PRELIMINARY
STORMWATER MANAGEMENT DESIGN REPORT

Alexan Marymoor

6801 East Lake Sammamish Parkway NW
Redmond, Washington 98052

Prepared for:
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DCI Job No. 15012-0020
July 27, 2015
Updated September 17, 2015
Updated November 5, 2015
Updated November 25, 2015

This report has been prepared by Staff of DCI Engineers under the direction of the professional engineer whose stamp and signature appears hereon.

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Figure 1: Existing Conditions
Figure 2: Developed Land Cover
WWHM Stormwater Calculations

PROJECT OVERVIEW

The proposed Alexan Marymoor project will construct a multi-story building on a 135,417 sq. ft. (3.11-acre) site comprising three parcels along the west side of East Lake Sammamish Parkway NW south of NE 65th St in Redmond, Washington. The site is comprised of the following tax parcels: 1318300180, 1318300190, and 1318300195.

This preliminary Stormwater Site Plan was created in accordance with the 2005 Washington State Department of Ecology Stormwater Management Manual with amendments per the 2012 City of Redmond Stormwater Technical Notebook, as adopted by the City of Redmond. This Stormwater Report provides stormwater requirements and design calculations for the project site.

EXISTING CONDITIONS

The site currently is occupied by a single family home and associated structures. A gravel access drive off of East Lake Sammamish Parkway NW is located along the SE corner of the site that provides access to the home and the onsite buildings. The remainder of the parcel is vegetated and contains trees and overgrown bushes. The eastern two parcels are entirely covered with vegetation. The triangular shaped parcels contain an office park to the northwest, King County trail along the eastern property line, a storage facility to the south, and King County Marymoor Park to the southwest. Existing utilities (storm, sewer, water, gas, and power) lie within East Lake Sammamish Parkway.

The eastern property line is the high side of the site, where the remainder of the site slopes away at approximately 8% towards the west/southwest. There is approximately 10-feet of relief across the site. The majority of the surface water is infiltrated onsite and the remainder sheet flows towards the southwest corner offsite. Though there is no private storm system onsite, a conveyance ditch is located offsite along the western property line of the site. This ditch conveys collected surface water runoff from the north and drains towards the south to where it discharges eventually to Lake Sammamish. The northern limits of Lake Sammamish are located approximately 0.5-miles south of the site. No stormwater runoff enters the site from adjacent areas.

Per the NRCS website, Indianola Loamy fine sands, 0-4 percent slopes are mapped onsite. These are type 'A' soils and are considered highly infiltratable.

City critical area maps were reviewed with the project. The following City of Redmond maps were reviewed (maps and project location are included in the Appendix):

- Erosion Hazard Areas – no areas mapped
- Landslide Hazard Areas – no areas mapped
- Frequently Flooded Areas – no areas mapped
- Wellhead Protection Zones – Wellhead Protection Zone 4
- Wetlands – no areas mapped onsite
- King County Wetlands map – offsite wetlands mapped

PROPOSED CONDITIONS

The proposed building will house five stories of apartments and an on-grade parking structure with access from East Lake Sammamish Parkway. The property is adjacent to 600 ft. of City of Redmond property along the King County trail. The southeast corner of the right of way (105'x36') will be vacated and become part of the subject property being developed. A 90-foot wide ingress/egress and trail easement will be provided across the King County trail, providing access to East Lake Sammamish Parkway. NE 63rd St will be located in this easement and connect to East Lake Sammamish Parkway and 180th Pl NE. Along the east side of the subject site, a 24-foot wide dedication and a 10' utility easement will be granted from the subject property to the city. Along the northern portion of the site, a 60-foot wide future right of way easement and two 10-foot future utility easements are proposed to be granted to the City at a future time.

Private Site Improvements: The development includes the apartments and associated parking structure. A 20-foot wide fire access drive is proposed around the building to provide fire truck access per the code. A drop off turnaround facility is centrally located in the apartments to provide access to the main entrance.

The perimeter of the building will be landscaped and a portion of the fire lane is proposed to be a pervious surface. An open space for the residents is located in the southwest area of the site.

The proposed land cover for the onsite developed conditions is as follows:

	Impervious	Pervious	Total Site Area
Developed Conditions	91,679 SF	45,662 SF	137,341 SF

Multiple infiltration facilities are proposed onsite. See the appendix for infiltration calculations, infiltration basin maps, infiltration gallery locations, and design summary. The proposed infiltration layout is designed to infiltrate 99.99% of the surface water runoff modeled in WWHM. An overflow pipe will be routed around the site, connecting to each infiltration facility. Any overflows from the infiltration facilities will drain to the overflow pipe, and be discharged to an existing manhole along the west PL of the site. The overflow pipe is anticipated to be dry for the majority of storms and expects to only see flow during the largest storms.

Collected surface water runoff from the pollution generating impervious surfaces will drain to a water quality treatment canister filter. After the collected surface water has been treated via the canister filters, the surface water drains to infiltration facilities as described above.

Public Improvements: NE 63rd Street is a new collector road that is proposed to connect to East Lake Sammamish Parkway and 180th Pl NE. NE 63rd St is a 36-foot wide road that is located in a 90-foot wide trail/access easement that is to be obtained by the City. NE 63rd St connects to 180th Pl NE. 180th Pl NE is a new road that will lie within an existing 36-foot wide right of way. It will be constructed as a collector road with 35' of

pavement (with two-six inch curbs). 180th Pl NE will connect to both NE 63rd Street to the south and NE 65th St at the north.

Both NE 63rd St and 180th Pl NE are crowned roadways. The surface water will be collected via catch basins and conveyed to adjacent Filterras to be treated for basic water quality treatment and phosphorous control. The surface water will then be connected to an infiltration trench where it is designed to infiltrate the full modeled storm event in WWHM. Infiltration galleries that infiltrate surface water from the existing and future right of way are separate facilities from the proposed private infrastructure associated with the site development.

MINIMUM REQUIREMENTS

This project is classified as a Large Project because it will create more than 5000 sq. ft. of new impervious surface, and will be required to meet all of the following minimum requirements as applicable. As indicated in Figure 3.2, Minimum Requirements 1-9 will be required to be applied to the new and replaced impervious surfaces onsite.

MR 1: Preparation of Stormwater Site Plans

Stormwater site plans showing how stormwater will be collected and infiltrated will be prepared in accordance with DOE and City of Redmond standards upon finalization of the site configuration.

MR 2: Construction Stormwater Pollution Prevention

The site construction plans will include TESC provisions with notes and details. A Construction Stormwater Pollution Prevention Plan (CSWPPP) also will be prepared. The proposed BMPs will include siltation barriers, an armored construction entrance, inlet protection and covering of exposed soil. This project will require a Construction Stormwater General Permit (NPDES) from the Department of Ecology because it encompasses greater than one acre.

MR 3: Source Control of Pollution

The CSWPPP will include provisions for materials handling and pollution source control during construction. Any hazardous material releases shall be contained, cleaned up, and reported. The CSWPPP will provide details on how the following requirements will be met:

- Monitoring plan.
- Designated project contact.
- Secondary containment.
- Provisions to secure hazardous materials.
- Response to leaking vehicles and equipment.
- Practices and procedures regarding transfer of flammable and combustible liquids.
- On-site cleanup materials and other containment and cleanup provisions.

The operation of the completed mixed use building is not expected to generate significant pollutants on an ongoing basis.

MR 4: Preservation of Natural Drainage Systems and Outfalls

There are no surface channels on the project site. Runoff from the site is designed to 100% infiltrate into the ground.

MR 5: On-site Stormwater Management

All stormwater will be managed onsite. Surface water will be infiltrated in accordance with the City of Redmond and Department of Ecology standards.

MR 6: Runoff Treatment

All collected pollution generating impervious surface (PGIS) will be treated in accordance with the City of Redmond Standards. PGIS from the roadway will be treated using a Filterra Vault. PGIS from the private development will be treated via canister filters.

MR 7: Flow Control

The project site will provide infiltration galleries throughout the site to infiltrate the collected surface water runoff. Preliminary sizing information is included in the description above and calculations are provided in the Appendix.

MR 8: Wetlands Protection

There are no wetlands within the project limits. King County has mapped wetlands south (downstream) of the site by approximately ¼ mile and has identified them by Wetlands ID 5104. The downstream wetlands are noted on the City of Redmond map and the King County map in the Appendix. As noted in the discussion under 'Proposed Conditions', all of the surface water is designed to infiltrate onsite. Infiltrating the surface water will continue to follow the sites existing hydrological conditions and will continue to provide groundwater recharge. Since the proposed hydrologic conditions mimic the existing hydrologic conditions, the offsite/downstream wetlands will not be impacted.

MR 9: Operation and Maintenance

The building's maintenance staff will be charged with monitoring the function of the on-site drainage facilities. If the final drainage design includes elements for which the Department of Ecology has identified maintenance guidelines, an Operations & Maintenance Manual will be prepared for maintenance staff.

DOWNSTREAM ANALYSIS

The site is sloped towards the southwest. Surface water primarily infiltrates onsite. Water that is not infiltrated sheetflows towards the southwest corner and continues offsite. Adjacent to the property is King County Marymoor Park. Surface water sheetflows south through the park, continues to infiltrate, as it drains south towards Lake Sammamish. Lake Sammamish is less than 0.5 miles from the site.

APPENDIX

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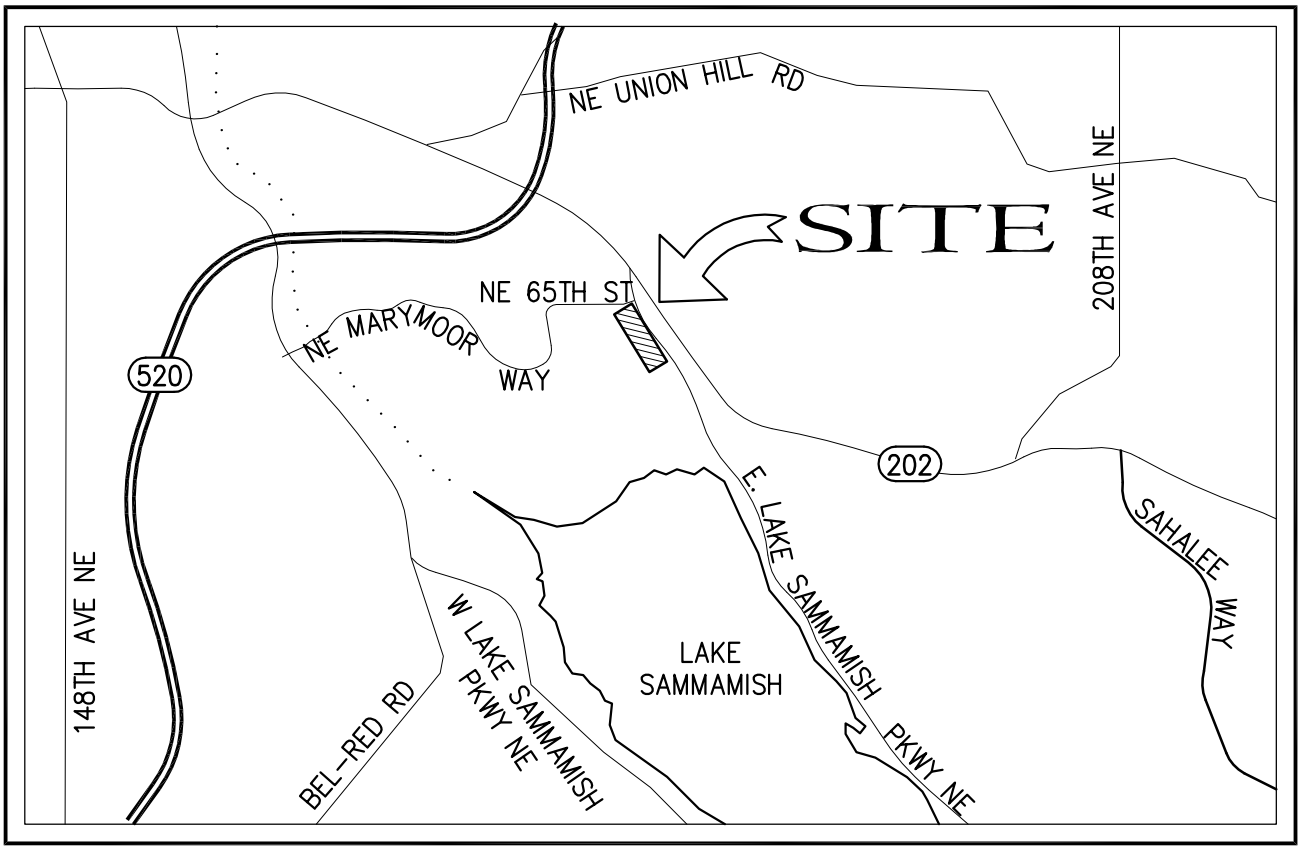
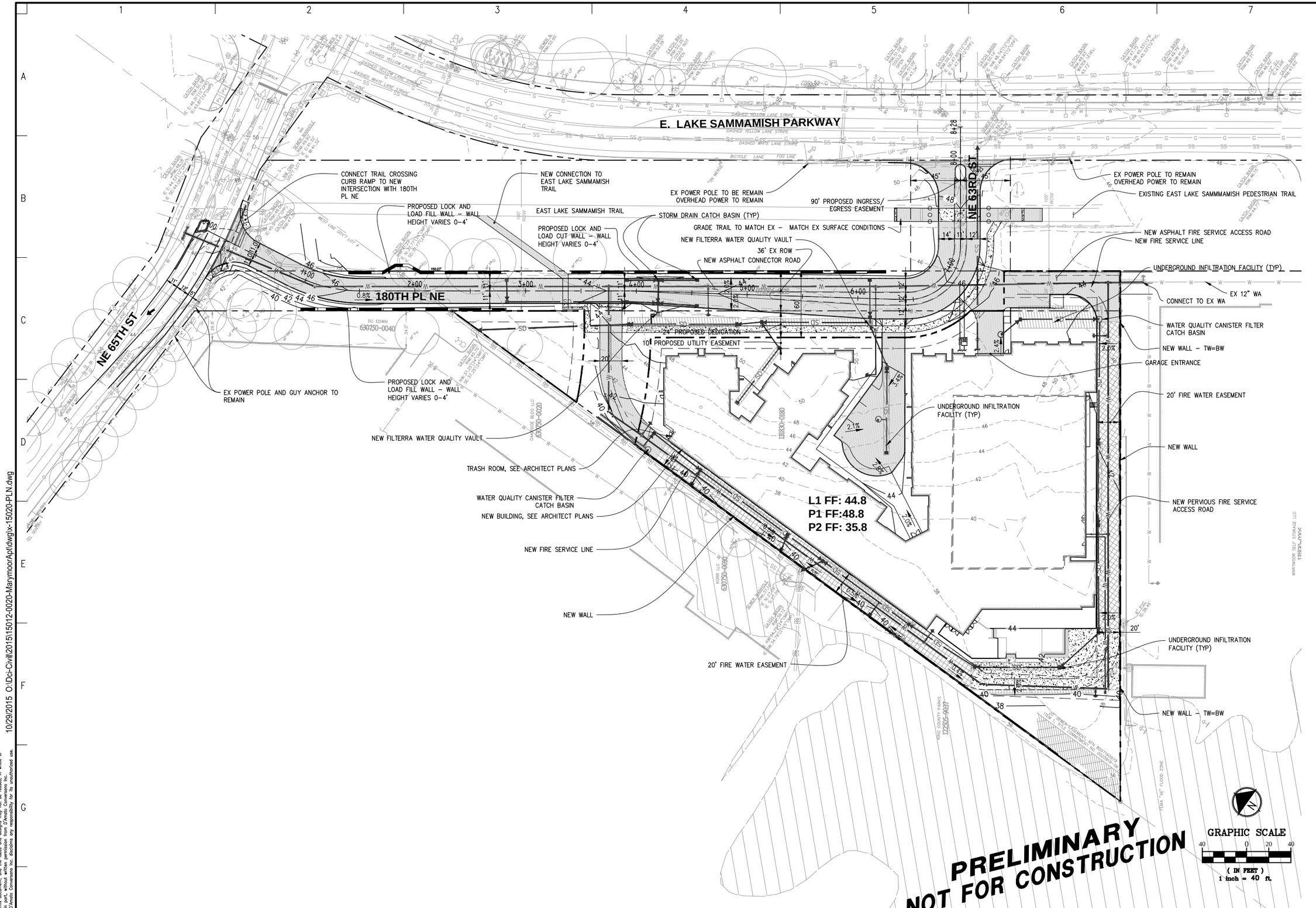


VICINITY MAP

NOT TO SCALE



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SIGNATURE: DARREN A. SIMPSON, STATE OF WASHINGTON, 27858, REGISTERED PROFESSIONAL ENGINEER — 11/5/2015

REVISIONS:
09/17/2015 30% PREP COMMENT REVISION

APPROVALS:

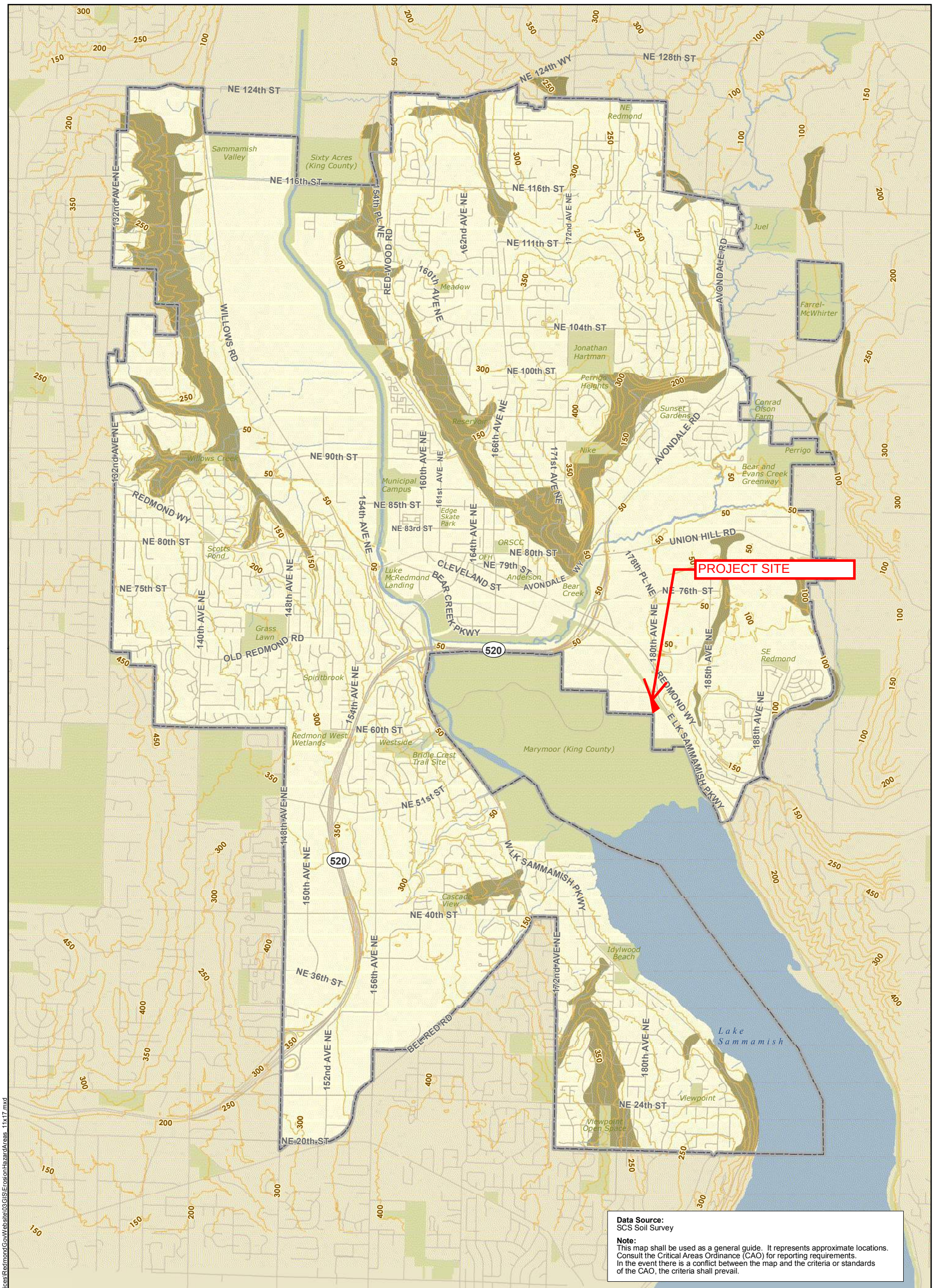
Job No.:	15012-0020
Proj. Manager:	DAS
Designed:	KO
Reviewed:	DAS
Drawn:	RH
Dwg. Checked:	KO
Scale:	AS SHOWN

PROJECT TITLE:
MARYMOOR APARTMENTS
REDMOND, WA

SHEET TITLE:
SITE PLAN

SHEET NO.
C-3

SECTION 07, TOWNSHIP 25 NORTH, RANGE 06 EAST, W.M.



Data Source:
SCS Soil Survey

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

Erosion Hazard Areas

Critical Areas Map

City of Redmond, Washington

Effective: 05/28/2005

0 0.5 1
Miles

N

Contour
Erosion Hazard Area
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.

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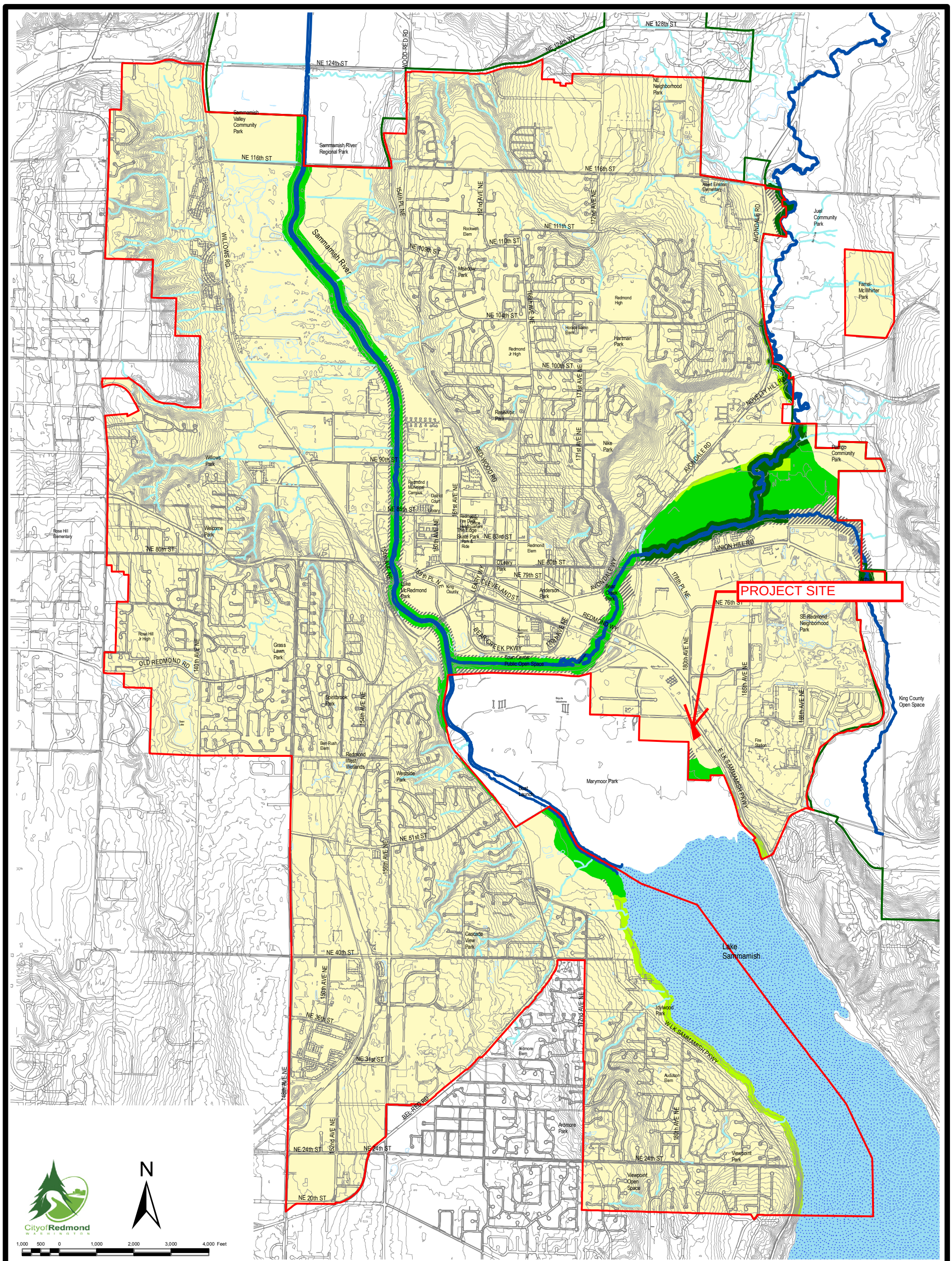

SHORELINE MASTER PROGRAM

Shoreline Environments

This map was funded in part through a cooperative agreement with the National Oceanic and Atmospheric Administration. The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or any of its sub-age

City of Redmond Grant No. G9600303 **Effective:** 9/26/2009 **Revision:** __/__/____

These maps shall be used as a general guide; boundaries and classifications are approximate. Consult the Redmond Community Development Guide for procedures, definitions and criteria for determining actual boundaries and classifications.

LEGEND

- Redmond City Limit
- 2004 Urban Growth Boundary
- Other Streams
- Shoreline Master Program Water Bodies
- Street Right of Way
- Contours

Shoreline Environments

- Aquatic
- High Intensity/Multi-Use
- Natural
- Shoreline Residential
- Urban Conservancy

Sources: City of Redmond Planning Department
Map File: h:\gisdata\projects\shrlnmp\shrlnenv.mxd

Data Source:
FEMA Flood Insurance Rate 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.

Frequently Flooded Areas

Critical Areas Map

City of Redmond, Washington

Effective: 05/28/2005

0 0.5 1
Miles

N

100 Year Floodplain

FEMA Floodway

City Limit

Park and Open Space

Water

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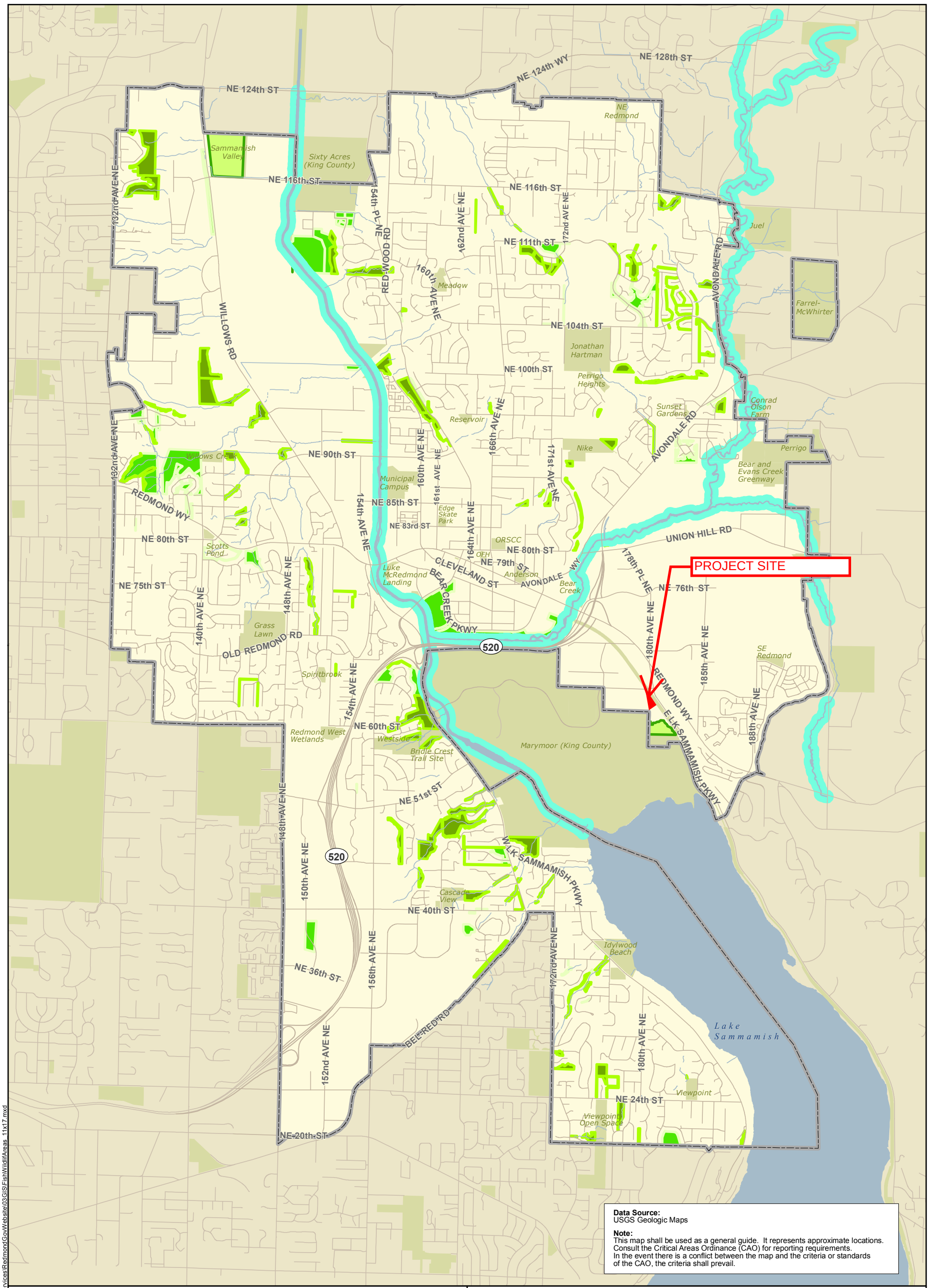

Data Source:
USGS Geologic Maps

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

N

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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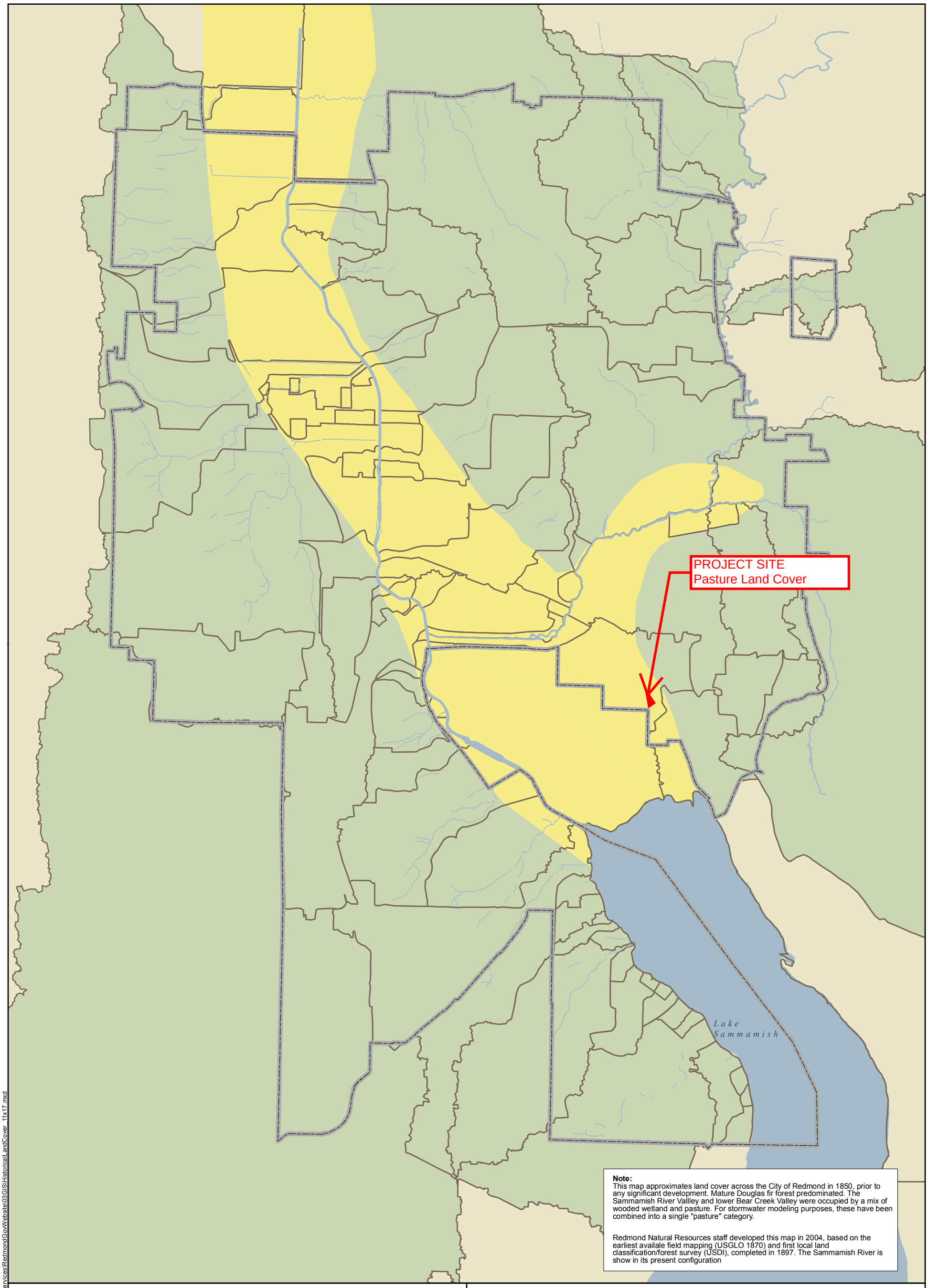

Note:
This map approximates land cover across the City of Redmond in 1850, prior to any significant development. Mature Douglas fir forest predominated. The Sammamish River Vallley and lower Bear Creek Valley were occupied by a mix of wooded wetland and pasture. For stormwater modeling purposes, these have been combined into a single "pasture" category.

Redmond Natural Resources staff developed this map in 2004, based on the earliest availale field mapping (USGLO 1870) and first local land classification/forest survey (USDI), completed in 1897. The Sammamish River is show in its present configuration

Historical Land Cover

City of Redmond, Washington

11/18/2010

0 0.5 1
Miles

N

Watershed
Forest
Pasture
City Limit
Water

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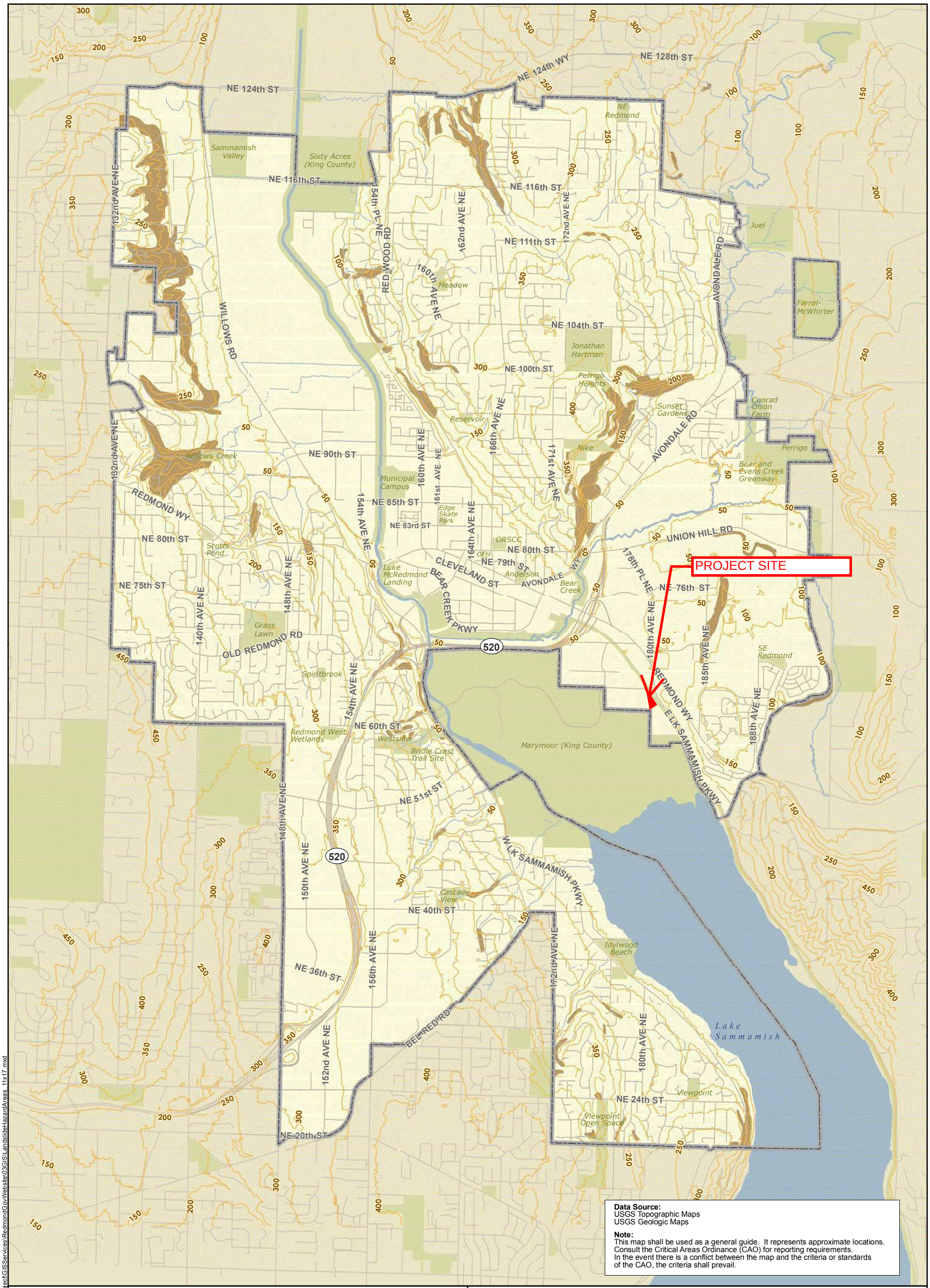

Data Source:
USGS Topographic Maps
USGS Geologic Maps

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.

Landslide Hazard Areas

Critical Areas Map

City of Redmond, Washington

Effective: 05/28/2005

0 0.5 1
Miles

N

Contour
Landslide Hazard Area
City Limit
Park and Open Space
Water

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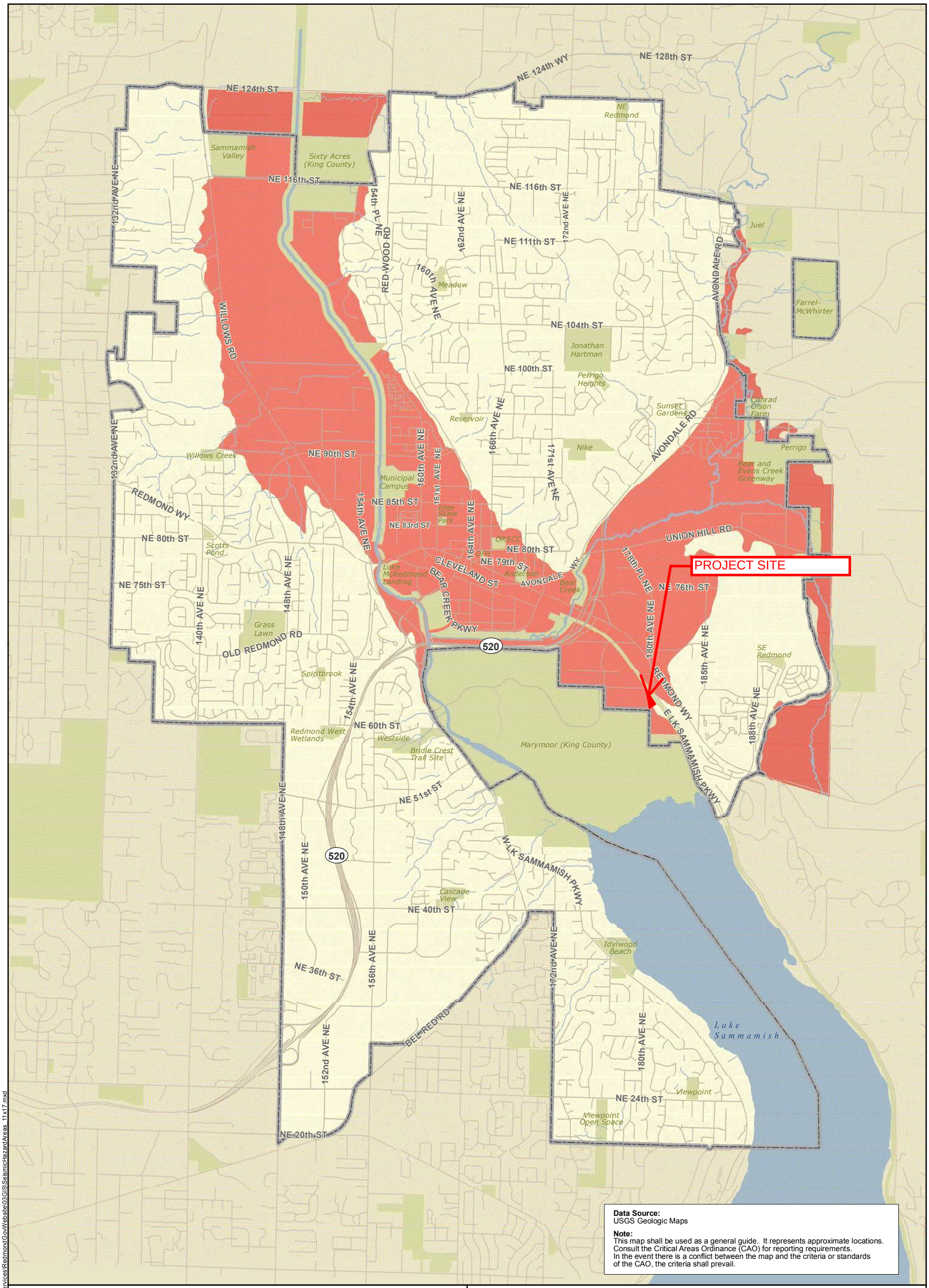

Data Source:
USGS Geologic Maps

Note:
This map shall be used as a general guide. It represents approximate locations.
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In the event there is a conflict between the map and the criteria or standards of the CAO, the criteria shall prevail.

Seismic Hazard Areas

Critical Areas Map

City of Redmond, Washington

Effective: 05/28/2005

0 0.5 1
Miles

N

Seismic Hazard Area
City Limit
Park and Open Space
Water

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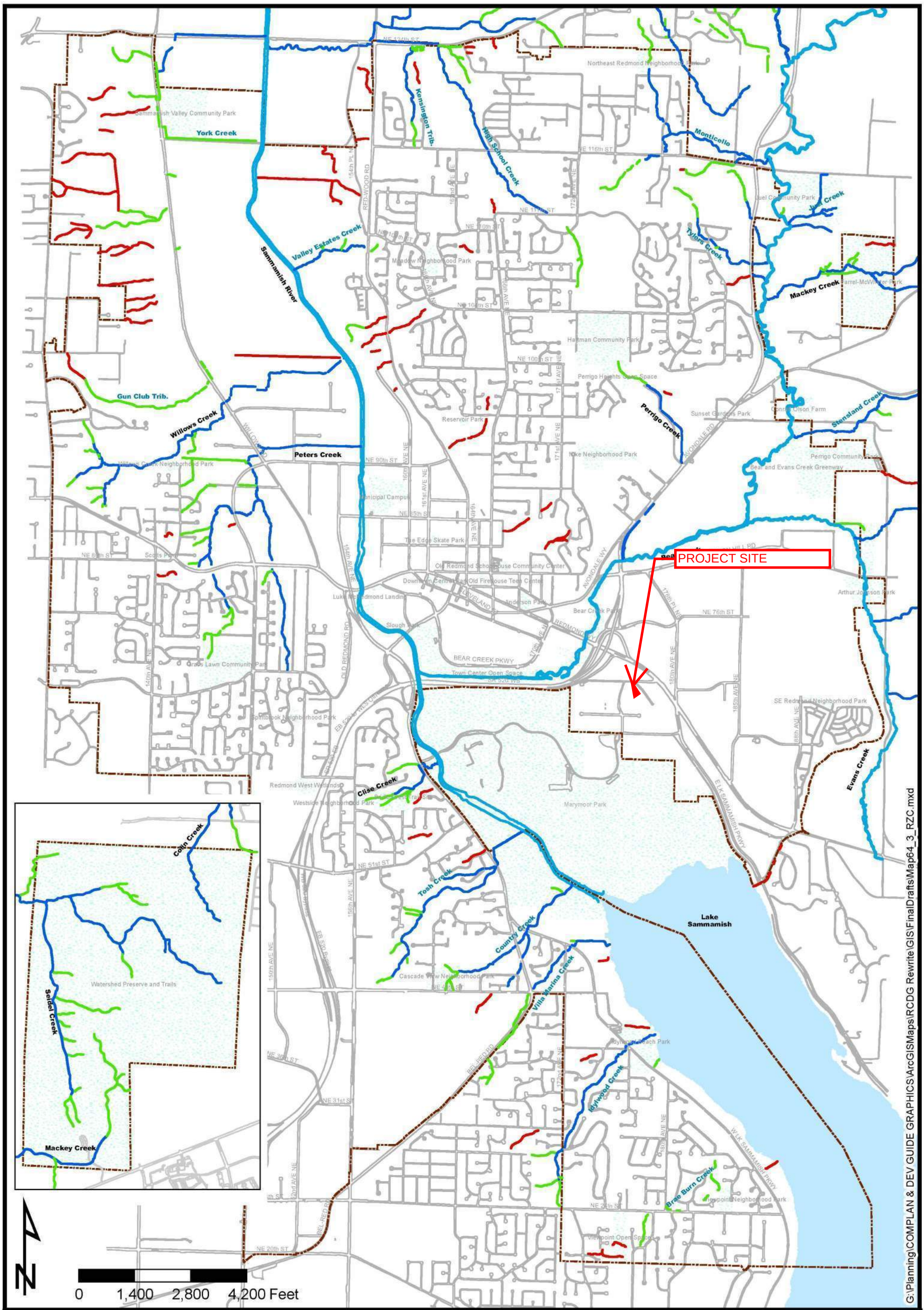


City of Redmond

Critical Areas Map
Effective: September 1, 2012

Map 64.3 Streams Classification

Legend:

- Class I
- Class II
- Class III
- Class IV

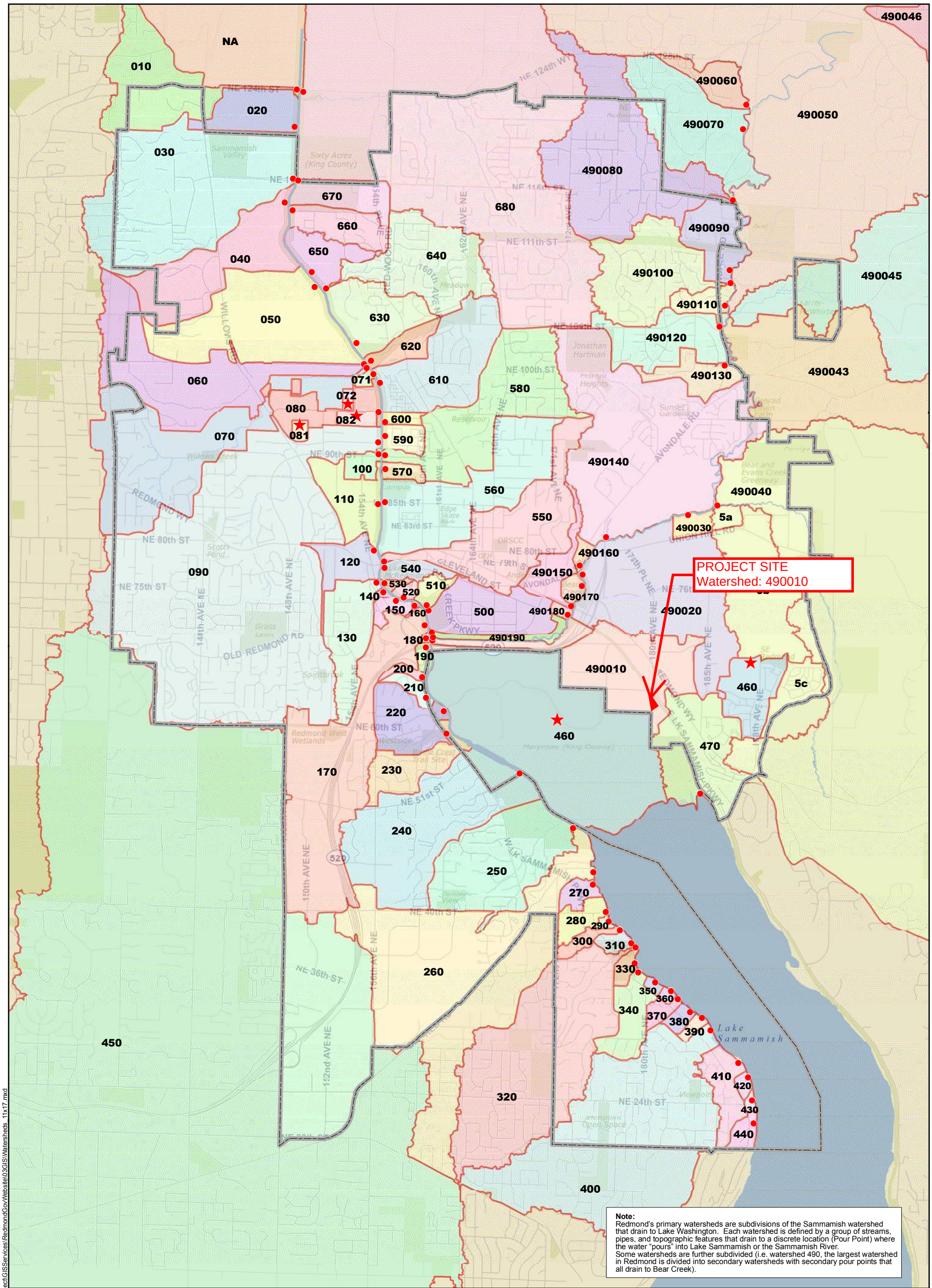
Stream Official USGS Stream Name
Stream Informal Stream Name

Sources:
City of Redmond Public Works, Natural Resources Division
City of Redmond GIS Services
Washington Trout / Wild Fish Conservancy
King County GIS

Note: This map shall be used as a general guide representing the approximate location of streams, per RZC 21.64.010(E)(2). The map does not necessarily ensure the presence or absence of streams. In the event of a conflict between the map and the criteria of the Critical Areas Ordinance (CAO), the criteria shall prevail. Consult the CAO (RZC 21.64) for reporting requirements

Note: Gaps in illustrated streams may indicate culverts, pipes, ponds, etc.

Note: Informal stream names may not conform to USGS policies and may change in the future.



Note:
Redmond's primary watersheds are subdivisions of the Sammamish watershed that drain to Lake Washington. Each watershed is defined by a group of streams, pipes, and topographic features that drain to a discrete location (Pour Point) where the water "pours" into Lake Sammamish or the Sammamish River.
Some watersheds are further subdivided (i.e. watershed 490, the largest watershed in Redmond is divided into secondary watersheds with secondary pour points that all drain to Bear Creek).

Redmond Watershed Map

City of Redmond, Washington

11/18/2010

0 0.5 1
Miles

N

Pour Points

Denotes Infiltration

Watershed

City Limit

Park and Open Space

Water

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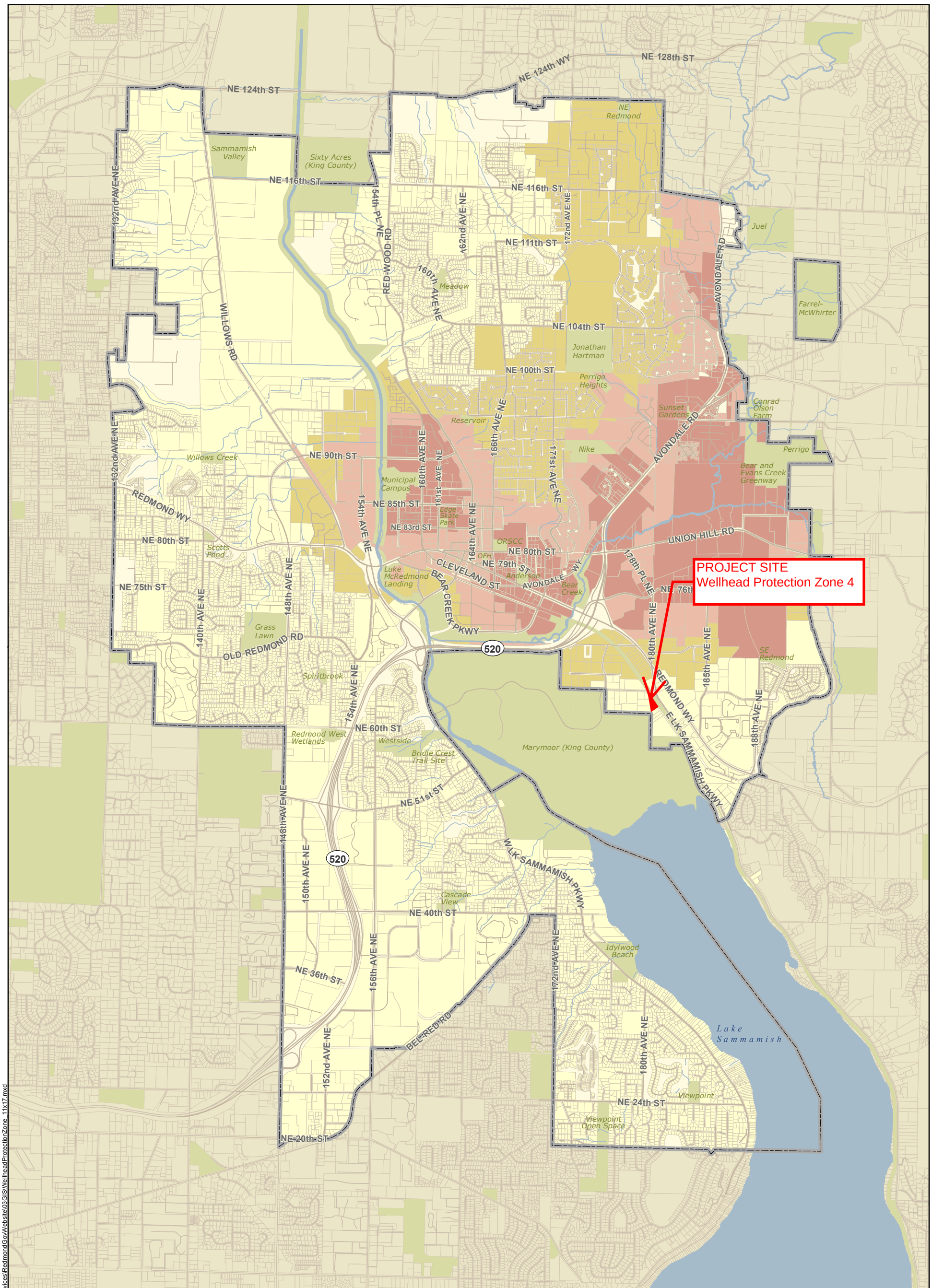

Wellhead Protection Zones

City of Redmond, Washington

11/18/2010

0 0.5 1
Miles

N

Wellhead Zone 1
Wellhead Zone 2
Wellhead Zone 3
Wellhead Zone 4
City Limit
Park and Open Space
Water

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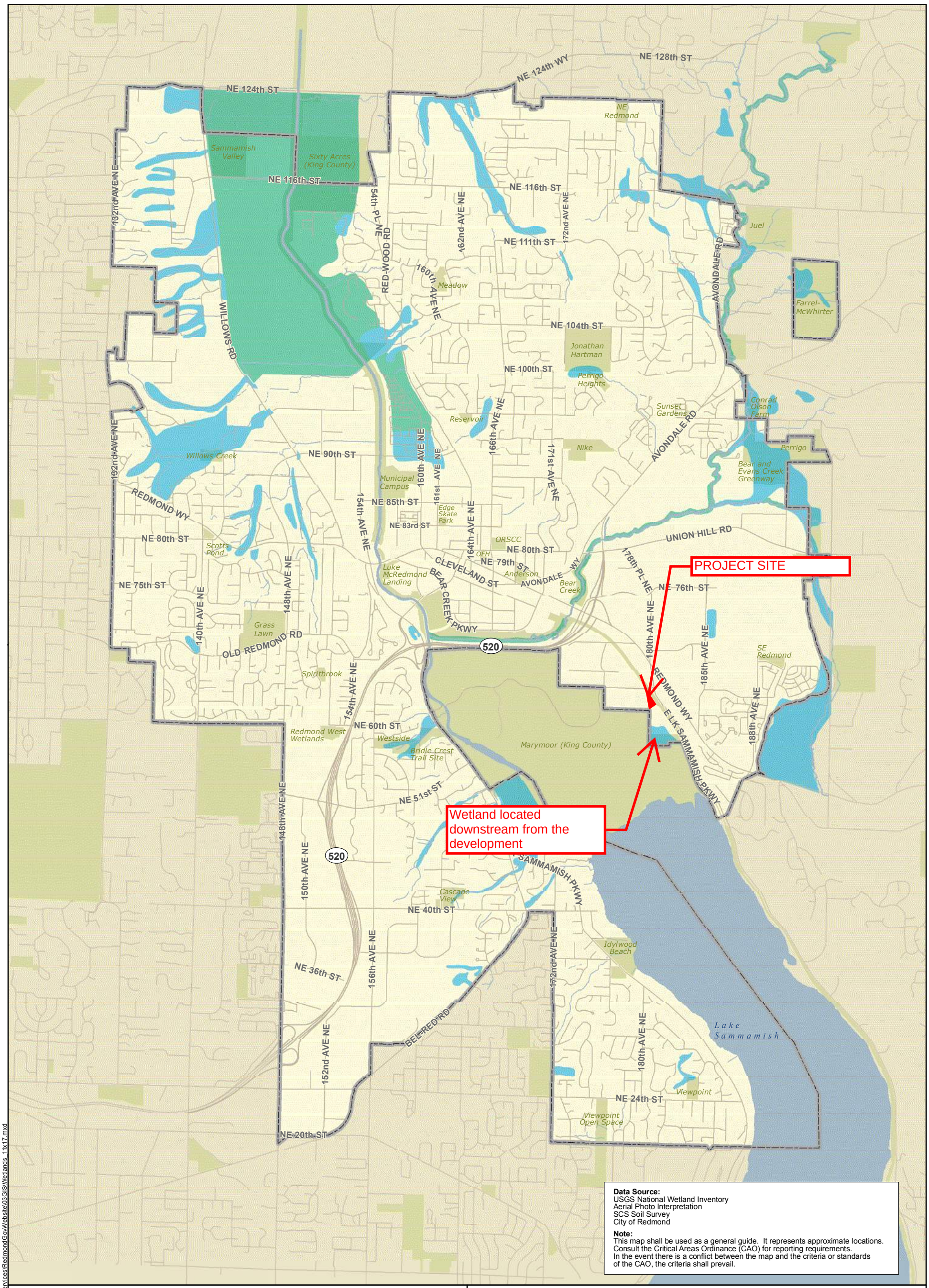

Data Source:
USGS National Wetland Inventory
Aerial Photo Interpretation
SCS Soil Survey
City of Redmond

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

N

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.

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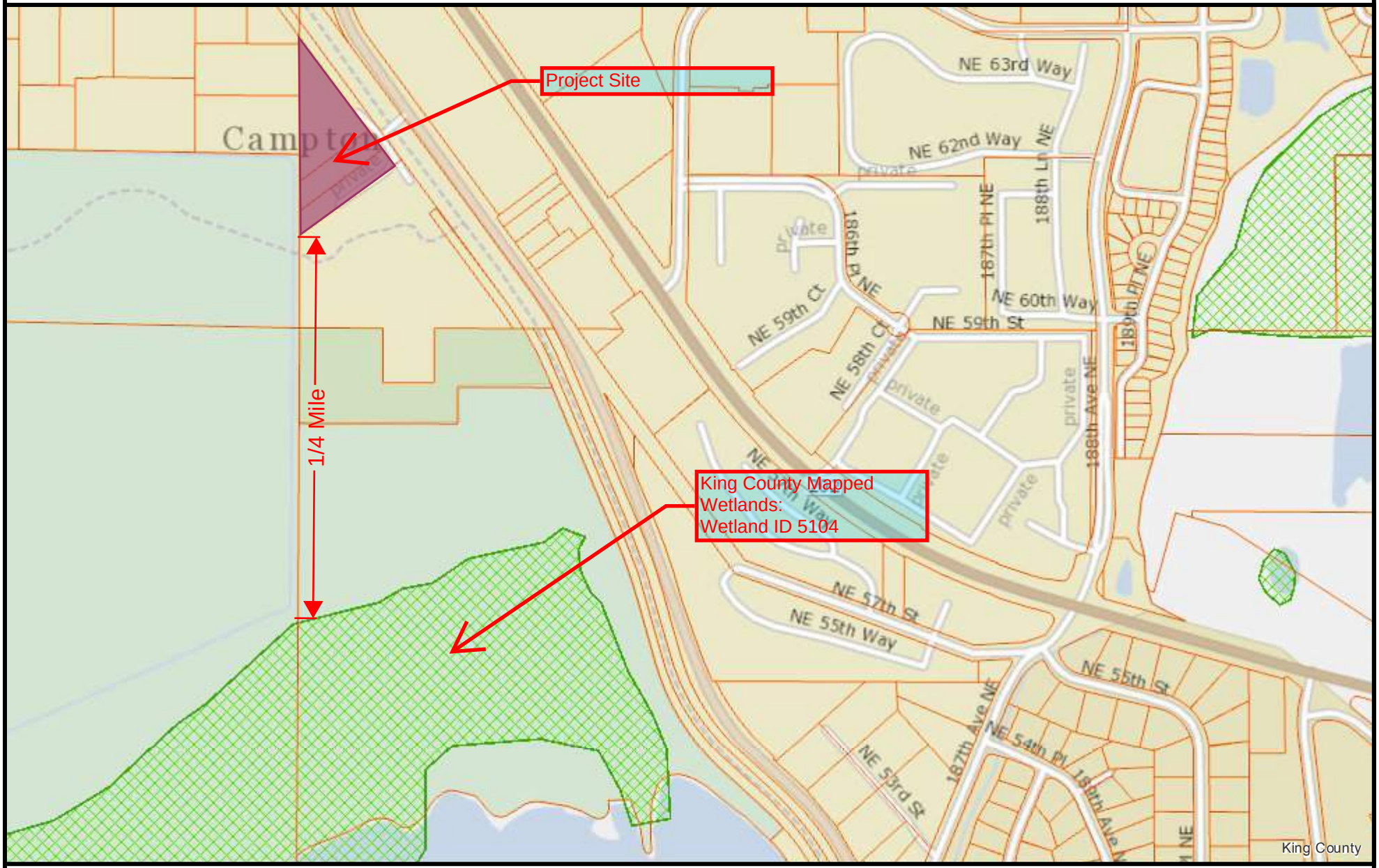
Downstream Wetlands



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Date: 11/24/2015 Notes:

N

King County GIS Center

Hydrologic Soil Group—King County Area, Washington

Map Scale: 1:4,080 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — King County Area, Washington (WA633)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
EvB	Everett gravelly sandy loam, 0 to 5 percent slopes	A	1.1	1.7%
EvD	Everett gravelly sandy loam, 15 to 30 percent slopes	A	1.0	1.6%
InA	Indianola loamy fine sand, 0 to 4 percent slopes	A	28.5	42.6%
InC	Indianola loamy fine sand, 4 to 15 percent slopes	A	13.8	20.5%
Sk	Seattle muck	B/D	22.5	33.7%
Totals for Area of Interest			**67.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

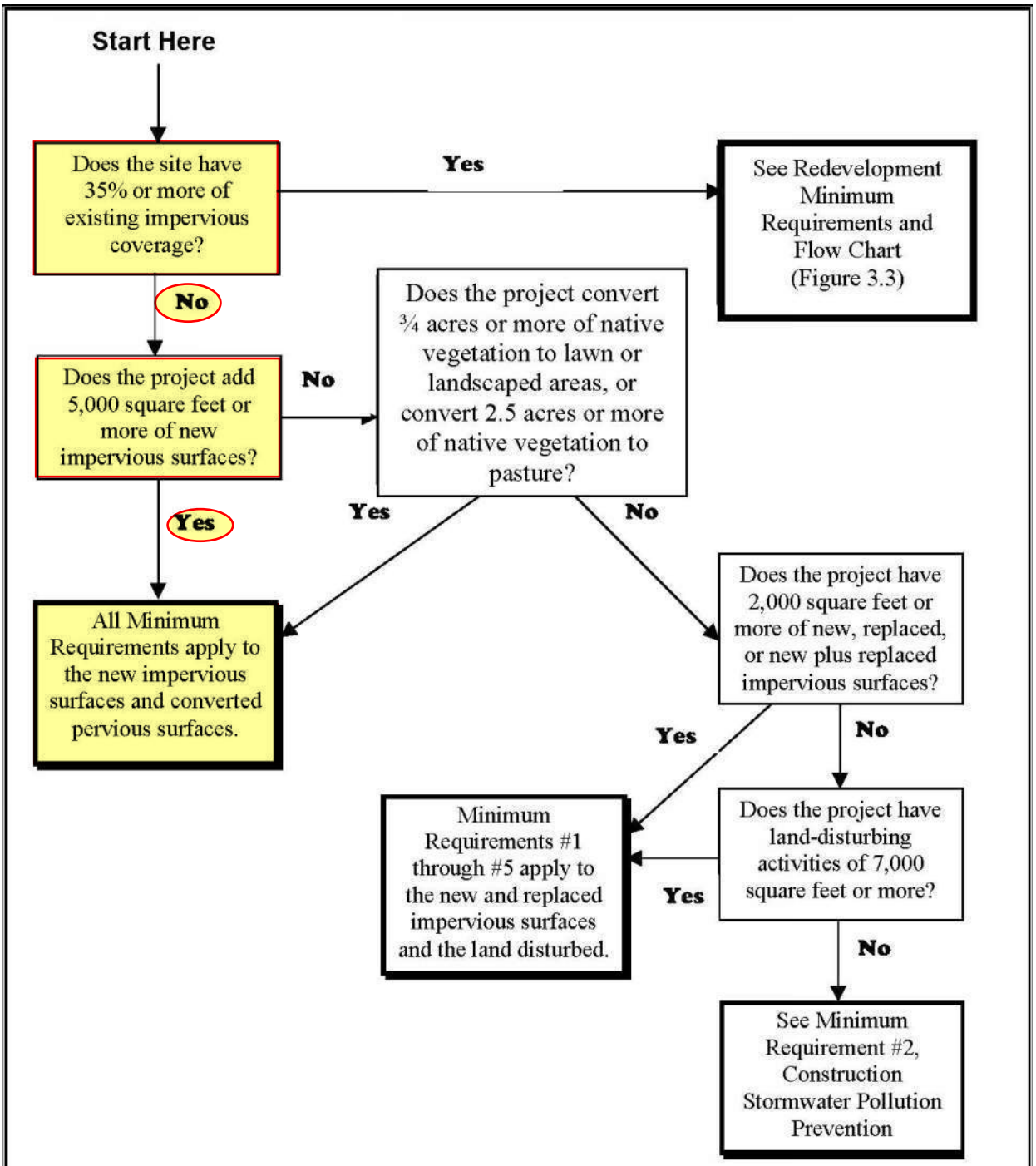
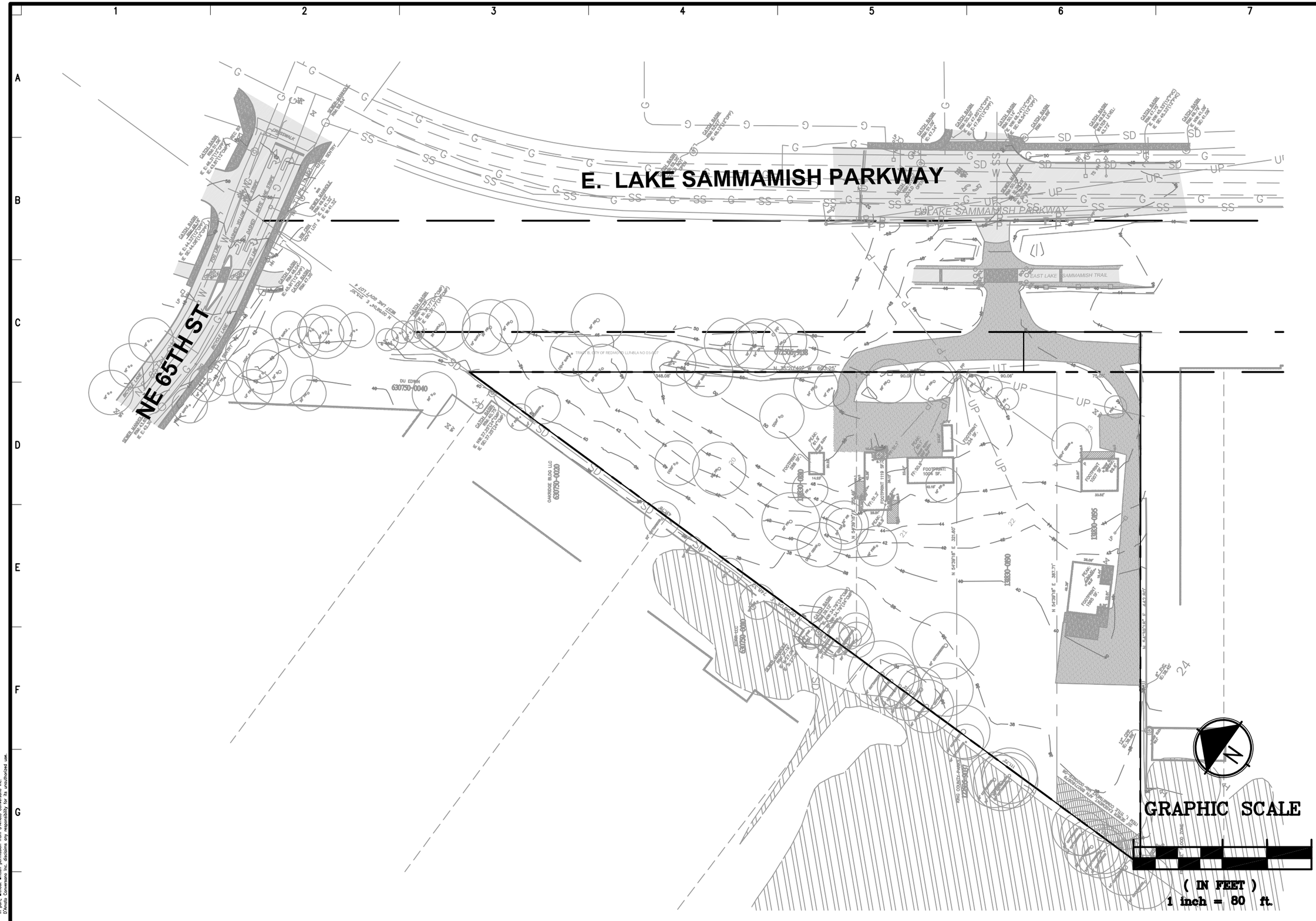


Figure 3.2 Flow Chart for Determining Requirements for New Development



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Job No.: 180118-0000

Proj. Manager:

Designed:

Reviewed:

Drawn:

Dwg. Checked:

Scale: 1" = 80'

PROJECT TITLE:

MARYMOOR APARTMENTS

REDMOND, WA

SHEET TITLE:

EXISTING SITE PLAN

SHEET NO.

1

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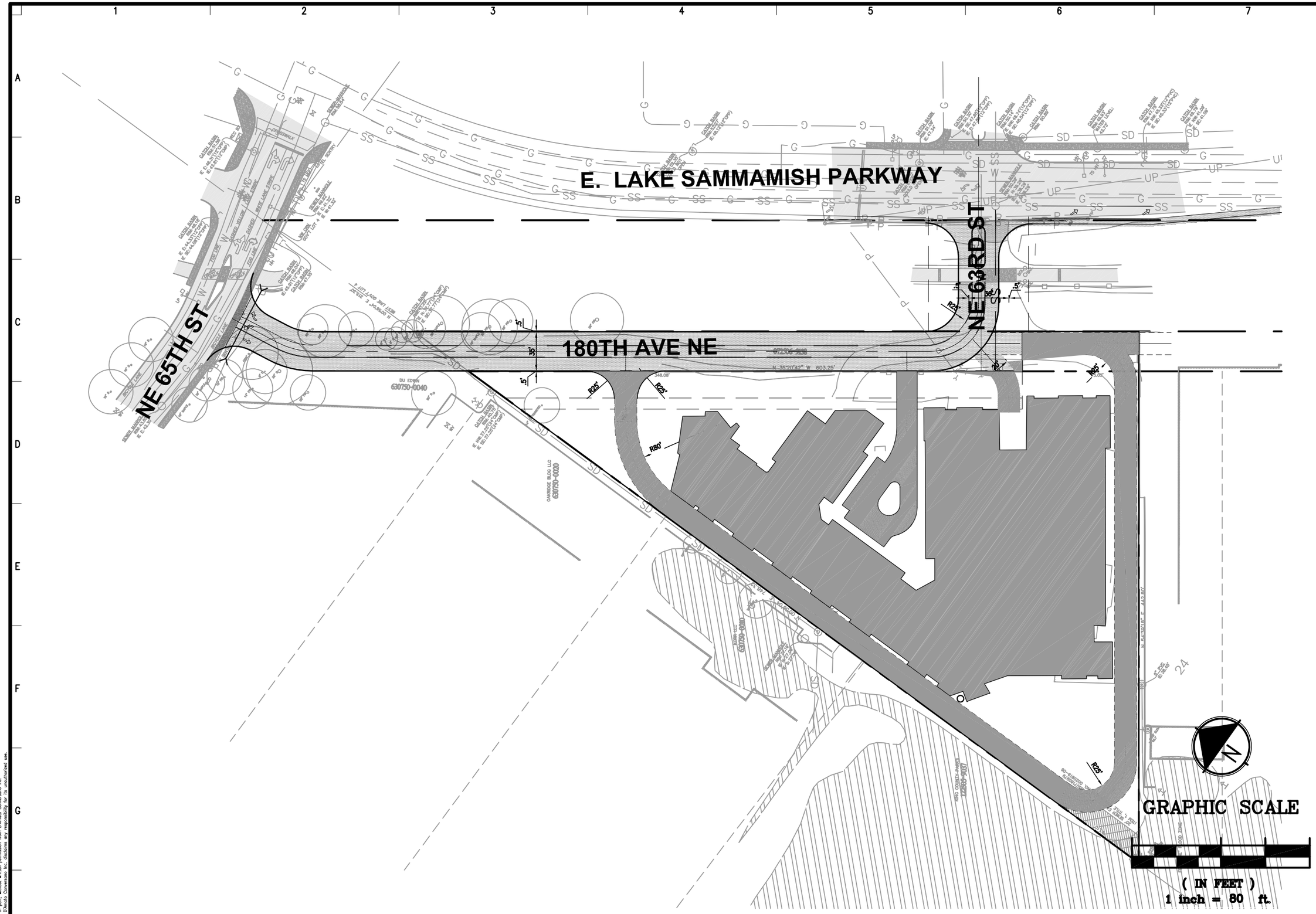
SECTION TOWNSHIP NORTH RANGE EAST W.M.



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Dwg. Checked:	
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PROJECT TITLE:
MARYMOOR APARTMENTS
REDMOND, WA

SHEET TITLE:
DEVELOPED LAND COVER

SHEET NO.
2

SECTION TOWNSHIP NORTH RANGE EAST W.M.

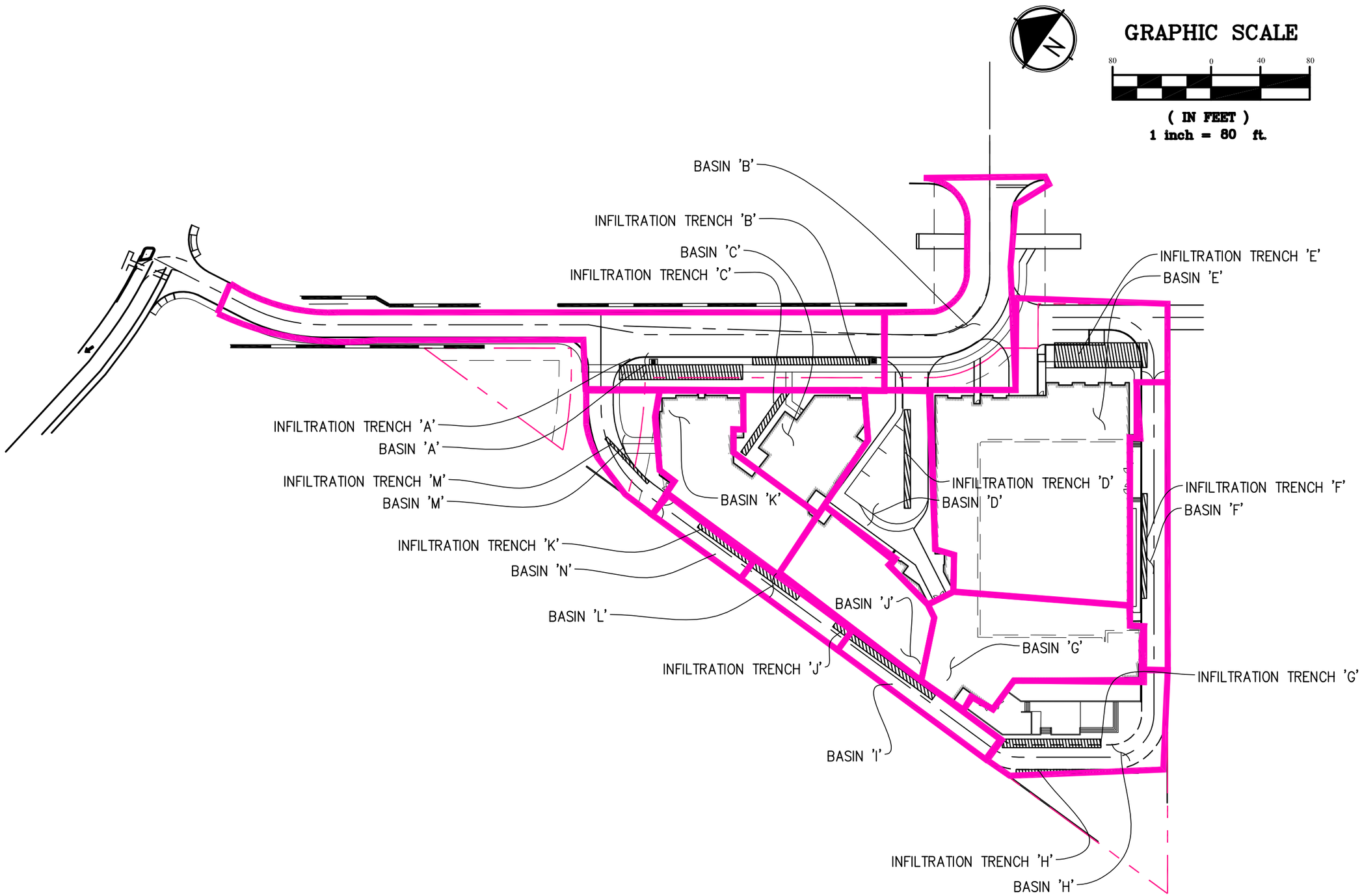
DCI ENGINEERS	Project No. 15012-0020	Sheet No. 1
Project Marymoor Park Apartments		Date 9/16/2015
Subject Infiltration Trench Sizing Summary		By K. Oliver

Determine: Infiltration trench sizes to infiltrate project site 100% as modeled in WWHM

Given:
- Infiltration Rate: 6.5 in/hr per Geotechnical engineering Report
- Ground Water Elevation: 31
- Minimum lowest elevation of infiltration facility: 36 (provides 5' vertical separation between infiltration facility and groundwater elevation)
- Site areas per basin map attached

Calculations:
- Site areas were modeled in WWHM as a 'gravel trench'. The trenches had the infiltration turned 'on' with the given design infiltration rates.
- A weighted porosity for each gravel trench was used, depending on cross section of trench. The trench accounts for the 8" perforated storm drain that runs the length of the trench, therefore, increasing the overall trench porosity.
- Top of trench should be approximately 3' below finished grade, to allow a root zone for landscaping

Results:
- Infiltration trenches were sized and infiltrate minimum 99.99% of the modeled design storms. An analysis to confirm that the site storm drainage design meets City of Redmond flow control requirements was performed and the facilities passed. See attached spreadsheet containing trench sizes, tributary areas to each trench, and WWHM inputs and calculations.



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Proj. Manager:
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Reviewed:
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Dwg. Checked:
Scale: 1" = 80'

PROJECT TITLE:
MARYMOOR APARTMENTS
REDMOND, WA

SHEET TITLE:
INFILTRATION SITE PLAN

SHEET NO.
4

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SECTION TOWNSHIP NORTH RANGE EAST W.M.

Project: Marymoor Park Apartments
Date: 11/05/2015
Calculations by: Kittrina Oliver, DCI Engineers

	Infiltration Trench Size			Tributary Area to Infiltration Basin								
TRENCH ID	TRENCH LENGTH (FEET)	TRENCH WIDTH (FEET)	TRENCH DEPTH (FEET)	PERVIOUS AREA DRAINING TO INFILTRATION TRENCH (ACRES)	IMPERVIOUS AREA DRAINING TO INFILTRATION TRENCH (ACRES)	TOTAL AREA DRAINING TO INFILTRATION TRENCH (ACRES)	APPROX. FINISHED GRADE AT SURFACE	TOP OF INFILTRATION FACILITY ELEVATION	BOTTOM OF INFILTRATION FACILITY ELEVATION	GROUND WATER ELEVATION	INFILTRATION RATE (IN/HR)	PERFORATED PIPE IN TRENCH
A	100	12	2.5	0.06	0.45	0.51	44.3	38.5	36	31	6.5	8
B	95	6	3	0.02	0.26	0.28	45	39	36	31	6.5	8
C	65	5	2	0.02	0.16	0.18	45	42	40	31	6.5	8
D	80	5	2	0.02	0.21	0.23	42.5	42	40	31	6.5	8
E	75	20	4.5	0.02	0.79	0.81	43.2	41	36.5	31	6.5	8
F*	85	4	2	0.08	0.08	0.16	41.3	38	36	31	6.5	8
G	80	7	2	0.00	0.28	0.28	40.6	38	36	31	6.5	8
H	100	3.5	2.5	0.05	0.19	0.24	40.2	40.2	37.7	31	6.5	8
I*	Drains to Trench J			0.03	0.03	0.06						
J	100	5	2	0.00	0.19	0.19	40.15	38	36	31	6.5	8
K	100	5	2	0.00	0.23	0.23	40.3	38	36	31	6.5	8
L*	Drains to Trench J			0.02	0.02	0.04						
M	50	2	2	0.05	0.06	0.11	40.1	38	36	31	6.5	8
N*	Drains to Trench K			0.02	0.02	0.04						
*Pervious Pavement - modeled as 50% Impervious and 50% Pervious												

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	2015-1013 Infiltration Model
Site Name:	
Site Address:	
City:	
Report Date:	11/2/2015
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	Hourly
Precip Scale:	1.00
Version:	2015/08/19

POC Thresholds

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

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Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Pasture, Flat	3.36
Pervious Total	3.36
Impervious Land Use	Acres
Impervious Total	0
Basin Total	3.36

Element Flows To:

Surface	Interflow	Groundwater

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Mitigated Land Use

BASIN K

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
Pervious Total	0
Impervious Land Use	Acres
ROOF TOPS FLAT	0.23
Impervious Total	0.23
Basin Total	0.23

Element Flows To:

Surface	Interflow	Groundwater
TRENCH K	TRENCH K	

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BASIN J

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
Pervious Total	0
Impervious Land Use	Acres
ROOF TOPS FLAT	0.19
Impervious Total	0.19
Basin Total	0.19

Element Flows To:

Surface	Interflow	Groundwater
TRENCH J	TRENCH J	

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BASIN L

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
A B, Lawn, Flat	0.02
Pervious Total	0.02

Impervious Land Use	Acres
ROADS FLAT	0.02
Impervious Total	0.02
Basin Total	0.04

Element Flows To:

Surface	Interflow	Groundwater
TRENCH J	TRENCH J	

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BASIN N

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
A B, Lawn, Flat	0.02
Pervious Total	0.02

Impervious Land Use	Acres
ROOF TOPS FLAT	0.02
Impervious Total	0.02
Basin Total	0.04

Element Flows To:

Surface	Interflow	Groundwater
TRENCH K	TRENCH K	

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BASIN I

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.03
Pervious Total	0.03
Impervious Land Use	Acres
ROADS FLAT	0.03
Impervious Total	0.03
Basin Total	0.06

Element Flows To:

Surface	Interflow	Groundwater
TRENCH J	TRENCH J	

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BASIN A

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
A B, Lawn, Flat	0.06
Pervious Total	0.06

Impervious Land Use	Acres
ROADS FLAT	0.45
Impervious Total	0.45
Basin Total	0.51

Element Flows To:

Surface	Interflow	Groundwater
TRENCH A	TRENCH A	

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Basin B

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.02
Pervious Total	0.02
Impervious Land Use	Acres
ROADS FLAT	0.26
Impervious Total	0.26
Basin Total	0.28

Element Flows To:

Surface	Interflow	Groundwater
TRENCH B	TRENCH B	

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Basin D

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.02
Pervious Total	0.02
Impervious Land Use	Acres
ROADS FLAT	0.21
Impervious Total	0.21
Basin Total	0.23

Element Flows To:

Surface	Interflow	Groundwater
TRENCH D	TRENCH D	

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Basin C

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.02
Pervious Total	0.02
Impervious Land Use	Acres
ROOF TOPS FLAT	0.16
Impervious Total	0.16
Basin Total	0.18

Element Flows To:

Surface	Interflow	Groundwater
TRENCH C	TRENCH C	

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Basin M

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.05
Pervious Total	0.05
Impervious Land Use	Acres
ROOF TOPS FLAT	0.06
Impervious Total	0.06
Basin Total	0.11

Element Flows To:

Surface	Interflow	Groundwater
TRENCH M	TRENCH M	

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Basin E

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.02
Pervious Total	0.02
Impervious Land Use	Acres
ROOF TOPS FLAT	0.79
Impervious Total	0.79
Basin Total	0.81

Element Flows To:

Surface	Interflow	Groundwater
TRENCH E	TRENCH E	

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Basin F

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.08
Pervious Total	0.08
Impervious Land Use	Acres
ROOF TOPS FLAT	0.08
Impervious Total	0.08
Basin Total	0.16

Element Flows To:

Surface	Interflow	Groundwater
TRENCH F	TRENCH F	

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Basin G

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
Pervious Total	0
Impervious Land Use	Acres
ROOF TOPS FLAT	0.28
Impervious Total	0.28
Basin Total	0.28

Element Flows To:

Surface	Interflow	Groundwater
TRENCH G	TRENCH G	

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Basin H

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
A B, Lawn, Flat	0.05
Pervious Total	0.05
Impervious Land Use	Acres
ROOF TOPS FLAT	0.19
Impervious Total	0.19
Basin Total	0.24

Element Flows To:

Surface	Interflow	Groundwater
TRENCH H	TRENCH H	

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Routing Elements
Predeveloped Routing

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Mitigated Routing

TRENCH K

Bottom Length:	100.00 ft.
Bottom Width:	5.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	39.061
Total Volume Through Riser (ac-ft):	0.022
Total Volume Through Facility (ac-ft):	39.083
Percent Infiltrated:	99.94
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

TRENCH J

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Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.011	0.000	0.000	0.000
0.0222	0.011	0.000	0.000	0.075
0.0444	0.011	0.000	0.000	0.075
0.0667	0.011	0.000	0.000	0.075
0.0889	0.011	0.000	0.000	0.075
0.1111	0.011	0.000	0.000	0.075
0.1333	0.011	0.000	0.000	0.075
0.1556	0.011	0.000	0.000	0.075
0.1778	0.011	0.000	0.000	0.075
0.2000	0.011	0.000	0.000	0.075
0.2222	0.011	0.000	0.000	0.075
0.2444	0.011	0.001	0.000	0.075
0.2667	0.011	0.001	0.000	0.075
0.2889	0.011	0.001	0.000	0.075
0.3111	0.011	0.001	0.000	0.075
0.3333	0.011	0.001	0.000	0.075
0.3556	0.011	0.001	0.000	0.075
0.3778	0.011	0.001	0.000	0.075
0.4000	0.011	0.001	0.000	0.075
0.4222	0.011	0.001	0.000	0.075
0.4444	0.011	0.001	0.000	0.075
0.4667	0.011	0.001	0.000	0.075
0.4889	0.011	0.002	0.000	0.075
0.5111	0.011	0.002	0.000	0.075

0.5333	0.011	0.002	0.000	0.075
0.5556	0.011	0.002	0.000	0.075
0.5778	0.011	0.002	0.000	0.075
0.6000	0.011	0.002	0.000	0.075
0.6222	0.011	0.002	0.000	0.075
0.6444	0.011	0.002	0.000	0.075
0.6667	0.011	0.002	0.000	0.075
0.6889	0.011	0.002	0.000	0.075
0.7111	0.011	0.002	0.000	0.075
0.7333	0.011	0.002	0.000	0.075
0.7556	0.011	0.003	0.000	0.075
0.7778	0.011	0.003	0.000	0.075
0.8000	0.011	0.003	0.000	0.075
0.8222	0.011	0.003	0.000	0.075
0.8444	0.011	0.003	0.000	0.075
0.8667	0.011	0.003	0.000	0.075
0.8889	0.011	0.003	0.000	0.075
0.9111	0.011	0.003	0.000	0.075
0.9333	0.011	0.003	0.000	0.075
0.9556	0.011	0.003	0.000	0.075
0.9778	0.011	0.003	0.000	0.075
1.0000	0.011	0.004	0.000	0.075
1.0222	0.011	0.004	0.000	0.075
1.0444	0.011	0.004	0.000	0.075
1.0667	0.011	0.004	0.000	0.075
1.0889	0.011	0.004	0.000	0.075
1.1111	0.011	0.004	0.000	0.075
1.1333	0.011	0.004	0.000	0.075
1.1556	0.011	0.004	0.000	0.075
1.1778	0.011	0.004	0.000	0.075
1.2000	0.011	0.004	0.000	0.075
1.2222	0.011	0.004	0.000	0.075
1.2444	0.011	0.005	0.000	0.075
1.2667	0.011	0.005	0.000	0.075
1.2889	0.011	0.005	0.000	0.075
1.3111	0.011	0.005	0.000	0.075
1.3333	0.011	0.005	0.000	0.075
1.3556	0.011	0.005	0.000	0.075
1.3778	0.011	0.005	0.000	0.075
1.4000	0.011	0.005	0.000	0.075
1.4222	0.011	0.005	0.000	0.075
1.4444	0.011	0.005	0.000	0.075
1.4667	0.011	0.005	0.000	0.075
1.4889	0.011	0.006	0.000	0.075
1.5111	0.011	0.006	0.010	0.075
1.5333	0.011	0.006	0.053	0.075
1.5556	0.011	0.006	0.115	0.075
1.5778	0.011	0.007	0.190	0.075
1.6000	0.011	0.007	0.276	0.075
1.6222	0.011	0.007	0.371	0.075
1.6444	0.011	0.007	0.471	0.075
1.6667	0.011	0.008	0.575	0.075
1.6889	0.011	0.008	0.680	0.075
1.7111	0.011	0.008	0.784	0.075
1.7333	0.011	0.008	0.885	0.075
1.7556	0.011	0.009	0.980	0.075
1.7778	0.011	0.009	1.067	0.075
1.8000	0.011	0.009	1.145	0.075

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1.8222	0.011	0.009	1.212	0.075
1.8444	0.011	0.010	1.269	0.075
1.8667	0.011	0.010	1.316	0.075
1.8889	0.011	0.010	1.355	0.075
1.9111	0.011	0.010	1.388	0.075
1.9333	0.011	0.011	1.439	0.075
1.9556	0.011	0.011	1.476	0.075
1.9778	0.011	0.011	1.511	0.075
2.0000	0.011	0.011	1.546	0.075

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TRENCH J

Bottom Length:	100.00 ft.
Bottom Width:	5.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	37.555
Total Volume Through Riser (ac-ft):	0.017
Total Volume Through Facility (ac-ft):	37.572
Percent Infiltrated:	99.95
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.011	0.000	0.000	0.000
0.0278	0.011	0.000	0.000	0.075
0.0556	0.011	0.000	0.000	0.075
0.0833	0.011	0.000	0.000	0.075
0.1111	0.011	0.000	0.000	0.075
0.1389	0.011	0.000	0.000	0.075
0.1667	0.011	0.000	0.000	0.075
0.1944	0.011	0.000	0.000	0.075
0.2222	0.011	0.000	0.000	0.075
0.2500	0.011	0.001	0.000	0.075
0.2778	0.011	0.001	0.000	0.075
0.3056	0.011	0.001	0.000	0.075
0.3333	0.011	0.001	0.000	0.075
0.3611	0.011	0.001	0.000	0.075
0.3889	0.011	0.001	0.000	0.075
0.4167	0.011	0.001	0.000	0.075
0.4444	0.011	0.001	0.000	0.075
0.4722	0.011	0.001	0.000	0.075
0.5000	0.011	0.002	0.000	0.075
0.5278	0.011	0.002	0.000	0.075
0.5556	0.011	0.002	0.000	0.075
0.5833	0.011	0.002	0.000	0.075
0.6111	0.011	0.002	0.000	0.075
0.6389	0.011	0.002	0.000	0.075
0.6667	0.011	0.002	0.000	0.075
0.6944	0.011	0.002	0.000	0.075

0.7222	0.011	0.002	0.000	0.075
0.7500	0.011	0.003	0.000	0.075
0.7778	0.011	0.003	0.000	0.075
0.8056	0.011	0.003	0.000	0.075
0.8333	0.011	0.003	0.000	0.075
0.8611	0.011	0.003	0.000	0.075
0.8889	0.011	0.003	0.000	0.075
0.9167	0.011	0.003	0.000	0.075
0.9444	0.011	0.003	0.000	0.075
0.9722	0.011	0.003	0.000	0.075
1.0000	0.011	0.004	0.000	0.075
1.0278	0.011	0.004	0.000	0.075
1.0556	0.011	0.004	0.000	0.075
1.0833	0.011	0.004	0.000	0.075
1.1111	0.011	0.004	0.000	0.075
1.1389	0.011	0.004	0.000	0.075
1.1667	0.011	0.004	0.000	0.075
1.1944	0.011	0.004	0.000	0.075
1.2222	0.011	0.004	0.000	0.075
1.2500	0.011	0.005	0.000	0.075
1.2778	0.011	0.005	0.000	0.075
1.3056	0.011	0.005	0.000	0.075
1.3333	0.011	0.005	0.000	0.075
1.3611	0.011	0.005	0.000	0.075
1.3889	0.011	0.005	0.000	0.075
1.4167	0.011	0.005	0.000	0.075
1.4444	0.011	0.005	0.000	0.075
1.4722	0.011	0.005	0.000	0.075
1.5000	0.011	0.006	0.000	0.075
1.5278	0.011	0.006	0.000	0.075
1.5556	0.011	0.006	0.000	0.075
1.5833	0.011	0.006	0.000	0.075
1.6111	0.011	0.006	0.000	0.075
1.6389	0.011	0.006	0.000	0.075
1.6667	0.011	0.006	0.000	0.075
1.6944	0.011	0.006	0.000	0.075
1.7222	0.011	0.006	0.000	0.075
1.7500	0.011	0.007	0.000	0.075
1.7778	0.011	0.007	0.000	0.075
1.8056	0.011	0.007	0.000	0.075
1.8333	0.011	0.007	0.000	0.075
1.8611	0.011	0.007	0.000	0.075
1.8889	0.011	0.007	0.000	0.075
1.9167	0.011	0.007	0.000	0.075
1.9444	0.011	0.007	0.000	0.075
1.9722	0.011	0.007	0.000	0.075
2.0000	0.011	0.008	0.000	0.075
2.0278	0.011	0.008	0.032	0.075
2.0556	0.011	0.008	0.092	0.075
2.0833	0.011	0.009	0.168	0.075
2.1111	0.011	0.009	0.255	0.075
2.1389	0.011	0.009	0.348	0.075
2.1667	0.011	0.009	0.441	0.075
2.1944	0.011	0.010	0.531	0.075
2.2222	0.011	0.010	0.610	0.075
2.2500	0.011	0.010	0.678	0.075
2.2778	0.011	0.011	0.730	0.075
2.3056	0.011	0.011	0.769	0.075

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2.3333	0.011	0.011	0.799	0.075
2.3611	0.011	0.012	0.841	0.075
2.3889	0.011	0.012	0.873	0.075
2.4167	0.011	0.012	0.903	0.075
2.4444	0.011	0.013	0.933	0.075
2.4722	0.011	0.013	0.961	0.075
2.5000	0.011	0.013	0.989	0.075

DRAFT

TRENCH M

Bottom Length:	50.00 ft.
Bottom Width:	2.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	9.188
Total Volume Through Riser (ac-ft):	0.017
Total Volume Through Facility (ac-ft):	9.205
Percent Infiltrated:	99.82
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2
TRENCH K	

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.002	0.000	0.000	0.000
0.0222	0.002	0.000	0.000	0.015
0.0444	0.002	0.000	0.000	0.015
0.0667	0.002	0.000	0.000	0.015
0.0889	0.002	0.000	0.000	0.015
0.1111	0.002	0.000	0.000	0.015
0.1333	0.002	0.000	0.000	0.015
0.1556	0.002	0.000	0.000	0.015
0.1778	0.002	0.000	0.000	0.015
0.2000	0.002	0.000	0.000	0.015
0.2222	0.002	0.000	0.000	0.015
0.2444	0.002	0.000	0.000	0.015
0.2667	0.002	0.000	0.000	0.015
0.2889	0.002	0.000	0.000	0.015
0.3111	0.002	0.000	0.000	0.015
0.3333	0.002	0.000	0.000	0.015
0.3556	0.002	0.000	0.000	0.015
0.3778	0.002	0.000	0.000	0.015
0.4000	0.002	0.000	0.000	0.015
0.4222	0.002	0.000	0.000	0.015
0.4444	0.002	0.000	0.000	0.015
0.4667	0.002	0.000	0.000	0.015
0.4889	0.002	0.000	0.000	0.015
0.5111	0.002	0.000	0.000	0.015
0.5333	0.002	0.000	0.000	0.015
0.5556	0.002	0.000	0.000	0.015

0.5778	0.002	0.000	0.000	0.015
0.6000	0.002	0.000	0.000	0.015
0.6222	0.002	0.000	0.000	0.015
0.6444	0.002	0.000	0.000	0.015
0.6667	0.002	0.000	0.000	0.015
0.6889	0.002	0.000	0.000	0.015
0.7111	0.002	0.000	0.000	0.015
0.7333	0.002	0.000	0.000	0.015
0.7556	0.002	0.000	0.000	0.015
0.7778	0.002	0.000	0.000	0.015
0.8000	0.002	0.000	0.000	0.015
0.8222	0.002	0.000	0.000	0.015
0.8444	0.002	0.000	0.000	0.015
0.8667	0.002	0.000	0.000	0.015
0.8889	0.002	0.000	0.000	0.015
0.9111	0.002	0.000	0.000	0.015
0.9333	0.002	0.000	0.000	0.015
0.9556	0.002	0.000	0.000	0.015
0.9778	0.002	0.000	0.000	0.015
1.0000	0.002	0.000	0.000	0.015
1.0222	0.002	0.000	0.000	0.015
1.0444	0.002	0.000	0.000	0.015
1.0667	0.002	0.000	0.000	0.015
1.0889	0.002	0.000	0.000	0.015
1.1111	0.002	0.000	0.000	0.015
1.1333	0.002	0.000	0.000	0.015
1.1556	0.002	0.000	0.000	0.015
1.1778	0.002	0.000	0.000	0.015
1.2000	0.002	0.001	0.000	0.015
1.2222	0.002	0.001	0.000	0.015
1.2444	0.002	0.001	0.000	0.015
1.2667	0.002	0.001	0.000	0.015
1.2889	0.002	0.001	0.000	0.015
1.3111	0.002	0.001	0.000	0.015
1.3333	0.002	0.001	0.000	0.015
1.3556	0.002	0.001	0.000	0.015
1.3778	0.002	0.001	0.000	0.015
1.4000	0.002	0.001	0.000	0.015
1.4222	0.002	0.001	0.000	0.015
1.4444	0.002	0.001	0.000	0.015
1.4667	0.002	0.001	0.000	0.015
1.4889	0.002	0.001	0.000	0.015
1.5111	0.002	0.001	0.010	0.015
1.5333	0.002	0.001	0.053	0.015
1.5556	0.002	0.001	0.115	0.015
1.5778	0.002	0.001	0.190	0.015
1.6000	0.002	0.001	0.276	0.015
1.6222	0.002	0.001	0.371	0.015
1.6444	0.002	0.001	0.471	0.015
1.6667	0.002	0.001	0.575	0.015
1.6889	0.002	0.001	0.680	0.015
1.7111	0.002	0.001	0.784	0.015
1.7333	0.002	0.001	0.885	0.015
1.7556	0.002	0.001	0.980	0.015
1.7778	0.002	0.001	1.067	0.015
1.8000	0.002	0.001	1.145	0.015
1.8222	0.002	0.002	1.212	0.015
1.8444	0.002	0.002	1.269	0.015

DRAFT

1.8667	0.002	0.002	1.316	0.015
1.8889	0.002	0.002	1.355	0.015
1.9111	0.002	0.002	1.388	0.015
1.9333	0.002	0.002	1.439	0.015
1.9556	0.002	0.002	1.476	0.015
1.9778	0.002	0.002	1.511	0.015
2.0000	0.002	0.002	1.546	0.015

DRAFT

TRENCH A

Bottom Length:	100.00 ft.
Bottom Width:	10.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	70.644
Total Volume Through Riser (ac-ft):	0.01
Total Volume Through Facility (ac-ft):	70.654
Percent Infiltrated:	99.99
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.023	0.000	0.000	0.000
0.0333	0.023	0.000	0.000	0.150
0.0667	0.023	0.000	0.000	0.150
0.1000	0.023	0.000	0.000	0.150
0.1333	0.023	0.001	0.000	0.150
0.1667	0.023	0.001	0.000	0.150
0.2000	0.023	0.001	0.000	0.150
0.2333	0.023	0.001	0.000	0.150
0.2667	0.023	0.002	0.000	0.150
0.3000	0.023	0.002	0.000	0.150
0.3333	0.023	0.002	0.000	0.150
0.3667	0.023	0.002	0.000	0.150
0.4000	0.023	0.003	0.000	0.150
0.4333	0.023	0.003	0.000	0.150
0.4667	0.023	0.003	0.000	0.150
0.5000	0.023	0.004	0.000	0.150
0.5333	0.023	0.004	0.000	0.150
0.5667	0.023	0.004	0.000	0.150
0.6000	0.023	0.004	0.000	0.150
0.6333	0.023	0.005	0.000	0.150
0.6667	0.023	0.005	0.000	0.150
0.7000	0.023	0.005	0.000	0.150
0.7333	0.023	0.005	0.000	0.150
0.7667	0.023	0.006	0.000	0.150
0.8000	0.023	0.006	0.000	0.150
0.8333	0.023	0.006	0.000	0.150

0.8667	0.023	0.007	0.000	0.150
0.9000	0.023	0.007	0.000	0.150
0.9333	0.023	0.007	0.000	0.150
0.9667	0.023	0.007	0.000	0.150
1.0000	0.023	0.008	0.000	0.150
1.0333	0.023	0.008	0.000	0.150
1.0667	0.023	0.008	0.000	0.150
1.1000	0.023	0.008	0.000	0.150
1.1333	0.023	0.009	0.000	0.150
1.1667	0.023	0.009	0.000	0.150
1.2000	0.023	0.009	0.000	0.150
1.2333	0.023	0.009	0.000	0.150
1.2667	0.023	0.010	0.000	0.150
1.3000	0.023	0.010	0.000	0.150
1.3333	0.023	0.010	0.000	0.150
1.3667	0.023	0.011	0.000	0.150
1.4000	0.023	0.011	0.000	0.150
1.4333	0.023	0.011	0.000	0.150
1.4667	0.023	0.011	0.000	0.150
1.5000	0.023	0.012	0.000	0.150
1.5333	0.023	0.012	0.000	0.150
1.5667	0.023	0.012	0.000	0.150
1.6000	0.023	0.012	0.000	0.150
1.6333	0.023	0.013	0.000	0.150
1.6667	0.023	0.013	0.000	0.150
1.7000	0.023	0.013	0.000	0.150
1.7333	0.023	0.013	0.000	0.150
1.7667	0.023	0.014	0.000	0.150
1.8000	0.023	0.014	0.000	0.150
1.8333	0.023	0.014	0.000	0.150
1.8667	0.023	0.015	0.000	0.150
1.9000	0.023	0.015	0.000	0.150
1.9333	0.023	0.015	0.000	0.150
1.9667	0.023	0.015	0.000	0.150
2.0000	0.023	0.016	0.000	0.150
2.0333	0.023	0.017	0.053	0.150
2.0667	0.023	0.018	0.151	0.150
2.1000	0.023	0.018	0.276	0.150
2.1333	0.023	0.019	0.420	0.150
2.1667	0.023	0.020	0.575	0.150
2.2000	0.023	0.021	0.733	0.150
2.2333	0.023	0.021	0.885	0.150
2.2667	0.023	0.022	1.024	0.150
2.3000	0.023	0.023	1.145	0.150
2.3333	0.023	0.024	1.242	0.150
2.3667	0.023	0.025	1.316	0.150
2.4000	0.023	0.025	1.372	0.150
2.4333	0.023	0.026	1.439	0.150
2.4667	0.023	0.027	1.494	0.150
2.5000	0.023	0.028	1.546	0.150
2.5333	0.023	0.028	1.597	0.150
2.5667	0.023	0.029	1.646	0.150
2.6000	0.023	0.030	1.694	0.150
2.6333	0.023	0.031	1.740	0.150
2.6667	0.023	0.031	1.785	0.150
2.7000	0.023	0.032	1.830	0.150
2.7333	0.023	0.033	1.873	0.150
2.7667	0.023	0.034	1.915	0.150

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2.8000	0.023	0.034	1.956	0.150
2.8333	0.023	0.035	1.996	0.150
2.8667	0.023	0.036	2.036	0.150
2.9000	0.023	0.037	2.075	0.150
2.9333	0.023	0.038	2.113	0.150
2.9667	0.023	0.038	2.150	0.150
3.0000	0.023	0.039	2.187	0.150

DRAFT

TRENCH B

Bottom Length:	95.00 ft.
Bottom Width:	5.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	40.67
Total Volume Through Riser (ac-ft):	0.024
Total Volume Through Facility (ac-ft):	40.693
Percent Infiltrated:	99.94
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2
TRENCH A	

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.010	0.000	0.000	0.000
0.0278	0.010	0.000	0.000	0.071
0.0556	0.010	0.000	0.000	0.071
0.0833	0.010	0.000	0.000	0.071
0.1111	0.010	0.000	0.000	0.071
0.1389	0.010	0.000	0.000	0.071
0.1667	0.010	0.000	0.000	0.071
0.1944	0.010	0.000	0.000	0.071
0.2222	0.010	0.000	0.000	0.071
0.2500	0.010	0.001	0.000	0.071
0.2778	0.010	0.001	0.000	0.071
0.3056	0.010	0.001	0.000	0.071
0.3333	0.010	0.001	0.000	0.071
0.3611	0.010	0.001	0.000	0.071
0.3889	0.010	0.001	0.000	0.071
0.4167	0.010	0.001	0.000	0.071
0.4444	0.010	0.001	0.000	0.071
0.4722	0.010	0.001	0.000	0.071
0.5000	0.010	0.001	0.000	0.071
0.5278	0.010	0.002	0.000	0.071
0.5556	0.010	0.002	0.000	0.071
0.5833	0.010	0.002	0.000	0.071
0.6111	0.010	0.002	0.000	0.071
0.6389	0.010	0.002	0.000	0.071
0.6667	0.010	0.002	0.000	0.071
0.6944	0.010	0.002	0.000	0.071

0.7222	0.010	0.002	0.000	0.071
0.7500	0.010	0.002	0.000	0.071
0.7778	0.010	0.003	0.000	0.071
0.8056	0.010	0.003	0.000	0.071
0.8333	0.010	0.003	0.000	0.071
0.8611	0.010	0.003	0.000	0.071
0.8889	0.010	0.003	0.000	0.071
0.9167	0.010	0.003	0.000	0.071
0.9444	0.010	0.003	0.000	0.071
0.9722	0.010	0.003	0.000	0.071
1.0000	0.010	0.003	0.000	0.071
1.0278	0.010	0.003	0.000	0.071
1.0556	0.010	0.004	0.000	0.071
1.0833	0.010	0.004	0.000	0.071
1.1111	0.010	0.004	0.000	0.071
1.1389	0.010	0.004	0.000	0.071
1.1667	0.010	0.004	0.000	0.071
1.1944	0.010	0.004	0.000	0.071
1.2222	0.010	0.004	0.000	0.071
1.2500	0.010	0.004	0.000	0.071
1.2778	0.010	0.004	0.000	0.071
1.3056	0.010	0.005	0.000	0.071
1.3333	0.010	0.005	0.000	0.071
1.3611	0.010	0.005	0.000	0.071
1.3889	0.010	0.005	0.000	0.071
1.4167	0.010	0.005	0.000	0.071
1.4444	0.010	0.005	0.000	0.071
1.4722	0.010	0.005	0.000	0.071
1.5000	0.010	0.005	0.000	0.071
1.5278	0.010	0.005	0.000	0.071
1.5556	0.010	0.005	0.000	0.071
1.5833	0.010	0.006	0.000	0.071
1.6111	0.010	0.006	0.000	0.071
1.6389	0.010	0.006	0.000	0.071
1.6667	0.010	0.006	0.000	0.071
1.6944	0.010	0.006	0.000	0.071
1.7222	0.010	0.006	0.000	0.071
1.7500	0.010	0.006	0.000	0.071
1.7778	0.010	0.006	0.000	0.071
1.8056	0.010	0.006	0.000	0.071
1.8333	0.010	0.007	0.000	0.071
1.8611	0.010	0.007	0.000	0.071
1.8889	0.010	0.007	0.000	0.071
1.9167	0.010	0.007	0.000	0.071
1.9444	0.010	0.007	0.000	0.071
1.9722	0.010	0.007	0.000	0.071
2.0000	0.010	0.007	0.000	0.071
2.0278	0.010	0.007	0.040	0.071
2.0556	0.010	0.008	0.115	0.071
2.0833	0.010	0.008	0.211	0.071
2.1111	0.010	0.008	0.323	0.071
2.1389	0.010	0.009	0.445	0.071
2.1667	0.010	0.009	0.575	0.071
2.1944	0.010	0.009	0.706	0.071
2.2222	0.010	0.010	0.835	0.071
2.2500	0.010	0.010	0.957	0.071
2.2778	0.010	0.010	1.067	0.071
2.3056	0.010	0.011	1.163	0.071

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2.3333	0.010	0.011	1.242	0.071
2.3611	0.010	0.011	1.305	0.071
2.3889	0.010	0.011	1.355	0.071
2.4167	0.010	0.012	1.396	0.071
2.4444	0.010	0.012	1.458	0.071
2.4722	0.010	0.012	1.503	0.071
2.5000	0.010	0.013	1.546	0.071

DRAFT

TRENCH D

Bottom Length:	85.00 ft.
Bottom Width:	5.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	32.827
Total Volume Through Riser (ac-ft):	0.003
Total Volume Through Facility (ac-ft):	32.83
Percent Infiltrated:	99.99
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2
TRENCH B	

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.009	0.000	0.000	0.000
0.0278	0.009	0.000	0.000	0.063
0.0556	0.009	0.000	0.000	0.063
0.0833	0.009	0.000	0.000	0.063
0.1111	0.009	0.000	0.000	0.063
0.1389	0.009	0.000	0.000	0.063
0.1667	0.009	0.000	0.000	0.063
0.1944	0.009	0.000	0.000	0.063
0.2222	0.009	0.000	0.000	0.063
0.2500	0.009	0.000	0.000	0.063
0.2778	0.009	0.000	0.000	0.063
0.3056	0.009	0.001	0.000	0.063
0.3333	0.009	0.001	0.000	0.063
0.3611	0.009	0.001	0.000	0.063
0.3889	0.009	0.001	0.000	0.063
0.4167	0.009	0.001	0.000	0.063
0.4444	0.009	0.001	0.000	0.063
0.4722	0.009	0.001	0.000	0.063
0.5000	0.009	0.001	0.000	0.063
0.5278	0.009	0.001	0.000	0.063
0.5556	0.009	0.001	0.000	0.063
0.5833	0.009	0.002	0.000	0.063
0.6111	0.009	0.002	0.000	0.063
0.6389	0.009	0.002	0.000	0.063
0.6667	0.009	0.002	0.000	0.063
0.6944	0.009	0.002	0.000	0.063

0.7222	0.009	0.002	0.000	0.063
0.7500	0.009	0.002	0.000	0.063
0.7778	0.009	0.002	0.000	0.063
0.8056	0.009	0.002	0.000	0.063
0.8333	0.009	0.002	0.000	0.063
0.8611	0.009	0.002	0.000	0.063
0.8889	0.009	0.003	0.000	0.063
0.9167	0.009	0.003	0.000	0.063
0.9444	0.009	0.003	0.000	0.063
0.9722	0.009	0.003	0.000	0.063
1.0000	0.009	0.003	0.000	0.063
1.0278	0.009	0.003	0.000	0.063
1.0556	0.009	0.003	0.000	0.063
1.0833	0.009	0.003	0.000	0.063
1.1111	0.009	0.003	0.000	0.063
1.1389	0.009	0.003	0.000	0.063
1.1667	0.009	0.004	0.000	0.063
1.1944	0.009	0.004	0.000	0.063
1.2222	0.009	0.004	0.000	0.063
1.2500	0.009	0.004	0.000	0.063
1.2778	0.009	0.004	0.000	0.063
1.3056	0.009	0.004	0.000	0.063
1.3333	0.009	0.004	0.000	0.063
1.3611	0.009	0.004	0.000	0.063
1.3889	0.009	0.004	0.000	0.063
1.4167	0.009	0.004	0.000	0.063
1.4444	0.009	0.004	0.000	0.063
1.4722	0.009	0.005	0.000	0.063
1.5000	0.009	0.005	0.000	0.063
1.5278	0.009	0.005	0.000	0.063
1.5556	0.009	0.005	0.000	0.063
1.5833	0.009	0.005	0.000	0.063
1.6111	0.009	0.005	0.000	0.063
1.6389	0.009	0.005	0.000	0.063
1.6667	0.009	0.005	0.000	0.063
1.6944	0.009	0.005	0.000	0.063
1.7222	0.009	0.005	0.000	0.063
1.7500	0.009	0.006	0.000	0.063
1.7778	0.009	0.006	0.000	0.063
1.8056	0.009	0.006	0.000	0.063
1.8333	0.009	0.006	0.000	0.063
1.8611	0.009	0.006	0.000	0.063
1.8889	0.009	0.006	0.000	0.063
1.9167	0.009	0.006	0.000	0.063
1.9444	0.009	0.006	0.000	0.063
1.9722	0.009	0.006	0.000	0.063
2.0000	0.009	0.006	0.000	0.063
2.0278	0.009	0.007	0.040	0.063
2.0556	0.009	0.007	0.115	0.063
2.0833	0.009	0.007	0.211	0.063
2.1111	0.009	0.007	0.323	0.063
2.1389	0.009	0.008	0.445	0.063
2.1667	0.009	0.008	0.575	0.063
2.1944	0.009	0.008	0.706	0.063
2.2222	0.009	0.009	0.835	0.063
2.2500	0.009	0.009	0.957	0.063
2.2778	0.009	0.009	1.067	0.063
2.3056	0.009	0.009	1.163	0.063

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2.3333	0.009	0.010	1.242	0.063
2.3611	0.009	0.010	1.305	0.063
2.3889	0.009	0.010	1.355	0.063
2.4167	0.009	0.010	1.396	0.063
2.4444	0.009	0.011	1.458	0.063
2.4722	0.009	0.011	1.503	0.063
2.5000	0.009	0.011	1.546	0.063

DRAFT

TRENCH C

Bottom Length:	65.00 ft.
Bottom Width:	5.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	24.962
Total Volume Through Riser (ac-ft):	0.002
Total Volume Through Facility (ac-ft):	24.965
Percent Infiltrated:	99.99
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2
TRENCH A	

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.007	0.000	0.000	0.000
0.0278	0.007	0.000	0.000	0.048
0.0556	0.007	0.000	0.000	0.048
0.0833	0.007	0.000	0.000	0.048
0.1111	0.007	0.000	0.000	0.048
0.1389	0.007	0.000	0.000	0.048
0.1667	0.007	0.000	0.000	0.048
0.1944	0.007	0.000	0.000	0.048
0.2222	0.007	0.000	0.000	0.048
0.2500	0.007	0.000	0.000	0.048
0.2778	0.007	0.000	0.000	0.048
0.3056	0.007	0.000	0.000	0.048
0.3333	0.007	0.000	0.000	0.048
0.3611	0.007	0.000	0.000	0.048
0.3889	0.007	0.001	0.000	0.048
0.4167	0.007	0.001	0.000	0.048
0.4444	0.007	0.001	0.000	0.048
0.4722	0.007	0.001	0.000	0.048
0.5000	0.007	0.001	0.000	0.048
0.5278	0.007	0.001	0.000	0.048
0.5556	0.007	0.001	0.000	0.048
0.5833	0.007	0.001	0.000	0.048
0.6111	0.007	0.001	0.000	0.048
0.6389	0.007	0.001	0.000	0.048
0.6667	0.007	0.001	0.000	0.048
0.6944	0.007	0.001	0.000	0.048

0.7222	0.007	0.001	0.000	0.048
0.7500	0.007	0.002	0.000	0.048
0.7778	0.007	0.002	0.000	0.048
0.8056	0.007	0.002	0.000	0.048
0.8333	0.007	0.002	0.000	0.048
0.8611	0.007	0.002	0.000	0.048
0.8889	0.007	0.002	0.000	0.048
0.9167	0.007	0.002	0.000	0.048
0.9444	0.007	0.002	0.000	0.048
0.9722	0.007	0.002	0.000	0.048
1.0000	0.007	0.002	0.000	0.048
1.0278	0.007	0.002	0.000	0.048
1.0556	0.007	0.002	0.000	0.048
1.0833	0.007	0.002	0.000	0.048
1.1111	0.007	0.002	0.000	0.048
1.1389	0.007	0.003	0.000	0.048
1.1667	0.007	0.003	0.000	0.048
1.1944	0.007	0.003	0.000	0.048
1.2222	0.007	0.003	0.000	0.048
1.2500	0.007	0.003	0.000	0.048
1.2778	0.007	0.003	0.000	0.048
1.3056	0.007	0.003	0.000	0.048
1.3333	0.007	0.003	0.000	0.048
1.3611	0.007	0.003	0.000	0.048
1.3889	0.007	0.003	0.000	0.048
1.4167	0.007	0.003	0.000	0.048
1.4444	0.007	0.003	0.000	0.048
1.4722	0.007	0.003	0.000	0.048
1.5000	0.007	0.003	0.000	0.048
1.5278	0.007	0.004	0.000	0.048
1.5556	0.007	0.004	0.000	0.048
1.5833	0.007	0.004	0.000	0.048
1.6111	0.007	0.004	0.000	0.048
1.6389	0.007	0.004	0.000	0.048
1.6667	0.007	0.004	0.000	0.048
1.6944	0.007	0.004	0.000	0.048
1.7222	0.007	0.004	0.000	0.048
1.7500	0.007	0.004	0.000	0.048
1.7778	0.007	0.004	0.000	0.048
1.8056	0.007	0.004	0.000	0.048
1.8333	0.007	0.004	0.000	0.048
1.8611	0.007	0.004	0.000	0.048
1.8889	0.007	0.004	0.000	0.048
1.9167	0.007	0.005	0.000	0.048
1.9444	0.007	0.005	0.000	0.048
1.9722	0.007	0.005	0.000	0.048
2.0000	0.007	0.005	0.000	0.048
2.0278	0.007	0.005	0.040	0.048
2.0556	0.007	0.005	0.115	0.048
2.0833	0.007	0.005	0.211	0.048
2.1111	0.007	0.006	0.323	0.048
2.1389	0.007	0.006	0.445	0.048
2.1667	0.007	0.006	0.575	0.048
2.1944	0.007	0.006	0.706	0.048
2.2222	0.007	0.006	0.835	0.048
2.2500	0.007	0.007	0.957	0.048
2.2778	0.007	0.007	1.067	0.048
2.3056	0.007	0.007	1.163	0.048

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2.3333	0.007	0.007	1.242	0.048
2.3611	0.007	0.007	1.305	0.048
2.3889	0.007	0.008	1.355	0.048
2.4167	0.007	0.008	1.396	0.048
2.4444	0.007	0.008	1.458	0.048
2.4722	0.007	0.008	1.503	0.048
2.5000	0.007	0.009	1.546	0.048

DRAFT

TRENCH E

Bottom Length:	75.00 ft.
Bottom Width:	20.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	4.5
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	124.147
Total Volume Through Riser (ac-ft):	0
Total Volume Through Facility (ac-ft):	124.147
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	4.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

TRENCH F

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.034	0.000	0.000	0.000
0.0556	0.034	0.000	0.000	0.225
0.1111	0.034	0.001	0.000	0.225
0.1667	0.034	0.002	0.000	0.225
0.2222	0.034	0.002	0.000	0.225
0.2778	0.034	0.003	0.000	0.225
0.3333	0.034	0.004	0.000	0.225
0.3889	0.034	0.004	0.000	0.225
0.4444	0.034	0.005	0.000	0.225
0.5000	0.034	0.006	0.000	0.225
0.5556	0.034	0.006	0.000	0.225
0.6111	0.034	0.007	0.000	0.225
0.6667	0.034	0.008	0.000	0.225
0.7222	0.034	0.008	0.000	0.225
0.7778	0.034	0.009	0.000	0.225
0.8333	0.034	0.010	0.000	0.225
0.8889	0.034	0.010	0.000	0.225
0.9444	0.034	0.011	0.000	0.225
1.0000	0.034	0.012	0.000	0.225
1.0556	0.034	0.012	0.000	0.225
1.1111	0.034	0.013	0.000	0.225
1.1667	0.034	0.014	0.000	0.225
1.2222	0.034	0.014	0.000	0.225
1.2778	0.034	0.015	0.000	0.225
1.3333	0.034	0.016	0.000	0.225
1.3889	0.034	0.016	0.000	0.225

1.4444	0.034	0.017	0.000	0.225
1.5000	0.034	0.018	0.000	0.225
1.5556	0.034	0.018	0.000	0.225
1.6111	0.034	0.019	0.000	0.225
1.6667	0.034	0.020	0.000	0.225
1.7222	0.034	0.020	0.000	0.225
1.7778	0.034	0.021	0.000	0.225
1.8333	0.034	0.022	0.000	0.225
1.8889	0.034	0.022	0.000	0.225
1.9444	0.034	0.023	0.000	0.225
2.0000	0.034	0.024	0.000	0.225
2.0556	0.034	0.024	0.000	0.225
2.1111	0.034	0.025	0.000	0.225
2.1667	0.034	0.026	0.000	0.225
2.2222	0.034	0.026	0.000	0.225
2.2778	0.034	0.027	0.000	0.225
2.3333	0.034	0.028	0.000	0.225
2.3889	0.034	0.028	0.000	0.225
2.4444	0.034	0.029	0.000	0.225
2.5000	0.034	0.030	0.000	0.225
2.5556	0.034	0.030	0.000	0.225
2.6111	0.034	0.031	0.000	0.225
2.6667	0.034	0.032	0.000	0.225
2.7222	0.034	0.032	0.000	0.225
2.7778	0.034	0.033	0.000	0.225
2.8333	0.034	0.034	0.000	0.225
2.8889	0.034	0.034	0.000	0.225
2.9444	0.034	0.035	0.000	0.225
3.0000	0.034	0.036	0.000	0.225
3.0556	0.034	0.036	0.000	0.225
3.1111	0.034	0.037	0.000	0.225
3.1667	0.034	0.038	0.000	0.225
3.2222	0.034	0.038	0.000	0.225
3.2778	0.034	0.039	0.000	0.225
3.3333	0.034	0.040	0.000	0.225
3.3889	0.034	0.040	0.000	0.225
3.4444	0.034	0.041	0.000	0.225
3.5000	0.034	0.042	0.000	0.225
3.5556	0.034	0.042	0.000	0.225
3.6111	0.034	0.043	0.000	0.225
3.6667	0.034	0.044	0.000	0.225
3.7222	0.034	0.044	0.000	0.225
3.7778	0.034	0.045	0.000	0.225
3.8333	0.034	0.046	0.000	0.225
3.8889	0.034	0.046	0.000	0.225
3.9444	0.034	0.047	0.000	0.225
4.0000	0.034	0.048	0.000	0.225
4.0556	0.034	0.048	0.000	0.225
4.1111	0.034	0.049	0.000	0.225
4.1667	0.034	0.050	0.000	0.225
4.2222	0.034	0.050	0.000	0.225
4.2778	0.034	0.051	0.000	0.225
4.3333	0.034	0.052	0.000	0.225
4.3889	0.034	0.052	0.000	0.225
4.4444	0.034	0.053	0.000	0.225
4.5000	0.034	0.054	0.000	0.225
4.5556	0.034	0.056	0.115	0.225
4.6111	0.034	0.058	0.323	0.225

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4.6667	0.034	0.060	0.575	0.225
4.7222	0.034	0.061	0.835	0.225
4.7778	0.034	0.063	1.067	0.225
4.8333	0.034	0.065	1.242	0.225
4.8889	0.034	0.067	1.355	0.225
4.9444	0.034	0.069	1.458	0.225
5.0000	0.034	0.071	1.546	0.225

DRAFT

TRENCH F

Bottom Length:	85.00 ft.
Bottom Width:	4.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	12.363
Total Volume Through Riser (ac-ft):	0
Total Volume Through Facility (ac-ft):	12.363
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

TRENCH G

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.007	0.000	0.000	0.000
0.0222	0.007	0.000	0.000	0.051
0.0444	0.007	0.000	0.000	0.051
0.0667	0.007	0.000	0.000	0.051
0.0889	0.007	0.000	0.000	0.051
0.1111	0.007	0.000	0.000	0.051
0.1333	0.007	0.000	0.000	0.051
0.1556	0.007	0.000	0.000	0.051
0.1778	0.007	0.000	0.000	0.051
0.2000	0.007	0.000	0.000	0.051
0.2222	0.007	0.000	0.000	0.051
0.2444	0.007	0.000	0.000	0.051
0.2667	0.007	0.000	0.000	0.051
0.2889	0.007	0.000	0.000	0.051
0.3111	0.007	0.000	0.000	0.051
0.3333	0.007	0.000	0.000	0.051
0.3556	0.007	0.001	0.000	0.051
0.3778	0.007	0.001	0.000	0.051
0.4000	0.007	0.001	0.000	0.051
0.4222	0.007	0.001	0.000	0.051
0.4444	0.007	0.001	0.000	0.051
0.4667	0.007	0.001	0.000	0.051
0.4889	0.007	0.001	0.000	0.051
0.5111	0.007	0.001	0.000	0.051
0.5333	0.007	0.001	0.000	0.051
0.5556	0.007	0.001	0.000	0.051

0.5778	0.007	0.001	0.000	0.051
0.6000	0.007	0.001	0.000	0.051
0.6222	0.007	0.001	0.000	0.051
0.6444	0.007	0.001	0.000	0.051
0.6667	0.007	0.001	0.000	0.051
0.6889	0.007	0.001	0.000	0.051
0.7111	0.007	0.001	0.000	0.051
0.7333	0.007	0.002	0.000	0.051
0.7556	0.007	0.002	0.000	0.051
0.7778	0.007	0.002	0.000	0.051
0.8000	0.007	0.002	0.000	0.051
0.8222	0.007	0.002	0.000	0.051
0.8444	0.007	0.002	0.000	0.051
0.8667	0.007	0.002	0.000	0.051
0.8889	0.007	0.002	0.000	0.051
0.9111	0.007	0.002	0.000	0.051
0.9333	0.007	0.002	0.000	0.051
0.9556	0.007	0.002	0.000	0.051
0.9778	0.007	0.002	0.000	0.051
1.0000	0.007	0.002	0.000	0.051
1.0222	0.007	0.002	0.000	0.051
1.0444	0.007	0.002	0.000	0.051
1.0667	0.007	0.002	0.000	0.051
1.0889	0.007	0.003	0.000	0.051
1.1111	0.007	0.003	0.000	0.051
1.1333	0.007	0.003	0.000	0.051
1.1556	0.007	0.003	0.000	0.051
1.1778	0.007	0.003	0.000	0.051
1.2000	0.007	0.003	0.000	0.051
1.2222	0.007	0.003	0.000	0.051
1.2444	0.007	0.003	0.000	0.051
1.2667	0.007	0.003	0.000	0.051
1.2889	0.007	0.003	0.000	0.051
1.3111	0.007	0.003	0.000	0.051
1.3333	0.007	0.003	0.000	0.051
1.3556	0.007	0.003	0.000	0.051
1.3778	0.007	0.003	0.000	0.051
1.4000	0.007	0.003	0.000	0.051
1.4222	0.007	0.003	0.000	0.051
1.4444	0.007	0.003	0.000	0.051
1.4667	0.007	0.004	0.000	0.051
1.4889	0.007	0.004	0.000	0.051
1.5111	0.007	0.004	0.010	0.051
1.5333	0.007	0.004	0.053	0.051
1.5556	0.007	0.004	0.115	0.051
1.5778	0.007	0.004	0.190	0.051
1.6000	0.007	0.004	0.276	0.051
1.6222	0.007	0.005	0.371	0.051
1.6444	0.007	0.005	0.471	0.051
1.6667	0.007	0.005	0.575	0.051
1.6889	0.007	0.005	0.680	0.051
1.7111	0.007	0.005	0.784	0.051
1.7333	0.007	0.006	0.885	0.051
1.7556	0.007	0.006	0.980	0.051
1.7778	0.007	0.006	1.067	0.051
1.8000	0.007	0.006	1.145	0.051
1.8222	0.007	0.006	1.212	0.051
1.8444	0.007	0.006	1.269	0.051

DRAFT

1.8667	0.007	0.007	1.316	0.051
1.8889	0.007	0.007	1.355	0.051
1.9111	0.007	0.007	1.388	0.051
1.9333	0.007	0.007	1.439	0.051
1.9556	0.007	0.007	1.476	0.051
1.9778	0.007	0.007	1.511	0.051
2.0000	0.007	0.008	1.546	0.051

DRAFT

TRENCH G

Bottom Length:	80.00 ft.
Bottom Width:	7.00 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	43.774
Total Volume Through Riser (ac-ft):	0.011
Total Volume Through Facility (ac-ft):	43.784
Percent Infiltrated:	99.98
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

TRENCH H

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.012	0.000	0.000	0.000
0.0222	0.012	0.000	0.000	0.084
0.0444	0.012	0.000	0.000	0.084
0.0667	0.012	0.000	0.000	0.084
0.0889	0.012	0.000	0.000	0.084
0.1111	0.012	0.000	0.000	0.084
0.1333	0.012	0.000	0.000	0.084
0.1556	0.012	0.000	0.000	0.084
0.1778	0.012	0.000	0.000	0.084
0.2000	0.012	0.000	0.000	0.084
0.2222	0.012	0.001	0.000	0.084
0.2444	0.012	0.001	0.000	0.084
0.2667	0.012	0.001	0.000	0.084
0.2889	0.012	0.001	0.000	0.084
0.3111	0.012	0.001	0.000	0.084
0.3333	0.012	0.001	0.000	0.084
0.3556	0.012	0.001	0.000	0.084
0.3778	0.012	0.001	0.000	0.084
0.4000	0.012	0.001	0.000	0.084
0.4222	0.012	0.001	0.000	0.084
0.4444	0.012	0.002	0.000	0.084
0.4667	0.012	0.002	0.000	0.084
0.4889	0.012	0.002	0.000	0.084
0.5111	0.012	0.002	0.000	0.084
0.5333	0.012	0.002	0.000	0.084
0.5556	0.012	0.002	0.000	0.084

0.5778	0.012	0.002	0.000	0.084
0.6000	0.012	0.002	0.000	0.084
0.6222	0.012	0.002	0.000	0.084
0.6444	0.012	0.002	0.000	0.084
0.6667	0.012	0.003	0.000	0.084
0.6889	0.012	0.003	0.000	0.084
0.7111	0.012	0.003	0.000	0.084
0.7333	0.012	0.003	0.000	0.084
0.7556	0.012	0.003	0.000	0.084
0.7778	0.012	0.003	0.000	0.084
0.8000	0.012	0.003	0.000	0.084
0.8222	0.012	0.003	0.000	0.084
0.8444	0.012	0.003	0.000	0.084
0.8667	0.012	0.003	0.000	0.084
0.8889	0.012	0.004	0.000	0.084
0.9111	0.012	0.004	0.000	0.084
0.9333	0.012	0.004	0.000	0.084
0.9556	0.012	0.004	0.000	0.084
0.9778	0.012	0.004	0.000	0.084
1.0000	0.012	0.004	0.000	0.084
1.0222	0.012	0.004	0.000	0.084
1.0444	0.012	0.004	0.000	0.084
1.0667	0.012	0.004	0.000	0.084
1.0889	0.012	0.004	0.000	0.084
1.1111	0.012	0.005	0.000	0.084
1.1333	0.012	0.005	0.000	0.084
1.1556	0.012	0.005	0.000	0.084
1.1778	0.012	0.005	0.000	0.084
1.2000	0.012	0.005	0.000	0.084
1.2222	0.012	0.005	0.000	0.084
1.2444	0.012	0.005	0.000	0.084
1.2667	0.012	0.005	0.000	0.084
1.2889	0.012	0.005	0.000	0.084
1.3111	0.012	0.005	0.000	0.084
1.3333	0.012	0.006	0.000	0.084
1.3556	0.012	0.006	0.000	0.084
1.3778	0.012	0.006	0.000	0.084
1.4000	0.012	0.006	0.000	0.084
1.4222	0.012	0.006	0.000	0.084
1.4444	0.012	0.006	0.000	0.084
1.4667	0.012	0.006	0.000	0.084
1.4889	0.012	0.006	0.000	0.084
1.5111	0.012	0.007	0.010	0.084
1.5333	0.012	0.007	0.053	0.084
1.5556	0.012	0.007	0.115	0.084
1.5778	0.012	0.007	0.190	0.084
1.6000	0.012	0.008	0.276	0.084
1.6222	0.012	0.008	0.371	0.084
1.6444	0.012	0.008	0.471	0.084
1.6667	0.012	0.009	0.575	0.084
1.6889	0.012	0.009	0.680	0.084
1.7111	0.012	0.009	0.784	0.084
1.7333	0.012	0.009	0.885	0.084
1.7556	0.012	0.010	0.980	0.084
1.7778	0.012	0.010	1.067	0.084
1.8000	0.012	0.010	1.145	0.084
1.8222	0.012	0.011	1.212	0.084
1.8444	0.012	0.011	1.269	0.084

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1.8667	0.012	0.011	1.316	0.084
1.8889	0.012	0.011	1.355	0.084
1.9111	0.012	0.012	1.388	0.084
1.9333	0.012	0.012	1.439	0.084
1.9556	0.012	0.012	1.476	0.084
1.9778	0.012	0.013	1.511	0.084
2.0000	0.012	0.013	1.546	0.084

DRAFT

TRENCH H

Bottom Length:	100.00 ft.
Bottom Width:	3.50 ft.
Trench bottom slope 1:	0.001 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	2.5
Pour Space of material for first layer:	0.35
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.5
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft):	29.721
Total Volume Through Riser (ac-ft):	0.017
Total Volume Through Facility (ac-ft):	29.737
Percent Infiltrated:	99.95
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

DRAFT

Gravel Trench Bed Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.008	0.000	0.000	0.000
0.0333	0.008	0.000	0.000	0.052
0.0667	0.008	0.000	0.000	0.052
0.1000	0.008	0.000	0.000	0.052
0.1333	0.008	0.000	0.000	0.052
0.1667	0.008	0.000	0.000	0.052
0.2000	0.008	0.000	0.000	0.052
0.2333	0.008	0.000	0.000	0.052
0.2667	0.008	0.000	0.000	0.052
0.3000	0.008	0.000	0.000	0.052
0.3333	0.008	0.000	0.000	0.052
0.3667	0.008	0.001	0.000	0.052
0.4000	0.008	0.001	0.000	0.052
0.4333	0.008	0.001	0.000	0.052
0.4667	0.008	0.001	0.000	0.052
0.5000	0.008	0.001	0.000	0.052
0.5333	0.008	0.001	0.000	0.052
0.5667	0.008	0.001	0.000	0.052
0.6000	0.008	0.001	0.000	0.052
0.6333	0.008	0.001	0.000	0.052
0.6667	0.008	0.001	0.000	0.052
0.7000	0.008	0.002	0.000	0.052
0.7333	0.008	0.002	0.000	0.052
0.7667	0.008	0.002	0.000	0.052
0.8000	0.008	0.002	0.000	0.052
0.8333	0.008	0.002	0.000	0.052

0.8667	0.008	0.002	0.000	0.052
0.9000	0.008	0.002	0.000	0.052
0.9333	0.008	0.002	0.000	0.052
0.9667	0.008	0.002	0.000	0.052
1.0000	0.008	0.002	0.000	0.052
1.0333	0.008	0.002	0.000	0.052
1.0667	0.008	0.003	0.000	0.052
1.1000	0.008	0.003	0.000	0.052
1.1333	0.008	0.003	0.000	0.052
1.1667	0.008	0.003	0.000	0.052
1.2000	0.008	0.003	0.000	0.052
1.2333	0.008	0.003	0.000	0.052
1.2667	0.008	0.003	0.000	0.052
1.3000	0.008	0.003	0.000	0.052
1.3333	0.008	0.003	0.000	0.052
1.3667	0.008	0.003	0.000	0.052
1.4000	0.008	0.003	0.000	0.052
1.4333	0.008	0.004	0.000	0.052
1.4667	0.008	0.004	0.000	0.052
1.5000	0.008	0.004	0.000	0.052
1.5333	0.008	0.004	0.000	0.052
1.5667	0.008	0.004	0.000	0.052
1.6000	0.008	0.004	0.000	0.052
1.6333	0.008	0.004	0.000	0.052
1.6667	0.008	0.004	0.000	0.052
1.7000	0.008	0.004	0.000	0.052
1.7333	0.008	0.004	0.000	0.052
1.7667	0.008	0.005	0.000	0.052
1.8000	0.008	0.005	0.000	0.052
1.8333	0.008	0.005	0.000	0.052
1.8667	0.008	0.005	0.000	0.052
1.9000	0.008	0.005	0.000	0.052
1.9333	0.008	0.005	0.000	0.052
1.9667	0.008	0.005	0.000	0.052
2.0000	0.008	0.005	0.000	0.052
2.0333	0.008	0.005	0.000	0.052
2.0667	0.008	0.005	0.000	0.052
2.1000	0.008	0.005	0.000	0.052
2.1333	0.008	0.006	0.000	0.052
2.1667	0.008	0.006	0.000	0.052
2.2000	0.008	0.006	0.000	0.052
2.2333	0.008	0.006	0.000	0.052
2.2667	0.008	0.006	0.000	0.052
2.3000	0.008	0.006	0.000	0.052
2.3333	0.008	0.006	0.000	0.052
2.3667	0.008	0.006	0.000	0.052
2.4000	0.008	0.006	0.000	0.052
2.4333	0.008	0.006	0.000	0.052
2.4667	0.008	0.006	0.000	0.052
2.5000	0.008	0.007	0.000	0.052
2.5333	0.008	0.007	0.053	0.052
2.5667	0.008	0.007	0.151	0.052
2.6000	0.008	0.008	0.276	0.052
2.6333	0.008	0.008	0.420	0.052
2.6667	0.008	0.008	0.575	0.052
2.7000	0.008	0.008	0.733	0.052
2.7333	0.008	0.009	0.885	0.052
2.7667	0.008	0.009	1.024	0.052

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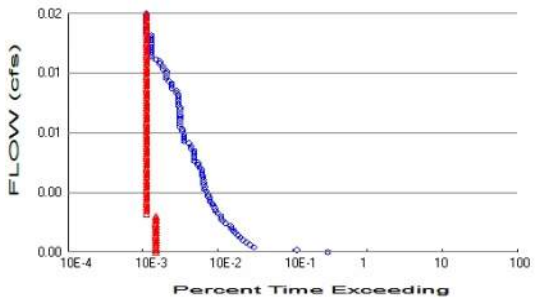
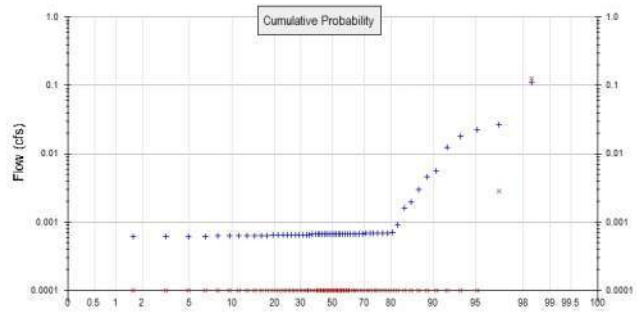
2.8000	0.008	0.009	1.145	0.052
2.8333	0.008	0.009	1.242	0.052
2.8667	0.008	0.010	1.316	0.052
2.9000	0.008	0.010	1.372	0.052
2.9333	0.008	0.010	1.439	0.052
2.9667	0.008	0.011	1.494	0.052
3.0000	0.008	0.011	1.546	0.052

DRAFT

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.36
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.39
Total Impervious Area: 2.97

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000872
5 year	0.002393
10 year	0.004433
25 year	0.009176
50 year	0.015272
100 year	0.02481

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.001	0.000
1950	0.023	0.000
1951	0.012	0.000
1952	0.001	0.000
1953	0.001	0.000
1954	0.001	0.000
1955	0.001	0.000
1956	0.003	0.000
1957	0.001	0.000
1958	0.001	0.000

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1959	0.001	0.000
1960	0.002	0.000
1961	0.001	0.000
1962	0.001	0.000
1963	0.001	0.000
1964	0.001	0.000
1965	0.001	0.000
1966	0.001	0.000
1967	0.001	0.000
1968	0.001	0.000
1969	0.001	0.000
1970	0.001	0.000
1971	0.001	0.000
1972	0.018	0.000
1973	0.001	0.000
1974	0.001	0.000
1975	0.001	0.000
1976	0.001	0.000
1977	0.001	0.000
1978	0.001	0.000
1979	0.001	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.001	0.000
1983	0.001	0.000
1984	0.001	0.000
1985	0.001	0.000
1986	0.001	0.000
1987	0.001	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.001	0.000
1991	0.006	0.000
1992	0.001	0.000
1993	0.001	0.000
1994	0.001	0.000
1995	0.001	0.000
1996	0.027	0.000
1997	0.005	0.000
1998	0.001	0.000
1999	0.002	0.000
2000	0.001	0.000
2001	0.001	0.000
2002	0.001	0.000
2003	0.001	0.000
2004	0.001	0.128
2005	0.001	0.000
2006	0.001	0.000
2007	0.110	0.000
2008	0.001	0.003
2009	0.001	0.000

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Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1096	0.1283
2	0.0267	0.0028
3	0.0226	0.0000

4	0.0181	0.0000
5	0.0124	0.0000
6	0.0056	0.0000
7	0.0045	0.0000
8	0.0030	0.0000
9	0.0019	0.0000
10	0.0016	0.0000
11	0.0009	0.0000
12	0.0007	0.0000
13	0.0007	0.0000
14	0.0007	0.0000
15	0.0007	0.0000
16	0.0007	0.0000
17	0.0007	0.0000
18	0.0007	0.0000
19	0.0007	0.0000
20	0.0007	0.0000
21	0.0007	0.0000
22	0.0007	0.0000
23	0.0007	0.0000
24	0.0007	0.0000
25	0.0007	0.0000
26	0.0007	0.0000
27	0.0007	0.0000
28	0.0007	0.0000
29	0.0007	0.0000
30	0.0007	0.0000
31	0.0007	0.0000
32	0.0007	0.0000
33	0.0007	0.0000
34	0.0007	0.0000
35	0.0007	0.0000
36	0.0007	0.0000
37	0.0007	0.0000
38	0.0007	0.0000
39	0.0007	0.0000
40	0.0007	0.0000
41	0.0007	0.0000
42	0.0007	0.0000
43	0.0007	0.0000
44	0.0007	0.0000
45	0.0007	0.0000
46	0.0006	0.0000
47	0.0006	0.0000
48	0.0006	0.0000
49	0.0006	0.0000
50	0.0006	0.0000
51	0.0006	0.0000
52	0.0006	0.0000
53	0.0006	0.0000
54	0.0006	0.0000
55	0.0006	0.0000
56	0.0006	0.0000
57	0.0006	0.0000
58	0.0006	0.0000
59	0.0006	0.0000
60	0.0006	0.0000
61	0.0005	0.0000

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Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	1575	8	0	Pass
0.0006	613	8	1	Pass
0.0007	166	8	4	Pass
0.0009	142	8	5	Pass
0.0010	128	8	6	Pass
0.0012	116	8	6	Pass
0.0013	108	8	7	Pass
0.0015	100	8	8	Pass
0.0016	92	8	8	Pass
0.0018	87	8	9	Pass
0.0019	81	8	9	Pass
0.0021	79	8	10	Pass
0.0022	68	8	11	Pass
0.0024	63	8	12	Pass
0.0025	59	8	13	Pass
0.0027	59	8	13	Pass
0.0028	54	6	11	Pass
0.0030	50	6	12	Pass
0.0031	49	6	12	Pass
0.0033	47	6	12	Pass
0.0034	46	6	13	Pass
0.0036	43	6	13	Pass
0.0037	42	6	14	Pass
0.0039	40	6	15	Pass
0.0040	40	6	15	Pass
0.0042	38	6	15	Pass
0.0043	36	6	16	Pass
0.0045	36	6	16	Pass
0.0046	35	6	17	Pass
0.0048	35	6	17	Pass
0.0049	35	6	17	Pass
0.0051	34	6	17	Pass
0.0052	33	6	18	Pass
0.0054	33	6	18	Pass
0.0055	33	6	18	Pass
0.0057	31	6	19	Pass
0.0058	29	6	20	Pass
0.0060	29	6	20	Pass
0.0061	26	6	23	Pass
0.0063	26	6	23	Pass
0.0064	26	6	23	Pass
0.0066	26	6	23	Pass
0.0067	26	6	23	Pass
0.0069	24	6	25	Pass
0.0070	24	6	25	Pass
0.0072	22	6	27	Pass
0.0073	19	6	31	Pass
0.0075	19	6	31	Pass
0.0076	19	6	31	Pass
0.0078	19	6	31	Pass
0.0079	18	6	33	Pass
0.0081	18	6	33	Pass
0.0082	17	6	35	Pass

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0.0084	17	6	35	Pass
0.0085	17	6	35	Pass
0.0087	17	6	35	Pass
0.0088	17	6	35	Pass
0.0090	17	6	35	Pass
0.0091	17	6	35	Pass
0.0093	17	6	35	Pass
0.0094	17	6	35	Pass
0.0096	16	6	37	Pass
0.0097	16	6	37	Pass
0.0099	16	6	37	Pass
0.0100	16	6	37	Pass
0.0102	16	6	37	Pass
0.0103	15	6	40	Pass
0.0105	15	6	40	Pass
0.0106	13	6	46	Pass
0.0108	13	6	46	Pass
0.0109	13	6	46	Pass
0.0111	12	6	50	Pass
0.0112	11	6	54	Pass
0.0114	11	6	54	Pass
0.0115	11	6	54	Pass
0.0117	11	6	54	Pass
0.0118	10	6	60	Pass
0.0120	10	6	60	Pass
0.0121	9	6	66	Pass
0.0123	9	6	66	Pass
0.0124	8	6	75	Pass
0.0126	7	6	85	Pass
0.0127	7	6	85	Pass
0.0129	7	6	85	Pass
0.0130	7	6	85	Pass
0.0132	7	6	85	Pass
0.0133	7	6	85	Pass
0.0135	7	6	85	Pass
0.0136	7	6	85	Pass
0.0138	7	6	85	Pass
0.0139	7	6	85	Pass
0.0141	6	6	100	Pass
0.0142	6	6	100	Pass
0.0144	6	6	100	Pass
0.0145	6	6	100	Pass
0.0147	6	6	100	Pass
0.0148	6	6	100	Pass
0.0150	6	6	100	Pass
0.0151	6	6	100	Pass
0.0153	6	6	100	Pass

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Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

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LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
TRENCH J POC	☐	34.41			☐	99.32			
TRENCH K	☐	35.82			☐	99.23			
TRENCH M	☐	8.61			☐	97.10			
TRENCH A POC	☐	64.48			☐	99.70			
TRENCH B	☐	37.24			☐	99.39			
TRENCH D	☐	30.07			☐	99.33			
TRENCH C	☐	22.92			☐	99.13			
TRENCH H POC	☐	27.24			☐	99.30			
TRENCH G	☐	40.09			☐	99.35			
TRENCH F	☐	11.49			☐	97.94			
TRENCH E	☐	113.12			☐	99.87			
Total Volume Infiltrated		425.48	0.00	0.00		99.43	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

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Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

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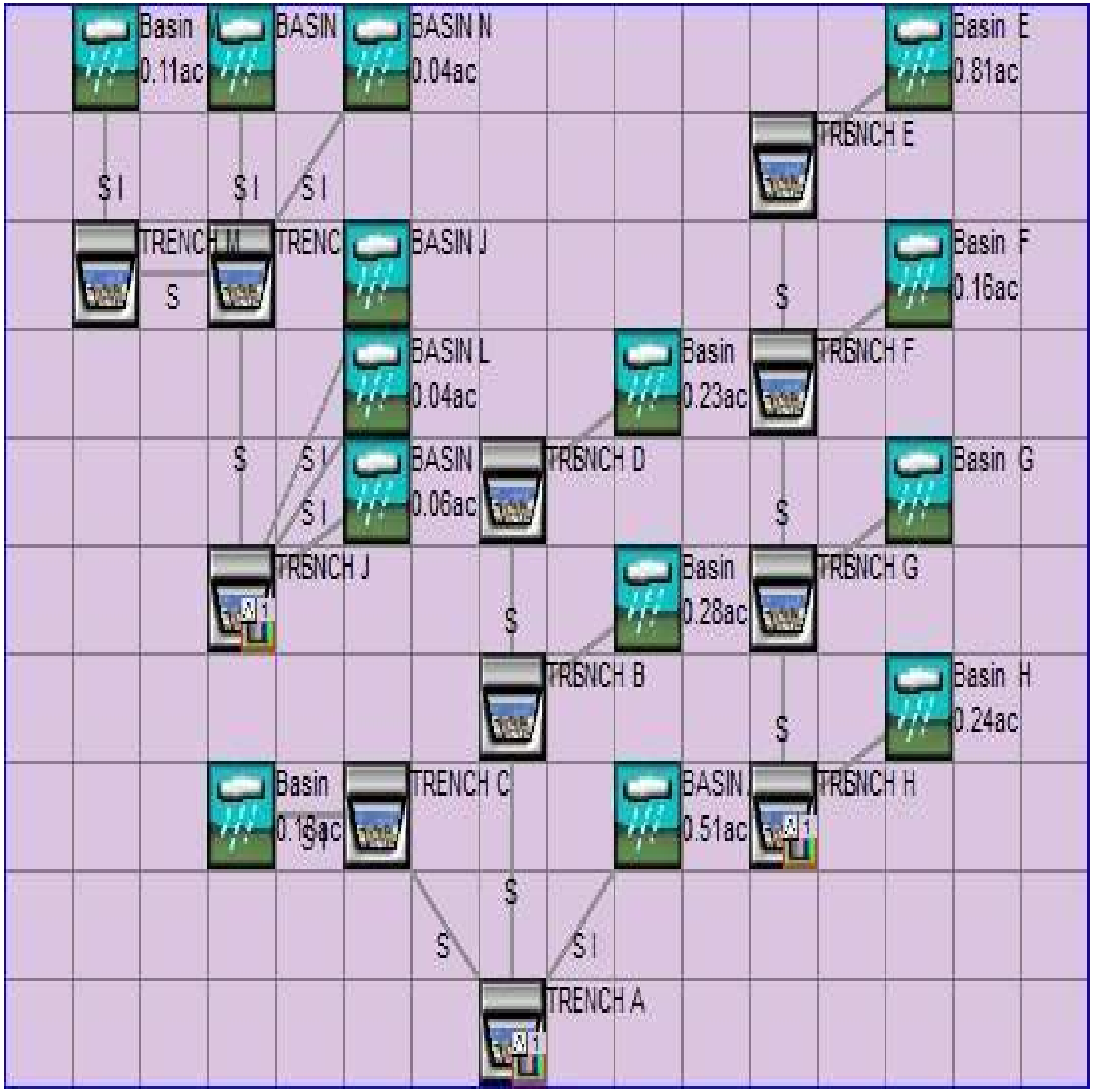
Appendix

Predeveloped Schematic

Mitigated Schematic



GEOTECHNICAL ENGINEERING REPORT

PREPARED BY:

THE RILEY GROUP, INC.
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BOTHELL, WASHINGTON 98011

PREPARED FOR:

MAPLE MULTI-FAMILY TX L.P.
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RGI PROJECT NO. 2015-111

MARYMOOR PARK APARTMENTS
6081 AND 6213 EAST LAKE SAMMAMISH PARKWAY
REDMOND, WASHINGTON

JULY 31, 2015

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RILEYGROUP

July 31, 2015

Mr. Mark Hoyt
Maple Multi-Family TX L.P.
101 Stewart Street, Suite 935
Seattle, Washington 98101

Subject: **Geotechnical Engineering Report**
Marymoor Park Apartments
6018 and 6213 East Lake Sammamish Parkway
Redmond, Washington
RGI Project No. 2015-111

Dear Mr. Hoyt:

As requested, The Riley Group, Inc. (RGI) has performed a Geotechnical Engineering Report (GER) for the above-referenced subject site. Our services were completed in accordance with our proposal PRP2015-161 forwarded to you June 22, 2015 and authorized by you on July 13, 2015. The information in this report is based on our understanding of the proposed construction, and the soil and groundwater conditions encountered in the test pits and borings completed by RGI at the site on July 23 and 29, 2015.

RGI recommends that you submit the project plans and specifications to RGI for a general review so that we may confirm that the recommendations in this report are interpreted and implemented properly in the construction documents. RGI also recommends that a representative of our firm be present on site during portions of the project construction to confirm that the soil and groundwater conditions are consistent with those that form the basis for the engineering recommendations in this report.

If you have any questions or require additional information, please contact us.

Sincerely yours,

THE RILEY GROUP, INC.

RICKY RUNQI WANG
STATE OF WASHINGTON
35013
REGISTERED
PROFESSIONAL ENGINEER

7/31/2015

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Executive Summary

This Executive Summary should be used in conjunction with the entire Geotechnical Engineering Report (GER) for design and/or construction purposes. It should be recognized that specific details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. Section 7.0 should be read for an understanding of limitations.

RGI's geotechnical scope of work included the advancement of three test borings to 26.5 feet and six test pits to depths of 12 feet below ground surface (bgs).

Based on the information obtained from our subsurface exploration, the site is suitable for development of the proposed project. The following geotechnical considerations were identified:

Soil Conditions: The site is underlain by loose to medium dense sand with silt and gravel with trace of cobbles with occasional layers of sandy gravel. An organic layer was encountered from 3 to 5 feet in TP-4 underlying silty sand fill in the southwest corner of the site.

Groundwater: Groundwater was encountered from 9 feet to 17 feet bgs (or Elevation 27 to 29 feet) in all three borings and three of the six test pits during field exploration.

Foundations: The foundations for the proposed apartment building may be supported on conventional spread footings bearing on medium dense native soil or structural fill. The organic soil is not suitable for supporting the proposed building foundation. It should be overexcavated (where encountered) and replaced with structural fill.

Slab-on-grade: Slab-on-grade floors for the proposed building can be supported on native soil or structural fill.

Pavements: The parking around the proposed apartment and retail should include the following sections:

- **For heavy truck traffic areas**: 3 inches of asphalt concrete (AC) over 6 inches of crushed rock base (CRB) over compacted native soil or structural fill; and
- **For general parking areas**: 2 inches of AC over 4 inches of CRB over compacted native soil or structural fill.

1.0 Introduction

This Geotechnical Engineering Report (GER) presents the results of the geotechnical engineering services provided for an apartment complex located at 6081 and 6213 East Lake Sammamish Parkway in Redmond, Washington. The approximate location of the site is shown on Figure 1. The site is currently occupied by a single-family residence.

RGI understands that a 3- to 5-story apartment complex will be constructed on the site with associated utilities, drive ways, and parking areas. No underground parking or basement is proposed. Our understanding of the project is based on a site plan prepared by Jackson Main Architects in May 2015.

The recommendations in the following sections of this GER are based upon our current understanding of the proposed site development as outlined below. If actual features vary or changes are made, we should review them in order to modify our recommendations as required. In addition, RGI requests to review the site grading plan, final design drawings and specifications when available to verify that our project understanding is correct and that our recommendations have been properly interpreted and incorporated into the project design and construction.

2.0 Project description

The project site is located at 6081 and 6213 East Lake Sammamish Parkway in Redmond, Washington. The approximate location of the site is shown on Figure 1.

The site is occupied by a single-family residence in the south portion of the site. We understand it is proposed to demolish the existing building and construct a 3- to 5-story wood frame apartment complex with associated drive and parking areas and underground utilities. Storm water is proposed to be infiltrated in several areas across the site.

At the time of preparing this GER, detailed building plans were not available for our review. Based on our experience with similar projects, RGI anticipates that the proposed apartment building will be supported on perimeter walls with bearing loads of 4 to 6 kips per linear foot and a series of columns with a maximum load up to 250 kips. Slab-on-grade floor loading for both building will be 250 pounds per square foot (psf).

3.0 Field Exploration and Laboratory Testing

3.1 Field Exploration

On July 23 and 29, 2015, RGI observed the excavation of six test pits to depths up to 12 feet and three test borings up 25 feet bgs. Two infiltration tests were performed in Test

pits TP-2 and TP-3. The approximate exploration and infiltration locations are shown on Figure 2.

Field logs of each exploration were prepared by the geologist that continuously observed the explorations. These logs included visual classifications of the materials encountered during excavation as well as our interpretation of the subsurface conditions between samples. The test pit and boring logs included in Appendix A represent an interpretation of the field logs and include modifications based on laboratory observation and analysis of the samples.

3.2 LABORATORY TESTING

During the field investigation, a representative portion of each recovered sample was sealed in containers and transported to our laboratory for further visual and laboratory examination. Selected samples retrieved from the test pits and borings were tested for moisture content and grain size analysis to aid in soil classification and provide input for the recommendations provided in this report. The results and descriptions of the laboratory tests are enclosed in Appendix A.

4.0 Site Conditions

4.1 SURFACE

The site is bound to the north by Northeast 65th Street, to the west by park and commercial properties, to the south by a storage facility, and to the east by East Lake Sammamish Parkway Northeast.

The site slopes downwards to the west with an overall elevation difference of about 10 feet. The site is occupied by a single-family residence in the south portion of the site and several trailers in the northern and western portion of the site.

4.2 GEOLOGY

Review of the *Geologic Map of King County, Washington* (Derek B. Booth, etc, 2002) indicates that the native soil is mapped as Alluvium of Holocene (map unit Qal), consisting of moderately sorted deposits of cobbles gravel, pebbly sand, and sandy silt along major rivers and stream channels. These descriptions are generally similar to the findings in our field exploration.

4.3 SOILS

The site is underlain by loose to medium dense sand with silt and gravel with trace of cobbles with occasional layers of sandy gravel. An organic layer was encountered from 3 to 5 feet in TP-4 underlying silty sand fill in the southwest corner of the site.

More detailed descriptions of the subsurface conditions encountered are included in Appendix A. Sieve analysis was performed on eleven selected soil samples. Grain size distribution curves are included in Appendix A.

4.4 GROUNDWATER

Groundwater was encountered from 9 feet to 17 feet bgs (Elevation 27 to 29 feet) in all three borings and three of the six test pits during the field exploration. Considering the time of the field exploration and the dry summer conditions, this should represent season low groundwater level. Based on the soil color change, we expect that the groundwater level will be 2 to 4 feet higher during wet season. For stormwater system design, RGI recommends an elevation of 31 feet be used as seasonal high groundwater table.

It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the explorations were performed. In addition, perched water can develop within seams and layers contained in fill soils or higher permeability soils overlying less permeable soils following periods of heavy or prolonged precipitation. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the logs.

4.5 SEISMIC CONSIDERATIONS

Based on the 2012 International Building Code (IBC), RGI recommends the follow seismic parameters in Table 1 be used for design.

Table 1 IBC Seismic Parameters

2012 IBC Parameter	Value
Site Soil Class[1]	E[2]
Site Latitude	47.66178 N
Site Longitude	122.09947 W
Maximum considered earthquake spectral response acceleration parameters (g)	S_s =1.251, S_1 =0.479
Spectral response acceleration parameters adjusted for site class (g)	S_{ms} =1.126, S_{m1} =1.149
Design spectral response acceleration parameters (g)	S_{ds} =0.751, S_{d1} =0.766

1 Note: In general accordance with the USGS *2012 International Building Code*. IBC Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.

2 Note: The *2012 International Building Code* requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope of our services does not include the required 100 foot soil profile determination. Test borings extended to a maximum depth of 26.5 feet, and this seismic site class definition considers that simmilar soil continues below the maximum depth of the subsurface exploration.

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in water pressure induced by vibrations from a seismic event. Liquefaction mainly affects geologically recent deposits of fine-grained sands that are below the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction, thus reducing or eliminating the soil's strength.

For liquefaction analysis, soil information obtained from the test borings B-1 to B-3 was used. Groundwater was assumed to be 5 feet bgs in B-2 and 15 feet bgs in B-1 and B-3. Analysis indicates the native soil below 20 feet in all three borings and between 7 feet and 12 feet in B-2 may liquefy under severe earthquake ground motions (Magnitude 7 and horizontal acceleration 0.25g) or moderate ground shaking of significant duration. However, the soil above the groundwater table will not liquefy during an earthquake event.

Based on our analysis and the upper non-liquefiable soil, a spread footing foundation over native soil or structural fill would not experience a bearing capacity failure. However, total ground settlement up to 3 inches is possible upon dissipation of excess pore pressures generated during a seismic event. The resulting differential settlement will be approximately 2 inches across the site. RGI expects that a typical structural design should be able to tolerate the differential settlements. The analysis is attached in Appendix B.

4.6 GEOLOGIC HAZARD AREAS

Regulated geologically hazardous areas include erosion, landslide, earthquake, or other geological hazards. Based on City of Redmond Critical Areas Map dated April 16, 2011, the site is mapped as a seismic hazard area.

5.0 Discussion and Recommendations

5.1 GEOTECHNICAL CONSIDERATIONS

Based on our explorations and observations, the site is suitable for the proposed project from a geotechnical standpoint. The proposed apartment building can be supported on spread footing foundations bearing on medium dense native soil or structural fill as needed. Slab-on-grade floors can be supported on native soil or structural fill. Pavement can be similarly supported.

Detailed recommendations regarding the above issues and other geotechnical design considerations are provided in the following sections. These recommendations should be incorporated into the final design drawings and construction specifications.

5.2 EARTHWORK

Based on the site grades, RGI anticipates the earthwork will include cuts and fills to reach subgrade elevations for the building and parking lot grades, installing underground utilities including the stormwater detention system, and excavating and backfilling the building foundations.

5.2.1 EROSION AND SEDIMENT CONTROL

Potential sources or causes of erosion and sedimentation depend on construction methods, slope length, and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. The impacts on erosion-prone areas can be reduced by implementing an erosion and sedimentation control plan. The plan should be designed in accordance with applicable city and/or county standards.

RGI recommends the following erosion control Best Management Practices (BMPs):

- Scheduling site preparation and grading for the drier summer and early fall months and undertaking activities that expose soil during periods of little or no rainfall
- Retaining existing vegetation whenever feasible
- Establishing a quarry spall construction entrance
- Installing siltation control fencing or anchored straw or coir wattles on the downhill side of work areas
- Covering soil stockpiles with anchored plastic sheeting
- Revegetating or mulching exposed soils with a minimum 3-inch thickness of straw if surfaces will be left undisturbed for more than 1 day during wet weather or 1 week in dry weather
- Directing runoff away from exposed soils and slopes
- Minimizing the length and steepness of slopes with exposed soils and cover excavation surfaces with anchored plastic sheeting (Graded and disturbed slopes should be tracked in place with the equipment running perpendicular to the slope contours so that the track marks provide a texture to help resist erosion and channeling. Some sloughing and raveling of slopes with exposed or disturbed soil should be expected.)
- Decreasing runoff velocities with check dams, straw bales, or coir wattles
- Confining sediment to the project site
- Inspecting and maintaining erosion and sediment control measures frequently (The contractor should be aware that inspection and maintenance of erosion control BMPs is critical toward their satisfactory performance. Repair and/or replacement of dysfunctional erosion control elements should be anticipated.)

Permanent erosion protection should be provided by reestablishing vegetation using hydroseeding and/or landscape planting. Until the permanent erosion protection is established, site monitoring should be performed by qualified personnel to evaluate the effectiveness of the erosion control measures. Provisions for modifications to the erosion control system based on monitoring observations should be included in the erosion and sedimentation control plan.

5.2.2 STRIPPING

Stripping efforts should include removal of pavements, vegetation, organic materials, and deleterious debris from areas slated for building, pavement and utility construction. Based on the site conditions observed, we anticipate about 6 to 12 inches of stripping will be needed. The stripping depth will be increased along the western property line where organic soil was encountered.

5.2.3 EXCAVATIONS

All temporary cut slopes associated with the site and utility excavations should be adequately inclined to prevent sloughing and collapse. Based on OSHA regulations, the native soil classifies as a Group C soil.

Accordingly, for excavations more than 4 feet but less than 20 feet in depth, the temporary side slopes should be laid back with a minimum slope inclination of 1.5H:1V (horizontal:vertical) in native soil. If there is insufficient room to complete the excavations in this manner, or excavations greater than 20 feet in depth are planned, using temporary shoring to support the excavations should be considered. For open cuts at the site, RGI recommends:

- No traffic, construction equipment, stockpiles, or building supplies are allowed at the top of cut slopes within a distance of at least 5 feet from the top of the cut.
- Exposed soil along the slope is protected from surface erosion using waterproof tarps and/or plastic sheeting.
- Construction activities are scheduled so that the length of time the temporary cut is left open is minimized.
- Surface water is diverted away from the excavation.
- The general condition of slopes should be observed periodically by a geotechnical engineer to confirm adequate stability and erosion control measures.

In all cases, however, appropriate inclinations will depend on the actual soil and groundwater conditions encountered during earthwork. Ultimately, the site contractor must be responsible for maintaining safe excavation slopes that comply with applicable OSHA or WISHA guidelines.

5.2.4 SITE PREPARATION

RGI anticipates that some areas of loose or/and organic soil will be exposed upon completion of stripping and grubbing especially along the western property line. Proofrolling and subgrade verification should be considered an essential step in site preparation. After stripping and prior to placement of structural fill, RGI recommends proofrolling building and pavement subgrades and areas to receive structural fill. These areas should compacted to a firm and unyielding condition in order to achieve a minimum compaction level of 95 percent of the modified proctor maximum dry density as determined by the American Society of Testing and Materials D1557-09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557) prior to proofrolling under the observation of RGI.

Proofrolling and adequate subgrade compaction can only be achieved when the soils are within approximately ± 2 percent moisture content of the optimum moisture content. Soils which appear firm after stripping and grubbing may be proofrolled with a heavy compactor, loaded double-axle dump truck, or other heavy equipment under the observation of an RGI representative. This observer will assess the subgrade conditions prior to filling. The need for or advisability of proofrolling due to soil moisture conditions should be determined at the time of construction. In wet areas it may be necessary to hand probe the exposed subgrades in lieu of proofrolling with mechanical equipment.

Subgrade soils that become disturbed due to elevated moisture conditions should be overexcavated to reveal firm, non-yielding, non-organic soils and backfilled with compacted structural fill. In order to maximize utilization of site soils as structural fill, RGI recommends that the earthwork portion of this project be completed during extended periods of warm and dry weather, if possible. If earthwork is completed during the wet season (typically November through May) it will be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork will require additional mitigative measures beyond what would be expected during the drier summer and fall months.

5.2.5 STRUCTURAL FILL

RGI recommends fill below the foundation and floor slab, behind retaining walls, and below pavement and hardscape surfaces be placed in accordance with the following recommendations for structural fill. The structural fill should be placed after completion of site preparation procedures as described above.

RGI recommends placing structural fill in lifts not exceeding 12 inches in loose thickness and thoroughly compacted as specified in Table 3. The suitability of soils for compacted structural fill use will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the US. No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate

compaction becomes more difficult or impossible to achieve. Soils containing more than about 5 percent fines cannot be consistently compacted to a dense, non-yielding condition when the moisture content is more than 2 percent above or below optimum. Optimum moisture content is that moisture, which results in the greatest compacted dry density with a specified compactive effort.

The native soil without organic content can be used as structural fill if the moisture can be property controlled. If on-site soils are or become unusable or if additional fill is necessary, imported soils should consist of clean, granular soils that meet the grading requirements listed in Table 2 for use in wet weather.

Table 2 Structural Fill Gradation

U.S. Sieve Size	Percent Passing
4 inches	100
No. 4 sieve	75 percent
No. 200 sieve	5 percent *

*Based on minus 3/4 inch fraction.

Prior to use, a RGI representative should observe and test all materials imported to the site for use as structural fill. Structural fill materials should be placed in uniform loose layers not exceeding 12 inches and compacted as specified in Table 3. The soil's maximum density and optimum moisture should be determined by ASTM D1557.

Table 3 Structural Fill Compaction ASTM D1557

Location	Material Type	Minimum Compaction Percentage	Moisture Content Range	
Foundations	On-site granular or approved imported fill soils:	95	+2	-2
Retaining Wall Backfill	On-site granular or approved imported fill soils:	92	+2	-2
Slab-on-grade	On-site granular or approved imported fill soils:	95	+2	-2
General Fill (non-structural areas)	On-site granular or approved imported fill soils:	90	+3	-2
Pavement – Subgrade and Base Course	On-site granular or approved imported fill soils:	95	+2	-2

Placement and compaction of structural fill should be observed by RGI. A representative number of in-place density tests should be performed as the fill is being placed to confirm that the recommended level of compaction is achieved.

5.2.6 CUT AND FILL SLOPES

All permanent cut and fill slopes should be graded with a finished inclination no greater than 2H:1V. Upon completion of construction, the slope face should be trackwalked, compacted and vegetated, or provided with other physical means to guard against erosion. All fill placed for slope construction should meet the structural fill requirements as described in Section 5.2.5.

Final grades at the top of the slopes must promote surface drainage away from the slope crest. Water must not be allowed to flow in an uncontrolled fashion over the slope face. If it is necessary to direct surface runoff towards the slope, it 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 of the slope.

5.2.7 WET WEATHER CONSTRUCTION CONSIDERATIONS

RGI recommends that preparation for site grading and construction include procedures intended to drain ponded water, control surface water runoff, and to collect shallow subsurface seepage zones in excavations where encountered. It will not be possible to successfully compact the subgrade or utilize on-site soils as structural fill if accumulated water is not drained prior to grading or if drainage is not controlled during construction. Attempting to grade the site without adequate drainage control measures will reduce the amount of on-site soil effectively available for use, increase the amount of select import fill materials required, and ultimately increase the cost of the earthwork phases of the project. Free water should not be allowed to pond on the subgrade soils. RGI anticipates that the use of berms and shallow drainage ditches will be suitable for surface water control during wet weather and/or wet site conditions.

5.3 FOUNDATIONS

Following site preparation and grading, the proposed building foundation can be supported on conventional spread footings bearing on medium dense native soil or structural fill. It may be possible to compact the native soils in place to provide the foundation bearing layer. The suitably of the foundation soils and the possibility of compaction in place should be addressed by a representative of RGI once the foundation subgrade soils are exposed.

Perimeter foundations exposed to weather should be at a minimum depth of 18 inches below final exterior grades. Interior foundations can be constructed at any convenient depth below the floor slab. Finished grade is defined as the lowest adjacent grade within 5 feet of the foundation for perimeter (or exterior) footings and finished floor level for interior footings.

Table 4 Foundation Design

Design Parameter	Value
Allowable Bearing Capacity – Structural Fill	2,500 psf[1]
Friction Coefficient	0.25
Passive pressure (equivalent fluid pressure)	250 pcf[2]
Minimum foundation dimensions	Columns: 24 inches Walls: 16 inches

[1]. psf = pounds per square foot
[2]. pcf = pounds per cubic foot

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. For short-term loads, such as wind and seismic, a 1/3 increase in this allowable capacity may be used. At perimeter locations, RGI recommends not including the upper 12 inches of soil in the computation of passive pressures because they can be affected by weather or disturbed by future grading activity. The passive pressure value assumes the foundation will be constructed neat against competent soil or backfilled with structural fill as described in Section 5.2.5. The recommended base friction and passive resistance value includes a safety factor of about 1.5.

With spread footing foundations designed in accordance with the recommendations in this section, maximum total and differential post-construction settlements of 1 inch and 1/2 inch, respectively, should be expected.

5.4 RETAINING WALLS

If retaining walls are needed for the detention vault or within building areas, RGI recommends cast-in-place concrete walls be used. The footing can be supported on native soil or structural fill. If walls are needed outside of building areas, modular block walls may be used. RGI can provide a design for modular block walls if they are necessary for site grade changes.

The magnitude of earth pressure development on retaining walls will partly depend on the quality of the wall backfill. RGI recommends placing and compacting wall backfill as structural fill. Wall drainage will be needed behind the wall face. A typical retaining wall drainage detail is shown on Figure 3.

With wall backfill placed and compacted as recommended, and drainage properly installed, RGI recommends using the values in the following table for design.

Table 5 Retaining Wall Design

Design Parameter	Value
Allowable Bearing Capacity - Structural fill	2,500 psf
Active Earth Pressure (unrestrained walls)	35 pcf
At-rest Earth Pressure (restrained walls)	50 pcf

For seismic design, an additional uniform load of 7 times the wall height (H) for unrestrained walls and 14H for restrained walls should be applied to the wall surface. Friction at the base of foundations and passive earth pressure will provide resistance to these lateral loads. Values for these parameters are provided in the Section 5.3.

5.5 SLAB-ON-GRADE CONSTRUCTION

Once site preparation has been completed as described in Section 5.2, slab-on-grade construction can be supported on medium dense native soil or structural fill. Immediately below the floor slab, RGI recommend placing a 4-inch-thick capillary break layer of clean, free-draining sand or gravel that has less than 5 percent passing the U.S. 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.

Where moisture by vapor transmission is undesirable, an 8- to 10-millimeter-thick plastic membrane should be placed on a 4-inch-thick layer of clean gravel. For the anticipated floor slab loading, RGI estimates post-construction floor settlements of 1/4- to 1/2-inch. For thickness design of the slab subjected to point loading, RGI recommends using a subgrade modulus (Ks) of 150 pounds per square inch per inch of deflection.

5.6 DRAINAGE

5.6.1 SURFACE

Final exterior grades should promote free and positive drainage away from the building area. Water must not be allowed to pond or collect adjacent to foundations or within the immediate building area. For non-pavement locations, RGI recommends providing a minimum drainage gradient of 3 percent for a minimum distance of 10 feet from the building perimeter. In paved locations, a minimum gradient of 1 percent should be provided unless provisions are included for collection and disposal of surface water adjacent to the structure.

5.6.2 SUBSURFACE

RGI recommends installing perimeter foundation drains, details shown on Figure 4. The foundation drains and roof downspouts should be tightlined separately to an approved discharge facility. Subsurface drains must be laid with a gradient sufficient to promote positive flow to a controlled point of approved discharge.

5.6.3 INFILTRATION

RGI understands that infiltration system is being considered for the on-site disposal of stormwater run-off in different areas across the site. Field infiltration tests were performed in test pits TP-2 and TP-3. The tests were performed in general accordance with the falling head percolation test procedure (*Onsite Wastewater Treatment and Disposal Systems,* EPA, 1980).

Table 5 Measured Infiltration Rates

Test Location	Test Depth (inches)	Measured Rate (inches/hour)
TP-2	36	22
TP-3	48	26

Based on the results of our infiltration testing, native soil is suitable for the proposed infiltration system. The field measured infiltration rates are too high to be used directly for design. A proper safety factor should be used in infiltration system design.

Based on Stormwater Management Manual for Western Washington by Washington State Department of Ecology in 2005, ASTM gradation testing can be used for design infiltration rates. Based on gradation testing, the D_{10} grain size for the soils encountered at the infiltration surface ranged from 0.075 to 1.2 mm (average 0.44mm) with no fine layering observed in the material. Based on Table 3.8 of the manual, a design rate of 6.5 inches per hour is recommended for the system design.

Based on our infiltration analysis, a design rate of 6.5 inches per hour is recommended. The infiltration system should be designed at least 5 feet above the season high groundwater table or elevation 31 feet. The soils observed on site are not suitable for treatment.

5.7 UTILITIES

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) specifications. For site utilities located within the right-of-ways, bedding and backfill should be completed in accordance with City of Redmond specifications. At a minimum, trench backfill should be placed as structural fill, as described in Section 5.2.5 and compacted to at least 95 percent of the maximum dry density per ASTM D1557. Where utilities occur below unimproved areas, the degree of

compaction can be reduced to a minimum of 90 percent of the soil's maximum density as determined by ASTM D1557.

The native soils can reused as structural fill if they can be moisture conditioned and compacted. Since the site will subject to liquefaction induced settlements, all utilities pipes should use flexible joints for connections to structures.

5.8 PAVEMENTS

Pavement subgrades should be prepared as described in Section 5.2 and as discussed below. Regardless of the relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. The subgrade should be proofrolled with heavy construction equipment to verify this condition.

With the pavement subgrade prepared as described above, RGI recommends the following pavement sections for parking and drive areas paved with flexible asphalt concrete surfacing.

- **For general parking**: 2 inches of asphalt concrete (AC) over 4 inches of crushed rock base (CRB)
- **For heavy traffic area**: 3 inches of AC over 6 inches of CRB

The asphalt paving materials used should conform to the Washington State Department of Transportation (WSDOT) specifications for Hot Mix Asphalt Class 1/2 inch and CRB surfacing.

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, surface drainage gradients of no less than 2 percent are recommended. Also, 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

RGI is available to provide further geotechnical consultation throughout the design phase of the project. RGI should review the final design and specifications in order to verify that earthwork and foundation recommendations have been properly interpreted and incorporated into project design and construction.

RGI is also available to provide geotechnical engineering and construction monitoring services during construction. The integrity of the earthwork and construction depends on proper site preparation and procedures. In addition, engineering decisions may arise in the field in the event that variations in subsurface conditions become apparent.

Construction monitoring services are not part of this scope of work. If these services are desired, please let us know and we will prepare a cost proposal.

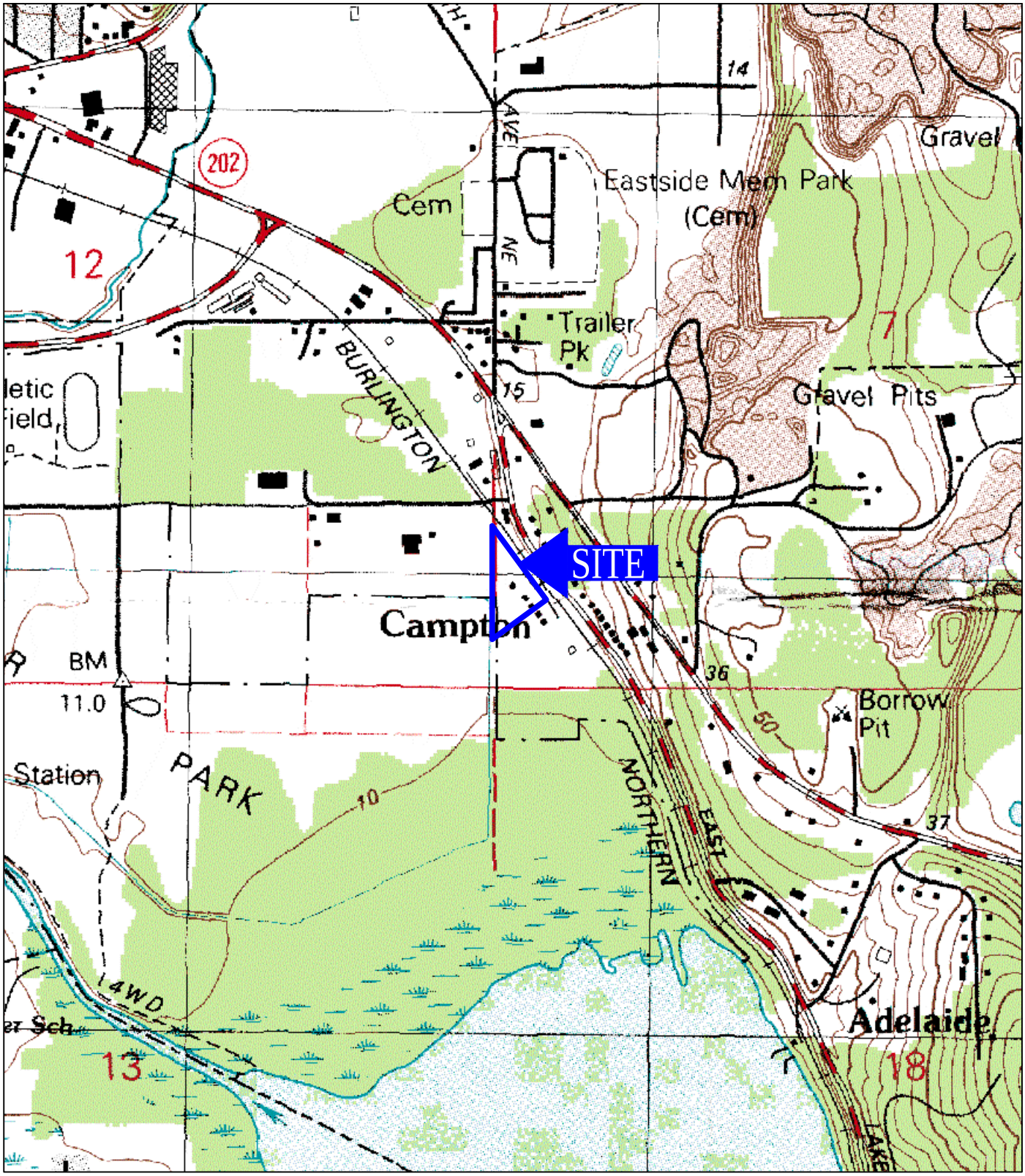
7.0 Limitations

This report is the property of RGI, Maple Multi-Family TX L.P., and their designated agents. Within the limits of the scope and budget, this report was prepared in accordance with generally accepted geotechnical engineering practices in the area at the time this report was issued. This report is intended for specific application to Marymoor Park Apartments in Redmond, Washington, and for the exclusive use of Maple Multi-Family TX L.P., and their authorized representatives. No other warranty, expressed or implied, is made. Site safety, excavation support, and dewatering requirements are the responsibility of others.

The scope of services for this project does not include either specifically or by implication any environmental or biological (for example, mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions.

The analyses and recommendations presented in this report are based upon data obtained from the test exploration performed on-site. Variations in soil conditions can occur, the nature and extent of which may not become evident until construction. If variations appear evident, RGI should be requested to reevaluate the recommendations in this report prior to proceeding with construction.

It is the client's responsibility to see that all parties to the project, including the designers, contractors, subcontractors, are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.



USGS, 1982, Bellevue North, Washington
7.5-Minute Quadrangle

Approximate Scale: 1"=1000'

0 500 1000 2000

N

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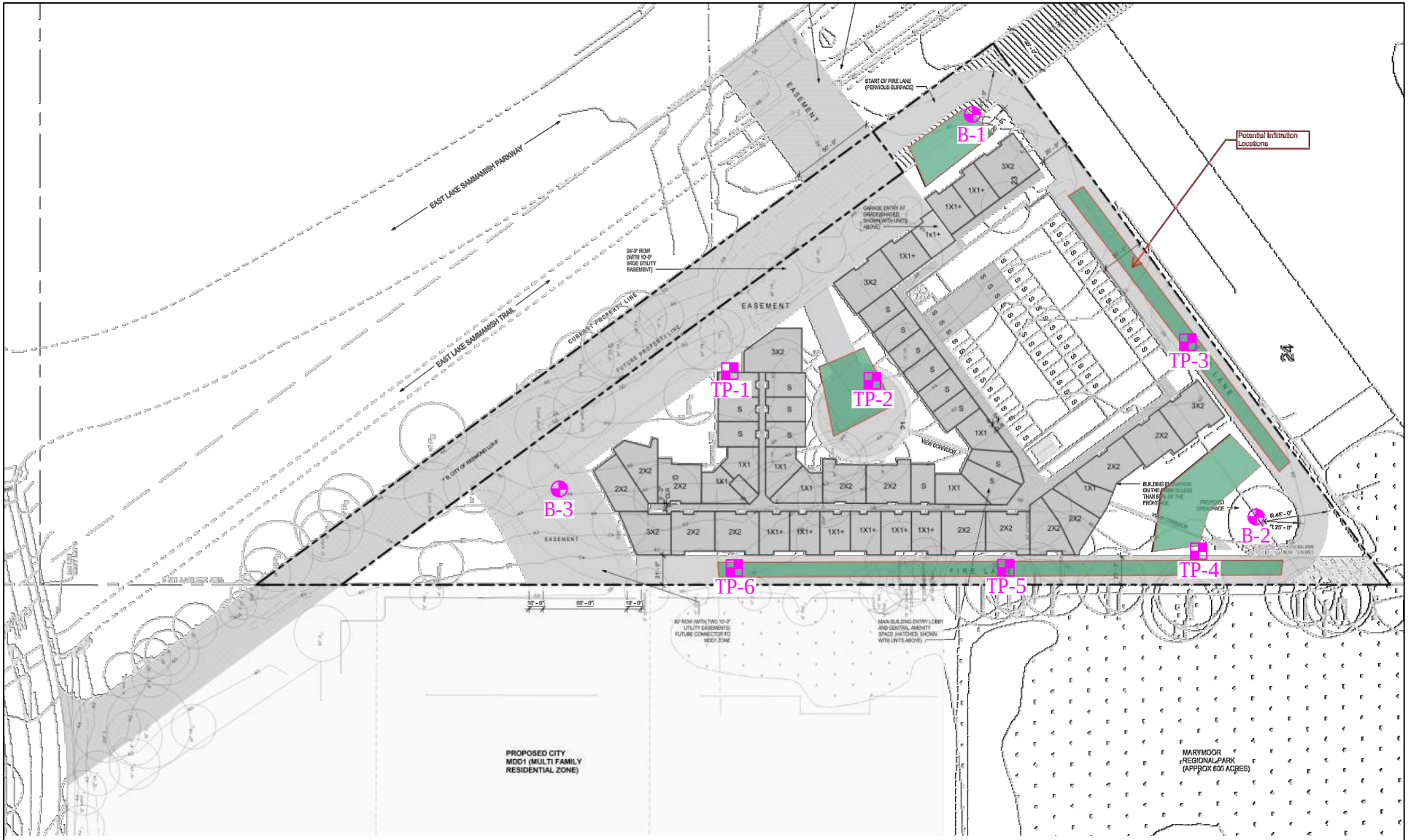
Marymoor Park Apartments		Figure 1
RGI Project Number 2015-111	Site Vicinity Map	Date Drawn: 07/2015
Address: 6081 and 6213 East Lake Sammmish Parkway, Redmond, Washington 98052		



= B-1 to B-3 Borings by RGI on 07/29/15

= TP-1 to TP-6 Test Pits by RGI on 07/23/15

Drawn from Jackson|Main Architecture, Site Plan A1.00, 07/10/15.

Approximate Scale: 1"=100'

0 50 100 200

N

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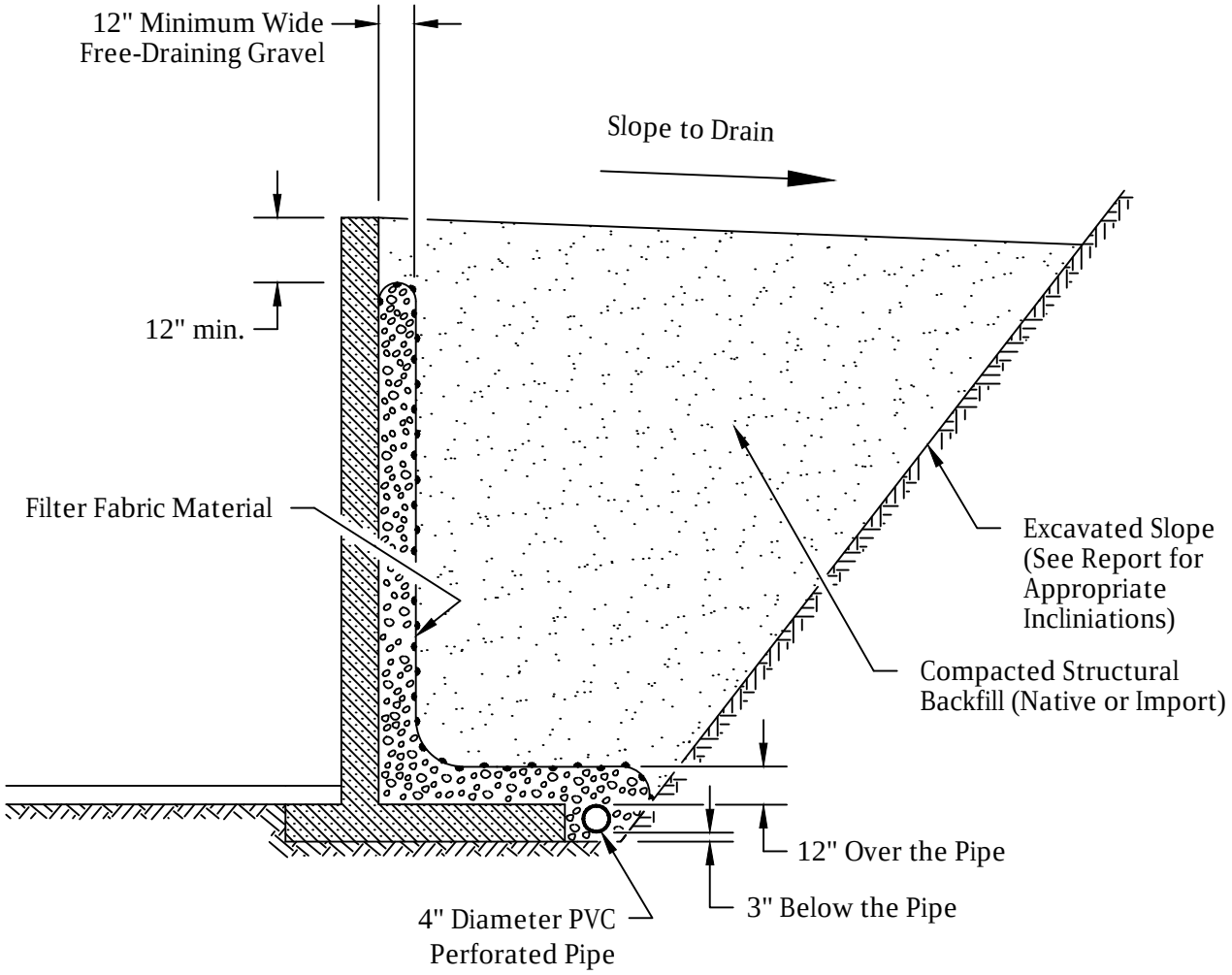
Marymoor Park Apartments		Figure 2
RGI Project Number 2015-111	Geotechnical Exploration Plan	Date Drawn: 07/2015
Address: 6081 and 6213 East Lake Sammmish Parkway, Redmond, Washington 98052		



Not to Scale

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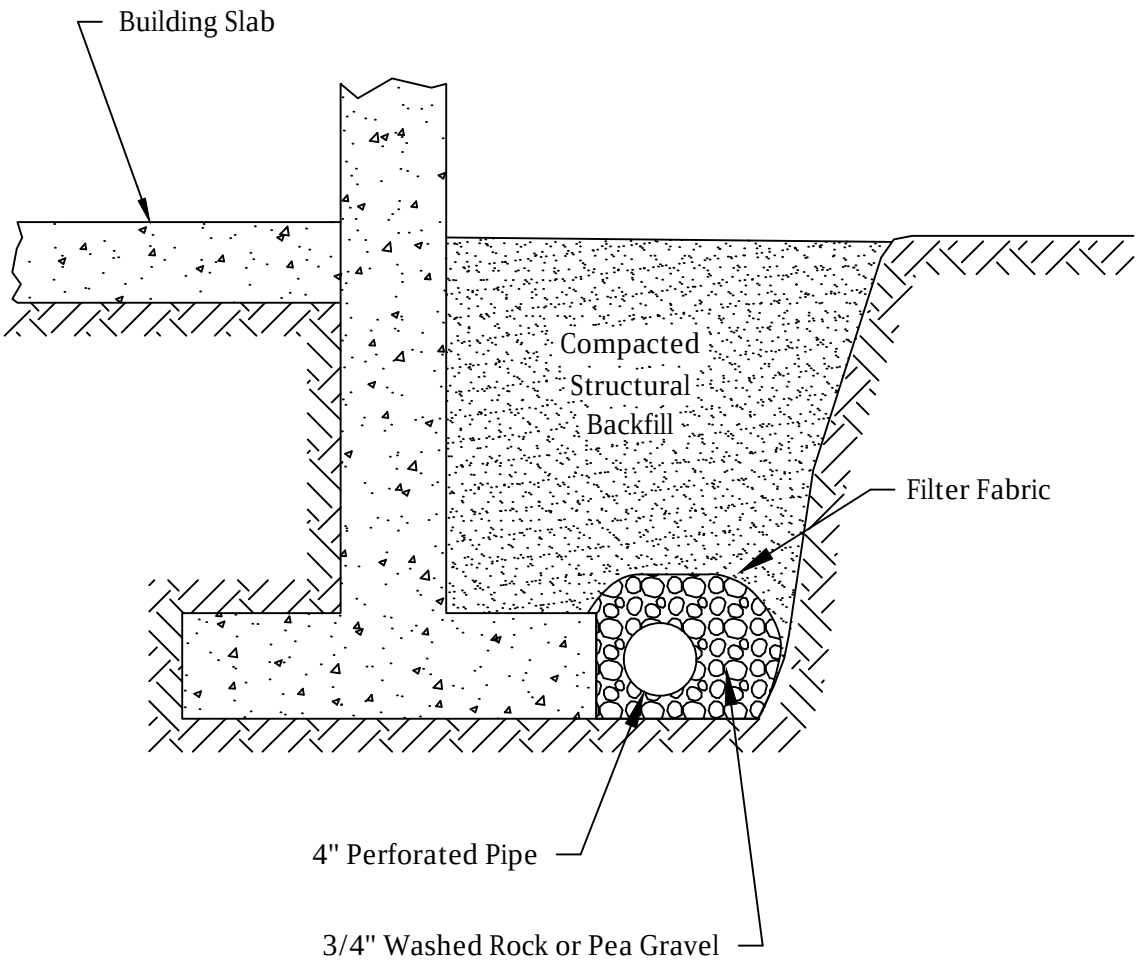
Marymoor Park Apartments		Figure 3
RGI Project Number 2015-111	Retaining Wall Drainage Detail	Date Drawn: 07/2015
Address: 6081 and 6213 East Lake Sammmish Parkway, Redmond, Washington 98052		



Not to Scale

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Marymoor Park Apartments		Figure 4
RGI Project Number 2015-111	Typical Footing Drain Detail	Date Drawn: 07/2015
Address: 6081 and 6213 East Lake Sammmish Parkway, Redmond, Washington 98052		

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

On July 23 and 29, 2015, RGI explored the subsurface soil conditions at the site by observing the excavation of six test pits to a maximum depth of 12 feet bgs and three test borings to a maximum depth of 26.5 feet bgs. The test pit and boring locations are shown on Figure 2. The test pit and boring locations were approximately determined by measurements from existing property lines and paved roads.

A geologist from our office conducted the field exploration and classified the soil conditions encountered, maintained a log of each test exploration, obtained representative soil samples, and observed pertinent site features. All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A.

Representative soil samples obtained from the explorations were placed in closed containers and taken to our laboratory for further examination and testing. As a part of the laboratory testing program, the soil samples were classified in our in house laboratory based on visual observation, texture, and the limited laboratory testing described below.

Moisture Content Determinations

Moisture content determinations were performed in accordance with the American Society of Testing and Materials D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216) on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. The moisture content of typical sample was measured and is reported on the test pit logs.

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analyses for the greater than 75 micrometer portion of the samples were performed in accordance with American Society of Testing and Materials D422 Standard Test Method for Particle-Size Analysis of Soils (ASTM D422) on eleven of the samples.

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Boring No.: **B-1** **Sheet 1 of 1**

Date(s) Drilled: **7/29/15**	Logged By: **CM**	Surface Conditions: **Grass**
Drilling Method(s): **HSA**	Drill Bit Size/Type: **4.25"**	Total Depth of Borehole: **26.5'**
Drill Rig Type: **Trailer-mounted**	Drilling Contractor: **Boretec**	Approximate Surface Elevation: **46'**
Groundwater Level and Date Measured: **17'**	Sampling Method(s): **SPT**	Hammer Data : **140lb, 30" drop, rope and cathead**
Borehole Backfill: **Bentonite Chips**	Location: **6081 East Lake Sammamish Parkway, Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture (%)
	0					SP-SM		Light brown SAND with some silt and gravel, moist, medium dense	
			B1-2.5	12	33%				4%
	5							Becomes loose, no gravel	
			B1-5	9	89%				7%
								Becomes darker brown, medium dense	
			B1-7.5	12	28%				9%
	10								
			B1-10	18	50%				7%
						SP		Gray/light brown SAND with trace silt and gravel, moist, medium dense	
	15							Becomes brown, wet, medium dense	
			B1-15	22	89%				7%
	20					GP		Black/brown sandy GRAVEL with trace silt, wet, medium dense	
			B1-20	12	89%				14%
	25					SP		Black SAND with some gravel and trace silt, wet, medium dense	
			B1-25	14	78%				15%
								Boring terminated at 26.5 feet bgs.	
	30								

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Boring No.: **B-2** **Sheet 1 of 1**

Date(s) Drilled: **7/29/15**	Logged By: **CM**	Surface Conditions: **Grass**
Drilling Method(s): **HSA**	Drill Bit Size/Type: **4.25"**	Total Depth of Borehole: **26.5'**
Drill Rig Type: **Trailer-mounted**	Drilling Contractor: **Boretec**	Approximate Surface Elevation: **38'**
Groundwater Level and Date Measured: **9'**	Sampling Method(s): **SPT**	Hammer Data : **140lb, 30" drop, rope and cathead**
Borehole Backfill: **Bentonite Chips**	Location: **6081 East Lake Sammamish Parkway, Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture (%)
	0					SP-SM		Dark brown SAND with some silt and trace organics, moist, medium dense	
			B2-2.5	12	66%				17%
	5		B2-5	19	100%				12%
						SP-SM		Gray SAND with some silt, moist, medium dense	
								Becomes moist to wet with depth, loose	
			B2-7.5	9	100%				14%
	10					SP-SM		Gray SAND with some silt, wet, loose, iron oxidation	
			B2-10	10	100%				16%
	15							Becomes black/brown, trace gravel, medium dense	
			B2-15	24	100%				14%
	20							Grades with gravel	
			B2-20	14	100%				15%
	25								
			B2-25	12	100%				19%
								Boring terminated at 26.5 feet bgs.	
	30								

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Boring No.: **B-3** **Sheet 1 of 1**

Date(s) Drilled: **7/29/15**	Logged By: **CM**	Surface Conditions: **Gravel**
Drilling Method(s): **HSA**	Drill Bit Size/Type: **4.25"**	Total Depth of Borehole: **26.5'**
Drill Rig Type: **Trailer-mounted**	Drilling Contractor: **Boretec**	Approximate Surface Elevation: **44'**
Groundwater Level and Date Measured: **17'**	Sampling Method(s): **SPT**	Hammer Data : **140lb, 30" drop, rope and cathead**
Borehole Backfill: **Bentonite Chips**	Location: **6081 East Lake Sammamish Parkway, Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture (%)
	0					SP-SM		Tan SAND with some silt and trace gravel, moist, medium dense	
			B3-2.5	14	66%				6%
	5							No gravel	
			B3-5	24	89%				7%
								Becomes brown to tan, gravelly	
			B3-7.5	17	66%				4%
	10								
			B3-10	27	50%				3%
	15					GP		Black/brown sandy GRAVEL with some silt, wet, dense	
			B3-15	34	44%				9%
	20					SP		Black/brown SAND with trace silt, wet, medium dense	
			B3-20	11	100%				17%
	25							Becomes loose	
			B3-25	10	100%				18%
								Boring terminated at 26.5 feet bgs.	
	30								

Project Name: **Marymoor Park Apartments**

Project Number: **2015-111**

Client: **Maple Multi-Family TX L.P.**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture (%)
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample ID: Sample identification number.
5. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. Recovery (%): Core Recovery Percentage is determined based on a ratio of the length of core sample recovered compared to the cored interval length.
7. USCS Symbol: USCS symbol of the subsurface material.
8. Graphic Log: Graphic depiction of the subsurface material encountered.
9. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
10. Moisture (%): Moisture, expressed as a water content.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Poorly graded GRAVEL (GP)

Poorly graded SAND (SP)

Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler

CME Sampler

Pitcher Sample

Bulk Sample

Grab Sample

2-inch-OD unlined split spoon (SPT)

3-inch-OD California w/ brass rings

2.5-inch-OD Modified California w/ brass liners

Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)

Water level (after waiting)

Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Test Pit No.: TP-1 **Sheet 1 of 1**

Date(s) Excavated: **7/23/15**	Logged By **CM**	Surface Conditions: **Asphalt**
Excavation Method: **Excavator**	Bucket Size: **18"**	Total Depth of Excavation: **12'**
Excavator Type: **Track-mounted**	Excavating Contractor: **Hobart**	Approximate Surface Elevation **52'**
Groundwater Level and Date Measured **Not encountered**	Sampling Method(s) **Grab**	Compaction Method **Excavator Bucket**
Test Pit Backfill: **Cuttings**	Location **6081 East Lake Sammmish Parkway Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0			Asphalt		2" Asphalt	
				GP		Crushed rock base, 5/8" minus, dry, dense	
			TP1-1	SP		Brown SAND with trace silt and gravel, medium dense, moist	7% Moisture
						Becomes tan	
	5						
	10						
			TP1-11				8% Moisture
						Test pit terminated at 12 feet bgs.	
	15						

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Test Pit No.: TP-2 **Sheet 1 of 1**

Date(s) Excavated: **7/23/15**	Logged By **CM**	Surface Conditions: **Gravel**
Excavation Method: **Excavator**	Bucket Size: **18"**	Total Depth of Excavation: **12'**
Excavator Type: **Track-mounted**	Excavating Contractor: **Hobart**	Approximate Surface Elevation **46'**
Groundwater Level and Date Measured **Not encountered**	Sampling Method(s) **Grab**	Compaction Method **Excavator Bucket**
Test Pit Backfill: **Cuttings**	Location **6081 East Lake Sammmish Parkway Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0			GP		Crushed rock, 5/8" minus, dry, dense	
						Slight iron oxidation	
				SP		Reddish brown SAND with trace silt, gravel and cobbles, moist, medium dense	
			TP2-2				6% Moisture 4.7% Fines
						Becomes tan	
	5						
			TP2-9				11% Moisture
	10						
						Test pit terminated at 12 feet bgs.	
	15						

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Test Pit No.: TP-3 **Sheet 1 of 1**

Date(s) Excavated: **7/23/15**	Logged By **CM**	Surface Conditions: **Gravel**
Excavation Method: **Excavator**	Bucket Size: **18"**	Total Depth of Excavation: **12'**
Excavator Type: **Track-mounted**	Excavating Contractor: **Hobart**	Approximate Surface Elevation **40'**
Groundwater Level and Date Measured **Not encountered**	Sampling Method(s) **Grab**	Compaction Method **Excavator Bucket**
Test Pit Backfill: **Cuttings**	Location **6081 East Lake Sammmish Parkway Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0			GP		Crushed rock, 5/8" minus, dry, dense	
				SP		Brown SAND with trace silt, moist, medium dense to loose with depth, trace iron oxidation	
			TP3-2				5% Moisture 3.6% Fines
	5						
			TP3-8				11% Moisture
			TP3-9	SP		Black to brown SAND with some gravel and trace silt and cobbles, moist, loose to medium dense	6% Moisture
	10						
						Test pit terminated at 12 feet bgs.	
	15						

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Test Pit No.: TP-4 **Sheet 1 of 1**

Date(s) Excavated: **7/23/15**	Logged By **CM**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **18"**	Total Depth of Excavation: **10'**
Excavator Type: **Track-mounted**	Excavating Contractor: **Hobart**	Approximate Surface Elevation **36'**
Groundwater Level and Date Measured **9'**	Sampling Method(s) **Grab**	Compaction Method **Excavator Bucket**
Test Pit Backfill: **Cuttings**	Location **6081 East Lake Sammmish Parkway Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0			SM		Light brown silty SAND with some gravel, moist, medium dense (Fill)	
			TP4-1				16% Moisture
			TP4-3	Peat		Heavy organic material, wood debris, moist, dense	131% Moisture
	5		TP4-5	SP		Gray SAND with trace silt, gravel and cobbles, moist to wet, medium dense	5% Moisture 2.7% Fines
	10		TP4-10			Test pit terminated at 10 feet bgs due to excessive caving.	9% Moisture
	15						

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Test Pit No.: TP-5 **Sheet 1 of 1**

Date(s) Excavated: **7/23/15**	Logged By **CM**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **18"**	Total Depth of Excavation: **9'**
Excavator Type: **Track-mounted**	Excavating Contractor: **Hobart**	Approximate Surface Elevation **36'**
Groundwater Level and Date Measured **9'**	Sampling Method(s) **Grab**	Compaction Method **Excavator Bucket**
Test Pit Backfill: **Cuttings**	Location **6081 East Lake Sammmish Parkway Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0			SM		Brown silty SAND with trace gravel and organics, dry, very loose	
				GW		Light brown Gravel with some sand, moist, medium dense	
			TP5-2				2% Moisture 0.3% Fines
				SP		Grayish black SAND with some gravel and cobbles, moist to wet, loose to medium dense	
	5		TP5-5				3% Moisture
			TP5-8				4% Moisture
						Test pit terminated at 9 feet bgs due to excessive caving.	
	10						
	15						

Project Name: **Marymoor Park Apartments** Project Number: **2015-111** Client: **Maple Multi-Family TX L.P.**	RILEYGROUP Test Pit No.: TP-6 **Sheet 1 of 1**

Date(s) Excavated: **7/23/15**	Logged By **CM**	Surface Conditions: **Grass**
Excavation Method: **Excavator**	Bucket Size: **18"**	Total Depth of Excavation: **10'**
Excavator Type: **Track-mounted**	Excavating Contractor: **Hobart**	Approximate Surface Elevation **36'**
Groundwater Level and Date Measured **9'**	Sampling Method(s)	Compaction Method **Excavator Bucket**
Test Pit Backfill: **Cuttings**	Location **6081 East Lake Sammmish Parkway Redmond, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0			SM		Brown silty SAND with some gravel and organics, dry, very loose	
				SW-SM		Tan gravelly SAND with some silt and cobbles, moist, medium dense, glass debris	
			TP6-2				3% Moisture 10% Fines
				GW		Tan sandy GRAVEL with cobbles, moist, medium dense Slight iron oxidation from 4 feet bgs to 5 feet bgs	
	5		TP6-5				2% Moisture 0.9% Fines
			TP6-6				2% Moisture
			TP6-9	SP		Grayish black SAND with gravel and some cobbles, wet, loose to medium dense, moderate caving	4% Moisture
	10					Test pit terminated at 10 feet bgs.	
	15						

Project Name: **Marymoor Park Apartments**
Project Number: **2015-111**
Client: **Maple Multi-Family TX L.P.**

Key to Logs

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. USCS Symbol: USCS symbol of the subsurface material.
6. Graphic Log: Graphic depiction of the subsurface material encountered.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

- Asphaltic Concrete (AC)
- Poorly graded GRAVEL (GP)
- Well graded GRAVEL (GW)
- Silty SAND (SM)
- Poorly graded SAND (SP)
- Well graded SAND with Silt (SW-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Auger sampler
- Bulk Sample
- 3-inch-OD California w/ brass rings
- CME Sampler
- Grab Sample
- 2.5-inch-OD Modified California w/ brass liners
- Pitcher Sample
- 2-inch-OD unlined split spoon (SPT)
- Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	B-1
PROJECT NO.	2015-111	SAMPLE DEPTH	5'
TECH/TEST DATE	CM/EW/PL 7/30/2015	DATE RECEIVED	7/30/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	252.1
Wt Dry Soil & Tare (gm)	(w2)	236.0
Weight of Tare (gm)	(w3)	8.3
Weight of Water (gm)	(w4=w1-w2)	16.1
Weight of Dry Soil (gm)	(w5=w2-w3)	227.7
Moisture Content (%)	(w4/w5)*100	7

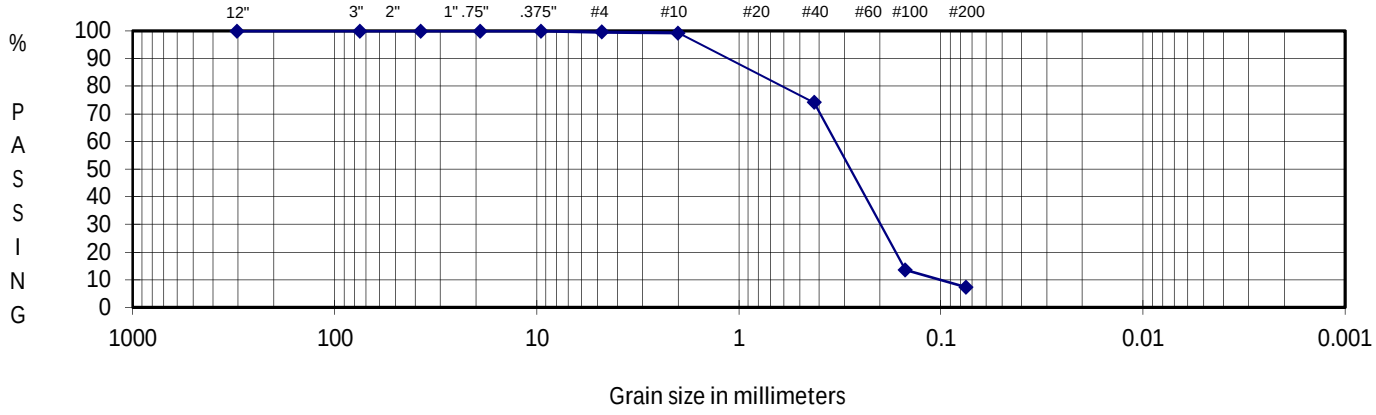
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	236.0
	Tare Weight (gm)	8.3
(W6)	Total Dry Weight (gm)	227.7

% COBBLES	0.0
% C GRAVEL	0.0
% F GRAVEL	0.4
% C SAND	0.4
% M SAND	25.1
% F SAND	66.9
% FINES	7.2
% TOTAL	100.0
D10 (mm)	0.1
D30 (mm)	0.2
D60 (mm)	0.34
Cu	3.4
Cc	1.2

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	8.3	0.00	0.00	100.00	cobbles
3.0"	8.3	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	8.3	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	8.3	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	8.3	0.00	0.00	100.00	fine gravel
#4	9.2	0.90	0.40	99.60	coarse sand
#10	10.1	1.80	0.79	99.21	medium sand
#20					medium sand
#40	67.2	58.90	25.87	74.13	fine sand
#60					fine sand
#100	205.3	197.00	86.52	13.48	fine sand
#200	219.5	211.20	92.75	7.25	fines
PAN	236.0	227.70	100.00	0.00	silt/clay



DESCRIPTION	SAND with some silt
USCS	SP-SM

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	B-1
PROJECT NO.	2015-111	SAMPLE DEPTH	25'
TECH/TEST DATE	CM/EW/PL 7/30/2015	DATE RECEIVED	7/30/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	390.2
Wt Dry Soil & Tare (gm)	(w2)	341.7
Weight of Tare (gm)	(w3)	8.3
Weight of Water (gm)	(w4=w1-w2)	48.5
Weight of Dry Soil (gm)	(w5=w2-w3)	333.4
Moisture Content (%)	(w4/w5)*100	15

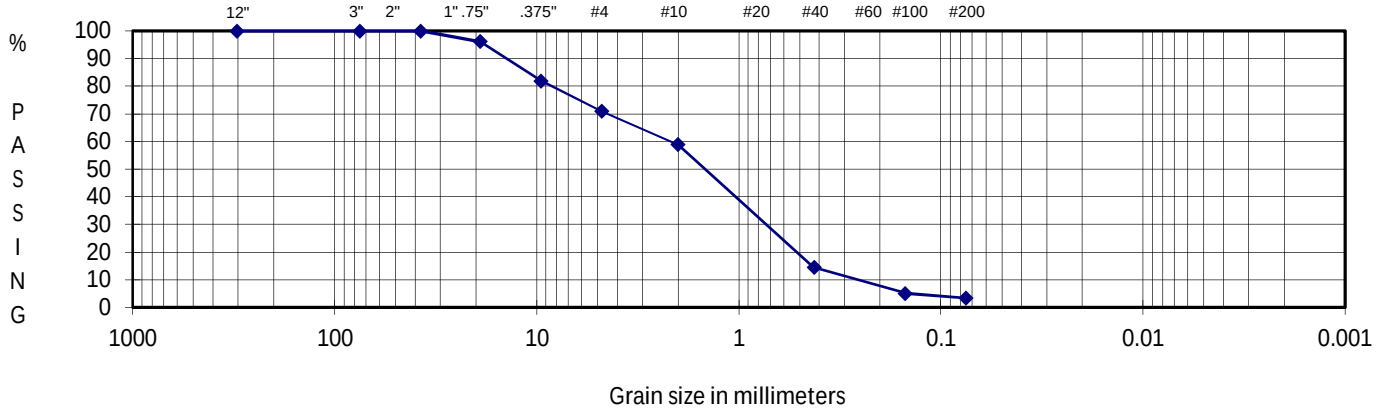
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	341.7
	Tare Weight (gm)	8.3
(W6)	Total Dry Weight (gm)	333.4

% COBBLES	0.0
% C GRAVEL	3.8
% F GRAVEL	25.3
% C SAND	12.0
% M SAND	44.5
% F SAND	11.0
% FINES	3.3
% TOTAL	100.0
D10 (mm)	0.26
D30 (mm)	0.73
D60 (mm)	2.2
Cu	8.5
Cc	0.9

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	8.3	0.00	0.00	100.00	cobbles
3.0"	8.3	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	8.3	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	21.1	12.80	3.84	96.16	fine gravel
0.50"					fine gravel
0.375"	68.8	60.50	18.15	81.85	fine gravel
#4	105.5	97.20	29.15	70.85	coarse sand
#10	145.5	137.20	41.15	58.85	medium sand
#20					medium sand
#40	293.8	285.50	85.63	14.37	fine sand
#60					fine sand
#100	325.0	316.70	94.99	5.01	fine sand
#200	330.6	322.30	96.67	3.33	fines
PAN	341.7	333.40	100.00	0.00	silt/clay



DESCRIPTION	SAND with some gravel and trace silt
USCS	SP

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	B-2
PROJECT NO.	2015-111	SAMPLE DEPTH	10'
TECH/TEST DATE	CM/EW/PL 7/30/2015	DATE RECEIVED	7/30/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	560.7
Wt Dry Soil & Tare (gm)	(w2)	483.8
Weight of Tare (gm)	(w3)	8.5
Weight of Water (gm)	(w4=w1-w2)	76.9
Weight of Dry Soil (gm)	(w5=w2-w3)	475.3
Moisture Content (%)	(w4/w5)*100	16

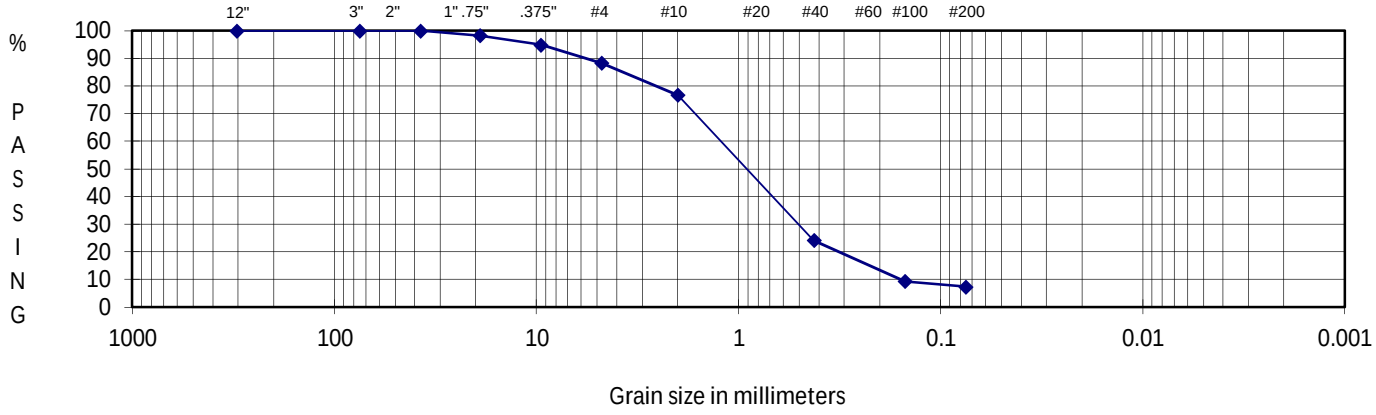
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	483.8
	Tare Weight (gm)	8.5
(W6)	Total Dry Weight (gm)	475.3

% COBBLES	0.0
% C GRAVEL	1.8
% F GRAVEL	9.9
% C SAND	11.6
% M SAND	52.6
% F SAND	16.8
% FINES	7.3
% TOTAL	100.0
D10 (mm)	0.16
D30 (mm)	0.5
D60 (mm)	1.7
Cu	10.6
Cc	0.9

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	8.5	0.00	0.00	100.00	cobbles
3.0"	8.5	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	8.5	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	17.0	8.50	1.79	98.21	fine gravel
0.50"					fine gravel
0.375"	33.0	24.50	5.15	94.85	fine gravel
#4	64.1	55.60	11.70	88.30	coarse sand
#10	119.4	110.90	23.33	76.67	medium sand
#20					medium sand
#40	369.3	360.80	75.91	24.09	fine sand
#60					fine sand
#100	439.4	430.90	90.66	9.34	fine sand
#200	449.1	440.60	92.70	7.30	fines
PAN	483.8	475.30	100.00	0.00	silt/clay



DESCRIPTION	SAND with some silt and trace gravel
USCS	SP-SM

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	B-2
PROJECT NO.	2015-111	SAMPLE DEPTH	20'
TECH/TEST DATE	CM/EW/PL 7/30/2015	DATE RECEIVED	7/30/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	446.8
Wt Dry Soil & Tare (gm)	(w2)	389.9
Weight of Tare (gm)	(w3)	8.6
Weight of Water (gm)	(w4=w1-w2)	56.9
Weight of Dry Soil (gm)	(w5=w2-w3)	381.3
Moisture Content (%)	(w4/w5)*100	15

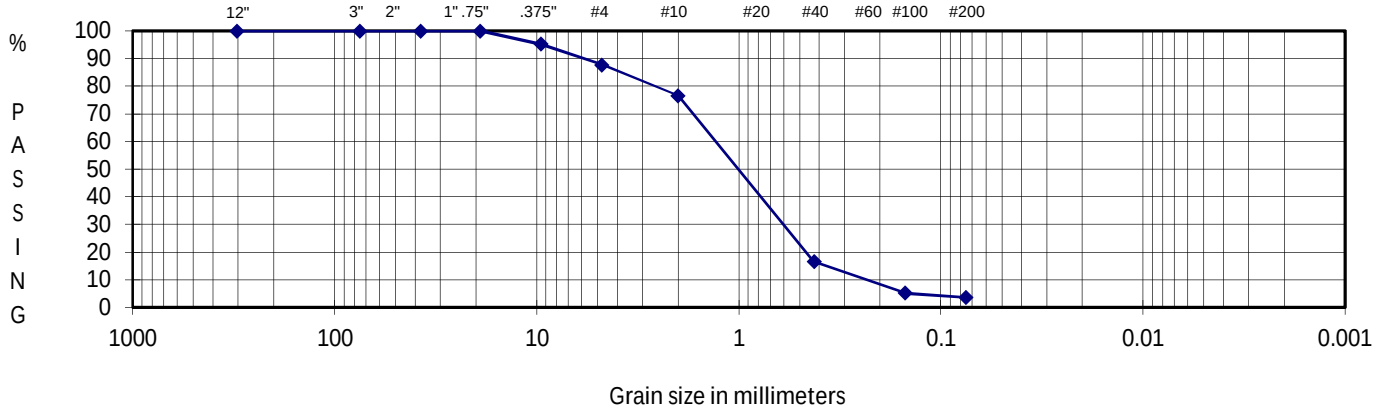
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	389.9
	Tare Weight (gm)	8.6
(W6)	Total Dry Weight (gm)	381.3

% COBBLES	0.0
% C GRAVEL	0.0
% F GRAVEL	12.3
% C SAND	11.1
% M SAND	60.1
% F SAND	13.1
% FINES	3.5
% TOTAL	100.0
D10 (mm)	0.23
D30 (mm)	0.6
D60 (mm)	1.8
Cu	7.8
Cc	0.9

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	8.6	0.00	0.00	100.00	cobbles
3.0"	8.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	8.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	8.6	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	26.9	18.30	4.80	95.20	fine gravel
#4	55.5	46.90	12.30	87.70	coarse sand
#10	97.8	89.20	23.39	76.61	medium sand
#20					medium sand
#40	326.8	318.20	83.45	16.55	fine sand
#60					fine sand
#100	370.3	361.70	94.86	5.14	fine sand
#200	376.6	368.00	96.51	3.49	fines
PAN	389.9	381.30	100.00	0.00	silt/clay



DESCRIPTION	SAND with trace silt and gravel
USCS	SP

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	B-3
PROJECT NO.	2015-111	SAMPLE DEPTH	10'
TECH/TEST DATE	CM/EW/PL 7/30/2015	DATE RECEIVED	7/30/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	415.9
Wt Dry Soil & Tare (gm)	(w2)	405.0
Weight of Tare (gm)	(w3)	8.4
Weight of Water (gm)	(w4=w1-w2)	10.9
Weight of Dry Soil (gm)	(w5=w2-w3)	396.6
Moisture Content (%)	(w4/w5)*100	3

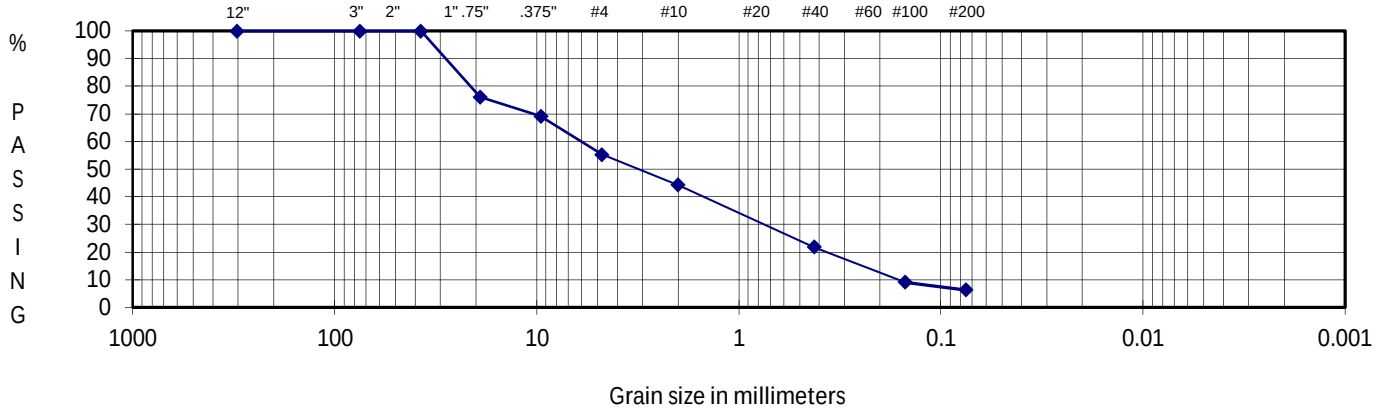
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	405.0
	Tare Weight (gm)	8.4
(W6)	Total Dry Weight (gm)	396.6

% COBBLES	0.0
% C GRAVEL	24.1
% F GRAVEL	20.7
% C SAND	11.0
% M SAND	22.4
% F SAND	15.6
% FINES	6.3
% TOTAL	100.0
D10 (mm)	0.17
D30 (mm)	0.75
D60 (mm)	6
Cu	35.3
Cc	0.6

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	8.4	0.00	0.00	100.00	cobbles
3.0"	8.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	8.4	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	103.8	95.40	24.05	75.95	fine gravel
0.50"					fine gravel
0.375"	131.2	122.80	30.96	69.04	fine gravel
#4	186.0	177.60	44.78	55.22	coarse sand
#10	229.6	221.20	55.77	44.23	medium sand
#20					medium sand
#40	318.5	310.10	78.19	21.81	fine sand
#60					fine sand
#100	369.1	360.70	90.95	9.05	fine sand
#200	380.2	371.80	93.75	6.25	fines
PAN	405.0	396.60	100.00	0.00	silt/clay



DESCRIPTION	Gravelly SAND with some silt
USCS	SP-SM

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	TP-2
PROJECT NO.	2015-111	SAMPLE DEPTH	2'
TECH/TEST DATE	CM/EW 7/23/2015	DATE RECEIVED	7/23/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	622.5
Wt Dry Soil & Tare (gm)	(w2)	587.4
Weight of Tare (gm)	(w3)	15.6
Weight of Water (gm)	(w4=w1-w2)	35.1
Weight of Dry Soil (gm)	(w5=w2-w3)	571.8
Moisture Content (%)	(w4/w5)*100	6

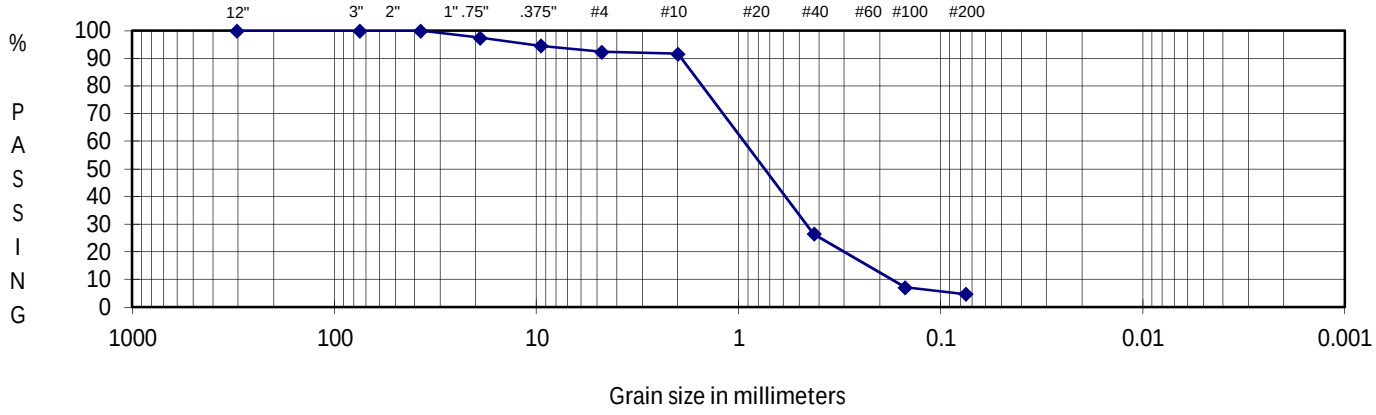
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	587.4
	Tare Weight (gm)	15.6
(W6)	Total Dry Weight (gm)	571.8

% COBBLES	0.0
% C GRAVEL	2.6
% F GRAVEL	5.1
% C SAND	0.8
% M SAND	65.1
% F SAND	21.8
% FINES	4.7
% TOTAL	100.0
D10 (mm)	0.18
D30 (mm)	0.46
D60 (mm)	0.94
Cu	5.2
Cc	1.3

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	15.6	0.00	0.00	100.00	cobbles
3.0"	15.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	15.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	30.2	14.60	2.55	97.45	fine gravel
0.50"					fine gravel
0.375"	47.2	31.60	5.53	94.47	fine gravel
#4	59.5	43.90	7.68	92.32	coarse sand
#10	63.9	48.30	8.45	91.55	medium sand
#20					medium sand
#40	436.0	420.40	73.52	26.48	fine sand
#60					fine sand
#100	546.5	530.90	92.85	7.15	fine sand
#200	560.7	545.10	95.33	4.67	fines
PAN	587.4	571.80	100.00	0.00	silt/clay



DESCRIPTION	SAND with trace silt and gravel
USCS	SP

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	TP-3
PROJECT NO.	2015-111	SAMPLE DEPTH	2'
TECH/TEST DATE	CM/EW 7/23/2015	DATE RECEIVED	7/23/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	568.7
Wt Dry Soil & Tare (gm)	(w2)	543.6
Weight of Tare (gm)	(w3)	15.6
Weight of Water (gm)	(w4=w1-w2)	25.1
Weight of Dry Soil (gm)	(w5=w2-w3)	528.0
Moisture Content (%)	(w4/w5)*100	5

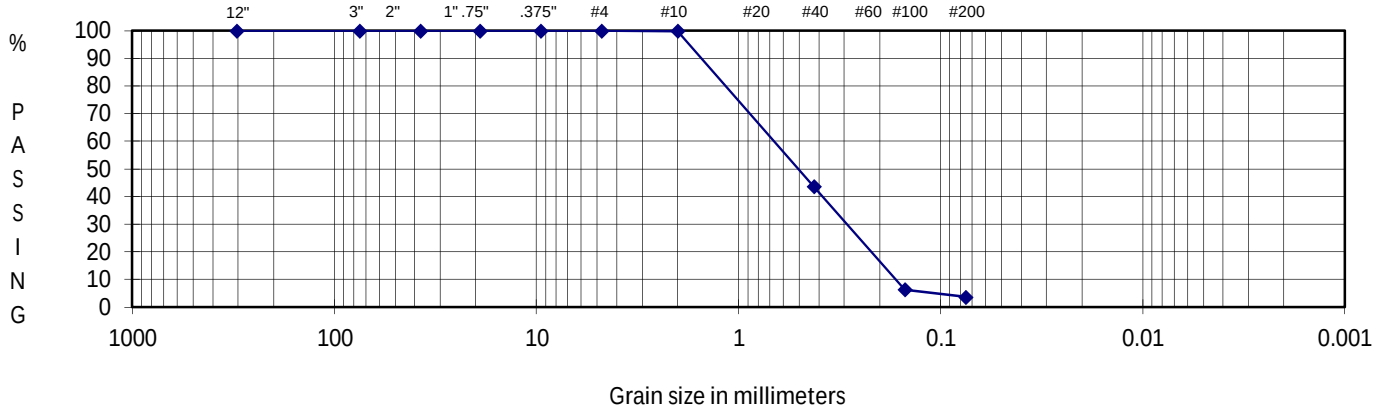
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	543.6
	Tare Weight (gm)	15.6
(W6)	Total Dry Weight (gm)	528.0

% COBBLES	0.0
% C GRAVEL	0.0
% F GRAVEL	0.0
% C SAND	0.1
% M SAND	56.1
% F SAND	40.1
% FINES	3.6
% TOTAL	100.0
D10 (mm)	0.17
D30 (mm)	0.29
D60 (mm)	0.68
Cu	4.0
Cc	0.7

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	15.6	0.00	0.00	100.00	cobbles
3.0"	15.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	15.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	15.6	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	15.6	0.00	0.00	100.00	fine gravel
#4	15.8	0.20	0.04	99.96	coarse sand
#10	16.5	0.90	0.17	99.83	medium sand
#20					medium sand
#40	312.9	297.30	56.31	43.69	fine sand
#60					fine sand
#100	510.4	494.80	93.71	6.29	fine sand
#200	524.5	508.90	96.38	3.62	fines
PAN	543.6	528.00	100.00	0.00	silt/clay



DESCRIPTION	SAND with trace silt
USCS	SP

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	TP-4
PROJECT NO.	2015-111	SAMPLE DEPTH	5'
TECH/TEST DATE	CM/EW 7/23/2015	DATE RECEIVED	7/23/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	620.3
Wt Dry Soil & Tare (gm)	(w2)	588.9
Weight of Tare (gm)	(w3)	15.6
Weight of Water (gm)	(w4=w1-w2)	31.4
Weight of Dry Soil (gm)	(w5=w2-w3)	573.3
Moisture Content (%)	(w4/w5)*100	5

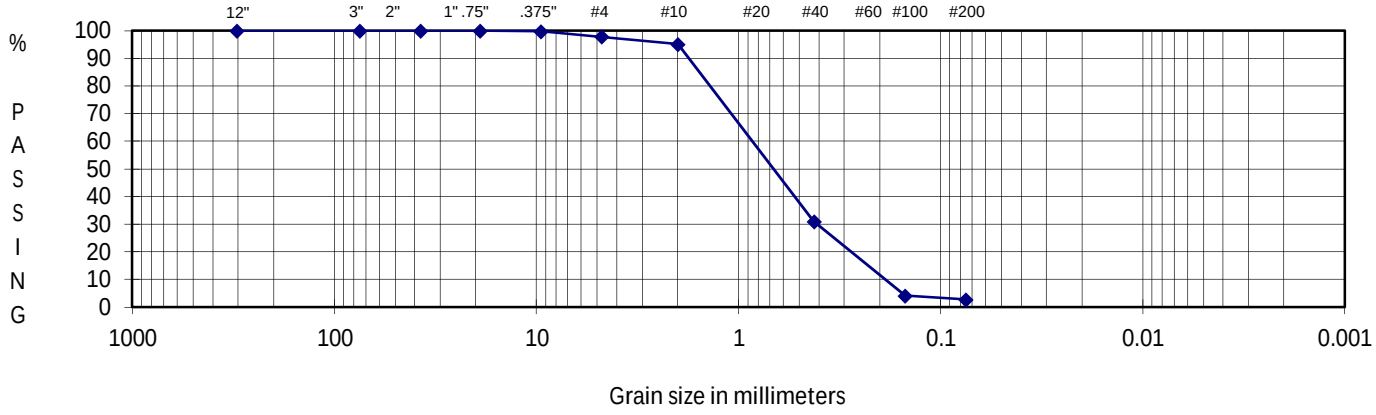
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	588.9
	Tare Weight (gm)	15.6
(W6)	Total Dry Weight (gm)	573.3

% COBBLES	0.0
% C GRAVEL	0.0
% F GRAVEL	2.3
% C SAND	2.7
% M SAND	64.1
% F SAND	28.2
% FINES	2.7
% TOTAL	100.0
D10 (mm)	0.19
D30 (mm)	0.4
D60 (mm)	0.85
Cu	4.5
Cc	1.0

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	15.6	0.00	0.00	100.00	cobbles
3.0"	15.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	15.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	15.6	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	17.4	1.80	0.31	99.69	fine gravel
#4	28.8	13.20	2.30	97.70	coarse sand
#10	44.1	28.50	4.97	95.03	medium sand
#20					medium sand
#40	411.5	395.90	69.06	30.94	fine sand
#60					fine sand
#100	565.6	550.00	95.94	4.06	fine sand
#200	573.4	557.80	97.30	2.70	fines
PAN	588.9	573.30	100.00	0.00	silt/clay



DESCRIPTION	SAND with trace silt
USCS	SP

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	TP-5
PROJECT NO.	2015-111	SAMPLE DEPTH	2'
TECH/TEST DATE	CM/EW 7/23/2015	DATE RECEIVED	7/23/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1556.1
Wt Dry Soil & Tare (gm)	(w2)	1521.3
Weight of Tare (gm)	(w3)	15.8
Weight of Water (gm)	(w4=w1-w2)	34.8
Weight of Dry Soil (gm)	(w5=w2-w3)	1505.5
Moisture Content (%)	(w4/w5)*100	2

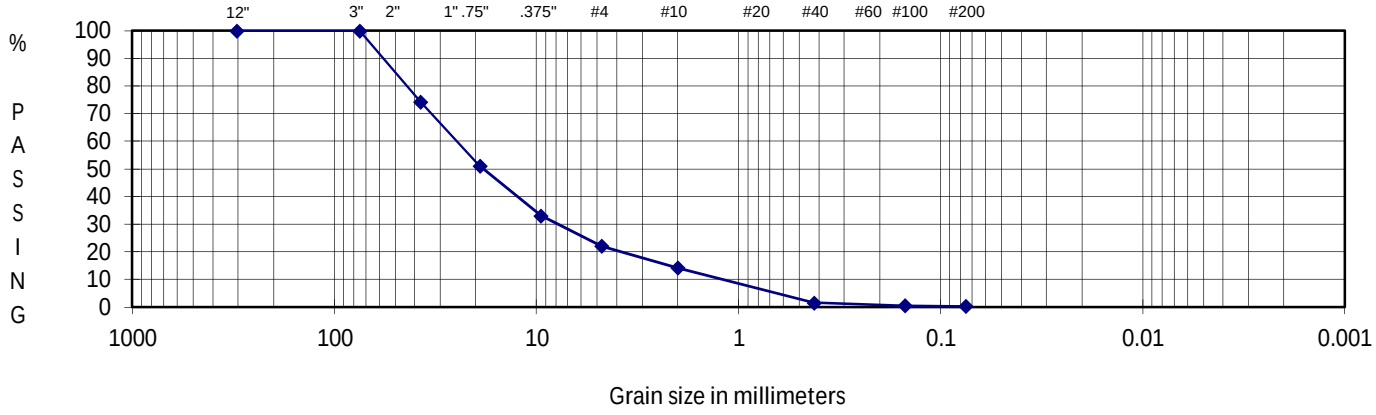
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	1521.3
	Tare Weight (gm)	15.8
(W6)	Total Dry Weight (gm)	1505.5

% COBBLES	0.0
% C GRAVEL	49.0
% F GRAVEL	28.9
% C SAND	7.9
% M SAND	12.6
% F SAND	1.3
% FINES	0.3
% TOTAL	100.0
D10 (mm)	1.2
D30 (mm)	8
D60 (mm)	25
Cu	20.8
Cc	2.1

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	15.8	0.00	0.00	100.00	cobbles
3.0"	15.8	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	402.7	386.90	25.70	74.30	coarse gravel
1.0"					coarse gravel
0.75"	753.9	738.10	49.03	50.97	fine gravel
0.50"					fine gravel
0.375"	1024.1	1008.30	66.97	33.03	fine gravel
#4	1189.2	1173.40	77.94	22.06	coarse sand
#10	1308.5	1292.70	85.87	14.13	medium sand
#20					medium sand
#40	1497.7	1481.90	98.43	1.57	fine sand
#60					fine sand
#100	1513.6	1497.80	99.49	0.51	fine sand
#200	1516.6	1500.80	99.69	0.31	fines
PAN	1521.3	1505.50	100.00	0.00	silt/clay



DESCRIPTION	GRAVEL with some sand
USCS	GW

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	TP-6
PROJECT NO.	2015-111	SAMPLE DEPTH	2'
TECH/TEST DATE	CM/EW 7/23/2015	DATE RECEIVED	7/23/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	831.2
Wt Dry Soil & Tare (gm)	(w2)	804.3
Weight of Tare (gm)	(w3)	15.8
Weight of Water (gm)	(w4=w1-w2)	26.9
Weight of Dry Soil (gm)	(w5=w2-w3)	788.5
Moisture Content (%)	(w4/w5)*100	3

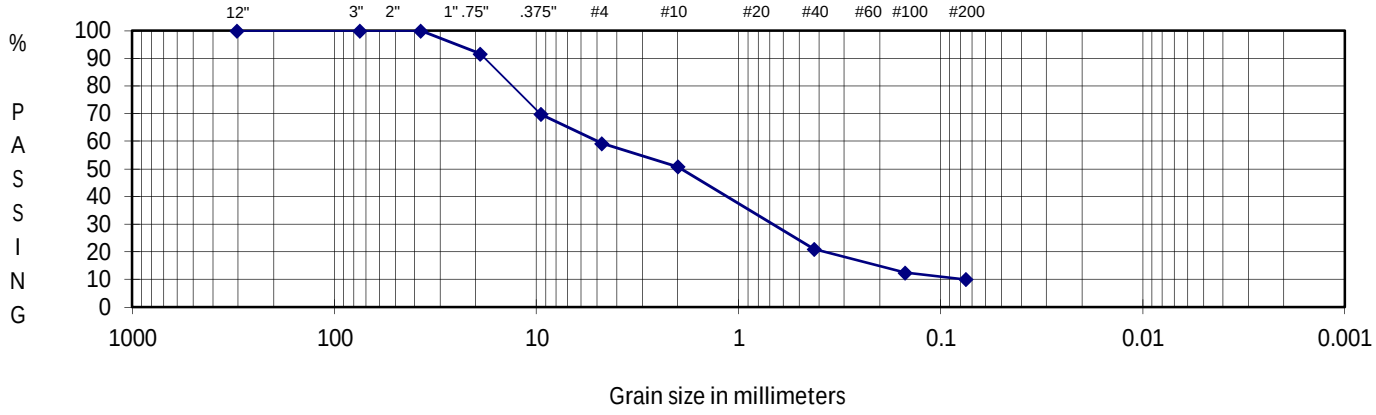
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	804.3
	Tare Weight (gm)	15.8
(W6)	Total Dry Weight (gm)	788.5

% COBBLES	0.0
% C GRAVEL	8.3
% F GRAVEL	32.5
% C SAND	8.4
% M SAND	29.8
% F SAND	11.0
% FINES	10.0
% TOTAL	100.0
D10 (mm)	0.075
D30 (mm)	0.68
D60 (mm)	5
Cu	66.7
Cc	1.2

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	15.8	0.00	0.00	100.00	cobbles
3.0"	15.8	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	15.8	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	81.6	65.80	8.34	91.66	fine gravel
0.50"					fine gravel
0.375"	254.7	238.90	30.30	69.70	fine gravel
#4	337.9	322.10	40.85	59.15	coarse sand
#10	404.1	388.30	49.25	50.75	medium sand
#20					medium sand
#40	638.7	622.90	79.00	21.00	fine sand
#60					fine sand
#100	705.8	690.00	87.51	12.49	fine sand
#200	725.8	710.00	90.04	9.96	fines
PAN	804.3	788.50	100.00	0.00	silt/clay



DESCRIPTION	Gravelly SAND with some silt
USCS	SW-SM

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

PHONE: (425) 415-0551
FAX: (425) 415-0311

GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Marymoor Park Apartments	SAMPLE ID/TYPE	TP-6
PROJECT NO.	2015-111	SAMPLE DEPTH	5'
TECH/TEST DATE	CM/EW 7/23/2015	DATE RECEIVED	7/23/2015

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1522.7
Wt Dry Soil & Tare (gm)	(w2)	1499.5
Weight of Tare (gm)	(w3)	15.6
Weight of Water (gm)	(w4=w1-w2)	23.2
Weight of Dry Soil (gm)	(w5=w2-w3)	1483.9
Moisture Content (%)	(w4/w5)*100	2

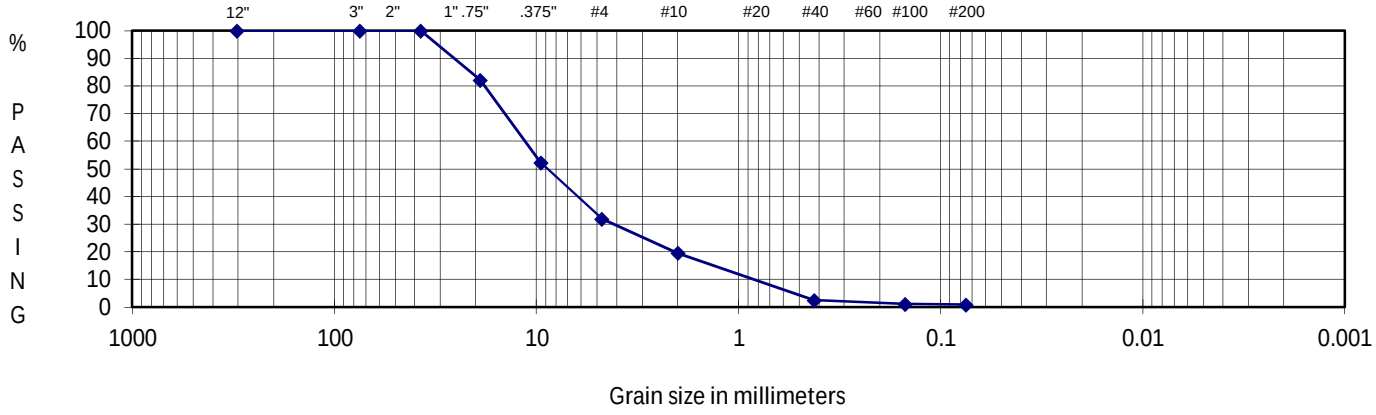
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	1499.5
	Tare Weight (gm)	15.6
(W6)	Total Dry Weight (gm)	1483.9

% COBBLES	0.0
% C GRAVEL	17.9
% F GRAVEL	50.2
% C SAND	12.4
% M SAND	17.0
% F SAND	1.6
% FINES	0.9
% TOTAL	100.0
D10 (mm)	0.85
D30 (mm)	4.2
D60 (mm)	12
Cu	14.1
Cc	1.7

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	15.6	0.00	0.00	100.00	cobbles
3.0"	15.6	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	15.6	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	281.5	265.90	17.92	82.08	fine gravel
0.50"					fine gravel
0.375"	725.0	709.40	47.81	52.19	fine gravel
#4	1026.1	1010.50	68.10	31.90	coarse sand
#10	1210.0	1194.40	80.49	19.51	medium sand
#20					medium sand
#40	1462.1	1446.50	97.48	2.52	fine sand
#60					fine sand
#100	1482.7	1467.10	98.87	1.13	fine sand
#200	1486.0	1470.40	99.09	0.91	fines
PAN	1499.5	1483.90	100.00	0.00	silt/clay



DESCRIPTION	Sandy GRAVEL
USCS	GW

Prepared For:
Maple Multi-Family TX L.P.

Reviewed By: RW

RILEYGROUP

APPENDIX B
LIQUEFACTION ANALYSIS

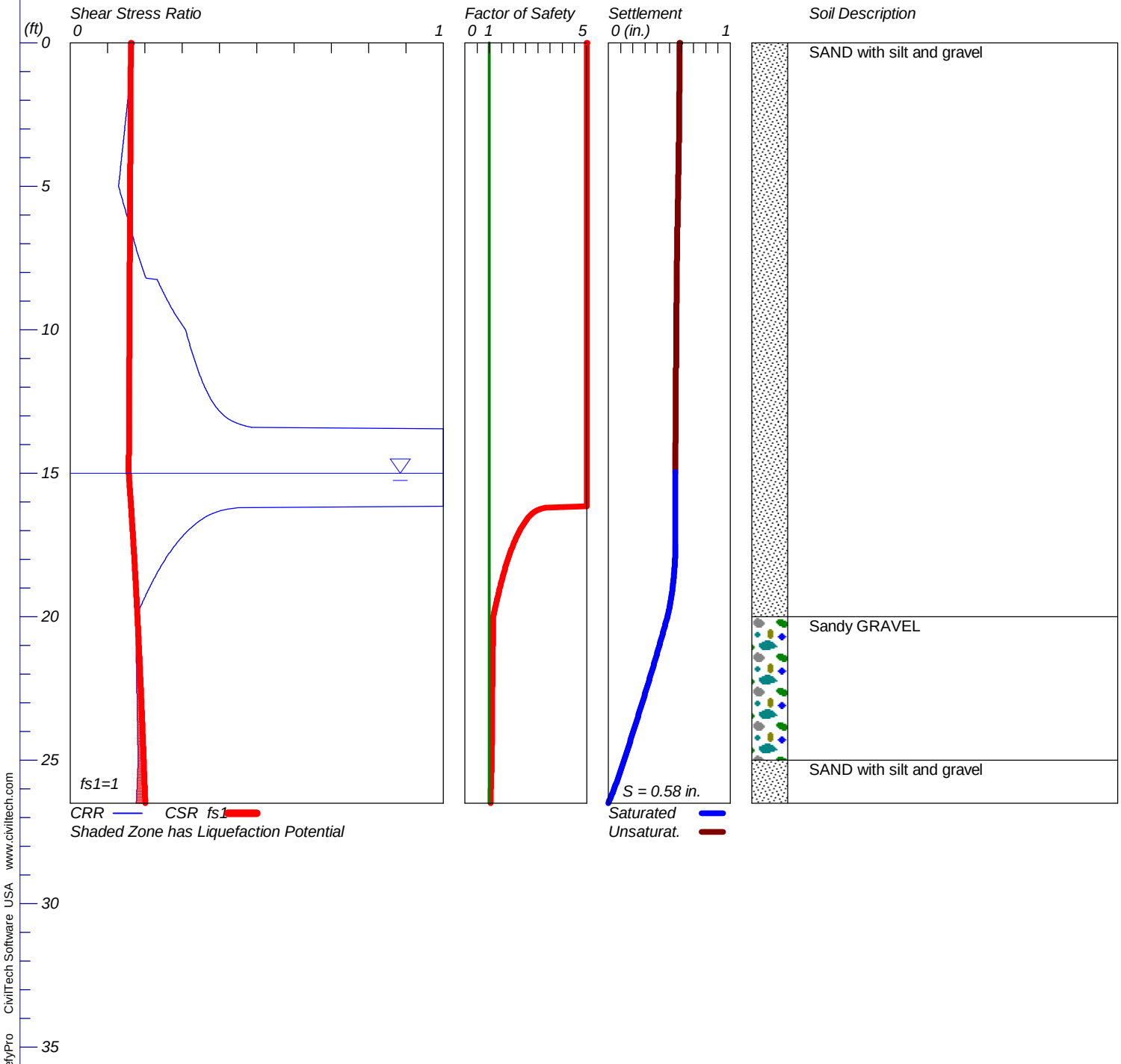
Liquefaction analysis was completed using the LiquefyPro software from CivilTech Software USA. Soil and groundwater conditions from borings B-1, B-2 and B-3 were used and the printout is attached.

LIQUEFACTION ANALYSIS

Marymoor Park Apartment

Hole No.=B-1 Water Depth=15 ft Surface Elev.=46

Magnitude=7
Acceleration=0.25g

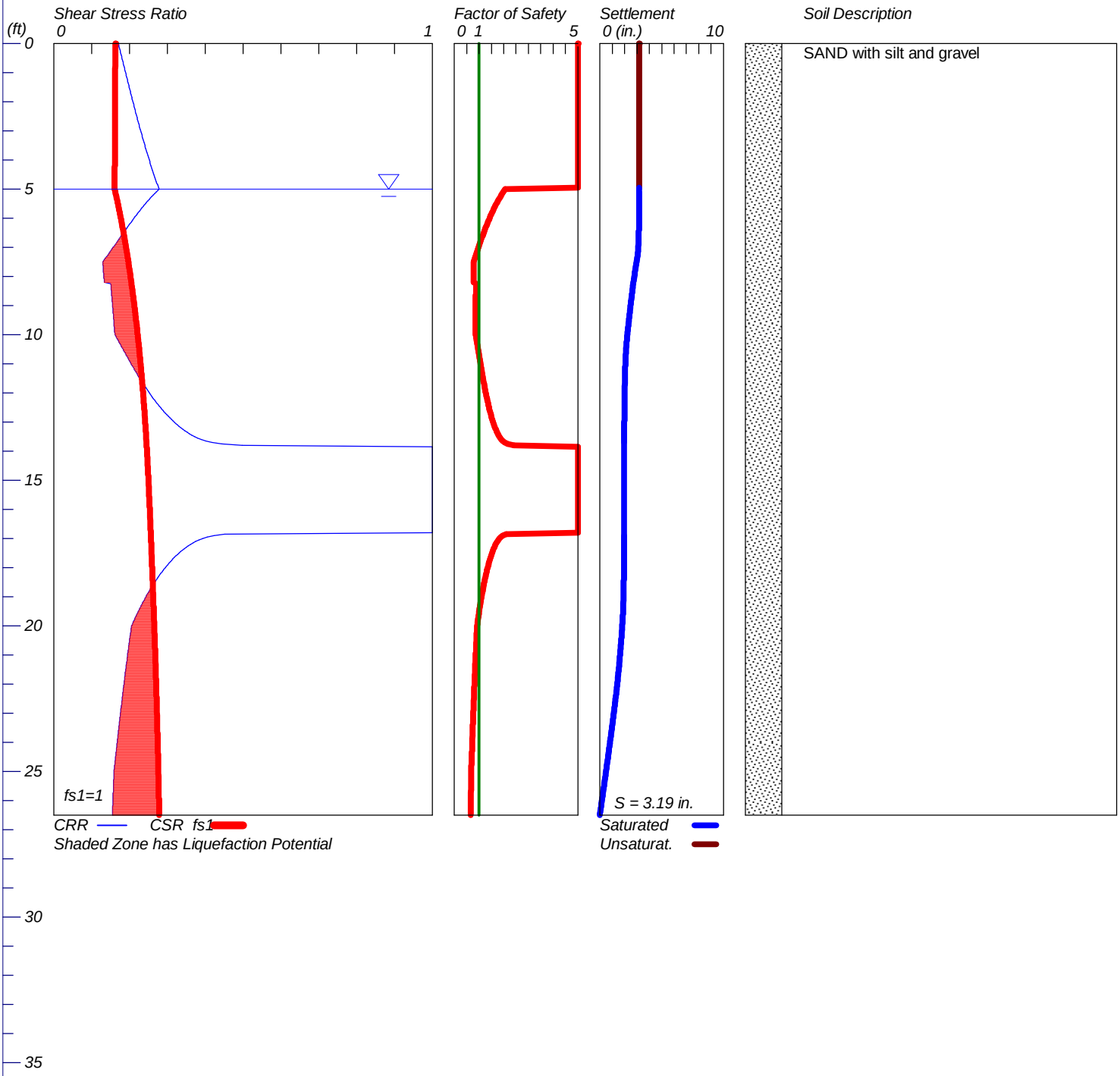


LIQUEFACTION ANALYSIS

Marymoor Park Apartment

Hole No.=B-2 Water Depth=5 ft Surface Elev.=36

Magnitude=7
Acceleration=0.25g



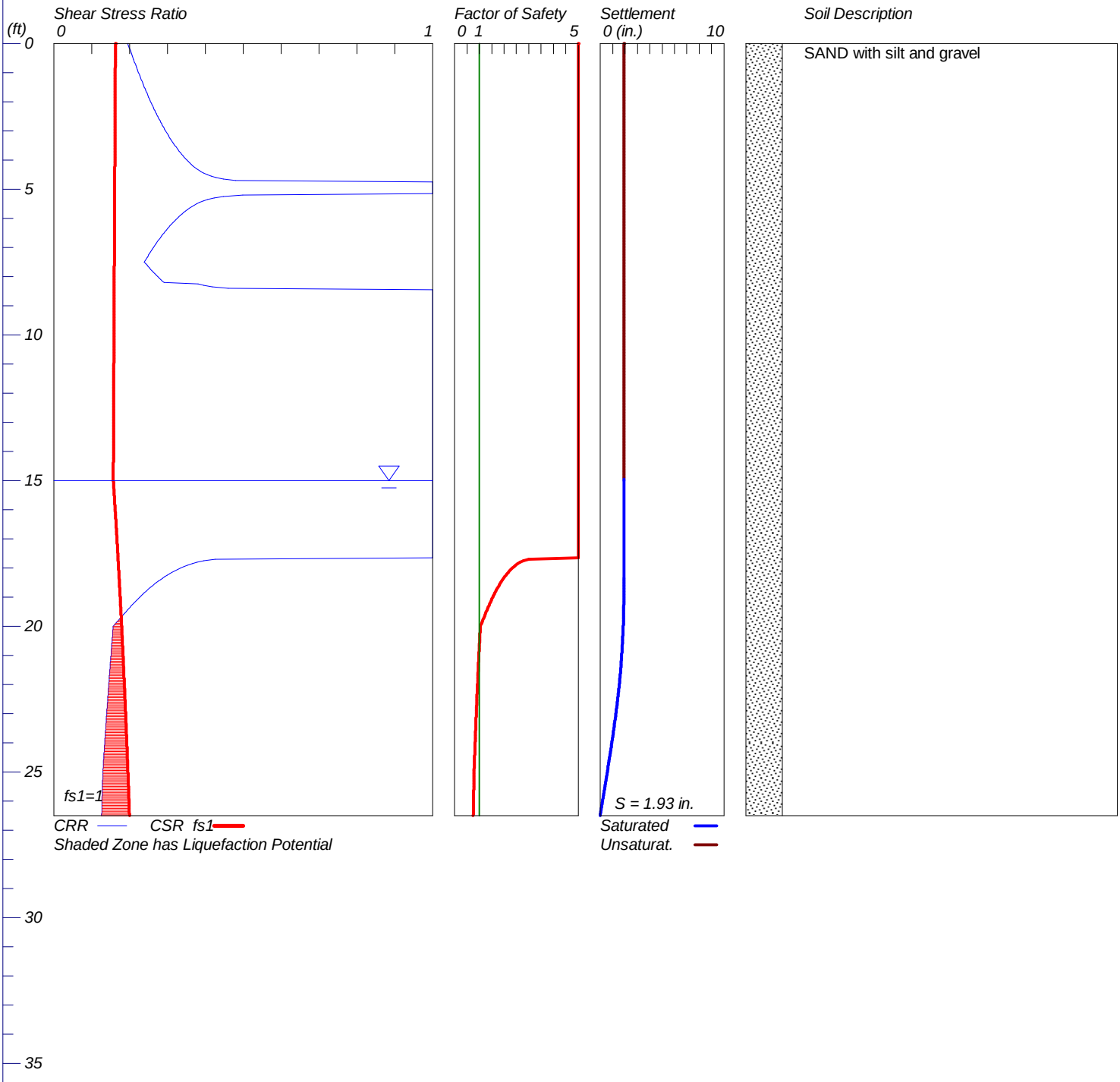
LiquefyPro CivilTech Software USA www.civiltech.com

LIQUEFACTION ANALYSIS

Marymoor Park Apartment

Hole No.=B-3 Water Depth=15 ft Surface Elev.=46

Magnitude=7
Acceleration=0.25g



LiquefyPro CivilTech Software USA www.civiltech.com

RILEYGROUP

November 3, 2015

Mr. Mark Hoyt
Maple Multi-Family TX L.P.
101 Stewart Street, Suite 935
Seattle, Washington 98101

Subject: **Geotechnical Report Addendum A**
Marymoor Park Apartments
6018 and 6213 East Lake Sammamish Parkway
Redmond, Washington
RGI Project No. 2015-111

References: 1. Geotechnical Engineering Report for Marymoor Park Apartments prepared by The Riley Group, Inc. dated June 31, 2015.
2. Drainage Plan and Infiltration Details (C-8 and C-17) prepared by DCI Engineers dated September 17, 2015.

Dear Mr. Hoyt:

The Riley Group, Inc. (RGI) previously provided the referenced geotechnical engineering report for the site. After the report was submitted, RGI was requested to provide additional information for the pavement design along 180th Place Northeast, permeable paver recommendations, infiltration trench details, and soil pressures for the retaining wall along the western property line.

Pavement along 180th Place Northeast

Based on the City of Redmond Community Development Guide (Appendix 20D-3), the minimum pavement for a non-arterial public street is 7 inches of hot mix asphalt (HMA) class 1/2 inch PG64-22 over compacted native soil subgrade. The subgrade should be prepared as recommended in our referenced report.

Permeable Pavers

RGI understands that the design team is considering Uni Ecoloc permeable pavers over an aggregate base for the proposed driveway. The anticipated traffic in this section is low with occasional fire trucks. RGI recommends that the permeable pavers be installed following Uni Ecoloc installation instruction. The pavers should be supported over 14 inches of clean crushed rock (2 inches of bedding course over 4" of open-graded base over 8 inches of subbase) over a geogrid such as BaseGrid 11 over native soil. Concrete curbs should be installed along the sides of the permeable paver sections.

Infiltration Trench Details

RGI understands that and infiltration trench with perforated pipe system will be used to dispose of storm water. The system is flexible and can vary in depth based on the site conditions. The trench should be at least 24 inches wide and 24 inches deep. The perforated pipe should be surrounded with clean gravel wrapped with geotextile fabric. Typically, Mirafi 140N or equivalent drainage fabric is used.

RGI understands that the building code requires that the infiltration trenches to be 20-feet downslope and 100-feet upslope of the building foundations. Considering the site is gently sloped and the native soil is fairly permeable, RGI recommends that the infiltration trench setbacks can be reduced to 2.5-feet from the building foundation or property line. Footing drains around the building can be eliminated.

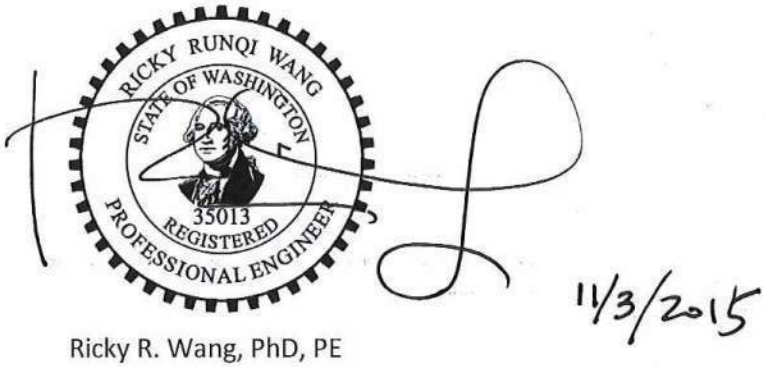
Retaining Walls

RGI understands that a retaining wall will be needed along the western property line to retain new fill. Due to site conditions, drainage is not able to be installed. RGI recommends that the retaining wall be designed using an active soil pressure of 85 pcf to account for hydrostatic pressure. Other soil parameters provided in our referenced report.

We trust the information presented is sufficient for your current needs. If you have any questions regarding this letter report or require additional information, please call us at (425) 415-0551.

Sincerely,

THE RILEY GROUP, INC.



Ricky R. Wang, PhD, PE
Principal Engineer