DRAFT Drainage Control Plan Report for MOREL MEADOWS

8322 Steilacoom Road SE, Olympia WA, 98513

Project Applicant
DR Horton
11241 Slater Avenue NE, Suite 200, Kirkland WA, 98033
(425) 736-1638
rhulquist@drhorton.com

HATTON GODAT PANTIER

Prepared By
Jared Greisz, EIT

Project Engineer
Chloe McIntyre, PE
Hatton Godat Pantier, Inc.
3910 Martin Way E. Suite B, Olympia, WA 98506
(360) 943-1599
chloem@hattonpantier.com

09.18.2023

Project Engineer's Certification

"I hereby state that this Drainage Control Plan Report for Morel Meadows has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Lacey does not and will not assume liability for the sufficiency, suitability, or performance of drainage BMPs prepared by me."

Digitally signed by Chloe P. McIntyre
Date: 2023.09.18 14:04:05-07'00'

Table of Contents

Section 1. Project Overview

1.1 Site Information

Parcel number(s)	11814140500
Address or legal description of site property	8322 Steilacoom Road SE, Olympia WA, 98513
Current zoning	Low Density Residential 3-6
Streets/general vicinity	Steilacoom Road SE, Marvin Road SE
Property owner(s)	Ostrom Mushroom Co Inc.
Total project site area	32.08 ac
Surrounding land uses	Single-family homes, school, city-owned athletic complex

1.2 Project Description

The Morel Meadows project is located northeast of the intersection of Marvin Road and Steilacoom Road SE in the City of Lacey in Section 14, Township 18, Range 1 West, W.M. on tax parcel number 11814140500. The project proposes to construct 179 single-family homes and associated driveways, 5.76 acres of roadway and 1.52 acres of associated sidewalk, with three stormwater ponds and four bioretention cells, and required landscaping, sewer, and water service improvements. See proposed Site Plan in Appendix 1.

The proposed project will require grading, encroachment, building, and utility permits. Water and sewer will be provided via connections to the City of Lacey's utilities. Zoning for the property is Low Density Residential 3-6.

1.3 Proposed Stormwater Drainage Design

The site will be split into five basins for stormwater mitigation. The northwest basin will include 12.22 total acres with 63% impervious, the southwest basin is 3.82 acres with 52% impervious, and the east basin is 16.04 acres with 46% impervious. Each of these basins includes houses, roads, sidewalk, and landscaping. Runoff for each of these three basins will be routed first to one of three bioretention cells for treatment and then one of three retention ponds to infiltrate the remainder of the runoff. The Southeast Frontage basin consists of 0.88 acres (57% impervious) of frontage along Steilacoom Road SE and a bit of the southeast portion of the site. Runoff from this basin will be routed to a bioretention cell for treatment and full infiltration. The north bypass basin will consist of 1.39 acres of mostly forest with some landscaped areas, and runoff will continue to sheet flow to the north as in the predeveloped condition. See Area Summary table for basins in Appendix 3.

Table 1.1. Proposed Permanent Stormwater BMPs.		
Permanent Stormwater BMP	**Location**	**Proposed Ownership**
Northwest Bioretention	Northwest Basin	HOA
Northwest Pond	Northwest Basin	HOA
Southwest Bioretention	Southwest Basin	HOA
Southwest Pond	Southwest Basin	HOA
East Basin	East Basin	HOA
East Pond	East Basin	HOA
Southeast Bioretention	Southeast Frontage Basin	HOA

1.4 Subarea Data Tabulation

The project is split into five basins in the developed condition. The northwest basin includes the northwest portion of the site and Marvin Road frontage and goes to the Northwest Bioretention Cell for treatment and Northwest Pond for infiltration. The southwest basin includes the southwest portion of the site and goes to the Southwest Bioretention Cell for treatment and the Southwest Pond for infiltration. The east basin includes the east of the site, and goes to the East Bioretention Cell for treatment and East Pond for infiltration. The southeast frontage basin includes Steilacoom Road frontage and goes to the Southeast Bioretention Cell for treatment and infiltration. The north bypass basin includes undisturbed areas in the north of the site and will continue to sheet flow as in the existing condition. See Basin Map in Appendix 1 and basin area summary in Appendix 3.

Tables 1.2 and 1.3 summarize the existing and proposed areas for this project, respectively.

Table 1.2. Existing Site Land Coverage Tabulation.			
Existing Surface	**Surface Type**	**Area (square feet)**	**Area (acres)**
Asphalt	Hard/Impervious	135,213	3.10
Concrete	Hard/Impervious	268,335	6.16
Roof	Hard/Impervious	219,867	5.05
Forested/Trees	Pervious	386,995	8.88
Pasture/Landscaping	Pervious	386,995	8.88
Total Site/Parcel Area		1,397,405	32.08

Table 1.3. Proposed Site Land Use Coverage Tabulation.				
Proposed Surface	**Surface Type**	**Pollutant Generating**	**Area (square feet)**	**Area (acres)**
Roadway	Hard/Impervious	Yes - PGIS	258,746	5.94
Driveway	Hard/Impervious	Yes - PGIS	89,298	2.05
Walkway	Hard/Impervious	No	66,211	1.52
Roof	Hard/Impervious	No	295,772	6.79
Pond	Hard/Pervious	Yes - PGPS	40,075	0.92
Landscaping	Pervious	Yes - PGPS	548,856	12.60
Undisturbed (e.g., tree tract)	Pervious	No	181,645	4.17
Bioretention:	Pervious	No	15,246	0.35
		Total Project Area*	1,495,849	34.36

PGIS = Pollution Generating Impervious Surface

PGPS = Pollution Generating Pervious Surface

*Total Project Area includes offsite frontage tributary to proposed stormwater facilities.

Section 2. Development Conditions and Requirements

2.1 Project Vesting

☒	2022 SDM
☐	SDM from another year
☒	2017 City of Lacey Development Guidelines and Public Works Standards (DG&PWS)
☐	DG&PWS from another year

2.2 Permits Required

Table 2.1. Permits Required.

Permit Title	Agency Requiring Permit	Permit Requirements that Impact the Project	Present Status
Right-of-Way Access Permit	City of Lacey	Frontage improvement areas to be factored into site storm design	Not Applied

2.3 Project Type and Size

Table 2.2 lists the new, replaced, and disturbed areas for the project.

Table 2.2. New, Replaced, and Disturbed Areas.

Area Type	Area
Total New Hard Surfaces	1.18
Total Replaced Hard Surfaces	15.12
Total Area Disturbed	27.91

A Drainage Control Plan is required for projects that must address all Core Requirements. **Select "yes" or "no" for each statement below.** If the answer is "yes" for any statement, a Drainage Control Plan is required for the project.

Yes	No	Statement
☒	☐	Does the project convert 0.75 acres **or more** of vegetation to lawn or landscaped areas to pasture?
☐	☒	Does the project convert 2.5 acres **or more** of native vegetation to pasture?
☒	☐	Does the Project result in 5,000 square feet **or more** of new plus replaced hard surface area?

☐ **New Development**: Include markup of flow chart from Figure 2.1
☒ **Redevelopment:** Include markup of flow chart from Figure 2.2
If this is a redevelopment project, include valuation of proposed improvements, including interior improvements:
179 single-family homes with associated roads, sidewalks, and utilities. Four storm ponds.

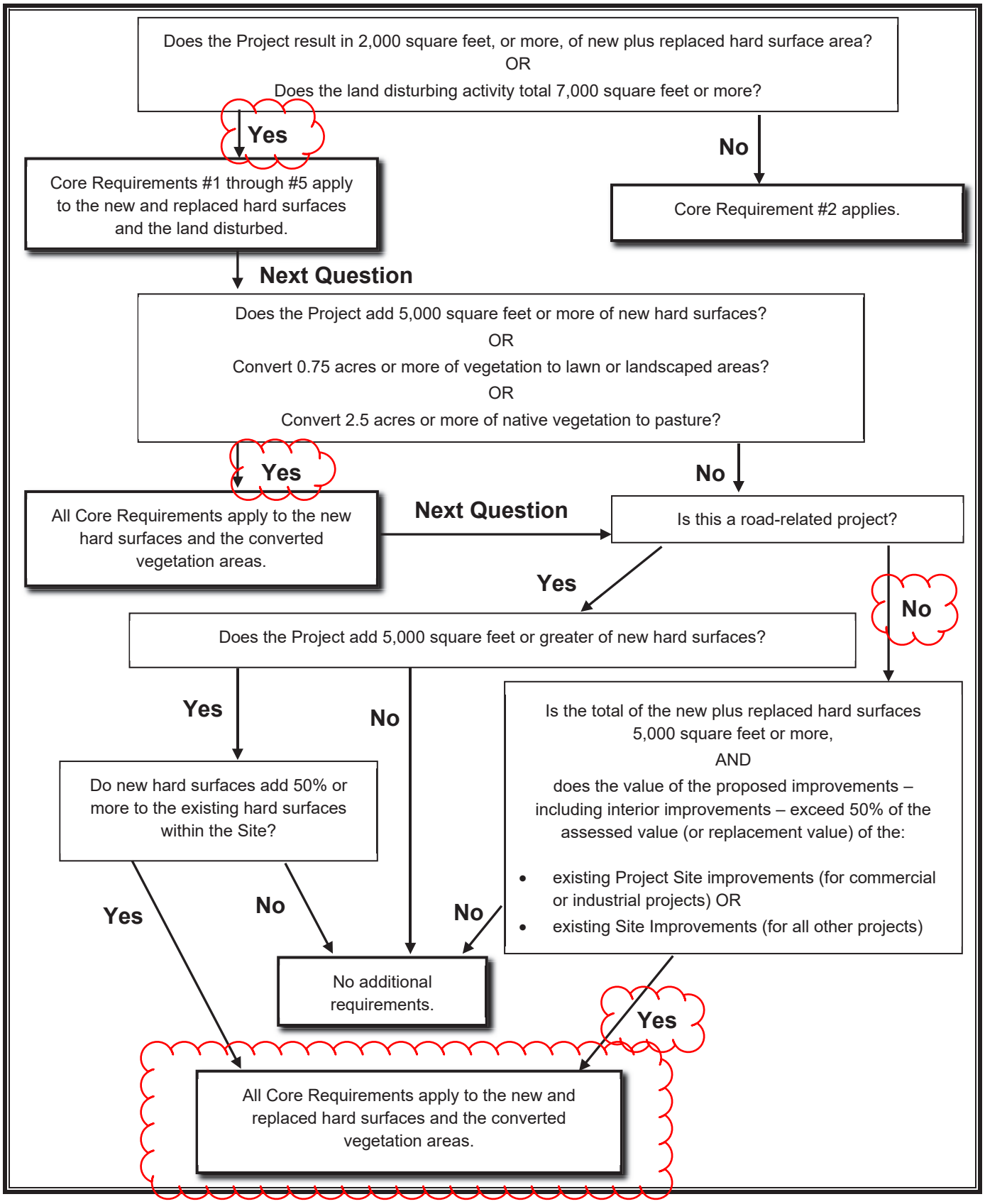


Figure 2.2. Flow Chart for Determining Requirements for Redevelopment.

2.4 Critical Areas

Does this project involve work in or near critical areas? ☒Yes ☐No

Describe the presence of any critical areas or environmentally sensitive areas, including the following:

☐	Wetlands	☐	Endangered Species Act (ESA) species habitat
☒	Wellhead Protection Areas (WHPAs)	☒	Critical Aquifer Recharge Areas (CARAs)
☐	Geologically hazardous areas	☐	Steep slopes
☐	Other: _____	☐	Other: _____

2.5 Core Requirements

Core Requirement #1: Preparation of Stormwater Site Plans

The main components of Stormwater Site Planning are Construction Stormwater Pollution Prevention Planning and Permanent Stormwater Control Planning. This Drainage Report, a Construction Stormwater Pollution Prevention Plan, Soils Report, Maintenance and Source Control Manual, and copy of the proposed Maintenance Covenant for stormwater facilities are submitted as part of the Morel Meadows Drainage Control Plan to meet this requirement.

Core Requirement #2: Construction Stormwater Pollution Prevention

A Construction Stormwater Pollution Prevention Plan (C-SWPPP) has been developed to address erosion and sediment control anticipated during construction. A Construction NPDES permit will be obtained prior to construction. The C-SWPPP will address all thirteen elements as required by the Department of Ecology.

Core Requirement #3: Source Control of Pollution

Source control BMPs are used to prevent stormwater from coming in contact with pollutants and are used as a cost-effective means of reducing pollutants in stormwater. The selection of permanent source control BMPs is based on the activities likely to occur on the site and the pollutants associated with those activities.

The Stormwater Pollution Source Control Checklist and Worksheet found in Appendix 9A of Chapter 9 of 2022 SDM has been completed to determine the applicable post-construction activities with required Source Control BMPs on this site. Methods to address source control of pollution from these activities are provided in the Maintenance and Source Control Manual submitted as part of the Drainage Control Plan for this project. Construction source control BMPs are addressed in the C-SWPPP to be included in a later submittal. A copy of the Stormwater Pollution Source Control Checklist and Worksheet can be found in Appendix C of the Maintenance and Source Control Manual included in a later submittal.

Core Requirement #4: Preservation of Drainage Systems and Outfalls

Low-impact development techniques will be used to preserve existing site runoff patterns to the maximum extent feasible. In the predeveloped condition, stormwater runoff from the site generally sheet flows from south to north of the site towards adjacent properties. Soil in the disturbed lawn/landscape areas will be amended per BMP T5.13 to increase treatment and infiltration capacity and to reduce runoff from the site. Runoff in the developed condition will be fully infiltrated in onsite infiltration ponds, per WWHM Site Analysis model attached in Appendix 3. Runoff from the northwest basin will go to the Northwest Pond, runoff from the southwest basin to the Southwest Pond, runoff from the east basin to the East Pond, and runoff from the southeast frontage basin to the Southeast Bioretention Cell. Stormwater runoff from the preserved native areas of the project will continue to sheet flow onto adjacent properties, matching existing conditions.

Core Requirement #5: On-Site Stormwater Management

Which of the following options was implemented for CR #5?

☐	List #1
☐	List #2
☐	List #3
☒	LID performance standard

This project proposes to implement Postconstruction Soil Quality and Depth (Ecology BMP T5.13) in all new and disturbed lawn/landscape areas to retain greater stormwater functions, including increased infiltration potential and treatment of pollutants and sediments resulting from development. This project also proposes the use of bioretention cells (BMP T7.30) and infiltration basins (BMP T7.10) to treat and infiltrate 100% of tributary stormwater runoff from the proposed improvements. The combination of stormwater BMPs used for this project results in the site meeting the Low-Impact Development Performance Standard as illustrated on Page 44 of the 21-100 Site Analysis WWHM report. See attached report in Appendix 3. By implementing these BMPs, this project fully satisfies the criteria of Core Requirement #5.

Core Requirement #6: Runoff Treatment

Table 2.3. Thresholds for Core Requirement #6: Runoff Treatment	
	Required to Comply
< 5,000 sf of total effective pollution-generating hard surface (PGHS)	
≥ 5,000 sf of total effective pollution-generating hard surface (PGHS)	X
< ¾ acres of pollution-generating pervious surface (PGPS) from which there will be a surface discharge in a natural or artificial conveyance system from the site	
≥ ¾ acres of pollution-generating pervious surface (PGPS) from which there will be a surface discharge in a natural or artificial conveyance system from the site	X

Table 2.3 above summarizes the thresholds for construction of stormwater treatment facilities. This project will add 350,000 sf of PGHS; therefore, treatment is required.

This project proposes to provide enhanced treatment by infiltrating 100% of stormwater from pollution-generating surfaces through one of four bioretention cells. Bioretention cells have been sized to filter at least 91% of the water quality volume in WWHM and are used for the northwest, southwest, southeast frontage, and east basins. See further explanation of water quality facility sizing in Section 6 of this Drainage Report.

Core Requirement #7: Flow Control

Table 2.4. Thresholds for Core Requirement #7: Flow Control	
	Required to Comply
< ¾ acres of native vegetation converted to lawn/landscape or < 2.5 acres converted to pasture from which there is a surface discharge in a natural or artificial conveyance system from the site	
≥ ¾ acres of native vegetation converted to lawn/landscape or ≥ 2.5 acres converted to pasture from which there is a surface discharge in a natural or artificial conveyance system from the site	X
< 10,000 sf of effective impervious area	
≥ 10,000 sf of effective impervious area	X
≥ 0.10 cfs increase in the 100-year storm flow frequency using 1-hour time steps or ≥ 0.15 cfs increase in the 100-year storm flow frequency using 15-minute time steps	X

Table 2.4 above summarizes the thresholds for achievement of the standard flow control requirement for Western Washington. This project will add 775,000 sf of effective impervious surface. Flow control is required. This project proposes to provide flow control through the use of three infiltration ponds and four bioretention cells sized to

infiltrate 100% of tributary runoff. See further explanation of flow control facility sizing in Section 6 of this Drainage Report.

Core Requirement #8: Wetlands Protection

This project does not propose to discharge stormwater to a wetland.

Core Requirement #9: Operation and Maintenance

Proper operation and maintenance of proposed stormwater facilities is a vital component to the success of stormwater mitigation. A Maintenance and Source Control Manual and Operation and Maintenance Agreement will be included with the final design for the Morel Meadows project.

Section 3. Site and Vicinity Description

3.1 Existing Physiography

The existing site has a general slope from an elevation of around 230 in the south to 212 in the north. It includes oak trees near the edge of the property in the north and east.

3.2 Existing Improvements

The existing site is developed with Ostrom Mushroom Farm, consisting of around 5 acres of roof, 9 acres of concrete and asphalt, and several storm ponds and water storage tanks as well as a well in the southeast.

3.3 Drainage Patterns

In the existing condition, drainage generally flows south to north across the site. There are several ponds used for stormwater storage. Existing soil is Type A/B with a high hydraulic conductivity.

3.4 Qualitative Analysis

The project proposes to use infiltration BMPs and post-construction soil enhancements to reduce overall site runoff from the pre-developed condition. A majority of onsite runoff will be conveyed via catch basins and piping to bioretention cells and infiltration ponds.

Conveyance capacity is not anticipated to be a problem. Onsite conveyance systems are to be designed to convey the 25-year 24-hour flow in accordance with the SDM. Flows tributary to downstream conveyances will be reduced by development of this site. See Section 7 for analysis. Erosion impacts are not anticipated. No stream channel or surface flow impacts are anticipated as the runoff is being fully infiltrated.

Overflow structures were sized for the northwest and east ponds to convey the 100-year inflow to the pond. Due to topography, the southwest infiltration pond and southeast bioretention pond cannot have overflow structures. Instead, excess runoff would back up

in the conveyance systems directed towards these ponds and eventually rise through catch basins to join the conveyance systems of the northwest and east basins.

Stormwater will be treated in bioretention cells prior to infiltration, ensuring no negative impact to subgrade aquifers or downstream conveyances.

The project will reduce overall runoff from the site, improving any existing capacity or flooding issues that may exist. No adverse downstream impacts are expected due to the development of the site.

3.5 Quantitative Analysis

N/A

Section 4. Soils and Infiltration Analysis

4.1 Summary of Soils and Geotechnical Data

The soil is mapped as Vashon recessional outwash (Qgo.) Soil conditions are primarily gravelly sandy loam with high hydraulic conductivities. See Table 4.1 for soil types by area, and Appendix 1 for NRCS soils map.

The Riley Group conducted a geotechnical investigation, with an updated Geotechnical Engineering Report dated August 23, 2023 They encountered up to 12 feet of loose to medium dense fill made up of gravel with some sand and trace silt and silty sandy gravel over medium dense native deposits of silty sandy gravel, sandy gravel with trace silt, and gravel with trace to some sand and silt. Under the gravel deposits was dense silty sand with gravel. See Riley Group geotechnical report in Appendix 2.

Additional soils exploration and testing was conducted by Riley Group in the proposed infiltration facility locations with results presented in a memorandum dated September 18, 2023. Supplemental exploration confirms the presence of sand and gravel beneath proposed facilities. Grain size analysis was performed to determine the preliminary design infiltration rate for each facility. Riley Group suggests a design infiltration rate of 20 in/hr for the northwest, southwest, and southeast facilities and 9 in/hr for the east facility. A long-term infiltration rate of 10 in/hr was used for design of all facilities with the exception of the East facility for which a rate of 9 in/hr was used. See the Riley Group memo in Appendix 2.

Table 4.1. Soil Characteristics.

Soil description		**Area (acres)**	**Percent of Site**
Geologic/glacial (e.g., Vashon till or recessional outwash)	**NRCS Soil Units** (e.g., Indianola series, Hydrologic Soil Group A)		
Sandy and Gravelly Glacial Outwash	Everett very gravelly sandy loam, 8 to 15 % slopes, Hydrologic Soil Group A	0.2	0.8
Glacial Outwash	Spana gravelly loam, Hydrologic Soil Group B	6.9	21.6
Volcanic ash over gravelly outwash	Spanaway gravelly sandy loam, 0 to 3% slopes, Hydrologic Soil Group A	24.9	77.7

4.2 Subsurface Factors

Light groundwater seepage was found by the Riley Group at depths of 13.5 and 23.5 feet at two explorations in the northwest of the site in February of 2022. Test pits excavated in September 2023 found minor evidence of seepage 6’ below ground surface in the northwest corner of the site, interpreted as perched water. Infiltration was deemed feasible for the site.

4.3 Infiltration Rates

A Pilot Infiltration Test was conducted in TP-1 in the northern-central portion of the site in February 2022. The measured infiltration rate was 140 inches per hour. After correction factors were applied, the Riley Group estimated a design rate of 21 inches per hour.

In September 2023, grain size analysis was performed to determine the preliminary design infiltration rate for each facility. Riley Group suggests a design infiltration rate of 20 in/hr for the northwest, southwest, and southeast facilities and 9 in/hr for the east facility. A long-term infiltration rate of 10 in/hr was used for design of all facilities with the exception of the East facility for which a rate of 9 in/hr was used.

Section 5. On-Site Stormwater Management and Low Impact Development

(Core Requirement #5)

5.1 LID Site Design

Oak trees near the north edge of the site are to be preserved to the maximum extent feasible (BMP T5.40). The subdivision will be laid out to maximize lots per foot of roadway and limit impervious coverage, per Better Site Design (BMP T5.41).

5.2 Methodology

The project will meet the LID Performance Standard per WWHM modeling. This will be achieved through 100% infiltration using three infiltration ponds (T7.10) and four bioretention cells (T7.30). Roughly 13% of the site will remain in the native condition and runoff in this portion will match existing drainage patterns.

5.3 LID Practices

LID BMPs to be used are:

- Postconstruction Soil Quality and Depth (T5.13)
- Bioretention Cells (T7.30)
- Infiltration Basins (T7.10)

5.4 Post-Construction Soil Quality and Depth

Which of the implementation options will be used? Select all that apply.

☒	Retain and protect undisturbed soil
☒	Amend soil
☒	Stockpile soil
☒	Import soil

Soil in undisturbed forested areas will be retained. Soil in disturbed open space and lawn areas will be amended to meet the BMP requirements. Approximately 12.4 acres of soil will be amended. Soil will be stockpiled during grading and imported soil will meet BMP requirements.

5.5 Retained Trees and Aesthetics

N/A

Section 6. Runoff Treatment and Flow Control
(Core Requirements #6 & #7)

6.1 Runoff Treatment Selection

Step 1: The receiving waters for this project will be groundwater, which is in a category 1 and category 2 critical aquifer recharge area as well as the 5-year time-of-travel area for a Lacey System A well.

Step 2: It was determined that oil control is not required due to the site not being a commercial/industrial or high-traffic site.

Step 3: Infiltration into the native soil for treatment is not practicable due to high infiltration rates in the soil.

Step 4: It was determined that phosphorus treatment is not required because the site does not discharge to freshwater bodies.

Step 5: Enhanced treatment is required because the site infiltrates in a Category 1 critical aquifer recharge area.

Bioretention is proposed for treatment for this project.

Which of the following runoff treatment performance goals are required for the project site?

☐	Oil control (SDM Chapter 8, Section 8.3.2)
☐	Phosphorus Treatment (SDM Chapter 8, Section 8.3.3)
☒	Enhanced Treatment (SDM Chapter 8, Section 8.3.4)
☐	Basic Treatment (SDM Chapter 8, Section 8.3.6)
☐	Additional Runoff Treatment (SDM Chapter 8, Section 8.3.5): • Bacteria • Dissolved Oxygen • Temperature

Specify the basis for the selected BMPs and provide details below.

☐	Watershed or Basin Plans
☐	Water Clean-up Plans
☒	Groundwater Management Areas (Wellhead Protection and Critical Aquifer Recharge)
☐	Lake Management Plans

The site is located in a Category 1 Critical Aquifer Recharge Area.

6.2 BMP Types & Descriptions

Bioretention cells (BMP T7.30) are proposed to treat over 91% of the runoff in the northwest, southwest, east, and southeast frontage basins. In the northwest, southwest, and east basins the remaining runoff will be infiltrated in an infiltration basin (BMP T7.10). In the southeast frontage basin, runoff will be fully infiltrated in the bioretention cell.

6.3 Facility Selection and Design Data

In the Northwest, East, and Southwest Basins, bioretention facilities were sized to infiltrate a minimum of 91% of tributary runoff through the bioretention media for treatment. Flows exceeding the capacity of the bioretention cells will overflow through stormwater structures to unlined infiltration ponds to fully infiltrate the remainder of the runoff file.

Stormwater from the Southeast Frontage Basin will be directed to the southeast bioretention facility sized to treat 100% of the tributary runoff file.

The combination of bioretention and infiltration BMPs results in the site meeting both the Flow Control Standard and LID Performance Standard. See the Site Analysis WWHM Report in Appendix 3.

6.4 Design Calculations

Bioretention facilities were sized per WWHM to meet treatment requirements. See Site Analysis model in Appendix 3. An infiltration rate of 10 inches per hour was used for all infiltration facilities except for the East facilities which were designed with a rate of 9 in/hr. See Appendix 2 for Riley Group calculations.

Table 6.1A Design Stage for Northwest Infiltration Pond		
Recurrence Interval	**Stage (ft)**	**Storage Volume (ac-ft)**
2-year	209.3406	0.1875
5-year	209.9857	0.2108
10-year	210.3663	0.2732
25-year	210.8064	0.3745
50-year	211.1098	0.4513
100-year	211.3960	0.5257
Table 6.1B Design Stage for East Infiltration Pond		
Recurrence Interval	**Stage (ft)**	**Storage Volume (ac-ft)**
2-year	215.3493	0.0627
5-year	216.0563	0.2269
10-year	216.4657	0.3220
25-year	216.9335	0.4307
50-year	217.2534	0.5050
100-year	217.5531	0.5746
Table 6.1C Design Stage for Southeast Bioretention Cell*		
Recurrence Interval	**Stage (ft)**	**Storage Volume (ac-ft)**
2-year	214.7459	0.0254
5-year	214.7961	0.0264
10-year	214.8163	0.0269
25-year	214.8337	0.0272
50-year	214.8430	0.0274
100-year	214.8500	0.0276
Table 6.1D Design Stage for Southwest Infiltration Pond		
Recurrence Interval	**Stage (ft)**	**Storage Volume (ac-ft)**
2-year	220.1952	0.0126
5-year	220.5919	0.0430
10-year	220.8171	0.0603
25-year	221.0710	0.0797
50-year	221.2427	0.0929
100-year	221.4025	0.1051

*WWHM calculates the stage of the bioretention cell including the storage volume available within the bioretention soil layer.

Table 6.2A Elevations for Northwest Infiltration Pond	
Key Features	**Elevation (ft)**
Infiltration Surface (Base/Bottom)	209.00
BMP Overflow	214.00
BMP Rim (Overflow + Freeboard)	215.00
Table 6.2B Elevations for East Infiltration Pond	
Key Features	**Elevation (ft)**
Infiltration Surface (Base/Bottom)	215.00
BMP Overflow	220.00
BMP Rim (Overflow + Freeboard)	221.00
Table 6.2C Elevations for Southeast Bioretention Cell	
Key Features	**Elevation (ft)**
Infiltration Surface (Base/Bottom)	215.00
BMP Overflow	216.00
BMP Rim (Overflow + Freeboard)	218.00
Table 6.2D Elevations for Southwest Infiltration Pond	
Key Features	**Elevation (ft)**
Infiltration Surface (Base/Bottom)	220.00
BMP Overflow	223.00
BMP Rim (Overflow + Freeboard)	224.00

Section 7. Runoff Collection and Conveyance System

7.1 System Design and Layout

Runoff will be collected in catch basins and conveyed via pipes in the roadways to the stormwater facility for the corresponding basin.

7.2 Conveyance System Calculations Summary

Onsite conveyance and piping will be sized to convey the 25-year flow in accordance with the 2022 Lacey SDM at final design.

Section 8. Source Control
(Core Requirement #3)

8.1 Potential Sources of Pollutants

Potential sources of pollutants include automobile washing and maintenance, storage of solid wastes and food wastes, composting, yard hazardous material use, storage and disposal, pet waste management, and maintenance of stormwater drainage and treatment facilities.

8.2 Source Control BMPs

Source control BMPs will be described in the Maintenance and Source Control Plan as part of final submittal.

8.3 Source Control Checklist and Worksheet

Source control checklist included in Appendix 2.

Section 9. Covenants, Dedications, Easements, Agreements, and Guarantees

9.1 Covenants, Dedications, and Easements

All stormwater facilities located on private property shall be owned, operated and maintained by the property owners, their heirs, successors and assigns. The property owners shall enter into an agreement with the governing body, a copy of which agreement is included in the Maintenance and Source Control Manual of the Drainage Control Plan. The agreement requires maintenance of the stormwater facilities in accordance with the maintenance plan provided and shall grant easement for access to the governing body to inspect the stormwater facilities. The agreement also makes provisions for the governing body to make repairs, after due notice is given to the owners, if repairs are necessary to ensure proper performance of the stormwater system and if the owners fail to make the necessary repairs. The cost of said repairs shall be borne by the property owners, their heirs, successors and assigns.

9.2 Agreements and Guarantees

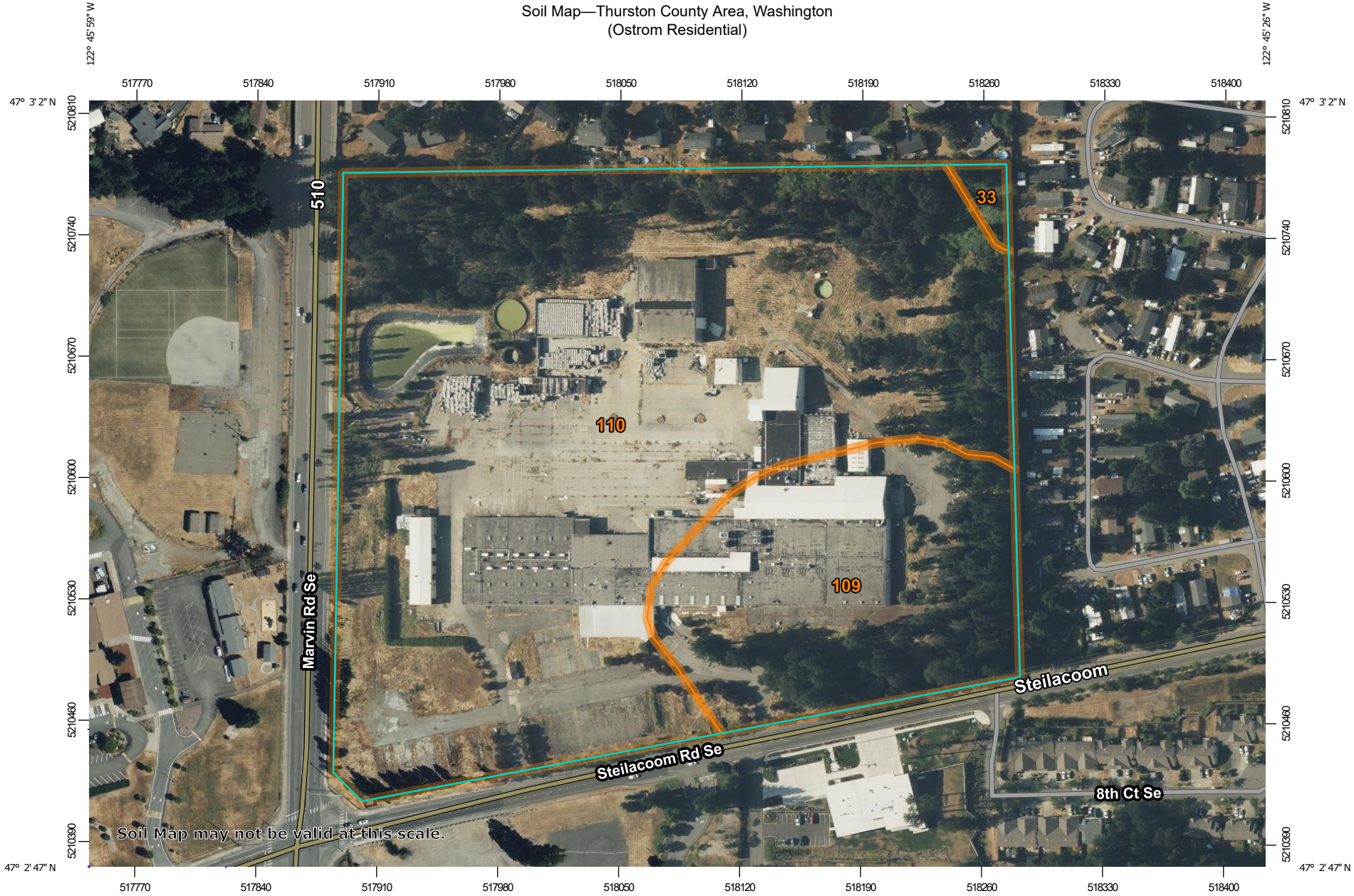
The property owner is required to enter into a Stormwater Maintenance Agreement to maintain stormwater facilities and implement a Pollution Source Control Plan. A copy of the maintenance agreement is included in the Maintenance and Source Control Manual.

The owner is required to provide a Performance Guarantee to the City of Lacey in the amount of 150% of the estimated cost of onsite drainage systems and public utilities (sidewalk, planter strip, sewer, and watermain) construction. A Stormwater Maintenance Guarantee in the amount of 20% of the estimated cost of stormwater improvements for two years is required for maintenance and repair of drainage facilities.

Drainage Control Plan Appendices

Appendix 1: Maps and Plans

Soil Map—Thurston County Area, Washington
(Ostrom Residential)



Map Scale: 1:3,110 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Thurston County Area, Washington
Survey Area Data: Version 16, Sep 8, 2022

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

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

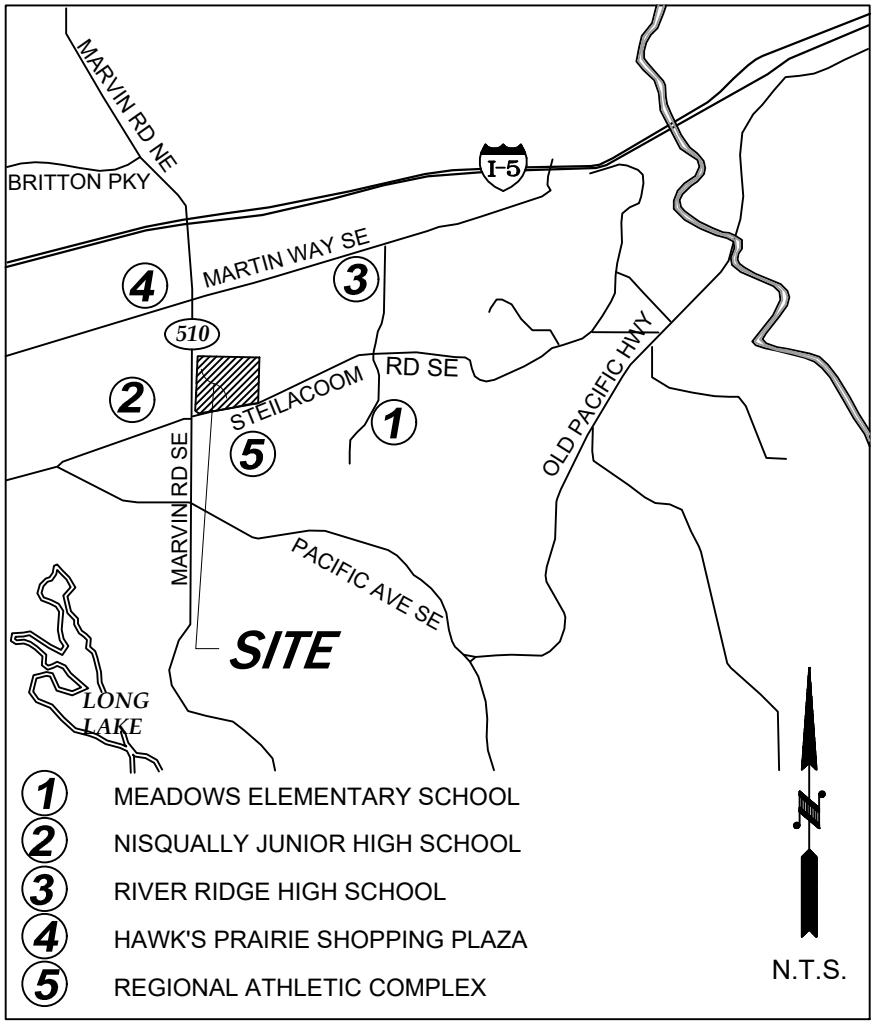
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
33	Everett very gravelly sandy loam, 8 to 15 percent slopes	0.2	0.8%
109	Spana gravelly loam	6.9	21.6%
110	Spanaway gravelly sandy loam, 0 to 3 percent slopes	24.9	77.7%
Totals for Area of Interest		**32.0**	**100.0%**

MOREL MEADOWS

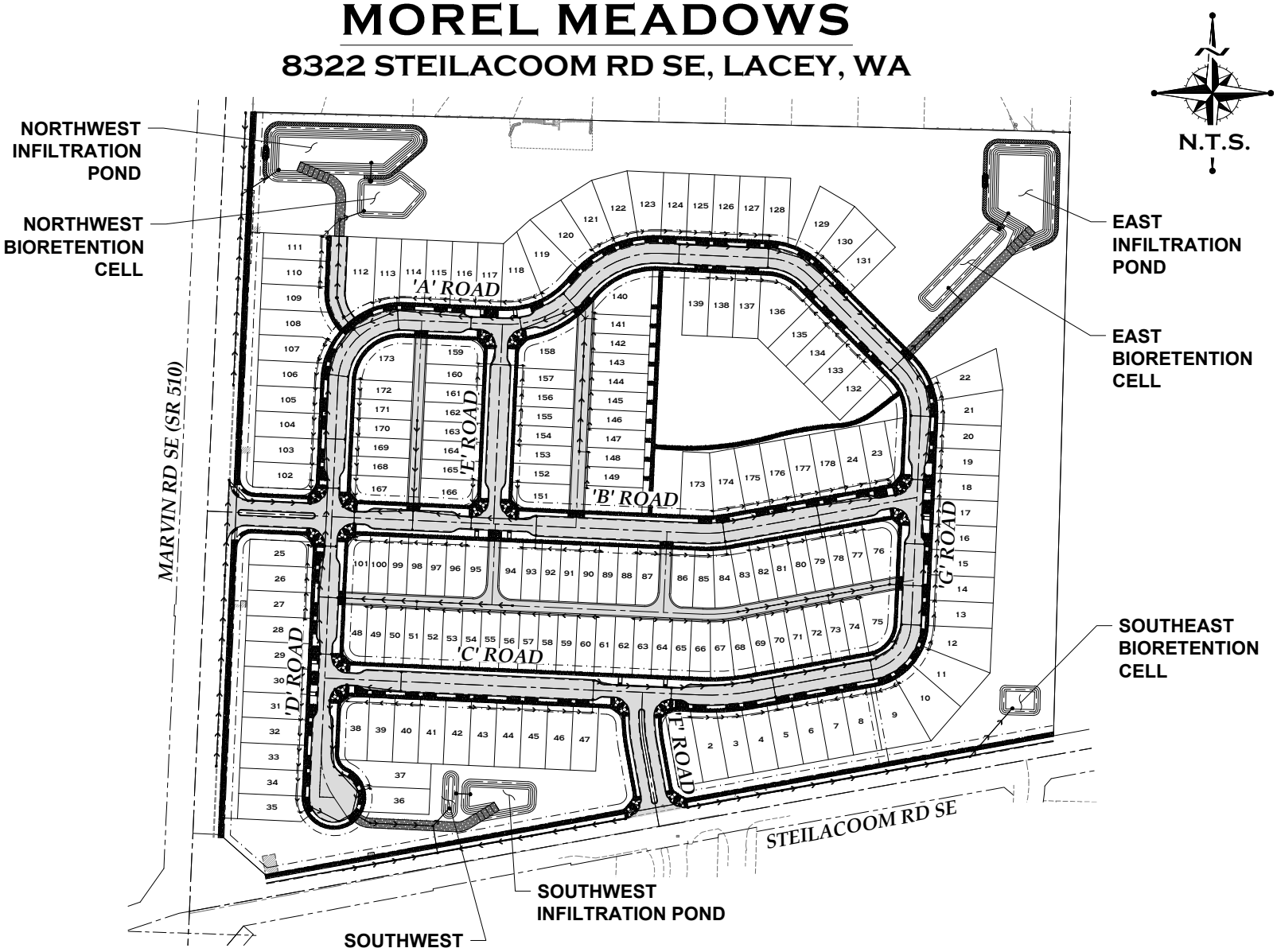
8322 STEILACOOM RD SE, LACEY, WA



VICINITY MAP

MOREL MEADOWS

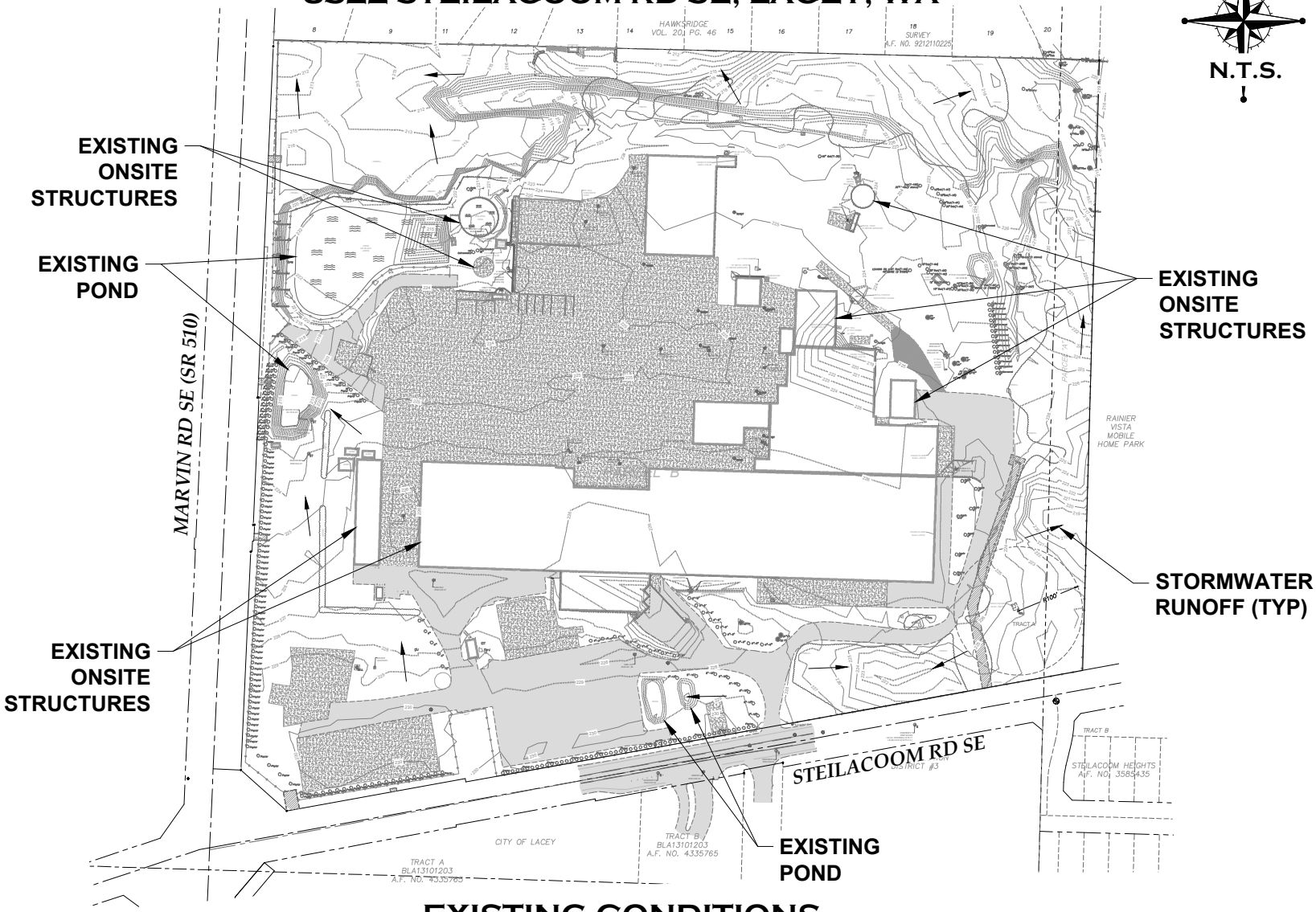
8322 STEILACOOM RD SE, LACEY, WA



SITE PLAN

MOREL MEADOWS

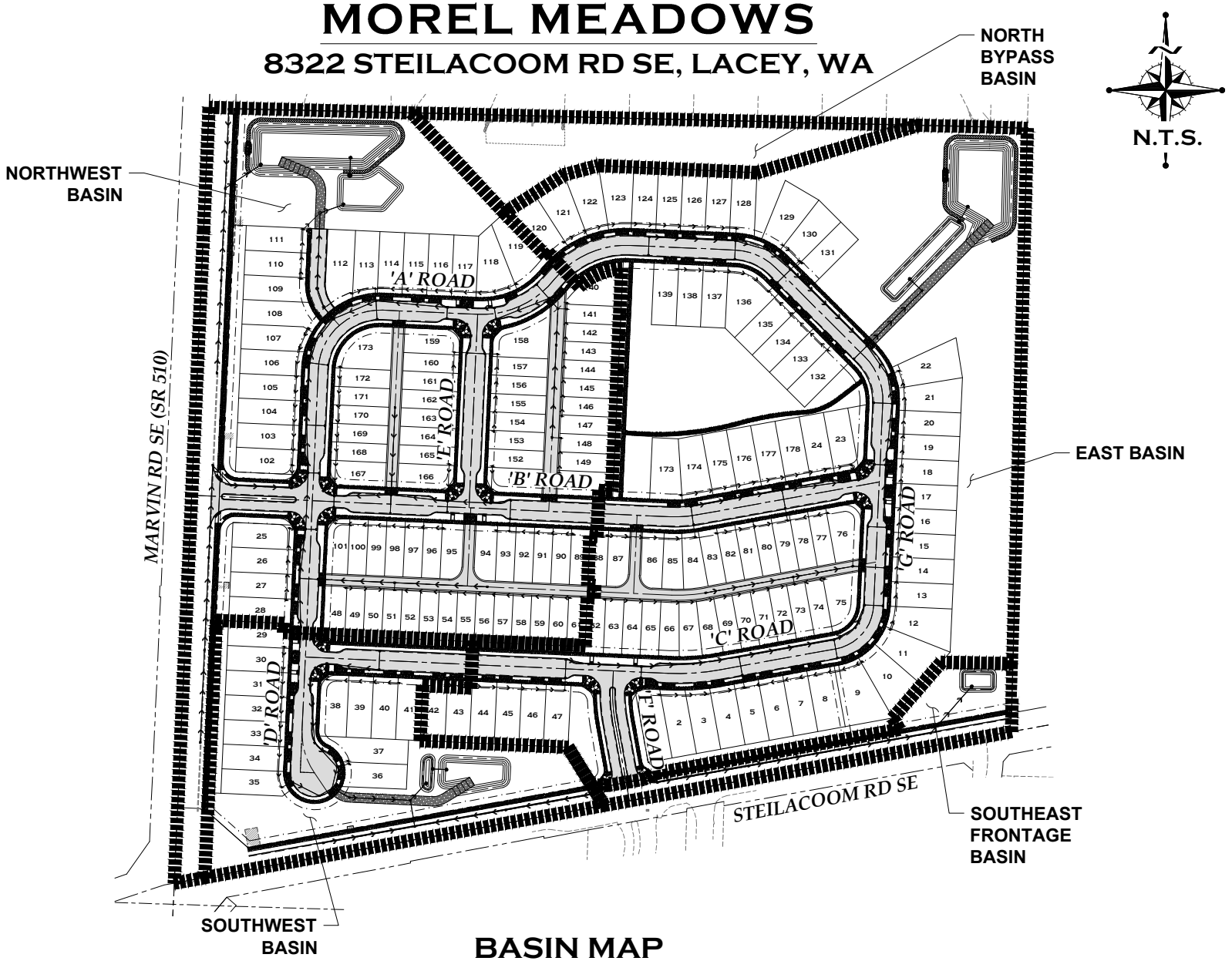
8322 STEILACOOM RD SE, LACEY, WA



EXISTING CONDITIONS

MOREL MEADOWS

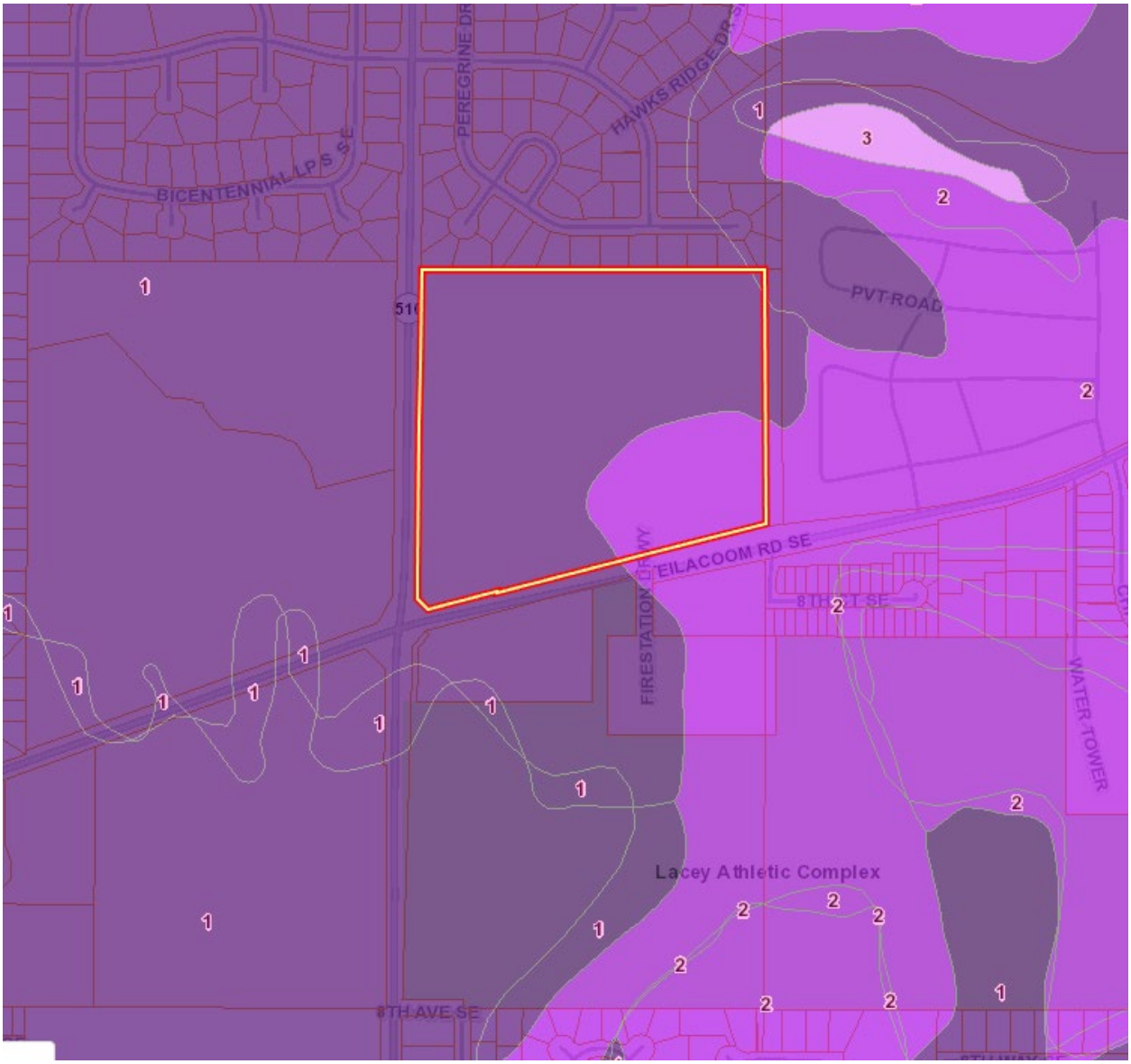
8322 STEILACOOM RD SE, LACEY, WA



BASIN MAP

Appendix 2: Supplemental Reports and Information

Critical Aquifer Recharge Area Map from Thurston County Geodata



CITY OF LACEY STORMWATER POLLUTION SOURCE CONTROL CHECKLIST

Project Name: Morel Meadows

Check all activities that will occur at a proposed site. Only activities common in the City of Lacey are included in this checklist. Other activities may apply to your site. Fill in the blank rows included under each activity grouping if needed based on the complete list of site-specific activities provided in Table 9A.1.

Source Control BMPs Applicable to All Sites		
BMP #	**BMP Name**	
S410	Correcting Illicit Discharges to Storm Drains	
S453	Formation of a Pollution Prevention Team	
S454	Preventive Maintenance/Good Housekeeping	
S455	Spill Prevention and Cleanup	
S456	Employee Training	
S457	Inspections	
S458	Record Keeping	
Source Control BMPs for Specific Activities		
BMP #	**BMP Name**	**Activity Conducted on the Site?**
Cleaning or Washing Source Control BMPs		
S431	Washing and Steam Cleaning Vehicles/Equipment/Building Structures	☑ Yes ☐ No
_____	_____	☐ Yes ☐ No
Roads, Ditches, and Parking Lot Source Control BMPs		
S415	Maintenance of Public and Private Utility Corridors and Facilities	☐ Yes ☐ No
S416	Maintenance of Roadside Ditches	☐ Yes ☐ No
S417	Maintenance of Stormwater Drainage and Treatment Systems	☑ Yes ☐ No
S421	Parking and Storage of Vehicles and Equipment	☐ Yes ☐ No
S430	Urban Streets	☑ Yes ☐ No
_____	_____	☐ Yes ☐ No
Soil Erosion, Sediment Control, and Landscaping Source Control BMPs		
S407	Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots	☑ Yes ☐ No
S408	Dust Control at Manufacturing Areas	☐ Yes ☐ No
S411	Landscaping and Lawn/Vegetation Management	☑ Yes ☐ No
S425	Soil Erosion and Sediment Control at Industrial Sites	☐ Yes ☐ No
S435	Pesticides and an Integrated Pest Management Program	☐ Yes ☐ No

BMP #	BMP Name	Activity Conducted on the Site?
Soil Erosion, Sediment Control, and Landscaping Source Control BMPs (continued)		
S444	Storage of Dry Pesticides and Fertilizers	□ Yes □ No
S449	Nurseries and Greenhouses	□ Yes □ No
S450	Irrigation	□ Yes □ No
_____	_____	□ Yes □ No
Storage and Stockpiling Source Control BMPs		
S427	Storage of Liquids, Food Waste, or Dangerous Waste Containers	□ Yes □ No
S428	Storage of Liquids in Permanent Aboveground Tanks	□ Yes □ No
S429	Storage or Transfer (Outside) of Solid Raw Materials, Byproducts or Finished Products	□ Yes □ No
_____	_____	□ Yes □ No
Transfer of Liquid or Solid Materials Source Control BMPs		
S409	Fueling at Dedicated Stations	□ Yes □ No
S412	Loading and Unloading Areas for Liquid or Solid Material	□ Yes □ No
S419	Mobile Fueling of Vehicles and Heavy Equipment	□ Yes □ No
S426	Spills of Oil and Hazardous Substances	□ Yes □ No
_____	_____	□ Yes □ No
Other Source Control BMPs		
S404	Commercial Printing Operations	□ Yes □ No
S414	Maintenance and Repair of Vehicles and Equipment	□ Yes □ No
S418	Manufacturing Activities – Outside	□ Yes □ No
S420	Painting/Finishing/Coating of Vehicles/Boats/Buildings/ Equipment	□ Yes □ No
S423	Recyclers and Scrap Yards	□ Yes □ No
S424	Roof/Building Drains at Manufacturing and Commercial Buildings	□ Yes □ No
S432	Wood Treatment Areas	□ Yes □ No
S433	Pools, Spas, Hot Tubs, and Fountains	□ Yes □ No
S438	Construction Demolition	□ Yes □ No
S443	Fertilizer Application	□ Yes □ No
S447	Roof Vents	□ Yes □ No
S451	Building, Repair, Remodeling, Painting, and Construction	□ Yes □ No
_____	_____	□ Yes □ No

UPDATED GEOTECHNICAL ENGINEERING REPORT

PREPARED BY:

THE RILEY GROUP, INC.
17522 BOTHELL WAY NORTHEAST
BOTHELL, WASHINGTON 98011

PREPARED FOR:

D.R. HORTON
11241 SLATER AVENUE NORTHEAST, SUITE 200
KIRKLAND, WASHINGTON 98034

RGI PROJECT NO. 2022-007-2

MOREL MEADOWS
8322 STEILACOOM ROAD SOUTHEAST
LACEY, WASHINGTON

AUGUST 23, 2023

Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone 425.415.0551 ♦ Fax 425.415.0311

www.riley-group.com

RILEYGROUP

August 23, 2023

Raelyn Hulquist
D.R. Horton
11241 Slater Avenue Northeast, Suite 200
Kirkland, Washington 98034

Subject: **Updated Geotechnical Engineering Report**
Morel Meadows
8322 Steilacoom Road Southeast
Lacey, Washington
RGI Project No. 2022-007-2

Dear Raelyn Hulquist:

As requested, The Riley Group, Inc. (RGI) has performed a Geotechnical Engineering Report (GER) for the Morel Meadows project located at 8322 Steilacoom Road Southeast, Lacey, Washington. Our services were completed in accordance with our proposal dated January 11, 2022 and authorized by Clint Lucas with D.R. Horton on February 14, 2022. The information in this GER is based on our understanding of the proposed construction, and the soil and groundwater conditions encountered in the monitoring wells and test pits completed by RGI at the site on January 20, and February 3 and 4, 2022. The report has been updated per the City of Lacey comments.

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

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

Respectfully submitted,

THE RILEY GROUP, INC.

KRISTINA MARIE WELLER
STATE OF WASHINGTON
33182
REGISTERED
PROFESSIONAL ENGINEER

8/23/2023

Eric L. Woods, LG
Project Geologist

Kristina M. Weller, PE
Principal Geotechnical Engineer

Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone 425.415.0551 ♦ Fax 425.415.0311

www.riley-group.com

TABLE OF CONTENTS

LIST OF FIGURES AND APPENDICES

Executive Summary

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

RGI's geotechnical scope of work included the advancement of 2 monitoring wells and 11 test pits to approximate depths of 5 to 25 feet below existing site grades.

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

Soil Conditions: The soils encountered during field exploration include up to 12 feet of loose to medium dense fill comprised of gravel with some sand and trace silt and silty sandy gravel over medium dense native deposits of silty sandy gravel, sandy gravel with trace silt, and gravel with trace to some sand and silt. The gravel deposits were underlain by dense silty sand with gravel at a depth of 14 feet at TP-2.

Groundwater: Light groundwater seepage was encountered at two locations at depths of 13.5 to 23.5 feet during our subsurface exploration.

Foundations: Foundations for the proposed building may be supported on conventional spread footings bearing on medium dense native soil or structural fill.

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

Pavements: The following pavement sections are recommended in accordance with the City of Lacey standards:

- **For minor local access streets**: 4 inches of Hot Mix Asphalt (HMA) class ½ inch PG 64-22 over 2 inches of crushed surfacing base course (CSBC) over 13 inches of ballast or 9 inches of crushed surfacing base course (CSBC)
- **For concrete pavement areas**: 4 inches of concrete for sidewalks and 6 inches for driveways over 1 inch of CSTC or well graded sand

1.0 Introduction

This Geotechnical Engineering Report (GER) presents the results of the geotechnical engineering services provided for the Morel Meadows project in Lacey, Washington. The purpose of this evaluation is to assess subsurface conditions and provide geotechnical recommendations for the construction of a residential development with associated roadways and infrastructure. Our scope of services included field explorations, laboratory testing, engineering analyses, and preparation of this GER.

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

2.0 Project description

The project site is located at 8322 Steilacoom Road Southeast in Lacey, Washington. The approximate location of the site is shown on Figure 1.

The existing site is occupied by several concrete buildings with asphalt, concrete, and gravel roadways. RGI understands the existing structures are to be demolished and the site is to be developed with a 179-lot residential plat with associated paved streets and utilities, and stormwater facilities.

At the time of preparing this GER, building plans were not available for our review. Based on our experience with similar construction, RGI anticipates that the proposed residences will be supported on perimeter walls with bearing loads of two to six kips per linear foot, and a series of columns with a maximum load up to 30 kips. Slab-on-grade floor loading of 150 pounds per square foot (psf) are expected.

3.0 Field Exploration and Laboratory Testing

3.1 Field Exploration

On January 20, RGI observed the drilling of 2 monitoring wells and on February 3 and 4, 2022 the excavation of 11 test pits. The approximate exploration locations are shown on Figure 2.

Field logs of each exploration were prepared by the geologist that continuously observed the excavation or drilling. These logs included visual classifications of the materials encountered during excavation and drilling as well as our interpretation of the subsurface

conditions between samples. The monitoring well and test pit logs included in Appendix A represent an interpretation of the field logs and include modifications based on laboratory observation and analysis of the samples.

3.2 LABORATORY TESTING

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

4.0 Site Conditions

4.1 SURFACE

The subject site is an irregular-shaped parcel of land approximately 33.86 acres in size. The site is bound to the north and east by residential property, to the south by Steilacoom Road Southeast, and to the west by Marvin Road Southeast.

The existing site is occupied by several concrete buildings and asphalt, concrete, and gravel roadways and parking areas. The site slopes generally north with about 18 feet of elevation change across the site. The site is vegetated with grass, blackberries, decorative shrubs, and small- to large-diameter trees.

4.2 GEOLOGY

Review of the *Geologic Map of the Lacey 7.5-minute Quadrangle, Thurston County, Washington,* by Robert L. Logan, etc. (2003) indicates that the soil in the project vicinity is mapped as Vashon recessional outwash (Qgo), which is stratified sand and gravel deposited by meltwater streams issuing from the receding Vashon ice sheet. These descriptions are generally similar to the findings in our field explorations.

4.3 SOILS

The soils encountered during field exploration include up to 12 feet of loose to medium dense fill comprised of gravel with some sand and trace silt and silty sandy gravel over medium dense native deposits of silty sandy gravel, sandy gravel with trace silt, and gravel with trace to some sand and silt. The gravel deposits were underlain by dense silty sand with gravel at a depth of 14 feet at TP-2.

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

4.4 GROUNDWATER

Light groundwater seepage was encountered at two locations at depths of 13.5 to 23.5 feet during our subsurface exploration.

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

4.5 SEISMIC CONSIDERATIONS

Based on the International Building Code (IBC), RGI recommends the follow seismic parameters for design.

Table 1 IBC

Parameter	2018 Value
Site Soil Class[1]	D[2]
Site Latitude	47.0483
Site Longitude	-122.7609
Short Period Spectral Response Acceleration, S_S (g)	1.378
1-Second Period Spectral Response Acceleration, S_1 (g)	0.5
Adjusted Short Period Spectral Response Acceleration, S_{MS} (g)	1.378
Adjusted 1-Sec Period Spectral Response Acceleration, S_{M1} (g)	0.9[3]
Numeric seismic design value at 0.2 second; S_{DS}(g)	0.919
Numeric seismic design value at 1.0 second; S_{D1}(g)	0.6[3]

1. Note: In general accordance with Chapter 20 of ASCE 7-16, the Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.

2. Note: ASCE 7-16 require a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope of our services does not include the required 100 foot soil profile determination. Test pits extended to a maximum depth of 25 feet, and this seismic site class definition considers that very dense soil continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

3. Note: In accordance with ASCE 11.4.8, a ground motion hazard analysis is not required for the following cases:

- Structures on Site Class E sites with S_S greater than or equal to 1.0, provided the site coefficient Fa is taken as equal to that of Site Class C.
- Structures on Site Class D sites with S_1 greater than or equal to 0.2, provided that the value of the seismic response coefficient Cs is determined by Eq. 12.8-2 for values of $T \leq 1.5Ts$ and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for $T_L \geq T > 1.5T_s$ or Eq. 12.8-4 for $T > TL$.

- Structures on Site Class E sites with S_1 greater than or equal to 0.2, provided that T is less than or equal to T_s and the equivalent static force procedure is used for design.

The above exceptions do not apply to seismically isolated structures, structures with damping systems or structures designed using the response history procedures of Chapter 16.

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

RGI reviewed the results of the field and laboratory testing and assessed the potential for liquefaction of the site's soil during an earthquake. Since the site is underlain by medium dense gravel and lacks an established shallow groundwater table, RGI considers that the possibility of liquefaction during an earthquake is low. Review of the *Liquefaction Susceptibility Map of Thurston County, Washington* by Stephen P. Palmer, etc. (2004) indicates the site is mapped as having a very low liquefaction susceptibility.

4.6 Geologic Hazard Areas

Regulated geologically hazardous areas include erosion, landslide, earthquake, or other geological hazards. Based on the definitions in the Thurston County Code, the site does not contain geologically hazardous areas.

5.0 Discussion and Recommendations

5.1 Geotechnical Considerations

Based on our study, the site is suitable for the proposed construction from a geotechnical standpoint. Foundations for the proposed building can be supported on conventional spread footings bearing on medium dense native soil or structural fill. Slab-on-grade floors and pavements can be similarly supported.

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

5.2 Earthwork

Earthwork during plat work will include excavating the retention ponds, grading the lots, installing underground utilities, preparing roadway and sidewalk subgrades. The existing fill soils should be evaluated during construction and may need to be removed under structures and roadways. It may be possible to reuse some of the materials for structural fill provided the organic content is suitable and the debris is removed from the soils.

Earthwork for the home construction should include excavating and backfilling building foundations and tying into the lot utilities.

5.2.1 EROSION AND SEDIMENT CONTROL

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

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

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

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

5.2.2 STRIPPING

Stripping efforts should include removal of pavements, vegetation, organic materials, and deleterious debris from areas slated for building, pavement, and utility construction. The test pits encountered 6 to 30 inches of topsoil and rootmass. Deeper areas of stripping may be required in forested or heavily vegetated areas of the site.

5.2.3 EXCAVATIONS

All temporary cut slopes associated with the site and utility excavations should be adequately inclined to prevent sloughing and collapse. The site soils consist of gravel with varying amounts of sand and silt.

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

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

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

5.2.4 SITE PREPARATION

RGI anticipates that some areas of loose or soft soil will be exposed upon completion of stripping and grubbing. Proofrolling and subgrade verification should be considered an essential step in site preparation. After stripping, grubbing, and prior to placement of structural fill, RGI recommends proofrolling building and pavement subgrades and areas to receive structural fill. These areas should moisture conditioned and compacted to a firm and unyielding condition in order to achieve a minimum compaction level of 95 percent of the modified proctor maximum dry density as determined by the American Society of

Testing and Materials D1557-09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557).

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

If fill is placed in areas of the site where existing slopes are steeper than 5:1 (Horizontal:Vertical), the area should be benched to reduce the potential for slippage between existing slopes and fills. Benches should be wide enough to accommodate compaction and earth moving equipment, and to allow placement of horizontal lifts of fill.

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

5.2.5 STRUCTURAL FILL

Once stripping, clearing and other preparing operations are complete, cuts and fills can be made to establish desired building grades. Prior to placing fill, RGI recommends proof-rolling as described above. The existing fill soils should be evaluated during construction and may need to be removed under structures and roadways. It may be possible to reuse some of the materials for structural fill provided the organic content is suitable and the debris is removed from the soil.

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

The suitability of excavated site soils and import soils for compacted structural fill use will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the U.S. No. 200 sieve) increases, soil becomes increasingly

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

Non-organic site soils are only considered suitable for structural fill provided that their moisture content is within about two percent of the optimum moisture level as determined by ASTM D1557. Excavated site soils may not be suitable for re-use as structural fill depending on the moisture content and weather conditions at the time of construction. If soils are stockpiled for future reuse and wet weather is anticipated, the stockpile should be protected with plastic sheeting that is securely anchored.

Even during dry weather, moisture conditioning (such as, windrowing and drying) of site soils to be reused as structural fill may be required. Even during the summer, delays in grading can occur due to excessively high moisture conditions of the soils or due to precipitation. If wet weather occurs, the upper wetted portion of the site soils may need to be scarified and allowed to dry prior to further earthwork, or may need to be wasted from the site.

If on-site soils are or become unusable, it may become necessary to import clean, granular soils to complete site work. Prior to use, an RGI representative should observe and test all materials imported to the site for use as structural fill. Structural fill materials should be placed in uniform loose layers not exceeding 12 inches and compacted to 95 percent of the maximum dry density. The soil's maximum density and optimum moisture should be determined by ASTM D1557. Placement and compaction of structural fill should be observed by RGI. A representative number of in-place density tests should be performed as the fill is being placed to confirm that the recommended level of compaction is achieved.

5.2.6 CUT AND FILL SLOPES

All permanent cut and fill slopes (except interior slopes of infiltration pond) should be graded with a finished inclination no greater than 2H:1V. The interior slopes of the infiltration pond must be graded with a slope gradient no steeper than 3H:1V. Upon completion of construction, the slope face should be trackwalked, compacted and vegetated, or provided with other physical means to guard against erosion. All fill placed for slope construction should meet the structural fill requirements as described in Section 5.2.5.

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

of the slope, piped in a closed conduit installed on the slope face, and taken to an appropriate point of discharge beyond the toe of the slope.

5.2.7 WET WEATHER CONSTRUCTION CONSIDERATIONS

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

5.3 FOUNDATIONS

Following site preparation and grading, the proposed building foundation can be supported on conventional spread footings bearing on medium dense native soil or structural fill. Loose, organic, or other unsuitable soils may be encountered in the proposed building footprint. If unsuitable soils are encountered, they should be overexcavated and backfilled with structural fill.

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

Table 2 Foundation Design

Design Parameter	Value
Allowable Bearing Capacity	2,000 psf[1]
Friction Coefficient	0.30
Passive pressure (equivalent fluid pressure)	250 pcf[2]

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

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. For short-term loads, such as wind and seismic, a 1/3 increase in this allowable capacity may be used. At perimeter locations, RGI recommends not including the upper 12

inches of soil in the computation of passive pressures because they can be affected by weather or disturbed by future grading activity. The passive pressure value assumes the foundation will be constructed neat against competent soil or backfilled with structural fill as described in Section 5.2.5. The recommended base friction and passive resistance value includes a safety factor of about 1.5.

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

5.4 RETAINING WALLS

If retaining walls are needed for the residences, retaining walls in ponds or for underground vaults, RGI recommends cast-in-place concrete walls be used. Modular block wall may be used for grade changes outside of structures.

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

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

Table 3 Retaining Wall Design

Design Parameter	Value
Allowable Bearing Capacity - Structural Fill Dense native soils	2,500 psf 4,000 psf
Active Earth Pressure (unrestrained walls)	35 pcf
At-rest Earth Pressure (restrained walls)	50 pcf

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

5.5 SLAB-ON-GRADE CONSTRUCTION

RGI recommends that the concrete slab be placed on top of medium dense native soil or structural fill. Immediately below the floor slab, RGI recommends placing a four-inch thick capillary break layer of clean, free-draining sand or gravel that has less than five percent passing the U.S. No. 200 sieve. This material will reduce the potential for upward capillary

movement of water through the underlying soil and subsequent wetting of the floor slab. Where moisture by vapor transmission is undesirable, an 8- to 10-millimeter thick plastic membrane should be placed on a 4-inch thick layer of clean gravel. For the anticipated floor slab loading, we estimate post-construction floor settlements of 1/4- to 1/2-inch.

5.6 DRAINAGE

5.6.1 SURFACE

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

5.6.2 SUBSURFACE

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

5.6.3 INFILTRATION

RGI understands that an infiltration system is being considered for the on-site disposal of stormwater run-off at the Site. A small-scale Pilot Infiltration Test (PIT) was completed in test pit TP-1 in accordance with the City of Lacey 2022 Stormwater Design Manual (CLSDM). The test pit dimensions were 4 feet by 8 feet, with the test conducted at approximately 6 feet below grade. Soil conditions at the PIT testing horizon are gravel.

Table 4 Measured Infiltration Rates

Test Location	Test Depth	Measured Rate (inches/hour)	K_{sat} Design (inches/hour
TP-1	6	140	21

A Total Correction Factor was applied to the field measured infiltration rate.

Total Correction Factor $CF_T = CF_v \times CF_t \times CF_m$

Site variability (CF_v) = 0.33, Test Method (CF_t) = 0.5 Small scale PIT, Influent Control (CF_m) = 0.9 and $CF_T = 0.33 \times 0.5 \times 0.9 = 0.15$

Application of the Total Correction Factor yields a K_{sat} Design rate of **21 inches/hour**.

5.7 UTILITIES

Utility pipes should be bedded and backfilled in accordance with American Public Works Association (APWA) specifications. For site utilities located within the right-of-ways, bedding and backfill should be completed in accordance with City of Lacey specifications. At a minimum, trench backfill should be placed and compacted as structural fill, as described in Section 5.2.5. Where utilities occur below unimproved areas, the degree of compaction can be reduced to a minimum of 90 percent of the soil's maximum density as determined by the referenced ASTM D1557. As noted, soils excavated on site should be suitable for use as backfill material. If on-site soils are or become unusable or do not meet the City of Lacey specifications, imported structural fill meeting City of Lacey specifications shall be used.

5.8 PAVEMENTS

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

5.8.1 FLEXIBLE PAVEMENTS

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

- **For minor local access streets:** 4 inches of Hot Mix Asphalt (HMA) class ½ inch PG 64-22 over 2 inches of crushed surfacing base course (CSBC) over 13 inches of ballast or 9 inches of crushed surfacing base course (CSBC)

5.8.2 CONCRETE PAVEMENTS

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

- **For concrete pavement areas**: 4 inches of concrete for sidewalks and 6 inches for driveways over 1 inch of CSTC or well graded sand

The paving materials used should conform to the WSDOT specifications for HMA, concrete paving, and 9-03.9(3) Crushed Surfacing.

Long-term pavement performance will depend on surface drainage. A poorly-drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability.

For optimum pavement performance, surface drainage gradients of no less than 2 percent are recommended. Also, some degree of longitudinal and transverse cracking of the

pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

6.0 Additional Services

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

RGI is also available to provide geotechnical engineering and construction monitoring services during construction. The integrity of the earthwork and construction depends on proper site preparation and procedures. In addition, engineering decisions may arise in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of this scope of work. If these services are desired, please let us know and we will prepare a cost proposal.

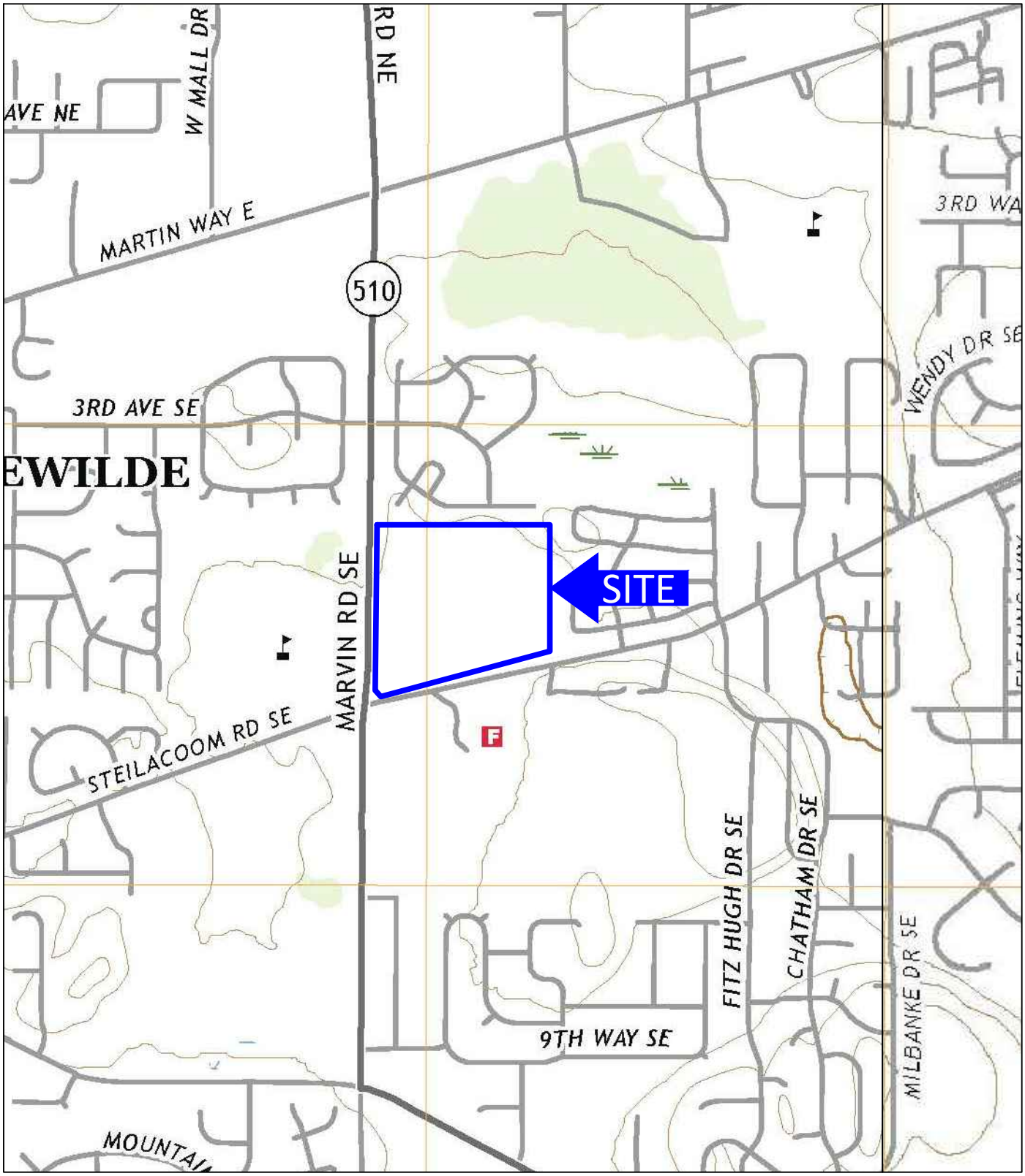
7.0 Limitations

This GER is the property of RGI, D.R. Horton, and its designated agents. Within the limits of the scope and budget, this GER was prepared in accordance with generally accepted geotechnical engineering practices in the area at the time this GER was issued. This GER is intended for specific application to the Morel Meadows project in Lacey, Washington, and for the exclusive use of D.R. Horton and its authorized representatives. No other warranty, expressed or implied, is made. Site safety, excavation support, and dewatering requirements are the responsibility of others.

The scope of services for this project does not include either specifically or by implication any environmental or biological (for example, mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, we can provide a proposal for these services.

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

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



USGS, 2020, Nisqually, Washington
USGS, 2020, Lacey, Washington
7.5-Minute Quadrangle

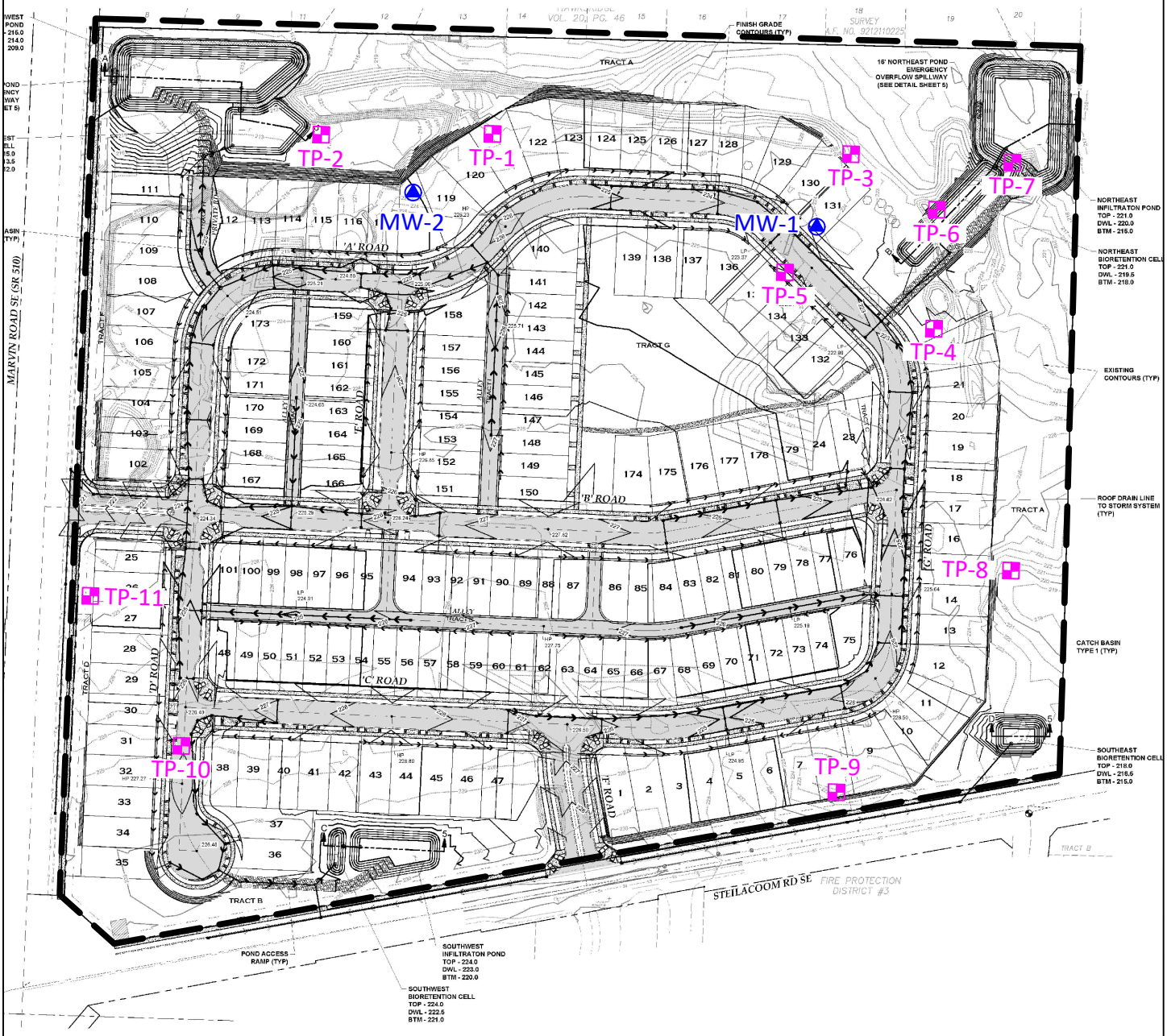
Approximate Scale: 1"=1000'

0 500 1000 2000

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Morel Meadows		Figure 1
RGI Project Number: 2022-007-2	Site Vicinity Map	Date Drawn: 08/2023
Address: 8322 Steilacoom Road Southeast, Lacey, Washington 98513		



= Monitoring well by RGI, 01/20/22

= Test pit by RGI, 02/03-04/22

= Site boundary

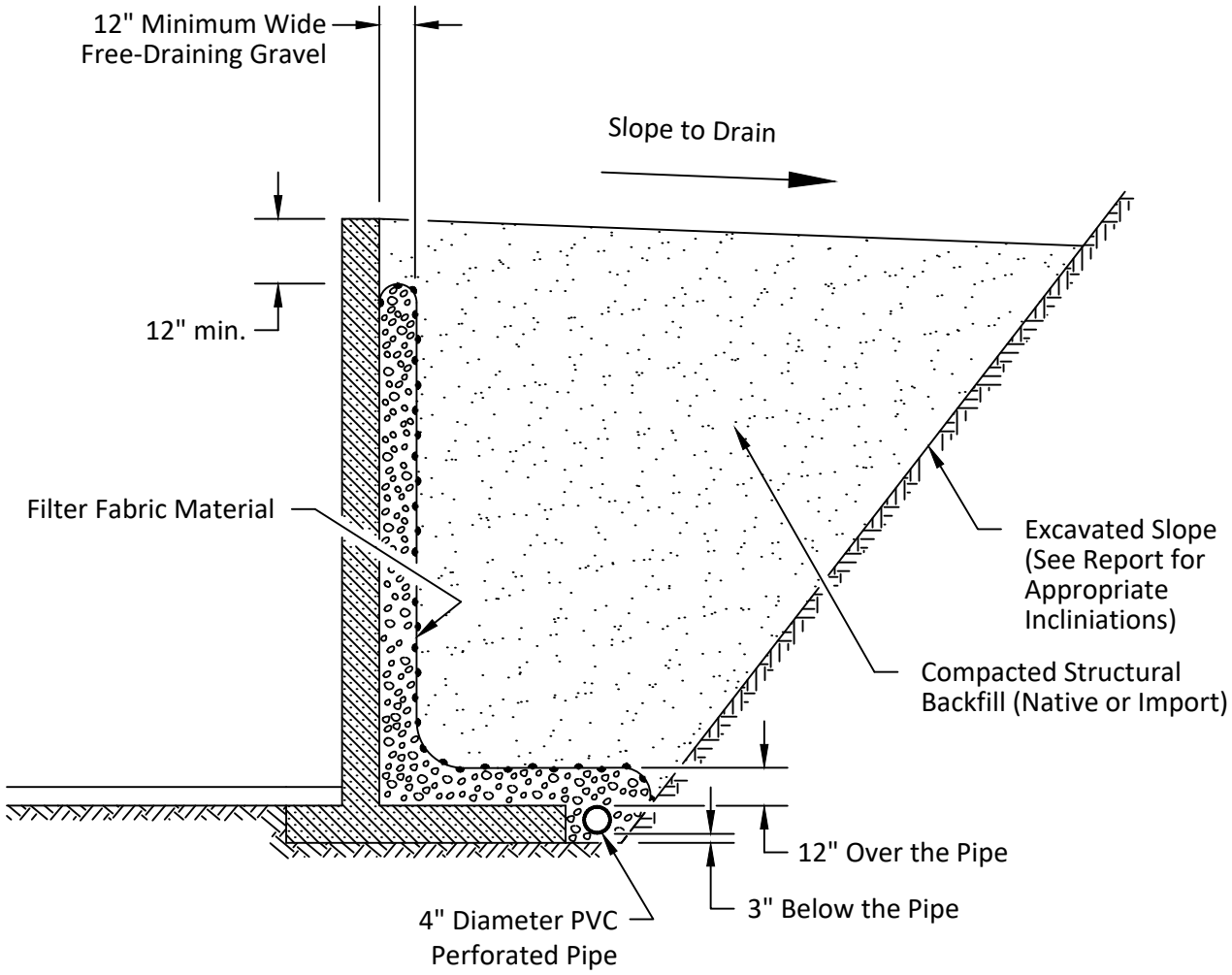
Approximate Scale: 1"=200'

0 100 200 400

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

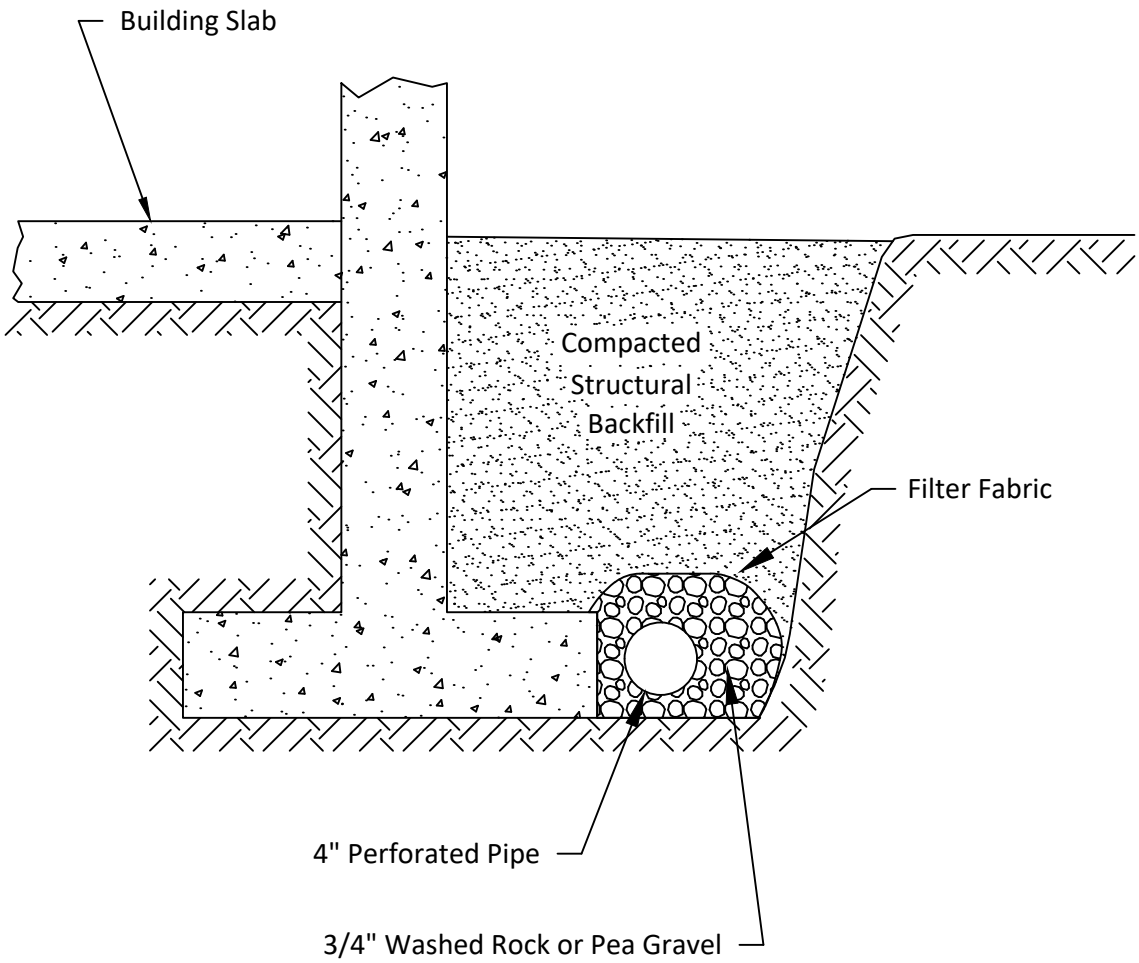
Morel Meadows		Figure 2
RGI Project Number: 2022-007-2	Geotechnical Exploration Plan	Date Drawn: 08/2023
Address: 8322 Steilacoom Road Southeast, Lacey, Washington 98513		



Not to Scale

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Morel Meadows		Figure 3
RGI Project Number: 2022-007-2	Retaining Wall Drainage Detail	Date Drawn: 08/2023
Address: 8322 Steilacoom Road Southeast, Lacey, Washington 98513		



Not to Scale

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Morel Meadows		Figure 4
RGI Project Number: 2022-007-2	Typical Footing Drain Detail	Date Drawn: 08/2023
Address: 8322 Steilacoom Road Southeast, Lacey, Washington 98513		

APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTING

On January 20, and February 3 and 4, 2022, RGI performed field explorations using a drill rig and an excavator. We explored subsurface soil conditions at the site by observing the excavation/drilling of 2 monitoring wells and 11 test pits to a maximum depth of 25 feet below existing grade. The well and test pit locations are shown on Figure 2. The well and test pit locations were approximately determined by measurements from existing property lines and paved roads.

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

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

Moisture Content Determinations

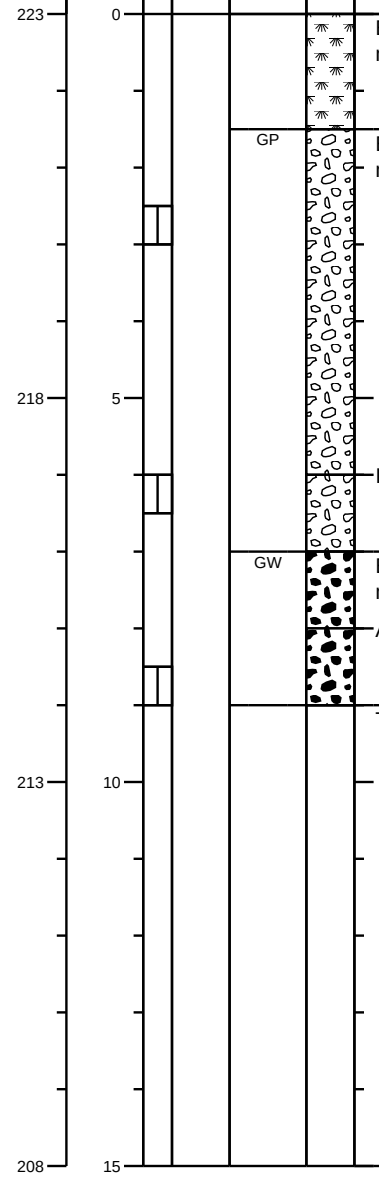
Moisture content determinations were performed in accordance with ASTM D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (ASTM D2216) on representative samples obtained from the exploration in order to aid in identification and correlation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

Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analyses was determined using D6913-04(2009) Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis (ASTM D6913) on five of the samples.

Project Name: **Morel Meadows** Project Number: **2022-007-2** Client: **D.R. Horton**	RILEYGROUP	Test Pit No.: TP-1

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **9 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **223**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



MATERIAL DESCRIPTION	USCS Symbol	REMARKS AND OTHER TESTS
Black gravelly topsoil with trace garbage debris, loose, moist (Fill)		
Brown GRAVEL with trace sand and silt, medium dense, moist	GP	3% moisture, 1% fines
Infiltration test at 6'		3% moisture, 2% fines
Brown GRAVEL with trace sand and silt, medium dense, moist Abundant cobbles and boulders	GW	3% moisture, 1% fines
Test Pit terminated at 9'		

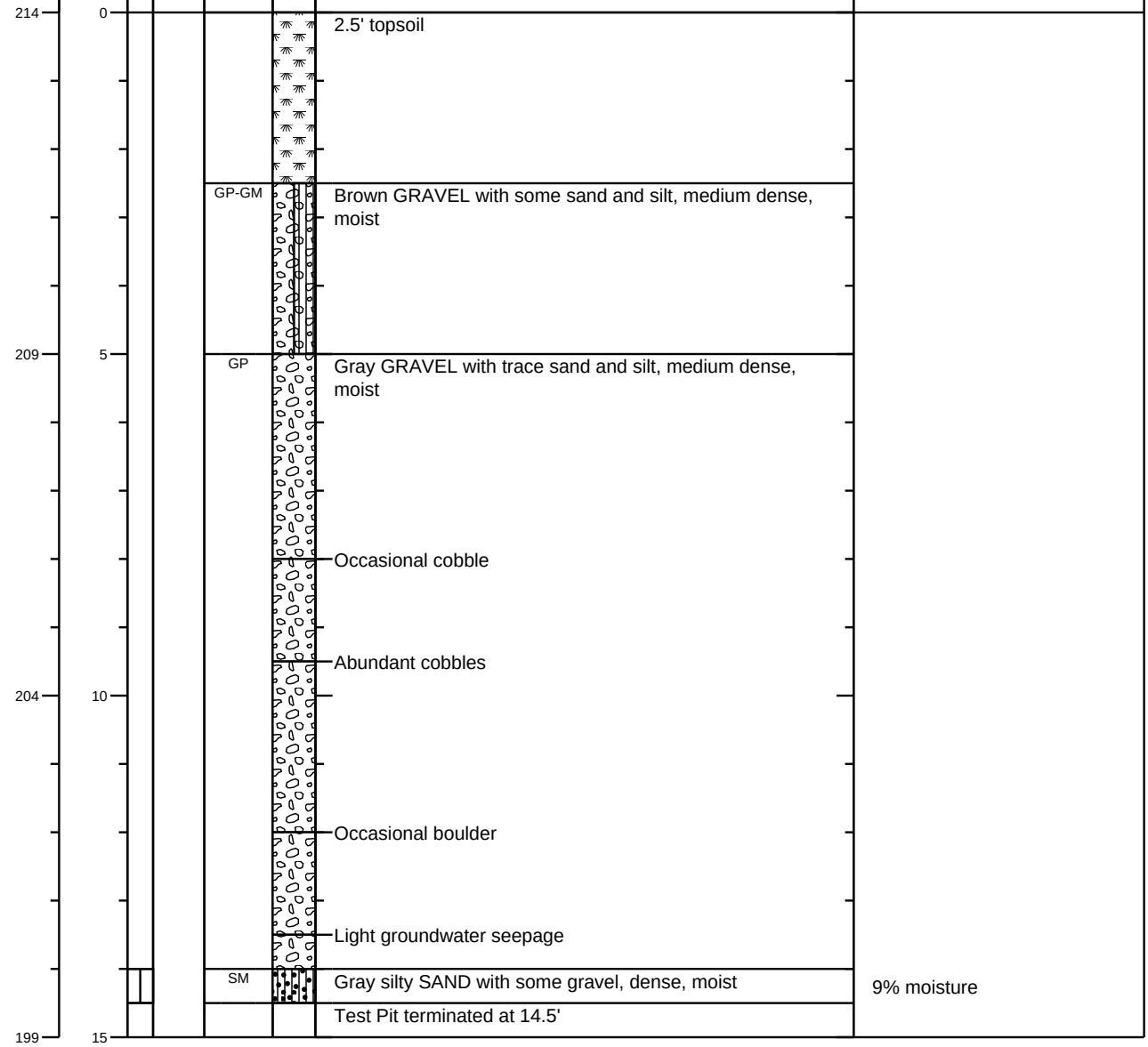
The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-2**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: TP-2

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Blackberries**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **14.5 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **214**
Groundwater Level: **Seepage at 13.5'**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



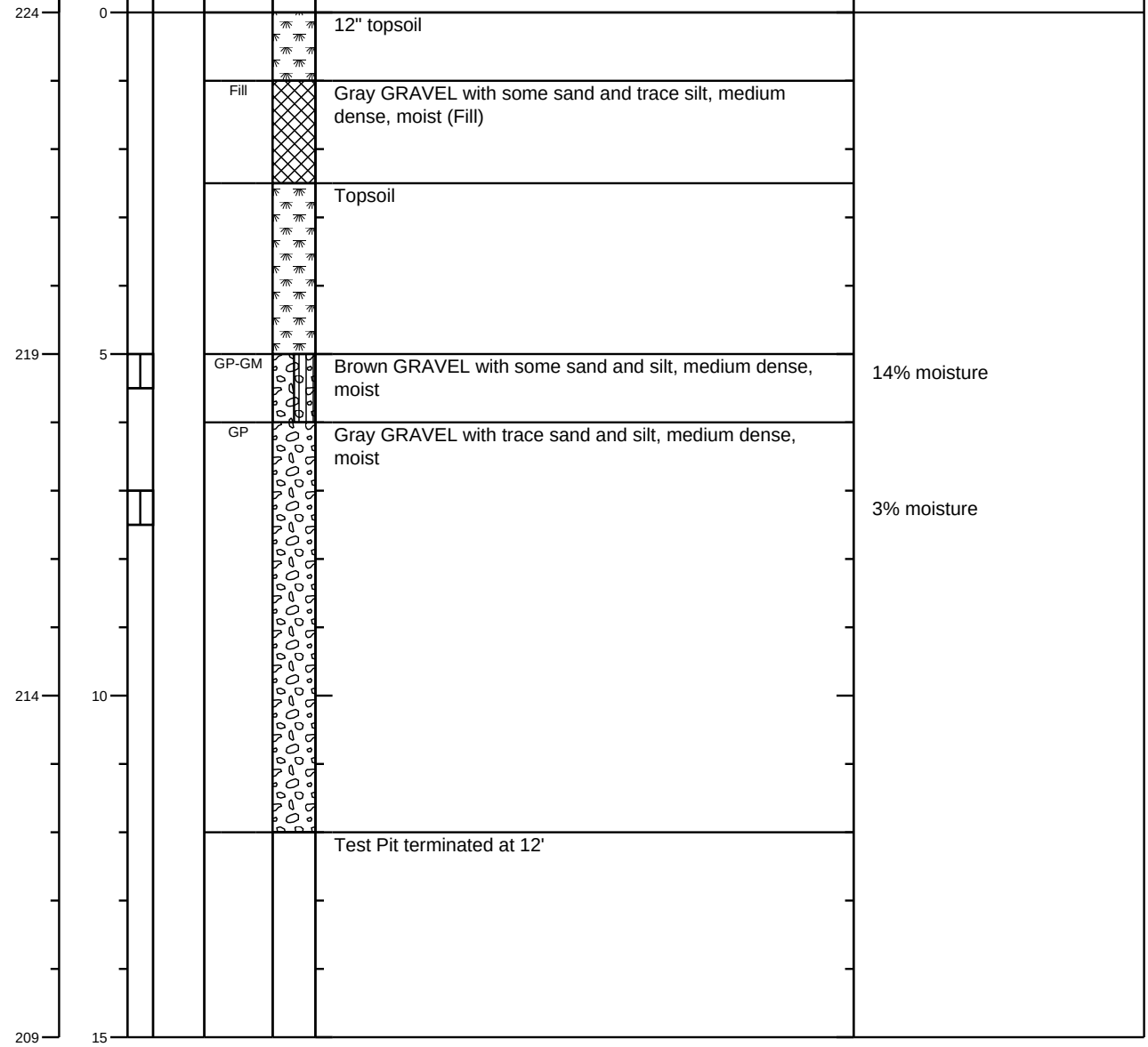
The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-2**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: TP-3

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **12 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **224**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



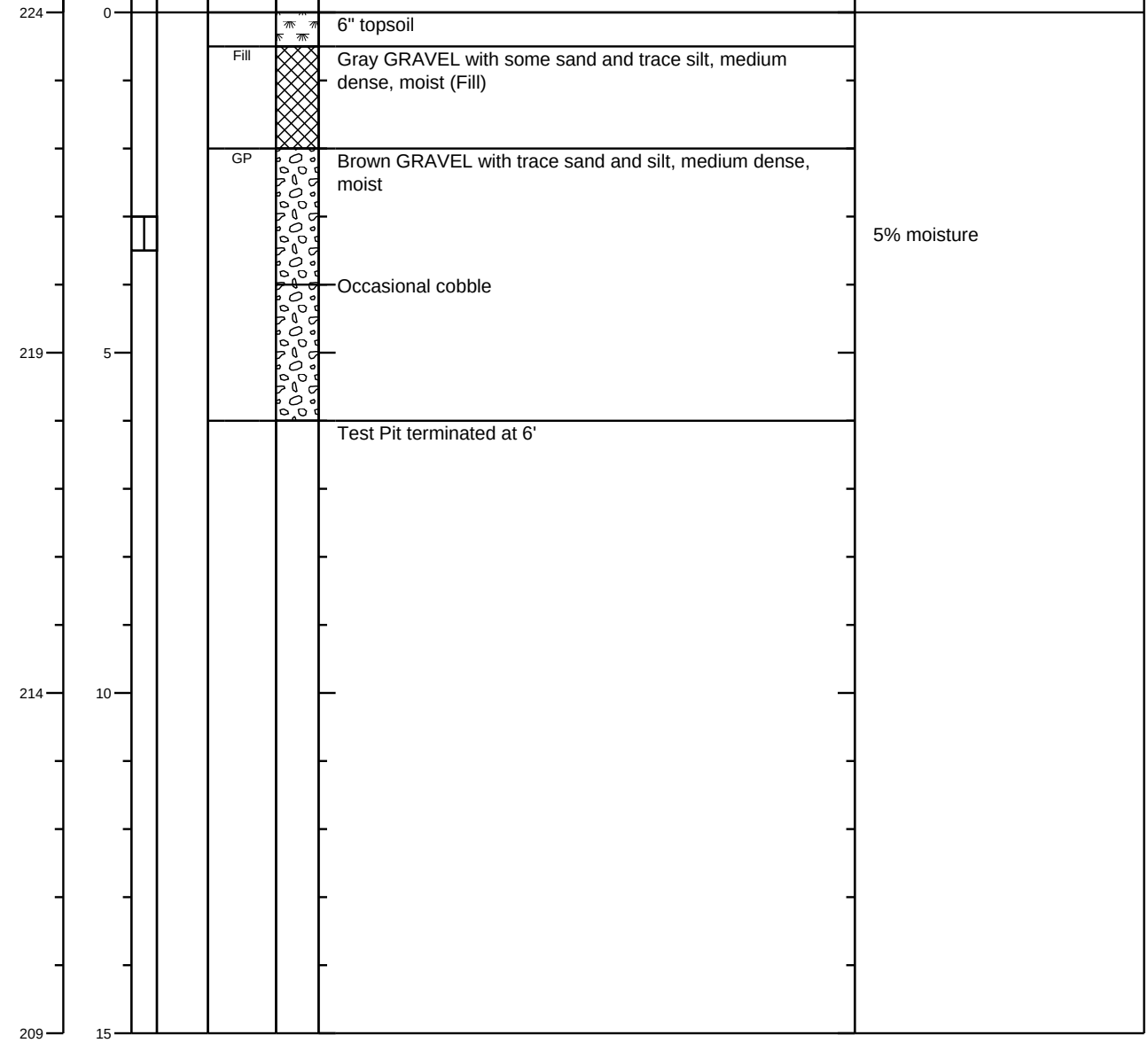
The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-2**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: TP-4

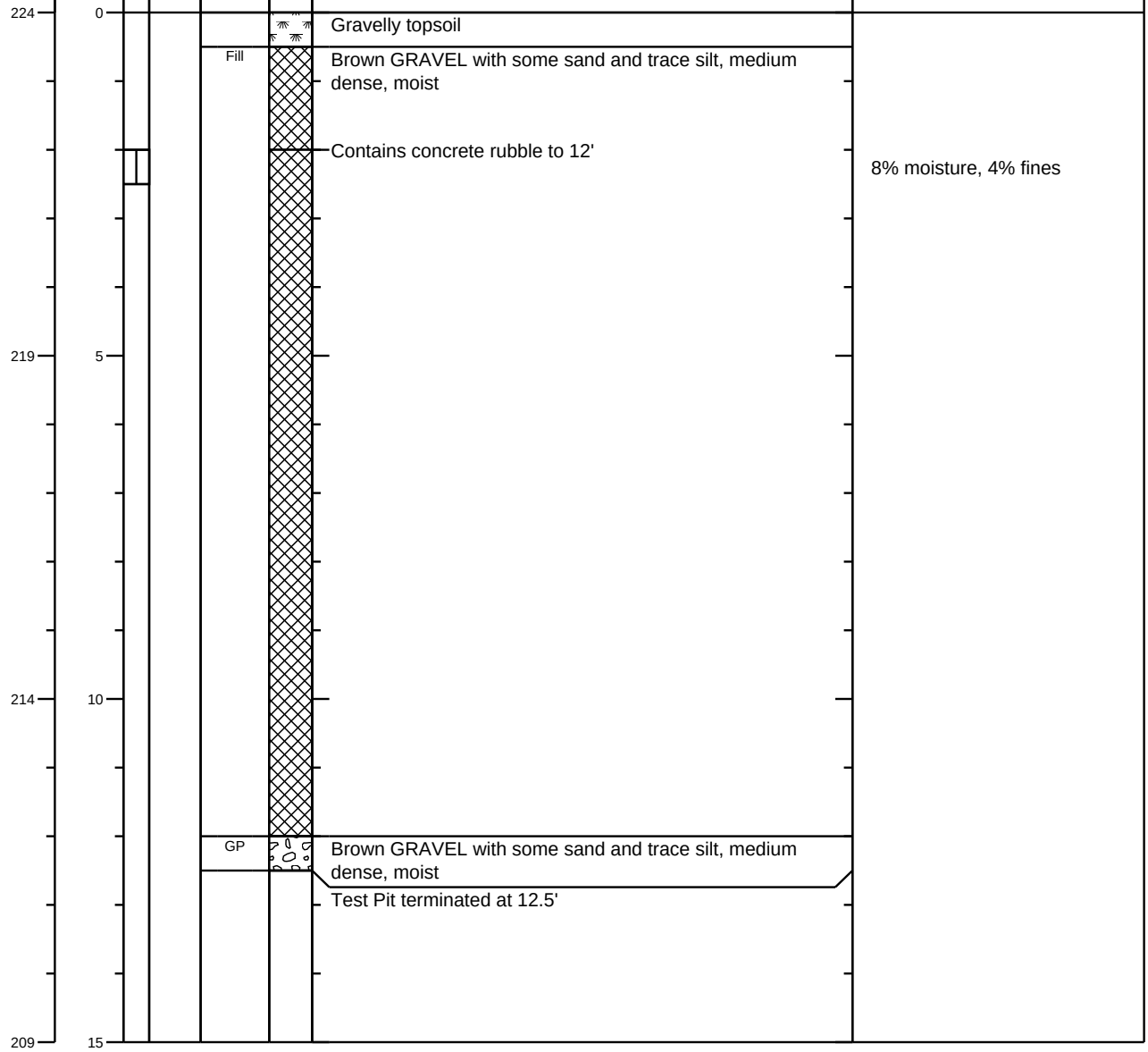
Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **6 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **224**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows** Project Number: **2022-007-2** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: TP-5

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **12.5 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **224**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-2**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: TP-6

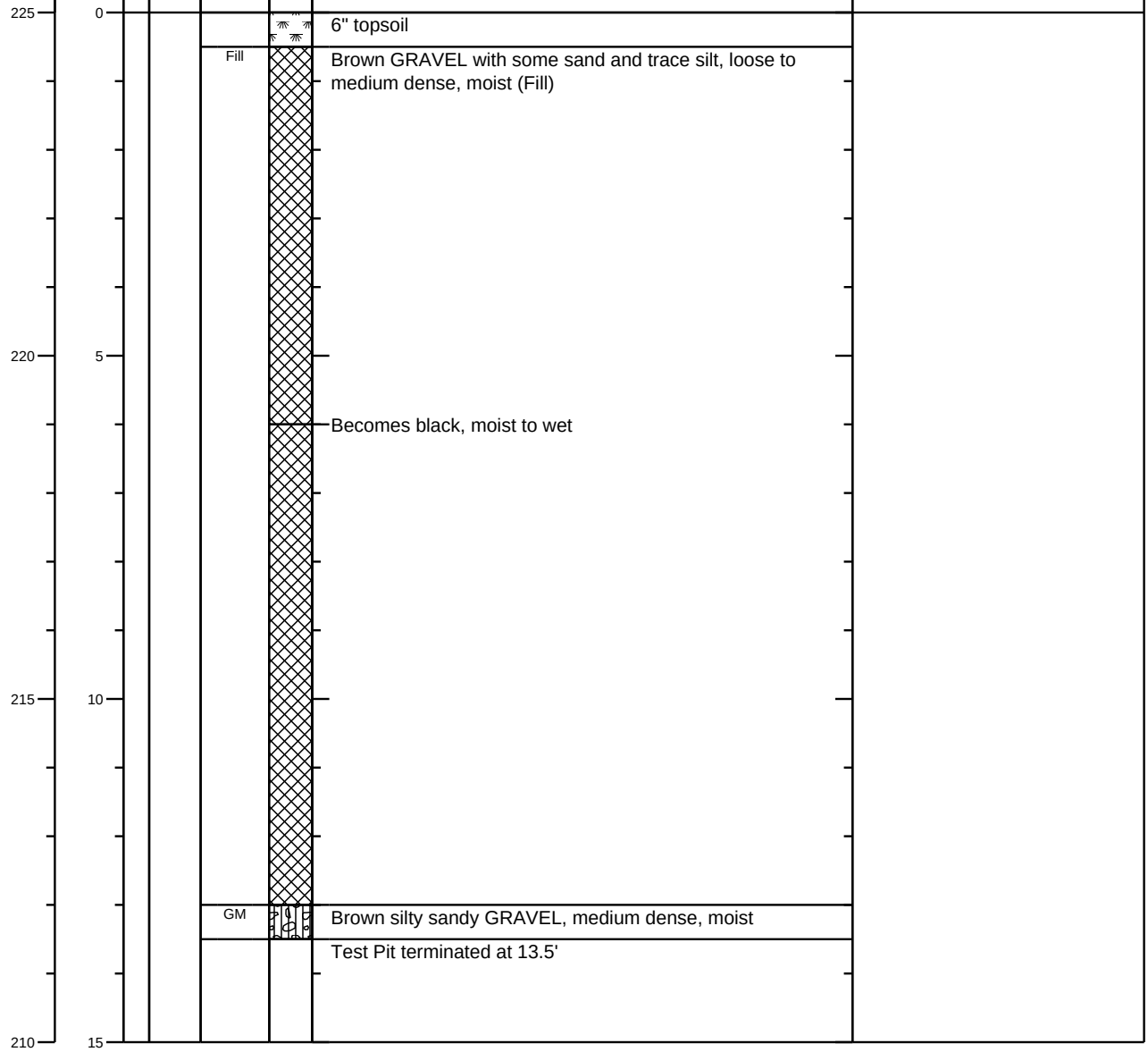
Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **9 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **225**
Groundwater Level: **Not Encountered**	Sampling Method(s)	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
225	0					6" topsoil	
				Fill		Dark brown GRAVEL with some sand and trace silt, medium dense, moist (Fill)	
						Contains concrete and wood debris	
220	5						
				GP		Brown GRAVEL with some sand, medium dense, moist	
						Test Pit terminated at 9'	
215	10						
210	15						

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows** Project Number: **2022-007-2** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: TP-7

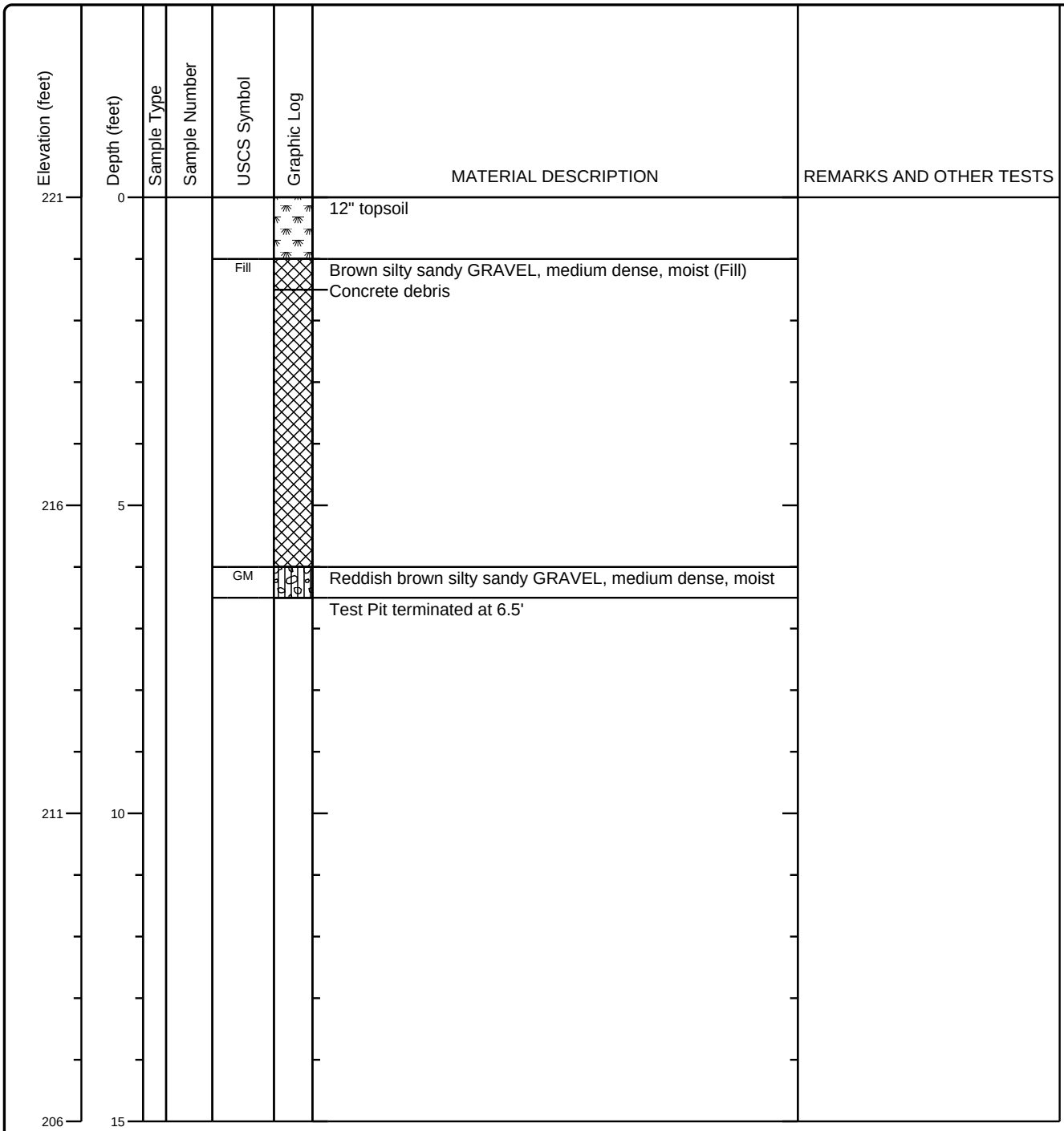
Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **13.5 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **225**
Groundwater Level: **Not Encountered**	Sampling Method(s)	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows** Project Number: **2022-007-2** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: TP-8

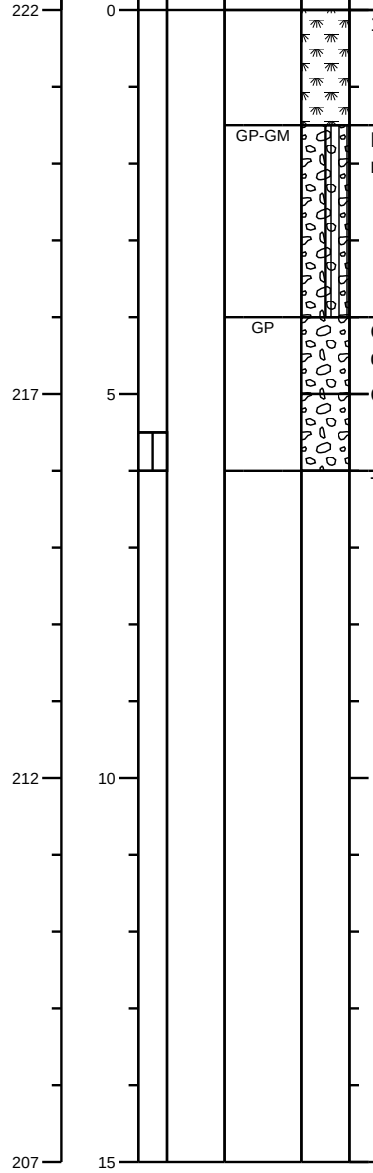
Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass, Moss**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **6.5 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **221**
Groundwater Level: **Not Encountered**	Sampling Method(s)	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows** Project Number: **2022-007-2** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: TP-9

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass, Moss**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **6 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **222**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
18" topsoil	
Brown GRAVEL with some sand and silt, medium dense, moist	
Gray GRAVEL with some sand and trace silt, medium dense, moist	
Contains sand lenses	2% moisture
Test Pit terminated at 6'	

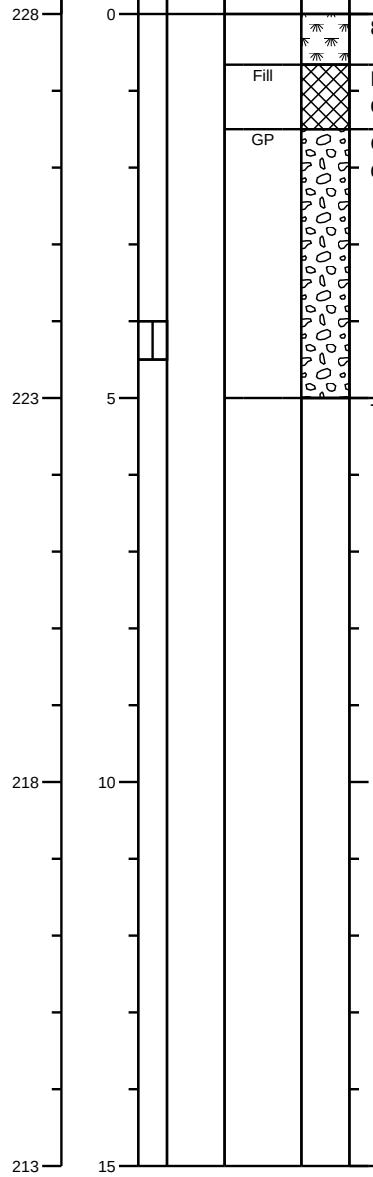
The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-2**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: TP-10

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **5 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **228**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
8" topsoil	
Brown GRAVEL with some sand and trace silt, medium dense, moist (Fill)	
Gray GRAVEL with some sand and trace silt, medium dense, moist	3% moisture
Test Pit terminated at 5'	

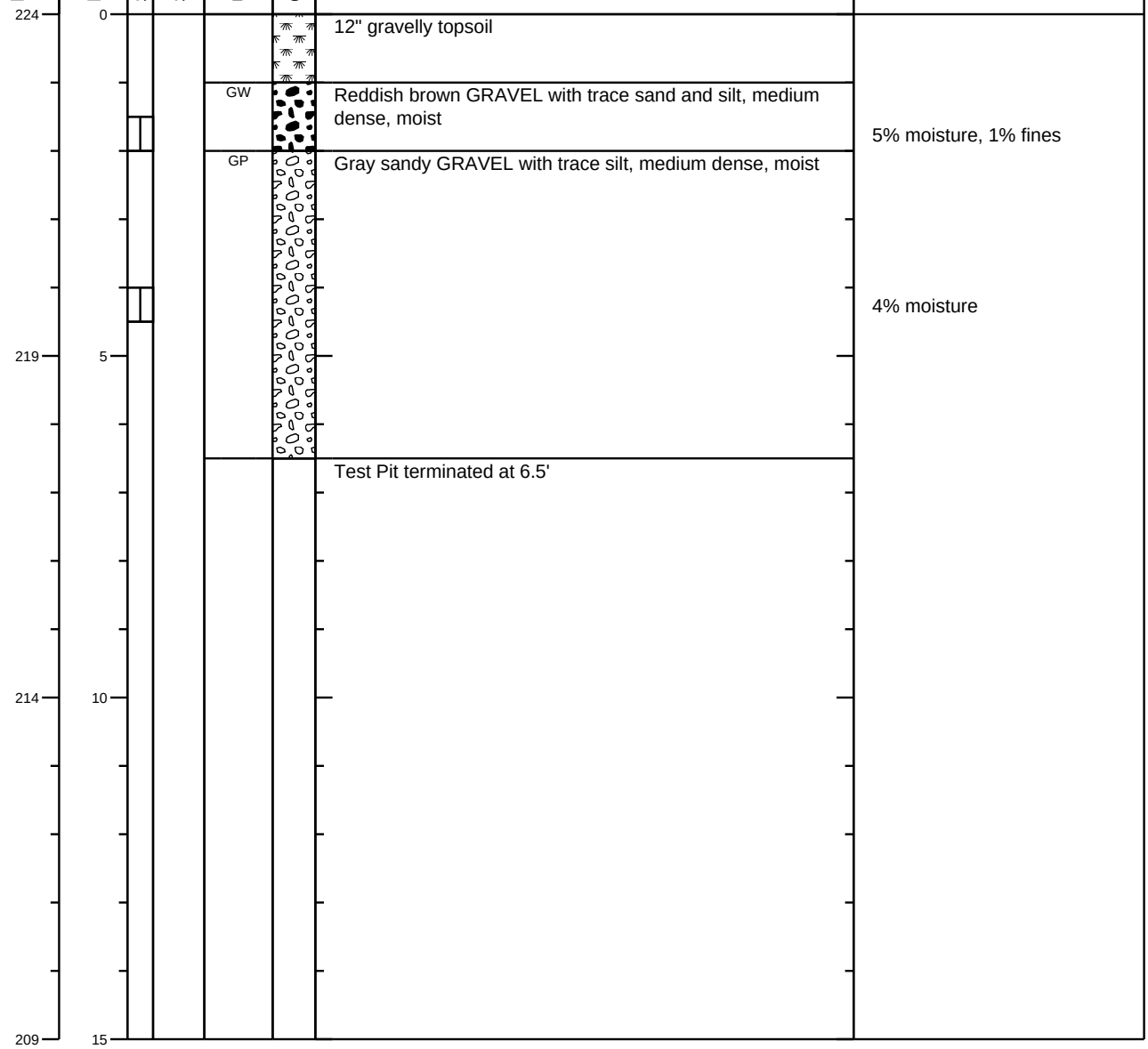
The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-2**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: TP-11

Date(s) Excavated: **2/3/2022**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **6.5 feet bgs**
Excavator Type: **Tracked Excavator**	Excavating Contractor: **Client Provided**	Approximate Surface Elevation **224**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **8322 Steilacoom Road Southeast, Lacey, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**

Project Number: **2022-007-2**

Client: **D.R. Horton**

RILEYGROUP

Key to Logs

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

COLUMN DESCRIPTIONS

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

FIELD AND LABORATORY TEST ABBREVIATIONS

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

MATERIAL GRAPHIC SYMBOLS


AF


Silty GRAVEL (GM)


Poorly graded GRAVEL (GP)


Poorly graded GRAVEL with Silt (GP-GM)


Well graded GRAVEL (GW)


Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS


Auger sampler


Bulk Sample


3-inch-OD California w/ brass rings


CME Sampler


Grab Sample


2.5-inch-OD Modified California w/ brass liners


Pitcher Sample


2-inch-OD unlined split spoon (SPT)


Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS


Water level (at time of drilling, ATD)


Water level (after waiting, AW)


Minor change in material properties within a stratum

Inferred/gradational contact between strata

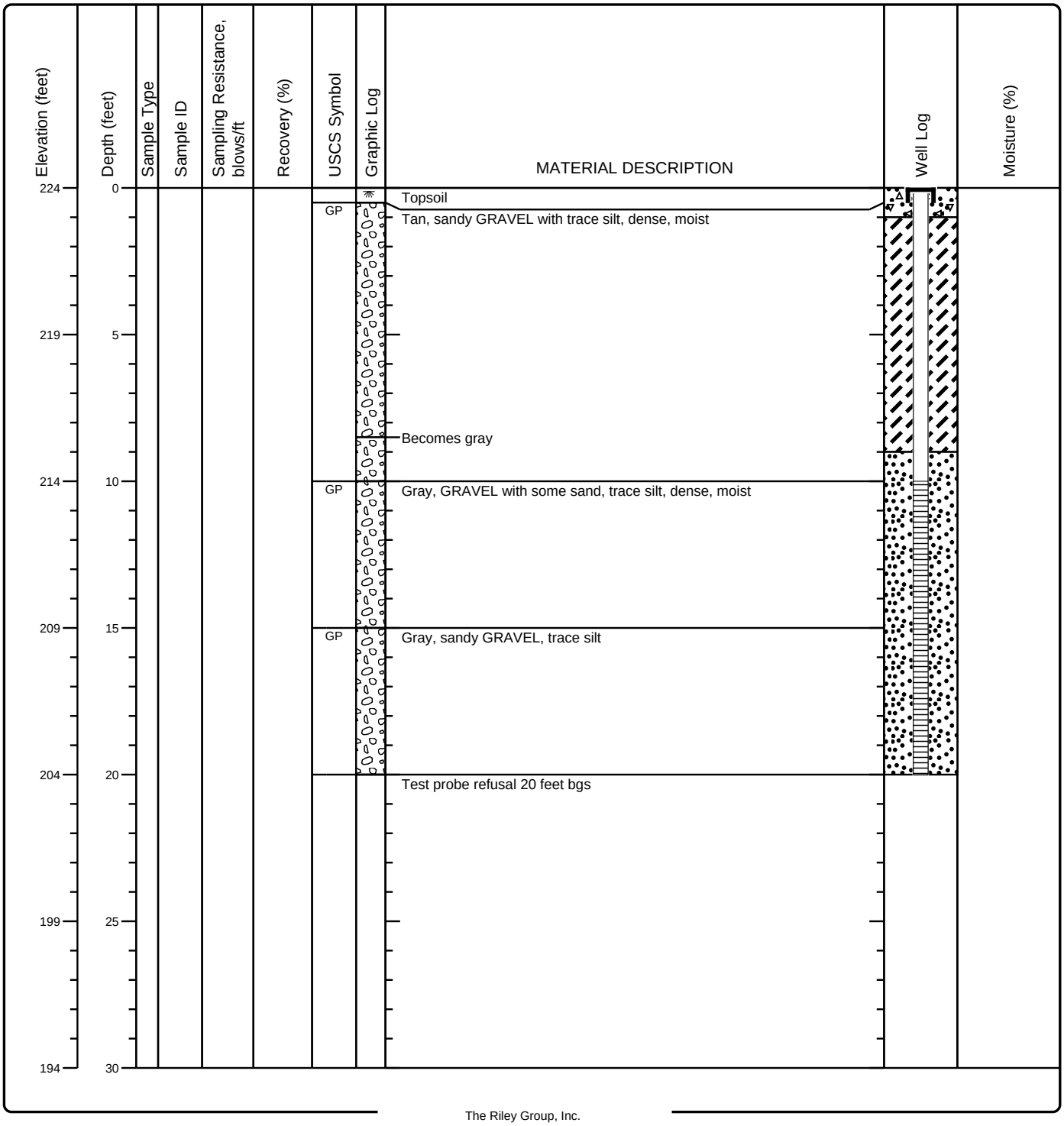
Queried contact between strata

GENERAL NOTES

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

Project Name: **Morel Meadows** Project Number: **2022-007-1** Client: **DR Horton**	RILEYGROUP Boring No.: **MW-1** **Sheet 1 of 1**

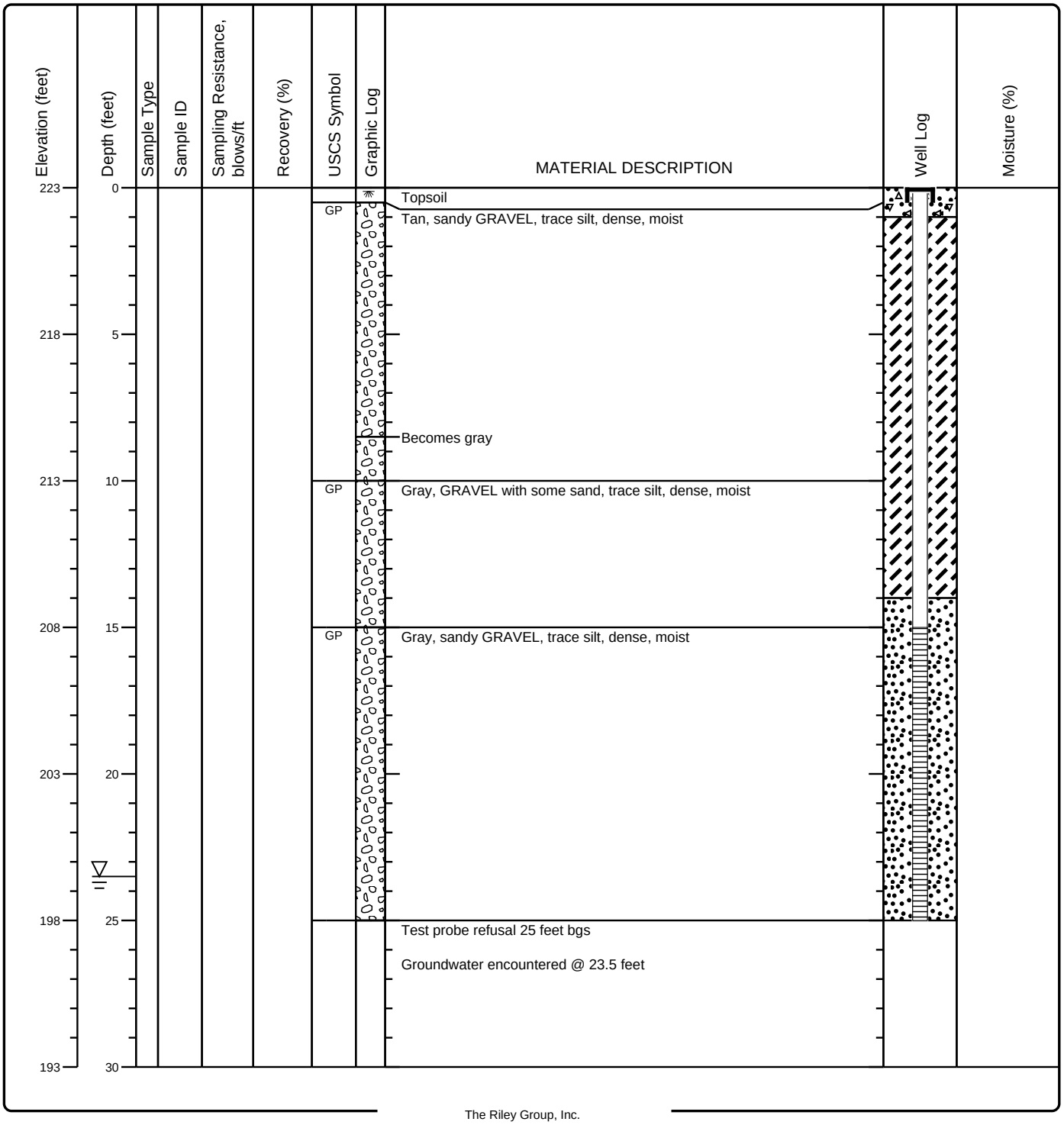
Date(s) Drilled: **01/20/22**	Logged By: **JH**	Surface Conditions: **Grass**
Drilling Method(s): **Geoprobe**	Drill Bit Size/Type: **2.25"**	Total Depth of Borehole: **20 feet bgs**
Drill Rig Type: **Geoprobe 7730 DT**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **224**
Groundwater Level: **Not Encountered**	Sampling Method(s):	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **8322 Steilacoom Road Southeast, Lacey, Washington 98513**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows** Project Number: **2022-007-1** Client: **DR Horton**	RILEYGROUP Boring No.: **MW-2** **Sheet 1 of 1**

Date(s) Drilled: **01/20/22**	Logged By: **JH**	Surface Conditions: **Grass**
Drilling Method(s): **Geoprobe**	Drill Bit Size/Type: **2.25"**	Total Depth of Borehole: **25 feet bgs**
Drill Rig Type: **Geoprobe 7730 DT**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **223**
Groundwater Level: **23.5'**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Native Soil**	Location: **8322 Steilacoom Road Southeast, Lacey, Washington 98513**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**

Project Number: **2022-007-1**

Client: **DR Horton**

RILEYGROUP

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Well Log	Moisture (%)
1	2	3	4	5	6	7	8	9	10	11

COLUMN DESCRIPTIONS

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

FIELD AND LABORATORY TEST ABBREVIATIONS

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

MATERIAL GRAPHIC SYMBOLS

Bentonite chips

Portland Cement Concrete

Poorly graded GRAVEL (GP)

Poorly graded SAND (SP)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler

Bulk Sample

3-inch-OD California w/ brass rings

CME Sampler

Grab Sample

2.5-inch-OD Modified California w/ brass liners

Pitcher Sample

2-inch-OD unlined split spoon (SPT)

Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)

Water level (after waiting, AW)

Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

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

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

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

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

PROJECT TITLE	Morel Meadows	**SAMPLE ID/TYPE**	TP-1
PROJECT NO.	2022-007-2	**SAMPLE DEPTH**	2.5'
TECH/TEST DATE	CM/EW 2/10/2022	**DATE RECEIVED**	2/4/2022

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	848.8
Wt Dry Soil & Tare (gm)	(w2)	825.4
Weight of Tare (gm)	(w3)	133.3
Weight of Water (gm)	(w4=w1-w2)	23.4
Weight of Dry Soil (gm)	(w5=w2-w3)	692.1
Moisture Content (%)	(w4/w5)*100	3

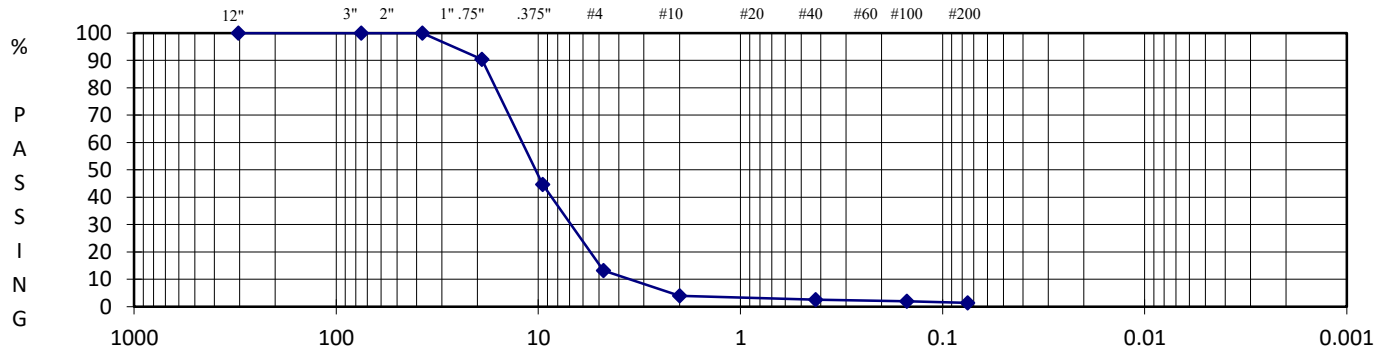
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		825.4
Tare Weight (gm)		133.3
(W6) Total Dry Weight (gm)		692.1

% COBBLES	**0.0**
% C GRAVEL	**9.6**
% F GRAVEL	**77.2**
% C SAND	**9.3**
% M SAND	**1.4**
% F SAND	**1.1**
% FINES	**1.4**
% TOTAL	**100.0**
D10 (mm)	3.4
D30 (mm)	6.9
D60 (mm)	13
Cu	3.8
Cc	1.1

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	133.3	0.00	0.00	100.00	cobbles
3.0"	133.3	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	133.3	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	200.0	66.70	9.64	90.36	fine gravel
0.50"					fine gravel
0.375"	516.2	382.90	55.32	44.68	fine gravel
#4	734.0	600.70	86.79	13.21	coarse sand
#10	798.1	664.80	96.06	3.94	medium sand
#20					medium sand
#40	807.9	674.60	97.47	2.53	fine sand
#60					fine sand
#100	811.6	678.30	98.01	1.99	fine sand
#200	815.6	682.30	98.58	1.42	fines
PAN	825.4	692.10	100.00	0.00	silt/clay



DESCRIPTION	GRAVEL with trace sand and silt
USCS	GP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows	**SAMPLE ID/TYPE**	TP-1
PROJECT NO.	2022-007-2	**SAMPLE DEPTH**	6'
TECH/TEST DATE	CM/EW 2/10/2022	**DATE RECEIVED**	2/4/2022

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	885.6
Wt Dry Soil & Tare (gm)	(w2)	861.5
Weight of Tare (gm)	(w3)	76.4
Weight of Water (gm)	(w4=w1-w2)	24.1
Weight of Dry Soil (gm)	(w5=w2-w3)	785.1
Moisture Content (%)	(w4/w5)*100	3

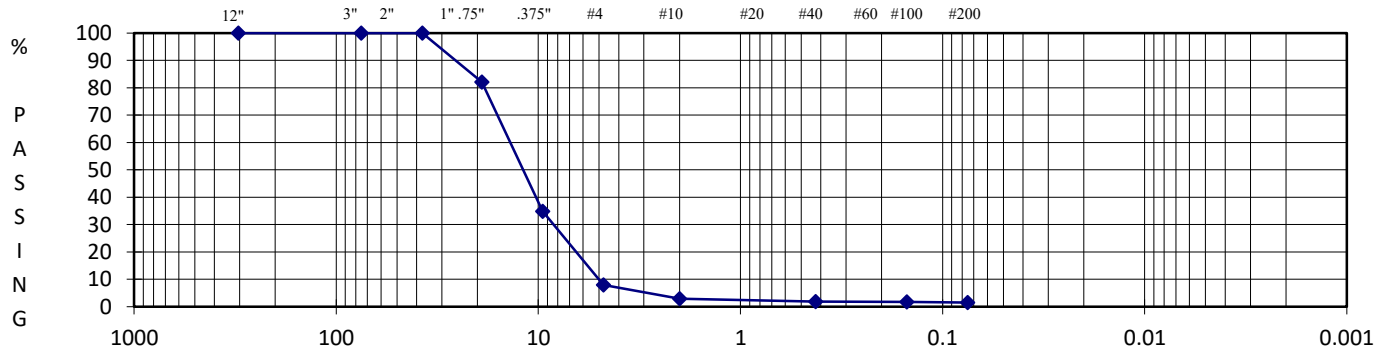
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		861.5
Tare Weight (gm)		76.4
(W6) Total Dry Weight (gm)		785.1

% COBBLES	**0.0**
% C GRAVEL	**17.9**
% F GRAVEL	**74.1**
% C SAND	**5.1**
% M SAND	**1.1**
% F SAND	**0.3**
% FINES	**1.5**
% TOTAL	**100.0**
D10 (mm)	4.9
D30 (mm)	8.5
D60 (mm)	15
Cu	3.1
Cc	1.0

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	76.4	0.00	0.00	100.00	cobbles
3.0"	76.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	76.4	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	217.2	140.80	17.93	82.07	fine gravel
0.50"					fine gravel
0.375"	587.6	511.20	65.11	34.89	fine gravel
#4	798.8	722.40	92.01	7.99	coarse sand
#10	838.7	762.30	97.10	2.90	medium sand
#20					medium sand
#40	847.0	770.60	98.15	1.85	fine sand
#60					fine sand
#100	848.2	771.80	98.31	1.69	fine sand
#200	849.5	773.10	98.47	1.53	fines
PAN	861.5	785.10	100.00	0.00	silt/clay



DESCRIPTION GRAVEL with trace sand and silt

USCS GP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows	**SAMPLE ID/TYPE**	TP-1
PROJECT NO.	2022-007-2	**SAMPLE DEPTH**	8.5'
TECH/TEST DATE	CM/EW 2/10/2022	**DATE RECEIVED**	2/4/2022

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	780.6
Wt Dry Soil & Tare (gm)	(w2)	760.9
Weight of Tare (gm)	(w3)	125.5
Weight of Water (gm)	(w4=w1-w2)	19.7
Weight of Dry Soil (gm)	(w5=w2-w3)	635.4
Moisture Content (%)	(w4/w5)*100	3

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

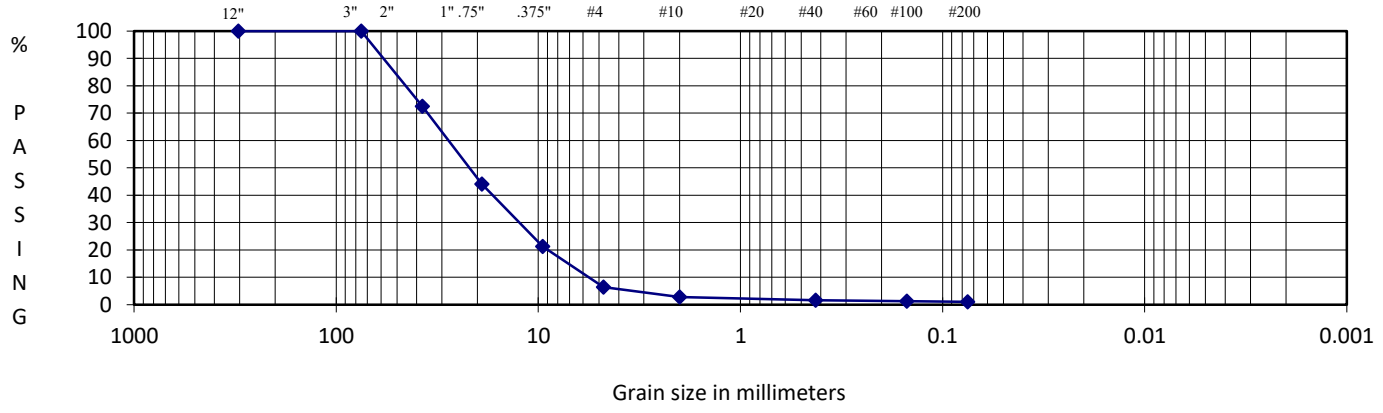
Weight Of Sample (gm)		760.9
Tare Weight (gm)		125.5
(W6) Total Dry Weight (gm)		635.4

% COBBLES	**0.0**
% C GRAVEL	**55.9**
% F GRAVEL	**37.7**
% C SAND	**3.7**
% M SAND	**1.2**
% F SAND	**0.5**
% FINES	**1.1**
% TOTAL	**100.0**

D10 (mm)	5.7
D30 (mm)	13
D60 (mm)	28
Cu	4.9
Cc	1.1

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	125.5	0.00	0.00	100.00	cobbles
3.0"	125.5	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	300.5	175.00	27.54	72.46	coarse gravel
1.0"					coarse gravel
0.75"	480.7	355.20	55.90	44.10	fine gravel
0.50"					fine gravel
0.375"	625.4	499.90	78.67	21.33	fine gravel
#4	720.2	594.70	93.59	6.41	coarse sand
#10	743.4	617.90	97.25	2.75	medium sand
#20					medium sand
#40	750.8	625.30	98.41	1.59	fine sand
#60					fine sand
#100	752.6	627.10	98.69	1.31	fine sand
#200	754.0	628.50	98.91	1.09	fines
PAN	760.9	635.40	100.00	0.00	silt/clay



DESCRIPTION	GRAVEL with trace sand and silt
USCS	GW

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows	**SAMPLE ID/TYPE**	TP-5
PROJECT NO.	2022-007-2	**SAMPLE DEPTH**	2'
TECH/TEST DATE	CM/EW 2/10/2022	**DATE RECEIVED**	2/4/2022

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	886.7
Wt Dry Soil & Tare (gm)	(w2)	819.1
Weight of Tare (gm)	(w3)	16.0
Weight of Water (gm)	(w4=w1-w2)	67.6
Weight of Dry Soil (gm)	(w5=w2-w3)	803.1
Moisture Content (%)	(w4/w5)*100	8

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

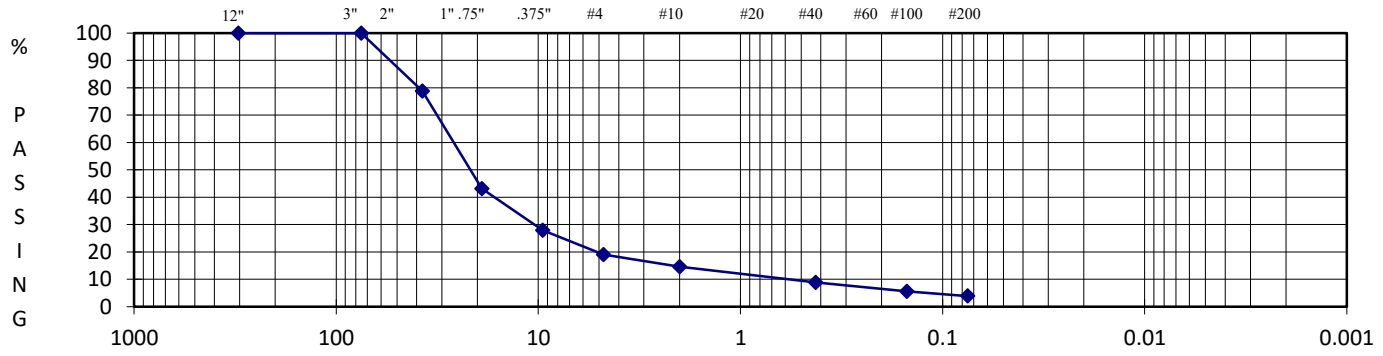
Weight Of Sample (gm)		819.1
Tare Weight (gm)		16.0
Total Dry Weight (gm)	(W6)	803.1

% COBBLES	**0.0**
% C GRAVEL	**56.8**
% F GRAVEL	**24.1**
% C SAND	**4.4**
% M SAND	**5.8**
% F SAND	**4.9**
% FINES	**3.9**
% TOTAL	**100.0**

D10 (mm)	0.6
D30 (mm)	10
D60 (mm)	27
Cu	45.0
Cc	6.2

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.0	0.00	0.00	100.00	cobbles
3.0"	16.0	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	186.3	170.30	21.21	78.79	coarse gravel
1.0"					coarse gravel
0.75"	472.4	456.40	56.83	43.17	fine gravel
0.50"					fine gravel
0.375"	594.6	578.60	72.05	27.95	fine gravel
#4	666.0	650.00	80.94	19.06	coarse sand
#10	701.4	685.40	85.34	14.66	medium sand
#20					medium sand
#40	747.8	731.80	91.12	8.88	fine sand
#60					fine sand
#100	774.3	758.30	94.42	5.58	fine sand
#200	787.4	771.40	96.05	3.95	fines
PAN	819.1	803.10	100.00	0.00	silt/clay



DESCRIPTION	GRAVEL with some sand and trace silt
USCS	GP

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows	**SAMPLE ID/TYPE**	TP-11
PROJECT NO.	2022-007-2	**SAMPLE DEPTH**	1.5'
TECH/TEST DATE	CM/EW 2/10/2022	**DATE RECEIVED**	2/4/2022

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	785.0
Wt Dry Soil & Tare (gm)	(w2)	751.1
Weight of Tare (gm)	(w3)	16.1
Weight of Water (gm)	(w4=w1-w2)	33.9
Weight of Dry Soil (gm)	(w5=w2-w3)	735.0
Moisture Content (%)	(w4/w5)*100	5

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

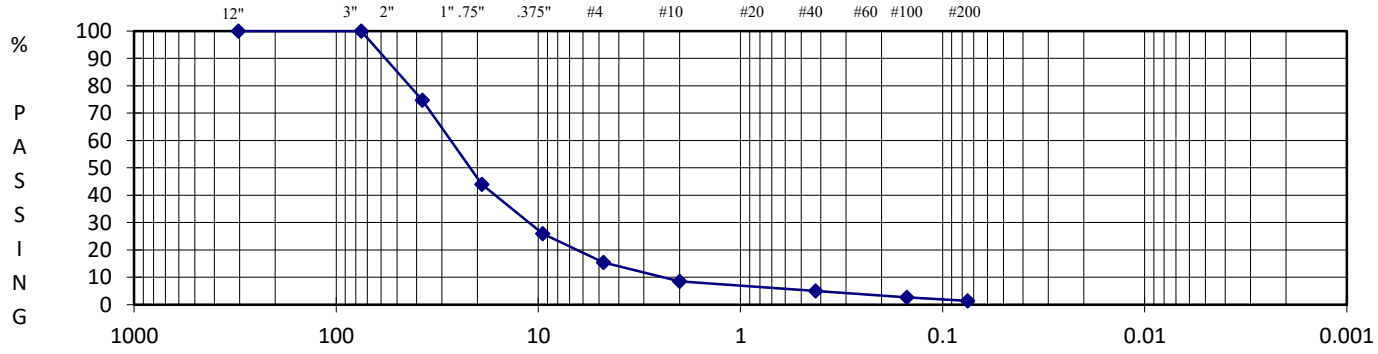
Weight Of Sample (gm)		751.1
Tare Weight (gm)		16.1
(W6) Total Dry Weight (gm)		735.0

% COBBLES	**0.0**
% C GRAVEL	**56.0**
% F GRAVEL	**28.6**
% C SAND	**6.8**
% M SAND	**3.6**
% F SAND	**3.6**
% FINES	**1.4**
% TOTAL	**100.0**

D10 (mm)	2.3
D30 (mm)	11
D60 (mm)	28
Cu	12.2
Cc	1.9

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.1	0.00	0.00	100.00	cobbles
3.0"	16.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	202.1	186.00	25.31	74.69	coarse gravel
1.0"					coarse gravel
0.75"	427.9	411.80	56.03	43.97	fine gravel
0.50"					fine gravel
0.375"	560.7	544.60	74.10	25.90	fine gravel
#4	637.9	621.80	84.60	15.40	coarse sand
#10	688.2	672.10	91.44	8.56	medium sand
#20					medium sand
#40	714.6	698.50	95.03	4.97	fine sand
#60					fine sand
#100	731.8	715.70	97.37	2.63	fine sand
#200	740.8	724.70	98.60	1.40	fines
PAN	751.1	735.00	100.00	0.00	silt/clay



DESCRIPTION	GRAVEL with trace sand and silt
USCS	GW

Prepared For:
D.R. Horton

Reviewed By:
ELW

RILEYGROUP

September 18, 2023

Raelyn Hulquist
D.R. Horton
11241 Slater Avenue NE, Suite 200
Kirkland, Washington 98034

RE: Preliminary Infiltration Exploration
Proposed Morel Meadows
8322 Steilacoom Road Southeast
Lacey, Washington
RGI Job No. 2022-007-4

Dear Raelyn Hulquist,

As requested, The Riley Group, Inc. (RGI) is pleased to present this report documenting the preliminary infiltration exploration and recommended preliminary design rates for the Morel Meadows site. The site is located at 8322 Steilacoom Road Southeast in Lacey, Washington as shown on Figure 1.

RGI understands that the plans to develop the property include a multiple lot residential plat with associated stormwater facilities, utilities, roadways, and landscape areas.

Exploration Pits and Sample Collection

RGI oversaw the advancement of seven exploration pits at locations corresponding to bioretention cells and infiltration ponds proposed for the Morel Meadows development. The locations of the exploration pits are shown on Figure 2. The pits were advanced on September 5 and September 6, 2023. The pits were advanced using a trackhoe owned and operated by RPD.

Pits TP-12 through TP-18 were excavated to depths of 11 to 19 feet below existing ground surface. At each pit, samples were collected at elevations corresponding to the designed depth of the infiltration ponds and bioretention cells proposed at the site. Exploration pits were advanced to depths of 10 feet below the design elevation of the proposed pond bottoms. Samples were collected via grab method every 2 to 3 feet and transferred to sealed containers which were later transported to our lab for sieve testing. Soils encountered in the exploration pits generally consisted of sands and gravels with variable silt content. No groundwater was encountered in the test pits.

Groundwater

Based on previous monitoring completed at the site and readings taken by the environmental consultant, we expect high groundwater will be near elevation 195 feet on the norther portion to elevation 200 feet on the south portion. Additional groundwater monitoring will be completed for the new proposed pond locations over the next wet season.

Sieve Testing

RGI sieved samples collected from the exploration pits from elevations corresponding to the proposed pond bottoms per preliminary design documents provided by Hatton Godat Pantier. Additionally, RGI sieved the samples collected immediately below the design pond bottom,

usually 2 to 3 feet below the pond bottom elevations. Based on the sieve testing and analysis using the grain size method, preliminary infiltration rates of 20 inches per hour for the ponds and biofiltration cells of 20 inches per hour may be used with the exception of the northeast pond where 9 inches per hour may be used. Additional pilot infiltration testing will be completed in the wet season for the proposed ponds.

Limitations

This report is the property of RGI, D.R. Horton, and its designated agents. Within the limits of the scope and budget, the preliminary infiltration exploration was completed in accordance with generally accepted geotechnical engineering practices in the area at the time this report was issued. This report is intended for specific application to the proposed Morel Meadows site in Lacey, Washington, and for the exclusive use of D.R. Horton and its authorized representatives.

Please call us at (425) 415-0551 if you have any questions or need additional information.

Respectfully submitted,

THE RILEY GROUP, INC.

State of Washington 21034858 Licensed Geologist

09/18/2023

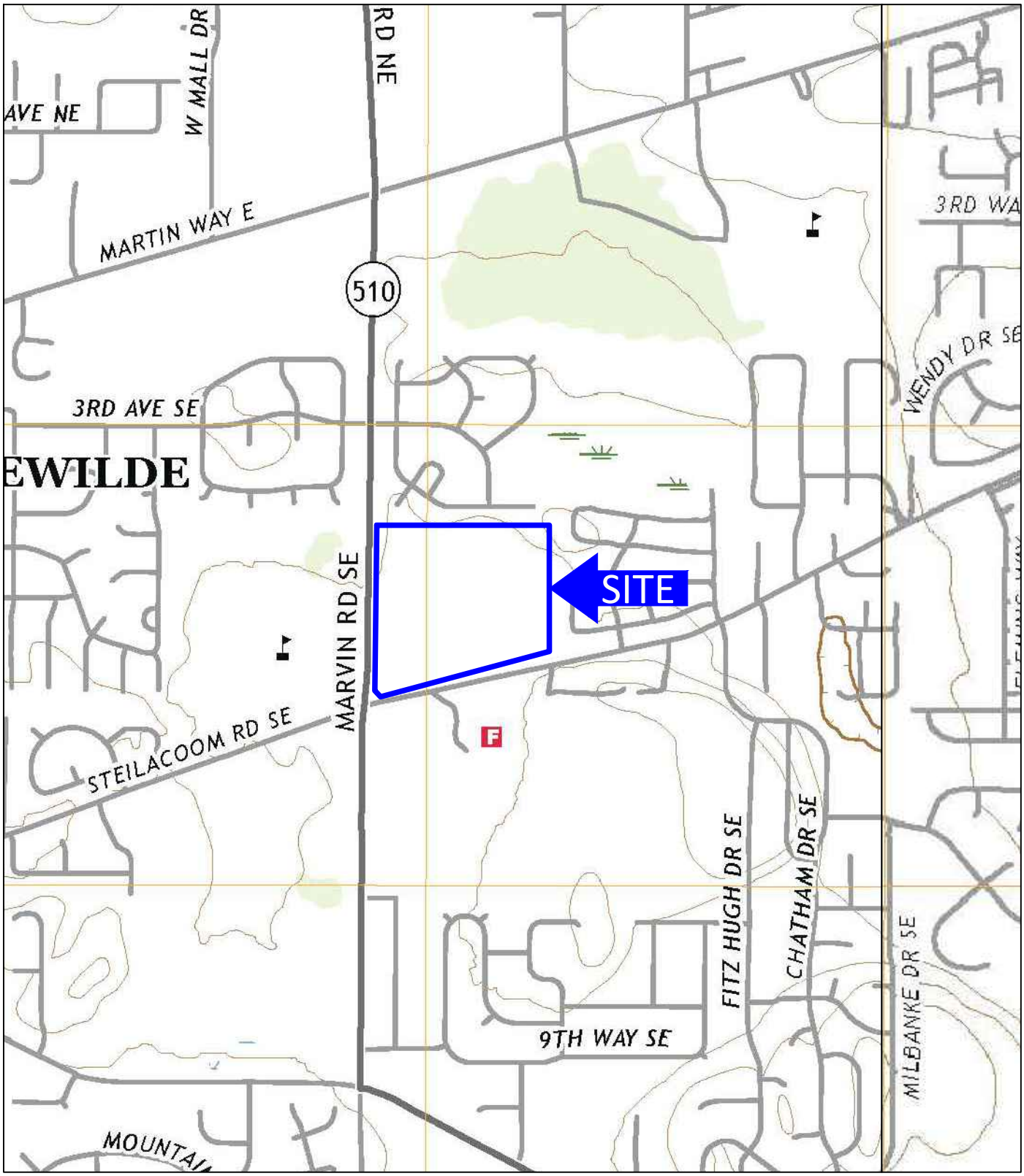
Angela L. Gelfer, LG
Project Geologist II

KRISTINA MARIE WELLER STATE OF WASHINGTON 33182 REGISTERED PROFESSIONAL ENGINEER

09/18/2023

Kristina M. Weller, PE
Principal Geotechnical Engineer

Attachments: Figure 1 Site Vicinity Map
Figure 2 Geotechnical Exploration Plan
Exploration Pit logs
Laboratory Testing results



USGS, 2020, Nisqually, Washington
USGS, 2020, Lacey, Washington
7.5-Minute Quadrangle

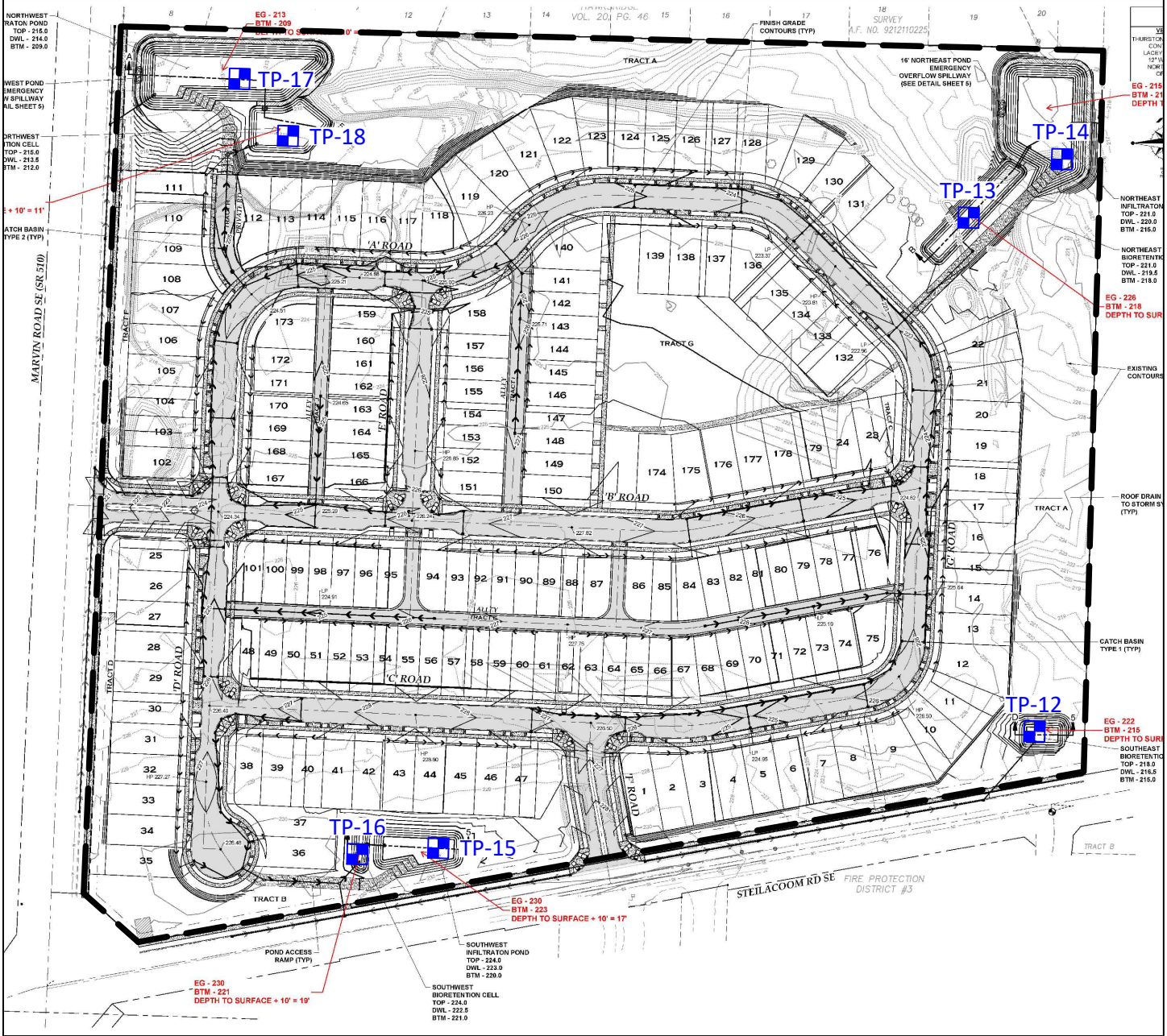
Approximate Scale: 1"=1000'

0 500 1000 2000

N

RILEYGROUP
Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Morel Meadows		Figure 1
RGI Project Number: 2022-007-4	Site Vicinity Map	Date Drawn: 09/2023
Address: 8322 Steilacoom Road Southeast, Lacey, Washington 98513		



= Test pit locations by RGI, 09/05/2023

= Site boundary

Approximate Scale: 1"=200'

0 100 200 400

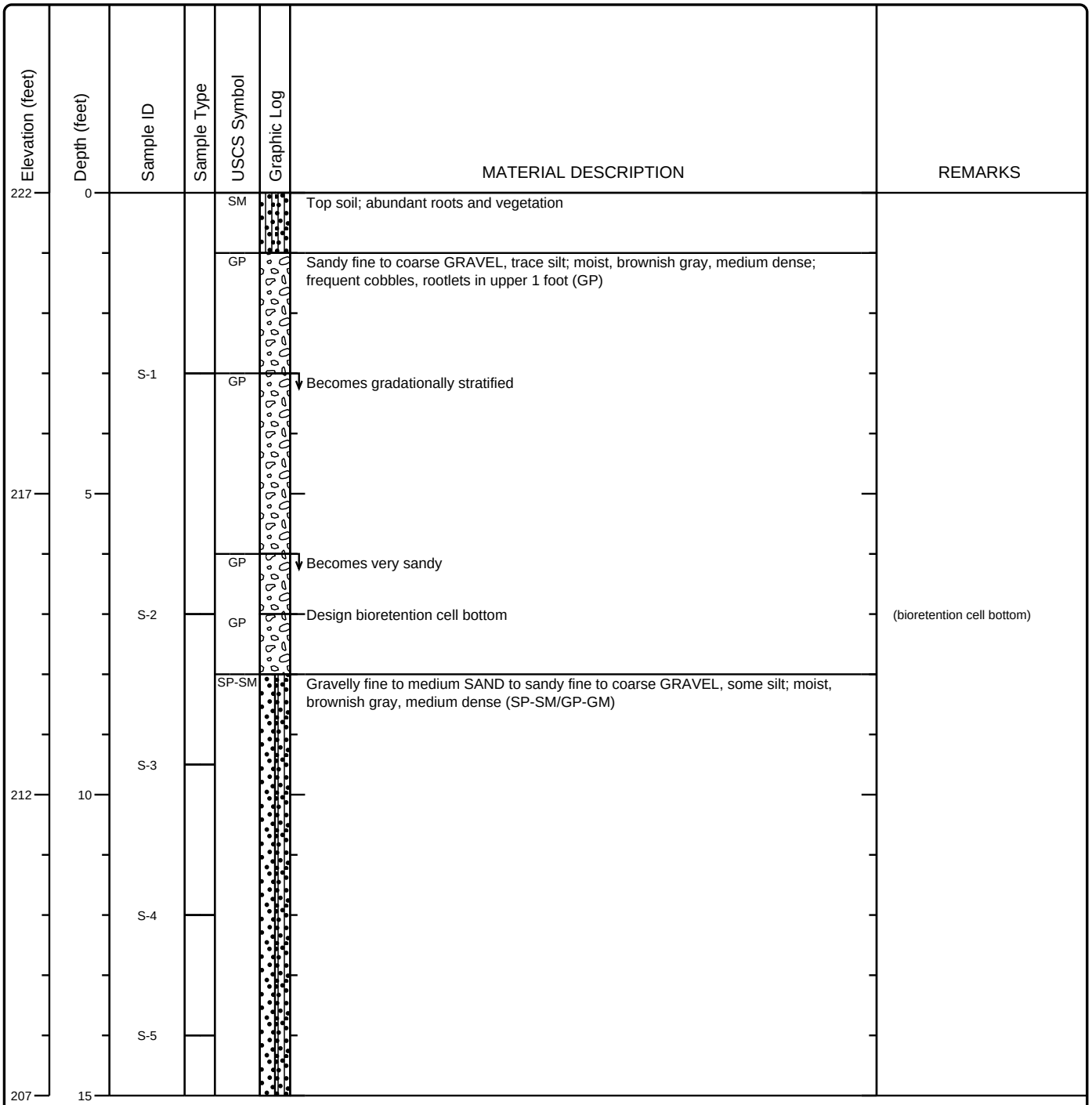
N

Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone: 425.415.0551
Fax: 425.415.0311

Morel Meadows		Figure 2
RGI Project Number: 2022-007-4	Geotechnical Exploration Plan	Date Drawn: 09/2023
Address: 8322 Steilacoom Road Southeast, Lacey, Washington 98513		

Project Name: **Morel Meadows**	Test Pit No.: **TP-12**
Project Number: **2022-007-4**	**Sheet 1 of 2**
Client: **D.R. Horton**	

Date(s) Excavated: **9/5/2023**	Logged By: **ALG**	Surface Conditions: **Forested**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **17**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **222'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **SE Bioretention cell**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-4**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: **TP-12**
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
207	15			SP-SM		Gravelly fine to medium SAND to sandy fine to coarse GRAVEL, some silt; moist, brownish gray, medium dense (SP-SM/GP-GM)	
		S-6		SP-SM		Bottom of hole (17'). No caving. No groundwater.	
202	20						
197	25						
192	30						

Project Name: **Morel Meadows** Project Number: **2022-007-4** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: **TP-13** **Sheet 1 of 2**

Date(s) Excavated: **9/5/2023**	Logged By: **ALG**	Surface Conditions: **Forested**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **17**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **224'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **NE Bioretention cell**	

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
224	0			SM		Silty, gravelly fine to medium SAND; moist, brown, loose; frequent rootlets and fill debris (concrete) (SM)	
				SM		Remnant top soil layer	
		S-1		SM		Silty fine SAND, some gravel; moist, dark brown, loose; organic odor (SM)	
219	5						
		S-2		SP		Gravelly fine to coarse SAND, trace to some silt; moist, grayish brown, medium dense; design bioretention cell bottom (SP/SP-SM)	(bioretention cell bottom)
				GP-GM		Sandy fine to coarse GRAVEL, some silt; moist, grayish brown, medium dense; gravels rounded (GP-GM)	
214	10	S-3					
		S-4		SP		Gravelly fine to coarse SAND, trace silt; moist, grayish brown, medium dense (SP)	
209	15						

Project Name: **Morel Meadows**
Project Number: **2022-007-4**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: **TP-13**
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
209	15	S-5		SP		Gravelly fine to coarse SAND, trace silt; moist, grayish brown, medium dense (SP)	
		S-6		SP		Bottom of hole (17'). No caving. No groundwater.	
204	20						
199	25						
194	30						

Project Name: **Morel Meadows**
Project Number: **2022-007-4**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: **TP-14**
Sheet 1 of 1

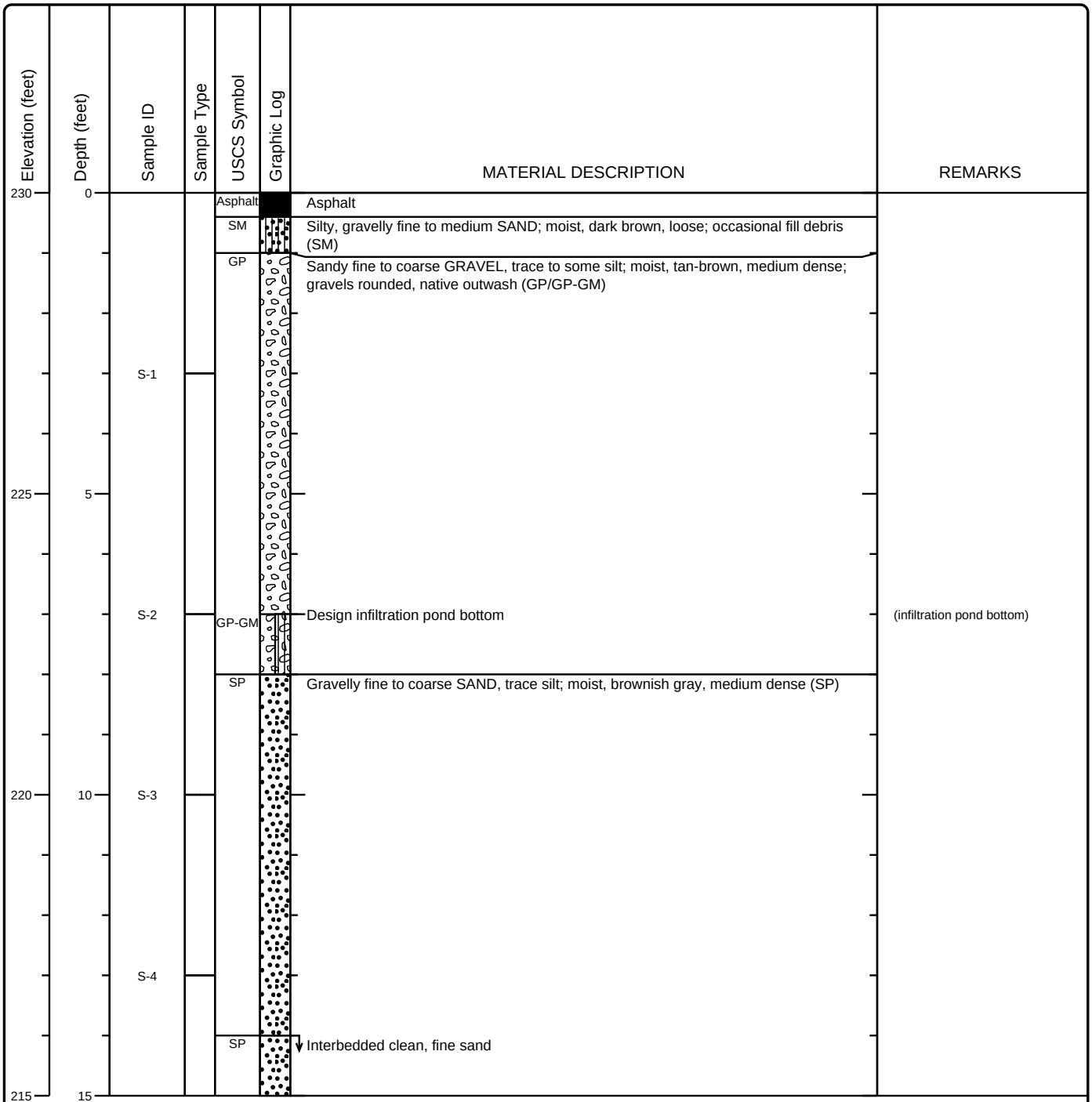
Date(s) Excavated: **9/5/2023**	Logged By: **ALG**	Surface Conditions: **Forested**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **14**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **219'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **NE Emergency Overflow Cell**	

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
219	0			SM		Top soil; frequent rootlets	
				GP-GM		Sandy fine to coarse GRAVEL. some silt; moist, light gray, loose; crushed rock and occasional fill debris (concrete), fill (GP-GM)	
		S-1					
				GP-GM		Sandy fine to coarse GRAVEL, some silt; moist, grayish brown, medium dense; occasional organics (rootlets, some woody debris in upper 6 inches), gravels rounded (GP-GM)	
		S-2		GP-GM		Design emergency overflow cell bottom	(infiltration cell bottom)
214	5						
		S-3					
				GP-GM		Occasional silty interbeds	
209	10	S-4					
		S-5		GP-GM		Bottom of hole (14'). No caving. No groundwater.	
204	15						

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**	Test Pit No.: **TP-15**
Project Number: **2022-007-4**	**Sheet 1 of 2**
Client: **D.R. Horton**	

Date(s) Excavated: **9/5/2023**	Logged By: **ALG**	Surface Conditions: **Asphalt**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **17**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **230'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **SW Infiltration Pond**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-4**
Client: **D.R. Horton**

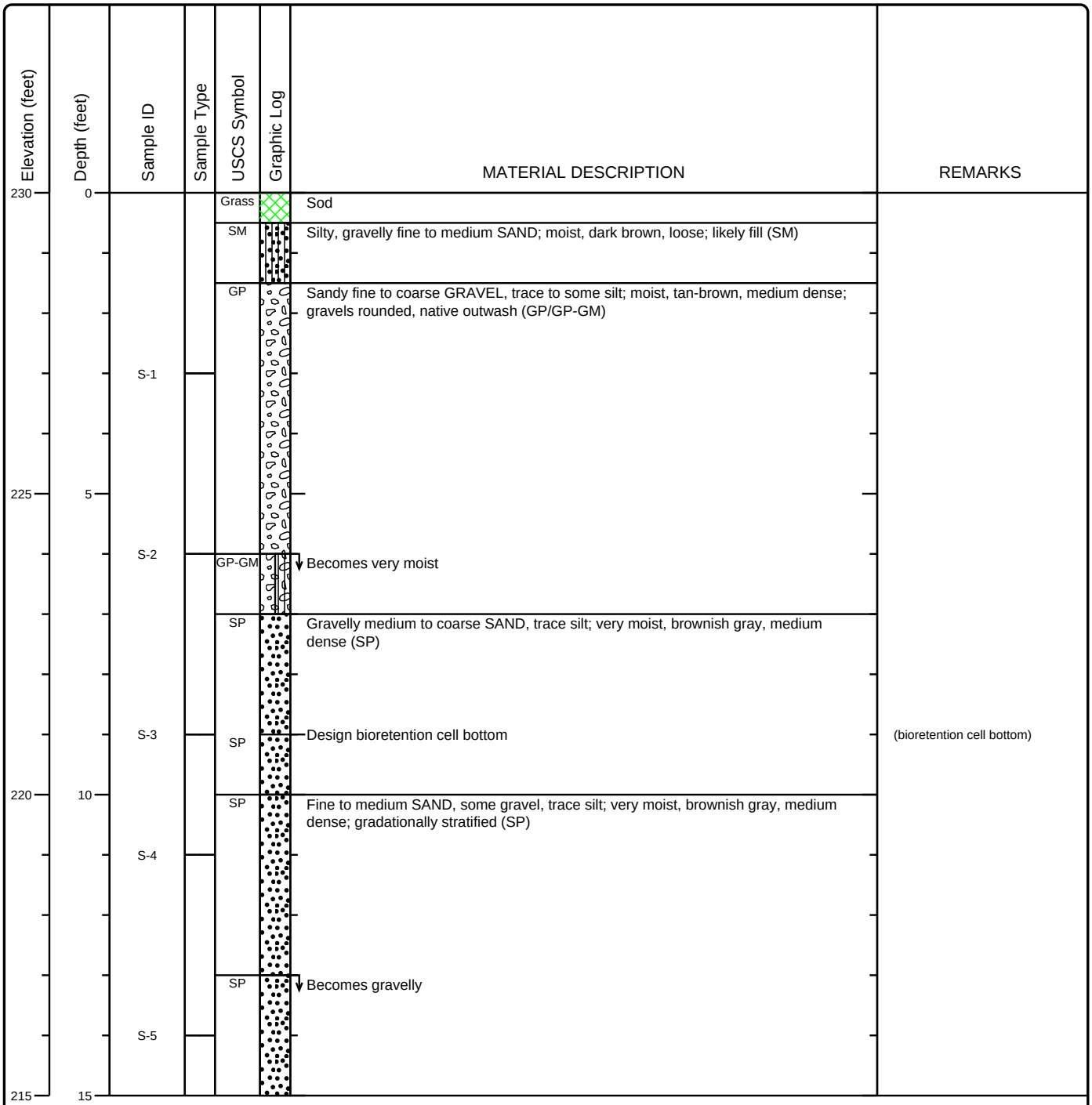
RILEYGROUP

Test Pit No.: **TP-15**
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
215	15	S-5		SP		Interbedded clean, fine sand	
		S-6		SP		Bottom of hole (17'). Heavy caving. No groundwater.	
210	20						
205	25						
200	30						

Project Name: **Morel Meadows** Project Number: **2022-007-4** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: **TP-16** **Sheet 1 of 2**

Date(s) Excavated: **9/6/2023**	Logged By: **ALG**	Surface Conditions: **Asphalt**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **19**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **230'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **SW Bioretention Cell**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-4**
Client: **D.R. Horton**

RILEYGROUP

Test Pit No.: **TP-16**
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
215	15			SP		Becomes gravelly	
		S-6					
		S-7		SP		Bottom of hole (19'). Minor caving (1'-5'). No groundwater.	
210	20						
205	25						
200	30						

Project Name: **Morel Meadows** Project Number: **2022-007-4** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: **TP-17** **Sheet 1 of 1**

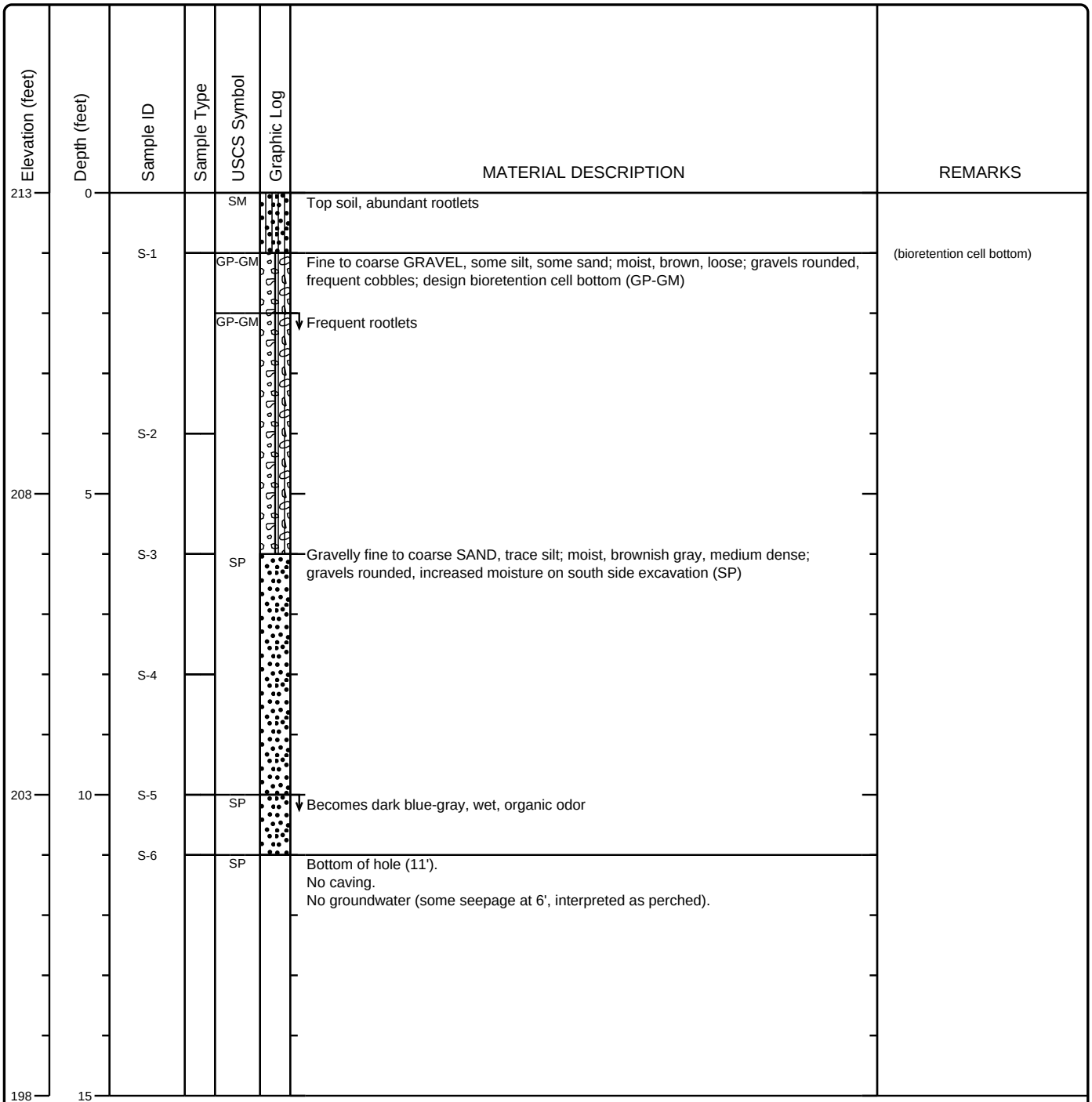
Date(s) Excavated: **9/6/2023**	Logged By: **ALG**	Surface Conditions: **Forested**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **14**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **213'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **NW Infiltration Pond**	

Elevation (feet)	Depth (feet)	Sample ID	Sample Type	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS
213	0			SM		Top soil, abundant rootlets	
				GM		Silty, sandy fine to coarse GRAVEL; moist, dark brown, loose; frequent organics (woody debris and rootlets) (SM)	
		S-1		GP-GM		Fine to coarse GRAVEL, some sand, some silt; moist, brownish-gray, medium dense; gravels rounded, native outwash (GP-GM)	
		S-2		GP-GM		Design infiltration pond bottom; abundant cobbles	(infiltration pond bottom)
208	5			GP-GM		Weak seepage from the south side of the excavation	
		S-3					
203	10	S-4		SM		Silty, gravelly, fine to medium SAND; moist, gray, medium dense; massive and unsorted (SM)	
		S-5		SM		Harder digging	
		S-6		SM		Bottom of hole (14'). No caving. No groundwater (some seepage at 6', interpreted as perched).	
198	15						

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows** Project Number: **2022-007-4** Client: **D.R. Horton**	RILEYGROUP Test Pit No.: **TP-18** **Sheet 1 of 1**

Date(s) Excavated: **9/6/2023**	Logged By: **ALG**	Surface Conditions: **Forested**
Excavation Method(s): **Excavator**	Bucket Size: **4'**	Total Depth of Excavation: **11**
Excavator Type:	Excavation Contractor: **RPD**	Approximate Surface Elevation: **213'**
Groundwater Level: **NA**	Sampling Method(s): **Grab**	Compaction Method: **bucket**
Test Pit Backfill: **spoils**	Location: **NW Bioretention Cell**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Morel Meadows**
Project Number: **2022-007-4**
Client: **D.R. Horton**

RILEYGROUP

Key to Log of Boring

Sheet 1 of 1

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

COLUMN DESCRIPTIONS

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

FIELD AND LABORATORY TEST ABBREVIATIONS

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

MATERIAL GRAPHIC SYMBOLS

Asphaltic Concrete (AC)
Grass and/or topsoil
Silty GRAVEL (GM)
Silty SAND (SM)
Poorly graded GRAVEL (GP)
Poorly graded SAND (SP)
Poorly graded GRAVEL with Silt (GP-GM)
Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

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

OTHER GRAPHIC SYMBOLS

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

GENERAL NOTES

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

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-12	
PROJECT NO.	2022-007		**Depth**	7 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	713.1
Wt Dry Soil & Tare (gm)	(w2)	698.9
Weight of Tare (gm)	(w3)	16.2
Weight of Water (gm)	(w4=w1-w2)	14.2
Weight of Dry Soil (gm)	(w5=w2-w3)	682.7
Moisture Content (%)	(w4/w5)*100	2

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

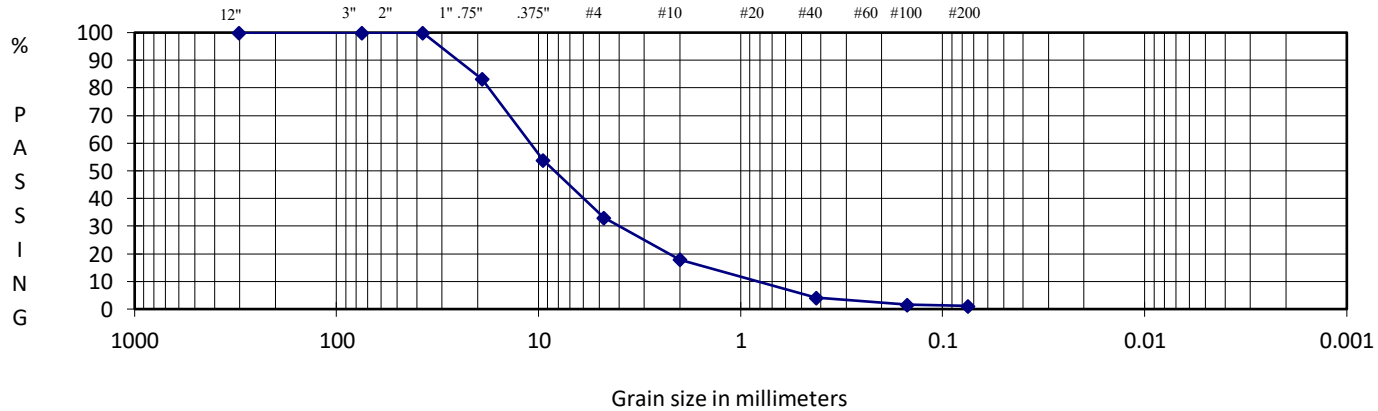
Weight Of Sample (gm)		698.9
Tare Weight (gm)		16.2
(W6) Total Dry Weight (gm)		682.7

% COBBLES	**0.0**
% C GRAVEL	**16.8**
% F GRAVEL	**50.1**
% C SAND	**15.2**
% M SAND	**13.7**
% F SAND	**3.0**
% FINES	**1.2**
% TOTAL	**100.0**

D10 (mm)	0.8
D30 (mm)	3.9
D60 (mm)	12
Cu	15.0
Cc	1.6

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.2	0.00	0.00	100.00	cobbles
3.0"	16.2	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.2	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	131.0	114.80	16.82	83.18	fine gravel
0.50"					fine gravel
0.375"	331.1	314.90	46.13	53.87	fine gravel
#4	473.2	457.00	66.94	33.06	coarse sand
#10	576.9	560.70	82.13	17.87	medium sand
#20					medium sand
#40	670.5	654.30	95.84	4.16	fine sand
#60					fine sand
#100	688.0	671.80	98.40	1.60	fine sand
#200	691.0	674.80	98.84	1.16	fines
PAN	698.9	682.70	100.00	0.00	silt/clay



DESCRIPTION Well Graded Sandy GRAVEL with trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-12	
PROJECT NO.	2022-007		**Depth**	9.5 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	649.4
Wt Dry Soil & Tare (gm)	(w2)	629.5
Weight of Tare (gm)	(w3)	16.0
Weight of Water (gm)	(w4=w1-w2)	19.9
Weight of Dry Soil (gm)	(w5=w2-w3)	613.5
Moisture Content (%)	(w4/w5)*100	3

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

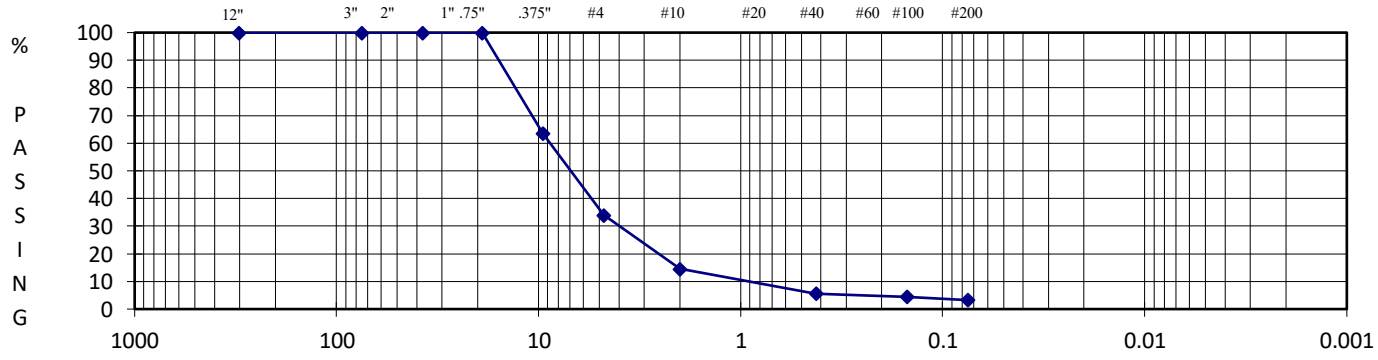
Weight Of Sample (gm)		629.5
Tare Weight (gm)		16.0
(W6) Total Dry Weight (gm)		613.5

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**66.0**
% C SAND	**19.5**
% M SAND	**8.9**
% F SAND	**2.2**
% FINES	**3.4**
% TOTAL	**100.0**

D10 (mm)	0.94
D30 (mm)	2.9
D60 (mm)	8.8
Cu	9.4
Cc	1.0

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.0	0.00	0.00	100.00	cobbles
3.0"	16.0	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.0	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	16.0	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	240.0	224.00	36.51	63.49	fine gravel
#4	420.8	404.80	65.98	34.02	coarse sand
#10	540.4	524.40	85.48	14.52	medium sand
#20					medium sand
#40	594.8	578.80	94.34	5.66	fine sand
#60					fine sand
#100	602.0	586.00	95.52	4.48	fine sand
#200	608.5	592.50	96.58	3.42	fines
PAN	629.5	613.50	100.00	0.00	silt/clay



DESCRIPTION Well Graded Sandy GRAVEL with trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-13	
PROJECT NO.	2022-007		**Depth**	6.5 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	692.8
Wt Dry Soil & Tare (gm)	(w2)	664.3
Weight of Tare (gm)	(w3)	16.0
Weight of Water (gm)	(w4=w1-w2)	28.5
Weight of Dry Soil (gm)	(w5=w2-w3)	648.3
Moisture Content (%)	(w4/w5)*100	4

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

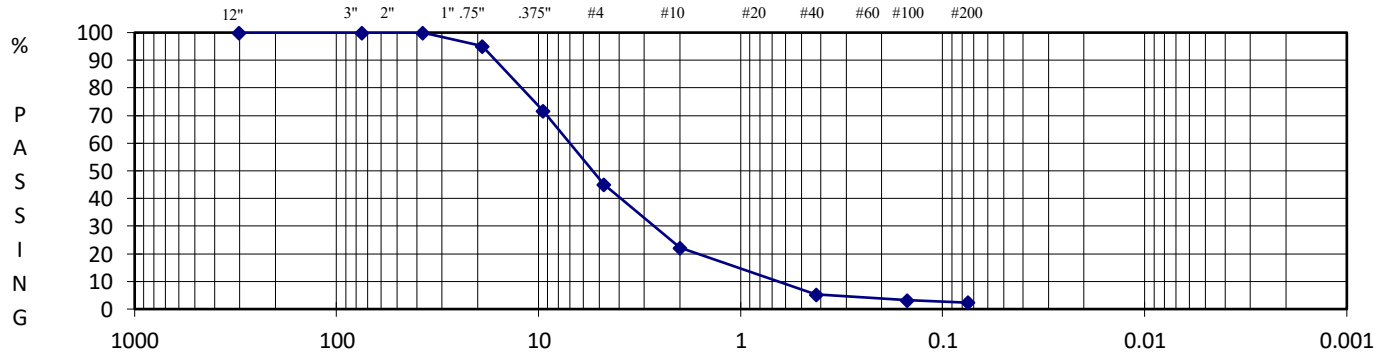
Weight Of Sample (gm)		664.3
Tare Weight (gm)		16.0
(W6) Total Dry Weight (gm)		648.3

% COBBLES	**0.0**
% C GRAVEL	**4.9**
% F GRAVEL	**50.0**
% C SAND	**22.9**
% M SAND	**16.9**
% F SAND	**2.7**
% FINES	**2.5**
% TOTAL	**100.0**

D10 (mm)	0.65
D30 (mm)	2.8
D60 (mm)	6
Cu	9.2
Cc	2.0

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.0	0.00	0.00	100.00	cobbles
3.0"	16.0	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.0	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	47.8	31.80	4.91	95.09	fine gravel
0.50"					fine gravel
0.375"	199.6	183.60	28.32	71.68	fine gravel
#4	372.1	356.10	54.93	45.07	coarse sand
#10	520.8	504.80	77.87	22.13	medium sand
#20					medium sand
#40	630.2	614.20	94.74	5.26	fine sand
#60					fine sand
#100	644.0	628.00	96.87	3.13	fine sand
#200	648.0	632.00	97.49	2.51	fines
PAN	664.3	648.30	100.00	0.00	silt/clay



DESCRIPTION Well Graded Sandy GRAVEL with trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-13	
PROJECT NO.	2022-007		**Depth**	10 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	727.5
Wt Dry Soil & Tare (gm)	(w2)	704.9
Weight of Tare (gm)	(w3)	16.1
Weight of Water (gm)	(w4=w1-w2)	22.6
Weight of Dry Soil (gm)	(w5=w2-w3)	688.8
Moisture Content (%)	(w4/w5)*100	3

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

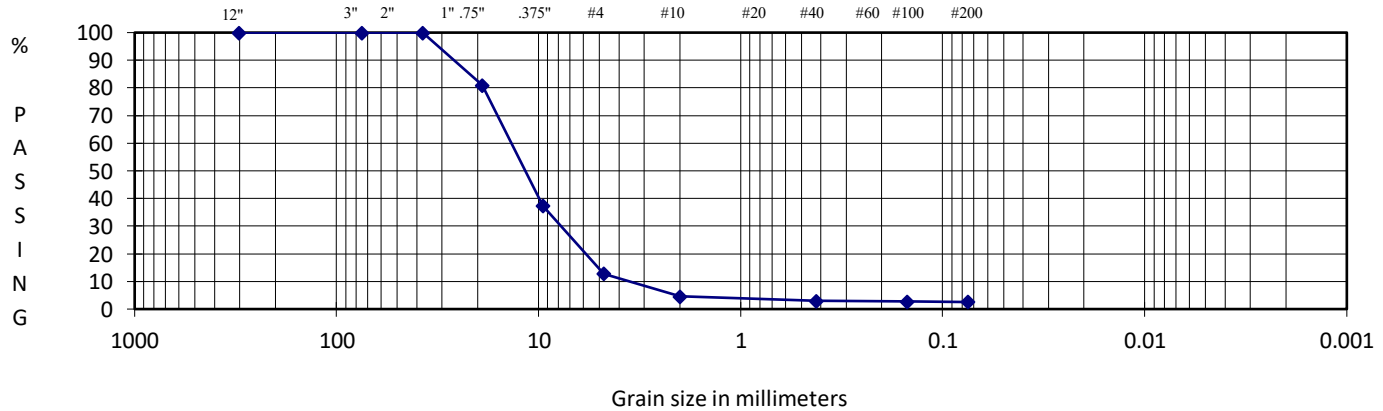
Weight Of Sample (gm)		704.9
Tare Weight (gm)		16.1
Total Dry Weight (gm)	(W6)	688.8

% COBBLES	**0.0**
% C GRAVEL	**19.1**
% F GRAVEL	**68.1**
% C SAND	**8.2**
% M SAND	**1.6**
% F SAND	**0.4**
% FINES	**2.6**
% TOTAL	**100.0**

D10 (mm)	3.5
D30 (mm)	7.8
D60 (mm)	15
Cu	4.3
Cc	1.2

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.1	0.00	0.00	100.00	cobbles
3.0"	16.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.1	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	147.4	131.30	19.06	80.94	fine gravel
0.50"					fine gravel
0.375"	448.1	432.00	62.72	37.28	fine gravel
#4	616.6	600.50	87.18	12.82	coarse sand
#10	673.1	657.00	95.38	4.62	medium sand
#20					medium sand
#40	684.4	668.30	97.02	2.98	fine sand
#60					fine sand
#100	686.1	670.00	97.27	2.73	fine sand
#200	687.0	670.90	97.40	2.60	fines
PAN	704.9	688.80	100.00	0.00	silt/clay



DESCRIPTION Well Graded GRAVEL with trace sand and trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-14	
PROJECT NO.	2022-007		**Depth**	4 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	600.9
Wt Dry Soil & Tare (gm)	(w2)	589.8
Weight of Tare (gm)	(w3)	16.0
Weight of Water (gm)	(w4=w1-w2)	11.1
Weight of Dry Soil (gm)	(w5=w2-w3)	573.8
Moisture Content (%)	(w4/w5)*100	2

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

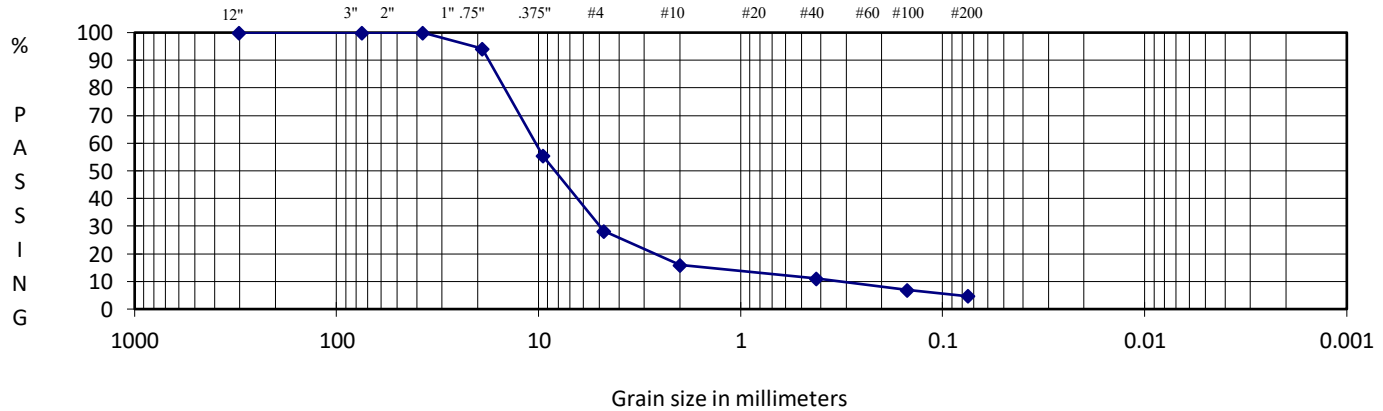
Weight Of Sample (gm)		589.8
Tare Weight (gm)		16.0
(W6) Total Dry Weight (gm)		573.8

% COBBLES	**0.0**
% C GRAVEL	**5.9**
% F GRAVEL	**65.9**
% C SAND	**12.3**
% M SAND	**4.9**
% F SAND	**6.4**
% FINES	**4.6**
% TOTAL	**100.0**

D10 (mm)	0.3
D30 (mm)	5
D60 (mm)	11
Cu	36.7
Cc	7.6

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.0	0.00	0.00	100.00	cobbles
3.0"	16.0	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.0	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	49.6	33.60	5.86	94.14	fine gravel
0.50"					fine gravel
0.375"	272.1	256.10	44.63	55.37	fine gravel
#4	427.9	411.90	71.78	28.22	coarse sand
#10	498.5	482.50	84.09	15.91	medium sand
#20					medium sand
#40	526.4	510.40	88.95	11.05	fine sand
#60					fine sand
#100	550.3	534.30	93.12	6.88	fine sand
#200	563.2	547.20	95.36	4.64	fines
PAN	589.8	573.80	100.00	0.00	silt/clay



DESCRIPTION Poorly Graded GRAVEL with some sand and trace silt

USCS GP

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-14	
PROJECT NO.	2022-007		**Depth**	7 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	668.4
Wt Dry Soil & Tare (gm)	(w2)	654.4
Weight of Tare (gm)	(w3)	16.2
Weight of Water (gm)	(w4=w1-w2)	14.0
Weight of Dry Soil (gm)	(w5=w2-w3)	638.2
Moisture Content (%)	(w4/w5)*100	2

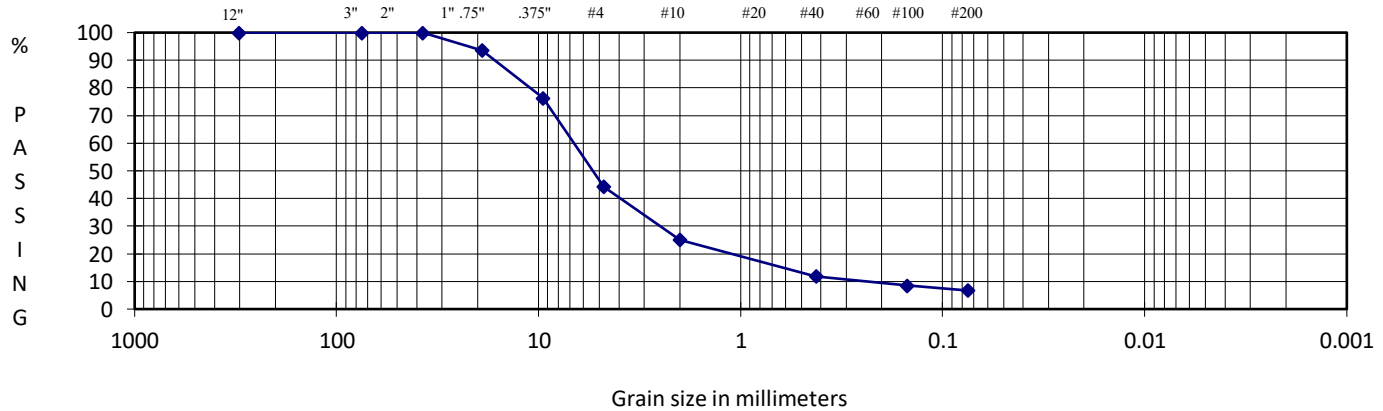
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		654.4
Tare Weight (gm)		16.2
(W6) Total Dry Weight (gm)		638.2

% COBBLES	**0.0**
% C GRAVEL	**6.4**
% F GRAVEL	**49.3**
% C SAND	**19.2**
% M SAND	**13.2**
% F SAND	**5.0**
% FINES	**6.9**
% TOTAL	**100.0**
D10 (mm)	0.25
D30 (mm)	2.5
D60 (mm)	6.7
Cu	26.8
Cc	3.7

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.2	0.00	0.00	100.00	cobbles
3.0"	16.2	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.2	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	57.2	41.00	6.42	93.58	fine gravel
0.50"					fine gravel
0.375"	167.2	151.00	23.66	76.34	fine gravel
#4	371.6	355.40	55.69	44.31	coarse sand
#10	494.4	478.20	74.93	25.07	medium sand
#20					medium sand
#40	578.4	562.20	88.09	11.91	fine sand
#60					fine sand
#100	600.3	584.10	91.52	8.48	fine sand
#200	610.3	594.10	93.09	6.91	fines
PAN	654.4	638.20	100.00	0.00	silt/clay



DESCRIPTION Poorly Graded Sandy Gravel with some silt

USCS GP-GM

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-15	
PROJECT NO.	2022-007		**Depth**	7 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	674.9
Wt Dry Soil & Tare (gm)	(w2)	658.1
Weight of Tare (gm)	(w3)	16.1
Weight of Water (gm)	(w4=w1-w2)	16.8
Weight of Dry Soil (gm)	(w5=w2-w3)	642.0
Moisture Content (%)	(w4/w5)*100	3

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

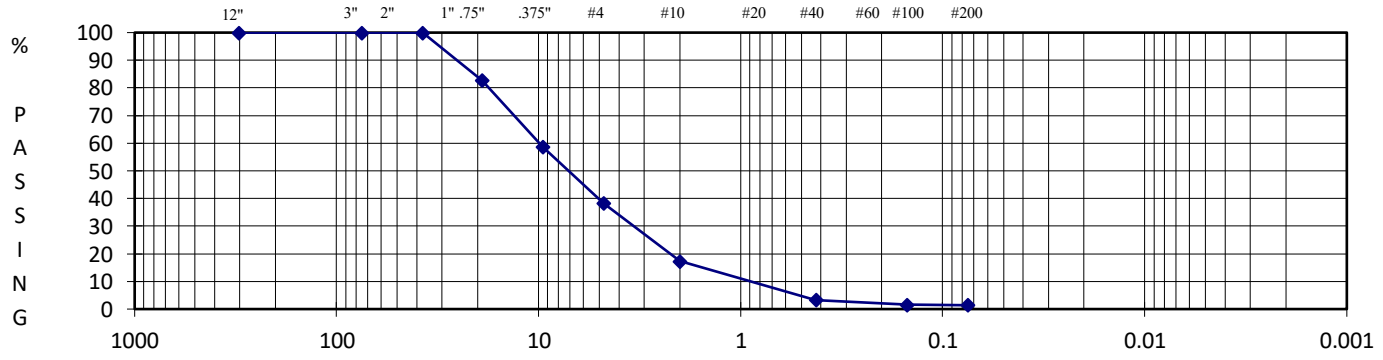
Weight Of Sample (gm)		658.1
Tare Weight (gm)		16.1
(W6) Total Dry Weight (gm)		642.0

% COBBLES	**0.0**
% C GRAVEL	**17.3**
% F GRAVEL	**44.4**
% C SAND	**21.0**
% M SAND	**13.9**
% F SAND	**1.9**
% FINES	**1.5**
% TOTAL	**100.0**

D10 (mm)	0.9
D30 (mm)	3.3
D60 (mm)	9.9
Cu	11.0
Cc	1.2

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.1	0.00	0.00	100.00	cobbles
3.0"	16.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.1	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	126.9	110.80	17.26	82.74	fine gravel
0.50"					fine gravel
0.375"	281.4	265.30	41.32	58.68	fine gravel
#4	412.2	396.10	61.70	38.30	coarse sand
#10	547.3	531.20	82.74	17.26	medium sand
#20					medium sand
#40	636.6	620.50	96.65	3.35	fine sand
#60					fine sand
#100	648.2	632.10	98.46	1.54	fine sand
#200	648.5	632.40	98.50	1.50	fines
PAN	658.1	642.00	100.00	0.00	silt/clay



DESCRIPTION	Well Graded Sandy GRAVEL with trace silt
USCS	GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-15	
PROJECT NO.	2022-007		**Depth**	10 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	560.6
Wt Dry Soil & Tare (gm)	(w2)	543.9
Weight of Tare (gm)	(w3)	16.1
Weight of Water (gm)	(w4=w1-w2)	16.7
Weight of Dry Soil (gm)	(w5=w2-w3)	527.8
Moisture Content (%)	(w4/w5)*100	3

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

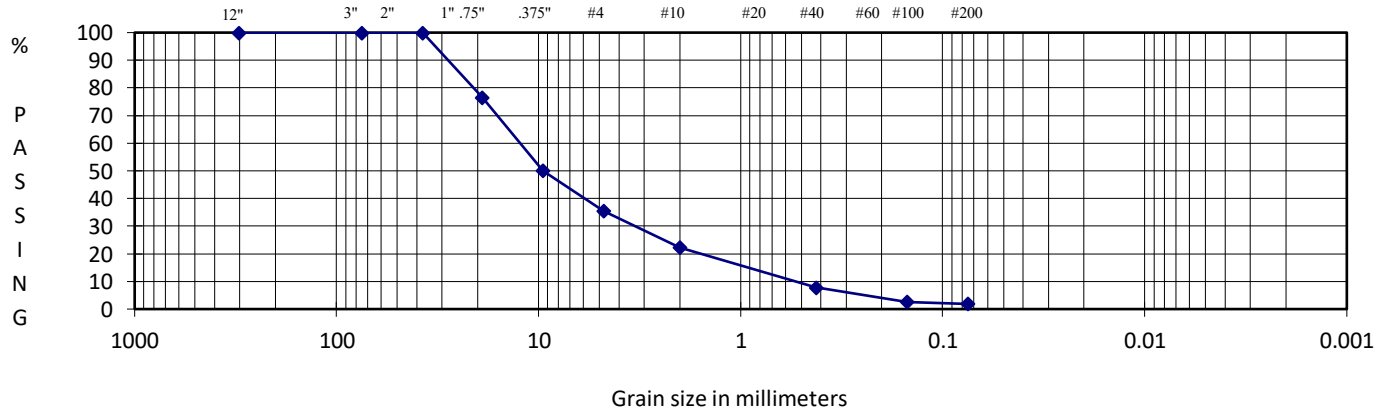
Weight Of Sample (gm)		543.9
Tare Weight (gm)		16.1
(W6) Total Dry Weight (gm)		527.8

% COBBLES	**0.0**
% C GRAVEL	**23.4**
% F GRAVEL	**41.1**
% C SAND	**13.2**
% M SAND	**14.5**
% F SAND	**5.9**
% FINES	**1.9**
% TOTAL	**100.0**

D10 (mm)	0.52
D30 (mm)	3.3
D60 (mm)	14
Cu	26.9
Cc	1.5

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.1	0.00	0.00	100.00	cobbles
3.0"	16.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.1	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	139.6	123.50	23.40	76.60	fine gravel
0.50"					fine gravel
0.375"	279.9	263.80	49.98	50.02	fine gravel
#4	356.6	340.50	64.51	35.49	coarse sand
#10	426.1	410.00	77.68	22.32	medium sand
#20					medium sand
#40	502.4	486.30	92.14	7.86	fine sand
#60					fine sand
#100	530.3	514.20	97.42	2.58	fine sand
#200	533.8	517.70	98.09	1.91	fines
PAN	543.9	527.80	100.00	0.00	silt/clay



DESCRIPTION Well Graded Sandy GRAVEL with trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-16	
PROJECT NO.	2022-007		**Depth**	9 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	786.4
Wt Dry Soil & Tare (gm)	(w2)	770.1
Weight of Tare (gm)	(w3)	16.1
Weight of Water (gm)	(w4=w1-w2)	16.3
Weight of Dry Soil (gm)	(w5=w2-w3)	754.0
Moisture Content (%)	(w4/w5)*100	2

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

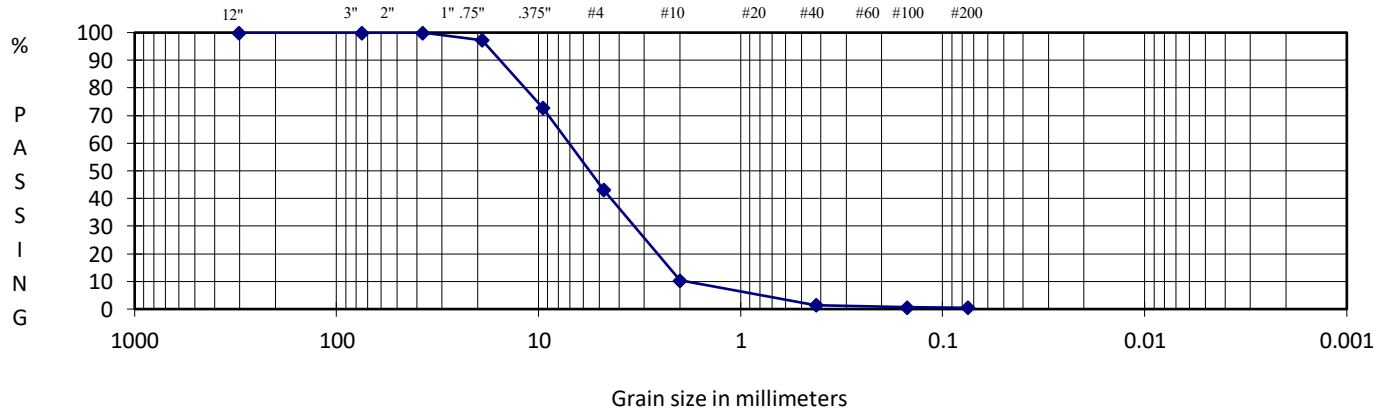
Weight Of Sample (gm)		770.1
Tare Weight (gm)		16.1
(W6) Total Dry Weight (gm)		754.0

% COBBLES	**0.0**
% C GRAVEL	**2.7**
% F GRAVEL	**54.3**
% C SAND	**32.7**
% M SAND	**9.0**
% F SAND	**0.9**
% FINES	**0.5**
% TOTAL	**100.0**

D10 (mm)	2
D30 (mm)	3.3
D60 (mm)	7
Cu	3.5
Cc	0.8

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.1	0.00	0.00	100.00	cobbles
3.0"	16.1	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.1	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	36.2	20.10	2.67	97.33	fine gravel
0.50"					fine gravel
0.375"	221.4	205.30	27.23	72.77	fine gravel
#4	445.4	429.30	56.94	43.06	coarse sand
#10	691.7	675.60	89.60	10.40	medium sand
#20					medium sand
#40	759.3	743.20	98.57	1.43	fine sand
#60					fine sand
#100	765.2	749.10	99.35	0.65	fine sand
#200	766.3	750.20	99.50	0.50	fines
PAN	770.1	754.00	100.00	0.00	silt/clay



DESCRIPTION	Poorly graded sandy GRAVEL
USCS	GP

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-16	
PROJECT NO.	2022-007		**Depth**	11 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	580.0
Wt Dry Soil & Tare (gm)	(w2)	563.2
Weight of Tare (gm)	(w3)	16.5
Weight of Water (gm)	(w4=w1-w2)	16.8
Weight of Dry Soil (gm)	(w5=w2-w3)	546.7
Moisture Content (%)	(w4/w5)*100	3

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

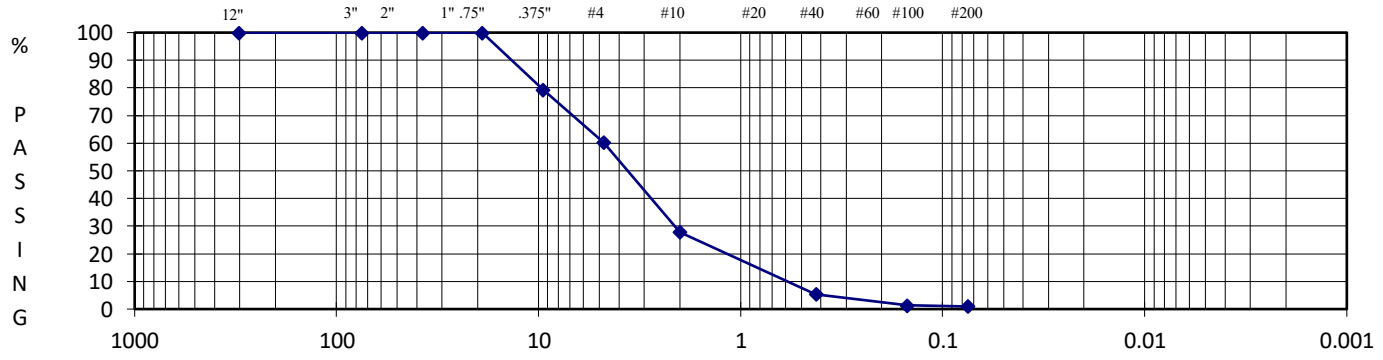
Weight Of Sample (gm)		563.2
Tare Weight (gm)		16.5
(W6) Total Dry Weight (gm)		546.7

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**39.8**
% C SAND	**32.4**
% M SAND	**22.5**
% F SAND	**4.3**
% FINES	**1.0**
% TOTAL	**100.0**

D10 (mm)	0.59
D30 (mm)	2.2
D60 (mm)	4.9
Cu	8.3
Cc	1.7

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.5	0.00	0.00	100.00	cobbles
3.0"	16.5	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.5	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	16.5	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	129.6	113.10	20.69	79.31	fine gravel
#4	233.9	217.40	39.77	60.23	coarse sand
#10	411.1	394.60	72.18	27.82	medium sand
#20					medium sand
#40	534.0	517.50	94.66	5.34	fine sand
#60					fine sand
#100	556.1	539.60	98.70	1.30	fine sand
#200	557.7	541.20	98.99	1.01	fines
PAN	563.2	546.70	100.00	0.00	silt/clay



DESCRIPTION Well graded gravelly SAND with trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-17	
PROJECT NO.	2022-007		**Depth**	4 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	600.8
Wt Dry Soil & Tare (gm)	(w2)	575.1
Weight of Tare (gm)	(w3)	16.2
Weight of Water (gm)	(w4=w1-w2)	25.7
Weight of Dry Soil (gm)	(w5=w2-w3)	558.9
Moisture Content (%)	(w4/w5)*100	5

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

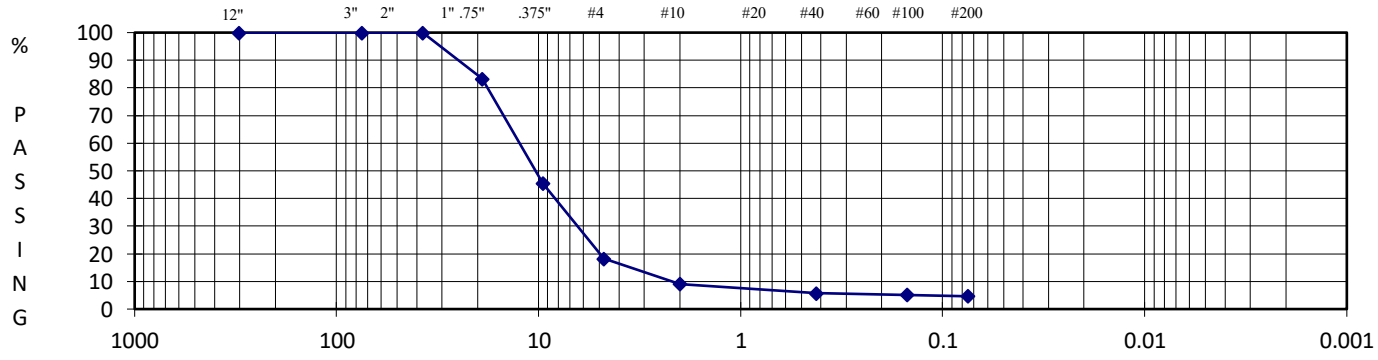
Weight Of Sample (gm)		575.1
Tare Weight (gm)		16.2
Total Dry Weight (gm)	(W6)	558.9

% COBBLES	**0.0**
% C GRAVEL	**16.7**
% F GRAVEL	**65.1**
% C SAND	**9.2**
% M SAND	**3.3**
% F SAND	**0.9**
% FINES	**4.8**
% TOTAL	**100.0**

D10 (mm)	2.1
D30 (mm)	6.4
D60 (mm)	14
Cu	6.7
Cc	1.4

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.2	0.00	0.00	100.00	cobbles
3.0"	16.2	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.2	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	109.4	93.20	16.68	83.32	fine gravel
0.50"					fine gravel
0.375"	321.4	305.20	54.61	45.39	fine gravel
#4	473.1	456.90	81.75	18.25	coarse sand
#10	524.3	508.10	90.91	9.09	medium sand
#20					medium sand
#40	543.0	526.80	94.26	5.74	fine sand
#60					fine sand
#100	546.3	530.10	94.85	5.15	fine sand
#200	548.1	531.90	95.17	4.83	fines
PAN	575.1	558.90	100.00	0.00	silt/clay



DESCRIPTION Well graded GRAVEL with trace sand and trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-17	
PROJECT NO.	2022-007		**Depth**	7 feet	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	607.9
Wt Dry Soil & Tare (gm)	(w2)	570.9
Weight of Tare (gm)	(w3)	16.3
Weight of Water (gm)	(w4=w1-w2)	37.0
Weight of Dry Soil (gm)	(w5=w2-w3)	554.6
Moisture Content (%)	(w4/w5)*100	7

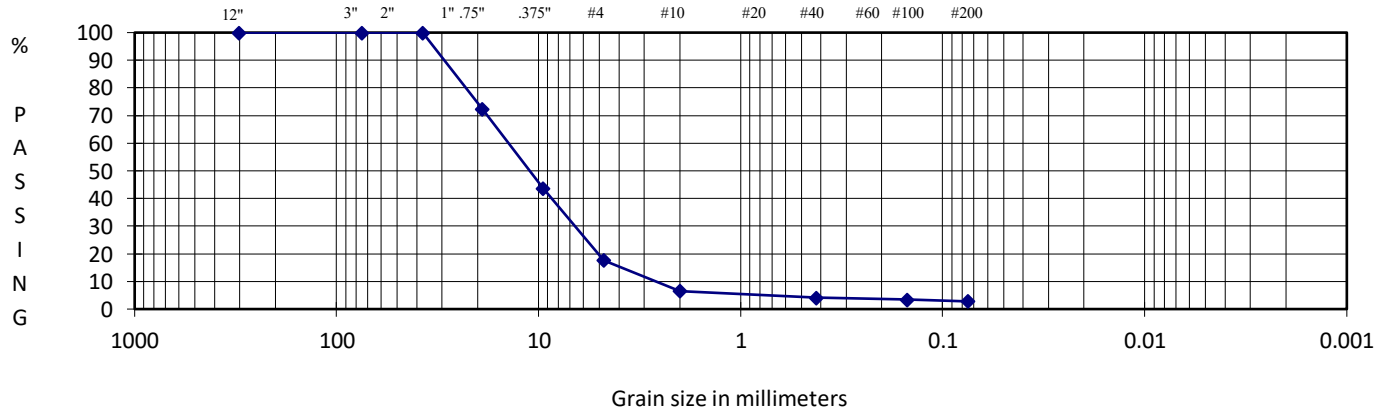
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		570.9
Tare Weight (gm)		16.3
(W6) Total Dry Weight (gm)		554.6

% COBBLES	**0.0**
% C GRAVEL	**27.6**
% F GRAVEL	**54.7**
% C SAND	**11.1**
% M SAND	**2.4**
% F SAND	**1.2**
% FINES	**2.9**
% TOTAL	**100.0**
D10 (mm)	2.6
D30 (mm)	6.6
D60 (mm)	15
Cu	5.8
Cc	1.1

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.3	0.00	0.00	100.00	cobbles
3.0"	16.3	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.3	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	169.3	153.00	27.59	72.41	fine gravel
0.50"					fine gravel
0.375"	328.9	312.60	56.36	43.64	fine gravel
#4	472.8	456.50	82.31	17.69	coarse sand
#10	534.5	518.20	93.44	6.56	medium sand
#20					medium sand
#40	548.0	531.70	95.87	4.13	fine sand
#60					fine sand
#100	551.9	535.60	96.57	3.43	fine sand
#200	554.9	538.60	97.12	2.88	fines
PAN	570.9	554.60	100.00	0.00	silt/clay



DESCRIPTION Well graded GRAVEL with trace sand and trace silt

USCS GW

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

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

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

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

PROJECT TITLE	Morel Meadows		**Exploration Type**	TP-18	
PROJECT NO.	2022-007		**Depth**	1 foot	
TECH/TEST DATE	GS/RT		**Date Received**	9/6/2023	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	709.6
Wt Dry Soil & Tare (gm)	(w2)	697.9
Weight of Tare (gm)	(w3)	16.2
Weight of Water (gm)	(w4=w1-w2)	11.7
Weight of Dry Soil (gm)	(w5=w2-w3)	681.7
Moisture Content (%)	(w4/w5)*100	2

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

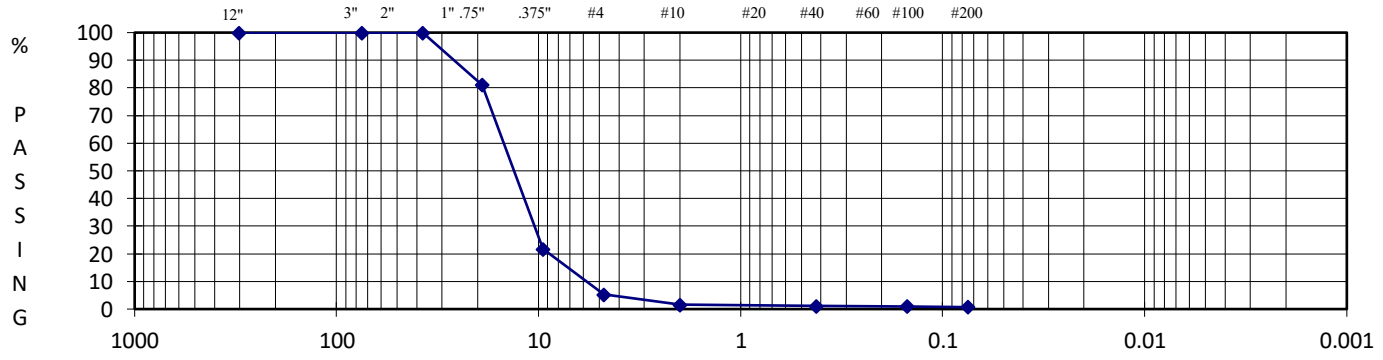
Weight Of Sample (gm)		697.9
Tare Weight (gm)		16.2
(W6) Total Dry Weight (gm)		681.7

% COBBLES	**0.0**
% C GRAVEL	**18.9**
% F GRAVEL	**75.8**
% C SAND	**3.8**
% M SAND	**0.4**
% F SAND	**0.3**
% FINES	**0.8**
% TOTAL	**100.0**

D10 (mm)	5.9
D30 (mm)	11
D60 (mm)	16
Cu	2.7
Cc	1.3

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	16.2	0.00	0.00	100.00	cobbles
3.0"	16.2	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	16.2	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	145.1	128.90	18.91	81.09	fine gravel
0.50"					fine gravel
0.375"	550.3	534.10	78.35	21.65	fine gravel
#4	661.7	645.50	94.69	5.31	coarse sand
#10	687.5	671.30	98.47	1.53	medium sand
#20					medium sand
#40	690.5	674.30	98.91	1.09	fine sand
#60					fine sand
#100	691.4	675.20	99.05	0.95	fine sand
#200	692.6	676.40	99.22	0.78	fines
PAN	697.9	681.70	100.00	0.00	silt/clay



DESCRIPTION	Poorly graded GRAVEL with trace sand
USCS	GP

Prepared For:
DR Horton

Reviewed By: KW

RILEYGROUP

Appendix 3: Design Calculations

Area Summary							
	Pre-Developed	Developed					
	Pre-Developed Total	NW Basin	SW Basin	E Basin	SE Frontage	N Bypass	Developed Total
Forest (A/B Flat)	32.08	0.40					0.40
Forest (A/B Moderate)				2.46		1.02	3.48
Forest (A/B Steep)						0.29	0.29
Lawn (A/B Flat)		3.59	1.82	6.22	0.26		11.89
Lawn (A/B Steep)		0.51			0.12	0.08	0.71
Roofs		2.76	0.62	3.41	0.00	0.00	6.79
Roads (Flat)		2.31	0.77	1.68	0.37		5.12
Alleys (Flat)		0.45		0.20			0.64
Access Road (Steep)		0.03	0.07	0.08	0.00		0.18
Sidewalk (Flat)		0.66	0.22	0.55	0.09		1.52
Driveway (Flat)		0.95	0.15	0.95			2.05
Bioretention		0.14	0.03	0.14	0.05		0.35
Pond		0.41	0.15	0.36			0.92
Total Area (ac)	32.08	12.22	3.82	16.04	0.88	1.39	34.36

Developed Area Summary					
Impervious					
NW Basin	SW Basin	E Basin	SE Frontage Basin	North Bypass Basin	Developed Total
7.72	2.00	7.36	0.51	0.00	17.59
63%	52%	46%	57%	0%	51%
Pervious					
4.50	1.82	8.68	0.38	1.39	16.77
37%	48%	54%	43%	100%	49%

Emergency Overflow Structure - Bioretention 1

$$Q_{100} = 9.739 \frac{D}{12} H^{\frac{3}{2}}$$

(equation from Volume II, Figure 3.28. Riser Inflow Curves of the Thurston County 2022 DDECM)

D =	**72**	Diameter of Discharge Riser (inches)
H =	**0.33'**	Flow Depth (ft)
Q =	11.08	cfs (100 Year Design Peak Inflow to NW Bioretention - 9.26 cfs)

Emergency Overflow Structure - Bioretention 2

$$Q_{100} = 9.739 \frac{D}{12} H^{\frac{3}{2}}$$

(equation from Volume II, Figure 3.28. Riser Inflow Curves of the Thurston County 2022 DDECM)

D =	**18**	Diameter of Discharge Riser (inches)
H =	**0.33'**	Flow Depth (ft)
Q =	2.77	cfs (100 Year Design Peak Inflow to SW Bioretention - 2.35 cfs)

Emergency Overflow Structure - Bioretention 3

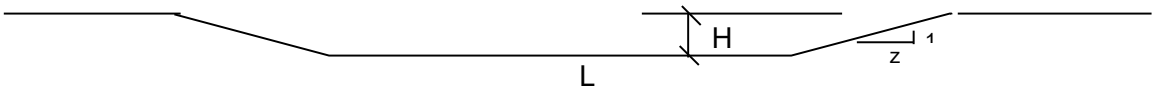
$$Q_{100} = 9.739 \frac{D}{12} H^{\frac{3}{2}}$$

(equation from Volume II, Figure 3.28. Riser Inflow Curves of the Thurston County 2022 DDECM)

D =	**60**	Diameter of Discharge Riser (inches)
H =	**0.33'**	Flow Depth (ft)
Q =	9.23	cfs (100 Year Design Peak Inflow to E Bioretention - 9.13 cfs)

Emergency Overflow Spillway - NW Pond

Broad Crested Weir

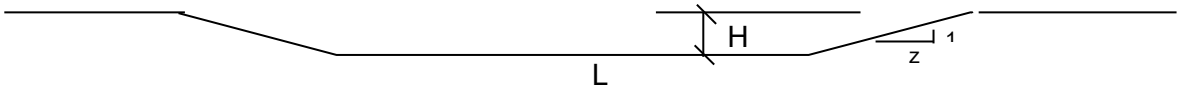


For this weir $Q_{100} = C\sqrt{2g}(2/3LH^{3/2} + 8/15Tan\,\theta H^{5/2})$

C =	**0.6**	discharge coefficient
L =	**16.00'**	(6' Minimum)
z =	**3**	side slope
H =	**0.33'**	flow depth
Q =	10.22	cfs (100 Year Design Peak Inflow NW basin 9.86 cfs)
V =	1.82	fps

Emergency Overflow Spillway - NE Pond

Broad Crested Weir



For this weir $Q_{100} = C\sqrt{2g}(2/3LH^{3/2} + 8/15Tan\,\theta H^{5/2})$

C =	**0.6**	discharge coefficient
L =	**16.00'**	(6' Minimum)
z =	**3**	side slope
H =	**0.33'**	flow depth
Q =	10.22	cfs (100 Year Design Peak Inflow E Basin 9.91 cfs)
V =	1.82	fps

SITE ANALYSIS

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: SiteAnalysis

Site Name:	Morel Meadows
Site Address:	8322 Steilacoom Rd SE
City:	Lacey
Report Date:	9/18/2023
Gage:	Fairgrounds (Kaiser)
Data Start:	1955/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2023/01/27
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

Total Site

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	32.08
Pervious Total	32.08
Impervious Land Use	acre
Impervious Total	0
Basin Total	32.08

Mitigated Land Use

Northwest Basin

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	0.4
A B, Pasture, Flat	3.59
A B, Pasture, Steep	0.15
A B IMP INF FLAT	0.14
Pervious Total	4.28

PORTION OF STEEP PASTURE IN NW BASIN GOING TO THE BIORETENTION CELL

AREA ACCOUNTING FOR BIORETENTION CELL

Impervious Land Use	acre
ROADS FLAT	2.76
ROOF TOPS FLAT	2.76
DRIVEWAYS FLAT	0.95
SIDEWALKS FLAT	0.66
Impervious Total	7.13
Basin Total	11.41

ROADS & ALLEYS

NOTE: POND AREA, ACCESS ROAD AREA, AND TRIBUTARY LANDSCAPE AREAS ARE INCLUDED IN NW TRIB TO POND BASIN. SEE PAGE 9 OF THIS REPORT.

Southwest Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Flat	1.53
A B IMP INF FLAT	0.03
Pervious Total	1.56
Impervious Land Use	acre
ROADS FLAT	0.77
ROOF TOPS FLAT	0.62
DRIVEWAYS FLAT	0.15
SIDEWALKS FLAT	0.22
Impervious Total	1.76
Basin Total	3.32

PORTION OF FLAT PASTURE IN SW BASIN GOING TO THE BIORETENTION CELL

AREA ACCOUNTING FOR BIORETENTION CELL

ROADS & ALLEYS

NOTE: POND AREA, ACCESS ROAD AREA, AND TRIBUTARY LANDSCAPE AREAS ARE INCLUDED IN SW TRIB TO POND BASIN. SEE PAGE 10 OF THIS REPORT.

East Basin

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	6.22
A B IMP INF FLAT	0.14
Pervious Total	6.36

AREA ACCOUNTING FOR BIORETENTION CELL

Impervious Land Use	acre
ROADS FLAT	1.88
ROOF TOPS FLAT	3.41
DRIVEWAYS FLAT	0.95
SIDEWALKS FLAT	0.55
Impervious Total	6.79

ROADS & ALLEYS

Basin Total	13.15

NOTE: POND AREA, ACCESS ROAD AREA, AND TRIBUTARY LANDSCAPE AREAS ARE INCLUDED IN E TRIB TO POND BASIN. SEE PAGE 11 OF THIS REPORT.

Southeast Frontage Basin

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	0.26
A B, Pasture, Steep	0.12
A B IMP INF FLAT	0.05
Pervious Total	0.43

Impervious Land Use	acre
ROADS FLAT	0.37
SIDEWALKS FLAT	0.09
Impervious Total	0.46
Basin Total	0.89

North Bypass

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Mod	1.02
A B, Forest, Steep	0.29
A B, Pasture, Steep	0.08
Pervious Total	1.39
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.39

Northwest Trib to Pond

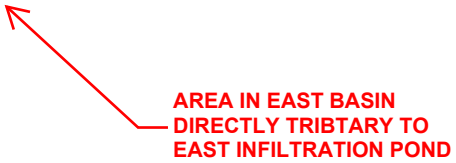
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Steep	0.36
Pervious Total	0.36
Impervious Land Use	acre
ROADS FLAT	0.03
POND	0.41
Impervious Total	0.44
Basin Total	0.8

Southwest Trib to Pond

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Flat	0.29
Pervious Total	0.29
Impervious Land Use	acre
ROADS STEEP	0.07
POND	0.15
Impervious Total	0.22
Basin Total	0.51

East Trib to Pond

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Mod	2.46
Pervious Total	2.46
Impervious Land Use	acre
ROADS STEEP	0.08
POND	0.36
Impervious Total	0.44
Basin Total	2.9



Routing Elements
Predeveloped Routing

Mitigated Routing

NW Bioretention

Bottom Length:	60.00 ft.
Bottom Width:	58.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	SMMWW 12 in/hr
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	10
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	1354.532
Total Volume Through Riser (ac-ft.):	105.518
Total Volume Through Facility (ac-ft.):	1460.05
Percent Infiltrated:	92.77
Total Precip Applied to Facility:	22.05
Total Evap From Facility:	7.659
Underdrain not used	
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	48 in.
Element Flows To:	
Outlet 1	Outlet 2
NW Pond	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
210.25	0.1109	0.0000	0.0000	0.0000
210.30	0.1103	0.0019	0.0000	0.0000
210.35	0.1093	0.0039	0.0000	0.0000
210.41	0.1084	0.0058	0.0000	0.0000
210.46	0.1074	0.0078	0.0000	0.0000
210.51	0.1064	0.0098	0.0016	0.0016
210.56	0.1054	0.0118	0.0027	0.0027
210.62	0.1044	0.0139	0.0044	0.0044
210.67	0.1035	0.0159	0.0065	0.0065
210.72	0.1025	0.0180	0.0093	0.0093
210.77	0.1015	0.0201	0.0127	0.0127
210.82	0.1006	0.0222	0.0168	0.0168
210.88	0.0996	0.0244	0.0216	0.0216
210.93	0.0987	0.0265	0.0273	0.0273
210.98	0.0978	0.0287	0.0339	0.0339
211.03	0.0968	0.0309	0.0414	0.0414
211.09	0.0959	0.0332	0.0470	0.0470
211.14	0.0950	0.0354	0.0504	0.0504
211.19	0.0940	0.0377	0.0600	0.0600
211.24	0.0931	0.0400	0.0708	0.0708
211.29	0.0922	0.0423	0.0828	0.0828
211.35	0.0913	0.0447	0.0960	0.0960
211.40	0.0904	0.0470	0.1106	0.1106
211.45	0.0895	0.0494	0.1149	0.1149
211.50	0.0886	0.0518	0.1277	0.1277

211.55	0.0877	0.0543	0.1452	0.1452
211.61	0.0868	0.0567	0.1641	0.1641
211.66	0.0859	0.0592	0.1847	0.1847
211.71	0.0851	0.0617	0.2068	0.2068
211.76	0.0842	0.0643	0.2266	0.2266
211.82	0.0833	0.0668	0.3952	0.3952
211.87	0.0825	0.0694	0.4574	0.4574
211.92	0.0816	0.0720	0.5164	0.5164
211.97	0.0807	0.0746	0.5804	0.5804
212.00	0.0799	0.0760	0.6148	0.6148

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.7500	0.1109	0.0760	0.0000	0.2904	0.0101
1.8022	0.1119	0.0818	0.0000	0.2904	0.0202
1.8544	0.1129	0.0877	0.0000	0.2988	0.0304
1.9066	0.1139	0.0936	0.0000	0.3072	0.0407
1.9588	0.1149	0.0996	0.0000	0.3156	0.0510
2.0110	0.1159	0.1056	0.0000	0.3240	0.0613
2.0632	0.1169	0.1117	0.0000	0.3324	0.0717
2.1154	0.1180	0.1178	0.0000	0.3408	0.0821
2.1676	0.1190	0.1240	0.0000	0.3492	0.0925
2.2198	0.1200	0.1302	0.0000	0.3576	0.1030
2.2720	0.1211	0.1365	0.0000	0.3660	0.1136
2.3242	0.1221	0.1429	0.0000	0.3745	0.1242
2.3764	0.1232	0.1493	0.0000	0.3829	0.1348
2.4286	0.1242	0.1557	0.0000	0.3913	0.1455
2.4808	0.1253	0.1622	0.0000	0.3997	0.1563
2.5330	0.1264	0.1688	0.0000	0.4081	0.1670
2.5852	0.1274	0.1754	0.0000	0.4165	0.1779
2.6374	0.1285	0.1821	0.0000	0.4249	0.1887
2.6896	0.1296	0.1888	0.0000	0.4333	0.1997
2.7418	0.1307	0.1956	0.0000	0.4417	0.2106
2.7940	0.1318	0.2025	0.0000	0.4501	0.2216
2.8462	0.1328	0.2094	0.0000	0.4585	0.2327
2.8984	0.1339	0.2163	0.0000	0.4670	0.2438
2.9505	0.1350	0.2234	0.0000	0.4754	0.2549
3.0027	0.1361	0.2304	0.0000	0.4838	0.2661
3.0549	0.1373	0.2376	0.0000	0.4922	0.2774
3.1071	0.1384	0.2448	0.0000	0.5006	0.2886
3.1593	0.1395	0.2520	0.0000	0.5090	0.3000
3.2115	0.1406	0.2593	0.0000	0.5174	0.3113
3.2637	0.1417	0.2667	0.0000	0.5258	0.3227
3.3159	0.1429	0.2741	0.0000	0.5342	0.3342
3.3681	0.1440	0.2816	0.0000	0.5426	0.3457
3.4203	0.1452	0.2892	0.0000	0.5511	0.3573
3.4725	0.1463	0.2968	0.0000	0.5595	0.3689
3.5247	0.1474	0.3044	0.0000	0.5679	0.3805
3.5769	0.1486	0.3122	30.385	0.5763	0.3922
3.6291	0.1498	0.3199	32.986	0.5847	0.4039
3.6813	0.1509	0.3278	35.581	0.5931	0.4157
3.7335	0.1521	0.3357	38.155	0.6015	0.4275
3.7857	0.1533	0.3437	40.695	0.6099	0.4394
3.8379	0.1544	0.3517	43.186	0.6148	0.4513
3.8901	0.1556	0.3598	45.615	0.6148	0.4633
3.9423	0.1568	0.3680	47.969	0.6148	0.4753
3.9945	0.1580	0.3762	50.238	0.6148	0.4873
4.0467	0.1592	0.3844	52.410	0.6148	0.4994

4.0989	0.1604	0.3928	54.475	0.6148	0.5116
4.1511	0.1616	0.4012	56.426	0.6148	0.5238
4.2033	0.1628	0.4097	58.256	0.6148	0.5360
4.2555	0.1640	0.4182	59.961	0.6148	0.5483
4.3077	0.1652	0.4268	61.537	0.6148	0.5606
4.3599	0.1665	0.4354	62.986	0.6148	0.5730
4.4121	0.1677	0.4442	64.309	0.6148	0.5854
4.4643	0.1689	0.4529	65.511	0.6148	0.5979
4.5165	0.1702	0.4618	66.601	0.6148	0.6104
4.5687	0.1714	0.4707	67.591	0.6148	0.6229
4.6209	0.1726	0.4797	68.497	0.6148	0.6355
4.6731	0.1739	0.4887	69.337	0.6148	0.6482
4.7253	0.1751	0.4978	70.135	0.6148	0.6542
4.7500	0.1757	0.5022	71.756	0.6148	0.0000

Surface Bioretention

NW Pond

Bottom Length:	100.00 ft.	
Bottom Width:	76.54 ft.	
Depth:	6 ft.	
Volume at riser head:	1.3650 acre-feet.	
Infiltration On		
Infiltration rate:	10	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		194.705
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		194.705
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Side slope 1:	7.3 To 1	
Side slope 2:	3 To 1	
Side slope 3:	3 To 1	
Side slope 4:	3 To 1	
Discharge Structure		
Riser Height:	5 ft.	
Riser Diameter:	48 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
209.00	0.175	0.000	0.000	0.000
209.07	0.178	0.011	0.000	1.771
209.13	0.180	0.023	0.000	1.771
209.20	0.182	0.035	0.000	1.771
209.27	0.184	0.048	0.000	1.771
209.33	0.187	0.060	0.000	1.771
209.40	0.189	0.073	0.000	1.771
209.47	0.192	0.085	0.000	1.771
209.53	0.194	0.098	0.000	1.771
209.60	0.196	0.111	0.000	1.771
209.67	0.199	0.124	0.000	1.771
209.73	0.201	0.138	0.000	1.771
209.80	0.204	0.151	0.000	1.771
209.87	0.206	0.165	0.000	1.771
209.93	0.208	0.179	0.000	1.771
210.00	0.211	0.193	0.000	1.771
210.07	0.213	0.207	0.000	1.771
210.13	0.216	0.221	0.000	1.771
210.20	0.218	0.236	0.000	1.771
210.27	0.221	0.251	0.000	1.771
210.33	0.223	0.265	0.000	1.771
210.40	0.226	0.280	0.000	1.771
210.47	0.228	0.296	0.000	1.771
210.53	0.231	0.311	0.000	1.771
210.60	0.234	0.326	0.000	1.771
210.67	0.236	0.342	0.000	1.771
210.73	0.239	0.358	0.000	1.771
210.80	0.241	0.374	0.000	1.771
210.87	0.244	0.390	0.000	1.771

210.93	0.247	0.407	0.000	1.771
211.00	0.249	0.423	0.000	1.771
211.07	0.252	0.440	0.000	1.771
211.13	0.255	0.457	0.000	1.771
211.20	0.257	0.474	0.000	1.771
211.27	0.260	0.491	0.000	1.771
211.33	0.263	0.509	0.000	1.771
211.40	0.265	0.526	0.000	1.771
211.47	0.268	0.544	0.000	1.771
211.53	0.271	0.562	0.000	1.771
211.60	0.274	0.580	0.000	1.771
211.67	0.277	0.599	0.000	1.771
211.73	0.279	0.617	0.000	1.771
211.80	0.282	0.636	0.000	1.771
211.87	0.285	0.655	0.000	1.771
211.93	0.288	0.674	0.000	1.771
212.00	0.291	0.693	0.000	1.771
212.07	0.293	0.713	0.000	1.771
212.13	0.296	0.732	0.000	1.771
212.20	0.299	0.752	0.000	1.771
212.27	0.302	0.772	0.000	1.771
212.33	0.305	0.793	0.000	1.771
212.40	0.308	0.813	0.000	1.771
212.47	0.311	0.834	0.000	1.771
212.53	0.314	0.855	0.000	1.771
212.60	0.317	0.876	0.000	1.771
212.67	0.320	0.897	0.000	1.771
212.73	0.323	0.918	0.000	1.771
212.80	0.326	0.940	0.000	1.771
212.87	0.329	0.962	0.000	1.771
212.93	0.332	0.984	0.000	1.771
213.00	0.335	1.006	0.000	1.771
213.07	0.338	1.029	0.000	1.771
213.13	0.341	1.051	0.000	1.771
213.20	0.344	1.074	0.000	1.771
213.27	0.347	1.097	0.000	1.771
213.33	0.350	1.120	0.000	1.771
213.40	0.353	1.144	0.000	1.771
213.47	0.356	1.168	0.000	1.771
213.53	0.359	1.191	0.000	1.771
213.60	0.363	1.216	0.000	1.771
213.67	0.366	1.240	0.000	1.771
213.73	0.369	1.264	0.000	1.771
213.80	0.372	1.289	0.000	1.771
213.87	0.375	1.314	0.000	1.771
213.93	0.378	1.339	0.000	1.771
214.00	0.382	1.365	0.000	1.771
214.07	0.385	1.390	0.730	1.771
214.13	0.388	1.416	2.065	1.771
214.20	0.391	1.442	3.791	1.771
214.27	0.395	1.468	5.831	1.771
214.33	0.398	1.495	8.137	1.771
214.40	0.401	1.521	10.67	1.771
214.47	0.405	1.548	13.40	1.771
214.53	0.408	1.575	16.30	1.771
214.60	0.411	1.603	19.35	1.771
214.67	0.415	1.630	22.51	1.771
214.73	0.418	1.658	25.75	1.771

214.80	0.421	1.686	29.04	1.771
214.87	0.425	1.714	32.36	1.771
214.93	0.428	1.743	35.68	1.771
215.00	0.431	1.771	38.96	1.771
215.07	0.435	1.800	42.17	1.771

SW Bioretention

Bottom Length:	55.61 ft.
Bottom Width:	6.50 ft.
Material thickness of first layer:	0.25
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	SMMWW 12 in/hr
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	10
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	335.785
Total Volume Through Riser (ac-ft.):	25.579
Total Volume Through Facility (ac-ft.):	361.364
Percent Infiltrated:	92.92
Total Precip Applied to Facility:	5.568
Total Evap From Facility:	1.319
Underdrain not used	
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	48 in.
Element Flows To:	
Outlet 1	Outlet 2
SW Pond	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
219.25	0.0258	0.0000	0.0000	0.0000
219.30	0.0255	0.0002	0.0000	0.0000
219.35	0.0249	0.0004	0.0000	0.0000
219.41	0.0243	0.0006	0.0000	0.0000
219.46	0.0237	0.0009	0.0000	0.0000
219.51	0.0231	0.0011	0.0002	0.0002
219.56	0.0226	0.0014	0.0004	0.0004
219.62	0.0220	0.0017	0.0006	0.0006
219.67	0.0214	0.0019	0.0009	0.0009
219.72	0.0209	0.0022	0.0013	0.0013
219.77	0.0203	0.0025	0.0019	0.0019
219.82	0.0198	0.0028	0.0025	0.0025
219.88	0.0192	0.0032	0.0033	0.0033
219.93	0.0187	0.0035	0.0043	0.0043
219.98	0.0181	0.0039	0.0055	0.0055
220.03	0.0176	0.0042	0.0069	0.0069
220.09	0.0171	0.0046	0.0080	0.0080
220.14	0.0165	0.0050	0.0088	0.0088
220.19	0.0160	0.0054	0.0107	0.0107
220.24	0.0155	0.0058	0.0129	0.0129
220.29	0.0150	0.0062	0.0154	0.0154
220.35	0.0145	0.0067	0.0182	0.0182
220.40	0.0140	0.0071	0.0213	0.0213
220.45	0.0135	0.0076	0.0226	0.0226
220.50	0.0130	0.0081	0.0255	0.0255
220.55	0.0125	0.0086	0.0295	0.0295
220.61	0.0120	0.0091	0.0340	0.0340

220.66	0.0115	0.0096	0.0389	0.0389
220.71	0.0111	0.0101	0.0443	0.0443
220.76	0.0106	0.0107	0.0493	0.0493
220.82	0.0101	0.0112	0.0873	0.0873
220.87	0.0097	0.0118	0.1026	0.1026
220.92	0.0092	0.0124	0.1175	0.1175
220.97	0.0087	0.0130	0.1340	0.1340
221.00	0.0083	0.0133	0.1431	0.1431

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.7500	0.0258	0.0133	0.0000	0.0302	0.0060
1.8022	0.0264	0.0147	0.0000	0.0302	0.0121
1.8544	0.0270	0.0161	0.0000	0.0310	0.0183
1.9066	0.0276	0.0175	0.0000	0.0319	0.0245
1.9588	0.0282	0.0189	0.0000	0.0328	0.0307
2.0110	0.0288	0.0204	0.0000	0.0336	0.0370
2.0632	0.0295	0.0220	0.0000	0.0345	0.0433
2.1154	0.0301	0.0235	0.0000	0.0354	0.0497
2.1676	0.0307	0.0251	0.0000	0.0363	0.0561
2.2198	0.0314	0.0267	0.0000	0.0371	0.0625
2.2720	0.0320	0.0284	0.0000	0.0380	0.0690
2.3242	0.0326	0.0301	0.0000	0.0389	0.0756
2.3764	0.0333	0.0318	0.0000	0.0398	0.0822
2.4286	0.0339	0.0335	0.0000	0.0406	0.0888
2.4808	0.0346	0.0353	0.0000	0.0415	0.0955
2.5330	0.0353	0.0371	0.0000	0.0424	0.1022
2.5852	0.0359	0.0390	0.0000	0.0433	0.1090
2.6374	0.0366	0.0409	0.0000	0.0441	0.1158
2.6896	0.0373	0.0428	0.0000	0.0450	0.1227
2.7418	0.0380	0.0448	0.0000	0.0459	0.1296
2.7940	0.0386	0.0468	0.0000	0.0468	0.1365
2.8462	0.0393	0.0488	0.0000	0.0476	0.1435
2.8984	0.0400	0.0509	0.0000	0.0485	0.1506
2.9505	0.0407	0.0530	0.0000	0.0494	0.1577
3.0027	0.0414	0.0551	0.0000	0.0502	0.1648
3.0549	0.0421	0.0573	0.0000	0.0511	0.1720
3.1071	0.0429	0.0595	0.0000	0.0520	0.1792
3.1593	0.0436	0.0618	0.0000	0.0529	0.1865
3.2115	0.0443	0.0641	0.0000	0.0537	0.1938
3.2637	0.0450	0.0664	0.0000	0.0546	0.2012
3.3159	0.0458	0.0688	0.0000	0.0555	0.2086
3.3681	0.0465	0.0712	0.0000	0.0564	0.2160
3.4203	0.0472	0.0737	0.0000	0.0572	0.2235
3.4725	0.0480	0.0761	0.0000	0.0581	0.2311
3.5247	0.0487	0.0787	0.0000	0.0590	0.2387
3.5769	0.0495	0.0812	30.385	0.0599	0.2463
3.6291	0.0502	0.0838	32.986	0.0607	0.2540
3.6813	0.0510	0.0865	35.581	0.0616	0.2617
3.7335	0.0518	0.0891	38.155	0.0625	0.2695
3.7857	0.0525	0.0919	40.695	0.0633	0.2773
3.8379	0.0533	0.0946	43.186	0.0642	0.2852
3.8901	0.0541	0.0974	45.615	0.0651	0.2931
3.9423	0.0549	0.1003	47.969	0.0660	0.3011
3.9945	0.0557	0.1032	50.238	0.0668	0.3091
4.0467	0.0564	0.1061	52.410	0.0677	0.3171
4.0989	0.0572	0.1091	54.475	0.0686	0.3252
4.1511	0.0580	0.1121	56.426	0.0695	0.3333

4.2033	0.0589	0.1151	58.256	0.0703	0.3415
4.2555	0.0597	0.1182	59.961	0.0712	0.3497
4.3077	0.0605	0.1213	61.537	0.0721	0.3580
4.3599	0.0613	0.1245	62.986	0.0730	0.3663
4.4121	0.0621	0.1277	64.309	0.0738	0.3747
4.4643	0.0630	0.1310	65.511	0.0747	0.3831
4.5165	0.0638	0.1343	66.601	0.0756	0.3916
4.5687	0.0646	0.1377	67.591	0.0764	0.4001
4.6209	0.0655	0.1411	68.497	0.0773	0.4086
4.6731	0.0663	0.1445	69.337	0.0782	0.4172
4.7253	0.0672	0.1480	70.135	0.0791	0.4213
4.7500	0.0676	0.1497	71.756	0.0795	0.0000

Surface Bioretention

SW Pond

Bottom Length:	76.00 ft.	
Bottom Width:	35.00 ft.	
Depth:	5 ft.	
Volume at riser head:	0.4214 acre-feet.	
Infiltration On		
Infiltration rate:	10	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		70.626
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		70.626
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Side slope 1:	4.7 To 1	
Side slope 2:	3 To 1	
Side slope 3:	3 To 1	
Side slope 4:	3 To 1	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	48 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
220.00	0.061	0.000	0.000	0.000
220.06	0.062	0.003	0.000	0.615
220.11	0.063	0.006	0.000	0.615
220.17	0.064	0.010	0.000	0.615
220.22	0.065	0.014	0.000	0.615
220.28	0.066	0.017	0.000	0.615
220.33	0.067	0.021	0.000	0.615
220.39	0.068	0.025	0.000	0.615
220.44	0.069	0.029	0.000	0.615
220.50	0.070	0.032	0.000	0.615
220.56	0.071	0.036	0.000	0.615
220.61	0.072	0.040	0.000	0.615
220.67	0.073	0.044	0.000	0.615
220.72	0.074	0.049	0.000	0.615
220.78	0.075	0.053	0.000	0.615
220.83	0.077	0.057	0.000	0.615
220.89	0.078	0.061	0.000	0.615
220.94	0.079	0.066	0.000	0.615
221.00	0.080	0.070	0.000	0.615
221.06	0.081	0.075	0.000	0.615
221.11	0.082	0.079	0.000	0.615
221.17	0.083	0.084	0.000	0.615
221.22	0.085	0.088	0.000	0.615
221.28	0.086	0.093	0.000	0.615
221.33	0.087	0.098	0.000	0.615
221.39	0.088	0.103	0.000	0.615
221.44	0.089	0.108	0.000	0.615
221.50	0.090	0.113	0.000	0.615
221.56	0.092	0.118	0.000	0.615

221.61	0.093	0.123	0.000	0.615
221.67	0.094	0.128	0.000	0.615
221.72	0.095	0.134	0.000	0.615
221.78	0.096	0.139	0.000	0.615
221.83	0.098	0.144	0.000	0.615
221.89	0.099	0.150	0.000	0.615
221.94	0.100	0.155	0.000	0.615
222.00	0.101	0.161	0.000	0.615
222.06	0.103	0.167	0.000	0.615
222.11	0.104	0.172	0.000	0.615
222.17	0.105	0.178	0.000	0.615
222.22	0.106	0.184	0.000	0.615
222.28	0.108	0.190	0.000	0.615
222.33	0.109	0.196	0.000	0.615
222.39	0.110	0.202	0.000	0.615
222.44	0.112	0.209	0.000	0.615
222.50	0.113	0.215	0.000	0.615
222.56	0.114	0.221	0.000	0.615
222.61	0.116	0.228	0.000	0.615
222.67	0.117	0.234	0.000	0.615
222.72	0.118	0.241	0.000	0.615
222.78	0.120	0.247	0.000	0.615
222.83	0.121	0.254	0.000	0.615
222.89	0.122	0.261	0.000	0.615
222.94	0.124	0.268	0.000	0.615
223.00	0.125	0.274	0.000	0.615
223.06	0.126	0.281	0.000	0.615
223.11	0.128	0.289	0.000	0.615
223.17	0.129	0.296	0.000	0.615
223.22	0.130	0.303	0.000	0.615
223.28	0.132	0.310	0.000	0.615
223.33	0.133	0.318	0.000	0.615
223.39	0.135	0.325	0.000	0.615
223.44	0.136	0.333	0.000	0.615
223.50	0.138	0.340	0.000	0.615
223.56	0.139	0.348	0.000	0.615
223.61	0.140	0.356	0.000	0.615
223.67	0.142	0.364	0.000	0.615
223.72	0.143	0.372	0.000	0.615
223.78	0.145	0.380	0.000	0.615
223.83	0.146	0.388	0.000	0.615
223.89	0.148	0.396	0.000	0.615
223.94	0.149	0.404	0.000	0.615
224.00	0.151	0.412	0.000	0.615
224.06	0.152	0.421	0.555	0.615
224.11	0.154	0.429	1.571	0.615
224.17	0.155	0.438	2.885	0.615
224.22	0.157	0.447	4.439	0.615
224.28	0.158	0.455	6.198	0.615
224.33	0.160	0.464	8.137	0.615
224.39	0.161	0.473	10.23	0.615
224.44	0.163	0.482	12.47	0.615
224.50	0.164	0.491	14.83	0.615
224.56	0.166	0.501	17.31	0.615
224.61	0.167	0.510	19.87	0.615
224.67	0.169	0.519	22.51	0.615
224.72	0.170	0.529	25.20	0.615
224.78	0.172	0.538	27.94	0.615

224.83	0.174	0.548	30.70	0.615
224.89	0.175	0.558	33.47	0.615
224.94	0.177	0.567	36.23	0.615
225.00	0.178	0.577	38.96	0.615
225.06	0.180	0.587	41.64	0.615

E Bioretention

Bottom Length:	155.00 ft.
Bottom Width:	16.80 ft.
Material thickness of first layer:	0.25
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	SMMWW 12 in/hr
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	9
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	1279.647
Total Volume Through Riser (ac-ft.):	112.652
Total Volume Through Facility (ac-ft.):	1392.299
Percent Infiltrated:	91.91
Total Precip Applied to Facility:	20.946
Total Evap From Facility:	6.553
Underdrain not used	
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	48 in.
Element Flows To:	
Outlet 1	Outlet 2
E Pond	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
216.25	0.1037	0.0000	0.0000	0.0000
216.30	0.1030	0.0014	0.0000	0.0000
216.35	0.1016	0.0029	0.0000	0.0000
216.41	0.1002	0.0044	0.0000	0.0000
216.46	0.0989	0.0059	0.0000	0.0000
216.51	0.0975	0.0075	0.0000	0.0012
216.56	0.0961	0.0091	0.0000	0.0022
216.62	0.0948	0.0107	0.0000	0.0035
216.67	0.0934	0.0124	0.0000	0.0053
216.72	0.0921	0.0140	0.0000	0.0075
216.77	0.0907	0.0158	0.0000	0.0103
216.82	0.0894	0.0175	0.0000	0.0138
216.88	0.0880	0.0193	0.0000	0.0179
216.93	0.0867	0.0211	0.0000	0.0228
216.98	0.0854	0.0229	0.0000	0.0285
217.03	0.0841	0.0248	0.0000	0.0350
217.09	0.0827	0.0267	0.0000	0.0400
217.14	0.0814	0.0286	0.0000	0.0432
217.19	0.0801	0.0306	0.0000	0.0518
217.24	0.0788	0.0326	0.0000	0.0615
217.29	0.0775	0.0346	0.0000	0.0723
217.35	0.0762	0.0366	0.0000	0.0844
217.40	0.0749	0.0387	0.0000	0.0977
217.45	0.0736	0.0408	0.0000	0.1021
217.50	0.0724	0.0430	0.0000	0.1141
217.55	0.0711	0.0452	0.0000	0.1304
217.61	0.0698	0.0474	0.0000	0.1482

217.66	0.0685	0.0496	0.0000	0.1676
217.71	0.0673	0.0519	0.0000	0.1886
217.76	0.0660	0.0542	0.0000	0.2077
217.82	0.0648	0.0566	0.0000	0.3639
217.87	0.0635	0.0589	0.0000	0.4231
217.92	0.0623	0.0613	0.0000	0.4798
217.97	0.0610	0.0638	0.0000	0.5417
218.00	0.0598	0.0651	0.0000	0.5752

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.7500	0.1037	0.0651	0.0000	0.2173	0.0126
1.8022	0.1051	0.0705	0.0000	0.2173	0.0252
1.8544	0.1065	0.0761	0.0000	0.2236	0.0379
1.9066	0.1079	0.0817	0.0000	0.2299	0.0506
1.9588	0.1093	0.0873	0.0000	0.2361	0.0634
2.0110	0.1107	0.0931	0.0000	0.2424	0.0762
2.0632	0.1121	0.0989	0.0000	0.2487	0.0891
2.1154	0.1135	0.1048	0.0000	0.2550	0.1019
2.1676	0.1150	0.1107	0.0000	0.2613	0.1149
2.2198	0.1164	0.1168	0.0000	0.2676	0.1278
2.2720	0.1178	0.1229	0.0000	0.2739	0.1408
2.3242	0.1192	0.1291	0.0000	0.2802	0.1539
2.3764	0.1207	0.1353	0.0000	0.2865	0.1670
2.4286	0.1221	0.1417	0.0000	0.2928	0.1801
2.4808	0.1236	0.1481	0.0000	0.2991	0.1933
2.5330	0.1250	0.1546	0.0000	0.3054	0.2065
2.5852	0.1265	0.1611	0.0000	0.3117	0.2198
2.6374	0.1279	0.1678	0.0000	0.3179	0.2331
2.6896	0.1294	0.1745	0.0000	0.3242	0.2464
2.7418	0.1309	0.1813	0.0000	0.3305	0.2598
2.7940	0.1323	0.1882	0.3913	0.3368	0.2732
2.8462	0.1338	0.1951	1.2653	0.3431	0.2866
2.8984	0.1353	0.2021	2.4235	0.3494	0.3001
2.9505	0.1368	0.2092	3.8071	0.3557	0.3137
3.0027	0.1383	0.2164	5.3822	0.3620	0.3273
3.0549	0.1398	0.2237	7.1255	0.3683	0.3409
3.1071	0.1413	0.2310	9.0182	0.3746	0.3545
3.1593	0.1428	0.2384	11.044	0.3809	0.3683
3.2115	0.1443	0.2459	13.190	0.3872	0.3820
3.2637	0.1458	0.2535	15.440	0.3935	0.3958
3.3159	0.1473	0.2611	17.782	0.3998	0.4096
3.3681	0.1489	0.2689	20.202	0.4060	0.4235
3.4203	0.1504	0.2767	22.686	0.4123	0.4374
3.4725	0.1519	0.2846	25.221	0.4186	0.4513
3.5247	0.1535	0.2925	27.792	0.4249	0.4653
3.5769	0.1550	0.3006	30.385	0.4312	0.4794
3.6291	0.1565	0.3087	32.986	0.4375	0.4934
3.6813	0.1581	0.3169	35.581	0.4438	0.5075
3.7335	0.1596	0.3252	38.155	0.4501	0.5217
3.7857	0.1612	0.3336	40.695	0.4564	0.5359
3.8379	0.1628	0.3420	43.186	0.4627	0.5501
3.8901	0.1643	0.3506	45.615	0.4690	0.5644
3.9423	0.1659	0.3592	47.969	0.4753	0.5787
3.9945	0.1675	0.3679	50.238	0.4816	0.5931
4.0467	0.1691	0.3767	52.410	0.4879	0.6075
4.0989	0.1707	0.3856	54.475	0.4941	0.6219
4.1511	0.1723	0.3945	56.426	0.5004	0.6364

4.2033	0.1738	0.4035	58.256	0.5067	0.6509
4.2555	0.1754	0.4127	59.961	0.5130	0.6655
4.3077	0.1771	0.4218	61.537	0.5193	0.6801
4.3599	0.1787	0.4311	62.986	0.5256	0.6947
4.4121	0.1803	0.4405	64.309	0.5319	0.7094
4.4643	0.1819	0.4500	65.511	0.5382	0.7241
4.5165	0.1835	0.4595	66.601	0.5445	0.7389
4.5687	0.1851	0.4691	67.591	0.5508	0.7537
4.6209	0.1868	0.4788	68.497	0.5571	0.7685
4.6731	0.1884	0.4886	69.337	0.5634	0.7834
4.7253	0.1901	0.4985	70.135	0.5697	0.7905
4.7500	0.1908	0.5032	71.756	0.5726	0.0000

Surface Bioretention

E Pond

Bottom Length:	100.00 ft.	
Bottom Width:	79.13 ft.	
Depth:	6 ft.	
Volume at riser head:	1.2821 acre-feet.	
Infiltration On		
Infiltration rate:	9	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		203.029
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		203.029
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
Side slope 1:	3.9 To 1	
Side slope 2:	3 To 1	
Side slope 3:	3 To 1	
Side slope 4:	3 To 1	
Discharge Structure		
Riser Height:	5 ft.	
Riser Diameter:	48 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
215.00	0.181	0.000	0.000	0.000
215.07	0.183	0.012	0.000	1.648
215.13	0.185	0.024	0.000	1.648
215.20	0.187	0.036	0.000	1.648
215.27	0.188	0.049	0.000	1.648
215.33	0.190	0.062	0.000	1.648
215.40	0.192	0.074	0.000	1.648
215.47	0.194	0.087	0.000	1.648
215.53	0.196	0.100	0.000	1.648
215.60	0.198	0.113	0.000	1.648
215.67	0.199	0.127	0.000	1.648
215.73	0.201	0.140	0.000	1.648
215.80	0.203	0.154	0.000	1.648
215.87	0.205	0.167	0.000	1.648
215.93	0.207	0.181	0.000	1.648
216.00	0.209	0.195	0.000	1.648
216.07	0.211	0.209	0.000	1.648
216.13	0.213	0.223	0.000	1.648
216.20	0.215	0.237	0.000	1.648
216.27	0.217	0.252	0.000	1.648
216.33	0.219	0.266	0.000	1.648
216.40	0.221	0.281	0.000	1.648
216.47	0.222	0.296	0.000	1.648
216.53	0.224	0.311	0.000	1.648
216.60	0.226	0.326	0.000	1.648
216.67	0.228	0.341	0.000	1.648
216.73	0.230	0.356	0.000	1.648
216.80	0.232	0.372	0.000	1.648
216.87	0.234	0.387	0.000	1.648

216.93	0.236	0.403	0.000	1.648
217.00	0.238	0.419	0.000	1.648
217.07	0.241	0.435	0.000	1.648
217.13	0.243	0.451	0.000	1.648
217.20	0.245	0.467	0.000	1.648
217.27	0.247	0.484	0.000	1.648
217.33	0.249	0.500	0.000	1.648
217.40	0.251	0.517	0.000	1.648
217.47	0.253	0.534	0.000	1.648
217.53	0.255	0.551	0.000	1.648
217.60	0.257	0.568	0.000	1.648
217.67	0.259	0.585	0.000	1.648
217.73	0.261	0.602	0.000	1.648
217.80	0.264	0.620	0.000	1.648
217.87	0.266	0.638	0.000	1.648
217.93	0.268	0.655	0.000	1.648
218.00	0.270	0.673	0.000	1.648
218.07	0.272	0.692	0.000	1.648
218.13	0.274	0.710	0.000	1.648
218.20	0.277	0.728	0.000	1.648
218.27	0.279	0.747	0.000	1.648
218.33	0.281	0.765	0.000	1.648
218.40	0.283	0.784	0.000	1.648
218.47	0.285	0.803	0.000	1.648
218.53	0.288	0.822	0.000	1.648
218.60	0.290	0.842	0.000	1.648
218.67	0.292	0.861	0.000	1.648
218.73	0.294	0.881	0.000	1.648
218.80	0.297	0.900	0.000	1.648
218.87	0.299	0.920	0.000	1.648
218.93	0.301	0.940	0.000	1.648
219.00	0.303	0.960	0.000	1.648
219.07	0.306	0.981	0.000	1.648
219.13	0.308	1.001	0.000	1.648
219.20	0.310	1.022	0.000	1.648
219.27	0.313	1.043	0.000	1.648
219.33	0.315	1.064	0.000	1.648
219.40	0.317	1.085	0.000	1.648
219.47	0.320	1.106	0.000	1.648
219.53	0.322	1.127	0.000	1.648
219.60	0.324	1.149	0.000	1.648
219.67	0.327	1.171	0.000	1.648
219.73	0.329	1.193	0.000	1.648
219.80	0.331	1.215	0.000	1.648
219.87	0.334	1.237	0.000	1.648
219.93	0.336	1.259	0.000	1.648
220.00	0.339	1.282	0.000	1.648
220.07	0.341	1.304	0.730	1.648
220.13	0.344	1.327	2.065	1.648
220.20	0.346	1.350	3.791	1.648
220.27	0.348	1.373	5.831	1.648
220.33	0.351	1.397	8.137	1.648
220.40	0.353	1.420	10.67	1.648
220.47	0.356	1.444	13.40	1.648
220.53	0.358	1.468	16.30	1.648
220.60	0.361	1.492	19.35	1.648
220.67	0.363	1.516	22.51	1.648
220.73	0.366	1.540	25.75	1.648

220.80	0.368	1.565	29.04	1.648
220.87	0.371	1.589	32.36	1.648
220.93	0.373	1.614	35.68	1.648
221.00	0.376	1.639	38.96	1.648
221.07	0.378	1.664	42.17	1.648

SE Bioretention

Bottom Length:	45.00 ft.
Bottom Width:	28.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	SMMWW 12 in/hr
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	10
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	96.731
Total Volume Through Riser (ac-ft.):	0.004
Total Volume Through Facility (ac-ft.):	96.735
Percent Infiltrated:	100
Total Precip Applied to Facility:	6.005
Total Evap From Facility:	2.595
Underdrain not used	
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	48 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
213.25	0.0491	0.0000	0.0000	0.0000
213.30	0.0487	0.0007	0.0000	0.0000
213.35	0.0480	0.0014	0.0000	0.0000
213.41	0.0474	0.0021	0.0000	0.0000
213.46	0.0467	0.0029	0.0000	0.0000
213.51	0.0460	0.0036	0.0006	0.0006
213.56	0.0454	0.0044	0.0010	0.0010
213.62	0.0447	0.0051	0.0017	0.0017
213.67	0.0441	0.0059	0.0025	0.0025
213.72	0.0435	0.0067	0.0036	0.0036
213.77	0.0428	0.0075	0.0049	0.0049
213.82	0.0422	0.0084	0.0065	0.0065
213.88	0.0416	0.0092	0.0085	0.0085
213.93	0.0409	0.0101	0.0108	0.0108
213.98	0.0403	0.0109	0.0135	0.0135
214.03	0.0397	0.0118	0.0166	0.0166
214.09	0.0391	0.0127	0.0189	0.0189
214.14	0.0385	0.0136	0.0204	0.0204
214.19	0.0379	0.0146	0.0245	0.0245
214.24	0.0373	0.0155	0.0291	0.0291
214.29	0.0367	0.0165	0.0342	0.0342
214.35	0.0361	0.0174	0.0398	0.0398
214.40	0.0355	0.0184	0.0461	0.0461
214.45	0.0350	0.0194	0.0482	0.0482
214.50	0.0344	0.0204	0.0538	0.0538
214.55	0.0338	0.0215	0.0615	0.0615
214.61	0.0333	0.0225	0.0699	0.0699

214.66	0.0327	0.0236	0.0791	0.0791
214.71	0.0322	0.0246	0.0890	0.0890
214.76	0.0316	0.0257	0.0981	0.0981
214.82	0.0311	0.0268	0.1719	0.1719
214.87	0.0305	0.0280	0.1999	0.1999
214.92	0.0300	0.0291	0.2268	0.2268
214.97	0.0295	0.0303	0.2562	0.2562
215.00	0.0289	0.0309	0.2720	0.2720

Bioretention Hydraulic Table

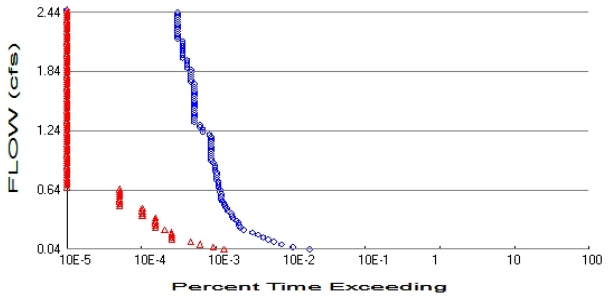
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.7500	0.0491	0.0309	0.0000	0.1051	0.0068
1.8022	0.0497	0.0334	0.0000	0.1051	0.0137
1.8544	0.0504	0.0361	0.0000	0.1082	0.0206
1.9066	0.0511	0.0387	0.0000	0.1112	0.0276
1.9588	0.0518	0.0414	0.0000	0.1143	0.0346
2.0110	0.0525	0.0441	0.0000	0.1173	0.0417
2.0632	0.0532	0.0469	0.0000	0.1204	0.0488
2.1154	0.0539	0.0497	0.0000	0.1234	0.0560
2.1676	0.0546	0.0525	0.0000	0.1264	0.0632
2.2198	0.0553	0.0554	0.0000	0.1295	0.0704
2.2720	0.0560	0.0583	0.0000	0.1325	0.0777
2.3242	0.0568	0.0612	0.0000	0.1356	0.0850
2.3764	0.0575	0.0642	0.0000	0.1386	0.0924
2.4286	0.0582	0.0672	0.0000	0.1417	0.0999
2.4808	0.0590	0.0703	0.0000	0.1447	0.1073
2.5330	0.0597	0.0734	0.0000	0.1478	0.1148
2.5852	0.0604	0.0765	0.0000	0.1508	0.1224
2.6374	0.0612	0.0797	0.0000	0.1538	0.1300
2.6896	0.0619	0.0829	0.0000	0.1569	0.1377
2.7418	0.0627	0.0862	0.0000	0.1599	0.1454
2.7940	0.0635	0.0894	0.0000	0.1630	0.1531
2.8462	0.0642	0.0928	0.0000	0.1660	0.1609
2.8984	0.0650	0.0961	0.0000	0.1691	0.1687
2.9505	0.0658	0.0996	0.0000	0.1721	0.1766
3.0027	0.0666	0.1030	0.0000	0.1752	0.1846
3.0549	0.0674	0.1065	0.0000	0.1782	0.1925
3.1071	0.0681	0.1100	0.0000	0.1813	0.2005
3.1593	0.0689	0.1136	0.0000	0.1843	0.2086
3.2115	0.0697	0.1172	0.0000	0.1873	0.2167
3.2637	0.0705	0.1209	0.0000	0.1904	0.2249
3.3159	0.0714	0.1246	0.0000	0.1934	0.2331
3.3681	0.0722	0.1284	0.0000	0.1965	0.2413
3.4203	0.0730	0.1321	0.0000	0.1995	0.2496
3.4725	0.0738	0.1360	0.0000	0.2026	0.2579
3.5247	0.0746	0.1399	0.0000	0.2056	0.2663
3.5769	0.0755	0.1438	30.385	0.2087	0.2748
3.6291	0.0763	0.1477	32.986	0.2117	0.2832
3.6813	0.0771	0.1517	35.581	0.2147	0.2917
3.7335	0.0780	0.1558	38.155	0.2178	0.3003
3.7857	0.0788	0.1599	40.695	0.2208	0.3089
3.8379	0.0797	0.1640	43.186	0.2239	0.3176
3.8901	0.0805	0.1682	45.615	0.2269	0.3263
3.9423	0.0814	0.1724	47.969	0.2300	0.3350
3.9945	0.0823	0.1767	50.238	0.2330	0.3438
4.0467	0.0831	0.1810	52.410	0.2361	0.3526
4.0989	0.0840	0.1854	54.475	0.2391	0.3615
4.1511	0.0849	0.1898	56.426	0.2421	0.3704

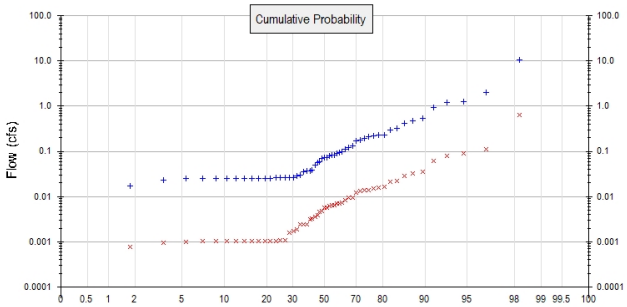
4.2033	0.0858	0.1942	58.256	0.2452	0.3794
4.2555	0.0867	0.1987	59.961	0.2482	0.3884
4.3077	0.0876	0.2033	61.537	0.2513	0.3975
4.3599	0.0885	0.2079	62.986	0.2543	0.4066
4.4121	0.0894	0.2125	64.309	0.2574	0.4158
4.4643	0.0903	0.2172	65.511	0.2604	0.4250
4.5165	0.0912	0.2220	66.601	0.2635	0.4342
4.5687	0.0921	0.2267	67.591	0.2665	0.4435
4.6209	0.0930	0.2316	68.497	0.2696	0.4528
4.6731	0.0940	0.2364	69.337	0.2720	0.4622
4.7253	0.0949	0.2414	70.135	0.2720	0.4667
4.7500	0.0953	0.2437	71.756	0.2720	0.0000

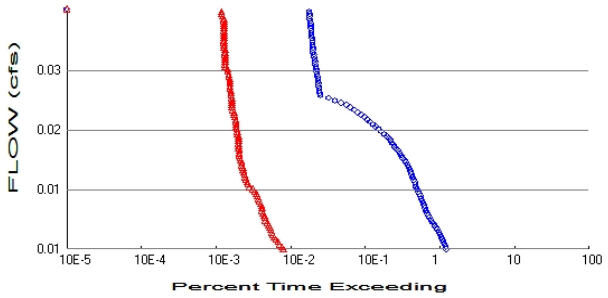
Surface Bioretention

Analysis Results

POC 1







\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 32.08
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 17.13
Total Impervious Area: 17.24

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.073583
5 year	0.258538
10 year	0.549081
25 year	1.32257
50 year	2.435458
100 year	4.342687

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.004648
5 year	0.018015
10 year	0.039396
25 year	0.096162
50 year	0.176787
100 year	0.312539

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.222	0.015
1957	0.055	0.006
1958	0.038	0.004
1959	0.080	0.007
1960	0.074	0.006
1961	0.100	0.007
1962	0.026	0.001
1963	1.267	0.089
1964	0.320	0.022
1965	0.113	0.010
1966	0.026	0.001
1967	0.094	0.006
1968	0.035	0.002
1969	0.036	0.002
1970	0.072	0.005
1971	0.475	0.032
1972	0.418	0.029
1973	0.025	0.001
1974	0.181	0.012
1975	0.037	0.003
1976	0.209	0.014
1977	0.026	0.001
1978	0.172	0.014
1979	0.026	0.001
1980	0.026	0.002
1981	0.534	0.036
1982	0.917	0.061
1983	0.049	0.003
1984	0.069	0.005
1985	0.025	0.001
1986	0.091	0.007
1987	0.194	0.013
1988	0.025	0.001
1989	0.026	0.001
1990	0.030	0.002
1991	1.973	0.113
1992	10.608	0.643
1993	1.205	0.079
1994	0.025	0.001
1995	0.082	0.006
1996	0.229	0.016
1997	0.134	0.009
1998	0.025	0.001
1999	0.026	0.002
2000	0.017	0.001
2001	0.017	0.001
2002	0.028	0.002
2003	0.235	0.017
2004	0.295	0.021
2005	0.025	0.001
2006	0.025	0.001
2007	0.026	0.001
2008	0.023	0.001
2009	0.058	0.004
2010	0.084	0.006
2011	0.122	0.008

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	10.6076	0.6429
2	1.9731	0.1126
3	1.2666	0.0891
4	1.2052	0.0790
5	0.9173	0.0610
6	0.5335	0.0360
7	0.4752	0.0320
8	0.4184	0.0287
9	0.3199	0.0217
10	0.2952	0.0215
11	0.2346	0.0166
12	0.2293	0.0157
13	0.2220	0.0150
14	0.2094	0.0141
15	0.1944	0.0138
16	0.1813	0.0134
17	0.1725	0.0122
18	0.1342	0.0096
19	0.1216	0.0093
20	0.1128	0.0082
21	0.1001	0.0072
22	0.0943	0.0071
23	0.0914	0.0070
24	0.0845	0.0064
25	0.0823	0.0064
26	0.0798	0.0062
27	0.0744	0.0058
28	0.0716	0.0056
29	0.0689	0.0048
30	0.0582	0.0046
31	0.0555	0.0039
32	0.0489	0.0035
33	0.0382	0.0033
34	0.0370	0.0031
35	0.0363	0.0025
36	0.0346	0.0025
37	0.0295	0.0024
38	0.0283	0.0019
39	0.0259	0.0017
40	0.0258	0.0016
41	0.0258	0.0011
42	0.0257	0.0011
43	0.0257	0.0011
44	0.0256	0.0011
45	0.0255	0.0010
46	0.0255	0.0010
47	0.0255	0.0010
48	0.0254	0.0010
49	0.0253	0.0010
50	0.0253	0.0010
51	0.0253	0.0010
52	0.0248	0.0010
53	0.0247	0.0010
54	0.0230	0.0009

55	0.0174	0.0008
56	0.0171	0.0007

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0059	24015	156	0	Pass
0.0062	23229	149	0	Pass
0.0065	22483	138	0	Pass
0.0068	21737	133	0	Pass
0.0071	21050	124	0	Pass
0.0074	20343	117	0	Pass
0.0078	19695	113	0	Pass
0.0081	18966	109	0	Pass
0.0084	18189	105	0	Pass
0.0087	17450	103	0	Pass
0.0090	16555	99	0	Pass
0.0093	15726	95	0	Pass
0.0096	14978	90	0	Pass
0.0099	14295	88	0	Pass
0.0103	13788	87	0	Pass
0.0106	13303	83	0	Pass
0.0109	12824	81	0	Pass
0.0112	12410	81	0	Pass
0.0115	12047	80	0	Pass
0.0118	11668	77	0	Pass
0.0121	11310	75	0	Pass
0.0124	10978	72	0	Pass
0.0128	10647	70	0	Pass
0.0131	10325	68	0	Pass
0.0134	9991	64	0	Pass
0.0137	9716	61	0	Pass
0.0140	9447	55	0	Pass
0.0143	9203	52	0	Pass
0.0146	8968	51	0	Pass
0.0149	8728	49	0	Pass
0.0153	8473	48	0	Pass
0.0156	8222	47	0	Pass
0.0159	7974	46	0	Pass
0.0162	7738	45	0	Pass
0.0165	7479	45	0	Pass
0.0168	7210	43	0	Pass
0.0171	6910	43	0	Pass
0.0174	6594	42	0	Pass
0.0177	6230	41	0	Pass
0.0181	5934	40	0	Pass
0.0184	5637	40	0	Pass
0.0187	5372	40	0	Pass
0.0190	5074	39	0	Pass
0.0193	4781	39	0	Pass
0.0196	4542	39	0	Pass
0.0199	4283	39	0	Pass
0.0202	4049	39	0	Pass
0.0206	3811	39	1	Pass
0.0209	3499	38	1	Pass
0.0212	3218	38	1	Pass
0.0215	2943	37	1	Pass
0.0218	2710	36	1	Pass
0.0221	2482	36	1	Pass

0.0224	2272	36	1	Pass
0.0227	2077	36	1	Pass
0.0231	1895	35	1	Pass
0.0234	1733	34	1	Pass
0.0237	1568	34	2	Pass
0.0240	1402	33	2	Pass
0.0243	1228	32	2	Pass
0.0246	1092	32	2	Pass
0.0249	923	32	3	Pass
0.0252	765	32	4	Pass
0.0256	625	32	5	Pass
0.0259	487	31	6	Pass
0.0262	475	31	6	Pass
0.0265	473	31	6	Pass
0.0268	470	30	6	Pass
0.0271	466	30	6	Pass
0.0274	460	30	6	Pass
0.0277	457	30	6	Pass
0.0281	454	30	6	Pass
0.0284	447	29	6	Pass
0.0287	441	29	6	Pass
0.0290	434	28	6	Pass
0.0293	430	28	6	Pass
0.0296	424	26	6	Pass
0.0299	418	26	6	Pass
0.0302	414	26	6	Pass
0.0305	411	26	6	Pass
0.0309	407	26	6	Pass
0.0312	402	26	6	Pass
0.0315	393	26	6	Pass
0.0318	392	26	6	Pass
0.0321	387	25	6	Pass
0.0324	385	25	6	Pass
0.0327	384	25	6	Pass
0.0330	383	25	6	Pass
0.0334	377	25	6	Pass
0.0337	372	25	6	Pass
0.0340	370	25	6	Pass
0.0343	370	25	6	Pass
0.0346	367	25	6	Pass
0.0349	366	25	6	Pass
0.0352	360	25	6	Pass
0.0355	358	25	6	Pass
0.0359	355	25	7	Pass
0.0362	350	24	6	Pass
0.0365	348	23	6	Pass
0.0368	347	23	6	Pass

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0368	353	25	7	Pass
0.0610	210	18	8	Pass
0.0852	147	12	8	Pass
0.1095	115	9	7	Pass
0.1337	98	5	5	Pass
0.1579	84	5	5	Pass
0.1822	72	5	6	Pass
0.2064	60	5	8	Pass
0.2306	46	4	8	Pass
0.2549	41	3	7	Pass
0.2791	40	3	7	Pass
0.3033	39	3	7	Pass
0.3275	37	3	8	Pass
0.3518	33	3	9	Pass
0.3760	32	2	6	Pass
0.4002	31	2	6	Pass
0.4245	28	2	7	Pass
0.4487	27	2	7	Pass
0.4729	26	1	3	Pass
0.4971	25	1	4	Pass
0.5214	24	1	4	Pass
0.5456	23	1	4	Pass
0.5698	23	1	4	Pass
0.5941	23	1	4	Pass
0.6183	22	1	4	Pass
0.6425	22	1	4	Pass
0.6667	21	0	0	Pass
0.6910	21	0	0	Pass
0.7152	21	0	0	Pass
0.7394	20	0	0	Pass
0.7637	20	0	0	Pass
0.7879	20	0	0	Pass
0.8121	20	0	0	Pass
0.8363	19	0	0	Pass
0.8606	19	0	0	Pass
0.8848	19	0	0	Pass
0.9090	18	0	0	Pass
0.9333	17	0	0	Pass
0.9575	17	0	0	Pass
0.9817	17	0	0	Pass
1.0059	17	0	0	Pass
1.0302	17	0	0	Pass
1.0544	17	0	0	Pass
1.0786	17	0	0	Pass
1.1029	17	0	0	Pass
1.1271	17	0	0	Pass
1.1513	17	0	0	Pass
1.1756	17	0	0	Pass
1.1998	16	0	0	Pass
1.2240	13	0	0	Pass
1.2482	13	0	0	Pass
1.2725	12	0	0	Pass
1.2967	12	0	0	Pass

1.3209	10	0	0	Pass
1.3452	10	0	0	Pass
1.3694	10	0	0	Pass
1.3936	10	0	0	Pass
1.4178	10	0	0	Pass
1.4421	10	0	0	Pass
1.4663	10	0	0	Pass
1.4905	10	0	0	Pass
1.5148	10	0	0	Pass
1.5390	10	0	0	Pass
1.5632	10	0	0	Pass
1.5874	10	0	0	Pass
1.6117	10	0	0	Pass
1.6359	10	0	0	Pass
1.6601	10	0	0	Pass
1.6844	10	0	0	Pass
1.7086	10	0	0	Pass
1.7328	9	0	0	Pass
1.7570	9	0	0	Pass
1.7813	9	0	0	Pass
1.8055	9	0	0	Pass
1.8297	9	0	0	Pass
1.8540	9	0	0	Pass
1.8782	8	0	0	Pass
1.9024	8	0	0	Pass
1.9266	8	0	0	Pass
1.9509	8	0	0	Pass
1.9751	7	0	0	Pass
1.9993	7	0	0	Pass
2.0236	7	0	0	Pass
2.0478	7	0	0	Pass
2.0720	7	0	0	Pass
2.0963	7	0	0	Pass
2.1205	7	0	0	Pass
2.1447	7	0	0	Pass
2.1689	6	0	0	Pass
2.1932	6	0	0	Pass
2.2174	6	0	0	Pass
2.2416	6	0	0	Pass
2.2659	6	0	0	Pass
2.2901	6	0	0	Pass
2.3143	6	0	0	Pass
2.3385	6	0	0	Pass
2.3628	6	0	0	Pass
2.3870	6	0	0	Pass
2.4112	6	0	0	Pass
2.4355	6	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
NW Pond POC	☐	177.18			☐	100.00			
Bioretention	☐	1328.65			☐	92.77			
SW Pond POC	☐	64.27			☐	100.00			
Bioretention	☐	328.84			☐	92.92			
E Pond POC	☐	184.76			☐	100.00			
Bioretention	☐	1266.99			☐	91.91			
Bioretention POC	☐	88.03			☐	100.00			
Total Volume Infiltrated		3438.72	0.00	0.00		93.55	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

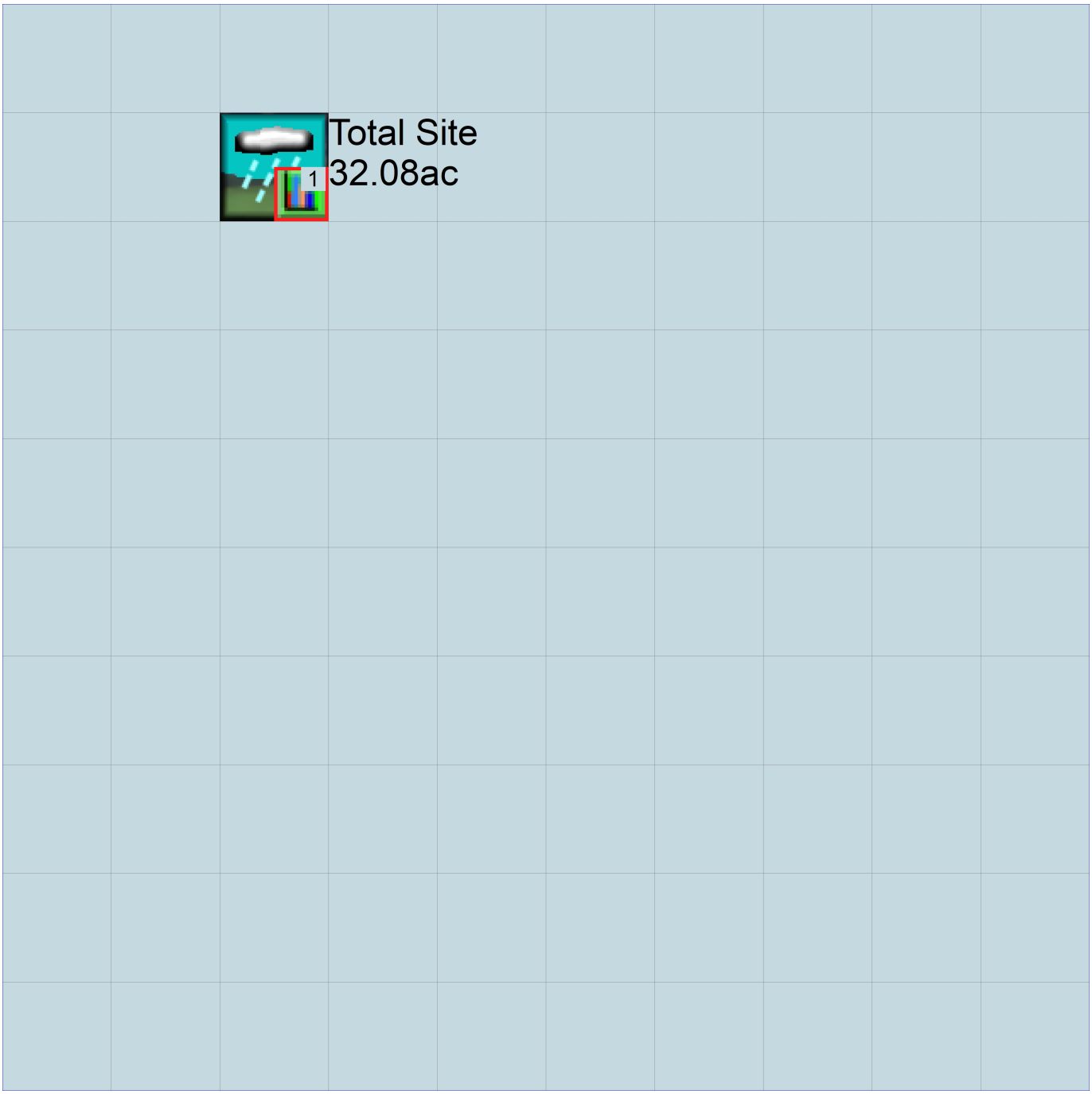
PERLND Changes

No PERLND changes have been made.

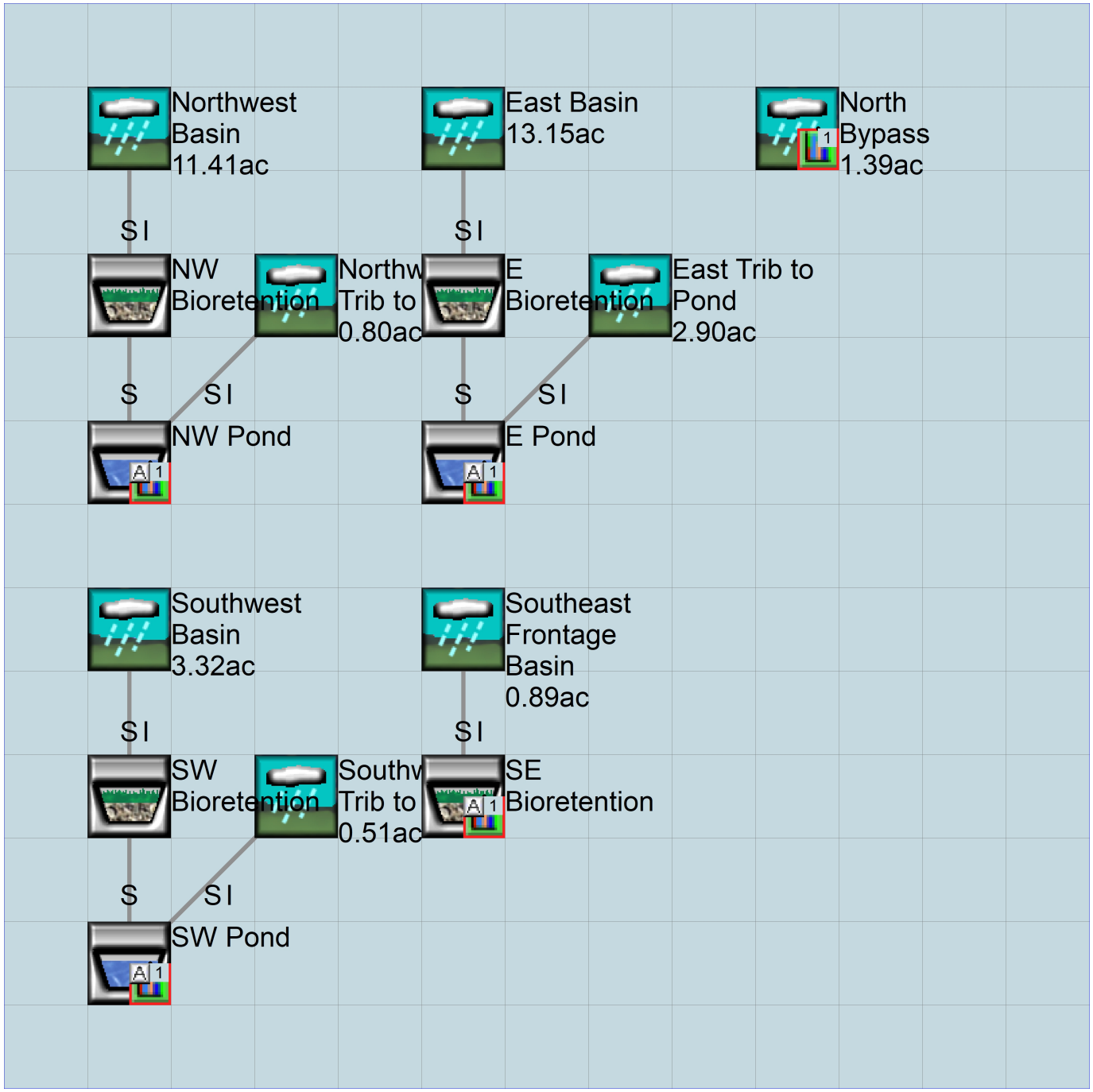
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 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   SiteAnalysis.wdm
MESSU       25   PreSiteAnalysis.MES
            27   PreSiteAnalysis.L61
            28   PreSiteAnalysis.L62
            30   POCSiteAnalysis1.dat
END FILES

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

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

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

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

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

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

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

END PERLND

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

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Total Site***
PERLND   1                       32.08     COPY   501     12
PERLND   1                       32.08     COPY   501     13

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

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



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

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

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 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   SiteAnalysis.wdm
MESSU       25   MitSiteAnalysis.MES
            27   MitSiteAnalysis.L61
            28   MitSiteAnalysis.L62
            30   POCSiteAnalysis1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      PERLND       4
      PERLND       6
      PERLND      31
      IMPLND       1
      IMPLND       4
      IMPLND       5
      IMPLND       8
      PERLND       2
      PERLND       3
      IMPLND      14
      IMPLND       3
      RCHRES       1
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      RCHRES       7
      RCHRES       8
      RCHRES       9
      RCHRES      10
      RCHRES      11
      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        Surface Bioretention        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           ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
    4     A/B, Pasture, Flat      1    1    1    1   27    0
    6     A/B, Pasture, Steep     1    1    1    1   27    0
   31      A/B/IMP INF/FLAT       1    1    1    1   27    0
    2     A/B, Forest, Mod        1    1    1    1   27    0
    3     A/B, Forest, Steep      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
    4         0    0    1    0    0    0    0    0    0    0    0    0
    6         0    0    1    0    0    0    0    0    0    0    0    0
   31         0    0    1    0    0    0    0    0    0    0    0    0
    2         0    0    1    0    0    0    0    0    0    0    0    0
    3         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
    4         0    0    4    0    0    0    0    0    0    0    0    0    1    9
    6         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   31         0    0    4    0    0    0    0    0    0    0    0    0    1    9
    2         0    0    4    0    0    0    0    0    0    0    0    0    1    9
    3         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
    4         0    0    0    0    0    0    0    0    0    0    0
    6         0    0    0    0    0    0    0    0    0    0    0
   31         0    0    0    0    0    0    0    0    0    0    0
    2         0    0    0    0    0    0    0    0    0    0    0
    3         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
    1               0         5         2       400      0.05        0.3      0.996
    4               0         5       1.5       400      0.05        0.3      0.996
    6               0         5       1.5       400      0.15        0.3      0.996
   31               0         5       0.8       400      0.05        0.3      0.996
    2               0         5         2       400       0.1        0.3      0.996
    3               0         5         2       400      0.15        0.3      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1               0         0         2         2         0         0         0
    4               0         0         2         2         0         0         0
    6               0         0         2         2         0         0         0
   31               0         0         2         2         0         0         0
    2               0         0         2         2         0         0         0
```

```
    3              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                    ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1          0.2       0.5      0.35         0       0.7       0.7
    4         0.15       0.5       0.3         0       0.7       0.4
    6         0.15       0.5       0.3         0       0.7       0.4
   31          0.1       0.5      0.25         0       0.7      0.25
    2          0.2       0.5      0.35         0       0.7       0.7
    3          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1             0         0         0         0         3         1         0
    4             0         0         0         0         3         1         0
    6             0         0         0         0         3         1         0
   31             0         0         0         0         3         1         0
    2             0         0         0         0         3         1         0
    3             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           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
   14      POND                   1    1    1   27    0
    3      ROADS/STEEP            1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
    8         0    0    1    0    0    0
   14         0    0    1    0    0    0
    3         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
    3         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     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
    5         0    0    0    0    0
    8         0    0    0    0    0
```

```
   14         0    0    0    0    0
    3         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
   14            400      0.01       0.1       0.1
    3            400       0.1       0.1      0.05
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
    5              0         0
    8              0         0
   14              0         0
    3              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    5              0         0
    8              0         0
   14              0         0
    3              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Northwest Basin***
PERLND   1                       0.4      RCHRES   1      2
PERLND   1                       0.4      RCHRES   1      3
PERLND   4                      3.59      RCHRES   1      2
PERLND   4                      3.59      RCHRES   1      3
PERLND   6                      0.15      RCHRES   1      2
PERLND   6                      0.15      RCHRES   1      3
IMPLND   1                      2.76      RCHRES   1      5
IMPLND   4                      2.76      RCHRES   1      5
IMPLND   5                      0.95      RCHRES   1      5
IMPLND   8                      0.66      RCHRES   1      5
Southwest Basin***
PERLND   4                      1.53      RCHRES   3      2
PERLND   4                      1.53      RCHRES   3      3
IMPLND   1                      0.77      RCHRES   3      5
IMPLND   4                      0.62      RCHRES   3      5
IMPLND   5                      0.15      RCHRES   3      5
IMPLND   8                      0.22      RCHRES   3      5
East Basin***
PERLND   4                      6.22      RCHRES   5      2
PERLND   4                      6.22      RCHRES   5      3
IMPLND   1                      1.88      RCHRES   5      5
IMPLND   4                      3.41      RCHRES   5      5
IMPLND   5                      0.95      RCHRES   5      5
IMPLND   8                      0.55      RCHRES   5      5
Southeast Frontage Basin***
PERLND   4                      0.26      RCHRES   7      2
PERLND   4                      0.26      RCHRES   7      3
```

```
PERLND   6                      0.12     RCHRES   7      2
PERLND   6                      0.12     RCHRES   7      3
IMPLND   1                      0.37     RCHRES   7      5
IMPLND   8                      0.09     RCHRES   7      5
Northwest Trib to Pond***
PERLND   6                      0.36     RCHRES   9      2
PERLND   6                      0.36     RCHRES   9      3
IMPLND   1                      0.03     RCHRES   9      5
IMPLND  14                      0.41     RCHRES   9      5
Southwest Trib to Pond***
PERLND   4                      0.29     RCHRES  10      2
PERLND   4                      0.29     RCHRES  10      3
IMPLND   3                      0.07     RCHRES  10      5
IMPLND  14                      0.15     RCHRES  10      5
East Trib to Pond***
PERLND   2                      2.46     RCHRES  11      2
PERLND   2                      2.46     RCHRES  11      3
IMPLND   3                      0.08     RCHRES  11      5
IMPLND  14                      0.36     RCHRES  11      5
North Bypass***
PERLND   2                      1.02     COPY   501     12
PERLND   2                      1.02     COPY   601     12
PERLND   2                      1.02     COPY   501     13
PERLND   2                      1.02     COPY   601     13
PERLND   3                      0.29     COPY   501     12
PERLND   3                      0.29     COPY   601     12
PERLND   3                      0.29     COPY   501     13
PERLND   3                      0.29     COPY   601     13
PERLND   6                      0.08     COPY   501     12
PERLND   6                      0.08     COPY   601     12
PERLND   6                      0.08     COPY   501     13
PERLND   6                      0.08     COPY   601     13

******Routing******
PERLND   4                      0.26     COPY     1     12
PERLND   6                      0.12     COPY     1     12
PERLND  31                      0.05     COPY     1     12
IMPLND   1                      0.37     COPY     1     15
IMPLND   8                      0.09     COPY     1     15
PERLND   4                      0.26     COPY     1     13
PERLND   6                      0.12     COPY     1     13
PERLND  31                      0.05     COPY     1     13
PERLND   6                      0.36     COPY     1     12
IMPLND   1                      0.03     COPY     1     15
IMPLND  14                      0.41     COPY     1     15
PERLND   6                      0.36     COPY     1     13
PERLND   4                      0.29     COPY     1     12
IMPLND   3                      0.07     COPY     1     15
IMPLND  14                      0.15     COPY     1     15
PERLND   4                      0.29     COPY     1     13
PERLND   2                      2.46     COPY     1     12
IMPLND   3                      0.08     COPY     1     15
IMPLND  14                      0.36     COPY     1     15
PERLND   2                      2.46     COPY     1     13
RCHRES   2                         1     RCHRES   9      7
RCHRES   2                               COPY     1     17
RCHRES   1                         1     RCHRES   9      7
RCHRES   1                               COPY     1     17
RCHRES   1                         1     RCHRES   2      8
RCHRES   4                         1     RCHRES  10      7
RCHRES   4                               COPY     1     17
RCHRES   3                         1     RCHRES  10      7
RCHRES   3                               COPY     1     17
RCHRES   3                         1     RCHRES   4      8
RCHRES   6                         1     RCHRES  11      7
RCHRES   6                               COPY     1     17
RCHRES   5                         1     RCHRES  11      7
RCHRES   5                               COPY     1     17
RCHRES   5                         1     RCHRES   6      8
RCHRES   7                         1     RCHRES   8      8
```

```
RCHRES   9                             1     COPY   501     17
RCHRES  10                             1     COPY   501     17
RCHRES  11                             1     COPY   501     17
RCHRES   8                             1     COPY   501     17
RCHRES   7                             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     Surface Bioreten-013    3    1    1    1   28    0    1
    2     NW Bioretention         2    1    1    1   28    0    1
    3     Surface Bioreten-016    3    1    1    1   28    0    1
    4     SW Bioretention         2    1    1    1   28    0    1
    5     Surface Bioreten-019    3    1    1    1   28    0    1
    6     E Bioretention          2    1    1    1   28    0    1
    7     Surface Bioreten-022    3    1    1    1   28    0    1
    8     SE Bioretention         2    1    1    1   28    0    1
    9     NW Pond                 2    1    1    1   28    0    1
   10     SW Pond                 2    1    1    1   28    0    1
   11     E Pond                  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
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
    7         1    0    0    0    0    0    0    0    0    0
    8         1    0    0    0    0    0    0    0    0    0
    9         1    0    0    0    0    0    0    0    0    0
   10         1    0    0    0    0    0    0    0    0    0
   11         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
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
    7         4    0    0    0    0    0    0    0    0    0    1    9
    8         4    0    0    0    0    0    0    0    0    0    1    9
    9         4    0    0    0    0    0    0    0    0    0    1    9
   10         4    0    0    0    0    0    0    0    0    0    1    9
   11         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  6  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
    3       0  1  0  0    4  5  6  0  0       0  0  0  0  0          2  2  2  2  2
    4       0  1  0  0    4  5  0  0  0       0  0  0  0  0          2  2  2  2  2
    5       0  1  0  0    4  5  6  0  0       0  0  0  0  0          2  2  2  2  2
    6       0  1  0  0    4  5  0  0  0       0  0  0  0  0          2  2  2  2  2
    7       0  1  0  0    4  5  6  0  0       0  0  0  0  0          2  2  2  2  2
    8       0  1  0  0    4  5  0  0  0       0  0  0  0  0          2  2  2  2  2
    9       0  1  0  0    4  5  0  0  0       0  0  0  0  0          2  2  2  2  2
   10       0  1  0  0    4  5  0  0  0       0  0  0  0  0          2  2  2  2  2
   11       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    210.25       0.0       0.0
    2              2      0.01       0.0    210.25       0.0       0.0
    3              3      0.01       0.0    219.25       0.0       0.0
    4              4      0.01       0.0    219.25       0.0       0.0
    5              5      0.01       0.0    216.25       0.0       0.0
    6              6      0.03       0.0    216.25       0.0       0.0
    7              7      0.01       0.0    213.25       0.0       0.0
    8              8      0.01       0.0    213.25       0.0       0.0
    9              9      0.02       0.0     209.0       0.5       0.0
   10             10      0.01       0.0     220.0       0.5       0.0
   11             11      0.02       0.0     215.0       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  6.0  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
    3            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    7            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    8            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    9            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   10         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   11         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
   35    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.110864  0.000000  0.000000  0.000000
  0.052198  0.110339  0.001917  0.000000  0.000000
  0.104396  0.109344  0.003855  0.000000  0.000000
  0.156593  0.108354  0.005813  0.000000  0.000000
  0.208791  0.107368  0.007791  0.000000  0.000000
  0.260989  0.106387  0.009790  0.000000  0.001573
  0.313187  0.105410  0.011810  0.000000  0.002747
  0.365385  0.104438  0.013851  0.000000  0.004377
  0.417582  0.103470  0.015913  0.000000  0.006530
  0.469780  0.102507  0.017996  0.000000  0.009269
  0.521978  0.101548  0.020100  0.000000  0.012656
  0.574176  0.100594  0.022226  0.000000  0.016750
```

```
  0.626374  0.099644  0.024373  0.000000  0.021611
  0.678571  0.098699  0.026541  0.000000  0.027298
  0.730769  0.097758  0.028732  0.000000  0.033869
  0.782967  0.096822  0.030943  0.000000  0.041382
  0.835165  0.095890  0.033177  0.000000  0.046974
  0.887363  0.094963  0.035433  0.000000  0.050385
  0.939560  0.094041  0.037711  0.000000  0.060049
  0.991758  0.093122  0.040011  0.000000  0.070841
  1.043956  0.092209  0.042333  0.000000  0.082819
  1.096154  0.091299  0.044678  0.000000  0.096045
  1.148352  0.090395  0.047045  0.000000  0.110576
  1.200549  0.089495  0.049435  0.000000  0.114887
  1.252747  0.088599  0.051848  0.000000  0.127673
  1.304945  0.087708  0.054283  0.000000  0.145153
  1.357143  0.086821  0.056741  0.000000  0.164129
  1.409341  0.085939  0.059223  0.000000  0.184659
  1.461538  0.085061  0.061727  0.000000  0.206800
  1.513736  0.084188  0.064255  0.000000  0.226609
  1.565934  0.083319  0.066806  0.000000  0.395206
  1.618132  0.082455  0.069381  0.000000  0.457425
  1.670330  0.081596  0.071979  0.000000  0.516360
  1.722527  0.080740  0.074601  0.000000  0.580385
  1.750000  0.079890  0.088694  0.000000  0.614835
  END FTABLE  2
  FTABLE      1
   59    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.079890  0.000000  0.000000  0.000000  0.010100
  0.052198  0.111866  0.005813  0.000000  0.290354  0.010100
  0.104396  0.112872  0.011678  0.000000  0.298764  0.020245
  0.156593  0.113883  0.017596  0.000000  0.307174  0.030436
  0.208791  0.114898  0.023567  0.000000  0.315583  0.040672
  0.260989  0.115918  0.029591  0.000000  0.323993  0.050953
  0.313187  0.116942  0.035669  0.000000  0.332403  0.061280
  0.365385  0.117970  0.041800  0.000000  0.340812  0.071652
  0.417582  0.119003  0.047985  0.000000  0.349222  0.082070
  0.469780  0.120041  0.054223  0.000000  0.357632  0.092533
  0.521978  0.121083  0.060516  0.000000  0.366041  0.103041
  0.574176  0.122130  0.066864  0.000000  0.374451  0.113595
  0.626374  0.123181  0.073266  0.000000  0.382861  0.124194
  0.678571  0.124237  0.079724  0.000000  0.391270  0.134839
  0.730769  0.125297  0.086236  0.000000  0.399680  0.145529
  0.782967  0.126362  0.092804  0.000000  0.408089  0.156265
  0.835165  0.127431  0.099428  0.000000  0.416499  0.167046
  0.887363  0.128505  0.106108  0.000000  0.424909  0.177872
  0.939560  0.129583  0.112843  0.000000  0.433318  0.188744
  0.991758  0.130665  0.119636  0.000000  0.441728  0.199661
  1.043956  0.131753  0.126484  0.391302  0.450138  0.210624
  1.096154  0.132844  0.133390  1.265259  0.458547  0.221632
  1.148352  0.133941  0.140353  2.423511  0.466957  0.232685
  1.200549  0.135041  0.147373  3.807068  0.475367  0.243784
  1.252747  0.136146  0.154451  5.382232  0.483776  0.254928
  1.304945  0.137256  0.161586  7.125454  0.492186  0.266118
  1.357143  0.138370  0.168780  9.018157  0.500596  0.277353
  1.409341  0.139489  0.176032  11.04439  0.509005  0.288633
  1.461538  0.140612  0.183342  13.18961  0.517415  0.299959
  1.513736  0.141740  0.190711  15.43996  0.525825  0.311330
  1.565934  0.142872  0.198139  17.78185  0.534234  0.322747
  1.618132  0.144009  0.205626  20.20174  0.542644  0.334209
  1.670330  0.145150  0.213173  22.68596  0.551054  0.345716
  1.722527  0.146296  0.220780  25.22066  0.559463  0.357269
  1.774725  0.147446  0.228446  27.79179  0.567873  0.368868
  1.826923  0.148601  0.236172  30.38517  0.576283  0.380511
  1.879121  0.149760  0.243959  32.98645  0.584692  0.392201
  1.931319  0.150924  0.251807  35.58130  0.593102  0.403935
  1.983516  0.152092  0.259715  38.15544  0.601511  0.415715
  2.035714  0.153265  0.267685  40.69481  0.609921  0.427540
```

```
2.087912  0.154442  0.275716  43.18566  0.614835  0.439411
2.140110  0.155624  0.283808  45.61475  0.614835  0.451327
2.192308  0.156810  0.291962  47.96950  0.614835  0.463289
2.244505  0.158001  0.300178  50.23813  0.614835  0.475296
2.296703  0.159196  0.308457  52.40992  0.614835  0.487348
2.348901  0.160396  0.316798  54.47533  0.614835  0.499446
2.401099  0.161600  0.325202  56.42628  0.614835  0.511589
2.453297  0.162809  0.333668  58.25631  0.614835  0.523778
2.505495  0.164023  0.342198  59.96084  0.614835  0.536012
2.557692  0.165240  0.350792  61.53738  0.614835  0.548292
2.609890  0.166463  0.359449  62.98578  0.614835  0.560617
2.662088  0.167689  0.368170  64.30850  0.614835  0.572987
2.714286  0.168921  0.376955  65.51084  0.614835  0.585402
2.766484  0.170157  0.385804  66.60120  0.614835  0.597864
2.818681  0.171397  0.394719  67.59137  0.614835  0.610370
2.870879  0.172642  0.403698  68.49679  0.614835  0.622922
2.923077  0.173891  0.412742  69.33686  0.614835  0.635519
2.975275  0.175145  0.421851  70.13520  0.614835  0.648162
3.000000  0.175740  0.426189  71.75580  0.614835  0.654167
END FTABLE  1
FTABLE      9
 91    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.175712  0.000000  0.000000  0.000000
0.066667  0.177997  0.011790  0.000000  1.771759
0.133333  0.180295  0.023733  0.000000  1.771759
0.200000  0.182606  0.035830  0.000000  1.771759
0.266667  0.184929  0.048081  0.000000  1.771759
0.333333  0.187265  0.060488  0.000000  1.771759
0.400000  0.189614  0.073050  0.000000  1.771759
0.466667  0.191975  0.085770  0.000000  1.771759
0.533333  0.194349  0.098648  0.000000  1.771759
0.600000  0.196735  0.111684  0.000000  1.771759
0.666667  0.199134  0.124879  0.000000  1.771759
0.733333  0.201546  0.138235  0.000000  1.771759
0.800000  0.203970  0.151753  0.000000  1.771759
0.866667  0.206407  0.165432  0.000000  1.771759
0.933333  0.208857  0.179274  0.000000  1.771759
1.000000  0.211319  0.193280  0.000000  1.771759
1.066667  0.213793  0.207450  0.000000  1.771759
1.133333  0.216281  0.221786  0.000000  1.771759
1.200000  0.218781  0.236288  0.000000  1.771759
1.266667  0.221293  0.250957  0.000000  1.771759
1.333333  0.223818  0.265794  0.000000  1.771759
1.400000  0.226356  0.280800  0.000000  1.771759
1.466667  0.228906  0.295975  0.000000  1.771759
1.533333  0.231469  0.311321  0.000000  1.771759
1.600000  0.234045  0.326838  0.000000  1.771759
1.666667  0.236633  0.342528  0.000000  1.771759
1.733333  0.239234  0.358390  0.000000  1.771759
1.800000  0.241847  0.374426  0.000000  1.771759
1.866667  0.244473  0.390637  0.000000  1.771759
1.933333  0.247112  0.407023  0.000000  1.771759
2.000000  0.249763  0.423585  0.000000  1.771759
2.066667  0.252427  0.440325  0.000000  1.771759
2.133333  0.255103  0.457243  0.000000  1.771759
2.200000  0.257792  0.474339  0.000000  1.771759
2.266667  0.260494  0.491615  0.000000  1.771759
2.333333  0.263208  0.509072  0.000000  1.771759
2.400000  0.265935  0.526710  0.000000  1.771759
2.466667  0.268675  0.544531  0.000000  1.771759
2.533333  0.271427  0.562534  0.000000  1.771759
2.600000  0.274192  0.580721  0.000000  1.771759
2.666667  0.276969  0.599093  0.000000  1.771759
2.733333  0.279759  0.617651  0.000000  1.771759
2.800000  0.282562  0.636395  0.000000  1.771759
2.866667  0.285377  0.655326  0.000000  1.771759
2.933333  0.288205  0.674446  0.000000  1.771759
3.000000  0.291045  0.693754  0.000000  1.771759
```

```
3.066667  0.293898  0.713252  0.000000  1.771759
3.133333  0.296764  0.732941  0.000000  1.771759
3.200000  0.299642  0.752821  0.000000  1.771759
3.266667  0.302533  0.772893  0.000000  1.771759
3.333333  0.305436  0.793159  0.000000  1.771759
3.400000  0.308352  0.813619  0.000000  1.771759
3.466667  0.311281  0.834273  0.000000  1.771759
3.533333  0.314222  0.855123  0.000000  1.771759
3.600000  0.317176  0.876170  0.000000  1.771759
3.666667  0.320143  0.897414  0.000000  1.771759
3.733333  0.323122  0.918856  0.000000  1.771759
3.800000  0.326113  0.940497  0.000000  1.771759
3.866667  0.329118  0.962338  0.000000  1.771759
3.933333  0.332135  0.984380  0.000000  1.771759
4.000000  0.335164  1.006623  0.000000  1.771759
4.066667  0.338207  1.029069  0.000000  1.771759
4.133333  0.341261  1.051718  0.000000  1.771759
4.200000  0.344329  1.074571  0.000000  1.771759
4.266667  0.347409  1.097629  0.000000  1.771759
4.333333  0.350501  1.120892  0.000000  1.771759
4.400000  0.353607  1.144363  0.000000  1.771759
4.466667  0.356724  1.168040  0.000000  1.771759
4.533333  0.359855  1.191926  0.000000  1.771759
4.600000  0.362998  1.216021  0.000000  1.771759
4.666667  0.366154  1.240326  0.000000  1.771759
4.733333  0.369322  1.264842  0.000000  1.771759
4.800000  0.372503  1.289570  0.000000  1.771759
4.866667  0.375696  1.314510  0.000000  1.771759
4.933333  0.378902  1.339663  0.000000  1.771759
5.000000  0.382121  1.365031  0.000000  1.771759
5.066667  0.385353  1.390613  0.730683  1.771759
5.133333  0.388597  1.416411  2.065279  1.771759
5.200000  0.391853  1.442426  3.791459  1.771759
5.266667  0.395122  1.468659  5.831490  1.771759
5.333333  0.398404  1.495110  8.137338  1.771759
5.400000  0.401698  1.521780  10.67266  1.771759
5.466667  0.405005  1.548670  13.40627  1.771759
5.533333  0.408325  1.575781  16.30919  1.771759
5.600000  0.411657  1.603114  19.35316  1.771759
5.666667  0.415002  1.630669  22.50982  1.771759
5.733333  0.418360  1.658448  25.75040  1.771759
5.800000  0.421730  1.686451  29.04564  1.771759
5.866667  0.425112  1.714679  32.36584  1.771759
5.933333  0.428508  1.743133  35.68113  1.771759
6.000000  0.431916  1.771813  38.96176  1.771759
END FTABLE  9
FTABLE      4
 35    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.025799  0.000000  0.000000  0.000000
0.052198  0.025485  0.000203  0.000000  0.000000
0.104396  0.024892  0.000418  0.000000  0.000000
0.156593  0.024303  0.000643  0.000000  0.000000
0.208791  0.023720  0.000879  0.000000  0.000000
0.260989  0.023140  0.001126  0.000000  0.000198
0.313187  0.022565  0.001384  0.000000  0.000357
0.365385  0.021995  0.001654  0.000000  0.000587
0.417582  0.021429  0.001935  0.000000  0.000904
0.469780  0.020868  0.002227  0.000000  0.001321
0.521978  0.020311  0.002532  0.000000  0.001855
0.574176  0.019759  0.002847  0.000000  0.002523
0.626374  0.019211  0.003175  0.000000  0.003342
0.678571  0.018667  0.003515  0.000000  0.004330
0.730769  0.018128  0.003867  0.000000  0.005506
0.782967  0.017594  0.004231  0.000000  0.006889
0.835165  0.017064  0.004607  0.000000  0.008001
0.887363  0.016539  0.004995  0.000000  0.008775
0.939560  0.016018  0.005396  0.000000  0.010686
0.991758  0.015502  0.005810  0.000000  0.012873
```

```
  1.043956  0.014990  0.006236  0.000000  0.015358
  1.096154  0.014483  0.006676  0.000000  0.018165
  1.148352  0.013980  0.007128  0.000000  0.021318
  1.200549  0.013482  0.007593  0.000000  0.022566
  1.252747  0.012988  0.008071  0.000000  0.025536
  1.304945  0.012498  0.008562  0.000000  0.029549
  1.357143  0.012014  0.009067  0.000000  0.033992
  1.409341  0.011533  0.009585  0.000000  0.038890
  1.461538  0.011058  0.010117  0.000000  0.044270
  1.513736  0.010586  0.010663  0.000000  0.049290
  1.565934  0.010119  0.011222  0.000000  0.087308
  1.618132  0.009657  0.011795  0.000000  0.102599
  1.670330  0.009199  0.012382  0.000000  0.117548
  1.722527  0.008746  0.012984  0.000000  0.134050
  1.750000  0.008297  0.016262  0.000000  0.143074
  END FTABLE  4
  FTABLE      3
   59    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.008297  0.000000  0.000000  0.000000  0.006048
  0.052198  0.026398  0.001362  0.000000  0.030156  0.006048
  0.104396  0.027003  0.002756  0.000000  0.031030  0.012141
  0.156593  0.027611  0.004181  0.000000  0.031903  0.018279
  0.208791  0.028225  0.005639  0.000000  0.032776  0.024463
  0.260989  0.028842  0.007128  0.000000  0.033650  0.030692
  0.313187  0.029465  0.008650  0.000000  0.034523  0.036967
  0.365385  0.030091  0.010204  0.000000  0.035397  0.043287
  0.417582  0.030723  0.011791  0.000000  0.036270  0.049652
  0.469780  0.031359  0.013412  0.000000  0.037144  0.056063
  0.521978  0.031999  0.015065  0.000000  0.038017  0.062519
  0.574176  0.032644  0.016752  0.000000  0.038890  0.069021
  0.626374  0.033293  0.018473  0.000000  0.039764  0.075568
  0.678571  0.033947  0.020228  0.000000  0.040637  0.082160
  0.730769  0.034605  0.022017  0.000000  0.041511  0.088798
  0.782967  0.035268  0.023841  0.000000  0.042384  0.095482
  0.835165  0.035935  0.025699  0.000000  0.043258  0.102210
  0.887363  0.036607  0.027592  0.000000  0.044131  0.108984
  0.939560  0.037283  0.029521  0.000000  0.045004  0.115804
  0.991758  0.037964  0.031485  0.000000  0.045878  0.122669
  1.043956  0.038649  0.033484  0.391302  0.046751  0.129579
  1.096154  0.039339  0.035520  1.265259  0.047625  0.136535
  1.148352  0.040034  0.037591  2.423511  0.048498  0.143536
  1.200549  0.040732  0.039699  3.807068  0.049372  0.150583
  1.252747  0.041436  0.041843  5.382232  0.050245  0.157675
  1.304945  0.042144  0.044025  7.125454  0.051118  0.164812
  1.357143  0.042856  0.046243  9.018157  0.051992  0.171995
  1.409341  0.043573  0.048499  11.04439  0.052865  0.179223
  1.461538  0.044294  0.050792  13.18961  0.053739  0.186497
  1.513736  0.045020  0.053123  15.43996  0.054612  0.193816
  1.565934  0.045750  0.055492  17.78185  0.055486  0.201180
  1.618132  0.046485  0.057899  20.20174  0.056359  0.208590
  1.670330  0.047225  0.060345  22.68596  0.057232  0.216045
  1.722527  0.047968  0.062829  25.22066  0.058106  0.223546
  1.774725  0.048717  0.065353  27.79179  0.058979  0.231092
  1.826923  0.049470  0.067915  30.38517  0.059853  0.238684
  1.879121  0.050227  0.070517  32.98645  0.060726  0.246321
  1.931319  0.050989  0.073159  35.58130  0.061600  0.254003
  1.983516  0.051755  0.075841  38.15544  0.062473  0.261731
  2.035714  0.052526  0.078562  40.69481  0.063346  0.269504
  2.087912  0.053302  0.081324  43.18566  0.064220  0.277322
  2.140110  0.054082  0.084127  45.61475  0.065093  0.285186
  2.192308  0.054866  0.086970  47.96950  0.065967  0.293096
  2.244505  0.055655  0.089855  50.23813  0.066840  0.301051
  2.296703  0.056448  0.092780  52.40992  0.067713  0.309051
  2.348901  0.057246  0.095748  54.47533  0.068587  0.317096
  2.401099  0.058049  0.098757  56.42628  0.069460  0.325187
  2.453297  0.058855  0.101808  58.25631  0.070334  0.333324
```

```
2.505495  0.059667  0.104901  59.96084  0.071207  0.341506
2.557692  0.060483  0.108037  61.53738  0.072081  0.349733
2.609890  0.061303  0.111215  62.98578  0.072954  0.358006
2.662088  0.062128  0.114437  64.30850  0.073827  0.366324
2.714286  0.062958  0.117701  65.51084  0.074701  0.374687
2.766484  0.063792  0.121009  66.60120  0.075574  0.383096
2.818681  0.064630  0.124361  67.59137  0.076448  0.391550
2.870879  0.065473  0.127757  68.49679  0.077321  0.400050
2.923077  0.066320  0.131196  69.33686  0.078195  0.408595
2.975275  0.067172  0.134680  70.13520  0.079068  0.417186
3.000000  0.067577  0.136346  71.75580  0.079482  0.421271
END FTABLE  3
FTABLE     10
 91    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.061065  0.000000  0.000000  0.000000
0.055556  0.062083  0.003421  0.000000  0.615741
0.111111  0.063107  0.006898  0.000000  0.615741
0.166667  0.064137  0.010433  0.000000  0.615741
0.222222  0.065174  0.014025  0.000000  0.615741
0.277778  0.066218  0.017675  0.000000  0.615741
0.333333  0.067268  0.021383  0.000000  0.615741
0.388889  0.068325  0.025149  0.000000  0.615741
0.444444  0.069388  0.028974  0.000000  0.615741
0.500000  0.070458  0.032859  0.000000  0.615741
0.555556  0.071534  0.036803  0.000000  0.615741
0.611111  0.072617  0.040807  0.000000  0.615741
0.666667  0.073707  0.044872  0.000000  0.615741
0.722222  0.074803  0.048997  0.000000  0.615741
0.777778  0.075905  0.053184  0.000000  0.615741
0.833333  0.077014  0.057431  0.000000  0.615741
0.888889  0.078130  0.061741  0.000000  0.615741
0.944444  0.079252  0.066113  0.000000  0.615741
1.000000  0.080381  0.070547  0.000000  0.615741
1.055556  0.081516  0.075044  0.000000  0.615741
1.111111  0.082658  0.079604  0.000000  0.615741
1.166667  0.083807  0.084229  0.000000  0.615741
1.222222  0.084962  0.088917  0.000000  0.615741
1.277778  0.086123  0.093669  0.000000  0.615741
1.333333  0.087291  0.098486  0.000000  0.615741
1.388889  0.088466  0.103368  0.000000  0.615741
1.444444  0.089647  0.108316  0.000000  0.615741
1.500000  0.090834  0.113329  0.000000  0.615741
1.555556  0.092029  0.118409  0.000000  0.615741
1.611111  0.093229  0.123555  0.000000  0.615741
1.666667  0.094437  0.128768  0.000000  0.615741
1.722222  0.095651  0.134048  0.000000  0.615741
1.777778  0.096871  0.139396  0.000000  0.615741
1.833333  0.098098  0.144811  0.000000  0.615741
1.888889  0.099332  0.150296  0.000000  0.615741
1.944444  0.100572  0.155848  0.000000  0.615741
2.000000  0.101818  0.161470  0.000000  0.615741
2.055556  0.103071  0.167162  0.000000  0.615741
2.111111  0.104331  0.172923  0.000000  0.615741
2.166667  0.105597  0.178754  0.000000  0.615741
2.222222  0.106870  0.184656  0.000000  0.615741
2.277778  0.108149  0.190629  0.000000  0.615741
2.333333  0.109435  0.196673  0.000000  0.615741
2.388889  0.110728  0.202789  0.000000  0.615741
2.444444  0.112027  0.208976  0.000000  0.615741
2.500000  0.113332  0.215236  0.000000  0.615741
2.555556  0.114644  0.221569  0.000000  0.615741
2.611111  0.115963  0.227975  0.000000  0.615741
2.666667  0.117288  0.234454  0.000000  0.615741
2.722222  0.118620  0.241007  0.000000  0.615741
2.777778  0.119958  0.247634  0.000000  0.615741
2.833333  0.121303  0.254336  0.000000  0.615741
2.888889  0.122654  0.261112  0.000000  0.615741
2.944444  0.124012  0.267964  0.000000  0.615741
```

```
3.000000  0.125376  0.274891  0.000000  0.615741
3.055556  0.126747  0.281895  0.000000  0.615741
3.111111  0.128125  0.288975  0.000000  0.615741
3.166667  0.129509  0.296131  0.000000  0.615741
3.222222  0.130900  0.303365  0.000000  0.615741
3.277778  0.132297  0.310676  0.000000  0.615741
3.333333  0.133701  0.318065  0.000000  0.615741
3.388889  0.135111  0.325532  0.000000  0.615741
3.444444  0.136528  0.333077  0.000000  0.615741
3.500000  0.137951  0.340702  0.000000  0.615741
3.555556  0.139381  0.348405  0.000000  0.615741
3.611111  0.140817  0.356188  0.000000  0.615741
3.666667  0.142260  0.364052  0.000000  0.615741
3.722222  0.143710  0.371995  0.000000  0.615741
3.777778  0.145166  0.380020  0.000000  0.615741
3.833333  0.146629  0.388125  0.000000  0.615741
3.888889  0.148098  0.396312  0.000000  0.615741
3.944444  0.149574  0.404581  0.000000  0.615741
4.000000  0.151056  0.412931  0.000000  0.615741
4.055556  0.152545  0.421365  0.555921  0.615741
4.111111  0.154040  0.429881  1.571452  0.615741
4.166667  0.155542  0.438481  2.885348  0.615741
4.222222  0.157051  0.447164  4.439323  0.615741
4.277778  0.158566  0.455931  6.198416  0.615741
4.333333  0.160087  0.464782  8.137338  0.615741
4.388889  0.161615  0.473719  10.23553  0.615741
4.444444  0.163150  0.482740  12.47484  0.615741
4.500000  0.164691  0.491846  14.83834  0.615741
4.555556  0.166239  0.501039  17.30957  0.615741
4.611111  0.167793  0.510318  19.87221  0.615741
4.666667  0.169354  0.519683  22.50982  0.615741
4.722222  0.170922  0.529135  25.20571  0.615741
4.777778  0.172495  0.538674  27.94298  0.615741
4.833333  0.174076  0.548301  30.70448  0.615741
4.888889  0.175663  0.558016  33.47296  0.615741
4.944444  0.177257  0.567820  36.23110  0.615741
5.000000  0.178857  0.577712  38.96176  0.615741
END FTABLE 10
FTABLE      6
 35    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.103722  0.000000  0.000000  0.000000
0.052198  0.102994  0.001442  0.000000  0.000000
0.104396  0.101612  0.002913  0.000000  0.000000
0.156593  0.100235  0.004414  0.000000  0.000000
0.208791  0.098862  0.005945  0.000000  0.000000
0.260989  0.097494  0.007506  0.000000  0.001233
0.313187  0.096131  0.009096  0.000000  0.002172
0.365385  0.094772  0.010717  0.000000  0.003491
0.417582  0.093417  0.012368  0.000000  0.005250
0.469780  0.092067  0.014050  0.000000  0.007512
0.521978  0.090722  0.015762  0.000000  0.010336
0.574176  0.089380  0.017504  0.000000  0.013783
0.626374  0.088044  0.019277  0.000000  0.017913
0.678571  0.086712  0.021081  0.000000  0.022789
0.730769  0.085384  0.022916  0.000000  0.028471
0.782967  0.084061  0.024782  0.000000  0.035023
0.835165  0.082743  0.026679  0.000000  0.040020
0.887363  0.081429  0.028607  0.000000  0.043204
0.939560  0.080119  0.030566  0.000000  0.051815
0.991758  0.078814  0.032557  0.000000  0.061504
1.043956  0.077514  0.034579  0.000000  0.072336
1.096154  0.076218  0.036633  0.000000  0.084380
1.148352  0.074926  0.038719  0.000000  0.097703
1.200549  0.073639  0.040836  0.000000  0.102080
1.252747  0.072357  0.042986  0.000000  0.114061
1.304945  0.071079  0.045168  0.000000  0.130369
1.357143  0.069805  0.047381  0.000000  0.148182
1.409341  0.068536  0.049627  0.000000  0.167568
```

```
  1.461538  0.067272  0.051906  0.000000  0.188595
  1.513736  0.066012  0.054217  0.000000  0.207667
  1.565934  0.064756  0.056560  0.000000  0.363897
  1.618132  0.063505  0.058936  0.000000  0.423150
  1.670330  0.062259  0.061346  0.000000  0.479846
  1.722527  0.061017  0.063788  0.000000  0.541748
  1.750000  0.059780  0.076971  0.000000  0.575227
  END FTABLE  6
  FTABLE      5
   59    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.059780  0.000000  0.000000  0.000000  0.012600
  0.052198  0.105111  0.005450  0.000000  0.217265  0.012600
  0.104396  0.106504  0.010973  0.000000  0.223558  0.025241
  0.156593  0.107901  0.016569  0.000000  0.229851  0.037923
  0.208791  0.109303  0.022238  0.000000  0.236143  0.050646
  0.260989  0.110710  0.027980  0.000000  0.242436  0.063409
  0.313187  0.112121  0.033795  0.000000  0.248729  0.076214
  0.365385  0.113536  0.039685  0.000000  0.255022  0.089059
  0.417582  0.114956  0.045648  0.000000  0.261314  0.101945
  0.469780  0.116381  0.051686  0.000000  0.267607  0.114872
  0.521978  0.117810  0.057798  0.000000  0.273900  0.127840
  0.574176  0.119243  0.063985  0.000000  0.280193  0.140849
  0.626374  0.120681  0.070247  0.000000  0.286485  0.153899
  0.678571  0.122123  0.076584  0.000000  0.292778  0.166989
  0.730769  0.123570  0.082996  0.000000  0.299071  0.180121
  0.782967  0.125022  0.089484  0.000000  0.305363  0.193293
  0.835165  0.126478  0.096048  0.000000  0.311656  0.206506
  0.887363  0.127938  0.102688  0.000000  0.317949  0.219760
  0.939560  0.129403  0.109404  0.000000  0.324242  0.233055
  0.991758  0.130873  0.116197  0.000000  0.330534  0.246391
  1.043956  0.132347  0.123067  0.391302  0.336827  0.259767
  1.096154  0.133825  0.130014  1.265259  0.343120  0.273185
  1.148352  0.135308  0.137038  2.423511  0.349413  0.286643
  1.200549  0.136796  0.144139  3.807068  0.355705  0.300142
  1.252747  0.138288  0.151319  5.382232  0.361998  0.313682
  1.304945  0.139785  0.158576  7.125454  0.368291  0.327263
  1.357143  0.141286  0.165912  9.018157  0.374584  0.340885
  1.409341  0.142791  0.173326  11.04439  0.380876  0.354548
  1.461538  0.144301  0.180819  13.18961  0.387169  0.368251
  1.513736  0.145816  0.188390  15.43996  0.393462  0.381996
  1.565934  0.147335  0.196041  17.78185  0.399755  0.395781
  1.618132  0.148858  0.203771  20.20174  0.406047  0.409607
  1.670330  0.150386  0.211581  22.68596  0.412340  0.423474
  1.722527  0.151919  0.219471  25.22066  0.418633  0.437382
  1.774725  0.153456  0.227441  27.79179  0.424926  0.451331
  1.826923  0.154997  0.235491  30.38517  0.431218  0.465321
  1.879121  0.156544  0.243622  32.98645  0.437511  0.479351
  1.931319  0.158094  0.251834  35.58130  0.443804  0.493423
  1.983516  0.159649  0.260127  38.15544  0.450097  0.507535
  2.035714  0.161209  0.268501  40.69481  0.456389  0.521688
  2.087912  0.162773  0.276956  43.18566  0.462682  0.535882
  2.140110  0.164341  0.285494  45.61475  0.468975  0.550117
  2.192308  0.165914  0.294113  47.96950  0.475267  0.564393
  2.244505  0.167492  0.302815  50.23813  0.481560  0.578709
  2.296703  0.169074  0.311599  52.40992  0.487853  0.593067
  2.348901  0.170661  0.320465  54.47533  0.494146  0.607465
  2.401099  0.172252  0.329415  56.42628  0.500438  0.621904
  2.453297  0.173847  0.338448  58.25631  0.506731  0.636384
  2.505495  0.175448  0.347564  59.96084  0.513024  0.650905
  2.557692  0.177052  0.356764  61.53738  0.519317  0.665467
  2.609890  0.178661  0.366048  62.98578  0.525609  0.680070
  2.662088  0.180275  0.375415  64.30850  0.531902  0.694714
  2.714286  0.181893  0.384868  65.51084  0.538195  0.709398
  2.766484  0.183516  0.394404  66.60120  0.544488  0.724123
  2.818681  0.185143  0.404026  67.59137  0.550780  0.738889
  2.870879  0.186774  0.413733  68.49679  0.557073  0.753696
```

```
2.923077  0.188411  0.423524  69.33686  0.563366  0.768544
2.975275  0.190051  0.433402  70.13520  0.569659  0.783433
3.000000  0.190830  0.438111  71.75580  0.572639  0.790500
END FTABLE  5
FTABLE     11
 91    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.181657  0.000000  0.000000  0.000000
0.066667  0.183444  0.012170  0.000000  1.648542
0.133333  0.185240  0.024460  0.000000  1.648542
0.200000  0.187043  0.036869  0.000000  1.648542
0.266667  0.188856  0.049399  0.000000  1.648542
0.333333  0.190676  0.062050  0.000000  1.648542
0.400000  0.192505  0.074823  0.000000  1.648542
0.466667  0.194343  0.087718  0.000000  1.648542
0.533333  0.196189  0.100735  0.000000  1.648542
0.600000  0.198043  0.113876  0.000000  1.648542
0.666667  0.199906  0.127141  0.000000  1.648542
0.733333  0.201778  0.140531  0.000000  1.648542
0.800000  0.203657  0.154045  0.000000  1.648542
0.866667  0.205546  0.167686  0.000000  1.648542
0.933333  0.207442  0.181452  0.000000  1.648542
1.000000  0.209348  0.195345  0.000000  1.648542
1.066667  0.211261  0.209365  0.000000  1.648542
1.133333  0.213183  0.223513  0.000000  1.648542
1.200000  0.215114  0.237790  0.000000  1.648542
1.266667  0.217053  0.252195  0.000000  1.648542
1.333333  0.219000  0.266730  0.000000  1.648542
1.400000  0.220956  0.281396  0.000000  1.648542
1.466667  0.222920  0.296192  0.000000  1.648542
1.533333  0.224893  0.311119  0.000000  1.648542
1.600000  0.226874  0.326178  0.000000  1.648542
1.666667  0.228864  0.341369  0.000000  1.648542
1.733333  0.230862  0.356693  0.000000  1.648542
1.800000  0.232868  0.372151  0.000000  1.648542
1.866667  0.234883  0.387742  0.000000  1.648542
1.933333  0.236907  0.403469  0.000000  1.648542
2.000000  0.238938  0.419330  0.000000  1.648542
2.066667  0.240979  0.435327  0.000000  1.648542
2.133333  0.243028  0.451461  0.000000  1.648542
2.200000  0.245085  0.467731  0.000000  1.648542
2.266667  0.247150  0.484139  0.000000  1.648542
2.333333  0.249225  0.500685  0.000000  1.648542
2.400000  0.251307  0.517369  0.000000  1.648542
2.466667  0.253398  0.534193  0.000000  1.648542
2.533333  0.255498  0.551156  0.000000  1.648542
2.600000  0.257605  0.568260  0.000000  1.648542
2.666667  0.259722  0.585504  0.000000  1.648542
2.733333  0.261847  0.602889  0.000000  1.648542
2.800000  0.263980  0.620417  0.000000  1.648542
2.866667  0.266121  0.638087  0.000000  1.648542
2.933333  0.268272  0.655900  0.000000  1.648542
3.000000  0.270430  0.673857  0.000000  1.648542
3.066667  0.272597  0.691958  0.000000  1.648542
3.133333  0.274773  0.710203  0.000000  1.648542
3.200000  0.276957  0.728594  0.000000  1.648542
3.266667  0.279149  0.747131  0.000000  1.648542
3.333333  0.281350  0.765815  0.000000  1.648542
3.400000  0.283559  0.784645  0.000000  1.648542
3.466667  0.285777  0.803623  0.000000  1.648542
3.533333  0.288003  0.822749  0.000000  1.648542
3.600000  0.290238  0.842023  0.000000  1.648542
3.666667  0.292481  0.861447  0.000000  1.648542
3.733333  0.294732  0.881021  0.000000  1.648542
3.800000  0.296992  0.900745  0.000000  1.648542
3.866667  0.299261  0.920620  0.000000  1.648542
3.933333  0.301537  0.940647  0.000000  1.648542
4.000000  0.303823  0.960826  0.000000  1.648542
4.066667  0.306117  0.981157  0.000000  1.648542
```

```
4.133333  0.308419  1.001641  0.000000  1.648542
4.200000  0.310729  1.022280  0.000000  1.648542
4.266667  0.313048  1.043072  0.000000  1.648542
4.333333  0.315376  1.064020  0.000000  1.648542
4.400000  0.317712  1.085123  0.000000  1.648542
4.466667  0.320056  1.106382  0.000000  1.648542
4.533333  0.322409  1.127797  0.000000  1.648542
4.600000  0.324771  1.149370  0.000000  1.648542
4.666667  0.327140  1.171100  0.000000  1.648542
4.733333  0.329519  1.192989  0.000000  1.648542
4.800000  0.331905  1.215036  0.000000  1.648542
4.866667  0.334301  1.237243  0.000000  1.648542
4.933333  0.336704  1.259610  0.000000  1.648542
5.000000  0.339116  1.282137  0.000000  1.648542
5.066667  0.341537  1.304826  0.730683  1.648542
5.133333  0.343966  1.327676  2.065279  1.648542
5.200000  0.346403  1.350688  3.791459  1.648542
5.266667  0.348849  1.373863  5.831490  1.648542
5.333333  0.351303  1.397202  8.137338  1.648542
5.400000  0.353766  1.420704  10.67266  1.648542
5.466667  0.356237  1.444371  13.40627  1.648542
5.533333  0.358717  1.468202  16.30919  1.648542
5.600000  0.361205  1.492200  19.35316  1.648542
5.666667  0.363701  1.516363  22.50982  1.648542
5.733333  0.366206  1.540694  25.75040  1.648542
5.800000  0.368719  1.565191  29.04564  1.648542
5.866667  0.371241  1.589856  32.36584  1.648542
5.933333  0.373772  1.614690  35.68113  1.648542
6.000000  0.376310  1.639693  38.96176  1.648542
END FTABLE 11
FTABLE      8
 35    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.049053  0.000000  0.000000  0.000000
0.052198  0.048698  0.000697  0.000000  0.000000
0.104396  0.048027  0.001406  0.000000  0.000000
0.156593  0.047360  0.002128  0.000000  0.000000
0.208791  0.046698  0.002863  0.000000  0.000000
0.260989  0.046040  0.003611  0.000000  0.000591
0.313187  0.045387  0.004372  0.000000  0.001038
0.365385  0.044738  0.005146  0.000000  0.001666
0.417582  0.044094  0.005934  0.000000  0.002502
0.469780  0.043454  0.006735  0.000000  0.003575
0.521978  0.042819  0.007549  0.000000  0.004914
0.574176  0.042188  0.008377  0.000000  0.006545
0.626374  0.041562  0.009219  0.000000  0.008499
0.678571  0.040941  0.010074  0.000000  0.010802
0.730769  0.040323  0.010943  0.000000  0.013486
0.782967  0.039711  0.011827  0.000000  0.016578
0.835165  0.039103  0.012724  0.000000  0.018931
0.887363  0.038499  0.013636  0.000000  0.020426
0.939560  0.037900  0.014562  0.000000  0.024487
0.991758  0.037305  0.015503  0.000000  0.029055
1.043956  0.036715  0.016458  0.000000  0.034161
1.096154  0.036129  0.017428  0.000000  0.039840
1.148352  0.035548  0.018413  0.000000  0.046122
1.200549  0.034971  0.019412  0.000000  0.048183
1.252747  0.034399  0.020427  0.000000  0.053835
1.304945  0.033832  0.021457  0.000000  0.061532
1.357143  0.033269  0.022502  0.000000  0.069944
1.409341  0.032710  0.023562  0.000000  0.079103
1.461538  0.032156  0.024637  0.000000  0.089043
1.513736  0.031606  0.025729  0.000000  0.098068
1.565934  0.031061  0.026835  0.000000  0.171887
1.618132  0.030520  0.027958  0.000000  0.199934
1.670330  0.029984  0.029096  0.000000  0.226798
1.722527  0.029453  0.030251  0.000000  0.256152
1.750000  0.028926  0.036486  0.000000  0.272040
END FTABLE  8
```

```
  FTABLE      7
   59    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.028926  0.000000  0.000000  0.000000  0.006837
  0.052198  0.049731  0.002578  0.000000  0.105128  0.006837
  0.104396  0.050414  0.005192  0.000000  0.108173  0.013720
  0.156593  0.051101  0.007841  0.000000  0.111218  0.020648
  0.208791  0.051792  0.010527  0.000000  0.114263  0.027622
  0.260989  0.052489  0.013248  0.000000  0.117308  0.034641
  0.313187  0.053189  0.016006  0.000000  0.120353  0.041706
  0.365385  0.053894  0.018801  0.000000  0.123398  0.048816
  0.417582  0.054604  0.021633  0.000000  0.126442  0.055971
  0.469780  0.055318  0.024502  0.000000  0.129487  0.063172
  0.521978  0.056037  0.027408  0.000000  0.132532  0.070418
  0.574176  0.056760  0.030352  0.000000  0.135577  0.077709
  0.626374  0.057487  0.033333  0.000000  0.138622  0.085046
  0.678571  0.058219  0.036353  0.000000  0.141667  0.092428
  0.730769  0.058956  0.039411  0.000000  0.144712  0.099856
  0.782967  0.059697  0.042508  0.000000  0.147757  0.107329
  0.835165  0.060443  0.045644  0.000000  0.150801  0.114848
  0.887363  0.061193  0.048818  0.000000  0.153846  0.122412
  0.939560  0.061948  0.052032  0.000000  0.156891  0.130021
  0.991758  0.062707  0.055285  0.000000  0.159936  0.137676
  1.043956  0.063471  0.058578  0.391302  0.162981  0.145376
  1.096154  0.064239  0.061912  1.265259  0.166026  0.153122
  1.148352  0.065011  0.065285  2.423511  0.169071  0.160913
  1.200549  0.065789  0.068699  3.807068  0.172116  0.168749
  1.252747  0.066570  0.072153  5.382232  0.175160  0.176631
  1.304945  0.067356  0.075648  7.125454  0.178205  0.184559
  1.357143  0.068147  0.079185  9.018157  0.181250  0.192531
  1.409341  0.068942  0.082763  11.04439  0.184295  0.200549
  1.461538  0.069742  0.086382  13.18961  0.187340  0.208613
  1.513736  0.070546  0.090044  15.43996  0.190385  0.216722
  1.565934  0.071355  0.093747  17.78185  0.193430  0.224876
  1.618132  0.072168  0.097493  20.20174  0.196475  0.233076
  1.670330  0.072986  0.101281  22.68596  0.199519  0.241321
  1.722527  0.073808  0.105112  25.22066  0.202564  0.249611
  1.774725  0.074635  0.108986  27.79179  0.205609  0.257947
  1.826923  0.075466  0.112904  30.38517  0.208654  0.266329
  1.879121  0.076302  0.116865  32.98645  0.211699  0.274755
  1.931319  0.077142  0.120870  35.58130  0.214744  0.283228
  1.983516  0.077986  0.124918  38.15544  0.217789  0.291745
  2.035714  0.078836  0.129011  40.69481  0.220834  0.300308
  2.087912  0.079689  0.133148  43.18566  0.223878  0.308917
  2.140110  0.080548  0.137331  45.61475  0.226923  0.317570
  2.192308  0.081410  0.141557  47.96950  0.229968  0.326270
  2.244505  0.082278  0.145830  50.23813  0.233013  0.335014
  2.296703  0.083149  0.150147  52.40992  0.236058  0.343804
  2.348901  0.084026  0.154510  54.47533  0.239103  0.352640
  2.401099  0.084906  0.158919  56.42628  0.242148  0.361521
  2.453297  0.085792  0.163374  58.25631  0.245193  0.370447
  2.505495  0.086681  0.167875  59.96084  0.248237  0.379419
  2.557692  0.087576  0.172423  61.53738  0.251282  0.388436
  2.609890  0.088474  0.177018  62.98578  0.254327  0.397498
  2.662088  0.089378  0.181660  64.30850  0.257372  0.406606
  2.714286  0.090285  0.186349  65.51084  0.260417  0.415760
  2.766484  0.091198  0.191085  66.60120  0.263462  0.424958
  2.818681  0.092114  0.195869  67.59137  0.266507  0.434203
  2.870879  0.093036  0.200702  68.49679  0.269551  0.443492
  2.923077  0.093962  0.205582  69.33686  0.272040  0.452827
  2.975275  0.094892  0.210511  70.13520  0.272040  0.462207
  3.000000  0.095334  0.212863  71.75580  0.272040  0.466667
  END FTABLE  7
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   7     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   6     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   7     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   8     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL       REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL       REPL
RCHRES   9 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL       REPL
RCHRES   9 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL       REPL
RCHRES   9 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL       REPL
RCHRES   9 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL       REPL
RCHRES  10 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL       REPL
RCHRES  10 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL       REPL
RCHRES  10 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL       REPL
RCHRES  10 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL       REPL
RCHRES  11 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL       REPL
RCHRES  11 HYDR   O      1 1        1      WDM   1009 FLOW     ENGL       REPL
RCHRES  11 HYDR   O      2 1        1      WDM   1010 FLOW     ENGL       REPL
RCHRES  11 HYDR   STAGE  1 1        1      WDM   1011 STAG     ENGL       REPL
RCHRES   8 HYDR   RO     1 1        1      WDM   1012 FLOW     ENGL       REPL
RCHRES   8 HYDR   O      1 1        1      WDM   1013 FLOW     ENGL       REPL
RCHRES   8 HYDR   O      2 1        1      WDM   1014 FLOW     ENGL       REPL
RCHRES   8 HYDR   STAGE  1 1        1      WDM   1015 STAG     ENGL       REPL
RCHRES   7 HYDR   STAGE  1 1        1      WDM   1016 STAG     ENGL       REPL
RCHRES   7 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
```

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

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

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

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


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

Conveyances from WWHM

Inflow to Bioretention Cell 1 (Northwest):

```
Flow Frequency
Flow(cfs)  0701 15m
2 Year   =    3.2659
5 Year   =    4.5032
10 Year  =    5.4595
25 Year  =    6.8352
50 Year  =    7.9899
100 Year =    9.2631
```

Inflow to Bioretention Cell 2 (Southwest):

```
Flow Frequency
Flow(cfs)  0702 15m
2 Year   =    0.8092
5 Year   =    1.1243
10 Year  =    1.3693
25 Year  =    1.7235
50 Year  =    2.0221
100 Year =    2.3526
```

Inflow to Bioretention Cell 3 (East):

```
Flow Frequency
Flow(cfs)  0703 15m
2 Year   =    3.1244
5 Year   =    4.3473
10 Year  =    5.2992
25 Year  =    6.6768
50 Year  =    7.8392
100 Year =    9.1263
```

Inflow to Bioretention Cell 4 (Southeast Frontage):

```
Flow Frequency
Flow(cfs)  0704 15m
2 Year   =    0.2132
5 Year   =    0.2986
10 Year  =    0.3654
25 Year  =    0.4625
50 Year  =    0.5448
100 Year =    0.6361
```

Bioretention Stage from WWHM

Bioretention Cell 1 (Northwest):

```
Stage Frequency
(feet)      1021 15m
2 Year   =    1.7408
5 Year   =    1.7411
10 Year  =    1.7413
25 Year  =    1.7414
50 Year  =    1.7415
100 Year =    1.7415
```

Bioretention Cell 2 (Southwest):

```
Stage Frequency
(feet)      1027 15m
2 Year   =    1.4645
5 Year   =    1.4680
10 Year  =    1.4695
25 Year  =    1.4709
50 Year  =    1.4717
100 Year =    1.4723
```

Bioretention Cell 3 (East):

```
Stage Frequency
(feet)      1033 15m
2 Year   =    1.7357
5 Year   =    1.7359
10 Year  =    1.7360
25 Year  =    1.7361
50 Year  =    1.7361
100 Year =    1.7361
```

Bioretention Cell 4 (Southeast Frontage):

```
Stage Frequency
(feet)      1015 15m
2 Year   =    1.5528
5 Year   =    1.6068
10 Year  =    1.6370
25 Year  =    1.6707
50 Year  =    1.6935
100 Year =    1.7145
```

Appendix 4: Soil Management Plan

To be completed with final design.

Drainage Control Plan Attachments

Attachment 1: Construction SWPPP Report

To be completed with final design.

Attachment 2: Maintenance and Source Control Manual

To be completed with final design.