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App #11458

STORMWATER MANAGEMENT REPORT

(Stormwater Site Plan)

MEAN BEAN COFFEE STAND

134 South Ferry Avenue
Monroe, WA 98272

CSP Engineering PFN 24-014
City PFN _____

05-02-25

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This document, in conjunction with the Site Development Construction Plans prepared for this project, is intended to satisfy the local governing authority's adopted drainage manual requirements as interpreted and implemented by agency staff. The Site Development Construction Plans supplement the documentation provided in this report and also serve as the construction documents necessary for implementation of the project.

Section 1
Project Overview

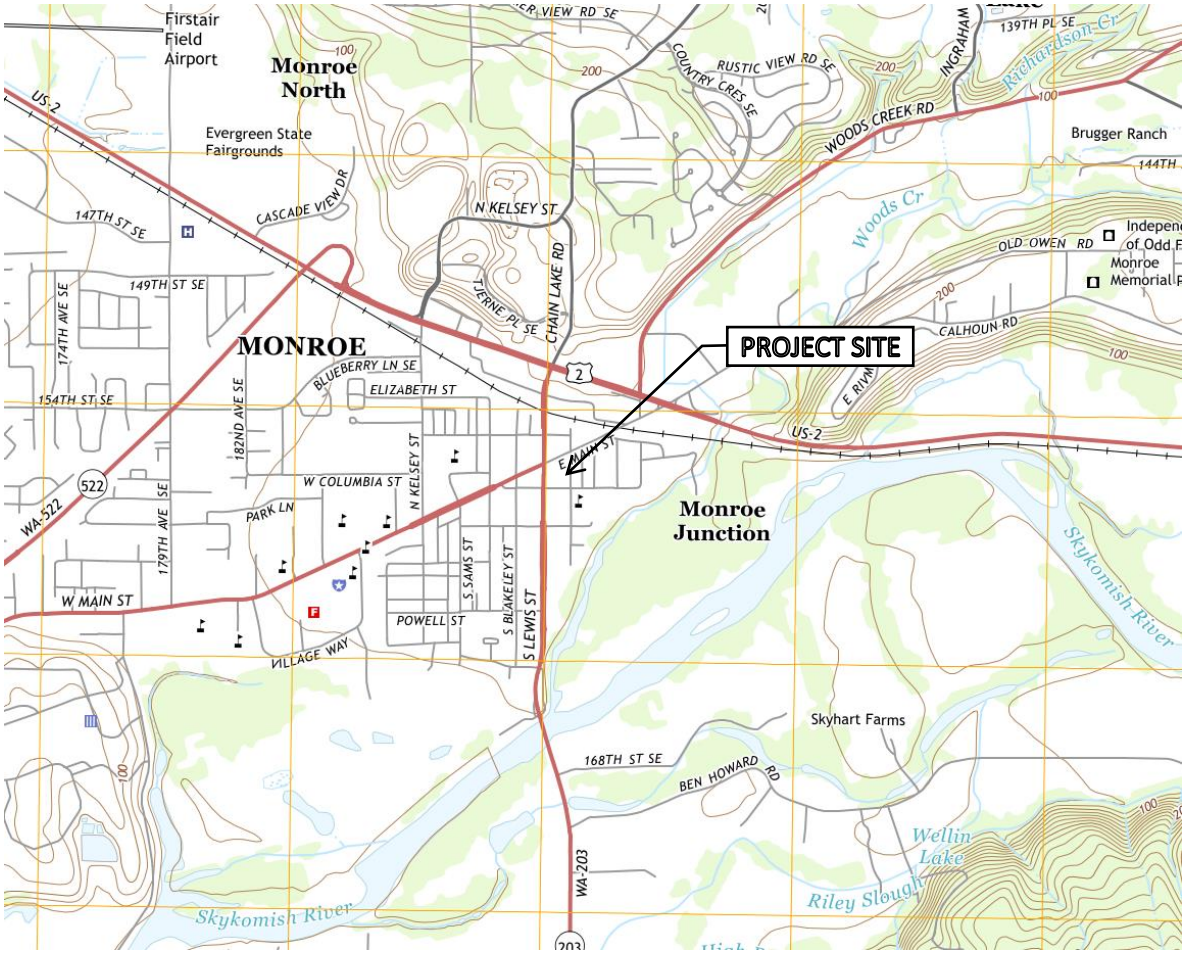
Project Summary

A coffee stand is proposed for a Site Parcel situated in the Skykomish River drainage basin, Puget Sound watershed. The Site is currently unimproved but was previously developed by a single-family residence which was subject to a fire and subsequent demolition. Previously existing Hard Surface coverage totaled 22% categorizing the project as New Development. The development proposes 7,264 sf of New/Replaced Hard Surface requiring compliance Minimum Requirements 1-9. The Project Site totals ~0.17 acres.

EXISTING SITE PARCEL IMPERVIOUS SURFACE COVERAGE	SF	AC
SITE PARCEL	6,502	0.149
ROOF IMPERVIOUS SURFACE	1,358	0.031
HARDSCAPE IMPERVIOUS SURFACE	73	0.002
EXISTING IMPERVIOUS SURFACE COVERAGE	**22%**	

PROJECT SITE DATA	SF	AC
DISTURBED AREA SITE PARCEL/ROW	7,264	0.167
TOTAL DISTURBED AREA	**7,264**	**0.167**

PROJECT SITE NEW/REPLACED HARD SURFACE		SF	AC
PGHS	ROW DRIVEWAY APRONS	356	0.008
PGHS	ROW PAVEMENT	112	0.003
NPGHS	ROW SIDEWALK/WALKWAY	300	0.007
PGHS	SITE PARCEL PAVEMENT (MODELED AS PERMEABLE PVMNT)	2,918	0.067
PGHS	SITE PARCEL GRAVEL (MODELED AS PERMEABLE PVMNT)	3,368	0.077
NPGHS	SITE PARCEL ROOF	210	0.005
	TOTAL NEW/REPLACED HARD SURFACE	**7,264**	**0.167**



Vicinity Map

Minimum Requirements

Minimum Requirement #1 – Preparation of Stormwater Site Plans
Applicable – This document and the Site Development Construction Plans satisfy the Stormwater Site Plan requirement.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention
Applicable – A Construction Stormwater Pollution Prevention Plan narrative and a Construction Stormwater Pollution Prevention Plan is included in the construction permit application documents.

Minimum Requirement #3 – Source Control of Pollution
Applicable – No Operational and Structural Source Control BMPs are applicable to the facility.

Minimum Requirement #4 – Preservation of Natural Drainage System and Outfalls
Applicable - The post-developed site will not significantly alter the natural drainage system characteristics and/or outfall location of the Site.

Minimum Requirement #5 – On-Site Stormwater Management
Applicable - On-Site Stormwater Management BMPs to infiltrate, disperse, and retain stormwater runoff will be implemented from List #2.

Minimum Requirement #6: Runoff Treatment
Applicable – Basic Water Quality will be provided by the organic content and cation exchange capacity of the existing subgrade soils.

Minimum Requirement #7: Flow Control
Applicable – Flow Control will be provided via infiltration into the subsurface soils.

Minimum Requirement #8: Wetlands Protection
Not Applicable – The Project is not known to be within ¼ mile of a wetland.

Minimum Requirement #9: Operation and Maintenance
Applicable - An Operation and Maintenance Manual is provided in Section 8 of this Stormwater Management Report.

Section 2

Existing Conditions Summary

The subject Site Parcel is situated on a relatively flat parcel within an urban residential neighborhood and is currently undeveloped. Previous site coverage consisted of a single-family residential home. Current site coverage currently consists of scrub grasses. No stormwater facilities, BMPs, or surface water features are known to exist on the Site. Site topography is flat. Developed parcels exist north and west of the Project Site. The Geotech report identifies 2 to 3 feet of topsoil and old fill materials overlying recessional outwash (gravelly sand and sandy gravel). No ground water was observed to a maximum depth of 9 feet below existing grade.

Existing Conditions Maps

Section 3

Off-Site Analysis

Due to the flat topography and granular soil types on and in the vicinity of the project site no stormwater enters the site parcel and the incorporation of onsite infiltration for proposed impervious surfaces results in no runoff leaving the developed site.

Basin Map

Section 4

Permanent Stormwater Control Plan

Existing Site Hydrology

Precipitation reaching the Site evaporates and/or infiltrates into the existing granular soils. No surface water drainage facilities or BMPs are known to be located on the Site.

Developed Site Hydrology

The proposed development will mitigate stormwater runoff utilizing Stormwater Management BMPs from List #2. Conventional asphalt pavement is proposed for the drive aisle with interceptor trenches along the edges to collect stormwater runoff and disperse it beneath the pavement providing an equivalent to Permeable Pavement. Non paved areas will be surfaced with permeable rock ballast providing the functionality of Permeable Pavement. Underlying soils will provide Runoff Treatment via organic content and cation exchange. Right of way sidewalks, driveway aprons, and pavement will be modeled as Bypass.

Lawn and Landscaped Areas:
[1] BMP T5.13 Post-Construction Soil Quality and Depth: Not Applicable

Roofs:
[1] BMP T5.10A Downspout Full Infiltration: Feasible
Per WWHM analysis the proposed drive aisle modeled as Permeable Pavement provides 100% Infiltration for roof areas.

Other Hard Surfaces:
Non-paved areas within Site Parcel
[1] BMP T5:30 Full Dispersion – Not Feasible
The Site cannot meet the 65%/10% native vegetation to Impervious Surface ratio.

[2] BMP T5.15 Permeable Pavement: Feasible
Per WWHM modeling the proposed pavement and rock ballast subgrade modeled as Permeable Pavement provides 100% Infiltration.

Other Hard Surfaces:
ROW Sidewalks/Driveway Aprons/Roadway Pavement
[1] BMP T5:30 Full Dispersion – Not Feasible
The Site cannot meet the 65%/10% native vegetation to Impervious Surface ratio.

[2] BMP T5.15 Permeable Pavement: Not an approved surface in the right of way.

[3] BMP T7.30 Bioretention: Not Feasible
Insufficient space exists within the right of way.

[4] BMP T5.11/T5.12: Sheet Flow Dispersion/Concentrated Flow Dispersion: Not Feasible
The required vegetated flowpath cannot be achieved.

Performance Standards and Goals

Water Quality
Basic Water Quality

Flow Control
Match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow

Water Quality System
Basic Water Quality will be provided by the organic content and cation exchange capacity of the existing subgrade soils.

Flow Control System
The project does not exceed the thresholds triggering Flow Control based on the following criteria:

DOE

- TDAs total of 10,000 square feet or more of effective impervious surfaces
- TDAs that convert ¾ acres or more of native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture, and from which there is a surface discharge in a natural or manmade conveyance system from the TDA,
- TDAs that through a combination of effective hard surfaces and converted vegetation areas cause a 0.15 cubic feet per second (cfs) or greater increase in the 100-year flow frequency as estimated using an approved continuous simulation model and 15-minute time steps.

The 100-year peak flow analysis was based on the following Pre-Project conditions (No credit was taken for removed Impervious Surfaces):

PROJECT SITE PRE-DEVELOPMENT CONDITIONS	SF	AC	BMP	WWHM MODEL				AC
Lawn/Landscape	7,264	0.167	NA	LAWN/LANDSCAPE	FLAT	A/B		0.167
TOTALS	**7,264**	**0.167**						**0.167**

PROJECT SITE DEVELOPED CONDITIONS	SF	AC	BMP	WWHM MODEL			NOTES	AC
ROW DRIVEWAY APRONS	356	0.008	NA	DRIVEWAY	FLAT		BYPASS - NO APPLICABLE BMPS	0.008
ROW PAVEMENT	112	0.003	NA	ROADS	FLAT		BYPASS - NO APPLICABLE BMPS	0.003
ROW SIDEWALK/WALKWAY	300	0.007	NA	SIDEWALK	FLAT		BYPASS - NO APPLICABLE BMPS	0.007
SITE PARCEL ROOF	210	0.005		ROOF	FLAT		100% INFILTRATION - ROUTED TO PAVEMENT SUBGRADE	-
SITE PARCEL PAVEMENT (MODELED AS PERMEABLE PVMNT)	2,918	0.067		PERMEABLE PAVEMENT	FLAT	C	100% INFILTRATION - ROUTED TO PAVEMENT SUBGRADE	-
SITE PARCEL GRAVEL (MODELED AS PERMEABLE PVMNT)	3,368	0.077		PERMEABLE PAVEMENT	FLAT	C	100% INFILTRATION - PERMEABLE BALLAST SURFACING	-
TOTALS	**7,264**	**0.167**						**0.018**

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.005863
5 year	0.015664
10 year	0.024443
25 year	0.037403
50 year	0.04798
100 year	0.059041

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.01032
5 year	0.013881
10 year	0.016474
25 year	0.020027
50 year	0.022881
100 year	0.02592

Conveyance System Analysis and Design
No conveyance systems are proposed.

Section 5

Construction Stormwater Pollution Prevention Plan

Construction SWPPP elements are addressed in the DOE CSWPP report (provided under separate cover).

Section 6

Special Reports and Studies

- Gary A. Flowers, PLLC Geological & Geotechnical Consulting March 21, 2025 Soil Infiltration Rate Evaluation
- Cascade GeotechNW January 18, 2019 Geotechnical Engineering Report

Section 7

Other Permits

No other permits related to stormwater management beyond those issued by the local governing authority are anticipated for this project.

Section 8

Operation and Maintenance Manual

No stormwater facilites requiring maintenance are proposed for the project.

Permeable pavement is listed as source of infiltration. Will need O&M plan including maintenance tasks, inspection frequency and maintenance covenant/resposibilties.

Appendix

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 24-014 Monroe Coffee 100yr 2025-05-02

Site Name:	MEAN BEAN COFFEE STAND
Site Address:	134 S FERRY ST
City:	MONROE
Report Date:	5/1/2025
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2023/03/31
Version:	4.2.19

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

PRE-PROJECT

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.167
Pervious Total	0.167
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.167

Mitigated Land Use

ROOF

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT	0.005

ROW BYPASS

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.003
DRIVEWAYS MOD	0.008
SIDEWALKS FLAT	0.007
Impervious Total	0.018
Basin Total	0.018

Mitigated Routing

ACCESS DRIVE

Pavement Area:0.0670 acre.Pavement Length:54.02 ft.
Pavement Width: 54.02 ft.
Pavement slope 1:0.02 To 1
Pavement thickness: 0.33
Pour Space of Pavement: 0
Material thickness of second layer: 0.5
Pour Space of material for second layer: 0.35
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 6.8
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 12.845
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 12.845
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0.813
Discharge Structure
Riser Height: 1.83 ft.
Riser Diameter: 648.24 in.
Notch Type: Rectangular
Notch Width: 5.402 ft.
Notch Height: 1.000 ft.
Element Flows To:
Outlet 1 Outlet 2

Permeable Pavement Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.067	0.000	0.000	0.000
0.0203	0.067	0.000	0.000	0.459
0.0407	0.067	0.001	0.000	0.459
0.0610	0.067	0.001	0.000	0.459
0.0813	0.067	0.001	0.000	0.459
0.1017	0.067	0.002	0.000	0.459
0.1220	0.067	0.002	0.000	0.459
0.1423	0.067	0.003	0.000	0.459
0.1627	0.067	0.003	0.000	0.459
0.1830	0.067	0.004	0.000	0.459
0.2033	0.067	0.004	0.000	0.459
0.2237	0.067	0.005	0.000	0.459
0.2440	0.067	0.005	0.000	0.459
0.2643	0.067	0.006	0.000	0.459
0.2847	0.067	0.006	0.000	0.459
0.3050	0.067	0.007	0.000	0.459
0.3253	0.067	0.007	0.000	0.459
0.3457	0.067	0.008	0.000	0.459
0.3660	0.067	0.008	0.000	0.459
0.3863	0.067	0.009	0.000	0.459
0.4067	0.067	0.009	0.000	0.459
0.4270	0.067	0.010	0.000	0.459
0.4473	0.067	0.010	0.000	0.459

0.4677	0.067	0.011	0.000	0.459
0.4880	0.067	0.011	0.000	0.459
0.5083	0.067	0.011	0.000	0.459
0.5287	0.067	0.011	0.000	0.459
0.5490	0.067	0.011	0.000	0.459
0.5693	0.067	0.011	0.000	0.459
0.5897	0.067	0.011	0.000	0.459
0.6100	0.067	0.011	0.000	0.459
0.6303	0.067	0.011	0.000	0.459
0.6507	0.067	0.011	0.000	0.459
0.6710	0.067	0.011	0.000	0.459
0.6913	0.067	0.011	0.000	0.459
0.7117	0.067	0.011	0.000	0.459
0.7320	0.067	0.011	0.000	0.459
0.7523	0.067	0.011	0.000	0.459
0.7727	0.067	0.011	0.000	0.459
0.7930	0.067	0.011	0.000	0.459
0.8133	0.067	0.011	0.000	0.459
0.8337	0.067	0.012	0.004	0.459
0.8540	0.067	0.014	0.066	0.459
0.8743	0.067	0.015	0.167	0.459
0.8947	0.067	0.016	0.295	0.459
0.9150	0.067	0.018	0.445	0.459
0.9353	0.067	0.019	0.615	0.459
0.9557	0.067	0.021	0.801	0.459
0.9760	0.067	0.022	1.003	0.459
0.9963	0.067	0.023	1.220	0.459
1.0167	0.067	0.025	1.450	0.459
1.0370	0.067	0.026	1.694	0.459
1.0573	0.067	0.027	1.949	0.459
1.0777	0.067	0.029	2.217	0.459
1.0980	0.067	0.030	2.495	0.459
1.1183	0.067	0.031	2.785	0.459
1.1387	0.067	0.033	3.084	0.459
1.1590	0.067	0.034	3.394	0.459
1.1793	0.067	0.036	3.714	0.459
1.1997	0.067	0.037	4.043	0.459
1.2200	0.067	0.038	4.381	0.459
1.2403	0.067	0.040	4.728	0.459
1.2607	0.067	0.041	5.084	0.459
1.2810	0.067	0.042	5.448	0.459
1.3013	0.067	0.044	5.820	0.459
1.3217	0.067	0.045	6.201	0.459
1.3420	0.067	0.046	6.590	0.459
1.3623	0.067	0.048	6.986	0.459
1.3827	0.067	0.049	7.390	0.459
1.4030	0.067	0.051	7.802	0.459
1.4233	0.067	0.052	8.221	0.459
1.4437	0.067	0.053	8.647	0.459
1.4640	0.067	0.055	9.081	0.459
1.4843	0.067	0.056	9.521	0.459
1.5047	0.067	0.057	9.968	0.459
1.5250	0.067	0.059	10.42	0.459
1.5453	0.067	0.060	10.88	0.459
1.5657	0.067	0.061	11.35	0.459
1.5860	0.067	0.063	11.82	0.459
1.6063	0.067	0.064	12.30	0.459
1.6267	0.067	0.066	12.79	0.459

1.6470	0.067	0.067	13.28	0.459
1.6673	0.067	0.068	13.78	0.459
1.6877	0.067	0.070	14.28	0.459
1.7080	0.067	0.071	14.79	0.459
1.7283	0.067	0.072	15.31	0.459
1.7487	0.067	0.074	15.83	0.459
1.7690	0.067	0.075	16.36	0.459
1.7893	0.067	0.076	16.90	0.459
1.8097	0.067	0.078	17.44	0.459
1.8300	0.067	0.079	17.98	0.459

NON-PAVED AREAS

Pavement Area:0.0773 acre.Pavement Length:58.03 ft.

Pavement Width:	58.03 ft.
	Pavement slope 1:0 To 1
Pavement thickness:	0
Pour Space of Pavement:	0
Material thickness of second layer:	0.5
Pour Space of material for second layer:	0.35
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	6.8
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	13.754
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	13.754
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0.886
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	696.36 in.
Notch Type:	Rectangular
Notch Width:	5.803 ft.
Notch Height:	1.000 ft.

Element Flows To:
Outlet 1 Outlet 2

Permeable Pavement Hydraulic Table

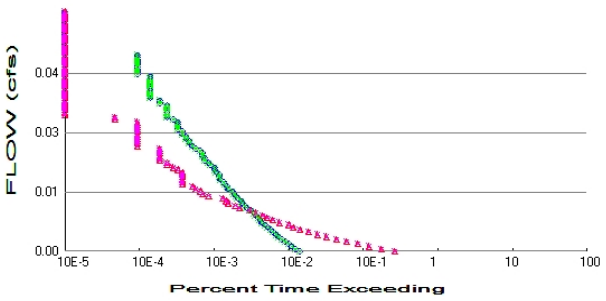
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.077	0.000	0.000	0.000
0.0167	0.077	0.000	0.000	0.530
0.0333	0.077	0.000	0.000	0.530
0.0500	0.077	0.001	0.000	0.530
0.0667	0.077	0.001	0.000	0.530
0.0833	0.077	0.002	0.000	0.530
0.1000	0.077	0.002	0.000	0.530
0.1167	0.077	0.003	0.000	0.530
0.1333	0.077	0.003	0.000	0.530
0.1500	0.077	0.004	0.000	0.530
0.1667	0.077	0.004	0.000	0.530
0.1833	0.077	0.005	0.000	0.530
0.2000	0.077	0.005	0.000	0.530
0.2167	0.077	0.005	0.000	0.530
0.2333	0.077	0.006	0.000	0.530
0.2500	0.077	0.006	0.000	0.530
0.2667	0.077	0.007	0.000	0.530
0.2833	0.077	0.007	0.000	0.530
0.3000	0.077	0.008	0.000	0.530
0.3167	0.077	0.008	0.000	0.530
0.3333	0.077	0.009	0.000	0.530
0.3500	0.077	0.009	0.000	0.530
0.3667	0.077	0.009	0.000	0.530
0.3833	0.077	0.010	0.000	0.530
0.4000	0.077	0.010	0.000	0.530

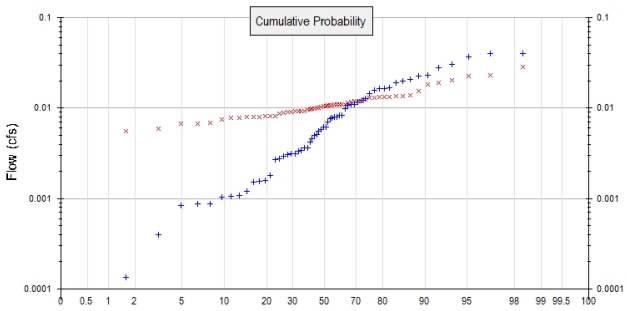
0.4167	0.077	0.011	0.000	0.530
0.4333	0.077	0.011	0.000	0.530
0.4500	0.077	0.012	0.000	0.530
0.4667	0.077	0.012	0.000	0.530
0.4833	0.077	0.013	0.000	0.530
0.5000	0.077	0.013	0.000	0.530
0.5167	0.077	0.014	0.041	0.530
0.5333	0.077	0.016	0.117	0.530
0.5500	0.077	0.017	0.216	0.530
0.5667	0.077	0.018	0.332	0.530
0.5833	0.077	0.020	0.464	0.530
0.6000	0.077	0.021	0.611	0.530
0.6167	0.077	0.022	0.770	0.530
0.6333	0.077	0.023	0.940	0.530
0.6500	0.077	0.025	1.122	0.530
0.6667	0.077	0.026	1.314	0.530
0.6833	0.077	0.027	1.516	0.530
0.7000	0.077	0.029	1.728	0.530
0.7167	0.077	0.030	1.948	0.530
0.7333	0.077	0.031	2.178	0.530
0.7500	0.077	0.032	2.415	0.530
0.7667	0.077	0.034	2.661	0.530
0.7833	0.077	0.035	2.914	0.530
0.8000	0.077	0.036	3.175	0.530
0.8167	0.077	0.038	3.443	0.530
0.8333	0.077	0.039	3.718	0.530
0.8500	0.077	0.040	4.001	0.530
0.8667	0.077	0.041	4.290	0.530
0.8833	0.077	0.043	4.586	0.530
0.9000	0.077	0.044	4.888	0.530
0.9167	0.077	0.045	5.197	0.530
0.9333	0.077	0.047	5.512	0.530
0.9500	0.077	0.048	5.833	0.530
0.9667	0.077	0.049	6.160	0.530
0.9833	0.077	0.050	6.493	0.530
1.0000	0.077	0.052	6.832	0.530
1.0167	0.077	0.053	7.176	0.530
1.0333	0.077	0.054	7.526	0.530
1.0500	0.077	0.056	7.882	0.530
1.0667	0.077	0.057	8.243	0.530
1.0833	0.077	0.058	8.609	0.530
1.1000	0.077	0.059	8.981	0.530
1.1167	0.077	0.061	9.357	0.530
1.1333	0.077	0.062	9.739	0.530
1.1500	0.077	0.063	10.12	0.530
1.1667	0.077	0.065	10.51	0.530
1.1833	0.077	0.066	10.91	0.530
1.2000	0.077	0.067	11.31	0.530
1.2167	0.077	0.068	11.72	0.530
1.2333	0.077	0.070	12.13	0.530
1.2500	0.077	0.071	12.55	0.530
1.2667	0.077	0.072	12.97	0.530
1.2833	0.077	0.074	13.39	0.530
1.3000	0.077	0.075	13.82	0.530
1.3167	0.077	0.076	14.26	0.530
1.3333	0.077	0.078	14.70	0.530
1.3500	0.077	0.079	15.14	0.530
1.3667	0.077	0.080	15.59	0.530

1.3833	0.077	0.081	16.04	0.530
1.4000	0.077	0.083	16.49	0.530
1.4167	0.077	0.084	16.96	0.530
1.4333	0.077	0.085	17.42	0.530
1.4500	0.077	0.087	17.89	0.530
1.4667	0.077	0.088	18.36	0.530
1.4833	0.077	0.089	18.84	0.530
1.5000	0.077	0.090	19.32	0.530

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.167
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.167299

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.005863
5 year	0.015664
10 year	0.024443
25 year	0.037403
50 year	0.04798
100 year	0.059041

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.01032
5 year	0.013881
10 year	0.016474
25 year	0.020027
50 year	0.022881
100 year	0.02592

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.000	0.011
1950	0.012	0.011
1951	0.008	0.013
1952	0.006	0.010
1953	0.008	0.012
1954	0.040	0.016
1955	0.028	0.013
1956	0.004	0.006
1957	0.017	0.009
1958	0.011	0.023

1959	0.008	0.009
1960	0.008	0.010
1961	0.023	0.028
1962	0.001	0.012
1963	0.020	0.012
1964	0.011	0.007
1965	0.001	0.009
1966	0.002	0.009
1967	0.008	0.019
1968	0.005	0.010
1969	0.011	0.020
1970	0.003	0.008
1971	0.015	0.011
1972	0.007	0.014
1973	0.003	0.011
1974	0.016	0.014
1975	0.004	0.011
1976	0.008	0.008
1977	0.000	0.008
1978	0.002	0.006
1979	0.037	0.013
1980	0.006	0.011
1981	0.006	0.008
1982	0.005	0.009
1983	0.016	0.011
1984	0.001	0.010
1985	0.016	0.013
1986	0.023	0.013
1987	0.010	0.012
1988	0.004	0.010
1989	0.012	0.009
1990	0.006	0.008
1991	0.003	0.011
1992	0.003	0.010
1993	0.003	0.008
1994	0.001	0.009
1995	0.003	0.007
1996	0.021	0.013
1997	0.041	0.011
1998	0.002	0.013
1999	0.003	0.006
2000	0.013	0.023
2001	0.000	0.007
2002	0.002	0.007
2003	0.001	0.010
2004	0.001	0.018
2005	0.003	0.008
2006	0.031	0.011
2007	0.019	0.010
2008	0.005	0.009
2009	0.001	0.008

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0407	0.0285
2	0.0402	0.0229
3	0.0366	0.0228

4	0.0307	0.0202
5	0.0279	0.0192
6	0.0233	0.0183
7	0.0226	0.0156
8	0.0210	0.0140
9	0.0200	0.0136
10	0.0190	0.0135
11	0.0168	0.0134
12	0.0164	0.0133
13	0.0164	0.0132
14	0.0157	0.0130
15	0.0146	0.0130
16	0.0129	0.0125
17	0.0123	0.0120
18	0.0118	0.0120
19	0.0111	0.0119
20	0.0109	0.0118
21	0.0107	0.0114
22	0.0100	0.0111
23	0.0084	0.0111
24	0.0083	0.0110
25	0.0081	0.0109
26	0.0081	0.0109
27	0.0078	0.0109
28	0.0076	0.0109
29	0.0070	0.0107
30	0.0062	0.0105
31	0.0061	0.0105
32	0.0058	0.0103
33	0.0056	0.0100
34	0.0052	0.0100
35	0.0050	0.0100
36	0.0046	0.0098
37	0.0042	0.0098
38	0.0036	0.0096
39	0.0036	0.0093
40	0.0034	0.0093
41	0.0033	0.0093
42	0.0031	0.0092
43	0.0031	0.0092
44	0.0031	0.0091
45	0.0029	0.0088
46	0.0028	0.0088
47	0.0027	0.0082
48	0.0018	0.0081
49	0.0016	0.0081
50	0.0016	0.0081
51	0.0015	0.0080
52	0.0012	0.0080
53	0.0011	0.0079
54	0.0011	0.0078
55	0.0010	0.0075
56	0.0009	0.0070
57	0.0009	0.0068
58	0.0008	0.0068
59	0.0004	0.0059
60	0.0001	0.0055
61	0.0001	0.0055

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0029	297	5649	1902	Fail
0.0034	263	3726	1416	Fail
0.0038	233	2541	1090	Fail
0.0043	214	1795	838	Fail
0.0048	192	1276	664	Fail
0.0052	171	932	545	Fail
0.0057	157	683	435	Fail
0.0061	147	519	353	Fail
0.0066	131	392	299	Fail
0.0070	121	302	249	Fail
0.0075	112	245	218	Fail
0.0079	104	213	204	Fail
0.0084	93	161	173	Fail
0.0088	88	130	147	Fail
0.0093	83	110	132	Fail
0.0098	77	95	123	Fail
0.0102	74	78	105	Pass
0.0107	67	64	95	Pass
0.0111	58	47	81	Pass
0.0116	55	41	74	Pass
0.0120	51	33	64	Pass
0.0125	50	31	62	Pass
0.0129	44	28	63	Pass
0.0134	42	18	42	Pass
0.0139	40	15	37	Pass
0.0143	38	14	36	Pass
0.0148	33	12	36	Pass
0.0152	32	11	34	Pass
0.0157	30	8	26	Pass
0.0161	29	8	27	Pass
0.0166	26	8	30	Pass
0.0170	25	8	32	Pass
0.0175	25	8	32	Pass
0.0179	23	8	34	Pass
0.0184	22	7	31	Pass
0.0189	22	6	27	Pass
0.0193	19	5	26	Pass
0.0198	18	5	27	Pass
0.0202	16	4	25	Pass
0.0207	16	4	25	Pass
0.0211	15	4	26	Pass
0.0216	15	4	26	Pass
0.0220	14	4	28	Pass
0.0225	12	4	33	Pass
0.0230	11	2	18	Pass
0.0234	10	2	20	Pass
0.0239	10	2	20	Pass
0.0243	9	2	22	Pass
0.0248	9	2	22	Pass
0.0252	8	2	25	Pass
0.0257	8	2	25	Pass
0.0261	7	2	28	Pass
0.0266	7	2	28	Pass
0.0270	7	2	28	Pass

0.0275	7	2	28	Pass
0.0280	6	1	16	Pass
0.0284	5	1	20	Pass
0.0289	5	0	0	Pass
0.0293	5	0	0	Pass
0.0298	5	0	0	Pass
0.0302	5	0	0	Pass
0.0307	5	0	0	Pass
0.0311	4	0	0	Pass
0.0316	4	0	0	Pass
0.0321	3	0	0	Pass
0.0325	3	0	0	Pass
0.0330	3	0	0	Pass
0.0334	3	0	0	Pass
0.0339	3	0	0	Pass
0.0343	3	0	0	Pass
0.0348	3	0	0	Pass
0.0352	3	0	0	Pass
0.0357	3	0	0	Pass
0.0361	3	0	0	Pass
0.0366	2	0	0	Pass
0.0371	2	0	0	Pass
0.0375	2	0	0	Pass
0.0380	2	0	0	Pass
0.0384	2	0	0	Pass
0.0389	2	0	0	Pass
0.0393	2	0	0	Pass
0.0398	2	0	0	Pass
0.0402	2	0	0	Pass
0.0407	0	0	0	Pass
0.0412	0	0	0	Pass
0.0416	0	0	0	Pass
0.0421	0	0	0	Pass
0.0425	0	0	0	Pass
0.0430	0	0	0	Pass
0.0434	0	0	0	Pass
0.0439	0	0	0	Pass
0.0443	0	0	0	Pass
0.0448	0	0	0	Pass
0.0452	0	0	0	Pass
0.0457	0	0	0	Pass
0.0462	0	0	0	Pass
0.0466	0	0	0	Pass
0.0471	0	0	0	Pass
0.0475	0	0	0	Pass
0.0480	0	0	0	Pass

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

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
ACCESS DRIVE POC	☐	11.69			☐	100.00			
NON-PAVED AREAS POC	☐	12.52			☐	100.00			
Total Volume Infiltrated		24.20	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 = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

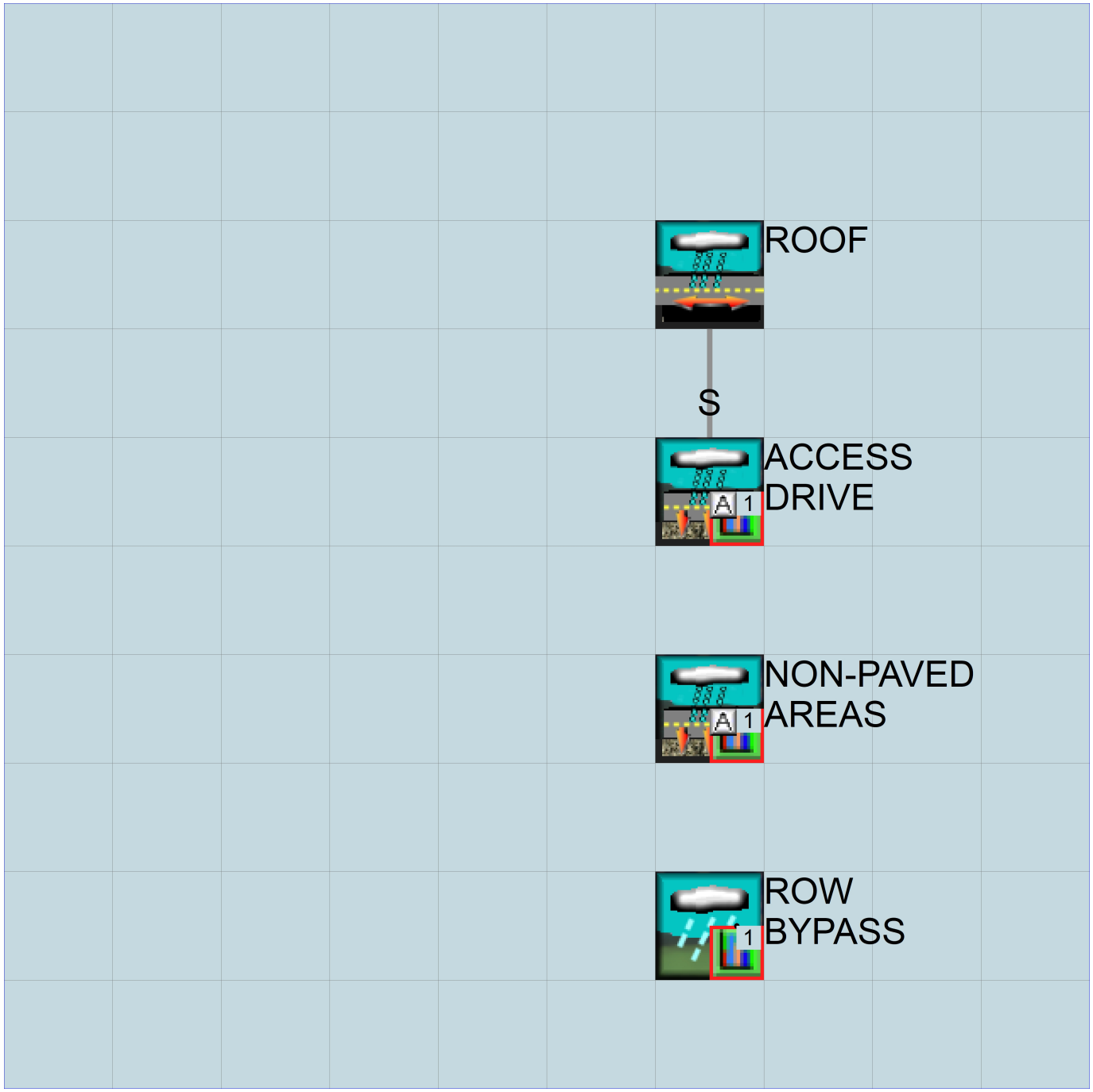
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

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   24-014 Monroe Coffee 100yr 2025-05-02.wdm
MESSU       25   Pre24-014 Monroe Coffee 100yr 2025-05-02.MES
            27   Pre24-014 Monroe Coffee 100yr 2025-05-02.L61
            28   Pre24-014 Monroe Coffee 100yr 2025-05-02.L62
            30   POC24-014 Monroe Coffee 100yr 2025-05-021.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        PRE-PROJECT                 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           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         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  *********
    7         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 ***
    7         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
    7               0         5       0.8       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
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7          0.1       0.5      0.25         0       0.7      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
    7              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#   ***
PRE-PROJECT***
PERLND   7                       0.167     COPY   501     12
PERLND   7                       0.167     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    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            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   24-014 Monroe Coffee 100yr 2025-05-02.wdm
MESSU       25   Mit24-014 Monroe Coffee 100yr 2025-05-02.MES
            27   Mit24-014 Monroe Coffee 100yr 2025-05-02.L61
            28   Mit24-014 Monroe Coffee 100yr 2025-05-02.L62
            30   POC24-014 Monroe Coffee 100yr 2025-05-021.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND      17
      IMPLND      18
      RCHRES       1
      IMPLND       1
      IMPLND       6
      IMPLND       8
      IMPLND      16
      RCHRES       2
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        NON-PAVED AREAS             MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         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           ***
  END GEN-INFO
  *** Section PWATER***

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

```
  END ACTIVITY

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

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

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  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
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                   in  out           ***
   17      ROOF TOPS/FLAT         1    1    1   27    0
   18      Porous Pavement        1    1    1   27    0
    1      ROADS/FLAT             1    1    1   27    0
    6      DRIVEWAYS/MOD          1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
   16      Porous Pavement        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   17         0    0    1    0    0    0
   18         0    0    1    0    0    0
    1         0    0    1    0    0    0
    6         0    0    1    0    0    0
    8         0    0    1    0    0    0
   16         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
   17         0    0    4    0    0    0    1    9
   18         0    0    4    0    0    0    1    9
    1         0    0    4    0    0    0    1    9
    6         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
   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     ***
   17         0    0    0    0    0
   18         0    0    0    0    0
    1         0    0    0    0    0
    6         0    0    0    0    0
    8         0    0    0    0    0
   16         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   17          400      0.01       0.1       0.1
   18          400      0.01       0.1       0.1
    1          400      0.01       0.1       0.1
    6          400      0.05       0.1      0.08
    8          400      0.01       0.1       0.1
   16          400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   17             0         0
   18             0         0
    1             0         0
    6             0         0
    8             0         0
   16             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   17             0         0
   18             0         0
    1             0         0
    6             0         0
    8             0         0
   16             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
ROOF***
IMPLND  17                     0.0746     IMPLND  16     53
IMPLND  16                      0.067     RCHRES   2      5
IMPLND  18                     0.0773     RCHRES   1      5
ROW BYPASS***
IMPLND   1                      0.003     COPY   501     15
IMPLND   1                      0.003     COPY   601     15
IMPLND   6                      0.008     COPY   501     15
IMPLND   6                      0.008     COPY   601     15
IMPLND   8                      0.007     COPY   501     15
IMPLND   8                      0.007     COPY   601     15

******Routing******
IMPLND  17                      0.005     COPY     1     15
RCHRES   2                          1     COPY   501     17
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     NON-PAVED AREAS         2    1    1    1   28    0    1
    2     ACCESS DRIVE            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
    2         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
    2         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
    2        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      0.01       0.0       0.0       0.5       0.0
    2              2      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
    <------><-------->    <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           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      2
   91    5
     Depth      Area     Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.066992  0.000000  0.000000  0.000000
  0.020333  0.066992  0.000477  0.000000  0.459340
  0.040667  0.066992  0.000954  0.000000  0.459340
  0.061000  0.066992  0.001430  0.000000  0.459340
  0.081333  0.066992  0.001907  0.000000  0.459340
  0.101667  0.066992  0.002384  0.000000  0.459340
```

0.122000	0.066992	0.002861	0.000000	0.459340
0.142333	0.066992	0.003337	0.000000	0.459340
0.162667	0.066992	0.003814	0.000000	0.459340
0.183000	0.066992	0.004291	0.000000	0.459340
0.203333	0.066992	0.004768	0.000000	0.459340
0.223667	0.066992	0.005244	0.000000	0.459340
0.244000	0.066992	0.005721	0.000000	0.459340
0.264333	0.066992	0.006198	0.000000	0.459340
0.284667	0.066992	0.006675	0.000000	0.459340
0.305000	0.066992	0.007151	0.000000	0.459340
0.325333	0.066992	0.007628	0.000000	0.459340
0.345667	0.066992	0.008105	0.000000	0.459340
0.366000	0.066992	0.008582	0.000000	0.459340
0.386333	0.066992	0.009058	0.000000	0.459340
0.406667	0.066992	0.009535	0.000000	0.459340
0.427000	0.066992	0.010012	0.000000	0.459340
0.447333	0.066992	0.010489	0.000000	0.459340
0.467667	0.066992	0.010965	0.000000	0.459340
0.488000	0.066992	0.011442	0.000000	0.459340
0.508333	0.066992	0.011442	0.000000	0.459340
0.528667	0.066992	0.011442	0.000000	0.459340
0.549000	0.066992	0.011442	0.000000	0.459340
0.569333	0.066992	0.011442	0.000000	0.459340
0.589667	0.066992	0.011442	0.000000	0.459340
0.610000	0.066992	0.011442	0.000000	0.459340
0.630333	0.066992	0.011442	0.000000	0.459340
0.650667	0.066992	0.011442	0.000000	0.459340
0.671000	0.066992	0.011442	0.000000	0.459340
0.691333	0.066992	0.011442	0.000000	0.459340
0.711667	0.066992	0.011442	0.000000	0.459340
0.732000	0.066992	0.011442	0.000000	0.459340
0.752333	0.066992	0.011442	0.000000	0.459340
0.772667	0.066992	0.011442	0.000000	0.459340
0.793000	0.066992	0.011442	0.000000	0.459340
0.813333	0.066992	0.011442	0.000000	0.459340
0.833667	0.066992	0.012804	0.003994	0.459340
0.854000	0.066992	0.014167	0.066883	0.459340
0.874333	0.066992	0.015529	0.167917	0.459340
0.894667	0.066992	0.016891	0.295815	0.459340
0.915000	0.066992	0.018253	0.445787	0.459340
0.935333	0.066992	0.019615	0.614961	0.459340
0.955667	0.066992	0.020977	0.801362	0.459340
0.976000	0.066992	0.022340	1.003525	0.459340
0.996333	0.066992	0.023702	1.220303	0.459340
1.016667	0.066992	0.025064	1.450771	0.459340
1.037000	0.066992	0.026426	1.694160	0.459340
1.057333	0.066992	0.027788	1.949815	0.459340
1.077667	0.066992	0.029150	2.217176	0.459340
1.098000	0.066992	0.030513	2.495750	0.459340
1.118333	0.066992	0.031875	2.785102	0.459340
1.138667	0.066992	0.033237	3.084845	0.459340
1.159000	0.066992	0.034599	3.394632	0.459340
1.179333	0.066992	0.035961	3.714145	0.459340
1.199667	0.066992	0.037323	4.043098	0.459340
1.220000	0.066992	0.038685	4.381227	0.459340
1.240333	0.066992	0.040048	4.728289	0.459340
1.260667	0.066992	0.041410	5.084060	0.459340
1.281000	0.066992	0.042772	5.448333	0.459340
1.301333	0.066992	0.044134	5.820912	0.459340
1.321667	0.066992	0.045496	6.201617	0.459340
1.342000	0.066992	0.046858	6.590278	0.459340
1.362333	0.066992	0.048221	6.986736	0.459340
1.382667	0.066992	0.049583	7.390839	0.459340
1.403000	0.066992	0.050945	7.802446	0.459340
1.423333	0.066992	0.052307	8.221422	0.459340
1.443667	0.066992	0.053669	8.647640	0.459340
1.464000	0.066992	0.055031	9.080980	0.459340
1.484333	0.066992	0.056394	9.521325	0.459340
1.504667	0.066992	0.057756	9.968566	0.459340
1.525000	0.066992	0.059118	10.42260	0.459340

```
1.545333  0.066992  0.060480  10.88332  0.459340
1.565667  0.066992  0.061842  11.35064  0.459340
1.586000  0.066992  0.063204  11.82447  0.459340
1.606333  0.066992  0.064567  12.30470  0.459340
1.626667  0.066992  0.065929  12.79127  0.459340
1.647000  0.066992  0.067291  13.28409  0.459340
1.667333  0.066992  0.068653  13.78308  0.459340
1.687667  0.066992  0.070015  14.28817  0.459340
1.708000  0.066992  0.071377  14.79928  0.459340
1.728333  0.066992  0.072740  15.31634  0.459340
1.748667  0.066992  0.074102  15.83929  0.459340
1.769000  0.066992  0.075464  16.36806  0.459340
1.789333  0.066992  0.076826  16.90258  0.459340
1.809667  0.066992  0.078188  17.44280  0.459340
1.830000  0.066992  0.079550  17.98866  0.459340
END FTABLE  2
FTABLE      1
 91    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.077307  0.000000  0.000000  0.000000
0.016667  0.077307  0.000451  0.000000  0.530066
0.033333  0.077307  0.000902  0.000000  0.530066
0.050000  0.077307  0.001353  0.000000  0.530066
0.066667  0.077307  0.001804  0.000000  0.530066
0.083333  0.077307  0.002255  0.000000  0.530066
0.100000  0.077307  0.002706  0.000000  0.530066
0.116667  0.077307  0.003157  0.000000  0.530066
0.133333  0.077307  0.003608  0.000000  0.530066
0.150000  0.077307  0.004059  0.000000  0.530066
0.166667  0.077307  0.004510  0.000000  0.530066
0.183333  0.077307  0.004961  0.000000  0.530066
0.200000  0.077307  0.005411  0.000000  0.530066
0.216667  0.077307  0.005862  0.000000  0.530066
0.233333  0.077307  0.006313  0.000000  0.530066
0.250000  0.077307  0.006764  0.000000  0.530066
0.266667  0.077307  0.007215  0.000000  0.530066
0.283333  0.077307  0.007666  0.000000  0.530066
0.300000  0.077307  0.008117  0.000000  0.530066
0.316667  0.077307  0.008568  0.000000  0.530066
0.333333  0.077307  0.009019  0.000000  0.530066
0.350000  0.077307  0.009470  0.000000  0.530066
0.366667  0.077307  0.009921  0.000000  0.530066
0.383333  0.077307  0.010372  0.000000  0.530066
0.400000  0.077307  0.010823  0.000000  0.530066
0.416667  0.077307  0.011274  0.000000  0.530066
0.433333  0.077307  0.011725  0.000000  0.530066
0.450000  0.077307  0.012176  0.000000  0.530066
0.466667  0.077307  0.012627  0.000000  0.530066
0.483333  0.077307  0.013078  0.000000  0.530066
0.500000  0.077307  0.013529  0.000000  0.530066
0.516667  0.077307  0.014817  0.041579  0.530066
0.533333  0.077307  0.016106  0.117602  0.530066
0.550000  0.077307  0.017394  0.216049  0.530066
0.566667  0.077307  0.018682  0.332629  0.530066
0.583333  0.077307  0.019971  0.464863  0.530066
0.600000  0.077307  0.021259  0.611078  0.530066
0.616667  0.077307  0.022548  0.770047  0.530066
0.633333  0.077307  0.023836  0.940816  0.530066
0.650000  0.077307  0.025125  1.122622  0.530066
0.666667  0.077307  0.026413  1.314831  0.530066
0.683333  0.077307  0.027702  1.516907  0.530066
0.700000  0.077307  0.028990  1.728390  0.530066
0.716667  0.077307  0.030278  1.948879  0.530066
0.733333  0.077307  0.031567  2.178021  0.530066
0.750000  0.077307  0.032855  2.415499  0.530066
0.766667  0.077307  0.034144  2.661031  0.530066
0.783333  0.077307  0.035432  2.914361  0.530066
0.800000  0.077307  0.036721  3.175256  0.530066
0.816667  0.077307  0.038009  3.443502  0.530066
```

```
  0.833333  0.077307  0.039298  3.718904  0.530066
  0.850000  0.077307  0.040586  4.001279  0.530066
  0.866667  0.077307  0.041874  4.290461  0.530066
  0.883333  0.077307  0.043163  4.586292  0.530066
  0.900000  0.077307  0.044451  4.888626  0.530066
  0.916667  0.077307  0.045740  5.197326  0.530066
  0.933333  0.077307  0.047028  5.512263  0.530066
  0.950000  0.077307  0.048317  5.833317  0.530066
  0.966667  0.077307  0.049605  6.160373  0.530066
  0.983333  0.077307  0.050894  6.493322  0.530066
  1.000000  0.077307  0.052182  6.832062  0.530066
  1.016667  0.077307  0.053470  7.176496  0.530066
  1.033333  0.077307  0.054759  7.526532  0.530066
  1.050000  0.077307  0.056047  7.882080  0.530066
  1.066667  0.077307  0.057336  8.243057  0.530066
  1.083333  0.077307  0.058624  8.609382  0.530066
  1.100000  0.077307  0.059913  8.980979  0.530066
  1.116667  0.077307  0.061201  9.357773  0.530066
  1.133333  0.077307  0.062490  9.739694  0.530066
  1.150000  0.077307  0.063778  10.12667  0.530066
  1.166667  0.077307  0.065066  10.51865  0.530066
  1.183333  0.077307  0.066355  10.91555  0.530066
  1.200000  0.077307  0.067643  11.31733  0.530066
  1.216667  0.077307  0.068932  11.72391  0.530066
  1.233333  0.077307  0.070220  12.13526  0.530066
  1.250000  0.077307  0.071509  12.55130  0.530066
  1.266667  0.077307  0.072797  12.97199  0.530066
  1.283333  0.077307  0.074086  13.39728  0.530066
  1.300000  0.077307  0.075374  13.82712  0.530066
  1.316667  0.077307  0.076663  14.26146  0.530066
  1.333333  0.077307  0.077951  14.70026  0.530066
  1.350000  0.077307  0.079239  15.14346  0.530066
  1.366667  0.077307  0.080528  15.59103  0.530066
  1.383333  0.077307  0.081816  16.04293  0.530066
  1.400000  0.077307  0.083105  16.49911  0.530066
  1.416667  0.077307  0.084393  16.95954  0.530066
  1.433333  0.077307  0.085682  17.42416  0.530066
  1.450000  0.077307  0.086970  17.89296  0.530066
  1.466667  0.077307  0.088259  18.36589  0.530066
  1.483333  0.077307  0.089547  18.84291  0.530066
  1.500000  0.077307  0.090835  19.32399  0.530066
  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    1.2             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2             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
WDM      1 EVAP     ENGL    0.76            RCHRES   2     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***
RCHRES   2 HYDR   RO      1 1        1      WDM   1000 FLOW     ENGL       REPL
RCHRES   2 HYDR   O       1 1        1      WDM   1001 FLOW     ENGL       REPL
RCHRES   2 HYDR   O       2 1        1      WDM   1002 FLOW     ENGL       REPL
RCHRES   2 HYDR   STAGE   1 1        1      WDM   1003 STAG     ENGL       REPL
COPY     1 OUTPUT MEAN    1 1     48.4      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN    1 1     48.4      WDM    801 FLOW     ENGL       REPL
COPY   601 OUTPUT MEAN    1 1     48.4      WDM    901 FLOW     ENGL       REPL
RCHRES   1 HYDR   RO      1 1        1      WDM   1004 FLOW     ENGL       REPL
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RCHRES   1 HYDR   STAGE   1 1        1      WDM   1007 STAG     ENGL       REPL
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END EXT TARGETS

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  END MASS-LINK    15

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RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
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IMPLND     IWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK    53


END MASS-LINK

END RUN
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Disclaimer

Legal Notice

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Local (360)943-0304

www.clearcreeksolutions.com

Gary A. Flowers, PLLC
Geological & Geotechnical Consulting
5205 23rd Avenue W
Everett, WA 98203

March 21, 2025
Project No. 25001

Mr. Eric Cavanaugh
Northern Star Construction
24220 Florence Acres Road
Monroe, WA 98272

Re: Soil Infiltration Rate Evaluation
Parcel #00517404101502
134 S. Ferry Avenue
Monroe, WA

This report summarizes the results of our soil infiltration rate evaluation that was conducted at the above noted property in Monroe, Washington. This study has been completed and this report prepared for the exclusive use of Northern Star Construction, and their agents, for specific application to this project. Within the limitations of scope and schedule, our services have been performed in accordance with generally accepted engineering geology practices in effect in this area at the time of our study. No other warranty, express or implied, is made.

The site is currently undeveloped. It is our understanding that a new, drive through coffee stand is planned for the parcel.

Existing Conditions

A professional survey of the site was not provided for this study. However, based on a site plan provided by HWL Architects, the property is rectangular in shape and measures approximately 90 feet in the east-west direction by 72 feet in the north-south direction with an area slightly less than 6500 square feet. The site topography is relatively flat. The site is relatively clear of vegetation with only field grass and some blackberry vines.

There was no indication of any standing or flowing water on the parcel at the time of our field work on February 14, 2025. No hydrophilic vegetation was observed on the site.

The property is bounded on the north and west single family residences, on the east by S. Ferry Avenue and on the south by Fremont Street.

Subsurface Exploration

A geotechnical study was previously performed on the site in 2019 by others. At that time four exploration pits were excavated on the parcel for construction and foundation design purposes. All four pits encountered 2 to 3 feet of topsoil/fill intermixture consisting of loose, moist, silty fine sand with trace to some organics, roots and gravel overlying gravelly sand and sandy gravel (recessional outwash). No ground water was observed within the exploration pits to a maximum depth of 7 feet. In addition, the report presented three exploration borings dilled nearby in Fremont Street. The borings also encountered fill overlying recessional outwash to a maximum drilled depth of 41 feet. Ground water was observed within the borings at a depth of about 28 feet.

For this soil infiltration rate study an additional two exploration pits were excavated on the site (see attached Figure 1, Site and Exploration Plan). Our pits also encountered 2 to 3 feet of topsoil and old fill materials overlying recessional outwash (gravelly sand and sandy gravel). No ground water was observed to a maximum depth of 9 feet below existing grade.

Soil samples were collected at depths of 1.5 feet in EP-1 and 1.5 and 4.0 feet in EP-2. The samples were taken to approved soils laboratories for grain size analysis, cation exchange capacity and organic content testing. Laboratory test results are attached with this report.

Ground Water

Ground water seepage was not encountered in any of the previous or current exploration pits excavated on the site to a maximum depth of 9 feet. Ground water was observed within a previous test boring in Fremont Street about 200 feet from the subject parcel, at a depth of 28 feet below grade. Although the depth and occurrence of ground water can vary in response to such factors as changes in season, amount of precipitation and site use, it is unlikely that ground water seepage will ever be observed on the subject parcel at a depth that could impact a shallow infiltration facility.

Infiltration

We understand that the on-site infiltration of site generated storm water is the preferred method for the disposal of storm water. Because the soils underlying the site consist of unconsolidated recessional outwash or unconsolidated fill materials, the methods outlined in the 2019 Surface Water Management Manual for Western Washington, Volume 5, V5.4, K_{sat} Determination Option 3: Soil Grain Size Analysis were used to determine the soil infiltration rate. The recommended uncorrected infiltration rates based upon grain size analyses of soil samples collected at each proposed infiltration location and performed in accordance with ASTM Method D422 are presented in Table 1 below:

Table 1. Soil Infiltration Rate, CEC & Organic Content

Sample No.	Depth (ft)	Ksat (cm/sec)	Uncorrected Infiltration Rate (in/hr)	Cation Exchange Capacity (meq/100 g)	Organic Content (%)
EP-1	1.5	1.486×10^{-2}	21	10.0	5.12
EP-2	1.5			11.1	5.19
EP-2	4.0	4.31×10^{-2}	30		

As per the 2019 SWMMWW correction factors are applied to the uncorrected infiltration rate to account for site variability (CFv), test method (CFt) and siltation and bio-buildup (CFm). For this site, the following correction factors should be applied. The site variability factor is high because in addition to our 2 exploration pits, there were 4 other explorations by others on the site and 4 explorations in the street – all of which identified the same material.

- CFv = 0.9
- CFt = 0.4
- CFm = 0.9

Applying these correction factors to the uncorrected infiltration rates determined above results in recommended, long term design infiltration rates as follows:

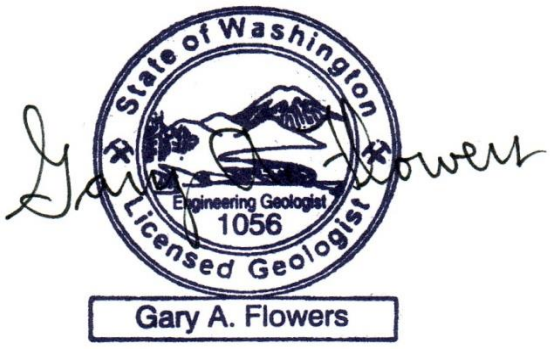
- Overlying granular fill = 6.8 in/hr
- Underlying native granular recessional outwash = 9.7 in/hr

Cation Exchange Capacity and Organic Content Soil Properties

As required by the city, the site soils were also evaluated for their potential to provide certain protection to underlying groundwater sources. As such, both the fill soil and the native soil were evaluated for Cation Exchange Capacity (CEC) and Organic Content. Generally, the required parameters useful for such protection is > 5 meq/100 gm CEC and > 1% organic content. As can be seen in Table 1 above, the onsite fill soil meets these requirements, but the underlying native soil does not.

Our findings and recommendations provided in this report were prepared in accordance with generally accepted principles of engineering geology and geotechnical engineering as practiced in the Puget Sound area at the time this report was submitted. We make no other warranty, either express or implied.

Respectfully submitted,



Gary A. Flowers, P.G., P.E.G.
Principal Engineering Geologist

Attachments: Exploration Pit Logs
Site & Exploration Plan
Sieve Analysis – EP-1 @ 1.5 feet
Sieve Analysis – EP-2 @ 4.0 feet
CEC & Organic Content Test results

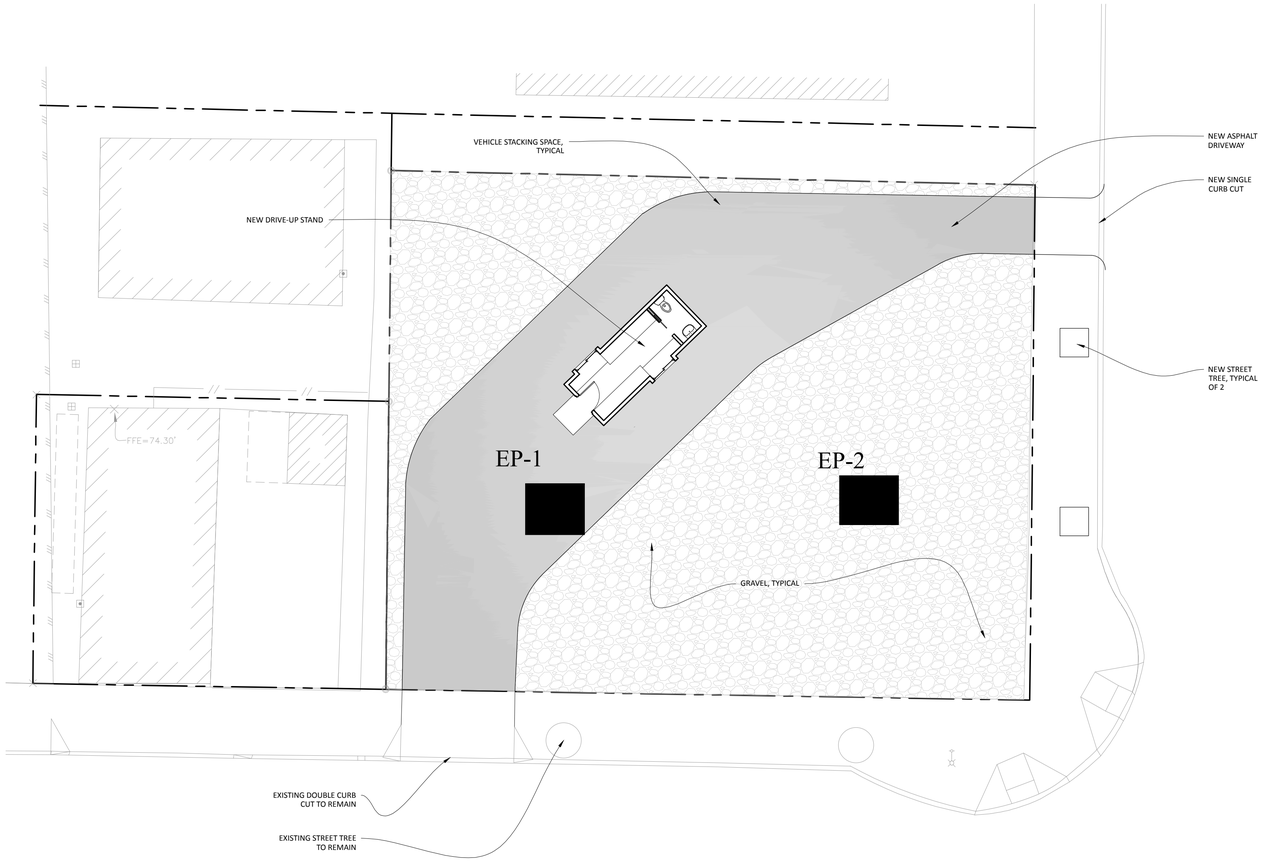
Exploration Pit Logs
134 S. Ferry Avenue
Monroe, WA

EP-1 Located in approximate area of planned drive through lane

0.0' – 0.2'	Grass sod/ minor topsoil
0.2' – 2.0'	Loose, moist, brown to dark brown, silty fine SAND, some crushed rock, roots, and organics
2.0' – 4.5	Medium dense, gray, sandy GRAVEL to gravelly coarse SAND with cobbles
	BOH @ 4.5' on February 14, 2025. No ground water. Minor sloughing.

EP-2 Located on southern portion of site, south of planned drive through lane

0.0' – 0.2'	Grass sod/ minor topsoil
0.2' – 2.5'	Loose, moist, brown to dark brown, silty fine SAND, minor crushed rock, roots, and organics
2.5' – 8.5	Medium dense, gray, sandy GRAVEL to gravelly coarse SAND with cobbles
	BOH @ 8.5' on February 14, 2025. No ground water. Minor sloughing.



1 SITE PLAN
1" = 10'-0"

0 5' 10' 20' 30'
GRAPHIC SCALE: 1"= 10'

NORTH

Haynes Wilson Lund ARCHITECTS LLC

CONSULTANT NAME / CONSULTANT LOGO

PROJECT TITLE / PROJECT ADDRESS

New Building
for
DRIVE-THRU
COFFEE &
ACAI BOWL
STAND

134 S. FERRY AVENUE
MONROE, WA. 98272

REVISIONS

PERMIT DOCUMENTS 1-15-2025
BID DOCUMENTS
CONSTRUCTION DOCUMENTS

PROJECT NUMBER
DRAWN BY HL
CHECKED BY HWL
DATE 15 JAN 2025

ARCHITECT / ENGINEER SEAL

SHEET TITLE
SITE PLAN

SHEET NUMBER
A10

20225 Cedar Valley Rd Ste 110
Lynnwood, WA 98036-6365
425-742-9360

SIEVE ANALYSIS REPORT

Report Number: M7251140.0001
Service Date: 02/20/25
Report Date: 02/25/25
Task:

Client

Gary Flowers, PLLC
Attn: Gary Flowers
5205 23rd Ave W
Everett, WA 98203

Project

QC Monroe Coffee Stand
20225 Cedar Valley Road
Suite 110
Lynnwood, WA 98036
Project No. M7251140

Laboratory Reference # **649**

Sample Description: **Reddish brown silty gravel with sand**
Sample Location: **EP-1 @ 1.5' - fill**

Delivered By: **Gary Flowers**
Date Delivered: **2/20/2025**
Sampled By: **Gary Flowers**

Silty gravel with sand, GM

Test Results:

Sieve Analysis (ASTM C136, C117, D422)
See attached analysis sheet

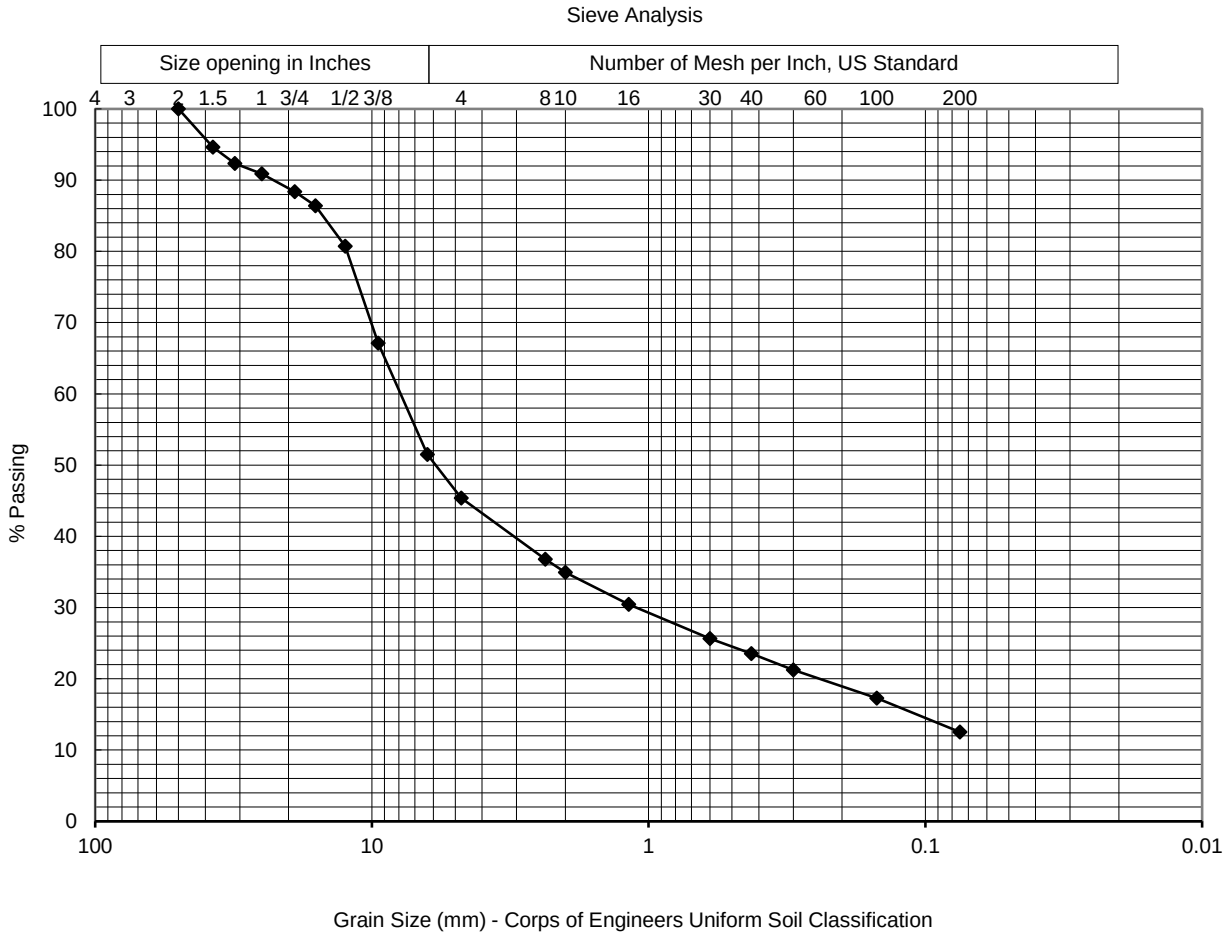
Services: Special Inspections / Materials Testing
Tested By: Kelsey Roberts

Report Distribution

(1) Gary Flowers, PLLC, Gary Flowers
(1) Terracon Consultants, Inc., Melinda Ferguson
(1) Terracon Consultants, Inc., Keith Bellows
(1) Terracon Consultants, Inc., Zen Revilla

Reviewed By: _____
Zenaida Revilla
Laboratory Manager

20225 Cedar Valley Road, Suite 110 Ph 425-742-9360
Lynnwood, WA 98036 Fax 425-745-1737



Sieve Analysis

ASTM C136 / C117

Sieve Size	% Passing	Specs * min	Specs * max
2.00"	100		
1.50"	95		
1.25"	92		
1.0"	91		
3/4"	88		
5/8"	86		
1/2"	81		
3/8"	67		
1/4"	51		
#4	45		
#8	37		
#10	35		
#16	30		
#30	26		
#40	24		
#50	21		
#100	17		
#200	12.5		

Material:	Reddish brown silty gravel with sand
Source:	EP-1 @ 1.5' - fill
Project:	Monroe Coffee Stand
Project #:	M7251140 (25-001)
Date Rec'd:	2/20/2025

Sample Number	Depth (ft)	Classification	
649		Silty gravel with sand, GM	

Tested By: K. Roberts/Z. Revilla Date Tested: 2/20/25 - 2/25/25

20225 Cedar Valley Rd Ste 110
Lynnwood, WA 98036-6365
425-742-9360

SIEVE ANALYSIS REPORT

Report Number: M7251140.0002
Service Date: 02/20/25
Report Date: 02/25/25
Task:

Client

Gary Flowers, PLLC
Attn: Gary Flowers
5205 23rd Ave W
Everett, WA 98203

Project

QC Monroe Coffee Stand
20225 Cedar Valley Road
Suite 110
Lynnwood, WA 98036
Project No. M7251140

Laboratory Reference # **650**

Sample Description: **Brown gravel with sand**
Sample Location: **EP-2 @ 4.0' - Native**

Delivered By: **Gary Flowers**
Date Delivered: **2/20/2025**
Sampled By: **Gary Flowers**

Poorly graded gravel with sand, GP

Test Results:

Sieve Analysis (ASTM C136, C117, D422)
See attached analysis sheet

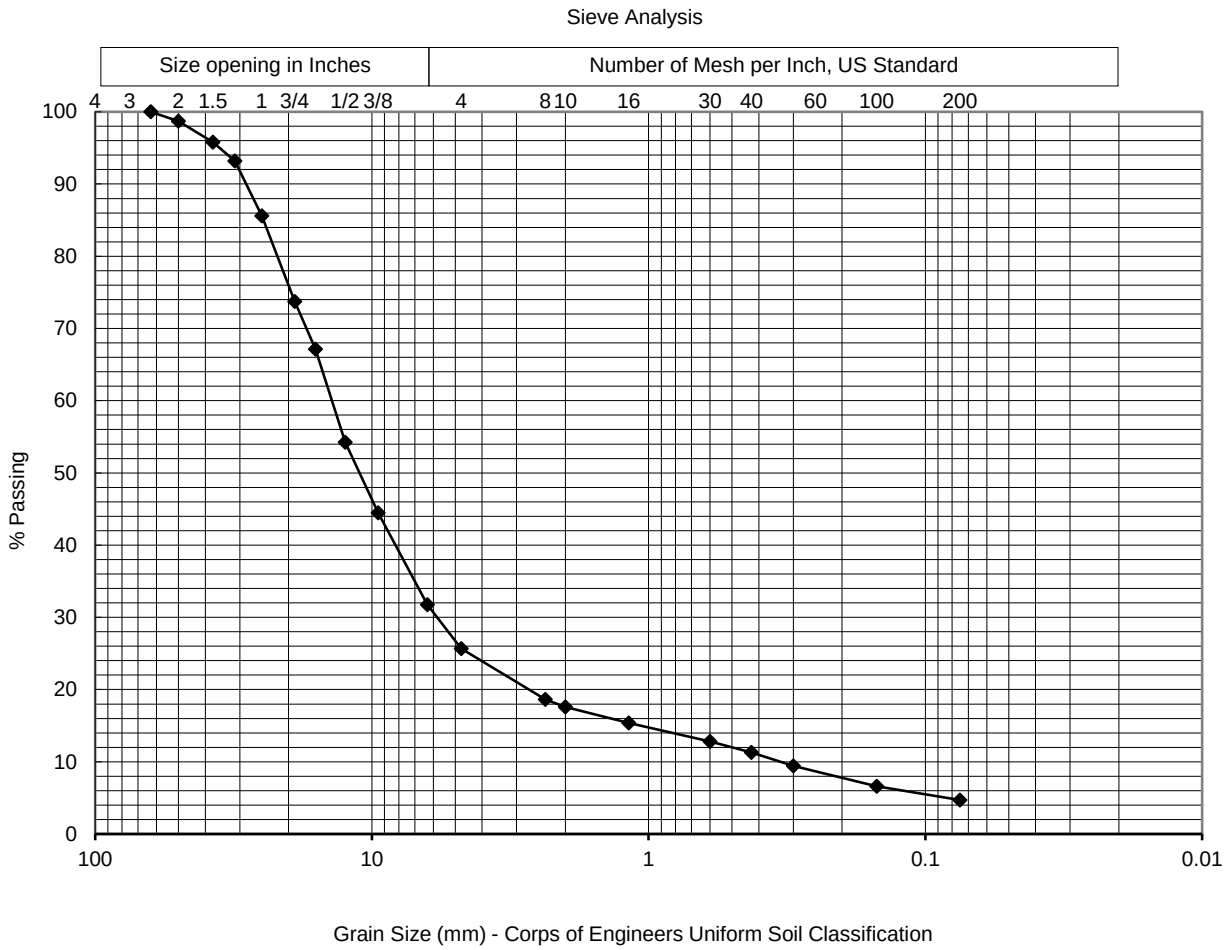
Services: Special Inspections / Materials Testing
Tested By: Kelsey Roberts

Report Distribution

(1) Gary Flowers, PLLC, Gary Flowers
(1) Terracon Consultants, Inc., Melinda Ferguson
(1) Terracon Consultants, Inc., Keith Bellows
(1) Terracon Consultants, Inc., Zen Revilla

Reviewed By: _____
Zenaida Revilla
Laboratory Manager

20225 Cedar Valley Road, Suite 110 Ph 425-742-9360
Lynnwood, WA 98036 Fax 425-745-1737



Sieve Analysis

ASTM C136 / C117

Sieve Size	% Passing	Specs * min	Specs * max
2.50"	100		
2.00"	99		
1.50"	96		
1.25"	93		
1.0"	86		
3/4"	74		
5/8"	67		
1/2"	54		
3/8"	44		
1/4"	32		
#4	26		
#8	19		
#10	18		
#16	15		
#30	13		
#40	11		
#50	9		
#100	7		
#200	4.7		

Material: Brown gravel with sand
Source: EP-2 @ 4.0' - Native
Project: Monroe Coffee Stand
Project #: M7251140 (25-001)
Date Rec'd: 2/2/025

Sample Number	Depth (ft)	Classification	
650		Poorly graded gravel with sand, GP	

Tested By: K. Robert/Z. Revilla Date Tested: 2/20/25-2/25/25

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

February 28, 2025

Gary Flowers, PLLC
5205 23rd Ave W
Everett, WA 98203
Attention: Gary Flowers

Project: Monroe Coffee Stand
Project Number: 25001
COC Number: A25B0301

Gary Flowers:

Enclosed please find the analytical data for your Monroe Coffee Stand project.

Your sample(s) were received on Wednesday, February 19, 2025 and properly maintained prior to the subsequent analysis. The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA, Standard Methods or the Army Corps of Engineers.

Following the analytical results you will find the Quality Control (QA/QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.
Sincerely,

ElementStationManager For Aaron Young
President
aarony@amtestlab.com

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

ANALYSIS REPORT

Professional Analytical Services

Gary Flowers, PLLC
5205 23rd Ave W
Everett, WA 98203
Attention: Gary Flowers
Project Name: Monroe Coffee Stand
Project #: 25001

Date Received: 02/19/25
Date Reported: 02/28/25

Reported Samples

Lab ID	Sample	Matrix	Qualifiers	Date Sampled	Date Received
A25B0301-01	EP-1 @ 1.5'	Solid		02/19/2025	02/19/2025
A25B0301-02	EP-2 @ 1.5'	Solid		02/19/2025	02/19/2025
A25B0301-03	EP-2 @ 4.0'	Solid		02/19/2025	02/19/2025

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Gary Flowers, PLLC
5205 23rd Ave W
Everett, WA 98203
Attention: Gary Flowers
Project Name: Monroe Coffee Stand
Project #: 25001

Date Received: 02/19/25
Date Reported: 02/28/25

AMTEST Identification Number: A25B0301-01
Client Identification: EP-1 @ 1.5'
Sampling Date: 02/19/25 07:00

Metals Extraction

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
CEC (Cation Exchange Capacity)	10.0	meq/100 g		0.500	EPA 9081	AE	02/24/2025

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Organic Matter	5.12	%			SM 2540G_2011	HV	02/28/2025

AMTEST Identification Number: A25B0301-02
Client Identification: EP-2 @ 1.5'
Sampling Date: 02/19/25 07:00

Metals Extraction

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
CEC (Cation Exchange Capacity)	11.1	meq/100 g		0.500	EPA 9081	AE	02/24/2025

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Organic Matter	5.19	%			SM 2540G_2011	HV	02/28/2025

AMTEST Identification Number: A25B0301-03
Client Identification: EP-2 @ 4.0'
Sampling Date: 02/19/25 07:00

Metals Extraction

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
CEC (Cation Exchange Capacity)	2.40	meq/100 g		0.500	EPA 9081	AE	02/24/2025

Conventional Chemistry Parameters by APHA/EPA Methods

PARAMETER	RESULT	UNITS	Q	R.L.	METHOD	ANALYST	DATE
Total Organic Matter	1.54	%			SM 2540G_2011	HV	02/28/2025

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
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www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Gary Flowers, PLLC
5205 23rd Ave W
Everett, WA 98203
Attention: Gary Flowers
Project Name: Monroe Coffee Stand
Project #: 25001

Date Received: 02/19/25
Date Reported: 02/28/25

Quality Control

Metals Extraction

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0260 - EPA 9081 (CEC)										
Calibration Blank (BCB0260-CCB1)					Prepared & Analyzed: 02/24/25					
CEC (Cation Exchange Capacity)	0.0169			meq/100 g						
Calibration Blank (BCB0260-CCB2)					Prepared & Analyzed: 02/24/25					
CEC (Cation Exchange Capacity)	0.0144			meq/100 g						
Calibration Check (BCB0260-CCV1)					Prepared & Analyzed: 02/24/25					
CEC (Cation Exchange Capacity)	2.06		0.500	meq/100 g	2.000		103%	85-115%		
Calibration Check (BCB0260-CCV2)					Prepared & Analyzed: 02/24/25					
CEC (Cation Exchange Capacity)	2.06		0.500	meq/100 g	2.000		103%	85-115%		
Duplicate (BCB0260-DUP1)		**Source: A25B0301-03**			Prepared & Analyzed: 02/24/25					
CEC (Cation Exchange Capacity)	2.01		0.500	meq/100 g		2.40			17	20
Duplicate (BCB0260-DUP2)		**Source: A25B0350-02**			Prepared & Analyzed: 02/24/25					
CEC (Cation Exchange Capacity)	7.15		0.500	meq/100 g		7.39			3	20

Quality Control

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BCB0315 - No Prep - WC Soil										
Duplicate (BCB0315-DUP1)		**Source: A25B0301-03**			Prepared: 02/25/25 Analyzed: 02/28/25					
Organic Matter	1.84			%		1.54			18	25.9
Duplicate (BCB0315-DUP3)		**Source: A25B0350-02**			Prepared: 02/25/25 Analyzed: 02/28/25					
Organic Matter	4.04			%		3.98			1	25.9

Am Test Inc.
13600 NE 126th Place Suite C
Kirkland, WA
(425) 885-1664
www.amtestlab.com

ANALYSIS REPORT

Professional Analytical Services

Gary Flowers, PLLC
5205 23rd Ave W
Everett, WA 98203
Attention: Gary Flowers
Project Name: Monroe Coffee Stand
Project #: 25001

Date Received: 02/19/25
Date Reported: 02/28/25

Notes and Definitions

Item	Definition
Dry	Sample results reported on a dry weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was matrix spiked or duplicated.

GEOTECHNICAL ENGINEERING REPORT
PROPOSED MIXED-USE BUILDING
134 SOUTH FERRY AVENUE
MONROE, WASHINGTON

PREPARED FOR
MR. COSMIN POPA

PREPARED BY
CASCADE GEOTECHNW
4957 LAKEMONT BLVD SE, C-4, #325
BELLEVUE, WA 98006
(206) 491-0081

PROJECT NO. 2019-003
January 18, 2019

CASCADE GROUP INT. LLC
DBA CASCADE GEOTECHNW
4957 Lakemont Blvd SE, C-4, #325
Bellevue, WA 98006
(206)491-81

January 18, 2019
Project No. 2019-003

Mr. Cosmin Popa
134 S Ferry Avenue, Monroe, WA 98272

Subject: Geotechnical Engineering Report
Proposed Mixed-Use Building
134 South Ferry Avenue, Monroe, Washington

Dear Mr. Popa,

As requested, Cascade GeotechNW has performed a geotechnical engineering study for the above-referenced project. The scope of our work included reviewing existing geologic and geotechnical data in the site vicinity, conducing a site reconnaissance, excavating four test pits, and developing geotechnical recommendations for the design of the proposed project.

Based on the results of the field exploration and review of existing borings in the site vicinity, the subsurface soils at the site and in the vicinity generally consisted of a layer of fill overlying medium dense sand and gravel. Groundwater seepage was not observed within the test pit depths during the field exploration.

In our opinion, the proposed development is feasible from a geotechnical standpoint. Based on the soil conditions at the site, the proposed mixed-use building may be supported by shallow continuous footings bearing on the recompacted native soils. However, limited over-excavation of fill or loose native soils may be needed below the design footings in localized areas. It is our opinion that temporary excavations may be accomplished with unsupported, sloped open cuts.

Cascade GeotechNW appreciates the opportunity to be of service to you for this project. Please contact us at if you have any questions or we can be of further assistance.

Respectfully submitted,

Michael Xue, P.E.
Principal Geotechnical Engineer

Encl.: Geotechnical Engineering Report

TABLE OF CONTENTS

Figures

Appendix

GEOTECHNICAL ENGINEERING REPORT
PROPOSED MIXED-USE BUILDING
134 SOUTH FERRY AVENUE
MONROE, WASHINGTON

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering study for the proposed development at the above-referenced site. The purpose of our work was to evaluate the subsurface conditions at the site and provide geotechnical recommendations regarding earthwork, foundation design, concrete slabs, and retaining walls for the proposed development. Authorization to conduct the geotechnical engineering study was provided by Mr. Popa on January 4, 2019.

2.0 SITE AND PROJECT DESCRIPTION

The subject site consists of two residential parcels: 134 South Ferry Avenue and 113 East Fremont Street in the City of Monroe, Washington (see Figure 1, Vicinity Map). The combined site is approximately is approximately 8,712 square foot lot, and is rectangular in shape and bordered to the west by an alley and a single-family residence, to the south by South Fremont Street, to the east by South Ferry Avenue, and to the north by an existing single-family residence. The 113 east Fremont Street site is currently occupied by an existing single-family residence. The 134 South Ferry Avenue site was previously occupied by an existing one-story house that had been removed at the time of our field exploration on January 5, 2019. The existing grade is generally flat.

Based on the information provided to us, we understand that you plan to construct a mixed-use building at the site. Based on preliminary design information provided to us, we understand that that the proposed mixed-use building will be an at-grade three-story isolated concrete form (ICF) construction with concrete slabs on grade. We anticipate that site grading will involve cuts and fill on the order of 3 to 4 feet for the foundation construction. We also understand that a geotechnical report is required as part of building permit application since he site is mapped within a soil liquefaction hazard area.

The conclusions and recommendations outlined in this report are based on our understanding of the proposed development, 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.

3.0 PROJECT SCOPE

The purpose of our geotechnical engineering study for the proposed development is to characterize subsurface conditions at the project site. The subsurface information obtained was used to develop geotechnical engineering recommendations pertinent to the design and construction of the subject project. The scope of our work for this project included the following tasks and work efforts:

1. Conducted a site reconnaissance to observe the existing site conditions, and to identify site conditions that may impact the proposed development from a geotechnical standpoint.

2. Reviewed readily available geologic and geotechnical data for the project area to supplement our subsurface exploration program at the subject site.

3. Excavated four (4) test pits to evaluate the general subsurface conditions at the site and to evaluate the potential geotechnical constrains for the proposed development. The test pits were excavated using a backhoe to about 6 and 7 feet below the existing grade, depending on the actual subsurface conditions encountered at each location.

4. Performed engineering analyses to develop engineering recommendations pertinent to the proposed development.

5. Preparation of this geotechnical report summarizing our work on the project and presenting our findings and preliminary geotechnical recommendations.

Detailed descriptions and logs of the field exploration are presented in Appendix A of this report.

It should be noted that our scope of work does not include an evaluation of chemical properties of soil and groundwater. Our scope also does not include evaluation of stormwater infiltration.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 SITE GEOLOGY

According to the geology maps of the area (The Geologic Map of Monroe 7.5-minute Quadrangle, King and Snohomish Counties, Washington: scale 1:24,000, Dragovich J. D, et. al, 2011), the project area is underlain by Deltaic Outwash (Map Unit Qgod), which is a recessional deposit of the Vashon Stade of the Fraser Glaciation. Deltaic Outwash (Qgod) typically consists of moderately to well sorted, thinly to very thickly bedded and well stratified, gravel to pebbly sand and cobble gravel, and is typically loose to medium dense in density.

4.2 CURRENT EXPLORATION AND SUBSURFACE CONDITIONS

We observed excavation of four (4) test pits by the client to explore the subsurface conditions at the site. The soils observed in the test pits consisted of a layer of fill overlying recessional outwash. The subsurface conditions encountered in our exploration is generally consistent with the mapped geology at the site. The following is a brief description of the soils encountered in the test pits excavated at the site. Please refer to the summary test pit logs in Appendix A for additional details.

> ***Unit 1 – Fill:*** Topsoil/fill was encountered in all four test pits to about 2 to 3 feet below the surface. The topsoil/fill generally consisted of loose, moist, silty fine sand with trace to some organics, roots, and gravel.
>
> ***Unit 2 – Recessional Outwash Deposit:*** Below fill, all test pits encountered gravelly sand and sandy gravel with occasional to abundant cobbles and occasional boulders that extended to the bottom of the test pits at about 7 feet below the surface. We interpret this unit as mapped Deltaic Outwash Deposit (Qgod). The Deltaic Outwash Deposit encountered was moist and medium dense in density.

Groundwater seepage was not observed within the excavation depths during our field exploration. It should also be noted that groundwater elevations may vary depending on the season, local subsurface conditions, and other factors. Groundwater levels and seepage rates are normally highest during the winter and early spring.

4.3 Previous Exploration and Subsurface Data

As part of our study, we also collected and reviewed existing geologic data in the site vicinity. Specifically, the following previous borings were reviewed:

- Summary test borings logs (B-1 through B-3) for East Premont Street Improvements (Kleinfelder, 2013).

The previous test borings along Fremont Street between South Lewis Street and South Charles Street (B-1 through B-3) by Kleinfelder in 2013 are located as close as approximately 200 feet southwest of the subject site. The existing borings generally encountered approximately 1 to 2 feet of fill overlying recessional outwash deposit consisting of medium dense to very dense, sand and silty sand with gravel, and gravel with sand and cobble extending to the maximum depth drilled at about 16 to 41½ feet below the surface. The groundwater table in the previous boring B-1 was observed at about 28½ below the surface. The boring location plans and summary test boring logs for the previous exploration are included in Appendix B for reference.

Based on review of the existing test borings and our experience in the area, the soil conditions are relatively uniform in the project area. As such, it is our opinion that the existing test boring data in the site vicinity can be used as a basis for our seismic hazard evaluation and soil liquefaction analysis.

5.0 GEOLOGY HAZARDS ASSESSMENT

5.1 Landslide Hazards and Steep Slopes

Based on the Snohomish County Hazard Map, the site is not mapped as landslide hazard map. The site is practically flat. Based on the site topography and soil conditions, it is our opinion the site is not considered as a Potential Landslide Hazard area. A site reconnaissance of the subject property was conducted on January 5, 2019. During our site reconnaissance, we did not observe obvious evidence of past ground slope instability/movement at the. Based on our site conditions, it is also our opinion that the proposed development as currently planned is feasible from a geotechnical engineering standpoint and will not adversely affect the stability of the site or adjacent properties, provided the project is properly designed and constructed in accordance with the current code and common practice.

5.2 EROSION HAZARDS

Based on the soils encountered in the test pits and site topography, the near-surface site soils will have low erosion potential. In our opinion, erosion potential at the site, if any, can be effectively mitigated with the best management practice during construction and with properly designed and implemented landscaping for permanent erosion control. During construction, the temporary erosion hazard can be effectively managed with an appropriate erosion and sediment control plan, including but not limited to installing silt fence at the construction perimeter, limiting removal of vegetation to the construction area, placing rocks or hay bales at the disturbed/traffic areas and on the downhill side of the project, covering stockpile soil or cut slopes with plastic sheets, constructing a temporary drainage pond to control surface runoff and sediment trap, placing quarry spalls at the construction entrance, etc. Permanent erosion control measures should include establishing vegetation, landscape plants, and hardscape established at the end of project, and reducing surface runoff to the minimum extent possible. It is our opinion that the potential for future erosion at the site is low, provided that the earthwork and permanent erosion control recommendations are properly implemented.

5.3 SEISMIC HAZARDS

Based on the Snohomish County Hazard Map, the site is mapped within a moderate to high soil liquefaction hazard risk area. Soil liquefaction is a condition where saturated cohesionless soils undergo a substantial loss of strength due to the build-up of excess pore water pressures resulting from cyclic stress applications induced by earthquakes. Soils most susceptible to liquefaction are loose, uniformly graded sands and loose silts with little cohesion.

Based on the dense nature of the near-surface soil and lack of defined static groundwater table at shallow depths, it is our opinion that the potential for soil liquefaction during an IBC-code level earthquake at the site is considered negligible. It is also our opinion that the potential for seismic-induced landslidng is low at the site due to the dense soil conditions and level surface. Therefore, special design considerations associated with soil liquefaction and seismic-induced landsliding are not necessary for this project.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 GENERAL

Based on the subsurface conditions at the site, it is our opinion that the proposed apartment building is feasible from a geotechnical standpoint. Our recommendations for the seismic design, earthwork, foundations, concrete slabs, and retaining wall are presented in the following sections.

6.2 SEISMIC DESIGN PARAMETERS

The Table 1 below provides seismic design parameters for the site that are in conformance with the 2015 edition of the International Building Code (IBC), which specifies a design earthquake having a 2% probability of occurrence in 50 years (return interval of 2,475 years), and the 2008 USGS seismic hazard maps.

Table 1 – Summary Seismic Design Parameters per 2015 IBC

Site Class	Spectral Acceleration at 0.2 sec. (g) S_S	Spectral Acceleration at 1.0 sec. (g) S_1	Site Coefficients		Design Spectral Response Parameters	
			F_a	F_v	S_{DS}	S_{D1}
D	1.194	0.451	1.022	1.549	0.814	0.466

6.3 GENERAL EARTHWORK RECOMMENDATIONS

6.3.1 Site Preparation

Site preparation includes removing the structures, striping and clearing of surface vegetation, and excavating to the design subgrade. Site preparation should begin with the removal of surface vegetation within the proposed improvement areas (i.e. building pads and parking/driveway areas), and excavating to the design subgrade. Based on our site exploration, we anticipate stripping depths of about 12 inches at the site. Organic-rich topsoil, fill, and other deleterious materials, should also be removed as part of stripping operation. Based on the test pit excavations, organic rich topsoil/fill will likely extend to

about 2 to 3 feet deep. All stripped surface materials should be properly disposed off-site or be "wasted" on site in non-structural landscaping areas.

Following site clearing and excavations, the adequacy of the subgrade where structural fill, foundations, slabs, or pavements are to be placed should be verified by a representative of Cascade GeotechNW. The exposed subgrade should be proof-rolled to check the soft/loose soils. The soft/loose soils detected during proof-rolling operation and cannot be re-compacted to a dense and unyielding condition should be over-excavated and backfilled with compacted structural fill or CDF/lean-mix concrete.

6.3.2 Temporary Excavations

In general, we anticipate site excavations to encounter fill up to 3 feet over medium dense sand and gravel with cobbles. All temporary excavations should be performed in accordance with Part N of WAC (Washington Administrative Code) 296-155. The contractor is responsible for maintaining safe excavation slopes and/or shoring. Excavations more than a total of 4 feet deep should be properly shored or sloped. For planning purposes, it is our opinion that temporary excavations may be sloped as steep as 1H:1V.

The temporary excavations and cut slopes should be re-evaluated by a qualified geotechnical engineer in the field during construction based on actual observed soil conditions, and may need to be modified in the wet reasons. The cut slopes should be covered with plastic sheets in the raining season. We also recommend that heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within a distance equal to 1/3 the slope height from the top of any excavation.

6.3.3 Material Reuse and Structural Fill Materials

In the context of this report, structural fill is defined as compacted fill placed under footings, concrete stairs and landings, roadway, and slabs, or other load-bearing areas. In our opinion, the on-site soils are not suitable as structural fill. Structural fill, if needed, should consist of imported, well-grade, granular material, such as WSDOT CSBC (WSDOT 9-03.9(3)) or Gravel Borrow (WSDOT 9-03.14(1)) or approved equivalent. The on-site soils may be used as general fill in the non-structural and landscaping areas.

If use of the on-site soil is planned, the excavated soil should be stockpiled and protected with plastic sheeting to prevent softening from rainfall in the wet season.

6.3.4 Structural Fill Placement and Compaction Requirements

Structural fills should be placed in thin horizontal lifts not exceeding 10 inches in loose thickness, moisture conditioned to within about 3 percent of optimum moisture content, and systematically compacted to meet the following minimum relative densities based on the maximal dry density as determined using test method ASTM D 1557.

Table 2 – Structural Fill Compaction Requirements

Application	**Percentage**
Beneath conventional strip & column footings, patios, porches, and slab-on-grade floors	95%
Beneath roadways, driveways, pavement areas, sidewalks and backfill behind retaining & basement walls (required for backfill next to vertical drain mats).	95% for the top 24 inches and 90-95% below 24 inches

Observations, probing, and soil density tests should be performed during grading operations to assist the contractor in obtaining the required degree of compaction and the proper moisture content on each fill lift. Where compaction is less than required, additional compactive effort should be applied with adjustment of moisture content as necessary, to obtain the specified compaction.

6.3.5 Permanent Cut and Fill Slopes

Permanent cut and fill slopes should be graded no steeper than 2H:1V. Erosion control measures such as erosion-control mats and/or vegetation should be applied to the permanent slopes as soon as feasible.

6.4 BUILDING FOUNDATIONS

Based on the soil conditions at the site, it is our opinion that the proposed mixed-use building may be supported on shallow continuous footings bearing on recompacted, competent native soils or compacted structural fills placed on recompacted native

competent soils. An allowable bearing capacity of 2,500 pounds per square foot (psf) may be used for sizing the footing. The recommended allowable bearing pressure is for dead plus live loads. For allowable stress design, the recommended bearing pressure may be increased by one-third for transient loading, such as wind or seismic forces.

Continuous footings should have minimum widths of 18 inches. Exterior foundation elements should be placed at a minimum depth of 18 inches below final exterior grade. Interior spread foundations should be placed at a minimum depth of 12 inches below the top of slab.

Based on the test pit excavations, the bearing soils are about 3 feet below the existing site grade. As such, we anticipate that over-excavation of footing subgrade soil will likely be needed in localized areas. The depth of over-excavation needed will depend on the design footing level relative to the existing grade. The footings can bear directly on the recompacted native soils or structural placed on the recompacted native soils. If structural fill is used in the footing areas, the over-excavation and structural fill width should extend at least one-half the over-excavation depth beyond the edge of footing.

Foundation Performance – For the anticipated light structural loading, we estimate total settlements of footings bearing on competent native soils or compacted structural fills to be on the order of 1-inch with differential settlements of about ½-inch.

Lateral Resistance – Lateral forces on the structures may be resisted by friction at the base of the foundations and by passive pressure acting against the buried portion of the foundation. To compute passive earth resistance, we recommend using an equivalent fluid weight of 300 pcf. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches of soil should be neglected. For a base friction, a factor of 0.35 may be used between concrete and soil. These values are based on the foundations being constructed neat against competent native soils or backfilled with structural fill as described in the structural fill section. The values include a safety factor of 1.5.

Footing Excavation and Subgrade Preparation – All footing subgrades should be carefully prepared. Any fill, loose/soft, or organic-rich subgrade soil should be removed from the footing excavations. The footing subgrade may need to be recompacted to a firm, unyielding condition using a jumping jack or other heavy compaction equipment, prior to form setting and rebar placement. If the on-site native soil is still loose and

yielding after re-compaction, they should be over-excavated to expose the bearing soil. The over-excavation should be backfilled with compacted structural fill or lean-mix concrete. The over-excavation width should extend at least one-half the over-excavation depth beyond the edge of footing. The adequacy of footing subgrade should be verified by a representative of Cascade GeotechNW prior to placing forms or rebar. If such observations are not performed during construction, Cascade GeotechNW cannot be held responsible for the long-term foundation performance.

6.5 SLAB-ON-GRADE

In our opinion, if needed, conventional slab-on-grade may be utilized for this project. The floor slabs should be supported on firm/dense native soil or compacted structural fill. If the slab subgrade soils are soft and cannot be compacted to a firm/dense condition, they should be removed to expose firm/dense, competent native soil and the resulting over-excavation should be backfilled with structural fill compacted to a dense condition.

Interior concrete slab-on-grade floors should be underlain by a capillary break consisting of at least of 4 inches of pea gravel or compacted ¾-inch, clean crushed rock (less than 3 percent fines). The capillary break material should also have no more than 10 percent passing the No. 4 sieve and less than 5 percent by weight of the material passing the U.S. Standard No. 100 sieve. The capillary break should be placed on the subgrade that has been compacted to a dense and unyielding condition. A 10-mil polyethylene vapor barrier should also be placed directly below the slab. We also recommend that construction joints be incorporated into the floor slab to control cracking.

Where concrete slabs will be subjected to vehicular traffic such as the garage, we recommend that a 6-inch layer of base course (WSDOT CSBC) compacted to a minimum of 95 percent relative compaction be provided below the slabs in-lieu of the 4-inch thick capillary layer.

6.6 RETAINING AND BASEMENT WALL DESIGN PARAMETERS

Retaining and basement walls should be properly designed to resist the lateral earth pressures exerted by the soils behind the wall. Proper drainage provisions should also be provided behind the walls to intercept and remove groundwater that may be present

behind the wall. Our geotechnical recommendations for the design and construction of the retaining/basement walls are presented below.

6.6.1 Lateral Earth Pressures

Concrete cantilever walls should be designed for an equivalent fluid pressure of 35 pcf for level backfills behind the walls assuming the walls are free to rotate. If walls are to be restrained at the top from free movement, such as basement walls, equivalent fluid pressures of 45 pcf should be used for level backfills behind the walls. Walls with a maximum 2H:1V backslope should be designed for an active and at rest earth pressure of 45 and 55 pcf, respectively.

Permanent walls should be designed for an additional uniform lateral pressure of 6H psf for seismic loading, where H corresponds to the buried depth of the wall. The recommended lateral pressures assume that the backfill behind the wall consists of a free draining and properly compacted fill with adequate drainage provisions.

6.6.2 Surcharge

Surcharge loads, where present, should also be included in the design of retaining walls. We recommend that a lateral load coefficient of 0.35 be used to compute the lateral pressure on the wall face resulting from surcharge loads located within a horizontal distance of one-half wall height.

6.6.3 Lateral Resistance

Lateral forces from seismic loading and unbalanced lateral earth pressures may be resisted by a combination of passive earth pressures acting against the embedded portions of the foundations and by friction acting on the base of the foundations. Passive resistance values may be determined using an equivalent fluid weight of 300 pcf. This value includes a factor of safety of 1.5, assuming the footing is poured against dense native sand, re-compacted on-site sandy soil or properly compacted structural fill adjacent to the sides of footing. A friction coefficient of 0.35 may be used to determine the frictional resistance at the base of the footings. The coefficient includes a factor safety of 1.5.

6.6.4 Wall Drainage

Provisions for wall drainage should consist of a 4-inch diameter perforated drainpipe behind and at the base of the wall footings, embedded in 12 to 18 inches of clean crushed rock and pea gravel wrapped with a layer of filter fabric. Where applicable, in-lieu of conventional footing drains, weep holes (2" diameter of 10 feet on center) may be used for site retaining walls. A minimum 18-inch wide zone of free draining granular soils (i.e. pea gravel or washed rock) is recommended to be placed adjacent to the wall for the full height of the wall. Alternatively, a composite drainage material, such as Miradrain 6000, may be used in lieu of the clean crushed rock. The drainpipe at the base of the wall should be graded to direct water to a suitable outlet.

6.6.5 Wall Backfill

Based on the field exploration, the on-site soil would not be suitable for wall backfill due to its high fines content. Where wall backfill is needed, we recommend using free draining granular soils, such as WSDOT Gravel Barrow or clean crushed gravel. In areas where the space is limited between the wall and the face of excavation, 5/8" clean crushed rock or pea gravel may be used as backfill without compaction.

Wall backfill should be moisture conditioned to within about 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 8 inches in thickness, and systematically compacted to a dense and relatively unyielding condition and to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557. Within 5 feet of the wall, the backfill should be compacted with hand-operated equipment to at least 90 percent of the maximum dry density.

6.7 WET WEATHER CONSTRUCTION

In our opinion, the proposed site construction may be accomplished during wet weather (such as in winter) without adversely affecting the site stability. However, earthwork construction performed during the drier summer months likely will be more economical. Winter construction will require the implementation of best management erosion and sedimentation control practices to reduce the chance of off-site sediment transport. Some of the site soils contain a high percentage of fines and are moisture sensitive. Any footing subgrade soils that become softened either by disturbance or rainfall should be

removed and replaced with structural fill, CDF, or lean-mix concrete. General recommendations relative to earthwork performed in wet conditions are presented below:

- Site stripping, excavation and subgrade preparation should be followed promptly by the placement and compaction of clean structural fill or CDF;
- The size and type of construction equipment used may have to be limited to prevent soil disturbance;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Geotextile silt fences should be strategically located to control erosion and the movement of soil;
- Structural fill should consist of less than 5% fines; and
- Excavation slopes should be covered with plastic sheets.

All permanent cut and fill slopes should be protected so that erosion will not occur. Vegetation should be established as soon after construction as possible to provide long-term erosion protection of the slopes. Prior to establishing vegetation, silt fences and straw bales staked along contours and slopes are recommended to reduce erosion. The slopes should be periodically monitored until vegetation has become fully established.

6.8 Surface Drainage and Erosion Control

Surface runoff can be controlled during construction by careful grading practices. Typically, this includes the construction of shallow, upgrade perimeter ditches or low earthen berms in conjunction with silt fences to collect runoff and prevent water from entering excavations or to prevent runoff from the construction area from leaving the immediate work site. Temporary erosion control may require the use of hay bales on the downhill side of the project to prevent water from leaving the site and potential storm water detention to trap sand and silt before the water is discharged to a suitable outlet. All collected water should be directed under control to a positive and permanent discharge system.

Permanent control of surface water should be incorporated in the final grading design. Adequate surface gradients and drainage systems should be incorporated into the design such that surface runoff is directed away from structures. We suggest that the ground surface be sloped at a gradient of 3 percent for a distance of at least 10 feet feet away from the building, except in paved areas, which can be sloped at a gradient of 1 percent. Potential problems associated with erosion may also be reduced by establishing vegetation within disturbed areas immediately following grading operations.

Roof downspouts should be tightlined to discharge into the storm-water collection system separately from any footing drain system. Cleanouts should be installed at strategic locations to allow for periodic maintenance of the downspout tightline system.

7.0 ADDITIONAL GEOTECHNICAL SERVICES

Plans and specifications should be forwarded to Cascade GeotechNW for review and written comments. This review is necessary to evaluate adherence to the intent of the foundation and earthwork recommendations provided herein. If this review is not made, Cascade GeotechNW cannot assume responsibility for misinterpretation of the recommendations presented.

It is recommended that Cascade GeotechNW be retained to provide monitoring and testing services for geotechnical-related work during construction. This is to observe compliance with the intent of the design concepts, specifications, and/or recommendations, and to allow design changes in the event when subsurface conditions differ from those anticipated during design. The recommendations presented in this report are contingent upon the above observations. If this geotechnical construction monitoring and inspection is not made, Cascade GeotechNW cannot be responsible for the long-term performance of foundations and geotechnical elements. We request that the contractor provide Cascade GeotechNW with a minimum 24 hours advance notice for performing the above inspections, so that we can arrange to have personnel available.

Modifications to our recommendations presented in this report may be necessary, based on the actual conditions encountered during construction.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of Mr. Cosmin Popa and the project team for specific application to the proposed development. This report is intended to provide geotechnical recommendations based on a site reconnaissance, review of pertinent subsurface information, and our understanding of the project. The study was performed using a mutually agreed-upon scope of work.

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. We are not mold consultants nor are our recommendations to be interpreted as being preventative of mold development. A mold specialist should be consulted for all mold-related issues.

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. Cascade GeotechNW 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 Cascade GeotechNW of such intended use and for permission to copy this report. Based on the intended use of the report, Cascade GeotechNW may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release Cascade GeotechNW from any liability resulting from the use this report.

We appreciate the opportunity to be of service.

Sincerely,

H. Michael Xue, P.E.
Principal Geotechnical Engineer

9.0 REFERENCES

Dragovich J. D, et. al, 2011, *Geologic Map of Monroe 7.5-minute Quadrangle, King and Snohomish Counties, Washington: scale 1:24,000.*

International Code Council, 2015, *International Building Code (IBC).*

Kleinfelder, 2013, *Geotechnical Engineering Report, East Fremont Street Improvements, Monroe, Washington.*

WSDOT, 2018, *Standard Specifications for Road, Bridges, and Municipal Construction.*

NTS

Base Map: Google Maps

Cascade GeotechNW	**Proposed Development 134 S Ferry Street Monroe, WA**	**VICINITY MAP**	
		Project No. **2019-003**	Figure No. **1**

Approx. Scale
1" = 20'

Note: Basemap modified from Snohomish County Parcel Map.

Legend:

TP-1 Approx. Test Pit Location

Approx. Proposed Building Footprint

Cascade GeotechNW	**Proposed Development** **134 S Ferry Avenue** **Monroe, Washington**	**SITE AND EXPLORATION PLAN**	
		Project No. **2019-003**	Figure No. **2**

APPENDIX A – FILED EXPLORATION

The subsurface conditions at the site were explored by excavating four (4) test pits to depths of 6½ and 7 feet below the existing ground surface on January 5, 2019. The approximate locations of the test pits are shown on the Site Exploration Plan, Figure 2.

The test pits were excavated with an excavator by the client. An engineer from Cascade GeotechNW was present during the field exploration to observe the test pit excavations, obtain representative samples, and to describe and document the soils encountered in the explorations. The materials encountered in the test pits were classified by visual and textural examination in the field by our engineer, who monitored the test pit excavations on a near-continuous basis in general accordance with ASTM Standard Practice D-2488, Description and Identification of Soils. The relative in-situ density of cohesionless soils, or the relative consistency of fine-grained soils was estimated from the excavating action of the back-hoe, 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 logs. After each test pit was logged, the excavation was backfilled with the excavated soils and the surface was tamped and re-graded smooth. Summary test pit logs are included in Figures A-1 through A-4 of Appendix A of this report. The key to the symbols and notations is shown on Figures A-5 and A-6.

Test Pit TP-1 Approximate ground surface elevation: N/A Ground Surface Conditions: Short Grass	
Depth (ft)	**Material Description**
0 – 0.3	Loose, gray-brown, crushed ROCKS, little silt, damp to moist
0.3 – 3	Loose, brown, silty SAND, trace to some gravel, organics and trace charcoal, moist **(Fill)**
3 – 7	Medium dense, gray, gravelly coarse SAND, occasional cobbles, moist **(Recessional Outwash)**
	Test Pit terminated approximately 7 feet below ground surface. No caving and groundwater seepage observed during excavation.

Test Pit TP-2

Approximate ground surface elevation: N/A
Ground Surface Conditions: Tall Grass

Depth (ft)	Material Description
0 – 2½	Loose, dark brown-brown, silty fine SAND, some roots and organics, trace gravel, moist (**Fill)**
2½ – 6½	Medium dense, gray, sandy GRAVEL/gravelly coarse SAND, some cobbles, occasional boulders **(Recessional Outwash)**
	Test Pit terminated approximately 6½ feet below ground surface. No caving and groundwater seepage observed during excavation.

Test Pit TP-3

Approximate ground surface elevation: N/A
Ground Surface Conditions: Short Grass

Depth (ft)	Material Description
0 – 2½	Loose, brown, silty fine SAND, some roots and organics, trace gravel, moist (**Fill)**
2½ – 6½	Medium dense, gray, sandy GRAVEL/gravelly coarse SAND, occasional to some cobbles **(Recessional Outwash)**
	Test Pit terminated approximately 6½ feet below ground surface. No caving and groundwater seepage observed during excavation.

Test Pit TP-4

Approximate ground surface elevation: N/A
Ground Surface Conditions: Short Grass

Depth (ft)	Material Description
0 – 2	Loose, brown-dark brown, silty fine SAND, some roots and organics, trace gravel, moist (**Fill)**
2 – 7	Medium dense, gray, sandy GRAVEL/gravelly coarse SAND, occasional cobbles **(Recessional Outwash)**
	Test Pit terminated approximately 7 feet below ground surface. No caving and groundwater seepage observed during excavation.

Date Test Pits Excavated: January 5, 2019
Test Pits Logged by: HMX

KEY:

■ Indicates 3-inch OD Dames & Moore Sample.

◥ Indicates 2-inch OD Split Spoon Sample (SPT).

☒ Indicates Disturbed Sample.

⊥ Indicates No Recovery.

□ Indicates Bag Sample.

▨ Indicates Shelby Tube Sample.

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace or little	1 - 5%
Some	6 - 12%
Clayey, silty, sandy, gravelly	13 - 30%
And	31 - 50%

MOISTURE CONTENT

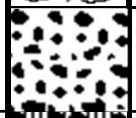
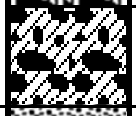
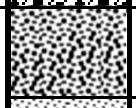
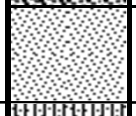
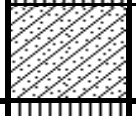
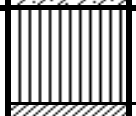
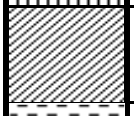
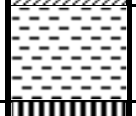
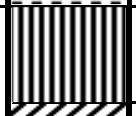
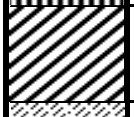
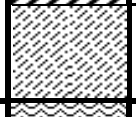
DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

ATD: At Time of Drilling

BGS: Below Ground Surface

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density (%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	< 250
Loose	5 to 10	16 - 35	Soft	3 to 4	250 - 500
Medium Dense	11 to 30	36 - 65	Medium Stiff	5 to 8	501 - 1000
Dense	31 to 50	66 - 85	Stiff	9 to 15	1001 - 2000
Very Dense	over 50	86 - 100	Very Stiff	16 to 30	2001 - 4000
			Hard	over 30	> 4000

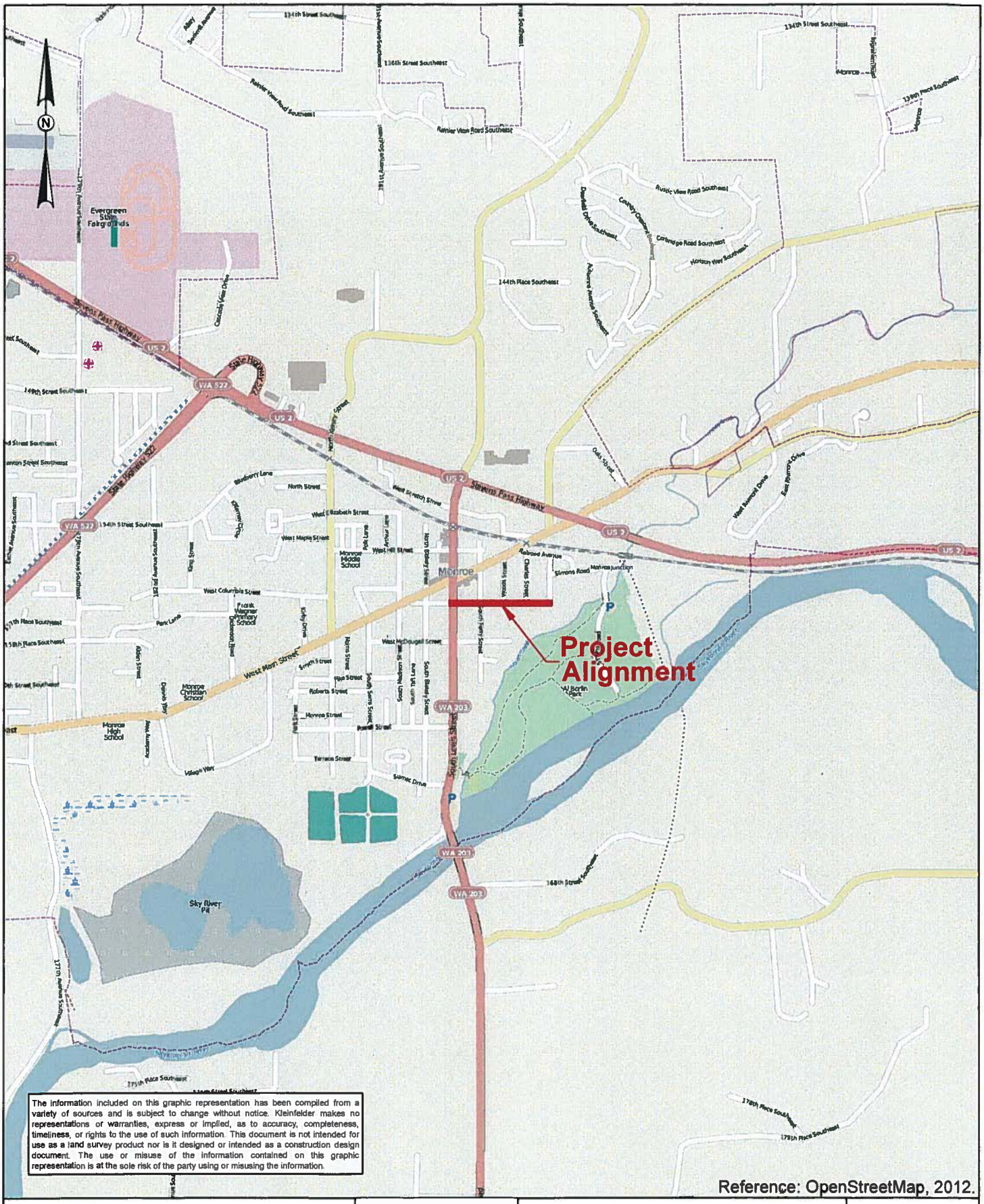
MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

APPENDIX B

PREVIOUS TEST BORING LOGS



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PROJECT NO.	130056
DRAWN BY:	J.S.
CHECKED BY:	E.A.
DATE:	11-1-2012
REVISED:	1-9-2013

VICINITY MAP

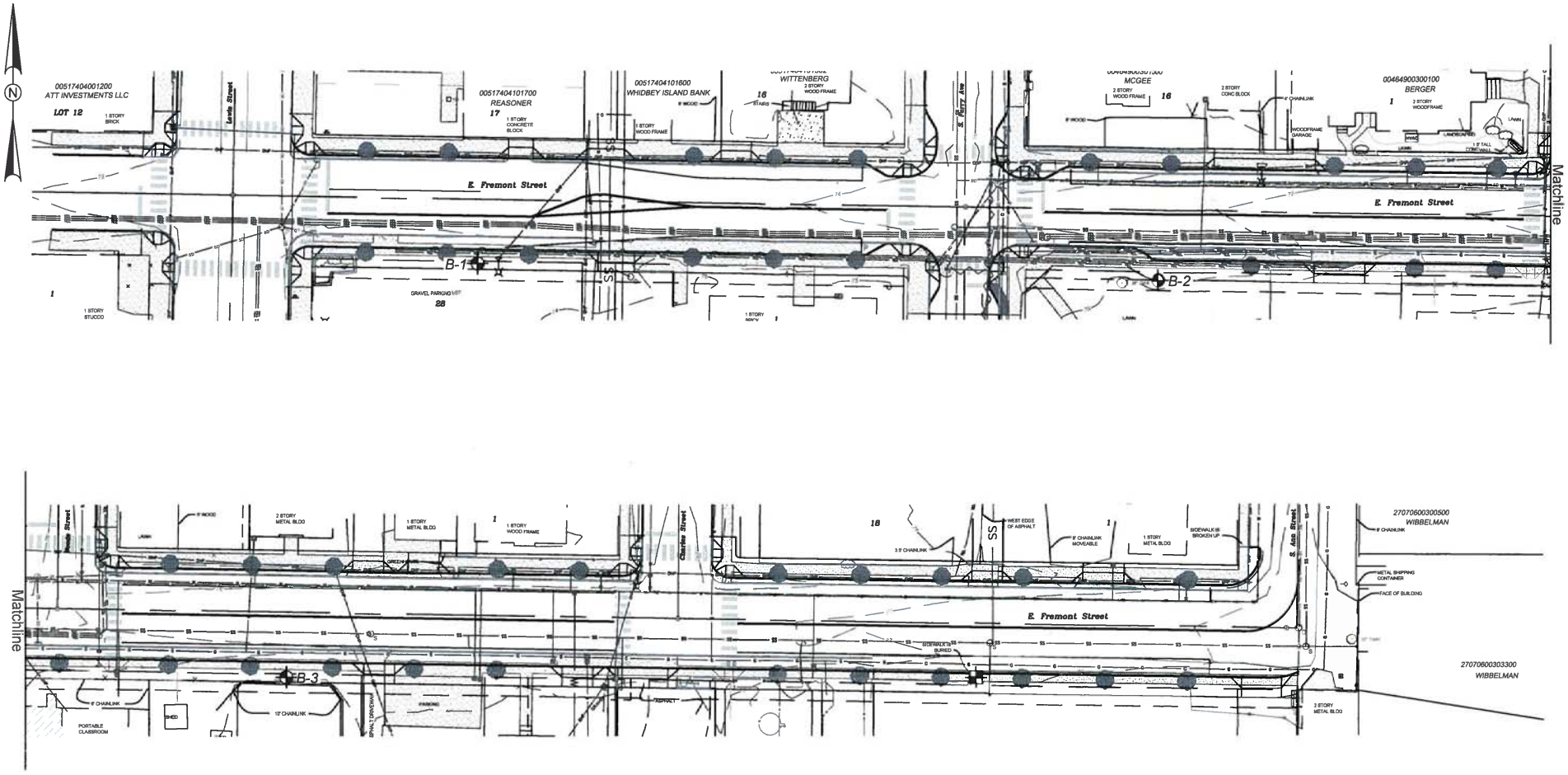
East Fremont Street Improvements
Monroe, Washington

PLATE 1

PAGE: 1 of 2

PLOTTED: 11/1/2012 3:37 PM BY: jeff stewart

CAD FILE: G:\130056\130056_Plates.dwg



Reference: Base file provided by City of Monroe, October 2012.

0 50 100
SCALE: 1" = 50' SCALE IN FEET

Legend

B-1 Boring Number and Approximate Location

Test Pit by Others (RH2)

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PROJECT NO.	130056
DRAWN BY	J.S.
CHECKED BY	E.A.
DATE:	11-1-2012
REVISED:	11-1-2012

SITE AND EXPLORATION PLAN

East Fremont Street
Improvements
Monroe, Washington

PLATE
2
PAGE: 2 of 2

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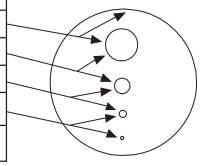
APPENDIX A

FIELD INVESTIGATION

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-sized
Cobbles		3 - 12'	3 - 12"	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3"	3/4 -3"	Thumb-sized to fist-sized
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized
	fine	#200 - #10	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029	Flour-sized and smaller



Munsell Color

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12- 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

NOTE: AFTER TERZAGHI AND PECK, 1948

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (Qu)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm)
Firm	2000 < 4000	Thumb will indent soil about 1/4 in. (6 mm)
Hard	4000 < 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4 in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4 in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

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PROJECT NO.:	130056
DRAWN BY:	HSS
CHECKED BY:	EOA
DATE:	11/01/2012
REVISED:	

SOIL DESCRIPTION KEY

East Frement Street
Monroe, WA

FIGURE

A-1

SAMPLE/SAMPLER TYPE GRAPHICS

CALIFORNIA SAMPLER
(3 inch outside diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 inch outside and 1-3/8 inch inner diameter)

GROUND WATER GRAPHICS

WATER LEVEL (level where first observed)

WATER LEVEL (level after exploration completion)

WATER LEVEL (additional levels after exploration)

OBSERVED SEEPAGE

NOTES

1. The report and log key are an integral part of these logs. All data and interpretations in this log are subject to the stated explanations and limitations stated in the report.

2. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.

3. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.

4. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.

5. In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate by visual classifications in the office and/or laboratory gradation and index property testing.

6. Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

7. If sampler is not able to be driven at least 6 inches, 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pounds hammer falling 30 inches.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3		**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3		**GP**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3		**GW-GM**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3		**GP-GM**	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES			**GM**	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
					GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
					GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3		**SW**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3		**SP**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3		**SW-SM**	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3		**SP-SM**	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES			**SM**	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
					SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
					SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	**ML**	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDE ON THIS LEGEND.

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PROJECT NO.:	130056
DRAWN BY:	HSS
CHECKED BY:	EOA
DATE:	11/01/2012
REVISED:	

GRAPHICS KEY

East Frement Street
Monroe, WA

FIGURE

A-2

Date Begin - End:	10/15/12	**Drill Company:**	Holocene	**BORING LOG B-1**	
Logged By:	S. Lewis	**Drill Crew:**	Jerrod		
Hor.-Vert. Datum:	Not Available	**Drill Equipment:**	BK81	**Hammer Type - Drop:**	140 lb. Automatic - 30 in.
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Cloudy and rain late	**Auger Diameter:**	6 inches in. O.D.		

No Coordinates Available
No Elevation Available

Surface Condition: Gravel Parking Lot

Depth (feet)	Graphical Log	Description	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		FILL **COBBLES with Silt And Sand (GM)**: angular cobbles, moist, medium dense, coarse cobble											
		RECESSIONAL OUTWASH **Poorly-Graded SAND with Silt And Gravel (SP-SM)**: light gray brown, moist, medium dense, fine to medium coarse sand, trace cobble		BC=5 5 8	8"				57	7.0			
5		**GRAVEL with Cobbles And Sand (GP)**: gray brown, very dense, coarse gravel		BC=50/3" BC=50/4"	NR NR								
		GRAVEL with Sand, Silt, And Cobbles (GP-GM): gray brown, very dense, coarse gravel, fine to coarse sand - Becomes wet at 8 feet during drilling		BC=30 50/6"	3"								
10		- Becomes very dense and wet		BC=43 50/6"	6"								
				BC=24 37 50/5"	10"								
15		**SAND with Gravel (SP)**: subrounded gravel, light gray brown, grades to very dense		BC=27 50/5"	9"								
20													

The exploration was terminated at approximately 16 ft. below ground surface. The exploration was backfilled with bentonite on October 15, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:

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PROJECT NO.:	130056
DRAWN BY:	HSS
CHECKED BY:	EOA
DATE:	11/01/2012
REVISED:	

BORING LOG B-1

East Frement Street
Monroe, WA

FIGURE
A-3

PAGE: 1 of 1

Date Begin - End:	10/15/12	**Drill Company:**	Holocene	**BORING LOG B-2**	
Logged By:	S. Lewis	**Drill Crew:**	Jerrod		
Hor.-Vert. Datum:	Not Available	**Drill Equipment:**	BK81	**Hammer Type - Drop:**	140 lb. Automatic - 30 in.
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Cloudy and rain late	**Auger Diameter:**	6 inches in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

No Coordinates Available
No Elevation Available

Surface Condition: Grassy lawn (1 ft south of side walk)

Depth (feet)	Graphical Log	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Sod (3 inches)									
			FILL									
			Silty SAND with Gravel And Cobbles (SP-SM): light brown, dense									
			RECESSIONAL OUTWASH									
			Poorly-Graded GRAVEL with Silt And Sand (GP-GM): light gray brown, moist, very dense, coarse gravel	BC=50/5"	4"			32	12			
5			**Well-Graded SAND with Silt And Gravel (SW-SM)**: light brown, moist, very dense, fine to medium coarse sand, 4 inches max.	BC=20 34 50/5"	1"			58	7.0			
			GRAVEL with Cobbles And Sand (GP): light gray, very dense, trace silt, about 4" max.	BC=21 22 50/4"	10"							
10			**GRAVEL with Silt, Sand, And Cobbles (GP-GM)**: light gray brown, very dense, coarse gravel	BC=27 47 50/3"	14"							
			- Becomes fine to medium coarse sand, 3" max.	BC=33 50/5"	12"							
15			**GRAVEL with Sand (GP)**: light gray brown, very dense, coarse gravel, fine to coarse sand, trace silt, 3" max.	BC=18 32 50/5"	12"							
20												

The exploration was terminated at approximately 16.5 ft. below ground surface. The exploration was backfilled with bentonite on October 15, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	130056
DRAWN BY:	HSS
CHECKED BY:	EOA
DATE:	11/01/2012
REVISED:	

BORING LOG B-2

East Frement Street
Monroe, WA

FIGURE
A-4

PAGE: 1 of 1

KLEINFELDER - 14710 NE 87th Street, Suite 100 | Redmond, WA 98052 | PH: 425 636 7900 | FAX: 425 636 7901 | www.kleinfelder.com

Date Begin - End:	10/15/12	**Drill Company:**	Holocene	**BORING LOG B-3**	
Logged By:	S. Lewis	**Drill Crew:**	Jerrod		
Hor.-Vert. Datum:	Not Available	**Drill Equipment:**	BK81	**Hammer Type - Drop:**	140 lb. Automatic - 30 in.
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Cloudy and rain late	**Auger Diameter:**	6 inches in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

No Coordinates Available
No Elevation Available

Surface Condition: In side walk

Depth (feet)	Graphical Log	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Portland cement concrete (5 inches)									
			FILL **Silty SAND with Gravel (SM)**: reddish brown, moist, medium dense, fine to coarse sand									
			RECESSIONAL OUTWASH **Poorly-Graded GRAVEL with Silt And Sand (GP-GM)**: subrounded sand, light brown, moist, medium dense, fine to coarse gravel, fine to medium coarse sand	BC=8 13 16	6"				41	8.9		
5			- Becomes very dense, 6" max. size	BC=25 50/1"	4"							
			GRAVEL with Sand And Cobbles (GP): rounded to subrounded gravel, light gray brown, moist, very dense, coarse gravel, trace silt, 4" or greater max. size	BC=33 50/3"	6"							
10			**Silty SAND with Gravel (SM)**: light gray brown, moist, very dense, fine to coarse gravel, fine to medium coarse sand, ~ 3" max. size, few cobbles	BC=26 32 50/5"	10"	SM			77	15		
				BC=50/2"	NR							
15			**GRAVEL with Cobbles And Sand (GP)**: light gray brown, very dense	BC=50/1"	6"							
			SAND with Gravel (SP): brown, moist, very dense, fine gravel, fine to coarse sand, trace silt									
20				BC=30 35 34	14"							

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CHECKED BY:	EOA
DATE:	11/01/2012
REVISED:	

BORING LOG B-3

East Frement Street
Monroe, WA

FIGURE

A-5

PAGE: 1 of 2

Date Begin - End:	10/15/12	**Drill Company:**	Holocene	**BORING LOG B-3**	
Logged By:	S. Lewis	**Drill Crew:**	Jerrod		
Hor.-Vert. Datum:	Not Available	**Drill Equipment:**	BK81	**Hammer Type - Drop:**	140 lb. Automatic - 30 in.
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Cloudy and rain late	**Auger Diameter:**	6 inches in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

No Coordinates Available
No Elevation Available

Surface Condition: In side walk

Depth (feet)	Graphical Log	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			BC=13 15 16	16"								
		SAND with Gravel (SP): brown, moist, very dense, fine gravel, fine to coarse sand, trace silt - Becomes medium dense, no gravel, trace silt, fine to medium coarse sand										
		Silty SAND with Gravel (SM): brown, wet, very dense, fine to medium coarse sand, coarse gravel										
30			BC=27 38 37	13"								
		SILT (ML): gray, moist, hard, trace organics and laminae of fine sand										
35			BC=12 13 25	18"								
		SAND (SP): gray, wet, very dense, trace, silt										
40			BC=25 50/5"	10"								
45												

The exploration was terminated at approximately 41.5 ft. below ground surface. The exploration was backfilled with bentonite on October 15, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at approximately 28.5 ft. below ground surface during drilling.
GENERAL NOTES:

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BORING LOG B-3

East Frement Street
Monroe, WA

FIGURE
A-5

PAGE: 2 of 2

AMTEST LABORATORIES

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034
Ph (425) 885-1664 Fx (425) 820-0245
www.amtestlab.com

A25B0301

Chain of Custody No. [illegible]

Client Name & Address:	Invoice To:
Gary Flowers, PLLC 5205 23RD Ave W Everett, WA 98203	SAME
Contact Person: Gary Flowers	Invoice Contact: Gary Flowers
Phone No: 206-819-4304	PO Number: Proj # 25-001
Fax No:	Invoice Ph/Fax: same
E-mail: gflowers01@comcast.net	Invoice E-mail: same
Report Delivery: (Choose all that apply) Mail / Fax / (Email) / Posted Online	Data posted to online account: YES / (NO) Web Login ID:
Special Instructions:	
Requested TAT: **(Rush must be pre-approved by lab)** Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)	Temperature upon Receipt: 21.9°C
Project Name: Mowry Coffee Stand	
Project Number: 25001	

AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested: Organic Carbon	Analysis Requested: OC	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	QA/QC
01	EP-1 @ 1.5'					X	X								
02	EP-2 @ 1.5'					X	X								
03	EP-2 @ 4.0'					X	X								

Collected/Relinquished By: Zach	Date 2/19/24	Time 12:35pm	Received By: SF	Date 2/19/24 Time 12:35
Relinquished By:	Date	Time	Received By:	Date Time
Relinquished By:	Date	Time	Received By:	Date Time

COMMENTS: