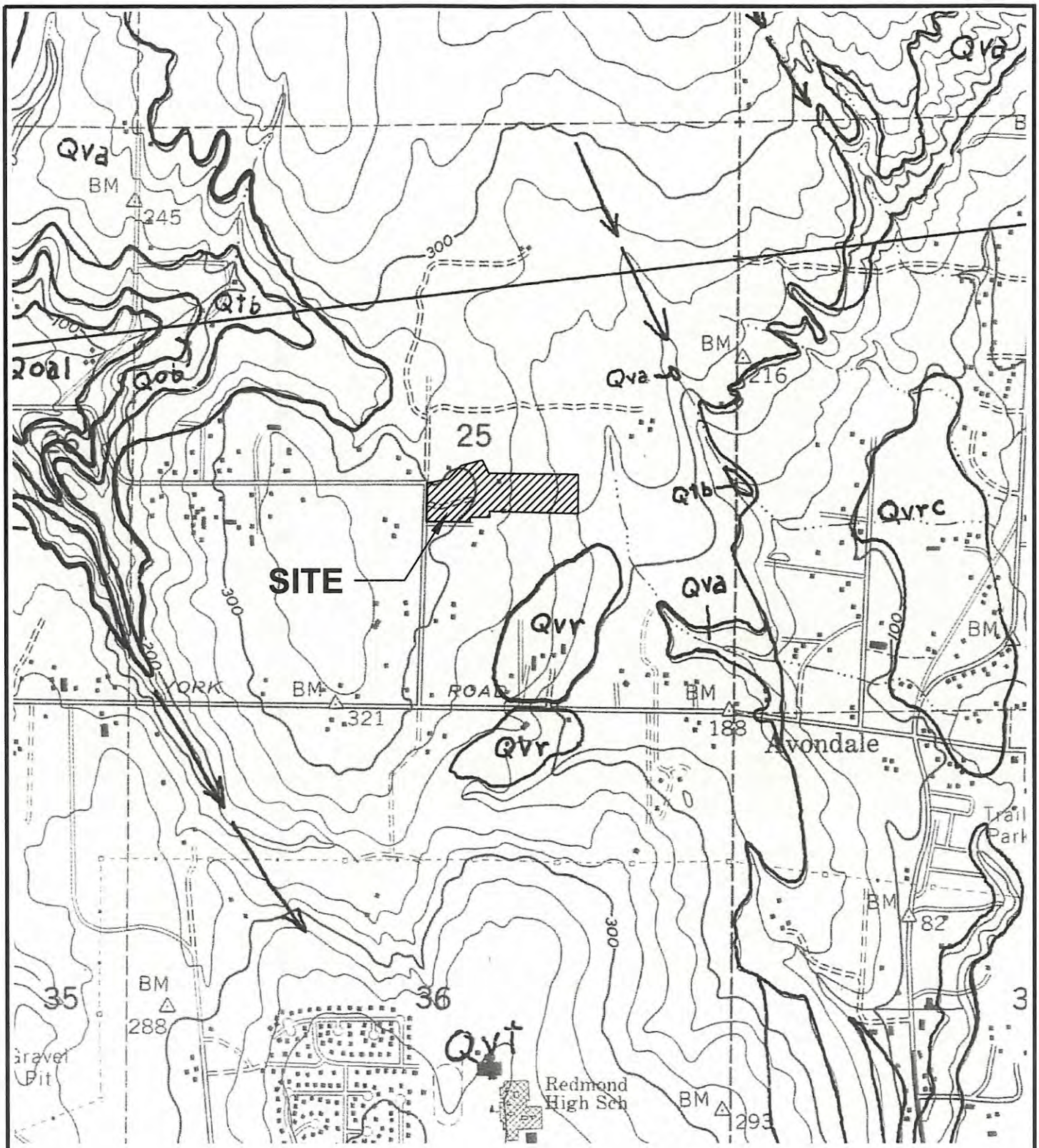
EXPLORATION LOCATION PLAN
EDGEWOOD WEST
REDMOND, WASHINGTON

Proj. No.T-7037	Date OCT 2014	Figure 3



REFERENCE: GEOLOGIC MAP OF THE REDMOND QUADRANGLE, KING COUTNY, WASHINGTON. (MINARD AND BOOTH, 1988)

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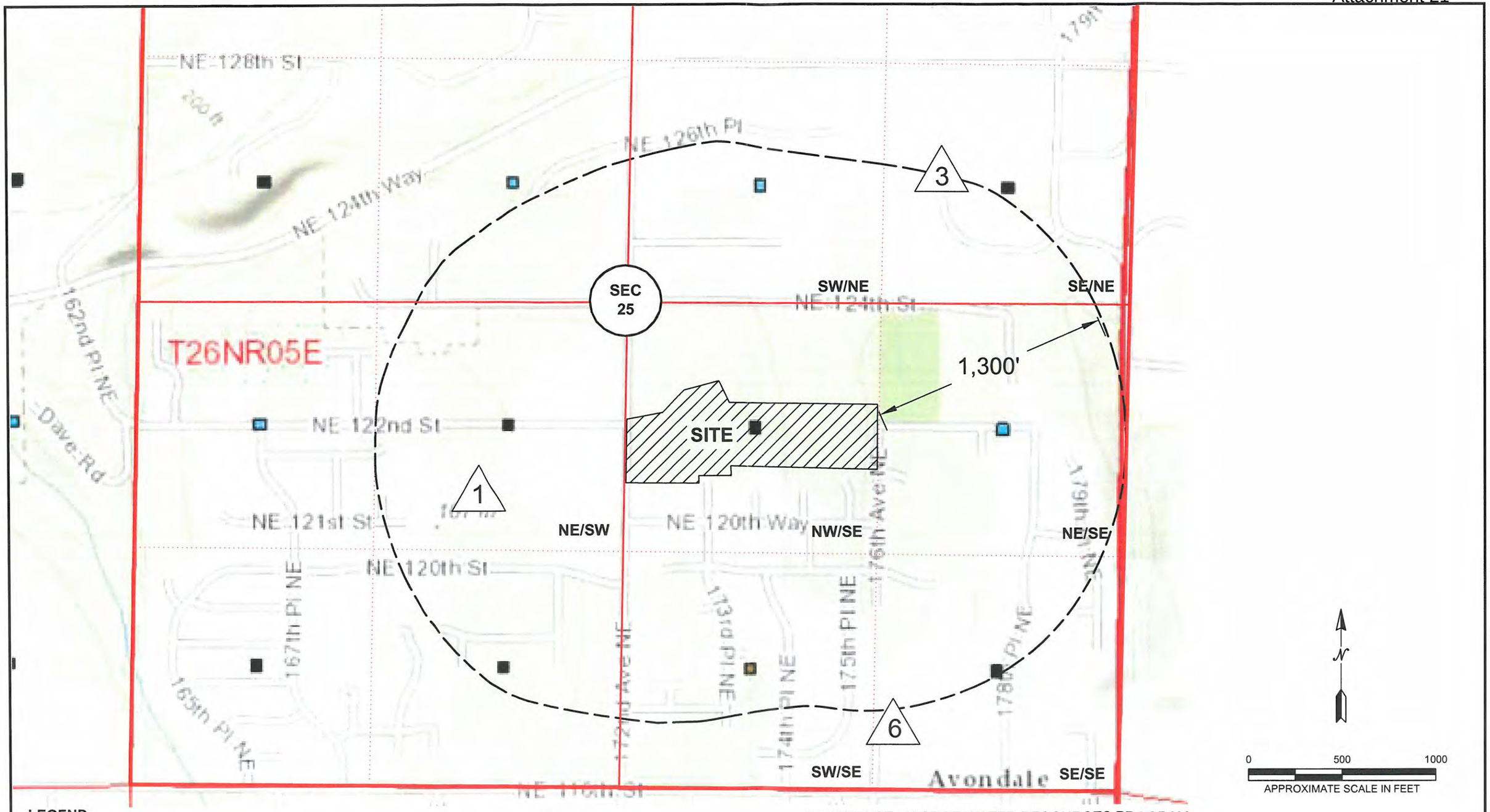
SURFICIAL GEOLOGIC MAP
EDGEWOOD WEST
REDMOND, WASHINGTON

Proj. No.T-7037	Date OCT 2014	Figure 4



LEGEND:

- 1 APPROXIMATE LOCATION OF DEZOTELL WELL
- 3 APPROXIMATE LOCATION OF V. VAN DYKE WELL
- 6 APPROXIMATE LOCATION OF UFFENS/MURRAY WELL

NOTE: WELL DETAILS AND DRILLER'S LOGS IN APPENDIX C

REFERENCE: WSDOE WATER RESOURCES PROGRAM

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DOE WELL LOCATION MAP
EDGEWOOD WEST
REDMOND, WASHINGTON

Proj. No.T-7037	Date OCT 2014	Figure 5

APPENDIX A

GENERAL INFORMATION FOR CRITICAL AREAS REPORT

Proposal Name: Edgewood West

Applicant Name: Quadrant Homes

Report Prepared by: John C. Sadler, L.E.G., L.H.G. of Terra Associates, Inc. Mr. Sadler is a State of Washington-licensed geologist, engineering geologist, and hydrogeologist with over 28 years of professional experience in Western Washington.

Report Date: October 17, 2014

Site Location: King County Tax Parcel No. 2526059033. See Figure 1 and report text.

Development Proposal: LAND-2014-00749 and PR-2014-00632. See Figure 2 and report text.

Description of Existing Site: See report text.

Aerial Photo Showing Site Boundaries and Critical Areas: See Figures 2 and 3 and Civil Plans.

Site Map: See Figure 2 and Civil Plans.

Assumptions and Recommendations: See report text.

Bibliography: See Appendix E

APPENDIX B

TEST PIT LOGS

LOG OF TEST PIT NO. TP-1

FIGURE A-2

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 5 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense	26.3		
3						
4	2	Gray SILT, fine grained, saturated, mottled. (ML)	Medium Stiff	29.8		
▼ 5	3	Gray silty SAND with gravel, fine to medium grained, wet to moist. (SM) (Unweathered Till)	Medium Dense	14.3		
6						
7			Dense			
8		Test pit terminated at approximately 8 feet. Minor groundwater seepage observed at 5 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-2

FIGURE A-3

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** N/A **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense	32.8		
3			Medium Dense			
4			Dense			
5	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4 feet. (SM) (Unweathered Till)		13.2		
6			Very Dense			
7		Test Pit terminated at approximately 7 feet. No groundwater seepage observed.				
8						
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-3

FIGURE A-4

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 4 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
	1			27.0		
2		Brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
			Medium Dense			
4 ▼			Dense			
	2			14.8		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4 feet. (SM) (Unweathered Till)				
6			Very Dense			
7						
8		Test pit terminated at approximately 8 feet. Moderate groundwater seepage observed at 4 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-4

FIGURE A-5

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Underbrush APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: 4 Feet DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense	24.7		
3						
4 ▼			Dense			
5	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation. (SM) (Unweathered Till)		16.3		
6			Very Dense			
7		Test pit terminated at approximately 6.5 feet. Minor groundwater seepage observed at 4 feet.				
8						
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-5

FIGURE A-6

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Underbrush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** N/A **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
	1			21.3		
2		Brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
4						
5						
6	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation. (SM) (Unweathered Till)	Dense	13.5		
7						
8		Test pit terminated at approximately 8 feet. No groundwater seepage observed.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-6

FIGURE A-7

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 3 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense	23.0		
3 ▼						
4			Dense			
5	2	Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 3 feet. (SM) (Unweathered Till)		13.7		
6			Very Dense			
7						
8		Test pit terminated at approximately 8 feet. Minor groundwater seepage observed at 3 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-7

FIGURE A-8

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** N/A **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1	1	Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose	14.7		
2		Brownish gray silty SAND with gravel, fine to medium grained, moist. (SM) (Weathered Till)	Medium Dense			
3						
4	2			13.8		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4 feet. (SM) (Unweathered Till)	Dense			
6						
7						
8		Test pit terminated at approximately 8 feet. No groundwater seepage observed.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-8

FIGURE A-9

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 4 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist to wet, heavy organics. (SM) (TOPSOIL)	Loose	28.1		
2	1	Red-brown silty SAND with gravel, fine to medium grained, moist, roots. (SM) (Weathered Till)	Medium Dense			
3						
4 ▼						
5	2	Gray silty SAND with gravel, fine to medium grained, moist, mottled to 4 feet, some cementation. (SM) (Unweathered Till)	Dense	16.2		
6						
7						
8		Test pit terminated at approximately 8 feet. Minor groundwater seepage observed at 4 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-9

FIGURE A-10

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 8 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist to wet, heavy organics. (SM) (TOPSOIL)	Loose			
	1			22.5		
2		Red-brown silty SAND with gravel, fine to medium grained, moist to wet, roots. (SM) (Weathered Till)	Medium Dense			
3						
4						
5		Gray silty SAND with gravel, fine to medium grained, wet to moist, mottled to 4 feet. (SM) (Unweathered Till)	Dense			
6	2			14.6		
7						
▼ 8		Test pit terminated at approximately 8 feet. Moderate groundwater seepage observed at 8 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-10

FIGURE A-11

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Tall Blackberries/Brush **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 0 to 8 Feet **DEPTH TO CAVING:** 0 to 8 Feet

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
0		(6 inches ORGANICS)				
1 (▼)		FILL: gray and brown silty sand with gravel, fine to medium grained, saturated, highly organic, bricks, pvc, plastic.	Loose			
8	1	Gray silty SAND with gravel, fine to medium grained, moist, pieces of weathered bedrock. (SM) (Unweathered Till)	Very Dense	11.2		
9		Test pit terminated at approximately 9 feet. Heavy groundwater seepage observed from 0 to 8 feet. Moderate caving observed from 0 to 8 feet.				
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-11

FIGURE A-12

PROJECT NAME: Mansoori Parcel **PROJ. NO:** T-7037 **LOGGED BY:** CSD

LOCATION: Redmond, Washington **SURFACE CONDS:** Brush, Weeds, Grass **APPROX. ELEV:** N/A

DATE LOGGED: April 11, 2014 **DEPTH TO GROUNDWATER:** 3 Feet **DEPTH TO CAVING:** N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist, heavy organics. (SM) (TOPSOIL)	Loose			
2	1	Red-brown to brown silty SAND with gravel, fine to medium grained, wet, roots. (SM) (Weathered Till)	Medium Dense	33.5		
▼ 3						
4	2			17.2		
5		Gray silty SAND with gravel, fine to medium grained, moist, some cementation, mottled to 4.5 feet, occasional cobble. (SM) (Unweathered Till)	Dense			
6						
	3			11.6		
7		Test pit terminated at approximately 7 feet. Minor groundwater seepage observed at 3 feet.				
8						
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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LOG OF TEST PIT NO. TP-12

FIGURE A-13

PROJECT NAME: Mansoori Parcel PROJ. NO: T-7037 LOGGED BY: CSD

LOCATION: Redmond, Washington SURFACE CONDS: Tall Blackberries/Brush APPROX. ELEV: N/A

DATE LOGGED: April 11, 2014 DEPTH TO GROUNDWATER: 3 Feet DEPTH TO CAVING: N/A

DEPTH (FT.)	SAMPLE NO.	DESCRIPTION	CONSISTENCY/ RELATIVE DENSITY	W (%)	POCKET PEN. (TSF)	REMARKS
1		Dark brown silty SAND with gravel, fine to medium grained, moist to wet, heavy organics. (SM) (TOPSOIL)	Loose			
	1			34.7		
2		Red-brown silty SAND with gravel, fine to medium grained, wet to saturated, roots. (SM) (Weathered Till)	Loose			
3 ▼						
	2			19.9		
4						
5		Gray silty SAND with gravel, fine to medium grained, wet to moist, mottled to 5 feet. (SM) (Unweathered Till)	Dense			
6						
	3			15.9		
7						
8		Test pit terminated at approximately 8 feet. Moderate groundwater seepage observed at 3 feet.				
9						
10						

NOTE: This subsurface information pertains only to this test pit location and should not be interpreted as being indicative of other locations at the site.

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APPENDIX C

DOE WELL DETAILS AND DRILLER'S LOGS

DEPARTMENT OF ECOLOGY State of Washington

Well Logs

Home | Map Search | Text Search | Forms | Site Info | Contact Us | Water Portal

MAP SEARCH RESULTS

Back | New Search

- **Search Criteria Used:** Left Coordinate: 1243080, Right Coordinate: 1243307, Top Coordinate: 870664, Bottom Coordinate: 870421
- There are 9 well logs that match your search criteria.

Download all 9 images | Download all 9 data records | Print this page | Help

Displaying 1 - 9 of 9 well log results Sort results by Well Owner Name

1. **BOB DEZOTELL** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
County: King, Well Address: (blank)
Well Log ID: 88555, Well Tag ID:(blank), Notice of Intent Number: (blank)
Well Diameter: 6 in. , Well Depth: 118 ft.
Well Type: Water
Well Completion Date: 12-01-1990, Well Log Received Date: 12-11-1990

2. **CHARLES PRIMBS** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
County: King, Well Address: (blank)
Well Log ID: 89251, Well Tag ID:(blank), Notice of Intent Number: (blank)
Well Diameter: 6 in. , Well Depth: 121 ft.
Well Type: Water
Well Completion Date: 07-28-1975, Well Log Received Date: (blank)

3. **DARREL SWAFFIELD** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
County: King, Well Address: (blank)
Well Log ID: 89996, Well Tag ID:(blank), Notice of Intent Number: (blank)
Well Diameter: 6 in. , Well Depth: 123 ft.
Well Type: Water
Well Completion Date: 03-25-1977, Well Log Received Date: 04-21-1977

4. **HIGHLAND CLASSIC HOMES** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
County: King, Well Address: (blank)
Well Log ID: 92401, Well Tag ID:(blank), Notice of Intent Number: A022255
Well Diameter: 6 in. , Well Depth: 0 ft.
Well Type: Decommissioned
Well Completion Date: 01-17-1994, Well Log Received Date: 02-01-1994

5. **Micheal Phillips** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
County: King, Well Address: 16922 NE 122nd St, Redmond 98052
Well Log ID: 574123, Well Tag ID:(blank), Notice of Intent Number: SE03735
Well Diameter: 8 in. , Well Depth: 15 ft.
Well Type: Resource Protection
Well Completion Date: 12-11-2008, Well Log Received Date: 01-07-2009

6. **Micheal Phillips** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
County: King, Well Address: 16922 NE 122nd St, Redmond 98052
Well Log ID: 574124, Well Tag ID:(blank), Notice of Intent Number: AE04962
Well Diameter: 8 in. , Well Depth: 15 ft.
Well Type: Decommissioned
Well Completion Date: 12-11-2008, Well Log Received Date: 01-07-2009

7. **PARSON CONSTRUCTION** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: 2526059059
County: King, Well Address: 17040 NE 122ND ST, REDMOND
Well Log ID: 506767, Well Tag ID:(blank), Notice of Intent Number: A126898
Well Diameter: 48 in. , Well Depth: 15 ft.
Well Type: Decommissioned
Well Completion Date: 09-12-2007, Well Log Received Date: 10-04-2007

8. **PARSON CONSTRUCTION** - { View PDF }
Public Land Survey: NE, SW, S-25, T-26-N, R-05-E, Tax Parcel Number: 12526059009
County: King, Well Address: 16922 NE 122ND ST, REDMOND
Well Log ID: 506771, Well Tag ID:(blank), Notice of Intent Number: A126897
Well Diameter: 6 in. , Well Depth: 119 ft.
Well Type: Decommissioned
Well Completion Date: 09-12-2007, Well Log Received Date: 10-04-2007

Attachment 21 B/SE/25 L

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 39113
Permit No. .....

(1) OWNER: Name Bob Dezotell Address 16919 NE 122nd Redmond Wa. 98052

(2) LOCATION OF WELL: County King — NE ¼ SW ¼ Sec. 25 T. 26 N., R. 5E W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☒ Method: Dug ☒ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 118 ft. Depth of completed well 118 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +18' ft. to 113 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Steel Model No. .....
Diam. 5 Slot size .018 from 113 ft. to 118 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name Flint & Walling
Type: Submersible H.P. 1

(8) WATER LEVELS: Land-surface elevation above mean sea level ..... ft.
Static level 96 ft. below top of well Date 12/1/90
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: 20 gal./min. with 8 ft. drawdown after 2 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 12/3/90
Bailer test 15 gal./min. with 5 ft. drawdown after 2 hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☒ No ☐
Bacteria & Nitrates.

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil: brown, clay, dry	0	6
Till: brown	6	50
Till: brown, very gravelly	50	60
Clay: brown, sandy	60	70
Sand: brown, dry	70	110
Sand: brown, coatse, water	110	118
Silty sand: gray/brown	118	119

RECEIVED
DEC 11 1990
DEPT. OF ECOLOGY

Work started Nov. 15, 19 90 Completed Dec. 1, 19 90

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Cable Tool Well Drilling Company
(Person, firm, or corporation) (Type or print)

Address 11723 194th Ave NE Redmond, Wa. 9805

[Signed] .....
(Well Driller)

License No. 0852 Date Dec. 7, 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

DEPARTMENT OF ECOLOGY State of Washington

Well Logs

MAP SEARCH RESULTS

Back | New Search

- **Search Criteria Used:** Left Coordinate: 1245853, Right Coordinate: 1245989, Top Coordinate: 871852, Bottom Coordinate: 871665
- There are 3 well logs that match your search criteria.

Download all 3 images | Download all 3 data records | Print this page | Help

Displaying 1 - 3 of 3 well log results Sort results by Well Owner Name

1. **CAMWEST DEVELOPMENT** - { View PDF }
   Public Land Survey: SE, NE, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
   County: King, Well Address: 172ND AVE NE AND NE 177TH WAY, RICHMOND
   Well Log ID: 384879, Well Tag ID:(blank), Notice of Intent Number: A064885
   Well Diameter: 6 in. , Well Depth: 82 ft.
   Well Type: Decommissioned
   Well Completion Date: 07-15-2004, Well Log Received Date: 08-20-2004
2. **Toll WA LP** - { View PDF }
   Public Land Survey: SE, NE, S-25, T-26-N, R-05-E, Tax Parcel Number: 2355000010
   County: King, Well Address: 17619 NE 128th ST, Redmond 98052
   Well Log ID: 812965, Well Tag ID:(blank), Notice of Intent Number: AE17888
   Well Diameter: 6 in. , Well Depth: 103 ft.
   Well Type: Decommissioned
   Well Completion Date: 07-21-2012, Well Log Received Date: 08-17-2012
3. **V. VAN DYKE** - { View PDF }
   Public Land Survey: SE, NE, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
   County: King, Well Address: (blank)
   Well Log ID: 98616, Well Tag ID:(blank), Notice of Intent Number: (blank)
   Well Diameter: 6 in. , Well Depth: 208 ft.
   Well Type: Water
   Well Completion Date: 10-06-1978, Well Log Received Date: (blank)

Total Result Pages: 1

Attachment 21 25 H

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy V. Van Dyke

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name V. Van Dyke Approximate Address 72nd + 128th, Redmond, Wa.

(2) LOCATION OF WELL: County King W½ of SE ¼ NE ¼ Sec. 25 T. 26 N., R. 5E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 208 ft. Depth of completed well 208 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 0 ft. to 208 ft.
Threaded ☐ ..." Diam. from ... ft. to ... ft.
Welded ☒ ..." Diam. from ... ft. to ... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name .....
Type ... Model No. ...
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ... ft. to ... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal: puddling clay
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ... Depth of strata ...
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ... H.P. ...

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 98 ft. below top of well Date 10/6/78
Artesian pressure ... lbs. per square inch Date ...
Artesian water is controlled by ... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? .....
Yield: ... gal./min. with ... ft. drawdown after ... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test 30 gal./min. with 75 ft. drawdown after 4 hrs.
Artesian flow ... g.p.m. Date ...
Temperature of water ... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Surface	0	2
Brown hardpan	2	35
Gray loose sand & gravel	35	54
Gray silty clay	54	95
Gray silt	95	184
Gray clay	184	198
Gray water sand & gravel	198	208

Work started 10/4, 19 78 Completed 10/6, 19 78

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Johnson Drilling Co., Inc. (Person, firm, or corporation) (Type or print)

Address 19415 108TH Ave SE Renton 98055

[Signed] Brad Johnson (Well Driller)

License No. 0233 Date 10/6, 1978

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

DEPARTMENT OF ECOLOGY State of Washington

Well Logs

MAP SEARCH RESULTS

Back | New Search

- **Search Criteria Used:** Left Coordinate: 1245555, Right Coordinate: 1246303, Top Coordinate: 869322, Bottom Coordinate: 868958
- There are 7 well logs that match your search criteria.

Download all 7 images | Download all 7 data records | Print this page | Help

Displaying 1 - 7 of 7 well log results Sort results by Well Owner Name

1. **C/O GNR DOZING AVALON MANAGEMENT** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
   County: King, Well Address: 17818 ne 116th st, REDMOND 98052
   Well Log ID: 727179, Well Tag ID:(blank), Notice of Intent Number: AE12310
   Well Diameter: 6 in. , Well Depth: 34 ft.
   Well Type: Decommissioned
   Well Completion Date: 02-28-2011, Well Log Received Date: 05-18-2011
2. **CURRY ANDERSON** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
   County: King, Well Address: 17838 NE 116TH ST, REDMOND
   Well Log ID: 347678, Well Tag ID:(blank), Notice of Intent Number: A063800
   Well Diameter: 24 in. , Well Depth: 29 ft.
   Well Type: Decommissioned
   Well Completion Date: 08-05-2002, Well Log Received Date: 08-12-2002
3. **DARTMOOR CANTERFIELD** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: 252605-9150
   County: King, Well Address: 17812 NE 116TH, REDMOND 98052
   Well Log ID: 369267, Well Tag ID:(blank), Notice of Intent Number: AE00702
   Well Diameter: 6 in. , Well Depth: 61 ft.
   Well Type: Decommissioned
   Well Completion Date: 09-23-2003, Well Log Received Date: 09-30-2003
4. **DARTMOOR CANTERFIELD** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: 252605-9182
   County: King, Well Address: 17812 NE 116TH ST, REDMOND 98052
   Well Log ID: 369268, Well Tag ID:(blank), Notice of Intent Number: AE00703
   Well Diameter: 36 in. , Well Depth: 28 ft.
   Well Type: Decommissioned
   Well Completion Date: 09-23-2003, Well Log Received Date: 09-30-2003
5. **JIM TOST** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
   County: King, Well Address: NE 116TH ST AND 178TH AVE NE
   Well Log ID: 306047, Well Tag ID:AFM763, Notice of Intent Number: R041617
   Well Diameter: 0 in. , Well Depth: 25 ft.
   Well Type: Resource Protection
   Well Completion Date: 12-04-2000, Well Log Received Date: 04-09-2001
6. **RONALD UFFENS & WILLIAM MURRAY** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: (blank)
   County: King, Well Address: (blank)
   Well Log ID: 97348, Well Tag ID:(blank), Notice of Intent Number: (blank)
   Well Diameter: 6 in. , Well Depth: 38 ft.
   Well Type: Water
   Well Completion Date: 05-04-1976, Well Log Received Date: (blank)
7. **S&I Properties LLC** - { View PDF }
   Public Land Survey: SE, SE, S-25, T-26-N, R-05-E, Tax Parcel Number: 2526059049
   County: King, Well Address: 11810 176th AVE NE
   Well Log ID: 906948, Well Tag ID:AGR903, Notice of Intent Number: AE25129
   Well Diameter: 6 in. , Well Depth: 39 ft.
   Well Type: Decommissioned
   Well Completion Date: 01-09-2014, Well Log Received Date: 01-21-2014

Total Result Pages: 1

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

SHORT PLAT NO. 775 74
26/05-25R

Attachment 21

STATE OF WASHINGTON

Permit No. ....

(1) OWNER: Name RONALD J. UFFENS + WILLIAM R. MURRAY Address 13705 NE 72ND PL. REDMOND, WASH.

(2) LOCATION OF WELL: County King SHORT PLAT NO: 775074 — SE ¼ SE ¼ Sec. 25 T. 26 N., R. 5E W.M.
Bearing and distance from section or subdivision corner: beginning 973 feet west of SE corner, then north to a point 994 feet west of NE corner, then west to NW corner, then south to SW corner

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☑ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Bored ☐ Cable ☑ Driven ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 39 ft. Depth of completed well 38 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 38 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☑ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☑
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: ....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 20 ft.
Material used in seal Bentonite & drill cuttings
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ..... Depth of strata .....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level ..... ft.
Static level 15 ft. below top of well Date .....
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☑ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test 10 gal./min. with 5 ft. drawdown after 1 hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☑

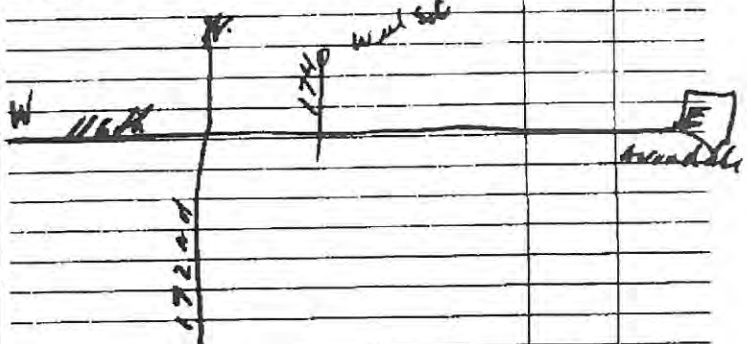
(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil & Fill	0	5
yellow clay & some sand	5	12
Light hard pan & clay	12	20
Some Water at 20 ft		
hardpan & grey clay	20	30
Lenses of water between layers of hard pan	30	32
Coarse sand & gr. [illegible]	32	34
Very Coarse sand & clean gravel	34	38
[illegible] sand	38	39

This gravel was round like marbles & grey in color - one of the prettiest gravels I have seen.

This well is pretty much in line with wells to the south about 1/4 mile - Formation fairly consistent



Work started 5-3, 1976. Completed 5-4, 1976.

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME H.C. MEYER DRLG Co. (Person, firm, or corporation) (Type or print)

Address 6929 Lake Wn. Blvd NE Kirkland, Wash 98033

[Signed] H.C. Meyer (Well Driller)

License No. 0308 Date 5- , 1976

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

APPENDIX D

WELL WATER QUALITY DATA

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

Individual System View - HIGHLAND RIDGE WATER SYSTEM - Water System Id - 03453J

Compliance Actions | Operating Permits | Operators | Reports | Water Use Efficiency

General Information | Source Information | Samples | Exceedances | Water Quality Monitoring Schedule

Group	B	**Status**	Active	**Ownership Type**	Investor
Type		**Residential Population**	10	**Jurisdiction**	WA DOH ODW
County	KING	**NonResidential Population**	0	**System Effective Date**	5/4/1994
Owner Name	HIGHLAND RIDGE WATER SYSTEM	**Total Calculated Connections**	3	**System Inactive Date**	
Primary Contact	CARRIE TIBBETTS	**Total Approved Connections**	Undetermined	**SMA Name**	
Primary Contact Phone	(425) 861-7812	**Distribution Capacity (gallons)**	0	**SMA Number**	
Water System Mailing Address	16911 NE 122ND ST REDMOND, WA 98052				

Home Page | Find Water Systems | Find Water Quality | Downloads/Reports

DOH Home | Community and Environment | Drinking Water Home | Drinking Water Contacts
Access Local Health | Privacy Notice | Disclaimer/Copyright Information

Links to external resources are provided as a public service and do not imply endorsement by the Washington State Department of Health

Department of Health, Office of Drinking Water

Street Address:
243 Israel Road S.E. 2nd floor
Tumwater, WA 98501

Mail:
PO BOX 47822
Olympia, WA 98504-7822

Phone: (360) 236-3100

Send inquiries about DOH and its programs to the Health Consumer Assistance Office
Comments or questions regarding this Web site? Send email to Environmental Health Application Testing and Support or call 360-236-3113.

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

Individual System View - HIGHLAND RIDGE WATER SYSTEM - Water System Id - 03453J

Compliance Actions | Operating Permits | Operators | Reports | Water Use Efficiency

General Information | Source Information | Samples | Exceedances | Water Quality Monitoring Schedule

Source 01 - B. DEZOTELL

Source Status	Active	**Usage**	Permanent	**WRIA**	Cedar-Sammamish	**Intertie Supplying System**	NA
Type	Groundwater Well	**Capacity (gpm)**	23	**Township**	26	**Intertie Supplying Number**	NA
Effective Date	5/4/1994	**Treated**	No	**Range**	05E		
Inactive Date		**Metered**	Yes	**Section**	25		
DOE Well Tag Number		**Well Depth (ft)**	119	**Qtr/Qtr Section**	NESW		

Records 1 - 1 of 1

☐ Display as table with source treatment information

Department of Health, Office of Drinking Water

Street Address:
243 Israel Road S.E. 2nd floor
Tumwater, WA 98501

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PO BOX 47822
Olympia, WA 98504-7822

Phone: (360) 236-3100

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Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

Individual System View - HIGHLAND RIDGE WATER SYSTEM - Water System Id - 03453J

Compliance Actions | Operating Permits | Operators | Reports | Water Use Efficiency

General Information | Source Information | Samples | Exceedances | Water Quality Monitoring Schedule

Source	DOE Source	Collect Date	Test Panel	Analyte Group	Sample Number	Lab Number	Exceedances
Dist		5/21/2014	COLI_AP	MICRO	02998	066	No
Dist		3/16/2010	COLI_AP	MICRO	01239	066	No
Dist		8/22/2006	COLI_AP	MICRO	02969	066	No
Dist		12/16/2004	COLI_AP	MICRO	04794	066	No
Dist		7/11/2003	COLI_AP	MICRO	03136	066	No
Dist		7/1/2002	COLI_AP	MICRO	02907	066	No
Dist		7/17/2000	COLI_AP	MICRO	04850	066	No
Dist		7/13/1999	COLI_AP	MICRO	04677	066	No
Dist		8/27/1998	COLI_AP	MICRO	05930	066	No
01		5/21/2014	NIT	IOC	07478	066	No
01		10/12/2004	IOC	IOC	15222	066	No
01		11/28/2000	NIT	IOC	46930	089	No
01		7/17/2000	NIT	IOC	10482	066	No
01		11/14/1996	IOC	IOC	27083	089	No
01		9/20/1996	NIT	IOC	13156	066	No
01		6/2/1993	IOC	IOC	08491	066	No
01		4/27/1993	IOC	IOC	06591	066	Yes
01		4/27/1993	VOC2	VOC	00129	104	No

Records 1 - 18 of 18

Export CSV

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Department of Health, Office of Drinking Water

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Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

Individual System View - HIGHLAND RIDGE WATER SYSTEM - Water System Id - 03453J

Compliance Actions | Operating Permits | Operators | Reports | Water Use Efficiency

General Information | Source Information | Samples | Exceedances | Water Quality Monitoring Schedule

Type	Source	DOE Source	Collect Date	Analyte	Result Quantity	Units	Test Panel	Analyte Group	Sample Number	Lab Number
MCL2	01		4/27/1993	COLOR	20.0	CU	IOC	IOC	06591	066
MCL2	01		4/27/1993	IRON	1.10	mg/L	IOC	IOC	06591	066

Records 1 - 2 of 2

Export CSV

Home Page | Find Water Systems | Find Water Quality | Downloads/Reports

DOH Home | Community and Environment | Drinking Water Home | Drinking Water Contacts
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Department of Health, Office of Drinking Water

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Comments or questions regarding this Web site? Send email to Environmental Health Application Testing and Support or call 360-236-3113.

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 03453J - HIGHLAND RIDGE WATER SYSTEM

Collect Date	4/27/1993
Lab Number	066
Lab Name	Amtest, Inc - Redmond
Sample Number	06591
Source	01
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	IOC-COMPLETE INORGANIC ANALYSIS
Sample Location	
Sample Type	Pre-Treatment / Raw

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	Units	State Reporting Limit
0008	IRON	EQ	1.1000	0.3000	mg/L	0.1000
0018	COLOR	EQ	20.0000	15.0000	CU	15.0000
0009	LEAD	EQ	0.0080		mg/L	0.0010
0010	MANGANESE	EQ	0.0460	0.0500	mg/L	0.0100
0014	SODIUM	EQ	9.4000		mg/L	5.0000
0015	HARDNESS	EQ	140.0000		mg/L	10.0000
0016	CONDUCTIVITY	EQ	320.0000	700.0000	Umhos/cm	70.0000
0017	TURBIDITY	EQ	18.0000		NTU	0.1000
0020	NITRATE-N	EQ	3.0000	10.0000	mg/L	0.2000
0022	SULFATE	EQ	18.0000	250.0000	mg/L	50.0000
0024	ZINC	EQ	0.2200	5.0000	mg/L	0.2000
0004	ARSENIC	LT	0.0100	0.0104	mg/L	0.0030
0005	BARIUM	LT	0.1000	2.0000	mg/L	0.4000
0006	CADMIUM	LT	0.0020	0.0050	mg/L	0.0020
0007	CHROMIUM	LT	0.0100	0.1000	mg/L	0.0200
0011	MERCURY	LT	0.0005	0.0020	mg/L	0.0004
0012	SELENIUM	LT	0.0050	0.0500	mg/L	0.0100
0013	SILVER	LT	0.0100	0.1000	mg/L	0.1000
0019	FLUORIDE	LT	0.2000	4.0000	mg/L	0.5000
0021	CHLORIDE	LT	20.0000	250.0000	mg/L	20.0000
0023	COPPER	LT	0.2000		mg/L	0.0200

Records 1 - 21 of 21

Department of Health, Office of Drinking Water

Groundwater Well Data - Details

Enter a Well ID: Go *Example: GrpA_01001_01*

The search returns detailed info about the well, including all the water level and water quality sampling data for the searched well.

Download data: Download to Excel

View Well location in:-- Groundwater Well Viewer OR iMap

Well Detail

Well ID	**R_474221122060501**
Location Name	MURRAY WILLIAM/UFFENS RONALD
Well Type	Well
Well Depth (ft)	38
Surface Elevation (ft)	180
X Coord (WAN-SPF)	1328217.375
Y Coord (WAN-SPF)	260037.125
Has Water Level Data?	No
Has Water Quality Data?	No
Local Number	26N/05E-25R02
Ecology Well Tag	Unknown
Parcel Number	
GWMA Code	Redmond-Bear Creek Valley
Basin	Bear Creek
CARA Area	None
City	Redmond

Water Level Sampling Data

No water level sampling data exists for the searched well.

Water Quality Sampling Data

No water quality sampling data exists for the searched well.

Updated: October 7, 2010

Groundwater Well Data - Details

Enter a Well ID: Go *Example: GrpA_01001_01*

The search returns detailed info about the well, including all the water level and water quality sampling data for the searched well.

Download data: Download to Excel

View Well location in:-- Groundwater Well Viewer OR iMap

Well Detail

Well ID	R_474246122060401
Location Name	VAN DYKE V.
Well Type	Well
Well Depth (ft)	208
Surface Elevation (ft)	225
X Coord (WAN-SPF)	1328328.125
Y Coord (WAN-SPF)	262570.78125
Has Water Level Data?	No
Has Water Quality Data?	No
Local Number	26N/05E-25H01
Ecology Well Tag	Unknown
Parcel Number	
GWMA Code	Redmond-Bear Creek Valley
Basin	Bear Creek
CARA Area	None
City	King County

Water Level Sampling Data

No water level sampling data exists for the searched well.

Water Quality Sampling Data

No water quality sampling data exists for the searched well.

Updated: October 7, 2010

APPENDIX E

BIBLIOGRAPHY

City of Redmond Critical Areas Map 64.3 (Streams Classification), Self Published, dated September 1, 2012

City of Redmond Wellhead Protection Report, prepared by Parametrix, Inc, Pacific Groundwater Group, and Carolyn Browne Associates, dated October 30, 1997

City of Redmond Zoning Code (RZC), Appendix 1 (Critical Areas Reporting Requirements), Self Published, Effective April 16, 2011

Conceptual Grading Plan, Edgewood West, prepared by Goldsmith Land Development Services, dated September 30, 2014

Constraints Exhibit, Mansoori Property, prepared by Goldsmith Land Development Services, dated September 16, 2014

Geologic Map of the Redmond Quadrangle, King County, Washington, United States Geologic Survey Miscellaneous Field Studies Map MF 2016, by J. P. Minard and D. B. Booth (1988)

Geotechnical Report, Wynstone, 12020 – 172nd Avenue NE, Redmond, Washington, prepared by Terra Associates, Inc., Project No. T-2375-3, dated October 28, 2003

King County Groundwater Well Viewer Website (http://green.kingcounty.gov/groundwater/map.aspx)

King County iMAP: Interactive Mapping Tool Website (http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx)

Potential Impacts to Neighboring Groundwater Wells, Prescott Glen, Glenshire I, Glenshire II, and Wexford Glen, NE 122nd Street, Redmond, Washington, prepared by Terra Associates, Inc., Project No. T-5627, dated December 29, 2005

Potential Impacts to Neighboring Groundwater Wells, Fischer Village, NE 116th Street and 178th Avenue NE Right-of-Way, King County, Washington, prepared by Terra Associates, Inc., Project No. T-3990-1, dated January 21, 2002

Preliminary Geotechnical Report, Fischer Property, NE 116th Street and 178th Avenue NE Right-of-Way, Redmond, Washington, prepared by Terra Associates, Inc., Project No. T-3990-1, dated December 7, 1998

Preliminary Geotechnical Report, Mansoori Parcel, 172nd Avenue NE and NE 122nd Street, Redmond, Washington, prepared by Terra Associates, Inc., Project No. T-7037, dated April 21, 2014

Topographic Survey, Mansoori Property, prepared by Goldsmith Land Development Services, dated September 11, 2014

Washington State Department of Ecology Well Log Viewer Website (https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx)

Washington State Department of Health, Division of Environmental Health, Office of Drinking Water (ODW) Website (https://fortress.wa.gov/doh/eh/portal/odw/si/FindWaterSystem.aspx)

TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

February 4, 2015
Project No. T-7037

Mr. Corey Watson
Quadrant Homes
14725 SE 36th Street, Suite 200
Bellevue, Washington 98006

Subject: Response to Review Comments
Edgewood West
Redmond, Washington

References:
1. Critical Aquifer Recharge Areas Report, Project No. T-7037, prepared by Terra Associates, Inc., dated October 17, 2014
2. Preliminary Geotechnical Report, Mansoori Parcel, Project No. T-7037, prepared by Terra Associates, Inc., dated April 21, 2014 (Updated January 15, 2015)

Dear Mr. Watson:

As requested, we reviewed review comments for the Edgewood West project provided by City of Redmond Planning, Stormwater, and Natural Resources review staff. Our responses to the review comments are discussed below:

Planning Review Comments

1. **"Please update the code references to reflect the Redmond Zoning Code rather than the Redmond Community Development Guide."**

Our preliminary geotechnical report has been revised to reference the Redmond Zoning Code.

Stormwater Review Comments

1. **"...For SPE provide a water balance showing that the development will not decrease groundwater recharge."**

As discussed in the referenced reports, the site is underlain by dense to very dense glacial till beginning at depths ranging between about two to four feet below the ground surface. Well log information indicates that till thicknesses near the western portion of the site are about 70 feet.

In our opinion, very little recharge to the deeper outwash (Qva) aquifer occurs as a result of direct rainfall and percolation on the subject site. Rainfall that does not run off and percolates the upper more permeable weathered soils will become perched on the underlying unweathered glacial till surface. The gradient of this till surface typically matches the surface gradient, and because of the low permeability of the till, the perched groundwater will flow laterally along the contact and eventually discharge as seeps or springs on slopes east of the site if not intercepted by existing development improvements east of the site. This lateral flow and discharge is the preferred flow path as continued vertical migration through the till is restricted. Theoretically, it would take about 14 years for water to migrate through the 70 foot till cap and locally recharge the deep Qva aquifer; whereas lateral flow along the contact from the west to east across the eastern approximately 770 feet of the site (slope inclination of approximately 10 percent) would take about 7 years. It is also more than likely that this water is consumed by evapotranspiration during the dry summer months before having any opportunity to recharge the deeper aquifer below the site.

We performed a water balance that is based on a very conservative approach that assumes the perched groundwater would remain locally beneath the site and have the opportunity to continue to migrate vertically through the till, and recharge the deeper aquifer. The attached spreadsheet summarizes the analysis and assumptions made.

As would be expected, if it is assumed the site is a recharge source for the deeper aquifer, development with impervious surfaces would impact the deep recharge. However this impact is mitigated by considering site activities such as irrigation of lawn and landscaped areas during the normally dry summer months.

2. "Show the lateral extent of the organic soil area identified by geotechnical test boring #10."

We performed supplemental subsurface investigation at the site to delineate the extent of the fill observed in Test Pit TP-10. The results of our study are presented in a report dated December 30, 2014. A copy of the report is attached.

Natural Resource Review Comments

1. "Describe construction and permanent dewatering of groundwater. Where will it discharge and what are the potential impacts? Is on site infiltration feasible?"

Site groundwater conditions consist predominantly of shallow perched groundwater that we observed above the dense to very dense, unweathered till at depths ranging between about 3 and 5 feet below existing surface grades. Exceptions to this include three test pits where we did not observe any seepage (Test Pits TP-2, TP-5, and TP-7); Test Pit TP-9, where we observed seepage from a localized sandy zone within the dense to very dense till at a depth of about 8 feet below the ground surface; and Test Pit TP-10, where we observed seepage perched on the bottom of a bathtub-like pit excavated into the dense to very dense till.

As discussed in our preliminary geotechnical report, the occurrence of shallow perched groundwater is typical for sites underlain by till. We expect that perched groundwater levels and flow rates will fluctuate seasonally and will typically reach their highest levels during and shortly following the wet winter months (October through May). During the summer and early fall, perched groundwater levels will typically be greatly diminished, or will disappeared completely. Considering this, we expect that the observed groundwater levels and seepage flow rates are representative of seasonal high levels.

Potential impacts to perched groundwater at the site include interruption of perched interflow (when present) by buried utilities and structures, and building foundations, and interception of interflow (when present) by permeable pipe bedding, and to a lesser extent, residential footing drains. In our opinion, interception and drainage of shallow interflow by buried utilities can be mitigated by constructing trench barriers or dams at regular intervals along the sanitary and storm sewer utilities using less permeable material. The construction interval of the trench barriers would typically be about 200 feet, but will depend on field conditions observed at the time of construction.

Interflow that is intercepted by drainage associated with buried structures will be routed to the stormwater management system for the project. The proposed stormwater system for the project will include on-site detention in a buried vault located in the southeastern corner of the site. The vault will discharge to a closed system that conveys flow to an existing manhole located in the right-of-way for 176th Avenue NE, approximately 200 feet south of the site, which then routes flow approximately 280 feet to the east to an existing gabion flow dispersion/energy dissipation structure located at the margin of a wetland adjacent to the Monticello Creek drainage. The Monticello Creek drainage is the natural downgradient receptor of interflow from the subject site. Because all interflow collected by site drainage systems will be routed to the project stormwater system, which will discharge to the Monticello Creek drainage, it is our opinion that potential adverse impacts to interflow recharge to the Monticello Creek drainage will be negligible.

Infiltration of site stormwater will not be feasible due to the presence of relatively-impermeable till at shallow depths and seasonal perched groundwater.

2. "Any heating oil USTs associated with past use?"

No recognized environmental conditions (RECs) associated with the site were identified by our Phase I Environmental Site Assessment dated May 8, 2014. A copy of the report text and figures is attached.

3. "Include cross section that shows groundwater elevations and subsurface structures."

See attached utility plan sheets U-2 through U-10 prepared by Goldsmith Land Development Services (Goldsmith), and attached Generalized Geologic Profiles.

4. "Include wetland on map and discuss interaction with groundwater as well as potential impacts from project activities."

The wetland area and its associated 50-foot wide buffer are shown on Figure 3 of our CARA report; however it was identified as "S.A." (Sensitive Area), not specifically as a wetland and buffer. A callout has been added to the report figures identifying the wetland and buffer.

The Category IV wetland at the site is formed in a closed depression, and will be protected by a 50-foot wide buffer. Considering the relatively flat surface gradient of the area surrounding the wetland and buffer, and that it has formed in a closed depression, we expect that wetland recharge is provided by direct precipitation to the wetland and buffer areas. Because the wetland has formed in a closed depression, it is also our opinion that any drainage of perched groundwater incidental to site development would not result in adverse impacts to the wetland.

Potential impacts to the wetland from project activities would generally be limited to sediment deposition resulting from uncontrolled surface runoff during construction. In our opinion, this will be mitigated with proper implementation and maintenance of Best Management Practices (BMPs) for erosion prevention and sedimentation control outlined in the forthcoming project construction stormwater pollution prevention plan (SWPPP) prepared by Goldsmith.

5. "Discuss TP-10. How will the project address that area and potential impacts."

Test Pit TP-10 was excavated in an area where an excavated pit had been filled with soil and scattered building debris. We performed a supplemental subsurface investigation to delineate the extent of the fill at this location. The results of this work indicate that the fill is contained within a pit that is approximately 8 feet by 9 feet in area at the surface, and approximately 8 feet deep. We documented the results of this study in a memo dated December 30, 2014. A copy of the memo is attached.

Soils exposed in the sidewalls and bottom of the pit consist of dense to very dense till. We did not observe any seepage at depth in the pit; however, all of the recent excavations made within and adjacent to the fill area encountered groundwater perched above the till at depths of about 2 to 2.5 feet below the ground surface. The presence of the existing fill has no significant impact on site groundwater.

The occurrence of undocumented fill on sites formerly occupied by residences or residential farms is not uncommon, and will be addressed by removal and replacement with structural fill during mass grading of the project. No additional mitigation is warranted or planned.

6. "Include a cross section that shows groundwater elevations and the sewer trench demonstrating the interception of flow."

See response to Natural Resource Review Item 3 above.

7. "Include Best Management Practices to use during construction that will protect groundwater."

BMPs for erosion prevention and sedimentation control will be outlined in the forthcoming project SWPPP. BMPs to reduce the potential for site utilities to intercept groundwater and drain the perched shallow interflow should include construction of trench barriers or dams discussed in Item 1 above.

In our opinion, potential impacts to groundwater associated with the use of equipment fuels and lubricants at the site during construction would be adequately mitigated with proper implementation and maintenance of BMPs for spill prevention and recovery of hazardous materials during construction as outlined in the forthcoming SWPPP.

8. "Include discussion about recharge on site, dewatering feasibility during construction and occupation, dewatering effects on wetland, constructability, and discharge amounts."

See response to Stormwater Review Item 1 above. See response to Natural Resource Review Item 4 above. Based on study, there are no unusual groundwater conditions at the site that would require special means and methods for construction or temporary and permanent drainage that are above and beyond those discussed in our referenced Preliminary Geotechnical Report.

We performed analysis to evaluate the volume of perched groundwater that could potentially be intercepted and drained to the stormwater system. The flow rate and/or volume of groundwater will depend on many factors, including the thickness of the saturated zone, flow gradient, and soil permeability. For existing conditions, and conservatively assuming that a 2-foot thick zone of the weathered till horizon is fully saturated across the site, analysis indicates an interflow rate of about 3.2×10^{-7} cubic feet per second (cfs) per horizontal foot is possible along the eastern site margin. This is equivalent to approximately 76 gallons of water per year, per horizontal foot.

The above theoretical value represents the maximum volume of groundwater interflow that would flow off site to the east. Using this conservative model, the maximum yearly volume of interflow that could possibly be intercepted and diverted to the site stormwater system would be approximately 26,343 gallons (3,521 cubic feet). Put in perspective, this volume would be approximately equivalent to 1 foot of water covering a 60 foot by 60 foot square area. The actual amount of interflow that could be intercepted and drained to the stormwater system would be a fraction of this conservative estimated volume, which would then be discharged to the Monticello Creek drainage in a controlled manner.

9. "As part of the Level 2 Hydrogeologic Assessment, include parts (F)(5)(c)(iii), (d,e,f,g,h)"

F(5)(c)(iii) Predictive evaluation of groundwater on the proposed project

See response to Stormwater Review Item 1 above. See response to Natural Resource Review Items 1, 4, 5, and 8 above.

As discussed above, there is the potential for interception and drainage of some volume of shallow interflow incidental to site development; however, collected water will be directed to the project stormwater system. The stormwater system will employ prescriptive measures for mitigation of water quality impacts, including detention and treatment by means of wetpool storage within the detention vault, and controlled discharge to the Monticello Creek drainage, which is the natural downgradient receptor of interflow from the site.

F(5)(d) Identify type and quantity of any deleterious substances or hazardous materials that will be stored, handled, treated, used, produced, recycled, or disposed of on the site, and F(5)(e) Proposed methods of storage of the above substances.

The proposed development is limited to residential land use. Therefore, quantities of deleterious substances, and hazardous materials will unlikely be in excess of typical household volumes. In our opinion, specific recommendations for storage or handling of typical residential volumes of these materials in not warranted.

F(5)(f) Proposed plan for implementing RZC 21.64.050.D.f, Protection Standards During Construction.

In our opinion, the potential for adverse impacts to the site resulting from erosion during construction would be adequately mitigated with proper implementation and maintenance of BMPs for erosion prevention and sedimentation control as outlined in the project SWPPP. It is also our opinion the potential hazards associated with the use of equipment fuels and lubricants at the site during construction would be adequately mitigated with proper implementation and maintenance of BMPs for spill prevention and recovery of hazardous materials during construction as outlined in the SWPPP. BMPs developed for this purpose should be compliant with the required performance measures outlined in RZC 21.64.050(D)(4)(a).

F(5)(g) Spill plan indentifying equipment and structures that could fail resulting in an impact.

See project SWPPP.

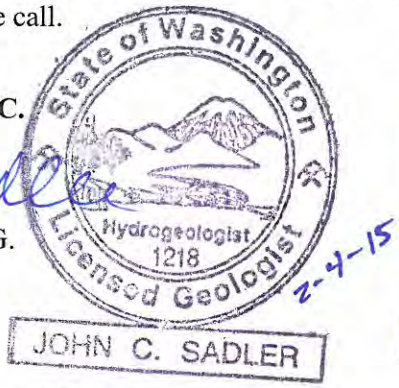
10. "Fill materials shall comply with standards in RMC 15.24.080 and 15.24.095."

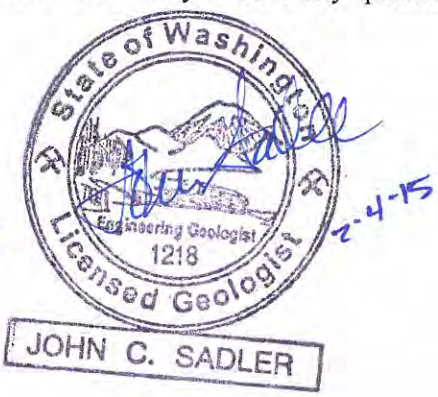
Any fill materials used in site development activities will conform to the requirements of Requirements of RMC 15.24.080. The proposed project is not subject to the requirements of RMC 15.24.095 as it is specific to Wellhead Protection Zones (WPZ) 1 and 2. The subject site is located in WPZ 3.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

John C. Sadler, L.E.G., L.H.G.
Project Manager





Encl: Water Balance Spreadsheet
Memo – Test Pit TP-10 Fill Area Delineation
Report - Phase I Environmental Site Assessment
Utility Plan Sheets U-2 through U-10
Generalized Geologic Profiles

cc: Ms. Trish Clements, Goldsmith Land Development Services
Mr. Erik Enstrom, Goldsmith Land Development Services

Water Balance/Budget
Edgewood West
Redmond, Washington

Deep recharge only occurs over pervious surface areas and is affected by ET losses durng drier summer months

Undeveloped Conditions

Percent runoff based on 6-month storm: 35

Month	January	February	March	April	May	June	July	August	September	October	November	December	Totals	Recharge in acre-feet
NOAA Rainfall	3.14	5.82	4.14	4.44	3.00	2.25	1.77	0.84	1.14	1.95	3.86	6.28	38.64	
Adjusted Rainfall (inches)[1]	3.25	5.55	4.22	4.36	2.98	2.23	1.67	0.83	1.26	2.16	4.00	6.13	38.63	
ET (inches)[2]	1	1	1	1.5	2	2.5	3	3.5	3	2	1.5	1	23.0	
Runoff (inches)[3]	1.14	1.94	1.48	1.53	1.04	0.78	0.58	0.29	0.44	0.76	1.40	2.14	13.52	
Net Shallow Recharge (inches)	1.11	2.60	1.74	1.34	-0.06	-1.05	-1.92	-2.96	-2.18	-0.59	1.10	2.98	2.11	**2.02**
Deep Recharge	1	1	1	1	-0.06	-1	-1	-1	-1	-0.59	1	1	1.35	**1.29**

Developed Conditions

Percent runoff based on 6-month storm: 61

ET (inches)[4]	0.42	0.42	0.42	0.63	0.84	1.05	1.26	1.47	1.26	0.84	0.63	0.42	9.66	
Runoff (inches)	1.98	3.38	2.57	2.66	1.82	1.36	1.02	0.51	0.77	1.32	2.44	3.74	23.57	
Net Shallow Recharge (inches)	0.85	1.74	1.22	1.07	0.32	-0.18	-0.61	-1.15	-0.77	0.00	0.93	1.97	5.41	**5.18**
Deep Recharge[5]	1	1	1	1	-0.06	-1	-1	-1	-1	-0.59	1	1	1.35	**0.70**
Mitigating Factors														
Irrigation (4.46 acres)[6]							1	0.5	1				2.50	0.93
												Net Shallow Recharge		**6.11**
												Net Deep Recharge		**1.63**

1. Monthly Rainfall based on average rainfall records for Puget Sound Lowland 1932-2014 - NOAA National Climatic Data Center adjusted by Terra to correlate to local Redmond Data 2008-2014
2. Calculated using Thornthwaite method - Adjusted by Terra to correlate with value cited for yearly ET from USGS Water Resources Investigation Report 94-4082
3. Calculated based on 6-month storm runoff provided by Goldsmith Land Development Services December 31, 2014
4. Assumes no ET losses from impervious areas (6.24 acres, 58 percent of developed site)
5. Based on recharge only occuring over till surface below impervious areas of developed site (6.24 acres).
6. Based on four inches of irrigation per month less undeveloped ET.

TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

MEMO

To: Erik Enstrom
Goldsmith Land Development Services

December 30, 2014
Project No. T-7037

From: John Sadler, L.E.G., L.H.G.
Terra Associates, Inc.

Subject: Test Pit TP-10 Fill Area Delineation
Edgewood West
Redmond, Washington

Dear Mr. Enstrom:

As requested by Jeff Dendy of the City of Redmond, we performed supplemental subsurface investigation at the Edgewood West site to delineate the extent of the fill material observed in Test Pit TP-10. Our work consisted of exposing native soils in several trenches excavated across the area where Test Pit TP-10 was dug. Using this process, we were able to accurately define the location of a pit that had been excavated into the dense to very dense native till soils and subsequently filled by others.

The pit is approximately 8 feet by 9 feet in area, and has a maximum depth of about 8 feet. The lateral extent of the pit was located in the field by measuring relative to nearby trees identified on the project tree plan. The location of the pit is shown on the attached Fill Delineation Map.

Fill materials in the pit generally consist of dark brown silty sand to sandy silt that was in a loose to medium dense and moist to wet condition, and scattered residential metal, wood, and brick debris. The till exposed on the sidewalls and bottom of the pit generally consist of dense to very dense silty sand with gravel.

We observed seepage of perched groundwater above the dense to very dense till in all of the trenches and potholes excavated at the site. The seepage was generally moderate to heavy and occurred at depths about 2 to 2.5 feet below the ground surface. The conditions we observed in the trenches and potholes are consistent with subsurface conditions observed in our previous test pits.

We trust that this information is sufficient for your current needs. If you have any questions, please call.

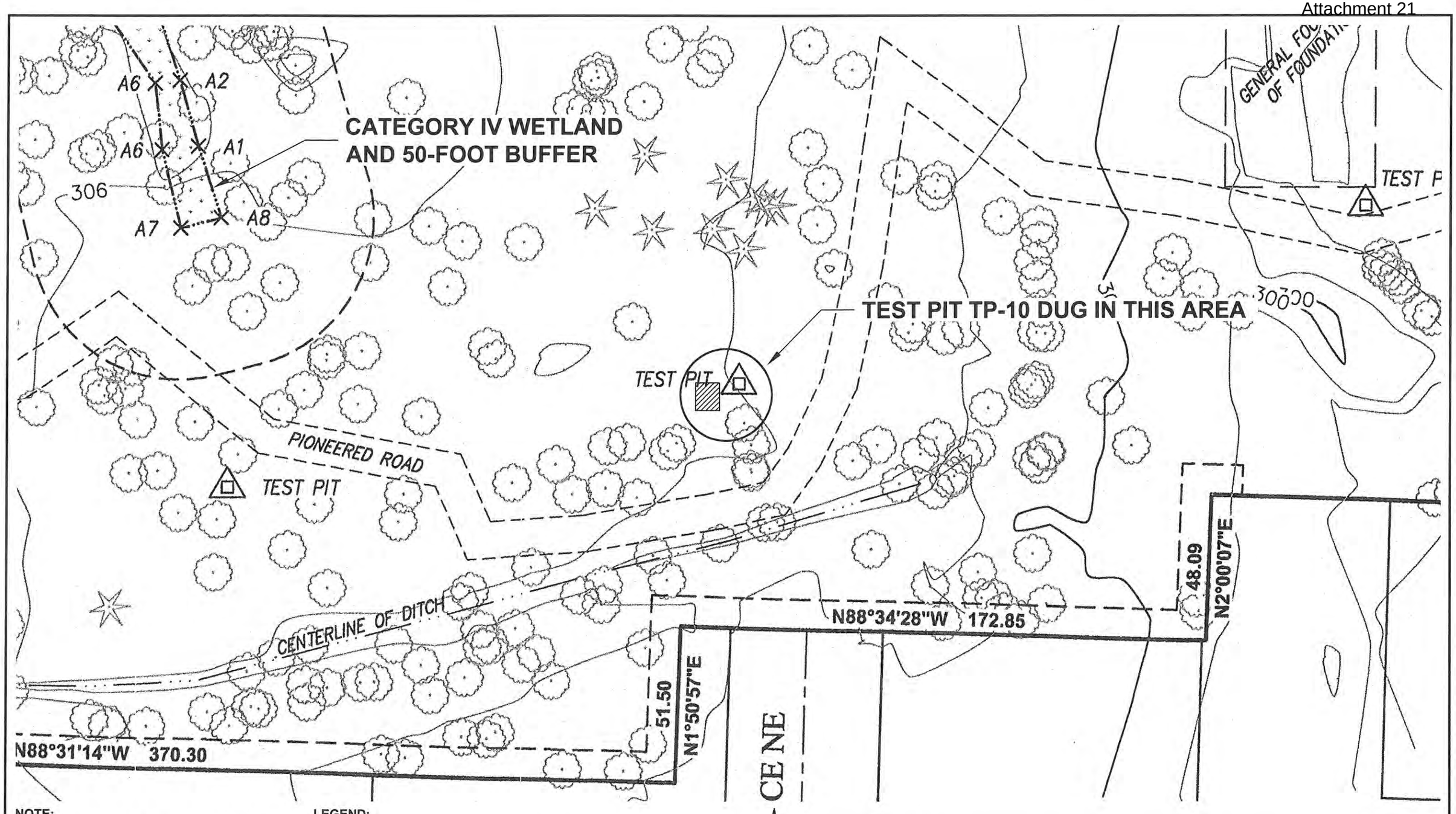
State of Washington
Engineering Geologist
1218
Licensed Geologist
JOHN C. SADLER

John Sadler, L.E.G., L.H.G. 12-30-14

Encl.: Fill Delineation Map

cc: Ms. Trish Clements, Goldsmith Land Development Services

12525 Willows Road NE, Suite 101, Kirkland, Washington 98034
Phone (425) 821-7777 • Fax (425) 821-4334



NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE:

GOLDSMITH LAND DEVELOPMENT SERVICES

LEGEND:

APPROXIMATE LOCATION OF 8'W x 9'L x 8'D FILL AREA

0 30 60

APPROXIMATE SCALE IN FEET

Terra Associates, Inc.

Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

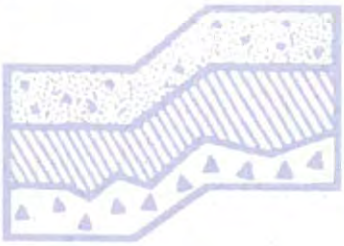
FILL DELINEATION MAP
EDGEWOOD WEST
REDMOND, WASHINGTON

Proj. No.T-7037	Date DEC 2014	Figure 1

PHASE I ENVIRONMENTAL SITE ASSESSMENT

Mansoori Parcel
Redmond, Washington
King County Tax Parcel 2526059033

Project No. T-7037-1



Terra Associates, Inc.

Prepared for:

Quadrant Homes
Bellevue, Washington

May 8, 2014

TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

May 8, 2014
Project No. T-7037-1

Mr. Mike Behn
Quadrant Homes
14725 SE 36th Street, Suite 200
Bellevue, Washington 98006

Subject: Phase I Environmental Site Assessment
Mansoori Parcel
Redmond, Washington
King County Tax Parcel 2526059033

Dear Mr. Behn:

We have completed a Phase I Environmental Site Assessment (ESA) for the Mansoori Parcel located in Redmond, Washington. The purpose of our study was to review the site and to provide our opinions on the probable presence or absence of recognized environmental conditions (RECs) that would affect the site. Our review has shown that the site and site vicinity were rural until the past decade. There was formerly a house and two chicken coops on the site.

No RECs were identified in our study.

The attached report describes our study in detail. We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

Charles R. Lie, L.E.G., L.H.G.
Project Manager

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(continued)

Phase I Environmental Site Assessment
Mansoori Parcel
Redmond, Washington
King County Tax Parcel 2526059033

1.0 EXECUTIVE SUMMARY

This report presents our Phase I Environmental Site Assessment (ESA) for the Mansoori Parcel site located in Redmond, Washington. This report has been prepared in general accordance with American Society for Testing and Materials (ASTM) E-1527-05. The subject site is composed of one tax parcel located in King County within the city limits of Redmond, Washington. The parcel is currently undeveloped and heavily vegetated. No recognized environmental conditions (RECs) were revealed during our study.

2.0 INTRODUCTION

2.1 Purpose

American Society for Testing and Materials (ASTM) E-1527-13 states: "The purpose of this practice is to define good commercial and customary practice in the United States of America for conducting an environmental site assessment of a parcel of commercial real estate with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. §9601) and petroleum products. As such, this practice is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability (hereinafter, the "landowner liability protections," or "LLPs"): that is, the practice that constitutes all appropriate inquiries into the previous ownership and uses of the property consistent with good commercial and customary practice as defined at 42 U.S.C. §9601(35)(B). Controlled substances are not included within the scope of this standard. Persons conducting an environmental site assessment as part of an EPA Brownfields Assessment and Characterization Grant awarded under CERCLA 42 U.S.C. §9604(k)(2)(B) must include controlled substances as defined in the Controlled Substances Act (21 U.S.C. §802) within the scope of the assessment investigations to the extent directed in the terms and conditions of the specific grant or cooperative agreement. Additionally, an evaluation of business environmental risk associated with a parcel of commercial real estate may necessitate investigation beyond that identified in this practice".

2.2 Scope of Work

Our scope of work for this project included:

- Review of a report compiled by EDR dated March 31, 2014 which consists of a tabulated summary of available federal and state databases named in the ASTM Test Designation E-1527-13: *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.*

- Site reconnaissance to observe existing conditions and to review potential risks to the subject site from on- and off-site activities.

- An interview with the current owner.

- Review of standard historical documents including tax assessor records for the site, fire insurance maps, real estate atlases, and aerial photographs of the area.
- Review of available current and archived tax information for the subject site.
- Review of geologic information in our files and public sources.
- Review of information developed by our firm for the concurrent geotechnical engineering study.
- Preparation of this report.

We performed the research for this project and report in general accordance with ASTM Test Designation E-1527-13: *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.*

2.3 Significant Assumptions

In the preparation of this report, it has been assumed that this report will be used for due diligence purposes.

2.4 Special Terms and Conditions

Our work did not include the following tasks:

- Site specific soil or groundwater sampling or testing.
- Asbestos or lead paint sampling on the site.

2.5 Limitations

We conducted no testing for this study. The findings, conclusions, and recommendations presented in this report are based on our documented site observations, current site conditions and use, review of historical and regulatory information, interviews, and review of the referenced historic resources. Other information related to past site uses or current site conditions may exist. Our conclusions in part are based on information provided or prepared by others.

If further information on the site becomes available, Terra Associates, Inc. should review the information, as it may affect our conclusions.

We prepared our conclusions and recommendations in accordance with generally accepted professional engineering practices. We make no other warranty, either expressed, or implied. This report is the copyrighted property of Terra Associates, Inc. and is intended for specific application to the Mansoori Parcel in Redmond, Washington. This report is for the exclusive use of Quadrant Homes and their authorized representatives.

3.0 SITE CONDITIONS

3.1 Site Description

The site is an 11.5-acre tax parcel located between 172nd Avenue NE and 176th Avenue NE in Redmond, Washington. The parcel does not have an assigned address. The approximate location of the subject site is shown on Figures 1 and 2. Figure 3 shows the existing layout of the site.

The subject site is irregularly-shaped with the long axis oriented east-west and is presently undeveloped and vacant. The parcel is heavily vegetated along the east, south, and west property boundaries with a more open area in the center. Site vegetation consists of cedar and alder trees. There is a wooden fence in the south-central portion of the site that is associated with the former residence.

We did not observe any unusual soil conditions, ground staining, or note any odors that would indicate significant contamination of the subject site. We observed no stressed vegetation. We did not observe any evidence of underground storage tanks (USTs).

3.2 Adjacent Land Use

The subject site is located in an area that is residential in nature. Figure 3 shows the relationship of the site to the adjacent parcel. Adjacent property use is summarized below:

North	Single-family residential neighborhoods
East	Single-family residential neighborhoods
West	Single-family residential neighborhoods
South	Single-family residential neighborhoods

3.3 Soil Conditions

Soil conditions observed indicate the site is generally underlain by 6 to 18 inches of organic topsoil overlying 1 to 4 feet of loose to medium dense silty sand with gravel (weathered till) overlying medium dense to very dense silty sand with gravel (unweathered glacial till). The other was observed in a test pit near the former house location where we observed approximately eight feet of loose, wet, organic fill material overlying the very dense native soils.

The Geologic Map of Redmond Quadrangle, King County, Washington, by J.P. Minard and D.B. Booth (1988) maps the site as till (Qvt). This mapped description is consistent with the native soil we observed in the test pits.

There were no signs of stained or contaminated soils or buried rubbish during our site visits to observe earthwork on-site.

3.4 Hydrogeologic Conditions

Light to heavy groundwater seepage was observed in 9 of the 12 test pits between 1 and 8 feet below current site grades. Typically, we noted seepage at the contact between the upper weathered and unweathered till horizons. This condition is very common within till geology and we expect that this seepage will diminish when we move

into the drier summer and fall months. Deeper zones of seepage observed in the test pits appear to be flowing from sandier layers contained within the till stratum.

Based on available topographic information and field exploration during our geotechnical study, the near-surface groundwater will flow towards the east. The topography of the area is shown on Figure 2.

4.0 SITE HISTORY RESEARCH

4.1 Aerial Photography Review

We reviewed historical aerial photographs of the site and vicinity on-line at TerraServer, the USGS, and Pierce County on-line resources, Historic Photos (NETR web site), Pictometry, and Google Earth. We also referred to aerial photos in our files. The aerial photos are vertical photos that show the footprints of the buildings and other details visible from that point of view. Dense forest cover can obscure small buildings such as houses and small outbuildings. The actual use of the buildings is usually not ascertainable from the photographs alone. Conclusions of the use of the buildings contained in the following description are based on research from other sources. Figure 3 attached to this report is a selected aerial photo.

1936 The site is cleared. There is a building visible in the south central portions of the site. Most of the surrounding area is forested. There is a road along the alignment of 172nd Avenue NE.

1964 The house appears to be gone. The surrounding area is mostly forest. The clearing on-site appears to be growing brush.

1968 The subject site and vicinity is similar to the 1964 photograph.

1980 The subject site is brush covered. The site vicinity resembles the 1968 conditions.

1990 The site and vicinity resemble the 1980 conditions.

1998 The site and vicinity resemble the 1990 conditions

2002 The site and vicinity resemble the 1998 conditions.

2006 The subject site is forested. The houses south of the site are under construction.

2009 The subject site is forested; the houses south of the site are built. The area to the north is forested.

2011 The site and vicinity resemble the 2009 conditions.

2013 The site is forested; the area to the north is being cleared.

4.2 Map Review

4.2.1 Cadastral Survey

The original survey is dated April 21, 1874. No land use or ownership is shown. No trails, roads, or land claims are shown in the site vicinity.

4.2.2 USGS Topographic Maps

1897 Snohomish, Washington 30' Quadrangle

There is a road that is approximately along the alignment of 172nd Avenue NE. There are two small buildings consistent with houses in the immediate site vicinity. Overall, the site vicinity is not very developed.

1900 Land Classification Sheet, Seattle Quadrangle, Washington

This map uses the 1897 Snohomish topographic map as a base. This map shows the site in an area marked as Merchantable Forest indicating it is virgin forest.

1956 USGS Redmond, Washington 7.5' Quadrangle, 1950 photo revised in 1968 and 1973

The original mapping shows a house on the site. The site vicinity is rural in all versions of the map. This map is the base map for Figure 2 attached to this report.

2011 USGS Map

This map has an orthographic photo overlay that shows the site and the vicinity as they exist at this time.

4.2.3 Sanborn Maps

Sanborn Maps were created to aid in underwriting fire insurance policies in urbanized areas. The maps were generally updated until the 1960s. They typically show the types of buildings and their use for the areas of coverage.

We reviewed the Sanborn Maps for the site electronically through the Library of Congress Sanborn Map collection at the King County Library System. Our search of the Sanborn Maps found no coverage for the site. This is consistent with the rural history of the site area.

4.2.4 Government Land Office Records

The subject site was originally part of a 160-acre serial grant issued to Jerome Rogers on January 11, 1892.

4.2.5 Commercial Real Estate Maps

Real estate maps have been published for the greater Seattle area for more than 100 years. They record subdivisions of land and were updated on a regular basis. For some years, the maps would show the type of building present on the parcel of land. We reviewed the following maps:

1907 **Andersons Map Company** – This atlas shows the site within an 80-acre parcel owned by J. Ware.

1912 **The Kroll Map Co. –** This map shows the site as within an 80-acre parcel owned by John Ware.

1936 **The Metsker Map Company** – This atlas shows the site within a 40-acre parcel owned by Geo. Lemishko el al. 172nd Avenue NE is present.

No buildings are shown on the real estate atlas pages reviewed for this project.

4.3 Tax Records

4.3.1 Archived Tax Records

For King County, the Washington State Archives has an incomplete collection of tax records. As the records were being updated, in some cases the old records would be discarded. The records date back to a Works Progress Administration project in the mid-1930s. Some of the records have dates of transactions that precede the mid-1930s. The available records list the following information:

Tax Parcel No.	Approximate Date of Records	Listed Owner	Size/Development/Notes
33	1939	Geo. Lemeshko	The parcel is shown as covering 12.08 acres. The parcel is developed with two 2-story chicken sheds and a house. The house is listed as having been built in 1931. The chicken sheds are listed as having been built in 1923 and 1935. The shed built in 1935 is reported to have 75 nests. The heat source of the house is reported to be a stove. The chicken sheds are reported to be unheated. The notes on the card indicate that the buildings were gone by August of 1964.
9033	1995	None listed	The parcel is listed as 12.1 acres. The development is listed as consisting of only an overgrown foundation.

The archived tax records are attached in Appendix A.

4.3.2 Current Tax Records

The current on-line tax records list the following information:

Tax Parcel No.	Site Address	Listed Owner	Size/Development/Notes
2526059033	None listed	N and T Mansoori	The site is listed as covering 11.5 acres and being vacant single-family residential land.

The current tax record summary is attached in Appendix A.

4.4 Activity and Use Limitation

Activity and use limitations (AULs) are commonly placed on sites that have undergone partial cleanups and have residual levels of contamination that remain in place. In the State of Washington, this is normally accomplished through the creation of a covenant that spells out the environmental issues and limitations on site use. To review for the possible presence of AULs, we reviewed the current Environmental Covenant Registry maintained by the Washington State Department of Ecology.

Our review found no AULs for the site.

4.5 Title Review

We received a title commitment and chain-of-title from First American Title Insurance Company. The commitment is attached in Appendix B. The title has no entries that would be considered to be RECs.

4.6 Interviews

4.6.1 User Questionnaire

The user questionnaire is attached in Appendix C.

4.6.2 Current Owner Interview

On May 7, 2014, we had a telephone interview with the current owner of the site, Mr. Nuri Mansoori. Mr. Mansoori reported:

- He has owned the property for about 35 years.
- When he bought the property, the prior house was in very poor shape and was collapsing; the prior owners were in a nursing home in California. The prior house was then demolished.
- He observed no fuel storage tanks or USTs on the site.
- He planned on building a house for himself. The project was suspended while the foundation was being built.
- He believes there is no well on the site. The house that was on-site formerly got water from a well on the adjacent parcel to the south.
- Besides some lawn mowing debris, no dumping has occurred on-site.

4.6.3 King County Health Department

We sent a written request to the King County Health Department for information relating to presence/absence of USTs/ASTs, environmental compliance issues-violations, and/or releases of hazardous/dangerous substances for the subject parcel. The department response indicated that they do have any records responsive to our request.

The request for information is attached in Appendix D.

4.7 City Directory Review

Due to the rural-residential history of the site, no significant city directory coverage is expected to exist for the site that would present information not covered by other data sources referenced in this report.

5.0 REGULATORY DOCUMENT REVIEW

We reviewed the EDR report dated March 31, 2014, compiled for the subject property by Environmental Data Resources, Inc. This company searches U.S. Environmental Protection Agency and Washington State Department of Ecology (Ecology) databases for sites within a specified radius of a subject property that may pose a risk to that property. The EDR report includes proprietary databases that summarize historic city directories as well as sites that have general stormwater discharge permits. We evaluate each listing to establish its relationship to the site.

We evaluate relative elevations and locations of listed sites based on our site reconnaissance and review of relevant topographic and geologic maps.

The EDR report is summarized below.

The EDR report is attached as Appendix E.

5.1 Federal Records

5.1.1 National Priority List (NPL or Superfund Sites)

Section 8.2.1 of the ASTM standards requires a review of federal and state lists of hazardous waste sites identified as NPL or Superfund sites within a one-mile radius of the subject property. The EDR search found no Superfund sites within a one-mile radius of the subject site.

5.1.2 Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) and CERCLIS – No Further Action Planned (CERCLIS-NFRAP)

Section 8.2.1 of the ASTM standards requires a review of federal and state lists of hazardous waste sites identified as CERCLIS sites within a one-half mile radius of the subject property. The EDR search found no CERCLIS or CERCLIS-NFRAP sites within a one-half mile radius of the subject site.

5.1.3 Resource Conservation Recovery Act Information System – Treatment, Storage, and Disposal (RCRA-TSD)

Section 8.2.1 of the ASTM standards requires a review of RCRA Treatment, Storage, or Disposal (TSD) lists to a radius of one-half mile. The EDR search found no RCRA-TSD site within a one-half mile radius of the subject site.

Section 8.2.1 of the ASTM standards requires a review of RCRA Treatment, Storage, or Disposal CORRACTS lists to a radius of one-mile. CORRACTS sites are TSD facilities that have had violations in the past. The EDR search found no CORRACTS sites within a one-mile radius of the subject site.

5.1.4 Resource Conservation Recovery Act (RCRA) – Generators

Section 8.2.1 of the ASTM standards requires a review of federal RCRA generators on the property and adjoining properties. The EDR search found no RCRA generators on or adjacent to the site.

5.1.5 Emergency Response Notification System (ERNS)

Section 8.2.1 of the ASTM standards requires a review of federal ERNS listings on the property. The ERNS database records' stores information on reported releases of oil and hazardous substances. The EDR search found no ERNS listing for the site.

5.1.6 US Brownfields

The Brownfields database records and stores information on abandoned, idle, or underused commercial or industrial properties with confirmed and/or suspected contamination. The EDR search found no US Brownfields sites within a half mile of the subject property.

5.2 State Records

5.2.1 Confirmed or Suspected Contaminated Sites List (CSCSL) and CSCSL No Further Action (NFA)

Section 8.2.1 of the ASTM standards requires a review of state lists of hazardous waste sites identified for investigation or remediation within a one-mile radius of the subject property. EDR conducted a records search for listed CSCSL sites within a one-mile radius and for CSCSL – NFA sites within one-half mile of the subject property. There is one CSCSL site listed within a one-mile radius of the site and no CSCSL NFA sites within one-half mile of the site. The CSCSL site is:

Site Name and Address	Relative Location	Notes
Shell Station 120525 11520 Avondale Road NE Redmond, Washington	About two thirds of a mile east southeast and downgradient of the subject site.	This site is also on the UST, LUST and VCP databases. This site has had confirmed releases of gasoline that have impacted soils and groundwater. The initial release appears to have been reported in1998. The site is reported to be in the process of being cleaned up.

Based on distance, status, and locally hydrogeologic conditions, it is our opinion that the CSCSL site is not an REC associated with the site.

5.2.2 Solid Waste Facilities/Landfills (SWF/LF)

Section 8.2.1 of the ASTM standards requires a review of state lists identifying landfill and solid waste disposal facilities within a one-half mile radius of the subject property. The EDR search found no SWF/LF sites listed within a half-mile radius of the subject site.

5.2.3 Underground Storage Tank (UST) List

Section 8.2.1 of the ASTM standards requires a review of state UST lists for regulated underground tanks listed on the subject site or adjoining properties. No USTs are listed as being present on or adjacent to the underlying subject site.

5.2.4 Leaking Underground Storage Tank (LUST) List

Section 8.2.1 of the ASTM standards requires a review of state LUST lists for possible contaminated sites within a half mile radius of the subject property. The EDR search found no LUST sites within a one-half mile radius of the subject site.

6.0 OTHER HAZARDS

6.1 PCBs and Transformers

Polychlorinated biphenyls (PCBs) are associated with electrical transformer fluids and ballasts in older fluorescent light fixtures. The use of PCBs in transformer fluids was discontinued in units manufactured after 1977. Transformers are the property of the local utility that is generally responsible for leakage or spills from the transformers. We did not observe any transformers on the subject site. We observed pole-mounted transformers adjacent to the site.

6.2 Water Wells

We observed no monitoring wells or other wells on or adjacent to the site.

6.3 On-site Tanks

The current tenant of the property reported that there are no USTs or ASTs on the site.

6.4 Area Wide Smelter Contamination

We reviewed the current map from Ecology that shows the extent of suspected and known impacts from the area wide Tacoma Smelter Plume (TSP) project. The site is in the distal area of the TSP where the impacts are expected to be below the cleanup level. It is our opinion that the TSP is not an REC associated with the site.

6.5 Vapor Migration

There are no known vapor plumes in this area. Vapor migration is not an REC associated with the site.

6.6 Clandestine Drug Labs

We reviewed the current listing of Meth Labs in King County. The web site was accessed on April 1, 2014. Neither the site nor adjacent parcels are listed as being former meth labs.

7.0 SUMMARY

7.1 Current Site Use

The site consists of a single parcel covered with brush and forest. The existing land use is not an REC.

7.2 Historical Site Use

The subject site has historically been rural/agricultural followed by becoming a vacant brush and forested parcel facility. There were formerly two chicken sheds on-site. It is our opinion that the historical site use is not an REC.

7.3 Off-site Parcels

Our reconnaissance of the vicinity and of the site found potential sources for soil and/or groundwater contamination within a one-mile radius of the site. The immediate vicinity of the site is and has been rural/agricultural and then single-family residential. Based on the data we reviewed, none of the off-site parcels are considered to be an REC.

7.4 Deviations (Data Gaps) For This Study

The only data gap is the lack of a response from the health department. The local health department response can take up to six weeks. Information from the local health department is not readily ascertainable. The lack of this response is not considered to be significant.

8.0 CONCLUSIONS

We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E-1527 for the Mansoori Parcel. Any exceptions to, or deletions from, this practice are described in Section 7.4 of this report. This assessment has revealed no recognized environmental conditions (RECs) in connection with the property.

9.0 QUALIFICATIONS

We declare that, to the best of our professional knowledge and belief, we meet the definition of *Environmental professional* as defined in §312.10 of 40 CFR 312. We have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the subject *property*. We have developed and performed all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Project work was performed by Charles R. Lie. The following brief biography summarizes the experience of this professional.

Charles R. Lie, L.E.G., L.H.G., has more than 26 years of experience in the assessment of contaminated sites, ranging from Phase I ESAs of rural-residential properties to characterization and remediation of parcels ranging from corner gasoline stations to industrial facilities. Mr. Lie has 35 years' experience performing hydrogeologic and engineering geologic assessments of sites ranging from large rural tracts to downtown urban properties. His project work has included detailed reviews of historical records, aerial photograph interpretation, geologic mapping, geophysical surveys, monitoring well installation and sampling, aquifer testing, hydrogeological interpretation, and report preparation. Mr. Lie has a Bachelor of Science in Geology. He is a licensed Geologist, Hydrogeologist, and UST Assessor in the State of Washington. Mr. Lie is a certified Asbestos Building Inspector.

10.0 REFERENCES

10.1 Documents and Publications

American Society for Testing and Materials (ASTM) 2013. *E-1527-13 Standard Practice for Environmental Site Assessments – Phase I Environmental Site Assessment Process.*

EDR *Environmental Data Resources, Inc.*, prepared for Terra Associates, Inc., dated March 31, 2014.

Sanborn Map Company, *Fire Insurance Atlas*, Library of Congress Collection.

Terra Associates Inc. Preliminary Geotechnical Report, Project No. T-6037, dated April 21, 2014.

United States Geological Survey (USGS). 1953 revised 1981. 7.5-Minute Series Topographic Map, Redmond Washington Quadrangle.

10.2 Internet Web Sites

Google Earth, accessed on April 21, 2014

Historic Aerials (NETR), accessed April 20, 2014
http://www.historicaerials.com/aerials.php?code=404

King County Parcel Viewer web site accessed April 24, 2014
http://gismaps.kingcounty.gov/parcelviewer2/?pin=2325069038

King County Recorded Documents accessed April 21, 2014
http://146.129.54.93:8193/search.asp?cabinet=opr

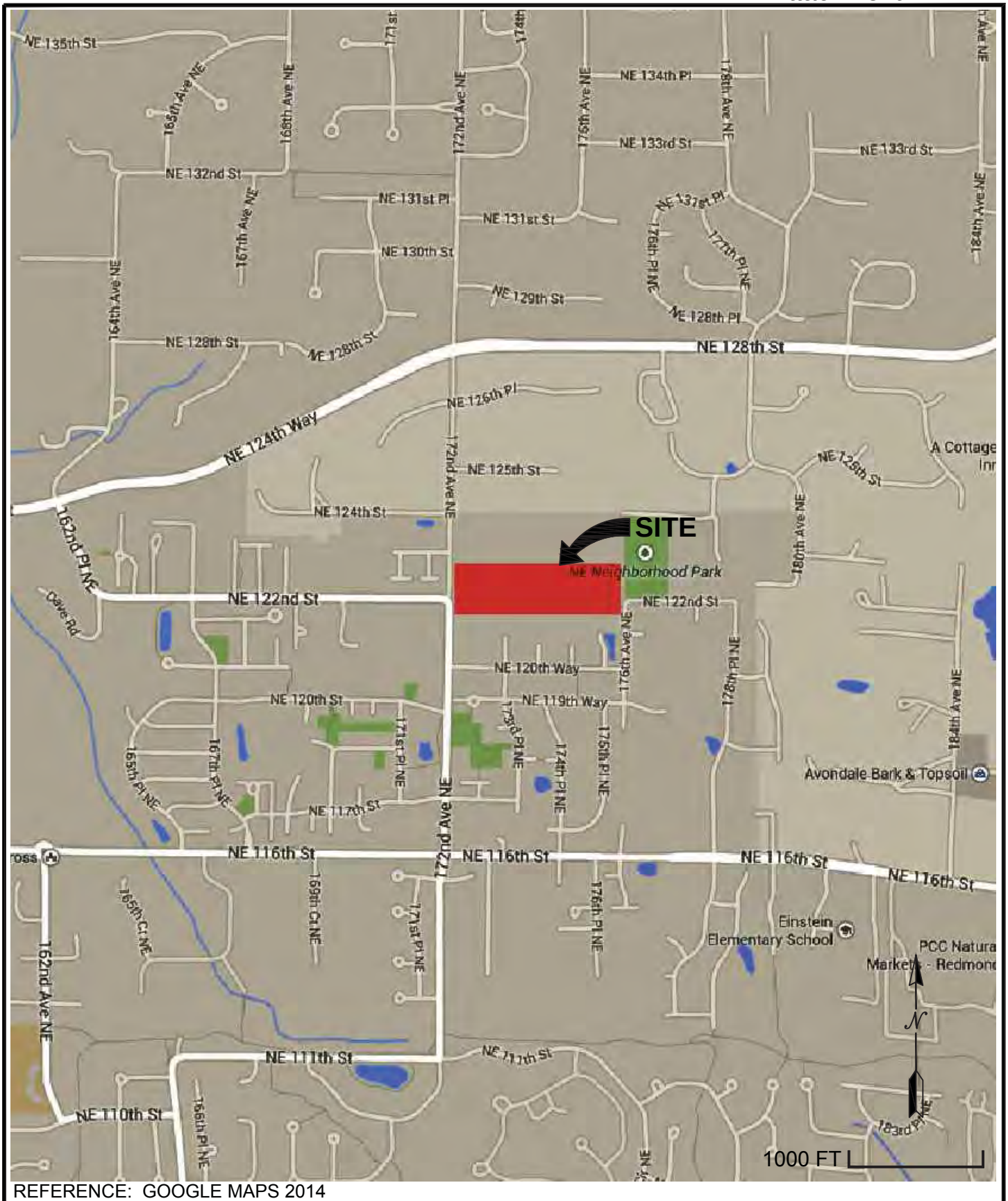
Seattle King County Health Department Meth Lab Information accessed April 23, 2014,
http://www.kingcounty.gov/healthservices/health/ehs/toxic/methlabs.aspx

Terra Server
http://www.terraserver.com/ accessed on April 23, 2014

USGS historic aerial Photos accessed April 23, 2014
http://earthexplorer.usgs.gov/

Washington State Department of Ecology Well Log Database, accessed on April 23, 2014
https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/TextSearch.aspx?prevpage=searchresultlist&newsearch=true

Washington State Department of Ecology TSP interactive map, accessed on April 23, 2014
https://fortress.wa.gov/ecy/smeltersearch/

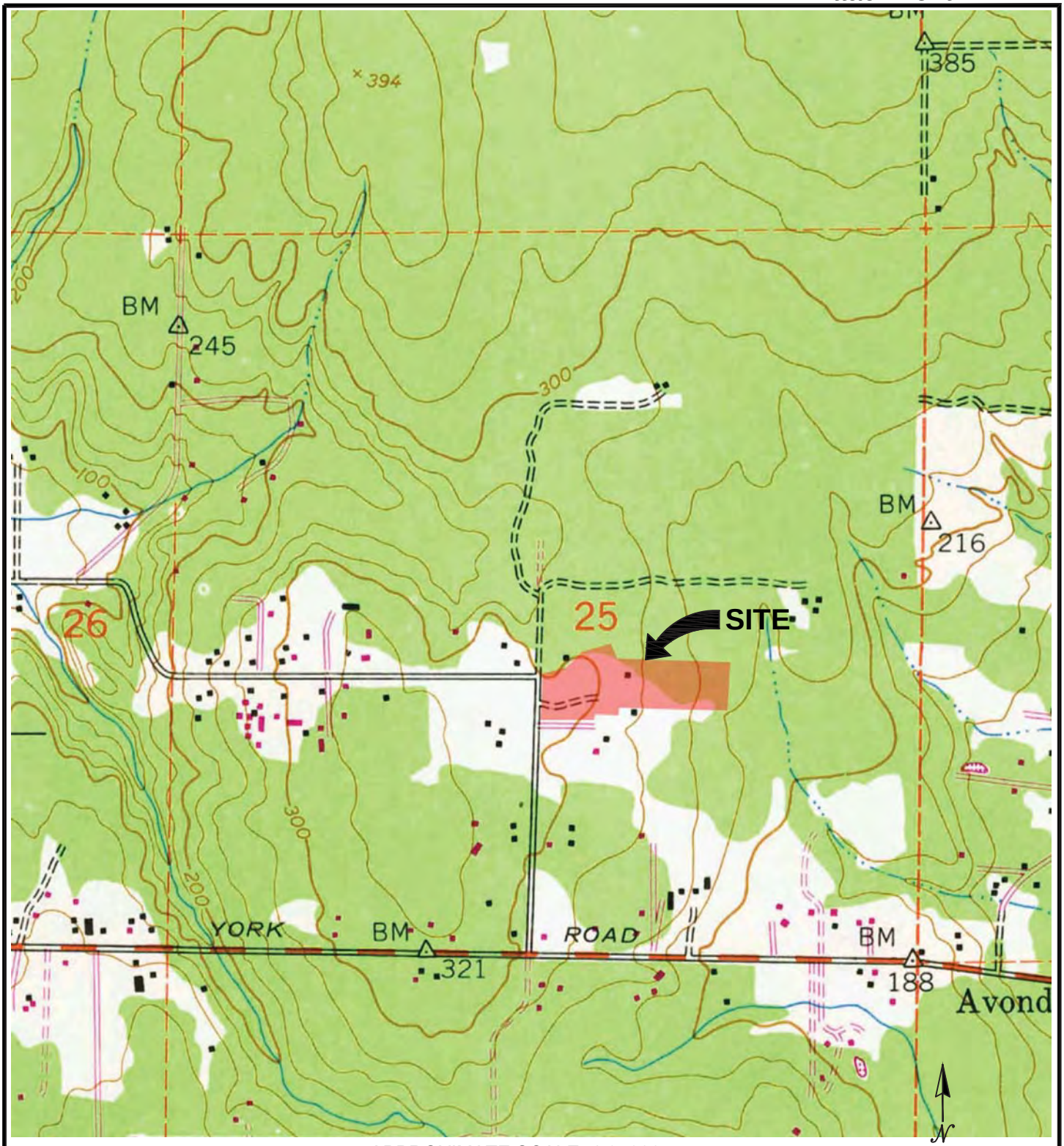


REFERENCE: GOOGLE MAPS 2014

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

VICINITY MAP
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037-1	Date MAY 2014	Figure 1



APPROXIMATE SCALE: 1:24000

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 1/2 0 1 MILE

CONTOUR INTERVAL: 25 FEET

REFERENCE: USGS MAPS, REDMOND, WASHINGTON QUADRANGLE

Terra Associates, Inc.

Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

TOPOGRAPHIC VICINITY MAP
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037-1	Date MAY 2014	Figure 2

NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE: pictometry.com

NOT TO SCALE

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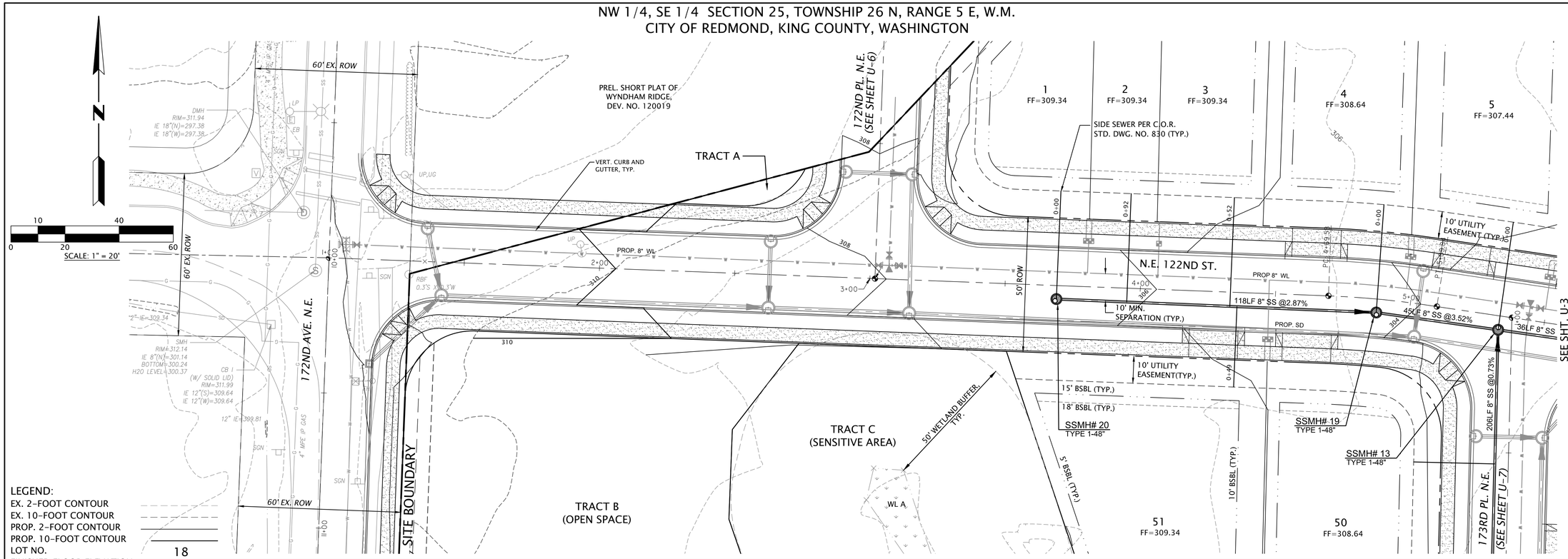
Environmental Earth Sciences

OBLIQUE AERIAL PHOTO
MANSOORI PARCEL
REDMOND, WASHINGTON

Proj. No.T-7037-1	Date MAY 2014	Figure 3

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON



LEGEND:
- EX. 2-FOOT CONTOUR
- EX. 10-FOOT CONTOUR
- PROP. 2-FOOT CONTOUR
- PROP. 10-FOOT CONTOUR
- LOT NO. 18
- FINISHED FLOOR ELEVATION FF=309.34
- PROPOSED SANITARY SEWER PIPE
- SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER PIPE
- EXIST. SAN. SEWER MANHOLE

SURVEY NOTES:

1. HORIZONTAL DATUM: NAD 83/91, HARN, WASHINGTON STATE COORDINATES - NORTH ZONE. THIS SURVEY HAS HELD THE CITY OF REDMOND COORDINATE LOCATIONS FOR THE SOUTH QUARTER CORNER AND SOUTHEAST CORNER OF SECTION 25, TOWNSHIP 26 NORTH, RANGE 5 EAST, WM AS SHOWN IN THE REDMOND CITY HORIZONTAL CONTROL NOTEBOOK, PUBLISHED IN 1993.

2. BASIS OF POSITION: HELD EXISTING MONUMENT IN CASE AT THE SOUTH QUARTER CORNER OF SAID SECTION 25 (ALSO KNOWN AS CITY OF REDMOND SURVEY CONTROL POINT GLO-4CS (N 259,343.33, E 1,325,873.11 GRID)).

3. BASIS OF BEARING: HELD BEARING OF SOUTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 25 BETWEEN THE ABOVE NOTED BASIS OF POSITION AND FOUND SOUTHEAST CORNER OF SAID SECTION 25 (ALSO KNOWN AS GLO-5CSW = GPS90-5C3 (N 259,265.666, E 1,328,568.055 GRID, 259,265.658, 1,328,568.141 GROUND)) TO BE N 88°20'57" W PER DIRECT INVERSE OF CITY OF REDMOND COORDINATES. SEE MAP FOR PLOTTED LOCATION AND DESCRIPTION.

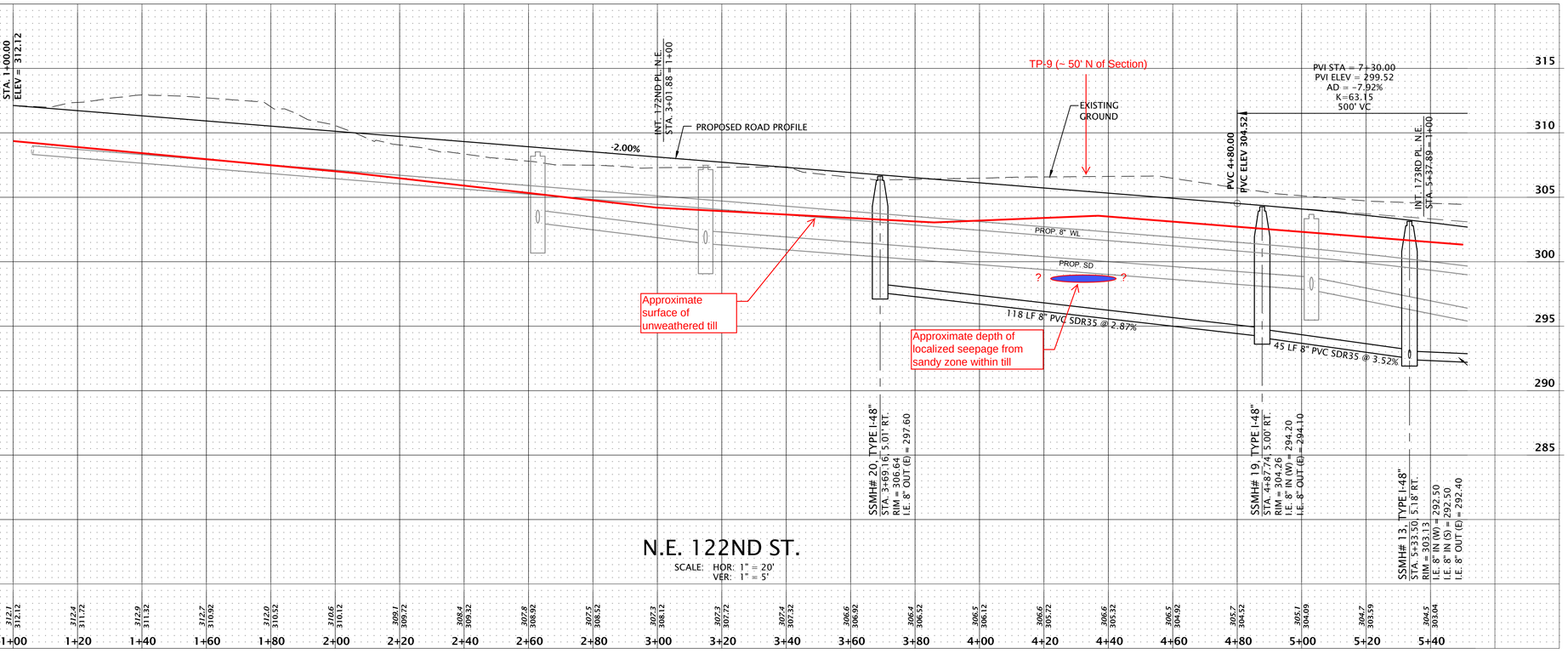
4. VERTICAL DATUM: NAVD 1988 PER CITY OF REDMOND BENCHMARK MONUMENT RECORDS DATED JUNE 2009.

MASTER BENCHMARK #1: CITY OF REDMOND BM NO. COR 9196 - FOUND CONCRETE MONUMENT WITH 1 3/4" BRASS DISK WITH "X" IN CASE AT THE INTERSECTION OF NE 12TH WAY AND 172ND AVENUE NE, STAMPED "LS 18102", DOWN 0.6 FEET. ELEVATION =312.11 FEET (NAVD 1988).

LEGAL DESCRIPTION:

TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)

KEY MAP
NTS



NO.	DATE	REVISIONS	BY	CHK.

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QUADRANT HOMES

UTILITY PLAN
N.E. 122ND ST.
EDGEWOOD WEST

REDMOND WASHINGTON

PLOTTED: 2014/11/24 16:18 EENSTROM
DRAWN: HWERLINGER
DESIGNED: EENSTROM
APPROVED: KGOLDSMITH

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425-462-1080
PROJECT MANAGER

SHEET U-2

JOB NO.: 14123

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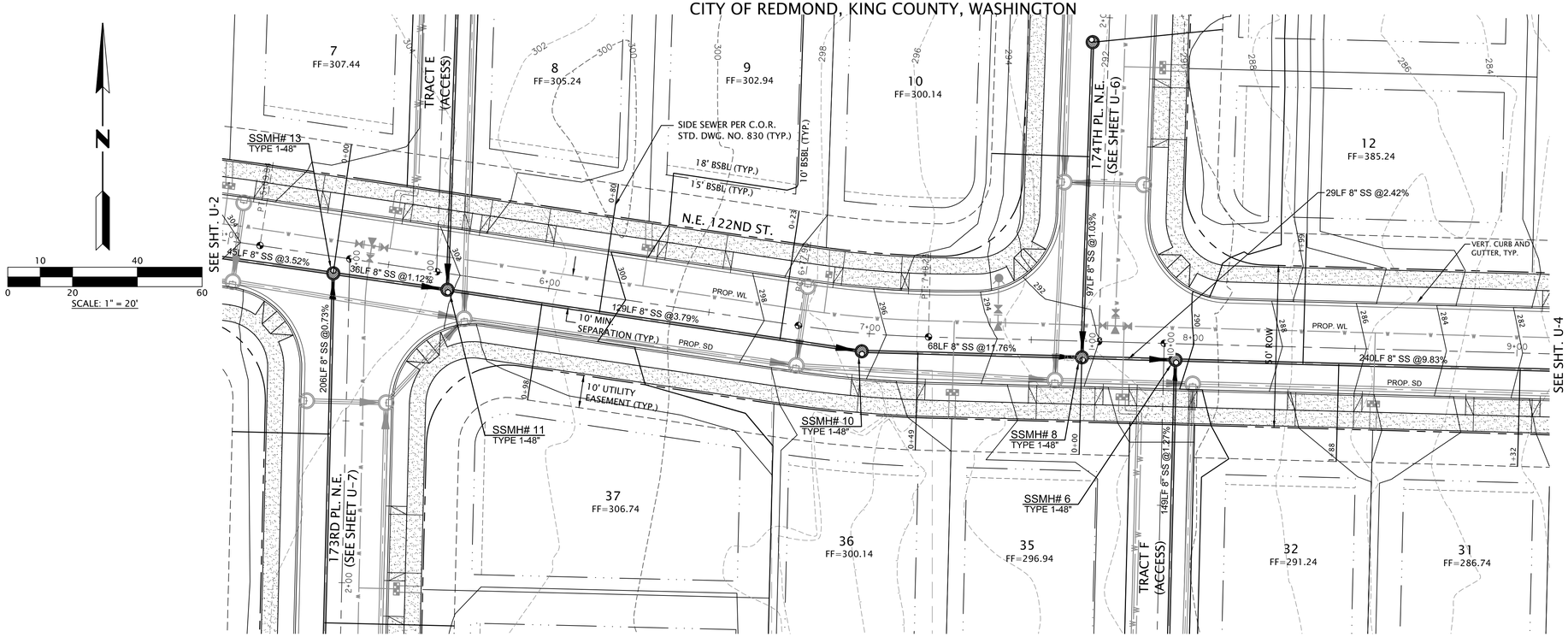
NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON



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PROP. 10-FOOT CONTOUR	
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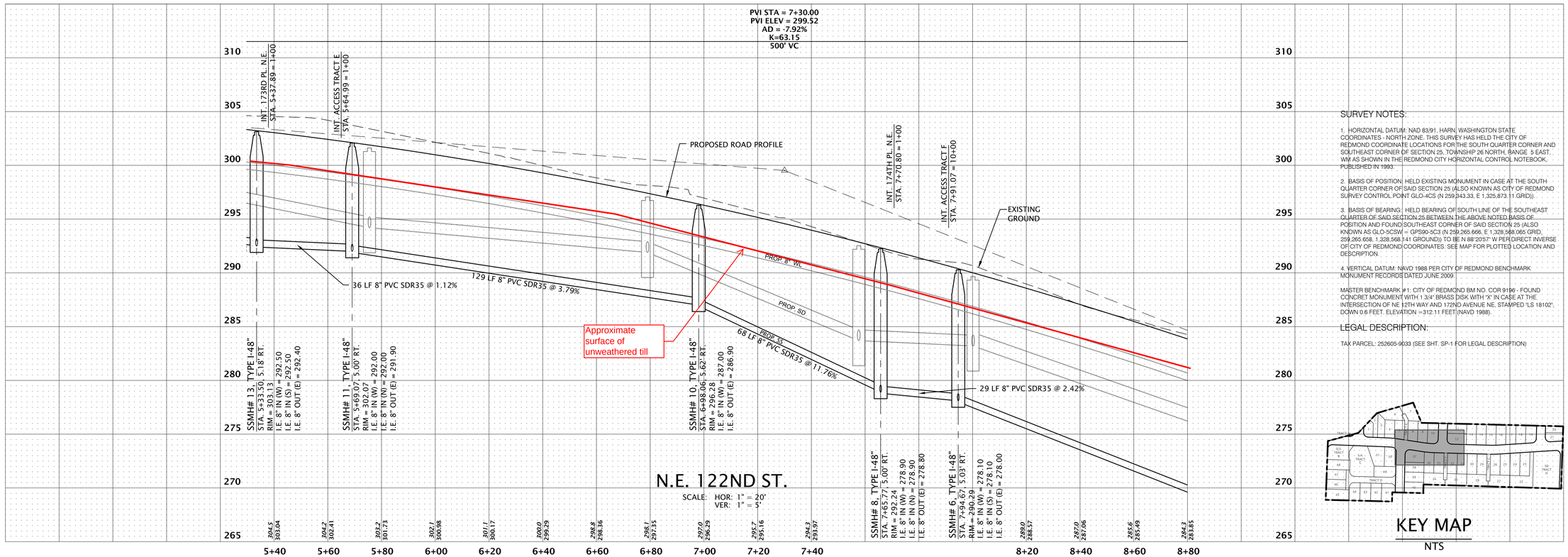

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TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)

KEY MAP
NTS

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PLOTTED: 2014 | 11 | 24 16:19 EINSTROM
DRAWN: SPASZTOR
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APPROVED: KGOLDSMITH

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QUADRANT HOMES

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REDMOND WASHINGTON

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SHEET
U-3

JOB NO.: 14123

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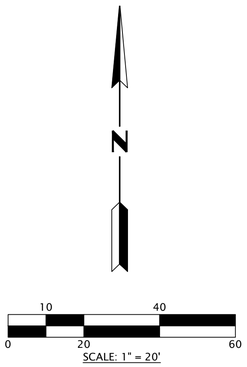

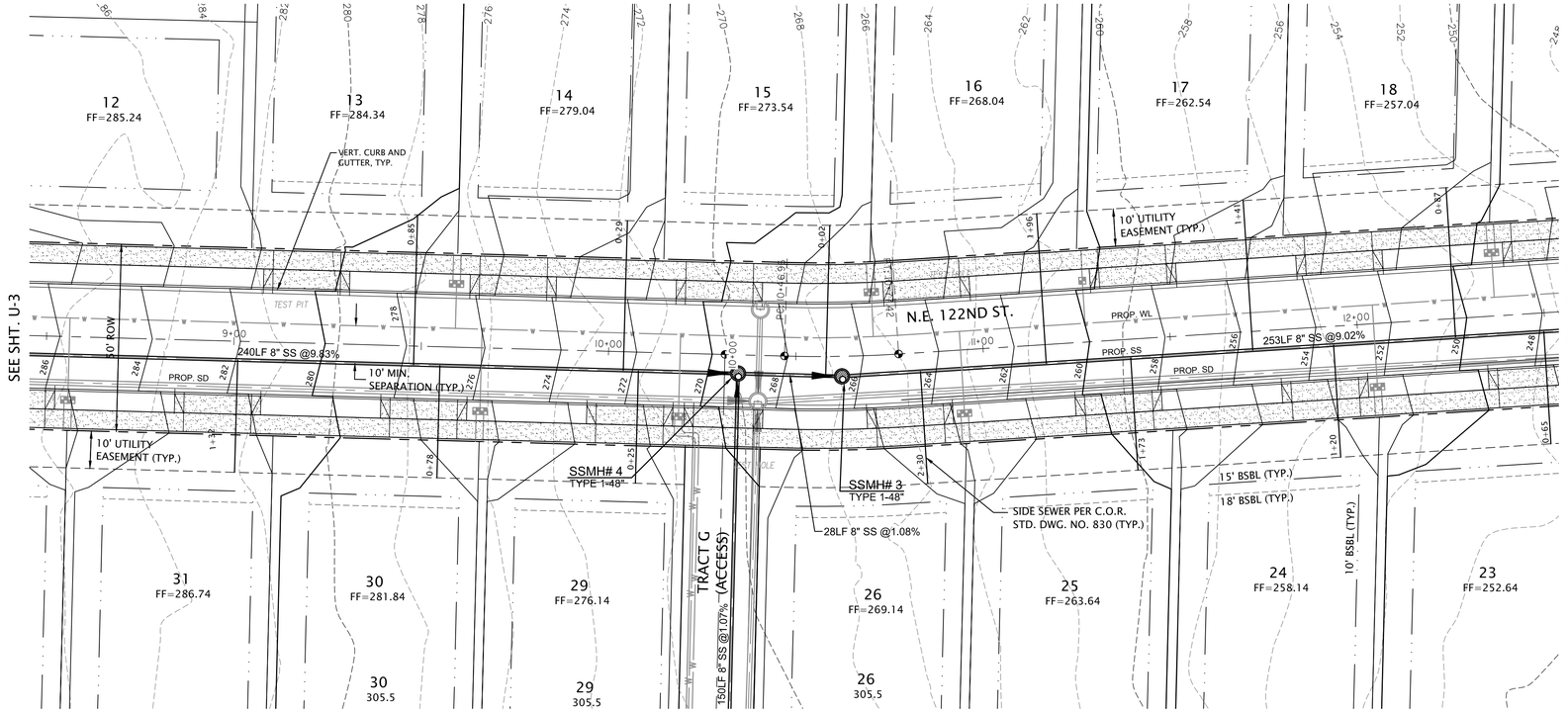

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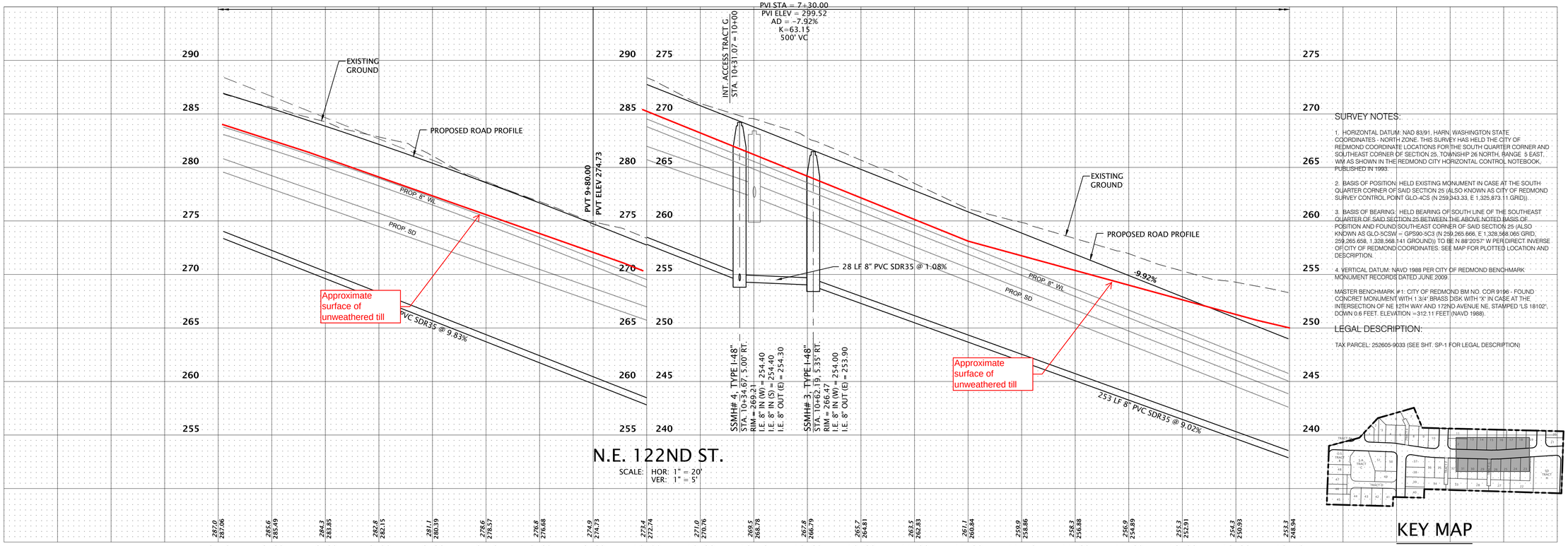
EXISTING SANITARY SEWER PIPE	
EXIST. SAN. SEWER MANHOLE	



SURVEY NOTES:

1. HORIZONTAL DATUM: NAD 83/91, HARN, WASHINGTON STATE COORDINATES - NORTH ZONE. THIS SURVEY HAS HELD THE CITY OF REDMOND COORDINATE LOCATIONS FOR THE SOUTH QUARTER CORNER AND SOUTHEAST CORNER OF SECTION 25, TOWNSHIP 26 NORTH, RANGE 5 EAST, WM AS SHOWN IN THE REDMOND CITY HORIZONTAL CONTROL NOTEBOOK, PUBLISHED IN 1993.

2. BASIS OF POSITION: HELD EXISTING MONUMENT IN CASE AT THE SOUTH QUARTER CORNER OF SAID SECTION 25 (ALSO KNOWN AS CITY OF REDMOND SURVEY CONTROL POINT GLO-4CS (N 259,343.33, E 1,325,873.11 GRID)).

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4. VERTICAL DATUM: NAVD 1988 PER CITY OF REDMOND BENCHMARK MONUMENT RECORDS DATED JUNE 2009.

MASTER BENCHMARK #1: CITY OF REDMOND BM NO. COR 9196 - FOUND CONCRET MONUMENT WITH 1 3/4" BRASS DISK WITH "X" IN CASE AT THE INTERSECTION OF NE 12TH WAY AND 172ND AVENUE NE, STAMPED "LS 18102", DOWN 0.6 FEET. ELEVATION =312.11 FEET (NAVD 1988).

LEGAL DESCRIPTION:

TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)

KEY MAP
NTS

NO.	DATE	REVISIONS	BY	CHK.

GOLDSMITH
LAND DEVELOPMENT SERVICES
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PLOTTED: 2014 / 11 / 24 16:20 EENSTROM
DRAWN: SPASZTOR
DESIGNED: EENSTROM
APPROVED: KGOLDSMITH

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QUADRANT HOMES

UTILITY PLAN
N.E. 122ND ST.
EDGEWOOD WEST

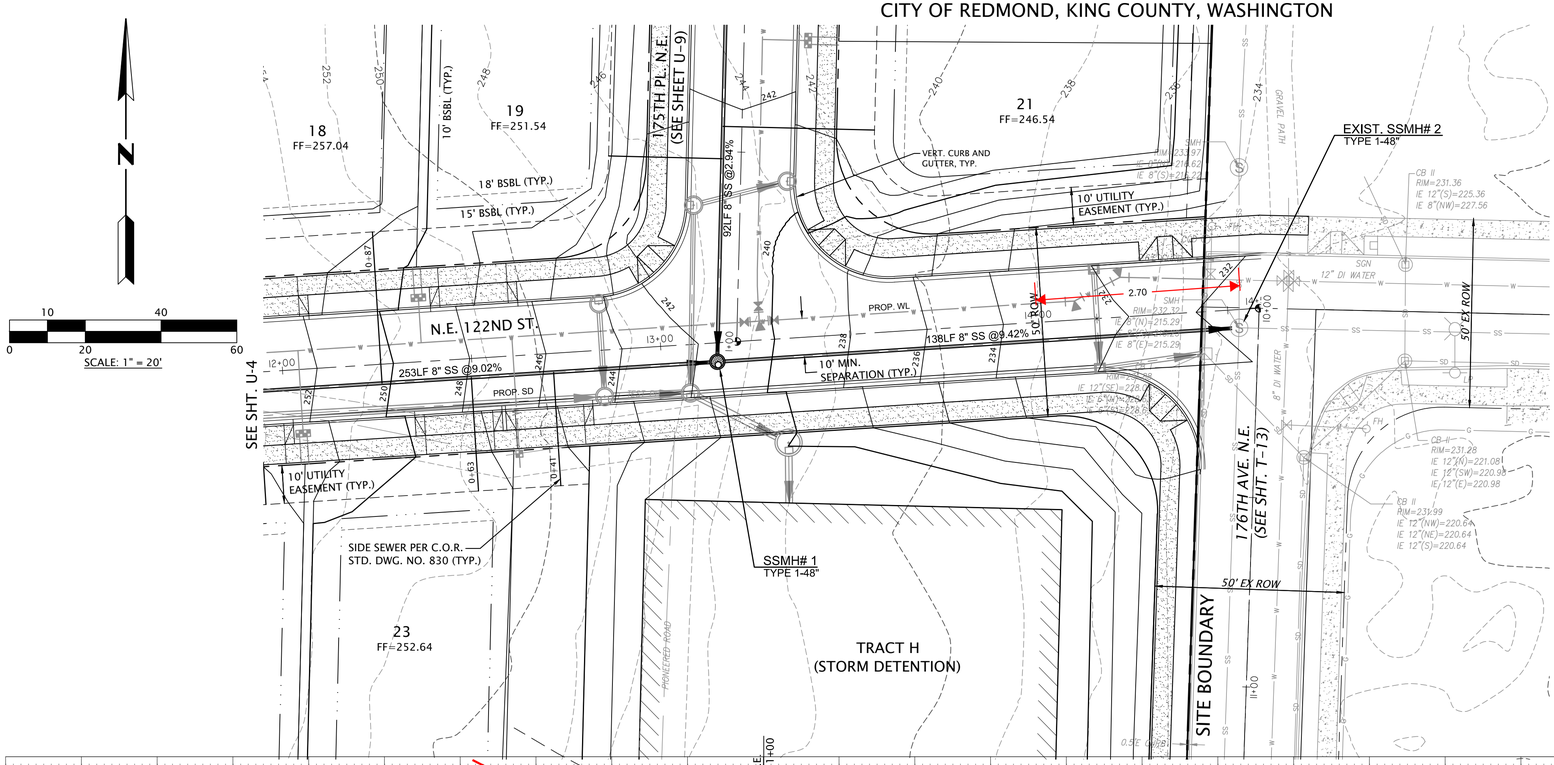
REDMOND WASHINGTON

M:\ACAD\PLAN\14114123\P PLAT PLANS\14123S03.DWG

SHEET
U-4

JOB NO.: 14123

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON



LEGEND:

EX. 2-FOOT CONTOUR	
EX. 10-FOOT CONTOUR	
PROP. 2-FOOT CONTOUR	
PROP. 10-FOOT CONTOUR	
LOT NO.	18
FINISHED FLOOR ELEVATION	FF=309.34
PROPOSED SANITARY SEWER PIPE	
SANITARY SEWER MANHOLE	
EXISTING SANITARY SEWER PIPE	
EXIST. SAN. SEWER MANHOLE	S

SURVEY NOTES:

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LEGAL DESCRIPTION:

TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)

NO.	DATE	REVISIONS	BY	CHK.

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11/25/14

11/25/14

PLOTTED: 2014/11/24 16:20 EENSTROM
DRAWN: SPASZTOR
DESIGNED: EENSTROM
APPROVED: KGOLDSMITH

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EDGEWOOD WEST

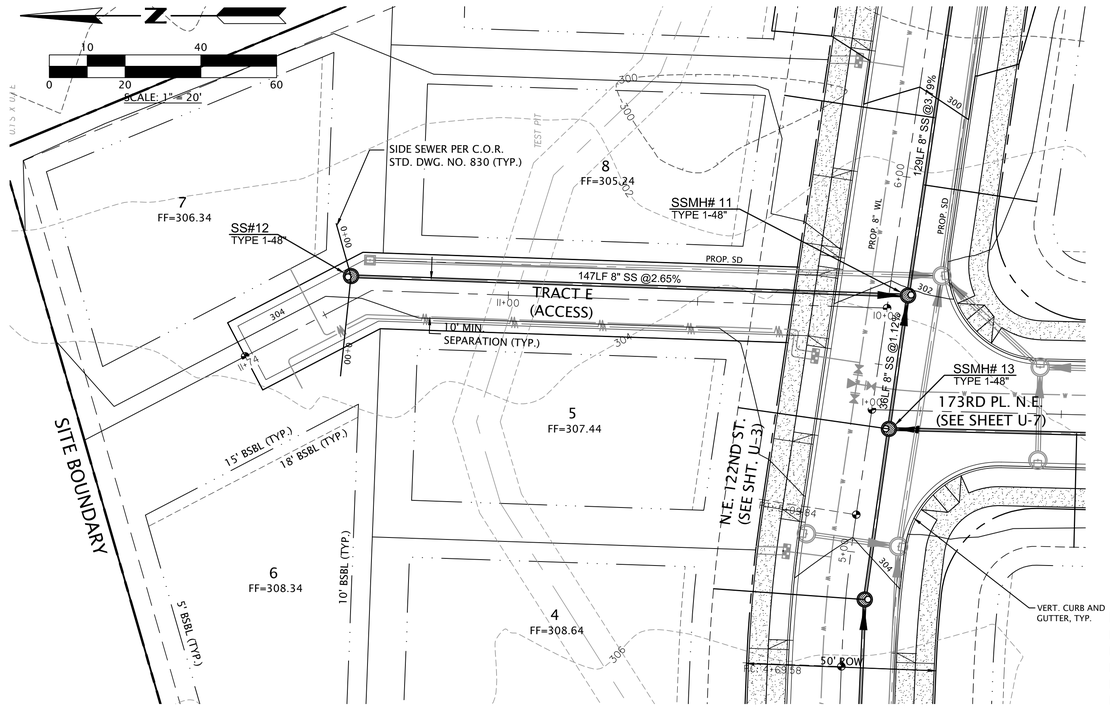
REDMOND WASHINGTON

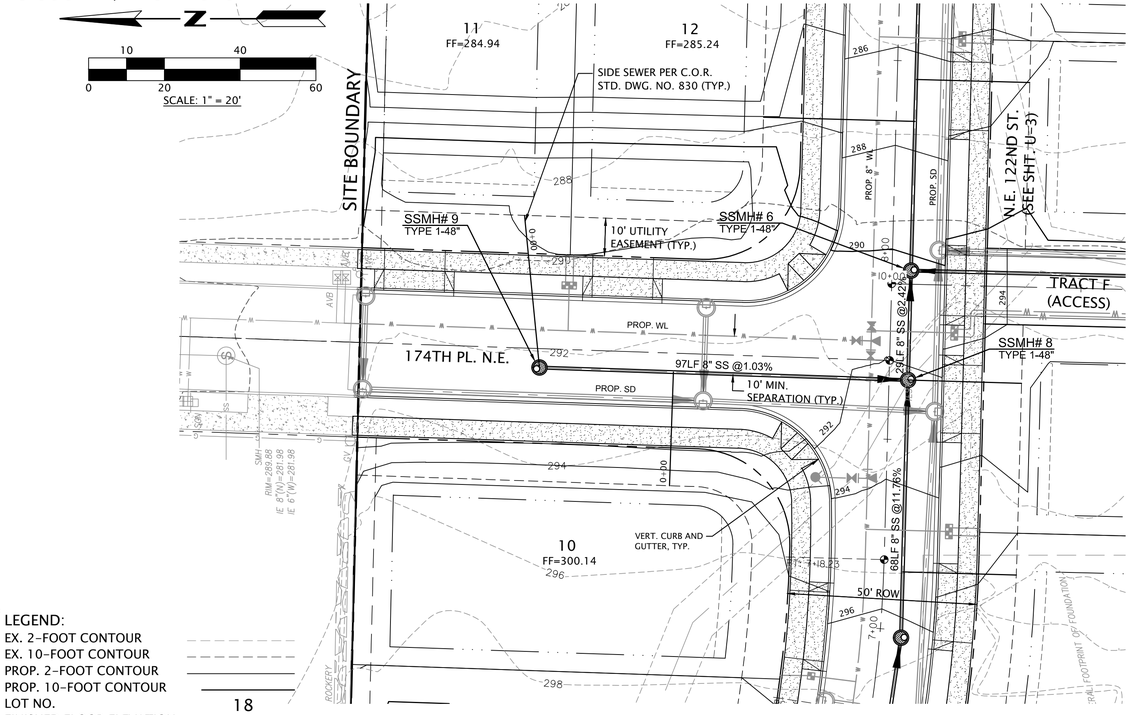
M:\ACAD\PLAN\14\14123\P PLAT PLANS\14123SH4.DWG

SHEET
U-5

JOB NO.: 14123

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON





LEGEND:

EX. 2-FOOT CONTOUR	
EX. 10-FOOT CONTOUR	
PROP. 2-FOOT CONTOUR	
PROP. 10-FOOT CONTOUR	
LOT NO.	18
FINISHED FLOOR ELEVATION	FF=309.34
PROPOSED SANITARY SEWER PIPE	
SANITARY SEWER MANHOLE	
EXISTING SANITARY SEWER PIPE	
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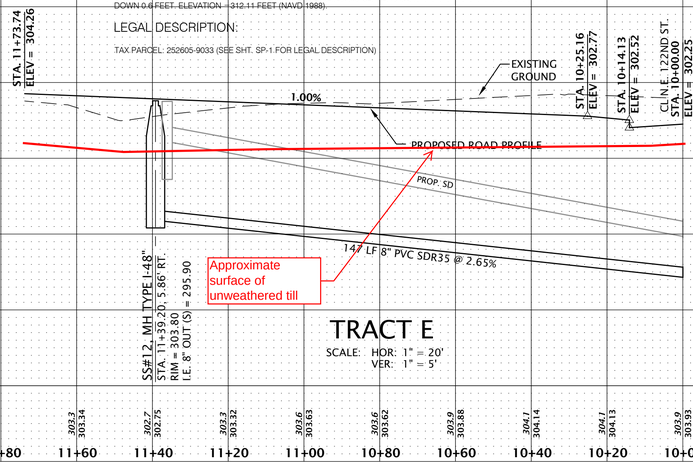
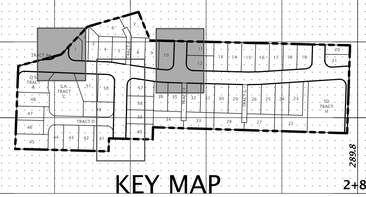
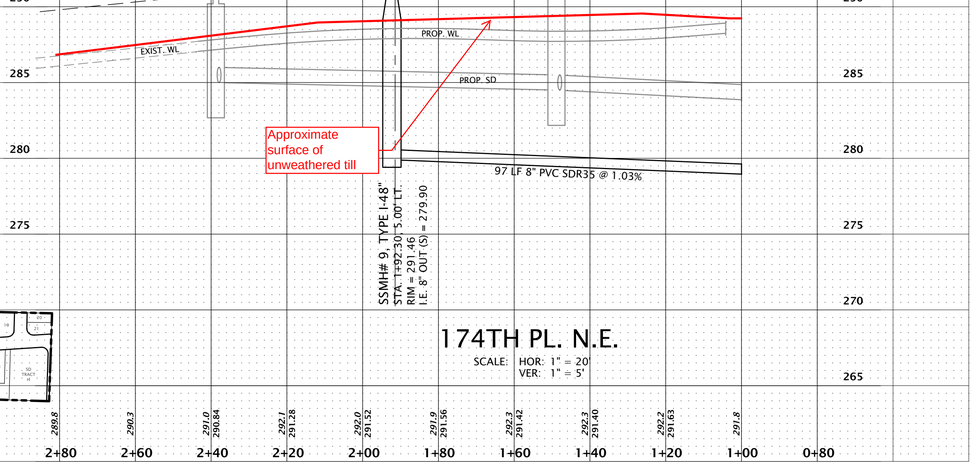
TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)







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NO.	DATE	REVISIONS	BY	CHK.

PLOTTED: 2014/11/24 16:21 EINSTROM
DRAWN: SPASZTOR
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APPROVED: KGOLDSMITH

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EDGEWOOD WEST

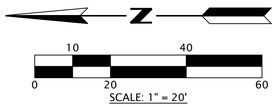
REDMOND WASHINGTON

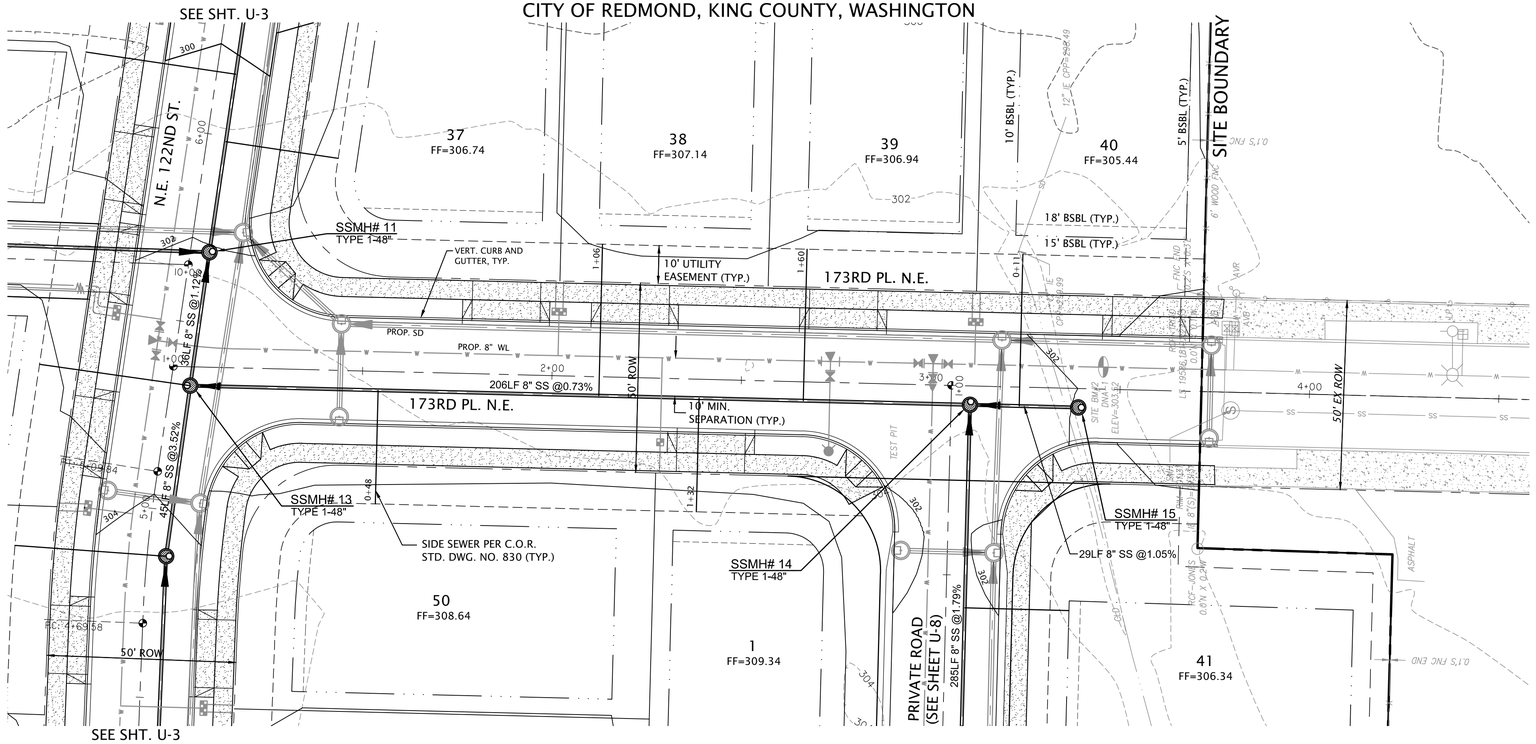
M:\ACAD\PLAN\14\14123\P PLAT PLANS\14123S05.DWG

SHEET U-6

JOB NO.: 14123

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON





LEGEND:

- EX. 2-FOOT CONTOUR
- EX. 10-FOOT CONTOUR
- PROP. 2-FOOT CONTOUR
- PROP. 10-FOOT CONTOUR
- LOT NO. 18
- FINISHED FLOOR ELEVATION FF=309.34
- PROPOSED SANITARY SEWER PIPE
- SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER PIPE
- EXIST. SAN. SEWER MANHOLE

SURVEY NOTES:

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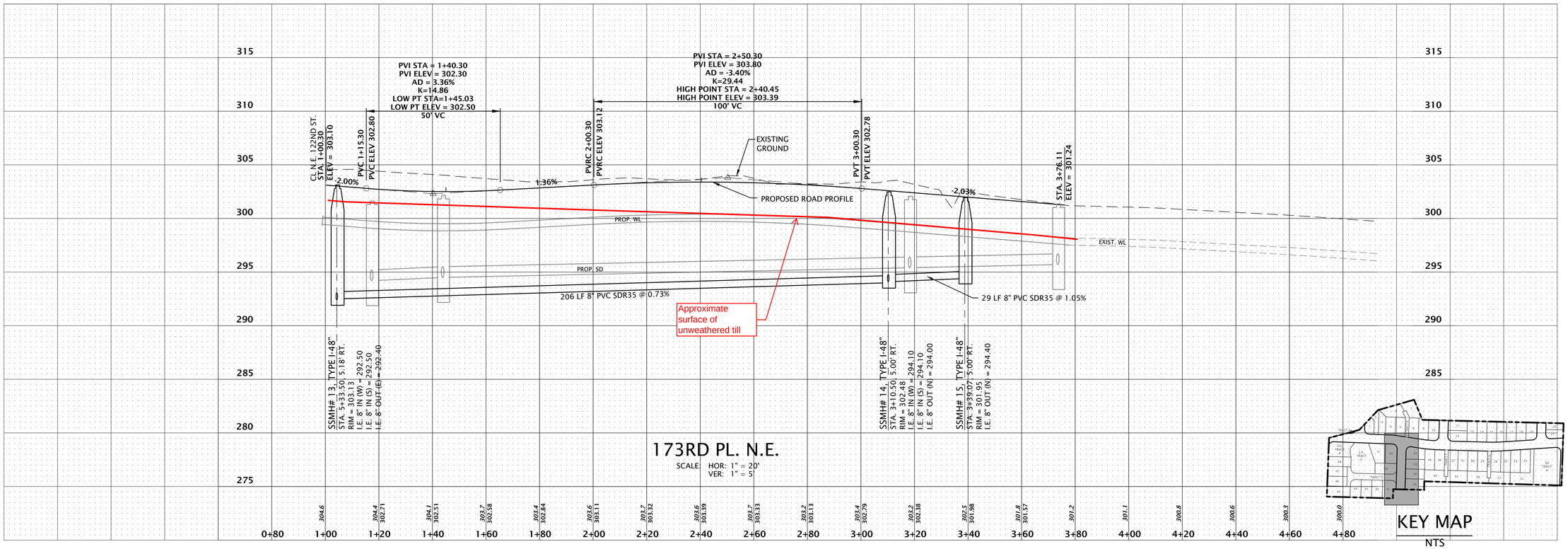
TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)



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NO.	DATE	REVISIONS	BY	CHK.

PLOTTED: 2014/11/24 16:22 EINSTROM
DRAWN: SPASZTOR
DESIGNED: EINSTROM
APPROVED: KGOLDSMITH

ERIK EINSTROM, P.E.
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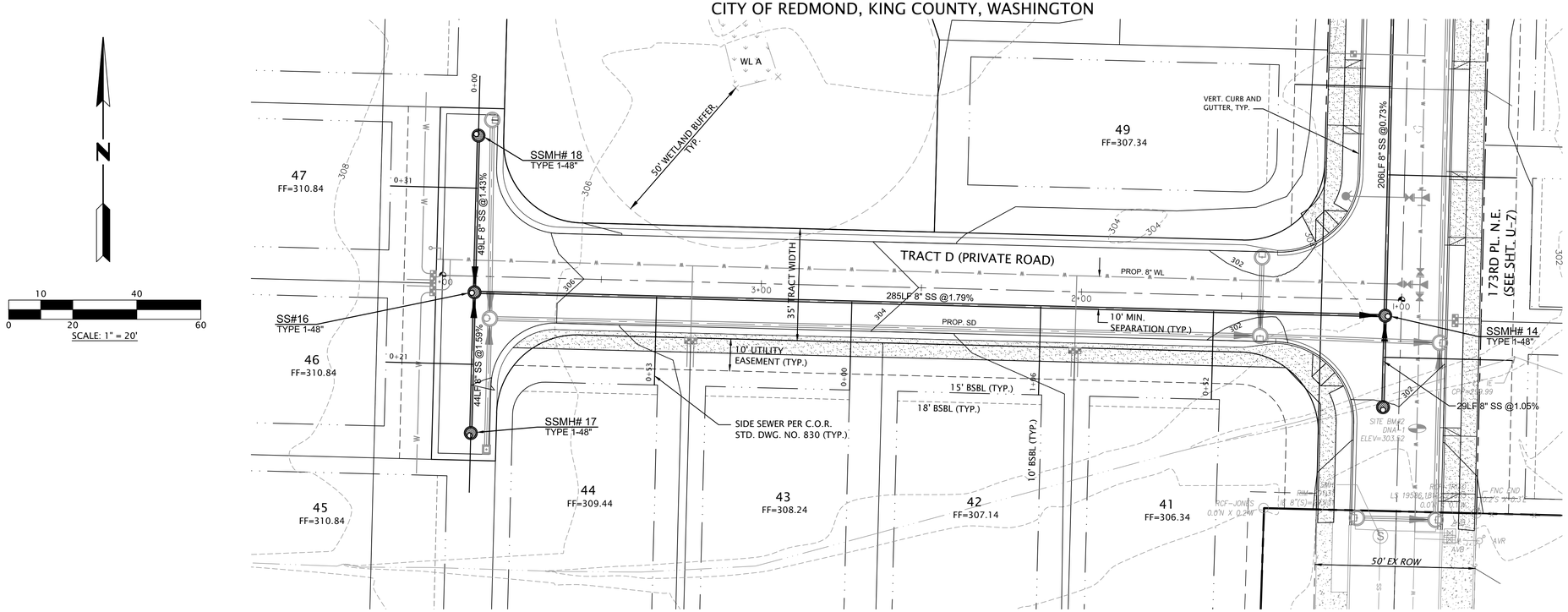
REDMOND WASHINGTON

M:\ACAD\PLAN\14123\P PLAT PLANS\14123S06.DWG

SHEET U-7

JOB NO.: 14123

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON



LEGEND:

EX. 2-FOOT CONTOUR	
EX. 10-FOOT CONTOUR	
PROP. 2-FOOT CONTOUR	
PROP. 10-FOOT CONTOUR	
LOT NO.	18
FINISHED FLOOR ELEVATION	FF=309.34
PROPOSED SANITARY SEWER PIPE	
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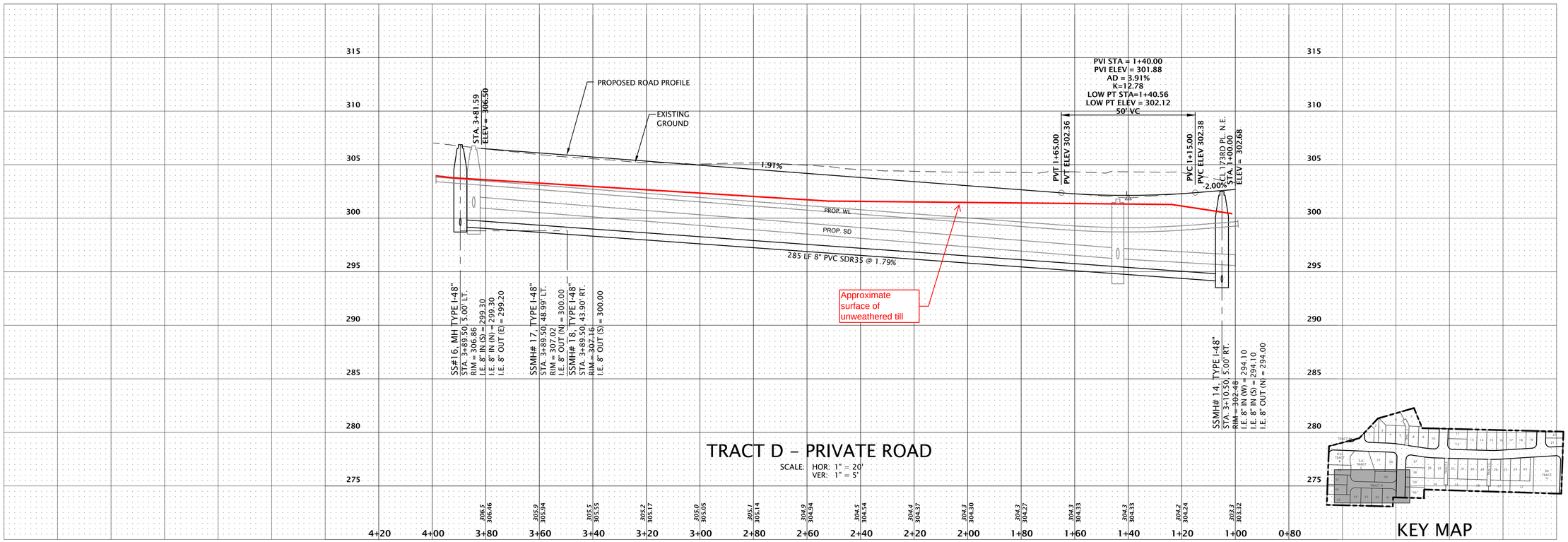

TRACT D – PRIVATE ROAD

SCALE: HOR: 1" = 20'
VER: 1" = 5'

KEY MAP
NTS

NO.	DATE	REVISIONS	BY	CHK.

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PLOTTED: 2014/11/24 16:22 EENSTROM
DRAWN: SPASZTOR
DESIGNED: EENSTROM
APPROVED: KGOLDSMITH

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PROJECT MANAGER

QUADRANT HOMES

UTILITY PLAN
TRACT D – PRIVATE ROAD
EDGEWOOD WEST

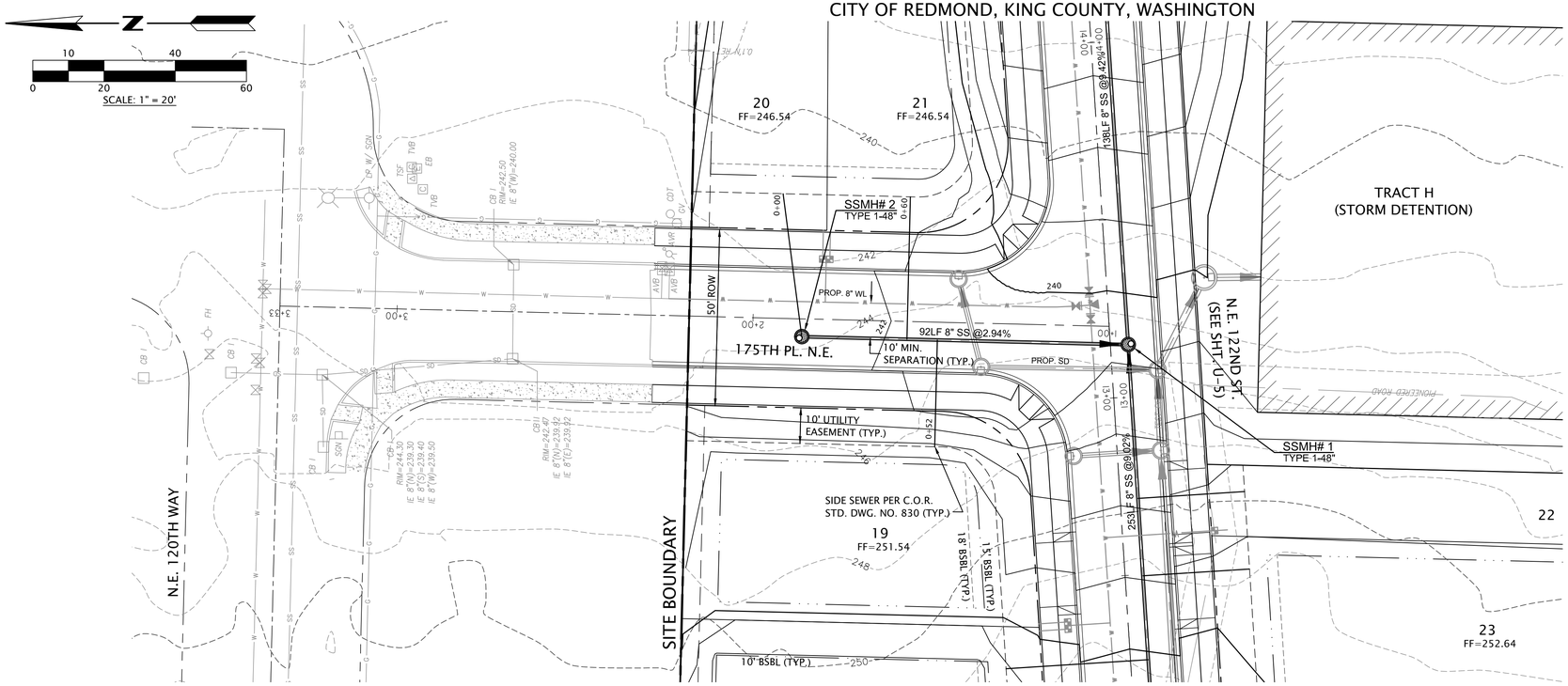
REDMOND WASHINGTON

SHEET U-8

JOB NO.: 14123

M:\ACAD\PLAN\14114123\P PLAT PLANS\14123SD7.DWG

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON



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EX. 2-FOOT CONTOUR	
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PROP. 2-FOOT CONTOUR	
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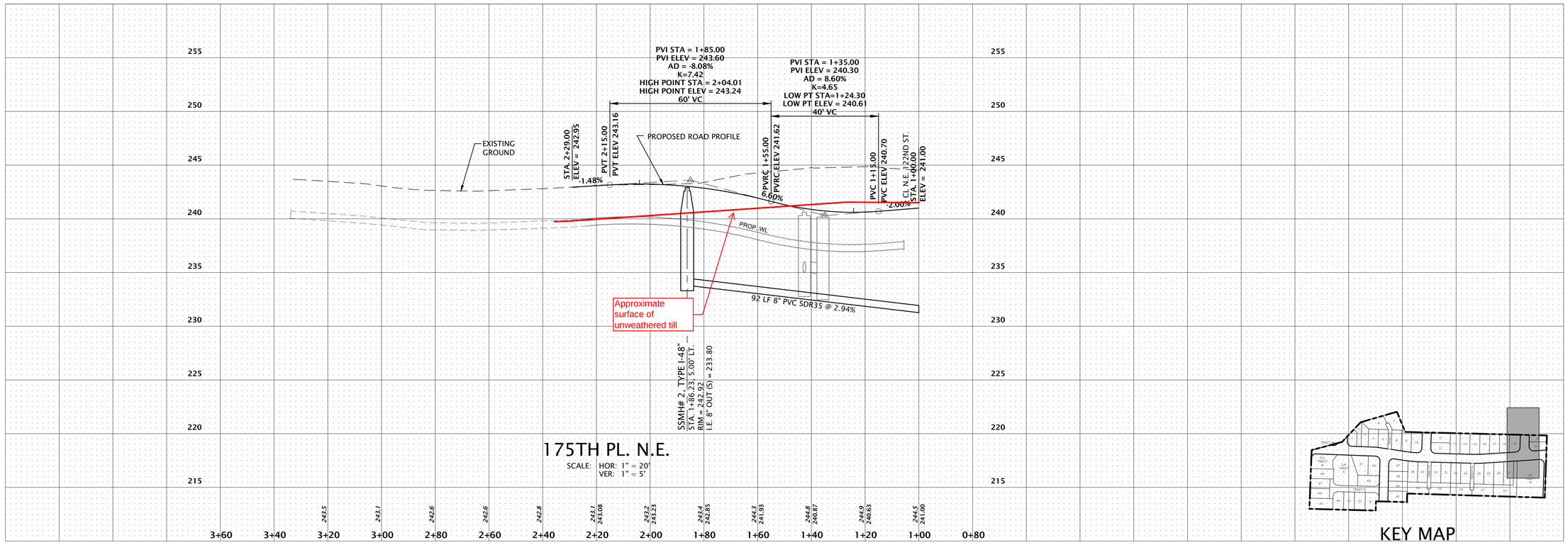

KEY MAP
NTS

NO.	DATE	REVISIONS	BY	CHK.

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LAND DEVELOPMENT SERVICES
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PLOTTED: 2014 | 11 | 24 16:23 EINSTROM
DRAWN: SPASZTOR
DESIGNED: EINSTROM
APPROVED: KGOLDSMITH

ERIK EINSTROM, P.E.
einstrom@goldsmithengineering.com
425-462-1080
PROJECT MANAGER

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UTILITY PLAN
175TH PL. N.E.
EDGEWOOD WEST

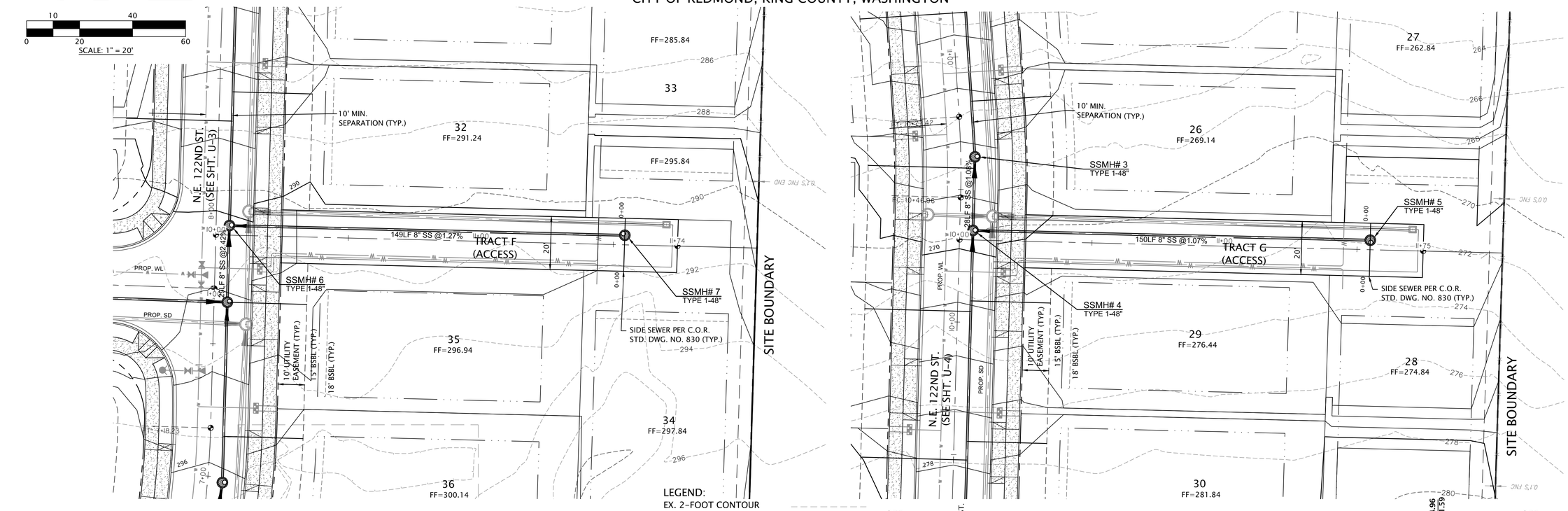
REDMOND WASHINGTON

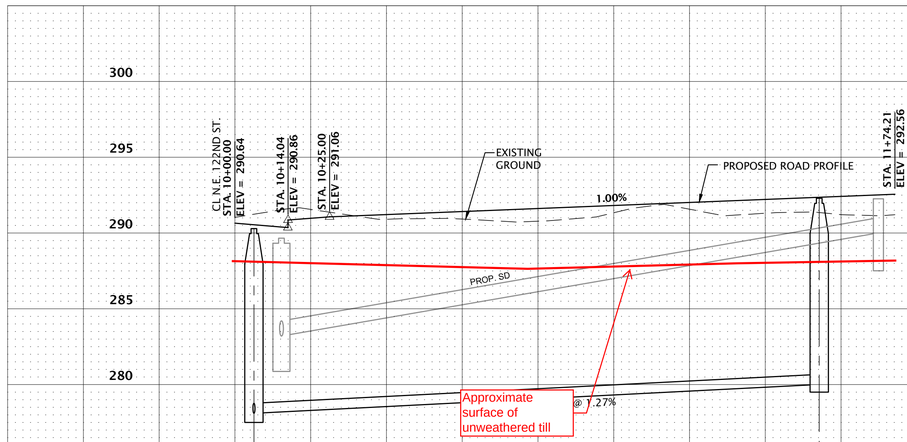
SHEET
U-9

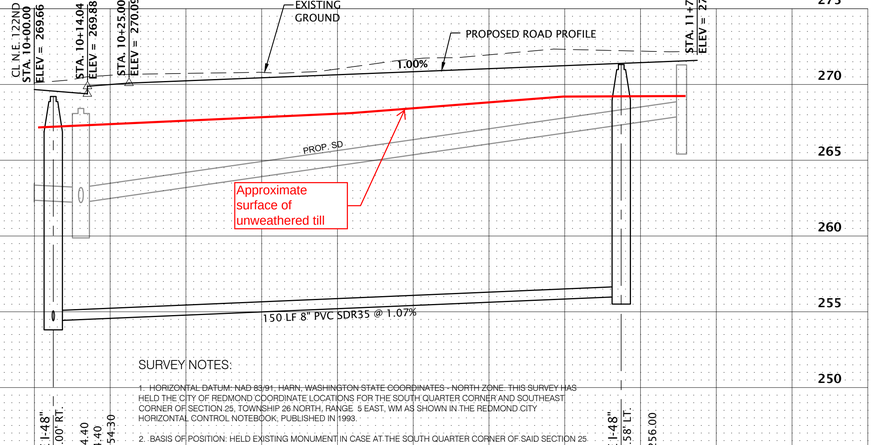
JOB NO.: 14123

M:\ACAD\PLAN\14114123 P PLAT PLANS\14123S08.DWG

NW 1/4, SE 1/4 SECTION 25, TOWNSHIP 26 N, RANGE 5 E, W.M.
CITY OF REDMOND, KING COUNTY, WASHINGTON







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1. HORIZONTAL DATUM: NAD 83/91, HARN, WASHINGTON STATE COORDINATES - NORTH ZONE. THIS SURVEY HAS HELD THE CITY OF REDMOND COORDINATE LOCATIONS FOR THE SOUTH QUARTER CORNER AND SOUTHEAST CORNER OF SECTION 25, TOWNSHIP 26 NORTH, RANGE 5 EAST, WM AS SHOWN IN THE REDMOND CITY HORIZONTAL CONTROL NOTEBOOK, PUBLISHED IN 1993.

2. BASIS OF POSITION: HELD EXISTING MONUMENT IN CASE AT THE SOUTH QUARTER CORNER OF SAID SECTION 25 (ALSO KNOWN AS CITY OF REDMOND SURVEY CONTROL POINT GLO-4CS (N 259,343.33, E 1,325,873.11 GRID)).

3. BASIS OF BEARING: HELD BEARING OF SOUTH LINE OF THE SOUTHEAST QUARTER OF SAID SECTION 25 BETWEEN THE ABOVE NOTED BASIS OF POSITION AND FOUND SOUTHEAST CORNER OF SAID SECTION 25 (ALSO KNOWN AS GLO-SCSW = GPS90-SC3 (N 259,265.668, E 1,328,568.065 GRID, 259,265.658, 1,328,568.141 GROUND)) TO BE N 88°20'57" W PER DIRECT INVERSE OF CITY OF REDMOND COORDINATES. SEE MAP FOR PLOTTED LOCATION AND DESCRIPTION.

4. VERTICAL DATUM: NAVD 1988 PER CITY OF REDMOND BENCHMARK MONUMENT RECORDS DATED JUNE 2009.

MASTER BENCHMARK #1: CITY OF REDMOND BM NO. COR 9196 - FOUND CONCRETE MONUMENT WITH 1 3/4" BRASS DISK WITH "X" IN CASE AT THE INTERSECTION OF NE 12TH WAY AND 172ND AVENUE NE, STAMPED "LS 18102", DOWN 0.6 FEET, ELEVATION =312.11 FEET (NAVD 1988).

LEGAL DESCRIPTION:

TAX PARCEL: 252605-9033 (SEE SHT. SP-1 FOR LEGAL DESCRIPTION)

GOLDSMITH LAND DEVELOPMENT SERVICES
1215 116th Ave SE, Bellevue, WA 98004 | PO Box 3565, Bellevue, WA 98009
(206) F 425.462.7719 www.goldsmithengineering.com
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NO.	DATE	REVISIONS	BY	CHK

PLOTTED: 2014/11/24 16:24 EENSTROM
DRAWN: SPASZTOR
DESIGNED: EENSTROM
APPROVED: KGOLDSMITH

ERIK ENSTROM, P.E.
eenstrom@goldsmithengineering.com
425-462-1080
PROJECT MANAGER

QUADRANT HOMES

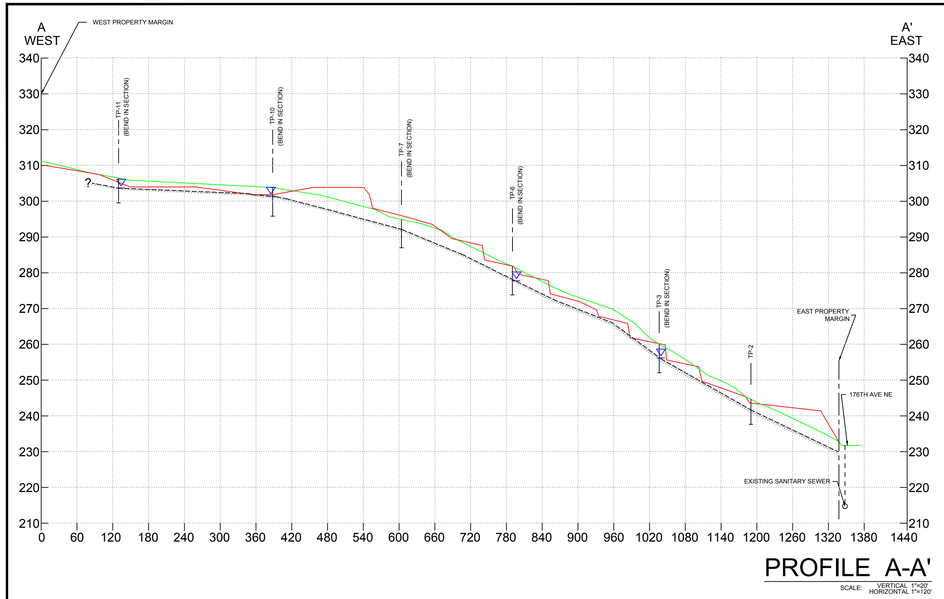
UTILITY PLAN
ACCESS TRACTS F AND G
EDGEWOOD WEST

REDMOND WASHINGTON

SHEET U-10

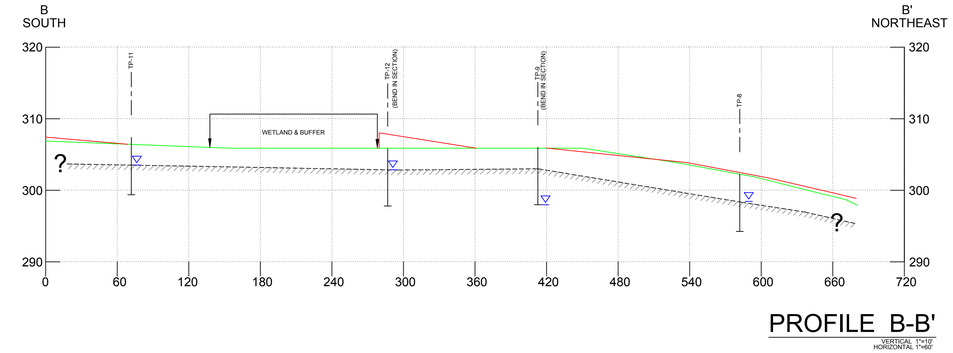
JOB NO.: 14123

M:\ACAD-PLAN\14114123\P PLAT PLANS\14123U10.DWG



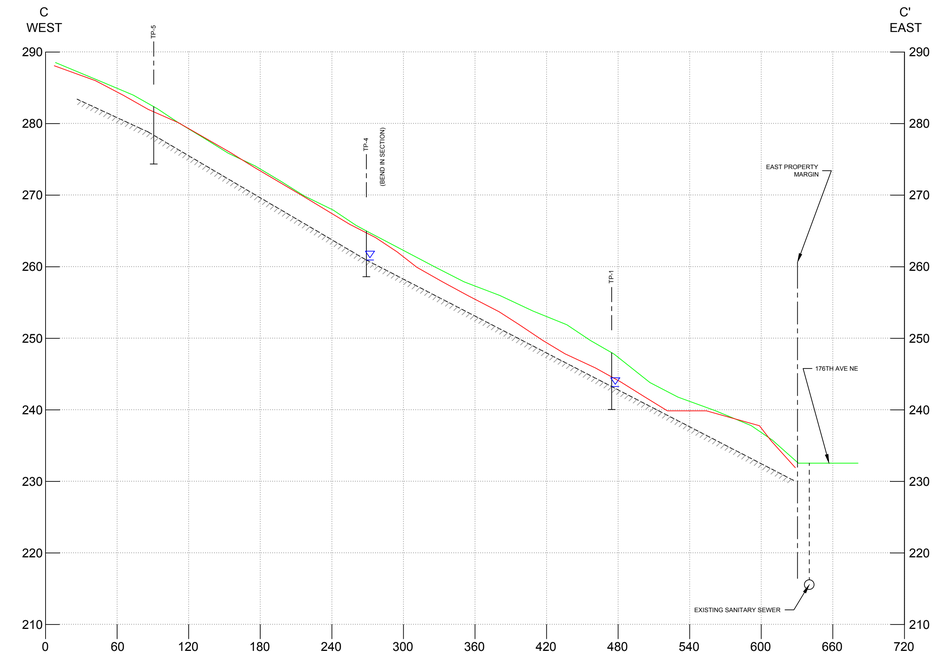
PROFILE A-A'

SCALE: VERTICAL 1"=20'
HORIZONTAL 1"=120'



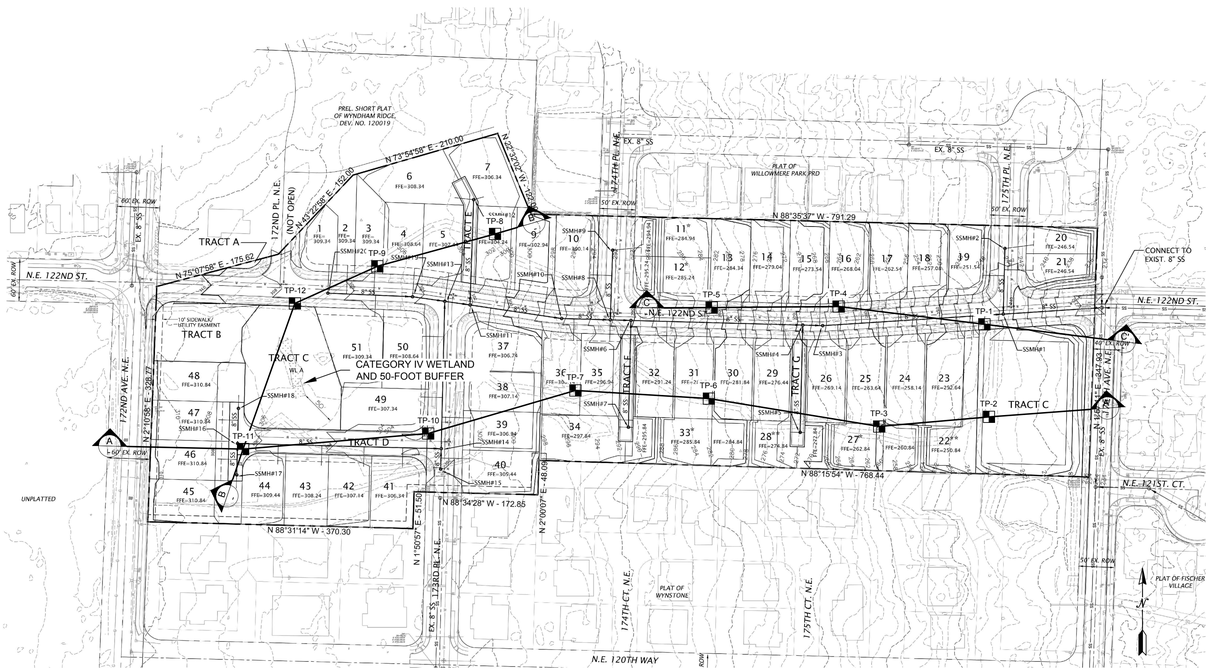
PROFILE B-B'

VERTICAL 1"=10'
HORIZONTAL 1"=60'



PROFILE C-C'

VERTICAL 1"=10'
HORIZONTAL 1"=60'



SITE PLAN

0 100 200
APPROXIMATE SCALE IN FEET

LEGEND

- EXISTING GROUND SURFACE
- PROPOSED GRADE
- APPROXIMATE UNWEATHERD TILL SURFACE
- PERCHED GROUNDWATER SEEPAGE
- APPROXIMATE TEST PIT LOCATION IN PLAN VIEW

NO.	DATE	DESCRIPTION

Terra Associates, Inc.
Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences
12525 Willows Road, Suite 101, Kirkland, Washington 98034 ♦Phone (425) 821-7777 ♦Fax (425) 821-4334

GENERALIZED GEOLOGIC PROFILES
EDGEWOOD WEST
REDMOND, WASHINGTON

Prepared by: SED
Designed by: JS
Approved by:
Date: FEB 2015

SHEET 1

Project No. T-7037

APPENDIX D

SWPPP Details / BMP'S

This information to will be submitted during the Coordinated Civil Design Review phase.

APPENDIX E

Pre-Development Hydrologic Modeling Plan – Technical Memorandum, March 31, 2015, Raedeke and Associates, Inc.

Raedeke Associates, Inc.

Wetland & Aquatic Sciences
Wildlife Ecology
Landscape Architecture

TECHNICAL MEMORANDUM

March 31, 2015

To:	Mr. Matt Perkins, Quadrant Homes
From	Christopher W. Wright, Principal/Soil & Wetland Scientist Raedeke Associates, Inc.
RE:	Edgewood West – Pre-Development Hydrologic Modeling Plan (RAI Project No. 2013-036-003)

The purpose of document is to outline the proposed pre-development wetland hydrologic monitoring at the Edgewood West plat in Redmond Washington. The proposed wetland monitoring would involve hydrologic monitoring of the on-site wetland in the undeveloped condition of the property. This monitoring program is at the request of the City of Redmond.

The Edgewood West project area is an approximately 11.5-acre irregularly shaped parcel located along the east side of 172nd Avenue NE, north of NE 120th Way in the City of Redmond, Washington.

OBJECTIVE

The objective of the hydrologic monitoring is to document pre-development hydrologic conditions in the on-site wetland.

SAMPLING LOCATION

Water level data would be gathered at location established within the on-site wetland. The location chosen for the monitoring represents the lowest point of the wetland and the area likely to be inundated during the wetter portions of the monitoring period.

SAMPLING METHODS, FREQUENCY, AND DURATION

Water level data would be measured at a stake established in the northern portion of the on-site wetland. Wetland hydrology data will be collected by physically measuring the depth of water at the monitoring location stake. In the event that surface water is not present during a monitoring visit, a soil auger will be used to excavate a hole near the monitoring location stake, and the depth to water in the bore hole will be measured.

SAMPLING SCHEDULE

Water levels at the on-site wetland will measured on a weekly basis beginning in February 2015 and continue through May 2015.

PARAMETERS AND EVALUATION

The measure water levels will be recorded in a tabular format and presented to the City of Redmond. In addition to water levels measured at the site, rainfall amounts recorded at Seattle-Tacoma International airport in the 24 hours preceding the site visit also will be recorded. As this data will likely be used as baseline data for future wetland hydrology monitoring, no additional evaluation of the collected data is anticipated.

REPORTING

The reporting of monitoring results would be prepared once per year and submitted to the City for review following completion of site visits for the monitoring period. It is anticipated that monitoring will commence in February 2015 and continue through May 2015.

The monitoring report will provide a description of the hydrologic conditions of the on-site wetland in the undeveloped condition.

Thank you for the opportunity to provide this information. If you have any comments or questions, need additional information, or wish to discuss this further, please contact me at 206-525-8122 or via email at cwright@raedeke.com.