DRAINAGE REPORT

Brindley Residence
78XX 79th Ave SE, Mercer Island, 98040

City of Mercer Island Permit No. 2203-116-SUB1

Prepared by:

HLENGINEERING

~~March 2, 2022~~
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Contents

1. INTRODUCTION
2. MINIMUM REQUIREMENTS
3. ON-SITE STORMWATER MANAGEMENT
4. FLOW CONTROL
5. CONVEYANCE SYSTEM ANALYSIS

- Appendix A DOE Flowchart for Determining Requirements For New Dev
- Appendix B Infiltration Feasibility Map
- Appendix C Western Washington Hydrology Model (WWHM) Output
- Appendix D Stormwater Plan
- Appendix E Stormwater Pump System Calculations
- Appendix F Operations and Maintenance Standards

1. INTRODUCTION:

These calculations and report document the storm drainage design for the single-family residential development project located at an un-addressed parcel on 79th Avenue SE in the City of Mercer Island.

The calculations and report have been prepared by HL Engineering for submittal of the building permit application, and in compliance with the City of Mercer Island's Stormwater Requirements (based on the Department of Ecology's 2014 Stormwater Management Manual for Western Washington).

The project is located on the east side of 79th Ave SE (see Figure 1). The site is surrounded on the north, south, and east by single family developments. The site is currently vacant as consists of a well-maintained lawn and several trees.

Figure 1: Location Map

The project improvements include the following:

- Removal of non-exceptional trees and fencing. The project proposes to re-use a stubbed sanitary side sewer.
- Construction of a new residential structure, along with walkways and driveway, along with Installation of service utilities, and an underground detention vault for roof stormwater runoff as a Best Management Practice (BMP).

See Appendix C for the Stormwater Plan, highlighted to show BMPs and proposed compliance.

2. MINIMUM REQUIREMENTS:

The project proposes one residential dwelling unit, with a total New + Replaced Hard Surface Footprint of 11,850 sf in a vacant / undeveloped parcel. As such, the minimum requirements for the project are summarized in Table 1.

Table 1. Minimum Stormwater Requirements for Parcel-Based Projects:

Minimum Requirement (MR) Description	Code Section	Applicability
Preparation of Stormwater Site Plan	1-3.4.1 MR1	Applies
Construction Stormwater Pollution Prevention Plan	1-3.4.2 MR2	Applies
Source Control of Pollution	1-3.4.3 MR3	Applies
Preservation of Natural Drainage Systems	1-3.4.4 MR4	Applies
On-Site Stormwater Management	1-3.4.5 MR5	Applies
Runoff Treatment	1-3.4.6 MR6	Applies
Flow Control	1-3.4.7 MR7	Applies
Wetlands Protection	1-3.4.8 MR8	Applies
Operations and Maintenance	1-3.4.9 MR9	Applies

This report will discuss the requirements that impact the strategy, selection, and sizing of proposed stormwater BMPs.

2.1 MR1: PREPARATION OF STORMWATER SITE PLAN

As a project that exceeds the 2,000 sf threshold of hard surfaces, the project is required to prepare Stormwater Site Plans. The permit drawings C4.00, C4.50, C4.60, and C4.70 provide stormwater system layouts and details for the project.

The stormwater system includes not only piping and detention system but also oil/water separation for pollutant-generating surfaces and a pump system to lift stormwater runoff from the detention tank to the shallow City main in 79th Avenue SE.

2.2 MR2: CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

The project exceeds the 2,000 sf threshold for preparation of Construction phase Stormwater Pollution Prevention Plans. Erosion and Sedimentation Control plan Sheets C1.00, C1.50 are included in the permit drawings, which would be used by the contractor as part of a completed SWPPP.

Temporary erosion and sedimentation control measures proposed for this project include silt fence, straw wattles, and a stabilized construction entrance.

2.3 MR3: SOURCE CONTROL OF POLLUTION

The project site is vacant in the existing condition. There are no known tanks or soil contaminations that would require mitigation or protection in order to provide source control of those pollutants.

2.4 MR4: PRESERVATION OF NATURAL DRAINAGE SYSTEM

The existing site topography indicates sheet flow drainage to the west (to the public right of way of 79th Avenue SE). The City's public storm drain main in 79th Avenue SE is the approved point of discharge for the project and for neighboring properties, given that the site has no ability to infiltrate stormwater and does not have the size to provide dispersion systems. The project will convey stormwater flow to the existing storm main in 79th Avenue SE.

2.5 MR5: ONSITE STORMWATER MANAGEMENT

On-site Stormwater Management is required for this project, and the specific requirement is to comply with LID Performance Standard:

> *"Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Refer to the Flow Control Performance Standard section in I-3.4.7 MR7: Flow Control for information about the assignment of the pre-developed condition. Project sites that must also meet I-3.4.7 MR7: Flow Control must match flow durations between 8% of the 2-year flow through the full 50-year flow."*

The pre-developed condition is the forested condition, per SWMMWW Section I-3.4.7 "MR7: Flow Control", since the project site and downstream areas are estimated to have a Total Impervious Area of less than 40% since 1985.

Ideally a project could use infiltration techniques to comply with this Requirement, as the City of Mercer Island Infiltration Feasibility Map (Appendix B) indicates moderate infiltration potential at the site. However, the project geotechnical engineer (Geotech Consultants, Inc) concluded in their September 2, 2021 Geotechnical Engineering Study:

> *Often, the impermeable nature of the glacial till causes a shallow seasonal perched water table to form where the ground surface is not covered by an impervious layer. This is a common problem in the wet season throughout the Pacific Northwest. Considering this, and because the upper soil at the site is generally fill soil that cannot be used to infiltrate into, it is our professional opinion that onsite infiltration of stormwater is not feasible for the subject site.*

The project reviewed the List Approach for MR5 Compliance (Table 1-3.2) within the SWMMWW for this project site, which is not considered to be exempt from Flow Control and is subject to MR #1 through MR #9, with the following conclusions in regards to options for stormwater BMPs:

Lawn and Landscape:

1. Post-Construction Soil Quality and Depth

Feasible and implemented

Roofs:

1. Full Dispersion -or- Downspout Full Infiltration
   Not Feasible – Site cannot infiltrate, and site does not have dispersion area of 6.5 x the hard surface area or a 50' flow path available within disturbed limits

2. Bioretention
   Not Feasible – the project's professional geotechnical evaluation recommends infiltration not be used

3. Downspout Dispersion Systems
   Not Feasible – 50' flow path is not available onsite

4. Perforated Stub-Out Connections
   Not Feasible – the project's professional geotechnical evaluation recommends infiltration not be used

5. On-Site Detention (MICC 15.09.050)
   Feasible and implemented

Other Hard Surfaces:

1. Full Dispersion
   Not Feasible – Site cannot infiltrate, and site does not have dispersion area of 6.5 x the hard surface area or a 50' flow path available within disturbed limits

2. Permeable Pavements
   Not Feasible – the project's professional geotechnical evaluation recommends infiltration not be used

3. Bioretention
   Not Feasible – the project's professional geotechnical evaluation recommends infiltration not be used

4. Sheet Flow Dispersion -or- Concentrated Flow Dispersion

Not Feasible – the project site does not have space for a 10'-wide vegetated buffer and 2'-wide transition zone downstream of the paved areas (largely due to tree protection zones)

5. On-Site Detention (MICC 15.09.050)
   Feasible and implemented

The selected On-Site Stormwater management mitigation for the project is a combination of below-grade detention system and Post-Construction Soil Quality and Depth. The Predeveloped and Mitigated flow rates are discussed more under MR7 "Flow Control" below.

** NOTE: Because the MR5 BMPs listed in the SWMMWW for Roof and Other Hard Surfaces are all determined to be infeasible, the actual flow release requirement will be based on MR7 requirements as noted below.

2.6 MR6: RUNOFF TREATMENT

Although this project proposes a total of 11,850 sf of New + Replaced Hard Surfaces, the area of Pollution-Generating Hard Surface (PGHS) consists only of the driveway, which is 2,310 sf. In accordance with the SWMMWW Section I-3.4.6 "Runoff Treatment", this project falls below the threshold for Treatment requirements.

In addition to the requirements of the SWMMWW, the City of Mercer Island Municipal Code Section 15.09.050.A requires passive spill control for driveways. As such, **this project proposes a French drain system to collect all driveway runoff, which then conveys to a 100 gallon proprietary, private oil / water separation unit**. The flow is then conveyed to the below-grade detention vault.

2.7 MR7: FLOW CONTROL

The project is required to achieve the Flow Control Performance Standard for the New + Replaced Hard Surfaces, for which the following must be met:

> *Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.*

When coupled with the requirements noted under MR5, the project is required to match flow durations between 8% of the 2-year flow through the full 50-year flow.

Given the inability to infiltrate stormwater, the project is providing detention to the maximum extent feasible to comply with the Flow Control Performance Standard.

The project applied the Western Washington Hydrology Model (WWHM) iteratively to prove compliance using increasing bioretention and detention vault sizing. The WWHM output is included as Appendix D. Using a Predeveloped Forested Condition for a footprint equal to the area of disturbance along with the proposed stormwater BMPs, the input, output, and results of WWHM are summarized as follows:

PREDEVELOPED LAND USE

Pervious Land Use	acre
C, Forest, Flat	0.49

Impervious Land Use	acre
ROOF TOPS FLAT	0.02 (existing shed structure)

MITIGATED LAND USE TO DETENTION VAULT

Pervious Land Use	acre
A B, Pasture, Flat	0.17

Impervious Land Use	acre
ROOF TOPS FLAT	0.18
DRIVEWAYS FLAT	0.05
SIDEWALKS FLAT	0.04

MITIGATED LAND USE BYPASS

Pervious Land Use	acre
A B, Pasture, Flat	0.07

DETENTION VAULT PARAMETERS

Width:	7 ft.
Length:	110 ft.

Depth: 7 ft.

Discharge Structure

Riser Height: 6.5 ft.

Riser Diameter: 18 in.

Orifice 1 Diameter: 0.25 in. Elevation: 0 ft.

Orifice 2 Diameter: 0.125 in. Elevation: 2 ft.

Orifice 3 Diameter: 0.125 in. Elevation: 3 ft.

Return Period	100% Predeveloped Flow (cfs)	50% of Predeveloped Flow (cfs)	Mitigated Flow (cfs)	Compliant?
2-Year	0.019	0.010	0.005	Y
50-Year	0.051	-	0.043	Y

2.8 MR8: WETLANDS PROTECTION

The project conveys stormwater into the existing public storm drain main in 79th Avenue SE, which outlets downstream into a series of open watercourses prior to outlet into Lake Washington. The drainage pathway is continuously downhill and does not impact any mapped wetlands.

2.9 MR9: OPERATIONS AND MAINTENANCE

The project's stormwater systems that require regular maintenance include the oil / water separator and the detention tank (the stormwater pump system is not actually providing Flow Control, and therefore is not required to be included in the Operations and Maintenance requirements).

Potential Defects and Maintenance are included in Appendix E for the oil / water separator and for the detention vault.

3. CONVEYANCE SYSTEM ANALYSIS:

In accordance with the City of Mercer Island's Pre-Application meeting guidance, the project is required to convey stormwater to the existing shallow 8" storm drain main located in 79th Avenue SE. The project has no ability to install storm drainage onsite in a manner to gravity flow to the existing main, so a pump system is proposed to elevate discharge just before entering the public right of way through a service drain connection to the public main.

Proposed storm drainage piping is designed with a minimum slope of 1.00% but due to site topography and available locations for bioretention, cannot be sloped at the standard 2.00% and accommodate the topography by gravity flow.

From the Rational Method:

$$Q_{25\text{-Year}} = (C)(i)(A)$$

Where:

- Rainfall intensity (i) can be derived from King County's Surface Water Design Manual isopluvial maps, Section 3.2. for a 25-year, 24-hour occurrence storm event to be a maximum of 3.40 in/hr.

- Area (A) represents the largest tributary basin to any pipe. The largest collection system is the pipe network carrying flow along the southeast and south downspouts, which deliver the flow into the south bioretention planter and further downstream into the large underground detention vault. That pipe system conveys a total roof area = 3,250 sf (0.075 ac)

- Runoff coefficient (C) for the scenario is based on the tributary areas, and since the roof flow is the only contributing area the coefficient of 0.90 is appropriate.

The maximum site runoff within any pipe is calculated from Rational Method to be:

$$Q_{25\text{-Year}} = (C)(i)(A)$$

$$Q_{25\text{-Year}} = (0.90)(3.40)(0.075)$$

$$Q_{25\text{-Year}} = 0.23 \text{ cfs}$$

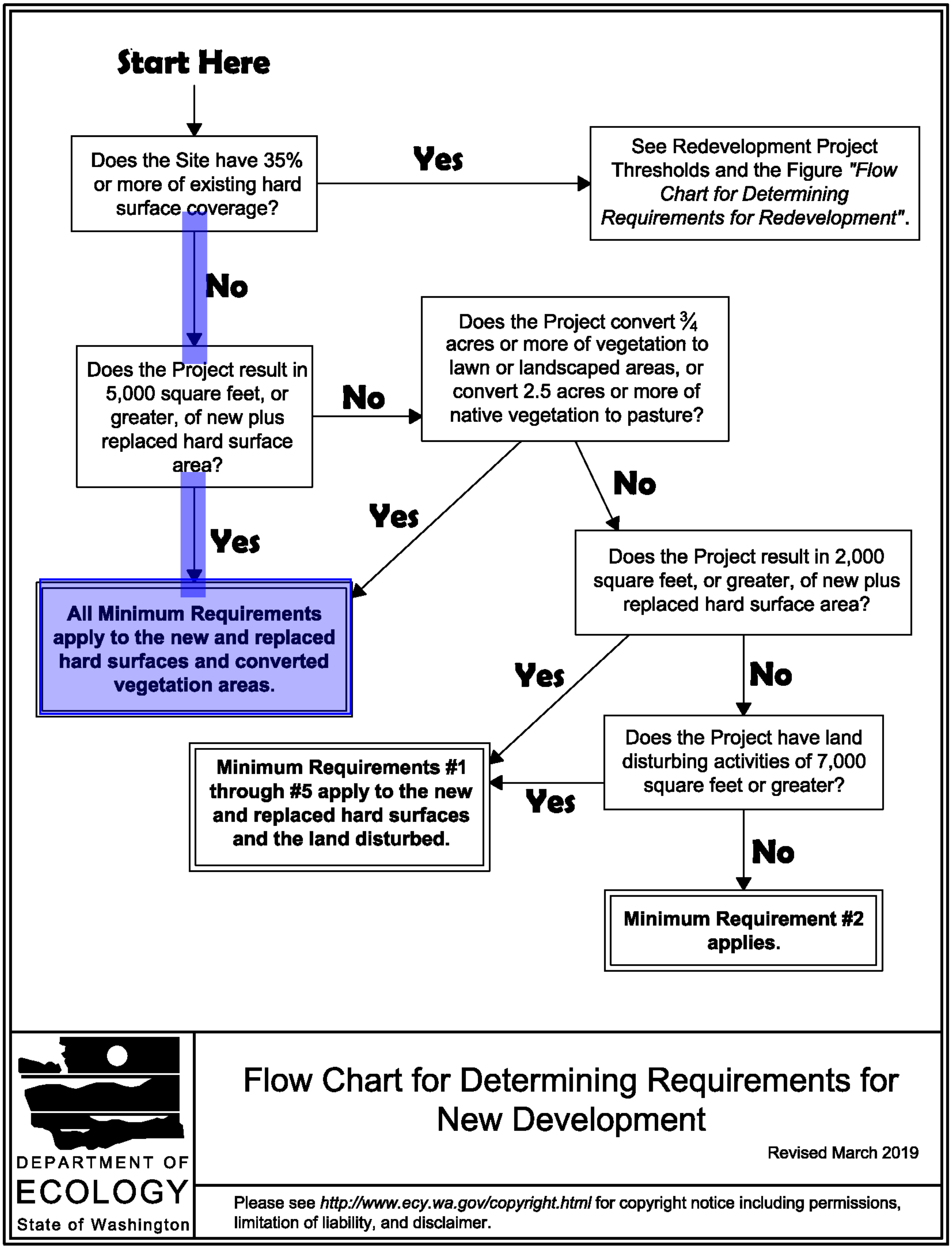
Using Manning's Equation:

- A 4" diameter plastic solid-wall pipe, sloped at 1.00% and flowing 75% ful (25% clogged) has capacity to convey **0.23 cfs.**

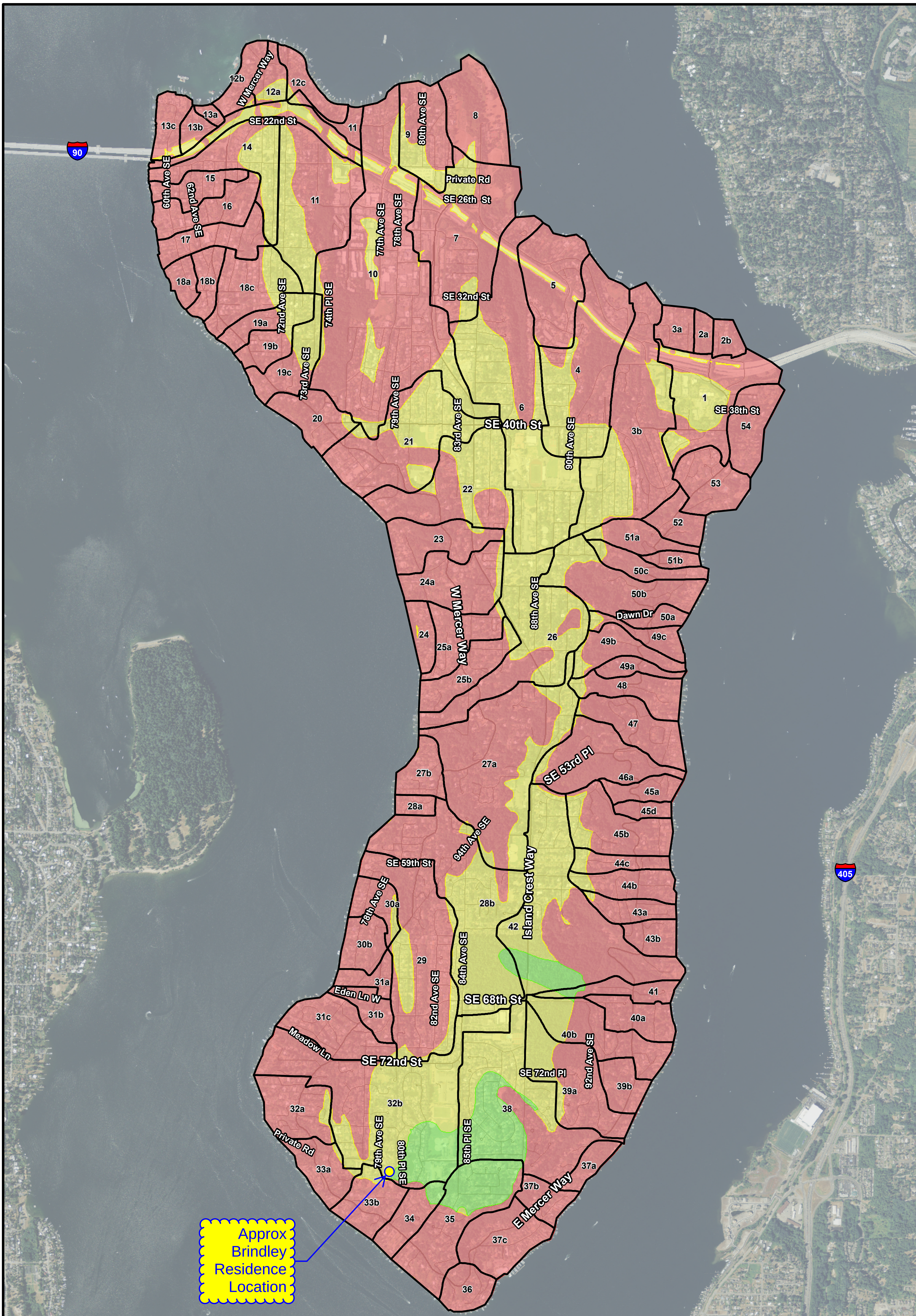
Therefore, the proposed drainage system pipe sizing is considered to be feasible and appropriate.

APPENDIX A: DOE Flowchart; Requirements for New Dev

Figure I-3.1: Flow Chart for Determining Requirements for New Development



APPENDIX B: Infiltration Feasibility Map



Legend

- Infiltrating LID facilities may be feasible, and soil has high infiltration potential
- Infiltrating LID facilities may be feasible, and soil has moderate infiltration potential
- Infiltrating LID facilities are not permitted
- 36 Storm drainage basin

* Map is intended to be used for planning purposes only. Site-specific analysis is required prior to design and construction of LID facilities.

Figure 3. Low impact development infiltration feasibility on Mercer Island.

N

0 950 1,900 3,800 Feet

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Aerial photography: USDA (2009)

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APPENDIX C: WWHM Output

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	79th Ave SW, Mercer Island
Site Name:	79th Ave SW
Site Address:	79th Ave SW
City:	Mercer Island
Report Date:	7/25/2022
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	8 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

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Landuse Basin Data

Predeveloped Land Use

Existing Condition

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.49
Pervious Total	0.49
Impervious Land Use	acre
ROOF TOPS FLAT	0.02
Impervious Total	0.02
Basin Total	0.51

Element Flows To:

Surface	Interflow	Groundwater

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Mitigated Land Use

Roof and Dwy

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Flat	0.17
Pervious Total	0.17
Impervious Land Use	acre
ROOF TOPS FLAT	0.18
DRIVEWAYS FLAT	0.05
SIDEWALKS FLAT	0.04
Impervious Total	0.27
Basin Total	0.44

Element Flows To:

Surface	Interflow	Groundwater
Detention Vault	Detention Vault	

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Amended Soil Areas

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Flat	0.07
Pervious Total	0.07
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.07

Element Flows To:

Surface	Interflow	Groundwater

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Routing Elements
Predeveloped Routing

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Mitigated Routing

Detention Vault

Width:	7 ft.
Length:	110 ft.
Depth:	7 ft.
Discharge Structure	
Riser Height:	6.5 ft.
Riser Diameter:	8 in.
Orifice 1 Diameter:	0.25 in. Elevation:0 ft.
Orifice 2 Diameter:	0.125 in. Elevation:2 ft.
Orifice 3 Diameter:	0.125 in. Elevation:3 ft.
Element Flows To:	
Outlet 1	Outlet 2

Vault Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.017	0.000	0.000	0.000
0.0778	0.017	0.001	0.000	0.000
0.1556	0.017	0.002	0.000	0.000
0.2333	0.017	0.004	0.000	0.000
0.3111	0.017	0.005	0.000	0.000
0.3889	0.017	0.006	0.001	0.000
0.4667	0.017	0.008	0.001	0.000
0.5444	0.017	0.009	0.001	0.000
0.6222	0.017	0.011	0.001	0.000
0.7000	0.017	0.012	0.001	0.000
0.7778	0.017	0.013	0.001	0.000
0.8556	0.017	0.015	0.001	0.000
0.9333	0.017	0.016	0.001	0.000
1.0111	0.017	0.017	0.001	0.000
1.0889	0.017	0.019	0.001	0.000
1.1667	0.017	0.020	0.001	0.000
1.2444	0.017	0.022	0.001	0.000
1.3222	0.017	0.023	0.002	0.000
1.4000	0.017	0.024	0.002	0.000
1.4778	0.017	0.026	0.002	0.000
1.5556	0.017	0.027	0.002	0.000
1.6333	0.017	0.028	0.002	0.000
1.7111	0.017	0.030	0.002	0.000
1.7889	0.017	0.031	0.002	0.000
1.8667	0.017	0.033	0.002	0.000
1.9444	0.017	0.034	0.002	0.000
2.0222	0.017	0.035	0.002	0.000
2.1000	0.017	0.037	0.002	0.000
2.1778	0.017	0.038	0.002	0.000
2.2556	0.017	0.039	0.002	0.000
2.3333	0.017	0.041	0.002	0.000
2.4111	0.017	0.042	0.002	0.000
2.4889	0.017	0.044	0.003	0.000
2.5667	0.017	0.045	0.003	0.000
2.6444	0.017	0.046	0.003	0.000
2.7222	0.017	0.048	0.003	0.000
2.8000	0.017	0.049	0.003	0.000
2.8778	0.017	0.050	0.003	0.000

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2.9556	0.017	0.052	0.003	0.000
3.0333	0.017	0.053	0.003	0.000
3.1111	0.017	0.055	0.003	0.000
3.1889	0.017	0.056	0.003	0.000
3.2667	0.017	0.057	0.003	0.000
3.3444	0.017	0.059	0.003	0.000
3.4222	0.017	0.060	0.003	0.000
3.5000	0.017	0.061	0.004	0.000
3.5778	0.017	0.063	0.004	0.000
3.6556	0.017	0.064	0.004	0.000
3.7333	0.017	0.066	0.004	0.000
3.8111	0.017	0.067	0.004	0.000
3.8889	0.017	0.068	0.004	0.000
3.9667	0.017	0.070	0.004	0.000
4.0444	0.017	0.071	0.004	0.000
4.1222	0.017	0.072	0.004	0.000
4.2000	0.017	0.074	0.004	0.000
4.2778	0.017	0.075	0.004	0.000
4.3556	0.017	0.077	0.004	0.000
4.4333	0.017	0.078	0.004	0.000
4.5111	0.017	0.079	0.004	0.000
4.5889	0.017	0.081	0.004	0.000
4.6667	0.017	0.082	0.004	0.000
4.7444	0.017	0.083	0.005	0.000
4.8222	0.017	0.085	0.005	0.000
4.9000	0.017	0.086	0.005	0.000
4.9778	0.017	0.088	0.005	0.000
5.0556	0.017	0.089	0.005	0.000
5.1333	0.017	0.090	0.005	0.000
5.2111	0.017	0.092	0.005	0.000
5.2889	0.017	0.093	0.005	0.000
5.3667	0.017	0.094	0.005	0.000
5.4444	0.017	0.096	0.005	0.000
5.5222	0.017	0.097	0.005	0.000
5.6000	0.017	0.099	0.005	0.000
5.6778	0.017	0.100	0.005	0.000
5.7556	0.017	0.101	0.005	0.000
5.8333	0.017	0.103	0.005	0.000
5.9111	0.017	0.104	0.005	0.000
5.9889	0.017	0.105	0.005	0.000
6.0667	0.017	0.107	0.005	0.000
6.1444	0.017	0.108	0.005	0.000
6.2222	0.017	0.110	0.005	0.000
6.3000	0.017	0.111	0.005	0.000
6.3778	0.017	0.112	0.005	0.000
6.4556	0.017	0.114	0.006	0.000
6.5333	0.017	0.115	0.049	0.000
6.6111	0.017	0.116	0.261	0.000
6.6889	0.017	0.118	0.519	0.000
6.7667	0.017	0.119	0.717	0.000
6.8444	0.017	0.121	0.827	0.000
6.9222	0.017	0.122	0.915	0.000
7.0000	0.017	0.123	0.996	0.000
7.0778	0.017	0.125	1.070	0.000
7.1556	0.000	0.000	1.139	0.000

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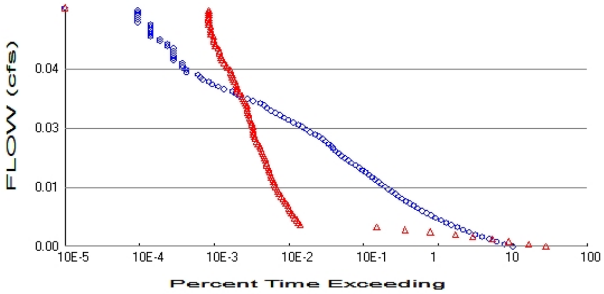
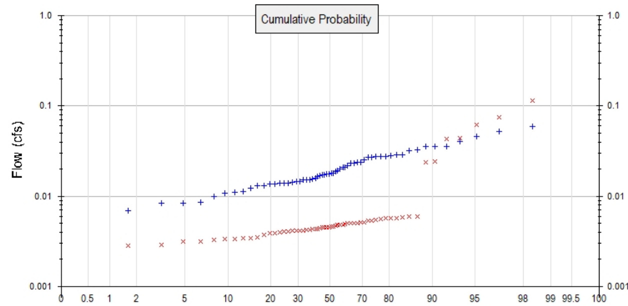
Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.49
Total Impervious Area: 0.02

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.24
Total Impervious Area: 0.27

Flow Frequency Method: Log Pearson Type III 17B

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Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.018597
5 year	0.027997
10 year	0.034831
25 year	0.044119
50 year	0.051495
100 year	0.059255

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.005136
5 year	0.010826
10 year	0.017066
25 year	0.029199
50 year	0.042531
100 year	0.060852

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

Year	**Predeveloped**	**Mitigated**
1949	0.024	0.004
1950	0.025	0.005
1951	0.036	0.044
1952	0.014	0.003
1953	0.011	0.005
1954	0.014	0.004
1955	0.023	0.004
1956	0.021	0.005
1957	0.020	0.004
1958	0.017	0.005

1959	0.014	0.004
1960	0.028	0.006
1961	0.016	0.005
1962	0.010	0.003
1963	0.014	0.005
1964	0.018	0.005
1965	0.015	0.005
1966	0.013	0.004
1967	0.028	0.005
1968	0.018	0.004
1969	0.017	0.004
1970	0.015	0.004
1971	0.018	0.005
1972	0.027	0.006
1973	0.014	0.005
1974	0.017	0.004
1975	0.024	0.004
1976	0.017	0.004
1977	0.007	0.003
1978	0.014	0.005
1979	0.011	0.003
1980	0.032	0.024
1981	0.014	0.004
1982	0.028	0.006
1983	0.019	0.004
1984	0.013	0.003
1985	0.008	0.003
1986	0.029	0.005
1987	0.028	0.006
1988	0.011	0.004
1989	0.008	0.003
1990	0.060	0.006
1991	0.036	0.006
1992	0.016	0.005
1993	0.014	0.003
1994	0.007	0.003
1995	0.019	0.005
1996	0.040	0.044
1997	0.033	0.076
1998	0.012	0.003
1999	0.036	0.024
2000	0.015	0.005
2001	0.009	0.002
2002	0.018	0.005
2003	0.023	0.004
2004	0.027	0.062
2005	0.021	0.004
2006	0.022	0.005
2007	0.046	0.115
2008	0.052	0.006
2009	0.029	0.005

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Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0598	0.1149
2	0.0525	0.0757
3	0.0457	0.0623

4	0.0404	0.0437
5	0.0358	0.0436
6	0.0356	0.0243
7	0.0356	0.0237
8	0.0327	0.0060
9	0.0317	0.0060
10	0.0291	0.0059
11	0.0289	0.0057
12	0.0279	0.0057
13	0.0278	0.0057
14	0.0278	0.0056
15	0.0277	0.0055
16	0.0273	0.0054
17	0.0271	0.0053
18	0.0252	0.0052
19	0.0238	0.0052
20	0.0236	0.0051
21	0.0233	0.0050
22	0.0231	0.0050
23	0.0216	0.0050
24	0.0209	0.0050
25	0.0208	0.0048
26	0.0199	0.0048
27	0.0192	0.0048
28	0.0188	0.0047
29	0.0180	0.0046
30	0.0179	0.0046
31	0.0176	0.0045
32	0.0175	0.0045
33	0.0172	0.0045
34	0.0171	0.0045
35	0.0170	0.0044
36	0.0165	0.0043
37	0.0158	0.0043
38	0.0156	0.0043
39	0.0153	0.0043
40	0.0153	0.0042
41	0.0152	0.0042
42	0.0145	0.0041
43	0.0144	0.0041
44	0.0141	0.0041
45	0.0140	0.0041
46	0.0140	0.0041
47	0.0138	0.0040
48	0.0137	0.0039
49	0.0137	0.0039
50	0.0132	0.0037
51	0.0131	0.0035
52	0.0123	0.0034
53	0.0113	0.0034
54	0.0109	0.0034
55	0.0109	0.0034
56	0.0100	0.0032
57	0.0086	0.0032
58	0.0083	0.0031
59	0.0083	0.0029
60	0.0069	0.0029
61	0.0066	0.0024

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Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0015	214744	590973	275	Fail
0.0020	164565	345001	209	Fail
0.0025	128996	187644	145	Fail
0.0030	102730	112954	109	Fail
0.0035	82689	61557	74	Pass
0.0040	67204	36254	53	Pass
0.0045	55290	16747	30	Pass
0.0050	45900	7668	16	Pass
0.0055	38307	3191	8	Pass
0.0060	32062	303	0	Pass
0.0065	27121	284	1	Pass
0.0070	23079	275	1	Pass
0.0075	19708	257	1	Pass
0.0081	16914	244	1	Pass
0.0086	14743	233	1	Pass
0.0091	12906	220	1	Pass
0.0096	11340	214	1	Pass
0.0101	10029	206	2	Pass
0.0106	8891	194	2	Pass
0.0111	7886	186	2	Pass
0.0116	7007	177	2	Pass
0.0121	6263	170	2	Pass
0.0126	5634	158	2	Pass
0.0131	5073	154	3	Pass
0.0136	4560	149	3	Pass
0.0141	4119	143	3	Pass
0.0146	3720	135	3	Pass
0.0151	3377	134	3	Pass
0.0156	3046	130	4	Pass
0.0161	2772	123	4	Pass
0.0166	2511	122	4	Pass
0.0171	2263	118	5	Pass
0.0177	2041	115	5	Pass
0.0182	1858	113	6	Pass
0.0187	1660	109	6	Pass
0.0192	1487	107	7	Pass
0.0197	1339	103	7	Pass
0.0202	1205	101	8	Pass
0.0207	1083	99	9	Pass
0.0212	989	96	9	Pass
0.0217	910	92	10	Pass
0.0222	836	89	10	Pass
0.0227	782	87	11	Pass
0.0232	722	82	11	Pass
0.0237	663	79	11	Pass
0.0242	593	75	12	Pass
0.0247	535	73	13	Pass
0.0252	477	72	15	Pass
0.0257	413	71	17	Pass
0.0262	368	71	19	Pass
0.0267	324	71	21	Pass
0.0272	286	68	23	Pass
0.0278	246	68	27	Pass
0.0283	210	65	30	Pass

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0.0288	185	63	34	Pass
0.0293	162	62	38	Pass
0.0298	140	60	42	Pass
0.0303	121	59	48	Pass
0.0308	109	59	54	Pass
0.0313	100	58	58	Pass
0.0318	88	56	63	Pass
0.0323	71	54	76	Pass
0.0328	59	52	88	Pass
0.0333	47	50	106	Pass
0.0338	41	47	114	Fail
0.0343	37	43	116	Fail
0.0348	29	43	148	Fail
0.0353	24	43	179	Fail
0.0358	20	42	209	Fail
0.0363	18	40	222	Fail
0.0368	15	38	253	Fail
0.0374	14	37	264	Fail
0.0379	13	37	284	Fail
0.0384	9	35	388	Fail
0.0389	9	35	388	Fail
0.0394	8	32	400	Fail
0.0399	8	31	387	Fail
0.0404	8	29	362	Fail
0.0409	6	27	450	Fail
0.0414	6	26	433	Fail
0.0419	6	26	433	Fail
0.0424	6	25	416	Fail
0.0429	6	25	416	Fail
0.0434	6	24	400	Fail
0.0439	5	22	440	Fail
0.0444	5	22	440	Fail
0.0449	4	21	525	Fail
0.0454	4	21	525	Fail
0.0459	3	21	700	Fail
0.0464	3	19	633	Fail
0.0469	3	19	633	Fail
0.0475	3	19	633	Fail
0.0480	3	19	633	Fail
0.0485	3	18	600	Fail
0.0490	2	18	900	Fail
0.0495	2	18	900	Fail
0.0500	2	18	900	Fail
0.0505	2	18	900	Fail
0.0510	2	18	900	Fail
0.0515	2	18	900	Fail

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

Water Quality

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 acre-feet
On-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.
Off-line facility target flow: 0 cfs.
Adjusted for 15 min: 0 cfs.

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LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Detention Vault POC	☐	38.65			☐	0.00			
Total Volume Infiltrated		38.65	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

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Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

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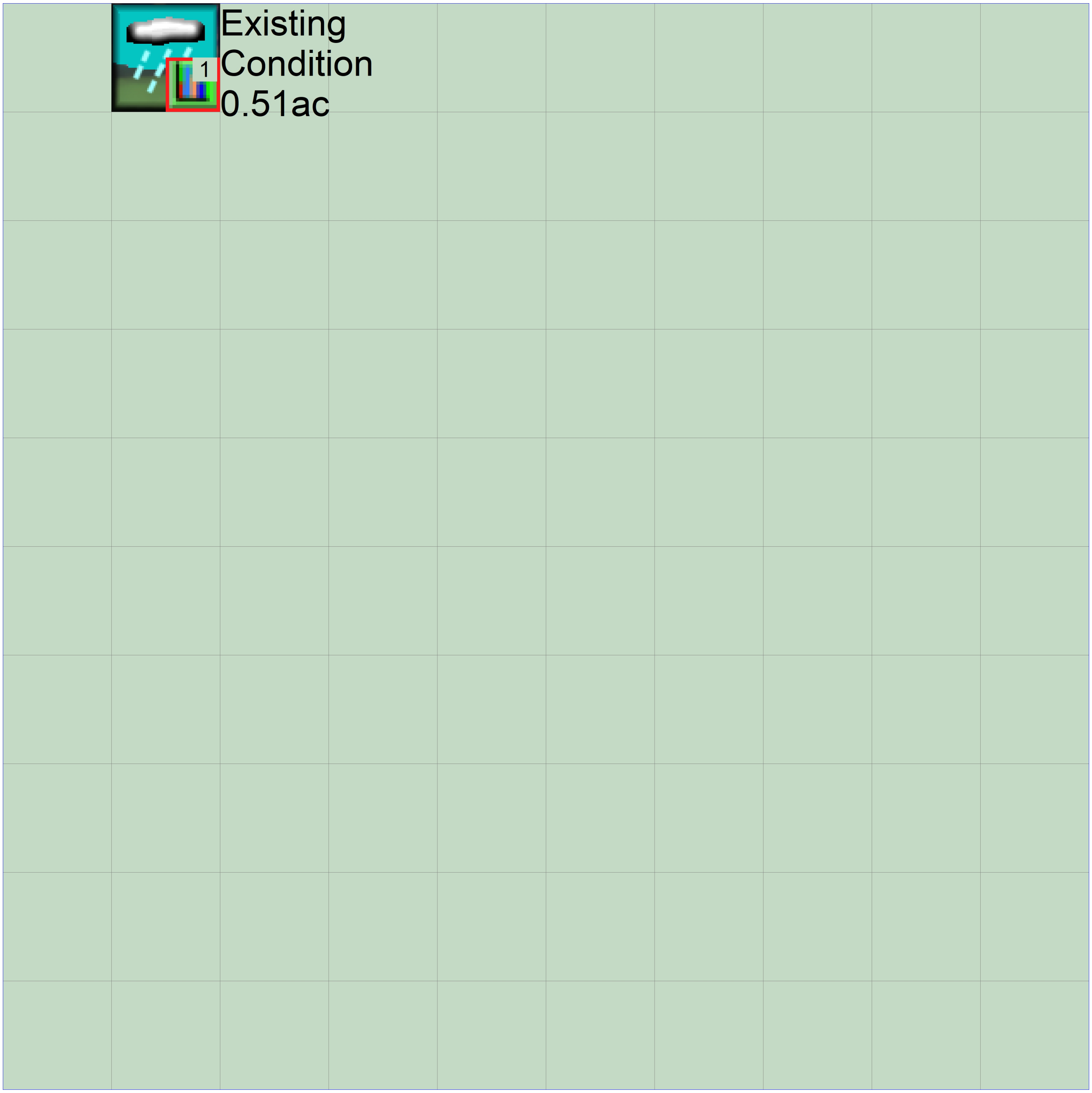
Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

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

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   79th Ave SW, Mercer Island.wdm
MESSU      25   Pre79th Ave SW, Mercer Island.MES
           27   Pre79th Ave SW, Mercer Island.L61
           28   Pre79th Ave SW, Mercer Island.L62
           30   POC79th Ave SW, Mercer Island1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      IMPLND       4
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Existing Condition          MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                            User  t-series Engl Metr ***
                                            in  out           ***
   10      C, Forest, Flat          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   10         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   10         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   10         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   10             0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                    ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
                ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   10             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------->   Unit-systems   Printer ***
    # -  #                      User  t-series Engl Metr ***
                                       in  out           ***
    4      ROOF TOPS/FLAT          1     1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4             0         0
```

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```
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Existing Condition***
PERLND  10                        0.49     COPY   501     12
PERLND  10                        0.49     COPY   501     13
IMPLND   4                        0.02     COPY   501     15

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

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



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

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

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

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

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

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

SPEC-ACTIONS
```

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```
END SPEC-ACTIONS
FTABLES
END FTABLES

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

END EXT SOURCES

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

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

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

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   79th Ave SW, Mercer Island.wdm
MESSU      25   Mit79th Ave SW, Mercer Island.MES
           27   Mit79th Ave SW, Mercer Island.L61
           28   Mit79th Ave SW, Mercer Island.L62
           30   POC79th Ave SW, Mercer Island1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       4
      IMPLND       4
      IMPLND       5
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1         Detention Vault            MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    4     A/B, Pasture, Flat      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

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

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

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

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

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    4              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    4           0.15       0.5       0.3         0       0.7       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    4              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI    ***
    4         0    0    0    0    0
```

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```
    5          0    0    0    0    0
    8          0    0    0    0    0
  END IWAT-PARM1

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Roof and Dwy***
PERLND   4                        0.17     RCHRES   1      2
PERLND   4                        0.17     RCHRES   1      3
IMPLND   4                        0.18     RCHRES   1      5
IMPLND   5                        0.05     RCHRES   1      5
IMPLND   8                        0.04     RCHRES   1      5
Amended Soil Areas***
PERLND   4                        0.07     COPY   501     12
PERLND   4                        0.07     COPY   601     12
PERLND   4                        0.07     COPY   501     13
PERLND   4                        0.07     COPY   601     13

******Routing******
PERLND   4                        0.17     COPY     1     12
IMPLND   4                        0.18     COPY     1     15
IMPLND   5                        0.05     COPY     1     15
IMPLND   8                        0.04     COPY     1     15
PERLND   4                        0.17     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

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



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

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

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```
    1      Detention Vault          1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1             1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0          4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.017677  0.000000  0.000000
  0.077778  0.017677  0.001375  0.000473
  0.155556  0.017677  0.002750  0.000669
  0.233333  0.017677  0.004125  0.000819
  0.311111  0.017677  0.005499  0.000946
  0.388889  0.017677  0.006874  0.001058
  0.466667  0.017677  0.008249  0.001159
  0.544444  0.017677  0.009624  0.001251
  0.622222  0.017677  0.010999  0.001338
  0.700000  0.017677  0.012374  0.001419
  0.777778  0.017677  0.013749  0.001496
  0.855556  0.017677  0.015123  0.001569
  0.933333  0.017677  0.016498  0.001639
  1.011111  0.017677  0.017873  0.001705
  1.088889  0.017677  0.019248  0.001770
  1.166667  0.017677  0.020623  0.001832
  1.244444  0.017677  0.021998  0.001892
  1.322222  0.017677  0.023373  0.001950
  1.400000  0.017677  0.024747  0.002007
  1.477778  0.017677  0.026122  0.002062
  1.555556  0.017677  0.027497  0.002115
  1.633333  0.017677  0.028872  0.002168
  1.711111  0.017677  0.030247  0.002219
  1.788889  0.017677  0.031622  0.002268
  1.866667  0.017677  0.032997  0.002317
```

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```
  1.944444  0.017677  0.034371  0.002365
  2.022222  0.017677  0.035746  0.002475
  2.100000  0.017677  0.037121  0.002592
  2.177778  0.017677  0.038496  0.002682
  2.255556  0.017677  0.039871  0.002762
  2.333333  0.017677  0.041246  0.002836
  2.411111  0.017677  0.042621  0.002905
  2.488889  0.017677  0.043996  0.002972
  2.566667  0.017677  0.045370  0.003036
  2.644444  0.017677  0.046745  0.003098
  2.722222  0.017677  0.048120  0.003159
  2.800000  0.017677  0.049495  0.003217
  2.877778  0.017677  0.050870  0.003274
  2.955556  0.017677  0.052245  0.003330
  3.033333  0.017677  0.053620  0.003462
  3.111111  0.017677  0.054994  0.003580
  3.188889  0.017677  0.056369  0.003675
  3.266667  0.017677  0.057744  0.003762
  3.344444  0.017677  0.059119  0.003842
  3.422222  0.017677  0.060494  0.003919
  3.500000  0.017677  0.061869  0.003992
  3.577778  0.017677  0.063244  0.004063
  3.655556  0.017677  0.064618  0.004132
  3.733333  0.017677  0.065993  0.004198
  3.811111  0.017677  0.067368  0.004264
  3.888889  0.017677  0.068743  0.004327
  3.966667  0.017677  0.070118  0.004389
  4.044444  0.017677  0.071493  0.004450
  4.122222  0.017677  0.072868  0.004510
  4.200000  0.017677  0.074242  0.004569
  4.277778  0.017677  0.075617  0.004627
  4.355556  0.017677  0.076992  0.004684
  4.433333  0.017677  0.078367  0.004740
  4.511111  0.017677  0.079742  0.004795
  4.588889  0.017677  0.081117  0.004850
  4.666667  0.017677  0.082492  0.004904
  4.744444  0.017677  0.083866  0.004957
  4.822222  0.017677  0.085241  0.005009
  4.900000  0.017677  0.086616  0.005061
  4.977778  0.017677  0.087991  0.005112
  5.055556  0.017677  0.089366  0.005163
  5.133333  0.017677  0.090741  0.005213
  5.211111  0.017677  0.092116  0.005262
  5.288889  0.017677  0.093490  0.005311
  5.366667  0.017677  0.094865  0.005359
  5.444444  0.017677  0.096240  0.005407
  5.522222  0.017677  0.097615  0.005455
  5.600000  0.017677  0.098990  0.005502
  5.677778  0.017677  0.100365  0.005548
  5.755556  0.017677  0.101740  0.005595
  5.833333  0.017677  0.103114  0.005640
  5.911111  0.017677  0.104489  0.005686
  5.988889  0.017677  0.105864  0.005731
  6.066667  0.017677  0.107239  0.005775
  6.144444  0.017677  0.108614  0.005819
  6.222222  0.017677  0.109989  0.005863
  6.300000  0.017677  0.111364  0.005907
  6.377778  0.017677  0.112738  0.005950
  6.455556  0.017677  0.114113  0.005993
  6.533333  0.017677  0.115488  0.049031
  6.611111  0.017677  0.116863  0.261344
  6.688889  0.017677  0.118238  0.519869
  6.766667  0.017677  0.119613  0.717432
  6.844444  0.017677  0.120988  0.827757
  6.922222  0.017677  0.122363  0.915837
  7.000000  0.017677  0.123737  0.996117
  7.077778  0.017677  0.125112  1.070363
  END FTABLE  1
END FTABLES
```

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

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO      1 1         1     WDM   1012 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE   1 1         1     WDM   1013 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN    1 1      48.4     WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN    1 1      48.4     WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN    1 1      48.4     WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       16
RCHRES     ROFLOW                         COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

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Predeveloped HSPF Message File

DRAFT

Mitigated HSPF Message File

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1999/ 9/30 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-5.473E-03     0.00000  0.0000E+00     0.00000  -1.085E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 2002/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-2.464E-02     0.00000  0.0000E+00     0.00000  -2.441E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
```

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DATE/TIME: 2004/ 7/31 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-7.063E-03	0.00000	0.0000E+00	0.00000	-8.521E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 2006/ 7/31 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-2.065E-02	0.00000	0.0000E+00	0.00000	-2.878E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

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APPENDIX D: Stormwater Site Plan

STORM DRAINAGE NOTES

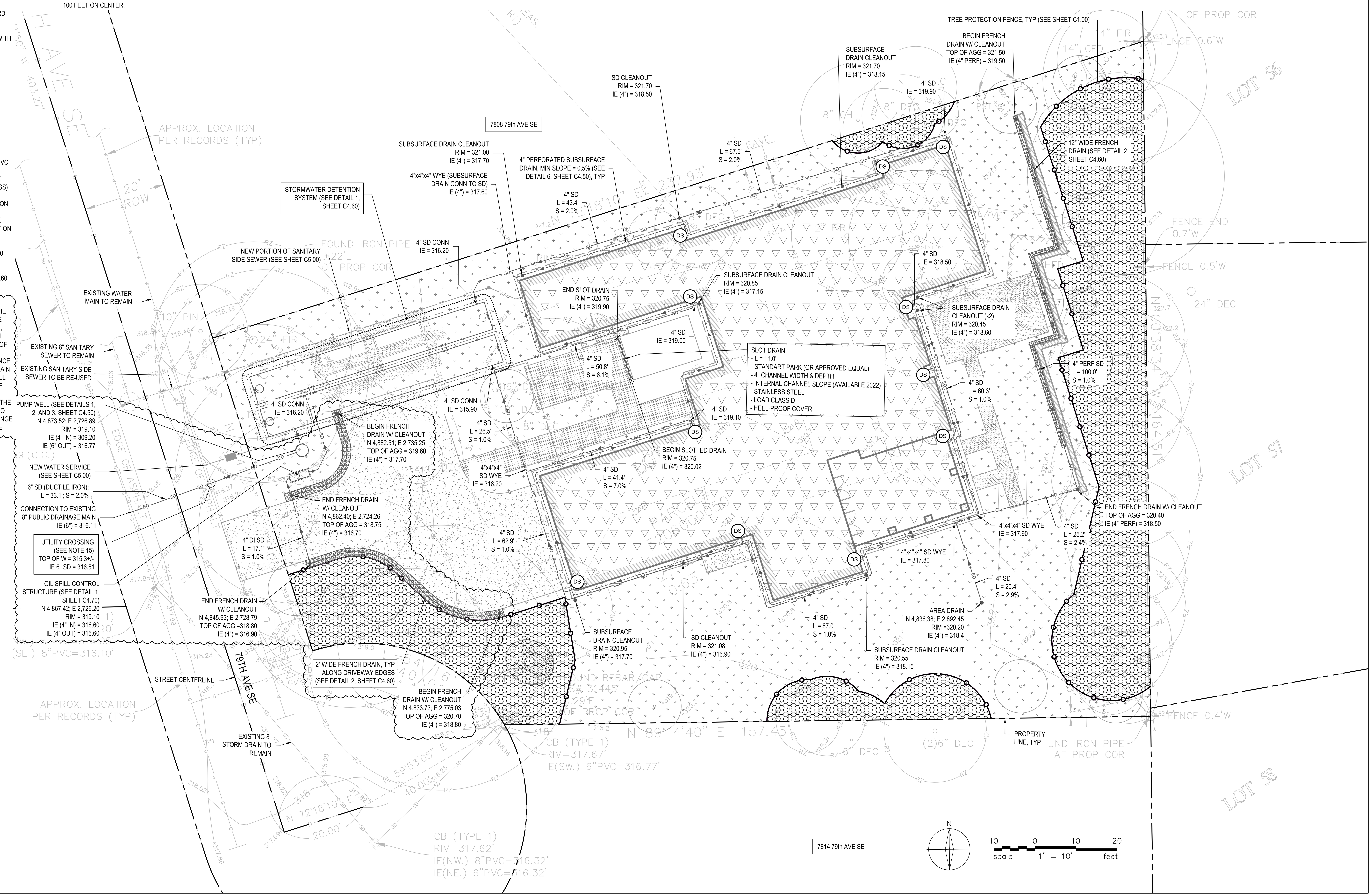
1. A COPY OF THE APPROVED DRAINAGE CONTROL PLANS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
2. ALL REQUIRED STORM WATER FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY PAVING UNLESS OTHERWISE APPROVED BY THE DEPARTMENT OF PLANNING AND DEVELOPMENT.
3. INSTALL CATCH BASIN INSERTS UNDER ALL CATCH BASIN AND AREA DRAIN GRATES IMMEDIATELY AFTER INSTALLATION. PROTECTION SHALL BE REMOVED AFTER FINAL PAVING AND/OR LANDSCAPING HAS BEEN ESTABLISHED.
4. TOP ELEVATION FOR ALL CATCH BASINS WITH SOLID COVER SHALL MATCH FINISH GRADE.
5. UNLESS NOTED OTHERWISE, THE CONTRACTOR MAY USE ANY COMBINATION OF PREFABRICATED FITTINGS (TEES, BENDS AND WYES) AT LOCATIONS WHERE STORM CONNECTION POINTS OF INTERSECTION (PI) ARE INDICATED. PREFABRICATED FITTINGS MAY BE ADJUSTED AS REQUIRED TO MAINTAIN POSITIVE SLOPE AND DRAINAGE. WHERE SPECIFICALLY INDICATED, THE CONTRACTOR SHALL PROVIDE THE FITTINGS AS SHOWN.
6. COORDINATE POINTS AND ELEVATIONS SHOWN FOR ALL CATCH BASINS, CLEANOUTS, AREA DRAINS AND MANHOLES ARE TO THE CENTER OF THE FRAME AND GRATE OR COVER, UNLESS NOTED OTHERWISE.
7. ALL TRENCHING FOR STORM DRAINS SHALL CONFORM TO CITY OF MERCER ISLAND STANDARD DETAILS S-3 AND S-4.
8. ALL STORM DRAIN PIPING SHALL BE INSTALLED WITH A MINIMUM SLOPE OF 1.0 PERCENT.
9. ALL STORM DRAIN MANHOLES ARE 48 INCHES IN DIAMETER, UNLESS NOTED OTHERWISE.
10. VERIFY LOCATIONS OF LATERAL BUILDING CONNECTIONS WITH THE PLUMBING DRAWINGS PRIOR TO INSTALLATION.
11. TOP ELEVATION FOR ALL VAULTS SHALL MATCH FINISH GRADE. SLOPE VAULT LIDS AS REQUIRED.
12. PIPE MATERIALS SHALL BE AS FOLLOWS:
    - 12.1. SOLID WALL STORM DRAIN PIPE SHALL BE PVC SDR 35, ASTM D3034.
    - 12.2. DUCTILE IRON STORM DRAIN PIPE SHALL BE CEMENT-MORTAR LINED (DOUBLE THICKNESS) PER CITY OF SEATTLE STANDARD SPECIFICATION SECTION 9-05.3 "DUCTILE IRON PIPE".
    - 12.3. PERFORATED SUBSURFACE DRAINAGE PIPE SHALL BE PER THE "SUBSURFACE FOUNDATION DRAINAGE" DETAIL 4, SHEET C4.60.
13. CLEANOUTS SHALL BE PER DETAIL 5, SHEET C4.60 UNLESS NOTED OTHERWISE.
14. AREA DRAINS SHALL BE PER DETAIL 3, SHEET C4.60 UNLESS NOTED OTHERWISE.
15. PRIOR TO COMMENCEMENT OF STORM DRAIN INSTALLATION, CONTRACTOR SHALL POTHOLE THE EXISTING WATER MAIN AT THE CROSSING OF THE NEW STORM DRAIN CONNECTION IN 79TH AVE SE, AND PROVIDE TOP AND BOTTOM OF WATER MAIN ELEVATIONS TO THE OWNER FOR VERIFICATION OF DESIGN.
    - 15.1. IN THE EVENT THAT THE VERTICAL CLEARANCE BETWEEN STORM DRAIN PIPE AND WATERMAIN IS LESS THAN 18", CONTROLLED DENSITY FILL SHALL BE PLACED FOR THE FULL HEIGHT OF CLEARANCE BETWEEN THE PIPES FOR A DISTANCE OF 24" IN ALL DIRECTIONS FROM THE CROSSING CENTERPOINT. ADDITIONALLY, NO PIPE JOINTS SHALL BE ALLOWED WITHIN RANGE OF THE CONTROLLED DENSITY FILL VOLUME.

FOUNDATION DRAINAGE NOTES

1. ALL FOUNDATION DRAINAGE CLEANOUTS SHALL BE AS INDICATED WITH LIDS MARKED "FD".
2. PROVIDE DUCTILE IRON SLEEVES WHERE FOUNDATION AND UNDERSLAB DRAINS PASS BELOW FOOTINGS. SEE STRUCTURAL DRAWINGS FOR ADDITIONAL REQUIREMENTS FOR PIPES PASSING BELOW FOOTINGS.
3. SEE THE STRUCTURAL DRAWINGS FOR BUILDING FOUNDATION AND FOOTING SIZES, SLAB ON GRADE DEPTH AND FOUNDATION AND SLAB ON GRADE ELEVATIONS.
4. FOUNDATION DRAINS SHALL BE SLOPED IN THE DIRECTION INDICATED WITH A MINIMUM SLOPE OF 0.50 PERCENT UNLESS NOTED OTHERWISE.
5. UNLESS NOTED OTHERWISE, THE CONTRACTOR MAY USE ANY COMBINATION OF PREFABRICATED FITTINGS (TEES, BENDS AND WYES) FOR INSTALLATION OF THE FOUNDATION AND UNDERSLAB DRAINS. PREFABRICATED FITTINGS MAY BE ADJUSTED AS REQUIRED TO MAINTAIN POSITIVE SLOPE AND DRAINAGE. WHERE SPECIFICALLY INDICATED THE CONTRACTOR SHALL PROVIDE THE FITTINGS AS SHOWN.
6. NO FOUNDATION DRAINAGE SHALL PASS THROUGH A BUILDING FOUNDATION WALL OR FOOTING WITHOUT PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.
7. CLEANOUTS SHALL BE SPACED NO GREATER THAN 100 FEET ON CENTER.

LEGEND:

- NEW OR REPLACED HARD SURFACE AREA: ROOF (7,859 SF)
- NEW OR REPLACED HARD SURFACE AREA: IMPERVIOUS DRIVEWAY (2,121 SF)
- NEW OR REPLACED HARD SURFACE AREA: IMPERVIOUS WALKWAYS (630 SF)
- NEW OR REPLACED HARD SURFACE AREA: CRUSHED GRANITE WALKWAYS (1,010 SF)
- NEW OR REPLACED PERVIOUS AREA: LANDSCAPING (10,184 SF)
- NEW OR REPLACED PERVIOUS AREA: NON-INFILTRATING BIORETENTION PLANTER (86 SF)
- UNDISTURBED (4,760 SF)
- FRENCH DRAIN (SEE DETAIL 2, SHEET C4.60)
- — SS — 6" PVC SANITARY SIDE SEWER
- — SD — 4" OR 6" STORM DRAIN (SOLID WALL PVC)
- — DI — 4" OR 6" STORM DRAIN (SOLID WALL DUCTILE IRON)
- - - - - 4" STORM DRAIN (PERFORATED WALL PVC)
- ● DRAINAGE STRUCTURE (NOT USED)
- • CLEANOUT OR AREA DRAIN AS NOTED (SEE DETAILS 3 AND 5, SHEET C4.60)
- (DS) ROOF DOWNSPOUT CONNECTION
- → FLOW DIRECTION ARROW



7-22-2022

DESIGN	HL
DRAWN	HL
CHECKED	HL
SHEET ISSUE DATE	03.07.2022

DRAWING SETS

PRE-APPLICATION	09/23/21
PERMIT	03/07/22
SET TITLE	DATE
SET TITLE	DATE

REVISIONS

#	DATE	DESCRIPTION
1	07.26.22	BLDG PERMIT REV 01

HLENGINEERING
6040 California Ave SW
Suite C
Seattle, WA 98136

BRINDLEY RESIDENCE

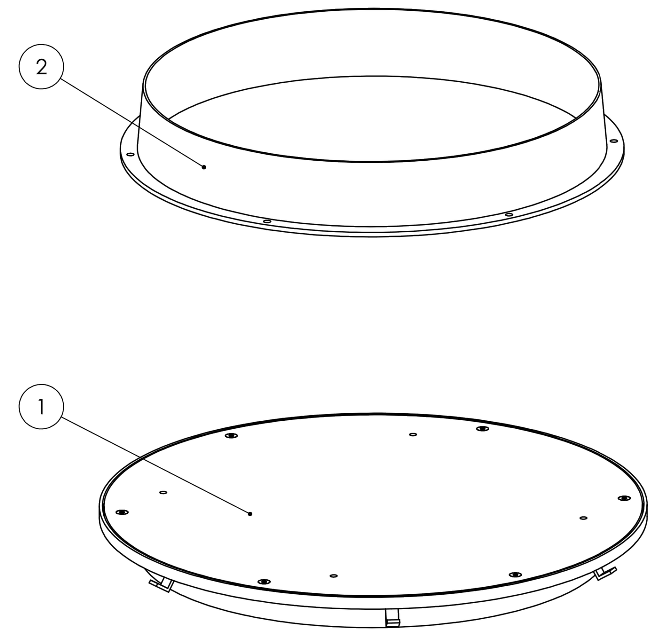
ADDRESS T.B.D.
78xx - 79th AVE SE
MERCER ISLAND, WA 98040

PERMIT DRAWINGS

Stormwater Site Plan

C4.00

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	4936000	COVER, 36IN GALV STEEL BLANK, H20 TRAFFIC RATED	1
2	4967000	36" TRAFFIC RATED FIBERGLASS FLANGE	1
3	7078000	LABEL BARCODE 4x 2-2-1/2	1



NOTES:
SHIP COVER OUT ON PALLET THAT COVER ARRIVED ON
SHIP FLANGE LOOSE ON TOP OF COVER
PLACE HARDWARE KIT FOR FLANGE (PRE-PACKAGED FROM TOPP) INSIDE FLANGE PRIOR TO WRAPPING.

description of change	rev	project	date	initials
NEW PART	A	NA	02/10/21	JRB

Liberty Pumps® 7000 APPLE TREE AVENUE BERGEN, N.Y. 14416 (585) 494-1817

drn by J.BURNS — tol: xx+/- .02" xxx+/- .005" angles +/- 2° unless otherwise noted
date 02/10/21
scale
title COVER 36 IN H20 TRAFFIC RATED BLANK WITH FIBERGLASS FLANGE
part no. K001928
drawing no. K001928 — sheet number 1 of 1 — sheet size B

DETAIL: STORMWATER PUMP WELL COVER
NTS

DETAIL NO.: 1
REF SHEET: C4.00

Liberty Pumps®

Product Quotation

Quote #	EPS99079 Rev B
By	Jon Emasie
Date	July 22, 2022

7000 Apple Tree Ave.
Bergen NY 14416
Phone: 800-543-2550
Fax: 585-494-1839

To: **Job:**

Gordon and Assoc

Attention:

Kyle

Preassembled Duplex Sump System — **Model # EPS99079 Rev B**

Qty	Item/Description
2	240-2 Sump pumps, 1/4 HP, 115 V, 1 phase, capacities of 34 GPM , heads to 20' TDH, 25' power cord
1	AE24L=3 NEMA 4X duplex alternating control panel including three floats, aux. contacts, and integral audio/ visual high level alarm
1	36" dia. X 120" H fiberglass basin with Fiberglass anti-floatation flange with 2" side discharge. 2" Female Threaded PVC discharge coupling.
1	36" Steel Blank cover Traffic Rated
1	XF36000 Fiberglass flange for H20 traffic rated covers
2	Guide rail assembly, including Campbell-Hausfeld guide rail, 3/4" stainless steel rails, s/s lifting chain, etc.
1	(1) 4" Unmounted inlet hub
1	Miscellaneous hardware and plumbing, including PVC ball valves, PVC check valves, float bracket, PVC discharge pipe etc.
1	JB70 junction box, with watertight cable connectors and 2" conduit coupling
1	Labor & Fabrication

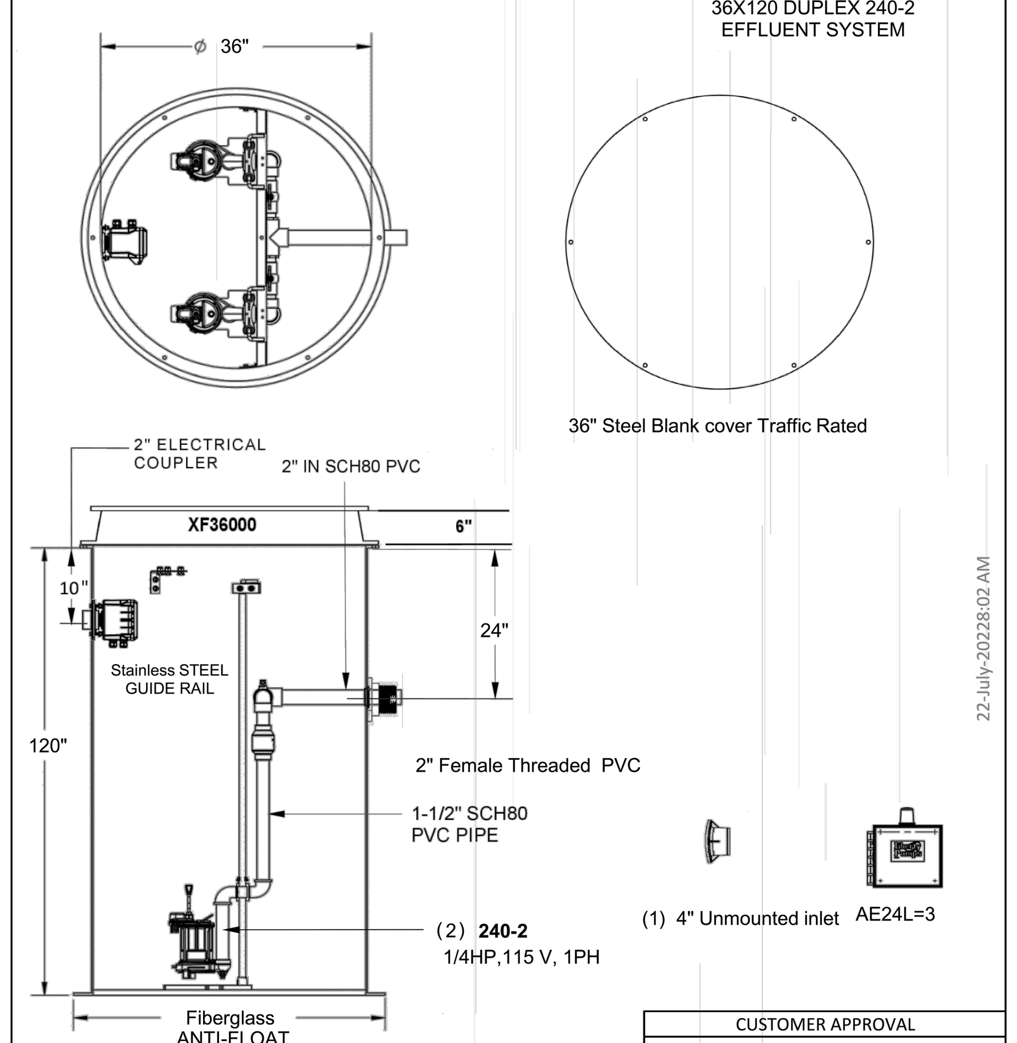
Complete System List Price: $27,740.00

Subject to approval, pump performance and materials of construction may vary. Please consult factory and / or product literature for actual performance and material of construction. Pump system startup not included on this quote, to be provided by others.

Warranty 3 Years
Freight Prepaid on orders over $3000.00 Net US for standard shipments. Jobsite deliveries may require additional charges
Shipment *Please check with factory before ordering for current lead times*
Returns Will incur a 25% restocking fee (custom items incur a 100% restocking fee)
Price Quoted prices valid for 30 days

**NOTE: LIFTER CHAINS AND FLOATS NOT SHOWN. PUMPS SHIPPED SEPARATELY TO PREVENT SYSTEM DAMAGE

EPS99079
36X120 DUPLEX 240-2
EFFLUENT SYSTEM



Fiberglass Tank dimension tolerance(s): +/- 1"
Custom items are non-cancelable once order is placed. 100% restocking fee applies

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF LIBERTY PUMPS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF LIBERTY PUMPS IS PROHIBITED.

Liberty Pumps® 7000 APPLE TREE AVENUE BERGEN, N.Y. 14416 (585) 494-1817
QUOTED PROVIDED BY: J.Emasie
DO NOT SCALE DRAWING — REVISION: B

CUSTOMER APPROVAL
DATE:
NAME(PRINT):
NAME(SIGN):
FINAL CONFIGURATIONS MAY VARY SLIGHTLY FROM THE ILLUSTRATIONS ON THIS PRINT

STORMWATER PUMP SELECTION AND NOTES

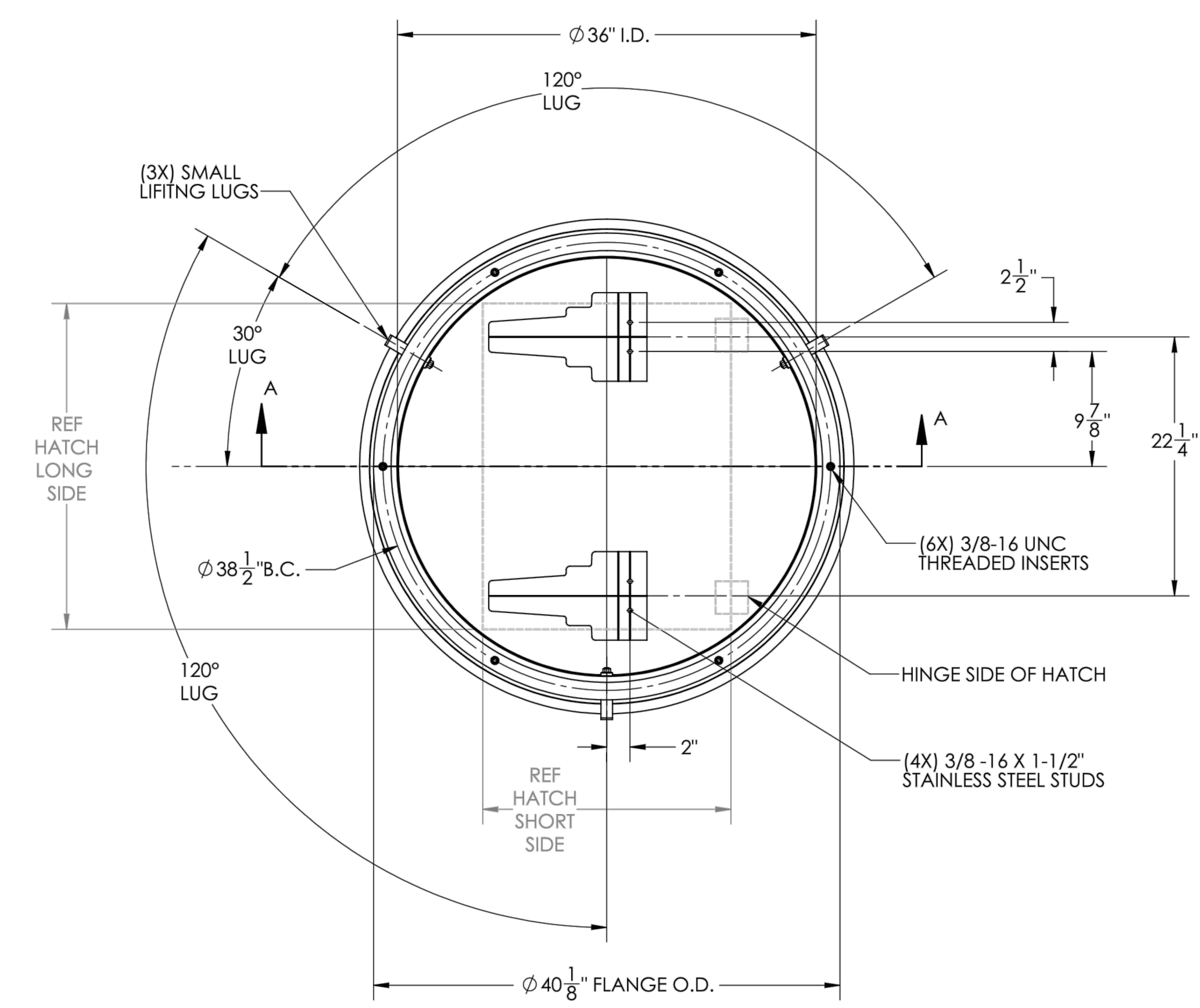
1. PUMP MODEL: LIBERTY PUMPS 240-SERIES SUBMERSIBLE (OR APPROVED EQUAL)
2. PUMP OPERATION: DUPLEX ALTERNATING ONE PUMP DURING NORMAL CONDITIONS, TWO PUMPS RUNNING DURING HIGH ALARM
3. DESIGN POINT: TBD
4. POWER REQUIREMENT: $\frac{1}{4}$ HP, 115V, 6 AMP
5. CONTROL PANEL: NEMA 4X
6. ON/OFF MECHANISM: THREE FLOATS, SET OFF / ON AT LEAST 12" APART TO PREVENT CYCLING

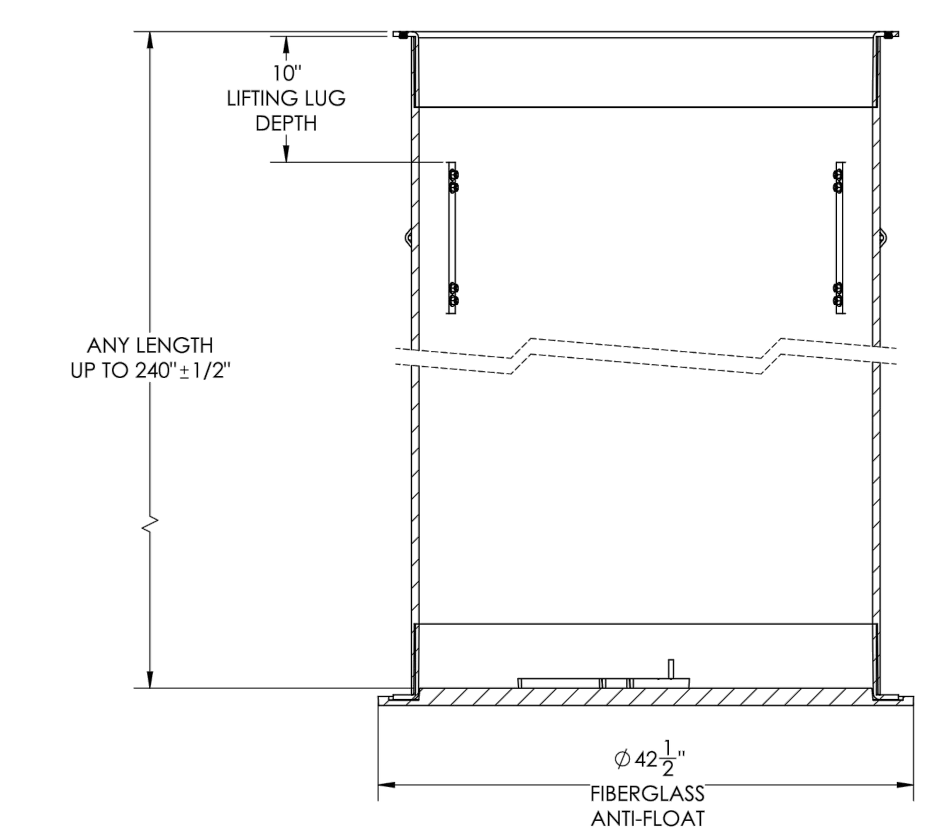
NOTES TO INSTALLER

1. SEE SHEET C4.00 FOR PUMP INSTALLATION LOCATION
2. SEE SHEET C4.00 FOR DISCHARGE LOCATION
3. FORCE MAIN TO BE 1-1/2" DIAMETER PVC WITH PRESSURE RATING OF AT LEAST 40 PSI
4. COORDINATE WITH PUMP VENDOR TO ACQUIRE ALL MATERIALS NEEDED FOR INSTALLATION, INCLUDING ELECTRICAL CABLES, FLOATS, INLET/OUTLET PENETRATIONS, BRACKETS OR RAILS FOR PUMPS, DISCHARGE CHECK VALVE, ETC.
5. SET PUMP OFF ELEVATION WITH 12" SUMP TO ALLOW FOR SOLIDS ACCUMULATION

DETAIL: STORMWATER PUMP AND WELL ASSEMBLY QUOTE
NTS

DETAIL NO.: 2
REF SHEET: C4.00





SECTION A-A
SCALE 1 : 10

*NOTES:
- TOPP INDUSTRIES PART NUMBER
  - BASE PART #FB(D)X(H)
  - D=DIAMETER
  - H=HEIGHT
  - EX. FB36X96
- FIBERGLASS ANTI-FLOAT
- SMALL LIFTING LUGS REQUIRED ON TANKS OVER 96" TALL
- TANKS OVER 96" TALL MUST BE SHIPPED LAYING DOWN AND REQUIRE SKIDS
- SEE 7499000 DRAWING FOR SKIDS
- SEE 7498000 DRAWING FOR CASTERS
- FIBERGLASS WOUND TANK
- FOR ALL OTHER MODEL DATA REFER TO CAD MODEL
- REFER TO FIBERGLASS BASIN SPECIFICATION FOLDER IN PART DATA FOLDER FOR BASIN SPECIFICATION
- LIBERTY PART NUMBER
  - XT36DSX(ANY LENGTH)

  SUFFIX
  - SUFFIX -G = GEL COATED
  - SUFFIX -DW = DOUBLE WALL
  - SUFFIX -VE = VINYL ESTER MATERIAL

description of change	rev	project	date	initials
NEW DRAWING	A		06/15/22	RHD

Liberty Pumps® 7000 APPLE TREE AVENUE BERGEN, N.Y. 14416 (585) 494-1817

drn by R.DUNLAP — tol: xx+/- .02" xxx+/- .005" angles +/- 2° unless otherwise noted
date 06/15/22
scale SEE NOTE
title 36" TANK, FIBERGLASS, DS
part no. SEE NOTE
drawing no. 36DS — sheet number of — sheet size C

DETAIL: STORMWATER PUMP AND WELL ASSEMBLY
NTS

DETAIL NO.: 3
REF SHEET: C4.00

7-22-2022

DESIGN	HL
DRAWN	HL
CHECKED	HL
SHEET ISSUE DATE	03.07.2022

DRAWING SETS
PRE-APPLICATION 09/23/21
PERMIT 03/07/22
SET TITLE DATE
SET TITLE DATE

REVISIONS

#	DATE	DESCRIPTION
1	07.26.22	BLDG PERMIT REV 01

HL ENGINEERING
6040 California Ave SW
Suite C
Seattle, WA 98136

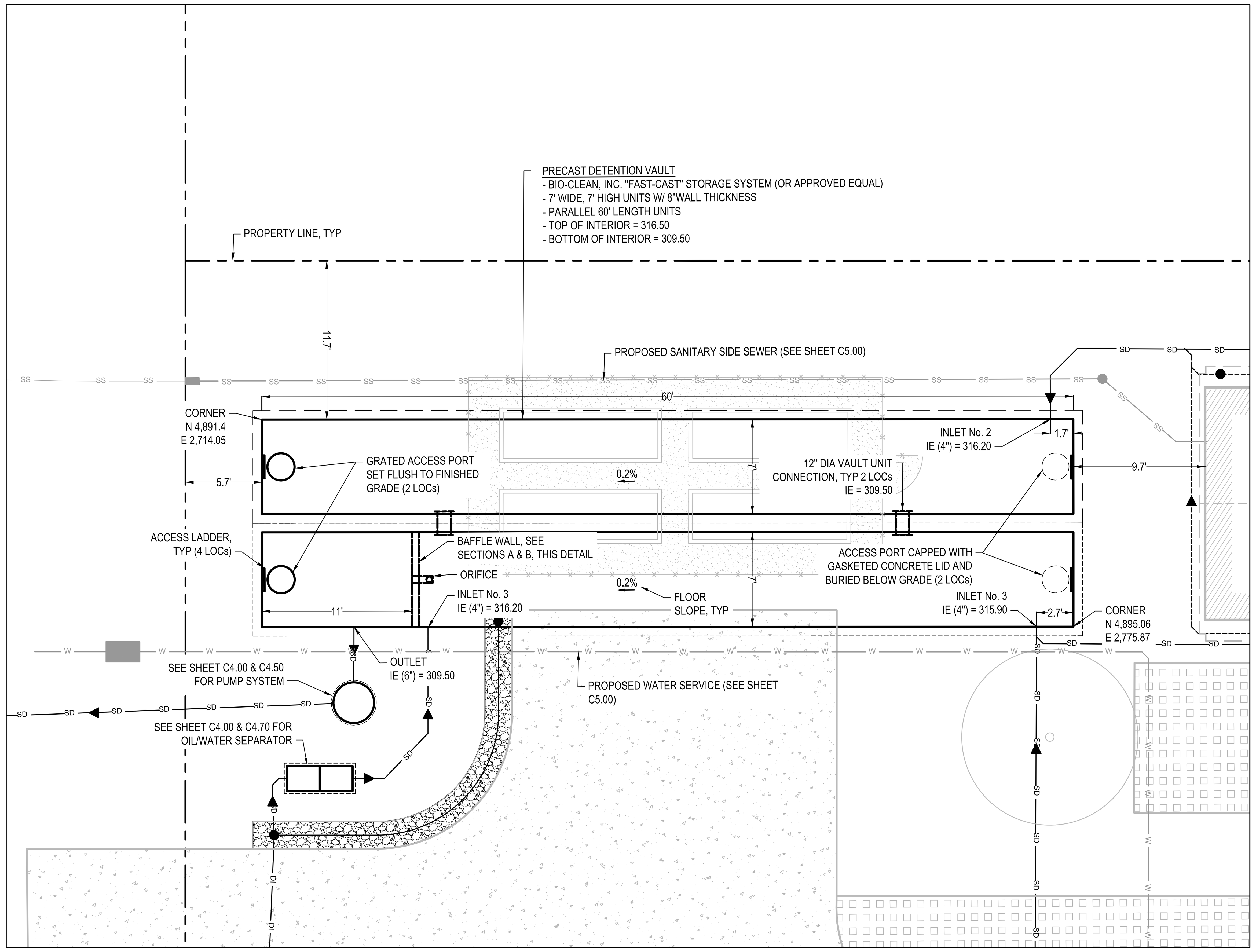
BRINDLEY RESIDENCE

ADDRESS T.B.D.
78xx - 79th AVE SE
MERCER ISLAND, WA 98040

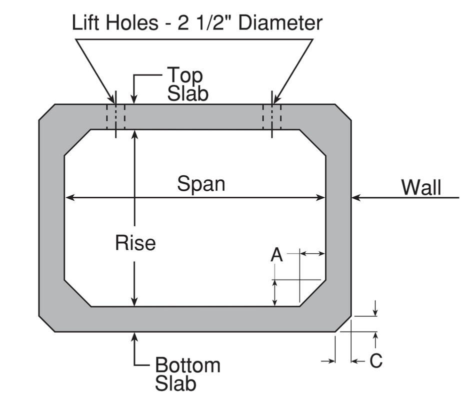
PERMIT DRAWINGS

Stormwater Pump and Well Details

C4.50



FastCast™ Drycast PreGasketed Stormwater Storage



Typical Section

Standard Box Dimensions

Span (Ft.)	Rise (Ft.)	Top Slab (In.)	Bottom Slab (In.)	Wall (In.)	Weight (Lbs./ft.)
3	2	7	6	4	848
3	3	7	6	4	952
4	2	7 1/2	6	5	1146
4	3	7 1/2	6	5	1276
4	4	7 1/2	6	5	1405
5	2	8	7	6	1541
5	3	8	7	6	1696
5	4	8	7	6	1851
5	5	8	7	6	2006
6	2	8	7	7	1821
6	3	8	7	7	2002
6	4	8	7	7	2183
6	5	8	7	7	2364
6	6	8	7	7	2545
7	2	8	8	8	2238
7	3	8	8	8	2446
7	4	8	8	8	2652
7	5	8	8	8	2859
7	6	8	8	8	3066
7	7	8	8	8	3272

Standard Box Dimensions

Span (Ft.)	Rise (Ft.)	Top Slab (In.)	Bottom Slab (In.)	Wall (In.)	Weight (Lbs./ft.)
8	3	8	8	8	2652
8	4	8	8	8	2859
8	5	8	8	8	3066
8	6	8	8	8	3272
8	7	8	8	8	3479
8	8	8	8	8	3686
9	4	9	9	9	3511
9	5	9	9	9	3744
9	6	9	9	9	3976
9	7	9	9	9	4209
9	8	9	9	9	4441
9	9	9	9	9	4674
10	4	10	10	10	4228
10	5	10	10	10	4486
10	6	10	10	10	4745
10	7	10	10	10	5003
10	8	10	10	10	5261
10	9	10	10	10	5520
10	10	10	10	10	5778

Standard Box Dimensions

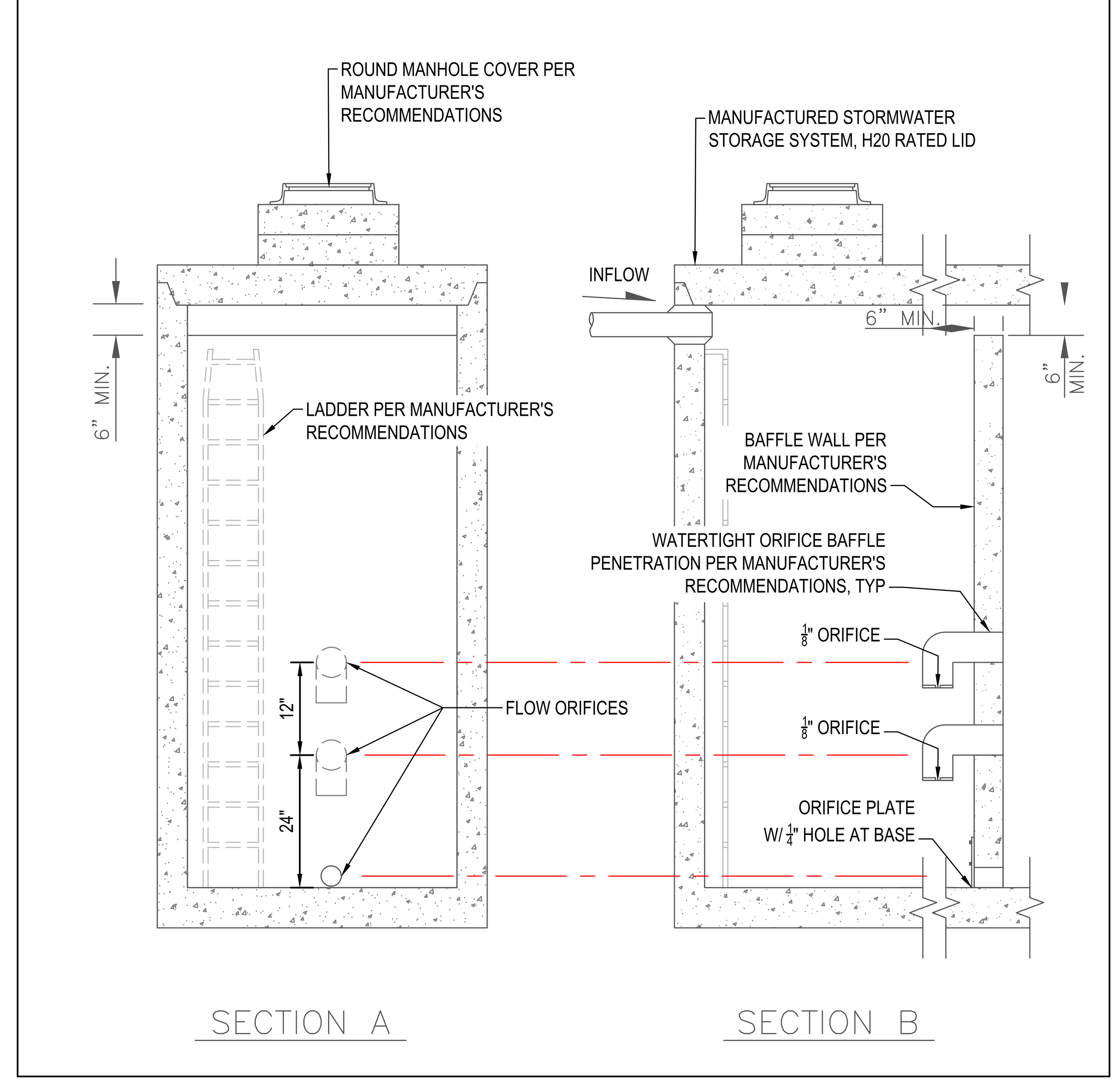
Span (Ft.)	Rise (Ft.)	Top Slab (In.)	Bottom Slab (In.)	Wall (In.)	Weight (Lbs./ft.)
11	4	11	11	11	5010
11	5	11	11	11	5294
11	6	11	11	11	5578
11	7	11	11	11	5862
11	8	11	11	11	6146
11	9	11	11	11	6430
11	10	11	11	11	6715
11	11	11	11	11	6999
12	4	12	12	12	5856
12	5	12	12	12	6166
12	6	12	12	12	6476
12	7	12	12	12	6786
12	8	12	12	12	7096
12	9	12	12	12	7406
12	10	12	12	12	7716
12	11	12	12	12	8026
12	12	12	12	12	8336

Note:
- A = Wall thickness
- C = 2" for 4", 5" and 6" wall
- C = 4" for 7" and greater wall
- Contact manufacturer for standard joint lengths.

-No Scale-
All dimensions subject to allowable specification tolerances.

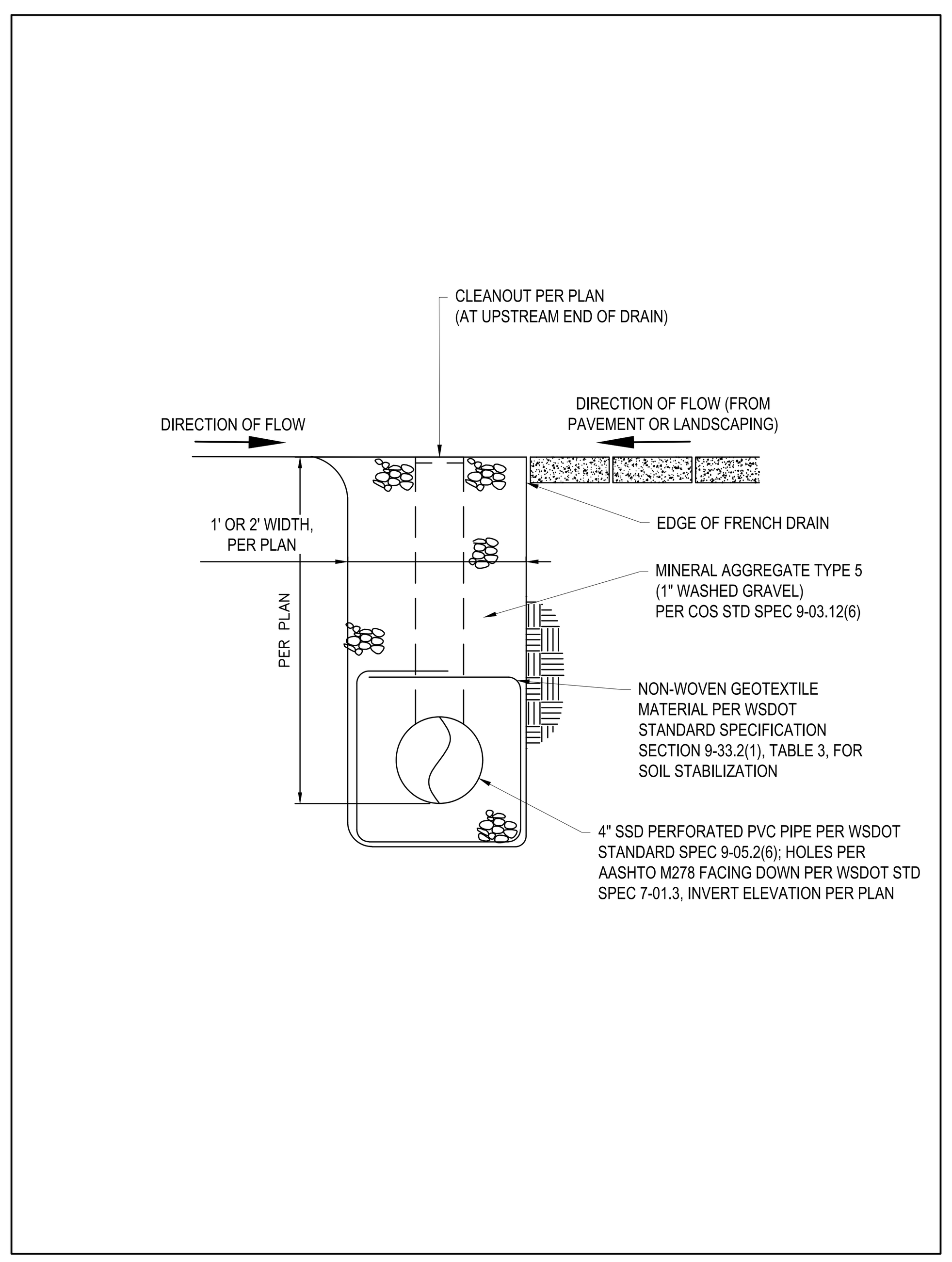
TITLE	PLANT	STATE	SECTION.PAGE	DATE
Reinforced Concrete Precast Box Section	Grand Prairie Houston	TX	4.1	11-12-15

Bio Clean
A Forterra Company



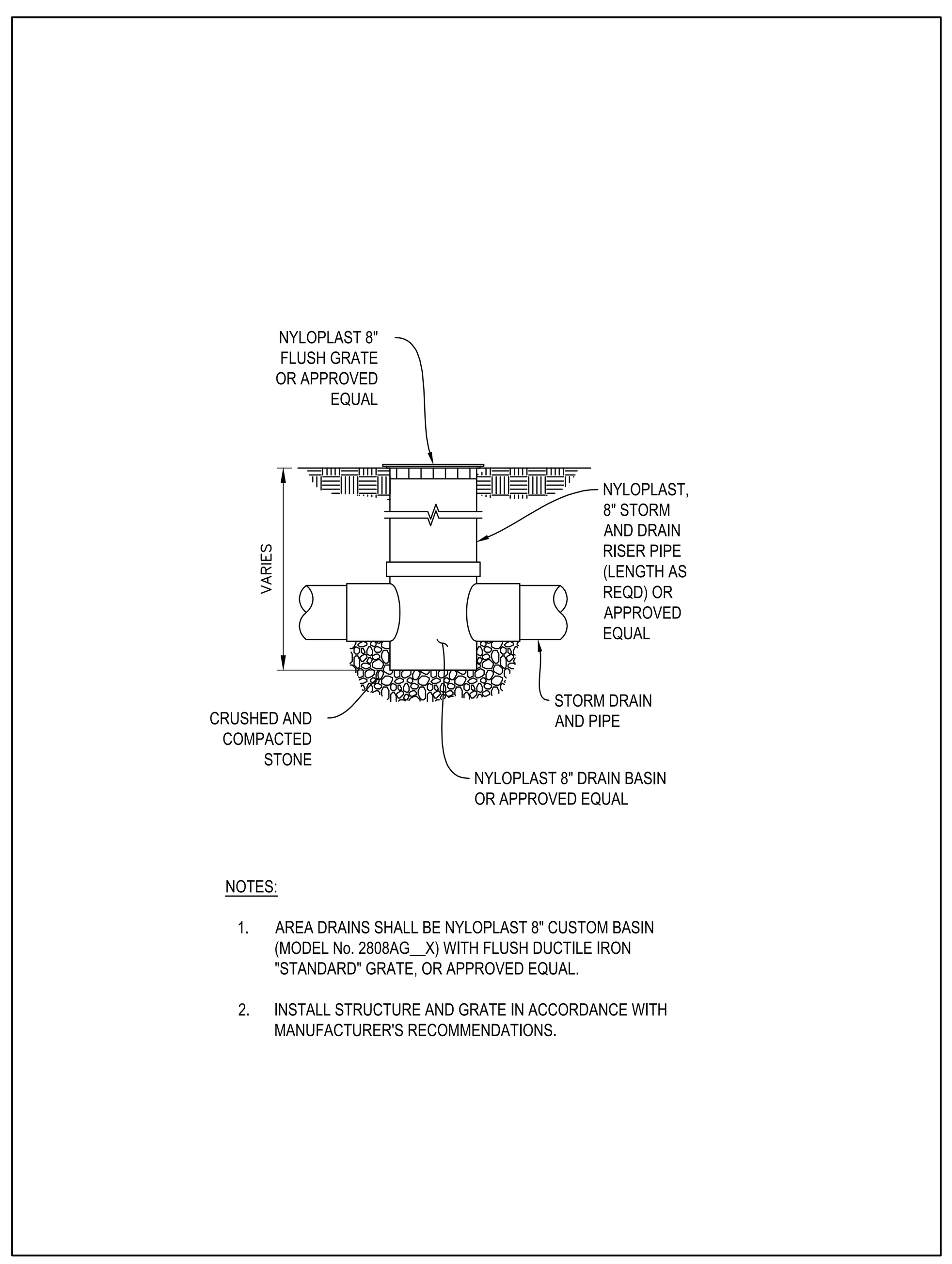
DETAIL: STORMWATER DETENTION SYSTEM
NTS

DETAIL NO.: 1
REF SHEET: C4.00



DETAIL: FRENCH DRAIN
NTS

DETAIL NO.: 2
REF SHEET: C4.00

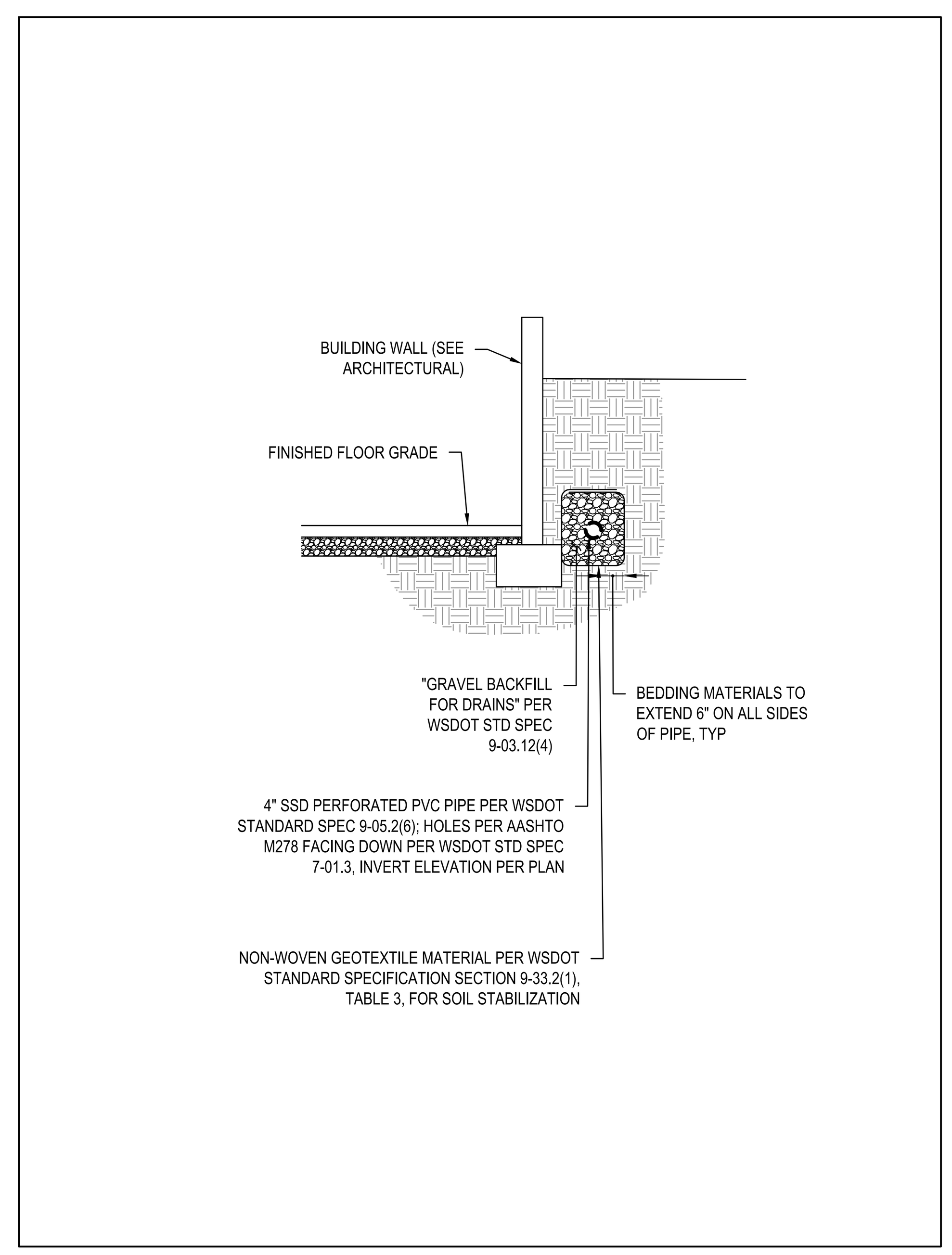


NOTES:

1. AREA DRAINS SHALL BE NYLOPLAST 8" CUSTOM BASIN (MODEL No. 2808AG__X) WITH FLUSH DUCTILE IRON "STANDARD" GRATE, OR APPROVED EQUAL.
2. INSTALL STRUCTURE AND GRATE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

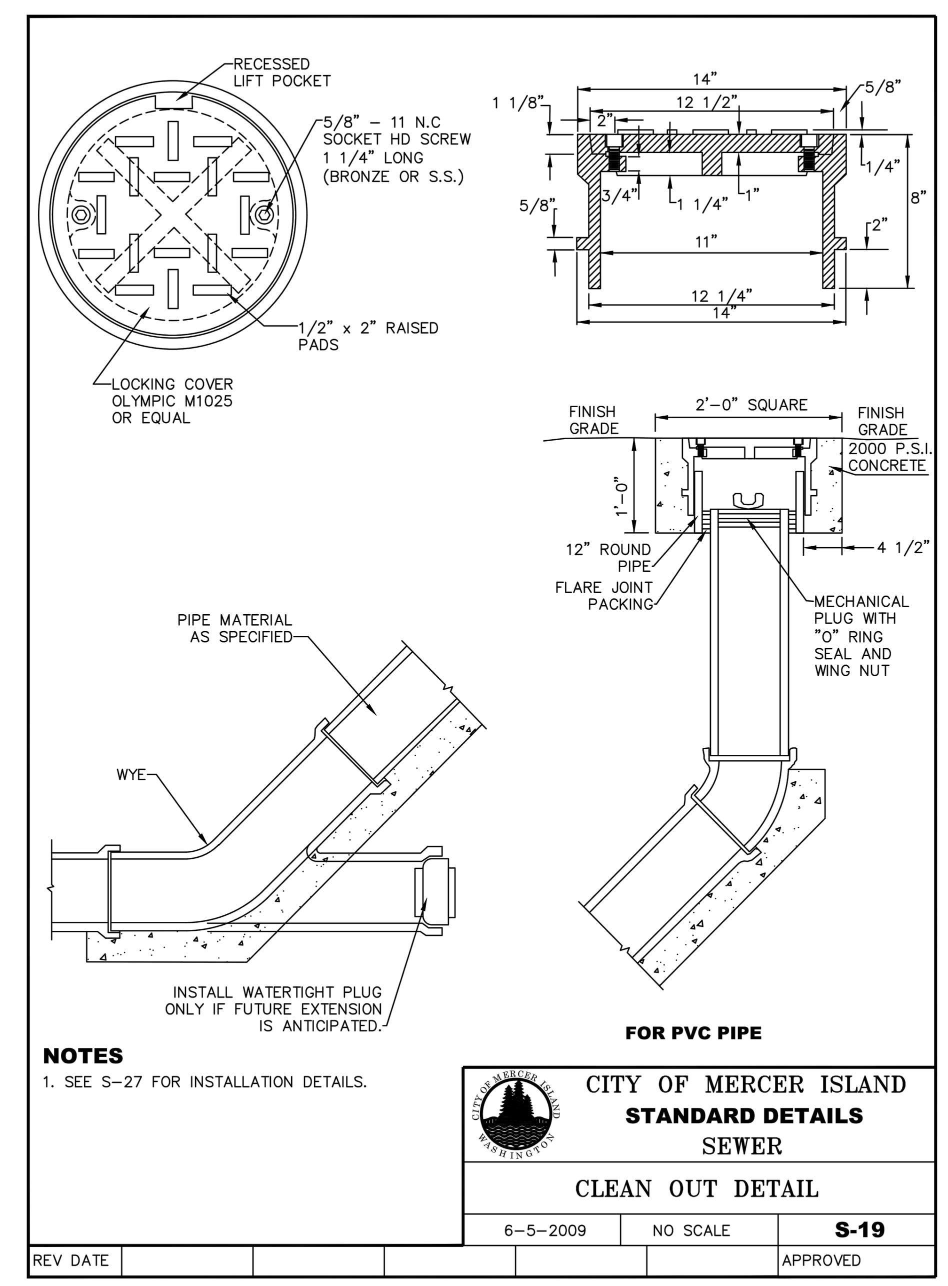
DETAIL: AREA DRAIN
NTS

DETAIL NO.: 3
REF SHEET: C4.00



DETAIL: SUBSURFACE FOUNDATION DRAIN
NTS

DETAIL NO.: 4
REF SHEET: C4.00



DETAIL: PRIVATE UTILITY CLEANOUT
NTS

DETAIL NO.: 5
REF SHEET: C4.00

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DRAWN	HL
CHECKED	HL
SHEET ISSUE DATE	03.07.2022

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SET TITLE DATE

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#	DATE	DESCRIPTION
1	07.26.22	BLDG PERMIT REV 01

HLENGINEERING
6040 California Ave SW
Suite C
Seattle, WA 98136

BRINDLEY RESIDENCE

ADDRESS T.B.D.
78xx - 79th AVE SE
MERCER ISLAND, WA 98040

PERMIT DRAWINGS

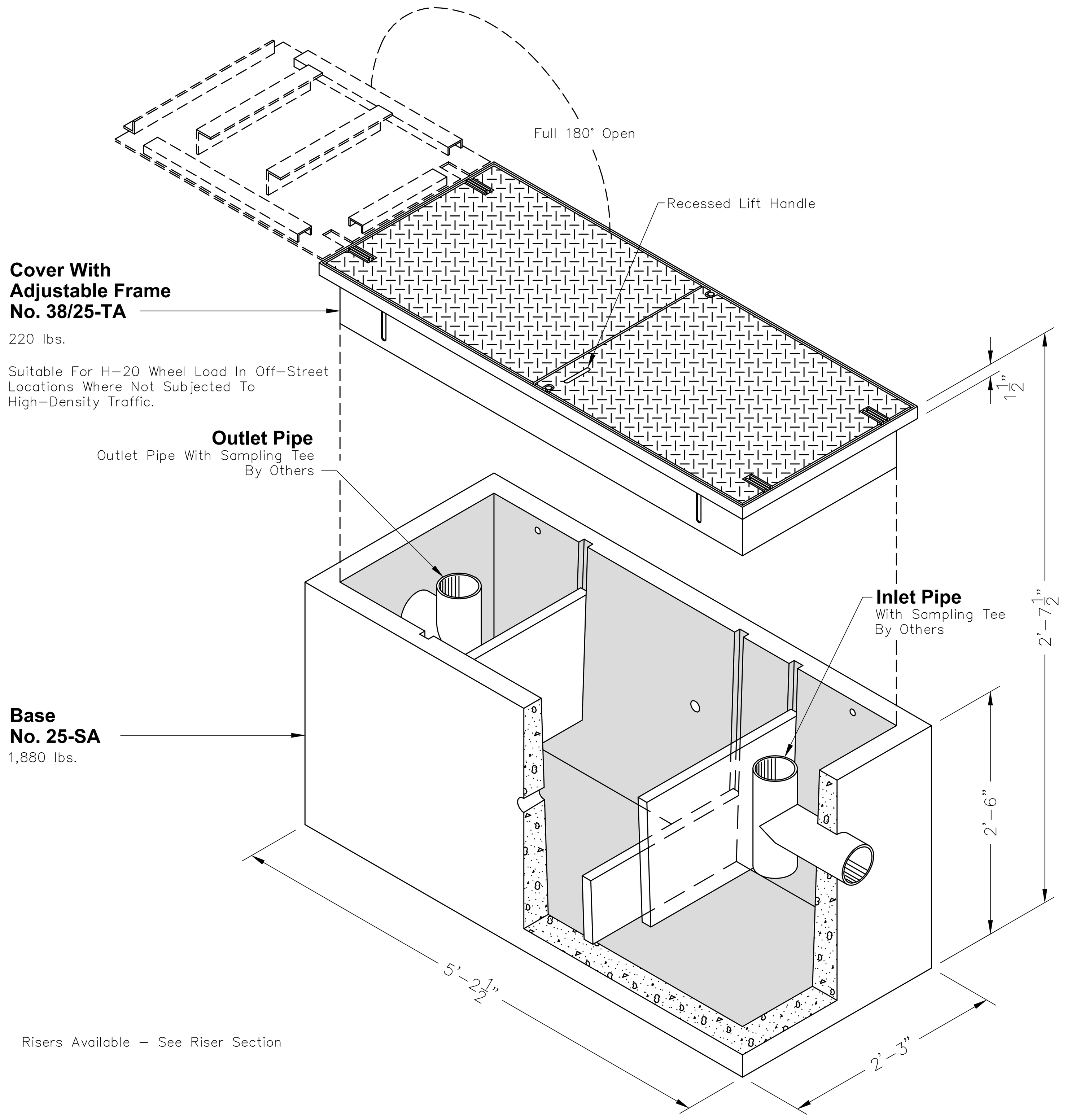
Stormwater Detention System Details

C4.60

Oldcastle Precast® *Delivering Reliability*

25-SA OIL WATER SEPERATOR

100 Gallon capacity



Non Skid Covers Available

FOR DETAILS, SEE REVERSE>>

Items Shown Are Subject To Change Without Notice
Issue Date: April 2016

133

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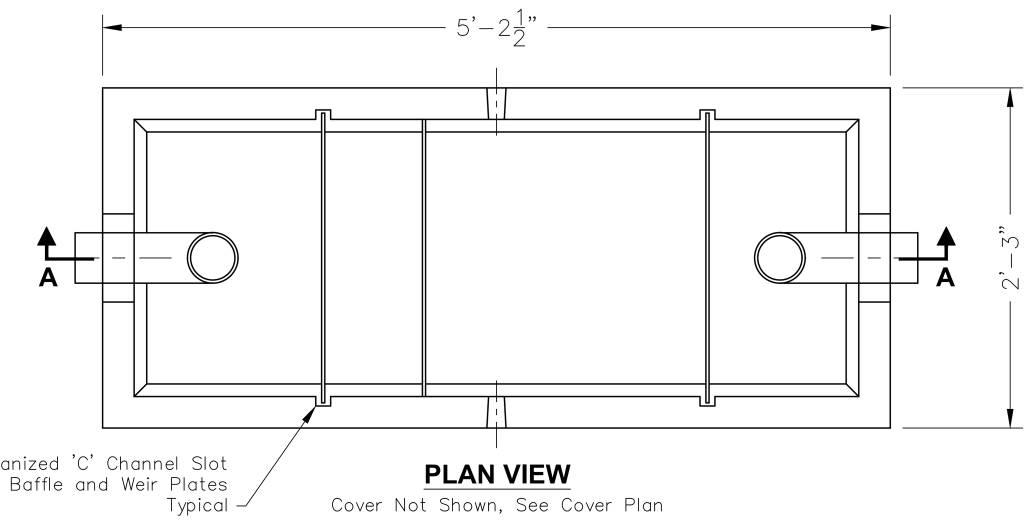
Mailing Address
PO Box 588
Auburn, WA 98071

Phone: 800-892-1538
Fax: 253-735-4201
Email: opauburn@oldcastle.com

opauburn.com

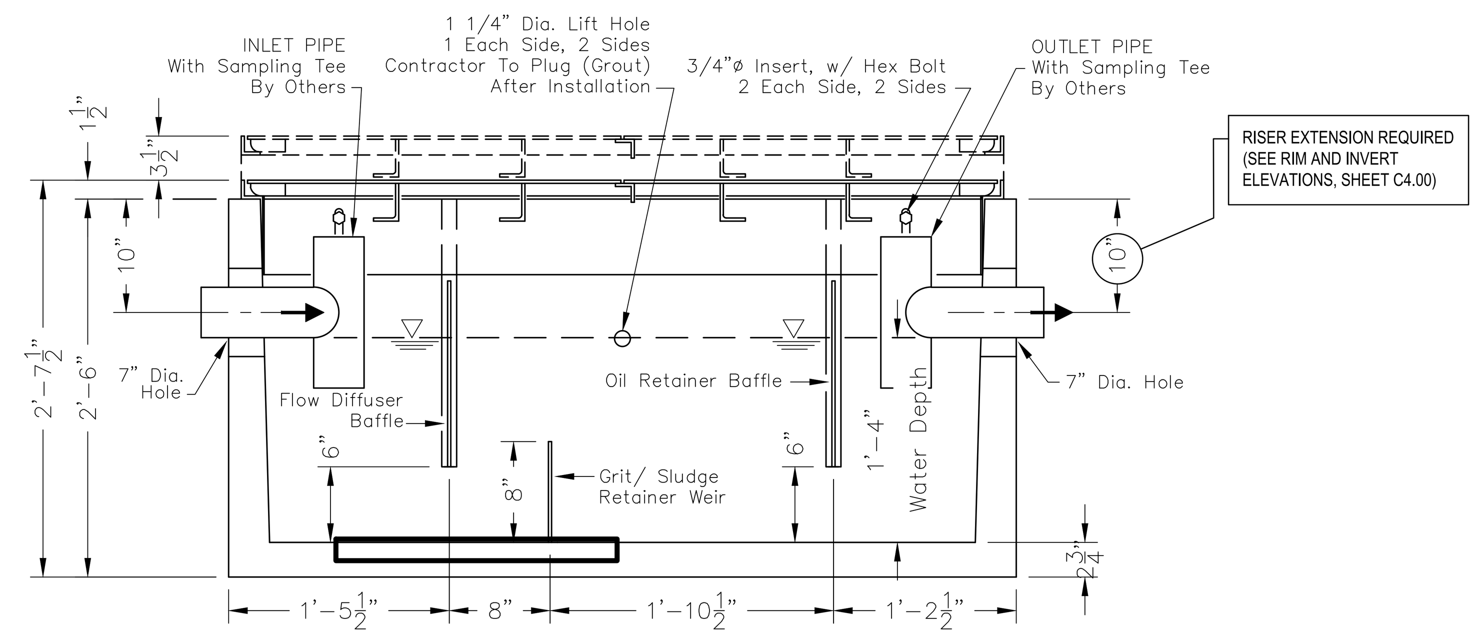
Oldcastle Precast® *Delivering Reliability*

25-SA



PLAN VIEW

Cover Not Shown, See Cover Plan



SECTION AA

STRUCTURAL NOTES:
1. Concrete: 28 Day Compressive Strength f'c= 7000 psi
2. Rebar: ASTM A-615 Grade 60
3. Mesh: ASTM A-185 Grade 65
4. Design: ACI-318-05 Building Code
   ASTM C-890 "Minimum Structural Design Loading For Underground Precast Concrete Water and Wastewater Structures"
5. Loads: HS-20 Truck Wheel w/ 30% Impact Per AASHTO

GENERAL NOTES:
1. All Baffles and Weirs To Be Steel
2. Contractor to:
   Supply and Install All Piping & Sampling Tees
   Grout In All Pipes
   Fill With Clean Water Prior To "Start-Up" Of System
   Verify All Blockout Sizes and Locations

FOR CUSTOM APPLICATIONS
THE FOLLOWING INFORMATION IS NEEDED:
Top Of Separator Elevation:
Inlet Pipe Size:
Inlet Pipe Elevation:
Outlet Pipe Size:
Outlet Pipe Elevation:

SCALE: 3/4"=1'-0"

133.1

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opauburn.com

DETAIL: STORMWATER OIL / WATER SEPARATION SYSTEM
NTS

DETAIL NO.: 1
REF SHEET: C4.00

7-22-2022

DESIGN	HL
DRAWN	HL
CHECKED	HL
SHEET ISSUE DATE	03.07.2022
DRAWING SETS	
PRE-APPLICATION	09/23/21
PERMIT	03/07/22
SET TITLE	DATE
SET TITLE	DATE

REVISIONS

#	DATE	DESCRIPTION
1	07.26.22	BLDG PERMIT REV 01

HL ENGINEERING
6040 California Ave SW
Suite C
Seattle, WA 98136

BRINDLEY RESIDENCE

ADDRESS T.B.D.
78xx - 79th AVE SE
MERCER ISLAND,
WA 98040

PERMIT DRAWINGS

Stormwater Control Details

C4.70

APPENDIX E: Stormwater Pump System Calculations

STORMWATER PUMP DESIGN

Project Name: **Brindley Residence**
Project Address: **78xx 79th Ave SE, Mercer Island, WA**

Legend:

= Value to be provided

= Value automatically calculated

Pump MH Inflow IE =	308.90	
Pump MH Outlet IE =	316.77	
Required Lift =	7.87	ft

Calculate Stormwater Flow Rates (Modeled in WWHM)

100-Yr Mitigated Flow Rate =	0.0074	cfs
Convert to GPM =	3.32	gpm
Proposed Outlet Pipe Dia =	2.00	in

Use Hazen-Williams equation to estimate frictional head loss

Hazen-Williams roughness coefficient =	150	
Volume of flow =	3.32	gpm
Wetted Perimeter of outlet pipe =	6.28	in
Inside hydraulic dia of outlet pipe =	2.00	in
Frictional Head Loss per foot =	0.03	ft per foot
Length of pressurized pipe =	10	ft
Additional Equivalent Length Due to Fittings =	0	ft
Total Frictional Head Loss =	0.31	ft
Total Dynamic Head =	8.18	ft

Check flow velocity is between 2 fps and 8 fps

Volume of flow =	0.0074	cfs
Internal cross sectional area of pipe =	0.02	sq ft
Velocity =	0.34	fps

APPENDIX 2: EQUIVALENT LENGTH OF TUBING FOR FRICTION LOSS IN VALVES AND FITTINGS

TABLE 13.2A EQUIVALENT LENGTH IN FEET OF TUBING FOR FRICTION LOSS IN VALVES AND FITTINGS (TUBING).

	Equivalent Feet of Pipe for Various Nominal Diameters							
Fitting or Valve	½ in	¾ in	1 in	1¼ in	1½ in	2 in	2½ in	3 in
45° elbow (wrought)	0.5	0.5	1.0	1.0	2.0	2.0	3.0	4.0
90° elbow (wrought)	0.5	1.0	1.0	2.0	2.0	2.0	2.0	3.0
Tee, straight run (wrought)	0.5	0.5	0.5	0.5	1.0	1.0	2.0	—
Tee, branch (wrought)	1.0	2.0	3.0	4.0	5.0	7.0	9.0	—
45° elbow (cast)	0.5	1.0	2.0	2.0	3.0	5.0	8.0	11.0
90° elbow (cast)	1.0	2.0	4.0	5.0	8.0	11.0	14.0	18.0
Tee, straight run (cast)	0.5	0.5	0.5	1.0	1.0	2.0	2.0	2.0
Tee, branch (cast)	2.0	3.0	5.0	7.0	9.0	12.0	16.0	20.0
Compression stop	13.0	21.0	30.0	—	—	—	—	—
Globe valve	—	—	—	53.0	66.0	90.0	—	—
Gate valve	—	—	1.0	1.0	2.0	2.0	2.0	2.0

240-SERIES

Cast Iron Submersible Sump Pumps

Liberty Pumps®

A Family and Employee Owned Company

1/4 hp
1-1/2" Discharge

The most advanced
1/4 hp pump available!

Features

- Unique one-piece UNI-BODY casting
- Cast-iron housing
- Peripheral port inlets eliminate bottom suction
- 304 Stainless-steel intake plate
- Quick-connect 10' standard power cord allows replacement of cord in seconds without breaking seals to motor (25' length optional)
- Available in three switch styles including Liberty Pumps VMF switch

Models

240 Manual

241 Wide-Angle Float Switch with Quick-connect

243 Wide-Angle Float Switch, Series Plug

247 VMF, Vertical Magnetic Float Switch

Wide-angle float switches are mercury-free, mechanically activated.

Model 247 VMF

Available with Wide-Angle Float Switch

SSPMA CERTIFIED

innovate. evolve.

240-Series

All Models Features

- Rugged 1/4 hp motor, oil-filled with thermal overload protection
- 1/4" Solids handling
- 1-1/2" Discharge
- Hermetically sealed motor and switch cavities, permanently lubricated bearings
- Liberty Pumps UNI-BODY casting – a solid, one-piece housing that eliminates the lower motor seal ring found on other pumps
- Integral, mid-mounted “peripheral-port” inlets eliminate bottom suction of debris and foreign materials
- Stainless-steel volute intake plate, internally mounted. Will not corrode
- 8 Vane, glass-reinforced thermoplastic impeller non-clog design
- Quick-connect 10' standard power cord allows replacement of cord in seconds without breaking seals to motor (25' length optional)
- For 25' cord option, add a “-2” suffix to model number Example: 247-2 for Model 247 with 25' cord
- Non-corrosive stainless-steel fasteners
- Stainless-steel rotor shaft

Motor Specifications

1/4 hp 115V 6A

Thermally protected and permanently lubricated

Dimensional Data

Weight: 21 lbs

Height: 10"

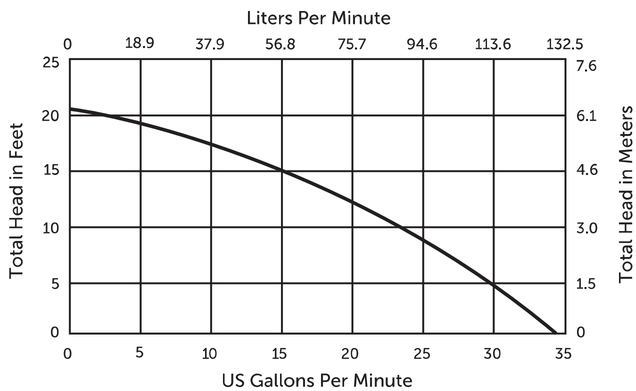
Major Width: 9" (manual model 240)

Maximum Fluid Temperature: 140°F (60°C) Intermittent

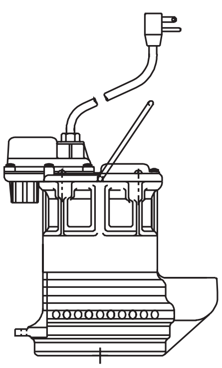
104°F (40°C) Continuous duty

Performance Curve

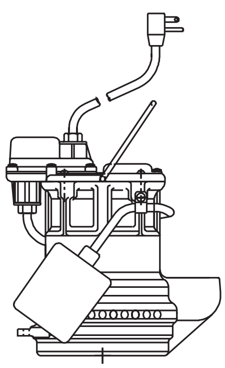
60 Hz, 3400 RPM



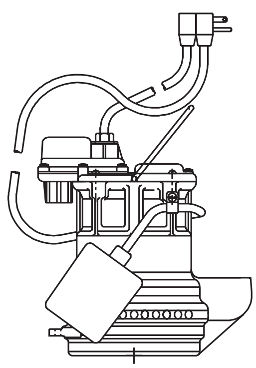
Effluent Models



Model 240
Manual,
no float switch

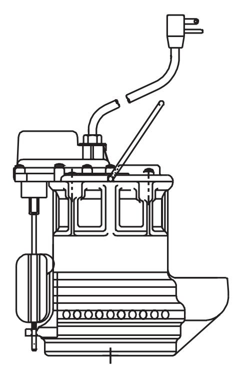


Model 241
Wide-angle float
switch with
Quick-connect



Model 243
Wide-angle float
switch with series
(piggyback) plug,
allows manual
operation of pump

Sump Models



Model 247
VMF-Series
VMF switch, magnetically
operated vertical float
switch – operates in a 10"
diameter sump

Specifications subject to change without notice.

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Liberty Pumps - 7000 Apple Tree Avenue - Bergen, New York 14416
Phone 800-543-2550 - Fax 585-494-1839 - LibertyPumps.com

APPENDIX F: Operations and Maintenance Standards

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.

Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		Gate is rusted over 50% of its surface area.	
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.16: Maintenance Standards - Baffle Oil/Water Separators (API Type)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with out thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulations that exceed 1-inch, at the surface of the water.	Extract oil from vault by vactoring. Disposal in accordance with state and local rules and regulations.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired or replaced.

Table V-A.16: Maintenance Standards - Baffle Oil/Water Separators (API Type)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	See Table V-A.5: Maintenance Standards - Catch Basins Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by

Table V-A.16: Maintenance Standards - Baffle Oil/Water Separators (API Type)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
			inspection personnel.