FINAL STORM DRAINAGE REPORT

FOR

1200 7th Ave SE Townhomes
Puyallup, Washington

Revised July, 2025
October 2024

Prepared for:
Seatac Enterprise, LLC
10019 SE 226th Place
Kent, WA 98031

Prepared by:
Daniel Smith, P.E., Senior Project Manager
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Puyallup, WA 98372
(253) 848-4282

Approved By:
Daniel Smith, P.E., Senior Project Manager

REPORT #19078

"I hereby state that this Drainage and Erosion/Sediment Control Plan for the 1200 7th Ave SE Townhomes project has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community of professional engineers. I understand that City of Puyallup does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by me."

This analysis is based on data and records either supplied to, or obtained by, C.E.S. NW, Inc. These documents are referenced within the text of the analysis. The analysis has been prepared utilizing procedures and practices within the standard accepted practices of the industry.

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STORM DRAINAGE

1. Project Overview

This report accompanies the site development plans, as submitted to the City of Puyallup for review and approval. This document provides site information, and the analysis used to prepare the storm drainage design for the 1200 7th Ave SE Townhome project. The *Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2019 (Manual),* and the City of Puyallup's modifications to that document establishes the methodology and design criteria used for this project.

The 1200 7th Ave SE Townhome project constructs 6 townhomes on a 0.48-acre parcel (7845001330). The project site is accessed from 7th Ave SE with a new commercial driveway approach. The project is located in the Puyallup River Water Resources Inventory Area (WRIA 10). The Vicinity Map has been included in Appendix 'A' of this report. A project summary is as follows:

Permit Applied for – Site Development and Building Permits
Address – 1200 7th Ave SE Puyallup, WA 98372
Parcel Numbers – 7845001330
Legal description – (Per statutory warranty deed filed under recording number 201910110806).

> The west 33 feet of block 77, and the east 50 feet of block 78, Frank R. Spinning's first addition to the Town of Puyallup, according to the plat thereof recorded in Book 4 of Plats, page 86, in Pierce County, Washington.
>
> Situate in the County of Pierce, State of Washington.

The property has historically been used as a single-family residence. Currently there is a single-family residence, a detached garage and sheds on site as depicted on the pre-developed basin map (Appendix 'B'). The existing house and garage are to be removed when construction permits are approved. The property has frontage along 7th Ave SE, which provides access to 6 units from a temporary asphalt driveway approach. Frontage improvements are not proposed since the City

has a capital improvement project 7th Ave SE which is to be completed Summer 2025. A fee in-lieu of frontage improvements will be paid to the City. Sewer, water, and stormwater improvements will be permitted under the site development permit. The project site proposes approximately 4,690 sq.ft. of rooftops, 6,195 sq.ft. of pavement, patios and walkways; therefore, according to Figure 2.4.1 of Volume I of the Manual, the project must evaluate all minimum requirements; see Section 5 of this report for a detailed discussion of each of the minimum requirements. A StormTech MC-3500 detention system is proposed in the northern half of the site for flow control. The project proposes 4,985 sq.ft. of pollution generating impervious surfaces (PGIS); therefore, runoff treatment is not required. Perforated stub-outs are proposed to connect the rooftops to the tank. All disturbed areas which are not converted to impervious surface will have soil amended (BMP T5.13).

2. Existing Conditions Summary

In the existing condition, the site is used as a single-family residence and yard. The existing topography is relatively flat with elevations between 53-54 (NAVD 88) and gradually slopes towards 7th Ave SE. Stormwater runoff from this site is currently collected by a closed conveyance system within 7th Ave SE which consists of a 30-inch concrete storm line on the north side of the roadway. Currently. site access is provided by a gravel driveway approach from 7th Ave SE which will be replaced with a temporary asphalt driveway approach as part of the site development permit.

Onsite soils have been identified as Puyallup fine sandy loam (31A a Type B soil) determined by the USDA SCS maps of Pierce County, Washington. A description of the USDA soils and a copy of the soil map for this portion of Pierce County have been included in Appendix 'A' of this report. A geotechnical engineer's report has been prepared by ESNW, dated April 9, 2020 and updated January 21, 2021, which documents poorly graded sands with fine content up to 87.50% across six test pits. Groundwater seepage was observed at a depth between 3.5-feet to 5-feet (between approximate elevations 48-49). A small-scale PIT was performed in TP-5 at a depth of 3.5-feet and an infiltration rate was measured at 0-inches per hour. A copy of the geotechnical report is included in Appendix 'D'.

There is an existing gravity sewer main in 23rd Avenue Southwest, which will service the properties. There are no known aquifer recharge or wellhead protection areas that affect this property. There are no known well or septic systems onsite. If a septic system or well is discovered onsite during construction, it will be decommissioned per Tacoma-Pierce County Health Department standards. The parcel and all the proposed improvements are located within Zone X, which is considered outside of the 100-year floodplain, per FEMA Map # 53053C0342E. A copy of the FIRM Panel map can be found in Appendix 'B' of this report.

3. Off-site Analysis Report

A quarter mile downstream analysis is required by the City of Puyallup. The project proposed an onsite detention tank to mitigate stormwater runoff from the post-developed site. The tank's riser releases stormwater matching 50 percent of the predeveloped 2-year storm event up to the predeveloped 50-year storm event, which discharges to a 30-inch public conveyance system on the north side of 7th Ave SE. Based on public GIS information, the runoff is conveyed west within 7th Ave SE towards 10th Street SE and an overpass with SR 512. The runoff outfalls to a 72-inch WSDOT conveyance pipe that flows north along SR 512. The ¼ mile drainage path concludes in WSDOT right-of-way. The runoff ultimately outfalls to the Puyallup River approximately 0.7 miles downstream of the site. A downstream map is included in Appendix 'B'. No adverse impacts are anticipated to the downstream system as a result of the development due to the proposed detention tank and bio-swale.

4. Permanent Stormwater Control Plan

Existing Site Hydrology

The existing site slopes towards 7th Ave SE as sheet flow. For pond sizing purposes the pre-developed basin (.487-acres) is modeled as a flat forested condition for C type soils with the WWHM computer program. Please refer to the Appendix 'B' for more information on the existing site.

Developed Site Hydrology

Under the developed conditions, the project site proposes approximately 4,708 sq.ft. of rooftops, 6,652 sq.ft. of pavement, patios and walkways. The landscape and yard areas can be modeled as "pasture" due to soil amendment per Ecology BMP T5.13. The runoff from rooftops will connect

to the StormTech chambers with a perforated stub-outs BMP T5.10C. The post developed basin is summarized in the table below:

Sub-Basin	Land-use	WWHM Description	Area (acre)
Basin A	Landscaping (Amended Soils)	C, Pasture, Flat.	0.187
Basin B	Parking Lot and Walkways	Parking Lot, Flat	0.128
Basin C	Rooftops	Rooftops Flat	0.108
Bypass A	Landscaping (Amended Soils)	C, Pasture, Mod.	0.040
Bypass B	Driveway Approach	Parking Lot, Mod.	0.018
Bypass C	Walkway	Sidewalk, Flat	0.006
Total			**0.487**

Table 1 – Post Developed Basin

Storm Event	Pre-Developed Flow Rate (cfs)	Mitigated Flow Rate (cfs)
2	0.011	0.013
10	0.020	0.022
50	0.027	0.032
100	0.029	0.038

Table 2 –Flow Rate Summary

An 18-inch open top flat riser with three orifices is provided to control the mitigated discharge rates from the detention tank (facility). The following is a summary of the riser schedule:

Elevation	Type	Size.
48.00	Orifice	0.300-in
52.80	Orifice	0.500-in
53.50	Orifice	0.750-in

Table 3 – Pond Riser Schedule

Facility Sizing

The StormTech MC-3500 chamber system is designed to release stormwater matching 50 percent of 2-year storm event up to the 50-year storm event of the predeveloped site's condition. As

modelled by the WWHM computer program, the system requires 41 MC-3500 chambers with a 4-foot riser. Since the project proposes 4,905 sq.ft. of pollution generating impervious surfaces (PGIS); therefore, it is exempt from runoff treatment. WWHM modeling report is included in Appendix 'C'.

Conveyance Calculations

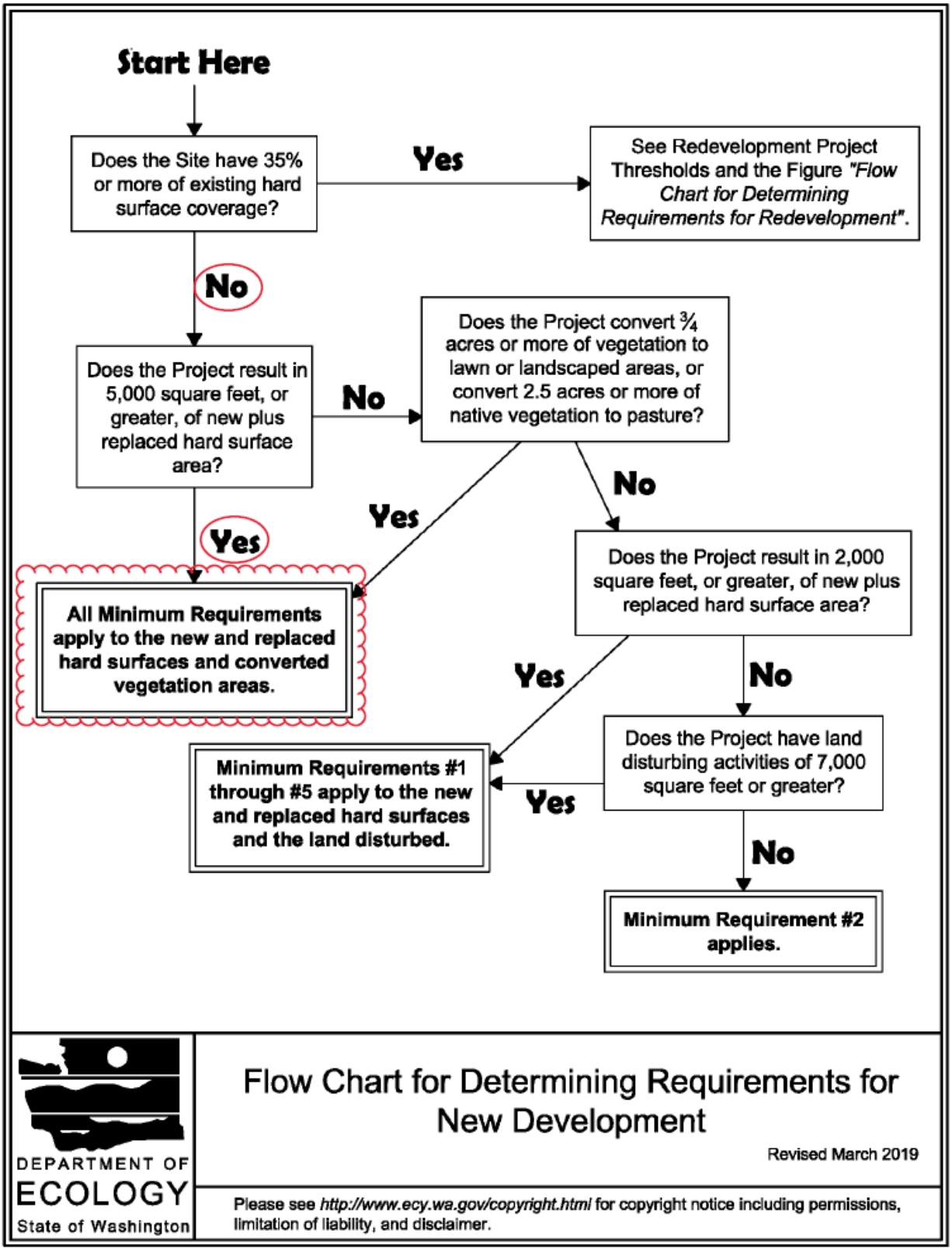
The project proposes an onsite closed conveyance system with catch basins, PVC and ductile iron pipes. To demonstrate the system's capacity the shallowest pipe's is analyzed with the manning's equation and the total site's 100-year storm event as calculated by the WWHM computer program. The pipe analyzed is 50-linear foot ductile iron pipe that connects to the existing storm system in 7th Ave SE. Computer modeling results are provided in Appendix 'C'. A summary of the calculations is provided below:

- Pipe Reach Name: **Pipe 1**
- Structure Tributary Area: **0.446-ac**
- Pipe Diameter (in): **12-in**
- Pipe Length (ft): **50-ft**
- Pipe Slope (%): **1.62 %**
- Manning's Coefficient (n): **0.012 (DI CL50)**
- Design Flow (cfs): **0.22-cfs (100-year)**
- Pipe-Full Flow (cfs): **2.73-cfs**
- Water Depth at Design Flow (in): **2.4-inches**
- Critical Depth (in): **2.4-inches**
- Velocity at Design Flow (fps): **1.95-fps**
- Velocity at Pipe-Full Flow (fps): **3.47-fps**
- Percent full at Design Flow (%): **15%**
- HGL for each Pipe Reach (elev): **50.03-feet**

5. Discussion of Minimum Requirements

The project proposes more than 5,000 sq.ft. of impervious surfaces; therefore, as required by Figure I-3.1 of Volume I of the Manual each minimum requirement applies.

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



The following is a summary of the minimum requirements as described in Section I-3.3 of Volume I of the Manual.

5.1 Minimum Requirement #1: Preparation of a Stormwater Site Plan

The Stormwater Site Plan is prepared and is provided with this document.

5.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP)

A SWPP Plan is provided as a separate document.

5.3 Minimum Requirement #3: Source Control of Pollution

Permanent source control BMPs are required for the development's daily operations, and the stormwater facilities must be maintained as described in the Operations and Maintenance Manual, which is included as a separate document.

5.4 Minimum Requirement #4: Preservation of Natural Drainage System and Outfalls

Under existing conditions, stormwater runoff is discharged into the public conveyance system on the north side of 7th Avenue Southeast. After being detained by the proposed tanks runoff will continue to be discharged to the public conveyance system.

5.5 Minimum Requirement #5: Onsite Stormwater Management

This project must meet minimum requirements 1-9; therefore, this project will evaluate List 2 for onsite stormwater management compliance. BMPs from List 2 were evaluated as follows:

Lawn and Landscape Areas

- **Soil Preservation and Amendment (Ecology BMP T5.13).**
  All disturbed areas which are not converted to impervious areas shall apply soil amendment per Ecology BMP T5.13.

Roof Areas

- **Full Dispersion (BMP T5.30)** is deemed **infeasible** since the required forested or native condition is not available on site.
- **Downspout Infiltration (BMP T5.10A)** is deemed **infeasible** since the measured infiltration rate is 0-inches per hour.

- **Bioretention (BMP T7.30)** is deemed **infeasible** since the measured infiltration rate is 0-inches per hour.
- **Downspout Dispersion Systems (BMP T5.10B)** is deemed **infeasible** since 25-foot flow paths and trench sizes cannot be provided onsite.
- **Perforated Stub-out Connections (BM T5.10C)** are deemed **feasible** above elevation of 51.50 (NAVD 88) and are proposed for the rooftops.

Other Hard Surfaces

- **Full Dispersion (BMP T5.30)** is deemed **infeasible** since the required forested or native condition is not available on site.
- **Permeable Pavement (BMP T5.15) and Bioretention (BMP T7.30)** are deemed **infeasible** since the measured infiltration rate is 0-inches per hour.
- **Sheet Flow Dispersion (T5.12) and Concentrated Flow Dispersion (BMP T5.11)** are deemed **infeasible** for the parking lot since the minimum flow paths are not available onsite. No other BMPs are required for this surface type.

5.6 Minimum Requirement #6: Runoff Treatment

The project proposes 4,905 sq.ft. of pollution generating impervious surfaces (PGIS); therefore, minimum requirement #6 is not applicable to this project.

5.7 Minimum Requirement #7: Flow Control

A StormTech MC-3500 detention system is located under the parking lot for flow control. The chambers are sized with WWHM modeling program to match a pre-developed forested condition between ½ 2-year to the full 50-year storm events.

5.8 Minimum Requirement #8: Wetlands Protection

This requirement is not applicable to the project since there are no existing wetlands onsite or adjacent to the site.

5.9 Minimum Requirement #9: Operation and Maintenance

An Operation and Maintenance Manual is included as a separate document.

6. Other Permits

Other necessary permits and approvals include:

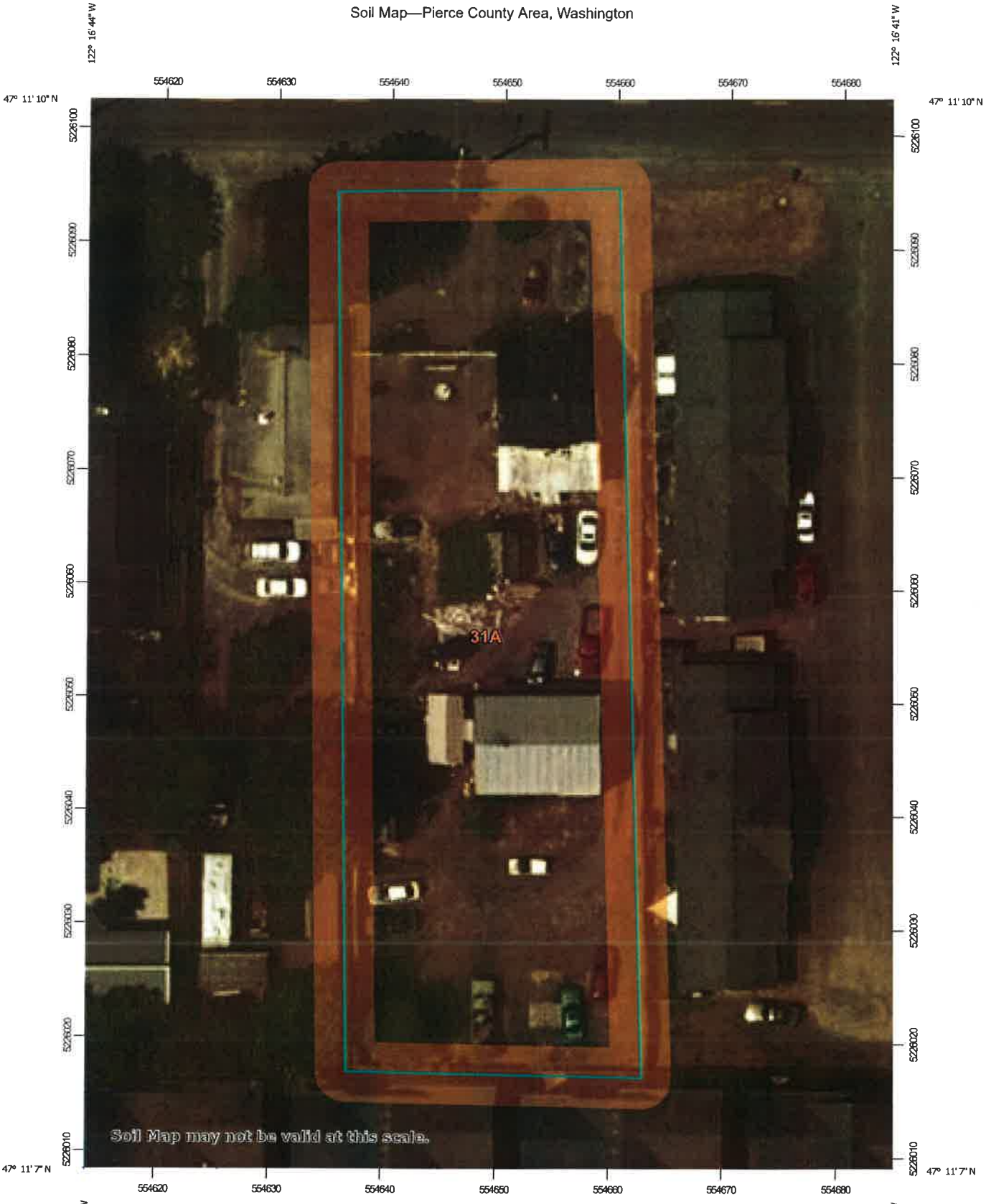
- Right of Way
- Sanitary Side Sewer Permits
- Water Service Permits
- Building Permits
- PSE

APPENDIX A

General Exhibits

VICINITY MAP

NTS



Map Scale: 1:458 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 20 40 80 120

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: Pierce County Area, Washington
Survey Area Data: Version 14, Sep 10, 2018

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

Date(s) aerial images were photographed: Jul 8, 2014—Jul 15, 2014

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
31A	Puyallup fine sandy loam	0.5	100.0%
Totals for Area of Interest		**0.5**	**100.0%**

Pierce County Area, Washington

31A—Puyallup fine sandy loam

Map Unit Setting

National map unit symbol: 2hq9
Elevation: 0 to 390 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 170 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Puyallup and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Puyallup

Setting

Landform: Flood plains, terraces
Parent material: Alluvium

Typical profile

H1 - 0 to 13 inches: ashy fine sandy loam
H2 - 13 to 29 inches: loamy fine sand
H3 - 29 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Forage suitability group: Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Briscot

Percent of map unit: 2 percent
Landform: Depressions

Hydric soil rating: Yes

Data Source Information

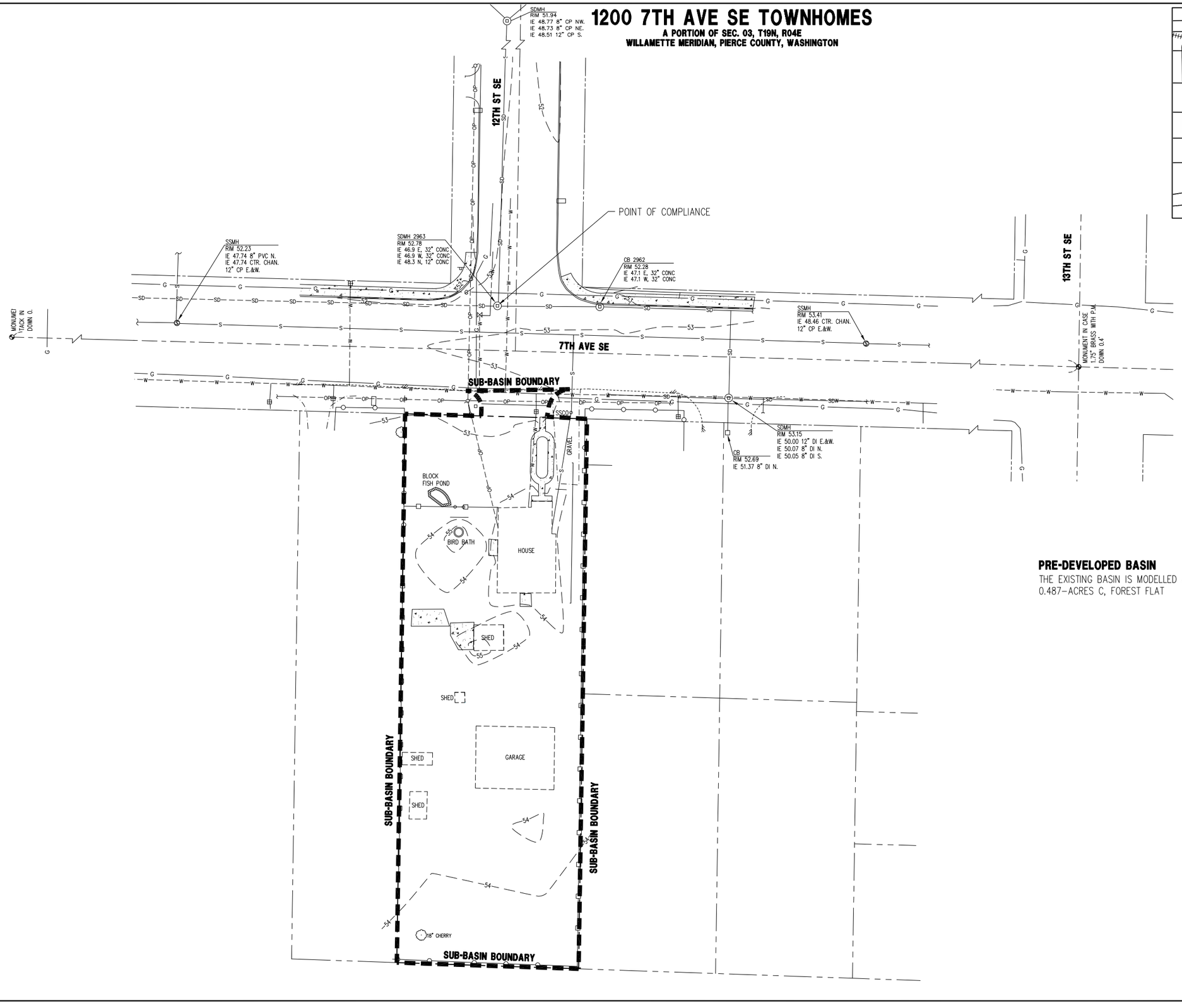
Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 14, Sep 10, 2018

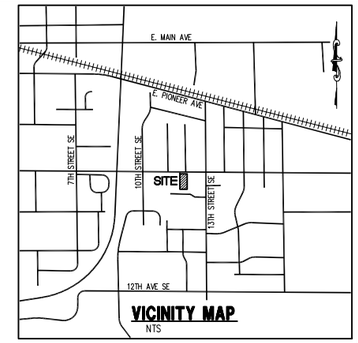
APPENDIX B

Basin Exhibits

1200 7TH AVE SE TOWNHOMES

A PORTION OF SEC. 03, T19N, R04E
WILLAMETTE MERIDIAN, PIERCE COUNTY, WASHINGTON





VICINITY MAP
NTS

PRE-DEVELOPED BASIN

THE EXISTING BASIN IS MODELLED AS
0.487–ACRES C, FOREST FLAT

No.	Revision:	Int.	Date:

DANIEL PAUL SMITH — STATE OF WASHINGTON — 47023 — REGISTERED PROFESSIONAL ENGINEER

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PUYALLUP, WA 98372
PH: (253) 848-4282
ceservices@cesnwinc.com

Project: **1200 7TH AVE SE TOWNHOMES**
PRE-DEVELOPED BASIN MAP

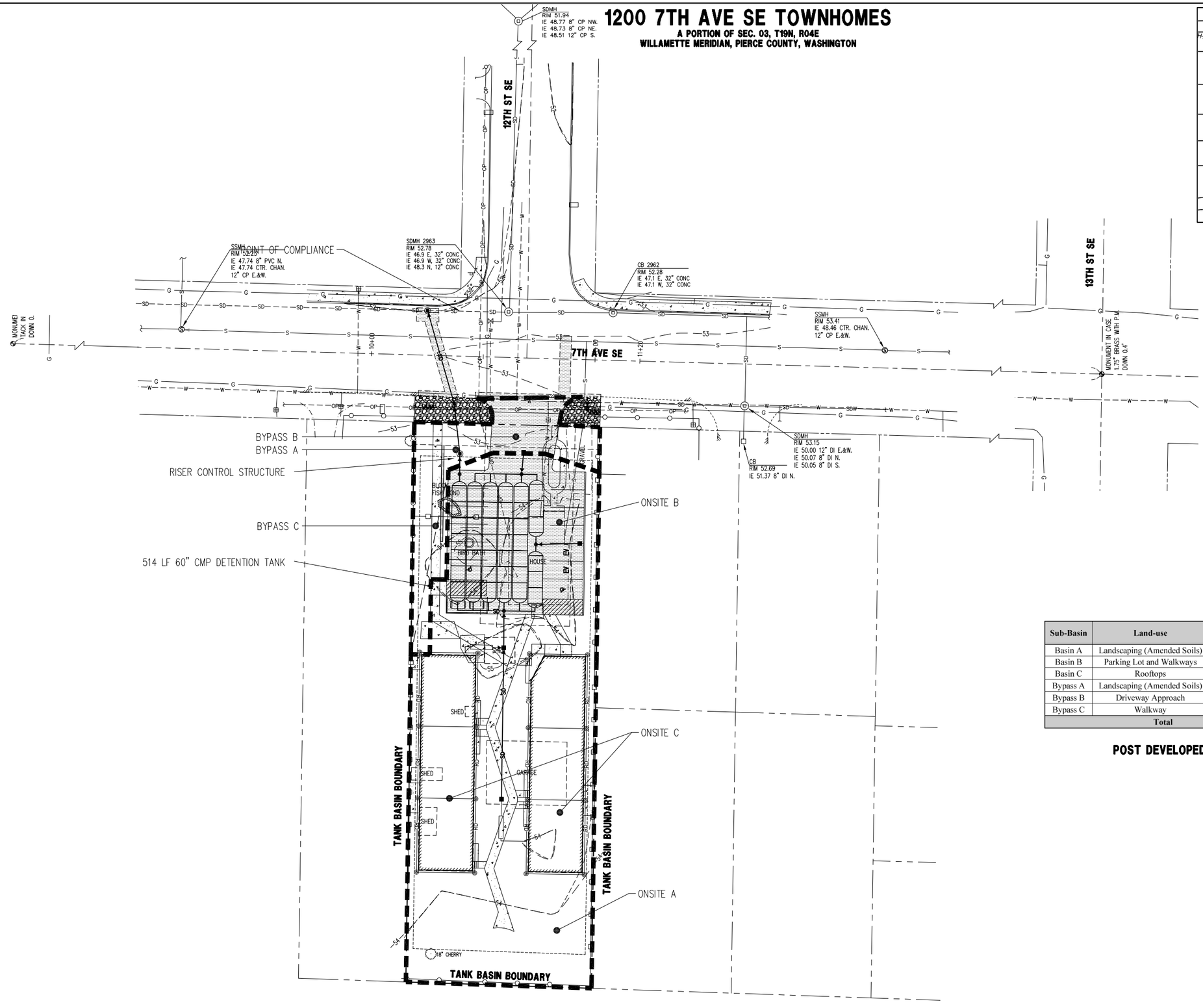
Client: **SEATAC ENTERPRISE, LLC**
10019 SE 226TH PL KENT, WA 98031

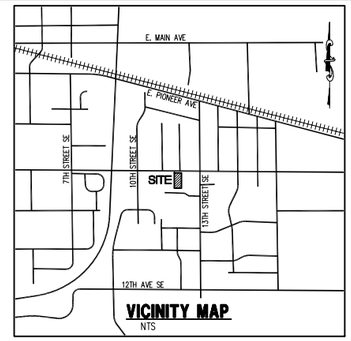
Designed:	DPS
Drawn:	DPS
Checked:	DPS
Scale:	1"=20'
Date:	07/29/25
Job No.:	19078

Sheet No.: **B-1**
1 of 2 Sheets

1200 7TH AVE SE TOWNHOMES

A PORTION OF SEC. 03, T19N, R04E
WILLAMETTE MERIDIAN, PIERCE COUNTY, WASHINGTON





Sub-Basin	Land-use	WWHM Description	Area (acre)
Basin A	Landscaping (Amended Soils)	C, Pasture, Flat.	0.187
Basin B	Parking Lot and Walkways	Parking Lot, Flat	0.128
Basin C	Rooftops	Rooftops Flat	0.108
Bypass A	Landscaping (Amended Soils)	C, Pasture, Mod.	0.040
Bypass B	Driveway Approach	Parking Lot, Mod.	0.018
Bypass C	Walkway	Sidewalk, Flat	0.006
Total			**0.487**

POST DEVELOPED BASIN

No.	Revision:	Int.	Date:

DANIEL PAUL SMITH — STATE OF WASHINGTON — 47023 — REGISTERED PROFESSIONAL ENGINEER

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PH: (253) 848-4282
cesenterprises@comcast.com

Project: **1200 7TH AVE SE TOWNHOMES**
POST DEVELOPED BASIN MAP

Client: **SEATAC ENTERPRISE, LLC**
10019 SE 226TH PL KENT, WA 98031

Designed:	DPS
Drawn:	DPS
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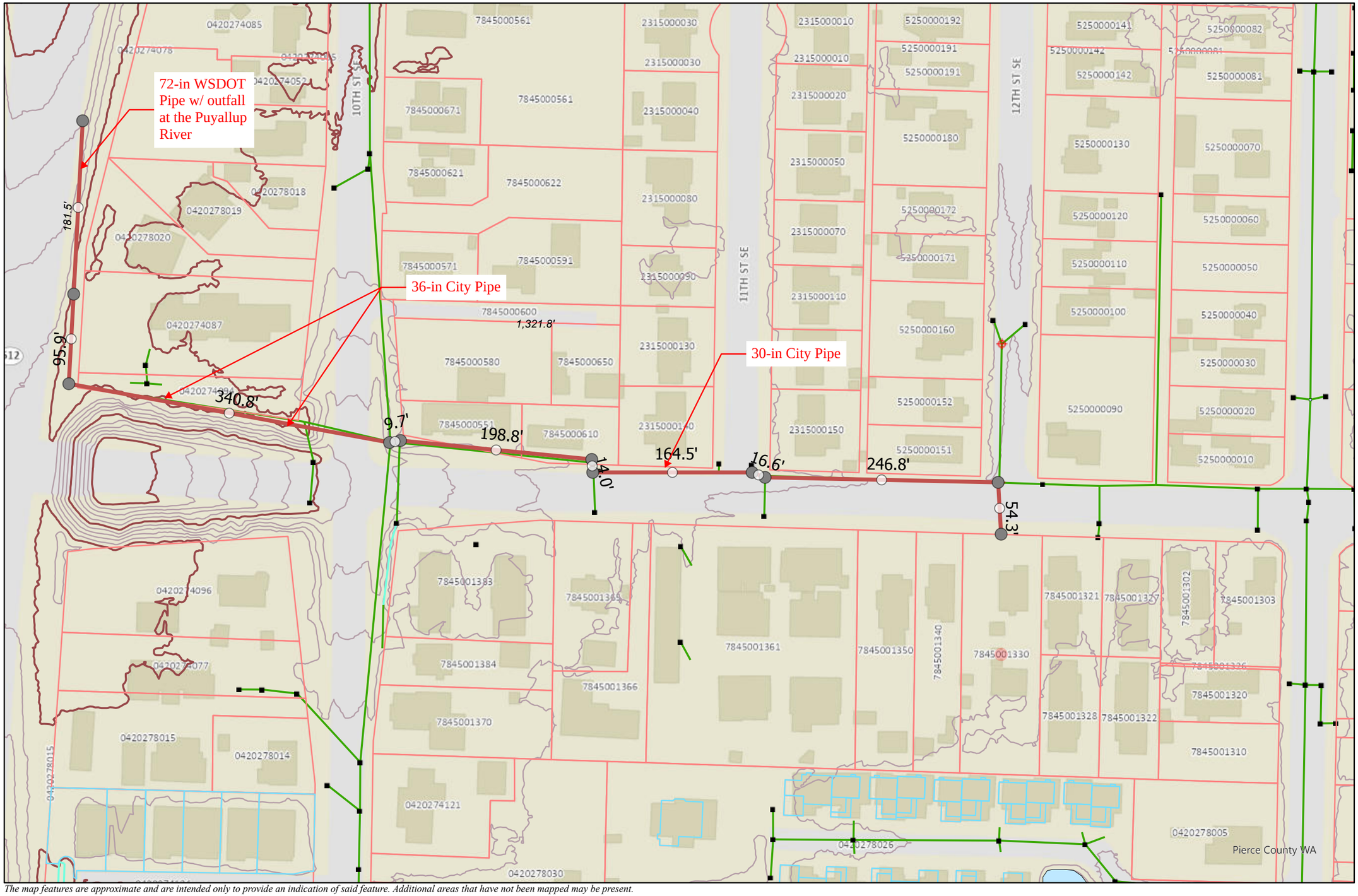
Date:	07/29/25
Job No.:	19078

Sheet No.: **B-2**
2 of 2 Sheets

Downstream Map



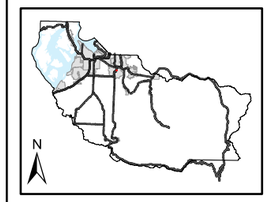
Legend

Tax Parcels

- Base Parcel
- Condominium
- Drainage - Manholes - Puyallup
- Drainage - Inlets - Puyallup
- Drainage - Channels - Puyallup
- Drainage - Pipes - Puyallup
- Drainage - Stormwater Facilities - Puyallup

Contours - 2017

- 10' Contour Line
- 2' Contour Line



0 20 40 80
Feet

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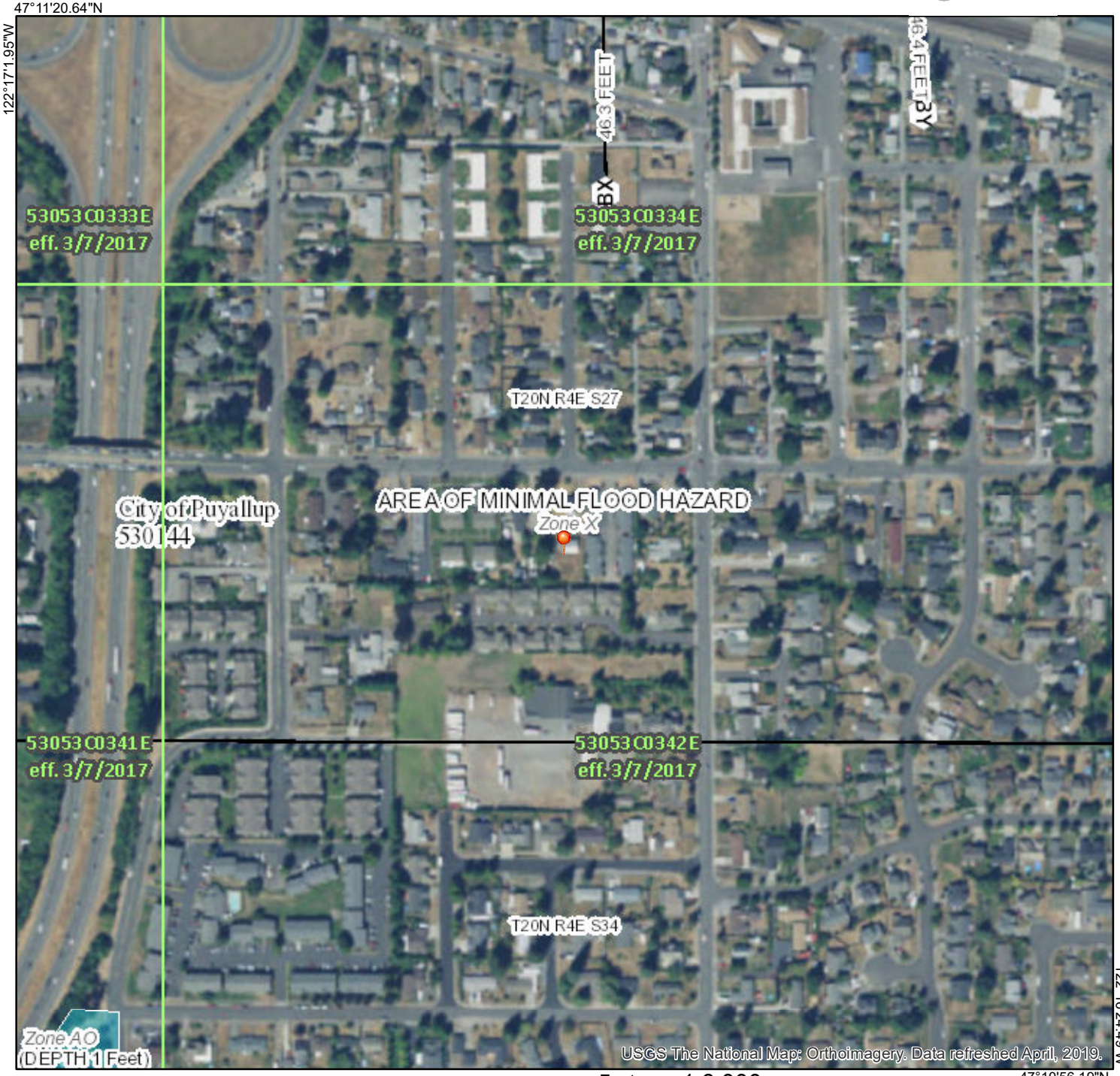
Date: 8/5/2021 03:32 PM

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/2/2020 at 6:13:10 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C

Computer Printouts

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 19078-StormTech

Site Name:	1200 7th TH
Site Address:	1200 7th Street
City:	Puyallup, WA
Report Date:	7/21/2025
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2024/06/28
Version:	4.3.1

POC Thresholds

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

Landuse Basin Data
Predeveloped Land Use

Pre Dev

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	0.487
Pervious Total	0.487
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.487

Element Flow Componants:

Surface	Interflow	Groundwater

Componant Flows To:

POC 1	POC 1

Mitigated Land Use

Post Dev

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Flat	0.187
Pervious Total	0.187

Impervious Land Use	acre
ROOF TOPS FLAT	0.108
PARKING FLAT	0.128
Impervious Total	0.236
Basin Total	0.423

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
StormTech 1	StormTech 1	

Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	0.044
Pervious Total	0.044

Impervious Land Use	acre
SIDEWALKS FLAT	0.006
PARKING MOD	0.018
Impervious Total	0.024
Basin Total	0.068

Element Flow Componants:

Surface	Interflow	Groundwater
Componant Flows To:		
POC 1	POC 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech 1

Chamber Model: 3500
Dimensions
Max Row Length: 59.83
Number of Chambers: 41
Number of Endcaps: 12
Top Stone Depth: 12
Bottom Stone Depth: 9
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 0.300 in. Elevation:0 ft.
Orifice 2 Diameter: 0.500 in. Elevation:2.8 ft.
Orifice 3 Diameter: 0.750 in. Elevation:3.5 ft.
Element Flow Outlets:
Outlet 1 Outlet 2
Outlets Flow To:

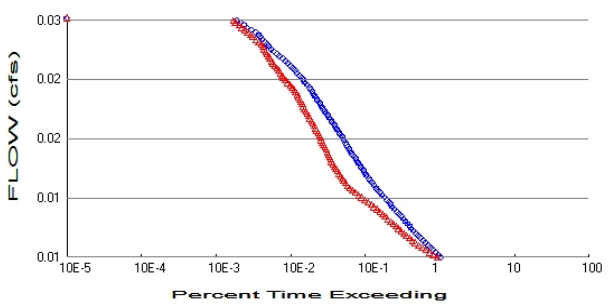
StormTech Hydraulic Table

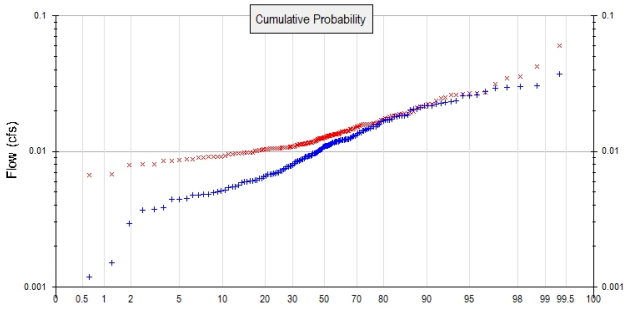
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.047	0.000	0.000	0.000
0.0833	0.050	0.001	0.000	0.000
0.1667	0.050	0.003	0.001	0.000
0.2500	0.050	0.005	0.001	0.000
0.3333	0.050	0.007	0.001	0.000
0.4167	0.050	0.008	0.001	0.000
0.5000	0.050	0.010	0.001	0.000
0.5833	0.050	0.012	0.001	0.000
0.6667	0.050	0.013	0.002	0.000
0.7500	0.050	0.015	0.002	0.000
0.8333	0.050	0.019	0.002	0.000
0.9167	0.050	0.022	0.002	0.000
1.0000	0.050	0.026	0.002	0.000
1.0833	0.050	0.030	0.002	0.000
1.1667	0.050	0.033	0.002	0.000
1.2500	0.050	0.037	0.002	0.000
1.3333	0.050	0.040	0.002	0.000
1.4167	0.050	0.044	0.002	0.000
1.5000	0.050	0.047	0.003	0.000
1.5833	0.050	0.051	0.003	0.000
1.6667	0.050	0.054	0.003	0.000
1.7500	0.050	0.058	0.003	0.000
1.8333	0.050	0.061	0.003	0.000
1.9167	0.050	0.065	0.003	0.000
2.0000	0.050	0.068	0.003	0.000
2.0833	0.050	0.071	0.003	0.000
2.1667	0.050	0.075	0.003	0.000
2.2500	0.050	0.078	0.003	0.000
2.3333	0.050	0.081	0.003	0.000
2.4167	0.050	0.085	0.003	0.000
2.5000	0.050	0.088	0.003	0.000
2.5833	0.050	0.091	0.003	0.000
2.6667	0.050	0.094	0.004	0.000

2.7500	0.050	0.098	0.004	0.000
2.8333	0.050	0.101	0.005	0.000
2.9167	0.050	0.104	0.006	0.000
3.0000	0.050	0.107	0.007	0.000
3.0833	0.050	0.110	0.007	0.000
3.1667	0.050	0.113	0.008	0.000
3.2500	0.050	0.116	0.009	0.000
3.3333	0.050	0.119	0.009	0.000
3.4167	0.050	0.121	0.009	0.000
3.5000	0.050	0.124	0.010	0.000
3.5833	0.050	0.127	0.015	0.000
3.6667	0.050	0.129	0.017	0.000
3.7500	0.050	0.132	0.019	0.000
3.8333	0.050	0.134	0.020	0.000
3.9167	0.050	0.137	0.021	0.000
4.0000	0.050	0.139	0.023	0.000
4.0833	0.050	0.141	0.406	0.000
4.1667	0.050	0.143	1.099	0.000
4.2500	0.050	0.145	1.964	0.000
4.3333	0.050	0.147	2.909	0.000
4.4167	0.050	0.148	3.841	0.000
4.5000	0.050	0.150	4.668	0.000
4.5833	0.050	0.152	5.324	0.000
4.6667	0.050	0.154	5.785	0.000
4.7500	0.050	0.155	6.103	0.000
4.8333	0.050	0.157	6.501	0.000
4.9167	0.050	0.159	6.818	0.000
5.0000	0.050	0.161	7.120	0.000
5.0833	0.050	0.162	7.411	0.000
5.1667	0.050	0.164	7.690	0.000
5.2500	0.050	0.166	7.959	0.000
5.3333	0.050	0.168	8.220	0.000
5.4167	0.050	0.169	8.472	0.000
5.5000	0.050	0.171	8.717	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.487
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.231
Total Impervious Area: 0.26

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.011004
5 year	0.01693
10 year	0.020356
25 year	0.024066
50 year	0.026453
100 year	0.028524

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.012807
5 year	0.017773
10 year	0.021708
25 year	0.027487
50 year	0.032426
100 year	0.037955

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.009	0.012
1903	0.007	0.014
1904	0.012	0.018
1905	0.006	0.010
1906	0.003	0.009
1907	0.017	0.013
1908	0.012	0.011
1909	0.012	0.011
1910	0.017	0.013
1911	0.011	0.013

1912	0.037	0.027
1913	0.017	0.013
1914	0.004	0.035
1915	0.007	0.010
1916	0.011	0.014
1917	0.004	0.007
1918	0.012	0.014
1919	0.009	0.009
1920	0.011	0.012
1921	0.012	0.011
1922	0.012	0.015
1923	0.010	0.010
1924	0.005	0.014
1925	0.006	0.008
1926	0.011	0.012
1927	0.008	0.010
1928	0.008	0.010
1929	0.017	0.015
1930	0.011	0.016
1931	0.010	0.011
1932	0.008	0.010
1933	0.009	0.011
1934	0.022	0.026
1935	0.010	0.012
1936	0.009	0.012
1937	0.015	0.015
1938	0.009	0.010
1939	0.001	0.010
1940	0.010	0.016
1941	0.006	0.018
1942	0.015	0.021
1943	0.008	0.013
1944	0.016	0.020
1945	0.012	0.013
1946	0.007	0.013
1947	0.005	0.009
1948	0.023	0.012
1949	0.020	0.016
1950	0.006	0.009
1951	0.008	0.016
1952	0.030	0.021
1953	0.028	0.019
1954	0.010	0.011
1955	0.009	0.009
1956	0.005	0.008
1957	0.015	0.010
1958	0.029	0.061
1959	0.018	0.027
1960	0.005	0.010
1961	0.018	0.024
1962	0.010	0.011
1963	0.005	0.008
1964	0.005	0.025
1965	0.021	0.017
1966	0.006	0.009
1967	0.009	0.013
1968	0.010	0.011
1969	0.009	0.011

1970	0.014	0.012
1971	0.022	0.019
1972	0.014	0.031
1973	0.018	0.018
1974	0.010	0.014
1975	0.023	0.027
1976	0.012	0.017
1977	0.005	0.008
1978	0.020	0.018
1979	0.006	0.012
1980	0.012	0.015
1981	0.011	0.012
1982	0.005	0.010
1983	0.018	0.014
1984	0.008	0.013
1985	0.013	0.016
1986	0.011	0.010
1987	0.021	0.016
1988	0.013	0.011
1989	0.012	0.009
1990	0.014	0.011
1991	0.011	0.016
1992	0.014	0.016
1993	0.015	0.013
1994	0.022	0.012
1995	0.005	0.010
1996	0.024	0.022
1997	0.010	0.011
1998	0.012	0.013
1999	0.001	0.013
2000	0.009	0.011
2001	0.005	0.009
2002	0.016	0.018
2003	0.013	0.012
2004	0.012	0.013
2005	0.022	0.027
2006	0.007	0.012
2007	0.007	0.014
2008	0.012	0.012
2009	0.008	0.009
2010	0.007	0.012
2011	0.006	0.010
2012	0.009	0.011
2013	0.007	0.011
2014	0.005	0.010
2015	0.009	0.017
2016	0.004	0.011
2017	0.017	0.016
2018	0.030	0.036
2019	0.030	0.025
2020	0.009	0.013
2021	0.015	0.013
2022	0.006	0.015
2023	0.013	0.019
2024	0.026	0.026
2025	0.011	0.010
2026	0.018	0.015
2027	0.007	0.013

2028	0.006	0.007
2029	0.012	0.011
2030	0.023	0.016
2031	0.007	0.007
2032	0.004	0.009
2033	0.007	0.011
2034	0.007	0.009
2035	0.026	0.042
2036	0.014	0.011
2037	0.004	0.014
2038	0.011	0.013
2039	0.002	0.021
2040	0.006	0.011
2041	0.009	0.012
2042	0.026	0.022
2043	0.012	0.013
2044	0.017	0.015
2045	0.011	0.011
2046	0.013	0.016
2047	0.010	0.010
2048	0.013	0.010
2049	0.011	0.013
2050	0.008	0.011
2051	0.012	0.016
2052	0.007	0.012
2053	0.012	0.019
2054	0.015	0.019
2055	0.006	0.010
2056	0.005	0.013
2057	0.009	0.008
2058	0.010	0.014
2059	0.018	0.017

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0370	0.0605
2	0.0303	0.0421
3	0.0299	0.0357
4	0.0295	0.0347
5	0.0293	0.0311
6	0.0275	0.0271
7	0.0260	0.0269
8	0.0257	0.0268
9	0.0256	0.0266
10	0.0237	0.0262
11	0.0234	0.0262
12	0.0230	0.0251
13	0.0226	0.0247
14	0.0224	0.0238
15	0.0218	0.0224
16	0.0217	0.0222
17	0.0217	0.0214
18	0.0210	0.0213
19	0.0206	0.0212
20	0.0204	0.0196
21	0.0202	0.0193
22	0.0184	0.0191

23	0.0183	0.0190
24	0.0183	0.0189
25	0.0183	0.0188
26	0.0182	0.0185
27	0.0179	0.0184
28	0.0172	0.0182
29	0.0171	0.0181
30	0.0170	0.0176
31	0.0170	0.0174
32	0.0167	0.0171
33	0.0165	0.0170
34	0.0158	0.0166
35	0.0157	0.0164
36	0.0152	0.0162
37	0.0152	0.0160
38	0.0151	0.0160
39	0.0149	0.0159
40	0.0148	0.0159
41	0.0146	0.0159
42	0.0143	0.0158
43	0.0142	0.0158
44	0.0141	0.0156
45	0.0137	0.0156
46	0.0137	0.0155
47	0.0135	0.0153
48	0.0131	0.0152
49	0.0131	0.0150
50	0.0130	0.0148
51	0.0128	0.0146
52	0.0127	0.0146
53	0.0124	0.0145
54	0.0123	0.0143
55	0.0123	0.0142
56	0.0123	0.0141
57	0.0123	0.0140
58	0.0122	0.0140
59	0.0122	0.0140
60	0.0122	0.0140
61	0.0120	0.0138
62	0.0120	0.0137
63	0.0119	0.0135
64	0.0118	0.0135
65	0.0117	0.0134
66	0.0117	0.0133
67	0.0117	0.0133
68	0.0116	0.0133
69	0.0116	0.0132
70	0.0114	0.0132
71	0.0114	0.0132
72	0.0113	0.0130
73	0.0112	0.0130
74	0.0111	0.0130
75	0.0110	0.0130
76	0.0110	0.0129
77	0.0110	0.0128
78	0.0109	0.0126
79	0.0109	0.0126
80	0.0108	0.0126

81	0.0107	0.0125
82	0.0104	0.0125
83	0.0103	0.0125
84	0.0102	0.0125
85	0.0102	0.0125
86	0.0101	0.0123
87	0.0099	0.0123
88	0.0098	0.0122
89	0.0098	0.0120
90	0.0097	0.0120
91	0.0097	0.0118
92	0.0096	0.0117
93	0.0094	0.0117
94	0.0093	0.0116
95	0.0093	0.0116
96	0.0092	0.0116
97	0.0092	0.0116
98	0.0092	0.0115
99	0.0092	0.0115
100	0.0091	0.0114
101	0.0089	0.0113
102	0.0088	0.0113
103	0.0088	0.0113
104	0.0086	0.0113
105	0.0085	0.0112
106	0.0085	0.0112
107	0.0084	0.0112
108	0.0083	0.0109
109	0.0081	0.0108
110	0.0079	0.0108
111	0.0078	0.0108
112	0.0078	0.0108
113	0.0077	0.0107
114	0.0077	0.0107
115	0.0074	0.0107
116	0.0073	0.0106
117	0.0072	0.0106
118	0.0072	0.0106
119	0.0069	0.0106
120	0.0069	0.0106
121	0.0069	0.0105
122	0.0069	0.0105
123	0.0068	0.0105
124	0.0068	0.0104
125	0.0068	0.0104
126	0.0066	0.0104
127	0.0065	0.0104
128	0.0063	0.0102
129	0.0063	0.0102
130	0.0061	0.0101
131	0.0061	0.0100
132	0.0060	0.0098
133	0.0060	0.0098
134	0.0060	0.0098
135	0.0059	0.0098
136	0.0059	0.0097
137	0.0056	0.0096
138	0.0055	0.0096

139	0.0054	0.0095
140	0.0054	0.0095
141	0.0052	0.0093
142	0.0051	0.0092
143	0.0050	0.0092
144	0.0050	0.0091
145	0.0048	0.0091
146	0.0048	0.0090
147	0.0048	0.0089
148	0.0048	0.0088
149	0.0045	0.0087
150	0.0044	0.0086
151	0.0044	0.0085
152	0.0038	0.0084
153	0.0037	0.0081
154	0.0037	0.0080
155	0.0029	0.0080
156	0.0015	0.0068
157	0.0012	0.0067
158	0.0008	0.0066

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0055	56841	51246	90	Pass
0.0057	52415	45168	86	Pass
0.0059	48348	39988	82	Pass
0.0061	44620	35600	79	Pass
0.0063	41213	31950	77	Pass
0.0066	38215	28731	75	Pass
0.0068	35479	26044	73	Pass
0.0070	32952	23678	71	Pass
0.0072	30515	21590	70	Pass
0.0074	28432	19767	69	Pass
0.0076	26493	18155	68	Pass
0.0078	24747	16792	67	Pass
0.0080	23130	15462	66	Pass
0.0083	21678	14255	65	Pass
0.0085	20321	13135	64	Pass
0.0087	19058	12077	63	Pass
0.0089	17845	11086	62	Pass
0.0091	16714	10227	61	Pass
0.0093	15606	9446	60	Pass
0.0095	14620	8642	59	Pass
0.0097	13717	7917	57	Pass
0.0099	12875	7241	56	Pass
0.0102	12116	6626	54	Pass
0.0104	11413	6039	52	Pass
0.0106	10654	5433	50	Pass
0.0108	9994	4915	49	Pass
0.0110	9368	4484	47	Pass
0.0112	8764	4055	46	Pass
0.0114	8210	3696	45	Pass
0.0116	7745	3409	44	Pass
0.0119	7241	3197	44	Pass
0.0121	6792	3023	44	Pass
0.0123	6421	2844	44	Pass
0.0125	6116	2716	44	Pass
0.0127	5834	2594	44	Pass
0.0129	5562	2457	44	Pass
0.0131	5265	2332	44	Pass
0.0133	5005	2227	44	Pass
0.0135	4788	2135	44	Pass
0.0138	4535	2042	45	Pass
0.0140	4343	1954	44	Pass
0.0142	4166	1891	45	Pass
0.0144	3936	1834	46	Pass
0.0146	3713	1764	47	Pass
0.0148	3537	1709	48	Pass
0.0150	3367	1659	49	Pass
0.0152	3233	1596	49	Pass
0.0154	3092	1534	49	Pass
0.0157	2964	1478	49	Pass
0.0159	2851	1429	50	Pass
0.0161	2740	1389	50	Pass
0.0163	2605	1343	51	Pass
0.0165	2479	1298	52	Pass

0.0167	2361	1247	52	Pass
0.0169	2267	1200	52	Pass
0.0171	2159	1142	52	Pass
0.0174	2057	1096	53	Pass
0.0176	1949	1060	54	Pass
0.0178	1838	1011	55	Pass
0.0180	1749	961	54	Pass
0.0182	1662	920	55	Pass
0.0184	1577	884	56	Pass
0.0186	1510	848	56	Pass
0.0188	1445	816	56	Pass
0.0190	1368	788	57	Pass
0.0193	1299	755	58	Pass
0.0195	1243	728	58	Pass
0.0197	1182	702	59	Pass
0.0199	1129	674	59	Pass
0.0201	1081	646	59	Pass
0.0203	1026	615	59	Pass
0.0205	981	583	59	Pass
0.0207	925	546	59	Pass
0.0210	871	503	57	Pass
0.0212	819	469	57	Pass
0.0214	771	441	57	Pass
0.0216	719	424	58	Pass
0.0218	668	400	59	Pass
0.0220	629	383	60	Pass
0.0222	586	363	61	Pass
0.0224	549	337	61	Pass
0.0226	507	321	63	Pass
0.0229	473	306	64	Pass
0.0231	428	292	68	Pass
0.0233	393	280	71	Pass
0.0235	363	266	73	Pass
0.0237	329	256	77	Pass
0.0239	300	245	81	Pass
0.0241	281	236	83	Pass
0.0243	264	223	84	Pass
0.0245	248	206	83	Pass
0.0248	233	187	80	Pass
0.0250	218	170	77	Pass
0.0252	205	159	77	Pass
0.0254	187	146	78	Pass
0.0256	163	135	82	Pass
0.0258	144	122	84	Pass
0.0260	132	113	85	Pass
0.0262	117	100	85	Pass
0.0265	105	94	89	Pass

Model Default Modifications

Total of 0 changes have been made.

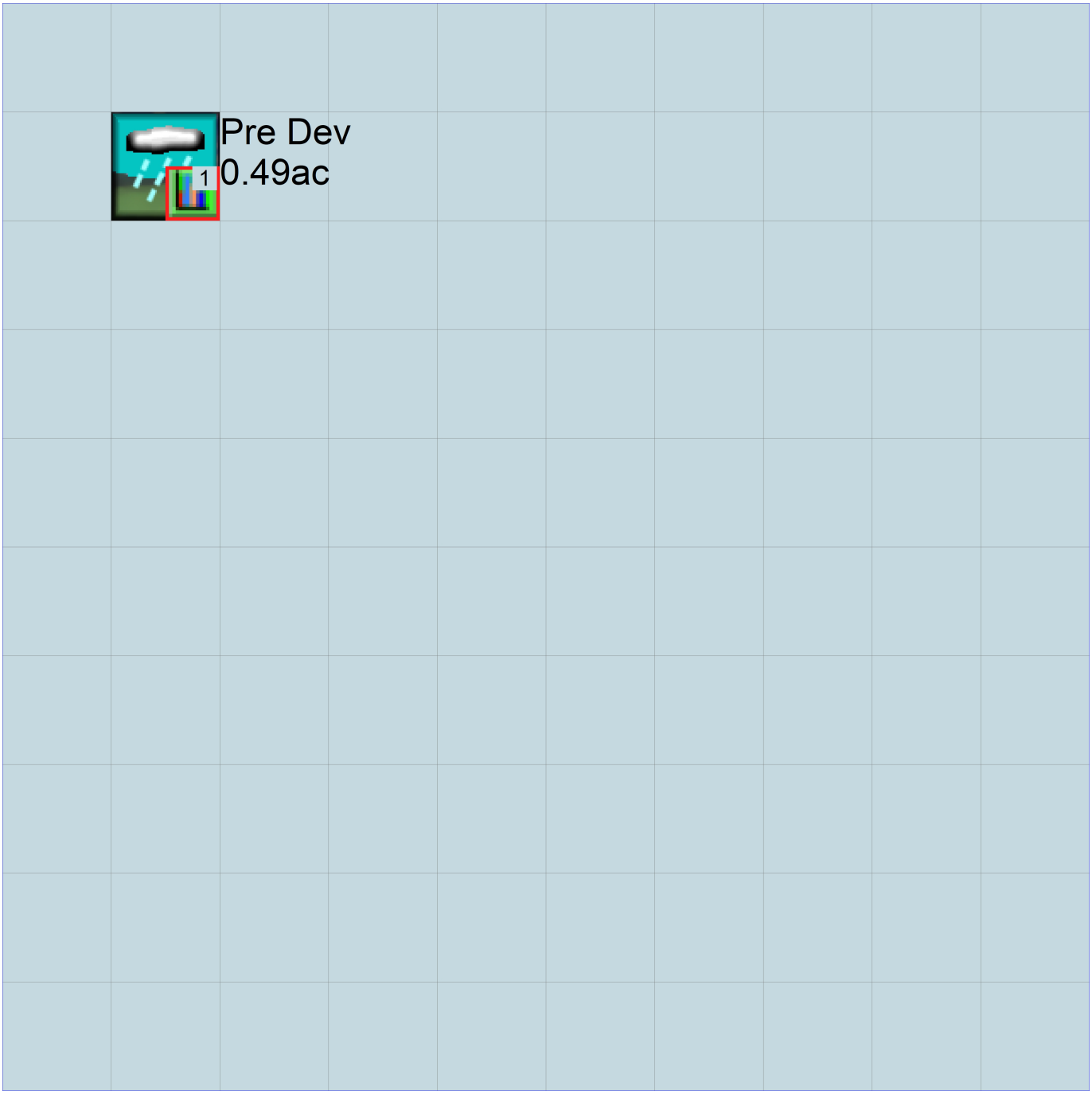
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
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<-ID->                                                              ***
WDM         26   19078-StormTech.wdm
MESSU       25   Pre19078-StormTech.MES
            27   Pre19078-StormTech.L61
            28   Pre19078-StormTech.L62
            30   POC19078-StormTech1.dat
END FILES

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

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

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

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

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

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

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

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  10                       0.487     COPY   501     12
PERLND  10                       0.487     COPY   501     13

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

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



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

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

END EXT SOURCES

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

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 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   19078-StormTech.wdm
MESSU       25   Mit19078-StormTech.MES
            27   Mit19078-StormTech.L61
            28   Mit19078-StormTech.L62
            30   POC19078-StormTech1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      13
      IMPLND       4
      IMPLND      11
      PERLND      14
      IMPLND       8
      IMPLND      12
      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        StormTech  1                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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
   14     C, Pasture, Mod         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 ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
   14         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  *********
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   14         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 ***
   13         0    0    0    0    0    0    0    0    0    0    0
   14         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
   13              0       4.5      0.06       400      0.05        0.5      0.996
   14              0       4.5      0.06       400       0.1        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13              0         0         2         2         0         0         0
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                          ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13           0.15       0.4       0.3         6       0.5       0.4
   14           0.15       0.4       0.3         6       0.5       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
   13              0         0         0         0       2.5          1         0
   14              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
   11      PARKING/FLAT           1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
   12      PARKING/MOD            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
   11         0    0    1    0    0    0
    8         0    0    1    0    0    0
   12         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    4    1    9
   11         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
   12         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
   11         0    0    0    0    0
    8         0    0    0    0    0
   12         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
   11            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
   12            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
   11              0         0
    8              0         0
   12              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
   11              0         0
    8              0         0
   12              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Post Dev***
PERLND  13                      0.187     RCHRES   1      2
PERLND  13                      0.187     RCHRES   1      3
IMPLND   4                      0.108     RCHRES   1      5
IMPLND  11                      0.128     RCHRES   1      5
Bypass***
PERLND  14                      0.044     COPY   501     12
PERLND  14                      0.044     COPY   601     12
PERLND  14                      0.044     COPY   501     13
PERLND  14                      0.044     COPY   601     13
IMPLND   8                      0.006     COPY   501     15
IMPLND   8                      0.006     COPY   601     15
IMPLND  12                      0.018     COPY   501     15
IMPLND  12                      0.018     COPY   601     15

******Routing******
PERLND  13                      0.187     COPY     1     12
IMPLND   4                      0.108     COPY     1     15
IMPLND  11                      0.128     COPY     1     15
PERLND  13                      0.187     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                              ***
    1     StormTech  1            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      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  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
   67    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.047924  0.000000  0.000000
  0.083333  0.051289  0.001765  0.000705
  0.166667  0.051289  0.003532  0.000997
  0.250000  0.051289  0.005297  0.001221
  0.333333  0.051289  0.007065  0.001410
  0.416667  0.051289  0.008830  0.001577
```

```
  0.500000  0.051289  0.010596  0.001727
  0.583333  0.051289  0.012362  0.001865
  0.666667  0.051289  0.014127  0.001994
  0.750000  0.051289  0.015894  0.002115
  0.833333  0.051289  0.019570  0.002230
  0.916667  0.051289  0.023223  0.002338
  1.000000  0.051289  0.026864  0.002442
  1.083333  0.051289  0.030492  0.002542
  1.166667  0.051289  0.034107  0.002638
  1.250000  0.051289  0.037702  0.002731
  1.333333  0.051289  0.041297  0.002820
  1.416667  0.051289  0.044864  0.002907
  1.500000  0.051289  0.048420  0.002991
  1.583333  0.051289  0.051957  0.003073
  1.666667  0.051289  0.055477  0.003153
  1.750000  0.051289  0.058980  0.003231
  1.833333  0.051289  0.062461  0.003307
  1.916667  0.051289  0.065923  0.003381
  2.000000  0.051289  0.069363  0.003454
  2.083333  0.051289  0.072781  0.003525
  2.166667  0.051289  0.076173  0.003595
  2.250000  0.051289  0.079541  0.003663
  2.333333  0.051289  0.082883  0.003731
  2.416667  0.051289  0.086197  0.003797
  2.500000  0.051289  0.089483  0.003862
  2.583333  0.051289  0.092736  0.003925
  2.666667  0.051289  0.095957  0.003988
  2.750000  0.051289  0.099147  0.004050
  2.833333  0.051289  0.102299  0.005350
  2.916667  0.051289  0.105415  0.006488
  3.000000  0.051289  0.108491  0.007264
  3.083333  0.051289  0.111520  0.007900
  3.166667  0.051289  0.114514  0.008454
  3.250000  0.051289  0.117461  0.008954
  3.333333  0.051289  0.120359  0.009414
  3.416667  0.051289  0.123191  0.009842
  3.500000  0.051289  0.125981  0.010245
  3.583333  0.051289  0.128709  0.015034
  3.666667  0.051289  0.131372  0.017224
  3.750000  0.051289  0.133951  0.018974
  3.833333  0.051289  0.136464  0.020491
  3.916667  0.051289  0.138889  0.021856
  4.000000  0.051289  0.141213  0.023110
  4.083333  0.051289  0.143396  0.406571
  4.166667  0.051289  0.145396  1.099649
  4.250000  0.051289  0.147234  1.964854
  4.333333  0.051289  0.149001  2.909939
  4.416667  0.051289  0.150712  3.840993
  4.500000  0.051289  0.152344  4.668383
  4.583333  0.051289  0.154265  5.324119
  4.666667  0.051289  0.156030  5.785527
  4.750000  0.051289  0.157798  6.103540
  4.833333  0.051289  0.159563  6.501882
  4.916667  0.051289  0.161329  6.818422
  5.000000  0.051289  0.163095  7.120886
  5.083333  0.051289  0.164860  7.411003
  5.166667  0.051289  0.166627  7.690170
  5.250000  0.051289  0.168392  7.959543
  5.333333  0.051289  0.170159  8.220085
  5.416667  0.051289  0.171924  8.472613
  5.500000  0.051289  0.173690  8.717822
  END FTABLE  1
END FTABLES

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

```
WDM      1 EVAP     ENGL    1              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     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
RCHRES   1 HYDR   RO     1 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1007 STAG     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
```

Predeveloped 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: 1908/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-0.07723     0.00000  0.0000E+00     0.00000  -2.481E-10

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: 1968/ 8/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-2.925E-02     0.00000  0.0000E+00     0.00000  -6.544E-10

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: 1984/ 7/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-2.068E-02	0.00000	0.0000E+00	0.00000	-9.337E-10

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: 1986/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-1.281E-03	0.00000	0.0000E+00	0.00000	-1.624E-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: 1994/ 7/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-3.093E-03	0.00000	0.0000E+00	0.00000	-6.700E-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.

The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.

Disclaimer

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Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012
PROJECT REPORT

Project Name: 19078
Site Name: 1200 7th Street
Site Address: 1200 7th Street
City : Puyallup, WA
Report Date: 6/14/2022
Gage : 40 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2021/08/18
Version : 4.2.18

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	.49
Pervious Total	0.49

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.49

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Post Dev
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.209
Pervious Total	0.209

Impervious Land Use	acre
ROOF TOPS FLAT	0.108
PARKING FLAT	0.129
Impervious Total	0.237
Basin Total	0.446

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.011071
5 year	0.017034
10 year	0.020481
25 year	0.024215
50 year	0.026616
100 year	0.0287

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.087681
5 year	0.117746
10 year	0.139606
25 year	0.169531
50 year	0.193554
100 year	0.219108

Perlnd and Implnd Changes

No changes have been made.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 17 2021

<Name>

Circular

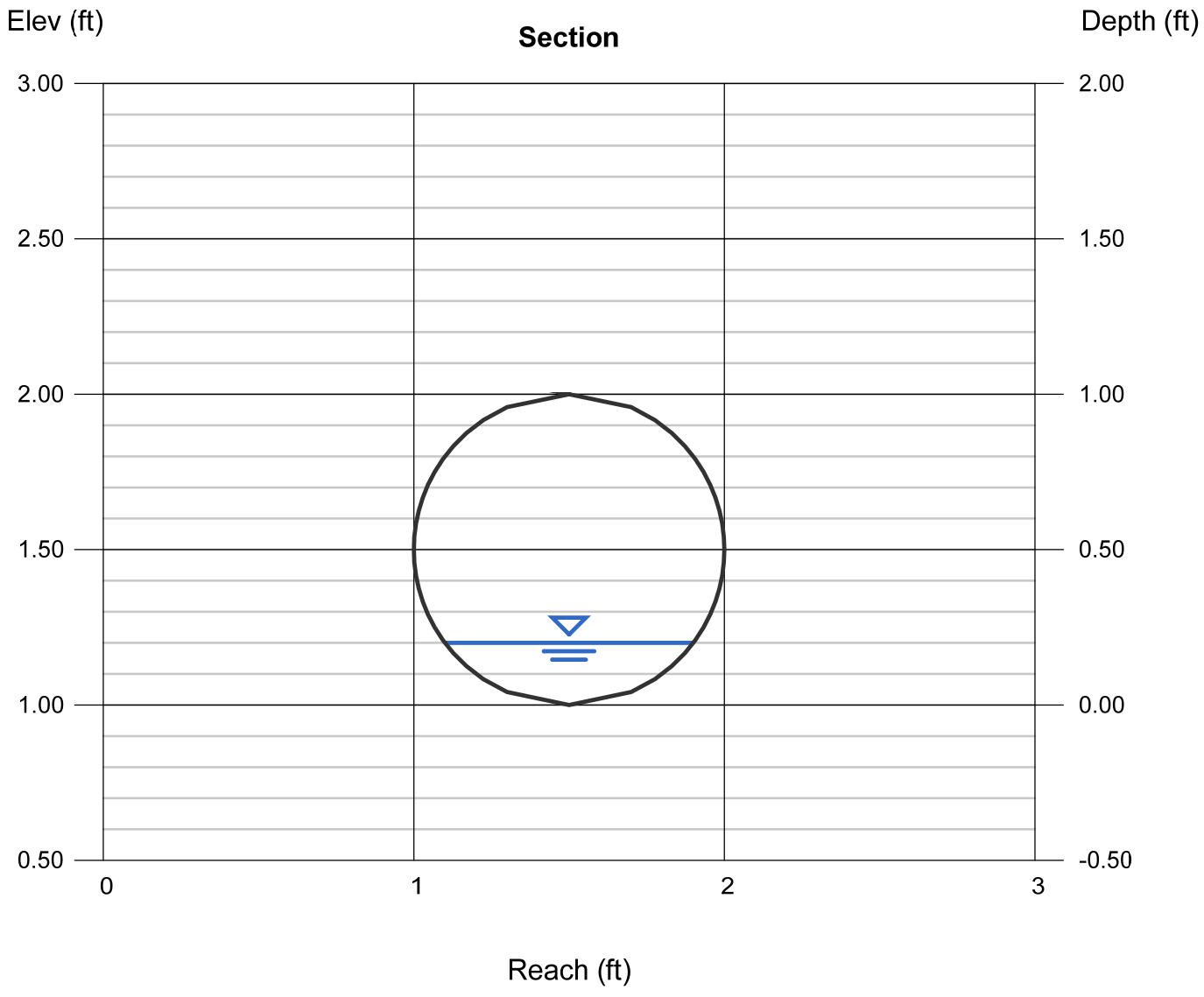
Diameter (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.22

Highlighted

Depth (ft)	= 0.20
Q (cfs)	= 0.220
Area (sqft)	= 0.11
Velocity (ft/s)	= 1.95
Wetted Perim (ft)	= 0.93
Crit Depth, Yc (ft)	= 0.20
Top Width (ft)	= 0.80
EGL (ft)	= 0.26



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jul 14 2022

8-inch PVC @ 0.30%; 80% Full

Circular

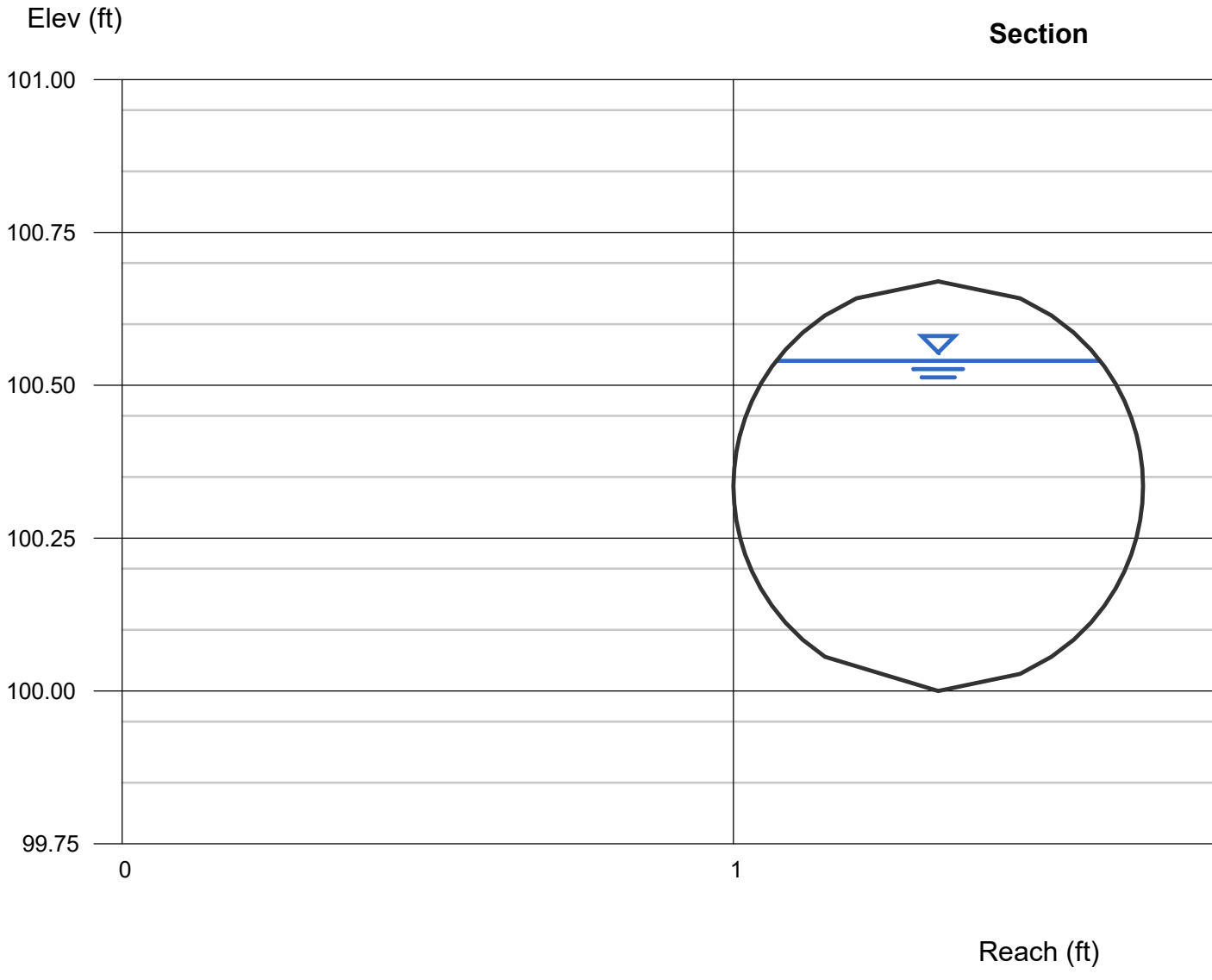
Diameter (ft)	= 0.67
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.54

Highlighted

Depth (ft)	= 0.54
Q (cfs)	= 0.660
Area (sqft)	= 0.30
Velocity (ft/s)	= 2.17
Wetted Perim (ft)	= 1.49
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 0.53
EGL (ft)	= 0.61



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jul 14 2022

8-inch PVC @ 0.30%; 100-year 0.22-CFS

Circular

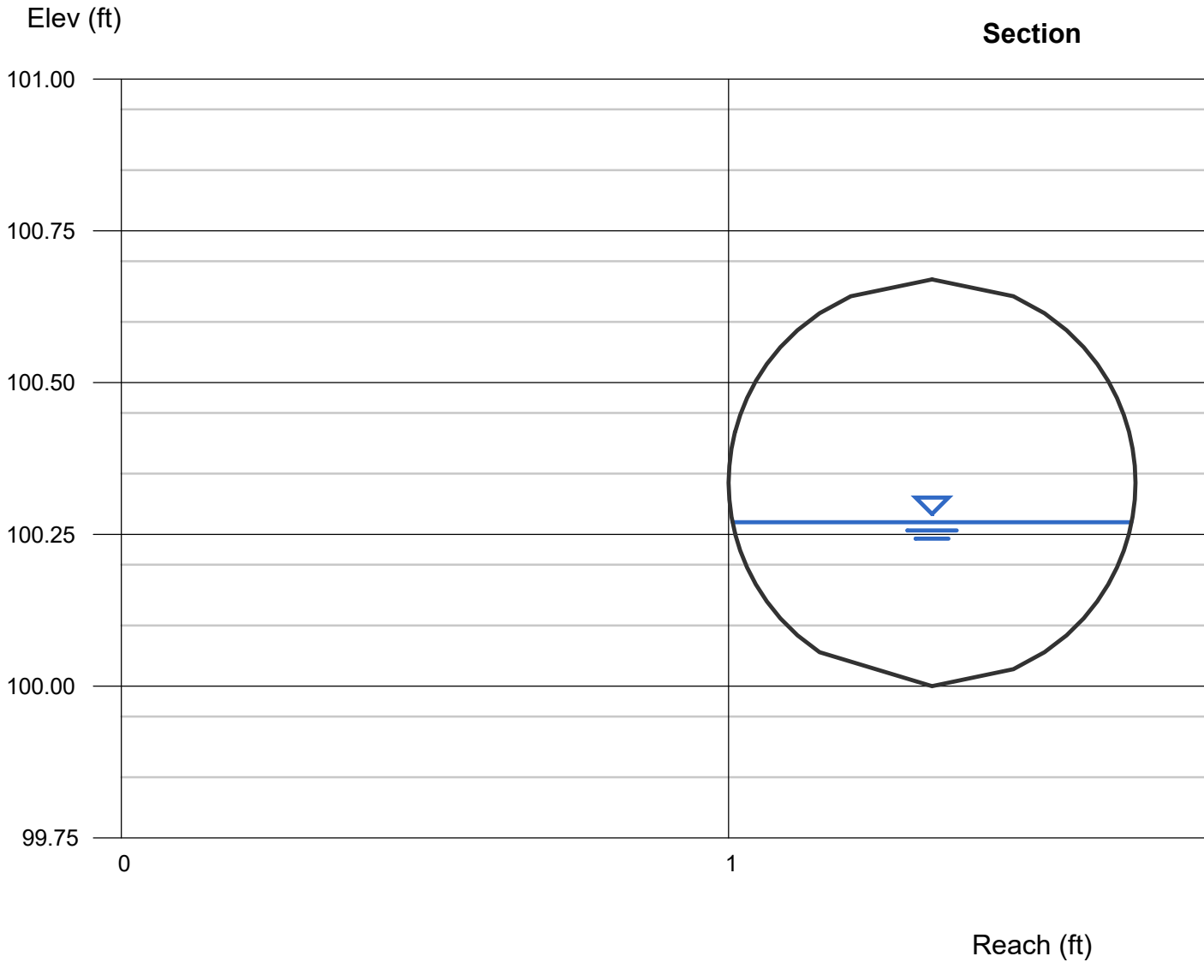
Diameter (ft)	= 0.67
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.22

Highlighted

Depth (ft)	= 0.27
Q (cfs)	= 0.220
Area (sqft)	= 0.13
Velocity (ft/s)	= 1.64
Wetted Perim (ft)	= 0.92
Crit Depth, Yc (ft)	= 0.22
Top Width (ft)	= 0.66
EGL (ft)	= 0.31



APPENDIX D

Other Studies

Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

April 9, 2020
Updated January 21, 2021
ES-7182

Tac Build, LLC
729 North Stadium Way
Tacoma, Washington 98403

Attention: Mr. Michael Hopkins

Subject: Preliminary Geotechnical Evaluation
Proposed Townhomes
1200 – 7th Avenue Southeast
Puyallup, Washington

Reference: CES NW, Inc.
Preliminary Site Plan, dated June 9, 2020

Puyallup Municipal Code (PMC) Chapter 21.06: Critical Areas

J. Eric Schuster et al.
Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington, 2015

Stephen P. Palmer et al.
Liquefaction Susceptibility Map of Pierce County, Washington, 2004

United States Department of Agriculture (USDA)
Natural Resources Conservation Service (NRCS)
Online Web Soil Survey (WSS) resource

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

Dear Mr. Hopkins:

As requested, Earth Solutions NW, LLC (ESNW), has prepared this letter for the proposed project. The letter was prepared in general accordance with the scope of services outlined in the November 2020 change order to our original proposal, which was authorized by you. A summary of the subsurface exploration on site and preliminary geotechnical recommendations to aid with the site design are provided in this letter.

Project Description

We understand that the existing improvements will be razed, and a new townhome development will be constructed. The proposal consists of six townhomes, a parking area (providing access from 7th Avenue Southeast), and an open space area between the proposed townhomes and the southern property line.

The referenced preliminary site plan indicates the parking area is to be comprised of pervious pavement. Based on our discussion with the project civil engineer as a result of our subsurface exploration, we understand that the stormwater management scheme may be modified.

Surface Conditions

The subject site is located south of the intersection between 7th Avenue Southeast and 12th Street Southeast, in Puyallup, Washington. The approximate location of the property is illustrated on Plate 1 (Vicinity Map). The site consists of one tax parcel (Pierce County Parcel No. 7845001330), totaling about 20,000 square feet. The site is surrounded to the east, south, and west by residential structures and to the north by 7th Avenue Southeast.

Subsurface Conditions

An ESNW representative observed, logged, and sampled three test pits on March 5, 2020. Three additional test pits were excavated on December 22, 2020. The test pits were excavated within accessible site areas, using a mini trackhoe and operator retained by ESNW. The test pits were completed to evaluate and classify site soils, characterize groundwater conditions within accessible site areas, and perform in-situ infiltration testing.

The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the attached test pit logs for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil and Fill

Where encountered at surface grades, the topsoil was about 6 to 12 inches thick. The topsoil was characterized by the observed dark brown hue, the presence of fine organics, and small root intrusions.

Fill was encountered at test pit locations TP-1, TP-2, TP-5, and TP-6 to depths of about two to four feet below the existing ground surface (bgs). The fill was characterized as sandy silt and poorly graded sand with silt, in a loose to medium dense and moist to wet condition. Small pieces of brick and glass were observed in the fill.

Native Soil

Underlying the topsoil and fill, native soil consisted primarily of poorly graded sand (USCS: SP or SP-SM) with layers of sandy silt (USCS: ML) present. The poorly graded sand layer ranged in thickness between about three feet to more than seven feet. The in-situ density of the native soil was characterized primarily as “medium dense” at each test location, and the in-situ moisture content was characterized as “moist” or “wet” depending on the presence of groundwater. The maximum exploration depth was approximately nine feet bgs.

Geologic Setting

The referenced geologic map resource identifies alluvium (Qa) as the primary native soil unit underlying the subject site and proximate areas. As reported on the geologic map resource, alluvium is typified by well-rounded and moderately to well-sorted beds of fluvial silt, sand, and gravel. The referenced WSS resource identifies Puyallup fine sandy loam (Map Unit Symbol: 31A) as the primary soil unit underlying the subject development area. The Puyallup series was formed in alluvial deposits as a result of the Mount Rainier watershed. Based on our field observations, the on-site native soil is consistent with the local geologic mapping of alluvium.

Groundwater

The groundwater table was encountered at all test pits during our March 2020 and December 2020 explorations at depths of about three and one-half to five-and-one-half feet bgs. Groundwater was allowed to stabilize at TP-4 to a depth of approximately four feet bgs. Shallower groundwater seepage was encountered at depths of roughly two-and-one-half and three feet bgs. It should be noted that seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Geologically Hazardous Areas

We reviewed the referenced PMC chapter to determine the presence of geologically hazardous areas on site. Based on our field observations and our review of the PMC, the subject site lies within a seismic hazard area. The three remaining geologically hazardous areas recognized by the PMC—erosion hazard area, landslide hazard area, and volcanic hazard area—are not applicable to the subject site.

According to PMC 21.06.1210(3)(c), seismic hazard areas are defined as “areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement or subsidence, soil liquefaction, or tsunamis.” The referenced liquefaction susceptibility map indicates the site and surrounding areas possess high liquefaction susceptibility. Based on our field observations, it is our opinion that the site is correctly mapped within a seismic hazard area, and the site possesses moderate to high susceptibility to liquefaction during a seismic event. Given the level of existing development surrounding the subject site, it is our opinion that the presence of a seismic hazard area does not preclude the proposed townhome development; however, appropriate mitigation measures should be incorporated into the plans, as discussed in this letter.

Preliminary Geotechnical Recommendations

The primary geotechnical considerations for the proposal are associated with structural fill placement and compaction, earthwork and grading activities, foundation support, and stormwater management. Based on our field observations and our understanding of the proposed development, pertinent geotechnical recommendations and design parameters are provided below.

In-situ and Imported Soil

The native alluvium is moisture sensitive, and successful use of the native alluvium as structural fill will largely be dictated by the moisture content at the time of placement and compaction. If the native alluvium cannot be successfully compacted, the use of an imported soil may be necessary.

Performing grading activities during summer months of relatively low rainfall activity is recommended to minimize site degradation. In our opinion, a contingency should be provided in the project budget for the export of soil that cannot be successfully compacted as structural fill, particularly if grading activities take place during periods of extended rainfall activity. In general, soil with an appreciable fines content (greater than 5 percent) typically degrades rapidly when exposed to periods of rainfall.

Imported soil intended for use as structural fill should be evaluated by ESNW during construction. The imported soil must be able to achieve the necessary moisture content, as determined by the Modified Proctor Method (ASTM D1557), at the time of placement and compaction. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. Structural fill placed and compacted during site grading activities should meet the following specifications:

- Structural fill material — Granular soil*****
- Moisture content — At or slightly above optimum†
- Relative compaction (minimum) — 95 percent (Modified Proctor)
- Loose lift thickness (maximum) — 12 inches

* *The existing soil may not be suitable for use as structural fill unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction*

† *Soil shall not be placed dry of optimum and should be evaluated by ESNW during construction*

Foundations

The proposed residential structures may be supported on conventional continuous and spread footing foundations bearing on either compact structural fill or competent native soil. In general, competent native soil should be encountered at a depth of roughly two to three feet bgs. Existing fill intended for reuse as structural fill must be free of debris and should be evaluated by ESNW prior to use. In general, if loose or unsuitable soil conditions are exposed at foundation subgrade elevations, additional mechanical compactive effort or overexcavation and replacement with suitable structural fill will likely be necessary.

Provided foundations will be supported as prescribed, the following parameters may be used for design:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 250 pcf (equivalent fluid)
- Coefficient of friction 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factor-of-safety of 1.5. With structural loading as expected, about one inch of total static settlement and about one-half inch of differential static settlement is anticipated. Most of the anticipated settlement should occur during construction when dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. Based on the soil conditions observed at the test pit locations, in accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class E should be used for design.

As summarized in the *Geologically Hazardous Areas* section of this letter, site susceptibility to liquefaction is characterized as moderate to high. Based on our experience with alluvial soil, liquefaction-induced settlement of the native soil may be roughly two to four inches and would likely not occur uniformly. ESNW can provide supplementary recommendations for soil improvement if the settlement estimates provided in this section are not tolerable, which may include a surcharge program, using grid foundations supported on at least two feet of structural fill, or pile-supported foundations.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed residential structures should be supported on firm and unyielding subgrades comprised of competent native soil, compacted structural fill, or new structural fill. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break, consisting of at least four inches of free-draining crushed rock or gravel, should be placed below each slab. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below each slab should be considered. If a vapor barrier is to be utilized, it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

- Active earth pressure (unrestrained condition) — 40 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 60 pcf
- Traffic surcharge* (passenger vehicles) — 70 psf (rectangular distribution)
- Passive earth pressure — 250 pcf (equivalent fluid)
- Coefficient of friction — 0.35
- Seismic surcharge — 8H psf†

* *Where applicable*
† *Where H equals the retained height (in feet)*

The above design parameters are based on a level backfill condition and level grade at the wall toe under the assumption that native soil will be retained. If a significant zone of imported structural fill will be retained directly behind the wall, less stringent design parameters can be provided. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Drainage

Groundwater will likely be encountered in site excavations, especially those necessary to construct utility trenches. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Infiltration Evaluation

The referenced preliminary site plan indicates the parking area will be comprised of pervious pavement. ESNW performed one small-scale Pilot Infiltration Test (PIT) at TP-5 at a depth of approximately three and one-half feet bgs. The PIT was performed outside of the building footprint. During the soaking and test periods, no measurable rate was obtained, i.e., the infiltration rate was 0 inches per hour. After the PIT was deemed complete, the test pit was advanced an additional five and one-half feet. Groundwater seepage was observed directly beneath the test depth and on intermittent silt layers, to the maximum exploration depth of about nine feet bgs.

Based on the results of our testing, ESNW interprets the sandy silt to represent an impermeable layer. Per the guidance provided in BMP T5.15 of the referenced 2014 Manual, endorsed by the City of Puyallup, it is our opinion that the impermeable sandy silt layer would create saturated conditions within one foot of the bottom of the lowest pavement gravel base course. As such, permeable pavement should not be considered feasible from a geotechnical standpoint. In addition, the presence of relatively shallow groundwater would preclude the use of deeper infiltration galleries.

In general, based on our field observations, the subject site is not suitable for infiltration. The presence of both uniform, shallow groundwater conditions and a uniformly present impermeable layer render infiltration impracticable from a geotechnical standpoint.

Limitations

This letter has been prepared for the exclusive use of Tac Build, LLC, and its representatives. No warranty, express or implied, is made. The recommendations and conclusions provided in this letter are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. Variations in the soil and groundwater conditions encountered at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the contents of this letter if variations are encountered.

We trust this letter meets your current needs. Please call if you have any questions about this letter or if we can be of further assistance.

Sincerely,

EARTH SOLUTIONS NW, LLC

01/21/2021

Samuel E. Suruda, G.I.T.
Staff Geologist

Keven D. Hoffmann, P.E.
Senior Project Manager

Attachments: Plate 1 – Vicinity Map
Plate 2 – Test Pit Location Plan
Plate 3 – Retaining Wall Drainage Detail
Plate 4 – Footing Drain Detail
Test Pit Logs
Grain Size Distribution

cc: CES NW, Inc.
Attention: Mr. Daniel Smith, P.E. (Email only)

Reference:
Pierce County, Washington
OpenStreetMap.org

NORTH

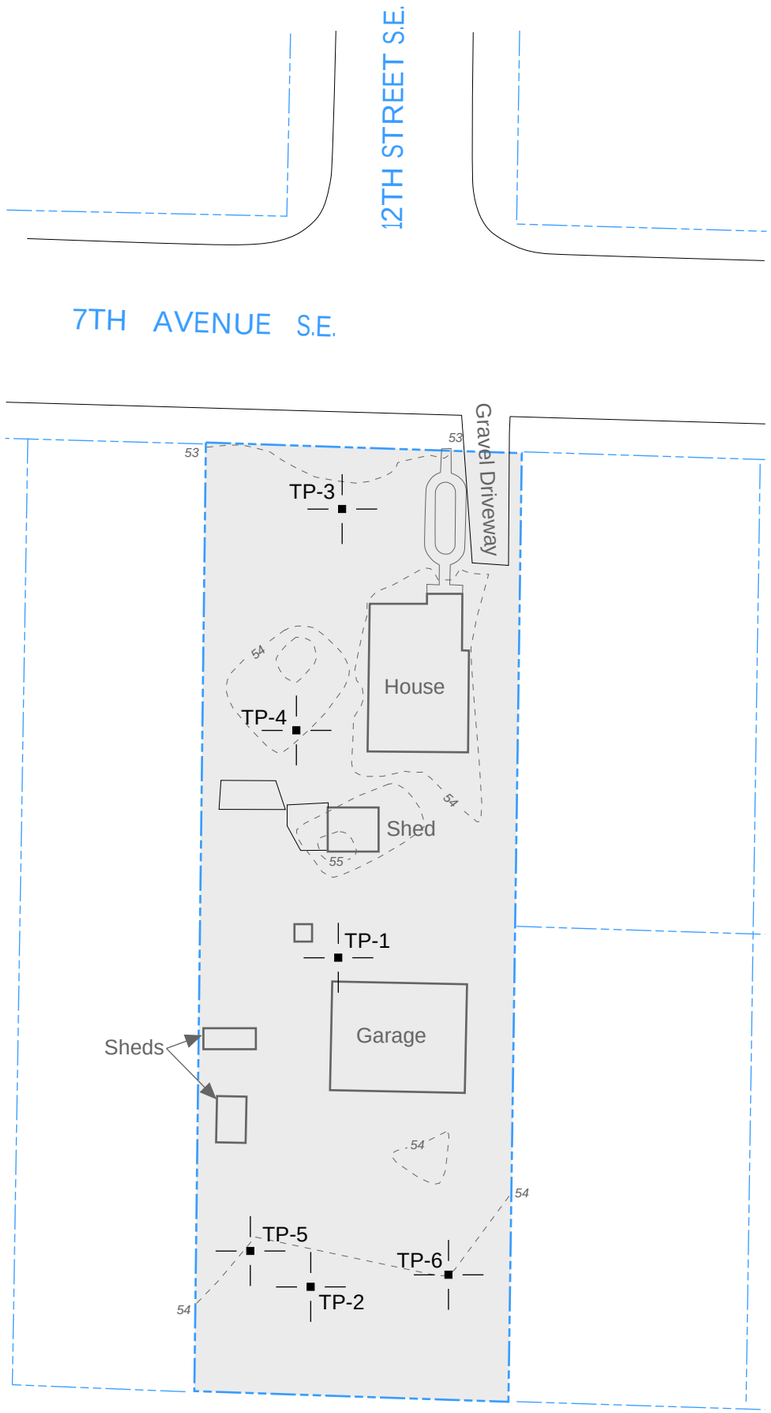
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
1200 – 7th Ave Townhomes
Puyallup, Washington

Drwn. MRS	Date 01/19/2021	Proj. No. 7182
Checked SES	Date Jan. 2021	Plate 1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-7182, Mar./Dec. 2020

Subject Site

Existing Building

NORTH

1"=40'

0 20 40 80

Scale in Feet

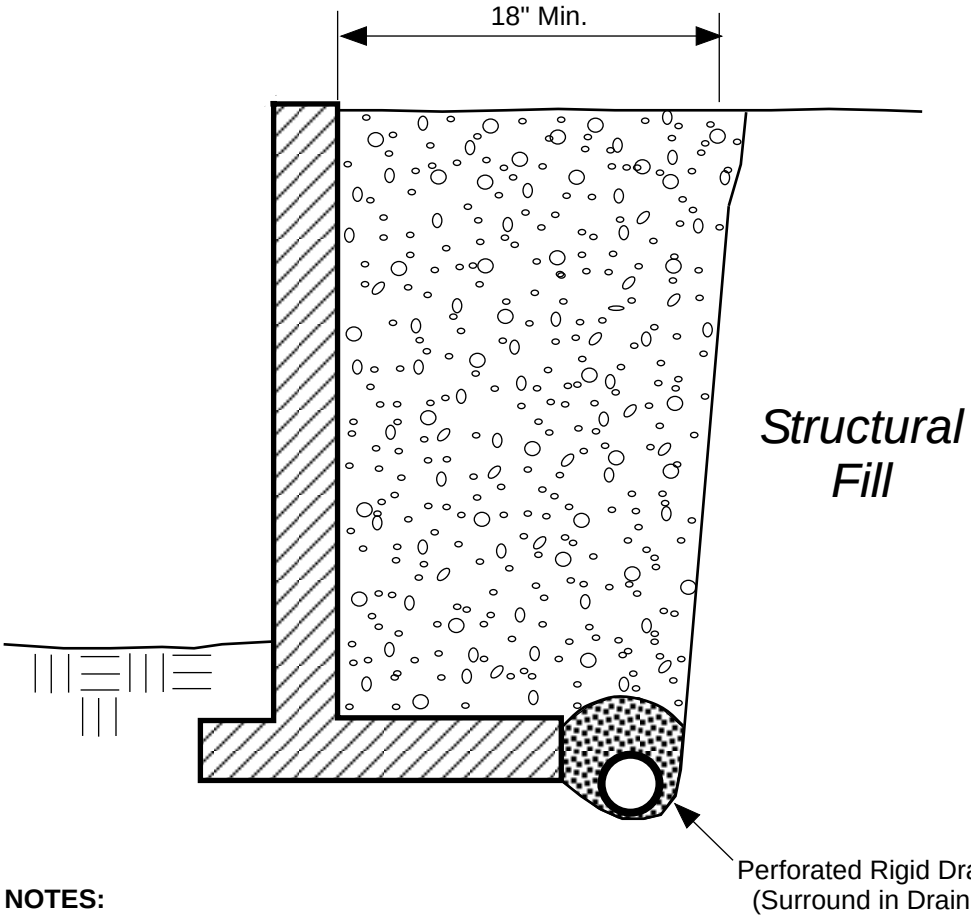
NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Test Pit Location Plan
1200 – 7th Ave Townhomes
Puyallup, Washington

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Drwn. By	MRS
Checked By	SES
Date	01/19/2021
Proj. No.	7182
Plate	2



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

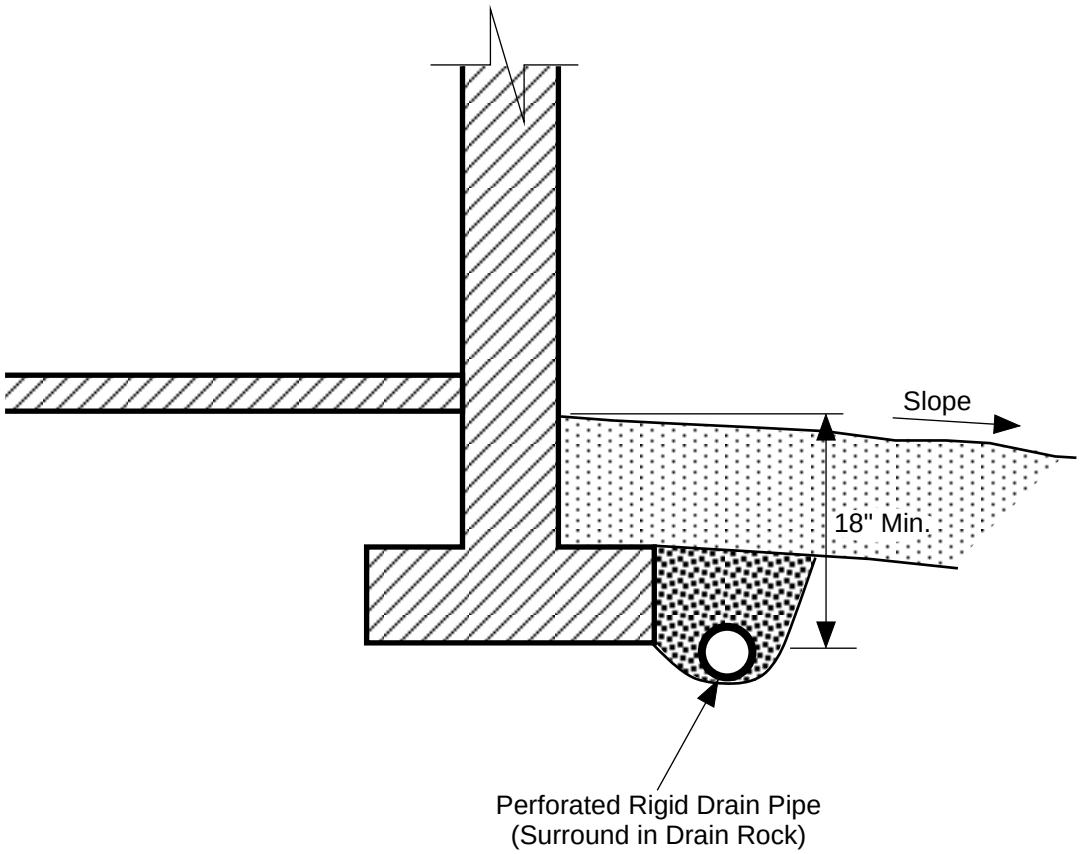
Free-draining Structural Backfill

1-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Retaining Wall Drainage Detail
1200 – 7th Ave Townhomes
Puyallup, Washington

Drwn. MRS	Date 01/19/2021	Proj. No. 7182
Checked SES	Date Jan. 2021	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal: native soil or other low-permeability material.

1-inch Drain Rock

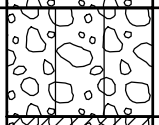
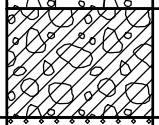
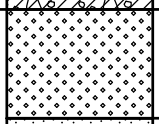
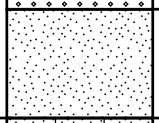
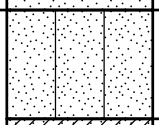
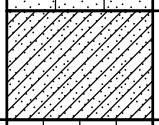
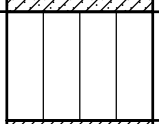
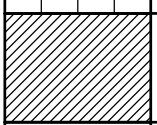
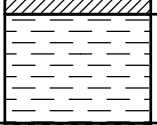
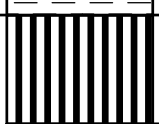
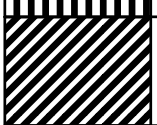
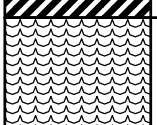
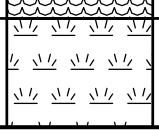
Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Footing Drain Detail
1200 – 7th Ave Townhomes
Puyallup, Washington

Drwn. MRS	Date 01/19/2021	Proj. No. 7182
Checked SES	Date Jan. 2021	Plate 4

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

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

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 – 7th Ave Townhomes

DATE STARTED 3/5/20 **COMPLETED** 3/5/20 **GROUND ELEVATION** 55 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD ▽ **AT TIME OF EXCAVATION** 5.5 ft

LOGGED BY SES **CHECKED BY** KDH **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL (Fill)	
				1.0		54.0
			SP-SM		Dark gray poorly graded SAND with silt, loose to medium dense, moist (Fill)	
		MC = 8.7% Fines = 7.9%			-moderate caving to BOH	
					-groundwater seepage	
				4.0	[USDA Classification: slightly gravelly SAND]	51.0
5		MC = 32.2%	ML		Dark gray sandy SILT, medium dense, wet	
					▽ -groundwater table, becomes water bearing	
		MC = 27.7%		7.0		48.0

Test pit terminated at 7.0 feet below existing grade due to caving. Groundwater seepage encountered at 3.0 feet and groundwater table encountered at 5.5 feet during excavation. Caving observed from 2.0 feet to BOH.

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TEST PIT NUMBER TP-2

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 – 7th Ave Townhomes

DATE STARTED 3/5/20 **COMPLETED** 3/5/20 **GROUND ELEVATION** 54 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD ▽ **AT TIME OF EXCAVATION** 5.5 ft

LOGGED BY SES **CHECKED BY** KDH **AT END OF EXCAVATION** ---

NOTES Surface Conditions: grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0					Gray sandy SILT, loose to medium dense, wet (Fill)	
		MC = 33.0% Fines = 87.5%	ML		-mottled texture [USDA Classification: slightly gravelly LOAM]	
				2.0		52.0
			SP-SM		Dark gray poorly graded SAND with silt, medium dense, moist -groundwater seepage -moderate caving to BOH -becomes wet	
5		MC = 17.4% Fines = 5.8%			▽ [USDA Classification: gravelly SAND] -groundwater table	
				6.0		48.0
		MC = 71.6%	ML		Gray SILT, medium dense, water bearing -wood debris	
		MC = 31.9% Fines = 25.3%		8.0	[USDA Classification: slightly gravelly LOAM]	46.0

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 3.0 feet and groundwater table encountered at 5.5 feet during excavation. Caving observed from 4.0 feet to BOH

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TEST PIT NUMBER TP-3

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 – 7th Ave Townhomes

DATE STARTED 3/5/20 **COMPLETED** 3/5/20 **GROUND ELEVATION** 53 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD ▽ **AT TIME OF EXCAVATION** 5.0 ft

LOGGED BY SES **CHECKED BY** KDH **AT END OF EXCAVATION** ---

NOTES Surface Conditions: grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, medium dense, moist
		MC = 26.9% Fines = 56.3%	ML		-root intrusions to 1.5'
					-massive (blocky) bedding, iron oxide staining
					[USDA Classification: slightly gravelly LOAM]
					-groundwater seepage at 2.5'
2.5					50.5
		MC = 19.9% Fines = 4.0%	SP		Dark gray poorly graded SAND, medium dense, wet
					[USDA Classification: slightly gravelly coarse SAND]
					-moderate caving to BOH
5		MC = 25.3%		▽	-groundwater table, becomes water bearing
					-wood debris to BOH
8.5		MC = 45.9%			44.5

Test pit terminated at 8.5 feet below existing grade. Groundwater seepage encountered at 2.5 feet and groundwater table encountered at 5.0 feet during excavation. Caving observed from 4.0 feet to BOH.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 – 7th Ave Townhomes

DATE STARTED 12/22/20 **COMPLETED** 12/22/20 **GROUND ELEVATION** 54 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD ▽ **AT TIME OF EXCAVATION** 5.0 ft

LOGGED BY SES **CHECKED BY** KDH **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		0.5 Dark brown TOPSOIL, minimal root intrusions	53.5
					Black poorly graded SAND, medium dense, damp	
		MC = 8.5%				
		MC = 14.8%	SP			
					-groundwater table (after excavation)	
5					▽ -moderate caving to BOH	
					-groundwater table (during excavation)	
		MC = 28.8%			7.0	47.0

Test pit terminated at 7.0 feet below existing grade. Groundwater table stabilized at 4.0 feet during excavation. Caving observed from 4.0 feet to BOH.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-5

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 – 7th Ave Townhomes

DATE STARTED 12/22/20 **COMPLETED** 12/22/20 **GROUND ELEVATION** 54 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY SES **CHECKED BY** KDH **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, shallow root intrusions (Fill)	
				1.0		53.0
			Fill		Construction debris (bricks, wood) (Fill)	
				2.5		51.5
		MC = 39.3% Fines = 71.9%	ML		Gray sandy SILT, stiff, wet -infiltration test [USDA Classification: slightly gravelly LOAM] -groundwater seepage -moderate caving to BOH	
5				5.0		49.0
		MC = 34.7%	SP		Black poorly graded SAND, medium dense, wet -interbedded silt layers -wood pieces present in silt	
		MC = 22.2% Fines = 1.3%		9.0	[USDA Classification: slightly gravelly SAND]	45.0

Test pit terminated at 9.0 feet below existing grade. Groundwater seepage encountered at 3.5 feet during excavation. Caving observed from 4.0 feet to BOH.

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Redmond, Washington 98052
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TEST PIT NUMBER TP-6

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 – 7th Ave Townhomes

DATE STARTED 12/22/20 **COMPLETED** 12/22/20 **GROUND ELEVATION** 54 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD ▽ **AT TIME OF EXCAVATION** 7.0 ft

LOGGED BY SES **CHECKED BY** KDH **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, minimal root intrusions (Fill)	
				1.0		53.0
			Fill		Construction debris in ML (bricks, wood) (Fill)	
				2.5		51.5
			ML		Gray sandy SILT, stiff, wet -mottled texture -groundwater seepage, moderate caving to BOH	
		MC = 41.1%				
5				5.0		49.0
			SP-SM		Black poorly graded SAND with silt, medium dense, wet -interbedded ML layers 1.5" thick ▽ -groundwater table	
		MC = 36.5%		8.0		46.0

Test pit terminated at 8.0 feet below existing grade. Groundwater table encountered at 7.0 feet and groundwater seepage encountered at 3.5 feet during excavation. Caving observed from 3.5 feet to BOH.

Earth Solutions NW, LLC
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Telephone: 425-449-4704
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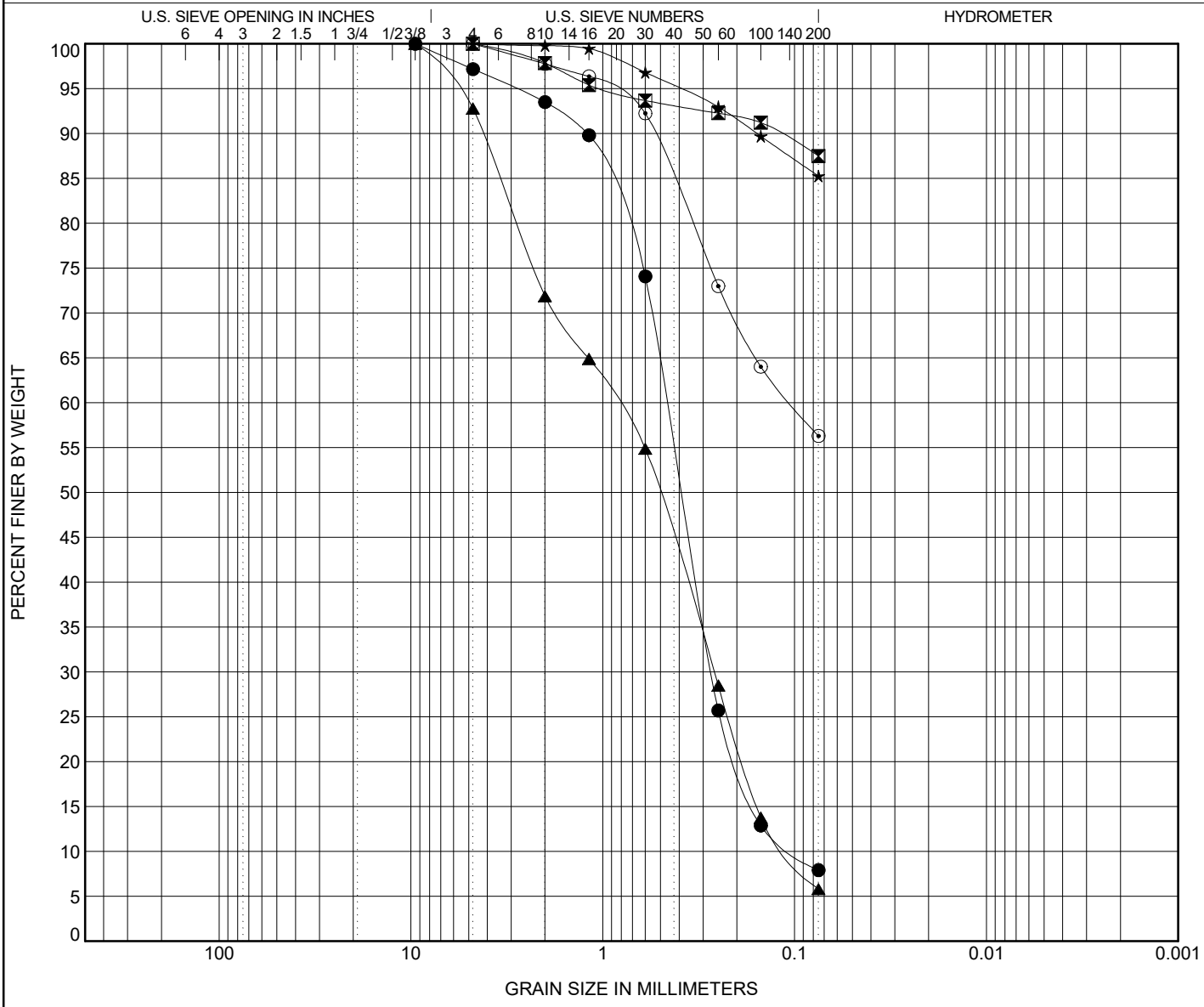
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 - 7th Ave Townhomes



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	Cc	Cu
●	TP-01	3.0ft.	USDA: Dark Gray Slightly Gravelly Sand. USCS: SP-SM.	1.56	4.63
⊠	TP-02	1.5ft.	USDA: Gray Slightly Gravelly Loam. USCS: ML.		
▲	TP-02	5.0ft.	USDA: Dark Gray Gravelly Sand. USCS: SP-SM.	0.75	7.86
★	TP-02	7.0ft.	UDSA: Gray Slightly Gravelly Loam. USCS: ML.		
⊙	TP-03	1.0ft.	USDA: Brown Slightly Gravelly Loam. USCS: Sandy ML.		

Specimen Identification			D100	D90	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	TP-01	3.0ft.	9.5	1.215	0.465	0.27	0.1				7.9	
⊠	TP-02	1.5ft.	4.75	0.12							87.5	
▲	TP-02	5.0ft.	9.5	4.232	0.849	0.263	0.108				5.8	
★	TP-02	7.0ft.	4.75	0.157							85.3	
⊙	TP-03	1.0ft.	4.75	0.542	0.105						56.3	

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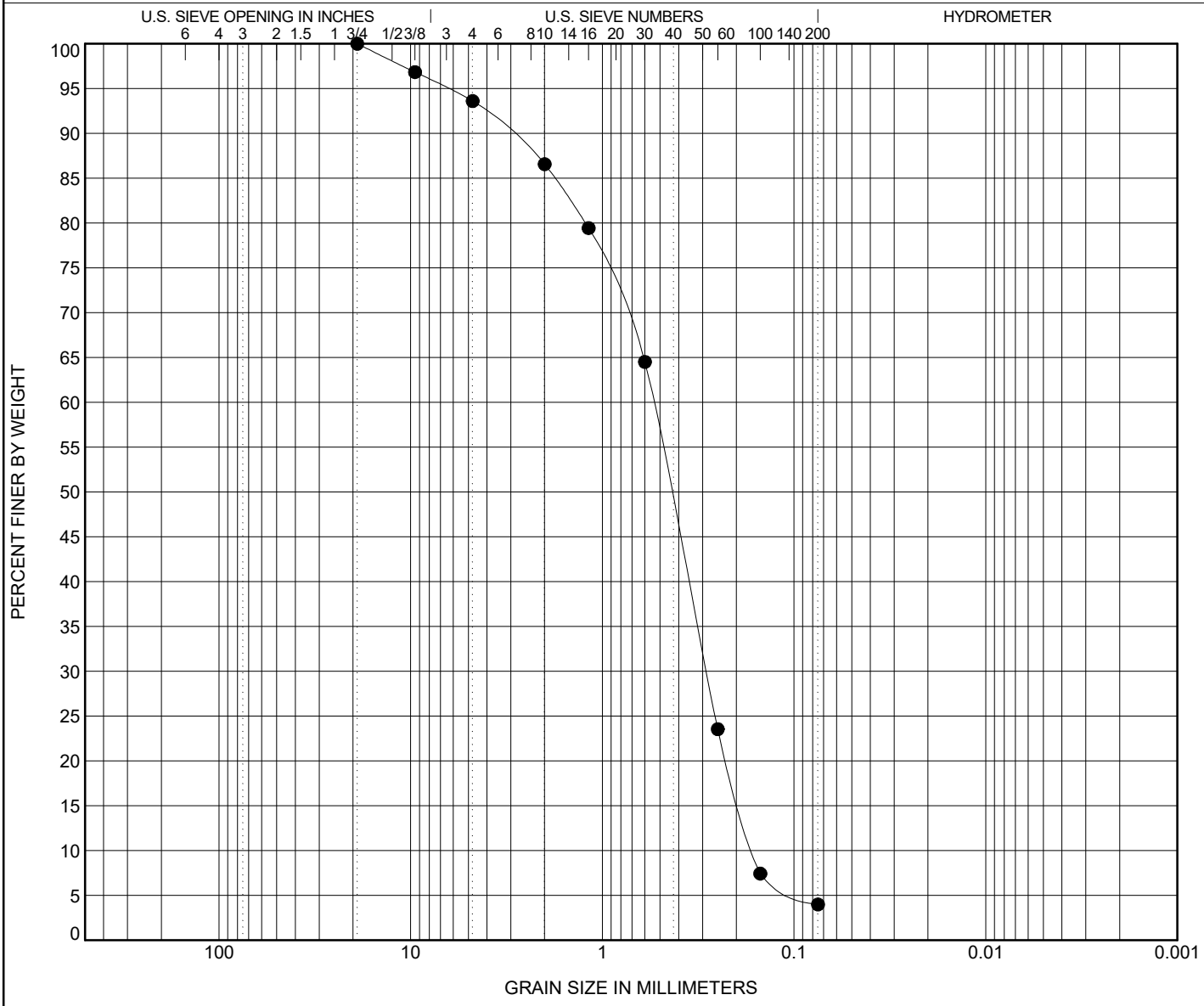
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 - 7th Ave Townhomes



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● **TP-03**	**3.0ft.**	**UDSA: Dark Gray Slightly Gravelly Coarse Sand. USCS: SP.**	**0.93**	**3.35**

Specimen Identification		D100	D90	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● **TP-03**	**3.0ft.**	**19**	**3.051**	**0.545**	**0.287**	**0.163**				**4.0**	

GRAIN SIZE USDA WITH D90 ES-7182 1200 - 7TH AVE TOWNHOMES.GPJ GINT US LAB.GDT 4/9/20

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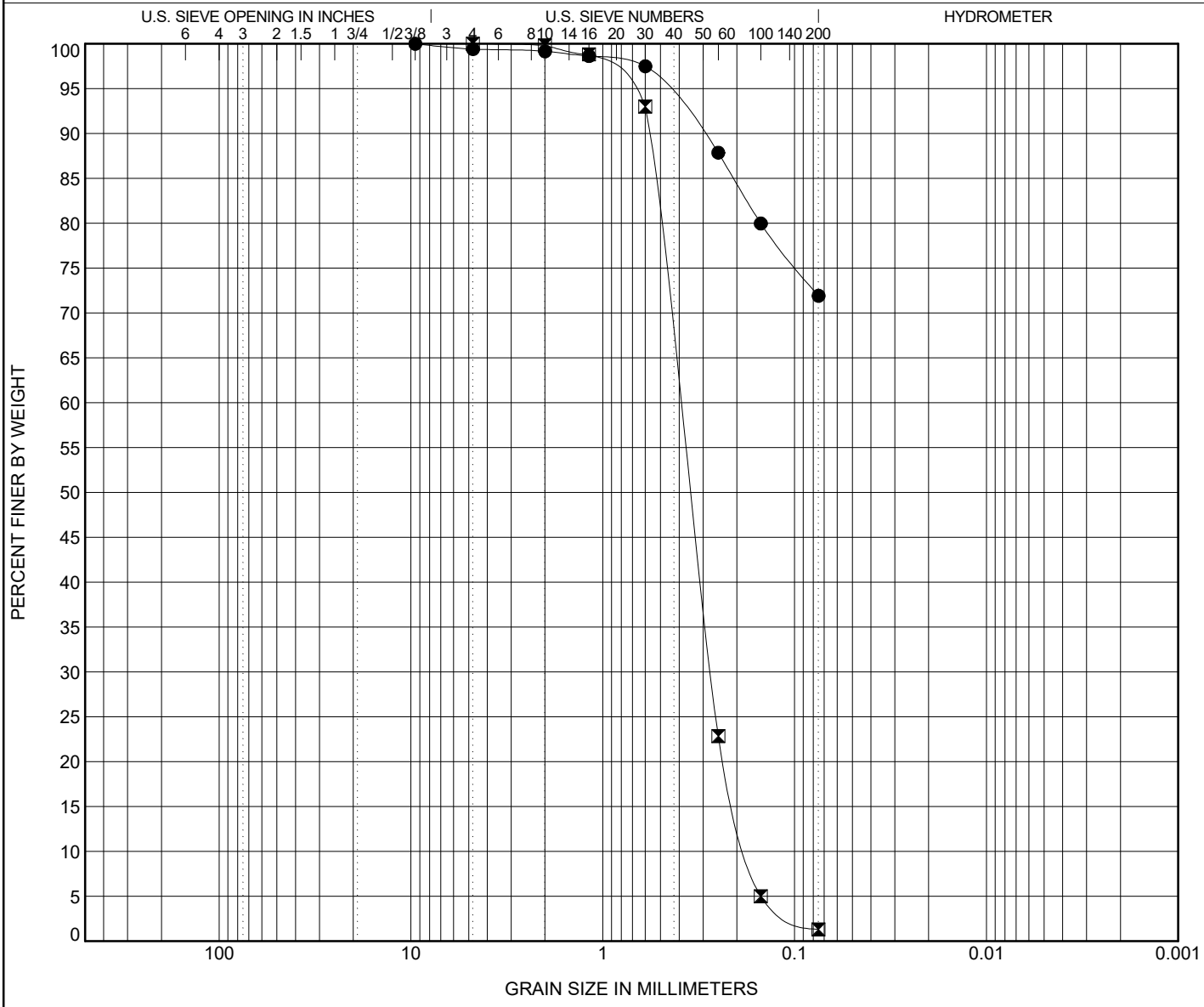
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-7182 **PROJECT NAME** 1200 - 7th Ave Townhomes



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	Cc	Cu
●	**TP-05**	**3.50ft.**	**USDA: Gray Slightly Gravelly Loam. USCS: ML with Sand.**		
⧓	**TP-05**	**9.00ft.**	**USDA: Gray Slightly Gravelly Sand. USCS: SP.**	**1.09**	**2.30**

Specimen Identification			D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**TP-05**	**3.5ft.**	**9.5**							**71.9**	
⧓	**TP-05**	**9.0ft.**	**4.75**	**0.397**	**0.273**	**0.173**				**1.3**	

GRAIN SIZE USDA ES-7182 1200 - 7TH AVE TOWNHOMES.GPJ GINT US LAB.GDT 12/28/20