Exhibit 11

Drainage Control Plan

Yorkshire
Tumwater, WA

Prepared For:
Fourth Street Housing
129 N Olympic Ave
Arlington, WA 98223

Prepared By:
LDC, Inc.
1411 State Ave. NE Suite 200
Olympia, WA 98506
425.806.1869

LDC
Surveying
Engineering
Planning

November 2022

Drainage Report

Project Information

Project:	**Yorkshire**
Prepared for:	**Fourth Street Housing** 129 N Olympic Ave Arlington, WA 98223 Contact Name:

Reviewing Agency

Jurisdiction:	City of Tumwater

Project Representative

Prepared by:	**LDC, Inc.** 1411 State Ave. NE, Suite 200 Olympia, WA 98506 425.806.1869 ldccorp.com
Contact:	Tyrell Bradley, PE
Project Reference:	C22-169

PROJECT ENGINEER'S CERTIFICATION

I hereby certify that this Drainage Control Plan for the Yorkshire project has been prepared by me or under my supervision and meets the minimum standards of the City of Tumwater and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

11/30/2022

Prepared by: Maggie Howsden, EIT
MHowsden@ldccorp.com
(425) 806-1869

Date

11/30/2022

Approved by: Tyrell, Bradley, PE
TBradley@ldccorp.com
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Date

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1. PROPOSED PROJECT DESCRIPTION

The following report was prepared for the Yorkshire project in Tumwater, WA. This report was prepared to comply with the minimum technical standards and requirements that are set forth in the *2022 City of Tumwater Drainage Design and Erosion Control Manual.*

Project Proponent:	Fourth Street Housing
Parcel Numbers:	12704440103, 12704431300, 12704440100
Total Parcel Area:	25.52 AC
Current Zoning:	GC (General Commercial)
Required Permits:	Grading, Utility, Paving, Building, etc.
Site Address:	Unaddressed Parcels on Israel Rd SW, Tumwater, WA 98512
Section, Township, Range:	Section 4, Township 17, Range 2W

The proposed Yorkshire project site is comprised of three parcels that total 25.52 acres between Israel Rd SW and Tumwater Boulevard SW. The proposed construction will develop 7 multi-story apartment buildings, clubhouse, self-storage building, swimming pool, sports court, landscaped areas, parking lots, drive aisles, and associated utilities, disturbing roughly 25 acres. Extension of Tyee Dr SW from the existing roundabout at the intersection of Israel Rd SW, through the site and connecting to Tumwater Boulevard SW will also be part of the site development. The proposed drive aisle and parking system will be accessed from both Israel Rd SW to the north and Tumwater Blvd SW to the south.

The project will be completed in five phases. Preliminary drainage design has been completed for Phase 1, Tyee Drive extension, and frontage improvements along Tumwater Boulevard. These designs are discussed in this report. The drainage design for Phases 2 through 5 will utilize the same BMPs as Phase 1. A WWHM analysis for Phase 2 through 5 has not been completed or provided within this drainage report and will be provided prior to construction. These phases have similar impervious and pervious areas as Phase 1. Using the prescriptive method, the permeable pavement and roof infiltration trench BMPs appear feasible for the future phases as well. See sheet SP-01 of the site development drawings in **Attachment No. 1** for phasing limits.

A site vicinity map of the proposed project location is enclosed herein as **Appendix 3**. A worksheet for determining the number of Minimum Requirements for this project per the *2022 City of Tumwater Drainage Design and Erosion Control Manual (DDECM)* has been prepared and enclosed herein as **Appendix 3**. According to Figure 2.1, the proposed project will trigger all of the minimum requirements for the new and replaced hard surfaces and the converted vegetation areas.

1.1 SUMMARY OF COMPLIANCE ON-SITE

The stormwater design complies with the 11 minimum requirements as follows:

<u>Minimum Requirement #1</u> – Stormwater Site Planning – The Stormwater Site Plan has been completed per the *2022 City of Tumwater DDECM* and is included within the Drainage Report.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan (SWPPP) – A pollution prevention plan, which describes the 13 required elements, will be completed, and included within the Drainage Control Plan as **Attachment No. 2** at the time of civil permit submittal. Further, an erosion control plan will be prepared and included as part of the engineering construction plan set in **Attachment No. 1**.

Minimum Requirement #3 – Source Control of Pollution – BMPs listed below are the minimum required for the site, additional BMPs not listed here may need to be implemented to meet the minimum requirements discussed in the *2022 City of Tumwater DDECM*.

- Volume IV, Chapter 5, Section S.2 Dispose of Collected Runoff and Waste Materials Properly
- Volume IV, Chapter 5, Section S.6 Pave the Activity Area and Slope to a Sump or Holding Tank
- Volume IV, Chapter 5, Section S.9 Clean Catch Basins

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls – Currently, stormwater runoff generated within the site sheet flows from north to south. Given the high infiltration capacity of native soils onsite, most of the stormwater likely does not leave the site. If stormwater does leave the site, it would enter the existing storm drain system within Tumwater Boulevard SW.

After construction, the stormwater runoff from the site will be collected and fully infiltrated onsite. Stormwater runoff patterns within the vicinity of the project site will remain similar to their current condition. All downstream conveyance systems are not anticipated to be adversely affected at this time.

Minimum Requirement #5 – On-site Stormwater Management – In accordance with Minimum requirement #7, this project is not flow control exempt per section 2.2.7. The proposed project will trigger Minimum Requirements #1-11 and therefore the project shall employ the On-Site Stormwater Management BMPs in accordance with the Low Impact Performance Standard or List #2. The project will demonstrate compliance with List #2, as shown below.

Lawn and Landscaped Areas:

- **Postconstruction soil quality and depth per Volume V, Chapter 6**: This BMP will be utilized to the maximum extent practicable for the project. See the landscape plans for more details.

Roofs:

- **Full Dispersion in Volume V, Section 7.2, or Downspout Infiltration in Volume V, Section 15.3:** The geotechnical analysis of the site determined that infiltration of stormwater is possible with native soils, so Downspout Infiltration is feasible. Full Dispersion is not feasible for this project because it requires that the project protect at least 65% of the site in a forested or native condition.
- It is important to note that the geotechnical analysis encountered shallow groundwater across the entire site. As such, the downspout infiltration facilities were designed to maintain a minimum vertical separation of 3ft from the groundwater. See Section 4 of this report for more information.

Other Hard Surfaces:

- **Full Dispersion in Volume V, Section 7.2:** Full Dispersion is not feasible for this project for the reasons mentioned in the section above.
- **Permeable Pavement in Volume V, Chapter 11**: Based on the proposed use of the site, basic treatment is required for the stormwater runoff, prior to infiltration. Native soils have shown a 4.6 meq/100g Cation Exchange Rate, which does not meet the 5.0 meq/100g requirement. However, if soils are amended with a 6" sand filter layer meeting city requirements for treatment, permeable pavement may be feasible.
- **Bioretention in Volume V, Chapter 9**: Bioretention facilities are feasible. Due to the site soils supporting infiltration, bioretention can be used to treat stormwater on-site.
- It is important to note that the geotechnical analysis encountered shallow groundwater across the entire site. As such, the bioretention facilities were designed to maintain a minimum vertical separation of 3ft from the groundwater for drainage areas greater than 5000 SF of pollution generating impervious

surfaces (PGIS) and 1ft for drainage areas less than or equal to 5000 SF of PGIS per Volume V, Section 9.3 of the *2022 DDECM*. See Section 4 of this report for more information.

Minimum Requirement #6 – Runoff Treatment – The proposed project will construct over 5,000 S.F. of pollution generating impervious surface by adding roadway, drive aisles, and parking lots: therefore, a stormwater treatment facility is required. The site does not trigger the requirements for enhanced treatment as it is not within the 1-year time-of-travel zone for a wellhead protection area or infiltrate stormwater within one-quarter mile of a body of fresh or salt water designated for aquatic life.

Development of the site will not trigger the requirements for Oil Control Facilities. Phosphorus control is not required as the system does not discharge to a body of fresh water or to a system tributary to a body of fresh water. Therefore, basic treatment is required. Treatment will be provided through the use of permeable pavement and bioretention ponds. See Section 4 for more information.

Minimum Requirement #7 – Flow Control – The proposed project will construct over 10,000 SF of impervious surface and does not discharge to a flow control exempt water body, therefore flow control is required. Flow control will be provided for the site through full infiltration using bioretention ponds, infiltration trenches, and permeable pavement throughout the site using WWHM. See Section 4 of this report for more information.

Minimum Requirement #8 – Wetlands Protection – There are no wetlands located onsite or adjacent to the site.

Minimum Requirement #9 – Operation and Maintenance – A Maintenance and Source Control Manual will be prepared and included herein the Drainage Control Plan as **Attachment No. 4** at the time of civil permit submittal.

Minimum Requirement #10 – Financial Liability – In accordance with Tumwater Municipal Code 12.16.080, the project applicant will provide financial guarantees to ensure that:

1. The project will operate according to the design approved by the project engineer, and
2. Operation of erosion control facilities will provide protection against siltation of surface water, erosion, damage to permanent stormwater BMPs, and damage to adjacent properties.

Minimum Requirement #11 – Off-Site Analysis and Mitigation – See section 3 for offsite analysis.

2. EXISTING CONDITIONS DESCRIPTION

2.1 TOPOGRAPHY

The site generally slopes from north to south, ranging from 0% to 3%, with an overall relief of approximately 10 ft.

2.2 GROUND COVER

The site has remained undeveloped since at least 1990. The existing site is currently undeveloped and covered with forested vegetation such as trees, ferns and vines. There are dirt roads that access the interior of the site and overhead power lines that cross the site from north to south.

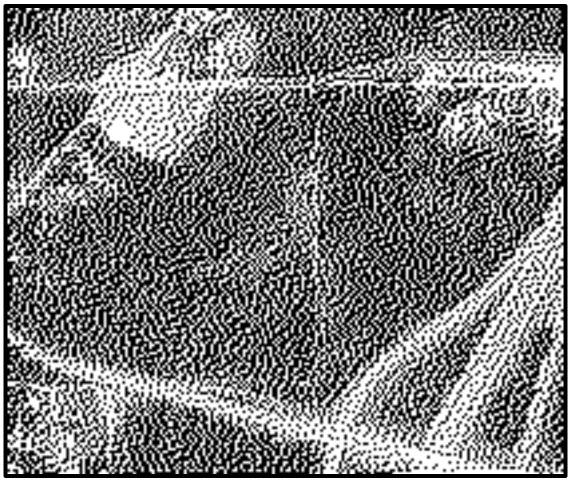


Figure 1: Existing Conditions (1990)

Figure 2: Existing Conditions (2021)

2.3 Drainage

The site is relatively flat. Flows on-site are generally conveyed from the north to the south where it is assumed to fully infiltrate on-site. Any flows that do not infiltrate discharge off the property to the south. There are no stormwater flow control, treatment, or conveyance systems on-site.

2.4 Soils

According to the geotechnical report prepared by Quality Geo NW, dated May 5th, 2022, test pits to 10 ft depth show that the soils generally consist of 1 ft of topsoil over 9 feet of poorly graded sand. Mottling and groundwater were encountered at 5 ft depth. The pervasive groundwater table across the site is at 5 ft depth. Analysis of native soils determined an infiltration rate of 10.0 inches per hour and a Cation Exchange Capacity of 4.6 meq/100g. There are no active surface water features onsite.

The current property owner also provided a Hydrogeologic Report prepared by Terra Associates, Inc. on April 25, 2013. The study advanced 12 test borings that were converted to groundwater monitoring wells and monitored through the winter for a 4-month period. A regression analysis was then performed to determine the 1999 flood elevation on the project site. Results of the report indicated the 1999 seasonal high groundwater table resides approximately 4 to 11 feet below the surface of the subject site, with a southern portion of the subject site having water near the surface. Please see **Attachment No. 3** for report.

For the purposes of the preliminary design, a groundwater elevation of 5 feet below the surface was used across the entire site.

2.5 Critical Areas

The project parcel is located within the Federal Emergency Management Agency (FEMA) Flood Insurance Rate map (FIRM) Panel No. 53067C0281E. According to the FIRM Map the project parcel is located within Zone X, which is determined to be an area of minimal flood hazard. According to City of Tumwater GIS Maps, the site is located within the 10-year time-of-travel Wellhead Protection Area.

2.6 Adjacent Areas

The proposed project is located between Israel Rd SW to the north and Tumwater Blvd SW to the south. In the developed condition, Tyee Dr SW will extend south to border the site to the east. The property is bound by several parcels that are accessed by Littlerock Rd SW to the west.

2.7 Reports and Studies

A geotechnical report was prepared for the subject site by Quality Geo NW, dated May 5th, 2022, and a hydrogeologic report was prepared by Terra Associates, dated April 25th, 2015. Both documents can be found in **Attachment No. 3**.

A mounding analysis will be provided at the time of civil permit submittal.

3. VICINITY ANALYSIS AND SUBBASIN DESCRIPTION

3.1 Qualitative Upstream Analysis

The proposed extension of Tyee Dr SW will flow into the site from the existing roundabout intersection with Israel Rd SW. Tumwater Blvd SW to the south also flows into the site. The other adjacent areas are downhill from the site.

3.2 Qualitative Downstream Analysis

All of the stormwater runoff generated onsite by the disturbed area of the parcel will be collected, treated, and infiltrated on-site. Given the native soils and flat nature of the existing site, its believed that most stormwater currently infiltrates on-site. Therefore, there are no anticipated affects to the downstream system.

4. FLOW CONTROL AND WATER QUALITY FACILITY SIZING

4.1 Impervious and Pervious Area Tabulations

The proposed project follows the development requirements stated in the *2022 City of Tumwater Drainage Design and Erosion Control Manual*. Following Figure 2.1 (See **Appendix 3**), this project classifies as a new development that triggers all of the minimum requirements. The site does not have 35% or more of existing impervious coverage, and the project will add more than 5,000 S.F. of new impervious surfaces. See **Attachment No. 1** for the proposed stormwater facility locations and details. Table 1: Land Type Designations Existing vs. Proposed (Full Site) below illustrates the existing and proposed impervious and pervious areas of the full site. Table 2: Land Type Designations Existing vs. Proposed below illustrates the existing and proposed impervious and pervious areas of Phase 1 (See **Appendix 3** for the basin map).

Table 1: Land Type Designations Existing vs. Proposed (Full Site)

FULL SITE LAND TYPE DESIGNATIONS	AREA (ACRES)	% OF TOTAL AREA
Existing Areas	**23.5**	**100%**
Impervious	0.0	0%
Pervious	23.5	100%
Proposed Areas	**23.5**	**100**
Road	8.3	35%
Roof	6.0	26%
Landscaping + Open Space	9.2	39%

Table 2: Land Type Designations Existing vs. Proposed-Phase 1

*PHASE 1 LAND TYPE DESIGNATIONS	AREA (ACRES)	% OF TOTAL AREA
Existing Areas	**9.84**	**100**
Impervious	0.0	0
Pervious	9.84	100
Proposed Areas	**9.84**	**100**
Road + Sidewalks	5.00	50.81
Roof	1.06	10.77
Landscaping + Open Space	3.78	38.42

*Modeling has been provided for Phase 1 improvements only. All future phases will follow the same prescriptive methods of stormwater management.

4.2 WATER QUALITY ANALYSIS

Per Minimum Requirement #6, the proposed project requires basic treatment for all on-site pollution-generating impervious surfaces. Pollution generating surfaces will include the parking lots and drive aisles onsite as well as the extension of Tyee Dr through the site and the Tumwater Blvd frontage improvements. The pollutant generating impervious surfaces and pervious areas in the treatment basins are shown in Table 3: Water Quality Basin Areas. The pollutant generating impervious surface consists of the sidewalks, parking lots, drive aisles, and roadway. See **Appendix 3** for the Treatment Basin Map.

Basic treatment will be provided in the parking lots and associated drive aisles through a 6-inch sand filter layer meeting city specifications for treatment, located beneath the permeable pavement that will comprise the parking stalls. Even though only basic treatment is required, enhanced treatment will be provided for runoff from Tyee Dr and Tumwater Blvd by means of an 18” bioretention soil layer in the bioretention ponds located along of Tyee Dr and Tumwater Blvd. All runoff from PGIS will infiltrate onsite after treatment. The drainage plan with the locations of the treatment facilities has been included as **Attachment No. 1**. See **Appendix 1** for the WWHM reports.

Table 3: Water Quality Basin Areas

TREATMENT BASIN	PGIS AREA (ACRES)	PERVIOUS AREA (ACRES)
Parking Lot 1	0.48	0.25
Parking Lot 2	0.73	0.14
Parking Lot 3	1.37	0.12
Tyee Dr 1	1.17	0.30
Tyee Dr 2	0.95	0.39
Tumwater Blvd 1	0.12	0.03
Tumwater Blvd 2	0.12	0.03
Tumwater Blvd 3	0.10	0.03
Tumwater Blvd 4	0.11	0.03
Tumwater Blvd 5	0.15	0.07
Tumwater Blvd 6	0.87	0.32

4.3 FLOW CONTROL ANALYSIS

Flow control is required for the proposed development and will be provided through a system of permeable pavement areas, bioretention ponds, and downspout infiltration trenches spread out across the site. WWHM was used to size the each of the infiltration BMPs so that they will infiltrate 100% of the stormwater runoff generated onsite. The design infiltration rate of 10.0 in/hr provided in the geotechnical report from Quality Geo NW dated May 5, 2022, was used to size the trenches in WWHM. Phase 1 has been divided into eleven separate basins for the separate infiltration systems. See **Appendix 3** for the developed basin map. The drainage plan with the infiltration and conveyance layouts has been included as **Attachment No. 1**.

4.3.1 Permeable Pavement

The parking areas have been divided into three basins (Parking Lots 1 through 3) for modeling purposes. Each lot will consist of an impermeable pavement drive aisle and permeable pavement parking stalls. The lots will be graded such that the drive aisles and adjacent sidewalk and landscaping areas will flow onto the permeable pavement and then fully infiltrate. This system has been modeled using lateral basins in WWHM for Phase 1 only. However, the ratio of parking areas to drive aisles is similar across the full site, so the design shall be applied to all phases.

4.3.2 Downspout Infiltration Trenches

The basin for Building 6 has been subdivided such that the roof areas will be able to utilize an infiltration trench with lengths under 100 ft. The full basin and two typical infiltration trenches have been modeled and provided within this report. The infiltration trenches are anticipated to infiltrate both roof runoff and lawn/landscaping runoff. See Table 5 for a breakdown of areas and number of typical trenches required for Building 6 per the full basin calculations. WWHM modelling was completed for Building 6 in Phase 1 only. The proposed buildings in Phases 2 through 5 are anticipated to have a similar design approach.

It is important to note that the downspout infiltration trenches were designed with 3-feet of separation from the known high groundwater elevation provided by Terra Associates, Inc. (See **Attachment No. 3** for the groundwater contour map). Per Section 2.2.2 of Volume V of the *DDECM*, a mounding analysis is required and will be provided at the time of civil permit submittal.

4.3.3 Bioretention Ponds

The Tyee Dr extension will have two bioretention ponds located in the tenant open space by Building 4 and Building 6. The Tumwater Blvd frontage improvements will have two bioretention ponds located in the tenant open spaces by Building 3 and Building 1. The remaining four ponds will be located adjacent to Tumwater Blvd. The bioretention ponds located in the tenant open spaces will be 3ft above the groundwater while the four bioretention ponds along Tumwater Blvd will be 1ft above the groundwater since less than 5000 SF of pollutant generating impervious surfaces and less than 0.75 acres of landscaping drain to them, per Volume V, Chapter 9, Section 9.3 of the *2022 City of Tumwater DDECM*. The bioretention ponds will collect runoff from the roadway, sidewalk and adjacent landscaping areas. The bioretention ponds in Phase 1 have been sized in WWHM to fully infiltrate all runoff generated from these areas.

The drainage plan with parking lot permeable pavement, roof and lawn infiltration trenches, and Tyee Dr and Tumwater Blvd bioretention pond systems has been included as **Attachment No. 1**. See **Appendix 1** for the WWHM reports on each individual infiltration BMP.

Table 4: Phase 1 Flow Control Basin Areas as Modeled in WWHM

BASIN	ROAD (ACRES)	SIDEWALK (ACRES)	ROOF (ACRES)	PERMEABLE PAVEMENT (ACRES)	LANDSCAPING (ACRES)	TOTAL (ACRES)
Parking Lot 1	0.20	0.00	0.00	0.28	0.25	0.73
Parking Lot 2	0.44	0.03	0.00	0.26	0.14	0.87
Parking Lot 3	0.64	0.06	0.00	0.68	0.12	1.50
Building 6	0.00	0.04	1.06	0.00	0.85	1.95
Tyee Dr 1	0.95	0.22	0.00	0.00	0.30	1.47
Tyee Dr 2	0.77	0.18	0.00	0.00	0.39	1.34
Tumwater Blvd 1	0.10	0.02	0.00	0.00	0.03	0.15
Tumwater Blvd 2	0.10	0.02	0.00	0.00	0.03	0.15
Tumwater Blvd 3	0.08	0.02	0.00	0.00	0.03	0.13
Tumwater Blvd 4	0.09	0.02	0.00	0.00	0.03	0.14
Tumwater Blvd 5	0.12	0.03	0.00	0.00	0.07	0.22
Tumwater Blvd 6	0.75	0.12	0.00	0.00	0.32	1.19

Table 5: Modeled Areas for Typical Infiltration Trenches

MODELED TRENCHES	ROOF	LAWN	# TRENCHES
Building 6 Trench 1	0.27	0.11	3
Building 6 Trench 2	0.19	0.10	2

5. AESTHETIC CONSIDERATIONS FOR FACILITIES

All disturbed soil will be vegetated and landscaped using Best Management Practices. The proposed bioretention/infiltration trenches will be covered with a variety of plants that will help them blend in with other landscaping features. All conveyance and water quality facilities will be underground.

6. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The Conveyance System Analysis and Design will be provided at the civil permit submittal.

7. COVENANTS, DEDICATIONS, EASEMENTS

It is the City of Tumwater policy that the property owner(s) shall maintain their stormwater drainage facilities. Thus, Fourth Street Housing, LLC will be responsible for maintaining and ensuring that all installed drainage facilities are functioning in accordance with the design purpose. Fourth Street Housing, LLC will keep a copy of the maintenance plan at the project site. The Maintenance and Source Control Manual will be completed and included herein as **Attachment No. 4** at the time of civil permit submittal. Additionally, the Establishment of Maintenance Covenants has also be completed and included herein as **Attachment No. 5** at the time of civil permit submittal.

8. AGREEMENTS AND GUARANTEES

Maintenance and/or operation bonding or other appropriate financial guarantees are required for all projects to ensure construction and functionality of drainage facilities are in compliance with applicable standards. These guarantees are to be consistent with the most recent edition of the City of Tumwater Development Guidelines and Public Works Standards.

9. OTHER PERMITS OR CONDITIONS PLACED ON THE PROJECT

No other permits or conditions have been placed on the project at this time.
Other permits that may be required for the proposed development are as follows:

- Clearing and Grading Permit
- National Pollution Discharge Elimination System (NPDES)
- Right-of-Way permit
- Utility Permit
- Building Permits

END OF STORMWATER SITE PLAN

APPENDIX 1
DESIGN CALCULATIONS

WWHM2012

PROJECT REPORT

PARKING LOT

BASIN 1

General Model Information

Project Name:	C22-169 Yorkshire_ParkingLot1
Site Name:	Yorkshire
Site Address:	
City:	
Report Date:	8/11/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Lot 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.73
Pervious Total	0.73
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.73

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Lot 1 Drive Aisles

Bypass:		No
Impervious Land Use		acre
ROADS FLAT LAT		0.2
Element Flows To:		
Outlet 1	Outlet 2	
Lot 1 Perm Pvmt		

Lot 1 Landscape

Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.25

Element Flows To:

Surface	Interflow	Groundwater
Lot 1 Perm Pvmt	Lot 1 Perm Pvmt	

Mitigated Routing

Lot 1 Perm Pvmt

Pavement Area:0.2803 acre.Pavement Length:110.00 ft.
Pavement Width: 111.00 ft.
Pavement slope 1:0.01 To 1
Pavement thickness: 0.67
Pour Space of Pavement: 0.2
Material thickness of second layer: 0.67
Pour Space of material for second layer: 0.35
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 10
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 100.881
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 100.881
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 3.008
Element Flows To:
Outlet 1 Outlet 2

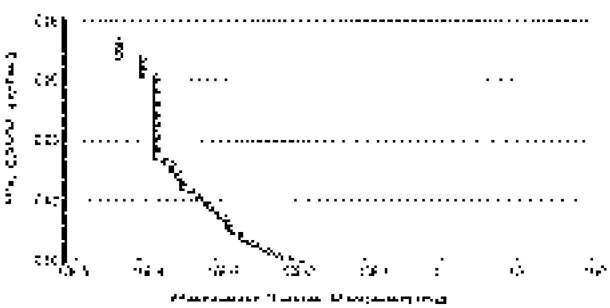
Permeable Pavement Hydraulic Table

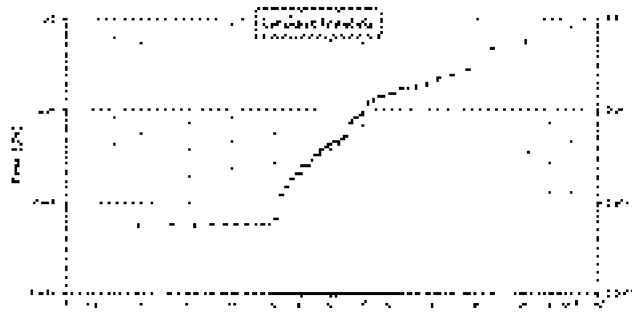
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.280	0.000	0.000	0.000
0.0148	0.280	0.001	0.000	2.826
0.0296	0.280	0.002	0.000	2.826
0.0444	0.280	0.004	0.000	2.826
0.0592	0.280	0.005	0.000	2.826
0.0741	0.280	0.007	0.000	2.826
0.0889	0.280	0.008	0.000	2.826
0.1037	0.280	0.010	0.000	2.826
0.1185	0.280	0.011	0.000	2.826
0.1333	0.280	0.013	0.000	2.826
0.1481	0.280	0.014	0.000	2.826
0.1629	0.280	0.016	0.000	2.826
0.1777	0.280	0.017	0.000	2.826
0.1925	0.280	0.018	0.000	2.826
0.2074	0.280	0.020	0.000	2.826
0.2222	0.280	0.021	0.000	2.826
0.2370	0.280	0.023	0.000	2.826
0.2518	0.280	0.024	0.000	2.826
0.2666	0.280	0.026	0.000	2.826
0.2814	0.280	0.027	0.000	2.826
0.2962	0.280	0.029	0.000	2.826
0.3110	0.280	0.030	0.000	2.826
0.3258	0.280	0.032	0.000	2.826
0.3407	0.280	0.033	0.000	2.826
0.3555	0.280	0.034	0.000	2.826
0.3703	0.280	0.036	0.000	2.826
0.3851	0.280	0.037	0.000	2.826
0.3999	0.280	0.039	0.000	2.826
0.4147	0.280	0.040	0.000	2.826

0.4295	0.280	0.042	0.000	2.826
0.4443	0.280	0.043	0.000	2.826
0.4591	0.280	0.045	0.000	2.826
0.4740	0.280	0.046	0.000	2.826
0.4888	0.280	0.048	0.000	2.826
0.5036	0.280	0.049	0.000	2.826
0.5184	0.280	0.050	0.000	2.826
0.5332	0.280	0.052	0.000	2.826
0.5480	0.280	0.053	0.000	2.826
0.5628	0.280	0.055	0.000	2.826
0.5776	0.280	0.056	0.000	2.826
0.5924	0.280	0.058	0.000	2.826
0.6073	0.280	0.059	0.000	2.826
0.6221	0.280	0.061	0.000	2.826
0.6369	0.280	0.062	0.000	2.826
0.6517	0.280	0.063	0.000	2.826
0.6665	0.280	0.065	0.000	2.826
0.6813	0.280	0.066	0.000	2.826
0.6961	0.280	0.067	0.000	2.826
0.7109	0.280	0.067	0.000	2.826
0.7257	0.280	0.068	0.000	2.826
0.7406	0.280	0.069	0.000	2.826
0.7554	0.280	0.070	0.000	2.826
0.7702	0.280	0.071	0.000	2.826
0.7850	0.280	0.072	0.000	2.826
0.7998	0.280	0.072	0.000	2.826
0.8146	0.280	0.073	0.000	2.826
0.8294	0.280	0.074	0.000	2.826
0.8442	0.280	0.075	0.000	2.826
0.8590	0.280	0.076	0.000	2.826
0.8739	0.280	0.077	0.000	2.826
0.8887	0.280	0.077	0.000	2.826
0.9035	0.280	0.078	0.000	2.826
0.9183	0.280	0.079	0.000	2.826
0.9331	0.280	0.080	0.000	2.826
0.9479	0.280	0.081	0.000	2.826
0.9627	0.280	0.082	0.000	2.826
0.9775	0.280	0.082	0.000	2.826
0.9923	0.280	0.083	0.000	2.826
1.0072	0.280	0.084	0.000	2.826
1.0220	0.280	0.085	0.000	2.826
1.0368	0.280	0.086	0.000	2.826
1.0516	0.280	0.087	0.000	2.826
1.0664	0.280	0.087	0.000	2.826
1.0812	0.280	0.088	0.000	2.826
1.0960	0.280	0.089	0.000	2.826
1.1108	0.280	0.090	0.000	2.826
1.1256	0.280	0.091	0.000	2.826
1.1405	0.280	0.092	0.000	2.826
1.1553	0.280	0.092	0.000	2.826
1.1701	0.280	0.093	0.000	2.826
1.1849	0.280	0.094	0.000	2.826
1.1997	0.280	0.095	0.000	2.826
1.2145	0.280	0.096	0.000	2.826
1.2293	0.280	0.096	0.000	2.826
1.2441	0.280	0.097	0.000	2.826
1.2589	0.280	0.098	0.000	2.826
1.2738	0.280	0.099	0.000	2.826

1.2886	0.280	0.100	0.000	2.826
1.3034	0.280	0.101	0.000	2.826
1.3182	0.280	0.101	0.000	2.826
1.3330	0.280	0.102	0.000	2.826

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.73
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.25
Total Impervious Area: 0.480303

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.003996
5 year	0.012364
10 year	0.022315
25 year	0.041884
50 year	0.062908
100 year	0.090699

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.008	0.000
1957	0.004	0.000
1958	0.003	0.000
1959	0.003	0.000
1960	0.017	0.000
1961	0.015	0.000
1962	0.001	0.000
1963	0.022	0.000
1964	0.013	0.000
1965	0.014	0.000

1966	0.007	0.000
1967	0.005	0.000
1968	0.003	0.000
1969	0.001	0.000
1970	0.002	0.000
1971	0.005	0.000
1972	0.012	0.000
1973	0.001	0.000
1974	0.009	0.000
1975	0.005	0.000
1976	0.005	0.000
1977	0.001	0.000
1978	0.004	0.000
1979	0.002	0.000
1980	0.004	0.000
1981	0.005	0.000
1982	0.004	0.000
1983	0.002	0.000
1984	0.009	0.000
1985	0.001	0.000
1986	0.008	0.000
1987	0.049	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.028	0.000
1991	0.024	0.000
1992	0.001	0.000
1993	0.001	0.000
1994	0.001	0.000
1995	0.004	0.000
1996	0.014	0.000
1997	0.015	0.000
1998	0.003	0.000
1999	0.018	0.000
2000	0.002	0.000
2001	0.001	0.000
2002	0.004	0.000
2003	0.001	0.000
2004	0.020	0.000
2005	0.001	0.000
2006	0.058	0.000
2007	0.018	0.000
2008	0.001	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.0580	0.0000
2	0.0490	0.0000
3	0.0282	0.0000
4	0.0245	0.0000
5	0.0225	0.0000
6	0.0198	0.0000
7	0.0182	0.0000
8	0.0178	0.0000
9	0.0171	0.0000
10	0.0154	0.0000
11	0.0152	0.0000

12	0.0144	0.0000
13	0.0143	0.0000
14	0.0129	0.0000
15	0.0120	0.0000
16	0.0094	0.0000
17	0.0088	0.0000
18	0.0083	0.0000
19	0.0077	0.0000
20	0.0073	0.0000
21	0.0052	0.0000
22	0.0049	0.0000
23	0.0048	0.0000
24	0.0047	0.0000
25	0.0046	0.0000
26	0.0045	0.0000
27	0.0042	0.0000
28	0.0042	0.0000
29	0.0039	0.0000
30	0.0038	0.0000
31	0.0037	0.0000
32	0.0033	0.0000
33	0.0033	0.0000
34	0.0029	0.0000
35	0.0025	0.0000
36	0.0025	0.0000
37	0.0021	0.0000
38	0.0020	0.0000
39	0.0018	0.0000
40	0.0015	0.0000
41	0.0012	0.0000
42	0.0007	0.0000
43	0.0006	0.0000
44	0.0006	0.0000
45	0.0006	0.0000
46	0.0006	0.0000
47	0.0006	0.0000
48	0.0006	0.0000
49	0.0006	0.0000
50	0.0006	0.0000
51	0.0006	0.0000
52	0.0006	0.0000
53	0.0006	0.0000

Duration Flows

The Facility PASSED

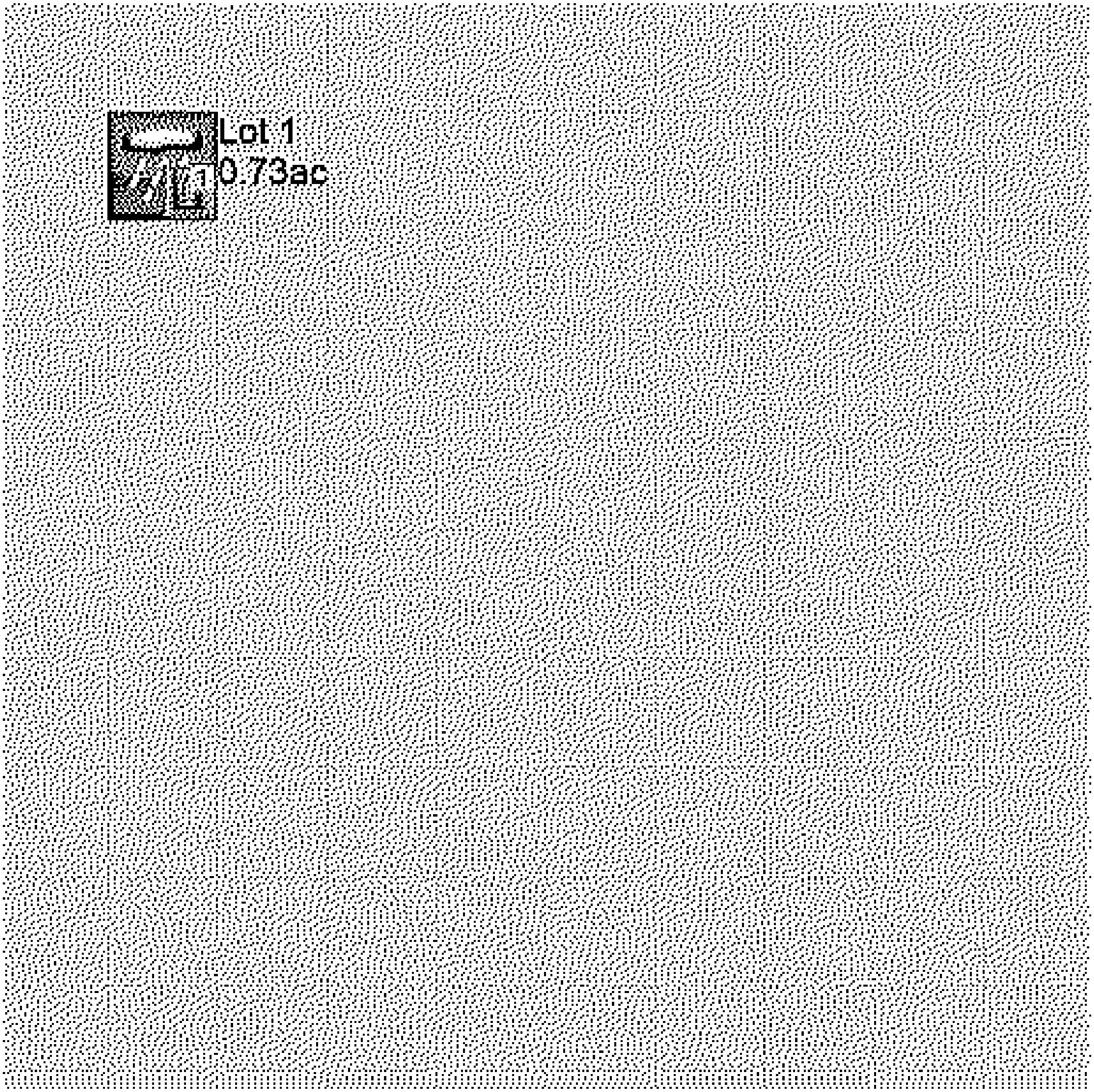
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0020	263	0	0	Pass
0.0026	194	0	0	Pass
0.0032	149	0	0	Pass
0.0038	121	0	0	Pass
0.0045	98	0	0	Pass
0.0051	84	0	0	Pass
0.0057	75	0	0	Pass
0.0063	62	0	0	Pass
0.0069	54	0	0	Pass
0.0075	47	0	0	Pass
0.0082	42	0	0	Pass
0.0088	40	0	0	Pass
0.0094	33	0	0	Pass
0.0100	31	0	0	Pass
0.0106	28	0	0	Pass
0.0112	27	0	0	Pass
0.0118	27	0	0	Pass
0.0125	26	0	0	Pass
0.0131	24	0	0	Pass
0.0137	21	0	0	Pass
0.0143	21	0	0	Pass
0.0149	19	0	0	Pass
0.0155	16	0	0	Pass
0.0161	15	0	0	Pass
0.0168	15	0	0	Pass
0.0174	14	0	0	Pass
0.0180	13	0	0	Pass
0.0186	11	0	0	Pass
0.0192	11	0	0	Pass
0.0198	9	0	0	Pass
0.0205	7	0	0	Pass
0.0211	7	0	0	Pass
0.0217	7	0	0	Pass
0.0223	7	0	0	Pass
0.0229	6	0	0	Pass
0.0235	6	0	0	Pass
0.0241	6	0	0	Pass
0.0248	5	0	0	Pass
0.0254	5	0	0	Pass
0.0260	5	0	0	Pass
0.0266	5	0	0	Pass
0.0272	4	0	0	Pass
0.0278	4	0	0	Pass
0.0285	3	0	0	Pass
0.0291	3	0	0	Pass
0.0297	3	0	0	Pass
0.0303	3	0	0	Pass
0.0309	3	0	0	Pass
0.0315	3	0	0	Pass
0.0321	3	0	0	Pass
0.0328	3	0	0	Pass
0.0334	3	0	0	Pass
0.0340	3	0	0	Pass

0.0346	3	0	0	Pass
0.0352	3	0	0	Pass
0.0358	3	0	0	Pass
0.0365	3	0	0	Pass
0.0371	3	0	0	Pass
0.0377	3	0	0	Pass
0.0383	3	0	0	Pass
0.0389	3	0	0	Pass
0.0395	3	0	0	Pass
0.0401	3	0	0	Pass
0.0408	3	0	0	Pass
0.0414	3	0	0	Pass
0.0420	3	0	0	Pass
0.0426	3	0	0	Pass
0.0432	3	0	0	Pass
0.0438	3	0	0	Pass
0.0445	3	0	0	Pass
0.0451	3	0	0	Pass
0.0457	3	0	0	Pass
0.0463	3	0	0	Pass
0.0469	3	0	0	Pass
0.0475	3	0	0	Pass
0.0481	3	0	0	Pass
0.0488	3	0	0	Pass
0.0494	2	0	0	Pass
0.0500	2	0	0	Pass
0.0506	2	0	0	Pass
0.0512	2	0	0	Pass
0.0518	2	0	0	Pass
0.0524	2	0	0	Pass
0.0531	2	0	0	Pass
0.0537	2	0	0	Pass
0.0543	1	0	0	Pass
0.0549	1	0	0	Pass
0.0555	1	0	0	Pass
0.0561	1	0	0	Pass
0.0568	1	0	0	Pass
0.0574	1	0	0	Pass
0.0580	1	0	0	Pass
0.0586	0	0	0	Pass
0.0592	0	0	0	Pass
0.0598	0	0	0	Pass
0.0604	0	0	0	Pass
0.0611	0	0	0	Pass
0.0617	0	0	0	Pass
0.0623	0	0	0	Pass
0.0629	0	0	0	Pass

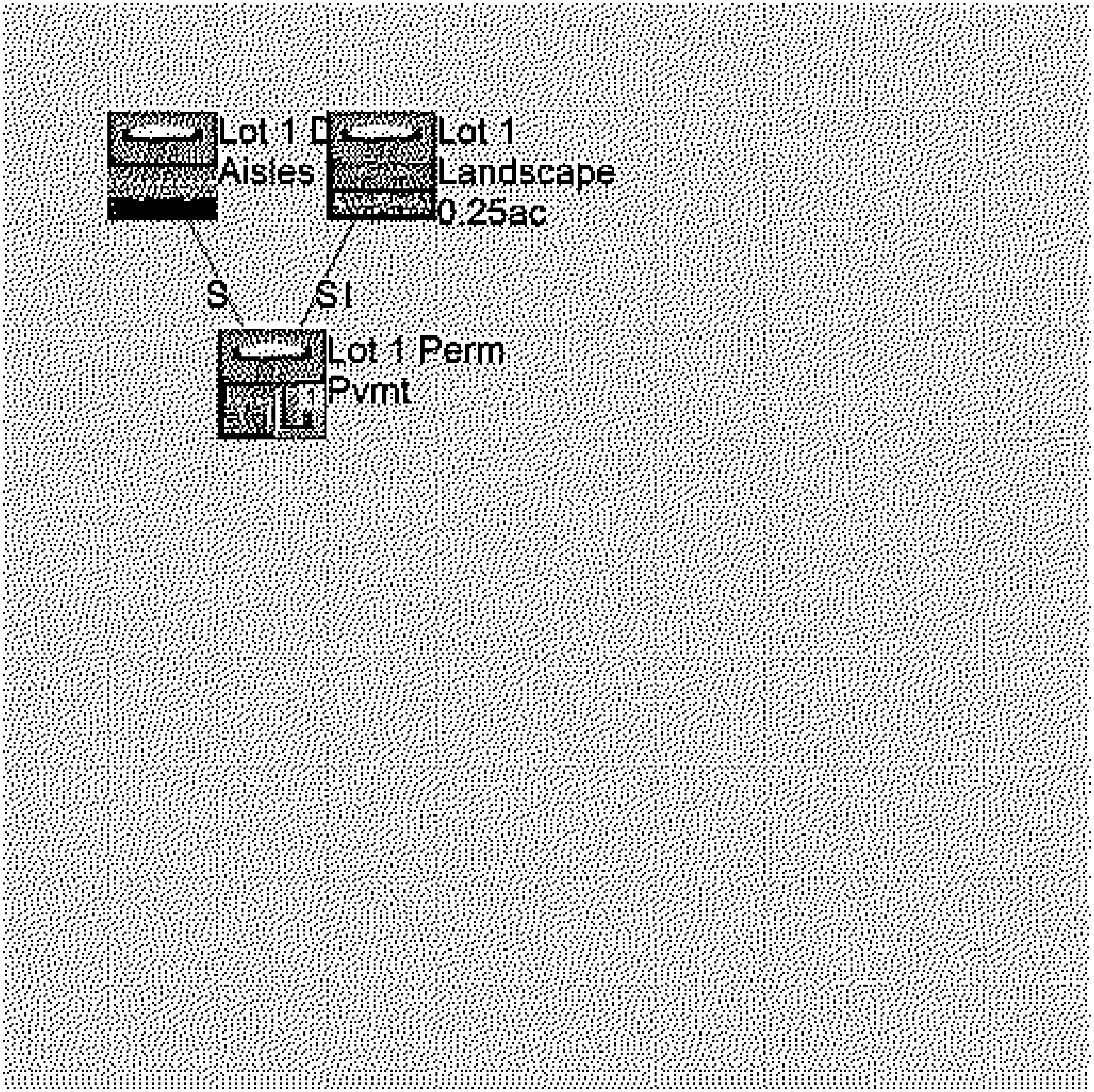
LID Report

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
Lot 1 Perm Pave POC	☐	91.80			☐	100.00			
Total Volume Infiltrated		91.50	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

PARKING LOT

BASIN 2

General Model Information

Project Name:	C22-169 Yorkshire_ParkingLot2
Site Name:	Yorkshire
Site Address:	
City:	
Report Date:	8/11/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Parking Lot 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.87
Pervious Total	0.87
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.87

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Lot 2 Drive Aisles

Bypass:		No
Impervious Land Use		acre
ROADS FLAT LAT		0.47
Element Flows To:		
Outlet 1	Outlet 2	
Lot 2 Perm Pvmt		

Parking Lot 2 Landscaping

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	.14

Element Flows To:

Surface	Interflow	Groundwater
Lot 2 Perm Pvmt	Lot 2 Perm Pvmt	

Mitigated Routing

Lot 2 Perm Pvmt

Pavement Area:0.5767 acre.Pavement Length:158.00 ft.
Pavement Width: 159.00 ft.
Pavement slope 1:0.01 To 1
Pavement thickness: 0.67
Pour Space of Pavement: 0.2
Material thickness of second layer: 0.67
Pour Space of material for second layer: 0.35
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 10
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 219.599
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 219.599
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 6.326
Element Flows To:
Outlet 1 Outlet 2

Permeable Pavement Hydraulic Table

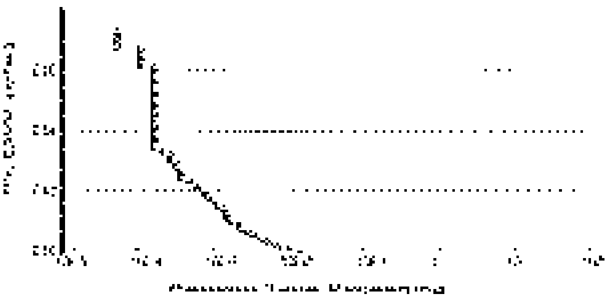
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.576	0.000	0.000	0.000
0.0148	0.576	0.003	0.000	5.815
0.0296	0.576	0.006	0.000	5.815
0.0444	0.576	0.009	0.000	5.815
0.0592	0.576	0.012	0.000	5.815
0.0741	0.576	0.014	0.000	5.815
0.0889	0.576	0.017	0.000	5.815
0.1037	0.576	0.020	0.000	5.815
0.1185	0.576	0.023	0.000	5.815
0.1333	0.576	0.026	0.000	5.815
0.1481	0.576	0.029	0.000	5.815
0.1629	0.576	0.032	0.000	5.815
0.1777	0.576	0.035	0.000	5.815
0.1925	0.576	0.038	0.000	5.815
0.2074	0.576	0.041	0.000	5.815
0.2222	0.576	0.044	0.000	5.815
0.2370	0.576	0.047	0.000	5.815
0.2518	0.576	0.050	0.000	5.815
0.2666	0.576	0.053	0.000	5.815
0.2814	0.576	0.056	0.000	5.815
0.2962	0.576	0.059	0.000	5.815
0.3110	0.576	0.062	0.000	5.815
0.3258	0.576	0.065	0.000	5.815
0.3407	0.576	0.068	0.000	5.815
0.3555	0.576	0.071	0.000	5.815
0.3703	0.576	0.074	0.000	5.815
0.3851	0.576	0.077	0.000	5.815
0.3999	0.576	0.080	0.000	5.815
0.4147	0.576	0.083	0.000	5.815

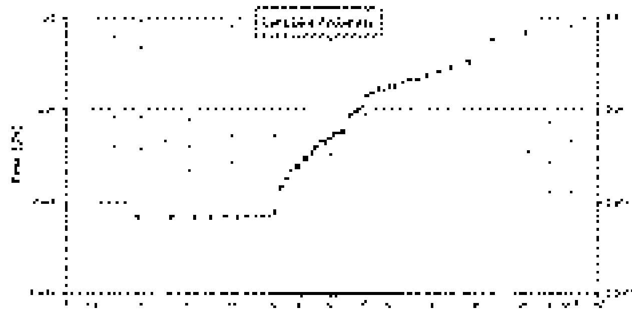
0.4295	0.576	0.086	0.000	5.815
0.4443	0.576	0.089	0.000	5.815
0.4591	0.576	0.092	0.000	5.815
0.4740	0.576	0.095	0.000	5.815
0.4888	0.576	0.098	0.000	5.815
0.5036	0.576	0.101	0.000	5.815
0.5184	0.576	0.104	0.000	5.815
0.5332	0.576	0.107	0.000	5.815
0.5480	0.576	0.110	0.000	5.815
0.5628	0.576	0.113	0.000	5.815
0.5776	0.576	0.116	0.000	5.815
0.5924	0.576	0.119	0.000	5.815
0.6073	0.576	0.122	0.000	5.815
0.6221	0.576	0.125	0.000	5.815
0.6369	0.576	0.128	0.000	5.815
0.6517	0.576	0.131	0.000	5.815
0.6665	0.576	0.134	0.000	5.815
0.6813	0.576	0.136	0.000	5.815
0.6961	0.576	0.138	0.000	5.815
0.7109	0.576	0.139	0.000	5.815
0.7257	0.576	0.141	0.000	5.815
0.7406	0.576	0.143	0.000	5.815
0.7554	0.576	0.144	0.000	5.815
0.7702	0.576	0.146	0.000	5.815
0.7850	0.576	0.148	0.000	5.815
0.7998	0.576	0.149	0.000	5.815
0.8146	0.576	0.151	0.000	5.815
0.8294	0.576	0.153	0.000	5.815
0.8442	0.576	0.155	0.000	5.815
0.8590	0.576	0.156	0.000	5.815
0.8739	0.576	0.158	0.000	5.815
0.8887	0.576	0.160	0.000	5.815
0.9035	0.576	0.161	0.000	5.815
0.9183	0.576	0.163	0.000	5.815
0.9331	0.576	0.165	0.000	5.815
0.9479	0.576	0.167	0.000	5.815
0.9627	0.576	0.168	0.000	5.815
0.9775	0.576	0.170	0.000	5.815
0.9923	0.576	0.172	0.000	5.815
1.0072	0.576	0.173	0.000	5.815
1.0220	0.576	0.175	0.000	5.815
1.0368	0.576	0.177	0.000	5.815
1.0516	0.576	0.179	0.000	5.815
1.0664	0.576	0.180	0.000	5.815
1.0812	0.576	0.182	0.000	5.815
1.0960	0.576	0.184	0.000	5.815
1.1108	0.576	0.185	0.000	5.815
1.1256	0.576	0.187	0.000	5.815
1.1405	0.576	0.189	0.000	5.815
1.1553	0.576	0.190	0.000	5.815
1.1701	0.576	0.192	0.000	5.815
1.1849	0.576	0.194	0.000	5.815
1.1997	0.576	0.196	0.000	5.815
1.2145	0.576	0.197	0.000	5.815
1.2293	0.576	0.199	0.000	5.815
1.2441	0.576	0.201	0.000	5.815
1.2589	0.576	0.202	0.000	5.815
1.2738	0.576	0.204	0.000	5.815

1.2886	0.576	0.206	0.000	5.815
1.3034	0.576	0.208	0.000	5.815
1.3182	0.576	0.209	0.000	5.815
1.3330	0.576	0.211	0.000	5.815

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.87
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.14
Total Impervious Area: 1.046722

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.004762
5 year	0.014735
10 year	0.026594
25 year	0.049917
50 year	0.074972
100 year	0.108093

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.009	0.000
1957	0.005	0.000
1958	0.004	0.000
1959	0.003	0.000
1960	0.020	0.000
1961	0.018	0.000
1962	0.001	0.000
1963	0.027	0.000
1964	0.015	0.000
1965	0.017	0.000

1966	0.009	0.000
1967	0.006	0.000
1968	0.004	0.000
1969	0.001	0.000
1970	0.003	0.000
1971	0.006	0.000
1972	0.014	0.000
1973	0.001	0.000
1974	0.010	0.000
1975	0.006	0.000
1976	0.006	0.000
1977	0.001	0.000
1978	0.005	0.000
1979	0.002	0.000
1980	0.004	0.000
1981	0.006	0.000
1982	0.005	0.000
1983	0.002	0.000
1984	0.011	0.000
1985	0.001	0.000
1986	0.010	0.000
1987	0.058	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.034	0.000
1991	0.029	0.000
1992	0.001	0.000
1993	0.001	0.000
1994	0.001	0.000
1995	0.005	0.000
1996	0.017	0.000
1997	0.018	0.000
1998	0.003	0.000
1999	0.021	0.000
2000	0.002	0.000
2001	0.001	0.000
2002	0.005	0.000
2003	0.001	0.000
2004	0.024	0.000
2005	0.001	0.000
2006	0.069	0.000
2007	0.022	0.000
2008	0.002	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0692	0.0000
2	0.0584	0.0000
3	0.0336	0.0000
4	0.0292	0.0000
5	0.0268	0.0000
6	0.0235	0.0000
7	0.0217	0.0000
8	0.0212	0.0000
9	0.0204	0.0000
10	0.0184	0.0000
11	0.0181	0.0000

12	0.0172	0.0000
13	0.0171	0.0000
14	0.0154	0.0000
15	0.0143	0.0000
16	0.0112	0.0000
17	0.0105	0.0000
18	0.0099	0.0000
19	0.0092	0.0000
20	0.0087	0.0000
21	0.0062	0.0000
22	0.0058	0.0000
23	0.0058	0.0000
24	0.0056	0.0000
25	0.0055	0.0000
26	0.0053	0.0000
27	0.0050	0.0000
28	0.0050	0.0000
29	0.0046	0.0000
30	0.0046	0.0000
31	0.0044	0.0000
32	0.0040	0.0000
33	0.0039	0.0000
34	0.0034	0.0000
35	0.0030	0.0000
36	0.0030	0.0000
37	0.0025	0.0000
38	0.0024	0.0000
39	0.0021	0.0000
40	0.0017	0.0000
41	0.0015	0.0000
42	0.0008	0.0000
43	0.0007	0.0000
44	0.0007	0.0000
45	0.0007	0.0000
46	0.0007	0.0000
47	0.0007	0.0000
48	0.0007	0.0000
49	0.0007	0.0000
50	0.0007	0.0000
51	0.0007	0.0000
52	0.0007	0.0000
53	0.0007	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0024	263	0	0	Pass
0.0031	194	0	0	Pass
0.0038	149	0	0	Pass
0.0046	121	0	0	Pass
0.0053	98	0	0	Pass
0.0060	84	0	0	Pass
0.0068	75	0	0	Pass
0.0075	62	0	0	Pass
0.0082	54	0	0	Pass
0.0090	47	0	0	Pass
0.0097	42	0	0	Pass
0.0104	40	0	0	Pass
0.0112	33	0	0	Pass
0.0119	31	0	0	Pass
0.0126	28	0	0	Pass
0.0134	27	0	0	Pass
0.0141	27	0	0	Pass
0.0148	26	0	0	Pass
0.0156	24	0	0	Pass
0.0163	21	0	0	Pass
0.0170	21	0	0	Pass
0.0178	19	0	0	Pass
0.0185	16	0	0	Pass
0.0192	15	0	0	Pass
0.0200	15	0	0	Pass
0.0207	14	0	0	Pass
0.0214	13	0	0	Pass
0.0222	11	0	0	Pass
0.0229	11	0	0	Pass
0.0236	9	0	0	Pass
0.0244	7	0	0	Pass
0.0251	7	0	0	Pass
0.0258	7	0	0	Pass
0.0266	7	0	0	Pass
0.0273	6	0	0	Pass
0.0280	6	0	0	Pass
0.0288	6	0	0	Pass
0.0295	5	0	0	Pass
0.0302	5	0	0	Pass
0.0310	5	0	0	Pass
0.0317	5	0	0	Pass
0.0324	4	0	0	Pass
0.0332	4	0	0	Pass
0.0339	3	0	0	Pass
0.0346	3	0	0	Pass
0.0354	3	0	0	Pass
0.0361	3	0	0	Pass
0.0368	3	0	0	Pass
0.0376	3	0	0	Pass
0.0383	3	0	0	Pass
0.0390	3	0	0	Pass
0.0398	3	0	0	Pass
0.0405	3	0	0	Pass

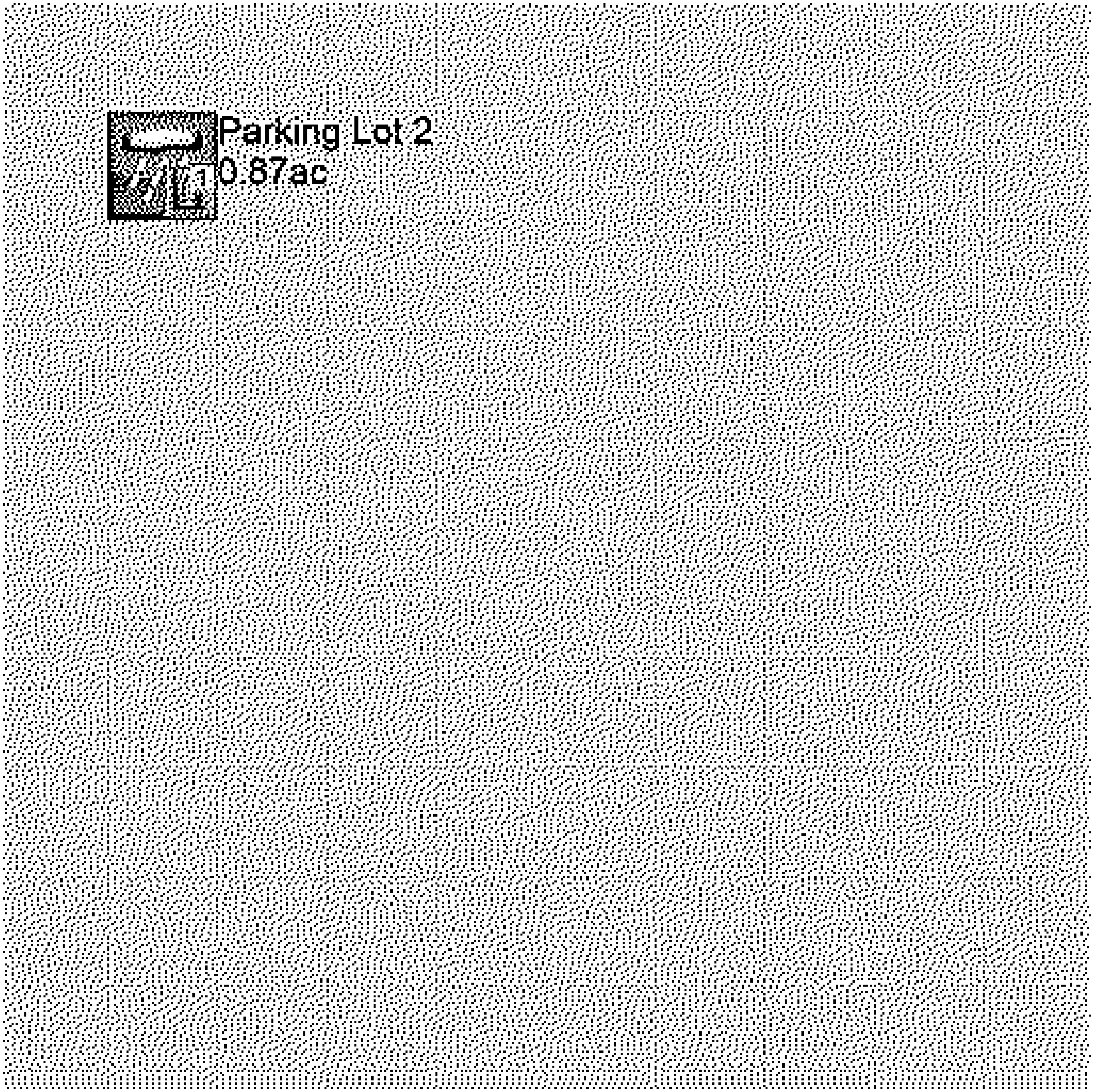
0.0412	3	0	0	Pass
0.0420	3	0	0	Pass
0.0427	3	0	0	Pass
0.0434	3	0	0	Pass
0.0442	3	0	0	Pass
0.0449	3	0	0	Pass
0.0456	3	0	0	Pass
0.0464	3	0	0	Pass
0.0471	3	0	0	Pass
0.0478	3	0	0	Pass
0.0486	3	0	0	Pass
0.0493	3	0	0	Pass
0.0500	3	0	0	Pass
0.0508	3	0	0	Pass
0.0515	3	0	0	Pass
0.0522	3	0	0	Pass
0.0530	3	0	0	Pass
0.0537	3	0	0	Pass
0.0544	3	0	0	Pass
0.0552	3	0	0	Pass
0.0559	3	0	0	Pass
0.0566	3	0	0	Pass
0.0574	3	0	0	Pass
0.0581	3	0	0	Pass
0.0588	2	0	0	Pass
0.0596	2	0	0	Pass
0.0603	2	0	0	Pass
0.0610	2	0	0	Pass
0.0618	2	0	0	Pass
0.0625	2	0	0	Pass
0.0632	2	0	0	Pass
0.0640	2	0	0	Pass
0.0647	1	0	0	Pass
0.0654	1	0	0	Pass
0.0662	1	0	0	Pass
0.0669	1	0	0	Pass
0.0676	1	0	0	Pass
0.0684	1	0	0	Pass
0.0691	1	0	0	Pass
0.0698	0	0	0	Pass
0.0706	0	0	0	Pass
0.0713	0	0	0	Pass
0.0720	0	0	0	Pass
0.0728	0	0	0	Pass
0.0735	0	0	0	Pass
0.0742	0	0	0	Pass
0.0750	0	0	0	Pass

LID Report

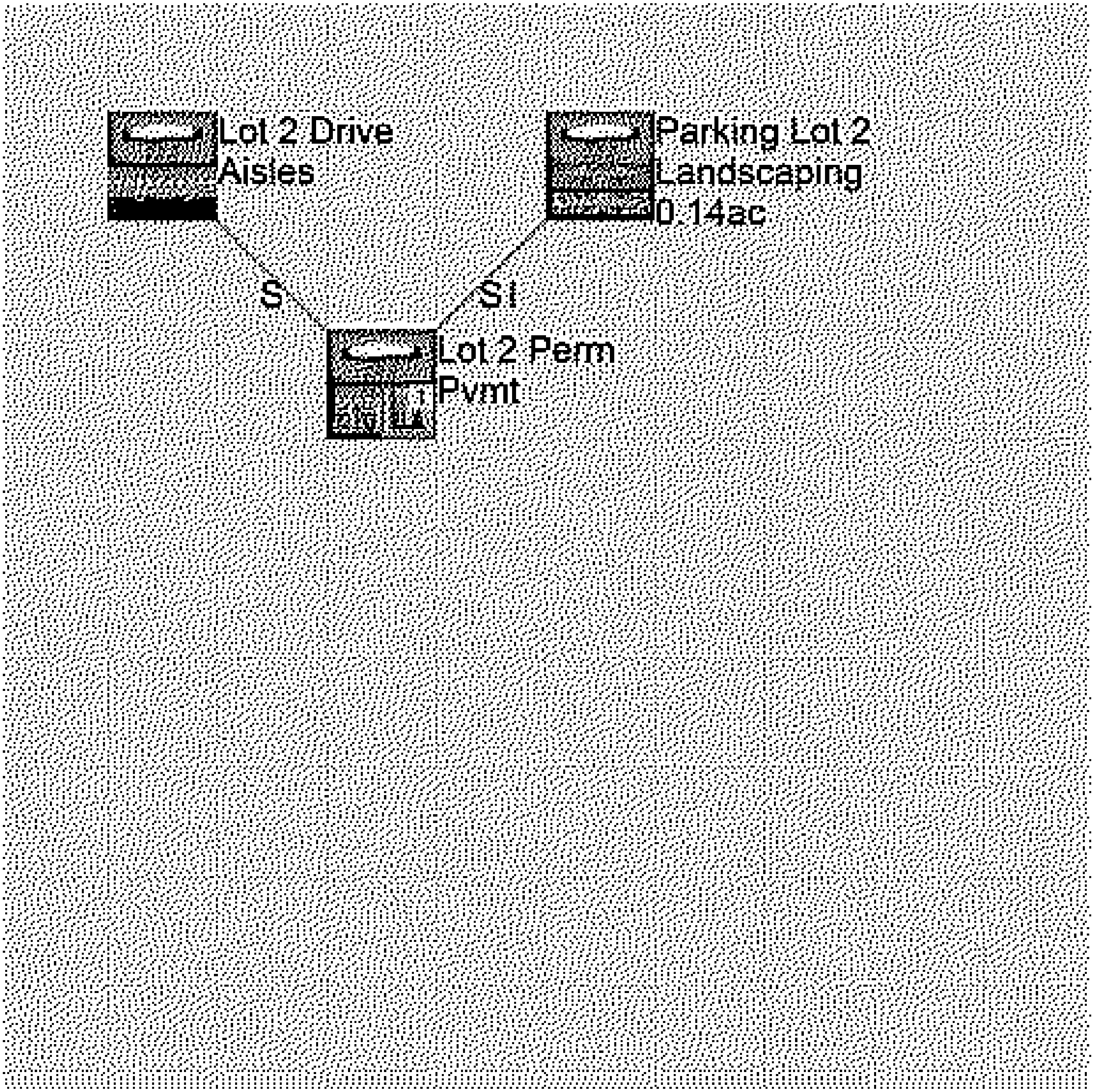
LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Lot 7 Perm Pvmt POC	☐	129.83			☐	100.00			
Total Volume Infiltrated		129.83	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix

Predeveloped Schematic



Mitigated Schematic



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Olympia, WA. 98501
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Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012

PROJECT REPORT

PARKING LOT

BASIN 3

General Model Information

Project Name:	C22-169 Yorkshire_ParkingLot3
Site Name:	Yorkshire
Site Address:	
City:	
Report Date:	8/11/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Lot 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	1.5
Pervious Total	1.5
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.5

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Lot 3 Drive Aisles

Bypass:	No
Impervious Land Use	acre
ROADS FLAT LAT	0.7

Element Flows To:

Outlet 1	Outlet 2
Lot 3 Perm Pvmt	

Parking Lot 3 Landscaping

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	.12

Element Flows To:

Surface	Interflow	Groundwater
Lot 3 Perm Pvmt	Lot 3 Perm Pvmt	

Mitigated Routing

Lot 3 Perm Pvmt

Pavement Area:0.6895 acre.Pavement Length:	173.30 ft.
Pavement Width:	173.30 ft.
	Pavement slope 1:0.01 To 1
Pavement thickness:	0.67
Pour Space of Pavement:	0.2
Material thickness of second layer:	0.67
Pour Space of material for second layer:	0.35
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	10
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	292.037
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	292.037
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	7.854
Element Flows To:	
Outlet 1	Outlet 2

Permeable Pavement Hydraulic Table

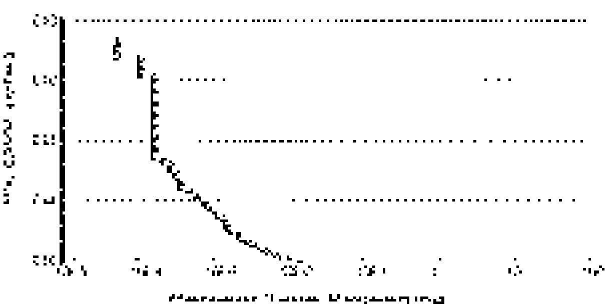
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.689	0.000	0.000	0.000
0.0148	0.689	0.003	0.000	6.952
0.0296	0.689	0.007	0.000	6.952
0.0444	0.689	0.010	0.000	6.952
0.0592	0.689	0.014	0.000	6.952
0.0741	0.689	0.017	0.000	6.952
0.0889	0.689	0.021	0.000	6.952
0.1037	0.689	0.025	0.000	6.952
0.1185	0.689	0.028	0.000	6.952
0.1333	0.689	0.032	0.000	6.952
0.1481	0.689	0.035	0.000	6.952
0.1629	0.689	0.039	0.000	6.952
0.1777	0.689	0.042	0.000	6.952
0.1925	0.689	0.046	0.000	6.952
0.2074	0.689	0.050	0.000	6.952
0.2222	0.689	0.053	0.000	6.952
0.2370	0.689	0.057	0.000	6.952
0.2518	0.689	0.060	0.000	6.952
0.2666	0.689	0.064	0.000	6.952
0.2814	0.689	0.067	0.000	6.952
0.2962	0.689	0.071	0.000	6.952
0.3110	0.689	0.075	0.000	6.952
0.3258	0.689	0.078	0.000	6.952
0.3407	0.689	0.082	0.000	6.952
0.3555	0.689	0.085	0.000	6.952
0.3703	0.689	0.089	0.000	6.952
0.3851	0.689	0.092	0.000	6.952
0.3999	0.689	0.096	0.000	6.952
0.4147	0.689	0.100	0.000	6.952

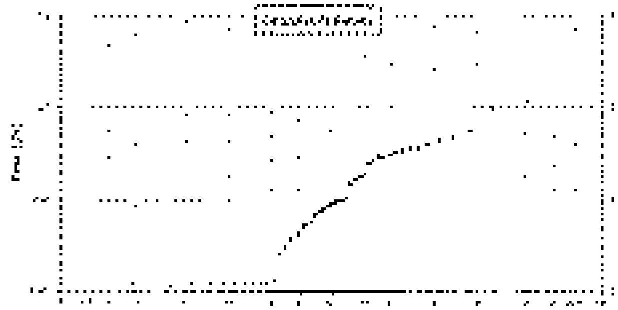
0.4295	0.689	0.103	0.000	6.952
0.4443	0.689	0.107	0.000	6.952
0.4591	0.689	0.110	0.000	6.952
0.4740	0.689	0.114	0.000	6.952
0.4888	0.689	0.117	0.000	6.952
0.5036	0.689	0.121	0.000	6.952
0.5184	0.689	0.125	0.000	6.952
0.5332	0.689	0.128	0.000	6.952
0.5480	0.689	0.132	0.000	6.952
0.5628	0.689	0.135	0.000	6.952
0.5776	0.689	0.139	0.000	6.952
0.5924	0.689	0.143	0.000	6.952
0.6073	0.689	0.146	0.000	6.952
0.6221	0.689	0.150	0.000	6.952
0.6369	0.689	0.153	0.000	6.952
0.6517	0.689	0.157	0.000	6.952
0.6665	0.689	0.160	0.000	6.952
0.6813	0.689	0.162	0.000	6.952
0.6961	0.689	0.164	0.000	6.952
0.7109	0.689	0.167	0.000	6.952
0.7257	0.689	0.169	0.000	6.952
0.7406	0.689	0.171	0.000	6.952
0.7554	0.689	0.173	0.000	6.952
0.7702	0.689	0.175	0.000	6.952
0.7850	0.689	0.177	0.000	6.952
0.7998	0.689	0.179	0.000	6.952
0.8146	0.689	0.181	0.000	6.952
0.8294	0.689	0.183	0.000	6.952
0.8442	0.689	0.185	0.000	6.952
0.8590	0.689	0.187	0.000	6.952
0.8739	0.689	0.189	0.000	6.952
0.8887	0.689	0.191	0.000	6.952
0.9035	0.689	0.193	0.000	6.952
0.9183	0.689	0.195	0.000	6.952
0.9331	0.689	0.197	0.000	6.952
0.9479	0.689	0.199	0.000	6.952
0.9627	0.689	0.201	0.000	6.952
0.9775	0.689	0.203	0.000	6.952
0.9923	0.689	0.205	0.000	6.952
1.0072	0.689	0.207	0.000	6.952
1.0220	0.689	0.209	0.000	6.952
1.0368	0.689	0.211	0.000	6.952
1.0516	0.689	0.213	0.000	6.952
1.0664	0.689	0.216	0.000	6.952
1.0812	0.689	0.218	0.000	6.952
1.0960	0.689	0.220	0.000	6.952
1.1108	0.689	0.222	0.000	6.952
1.1256	0.689	0.224	0.000	6.952
1.1405	0.689	0.226	0.000	6.952
1.1553	0.689	0.228	0.000	6.952
1.1701	0.689	0.230	0.000	6.952
1.1849	0.689	0.232	0.000	6.952
1.1997	0.689	0.234	0.000	6.952
1.2145	0.689	0.236	0.000	6.952
1.2293	0.689	0.238	0.000	6.952
1.2441	0.689	0.240	0.000	6.952
1.2589	0.689	0.242	0.000	6.952
1.2738	0.689	0.244	0.000	6.952

1.2886	0.689	0.246	0.000	6.952
1.3034	0.689	0.248	0.000	6.952
1.3182	0.689	0.250	0.000	6.952
1.3330	0.689	0.252	0.000	6.952

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.5
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.12
Total Impervious Area: 1.38946

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.00821
5 year	0.025405
10 year	0.045852
25 year	0.086063
50 year	0.129262
100 year	0.186367

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.016	0.000
1957	0.009	0.000
1958	0.007	0.000
1959	0.006	0.000
1960	0.035	0.000
1961	0.031	0.000
1962	0.001	0.000
1963	0.046	0.000
1964	0.027	0.000
1965	0.029	0.000

1966	0.015	0.000
1967	0.010	0.000
1968	0.007	0.000
1969	0.001	0.000
1970	0.005	0.000
1971	0.010	0.000
1972	0.025	0.000
1973	0.001	0.000
1974	0.018	0.000
1975	0.011	0.000
1976	0.010	0.000
1977	0.001	0.000
1978	0.009	0.000
1979	0.004	0.000
1980	0.008	0.000
1981	0.010	0.000
1982	0.008	0.000
1983	0.004	0.000
1984	0.019	0.000
1985	0.001	0.000
1986	0.017	0.000
1987	0.101	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.058	0.000
1991	0.050	0.000
1992	0.001	0.000
1993	0.003	0.000
1994	0.001	0.000
1995	0.008	0.000
1996	0.030	0.000
1997	0.032	0.000
1998	0.005	0.000
1999	0.037	0.000
2000	0.004	0.000
2001	0.001	0.000
2002	0.009	0.000
2003	0.001	0.000
2004	0.041	0.000
2005	0.001	0.000
2006	0.119	0.000
2007	0.037	0.000
2008	0.003	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1193	0.0000
2	0.1007	0.0000
3	0.0579	0.0000
4	0.0503	0.0000
5	0.0462	0.0000
6	0.0406	0.0000
7	0.0375	0.0000
8	0.0366	0.0000
9	0.0352	0.0000
10	0.0317	0.0000
11	0.0313	0.0000

12	0.0297	0.0000
13	0.0294	0.0000
14	0.0266	0.0000
15	0.0247	0.0000
16	0.0193	0.0000
17	0.0181	0.0000
18	0.0170	0.0000
19	0.0159	0.0000
20	0.0150	0.0000
21	0.0108	0.0000
22	0.0100	0.0000
23	0.0099	0.0000
24	0.0097	0.0000
25	0.0095	0.0000
26	0.0092	0.0000
27	0.0087	0.0000
28	0.0086	0.0000
29	0.0080	0.0000
30	0.0079	0.0000
31	0.0075	0.0000
32	0.0068	0.0000
33	0.0067	0.0000
34	0.0059	0.0000
35	0.0052	0.0000
36	0.0051	0.0000
37	0.0042	0.0000
38	0.0042	0.0000
39	0.0037	0.0000
40	0.0030	0.0000
41	0.0025	0.0000
42	0.0013	0.0000
43	0.0012	0.0000
44	0.0012	0.0000
45	0.0012	0.0000
46	0.0012	0.0000
47	0.0012	0.0000
48	0.0012	0.0000
49	0.0012	0.0000
50	0.0012	0.0000
51	0.0012	0.0000
52	0.0012	0.0000
53	0.0012	0.0000

Duration Flows

The Facility PASSED

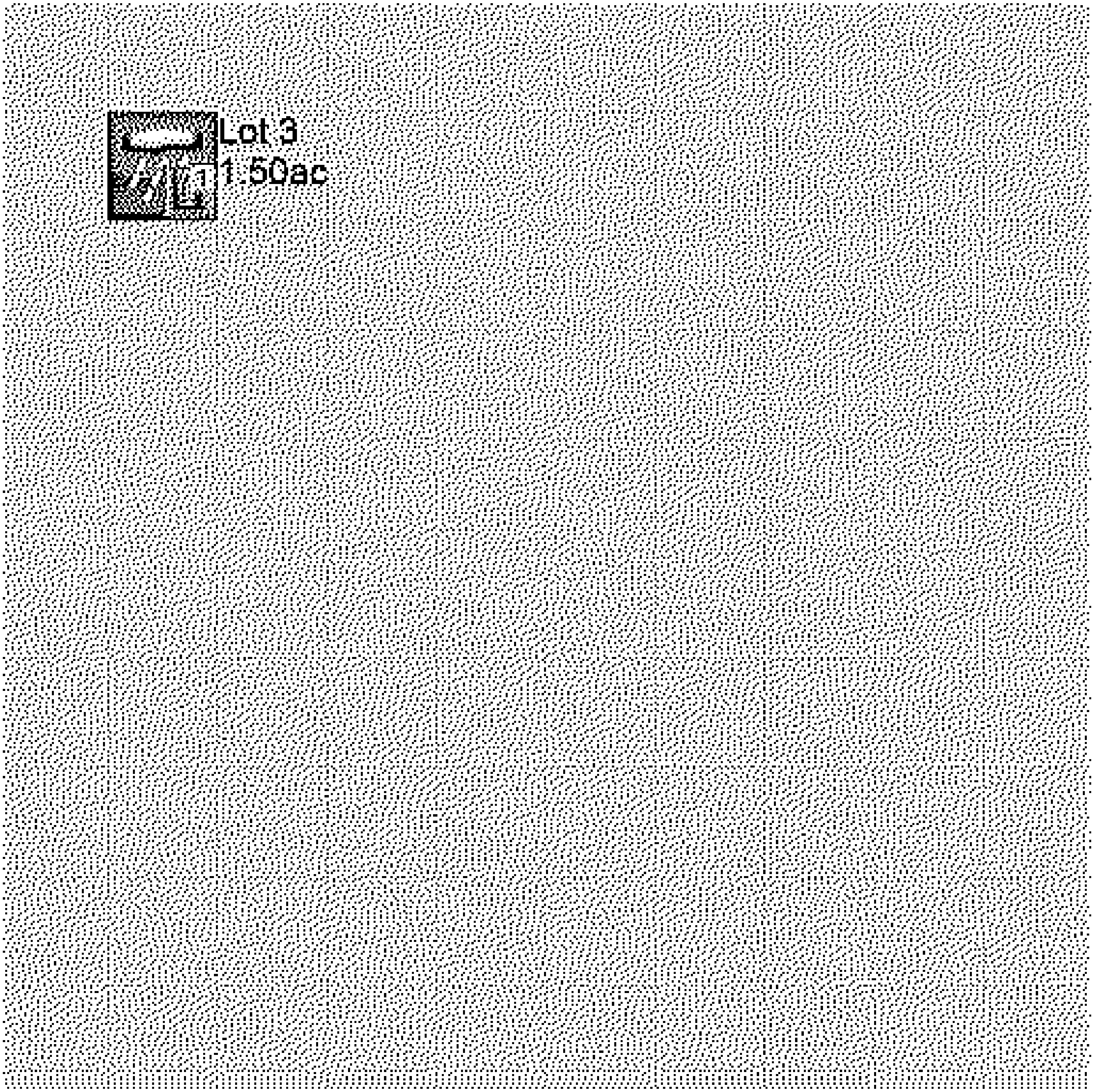
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0041	263	0	0	Pass
0.0054	194	0	0	Pass
0.0066	149	0	0	Pass
0.0079	121	0	0	Pass
0.0092	98	0	0	Pass
0.0104	84	0	0	Pass
0.0117	75	0	0	Pass
0.0130	62	0	0	Pass
0.0142	54	0	0	Pass
0.0155	47	0	0	Pass
0.0167	42	0	0	Pass
0.0180	40	0	0	Pass
0.0193	33	0	0	Pass
0.0205	31	0	0	Pass
0.0218	28	0	0	Pass
0.0231	27	0	0	Pass
0.0243	27	0	0	Pass
0.0256	26	0	0	Pass
0.0269	24	0	0	Pass
0.0281	21	0	0	Pass
0.0294	21	0	0	Pass
0.0307	19	0	0	Pass
0.0319	16	0	0	Pass
0.0332	15	0	0	Pass
0.0344	15	0	0	Pass
0.0357	14	0	0	Pass
0.0370	13	0	0	Pass
0.0382	11	0	0	Pass
0.0395	11	0	0	Pass
0.0408	9	0	0	Pass
0.0420	7	0	0	Pass
0.0433	7	0	0	Pass
0.0446	7	0	0	Pass
0.0458	7	0	0	Pass
0.0471	6	0	0	Pass
0.0484	6	0	0	Pass
0.0496	6	0	0	Pass
0.0509	5	0	0	Pass
0.0521	5	0	0	Pass
0.0534	5	0	0	Pass
0.0547	5	0	0	Pass
0.0559	4	0	0	Pass
0.0572	4	0	0	Pass
0.0585	3	0	0	Pass
0.0597	3	0	0	Pass
0.0610	3	0	0	Pass
0.0623	3	0	0	Pass
0.0635	3	0	0	Pass
0.0648	3	0	0	Pass
0.0661	3	0	0	Pass
0.0673	3	0	0	Pass
0.0686	3	0	0	Pass
0.0698	3	0	0	Pass

0.0711	3	0	0	Pass
0.0724	3	0	0	Pass
0.0736	3	0	0	Pass
0.0749	3	0	0	Pass
0.0762	3	0	0	Pass
0.0774	3	0	0	Pass
0.0787	3	0	0	Pass
0.0800	3	0	0	Pass
0.0812	3	0	0	Pass
0.0825	3	0	0	Pass
0.0838	3	0	0	Pass
0.0850	3	0	0	Pass
0.0863	3	0	0	Pass
0.0875	3	0	0	Pass
0.0888	3	0	0	Pass
0.0901	3	0	0	Pass
0.0913	3	0	0	Pass
0.0926	3	0	0	Pass
0.0939	3	0	0	Pass
0.0951	3	0	0	Pass
0.0964	3	0	0	Pass
0.0977	3	0	0	Pass
0.0989	3	0	0	Pass
0.1002	3	0	0	Pass
0.1014	2	0	0	Pass
0.1027	2	0	0	Pass
0.1040	2	0	0	Pass
0.1052	2	0	0	Pass
0.1065	2	0	0	Pass
0.1078	2	0	0	Pass
0.1090	2	0	0	Pass
0.1103	2	0	0	Pass
0.1116	1	0	0	Pass
0.1128	1	0	0	Pass
0.1141	1	0	0	Pass
0.1154	1	0	0	Pass
0.1166	1	0	0	Pass
0.1179	1	0	0	Pass
0.1191	1	0	0	Pass
0.1204	0	0	0	Pass
0.1217	0	0	0	Pass
0.1229	0	0	0	Pass
0.1242	0	0	0	Pass
0.1255	0	0	0	Pass
0.1267	0	0	0	Pass
0.1280	0	0	0	Pass
0.1293	0	0	0	Pass

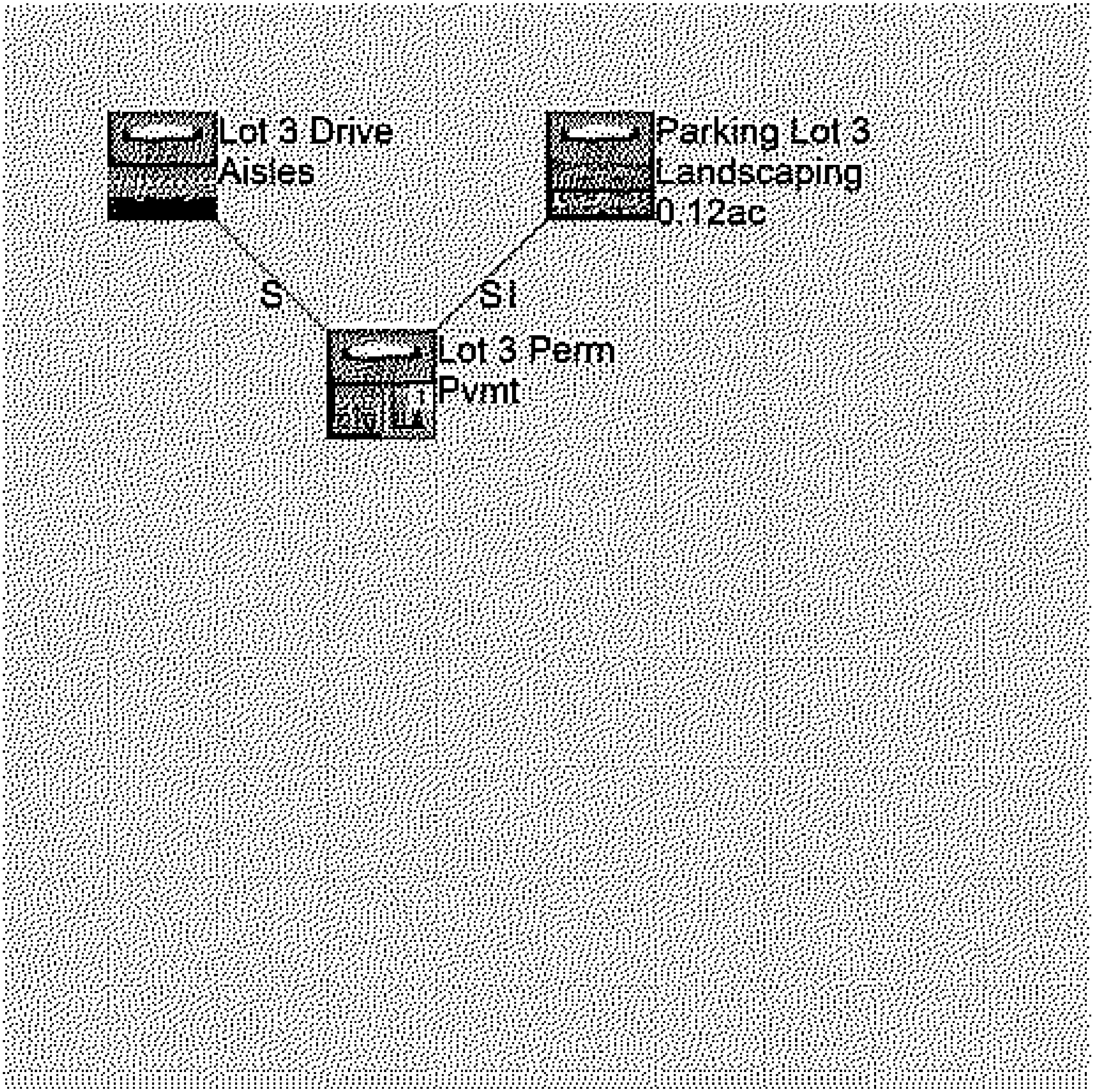
LID Report

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
Lot 3 Perm Pvmt POC	☐	266.75			☐	100.00			
Total Volume Infiltrated		266.75	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

BUILDING 6

TOTAL

General Model Information

Project Name:	20220811 Building 6-1
Site Name:	
Site Address:	
City:	
Report Date:	8/11/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Building 6-1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	1.95
Pervious Total	1.95
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.95

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Building 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.85
Pervious Total	0.85
Impervious Land Use	acre
ROOF TOPS FLAT	1.06
SIDEWALKS FLAT	0.04
Impervious Total	1.1
Basin Total	1.95

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Mitigated Routing

Gravel Trench Bed 1

Bottom Length: 92.00 ft.
Bottom Width: 30.00 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 1.5
Pour Space of material for first layer: 0.4
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 10
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 350.817
Total Volume Through Riser (ac-ft.): 0.013
Total Volume Through Facility (ac-ft.): 350.829
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 1.5 ft.
Riser Diameter: 6 in.
Element Flows To:
Outlet 1 Outlet 2

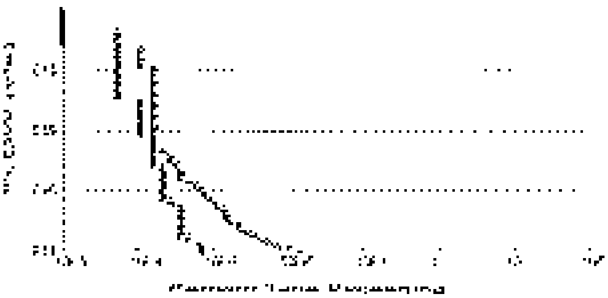
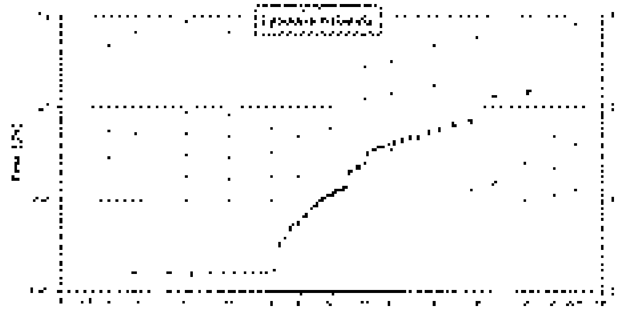
Gravel Trench Bed Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.063	0.000	0.000	0.000
0.0167	0.063	0.000	0.000	0.638
0.0333	0.063	0.000	0.000	0.638
0.0500	0.063	0.001	0.000	0.638
0.0667	0.063	0.001	0.000	0.638
0.0833	0.063	0.002	0.000	0.638
0.1000	0.063	0.002	0.000	0.638
0.1167	0.063	0.003	0.000	0.638
0.1333	0.063	0.003	0.000	0.638
0.1500	0.063	0.003	0.000	0.638
0.1667	0.063	0.004	0.000	0.638
0.1833	0.063	0.004	0.000	0.638
0.2000	0.063	0.005	0.000	0.638
0.2167	0.063	0.005	0.000	0.638
0.2333	0.063	0.005	0.000	0.638
0.2500	0.063	0.006	0.000	0.638
0.2667	0.063	0.006	0.000	0.638
0.2833	0.063	0.007	0.000	0.638
0.3000	0.063	0.007	0.000	0.638
0.3167	0.063	0.008	0.000	0.638
0.3333	0.063	0.008	0.000	0.638
0.3500	0.063	0.008	0.000	0.638
0.3667	0.063	0.009	0.000	0.638
0.3833	0.063	0.009	0.000	0.638

0.4000	0.063	0.010	0.000	0.638
0.4167	0.063	0.010	0.000	0.638
0.4333	0.063	0.011	0.000	0.638
0.4500	0.063	0.011	0.000	0.638
0.4667	0.063	0.011	0.000	0.638
0.4833	0.063	0.012	0.000	0.638
0.5000	0.063	0.012	0.000	0.638
0.5167	0.063	0.013	0.000	0.638
0.5333	0.063	0.013	0.000	0.638
0.5500	0.063	0.013	0.000	0.638
0.5667	0.063	0.014	0.000	0.638
0.5833	0.063	0.014	0.000	0.638
0.6000	0.063	0.015	0.000	0.638
0.6167	0.063	0.015	0.000	0.638
0.6333	0.063	0.016	0.000	0.638
0.6500	0.063	0.016	0.000	0.638
0.6667	0.063	0.016	0.000	0.638
0.6833	0.063	0.017	0.000	0.638
0.7000	0.063	0.017	0.000	0.638
0.7167	0.063	0.018	0.000	0.638
0.7333	0.063	0.018	0.000	0.638
0.7500	0.063	0.019	0.000	0.638
0.7667	0.063	0.019	0.000	0.638
0.7833	0.063	0.019	0.000	0.638
0.8000	0.063	0.020	0.000	0.638
0.8167	0.063	0.020	0.000	0.638
0.8333	0.063	0.021	0.000	0.638
0.8500	0.063	0.021	0.000	0.638
0.8667	0.063	0.022	0.000	0.638
0.8833	0.063	0.022	0.000	0.638
0.9000	0.063	0.022	0.000	0.638
0.9167	0.063	0.023	0.000	0.638
0.9333	0.063	0.023	0.000	0.638
0.9500	0.063	0.024	0.000	0.638
0.9667	0.063	0.024	0.000	0.638
0.9833	0.063	0.024	0.000	0.638
1.0000	0.063	0.025	0.000	0.638
1.0167	0.063	0.025	0.000	0.638
1.0333	0.063	0.026	0.000	0.638
1.0500	0.063	0.026	0.000	0.638
1.0667	0.063	0.027	0.000	0.638
1.0833	0.063	0.027	0.000	0.638
1.1000	0.063	0.027	0.000	0.638
1.1167	0.063	0.028	0.000	0.638
1.1333	0.063	0.028	0.000	0.638
1.1500	0.063	0.029	0.000	0.638
1.1667	0.063	0.029	0.000	0.638
1.1833	0.063	0.030	0.000	0.638
1.2000	0.063	0.030	0.000	0.638
1.2167	0.063	0.030	0.000	0.638
1.2333	0.063	0.031	0.000	0.638
1.2500	0.063	0.031	0.000	0.638
1.2667	0.063	0.032	0.000	0.638
1.2833	0.063	0.032	0.000	0.638
1.3000	0.063	0.032	0.000	0.638
1.3167	0.063	0.033	0.000	0.638
1.3333	0.063	0.033	0.000	0.638
1.3500	0.063	0.034	0.000	0.638

1.3667	0.063	0.034	0.000	0.638
1.3833	0.063	0.035	0.000	0.638
1.4000	0.063	0.035	0.000	0.638
1.4167	0.063	0.035	0.000	0.638
1.4333	0.063	0.036	0.000	0.638
1.4500	0.063	0.036	0.000	0.638
1.4667	0.063	0.037	0.000	0.638
1.4833	0.063	0.037	0.000	0.638
1.5000	0.063	0.038	0.000	0.638

Analysis Results
POC 1

+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.95
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.85
Total Impervious Area: 1.1

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.010673
5 year	0.033027
10 year	0.059607
25 year	0.111882
50 year	0.168041
100 year	0.242277

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.021	0.000
1957	0.011	0.015
1958	0.009	0.000
1959	0.008	0.000
1960	0.046	0.000
1961	0.041	0.000
1962	0.002	0.000
1963	0.060	0.000
1964	0.035	0.000
1965	0.038	0.000

1966	0.019	0.000
1967	0.013	0.000
1968	0.009	0.000
1969	0.002	0.000
1970	0.007	0.000
1971	0.013	0.000
1972	0.032	0.000
1973	0.002	0.000
1974	0.024	0.000
1975	0.014	0.000
1976	0.012	0.000
1977	0.002	0.000
1978	0.012	0.000
1979	0.005	0.000
1980	0.010	0.000
1981	0.013	0.000
1982	0.010	0.000
1983	0.005	0.000
1984	0.025	0.000
1985	0.002	0.000
1986	0.022	0.000
1987	0.131	0.000
1988	0.002	0.000
1989	0.002	0.000
1990	0.075	0.013
1991	0.065	0.000
1992	0.002	0.000
1993	0.003	0.000
1994	0.002	0.000
1995	0.010	0.000
1996	0.039	0.000
1997	0.041	0.000
1998	0.007	0.000
1999	0.048	0.000
2000	0.006	0.000
2001	0.002	0.000
2002	0.011	0.000
2003	0.002	0.000
2004	0.053	0.000
2005	0.002	0.000
2006	0.155	0.145
2007	0.049	0.000
2008	0.004	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1551	0.1453
2	0.1309	0.0152
3	0.0753	0.0132
4	0.0654	0.0000
5	0.0601	0.0000
6	0.0528	0.0000
7	0.0487	0.0000
8	0.0475	0.0000
9	0.0458	0.0000
10	0.0412	0.0000
11	0.0406	0.0000

12	0.0386	0.0000
13	0.0382	0.0000
14	0.0345	0.0000
15	0.0322	0.0000
16	0.0251	0.0000
17	0.0235	0.0000
18	0.0222	0.0000
19	0.0207	0.0000
20	0.0194	0.0000
21	0.0140	0.0000
22	0.0130	0.0000
23	0.0129	0.0000
24	0.0126	0.0000
25	0.0124	0.0000
26	0.0119	0.0000
27	0.0113	0.0000
28	0.0112	0.0000
29	0.0104	0.0000
30	0.0103	0.0000
31	0.0098	0.0000
32	0.0089	0.0000
33	0.0088	0.0000
34	0.0076	0.0000
35	0.0068	0.0000
36	0.0066	0.0000
37	0.0055	0.0000
38	0.0055	0.0000
39	0.0048	0.0000
40	0.0039	0.0000
41	0.0033	0.0000
42	0.0017	0.0000
43	0.0016	0.0000
44	0.0016	0.0000
45	0.0016	0.0000
46	0.0016	0.0000
47	0.0016	0.0000
48	0.0016	0.0000
49	0.0016	0.0000
50	0.0016	0.0000
51	0.0016	0.0000
52	0.0016	0.0000
53	0.0015	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0053	263	13	4	Pass
0.0070	194	13	6	Pass
0.0086	149	13	8	Pass
0.0103	121	13	10	Pass
0.0119	98	12	12	Pass
0.0136	84	9	10	Pass
0.0152	75	9	12	Pass
0.0168	62	7	11	Pass
0.0185	54	7	12	Pass
0.0201	47	7	14	Pass
0.0218	42	7	16	Pass
0.0234	40	7	17	Pass
0.0251	33	7	21	Pass
0.0267	31	7	22	Pass
0.0283	28	7	25	Pass
0.0300	27	7	25	Pass
0.0316	27	7	25	Pass
0.0333	26	7	26	Pass
0.0349	24	7	29	Pass
0.0366	21	7	33	Pass
0.0382	21	6	28	Pass
0.0398	19	5	26	Pass
0.0415	16	4	25	Pass
0.0431	15	4	26	Pass
0.0448	15	4	26	Pass
0.0464	14	4	28	Pass
0.0481	13	4	30	Pass
0.0497	11	4	36	Pass
0.0514	11	4	36	Pass
0.0530	9	4	44	Pass
0.0546	7	4	57	Pass
0.0563	7	4	57	Pass
0.0579	7	4	57	Pass
0.0596	7	4	57	Pass
0.0612	6	4	66	Pass
0.0629	6	4	66	Pass
0.0645	6	3	50	Pass
0.0661	5	3	60	Pass
0.0678	5	3	60	Pass
0.0694	5	3	60	Pass
0.0711	5	3	60	Pass
0.0727	4	3	75	Pass
0.0744	4	3	75	Pass
0.0760	3	3	100	Pass
0.0776	3	3	100	Pass
0.0793	3	3	100	Pass
0.0809	3	3	100	Pass
0.0826	3	3	100	Pass
0.0842	3	3	100	Pass
0.0859	3	2	66	Pass
0.0875	3	2	66	Pass
0.0892	3	2	66	Pass
0.0908	3	2	66	Pass

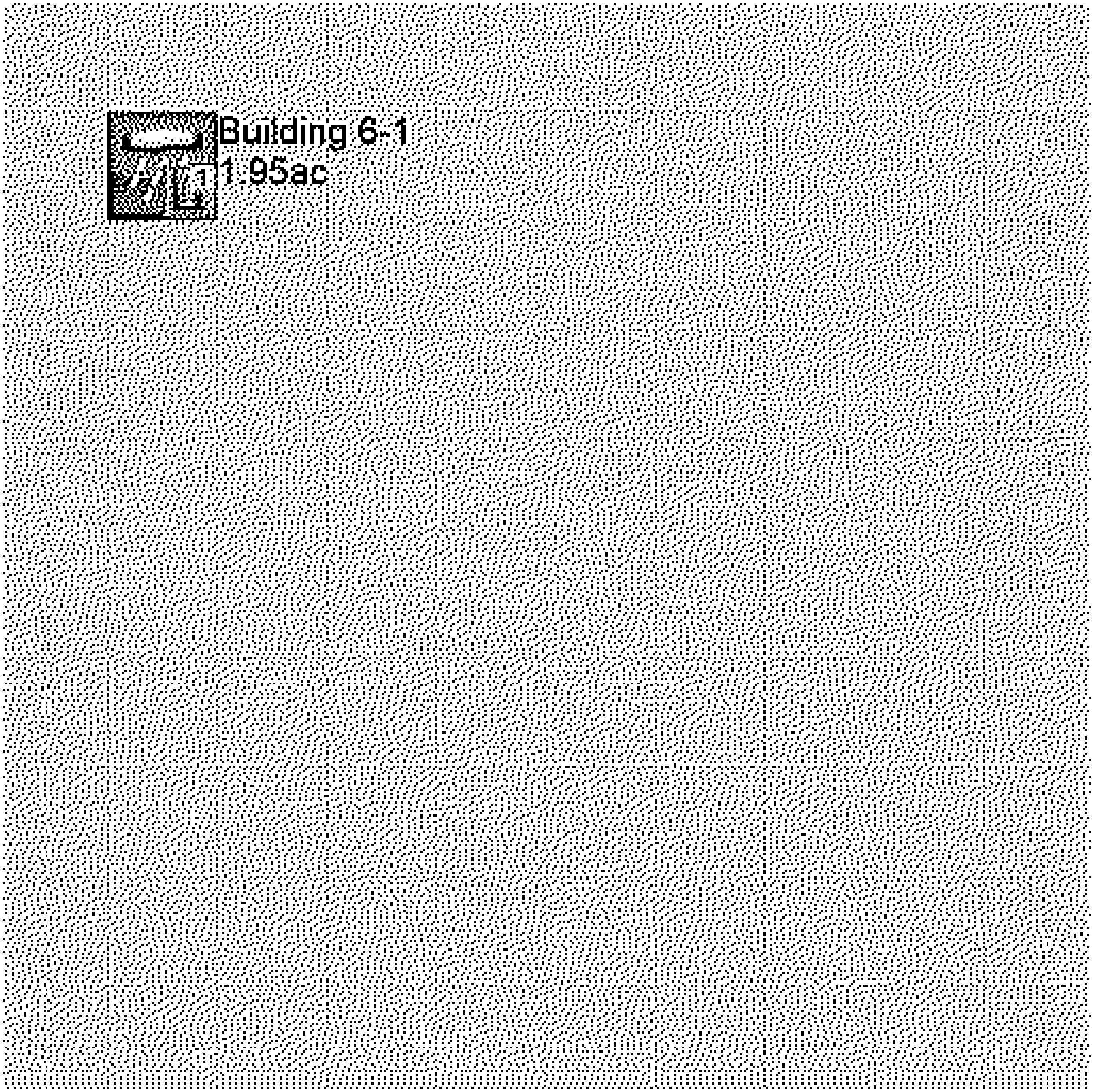
0.0924	3	2	66	Pass
0.0941	3	2	66	Pass
0.0957	3	2	66	Pass
0.0974	3	2	66	Pass
0.0990	3	2	66	Pass
0.1007	3	2	66	Pass
0.1023	3	2	66	Pass
0.1039	3	2	66	Pass
0.1056	3	2	66	Pass
0.1072	3	2	66	Pass
0.1089	3	2	66	Pass
0.1105	3	1	33	Pass
0.1122	3	1	33	Pass
0.1138	3	1	33	Pass
0.1154	3	1	33	Pass
0.1171	3	1	33	Pass
0.1187	3	1	33	Pass
0.1204	3	1	33	Pass
0.1220	3	1	33	Pass
0.1237	3	1	33	Pass
0.1253	3	1	33	Pass
0.1270	3	1	33	Pass
0.1286	3	1	33	Pass
0.1302	3	1	33	Pass
0.1319	2	1	50	Pass
0.1335	2	1	50	Pass
0.1352	2	1	50	Pass
0.1368	2	1	50	Pass
0.1385	2	1	50	Pass
0.1401	2	1	50	Pass
0.1417	2	1	50	Pass
0.1434	2	1	50	Pass
0.1450	1	1	100	Pass
0.1467	1	0	0	Pass
0.1483	1	0	0	Pass
0.1500	1	0	0	Pass
0.1516	1	0	0	Pass
0.1532	1	0	0	Pass
0.1549	1	0	0	Pass
0.1565	0	0	0	Pass
0.1582	0	0	0	Pass
0.1598	0	0	0	Pass
0.1615	0	0	0	Pass
0.1631	0	0	0	Pass
0.1648	0	0	0	Pass
0.1664	0	0	0	Pass
0.1680	0	0	0	Pass

LID Report

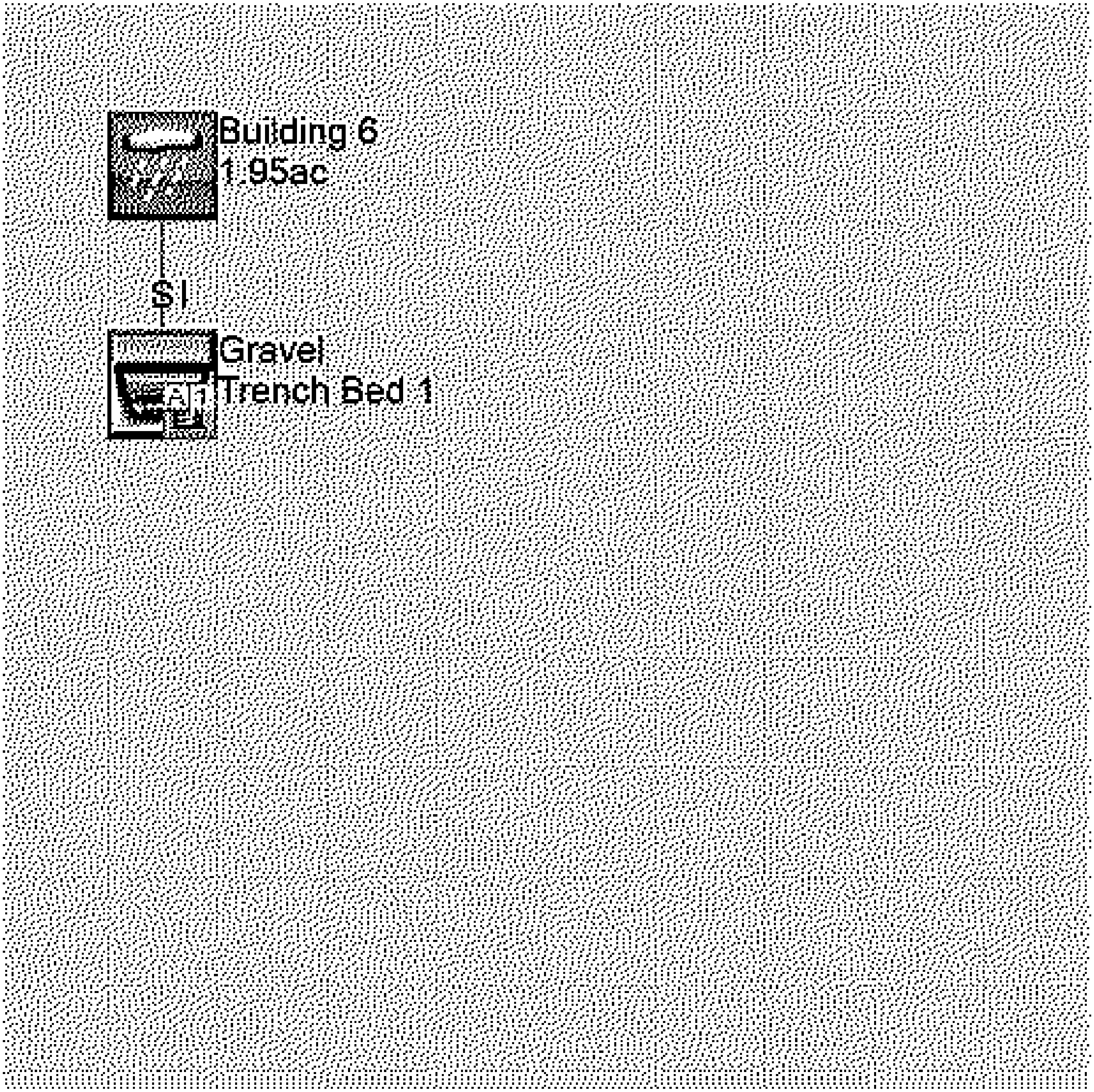
LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Gravel Trench Bed 1 POC	☐	319.75			☐	100.00			
Total Volume Infiltrated		319.75	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix

Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

BUILDING 6

TYP. TRENCH 1

General Model Information

Project Name:	20220511 Building 6 Trench-0.27 AC Roof
Site Name:	
Site Address:	
City:	
Report Date:	8/11/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2021/08/18
Version:	4.2.18

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

Building 6-1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.27
Pervious Total	0.27
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.27

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Building 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.16
Pervious Total	0.16
Impervious Land Use	acre
ROOF TOPS FLAT	0.27
Impervious Total	0.27
Basin Total	0.43

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Mitigated Routing

Gravel Trench Bed 1

Bottom Length:	100.00 ft.
Bottom Width:	6.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	10
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	58.067
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	58.067
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0

Discharge Structure

Riser Height:	2 ft.
Riser Diameter:	6 in.

Element Flows To:

Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

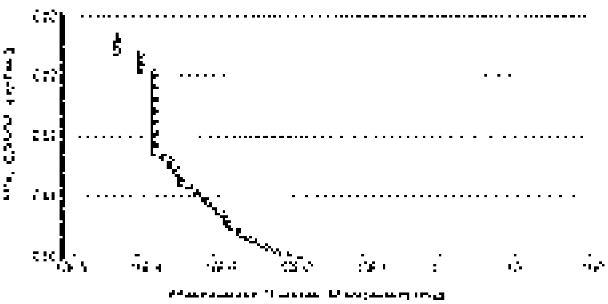
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.013	0.000	0.000	0.000
0.0167	0.013	0.000	0.000	0.138
0.0333	0.013	0.000	0.000	0.138
0.0500	0.013	0.000	0.000	0.138
0.0667	0.013	0.000	0.000	0.138
0.0833	0.013	0.000	0.000	0.138
0.1000	0.013	0.000	0.000	0.138
0.1167	0.013	0.000	0.000	0.138
0.1333	0.013	0.000	0.000	0.138
0.1500	0.013	0.000	0.000	0.138
0.1667	0.013	0.000	0.000	0.138
0.1833	0.013	0.001	0.000	0.138
0.2000	0.013	0.001	0.000	0.138
0.2167	0.013	0.001	0.000	0.138
0.2333	0.013	0.001	0.000	0.138
0.2500	0.013	0.001	0.000	0.138
0.2667	0.013	0.001	0.000	0.138
0.2833	0.013	0.001	0.000	0.138
0.3000	0.013	0.001	0.000	0.138
0.3167	0.013	0.001	0.000	0.138
0.3333	0.013	0.001	0.000	0.138
0.3500	0.013	0.001	0.000	0.138
0.3667	0.013	0.002	0.000	0.138
0.3833	0.013	0.002	0.000	0.138

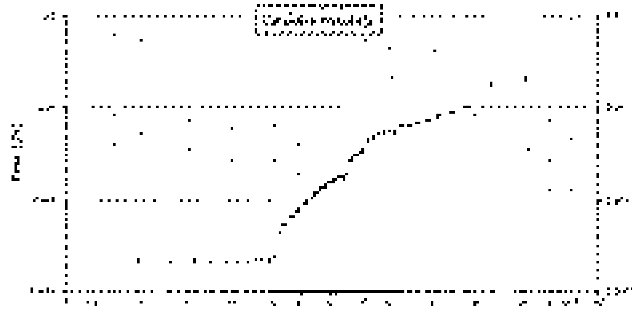
0.4000	0.013	0.002	0.000	0.138
0.4167	0.013	0.002	0.000	0.138
0.4333	0.013	0.002	0.000	0.138
0.4500	0.013	0.002	0.000	0.138
0.4667	0.013	0.002	0.000	0.138
0.4833	0.013	0.002	0.000	0.138
0.5000	0.013	0.002	0.000	0.138
0.5167	0.013	0.002	0.000	0.138
0.5333	0.013	0.002	0.000	0.138
0.5500	0.013	0.003	0.000	0.138
0.5667	0.013	0.003	0.000	0.138
0.5833	0.013	0.003	0.000	0.138
0.6000	0.013	0.003	0.000	0.138
0.6167	0.013	0.003	0.000	0.138
0.6333	0.013	0.003	0.000	0.138
0.6500	0.013	0.003	0.000	0.138
0.6667	0.013	0.003	0.000	0.138
0.6833	0.013	0.003	0.000	0.138
0.7000	0.013	0.003	0.000	0.138
0.7167	0.013	0.003	0.000	0.138
0.7333	0.013	0.004	0.000	0.138
0.7500	0.013	0.004	0.000	0.138
0.7667	0.013	0.004	0.000	0.138
0.7833	0.013	0.004	0.000	0.138
0.8000	0.013	0.004	0.000	0.138
0.8167	0.013	0.004	0.000	0.138
0.8333	0.013	0.004	0.000	0.138
0.8500	0.013	0.004	0.000	0.138
0.8667	0.013	0.004	0.000	0.138
0.8833	0.013	0.004	0.000	0.138
0.9000	0.013	0.005	0.000	0.138
0.9167	0.013	0.005	0.000	0.138
0.9333	0.013	0.005	0.000	0.138
0.9500	0.013	0.005	0.000	0.138
0.9667	0.013	0.005	0.000	0.138
0.9833	0.013	0.005	0.000	0.138
1.0000	0.013	0.005	0.000	0.138
1.0167	0.013	0.005	0.000	0.138
1.0333	0.013	0.005	0.000	0.138
1.0500	0.013	0.005	0.000	0.138
1.0667	0.013	0.005	0.000	0.138
1.0833	0.013	0.006	0.000	0.138
1.1000	0.013	0.006	0.000	0.138
1.1167	0.013	0.006	0.000	0.138
1.1333	0.013	0.006	0.000	0.138
1.1500	0.013	0.006	0.000	0.138
1.1667	0.013	0.006	0.000	0.138
1.1833	0.013	0.006	0.000	0.138
1.2000	0.013	0.006	0.000	0.138
1.2167	0.013	0.006	0.000	0.138
1.2333	0.013	0.006	0.000	0.138
1.2500	0.013	0.006	0.000	0.138
1.2667	0.013	0.007	0.000	0.138
1.2833	0.013	0.007	0.000	0.138
1.3000	0.013	0.007	0.000	0.138
1.3167	0.013	0.007	0.000	0.138
1.3333	0.013	0.007	0.000	0.138
1.3500	0.013	0.007	0.000	0.138

1.3667	0.013	0.007	0.000	0.138
1.3833	0.013	0.007	0.000	0.138
1.4000	0.013	0.007	0.000	0.138
1.4167	0.013	0.007	0.000	0.138
1.4333	0.013	0.007	0.000	0.138
1.4500	0.013	0.008	0.000	0.138
1.4667	0.013	0.008	0.000	0.138
1.4833	0.013	0.008	0.000	0.138
1.5000	0.013	0.008	0.000	0.138

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area:	0.27
Total Impervious Area:	0

Mitigated Landuse Totals for POC #1

Total Pervious Area:	0.16
Total Impervious Area:	0.27

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.001478
5 year	0.004573
10 year	0.008253
25 year	0.015491
50 year	0.023267
100 year	0.033546

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.003	0.000
1957	0.002	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.006	0.000
1961	0.006	0.000
1962	0.000	0.000
1963	0.008	0.000
1964	0.005	0.000
1965	0.005	0.000

1966	0.003	0.000
1967	0.002	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.001	0.000
1971	0.002	0.000
1972	0.004	0.000
1973	0.000	0.000
1974	0.003	0.000
1975	0.002	0.000
1976	0.002	0.000
1977	0.000	0.000
1978	0.002	0.000
1979	0.001	0.000
1980	0.001	0.000
1981	0.002	0.000
1982	0.001	0.000
1983	0.001	0.000
1984	0.003	0.000
1985	0.000	0.000
1986	0.003	0.000
1987	0.018	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.010	0.000
1991	0.009	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.005	0.000
1997	0.006	0.000
1998	0.001	0.000
1999	0.007	0.000
2000	0.001	0.000
2001	0.000	0.000
2002	0.002	0.000
2003	0.000	0.000
2004	0.007	0.000
2005	0.000	0.000
2006	0.021	0.000
2007	0.007	0.000
2008	0.001	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0215	0.0000
2	0.0181	0.0000
3	0.0104	0.0000
4	0.0091	0.0000
5	0.0083	0.0000
6	0.0073	0.0000
7	0.0067	0.0000
8	0.0066	0.0000
9	0.0063	0.0000
10	0.0057	0.0000
11	0.0056	0.0000

12	0.0053	0.0000
13	0.0053	0.0000
14	0.0048	0.0000
15	0.0045	0.0000
16	0.0035	0.0000
17	0.0033	0.0000
18	0.0031	0.0000
19	0.0029	0.0000
20	0.0027	0.0000
21	0.0019	0.0000
22	0.0018	0.0000
23	0.0018	0.0000
24	0.0017	0.0000
25	0.0017	0.0000
26	0.0016	0.0000
27	0.0016	0.0000
28	0.0016	0.0000
29	0.0014	0.0000
30	0.0014	0.0000
31	0.0014	0.0000
32	0.0012	0.0000
33	0.0012	0.0000
34	0.0011	0.0000
35	0.0009	0.0000
36	0.0009	0.0000
37	0.0008	0.0000
38	0.0008	0.0000
39	0.0007	0.0000
40	0.0005	0.0000
41	0.0005	0.0000
42	0.0002	0.0000
43	0.0002	0.0000
44	0.0002	0.0000
45	0.0002	0.0000
46	0.0002	0.0000
47	0.0002	0.0000
48	0.0002	0.0000
49	0.0002	0.0000
50	0.0002	0.0000
51	0.0002	0.0000
52	0.0002	0.0000
53	0.0002	0.0000

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0007	263	0	0	Pass
0.0010	194	0	0	Pass
0.0012	149	0	0	Pass
0.0014	121	0	0	Pass
0.0016	98	0	0	Pass
0.0019	84	0	0	Pass
0.0021	75	0	0	Pass
0.0023	62	0	0	Pass
0.0026	54	0	0	Pass
0.0028	47	0	0	Pass
0.0030	42	0	0	Pass
0.0032	40	0	0	Pass
0.0035	33	0	0	Pass
0.0037	31	0	0	Pass
0.0039	28	0	0	Pass
0.0042	27	0	0	Pass
0.0044	27	0	0	Pass
0.0046	26	0	0	Pass
0.0048	24	0	0	Pass
0.0051	21	0	0	Pass
0.0053	21	0	0	Pass
0.0055	19	0	0	Pass
0.0057	16	0	0	Pass
0.0060	15	0	0	Pass
0.0062	15	0	0	Pass
0.0064	14	0	0	Pass
0.0067	13	0	0	Pass
0.0069	11	0	0	Pass
0.0071	11	0	0	Pass
0.0073	9	0	0	Pass
0.0076	7	0	0	Pass
0.0078	7	0	0	Pass
0.0080	7	0	0	Pass
0.0082	7	0	0	Pass
0.0085	6	0	0	Pass
0.0087	6	0	0	Pass
0.0089	6	0	0	Pass
0.0092	5	0	0	Pass
0.0094	5	0	0	Pass
0.0096	5	0	0	Pass
0.0098	5	0	0	Pass
0.0101	4	0	0	Pass
0.0103	4	0	0	Pass
0.0105	3	0	0	Pass
0.0108	3	0	0	Pass
0.0110	3	0	0	Pass
0.0112	3	0	0	Pass
0.0114	3	0	0	Pass
0.0117	3	0	0	Pass
0.0119	3	0	0	Pass
0.0121	3	0	0	Pass
0.0123	3	0	0	Pass
0.0126	3	0	0	Pass

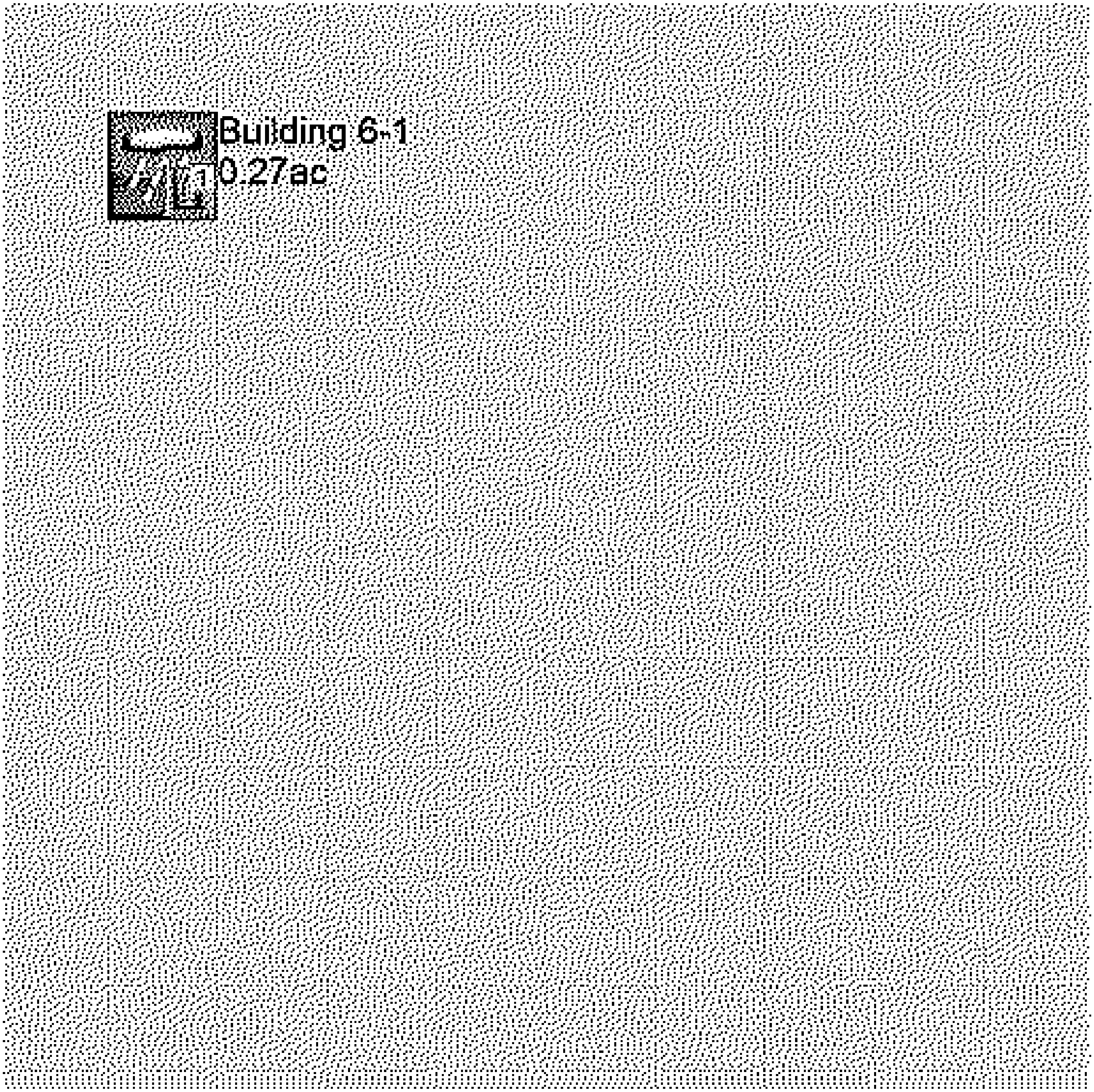
0.0128	3	0	0	Pass
0.0130	3	0	0	Pass
0.0133	3	0	0	Pass
0.0135	3	0	0	Pass
0.0137	3	0	0	Pass
0.0139	3	0	0	Pass
0.0142	3	0	0	Pass
0.0144	3	0	0	Pass
0.0146	3	0	0	Pass
0.0148	3	0	0	Pass
0.0151	3	0	0	Pass
0.0153	3	0	0	Pass
0.0155	3	0	0	Pass
0.0158	3	0	0	Pass
0.0160	3	0	0	Pass
0.0162	3	0	0	Pass
0.0164	3	0	0	Pass
0.0167	3	0	0	Pass
0.0169	3	0	0	Pass
0.0171	3	0	0	Pass
0.0174	3	0	0	Pass
0.0176	3	0	0	Pass
0.0178	3	0	0	Pass
0.0180	3	0	0	Pass
0.0183	2	0	0	Pass
0.0185	2	0	0	Pass
0.0187	2	0	0	Pass
0.0189	2	0	0	Pass
0.0192	2	0	0	Pass
0.0194	2	0	0	Pass
0.0196	2	0	0	Pass
0.0199	2	0	0	Pass
0.0201	1	0	0	Pass
0.0203	1	0	0	Pass
0.0205	1	0	0	Pass
0.0208	1	0	0	Pass
0.0210	1	0	0	Pass
0.0212	1	0	0	Pass
0.0214	1	0	0	Pass
0.0217	0	0	0	Pass
0.0219	0	0	0	Pass
0.0221	0	0	0	Pass
0.0224	0	0	0	Pass
0.0226	0	0	0	Pass
0.0228	0	0	0	Pass
0.0230	0	0	0	Pass
0.0233	0	0	0	Pass

LID Report

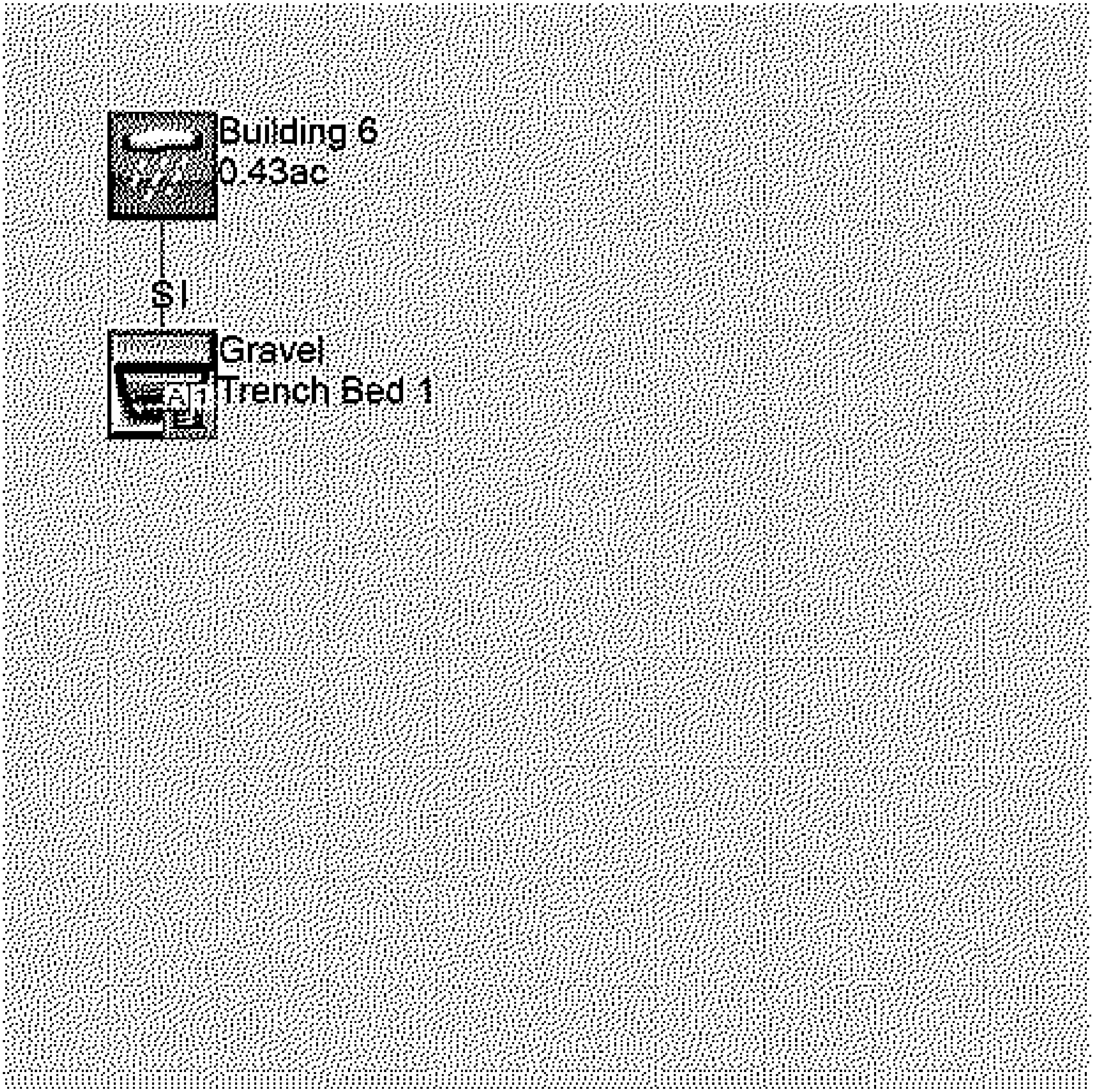
LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Gravel Trench Bed 1 POC	☐	52.64			☐	100.00			
Total Volume Infiltrated		52.84	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix

Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

BUILDING 6

TYP. TRENCH 2

General Model Information

Project Name:	20220511 Building 6 Trench-0.19 AC Roof
Site Name:	
Site Address:	
City:	
Report Date:	8/11/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Building 6-1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.32
Pervious Total	0.32
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.32

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Building 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.13
Pervious Total	0.13
Impervious Land Use	acre
ROOF TOPS FLAT	0.19
Impervious Total	0.19
Basin Total	0.32

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Mitigated Routing

Gravel Trench Bed 1

Bottom Length:	80.00 ft.
Bottom Width:	6.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	10
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	40.758
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	40.758
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0

Discharge Structure
Riser Height: 2 ft.
Riser Diameter: 12 in.
Element Flows To:
Outlet 1 Outlet 2

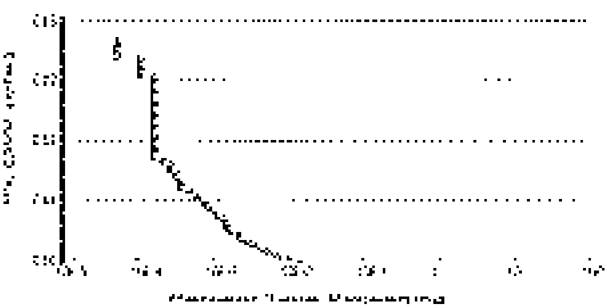
Gravel Trench Bed Hydraulic Table

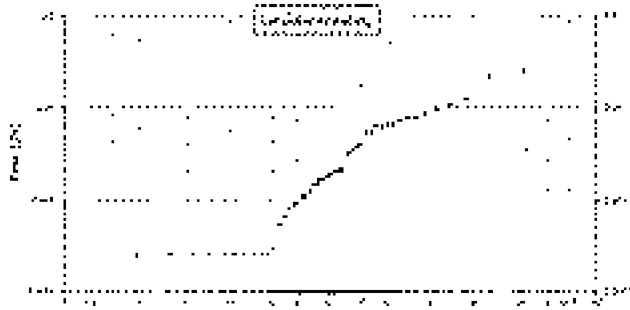
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.011	0.000	0.000	0.000
0.0167	0.011	0.000	0.000	0.111
0.0333	0.011	0.000	0.000	0.111
0.0500	0.011	0.000	0.000	0.111
0.0667	0.011	0.000	0.000	0.111
0.0833	0.011	0.000	0.000	0.111
0.1000	0.011	0.000	0.000	0.111
0.1167	0.011	0.000	0.000	0.111
0.1333	0.011	0.000	0.000	0.111
0.1500	0.011	0.000	0.000	0.111
0.1667	0.011	0.000	0.000	0.111
0.1833	0.011	0.000	0.000	0.111
0.2000	0.011	0.000	0.000	0.111
0.2167	0.011	0.001	0.000	0.111
0.2333	0.011	0.001	0.000	0.111
0.2500	0.011	0.001	0.000	0.111
0.2667	0.011	0.001	0.000	0.111
0.2833	0.011	0.001	0.000	0.111
0.3000	0.011	0.001	0.000	0.111
0.3167	0.011	0.001	0.000	0.111
0.3333	0.011	0.001	0.000	0.111
0.3500	0.011	0.001	0.000	0.111
0.3667	0.011	0.001	0.000	0.111
0.3833	0.011	0.001	0.000	0.111

0.4000	0.011	0.001	0.000	0.111
0.4167	0.011	0.001	0.000	0.111
0.4333	0.011	0.001	0.000	0.111
0.4500	0.011	0.002	0.000	0.111
0.4667	0.011	0.002	0.000	0.111
0.4833	0.011	0.002	0.000	0.111
0.5000	0.011	0.002	0.000	0.111
0.5167	0.011	0.002	0.000	0.111
0.5333	0.011	0.002	0.000	0.111
0.5500	0.011	0.002	0.000	0.111
0.5667	0.011	0.002	0.000	0.111
0.5833	0.011	0.002	0.000	0.111
0.6000	0.011	0.002	0.000	0.111
0.6167	0.011	0.002	0.000	0.111
0.6333	0.011	0.002	0.000	0.111
0.6500	0.011	0.002	0.000	0.111
0.6667	0.011	0.002	0.000	0.111
0.6833	0.011	0.003	0.000	0.111
0.7000	0.011	0.003	0.000	0.111
0.7167	0.011	0.003	0.000	0.111
0.7333	0.011	0.003	0.000	0.111
0.7500	0.011	0.003	0.000	0.111
0.7667	0.011	0.003	0.000	0.111
0.7833	0.011	0.003	0.000	0.111
0.8000	0.011	0.003	0.000	0.111
0.8167	0.011	0.003	0.000	0.111
0.8333	0.011	0.003	0.000	0.111
0.8500	0.011	0.003	0.000	0.111
0.8667	0.011	0.003	0.000	0.111
0.8833	0.011	0.003	0.000	0.111
0.9000	0.011	0.004	0.000	0.111
0.9167	0.011	0.004	0.000	0.111
0.9333	0.011	0.004	0.000	0.111
0.9500	0.011	0.004	0.000	0.111
0.9667	0.011	0.004	0.000	0.111
0.9833	0.011	0.004	0.000	0.111
1.0000	0.011	0.004	0.000	0.111
1.0167	0.011	0.004	0.000	0.111
1.0333	0.011	0.004	0.000	0.111
1.0500	0.011	0.004	0.000	0.111
1.0667	0.011	0.004	0.000	0.111
1.0833	0.011	0.004	0.000	0.111
1.1000	0.011	0.004	0.000	0.111
1.1167	0.011	0.004	0.000	0.111
1.1333	0.011	0.005	0.000	0.111
1.1500	0.011	0.005	0.000	0.111
1.1667	0.011	0.005	0.000	0.111
1.1833	0.011	0.005	0.000	0.111
1.2000	0.011	0.005	0.000	0.111
1.2167	0.011	0.005	0.000	0.111
1.2333	0.011	0.005	0.000	0.111
1.2500	0.011	0.005	0.000	0.111
1.2667	0.011	0.005	0.000	0.111
1.2833	0.011	0.005	0.000	0.111
1.3000	0.011	0.005	0.000	0.111
1.3167	0.011	0.005	0.000	0.111
1.3333	0.011	0.005	0.000	0.111
1.3500	0.011	0.006	0.000	0.111

1.3667	0.011	0.006	0.000	0.111
1.3833	0.011	0.006	0.000	0.111
1.4000	0.011	0.006	0.000	0.111
1.4167	0.011	0.006	0.000	0.111
1.4333	0.011	0.006	0.000	0.111
1.4500	0.011	0.006	0.000	0.111
1.4667	0.011	0.006	0.000	0.111
1.4833	0.011	0.006	0.000	0.111
1.5000	0.011	0.006	0.000	0.111

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.32
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.13
Total Impervious Area: 0.19

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.001751
5 year	0.00542
10 year	0.009782
25 year	0.01836
50 year	0.027576
100 year	0.039758

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.003	0.000
1957	0.002	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.008	0.000
1961	0.007	0.000
1962	0.000	0.000
1963	0.010	0.000
1964	0.006	0.000
1965	0.006	0.000

1966	0.003	0.000
1967	0.002	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.001	0.000
1971	0.002	0.000
1972	0.005	0.000
1973	0.000	0.000
1974	0.004	0.000
1975	0.002	0.000
1976	0.002	0.000
1977	0.000	0.000
1978	0.002	0.000
1979	0.001	0.000
1980	0.002	0.000
1981	0.002	0.000
1982	0.002	0.000
1983	0.001	0.000
1984	0.004	0.000
1985	0.000	0.000
1986	0.004	0.000
1987	0.021	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.012	0.000
1991	0.011	0.000
1992	0.000	0.000
1993	0.001	0.000
1994	0.000	0.000
1995	0.002	0.000
1996	0.006	0.000
1997	0.007	0.000
1998	0.001	0.000
1999	0.008	0.000
2000	0.001	0.000
2001	0.000	0.000
2002	0.002	0.000
2003	0.000	0.000
2004	0.009	0.000
2005	0.000	0.000
2006	0.025	0.000
2007	0.008	0.000
2008	0.001	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.0254	0.0000
2	0.0215	0.0000
3	0.0124	0.0000
4	0.0107	0.0000
5	0.0099	0.0000
6	0.0087	0.0000
7	0.0080	0.0000
8	0.0078	0.0000
9	0.0075	0.0000
10	0.0068	0.0000
11	0.0067	0.0000

12	0.0063	0.0000
13	0.0063	0.0000
14	0.0057	0.0000
15	0.0053	0.0000
16	0.0041	0.0000
17	0.0039	0.0000
18	0.0036	0.0000
19	0.0034	0.0000
20	0.0032	0.0000
21	0.0023	0.0000
22	0.0021	0.0000
23	0.0021	0.0000
24	0.0021	0.0000
25	0.0020	0.0000
26	0.0020	0.0000
27	0.0018	0.0000
28	0.0018	0.0000
29	0.0017	0.0000
30	0.0017	0.0000
31	0.0016	0.0000
32	0.0015	0.0000
33	0.0014	0.0000
34	0.0013	0.0000
35	0.0011	0.0000
36	0.0011	0.0000
37	0.0009	0.0000
38	0.0009	0.0000
39	0.0008	0.0000
40	0.0006	0.0000
41	0.0005	0.0000
42	0.0003	0.0000
43	0.0003	0.0000
44	0.0003	0.0000
45	0.0003	0.0000
46	0.0003	0.0000
47	0.0003	0.0000
48	0.0003	0.0000
49	0.0003	0.0000
50	0.0003	0.0000
51	0.0003	0.0000
52	0.0003	0.0000
53	0.0003	0.0000

Duration Flows
The Facility PASSED

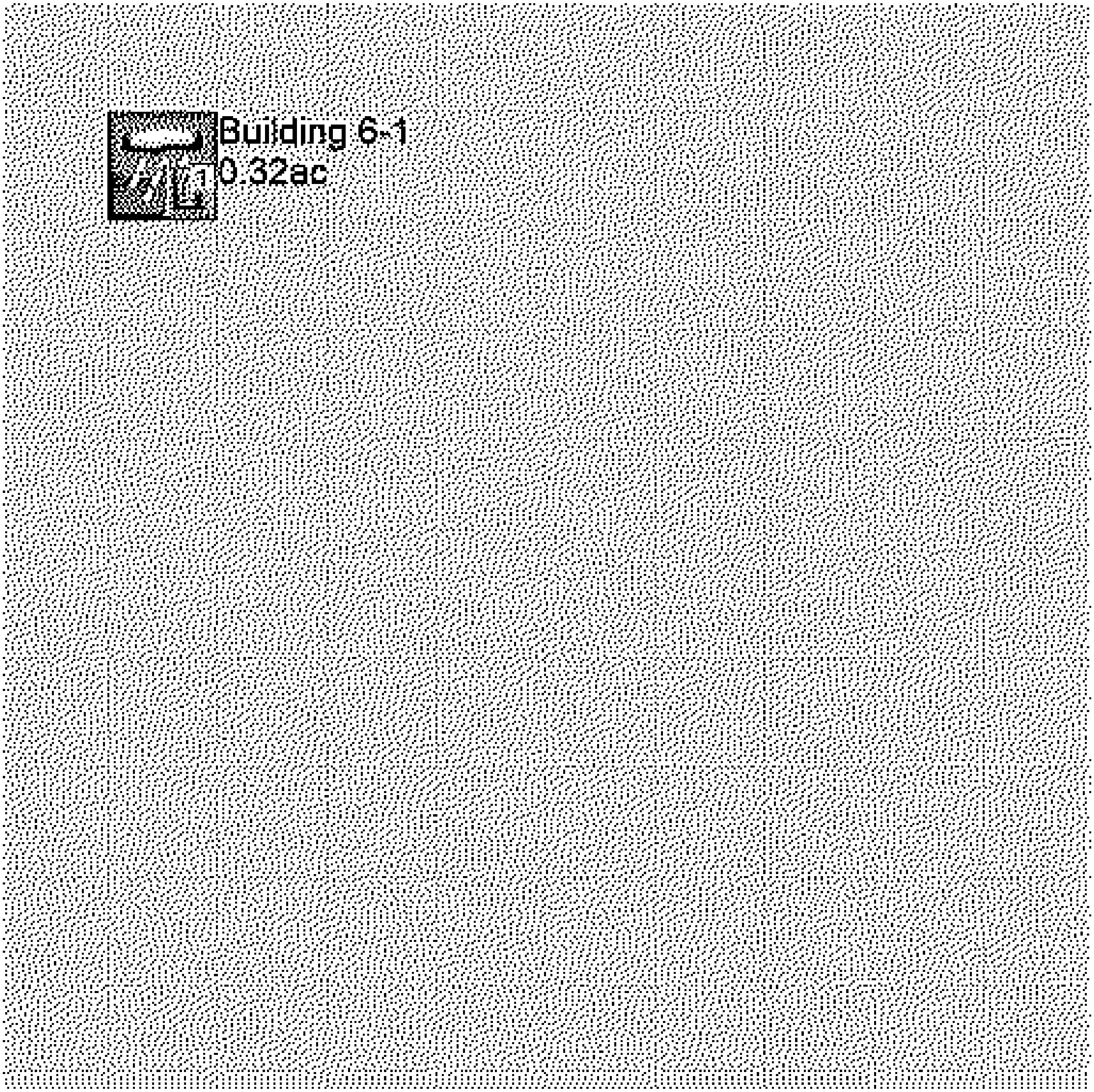
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0009	263	0	0	Pass
0.0011	194	0	0	Pass
0.0014	149	0	0	Pass
0.0017	121	0	0	Pass
0.0020	98	0	0	Pass
0.0022	84	0	0	Pass
0.0025	75	0	0	Pass
0.0028	62	0	0	Pass
0.0030	54	0	0	Pass
0.0033	47	0	0	Pass
0.0036	42	0	0	Pass
0.0038	40	0	0	Pass
0.0041	33	0	0	Pass
0.0044	31	0	0	Pass
0.0047	28	0	0	Pass
0.0049	27	0	0	Pass
0.0052	27	0	0	Pass
0.0055	26	0	0	Pass
0.0057	24	0	0	Pass
0.0060	21	0	0	Pass
0.0063	21	0	0	Pass
0.0065	19	0	0	Pass
0.0068	16	0	0	Pass
0.0071	15	0	0	Pass
0.0073	15	0	0	Pass
0.0076	14	0	0	Pass
0.0079	13	0	0	Pass
0.0082	11	0	0	Pass
0.0084	11	0	0	Pass
0.0087	9	0	0	Pass
0.0090	7	0	0	Pass
0.0092	7	0	0	Pass
0.0095	7	0	0	Pass
0.0098	7	0	0	Pass
0.0100	6	0	0	Pass
0.0103	6	0	0	Pass
0.0106	6	0	0	Pass
0.0109	5	0	0	Pass
0.0111	5	0	0	Pass
0.0114	5	0	0	Pass
0.0117	5	0	0	Pass
0.0119	4	0	0	Pass
0.0122	4	0	0	Pass
0.0125	3	0	0	Pass
0.0127	3	0	0	Pass
0.0130	3	0	0	Pass
0.0133	3	0	0	Pass
0.0136	3	0	0	Pass
0.0138	3	0	0	Pass
0.0141	3	0	0	Pass
0.0144	3	0	0	Pass
0.0146	3	0	0	Pass
0.0149	3	0	0	Pass

0.0152	3	0	0	Pass
0.0154	3	0	0	Pass
0.0157	3	0	0	Pass
0.0160	3	0	0	Pass
0.0162	3	0	0	Pass
0.0165	3	0	0	Pass
0.0168	3	0	0	Pass
0.0171	3	0	0	Pass
0.0173	3	0	0	Pass
0.0176	3	0	0	Pass
0.0179	3	0	0	Pass
0.0181	3	0	0	Pass
0.0184	3	0	0	Pass
0.0187	3	0	0	Pass
0.0189	3	0	0	Pass
0.0192	3	0	0	Pass
0.0195	3	0	0	Pass
0.0198	3	0	0	Pass
0.0200	3	0	0	Pass
0.0203	3	0	0	Pass
0.0206	3	0	0	Pass
0.0208	3	0	0	Pass
0.0211	3	0	0	Pass
0.0214	3	0	0	Pass
0.0216	2	0	0	Pass
0.0219	2	0	0	Pass
0.0222	2	0	0	Pass
0.0225	2	0	0	Pass
0.0227	2	0	0	Pass
0.0230	2	0	0	Pass
0.0233	2	0	0	Pass
0.0235	2	0	0	Pass
0.0238	1	0	0	Pass
0.0241	1	0	0	Pass
0.0243	1	0	0	Pass
0.0246	1	0	0	Pass
0.0249	1	0	0	Pass
0.0251	1	0	0	Pass
0.0254	1	0	0	Pass
0.0257	0	0	0	Pass
0.0260	0	0	0	Pass
0.0262	0	0	0	Pass
0.0265	0	0	0	Pass
0.0268	0	0	0	Pass
0.0270	0	0	0	Pass
0.0273	0	0	0	Pass
0.0276	0	0	0	Pass

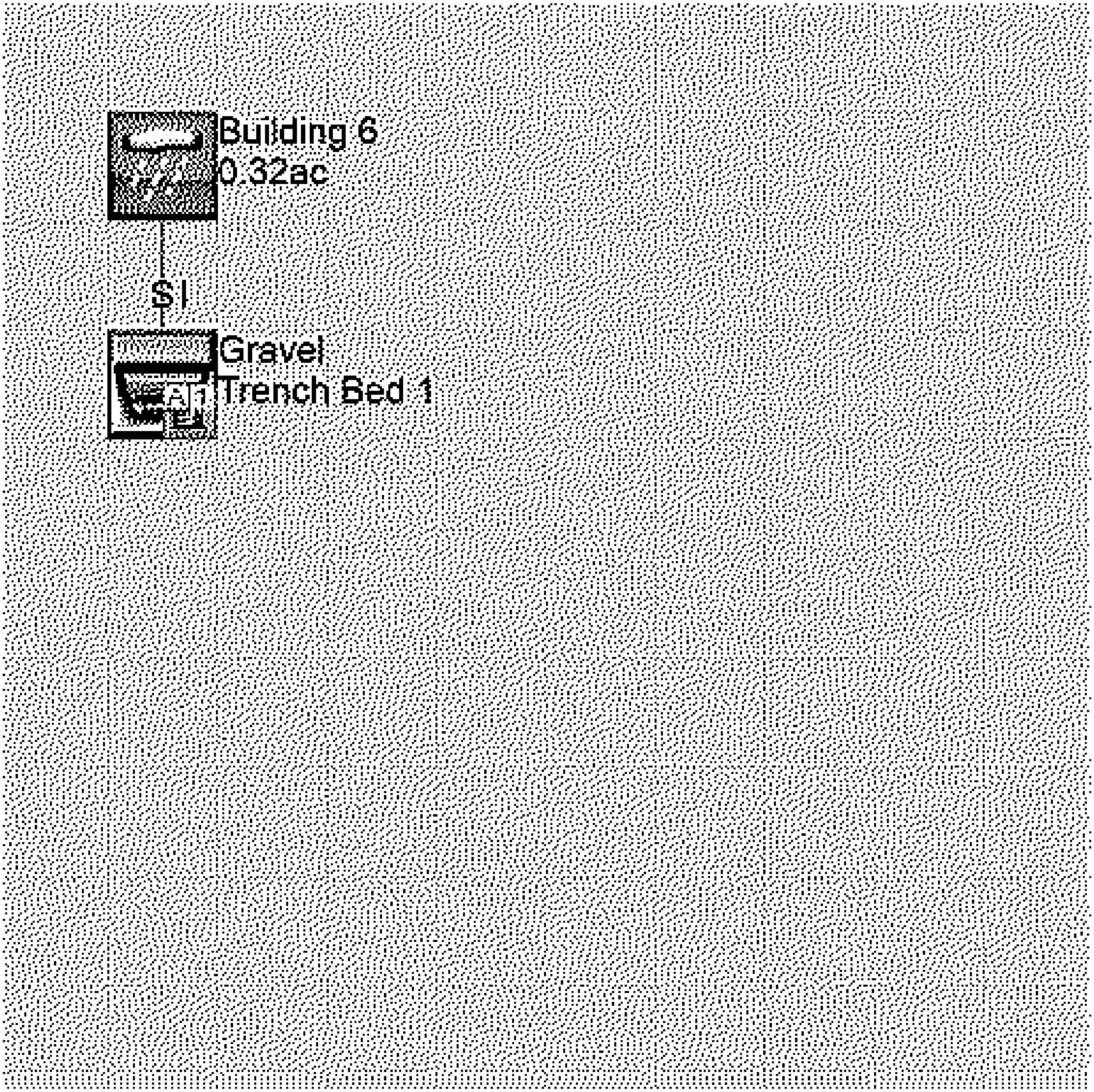
LID Report

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
Gravel Trench Bed 1 POC	☐	57.09			☐	100.00			
Total Volume Infiltrated		57.09	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

TYREE DR

BASIN 1

General Model Information

Project Name:	C22-169 Yorkshire_TyeeDrBasin1
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tyee Dr Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	1.47
Pervious Total	1.47
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.47

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tyee Dr Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.3
Pervious Total	0.3
Impervious Land Use	acre
ROADS FLAT	1.17
Impervious Total	1.17
Basin Total	1.47

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Mitigated Routing

Tyee Dr Bioretention 1

Bottom Length:	100.00 ft.
Bottom Width:	30.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	264.574
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	264.574
Percent Infiltrated:	100
Total Precip Applied to Facility:	15.974
Total Evap From Facility:	4.606

Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0689	0.0000	0.0000	0.0000
0.0330	0.0689	0.0009	0.0000	0.0000
0.0659	0.0689	0.0018	0.0000	0.0000
0.0989	0.0689	0.0027	0.0000	0.0000
0.1319	0.0689	0.0036	0.0000	0.0002
0.1648	0.0689	0.0046	0.0000	0.0018
0.1978	0.0689	0.0055	0.0000	0.0028
0.2308	0.0689	0.0064	0.0000	0.0040
0.2637	0.0689	0.0073	0.0000	0.0056
0.2967	0.0689	0.0082	0.0000	0.0075
0.3297	0.0689	0.0091	0.0000	0.0097
0.3626	0.0689	0.0100	0.0000	0.0122
0.3956	0.0689	0.0109	0.0000	0.0152
0.4286	0.0689	0.0119	0.0000	0.0185
0.4615	0.0689	0.0128	0.0000	0.0222
0.4945	0.0689	0.0137	0.0000	0.0264
0.5275	0.0689	0.0146	0.0000	0.0309
0.5604	0.0689	0.0155	0.0000	0.0359
0.5934	0.0689	0.0164	0.0000	0.0414
0.6264	0.0689	0.0173	0.0000	0.0473
0.6593	0.0689	0.0182	0.0000	0.0537
0.6923	0.0689	0.0191	0.0000	0.0606
0.7253	0.0689	0.0201	0.0000	0.0681
0.7582	0.0689	0.0210	0.0000	0.0760
0.7912	0.0689	0.0219	0.0000	0.0845

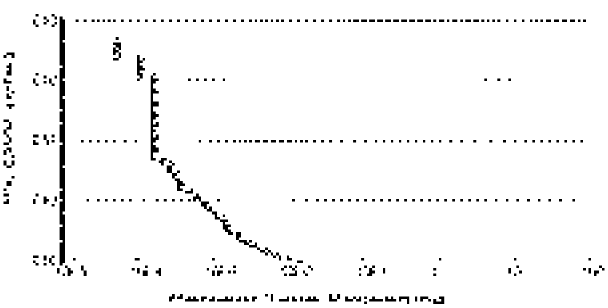
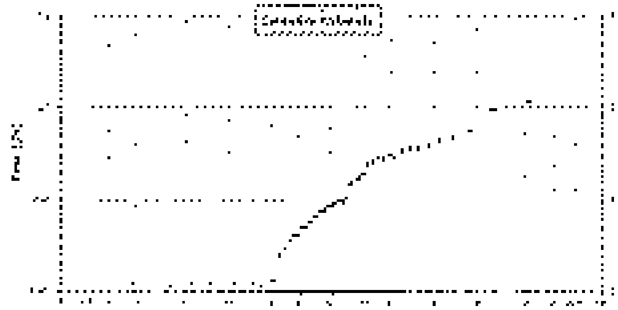
0.8242	0.0689	0.0228	0.0000	0.0935
0.8571	0.0689	0.0237	0.0000	0.1030
0.8901	0.0689	0.0246	0.0000	0.1131
0.9231	0.0689	0.0255	0.0000	0.1238
0.9560	0.0689	0.0264	0.0000	0.1351
0.9890	0.0689	0.0273	0.0000	0.1470
1.0220	0.0689	0.0283	0.0000	0.1594
1.0549	0.0689	0.0292	0.0000	0.1725
1.0879	0.0689	0.0301	0.0000	0.1862
1.1209	0.0689	0.0310	0.0000	0.2005
1.1538	0.0689	0.0319	0.0000	0.2155
1.1868	0.0689	0.0328	0.0000	0.2311
1.2198	0.0689	0.0337	0.0000	0.2474
1.2527	0.0689	0.0346	0.0000	0.2643
1.2857	0.0689	0.0356	0.0000	0.2819
1.3187	0.0689	0.0365	0.0000	0.3002
1.3516	0.0689	0.0374	0.0000	0.3191
1.3846	0.0689	0.0383	0.0000	0.3387
1.4176	0.0689	0.0392	0.0000	0.3590
1.4505	0.0689	0.0401	0.0000	0.3799
1.4835	0.0689	0.0410	0.0000	0.4013
1.5000	0.0689	0.0415	0.0000	0.6944

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
1.5000	0.0689	0.0415	0.0000	0.4167	0.0000
1.5330	0.0689	0.0437	0.0000	0.4167	0.0000
1.5659	0.0689	0.0460	0.0000	0.4350	0.0000
1.5989	0.0689	0.0483	0.0000	0.4441	0.0000
1.6319	0.0689	0.0506	0.0000	0.4533	0.0000
1.6648	0.0689	0.0528	0.0000	0.4625	0.0000
1.6978	0.0689	0.0551	0.0000	0.4716	0.0000
1.7308	0.0689	0.0574	0.0000	0.4808	0.0000
1.7637	0.0689	0.0596	0.0000	0.4899	0.0000
1.7967	0.0689	0.0619	0.0000	0.4991	0.0000
1.8297	0.0689	0.0642	0.0000	0.5082	0.0000
1.8626	0.0689	0.0665	0.0000	0.5174	0.0000
1.8956	0.0689	0.0687	0.0000	0.5266	0.0000
1.9286	0.0689	0.0710	0.0000	0.5357	0.0000
1.9615	0.0689	0.0733	0.0000	0.5449	0.0000
1.9945	0.0689	0.0755	0.0000	0.5540	0.0000
2.0275	0.0689	0.0778	0.0000	0.5632	0.0000
2.0604	0.0689	0.0801	0.0000	0.5723	0.0000
2.0934	0.0689	0.0823	0.0000	0.5815	0.0000
2.1264	0.0689	0.0846	0.0000	0.5907	0.0000
2.1593	0.0689	0.0869	0.0000	0.5998	0.0000
2.1923	0.0689	0.0892	0.0000	0.6090	0.0000
2.2253	0.0689	0.0914	0.0000	0.6181	0.0000
2.2582	0.0689	0.0937	0.0000	0.6273	0.0000
2.2912	0.0689	0.0960	0.0000	0.6364	0.0000
2.3242	0.0689	0.0982	0.0000	0.6456	0.0000
2.3571	0.0689	0.1005	0.0000	0.6548	0.0000
2.3901	0.0689	0.1028	0.0000	0.6639	0.0000
2.4231	0.0689	0.1051	0.0000	0.6731	0.0000
2.4560	0.0689	0.1073	0.0000	0.6822	0.0000
2.4890	0.0689	0.1096	0.0000	0.6914	0.0000
2.5220	0.0689	0.1119	0.0519	0.6944	0.0000
2.5549	0.0689	0.1141	0.2049	0.6944	0.0000

2.5879	0.0689	0.1164	0.4142	0.6944	0.0000
2.6209	0.0689	0.1187	0.6666	0.6944	0.0000
2.6538	0.0689	0.1209	0.9542	0.6944	0.0000
2.6868	0.0689	0.1232	1.2709	0.6944	0.0000
2.7198	0.0689	0.1255	1.6110	0.6944	0.0000
2.7527	0.0689	0.1278	1.9688	0.6944	0.0000
2.7857	0.0689	0.1300	2.3387	0.6944	0.0000
2.8187	0.0689	0.1323	2.7149	0.6944	0.0000
2.8516	0.0689	0.1346	3.0914	0.6944	0.0000
2.8846	0.0689	0.1368	3.4625	0.6944	0.0000
2.9176	0.0689	0.1391	3.8224	0.6944	0.0000
2.9505	0.0689	0.1414	4.1657	0.6944	0.0000
2.9835	0.0689	0.1436	4.4876	0.6944	0.0000
3.0000	0.0689	0.1448	4.7838	0.6944	0.0000

Analysis Results
POC 1

+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.47
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.3
Total Impervious Area: 1.17

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.008046
5 year	0.024897
10 year	0.044935
25 year	0.084342
50 year	0.126677
100 year	0.18264

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.016	0.000
1957	0.008	0.000
1958	0.007	0.000
1959	0.006	0.000
1960	0.034	0.000
1961	0.031	0.000
1962	0.001	0.000
1963	0.045	0.000
1964	0.026	0.000
1965	0.029	0.000

1966	0.015	0.000
1967	0.010	0.000
1968	0.007	0.000
1969	0.001	0.000
1970	0.005	0.000
1971	0.010	0.000
1972	0.024	0.000
1973	0.001	0.000
1974	0.018	0.000
1975	0.011	0.000
1976	0.009	0.000
1977	0.001	0.000
1978	0.009	0.000
1979	0.004	0.000
1980	0.007	0.000
1981	0.010	0.000
1982	0.008	0.000
1983	0.004	0.000
1984	0.019	0.000
1985	0.001	0.000
1986	0.017	0.000
1987	0.099	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.057	0.000
1991	0.049	0.000
1992	0.001	0.000
1993	0.002	0.000
1994	0.001	0.000
1995	0.008	0.000
1996	0.029	0.000
1997	0.031	0.000
1998	0.005	0.000
1999	0.036	0.000
2000	0.004	0.000
2001	0.001	0.000
2002	0.008	0.000
2003	0.001	0.000
2004	0.040	0.000
2005	0.001	0.000
2006	0.117	0.000
2007	0.037	0.000
2008	0.003	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1169	0.0000
2	0.0987	0.0000
3	0.0567	0.0000
4	0.0493	0.0000
5	0.0453	0.0000
6	0.0398	0.0000
7	0.0367	0.0000
8	0.0358	0.0000
9	0.0345	0.0000
10	0.0310	0.0000
11	0.0306	0.0000

12	0.0291	0.0000
13	0.0288	0.0000
14	0.0260	0.0000
15	0.0242	0.0000
16	0.0189	0.0000
17	0.0177	0.0000
18	0.0167	0.0000
19	0.0156	0.0000
20	0.0147	0.0000
21	0.0105	0.0000
22	0.0098	0.0000
23	0.0097	0.0000
24	0.0095	0.0000
25	0.0093	0.0000
26	0.0090	0.0000
27	0.0085	0.0000
28	0.0084	0.0000
29	0.0078	0.0000
30	0.0077	0.0000
31	0.0074	0.0000
32	0.0067	0.0000
33	0.0066	0.0000
34	0.0058	0.0000
35	0.0051	0.0000
36	0.0050	0.0000
37	0.0042	0.0000
38	0.0041	0.0000
39	0.0036	0.0000
40	0.0029	0.0000
41	0.0025	0.0000
42	0.0013	0.0000
43	0.0012	0.0000
44	0.0012	0.0000
45	0.0012	0.0000
46	0.0012	0.0000
47	0.0012	0.0000
48	0.0012	0.0000
49	0.0012	0.0000
50	0.0012	0.0000
51	0.0012	0.0000
52	0.0012	0.0000
53	0.0012	0.0000

Duration Flows

The Facility PASSED

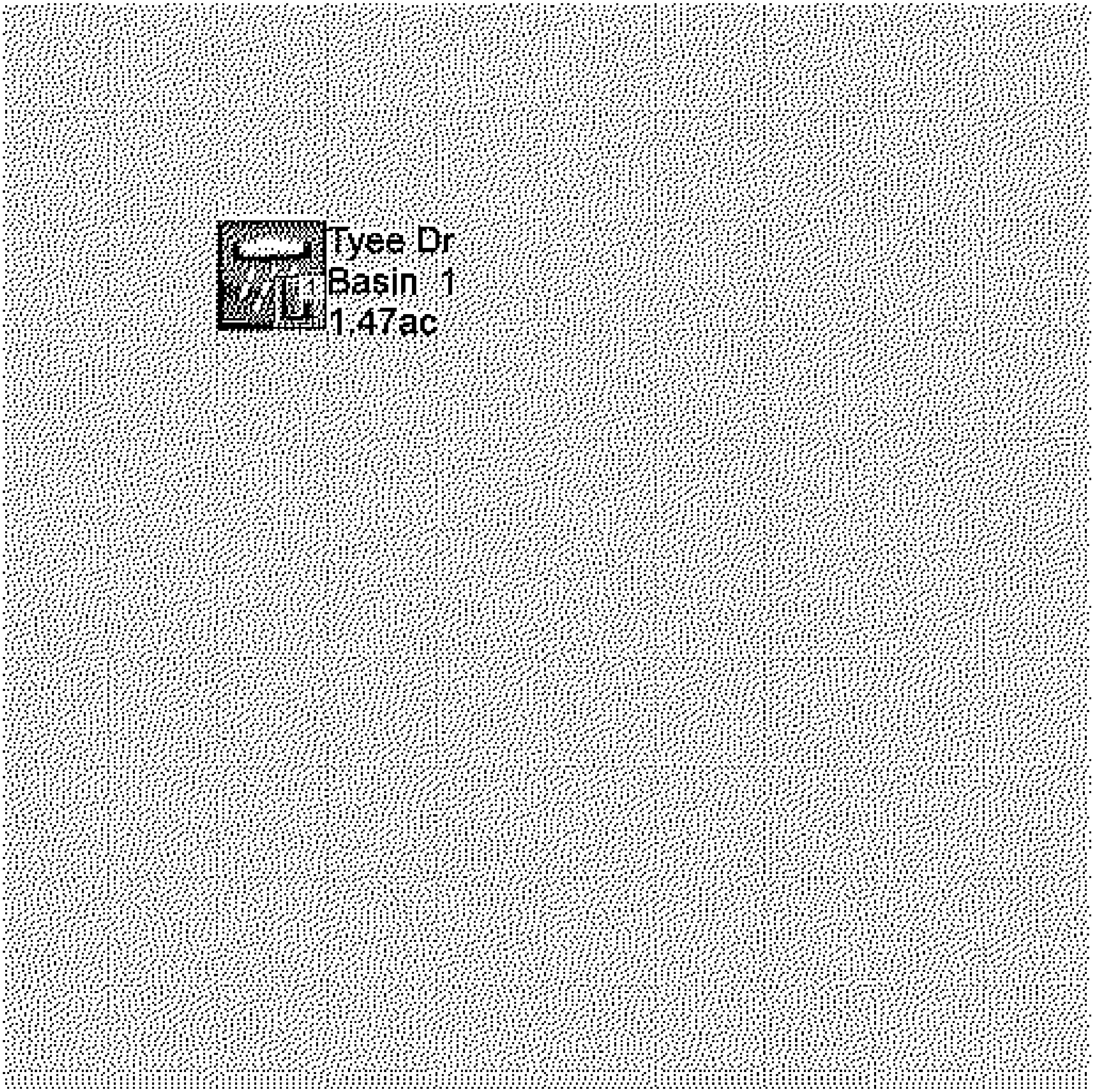
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0040	263	0	0	Pass
0.0053	194	0	0	Pass
0.0065	149	0	0	Pass
0.0077	121	0	0	Pass
0.0090	98	0	0	Pass
0.0102	84	0	0	Pass
0.0115	75	0	0	Pass
0.0127	62	0	0	Pass
0.0139	54	0	0	Pass
0.0152	47	0	0	Pass
0.0164	42	0	0	Pass
0.0177	40	0	0	Pass
0.0189	33	0	0	Pass
0.0201	31	0	0	Pass
0.0214	28	0	0	Pass
0.0226	27	0	0	Pass
0.0238	27	0	0	Pass
0.0251	26	0	0	Pass
0.0263	24	0	0	Pass
0.0276	21	0	0	Pass
0.0288	21	0	0	Pass
0.0300	19	0	0	Pass
0.0313	16	0	0	Pass
0.0325	15	0	0	Pass
0.0338	15	0	0	Pass
0.0350	14	0	0	Pass
0.0362	13	0	0	Pass
0.0375	11	0	0	Pass
0.0387	11	0	0	Pass
0.0400	9	0	0	Pass
0.0412	7	0	0	Pass
0.0424	7	0	0	Pass
0.0437	7	0	0	Pass
0.0449	7	0	0	Pass
0.0461	6	0	0	Pass
0.0474	6	0	0	Pass
0.0486	6	0	0	Pass
0.0499	5	0	0	Pass
0.0511	5	0	0	Pass
0.0523	5	0	0	Pass
0.0536	5	0	0	Pass
0.0548	4	0	0	Pass
0.0561	4	0	0	Pass
0.0573	3	0	0	Pass
0.0585	3	0	0	Pass
0.0598	3	0	0	Pass
0.0610	3	0	0	Pass
0.0623	3	0	0	Pass
0.0635	3	0	0	Pass
0.0647	3	0	0	Pass
0.0660	3	0	0	Pass
0.0672	3	0	0	Pass
0.0684	3	0	0	Pass

0.0697	3	0	0	Pass
0.0709	3	0	0	Pass
0.0722	3	0	0	Pass
0.0734	3	0	0	Pass
0.0746	3	0	0	Pass
0.0759	3	0	0	Pass
0.0771	3	0	0	Pass
0.0784	3	0	0	Pass
0.0796	3	0	0	Pass
0.0808	3	0	0	Pass
0.0821	3	0	0	Pass
0.0833	3	0	0	Pass
0.0846	3	0	0	Pass
0.0858	3	0	0	Pass
0.0870	3	0	0	Pass
0.0883	3	0	0	Pass
0.0895	3	0	0	Pass
0.0907	3	0	0	Pass
0.0920	3	0	0	Pass
0.0932	3	0	0	Pass
0.0945	3	0	0	Pass
0.0957	3	0	0	Pass
0.0969	3	0	0	Pass
0.0982	3	0	0	Pass
0.0994	2	0	0	Pass
0.1007	2	0	0	Pass
0.1019	2	0	0	Pass
0.1031	2	0	0	Pass
0.1044	2	0	0	Pass
0.1056	2	0	0	Pass
0.1069	2	0	0	Pass
0.1081	2	0	0	Pass
0.1093	1	0	0	Pass
0.1106	1	0	0	Pass
0.1118	1	0	0	Pass
0.1130	1	0	0	Pass
0.1143	1	0	0	Pass
0.1155	1	0	0	Pass
0.1168	1	0	0	Pass
0.1180	0	0	0	Pass
0.1192	0	0	0	Pass
0.1205	0	0	0	Pass
0.1217	0	0	0	Pass
0.1230	0	0	0	Pass
0.1242	0	0	0	Pass
0.1254	0	0	0	Pass
0.1267	0	0	0	Pass

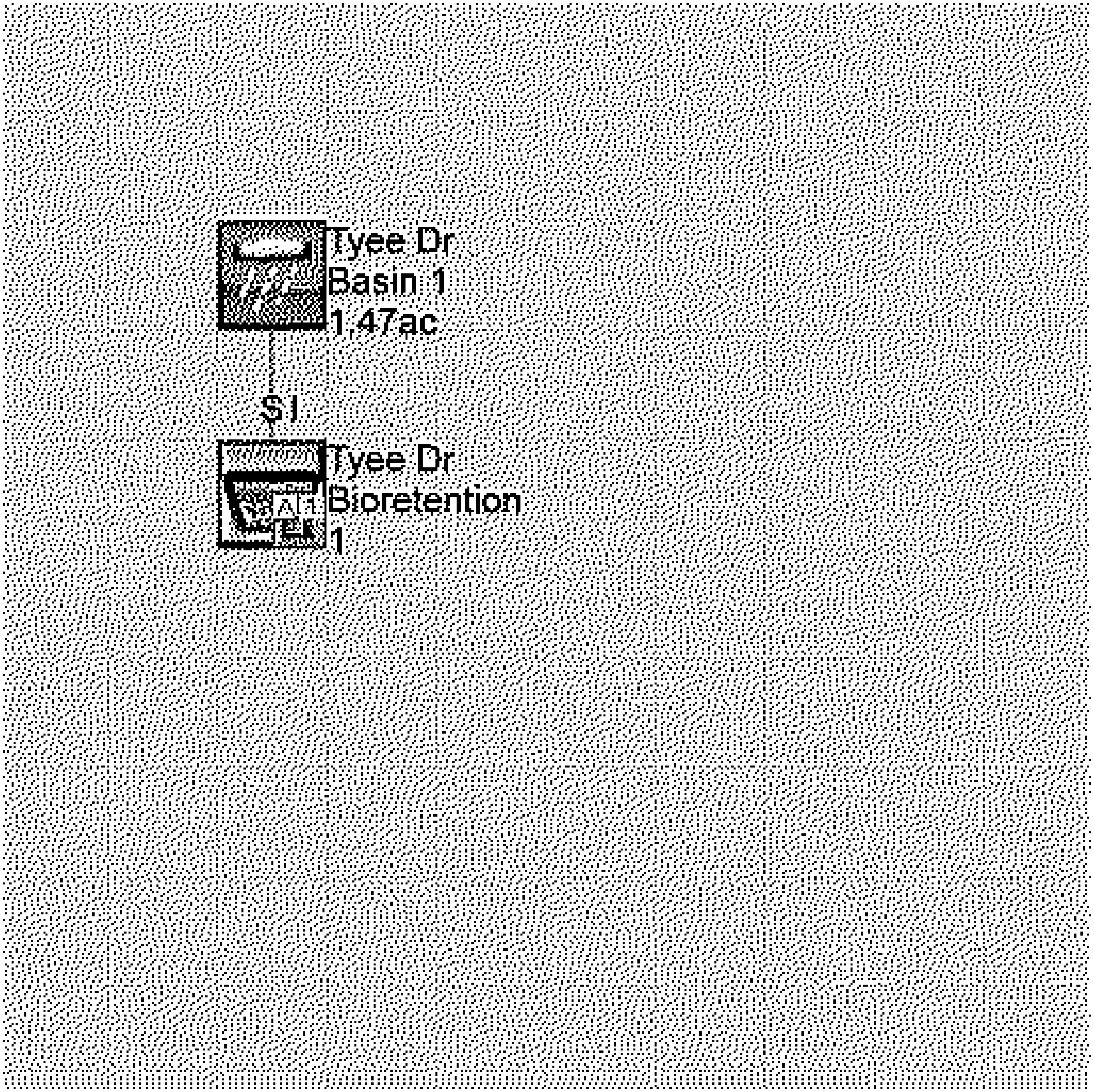
LID Report

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
retention 1 POC	☐	240.76			☐	100.00			
Total Volume Infiltrated		240.76	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic



Mitigated Schematic



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Local (360)943-0304

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WWHM2012

PROJECT REPORT

TYREE DR

BASIN 2

General Model Information

Project Name:	C22-169 Yorkshire_TyeeDrBasin2
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tyee Dr 2 Basin

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	1.34
Pervious Total	1.34
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.34

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tyee Dr Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.39
Pervious Total	0.39
Impervious Land Use	acre
ROADS FLAT	0.95
Impervious Total	0.95
Basin Total	1.34

Element Flows To:

Surface	Interflow	Groundwater
Surface Bioretention	Surface Bioretention	

Mitigated Routing

Tyee Dr 2 Bioretention

Bottom Length:	88.00 ft.
Bottom Width:	18.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	212.595
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	212.595
Percent Infiltrated:	100
Total Precip Applied to Facility:	9.231
Total Evap From Facility:	2.647

Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0601	0.0000	0.0000	0.0000
0.0330	0.0598	0.0005	0.0000	0.0000
0.0659	0.0593	0.0010	0.0000	0.0000
0.0989	0.0587	0.0015	0.0000	0.0000
0.1319	0.0582	0.0020	0.0000	0.0001
0.1648	0.0576	0.0025	0.0000	0.0010
0.1978	0.0571	0.0030	0.0000	0.0016
0.2308	0.0565	0.0035	0.0000	0.0023
0.2637	0.0560	0.0041	0.0000	0.0033
0.2967	0.0554	0.0046	0.0000	0.0044
0.3297	0.0549	0.0051	0.0000	0.0058
0.3626	0.0543	0.0057	0.0000	0.0074
0.3956	0.0538	0.0062	0.0000	0.0093
0.4286	0.0532	0.0068	0.0000	0.0115
0.4615	0.0527	0.0074	0.0000	0.0140
0.4945	0.0521	0.0079	0.0000	0.0168
0.5275	0.0516	0.0085	0.0000	0.0199
0.5604	0.0511	0.0091	0.0000	0.0234
0.5934	0.0505	0.0097	0.0000	0.0272
0.6264	0.0500	0.0103	0.0000	0.0315
0.6593	0.0495	0.0109	0.0000	0.0362
0.6923	0.0490	0.0115	0.0000	0.0413
0.7253	0.0484	0.0122	0.0000	0.0468
0.7582	0.0479	0.0128	0.0000	0.0529
0.7912	0.0474	0.0134	0.0000	0.0594

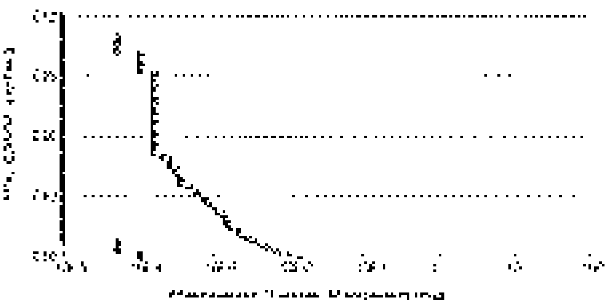
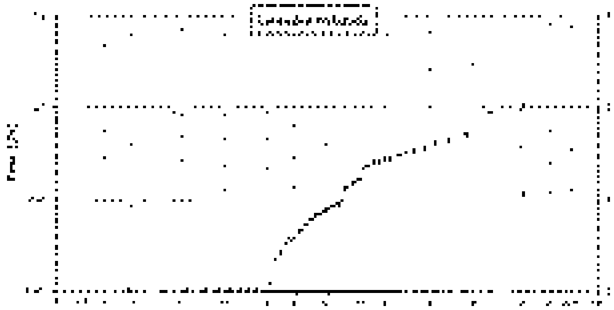
0.8242	0.0469	0.0141	0.0000	0.0664
0.8571	0.0463	0.0147	0.0000	0.0740
0.8901	0.0458	0.0154	0.0000	0.0822
0.9231	0.0453	0.0161	0.0000	0.0909
0.9560	0.0448	0.0167	0.0000	0.1002
0.9890	0.0443	0.0174	0.0000	0.1101
1.0220	0.0438	0.0181	0.0000	0.1207
1.0549	0.0433	0.0188	0.0000	0.1320
1.0879	0.0428	0.0195	0.0000	0.1439
1.1209	0.0423	0.0202	0.0000	0.1566
1.1538	0.0418	0.0209	0.0000	0.1699
1.1868	0.0413	0.0216	0.0000	0.1841
1.2198	0.0408	0.0224	0.0000	0.1990
1.2527	0.0403	0.0231	0.0000	0.2147
1.2857	0.0398	0.0239	0.0000	0.2313
1.3187	0.0393	0.0246	0.0000	0.2487
1.3516	0.0388	0.0254	0.0000	0.2669
1.3846	0.0383	0.0261	0.0000	0.2861
1.4176	0.0378	0.0269	0.0000	0.3061
1.4505	0.0373	0.0277	0.0000	0.3270
1.4835	0.0368	0.0285	0.0000	0.3487
1.5000	0.0364	0.0289	0.0000	0.6063

Bioretention Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0601	0.0289	0.0000	0.2200	0.0057
1.5330	0.0607	0.0309	0.0000	0.2200	0.0114
1.5659	0.0613	0.0329	0.0000	0.2297	0.0171
1.5989	0.0618	0.0349	0.0000	0.2345	0.0229
1.6319	0.0624	0.0369	0.0000	0.2393	0.0286
1.6648	0.0630	0.0390	0.0000	0.2442	0.0344
1.6978	0.0635	0.0411	0.0000	0.2490	0.0402
1.7308	0.0641	0.0432	0.0000	0.2538	0.0460
1.7637	0.0647	0.0453	0.0000	0.2587	0.0518
1.7967	0.0653	0.0475	0.0000	0.2635	0.0577
1.8297	0.0658	0.0496	0.0000	0.2684	0.0636
1.8626	0.0664	0.0518	0.0000	0.2732	0.0694
1.8956	0.0670	0.0540	0.0000	0.2780	0.0753
1.9286	0.0676	0.0562	0.0000	0.2829	0.0813
1.9615	0.0682	0.0585	0.0000	0.2877	0.0872
1.9945	0.0688	0.0607	0.0000	0.2925	0.0932
2.0275	0.0694	0.0630	0.0000	0.2974	0.0991
2.0604	0.0700	0.0653	0.0000	0.3022	0.1051
2.0934	0.0706	0.0676	0.0000	0.3070	0.1111
2.1264	0.0711	0.0699	0.0000	0.3119	0.1172
2.1593	0.0717	0.0723	0.0000	0.3167	0.1232
2.1923	0.0723	0.0747	0.0000	0.3215	0.1293
2.2253	0.0729	0.0771	0.0000	0.3264	0.1354
2.2582	0.0735	0.0795	0.0000	0.3312	0.1415
2.2912	0.0742	0.0819	0.0000	0.3360	0.1476
2.3242	0.0748	0.0844	0.0000	0.3409	0.1537
2.3571	0.0754	0.0869	0.0000	0.3457	0.1599
2.3901	0.0760	0.0893	0.0000	0.3505	0.1661
2.4231	0.0766	0.0919	0.0000	0.3554	0.1723
2.4560	0.0772	0.0944	0.0000	0.3602	0.1785
2.4890	0.0778	0.0970	0.0000	0.3651	0.1847
2.5220	0.0784	0.0995	0.0519	0.3667	0.1910
2.5549	0.0791	0.1021	0.2049	0.3667	0.1972

2.5879	0.0797	0.1047	0.4142	0.3667	0.2035
2.6209	0.0803	0.1074	0.6666	0.3667	0.2098
2.6538	0.0809	0.1100	0.9542	0.3667	0.2161
2.6868	0.0816	0.1127	1.2709	0.3667	0.2225
2.7198	0.0822	0.1154	1.6110	0.3667	0.2288
2.7527	0.0828	0.1181	1.9688	0.3667	0.2352
2.7857	0.0834	0.1209	2.3387	0.3667	0.2416
2.8187	0.0841	0.1236	2.7149	0.3667	0.2480
2.8516	0.0847	0.1264	3.0914	0.3667	0.2544
2.8846	0.0854	0.1292	3.4625	0.3667	0.2609
2.9176	0.0860	0.1320	3.8224	0.3667	0.2674
2.9505	0.0866	0.1349	4.1657	0.3667	0.2738
2.9835	0.0873	0.1378	4.4876	0.3667	0.2771
3.0000	0.0876	0.1392	4.7838	0.3667	0.0000

Analysis Results
POC 1

+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.34
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.39
Total Impervious Area: 0.95

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.007334
5 year	0.022695
10 year	0.040961
25 year	0.076883
50 year	0.115474
100 year	0.166488

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.014	0.000
1957	0.008	0.000
1958	0.006	0.000
1959	0.005	0.000
1960	0.031	0.000
1961	0.028	0.000
1962	0.001	0.000
1963	0.041	0.000
1964	0.024	0.000
1965	0.026	0.000

1966	0.013	0.000
1967	0.009	0.000
1968	0.006	0.000
1969	0.001	0.000
1970	0.005	0.000
1971	0.009	0.000
1972	0.022	0.000
1973	0.001	0.000
1974	0.016	0.000
1975	0.010	0.000
1976	0.008	0.000
1977	0.001	0.000
1978	0.008	0.000
1979	0.003	0.000
1980	0.007	0.000
1981	0.009	0.000
1982	0.007	0.000
1983	0.004	0.000
1984	0.017	0.000
1985	0.001	0.000
1986	0.015	0.000
1987	0.090	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.052	0.000
1991	0.045	0.000
1992	0.001	0.000
1993	0.002	0.000
1994	0.001	0.000
1995	0.007	0.000
1996	0.026	0.000
1997	0.028	0.000
1998	0.005	0.000
1999	0.033	0.000
2000	0.004	0.000
2001	0.001	0.000
2002	0.008	0.000
2003	0.001	0.000
2004	0.036	0.000
2005	0.001	0.000
2006	0.107	0.012
2007	0.033	0.000
2008	0.003	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1066	0.0119
2	0.0900	0.0000
3	0.0517	0.0000
4	0.0449	0.0000
5	0.0413	0.0000
6	0.0363	0.0000
7	0.0335	0.0000
8	0.0327	0.0000
9	0.0314	0.0000
10	0.0283	0.0000
11	0.0279	0.0000

12	0.0265	0.0000
13	0.0263	0.0000
14	0.0237	0.0000
15	0.0221	0.0000
16	0.0172	0.0000
17	0.0162	0.0000
18	0.0152	0.0000
19	0.0142	0.0000
20	0.0134	0.0000
21	0.0096	0.0000
22	0.0089	0.0000
23	0.0089	0.0000
24	0.0087	0.0000
25	0.0085	0.0000
26	0.0082	0.0000
27	0.0077	0.0000
28	0.0077	0.0000
29	0.0071	0.0000
30	0.0071	0.0000
31	0.0067	0.0000
32	0.0061	0.0000
33	0.0060	0.0000
34	0.0053	0.0000
35	0.0047	0.0000
36	0.0045	0.0000
37	0.0038	0.0000
38	0.0038	0.0000
39	0.0033	0.0000
40	0.0027	0.0000
41	0.0023	0.0000
42	0.0012	0.0000
43	0.0011	0.0000
44	0.0011	0.0000
45	0.0011	0.0000
46	0.0011	0.0000
47	0.0011	0.0000
48	0.0011	0.0000
49	0.0011	0.0000
50	0.0011	0.0000
51	0.0011	0.0000
52	0.0011	0.0000
53	0.0011	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0037	263	2	0	Pass
0.0048	194	2	1	Pass
0.0059	149	2	1	Pass
0.0071	121	1	0	Pass
0.0082	98	1	1	Pass
0.0093	84	1	1	Pass
0.0104	75	1	1	Pass
0.0116	62	1	1	Pass
0.0127	54	0	0	Pass
0.0138	47	0	0	Pass
0.0150	42	0	0	Pass
0.0161	40	0	0	Pass
0.0172	33	0	0	Pass
0.0183	31	0	0	Pass
0.0195	28	0	0	Pass
0.0206	27	0	0	Pass
0.0217	27	0	0	Pass
0.0229	26	0	0	Pass
0.0240	24	0	0	Pass
0.0251	21	0	0	Pass
0.0263	21	0	0	Pass
0.0274	19	0	0	Pass
0.0285	16	0	0	Pass
0.0296	15	0	0	Pass
0.0308	15	0	0	Pass
0.0319	14	0	0	Pass
0.0330	13	0	0	Pass
0.0342	11	0	0	Pass
0.0353	11	0	0	Pass
0.0364	9	0	0	Pass
0.0375	7	0	0	Pass
0.0387	7	0	0	Pass
0.0398	7	0	0	Pass
0.0409	7	0	0	Pass
0.0421	6	0	0	Pass
0.0432	6	0	0	Pass
0.0443	6	0	0	Pass
0.0455	5	0	0	Pass
0.0466	5	0	0	Pass
0.0477	5	0	0	Pass
0.0488	5	0	0	Pass
0.0500	4	0	0	Pass
0.0511	4	0	0	Pass
0.0522	3	0	0	Pass
0.0534	3	0	0	Pass
0.0545	3	0	0	Pass
0.0556	3	0	0	Pass
0.0567	3	0	0	Pass
0.0579	3	0	0	Pass
0.0590	3	0	0	Pass
0.0601	3	0	0	Pass
0.0613	3	0	0	Pass
0.0624	3	0	0	Pass

0.0635	3	0	0	Pass
0.0647	3	0	0	Pass
0.0658	3	0	0	Pass
0.0669	3	0	0	Pass
0.0680	3	0	0	Pass
0.0692	3	0	0	Pass
0.0703	3	0	0	Pass
0.0714	3	0	0	Pass
0.0726	3	0	0	Pass
0.0737	3	0	0	Pass
0.0748	3	0	0	Pass
0.0759	3	0	0	Pass
0.0771	3	0	0	Pass
0.0782	3	0	0	Pass
0.0793	3	0	0	Pass
0.0805	3	0	0	Pass
0.0816	3	0	0	Pass
0.0827	3	0	0	Pass
0.0839	3	0	0	Pass
0.0850	3	0	0	Pass
0.0861	3	0	0	Pass
0.0872	3	0	0	Pass
0.0884	3	0	0	Pass
0.0895	3	0	0	Pass
0.0906	2	0	0	Pass
0.0918	2	0	0	Pass
0.0929	2	0	0	Pass
0.0940	2	0	0	Pass
0.0951	2	0	0	Pass
0.0963	2	0	0	Pass
0.0974	2	0	0	Pass
0.0985	2	0	0	Pass
0.0997	1	0	0	Pass
0.1008	1	0	0	Pass
0.1019	1	0	0	Pass
0.1031	1	0	0	Pass
0.1042	1	0	0	Pass
0.1053	1	0	0	Pass
0.1064	1	0	0	Pass
0.1076	0	0	0	Pass
0.1087	0	0	0	Pass
0.1098	0	0	0	Pass
0.1110	0	0	0	Pass
0.1121	0	0	0	Pass
0.1132	0	0	0	Pass
0.1143	0	0	0	Pass
0.1155	0	0	0	Pass

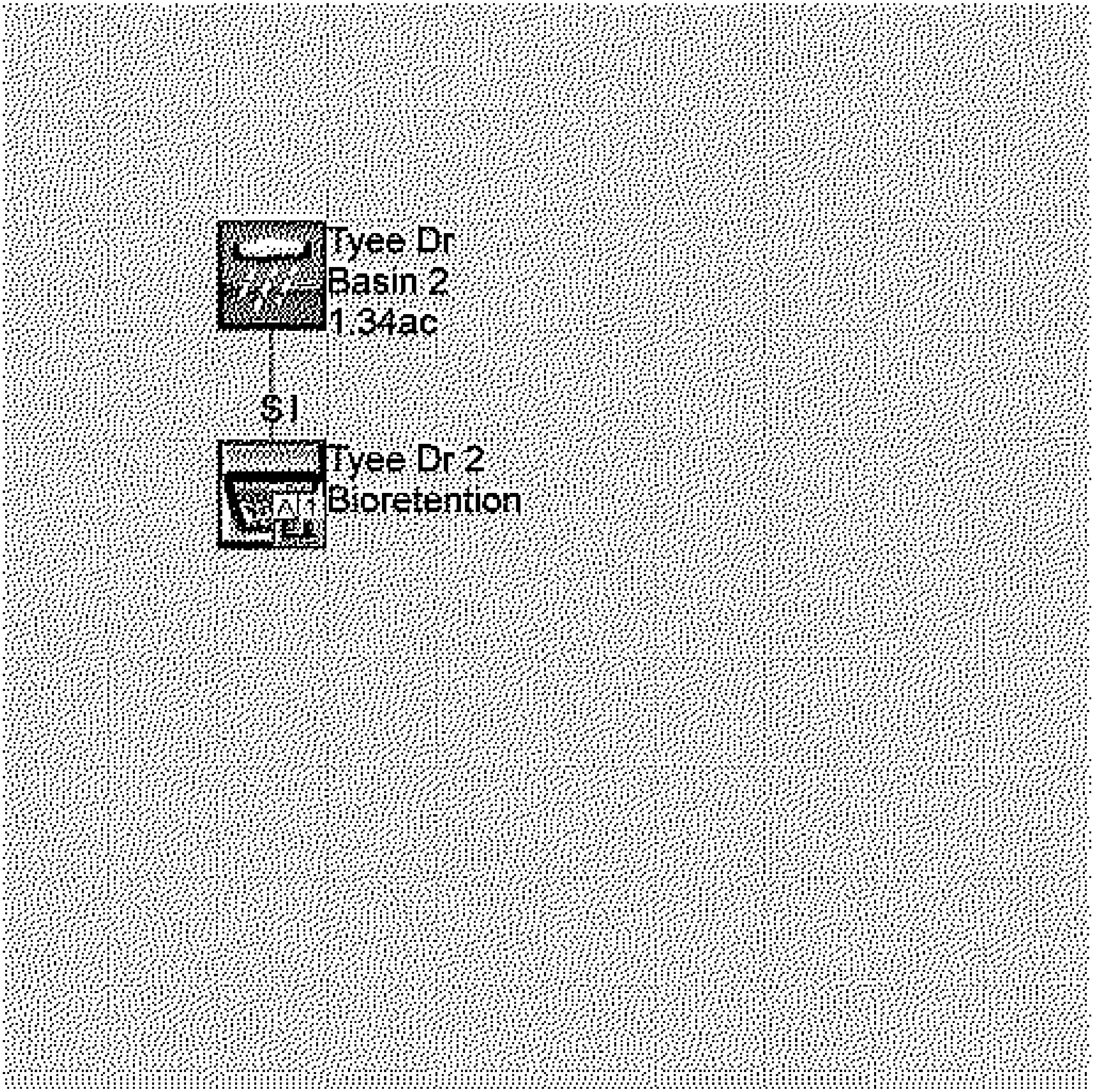
LID Report

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
Bioretention RSC	☐	193.46			☐	100.00			
Total Volume Infiltrated		193.46	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix

Predeveloped Schematic

Mitigated Schematic



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WWHM2012

PROJECT REPORT

TUMWATER BLVD

BASIN 1

General Model Information

Project Name:	C22-169 Yorkshire_TumwaterBlvdBasin1
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tumwater Blvd Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.15
Pervious Total	0.15
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.15

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tumwater Blvd Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.03
Pervious Total	0.03
Impervious Land Use	acre
ROADS FLAT	0.12
Impervious Total	0.12
Basin Total	0.15

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 1	Surface oretention 1	

Mitigated Routing

Tumwater Blvd Bioretention 1

Bottom Length:	20.00 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	26.959
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	26.959
Percent Infiltrated:	100
Total Precip Applied to Facility:	1.303
Total Evap From Facility:	0.32

Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0107	0.0000	0.0000	0.0000
0.0330	0.0106	0.0000	0.0000	0.0000
0.0659	0.0103	0.0001	0.0000	0.0000
0.0989	0.0101	0.0001	0.0000	0.0000
0.1319	0.0099	0.0002	0.0000	0.0000
0.1648	0.0098	0.0002	0.0000	0.0001
0.1978	0.0096	0.0003	0.0000	0.0002
0.2308	0.0094	0.0003	0.0000	0.0002
0.2637	0.0092	0.0004	0.0000	0.0003
0.2967	0.0090	0.0005	0.0000	0.0005
0.3297	0.0088	0.0005	0.0000	0.0006
0.3626	0.0086	0.0006	0.0000	0.0008
0.3956	0.0084	0.0006	0.0000	0.0011
0.4286	0.0082	0.0007	0.0000	0.0013
0.4615	0.0081	0.0008	0.0000	0.0016
0.4945	0.0079	0.0008	0.0000	0.0020
0.5275	0.0077	0.0009	0.0000	0.0024
0.5604	0.0075	0.0010	0.0000	0.0029
0.5934	0.0074	0.0011	0.0000	0.0034
0.6264	0.0072	0.0011	0.0000	0.0040
0.6593	0.0070	0.0012	0.0000	0.0047
0.6923	0.0068	0.0013	0.0000	0.0054
0.7253	0.0067	0.0014	0.0000	0.0063
0.7582	0.0065	0.0015	0.0000	0.0072
0.7912	0.0063	0.0015	0.0000	0.0082

0.8242	0.0062	0.0016	0.0000	0.0093
0.8571	0.0060	0.0017	0.0000	0.0105
0.8901	0.0059	0.0018	0.0000	0.0118
0.9231	0.0057	0.0019	0.0000	0.0132
0.9560	0.0056	0.0020	0.0000	0.0148
0.9890	0.0054	0.0021	0.0000	0.0164
1.0220	0.0053	0.0022	0.0000	0.0182
1.0549	0.0051	0.0023	0.0000	0.0202
1.0879	0.0050	0.0024	0.0000	0.0223
1.1209	0.0048	0.0025	0.0000	0.0245
1.1538	0.0047	0.0027	0.0000	0.0269
1.1868	0.0045	0.0028	0.0000	0.0295
1.2198	0.0044	0.0029	0.0000	0.0323
1.2527	0.0043	0.0030	0.0000	0.0352
1.2857	0.0041	0.0031	0.0000	0.0383
1.3187	0.0040	0.0033	0.0000	0.0416
1.3516	0.0038	0.0034	0.0000	0.0452
1.3846	0.0037	0.0035	0.0000	0.0489
1.4176	0.0036	0.0036	0.0000	0.0529
1.4505	0.0035	0.0038	0.0000	0.0571
1.4835	0.0033	0.0039	0.0000	0.0615
1.5000	0.0032	0.0040	0.0000	0.1074

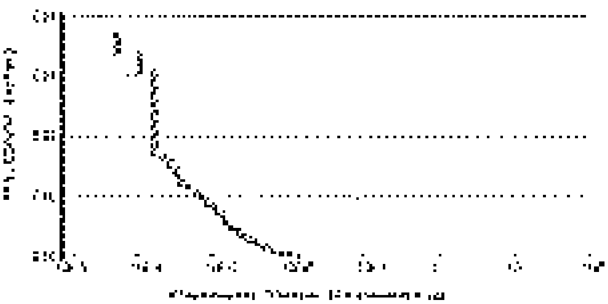
Bioretention Hydraulic Table

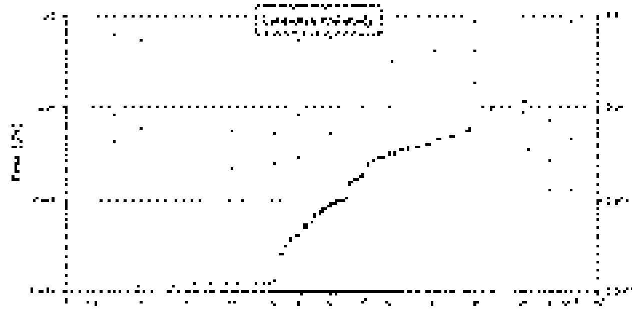
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0107	0.0040	0.0000	0.0194	0.0021
1.5330	0.0109	0.0043	0.0000	0.0194	0.0042
1.5659	0.0111	0.0047	0.0000	0.0203	0.0063
1.5989	0.0113	0.0051	0.0000	0.0207	0.0084
1.6319	0.0115	0.0054	0.0000	0.0212	0.0105
1.6648	0.0117	0.0058	0.0000	0.0216	0.0127
1.6978	0.0119	0.0062	0.0000	0.0220	0.0149
1.7308	0.0121	0.0066	0.0000	0.0224	0.0171
1.7637	0.0123	0.0070	0.0000	0.0229	0.0193
1.7967	0.0126	0.0074	0.0000	0.0233	0.0215
1.8297	0.0128	0.0078	0.0000	0.0237	0.0238
1.8626	0.0130	0.0083	0.0000	0.0241	0.0260
1.8956	0.0132	0.0087	0.0000	0.0246	0.0283
1.9286	0.0135	0.0091	0.0000	0.0250	0.0306
1.9615	0.0137	0.0096	0.0000	0.0254	0.0329
1.9945	0.0139	0.0100	0.0000	0.0259	0.0353
2.0275	0.0142	0.0105	0.0000	0.0263	0.0376
2.0604	0.0144	0.0110	0.0000	0.0267	0.0400
2.0934	0.0146	0.0115	0.0000	0.0271	0.0424
2.1264	0.0149	0.0119	0.0000	0.0276	0.0448
2.1593	0.0151	0.0124	0.0000	0.0280	0.0473
2.1923	0.0153	0.0129	0.0000	0.0284	0.0497
2.2253	0.0156	0.0134	0.0000	0.0288	0.0522
2.2582	0.0158	0.0140	0.0000	0.0293	0.0547
2.2912	0.0161	0.0145	0.0000	0.0297	0.0572
2.3242	0.0163	0.0150	0.0000	0.0301	0.0597
2.3571	0.0166	0.0156	0.0000	0.0306	0.0622
2.3901	0.0168	0.0161	0.0000	0.0310	0.0648
2.4231	0.0171	0.0167	0.0000	0.0314	0.0674
2.4560	0.0173	0.0172	0.0000	0.0318	0.0700
2.4890	0.0176	0.0178	0.0000	0.0323	0.0726
2.5220	0.0178	0.0184	0.0519	0.0324	0.0752
2.5549	0.0181	0.0190	0.2049	0.0324	0.0779

2.5879	0.0184	0.0196	0.4142	0.0324	0.0805
2.6209	0.0186	0.0202	0.6666	0.0324	0.0832
2.6538	0.0189	0.0208	0.9542	0.0324	0.0859
2.6868	0.0192	0.0215	1.2709	0.0324	0.0886
2.7198	0.0194	0.0221	1.6110	0.0324	0.0914
2.7527	0.0197	0.0227	1.9688	0.0324	0.0941
2.7857	0.0200	0.0234	2.3387	0.0324	0.0969
2.8187	0.0203	0.0241	2.7149	0.0324	0.0997
2.8516	0.0205	0.0247	3.0914	0.0324	0.1025
2.8846	0.0208	0.0254	3.4625	0.0324	0.1053
2.9176	0.0211	0.0261	3.8224	0.0324	0.1082
2.9505	0.0214	0.0268	4.1657	0.0324	0.1111
2.9835	0.0217	0.0275	4.4876	0.0324	0.1125
3.0000	0.0218	0.0279	4.7838	0.0324	0.0000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.15
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.03
Total Impervious Area: 0.12

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.000821
5 year	0.002541
10 year	0.004585
25 year	0.008606
50 year	0.012926
100 year	0.018637

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.002	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.004	0.000
1961	0.003	0.000
1962	0.000	0.000
1963	0.005	0.000
1964	0.003	0.000
1965	0.003	0.000

1966	0.001	0.000
1967	0.001	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.001	0.000
1971	0.001	0.000
1972	0.002	0.000
1973	0.000	0.000
1974	0.002	0.000
1975	0.001	0.000
1976	0.001	0.000
1977	0.000	0.000
1978	0.001	0.000
1979	0.000	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.001	0.000
1983	0.000	0.000
1984	0.002	0.000
1985	0.000	0.000
1986	0.002	0.000
1987	0.010	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.006	0.000
1991	0.005	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.003	0.000
1997	0.003	0.000
1998	0.001	0.000
1999	0.004	0.000
2000	0.000	0.000
2001	0.000	0.000
2002	0.001	0.000
2003	0.000	0.000
2004	0.004	0.000
2005	0.000	0.000
2006	0.012	0.000
2007	0.004	0.000
2008	0.000	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0119	0.0000
2	0.0101	0.0000
3	0.0058	0.0000
4	0.0050	0.0000
5	0.0046	0.0000
6	0.0041	0.0000
7	0.0037	0.0000
8	0.0037	0.0000
9	0.0035	0.0000
10	0.0032	0.0000
11	0.0031	0.0000

12	0.0030	0.0000
13	0.0029	0.0000
14	0.0027	0.0000
15	0.0025	0.0000
16	0.0019	0.0000
17	0.0018	0.0000
18	0.0017	0.0000
19	0.0016	0.0000
20	0.0015	0.0000
21	0.0011	0.0000
22	0.0010	0.0000
23	0.0010	0.0000
24	0.0010	0.0000
25	0.0010	0.0000
26	0.0009	0.0000
27	0.0009	0.0000
28	0.0009	0.0000
29	0.0008	0.0000
30	0.0008	0.0000
31	0.0008	0.0000
32	0.0007	0.0000
33	0.0007	0.0000
34	0.0006	0.0000
35	0.0005	0.0000
36	0.0005	0.0000
37	0.0004	0.0000
38	0.0004	0.0000
39	0.0004	0.0000
40	0.0003	0.0000
41	0.0003	0.0000
42	0.0001	0.0000
43	0.0001	0.0000
44	0.0001	0.0000
45	0.0001	0.0000
46	0.0001	0.0000
47	0.0001	0.0000
48	0.0001	0.0000
49	0.0001	0.0000
50	0.0001	0.0000
51	0.0001	0.0000
52	0.0001	0.0000
53	0.0001	0.0000

Duration Flows
The Facility PASSED

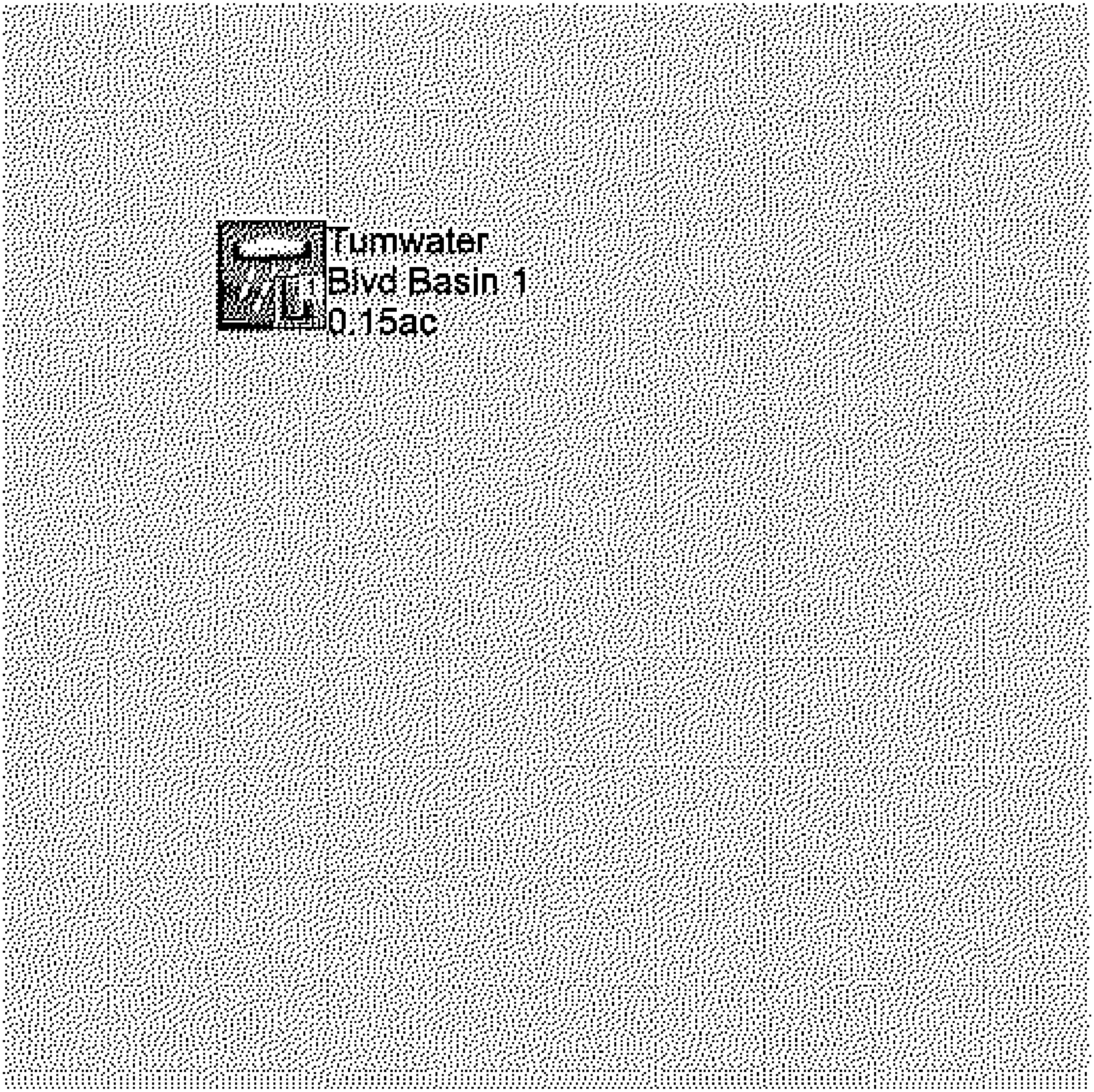
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	263	0	0	Pass
0.0005	194	0	0	Pass
0.0007	149	0	0	Pass
0.0008	121	0	0	Pass
0.0009	98	0	0	Pass
0.0010	84	0	0	Pass
0.0012	75	0	0	Pass
0.0013	62	0	0	Pass
0.0014	54	0	0	Pass
0.0015	47	0	0	Pass
0.0017	42	0	0	Pass
0.0018	40	0	0	Pass
0.0019	33	0	0	Pass
0.0021	31	0	0	Pass
0.0022	28	0	0	Pass
0.0023	27	0	0	Pass
0.0024	27	0	0	Pass
0.0026	26	0	0	Pass
0.0027	24	0	0	Pass
0.0028	21	0	0	Pass
0.0029	21	0	0	Pass
0.0031	19	0	0	Pass
0.0032	16	0	0	Pass
0.0033	15	0	0	Pass
0.0034	15	0	0	Pass
0.0036	14	0	0	Pass
0.0037	13	0	0	Pass
0.0038	11	0	0	Pass
0.0040	11	0	0	Pass
0.0041	9	0	0	Pass
0.0042	7	0	0	Pass
0.0043	7	0	0	Pass
0.0045	7	0	0	Pass
0.0046	7	0	0	Pass
0.0047	6	0	0	Pass
0.0048	6	0	0	Pass
0.0050	6	0	0	Pass
0.0051	5	0	0	Pass
0.0052	5	0	0	Pass
0.0053	5	0	0	Pass
0.0055	5	0	0	Pass
0.0056	4	0	0	Pass
0.0057	4	0	0	Pass
0.0058	3	0	0	Pass
0.0060	3	0	0	Pass
0.0061	3	0	0	Pass
0.0062	3	0	0	Pass
0.0064	3	0	0	Pass
0.0065	3	0	0	Pass
0.0066	3	0	0	Pass
0.0067	3	0	0	Pass
0.0069	3	0	0	Pass
0.0070	3	0	0	Pass

0.0071	3	0	0	Pass
0.0072	3	0	0	Pass
0.0074	3	0	0	Pass
0.0075	3	0	0	Pass
0.0076	3	0	0	Pass
0.0077	3	0	0	Pass
0.0079	3	0	0	Pass
0.0080	3	0	0	Pass
0.0081	3	0	0	Pass
0.0082	3	0	0	Pass
0.0084	3	0	0	Pass
0.0085	3	0	0	Pass
0.0086	3	0	0	Pass
0.0088	3	0	0	Pass
0.0089	3	0	0	Pass
0.0090	3	0	0	Pass
0.0091	3	0	0	Pass
0.0093	3	0	0	Pass
0.0094	3	0	0	Pass
0.0095	3	0	0	Pass
0.0096	3	0	0	Pass
0.0098	3	0	0	Pass
0.0099	3	0	0	Pass
0.0100	3	0	0	Pass
0.0101	2	0	0	Pass
0.0103	2	0	0	Pass
0.0104	2	0	0	Pass
0.0105	2	0	0	Pass
0.0107	2	0	0	Pass
0.0108	2	0	0	Pass
0.0109	2	0	0	Pass
0.0110	2	0	0	Pass
0.0112	1	0	0	Pass
0.0113	1	0	0	Pass
0.0114	1	0	0	Pass
0.0115	1	0	0	Pass
0.0117	1	0	0	Pass
0.0118	1	0	0	Pass
0.0119	1	0	0	Pass
0.0120	0	0	0	Pass
0.0122	0	0	0	Pass
0.0123	0	0	0	Pass
0.0124	0	0	0	Pass
0.0125	0	0	0	Pass
0.0127	0	0	0	Pass
0.0128	0	0	0	Pass
0.0129	0	0	0	Pass

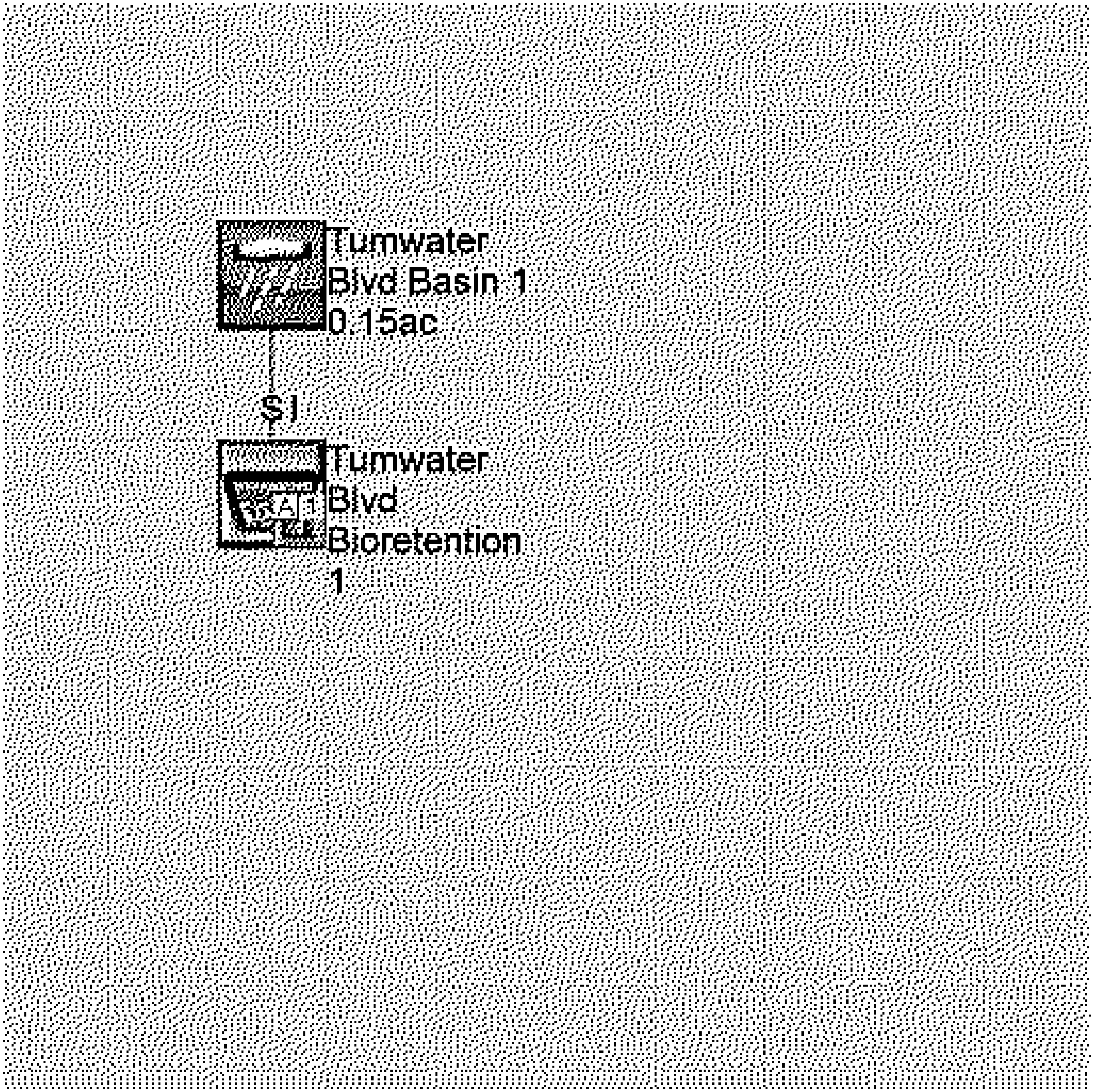
LID Report

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
[illegible] 1 POC	☐	24.53			☐	100.00			
Total Volume Infiltrated		24.53	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

TUMWATER BLVD

BASIN 2

General Model Information

Project Name:	C22-169 Yorkshire_TumwaterBlvdBasin2
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tumwater Blvd Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.15
Pervious Total	0.15
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.15

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tumwater Blvd Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.03
Pervious Total	0.03
Impervious Land Use	acre
ROADS FLAT	0.12
Impervious Total	0.12
Basin Total	0.15

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 2	Surface oretention 2	

Mitigated Routing

Tumwater Blvd Bioretention 2

Bottom Length:	20.00 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	26.959
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	26.959
Percent Infiltrated:	100
Total Precip Applied to Facility:	1.303
Total Evap From Facility:	0.32

Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0107	0.0000	0.0000	0.0000
0.0330	0.0106	0.0000	0.0000	0.0000
0.0659	0.0103	0.0001	0.0000	0.0000
0.0989	0.0101	0.0001	0.0000	0.0000
0.1319	0.0099	0.0002	0.0000	0.0000
0.1648	0.0098	0.0002	0.0000	0.0001
0.1978	0.0096	0.0003	0.0000	0.0002
0.2308	0.0094	0.0003	0.0000	0.0002
0.2637	0.0092	0.0004	0.0000	0.0003
0.2967	0.0090	0.0005	0.0000	0.0005
0.3297	0.0088	0.0005	0.0000	0.0006
0.3626	0.0086	0.0006	0.0000	0.0008
0.3956	0.0084	0.0006	0.0000	0.0011
0.4286	0.0082	0.0007	0.0000	0.0013
0.4615	0.0081	0.0008	0.0000	0.0016
0.4945	0.0079	0.0008	0.0000	0.0020
0.5275	0.0077	0.0009	0.0000	0.0024
0.5604	0.0075	0.0010	0.0000	0.0029
0.5934	0.0074	0.0011	0.0000	0.0034
0.6264	0.0072	0.0011	0.0000	0.0040
0.6593	0.0070	0.0012	0.0000	0.0047
0.6923	0.0068	0.0013	0.0000	0.0054
0.7253	0.0067	0.0014	0.0000	0.0063
0.7582	0.0065	0.0015	0.0000	0.0072
0.7912	0.0063	0.0015	0.0000	0.0082

0.8242	0.0062	0.0016	0.0000	0.0093
0.8571	0.0060	0.0017	0.0000	0.0105
0.8901	0.0059	0.0018	0.0000	0.0118
0.9231	0.0057	0.0019	0.0000	0.0132
0.9560	0.0056	0.0020	0.0000	0.0148
0.9890	0.0054	0.0021	0.0000	0.0164
1.0220	0.0053	0.0022	0.0000	0.0182
1.0549	0.0051	0.0023	0.0000	0.0202
1.0879	0.0050	0.0024	0.0000	0.0223
1.1209	0.0048	0.0025	0.0000	0.0245
1.1538	0.0047	0.0027	0.0000	0.0269
1.1868	0.0045	0.0028	0.0000	0.0295
1.2198	0.0044	0.0029	0.0000	0.0323
1.2527	0.0043	0.0030	0.0000	0.0352
1.2857	0.0041	0.0031	0.0000	0.0383
1.3187	0.0040	0.0033	0.0000	0.0416
1.3516	0.0038	0.0034	0.0000	0.0452
1.3846	0.0037	0.0035	0.0000	0.0489
1.4176	0.0036	0.0036	0.0000	0.0529
1.4505	0.0035	0.0038	0.0000	0.0571
1.4835	0.0033	0.0039	0.0000	0.0615
1.5000	0.0032	0.0040	0.0000	0.1074

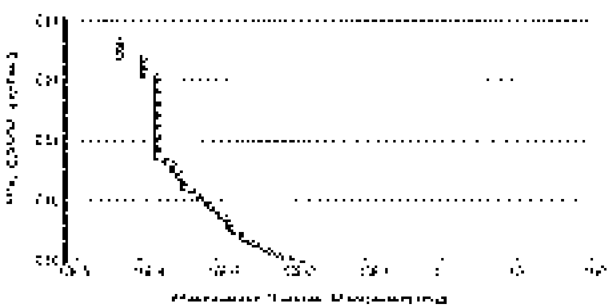
Bioretention Hydraulic Table

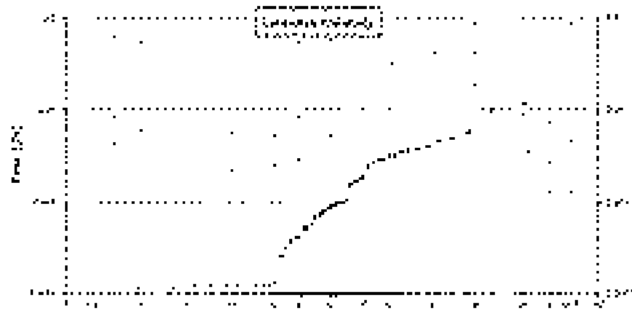
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0107	0.0040	0.0000	0.0194	0.0021
1.5330	0.0109	0.0043	0.0000	0.0194	0.0042
1.5659	0.0111	0.0047	0.0000	0.0203	0.0063
1.5989	0.0113	0.0051	0.0000	0.0207	0.0084
1.6319	0.0115	0.0054	0.0000	0.0212	0.0105
1.6648	0.0117	0.0058	0.0000	0.0216	0.0127
1.6978	0.0119	0.0062	0.0000	0.0220	0.0149
1.7308	0.0121	0.0066	0.0000	0.0224	0.0171
1.7637	0.0123	0.0070	0.0000	0.0229	0.0193
1.7967	0.0126	0.0074	0.0000	0.0233	0.0215
1.8297	0.0128	0.0078	0.0000	0.0237	0.0238
1.8626	0.0130	0.0083	0.0000	0.0241	0.0260
1.8956	0.0132	0.0087	0.0000	0.0246	0.0283
1.9286	0.0135	0.0091	0.0000	0.0250	0.0306
1.9615	0.0137	0.0096	0.0000	0.0254	0.0329
1.9945	0.0139	0.0100	0.0000	0.0259	0.0353
2.0275	0.0142	0.0105	0.0000	0.0263	0.0376
2.0604	0.0144	0.0110	0.0000	0.0267	0.0400
2.0934	0.0146	0.0115	0.0000	0.0271	0.0424
2.1264	0.0149	0.0119	0.0000	0.0276	0.0448
2.1593	0.0151	0.0124	0.0000	0.0280	0.0473
2.1923	0.0153	0.0129	0.0000	0.0284	0.0497
2.2253	0.0156	0.0134	0.0000	0.0288	0.0522
2.2582	0.0158	0.0140	0.0000	0.0293	0.0547
2.2912	0.0161	0.0145	0.0000	0.0297	0.0572
2.3242	0.0163	0.0150	0.0000	0.0301	0.0597
2.3571	0.0166	0.0156	0.0000	0.0306	0.0622
2.3901	0.0168	0.0161	0.0000	0.0310	0.0648
2.4231	0.0171	0.0167	0.0000	0.0314	0.0674
2.4560	0.0173	0.0172	0.0000	0.0318	0.0700
2.4890	0.0176	0.0178	0.0000	0.0323	0.0726
2.5220	0.0178	0.0184	0.0519	0.0324	0.0752
2.5549	0.0181	0.0190	0.2049	0.0324	0.0779

2.5879	0.0184	0.0196	0.4142	0.0324	0.0805
2.6209	0.0186	0.0202	0.6666	0.0324	0.0832
2.6538	0.0189	0.0208	0.9542	0.0324	0.0859
2.6868	0.0192	0.0215	1.2709	0.0324	0.0886
2.7198	0.0194	0.0221	1.6110	0.0324	0.0914
2.7527	0.0197	0.0227	1.9688	0.0324	0.0941
2.7857	0.0200	0.0234	2.3387	0.0324	0.0969
2.8187	0.0203	0.0241	2.7149	0.0324	0.0997
2.8516	0.0205	0.0247	3.0914	0.0324	0.1025
2.8846	0.0208	0.0254	3.4625	0.0324	0.1053
2.9176	0.0211	0.0261	3.8224	0.0324	0.1082
2.9505	0.0214	0.0268	4.1657	0.0324	0.1111
2.9835	0.0217	0.0275	4.4876	0.0324	0.1125
3.0000	0.0218	0.0279	4.7838	0.0324	0.0000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.15
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.03
Total Impervious Area: 0.12

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000821
5 year	0.002541
10 year	0.004585
25 year	0.008606
50 year	0.012926
100 year	0.018637

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.002	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.004	0.000
1961	0.003	0.000
1962	0.000	0.000
1963	0.005	0.000
1964	0.003	0.000
1965	0.003	0.000

1966	0.001	0.000
1967	0.001	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.001	0.000
1971	0.001	0.000
1972	0.002	0.000
1973	0.000	0.000
1974	0.002	0.000
1975	0.001	0.000
1976	0.001	0.000
1977	0.000	0.000
1978	0.001	0.000
1979	0.000	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.001	0.000
1983	0.000	0.000
1984	0.002	0.000
1985	0.000	0.000
1986	0.002	0.000
1987	0.010	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.006	0.000
1991	0.005	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.003	0.000
1997	0.003	0.000
1998	0.001	0.000
1999	0.004	0.000
2000	0.000	0.000
2001	0.000	0.000
2002	0.001	0.000
2003	0.000	0.000
2004	0.004	0.000
2005	0.000	0.000
2006	0.012	0.000
2007	0.004	0.000
2008	0.000	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0119	0.0000
2	0.0101	0.0000
3	0.0058	0.0000
4	0.0050	0.0000
5	0.0046	0.0000
6	0.0041	0.0000
7	0.0037	0.0000
8	0.0037	0.0000
9	0.0035	0.0000
10	0.0032	0.0000
11	0.0031	0.0000

12	0.0030	0.0000
13	0.0029	0.0000
14	0.0027	0.0000
15	0.0025	0.0000
16	0.0019	0.0000
17	0.0018	0.0000
18	0.0017	0.0000
19	0.0016	0.0000
20	0.0015	0.0000
21	0.0011	0.0000
22	0.0010	0.0000
23	0.0010	0.0000
24	0.0010	0.0000
25	0.0010	0.0000
26	0.0009	0.0000
27	0.0009	0.0000
28	0.0009	0.0000
29	0.0008	0.0000
30	0.0008	0.0000
31	0.0008	0.0000
32	0.0007	0.0000
33	0.0007	0.0000
34	0.0006	0.0000
35	0.0005	0.0000
36	0.0005	0.0000
37	0.0004	0.0000
38	0.0004	0.0000
39	0.0004	0.0000
40	0.0003	0.0000
41	0.0003	0.0000
42	0.0001	0.0000
43	0.0001	0.0000
44	0.0001	0.0000
45	0.0001	0.0000
46	0.0001	0.0000
47	0.0001	0.0000
48	0.0001	0.0000
49	0.0001	0.0000
50	0.0001	0.0000
51	0.0001	0.0000
52	0.0001	0.0000
53	0.0001	0.0000

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	263	0	0	Pass
0.0005	194	0	0	Pass
0.0007	149	0	0	Pass
0.0008	121	0	0	Pass
0.0009	98	0	0	Pass
0.0010	84	0	0	Pass
0.0012	75	0	0	Pass
0.0013	62	0	0	Pass
0.0014	54	0	0	Pass
0.0015	47	0	0	Pass
0.0017	42	0	0	Pass
0.0018	40	0	0	Pass
0.0019	33	0	0	Pass
0.0021	31	0	0	Pass
0.0022	28	0	0	Pass
0.0023	27	0	0	Pass
0.0024	27	0	0	Pass
0.0026	26	0	0	Pass
0.0027	24	0	0	Pass
0.0028	21	0	0	Pass
0.0029	21	0	0	Pass
0.0031	19	0	0	Pass
0.0032	16	0	0	Pass
0.0033	15	0	0	Pass
0.0034	15	0	0	Pass
0.0036	14	0	0	Pass
0.0037	13	0	0	Pass
0.0038	11	0	0	Pass
0.0040	11	0	0	Pass
0.0041	9	0	0	Pass
0.0042	7	0	0	Pass
0.0043	7	0	0	Pass
0.0045	7	0	0	Pass
0.0046	7	0	0	Pass
0.0047	6	0	0	Pass
0.0048	6	0	0	Pass
0.0050	6	0	0	Pass
0.0051	5	0	0	Pass
0.0052	5	0	0	Pass
0.0053	5	0	0	Pass
0.0055	5	0	0	Pass
0.0056	4	0	0	Pass
0.0057	4	0	0	Pass
0.0058	3	0	0	Pass
0.0060	3	0	0	Pass
0.0061	3	0	0	Pass
0.0062	3	0	0	Pass
0.0064	3	0	0	Pass
0.0065	3	0	0	Pass
0.0066	3	0	0	Pass
0.0067	3	0	0	Pass
0.0069	3	0	0	Pass
0.0070	3	0	0	Pass

0.0071	3	0	0	Pass
0.0072	3	0	0	Pass
0.0074	3	0	0	Pass
0.0075	3	0	0	Pass
0.0076	3	0	0	Pass
0.0077	3	0	0	Pass
0.0079	3	0	0	Pass
0.0080	3	0	0	Pass
0.0081	3	0	0	Pass
0.0082	3	0	0	Pass
0.0084	3	0	0	Pass
0.0085	3	0	0	Pass
0.0086	3	0	0	Pass
0.0088	3	0	0	Pass
0.0089	3	0	0	Pass
0.0090	3	0	0	Pass
0.0091	3	0	0	Pass
0.0093	3	0	0	Pass
0.0094	3	0	0	Pass
0.0095	3	0	0	Pass
0.0096	3	0	0	Pass
0.0098	3	0	0	Pass
0.0099	3	0	0	Pass
0.0100	3	0	0	Pass
0.0101	2	0	0	Pass
0.0103	2	0	0	Pass
0.0104	2	0	0	Pass
0.0105	2	0	0	Pass
0.0107	2	0	0	Pass
0.0108	2	0	0	Pass
0.0109	2	0	0	Pass
0.0110	2	0	0	Pass
0.0112	1	0	0	Pass
0.0113	1	0	0	Pass
0.0114	1	0	0	Pass
0.0115	1	0	0	Pass
0.0117	1	0	0	Pass
0.0118	1	0	0	Pass
0.0119	1	0	0	Pass
0.0120	0	0	0	Pass
0.0122	0	0	0	Pass
0.0123	0	0	0	Pass
0.0124	0	0	0	Pass
0.0125	0	0	0	Pass
0.0127	0	0	0	Pass
0.0128	0	0	0	Pass
0.0129	0	0	0	Pass

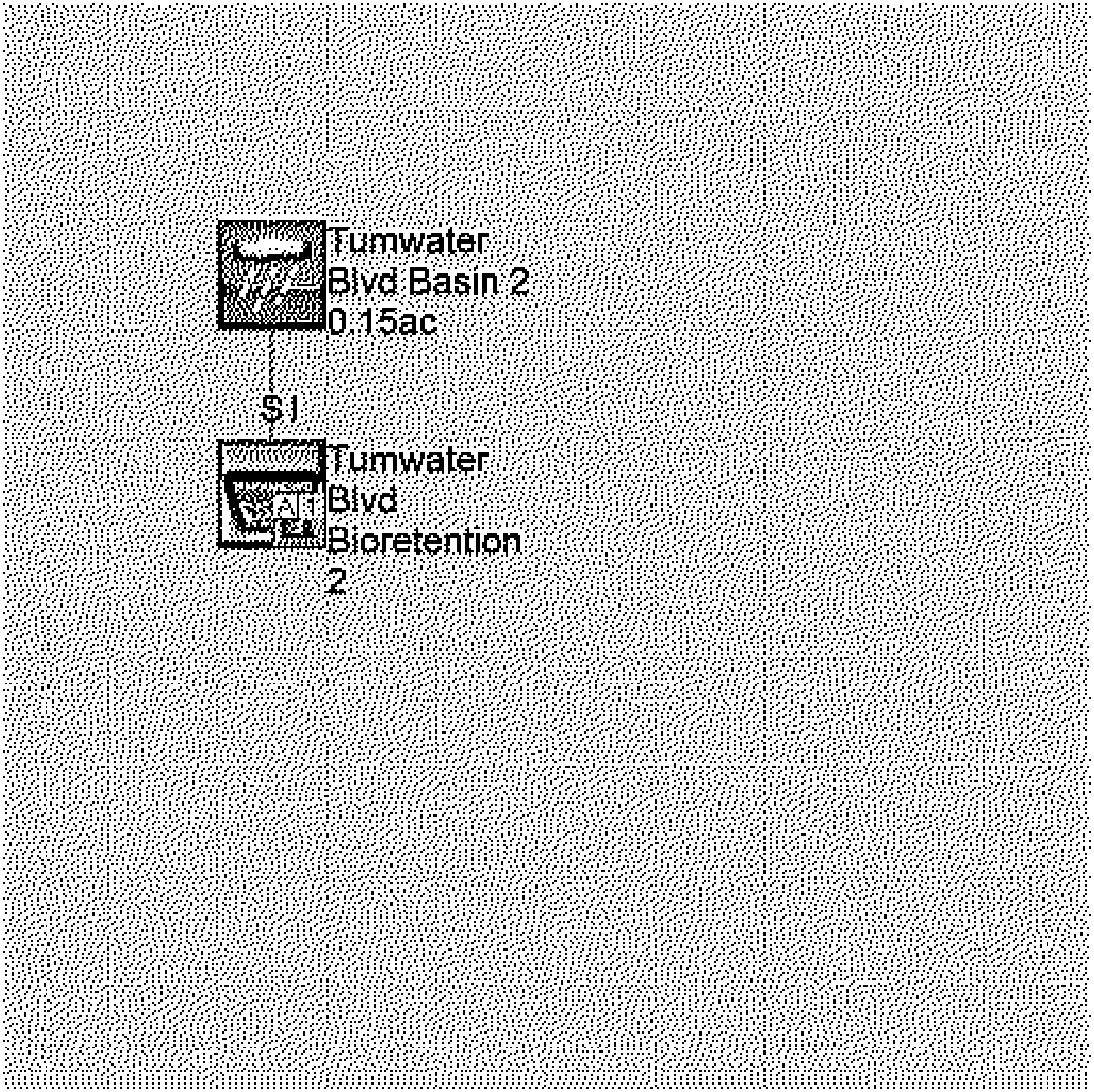
LID Report

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
[illegible] 3 POC	☐	24.53			☐	100.00			
Total Volume Infiltrated		24.53	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix

Predeveloped Schematic

Mitigated Schematic



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WWHM2012

PROJECT REPORT

TUMWATER BLVD

BASIN 3

General Model Information

Project Name:	C22-169 Yorkshire_TumwaterBlvdBasin3
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tumwater Blvd Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.13
Pervious Total	0.13
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.13

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tumwater Blvd Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.03
Pervious Total	0.03
Impervious Land Use	acre
ROADS FLAT	0.1
Impervious Total	0.1
Basin Total	0.13

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 3	Surface oretention 3	

Mitigated Routing

Tumwater Blvd Bioretention 3

Bottom Length:	20.00 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	22.535
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	22.535
Percent Infiltrated:	100
Total Precip Applied to Facility:	1.186
Total Evap From Facility:	0.31

Underdrain not used

Discharge Structure

Riser Height: 1 ft.

Riser Diameter: 18 in.

Element Flows To:

Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0107	0.0000	0.0000	0.0000
0.0330	0.0106	0.0000	0.0000	0.0000
0.0659	0.0103	0.0001	0.0000	0.0000
0.0989	0.0101	0.0001	0.0000	0.0000
0.1319	0.0099	0.0002	0.0000	0.0000
0.1648	0.0098	0.0002	0.0000	0.0001
0.1978	0.0096	0.0003	0.0000	0.0002
0.2308	0.0094	0.0003	0.0000	0.0002
0.2637	0.0092	0.0004	0.0000	0.0003
0.2967	0.0090	0.0005	0.0000	0.0005
0.3297	0.0088	0.0005	0.0000	0.0006
0.3626	0.0086	0.0006	0.0000	0.0008
0.3956	0.0084	0.0006	0.0000	0.0011
0.4286	0.0082	0.0007	0.0000	0.0013
0.4615	0.0081	0.0008	0.0000	0.0016
0.4945	0.0079	0.0008	0.0000	0.0020
0.5275	0.0077	0.0009	0.0000	0.0024
0.5604	0.0075	0.0010	0.0000	0.0029
0.5934	0.0074	0.0011	0.0000	0.0034
0.6264	0.0072	0.0011	0.0000	0.0040
0.6593	0.0070	0.0012	0.0000	0.0047
0.6923	0.0068	0.0013	0.0000	0.0054
0.7253	0.0067	0.0014	0.0000	0.0063
0.7582	0.0065	0.0015	0.0000	0.0072
0.7912	0.0063	0.0015	0.0000	0.0082

0.8242	0.0062	0.0016	0.0000	0.0093
0.8571	0.0060	0.0017	0.0000	0.0105
0.8901	0.0059	0.0018	0.0000	0.0118
0.9231	0.0057	0.0019	0.0000	0.0132
0.9560	0.0056	0.0020	0.0000	0.0148
0.9890	0.0054	0.0021	0.0000	0.0164
1.0220	0.0053	0.0022	0.0000	0.0182
1.0549	0.0051	0.0023	0.0000	0.0202
1.0879	0.0050	0.0024	0.0000	0.0223
1.1209	0.0048	0.0025	0.0000	0.0245
1.1538	0.0047	0.0027	0.0000	0.0269
1.1868	0.0045	0.0028	0.0000	0.0295
1.2198	0.0044	0.0029	0.0000	0.0323
1.2527	0.0043	0.0030	0.0000	0.0352
1.2857	0.0041	0.0031	0.0000	0.0383
1.3187	0.0040	0.0033	0.0000	0.0416
1.3516	0.0038	0.0034	0.0000	0.0452
1.3846	0.0037	0.0035	0.0000	0.0489
1.4176	0.0036	0.0036	0.0000	0.0529
1.4505	0.0035	0.0038	0.0000	0.0571
1.4835	0.0033	0.0039	0.0000	0.0615
1.5000	0.0032	0.0040	0.0000	0.1074

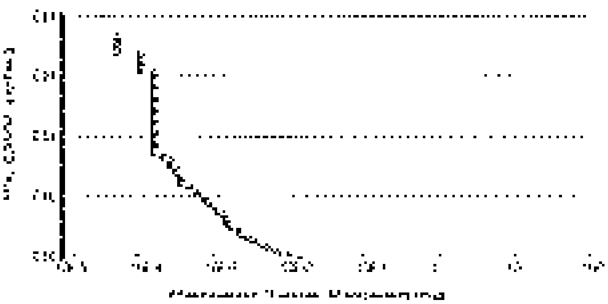
Bioretention Hydraulic Table

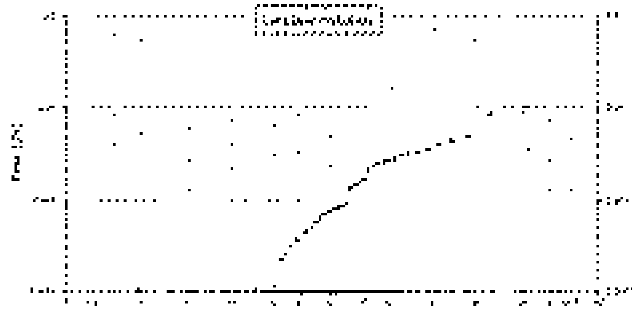
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0107	0.0040	0.0000	0.0194	0.0021
1.5330	0.0109	0.0043	0.0000	0.0194	0.0042
1.5659	0.0111	0.0047	0.0000	0.0203	0.0063
1.5989	0.0113	0.0051	0.0000	0.0207	0.0084
1.6319	0.0115	0.0054	0.0000	0.0212	0.0105
1.6648	0.0117	0.0058	0.0000	0.0216	0.0127
1.6978	0.0119	0.0062	0.0000	0.0220	0.0149
1.7308	0.0121	0.0066	0.0000	0.0224	0.0171
1.7637	0.0123	0.0070	0.0000	0.0229	0.0193
1.7967	0.0126	0.0074	0.0000	0.0233	0.0215
1.8297	0.0128	0.0078	0.0000	0.0237	0.0238
1.8626	0.0130	0.0083	0.0000	0.0241	0.0260
1.8956	0.0132	0.0087	0.0000	0.0246	0.0283
1.9286	0.0135	0.0091	0.0000	0.0250	0.0306
1.9615	0.0137	0.0096	0.0000	0.0254	0.0329
1.9945	0.0139	0.0100	0.0000	0.0259	0.0353
2.0275	0.0142	0.0105	0.0000	0.0263	0.0376
2.0604	0.0144	0.0110	0.0000	0.0267	0.0400
2.0934	0.0146	0.0115	0.0000	0.0271	0.0424
2.1264	0.0149	0.0119	0.0000	0.0276	0.0448
2.1593	0.0151	0.0124	0.0000	0.0280	0.0473
2.1923	0.0153	0.0129	0.0000	0.0284	0.0497
2.2253	0.0156	0.0134	0.0000	0.0288	0.0522
2.2582	0.0158	0.0140	0.0000	0.0293	0.0547
2.2912	0.0161	0.0145	0.0000	0.0297	0.0572
2.3242	0.0163	0.0150	0.0000	0.0301	0.0597
2.3571	0.0166	0.0156	0.0000	0.0306	0.0622
2.3901	0.0168	0.0161	0.0000	0.0310	0.0648
2.4231	0.0171	0.0167	0.0000	0.0314	0.0674
2.4560	0.0173	0.0172	0.0000	0.0318	0.0700
2.4890	0.0176	0.0178	0.0000	0.0323	0.0726
2.5220	0.0178	0.0184	0.0519	0.0324	0.0752
2.5549	0.0181	0.0190	0.2049	0.0324	0.0779

2.5879	0.0184	0.0196	0.4142	0.0324	0.0805
2.6209	0.0186	0.0202	0.6666	0.0324	0.0832
2.6538	0.0189	0.0208	0.9542	0.0324	0.0859
2.6868	0.0192	0.0215	1.2709	0.0324	0.0886
2.7198	0.0194	0.0221	1.6110	0.0324	0.0914
2.7527	0.0197	0.0227	1.9688	0.0324	0.0941
2.7857	0.0200	0.0234	2.3387	0.0324	0.0969
2.8187	0.0203	0.0241	2.7149	0.0324	0.0997
2.8516	0.0205	0.0247	3.0914	0.0324	0.1025
2.8846	0.0208	0.0254	3.4625	0.0324	0.1053
2.9176	0.0211	0.0261	3.8224	0.0324	0.1082
2.9505	0.0214	0.0268	4.1657	0.0324	0.1111
2.9835	0.0217	0.0275	4.4876	0.0324	0.1125
3.0000	0.0218	0.0279	4.7838	0.0324	0.0000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.13
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.03
Total Impervious Area: 0.1

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000712
5 year	0.002202
10 year	0.003974
25 year	0.007459
50 year	0.011203
100 year	0.016152

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.001	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.003	0.000
1961	0.003	0.000
1962	0.000	0.000
1963	0.004	0.000
1964	0.002	0.000
1965	0.003	0.000

1966	0.001	0.000
1967	0.001	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.000	0.000
1971	0.001	0.000
1972	0.002	0.000
1973	0.000	0.000
1974	0.002	0.000
1975	0.001	0.000
1976	0.001	0.000
1977	0.000	0.000
1978	0.001	0.000
1979	0.000	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.001	0.000
1983	0.000	0.000
1984	0.002	0.000
1985	0.000	0.000
1986	0.001	0.000
1987	0.009	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.005	0.000
1991	0.004	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.003	0.000
1997	0.003	0.000
1998	0.000	0.000
1999	0.003	0.000
2000	0.000	0.000
2001	0.000	0.000
2002	0.001	0.000
2003	0.000	0.000
2004	0.004	0.000
2005	0.000	0.000
2006	0.010	0.000
2007	0.003	0.000
2008	0.000	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0103	0.0000
2	0.0087	0.0000
3	0.0050	0.0000
4	0.0044	0.0000
5	0.0040	0.0000
6	0.0035	0.0000
7	0.0032	0.0000
8	0.0032	0.0000
9	0.0031	0.0000
10	0.0027	0.0000
11	0.0027	0.0000

12	0.0026	0.0000
13	0.0025	0.0000
14	0.0023	0.0000
15	0.0021	0.0000
16	0.0017	0.0000
17	0.0016	0.0000
18	0.0015	0.0000
19	0.0014	0.0000
20	0.0013	0.0000
21	0.0009	0.0000
22	0.0009	0.0000
23	0.0009	0.0000
24	0.0008	0.0000
25	0.0008	0.0000
26	0.0008	0.0000
27	0.0008	0.0000
28	0.0007	0.0000
29	0.0007	0.0000
30	0.0007	0.0000
31	0.0007	0.0000
32	0.0006	0.0000
33	0.0006	0.0000
34	0.0005	0.0000
35	0.0005	0.0000
36	0.0004	0.0000
37	0.0004	0.0000
38	0.0004	0.0000
39	0.0003	0.0000
40	0.0003	0.0000
41	0.0002	0.0000
42	0.0001	0.0000
43	0.0001	0.0000
44	0.0001	0.0000
45	0.0001	0.0000
46	0.0001	0.0000
47	0.0001	0.0000
48	0.0001	0.0000
49	0.0001	0.0000
50	0.0001	0.0000
51	0.0001	0.0000
52	0.0001	0.0000
53	0.0001	0.0000

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	263	0	0	Pass
0.0005	194	0	0	Pass
0.0006	149	0	0	Pass
0.0007	121	0	0	Pass
0.0008	98	0	0	Pass
0.0009	84	0	0	Pass
0.0010	75	0	0	Pass
0.0011	62	0	0	Pass
0.0012	54	0	0	Pass
0.0013	47	0	0	Pass
0.0015	42	0	0	Pass
0.0016	40	0	0	Pass
0.0017	33	0	0	Pass
0.0018	31	0	0	Pass
0.0019	28	0	0	Pass
0.0020	27	0	0	Pass
0.0021	27	0	0	Pass
0.0022	26	0	0	Pass
0.0023	24	0	0	Pass
0.0024	21	0	0	Pass
0.0025	21	0	0	Pass
0.0027	19	0	0	Pass
0.0028	16	0	0	Pass
0.0029	15	0	0	Pass
0.0030	15	0	0	Pass
0.0031	14	0	0	Pass
0.0032	13	0	0	Pass
0.0033	11	0	0	Pass
0.0034	11	0	0	Pass
0.0035	9	0	0	Pass
0.0036	7	0	0	Pass
0.0038	7	0	0	Pass
0.0039	7	0	0	Pass
0.0040	7	0	0	Pass
0.0041	6	0	0	Pass
0.0042	6	0	0	Pass
0.0043	6	0	0	Pass
0.0044	5	0	0	Pass
0.0045	5	0	0	Pass
0.0046	5	0	0	Pass
0.0047	5	0	0	Pass
0.0048	4	0	0	Pass
0.0050	4	0	0	Pass
0.0051	3	0	0	Pass
0.0052	3	0	0	Pass
0.0053	3	0	0	Pass
0.0054	3	0	0	Pass
0.0055	3	0	0	Pass
0.0056	3	0	0	Pass
0.0057	3	0	0	Pass
0.0058	3	0	0	Pass
0.0059	3	0	0	Pass
0.0061	3	0	0	Pass

0.0062	3	0	0	Pass
0.0063	3	0	0	Pass
0.0064	3	0	0	Pass
0.0065	3	0	0	Pass
0.0066	3	0	0	Pass
0.0067	3	0	0	Pass
0.0068	3	0	0	Pass
0.0069	3	0	0	Pass
0.0070	3	0	0	Pass
0.0071	3	0	0	Pass
0.0073	3	0	0	Pass
0.0074	3	0	0	Pass
0.0075	3	0	0	Pass
0.0076	3	0	0	Pass
0.0077	3	0	0	Pass
0.0078	3	0	0	Pass
0.0079	3	0	0	Pass
0.0080	3	0	0	Pass
0.0081	3	0	0	Pass
0.0082	3	0	0	Pass
0.0084	3	0	0	Pass
0.0085	3	0	0	Pass
0.0086	3	0	0	Pass
0.0087	3	0	0	Pass
0.0088	2	0	0	Pass
0.0089	2	0	0	Pass
0.0090	2	0	0	Pass
0.0091	2	0	0	Pass
0.0092	2	0	0	Pass
0.0093	2	0	0	Pass
0.0094	2	0	0	Pass
0.0096	2	0	0	Pass
0.0097	1	0	0	Pass
0.0098	1	0	0	Pass
0.0099	1	0	0	Pass
0.0100	1	0	0	Pass
0.0101	1	0	0	Pass
0.0102	1	0	0	Pass
0.0103	1	0	0	Pass
0.0104	0	0	0	Pass
0.0105	0	0	0	Pass
0.0107	0	0	0	Pass
0.0108	0	0	0	Pass
0.0109	0	0	0	Pass
0.0110	0	0	0	Pass
0.0111	0	0	0	Pass
0.0112	0	0	0	Pass

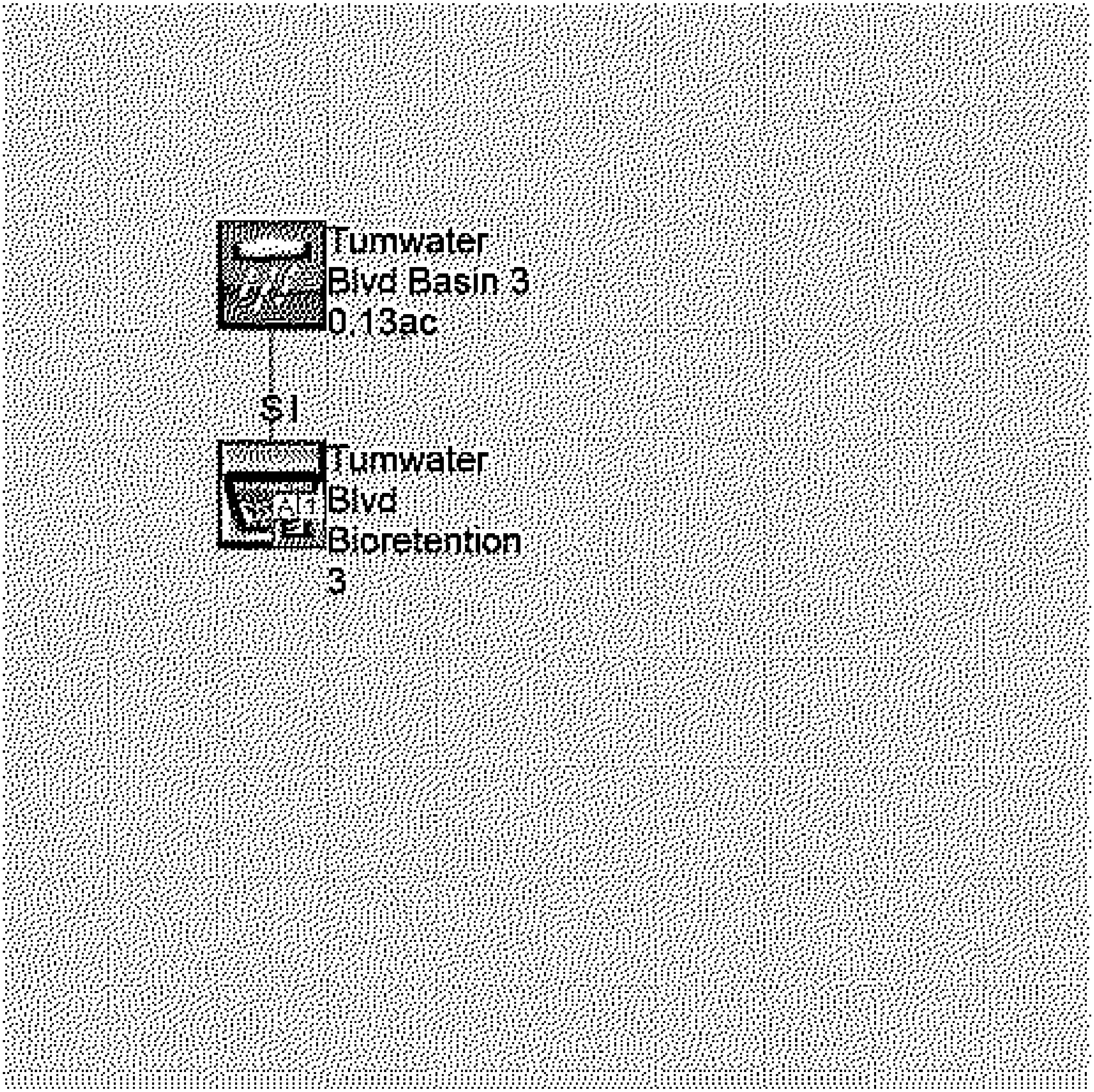
LID Report

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
Detention 3 POC	□	20.51			□	100.00			
Total Volume Infiltrated		20.51	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix

Predeveloped Schematic

Mitigated Schematic



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Local (360)943-0304

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WWHM2012

PROJECT REPORT

TUMWATER BLVD

BASIN 4

General Model Information

Project Name:	C22-169 Yorkshire_TumwaterBlvdBasin4
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tumwater Blvd Basin 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.14
Pervious Total	0.14
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.14

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tumwater Blvd Basin 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.03
Pervious Total	0.03
Impervious Land Use	acre
ROADS FLAT	0.11
Impervious Total	0.11
Basin Total	0.14

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 4	Surface oretention 4	

Mitigated Routing

Tumwater Blvd Bioretention 4

Bottom Length: 15.00 ft.
Bottom Width: 7.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW
Material thickness of second layer: 0
Material type for second layer: Sand
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.): 24.7
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 24.7
Percent Infiltrated: 100
Total Precip Applied to Facility: 1.139
Total Evap From Facility: 0.257
Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0088	0.0000	0.0000	0.0000
0.0330	0.0087	0.0000	0.0000	0.0000
0.0659	0.0085	0.0001	0.0000	0.0000
0.0989	0.0084	0.0001	0.0000	0.0000
0.1319	0.0082	0.0001	0.0000	0.0000
0.1648	0.0080	0.0002	0.0000	0.0001
0.1978	0.0078	0.0002	0.0000	0.0001
0.2308	0.0077	0.0003	0.0000	0.0002
0.2637	0.0075	0.0003	0.0000	0.0003
0.2967	0.0073	0.0003	0.0000	0.0004
0.3297	0.0072	0.0004	0.0000	0.0005
0.3626	0.0070	0.0004	0.0000	0.0006
0.3956	0.0068	0.0005	0.0000	0.0008
0.4286	0.0067	0.0005	0.0000	0.0010
0.4615	0.0065	0.0006	0.0000	0.0013
0.4945	0.0064	0.0006	0.0000	0.0016
0.5275	0.0062	0.0007	0.0000	0.0019
0.5604	0.0061	0.0008	0.0000	0.0023
0.5934	0.0059	0.0008	0.0000	0.0027
0.6264	0.0058	0.0009	0.0000	0.0032
0.6593	0.0056	0.0009	0.0000	0.0037
0.6923	0.0055	0.0010	0.0000	0.0043
0.7253	0.0053	0.0011	0.0000	0.0050
0.7582	0.0052	0.0011	0.0000	0.0057
0.7912	0.0050	0.0012	0.0000	0.0065

0.8242	0.0049	0.0013	0.0000	0.0074
0.8571	0.0048	0.0013	0.0000	0.0084
0.8901	0.0046	0.0014	0.0000	0.0095
0.9231	0.0045	0.0015	0.0000	0.0106
0.9560	0.0044	0.0016	0.0000	0.0119
0.9890	0.0042	0.0017	0.0000	0.0133
1.0220	0.0041	0.0017	0.0000	0.0147
1.0549	0.0040	0.0018	0.0000	0.0163
1.0879	0.0039	0.0019	0.0000	0.0181
1.1209	0.0037	0.0020	0.0000	0.0199
1.1538	0.0036	0.0021	0.0000	0.0219
1.1868	0.0035	0.0022	0.0000	0.0241
1.2198	0.0034	0.0023	0.0000	0.0264
1.2527	0.0033	0.0024	0.0000	0.0288
1.2857	0.0032	0.0025	0.0000	0.0314
1.3187	0.0030	0.0026	0.0000	0.0342
1.3516	0.0029	0.0027	0.0000	0.0371
1.3846	0.0028	0.0028	0.0000	0.0403
1.4176	0.0027	0.0029	0.0000	0.0436
1.4505	0.0026	0.0030	0.0000	0.0471
1.4835	0.0025	0.0031	0.0000	0.0508
1.5000	0.0024	0.0032	0.0000	0.0889

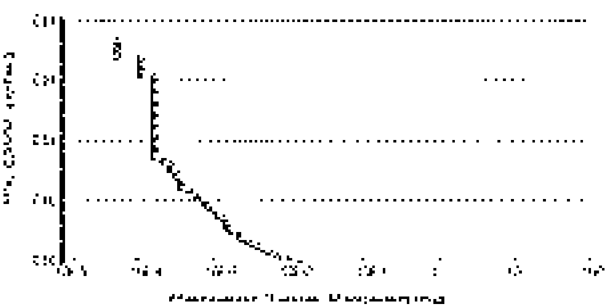
Bioretention Hydraulic Table

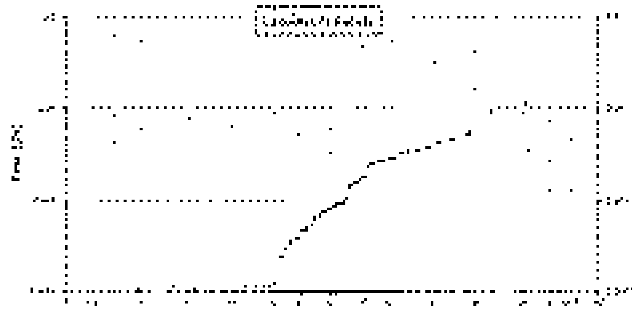
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0088	0.0032	0.0000	0.0146	0.0018
1.5330	0.0090	0.0035	0.0000	0.0146	0.0037
1.5659	0.0092	0.0038	0.0000	0.0152	0.0056
1.5989	0.0094	0.0041	0.0000	0.0155	0.0075
1.6319	0.0096	0.0044	0.0000	0.0159	0.0094
1.6648	0.0097	0.0047	0.0000	0.0162	0.0113
1.6978	0.0099	0.0050	0.0000	0.0165	0.0133
1.7308	0.0101	0.0054	0.0000	0.0168	0.0152
1.7637	0.0103	0.0057	0.0000	0.0171	0.0172
1.7967	0.0105	0.0061	0.0000	0.0175	0.0192
1.8297	0.0107	0.0064	0.0000	0.0178	0.0212
1.8626	0.0109	0.0068	0.0000	0.0181	0.0233
1.8956	0.0111	0.0071	0.0000	0.0184	0.0253
1.9286	0.0113	0.0075	0.0000	0.0188	0.0274
1.9615	0.0115	0.0079	0.0000	0.0191	0.0295
1.9945	0.0117	0.0083	0.0000	0.0194	0.0316
2.0275	0.0120	0.0087	0.0000	0.0197	0.0338
2.0604	0.0122	0.0090	0.0000	0.0200	0.0359
2.0934	0.0124	0.0095	0.0000	0.0204	0.0381
2.1264	0.0126	0.0099	0.0000	0.0207	0.0403
2.1593	0.0128	0.0103	0.0000	0.0210	0.0425
2.1923	0.0130	0.0107	0.0000	0.0213	0.0447
2.2253	0.0132	0.0111	0.0000	0.0216	0.0469
2.2582	0.0135	0.0116	0.0000	0.0220	0.0492
2.2912	0.0137	0.0120	0.0000	0.0223	0.0514
2.3242	0.0139	0.0125	0.0000	0.0226	0.0537
2.3571	0.0141	0.0129	0.0000	0.0229	0.0561
2.3901	0.0144	0.0134	0.0000	0.0232	0.0584
2.4231	0.0146	0.0139	0.0000	0.0236	0.0607
2.4560	0.0148	0.0144	0.0000	0.0239	0.0631
2.4890	0.0151	0.0149	0.0000	0.0242	0.0655
2.5220	0.0153	0.0154	0.0519	0.0243	0.0679
2.5549	0.0155	0.0159	0.2049	0.0243	0.0703

2.5879	0.0158	0.0164	0.4142	0.0243	0.0727
2.6209	0.0160	0.0169	0.6666	0.0243	0.0752
2.6538	0.0163	0.0175	0.9542	0.0243	0.0777
2.6868	0.0165	0.0180	1.2709	0.0243	0.0802
2.7198	0.0168	0.0185	1.6110	0.0243	0.0827
2.7527	0.0170	0.0191	1.9688	0.0243	0.0852
2.7857	0.0173	0.0197	2.3387	0.0243	0.0878
2.8187	0.0175	0.0202	2.7149	0.0243	0.0903
2.8516	0.0178	0.0208	3.0914	0.0243	0.0929
2.8846	0.0180	0.0214	3.4625	0.0243	0.0955
2.9176	0.0183	0.0220	3.8224	0.0243	0.0981
2.9505	0.0185	0.0226	4.1657	0.0243	0.1008
2.9835	0.0188	0.0232	4.4876	0.0243	0.1021
3.0000	0.0189	0.0235	4.7838	0.0243	0.0000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.14
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.03
Total Impervious Area: 0.11

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.000766
5 year	0.002371
10 year	0.00428
25 year	0.008033
50 year	0.012064
100 year	0.017394

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.001	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.003	0.000
1961	0.003	0.000
1962	0.000	0.000
1963	0.004	0.000
1964	0.002	0.000
1965	0.003	0.000

1966	0.001	0.000
1967	0.001	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.000	0.000
1971	0.001	0.000
1972	0.002	0.000
1973	0.000	0.000
1974	0.002	0.000
1975	0.001	0.000
1976	0.001	0.000
1977	0.000	0.000
1978	0.001	0.000
1979	0.000	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.001	0.000
1983	0.000	0.000
1984	0.002	0.000
1985	0.000	0.000
1986	0.002	0.000
1987	0.009	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.005	0.000
1991	0.005	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.003	0.000
1997	0.003	0.000
1998	0.000	0.000
1999	0.003	0.000
2000	0.000	0.000
2001	0.000	0.000
2002	0.001	0.000
2003	0.000	0.000
2004	0.004	0.000
2005	0.000	0.000
2006	0.011	0.000
2007	0.003	0.000
2008	0.000	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0111	0.0000
2	0.0094	0.0000
3	0.0054	0.0000
4	0.0047	0.0000
5	0.0043	0.0000
6	0.0038	0.0000
7	0.0035	0.0000
8	0.0034	0.0000
9	0.0033	0.0000
10	0.0030	0.0000
11	0.0029	0.0000

12	0.0028	0.0000
13	0.0027	0.0000
14	0.0025	0.0000
15	0.0023	0.0000
16	0.0018	0.0000
17	0.0017	0.0000
18	0.0016	0.0000
19	0.0015	0.0000
20	0.0014	0.0000
21	0.0010	0.0000
22	0.0009	0.0000
23	0.0009	0.0000
24	0.0009	0.0000
25	0.0009	0.0000
26	0.0009	0.0000
27	0.0008	0.0000
28	0.0008	0.0000
29	0.0007	0.0000
30	0.0007	0.0000
31	0.0007	0.0000
32	0.0006	0.0000
33	0.0006	0.0000
34	0.0005	0.0000
35	0.0005	0.0000
36	0.0005	0.0000
37	0.0004	0.0000
38	0.0004	0.0000
39	0.0003	0.0000
40	0.0003	0.0000
41	0.0002	0.0000
42	0.0001	0.0000
43	0.0001	0.0000
44	0.0001	0.0000
45	0.0001	0.0000
46	0.0001	0.0000
47	0.0001	0.0000
48	0.0001	0.0000
49	0.0001	0.0000
50	0.0001	0.0000
51	0.0001	0.0000
52	0.0001	0.0000
53	0.0001	0.0000

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	263	0	0	Pass
0.0005	194	0	0	Pass
0.0006	149	0	0	Pass
0.0007	121	0	0	Pass
0.0009	99	0	0	Pass
0.0010	84	0	0	Pass
0.0011	75	0	0	Pass
0.0012	62	0	0	Pass
0.0013	54	0	0	Pass
0.0014	47	0	0	Pass
0.0016	42	0	0	Pass
0.0017	40	0	0	Pass
0.0018	33	0	0	Pass
0.0019	31	0	0	Pass
0.0020	28	0	0	Pass
0.0022	27	0	0	Pass
0.0023	27	0	0	Pass
0.0024	26	0	0	Pass
0.0025	24	0	0	Pass
0.0026	21	0	0	Pass
0.0027	21	0	0	Pass
0.0029	19	0	0	Pass
0.0030	16	0	0	Pass
0.0031	15	0	0	Pass
0.0032	15	0	0	Pass
0.0033	14	0	0	Pass
0.0035	13	0	0	Pass
0.0036	11	0	0	Pass
0.0037	11	0	0	Pass
0.0038	9	0	0	Pass
0.0039	7	0	0	Pass
0.0040	7	0	0	Pass
0.0042	7	0	0	Pass
0.0043	7	0	0	Pass
0.0044	6	0	0	Pass
0.0045	6	0	0	Pass
0.0046	6	0	0	Pass
0.0047	5	0	0	Pass
0.0049	5	0	0	Pass
0.0050	5	0	0	Pass
0.0051	5	0	0	Pass
0.0052	4	0	0	Pass
0.0053	4	0	0	Pass
0.0055	3	0	0	Pass
0.0056	3	0	0	Pass
0.0057	3	0	0	Pass
0.0058	3	0	0	Pass
0.0059	3	0	0	Pass
0.0060	3	0	0	Pass
0.0062	3	0	0	Pass
0.0063	3	0	0	Pass
0.0064	3	0	0	Pass
0.0065	3	0	0	Pass

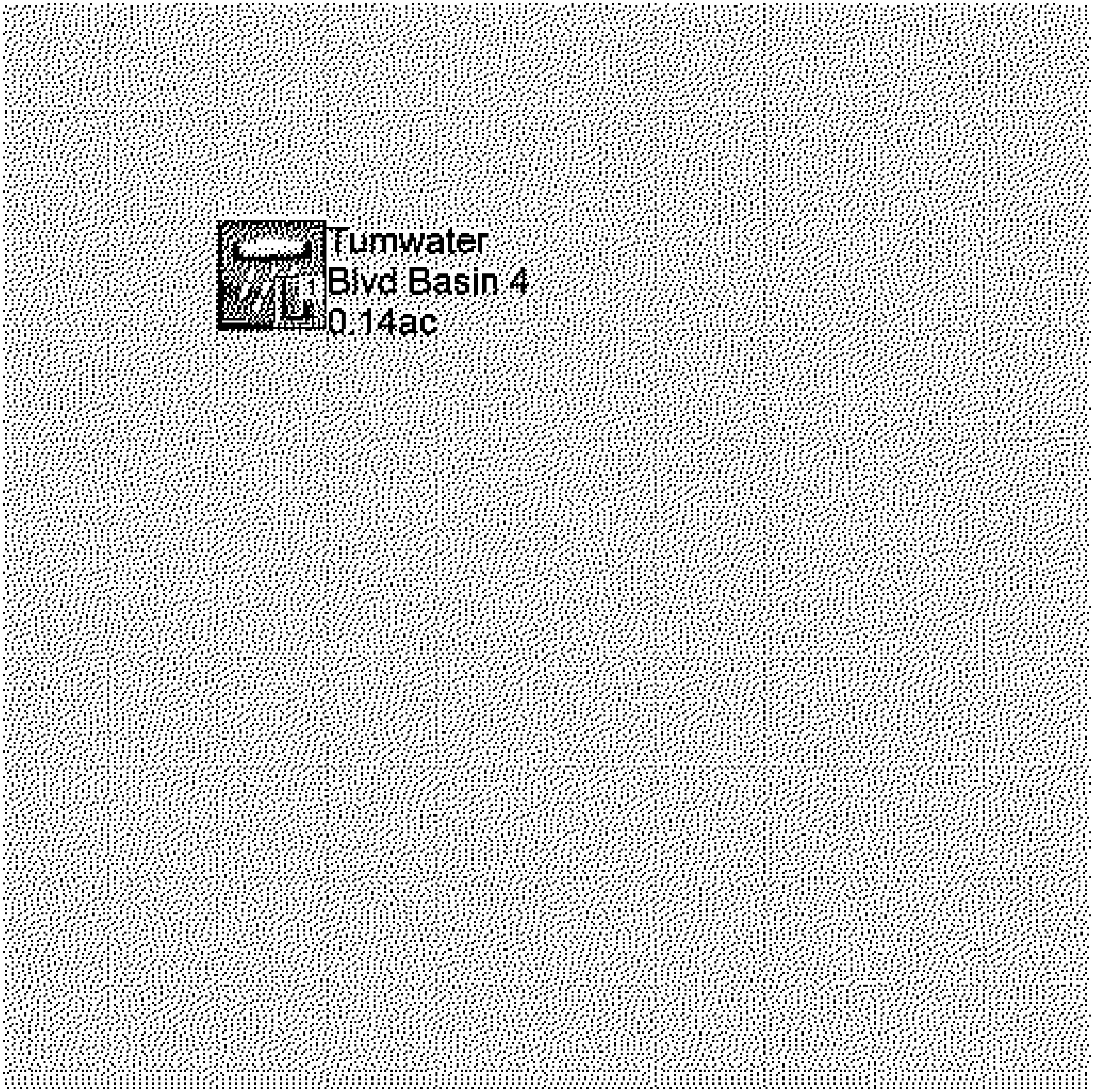
0.0066	3	0	0	Pass
0.0068	3	0	0	Pass
0.0069	3	0	0	Pass
0.0070	3	0	0	Pass
0.0071	3	0	0	Pass
0.0072	3	0	0	Pass
0.0073	3	0	0	Pass
0.0075	3	0	0	Pass
0.0076	3	0	0	Pass
0.0077	3	0	0	Pass
0.0078	3	0	0	Pass
0.0079	3	0	0	Pass
0.0081	3	0	0	Pass
0.0082	3	0	0	Pass
0.0083	3	0	0	Pass
0.0084	3	0	0	Pass
0.0085	3	0	0	Pass
0.0086	3	0	0	Pass
0.0088	3	0	0	Pass
0.0089	3	0	0	Pass
0.0090	3	0	0	Pass
0.0091	3	0	0	Pass
0.0092	3	0	0	Pass
0.0094	3	0	0	Pass
0.0095	2	0	0	Pass
0.0096	2	0	0	Pass
0.0097	2	0	0	Pass
0.0098	2	0	0	Pass
0.0099	2	0	0	Pass
0.0101	2	0	0	Pass
0.0102	2	0	0	Pass
0.0103	2	0	0	Pass
0.0104	1	0	0	Pass
0.0105	1	0	0	Pass
0.0106	1	0	0	Pass
0.0108	1	0	0	Pass
0.0109	1	0	0	Pass
0.0110	1	0	0	Pass
0.0111	1	0	0	Pass
0.0112	0	0	0	Pass
0.0114	0	0	0	Pass
0.0115	0	0	0	Pass
0.0116	0	0	0	Pass
0.0117	0	0	0	Pass
0.0118	0	0	0	Pass
0.0119	0	0	0	Pass
0.0121	0	0	0	Pass

LID Report

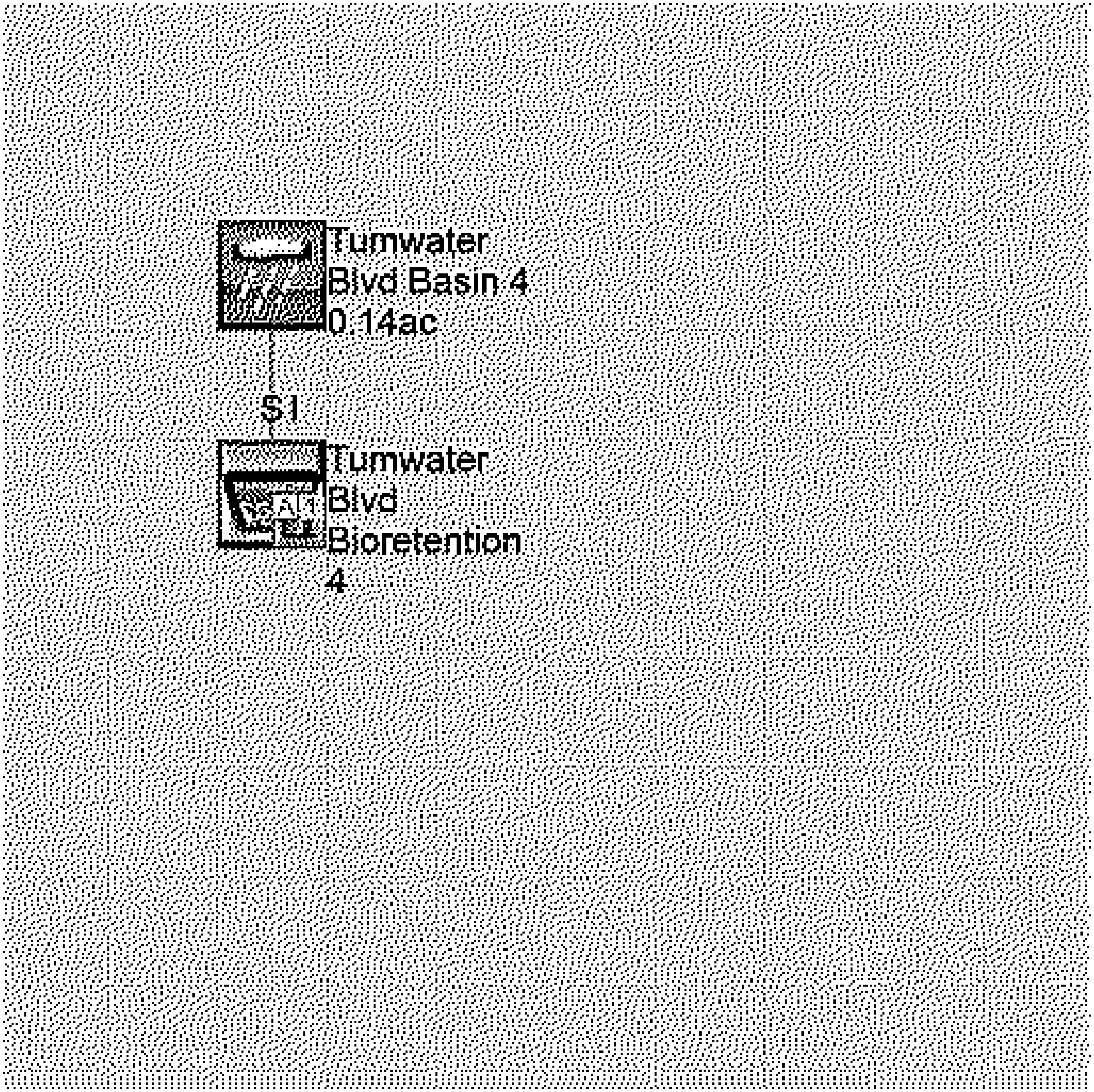
LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Detention 4 POC	☐	72.48			☐	100.00			
Total Volume Infiltrated		72.48	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

DRAFT

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

TUMWATER BLVD

BASIN 5

General Model Information

Project Name:	C22-169 Yorkshire_TumwaterBlvdBasin5
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tumwater Blvd Basin 5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.22
Pervious Total	0.22
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.22

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tumwater Blvd Basin 5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.07
Pervious Total	0.07
Impervious Land Use	acre
ROADS FLAT	0.15
Impervious Total	0.15
Basin Total	0.22

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 5	Surface oretention 5	

Mitigated Routing

Tumwater Blvd Bioretention 5

Bottom Length:	34.00 ft.
Bottom Width:	14.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	34.177
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	34.177
Percent Infiltrated:	100
Total Precip Applied to Facility:	2.411
Total Evap From Facility:	0.785

Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0227	0.0000	0.0000	0.0000
0.0330	0.0226	0.0001	0.0000	0.0000
0.0659	0.0223	0.0003	0.0000	0.0000
0.0989	0.0220	0.0004	0.0000	0.0000
0.1319	0.0217	0.0006	0.0000	0.0000
0.1648	0.0214	0.0008	0.0000	0.0003
0.1978	0.0211	0.0009	0.0000	0.0005
0.2308	0.0208	0.0011	0.0000	0.0007
0.2637	0.0205	0.0013	0.0000	0.0010
0.2967	0.0202	0.0014	0.0000	0.0014
0.3297	0.0199	0.0016	0.0000	0.0019
0.3626	0.0197	0.0018	0.0000	0.0024
0.3956	0.0194	0.0020	0.0000	0.0030
0.4286	0.0191	0.0021	0.0000	0.0037
0.4615	0.0188	0.0023	0.0000	0.0046
0.4945	0.0185	0.0025	0.0000	0.0055
0.5275	0.0183	0.0027	0.0000	0.0066
0.5604	0.0180	0.0029	0.0000	0.0078
0.5934	0.0177	0.0031	0.0000	0.0091
0.6264	0.0175	0.0033	0.0000	0.0106
0.6593	0.0172	0.0035	0.0000	0.0122
0.6923	0.0169	0.0037	0.0000	0.0140
0.7253	0.0167	0.0039	0.0000	0.0160
0.7582	0.0164	0.0041	0.0000	0.0181
0.7912	0.0162	0.0044	0.0000	0.0204

0.8242	0.0159	0.0046	0.0000	0.0230
0.8571	0.0156	0.0048	0.0000	0.0257
0.8901	0.0154	0.0050	0.0000	0.0287
0.9231	0.0151	0.0053	0.0000	0.0319
0.9560	0.0149	0.0055	0.0000	0.0353
0.9890	0.0146	0.0057	0.0000	0.0390
1.0220	0.0144	0.0060	0.0000	0.0429
1.0549	0.0142	0.0062	0.0000	0.0471
1.0879	0.0139	0.0065	0.0000	0.0516
1.1209	0.0137	0.0067	0.0000	0.0564
1.1538	0.0134	0.0070	0.0000	0.0615
1.1868	0.0132	0.0073	0.0000	0.0669
1.2198	0.0130	0.0075	0.0000	0.0726
1.2527	0.0127	0.0078	0.0000	0.0787
1.2857	0.0125	0.0081	0.0000	0.0851
1.3187	0.0123	0.0083	0.0000	0.0919
1.3516	0.0120	0.0086	0.0000	0.0990
1.3846	0.0118	0.0089	0.0000	0.1066
1.4176	0.0116	0.0092	0.0000	0.1145
1.4505	0.0114	0.0095	0.0000	0.1228
1.4835	0.0111	0.0098	0.0000	0.1314
1.5000	0.0109	0.0099	0.0000	0.2289

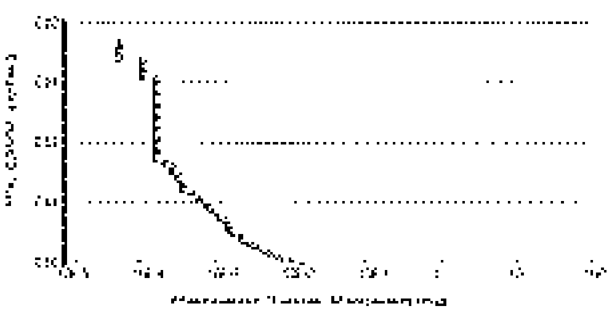
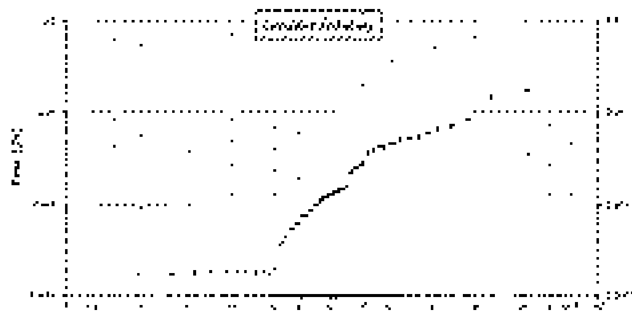
Bioretention Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0227	0.0099	0.0000	0.0661	0.0030
1.5330	0.0230	0.0107	0.0000	0.0661	0.0061
1.5659	0.0233	0.0115	0.0000	0.0690	0.0091
1.5989	0.0236	0.0122	0.0000	0.0705	0.0122
1.6319	0.0239	0.0130	0.0000	0.0719	0.0153
1.6648	0.0242	0.0138	0.0000	0.0734	0.0185
1.6978	0.0245	0.0146	0.0000	0.0748	0.0216
1.7308	0.0248	0.0154	0.0000	0.0763	0.0248
1.7637	0.0252	0.0163	0.0000	0.0777	0.0279
1.7967	0.0255	0.0171	0.0000	0.0792	0.0311
1.8297	0.0258	0.0179	0.0000	0.0806	0.0343
1.8626	0.0261	0.0188	0.0000	0.0821	0.0376
1.8956	0.0264	0.0197	0.0000	0.0835	0.0408
1.9286	0.0268	0.0205	0.0000	0.0850	0.0441
1.9615	0.0271	0.0214	0.0000	0.0865	0.0474
1.9945	0.0274	0.0223	0.0000	0.0879	0.0507
2.0275	0.0277	0.0232	0.0000	0.0894	0.0540
2.0604	0.0281	0.0241	0.0000	0.0908	0.0573
2.0934	0.0284	0.0251	0.0000	0.0923	0.0607
2.1264	0.0287	0.0260	0.0000	0.0937	0.0641
2.1593	0.0291	0.0270	0.0000	0.0952	0.0675
2.1923	0.0294	0.0279	0.0000	0.0966	0.0709
2.2253	0.0297	0.0289	0.0000	0.0981	0.0743
2.2582	0.0301	0.0299	0.0000	0.0995	0.0777
2.2912	0.0304	0.0309	0.0000	0.1010	0.0812
2.3242	0.0308	0.0319	0.0000	0.1024	0.0847
2.3571	0.0311	0.0329	0.0000	0.1039	0.0882
2.3901	0.0315	0.0339	0.0000	0.1053	0.0917
2.4231	0.0318	0.0350	0.0000	0.1068	0.0953
2.4560	0.0322	0.0360	0.0000	0.1082	0.0988
2.4890	0.0325	0.0371	0.0000	0.1097	0.1024
2.5220	0.0329	0.0382	0.0519	0.1102	0.1060
2.5549	0.0332	0.0393	0.2049	0.1102	0.1096

2.5879	0.0336	0.0404	0.4142	0.1102	0.1132
2.6209	0.0339	0.0415	0.6666	0.1102	0.1169
2.6538	0.0343	0.0426	0.9542	0.1102	0.1205
2.6868	0.0347	0.0437	1.2709	0.1102	0.1242
2.7198	0.0350	0.0449	1.6110	0.1102	0.1279
2.7527	0.0354	0.0461	1.9688	0.1102	0.1316
2.7857	0.0358	0.0472	2.3387	0.1102	0.1354
2.8187	0.0361	0.0484	2.7149	0.1102	0.1391
2.8516	0.0365	0.0496	3.0914	0.1102	0.1429
2.8846	0.0369	0.0508	3.4625	0.1102	0.1467
2.9176	0.0373	0.0520	3.8224	0.1102	0.1505
2.9505	0.0376	0.0533	4.1657	0.1102	0.1543
2.9835	0.0380	0.0545	4.4876	0.1102	0.1562
3.0000	0.0382	0.0552	4.7838	0.1102	0.0000

Analysis Results

POC 1

+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.22
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.07
Total Impervious Area: 0.15

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.001204
5 year	0.003726
10 year	0.006725
25 year	0.012623
50 year	0.018958
100 year	0.027334

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.002	0.000
1957	0.001	0.000
1958	0.001	0.000
1959	0.001	0.000
1960	0.005	0.000
1961	0.005	0.000
1962	0.000	0.000
1963	0.007	0.000
1964	0.004	0.000
1965	0.004	0.000

1966	0.002	0.000
1967	0.001	0.000
1968	0.001	0.000
1969	0.000	0.000
1970	0.001	0.000
1971	0.001	0.000
1972	0.004	0.000
1973	0.000	0.000
1974	0.003	0.000
1975	0.002	0.000
1976	0.001	0.000
1977	0.000	0.000
1978	0.001	0.000
1979	0.001	0.000
1980	0.001	0.000
1981	0.001	0.000
1982	0.001	0.000
1983	0.001	0.000
1984	0.003	0.000
1985	0.000	0.000
1986	0.002	0.000
1987	0.015	0.000
1988	0.000	0.000
1989	0.000	0.000
1990	0.008	0.000
1991	0.007	0.000
1992	0.000	0.000
1993	0.000	0.000
1994	0.000	0.000
1995	0.001	0.000
1996	0.004	0.000
1997	0.005	0.000
1998	0.001	0.000
1999	0.005	0.000
2000	0.001	0.000
2001	0.000	0.000
2002	0.001	0.000
2003	0.000	0.000
2004	0.006	0.000
2005	0.000	0.000
2006	0.017	0.000
2007	0.005	0.000
2008	0.000	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0175	0.0000
2	0.0148	0.0000
3	0.0085	0.0000
4	0.0074	0.0000
5	0.0068	0.0000
6	0.0060	0.0000
7	0.0055	0.0000
8	0.0054	0.0000
9	0.0052	0.0000
10	0.0046	0.0000
11	0.0046	0.0000

12	0.0043	0.0000
13	0.0043	0.0000
14	0.0039	0.0000
15	0.0036	0.0000
16	0.0028	0.0000
17	0.0027	0.0000
18	0.0025	0.0000
19	0.0023	0.0000
20	0.0022	0.0000
21	0.0016	0.0000
22	0.0015	0.0000
23	0.0015	0.0000
24	0.0014	0.0000
25	0.0014	0.0000
26	0.0013	0.0000
27	0.0013	0.0000
28	0.0013	0.0000
29	0.0012	0.0000
30	0.0012	0.0000
31	0.0011	0.0000
32	0.0010	0.0000
33	0.0010	0.0000
34	0.0009	0.0000
35	0.0008	0.0000
36	0.0007	0.0000
37	0.0006	0.0000
38	0.0006	0.0000
39	0.0005	0.0000
40	0.0004	0.0000
41	0.0004	0.0000
42	0.0002	0.0000
43	0.0002	0.0000
44	0.0002	0.0000
45	0.0002	0.0000
46	0.0002	0.0000
47	0.0002	0.0000
48	0.0002	0.0000
49	0.0002	0.0000
50	0.0002	0.0000
51	0.0002	0.0000
52	0.0002	0.0000
53	0.0002	0.0000

Duration Flows

The Facility PASSED

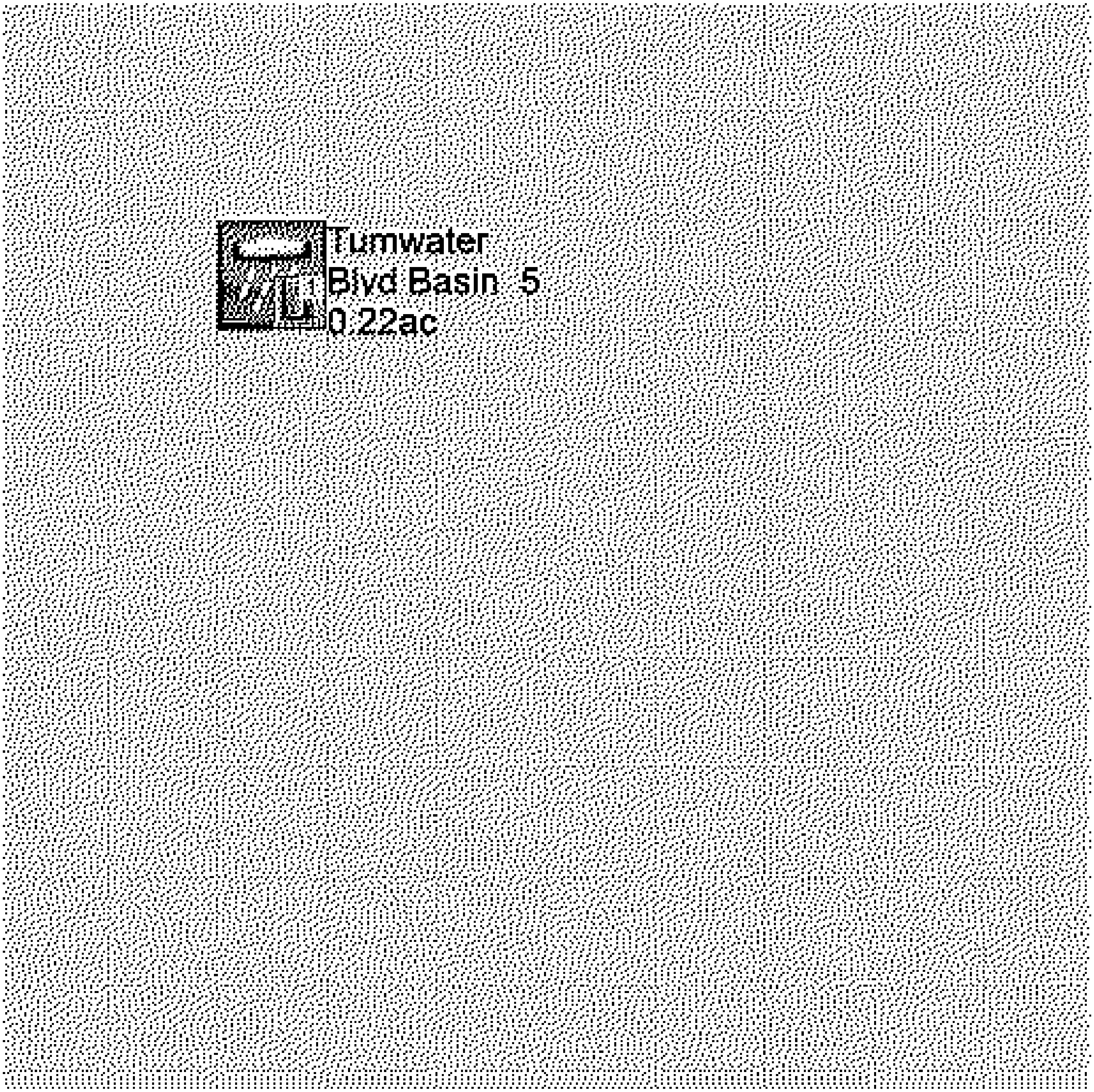
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0006	263	0	0	Pass
0.0008	194	0	0	Pass
0.0010	149	0	0	Pass
0.0012	121	0	0	Pass
0.0013	98	0	0	Pass
0.0015	84	0	0	Pass
0.0017	75	0	0	Pass
0.0019	62	0	0	Pass
0.0021	54	0	0	Pass
0.0023	47	0	0	Pass
0.0025	42	0	0	Pass
0.0026	40	0	0	Pass
0.0028	33	0	0	Pass
0.0030	31	0	0	Pass
0.0032	28	0	0	Pass
0.0034	27	0	0	Pass
0.0036	27	0	0	Pass
0.0038	26	0	0	Pass
0.0039	24	0	0	Pass
0.0041	21	0	0	Pass
0.0043	21	0	0	Pass
0.0045	19	0	0	Pass
0.0047	16	0	0	Pass
0.0049	15	0	0	Pass
0.0051	15	0	0	Pass
0.0052	14	0	0	Pass
0.0054	13	0	0	Pass
0.0056	11	0	0	Pass
0.0058	11	0	0	Pass
0.0060	9	0	0	Pass
0.0062	7	0	0	Pass
0.0063	7	0	0	Pass
0.0065	7	0	0	Pass
0.0067	7	0	0	Pass
0.0069	6	0	0	Pass
0.0071	6	0	0	Pass
0.0073	6	0	0	Pass
0.0075	5	0	0	Pass
0.0076	5	0	0	Pass
0.0078	5	0	0	Pass
0.0080	5	0	0	Pass
0.0082	4	0	0	Pass
0.0084	4	0	0	Pass
0.0086	3	0	0	Pass
0.0088	3	0	0	Pass
0.0089	3	0	0	Pass
0.0091	3	0	0	Pass
0.0093	3	0	0	Pass
0.0095	3	0	0	Pass
0.0097	3	0	0	Pass
0.0099	3	0	0	Pass
0.0101	3	0	0	Pass
0.0102	3	0	0	Pass

0.0104	3	0	0	Pass
0.0106	3	0	0	Pass
0.0108	3	0	0	Pass
0.0110	3	0	0	Pass
0.0112	3	0	0	Pass
0.0114	3	0	0	Pass
0.0115	3	0	0	Pass
0.0117	3	0	0	Pass
0.0119	3	0	0	Pass
0.0121	3	0	0	Pass
0.0123	3	0	0	Pass
0.0125	3	0	0	Pass
0.0127	3	0	0	Pass
0.0128	3	0	0	Pass
0.0130	3	0	0	Pass
0.0132	3	0	0	Pass
0.0134	3	0	0	Pass
0.0136	3	0	0	Pass
0.0138	3	0	0	Pass
0.0140	3	0	0	Pass
0.0141	3	0	0	Pass
0.0143	3	0	0	Pass
0.0145	3	0	0	Pass
0.0147	3	0	0	Pass
0.0149	2	0	0	Pass
0.0151	2	0	0	Pass
0.0152	2	0	0	Pass
0.0154	2	0	0	Pass
0.0156	2	0	0	Pass
0.0158	2	0	0	Pass
0.0160	2	0	0	Pass
0.0162	2	0	0	Pass
0.0164	1	0	0	Pass
0.0165	1	0	0	Pass
0.0167	1	0	0	Pass
0.0169	1	0	0	Pass
0.0171	1	0	0	Pass
0.0173	1	0	0	Pass
0.0175	1	0	0	Pass
0.0177	0	0	0	Pass
0.0178	0	0	0	Pass
0.0180	0	0	0	Pass
0.0182	0	0	0	Pass
0.0184	0	0	0	Pass
0.0186	0	0	0	Pass
0.0188	0	0	0	Pass
0.0190	0	0	0	Pass

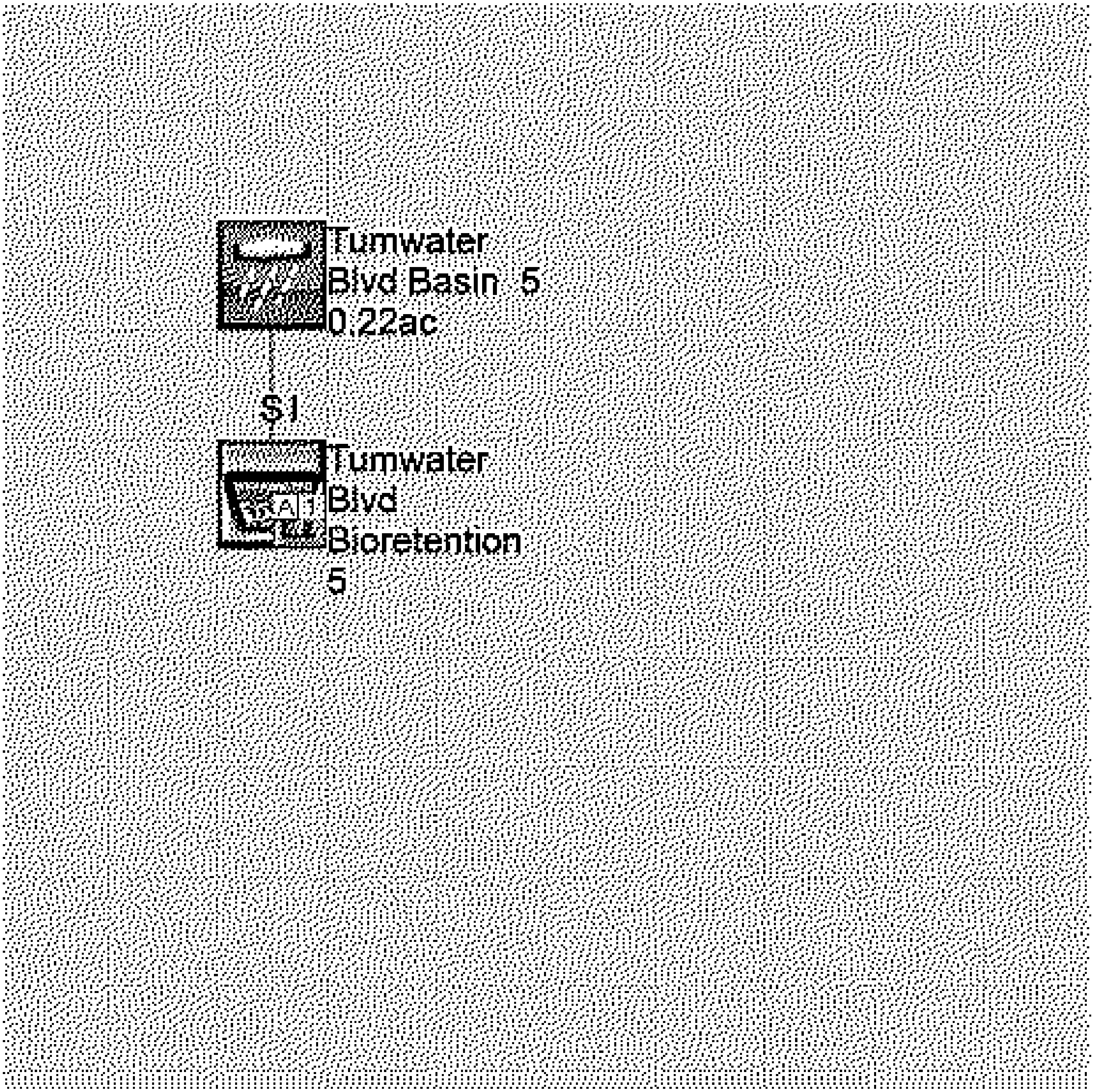
LID Report

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
[illegible] 5 ROC	☐	31.19			☐	100.00			
Total Volume Infiltrated		31.19	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic



Mitigated Schematic



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WWHM2012

PROJECT REPORT

TUMWATER BLVD

BASIN 6

General Model Information

Project Name:	C22-169 Yorkshire_TumwaterBlvdBasin6
Site Name:	C22-169 Yorkshire
Site Address:	
City:	Tumwater
Report Date:	11/28/2022
Gage:	Olympia Airport
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.111
Version Date:	2021/08/18
Version:	4.2.18

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

Tumwater Blvd Basin 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	1.19
Pervious Total	1.19
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.19

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Tumwater Blvd Basin 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.32
Pervious Total	0.32
Impervious Land Use	acre
ROADS FLAT	0.87
Impervious Total	0.87
Basin Total	1.19

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 6	Surface oretention 6	

Mitigated Routing

Tumwater Blvd Bioretention 6

Bottom Length:	87.00 ft.
Bottom Width:	16.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW
Material thickness of second layer:	0
Material type for second layer:	Sand
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.):	194.525
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	194.525
Percent Infiltrated:	100
Total Precip Applied to Facility:	8.328
Total Evap From Facility:	2.375

Underdrain not used
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 18 in.
Element Flows To:
Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0551	0.0000	0.0000	0.0000
0.0330	0.0548	0.0004	0.0000	0.0000
0.0659	0.0543	0.0009	0.0000	0.0000
0.0989	0.0537	0.0013	0.0000	0.0000
0.1319	0.0532	0.0017	0.0000	0.0001
0.1648	0.0526	0.0022	0.0000	0.0009
0.1978	0.0521	0.0027	0.0000	0.0014
0.2308	0.0516	0.0031	0.0000	0.0021
0.2637	0.0510	0.0036	0.0000	0.0029
0.2967	0.0505	0.0041	0.0000	0.0039
0.3297	0.0500	0.0045	0.0000	0.0052
0.3626	0.0494	0.0050	0.0000	0.0066
0.3956	0.0489	0.0055	0.0000	0.0083
0.4286	0.0484	0.0060	0.0000	0.0103
0.4615	0.0478	0.0065	0.0000	0.0125
0.4945	0.0473	0.0071	0.0000	0.0150
0.5275	0.0468	0.0076	0.0000	0.0178
0.5604	0.0463	0.0081	0.0000	0.0210
0.5934	0.0458	0.0086	0.0000	0.0244
0.6264	0.0452	0.0092	0.0000	0.0283
0.6593	0.0447	0.0097	0.0000	0.0325
0.6923	0.0442	0.0103	0.0000	0.0371
0.7253	0.0437	0.0108	0.0000	0.0422
0.7582	0.0432	0.0114	0.0000	0.0477
0.7912	0.0427	0.0120	0.0000	0.0536

0.8242	0.0422	0.0126	0.0000	0.0600
0.8571	0.0417	0.0132	0.0000	0.0669
0.8901	0.0412	0.0138	0.0000	0.0743
0.9231	0.0407	0.0144	0.0000	0.0823
0.9560	0.0402	0.0150	0.0000	0.0908
0.9890	0.0397	0.0156	0.0000	0.0999
1.0220	0.0392	0.0162	0.0000	0.1095
1.0549	0.0387	0.0168	0.0000	0.1198
1.0879	0.0382	0.0175	0.0000	0.1308
1.1209	0.0377	0.0181	0.0000	0.1424
1.1538	0.0372	0.0188	0.0000	0.1547
1.1868	0.0367	0.0194	0.0000	0.1677
1.2198	0.0362	0.0201	0.0000	0.1814
1.2527	0.0358	0.0208	0.0000	0.1958
1.2857	0.0353	0.0214	0.0000	0.2111
1.3187	0.0348	0.0221	0.0000	0.2271
1.3516	0.0343	0.0228	0.0000	0.2439
1.3846	0.0338	0.0235	0.0000	0.2616
1.4176	0.0334	0.0242	0.0000	0.2801
1.4505	0.0329	0.0249	0.0000	0.2994
1.4835	0.0324	0.0257	0.0000	0.3194
1.5000	0.0320	0.0260	0.0000	0.5556

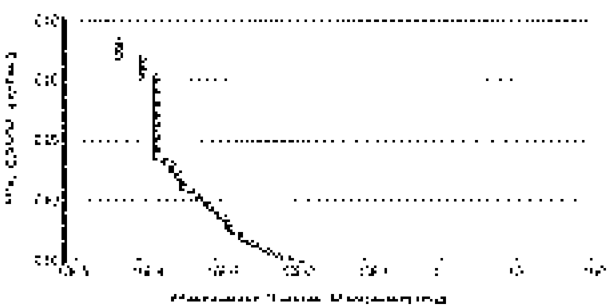
Bioretention Hydraulic Table

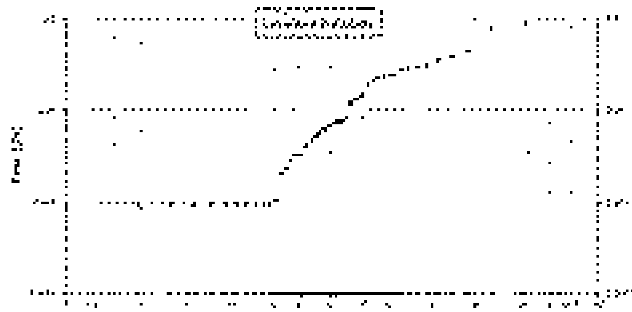
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
1.5000	0.0551	0.0260	0.0000	0.1933	0.0055
1.5330	0.0556	0.0279	0.0000	0.1933	0.0111
1.5659	0.0562	0.0297	0.0000	0.2018	0.0167
1.5989	0.0568	0.0316	0.0000	0.2061	0.0223
1.6319	0.0573	0.0334	0.0000	0.2103	0.0279
1.6648	0.0579	0.0353	0.0000	0.2146	0.0336
1.6978	0.0584	0.0373	0.0000	0.2188	0.0392
1.7308	0.0590	0.0392	0.0000	0.2231	0.0449
1.7637	0.0595	0.0411	0.0000	0.2273	0.0506
1.7967	0.0601	0.0431	0.0000	0.2316	0.0563
1.8297	0.0607	0.0451	0.0000	0.2358	0.0620
1.8626	0.0612	0.0471	0.0000	0.2401	0.0678
1.8956	0.0618	0.0491	0.0000	0.2443	0.0736
1.9286	0.0624	0.0512	0.0000	0.2486	0.0793
1.9615	0.0630	0.0533	0.0000	0.2528	0.0851
1.9945	0.0635	0.0553	0.0000	0.2571	0.0910
2.0275	0.0641	0.0574	0.0000	0.2613	0.0968
2.0604	0.0647	0.0596	0.0000	0.2656	0.1027
2.0934	0.0653	0.0617	0.0000	0.2698	0.1085
2.1264	0.0659	0.0639	0.0000	0.2741	0.1144
2.1593	0.0664	0.0661	0.0000	0.2783	0.1203
2.1923	0.0670	0.0683	0.0000	0.2826	0.1263
2.2253	0.0676	0.0705	0.0000	0.2868	0.1322
2.2582	0.0682	0.0727	0.0000	0.2911	0.1382
2.2912	0.0688	0.0750	0.0000	0.2953	0.1442
2.3242	0.0694	0.0773	0.0000	0.2996	0.1502
2.3571	0.0700	0.0795	0.0000	0.3038	0.1562
2.3901	0.0706	0.0819	0.0000	0.3081	0.1622
2.4231	0.0712	0.0842	0.0000	0.3123	0.1683
2.4560	0.0718	0.0866	0.0000	0.3166	0.1744
2.4890	0.0724	0.0889	0.0000	0.3208	0.1805
2.5220	0.0730	0.0913	0.0519	0.3222	0.1866
2.5549	0.0736	0.0937	0.2049	0.3222	0.1927

2.5879	0.0742	0.0962	0.4142	0.3222	0.1988
2.6209	0.0748	0.0986	0.6666	0.3222	0.2050
2.6538	0.0754	0.1011	0.9542	0.3222	0.2112
2.6868	0.0760	0.1036	1.2709	0.3222	0.2174
2.7198	0.0767	0.1061	1.6110	0.3222	0.2236
2.7527	0.0773	0.1087	1.9688	0.3222	0.2298
2.7857	0.0779	0.1112	2.3387	0.3222	0.2361
2.8187	0.0785	0.1138	2.7149	0.3222	0.2424
2.8516	0.0791	0.1164	3.0914	0.3222	0.2487
2.8846	0.0798	0.1190	3.4625	0.3222	0.2550
2.9176	0.0804	0.1217	3.8224	0.3222	0.2613
2.9505	0.0810	0.1243	4.1657	0.3222	0.2677
2.9835	0.0816	0.1270	4.4876	0.3222	0.2708
3.0000	0.0820	0.1284	4.7838	0.3222	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.19
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.32
Total Impervious Area: 0.87

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.006513
5 year	0.020155
10 year	0.036376
25 year	0.068277
50 year	0.102548
100 year	0.147851

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.013	0.000
1957	0.007	0.000
1958	0.005	0.000
1959	0.005	0.000
1960	0.028	0.000
1961	0.025	0.000
1962	0.001	0.000
1963	0.037	0.000
1964	0.021	0.000
1965	0.023	0.000

1966	0.012	0.000
1967	0.008	0.000
1968	0.005	0.000
1969	0.001	0.000
1970	0.004	0.000
1971	0.008	0.000
1972	0.020	0.000
1973	0.001	0.000
1974	0.014	0.000
1975	0.009	0.000
1976	0.008	0.000
1977	0.001	0.000
1978	0.007	0.000
1979	0.003	0.000
1980	0.006	0.000
1981	0.008	0.000
1982	0.006	0.000
1983	0.003	0.000
1984	0.015	0.000
1985	0.001	0.000
1986	0.014	0.000
1987	0.080	0.000
1988	0.001	0.000
1989	0.001	0.000
1990	0.046	0.000
1991	0.040	0.000
1992	0.001	0.000
1993	0.002	0.000
1994	0.001	0.000
1995	0.006	0.000
1996	0.024	0.000
1997	0.025	0.000
1998	0.004	0.000
1999	0.029	0.000
2000	0.003	0.000
2001	0.001	0.000
2002	0.007	0.000
2003	0.001	0.000
2004	0.032	0.000
2005	0.001	0.000
2006	0.095	0.000
2007	0.030	0.000
2008	0.002	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.0946	0.0000
2	0.0799	0.0000
3	0.0459	0.0000
4	0.0399	0.0000
5	0.0367	0.0000
6	0.0322	0.0000
7	0.0297	0.0000
8	0.0290	0.0000
9	0.0279	0.0000
10	0.0251	0.0000
11	0.0248	0.0000

12	0.0235	0.0000
13	0.0233	0.0000
14	0.0211	0.0000
15	0.0196	0.0000
16	0.0153	0.0000
17	0.0144	0.0000
18	0.0135	0.0000
19	0.0126	0.0000
20	0.0119	0.0000
21	0.0085	0.0000
22	0.0079	0.0000
23	0.0079	0.0000
24	0.0077	0.0000
25	0.0075	0.0000
26	0.0073	0.0000
27	0.0069	0.0000
28	0.0068	0.0000
29	0.0063	0.0000
30	0.0063	0.0000
31	0.0060	0.0000
32	0.0054	0.0000
33	0.0053	0.0000
34	0.0047	0.0000
35	0.0041	0.0000
36	0.0040	0.0000
37	0.0034	0.0000
38	0.0033	0.0000
39	0.0029	0.0000
40	0.0024	0.0000
41	0.0020	0.0000
42	0.0011	0.0000
43	0.0010	0.0000
44	0.0010	0.0000
45	0.0010	0.0000
46	0.0010	0.0000
47	0.0010	0.0000
48	0.0010	0.0000
49	0.0009	0.0000
50	0.0009	0.0000
51	0.0009	0.0000
52	0.0009	0.0000
53	0.0009	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0033	263	0	0	Pass
0.0043	194	0	0	Pass
0.0053	149	0	0	Pass
0.0063	121	0	0	Pass
0.0073	98	0	0	Pass
0.0083	84	0	0	Pass
0.0093	75	0	0	Pass
0.0103	62	0	0	Pass
0.0113	54	0	0	Pass
0.0123	47	0	0	Pass
0.0133	42	0	0	Pass
0.0143	40	0	0	Pass
0.0153	33	0	0	Pass
0.0163	31	0	0	Pass
0.0173	28	0	0	Pass
0.0183	27	0	0	Pass
0.0193	27	0	0	Pass
0.0203	26	0	0	Pass
0.0213	24	0	0	Pass
0.0223	21	0	0	Pass
0.0233	21	0	0	Pass
0.0243	19	0	0	Pass
0.0253	16	0	0	Pass
0.0263	15	0	0	Pass
0.0273	15	0	0	Pass
0.0283	14	0	0	Pass
0.0293	13	0	0	Pass
0.0303	11	0	0	Pass
0.0313	11	0	0	Pass
0.0323	9	0	0	Pass
0.0333	7	0	0	Pass
0.0343	7	0	0	Pass
0.0354	7	0	0	Pass
0.0364	7	0	0	Pass
0.0374	6	0	0	Pass
0.0384	6	0	0	Pass
0.0394	6	0	0	Pass
0.0404	5	0	0	Pass
0.0414	5	0	0	Pass
0.0424	5	0	0	Pass
0.0434	5	0	0	Pass
0.0444	4	0	0	Pass
0.0454	4	0	0	Pass
0.0464	3	0	0	Pass
0.0474	3	0	0	Pass
0.0484	3	0	0	Pass
0.0494	3	0	0	Pass
0.0504	3	0	0	Pass
0.0514	3	0	0	Pass
0.0524	3	0	0	Pass
0.0534	3	0	0	Pass
0.0544	3	0	0	Pass
0.0554	3	0	0	Pass

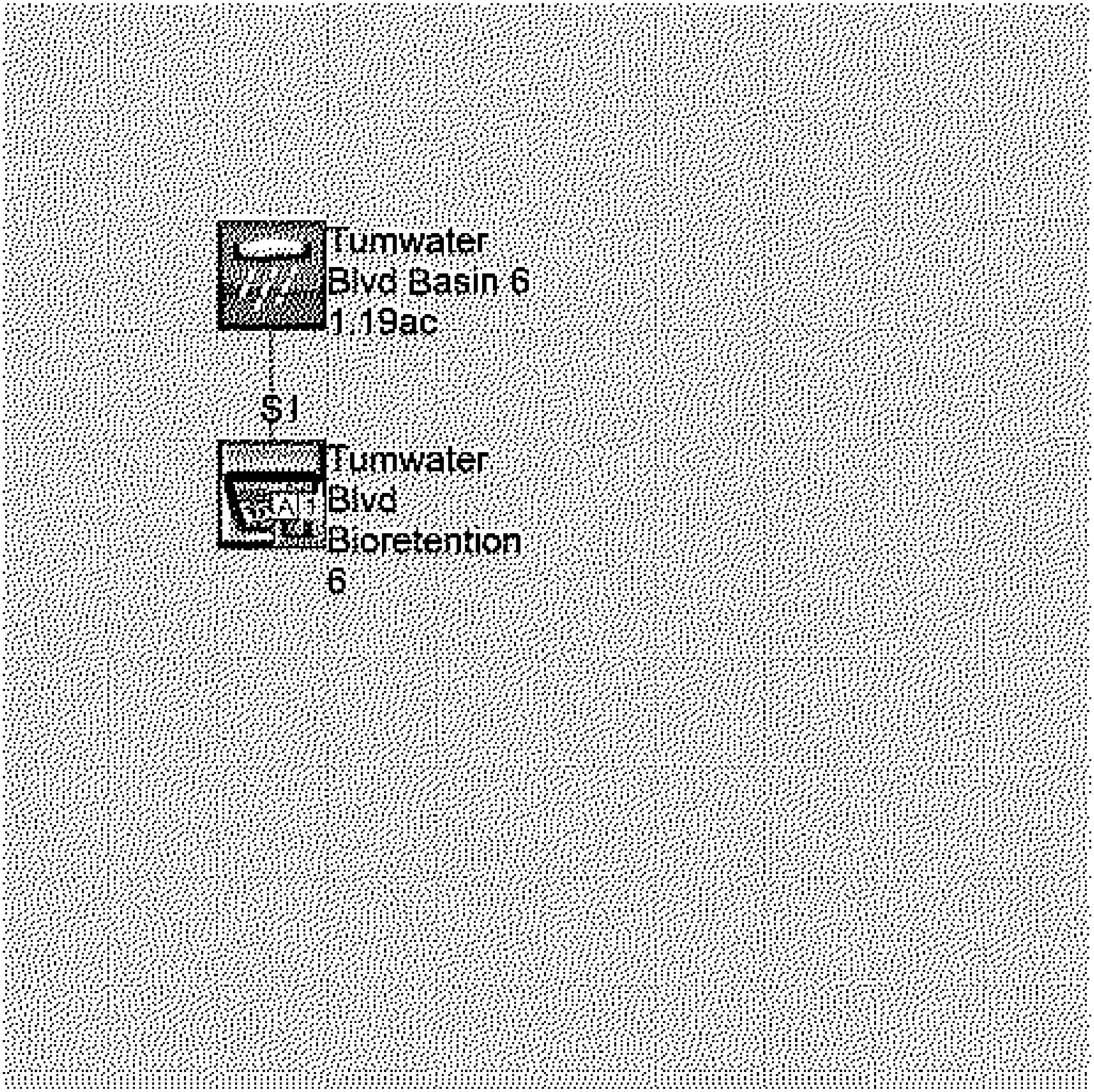
0.0564	3	0	0	Pass
0.0574	3	0	0	Pass
0.0584	3	0	0	Pass
0.0594	3	0	0	Pass
0.0604	3	0	0	Pass
0.0614	3	0	0	Pass
0.0624	3	0	0	Pass
0.0634	3	0	0	Pass
0.0644	3	0	0	Pass
0.0654	3	0	0	Pass
0.0664	3	0	0	Pass
0.0674	3	0	0	Pass
0.0684	3	0	0	Pass
0.0695	3	0	0	Pass
0.0705	3	0	0	Pass
0.0715	3	0	0	Pass
0.0725	3	0	0	Pass
0.0735	3	0	0	Pass
0.0745	3	0	0	Pass
0.0755	3	0	0	Pass
0.0765	3	0	0	Pass
0.0775	3	0	0	Pass
0.0785	3	0	0	Pass
0.0795	3	0	0	Pass
0.0805	2	0	0	Pass
0.0815	2	0	0	Pass
0.0825	2	0	0	Pass
0.0835	2	0	0	Pass
0.0845	2	0	0	Pass
0.0855	2	0	0	Pass
0.0865	2	0	0	Pass
0.0875	2	0	0	Pass
0.0885	1	0	0	Pass
0.0895	1	0	0	Pass
0.0905	1	0	0	Pass
0.0915	1	0	0	Pass
0.0925	1	0	0	Pass
0.0935	1	0	0	Pass
0.0945	1	0	0	Pass
0.0955	0	0	0	Pass
0.0965	0	0	0	Pass
0.0975	0	0	0	Pass
0.0985	0	0	0	Pass
0.0995	0	0	0	Pass
0.1005	0	0	0	Pass
0.1015	0	0	0	Pass
0.1025	0	0	0	Pass

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
[illegible] 1 POC	☐	177.02			☐	100.00			
Total Volume Infiltrated		177.02	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Appendix
Predeveloped Schematic

Mitigated Schematic



Disclaimer

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

www.clearcreeksolutions.com

APPENDIX 2

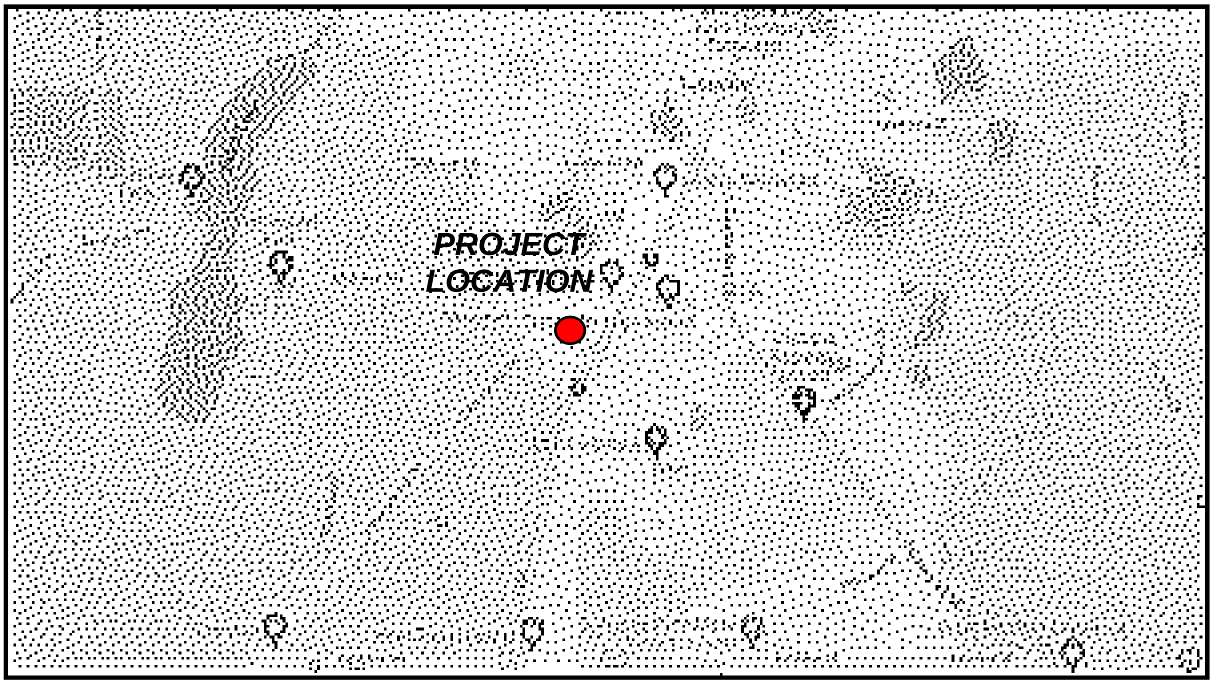
SOIL MANAGEMENT PLAN

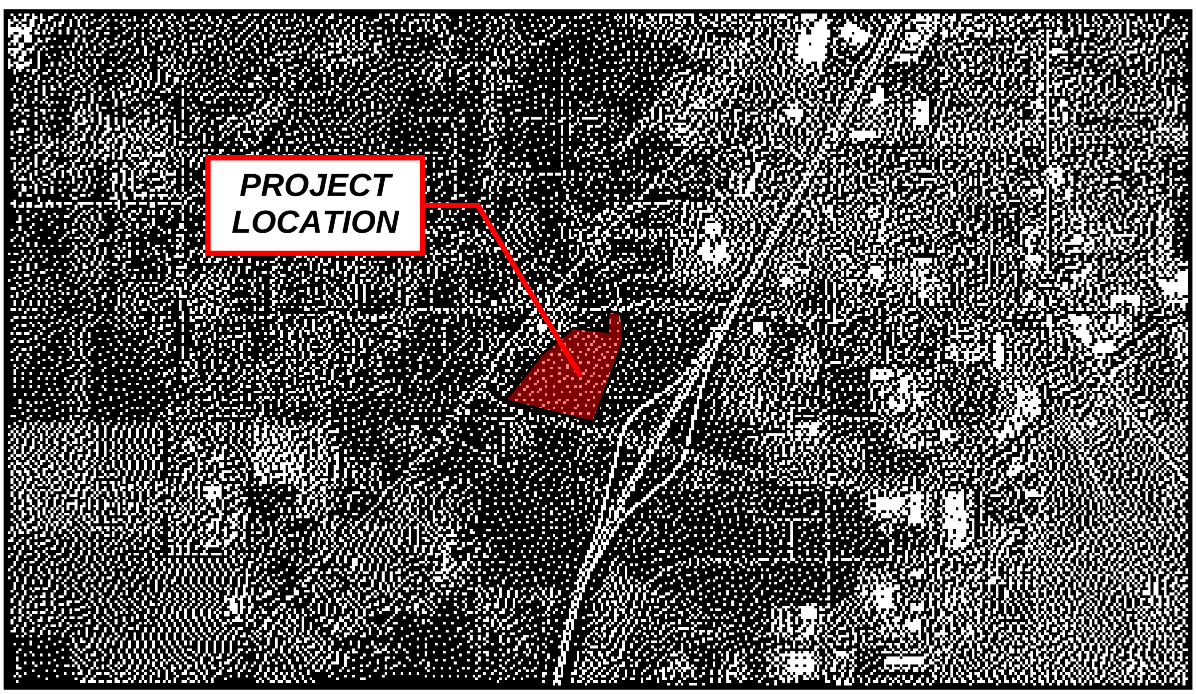
SECTION TO BE ADDED IN FUTURE SUBMITTAL

APPENDIX 3

SUPPLEMENTAL REPORTS AND INFORMATION

LDC
Surveying
Engineering
Planning





1411 State Avenue NE, Suite 200 • Olympia, WA 98506 • ph: 425.806.1869 • fx: 425.482.2893 • www.LDCcorp.com

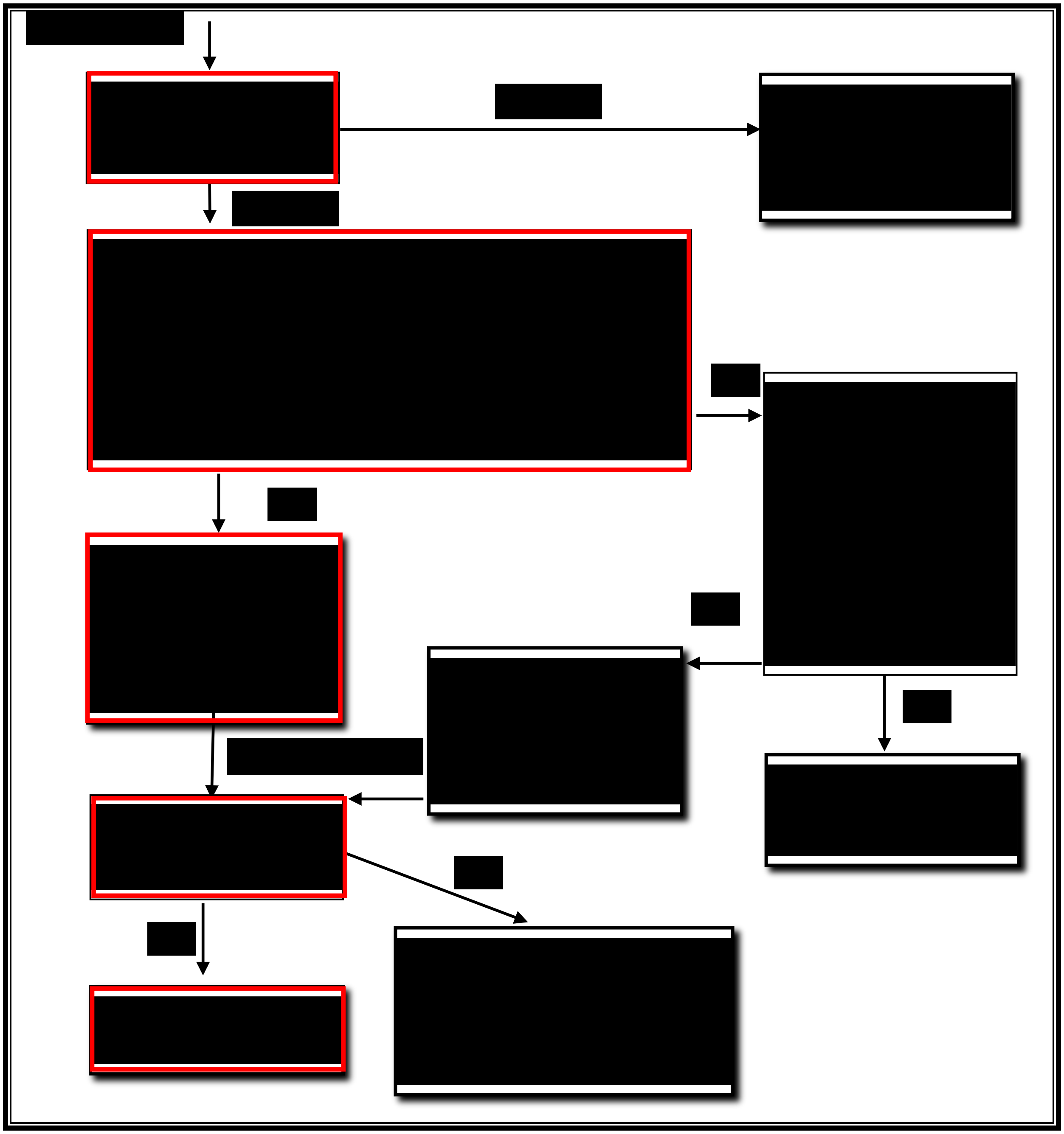


Figure 2.1. Flow Chart for Determining Requirements for New Development.

BASIN AREAS:

(green)	TUMWATER BLVD	1.76 AC
(blue)	YORKSHIRE	8.08 AC
	TOTAL	9.84 AC

JOB NUMBER:	C22-169
DRAWING NAME:	EX-01
DESIGNER:	MGH
DRAFTING BY:	MGH
DATE:	11-29-2022
SCALE:	1"=100'
JURISDICTION:	TUMWATER

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Olympia, WA 98506
T 425.806.1869 www.LDCcorp.com F 425.482.2893

FOURTH STREET HOUSING

YORKSHIRE PREDEVELOPED BASIN AREAS

EX-01

SHEET 1 OF 2

BASIN AREAS:

(blue)	TUMWATER BLVD 1	0.15 AC
(magenta)	TUMWATER BLVD 2	0.15 AC
(green)	TUMWATER BLVD 3	0.13 AC
(cyan)	TUMWATER BLVD 4	0.14 AC
(orange)	TUMWATER BLVD 5	0.22 AC
(purple)	TUMWATER BLVD 6	1.19 AC
(pink)	TYEE DR 1	1.47 AC
(light blue)	TYEE DR 2	1.34 AC
(dark blue)	BUILDING 6	1.95 AC
(tan)	PARKING LOT 1	0.73 AC
(teal)	PARKING LOT 2	0.87 AC
(red)	PARKING LOT 3	1.50 AC
	TOTAL	9.84 AC

JOB NUMBER:	C22-169
DRAWING NAME:	EX-02
DESIGNER:	MGH
DRAFTING BY:	MGH
DATE:	11-29-2022
SCALE:	1"=100'
JURISDICTION:	TUMWATER

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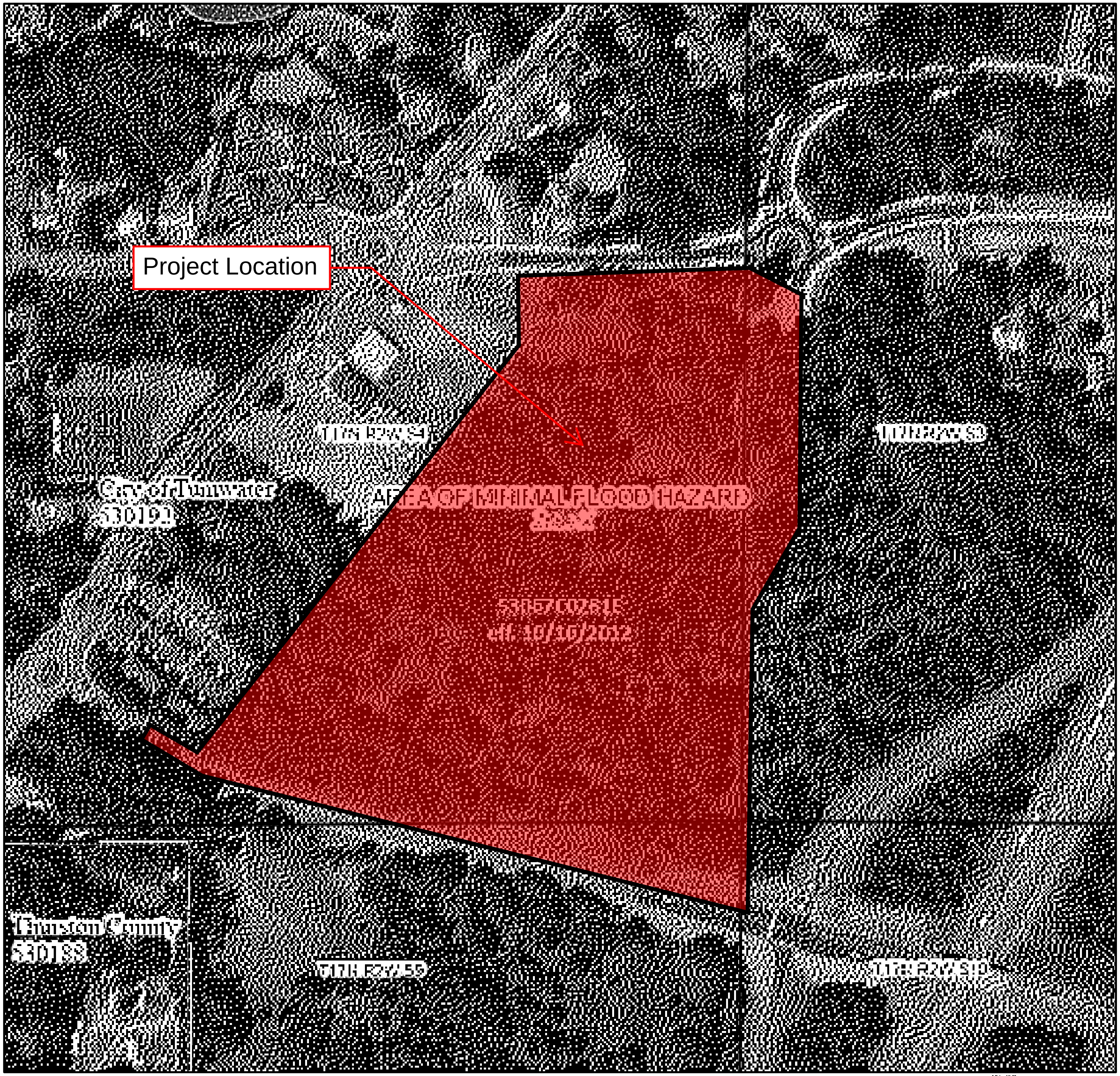
FOURTH STREET HOUSING

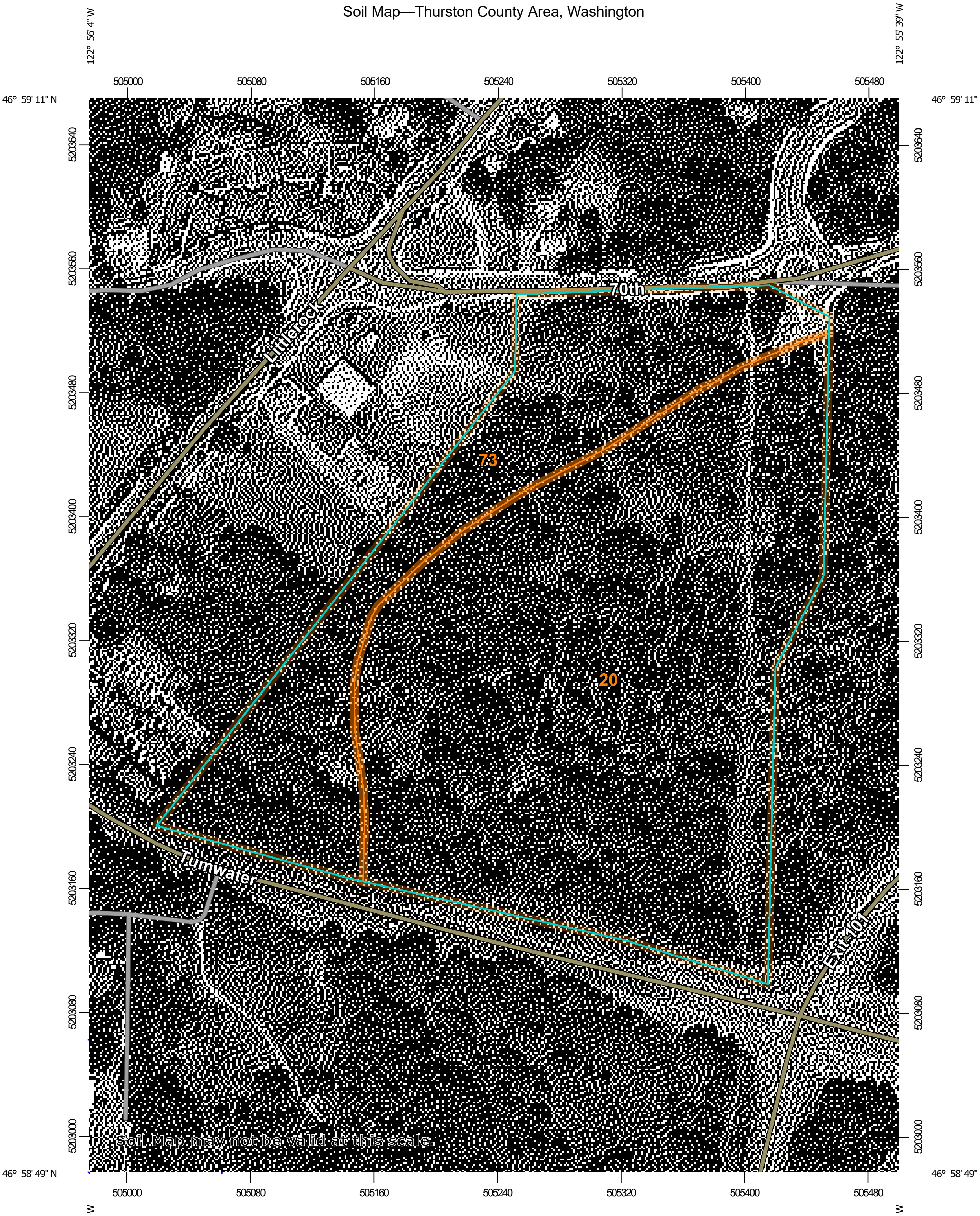
YORKSHIRE
DEVELOPED BASIN AREAS

EX-02

FEMA



Project Location
City of Tumwater
530191
AREA OF MINIMAL FLOOD HAZARD
53067C0281E
eff. 10/16/2012
Thurston County
530188



Map Scale: 1:3,380 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

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

MAP LEGEND

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

Soils
- Soil 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 15, Aug 31, 2021

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

Date(s) aerial images were photographed: Jul 18, 2020—Jul 30, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
20	Cagey loamy sand	21.0	71.2%
73	Nisqually loamy fine sand, 0 to 3 percent slopes	8.5	28.8%
Totals for Area of Interest		**29.5**	**100.0%**

Thurston County Area, Washington

20—Cagey loamy sand

Map Unit Setting

National map unit symbol: 2nd8d
Elevation: 330 to 980 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 165 to 195 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Cagey

Setting

Landform: Terraces
Parent material: Sandy glacial drift

Typical profile

H1 - 0 to 6 inches: loamy sand
H2 - 6 to 28 inches: loamy sand
H3 - 28 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Ecological site: F002XA005WA - Puget Lowlands Moist Forest
Forage suitability group: Seasonally Wet Soils (G002XS201WA)
Other vegetative classification: Seasonally Wet Soils (G002XS201WA)
Hydric soil rating: No

Minor Components

Mckenna

Percent of map unit: 5 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XS101WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Thurston County Area, Washington
Survey Area Data: Version 15, Aug 31, 2021

Thurston County Area, Washington

73—Nisqually loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2ndc8
Elevation: 160 to 1,310 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Nisqually

Setting

Landform: Terraces
Parent material: Sandy glacial outwash

Typical profile

H1 - 0 to 5 inches: loamy fine sand
H2 - 5 to 31 inches: loamy fine sand
H3 - 31 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: R002XA006WA - Puget Lowlands Prairie
Forage suitability group: Droughty Soils (G002XS401WA)
Other vegetative classification: Droughty Soils (G002XS401WA)
Hydric soil rating: No

Minor Components

Yelm

Percent of map unit: 3 percent

Hydric soil rating: No

Norma

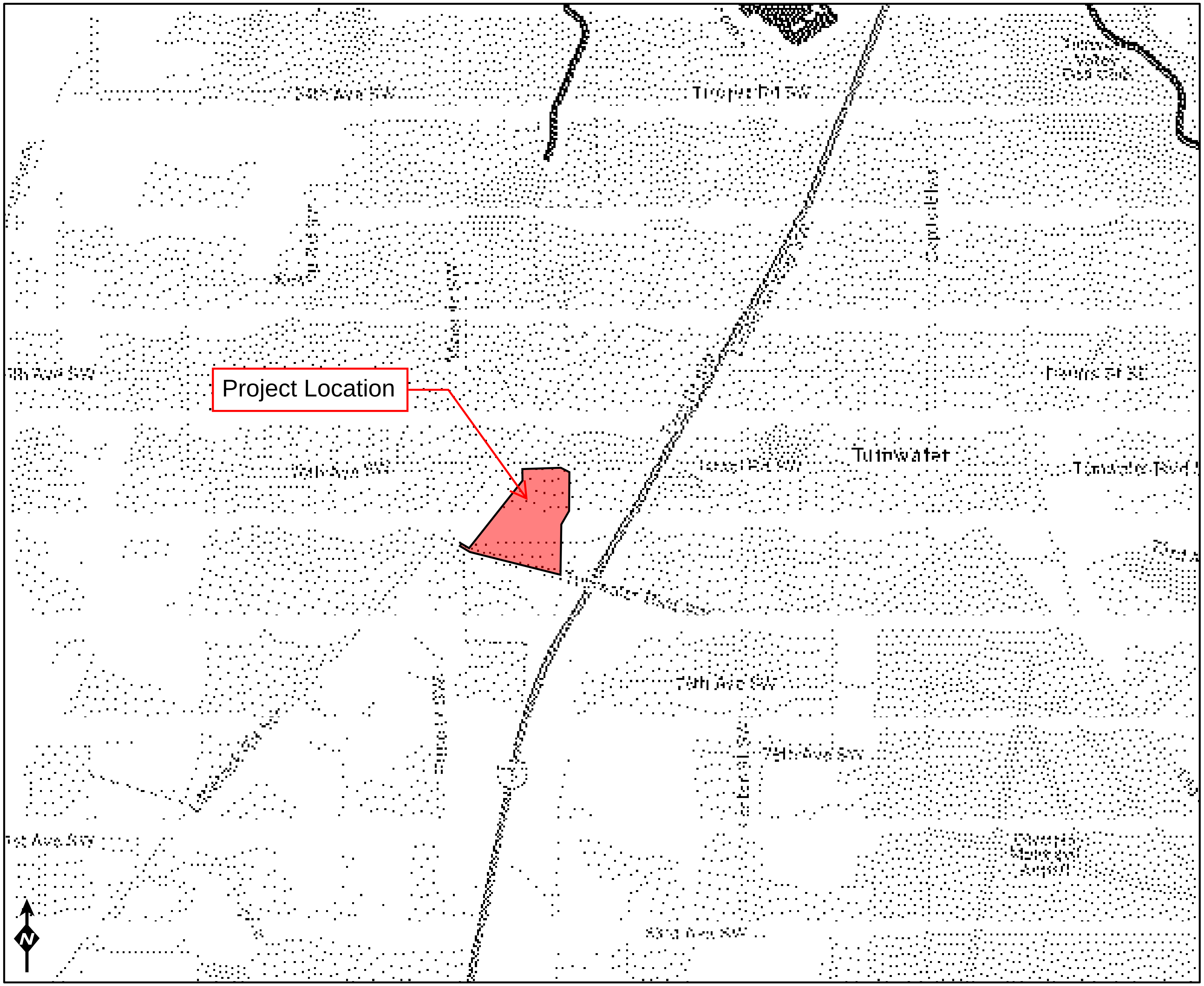
Percent of map unit: 2 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XS101WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Thurston County Area, Washington
Survey Area Data: Version 15, Aug 31, 2021

May 9, 2022

Yorkshire



Assessed Water/Sediment

Water

- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment

- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles

0 0.25 0.5 1

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and

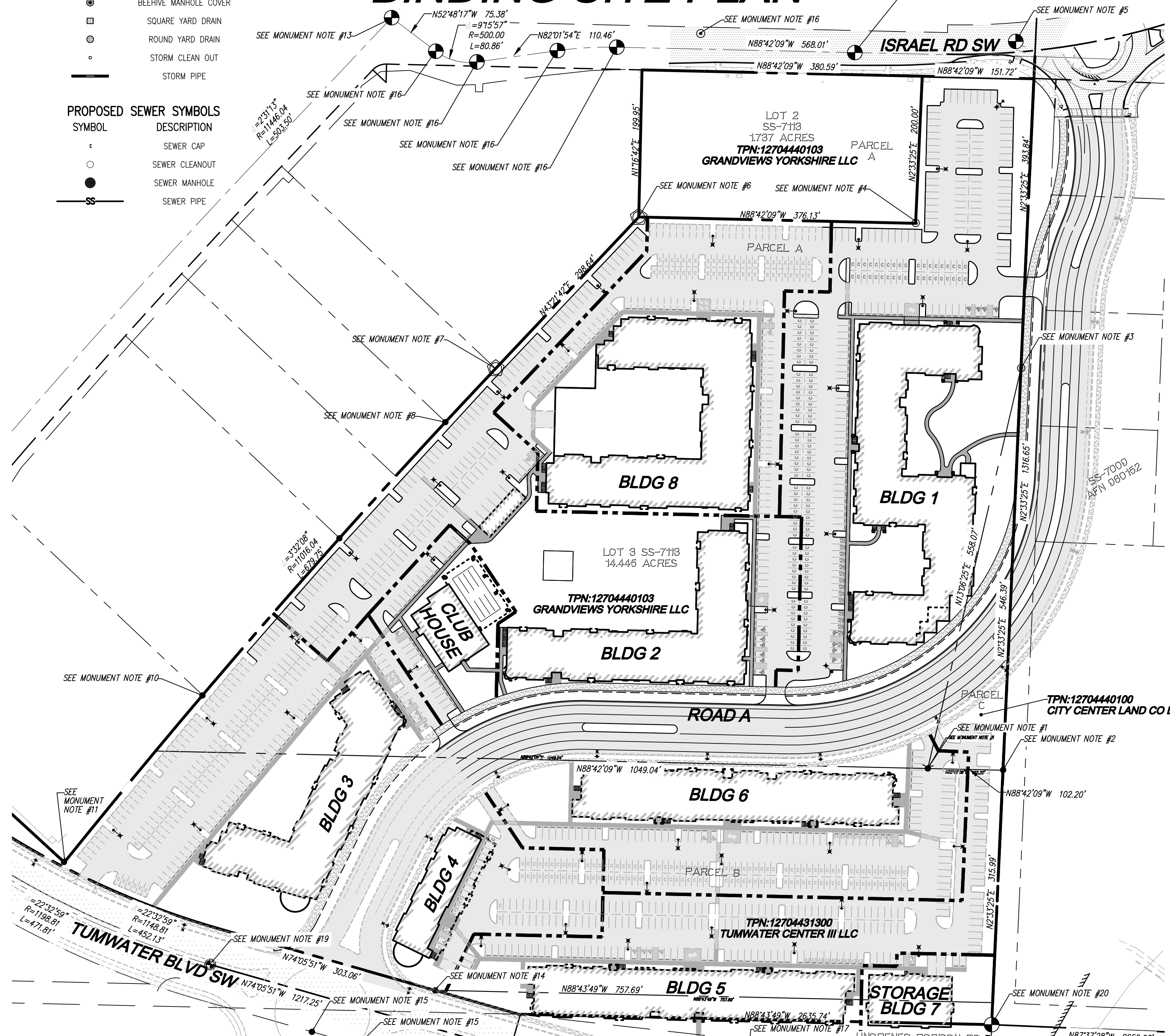
DEPARTMENT OF ECOLOGY State of Washington

DRAINAGE CONTROL PLAN
ATTACHMENT NO. 1
SITE DEVELOPMENT DRAWINGS

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON

YORKSHIRE
SITE PLAN REVIEW & BINDING SITE PLAN

SCALE: 1" = 100'



LEGEND AND ABBREVIATIONS

EXISTING SYMBOLS

SYMBOL	DESCRIPTION
	DECIDUOUS TREE
	CONIFEROUS TREE
	BOLLARD
	STREET SIGN (AS DESCRIBED)
	BRASS CAP
	MONUMENT IN CASE
	ALUMINUM CAP
	REBAR AND CAP
	REBAR WITHOUT CAP
	IRON PIPE
×LT	LEAD AND TACK
	REBAR AND CONROL CAP
	HUB AND TACK
	PK NAIL
	TELEPHONE RISER
T	TELEPHONE VAULT/MANHOLE
C	CABLE MARKER POST
C	CABLE RISER/ PEDESTAL
C	CABLE VAULT/MANHOLE
C	CABLE JUNCTION BOX
	LUMINAIRE WITH LONG ARM
GM	NATURAL GAS MARKER POST
	NATURAL GAS VALVE
	GUY ANCHOR
J	POWER JUNCTION BOX
PT	POWER TRANSFORMER
PV	POWER VAULT/ MANHOLE
	POWER POLE
	SS CLEANOUT
S	SS MANHOLE
S	SS MARKER POST
	STORM CATCH BASIN
	STORM MANHOLE
	STORM CLEANOUT
	IRRIGATION CONTROL VALVE
W	WATER MARKER POST
	WATER METER
	WATER VALVE
	WATER FIRE HYDRANT
W	WELL

ABBREVIATIONS

CB	CATCH BASIN
℄	CENTERLINE
CMP	CORRUGATED METAL PIPE
CP	CONCRETE PIPE
EL	ELEVATION
EXIST.	EXISTING
FL	FLOWLINE
IE	INVERT ELEVATION
LCPE	LINE CORRUGATED POLYETHYLENE
PL	PROPERTY LINE
PP	POWER POLE
PVC	POLYVINYL CHLORIDE PIPE
R/W	RIGHT-OF-WAY
STA	STATION
SD	STORM DRAIN
SS	SANITARY SEWER
SSMH	SANITARY SEWER MANHOLE
SWPE	SOLID WALL POLYETHYLENE PIPE
TYP	TYPICAL
TBR	TO BE REMOVED

PROPOSED WATER SYMBOLS

SYMBOL	DESCRIPTION
	WATER CAP
	CONCRETE BLOCKING
	BUTTERFLY VALVE
	11° BEND
	45° BEND
	90° BEND
	22° BEND
	VALVE
	HYDRANT ASSEMBLY
	BLOW-OFF VALVE
	REDUCER
	AIR-VAC ASSEMBLY
	WATER METER
W	WATER PIPE

PROPOSED SURVEY SYMBOLS

SYMBOL	DESCRIPTION
	SURVEY MONUMENT IN PROPOSED ROAD

PROPOSED STORM SYMBOLS

SYMBOL	DESCRIPTION
	SD CAP
	TYPE 1 CATCH BASIN, GRATED LID
	TYPE 1 CATCH BASIN, SOLID LID
	TYPE 2 CATCH BASIN, GRATED LID
	TYPE 2 CATCH BASIN, SOLID LID
	BEEHIVE MANHOLE COVER
	SQUARE YARD DRAIN
	ROUND YARD DRAIN
	STORM CLEAN OUT
	STORM PIPE

PROPOSED SEWER SYMBOLS

SYMBOL	DESCRIPTION
	SEWER CAP
	SEWER CLEANOUT
	SEWER MANHOLE
SS	SEWER PIPE

TABLE OF CONTENTS

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EMAIL:

GEOTECH:
QUALITY GEO NW
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LACEY, WASHINGTON 98513
CONTACT: LUKE P MCCANN, LEG
PHONE: (360) 878-9705
EMAIL: luke@quality.geonw.com

UTILITY NOTE

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

NOTE

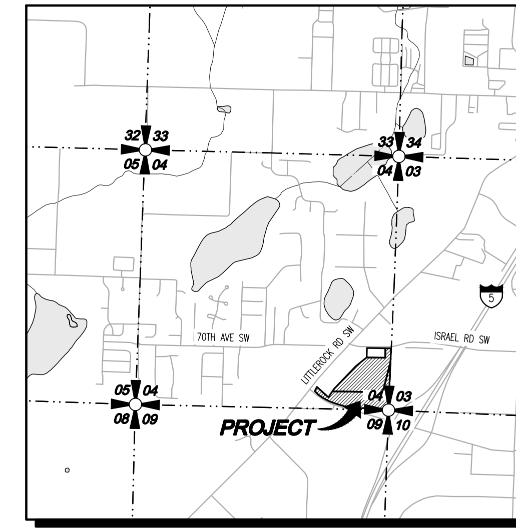
THE PROFESSIONAL LAND SURVEYOR RESPONSIBLE FOR SURVEYING THE PROJECT MUST OBTAIN A PERMIT FROM THE DNR BEFORE ANY MONUMENTS ARE DISTURBED.

DISCLAIMER

TOPOGRAPHIC SURVEY INFORMATION CONTAINED ON THESE PLANS HAS BEEN PROVIDED BY MTN2COAST, LLC. LDC, INC. (LAND DEVELOPMENT CONSULTANTS, INC.) ASSUMES NO LIABILITY AS TO THE ACCURACY AND COMPLETENESS OF THIS DATA. ANY DISCREPANCIES FOUND BETWEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.

MONUMENT NOTES

1. FOUND 5/8" REBAR WITH RED CAP MARKED "PORSCH LS 18413".
2. FOUND 5/8" REBAR WITH YELLOW CAP MARKED "BEEHLER LS 17656" WITH PINK FLAGGING, N21°09'03"E 0.4' FROM CALCULATED POSITION.
3. FOUND 5/8" REBAR WITH PINK FLAGGING, N29°52'14"E 0.4' FROM CALCULATED POSITION.
4. FOUND 5/8" REBAR WITH PINK FLAGGING, N04°53'54"E 0.4' FROM CALCULATED POSITION.
5. FOUND 2" BRASS CAP IN CURB ISLAND.
6. FOUND 2" OUTSIDE DIAMETER ALUMINUM CAP WITH PUNCH MARKED "AP 15 SQUAXIN ISLAND TRIBE 2018 PSE 35147", S16°16'56"W 0.3' FROM CALCULATED POSITION.
7. FOUND 2" OUTSIDE DIAMETER ALUMINUM CAP WITH PUNCH MARKED "AP 16 SQUAXIN ISLAND TRIBE 2018 PSE 35147".
8. FOUND 5/8" REBAR WITH RED CAP "JSP 28073".
9. FOUND 5/8" REBAR WITH YELLOW CAP MARKED "S.IVEY 29289".
10. FOUND 1/2" REBAR WITH YELLOW CAP MARKED "K.BLUHM 29269".
11. FOUND 1/2" REBAR WITH RED CAP MARKED "SWIFT LS 27198", N49°05'47"W 0.7' FROM CALCULATED PROPERTY CORNER, ON PROPERTY LINE.
12. FOUND 1/2" REBAR WITH YELLOW CAP MARKED "33138".
13. FOUND 2" BRASS CAP IN 12"X12" CONCRETE PAD AT CENTER OF ROUNDABOUT.
14. FOUND 1/2" REBAR WITH RED CAP MARKED "R.SWIFT LS 27195", S64°04'27"E 0.4' FROM CALCULATED POSITION.
15. FOUND 1/2" REBAR WITH YELLOW CAP MARKED "R.SWIFT LS 27195".
16. FOUND 2" BRASS CAP.
17. FOUND 1/2" REBAR WITH YELLOW CAP MARKED "HANSEN LS 27134", S66°11'07"E 0.5' FROM CALCULATED POSITION.
18. FOUND 1/2" REBAR WITH YELLOW CAP MARKED "HANSEN LS 27134"
19. FOUND LEAD & TACK IN CASE.
20. FOUND 2.5" BRASS CAP WITH PUNCH MARKED "JSP 28073" SET IN CONCRETE, THURSTON COUNTY CONTROL POINT 6480.



VICINITY MAP

SCALE: 1"=2000'

SURVEY INFORMATION

LEGAL DESCRIPTION

PARCEL A:
LOT 2 AND 3 OF SHORT SUBDIVISION NO. SS-7113, AS RECORDED MARCH 6, 1984 UNDER AUDITOR'S FILE NO. 8403060010.

PARCEL B:
THAT PORTION OF THE FOLLOWING DESCRIBED PROPERTY LYING NORTHERLY OF AIRDUSTRIAL WAY AND EASTERLY OF LITTLEROCK ROAD SW, AS SHOWN ON SURVEY RECORDED APRIL 19, 1995, UNDER AUDITOR'S FILE NO. 9504190153:
THAT PART OF THE SOUTH HALF OF THE SOUTHEAST QUARTER OF SECTION 4, TOWNSHIP 17 NORTH, RANGE 2 WEST, W.M., DESCRIBED AS BEGINNING AT A POINT ON THE EASTERLY LINE OF LITTLEROCK ROAD NORTH 37° 43' EAST 250 FEET FROM ITS INTERSECTION WITH THE SOUTH LINE OF SAID SECTION 4; RUNNING NORTH 37° 43' EAST ALONG SAID EASTERLY LINE OF ROAD 323.5 FEET; AND SOUTH 48° 02' EAST 400 FEET; THENCE NORTHEASTERLY PARALLEL WITH SAID ROAD 205 FEET, MORE OR LESS, TO THE SOUTH LINE OF THE NORTH 970 FEET OF THE SOUTHEAST QUARTER OF SAID SOUTHEAST QUARTER; THENCE EASTERLY ALONG SAID SOUTH LINE 1,150 FEET, MORE OR LESS, TO THE EAST LINE OF SAID SECTION; THENCE SOUTHERLY ALONG SAID EAST LINE 350 FEET, MORE OR LESS, TO THE SOUTHEAST CORNER OF SAID SECTION; THENCE WESTERLY ALONG SAID SOUTH LINE OF SECTION 1,490 FEET, MORE OR LESS; THENCE NORTH 52° 17' WEST 330 FEET, MORE OR LESS, TO THE POINT OF BEGINNING.
TOGETHER WITH THAT PORTION OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 4, TOWNSHIP 17 NORTH, RANGE 2 WEST, W.M., LYING SOUTH OF THE NORTH 970 FEET THEREOF, AND LYING EASTERLY OF A LINE DRAWN PARALLEL WITH AND 150 FEET WESTERLY, WHEN MEASURED AT RIGHT ANGLES FROM THE CENTER LINE OF SURVEY OF SR 5 (P.S.H. NO. 1), MAYTOWN TO TUMWATER. EXCEPTING THEREFROM PORTION LYING IN TRACT CONVEYED TO THE STATE OF WASHINGTON BY DEED DATED MARCH 3, 1953 AND RECORDED UNDER FILE NO. 518455.
ALSO EXCEPT THE SOUTH 30 FEET FOR COUNTY ROAD KNOWN AS ROBISON ROAD;
ALSO EXCEPT THAT PORTION TAKEN BY CONDEMNATION BY THE STATE OF WASHINGTON UNDER THURSTON COUNTY SUPERIOR COURT CAUSE NO. 85-2-00575-6.
ALSO EXCEPT THAT PORTION CONVEYED TO CITY OF TUMWATER BY STATUTORY WARRANTY DEED RECORDED APRIL 10, 2007 UNDER AUDITOR'S FILE NO. 3917804.

PARCEL C:
THAT PORTION OF THE NORTH 970 FEET OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 4, TOWNSHIP 17 NORTH, RANGE 2 WEST, W.M., LYING EASTERLY OF A LINE PARALLEL WITH AND 150 FEET WESTERLY, WHEN MEASURED AT RIGHT ANGLES, FROM THE CENTER LINE SURVEY OF SR 5 (P.S.H. NO. 1) MAYTOWN TO TUMWATER.

IN THURSTON COUNTY, WASHINGTON.

VERTICAL DATUM

NGVD 29 BASED ON GPS TIES TO THURSTON COUNTY MONUMENTS.

HORIZONTAL DATUM

GROUND SCALE BASED ON GPS TIES TO THURSTON COUNTY MONUMENTS, WASHINGTON STATE PLANE COORDINATES, SOUTH ZONE, NAD 83/91. GROUND SCALE COMBINED SCALE FACTOR = 0.999932791.

SURVEY NOTES

1. INSTRUMENT USED: SOKKIA IX 3" TOTAL STATION AND TOPCON VR GPS.
2. THIS SURVEY MEETS OR EXCEEDS THE STANDARDS OF WAC 332-130-090, 332-130-145.
3. SURVEY COMPLETED 01/27/2022
4. ALL MONUMENTS SHOWN AS FOUND VISITED 01/2022.
5. PURPOSE OF TOPOGRAPHICAL MAPPING IS FOR FUTURE DEVELOPMENT OF SITE.
6. CONTOURS WERE ESTABLISHED FROM FIELD MAPPING, 1' CONTOURS SHOWN.
7. MTN2COAST (M2C) WAS RETAINED BY FOURTH STREET HOUSING TO COMPLETE A BOUNDARY AND TOPOGRAPHIC SURVEY OF THE DESCRIBED PROPERTY.

UTILITY NOTES

UTILITIES SHOWN HEREON ARE FROM FIELD MAPPING VISIBLE SURFACE APPURTENANCES, AND MAPPING UTILITY PAINT MARKS FROM A UTILITY LOCATING SERVICE. BURIED UTILITIES ARE ONLY SHOWN AS APPROXIMATE AND SHOULD BE VERIFIED BEFORE CONSTRUCTION.

REFERENCED SURVEYS

1. SHORT PLAT NO. 7113, AFN 8403060010
2. BLA 11-0283-TW, AFN 4214060
3. ROS, AFN 971442
4. ROS, AFN 9504190153
5. ROS, AFN 4904946
6. PLAT OF WEST BRIGHTON PARK, AFN 4086

GENERAL NOTES

THE PLS RESPONSIBLE FOR THE SURVEYING OF THE PROJECT MUST OBTAIN A PERMIT FROM DNR BEFORE ANY MONUMENTS ARE DISTURBED.

REVISIONS			
NO.	DATE	DESCRIPTION	BY

LDC | Surveying Engineering Planning
Woodinville · Olympia · Kent
1411 State Avenue NE, #200
Olympia, WA 98506
T 425.806.1869 · www.LDCcorp.com · F 425.482.2893

GLENN WELLS

YORKSHIRE

COVER SHEET

TYRELL E. BRADLEY · STATE OF WASHINGTON · 51055 · REGISTERED PROFESSIONAL ENGINEER · 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22169-CS-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 100'
JURISDICTION:	TUMWATER, WA

CS-01

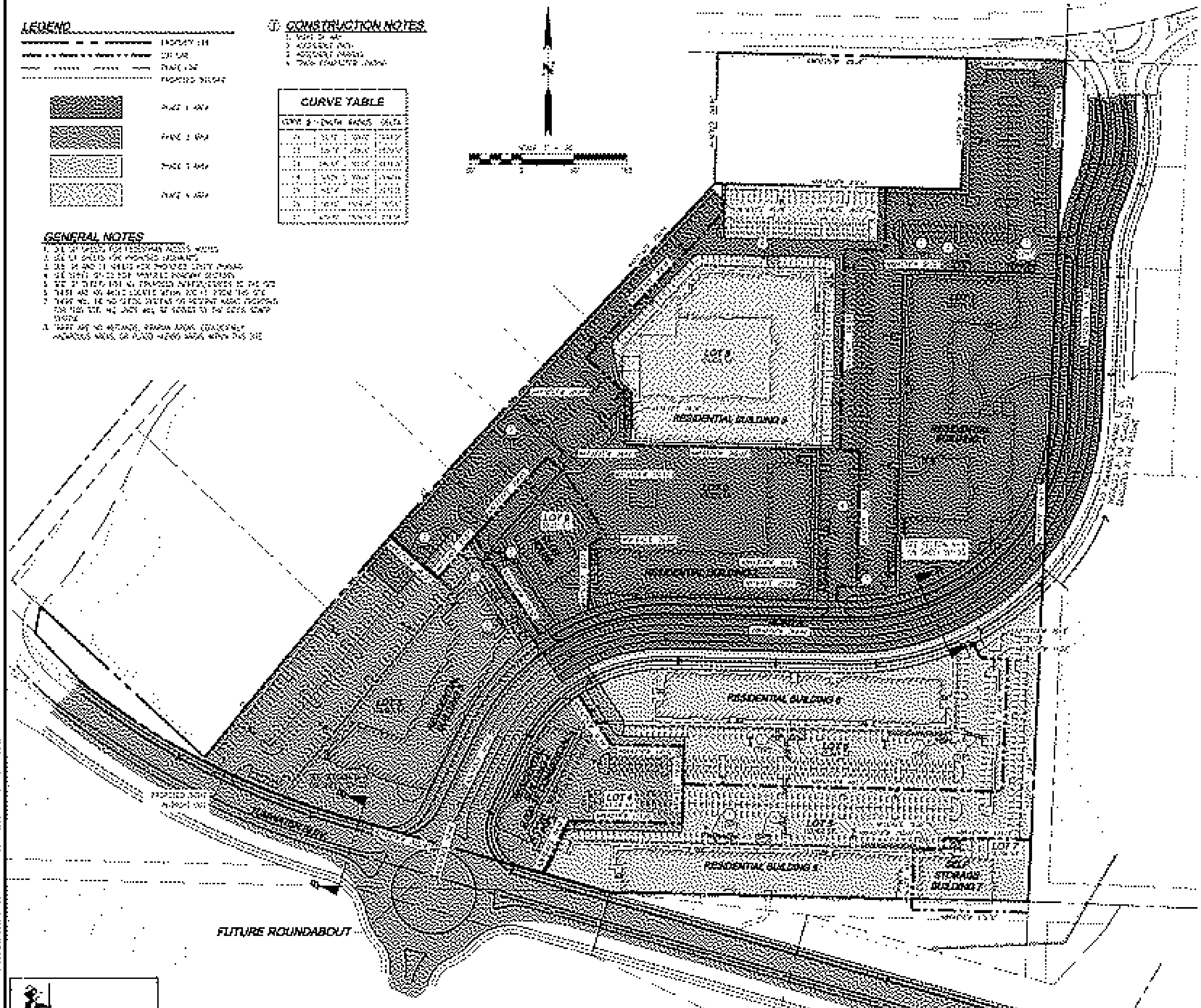
A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON

LEGEND

CONSTRUCTION NOTES

CURVE TABLE

GENERAL NOTES



SITE INFORMATION

PROPOSED USE

PARKING PROVIDED:

BIKE PARKING:

REQUIRED OPEN SPACE

Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

DISCLAIMER

SEE SHEET SP-01 FOR PHASE LIMITS

SEE SHEETS SP-02 THROUGH SHEETS SP-04 FOR ENLARGED VIEWS

REVISIONS

LDC
Surveying
Engineering
Planning

GLENN WELLS
YORKSHIRE
PRELIMINARY BINDING SITE PLAN

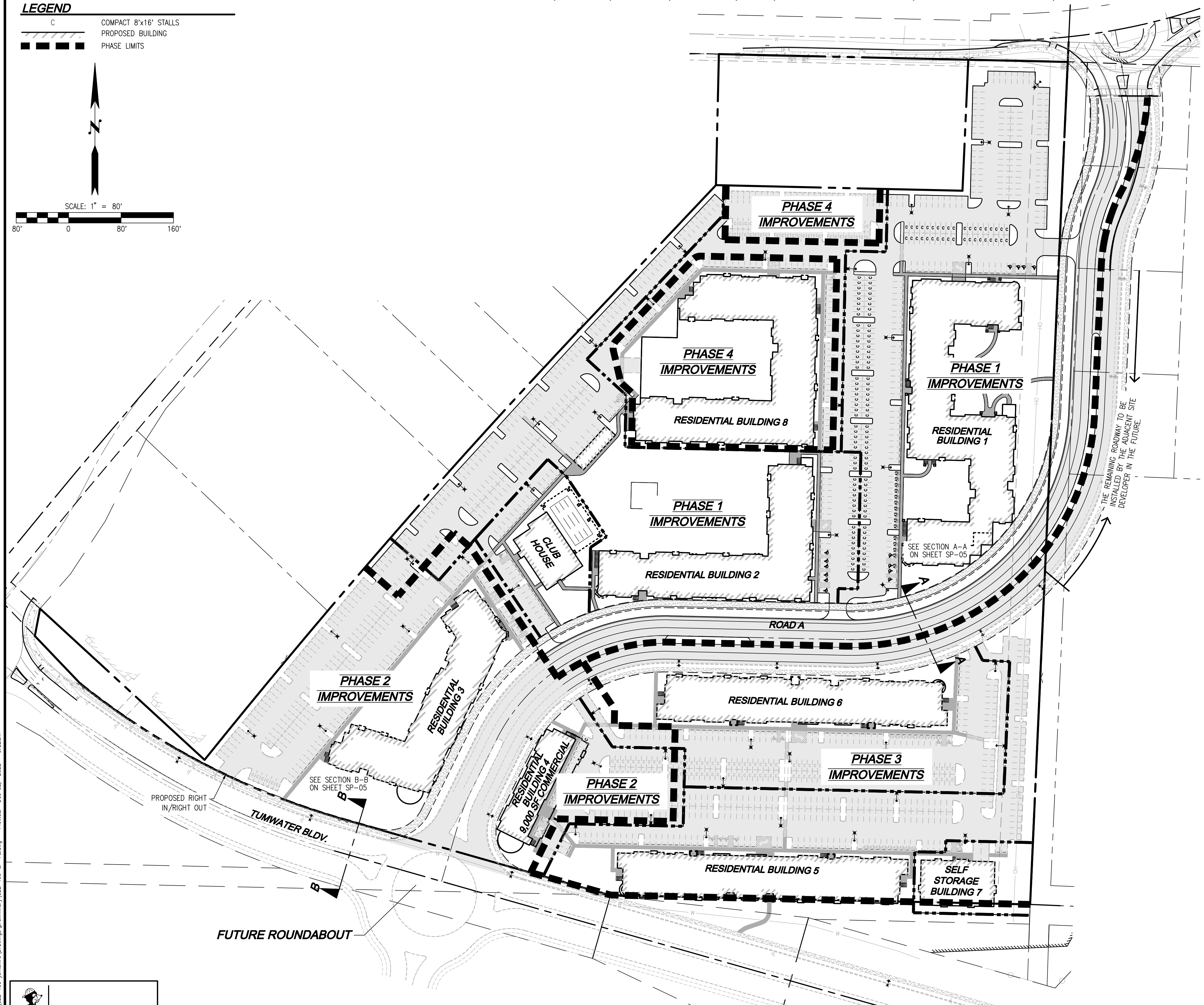
BSP-01
SHEET 2 OF 16

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON

LEGEND

C — COMPACT 8'x16' STALLS
PROPOSED BUILDING
PHASE LIMITS

SCALE: 1" = 80'
80' 0 80' 160'



Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

DISCLAIMER

TOPOGRAPHIC SURVEY INFORMATION CONTAINED ON THESE PLANS HAS BEEN PROVIDED BY MTN2COAST, LLC. LDC, INC. (LAND DEVELOPMENT CONSULTANTS, INC.) ASSUMES NO LIABILITY AS TO THE ACCURACY AND COMPLETENESS OF THIS DATA. ANY DISCREPANCIES FOUND BETWEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.

SEE SHEET SP-01 FOR PHASE LIMITS

SEE SHEETS SP-02 THROUGH SHEETS SP-04 FOR ENLARGED VIEWS

Drawing: P:\Civil\2022\c22-169 yorkshire\Drawings\preliminary\C22-169-SP-PL.dwg Plotted: Dec 02, 2022 - 9:22am

REVISIONS

NO.	DATE	DESCRIPTION	BY

LDC
Surveying Engineering Planning
Woodinville Olympia Kent
1411 State Avenue NE, #200
Olympia, WA 98506
T 425.806.1869 www.LDCcorp.com F 425.482.2893

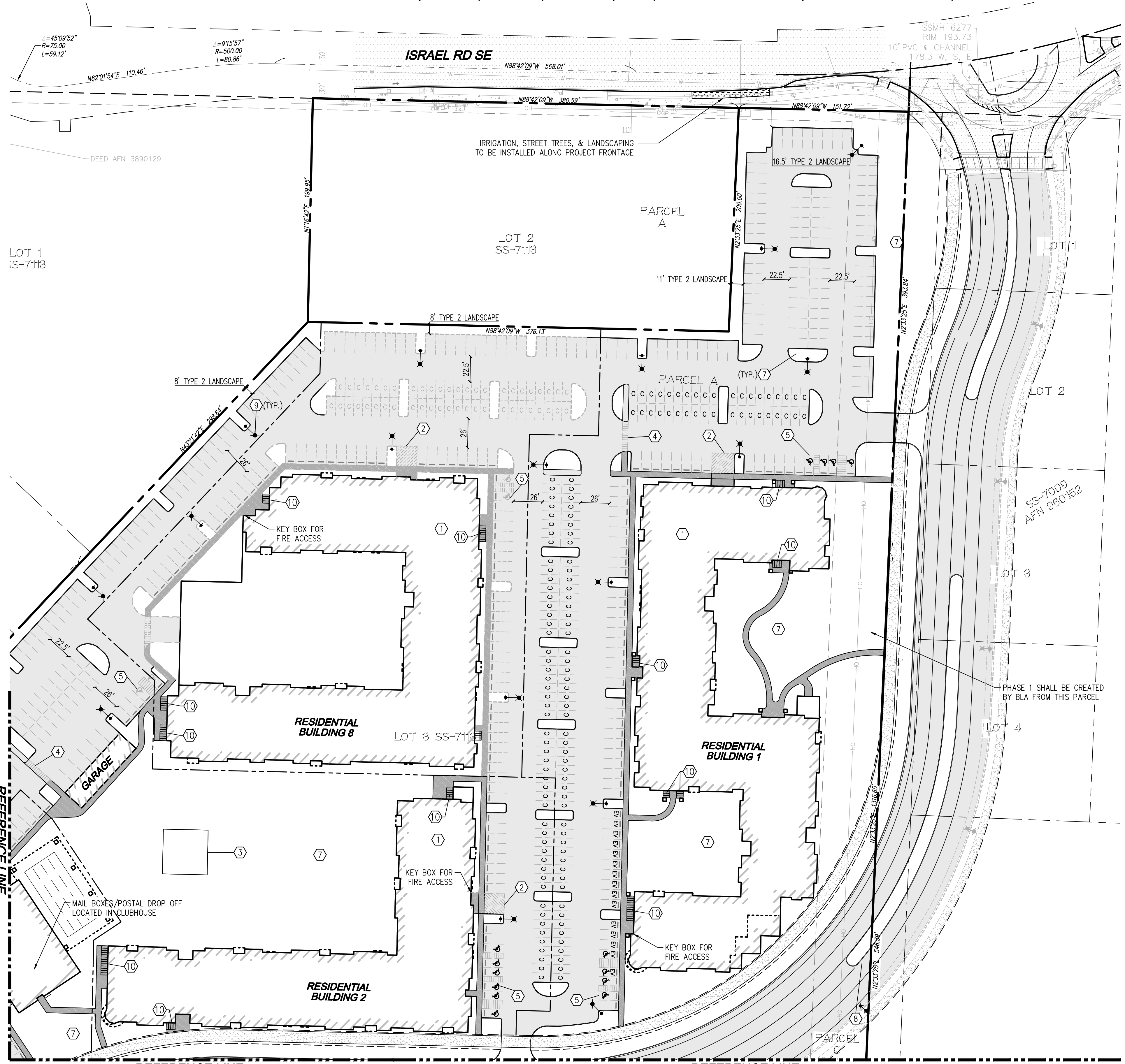
GLENN WELLS
YORKSHIRE
OVERALL SITE/PHASING PLAN

TYRELL E. BRADLEY, STATE OF WASHINGTON, 51055, REGISTERED PROFESSIONAL ENGINEER, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-SP-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 80'
JURISDICTION:	TUMWATER, WA

SP-01

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



SCALE: 1" = 50'

50' 0 50' 100'

LEGEND

- PARCEL LINE
- LOT LINE
- ROAD STRIPING
- CENTERLINE
- PROPOSED BUILDING
- CONCRETE SIDEWALK / PEDESTRIAN ACCESS PATH & ACCESSIBLE PATH OF TRAVEL
- ASPHALT PAVEMENT
- CEMENT CONCRETE CURB
- WHEEL STOP
- ADA PARKING STALL
- COMPACT PARKING STALL
- ELECTRIC VEHICLE PARKING STALL
- BIKE PARKING STALL
- PROPOSED OFF-SITE & ON-SITE LIGHTING, SEE PLAN FOR TYPE

GENERAL NOTES

1. ALL PARCELS WILL HAVE A CROSS ACCESS PARKING AGREEMENT IN-PLACE PRIOR TO OCCUPANCY
2. FIRE LANE SIGNS AND YELLOW STRIPING SHALL BE PROVIDED ON-SITE TO IDENTIFY FIRE DEPARTMENT ACCESS ROADS AND PROHIBIT THE OBSTRUCTION THEREOF. IFC 503.
3. FIRE HYDRANTS AND PAVED ACCESS ROADS SHALL BE INSTALLED, TESTED FOR FIRE FLOW BY THE FIRE DEPARTMENT AND MADE SERVICEABLE BY THE PUBLIC WORKS DEPARTMENT PRIOR TO ANY VERTICAL OR COMBUSTIBLE CONSTRUCTION. NO EXCEPTIONS. IFC 503

(X) CONSTRUCTION NOTES

1. PROPOSED APARTMENT BUILDING
2. COMPACTOR LOADING AREA
3. SPORTS COURT
4. ACCESSIBLE PATH
5. ACCESSIBLE PARKING
6. EXISTING HISTORIC STREET LIGHT
7. SEE LANDSCAPING PLAN BY OTHERS FOR LANDSCAPING IMPROVEMENTS
8. PROPOSED HISTORIC STREET LIGHT
9. ALL ON-SITE LIGHTING TYPE, MOUNTING HEIGHT ETC. SHALL BE DESIGNED AT PERMIT SUBMITTAL
10. LONG TERM AND SHORT TERM BIKE PARKING STALLS
11. SELF STORAGE LOADING AREA

Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

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DISCLAIMER

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SEE SHEET SP-01 FOR PHASE LIMITS

Drawing: P:\Civil\2022\C22-169 yorkshire\Drawings\preliminary\C22-169-SP-PL.dwg Plotted: Dec 02, 2022 - 9:22am

REVISIONS			
NO.	DATE	DESCRIPTION	BY

LDC Surveying Engineering Planning

Woodinville | Olympia 1411 State Avenue NE, #200 Olympia, WA 98506 | Kent

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GLENN WELLS

YORKSHIRE

SITE PLAN

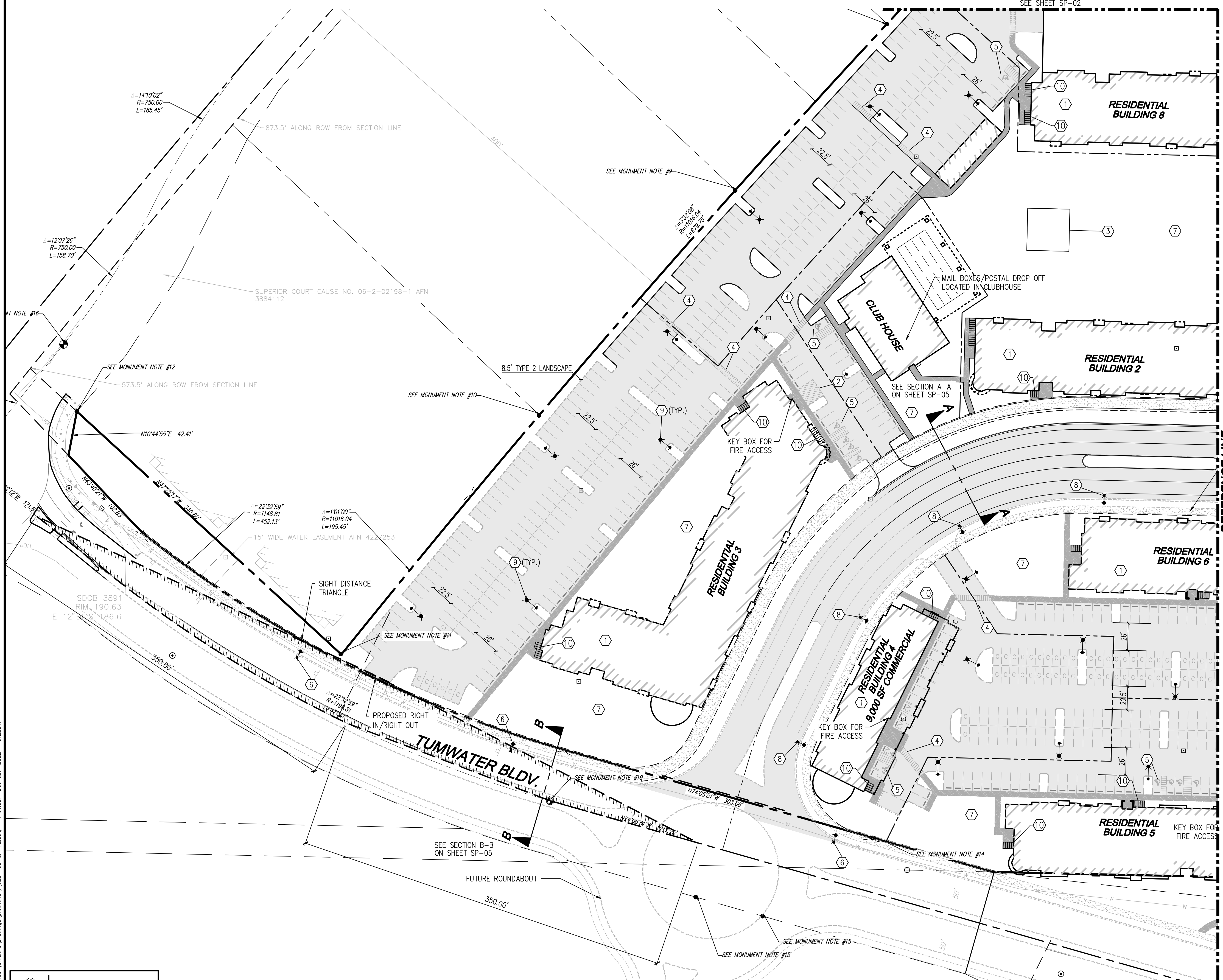
TYRELL E. BRAINARD, STATE OF WASHINGTON, 51055, REGISTERED PROFESSIONAL ENGINEER, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-SP-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER, WA

SP-02

SHEET 4 OF 15

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



SCALE: 1" = 50'

0 — 50' — 100'

LEGEND

- PARCEL LINE
- LOT LINE
- ROAD STRIPING
- CENTERLINE
- PROPOSED BUILDING
- CONCRETE SIDEWALK / PEDESTRIAN ACCESS PATH & ACCESSIBLE PATH OF TRAVEL
- ASPHALT PAVEMENT
- CEMENT CONCRETE CURB
- WHEEL STOP
- ADA PARKING STALL
- COMPACT PARKING STALL
- ELECTRIC VEHICLE PARKING STALL
- BIKE PARKING STALL
- PROPOSED OFF-SITE & ON-SITE LIGHTING, SEE PLAN FOR TYPE

GENERAL NOTES

1. ALL PARCELS WILL HAVE A CROSS ACCESS PARKING AGREEMENT IN-PLACE PRIOR TO OCCUPANCY
2. FIRE LANE SIGNS AND YELLOW STRIPING SHALL BE PROVIDED ON-SITE TO IDENTIFY FIRE DEPARTMENT ACCESS ROADS AND PROHIBIT THE OBSTRUCTION THEREOF. IFC 503.
3. FIRE HYDRANTS AND PAVED ACCESS ROADS SHALL BE INSTALLED, TESTED FOR FIRE FLOW BY THE FIRE DEPARTMENT AND MADE SERVICEABLE BY THE PUBLIC WORKS DEPARTMENT PRIOR TO ANY VERTICAL OR COMBUSTIBLE CONSTRUCTION. NO EXCEPTIONS. IFC 503

X CONSTRUCTION NOTES

1. PROPOSED APARTMENT BUILDING
2. COMPACTOR LOADING AREA
3. SPORTS COURT
4. ACCESSIBLE PATH
5. ACCESSIBLE PARKING
6. EXISTING HISTORIC STREET LIGHT
7. SEE LANDSCAPING PLAN BY OTHERS FOR LANDSCAPING IMPROVEMENTS
8. PROPOSED HISTORIC STREET LIGHT
9. ALL ON-SITE LIGHTING TYPE, MOUNTING HEIGHT ETC. SHALL BE DESIGNED AT PERMIT SUBMITTAL
10. LONG TERM AND SHORT TERM BIKE PARKING STALLS
11. SELF STORAGE LOADING AREA

Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

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SEE SHEET SP-01 FOR PHASE LIMITS

Drawing: P:\Civil\2022\C22-169 yorkshire\Drawings\preliminary\C22-169-SP-PL.dwg Plotted: Dec 02, 2022 - 9:22am

REVISIONS		
NO.	DATE	DESCRIPTION	BY

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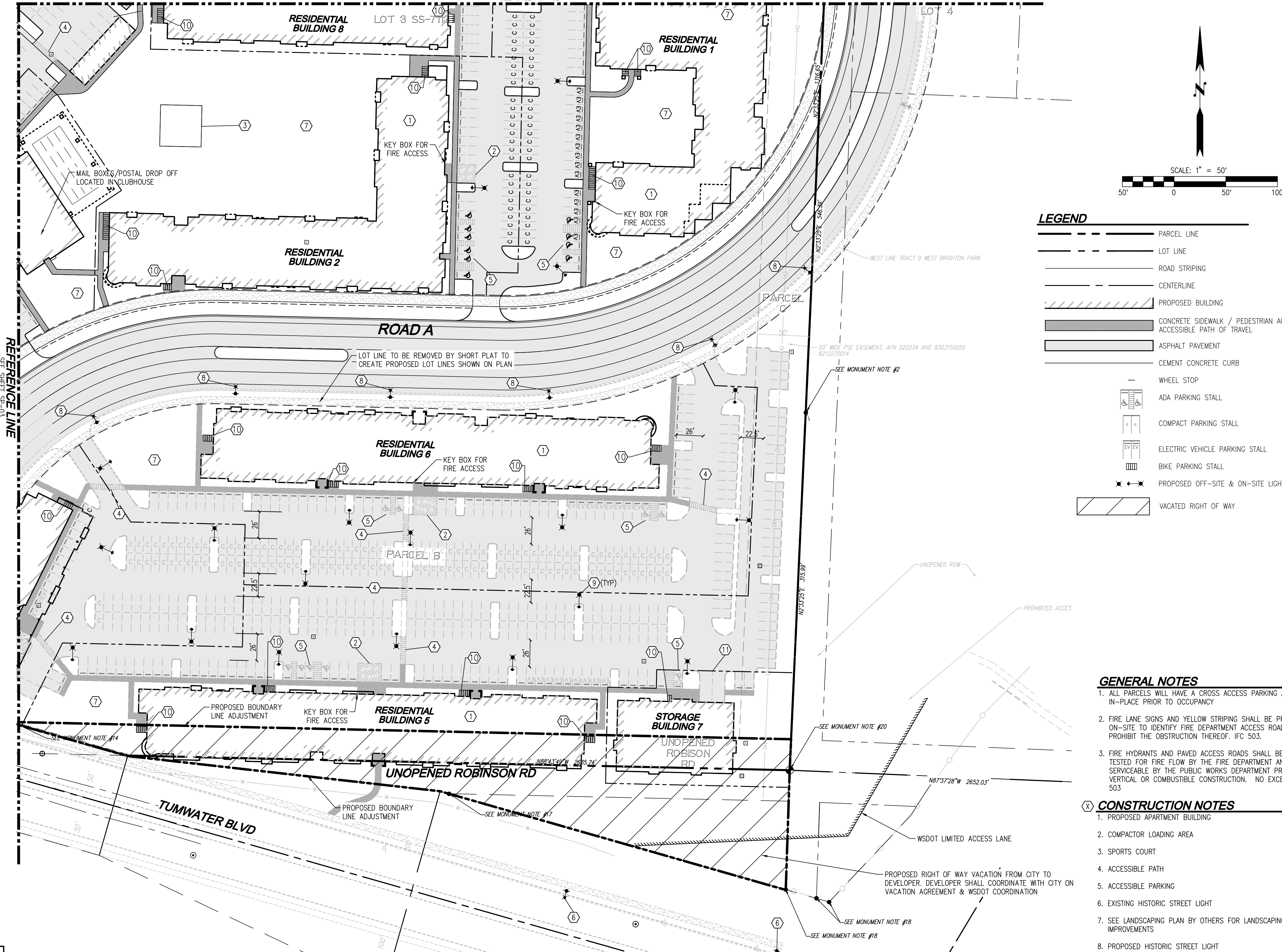
GLENN WELLS
YORKSHIRE
SITE PLAN

TYRELL E. BRAITHWAITE, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, 51055, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-SP-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER, WA

SP-03

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



LEGEND

- PARCEL LINE
- LOT LINE
- ROAD STRIPING
- CENTERLINE
- PROPOSED BUILDING
- CONCRETE SIDEWALK / PEDESTRIAN ACCESS PATH & ACCESSIBLE PATH OF TRAVEL
- ASPHALT PAVEMENT
- CEMENT CONCRETE CURB
- WHEEL STOP
- ADA PARKING STALL
- COMPACT PARKING STALL
- ELECTRIC VEHICLE PARKING STALL
- BIKE PARKING STALL
- PROPOSED OFF-SITE & ON-SITE LIGHTING, SEE PLAN FOR TYPE
- VACATED RIGHT OF WAY

GENERAL NOTES

1. ALL PARCELS WILL HAVE A CROSS ACCESS PARKING AGREEMENT IN-PLACE PRIOR TO OCCUPANCY
2. FIRE LANE SIGNS AND YELLOW STRIPING SHALL BE PROVIDED ON-SITE TO IDENTIFY FIRE DEPARTMENT ACCESS ROADS AND PROHIBIT THE OBSTRUCTION THEREOF. IFC 503.
3. FIRE HYDRANTS AND PAVED ACCESS ROADS SHALL BE INSTALLED, TESTED FOR FIRE FLOW BY THE FIRE DEPARTMENT AND MADE SERVICEABLE BY THE PUBLIC WORKS DEPARTMENT PRIOR TO ANY VERTICAL OR COMBUSTIBLE CONSTRUCTION. NO EXCEPTIONS. IFC 503

(X) CONSTRUCTION NOTES

1. PROPOSED APARTMENT BUILDING
2. COMPACTOR LOADING AREA
3. SPORTS COURT
4. ACCESSIBLE PATH
5. ACCESSIBLE PARKING
6. EXISTING HISTORIC STREET LIGHT
7. SEE LANDSCAPING PLAN BY OTHERS FOR LANDSCAPING IMPROVEMENTS
8. PROPOSED HISTORIC STREET LIGHT
9. ALL ON-SITE LIGHTING TYPE, MOUNTING HEIGHT ETC. SHALL BE DESIGNED AT PERMIT SUBMITTAL
10. LONG TERM AND SHORT TERM BIKE PARKING STALLS
11. SELF STORAGE LOADING AREA

UTILITY NOTE

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DISCLAIMER

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SEE SHEET SP-01 FOR PHASE LIMITS

Drawing: P:\Civil\2022\C22-169 yorkshire\Drawings\preliminary\C22-169-SP-PL.dwg Plotted: Dec 02, 2022 - 9:23am

REVISIONS			
NO.	DATE	DESCRIPTION	BY

LDC
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Woodinville Olympia Kent
1411 State Avenue NE, #200
Olympia, WA 98506
T 425.806.1869 www.LDCcorp.com F 425.482.2893

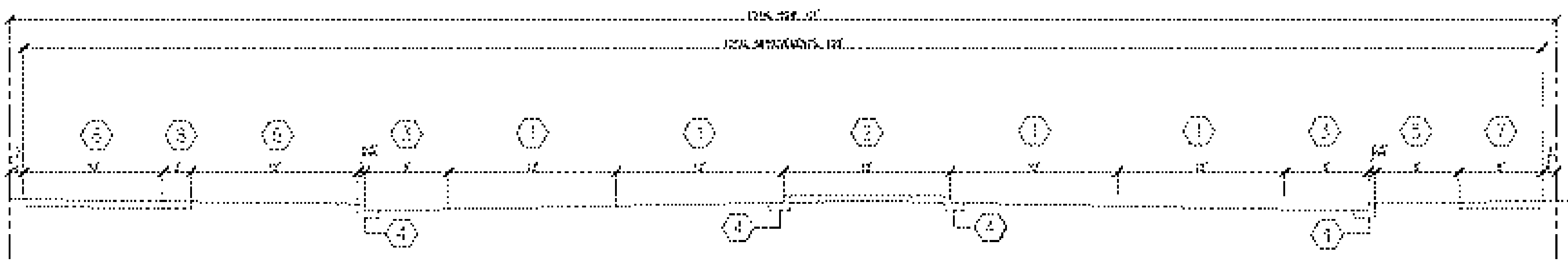
GLENN WELLS
YORKSHIRE
SITE PLAN

TYRELL E. BRADLEY, STATE OF WASHINGTON, 51055, REGISTERED PROFESSIONAL ENGINEER, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-SP-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER, WA

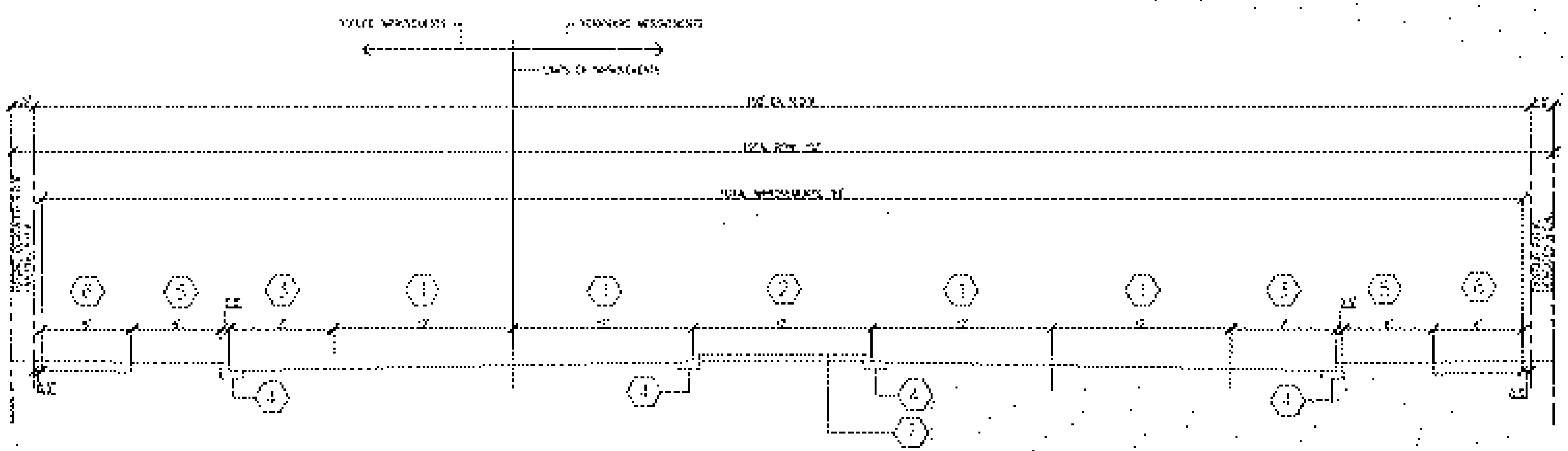
SP-04

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



SECTION A-A NOTES

TYEE DRIVE SECTION A-A



SECTION B-B NOTES

TUMWATER BLVD. SECTION B-B

Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

DISCLAIMER

SEE SHEET SP-01 FOR PHASE LIMITS

REVISIONS

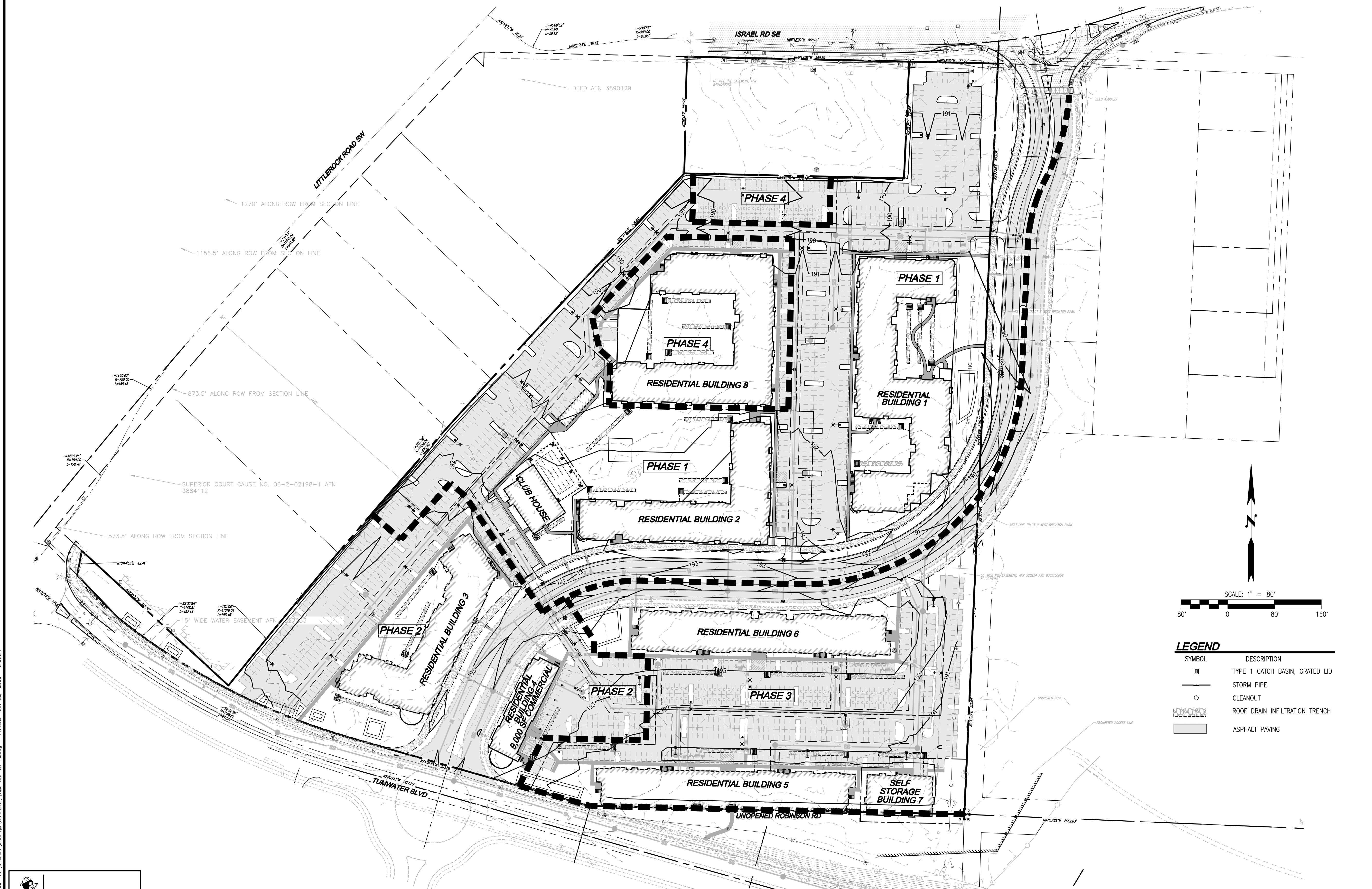
LDC
Surveying
Engineering
Planning

GLENN WELLS
YORKSHIRE
ROADWAY SECTIONS

SP-05

7 of 16

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



LEGEND

SYMBOL	DESCRIPTION
	TYPE 1 CATCH BASIN, GRATED LID
	STORM PIPE
	CLEANOUT
	ROOF DRAIN INFILTRATION TRENCH
	ASPHALT PAVING

SEE SHEETS GR-02 THROUGH SHEETS GR-04 FOR ENLARGED VIEWS

Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

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DISCLAIMER

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SEE SHEET SP-01 FOR PHASE LIMITS

Drawing: P:\Civil\2022\C22-169 yorkshire\Drawings\preliminary\C22-169-GR-PL.dwg Plotted: Dec 02, 2022 - 9:23am

REVISIONS

NO.	DATE	DESCRIPTION	BY

LDC
Surveying Engineering Planning
Woodinville T 425.806.1869
Olympia 1411 State Avenue NE, #200 Olympia, WA 98506 www.LDCcorp.com
Kent F 425.482.2893

GLENN WELLS

YORKSHIRE

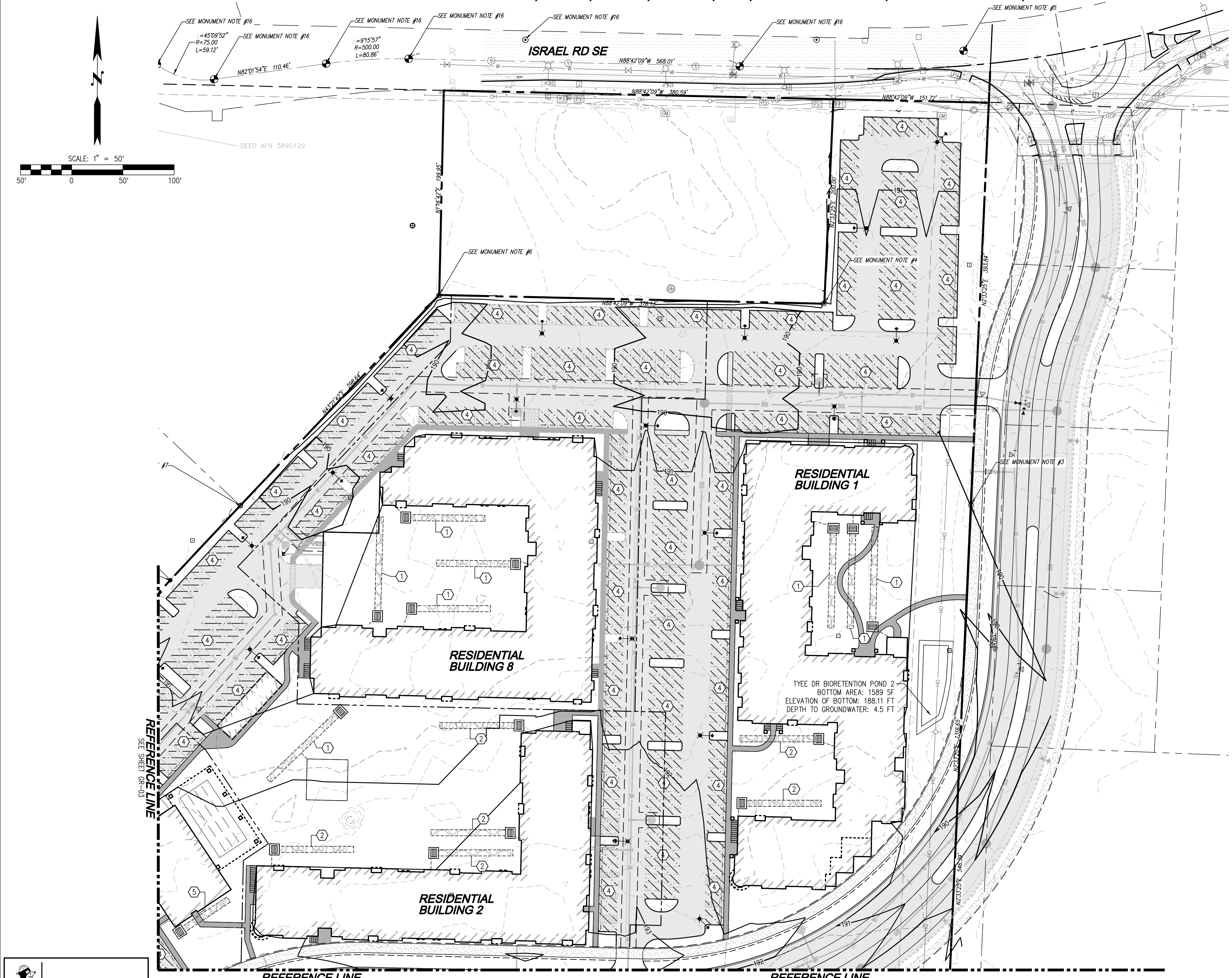
OVERALL GRADING AND DRAINAGE PLAN

TYRELL E. BRADLEY, STATE OF WASHINGTON, 51055, REGISTERED PROFESSIONAL ENGINEER, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-GR-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER, WA

GR-01

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



LEGEND

SYMBOL	DESCRIPTION
	TYPE 1 CATCH BASIN, GRATED LID
	STORM PIPE
	CLEANOUT
	ROOF DRAIN INFILTRATION TRENCH
	ASPHALT PAVING
	PERVIOUS PAVEMENT

STORM CONSTRUCTION NOTES:

1. 1.5' DEPTH x 6' WIDE x 100' LONG INFILTRATION TRENCH
2. 1.5' DEPTH x 6' WIDE x 80' LONG INFILTRATION TRENCH
3. NOT USED
4. PERVIOUS PAVEMENT
5. 1.5' DEPTH x 6' WIDE x 60' LONG INFILTRATION TRENCH

Call 2 Business Days Before You Dig
811 or 1-800-424-5555
Utilities Underground Location Center

UTILITY NOTE

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DISCLAIMER

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SEE SHEET SP-01 FOR PHASE LIMITS

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REVISIONS		
NO.	DATE	DESCRIPTION	BY

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Olympia, WA 98506
www.LDCcorp.com
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GLENN WELLS
YORKSHIRE
GRADING AND DRAINAGE PLAN

TYRELL E. BRAIN... STATE OF WASHINGTON 51055 REGISTERED PROFESSIONAL ENGINEER 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-GR-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 50'
JURISDICTION:	TUMWATER, WA

GR-02

SHEET 9 OF 15

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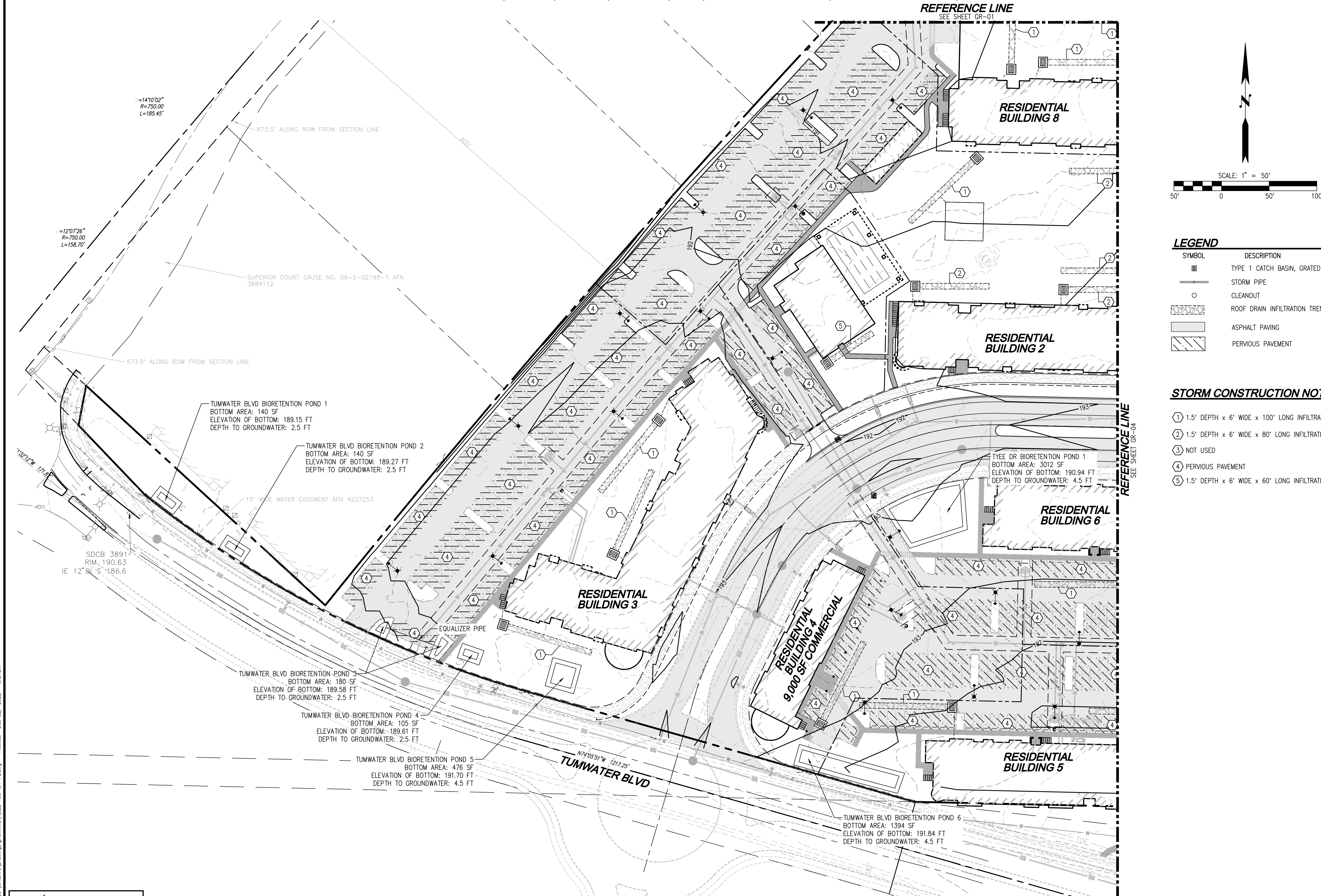

LEGEND

SYMBOL	DESCRIPTION
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	CLEANOUT
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	ASPHALT PAVING
	PERVIOUS PAVEMENT

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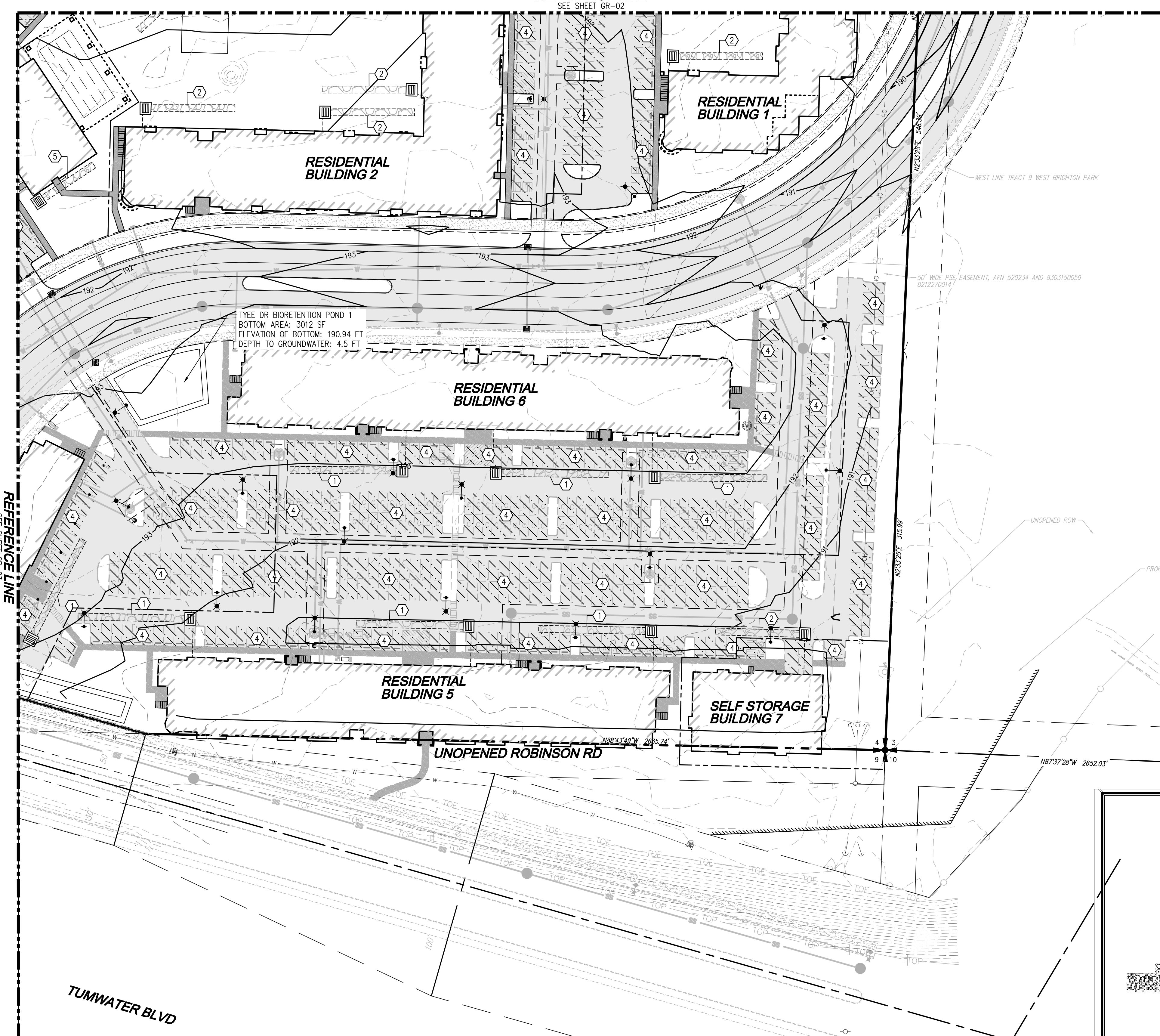
GLENN WELLS
YORKSHIRE
GRADING AND DRAINAGE PLAN

TYRELL E. BRAIRD — STATE OF WASHINGTON — 51055 — REGISTERED PROFESSIONAL ENGINEER — 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-GR-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 50'
JURISDICTION:	TUMWATER, WA

GR-03

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



SCALE: 1" = 50'

50' 0 50' 100'

LEGEND

SYMBOL	DESCRIPTION
	TYPE 1 CATCH BASIN, GRATED LID
	STORM PIPE
	CLEANOUT
	ROOF DRAIN INFILTRATION TRENCH
	ASPHALT PAVING
	PERVIOUS PAVEMENT

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CITY OF TUMWATER DRAINAGE DESIGN AND EROSION CONTROL MANUAL

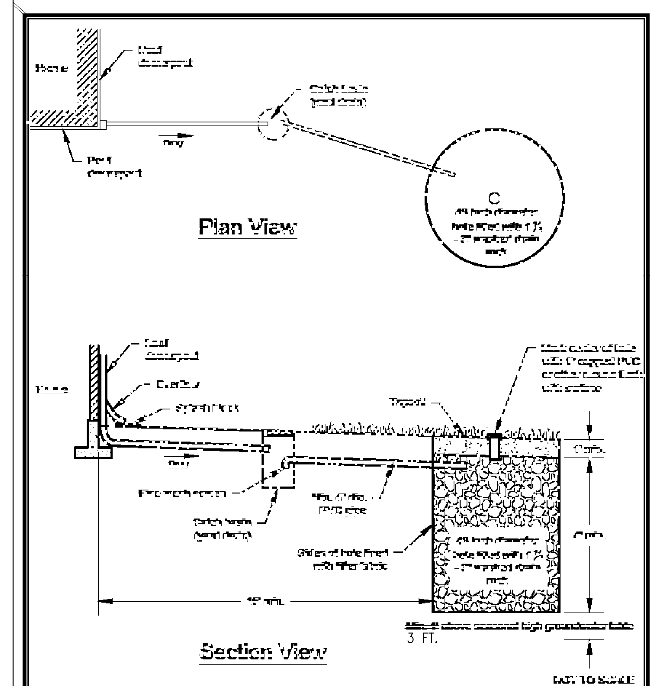
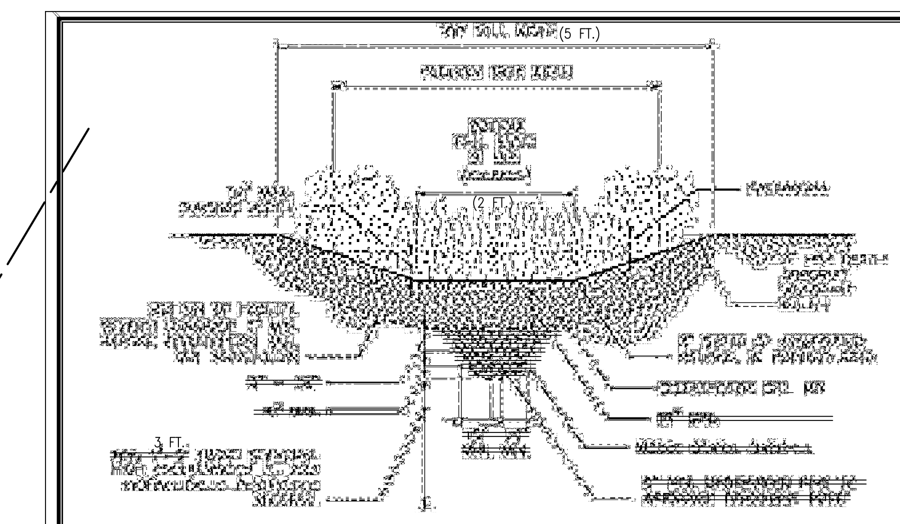


Figure 15.3. Typical Infiltration Drywell.



Source: Pierce County 2015

Figure 9.1. Bioretention Cell (shown with optional underdrain).

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GLENN WELLS

YORKSHIRE

GRADING AND DRAINAGE PLAN

TYRELL E. BRADLEY, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, 51055, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-GR-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 50'
JURISDICTION:	TUMWATER, WA

GR-04

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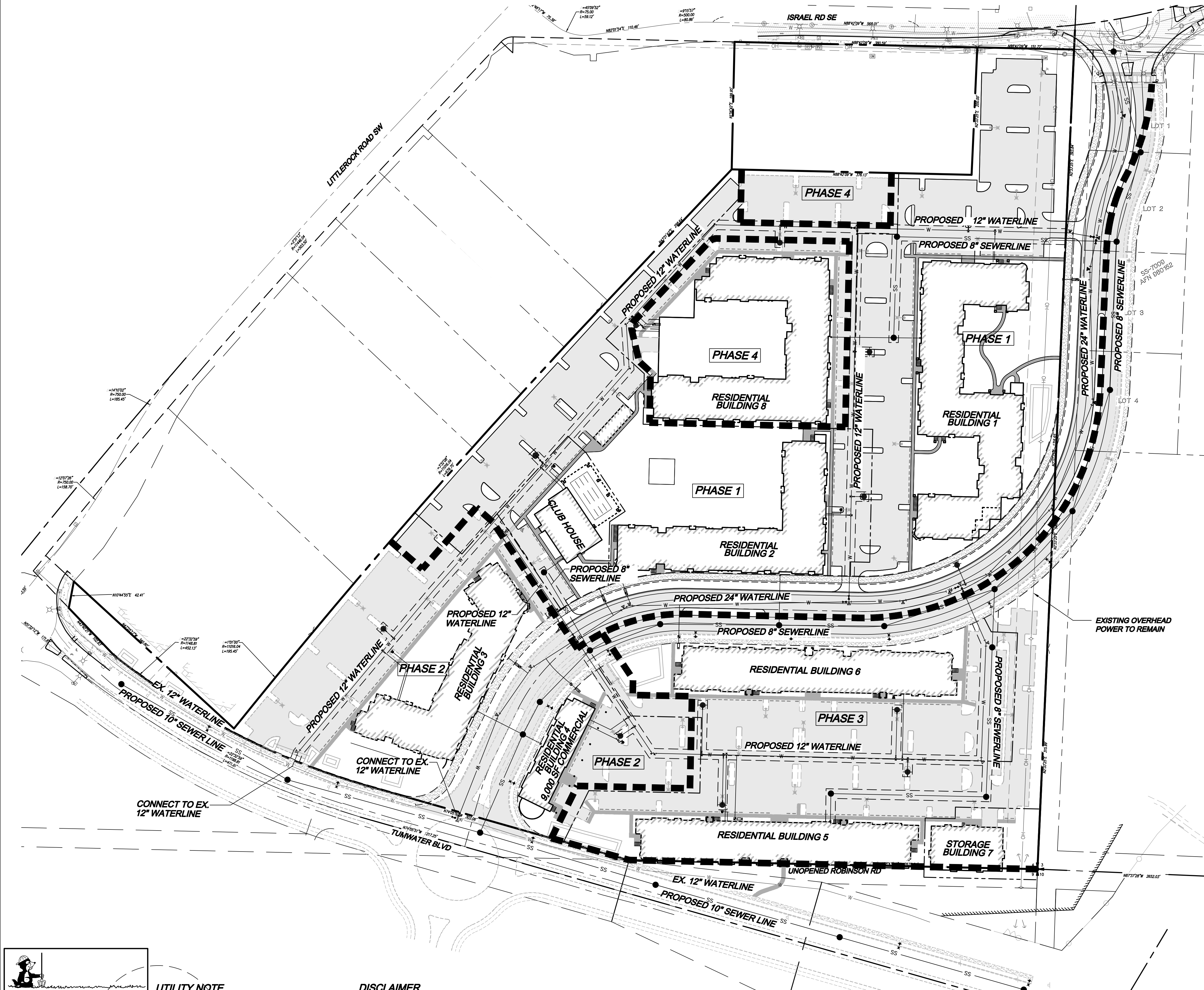

LEGEND

- ● PROPOSED SANITARY SEWER MANHOLE
- ○ PROPOSED SANITARY SEWER CLEANOUT
- —SS— SEWER PIPE
- ▷ THRUST BLOCKING
- GATE VALVE
- WATER METER
- FIRE HYDRANT
- FIRE DEPARTMENT CONNECTION
- —W— WATER PIPE

GENERAL NOTES

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SEE SHEET SP-01 FOR PHASE LIMITS

SEE SHEETS UT-02 THROUGH SHEETS UT-04 FOR UTILITY PHASING LIMITS

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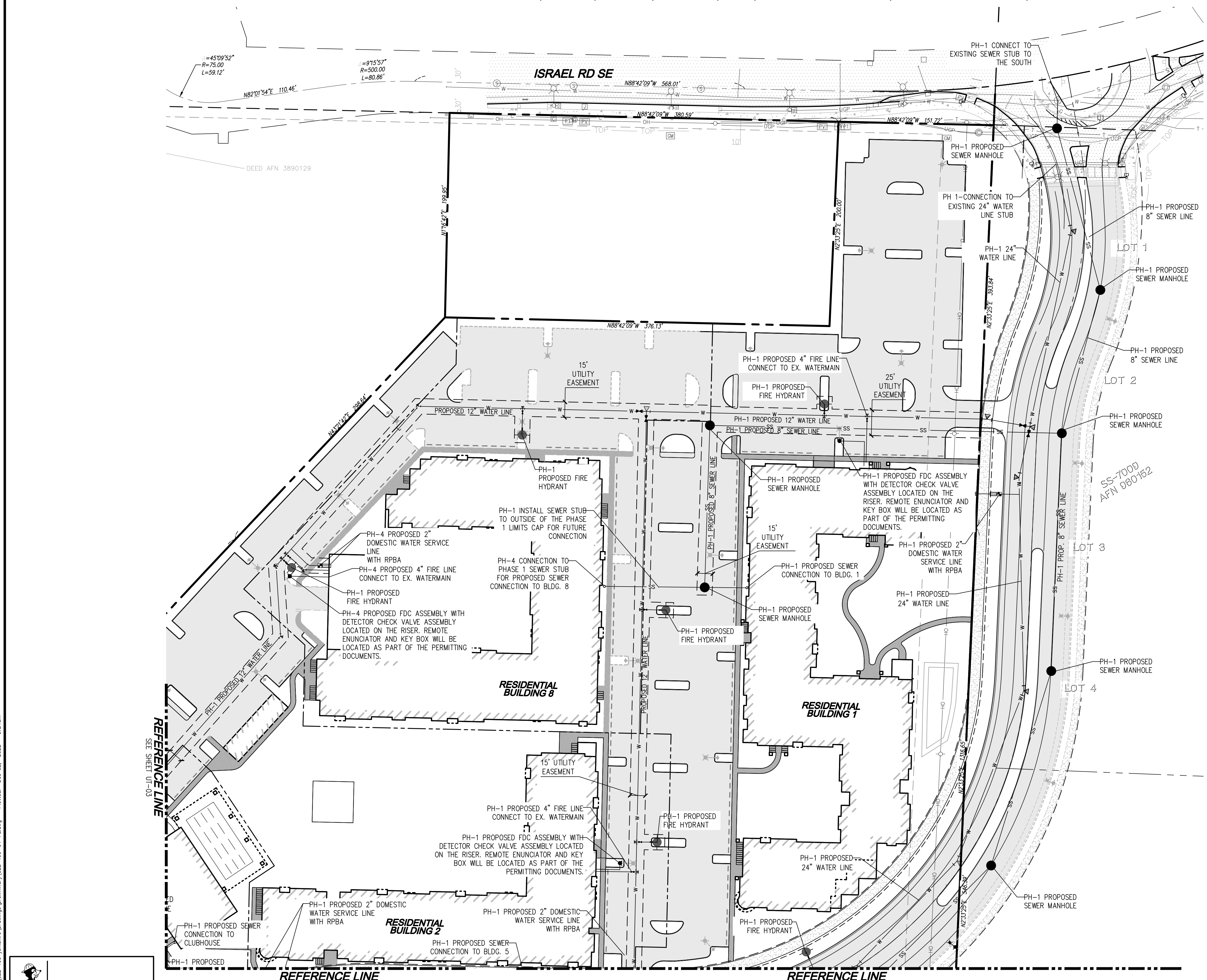
GLENN WELLS
YORKSHIRE
OVERALL UTILITY PLAN

TYRELL E. BRAIRD, STATE OF WASHINGTON, 51055, REGISTERED PROFESSIONAL ENGINEER, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-UT-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	AS NOTED
JURISDICTION:	TUMWATER, WA

UT-01

A PORTION OF SEC 04, TWN 17, RGE 2W, 1/4 S2 SE, W.M., CITY OF TUMWATER, THURSTON COUNTY, WASHINGTON



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

LEGEND

- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED SANITARY SEWER CLEANOUT
- SEWER PIPE
- THRUST BLOCKING
- GATE VALVE
- WATER METER
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3. FIRE HYDRANTS AND PAVED ACCESS ROADS SHALL BE INSTALLED, TESTED FOR FIRE FLOW BY THE FIRE DEPARTMENT AND MADE SERVICEABLE BY THE PUBLIC WORKS DEPARTMENT PRIOR TO ANY VERTICAL OR COMBUSTIBLE CONSTRUCTION. NO EXCEPTIONS.
4. ALL WATER AND SEWER MAINS ON-SITE WILL BE WITHIN A 15 FOOT EASEMENT. THIS WILL BE SHOWN ON THE SITE DEVELOPMENT DRAWING

PHASING NOTE:

ALL UTILITIES SHOWN ON THIS SHEET WILL BE INSTALLED AS A PORTION OF PHASE 1 IMPROVEMENTS EXCEPT FOR WATER AND SEWER CONNECTIONS INTO BUILDING 8. SEE PLAN FOR ADDITIONAL INFORMATION

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Utilities Underground Location Center

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GLENN WELLS
YORKSHIRE
UTILITY PLAN

TYRELL E. BRADLEY
STATE OF WASHINGTON
51055
REGISTERED PROFESSIONAL ENGINEER
12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-UT-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 50'
JURISDICTION:	TUMWATER, WA

UT-02

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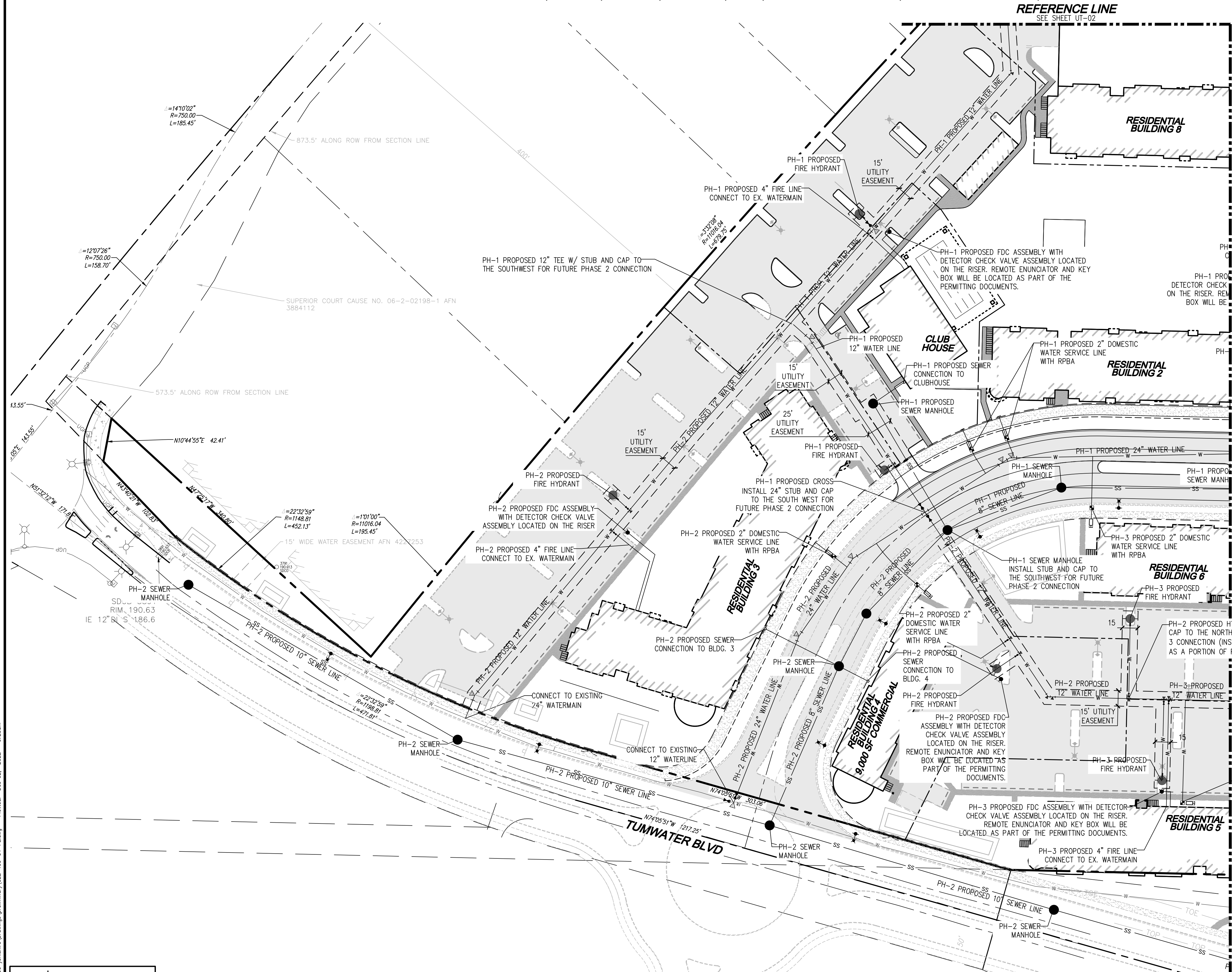

LEGEND

Symbol	Description
●	PROPOSED SANITARY SEWER MANHOLE
○	PROPOSED SANITARY SEWER CLEANOUT
—— SS ——	SEWER PIPE
▷	THRUST BLOCKING
⋈	GATE VALVE
	WATER METER
	FIRE HYDRANT
	FIRE DEPARTMENT CONNECTION
—— W ——	WATER PIPE

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GLENN WELLS
YORKSHIRE
UTILITY PLAN

TYRELL E. BRADLEY STATE OF WASHINGTON 51055 REGISTERED PROFESSIONAL ENGINEER 12-01-22

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DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
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UT-03

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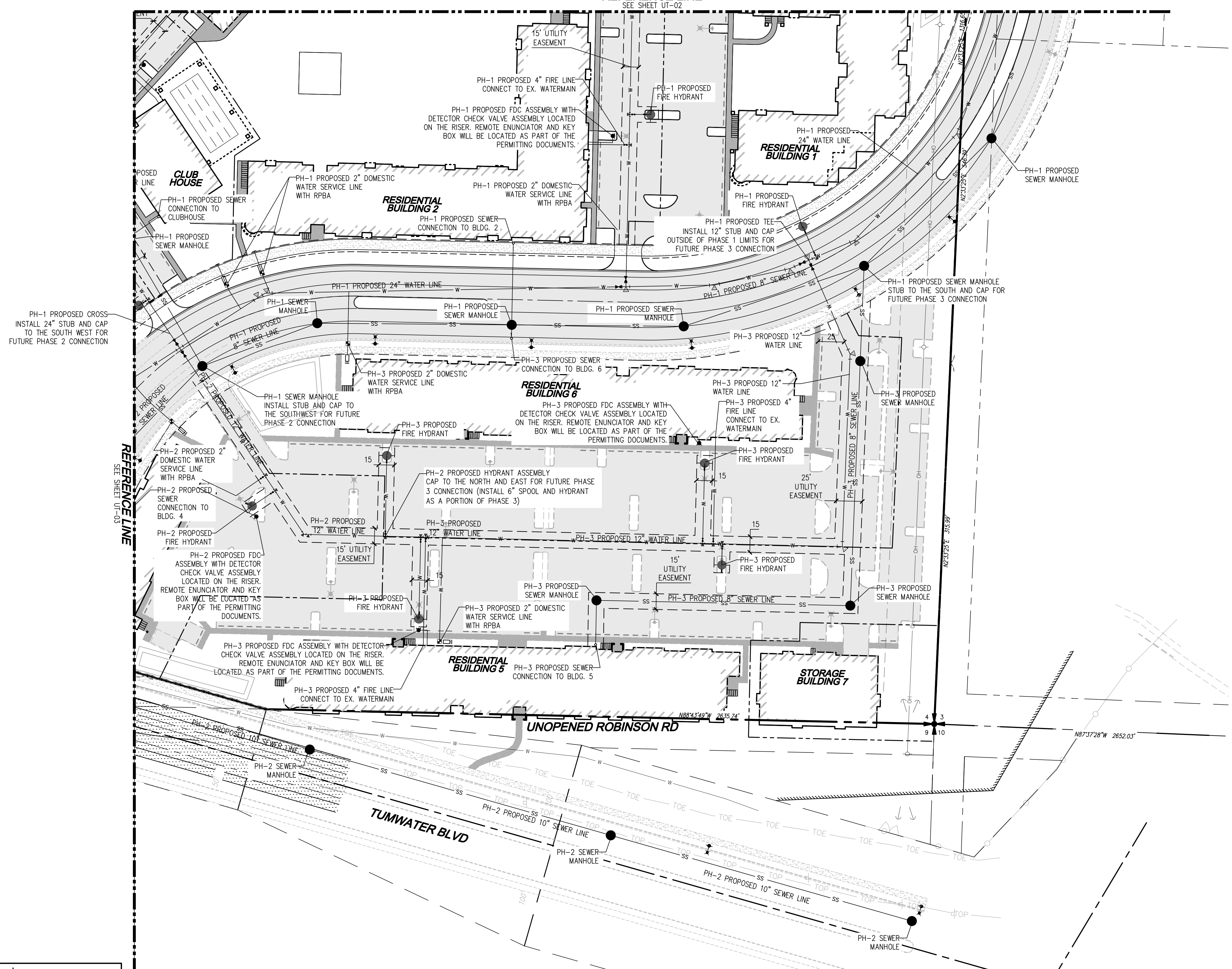

LEGEND

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⧓	GATE VALVE
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www.LDCcorp.com

GLENN WELLS
YORKSHIRE
UTILITY PLAN

TYRELL E. BRAITHWAITE, STATE OF WASHINGTON, 51055, REGISTERED PROFESSIONAL ENGINEER, 12-01-22

JOB NUMBER:	C22169
DRAWING NAME:	C22-169-UT-PL
DESIGNER:	R.WEEDEN
DRAFTING BY:	A.WHITE
DATE:	12/01/2022
SCALE:	1" = 50'
JURISDICTION:	TUMWATER, WA

UT-04

DRAINAGE CONTROL PLAN

ATTACHMENT NO. 2

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

SECTION TO BE ADDED IN FUTURE SUBMITTAL

DRAINAGE CONTROL PLAN
ATTACHMENT NO. 3
SOILS REPORT

5/5/2022

LDC, Inc.
Attn: Tyrell Bradley, P.E.

Subject: **Geotechnical Services Report**
Yorkshire Geotechnical Consultation
TPN 12704440103, 12704440100, 12704431300
Tumwater Blvd SW, Tumwater, WA
Project Number: QG22-065

Dear Mr. Bradley,

At your request, Quality Geo NW, PLLC (QG) has completed a soils investigation of the above referenced project. The investigation was performed in accordance with our proposal for professional services.

We would be pleased to continue our role as your geotechnical consultant of record during the project planning and construction phases, as local inspection firms have not been found to be as familiar or reliably experienced with geotechnical design. This may include soil subgrade inspections, periodic review of special inspection reports, or supplemental recommendations if changes occur during construction. We will happily meet with you at your convenience to discuss these and other additional *Time & Materials* services.

We thank you for the opportunity to be of service on this project and trust this report satisfies your project needs currently. QG wishes you the best while completing the project.

Respectfully Submitted,
Quality Geo NW, PLLC

Luke P.

Luke Preston McCann, L.E.G.
Owner + Principal

SOILS REPORT

YORKSHIRE
TPN 12704440103, 12704440100, 12704431300
Tumwater Blvd SW, Tumwater, WA

LDC, Inc.
Attn: Tyrell Bradley, P.E.

Prepared by:

5/5/2022

LUKE PRESTON MCCANN

Alexander Barnes
Staff Geologist

Luke Preston McCann, L.E.G.
Principal Licensed Engineering Geologist

Quality Geo NW, PLLC
Geotechnical Investigation & Engineering Consultation
Phone: 360-878-9750 | Web: qualitygeonw.com
Mail: 4631 Whitman Ln SE, Ste D, Lacey, WA 98513

5/5/2022

QG Project # QG22-065

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the findings and recommendations of Quality Geo NW's (QG) soil investigation conducted in support of new site surface improvements.

1.1 PROJECT DESCRIPTION

QG understands the project entails the construction of several new multi-family structures within a presently forested large parcel. QG has been contracted to perform a soils investigation of the proposed site to evaluate site soils, foundation conditions, and infiltration feasibility.

1.2 FIELD WORK

Site exploration activities were performed on 4/6/2022. Exploration locations were marked in the field by a QG Staff Geologist with respect to the provided map and cleared for public conductible utilities. Our exploration locations were selected by an QG Staff Geologist prior to field work to provide safest access to relevant soil conditions. The geologist directed the advancement of 3 excavated test pits (TP). The test pits were advanced within the vicinity of the anticipated development footprint areas, to maximum depths of 10.0 feet below present grade (BPG) in general accordance with the specified contract depth.

During explorations QG logged each soil horizon we encountered, and field classified them in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected from each unit, identified according to boring location and depth, placed in plastic bags to protect against moisture loss, and were transported to the soil laboratory for supplemental classification and other tests.

QG advanced 1 Wildcat Dynamic Cone Penetrometer (DCP) tests at a representative location within the vicinity of the proposed temporary road location and as slope conditions permitted. The penetrometer test was terminated upon reaching the equipment's maximum practical extent. During penetrometer advancement, blow counts were recorded in 10-centimeter increments as a thirty-five-pound weight was dropped 15 inches. Blow counts were then converted to resistance (kg/cm2), standard penetration blow counts (N-values), and corresponding soil consistency, with complete results shown on the attached logs.

2.0 EXISTING SITE CONDITIONS

2.1 AREA GEOLOGY

QG reviewed available map publications to assess known geologic conditions and hazards present at the site location. The Washington Geologic Information Portal (WGIP), maintained by the Department of Natural Resources Division of Geology and Earth Resources, provides 1:24,000-scale geologic mapping of the region. Geology of the site location and vicinity consists of Pleistocene Latest Vashon Stade recessional sand and minor silt (Qgos). The sediment deposits on site are described as "Sand and silt with minor gravel interbeds; tan to brown; clasts moderately to well rounded; generally well sorted; clasts and grains consist of northern-source plutonic and metamorphic rocks and polycrystalline quartz carried by Vashon ice, and porphyritic volcanic rock from the Cascade Range 60 mi to the east; thickness varies from about 4 to 20 ft. This unit covers much of the north half of the quadrangle and was probably deposited by meltwater derived from stagnant ice south of Lake St. Clair (Fig. 3) and drainage from glacial Lake Puyallup farther east, possibly grading in elevation to glacial Lake Nisqually (Bretz, 1913) and glacial Lake Russell. Fairly small patches of locally derived ice-contact sand are also included in this unit."

The WGIP Map also offers layers of mapped geohazard conditions within the state. According to the regional-scale interactive map, no known geohazards are mapped for the site.

The United States Department of Agriculture portal (USDA) provides a soil mapping of the region. The soils in the vicinity are mapped as Cagey loamy sand (20), these are formed glacial drift deposits. The soils are described as loamy sand from 0 to 28 inches, and fine sand from 28 to 60 inches. Depth to restrictive feature is more than 80 inches. Capacity of most limiting layer to transmit water (ksat), is listed as high to very high (5.95 to 19.98 in/hr). Depth to water table is about 18 to 30 inches.

2.2 SITE & SURFACE CONDITIONS

The project area is relatively flat, near the same elevation as the adjacent road. The site is currently undeveloped within the parcels and mostly forested vegetation such as trees, ferns, and vines.

2.3 SOIL LOG

Site soil conditions were generally identical across the property in all 3 test pits. Representative lab samples were taken from TP-1. Soil conditions on site were as follows:

- **0' to 1' – Topsoil:**

  An overriding 1-foot layer of topsoil was present over the site. In TP-1, this layer reached a depth of 3.5 feet.

- **1' to 10.0' – Poorly Graded Sand (SP)**

  Beneath topsoil was a 9-foot or greater layer of light brown, moist, soil. No cobbles or organics were present, layer was loose to medium dense This layer graduated in color from light brown to a gray at 6 feet in TP-2. Mottling was encountered at 5 feet in TP-3. Groundwater was encountered within this unit at 5 feet in TP-2 and TP-3. No groundwater was encountered in TP-1.

2.4 SURFACE WATER AND GROUNDWATER CONDITIONS

No active surface water features are present on site. During our test pit explorations, a pervasive groundwater table was encountered at 5-foot depth.

QG's scope of work did not include determination or monitoring of seasonal groundwater elevation variations, formal documentation of wet season site conditions, or conclusive measurement of groundwater elevations at depths past the extent feasible for explorations at the time of the field explorations.

3.0 GEOTECHNICAL RECOMMENDATIONS

3.1 SHALLOW FOUNDATION RECOMMENDATIONS

QG recommends excavating loose or organic cover soils down to firm bearing conditions expected within 1 foot, in other areas across the site this rich organic soil could be as thick as 3.5 feet from the surface. As the variability in subgrade support between consolidated glacial deposits and weathered medium dense cover soils may result in differential settlement, QG recommends that foundations be placed on compacted native soils wherever, or on firm structural fill installed over these compacted soils to achieve footing grade.

Assuming site preparation is completed as described above, we recommend the following:

- **Subgrade Preparation**

  QG recommends excavating and clearing any loose or organic cover soils, including the thick overriding layer of topsoil where necessary, from areas of proposed pavement construction, down to firm bearing conditions and benching the final bottom of subgrade elevation flat. Excavations should be performed with a smooth blade bucket to limit disturbance of subgrade soils. Vibratory compaction methods are suitable for densification of the non-organic native soils.

  After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the periodic guidance of a QG representative. Any areas that are identified as being soft or yielding during subgrade evaluation should be brought to the attention of the geotechnical engineer. Where over excavation is performed below a structure, the over excavation area should extend beyond the outside of the footing a distance equal to the depth of the over excavation below the footing. The over excavated areas should be backfilled with properly compacted structural fill.

  The proposed buildings may utilize either stepped or continuous footings with slab-on-grade elements. For continuous footing elements, upon reaching bearing strata, we recommend benching foundation lines flat. Continuous perimeter and strip foundations may be stepped as needed to accommodate variations in final subgrade level. We also recommend maximum steps of 18 inches with spacing of at least 5 feet be constructed unless specified otherwise by the design engineer. Structural fill may then be placed as needed to reestablish final foundation grade.

- **Allowable Bearing Capacity:**

  Up to 1,500 pounds per square foot (psf) for foundations placed on 12-inches of approved structural fill soils placed in accordance with the recommendations of *Section 4.2*. Bearing capacities, at or below 1,500 psf may eliminate the need for additional inspection requirements if approved by the county. The allowable bearing capacity may be increased by 1/3 for transient loading due to wind and seismic events.

- **Minimum Footing Depth:**

  For a shallow perimeter and spread footing system, all exterior footings shall be embedded a minimum of 18 inches and all interior footings shall be embedded a minimum of 12 inches below the lowest adjacent finished grade, but not less than the depth required by design. However, all footings must also penetrate to the prescribed bearing stratum cited above. Minimum depths are referenced per IBC requirements for frost protection; other design concerns may dictate greater values be applied.

- **Minimum Footing Width:**

  Footings should be proportioned to meet the stated bearing capacity and/or the IBC 2012 (or current) minimum requirements. For a shallow perimeter and spread footing system, continuous strip footings should be a minimum of 16 inches wide and interior or isolated column footings should be a minimum of 24 inches wide.

- **Estimated Settlements:**

  All concrete settles after placement. We estimate that the maximum settlements will be on the order of 0.5 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to occur soon after the load is applied during construction.

3.1.1 BUILDING SLAB ON GRADE FLOOR

QG anticipates that slab-on-grade floors are planned for the interior of the proposed building. Based on typical construction practices, we assume finished slab grade will be similar to or marginally above present grade for the below recommendations. If floor grades are planned to be substantially raised or lowered from existing grade, QG should be contacted to provide revised or alternative recommendations.

- **Capillary Break:**

  A capillary break will be helpful to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow perched water inundation. To provide a capillary moisture break, a 6-inch thick, properly compacted granular mat consisting of open-graded, free-draining angular aggregate is recommended below floor slabs. To provide additional slab structural support, or to substitute for a structural fill base pad where specified, QG recommends the capillary break should consist of crushed rock all passing the 1-inch sieve and no more than 3 percent (by weight) passing the U.S. No. #4 sieve, compacted in accordance with *Section 5.2.2* of this report.

- **Vapor Barrier:**

  A vapor retarding membrane such as 10 mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture where floor coverings may be affected. Care should be taken during construction not to puncture or damage the membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane if desired. If excessive relict organic fill material is discovered at any location, additional sealant or more industrial gas barriers may be required to prevent off-gassing of decaying material from infiltrating the new structure. These measures shall be determined by the structural engineer to meet local code requirements as necessary.

- **Structural Design Considerations:**

  QG assumes design and specifications of slabs will be assessed by the project design engineer. We suggest a minimum unreinforced concrete structural section of 4.0 inches be considered to help protect against cracking and localized settlement, especially where larger equipment or localized loads are anticipated. It is generally recommended that any floor slabs and annular exterior concrete paving subject to vehicular loading be designed to incorporate reinforcing. Additionally, some level of reinforcing, such as a wire mesh may be desirable to prolong slab life due to the overwhelming presence of such poor underlying soils. It should be noted that QG does not express any guarantee or warranty for proposed slab sections.

3.2 INFILTRATION RATE DETERMINATION

QG understands design of on-site stormwater controls are pending the results of this study to confirm design parameters and interpreted depths to perched seasonal groundwater and restrictive soil features.

3.2.1 GRADATION ANALYSIS METHODS & RESULTS

During test pit excavations for general site investigation, QG additionally collected representative samples of native soil deposits among potential infiltration strata and depths. Representative soil samples were selected from the north portion of the site (TP-1) to characterize the local infiltration conditions.

We understand the project will be subject to infiltration design based on the Washington Department of Ecology Stormwater Management Manual for Western Washington (DoE SMMWW). For initial site infiltration characterization within the scope of this study, laboratory gradation analyses were completed including sieve and hydrometer tests for stormwater design characterization and rate determination to supplement field observations. Results of laboratory testing in terms of rate calculation are summarized below.

Laboratory results were interpreted to recommended design inputs in accordance with methods of the 2019 DoE SMMWW. Gradation results were applied to the Massmann (2003) equation (1) to calculate Ksat representing the initial saturated hydraulic conductivity.

(1) log10(Ksat) = -1.57 + 1.90*D10 + 0.015*D60 - 0.013*D90 - 2.08*ff

Corrected Ksat values presented below are a product of the initial Ksat and correction factor CFT. For a generalized site-wide design situation, we have applied a site variability factor of CFv = 0.7 along with typical values of CFt = 0.4 (for the Grain Size Method) and CFm = 0.9 (assuming standard influent control).

(2) CFT = CFv x CFt x CFm = 0.7 x 0.4 x 0.9 = 0.25

Results were cross-referenced with test pit logs to determine the validity and suitability of unique materials as an infiltration receptor. Additional reduction factors were applied for practical rate determination based on our professional judgement.

Table 1. Results Of Massmann Analysis

TP #	**Sample Depth** *(BPG)*	**Unit Extent** *(ft)*	**Soil Type**	**D10**	**D60**	**D90**	**Fines** (%)	**Ksat** *(in/hr)*	**Corrected Ksat** *(in/hr)*	**LT Design Infiltration Rate***(in/hr)*	**Cation Exchange Capacity** (meq/100g)	**Organic Content %**
1	3.5	0.5 to 4	SP-SM	0.15	0.26	0.35	3.42	62.3	15.6	**10.0**	4.6	1.5

Beneath topsoils, the light brown outwash soils were observed to generally exhibit low fines content and minimal oxidation patterns. In-ground infiltration structures are required to maintain a minimum 5-feet separation from restrictive soil & perched water features. Excavated test pits indicated the potential for shallow ground water, however the required separation generally **does not** appear achievable across the site. At this time, QG does not recommend mounding analysis due to the generally suitable site conditions.

QG recommends the designer pursue shallow infiltration structures instead, such as bio swales, rain gardens, pervious pavements, etc. For shallow infiltration features utilizing treatment media, we recommend a maximum design rate of up to 10.0 inches/hour be considered, which is typically suitable for most shallow infiltration features, and considers potential reductions from compaction during construction. These rates are considered applicable to all areas of the subject site at the specified depths.

QG recommends the facility designer review these results and stated assumptions per reference literature to ensure applicability with the proposed development, level of anticipated controls, and long- term maintenance plan. The designer may make reasonable adjustments to correction factors and the resulting design values based on these criteria to ensure design and operational intent is met. We recommend that we be contacted if substantial changes to rate determination are considered.

3.2.2 TREATMENT POTENTIAL

Depending on stormwater and runoff sources, some stormwater features, such as rain gardens or pervious pavements may require treatment. Stormwater facilities utilizing native soils as treatment media typically require Cation Exchange Capacities (CEC) of greater than 5 milliequivalents per 100grams (meq/100g) and organic contents greater than 1% (this may vary depending on local code). The soils directly beneath the topsoil did not meet the minimum treatment standards for a CEC greater than 5 meq/100g.

3.2.3 DRAINAGE RECOMMENDATIONS

QG recommends proper drainage controls for stormwater runoff during and after site development to protect the site. The ground surface adjacent to structures should be sloped to drain away at a 5% minimum to prevent ponding of water adjacent to them.

QG recommends all stormwater catchments (new or existing) be tightlined (piped) away from structures to an existing catch basin, stormwater system, established channel, or approved outfall to be released using appropriate energy-dissipating features at the outfall to minimize point erosion. Roof and footing drains should be tightlined separately or should be gathered in an appropriately sized catch basin structure and redistributed collectively. If storm drains are incorporated for impervious flatworks (driveways, sidewalks, etc.) collected waters should also be discharged according to the above recommendations. Based on our observations of a shallow groundwater table, appropriate measures should be taken by the site designer to consider and allow for an adequate emergency outfall location in the event of future record stormwater fall that cannot be anticipated.

3.3 IMPERVIOUS PAVEMENT CONSIDERATIONS

QG anticipates most pavements will be constructed of flexible Hot Mix Asphalt surfacing, with thickened sections for anticipated heavy load areas. The main entrance/exit drive will likely experience different traffic volumes than the far end of the pavement areas. As a result, consideration could be given to increasing the pavement section in the main entrance/exit drive. Pavement sections presented in the above table should not be used for areas which experience repeated truck traffic/parking, equipment or truck parking areas, entrances and exit aprons, or contain trash dumpster loading zones. In these areas, a Portland Cement Concrete (PCC) pavement should be used, as opposed to HMA.

One of the important considerations in designing a high quality and durable pavement is providing adequate drainage. Design of drainage for the proposed pavement section is outside of QG 's scope of work at this time. It is important that bird baths (leeching basins) and surface waves are not created during construction of the HMA layer. A proper slope should also be allowed, and drainage should be provided along the edges of pavements and around catch basins to prevent accumulation of free water within the base course, which otherwise may result in subgrade softening and pavement deterioration under exposure and repeated traffic conditions.

All pavements require regular maintenance and repair in order to maintain the serviceability of the pavement. These repairs and maintenance are due to normal wear and tear of the pavement surface and are required in order to extend the serviceability life of the pavement. However, after 10 years of service, a normal pavement structure is likely to deteriorate to a point where pavement rehabilitation may be required to maintain the serviceability. The deterioration is more likely if the pavement is constructed over poor subgrade soils or in area of higher traffic volumes.

Rigid pavement components are commonly utilized for portions of accesses and ancillary exterior improvements. The project civil designer may re-evaluate the below general recommendations for pavement thicknesses and base sections, if necessary, to ensure proper application to a given structure and use. QG recommends that we be contacted for further consultation if the below sections are proposed to be reduced.

Concrete driveway aprons and curb alignments, if utilized, should consist of a minimum 6-inch thickness of unreinforced concrete pavement over structural base fill. Base thickness should correspond to related location and anticipated traffic loading. For light traffic areas, a 6-inch minimum base thickness (total 12-inch section) can be applied. For heavy traffic zones, we recommend allotting a 12- inch minimum base section beneath the pavement, or the incorporation of reinforcing steel in the concrete.

Concrete sidewalks, walkways and patios if present may consist of a minimum 4-inch section of plain concrete (unreinforced) installed over a 6-inch minimum compacted base of crushed rock. At locations where grade has been raised with structural fill, a 4-inch minimum crushed rock section may be used. Flatworks should employ frequent joint controls to limit cracking potential.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 EARTHWORK

4.1.1 GRADING & EXCAVATION

A grading plan was not available to QG at the time of this report. However, based on provided conceptual plans, this study assumes finished site grade will approximate current grade. Therefore, depths referred to in this report are considered roughly equivalent to final depths. Excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators.

4.1.2 SUBGRADE EVALUATION & PREPARATION

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the part-time observation and guidance of an QG representative.

The special inspection firm should continuously evaluate all backfilling. Any areas that are identified as being soft or yielding during subgrade evaluation should be over excavated to a firm and unyielding condition or to the depth determined by the geotechnical engineer. Where over excavation is performed below a structure, the over excavation area should extend beyond the outside of the footing a distance equal to the depth of the over excavation below the footing. The over excavated areas should be backfilled with properly compacted structural fill.

4.1.3 SITE PREPARATION, EROSION CONTROLL, WET WEATHER

Any silty or organic rich native soils may be moisture-sensitive and become soft and difficult to traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect any exposed soil subgrades, limit construction traffic during earthwork activities, and limit machine use only to areas undergoing active preparation.

Once the geotechnical engineer has approved subgrade, further measures should be implemented to prevent degradation or disturbance of the subgrade. These measures could include, but are not limited to, placing a layer of crushed rock or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tarp and keeping construction traffic off the subgrade. Once subgrade has been approved, any disturbance because the subgrade was not protected should be repaired by the contractor at no cost to the owner.

During wet weather, earthen berms or other methods should be used to prevent runoff from draining into excavations. All runoffs should be collected and disposed of properly. Measures may also be required to reduce the moisture content of on-site soils in the event of wet weather. These measures can include, but are not limited to, air drying and soil amendment, etc.

QG recommends earthwork activities take place during the summer dry season.

4.2 STRUCTURAL FILL MATERIALS AND COMPACTION

4.2.1 MATERIALS

All material placed below structures or pavement areas should be considered structural fill. Excavated native soils may be considered suitable for reuse as structural fill on a case-by-case basis. Imported material can also be used as structural fill. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials. Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

Structural fill material shall be free of deleterious materials, have a maximum particle size of 4 inches, and be compactable to the required compaction level. Imported structural fill material should conform to the WSDOT manual Section 9-03.14(1) Gravel Borrow, or an approved alternative import material. Controlled-density fill (CDF) or lean mix concrete can be used as an alternative to structural fill materials, except in areas where free-draining materials are required or specified.

Imported materials utilized for trench back fill shall conform to Section 9-03.19, Trench Backfill, of the most recent edition (at the time of construction) of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications)*. Imported materials utilize as grade fill beneath roads shall conform to WSDOT Section 9-03.10, Gravel Base.

Pipe bedding material should conform to the manufacturer’s recommendations and be worked around the pipe to provide uniform support. Cobbles exposed in the bottom of utility excavations should be covered with pipe bedding or removed to avoid inducing concentrated stresses on the pipe.

Soils with fines content near or greater than 10% fines content may likely be moisture sensitive and become difficult to use during wet weather. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials.

The contractor should submit samples of each of the required earthwork materials to the materials testing lab for evaluation and approval prior to delivery to the site. The samples should be submitted **at least 5 days prior to their delivery** and sufficiently in advance of the work to allow the contractor to identify alternative sources if the material proves unsatisfactory.

4.2.2 FILL PLACEMENT AND COMPACTION

For lateral and bearing support, structural fill placement below footings shall extend at minimum a distance past each edge of the base of the footing equal to the depth of structural fill placed below the footing [i.e. extending at least a 1H:1V past both the interior and the exterior of the concrete footing].

Prior to placement and compaction, structural fill should be moisture conditioned to within 3 percent of its optimum moisture content. Loose lifts of structural fill shall not exceed 12 inches in thickness. All structural fill shall be compacted to a firm and unyielding condition and to a minimum percent compaction based on its modified Proctor maximum dry density as determined per ASTM D1557. Structural fill placed beneath each of the following shall be compacted to the indicated percent compaction:

- Foundation and Floor Slab Subgrades: 95 Percent
- Pavement Subgrades & wall backfill (upper 2 feet): 95 Percent
- Pavement Subgrades & wall backfill (below 2 feet): 90 Percent
- Utility Trenches (upper 4 feet): 95 Percent
- Utility Trenches (below 4 feet): 90 Percent

A sufficient number of tests should be performed to verify compaction of each lift. The number of tests required will vary depending on the fill material, its moisture condition and the equipment being used. Initially, more frequent tests will be required while the contractor establishes the means and methods required to achieve proper compaction.

Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

4.3 TEMPORARY EXCAVATIONS AND TRENCHES

All excavations and trenches must comply with applicable local, state, and federal safety regulations. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing soil type information solely as a service to our client for planning purposes. Under no circumstances should the information be interpreted to mean that QG is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred. The contractor shall be responsible for the safety of personnel working in utility trenches. Given that steep excavations in native soils may be prone to caving, we recommend all utility trenches, but particularly those greater than 4 feet in depth, be supported in accordance with state and federal safety regulations. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation.

Temporary excavations and trenches should be protected from the elements by covering with plastic sheeting or some other similar impermeable material. Sheeting sections should overlap by at least 12 inches and be tightly secured with sandbags, tires, staking, or other means to prevent wind from exposing the soils under the sheeting.

5.0 SPECIAL INSPECTION

The recommendations made in this report assume that an adequate program of tests and observations will be made throughout construction to verify compliance with these recommendations. Testing and observations performed during construction should include, but not necessarily be limited to, the following:

- Geotechnical plan review and engineering consultation as needed prior to construction phase,
- Observations and testing during site preparation, earthwork, structural fill, and pavement section placement,
- Consultation on temporary excavation cutslopes and shoring if needed,
- Consultation as necessary during construction.

QG recommends that a local and reputable materials testing & inspection firm be retained for construction phase testing and observation in accordance with the local code requirements. We also strongly recommend that QG be retained as the project Geotechnical Engineering Firm of Record (GER) during the construction of this project to perform periodic supplementary geotechnical observations and review the special inspectors reports during construction.

Our knowledge of the project site and the design recommendations contained herein will be of great benefit in the event that difficulties arise and either modifications or additional geotechnical engineering recommendations are required or desired. We can also, in a timely fashion observe the actual soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

We would be pleased to meet with you at your convenience to discuss the *Time & Materials* scope and cost for these services.

6.0 LIMITATIONS

Upon acceptance and use of this report, and its interpretations and recommendations, the user shall agree to indemnify and hold harmless QG, including its owners, employees and subcontractors, from any adverse effects resulting from development and occupation of the subject site. Ultimately, it is the owner's choice to develop and live in such an area of possible geohazards (which exist in perpetuity across the earth in one form or another), and therefore the future consequences, both anticipated and unknown, are solely the responsibility of the owner. By using this report for development of the subject property, the owner must accept and understand that it is not possible to fully anticipate all inherent risks of development. The recommendations provided above are intended to reduce (but may not eliminate) such risks.

This report does not represent a construction specification or engineered plan and shall not be used or referenced as such. The information included in this report should be considered supplemental to the requirements contained in the project plans & specifications and should be read in conjunction with the above referenced information. The selected recommendations presented in this report are intended to inform only the specific corresponding subjects. All other requirements of the above-mentioned items remain valid, unless otherwise specified.

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, field observations and explorations, and laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, or if the scope of the proposed construction changes from that described in this report, QG should be notified immediately in order to review and provide supplemental recommendations.

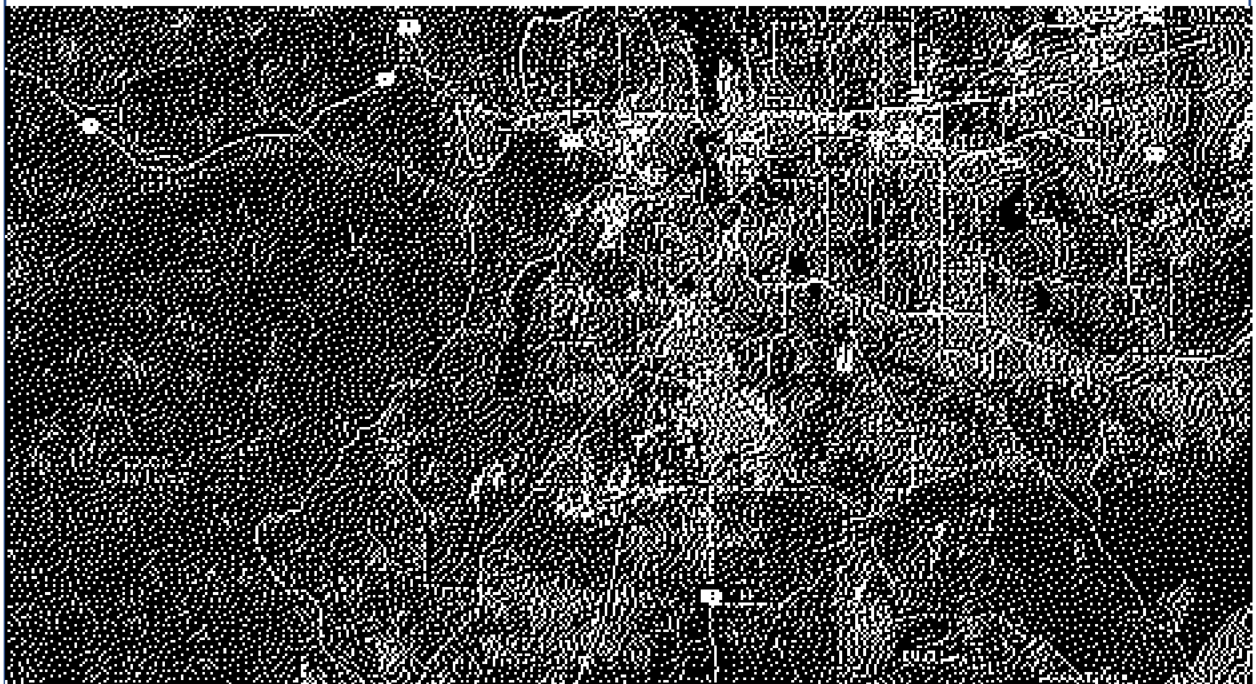
The findings of this study are limited by the level of scope applied. We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the subject region. No warranty, expressed or implied, is made. The recommendations provided in this report assume that an adequate program of tests and observations will be conducted by a WABO approved special inspection firm during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the Client and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the report. It is the Client's responsibility to ensure that the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. Note that if another firm assumes Geotechnical Engineer of Record responsibilities, they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required. Based on the intended use of the report, QG may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release QG from any liability resulting from the use of this report. The Client, the design consultants, and any unauthorized party, agree to defend, indemnify, and hold harmless QG from any claim or liability associated with such unauthorized use or non-compliance. We recommend that QG be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

Appendix A. Region & Vicinity Maps

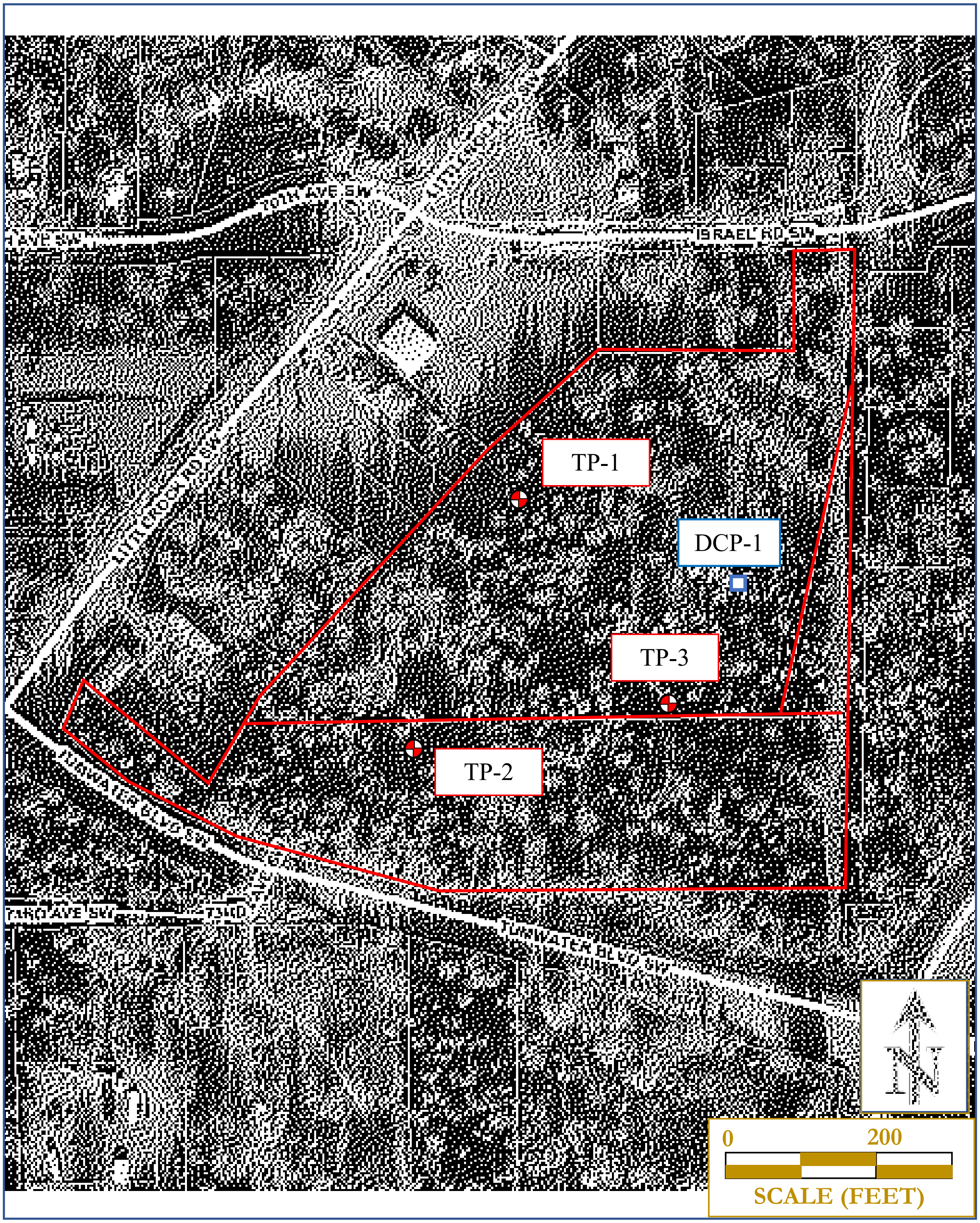
REGION



VICINITY

Quality Geo NW, PLLC	**Site Region** Yorkshire Geo	Source: Google Imagery, Thurston County GIS 2022 **Scale & Locations are approx.** **Not for Construction**	Figure 1

Appendix B. Exploration Map



Quality Geo NW, PLLC	**Site Map** Yorkshire Geo	Source: Thurston Co. GIS, 2022 **Scale & Locations are approx.** **Not for Construction**	**Figure 2**

Appendix C. Exploration Logs

TEST PIT LOG TP-1

PROJECT NUMBER [illegible]
PROJECT NAME [illegible]
PROJECT LOCATION [illegible]
FIELD WORK DATE [illegible]
DRILLING METHOD [illegible]
BORING LOCATION [illegible]
SURFACE ELEVATION [illegible]
LOGGED BY [illegible]

COMMENTS

Depth (ft) | Sample | Graphic Log | USCS | Material Description

[illegible]

[illegible]

TEST PIT LOG TP-2

PROJECT NUMBER: [illegible]
PROJECT NAME: [illegible]
PROJECT LOCATION: [illegible]

FIELD WORK DATE: [illegible]
DRILLING METHOD: [illegible]

BORING LOCATION: [illegible]
SURFACE ELEVATION: [illegible]
LOGGED BY: [illegible]

COMMENTS

Depth (ft)	Sample	[illegible]	Graphic Log	USCS	Material Description
0.5				[illegible]	TOPSOIL
1					
1.5				SP	POORLY GRADED SAND: [illegible]
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					
8					
					[illegible]

[illegible]

TEST PIT LOG TP-2

PROJECT NUMBER [illegible]	FIELDWORK DATE [illegible]	BORING LOCATION [illegible]
PROJECT NAME [illegible]	DRILLING METHOD [illegible]	SURFACE ELEVATION [illegible]
PROJECT LOCATION [illegible]		LOGGED BY [illegible]

COMMENTS

Depth (ft)	Sampler		Graphic Log	USCS	Material Description
				[illegible]	TOPSOIL
0.5					
1				[illegible]	[illegible]
1.5					
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5					
6					
6.5					
					[illegible]

[illegible]

WILDCAT DYNAMIC CONE LOG

Quality Geo NW, PLLC
Geotechnical Consultants
Lacey, WA

PROJECT NUMBER: QG22-065
DATE STARTED: 04-06-2022
DATE COMPLETED: 04-06-2022

HOLE #: DCP-1
CREW: AB
PROJECT: Yorkshire Geo
ADDRESS: Tumwater Blvd SW
LOCATION: Tumwater, WA

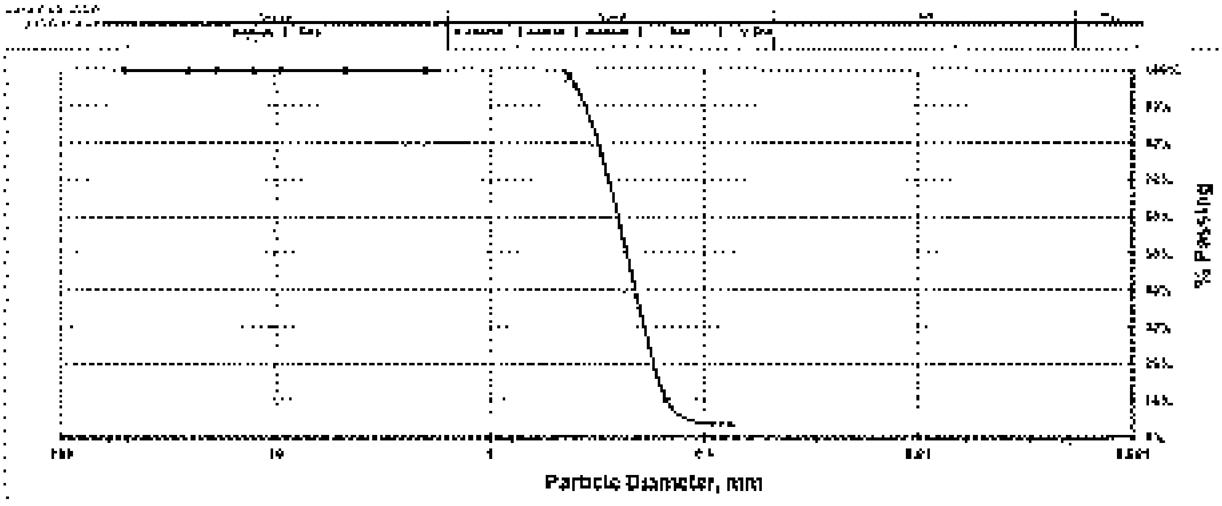
SURFACE ELEVATION: Existing
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	9	40.0		11	MEDIUM DENSE	STIFF
-	4	17.8		5	LOOSE	MEDIUM STIFF
- 1 ft	5	22.2		6	LOOSE	MEDIUM STIFF
-	4	17.8		5	LOOSE	MEDIUM STIFF
-	6	26.6		7	LOOSE	MEDIUM STIFF
- 2 ft	6	26.6		7	LOOSE	MEDIUM STIFF
-	7	31.1		8	LOOSE	MEDIUM STIFF
-	7	31.1		8	LOOSE	MEDIUM STIFF
- 3 ft	8	35.5		10	LOOSE	STIFF
- 1 m	12	53.3		15	MEDIUM DENSE	STIFF
-	10	38.6		11	MEDIUM DENSE	STIFF
- 4 ft	8	30.9		8	LOOSE	MEDIUM STIFF
-	7	27.0		7	LOOSE	MEDIUM STIFF
-	6	23.2		6	LOOSE	MEDIUM STIFF
- 5 ft	10	38.6		11	MEDIUM DENSE	STIFF
-	14	54.0		15	MEDIUM DENSE	STIFF
-	19	73.3		20	MEDIUM DENSE	VERY STIFF
- 6 ft	18	69.5		19	MEDIUM DENSE	VERY STIFF
-	16	61.8		17	MEDIUM DENSE	VERY STIFF
- 2 m	15	57.9		16	MEDIUM DENSE	VERY STIFF
- 7 ft	17	58.1		16	MEDIUM DENSE	VERY STIFF
-	18	61.6		17	MEDIUM DENSE	VERY STIFF
-	14	47.9		13	MEDIUM DENSE	STIFF
- 8 ft	13	44.5		12	MEDIUM DENSE	STIFF
-	15	51.3		14	MEDIUM DENSE	STIFF
-	16	54.7		15	MEDIUM DENSE	STIFF
- 9 ft	19	65.0		18	MEDIUM DENSE	VERY STIFF
-	17	58.1		16	MEDIUM DENSE	VERY STIFF
-	18	61.6		17	MEDIUM DENSE	VERY STIFF
- 3 m 10 ft	21	71.8		20	MEDIUM DENSE	VERY STIFF
-	22	67.3		19	MEDIUM DENSE	VERY STIFF
-	21	64.3		18	MEDIUM DENSE	VERY STIFF
-	23	70.4		20	MEDIUM DENSE	VERY STIFF
- 11 ft	19	58.1		16	MEDIUM DENSE	VERY STIFF
-	15	45.9		13	MEDIUM DENSE	STIFF
-	17	52.0		14	MEDIUM DENSE	STIFF
- 12 ft	13	39.8		11	MEDIUM DENSE	STIFF
-	13	39.8		11	MEDIUM DENSE	STIFF
-	20	61.2		17	MEDIUM DENSE	VERY STIFF
- 4 m 13 ft	21	64.3		18	MEDIUM DENSE	VERY STIFF

Appendix D. Laboratory Results

soiltest

Quality Geo NW
YORKSHIRE GEO - QG22-065



TERRA ASSOCIATES, Inc.

Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

April 25, 2013
Project No. T-6777

Mr. Ray Aspiri
Managing Partner
Tumwater Center LTD Partnership
2125 First Avenue, Suite 2704
Seattle, Washington 98121

Subject: Hydrogeologic Report
Tumwater Center
I-5 and Tumwater Boulevard
Tumwater, Washington

Dear Mr. Aspiri:

As requested, we completed a hydrogeologic study for the subject project. The purpose of our work was to provide an assessment of the potential 1999 seasonal high groundwater table at the property per the Salmon Creek Basin requirements. Our work consisted of observing soil and groundwater conditions at 12 test borings, monitoring groundwater levels for a duration of about 4 months, and performing analysis in accordance with Thurston Counties Salmon Creek Basin requirements to predict the 1999 seasonal high groundwater level at the site.

The site falls within the Salmon Creek Drainage basin, which is a basin designated by Thurston County as an area of high groundwater concern due to flooding in 1996 and 1999. Development standards in this basin require an evaluation to estimate the depth to the historically high groundwater table beneath the site. If this groundwater elevation is within six feet of the base of any planned retention/infiltration facilities, additional analysis and modeling of the retention system proposed is required to determine if infiltration is feasible and if so the potential effect on adjacent properties.

12525 Willows Road, Suite 101, Kirkland, Washington 98034
Phone (425) 821-7777 • Fax (425) 821-4334

SITE EXPLORATION AND MONITORING

We observed soil conditions at 12 test borings drilled to depths of 25 to 70 feet below existing site grades. The borings were then converted into 25-feet observation wells. These wells were then instrumented with automated groundwater data logging devices. Barghausen Consulting Engineers surveyed the ground surface and top of casing elevations of the monitoring wells.

We began monitoring the groundwater on October 13, 2012 and completed our monitoring on March 4, 2013. The automated logging devices were set to take a groundwater reading every one half hour. We collected this data on a bi-weekly base and compared it to our manual groundwater readings to ensure the loggers were reading correctly.

SOIL AND GROUNDWATER CONDITIONS

Surface

The project site consists of 6 tax parcels totaling approximately 98 acres. The properties are bisected east to west by Tumwater Boulevard. The properties north and south of Tumwater Boulevard are approximately 43 acres and 55 acres in size, respectively. The approximate site location is shown on Figure 1.

The site is undeveloped and covered with a variety of very tall brush, mature trees and associated understory, tall grass, open areas, and trails. The site topography is relatively flat with a few rolling hills throughout. Overall grade changes are between one and five feet.

Soils

On October 8 through October 11, 2012, we observed soil conditions at 12 test borings drilled to depths of 25 to 70 feet below current site grades. The soil conditions we observed consisted of two to four feet of silty sand with gravel overlying sand and gravel with varying amounts of silt to the termination of the test borings. The exception to this was observed in Test Boring B-6 where we observed silt and silty sand with gravel below the sand and gravel at a depth of 51 feet to the termination of the boring. At completion, all borings were converted to observation wells with screens set at a depth of 15 to 25 feet below current site grade.

The locations of our test borings/wells were surveyed in by Barghausen Consulting Engineers. Well locations along with elevation are shown on the attached Exploration Location Plan, Figure 2.

All soil samples were visually classified in accordance with the Unified Soil Classification System (USCS) described on the attached Figure 5. The Boring/Well Logs are presented as Figures 6 through 17.

In addition, we reviewed the reference document *Map of Hydrology and Quality of Ground Water in Northern Thurston County*, Thurston County, Washington, by B.W. Drost, G.L. Turney, N.P. Dion, and M.A. Jones (1998). This shows the site as mapped in the area of Vashon recessional outwash with younger alluvium (Qvr). This mapped description is consistent with the native soil we observed in the test borings.

Groundwater

Groundwater was observed in all 12 of the test borings. The groundwater was observed between 9 and 21.5 feet below current site grades during drilling and well construction. The groundwater observed is part of an unconfined regional unconfined aquifer. Monitoring indicates groundwater flows in a north/northwesterly direction with an approximate gradient of 0.0087ft/ft. During our monitoring, we noted fluctuations in groundwater elevation of approximately four-foot from the middle of October to the beginning of March.

DATA RESULTS

As required by the Salmon Creek Basin Plan, a regression analysis was completed to determine the 1999 seasonal high groundwater elevation at the site. This analysis consists of plotting the on-site groundwater readings at the instrumented wells against the groundwater elevation data for the same period from the closest groundwater reference well maintained by Thurston County Department of Water and Waste Management. Thurston County Well LRS-08 is located approximately 1.64 miles southeast of the intersection of I-5 and Tumwater Boulevard. This is the closest well to the site that is currently maintained by Thurston County. The approximate location of the reference well is shown on Figure 3. The reference well does have data for the 1999 water year which is the period of interest. The seasonal high elevation from 1999 was then input into the on-site well regression equations to determine the maximum 1999 groundwater elevations at the site. Plots of the regression analyses with the resulting equations are attached in Appendix A.

The data regression has a coefficient of variation ranging from 0.92 to 0.98. The Salmon Creek Basin development standards require a minimum coefficient of variation of 0.7 for the analysis to be considered reasonably accurate. The calculated historic high groundwater elevations based on the regression analysis for each of the monitoring wells are presented in the following table. These 1999 elevations are also shown adjacent the respective well locations on Figure 2.

Predicted 1999 On-site Groundwater Levels				
Date	**Maximum Water Elevation LRS-08**	**B-1**	**B-2**	**B-3**
2/25/1999	192.9	180.97	183.43	184.65
Date	**Maximum Water Elevation LRS-08**	**B-4**	**B-5**	**B-6**
2/25/1999	192.9	185.35	186.90	185.47
Date	**Maximum Water Elevation LRS-08**	**B-7**	**B-8**	**B-9**
2/25/1999	192.9	187.85	188.00	188.56
Date	**Maximum Water Elevation LRS-08**	**B-10**	**B-11**	**B-12**
2/25/1999	192.9	188.50	188.78	188.83

Relative to current site grades the results of our analysis indicates the 1999 seasonal high groundwater table resides approximately 4 to 11 feet below the surface in the northern and central portion of the northern property and near the surface in the southern portion of the northern parcel (B-5 and B-6). On the southern property, the 1999 seasonal high groundwater table resides approximately 2 to 6 feet below the surface in the north and near the surface in the central and south areas (B-9, B-10, B-12).

A groundwater contour map showing the elevation of the estimated 1999 seasonal high groundwater as determined by this analysis is shown on Figure 4.

LIMITATIONS

This report was prepared in accordance with generally accepted geotechnical engineering practices in the Puget Sound Region. This report is for the exclusive use of Tumwater Center LTD Partnership and their authorized representatives. No other warranty, expressed or implied, is made.

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

Sincerely yours,
TERRA ASSOCIATES, INC.

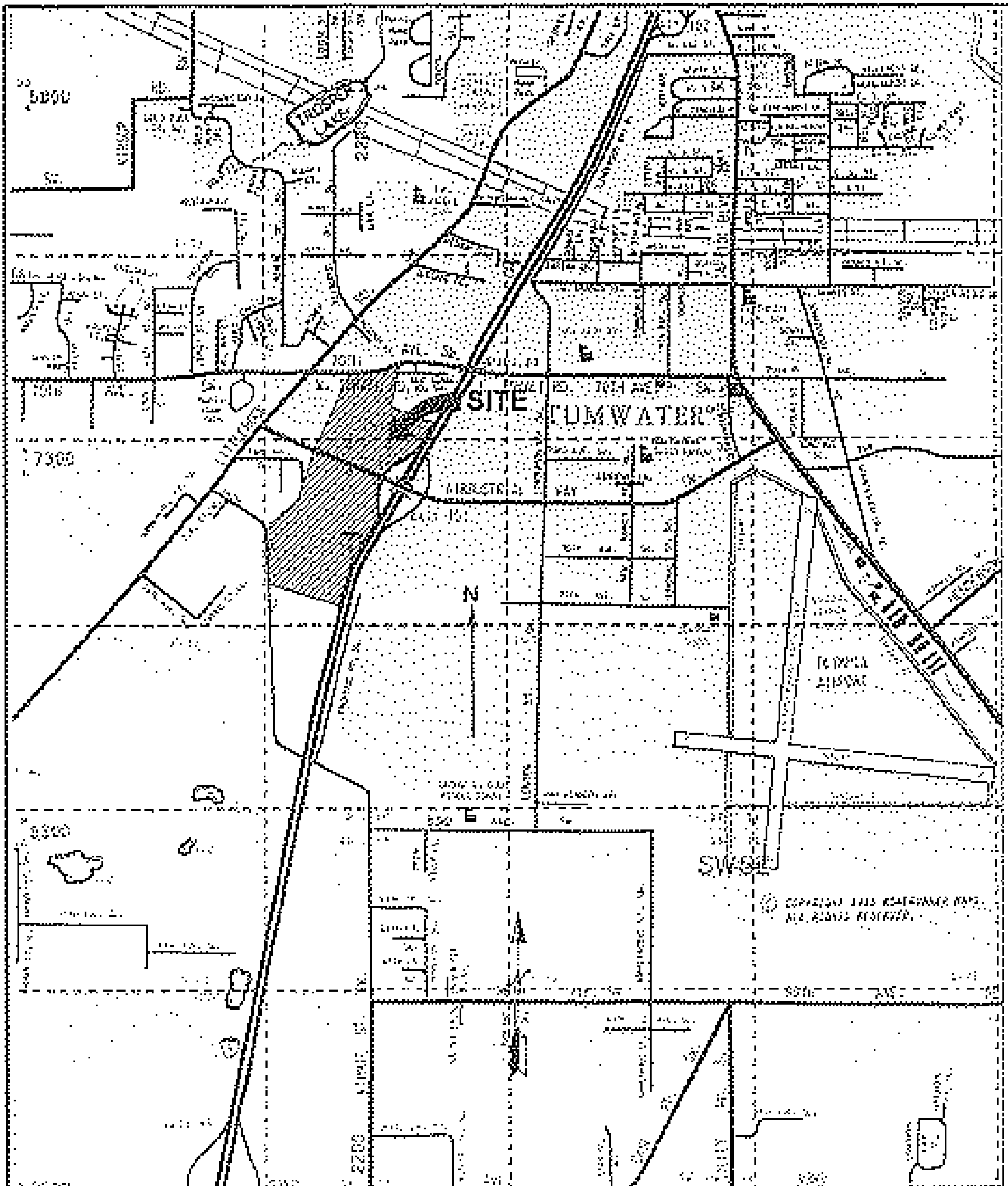
Carolyn S. Decker, P.E.
Project Engineer

4-25-13

Theodore J. Schepper, P.E.
President

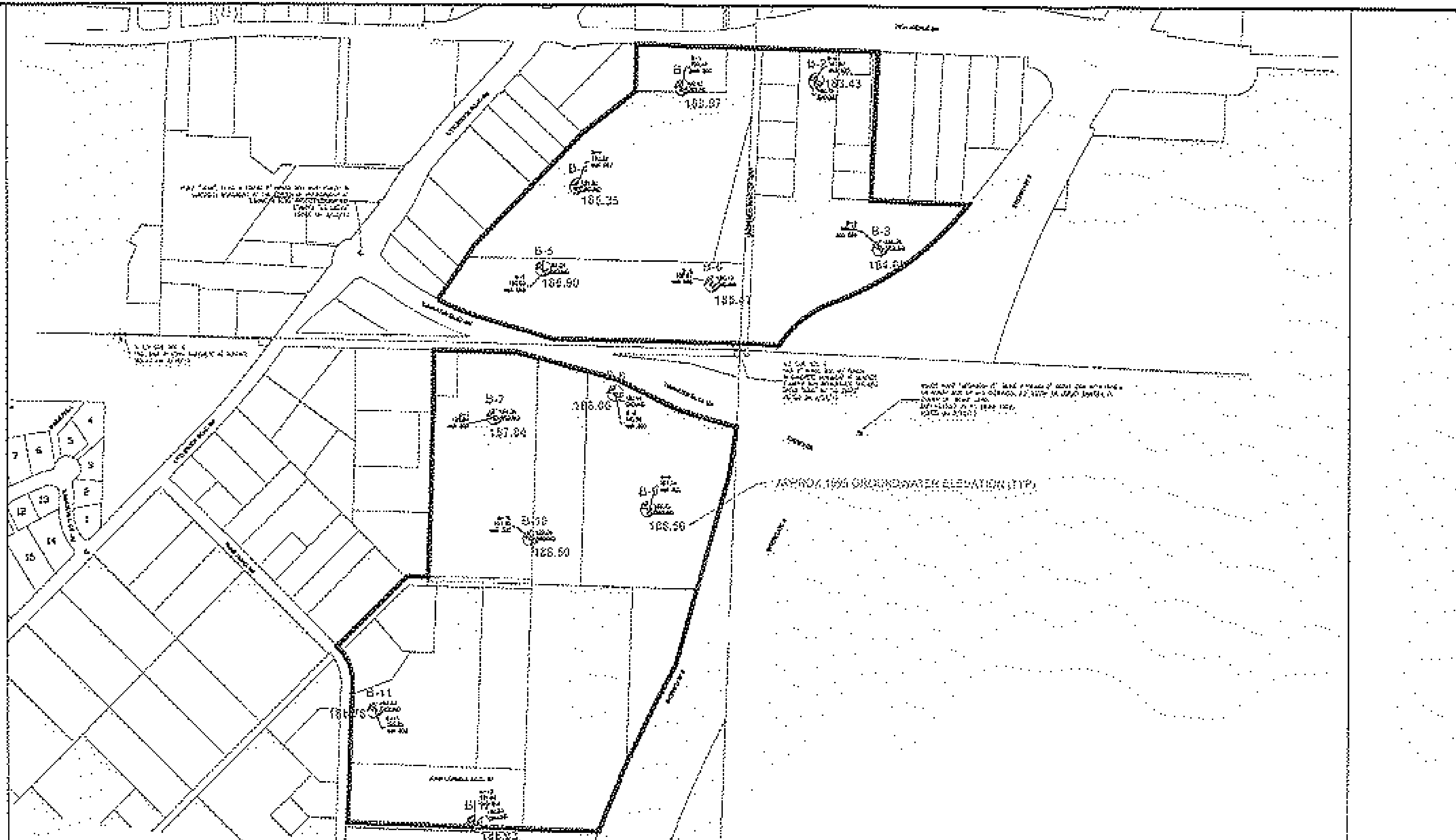
Encl: Figure 1 – Vicinity Map
Figure 2 – Exploration Location Plan
Figure 3 – Overall Site Plan
Figure 4 – 1999 Groundwater Contour Map
Figure 5 – Unified Soil Classification System
Figures 6 through 17 – Boring Logs
Appendix A – Regression Analysis Data

cc: Mr. Dan Balmelli, Barghausen Consulting Engineers



REFERENCE: 1996 ROADRUNNER, KITSAP/MASON/THURSTON COUNTY STREET ATLAS — NOT TO SCALE

Terra Associates, Inc. Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences	VICINITY MAP TUMWATER CENTER TUMWATER, WASHINGTON	
Proj. No. T-6777	Date APR 2013	Figure 1



NOTE:

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

REFERENCE:

SITE PLAN PROVIDED BY BARGHAUSEN CONSULTING ENGINEERS

LEGEND:

APPROXIMATE BORING LOCATION

N

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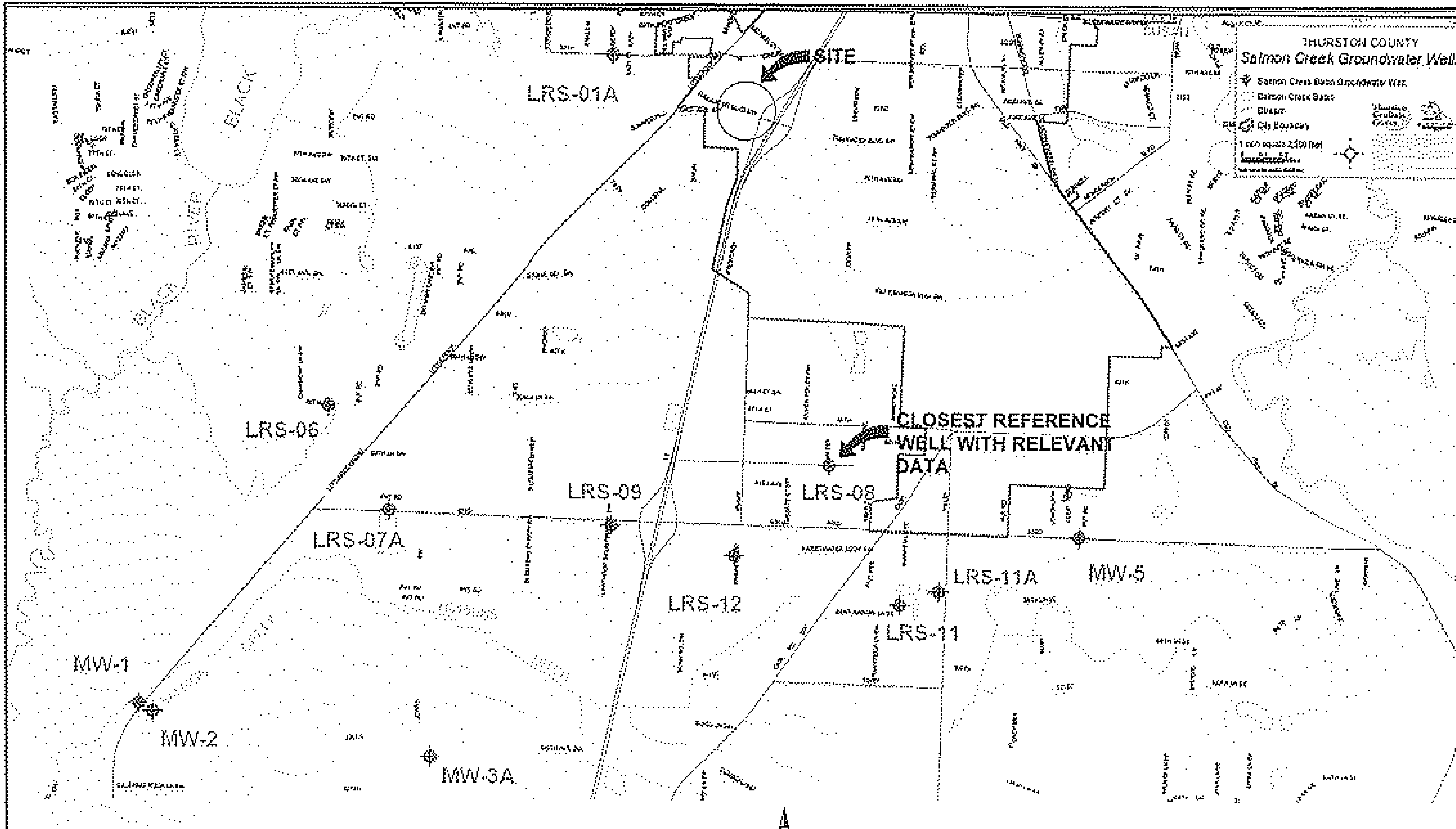
Environmental Earth Sciences

EXPLORATION LOCATION PLAN
TUMWATER CENTER
TUMWATER, WASHINGTON

Proj. No.T-6777	Date APR 2013	Figure 2



REFERENCE:
SITE PLAN PROVIDED BY THURSTON COUNTY

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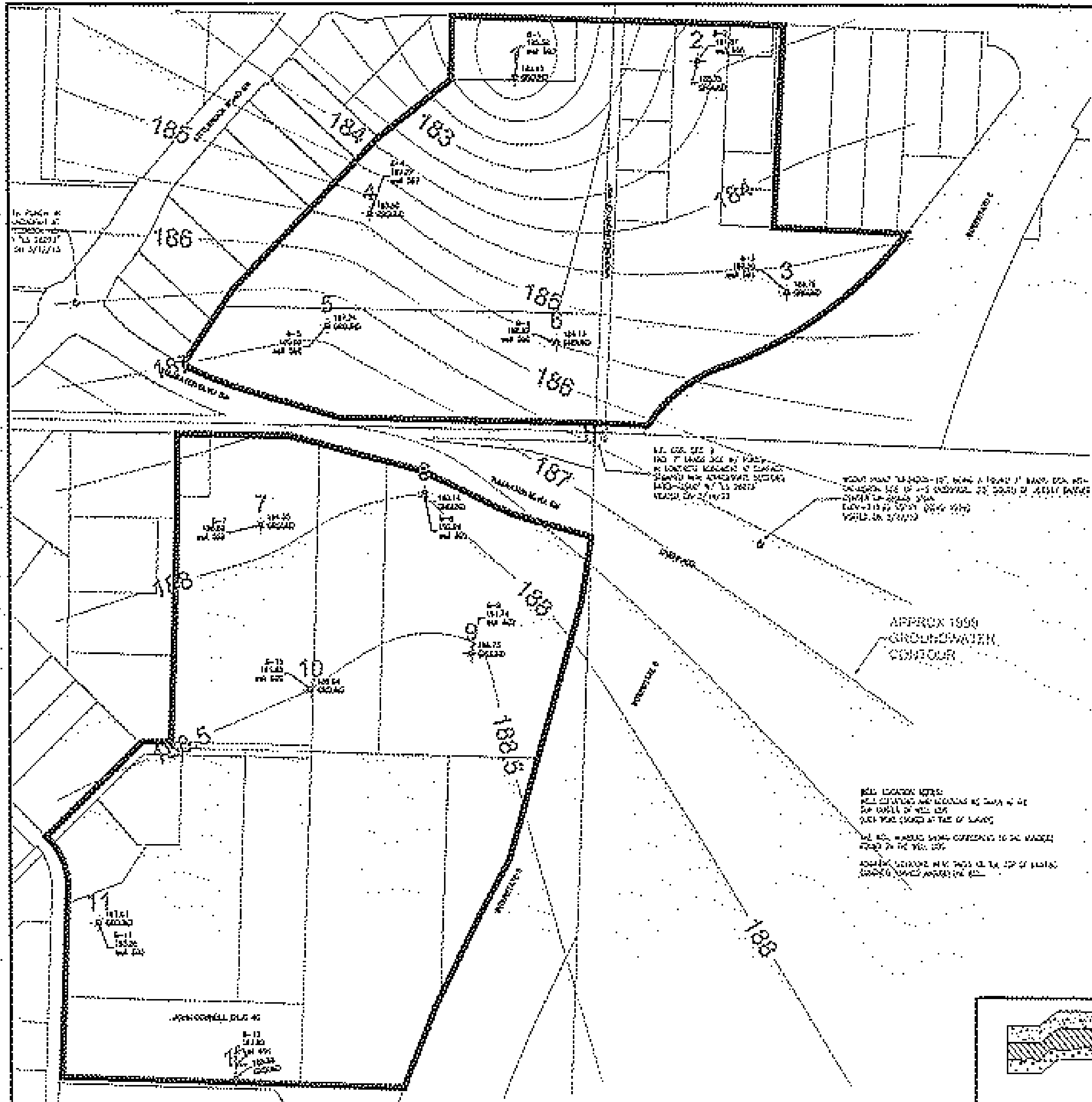
Environmental Earth Sciences

OVERALL SITE PLAN
TUMWATER CENTER
TUMWATER, WASHINGTON

Proj. No T-6777	Date APR 2013	Figure 3



LDC, Inc. note:
Datum appears to be NGVD 29

NOTE:

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

REFERENCE:

SITE PLAN PROVIDED BY BARGHAUSEN CONSULTING ENGINEERS

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Environmental Earth Sciences

APPROX 1999 G.W. CONTOUR MAP
TUMWATER CENTER
TUMWATER, WASHINGTON

Proj. No T-6777	Date APR 2013	Figure 4

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

DEFINITION OF TERMS AND SYMBOLS

COHESIONLESS

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

COHESIVE

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

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

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Environmental Earth Sciences

UNIFIED SOIL CLASSIFICATION SYSTEM
TUMWATER CENTER
TUMWATER, WASHINGTON

Proj. No T-6777 | Date APR 2013 | Figure 5

LOG OF BORING NO. B-1

Figure No. 6

Project: Tumwater Center   Project No: T-6777   Date Drilled: 10/8/12

Client: Tumwater Center LTD Partnership   Driller: BORETEC   Logged By: CSD

Location: Tumwater, Washington   Approx. Elev: 192.43 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp ——— Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0		(BLACKBERRIES)				
1–4		Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
4–8	5–6.5	Brown SAND, fine grained, dry. (SP)	Medium Dense	7.7	11	
8–25	10–11.5	Gray SAND, fine grained, dry. (SP)		8.2	11	
	15–16.5	*At 15 feet soil becomes moist.	Medium Dense	16.6	13	
20 ▼	20–21.5	*At 20 feet soil becomes saturated.		24.7	17	
25		*Continued on Next Page				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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LOG OF BORING NO. B-1

Figure No. 6

Project: Tumwater Center **Project No:** T-6777 **Date Drilled:** 10/8/12

Client: Tumwater Center LLC Partnership **Driller:** BORETEC **Logged By:** CSO

Location: Tumwater, Washington **Approx. Elev:** 182.43 Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp ├──x──┤ Wl; 10 20 30 40)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
26			25.4	15	
27					
28	Gray SAND, fine to medium grained, saturated. (SP)				
29					
30	*At 30 feet observed a 1-inch layer of silty SAND within the SAND formation.		26.0	16	
31					
32		Medium Dense			
33					
34					
35			29.2	9	
36					
37					
38					
39					
40			21.1	21	
41					
42					
43					
44					
45	Brown SAND with silt, fine to medium grained, saturated. (SP-SM)	Medium Dense	16.1	22	
46					
47					
48					
49	Brown GRAVEL with sand, medium to coarse grained, saturated. (GP)	Medium Dense			
50					

*Continued on Next Page.

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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LOG OF BORING NO. B-1

Figure No. 6

Project: Tumwater Center — Project No: T-6777 — Date Drilled: 10/8/12

Client: Tumwater Center LTD Partnership — Driller: BORETEC — Logged By: CSO

Location: Tumwater, Washington — Approx. Elev: 192.43 Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp |----x----| Wl; 10 20 30 40)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
51–53	Brown GRAVEL with sand, medium to coarse grained, saturated. (GP)	Medium Dense	6.0	28	
53–58	Brown SAND, fine to coarse grained, saturated. (SP)	Medium Dense	15.2	25	
58–68	Grey SAND, fine to coarse grained, saturated, trace gravel. (SP)	Medium Dense	17.0	29	
		Dense	14.3	44	
68–71.5	Grey GRAVEL, coarse grained, saturated. (GP)	Dense	7.2	50	
71.5	Test boring terminated at 71.5 feet. Groundwater observed at 20 feet during drilling. Installed a 2-inch monitoring well approximately 5 feet to the east. DOE Well No. BHK593				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences

LOG OF BORING NO. B-2

Figure No. 7

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/8/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 168.75 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp —— Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0		(FOREST DUFF)				
1–3		Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
5	▯			6.2	12	
7		Brown SAND, fine grained, dry. (SP)				
10	▯	*At 10 feet soil becomes gray.		6.4	20	
13			Medium Dense			
15	▯	*At 15 feet soil becomes wet-saturated.		22.4	14	
20	▯	*At 20 feet soil is saturated.		29.0	9	
25	▯			22.0	13	
27–30		Test boring terminated at 26.5 feet. Groundwater observed at 15.5 feet during drilling. Boring converted to 2 inch monitoring well. DOE Well No. BHK895				

Note: This geotechnical log has been prepared for geotechnical purposes. This information pertains only to the boring location and should not be interpreted as being indicative of other areas of the site.

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Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences

LOG OF BORING NO. B-3

Figure No. 8

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/8/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 186.79 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp ├──×──┤ Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4); SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0–4		(FOREST DUFF) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
5–6	sample	Brown SAND, fine grained, dry. (SP)		5.7	12	
10–11	sample	*At 10 feet soil becomes moist to wet.	Medium Dense	20.6	10	
12 (groundwater ▼)						
15–16	sample	*At 15 feet soil becomes saturated.		28.9	12	
20–21	sample			9.6	39	
21–24		Brown GRAVEL, coarse grained, saturated. (GP)	Dense			
25–26	sample	Brown SAND, fine to medium grained, saturated. (SP)	Dense	21.6	41	
27–30		Test boring terminated at 26.5 feet. Groundwater observed at 12 feet during drilling. Boring converted to 2-inch monitoring well. DOE Well No. BHK594				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences

LOG OF BORING NO. B-4

Figure No. 9

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/9/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 189.5 Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp — Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)
0–4	(FOREST DUFF) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose		
5	Brown SAND, fine grained, dry. (SP)	Medium Dense	8.0	11
10	*At 10 feet soil becomes gray, fine to medium grained.		7.4	11
15	*At 15 feet soil becomes saturated.		23.9	11
20			24.2	13
25			23.1	17

Observ. Well

Groundwater level marked at 14 feet.

Test boring terminated at 26.5 feet.
Groundwater observed at 14 feet during drilling.
Boring converted to 2-inch monitoring well.
DOE Well No. BHK597

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

Terra Associates, Inc.
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LOG OF BORING NO. B-5

Figure No. 10

Project: Tumwater Center **Project No:** T-6777 **Date Drilled:** 10/9/12

Client: Tumwater Center LTD Partnership **Driller:** BORETEC **Logged By:** CSD

Location: Tumwater, Washington **Approx. Elev:** 167.24 Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp |---x---| Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0–1	(FOREST DUFF)				
1–4	Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
4–13	Brown SAND, fine to medium grained, dry to moist. (SP)	Medium Dense	7.7 (5 ft)	13 (5 ft)	
	*At 10 feet soil becomes gray, wet to saturated.		30.0 (10 ft)	10 (10 ft)	
12	▼				
13–18	Brown SAND with silt, fine grained, saturated. (SP-SM)	Medium Dense	34.7 (15 ft)	9 (15 ft)	
18–26.5	Gray SAND, fine to medium grained, saturated, trace gravel. (SP)	Medium Dense	21.7 (20 ft); 28.2 (25 ft)	20 (20 ft); 10 (25 ft)	

Test boring terminated at 26.5 feet.
Groundwater observed at 12 feet during drilling.
Boring converted to 2-inch monitoring well DOE Well No. BIK698

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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

LOG OF BORING NO. B-6

Figure No. 11

Project: Tumwater Center　Project No: T-6777　Date Drilled: 10/9/12

Client: Tumwater Center LTD Partnership　Driller: BORETEC　Logged By: CSD

Location: Tumwater, Washington　Approx. Elev: 180 ±3 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % Wp |----x----| Wl 10 30 50 70 90	Pocket Penetrometer TSF 1 2 3 4 / SPT (N) Blows/ft 10 20 30 40	Observ. Well
0		(WEEDS/BLACKBERRIES)				
1–4		Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
5–8	5–6.5	Brown SAND, fine grained, dry. (SP)	Medium Dense	6.4	14	
8–25	10–11.5, 15–16.5, 20–21.5	Gray SAND, fine to medium grained, saturated. (SP)	Medium Dense	26.3; 27.2; 25.6	12; 11; 14	

◄ During Drilling (9 ft)
◄ After Drilling (13 ft)

*Continued on Next Page

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

Terra Associates, Inc.
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LOG OF BORING NO. B-6

Figure No. 11

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/9/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 186.13 Feet

Depth (ft)	Sample Interval	Soil Description	Consistancy/ Relative Density	Moisture Content % (Wp ├──x──┤ Wl; 10 20 30 40)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
26	▮			25.0	11	
27						
28		Gray SAND, fine to medium grained, saturated. (SP)	Medium Dense			
29						
30	▮			8.3	18	
31						
32		Brown GRAVEL, coarse grained, saturated. (GP)	Medium Dense			
33						
34						
35	▮			16.1	15	
36						
37						
38						
39						
40	▮	Gray SAND, fine to medium grained, saturated. (SP)	Medium Dense	22.1	20	
41						
42						
43						
44						
45	▮			23.1	16	
46						
47						
48						
49						
50		*Continued on Next Page				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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

LOG OF BORING NO. B-6

Figure No. 11

Project: Tumwater Center Project No: T-6777 Date Drilled: 10/9/12

Client: Tumwater Center LTD Partnership Driller: BORETEC Logged By: CSD

Location: Tumwater, Washington Approx. Elev: 186.13 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % Wp (----x----) Wl 10 20 30 40	Pocket Penetrometer TSF 1 2 3 4 / SPT (N) Blows/ft 10 20 30 40	Observ. Well
51	sample	Gray SAND, fine to medium grained, saturated. (SP)	Medium Dense	43.1	19	
52						
53		Brown SILT, fine grained, wet. (ML)	Dense			
54						
55	sample			9.9	45	
56						
57		Brown SAND with gravel, fine to coarse grained, wet. (SP)	Dense			
58						
59		Gray silty SAND with gravel, fine to medium grained, saturated. (SM)	Very Dense			
60	sample			9.4	50/4"	
61		Test boring terminated at 60 feet. Groundwater observed at 9 feet during drilling. Installed a 2-inch monitoring well approximately 10 feet to the north. DOE Well No. BHK596				
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						
73						
74						
75						

Note: This subsurface log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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LOG OF BORING NO. B-7

Figure No. 12

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/10/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 194.30 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % Wp |——| Wl (10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0		(TALL BRUSH)				
2		Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
5–6.5	▯	Brown SAND, fine grained, dry. (SP)	Medium Dense	7.6	9	
10–11.5	▯	Brown SAND with silt, fine grained, moist. (SP-SM)	Medium Dense	10.2	13	
15–16.5	▯	Gray SAND, fine to medium grained, moist. (SP)	Dense	15.1	37	
20–21.5	▯	Gray GRAVEL with sand, fine to coarse grained, wet to saturated. (GP)	Very Dense	7.7	57	
25						

*Continued on Next Page

Note: This subsurface log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences

LOG OF BORING NO. B-7

Figure No. 12

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/10/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 194.30 Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp |----|----| Wl; 10 20 30 40)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
26–27	Gray GRAVEL with sand, fine to coarse grained, saturated. (GP)	Dense	10.8	36	
30–31	Gray GRAVEL with silt and sand, fine to coarse grained, saturated. (GP-GM)	Dense	9.0	49	
35	Gray GRAVEL with sand, medium to coarse grained, saturated. (GP)	Very Dense	6.5	50/6"	
40			10.0	87	
45	Gray SAND, fine to medium grained, saturated. (SP)	Very Dense	10.5	56	
48–49	Gray GRAVEL with sand, medium to coarse grained, saturated. (GP)	Very Dense			
50	*Continued on Next Page				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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

LOG OF BORING NO. B-7

Figure No. 12

Project: Tumwater Center | Project No: T-6777 | Date Drilled: 10/10/12

Client: Tumwater Center LTD Partnership | Driller: BORETEC | Logged By: CSD

Location: Tumwater, Washington | Approx. Elev: 194.30 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % Wp Wl (10 20 30 40)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
51	✓	Gray GRAVEL with sand, medium to coarse grained, saturated. (GP)	Very Dense	9.6	50/5"	
52						
53						
54						
55	✓			9.6	50/6"	
56						
57						
58						
59						
60	✓			6.1	50/4"	
61						
62						
63						
64						
65	✓			8.6	50/5"	
66						
67						
68						
69						
70	✓			7.3	50/4"	
71–75		Test boring terminated at 71 feet. Groundwater observed at 21.5 feet during drilling. Installed a 2-inch monitoring well approximately 10 feet to the north. DOE No. BHX595				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas at the site.

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LOG OF BORING NO. B-6

Figure No. 13

Project: Tumwater Center **Project No:** 1-6777 **Date Drilled:** 10/10/12

Client: Tumwater Center LTD Partnership **Driller:** BORETEC **Logged By:** CSO

Location: Tumwater, Washington **Approx. Elev:** 190.14 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp |—x—| Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0–4		(FOREST DUFF) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
5–6	X	Brown SAND, fine grained, dry. (SP)		6.5	10	
10–11	X	*At 10 feet soil becomes gray, fine to medium grained, moist.	Medium Dense	7.3	15	
13		▼				
15–16	X	*At 15 feet soil becomes saturated.		9.1	14	
20–21	X			17.9	19	
21–26.5		Gray GRAVEL with silt and sand, medium to coarse grained, saturated. (GP-GM)	Medium Dense			
25–26	X		Dense	7.1	53	
27–30		Test boring terminated at 26.5 feet. Groundwater observed at 13 feet during drilling. Boring converted to 2-inch monitoring well. DOE Well No. BHX891				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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

LOG OF BORING NO. B-9

Figure No. 14

Project: Tumwater Center Project No: T-6777 Date Drilled: 10/11/13

Client: Tumwater Center LTD Partnership Driller: BORETEC Logged By: CSD

Location: Tumwater, Washington Approx. Elev: 185.73 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % Wp [----x----] Wl 10 30 50 70 90	Pocket Penetrometer TSF 1 2 3 4 / SPT (N) Blows/ft 10 20 30 40	Observ. Well
0–3		(TALL BRUSH/WEEDS) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
3–8	5–6.5	Brown SAND, fine grained, dry. (SP)	Medium Dense	7.3	11	
8–18	10–11.5; 15–16.5	Gray GRAVEL with sand, fine to coarse grained, dry. (GP)	Medium Dense	8.2	16; 24	
18–26.5	20–21.5	Gray SAND with gravel, medium to coarse grained, saturated. (SP)	Medium Dense	18.7	23	
	25–26.5		Dense	15.1	34	

Test boring terminated at 26.5 feet.
Groundwater observed at 18 feet during drilling.
Boring converted to 2-inch monitoring well.
DOE Well No. BHK007

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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LOG OF BORING NO. B-10

Figure No. 15

Project: Tumwater Center Project No: T-6777 Date Drilled: 10/10/12

Client: Tumwater Center LTD Partnership Driller: BORETEC Logged By: CSD

Location: Tumwater, Washington Approx. Elev: 169.0± Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % Wp (------) Wl 10 30 50 70 90	Pocket Penetrometer TSF 1 2 3 4 / SPT (N) Blows/ft 10 20 30 40	Observ. Well
0–4	(BLACKBERRIES/VERY TALL BRUSH) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
4–11	Brown SAND to SAND with silt, fine grained, dry to moist. (SP/SP-SM)	Medium Dense	23.4 16.0	9 25	
11–23	Gray GRAVEL with sand, fine to coarse grained, moist to saturated. (GP)	Medium Dense Dense	6.9 4.7 7.3	17 43	
23–26.5	Gray GRAVEL with silt and sand, medium to coarse grained, saturated. (GP-GM)	Very Dense	7.7	61	

Test boring terminated at 26.5 feet.
Groundwater observed at 15 feet during drilling.
Boring converted to 2-inch monitoring well.
DOE Well No. BHA600

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences

LOG OF BORING NO. B-11

Figure No. 16

Project: Tumwater Center **Project No:** T-6777 **Date Drilled:** 10/11/12

Client: Tumwater Center LTD Partnership **Driller:** BORETEC **Logged By:** CSO

Location: Tumwater, Washington **Approx. Elev:** 193.03 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp ├──┤ Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
0–2		(TALL BRUSH) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
2–8	5–6.5	Brown SAND, fine grained, dry. (SP)	Medium Dense	7.5	16	
8–15.5	10–11.5; 15–16.5	Brown GRAVEL with sand and silt to silty GRAVEL with sand, fine to coarse grained, dry. (GP-GM/GM)	Medium Dense	2.4; 8.0	24; 25	
15.5–18.5		Gray SAND with gravel, fine to coarse grained, moist. (SP)	Medium Dense	5.5		
18.5–25	20–21.5	Gray GRAVEL with silt and sand, fine to coarse grained, saturated. (GP-GM)	Dense	8.1	46	

Groundwater symbol at 19 ft.

*Continued on Next Page

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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LOG OF BORING NO. B-11

Figure No. 16

Project: Tumwater Center **Project No:** T-6777 **Date Drilled:** 10/11/12

Client: Tumwater Center LTD Partnership **Driller:** BORETEC **Logged By:** CSO

Location: Tumwater, Washington **Approx. Elev:** 193.03 Feet

Depth (ft)	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp ——— Wl; 10 20 30 40)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
26	Gray GRAVEL with silt and sand, fine to coarse grained, saturated. (GP-GM)	Very Dense	7.2	36	
27					
28					
29					
30			6.5	52	
31					
32					
33					
34					
35			10.1	50/3"	
36					
37					
38					
39	Gray SAND with gravel, medium to coarse grained, saturated. (SP)	Very Dense			
40			12.2	50/4"	
41					
42					
43					
44					
45	Gray GRAVEL with sand, coarse grained, saturated. (GP)	Very Dense		50/1"	
46					
47					
48					
49					
50	*Continued on Next Page				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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

LOG OF BORING NO. B-11

Figure No. 16

Project: Tumwater Center Project No: T-6777 Date Drilled: 10/11/12

Client: Tumwater Center LTD Partnership Driller: BORETEC Logged By: CSD

Location: Tumwater, Washington Approx. Elev: 193.03 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % Wp ├──┤ Wl 10 20 30 40	Pocket Penetrometer TSF 1 2 3 4 / SPT (N) Blows/ft 10 20 30 40	Observ. Well
51		Gray GRAVEL with sand, coarse grained, saturated. (GP)	Very Dense		50/4"	
55					50/6"	
60					50/3"	
65					50/5"	
68–71		Gray GRAVEL with silt and sand, medium to coarse grained, saturated. (GP-GM)	Very Dense		50/6"	
71–75		Test boring terminated at 71 feet. Groundwater observed at 19 feet during drilling. Installed a 2-inch monitoring well approximately 10 feet to the north. DOE No. BHK003				

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

Terra Associates, Inc.

Consultants in Geotechnical Engineering, Geology and Environmental Earth Sciences

LOG OF BORING NO. B-12

Figure No. 17

Project: Tumwater Center **Project No:** T-6777 **Date Drilled:** 10/11/12

Client: Tumwater Center LTD Partnership **Driller:** BORETEC **Logged By:** CSD

Location: Tumwater, Washington **Approx. Elev:** 188.86 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Moisture Content % (Wp |----x----| Wl; 10 30 50 70 90)	Pocket Penetrometer TSF (1 2 3 4) / SPT (N) Blows/ft (10 20 30 40)	Observ. Well
1–2		(Very thick BRUSH/Fallen FOREST LITTER) Dark brown silty SAND, fine grained, dry, roots. (SM)	Loose			
5–6	I	Brown SAND, fine grained, dry. (SP)	Medium Dense	0.6	11	
10–11	I	*At 10 feet soil becomes gray.		0.5	23	
15–16	I			8.3	21	
17 ▼						
20–21	I	Gray GRAVEL with sand, fine to coarse grained, wet to saturated. (GP)	Medium Dense	12.6	20	
25–26	I			15.5	15	

Test boring terminated at 26.5 feet.
Groundwater observed at 17 feet during drilling.
Boring converted to 2-inch monitoring well, DOE Well No. BHK804

Note: This subsurface log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpreted as being indicative of other areas of the site.

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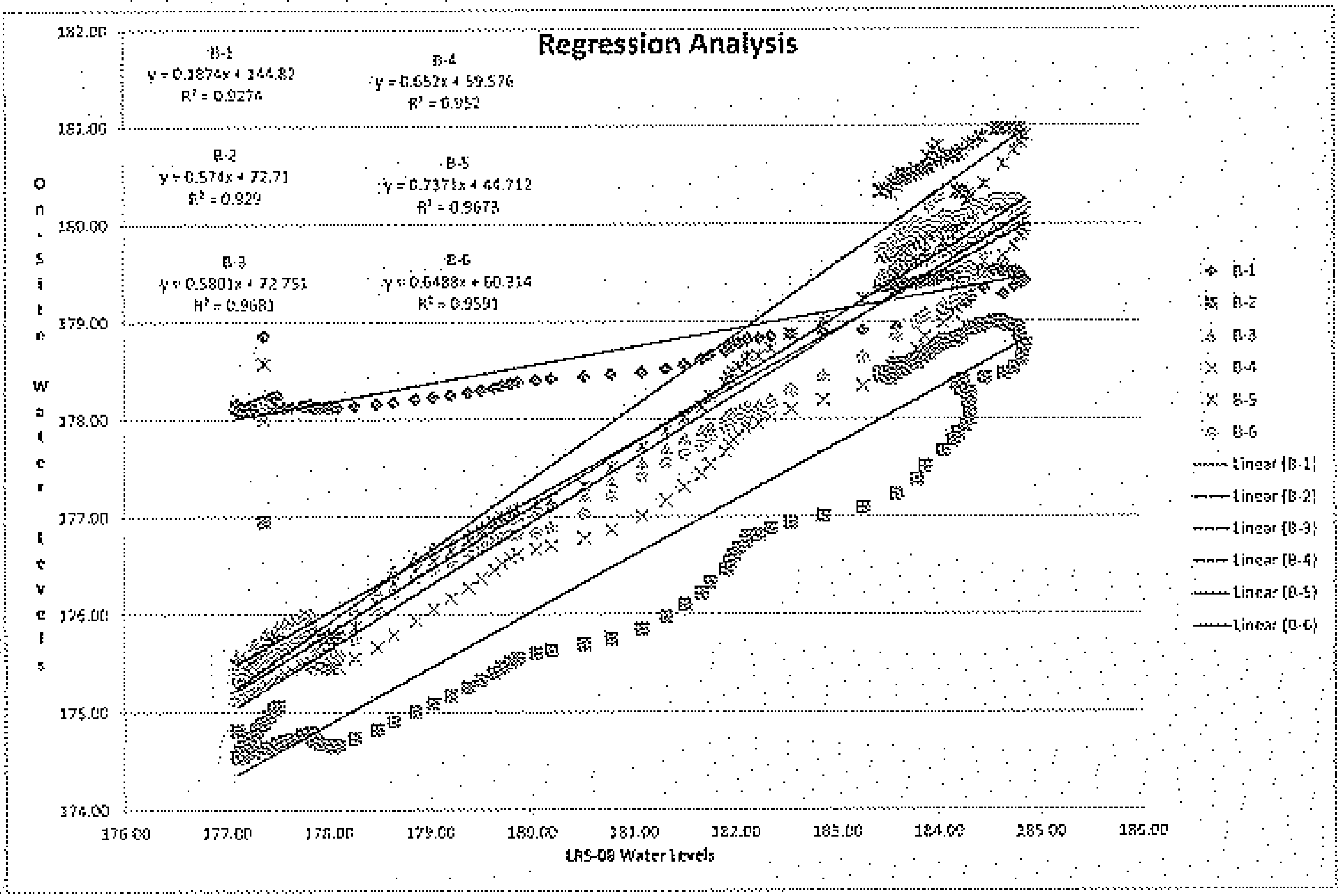
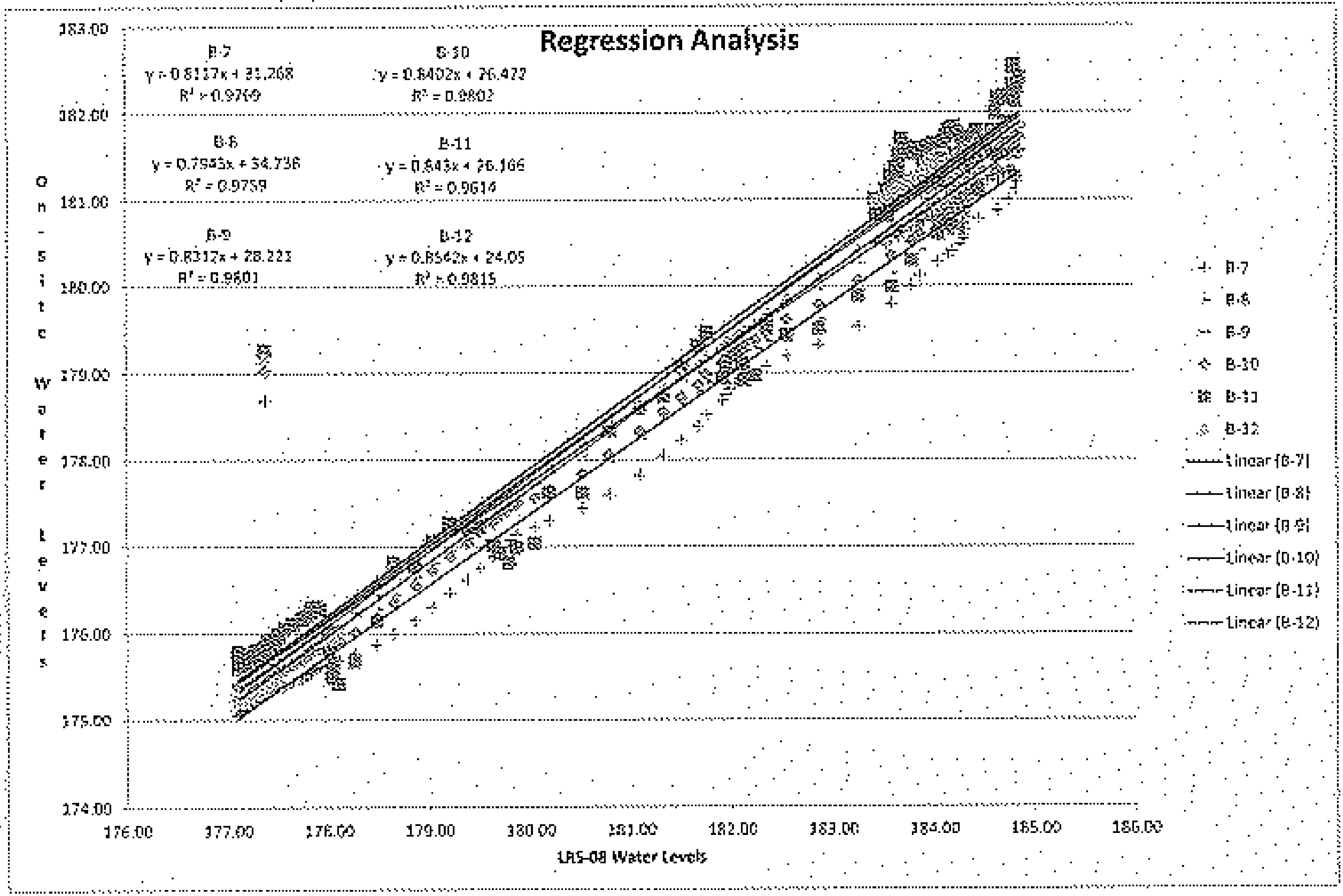
APPENDIX A

REGRESSION ANALYSIS DATA



Regression Analysis
B-1
y = 0.1874x + 144.82
R² = 0.9274
B-4
y = 0.652x + 59.576
R² = 0.952
B-2
y = 0.574x + 72.71
R² = 0.929
B-5
y = 0.7371x + 44.712
R² = 0.9673
B-3
y = 0.5801x + 72.751
R² = 0.9681
B-6
y = 0.6488x + 60.314
R² = 0.9591
On-site Water Levels
LRS-08 Water Levels
B-1
B-2
B-3
B-4
B-5
B-6
Linear (B-1)
Linear (B-2)
Linear (B-3)
Linear (B-4)
Linear (B-5)
Linear (B-6)



Regression Analysis
B-7
y = 0.8117x + 31.268
R² = 0.9769
B-10
y = 0.8402x + 26.472
R² = 0.9802
B-8
y = 0.7945x + 34.736
R² = 0.9759
B-11
y = 0.843x + 26.166
R² = 0.9614
B-9
y = 0.8317x + 28.223
R² = 0.9601
B-12
y = 0.8642x + 24.05
R² = 0.9815
On-Site Water Levels
183.00
182.00
181.00
180.00
179.00
178.00
177.00
176.00
175.00
174.00
176.00
177.00
178.00
179.00
180.00
181.00
182.00
183.00
184.00
185.00
186.00
LRS-08 Water Levels
B-7
B-8
B-9
B-10
B-11
B-12
Linear (B-7)
Linear (B-8)
Linear (B-9)
Linear (B-10)
Linear (B-11)
Linear (B-12)

Predicted 1999 onsite water levels - LRS-08 Reference Well

Date	Maximum Water Elevation					
		B-1	**B-2**	**B-3**	**B-4**	**B-5**
2/25/1999	192.9	180.97	183.43	184.65	185.35	186.00
		B-6	**B-7**	**B-8**	**B-9**	**B-10**
		185.47	187.84	188.00	188.56	188.50
		B-11	**B-12**			
		188.76	188.83			

Tumwater Center Water Levels and Analysis

Well Information

Well No.	B1	B2	B3
Well Tip from surface (feet)	24	24	22
Screen Section	178.12	174.61	174.71
Top of Pipe above surface(feet)	2.69	2.86	2.42
Top of Pipe Elevation	195.12	191.61	189.21
Surface Elevation	192.43	188.75	186.79

Note: Measured groundwater depth is recorded from the top of pipe inside casing. (Positive is below ground, Negative is above ground)

	B-1		B-2		B-3	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
10/13/2012	16.88	178.24	16.55	175.06	13.41	175.80
10/14/2012	16.89	178.23	16.58	175.03	13.44	175.77
10/15/2012	16.89	178.23	16.58	175.03	13.44	175.77
10/16/2012	16.91	178.21	16.65	174.96	13.50	175.71
10/17/2012	16.27	178.85	14.66	176.95	11.10	178.11
10/18/2012	16.93	178.19	16.71	174.90	13.55	175.66
10/19/2012	16.94	178.18	16.75	174.86	13.58	175.63
10/20/2012	16.95	178.17	16.78	174.83	13.62	175.59
10/21/2012	16.96	178.16	16.81	174.80	13.64	175.57
10/22/2012	16.97	178.15	16.83	174.78	13.66	175.55
10/23/2012	16.98	178.14	16.87	174.74	13.70	175.51
10/24/2012	17.00	178.12	16.91	174.70	13.73	175.48
10/25/2012	17.01	178.11	16.96	174.65	13.77	175.44
10/26/2012	17.02	178.10	16.98	174.63	13.79	175.42
10/27/2012	17.02	178.10	17.01	174.60	13.81	175.40
10/28/2012	16.96	178.16	16.80	174.81	13.63	175.58
10/29/2012	17.04	178.08	17.06	174.55	13.81	175.40
10/30/2012	17.05	178.07	17.07	174.54	13.77	175.44
10/31/2012	17.05	178.07	17.06	174.55	13.65	175.56
11/1/2012	17.04	178.08	17.02	174.59	13.51	175.70
11/2/2012	17.03	178.09	16.97	174.64	13.41	175.80
11/3/2012	17.01	178.11	16.93	174.68	13.33	175.88
11/4/2012	17.00	178.12	16.91	174.70	13.29	175.92
11/5/2012	17.00	178.12	16.89	174.72	13.26	175.95
11/6/2012	16.98	178.14	16.84	174.77	13.22	175.99
11/7/2012	16.98	178.14	16.84	174.77	13.22	175.99
11/8/2012	16.97	178.15	16.82	174.79	13.21	176.00

	B-1		B-2		B-3	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
11/9/2012	16.97	178.15	16.82	174.79	13.23	175.98
11/10/2012	16.98	178.14	16.85	174.76	13.28	175.93
11/11/2012	16.99	178.13	16.87	174.74	13.31	175.90
11/12/2012	16.99	178.13	16.89	174.72	13.34	175.87
11/13/2012	17.00	178.12	16.90	174.71	13.36	175.85
11/14/2012	17.00	178.12	16.93	174.68	13.40	175.81
11/15/2012	16.99	178.13	16.94	174.67	13.40	175.81
11/16/2012	16.99	178.13	16.94	174.67	13.42	175.79
11/17/2012	16.99	178.13	16.94	174.67	13.43	175.78
11/18/2012	17.00	178.12	16.97	174.64	13.45	175.76
11/19/2012	17.00	178.12	16.95	174.66	13.35	175.86
11/20/2012	16.98	178.14	16.88	174.73	13.14	176.07
11/21/2012	16.96	178.16	16.79	174.82	12.96	176.25
11/22/2012	16.94	178.18	16.71	174.90	12.78	176.43
11/23/2012	16.92	178.20	16.60	175.01	12.64	176.57
11/24/2012	16.89	178.23	16.52	175.09	12.54	176.67
11/25/2012	16.87	178.25	16.44	175.17	12.46	176.75
11/26/2012	16.84	178.28	16.36	175.25	12.38	176.83
11/27/2012	16.82	178.30	16.28	175.33	12.32	176.89
11/28/2012	16.80	178.32	16.21	175.40	12.27	176.94
11/29/2012	16.78	178.34	16.15	175.46	12.24	176.97
11/30/2012	16.76	178.36	16.10	175.51	12.23	176.98
12/1/2012	16.74	178.38	16.06	175.55	12.19	177.02
12/2/2012	16.72	178.40	16.01	175.60	12.14	177.07
12/3/2012	16.71	178.41	15.98	175.63	12.10	177.11
12/4/2012	16.68	178.44	15.92	175.69	11.99	177.22
12/5/2012	16.67	178.45	15.86	175.75	11.84	177.37
12/6/2012	16.64	178.48	15.76	175.85	11.65	177.56
12/7/2012	16.61	178.51	15.64	175.97	11.50	177.71
12/8/2012	16.56	178.56	15.52	176.09	11.40	177.81
12/9/2012	16.51	178.61	15.40	176.21	11.33	177.88
12/10/2012	16.47	178.65	15.29	176.32	11.27	177.94
12/11/2012	16.42	178.70	15.16	176.45	11.19	178.02
12/12/2012	16.39	178.73	15.08	176.53	11.16	178.05
12/13/2012	16.36	178.76	15.01	176.60	11.15	178.06
12/14/2012	16.34	178.78	14.94	176.67	11.13	178.08
12/15/2012	16.32	178.80	14.87	176.74	11.11	178.10
12/16/2012	16.30	178.82	14.81	176.80	11.08	178.13
12/17/2012	16.29	178.83	14.80	176.81	11.07	178.14
12/18/2012	16.27	178.85	14.74	176.87	11.00	178.21
12/19/2012	16.25	178.87	14.67	176.94	10.90	178.31
12/20/2012	16.24	178.88	14.61	177.00	10.76	178.45

	B-1		B-2		B-3	
Date	Measured Depth	Elevation	Measured Depth	Elevation	Measured Depth	Elevation
12/21/2012	16.21	178.91	14.52	177.09	10.56	178.65
12/22/2012	16.18	178.94	14.38	177.23	10.33	178.88
12/23/2012	16.13	178.99	14.23	177.38	10.19	179.02
12/24/2012	16.08	179.04	14.09	177.52	10.12	179.09
12/25/2012	16.01	179.11	13.94	177.67	10.04	179.17
12/26/2012	15.98	179.14	13.83	177.78	10.00	179.21
12/27/2012	15.95	179.17	13.76	177.85	9.97	179.24
12/28/2012	15.93	179.19	13.67	177.94	9.92	179.29
12/29/2012	15.91	179.21	13.60	178.01	9.88	179.33
12/30/2012	15.90	179.22	13.55	178.06	9.86	179.35
12/31/2012	15.88	179.24	13.48	178.13	9.83	179.38
1/1/2013	15.86	179.26	13.44	178.17	9.82	179.39
1/2/2013	15.85	179.27	13.38	178.23	9.80	179.41
1/3/2013	15.83	179.29	13.33	178.28	9.79	179.42
1/4/2013	15.82	179.30	13.32	178.29	9.81	179.40
1/5/2013	15.81	179.31	13.28	178.33	9.81	179.40
1/6/2013	15.81	179.31	13.26	178.35	9.81	179.40
1/7/2013	15.80	179.32	13.25	178.36	9.81	179.40
1/8/2013	15.79	179.33	13.22	178.39	9.79	179.42
1/9/2013	15.79	179.33	13.19	178.42	9.71	179.50
1/10/2013	15.84	179.28	13.15	178.46	9.58	179.63
1/11/2013	15.76	179.36	13.09	178.52	9.42	179.79
1/12/2013	15.74	179.38	12.99	178.62	9.32	179.89
1/13/2013	15.72	179.40	12.91	178.70	9.27	179.94
1/14/2013	15.70	179.42	12.84	178.77	9.24	179.97
1/15/2013	15.67	179.45	12.80	178.81	9.24	179.97
1/16/2013	15.65	179.47	12.75	178.86	9.22	179.99
1/17/2013	15.63	179.49	12.70	178.91	9.21	180.00
1/18/2013	15.62	179.50	12.67	178.94	9.22	179.99
1/19/2013	15.61	179.51	12.66	178.95	9.24	179.97
1/20/2013	15.61	179.51	12.64	178.97	9.26	179.95
1/21/2013	15.60	179.52	12.63	178.98	9.26	179.95
1/22/2013	15.59	179.53	12.61	179.00	9.26	179.95
1/23/2013	15.60	179.52	12.62	178.99	9.28	179.93
1/24/2013	15.61	179.51	12.66	178.95	9.33	179.88
1/25/2013	15.60	179.52	12.65	178.96	9.34	179.87
1/26/2013	15.61	179.51	12.65	178.96	9.35	179.86
1/27/2013	15.62	179.50	12.68	178.93	9.38	179.83
1/28/2013	15.62	179.50	12.70	178.91	9.40	179.81
1/29/2013	15.66	179.46	12.77	178.84	9.45	179.76
1/30/2013	15.65	179.47	12.79	178.82	9.47	179.74
1/31/2013	15.65	179.47	12.79	178.82	9.47	179.74

Date	B-1 Measured Depth	B-1 Elevation	B-2 Measured Depth	B-2 Elevation	B-3 Measured Depth	B-3 Elevation
2/1/2013	15.66	179.46	12.81	178.80	9.48	179.73
2/2/2013	15.66	179.46	12.81	178.80	9.48	179.73
2/3/2013	15.66	179.46	12.82	178.79	9.49	179.72
2/4/2013	15.65	179.47	12.80	178.81	9.47	179.74
2/5/2013	15.65	179.47	12.80	178.81	9.46	179.75
2/6/2013	15.67	179.45	12.84	178.77	9.48	179.73
2/7/2013	15.68	179.44	12.87	178.74	9.50	179.71
2/8/2013	15.70	179.42	12.93	178.68	9.54	179.67
2/9/2013	15.70	179.42	12.94	178.67	9.55	179.66
2/10/2013	15.71	179.41	12.97	178.64	9.57	179.64
2/11/2013	15.71	179.41	12.98	178.63	9.58	179.63
2/12/2013	15.72	179.40	13.01	178.60	9.60	179.61
2/13/2013	15.73	179.39	13.04	178.57	9.63	179.58
2/14/2013	15.74	179.38	13.07	178.54	9.65	179.56
2/15/2013	15.73	179.39	13.04	178.57	9.65	179.56
2/16/2013	15.73	179.39	13.05	178.56	9.66	179.55
2/17/2013	15.74	179.38	13.08	178.53	9.68	179.53
2/18/2013	15.73	179.39	13.05	178.56	9.67	179.54
2/19/2013	15.74	179.38	13.09	178.52	9.70	179.51
2/20/2013	15.76	179.36	13.15	178.46	9.74	179.47
2/21/2013	15.77	179.35	13.18	178.43	9.77	179.44
2/22/2013	15.76	179.36	13.14	178.47	9.73	179.48
2/23/2013	15.78	179.34	13.20	178.41	9.70	179.51
2/24/2013	15.77	179.35	13.15	178.46	9.63	179.58
2/25/2013	15.76	179.36	13.11	178.50	9.56	179.65
2/26/2013	15.76	179.36	13.11	178.50	9.53	179.68
2/27/2013	15.75	179.37	13.08	178.53	9.50	179.71
2/28/2013	15.75	179.37	13.06	178.55	9.47	179.74
3/1/2013	15.74	179.38	13.03	178.58	9.41	179.80
3/2/2013	15.72	179.40	12.94	178.67	9.30	179.91
3/3/2013	15.70	179.42	12.90	178.71	9.23	179.98
3/4/2013	15.69	179.43	12.85	178.76	9.19	180.02

Tumwater Center Water Levels and Analysis

Well No	B4	B5	B6
Well Tip from surface (feet)	25	24	25
Screen Section	174.46	173.22	171.18
Top of Pipe above surface(feet)	2.46	2.48	2.55
Top of Pipe Elevation	191.96	189.72	188.68
Surface Elevation	189.5	187.24	186.13

	B-4		B-5		B-6	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
10/13/2012	16.32	175.64	13.99	175.73	13.03	175.65
10/14/2012	16.35	175.61	14.01	175.71	13.06	175.62
10/15/2012	16.35	175.61	14.01	175.71	13.06	175.62
10/16/2012	16.42	175.54	14.10	175.62	13.13	175.55
10/17/2012	13.97	177.99	11.15	178.57	10.53	178.15
10/18/2012	16.48	175.48	14.16	175.56	13.19	175.49
10/19/2012	16.52	175.44	14.19	175.53	13.22	175.46
10/20/2012	16.55	175.41	14.22	175.50	13.26	175.42
10/21/2012	16.58	175.38	14.25	175.47	13.28	175.40
10/22/2012	16.60	175.36	14.27	175.45	13.31	175.37
10/23/2012	16.64	175.32	14.31	175.41	13.35	175.33
10/24/2012	16.68	175.28	14.35	175.37	13.38	175.30
10/25/2012	16.72	175.24	14.39	175.33	13.42	175.26
10/26/2012	16.74	175.22	14.41	175.31	13.44	175.24
10/27/2012	16.77	175.19	14.43	175.29	13.46	175.22
10/28/2012	16.57	175.39	14.24	175.48	13.27	175.41
10/29/2012	16.82	175.14	14.47	175.25	13.52	175.16
10/30/2012	16.83	175.13	14.47	175.25	13.52	175.16
10/31/2012	16.81	175.15	14.44	175.28	13.50	175.18
11/1/2012	16.74	175.22	14.36	175.36	13.36	175.32
11/2/2012	16.66	175.30	14.24	175.48	13.19	175.49
11/3/2012	16.60	175.36	14.14	175.58	13.06	175.62
11/4/2012	16.56	175.40	14.08	175.64	13.00	175.68
11/5/2012	16.53	175.43	14.03	175.69	12.96	175.72
11/6/2012	16.48	175.48	13.98	175.74	12.92	175.76
11/7/2012	16.47	175.49	13.96	175.76	12.92	175.76
11/8/2012	16.44	175.52	13.93	175.79	12.90	175.78

	B-4		B-5		B-6	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
11/9/2012	16.44	175.52	13.94	175.78	12.92	175.76
11/10/2012	16.46	175.50	13.95	175.77	12.96	175.72
11/11/2012	16.47	175.49	13.96	175.76	12.99	175.69
11/12/2012	16.49	175.47	13.97	175.75	13.02	175.66
11/13/2012	16.50	175.46	13.97	175.75	13.05	175.63
11/14/2012	16.52	175.44	13.98	175.74	13.08	175.60
11/15/2012	16.51	175.45	13.97	175.75	13.08	175.60
11/16/2012	16.50	175.46	13.96	175.75	13.08	175.60
11/17/2012	16.50	175.46	13.95	175.77	13.08	175.60
11/18/2012	16.52	175.44	13.96	175.76	13.11	175.57
11/19/2012	16.49	175.47	13.94	175.78	13.10	175.58
11/20/2012	16.40	175.56	13.85	175.87	12.94	175.74
11/21/2012	16.30	175.66	13.62	176.10	12.64	176.04
11/22/2012	16.17	175.79	13.41	176.31	12.46	176.22
11/23/2012	16.03	175.93	13.27	176.45	12.32	176.36
11/24/2012	15.91	176.05	13.17	176.55	12.23	176.45
11/25/2012	15.80	176.16	13.07	176.65	12.14	176.54
11/26/2012	15.69	176.27	12.97	176.75	12.05	176.63
11/27/2012	15.60	176.36	12.87	176.85	11.98	176.70
11/28/2012	15.51	176.45	12.78	176.94	11.93	176.75
11/29/2012	15.44	176.52	12.72	177.00	11.89	176.79
11/30/2012	15.39	176.57	12.67	177.05	11.87	176.81
12/1/2012	15.35	176.61	12.63	177.09	11.87	176.81
12/2/2012	15.30	176.66	12.58	177.14	11.85	176.83
12/3/2012	15.26	176.70	12.54	177.18	11.80	176.88
12/4/2012	15.19	176.77	12.40	177.32	11.66	177.02
12/5/2012	15.10	176.86	12.21	177.51	11.47	177.21
12/6/2012	14.95	177.01	12.00	177.72	11.27	177.41
12/7/2012	14.79	177.17	11.83	177.89	11.13	177.55
12/8/2012	14.65	177.31	11.71	178.01	11.04	177.64
12/9/2012	14.53	177.43	11.59	178.13	10.95	177.73
12/10/2012	14.42	177.54	11.49	178.23	10.87	177.81
12/11/2012	14.29	177.67	11.36	178.36	10.77	177.91
12/12/2012	14.23	177.73	11.30	178.42	10.73	177.95
12/13/2012	14.17	177.79	11.24	178.48	10.69	177.99
12/14/2012	14.11	177.85	11.19	178.53	10.66	178.02
12/15/2012	14.06	177.90	11.13	178.59	10.62	178.06
12/16/2012	14.01	177.95	11.07	178.65	10.58	178.10
12/17/2012	14.00	177.96	11.07	178.65	10.59	178.09
12/18/2012	13.94	178.02	10.99	178.73	10.52	178.16
12/19/2012	13.86	178.10	10.85	178.87	10.38	178.30
12/20/2012	13.76	178.20	10.71	179.01	10.26	178.42

Date	B-4 Measured Depth	B-4 Elevation	B-5 Measured Depth	B-5 Elevation	B-6 Measured Depth	B-6 Elevation
12/21/2012	13.62	178.34	10.49	179.23	10.05	178.63
12/22/2012	13.43	178.53	10.24	179.48	9.83	178.85
12/23/2012	13.25	178.71	10.11	179.61	9.70	178.98
12/24/2012	13.11	178.85	10.02	179.70	9.63	179.05
12/25/2012	12.97	178.99	9.91	179.81	9.53	179.15
12/26/2012	12.89	179.07	9.84	179.88	9.47	179.21
12/27/2012	12.84	179.12	9.78	179.94	9.42	179.26
12/28/2012	12.77	179.19	9.70	180.02	9.35	179.33
12/29/2012	12.71	179.25	9.63	180.09	9.28	179.40
12/30/2012	12.66	179.30	9.58	180.14	9.24	179.44
12/31/2012	12.60	179.36	9.53	180.19	9.19	179.49
1/1/2013	12.56	179.40	9.49	180.23	9.17	179.51
1/2/2013	12.51	179.45	9.45	180.27	9.13	179.55
1/3/2013	12.47	179.49	9.42	180.30	9.10	179.58
1/4/2013	12.46	179.50	9.42	180.30	9.10	179.58
1/5/2013	12.44	179.52	9.40	180.32	9.09	179.59
1/6/2013	12.42	179.54	9.39	180.33	9.08	179.60
1/7/2013	12.42	179.54	9.39	180.33	9.08	179.60
1/8/2013	12.39	179.57	9.37	180.35	9.06	179.62
1/9/2013	12.35	179.61	9.32	180.40	9.00	179.68
1/10/2013	12.29	179.67	9.12	180.60	8.76	179.92
1/11/2013	12.19	179.77	8.97	180.75	8.62	180.06
1/12/2013	12.09	179.87	8.89	180.83	8.56	180.12
1/13/2013	12.00	179.96	8.85	180.87	8.52	180.16
1/14/2013	11.93	180.03	8.81	180.91	8.49	180.19
1/15/2013	11.89	180.07	8.80	180.92	8.48	180.20
1/16/2013	11.85	180.11	8.78	180.94	8.46	180.22
1/17/2013	11.81	180.15	8.76	180.96	8.44	180.24
1/18/2013	11.80	180.16	8.75	180.97	8.44	180.24
1/19/2013	11.79	180.17	8.76	180.96	8.44	180.24
1/20/2013	11.79	180.17	8.76	180.96	8.44	180.24
1/21/2013	11.78	180.18	8.76	180.96	8.44	180.24
1/22/2013	11.77	180.19	8.75	180.97	8.43	180.25
1/23/2013	11.78	180.18	8.77	180.95	8.44	180.24
1/24/2013	11.82	180.14	8.83	180.89	8.49	180.19
1/25/2013	11.82	180.14	8.84	180.88	8.49	180.19
1/26/2013	11.83	180.13	8.86	180.86	8.50	180.18
1/27/2013	11.86	180.10	8.90	180.82	8.53	180.15
1/28/2013	11.88	180.08	8.92	180.80	8.55	180.13
1/29/2013	11.93	180.03	8.98	180.74	8.60	180.08
1/30/2013	11.96	180.00	9.01	180.71	8.62	180.06
1/31/2013	11.97	179.99	9.02	180.70	8.62	180.06

	B-4		B-5		B-6	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
2/1/2013	11.96	179.98	9.04	180.68	8.63	180.05
2/2/2013	11.96	179.98	9.04	180.68	8.62	180.06
2/3/2013	11.99	179.97	9.05	180.67	8.63	180.05
2/4/2013	11.96	179.98	9.04	180.68	8.61	180.07
2/5/2013	11.98	179.96	9.04	180.68	8.60	180.08
2/6/2013	12.01	179.95	9.07	180.65	8.64	180.04
2/7/2013	12.04	179.92	9.10	180.62	8.66	180.02
2/8/2013	12.09	179.87	9.15	180.57	8.71	179.97
2/9/2013	12.10	179.86	9.16	180.56	8.71	179.97
2/10/2013	12.12	179.84	9.18	180.54	8.73	179.95
2/11/2013	12.13	179.83	9.19	180.53	8.74	179.94
2/12/2013	12.16	179.80	9.21	180.51	8.77	179.91
2/13/2013	12.18	179.78	9.24	180.48	8.80	179.88
2/14/2013	12.21	179.75	9.27	180.45	8.83	179.85
2/15/2013	12.19	179.77	9.26	180.46	8.82	179.86
2/16/2013	12.20	179.76	9.27	180.45	8.83	179.85
2/17/2013	12.23	179.73	9.30	180.42	8.86	179.82
2/18/2013	12.21	179.75	9.28	180.44	8.84	179.84
2/19/2013	12.24	179.72	9.32	180.40	8.87	179.81
2/20/2013	12.29	179.67	9.36	180.36	8.92	179.76
2/21/2013	12.31	179.65	9.39	180.33	8.95	179.73
2/22/2013	12.29	179.67	9.38	180.34	8.94	179.74
2/23/2013	12.32	179.64	9.42	180.30	8.95	179.73
2/24/2013	12.29	179.67	9.34	180.38	8.84	179.84
2/25/2013	12.24	179.72	9.26	180.46	8.75	179.93
2/26/2013	12.23	179.73	9.25	180.47	8.74	179.94
2/27/2013	12.21	179.75	9.23	180.49	8.71	179.97
2/28/2013	12.17	179.79	9.21	180.51	8.70	179.98
3/1/2013	12.13	179.83	9.18	180.54	8.66	180.02
3/2/2013	12.05	179.91	9.05	180.67	8.51	180.17
3/3/2013	11.99	179.97	8.97	180.75	8.44	180.24
3/4/2013	11.94	180.02	8.92	180.80	8.41	180.27

Tumwater Center Water Levels and Analysis

Well No.	B7	B8	B9	B10
Well Tip from surface (feet)	24	25	24.5	24
Screen Section	180.22	175.27	174.2	174.99
Top of Pipe above surface(feet)	2.42	2.63	2.72	2.45
Top of Pipe Elevation	196.72	192.77	191.45	191.49
Surface Elevation	194.3	190.14	188.73	189.04

	B-7		B-8		B-9		B-10	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
10/13/2012	21.27	175.45	16.94	175.83	15.72	175.73	15.92	175.57
10/14/2012	21.30	175.42	16.96	175.81	15.75	175.70	15.95	175.54
10/15/2012	21.30	175.42	16.96	175.81	15.75	175.70	15.95	175.54
10/16/2012	21.37	175.35	17.04	175.73	15.81	175.64	16.01	175.48
10/17/2012	18.04	178.68	13.75	179.02	12.27	179.18	12.47	179.02
10/18/2012	21.41	175.31	17.06	175.71	15.86	175.59	16.06	175.43
10/19/2012	21.44	175.28	17.09	175.68	15.88	175.57	16.08	175.41
10/20/2012	21.47	175.25	17.12	175.65	15.91	175.54	16.11	175.38
10/21/2012	21.49	175.23	17.15	175.62	15.93	175.52	16.13	175.36
10/22/2012	21.51	175.21	17.16	175.61	15.94	175.51	16.15	175.34
10/23/2012	21.54	175.18	17.20	175.57	15.97	175.48	16.17	175.32
10/24/2012	21.57	175.15	17.24	175.53	16.00	175.45	16.20	175.29
10/25/2012	21.61	175.11	17.28	175.49	16.03	175.42	16.23	175.26
10/26/2012	21.62	175.10	17.28	175.49	16.04	175.41	16.24	175.25
10/27/2012	21.64	175.08	17.29	175.48	16.06	175.39	16.26	175.23
10/28/2012	21.48	175.24	17.14	175.63	15.92	175.53	16.12	175.37
10/29/2012	21.67	175.05	17.31	175.46	16.07	175.38	16.28	175.21
10/30/2012	21.66	175.06	17.29	175.48	16.05	175.40	16.26	175.23
10/31/2012	21.60	175.12	17.18	175.50	15.97	175.48	16.21	175.28
11/1/2012	21.51	175.21	17.08	175.69	15.85	175.60	16.12	175.37
11/2/2012	21.44	175.28	17.04	175.73	15.76	175.69	16.03	175.46
11/3/2012	21.39	175.33	17.01	175.76	15.69	175.76	15.96	175.53
11/4/2012	21.35	175.37	16.99	175.78	15.64	175.81	15.90	175.59
11/5/2012	21.31	175.41	16.95	175.82	15.60	175.85	15.85	175.64
11/6/2012	21.26	175.46	16.88	175.89	15.54	175.91	15.80	175.69
11/7/2012	21.22	175.50	16.86	175.91	15.51	175.94	15.76	175.73
11/8/2012	21.19	175.53	16.82	175.95	15.48	175.97	15.72	175.77

Date	B-7 Measured Depth	B-7 Elevation	B-8 Measured Depth	B-8 Elevation	B-9 Measured Depth	B-9 Elevation	B-10 Measured Depth	B-10 Elevation
11/9/2012	21.16	175.56	16.80	175.97	15.46	175.99	15.70	175.79
11/10/2012	21.15	175.57	16.82	175.95	15.45	176.00	15.68	175.81
11/11/2012	21.14	175.58	16.81	175.96	15.45	176.00	15.67	175.82
11/12/2012	21.13	175.59	16.81	175.96	15.44	176.01	15.67	175.82
11/13/2012	21.12	175.60	16.80	175.97	15.44	176.01	15.66	175.83
11/14/2012	21.11	175.61	16.80	175.97	15.43	176.02	15.65	175.84
11/15/2012	21.09	175.63	16.78	175.99	15.42	176.03	15.63	175.86
11/16/2012	21.08	175.64	16.77	176.00	15.41	176.04	15.62	175.87
11/17/2012	21.07	175.65	16.76	176.01	15.40	176.05	15.60	175.89
11/18/2012	21.06	175.66	16.76	176.01	15.39	176.06	15.60	175.89
11/19/2012	21.03	175.69	16.71	176.06	15.36	176.09	15.57	175.92
11/20/2012	20.94	175.78	16.57	176.20	15.20	176.25	15.48	176.01
11/21/2012	20.85	175.87	16.48	176.29	15.00	176.45	15.31	176.18
11/22/2012	20.72	176.00	16.32	176.45	14.80	176.65	15.13	176.36
11/23/2012	20.56	176.16	16.12	176.65	14.61	176.84	14.94	176.55
11/24/2012	20.41	176.31	15.96	176.81	14.45	177.00	14.77	176.72
11/25/2012	20.26	176.46	15.81	176.96	14.31	177.14	14.61	176.88
11/26/2012	20.10	176.62	15.68	177.09	14.18	177.27	14.46	177.03
11/27/2012	19.96	176.76	15.56	177.21	14.07	177.38	14.33	177.16
11/28/2012	19.84	176.88	15.45	177.32	13.97	177.48	14.22	177.27
11/29/2012	19.73	176.99	15.37	177.40	13.91	177.54	14.14	177.35
11/30/2012	19.65	177.07	15.30	177.47	13.85	177.60	14.07	177.42
12/1/2012	19.58	177.14	15.25	177.52	13.80	177.65	14.02	177.47
12/2/2012	19.49	177.23	15.17	177.60	13.71	177.74	13.93	177.56
12/3/2012	19.41	177.31	15.10	177.67	13.61	177.84	13.85	177.64
12/4/2012	19.28	177.44	14.96	177.81	13.40	178.05	13.66	177.83
12/5/2012	19.13	177.59	14.79	177.98	13.16	178.29	13.44	178.05
12/6/2012	18.90	177.82	14.52	178.25	12.89	178.56	13.16	178.33
12/7/2012	18.68	178.04	14.30	178.47	12.69	178.76	12.94	178.55
12/8/2012	18.49	178.23	14.13	178.64	12.54	178.91	12.77	178.72
12/9/2012	18.33	178.39	14.00	178.77	12.41	179.04	12.63	178.86
12/10/2012	18.20	178.52	13.89	178.88	12.31	179.14	12.52	178.97
12/11/2012	18.04	178.68	13.75	179.02	12.19	179.26	12.38	179.11
12/12/2012	17.97	178.75	13.70	179.07	12.14	179.31	12.32	179.17
12/13/2012	17.90	178.82	13.65	179.12	12.10	179.35	12.27	179.22
12/14/2012	17.84	178.88	13.60	179.17	12.06	179.39	12.23	179.26
12/15/2012	17.78	178.94	13.55	179.22	12.01	179.44	12.18	179.31
12/16/2012	17.72	179.00	13.51	179.26	11.97	179.48	12.13	179.36
12/17/2012	17.73	178.99	13.49	179.28	11.94	179.51	12.12	179.37
12/18/2012	17.65	179.07	13.42	179.35	11.84	179.61	12.04	179.45
12/19/2012	17.53	179.19	13.31	179.46	11.68	179.77	11.88	179.61
12/20/2012	17.40	179.32	13.16	179.61	11.48	179.97	11.71	179.78

	B-7		B-8		B-9		B-10	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
12/21/2012	17.19	179.53	12.92	179.85	11.18	180.27	11.43	180.06
12/22/2012	16.93	179.79	12.62	180.15	10.92	180.53	11.14	180.35
12/23/2012	16.73	179.99	12.44	180.33	10.78	180.67	10.97	180.52
12/24/2012	16.60	180.12	12.36	180.41	10.70	180.75	10.88	180.61
12/25/2012	16.44	180.28	12.24	180.53	10.59	180.86	10.75	180.74
12/26/2012	16.37	180.35	12.17	180.60	10.53	180.92	10.69	180.80
12/27/2012	16.31	180.41	12.12	180.65	10.48	180.97	10.64	180.85
12/28/2012	16.23	180.49	12.04	180.73	10.40	181.05	10.56	180.93
12/29/2012	16.17	180.55	11.98	180.79	10.35	181.10	10.51	180.98
12/30/2012	16.12	180.60	11.93	180.84	10.31	181.14	10.47	181.02
12/31/2012	16.08	180.64	11.88	180.89	10.28	181.17	10.43	181.06
1/1/2013	16.05	180.67	11.86	180.91	10.26	181.19	10.41	181.08
1/2/2013	16.01	180.71	11.82	180.95	10.24	181.21	10.38	181.11
1/3/2013	15.98	180.74	11.80	180.97	10.23	181.22	10.37	181.12
1/4/2013	16.00	180.72	11.82	180.95	10.26	181.19	10.40	181.09
1/5/2013	15.99	180.73	11.81	180.96	10.26	181.19	10.40	181.09
1/6/2013	16.00	180.72	11.82	180.95	10.27	181.18	10.41	181.08
1/7/2013	16.01	180.71	11.82	180.95	10.27	181.18	10.42	181.07
1/8/2013	15.99	180.73	11.80	180.97	10.25	181.20	10.40	181.09
1/9/2013	15.94	180.78	11.73	181.04	10.15	181.30	10.33	181.16
1/10/2013	15.85	180.87	11.59	181.18	9.94	181.51	10.16	181.33
1/11/2013	15.72	181.00	11.41	181.36	9.77	181.68	9.99	181.50
1/12/2013	15.60	181.12	11.30	181.47	9.69	181.76	9.88	181.61
1/13/2013	15.51	181.21	11.24	181.53	9.64	181.81	9.82	181.67
1/14/2013	15.46	181.26	11.21	181.56	9.62	181.83	9.79	181.70
1/15/2013	15.44	181.28	11.21	181.56	9.63	181.82	9.79	181.70
1/16/2013	15.41	181.31	11.19	181.58	9.62	181.83	9.78	181.71
1/17/2013	15.39	181.33	11.17	181.60	9.62	181.83	9.77	181.72
1/18/2013	15.40	181.32	11.18	181.59	9.63	181.82	9.78	181.71
1/19/2013	15.43	181.29	11.21	181.56	9.67	181.78	9.82	181.67
1/20/2013	15.44	181.28	11.23	181.54	9.69	181.76	9.84	181.65
1/21/2013	15.45	181.27	11.24	181.53	9.70	181.75	9.85	181.64
1/22/2013	15.46	181.26	11.24	181.53	9.72	181.73	9.86	181.63
1/23/2013	15.50	181.22	11.28	181.49	9.76	181.69	9.91	181.58
1/24/2013	15.56	181.16	11.35	181.42	9.82	181.63	9.97	181.52
1/25/2013	15.58	181.14	11.36	181.41	9.84	181.61	9.99	181.50
1/26/2013	15.61	181.11	11.39	181.38	9.87	181.58	10.02	181.47
1/27/2013	15.65	181.07	11.43	181.34	9.90	181.55	10.06	181.43
1/28/2013	15.69	181.03	11.46	181.31	9.93	181.52	10.09	181.40
1/29/2013	15.76	180.96	11.52	181.25	9.99	181.46	10.15	181.34
1/30/2013	15.78	180.94	11.55	181.22	10.02	181.43	10.18	181.31
1/31/2013	15.80	180.92	11.56	181.21	10.03	181.42	10.20	181.29

	B-7		B-8		B-9		B-10	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
2/1/2013	15.82	180.90	11.58	181.19	10.05	181.40	10.22	181.27
2/2/2013	15.83	180.89	11.58	181.19	10.06	181.39	10.23	181.26
2/3/2013	15.85	180.87	11.59	181.18	10.07	181.38	10.24	181.25
2/4/2013	15.84	180.88	11.58	181.19	10.07	181.38	10.24	181.25
2/5/2013	15.85	180.87	11.58	181.19	10.07	181.38	10.25	181.24
2/6/2013	15.88	180.84	11.62	181.15	10.10	181.35	10.28	181.21
2/7/2013	15.92	180.80	11.65	181.12	10.13	181.32	10.31	181.18
2/8/2013	15.96	180.76	11.69	181.08	10.17	181.28	10.35	181.14
2/9/2013	15.97	180.75	11.70	181.07	10.18	181.27	10.36	181.13
2/10/2013	15.99	180.73	11.72	181.05	10.20	181.25	10.39	181.10
2/11/2013	16.01	180.71	11.73	181.04	10.22	181.23	10.40	181.09
2/12/2013	16.03	180.69	11.75	181.02	10.24	181.21	10.42	181.07
2/13/2013	16.06	180.66	11.78	180.99	10.27	181.18	10.45	181.04
2/14/2013	16.08	180.64	11.81	180.96	10.30	181.15	10.48	181.01
2/15/2013	16.07	180.65	11.80	180.97	10.31	181.14	10.49	181.00
2/16/2013	16.10	180.62	11.82	180.95	10.32	181.13	10.51	180.98
2/17/2013	16.12	180.60	11.85	180.92	10.35	181.10	10.53	180.96
2/18/2013	16.11	180.61	11.84	180.93	10.35	181.10	10.53	180.96
2/19/2013	16.15	180.57	11.88	180.89	10.38	181.07	10.57	180.92
2/20/2013	16.20	180.52	11.93	180.84	10.43	181.02	10.61	180.88
2/21/2013	16.23	180.49	11.96	180.81	10.46	180.99	10.64	180.85
2/22/2013	16.21	180.51	11.94	180.83	10.45	181.00	10.64	180.85
2/23/2013	16.25	180.47	11.97	180.80	10.45	181.00	10.66	180.83
2/24/2013	16.19	180.53	11.90	180.87	10.39	181.06	10.60	180.89
2/25/2013	16.16	180.56	11.84	180.93	10.33	181.12	10.54	180.95
2/26/2013	16.14	180.58	11.81	180.96	10.31	181.14	10.52	180.97
2/27/2013	16.11	180.61	11.78	180.99	10.28	181.17	10.49	181.00
2/28/2013	16.08	180.64	11.75	181.02	10.26	181.19	10.47	181.02
3/1/2013	16.02	180.70	11.69	181.08	10.19	181.26	10.41	181.08
3/2/2013	15.92	180.80	11.58	181.19	10.07	181.38	10.30	181.19
3/3/2013	15.85	180.87	11.49	181.28	9.99	181.46	10.22	181.27
3/4/2013	15.78	180.94	11.43	181.34	9.94	181.51	10.16	181.33

Tumwater Center Water Levels and Analysis

Well No.	B11	B12
Well Tip from surface (feet)	24.5	24
Screen Section	178.69	175.02
Top of Pipe above surface(feet)	2.66	2.66
Top of Pipe Elevation	195.69	191.52
Surface Elevation	193.03	188.86

	B-11		B-12	
Date	*Measured Depth*	*Elevation*	*Measured Depth*	*Elevation*
10/13/2012	19.73	175.96	16.06	175.46
10/14/2012	19.76	175.93	16.07	175.45
10/15/2012	19.75	175.94	16.07	175.45
10/16/2012	19.80	175.89	16.12	175.40
10/17/2012	16.43	179.26	12.33	179.19
10/18/2012	19.85	175.84	16.15	175.37
10/19/2012	19.87	175.82	16.17	175.35
10/20/2012	19.90	175.79	16.20	175.32
10/21/2012	19.92	175.77	16.21	175.31
10/22/2012	19.93	175.76	16.21	175.31
10/23/2012	19.95	175.74	16.24	175.28
10/24/2012	19.98	175.71	16.27	175.25
10/25/2012	20.00	175.69	16.30	175.22
10/26/2012	20.02	175.67	16.30	175.22
10/27/2012	20.04	175.65	16.31	175.21
10/28/2012	19.90	175.79	16.20	175.32
10/29/2012	20.06	175.63	16.29	175.23
10/30/2012	20.03	175.66	16.26	175.26
10/31/2012	19.98	175.71	16.15	175.37
11/1/2012	19.87	175.82	16.01	175.51
11/2/2012	19.78	175.91	15.88	175.64
11/3/2012	19.70	175.99	15.79	175.73
11/4/2012	19.63	176.06	15.74	175.78
11/5/2012	19.58	176.11	15.69	175.83
11/6/2012	19.52	176.17	15.63	175.89
11/7/2012	19.48	176.21	15.61	175.91
11/8/2012	19.45	176.24	15.58	175.94

Date	B-11 Measured Depth	B-11 Elevation	B-12 Measured Depth	B-12 Elevation
11/9/2012	19.42	176.27	15.58	175.94
11/10/2012	19.41	176.28	15.60	175.92
11/11/2012	19.40	176.29	15.60	175.92
11/12/2012	19.39	176.30	15.60	175.92
11/13/2012	19.38	176.31	15.60	175.92
11/14/2012	19.41	176.28	15.60	175.92
11/15/2012	19.67	176.02	15.58	175.94
11/16/2012	19.92	175.77	15.57	175.95
11/17/2012	20.19	175.50	15.56	175.96
11/18/2012	20.11	175.58	15.54	175.98
11/19/2012	20.27	175.42	15.47	176.05
11/20/2012	20.01	175.68	15.19	176.33
11/21/2012	19.55	176.14	14.93	176.59
11/22/2012	18.87	176.82	14.74	176.78
11/23/2012	18.91	176.78	14.59	176.93
11/24/2012	18.64	177.05	14.46	177.06
11/25/2012	18.42	177.27	14.33	177.19
11/26/2012	18.48	177.21	14.21	177.31
11/27/2012	18.46	177.23	14.13	177.39
11/28/2012	18.68	177.01	14.05	177.47
11/29/2012	18.77	176.92	14.00	177.52
11/30/2012	18.88	176.81	13.96	177.56
12/1/2012	18.70	176.99	13.89	177.63
12/2/2012	18.65	177.04	13.76	177.76
12/3/2012	18.07	177.62	13.58	177.94
12/4/2012	18.07	177.62	13.30	178.22
12/5/2012	17.36	178.33	13.04	178.48
12/6/2012	17.10	178.59	12.83	178.69
12/7/2012	16.96	178.73	12.67	178.85
12/8/2012	16.62	179.07	12.54	178.98
12/9/2012	16.38	179.31	12.42	179.10
12/10/2012	16.23	179.46	12.33	179.19
12/11/2012	16.75	178.94	12.23	179.29
12/12/2012	16.63	179.06	12.18	179.34
12/13/2012	16.42	179.27	12.15	179.37
12/14/2012	16.47	179.22	12.11	179.41
12/15/2012	16.59	179.10	12.07	179.45
12/16/2012	16.77	178.92	12.03	179.49
12/17/2012	16.72	178.97	11.96	179.56
12/18/2012	16.16	179.53	11.82	179.70
12/19/2012	16.26	179.43	11.85	179.67
12/20/2012	16.18	179.51	11.42	180.10

Date	B-11 Measured Depth	B-11 Elevation	B-12 Measured Depth	B-12 Elevation
12/21/2012	15.81	179.88	11.09	180.43
12/22/2012	15.70	179.99	10.86	180.66
12/23/2012	15.39	180.30	10.74	180.78
12/24/2012	14.90	180.79	10.67	180.85
12/25/2012	15.08	180.61	10.56	180.96
12/26/2012	14.99	180.70	10.49	181.03
12/27/2012	14.59	181.10	10.43	181.09
12/28/2012	14.47	181.22	10.36	181.16
12/29/2012	14.36	181.33	10.32	181.20
12/30/2012	14.21	181.48	10.28	181.24
12/31/2012	14.12	181.57	10.26	181.26
1/1/2013	13.98	181.71	10.24	181.28
1/2/2013	14.12	181.57	10.22	181.30
1/3/2013	14.26	181.43	10.22	181.30
1/4/2013	14.18	181.51	10.26	181.26
1/5/2013	14.27	181.42	10.26	181.26
1/6/2013	14.31	181.38	10.28	181.24
1/7/2013	14.46	181.23	10.28	181.24
1/8/2013	14.47	181.22	10.25	181.27
1/9/2013	14.59	181.10	10.10	181.42
1/10/2013	14.18	181.51	9.85	181.67
1/11/2013	13.81	181.88	9.73	181.79
1/12/2013	13.57	182.12	9.66	181.86
1/13/2013	13.40	182.29	9.63	181.89
1/14/2013	13.31	182.38	9.62	181.90
1/15/2013	13.15	182.54	9.64	181.88
1/16/2013	13.18	182.51	9.65	181.87
1/17/2013	13.39	182.30	9.65	181.87
1/18/2013	13.54	182.15	9.66	181.86
1/19/2013	13.51	182.18	9.70	181.82
1/20/2013	13.55	182.14	9.72	181.80
1/21/2013	13.70	181.99	9.74	181.78
1/22/2013	13.91	181.78	9.76	181.76
1/23/2013	14.05	181.64	9.80	181.72
1/24/2013	13.90	181.79	9.86	181.66
1/25/2013	14.06	181.63	9.89	181.63
1/26/2013	14.16	181.53	9.90	181.62
1/27/2013	14.10	181.59	9.94	181.58
1/28/2013	14.10	181.59	9.96	181.56
1/29/2013	13.93	181.76	10.01	181.51
1/30/2013	13.85	181.84	10.05	181.47
1/31/2013	13.88	181.81	10.07	181.45

Date	B-11 Measured Depth	B-11 Elevation	B-12 Measured Depth	B-12 Elevation
2/1/2013	13.90	181.79	10.09	181.43
2/2/2013	13.98	181.71	10.10	181.42
2/3/2013	14.04	181.65	10.11	181.41
2/4/2013	14.23	181.46	10.12	181.40
2/5/2013	14.48	181.21	10.13	181.39
2/6/2013	14.42	181.27	10.15	181.37
2/7/2013	14.42	181.27	10.18	181.34
2/8/2013	14.16	181.53	10.21	181.31
2/9/2013	14.16	181.53	10.23	181.29
2/10/2013	14.10	181.59	10.25	181.27
2/11/2013	14.13	181.56	10.27	181.25
2/12/2013	14.11	181.58	10.30	181.22
2/13/2013	14.08	181.61	10.33	181.19
2/14/2013	14.00	181.69	10.36	181.16
2/15/2013	14.17	181.52	10.38	181.14
2/16/2013	14.40	181.29	10.39	181.13
2/17/2013	14.41	181.28	10.42	181.10
2/18/2013	14.71	180.98	10.42	181.10
2/19/2013	14.88	180.81	10.46	181.06
2/20/2013	14.70	180.99	10.50	181.02
2/21/2013	14.69	181.00	10.54	180.98
2/22/2013	14.87	180.82	10.53	180.99
2/23/2013	14.58	181.11	10.50	181.02
2/24/2013	14.41	181.28	10.44	181.08
2/25/2013	14.54	181.15	10.39	181.13
2/26/2013	14.33	181.36	10.38	181.14
2/27/2013	14.34	181.35	10.36	181.16
2/28/2013	14.34	181.35	10.34	181.18
3/1/2013	14.17	181.52	10.27	181.25
3/2/2013	14.24	181.45	10.15	181.37
3/3/2013	14.09	181.60	10.07	181.45
3/4/2013	14.05	181.64	10.03	181.49

Regression Analysis Data

Date	Reference Well LRS-68	B-1	B-2	B-3	B-4	B-5
			Groundwater Data			
10/13/2012	177.51	178.24	175.06	175.80	175.64	175.73
10/14/2012	177.5	178.23	175.03	175.77	175.61	175.71
10/15/2012	177.47	178.23	175.03	175.77	175.61	175.71
10/16/2012	177.42	178.21	174.96	175.71	175.54	175.62
10/17/2012	177.38	178.85	176.95	178.11	177.99	178.57
10/18/2012	177.37	178.19	174.90	175.66	175.48	175.56
10/19/2012	177.34	178.18	174.86	175.63	175.44	175.53
10/20/2012	177.31	178.17	174.83	175.59	175.41	175.50
10/21/2012	177.29	178.16	174.80	175.57	175.38	175.47
10/22/2012	177.28	178.15	174.78	175.55	175.36	175.45
10/23/2012	177.24	178.14	174.74	175.51	175.32	175.41
10/24/2012	177.21	178.12	174.70	175.48	175.28	175.37
10/25/2012	177.17	178.11	174.65	175.44	175.24	175.33
10/26/2012	177.16	178.10	174.63	175.42	175.22	175.31
10/27/2012	177.14	178.10	174.60	175.40	175.19	175.29
10/28/2012	177.11	178.16	174.81	175.58	175.39	175.46
10/29/2012	177.12	178.08	174.55	175.40	175.14	175.25
10/30/2012	177.13	178.07	174.54	175.44	175.13	175.25
10/31/2012	177.18	178.07	174.55	175.56	175.15	175.28
11/1/2012	177.28	178.08	174.59	175.70	175.22	175.36
11/2/2012	177.39	178.09	174.64	175.80	175.30	175.48
11/3/2012	177.50	178.11	174.68	175.88	175.36	175.58
11/4/2012	177.58	178.12	174.70	175.92	175.40	175.64
11/5/2012	177.65	178.12	174.72	175.95	175.43	175.69
11/6/2012	177.74	178.14	174.77	175.99	175.46	175.74
11/7/2012	177.78	178.14	174.77	175.99	175.49	175.76
11/8/2012	177.83	178.15	174.79	176.00	175.52	175.79
11/9/2012	177.84	178.15	174.79	175.98	175.52	175.78
11/10/2012	177.84	178.14	174.76	175.93	175.50	175.77
11/11/2012	177.85	178.13	174.74	175.90	175.49	175.76
11/12/2012	177.86	178.13	174.72	175.87	175.47	175.75
11/13/2012	177.88	178.12	174.71	175.85	175.46	175.75
11/14/2012	177.92	178.12	174.68	175.81	175.44	175.74
11/15/2012	178.00	178.13	174.67	175.81	175.45	175.75

Groundwater Data

Date	Reference Well LRS-08	B-1	B-2	B-3	B-4	B-5
11/16/2012	178.02	178.13	174.67	175.79	175.46	175.76
11/17/2012	178.05	178.13	174.67	175.78	175.46	175.77
11/18/2012	178.05	178.12	174.64	175.76	175.44	175.76
11/19/2012	178.11	178.12	174.66	175.86	175.47	175.78
11/20/2012	178.27	178.14	174.73	176.07	175.56	175.87
11/21/2012	178.49	178.16	174.82	176.25	175.66	176.10
11/22/2012	178.65	178.18	174.90	176.43	175.79	176.31
11/23/2012	178.87	178.20	175.01	176.57	175.93	176.45
11/24/2012	179.04	178.23	175.09	176.67	176.05	176.55
11/25/2012	179.21	178.25	175.17	176.75	176.16	176.65
11/26/2012	179.38	178.28	175.25	176.83	176.27	176.75
11/27/2012	179.51	178.30	175.33	176.89	176.36	176.85
11/28/2012	179.64	178.32	175.40	176.94	176.45	176.94
11/29/2012	179.71	178.34	175.46	176.97	176.52	177.00
11/30/2012	179.80	178.36	175.51	176.98	176.57	177.05
12/1/2012	179.87	178.38	175.55	177.02	176.61	177.09
12/2/2012	180.05	178.40	175.60	177.07	176.66	177.14
12/3/2012	180.20	178.41	175.63	177.11	176.70	177.18
12/4/2012	180.53	178.44	175.69	177.22	176.77	177.32
12/5/2012	180.79	178.45	175.75	177.37	176.86	177.51
12/6/2012	181.10	178.48	175.85	177.56	177.01	177.72
12/7/2012	181.33	178.51	175.97	177.71	177.17	177.89
12/8/2012	181.51	178.56	176.09	177.81	177.31	178.01
12/9/2012	181.68	178.61	176.21	177.88	177.43	178.13
12/10/2012	181.76	178.65	176.32	177.94	177.54	178.23
12/11/2012	181.92	178.70	176.45	178.02	177.67	178.36
12/12/2012	181.95	178.73	176.53	178.05	177.73	178.42
12/13/2012	181.99	178.76	176.60	178.06	177.79	178.48
12/14/2012	182.05	178.78	176.67	178.08	177.85	178.53
12/15/2012	182.12	178.80	176.74	178.10	177.90	178.59
12/16/2012	182.13	178.82	176.80	178.13	177.95	178.65
12/17/2012	182.24	178.83	176.81	178.14	177.96	178.65
12/18/2012	182.36	178.85	176.87	178.21	178.02	178.73
12/19/2012	182.56	178.87	176.94	178.31	178.10	178.87
12/20/2012	182.88	178.88	177.00	178.45	178.20	179.01
12/21/2012	183.27	178.91	177.09	178.65	178.34	179.23
12/22/2012	183.60	178.94	177.23	178.89	178.53	179.48

Groundwater Data

Date	Reference Well LRS-08	B-1	B-2	B-3	B-4	B-5
12/23/2012	183.79	178.99	177.38	179.02	178.71	179.61
12/24/2012	183.88	179.04	177.52	179.09	178.85	179.70
12/25/2012	184.05	179.11	177.67	179.17	178.90	179.81
12/26/2012	184.16	179.14	177.78	179.21	179.07	179.88
12/27/2012	184.20	179.17	177.85	179.24	179.12	179.94
12/28/2012	184.27	179.19	177.94	179.29	179.19	180.02
12/29/2012	184.31	179.21	178.01	179.33	179.25	180.09
12/30/2012	184.31	179.22	178.06	179.35	179.30	180.14
12/31/2012	184.32	179.24	178.13	179.38	179.36	180.19
1/1/2013	184.30	179.26	178.17	179.39	179.40	180.23
1/2/2013	184.32	179.27	178.23	179.41	179.45	180.27
1/3/2013	184.30	179.29	178.28	179.42	179.49	180.30
1/4/2013	184.23	179.30	178.29	179.40	179.50	180.30
1/5/2013	184.23	179.31	178.33	179.40	179.52	180.32
1/6/2013	184.18	179.31	178.35	179.40	179.54	180.33
1/7/2013	184.20	179.32	178.36	179.40	179.54	180.33
1/8/2013	184.24	179.33	178.39	179.42	179.57	180.35
1/9/2013	184.46	179.33	178.42	179.50	179.61	180.40
1/10/2013	184.64	179.28	178.46	179.63	179.67	180.60
1/11/2013	184.75	179.36	178.52	179.79	179.77	180.75
1/12/2013	184.82	179.38	178.62	179.89	179.87	180.83
1/13/2013	184.83	179.40	178.70	179.94	179.96	180.87
1/14/2013	184.86	179.42	178.77	179.97	180.03	180.91
1/15/2013	184.82	179.45	178.81	179.97	180.07	180.92
1/16/2013	184.80	179.47	178.86	179.99	180.11	180.94
1/17/2013	184.80	179.49	178.91	180.00	180.15	180.96
1/18/2013	184.76	179.50	178.94	179.99	180.16	180.97
1/19/2013	184.71	179.51	178.95	179.97	180.17	180.96
1/20/2013	184.65	179.51	178.97	179.95	180.17	180.96
1/21/2013	184.62	179.52	178.98	179.95	180.18	180.96
1/22/2013	184.59	179.53	179.00	179.95	180.19	180.97
1/23/2013	184.55	179.52	178.99	179.93	180.18	180.95
1/24/2013	184.43	179.51	178.95	179.88	180.14	180.89
1/25/2013	184.44	179.52	178.96	179.87	180.14	180.88
1/26/2013	184.42	179.51	178.96	179.86	180.13	180.86
1/27/2013	184.35	179.50	178.93	179.83	180.10	180.82
1/28/2013	184.31	179.50	178.91	179.81	180.08	180.80

Groundwater Data

Date	Reference Well LRS-08	B-1	B-2	B-3	B-4	B-5
1/29/2013	184.24	179.45	178.84	179.76	180.03	180.74
1/30/2013	184.21	179.47	178.82	179.74	180.00	180.71
1/31/2013	184.19	179.47	178.82	179.74	179.99	180.70
2/1/2013	184.16	179.46	178.80	179.73	179.98	180.68
2/2/2013	184.14	179.46	178.80	179.73	179.98	180.68
2/3/2013	184.10	179.46	178.79	179.72	179.97	180.67
2/4/2013	184.08	179.47	178.81	179.74	179.98	180.68
2/5/2013	184.08	179.47	178.81	179.75	179.98	180.68
2/6/2013	184.04	179.45	178.77	179.73	179.95	180.65
2/7/2013	184.00	179.44	178.74	179.71	179.92	180.62
2/8/2013	183.93	179.42	178.68	179.67	179.87	180.57
2/9/2013	183.91	179.42	178.67	179.66	179.86	180.56
2/10/2013	183.86	179.41	178.64	179.64	179.84	180.54
2/11/2013	183.84	179.41	178.63	179.63	179.83	180.53
2/12/2013	183.78	179.40	178.60	179.61	179.80	180.51
2/13/2013	183.74	179.39	178.57	179.58	179.76	180.48
2/14/2013	183.69	179.38	178.54	179.56	179.75	180.45
2/15/2013	183.66	179.39	178.57	179.56	179.77	180.46
2/16/2013	183.66	179.39	178.56	179.55	179.76	180.45
2/17/2013	183.60	179.38	178.53	179.53	179.73	180.42
2/18/2013	183.60	179.39	178.56	179.54	179.75	180.44
2/19/2013	183.56	179.38	178.52	179.51	179.72	180.40
2/20/2013	183.48	179.36	178.46	179.47	179.67	180.36
2/21/2013	183.43	179.35	178.43	179.44	179.65	180.33
2/22/2013	183.45	179.36	178.47	179.48	179.67	180.34
2/23/2013	183.54	179.34	178.41	179.51	179.64	180.30
2/24/2013	183.59	179.35	178.46	179.58	179.67	180.38
2/25/2013	183.67	179.36	178.50	179.65	179.72	180.46
2/26/2013	183.64	179.36	178.50	179.68	179.73	180.47
2/27/2013	183.66	179.37	178.53	179.71	179.75	180.49
2/28/2013	183.67	179.37	178.55	179.74	179.79	180.51
3/1/2013	183.79	179.38	178.58	179.80	179.83	180.54
3/2/2013	183.91	179.40	178.67	179.91	179.91	180.67
3/3/2013	183.96	179.42	178.71	179.98	179.97	180.75
3/4/2013	184.01	179.43	178.76	180.02	180.02	180.80

Date	Reference Well LRS-06	B-6	B-7	B-8	Groundwater Data B-9	B-10	B-11
10/13/2012	177.51	175.65	175.45	175.83	175.73	175.57	175.96
10/14/2012	177.5	175.62	175.42	175.81	175.70	175.54	175.93
10/15/2012	177.47	175.62	175.42	175.81	175.70	175.54	175.94
10/16/2012	177.42	175.55	175.35	175.73	175.64	175.48	175.89
10/17/2012	177.38	178.15	178.68	179.02	179.18	179.02	179.26
10/18/2012	177.37	175.49	175.31	175.71	175.59	175.43	175.84
10/19/2012	177.34	175.46	175.28	175.66	175.57	175.41	175.82
10/20/2012	177.31	175.42	175.25	175.65	175.54	175.38	175.79
10/21/2012	177.29	175.40	175.23	175.62	175.52	175.36	175.77
10/22/2012	177.28	175.37	175.21	175.61	175.51	175.34	175.76
10/23/2012	177.24	175.33	175.18	175.57	175.48	175.32	175.74
10/24/2012	177.21	175.30	175.15	175.53	175.45	175.29	175.71
10/25/2012	177.17	175.26	175.11	175.49	175.42	175.26	175.69
10/26/2012	177.15	175.24	175.10	175.49	175.41	175.25	175.67
10/27/2012	177.14	175.22	175.08	175.48	175.39	175.23	175.65
10/28/2012	177.11	175.41	175.24	175.63	175.53	175.37	175.79
10/29/2012	177.12	175.16	175.05	175.46	175.38	175.21	175.63
10/30/2012	177.13	175.16	175.06	175.48	175.40	175.23	175.66
10/31/2012	177.18	175.18	175.12	175.59	175.48	175.28	175.71
11/1/2012	177.28	175.32	175.21	175.69	175.60	175.37	175.82
11/2/2012	177.39	175.49	175.28	175.73	175.69	175.46	175.91
11/3/2012	177.50	175.62	175.33	175.76	175.76	175.53	175.99
11/4/2012	177.56	175.68	175.37	175.78	175.81	175.59	176.06
11/5/2012	177.65	175.72	175.41	175.82	175.85	175.64	176.11
11/6/2012	177.74	175.76	175.46	175.89	175.91	175.69	176.17
11/7/2012	177.78	175.76	175.50	175.91	175.94	175.73	176.21
11/8/2012	177.83	175.78	175.53	175.95	175.97	175.77	176.24
11/9/2012	177.84	175.76	175.56	175.97	175.90	175.79	176.27
11/10/2012	177.84	175.72	175.57	175.95	176.00	175.81	176.28
11/11/2012	177.85	175.69	175.56	175.96	176.00	175.82	176.29
11/12/2012	177.86	175.66	175.59	175.96	176.01	175.82	176.30
11/13/2012	177.88	175.63	175.60	175.97	176.01	175.83	176.31
11/14/2012	177.92	175.60	175.61	175.97	176.02	175.84	176.28
11/15/2012	178.00	175.60	175.63	175.99	176.03	175.86	176.02

Groundwater Data

Date	Reference Well LRS-08	B-6	B-7	B-8	B-9	B-10	B-11
11/16/2012	178.02	175.60	175.64	176.00	176.04	175.87	175.77
11/17/2012	178.05	175.60	175.65	176.01	176.05	175.89	175.50
11/18/2012	178.05	175.57	175.66	176.01	176.06	175.89	175.58
11/19/2012	178.11	175.58	175.69	176.06	176.09	175.92	175.42
11/20/2012	178.27	175.74	175.78	176.20	176.25	176.01	175.68
11/21/2012	178.49	176.04	175.87	176.29	176.45	176.18	176.14
11/22/2012	178.65	176.22	176.00	176.45	176.65	176.36	176.82
11/23/2012	178.87	176.36	176.16	176.65	176.84	176.55	176.78
11/24/2012	179.04	176.45	176.31	176.81	177.00	176.72	177.05
11/25/2012	179.21	176.54	176.46	176.96	177.14	176.88	177.27
11/26/2012	179.38	176.63	176.62	177.09	177.27	177.03	177.21
11/27/2012	179.51	176.70	176.76	177.21	177.38	177.16	177.23
11/28/2012	179.64	176.75	176.88	177.32	177.48	177.27	177.01
11/29/2012	179.71	176.79	176.99	177.40	177.54	177.35	176.92
11/30/2012	179.80	176.81	177.07	177.47	177.60	177.42	176.61
12/1/2012	179.87	176.81	177.14	177.52	177.65	177.47	176.99
12/2/2012	180.05	176.83	177.23	177.60	177.74	177.56	177.04
12/3/2012	180.20	176.88	177.31	177.67	177.84	177.64	177.62
12/4/2012	180.53	177.02	177.44	177.81	178.05	177.83	177.62
12/5/2012	180.79	177.21	177.59	177.98	178.29	178.05	178.33
12/6/2012	181.10	177.41	177.82	178.26	178.56	178.33	178.59
12/7/2012	181.33	177.55	178.04	178.47	178.76	178.55	178.73
12/8/2012	181.51	177.64	178.23	178.64	178.91	178.72	179.07
12/9/2012	181.66	177.73	178.39	178.77	179.04	178.86	179.31
12/10/2012	181.76	177.81	178.52	178.86	179.14	178.97	179.46
12/11/2012	181.92	177.91	178.68	179.02	179.26	179.11	178.94
12/12/2012	181.95	177.95	178.75	179.07	179.31	179.17	179.06
12/13/2012	181.99	177.99	178.82	179.12	179.35	179.22	179.27
12/14/2012	182.05	178.02	178.88	179.17	179.39	179.26	179.22
12/15/2012	182.12	178.06	178.94	179.22	179.44	179.31	179.10
12/16/2012	182.13	178.10	179.00	179.26	179.48	179.36	178.92
12/17/2012	182.24	178.09	178.99	179.28	179.51	179.37	178.97
12/18/2012	182.36	178.16	179.07	179.35	179.61	179.45	179.53
12/19/2012	182.56	178.30	179.19	179.46	179.77	179.61	179.43
12/20/2012	182.88	178.42	179.32	179.61	179.97	179.78	179.51
12/21/2012	183.27	178.63	179.53	179.85	180.27	180.06	179.88
12/22/2012	183.60	178.85	179.79	180.15	180.53	180.35	179.99

					Groundwater Data		
Date	Reference Well LRS-08	B-6	B-7	B-8	B-9	B-10	B-11
12/23/2012	183.79	178.98	179.99	180.33	180.67	180.52	180.30
12/24/2012	183.88	179.05	180.12	180.41	180.75	180.61	180.79
12/25/2012	184.05	179.15	180.28	180.53	180.86	180.74	180.61
12/26/2012	184.16	179.21	180.35	180.60	180.92	180.80	180.70
12/27/2012	184.20	179.26	180.41	180.65	180.97	180.85	181.10
12/28/2012	184.27	179.33	180.49	180.73	181.05	180.93	181.22
12/29/2012	184.31	179.40	180.55	180.79	181.10	180.98	181.33
12/30/2012	184.31	179.44	180.60	180.84	181.14	181.02	181.48
12/31/2012	184.32	179.49	180.64	180.89	181.17	181.06	181.57
1/1/2013	184.30	179.51	180.67	180.91	181.19	181.08	181.71
1/2/2013	184.32	179.55	180.71	180.95	181.21	181.11	181.57
1/3/2013	184.30	179.58	180.74	180.97	181.22	181.12	181.43
1/4/2013	184.23	179.58	180.72	180.95	181.19	181.09	181.51
1/5/2013	184.23	179.59	180.73	180.96	181.19	181.09	181.42
1/6/2013	184.18	179.60	180.72	180.95	181.18	181.08	181.38
1/7/2013	184.20	179.60	180.71	180.95	181.18	181.07	181.23
1/8/2013	184.24	179.62	180.73	180.97	181.20	181.09	181.22
1/9/2013	184.46	179.68	180.78	181.04	181.30	181.16	181.10
1/10/2013	184.64	179.92	180.87	181.18	181.51	181.33	181.51
1/11/2013	184.75	180.06	181.00	181.36	181.68	181.50	181.88
1/12/2013	184.82	180.12	181.12	181.47	181.76	181.61	182.12
1/13/2013	184.83	180.16	181.21	181.53	181.81	181.67	182.29
1/14/2013	184.86	180.19	181.26	181.56	181.83	181.70	182.38
1/15/2013	184.82	180.20	181.28	181.56	181.82	181.70	182.54
1/16/2013	184.80	180.22	181.31	181.58	181.83	181.71	182.51
1/17/2013	184.80	180.24	181.33	181.60	181.83	181.72	182.30
1/18/2013	184.76	180.24	181.32	181.59	181.82	181.71	182.15
1/19/2013	184.71	180.24	181.29	181.56	181.78	181.67	182.18
1/20/2013	184.65	180.24	181.28	181.54	181.76	181.65	182.14
1/21/2013	184.62	180.24	181.27	181.53	181.75	181.64	181.90
1/22/2013	184.59	180.25	181.26	181.53	181.73	181.63	181.79
1/23/2013	184.55	180.24	181.22	181.49	181.69	181.59	181.64
1/24/2013	184.43	180.19	181.16	181.42	181.63	181.52	181.79
1/25/2013	184.44	180.19	181.14	181.41	181.61	181.50	181.63
1/26/2013	184.42	180.18	181.11	181.38	181.56	181.47	181.53
1/27/2013	184.35	180.15	181.07	181.34	181.55	181.43	181.50
1/28/2013	184.31	180.13	181.03	181.31	181.52	181.40	181.59

					Groundwater Data		
Date	Reference Well LRS-08	B-6	B-7	B-8	B-9	B-10	B-11
1/29/2013	184.24	180.08	180.96	181.25	181.46	181.34	181.76
1/30/2013	184.21	180.06	180.94	181.22	181.43	181.31	181.84
1/31/2013	184.19	180.06	180.92	181.21	181.42	181.29	181.81
2/1/2013	184.16	180.05	180.90	181.19	181.40	181.27	181.79
2/2/2013	184.14	180.06	180.89	181.19	181.39	181.26	181.71
2/3/2013	184.10	180.05	180.87	181.18	181.36	181.25	181.65
2/4/2013	184.08	180.07	180.88	181.19	181.38	181.25	181.46
2/5/2013	184.08	180.08	180.87	181.19	181.38	181.24	181.21
2/6/2013	184.04	180.04	180.84	181.15	181.35	181.21	181.27
2/7/2013	184.00	180.02	180.80	181.12	181.32	181.18	181.27
2/8/2013	183.93	179.97	180.76	181.08	181.28	181.14	181.53
2/9/2013	183.91	179.97	180.75	181.07	181.27	181.13	181.53
2/10/2013	183.86	179.95	180.73	181.05	181.25	181.10	181.59
2/11/2013	183.84	179.94	180.71	181.04	181.23	181.09	181.56
2/12/2013	183.78	179.91	180.69	181.02	181.21	181.07	181.58
2/13/2013	183.74	179.88	180.66	180.99	181.16	181.04	181.61
2/14/2013	183.69	179.85	180.64	180.96	181.15	181.01	181.69
2/15/2013	183.68	179.86	180.65	180.97	181.14	181.00	181.52
2/16/2013	183.66	179.85	180.62	180.95	181.13	180.98	181.29
2/17/2013	183.60	179.82	180.60	180.92	181.10	180.96	181.28
2/18/2013	183.60	179.84	180.61	180.93	181.10	180.96	180.98
2/19/2013	183.56	179.81	180.57	180.89	181.07	180.92	180.81
2/20/2013	183.48	179.76	180.52	180.84	181.02	180.86	180.99
2/21/2013	183.43	179.73	180.49	180.81	180.99	180.85	181.00
2/22/2013	183.45	179.74	180.51	180.83	181.00	180.85	180.82
2/23/2013	183.54	179.73	180.47	180.80	181.00	180.83	181.11
2/24/2013	183.59	179.84	180.53	180.87	181.06	180.89	181.28
2/25/2013	183.67	179.93	180.56	180.93	181.12	180.95	181.15
2/26/2013	183.64	179.94	180.56	180.96	181.14	180.97	181.36
2/27/2013	183.66	179.97	180.61	180.99	181.17	181.00	181.35
2/28/2013	183.67	179.98	180.64	181.02	181.19	181.02	181.36
3/1/2013	183.79	180.02	180.70	181.08	181.26	181.08	181.52
3/2/2013	183.91	180.17	180.80	181.19	181.38	181.19	181.45
3/3/2013	183.96	180.24	180.87	181.28	181.46	181.27	181.60
3/4/2013	184.01	180.27	180.94	181.34	181.51	181.33	181.64

		Groundwater Data
Date	Reference Well LRS-08	B-12
10/13/2012	177.51	175.46
10/14/2012	177.5	175.45
10/15/2012	177.47	175.45
10/16/2012	177.42	175.40
10/17/2012	177.38	179.19
10/18/2012	177.37	175.37
10/19/2012	177.34	175.35
10/20/2012	177.31	175.32
10/21/2012	177.29	175.31
10/22/2012	177.28	175.31
10/23/2012	177.24	175.28
10/24/2012	177.21	175.25
10/25/2012	177.17	175.22
10/26/2012	177.16	175.22
10/27/2012	177.14	175.21
10/28/2012	177.11	175.32
10/29/2012	177.12	175.23
10/30/2012	177.13	175.26
10/31/2012	177.18	175.37
11/1/2012	177.28	175.51
11/2/2012	177.39	175.64
11/3/2012	177.50	175.73
11/4/2012	177.58	175.78
11/5/2012	177.65	175.83
11/6/2012	177.74	175.89
11/7/2012	177.78	175.91
11/8/2012	177.83	175.94
11/9/2012	177.84	175.94
11/10/2012	177.84	175.92
11/11/2012	177.85	175.92
11/12/2012	177.86	175.92
11/13/2012	177.88	175.92
11/14/2012	177.92	175.92
11/15/2012	178.00	175.94

Date	Reference Well LRS-08	B-12
11/16/2012	178.02	175.95
11/17/2012	178.05	175.96
11/18/2012	178.05	175.98
11/19/2012	178.11	176.05
11/20/2012	178.27	176.33
11/21/2012	178.49	176.59
11/22/2012	178.65	176.78
11/23/2012	178.87	176.93
11/24/2012	179.04	177.06
11/25/2012	179.21	177.19
11/26/2012	179.38	177.31
11/27/2012	179.51	177.39
11/28/2012	179.64	177.47
11/29/2012	179.71	177.52
11/30/2012	179.80	177.56
12/1/2012	179.87	177.63
12/2/2012	180.05	177.76
12/3/2012	180.20	177.94
12/4/2012	180.53	178.22
12/5/2012	180.79	178.46
12/6/2012	181.10	178.69
12/7/2012	181.33	178.85
12/8/2012	181.51	178.98
12/9/2012	181.68	179.10
12/10/2012	181.76	179.19
12/11/2012	181.92	179.29
12/12/2012	181.95	179.34
12/13/2012	181.99	179.37
12/14/2012	182.05	179.41
12/15/2012	182.12	179.45
12/16/2012	182.13	179.49
12/17/2012	182.24	179.56
12/18/2012	182.36	179.70
12/19/2012	182.56	179.87
12/20/2012	182.88	180.10
12/21/2012	183.27	180.43
12/22/2012	183.60	180.66

Date	Reference Well LRS-08	B-12
12/23/2012	183.79	180.78
12/24/2012	183.88	180.85
12/25/2012	184.05	180.96
12/26/2012	184.16	181.03
12/27/2012	184.20	181.09
12/28/2012	184.27	181.16
12/29/2012	184.31	181.20
12/30/2012	184.31	181.24
12/31/2012	184.32	181.26
1/1/2013	184.30	181.28
1/2/2013	184.32	181.30
1/3/2013	184.30	181.30
1/4/2013	184.23	181.26
1/5/2013	184.23	181.26
1/6/2013	184.18	181.24
1/7/2013	184.20	181.24
1/8/2013	184.24	181.27
1/9/2013	184.46	181.42
1/10/2013	184.64	181.67
1/11/2013	184.75	181.79
1/12/2013	184.82	181.86
1/13/2013	184.83	181.89
1/14/2013	184.86	181.90
1/15/2013	184.82	181.88
1/16/2013	184.80	181.87
1/17/2013	184.80	181.87
1/18/2013	184.76	181.86
1/19/2013	184.71	181.82
1/20/2013	184.65	181.80
1/21/2013	184.62	181.78
1/22/2013	184.59	181.76
1/23/2013	184.55	181.72
1/24/2013	184.43	181.66
1/25/2013	184.44	181.63
1/26/2013	184.42	181.62
1/27/2013	184.35	181.58
1/28/2013	184.31	181.56

Date	Reference Well LRS-08	B-12
1/29/2013	184.24	181.51
1/30/2013	184.21	181.47
1/31/2013	184.19	181.45
2/1/2013	184.16	181.43
2/2/2013	184.14	181.42
2/3/2013	184.10	181.41
2/4/2013	184.08	181.40
2/5/2013	184.08	181.39
2/6/2013	184.04	181.37
2/7/2013	184.00	181.34
2/8/2013	183.93	181.31
2/9/2013	183.91	181.29
2/10/2013	183.86	181.27
2/11/2013	183.84	181.25
2/12/2013	183.78	181.22
2/13/2013	183.74	181.19
2/14/2013	183.69	181.16
2/15/2013	183.66	181.14
2/16/2013	183.66	181.13
2/17/2013	183.60	181.10
2/18/2013	183.60	181.10
2/19/2013	183.56	181.06
2/20/2013	183.46	181.02
2/21/2013	183.43	180.98
2/22/2013	183.45	180.99
2/23/2013	183.54	181.02
2/24/2013	183.59	181.08
2/25/2013	183.67	181.13
2/26/2013	183.64	181.14
2/27/2013	183.66	181.16
2/28/2013	183.67	181.18
3/1/2013	183.79	181.25
3/2/2013	183.91	181.37
3/3/2013	183.96	181.45
3/4/2013	184.01	181.49

DRAINAGE CONTROL PLAN
ATTACHMENT NO. 4
MAINTENANCE AND SOURCE CONTROL MANUAL

SECTION TO BE ADDED IN FUTURE SUBMITTAL

DRAINAGE CONTROL PLAN

ATTACHMENT NO. 5

ESTABLISHMENT OF MAINTENANCE COVENANT

SECTION TO BE ADDED IN FUTURE SUBMITTAL