Harper
Houf Peterson
Righellis Inc.

Parr Lumber Improvements

Stormwater Report

November 8, 2022

Prepared For:

Eric Schmidlin
The Parr Company
5630 NE Century Blvd.
Hillsboro, OR 97124

PAR-43

Prepared By:

Harper Houf Peterson Righellis Inc.
1220 Main Street, Suite 150
Vancouver, WA 98660
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Kelly Bachelder, PE

HHPR

ENGINEERS ◆ PLANNERS
LANDSCAPE ARCHITECTS ◆ SURVEYORS

Table of Contents

1) List of Section Headings

INTRODUCTION

This is the Drainage Report for the Marysville Parr Lumber, located at 7610 47th Avenue NE in Marysville, WA. This report is also included as an appendix to the site plan review submittal package.

This report is submitted concurrently with a site application plan set that contains the stormwater plans. This site application plan set will hereafter be referred to as the "plan set" and is included as Appendix 2.

PROJECT SUMMARY

The site includes tax lot 30052100422800. The site consists of approximately 4.54 acre, but the disturbed area is approximately 1.12 acres. The project consists of paving the north portion of the lot for storage and drive aisles. The project will meet the requirements of the Western Washington Stormwater Manual.

Determination of Applicable Minimum Requirements

Minimum Requirements 1-9 are applicable for this project.

Existing Hard Surface …………………………………………… 0 AC
New Hard Surface ……………………………………………… 0.759 AC
Replaced Hard Surface ………………………………………… 0 AC
Native Vegetation converted to lawn or landscaping …………… 0.367 AC
Native vegetation converted to pasture ………………………… 0 AC
Total Land-Disturbing activity …………………………………… 1.12 AC
Pollution Generating Hard Surface (PGHS) ……………………… 0.759 AC
Pollution Generating Pervious Surfaces (PGPS) ………………… 0 AC
Total Pollution Generating Surfaces ……………………………… 0.759 AC
Total Non-Pollution Generating Surfaces ………………………… 0.367 AC

There is one TDA for this project.

Minimum Requirements

Minimum Requirement #1 – Preparation of Stormwater Site Plans
This Drainage Report and the project plans will serve as the Stormwater Site Plans. The runoff from the drive aisles will be infiltrated through the pervious concrete and treated through the existing soils.

Water quality minimum requirement will be achieved through the existing soils per the requirements of the Stormwater Manual.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention
The project plans indicate pollution prevention BMP's and a Stormwater Pollution Prevention Plan (SWPPP) will be prepared. The contractor shall comply with all requirements of the SWPPP and the Clark County erosion control ordinance.

Minimum Requirement #3 – Source Control
The project consists of lumber storage and therefore the development does not include any pollutant generating sources that could be spilled or leaked into the stormwater system.

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls
The existing stormwater runoff flows from east to west to an existing drainage ditch. The project will infiltrate the runoff, lessening the stormwater to the existing ditch. In the event of flooding or if the drainage system becomes plugged, the runoff will overflow to this existing ditch.

Minimum Requirement #5 – On-Site Stormwater Management BMP's
Infiltration will be utilized to meet Minimum Requirement #5. See the WWHM calculations that show that 100% of the runoff will be infiltrated through the pervious concrete.

BMP T5.13 Post Construction Soil Quality and Depth will be completed on all disturbed areas.

Minimum Requirement #6 – Runoff Treatment Analysis and Design
The project has over 5,000 s.f. of PGHS, and therefore must meet the conditions of Minimum Requirement #6. The treatment BMP utilized in design is infiltration and treatment through the existing soils. As shown in the WWHM printout, 100% will flow through the treatment soils. As shown in the Geotech Report, the organic content of the soils is over 1% and the CEC exceeds 5 Meq/100g.

* See Appendix 3 for WWHM calculations

Minimum Requirement #7 – Flow Control Analysis and Design
The project has over 10,000 square feet of impervious surface and therefore is required to meet Minimum Requirement #7. The project will meet Minimum Requirement #7 via infiltration. The pervious concrete area will infiltrate 100% of the runoff. Refer the WWHM printouts, Appendix 3.

The assumptions used for this project are:

- The rainfall data in WWHM accurately reflects the rainfall.
- The proposed pervious concrete be well maintained by the owner.
- They survey accurately demonstrates the on-site slopes and features.

Minimum Requirement #8 – Wetlands Protection
N/A. There are no wetlands on site.

Minimum Requirement #9 – Operations and Maintenance
The stormwater systems will be privately maintained by the property owner.

Appendices

Appendix 1 – Maps
Appendix 2 – Site Application Plan Set
Appendix 3 – Stormwater Calculations
Appendix 4 – Geotechnical Report

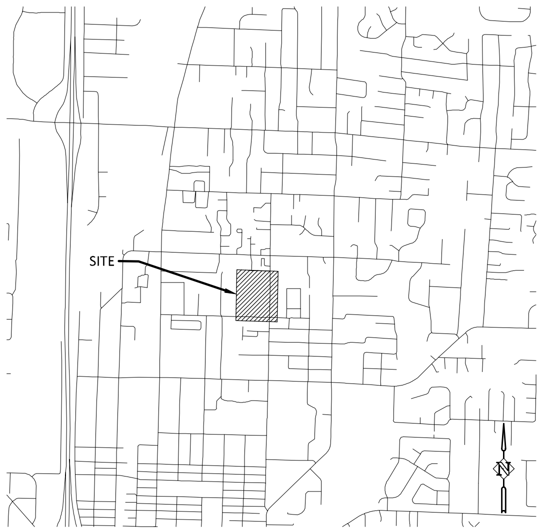
APPENDIX 1 – MAPS


Site Location Map
Project Site
Parr Lumber
Pinewood
ementary School
Marysville Comm
Food
Co-Op Supply
The Background
Check Company
#Beloved Momo
Adult Family Home
M&B Landscaping
Michael Mu
Constru
Hixson Dental
Lucas Landscape
& Designs
E & E Lumber
Westend Apartments
Allen Creek
Value Village
Mobile Haven
Senior Park
Cedar Ave
Roal Construction
& Remodel
Dutch Bros
Safeway Plaza
Safeway
MarysvilleSkate Center
Cristiano's Pizza Etc
Studio 51
72nd St NE
72nd St NE
Grove St
72nd St NE
Pacific Building Products
Morgan Cottag
Adult Fami
Jennings Park
Marysville Middle School
Jennings
5

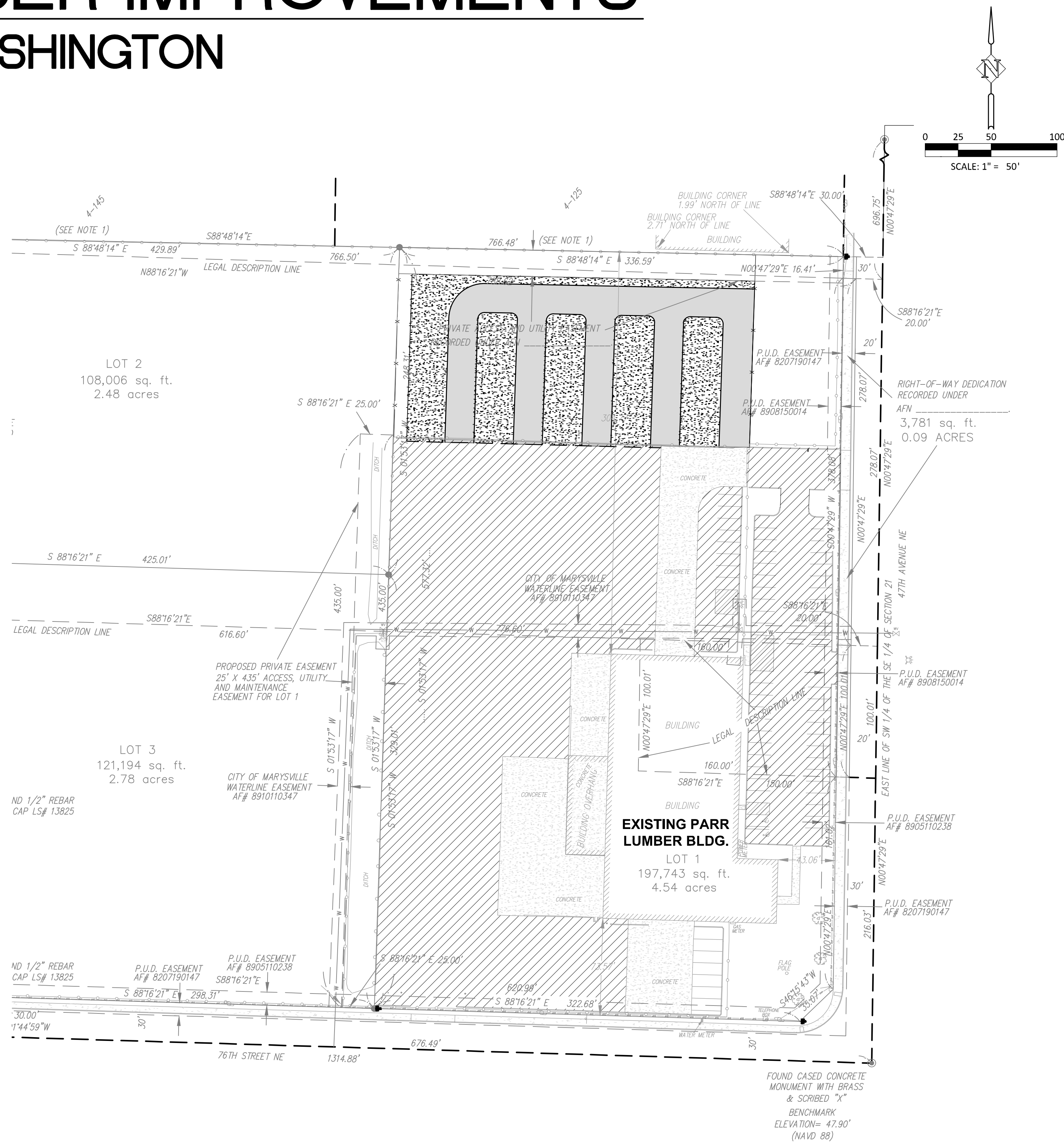
APPENDIX 2 - SITE APPLICATION PLAN SET

PARR LUMBER IMPROVEMENTS

MARYSVILLE, WASHINGTON



VICINITY MAP
NTS



PLAN VIEW
SCALE: 1" = 50'

SHEET INDEX

C1.0	COVER SHEET
C1.1	EXISTING CONDITIONS AND DEMOLITION PLAN
C2.0	GRADING PLAN
C2.1	CONSTRUCTION PLAN
C3.0	EROSION CONTROL DETAILS
C3.1	DETAILS

NOTE: ALL WORK SHALL BE COMPLETED TO THE CITY OF MARYSVILLE STANDARDS AND SPECIFICATIONS AND TO THE CURRENT WASHINGTON STANDARD SPECIFICATIONS FOR CONSTRUCTION

SITE INFORMATION

7610 NE 47TH AVE, MARYSVILLE, WA
TAX LOTS 30052100422800
DISTURBED AREA = 1.15 ACRES
GRADING QUANTITY: 2600 CY (CUT)

OWNER/APPLICANT

THE PARR COMPANY
CONTACT: ERIC SCHMIDLIN
5630 NE CENTURY BLVD.
HILLSBORO, OR 97124
PHONE: 503-614-2516
EMAIL: ERIC.SCHMIDLIN@PARR.COM

ENGINEER

HARPER HOUF PETERSON RIGHELLIS INC.
CONTACT: KELLY BACHELDER, PE
1220 MAIN STREET, SUITE 150
VANCOUVER, WA 98660
PHONE: 360-750-1131
EMAIL: KELLYB@HHPR.COM

COVER SHEET
PARR LUMBER
MARYSVILLE, WASHINGTON

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STATE OF WASHINGTON
40581
REGISTERED PROFESSIONAL ENGINEER
11/08/2022

DESIGNED: KDB
DRAWN: JWS
CHECKED: KDB
DATE: 11/08/2022

DATE	NO.	DESCRIPTION

REVISIONS

SHEET NO.
C1.0

JOB NO.
PAR-43

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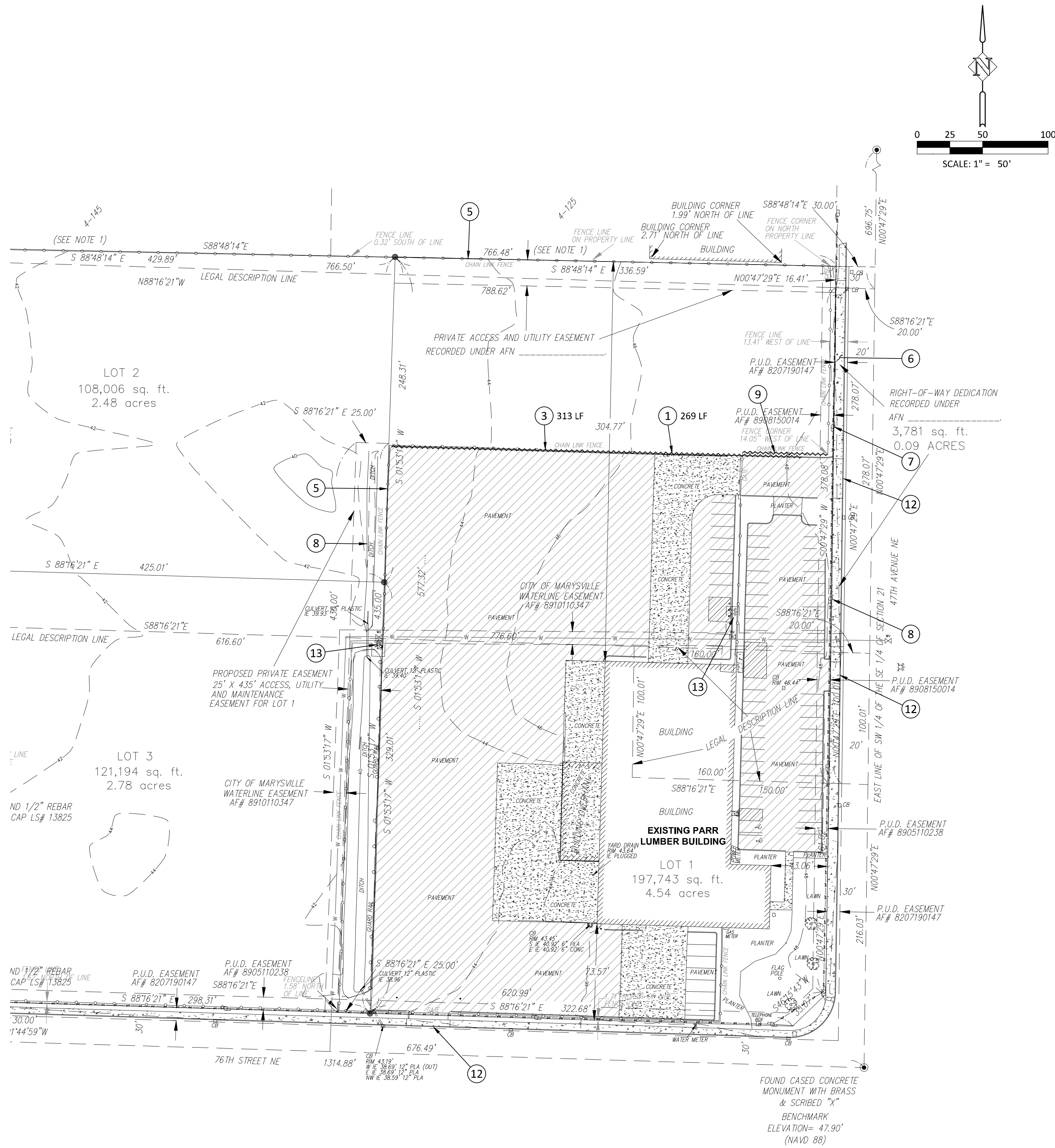

PLAN VIEW

SCALE: 1" = 50'

CONSTRUCTION NOTES:

1. REMOVE EXISTING FENCE AND/OR GATE. SEE PLAN FOR LENGTH.
3. REMOVE EXISTING CURB. SEE PLAN FOR LENGTH.
5. PROTECT EXISTING FENCE.
6. PROTECT EXISTING SIDEWALK.
7. PROTECT EXISTING UTILITY POLE.
8. PROTECT EXISTING DITCH.
9. REMOVE EXISTING FENCE AS NEEDED DURING CONSTRUCTION. REPLACE FENCE AND GATE AS NECESSARY AFTER PAVING TO SEPARATE PARKING FROM STORAGE AREA.
12. PROTECT EXISTING DRIVEWAY.
13. PROTECT EXISTING FIRE HYDRANT.

EXISTING CONDITIONS AND DEMO PLAN
PARR LUMBER
MARYSVILLE, WASHINGTON

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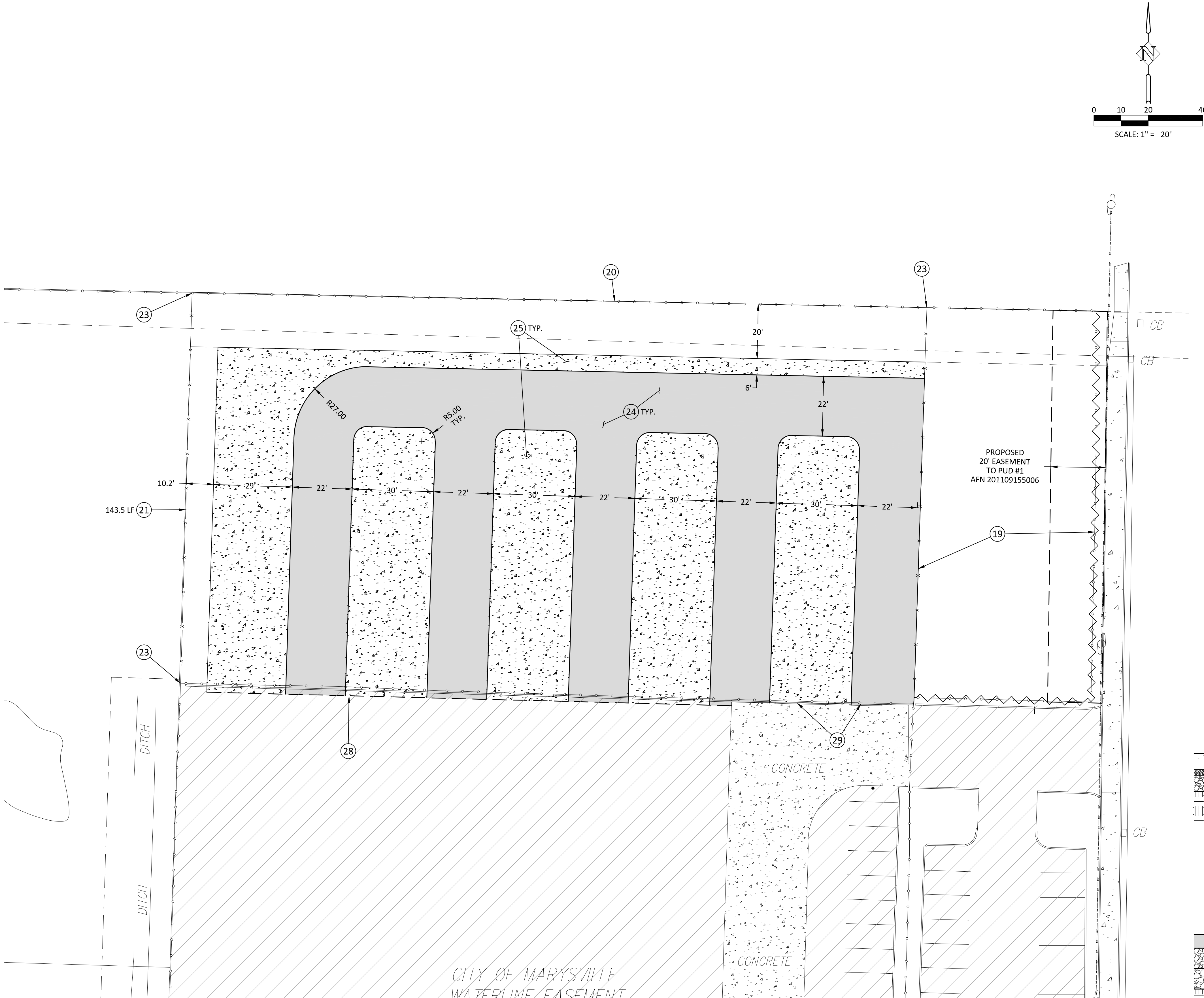


PLAN VIEW

CONSTRUCTION NOTES:

19 RELOCATE EXISTING FENCE.

20 ADD SLATS TO EXISTING FENCE ALONG NORTH PROPERTY LINE.

21 INSTALL 6' TALL CHAIN LINK FENCE WITH SLATS WITH BARBED WIRE ON TOP. SEE PLAN FOR FENCE LENGTH.

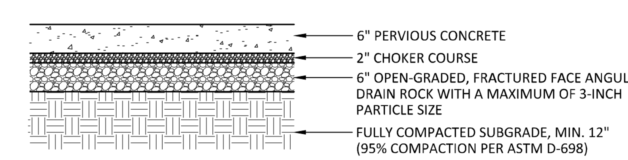
23 CONNECT NEW FENCE TO EXISTING FENCE.

24 INSTALL ASPHALT PAVEMENT PER SECTION, THIS SHEET.

25 INSTALL PERVIOUS CONCRETE PER SECTION, THIS SHEET.

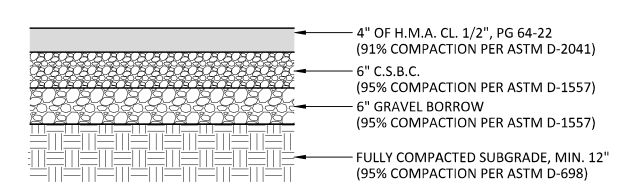
28 SAWCUT AND REMOVE EXISTING ASPHALT TO CREATE A CLEAN EDGE. MATCH EXISTING ELEVATIONS.

29 MATCH ELEVATION AT EXISTING CONCRETE.



PERVIOUS CONCRETE SECTION

N.T.S.



HMA SECTION

N.T.S.

CONSTRUCTION PLAN
PARR LUMBER
MARYSVILLE, WASHINGTON

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SHEET NO.
C2.1

JOB NO. PAR-43

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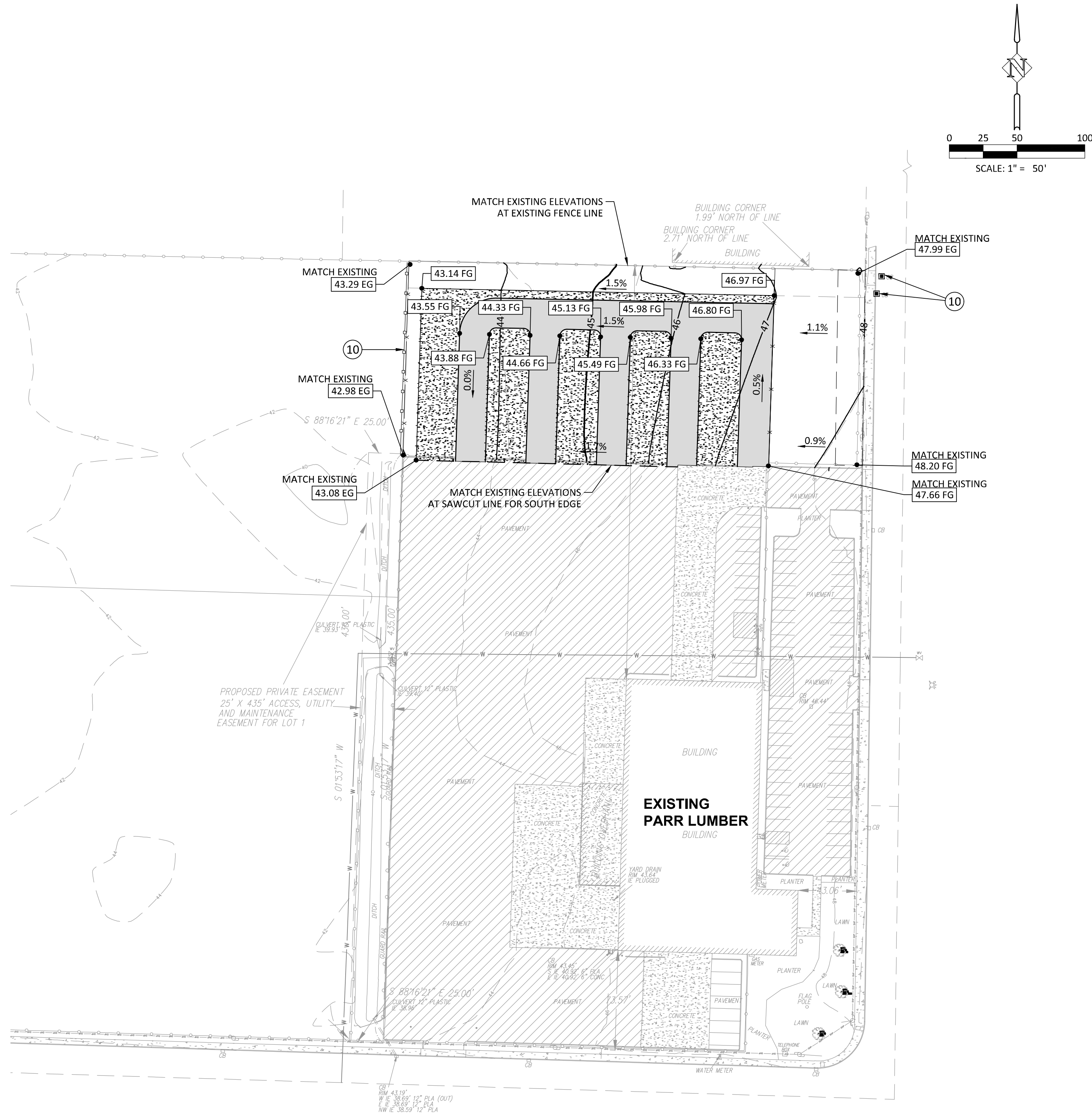

CONSTRUCTION NOTES:

10. INSTALL INLET PROTECTION PER DETAIL, SHEET C3.0.
11. INSTALL SEDIMENT FENCE PER DETAIL, SHEET C3.0.

PLAN VIEW
SCALE: 1" = 50'

GRADING PLAN
PARR LUMBER
MARYSVILLE, WASHINGTON

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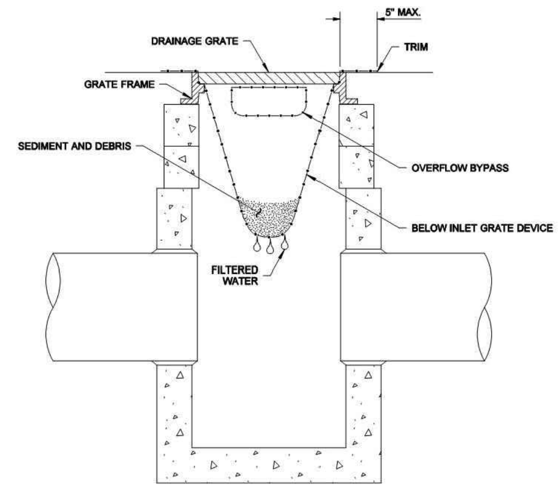
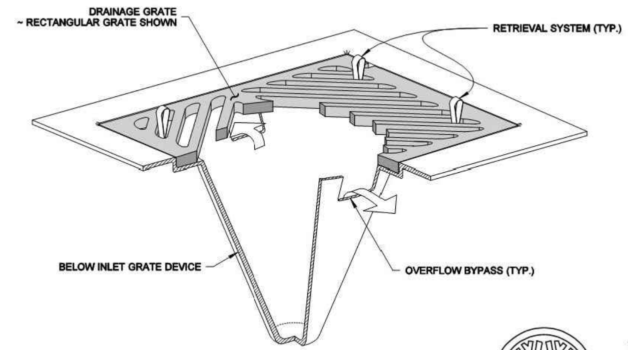
DRAWN BY: LISA CYFORD

NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.
2. The BIGD shall have a built-in high-flow relief system (overflow bypass).
3. The retrieval system must allow removal of the BIGD without spilling the collected material.
4. Perform maintenance in accordance with Standard Specification 8-01.3(15).



SECTION VIEW
NOT TO SCALE



ISOMETRIC VIEW

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
MARK W. MAURER
CERTIFICATE NO. 000598

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STORM DRAIN INLET PROTECTION

STANDARD PLAN I-40.20-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

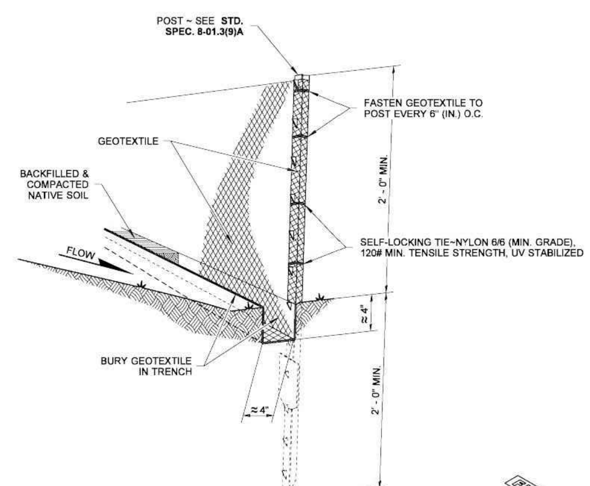
Pasco Bakotich III 09-20-07
STATE DESIGN ENGINEER DATE

Washington State Department of Transportation

DRAWN BY: BILL BERENS

NOTES

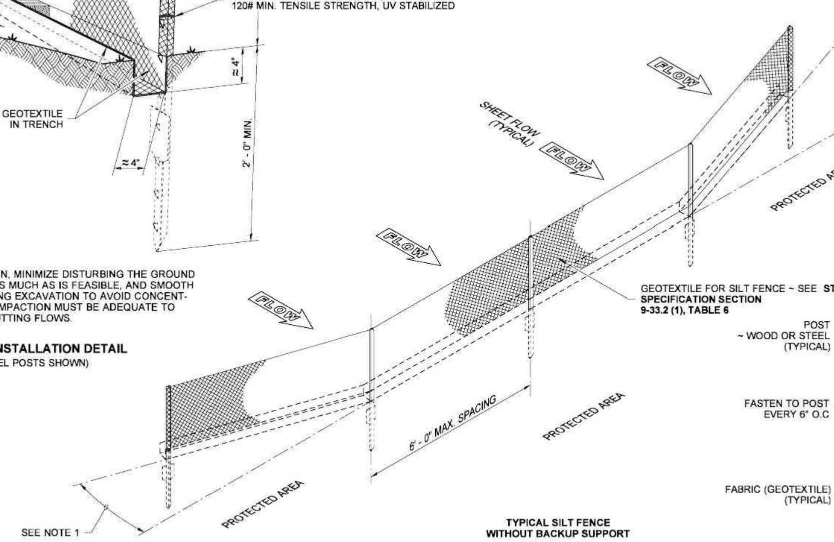
1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Perform maintenance in accordance with **Standard Specifications 8-01.3(9)A and 8-01.3(15).**
3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.
4. Install silt fencing parallel to mapped contour lines.



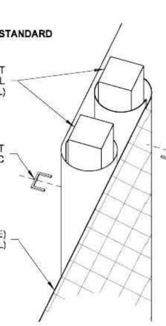
NOTE

DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.

TYPICAL INSTALLATION DETAIL
(STEEL POSTS SHOWN)



TYPICAL SILT FENCE WITHOUT BACKUP SUPPORT ISOMETRIC
(STEEL POSTS SHOWN)



SPLICED FENCE SECTIONS SHALL BE CLOSE ENOUGH TOGETHER TO PREVENT SILT LADEN WATER FROM ESCAPING THROUGH THE FENCE AT THE OVERLAP.

SPLICE DETAIL
(WOOD POSTS SHOWN)

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
SANDRA L. SALISBURY
CERTIFICATE NO. 000860

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SILT FENCE

STANDARD PLAN I-30.15-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III 3/22/13
STATE DESIGN ENGINEER DATE

Washington State Department of Transportation

EROSION CONTROL DETAILS
PARR LUMBER
MARYSVILLE, WASHINGTON

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11/08/2022

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REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO.
C3.0

JOB NO. PAR-43

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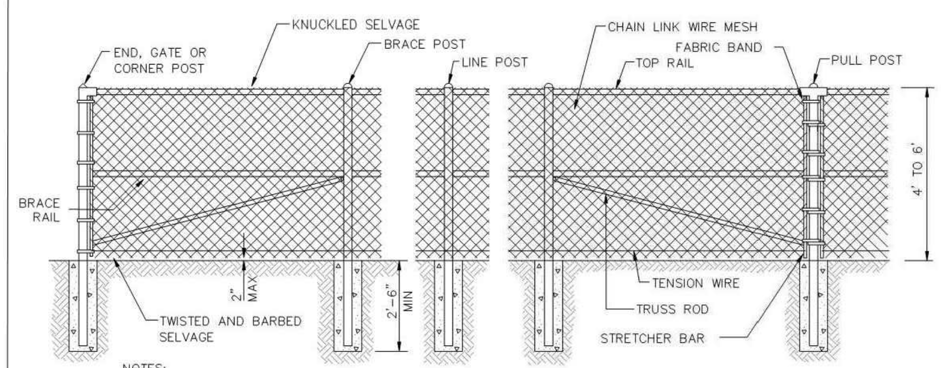

NOTES:

1. MATERIAL SHALL BE SCHEDULE 40
2. WIRE MESH SHALL BE 9 GAUGE WIRE
3. BARBED WIRE TO BE PLACED ON TOP AS DIRECTED
4. WOOD SLATS MAY BE REQUIRED
5. SCHEDULE 40 IS REQUIRED FOR ALL POSTS FOR FUTURE SLATES AND WIND SHEAR.
6. TENSION WIRE SHALL BE 7 GAUGE
7. ALL CHAIN LINK FENCE SHALL BE BLACK VINYL OR POWDER COATED.
8. FENCE SECTION SHALL BE 8' UNLESS OTHERWISE INSTRUCTED.

APPROVED BY 12/28/16
MARYSVILLE CITY ENGINEER DATE

CHAIN LINK FENCE

CITY OF Marysville WASHINGTON

LAST REVISED 12/28/16

REVISED STANDARD PLAN 3-501-007

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DETAILS
PARR LUMBER
MARYSVILLE, WASHINGTON

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REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO.

C3.1

JOB NO. PAR-43

APPENDIX 3 – STORMWATER CALCULATIONS

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Parr Lumber - perv conc final
Site Name:	Parr Lumber Marysville
Site Address:	
City:	
Report Date:	11/18/2022
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

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

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.76
Pervious Total	0.76
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.76

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Lateral Basin 1

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
C IMP DISP FLAT	.367	
Element Flows To:		
Surface	Interflow	Groundwater
Permeable Pavement 1	Permeable Pavement 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Permeable Pavement 1

Pavement Area:0.3926 acre.Pavement Length:570.00 ft.
Pavement Width: 30.00 ft.
Pavement slope 1:0 To 1
Pavement thickness: 0.5
Pour Space of Pavement: 0.4
Material thickness of second layer: 0.5
Pour Space of material for second layer: 0.33
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 6
Infiltration safety factor: 0.25
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 80.334
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 80.334
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 8.501
Element Flows To:
Outlet 1 Outlet 2

Permeable Pavement Hydraulic Table

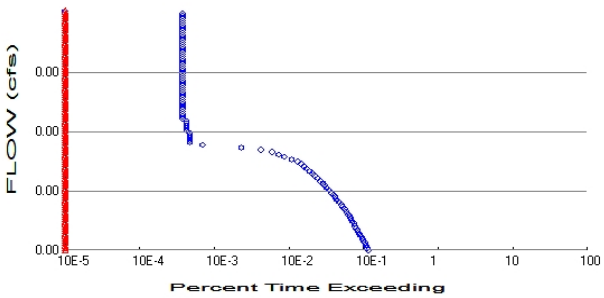
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.392	0.000	0.000	0.000
0.0122	0.392	0.001	0.000	0.593
0.0244	0.392	0.003	0.000	0.593
0.0367	0.392	0.004	0.000	0.593
0.0489	0.392	0.006	0.000	0.593
0.0611	0.392	0.007	0.000	0.593
0.0733	0.392	0.009	0.000	0.593
0.0856	0.392	0.011	0.000	0.593
0.0978	0.392	0.012	0.000	0.593
0.1100	0.392	0.014	0.000	0.593
0.1222	0.392	0.015	0.000	0.593
0.1344	0.392	0.017	0.000	0.593
0.1467	0.392	0.019	0.000	0.593
0.1589	0.392	0.020	0.000	0.593
0.1711	0.392	0.022	0.000	0.593
0.1833	0.392	0.023	0.000	0.593
0.1956	0.392	0.025	0.000	0.593
0.2078	0.392	0.026	0.000	0.593
0.2200	0.392	0.028	0.000	0.593
0.2322	0.392	0.030	0.000	0.593
0.2444	0.392	0.031	0.000	0.593
0.2567	0.392	0.033	0.000	0.593
0.2689	0.392	0.034	0.000	0.593
0.2811	0.392	0.036	0.000	0.593
0.2933	0.392	0.038	0.000	0.593
0.3056	0.392	0.039	0.000	0.593
0.3178	0.392	0.041	0.000	0.593
0.3300	0.392	0.042	0.000	0.593

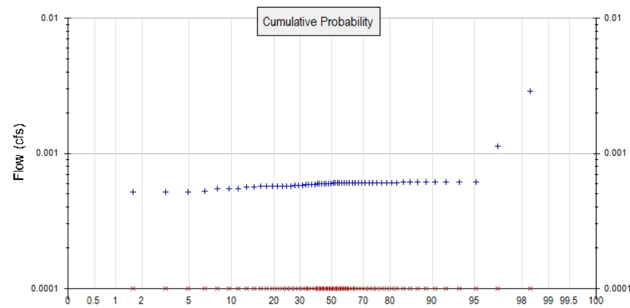
0.3422	0.392	0.044	0.000	0.593
0.3544	0.392	0.045	0.000	0.593
0.3667	0.392	0.047	0.000	0.593
0.3789	0.392	0.049	0.000	0.593
0.3911	0.392	0.050	0.000	0.593
0.4033	0.392	0.052	0.000	0.593
0.4156	0.392	0.053	0.000	0.593
0.4278	0.392	0.055	0.000	0.593
0.4400	0.392	0.057	0.000	0.593
0.4522	0.392	0.058	0.000	0.593
0.4644	0.392	0.060	0.000	0.593
0.4767	0.392	0.061	0.000	0.593
0.4889	0.392	0.063	0.000	0.593
0.5011	0.392	0.065	0.000	0.593
0.5133	0.392	0.067	0.000	0.593
0.5256	0.392	0.069	0.000	0.593
0.5378	0.392	0.071	0.000	0.593
0.5500	0.392	0.072	0.000	0.593
0.5622	0.392	0.074	0.000	0.593
0.5744	0.392	0.076	0.000	0.593
0.5867	0.392	0.078	0.000	0.593
0.5989	0.392	0.080	0.000	0.593
0.6111	0.392	0.082	0.000	0.593
0.6233	0.392	0.084	0.000	0.593
0.6356	0.392	0.086	0.000	0.593
0.6478	0.392	0.088	0.000	0.593
0.6600	0.392	0.090	0.000	0.593
0.6722	0.392	0.092	0.000	0.593
0.6844	0.392	0.094	0.000	0.593
0.6967	0.392	0.096	0.000	0.593
0.7089	0.392	0.097	0.000	0.593
0.7211	0.392	0.099	0.000	0.593
0.7333	0.392	0.101	0.000	0.593
0.7456	0.392	0.103	0.000	0.593
0.7578	0.392	0.105	0.000	0.593
0.7700	0.392	0.107	0.000	0.593
0.7822	0.392	0.109	0.000	0.593
0.7944	0.392	0.111	0.000	0.593
0.8067	0.392	0.113	0.000	0.593
0.8189	0.392	0.115	0.000	0.593
0.8311	0.392	0.117	0.000	0.593
0.8433	0.392	0.119	0.000	0.593
0.8556	0.392	0.120	0.000	0.593
0.8678	0.392	0.122	0.000	0.593
0.8800	0.392	0.124	0.000	0.593
0.8922	0.392	0.126	0.000	0.593
0.9044	0.392	0.128	0.000	0.593
0.9167	0.392	0.130	0.000	0.593
0.9289	0.392	0.132	0.000	0.593
0.9411	0.392	0.134	0.000	0.593
0.9533	0.392	0.136	0.000	0.593
0.9656	0.392	0.138	0.000	0.593
0.9778	0.392	0.140	0.000	0.593
0.9900	0.392	0.142	0.000	0.593
1.0022	0.392	0.146	0.000	0.593
1.0144	0.392	0.151	0.000	0.593
1.0267	0.392	0.156	0.000	0.593
1.0389	0.392	0.161	0.000	0.593

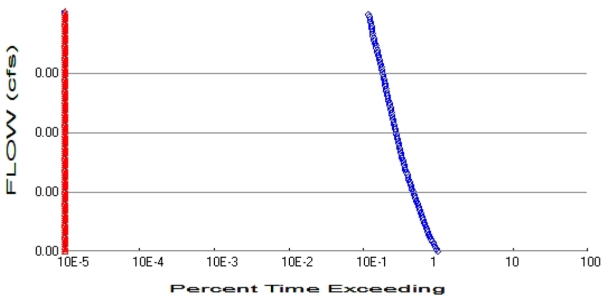
1.0511	0.392	0.166	0.000	0.593
1.0633	0.392	0.170	0.000	0.593
1.0756	0.392	0.175	0.000	0.593
1.0878	0.392	0.180	0.000	0.593

Analysis Results

POC 1







+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.76
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.367
Total Impervious Area: 0.392562

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.0006
5 year	0.000731
10 year	0.000816
25 year	0.000922
50 year	0.001001
100 year	0.001079

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	0.001	0.000
1951	0.001	0.000
1952	0.001	0.000
1953	0.001	0.000
1954	0.001	0.000
1955	0.001	0.000
1956	0.001	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.001	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	0.001	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	0.001	0.000
1992	0.001	0.000
1993	0.001	0.000
1994	0.001	0.000
1995	0.001	0.000
1996	0.001	0.000
1997	0.003	0.000
1998	0.001	0.000
1999	0.001	0.000
2000	0.001	0.000
2001	0.000	0.000
2002	0.001	0.000
2003	0.001	0.000
2004	0.001	0.000

2005	0.001	0.000
2006	0.001	0.000
2007	0.001	0.000
2008	0.001	0.000
2009	0.001	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0029	0.0000
2	0.0011	0.0000
3	0.0006	0.0000
4	0.0006	0.0000
5	0.0006	0.0000
6	0.0006	0.0000
7	0.0006	0.0000
8	0.0006	0.0000
9	0.0006	0.0000
10	0.0006	0.0000
11	0.0006	0.0000
12	0.0006	0.0000
13	0.0006	0.0000
14	0.0006	0.0000
15	0.0006	0.0000
16	0.0006	0.0000
17	0.0006	0.0000
18	0.0006	0.0000
19	0.0006	0.0000
20	0.0006	0.0000
21	0.0006	0.0000
22	0.0006	0.0000
23	0.0006	0.0000
24	0.0006	0.0000
25	0.0006	0.0000
26	0.0006	0.0000
27	0.0006	0.0000
28	0.0006	0.0000
29	0.0006	0.0000
30	0.0006	0.0000
31	0.0006	0.0000
32	0.0006	0.0000
33	0.0006	0.0000
34	0.0006	0.0000
35	0.0006	0.0000
36	0.0006	0.0000
37	0.0006	0.0000
38	0.0006	0.0000
39	0.0006	0.0000
40	0.0006	0.0000
41	0.0006	0.0000
42	0.0006	0.0000
43	0.0006	0.0000
44	0.0006	0.0000
45	0.0006	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	0.0005	0.0000
55	0.0005	0.0000
56	0.0005	0.0000
57	0.0005	0.0000
58	0.0005	0.0000
59	0.0005	0.0000
60	0.0005	0.0000
61	0.0005	0.0000

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0000	20995	0	0	Pass
0.0001	20294	0	0	Pass
0.0001	19267	0	0	Pass
0.0001	18657	0	0	Pass
0.0001	17787	0	0	Pass
0.0001	17246	0	0	Pass
0.0001	16444	0	0	Pass
0.0001	15947	0	0	Pass
0.0001	15413	0	0	Pass
0.0001	15083	0	0	Pass
0.0001	14600	0	0	Pass
0.0001	14125	0	0	Pass
0.0001	13819	0	0	Pass
0.0001	13383	0	0	Pass
0.0001	13116	0	0	Pass
0.0001	12741	0	0	Pass
0.0001	12480	0	0	Pass
0.0001	12091	0	0	Pass
0.0001	11849	0	0	Pass
0.0001	11488	0	0	Pass
0.0001	11242	0	0	Pass
0.0001	10883	0	0	Pass
0.0001	10579	0	0	Pass
0.0001	10365	0	0	Pass
0.0001	10048	0	0	Pass
0.0001	9832	0	0	Pass
0.0001	9537	0	0	Pass
0.0001	9332	0	0	Pass
0.0001	9030	0	0	Pass
0.0001	8855	0	0	Pass
0.0001	8622	0	0	Pass
0.0001	8453	0	0	Pass
0.0001	8196	0	0	Pass
0.0001	7950	0	0	Pass
0.0001	7798	0	0	Pass
0.0001	7610	0	0	Pass
0.0001	7492	0	0	Pass
0.0001	7315	0	0	Pass
0.0001	7178	0	0	Pass
0.0001	6988	0	0	Pass
0.0001	6881	0	0	Pass
0.0002	6733	0	0	Pass
0.0002	6639	0	0	Pass
0.0002	6496	0	0	Pass
0.0002	6367	0	0	Pass
0.0002	6265	0	0	Pass
0.0002	6145	0	0	Pass
0.0002	6072	0	0	Pass
0.0002	5948	0	0	Pass
0.0002	5878	0	0	Pass
0.0002	5751	0	0	Pass
0.0002	5659	0	0	Pass
0.0002	5550	0	0	Pass

0.0002	5476	0	0	Pass
0.0002	5360	0	0	Pass
0.0002	5266	0	0	Pass
0.0002	5191	0	0	Pass
0.0002	5093	0	0	Pass
0.0002	5043	0	0	Pass
0.0002	4954	0	0	Pass
0.0002	4883	0	0	Pass
0.0002	4774	0	0	Pass
0.0002	4712	0	0	Pass
0.0002	4616	0	0	Pass
0.0002	4543	0	0	Pass
0.0002	4464	0	0	Pass
0.0002	4380	0	0	Pass
0.0002	4331	0	0	Pass
0.0002	4250	0	0	Pass
0.0002	4194	0	0	Pass
0.0002	4117	0	0	Pass
0.0002	4062	0	0	Pass
0.0002	3985	0	0	Pass
0.0002	3940	0	0	Pass
0.0002	3880	0	0	Pass
0.0002	3820	0	0	Pass
0.0002	3760	0	0	Pass
0.0002	3698	0	0	Pass
0.0002	3643	0	0	Pass
0.0002	3551	0	0	Pass
0.0003	3491	0	0	Pass
0.0003	3426	0	0	Pass
0.0003	3377	0	0	Pass
0.0003	3287	0	0	Pass
0.0003	3230	0	0	Pass
0.0003	3155	0	0	Pass
0.0003	3112	0	0	Pass
0.0003	3039	0	0	Pass
0.0003	2967	0	0	Pass
0.0003	2920	0	0	Pass
0.0003	2853	0	0	Pass
0.0003	2823	0	0	Pass
0.0003	2776	0	0	Pass
0.0003	2746	0	0	Pass
0.0003	2712	0	0	Pass
0.0003	2680	0	0	Pass
0.0003	2622	0	0	Pass
0.0003	2594	0	0	Pass
0.0003	2539	0	0	Pass
0.0003	2494	0	0	Pass

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0003	2494	0	0	Pass
0.0003	2381	0	0	Pass
0.0003	2289	0	0	Pass
0.0003	2205	0	0	Pass
0.0003	2116	0	0	Pass
0.0003	2036	0	0	Pass
0.0003	1946	0	0	Pass
0.0003	1865	0	0	Pass
0.0004	1769	0	0	Pass
0.0004	1708	0	0	Pass
0.0004	1650	0	0	Pass
0.0004	1600	0	0	Pass
0.0004	1525	0	0	Pass
0.0004	1453	0	0	Pass
0.0004	1389	0	0	Pass
0.0004	1322	0	0	Pass
0.0004	1257	0	0	Pass
0.0004	1196	0	0	Pass
0.0004	1125	0	0	Pass
0.0004	1066	0	0	Pass
0.0004	1002	0	0	Pass
0.0004	942	0	0	Pass
0.0005	895	0	0	Pass
0.0005	851	0	0	Pass
0.0005	798	0	0	Pass
0.0005	738	0	0	Pass
0.0005	691	0	0	Pass
0.0005	646	0	0	Pass
0.0005	608	0	0	Pass
0.0005	563	0	0	Pass
0.0005	520	0	0	Pass
0.0005	469	0	0	Pass
0.0005	441	0	0	Pass
0.0005	403	0	0	Pass
0.0005	369	0	0	Pass
0.0005	338	0	0	Pass
0.0006	310	0	0	Pass
0.0006	281	0	0	Pass
0.0006	232	0	0	Pass
0.0006	186	0	0	Pass
0.0006	157	0	0	Pass
0.0006	127	0	0	Pass
0.0006	90	0	0	Pass
0.0006	49	0	0	Pass
0.0006	15	0	0	Pass
0.0006	10	0	0	Pass
0.0006	10	0	0	Pass
0.0006	10	0	0	Pass
0.0006	10	0	0	Pass
0.0006	10	0	0	Pass
0.0007	9	0	0	Pass
0.0007	9	0	0	Pass
0.0007	9	0	0	Pass

0.0007	9	0	0	Pass
0.0007	9	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0007	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0008	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0009	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass
0.0010	8	0	0	Pass

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.

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
Permeable Pavement 1 POC	☐	73.10			☐	100.00			
Total Volume Infiltrated		73.10	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

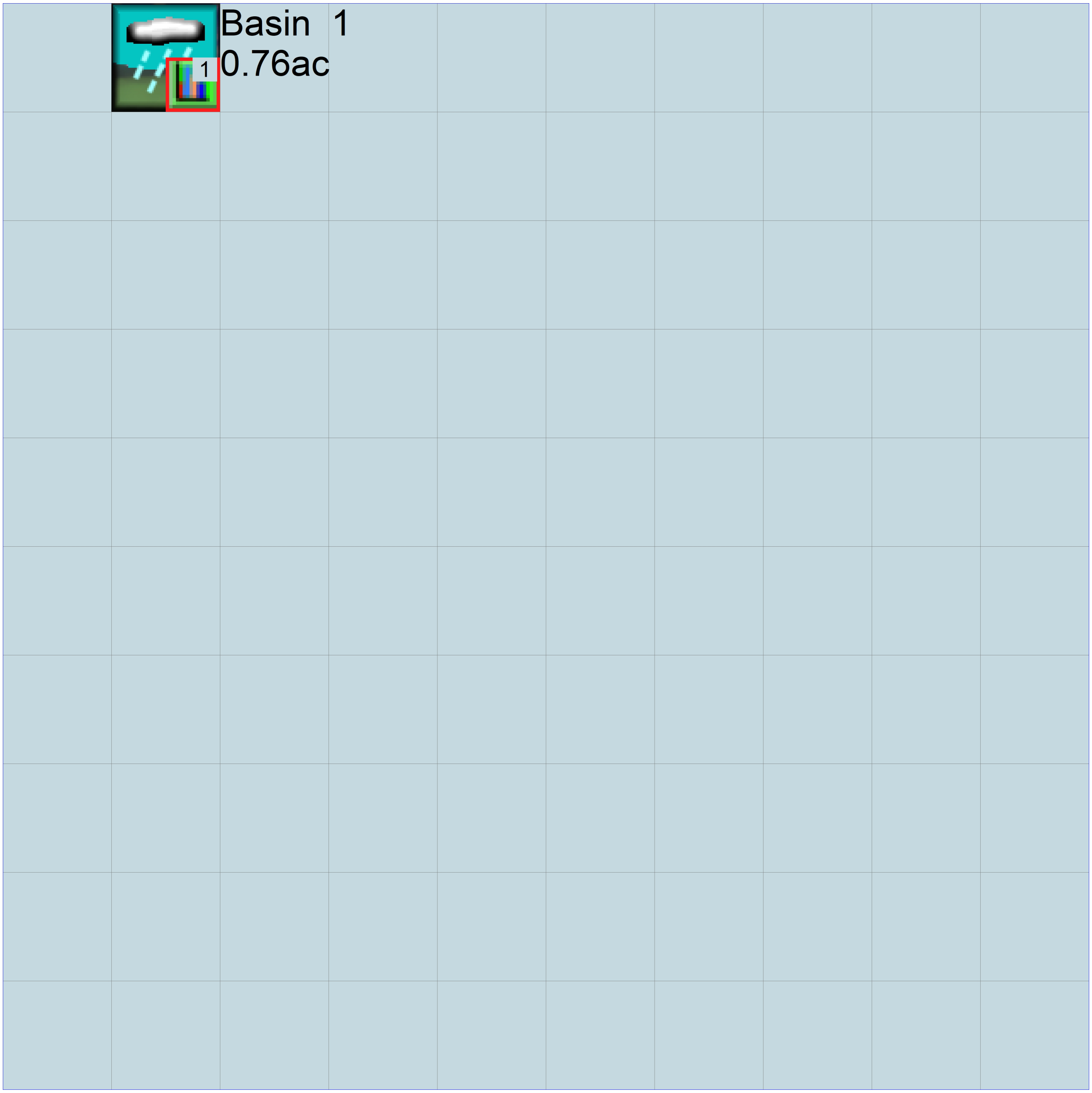
PERLND Changes

No PERLND changes have been made.

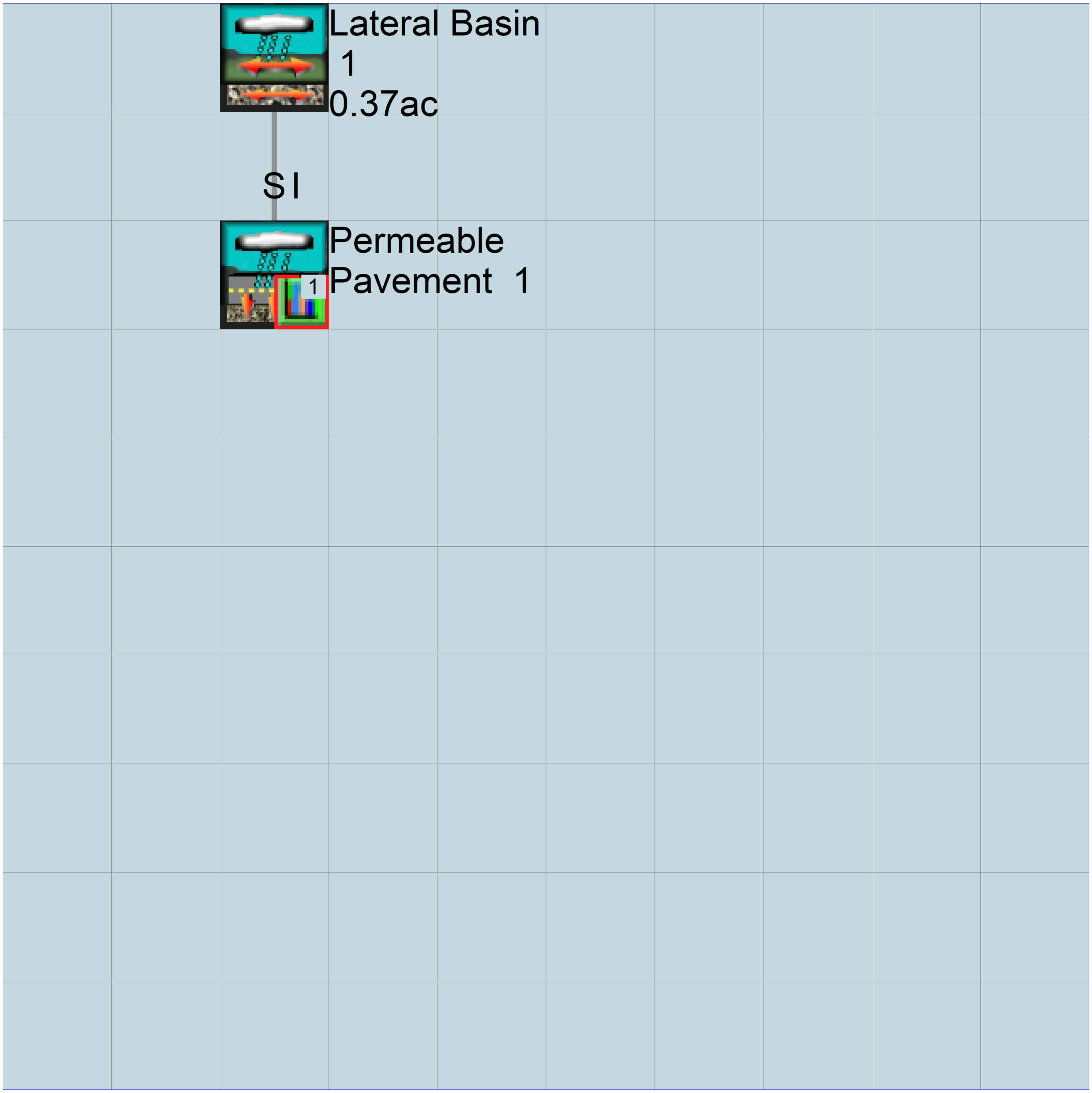
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   Parr Lumber - perv conc final.wdm
MESSU      25   PreParr Lumber - perv conc final.MES
           27   PreParr Lumber - perv conc final.L61
           28   PreParr Lumber - perv conc final.L62
           30   POCParr Lumber - perv conc final1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                         in  out           ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

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

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

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    1              0         5         2       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1            0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   1                        0.76     COPY   501     12
PERLND   1                        0.76     COPY   501     13

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

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



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

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

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

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

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   Parr Lumber - perv conc final.wdm
MESSU      25   MitParr Lumber - perv conc final.MES
           27   MitParr Lumber - perv conc final.L61
           28   MitParr Lumber - perv conc final.L62
           30   POCParr Lumber - perv conc final1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      38
      IMPLND      16
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Permeable Pavement  1       MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   38      C/IMP DISP /FLAT        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   38         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
  38         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  38         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  38              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  38              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  38            0.1      0.25      0.25         6       0.5      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
  38              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out            ***
  16      Porous Pavement        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  16         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  16         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  16         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  16            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
```

```
    # -  # ***PETMAX    PETMIN
   16             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   16             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
IMPLND  16                      0.3926     RCHRES   1      5
Lateral Basin  1***
PERLND  38                      0.9349     IMPLND  16     54
PERLND  38                      0.9349     IMPLND  16     55

******Routing******
PERLND  38                       0.367     COPY     1     12
PERLND  38                       0.367     COPY     1     13
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     Permeable Paveme-006    2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *          ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.11       0.0       0.0       0.5       0.0
```

```
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                           ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1          0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   90    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.392562  0.000000  0.000000  0.000000
  0.012222  0.392562  0.001583  0.000000  0.593750
  0.024444  0.392562  0.003167  0.000000  0.593750
  0.036667  0.392562  0.004750  0.000000  0.593750
  0.048889  0.392562  0.006333  0.000000  0.593750
  0.061111  0.392562  0.007917  0.000000  0.593750
  0.073333  0.392562  0.009500  0.000000  0.593750
  0.085556  0.392562  0.011083  0.000000  0.593750
  0.097778  0.392562  0.012667  0.000000  0.593750
  0.110000  0.392562  0.014250  0.000000  0.593750
  0.122222  0.392562  0.015833  0.000000  0.593750
  0.134444  0.392562  0.017417  0.000000  0.593750
  0.146667  0.392562  0.019000  0.000000  0.593750
  0.158889  0.392562  0.020583  0.000000  0.593750
  0.171111  0.392562  0.022167  0.000000  0.593750
  0.183333  0.392562  0.023750  0.000000  0.593750
  0.195556  0.392562  0.025333  0.000000  0.593750
  0.207778  0.392562  0.026917  0.000000  0.593750
  0.220000  0.392562  0.028500  0.000000  0.593750
  0.232222  0.392562  0.030083  0.000000  0.593750
  0.244444  0.392562  0.031667  0.000000  0.593750
  0.256667  0.392562  0.033250  0.000000  0.593750
  0.268889  0.392562  0.034833  0.000000  0.593750
  0.281111  0.392562  0.036417  0.000000  0.593750
  0.293333  0.392562  0.038000  0.000000  0.593750
  0.305556  0.392562  0.039583  0.000000  0.593750
  0.317778  0.392562  0.041167  0.000000  0.593750
  0.330000  0.392562  0.042750  0.000000  0.593750
  0.342222  0.392562  0.044333  0.000000  0.593750
  0.354444  0.392562  0.045917  0.000000  0.593750
  0.366667  0.392562  0.047500  0.000000  0.593750
  0.378889  0.392562  0.049083  0.000000  0.593750
  0.391111  0.392562  0.050667  0.000000  0.593750
  0.403333  0.392562  0.052250  0.000000  0.593750
  0.415556  0.392562  0.053833  0.000000  0.593750
  0.427778  0.392562  0.055417  0.000000  0.593750
  0.440000  0.392562  0.057000  0.000000  0.593750
  0.452222  0.392562  0.058583  0.000000  0.593750
  0.464444  0.392562  0.060167  0.000000  0.593750
  0.476667  0.392562  0.061750  0.000000  0.593750
  0.488889  0.392562  0.063333  0.000000  0.593750
  0.501111  0.392562  0.065253  0.000000  0.593750
  0.513333  0.392562  0.067172  0.000000  0.593750
  0.525556  0.392562  0.069091  0.000000  0.593750
  0.537778  0.392562  0.071010  0.000000  0.593750
  0.550000  0.392562  0.072929  0.000000  0.593750
  0.562222  0.392562  0.074848  0.000000  0.593750
  0.574444  0.392562  0.076768  0.000000  0.593750
  0.586667  0.392562  0.078687  0.000000  0.593750
  0.598889  0.392562  0.080606  0.000000  0.593750
  0.611111  0.392562  0.082525  0.000000  0.593750
  0.623333  0.392562  0.084444  0.000000  0.593750
  0.635556  0.392562  0.086364  0.000000  0.593750
```

```
  0.647778  0.392562  0.088283  0.000000  0.593750
  0.660000  0.392562  0.090202  0.000000  0.593750
  0.672222  0.392562  0.092121  0.000000  0.593750
  0.684444  0.392562  0.094040  0.000000  0.593750
  0.696667  0.392562  0.095960  0.000000  0.593750
  0.708889  0.392562  0.097879  0.000000  0.593750
  0.721111  0.392562  0.099798  0.000000  0.593750
  0.733333  0.392562  0.101717  0.000000  0.593750
  0.745556  0.392562  0.103636  0.000000  0.593750
  0.757778  0.392562  0.105556  0.000000  0.593750
  0.770000  0.392562  0.107475  0.000000  0.593750
  0.782222  0.392562  0.109394  0.000000  0.593750
  0.794444  0.392562  0.111313  0.000000  0.593750
  0.806667  0.392562  0.113232  0.000000  0.593750
  0.818889  0.392562  0.115152  0.000000  0.593750
  0.831111  0.392562  0.117071  0.000000  0.593750
  0.843333  0.392562  0.118990  0.000000  0.593750
  0.855556  0.392562  0.120909  0.000000  0.593750
  0.867778  0.392562  0.122828  0.000000  0.593750
  0.880000  0.392562  0.124747  0.000000  0.593750
  0.892222  0.392562  0.126667  0.000000  0.593750
  0.904444  0.392562  0.128586  0.000000  0.593750
  0.916667  0.392562  0.130505  0.000000  0.593750
  0.928889  0.392562  0.132424  0.000000  0.593750
  0.941111  0.392562  0.134343  0.000000  0.593750
  0.953333  0.392562  0.136263  0.000000  0.593750
  0.965556  0.392562  0.138182  0.000000  0.593750
  0.977778  0.392562  0.140101  0.000000  0.593750
  0.990000  0.392562  0.142020  0.000000  0.593750
  1.002222  0.392562  0.146818  0.000000  0.593750
  1.014444  0.392562  0.151616  0.000000  0.593750
  1.026667  0.392562  0.156414  0.000000  0.593750
  1.038889  0.392562  0.161212  0.000000  0.593750
  1.051111  0.392562  0.166010  0.000000  0.593750
  1.063333  0.392562  0.170808  0.000000  0.593750
  1.075556  0.392562  0.175606  0.000000  0.593750
  1.087778  0.392562  0.180404  0.000000  0.593750
  END FTABLE  1
END FTABLES

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

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
```

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY          INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       54
PERLND     PWATER SURO                     IMPLND        EXTNL  SURLI
  END MASS-LINK   54

  MASS-LINK       55
PERLND     PWATER IFWO                     IMPLND        EXTNL  SURLI
  END MASS-LINK   55

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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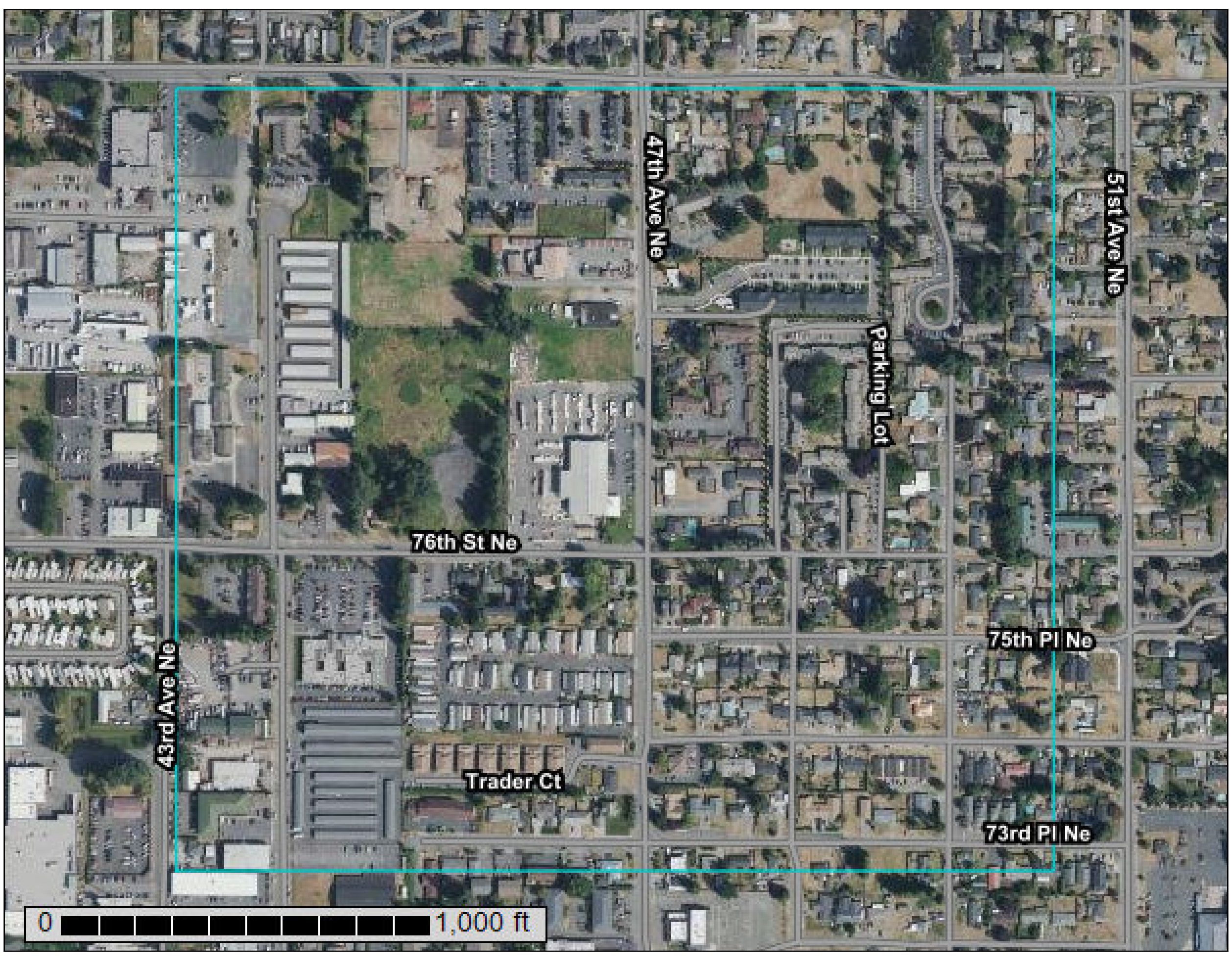
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Snohomish County Area, Washington



June 20, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

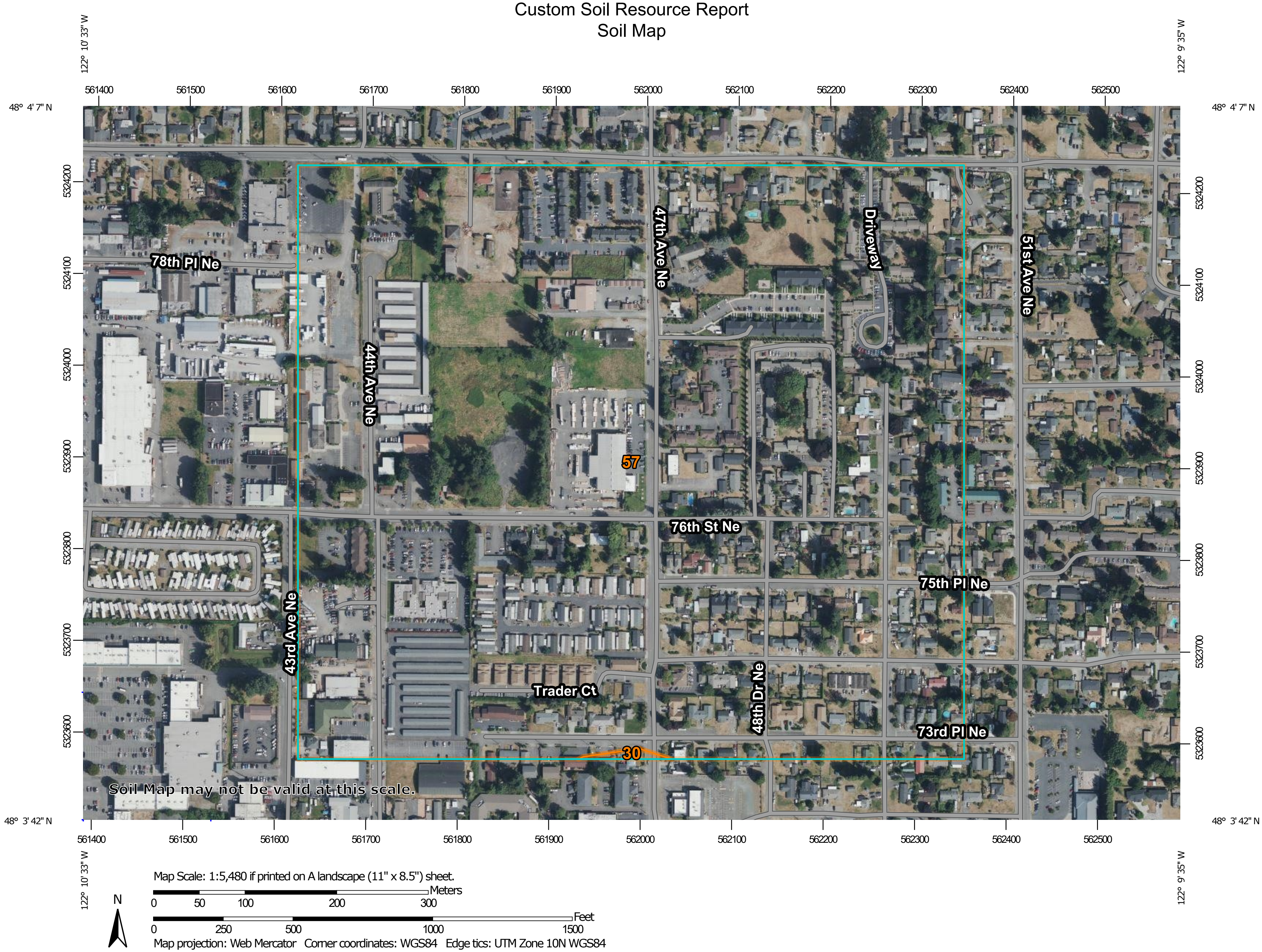
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Snohomish County Area, Washington
Survey Area Data: Version 23, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 16, 2020—Aug 19, 2020

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
30	Lynnwood loamy sand, 0 to 3 percent slopes	0.2	0.1%
57	Ragnar fine sandy loam, 0 to 8 percent slopes	116.8	99.9%
Totals for Area of Interest		**117.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Snohomish County Area, Washington

30—Lynnwood loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2hym
Elevation: 50 to 600 feet
Mean annual precipitation: 40 to 65 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 180 to 200 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Lynnwood and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lynnwood

Setting

Landform: Terraces, outwash plains
Parent material: Glacial outwash

Typical profile

H1 - 0 to 1 inches: loamy sand
H2 - 1 to 29 inches: loamy sand
H3 - 29 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Custer, undrained

Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

57—Ragnar fine sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2hzk
Elevation: 300 to 1,000 feet
Mean annual precipitation: 35 to 65 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 150 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ragnar and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ragnar

Setting

Landform: Outwash plains
Parent material: Glacial outwash

Typical profile

H1 - 0 to 2 inches: ashy fine sandy loam
H2 - 2 to 24 inches: ashy sandy loam
H3 - 24 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

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APPENDIX 4 – GEOTECHNICAL REPORT

INFILTRATION EVALUATION
PARR LUMBER EXPANSION
7610 47th Avenue Northeast
Marysville, Washington

PROJECT NO. 13-199.200
June 2022

Prepared for:

The Parr Company

PanGEO INCORPORATED

Geotechnical & Earthquake Engineering Consultants

PanGEO
INCORPORATED
Geotechnical & Earthquake Engineering Consultants

June 14, 2022
Project No. 13-199.200

Mr. Eric Schmidlin
The Parr Company
5630 Northeast Century Boulevard
Hillsboro, Oregon 97124

Subject: **Infiltration Evaluation**
Parr Lumber Expansion
7610 47th Avenue Northeast, Marysville, Washington

Dear Mr. Schmidlin:

Attached please find our report summarizing the results of our infiltration testing services that were performed at 7610 47th Avenue Northeast in Marysville, Washington. It is planned to construct an outdoor lumber storage yard to the north of the existing lumber yard. The outdoor storage yard will include permeable pavement to allow surface water to infiltrate into the site soils.

In order to evaluate the infiltration characteristics of the site soils, we conducted two infiltration tests in the area of the planned improvements. Based on the results of our testing, infiltration should be feasible with a long-term design infiltration rate of six inches per hour. The attached report presents the results of our exploration and long-term design rates for infiltration.

We appreciate the opportunity to be of service. Please call if you have any questions.

Sincerely,

Scott D. Dinkelman, LHG
Principal Hydrogeologist

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Seattle, WA 98102
Tel (206) 262-0370
Fax (206) 262-0374

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LIST OF ATTACHMENTS

INFILTRATION EVALUATION
PARR LUMBER EXPANSION
7610 47TH AVENUE NORTHEAST
MARYSVILLE, WASHINGTON

1.0 INTRODUCTION

PanGEO has completed an infiltration assessment for the proposed Parr Lumber Expansion in Marysville, Washington. This study was performed in general accordance with our mutually agreed scope of services outlined in our May 13, 2022, dated proposal. Our scope of services included conducting a site reconnaissance, conducting two Small Pilot Infiltration Tests, and developing the conclusions and recommendations presented in this report.

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located at 7610 47th Avenue Northeast in Marysville, Washington, approximately as shown on Figure 1, Vicinity Map.

The rectangular -shaped property comprises 4.5 acres and is located in an urban area with light commercial buildings and both multi- and single-family residences. The subject site is bordered to the north by a cabinet shop, to the east by multi- and single-family residences, to the south by 76th Street Northeast, and to the west by pasture and farmland. The layout of the site is shown on Figure 2, Site and Exploration Plan.

The site contains an existing Parr Lumber yard with a one-story retail and warehouse building in the south portion of the site. At the north end of the site is an approximately one-acre vacant area that is vegetated with tall grass. Site topography is generally flat, with a gentle slope down to the west with an overall change in relief of about seven feet. A surface water drainage swale trends north-south along the west margin of the property. Plate 1 on the next page shows an oblique aerial view of the site while Plate 2 shows a ground level view.

We understand it is planned to expand the lumber yard by adding an outdoor lumber storage area in the north, vacant portion of the site. The lumber yard surface will consist of asphalt paved drive aisles with permeable concrete strips below the lumber storage areas.

Plate 1: *Oblique aerial view of the site.*

Plate 2: *Ground level view of the site.*

The conclusions and recommendations in this report are based on our understanding of the proposed improvements, which is in turn based on the project information provided. If the above project description is incorrect, or the project information changes, we should be consulted to review the recommendations contained in this study and make modifications, if needed. In any case PanGEO should be retained to provide a review of the final design to confirm that our geotechnical recommendations have been correctly interpreted and adequately implemented in the construction documents.

3.0 SUBSURFACE EXPLORATIONS

Two test pits, identified as Test Pits TP-1 and TP-2, were excavated at the project site on May 24, 2022, for the purpose of infiltration testing. The approximate test pit locations were determined relative to existing site features and are indicated on the attached Figure 2. The test pits were situated approximately at the west and east ends of the lumber storage yard.

The relative in-situ density of the soils was estimated from the excavating action of the excavator, probing the test pit sidewalls with a ½-inch diameter T-handle probe, and the stability of the test pit sidewalls. Where soil contacts were gradual or undulating, the average depth of the contact was recorded in the log. After the infiltration tests were completed, the excavations were backfilled with the excavated soils and the surface was tamped and re-graded smooth.

A geologist from our firm was present throughout the infiltration test program to observe the excavation, assist in sampling, and to document the soil samples obtained from the excavation and perform the tests. The soils were logged in general accordance with the system summarized on Figure A-1, Terms and Symbols for Boring and Test Pit Logs. The summary test pit logs are included in Appendix A, as Figures A-2 and A-3.

4.0 SUBSURFACE CONDITIONS

4.1 SITE GEOLOGY

General geologic information for the site was developed based on review of the *Geologic Map of the Marysville 7.5-minute Quadrangle, Snohomish County, Washington* (J.P Minard, 1985).

Based on our review, the primary geologic units for the site and vicinity are the Marysville Sand Member (Geologic Map Unit Qvrm) and Quaternary Holocene alluvium (Qyal). The Marysville Sand member consists of a well-drained, stratified to massive outwash sand that was deposited by meltwater streams emerging from the receding glacial ice sheet during the Vashon Stade of the Fraser glaciation. The Holocene alluvium consists of silt and sand deposited by Quilceda Creek and Allen Creek.

4.2 Soil Conditions

For a detailed description of the subsurface conditions encountered at each exploration location, please refer to our test pit logs provided in Appendix A. The stratigraphic contacts indicated on the logs represent the approximate depth to boundaries between soil units. Actual transitions between soil units may be more gradual or occur at different elevations. The descriptions of groundwater conditions and depths are likewise approximate. The following is a generalized description of the soils encountered in the test pits.

> **Topsoil:** We encountered a surficial layer of topsoil approximately six inches thick at the test pit locations. The topsoil consisted of silty sand with organics including grass and roots, and it was characterized by its dark brown to black color, loose consistency, and the presence of abundant roots and organic debris.
>
> **Marysville Sand Member (Qvrm):** Directly below the topsoil layer we encountered medium dense fine to medium silty sand, overlying fine to medium sand. The silty sand and sand units were tan to olive-brown and poorly graded. We identified the sand as the Marysville Sand Member. The silty sand and sand was encountered to the maximum exploration depth of 6½ feet below grade.

The test pits excavated for this study were backfilled after the soils were logged. The backfill was tamped with the backhoe bucket and the ground surface leveled. The backfill was not compacted to the requirements of structural fill. During grading, the earthwork contractor should locate the test pits, remove the loose backfill and replace it with structural fill.

Our subsurface descriptions are based on the conditions encountered at the time of our exploration. Soil conditions between our exploration locations may vary from those encountered. The nature and extent of variations between our exploratory locations may not become evident until construction. If variations do appear, PanGEO should be requested to reevaluate the recommendations in this report and to modify or verify them in writing prior to proceeding with earthwork and construction.

4.3 Groundwater

Groundwater seepage was not observed in our subsurface explorations at the time of excavation. It should be noted that groundwater elevations may fluctuate depending on the seasonal rainfall, local subsurface and groundwater conditions, and other factors. In general, the groundwater level is highest and the seepage rate in the greatest during the winter and early spring (typically October through May).

4.4 Laboratory Testing

Representative soil samples collected from our test pits were returned to our office for classification purposes. Four representative samples, two from each test pit, were submitted to a testing lab for sieve and moisture content analyses. Sieve and moisture content results are provided in Appendix B. Two representative samples, one from each test pit, were submitted to an analytical lab for cation exchange capacity (CEC) and organics content testing. The CEC is a calculated value that estimates the soil's ability to attract, retain, and exchange cation elements. It is reported in milliequivalents per 100 grams of soil (meq/100g). The results of the CEC and organics tests are summarized in Tables 2 and 3 below and are provided in Appendix C.

It is important to note that these test results may not accurately represent the overall in-situ soil conditions. Our geotechnical recommendations are based on our interpretation of these test results and their use in guiding our engineering judgment.

5.0 INFILTRATION TESTING AND RECOMMENDATIONS

5.1 Test Method

The City of Marysville has adopted the 2014 Washington Department of Ecology Stormwater Management Manual for Western Washington (WDOE Manual) and will adopt the 2019 Washington Department of Ecology Stormwater Management Manual for Western Washington in June 2022. The field infiltration test was conducted in general accordance with the procedure for the Small Pilot Infiltration Test (PIT) outlined in the WDOE Manual, Volume III, Section 3.3.6. In general, the test consisted of the following procedure:

- The test pits were excavated to the approximate design bottom of the proposed infiltration facilities with a minimum bottom area of 12 square feet.
- The test pits were pre-soaked by maintaining a water level of at least 12 inches above the bottom of the pit for 6 hours.
- At the end of pre-soak period, a flow meter was used to monitor the amount of water needed to maintain a constant water head of 12 inches for at least one hour and until at least a point at which a constant volume of water per time unit was achieved.

- At the end of the constant head test, we measured the falling head infiltration rate by shutting off the water flow and recording the drop in water level over regular time intervals for one hour or until all of the water was infiltrated.

The field infiltration rate was then calculated based on the final measured volume per time unit and the surface area of the test hole. The results of our test are summarized in Table 1, below.

5.2 CORRECTION FACTORS

5.2 CORRECTION FACTORS FOR DESIGN INFILTRATION RATE

The small pilot infiltration test provides an uncorrected, saturated hydraulic conductivity (K_{sat}) of the soil. To provide a long-term design infiltration rate, the K_{sat} value is factored by applying a series of correction factors (CF) outlined in Table 3.3.1 of the WDOE Manual. As discussed below, the correction factors account for the test method (CF_t), influent control (CF_m) and site variability (CF_v). The value of each of these correction factors are discussed in Sections 5.2.1, 5.2.2 and 5.2.3, below.

5.2.1 Test Method

The correction factor for the test method (CF_t) is used to account for differences between the test method and in-situ infiltration testing. SCDM specifies a CF_t value of 0.5 based on the use of the small PIT method. This value was incorporated into our calculation.

5.2.2 Long-Term Conductivity Loss Correction Factor

The long-term conductivity loose correction factor of 0.9 is applied to the infiltration rate to account for a reduction in the infiltration capacity over time.

5.2.3 Site Variability

The correction factor for site variability (CF_v) is intended to correct for the number of locations sampled and the consistency of the underlying soil conditions. The value for CF_v ranges from 0.33 to 1.0. Based on the number of exploration locations, relatively uniform soil conditions encountered at our exploration locations and our experience and engineering judgment, we assigned a correction factor of 0.8 for site variability.

5.2.4 Correction Factor

The total correction factor (CF = CF_v x CF_t x CF_m = 0.36) is then applied to the infiltration rate to obtain a corrected infiltration rate appropriate for long term design purposes.

5.2.5 Design Infiltration Rate

With the Total Correction Factor (CF) of 0.36, the long-term design rate can be calculated from the field measured rates. Table 1, below, summarizes the infiltration data collected and the design infiltration rates calculated for each location along the project alignment.

TABLE 1: Summary of Small Pilot Infiltration Testing

Test Location	Test Depth (feet)	Soils (USCS)	Field Infiltration Rate K_{SAT} (inches/hour)	Correction Factor			Design Infiltration Rate (inches/hour)
				CF_v	CF_t	CF_m	
TP-1	2	SP-SM	20.0	0.8	0.5	0.9	7.2
TP-2	2	SP-SM	16.8	0.8	0.5	0.9	6.0

We recommend using the lower value of six inches per hour for the infiltration system design.

5.3 CATION EXCHANGE CAPACITY TEST RESULTS

The WDOE Manual specifies that soils used for treatment and infiltration should have a CEC of greater than or equal to 5 milliequivalents per 100 grams of dry soil (meq/100g). CEC testing was performed in general accordance with EPA Test Method 9081 on two representative samples from our test pits. Table 2 provides a summary of the CEC test results. Based on review of the testing, in general, the site soils meet the minimum CEC value of 5 meq/100g required for treatment.

TABLE 2: Cation Exchange Capacity Test Results

Location	Soil Sample Depth (feet)	CEC (meq/100g)
TP-1	1.5	8.4
TP-2	1.5	10.9

Based on the results of the tests, the soils have adequate CEC capacity for treatment. The results of the analytical testing are provided in Appendix C.

5.4 Organic Content Test Results

Two representative samples collected from our infiltration test pits were submitted to determine the percent of organic material in the soils at our infiltration test locations. The WDOW Manual specifies a minimum organic content of one percent if the soils will be used for treatment. The testing procedure was performed in general accordance with the ASTM D2974-13 *Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils*. Table 3 provides a summary of the organic material test results.

TABLE 3: Organic Matter of Organic Soils Test Results

Location	Soil Sample Depth (feet)	Organic Content (%)
TP-1	1.5	1.50
TP-2	1.5	3.03

Based on the results of the organic content tests, the soils contain at least one percent organics and should be suitable for treatment.

6.0 INFILTRATION CONCLUSIONS AND CONSTRUCTION CONSIDERATIONS

6.1 Conclusions

Based on the testing results and the applied correction factor, it is our opinion that an infiltration rate of 6.0 inches per hour be used for the permeable pavement design.

6.2 Construction Considerations

Infiltration facilities are post-construction facilities which are designed to improve the quality and manage the volume of stormwater runoff by encouraging natural infiltration on-site. In order to protect the infiltration receptor soils from becoming clogged with sediment and/or compacted during construction, we recommend the following measures be implemented during construction:

- The infiltration facilities should be constructed as late in the schedule as feasible and should not be constructed until after the upstream areas are stabilized.
- Heavy equipment traffic on prepared subgrades should be limited, especially during wet weather.
- If fine grained sediment is deposited or tracked onto the infiltration system subgrade, it should be removed using an excavator with a grade plate, small dozer or vacuum truck.
- The subgrade should be scarified prior to placing fill to prevent sealing of the receptor soils.
- Structural fill and aggregate base materials should be end-dumped at the edge of the fill area and the material pushed out over the subgrade.
- Grading of the infiltration galleries should be accomplished using low-impact earth-moving equipment to prevent compaction of the underlying soils. Wide tracked vehicles such as back hoes, small dozers and bobcats are suggested.

Furthermore, infiltration facilities should be located as far away as possible from any footings and basements in order to avoid water migration into adjacent structures and long-term settlement of foundation soils.

PanGEO should be retained during construction to observe excavations of infiltration facilities to confirm the infiltration facilities are constructed in the intended soil unit.

7.0 LIMITATIONS

We have prepared this report for The Parr Company and the project design team. Recommendations contained in this report are based on a site reconnaissance, a subsurface exploration program, review of pertinent subsurface information, and our understanding of the project. The study was performed using a mutually agreed-upon scope of services.

Variations in soil conditions may exist between the locations of the explorations and the actual conditions underlying the site. The nature and extent of soil variations may not be evident until construction occurs. If any soil conditions are encountered at the site that are different from those described in this report, we should be notified immediately to review the applicability of our recommendations. Additionally, we should also be notified to review the applicability of our recommendations if there are any changes in the project scope.

The scope of our work does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractors' methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design. Additionally, the scope of our work specifically excludes the assessment of environmental characteristics, particularly those involving hazardous substances.

This report has been prepared for planning and design purposes for specific application to the proposed project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

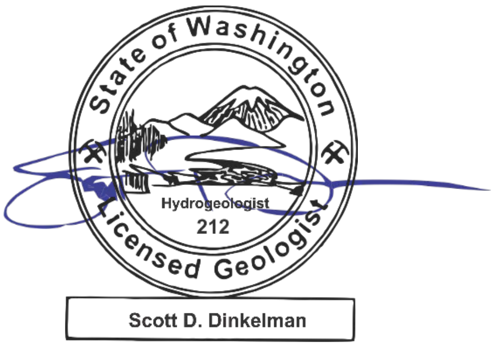
This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issuance. PanGEO should be notified if the project is delayed by more than 24 months from the date of this report so that we may review the applicability of our conclusions considering the time lapse.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., 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. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

We appreciate the opportunity to be of service.

Sincerely,

PanGEO, Inc.



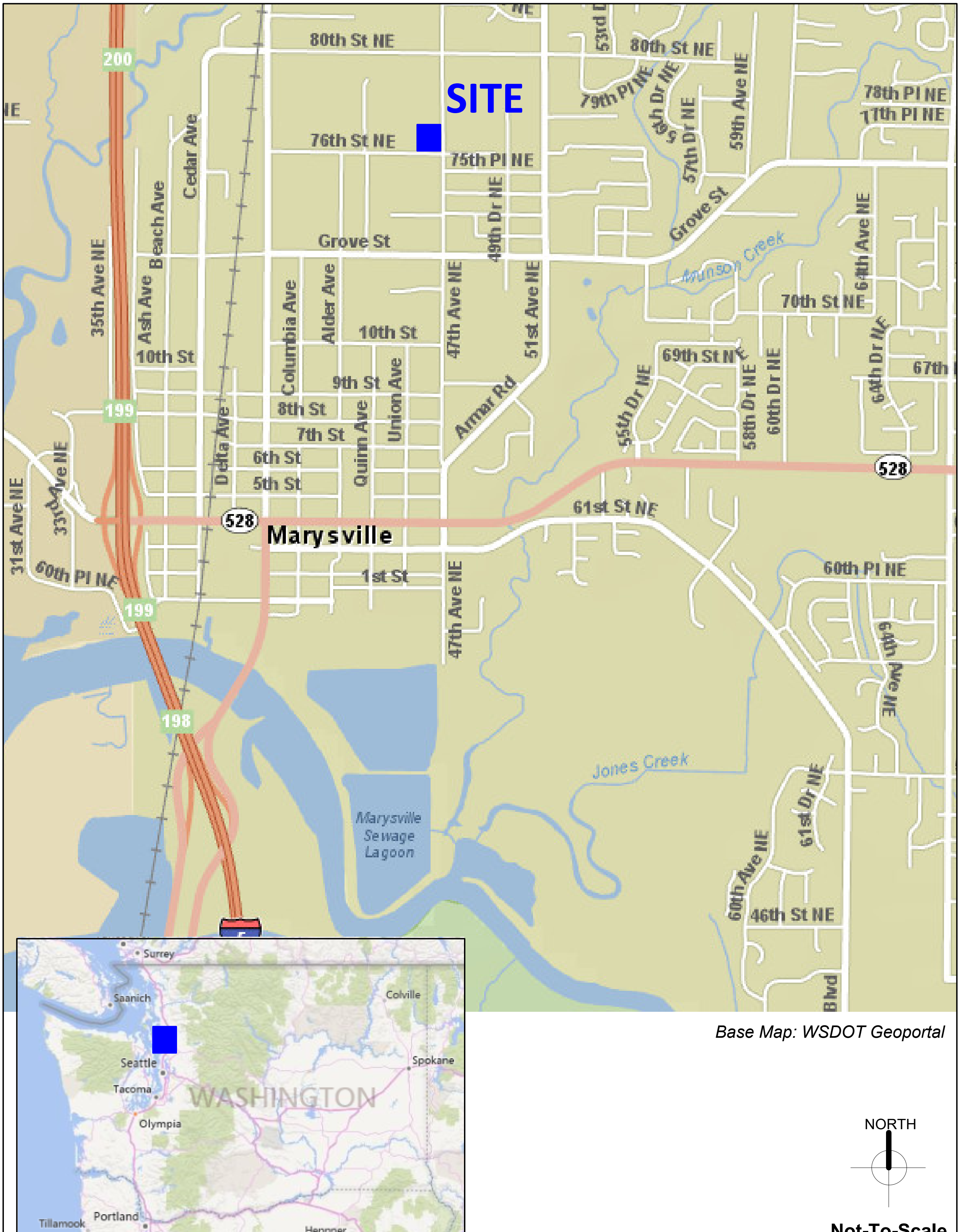
Scott D. Dinkelman, LHG
Principal Hydrogeologist
SDinkelman@pangeoinc.com

8.0 LIST OF REFERENCES

Minard, J.P., 1985, *Geologic map of the Marysville quadrangle, Snohomish County, Washington*: U.S. Geological Survey, 1 sheet, scale 1:24,000, Miscellaneous Field Studies Map MF-1743, https://ngmdb.usgs.gov/Prodesc/proddesc_7476.htm

Washington State Department of Ecology, 2014, *Stormwater Management Manual for Western Washington*

Washington State Department of Ecology, 2019, *Stormwater Management Manual for Western Washington*



Base Map: WSDOT Geoportal

NORTH

Not-To-Scale

PanGEO INCORPORATED	**Parr Lumber Expansion** **7610 47th Ave NE** **Marysville, Washington**	**VICINITY MAP** Project No. **13-199.200** Figure No. **1**

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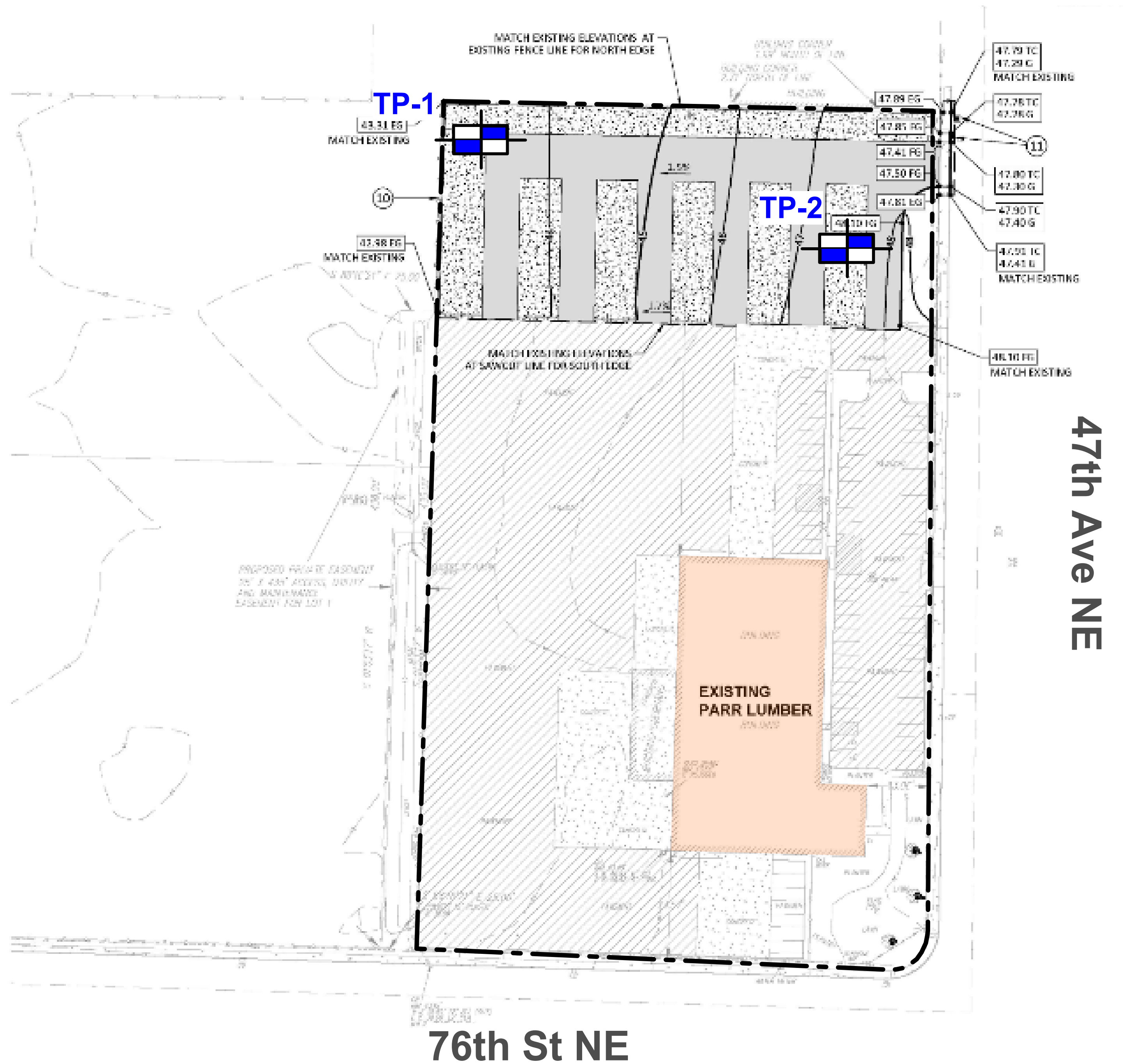


LEGEND:

Subject Site

Existing Structures

Approximate Infiltration Test Location, PanGEO, Inc., May, 2022

Approx. Scale (feet)

0 50 100

NORTH

PanGEO INCORPORATED	**Infiltration Evaluation** **Parr Lumber Expansion** **7610 47th Ave NE** **Marysville, WA**	**SITE AND EXPLORATION PLAN** Project No. **13.199.200** Figure No. **2**

13-011_Fig 2 Site & Exploration Plan.grf 6/13/22 JCR

APPENDIX A

SUMMARY TEST PIT LOGS

RELATIVE DENSITY / CONSISTENCY

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Med. Dense	10 to 30	35 - 65	Med. Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)	GW	Well-graded GRAVEL
		GP	Poorly-graded GRAVEL
	GRAVEL (>12% fines)	GM	Silty GRAVEL
		GC	Clayey GRAVEL
Sand 50% or more of the coarse fraction passing the #4 sieve. Use dual symbols (eg. SP-SM) for 5% to 12% fines.	SAND (<5% fines)	SW	Well-graded SAND
		SP	Poorly-graded SAND
	SAND (>12% fines)	SM	Silty SAND
		SC	Clayey SAND
Silt and Clay 50%or more passing #200 sieve	Liquid Limit < 50	ML	SILT
		CL	Lean CLAY
		OL	Organic SILT or CLAY
	Liquid Limit > 50	MH	Elastic SILT
		CH	Fat CLAY
		OH	Organic SILT or CLAY
Highly Organic Soils		PT	PEAT

Notes:
1. Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.

2. The graphic symbols given above are not inclusive of all symbols that may appear on the borehole logs. Other symbols may be used where field observations indicated mixed soil constituents or dual constituent materials.

DESCRIPTIONS OF SOIL STRUCTURES

Layered:	Units of material distinguished by color and/or composition from material units above and below	**Fissured:**	Breaks along defined planes
Laminated:	Layers of soil typically 0.05 to 1mm thick, max. 1 cm	**Slickensided:**	Fracture planes that are polished or glossy
Lens:	Layer of soil that pinches out laterally	**Blocky:**	Angular soil lumps that resist breakdown
Interlayered:	Alternating layers of differing soil material	**Disrupted:**	Soil that is broken and mixed
Pocket:	Erratic, discontinuous deposit of limited extent	**Scattered:**	Less than one per foot
Homogeneous:	Soil with uniform color and composition throughout	**Numerous:**	More than one per foot
		BCN:	Angle between bedding plane and a plane normal to core axis

COMPONENT DEFINITIONS

COMPONENT	SIZE / SIEVE RANGE	COMPONENT	SIZE / SIEVE RANGE
Boulder:	> 12 inches	Sand	
Cobbles:	3 to 12 inches	Coarse Sand:	#4 to #10 sieve (4.5 to 2.0 mm)
Gravel		Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
Coarse Gravel:	3 to 3/4 inches	Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Fine Gravel:	3/4 inches to #4 sieve	Silt	0.074 to 0.002 mm
		Clay	<0.002 mm

TEST SYMBOLS

for In Situ and Laboratory Tests listed in "Other Tests" column.

ATT	Atterberg Limit Test
Comp	Compaction Tests
Con	Consolidation
DD	Dry Density
DS	Direct Shear
%F	Fines Content
GS	Grain Size
Perm	Permeability
PP	Pocket Penetrometer
R	R-value
SG	Specific Gravity
TV	Torvane
TXC	Triaxial Compression
UCC	Unconfined Compression

SYMBOLS

Sample/In Situ test types and intervals

- 2-inch OD Split Spoon, SPT (140-lb. hammer, 30" drop)
- 3.25-inch OD Spilt Spoon (300-lb hammer, 30" drop)
- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

MONITORING WELL

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

MOISTURE CONTENT

Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

PanGEO INCORPORATED
Phone: 206.262.0370

Terms and Symbols for Boring and Test Pit Logs

Figure A-1

Test Pit Logs

Project No: 13-199.200
Project Name: Proposed Parr Lumber Expansion
Project Location: 7610 47th Ave NE, Marysville, WA
Excavated: 5/24/2022

Test Pit No. TP-1

Location: 48.066314545775434, -122.16797372891098 (WGS84)

Approximate ground surface elevation: 48 feet (NAVD88)

Depth (ft)	Material Description
0 - 1	Loose, brown, silty fine to medium SAND with organics (SM), moist; occasional rootlets **[Topsoil]**
1 - 3	Medium dense, tan to olive-brown, silty fine to medium SAND (SM), moist **[Recessional Outwash, Marysville Sand Member]**
3 - 6	Medium dense, tan to olive-brown, fine to medium SAND (SP) **[Recessional Outwash, Marysville Sand Member]**

Image of infiltration test setup at TP-1, during the falling head test. TP-1 was terminated at 6 feet below grade, where saturated soil and excavation sidewall caving was observed.

Logged by: E. Eckles

Test Pit Logs

Project No: 13-199.200
Project Name: Proposed Parr Lumber Expansion
Project Location: 7610 47th Ave NE, Marysville, WA
Excavated: 5/24/2022

Test Pit No. TP-2

Location: 48.066221338817094, -122.16848871305622 (WGS84)

Approximate ground surface elevation: 47 feet (NAVD88)

Depth (ft)	Material Description
0 - 1	Loose, brown, silty fine to medium SAND with organics (SM), moist; occasional rootlets **[Topsoil]**
1 – 3.5	Medium dense, tan to olive-brown, silty fine to medium SAND (SM), moist **[Recessional Outwash, Marysville Sand Member]**
3.5 – 6.5	Medium dense, tan to olive-brown, fine to medium SAND (SP) **[Recessional Outwash, Marysville Sand Member]**

Image of infiltration test setup at TP-2, at the start of the 6-hour presoak. TP-2 was terminated at 6.5 feet below grade, where saturated soil and excavation sidewall caving was observed.

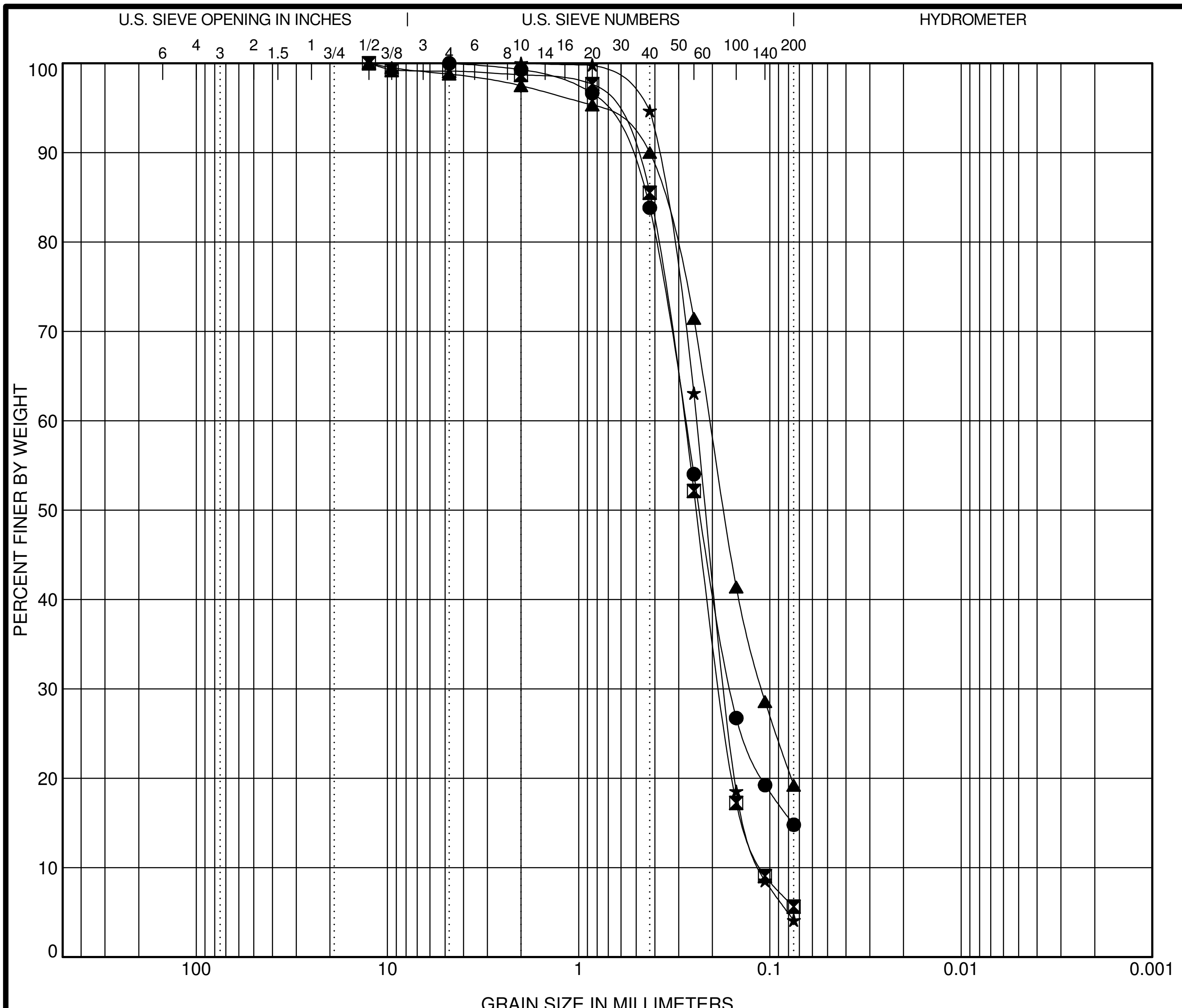
Logged by: E. Eckles

PanGEO INCORPORATED
Geotechnical & Earthquake Engineering Consultants

Figure A-3

APPENDIX B

HWA SIEVE & MOISTURE CONTENT TEST RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	TP-1	@ 1.5 ft.	SILTY SAND(SM)					
⊠	TP-1	@ 4.0 ft.	POORLY GRADED SAND with SILT(SP-SM)				1.05	2.57
▲	TP-2	@ 1.5 ft.	SILTY SAND(SM)					
★	TP-2	@ 5.0 ft.	POORLY GRADED SAND(SP)				1.09	2.16

	Specimen Identification		D100	D90	D60	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-1	1.5	4.75	0.593	0.278		0.0	85.2	14.8	
⊠	TP-1	4.0	12.5	0.549	0.283	0.11	0.9	93.5	5.6	
▲	TP-2	1.5	12.5	0.425	0.206		1.2	79.6	19.2	
★	TP-2	5.0	2	0.393	0.241	0.112	0.0	95.9	4.1	

GRAIN SIZE DISTRIBUTION

PanGEO INCORPORATED
Phone: 206.262.0370

Project: Parr Lumber Marysville
Job Number: 13-199.200
Location: 7610 47th Avenue Northeast, Marysville, Washington

Figure B-1

APPENDIX C

KTL ORGANIC CONTENT & CEC TEST RESULTS

Report Date: June 1, 2022

Report No: 87466

Client: PanGEO Inc.

Sampler: Scott Dinkelman

Project: ***PanGEO Inc.***

Field:

P.N.: 13-199.200

Sampled: 5/24/2022

KTL KUOTESTING LABS
A Matrix Sciences Company

SOIL ANALYSIS REPORT

Lab #	Depth Inches Start	Depth Inches End	Field ID	Sample ID	OM %	CEC Meq/ 100g
2368	0	18	**TP-1**		1.50	8.4
2369	0	18	**TP-2**		3.03	10.9

Main Office: **119 E Main St., Othello, WA 99344**
Oregon Office: **1300 Sixth St., Suite J, Umatilla, OR 97882**
Pasco Office: **1320 E Spokane St., Pasco, WA 99301**
(509) 488-0112 **info@kuotestinglabs.com**

Report Date: June 1, 2022

Report No: 87466

Client: PanGEO Inc.

Sampler: Scott Dinkelman

Project: ***PanGEO Inc.***

Field: ***TP-1***

P.N.: 13-199.200

Sampled: 5/24/2022

KTL KUOTESTING LABS
A Matrix Sciences Company

SOIL ANALYSIS REPORT

Lab #	Depth Inches Start	Depth Inches End	Field ID	Sample ID	OM %	CEC Meq/ 100g
2368	0	18	**TP-1**		1.50	8.4

Main Office: **119 E Main St., Othello, WA 99344**

Oregon Office: **1300 Sixth St., Suite J, Umatilla, OR 97882**

Pasco Office: **1320 E Spokane St., Pasco, WA 99301**

(509) 488-0112 **info@kuotestinglabs.com**

Report Date: June 1, 2022

Report No: 87466

Client: PanGEO Inc.

Sampler: Scott Dinkelman

Project: ***PanGEO Inc.***

Field: ***TP-2***

P.N.: 13-199.200

Sampled: 5/24/2022

KUOTESTING LABS
A Matrix Sciences Company

SOIL ANALYSIS REPORT

Lab #	Depth Inches Start	Depth Inches End	Field ID	Sample ID	OM %	CEC Meq/ 100g
2369	0	18	**TP-2**		3.03	10.9

Main Office: **119 E Main St., Othello, WA 99344**
Oregon Office: **1300 Sixth St., Suite J, Umatilla, OR 97882**
Pasco Office: **1320 E Spokane St., Pasco, WA 99301**
(509) 488-0112 **info@kuotestinglabs.com**