-The proposed engineered fill below the permeable pavement section must comply with the Soil Suitability Criteria for treatment...otherwise, permeable pavement is infeasible. Provide acknowlegement from a licensed geotechnical engineer that the proposed import fill can/will meet the treatment criteria as well as the assumed infiltration rate. [Storm Report; Cover]

2nd Review
P21-0025

STORMWATER SITE PLAN REPORT

EAST TOWN CROSSING

Shaw Road and Pioneer Way East
Puyallup, Washington

-At time of civil application, the geotechnical engineer shall provide specifications for the engineered fill considering structural stability and hydraulic conductivity with an emphasis on long-term performance.-At time of civil application, the geotechnical engineer shall address concerns associated with potential lateral flow leaving the site due to the shallow depth to native soils and associated restrictive layers. -At time of construction, engineered fill shall be field tested using Small Scale PIT testing at a frequency specified by the Ecology Manual for both the permeable pavement and any bioretention BMPs.-The preliminary storm report indicates the use of run-on onto permeable pavement areas. Please be aware that permeable pavement must be used for any pavement areas where feasible. -Also, at time of civil application, the applicant shall provide measures to minimize the potential for clogging and long-term performance concerns associated with run-on from landscape areas.[Storm Report; Cover]

Review comments associated with the preliminary storm report may be addressed through the Preliminary Site Plan Application, P-21-0034 so that the Short Plat Application, P-21-0025, may continue through landuse process independently. [Storm Report; Cover]

Job #06-171-01

Revised December 15th, 2021
Revised April 1, 2021
July 30, 2020

Prepared for:
East Town Crossing LLC

2102 East Main Ave, Suite 109, Puyallup, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699 / Fax (253) 446-3159

Abbey Road GROUP

Service Disabled Veteran Owned Small Business

"I hereby state that this Stormwater Site Plan drainage report, for the East Town Crossing 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 for professional engineers. I understand that the City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

JEFFREY M. BROWN
STATE OF WASHINGTON
21792
REGISTERED
PROFESSIONAL ENGINEER

12-15-24

TABLE OF CONTENTS

***Note: This document provides digital bookmarks via Bluebeam Software for ease of readability and reference access.

APPENDIX D - PIONEER FRONTAGE BASIN:

- **Figure D1 – Pioneer Frontage Basin Map**
- **Figure D2 – Pioneer Frontage Flow Splitter Calculations Analysis**
- **Figure D3 – Pioneer Frontage Calculations WWHM Report**
- **Figure D4 – Existing Asphalt Flows WWHM Report**
- **Figure D5 – Pioneer New Improvements only WWHM Report**
- **Figure D6 – Flow Comparison New VS. Existing**

APPENDIX E – ONSITE BASIN:

- **Figure E1 - Onsite Basin Map**
- **Figure E2 – Onsite Stormwater Calculations WWHM Report**

APPENDIX F – ADDITIONAL PROJECT DETAILS:

- **Figure F1 - Porous Pavement Drivable Surface Detail**
- **Figure F2 - Porous Concrete Sidewalk Detail**
- **Figure F3 - DOE Figure V-5.3.4 Example of Permeable Pavement**
- **Figure F4 - 60" Flow Splitter Detail**
- **Figure F5 - Bio-Swale Details**
- **Figure F6 - Permeable Pavement Details**
- **Figure F7 - Project Access Sections**

Project Parcel Data

Existing Site:

The proposed project consists of seven original parcels that will be converted in to three parcel through the current Short Plat application that is currently under review with the City of Puyallup. The seven original parcels have been listed below with the parcel sizes included:

Parcel #	Area – Sq Ft	Acres
0420264021	95,396 Sq Ft	2.190 AC
0420264053	202,648 Sq Ft	4.652 AC
0420264054	43,338 Sq Ft	0.995 AC
0420351030	25,700 Sq Ft	0.590 AC
0420351029	25,265 Sq Ft	0.590 AC
0420351026	25,265 Sq Ft	0.590 AC
0420351066	58,789 Sq Ft	1.350 AC

Development Site:

Upon approval of the Proposed Short Plat the developed site shall consist of three parcels; two of which will be zoned as Commercial General (CG), and the third lot will be zoned as High Density Multiple-Family Residential (RM-20).

The projected development will require frontage improvements along Shaw Road E as well as Pioneer Way E. As this Short Plat request has not been finalized the current Right of Way dedication may still fluctuate in size as well as the individual lot sizes. The below table proves the most current projected areas for both ROW Dedication as well as Lot Sizes:

Designation	Zoning	Area (SQ FT)	Area (AC)
Lot #1	CG	28,824	0.66
Lot #2	CG	50,896	1.17
Lot #3	RM-20	361,495	8.3
ROW Dedication	N/A	24,775	0.57
Stream Enhancement Area	N/A	65,282	1.534

The proposed project also intends to provide "Stream Enhancement Areas" throughout the Stream Relocation Corridor which is required to insure frontage improvement standards can be achieved.

1.0 PROJECT OVERVIEW

Existing Site:

The site is located southeast of the intersection of Pioneer Way East and Shaw Road in Puyallup, WA. The site extends approximately 660 feet east from the intersection, 830 feet south from the intersection, and is irregularly shaped. Refer to the Vicinity Map (Figure A1) and Existing Site Conditions map (Figure A2) included in Appendix A.

The northern portion of the site is currently vacant, contains mostly pasture, and was filled under an approved grading permit. Existing buildings and parking areas occupy the southwest portion of the site.

Drainage from the existing site currently sheet flows to the north to the existing unnamed stream and City of Puyallup Maintained ditch along the south side of Pioneer Way East. Runoff in the ditch flows to the west and enters the public conveyance system / tributary stream to Deer Creek at the intersection of Pioneer Way East and Shaw Road.

Developed Site:

The proposed development has been broken down into three main stormwater basins. These basins have been identified in Figure A3 (Appendix A) Overall Basin Map. These three basin areas are as followed: *Shaw Road Frontage*, *Pioneer Way Frontage*, and the *Onsite Basin.* Each of these basins are unique and based on flow patterns and projected ownership of improvements deemed it necessary to provide individual basins for these areas. Individual Basin Maps and Calculations for these basins have been provided in their corresponding appendix, please reference the table of contents to be directed to each specific basin. In addition, individual basins the proposed development intends to convert and existing stormwater pond onsite to an underground gravel / glass bed stormwater filtration and detention system. Appendix B of this report goes in to finite detail of the conversion and provides accurate calculations to complete this conversion.

The site will have an access driveway from Shaw Road and an access driveway from Pioneer Way East. The proposed site will include Multi-Family Residential, Office/Commercial/Retail, and Mixed-Use structures, as well as drive aisles, parking areas, sidewalks, and recreational landscaping areas.

Off-Site Area

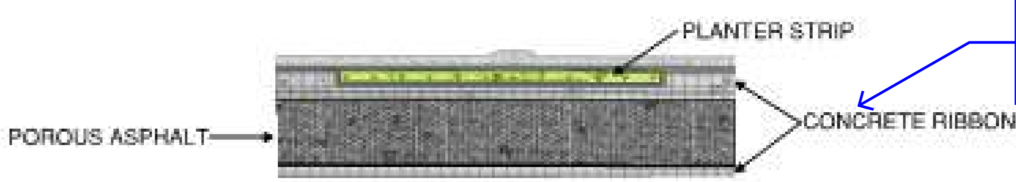
An off-site area, located south of the site, drains onto the project site. The off-site area, approximately 4.08 acres, contains office buildings, drive aisles, parking areas, sidewalks, and landscaping.

Currently, stormwater runoff from the off-site area is conveyed to a 2-celled water quality/detention pond located at the southeast portion of the project site. Discharge from the existing pond is conveyed in pipes to the north to the Pioneer Way roadside ditch. The ditch conveys flow to the west along Pioneer Way and discharges into an 18" culvert located south of Pioneer Way and east of the Pioneer Way/Shaw Road intersection. The culvert conveys flow under the Pioneer Way/Shaw Road intersection and discharges into the roadside ditch / tributary stream located north of Pioneer Way and west of the Pioneer Way/Shaw Road intersection. The roadside ditch / tributary stream conveys flow to the west along Pioneer Way, ultimately discharging to Deer Creek approximately 1,500 feet away. .

The project proposes to remove the existing 2-celled water quality/detention pond. The pond will be replaced with an engineered sized gravel /glass bend with 24" CMP Retention pipes. Located in Appendix B of this report is a full detailed conversion report that goes in to specifics on the sizing methods used along with projected flows of the converted system. The overall premise for the conversion is to provide an equivalent system that provides that same discharge flow rates based on the same projected volumes of the existing compromised system. The existing flow control structure will be retained, in order to replicate these existing flow that is directed in the same historic flow path as the existing system. Discharge from the gravel / glass bed will be conveyed in pipes north to Pioneer Way, to the west along Pioneer Way, and to the existing 18" culvert previously discussed.

Shaw Road Basin:

The Shaw Road Basin is required to meet the development improvement of the Shaw Road Shared Use Path Corridor. These improvements consist of 17.5-feet wide Pedestrian Access Path starting from the southern most point of the project traveling northern to the intersection of Shaw Road and Pioneer Way where this path transitions to typical frontage improvements. Based on the City of Puyallup Design parameters for this improvement and additional coordination with City Officials it was determined that the asphalt portion of the Shared Use Path can be converted to a Porous Asphalt Material to meet stormwater management minimum requirements for new or replaced impervious surface.



Per MR5 concrete area should be permeable if feasible. [Storm Report; Pg 4]

The above figure is an accurate representation of the proposed Shared Use Path with Porous Asphalt. Calculations have been made to insure that the Shaw Road

Improvements meet the Minimum Requirements per the stormwater design manual. These calculations can be viewed in Appendix C Figure C2- Shaw Road Calculations WWHM Report.

Pioneer Way Basin

The City's recommendation would be to connect the existing grass-lined ditch east of the project site with the proposed stream to avoid mixing "clean" ditch runoff and "clean" stream water with the polluted road runoff...see add'l review comments on Pioneer Basin Map, Appendix D. [Storm Report; Pg 5]

Existing Stream / Drainage Ditch Relocation:
The improvements required for Pioneer Way are extensively greater than those of Shaw Road. To meet the desires of the City of Puyallup requires the relocations of a newly defined stream that borders the subject parcels on the east and the north. This stream has historically been referred to as a drainage ditch and is currently maintained by the City of Puyallup. Through the fema flood zone reallocations process coupled with a number of wetlands and critical area reports it was determined that the historical ditch is truly a stream and thus any work within this area envelope will require an HPA permit through the Washington State Department of Fish and Wildlife. To provide the City of Puyallup with their desired frontage improvements along Pioneer Way the before mentions stream will have to be relocated and rechanneled per the WDFW required fish barring stream development guidelines. The general layout of the stream relocation has been provided in the Site Plan located in Appendix A Figure A4 – Site Plan. The formalized plans that will be submitted to WDFW will be drafted by the project lead Biologist with additional landscaping provided by the Landscaping Architect of this project.

Proposed Improvements:
Through coordination with the City of Puyallup, WDFW, and the Project Biologist it was determined that the Pioneer Way ditch line 50-feet east of the northeastern most property current is NOT considered a stream but is considered solely a drainage conveyance system that flows in to the stream. Based on the coordinated efforts of the City of Puyallup, WDFW, and the East Town Crossing Design team it was determined that it is an acceptable option to connect a closed piped conveyance system that woul bypass the majority of the stream relocation section and have these flows converge approximately 590-feet downstream from the point of connection. This bypass system consists of 12” stormwater pipe and 48” manholes spaced evenly to provide access points for cleaning and maintenance by the City of Puyallup.

At time of civil, the storm conveyance system along the frontage must be installed per City Stds in terms of alignment (CS Detail 01.01.14) and structures (CBs)...see add'l review comments on Pioneer Basin Map, Appendix D. [Storm Report; Pg 5]

Pioneer Way current is a crowned road with half of the existing asphalt flowing directly to the current stream / drainage ditch without any pretreatment currently in place to protect the stream from water quality issues and or flow frequency peaks. The propos Pioneer Way improvements projects to add additional driving surfaces, directional flow curb and gutter, 8-foot wide sidewalks, as well as 2-foot wide planter strips.

At time of civil, provide conveyance sizing calcs for trib. basin to ensure adequate capacity. [Storm Report; Pg 5]

2-ft planter allowed per discussions with City due to stream cooridor. [Storm Report; Pg5]

-This design approach appears to be recirculating stormwater between the splitter and the biocell...see add'l comments Pioneer Basin Map, Appendix D. [Storm Report; Pg 6]

60-in shown on Fig A4 [Storm Report; Pg6]

Sheet flow from the existing impervious road as well as the proposed drivable surface will be collected in the gutter system and flow westerly, as historical data confirms this flow direction. The proposed sidewalk will be graded in a manner that sheet flows any stormwater runoff through the 2-wide planter strip then in to the gutter system which then will also flow westerly. The flows from the sidewalks, proposed drivable surface, and existing flows will then converge at a 56-inch wide flow splitter manhole where the existing impervious flows will bypass through the system and be conveyed to a specified discharge point in the realigned stream conveyances system. The new development flow will be conveyed through the flow splitter and directed to an engineered calculated Bio-Swale System. This system provides water quality and flow control as required by the Minimum Requirements #5, #6, and #7. This system is designed with an underdrain as well as an overflow. A secondary flow control manhole will be provided in series to further reduce flows which was required to pass the modeled stream protection portion of the WWHM Model. This report can be found in Appendix D Figure D3 – Pioneer Frontage Calculations WWHM Report. The Bio-Swale for the Pioneer Frontage is approximately 4,020 SQ FT system lined under the gravel section. The proposed flow splitter orifices were sized based on the existing flows calculated through WWHM (Appendix D- Figure D4) in conjunction with the developed proposed improvements (Appendix D Figure D5) flows to determine a ratio for sizing. The existing flows are projected to encompass 46% of the total flows to the flow splitter. Making the new improvement approximately 54% of the total flows. A full breakdown for the flow splitter calculations have been provided in Appendix D Figure D2 Pioneer Frontage Flow Splitter Calculations Analysis.

Note: Any storm facility serving public infrastructure must be located in ROW or located in a tract dedicated to the City. [Storm Report; Pg 6]

Since flow control (MR7) is triggered, is the biocell large enough to treat (MR6) the entire frontage basin? This would eliminate the need for the "splitter" structure. Also, see add'l review comments on Pioneer Basin Map, Appendix D. [Storm Report; Pg 6]

Onsite Basin:

The Onsite Basi... ...cape court yards, curb and gutter, and Pedestrian Access Routes through out the project which connect to the frontage walkways.

Based on Geotechnical soils testing at a depth of two feet below existing grade the soils tested have been determined to be non-permeable and will constitute as the first restrictive layer. These testing locations where conducted with in the vicinity of the Seasonal High Groundwater Monitoring Points. Both test were conducted at a depth of two feet below existing grade. The existing grade for Groundwater Monitoring Point #1 is 72.84’ making the confirmed restrictive layer provided by the infiltration testing conducted at this point 70.84’. The existing grade for Groundwater Monitoring Point #2 is 74.13’ making the confirmed restrictive layer provided by the infiltration testing conducted at this point 72.13.Please refer to the following for Infiltration Testing Reports: Appendix A Figure A6 -Geotechnical Infiltrations Report.

Clarify...is the intent to strip the site to these lower elevations? Considering the results of the PIT testing, its obvious that any existing soil above the "restrictive layer" elevation is also non-infiltrative. [Storm Report; Pg 6]

As stated above Seasonal High Groundwater Testing was also conducted as part of this project, this report can be found in Appendix A – Figure A8. Over two years of monitoring the following elevations are determined to be the Seasonal High Groundwater Levels for their corresponding Monitoring Point.

Monitoring Well #1: Date: 1/31/2020 Elevation of Groundwater: 69.84’
Monitoring Well #2: Date: 1/31/2021 Elevation of Groundwater: 70.63’

To Summarize the restrictive layers associated with this project please refer to the below table:

Monitoring Point	Existing Elevation	1st Restrictive Layer NON-Permeable Soils	2nd Restrictive Layer Groundwater Elevation	Proposed Grade in Area
#1	72.84'	70.84'	69.84'	73.5' +/-
#2	74.14'	72.14'	70.63'	77.80' +/-

The provided table above clearly shows the defined restrictive soil layers that define this project. The above table also show that this site will require a substantial amount of Imported fill material. This imported fill material will be of an engineer fill that is both structurally sound within required compaction percentages for each given subgrade appurtenance and or building, but also be permeable with a minimum of 2” per hour. This engineered subgrade will then be utilized as this project infiltration zone. This engineered fill will be required to be maintain a minimum of 1-foot depth from the bottom of any porous pavement placed on site. 1- Foot separation between bottom of Permeable Facilities and the first restricted layer is required per the Stormwater Design Manual. Although the minimum requirement is one 1 it is the intent of this project to provide an average fill of engineered soils to the depth of 2-3feet depending on the fill required in specific locations.

NOTE: The engineered fill must also meet the WQ Soil Suitability Criteria per Ecology, Sect. 3.3.7, SSC-6. This will require geotechnical confirmation prior to short approval to ensure that permeable pavement is feasible. [Storm Report; Pg 7]

Stormwater Components:

The onsite basin map for this ba basin maps provided this basin map breaks down the total basin and all of the contributing impervious and pervious factors. The onsite stormwater management will be conducted through the permeable surfaces such as Porous Concrete Sidewalks and Porous Asphalt Drivable Surfaces. The contributing factor elements are defined below:

Sidewalks, Additional Hard Surfaces, Landscaping

Stormwater runoff from concrete surfaces throughout the site as well as Landscaping Components will sheet flow to either Porous Concrete Sidewalk and or Porous Asphalt Area. This passing model has been provided in Appendix E Figure E2 – Onsite Stormwater Calculations WWHM Report.

All Landscaping Areas shall have a minimum of 6" Imported A/B Soils, typical three-way topsoil meet these requirements. Also Please refer to the City of Puyallup Amended Soils Detail for ad

Per Ecology, roof runoff must be evaluated per MR5 BMPs. BMP T5.10A is not applicable (high density multi-family) then bioretention must be considered. If bioretention infeasible, then roof infiltration would require a minimum separation of 5ft to the restrictive layer...which is not possible based on the geotech analysis. (A separation down to 3ft would be allowed if supported by a mounding analysis). [Storm Report; Pg 8]

Roofs

Stormwater runoff from the roofs of the proposed buildings will be conveyed to the porous sidewalk areas and or open graded base course material and will infiltrate. This passing model has been provided in Appendix E Figure E2 – Onsite Stormwater Calculations WWHM Report.

Due to the minimal depth to the restrictive layer on this site, any infiltration facility other than permeable pavement will require a mounding analysis in accordance with Ecology 3.3.4. [Storm Report; Pg 8]

2.0 CONDITIONS AND R

Stormwater design shall be in accordance with the 2012 Stormwater Management Manual for Western Washington as amended in December 2014.

This section will be used to determine the storm drainage requirements for the project. Figure I-2.4.1 "Flow Chart for Determining Requirements for New Development" is used to determine requirements (Appendix A – Figure A9) .

A review of the project indicates that all minimum requirements #1- #9 will apply to the new/replaced hard surfaces and converted vegetation areas.

Minimum Requirement #1: Preparation of Stormwater Site Plans

Stormwater Site plan will be prepared for the project and has been provided in Appendix A Figure A4 of this report.

Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPPP)

The construction SWPPP will be prepared for the project and will be submitted under a separate permit application.

Minimum Requirement #3: Source Control of Pollution

The construction SWPPP will address source control of pollution.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns onsite will be preserved. Runoff pattern from the off-site area will be preserved, maintaining the flow that ultimately discharges to Deer Creek. Runoff from the existing site generally sheet flows from south to north.

Natural Drainage Systems that have been constructed through the history of this parcel will be modified and restored. Any new stormwater introduced to these facilities will be required to be model to pass water quality and flow control.

Minimum Requirement #5: On-Site Stormwater Management

Revise per comments in Section 1 and on the individual basin maps. [Storm Report; Pg 9]

On-site stormwater management has been addressed in vast detail under section 1.0 Project Overview Subsection Developed Site. In brief summary all onsite stormwaters will infiltrate through permeable pavement areas that provide engineered soils below the bottom of the facility to insure proper separation. Off Site Conditions include infiltration from permeable pavement of the shared use path on Shaw Road and Bio-filtration Treatment for the Pioneer Way frontage improvements.

Minimum Requirement #6: Runoff Treatment

Provide confirming CEC testing of engineered soil at time of civil. Provide geotechnical confirmation prior to short plat approval that the proposed engineered fill can meet Ecology SSC-6. (Note: if engineered soil cannot meet the WQ suitability criteria outlined in Ecology SSC-6, then permeable pavement is not feasible) [Storm Report; Pg 9]

Onsite Stormwater will treat all stormwater th engineered soil subgrades.

Shaw Road Frontage will also be treating through infiltration through engineered subgrade soils.

Shared Use Path non-pollutive

Pioneer Way Frontage will provided treatment through bio-swale filtrations and flow control.

Per Fig. F5, the biocell will remain saturated and not provide treatment. Revise accordingly. [Storm Report; Pg 9]

The pond conversion provides treatment through media based filtrations with included dead and live storage areas to match the existing pond. This will be a direct replacement of the existing pond.

Minimum Requirement #7: Flow Control

clarify...offsite area east of the site? South of the site? [Storm Report; Pg 9]

Runoff from the off-site area will be detained with flow control prior to discharging to the existing Pioneer Way conveyance system. The Pond Conversion facility will match existing flows by utilizing the existing flow control structure. All other areas will provide flow control based on engineered infiltration.

Minimum Requirement #8: Wetlands Protection

This project proposes to create additional wetlands areas near eastern stream but will not be discharging to the wetlands. This project just propose to discharge to the stream on the northern portion of the site, but this area is not considered wetlands as it has been identified as a Stream thus when modeling the systems that discharge to this portion of the stream the proposed model was insured to pass stream protection requirements.

Minimum Requirement #9: Operation and Maintenance

The Operation and Maintenance manual will be included within Site Development SSP and will be submitted under a separate permit application.

3.0 OFF-SITE ANALYSIS

Drainage from the existing site currently sheet flows to the north to the existing ditch / stream along the south side of Pioneer Way East. Runoff in the ditch / stream flows to the west and enters the public conveyance system at the intersection of Pioneer Way East and Shaw Road.

The site currently contains an existing combined detention and water quality wet pond that treats and detains runoff from the off-site area south of the site. Runoff from the existing pond is conveyed in pipes to the north and is discharged into the existing ditch / stream on the south side of Pioneer Way East. The existing ditch / stream flows west along the northern boundary of the site for approximately 700 feet until entering 12-inch and 18-inch storm drainage pipes at the intersection of Shaw Road and Pioneer Way East. The drainage pipes discharge into a roadside ditch / stream on the north side of Pioneer Way East, flowing west for approximately one-half mile until entering two box culverts that intersect with Deer Creek.

4.0 PERMANENT STORMWATER CONTROL PLAN

A permanent stormwater control plan has been prepared and is provided in Appendix A -Figure A4 Site Plan.

5.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

The construction SWPPP is to be provided with the final Stormwater Site Plan Report under a separate permit application.

6.0 SPECIAL REPORTS AND STUDIES

All reports and special studies have been prepared and provided with this Preliminary Stormwater Report, all additionally requested reports will be conducted and provided throughout the developmental permitting process.

7.0 OPERATION AND MAINTENANCE MANUAL

The Operation and Maintenance manual is to be provided with the final Stormwater Site Plan Report under a separate permit application.

8.0 DECLARATION OF COVENANT

The Declaration of Covenant will be provided with the final Stormwater Site Plan Report.

9.0 BOND QUANTITIES WORKSHEET

The Bond Quantities Worksheet will be provided with the final Stormwater Site Plan Report.

Report Prepared by:

Jeff Brown, P.E.

Company Engineer/Engineer-of-Record/Senior Design Engineer

Appendix A

06-171 East Town Crossing Vicinity Map

Client:

Job Number:

Issue Set/Date:

Sheet Title:

Sheet Number:

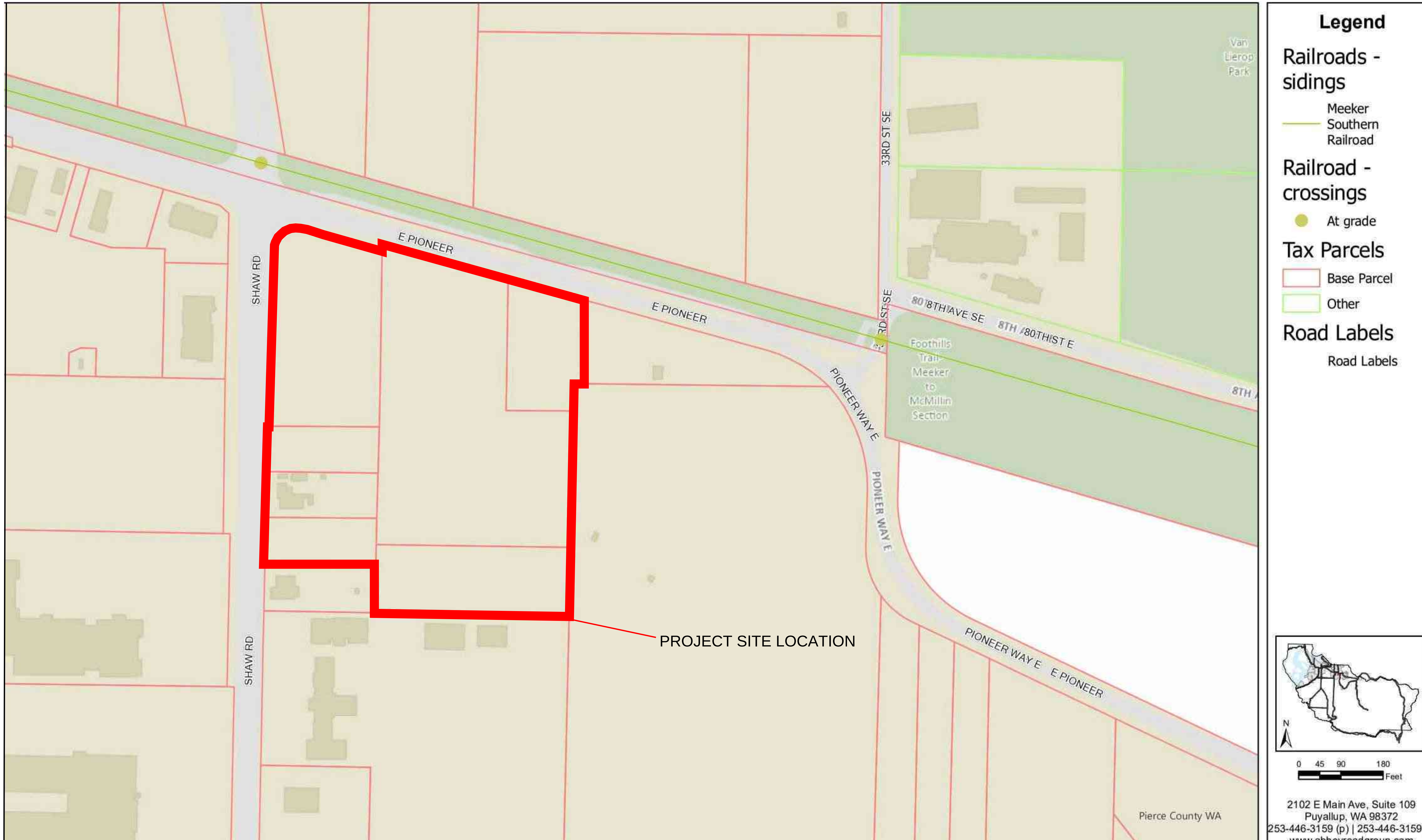


Figure A1 - Vicinity Map

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 12/10/2021 07:08 AM

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

EXISTING SITE CONDITIONS

GRAPHIC SCALE 0 20 40 80 (IN FEET) 1 inch = 40 ft.

Figure A2 - Existing Site Conditions

TITLE: East Town Crossing Existing Site Conditions Puyallup, WA

FOR: East Town Crossing, LLC. 1001 Shaw Road Puyallup, WA 98372

02/22/2021

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

Abbey Road GROUP

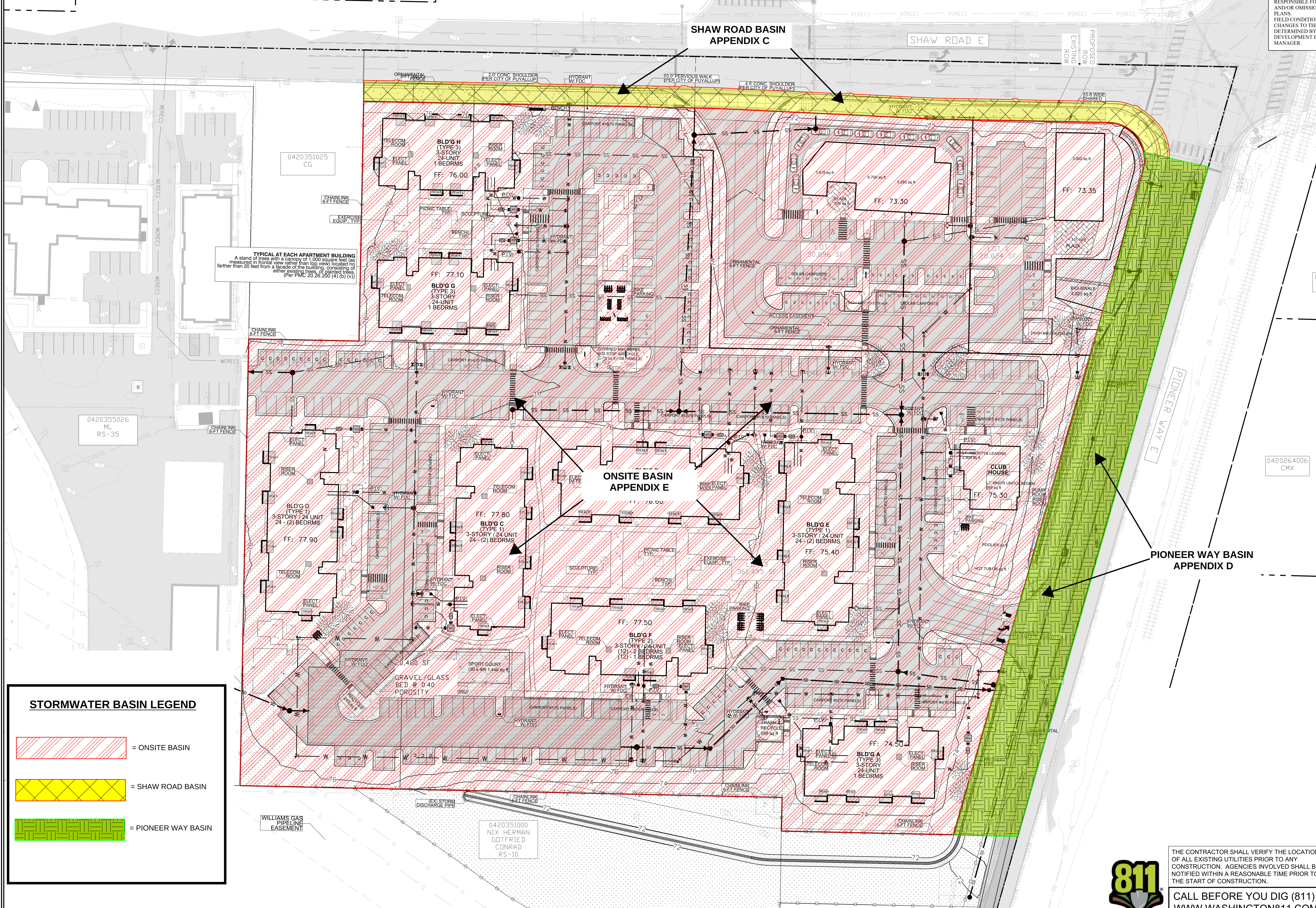
REVISIONS: BY: | CHK: | APR: | DATE: | PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: CPH
DATE: 02/22/2021
SHEET: 4 of

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

OVERALL STORMWATER BASIN MAP



STORMWATER BASIN LEGEND

- = ONSITE BASIN
- = SHAW ROAD BASIN
- = PIONEER WAY BASIN

APPROVED

BY ______ CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ______

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

TITLE: East Town Crossing
OVERALL STORMWATER BASIN MAP
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

Abbey Road GROUP

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

CALL BEFORE YOU DIG (811)
WWW.WASHINGTON811.COM

REVISIONS: BY: | CHK: | APR: | DATE: | PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 12/09/2021
SHEET:

Figure A3 - Overall Basin Map

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

SITE PLAN

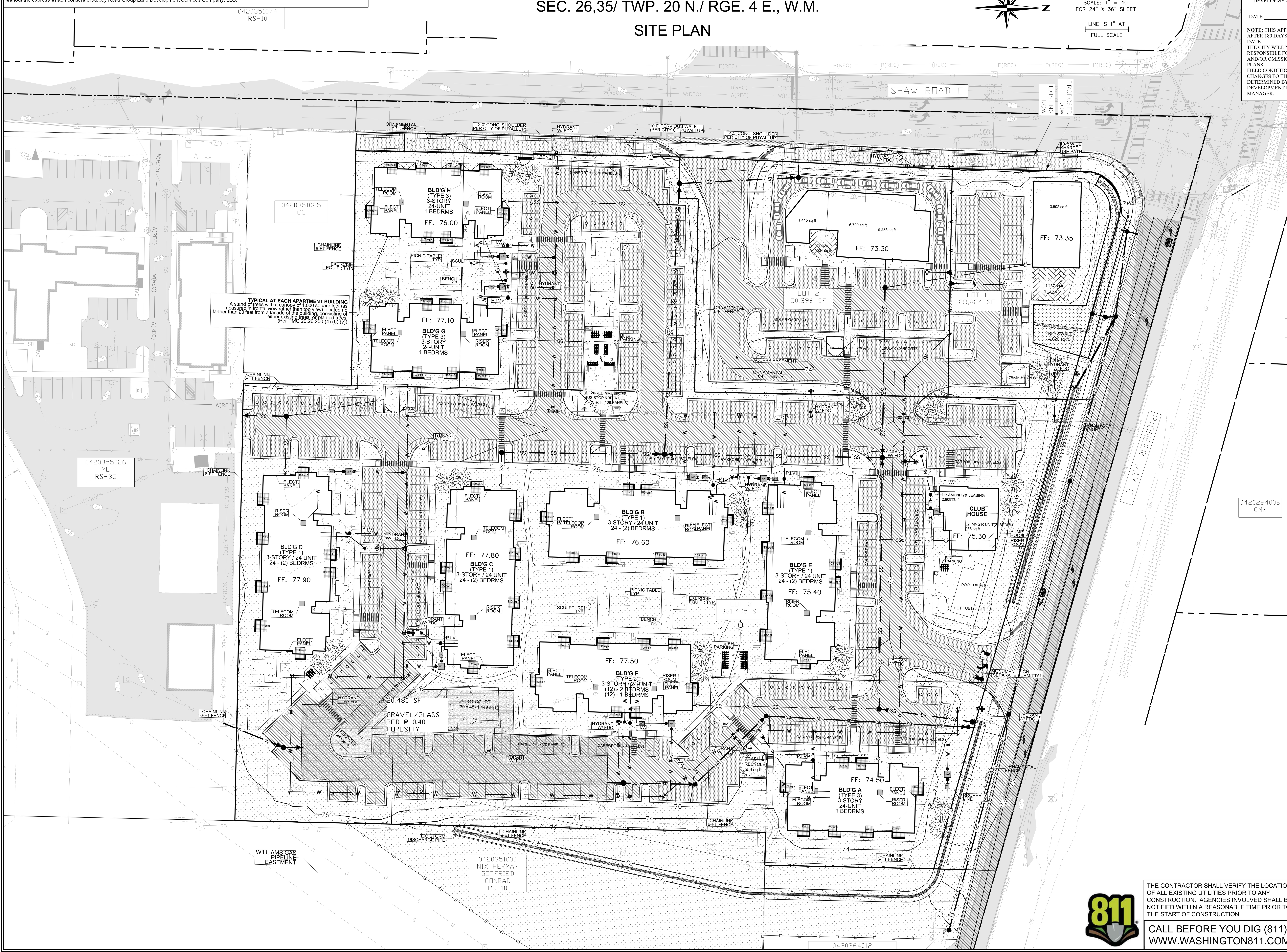


Figure A4 – Site Plan

APPROVED

BY ______ CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ______

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

TITLE: East Town Crossing / Site Plan / Puyallup, WA

FOR: East Town Crossing, LLC. / 1001 Shaw Road / Puyallup, WA 98372

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

Abbey Road GROUP

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

811 CALL BEFORE YOU DIG (811) WWW.WASHINGTON811.COM

REVISIONS: BY: | CHK: | APR: | DATE: | PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 12/09/2021
SHEET:

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

April 11, 2019

KA Project No. 062-19005

Abbey Road Group Land Development Services Company, LLC
PO Box 1224
Puyallup, Washington 98371

Attn: Mr. Gil Hulsmann

Email: Gil.Hulsmann@AbbeyRoadGroup.com
Tel: (253) 435-3699 (ext. 101)

Reference: **Geotechnical Engineering Investigation**
East Town Crossing
Parcel Nos. 0420264053, 0420264054, 0420351066
SE Corner of E. Shaw Road and E. Pioneer Way
Puyallup, Washington 98371

Dear Mr. Hulsmann,

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Theresa R. Nunan

Theresa R. Nunan
Project Engineer

TRN:MR

GEOTECHNICAL ENGINEERING INVESTIGATION
EAST TOWN CROSSING
PARCEL NOS. 0420264053, 0420264054, 0420351066
SE CORNER OF E. SHAW ROAD & E. PIONEER WAY
PUYALLUP, WASHINGTON

PROJECT NO. 062-19005
APRIL 11, 2019

Prepared for:

ABBEY ROAD GROUP LAND DEVELOPMENT SERVICES COMPANY, LLC
ATTN: MR. GIL HULSMANN
PO BOX 1224
PUYALLUP, WA 98371

Prepared by:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
825 CENTER STREET, STE A
TACOMA, WASHINGTON 98409
(253) 939-2500

TABLE OF CONTENTS

April 11, 2019 KA Project No. 062-19005

GEOTECHNICAL ENGINEERING INVESTIGATION
EAST TOWN CROSSING
PARCEL NOS. 0420264053, 0420264054, 0420351066
SE CORNER OF EAST SHAW ROAD AND EAST PIONEER WAY
PUYALLUP, WASHINGTON

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed East Town Crossing project located near the southeast corner of East Shaw Road and East Pioneer Way in Puyallup, Washington, as shown on the Vicinity Map in Figure 1. Discussions regarding site conditions are presented in this report, together with conclusions and recommendations pertaining to site preparation, excavations, structural fill, utility trench backfill, drainage and landscaping, erosion control, foundations, concrete floor slabs and exterior flatwork, lateral earth pressures, and pavement.

A Site Plan showing the approximate exploratory boring and monitoring well locations is presented following the text of this report in Figure 2. Appendix A includes USCS Soil Classification information, as well as a description of the field investigation, exploratory boring logs, and the laboratory testing results. Appendix B contains a guide to aid in the development of earthwork specifications. Pavement design guidelines are presented in Appendix C. The recommendations in the main text of the report have precedence over the more general specifications in the appendices.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the subsurface soil and groundwater conditions at the site, to develop geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and earthwork construction.

Our scope of services was performed in general accordance with our proposal for this project, dated January 25, 2019 (Proposal Number G19001WAT) and included the following:

- Exploration of the subsurface soil and groundwater conditions by conducting approximately three (3) geotechnical borings and installing two (2) groundwater level monitoring wells using a subcontracted drill rig;
- Provide a site plan showing the geotechnical boring and monitoring well locations;

- Provide comprehensive boring and monitoring well logs, including soil stratification and classification, and groundwater levels where applicable;
- Recommended foundation type for the proposed structures;
- Allowable foundation bearing pressure, anticipated settlements (both total and differential), coefficient of horizontal friction for footing design, and frost penetration depth;
- Recommendations for seismic design considerations including site coefficient and ground acceleration based on the 2015 IBC;
- Recommendations for structural fill materials, placement, and compaction;
- Recommendations for suitability of on-site soils as structural fill;
- Recommendations for temporary excavations;
- Recommendations for site drainage and erosion control;
- Recommendations for flexible and rigid pavements, as well as permeable pavement.

PROPOSED CONSTRUCTION

Based on the Overall Site Plan prepared by Abbey Road Group Land Development Services, dated December 12, 2018, we understand that the proposed development will include construction of six residential structures (designated Buildings A through E) and a club house/office building. Site drainage systems will include a subsurface stormwater system located in the southern portion of the property, and a rain garden along the northern and eastern edges of the site. We have not been provided with details regarding construction of the subsurface stormwater system. The planned development will also include utility installation, and paved parking areas and driveways. For the purpose of our analyses, we have assumed that the residential buildings and club house will be 1- to 2-story structures with a slab-on-grade floor system. We have also assumed only minor grading up to 1 foot of cut or fill will be required to establish planned elevations for the site.

SITE LOCATION AND DESCRIPTION

The site consists of three undeveloped parcels encompassing approximately 7 acres of land located south and east of the intersection of Shaw Road with East Pioneer Way. The site is bordered to the north by East Pioneer Way, to the south by commercial property, to the east by undeveloped land and a creek, and to the west by undeveloped land and abandoned residences. The site is roughly rectangular in shape and relatively level at approximately Elevation 72 to 74 feet. A dirt road runs north-south through the center of the site, and also extends from the center of the site westward towards Shaw Road. An existing storm pond is located in the southeast corner of the site, with the bottom at Elevation 69 feet. A wetland that has been field verified by others is located within the western central edge of the site. A creek runs along the eastern boundary of the site.

Most of the property is covered with seasonal vegetation, brambles, and a few trees located within the central portion of the site. Some trash and an abandoned trailer are located in the north central portion of the site. The southern portion of the site is currently being used by the adjacent business for container storage.

We understand that past construction activities for the undeveloped parcel to the west of the site that borders Shaw Road and East Pioneer Way consisted of the placement of fill material to raise the existing grades, based on the Geotechnical Evaluation and Additional Recommendations report prepared by Krazan & Associates, dated March 13, 2007. Those fill activities did not extend into this site.

GEOLOGIC SETTING

The site lies within the central Puget Lowland. The lowland is part of a regional north-south trending trough that extends from southwestern British Columbia to near Eugene, Oregon. North of Olympia, Washington, this lowland is glacially carved, with a depositional and erosional history including at least four separate glacial advances and retreats. The Puget Lowland is bounded to the west by the Olympic Mountains and to the east by the Cascade Range. The lowland is filled with glacial and nonglacial sediments.

The Washington Division of Geology and Earth Resources, Geologic Map of the South Half of the Tacoma Quadrangle, Washington (Open File Report 87-3) indicates that the property is located in an area that is predominantly underlain by recent alluvium deposited by the Puyallup River. The recent alluvium consists of interbedded silt, sandy silt, silty sand, sand, gravel, local areas of peat and clay. The finer material represents overbank material and local lacustrine deposits, and the coarser materials most likely represent deposits in abandoned channels of the Puyallup River.

FIELD INVESTIGATION

A field investigation consisting of three (3) exploratory soil borings and installation of two (2) monitoring wells was completed to evaluate the subsurface soil and groundwater conditions at the project location. The soil borings were completed on March 11, 2019 by a Krazan subcontractor utilizing a hollow stem auger drill rig. The soil borings were advanced to depths ranging from 21.5 to 38.5 feet below the existing ground surface (bgs). A geotechnical engineer from Krazan and Associates was present during the explorations, examined the soils and geologic conditions encountered, obtained samples of the different soil types, and maintained logs of the explorations.

Representative samples of the subsurface soils encountered in the borings were collected and sealed in plastic bags. These samples were transported to our laboratory for further examination and testing. The soils encountered in the exploratory borings were continuously examined and visually classified in accordance with the Unified Soil Classification System (USCS).

SOIL PROFILE AND SUBSURFACE CONDITIONS

The geotechnical subsurface exploration for this project consisted of soil borings and monitoring wells advanced to depths of approximately 21.5 to 38.5 feet bgs. The locations of the soil borings and monitoring wells are shown on the Site Plan in Figure 2.

Beneath 5 to 8 inches of surficial topsoil, the borings encountered alluvial soils to their explored depths. The topsoil was underlain by 4.5 to 7 feet of brown silty sand (SM) and poorly graded sand (SP) with relative densities in the loose to medium dense range. The sand soils were underlain by a 3-foot thick stratum of interbedded sandy silt (ML) that exhibited medium stiff to stiff consistencies and silty sand (SM) soils with relative densities in the loose to medium dense range.

Boring B-1 encountered a layer of silty clay and clayey silt beneath the sandy silt and silty sands from 7.5 to 11.0 feet bgs. The silty clay (CL) and clayey silt (ML) exhibited a very soft consistency with a Standard Penetration Test (SPT) resistance (N-value) of 1/12 inches and a moisture content of 51 percent.

The clayey silt in boring B-1 and the silty sand/sandy silt stratum in borings B-2 and B-3 were underlain by silty sand, sand, and gravel soils with varying silt contents to the termination depths of 21.5, 38.5, and 21.5 feet bgs, respectively. These granular soils exhibited relative densities in the loose to very dense range with N-values ranging from 8 to 60/8" blows per foot.

Gradation and Atterberg Limits tests were conducted on representative samples of the soils for classification purposes and for determination of engineering properties. The gradation and Atterberg Limits results are graphically depicted in Appendix A. For additional information about the soils encountered, please refer to the boring logs in Appendix A.

Monitoring Wells: Two monitoring wells, designated W-1 and W-2, were installed at the site on March 11, 2019 using a subcontracted driller and track mounted drill rig. Monitoring well W-1 was installed within borehole B-1. The boreholes for monitoring wells W-1 and W-2 were advanced to a depth of 21.5 feet and 20 feet below the existing ground surface, respectively, using 4¼-inch diameter hollow stem augers. A 10-foot long section of slotted PVC pipe attached to a 10-foot section of solid PVC pipe was inserted into the borehole, and the annular space between the pipe and the augers was backfilled with filter sand to a depth of 8 feet bgs followed by bentonite chips to the ground surface. A metal well cap was then installed over the pipe and cemented in-place to protect the well from unauthorized access. The installation log for monitoring wells W-1 and W-2 are included in Appendix A.

GROUNDWATER

Groundwater was encountered during the drilling operations at a depth of about 7 to 8 feet below the existing ground surface. It should be recognized that groundwater elevations may fluctuate with time. The groundwater level will be dependent upon seasonal precipitation, irrigation, land use, climatic conditions, as well as other factors. Therefore, water levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

GEOLOGIC HAZARDS

Erosion Concern/Hazard

The Natural Resources Conservation Services (NRCS) map for Pierce County Area, Washington, classifies the site area as Briscot loam. The NRCS classifies the Briscot loam as Hydrologic Soil Group B/D with low potential for erosion in a disturbed state.

It has been our experience that soil erosion can be minimized through landscaping and surface water runoff control. Typically, erosion of exposed soils will be most noticeable during periods of rainfall and may be controlled by the use of normal temporary erosion control measures, i.e., silt fences, hay bales, mulching, control ditches or diversion trenching, and contour furrowing. Erosion control measures should be in place before the onset of wet weather.

Seismic Hazard

The 2015 International Building Code (IBC), Section 1613.3.2, refers to Chapter 20 of ASCE-7 for Site Class Definitions. It is our opinion that the overall soil profile corresponds to Site Class D as defined by Table 20.3-1 “Site Class Definitions,” according to the 2010 ASCE-7 Standard. Site Class D applies to a “stiff soil” profile. The seismic site class is based on a soil profile extending to a depth of 100 feet. The soil borings on this site extended to a maximum depth of 38.5 feet and this seismic site class designation is based on the assumption that similar soil conditions continue below the depth explored.

We referred to the U.S. Geological Survey (USGS) Earthquake Hazards Program Website and 2012/2015 IBC to obtain values for S_S, S_{MS}, S_{DS}, S_1, S_{M1}, S_{D1}, F_a, and F_v. The USGS website includes the most updated published data on seismic conditions. The seismic design parameters for this site are as follows:

Seismic Design Parameters
(Reference: 2015 IBC Section 1613.3.2, ASCE, and USGS)

Seismic Item	Value
Site Coefficient F_a	1.003
S_s	1.243 g
S_{MS}	1.247 g
S_{DS}	0.831 g
Site Coefficient F_v	1.524
S_1	0.476 g
S_{M1}	0.726 g
S_{D1}	0.484 g

Additional seismic considerations include liquefaction potential and amplification of ground motions by loose/soft soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. Soil liquefaction is a state where soil particles lose contact with each other and become suspended in a viscous fluid. This suspension of the soil grains results in a complete loss of strength as the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events.

We have reviewed "Liquefaction Susceptibility Map of Pierce County, Washington" by Stephen P. Palmer et al., (WA DNR, 2004). The map indicates that the site area is located in a zone of high liquefaction susceptibility. At the request of our client, we have conducted a site-specific liquefaction analysis for this project.

To evaluate the liquefaction potential of the site, we analyzed the following factors:

1) Soil type
2) Groundwater depth
3) Relative soil density
4) Initial confining pressure
5) Maximum anticipated intensity and duration of ground shaking

Liquefaction Analysis: The commercially available liquefaction analysis software, LiquefyPro from CivilTech, was used to evaluate the liquefaction potential and the possible liquefaction induced settlement for the site soil and groundwater conditions based on our explorations. The analysis was performed using the information from the soil test boring and laboratory gradation analyses. Maximum

Considered Earthquake (MCE) was selected in accordance with the 2015 International Building Code (IBC) Chapter 16 and the U.S. Geological Survey (USGS) Earthquake Hazards Program website. For this analysis, a maximum earthquake magnitude of 7.11 and peak horizontal ground surface acceleration of 0.5g were used. Our analysis assumed a groundwater depth of 7.0 feet during the earthquake.

The maximum liquefaction induced settlement for this type of seismic event is estimated to be on the order of about 2 inches. The differential settlements are estimated to be on the order of about 1-inch.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion that the planned improvements at this site are feasible, provided that the geotechnical engineering recommendations presented in this report are included in the project design. Based on our explorations, it is our opinion that conventional spread foundations supported on medium dense/stiff or firmer native soil, or on structural fill extending to the medium dense/stiff or firmer native soil would be appropriate for the new buildings.

We recommend that organic topsoil, undocumented fill, and loose/soft soils be stripped to expose the underlying medium dense/stiff or firmer native soil. Footings should extend through any organic or loose soil and be founded on the underlying medium dense or firmer native soil, or structural fill extending to the competent native soils.

Exploration boring B-1 was drilled in the northern portion of the site, in the area of the planned rain garden between Pioneer Way and the Club House and Residential Building E. Boring B-1 encountered a layer of very soft silty clay between 7.5 and 11 feet below the existing ground surface. These materials are not considered suitable to support foundations and will need to be removed where they are encountered. Test pits should be conducted prior to the construction phase to determine the aerial extent (i.e. lateral extent and depth) of this very soft clay layer. If the additional test pit exploration reveals that the soft clay layer extends into the footprint of the Clubhouse or Residential Building E, or any of the other structures, additional foundation recommendations will be necessary to address the effect of the very soft clays. If the very soft clay is encountered in building areas, a deep foundation system may be required for support of the structure(s).

Borings B-2 and B-3 (drilled within the eastern and southern portions of the site) and monitoring well W-2 (installed within the central portion of the site) encountered medium dense/stiff native soils at depths of approximately 5 and 7 feet bgs, respectively; however, deeper layers of loose/soft soils may be encountered in unexplored areas of the site.

The soils encountered on this site are considered moisture-sensitive and will be easily disturbed and difficult to compact when wet. We recommend that construction take place during the drier summer months, if possible. If construction is to take place during wet weather, additional expenses and delays should be expected due to the wet conditions. Additional expenses could include the need for placing a blanket of rock spalls to protect exposed subgrades and construction traffic areas.

Site Preparation

General site clearing should include removal of any undocumented fill, organics, asphaltic concrete, abandoned utilities, structures including foundations, basement walls and floors, rubble, and rubbish. After stripping operations and removal of any loose and/or debris-laden fill, the exposed subgrade should be visually inspected and/or proof rolled to identify any soft/loose areas. Additional recommendations for preparation of specific areas are provided in the **Foundations**, **Pavement Design** and **Exterior Flatwork** subsections of this report.

The soils that will be encountered during site development are considered extremely moisture-sensitive and may disturb easily in wet conditions. The prepared subgrade should be protected from construction traffic and surface water should be diverted around prepared subgrade. We recommend that the site be developed only during extended periods of dry weather.

During wet weather conditions, subgrade stability problems and grading difficulties may develop due to excess moisture, disturbance of sensitive soils and/or the presence of perched groundwater. Construction during the extended periods of wet weather could result in the need to remove wet disturbed soils if they cannot be suitably compacted due to elevated moisture contents. The onsite soils have significant silt content in the explored areas and are moisture sensitive, and can be easily disturbed when wet. If over-excavation is necessary, it should be confirmed through continuous monitoring and testing by a qualified geotechnical engineer or geologist. Soils that have become unstable may require drying to near their optimal moisture content before compaction is feasible. Selective drying may be accomplished by scarifying or windrowing surficial material during extended periods of dry, warm weather (typically during the summer months). If the soils cannot be dried back to a workable moisture condition, remedial measures may be required. General project site winterization should consist of the placement of aggregate base and the protection of exposed soils during the construction phase. It should be understood that even if Best Management Practices (BMP's) for wintertime soil protection are implemented and followed there is a significant chance that moisture disturbed soil mitigation work will still be required.

Any buried structures encountered during construction should be properly removed and backfilled. Excavations, depressions, or soft and pliant areas extending below the planned finish subgrade levels should be excavated to expose firm undisturbed soil, and backfilled with structural fill. In general, any septic tanks, underground storage tanks, debris pits, cesspools, or similar structures should be completely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the geotechnical engineer. The resulting excavations should be backfilled with structural fill.

We understand that backfilling of the wetland in the central western edge of the site that has been field identified by others will be permitted for construction of the paved parking area and subsurface storm system. We also understand that proposed Residential Building C will be constructed within the area currently occupied by an existing storm pond. Our field explorations were not specifically conducted within either of these areas. Any organic, silt or clay soils, or accumulations of sediment, encountered within the wetland area or the existing storm pond should be removed down to firm undisturbed soil, and backfilled with structural fill to the planned finish grades.

A representative of our firm should be present during all site clearing and grading operations to observe, test and evaluate earthwork construction. This testing and observation is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction and stability of the material. The geotechnical engineer may reject any material that does not meet compaction and stability requirements. Further recommendations, contained in this report, are predicated upon the assumption that earthwork construction will conform to the recommendations set forth in this section and in the Structural Fill section below.

Temporary Excavations

The onsite soils have variable cohesion strengths, therefore the safe angles to which these materials may be cut for temporary excavations is limited, as the soils may be prone to caving and slope failures in temporary excavations. Temporary excavations in the loose to medium dense native soils should be sloped no steeper than 2H:1V (horizontal to vertical) where room permits.

All temporary cuts should be in accordance with Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. The temporary slope cuts should be visually inspected daily by a qualified person during construction work activities and the results of the inspections should be included in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and minimizing slope erosion during construction. The temporary cut slopes should be covered with plastic sheeting to help minimize erosion during wet weather and the slopes should be closely monitored until the permanent retaining systems are complete. Materials should not be stored and equipment operated within 10 feet of the top of any temporary cut slope.

A Krazan & Associates geologist or geotechnical engineer should observe, at least periodically, the temporary cut slopes during the excavation work. The reasoning for this is that all soil conditions may not be fully delineated by the limited sampling of the site from the geotechnical explorations. In the case of temporary slope cuts, the existing soil conditions may not be fully revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of the temporary slope will need to be evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed smoothly and required deadlines can be met. If any variations or undesirable conditions are encountered during construction, Krazan & Associates should be notified so that supplemental recommendations can be made.

Structural Fill

Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the Site Preparation subsection of this report prior to beginning fill placement.

Best Management Practices (BMP's) should be followed when considering the suitability of the existing materials for use as structural fill. The on-site soils are generally considered suitable for re-use as structural fill, provided the soil is free of organic material and debris, and it is within ± 2 percent of the optimum moisture content. If the native soils are stockpiled for later use as structural fill, the stockpiles should be covered to protect the soil from wet weather conditions. We recommend that a representative of Krazan & Associates be on site during the excavation work to determine which soils are suitable for use as structural fill.

Imported, all weather structural fill material should consist of well-graded gravel or a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). All structural fill material should be submitted for approval to the geotechnical engineer at least 48 hours prior to delivery to the site.

Fill soils should be placed in horizontal lifts not exceeding 8 inches in thickness prior to compaction, moisture-conditioned as necessary (moisture content of soil shall not vary by more than ±2 percent of optimum moisture), and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM D1557 Test Method. In-place density tests should be performed on all structural fill to document proper moisture content and adequate compaction. Additional lifts should not be placed if the previous lift did not meet the compaction requirements or if soil conditions are not considered stable.

Foundations

Our exploratory borings encountered loose to medium dense granular soils underlain by a 3-foot thick stratum of interbedded sandy silt and silty sand, followed by loose to very dense granular alluvial soils to the explored depths. Boring B-1, drilled at the proposed rain garden area in the northern end of the site, encountered a 3.5-foot thick layer of very soft silty clay at a depth of 7.5 feet bgs.

The very soft clay encountered in Boring B-1 between 7.5 and 11 feet below the existing ground surface is not considered suitable to support foundations and will need to be removed where it is encountered.

Further exploration of this area with test pits should be conducted during the planning phase to determine the aerial extent (i.e. lateral extent and depth) of this very soft clay layer. If the additional test pit exploration reveals that the soft clay layer extends into the footprint of the Clubhouse or Residential Building E, or any of the other structures, additional foundation recommendations will be necessary to address the effect of the very soft clays. If the very soft clay is encountered in building areas, a deep foundation system may be required for support of the structure(s).

Borings B-2 and B-3 and monitoring well W-2, drilled within the eastern, southern, and central portions of the site, encountered medium dense/stiff native soils at depths of approximately 5 and 7 feet bgs; however, deeper layers of loose/soft soils may be encountered in unexplored areas of the site.

Pending the findings of further explorations in the northern portion of the site, the proposed structures may be supported on a shallow foundation system. Where loose/soft soils are encountered at the planned footing elevations, the subgrade should be over-excavated to expose suitable bearing soil. The foundation excavations should be evaluated by Krazan & Associates prior to structural fill placement to verify that the foundations will bear on suitable material.

Building foundations should extend at least 18 inches below the lowest adjacent finished ground surface for frost protection and bearing capacity considerations. Footing widths should be based on the anticipated loads and allowable soil bearing pressure, and should conform to current International Building Code (IBC) guidelines. Water should not be allowed to accumulate in foundation excavations. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete.

For foundations constructed as outlined above, we recommend an allowable design bearing capacity of 2,000 pounds per square foot (psf) may be used for foundation design for this project. A representative of Krazan and Associates should evaluate the foundation bearing soil prior to footing form construction.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the bases of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 150 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglecting the upper 12 inches). The allowable friction factor and allowable equivalent fluid passive pressure values include a factor of safety of 1.5. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A 1/3 increase in the above values may be used for short duration wind and seismic loads.

For foundations constructed as recommended, the total static settlement is not expected to exceed 1-inch. Differential settlement, along a 20-foot exterior wall footing, or between adjoining column footings should be less than ½ inch. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils become flooded or saturated. It should be noted that the estimated settlement provided herewith is a static settlement and does not include liquefaction induced settlement. Static settlement is induced by the applied dead load from the structures.

Up to 2 inches of total settlement and 1 inch of differential settlement could occur during and/or following a seismic event. The foundation elements, i.e. spread and wall footings, could be structurally tied together to create a stiffer structure. It should be noted that this measure would not mitigate the anticipated seismic settlement; however, it may reduce the damage associated with the anticipated seismic settlement, particularly the effects of differential settlement on a structure.

Seasonal rainfall, water run-off, and the normal practice of watering trees and landscaping areas around the proposed structures, should not be permitted to flood and/or saturate foundation subgrade soils. To prevent the buildup of water within the footing areas, continuous footing drains (with cleanouts) should be provided at the bases of the footings. The footing drains should consist of a minimum 4-inch diameter rigid perforated PVC pipe, sloped to drain, with perforations placed near the bottom and enveloped in all directions by washed rock and wrapped with filter fabric to limit the migration of silt and clay into the drain.

Lateral Earth Pressures and Retaining Walls

We understand that a below grade stormwater vault is planned for this project. We have developed criteria for the design of retaining or below grade walls for the stormwater vault. Our design parameters are based on retention of the native soils. The parameters are also based on level, well-drained wall backfill conditions. Walls may be designed as "restrained" retaining walls based on "at-rest" earth pressures, plus any surcharge on top of the walls as described below, if the walls are braced to restrain movement and/or movement is not acceptable. Unrestrained walls may be designed based on "active" earth pressure, if the walls are not part of the buildings and some movement of the retaining walls is acceptable. Acceptable lateral movement equal to at least 0.2 percent of the wall height would warrant the use of "active" earth pressure values for design. We recommend that walls supporting horizontal backfill and not subjected to hydrostatic forces be designed using a triangular earth pressure distribution equivalent to that exerted by a fluid with a density of 38 pcf for yielding (active condition) walls, and 60 pcf for non-yielding (at-rest condition) walls.

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls or loads imposed by construction equipment, foundations, back slopes or roadways (surcharge loads). Groundwater was encountered in each of the borings at 7 to 8 feet below the ground surface. Portions of the vault that will extend below the groundwater level will need to be designed to resist hydrostatic pressures and buoyant forces. Equivalent fluid densities for buoyant soil pressure under yielding conditions would be 20 pcf and 30 pcf for nonyielding conditions. The allowable buoyant passive pressure would be 100 pcf with a factor of safety of 2.0.

Floor Slabs and Exterior Flatwork

Before the placement of concrete floors or pavements on the site, or before any floor supporting fill is placed, the loose soils and undocumented fill must be removed to expose medium dense or firmer undisturbed native soil. The subgrade should then be proof-rolled to confirm that the subgrade contains no soft or deflecting areas. Areas of yielding soils should be excavated and backfilled with structural fill.

Any additional fill used to increase the elevation of the floor slab should meet the requirements of structural fill. Fill soils should be placed in horizontal lifts not exceeding 8 inches loose thickness, moisture-conditioned as necessary, (moisture content of soil shall not vary by more than ±2 percent of optimum moisture) and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557.

Floor slabs may be designed using a modulus of subgrade reaction value of k = 200 pounds per cubic inch (pci) for slabs supported on medium dense or firmer native soils or on structural fill extending to medium dense or firmer native soil.

In areas where it is desired to reduce floor dampness, such as areas covered with moisture sensitive floor coverings, we recommend that concrete slab-on-grade floors be underlain by a water vapor retarder system. According to ASTM guidelines, the water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 4-inches of compacted clean (less than 5 percent passing the U.S. Standard No. 200 Sieve), open-graded angular rock of ¾-inch maximum size. The vapor retarder sheeting should be protected from puncture damage.

It is recommended that the utility trenches within the building pads be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the drainage and irrigation adjacent to the buildings is recommended. Grading should establish drainage away from the structures and this drainage pattern should be maintained. Water should not be allowed to collect adjacent to the structures. Excessive irrigation within landscaped areas adjacent to the structure should not be allowed to occur. In addition, ventilation of the structure may be prudent to reduce the accumulation of interior moisture.

Erosion and Sediment Control

Erosion and sediment control (ESC) is used to minimize the transportation of sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be implemented and these measures should be in general accordance with local regulations. As a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features of the site:

1) Phase the soil, foundation, utility and other work, requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be undertaken during the wet season (generally October through April), but it should also be known that this may increase the overall cost of the project.

2) All site work should be completed and stabilized as quickly as possible.

3) Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.

4) Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited, other filtration methods will need to be incorporated.

Groundwater Influence on Structures and Earthwork Construction

The soil borings were checked for the presence of groundwater during exploratory operations. Groundwater was encountered in all of our borings at approximately 7 to 8 feet bgs. It should be recognized that groundwater elevations may fluctuate with time. The groundwater level will be dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, groundwater levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

If groundwater is encountered during construction, we should observe the conditions to determine if dewatering will be needed. Design of temporary dewatering systems to remove groundwater should be the responsibility of the contractor. If earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated. These soils may "pump," and the materials may not respond to densification techniques. Typical remedial measures include: disking and aerating the soil during dry weather; mixing the soil with drier materials; removing and replacing the soil with an approved fill material. A qualified geotechnical engineering firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Drainage

The ground surface should slope away from building pads and pavement areas, toward appropriate drop inlets or other surface drainage devices. It is recommended that adjacent exterior grades be sloped a minimum of 2 percent for a minimum distance of 5 feet away from structures. Roof drains should be tightlined away from foundations. Roof drains should not be connected to the footing drains.

Pavement areas should be inclined at a minimum of 1 percent and drainage gradients should be maintained to carry all surface water to collection facilities and suitable outlets. These grades should be maintained for the life of the project.

Specific recommendations for and design of storm water disposal systems or septic disposal systems are beyond the scope of our services and should be prepared by other consultants that are familiar with design and discharge requirements.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided.

All utility trench backfill should consist of suitable on-site material or imported granular material. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Pavement Design

Based on our explorations, the near surface soils at the site are interpreted as loose to medium dense silty sand and sand soils to depths of approximately 4.5 to 7.0 feet bgs. Due to the loose nature of the anticipated pavement subgrade soils, we recommend that subgrade modification techniques be considered. Subgrade modification typically includes the over-excavation of unsuitable materials, the placement of a geotextile fabric at the bottom of the over-excavated area, and then the placement of structural fill, with the structural fill consisting of clean crushed rock, rock spalls, or Controlled Density Fill (CDF). We recommend the use of a high-strength geotextile separation fabric, such as Mirafi 600X or equivalent, for the geotextile. Subgrade modification such as this is intended to disperse surcharge loads and therefore aid in pavement performance.

Where loose soils are encountered in the pavement subgrade, we recommend over-excavation of the loose soil to at least 12 inches below the planned pavement subgrade elevation. The exposed grade after the over-excavation should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. We recommend that a high-strength geotextile separation fabric, such as Mirafi 600X or equivalent, then be placed over the compacted soil. After the fabric is placed, the area should be filled to the planned slab subgrade elevation with structural fill. The structural fill should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. In-place density tests should be performed to verify proper moisture content and adequate compaction.

In areas where the pavement subgrade soil consists of firm and unyielding native soils, a proof roll of the pavement subgrade soil may be performed in lieu of the compaction and in-place density tests. It should be noted that subgrade soils that have relatively high silt contents may be highly sensitive to moisture conditions. The subgrade strength and performance characteristics of a silty subgrade material may be dramatically reduced if this material becomes wet.

Traffic loads were not provided, however, based on our knowledge of the proposed project, we expect the traffic to range from light duty (passenger automobiles) to heavy duty (delivery and fire trucks). Pavement design life of 20 years was assumed for our analysis. Recommendations for an asphaltic concrete flexible pavement section and Portland Cement Concrete (PCC) rigid pavement section are provided in Tables 1 and 2 below.

Table 1: ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT

Asphaltic Concrete	Aggregate Base	Compacted Subgrade**
3.0 in.	6.0 in.	12.0 in.

Table 2: PORTLAND CEMENT CONCRETE (RIGID) PAVEMENT
4000 psi with FIBER MESH

Min. PCC Depth	Aggregate Base	Compacted Subgrade**
6.0 in.	4.0 in.	12.0 in.

** *A proof roll may be performed in lieu of in-place density tests*

The asphaltic concrete depth listed in Table 1 for the flexible pavement section should be a surface course type asphalt, such as Washington Department of Transportation (WSDOT) ½-inch Hot Mix Asphalt (HMA). The pavement specification in Appendix C provides additional recommendations, including aggregate base material.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our services as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. We should also be present during the construction of stormwater management system to evaluate the soils. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor. Furthermore, Krazan & Associates is not responsible for the contractor's procedures, methods, scheduling or management of the work site.

LIMITATIONS

Geotechnical engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences improves. Although your site was analyzed using the most appropriate current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to improvements in the field of geotechnical engineering, physical changes in the site either due to excavation or fill placement, new agency regulations or possible changes in the proposed structure after the time of completion of the soils report may require the soils report to be professionally reviewed. In light of this, the owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that two years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. Our report, design conclusions and interpretations should not be construed as a warranty of the subsurface conditions. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. The findings and conclusions of this report can be affected by the passage of time, such as seasonal weather conditions, manmade influences, such as construction on or adjacent to the site, natural events such as earthquakes, slope instability, flooding, or groundwater fluctuations. If any variations or undesirable conditions are encountered during construction, the geotechnical engineer should be notified so that supplemental recommendations can be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The geotechnical engineer should be notified of any changes so that the recommendations can be reviewed and reevaluated.

Misinterpretations of this report by other design team members can result in project delays and cost overruns. These risks can be reduced by having Krazan & Associates, Inc. involved with the design teams' meetings and discussions after submitting the report. Krazan & Associates, Inc. should also be retained for reviewing pertinent elements of the design team's plans and specifications. Contractors can also misinterpret this report. To reduce this, risk Krazan & Associates. Inc. should participate in pre-bid and preconstruction meetings, and provide construction observations during the site work.

This report is a geotechnical engineering investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any environmental site assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater or atmosphere, or the presence of wetlands. Any statements or absence of statements, in this report or on any soils log regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessments.

The geotechnical information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical developments. We emphasize that this report is valid for this project as outlined above, and should not be used for any other site. Our report is prepared for the exclusive use of our client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

04/11/19

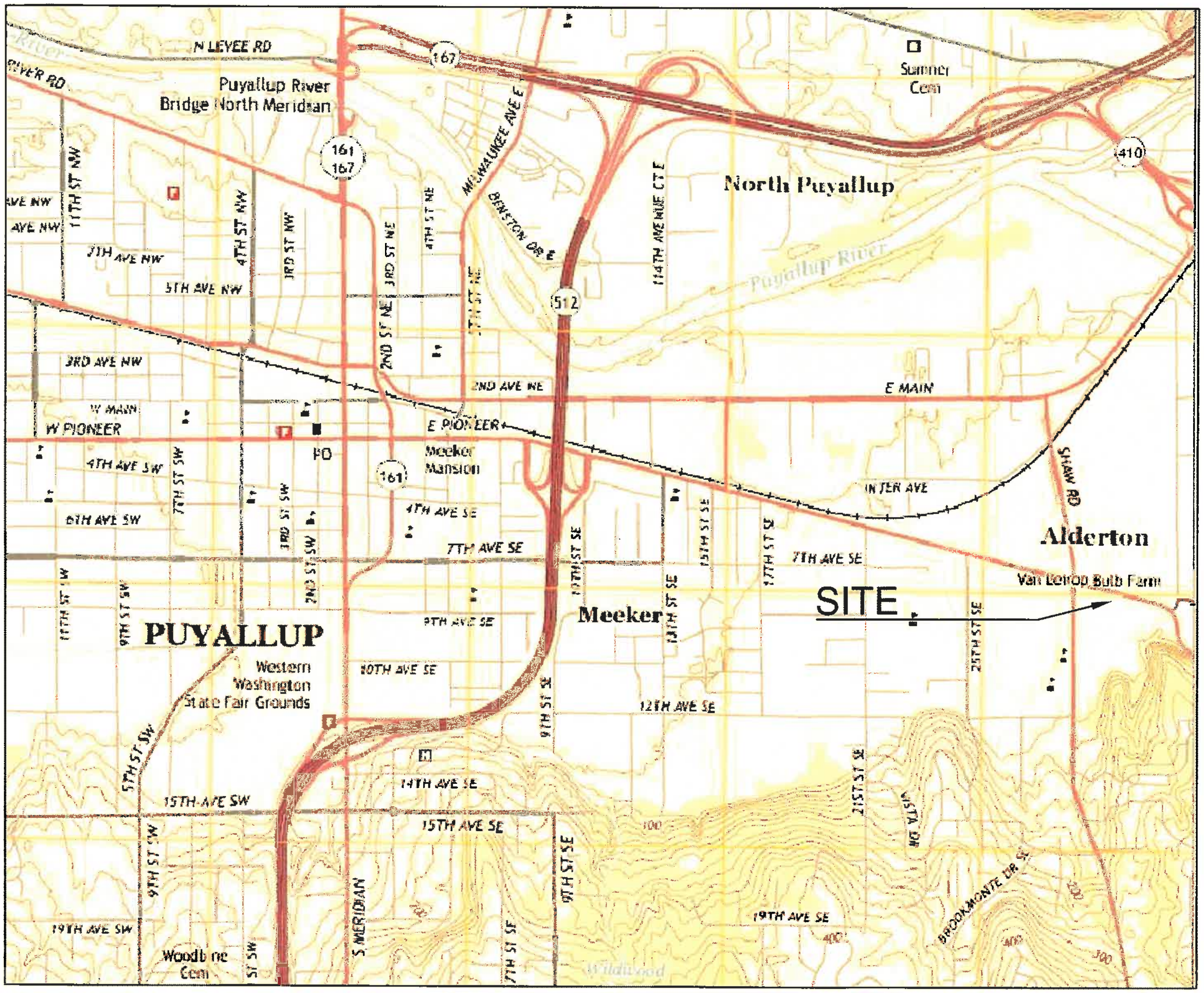
MICHAEL D. RUNDQUIST
STATE OF WASHINGTON
41415
REGISTERED
PROFESSIONAL ENGINEER

Theresa R. Nunan

Michael D. Rundquist, P.E.
Senior Project Manager

Theresa R. Nunan
Project Engineer

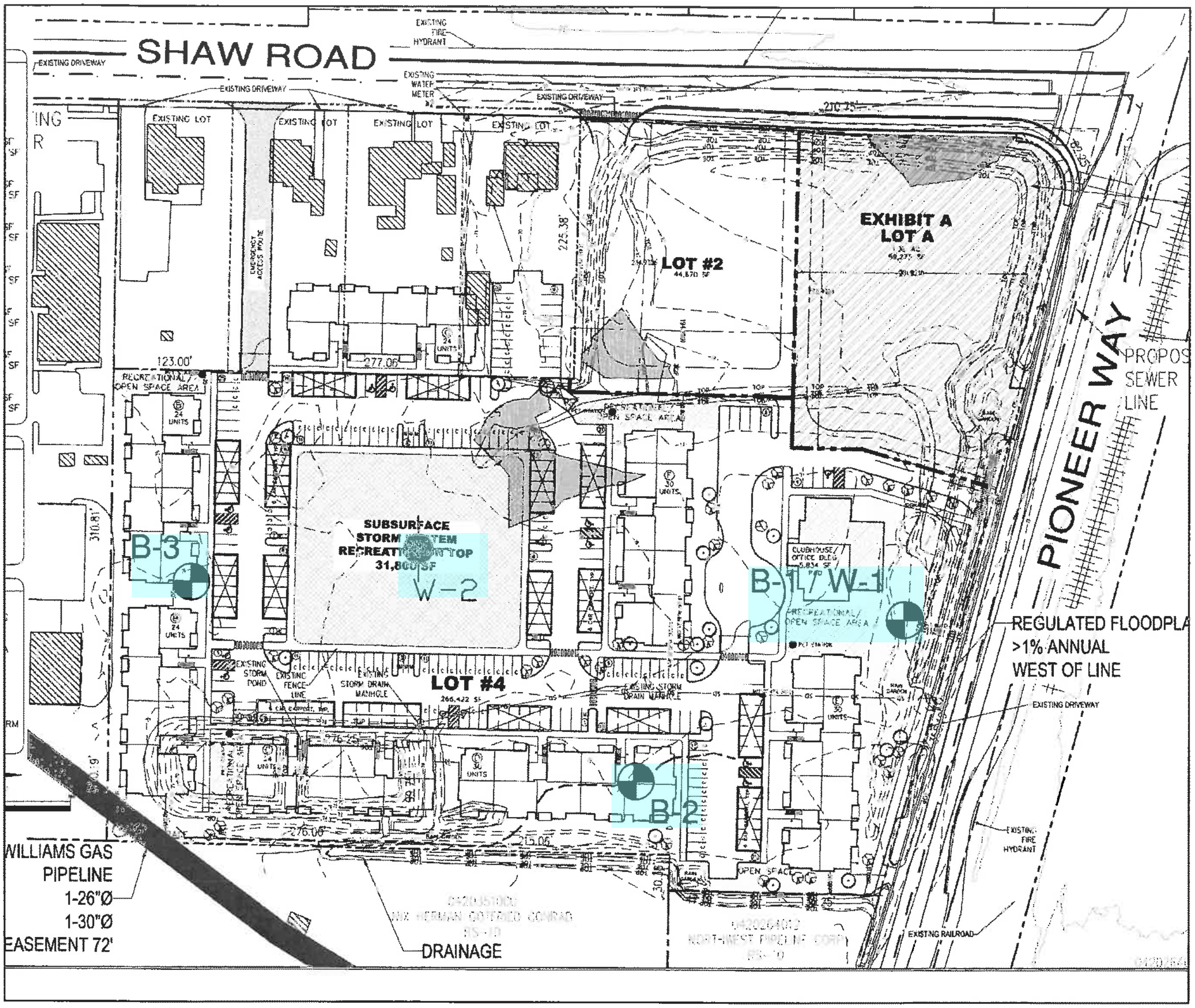
TRN:MDR



Reference: USGS topographic map website, Puyallup, WA, dated 2017.

N

Vicinity Map	
East Town Crossing	Figure 1
Shaw Rd & E Pioneer Way, Puyallup, WA	
Project Number: 062-19007	Drawn By: T. Nunan Date: April 2019
Krazan & ASSOCIATES, INC.	Not to Scale



LEGEND

B-1 Number and Approximate Location of Borings

W-1 Approximate Location of Monitoring Well

Reference: Plan Sheet titled "Overall Site Plan", prepared by Abbey Road Group dated December 7, 2018.

Site Plan

East Town Crossing	Figure 2
Shaw Rd & E Pioneer Way, Puyallup, WA	
Project Number: 062-19007	Drawn By: T. Nunan Date: April 2019
Krazan & ASSOCIATES, INC.	Not to Scale

APPENDIX A

FIELD INVESTIGATION AND LABORATORY TESTING

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploration program. Exploratory borings and monitoring wells were drilled and sampled for subsurface exploration at this site. The soil explorations reached depths of approximately 38.5 feet below the existing ground surface. The approximate exploratory boring locations are shown on the Site Plan (Figure 2). The logs of the soil explorations and monitoring wells are presented in this appendix. The depths shown on the attached logs are from the existing ground surface at the time of our exploration.

The drilled borings were advanced using a subcontracted drilling rig. Soil samples were obtained by using the Standard Penetration Test (SPT) as described in ASTM Test Method D1586. The Standard Penetration Test and sampling method consists of driving a standard 2-inch outside-diameter, split barrel sampler into the subsoil with a 140-pound hammer free falling a vertical distance of 30 inches. The summation of hammer-blows required to drive the sampler the final 12-inches of an 18-inch sample interval is defined as the Standard Penetration Resistance, or N-value. The blow count is presented graphically on the boring logs in this appendix. The resistance, or "N" value, provides a measure of the relative density of granular soils or of the relative consistency of cohesive soils.

The soils encountered were logged in the field during the exploration and are described in general accordance with the Unified Soil Classification System (USCS). All samples were returned to our laboratory for evaluation.

Laboratory Testing

The laboratory testing program was developed primarily to determine the index properties of the soils. Test results were used for soil classification and as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

Krazan & ASSOCIATES, INC.

Project: East Town Crossing	Project Number: 062-19007	Client: Abbey Road Group	Boring No.	B-1
Address, City, State: SE Corner Shaw Road & E. Pioneer Way, Puyallup, WA			Drilling Company: Geologic Drill Partners	
Project Manager: Theresa Nunan	Date — Started: 3.11.2019		Equipment: Track Bobcat	
Field Engineer: Theresa Nunan	Date — Completed: 3.11.2019		Drilling Method: Hollow Stem Augers	
Notes: Monitoring Well W-1 installed in borehole.	Date — Backfilled: 3.11.2019		Hammer Type: 140-lb. Manual	
Ground Surface Elevation: 72 +/- feet MSL	Groundwater Depth: 8 feet	Groundwater Elev.:	Total Depth of Boring: 21.5 ft.	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Classification	Lab Results
	0						Brown Silty SAND (SM), trace gravel and very thin roots, with occassional 6 to 8-inch thick stiff sandy clay layers, medium dense, moist	
		SPT	1-1	1 6 9	15			
							Brownsih Grey Poorly Graded SAND (SP), fine grained, medium dense, moist	
	5	SPT	1-2A 1-2B	4 5 5	10		Alternating 4 to 12-inch thick layers of brown Sandy SILT (ML) and Silty SAND (SM), medium stiff/loose, moist to wet	% Si/Cl = 78.5 % MC = 35.4
	▼ (8)	SPT	1-3A 1-3B	1 1/12"	1/12"		Dark Brownish Grey Silty CLAY (CL) with marsh grass, seams of peat and thin roots, very soft, wet	LL = 35 PI = 1 % F. Sa = 19.8 % Si/Cl = 79.1 % MC = 51.2
	10	SPT	1-4	1 2 6	8		- - - Becomes Clayey SILT (ML), with fine sand and thin roots, very soft	
							Dark Grey/Black Silty SAND (SM), fine to medium grained, loose, wet	
	15	SPT	1-5	5 4 4	8		- - - Same	
	20	SPT	1-6	4 12 12	24		- - - Becomes Poorly Graded SAND (SP-SM) with Silt, fine to medium grained, medium dense, wet	
							End of Boring at 21.5 Feet	
	25							

Krazan & ASSOCIATES, INC.

Project: East Town Crossing	Project Number: 062-19007		Client: Abbey Road Group	Boring No.	B-2
Address, City, State: SE Corner Shaw Road & E. Pioneer Way, Puyallup, WA				Drilling Company: Geologic Drill Partners	
Project Manager: Theresa Nunan	Date	Started: 3.11.2019		Equipment: Track Bobcat	
Field Engineer: Theresa Nunan		Completed: 3.11.2019		Drilling Method: Hollow Stem Augers	
Notes:		Backfilled: 3.11.2019		Hammer Type: 140-lb. Manual	
Ground Surface Elevation: 73 +/- feet MSL	Groundwater Depth: 8 feet		Groundwater Elev.:	Total Depth of Boring: 38.5 ft.	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Classification	Lab Results
	0						5 inches Grass and Topsoil	
		SPT	2-1	2 2 5	7		Brown Silty SAND (SM), fine grained, with occassional sandy clay seams, loose, moist	
	5	SPT	2-2	3 4 2	6		- - - Same	% Si/Cl = 42.9 % MC = 29.3
	▼ (8)	SPT	2-3	4 8 11	19		Brownish Grey Sandy SILT (ML), fine grained, with occassional 1 to 2-inch thick seams dark grey fine sand, moist to wet, stiff	% Si/Cl = 88.2 % MC = 37.0
	10	SPT	2-4	5 8 8	16		Dark Grey/Black Silty SAND (SM), fine to medium grained, medium dense, wet	% Si/Cl = 14.5 % MC = 25.0
	15	SPT	2-5	28 12 12	24		- - - Becomes Sand (SP-SM) with Silt, fine to medium grained, medium dense	% Grav = 0 % Sa = 90.8 % Si/Cl = 8.9 % MC = 22.6
							- - - At 18 feet, drilling choppy due to lots of gravel	
	20	SPT	2-6	18 40 20/8"	60/8"		Dark Grey/Black Poorly Graded GRAVEL (GP-GM) with sand and silt, very dense, wet	
	25							

Krazan & ASSOCIATES, INC.

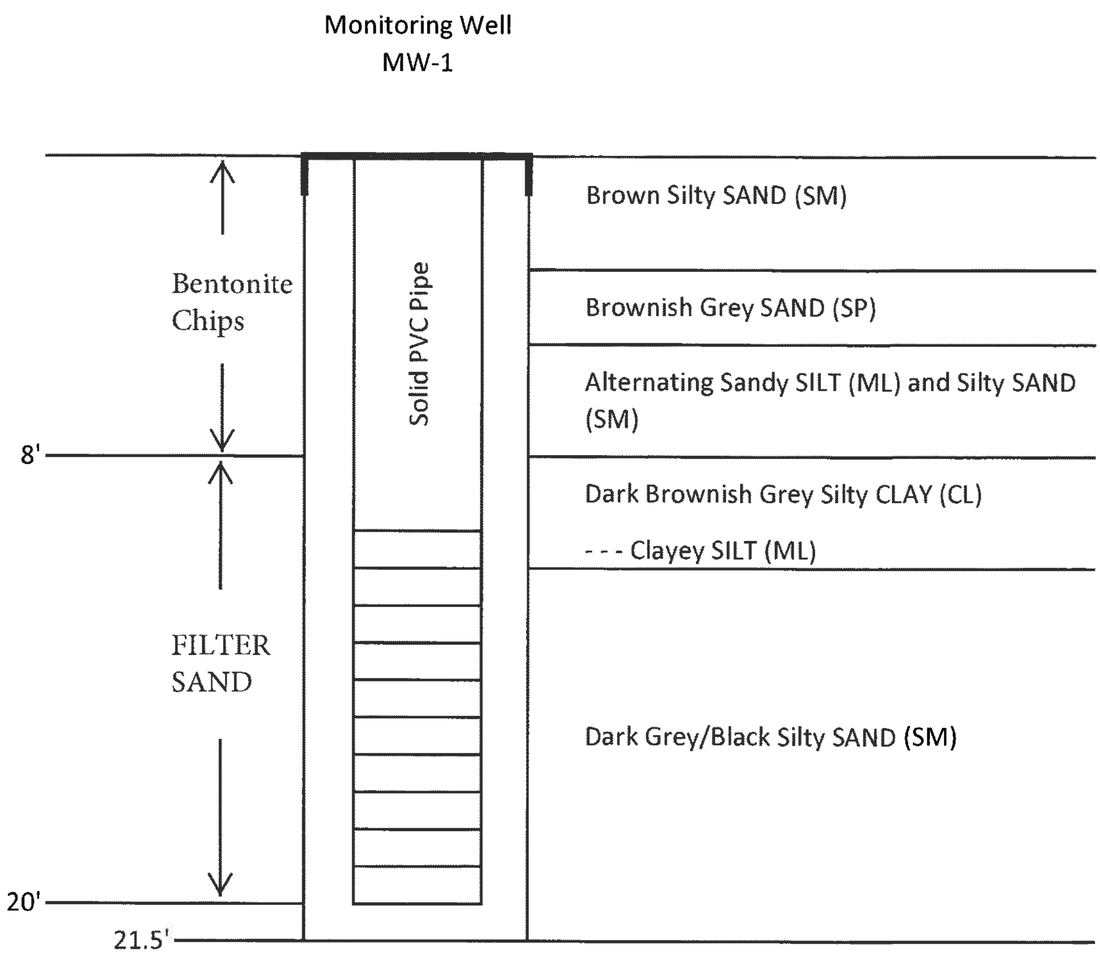
Project: East Town Crossing	Project Number: 062-19007	Client: Abbey Road Group	Boring No.	B-2
Address, City, State: SE Corner Shaw Road & E. Pioneer Way, Puyallup, WA			Drilling Company: Geologic Drill Partners	
Project Manager: Theresa Nunan	Date — Started: 3.11.2019		Equipment: Track Bobcat	
Field Engineer: Theresa Nunan	Date — Completed: 3.11.2019		Drilling Method: Hollow Stem Augers	
Notes:	Date — Backfilled: 3.11.2019		Hammer Type: 140-lb. Manual	
Ground Surface Elevation: 73 +/- feet MSL	Groundwater Depth: 8 feet	Groundwater Elev.:	Total Depth of Boring: 38.5 ft.	

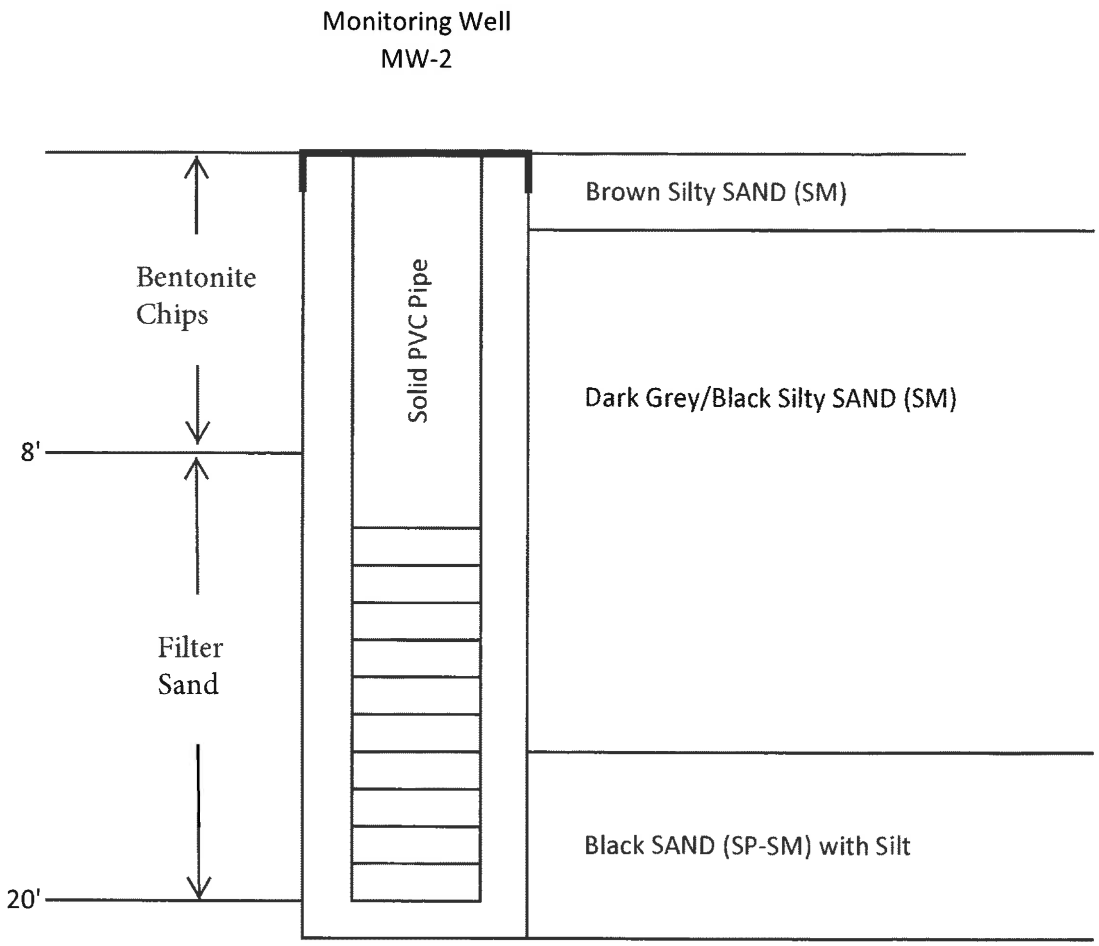
Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Classification	Lab Results
	25	SPT	2-7	10 9 14	23		Dark Grey SAND (SP-SM) with Silt, trace gravel, fine to coarse grained, with occassional 3 to 4-inch thick seams gravel (GP-GM) with silt, medium dense, wet	
	30	SPT	2-8	4 4 15	19		- - - Same	% Grav = 9.0 % Sa = 82.5 % Si/Cl = 8.5 % MC = 18.8
	35	SPT	2-9	6 5 10	15		At 33 feet, alternating 4 to 12-inch thick layers of Dark Grey/Black SAND (SP-SM) with gravel and silt **AND** Dark Grey/Black GRAVEL (GP-GM) with sand and silt, medium dense, wet	% Si/Cl = 5.6 % MC = 18.9
		SPT	2-10	37 20 17	37		- - - Becomes dense	% Grav = 44.8 % Sa = 47.4 % Si/Cl = 7.8 % MC = 9.4
	40						**End of Boring at 38.5 Feet**	
	45							
	50							

Krazan & ASSOCIATES, INC.

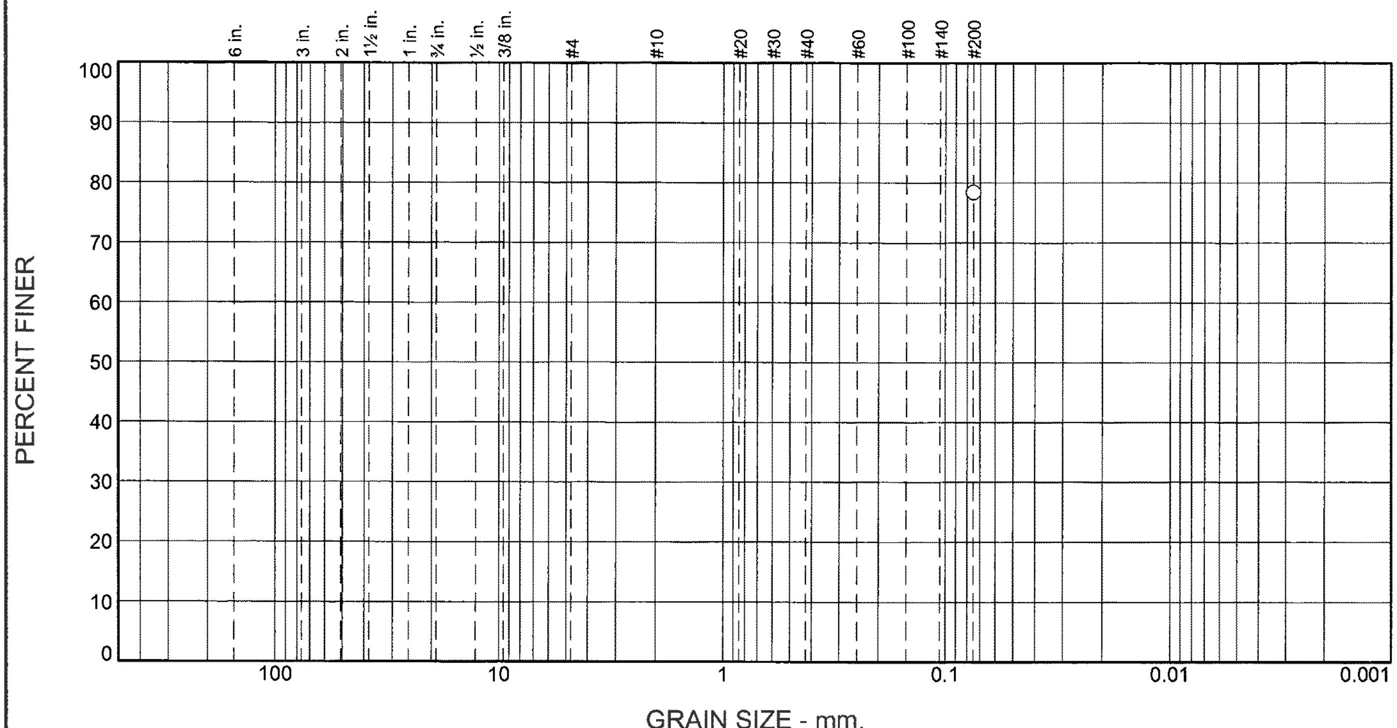
Project: East Town Crossing	Project Number: 062-19007	Client: Abbey Road Group	Boring No.	B-3
Address, City, State: SE Corner Shaw Road & E. Pioneer Way, Puyallup, WA			Drilling Company: Geologic Drill Partners	
Project Manager: Theresa Nunan	Date — Started: 3.11.2019		Equipment: Track Bobcat	
Field Engineer: Theresa Nunan	Date — Completed: 3.11.2019		Drilling Method: Hollow Stem Augers	
Notes:	Date — Backfilled: 3.11.2019		Hammer Type: 140-lb. Manual	
Ground Surface Elevation: 74 +/- feet MSL	Groundwater Depth: 7 feet		Total Depth of Boring: 21.5 ft.	

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Classification	Lab Results
							Brown Silty SAND (SM), trace gravel and very thin roots, with occassional 2 to 3-inch thick stiff sandy clay layers, loose, moist	
		SPT	3-1	2 4 5	9			
							Brownish Grey Sandy SILT (ML), fine grained, with occassional 0.5 to 2-inch thick seams dark grey fine sand, stiff, moist to wet, stiff	
	5	SPT	3-2	4 6 6	12			
	▼ (7)							
		SPT	3-3	5 5 5	10		Dark Grey/Black Silty SAND (SM), fine to medium grained, medium dense, wet	
	10	SPT	3-4	3 5 7	12			
							--- Becomes Sand (SP-SM) with Silt, fine to medium grained, medium dense, wet	
	15	SPT	3-5	6 10 7	17			
							Dark Grey/Black Silty SAND (SM), fine to medium grained, with a 4-inch thick seam of peat at 20 feet, medium dense, wet	
	20	SPT	3-6	4 6 8	14			
							End of Boring at 21.5 Feet	
	25							


Monitoring Well
MW-1
Bentonite
Chips
Solid PVC Pipe
FILTER
SAND
8'
20'
21.5'
Brown Silty SAND (SM)
Brownish Grey SAND (SP)
Alternating Sandy SILT (ML) and Silty SAND (SM)
Dark Brownish Grey Silty CLAY (CL)
--- Clayey SILT (ML)
Dark Grey/Black Silty SAND (SM)


Monitoring Well
MW-2
Brown Silty SAND (SM)
Bentonite
Chips
Solid PVC Pipe
Dark Grey/Black Silty SAND (SM)
8'
Filter
Sand
Black SAND (SP-SM) with Silt
20'

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
						78.5

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	78.5		

* (no specification provided)

Material Description

Brown Sandy SILT

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:19L131
Sample Date:3-11-19
Moisture Content = 35.4 %

Date Received: 3-15-19 **Date Tested:** 3-22-19

Tested By: M.Thomas

Checked By: M.Thomas

Title: Materials Laboratory Manager

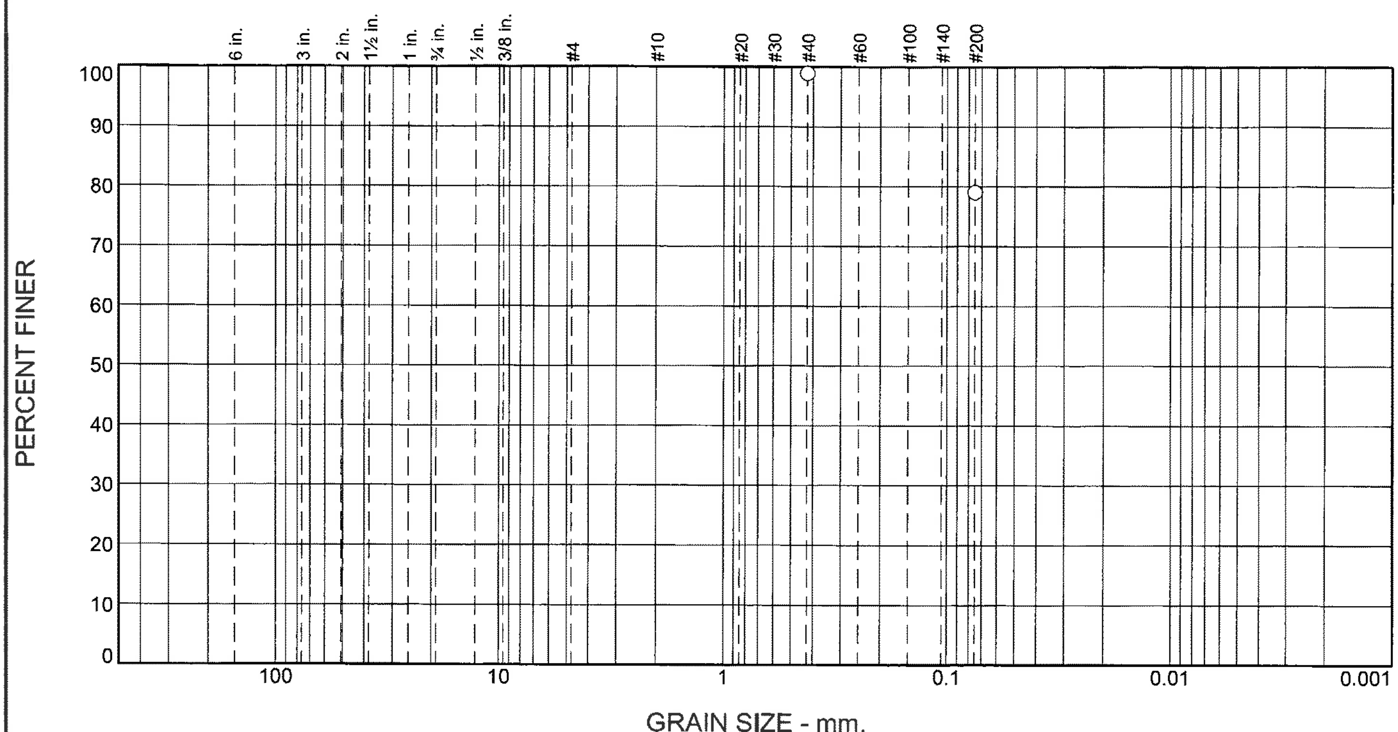
Location: B-1 Sample 1-2B
Sample Number: 19L131 **Depth:** 5'-6.5' **Date Sampled:** 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing

Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
					19.8	79.1

Test Results (C-136 & C-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	98.9		
#200	79.1		

* (no specification provided)

Material Description

Grey Clayey SILT with fine sand

Atterberg Limits (ASTM D 4318)

PL= 33.5 LL= 34.9 PI= 1.4

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= 0.1948 D_{85}= 0.1258 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:19L120
Sample Date:3-11-19
Moisture Content = 51.2 %

Date Received: 3-15-19 **Date Tested:** 3-15-19

Tested By: M.Thomas

Checked By: M.Thomas

Title: Materials Laboratory Manager

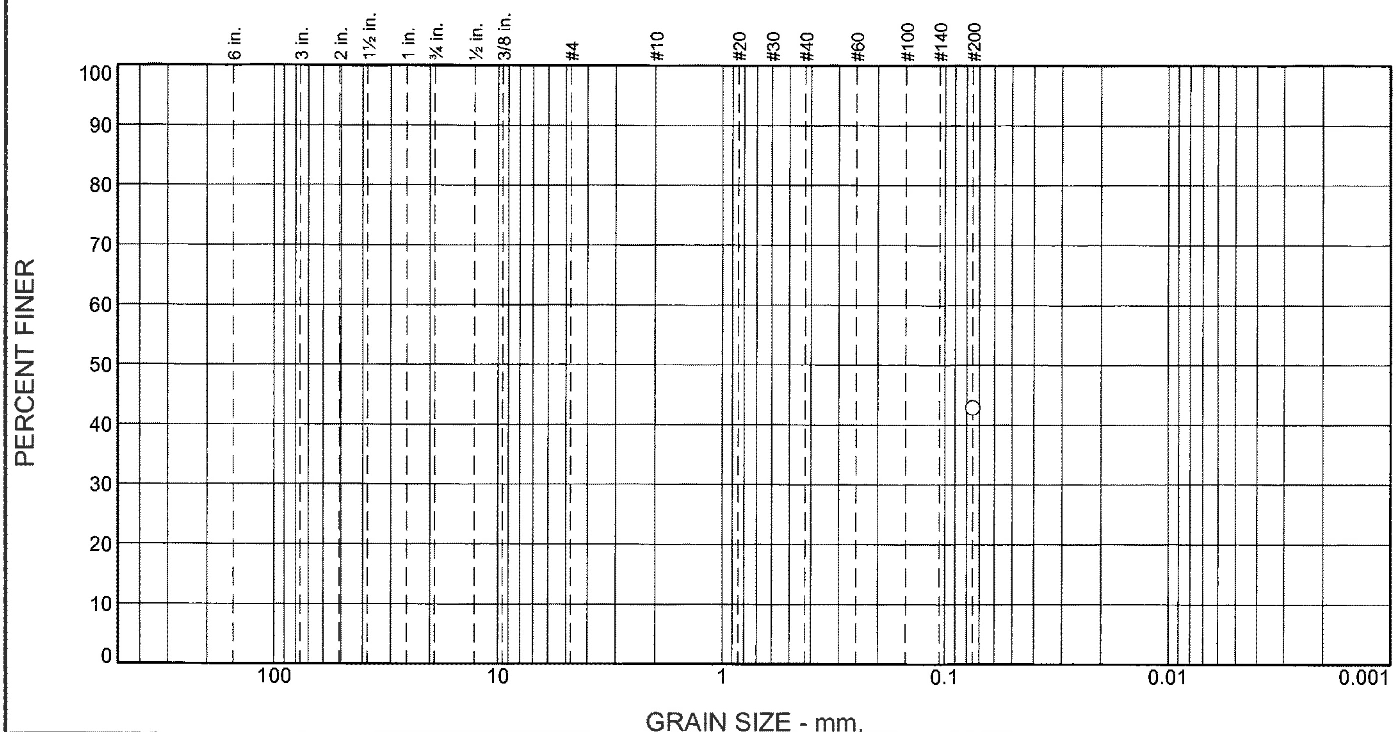
Location: B-1 Sample 1-3B
Sample Number: 19L120 **Depth:** 7.5'-9' **Date Sampled:** 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing

Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
						42.9

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	42.9		

* (no specification provided)

Material Description

Brown silty sand.

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:19L132
Sample Date:3-11-19
Moisture Content = 29.3 %

Date Received: 3-15-19 **Date Tested:** 3-22-19

Tested By: M.Thomas

Checked By: M.Thomas

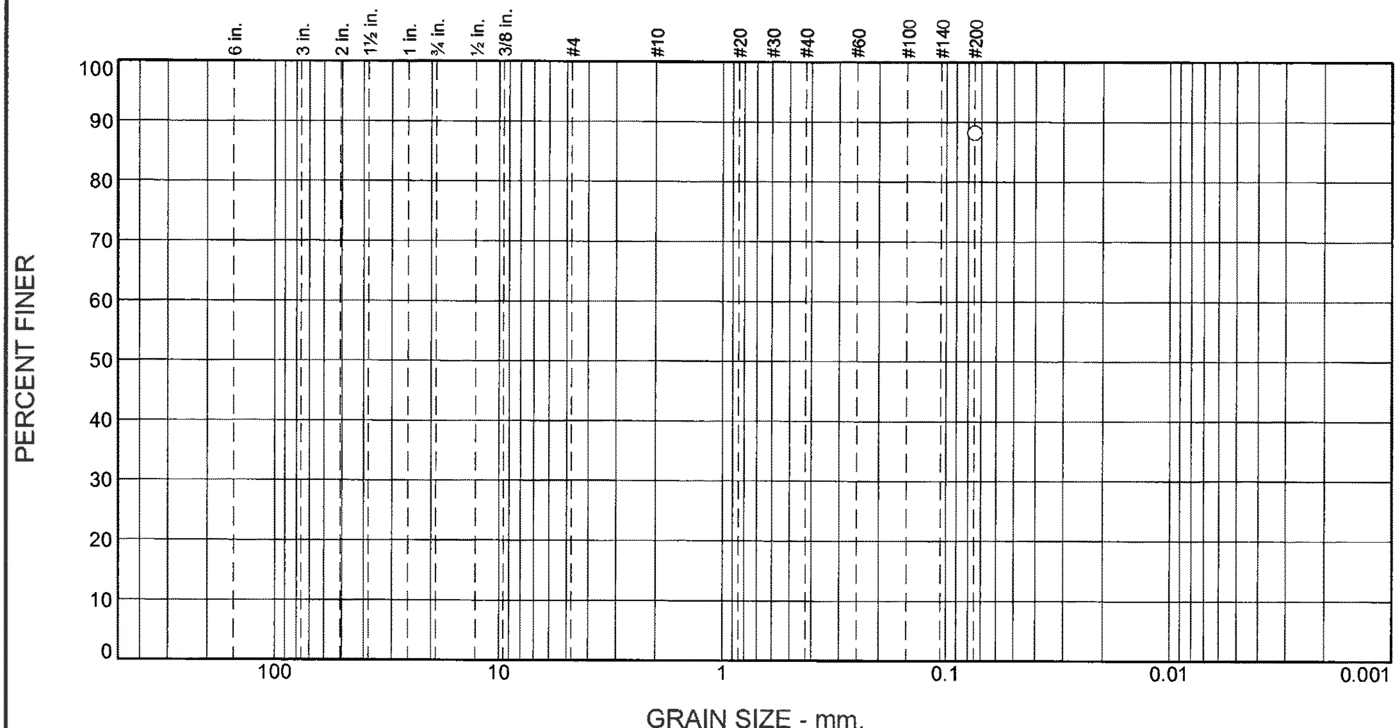
Title: Materials Laboratory Manager

Location: B-2 Sample 2-2
Sample Number: 19L132 **Depth:** 5'-6.5' **Date Sampled:** 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing
Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
						88.2

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	88.2		

* (no specification provided)

Material Description

Brown sandy silt.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=**

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:19L133
Sample Date:3-11-19
Moisture Content = 37.0%

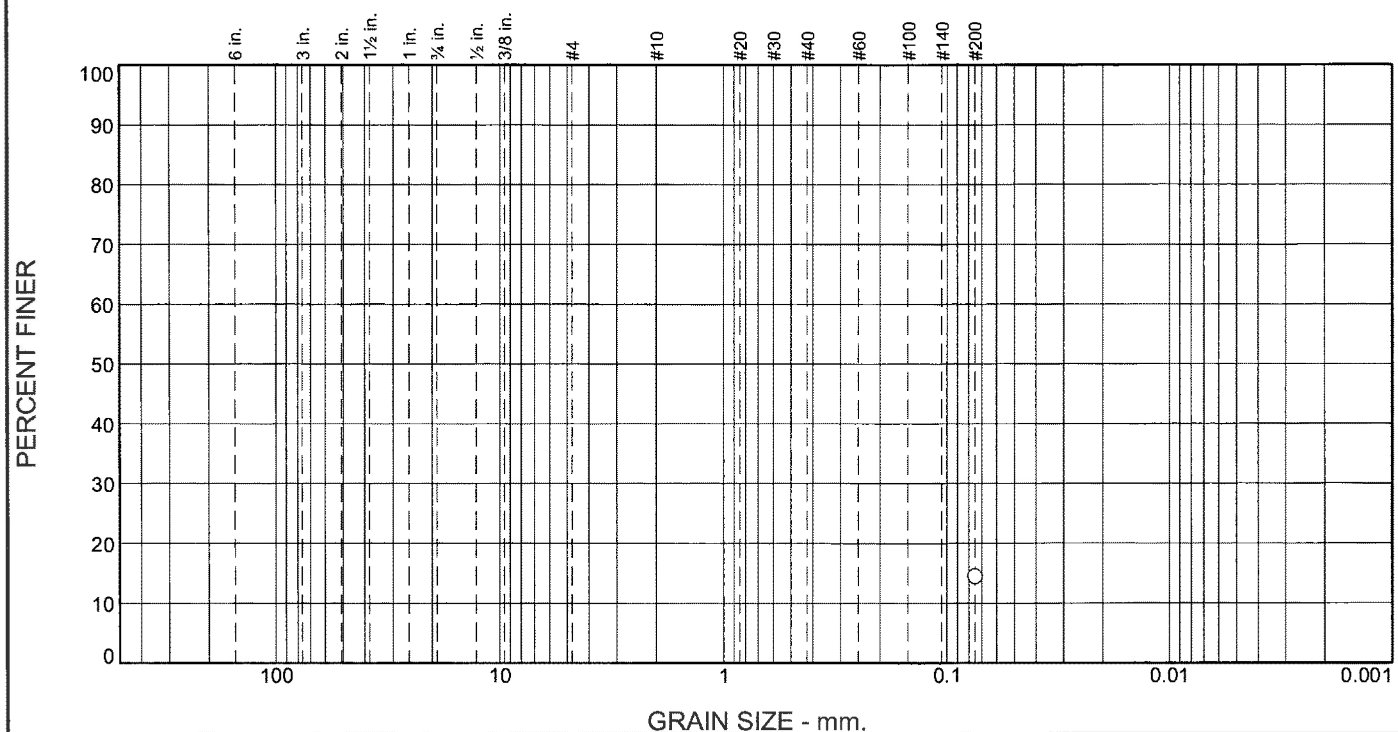
Date Received: 3-15-19 **Date Tested:** 3-22-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

Location: B-2 Sample 2-3
Sample Number: 19L133 **Depth:** 7.5'-9' **Date Sampled:** 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing
Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
						14.5

Test Results (C-136 & C-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	14.5		

* (no specification provided)

Material Description

Dark Grey/Black silty sand.

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:19L134
sample Date:3-11-19
Moisture Content = 25.0 %

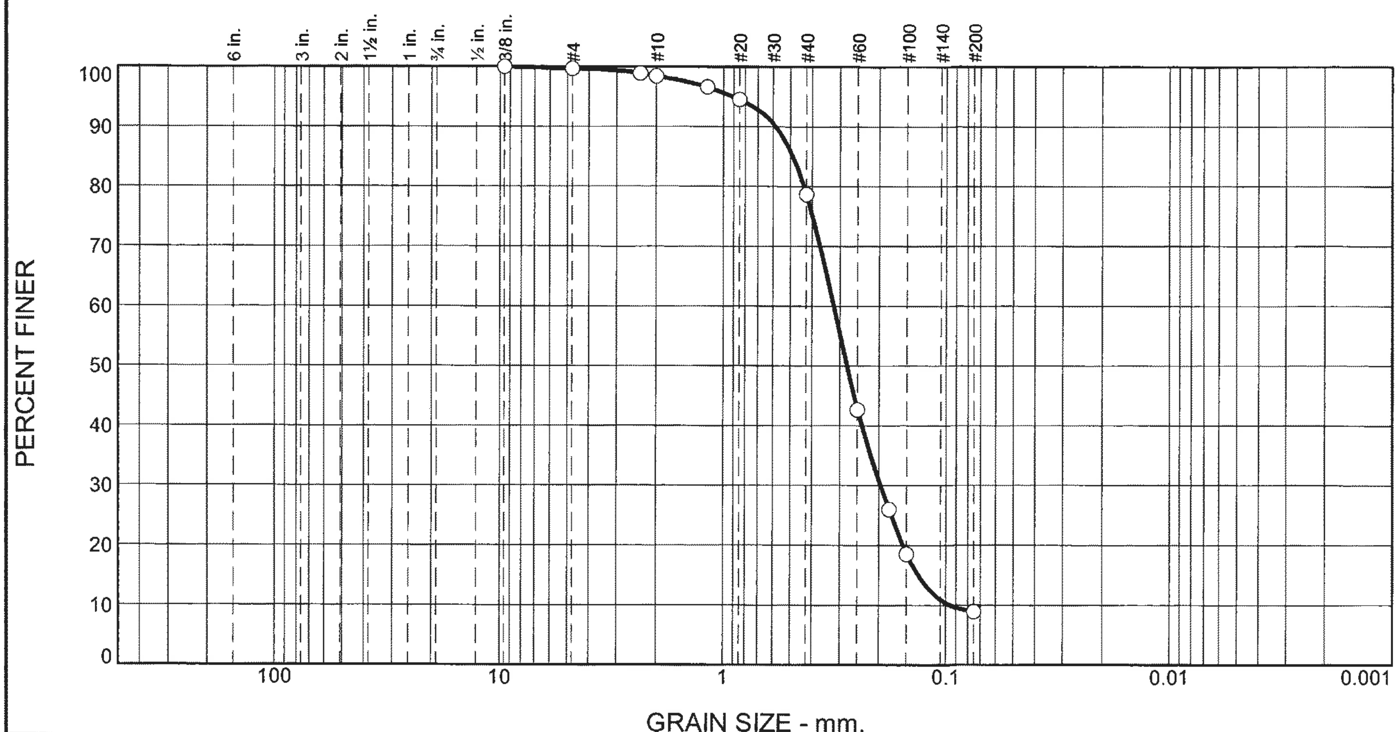
Date Received: 3-15-19 **Date Tested:** 3-22-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

Location: B-2 Sample 2-4
Sample Number: 19L134 **Depth:** 10'-11.5'
Date Sampled: 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing
Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	0.3	1.2	19.8	69.8	8.9

Test Results (C-136 & C-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.7		
#8	98.9		
#10	98.5		
#16	96.6		
#20	94.5		
#40	78.7		
#60	42.7		
#80	26.0		
#100	18.5		
#200	8.9		

* (no specification provided)

Material Description

Dark Grey/Black sand with silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.5827 D_{85}= 0.4892 D_{60}= 0.3205
D_{50}= 0.2792 D_{30}= 0.1966 D_{15}= 0.1334
D_{10}= 0.0956 C_u= 3.35 C_c= 1.26

Remarks

Sample ID:19L121
Sample Date:3-11-19
Moisture Content = 22.6 %

Date Received: 3-15-19 **Date Tested:** 3-22-19

Tested By: M.Thomas

Checked By: M.Thomas

Title: Materials laboratory Manager

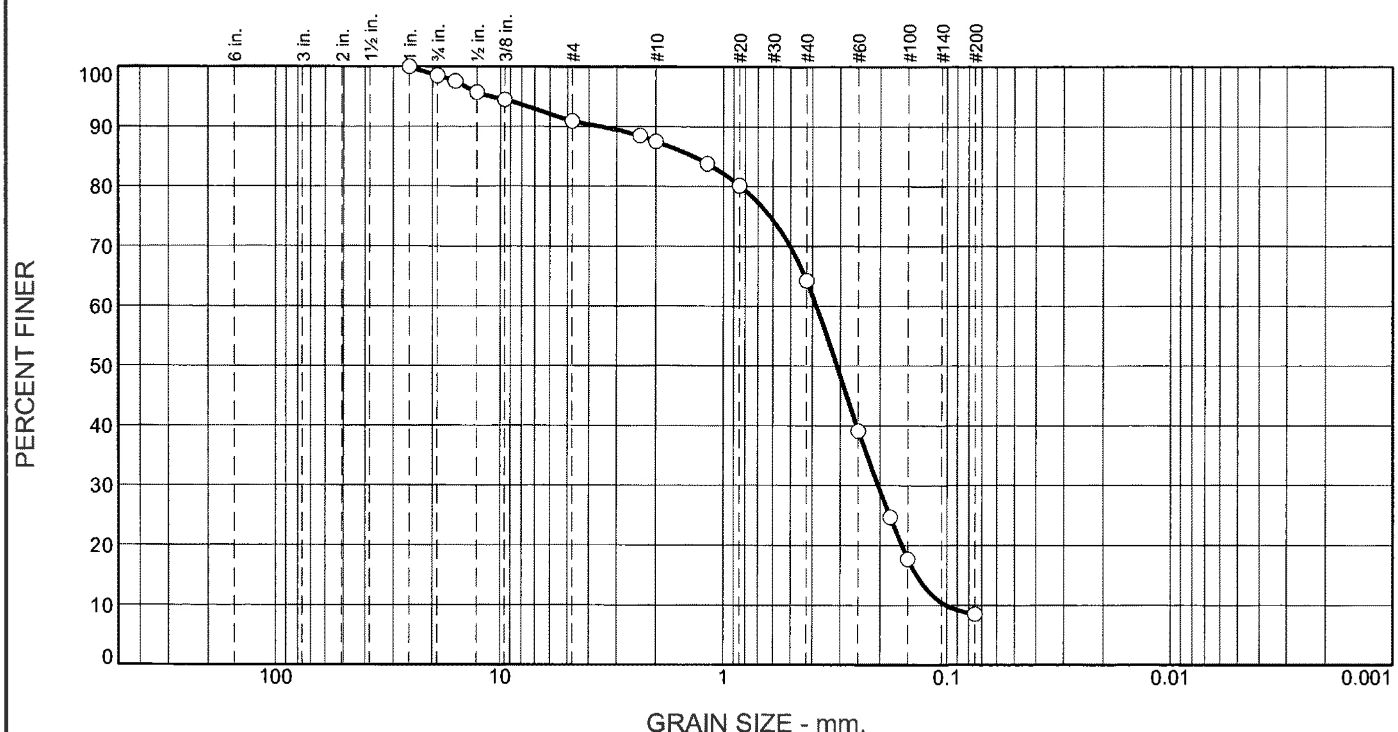
Location: B-2 Sample 2-5
Sample Number: 19L121 **Depth:** 15'-16.5' **Date Sampled:** 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing

Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	1.4	7.6	3.5	23.3	55.7	8.5

Test Results (C-136 & C-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	98.6		
.625	97.6		
.5	95.7		
.375	94.5		
#4	91.0		
#8	88.5		
#10	87.5		
#16	83.8		
#20	80.2		
#40	64.2		
#60	39.1		
#80	24.7		
#100	17.7		
#200	8.5		

* (no specification provided)

Material Description

Dark Grey/Black sand with silt.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 3.5671 D_{85}= 1.3567 D_{60}= 0.3839
D_{50}= 0.3115 D_{30}= 0.2039 D_{15}= 0.1371
D_{10}= 0.1011 C_u= 3.80 C_c= 1.07

Remarks

Sample ID:19L122
Sample Date:3-11-19
Moisture Content = 18.8 %

Date Received: 3-15-19 **Date Tested:** 3-22-19

Tested By: M.Thomas

Checked By: M.Thomas

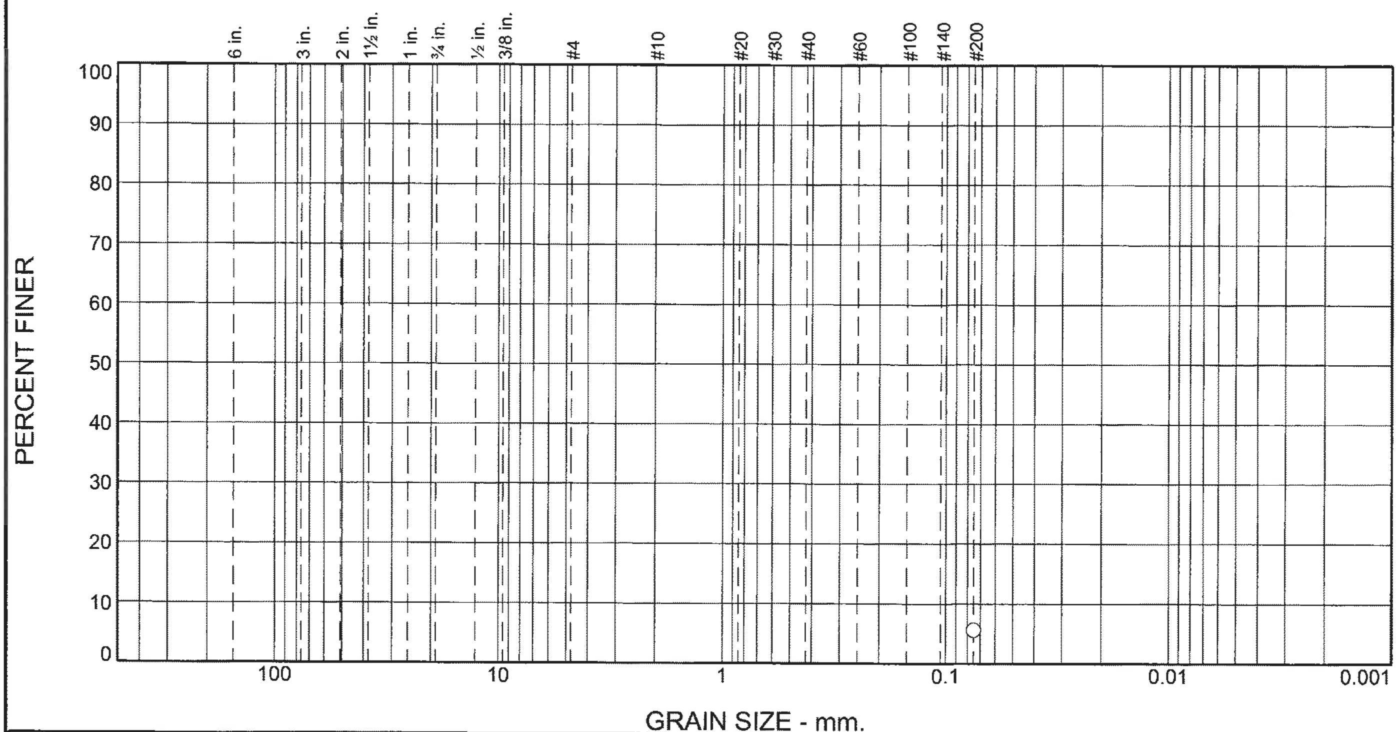
Title: Materials Laboratory Manager

Location: B-2 Sample 2-8
Sample Number: 19L122 **Depth:** 30'-31.5'
Date Sampled: 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing
Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
						5.6

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	5.6		

* (no specification provided)

Material Description

Dark Grey/Black sand with silt.

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:19L135
Sample Date:3-11-19
Moisture Content = 18.9 %

Date Received: 3-15-19 **Date Tested:** 3-11-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

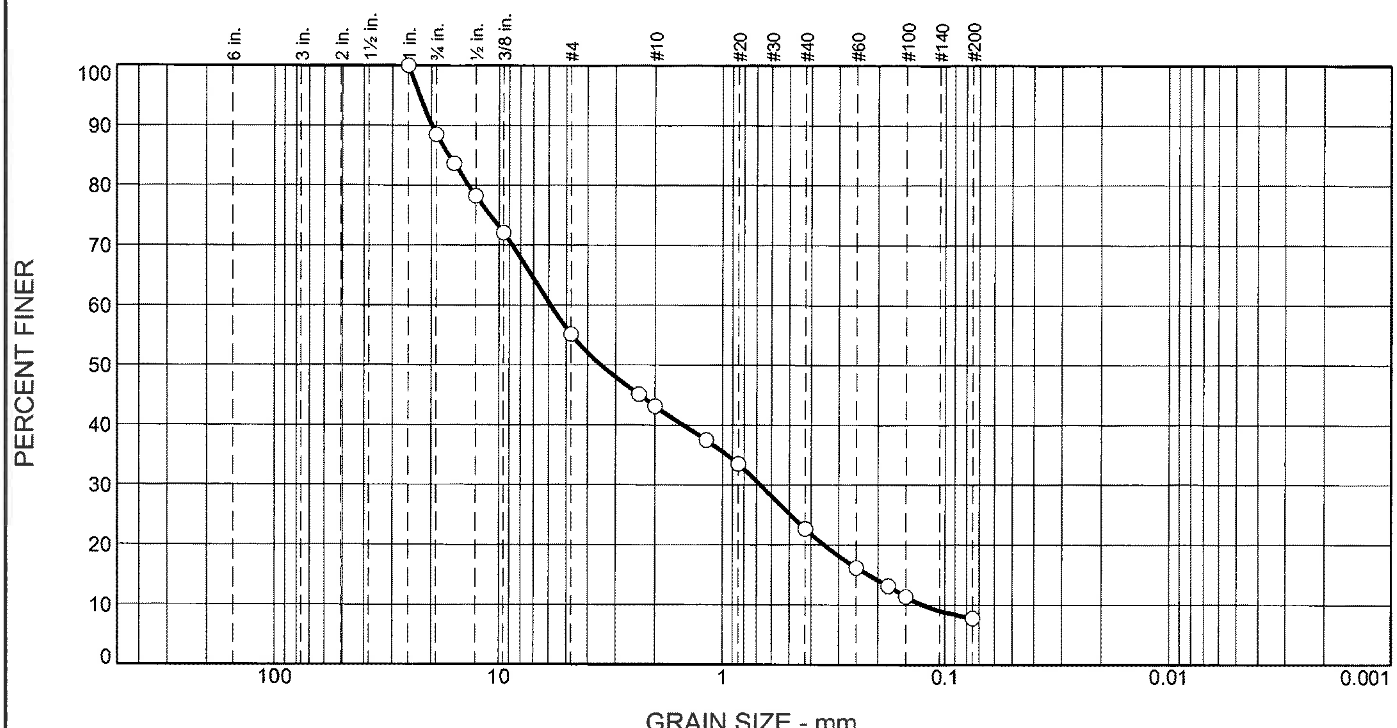
Location: B-2 Sample 2-9 **Date Sampled:** 3-11-19
Sample Number: 19L135 **Depth:** 35'-36.5'

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing

Project No: 062-19007 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	11.5	33.3	12.0	20.5	14.9	7.8

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	88.5		
.625	83.7		
.5	78.3		
.375	72.1		
#4	55.2		
#8	45.1		
#10	43.2		
#16	37.5		
#20	33.5		
#40	22.7		
#60	16.2		
#80	13.2		
#100	11.4		
#200	7.8		

* (no specification provided)

Material Description

Dark Grey/Black sand with silt and gravel.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 19.9452 D_{85}= 16.7747 D_{60}= 5.8717
D_{50}= 3.4968 D_{30}= 0.6741 D_{15}= 0.2194
D_{10}= 0.1253 C_u= 46.85 C_c= 0.62

Remarks

Sample ID:19L123
Sample Date:3-11-19
Moisture Content = 9.4 %

Date Received: 3-11-19 **Date Tested:** 3-11-19

Tested By: M.Thomas

Checked By: M.Thomas

Title: Materials Laboratory Manager

Location: B-2 Sample 2-10
Sample Number: 19L123 **Depth:** 37'-38.5' **Date Sampled:** 3-11-19

Krazan

Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing

Project No: 062-19007 **Figure**

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, **the recommendations in the report have precedence**.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Geotechnical Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Geotechnical Engineer and Civil Engineer are the Owner's representatives. If the contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Geotechnical Engineer and Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Geotechnical Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density of not less than 95 percent of maximum dry density as determined by ASTM Test Method D1557 as specified in the technical portion of the Geotechnical Engineering Report. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Geotechnical Engineer.

SOIL AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the contractor for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including Court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

General site clearing should include removal of any organics, asphaltic concrete, abandoned utilities, structures including foundations, basement walls and floors, rubble, and rubbish. After stripping operations and removal of any loose and/or debris-laden fill, the exposed subgrade should be visually inspected and/or proof rolled to identify any soft/loose areas.

SUBGRADE PREPARATION: Subgrade should be prepared as described in our site preparation section of this report.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Geotechnical Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Geotechnical Engineer. All materials utilized for constructing site fills shall be free from vegetable or other deleterious matter as determined by the Geotechnical Engineer.

PLACEMENT, SPREADING, AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Geotechnical Engineer.

Both cut and fill shall be surface compacted to the satisfaction of the Geotechnical Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Geotechnical Engineer indicates that the moisture content and density of previously placed fill are as specified.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. **DEFINITIONS** – The term "pavement" shall include asphalt concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

2. **SCOPE OF WORK** – This portion of the work shall include all labor, materials, tools, and equipment necessary for and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically notes as "Work Not Included."

3. **PREPARATION OF THE SUBGRADE** – Subgrade should be prepared as described in our site preparation and pavement design sections of this report.

4. **AGGREGATE BASE** – The aggregate base shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base should conform to WSDOT Standard Specification for Crushed Surfacing Base Course or Top Course (Item 9-03.9(3)). The base material shall be compacted to a minimum compaction of 95% as determined by ASTM D1557. Each layer of subbase shall be tested and approved by the Geotechnical Engineer prior to the placement of successive layers.

5. **ASPHALTIC CONCRETE SURFACING** – Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The drying, proportioning, and mixing of the materials shall conform to WSDOT Specifications.

The prime coat, spreading and compaction equipment, as well as the process of spreading and compacting the mixture, shall conform to WSDOT Specifications, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with combination steel-wheel and pneumatic rollers, as described in WSDOT Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

6. **TACK COAT** – The tack (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of WSDOT Specifications.

Steep Slope Addendum Letter

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

July 31, 2020

KA Project No. 062-190007

Abbey Road Group Land Development Services Company, LLC
PO Box 1224
Puyallup, Washington 98371

Attn: Gil Hulsmann
Email: Gil.Hulsmann@AbbeyRoadGroup.com
Phone: (253) 435-3699 (ext. 101)

Reference: **Geotechnical Engineering Investigation Addendum Letter**
East Town Crossing
Parcel Nos. 0420264053, 0420264054, 0420351066
SE Corner of E. Shaw Road and E. Pioneer Way
Puyallup, Washington 98371

Dear Mr. Hulsmann,

Per your request, we have prepared this letter to provide our opinion regarding the nearby steep slopes. We previously prepared a geotechnical report titled "Geotechnical Engineering Investigation – East Town Crossing – Parcel Nos. 0420264053, 0420264054, 0420351066 – SE Corner of E. Shaw Road & E. Pioneer Way – Puyallup, Washington", dated April 11, 2019.

Based on our communication with you, it is our understanding that the City of Puyallup has requested to provide our opinion on the hazards and risks to the site due to the site being within 300 feet of steep slopes.

We have reviewed Washington State Department of Natural Resources (DNR), City of Puyallup, and Pierce County published landslide hazard maps and web data. We have also reviewed the Landslide Inventory, Susceptibility, and Exposure Analysis of Pierce County, Washington (DNR), prepared by Katherine A. Mickelson et al., and dated July 2017.

Based on our review, we understand that steep slopes are located roughly 300 feet to the south and east from the site. These nearby slopes are mapped moderate to high for shallow landslide susceptibility, and moderate for deep susceptibility. However, there are no historic landslides or debris mapped at the nearby slopes. The closest landslide mapped is located roughly 1 mile southeast of the site.

There is an existing developed property between the nearby southern slope and the southern boundary of the site. There is a partially developed property between the nearby eastern slope and the eastern boundary of the site. In our opinion, these properties to the south and east create a buffer between the nearby slopes and the site. Based on our review of available published documents and maps, it is our opinion that there is minimum to no risk to the planned development from the nearby slopes.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,

KRAZAN & ASSOCIATES, INC.

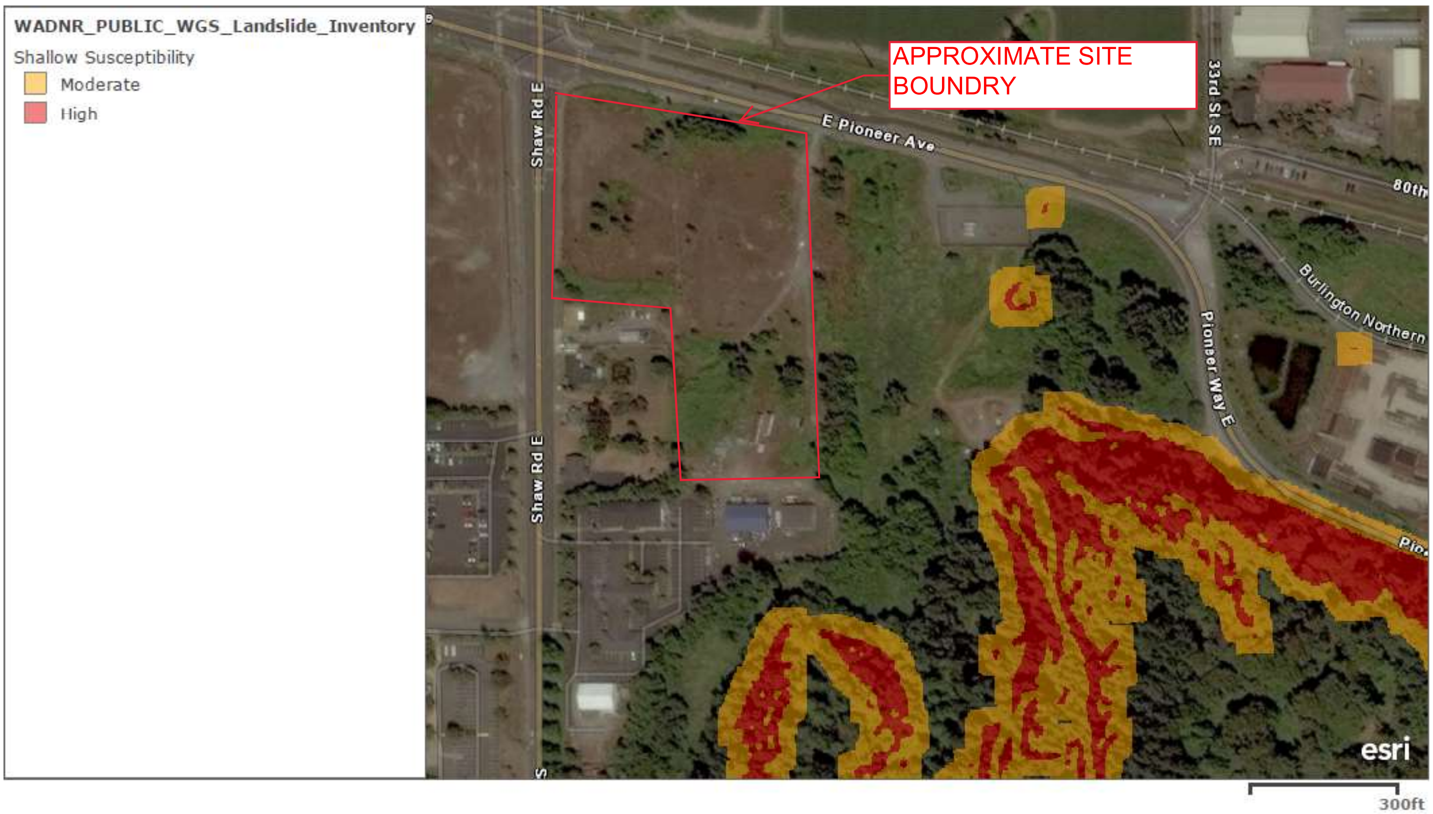
07/31/20

Theresa Nunan

Vijay Chaudhary, P.E.
Project Engineer

Theresa R. Nunan
Project Manager

Attachments: WA DNR Landslide Inventory Maps (Figures A, B, and C)



USDA FSA, GeoEye, Maxar | Esri Community Maps Contributors, King County, WA State Parks GIS, BuildingFootprintUSA, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

N

Krazan

East Town Crossing

Date: July 2020	Project Number: 062-19007

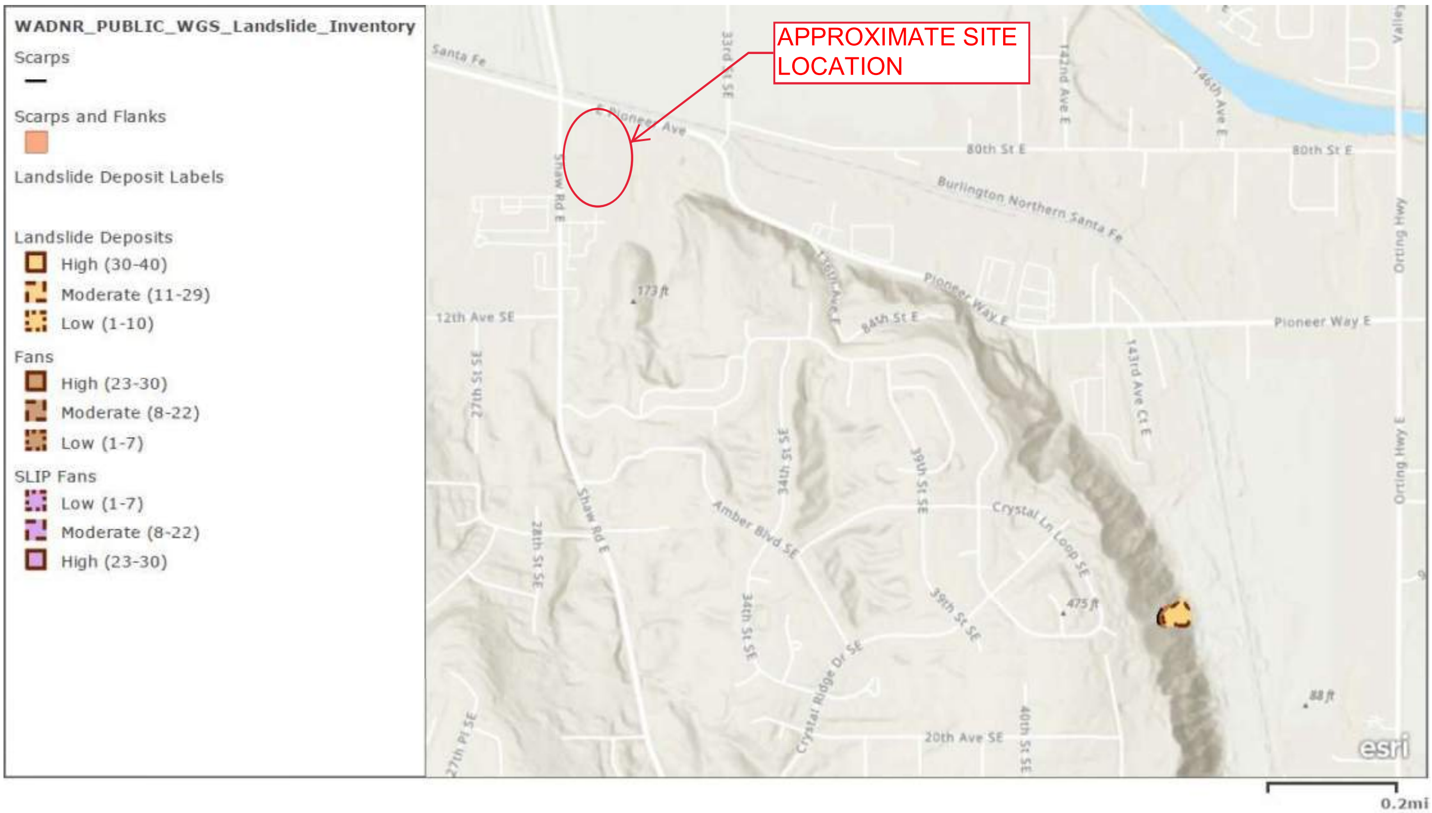
Drawn By: VC	Figure: A	Not to scale

USDA FSA, GeoEye, Maxar | Esri Community Maps Contributors, King County, WA State Parks GIS, BuildingFootprintUSA, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

N

Krazan

East Town Crossing		
Date: July 2020	Project Number: 062-19007	
Drawn By: VC	Figure: B	Not to scale



Esri, NASA, NGA, USGS, FEMA | Esri Community Maps Contributors, King County, WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA

N

Krazan

East Town Crossing

Date: July 2020 | Project Number: 062-19007

Drawn By: VC | Figure: C | Not to scale

Figure A6 - Geo-technical Infiltration Report

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

March 19, 2021

Abbey Road Group Land Development Services Company, LLC
PO Box 1224
Puyallup, Washington 98371

Attn: Gil Hulsmann
Email: Gil.Hulsmann@AbbeyRoadGroup.com
Phone: (253) 435-3699 (ext. 101)

Reference: **Geotechnical Engineering Investigation Addendum Letter**
East Town Crossing
SE Corner of E. Shaw Road and E. Pioneer Way
Puyallup, Washington

Dear Mr. Hulsmann,

Per your request, we have prepared this letter to provide the results of two (2) Large-Scale Pilot Infiltration Tests (PITs) we conducted at the above-referenced site. We previously prepared a geotechnical report titled "Geotechnical Engineering Investigation – East Town Crossing – Parcel Nos. 0420264053, 0420264054, 0420351066 – SE Corner of E. Shaw Road & E. Pioneer Way – Puyallup, Washington", dated April 11, 2019, as well as an addendum letter dated July 31, 2020 that addressed the nearby steep slopes.

Large-Scale PITs

Two (2) test pits, designated P-1 and P-2, were excavated near Monitoring Wells MW-1 and MW-2, respectively, on March 4, 2021 at the approximate locations indicated on the Site Plan, Figure 1, in order to conduct large-scale infiltration tests in accordance with the 2014 Stormwater Management Manual for Western Washington (SWMMWW). The infiltration test locations were selected in the field by the client and excavated using a client provided excavator and operator. The bottom of each pit was excavated 10-feet wide by 10-feet long, which met the minimum required horizontal surface area of 100 square feet (sf). Each test pit was initially excavated to a depth of 2 feet below the existing ground surface (bgs), which exposed silty sand (SM) soils at the pit bottom. Water was observed seeping from the sides of pit P-1 during excavation, and was observed ponded at the ground surface at several locations in the vicinity of pit P-1. Test pits P-1 and P-2 encountered undocumented fill to a depth of 1.8 feet and 0.5 feet bgs, respectively, followed by native brown silty sand (SM) with trace gravel and occasional sandy silt and sandy clay seams and layers to the bottom of the test pits. The soils exposed at the PIT test depth were similar to those encountered in the geotechnical borings conducted during our original exploration of the site.

The infiltration test procedure includes a pre-soak period, followed by steady-state and then falling head infiltration rate testing. Each pit was filled with water to a depth of 12 inches above the bottom of the pit for the pre-soak period. After two (2) hours of pre-soak, the water hose was turned off as even just a slight trickle caused the water level in the pit to continue to rise. Water level readings were obtained for an additional 4 hours in pit P-2 with no change in the water level, while the water level in pit P-1 increased ¾-inches which we attributed to seepage from the sides of this pit which were observed during its excavation. Since the water in pits P-1 and P-2 was not infiltrating, we left the pits open overnight, and returned to the site to record the water level. Since it had commenced to rain just prior to our leaving the site, a 5-gallon bucket was left at the location of pit P-2 to obtain an estimate of the amount of rain that fell overnight. We recorded 0.6 inches of rain in the bucket the following morning. On the morning of March 5, 2021, the water level in pit P-1 had risen another 1.2 inches, while the water level in pit P-2 rose about 0.3 inches. Figure 2 includes photos of pits P-1 and P-2 taken on March 5, 2021. The pits were not over-excavated due to the presence of water. The contractor had excavated three test pits within the northwestern corner of the site on March 4, 2021. We observed about 8 to 10 inches of water in the bottom of two of the test pits on March 5, 2021.

Evaluation of Infiltration Feasibility: One of the Site Suitability Criteria (SSC) presented in Section 3.3.7, Volume III, 2014 SWMMWW, **SSC-5 Depth to Bedrock, Water Table, or Impermeable Layer**, states that the base of all infiltration basins or trench systems shall be greater than or equal to 5 feet above the seasonal high-water mark, bedrock (or hardpan), or other low permeability layer. Based on the results of our field exploration and large-scale PITs, the soils at the site contain high silt content and are considered a very low to relatively impermeable layer. Based on the results of our general site assessment and field testing, the low permeability soils encountered at the site do not meet the requirements of Site Suitability Criteria SSC-5 and it is therefore our opinion that onsite infiltration of stormwater using basin or trench system is not considered feasible for the proposed development. **However,** consideration may be given to the use of permeable pavement and other Best Management Practices (BMPs), depending on the final site grading plan.

Limitations

This letter has been prepared for the exclusive use of the Abbey Road Group and their assigns, for the specific application to the site. The geotechnical information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. We emphasize that this letter is valid for this project as outlined above, and should not be used for any other site.

This letter does not include any environmental site assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater or atmosphere, or the presence of wetlands or other biological conditions. The information presented herein is based upon professional interpretation using standard industry practices and engineering conservatism that we consider proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical developments.

Within the limitations of scope, schedule and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this letter was prepared. No other warranty, expressed or implied, is made.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,

KRAZAN & ASSOCIATES, INC.

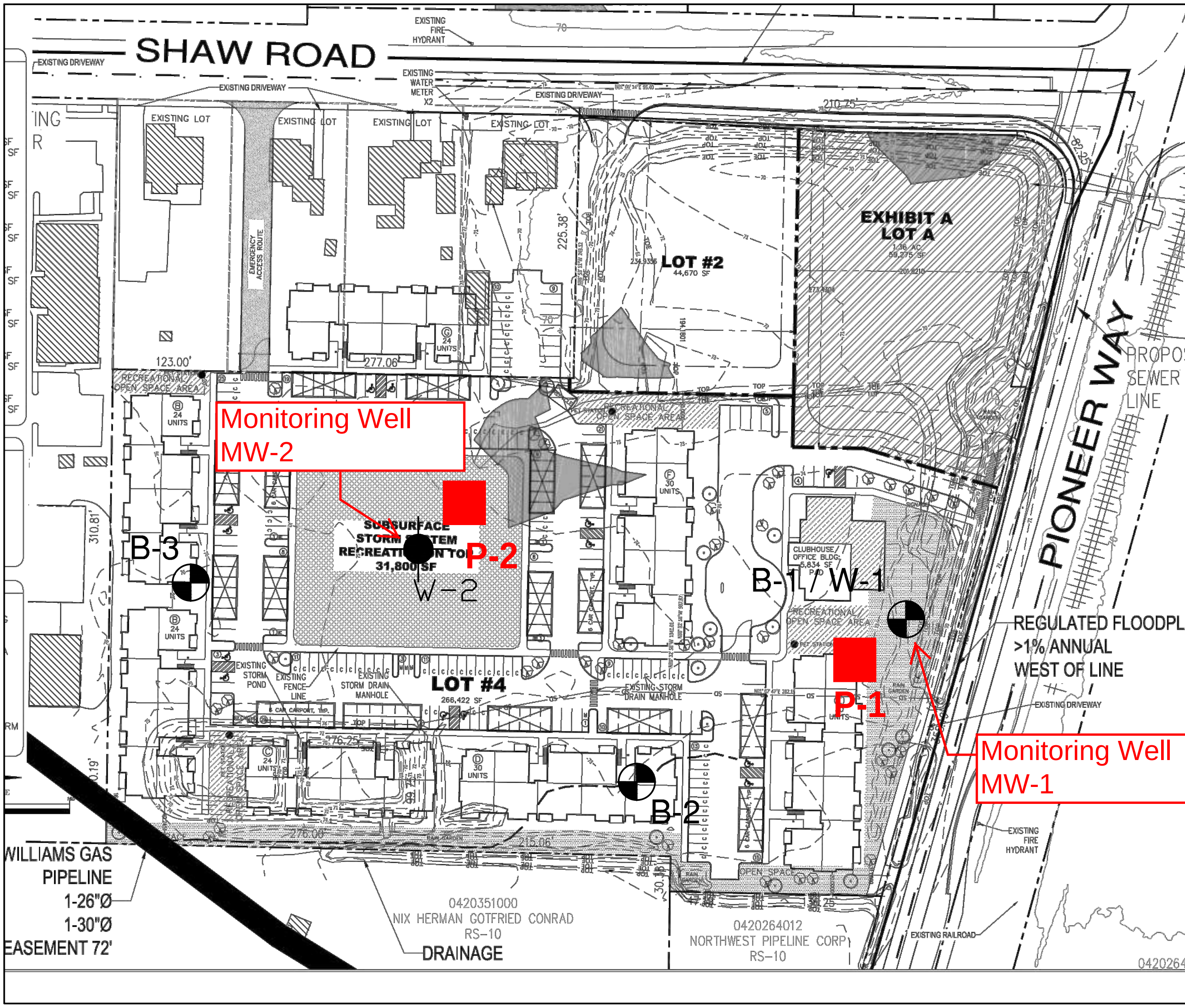
3/19/21

VIJAY CHAUDHARY
STATE OF WASHINGTON
51061
REGISTERED
PROFESSIONAL ENGINEER

Theresa R. Nunan
Project Manager

Vijay Chaudhary, P.E.
Assistant Regional Engineering Manager

Attachments: Figure 1 – Site Plan
Figure 2 – Photos

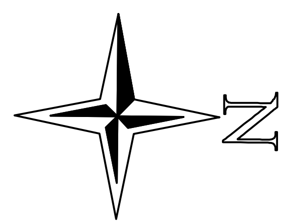


LEGEND

B-1 Number and Approximate Location of Borings

W-1 Approximate Location of Monitoring Well

P-1 Approximate Location of Pilot Infiltration Test



Reference: Plan Sheet titled "Overall Site Plan", prepared by Abbey Road Group dated December 7, 2018.

Site Plan

East Town Crossing	Figure 1
Shaw Rd & E Pioneer Way, Puyallup, WA	
Project Number: 062-19007	Drawn By: T. Nunan Date: March 2021
Krazan & ASSOCIATES, INC.	Not to Scale

Water in Pit P-1 on March 5, 2021.

Water in Pit P-2 on March 5, 2021.

Water in Test Pit on March 5, 2021. Test pit was excavated in NE portion of site on March 4, 2021.

Figure 2 - Photos (March 5, 2021)

Figure A7 - Geo-technical Glass Proctor Report

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

December 10, 2021 KA Project No. 062-21033

Abbey Road Group, LLC
P.O. Box 11489
Olympia, WA 98508

Attn: Mr. Gil Hulsmann
Tel: 253-435-3699 x1510
Email: gil.hulsmann@abbeyroadgroup.com

Reference: **Laboratory Testing – Recycled Glass**
East Town Crossing Project
SE Corner of E Shaw Road & E Pioneer Way
Puyallup, Washington

Dear Mr. Hulsmann,

The gradation and proctor test results for the two recycled glass samples, one designated "clean" and the other designated "with fines", supplied by Dan Lloyd Construction are attached to this letter. The gradation tests were conducted on the samples 'as received' and again after completing the Proctor compaction tests. As can be seen in the summary of test results, Table 1 attached to this letter, the glass pierces broke down significantly due to the compaction efforts.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,

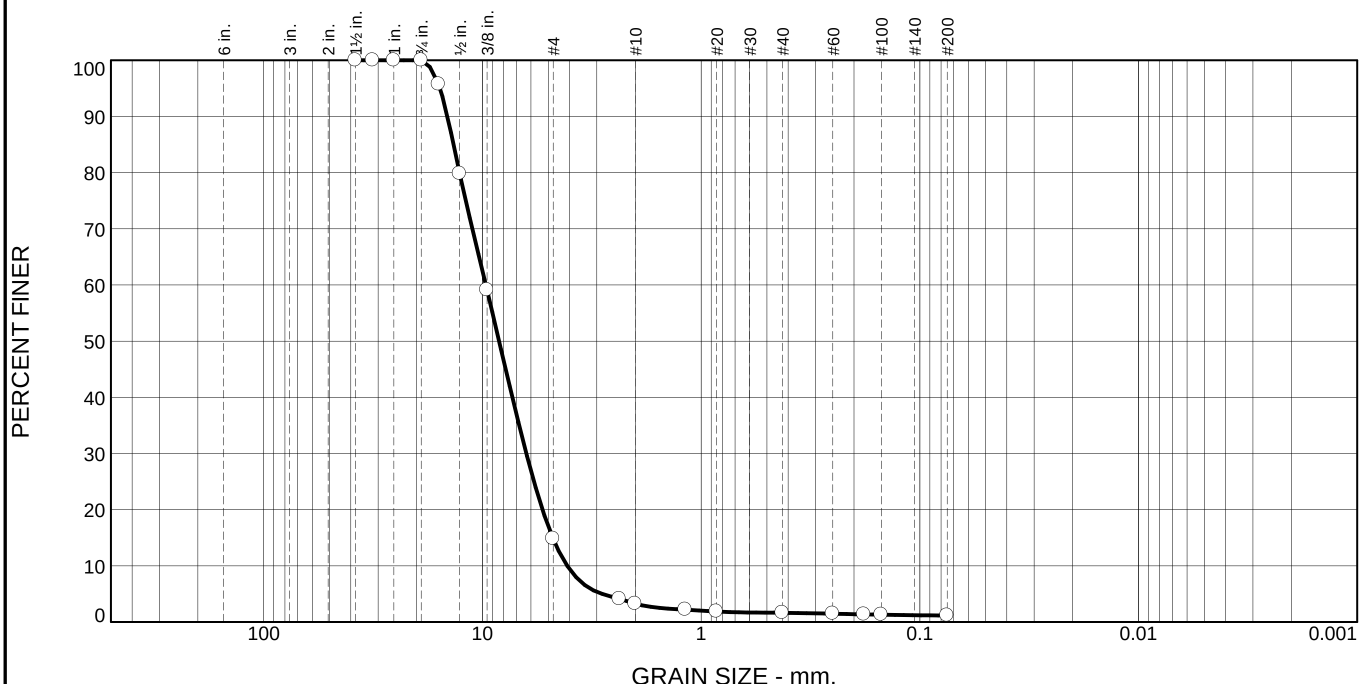
KRAZAN & ASSOCIATES, INC.

Theresa R. Nunan

Theresa R. Nunan
Project Manager

Attachments: **Recycled Glass Gradation and Proctor Test Results – "Clean" Sample**
Recycled Glass Gradation and Proctor Test Results – "With Fines" Sample
Table 1 – Summary of Recycled Glass Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	85	12	1	1	1	

Test Results (C-136 & C-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100		
1.25	100		
1	100		
.75	100		
.625	96		
.5	80		
.375	59		
#4	15		
#8	4		
#10	3		
#16	2		
#20	2		
#40	2		
#60	1		
#80	1		
#100	1		
#200	1.2		

* (no specification provided)

Material Description

Recycled Glass Clean - Before Compaction.
Sampled by the supplier.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 14.4630 D_{85}= 13.5519 D_{60}= 9.6467
D_{50}= 8.3902 D_{30}= 6.2995 D_{15}= 4.7699
D_{10}= 4.0959 C_u= 2.36 C_c= 1.00

Remarks

Sample ID:21L892
Sample Date:11-29-21

Date Received: 11-29-21 **Date Tested:** 12-1-21
Tested By: M.Thomas
Checked By: T.Nunan
Title: Project Manager

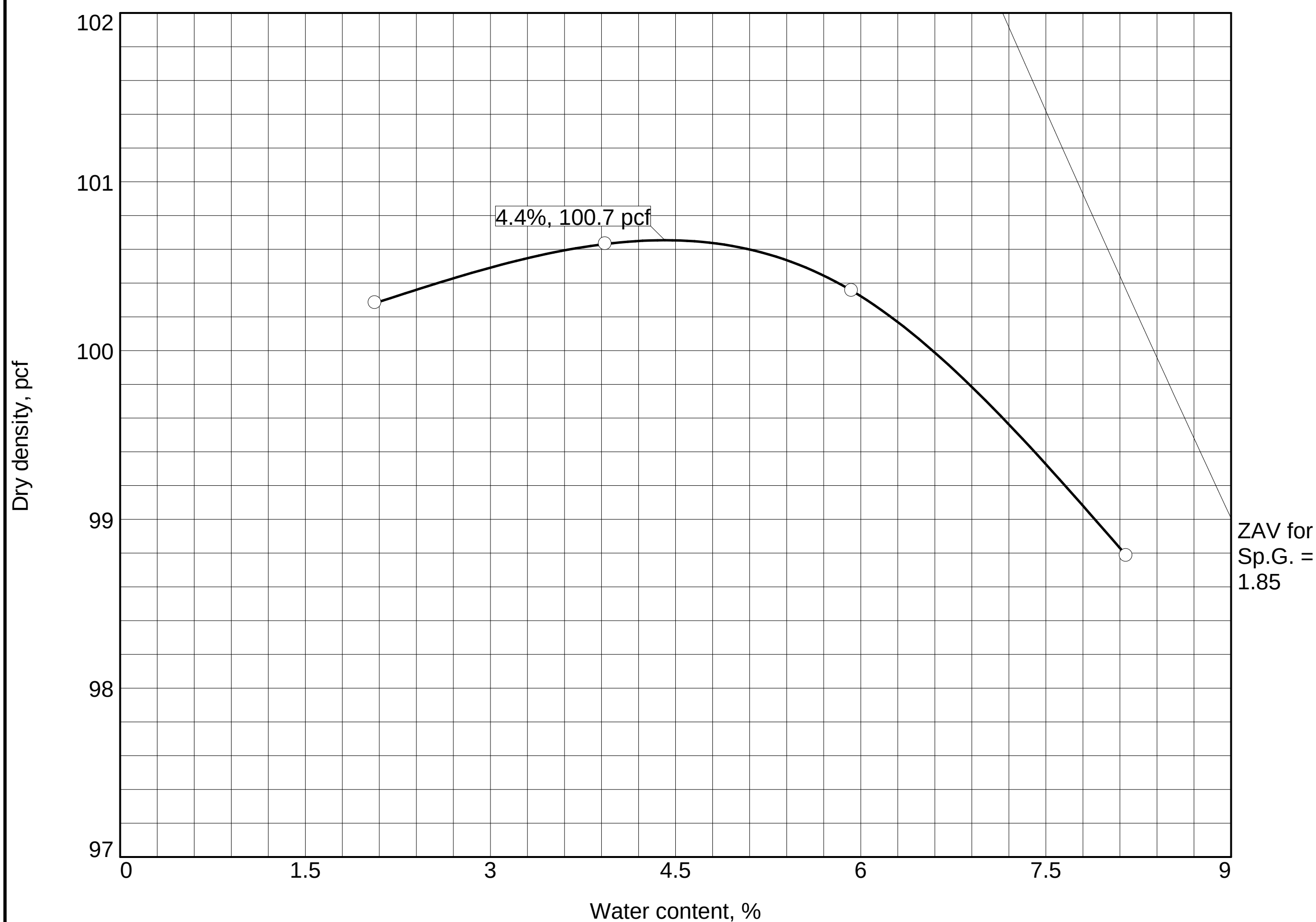
Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L892

Krazan

Client: Abbey Road Group Land Development Services Company LLC
Project: East Town Crossing Lab Testing - Recycled Glass

Project No: 062-21033 **Figure**

COMPACTION TEST REPORT



Test specification: ASTM D 1557 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	GP	A-1-a		1.85	NV	NP	0	1.2

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.7 pcf Optimum moisture = 4.4 %	Recycled Glass Clean. Sampled by the supplier.

Project No. 062-21033 **Client:** Abbey Road Group Land Development Services

Project: East Town Crossing Lab Testing - Recycled Glass

○**Source of Sample:** Dan Lloyd Construction **Sample Number:** 21L892

Krazan

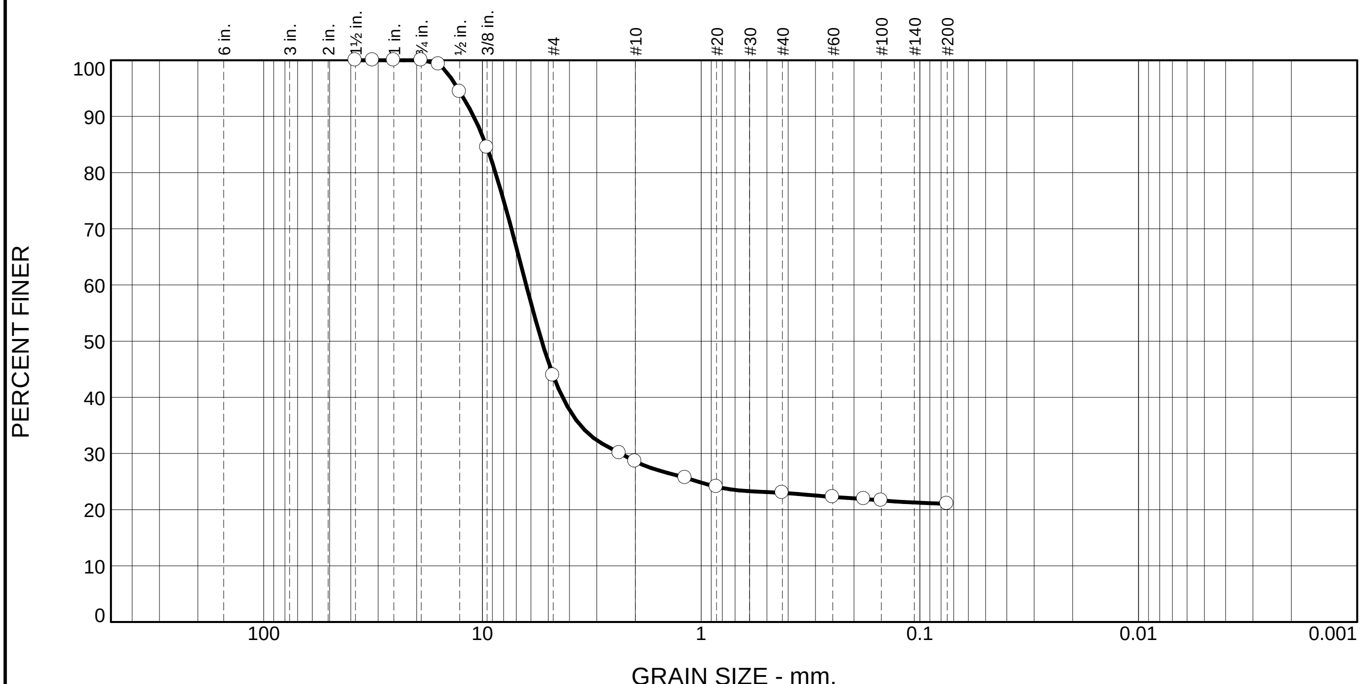
Remarks:

Sample ID:21L892
Sample Date:11-29-21
Void Ratio:0.14
Porosity:12%

Figure

Tested By: M.Thomas **Checked By:** T.Nunan.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	56	15	6	2	21	

Test Results (C-136 & C-117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100		
1.25	100		
1	100		
.75	100		
.625	99		
.5	94		
.375	84		
#4	44		
#8	30		
#10	29		
#16	26		
#20	24		
#40	23		
#60	22		
#80	22		
#100	22		
#200	21		

* (no specification provided)

Material Description

Recycled Glass Clean - After Compaction
Sampled by the supplier.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 10.9683 D_{85}= 9.6367 D_{60}= 6.3112
D_{50}= 5.3536 D_{30}= 2.3352 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:21L893
Sample Date: 11-29-21

Date Received: 11-29-21 **Date Tested:** 12-1-21
Tested By: M.Thomas
Checked By: I.Teriong
Title: Project Manager

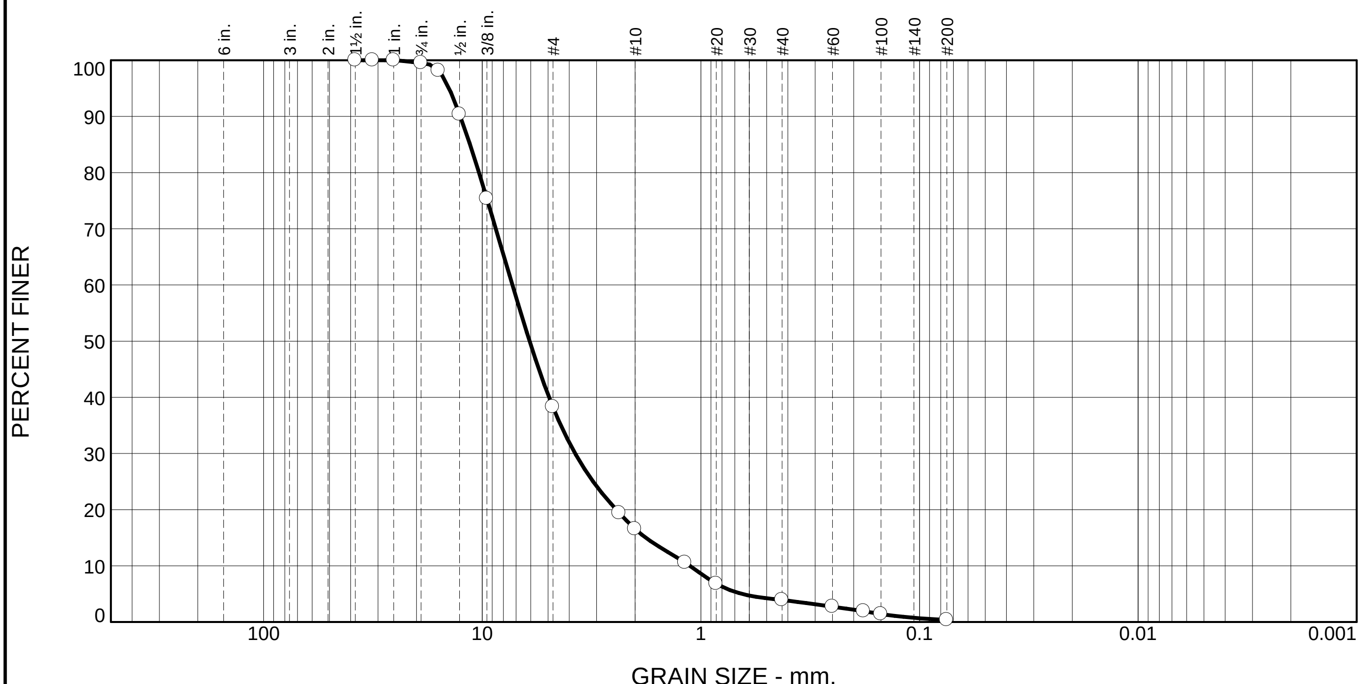
Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L892

Krazan

Client: Abbey Road Group Land Development Services Company LLC
Project: East Town Crossing Lab Testing - Recycled Glass

Project No: 062-21033 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	62	21	13	4	0	

Test Results (C-136 & c-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100		
1.25	100		
1	100		
.75	100		
.625	98		
.5	90		
.375	75		
#4	38		
#8	19		
#10	17		
#16	11		
#20	7		
#40	4		
#60	3		
#80	2		
#100	1		
#200	0.4		

* (no specification provided)

Material Description

Recycled Glass With Fines - Before Compaction.
Sampled by the supplier.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GW **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 12.6020 D_{85}= 11.3802 D_{60}= 7.2823
D_{50}= 6.0733 D_{30}= 3.7592 D_{15}= 1.7859
D_{10}= 1.1229 C_u= 6.49 C_c= 1.73

Remarks

Sample ID:21L893
Sample Date:11-29-21

Date Received: 11-29-21 **Date Tested:** 12-1-21

Tested By: M.Thomas

Checked By: T.Nunan

Title: Project Manager

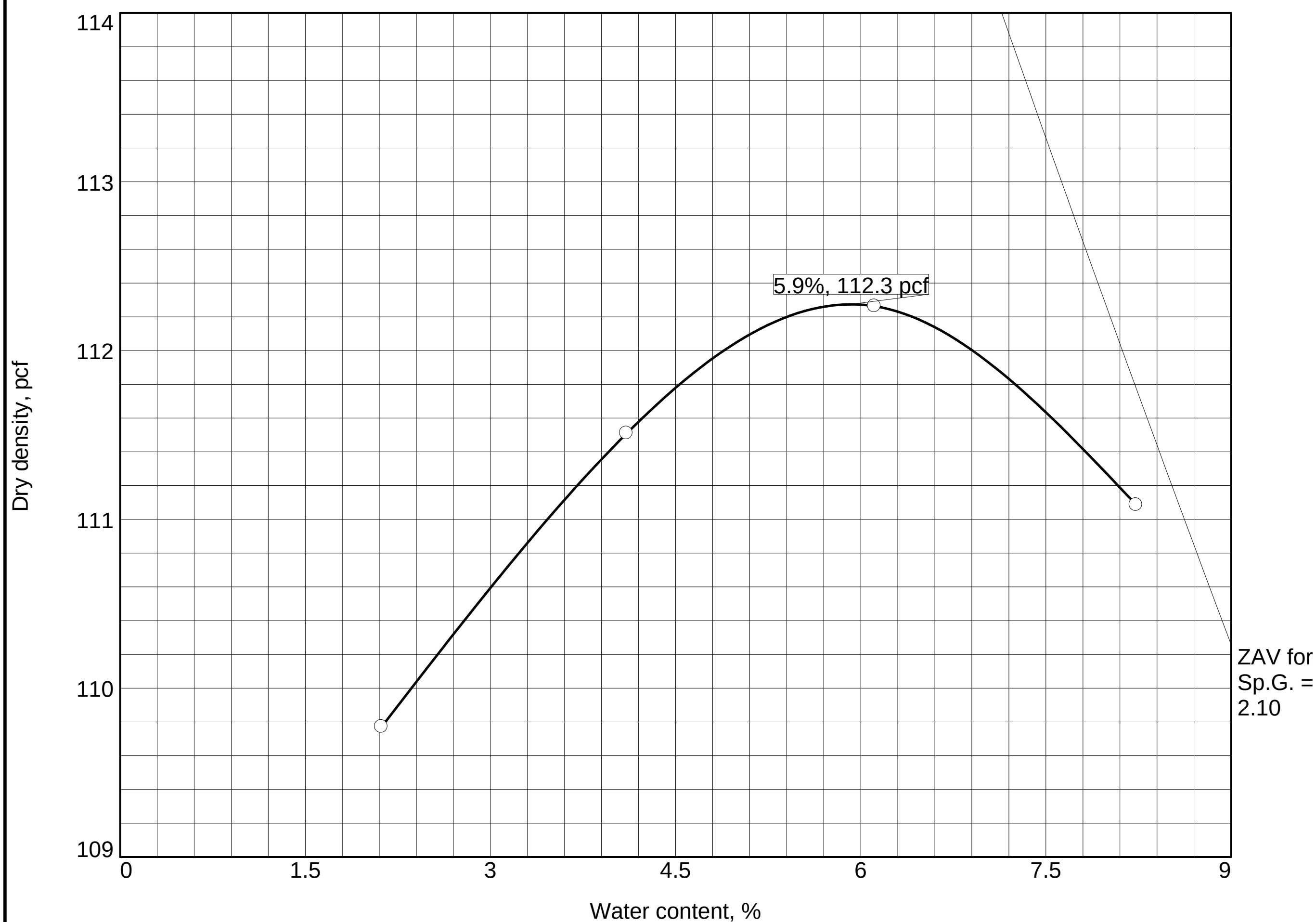
Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L893

Krazan

Client: Abbey Road Group Land Development Services Company LLC
Project: East Town Crossing Lab Testing - Recycled Glass

Project No: 062-21033 **Figure**

COMPACTION TEST REPORT



Test specification: ASTM D 1557 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	GW	A-1-a		2.1	NV	NP	0	0.4

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.3 pcf Optimum moisture = 5.9 %	Recycled Glass With Fines. Sampled by the supplier.

Project No. 062-21033 **Client:** Abbey Road Group Land Development Services

Project: East Town Crossing Lab Testing - Recycled Glass

○**Source of Sample:** Dan Lloyd Construction **Sample Number:** 21L893

Krazan

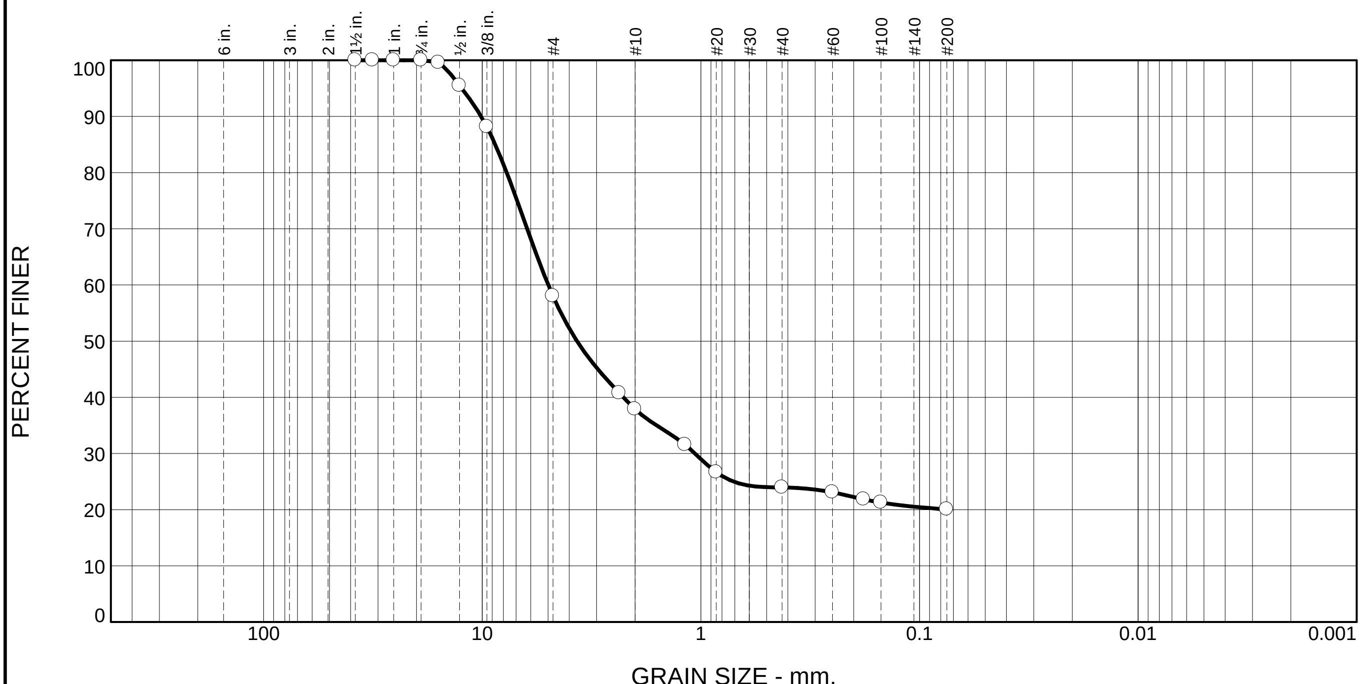
Remarks:

Sample ID:21L893
Sample Date:11-29-21
Void Ratio:0.16
Porosity:14%

Figure

Tested By: M.Thomas **Checked By:** T.Nunan.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	42	20	14	4	20	

Test Results (C-136 & C-117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100		
1.25	100		
1	100		
.75	100		
.625	100		
.5	95		
.375	88		
#4	58		
#8	41		
#10	38		
#16	32		
#20	27		
#40	24		
#60	23		
#80	22		
#100	21		
#200	20		

* (no specification provided)

Material Description

Recycled Glass With Fines - After Compaction.
Sampled by the Supplier.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 10.1195 D_{85}= 8.7171 D_{60}= 4.9887
D_{50}= 3.6862 D_{30}= 1.0651 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sample ID:21L893
Sample Date:11-29-21

Date Received: 11-29-21 **Date Tested:** 12-1-21
Tested By: M.Thomas
Checked By: T.Nunan
Title: Project Manager

Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L893

Krazan

Client: Abbey Road Group Land Development Services Company LLC
Project: East Town Crossing Lab Testing - Recycled Glass

Project No: 062-21033 **Figure**

Table 1: Recycled Glass Test Results

SAMPLE	GRADATION			PROCTOR		POROSITY
	GRAVEL (%)	SAND (%)	SILT / CLAY (%)	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	
Recycled Glass ("Clean") - **Before Proctor (Compaction)**	85	14	1	100.7	4.4	0.12
Recycled Glass ("Clean") - **After Proctor (Compaction)**	56	23	21	- - -	- - -	- - -
Recycled Glass ("w/Fines") - **Before Proctor (Compaction)**	62	38	0	112.3	5.9	0.14
Recycled Glass ("w/Fines") - **After Proctor (Compaction)**	42	38	20	- - -	- - -	- - -

Note: Porosity based on 100 percent compaction proctor value.

Figure A8 - Groundwater Monitoring Report

Abbey Road GROUP

Monitoring Well #1

Service Disabled Veteran Owned Small Business

Job #: 06-171
Project Name: East Town Crossing
As Of Date: 3/5/2021

Subject: Water Monitoring Information for the East Town Crossing Site

Special Notes:

On Site Average Elevation: 70 Elevation

Max Boring Depth for the Shaw / Pioneer Crossing: 51.75 IE sloping to 60.60 IE

Shaw / Pioneer Intersection Elevation: 69.9 Top Surface

East Town Crossing Monitoring Well Information:

Well # 1 (B-1/W-1):	72.84, Rim IE
Well # 2 (W-2)	74.13 Rim IE

Water Monitoring Information (Well #1):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
3/18/2019	East Town Crossing	B-1/W-1	64.64	8.20	Krazans Report	Water Monitoring Well Testing
3/26/2019	East Town Crossing	B-1/W-1	64.94	7.90	Krazans Report	Water Monitoring Well Testing
4/2/2019	East Town Crossing	B-1/W-1	64.84	8.00	Krazans Report	Water Monitoring Well Testing
4/10/2019	East Town Crossing	B-1/W-1	64.54	8.30	Krazans Report	Water Monitoring Well Testing
4/19/2019	East Town Crossing	B-1/W-1	64.54	8.30	Krazans Report	Water Monitoring Well Testing
4/24/2019	East Town Crossing	B-1/W-1	64.64	8.20	Krazans Report	Water Monitoring Well Testing
4/28/2019	East Town Crossing	B-1/W-1	64.64	8.20	Krazans Report	Water Monitoring Well Testing
12/27/2019	East Town Crossing	B-1/W-1	69.14	3.70	Krazans Report	Water Monitoring Well Testing
1/31/2020	East Town Crossing	B-1/W-1	69.84	3.00	Krazans Report	Water Monitoring Well Testing
2/17/2020	East Town Crossing	B-1/W-1	66.44	6.40	Krazans Report	Water Monitoring Well Testing
3/16/2020	East Town Crossing	B-1/W-1	65.54	7.30	Krazans Report	Water Monitoring Well Testing
8/21/2020	East Town Crossing	B-1/W-1	63.94	8.90	Abbey Road Group	Water Monitoring Well Testing
8/28/2020	East Town Crossing	B-1/W-1	63.99	8.85	Abbey Road Group	Water Monitoring Well Testing
9/4/2020	East Town Crossing	B-1/W-1	63.84	9.00	Abbey Road Group	Water Monitoring Well Testing
9/11/2020	East Town Crossing	B-1/W-1	63.68	9.16	Abbey Road Group	Water Monitoring Well Testing
9/21/2020	East Town Crossing	B-1/W-1	63.72	9.12	Abbey Road Group	Water Monitoring Well Testing
9/25/2020	East Town Crossing	B-1/W-1	64.36	8.48	Abbey Road Group	Water Monitoring Well Testing
10/2/2020	East Town Crossing	B-1/W-1	64.27	8.57	Abbey Road Group	Water Monitoring Well Testing
10/9/2020	East Town Crossing	B-1/W-1	64.25	8.59	Abbey Road Group	Water Monitoring Well Testing
10/16/2020	East Town Crossing	B-1/W-1	64.82	8.02	Abbey Road Group	Water Monitoring Well Testing
10/23/2020	East Town Crossing	B-1/W-1	64.81	8.03	Abbey Road Group	Water Monitoring Well Testing
11/6/2020	East Town Crossing	B-1/W-1	65.59	7.25	Abbey Road Group	Water Monitoring Well Testing
11/13/2020	East Town Crossing	B-1/W-1	65.49	7.35	Abbey Road Group	Water Monitoring Well Testing
11/19/2020	East Town Crossing	B-1/W-1	65.89	6.95	Abbey Road Group	Water Monitoring Well Testing
12/4/2020	East Town Crossing	B-1/W-1	65.67	7.17	Abbey Road Group	Water Monitoring Well Testing
12/11/2020	East Town Crossing	B-1/W-1	66.64	6.20	Abbey Road Group	Water Monitoring Well Testing
12/21/2020	East Town Crossing	B-1/W-1	67.28	5.56	Abbey Road Group	Water Monitoring Well Testing
12/28/2020	East Town Crossing	B-1/W-1	67.09	5.75	Abbey Road Group	Water Monitoring Well Testing
1/4/2021	East Town Crossing	B-1/W-1	68.44	4.40	Abbey Road Group	Water Monitoring Well Testing
1/11/2021	East Town Crossing	B-1/W-1	67.84	5.00	Abbey Road Group	Water Monitoring Well Testing
1/18/2021	East Town Crossing	B-1/W-1	67.89	4.95	Abbey Road Group	Water Monitoring Well Testing
2/1/2021	East Town Crossing	B-1/W-1	67.24	5.60	Abbey Road Group	Water Monitoring Well Testing
2/8/2021	East Town Crossing	B-1/W-1	66.96	5.88	Abbey Road Group	Water Monitoring Well Testing
2/16/2021	East Town Crossing	B-1/W-1	67.79	5.05	Abbey Road Group	Water Monitoring Well Testing
2/22/2021	East Town Crossing	B-1/W-1	68.09	4.75	Abbey Road Group	Water Monitoring Well Testing
3/1/2021	East Town Crossing	B-1/W-1	67.43	5.41	Abbey Road Group	Water Monitoring Well Testing
3/5/2021	East Town Crossing	B-1/W-1	67.11	5.73	Abbey Road Group	Water Monitoring Well Testing

Figure A8 - Groundwater Monitoring Report

Monitoring Well #2

Service Disabled Veteran Owned Small Business

Job #: 06-171
Project Name: East Town Crossing
As Of Date: 3/5/2021

Subject: Water Monitoring Information for the East Town Crossing Site

Special Notes:

On Site Average Elevation: 70 Elevation

Max Boring Depth for the Shaw / Pioneer Crossing: 51.75 IE sloping to 60.60 IE

Shaw / Pioneer Intersection Elevation: 69.9 Top Surface

East Town Crossing Monitoring Well Information:

Well # 1 (B-1/W-1): 72.84, Rim IE
Well # 2 (W-2) 74.13 Rim IE

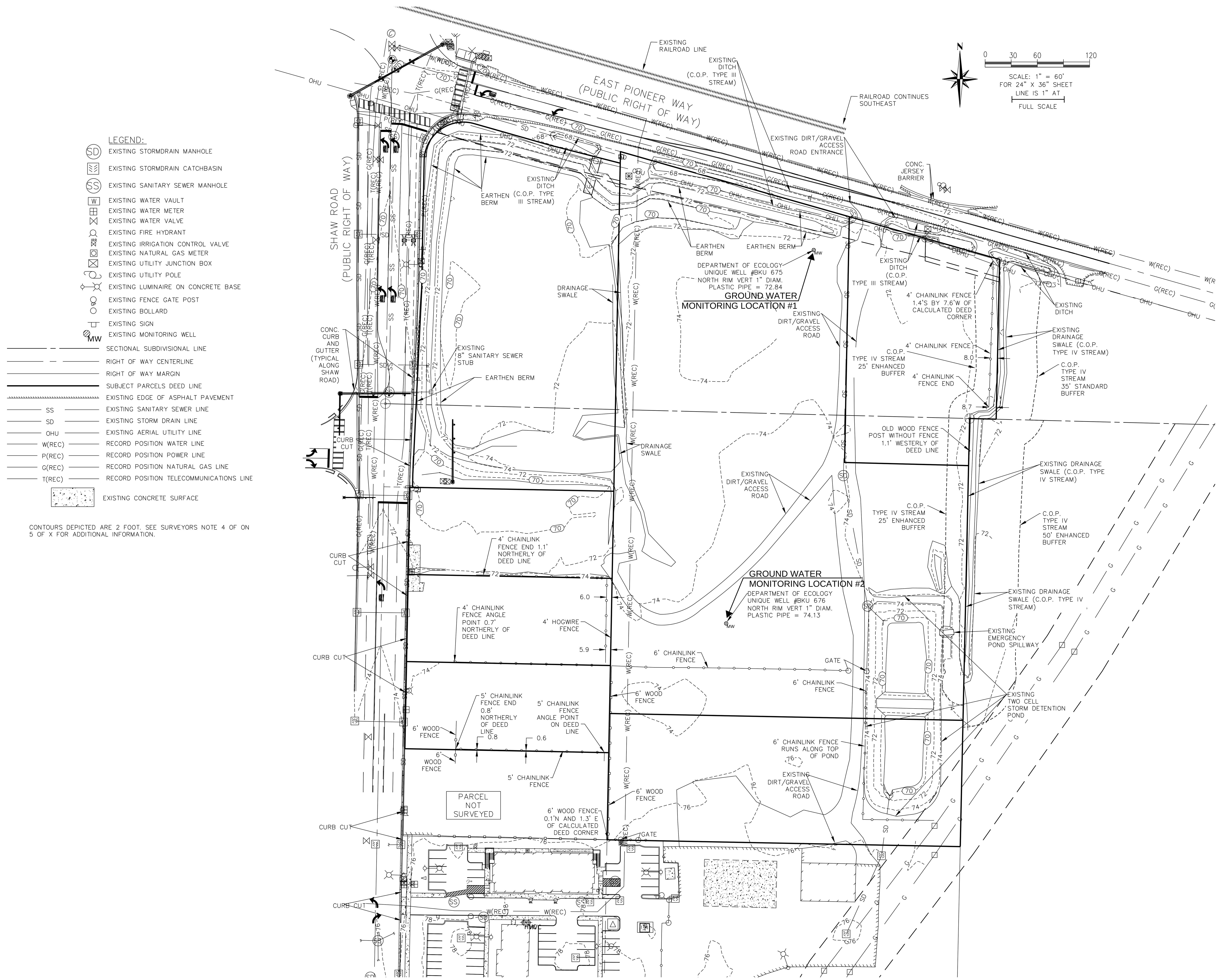
Water Monitoring Information (Well #2):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
3/18/2019	East Town Crossing	W-2	66.63	7.50	Krazans Report	Water Monitoring Well Testing
3/26/2020	East Town Crossing	W-2	66.83	7.30	Krazans Report	Water Monitoring Well Testing
4/2/2019	East Town Crossing	W-2	66.83	7.30	Krazans Report	Water Monitoring Well Testing
4/10/2019	East Town Crossing	W-2	66.33	7.80	Krazans Report	Water Monitoring Well Testing
4/19/2019	East Town Crossing	W-2	66.33	7.80	Krazans Report	Water Monitoring Well Testing
4/24/2019	East Town Crossing	W-2	66.33	7.80	Krazans Report	Water Monitoring Well Testing
4/28/2019	East Town Crossing	W-2	66.33	7.80	Krazans Report	Water Monitoring Well Testing
12/27/2019	East Town Crossing	W-2	70.03	4.10	Krazans Report	Water Monitoring Well Testing
1/31/2020	East Town Crossing	W-2	70.63	3.50	Krazans Report	Water Monitoring Well Testing
2/17/2020	East Town Crossing	W-2	68.33	5.80	Krazans Report	Water Monitoring Well Testing
3/16/2020	East Town Crossing	W-2	67.33	6.80	Krazans Report	Water Monitoring Well Testing
8/21/2020	East Town Crossing	W-2	66.08	8.05	Abbey Road Group	Water Monitoring Well Testing
8/28/2020	East Town Crossing	W-2	65.98	8.15	Abbey Road Group	Water Monitoring Well Testing
9/4/2020	East Town Crossing	W-2	65.81	8.32	Abbey Road Group	Water Monitoring Well Testing
9/11/2020	East Town Crossing	W-2	65.68	8.45	Abbey Road Group	Water Monitoring Well Testing
9/21/2020	East Town Crossing	W-2	65.58	8.55	Abbey Road Group	Water Monitoring Well Testing
9/25/2020	East Town Crossing	W-2	65.79	8.34	Abbey Road Group	Water Monitoring Well Testing
10/2/2020	East Town Crossing	W-2	65.82	8.31	Abbey Road Group	Water Monitoring Well Testing
10/9/2020	East Town Crossing	W-2	65.82	8.31	Abbey Road Group	Water Monitoring Well Testing
10/16/2020	East Town Crossing	W-2	66.27	7.86	Abbey Road Group	Water Monitoring Well Testing
10/23/2020	East Town Crossing	W-2	66.27	7.86	Abbey Road Group	Water Monitoring Well Testing
11/6/2020	East Town Crossing	W-2	66.88	7.25	Abbey Road Group	Water Monitoring Well Testing
11/13/2020	East Town Crossing	W-2	66.68	7.45	Abbey Road Group	Water Monitoring Well Testing
11/19/2020	East Town Crossing	W-2	67.08	7.05	Abbey Road Group	Water Monitoring Well Testing
12/4/2020	East Town Crossing	W-2	67.18	6.95	Abbey Road Group	Water Monitoring Well Testing
12/11/2020	East Town Crossing	W-2	68.10	6.03	Abbey Road Group	Water Monitoring Well Testing
12/21/2020	East Town Crossing	W-2	68.56	5.57	Abbey Road Group	Water Monitoring Well Testing
12/28/2020	East Town Crossing	W-2	68.73	5.40	Abbey Road Group	Water Monitoring Well Testing
1/4/2021	East Town Crossing	W-2	69.98	4.15	Abbey Road Group	Water Monitoring Well Testing
1/11/2021	East Town Crossing	W-2	69.73	4.40	Abbey Road Group	Water Monitoring Well Testing
1/18/2021	East Town Crossing	W-2	70.13	4.00	Abbey Road Group	Water Monitoring Well Testing
2/1/2021	East Town Crossing	W-2	69.31	4.82	Abbey Road Group	Water Monitoring Well Testing
2/8/2021	East Town Crossing	W-2	69.10	5.03	Abbey Road Group	Water Monitoring Well Testing
2/16/2021	East Town Crossing	W-2	69.48	4.65	Abbey Road Group	Water Monitoring Well Testing
2/22/2021	East Town Crossing	W-2	69.73	4.40	Abbey Road Group	Water Monitoring Well Testing
3/1/2021	East Town Crossing	W-2	69.52	4.61	Abbey Road Group	Water Monitoring Well Testing
3/5/2021	East Town Crossing	W-2	69.13	5.00	Abbey Road Group	Water Monitoring Well Testing

EAST TOWN CROSSING

BOUNDARY AND TOPOGRAPHY SURVEY

A PORTION OF THE SE 1/4 OF THE SE 1/4 , SEC. 26,
AND A PORTION OF THE NE 1/4 OF THE NE 1/4, SEC. 35,
ALL SITUATE IN TWP.20 N, RANGE 04 E, WM
CITY OF PUYALLUP, COUNTY OF PIERCE, STATE OF WASHINGTON



TITLE: East Town Crossing Boundary and Topography Survey

FOR: Ash Development, LLC
P.O. Box 280
Puyallup, Washington 98372

8/16/2021

Abbey Road Group Land Development Services Company, LLC
2102 E Main Ave, Suite 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

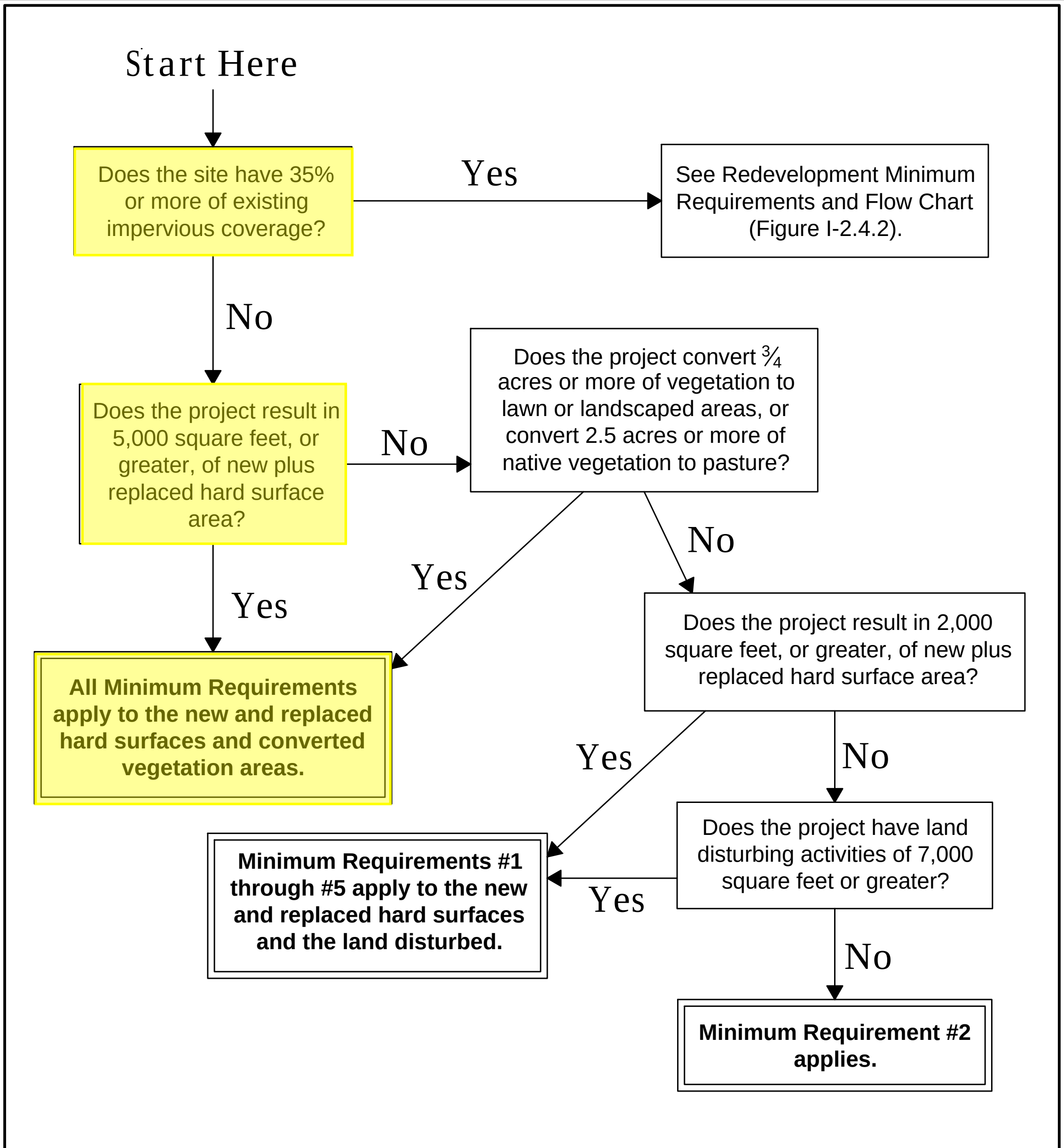
Abbey Road GROUP

REVISIONS:					
BY:	CHK:	APR:	DATE:	PER:	

JOB #: 06-171-01
DESIGNED BY:
DEVELOPMENT REVIEW: N/A
APPROVED BY: L. WALKER
DRAFTED BY: L. WALKER
DATE: 02/05/2019
SHEET:

Figure A9- Flow Chart for Determining Requirements of New Development

Figure I-2.4.1 Flow Chart for Determining Requirements for New Development



DEPARTMENT OF ECOLOGY State of Washington

Figure I-2.4.1
Flow Chart for Determining Requirements for New Development

Revised June 2015

Appendix B
Existing Pond Conversion

Figure B1 - Stormwater Pond Conversion Report

Proudly Served Our Country
Now Proudly Serving Our Community
Veteran/Servicemember Owned Business

SDVOSB

Service Disabled Veteran Owned Small Business

STORMWATER POND CONVERSION REPORT

EAST TOWN CROSSING

1001 Shaw Road
Puyallup, Washington

Job #06-171

19 November 2021

Prepared for:
East Town Crossing LLC

2102 East Main Ave, Suite 109, Puyallup, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699 / Fax (253) 446-3159

Abbey Road GROUP

Service Disabled Veteran Owned Small Business

"I hereby state that this Stormwater Drainage Conversion Report, for the East Town Crossing LLC has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

JEFFREY M. BROWN
STATE OF WASHINGTON
21792
REGISTERED
PROFESSIONAL ENGINEER

11-19-21

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

The intent of this report is to provide the key information regarding the existing East Town Pond System as well as the conversion from open pond to a closed gravel or glass bed system. The proposed system projects to provide the exact same water quality and flow control as the previously designed system.

The existing pond is situated on the southeast corner of the East Town Crossing Development. The proposed conversion will roughly be located in the same location with a slightly large foot print. The proposed gravel / glass bed will be buried opposed to the open air pond.

The reason for the conversion is to make room for the corresponding East Town Crossing Residential and Commercial Development . This development proposes to raise the existing grade in the pond location by approximately 2-feet as well as pave over the top of the proposed stormwater conversion bed.

Clarify...how are the new improvements over the top of the converted pond being accounted for flow control and water quality? If permeable pavement how is the infiltrated water prevented from entering the gravel/glass bed? [Storm Report; Pond Conv]

Existing Site:

Parcel 0420351066, 0420264053, 0420264054, 0420351026, 0420351029, 0420351030, 0420264021:

The existing pond is located on Parcel 0420351066 and 0420264053. This pond collects and treats stormwater from the development to the south. The approved Designed Stormwater Report by C.E.S. NW Inc. dated April 2002 drafted and Stamped 10/27/2002 by; Seabrook Schilt, PE, provided the baseline data for the conversion calculations in this report. This report can be found in Appendix A Figure 1.

also the 1/2-2yr release rate [Storm Report; Pond Conv]

The existing pond system collects stormwater drainage from within a 6.03 AC basin that is conveyed to the wetpond /detention pond. The C.E.S. Report goes into detail of how this pond was designed and constructed to meet 10 year and 100 year release rates. These release rates will be duplicated in the conversion proposal. Discharge from the existing pond is conveyed to the drainage ditch on the north side of the project parcel and located on the south side of E Pioneer Way.

As an added note the elevations provided in this report were provided in the NGVD 29 Survey data set which is currently not the approved Survey Data Set (NAVD 88). A combinations of NGVD 29 to NAVD 88 conversion was used (NGVD + 3.6') as well as a resurvey of the existing ponds (Appendix A -Figure 3) was used to assist in the calculations of the conversion. Lastly, a copy of the existing Pond Flow Control Structure Detail has been provided in Appendix A – Figure 2. This information will be used extensively in the conversion of this facility.

Datum conversion factor at Puyallup should be 3.5' [Storm Report; Pond Conv]

Abbey Road GROUP

Proudly Served Our Country — Now Proudly Serving Our Community — Veteran/Servicemember Owned Business

SDVOSB — cVE

Service Disabled Veteran Owned Small Business

2.0 CONVERSION REQUIREMENTS SUMMARY

> This may be due to the pond filling with sediment as a result of the sidewall failure and lack of maintenance over the decades. [Storm Report; Pond Conv]

Existing Facility Sizing Calculating

A survey of the existing pond provided the current volumes, elevations, and design parameters. The ponds current volumes based on this survey are: Total Live Storage 20,756 CF and Total Dead Storage of 8,415 CF with a 1 foot minimum freeboard. Calculating the existing Pond has proven to be problematic based on historical data conflicting with current pond conditions. To provide the most accurate representation of the existing pond a combinations of historical data provided in the 2002 Stormwater Report (Appendix A- Figure 1), Construction As-Built Flow Control Structure Detail (Appendix A – Figure 2), and current Survey of the pond (Appendix A – Figure 3) were used to model the existing pond in WWHM to provide a modern calculated review of the existing system.

> Please note that the converted pond must provide the same volumes and stages for both WQ an FC (not appropriate to match the existing pond condition for water quality). [Storm Report; Pond Conv]

The Existing Pond Calculations and Analysis Exhibit (Figure 4 in Appendix A) provides the Staged Calculations from the 2002 Stormwater Report and compares these results with the Re-Modeling of the Existing Pond in WWHM to match existing staged flows. The demonstrated returns of the re-modeled pond are with in a very small margin, corresponding with prior documented data within ten-thousands of the decimal in most cases.

> Also need to account for wetpool storage for WQ (23,454cf below live storage per CES Design Report) [Storm Report; Pond Conv]

STAGED CALCS FROM APRIL 2002

Node ID: DETENTION POND

Desc: Detention Pond - Stage/Storage **(Includes 30% correction factor)**

Start El: 66.5500 ft | Max El: 70.0000 ft

Contrib Basin: | Contrib Hyd:

Stage	Area	Volume	Volume
66.55	6793.70	0.00 cf	0.0000 acft
67.00	7218.53	3152.75 cf	0.0724 acft
68.00	8461.25	10992.64 cf	0.2524 acft
69.00	9257.75	19852.14 cf	0.4557 acft
70.00	10080.10	29521.07 cf	0.6777 acft

RE-MODELED EXISTING POND

Stage (ft)	Area (acres)	Storage (acre-ft)	Dschrge (cfs)	(cfs)
0.000000	0.183719	0.000000	0.000000	0.000000
0.433889	0.185466	0.080092	0.000000	0.000000
1.459444	0.189621	0.272425	0.432672	0.000000
2.445556	0.193650	0.461396	0.767467	0.000000
3.550000	0.198202	0.677781	1.019324	0.000000

0.000000 AC = 0.00
0.182981 AC = 7,970.65
0.188205 AC = 8,198.21
0.193274 AC = 8,419.02
0.199004 AC = 8,668.61

0.000000 AC = 0.00 CF
0.080092 AC = 3,488.81 CF
0.272425 AC = 11,866.83 CF
0.461396 AC = 20,098.41 CF
0.677781 AC = 29,524.14 CF

***Above shows the volume staged calcs from the 2002 report (left) and the WWHM Returns with conversion from AC to CF. (ac-ft / 43,560)

The objective of this conversion is intended to provide a like for like conversion of the existing facility. By modeling the existing pond in WWHM (Report found in Appendix A – Figure 5) it will allow for a true modeling of the water quality and flow returns and provide a more concise direct replacement, rather than having to covert all of the flow returns provided in the 2002 Stormwater Report. As demonstrated in the volume comparison table (Right) the 2021 modeling is comparable with the 2002 pond calcs. Thus the 2021 Modeling will be used for modeling the direct replacement.

VOLUME COMPARISON

STAGE (EXT. / MODELD)	2002 POND STORAGE CALCS (CF)	2021 MODELED STORAGE CALCS (CF)
0.000' / 0.000'	0.000 CF	0.00000 CF
0.45' / 0.433889	3,152.74 CF	3,488.81 CF
1.45' / 1.459444'	10,992.64 CF	11,866.83 CF
2.45' / 2.445556'	19,852.14 CF	20,098.41 CF
3.45' / 3.550000'	29,521.07 CF	29,524.14 CF

In addition to providing equal storage volumes as directed replacement conversion also requires that the existing facility and the replacement facility have the same flow frequency returns for 2 year, 5 year, 10 year, 25 year, 50 year, and 100 year.

and 1/2-2yr event (ref. CES Para 3.4) [Storm Report; Pond Conv]

To accomplish this the existing flow control structure that was modeled in the 2002 Report and As-Builted Pond Flow Control Structure Detail (Appendix A -Figure 2) will be retained for the direct replacement. The elevation found in the Figure 2 are based on NGVD 29 data set. This requires the cross reference of the Survey Pond Exhibit found in Figure 3 of Appendix A. The existing elevations based on the survey (NAVD 88) will take precedence over the 2002 elevations as the data sets have been updated. The orifice sizes will remain the same as well as the overall total height of the CMP riser. The intent is to retain and relocate the existing control structure while keeping the existing elevations as they currently have been surveyed. This will allow for the same flow frequency returns for the direct replacement facility. The existing pond flow frequency return periods, as modeled in WWHM, are listed below:

This is ok for the control riser, but facility volumes must be "equivalent" to those in the CES Design Report. [Storm Report; Pond Conv]

2 Year	0.149073 CFS
5 Year	0.218931 CFS
10 Year	0.264155 CFS
25 Year	0.319610 CFS
50 Year	0.359600 CFS
100 Year	0.398454 CFS

3.0 PROPOSED DIRECT REPLACEMENT

> In order to meet WQ, the dead storage must match the CES design, not the blown out pond condition. CES WQ Storage = 23,454cf. [Storm Report; Pond Conv]

Glass / Gravel Bed Replacement

The proposed direct replacement for the existing open pond is a gravel or glass bed with 0.40 porosity has a based elevations of 69.08’ and top of 1’ freeboard elevation of 71.63’. Giving the proposed facility 3.55 of operations space. This information was derived from the existing pond and control structure having the same vertical operations space. The projected footprint of 20,480 SQ FT. Given these two parameter the existing total pond volume matches the proposed total storage volumes. The projected dead storage volume for the proposed facility is 20,480 CF which is substantially larger than the existing pond. This is due to the porosity of the fill material vs the open pond capacity. The live storage volume 31,744 CF, and this facility is designed with 20,480 CF of Freeboard Volume with equals 1-foot vertically. The proposed facility design plan can be found in Appendix A - Figure 9.

> If this is the footprint, then only 8,192cf of WQ volume is provided. Need to match the CES Design WQ Volume of 23,454cf. [Storm Report; Pond Conv]

The proposed system included 24” CMP perforated pipe that will be installed to evenly spread flow across the entire bed as well as provide maintenance accesses to clean the system when maintenance is required.

Modeled Flow Frequency Return Periods for the above modeled direct replacement are as followed:

2 Year	0.1491 CFS
5 Year	0.2189 CFS
10 Year	0.2642 CFS
25 Year	0.3196 CFS
50 Year	0.3596 CFS
100 Year	0.3985 CFS

Comparison: Existing WWHM Pond VS. Direct Replacement Gravel / Glass Bed

To demonstrate that the existing pond and the proposed conversion facility are equivalent to one another the existing pond modeled in WWHM was used as the Pre-Existing Conditions. The Developed Conditions of this model was the proposed gravel / glass designed bed. The result of this comparison resulted in both facilities providing corresponding frow frequency returned periods. This report can be found in Appendix A - Figure 7.

> Once WQ wetpool volume (23454cf) is accounted for, will the same flow frequency results be obtained? [Storm Report; Pond Conv]

The results of this report were then furthered analyzed in Appendix A - Figure 6 Pond Conversion Calculations and Analysis.

Flow Frequency Returned Period Results:

RETURNS BASED ON EXISTING MODELED POND (PREDEVELOPED) AND MODELED CONVERSION FOR GRAVEL / GLASS BED (MITIGATED)

EXISTING POND

GRAVEL / GLASS BED @ 0.40 POROSITY

Flow Frequency

Flow(cfs)		Predeveloped	Mitigated
2 Year	=	0.1491	0.1491
5 Year	=	0.2189	0.2189
10 Year	=	0.2642	0.2642
25 Year	=	0.3196	0.3196
50 Year	=	0.3596	0.3596
100 Year	=	0.3985	0.3985

MODELED REPORT DIRECTLY FOLLOWS THIS PAGE.

(See Appendix A Figure 6)

Water Quality Returns from Figure Appendix A – Figure 5 are listed below:

EXISTING POND MODELED

Water Quality

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.2397 acre-feet
On-line facility target flow: 0.131 cfs.
Adjusted for 15 min: 0.131 cfs.
Off-line facility target flow: 0.0732 cfs.
Adjusted for 15 min: 0.0732 cfs.

These WQ values have no meaning (hypothetical pond). Need to match the original CES design WQ volume to provide the same level of treatment at the time of pond approval. [Storm Report; Pond Conv]

Water Quality Returns from Figure Appendix A – Figure 5 are listed below:

MODELED CONVERSION TO GLASS / GRAVEL BED W/ 0.40 POROSITY

Water Quality

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.2397 acre-feet
On-line facility target flow: 0.131 cfs.
Adjusted for 15 min: 0.131 cfs.
Off-line facility target flow: 0.0732 cfs.
Adjusted for 15 min: 0.0732 cfs.

Gravel Bed Footprint = 20,480sfGravel Bed Porosity = 0.40Wetpool depth (dead storage) = 1ftWQ Volume provided = 20480*0.4*1= 8,192cfWQ Volume required = 23, 454cf No Good.

Service Disabled Veteran Owned Small Business

Revise per review comments. [Storm Report; Pond Conv]

4.0 SUMMARY OF FINDINGS

As demonstrated above the open pond conversion to an underground sealed gravel / glass bed conversion meets the 10 year and 100 year required flow as well as attaining equal flow volumes for both dead storage, live storage, and freeboard. The proposed will operate at the same elevations as current conditions have demonstrated the result of this will not provide any differing effect to the upstream or downstream stormwater flows or capacity. The proposed is essentially a direct replacement in every measurable requirement.

5.0 SPECIAL REPORTS AND STUDIES

Provided in this report are the following Reports: 2002 Approved N.C.S. Stormwater Report (Appendix A -Figure 1), Existing Pond WWHM Modeling (Appendix A – Figure 5), and Existing Pond VS. Gravel / Grass Bed Conversion WWHM Report (Appendix A – Figure 7)

6.0 OPERATIONS AND MAINTENANCE MANUAL

Operations and Maintenance Manual is located in Appendix B

7.0 DECLARATION OF COVENANT

Maintenance Covenant will be provided and recorded proceeding full acceptance of approved construction engineering documents and prior to completion of the construction phase of the proposed project. A template of this document can be found in Appendix E.

This Stormwater Drainage Report was prepared by:

Jeff Brown, P.E

Company Engineer / Engineer of Record / Senior Design Engineer
Abbey Road Group Land Development Services Company LLC
253-435-3699 Ext 113 Office Phone
253-446-3159 Fax
Jeff.Brown@abbeyroadgroup.com

Appendix A

FIGURE 1 - 2002 STORMWATER REPORT - POND DESIGN

C.E.S. NW Inc.
Civil Engineering & Surveying

PRELIMINARY STORM DRAINAGE AND EROSION CONTROL REPORT FOR SHAW ROAD DEVELOPMENT

PREPARED FOR:

PIONEER DEVELOPMENT, LLC
C/O ABBEY ROAD GROUP
CONTACT: GIL HULSMANN
P.O. BOX 207
PUYALLUP, WA 98371
(253) 435-3699

PREPARED BY:

SEABROOK M. SCHILT, PRINCIPAL ENGINEER

C.E.S. NW, INC.
5308 12TH STREET EAST, SUITE B
FIFE, WA 98424
(253) 922-1532

PRELIMINARY STORM DRAINAGE AND EROSION CONTROL REPORT

FOR

SHAW ROAD DEVELOPEMENT
Puyallup, Washington

April 2002

Prepared for:

Pioneer Development LLC
C/O Abbey Road Group
Contact: Gil Hulsmann
P.O. Box 207
Puyallup, WA 98371

Prepared by:

Seabrook Schilt

Approved by:

Seabrook Schilt, PE, Principal

REPORT #01197.5

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

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

1.1 Purpose and Scope

This report accompanies the civil plans for the Pioneer Development LLC project as submitted to the City of Puyallup. This document provides site information and the analysis used for the storm drainage design.

The *1990 King County Surface Water Design Manual*, and the City of Puyallup addendum to that document, as well as City of Puyallup design standards establish the methodology and design criteria used for this project.

1.2 Pre-Developed Conditions

The existing site consists of parcels, 0420355019, 5020, 4011, 4043. Parcel 5018 currently occupied by Leroy Surveying is not part of this project but does drain to parcel 5019. These parcels include existing Absher construction offices and other buildings as well as associated parking. Areas not already developed are primarily pasture.

There is a previously delineated wetland southeast of the project areas, Shaw Road to the west, Pioneer Way to the north and undeveloped area to the east. The eastern edge is also the county-city line. The property slopes at approximately 10 percent to the west. See basin maps in appendix "B" for additional information.

Most of the previously developed areas flow to an existing retention pond which while small has apparently performed adequately most of the time. It is surmised that this pond infiltrates to subsurface flow in the area, which may flow north toward the Pioneer Way ditch which has water in it most of the time. While this infiltration pond is not overflowing it probably is still discharging to the downstream system. If we were to model the pond with more current storm water methods than when it was designed with I believe it would be shown to overflow under larger storm events.

1.3 Developed Conditions

The existing pond will be removed and a new combination wetpond / detention pond constructed to serve the developed and proposed areas generally in the south end of the project areas being considered.

The northerly portion of the site will be filled to elevations that will reflect grades required for future development. A semi-permanent erosion control pond will be constructed and left in place until future development is approved.

Both ponds will discharge to the ditch along Pioneer Way via a tight lined storm main.

2.0 OFFSITE ANALYSIS

The site is situated so that negligible offsite flows enter the site at least for the areas to be affected by the proposed improvements. Flows from the southerly hill and wetland area generally flow through the wetland to the easterly edge of the project from where they flow north to Pioneer Way along the eastern edge of the property.

2.1 Downstream

All site areas generally end up in a ditch along the south side of Pioneer Way. This ditch flows west and goes through and 18" driveway culvert then flows in open ditch another

50 feet where flow enters and 18-inch PVC storm pipe approximately 150 east of the intersection with Shaw Road. The storm pipe crosses Shaw Road to the west and then crosses Pioneer Way to the north side of Pioneer Way where it again enters roadside ditch flowing west. This ditch continues maybe half a mile then goes under the railroad tracks to the north and eventually ends up in the Puyallup River.

The ditch along Pioneer way, particularly along the project frontage may back up some during larger storm events. However, there were not apparent problems of scouring or erosion at the time of our field review.

3.0 FLOW CONTROL & WATER QUALITY FACILITY ANALYSIS AND DESIGN

3.1 Existing Site Hydrology

The existing site is irregularly shaped and totals approximately 6.03 acres in size (See Predeveloped Basin Map – appendix "B"). The soils have been mapped as Briscot Loam (6A) by the U.S. soil survey. Briscot Loam is classified as a hydrologic soil group type "D". Therefore, the type "D" soil group was used in determining the curve numbers associated with this project (See appendix "A" and "C").

3.2 Developed Site Hydrology

The site is partially developed at this time. The existing development consists of Absher construction offices and other buildings as well as associated parking. Areas not already developed are primarily pasture. The developed basin map for the proposed project is located in appendix "B".

Most of the previously developed areas flow to an existing retention pond which while small has apparently performed adequately most of the time. The existing pond will be removed and replaced with a new combination wetpond / detention pond.

As previously mentioned, stormwater drainage from within the 6.03 acre basin will be collected onsite and conveyed to the proposed wetpond / detention pond located along the eastern property line. The wetpond has been adequately sized to store the stormwater volume produced by the 6-month 24-hour storm event. The release from the detention pond will be controlled by a multiple orifice structure. The release rates will match the existing flows from the 10-year and 100-year 24-hour storm events and half of the 2-year 24-hour storm event. Stormwater from the proposed wetpond / detention pond will be conveyed and discharged into the existing ditch along the south side of Pioneer Way.

All segments of the proposed conveyance system will be designed to adequately convey the 100-year 24-hour storm event.

3.3 Facility Sizing

Storm water analysis calculations are included in appendix "D" of this report.

Assumptions and data used for developing the hydrology for the site are as follows:

Methodology:	SBUH
Rainfall Distribution:	Type 1A storm event
Runoff parameters:	Soils – Briscot Loam
Rainfall intensity:	6-month storm event = 1.28 inches/24-hour
	2-year, 24-hour = 2.00 inches/24-hour
	10-year, 24-hour = 3.00 inches/24-hour
	100-year, 24-hour = 4.10 inches/24-hour
Runoff Curve Numbers	Post-developed CN = 95.08
	Predeveloped CN = 91.90

Detention Facility Correction Factor = 1.3

The 100-year, 24-hour storm type 1A event was used in considering pipe conveyance capacity. The 6-month storm was used to size the water quality facility.

3.4 Flow Control System

The release from the detention pond will be controlled by a multiple orifice structure. The release rates will match the existing flows from the 10-year and 100-year 24-hour storm events and half of the 2-year 24-hour storm event. Analysis of the detention system is included in appendix "D".

3.5 Water Quality System

Storm water quality mitigation is to be provided in a wetpond beneath the detention pond live storage. The wetpond volume has been set to equal and/or exceed the developed 6-month 24-hour storm event as per the 1992 Department of Ecology storm water management manual guidelines. A separate variation application has been made for approval of a combination wetpond detention proposed. See appendix "D" for wetpond calculations.

4.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

Storm main pipe used on this site shall be a minimum of 12-inch diameter. The 100-year peak flow to the proposed pond is 3.84 cfs. Larger 15-inch diameter main at 0.50% slope has been proposed for the mainline having a capacity of 4.95 cfs with n=.012 based on Manning's equation. This is more than the required 3.84 cfs capacity.

Analysis has been included in appendix "D".

5.0 Special Reports and Studies

A geotechnical report has been prepared for this project by Earth Consultants Inc. The need for other special reports or studies is not anticipated.

6.0 TESC Analysis and Design

Soils on the site have been identified as Briscot Loam and are moisture sensitive. There will be some cut, fill, and grading necessary to construct the proposed improvements.

Temporary erosion control measures will include a construction entrance, filter fabric fencing along the project boundary, temporary interceptor ditches, semi-permanent sediment pond, and a sediment pond riser outlet. Other erosion control facilities will be provided as necessary.

APPENDIX A

General Exhibits

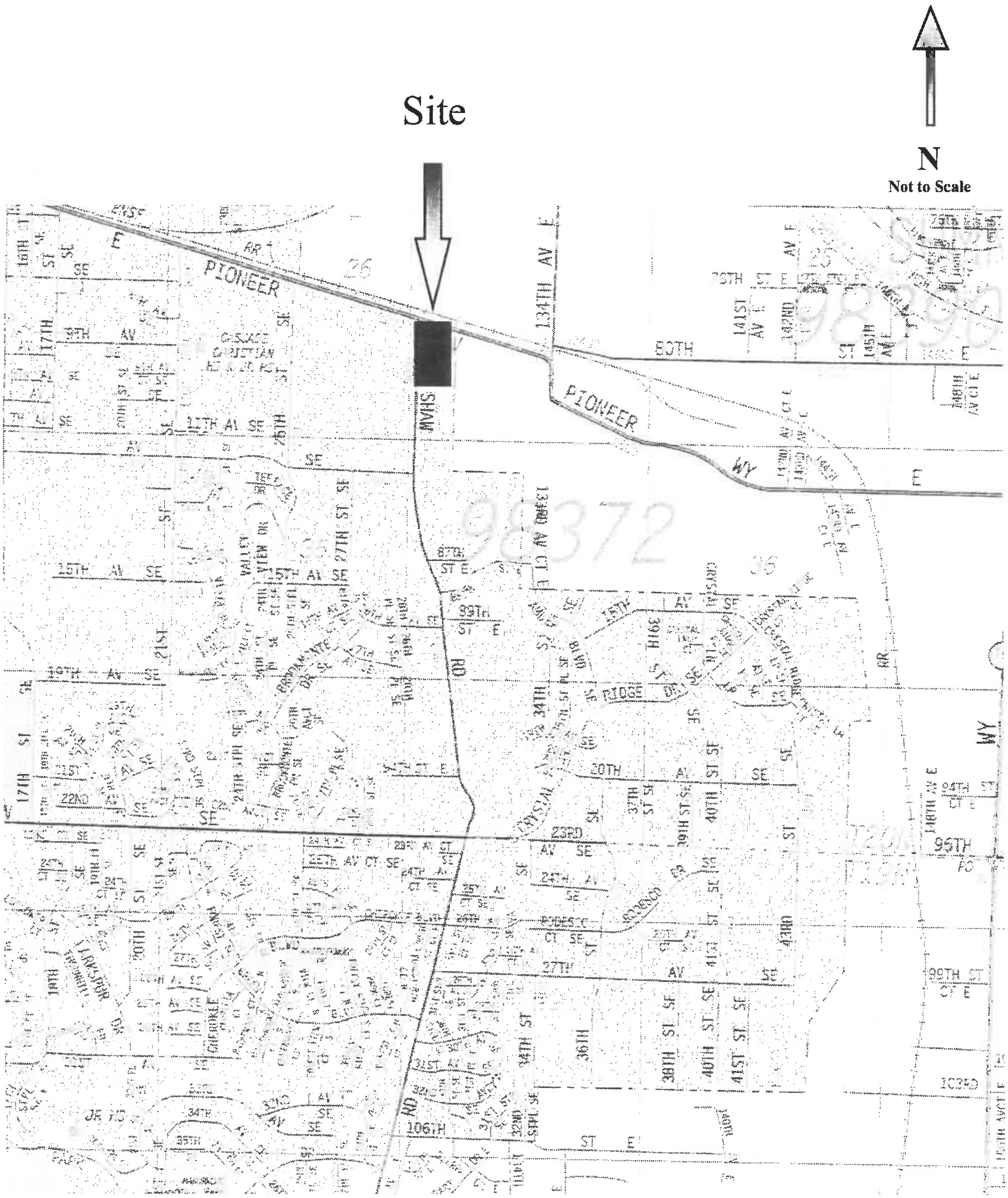
C.E.S. *NW Inc.*
Civil Engineering & Surveying

5308 12th Street East
Suite B
Fife, WA 98424

Business: (253) 922-1532
Fax: (253) 922-1954
ceservices@cesnwinc.com

Shaw Road / Pioneer Way Development

Vicinity Map

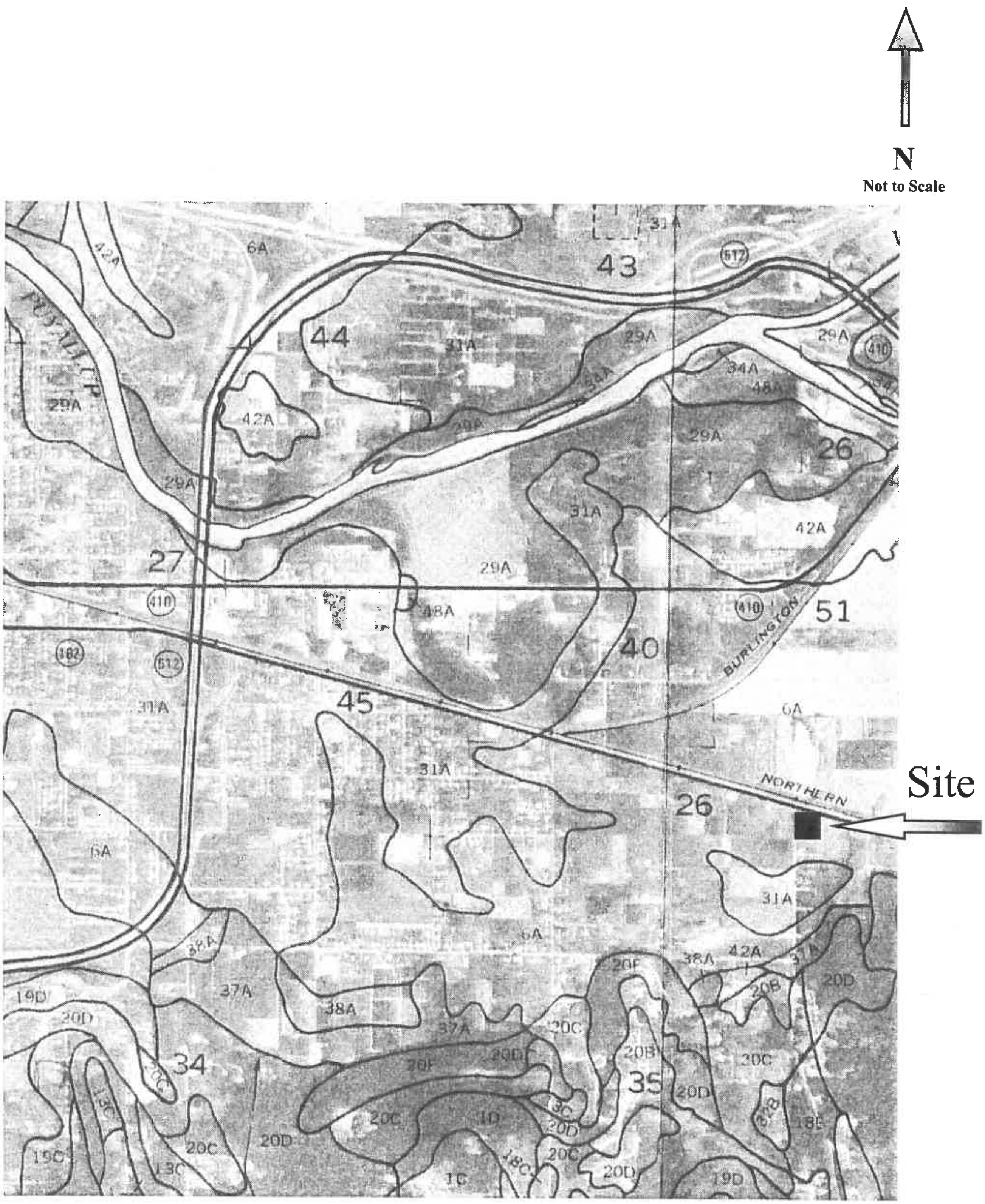


Map by Thomas Guide Maps ©2000

C.E.S. NW Inc.
Civil Engineering & Surveying
5308 12th Street East
Suite B
Fife, WA 98424
Business: (253)922-1532
Fax: (253)922-1954
ceservices@cesnwinc.com

Shaw Road / Pioneer Way Development

USDA Soil Conservation Service Soil Map



Map by USDA Soil Conservation Service ©1976

6A – Briscot loam. This nearly level soil is somewhat poorly drained. It formed in alluvium under hardwoods and conifers in the Puyallup River Valley. Elevation ranges from near sea level to 100 feet. Slopes are 0 to 2 percent. The annual precipitation is 35 to 50 inches, mean annual air temperature is about 53 degrees F, and the frost-free season averages about 190 days. Areas range in size from 5 to more than 300 acres; they average about 75 acres in size.

Included with this soil in mapping are about 10 percent a moderately well drained soil and 4 percent a well-drained Puyallup soil.

In a typical profile, the surface layer is a dark brown loam about 11 inches thick. The underlying material, to a depth of 29 inches, is mottled, dark grayish brown fine sandy loam and silt loam. Between depths of 29 and more than 60 inches, it is mottled, very dark grayish brown sand and gray silty clay loam. Reaction is neutral to medium acid.

Permeability is moderately slow. In undrained areas, effective rooting depth is about 30 inches. The available water capacity is high. Surface runoff is slow, and there is a slight erosion hazard.

A wide range of cultivated crops can be grown in this soil, and it is one of the more suitable soils for row crops. Daffodil bulbs, rhubarb, lettuce, sweet corn, strawberries, blackberries, and nursery plants are common crops.

Most of this soil is protected from periodic flooding by dikes. However, as a result of changing land use in the adjacent upland areas, this soil is subject to additional flooding from urban runoff.

Under good management, this soil is highly productive. Practices that maintain tilth and fertility are necessary. Drainage can be provided by tile or open ditch methods if outlets are available. Weed control and supplemental irrigation help to maximize crop yields.

The organic matter content can be maintained by using all crop residues, plowing under green manure crops, and using a suitable cropping system. A suitable cropping system includes 2 to 4 years of strawberries, bulbs, or rhubarb and 2 to 4 years of hay and pasture. Continuous cropping, that includes annual winter cover crops used as green manure, is also a suitable cropping system. When tulips are grown, a minimum rotation of 5 years is necessary to control fungus.

Most crops respond to commercial fertilizer, but a soils test is needed to determine specific fertilizer needs.

This soil is subject to residential and industrial development pressure. The soil is well suited to excavation for utility lines. It is protected from periodic flooding by dikes. Onsite sewage disposal systems function improperly or fail during the rainy season because of the high water table. The natural ability of this soil to support large loads is limited. Fill soil material is required for most types of construction. In addition, adequate drainage facilities to dispose of runoff from rooftops and pavement are necessary. Capability subclass IIw.

APPENDIX B

Basin Exhibits

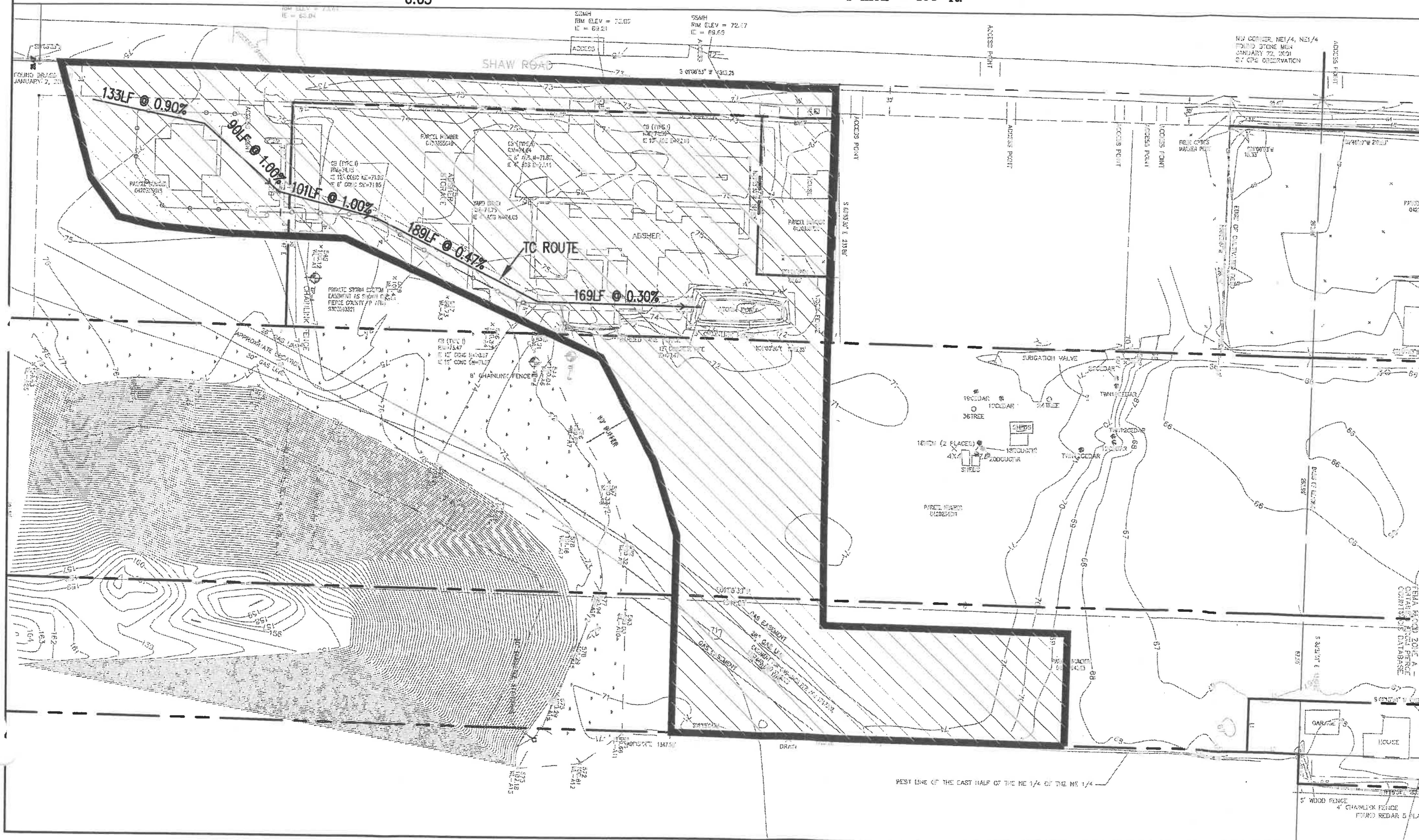
PREDEVELOPED BASIN = 6.03 ACRES
SOILS ARE HYDROLOGIC GROUP "D"
IMPERVIOUS SURFACE = 1.94 ACRES (CN=98)
PERVIOUS PASTURE = 4.09 ACRES (CN=89)

$$\text{CN COMBINED} = \frac{(1.94 \times 98) + (4.09 \times 89)}{6.03} = 91.90$$

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.



C.E.S. NW INC.
CIVIL ENGINEERING SERVICES
6010 East 20th St., Suite 6
Fife, WA 98424
Bus: (253) 922-1532
Fax: (253) 922-1954

Project:
SHAW ROAD / EAST PIONEER WAY PROJECT
PREDEVELOPED BASIN

Client:
ABBEY ROAD GROUP
P.O. BOX 207 PUYALLUP, WA 98371
(253) 435-3699

Designed:	SMS
Drawn:	JPW
Checked:	SMS
Scale:	1" = 100'
Date:	01/09/02
Job No.:	01197.2

Sheet No.:
B1
1 of 2 Sheets

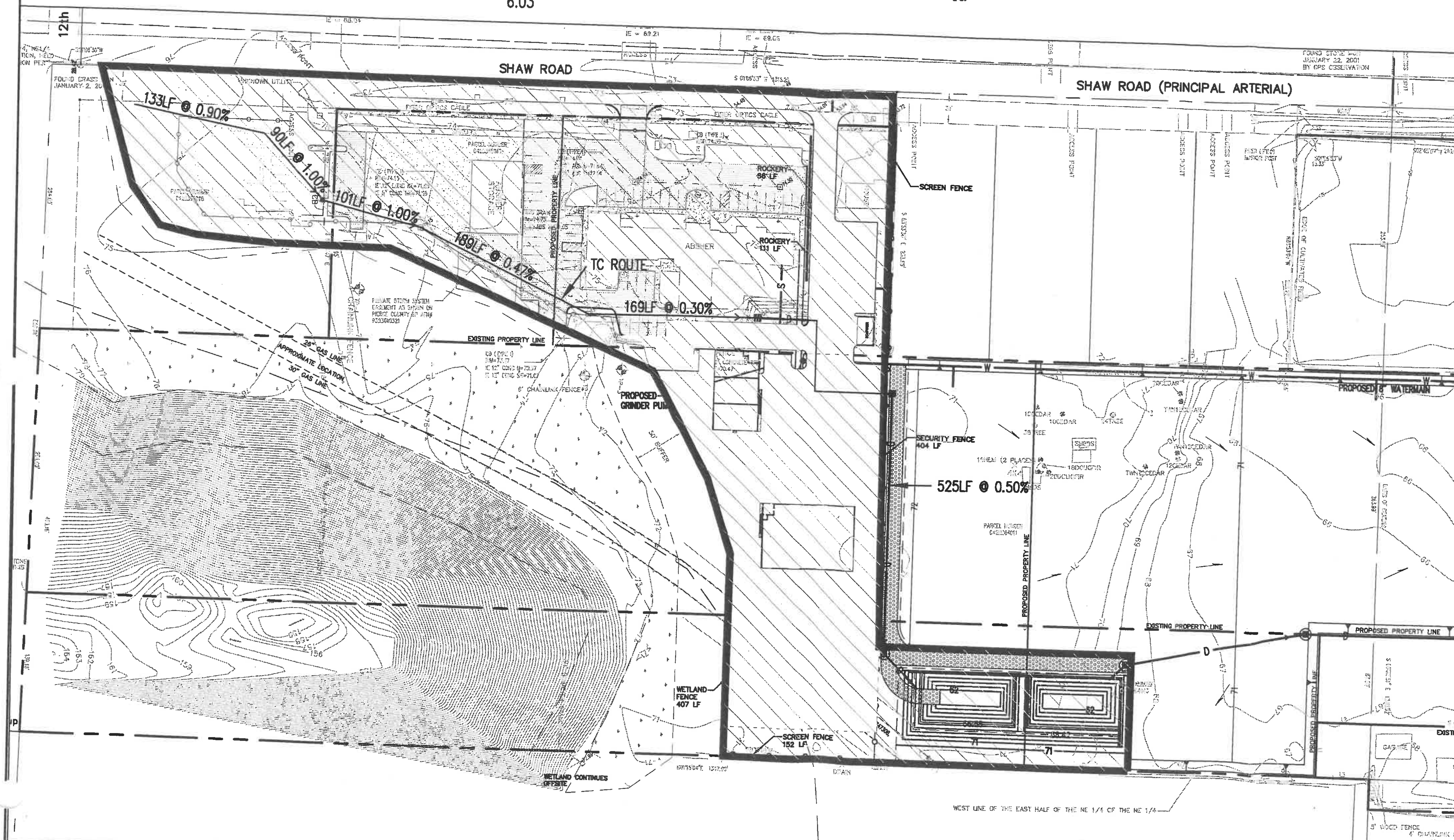
DEVELOPED BASIN = 6.03 ACRES
SOILS ARE HYDROLOGIC GROUP "D"
IMPERVIOUS SURFACE = 3.83 ACRES (CN=98)
PERVIOUS PASTURE = 2.20 ACRES (CN=90)

$$\text{CN COMBINED} = \frac{(3.83 \times 98) + (2.20 \times 90)}{6.03} = 95.08$$

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.



C.E.S. NW INC.
CIVIL ENGINEERING SERVICES
6010 East 20th St., Suite 6
Fife, WA 98424
Bus: (253) 922-1532
Fax: (253) 922-1954

Project:
SHAW ROAD /
EAST PIONEER WAY PROJECT
DEVELOPED BASIN

Client:
ABBEY ROAD GROUP
P.O. BOX 207 PUYALLUP, WA 98371
(253) 435-3699

Designed:	SMS
Drawn:	JPW
Checked:	SMS
Scale:	1" = 100'
Date:	01/04/02
Job No.:	01197.2

Sheet No.:
B2
2 of 2 Sheets

APPENDIX C

Temporary Erosion Control Pond Calculations

TEMPORARY EROSION CONTROL SEDIMENT POND CALCULATIONS

SEDIMENT POND Event Summary:

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
SEDIMENT POND	1.85	8.00	0.7488	4.73	SBUH/SCS	TYPE1A	10 yr

Drainage Area: SEDIMENT POND

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.0000 ac	00.00	0.00 hrs	
Impervious	4.7300 ac	89.00	0.26 hrs	
Total	4.7300 ac			

Supporting Data:

Impervious CN Data:

Developed CN	89.00	4.7300 ac

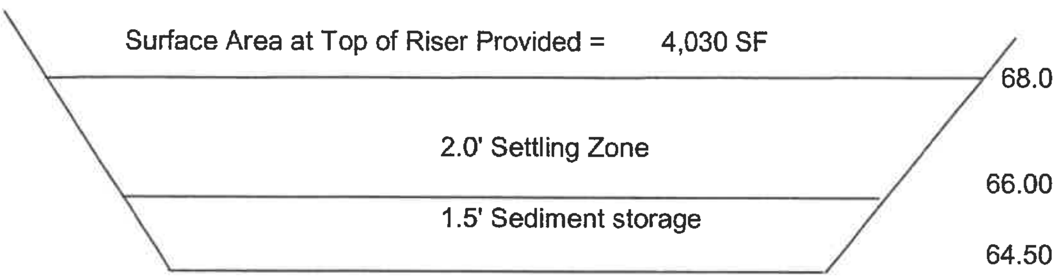
Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Developed Tc	300.00 ft	0.25%	0.0110	8.48 min
Shallow	Developed Tc	335.00 ft	0.25%	13.0000	6.92 min

Size Sediment ponds (King County)

Surface Area = FS(Q_2/V_{sed})

Q10 = 1.85 cfs (Peak Flow , 10-yr 24hr Storm Event)
V_{sed} = 0.00096 ft/s (Particle Settling Velocity)
FS = 2 (Factor of Safety)
SA = 2*Q2 / V_{sed} = **3854.17** sf, (Surface area at Top of Riser)
(Per Pierce County Stormwater Manual Section 8.10.7.1)



Principal Spillway (Riser) Diameter

Q_{100} = 2.94 cfs (Peak Flow, 100-yr 24hr Storm) Developed Basin
H = 1.00ft. (Head measured from Top of Riser to Top of Spillway)
Diameter = 12" See Conveyance Calculations

Dewatering Orifice

$Ao = (A_s(2*h)^{0.5})/(10.6*3600*T*g^{0.5})$

Ao= 0.001962 (Orifice Area , Square Feet)
A_s= 3854.17 (Pond surface Area, Square Feet)
h = 3.5 (Height of Riser in Feet)
T = 24 (Dewatering Time, HRs)
g = 32.2 (Acceleration of gravity ft/sec^2)

Dewatering Orifice Diameter

D = 24 * (A_o / 3.14)^.5 = 0.60 **in (1" min)**

APPENDIX D

Storm Water Calculations

(2) CN values can be area weighted when they apply to pervious areas of similar CN's (within 20 CN points). However, high CN areas should not be combined with low CN areas (unless the low CN areas are less than 15% of the subbasin). In this case, separate hydrographs should be generated and summed to form one hydrograph.

FIGURE 3.5.2A HYDROLOGIC SOIL GROUP OF THE SOILS IN KING COUNTY

SOIL GROUP	HYDROLOGIC GROUP*	SOIL GROUP	HYDROLOGIC GROUP*
Alderwood	C	Orcas Peat	D
Arents, Alderwood Material	C	Oridia	D
Arents, Everett Material	B	Ovall	C
Beausite	C	Pilchuck	C
Bellingham	D	Puget	D
Briscot	D	Puyallup	B
Buckley	D	Ragnar	B
Coastal Beaches	Variable	Renton	D
Earlmont Silt Loam	D	Riverwash	Variable
Edgewick	C	Salal	C
Everett	A/B	Sammamish	D
Indianola	A	Seattle	D
Kitsap	C	Shacar	D
Klaus	C	Si Silt	C
Mixed Alluvial Land	Variable	Snohomish	D
Neilton	A	Sultan	C
Newberg	B	Tukwila	D
Nooksack	C	Urban	Variable
Normal Sandy Loam	D	Woodinville	D

HYDROLOGIC SOIL GROUP CLASSIFICATIONS

A. (Low runoff potential). Soils having high infiltration rates, even when thoroughly wetted, and consisting chiefly of deep, well-to-excessively drained sands or gravels. These soils have a high rate of water transmission.

B. (Moderately low runoff potential). Soils having moderate infiltration rates when thoroughly wetted, and consisting chiefly of moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

C. (Moderately high runoff potential). Soils having slow infiltration rates when thoroughly wetted, and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures. These soils have a slow rate of water transmission.

D. (High runoff potential). Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a hardpan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

* From SCS, TR-55, Second Edition, June 1986, Exhibit A-1. Revisions made from SCS, Soil Interpretation Record, Form #5, September 1988.

TABLE 3.5.2B SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS

SCS WESTERN WASHINGTON RUNOFF CURVE NUMBERS (Published by SCS in 1982)

Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush and grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed or older second growth	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
good condition:	grass cover on 75% or more of the area	68	80	86	90
fair condition:	grass cover on 50% to 75% of the area	77	85	90	92
Gravel roads and parking lots		76	85	89	91
Dirt roads and parking lots		72	82	87	89
Impervious surfaces, pavement, roofs, etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds, etc.	100	100	100	100
Single Family Residential (2)		Separate curve number shall be selected for pervious and impervious portion of the site or basin			
Dwelling Unit/Gross Acre	% Impervious (3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
Planned unit developments, condominiums, apartments, commercial business and industrial areas.	% impervious must be computed				

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, August 1972.
(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

DESIGN STORM PRECIPITATION VALUES

RETURN FREQUENCY 24-HOUR STORM EVENT (YEARS)	TACOMA/PUYALLUP SOUTHERN PIERCE COUNTY	GIG HARBOR	KPN*
0.5	1.28	1.6	1.92
2	2.0	2.5	3.0
5	2.5	3.0	3.5
10	3.0	3.5	4.3
25	3.5	4.0	4.5-5.0
50	3.8	4.5	5.0-5.5
100	4.1	4.8	5.5-6.0

The depth of the 7-day, 100-year storm can be determined in one of three ways:

1) Use 12 inches for the lowland areas between sea level and 650 MSL.

2) Use the U.S. Department of Commerce Technical Paper No. 49, "Two- to Ten -Day Precipitation For Return Periods Of 2 To 100 Years In The Contiguous United States."

3) Use the U.S. Department of Commerce NOAA Atlas 2, " Precipitation-Frequency Atlas of the Western United States," Volume IX -- Washington, 24 hour, 100-year Isopluvials and add 6.0 inches to the appropriate isopluvial for the project area.

*KPN = Key Peninsula, North

Wetpond Storage Volume Calculation
(6-month 24-hour storm event)

DEVELOPED Event Summary:

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
DEVELOPED	0.85	8.17	0.4106	6.03	SBUH/SCS	TYPE1A	6 mo

Drainage Area: DEVELOPED

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.0000 ac	00.00	0.00 hrs	
Impervious	6.0300 ac	95.08	0.48 hrs	
Total	6.0300 ac			

Supporting Data:

Impervious CN Data:

Developed CN	95.08	6.0300 ac

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Developed Tc	133.00 ft	0.90%	0.1500	21.43 min
Sheet	Developed Tc	90.00 ft	1.00%	0.0110	1.86 min
Channel	Developed Tc	101.00 ft	1.00%	42.0000	0.40 min
Channel	Developed Tc	189.00 ft	0.47%	42.0000	1.09 min
Channel	Developed Tc	169.00 ft	0.30%	42.0000	1.22 min
Channel	Developed Tc	525.00 ft	0.50%	42.0000	2.95 min

Storage Volume Required = 17,886 cf

Storage Volume Provided = 23,454 cf
(see following calculations)

Wetpond Design Storage Volume

Elevation	Area (SF)	Volume Totals
62	**1770**	0
63	**3036**	2403
64	**4526**	6184
65	**6240**	11567
66	**8178**	18776
66.55	**8832**	23454

Detention Pond Sizing

Summary Report of all RLPool Data

Project Precips

[2 yr]	2.00 in
[10 yr]	3.00 in
[100 yr]	4.10 in

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
--------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
EXISTING	1.2981	8.17	0.6178	6.03	SBUH/SCS	TYPE1A	2 yr
EXISTING	2.3723	8.17	1.0813	6.03	SBUH/SCS	TYPE1A	10 yr
EXISTING	3.5788	8.17	1.6100	6.03	SBUH/SCS	TYPE1A	100 yr
DEVELOPED	1.6047	8.17	0.7487	6.03	SBUH/SCS	TYPE1A	2 yr
DEVELOPED	2.6729	8.17	1.2348	6.03	SBUH/SCS	TYPE1A	10 yr
DEVELOPED	3.8392	8.17	1.7780	6.03	SBUH/SCS	TYPE1A	100 yr

Drainage Area: EXISTING

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.0000 ac	00.00	0.00 hrs	
Impervious	6.0300 ac	91.90	0.43 hrs	
Total	6.0300 ac			

Supporting Data:

Impervious CN Data:

Existing CN	91.90	6.0300 ac

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Existing Tc	133.00 ft	0.90%	0.1500	21.43 min
Sheet	Existing Tc	90.00 ft	1.00%	0.0110	1.86 min
Channel	Existing Tc	101.00 ft	1.00%	42.0000	0.40 min
Channel	Existing Tc	189.00 ft	0.47%	42.0000	1.09 min
Channel	Existing Tc	169.00 ft	0.30%	42.0000	1.22 min

Drainage Area: DEVELOPED

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.0000 ac	00.00	0.00 hrs	
Impervious	6.0300 ac	95.08	0.48 hrs	
Total	6.0300 ac			

Supporting Data:

Impervious CN Data:

Developed CN	95.08	6.0300 ac

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Developed Tc	133.00 ft	0.90%	0.1500	21.43 min
Sheet	Developed Tc	90.00 ft	1.00%	0.0110	1.86 min
Channel	Developed Tc	101.00 ft	1.00%	42.0000	0.40 min
Channel	Developed Tc	189.00 ft	0.47%	42.0000	1.09 min
Channel	Developed Tc	169.00 ft	0.30%	42.0000	1.22 min
Channel	Developed Tc	525.00 ft	0.50%	42.0000	2.95 min

Node ID: DETENTION POND

Desc: Detention Pond - Stage/Storage **(Includes 30% correction factor)**

Start El: 66.5500 ft   Max El: 70.0000 ft

Contrib Basin: Contrib Hyd:

Stage	Area	Volume	Volume
66.55	6793.70	0.00 cf	0.0000 acft
67.00	7218.53	3152.75 cf	0.0724 acft
68.00	8461.25	10992.64 cf	0.2524 acft
69.00	9257.75	19852.14 cf	0.4557 acft
70.00	10080.10	29521.07 cf	0.6777 acft

Control Structure ID: COMBINATION - Combination Control Structure

Descrip:	Multiple Orifice	
Start El	Max El	Increment
66.4100 ft	71.0000 ft	0.10
ID List:	DISCHARGE	RISER

Control Structure ID: DISCHARGE - Multiple Orifice Structure

Descrip:	Multiple Orifice			
Start El	Max El	Increment		
66.4100 ft	71.0000 ft	0.10		
Orif Coeff:	0.62		Bottom El:	64.41 ft
			Lowest Diam:	5.00 in

Control Structure ID: RISER - Overflow riser

Descrip:	Multiple Orifice				
Start El	Max El	Increment			
68.1500 ft	71.0000 ft	0.10			
Riser Dia:	15.00 in	Orif Coeff:	3.78	Weir Coeff:	9.74

RLPCOMPUTE [LEVEL POOL] SUMMARY

2 yr	Match Q: 0.6491 cfs Peak Out Q: 0.6491 cfs - Peak Stg: 67.32 ft - Active Vol: 0.13 acft
10 yr	Match Q: 2.3723 cfs Peak Out Q: 0.9271 cfs - Peak Stg: 68.17 ft - Active Vol: 0.29 acft
100 yr	Match Q: 3.5788 cfs Peak Out Q: 2.6724 cfs - Peak Stg: 68.42 ft - Active Vol: 0.34 acft

Flow Capacity Calcs. (manning's)

$Q = 1.486 / n \times R^{2/3} \times S^{1/2}$

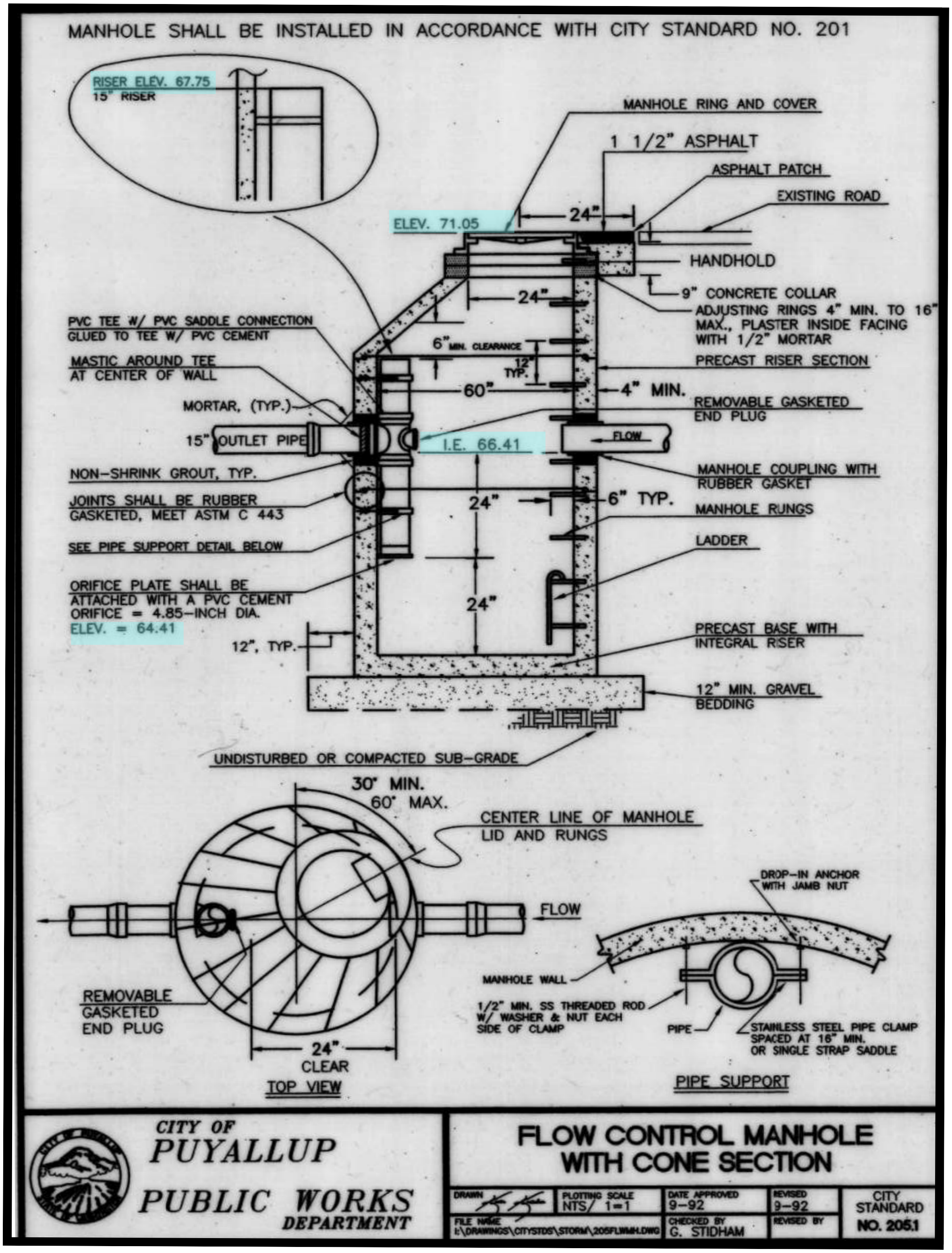
Bold Numbers entered directly

Pipe Dia. (D)	**12.00 "**	**15.00 "**	**6.00 "**
Manning's n (n)	**0.012**	**0.012**	**0.012**
Slope (S)	**0.50%**	**0.50%**	**0.50%**
Depth (Y)	**1.00'**	**1.25'**	**0.50'**
Qactual	2.73 cfs	4.95 cfs	0.43 cfs
Vactual	3.475 fps	4.032 fps	2.189 fps

FIGURE 2 - POND FLOW CONTROL STRUCTURE DETAIL

***THIS DETAIL WAS PROVIDED IN THE 2002 AS-BUILT DRAWING APPROVED BY CITY OF PUYALLUP 7/17/2002.

***THE ELEVATIONS PROVIDED IN THIS DETAIL ARE NGVD 29 (NOT NAVD 88 DATA SET)



NOTE:

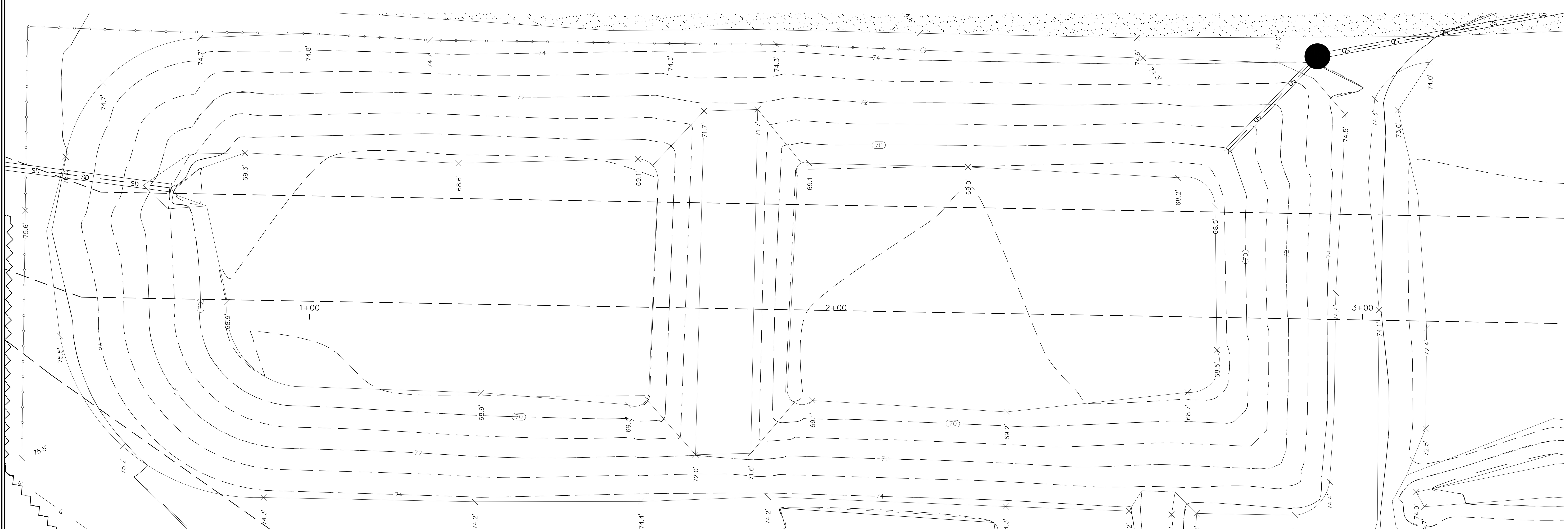
ORIGINAL APPROVED CONTROL STRUCTURE. ELEVATIONS MUST BE CONVERTED TO PROPER DATA SET. FLOW CONTROL ORIFICES SHALL REMAIN THE SAME DUE TO THIS SYSTEM PROVIDING HISTORICAL FLOWS TO DEER CREEK THAT SHALL NOT BE ALTERED PER WASHINGTON STATE DEPARTMENT OF ECOLOGY.

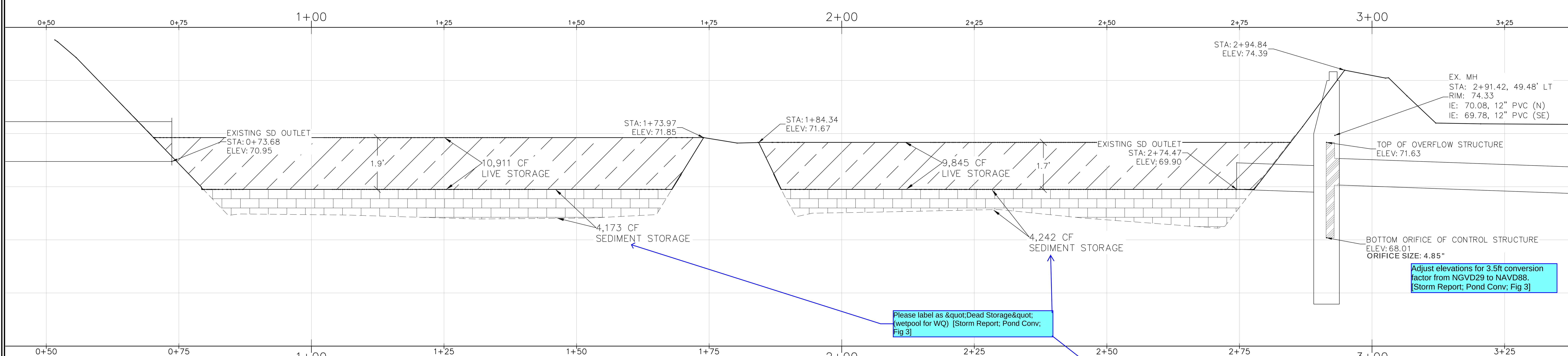
EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

EXISTING STORM POND EXHIBIT

GRAPHIC SCALE
0 5 10 20
(IN FEET)
1 inch = 10 ft.





Adjust elevations for 3.5ft conversion factor from NGVD29 to NAVD88. [Storm Report; Pond Conv; Fig 3]

Please label as "Dead Storage" (wetpool for WQ) [Storm Report; Pond Conv; Fig 3]

EXISTING STORM SYSTEM PROFILE
HORZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 2'

NEW SURVEY DATA PROVIDED AS DEFINED BY NGS (NAVD 88)

***** PRIOR AS-BUILT RECORDS WERE SURVEYED USING NGVD 29 DATA SET**

Per CES design report, total dead storage below El 66.55 (70.05) for WQ should be 23,454cf. [Storm Report; Pond Conv; Fig 3]

POND VOLUME

TOTAL LIVE STORAGE:	20,756 CF
TOTAL SEDIMENT STORAGE:	8,415 CF

FIGURE 3 - SURVEYED POND EXHIBIT

TITLE: East Town Crossing Existing Storm Pond Exhibit
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

07/07/2021

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

Abbey Road GROUP

REVISIONS: BY: CHK: APR: DATE: PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 07/07/2021
SHEET: STORMWATER EXHIBIT

EXISTING POND CALCULATIONS AND ANALYSIS

STAGED CALCS FROM APRIL 2002

Node ID: DETENTION POND

Desc: Detention Pond - Stage/Storage **(Includes 30% correction factor)**

Start El: 66.5500 ft   Max El: 70.0000 ft

Contrib Basin: Contrib Hyd:

Stage	Area	Volume	Volume
66.55	6793.70	0.00 cf	0.0000 acft
67.00	7218.53	3152.75 cf	0.0724 acft
68.00	8461.25	10992.64 cf	0.2524 acft
69.00	9257.75	19852.14 cf	0.4557 acft
70.00	10080.10	29521.07 cf	0.6777 acft

RE-MODELED EXISTING POND

Stage (ft)	Area (acres)	Storage (acre-ft)	Dschrge (cfs)	(cfs)
0.000000	0.183719	0.000000	0.000000	0.000000
0.433889	0.185466	0.080092	0.000000	0.000000
1.459444	0.189621	0.272425	0.432672	0.000000
2.445556	0.193650	0.461396	0.767467	0.000000
3.550000	0.198202	0.677781	1.019324	0.000000

0.000000 AC = 0.00
0.182981 AC = 7,970.65
0.188205 AC = 8,198.21
0.193274 AC = 8,419.02
0.199004 AC = 8,668.61

0.000000 AC = 0.00 CF
0.080092 AC = 3,488.81 CF
0.272425 AC = 11,866.83 CF
0.461396 AC = 20,098.41 CF
0.677781 AC = 29,524.14 CF

VOLUME COMPARISON

STAGE (EXT. / MODELD)	2002 POND STORAGE CALCS (CF)	2021 MODELED STORAGE CALCS (CF)
0.000' / 0.000'	0.000 CF	0.00000 CF
0.45' / 0.433889	3,152.74 CF	3,488.81 CF
1.45' / 1.459444'	10,992.64 CF	11,866.83 CF
2.45' / 2.445556'	19,852.14 CF	20,098.41 CF
3.45' / 3.550000'	29,521.07 CF	29,524.14 CF

2021 MODELED EXISTING POND WWHM MODELING DATA

☐ Evaporation Applied to Facility

Facility Dimensions

Facility Bottom Elevation (ft)	66.55
Bottom Length (ft)	171
Bottom Width (ft)	46.8
Effective Depth (ft)	3.55
Left Side Slope (H/V)	.25
Bottom Side Slope (H/V)	0.5
Right Side Slope (H/V)	0.5
Top Side Slope (H/V)	0.5
Infiltration	NO

Facility Dimension Diagram

Outlet Structure Data

Riser Height (ft)	3.55
Riser Diameter (in)	15
Riser Type	Flat
Notch Type	

Orifice Number	Diameter (in)	Height (ft)
1	4.85	1
2	0	0
3	0	0

Shouldn't this be zero?

Pond Volume at Riser Head (ac-ft) .678

Show Pond Table Close Table

Initial 0

MODELING BASED ON EXISTING AS-BUILTED DATA PROVIDED BY 2021 SURVEY BY ABBEY ROAD GROUP AS WELL AS DATA PROVIDE BY PUYALLUP CONSTRUCTION AS-BUILTS

CONTROL STRUCTURE SURVEY DATA COMPARISON

THE FOLLOWING DATA WILL BE USED TO MEET THE DISCHARGE RATES OF THE EXISTING MODELED POND .

THE CALCS PROVIDED COMBINED DEAD STORAGE AND LIVE STORAGE TO MAKE A TOTAL OF 3.45' OF STAGES PROVIDED. BASED ON THE AS-BUILTED RECORDS PROVIDED BY CITY OF PUYALLUP. THE CONSTRUCTED FLOW CONTROL (FIGURE 2) DEVICE HAS THE FOLLOWING ELEVATIONS:

RIM ELEV:	(NGVD 29) 71.05' (NAVD 88) 74.65'
SURVEYED:	(NAVD 88) 74.33'
IN / OUT 12" PIPE IE:	(NGVD 29) 66.41' (NAVD 88) 70.01'
SURVEYED: 12" SOUTH IE: 12" NORTH IE:	(NAVD 88) 69.78' (NAVD 88) 70.08'
ORIFICE BASE PLATE ELEV: (ORIFICE SIZE 4.85")	(NGVD 29) 64.41' (NAVD 88) 68.01'
TOP OF RISER ELEV:	(NGVD 29) 67.75' (NAVD 88) 71.35'
SURVEYED:	(NAVD 88) 71.63'
PROJECTED TOP OF FREEBOARD (12"min.)	(NGVD 29) 68.75' (NAVD 88) 72.35'

NGVD 29 = NAVD 88 −3.6 feet. This conversion generally is accurate within about ± 0.5 feet for 95 percent of the study area. Jan 10, 2013

FIGURE 4 - EXISTING POND CALCULATIONS AND ANALYSIS

Abbey Road Group
Land Development
Services Company, LLC
2102 EAST MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159
Abbey Road GROUP

FIGURE 5 - EXISTING POND WWHM MODELING

WWHM2012

PROJECT REPORT

06-171 Existing Pond Modeled for Conversion Flow, WQ Rates, and Replacement Sizing
11-11-2021

General Model Information

Project Name:	default[1]
Site Name:	
Site Address:	
City:	
Report Date:	11/11/2021
Gage:	Seatac
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	6.03
Pervious Total	6.03
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.03

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	6.03
Pervious Total	6.03
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.03

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Routing Elements
Predeveloped Routing

Trapezoidal Pond 1

Bottom Length:	171.00 ft.
Bottom Width:	46.80 ft.
Depth:	3.55 ft.
Volume at riser head:	0.6778 acre-feet.
Side slope 1:	0.25 To 1
Side slope 2:	0.5 To 1
Side slope 3:	0.5 To 1
Side slope 4:	0.5 To 1
Discharge Structure	
Riser Height:	3.55 ft.
Riser Diameter:	15 in.
Orifice 1 Diameter:	4.85 in. Elevation:1 ft.

Shouldn't this be zero (bottom of live storage)? [Storm Report; Fig 5}

Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
66.550	0.183	0.000	0.000	0.000
66.589	0.183	0.007	0.000	0.000
66.629	0.184	0.014	0.000	0.000
66.668	0.184	0.021	0.000	0.000
66.708	0.184	0.029	0.000	0.000
66.747	0.184	0.036	0.000	0.000
66.787	0.184	0.043	0.000	0.000
66.826	0.184	0.050	0.000	0.000
66.866	0.185	0.058	0.000	0.000
66.905	0.185	0.065	0.000	0.000
66.944	0.185	0.072	0.000	0.000
66.984	0.185	0.080	0.000	0.000
67.023	0.185	0.087	0.000	0.000
67.063	0.185	0.094	0.000	0.000
67.102	0.185	0.102	0.000	0.000
67.142	0.186	0.109	0.000	0.000
67.181	0.186	0.116	0.000	0.000
67.221	0.186	0.124	0.000	0.000
67.260	0.186	0.131	0.000	0.000
67.299	0.186	0.138	0.000	0.000
67.339	0.186	0.146	0.000	0.000
67.378	0.187	0.153	0.000	0.000
67.418	0.187	0.160	0.000	0.000
67.457	0.187	0.168	0.000	0.000
67.497	0.187	0.175	0.000	0.000
67.536	0.187	0.183	0.000	0.000
67.576	0.187	0.190	0.102	0.000
67.615	0.188	0.197	0.162	0.000
67.654	0.188	0.205	0.206	0.000
67.694	0.188	0.212	0.242	0.000
67.733	0.188	0.220	0.273	0.000
67.773	0.188	0.227	0.301	0.000
67.812	0.188	0.235	0.326	0.000

67.852	0.189	0.242	0.350	0.000
67.891	0.189	0.250	0.372	0.000
67.931	0.189	0.257	0.393	0.000
67.970	0.189	0.264	0.413	0.000
68.009	0.189	0.272	0.432	0.000
68.049	0.189	0.279	0.450	0.000
68.088	0.189	0.287	0.468	0.000
68.128	0.190	0.294	0.485	0.000
68.167	0.190	0.302	0.501	0.000
68.207	0.190	0.309	0.517	0.000
68.246	0.190	0.317	0.532	0.000
68.286	0.190	0.324	0.547	0.000
68.325	0.190	0.332	0.561	0.000
68.364	0.191	0.340	0.576	0.000
68.404	0.191	0.347	0.589	0.000
68.443	0.191	0.355	0.603	0.000
68.483	0.191	0.362	0.616	0.000
68.522	0.191	0.370	0.629	0.000
68.562	0.191	0.377	0.642	0.000
68.601	0.192	0.385	0.654	0.000
68.641	0.192	0.392	0.666	0.000
68.680	0.192	0.400	0.678	0.000
68.719	0.192	0.408	0.690	0.000
68.759	0.192	0.415	0.701	0.000
68.798	0.192	0.423	0.713	0.000
68.838	0.193	0.430	0.724	0.000
68.877	0.193	0.438	0.735	0.000
68.917	0.193	0.446	0.746	0.000
68.956	0.193	0.453	0.756	0.000
68.996	0.193	0.461	0.767	0.000
69.035	0.193	0.469	0.777	0.000
69.074	0.194	0.476	0.788	0.000
69.114	0.194	0.484	0.798	0.000
69.153	0.194	0.492	0.808	0.000
69.193	0.194	0.499	0.818	0.000
69.232	0.194	0.507	0.827	0.000
69.272	0.194	0.515	0.837	0.000
69.311	0.194	0.522	0.847	0.000
69.351	0.195	0.530	0.856	0.000
69.390	0.195	0.538	0.865	0.000
69.429	0.195	0.545	0.875	0.000
69.469	0.195	0.553	0.884	0.000
69.508	0.195	0.561	0.893	0.000
69.548	0.195	0.569	0.902	0.000
69.587	0.196	0.576	0.911	0.000
69.627	0.196	0.584	0.919	0.000
69.666	0.196	0.592	0.928	0.000
69.706	0.196	0.599	0.937	0.000
69.745	0.196	0.607	0.945	0.000
69.784	0.196	0.615	0.954	0.000
69.824	0.197	0.623	0.962	0.000
69.863	0.197	0.631	0.970	0.000
69.903	0.197	0.638	0.979	0.000
69.942	0.197	0.646	0.987	0.000
69.982	0.197	0.654	0.995	0.000
70.021	0.197	0.662	1.003	0.000
70.061	0.198	0.670	1.011	0.000
70.100	0.198	0.677	1.019	0.000

70.139	0.198	0.685	1.131	0.000

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	171.00 ft.
Bottom Width:	46.80 ft.
Depth:	3.55 ft.
Volume at riser head:	0.6778 acre-feet.
Side slope 1:	0.25 To 1
Side slope 2:	0.5 To 1
Side slope 3:	0.5 To 1
Side slope 4:	0.5 To 1
Discharge Structure	
Riser Height:	3.55 ft.
Riser Diameter:	15 in.
Orifice 1 Diameter:	4.85 in. Elevation:1 ft.
Element Flows To:	
Outlet 1	Outlet 2

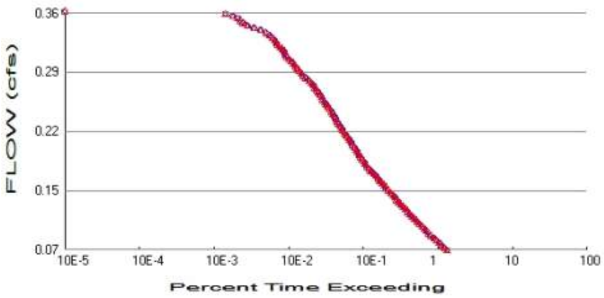
Shouldn't this be zero (bottom of live storage)? [Storm Report; Pond Conv; Fig 5]

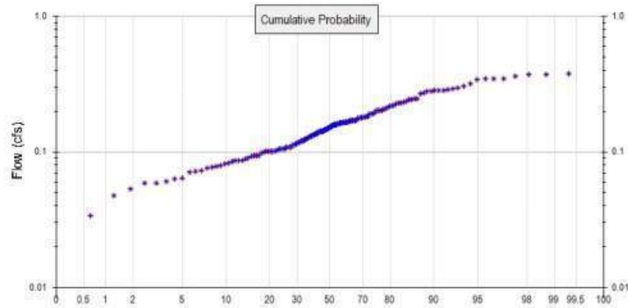
Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
66.550	0.183	0.000	0.000	0.000
66.589	0.183	0.007	0.000	0.000
66.629	0.184	0.014	0.000	0.000
66.668	0.184	0.021	0.000	0.000
66.708	0.184	0.029	0.000	0.000
66.747	0.184	0.036	0.000	0.000
66.787	0.184	0.043	0.000	0.000
66.826	0.184	0.050	0.000	0.000
66.866	0.185	0.058	0.000	0.000
66.905	0.185	0.065	0.000	0.000
66.944	0.185	0.072	0.000	0.000
66.984	0.185	0.080	0.000	0.000
67.023	0.185	0.087	0.000	0.000
67.063	0.185	0.094	0.000	0.000
67.102	0.185	0.102	0.000	0.000
67.142	0.186	0.109	0.000	0.000
67.181	0.186	0.116	0.000	0.000
67.221	0.186	0.124	0.000	0.000
67.260	0.186	0.131	0.000	0.000
67.299	0.186	0.138	0.000	0.000
67.339	0.186	0.146	0.000	0.000
67.378	0.187	0.153	0.000	0.000
67.418	0.187	0.160	0.000	0.000
67.457	0.187	0.168	0.000	0.000
67.497	0.187	0.175	0.000	0.000
67.536	0.187	0.183	0.000	0.000
67.576	0.187	0.190	0.102	0.000
67.615	0.188	0.197	0.162	0.000
67.654	0.188	0.205	0.206	0.000
67.694	0.188	0.212	0.242	0.000
67.733	0.188	0.220	0.273	0.000
67.773	0.188	0.227	0.301	0.000
67.812	0.188	0.235	0.326	0.000
67.852	0.189	0.242	0.350	0.000
67.891	0.189	0.250	0.372	0.000

67.931	0.189	0.257	0.393	0.000
67.970	0.189	0.264	0.413	0.000
68.009	0.189	0.272	0.432	0.000
68.049	0.189	0.279	0.450	0.000
68.088	0.189	0.287	0.468	0.000
68.128	0.190	0.294	0.485	0.000
68.167	0.190	0.302	0.501	0.000
68.207	0.190	0.309	0.517	0.000
68.246	0.190	0.317	0.532	0.000
68.286	0.190	0.324	0.547	0.000
68.325	0.190	0.332	0.561	0.000
68.364	0.191	0.340	0.576	0.000
68.404	0.191	0.347	0.589	0.000
68.443	0.191	0.355	0.603	0.000
68.483	0.191	0.362	0.616	0.000
68.522	0.191	0.370	0.629	0.000
68.562	0.191	0.377	0.642	0.000
68.601	0.192	0.385	0.654	0.000
68.641	0.192	0.392	0.666	0.000
68.680	0.192	0.400	0.678	0.000
68.719	0.192	0.408	0.690	0.000
68.759	0.192	0.415	0.701	0.000
68.798	0.192	0.423	0.713	0.000
68.838	0.193	0.430	0.724	0.000
68.877	0.193	0.438	0.735	0.000
68.917	0.193	0.446	0.746	0.000
68.956	0.193	0.453	0.756	0.000
68.996	0.193	0.461	0.767	0.000
69.035	0.193	0.469	0.777	0.000
69.074	0.194	0.476	0.788	0.000
69.114	0.194	0.484	0.798	0.000
69.153	0.194	0.492	0.808	0.000
69.193	0.194	0.499	0.818	0.000
69.232	0.194	0.507	0.827	0.000
69.272	0.194	0.515	0.837	0.000
69.311	0.194	0.522	0.847	0.000
69.351	0.195	0.530	0.856	0.000
69.390	0.195	0.538	0.865	0.000
69.429	0.195	0.545	0.875	0.000
69.469	0.195	0.553	0.884	0.000
69.508	0.195	0.561	0.893	0.000
69.548	0.195	0.569	0.902	0.000
69.587	0.196	0.576	0.911	0.000
69.627	0.196	0.584	0.919	0.000
69.666	0.196	0.592	0.928	0.000
69.706	0.196	0.599	0.937	0.000
69.745	0.196	0.607	0.945	0.000
69.784	0.196	0.615	0.954	0.000
69.824	0.197	0.623	0.962	0.000
69.863	0.197	0.631	0.970	0.000
69.903	0.197	0.638	0.979	0.000
69.942	0.197	0.646	0.987	0.000
69.982	0.197	0.654	0.995	0.000
70.021	0.197	0.662	1.003	0.000
70.061	0.198	0.670	1.011	0.000
70.100	0.198	0.677	1.019	0.000
70.139	0.198	0.685	1.131	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 6.03
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 6.03
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.149073
5 year	0.218931
10 year	0.264155
25 year	0.31961
50 year	0.3596
100 year	0.398454

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.149073
5 year	0.218931
10 year	0.264155
25 year	0.31961
50 year	0.3596
100 year	0.398454

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.117	0.117
1903	0.105	0.105
1904	0.139	0.139
1905	0.094	0.094
1906	0.048	0.048
1907	0.231	0.231
1908	0.163	0.163
1909	0.156	0.156
1910	0.207	0.207
1911	0.161	0.161

1912	0.346	0.346
1913	0.228	0.228
1914	0.058	0.058
1915	0.108	0.108
1916	0.156	0.156
1917	0.064	0.064
1918	0.159	0.159
1919	0.135	0.135
1920	0.159	0.159
1921	0.163	0.163
1922	0.166	0.166
1923	0.151	0.151
1924	0.090	0.090
1925	0.101	0.101
1926	0.142	0.142
1927	0.108	0.108
1928	0.117	0.117
1929	0.216	0.216
1930	0.142	0.142
1931	0.150	0.150
1932	0.114	0.114
1933	0.141	0.141
1934	0.284	0.284
1935	0.135	0.135
1936	0.127	0.127
1937	0.202	0.202
1938	0.142	0.142
1939	0.030	0.030
1940	0.142	0.142
1941	0.082	0.082
1942	0.220	0.220
1943	0.113	0.113
1944	0.243	0.243
1945	0.169	0.169
1946	0.108	0.108
1947	0.078	0.078
1948	0.303	0.303
1949	0.281	0.281
1950	0.095	0.095
1951	0.108	0.108
1952	0.359	0.359
1953	0.346	0.346
1954	0.134	0.134
1955	0.122	0.122
1956	0.071	0.071
1957	0.190	0.190
1958	0.370	0.370
1959	0.237	0.237
1960	0.079	0.079
1961	0.244	0.244
1962	0.152	0.152
1963	0.087	0.087
1964	0.102	0.102
1965	0.273	0.273
1966	0.092	0.092
1967	0.124	0.124
1968	0.170	0.170
1969	0.135	0.135

1970	0.193	0.193
1971	0.288	0.288
1972	0.180	0.180
1973	0.246	0.246
1974	0.125	0.125
1975	0.285	0.285
1976	0.166	0.166
1977	0.082	0.082
1978	0.269	0.269
1979	0.089	0.089
1980	0.159	0.159
1981	0.145	0.145
1982	0.073	0.073
1983	0.245	0.245
1984	0.146	0.146
1985	0.182	0.182
1986	0.158	0.158
1987	0.283	0.283
1988	0.167	0.167
1989	0.167	0.167
1990	0.191	0.191
1991	0.167	0.167
1992	0.181	0.181
1993	0.201	0.201
1994	0.281	0.281
1995	0.076	0.076
1996	0.298	0.298
1997	0.131	0.131
1998	0.170	0.170
1999	0.053	0.053
2000	0.131	0.131
2001	0.077	0.077
2002	0.170	0.170
2003	0.183	0.183
2004	0.151	0.151
2005	0.181	0.181
2006	0.101	0.101
2007	0.100	0.100
2008	0.163	0.163
2009	0.113	0.113
2010	0.101	0.101
2011	0.085	0.085
2012	0.177	0.177
2013	0.098	0.098
2014	0.071	0.071
2015	0.148	0.148
2016	0.063	0.063
2017	0.213	0.213
2018	0.371	0.371
2019	0.377	0.377
2020	0.121	0.121
2021	0.201	0.201
2022	0.086	0.086
2023	0.170	0.170
2024	0.317	0.317
2025	0.160	0.160
2026	0.233	0.233
2027	0.119	0.119

2028	0.094	0.094
2029	0.162	0.162
2030	0.292	0.292
2031	0.106	0.106
2032	0.060	0.060
2033	0.103	0.103
2034	0.106	0.106
2035	0.342	0.342
2036	0.177	0.177
2037	0.058	0.058
2038	0.154	0.154
2039	0.034	0.034
2040	0.105	0.105
2041	0.130	0.130
2042	0.344	0.344
2043	0.191	0.191
2044	0.221	0.221
2045	0.146	0.146
2046	0.173	0.173
2047	0.138	0.138
2048	0.177	0.177
2049	0.165	0.165
2050	0.122	0.122
2051	0.207	0.207
2052	0.099	0.099
2053	0.166	0.166
2054	0.202	0.202
2055	0.101	0.101
2056	0.086	0.086
2057	0.129	0.129
2058	0.143	0.143
2059	0.227	0.227

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3770	0.3770
2	0.3706	0.3706
3	0.3702	0.3702
4	0.3587	0.3587
5	0.3463	0.3463
6	0.3460	0.3460
7	0.3443	0.3443
8	0.3424	0.3424
9	0.3169	0.3169
10	0.3032	0.3032
11	0.2981	0.2981
12	0.2925	0.2925
13	0.2882	0.2882
14	0.2849	0.2849
15	0.2839	0.2839
16	0.2831	0.2831
17	0.2813	0.2813
18	0.2812	0.2812
19	0.2728	0.2728
20	0.2685	0.2685
21	0.2463	0.2463
22	0.2450	0.2450

23	0.2442	0.2442
24	0.2425	0.2425
25	0.2371	0.2371
26	0.2333	0.2333
27	0.2307	0.2307
28	0.2280	0.2280
29	0.2274	0.2274
30	0.2208	0.2208
31	0.2202	0.2202
32	0.2160	0.2160
33	0.2135	0.2135
34	0.2069	0.2069
35	0.2069	0.2069
36	0.2021	0.2021
37	0.2021	0.2021
38	0.2013	0.2013
39	0.2010	0.2010
40	0.1932	0.1932
41	0.1915	0.1915
42	0.1912	0.1912
43	0.1903	0.1903
44	0.1834	0.1834
45	0.1824	0.1824
46	0.1813	0.1813
47	0.1812	0.1812
48	0.1799	0.1799
49	0.1774	0.1774
50	0.1769	0.1769
51	0.1766	0.1766
52	0.1732	0.1732
53	0.1705	0.1705
54	0.1699	0.1699
55	0.1695	0.1695
56	0.1695	0.1695
57	0.1693	0.1693
58	0.1674	0.1674
59	0.1669	0.1669
60	0.1667	0.1667
61	0.1661	0.1661
62	0.1656	0.1656
63	0.1656	0.1656
64	0.1648	0.1648
65	0.1630	0.1630
66	0.1629	0.1629
67	0.1625	0.1625
68	0.1623	0.1623
69	0.1609	0.1609
70	0.1600	0.1600
71	0.1592	0.1592
72	0.1591	0.1591
73	0.1590	0.1590
74	0.1579	0.1579
75	0.1565	0.1565
76	0.1563	0.1563
77	0.1541	0.1541
78	0.1520	0.1520
79	0.1512	0.1512
80	0.1505	0.1505

81	0.1497	0.1497
82	0.1483	0.1483
83	0.1463	0.1463
84	0.1457	0.1457
85	0.1451	0.1451
86	0.1430	0.1430
87	0.1424	0.1424
88	0.1418	0.1418
89	0.1418	0.1418
90	0.1417	0.1417
91	0.1415	0.1415
92	0.1387	0.1387
93	0.1383	0.1383
94	0.1354	0.1354
95	0.1349	0.1349
96	0.1347	0.1347
97	0.1341	0.1341
98	0.1311	0.1311
99	0.1308	0.1308
100	0.1296	0.1296
101	0.1291	0.1291
102	0.1268	0.1268
103	0.1251	0.1251
104	0.1243	0.1243
105	0.1220	0.1220
106	0.1216	0.1216
107	0.1206	0.1206
108	0.1186	0.1186
109	0.1172	0.1172
110	0.1165	0.1165
111	0.1140	0.1140
112	0.1127	0.1127
113	0.1126	0.1126
114	0.1083	0.1083
115	0.1083	0.1083
116	0.1077	0.1077
117	0.1075	0.1075
118	0.1057	0.1057
119	0.1056	0.1056
120	0.1053	0.1053
121	0.1049	0.1049
122	0.1033	0.1033
123	0.1016	0.1016
124	0.1015	0.1015
125	0.1012	0.1012
126	0.1007	0.1007
127	0.1007	0.1007
128	0.1004	0.1004
129	0.0994	0.0994
130	0.0978	0.0978
131	0.0945	0.0945
132	0.0944	0.0944
133	0.0938	0.0938
134	0.0921	0.0921
135	0.0903	0.0903
136	0.0892	0.0892
137	0.0867	0.0867
138	0.0862	0.0862

139	0.0862	0.0862
140	0.0847	0.0847
141	0.0824	0.0824
142	0.0818	0.0818
143	0.0793	0.0793
144	0.0779	0.0779
145	0.0769	0.0769
146	0.0757	0.0757
147	0.0727	0.0727
148	0.0712	0.0712
149	0.0706	0.0706
150	0.0639	0.0639
151	0.0635	0.0635
152	0.0605	0.0605
153	0.0584	0.0584
154	0.0584	0.0584
155	0.0530	0.0530
156	0.0478	0.0478
157	0.0336	0.0336
158	0.0298	0.0298

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0745	73295	73295	100	Pass
0.0774	67423	67423	100	Pass
0.0803	62049	62049	100	Pass
0.0832	57229	57229	100	Pass
0.0861	52780	52780	100	Pass
0.0889	48531	48531	100	Pass
0.0918	44708	44708	100	Pass
0.0947	41418	41418	100	Pass
0.0976	38487	38487	100	Pass
0.1005	36121	36121	100	Pass
0.1033	33750	33750	100	Pass
0.1062	31240	31240	100	Pass
0.1091	29002	29002	100	Pass
0.1120	26936	26936	100	Pass
0.1148	25036	25036	100	Pass
0.1177	23368	23368	100	Pass
0.1206	21772	21772	100	Pass
0.1235	20360	20360	100	Pass
0.1264	18958	18958	100	Pass
0.1292	17684	17684	100	Pass
0.1321	16498	16498	100	Pass
0.1350	15473	15473	100	Pass
0.1379	14587	14587	100	Pass
0.1408	13678	13678	100	Pass
0.1436	12803	12803	100	Pass
0.1465	11989	11989	100	Pass
0.1494	11213	11213	100	Pass
0.1523	10521	10521	100	Pass
0.1552	9872	9872	100	Pass
0.1580	9246	9246	100	Pass
0.1609	8654	8654	100	Pass
0.1638	8100	8100	100	Pass
0.1667	7523	7523	100	Pass
0.1696	7008	7008	100	Pass
0.1724	6548	6548	100	Pass
0.1753	6183	6183	100	Pass
0.1782	5884	5884	100	Pass
0.1811	5579	5579	100	Pass
0.1840	5309	5309	100	Pass
0.1868	5061	5061	100	Pass
0.1897	4838	4838	100	Pass
0.1926	4609	4609	100	Pass
0.1955	4386	4386	100	Pass
0.1984	4182	4182	100	Pass
0.2012	3975	3975	100	Pass
0.2041	3789	3789	100	Pass
0.2070	3606	3606	100	Pass
0.2099	3442	3442	100	Pass
0.2127	3272	3272	100	Pass
0.2156	3079	3079	100	Pass
0.2185	2936	2936	100	Pass
0.2214	2812	2812	100	Pass
0.2243	2693	2693	100	Pass

0.2271	2561	2561	100	Pass
0.2300	2448	2448	100	Pass
0.2329	2335	2335	100	Pass
0.2358	2247	2247	100	Pass
0.2387	2164	2164	100	Pass
0.2415	2078	2078	100	Pass
0.2444	1926	1926	100	Pass
0.2473	1831	1831	100	Pass
0.2502	1754	1754	100	Pass
0.2531	1677	1677	100	Pass
0.2559	1584	1584	100	Pass
0.2588	1508	1508	100	Pass
0.2617	1437	1437	100	Pass
0.2646	1379	1379	100	Pass
0.2675	1310	1310	100	Pass
0.2703	1244	1244	100	Pass
0.2732	1171	1171	100	Pass
0.2761	1108	1108	100	Pass
0.2790	1031	1031	100	Pass
0.2819	940	940	100	Pass
0.2847	862	862	100	Pass
0.2876	811	811	100	Pass
0.2905	757	757	100	Pass
0.2934	716	716	100	Pass
0.2963	678	678	100	Pass
0.2991	633	633	100	Pass
0.3020	602	602	100	Pass
0.3049	557	557	100	Pass
0.3078	515	515	100	Pass
0.3106	497	497	100	Pass
0.3135	478	478	100	Pass
0.3164	455	455	100	Pass
0.3193	423	423	100	Pass
0.3222	391	391	100	Pass
0.3250	373	373	100	Pass
0.3279	352	352	100	Pass
0.3308	329	329	100	Pass
0.3337	306	306	100	Pass
0.3366	276	276	100	Pass
0.3394	230	230	100	Pass
0.3423	188	188	100	Pass
0.3452	155	155	100	Pass
0.3481	136	136	100	Pass
0.3510	126	126	100	Pass
0.3538	114	114	100	Pass
0.3567	99	99	100	Pass
0.3596	78	78	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.2397 acre-feet
On-line facility target flow:	0.131 cfs.
Adjusted for 15 min:	0.131 cfs.
Off-line facility target flow:	0.0732 cfs.
Adjusted for 15 min:	0.0732 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	631.49			☐	0.00			
Total Volume Infiltrated		631.49	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   default[1].wdm
MESSU      25   Predefault[1].MES
           27   Predefault[1].L61
           28   Predefault[1].L62
           30   POCdefault[1]1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      RCHRES       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         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
  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
  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
  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
  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
  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
  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  13                        6.03     RCHRES   1      2
PERLND  13                        6.03     RCHRES   1      3

******Routing******
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     Trapezoidal Pond-006    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      0.03       0.0     66.55       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
91 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.183719	0.000000	0.000000		
0.039444	0.183878	0.007250	0.000000		
0.078889	0.184036	0.014506	0.000000		
0.118333	0.184195	0.021768	0.000000		
0.157778	0.184353	0.029037	0.000000		
0.197222	0.184512	0.036312	0.000000		
0.236667	0.184671	0.043593	0.000000		
0.276111	0.184830	0.050880	0.000000		
0.315556	0.184989	0.058174	0.000000		
0.355000	0.185148	0.065474	0.000000		
0.394444	0.185307	0.072780	0.000000		
0.433889	0.185466	0.080092	0.000000		
0.473333	0.185625	0.087411	0.000000		
0.512778	0.185784	0.094736	0.000000		
0.552222	0.185943	0.102067	0.000000		
0.591667	0.186103	0.109405	0.000000		
0.631111	0.186262	0.116749	0.000000		
0.670556	0.186421	0.124099	0.000000		
0.710000	0.186581	0.131455	0.000000		
0.749444	0.186740	0.138818	0.000000		
0.788889	0.186900	0.146187	0.000000		
0.828333	0.187060	0.153562	0.000000		
0.867778	0.187219	0.160944	0.000000		
0.907222	0.187379	0.168332	0.000000		
0.946667	0.187539	0.175726	0.000000		
0.986111	0.187699	0.183127	0.000000		
1.025556	0.187858	0.190534	0.102043		
1.065000	0.188018	0.197947	0.162742		
1.104444	0.188178	0.205366	0.206293		
1.143889	0.188338	0.212792	0.242134		
1.183333	0.188498	0.220224	0.273315		
1.222778	0.188659	0.227662	0.301285		
1.262222	0.188819	0.235107	0.326871		
1.301667	0.188979	0.242558	0.350595		
1.341111	0.189139	0.250015	0.372812		
1.380556	0.189300	0.257479	0.393778		
1.420000	0.189460	0.264949	0.413682		
1.459444	0.189621	0.272425	0.432672		
1.498889	0.189781	0.279908	0.450863		
1.538333	0.189942	0.287397	0.468347		
1.577778	0.190102	0.294892	0.485202		
1.617222	0.190263	0.302394	0.501491		
1.656667	0.190424	0.309902	0.517267		
1.696111	0.190585	0.317416	0.532576		
1.735556	0.190745	0.324937	0.547457		
1.775000	0.190906	0.332464	0.561944		
1.814444	0.191067	0.339997	0.576067		
1.853889	0.191228	0.347537	0.589852		
1.893333	0.191389	0.355083	0.603322		
1.932778	0.191550	0.362635	0.616497		
1.972222	0.191712	0.370194	0.629397		
2.011667	0.191873	0.377759	0.642038		
2.051111	0.192034	0.385331	0.654435		
2.090556	0.192195	0.392909	0.666601		
2.130000	0.192357	0.400493	0.678549		
2.169444	0.192518	0.408084	0.690291		
2.208889	0.192680	0.415680	0.701836		
2.248333	0.192841	0.423284	0.713194		
2.287778	0.193003	0.430894	0.724374		
2.327222	0.193164	0.438510	0.735384		
2.366667	0.193326	0.446132	0.746231		
2.406111	0.193488	0.453761	0.756924		
2.445556	0.193650	0.461396	0.767467		
2.485000	0.193812	0.469038	0.777867		
2.524444	0.193973	0.476686	0.788130		

```
  2.563889  0.194135  0.484340  0.798261
  2.603333  0.194297  0.492001  0.808266
  2.642778  0.194460  0.499668  0.818148
  2.682222  0.194622  0.507341  0.827911
  2.721667  0.194784  0.515021  0.837562
  2.761111  0.194946  0.522708  0.847102
  2.800556  0.195108  0.530401  0.856536
  2.840000  0.195271  0.538100  0.865867
  2.879444  0.195433  0.545805  0.875099
  2.918889  0.195596  0.553517  0.884234
  2.958333  0.195758  0.561236  0.893276
  2.997778  0.195921  0.568960  0.902227
  3.037222  0.196083  0.576691  0.911090
  3.076667  0.196246  0.584429  0.919868
  3.116111  0.196409  0.592173  0.928563
  3.155556  0.196571  0.599924  0.937177
  3.195000  0.196734  0.607680  0.945713
  3.234444  0.196897  0.615444  0.954173
  3.273889  0.197060  0.623213  0.962558
  3.313333  0.197223  0.630990  0.970871
  3.352778  0.197386  0.638772  0.979113
  3.392222  0.197549  0.646561  0.987286
  3.431667  0.197712  0.654357  0.995392
  3.471111  0.197875  0.662158  1.003433
  3.510556  0.198039  0.669967  1.011410
  3.550000  0.198202  0.677781  1.019324
  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***
RCHRES   1 HYDR   RO      1 1        1     WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE   1 1        1     WDM   1001 STAG     ENGL      REPL
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        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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


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   default[1].wdm
MESSU      25   Mitdefault[1].MES
           27   Mitdefault[1].L61
           28   Mitdefault[1].L62
           30   POCdefault[1]1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  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           ***
   13      C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         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
```

```
  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
  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
  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
  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
  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
  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  13                        6.03     RCHRES   1      2
PERLND  13                        6.03     RCHRES   1      3

******Routing******
PERLND  13                        6.03     COPY     1     12
PERLND  13                        6.03     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     Trapezoidal Pond-008    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      0.03       0.0     66.55       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
91 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.183719	0.000000	0.000000		
0.039444	0.183878	0.007250	0.000000		
0.078889	0.184036	0.014506	0.000000		
0.118333	0.184195	0.021768	0.000000		
0.157778	0.184353	0.029037	0.000000		
0.197222	0.184512	0.036312	0.000000		
0.236667	0.184671	0.043593	0.000000		
0.276111	0.184830	0.050880	0.000000		
0.315556	0.184989	0.058174	0.000000		
0.355000	0.185148	0.065474	0.000000		
0.394444	0.185307	0.072780	0.000000		
0.433889	0.185466	0.080092	0.000000		
0.473333	0.185625	0.087411	0.000000		
0.512778	0.185784	0.094736	0.000000		
0.552222	0.185943	0.102067	0.000000		
0.591667	0.186103	0.109405	0.000000		
0.631111	0.186262	0.116749	0.000000		
0.670556	0.186421	0.124099	0.000000		
0.710000	0.186581	0.131455	0.000000		
0.749444	0.186740	0.138818	0.000000		
0.788889	0.186900	0.146187	0.000000		
0.828333	0.187060	0.153562	0.000000		
0.867778	0.187219	0.160944	0.000000		
0.907222	0.187379	0.168332	0.000000		
0.946667	0.187539	0.175726	0.000000		
0.986111	0.187699	0.183127	0.000000		
1.025556	0.187858	0.190534	0.102043		
1.065000	0.188018	0.197947	0.162742		
1.104444	0.188178	0.205366	0.206293		
1.143889	0.188338	0.212792	0.242134		
1.183333	0.188498	0.220224	0.273315		
1.222778	0.188659	0.227662	0.301285		
1.262222	0.188819	0.235107	0.326871		
1.301667	0.188979	0.242558	0.350595		
1.341111	0.189139	0.250015	0.372812		
1.380556	0.189300	0.257479	0.393778		
1.420000	0.189460	0.264949	0.413682		
1.459444	0.189621	0.272425	0.432672		
1.498889	0.189781	0.279908	0.450863		
1.538333	0.189942	0.287397	0.468347		
1.577778	0.190102	0.294892	0.485202		
1.617222	0.190263	0.302394	0.501491		
1.656667	0.190424	0.309902	0.517267		
1.696111	0.190585	0.317416	0.532576		
1.735556	0.190745	0.324937	0.547457		
1.775000	0.190906	0.332464	0.561944		
1.814444	0.191067	0.339997	0.576067		
1.853889	0.191228	0.347537	0.589852		
1.893333	0.191389	0.355083	0.603322		
1.932778	0.191550	0.362635	0.616497		
1.972222	0.191712	0.370194	0.629397		
2.011667	0.191873	0.377759	0.642038		
2.051111	0.192034	0.385331	0.654435		
2.090556	0.192195	0.392909	0.666601		
2.130000	0.192357	0.400493	0.678549		
2.169444	0.192518	0.408084	0.690291		
2.208889	0.192680	0.415680	0.701836		
2.248333	0.192841	0.423284	0.713194		
2.287778	0.193003	0.430894	0.724374		
2.327222	0.193164	0.438510	0.735384		
2.366667	0.193326	0.446132	0.746231		
2.406111	0.193488	0.453761	0.756924		

```
  2.445556  0.193650  0.461396  0.767467
  2.485000  0.193812  0.469038  0.777867
  2.524444  0.193973  0.476686  0.788130
  2.563889  0.194135  0.484340  0.798261
  2.603333  0.194297  0.492001  0.808266
  2.642778  0.194460  0.499668  0.818148
  2.682222  0.194622  0.507341  0.827911
  2.721667  0.194784  0.515021  0.837562
  2.761111  0.194946  0.522708  0.847102
  2.800556  0.195108  0.530401  0.856536
  2.840000  0.195271  0.538100  0.865867
  2.879444  0.195433  0.545805  0.875099
  2.918889  0.195596  0.553517  0.884234
  2.958333  0.195758  0.561236  0.893276
  2.997778  0.195921  0.568960  0.902227
  3.037222  0.196083  0.576691  0.911090
  3.076667  0.196246  0.584429  0.919868
  3.116111  0.196409  0.592173  0.928563
  3.155556  0.196571  0.599924  0.937177
  3.195000  0.196734  0.607680  0.945713
  3.234444  0.196897  0.615444  0.954173
  3.273889  0.197060  0.623213  0.962558
  3.313333  0.197223  0.630990  0.970871
  3.352778  0.197386  0.638772  0.979113
  3.392222  0.197549  0.646561  0.987286
  3.431667  0.197712  0.654357  0.995392
  3.471111  0.197875  0.662158  1.003433
  3.510556  0.198039  0.669967  1.011410
  3.550000  0.198202  0.677781  1.019324
  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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
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       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        16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

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

www.clearcreeksolutions.com

POND CONVERSION CALCULATIONS & ANALYSIS

EXISTING POND MODELED

Mitigated Landuse Totals for POC #1
Total Pervious Area: 6.03
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.149073
5 year	0.218931
10 year	0.264155
25 year	0.31961
50 year	0.3596
100 year	0.398454

Water Quality

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.2397 acre-feet
On-line facility target flow: 0.131 cfs.
Adjusted for 15 min: 0.131 cfs.
Off-line facility target flow: 0.0732 cfs.
Adjusted for 15 min: 0.0732 cfs.

These WQ values have no meaning. WQ volume should be based on CES's original wetpond design (23,454cf) [Storm Report, Pond Conv; Fig 6]

MODELED CONVERSION TO GLASS / GRAVEL BED W/ 0.40 POROSITY

POC #1 MATCHES 6.03 AC PERVIOUS AREA AS PREVIOUSLY DESIGNED.

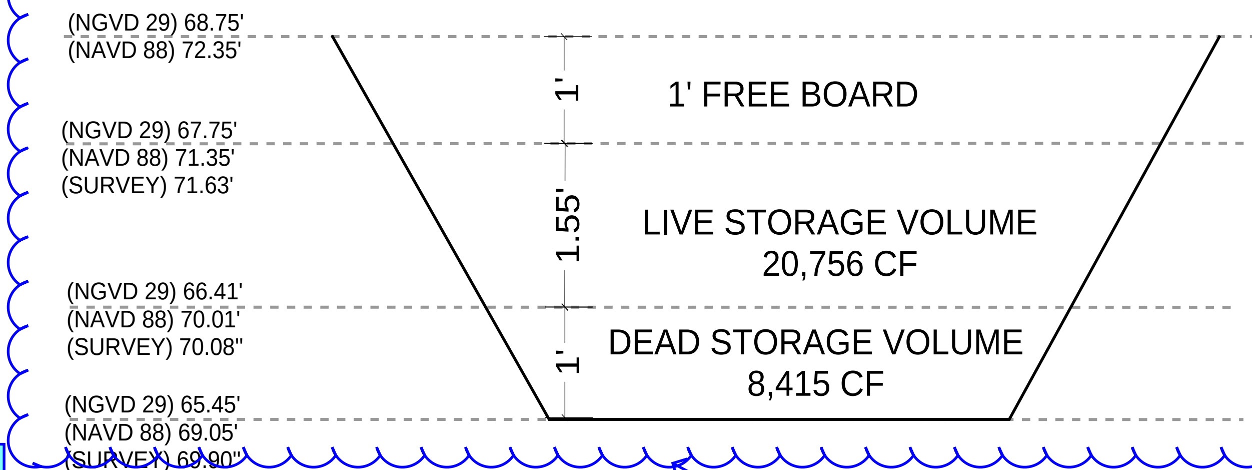
Flow Frequency		
Flow(cfs)		0801 15m
2 Year	=	0.1491
5 Year	=	0.2189
10 Year	=	0.2642
25 Year	=	0.3196
50 Year	=	0.3596
100 Year	=	0.3985

512' x 40' x 1' = 20,480 CF (DEAD STORAGE VOL.)
512' x 40' x 1.55' = 31,744 CF (LIVE STORAGE VOL)
512' x 40 x 1' = 20,480 CF (FREE BOARD STORAGE VOL)
512' x 40' x 3.55' = 72,704 CF (TOTAL VOLUME)

Water Quality

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.2397 acre-feet
On-line facility target flow: 0.131 cfs.
Adjusted for 15 min: 0.131 cfs.
Off-line facility target flow: 0.0732 cfs.
Adjusted for 15 min: 0.0732 cfs.

EXISTING POND VOLUMES



This appears to be the pond volumes based on the as-surveyed condition. The conversion design must match the FC volumes (and release rates) as well as the original WQ volume of 23,454cf. [Storm Report; Pond Conv; Fig 6]

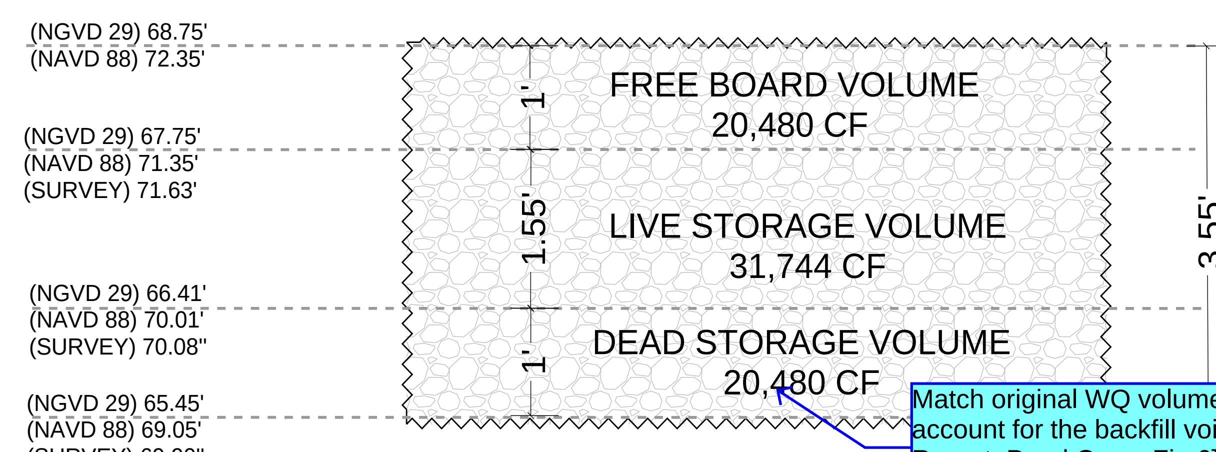
RETURNS BASED ON EXISTING MODELED POND (PREDEVELOPED) AND MODELED CONVERSION FOR GRAVEL / GLASS BED (MITIGATED)

EXISTING POND → Predeveloped; GRAVEL / GLASS BED @ 0.40 POROSITY → Mitigated

Flow Frequency			
Flow(cfs)		Predeveloped	Mitigated
2 Year	=	0.1491	0.1491
5 Year	=	0.2189	0.2189
10 Year	=	0.2642	0.2642
25 Year	=	0.3196	0.3196
50 Year	=	0.3596	0.3596
100 Year	=	0.3985	0.3985

MODELED REPORT DIRECTLY FOLLOWS THIS PAGE.

PROPOSED GRAVEL / GLASS BED WITH 0.40 POROSITY



Match original WQ volume of 23, 454cf and account for the backfill void space. [Storm Report; Pond Conv; Fig 6]

Abbey Road Group
Land Development
Services Company, LLC
2102 EAST MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159
Abbey Road GROUP

FIGURE 6 - POND CONVERSION CALCULATIONS AND ANALYSIS

FIGURE 7 - EXISTING POND VS. GRAVEL / GLASS BED CONVERSION WWHM MODELING

WWHM2012

PROJECT REPORT

06-171 EAST TOWN EXISTING POND CONVERSION TO GRAVEL OR GLASS BED

REPORT CONTAINS:
-EXISTING POND CALCS
-PROPOSED GRAVEL OR GLASS BED.

General Model Information

Project Name:	pond
Site Name:	06-171 Pond Conversion
Site Address:	
City:	Puyallup
Report Date:	11/11/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	6.03
Pervious Total	6.03
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.03

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Flat	6.03
Pervious Total	6.03
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.03

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Routing Elements
Predeveloped Routing

Trapezoidal Pond 1

Bottom Length: 171.00 ft.
Bottom Width: 46.80 ft.
Depth: 3.55 ft.
Volume at riser head: 0.6778 acre-feet.
Side slope 1: 0.25 To 1
Side slope 2: 0.5 To 1
Side slope 3: 0.5 To 1
Side slope 4: 0.5 To 1
Discharge Structure
Riser Height: 3.55 ft.
Riser Diameter: 15 in.
Orifice 1 Diameter: 4.85 in. Elevation:1 ft.
Element Flows To:
Outlet 1 Outlet 2

Should be zero (bottom of live storage)?
[Storm Report; Pond Conv; Fig 5]

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
66.550	0.183	0.000	0.000	0.000
66.589	0.183	0.007	0.000	0.000
66.629	0.184	0.014	0.000	0.000
66.668	0.184	0.021	0.000	0.000
66.708	0.184	0.029	0.000	0.000
66.747	0.184	0.036	0.000	0.000
66.787	0.184	0.043	0.000	0.000
66.826	0.184	0.050	0.000	0.000
66.866	0.185	0.058	0.000	0.000
66.905	0.185	0.065	0.000	0.000
66.944	0.185	0.072	0.000	0.000
66.984	0.185	0.080	0.000	0.000
67.023	0.185	0.087	0.000	0.000
67.063	0.185	0.094	0.000	0.000
67.102	0.185	0.102	0.000	0.000
67.142	0.186	0.109	0.000	0.000
67.181	0.186	0.116	0.000	0.000
67.221	0.186	0.124	0.000	0.000
67.260	0.186	0.131	0.000	0.000
67.299	0.186	0.138	0.000	0.000
67.339	0.186	0.146	0.000	0.000
67.378	0.187	0.153	0.000	0.000
67.418	0.187	0.160	0.000	0.000
67.457	0.187	0.168	0.000	0.000
67.497	0.187	0.175	0.000	0.000
67.536	0.187	0.183	0.000	0.000
67.576	0.187	0.190	0.102	0.000
67.615	0.188	0.197	0.162	0.000
67.654	0.188	0.205	0.206	0.000
67.694	0.188	0.212	0.242	0.000
67.733	0.188	0.220	0.273	0.000
67.773	0.188	0.227	0.301	0.000
67.812	0.188	0.235	0.326	0.000

67.852	0.189	0.242	0.350	0.000
67.891	0.189	0.250	0.372	0.000
67.931	0.189	0.257	0.393	0.000
67.970	0.189	0.264	0.413	0.000
68.009	0.189	0.272	0.432	0.000
68.049	0.189	0.279	0.450	0.000
68.088	0.189	0.287	0.468	0.000
68.128	0.190	0.294	0.485	0.000
68.167	0.190	0.302	0.501	0.000
68.207	0.190	0.309	0.517	0.000
68.246	0.190	0.317	0.532	0.000
68.286	0.190	0.324	0.547	0.000
68.325	0.190	0.332	0.561	0.000
68.364	0.191	0.340	0.576	0.000
68.404	0.191	0.347	0.589	0.000
68.443	0.191	0.355	0.603	0.000
68.483	0.191	0.362	0.616	0.000
68.522	0.191	0.370	0.629	0.000
68.562	0.191	0.377	0.642	0.000
68.601	0.192	0.385	0.654	0.000
68.641	0.192	0.392	0.666	0.000
68.680	0.192	0.400	0.678	0.000
68.719	0.192	0.408	0.690	0.000
68.759	0.192	0.415	0.701	0.000
68.798	0.192	0.423	0.713	0.000
68.838	0.193	0.430	0.724	0.000
68.877	0.193	0.438	0.735	0.000
68.917	0.193	0.446	0.746	0.000
68.956	0.193	0.453	0.756	0.000
68.996	0.193	0.461	0.767	0.000
69.035	0.193	0.469	0.777	0.000
69.074	0.194	0.476	0.788	0.000
69.114	0.194	0.484	0.798	0.000
69.153	0.194	0.492	0.808	0.000
69.193	0.194	0.499	0.818	0.000
69.232	0.194	0.507	0.827	0.000
69.272	0.194	0.515	0.837	0.000
69.311	0.194	0.522	0.847	0.000
69.351	0.195	0.530	0.856	0.000
69.390	0.195	0.538	0.865	0.000
69.429	0.195	0.545	0.875	0.000
69.469	0.195	0.553	0.884	0.000
69.508	0.195	0.561	0.893	0.000
69.548	0.195	0.569	0.902	0.000
69.587	0.196	0.576	0.911	0.000
69.627	0.196	0.584	0.919	0.000
69.666	0.196	0.592	0.928	0.000
69.706	0.196	0.599	0.937	0.000
69.745	0.196	0.607	0.945	0.000
69.784	0.196	0.615	0.954	0.000
69.824	0.197	0.623	0.962	0.000
69.863	0.197	0.631	0.970	0.000
69.903	0.197	0.638	0.979	0.000
69.942	0.197	0.646	0.987	0.000
69.982	0.197	0.654	0.995	0.000
70.021	0.197	0.662	1.003	0.000
70.061	0.198	0.670	1.011	0.000
70.100	0.198	0.677	1.019	0.000

70.139	0.198	0.685	1.131	0.000

Mitigated Routing

Gravel Trench Bed 1

Bottom Length:	512.00 ft.
Bottom Width:	40.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	3.55
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0

Why the change in diameter?

Should be zero (bottom of live storage)?
[Storm Report; Pond Conv; Fig 5]

Discharge Structure
Riser Height: 3.55 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 4.85 in. Elevation:1 ft.
Element Flows To:
Outlet 1 Outlet 2

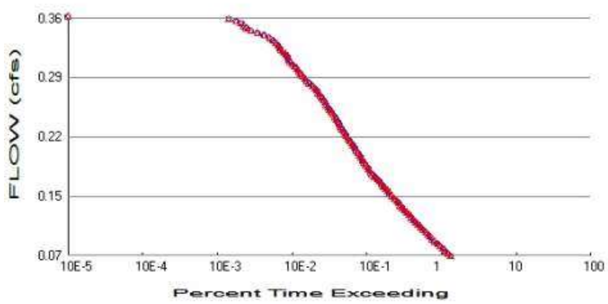
Gravel Trench Bed Hydraulic Table

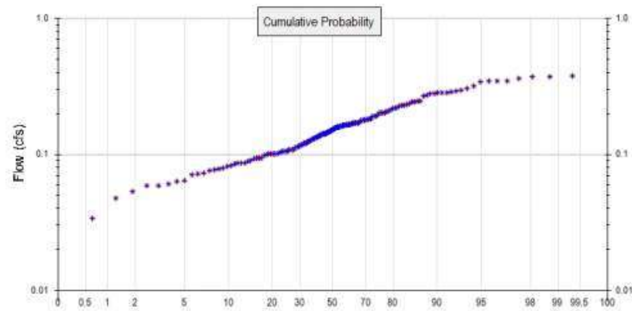
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.470	0.000	0.000	0.000
0.0394	0.470	0.007	0.000	0.000
0.0789	0.470	0.014	0.000	0.000
0.1183	0.470	0.022	0.000	0.000
0.1578	0.470	0.029	0.000	0.000
0.1972	0.470	0.037	0.000	0.000
0.2367	0.470	0.044	0.000	0.000
0.2761	0.470	0.051	0.000	0.000
0.3156	0.470	0.059	0.000	0.000
0.3550	0.470	0.066	0.000	0.000
0.3944	0.470	0.074	0.000	0.000
0.4339	0.470	0.081	0.000	0.000
0.4733	0.470	0.089	0.000	0.000
0.5128	0.470	0.096	0.000	0.000
0.5522	0.470	0.103	0.000	0.000
0.5917	0.470	0.111	0.000	0.000
0.6311	0.470	0.118	0.000	0.000
0.6706	0.470	0.126	0.000	0.000
0.7100	0.470	0.133	0.000	0.000
0.7494	0.470	0.140	0.000	0.000
0.7889	0.470	0.148	0.000	0.000
0.8283	0.470	0.155	0.000	0.000
0.8678	0.470	0.163	0.000	0.000
0.9072	0.470	0.170	0.000	0.000
0.9467	0.470	0.178	0.000	0.000
0.9861	0.470	0.185	0.000	0.000
1.0256	0.470	0.192	0.102	0.000
1.0650	0.470	0.200	0.162	0.000
1.1044	0.470	0.207	0.206	0.000
1.1439	0.470	0.215	0.242	0.000
1.1833	0.470	0.222	0.273	0.000
1.2228	0.470	0.230	0.301	0.000

1.2622	0.470	0.237	0.326	0.000
1.3017	0.470	0.244	0.350	0.000
1.3411	0.470	0.252	0.372	0.000
1.3806	0.470	0.259	0.393	0.000
1.4200	0.470	0.267	0.413	0.000
1.4594	0.470	0.274	0.432	0.000
1.4989	0.470	0.281	0.450	0.000
1.5383	0.470	0.289	0.468	0.000
1.5778	0.470	0.296	0.485	0.000
1.6172	0.470	0.304	0.501	0.000
1.6567	0.470	0.311	0.517	0.000
1.6961	0.470	0.319	0.532	0.000
1.7356	0.470	0.326	0.547	0.000
1.7750	0.470	0.333	0.561	0.000
1.8144	0.470	0.341	0.576	0.000
1.8539	0.470	0.348	0.589	0.000
1.8933	0.470	0.356	0.603	0.000
1.9328	0.470	0.363	0.616	0.000
1.9722	0.470	0.370	0.629	0.000
2.0117	0.470	0.378	0.642	0.000
2.0511	0.470	0.385	0.654	0.000
2.0906	0.470	0.393	0.666	0.000
2.1300	0.470	0.400	0.678	0.000
2.1694	0.470	0.408	0.690	0.000
2.2089	0.470	0.415	0.701	0.000
2.2483	0.470	0.422	0.713	0.000
2.2878	0.470	0.430	0.724	0.000
2.3272	0.470	0.437	0.735	0.000
2.3667	0.470	0.445	0.746	0.000
2.4061	0.470	0.452	0.756	0.000
2.4456	0.470	0.459	0.767	0.000
2.4850	0.470	0.467	0.777	0.000
2.5244	0.470	0.474	0.788	0.000
2.5639	0.470	0.482	0.798	0.000
2.6033	0.470	0.489	0.808	0.000
2.6428	0.470	0.497	0.818	0.000
2.6822	0.470	0.504	0.827	0.000
2.7217	0.470	0.511	0.837	0.000
2.7611	0.470	0.519	0.847	0.000
2.8006	0.470	0.526	0.856	0.000
2.8400	0.470	0.534	0.865	0.000
2.8794	0.470	0.541	0.875	0.000
2.9189	0.470	0.548	0.884	0.000
2.9583	0.470	0.556	0.893	0.000
2.9978	0.470	0.563	0.902	0.000
3.0372	0.470	0.571	0.911	0.000
3.0767	0.470	0.578	0.919	0.000
3.1161	0.470	0.586	0.928	0.000
3.1556	0.470	0.593	0.937	0.000
3.1950	0.470	0.600	0.945	0.000
3.2344	0.470	0.608	0.954	0.000
3.2739	0.470	0.615	0.962	0.000
3.3133	0.470	0.623	0.970	0.000
3.3528	0.470	0.630	0.979	0.000
3.3922	0.470	0.637	0.987	0.000
3.4317	0.470	0.645	0.995	0.000
3.4711	0.470	0.652	1.003	0.000
3.5106	0.470	0.660	1.011	0.000

3.5500	0.470	0.667	1.019	0.000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 6.03
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 6.03
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.149073
5 year	0.218931
10 year	0.264155
25 year	0.31961
50 year	0.3596
100 year	0.398454

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.149074
5 year	0.218944
10 year	0.264178
25 year	0.319647
50 year	0.359648
100 year	0.398513

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

Year	Predeveloped	Mitigated
1902	0.117	0.117
1903	0.105	0.105
1904	0.139	0.139
1905	0.094	0.094
1906	0.048	0.048
1907	0.231	0.231
1908	0.163	0.163
1909	0.156	0.156
1910	0.207	0.207
1911	0.161	0.161

1912	0.346	0.346
1913	0.228	0.228
1914	0.058	0.058
1915	0.108	0.108
1916	0.156	0.156
1917	0.064	0.064
1918	0.159	0.159
1919	0.135	0.135
1920	0.159	0.159
1921	0.163	0.163
1922	0.166	0.166
1923	0.151	0.151
1924	0.090	0.090
1925	0.101	0.101
1926	0.142	0.142
1927	0.108	0.108
1928	0.117	0.117
1929	0.216	0.216
1930	0.142	0.142
1931	0.150	0.150
1932	0.114	0.114
1933	0.141	0.141
1934	0.284	0.284
1935	0.135	0.135
1936	0.127	0.127
1937	0.202	0.202
1938	0.142	0.142
1939	0.030	0.030
1940	0.142	0.142
1941	0.082	0.082
1942	0.220	0.220
1943	0.113	0.113
1944	0.243	0.243
1945	0.169	0.169
1946	0.108	0.108
1947	0.078	0.078
1948	0.303	0.303
1949	0.281	0.281
1950	0.095	0.095
1951	0.108	0.108
1952	0.359	0.359
1953	0.346	0.346
1954	0.134	0.134
1955	0.122	0.122
1956	0.071	0.071
1957	0.190	0.190
1958	0.370	0.370
1959	0.237	0.237
1960	0.079	0.079
1961	0.244	0.244
1962	0.152	0.152
1963	0.087	0.087
1964	0.102	0.102
1965	0.273	0.273
1966	0.092	0.092
1967	0.124	0.124
1968	0.170	0.170
1969	0.135	0.135

1970	0.193	0.193
1971	0.288	0.288
1972	0.180	0.180
1973	0.246	0.246
1974	0.125	0.125
1975	0.285	0.285
1976	0.166	0.166
1977	0.082	0.082
1978	0.269	0.269
1979	0.089	0.089
1980	0.159	0.159
1981	0.145	0.145
1982	0.073	0.073
1983	0.245	0.245
1984	0.146	0.146
1985	0.182	0.182
1986	0.158	0.158
1987	0.283	0.283
1988	0.167	0.167
1989	0.167	0.167
1990	0.191	0.191
1991	0.167	0.167
1992	0.181	0.181
1993	0.201	0.201
1994	0.281	0.281
1995	0.076	0.076
1996	0.298	0.298
1997	0.131	0.131
1998	0.170	0.170
1999	0.053	0.053
2000	0.131	0.131
2001	0.077	0.077
2002	0.170	0.169
2003	0.183	0.183
2004	0.151	0.151
2005	0.181	0.181
2006	0.101	0.101
2007	0.100	0.100
2008	0.163	0.163
2009	0.113	0.113
2010	0.101	0.101
2011	0.085	0.085
2012	0.177	0.177
2013	0.098	0.098
2014	0.071	0.071
2015	0.148	0.148
2016	0.063	0.063
2017	0.213	0.213
2018	0.371	0.371
2019	0.377	0.377
2020	0.121	0.121
2021	0.201	0.201
2022	0.086	0.086
2023	0.170	0.170
2024	0.317	0.317
2025	0.160	0.160
2026	0.233	0.233
2027	0.119	0.119

2028	0.094	0.094
2029	0.162	0.162
2030	0.292	0.293
2031	0.106	0.106
2032	0.060	0.060
2033	0.103	0.103
2034	0.106	0.106
2035	0.342	0.342
2036	0.177	0.177
2037	0.058	0.058
2038	0.154	0.154
2039	0.034	0.034
2040	0.105	0.105
2041	0.130	0.130
2042	0.344	0.344
2043	0.191	0.191
2044	0.221	0.221
2045	0.146	0.146
2046	0.173	0.173
2047	0.138	0.138
2048	0.177	0.177
2049	0.165	0.165
2050	0.122	0.122
2051	0.207	0.207
2052	0.099	0.099
2053	0.166	0.166
2054	0.202	0.202
2055	0.101	0.101
2056	0.086	0.086
2057	0.129	0.129
2058	0.143	0.143
2059	0.227	0.227

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3770	0.3771
2	0.3706	0.3707
3	0.3702	0.3703
4	0.3587	0.3588
5	0.3463	0.3465
6	0.3460	0.3461
7	0.3443	0.3443
8	0.3424	0.3425
9	0.3169	0.3171
10	0.3032	0.3032
11	0.2981	0.2981
12	0.2925	0.2925
13	0.2882	0.2883
14	0.2849	0.2849
15	0.2839	0.2840
16	0.2831	0.2832
17	0.2813	0.2813
18	0.2812	0.2813
19	0.2728	0.2728
20	0.2685	0.2686
21	0.2463	0.2463
22	0.2450	0.2450

23	0.2442	0.2442
24	0.2425	0.2425
25	0.2371	0.2371
26	0.2333	0.2333
27	0.2307	0.2307
28	0.2280	0.2280
29	0.2274	0.2274
30	0.2208	0.2208
31	0.2202	0.2202
32	0.2160	0.2160
33	0.2135	0.2135
34	0.2069	0.2069
35	0.2069	0.2069
36	0.2021	0.2021
37	0.2021	0.2021
38	0.2013	0.2013
39	0.2010	0.2010
40	0.1932	0.1932
41	0.1915	0.1915
42	0.1912	0.1912
43	0.1903	0.1903
44	0.1834	0.1834
45	0.1824	0.1824
46	0.1813	0.1813
47	0.1812	0.1812
48	0.1799	0.1799
49	0.1774	0.1774
50	0.1769	0.1769
51	0.1766	0.1766
52	0.1732	0.1732
53	0.1705	0.1705
54	0.1699	0.1699
55	0.1695	0.1695
56	0.1695	0.1695
57	0.1693	0.1693
58	0.1674	0.1674
59	0.1669	0.1669
60	0.1667	0.1667
61	0.1661	0.1661
62	0.1656	0.1656
63	0.1656	0.1656
64	0.1648	0.1648
65	0.1630	0.1630
66	0.1629	0.1629
67	0.1625	0.1625
68	0.1623	0.1623
69	0.1609	0.1609
70	0.1600	0.1600
71	0.1592	0.1592
72	0.1591	0.1591
73	0.1590	0.1590
74	0.1579	0.1579
75	0.1565	0.1565
76	0.1563	0.1563
77	0.1541	0.1541
78	0.1520	0.1520
79	0.1512	0.1512
80	0.1505	0.1505

81	0.1497	0.1497
82	0.1483	0.1483
83	0.1463	0.1463
84	0.1457	0.1457
85	0.1451	0.1451
86	0.1430	0.1430
87	0.1424	0.1424
88	0.1418	0.1418
89	0.1418	0.1418
90	0.1417	0.1417
91	0.1415	0.1415
92	0.1387	0.1386
93	0.1383	0.1383
94	0.1354	0.1354
95	0.1349	0.1349
96	0.1347	0.1347
97	0.1341	0.1341
98	0.1311	0.1311
99	0.1308	0.1308
100	0.1296	0.1296
101	0.1291	0.1291
102	0.1268	0.1268
103	0.1251	0.1251
104	0.1243	0.1243
105	0.1220	0.1220
106	0.1216	0.1216
107	0.1206	0.1206
108	0.1186	0.1186
109	0.1172	0.1171
110	0.1165	0.1165
111	0.1140	0.1140
112	0.1127	0.1127
113	0.1126	0.1126
114	0.1083	0.1083
115	0.1083	0.1083
116	0.1077	0.1077
117	0.1075	0.1075
118	0.1057	0.1057
119	0.1056	0.1056
120	0.1053	0.1053
121	0.1049	0.1049
122	0.1033	0.1033
123	0.1016	0.1016
124	0.1015	0.1015
125	0.1012	0.1012
126	0.1007	0.1007
127	0.1007	0.1006
128	0.1004	0.1004
129	0.0994	0.0994
130	0.0978	0.0978
131	0.0945	0.0945
132	0.0944	0.0944
133	0.0938	0.0938
134	0.0921	0.0921
135	0.0903	0.0903
136	0.0892	0.0892
137	0.0867	0.0867
138	0.0862	0.0862

139	0.0862	0.0862
140	0.0847	0.0847
141	0.0824	0.0824
142	0.0818	0.0818
143	0.0793	0.0793
144	0.0779	0.0779
145	0.0769	0.0769
146	0.0757	0.0757
147	0.0727	0.0727
148	0.0712	0.0712
149	0.0706	0.0706
150	0.0639	0.0639
151	0.0635	0.0635
152	0.0605	0.0605
153	0.0584	0.0584
154	0.0584	0.0584
155	0.0530	0.0530
156	0.0478	0.0478
157	0.0336	0.0336
158	0.0298	0.0297

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0745	73295	73295	100	Pass
0.0774	67423	67423	100	Pass
0.0803	62049	62049	100	Pass
0.0832	57229	57229	100	Pass
0.0861	52780	52780	100	Pass
0.0889	48531	48531	100	Pass
0.0918	44708	44708	100	Pass
0.0947	41418	41418	100	Pass
0.0976	38487	38487	100	Pass
0.1005	36121	36127	100	Pass
0.1033	33750	33750	100	Pass
0.1062	31240	31240	100	Pass
0.1091	29002	29002	100	Pass
0.1120	26936	26936	100	Pass
0.1148	25036	25036	100	Pass
0.1177	23368	23368	100	Pass
0.1206	21772	21772	100	Pass
0.1235	20360	20360	100	Pass
0.1264	18958	18958	100	Pass
0.1292	17684	17684	100	Pass
0.1321	16498	16498	100	Pass
0.1350	15473	15479	100	Pass
0.1379	14587	14581	99	Pass
0.1408	13678	13678	100	Pass
0.1436	12803	12803	100	Pass
0.1465	11989	11989	100	Pass
0.1494	11213	11208	99	Pass
0.1523	10521	10521	100	Pass
0.1552	9872	9872	100	Pass
0.1580	9246	9246	100	Pass
0.1609	8654	8654	100	Pass
0.1638	8100	8100	100	Pass
0.1667	7523	7518	99	Pass
0.1696	7008	7008	100	Pass
0.1724	6548	6543	99	Pass
0.1753	6183	6183	100	Pass
0.1782	5884	5884	100	Pass
0.1811	5579	5579	100	Pass
0.1840	5309	5309	100	Pass
0.1868	5061	5061	100	Pass
0.1897	4838	4836	99	Pass
0.1926	4609	4609	100	Pass
0.1955	4386	4386	100	Pass
0.1984	4182	4182	100	Pass
0.2012	3975	3975	100	Pass
0.2041	3789	3789	100	Pass
0.2070	3606	3604	99	Pass
0.2099	3442	3441	99	Pass
0.2127	3272	3271	99	Pass
0.2156	3079	3079	100	Pass
0.2185	2936	2936	100	Pass
0.2214	2812	2812	100	Pass
0.2243	2693	2693	100	Pass

0.2271	2561	2561	100	Pass
0.2300	2448	2447	99	Pass
0.2329	2335	2336	100	Pass
0.2358	2247	2247	100	Pass
0.2387	2164	2164	100	Pass
0.2415	2078	2078	100	Pass
0.2444	1926	1926	100	Pass
0.2473	1831	1831	100	Pass
0.2502	1754	1754	100	Pass
0.2531	1677	1678	100	Pass
0.2559	1584	1584	100	Pass
0.2588	1508	1508	100	Pass
0.2617	1437	1437	100	Pass
0.2646	1379	1377	99	Pass
0.2675	1310	1311	100	Pass
0.2703	1244	1244	100	Pass
0.2732	1171	1170	99	Pass
0.2761	1108	1108	100	Pass
0.2790	1031	1032	100	Pass
0.2819	940	940	100	Pass
0.2847	862	861	99	Pass
0.2876	811	811	100	Pass
0.2905	757	758	100	Pass
0.2934	716	714	99	Pass
0.2963	678	679	100	Pass
0.2991	633	633	100	Pass
0.3020	602	602	100	Pass
0.3049	557	557	100	Pass
0.3078	515	516	100	Pass
0.3106	497	497	100	Pass
0.3135	478	477	99	Pass
0.3164	455	455	100	Pass
0.3193	423	423	100	Pass
0.3222	391	391	100	Pass
0.3250	373	373	100	Pass
0.3279	352	352	100	Pass
0.3308	329	329	100	Pass
0.3337	306	306	100	Pass
0.3366	276	276	100	Pass
0.3394	230	231	100	Pass
0.3423	188	190	101	Pass
0.3452	155	156	100	Pass
0.3481	136	136	100	Pass
0.3510	126	126	100	Pass
0.3538	114	114	100	Pass
0.3567	99	99	100	Pass
0.3596	78	78	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.2397 acre-feet
On-line facility target flow:	0.131 cfs.
Adjusted for 15 min:	0.131 cfs.
Off-line facility target flow:	0.0732 cfs.
Adjusted for 15 min:	0.0732 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Gravel Trench Bed 1 POC	☐	631.49			☐	0.00			
Total Volume Infiltrated		631.49	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

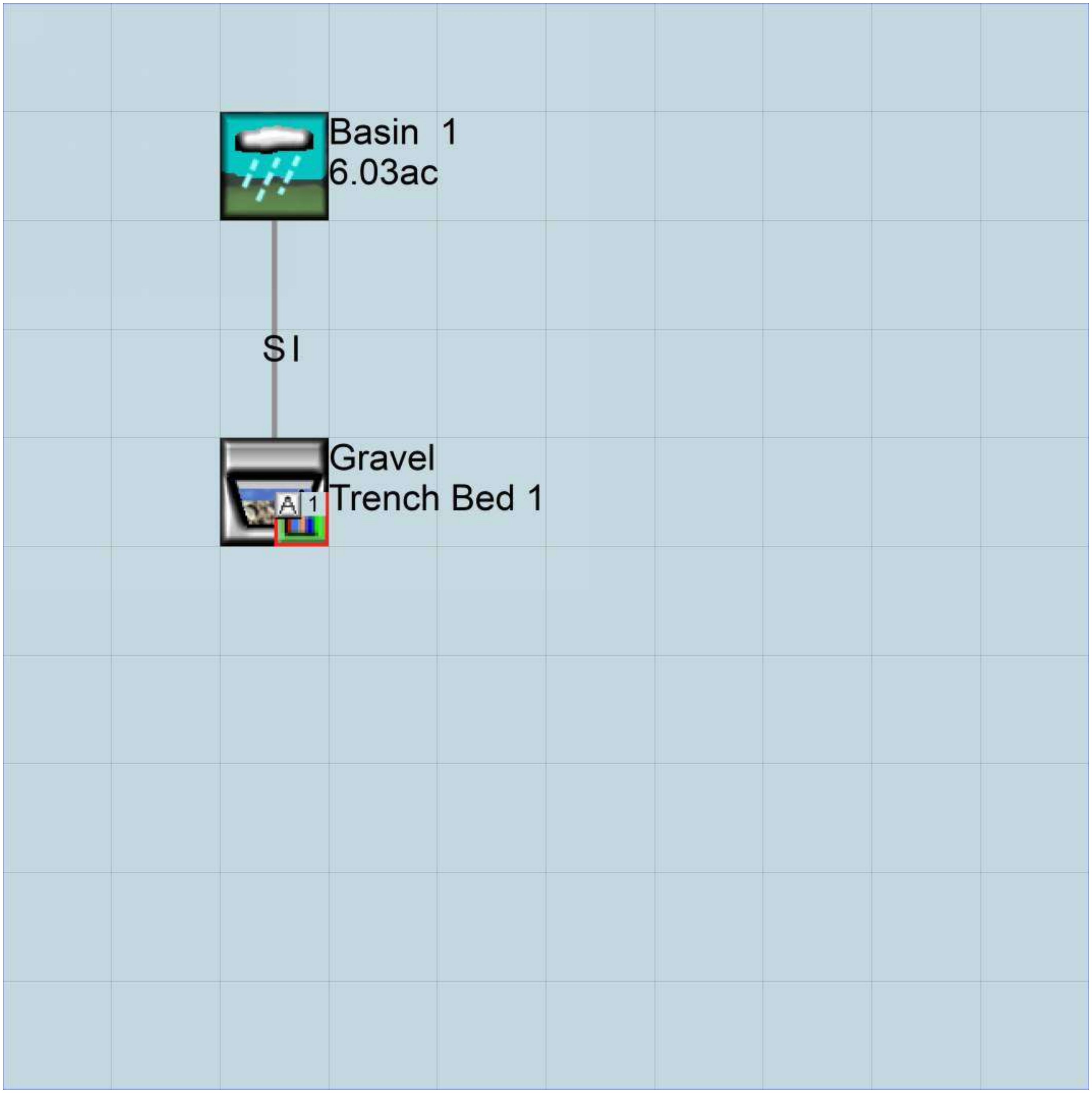
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   pond.wdm
MESSU      25   Prepond.MES
           27   Prepond.L61
           28   Prepond.L62
           30   POCpond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      RCHRES       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  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          ***
   13      C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         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
  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
  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
  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
  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
  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
  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  13                        6.03     RCHRES   1      2
PERLND  13                        6.03     RCHRES   1      3

******Routing******
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     Trapezoidal Pond-005    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      0.03       0.0     66.55       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
91 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.183719	0.000000	0.000000		
0.039444	0.183878	0.007250	0.000000		
0.078889	0.184036	0.014506	0.000000		
0.118333	0.184195	0.021768	0.000000		
0.157778	0.184353	0.029037	0.000000		
0.197222	0.184512	0.036312	0.000000		
0.236667	0.184671	0.043593	0.000000		
0.276111	0.184830	0.050880	0.000000		
0.315556	0.184989	0.058174	0.000000		
0.355000	0.185148	0.065474	0.000000		
0.394444	0.185307	0.072780	0.000000		
0.433889	0.185466	0.080092	0.000000		
0.473333	0.185625	0.087411	0.000000		
0.512778	0.185784	0.094736	0.000000		
0.552222	0.185943	0.102067	0.000000		
0.591667	0.186103	0.109405	0.000000		
0.631111	0.186262	0.116749	0.000000		
0.670556	0.186421	0.124099	0.000000		
0.710000	0.186581	0.131455	0.000000		
0.749444	0.186740	0.138818	0.000000		
0.788889	0.186900	0.146187	0.000000		
0.828333	0.187060	0.153562	0.000000		
0.867778	0.187219	0.160944	0.000000		
0.907222	0.187379	0.168332	0.000000		
0.946667	0.187539	0.175726	0.000000		
0.986111	0.187699	0.183127	0.000000		
1.025556	0.187858	0.190534	0.102043		
1.065000	0.188018	0.197947	0.162742		
1.104444	0.188178	0.205366	0.206293		
1.143889	0.188338	0.212792	0.242134		
1.183333	0.188498	0.220224	0.273315		
1.222778	0.188659	0.227662	0.301285		
1.262222	0.188819	0.235107	0.326871		
1.301667	0.188979	0.242558	0.350595		
1.341111	0.189139	0.250015	0.372812		
1.380556	0.189300	0.257479	0.393778		
1.420000	0.189460	0.264949	0.413682		
1.459444	0.189621	0.272425	0.432672		
1.498889	0.189781	0.279908	0.450863		
1.538333	0.189942	0.287397	0.468347		
1.577778	0.190102	0.294892	0.485202		
1.617222	0.190263	0.302394	0.501491		
1.656667	0.190424	0.309902	0.517267		
1.696111	0.190585	0.317416	0.532576		
1.735556	0.190745	0.324937	0.547457		
1.775000	0.190906	0.332464	0.561944		
1.814444	0.191067	0.339997	0.576067		
1.853889	0.191228	0.347537	0.589852		
1.893333	0.191389	0.355083	0.603322		
1.932778	0.191550	0.362635	0.616497		
1.972222	0.191712	0.370194	0.629397		
2.011667	0.191873	0.377759	0.642038		
2.051111	0.192034	0.385331	0.654435		
2.090556	0.192195	0.392909	0.666601		
2.130000	0.192357	0.400493	0.678549		
2.169444	0.192518	0.408084	0.690291		
2.208889	0.192680	0.415680	0.701836		
2.248333	0.192841	0.423284	0.713194		
2.287778	0.193003	0.430894	0.724374		
2.327222	0.193164	0.438510	0.735384		
2.366667	0.193326	0.446132	0.746231		
2.406111	0.193488	0.453761	0.756924		
2.445556	0.193650	0.461396	0.767467		
2.485000	0.193812	0.469038	0.777867		
2.524444	0.193973	0.476686	0.788130		

```
  2.563889  0.194135  0.484340  0.798261
  2.603333  0.194297  0.492001  0.808266
  2.642778  0.194460  0.499668  0.818148
  2.682222  0.194622  0.507341  0.827911
  2.721667  0.194784  0.515021  0.837562
  2.761111  0.194946  0.522708  0.847102
  2.800556  0.195108  0.530401  0.856536
  2.840000  0.195271  0.538100  0.865867
  2.879444  0.195433  0.545805  0.875099
  2.918889  0.195596  0.553517  0.884234
  2.958333  0.195758  0.561236  0.893276
  2.997778  0.195921  0.568960  0.902227
  3.037222  0.196083  0.576691  0.911090
  3.076667  0.196246  0.584429  0.919868
  3.116111  0.196409  0.592173  0.928563
  3.155556  0.196571  0.599924  0.937177
  3.195000  0.196734  0.607680  0.945713
  3.234444  0.196897  0.615444  0.954173
  3.273889  0.197060  0.623213  0.962558
  3.313333  0.197223  0.630990  0.970871
  3.352778  0.197386  0.638772  0.979113
  3.392222  0.197549  0.646561  0.987286
  3.431667  0.197712  0.654357  0.995392
  3.471111  0.197875  0.662158  1.003433
  3.510556  0.198039  0.669967  1.011410
  3.550000  0.198202  0.677781  1.019324
  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***
RCHRES   1 HYDR   RO      1 1        1     WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE   1 1        1     WDM   1001 STAG     ENGL      REPL
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        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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


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   pond.wdm
MESSU      25   Mitpond.MES
           27   Mitpond.L61
           28   Mitpond.L62
           30   POCpond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Gravel Trench Bed 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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         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
```

```
  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
  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
  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
  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
  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
  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  13                        6.03     RCHRES   1      2
PERLND  13                        6.03     RCHRES   1      3

******Routing******
PERLND  13                        6.03     COPY     1     12
PERLND  13                        6.03     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     Gravel Trench Be-006    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       0.1       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES
```

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
FTABLE 1
92 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.470156	0.000000	0.000000		
0.039444	0.470156	0.007418	0.000000		
0.078889	0.470156	0.014836	0.000000		
0.118333	0.470156	0.022254	0.000000		
0.157778	0.470156	0.029672	0.000000		
0.197222	0.470156	0.037090	0.000000		
0.236667	0.470156	0.044508	0.000000		
0.276111	0.470156	0.051926	0.000000		
0.315556	0.470156	0.059344	0.000000		
0.355000	0.470156	0.066762	0.000000		
0.394444	0.470156	0.074180	0.000000		
0.433889	0.470156	0.081598	0.000000		
0.473333	0.470156	0.089016	0.000000		
0.512778	0.470156	0.096434	0.000000		
0.552222	0.470156	0.103852	0.000000		
0.591667	0.470156	0.111270	0.000000		
0.631111	0.470156	0.118688	0.000000		
0.670556	0.470156	0.126106	0.000000		
0.710000	0.470156	0.133524	0.000000		
0.749444	0.470156	0.140942	0.000000		
0.788889	0.470156	0.148360	0.000000		
0.828333	0.470156	0.155778	0.000000		
0.867778	0.470156	0.163196	0.000000		
0.907222	0.470156	0.170614	0.000000		
0.946667	0.470156	0.178032	0.000000		
0.986111	0.470156	0.185450	0.000000		
1.025556	0.470156	0.192868	0.102043		
1.065000	0.470156	0.200287	0.162742		
1.104444	0.470156	0.207705	0.206293		
1.143889	0.470156	0.215123	0.242134		
1.183333	0.470156	0.222541	0.273315		
1.222778	0.470156	0.229959	0.301285		
1.262222	0.470156	0.237377	0.326871		
1.301667	0.470156	0.244795	0.350595		
1.341111	0.470156	0.252213	0.372812		
1.380556	0.470156	0.259631	0.393778		
1.420000	0.470156	0.267049	0.413682		
1.459444	0.470156	0.274467	0.432672		
1.498889	0.470156	0.281885	0.450863		
1.538333	0.470156	0.289303	0.468347		
1.577778	0.470156	0.296721	0.485202		
1.617222	0.470156	0.304139	0.501491		
1.656667	0.470156	0.311557	0.517267		
1.696111	0.470156	0.318975	0.532576		
1.735556	0.470156	0.326393	0.547457		
1.775000	0.470156	0.333811	0.561944		
1.814444	0.470156	0.341229	0.576067		
1.853889	0.470156	0.348647	0.589852		
1.893333	0.470156	0.356065	0.603322		
1.932778	0.470156	0.363483	0.616497		
1.972222	0.470156	0.370901	0.629397		
2.011667	0.470156	0.378319	0.642038		
2.051111	0.470156	0.385737	0.654435		
2.090556	0.470156	0.393155	0.666601		
2.130000	0.470156	0.400573	0.678549		
2.169444	0.470156	0.407991	0.690291		
2.208889	0.470156	0.415409	0.701836		
2.248333	0.470156	0.422827	0.713194		
2.287778	0.470156	0.430245	0.724374		
2.327222	0.470156	0.437663	0.735384		
2.366667	0.470156	0.445081	0.746231		
2.406111	0.470156	0.452499	0.756924		

```
  2.445556  0.470156  0.459917  0.767467
  2.485000  0.470156  0.467335  0.777867
  2.524444  0.470156  0.474753  0.788130
  2.563889  0.470156  0.482171  0.798261
  2.603333  0.470156  0.489589  0.808266
  2.642778  0.470156  0.497007  0.818148
  2.682222  0.470156  0.504425  0.827911
  2.721667  0.470156  0.511843  0.837562
  2.761111  0.470156  0.519261  0.847102
  2.800556  0.470156  0.526679  0.856536
  2.840000  0.470156  0.534097  0.865867
  2.879444  0.470156  0.541515  0.875099
  2.918889  0.470156  0.548933  0.884234
  2.958333  0.470156  0.556351  0.893276
  2.997778  0.470156  0.563769  0.902227
  3.037222  0.470156  0.571187  0.911090
  3.076667  0.470156  0.578605  0.919868
  3.116111  0.470156  0.586023  0.928563
  3.155556  0.470156  0.593441  0.937177
  3.195000  0.470156  0.600860  0.945713
  3.234444  0.470156  0.608278  0.954173
  3.273889  0.470156  0.615696  0.962558
  3.313333  0.470156  0.623114  0.970871
  3.352778  0.470156  0.630532  0.979113
  3.392222  0.470156  0.637950  0.987286
  3.431667  0.470156  0.645368  0.995392
  3.471111  0.470156  0.652786  1.003433
  3.510556  0.470156  0.660204  1.011410
  3.550000  0.470156  0.667622  1.019324
  3.589444  0.470156  0.686167  1.110236
  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***
RCHRES   1 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
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       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        16
RCHRES     ROFLOW                              COPY            INPUT  MEAN
  END MASS-LINK    16

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

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

www.clearcreeksolutions.com

FIGURE 8 - GLASS SOILS PROCTOR 0.40 POROSITY

PROCTOR TO BE PROVIDED AT A LATER DATE

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

STORM DETENTION PLAN

SCALE: 1" = 20
FOR 24" X 36" SHEET

LINE IS 1" AT FULL SCALE

APPROVED

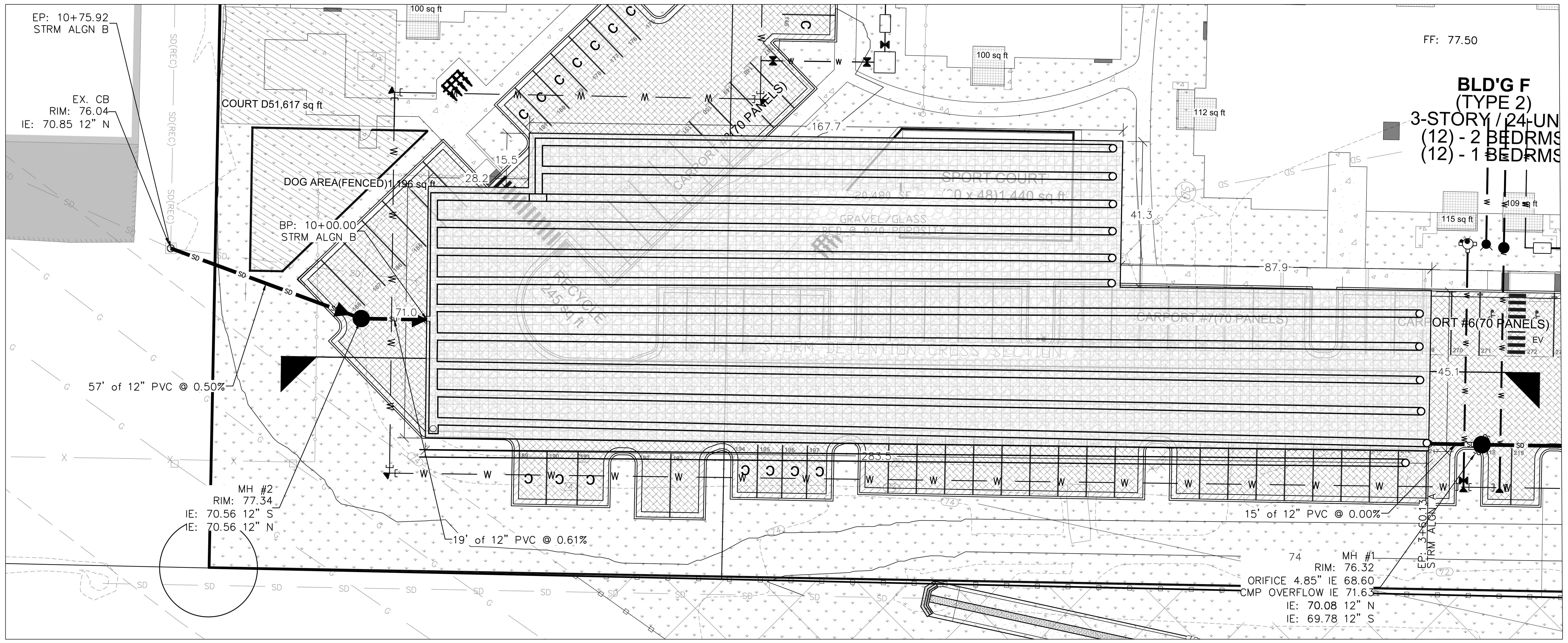
BY ____________________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

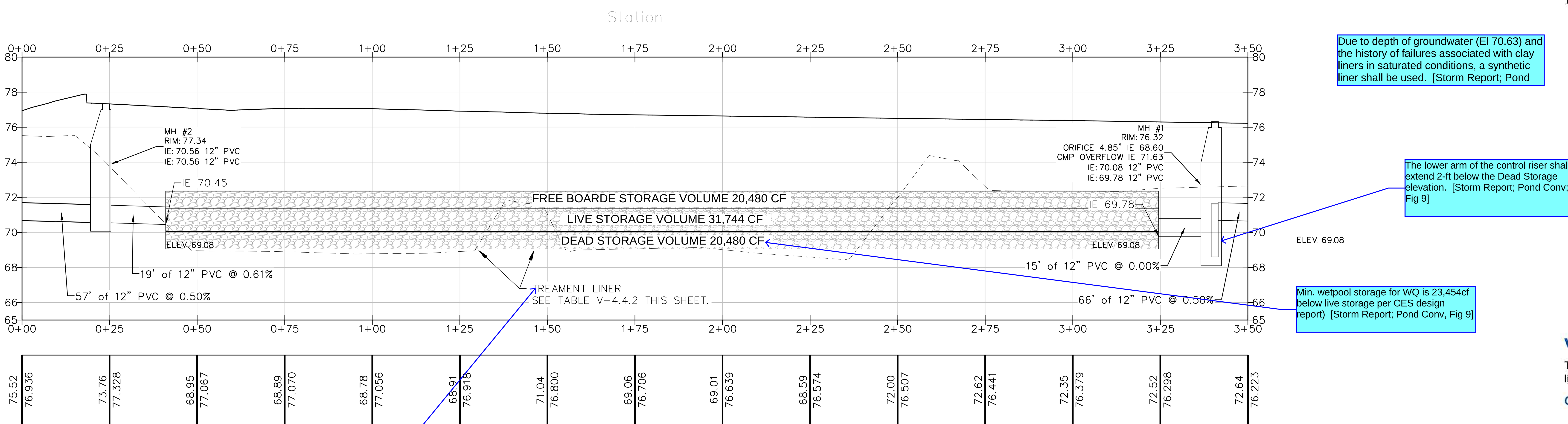
DATE ____________________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

TITLE: East Town Crossing Storm Detention Plan
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

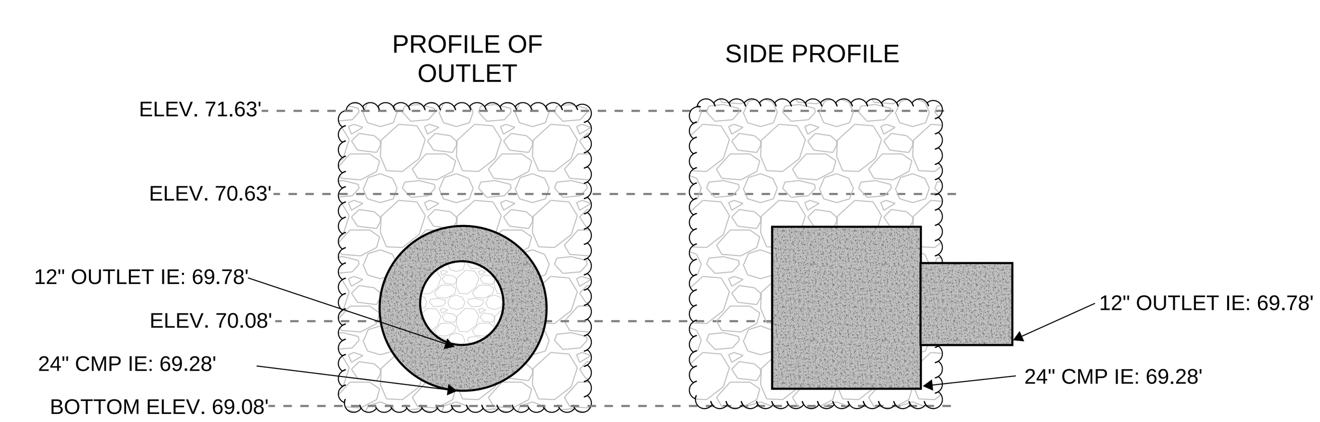




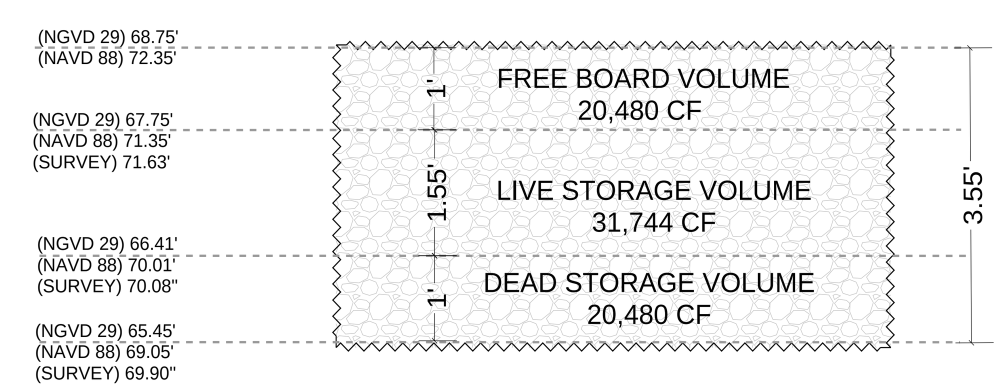
STORM DETENTION CROSS SECTION

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'

Liner must be impervious due to groundwater levels onsite. [Storm Report; Pond Conv.; Fig 9]



PROPOSED GRAVEL / GLASS BED WITH 0.40 POROSITY



water specialist and found to be as protective as if the liner were above the level of the ground water.

See V-4.4 Facility Liners (p.802) and V-4.4 Facility Liners (p.802) for more specific design criteria for treatment liners and low permeability liners.

Table V-4.4.1 Lining Types Recommended for Runoff Treatment Facilities

WQ Facility	Area to be Lined	Type of Liner Recommended
Presettling basin	Bottom and sides	Low permeability liner or Treatment liner (If the basin will intercept the seasonal high ground water table, a treatment liner is recommended.)
Wetpond, first cell	bottom and sides to WQ design water surface	Low permeability liner or Treatment liner (If the wet pond will intercept the seasonal high ground water table, a treatment liner is recommended.)
Wetpond, second cell	bottom and sides to WQ design water surface	Treatment liner
Combined detention/WQ facility, first cell	bottom and sides to WQ design water surface	Low permeability liner or Treatment liner (If the facility will intercept the seasonal high ground water table a treatment liner is recommended.)
Combined detention/WQ facility, second cell	bottom and sides to WQ design water surface	Treatment liner
Stormwater wetland	Bottom and sides, both cells	Low permeability liner (If the facility will intercept the seasonal high ground water table, a treatment liner is recommended.)
Sand filtration basin	Basin sides only	Treatment liner
Sand filter vault	Not applicable	No liner needed
Linear sand filter	Not applicable if in vault Bottom and sides of presettling cell if not in vault	No liner needed Low permeability or treatment liner
Media filter (in vault)	Not applicable	No liner needed
Wet vault	Not applicable	No liner needed

V-4.4.2 Design Criteria for Treatment Liners

This section presents the design criteria for treatment liners.

- A two foot thick layer of soil with a minimum organic content of 1.0% AND a minimum cation exchange capacity (CEC) of 5 milliequivalents/100 grams can be used as a treatment layer beneath a water quality or detention facility.
- To demonstrate that in place soils meet the above criteria, one sample per 1,000 square feet of facility area shall be tested. Each sample shall be a composite of subsamples taken throughout the depth of the treatment layer (usually two to six feet below the expected facility invert).
- Typically, side wall seepage is not a concern if the seepage flows through the same stratum as the bottom of the treatment BMP. However, if the treatment soil is an engineered soil or has very low permeability, the potential to bypass the treatment soil through the side walls may be significant. In those cases, the treatment BMP side walls may be lined with at least 18 inches of treatment soil, as described above, to prevent untreated seepage. This lesser soil thickness is based on unsaturated flow as a result of alternating wet-dry periods.
- Organic content shall be measured on a dry weight basis using ASTM D2974.
- Cation exchange capacity (CEC) shall be tested using EPA laboratory method 9081.
- Certification by a soils testing laboratory that imported soil meets the organic content and CEC criteria above shall be provided to the local approval authority.
- Animal manures used in treatment soil layers must be sterilized because of potential for bacterial contamination of the ground water.

V-4.4.3 Design Criteria for Low Permeability Liner Options

This section presents the design criteria for each of the following four low permeability liner options: compacted till liners, clay liners, geomembrane liners, and concrete liners.

Compacted Till Liners

- Liner thickness shall be 18 inches after compaction.
- Soil shall be compacted to 95% minimum dry density, modified proctor method (ASTM D 1557).
- A different depth and density sufficient to retard the infiltration rate to 2.4×10^{-5} inches per minute (1×10^{-6} cm/s) may also be used instead of Criteria 1 and 2.
- Soil should be placed in 6-inch lifts.
- Soils may be used that meet the following gradation:

2014 Stormwater Management Manual for Western Washington

Volume V - Chapter 4 - Page 804

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

CALL BEFORE YOU DIG (811)
WWW.WASHINGTON811.COM

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

REVISIONS: | BY: | CHK: | APR: | DATE: | PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 11/11/2021
SHEET: SW FIGURE 9

FIGURE 9 - GLASS / GRAVEL BED EXHIBIT

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

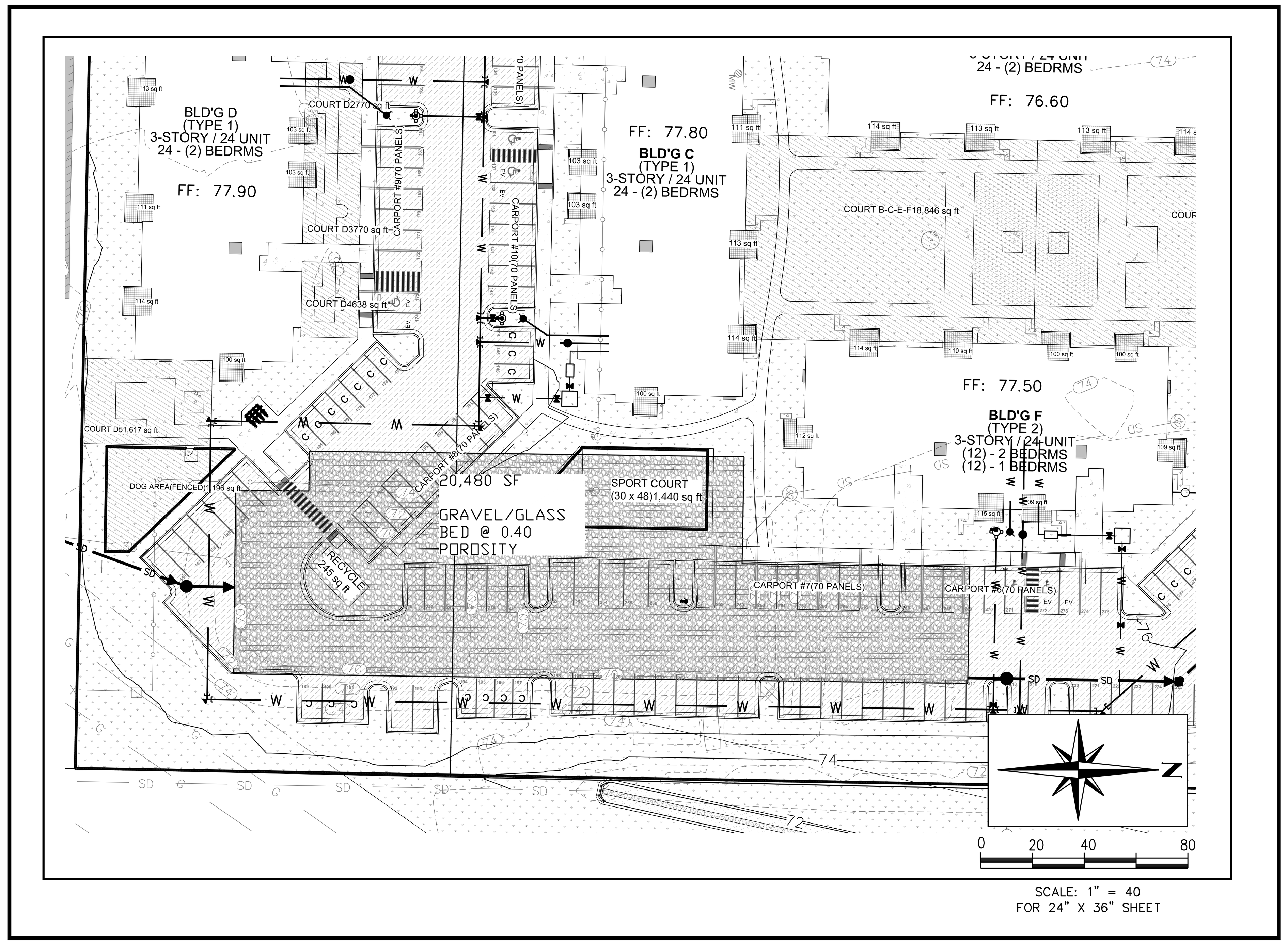
GRAVEL / GLASS BED CONVERSION EXHIBIT

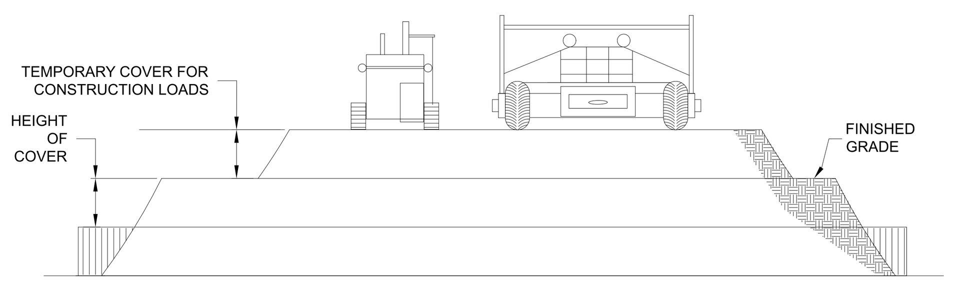
APPROVED

BY ______________ CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ______________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.





CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

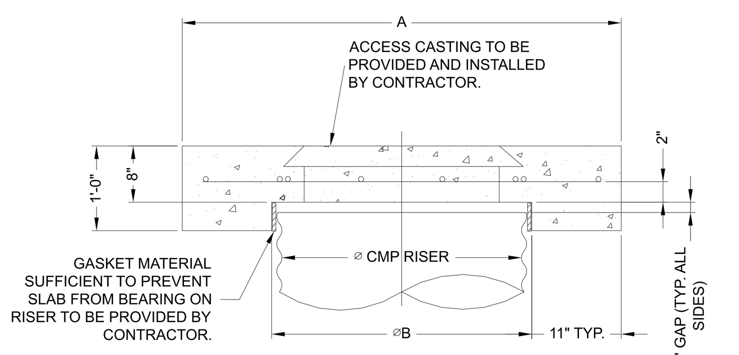
POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

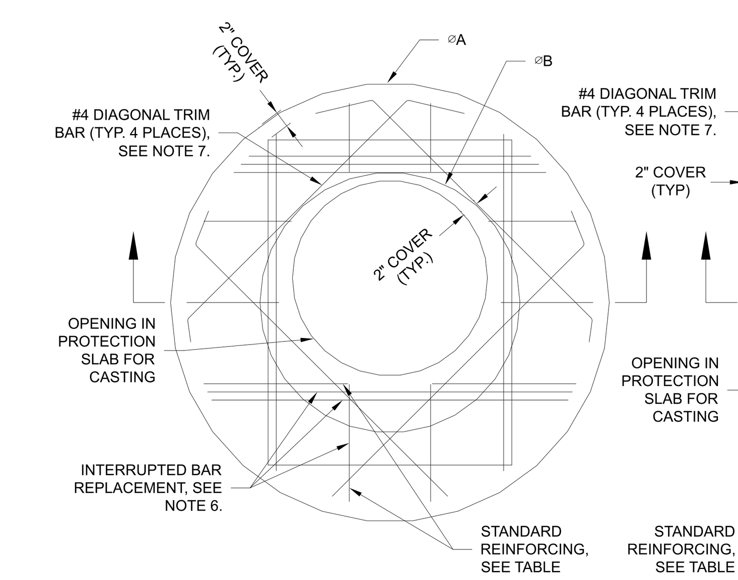


SECTION VIEW

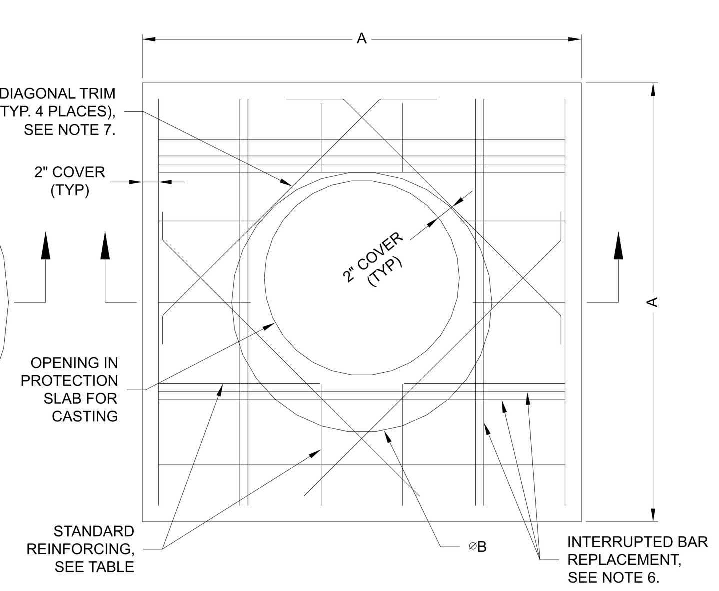
∅ CMP RISER	A	∅ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	∅ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	∅ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	∅ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	∅ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	∅ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

REINFORCING TABLE

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



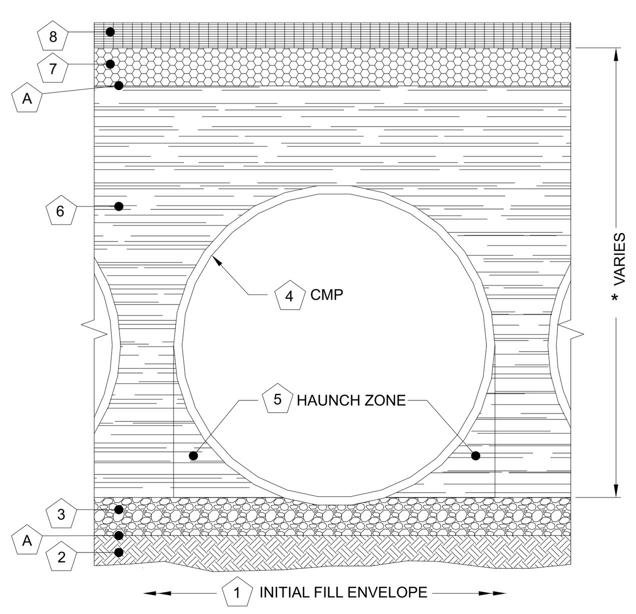
SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.



(1) MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

(2) PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

(5) HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

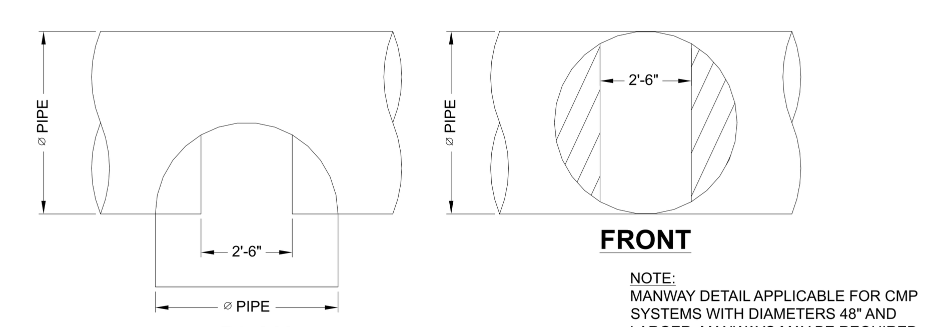
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE

	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			



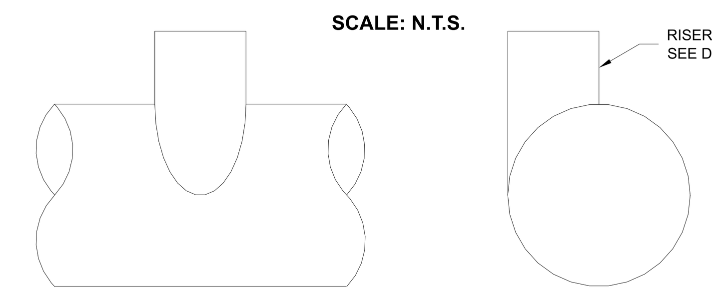
PLAN

FRONT

NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



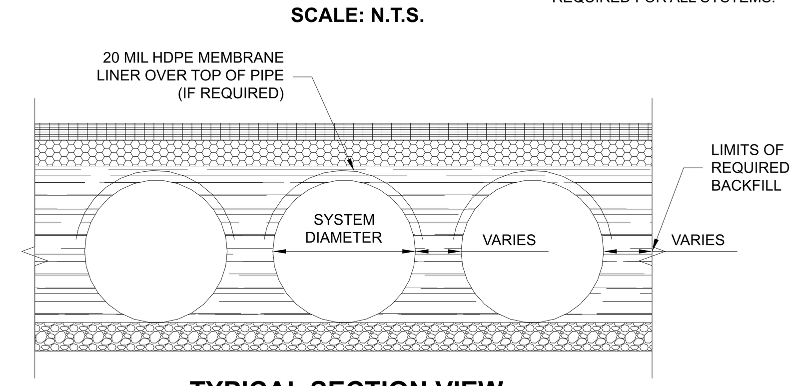
ELEVATION

END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

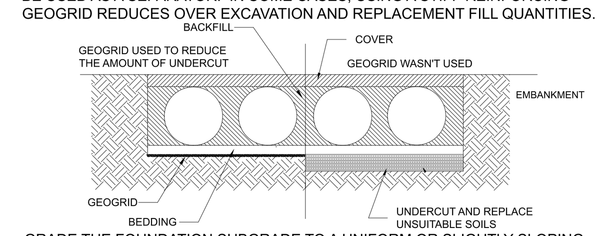
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

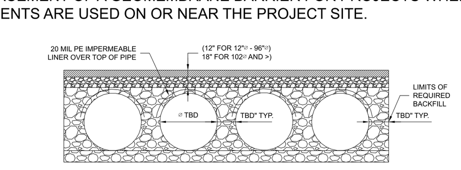


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

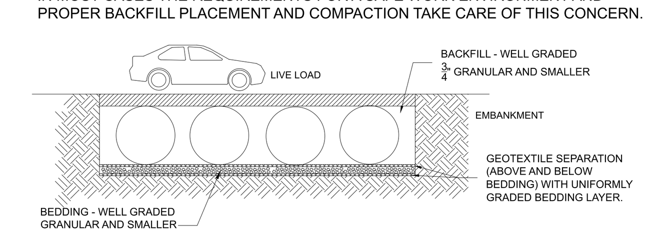
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

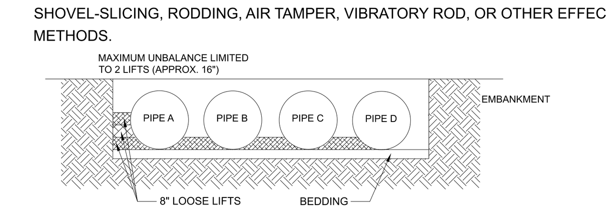
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



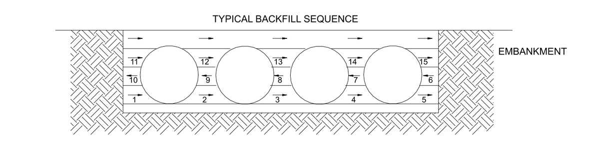
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

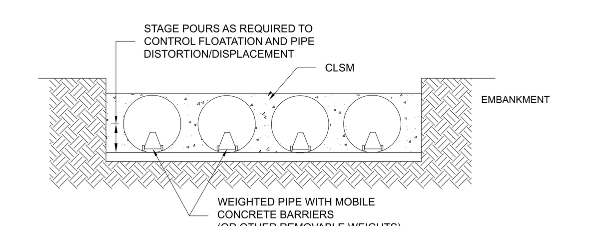


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

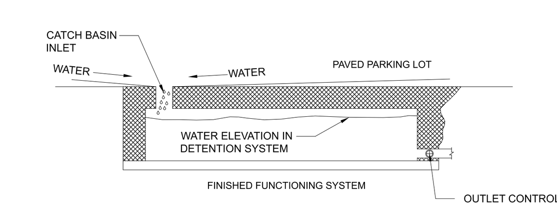


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM.

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

FIGURE 9 - GLASS / GRAVEL BED EXHIBIT

TITLE: East Town Crossing
GRAVEL / GLASS BED CONVERSION EXHIBIT
Puyallup, WA

FOR: East Town Crossing, LLC.
East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

Abbey Road Group Land Development Services Company, LLC
2102 EAST MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

Abbey Road GROUP

REVISIONS: BY: | CHK: | APR: | DATE: | PER:

JOB #: 06-171-1
DESIGNED BY: PRB
DEVELOPMENT REVIEW: JMB
APPROVED BY: GFH
DRAFTED BY: PRB
DATE: 17 NOVEMBER 2021
SHEET: SW FIGURE 9

Appendix B

Stormwater Pond Conversion Operations and Maintenance Manual

East Town Crossing

1001 Shaw Road
Puyallup, Washington

Job #06-171

19 November 2021

Prepared for:
East Town Crossing LLC

2102 East Main Ave, Suite 109, Puyallup, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699 / Fax (253) 446-3159

SECTION 1.0 PROPOSED PROJECT DESCRIPTION

Site Specific Data for Facility Conversion

Parcel 0420351066, 0420264053, 0420264054, 0420351026, 0420351029, 0420351030, 0420264021:

The existing pond is located on Parcel 0420351066 and 0420264053. This pond collects and treats stormwater from the development to the south. The approved Designed Stormwater Report by C.E.S. NW Inc. dated April 2002 drafted and Stamped 10/27/2002 by; Seabrook Schilt, PE, provided the baseline data for the conversion calculations in this report. This report can be found in Appendix A Figure 1 of the 06-171 East Town Pond Conversion Report.

The 06-171 East Town Pond Conversion Report by Abbey Road Group, goes in to detail regarding the direct replacement of an open existing pond to a closed Gravel / Glass Bed that will serve the same purpose of the existing pond but does require an updated Operations Report based on the differing stormwater facilities.

The conversion from one facility to another will not change the parameters of the existing stormwater flows going in to the facilities as such this information has been provided in Appendix A – Figure 1 2002 Stormwater Report – Pond Design. The proposed development is only change the facility type and not proposing to add additional stormwater flows.

The intent of the conversion is to allow for additional developable area for the East Town Crossing Development.

The proposed direct replacement for the existing open pond is a gravel or glass bed with 0.40 porosity has a based elevations of 69.08' and top of 1' freeboard elevation of 71.63'. Giving the proposed facility 3.55 of operations space. This information was derived from the existing pond and control structure having the same vertical operations space. The projected footprint of 20,480 SQ FT. Given these two parameter the existing total pond volume matches the proposed total storage volumes. The projected dead storage volume for the proposed facility is 20,480 CF which is substantially larger than the existing pond. This is due to the porosity of the fill material vs the open pond capacity. The live storage volume 31,744 CF, and this facility is designed with 20,480 CF of Freeboard Volume with equals 1-foot vertically. The proposed facility design plan can be found in Appendix A – Figure 9.

The proposed system included 24" CMP perforated pipe that will be installed to evenly spread flow across the entire bed as well as provide maintenance accesses to clean the system when maintenance is required.

SECTION 2.0 Maintenance Importance and Intent

The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. A substantial portion of failures (clogging of filters, resuspension of sediments, loss of storage capacity, etc.) are due to inadequate maintenance. Stormwater BMP maintenance is essential to ensure that BMPs function as intended throughout their full life cycle.

The fundamental goals of maintenance activities are to insure the entire flow regime and treatment train designed for this site continue to fully function. For this site these include: (engineer can delete non applicable BMPs listed below):

- Maintain designed stormwater detention/retention volume
- Maintain ability of storm facility to attenuate flow rates
- Maintain ability to safely convey design stormwater flows
- Maintain ability to treat stormwater runoff quality
- Preserve soil and plant health, as well as stormwater flow contact with plant and soil systems
- Clearly identify systems so they can be protected
- Keep maintenance costs low
- Prevent large-scale or expensive stormwater system failures
- Prevent water quality violations or damage to downstream properties.

The intent of this section and manual is to pass on to the responsible party(s) all the information critical to understand the design of the system, risks and considerations for proper use, suggestions for maintenance frequencies, and cost so that realistic budgets can be established.

SECTION 3.0 Responsible Parties

East Town Crossing LLC
1001 Shaw Road
Puyallup, WA 98372

SECTION 4.0 Facilities Requiring Maintenance

The following facilities are onsite:

3.3 Closed Detention Systems (Tanks/Vaults)
3.4 Control Structure/Flow Restrictor
3.5 Catch Basins
3.7 Energy Dissipaters
3.21 Grounds (Landscaping)
3.26 Inlet/Outlet Stormwater Pipe

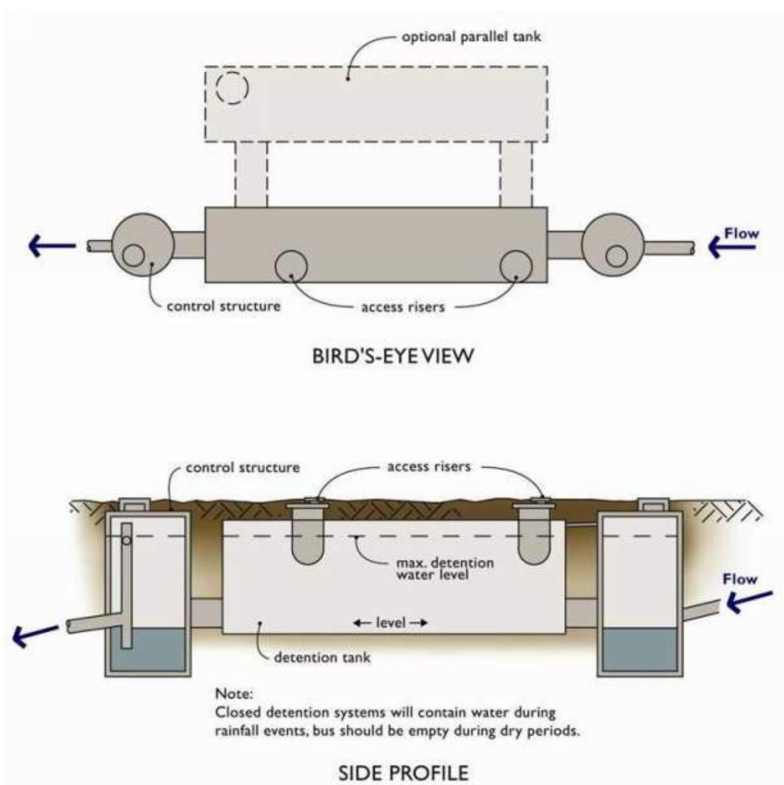
SECTION 5.0 Maintenance Instructions

The parties responsible for maintenance must review and apply the maintenance requirements contained herein. These maintenance instructions outline conditions for determining if maintenance actions are required, as identified through inspection. However, they are not intended to be measures of the facilities required condition at all times between inspections. Exceedance of these conditions at any time between inspections or maintenance activity does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance presented in the checklists shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action. For facilities not owned and maintained by the city, a log of maintenance activity that indicates what actions were taken must be kept on site and be available for inspection by the city.

3.3 Closed Detention Systems (Tanks/Vaults)

Closed detention systems function similar to detention ponds with the temporary storage volume provided by an underground structure to regulate the storm discharge rate from the site. The structure is typically constructed of large diameter pipe (48" diameter or greater) or a concrete box (Vault). These systems are typically utilized for sites that do not have space available for an above-ground system and are more commonly associated with commercial sites.

Underground detention systems are an enclosed space where harmful chemicals and vapors can accumulate. Therefore, the inspection and maintenance of these facilities should be conducted by an individual with training and certification in working in hazardous confined spaces.



Closed Detention Systems (Tanks/Vaults) Checklist

		Date						
Frequency	Drainage System Feature	✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
M	Storage Area					Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
M	Storage Area					Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
A	Storage Area					Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
A	Storage Area					Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
A	Storage Area					Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.
A	Storage Area						Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
A	Manhole					Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
A	Manhole					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.

Closed Detention Systems (Tanks/Vaults) Checklist (Continued)

Frequency	Drainage System Feature	Date ✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
A	Manhole					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
A	Manhole					Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:
(M) Monthly from November through April.
(A) Once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).

CONTECH®
ENGINEERED SOLUTIONS

Detention and Infiltration Installation Guide

DuroMaxx® Detention and Infiltration Installation Guide

DuroMaxx Steel Reinforced Polyethylene Pipe (SRPE) is a flexible pipe. Proper installation of a flexible pipe underground detention system will ensure long-term performance. The configuration of the system often requires special construction practices that differ from conventional flexible pipe construction. Contech strongly suggest scheduling a pre-construction meeting with your local Sales Engineer to determine if additional measures, not covered in this guide, are appropriate for your site. All OSHA and local safety guidelines should be observed during the construction of the system and site.

Preconstruction Meeting

It is a best practice to have a pre-construction meeting with the installation contractor and Contech personnel. Included at the end of this guide is a preconstruction checklist to review prior to installation.

Proper Pipe Unloading, Handling and Placement

The pipe should be unloaded with a fork lift, excavator, crane or other piece of construction equipment. The pipe should never be dropped or pushed off the flatbed trailer. For any piece 20' and longer, nylon slings should be used to lift the pipe off the truck into place.

Normally the header row pipe section is placed on the downstream end first. For detention systems with a single header row on one end and pipe with bulkheads on the other end; it is a best practice to start pipe placement on the header row end. If DuroMaxx with a bell and spigot is used, proper storage practices should be used to prevent any damage to the bell end of the pipe. The gaskets shall be kept clean and free from any dirt or stone particles.

Lifting DuroMaxx off the flatbed with a frontend loader with forks.

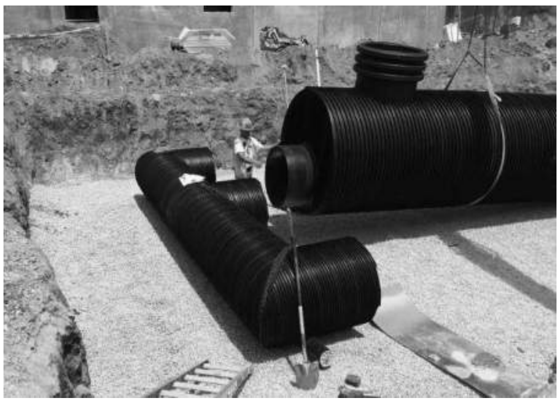
Lifting DuroMaxx into place with an excavator using nylon slings. When longer pieces are used, multiple nylon slings spaced 1/3 of the pipe apart should be used.

Foundation and Pipe Bedding

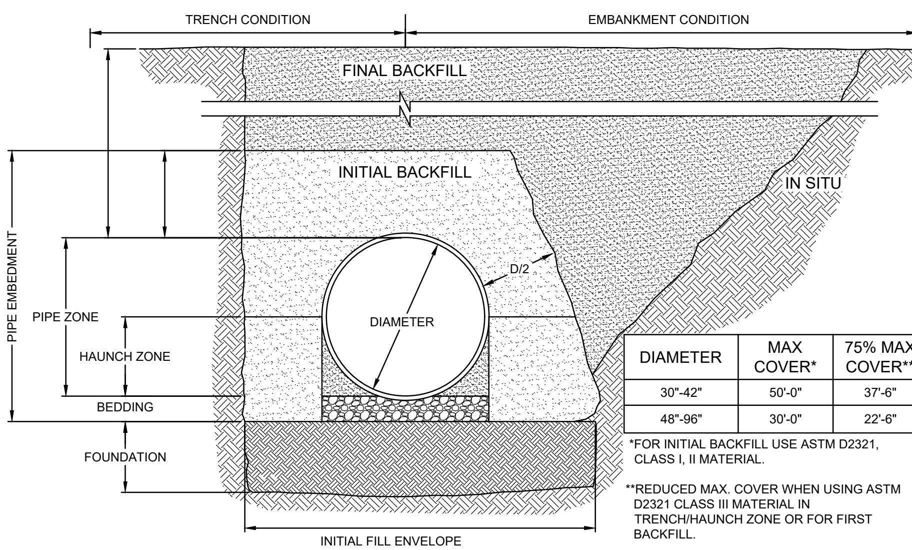
Construct a foundation that can support the design loading applied by the pipe and adjacent backfill weight as well as maintain its integrity during construction. If soft or unsuitable soils are encountered, remove the poor soils to a suitable depth and then replace with a competent granular material to the appropriate elevation. The granular material gradation should not allow the migration of fines, which can cause settlement of the detention system or pavement above. If the structural fill material is not compatible with the underlying soils a geotextile fabric should be used as a separator. Refer to ASTM D2321, for suitable material and proper placement of flexible pipe.

Grade the foundation subgrade to a uniform or slightly sloping grade. If the subgrade is clay or relatively non-porous and the construction sequence will last for an extended period of time, it is best to slope the grade to one end of the system. This will allow excess water to drain quickly, preventing saturation of the subgrade.

A 4" – 6" thick, well-graded granular material is preferred pipe bedding. If the existing foundation is made up of a course sand or other suitable granular material, imported bedding material will not be required.



Site conditions may require 4" – 6" of imported granular material as pipe bedding.

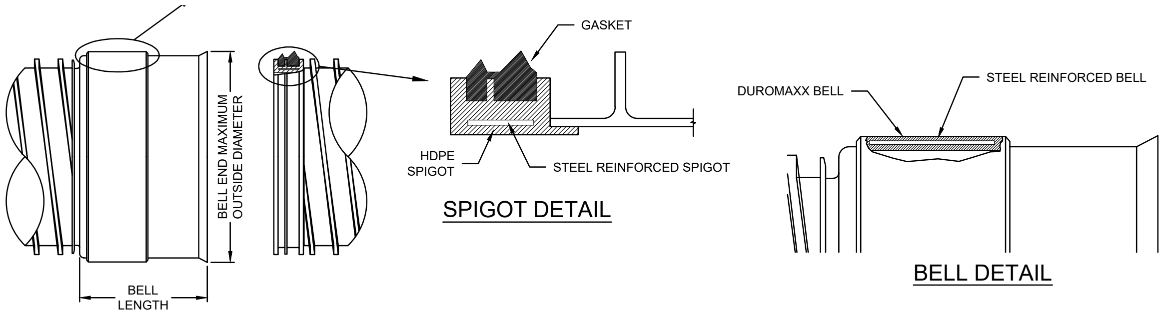


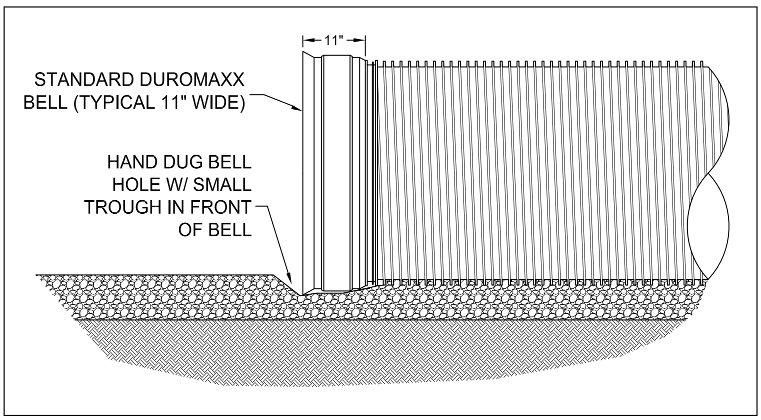
DIAMETER	MAX COVER*	75% MAX COVER**
30"-42"	50'-0"	37'-6"
48"-96"	30'-0"	22'-6"

*FOR INITIAL BACKFILL USE ASTM D2321, CLASS I, II MATERIAL.

**REDUCED MAX. COVER WHEN USING ASTM D2321 CLASS III MATERIAL IN TRENCH/HAUNCH ZONE OR FOR FIRST BACKFILL.

High Performance (Bell & Spigot) Joints

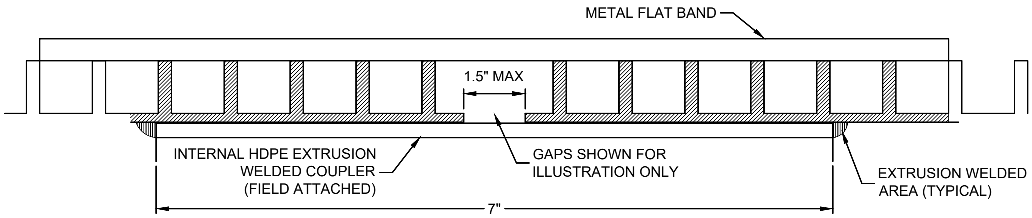




A "bell hole" needs to be dug under the bell end of the pipe to accommodate the diameter difference.

A best practice for bell and spigot joints is to lay a steel plate under the bell to help "home" the next pipe.

Welded Coupler Joints



Installing a flat gasket and band around DuroMaxx plain end pipe.

Tightening bolts on a flat band.

Internally welding pipe joints. The pipe needs to be backfilled prior to the joints being welded together. The pipe should be clean and dry. The gap between the two pipes should be limited to 1.5″ maximum. The maximum pipe misalignment is ¼″. Pipe joints outside recommendations could result in higher joint welding costs.

In-Situ Trench Wall

If excavation is required, the trench wall needs to be capable of supporting the load that the pipe sheds as the system is loaded. If soils are not capable of supporting these loads, the pipe can deflect. Perform a simple soil pressure check using the applied loads to determine the limits of excavation beyond the spring line of the outer most pipes. Poor in-situ trench wall soils may require a wider structural trench.

In most cases the requirements for a safe work environment and proper backfill placement and compaction take care of the concern.

Backfill Material

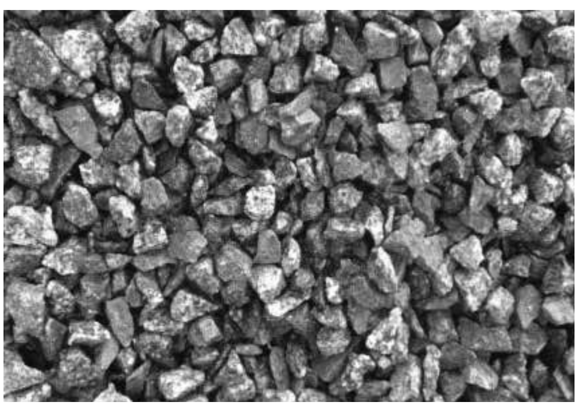
DuroMaxx® SRPE is a flexible pipe that is designed per AASHTO Design Section 12. All buried flexible pipes are dependent on a quality backfill material for structural support. The best backfill material is an angular, well-graded, granular fill meeting the requirements of AASHTO M 145, Classes A-1-a, A-1-b, A-3, A-2-4, A-2-5, or ASTM D2321, Classes I, II or III. AASHTO M 145, Class A-1-a (ASTM D2321, Class I) backfill is recommended for 108" diameter and larger. The maximum aggregate particle size shall not exceed 2.5" in diameter.

Backfill using controlled low-strength material (CLSM, "flash fill", or "flowable fill") is acceptable when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.

EXAMPLES OF ACCEPTABLE BACKFILL MATERIAL

Course Sand

Crushed Limestone



Crushed Granite

Crushed River Gravel

Backfill Placement

DuroMaxx SRPE is made from a high quality polyethylene resin. Polyethylene does have a high coefficient of thermal expansion. It is recommended that each pipe be completely backfilled the same day it is placed to minimize expansion and contraction due to large potential temperature swings of day and night. If backfilling the same day is not feasible, backfill the pipe when the temperature is similar to when the pipe joints were first installed.

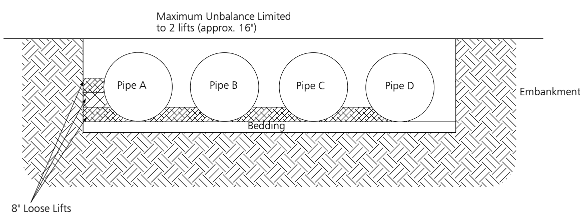
The backfill shall be placed in 8" +/- loose lifts and compact to 90% AASHTO T99 standard proctor density. Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, vibratory packer, or other effective methods. If AASHTO T99 procedures are determined infeasible by the geotechnical engineer of record, compaction is considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the geotechnical engineer of record (or representative thereof) is satisfied with the level of compaction.

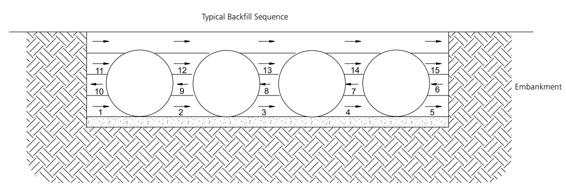
For large systems, conveyor systems, or backhoes with long reaches may be used to place backfill. Once minimum cover for the construction loading across the entire width of the system is reached, advance the equipment to the end of the recently placed fill, and begin the sequence again until the system is completely backfilled. This type of construction sequence provides room for stockpiled backfill directly behind the backhoe, as well as the movement of construction traffic.

It is important to keep the elevation of backfill between pipes and between the pipe and side embankment evenly. As a rule of thumb, do not allow for backfill to exceed the elevation of one side of pipe to the other and pipe to side embankment by more than two (2) compacted lifts.

Material stockpiles on top of the backfilled detention system should be limited to 8' +/- high and must provide balanced loading across all barrels. To determine the proper minimum cover over the pipes to allow the movement of construction equipment, contact your local Contech Sales Engineer.

If CLSM or "flowable fill" is used as backfill, pipe flotation needs to be prevented. Typically, small lifts are placed between the pipes and then allowed to set-up prior to the placement of the next lift. The allowable thickness of the CLSM lift is a function of a proper balance between the uplift force of the CLSM, the opposing weight of the pipe, and the effect of other restraining measures. Your local Sales Engineer can help determine an appropriate lift thickness.





Placing backfill with a stone conveyor.

Compaction with vibratory equipment.

Final Cover Placement and Construction Loading

The minimum cover specified for a project normally assumes H-20 highway live loading. Backfill must be placed and fully compacted to the minimum cover level over the structure before the pipe is subjected to design loads. The minimum cover for H-20 Live Loading is based on AASHTO design section 12. Minimum cover is 1.0′ for 30″ – 60″, 1.5′ for 66″ – 72″, 2.0′ for 84″ – 96″, 2.5″ for 108″ and 3.0′ for 120″ diameter. This minimum cover is measured from top of pipe to the bottom of asphalt pavement.

Construction loads often exceed design highway loading. During construction, keep heavy construction equipment that exceeds legal highway loads off the pipe. Light construction equipment on tracks such as a D-3 dozer (or lighter weight) may cross over the pipe when a minimum of 12″ of compacted backfill is over pipe. When construction equipment that exceeds legal highway loads must cross over pipe, an additional thickness of compacted fill, beyond that required for planned cover is required. Since construction equipment varies from job to job, it is best to address equipment specific minimum cover requirements with your local Contech Sales Engineer during your pre-construction meeting.

Minimum Height of Cover Requirements for Tracked Loading for DuroMaxx® SRPE

Diameter (inches)	Track Pressure at Surface (psi)				
	10	15	22	30	40
30-60	1.0 ft	1.5 ft	2.0 ft	2.5 ft	3.0 ft
66-120	1.0 ft	2.0 ft	2.5 ft	3.0 ft	3.5 ft

1. *Minimum cover may vary depending on local conditions. The contractor must provide additional cover required to avoid damage to the pipe. Minimum cover is measured from the top of the pipe to the top of the maintained construction roadway surface.*
2. *The ratio of the track length on ground to the track show width is taken conservatively as 4.50:1. Weight applied to the track is taken as two-thirds of the total dozer weight.*
3. *Contact your local Contech representative for more specific tracked vehicles outside of these conditions.*

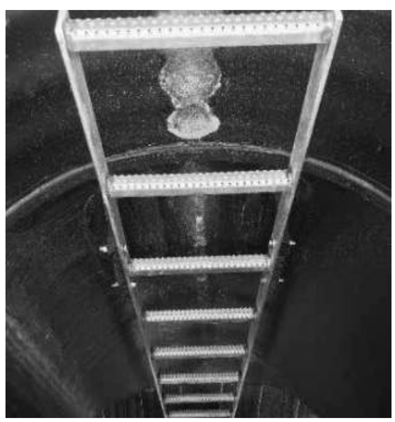
Examples of light, tracked, construction equipment used to place final cover over the pipe system.

Heavy Construction Loads Minimum Height of Cover Requirements for Construction Loads. **The Minimum Cover should be COMPACTED.**				
Diameter (inches)	**Axle Load (Kips)**			
	>32≤50	**50≤75**	**75≤100**	**110≤150**
30-42	2.0 ft	2.5 ft	3.0 ft	3.0 ft
48-72	3.0 ft	3.0 ft	3.5 ft	4.0 ft
84-96	3.0 ft	3.5 ft	4.0 ft	4.5 ft
102-120	3.5 ft	4.0 ft	4.5 ft	5.0 ft


Examples of heavy construction equipment that may require additional minimal cover.

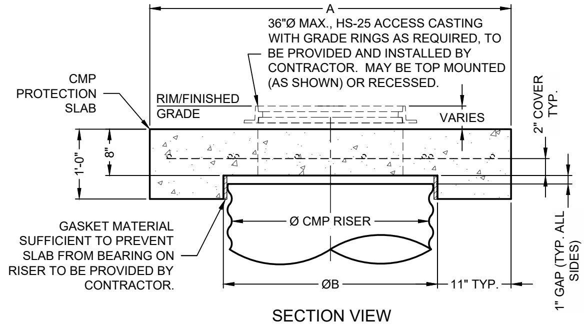
DuroMaxx® SRPE Manhole Risers

DuroMaxx manhole risers allow easy access for future maintenance of the system. If the system is installed under a parking lot or road way subject to live loads, care must be taken to ensure loads are not applied directly to the riser structure. A pre-cast or cast-in-place slab should be installed above the riser. The manhole lid and frame should not rest directly on the DuroMaxx riser.

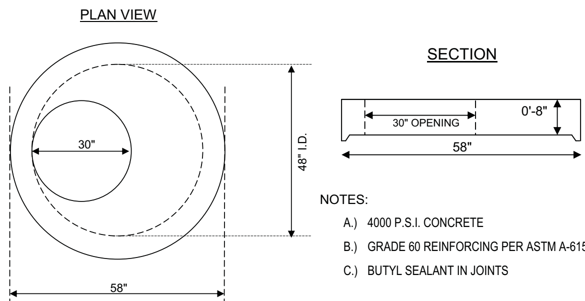




Reinforcing Table				
Ø CMP Riser	**A**	**ØB**	**Reinforcing**	**Bearing Pressure** (psf)**
24	4'Ø 4' x 4'	26"	#5 @ 10" OCEW #5 @ 10" OCEW	2,540 1,900
30"	4'-6"Ø 4'-6" x 4'-6"	32"	#5 @ 10" OCEW #5 @ 9" OCEW	2,260 1,670
36"	5'Ø 5' x 5'	38"	#5 @ 9" OCEW #5 @ 8" OCEW	2,060 1,500
42"	5'-6"Ø 5'-6" x 5'-6"	44"	#5 @ 8" OCEW #5 @ 8" OCEW	1,490 1,370
48"	6'Ø 6' x 6'	50"	#5 @ 7" OCEW #5 @ 7" OCEW	1,210 1,270

*** Assumed soil bearing capacity.*



Precast option for manhole riser caps.



Additional Fittings Reinforcement

Some fittings (tees, risers, etc.) may require additional reinforcement. Additional reinforcement would include flowable fill or concrete fill around the mainline pipe in the area of the fitting.

Additional Considerations

Because most systems are constructed below-grade, rainfall can rapidly fill the excavation, potentially causing floatation and movement of the previously placed pipes. To help mitigate potential problems, it is best to start the installation at the downstream end with the outlet already constructed to allow a route for the water to escape. Temporary diversion measures may be required to handle high flows due to the restricted nature of the outlet pipe.

Preconstruction Checklist

Contech Field Contact / Phone: ______________________________

Contech Plant Contact / Phone: ______________________________

Contractor Contact / Phone: ______________________________

Project Name: ______________________________

Site Address: ______________________________

Pre-con Attendees: ______________________________

Topics to Review:

- ☐ Expected delivery dates
- ☐ Starting station/location
- ☐ Drawing review
- ☐ Unloading and handling
  - ○ Handling weights
  - ○ Unloading and moving
    - ● Use nylon slings, approved unloading pole, or full length forks adequately spaced
    - ● Slings at 1/3 points of pipes length for pipes > 30"ø
    - ● Forks need to be free of protrusions or spikes (typical protrusion to be mindful of is on the vertical back of the forks)
  - ○ Storage
    - ● Store pipe on dunnage with bells and spigots raised off the ground
    - ● Do not set bells or spigots directly on top of dunnage
- ☐ Trench dimensions
- ☐ Bedding
  - ○ 4" to 6" of relatively loose material on adequate foundation
  - ○ If foundation is not adequate, it must be stabilized at the engineer's direction
- ☐ Bell and spigot assembly, if applicable
  - ○ Dig a bell hole in the bedding to accommodate the larger diameter bell
  - ○ Place a reusable skid plate under in front of the joint (remove after joint is made)
  - ○ Ensure proper gasket placement (a visible white line in front of the gasket indicates improper seating)
  - ○ Lube the bell and the spigot
  - ○ Use of a restraint, which sits between the ribs, to restrain pipe movement during jointing can help
  - ○ Use nylon strap to pull the pipe home
  - ○ White markings on the spigot end will be visible on the bell's outside edge when the pipe is home
  - ○ Hand shovel and knife in bedding to fill the bell hole
  - ○ IMPROPER BELL HOLES SHOW ON THE INSIDE OF THE PIPE

- ☐ Welded joint assembly, if applicable
  - Lay bottom portion of the alignment band under joint location
  - Set pipe next to each other
  - Misalignment < ¼”
  - Gap < 1 ½”
  - Install valley gaskets (if using flow fill as backfill)
  - Install flat gasket (if using flow fill as backfill)
  - Assemble the rest of the alignment band
- ☐ Backfill requirements (refer to Contech project drawings or standard details)
  - 30” – 96”: compacted ASTM D 2321 class I, II, or III
  - 108” & 120”: compacted ASTM D 2321 class I
  - Flow fill (generally necessary around size on size tees, around large diameter manholes, deep manholes, refer to Contech project details.)
  - The use of native materials needs to be approved by the engineer (the use of native materials could negatively affect the structural capacity of the pipe and will be more difficult to install)
  - Special backfill or thrust blocks around manholes or fittings
  - Hand shovel or knife haunching material in place (regardless of material type)
  - 8” to 12” loose lifts
  - Compact to 90% standard proctor (light weight compaction equipment, such as a walk behind plate compactor, is recommended)
  - Maximum backfill height differential from one side of the pipe to the other is 12”
  - Use this method for entire initial backfill to minimum cover
- ☐ Anticipated construction loading
  - What are anticipated construction loads
- ☐ Preparation for welding crew
  - Projected date welders need to be on site
  - Crew there to weld joints only
  - Pipe must be dry
  - Pipe must be clean
  - Contractor to supply 1 person for hole watch
  - Contractor to supply ladder for ingress/egress, safety tripod, harnesses and leads if required
  - Actual number of days the project will take will be billed
  - Downtime caused by contractor will be billed (for example, no supplied ladder, hole watch or clean/dry pipe)
  - Backfilling is typically completed prior to welding operations begin
- ☐ Connecting to concrete manholes or other pipe
  - Lateral connection type
  - End to end connection type
  - Concrete manhole connection detail

- ☐ Thermal expansion and contraction
  - Backfill pipe quickly to overcome thermal expansion and contraction
- ☐ Joint testing
  - Type of testing required
  - Testing not performed by Contech
- ☐ Field modification and repairs
  - Same blade as used to cut DIP
  - 2' x 2' damaged area is not structural
  - Localized repair
  - Segmental pipe repair
- ☐ Manhole risers
  - Man holes are fabricated by using a 1' solid wall stub which a length of HDPE is slid over and then welded to. This makes the actual inside diameter less than stated on the drawings. For a 36" riser, the ID is actually closer to 32". (this is important if the contractor needs to fit mechanical/electrical components through the manholes)
- ☐ Items Contech is not delivering (typical estimate should include pipe & fabricated pieces, one of the jointing systems, freight)
  - Pumps, grinders, other mechanical
  - Power for anything
  - Floats and/or level indicators
  - Connections to inlet/outlet pipe
  - Air vents
  - Valves
  - Manhole lids and covers
  - Ladders
  - Engineering
  - Installation
  - Grout, backfill, etc
  - Flotation mitigation
  - Other ____

Notes:

Notes:

CONTECH® ENGINEERED SOLUTIONS

800-338-1122

www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit ContechES.com or call 800-338-1122.

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; related foreign patents or other patents pending.

Support

Drawings and specifications are available at www.ContechES.com/cmp-detention

DMX Detention Install Guide 11/20

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS A WARRANTY. APPLICATIONS SUGGESTED HEREIN ARE DESCRIBED ONLY TO HELP READERS MAKE THEIR OWN EVALUATIONS AND DECISIONS, AND ARE NEITHER GUARANTEES NOR WARRANTIES OF SUITABILITY FOR ANY APPLICATION. CONTECH MAKES NO WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, RELATED TO THE APPLICATIONS, MATERIALS, COATINGS, OR PRODUCTS DISCUSSED HEREIN. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY CONTECH. SEE CONTECH'S CONDITIONS OF SALE (AVAILABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

Detention & Infiltration Maintenance Guide

DuroMaxx® Steel Reinforced Polyethylene (SRPE) Detention and Infiltration Systems

Maintenance

Underground storm water detention and infiltration systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. Contech Engineered Solutions recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

Inspection & Maintenance Log Sample Template

_________" Diameter System			Location: Anywhere, USA		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	**Comments**
12/01/14	2"	None	Removed Sediment	B. Johnson	Installed
03/01/15	1"	Some	Removed Sediment and Trash	B. Johnson	Swept parking lot
06/01/15	0"	None	None		
09/01/15	0"	Heavy	Removed Trash	S. Riley	
12/01/15	1"	None	Removed Sediment	S. Riley	
04/01/15	0"	None	None	S. Riley	
04/15/15	2	Some	Removed Sediment and Trash	ACE Environmental Services	

Support

Drawings and specifications are available at www.ContechES.com.

Site-specific support is available from our engineers.

DuroMaxx®
STEEL REINFORCED PE TECHNOLOGY

CONTECH®
ENGINEERED SOLUTIONS
800.338.1122
www.ContechES.com

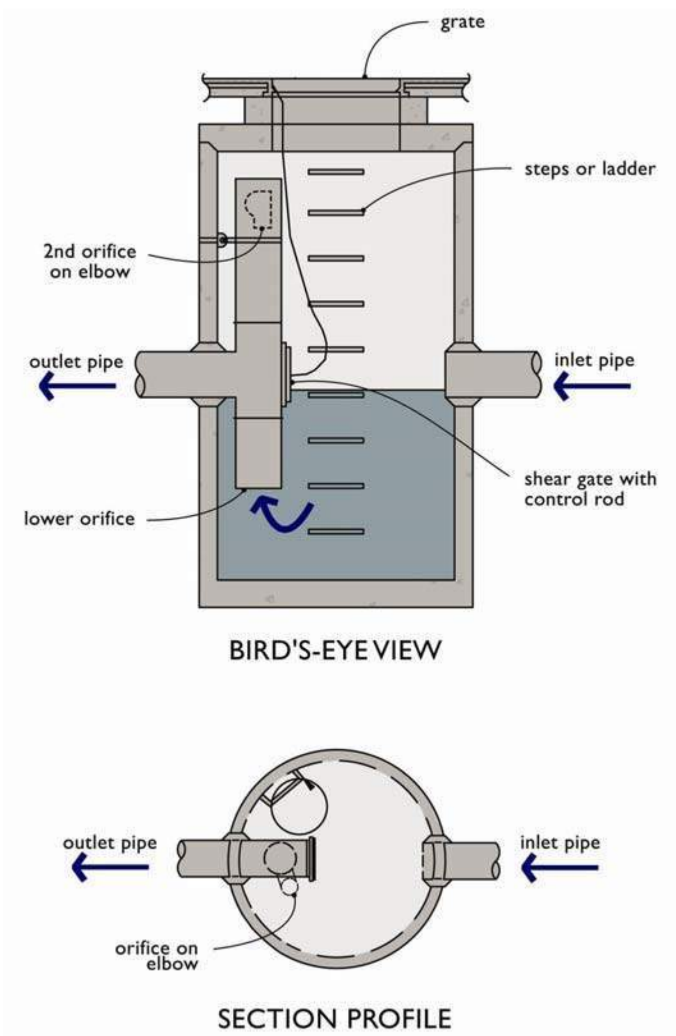
Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, earth stabilitation and stormwater treatment products. For information, visit www.ContechES.com or call 800.338.1122.

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS AN EXPRESSED WARRANTY OR AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. SEE THE CONTECH STANDARD CONDITION OF SALES (VIEWABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

3.4 Control Structure/Flow Restrictor

Control structures/flow restrictors are located on the outlet pipe of a detention system. The control structure is typically a Type 2 concrete catch basin (see Section 3.5 for catch basin description) with a riser (vertical pipe). The control structure reduces the discharge rate of stormwater from a detention facility. The flow is regulated by a combination of orifices (holes with specifically sized diameters) and weirs (plates with rectangular or vee shaped notch). Lack of maintenance of the control structure can result in the plugging of an orifice. This can result in flooding of the stormwater system and/or an increase in the rate of discharge from the site potentially damaging downstream property.



Control Structure/Flow Restrictor Checklist

		Date						
Frequency	Drainage System Feature	✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
M	General					Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
A	General					Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
A	General					Structural Damage	Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
A	General					Structural Damage	Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
A	General					Structural Damage	Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
A	Cleanout Gate					Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
A	Cleanout Gate					Damaged or Missing	Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
A	Cleanout Gate					Damaged or Missing	Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
A	Cleanout Gate					Damaged or Missing	Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
A	Orifice Plate					Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
M,S	Orifice Plate					Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
	Overflow Pipe					Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
A	Manhole					Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.

Control Structure/Flow Restrictor Checklist (Continued)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Conditions That Should Exist**
A	Manhole					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
A	Manhole					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
A	Manhole					Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:

(M) Monthly from November through April.
(A) Once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).

3.5 Catch Basins

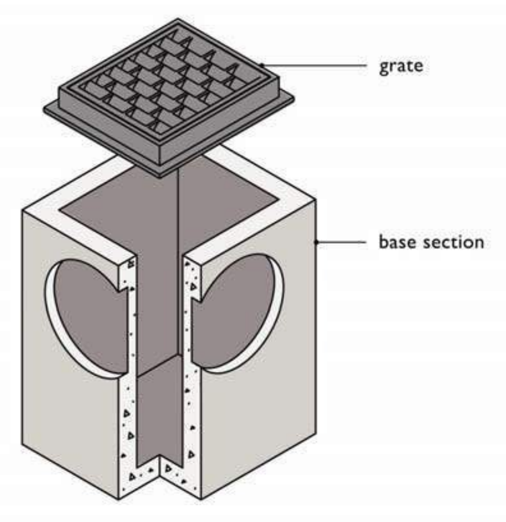
Catch basins are underground concrete structures typically provided with a slotted grate to collect stormwater runoff and route it through underground pipes. Catch basins can also be used as a junction in a pipe system and may have a solid lid. There are two catch basin types.

A Type 1 catch basin is a rectangular box with approximate dimensions of 3’x2’x5’. Type 1 catch basins are utilized when the connected conveyance pipes are less than 18 inches in diameter and the depth from the gate to the bottom of the pipe is less than 5 feet.

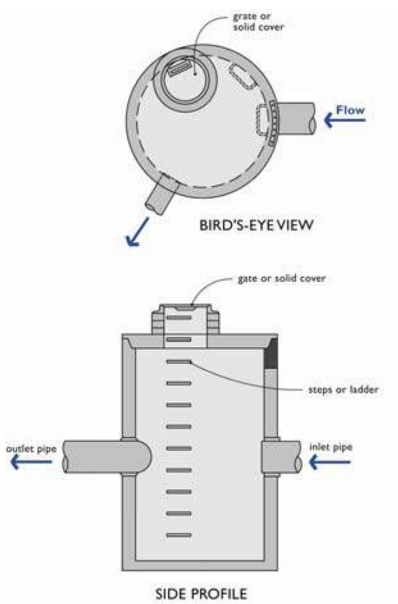
Type 2 catch basins, also commonly referred to as storm manholes, are round concrete structures ranging in diameter of 4 feet to 8 feet. Type 2 catch basins are used when the connecting conveyance pipe is 18 inches or greater or the depth from grate to pipe bottom exceeds 5 feet. Type 2 catch basins typically have manhole steps mounted on the side of the structure to allow for access.

Both catch basin types typically provide a storage volume (sump) below the outlet pipe to allow sediments and debris to settle out of the stormwater runoff. Some catch basins are also provided with a spill control device (inverted elbow on outlet pipe) intended to contain large quantities of grease or oils.

The most common cleaning method for catch basins is to utilize a truck with a tank and vacuum hose (vactor truck) to remove sediment and debris from the sump. Catch basins may be an enclosed space where harmful chemicals and vapors can accumulate. Therefore, if the inspection and maintenance requires entering a catch basin, it should be conducted by an individual with training and certification in working in hazardous confined spaces.



Type 1



Type 2

Catch Basins Checklist

		Date						
Frequency	Drainage System Feature	✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
A	General					“Dump no pollutants “ Stencil or stamp not visible	Stencil or stamp should be visible and easily read	Warning signs (e.g., "Dump No Waste-Drains to Stream") shall be painted or embossed on or adjacent to all storm drain inlets.
M,S	General					Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No trash or debris located immediately in front of catch basin or on grate opening.
M	General					Trash & Debris	Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
M	General					Trash & Debris	Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
M	General					Trash & Debris	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
M	General					Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
A	General					Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.

Catch Basins Checklist (Continued)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Conditions That Should Exist**
A	General					Structure Damage to Frame and/or Top Slab	Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached.
A	General					Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
A	General					Fractures or Cracks in Basin Walls/ Bottom	Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is re-grouted and secure at basin wall.
A	General					Settlement / Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
M	General					Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
M	General					Vegetation	Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
M	General					Contamination and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
A	Catch Basin Cover					Cover Not in Place	Cover is missing or only partially in place.	Any open catch basin requires maintenance. Catch basin cover is closed
A	Catch Basin Cover					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
A	Catch Basin Cover					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is to keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.

Catch Basins Checklist (Continued)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Conditions That Should Exist**
A	Ladder					Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
	Grates					Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
M,S	Grates					Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
A	Grates					Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

If you are unsure whether a problem exists, please contact a Professional Engineer.

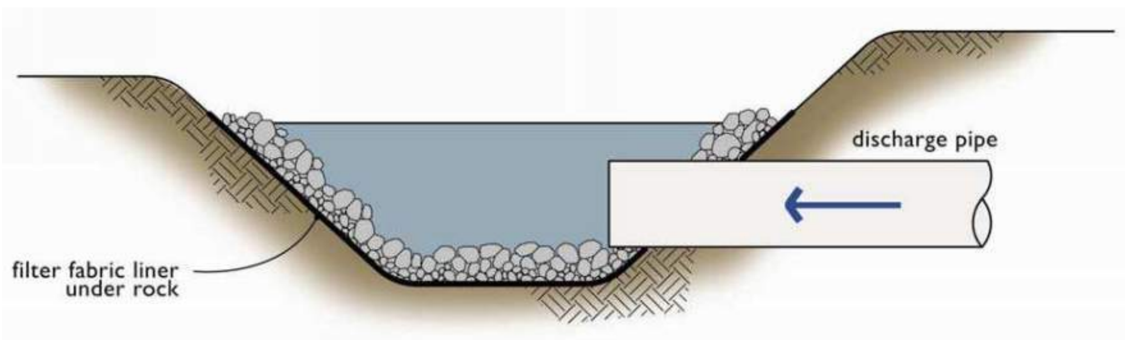
Comments:

Key:

(M) Monthly from November through April.
(A) Once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).

3.7 Energy Dissipaters

Energy dissipaters are provided on the inlet and outlet to a closed pipe system to prevent erosion at these locations. Design of an energy dissipater can vary significantly from highly engineered systems (concrete or rock gabion structures) to the more commonly used rock pad. The rock pad is typically constructed of 4- to 12-inch diameter rocks a minimum of 12 inches thick and is often lined with filter fabric. The rock pad should extend above the top of the pipe a minimum of 1 foot.



Energy Dissipaters Checklist

		Date						
Frequency	Drainage System Feature	✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
External:								
M	Rock Pad					Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
M	Rock Pad					Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
M	Dispersion Trench					Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
M	Dispersion Trench					Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
M	Dispersion Trench					Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
M	Dispersion Trench					Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
M	Dispersion Trench					Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:								
M	Manhole/ Chamber					Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
M	Manhole/ Chamber					Trash& Debris	Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
M	Manhole/ Chamber					Trash& Debris	Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
M	Manhole/ Chamber					Trash& Debris	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.

Energy Dissipaters Checklist (Continued)

Frequency	Drainage System Feature	Date ✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
Internal (Continued):								
M	Manhole/ Chamber					Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe. There shall be a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
A	Manhole/ Chamber					Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
A	Manhole/ Chamber					Structure Damage to Frame and/or Top Slab	Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
A	Manhole/ Chamber					Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
A	Manhole/ Chamber					Fractures or Cracks in Basin Walls/ Bottom	Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is re-grouted and secure at basin wall.
A	Manhole/ Chamber					Settlement / Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
M	Manhole/ Chamber					Contamination and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
A	Catch Basin Cover					Cover Not in Place	Cover is missing or only partially in place.	Any open catch basin requires maintenance. Catch basin cover is closed

Energy Dissipaters Checklist (Continued)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Conditions That Should Exist**
Internal (Continued):								
A	Catch Basin Cover					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
A	Catch Basin Cover					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is to keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:
(M) Monthly from November through April.
(A) Once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).

3.21 Grounds (Landscaping)

Landscaping is an essential component of stormwater management. Bare soil areas generate higher levels of stormwater runoff and sedimentation in stormwater facilities. The following check list gives some general guidance for landscape management.

Grounds (Landscaping) Checklist

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Conditions That Should Exist**
M	General					Weeds (nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
M	General					Insect hazard	Any presence of poison ivy or other poisonous vegetation or insect nests.	No poisonous vegetation or insect nests present in landscaped area.
M,S	General					Trash or litter	See Ponds Checklist.	See Ponds Checklist.
M,S	General					Erosion of Ground Surface	Noticeable rills are seen in landscaped areas.	Causes of erosion are identified and steps taken to slow down/spread out the water. Eroded areas are filled, contoured, and seeded.
A	Trees and shrubs					Damage	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trim trees/shrubs to restore shape. Replace trees/shrubs with severe damage.
M	Trees and shrubs					Damage	Trees or shrubs that have been blown down or knocked over.	Replant tree, inspecting for injury to stem or roots. Replace if severely damaged.
A	Trees and shrubs					Damage	Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Place stakes and rubber-coated ties around young trees/shrubs for support.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:
(M) Monthly from November through April.
(A) Once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).

3.26 Inlet/Outlet Stormwater Pipe

The inlet and outlet stormwater pipes convey stormwater in through and out of stormwater facilities.

Storm sewer pipes convey stormwater. Pipes are built from many materials and are sometimes perforated to allow stormwater to infiltrate into the ground. Stormwater pipes are cleaned to remove sediment or blockages when problems are identified. Stormwater pipes must be clear of obstructions and breaks to prevent localized flooding. All stormwater pipes should be in proper working order and free of the possible defects listed below.

In addition, outlet stormwater pipes should be inspected to make sure stormwater exits the facility without causing any negative impacts to the drainage area, if applicable.

Inlet/Outlet Storm Pipe Checklist

		Date						
Frequency	Drainage System Feature	✓	✓	✓	✓	Problem	Conditions to Check For	Conditions That Should Exist
M	General					Obstructions including roots	Storm pipe- root enters or deforms pipe, reducing flow.	Use mechanical methods to remove root. Do not put root-dissolving chemicals in storm sewer pipes. If necessary, remove the vegetation over the line.
M	General					Pipe dented or broken	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
M	General					Pipe rusted or deteriorated	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired and/or replaced.
M	Erosion					Erosion	Eroded or scoured areas due to flow channelization, high flows, or vehicular damage.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the damaged area should be re-graded and re-seeded. For smaller bare areas, overseed.
M	Pipe outfall					Missing or removed rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
M	Pipe outfall					Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.

Inlet/Outlet Storm Pipe Checklist (Continued)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Conditions That Should Exist**
M	Pipe outfall					Erosion/Scouring	Eroded or scoured ditch or stream banks due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, damaged area should be re-graded and re-seeded. For smaller bare areas, overseed.
M	Pipe Outfall					Missing or Moved Rock	Only one layer of rock exists above native soil area in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
M	Pipe Outfall					Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.

If you are unsure whether a problem exists, please contact a Professional Engineer.

Comments:

Key:
(A) Annual (March or April preferred)
(M) Monthly (see schedule)
(S) After major storms (use 1-inch in 24 hours as a guideline)

SECTION 6.0 Vegetation Maintenance

All landscape management decisions for controlling unwanted vegetation, diseases, and pests should follow Integrated Pest Management principles and decision-making rationale. These are:

- Proper planning and management decisions begin the IPM process
- Cultural methods of vegetation and pest control are preferred and are first employed
- Mechanical means of vegetation and pest control are next in line of preference, and are utilized where feasible
- Biological methods of vegetation and pest control are considered before chemical means, where they are feasible
- Botanical and synthetic pesticides are used only when no other feasible methods exist

The vegetation management focus is establishing and maintaining healthy low-maintenance native plantings and sustaining the design function of vegetated filters, such as filter strips. This includes controlling invasive plants where feasible, and planting cover on bare soils.

Chemical use should be avoided within 25 feet of any area that holds or conveys surface water or stormwater. This includes the filter strips.

Trees or shrubs that block access driveways may be trimmed (or removed if within the access driveway) when access is required for maintenance by heavy equipment. Trees that pose a risk to stormwater structures due to root growth may be removed and replaced by smaller shrubs.

SECTION 7.0 Pollution Source Control Measures

Pollution source control is the application of pollution prevention practices on a developed site to reduce contamination of stormwater runoff at its source. BMPs and resource management systems are designed to reduce the amount of contaminants used and potentially discharged to the environment. This section of the Maintenance and Source Control Manual contains language regarding pollution source controls that are specifically applicable to the site.

Storage of Solid Wastes and Yard Wastes, improper storage of recycling, yard waste, and trash at residences can lead not only to water pollution problems, but problems with neighborhood pets and vermin as well.

- Leaking containers should be replaced. If your container is supplied by your hauler, contact the hauler to have damaged containers replaced.
- Store containers under cover if possible, or on grassy areas.
- Inspect the storage area regularly to pick up loose scraps of material and dispose of them properly.
- Compost biodegradable materials such as grass clippings and vegetable scraps instead of throwing them away

Yard Maintenance and Gardening, deals with the normal yard maintenance activities we all perform at our homes. Overwatering, over-fertilizing, improper herbicide application, and improper disposal of trimmings and clippings can all contribute to serious water pollution problems. Following the BMPs listed below will help alleviate pollutant runoff.

- **(Required)** Follow the manufacturer's directions exactly for mixing and applying herbicides, fungicides, and pesticides, and use them sparingly. Never apply when it is windy or when rain is expected. Never apply over water, within 100 feet of a well-head, or adjacent to streams, wetlands, or other water bodies. Triple-rinse empty containers, using the rinsate for mixing your next batch of spray, and then double-bag and dispose of the empty container in your regular garbage.

Never dispose of grass clippings or other vegetation in or near storm drains, streams, lakes, or Puget Sound.

- Use natural, organic soil amendments like Pierce County's SoundGRO Mix. SoundGRO Mix is a 100 percent recycled blend of dewatered, Class A, "Exceptional Quality" biosolids, mixed with sawdust and sand. The excellent soil conditioning properties of the organic matter aid water retention in lighter soils and help to break up and aerate heavier soils, so roots can grow better and less watering is needed. It contains both readily available and long term nitrogen and other nutrients commonly lacking in Northwest soils. The slow release of nitrogen better matches the needs of plants. Thus, there is much less potential for nitrates to leach into surface or groundwater due both to less "excess nitrogen" and less water use. Better vegetative growth can also reduce erosion and runoff.
- Save water and prevent pollution problems by watering your lawn sensibly. Lawns and gardens typically need the equivalent of 1 inch of rainfall per week. You can check on how you're doing by putting a wide mouth jar out where you're sprinkling, and measure the water with a small plastic ruler. Overwatering to the point of runoff can carry polluting nutrients to the nearest water body.

- Make sure all fertilizers and pesticides are stored in a covered location. Rain can wash the labels off of bottles and convert 50 pounds of fertilizer into either a solid lump or a river of nutrients.

- Use a mulching mower and mow higher to improve soil/grass health and reduce or eliminate pesticide use.

- Compost all yard clippings, or use them as mulch to save water and keep down weeds in your garden.

- Practice organic gardening and virtually eliminate the need to use pesticides and fertilizers. Contact Pierce County Cooperative Extension at (253) 798-7180 or the Ask-A-Master Gardener program at (253) 798-7170 for information and classes on earth friendly gardening.

- Work fertilizers into the soil instead of letting them lie on the ground surface exposed to the next rain storm.

- Plant native vegetation which is suited to Northwest conditions, they require less water and little to no fertilizers and pesticides.

Household Hazardous Material Use, Storage, and Disposal, the amount of hazardous materials we have onsite is a real eye-opener. Oil-based paints and stains, paint thinner, gasoline, charcoal starter fluid, cleaners, waxes, pesticides, fingernail polish remover, and wood preservatives are just a few hazardous materials that most c us have around the house.

When products such as these are dumped on the ground or in a storm drain, they can be washed directly to receiving waters where they can harm fish and wildlife. They can also infiltrate into the ground and contaminate drinking water supplies. The same problem can occur if they are disposed of with your regular garbage; the containers cai leak at the landfill and contaminate groundwater. The same type of contamination can also occur if hazardous products are poured down a sink or toilet into a septic system. Don't pour them down the drain if you're on municipal sewers, either. Many compounds can “pass through” the wastewater treatment plant without treatment and contaminate receiving waters, or they can harm the biological process used at the treatment plant, reducing overall treatment efficiency.

With such a diversity of hazardous products present in all homes in Pierce County, a large potential for serious environmental harm exists if improper methods of storage, usage, and disposal are employed. Using the following **required** BMPs will help keep these materials out of our soils, sediments, and waters.

- Hazardous Materials must be used in accordance with the manufacturer recommendation or guidelines as shown on the label.

- Always store hazardous materials in properly labeled containers, never in food or beverage containers which could be misinterpreted by a child as something to eat or drink.

- Dispose of hazardous materials and their containers properly. Never dump products labeled as poisonous, corrosive, caustic, flammable, inflammable, volatile, explosive danger, warning, caution, or dangerous outdoors, in a storm drain, or into sinks, toilets or drains. Call the Hazardous Waste Line at 1-800-287-6429, Tacoma-Pierce County Health Department (253) 798-6047, or the Tacoma Solid Waste Utility Household Hazardous Waste at (253) 591-5418 for information on disposal methods, collection events, and alternative products. Household hazardous wastes from Pierce County residents and non-residents are accepted at the Tacoma Landfill and LRI Landfill.

SECTION 8.0 Annual Cost of Maintenance

Specific maintenance costs depend on the characteristics of the facility, the site, and the area that contributes runoff to the facility. The general rule of thumb is that annual maintenance costs will be 5 to 10% of the facility's total capital cost. Routine, scheduled maintenance can help keep overall costs down by addressing problems before they require major attention. In this case, the cost of maintaining the proposed storm drainage facilities for this project is estimated to be approximately $2,000 per year.

Most of the routine maintenance measures recommended in the checklists (excluding major repair and replacement) are estimated to have an annual cost of $200 to $600 per acre of facility, above current landscape maintenance costs. Costs can vary depending on the types and level of maintenance practices used.

The cost and intensity of maintenance activities are usually higher during the two-year plant establishment period than after the facility has "settled in" after those first two years.

Abbey Road Group Land Development Services Company, LLC

Jeff Brown, P.E

Company Engineer / Engineer of Record / Senior Design Engineer

Abbey Road Group Land Development Services Company LLC

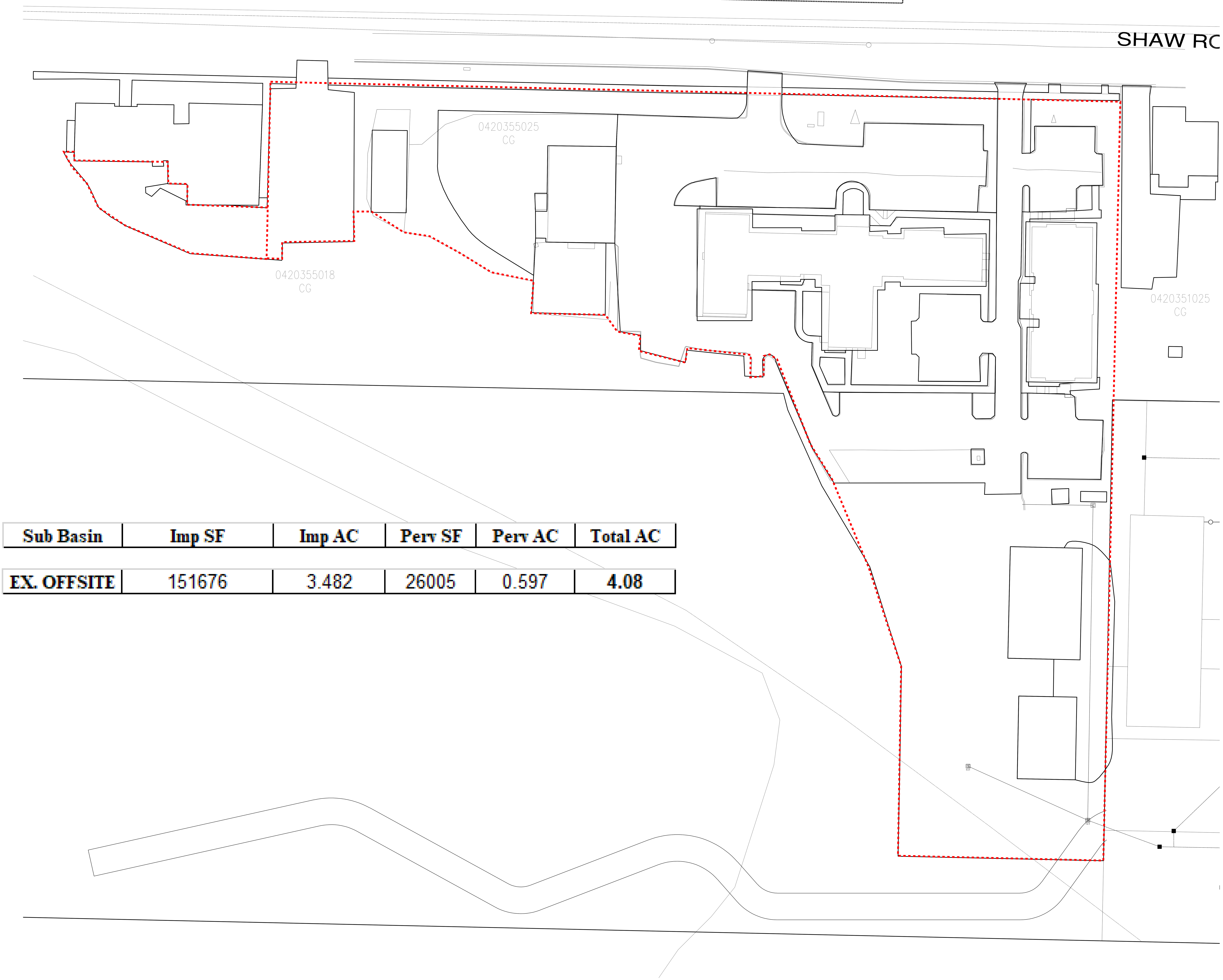
253-435-3699 Ext 113 Office Phone

253-446-3159 Fax

Jeff.Brown@abbeyroadgroup.com

OFF-SITE DRAINAGE BASIN MAP

06-171-1 EAST TOWN CROSSING



Sub Basin	Imp SF	Imp AC	Perv SF	Perv AC	Total AC
EX. OFFSITE	151676	3.482	26005	0.597	**4.08**

Figure B2 - Off-site Drainage Basin Map

Appendix C
Shaw Road Frontage Basin

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

SHAW ROAD FRONTAGE STORMWATER BASIN MAP

SCALE: 1" = 40 FOR 24" X 36" SHEET

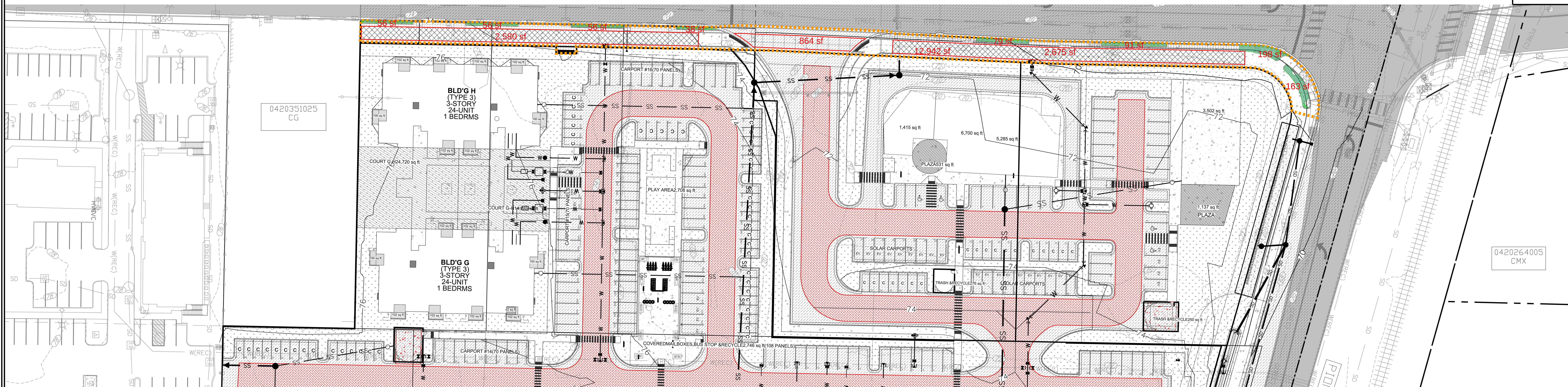
LINE IS 1" AT FULL SCALE

APPROVED

BY ____ CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.



TOTAL SHAW ROAD BASIN
12,942 SQ FT OR 0.297107 AC

(PREDEVELOPED CONDITIONS C, FOREST, MOD, @ 0.297104 AC)

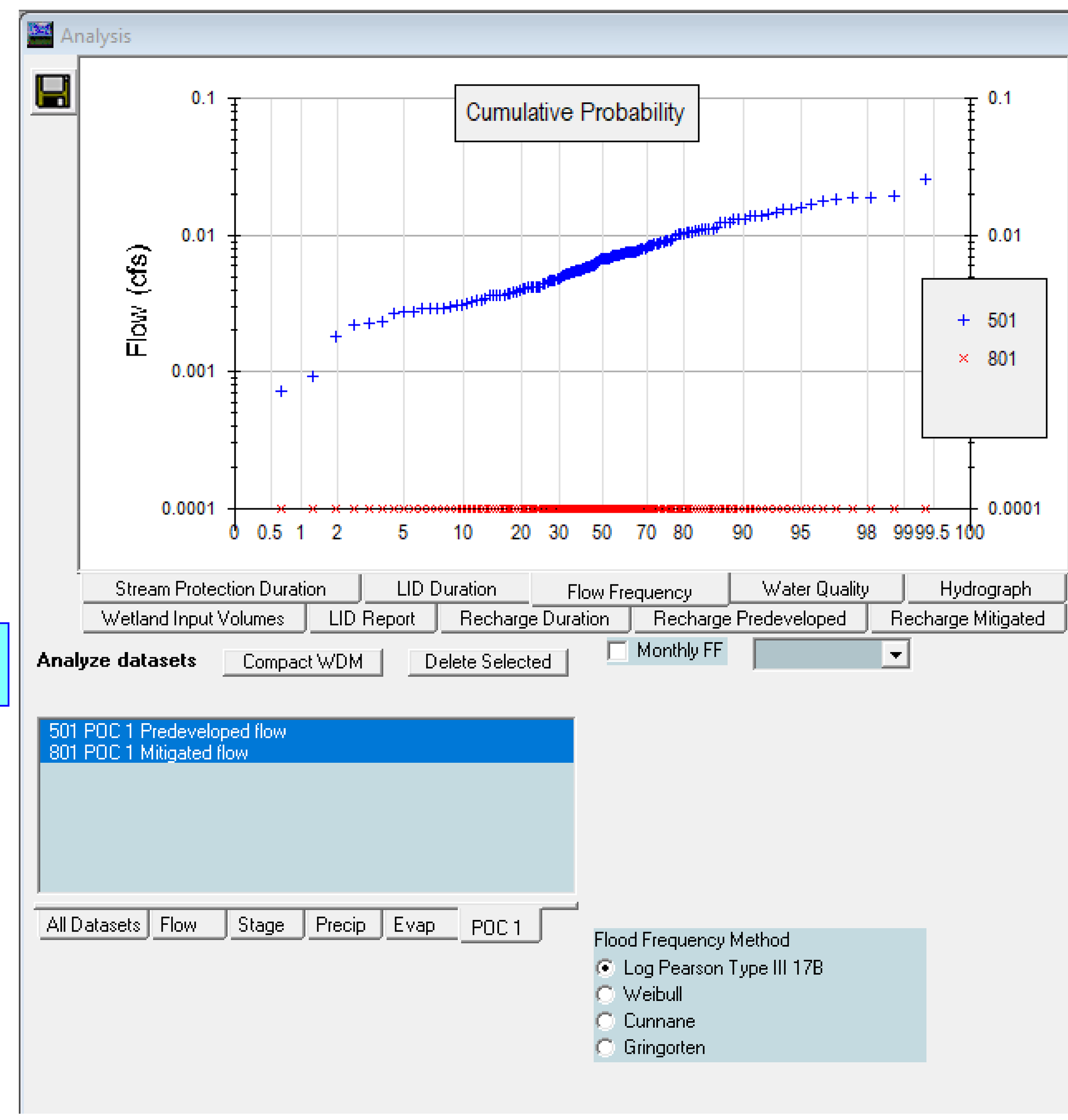
PROPOSED POROUS ASPHALT
5,255 SQ FT OR 0.120638 AC

LANDSCAPING A/B SOIL, FLAT
737 SQ FT OR 0.01619 AC

CONCRETE SIDE WALK, FLAT
6,086 SQ FT OR 0.1399715 AC

POROUS CONCRETE ENTRANCE
864 SQ FT OR 0.0198347 AC

Is there a reason the sidewalk is conventional concrete? Per MR5 pavement is to be permeable if feasible. [Storm Report; Fig.C1]



Flow Frequency

Flow(cfs)	Predeveloped	Mitigated
2 Year =	0.0068	0.0000
5 Year =	0.0105	0.0000
10 Year =	0.0127	0.0000
25 Year =	0.0150	0.0000
50 Year =	0.0165	0.0000
100 Year =	0.0178	0.0000

Annual Peaks

1902	0.0054	0.0000
1903	0.0041	0.0000
1904	0.0083	0.0000
1905	0.0034	0.0000
1906	0.0018	0.0000
1907	0.0104	0.0000
1908	0.0075	0.0000
1909	0.0073	0.0000
1910	0.0104	0.0000
1911	0.0067	0.0000
1912	0.0258	0.0000
1913	0.0105	0.0000
1914	0.0027	0.0000
1915	0.0044	0.0000
1916	0.0067	0.0000
1917	0.0023	0.0000
1918	0.0072	0.0000
1919	0.0056	0.0000
1920	0.0068	0.0000
1921	0.0074	0.0000
1922	0.0075	0.0000
1923	0.0060	0.0000
1924	0.0029	0.0000
1925	0.0037	0.0000
1926	0.0067	0.0000
1927	0.0048	0.0000
1928	0.0051	0.0000
1929	0.0106	0.0000

*****INFILTRATES AT 100% FOR SHAW ROAD FRONTAGE

Figure C1 – Shaw Road Basin Map

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

CALL BEFORE YOU DIG (811)
WWW.WASHINGTON811.COM

TITLE: East Town Crossing
SHAW ROAD FRONTAGE STORMWATER BASIN MAP
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

REVISIONS: BY: CHK: APR: DATE: PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 11/11/2021
SHEET:

Figure C2 – Shaw Road Frontage Calculations
WWHM Report

WWHM2012

PROJECT REPORT

06-171 East Town Shaw Road
Frontage Calculations 12-7-2021

General Model Information

Project Name:	East Town Shaw Road
Site Name:	East Town Shaw Road Basin
Site Address:	
City:	Puyallup
Report Date:	12/7/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	0.297107
Pervious Total	0.297107
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.297107

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Sidewalks Lateral I Basin

Bypass: No

Impervious Land Use acre

SIDEWALKS FLAT LAT 0.139715

Element Flows To:

Outlet 1 Outlet 2

Permeable Pavement 1

Is there a reason the sidewalk is conventional? Per MR5 pavement is to be permeable if feasible. [Storm Report; Shaw Road Calcs]

Entrance Lateral I Basin

Bypass:	No
Impervious Land Use	acre
ROADS FLAT LAT	0.019835

Element Flows To:

Outlet 1	Outlet 2
Permeable Pavement 1	

A/B Lawn Lateral Basin

Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.016919

Element Flows To:

Surface	Interflow	Groundwater
Permeable Pavement 1	Permeable Pavement 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Permeable Pavement 1

Pavement Area:0.1206 acre.Pavement Length:525.50 ft.
Pavement Width: 10.00 ft.
Pavement slope 1:0 To 1
Pavement thickness: 0.3333
Pour Space of Pavement: 0.5
Material thickness of second layer: 0.083
Pour Space of material for second layer: 0.5
Material thickness of third layer: 0.58333
Pour Space of material for third layer: 0.4
Infiltration On
Infiltration rate: 2
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 115.083
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 115.083
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 4.374
Element Flows To:
Outlet 1 Outlet 2

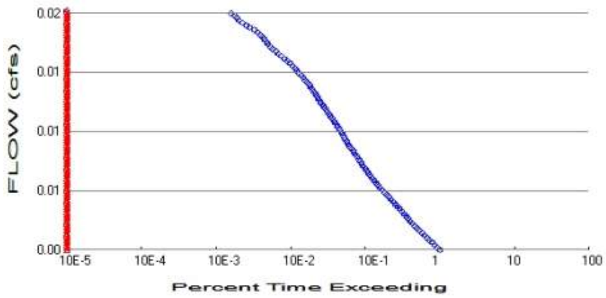
Permeable Pavement Hydraulic Table

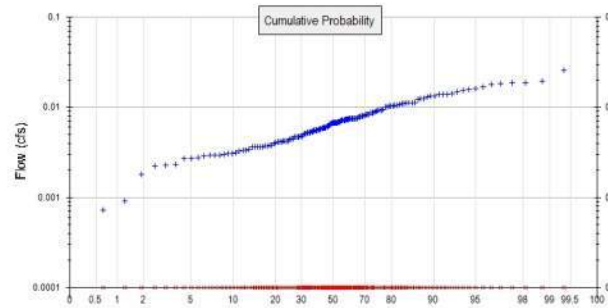
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.120	0.000	0.000	0.000
0.0111	0.120	0.000	0.000	0.243
0.0222	0.120	0.001	0.000	0.243
0.0333	0.120	0.001	0.000	0.243
0.0444	0.120	0.002	0.000	0.243
0.0556	0.120	0.002	0.000	0.243
0.0667	0.120	0.003	0.000	0.243
0.0778	0.120	0.003	0.000	0.243
0.0889	0.120	0.004	0.000	0.243
0.1000	0.120	0.004	0.000	0.243
0.1111	0.120	0.005	0.000	0.243
0.1222	0.120	0.005	0.000	0.243
0.1333	0.120	0.006	0.000	0.243
0.1444	0.120	0.007	0.000	0.243
0.1556	0.120	0.007	0.000	0.243
0.1667	0.120	0.008	0.000	0.243
0.1778	0.120	0.008	0.000	0.243
0.1889	0.120	0.009	0.000	0.243
0.2000	0.120	0.009	0.000	0.243
0.2111	0.120	0.010	0.000	0.243
0.2222	0.120	0.010	0.000	0.243
0.2333	0.120	0.011	0.000	0.243
0.2444	0.120	0.011	0.000	0.243
0.2556	0.120	0.012	0.000	0.243
0.2667	0.120	0.012	0.000	0.243
0.2778	0.120	0.013	0.000	0.243
0.2889	0.120	0.013	0.000	0.243
0.3000	0.120	0.014	0.000	0.243

0.3111	0.120	0.015	0.000	0.243
0.3222	0.120	0.015	0.000	0.243
0.3333	0.120	0.016	0.000	0.243
0.3444	0.120	0.016	0.000	0.243
0.3556	0.120	0.017	0.000	0.243
0.3667	0.120	0.017	0.000	0.243
0.3778	0.120	0.018	0.000	0.243
0.3889	0.120	0.018	0.000	0.243
0.4000	0.120	0.019	0.000	0.243
0.4111	0.120	0.019	0.000	0.243
0.4222	0.120	0.020	0.000	0.243
0.4333	0.120	0.020	0.000	0.243
0.4444	0.120	0.021	0.000	0.243
0.4556	0.120	0.022	0.000	0.243
0.4667	0.120	0.022	0.000	0.243
0.4778	0.120	0.023	0.000	0.243
0.4889	0.120	0.023	0.000	0.243
0.5000	0.120	0.024	0.000	0.243
0.5111	0.120	0.024	0.000	0.243
0.5222	0.120	0.025	0.000	0.243
0.5333	0.120	0.025	0.000	0.243
0.5444	0.120	0.026	0.000	0.243
0.5556	0.120	0.026	0.000	0.243
0.5667	0.120	0.027	0.000	0.243
0.5778	0.120	0.027	0.000	0.243
0.5889	0.120	0.028	0.000	0.243
0.6000	0.120	0.029	0.000	0.243
0.6111	0.120	0.029	0.000	0.243
0.6222	0.120	0.030	0.000	0.243
0.6333	0.120	0.031	0.000	0.243
0.6444	0.120	0.031	0.000	0.243
0.6556	0.120	0.032	0.000	0.243
0.6667	0.120	0.033	0.000	0.243
0.6778	0.120	0.033	0.000	0.243
0.6889	0.120	0.034	0.000	0.243
0.7000	0.120	0.035	0.000	0.243
0.7111	0.120	0.035	0.000	0.243
0.7222	0.120	0.036	0.000	0.243
0.7333	0.120	0.037	0.000	0.243
0.7444	0.120	0.037	0.000	0.243
0.7556	0.120	0.038	0.000	0.243
0.7667	0.120	0.039	0.000	0.243
0.7778	0.120	0.039	0.000	0.243
0.7889	0.120	0.040	0.000	0.243
0.8000	0.120	0.041	0.000	0.243
0.8111	0.120	0.042	0.000	0.243
0.8222	0.120	0.042	0.000	0.243
0.8333	0.120	0.043	0.000	0.243
0.8444	0.120	0.044	0.000	0.243
0.8556	0.120	0.044	0.000	0.243
0.8667	0.120	0.045	0.000	0.243
0.8778	0.120	0.046	0.000	0.243
0.8889	0.120	0.046	0.000	0.243
0.9000	0.120	0.047	0.000	0.243
0.9111	0.120	0.048	0.000	0.243
0.9222	0.120	0.048	0.000	0.243
0.9333	0.120	0.049	0.000	0.243
0.9444	0.120	0.050	0.000	0.243

0.9556	0.120	0.050	0.000	0.243
0.9667	0.120	0.051	0.000	0.243
0.9778	0.120	0.052	0.000	0.243
0.9889	0.120	0.052	0.000	0.243
1.0000	0.120	0.054	0.000	0.243

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.297107
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.016919
Total Impervious Area: 0.280188

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.006778
5 year	0.010494
10 year	0.012651
25 year	0.014994
50 year	0.016504
100 year	0.017815

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.005	0.000
1903	0.004	0.000
1904	0.008	0.000
1905	0.003	0.000
1906	0.002	0.000
1907	0.010	0.000
1908	0.007	0.000
1909	0.007	0.000
1910	0.010	0.000
1911	0.007	0.000

1912	0.026	0.000
1913	0.011	0.000
1914	0.003	0.000
1915	0.004	0.000
1916	0.007	0.000
1917	0.002	0.000
1918	0.007	0.000
1919	0.006	0.000
1920	0.007	0.000
1921	0.007	0.000
1922	0.008	0.000
1923	0.006	0.000
1924	0.003	0.000
1925	0.004	0.000
1926	0.007	0.000
1927	0.005	0.000
1928	0.005	0.000
1929	0.011	0.000
1930	0.007	0.000
1931	0.006	0.000
1932	0.005	0.000
1933	0.005	0.000
1934	0.014	0.000
1935	0.006	0.000
1936	0.006	0.000
1937	0.010	0.000
1938	0.006	0.000
1939	0.000	0.000
1940	0.006	0.000
1941	0.004	0.000
1942	0.009	0.000
1943	0.005	0.000
1944	0.010	0.000
1945	0.007	0.000
1946	0.005	0.000
1947	0.003	0.000
1948	0.014	0.000
1949	0.012	0.000
1950	0.004	0.000
1951	0.005	0.000
1952	0.019	0.000
1953	0.017	0.000
1954	0.006	0.000
1955	0.005	0.000
1956	0.003	0.000
1957	0.009	0.000
1958	0.018	0.000
1959	0.011	0.000
1960	0.003	0.000
1961	0.011	0.000
1962	0.006	0.000
1963	0.003	0.000
1964	0.003	0.000
1965	0.013	0.000
1966	0.004	0.000
1967	0.006	0.000
1968	0.006	0.000
1969	0.006	0.000

1970	0.009	0.000
1971	0.013	0.000
1972	0.009	0.000
1973	0.011	0.000
1974	0.007	0.000
1975	0.014	0.000
1976	0.007	0.000
1977	0.003	0.000
1978	0.012	0.000
1979	0.004	0.000
1980	0.007	0.000
1981	0.007	0.000
1982	0.003	0.000
1983	0.011	0.000
1984	0.005	0.000
1985	0.008	0.000
1986	0.007	0.000
1987	0.013	0.000
1988	0.008	0.000
1989	0.007	0.000
1990	0.008	0.000
1991	0.007	0.000
1992	0.009	0.000
1993	0.009	0.000
1994	0.013	0.000
1995	0.003	0.000
1996	0.015	0.000
1997	0.006	0.000
1998	0.007	0.000
1999	0.001	0.000
2000	0.005	0.000
2001	0.003	0.000
2002	0.011	0.000
2003	0.008	0.000
2004	0.007	0.000
2005	0.016	0.000
2006	0.004	0.000
2007	0.004	0.000
2008	0.007	0.000
2009	0.005	0.000
2010	0.004	0.000
2011	0.004	0.000
2012	0.006	0.000
2013	0.004	0.000
2014	0.003	0.000
2015	0.006	0.000
2016	0.002	0.000
2017	0.010	0.000
2018	0.018	0.000
2019	0.019	0.000
2020	0.006	0.000
2021	0.009	0.000
2022	0.004	0.000
2023	0.008	0.000
2024	0.020	0.000
2025	0.007	0.000
2026	0.011	0.000
2027	0.004	0.000

2028	0.004	0.000
2029	0.008	0.000
2030	0.014	0.000
2031	0.005	0.000
2032	0.003	0.000
2033	0.004	0.000
2034	0.004	0.000
2035	0.016	0.000
2036	0.008	0.000
2037	0.002	0.000
2038	0.007	0.000
2039	0.001	0.000
2040	0.004	0.000
2041	0.005	0.000
2042	0.016	0.000
2043	0.008	0.000
2044	0.010	0.000
2045	0.007	0.000
2046	0.008	0.000
2047	0.006	0.000
2048	0.008	0.000
2049	0.007	0.000
2050	0.005	0.000
2051	0.007	0.000
2052	0.004	0.000
2053	0.007	0.000
2054	0.009	0.000
2055	0.004	0.000
2056	0.003	0.000
2057	0.005	0.000
2058	0.006	0.000
2059	0.011	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0258	0.0000
2	0.0196	0.0000
3	0.0188	0.0000
4	0.0187	0.0000
5	0.0184	0.0000
6	0.0178	0.0000
7	0.0168	0.0000
8	0.0160	0.0000
9	0.0157	0.0000
10	0.0155	0.0000
11	0.0148	0.0000
12	0.0143	0.0000
13	0.0140	0.0000
14	0.0138	0.0000
15	0.0137	0.0000
16	0.0133	0.0000
17	0.0132	0.0000
18	0.0131	0.0000
19	0.0125	0.0000
20	0.0124	0.0000
21	0.0123	0.0000
22	0.0113	0.0000

23	0.0112	0.0000
24	0.0112	0.0000
25	0.0112	0.0000
26	0.0111	0.0000
27	0.0109	0.0000
28	0.0108	0.0000
29	0.0106	0.0000
30	0.0105	0.0000
31	0.0104	0.0000
32	0.0104	0.0000
33	0.0103	0.0000
34	0.0102	0.0000
35	0.0101	0.0000
36	0.0095	0.0000
37	0.0093	0.0000
38	0.0092	0.0000
39	0.0092	0.0000
40	0.0090	0.0000
41	0.0089	0.0000
42	0.0087	0.0000
43	0.0087	0.0000
44	0.0086	0.0000
45	0.0084	0.0000
46	0.0083	0.0000
47	0.0083	0.0000
48	0.0082	0.0000
49	0.0080	0.0000
50	0.0080	0.0000
51	0.0079	0.0000
52	0.0078	0.0000
53	0.0078	0.0000
54	0.0076	0.0000
55	0.0075	0.0000
56	0.0075	0.0000
57	0.0075	0.0000
58	0.0075	0.0000
59	0.0074	0.0000
60	0.0074	0.0000
61	0.0074	0.0000
62	0.0074	0.0000
63	0.0074	0.0000
64	0.0073	0.0000
65	0.0073	0.0000
66	0.0072	0.0000
67	0.0072	0.0000
68	0.0071	0.0000
69	0.0071	0.0000
70	0.0071	0.0000
71	0.0070	0.0000
72	0.0069	0.0000
73	0.0068	0.0000
74	0.0068	0.0000
75	0.0067	0.0000
76	0.0067	0.0000
77	0.0067	0.0000
78	0.0067	0.0000
79	0.0067	0.0000
80	0.0067	0.0000

81	0.0066	0.0000
82	0.0066	0.0000
83	0.0063	0.0000
84	0.0063	0.0000
85	0.0062	0.0000
86	0.0061	0.0000
87	0.0061	0.0000
88	0.0060	0.0000
89	0.0060	0.0000
90	0.0059	0.0000
91	0.0059	0.0000
92	0.0059	0.0000
93	0.0058	0.0000
94	0.0057	0.0000
95	0.0057	0.0000
96	0.0057	0.0000
97	0.0056	0.0000
98	0.0056	0.0000
99	0.0056	0.0000
100	0.0056	0.0000
101	0.0054	0.0000
102	0.0054	0.0000
103	0.0053	0.0000
104	0.0053	0.0000
105	0.0052	0.0000
106	0.0052	0.0000
107	0.0051	0.0000
108	0.0051	0.0000
109	0.0050	0.0000
110	0.0048	0.0000
111	0.0048	0.0000
112	0.0047	0.0000
113	0.0047	0.0000
114	0.0047	0.0000
115	0.0047	0.0000
116	0.0045	0.0000
117	0.0045	0.0000
118	0.0044	0.0000
119	0.0042	0.0000
120	0.0042	0.0000
121	0.0042	0.0000
122	0.0042	0.0000
123	0.0041	0.0000
124	0.0041	0.0000
125	0.0041	0.0000
126	0.0040	0.0000
127	0.0039	0.0000
128	0.0038	0.0000
129	0.0038	0.0000
130	0.0037	0.0000
131	0.0037	0.0000
132	0.0037	0.0000
133	0.0037	0.0000
134	0.0036	0.0000
135	0.0036	0.0000
136	0.0036	0.0000
137	0.0034	0.0000
138	0.0033	0.0000

139	0.0033	0.0000
140	0.0033	0.0000
141	0.0031	0.0000
142	0.0031	0.0000
143	0.0031	0.0000
144	0.0030	0.0000
145	0.0030	0.0000
146	0.0029	0.0000
147	0.0029	0.0000
148	0.0029	0.0000
149	0.0027	0.0000
150	0.0027	0.0000
151	0.0027	0.0000
152	0.0023	0.0000
153	0.0023	0.0000
154	0.0022	0.0000
155	0.0018	0.0000
156	0.0009	0.0000
157	0.0007	0.0000
158	0.0005	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0034	55678	0	0	Pass
0.0035	51240	0	0	Pass
0.0037	47185	0	0	Pass
0.0038	43456	0	0	Pass
0.0039	40121	0	0	Pass
0.0041	37168	0	0	Pass
0.0042	34431	0	0	Pass
0.0043	31889	0	0	Pass
0.0044	29534	0	0	Pass
0.0046	27484	0	0	Pass
0.0047	25634	0	0	Pass
0.0048	23867	0	0	Pass
0.0050	22293	0	0	Pass
0.0051	20886	0	0	Pass
0.0052	19551	0	0	Pass
0.0054	18277	0	0	Pass
0.0055	17097	0	0	Pass
0.0056	15955	0	0	Pass
0.0058	14903	0	0	Pass
0.0059	13944	0	0	Pass
0.0060	13063	0	0	Pass
0.0062	12277	0	0	Pass
0.0063	11512	0	0	Pass
0.0064	10787	0	0	Pass
0.0066	10083	0	0	Pass
0.0067	9413	0	0	Pass
0.0068	8787	0	0	Pass
0.0070	8233	0	0	Pass
0.0071	7728	0	0	Pass
0.0072	7230	0	0	Pass
0.0074	6781	0	0	Pass
0.0075	6399	0	0	Pass
0.0076	6094	0	0	Pass
0.0078	5812	0	0	Pass
0.0079	5510	0	0	Pass
0.0080	5230	0	0	Pass
0.0082	4963	0	0	Pass
0.0083	4733	0	0	Pass
0.0084	4482	0	0	Pass
0.0086	4292	0	0	Pass
0.0087	4096	0	0	Pass
0.0088	3869	0	0	Pass
0.0090	3648	0	0	Pass
0.0091	3474	0	0	Pass
0.0092	3312	0	0	Pass
0.0094	3162	0	0	Pass
0.0095	3019	0	0	Pass
0.0096	2915	0	0	Pass
0.0097	2789	0	0	Pass
0.0099	2677	0	0	Pass
0.0100	2527	0	0	Pass
0.0101	2415	0	0	Pass
0.0103	2306	0	0	Pass

0.0104	2200	0	0	Pass
0.0105	2097	0	0	Pass
0.0107	1981	0	0	Pass
0.0108	1878	0	0	Pass
0.0109	1764	0	0	Pass
0.0111	1685	0	0	Pass
0.0112	1596	0	0	Pass
0.0113	1529	0	0	Pass
0.0115	1464	0	0	Pass
0.0116	1379	0	0	Pass
0.0117	1306	0	0	Pass
0.0119	1250	0	0	Pass
0.0120	1193	0	0	Pass
0.0121	1135	0	0	Pass
0.0123	1084	0	0	Pass
0.0124	1032	0	0	Pass
0.0125	985	0	0	Pass
0.0127	929	0	0	Pass
0.0128	873	0	0	Pass
0.0129	819	0	0	Pass
0.0131	777	0	0	Pass
0.0132	709	0	0	Pass
0.0133	663	0	0	Pass
0.0135	627	0	0	Pass
0.0136	585	0	0	Pass
0.0137	540	0	0	Pass
0.0139	501	0	0	Pass
0.0140	458	0	0	Pass
0.0141	419	0	0	Pass
0.0143	380	0	0	Pass
0.0144	353	0	0	Pass
0.0145	320	0	0	Pass
0.0146	297	0	0	Pass
0.0148	276	0	0	Pass
0.0149	264	0	0	Pass
0.0150	246	0	0	Pass
0.0152	231	0	0	Pass
0.0153	216	0	0	Pass
0.0154	203	0	0	Pass
0.0156	180	0	0	Pass
0.0157	157	0	0	Pass
0.0158	141	0	0	Pass
0.0160	126	0	0	Pass
0.0161	113	0	0	Pass
0.0162	105	0	0	Pass
0.0164	99	0	0	Pass
0.0165	89	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Permeable Pavement 1 POC	☐	104.73			☐	100.00			
Total Volume Infiltrated		104.73	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

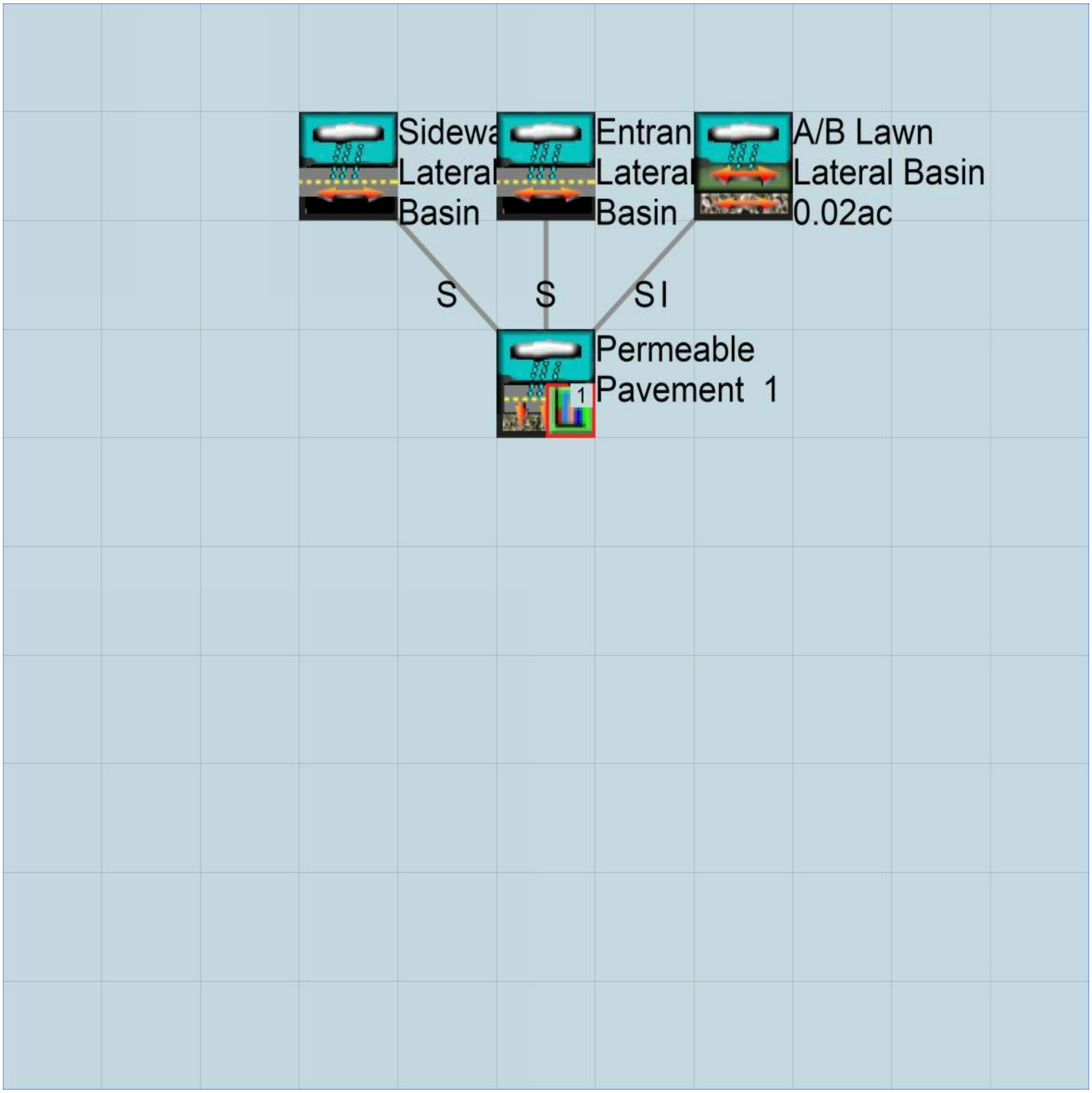
No PERLND changes have been made.

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
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   East Town Shaw Road.wdm
MESSU      25   PreEast Town Shaw Road.MES
           27   PreEast Town Shaw Road.L61
           28   PreEast Town Shaw Road.L62
           30   POCEast Town Shaw Road1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      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           ***
   11     C, Forest, 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 ***
   11         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  *********
   11         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 ***
   11         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
   11             0       4.5      0.08       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
   11             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11           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
   11             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  11                    0.297107     COPY   501     12
PERLND  11                    0.297107     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   East Town Shaw Road.wdm
MESSU      25   MitEast Town Shaw Road.MES
           27   MitEast Town Shaw Road.L61
           28   MitEast Town Shaw Road.L62
           30   POCEast Town Shaw Road1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND      17
      IMPLND      18
      PERLND      39
      IMPLND      16
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Permeable Pavement  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           ***
   39      A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   39         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  *********
   39         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 ***
   39         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
   39              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   39              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                   ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   39            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   39              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   17         0    0    0    0    0
   18         0    0    0    0    0
   16         0    0    0    0    0
```

```
  END IWAT-PARM1

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Sidewalks Lateral I Basin  ***
IMPLND  17                      1.1581     IMPLND  16     53
A/B Lawn Lateral Basin ***
PERLND  39                      0.1402     IMPLND  16     54
PERLND  39                      0.1402     IMPLND  16     55
Entrance Lateral I Basin  ***
IMPLND  18                      0.1644     IMPLND  16     53
IMPLND  16                      0.1206     RCHRES   1      5

******Routing******
IMPLND  17                    0.139715     COPY     1     15
IMPLND  18                    0.019835     COPY     1     15
PERLND  39                    0.016919     COPY     1     12
PERLND  39                    0.016919     COPY     1     13
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
    1     Permeable Paveme-005    2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
```

```
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  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  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1       0.1       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE       1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)    (ft/sec)    (Minutes)***
  0.000000  0.120638  0.000000  0.000000  0.000000
  0.011111  0.120638  0.000536  0.000000  0.243287
  0.022222  0.120638  0.001072  0.000000  0.243287
  0.033333  0.120638  0.001609  0.000000  0.243287
  0.044444  0.120638  0.002145  0.000000  0.243287
  0.055556  0.120638  0.002681  0.000000  0.243287
  0.066667  0.120638  0.003217  0.000000  0.243287
  0.077778  0.120638  0.003753  0.000000  0.243287
  0.088889  0.120638  0.004289  0.000000  0.243287
  0.100000  0.120638  0.004826  0.000000  0.243287
  0.111111  0.120638  0.005362  0.000000  0.243287
  0.122222  0.120638  0.005898  0.000000  0.243287
  0.133333  0.120638  0.006434  0.000000  0.243287
  0.144444  0.120638  0.006970  0.000000  0.243287
  0.155556  0.120638  0.007506  0.000000  0.243287
  0.166667  0.120638  0.008043  0.000000  0.243287
  0.177778  0.120638  0.008579  0.000000  0.243287
  0.188889  0.120638  0.009115  0.000000  0.243287
  0.200000  0.120638  0.009651  0.000000  0.243287
  0.211111  0.120638  0.010187  0.000000  0.243287
  0.222222  0.120638  0.010723  0.000000  0.243287
  0.233333  0.120638  0.011260  0.000000  0.243287
  0.244444  0.120638  0.011796  0.000000  0.243287
  0.255556  0.120638  0.012332  0.000000  0.243287
  0.266667  0.120638  0.012868  0.000000  0.243287
  0.277778  0.120638  0.013404  0.000000  0.243287
  0.288889  0.120638  0.013940  0.000000  0.243287
  0.300000  0.120638  0.014477  0.000000  0.243287
  0.311111  0.120638  0.015013  0.000000  0.243287
  0.322222  0.120638  0.015549  0.000000  0.243287
  0.333333  0.120638  0.016085  0.000000  0.243287
```

```
  0.344444  0.120638  0.016621  0.000000  0.243287
  0.355556  0.120638  0.017157  0.000000  0.243287
  0.366667  0.120638  0.017694  0.000000  0.243287
  0.377778  0.120638  0.018230  0.000000  0.243287
  0.388889  0.120638  0.018766  0.000000  0.243287
  0.400000  0.120638  0.019302  0.000000  0.243287
  0.411111  0.120638  0.019838  0.000000  0.243287
  0.422222  0.120638  0.020374  0.000000  0.243287
  0.433333  0.120638  0.020911  0.000000  0.243287
  0.444444  0.120638  0.021447  0.000000  0.243287
  0.455556  0.120638  0.021983  0.000000  0.243287
  0.466667  0.120638  0.022519  0.000000  0.243287
  0.477778  0.120638  0.023055  0.000000  0.243287
  0.488889  0.120638  0.023591  0.000000  0.243287
  0.500000  0.120638  0.024128  0.000000  0.243287
  0.511111  0.120638  0.024664  0.000000  0.243287
  0.522222  0.120638  0.025200  0.000000  0.243287
  0.533333  0.120638  0.025736  0.000000  0.243287
  0.544444  0.120638  0.026272  0.000000  0.243287
  0.555556  0.120638  0.026808  0.000000  0.243287
  0.566667  0.120638  0.027345  0.000000  0.243287
  0.577778  0.120638  0.027881  0.000000  0.243287
  0.588889  0.120638  0.028551  0.000000  0.243287
  0.600000  0.120638  0.029221  0.000000  0.243287
  0.611111  0.120638  0.029891  0.000000  0.243287
  0.622222  0.120638  0.030562  0.000000  0.243287
  0.633333  0.120638  0.031232  0.000000  0.243287
  0.644444  0.120638  0.031902  0.000000  0.243287
  0.655556  0.120638  0.032572  0.000000  0.243287
  0.666667  0.120638  0.033243  0.000000  0.243287
  0.677778  0.120638  0.033913  0.000000  0.243287
  0.688889  0.120638  0.034583  0.000000  0.243287
  0.700000  0.120638  0.035253  0.000000  0.243287
  0.711111  0.120638  0.035923  0.000000  0.243287
  0.722222  0.120638  0.036594  0.000000  0.243287
  0.733333  0.120638  0.037264  0.000000  0.243287
  0.744444  0.120638  0.037934  0.000000  0.243287
  0.755556  0.120638  0.038604  0.000000  0.243287
  0.766667  0.120638  0.039274  0.000000  0.243287
  0.777778  0.120638  0.039945  0.000000  0.243287
  0.788889  0.120638  0.040615  0.000000  0.243287
  0.800000  0.120638  0.041285  0.000000  0.243287
  0.811111  0.120638  0.041955  0.000000  0.243287
  0.822222  0.120638  0.042625  0.000000  0.243287
  0.833333  0.120638  0.043296  0.000000  0.243287
  0.844444  0.120638  0.043966  0.000000  0.243287
  0.855556  0.120638  0.044636  0.000000  0.243287
  0.866667  0.120638  0.045306  0.000000  0.243287
  0.877778  0.120638  0.045977  0.000000  0.243287
  0.888889  0.120638  0.046647  0.000000  0.243287
  0.900000  0.120638  0.047317  0.000000  0.243287
  0.911111  0.120638  0.047987  0.000000  0.243287
  0.922222  0.120638  0.048657  0.000000  0.243287
  0.933333  0.120638  0.049328  0.000000  0.243287
  0.944444  0.120638  0.049998  0.000000  0.243287
  0.955556  0.120638  0.050668  0.000000  0.243287
  0.966667  0.120638  0.051338  0.000000  0.243287
  0.977778  0.120638  0.052008  0.000000  0.243287
  0.988889  0.120638  0.052679  0.000000  0.243287
  1.000000  0.120638  0.054019  0.000118  0.243287
  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
```

```
WDM       1 EVAP      ENGL     1               RCHRES   1     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY      1 OUTPUT MEAN   1 1     48.4       WDM    701 FLOW     ENGL      REPL
COPY    501 OUTPUT MEAN   1 1     48.4       WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  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       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       53
IMPLND     IWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   53

  MASS-LINK       54
PERLND     PWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   54

  MASS-LINK       55
PERLND     PWATER IFWO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   55

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

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

www.clearcreeksolutions.com

Appendix D
Pioneer Way Frontage Basin

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

PIONEER BASIN MAP

SCALE: 1" = 30
FOR 24" X 36" SHEET

LINE IS 1" AT FULL SCALE

APPROVED

BY ____________
CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

PREDEVELOPED CONDITIONS

EXISTING ROAD/ FLAT - ASPHALT PAVEMENT:	11,817 SQ FT	OR	0.277655 AC
EXISTING C, FOREST, MOD - VEGETATION:	14,640 SQ FT	OR	0.343985 AC
TOTAL PREDEVELOPED BASIN:	26,457 SQ FT	OR	0.62164 AC

*****PRE-DEVELOPMENT FLOWS TO POINT OF COMPLIANCE CAN BE FOUND IN APPENDIX C - FIGURE C1 OF THIS STORMWATER REPORT.

FULL PRE-DEVELOPED FLOW RETURNS

```
Flow Frequency
Flow(cfs)   0501 15m
2 Year    =     0.1026
5 Year    =     0.1375
10 Year   =     0.1629
25 Year   =     0.1976
50 Year   =     0.2255
100 Year  =     0.2551
```

DEVELOPED CONDITIONS

ROAD / FLAT (EXISTING + NEW) PAVEMENT:	22,106 SQ FT	OR	0.519408 AC
SIDEWALK / FLAT CONC. :	3,551 SQ FT	OR	0.083435 AC
A/B, LAWN, FLAT - LANDSCAPING STRIP:	800 SQ FT	OR	0.018797 AC
TOTAL DEVELOPED FRONTAGE:	26,457 SQ FT	OR	0.62164 AC

```
Flow Frequency
Flow(cfs)   0701 15m
2 Year    =     0.2226
5 Year    =     0.2968
10 Year   =     0.3504
25 Year   =     0.4235
50 Year   =     0.4820
100 Year  =     0.5440
```

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

811 CALL BEFORE YOU DIG (811) WWW.WASHINGTON811.COM

TITLE: East Town Crossing
PIONEER BASIN MAP
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

REVISIONS: BY: CHK: APR: DATE: PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 11/16/2021
SHEET:

Figure D1 – Pioneer Frontage Basin Map

Figure D2 – Pioneer Frontage Flow Splitter Calculations Analysis

PRE-EXISTING FRONTAGE CONDITIONS ASPHALT ONLY FLOW RETURNS

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.277655

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.277655

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.09957
5 year	0.133569
10 year	0.158268
25 year	0.192057
50 year	0.219166
100 year	0.247989

DEVELOPED FRONTAGE CONDITIONS ONLY NO PRE-EXISTING SURFACES FLOW RETURNS

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.018797
Total Impervious Area: 0.325188

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.018797
Total Impervious Area: 0.325188

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.116655
5 year	0.15651
10 year	0.185465
25 year	0.225082
50 year	0.256869
100 year	0.290666

PRE-EXISTING ASPHALT ONLY FLOW RETURNS

EXISTING ROAD/ FLAT - ASPHALT PAVEMENT: 11,817 SQ FT OR 0.277655 AC

Flow Frequency		
Flow(cfs)		Predeveloped
2 Year	=	0.0996
5 Year	=	0.1336
10 Year	=	0.1583
25 Year	=	0.1921
50 Year	=	0.2192
100 Year	=	0.2480

PROPOSED IMPERVIOUS IMPROVEMENTS

ROAD/ FLAT (PROPOSED NEW ONLY)	10,289 SQ FT	OR	0.2417528 AC
SIDEWALK / FLAT CONC. :	3,551 SQ FT	OR	0.083435 AC
A/B, LAWN, FLAT - LANDSCAPING STRIP	800 SQ FT	OR	0.018797 AC

Flow Frequency		
Flow(cfs)		Predeveloped
2 Year	=	0.1167
5 Year	=	0.1565
10 Year	=	0.1855
25 Year	=	0.2251
50 Year	=	0.2569
100 Year	=	0.2907

**** NOTE:
C, FOREST, MOD - VEGETATIVE AREA: 10,060 SQ FT OR 0.236372 AC WAS NOT USED IN THIS CALCULATIONS AS THESE AREAS WILL MATCH PRE-EXISTING CONDITIONS AND THESE FLOWS WILL FLOW DIRECTLY TO THE STREAM.

DIRECT COMPARISION BETWEEN PRE-EXISTING ASPHALT AND PROPOSED IMPERVIOUS

Flow Frequency			
Flow(cfs)		Predeveloped	Mitigated
2 Year	=	0.0996	0.1167
5 Year	=	0.1336	0.1565
10 Year	=	0.1583	0.1855
25 Year	=	0.1921	0.2251
50 Year	=	0.2192	0.2569
100 Year	=	0.2480	0.2907

STAGE	PRE-EXISTING ASPHALT	PROPOSED IMPROVEMENTS	TOTAL FLOWS	PRE-EXISTING %	IMPROVEMENT %	TOTAL
2 YEAR	0.0996	0.1167	0.2163	0.460471567	0.539528433	1.000000000
5 YEAR	0.1336	0.1565	0.2901	0.460530851	0.539469149	1.000000000
10 YEAR	0.1583	0.1855	0.3438	0.460442118	0.539557882	1.000000000
25 YEAR	0.1921	0.2251	0.4172	0.460450623	0.539549377	1.000000000
50 YEAR	0.2192	0.2569	0.4761	0.460407477	0.539592523	1.000000000
100 YEAR	0.248	0.2907	0.5387	0.460367552	0.539632448	1.000000000
			AVERAGE	0.460445031	0.539554969	1.000000000

BASED ON PRELIMINARY RETURNS OF EXISTING ASPHALT DATA IN CONJUNCTION WITH THE PROJECTED CALCULATED FLOWS OF THE NEW DEVELOPED AREA ONLY, THE PROPOSED IMPROVEMENT FLOWS ARE APPROXIMATELY 54% OF THE FULL BASIN ONCE COMBINED WITH THE EXISTING FLOWS BEING ONLY 46% PERCENT OF THE FLOWS IN THE BASIN. THIS DATA WILL BE USED TO SIZE THE ORIFICES OF THE FLOW SPLITTER.

THE PROJECTED FLOW SPLITTER OUTLET #1 WILL DIRECT FLOW IN TO THE BIO-SWALE SYSTEM AND OUTLET #2 WILL BE DIRECTED TO BYPASS THE NEWLY DEVELOPED SYSTEM. IT IS THE GOAL FOR THE EXISTING FLOWS TO BE AS SIMILAR TO THE EXISTING CONDITIONS AS POSSIBLE. BUT MAY ALSO BE LESS THEN THE EXACT FLOWS DUE TO OVERSIZING OF PROJECTED SYSTEM.

FLOW SPLITTER OUTLET #1 ORIFICE IS CALCULATED AT: 2.70" @ 0-FEET
FLOW SPLITTER OUTLET #2 ORIFICE IS CALCULATED AT: 2.30" @ 0-FEET OUTLET 1 ORIFICE 2.754.000%

OUTLET 1 ORIFICE	2.7	54.000%
OUTLET 2 ORIFICE	2.3	46.000%
TOTAL ORIFICE SIZE	5	

FLOWS RETURNED UNDER FULL FRONTAGE DEVELOPMENT CONDITIONS

Flow Frequency			
Flow(cfs)		1001 15m	1002 15m
2 Year	=	0.1274	0.0922
5 Year	=	0.1701	0.1244
10 Year	=	0.2016	0.1489
25 Year	=	0.2453	0.1836
50 Year	=	0.2808	0.2125
100 Year	=	0.3188	0.2439

Abbey Road Group
Land Development
Services Company, LLC
2102 EAST MAIN AVE. SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

OUTLET # 1 @ ELEV. 0.2000'

$$DIA = \sqrt{\frac{36.88 \times .083411 (CFS)}{\sqrt{0.2000 \ (H)}}}$$

$$DIA = \sqrt{\frac{3.0761976}{.4472135}}$$

$$DIA = \sqrt{6.8785884}$$

DIA = 2.6227063

OUTLET # 2 @ ELEV. 0.2000'

$$DIA = \sqrt{\frac{36.88 \times .064199 (CFS)}{\sqrt{0.2000 \ (H)}}}$$

$$DIA = \sqrt{\frac{2.23676591}{.4472135}}$$

$$DIA = \sqrt{5.2942478}$$

DIA = 2.3009232

OUTLET 1 ORIFICE	2.6227063	53.268%
OUTLET 2 ORIFICE	2.3009232	46.732%
TOTAL ORIFICE SIZE	4.9236295	

OUTLET # 1 @ ELEV. 0.8000'

$$DIA = \sqrt{\frac{36.88 \times .176942 (CFS)}{\sqrt{0.8000 \ (H)}}}$$

$$DIA = \sqrt{\frac{6.5256209}{.8944271}}$$

$$DIA = \sqrt{7.2958667}$$

DIA = 2.7010862

OUTLET # 2 @ ELEV. 0.8000'

$$DIA = \sqrt{\frac{36.88 \times .128398 (CFS)}{\sqrt{0.8000 \ (H)}}}$$

$$DIA = \sqrt{\frac{4.7353182}{.8944271}}$$

$$DIA = \sqrt{5.2942472}$$

DIA = 2.3009231

OUTLET 1 ORIFICE	2.7010862	54.000%
OUTLET 2 ORIFICE	2.3009231	46.000%
TOTAL ORIFICE SIZE	5.0020093	

OUTLET # 1 @ ELEV. 1.2000'

$$DIA = \sqrt{\frac{36.88 \times .216709 (CFS)}{\sqrt{1.20000 \ (H)}}}$$

$$DIA = \sqrt{\frac{7.9922279}{1.0954451}}$$

$$DIA = \sqrt{7.2958726}$$

DIA = 2.7010872

OUTLET # 2 @ ELEV. 1.2000'

$$DIA = \sqrt{\frac{36.88 \times .157255 (CFS)}{\sqrt{1.2000 \ (H)}}}$$

$$DIA = \sqrt{\frac{5.7995644}{1.0954451}}$$

$$DIA = \sqrt{5.2942538}$$

DIA = 2.3009245

OUTLET 1 ORIFICE	2.7010872	54.000%
OUTLET 2 ORIFICE	2.3009245	46.000%
TOTAL ORIFICE SIZE	5.0020117	

FULL PIONEER FRONTAGE DEVELOPEMENT AT FLOW FREQUENCY STAGED RETURNS

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.343985
Total Impervious Area: 0.277655

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.018797
Total Impervious Area: 0.602843

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.102557
5 year	0.137516
10 year	0.162903
25 year	0.197626
50 year	0.225477
100 year	0.255083

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.093591
5 year	0.12452
10 year	0.147303
25 year	0.178823
50 year	0.204365
100 year	0.231745

FLOW SPLITTER TABLE TO CONFIRM ORIFICE SIZING AT MULITIPLE LEVELS

Flow Splitter 1

Stage (ft)	Area (acres)	Storage (acre-ft)	Dschrge (cfs)	Discharge2 (cfs)
0.000000	0.002296	0.000000	0.000000	0.000000
0.022222	0.002296	0.000051	0.029490	0.021400
0.044444	0.002296	0.000102	0.041706	0.030264
0.066667	0.002296	0.000153	0.051079	0.037065
0.088889	0.002296	0.000204	0.058981	0.042799
0.111111	0.002296	0.000255	0.065942	0.047851
0.133333	0.002296	0.000306	0.072236	0.052418
0.155556	0.002296	0.000357	0.078024	0.056618
0.177778	0.002296	0.000408	0.083411	0.060528
0.200000	0.002296	0.000459	0.088471	0.064199
0.222222	0.002296	0.000510	0.093257	0.067672
0.244444	0.002296	0.000561	0.097808	0.070975
0.266667	0.002296	0.000612	0.102158	0.074131
0.288889	0.002296	0.000663	0.106329	0.077158
0.311111	0.002296	0.000714	0.110343	0.080070
0.333333	0.002296	0.000765	0.114216	0.082881
0.355556	0.002296	0.000816	0.117961	0.085599
0.377778	0.002296	0.000867	0.121592	0.088233
0.400000	0.002296	0.000918	0.125117	0.090791
0.422222	0.002296	0.000969	0.128545	0.093279
0.444444	0.002296	0.001020	0.131885	0.095702
0.466667	0.002296	0.001071	0.135142	0.098066
0.488889	0.002296	0.001122	0.138322	0.100374
0.511111	0.002296	0.001173	0.141431	0.102629
0.533333	0.002296	0.001224	0.144473	0.104837
0.555556	0.002296	0.001275	0.147452	0.106999
0.577778	0.002296	0.001326	0.150372	0.109118
0.600000	0.002296	0.001377	0.153236	0.111196
0.622222	0.002296	0.001428	0.156048	0.113237
0.644444	0.002296	0.001479	0.158810	0.115241
0.666667	0.002296	0.001530	0.161525	0.117211
0.688889	0.002296	0.001581	0.164195	0.119149
0.711111	0.002296	0.001632	0.166823	0.121055
0.733333	0.002296	0.001684	0.169409	0.122932
0.755556	0.002296	0.001735	0.171957	0.124781
0.777778	0.002296	0.001786	0.174467	0.126602
0.800000	0.002296	0.001837	0.176942	0.128398
0.822222	0.002296	0.001888	0.179383	0.130169
0.844444	0.002296	0.001939	0.181791	0.131917
0.866667	0.002296	0.001990	0.184167	0.133641
0.888889	0.002296	0.002041	0.186513	0.135344
0.911111	0.002296	0.002092	0.188830	0.137025
0.933333	0.002296	0.002143	0.191119	0.138686
0.955556	0.002296	0.002194	0.193381	0.140327
0.977778	0.002296	0.002245	0.195617	0.141950
1.000000	0.002296	0.002296	0.197827	0.143554
1.022222	0.002296	0.002347	0.200013	0.145140
1.044444	0.002296	0.002398	0.202176	0.146709
1.066667	0.002296	0.002449	0.204315	0.148262
1.088889	0.002296	0.002500	0.206432	0.149798
1.111111	0.002296	0.002551	0.208528	0.151319
1.133333	0.002296	0.002602	0.210603	0.152825
1.155556	0.002296	0.002653	0.212658	0.154316
1.177778	0.002296	0.002704	0.214693	0.155792
1.200000	0.002296	0.002755	0.216709	0.157255
1.222222	0.002296	0.002806	0.218706	0.158705
1.244444	0.002296	0.002857	0.220686	0.160141
1.266667	0.002296	0.002908	0.222647	0.161564
1.288889	0.002296	0.002959	0.224592	0.162975
1.311111	0.002296	0.003010	0.226520	0.164374
1.333333	0.002296	0.003061	0.228431	0.165762
1.355556	0.002296	0.003112	0.230327	0.167137
1.377778	0.002296	0.003163	0.232207	0.168502
1.400000	0.002296	0.003214	0.234072	0.169855
1.422222	0.002296	0.003265	0.235923	0.171198
1.444444	0.002296	0.003316	0.237759	0.172530
1.466667	0.002296	0.003367	0.239581	0.173852
1.488889	0.002296	0.003418	0.241389	0.175164
1.511111	0.002296	0.003469	0.255616	0.188899
1.533333	0.002296	0.003520	0.309505	0.242299
1.555556	0.002296	0.003571	0.385463	0.317772
1.577778	0.002296	0.003622	0.477914	0.409742
1.600000	0.002296	0.003673	0.583754	0.515103
1.622222	0.002296	0.003724	0.700606	0.631480
1.644444	0.002296	0.003775	0.826329	0.756730
1.666667	0.002296	0.003826	0.958826	0.888759
1.688889	0.002296	0.003877	1.095972	1.025440
1.711111	0.002296	0.003928	1.235595	1.164600
1.733333	0.002296	0.003979	1.375487	1.304032
1.755556	0.002296	0.004030	1.513445	1.441534
1.777778	0.002296	0.004081	1.647321	1.574956
1.800000	0.002296	0.004132	1.775085	1.702269
1.822222	0.002296	0.004183	1.894901	1.821637
1.844444	0.002296	0.004234	2.005208	1.931499
1.866667	0.002296	0.004285	2.104815	2.030663
1.888889	0.002296	0.004336	2.192993	2.118401
1.911111	0.002296	0.004387	2.269582	2.194553
1.933333	0.002296	0.004438	2.335104	2.259639
1.955556	0.002296	0.004489	2.390871	2.314974
1.977778	0.002296	0.004540	2.439115	2.362788
2.000000	0.002296	0.004591	2.483105	2.406350

Figure D3 – Pioneer Frontage Calculations
WWHM Report

WWHM2012

PROJECT REPORT

06-171 East Town Crossing - Pioneer
Frontage Stormwater Calculations
12-7-2021

General Model Information

Project Name:	ET-P
Site Name:	ET-P
Site Address:	
City:	
Report Date:	12/7/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	0.343985
Pervious Total	0.343985
Impervious Land Use	acre
ROADS FLAT	0.277655
Impervious Total	0.277655
Basin Total	0.62164

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.018797
Pervious Total	0.018797
Impervious Land Use	acre
ROADS FLAT	0.519408
SIDEWALKS FLAT	0.083435
Impervious Total	0.602843
Basin Total	0.62164

Element Flows To:

Surface	Interflow	Groundwater
Flow Splitter 1	Flow Splitter 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

What is this describing?
[Storm Report; Fig. D3]

Flow Splitter 1
Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 2 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Control Structure Splitter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Primary(cfs)**	**Secondary(cfs)**
0.000	0.002	0.000	0.000	0.000
0.022	0.002	0.000	0.029	0.021
0.044	0.002	0.000	0.041	0.030
0.066	0.002	0.000	0.051	0.037
0.088	0.002	0.000	0.059	0.042
0.111	0.002	0.000	0.065	0.047
0.133	0.002	0.000	0.072	0.052
0.155	0.002	0.000	0.078	0.056
0.177	0.002	0.000	0.083	0.060
0.200	0.002	0.000	0.088	0.064
0.222	0.002	0.000	0.093	0.067
0.244	0.002	0.000	0.097	0.071
0.266	0.002	0.000	0.102	0.074
0.288	0.002	0.000	0.106	0.077
0.311	0.002	0.000	0.110	0.080
0.333	0.002	0.000	0.114	0.082
0.355	0.002	0.000	0.118	0.085
0.377	0.002	0.000	0.121	0.088
0.400	0.002	0.000	0.125	0.090
0.422	0.002	0.001	0.128	0.093
0.444	0.002	0.001	0.131	0.095
0.466	0.002	0.001	0.135	0.098
0.488	0.002	0.001	0.138	0.100
0.511	0.002	0.001	0.141	0.102
0.533	0.002	0.001	0.144	0.104
0.555	0.002	0.001	0.147	0.107
0.577	0.002	0.001	0.150	0.109
0.600	0.002	0.001	0.153	0.111
0.622	0.002	0.001	0.156	0.113
0.644	0.002	0.001	0.158	0.115
0.666	0.002	0.001	0.161	0.117
0.688	0.002	0.001	0.164	0.119
0.711	0.002	0.001	0.166	0.121
0.733	0.002	0.001	0.169	0.122
0.755	0.002	0.001	0.172	0.124
0.777	0.002	0.001	0.174	0.126
0.800	0.002	0.001	0.176	0.128
0.822	0.002	0.001	0.179	0.130
0.844	0.002	0.001	0.181	0.131
0.866	0.002	0.002	0.184	0.133
0.888	0.002	0.002	0.186	0.135
0.911	0.002	0.002	0.188	0.137
0.933	0.002	0.002	0.191	0.138
0.955	0.002	0.002	0.193	0.140
0.977	0.002	0.002	0.195	0.141

1.000	0.002	0.002	0.197	0.143
1.022	0.002	0.002	0.200	0.145
1.044	0.002	0.002	0.202	0.146
1.066	0.002	0.002	0.204	0.148
1.088	0.002	0.002	0.206	0.149
1.111	0.002	0.002	0.208	0.151
1.133	0.002	0.002	0.210	0.152
1.155	0.002	0.002	0.212	0.154
1.177	0.002	0.002	0.214	0.155
1.200	0.002	0.002	0.216	0.157
1.222	0.002	0.002	0.218	0.158
1.244	0.002	0.002	0.220	0.160
1.266	0.002	0.002	0.222	0.161
1.288	0.002	0.003	0.224	0.163
1.311	0.002	0.003	0.226	0.164
1.333	0.002	0.003	0.228	0.165
1.355	0.002	0.003	0.230	0.167
1.377	0.002	0.003	0.232	0.168
1.400	0.002	0.003	0.234	0.169
1.422	0.002	0.003	0.235	0.171
1.444	0.002	0.003	0.237	0.172
1.466	0.002	0.003	0.239	0.173
1.488	0.002	0.003	0.241	0.175
1.511	0.002	0.003	0.255	0.188
1.533	0.002	0.003	0.309	0.242
1.555	0.002	0.003	0.385	0.317
1.577	0.002	0.003	0.477	0.409
1.600	0.002	0.003	0.583	0.515
1.622	0.002	0.003	0.700	0.631
1.644	0.002	0.003	0.826	0.756
1.666	0.002	0.003	0.958	0.888
1.688	0.002	0.003	1.096	1.025
1.711	0.002	0.003	1.235	1.164
1.733	0.002	0.004	1.375	1.304
1.755	0.002	0.004	1.513	1.441
1.777	0.002	0.004	1.647	1.575
1.800	0.002	0.004	1.775	1.702
1.822	0.002	0.004	1.894	1.821
1.844	0.002	0.004	2.005	1.931
1.866	0.002	0.004	2.104	2.030
1.888	0.002	0.004	2.193	2.118
1.911	0.002	0.004	2.269	2.194
1.933	0.002	0.004	2.335	2.259
1.955	0.002	0.004	2.390	2.315
1.977	0.002	0.004	2.439	2.362
2.000	0.002	0.004	2.483	2.406
2.022	0.002	0.004	2.557	2.480

Discharge Structure
Riser Height: 1.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 2.7 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2
Surface retention 1

Bioretention 1

Bottom Length:	134.00 ft.
Bottom Width:	30.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	Sand
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.85
Offset (in.):	1
Flow Through Underdrain (ac-ft.):	156.731
Total Outflow (ac-ft.):	160.318
Percent Through Underdrain:	97.76

Discharge Structure

Riser Height:	1.17 ft.	
Riser Diameter:	48 in.	
Notch Type:	Rectangular	
Notch Width:	0.500 ft.	
Notch Height:	0.500 ft.	
Orifice 1 Diameter:	0.3 in.	Elevation:0 ft.

Element Flows To:

Outlet 1	Outlet 2
Vault 1	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
64.250	0.0923	0.0000	0.0000	0.0000
64.299	0.0923	0.0020	0.0000	0.0000
64.347	0.0923	0.0041	0.0000	0.0000
64.396	0.0923	0.0061	0.0000	0.0000
64.444	0.0923	0.0082	0.0000	0.0000
64.493	0.0923	0.0102	0.0000	0.0000
64.541	0.0923	0.0120	0.0000	0.0000
64.590	0.0923	0.0138	0.0000	0.0000
64.639	0.0923	0.0156	0.0000	0.0000
64.687	0.0923	0.0174	0.0000	0.0000
64.736	0.0923	0.0192	0.0000	0.0000
64.784	0.0923	0.0210	0.0000	0.0000
64.833	0.0923	0.0228	0.0000	0.0000
64.881	0.0923	0.0246	0.0000	0.0000
64.930	0.0923	0.0264	0.0000	0.0000
64.979	0.0923	0.0282	0.0000	0.0000
65.027	0.0923	0.0300	0.0000	0.0000
65.076	0.0923	0.0318	0.0000	0.0000
65.124	0.0923	0.0336	0.0000	0.0000
65.173	0.0923	0.0354	0.0000	0.0000
65.221	0.0923	0.0371	0.0000	0.0000
65.270	0.0923	0.0389	0.0000	0.0000
65.319	0.0923	0.0407	0.0000	0.0000
65.367	0.0923	0.0425	0.0000	0.0000
65.416	0.0923	0.0443	0.0000	0.0000
65.464	0.0923	0.0461	0.0000	0.0000
65.513	0.0923	0.0479	0.0000	0.0000

65.561	0.0923	0.0497	0.0000	0.0000
65.610	0.0923	0.0515	0.0000	0.0000
65.659	0.0923	0.0533	0.0000	0.0000
65.707	0.0923	0.0551	0.0000	0.0000
65.756	0.0923	0.0569	0.0000	0.0000
65.804	0.0923	0.0587	0.0000	0.0000
65.853	0.0923	0.0605	0.0000	0.0000
65.901	0.0923	0.0622	0.0000	0.0000
65.950	0.0923	0.0640	0.0000	0.0000
65.999	0.0923	0.0658	0.0000	0.0000
66.047	0.0923	0.0677	0.0000	0.0000
66.096	0.0923	0.0696	0.0000	0.0000
66.144	0.0923	0.0714	0.0000	0.0000
66.193	0.0923	0.0733	0.0000	0.0000
66.241	0.0923	0.0751	0.0000	0.0000
66.290	0.0923	0.0770	0.0000	0.0000
66.339	0.0923	0.0789	0.0000	0.0000
66.387	0.0923	0.0807	0.0000	0.0000
66.436	0.0923	0.0826	0.0000	0.0000
66.484	0.0923	0.0844	0.0000	0.0000
66.533	0.0923	0.0863	0.0000	0.0000
66.581	0.0923	0.0882	0.0000	0.0000
66.630	0.0923	0.0900	0.0000	0.0000
66.679	0.0923	0.0919	0.0000	0.0000
66.727	0.0923	0.0937	0.0000	0.0000
66.776	0.0923	0.0956	0.0000	0.0000
66.824	0.0923	0.0975	0.0000	0.0000
66.873	0.0923	0.0993	0.0000	0.0000
66.921	0.0923	0.1012	0.0000	0.0000
66.970	0.0923	0.1030	0.0000	0.0000
67.000	0.0923	0.1042	0.0000	0.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.7500	0.0923	0.1042	0.0000	0.0320	0.0000
2.7986	0.0923	0.1087	0.0000	0.0320	0.0000
2.8471	0.0923	0.1132	0.0000	0.0320	0.0000
2.8957	0.0923	0.1176	0.0000	0.0320	0.0000
2.9443	0.0923	0.1221	0.0000	0.0320	0.0000
2.9929	0.0923	0.1266	0.0000	0.0320	0.0000
3.0414	0.0923	0.1311	0.0000	0.0320	0.0000
3.0900	0.0923	0.1356	0.0000	0.0320	0.0000
3.1386	0.0923	0.1400	0.0000	0.0320	0.0000
3.1871	0.0923	0.1445	0.0000	0.0320	0.0000
3.2357	0.0923	0.1490	0.0000	0.0320	0.0000
3.2843	0.0923	0.1535	0.0000	0.0320	0.0000
3.3329	0.0923	0.1580	0.0000	0.0320	0.0000
3.3814	0.0923	0.1625	0.0000	0.0320	0.0000
3.4300	0.0923	0.1669	0.0015	0.0320	0.0000
3.4786	0.0923	0.1714	0.0022	0.0320	0.0000
3.5271	0.0923	0.1759	0.0032	0.0320	0.0000
3.5757	0.0923	0.1804	0.0037	0.0320	0.0000
3.6243	0.0923	0.1849	0.0045	0.0320	0.0000
3.6729	0.0923	0.1894	0.0049	0.0320	0.0000
3.7214	0.0923	0.1938	0.0055	0.0320	0.0000
3.7700	0.0923	0.1983	0.0058	0.0320	0.0000
3.8186	0.0923	0.2028	0.0063	0.0320	0.0000
3.8671	0.0923	0.2073	0.0066	0.0320	0.0000

3.9157	0.0923	0.2118	0.0071	0.0320	0.0000
3.9643	0.0923	0.2162	0.0073	0.0320	0.0000
4.0129	0.0923	0.2207	0.0077	0.0320	0.0000
4.0614	0.0923	0.2252	0.0079	0.0320	0.0000
4.1100	0.0923	0.2297	0.0083	0.0320	0.0000
4.1586	0.0923	0.2342	0.0085	0.0320	0.0000
4.2071	0.0923	0.2387	0.0089	0.0320	0.0000
4.2557	0.0923	0.2431	0.0090	0.0320	0.0000
4.3043	0.0923	0.2476	0.0094	0.0320	0.0000
4.3529	0.0923	0.2521	0.0095	0.0320	0.0000
4.4014	0.0923	0.2566	0.0099	0.0320	0.0000
4.4200	0.0923	0.2583	0.0100	0.0320	0.0000

Surface retention 1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 1

Vault is connected to POC, but it appears that the vault is discharging back into the flow splitter per the Bioswale Detail Sheet. [Storm Report; Fig. D3]

Vault 1

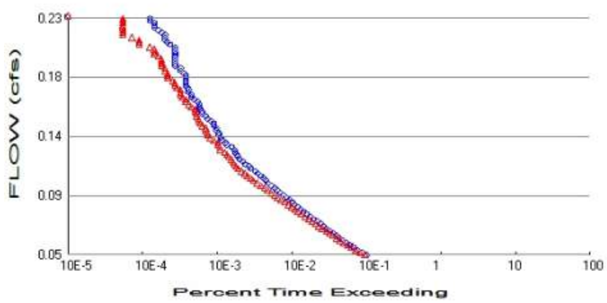
Width: 5 ft.
Length: 5 ft.
Depth: 3 ft.
Discharge Structure
Riser Height: 1.75 ft.
Riser Diameter: 10 in.
Orifice 1 Diameter: 0.5 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

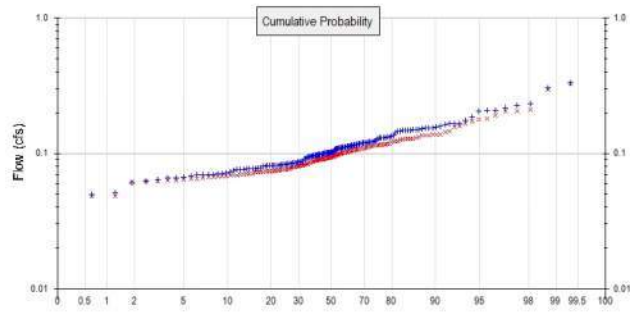
Vault Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.000574	0.000000	0.000	0.000
0.0333	0.000574	0.000019	0.001	0.000
0.0667	0.000574	0.000038	0.001	0.000
0.1000	0.000574	0.000057	0.002	0.000
0.1333	0.000574	0.000077	0.002	0.000
0.1667	0.000574	0.000096	0.002	0.000
0.2000	0.000574	0.000115	0.003	0.000
0.2333	0.000574	0.000134	0.003	0.000
0.2667	0.000574	0.000153	0.003	0.000
0.3000	0.000574	0.000172	0.003	0.000
0.3333	0.000574	0.000191	0.003	0.000
0.3667	0.000574	0.000210	0.004	0.000
0.4000	0.000574	0.000230	0.004	0.000
0.4333	0.000574	0.000249	0.004	0.000
0.4667	0.000574	0.000268	0.004	0.000
0.5000	0.000574	0.000287	0.004	0.000
0.5333	0.000574	0.000306	0.005	0.000
0.5667	0.000574	0.000325	0.005	0.000
0.6000	0.000574	0.000344	0.005	0.000
0.6333	0.000574	0.000363	0.005	0.000
0.6667	0.000574	0.000383	0.005	0.000
0.7000	0.000574	0.000402	0.005	0.000
0.7333	0.000574	0.000421	0.005	0.000
0.7667	0.000574	0.000440	0.005	0.000
0.8000	0.000574	0.000459	0.006	0.000
0.8333	0.000574	0.000478	0.006	0.000
0.8667	0.000574	0.000497	0.006	0.000
0.9000	0.000574	0.000517	0.006	0.000
0.9333	0.000574	0.000536	0.006	0.000
0.9667	0.000574	0.000555	0.006	0.000
1.0000	0.000574	0.000574	0.006	0.000
1.0333	0.000574	0.000593	0.006	0.000
1.0667	0.000574	0.000612	0.007	0.000
1.1000	0.000574	0.000631	0.007	0.000
1.1333	0.000574	0.000650	0.007	0.000
1.1667	0.000574	0.000670	0.007	0.000
1.2000	0.000574	0.000689	0.007	0.000
1.2333	0.000574	0.000708	0.007	0.000
1.2667	0.000574	0.000727	0.007	0.000
1.3000	0.000574	0.000746	0.007	0.000
1.3333	0.000574	0.000765	0.007	0.000
1.3667	0.000574	0.000784	0.007	0.000

1.4000	0.000574	0.000803	0.008	0.000
1.4333	0.000574	0.000823	0.008	0.000
1.4667	0.000574	0.000842	0.008	0.000
1.5000	0.000574	0.000861	0.008	0.000
1.5333	0.000574	0.000880	0.008	0.000
1.5667	0.000574	0.000899	0.008	0.000
1.6000	0.000574	0.000918	0.008	0.000
1.6333	0.000574	0.000937	0.008	0.000
1.6667	0.000574	0.000957	0.008	0.000
1.7000	0.000574	0.000976	0.008	0.000
1.7333	0.000574	0.000995	0.008	0.000
1.7667	0.000574	0.001014	0.028	0.000
1.8000	0.000574	0.001033	0.107	0.000
1.8333	0.000574	0.001052	0.220	0.000
1.8667	0.000574	0.001071	0.356	0.000
1.9000	0.000574	0.001090	0.506	0.000
1.9333	0.000574	0.001110	0.663	0.000
1.9667	0.000574	0.001129	0.819	0.000
2.0000	0.000574	0.001148	0.966	0.000
2.0333	0.000574	0.001167	1.097	0.000
2.0667	0.000574	0.001186	1.206	0.000
2.1000	0.000574	0.001205	1.292	0.000
2.1333	0.000574	0.001224	1.356	0.000
2.1667	0.000574	0.001243	1.421	0.000
2.2000	0.000574	0.001263	1.477	0.000
2.2333	0.000574	0.001282	1.530	0.000
2.2667	0.000574	0.001301	1.582	0.000
2.3000	0.000574	0.001320	1.632	0.000
2.3333	0.000574	0.001339	1.680	0.000
2.3667	0.000574	0.001358	1.728	0.000
2.4000	0.000574	0.001377	1.773	0.000
2.4333	0.000574	0.001397	1.818	0.000
2.4667	0.000574	0.001416	1.862	0.000
2.5000	0.000574	0.001435	1.904	0.000
2.5333	0.000574	0.001454	1.946	0.000
2.5667	0.000574	0.001473	1.987	0.000
2.6000	0.000574	0.001492	2.027	0.000
2.6333	0.000574	0.001511	2.066	0.000
2.6667	0.000574	0.001530	2.105	0.000
2.7000	0.000574	0.001550	2.143	0.000
2.7333	0.000574	0.001569	2.180	0.000
2.7667	0.000574	0.001588	2.216	0.000
2.8000	0.000574	0.001607	2.252	0.000
2.8333	0.000574	0.001626	2.288	0.000
2.8667	0.000574	0.001645	2.322	0.000
2.9000	0.000574	0.001664	2.357	0.000
2.9333	0.000574	0.001684	2.390	0.000
2.9667	0.000574	0.001703	2.424	0.000
3.0000	0.000574	0.001722	2.457	0.000
3.0333	0.000574	0.001741	2.489	0.000
3.0667	0.000000	0.000000	2.521	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.343985
Total Impervious Area: 0.277655

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.018797
Total Impervious Area: 0.602843

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.102557
5 year	0.137516
10 year	0.162903
25 year	0.197626
50 year	0.225477
100 year	0.255083

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.093591
5 year	0.12452
10 year	0.147303
25 year	0.178823
50 year	0.204365
100 year	0.231745

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.118	0.103
1903	0.131	0.116
1904	0.157	0.128
1905	0.066	0.071
1906	0.075	0.070
1907	0.109	0.097
1908	0.085	0.076
1909	0.100	0.094
1910	0.103	0.098
1911	0.109	0.095

1912	0.207	0.166
1913	0.077	0.074
1914	0.332	0.329
1915	0.070	0.071
1916	0.125	0.118
1917	0.050	0.048
1918	0.100	0.090
1919	0.066	0.063
1920	0.086	0.080
1921	0.078	0.073
1922	0.117	0.099
1923	0.082	0.074
1924	0.145	0.124
1925	0.062	0.062
1926	0.118	0.105
1927	0.101	0.091
1928	0.077	0.071
1929	0.142	0.126
1930	0.150	0.137
1931	0.075	0.068
1932	0.081	0.080
1933	0.081	0.077
1934	0.135	0.113
1935	0.068	0.064
1936	0.093	0.088
1937	0.121	0.104
1938	0.069	0.067
1939	0.084	0.082
1940	0.151	0.137
1941	0.165	0.145
1942	0.117	0.108
1943	0.110	0.102
1944	0.159	0.190
1945	0.120	0.108
1946	0.098	0.091
1947	0.073	0.068
1948	0.100	0.095
1949	0.154	0.136
1950	0.085	0.072
1951	0.131	0.115
1952	0.167	0.147
1953	0.153	0.128
1954	0.085	0.077
1955	0.076	0.070
1956	0.070	0.066
1957	0.081	0.076
1958	0.112	0.100
1959	0.112	0.110
1960	0.081	0.073
1961	0.226	0.205
1962	0.098	0.090
1963	0.072	0.065
1964	0.208	0.181
1965	0.101	0.092
1966	0.081	0.075
1967	0.116	0.102
1968	0.094	0.080
1969	0.087	0.082

1970	0.102	0.090
1971	0.101	0.089
1972	0.304	0.298
1973	0.176	0.156
1974	0.130	0.116
1975	0.147	0.127
1976	0.148	0.122
1977	0.061	0.062
1978	0.114	0.105
1979	0.111	0.100
1980	0.110	0.098
1981	0.101	0.093
1982	0.081	0.078
1983	0.115	0.107
1984	0.112	0.101
1985	0.130	0.119
1986	0.070	0.065
1987	0.113	0.102
1988	0.070	0.068
1989	0.066	0.062
1990	0.087	0.075
1991	0.121	0.117
1992	0.116	0.107
1993	0.129	0.115
1994	0.097	0.090
1995	0.071	0.069
1996	0.098	0.102
1997	0.086	0.081
1998	0.106	0.092
1999	0.113	0.106
2000	0.095	0.091
2001	0.077	0.066
2002	0.149	0.128
2003	0.083	0.083
2004	0.120	0.110
2005	0.234	0.211
2006	0.108	0.094
2007	0.121	0.107
2008	0.100	0.088
2009	0.075	0.069
2010	0.097	0.098
2011	0.101	0.086
2012	0.096	0.088
2013	0.091	0.081
2014	0.088	0.081
2015	0.149	0.128
2016	0.095	0.088
2017	0.146	0.135
2018	0.106	0.116
2019	0.151	0.205
2020	0.112	0.101
2021	0.096	0.092
2022	0.149	0.123
2023	0.186	0.159
2024	0.217	0.174
2025	0.098	0.084
2026	0.110	0.108
2027	0.120	0.112

2028	0.047	0.043
2029	0.083	0.074
2030	0.163	0.138
2031	0.051	0.048
2032	0.081	0.075
2033	0.103	0.089
2034	0.078	0.068
2035	0.114	0.099
2036	0.081	0.074
2037	0.108	0.106
2038	0.111	0.095
2039	0.205	0.178
2040	0.083	0.079
2041	0.103	0.092
2042	0.120	0.132
2043	0.131	0.112
2044	0.091	0.085
2045	0.077	0.072
2046	0.084	0.074
2047	0.100	0.091
2048	0.082	0.075
2049	0.121	0.113
2050	0.095	0.087
2051	0.134	0.121
2052	0.098	0.091
2053	0.083	0.075
2054	0.165	0.138
2055	0.094	0.084
2056	0.131	0.115
2057	0.064	0.063
2058	0.123	0.114
2059	0.155	0.130

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3316	0.3287
2	0.3042	0.2978
3	0.2336	0.2105
4	0.2257	0.2054
5	0.2175	0.2049
6	0.2083	0.1898
7	0.2074	0.1808
8	0.2052	0.1781
9	0.1863	0.1737
10	0.1757	0.1659
11	0.1665	0.1592
12	0.1650	0.1560
13	0.1646	0.1468
14	0.1630	0.1447
15	0.1588	0.1375
16	0.1572	0.1375
17	0.1546	0.1368
18	0.1539	0.1366
19	0.1532	0.1364
20	0.1512	0.1355
21	0.1506	0.1321
22	0.1504	0.1304

23	0.1495	0.1281
24	0.1486	0.1280
25	0.1485	0.1278
26	0.1480	0.1278
27	0.1471	0.1273
28	0.1457	0.1264
29	0.1449	0.1236
30	0.1423	0.1226
31	0.1349	0.1222
32	0.1342	0.1208
33	0.1313	0.1185
34	0.1312	0.1175
35	0.1308	0.1169
36	0.1306	0.1164
37	0.1303	0.1160
38	0.1300	0.1158
39	0.1288	0.1150
40	0.1252	0.1148
41	0.1226	0.1146
42	0.1214	0.1143
43	0.1213	0.1132
44	0.1208	0.1128
45	0.1205	0.1121
46	0.1203	0.1118
47	0.1199	0.1101
48	0.1199	0.1097
49	0.1198	0.1084
50	0.1179	0.1082
51	0.1176	0.1079
52	0.1170	0.1072
53	0.1169	0.1072
54	0.1163	0.1067
55	0.1155	0.1060
56	0.1148	0.1057
57	0.1144	0.1053
58	0.1140	0.1049
59	0.1130	0.1044
60	0.1130	0.1031
61	0.1122	0.1024
62	0.1119	0.1021
63	0.1118	0.1019
64	0.1116	0.1016
65	0.1109	0.1015
66	0.1107	0.1012
67	0.1103	0.1004
68	0.1103	0.1000
69	0.1102	0.0988
70	0.1090	0.0986
71	0.1089	0.0983
72	0.1082	0.0977
73	0.1076	0.0976
74	0.1065	0.0970
75	0.1063	0.0950
76	0.1028	0.0947
77	0.1026	0.0947
78	0.1025	0.0944
79	0.1016	0.0943
80	0.1014	0.0934

81	0.1014	0.0924
82	0.1013	0.0922
83	0.1007	0.0921
84	0.1007	0.0920
85	0.1003	0.0913
86	0.1002	0.0908
87	0.0996	0.0907
88	0.0996	0.0907
89	0.0996	0.0906
90	0.0984	0.0902
91	0.0980	0.0897
92	0.0980	0.0897
93	0.0978	0.0896
94	0.0976	0.0895
95	0.0971	0.0888
96	0.0967	0.0884
97	0.0964	0.0881
98	0.0961	0.0879
99	0.0953	0.0878
100	0.0950	0.0866
101	0.0946	0.0865
102	0.0941	0.0855
103	0.0935	0.0837
104	0.0928	0.0837
105	0.0914	0.0828
106	0.0908	0.0820
107	0.0876	0.0817
108	0.0873	0.0810
109	0.0866	0.0809
110	0.0862	0.0806
111	0.0857	0.0802
112	0.0850	0.0801
113	0.0849	0.0796
114	0.0848	0.0789
115	0.0837	0.0781
116	0.0836	0.0773
117	0.0833	0.0769
118	0.0830	0.0761
119	0.0827	0.0758
120	0.0826	0.0755
121	0.0821	0.0755
122	0.0818	0.0753
123	0.0814	0.0752
124	0.0814	0.0751
125	0.0813	0.0742
126	0.0813	0.0741
127	0.0812	0.0741
128	0.0812	0.0740
129	0.0808	0.0738
130	0.0805	0.0731
131	0.0781	0.0726
132	0.0780	0.0723
133	0.0774	0.0723
134	0.0774	0.0711
135	0.0768	0.0711
136	0.0767	0.0710
137	0.0758	0.0700
138	0.0755	0.0698

139	0.0754	0.0690
140	0.0747	0.0688
141	0.0727	0.0682
142	0.0720	0.0681
143	0.0706	0.0680
144	0.0702	0.0678
145	0.0701	0.0671
146	0.0701	0.0663
147	0.0695	0.0655
148	0.0692	0.0653
149	0.0680	0.0646
150	0.0665	0.0636
151	0.0659	0.0634
152	0.0659	0.0629
153	0.0644	0.0622
154	0.0621	0.0620
155	0.0607	0.0617
156	0.0508	0.0483
157	0.0496	0.0480
158	0.0466	0.0430

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0513	5533	5300	95	Pass
0.0530	4850	4574	94	Pass
0.0548	4248	3992	93	Pass
0.0566	3747	3508	93	Pass
0.0583	3378	3120	92	Pass
0.0601	2994	2757	92	Pass
0.0618	2688	2484	92	Pass
0.0636	2428	2217	91	Pass
0.0654	2193	1959	89	Pass
0.0671	1980	1769	89	Pass
0.0689	1766	1608	91	Pass
0.0706	1610	1422	88	Pass
0.0724	1466	1283	87	Pass
0.0742	1339	1164	86	Pass
0.0759	1209	1037	85	Pass
0.0777	1085	929	85	Pass
0.0794	982	831	84	Pass
0.0812	881	740	83	Pass
0.0830	796	669	84	Pass
0.0847	729	605	82	Pass
0.0865	668	559	83	Pass
0.0882	616	497	80	Pass
0.0900	562	446	79	Pass
0.0917	518	396	76	Pass
0.0935	470	358	76	Pass
0.0953	428	325	75	Pass
0.0970	391	294	75	Pass
0.0988	355	262	73	Pass
0.1005	329	239	72	Pass
0.1023	299	214	71	Pass
0.1041	265	193	72	Pass
0.1058	250	170	68	Pass
0.1076	234	156	66	Pass
0.1093	214	140	65	Pass
0.1111	194	131	67	Pass
0.1129	179	117	65	Pass
0.1146	157	106	67	Pass
0.1164	148	98	66	Pass
0.1181	131	94	71	Pass
0.1199	123	91	73	Pass
0.1217	110	86	78	Pass
0.1234	106	79	74	Pass
0.1252	101	75	74	Pass
0.1269	96	70	72	Pass
0.1287	94	61	64	Pass
0.1305	87	60	68	Pass
0.1322	75	57	76	Pass
0.1340	71	57	80	Pass
0.1357	65	50	76	Pass
0.1375	63	45	71	Pass
0.1393	59	42	71	Pass
0.1410	58	41	70	Pass
0.1428	55	39	70	Pass

0.1445	55	39	70	Pass
0.1463	51	35	68	Pass
0.1481	50	33	66	Pass
0.1498	46	32	69	Pass
0.1516	41	31	75	Pass
0.1533	39	29	74	Pass
0.1551	35	29	82	Pass
0.1569	35	28	80	Pass
0.1586	33	28	84	Pass
0.1604	32	25	78	Pass
0.1621	32	23	71	Pass
0.1639	30	21	70	Pass
0.1657	27	21	77	Pass
0.1674	25	19	76	Pass
0.1692	25	18	72	Pass
0.1709	23	18	78	Pass
0.1727	23	18	78	Pass
0.1744	22	16	72	Pass
0.1762	21	15	71	Pass
0.1780	21	15	71	Pass
0.1797	21	14	66	Pass
0.1815	21	12	57	Pass
0.1832	21	12	57	Pass
0.1850	20	12	60	Pass
0.1868	18	11	61	Pass
0.1885	18	11	61	Pass
0.1903	15	10	66	Pass
0.1920	15	10	66	Pass
0.1938	15	10	66	Pass
0.1956	15	10	66	Pass
0.1973	15	9	60	Pass
0.1991	15	8	53	Pass
0.2008	15	8	53	Pass
0.2026	15	8	53	Pass
0.2044	15	7	46	Pass
0.2061	13	5	38	Pass
0.2079	12	5	41	Pass
0.2096	11	5	45	Pass
0.2114	11	4	36	Pass
0.2132	11	3	27	Pass
0.2149	10	3	30	Pass
0.2167	9	3	33	Pass
0.2184	8	3	37	Pass
0.2202	8	3	37	Pass
0.2220	8	3	37	Pass
0.2237	7	3	42	Pass
0.2255	7	3	42	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0366 acre-feet
On-line facility target flow:	0.0419 cfs.
Adjusted for 15 min:	0.0419 cfs.
Off-line facility target flow:	0.024 cfs.
Adjusted for 15 min:	0.024 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Flow Splitter 1 POC	☐	233.29			☐	42.06			
Vault 1 POC	☐	145.88			☐	0.00			
retention 1	☐	145.89			☐	0.00			
Flow Splitter 1 POC	☐	233.29			☐	42.06			
Total Volume Infiltrated		758.36	0.00	0.00		25.88	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

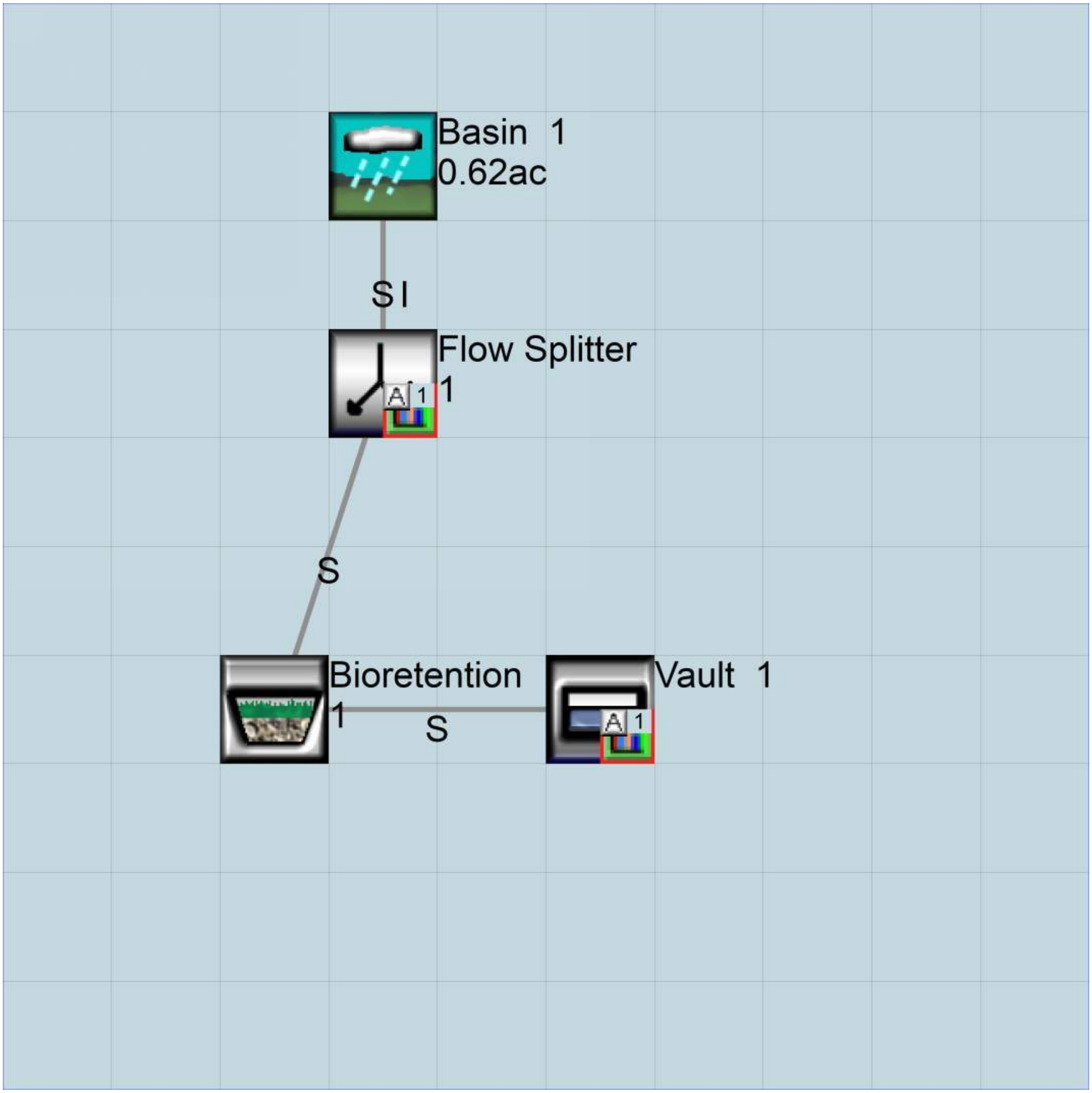
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   ET-P.wdm
MESSU      25   PreET-P.MES
           27   PreET-P.L61
           28   PreET-P.L62
           30   POCET-P1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      IMPLND       1
      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            ***
   11     C, Forest, 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 ***
   11         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  *********
   11         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 ***
   11         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
   11              0       4.5      0.08       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
   11              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11            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
   11              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          ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
```

```
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1            0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                    0.343985     COPY   501     12
PERLND  11                    0.343985     COPY   501     13
IMPLND   1                    0.277655     COPY   501     15

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

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



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

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

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

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

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

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

SPEC-ACTIONS
```

```
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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   ET-P.wdm
MESSU      25   MitET-P.MES
           27   MitET-P.L61
           28   MitET-P.L62
           30   POCET-P1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       1
      IMPLND       8
      RCHRES       1
      RCHRES       2
      RCHRES       3
      RCHRES       4
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Flow Splitter  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           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2          ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1
```

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

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

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

END IMPLND

SCHEMATIC
<-Source->                    <--Area-->     <-Target->   MBLK   ***
<Name>   #                    <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   7                        0.0188     RCHRES   1      2
PERLND   7                        0.0188     RCHRES   1      3
IMPLND   1                        0.5194     RCHRES   1      5
IMPLND   8                        0.0834     RCHRES   1      5

******Routing******
PERLND   7                      0.018797     COPY     1     12
IMPLND   1                      0.519408     COPY     1     15
IMPLND   8                      0.083435     COPY     1     15
PERLND   7                      0.018797     COPY     1     13
RCHRES   1                             1     RCHRES   2      7
RCHRES   3                             1     RCHRES   4      6
RCHRES   3                                   COPY     1     16
RCHRES   2                             1     RCHRES   4      7
RCHRES   2                                   COPY     1     17
RCHRES   2                             1     RCHRES   3      8
RCHRES   1                             1     COPY   501     18
RCHRES   1                             1     COPY   601     18
RCHRES   4                             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     Flow Splitter  1-005    2    1    1    1   28    0    1
    2     Surface retentio-007    2    1    1    1   28    0    1
    3     Bioretention  1         1    1    1    1   28    0    1
    4     Vault  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
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    3        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    4        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
    2             2      0.01       0.0     64.25       0.0       0.0
    3             3      0.03       0.0     64.25       0.0       0.0
    4             4      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
    2           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3           0          4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4           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
   90    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)     (cfs)     (cfs)  (ft/sec)    (Minutes)***
  0.000000  0.002296  0.000000  0.000000  0.000000
  0.022222  0.002296  0.000051  0.029490  0.021400
  0.044444  0.002296  0.000102  0.041706  0.030264
  0.066667  0.002296  0.000153  0.051079  0.037065
  0.088889  0.002296  0.000204  0.058981  0.042799
  0.111111  0.002296  0.000255  0.065942  0.047851
  0.133333  0.002296  0.000306  0.072236  0.052418
  0.155556  0.002296  0.000357  0.078024  0.056618
  0.177778  0.002296  0.000408  0.083411  0.060528
  0.200000  0.002296  0.000459  0.088471  0.064199
  0.222222  0.002296  0.000510  0.093257  0.067672
  0.244444  0.002296  0.000561  0.097808  0.070975
  0.266667  0.002296  0.000612  0.102158  0.074131
```

0.288889	0.002296	0.000663	0.106329	0.077158
0.311111	0.002296	0.000714	0.110343	0.080070
0.333333	0.002296	0.000765	0.114216	0.082881
0.355556	0.002296	0.000816	0.117961	0.085599
0.377778	0.002296	0.000867	0.121592	0.088233
0.400000	0.002296	0.000918	0.125117	0.090791
0.422222	0.002296	0.000969	0.128545	0.093279
0.444444	0.002296	0.001020	0.131885	0.095702
0.466667	0.002296	0.001071	0.135142	0.098066
0.488889	0.002296	0.001122	0.138322	0.100374
0.511111	0.002296	0.001173	0.141431	0.102629
0.533333	0.002296	0.001224	0.144473	0.104837
0.555556	0.002296	0.001275	0.147452	0.106999
0.577778	0.002296	0.001326	0.150372	0.109118
0.600000	0.002296	0.001377	0.153236	0.111196
0.622222	0.002296	0.001428	0.156048	0.113237
0.644444	0.002296	0.001479	0.158810	0.115241
0.666667	0.002296	0.001530	0.161525	0.117211
0.688889	0.002296	0.001581	0.164195	0.119149
0.711111	0.002296	0.001632	0.166823	0.121055
0.733333	0.002296	0.001684	0.169409	0.122932
0.755556	0.002296	0.001735	0.171957	0.124781
0.777778	0.002296	0.001786	0.174467	0.126602
0.800000	0.002296	0.001837	0.176942	0.128398
0.822222	0.002296	0.001888	0.179383	0.130169
0.844444	0.002296	0.001939	0.181791	0.131917
0.866667	0.002296	0.001990	0.184167	0.133641
0.888889	0.002296	0.002041	0.186513	0.135344
0.911111	0.002296	0.002092	0.188830	0.137025
0.933333	0.002296	0.002143	0.191119	0.138686
0.955556	0.002296	0.002194	0.193381	0.140327
0.977778	0.002296	0.002245	0.195617	0.141950
1.000000	0.002296	0.002296	0.197827	0.143554
1.022222	0.002296	0.002347	0.200013	0.145140
1.044444	0.002296	0.002398	0.202176	0.146709
1.066667	0.002296	0.002449	0.204315	0.148262
1.088889	0.002296	0.002500	0.206432	0.149798
1.111111	0.002296	0.002551	0.208528	0.151319
1.133333	0.002296	0.002602	0.210603	0.152825
1.155556	0.002296	0.002653	0.212658	0.154316
1.177778	0.002296	0.002704	0.214693	0.155792
1.200000	0.002296	0.002755	0.216709	0.157255
1.222222	0.002296	0.002806	0.218706	0.158705
1.244444	0.002296	0.002857	0.220686	0.160141
1.266667	0.002296	0.002908	0.222647	0.161564
1.288889	0.002296	0.002959	0.224592	0.162975
1.311111	0.002296	0.003010	0.226520	0.164374
1.333333	0.002296	0.003061	0.228431	0.165762
1.355556	0.002296	0.003112	0.230327	0.167137
1.377778	0.002296	0.003163	0.232207	0.168502
1.400000	0.002296	0.003214	0.234072	0.169855
1.422222	0.002296	0.003265	0.235923	0.171198
1.444444	0.002296	0.003316	0.237759	0.172530
1.466667	0.002296	0.003367	0.239581	0.173852
1.488889	0.002296	0.003418	0.241389	0.175164
1.511111	0.002296	0.003469	0.255616	0.188899
1.533333	0.002296	0.003520	0.309505	0.242299
1.555556	0.002296	0.003571	0.385463	0.317772
1.577778	0.002296	0.003622	0.477914	0.409742
1.600000	0.002296	0.003673	0.583754	0.515103
1.622222	0.002296	0.003724	0.700606	0.631480
1.644444	0.002296	0.003775	0.826329	0.756730
1.666667	0.002296	0.003826	0.958826	0.888759
1.688889	0.002296	0.003877	1.095972	1.025440
1.711111	0.002296	0.003928	1.235595	1.164600
1.733333	0.002296	0.003979	1.375487	1.304032
1.755556	0.002296	0.004030	1.513445	1.441534
1.777778	0.002296	0.004081	1.647321	1.574956
1.800000	0.002296	0.004132	1.775085	1.702269
1.822222	0.002296	0.004183	1.894901	1.821637

```
 1.844444  0.002296  0.004234  2.005208  1.931499
 1.866667  0.002296  0.004285  2.104815  2.030663
 1.888889  0.002296  0.004336  2.192993  2.118401
 1.911111  0.002296  0.004387  2.269582  2.194553
 1.933333  0.002296  0.004438  2.335104  2.259639
 1.955556  0.002296  0.004489  2.390871  2.314974
 1.977778  0.002296  0.004540  2.439115  2.362788
 END FTABLE  1
 FTABLE      3
  58    4
    Depth      Area    Volume  Outflow1 Velocity  Travel Time***
     (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
 0.000000  0.092287  0.000000  0.000000
 0.048571  0.092287  0.002050  0.000000
 0.097143  0.092287  0.004100  0.000000
 0.145714  0.092287  0.006150  0.000000
 0.194286  0.092287  0.008199  0.000000
 0.242857  0.092287  0.010249  0.000000
 0.291429  0.092287  0.012042  0.000000
 0.340000  0.092287  0.013835  0.000000
 0.388571  0.092287  0.015628  0.000000
 0.437143  0.092287  0.017421  0.000000
 0.485714  0.092287  0.019214  0.000000
 0.534286  0.092287  0.021007  0.000000
 0.582857  0.092287  0.022800  0.000000
 0.631429  0.092287  0.024593  0.000000
 0.680000  0.092287  0.026386  0.001462
 0.728571  0.092287  0.028179  0.002193
 0.777143  0.092287  0.029972  0.003229
 0.825714  0.092287  0.031765  0.003747
 0.874286  0.092287  0.033558  0.004509
 0.922857  0.092287  0.035351  0.004890
 0.971429  0.092287  0.037144  0.005501
 1.020000  0.092287  0.038937  0.005806
 1.068571  0.092287  0.040730  0.006327
 1.117143  0.092287  0.042523  0.006588
 1.165714  0.092287  0.044316  0.007050
 1.214286  0.092287  0.046109  0.007281
 1.262857  0.092287  0.047902  0.007701
 1.311429  0.092287  0.049695  0.007911
 1.360000  0.092287  0.051488  0.008299
 1.408571  0.092287  0.053281  0.008492
 1.457143  0.092287  0.055074  0.008855
 1.505714  0.092287  0.056867  0.009036
 1.554286  0.092287  0.058660  0.009377
 1.602857  0.092287  0.060453  0.009547
 1.651429  0.092287  0.062246  0.009871
 1.700000  0.092287  0.064039  0.010032
 1.748571  0.092287  0.065832  0.010341
 1.797143  0.092287  0.067692  0.010495
 1.845714  0.092287  0.069553  0.010790
 1.894286  0.092287  0.071413  0.010937
 1.942857  0.092287  0.073273  0.011220
 1.991429  0.092287  0.075133  0.011362
 2.040000  0.092287  0.076993  0.011635
 2.088571  0.092287  0.078854  0.011772
 2.137143  0.092287  0.080714  0.012035
 2.185714  0.092287  0.082574  0.012167
 2.234286  0.092287  0.084434  0.012423
 2.282857  0.092287  0.086295  0.012550
 2.331429  0.092287  0.088155  0.012966
 2.380000  0.092287  0.090015  0.013519
 2.428571  0.092287  0.091875  0.014124
 2.477143  0.092287  0.093736  0.014742
 2.525714  0.092287  0.095596  0.015353
 2.574286  0.092287  0.097456  0.015952
 2.622857  0.092287  0.099316  0.016534
 2.671429  0.092287  0.101176  0.017102
 2.720000  0.092287  0.103037  0.017659
 2.750000  0.092287  0.104847  0.032017
```

END FTABLE 3
FTABLE 2
36 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.092287	0.000000	0.000000	0.000000		
0.048571	0.092287	0.004482	0.000538	0.032017		
0.097143	0.092287	0.008965	0.000761	0.032017		
0.145714	0.092287	0.013447	0.000932	0.032017		
0.194286	0.092287	0.017930	0.001077	0.032017		
0.242857	0.092287	0.022412	0.001204	0.032017		
0.291429	0.092287	0.026895	0.001318	0.032017		
0.340000	0.092287	0.031377	0.001424	0.032017		
0.388571	0.092287	0.035860	0.001522	0.032017		
0.437143	0.092287	0.040342	0.001615	0.032017		
0.485714	0.092287	0.044825	0.001702	0.032017		
0.534286	0.092287	0.049307	0.001785	0.032017		
0.582857	0.092287	0.053790	0.001865	0.032017		
0.631429	0.092287	0.058272	0.001941	0.032017		
0.680000	0.092287	0.062755	0.003679	0.032017		
0.728571	0.092287	0.067237	0.025686	0.032017		
0.777143	0.092287	0.071720	0.060546	0.032017		
0.825714	0.092287	0.076202	0.104527	0.032017		
0.874286	0.092287	0.080685	0.156018	0.032017		
0.922857	0.092287	0.085167	0.214049	0.032017		
0.971429	0.092287	0.089650	0.277951	0.032017		
1.020000	0.092287	0.094132	0.347226	0.032017		
1.068571	0.092287	0.098615	0.421486	0.032017		
1.117143	0.092287	0.103097	0.500414	0.032017		
1.165714	0.092287	0.107580	0.583751	0.032017		
1.214286	0.092287	0.112062	0.987068	0.032017		
1.262857	0.092287	0.116545	1.792201	0.032017		
1.311429	0.092287	0.121027	2.847478	0.032017		
1.360000	0.092287	0.125510	4.102618	0.032017		
1.408571	0.092287	0.129992	5.528523	0.032017		
1.457143	0.092287	0.134475	7.104879	0.032017		
1.505714	0.092287	0.138957	8.815793	0.032017		
1.554286	0.092287	0.143440	10.64779	0.032017		
1.602857	0.092287	0.147922	12.58874	0.032017		
1.651429	0.092287	0.152405	14.62726	0.032017		
1.670000	0.092287	0.154118	16.75231	0.032017		

END FTABLE 2
FTABLE 4
92 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.000574	0.000000	0.000000		
0.033333	0.000574	0.000019	0.001239		
0.066667	0.000574	0.000038	0.001752		
0.100000	0.000574	0.000057	0.002145		
0.133333	0.000574	0.000077	0.002477		
0.166667	0.000574	0.000096	0.002770		
0.200000	0.000574	0.000115	0.003034		
0.233333	0.000574	0.000134	0.003277		
0.266667	0.000574	0.000153	0.003503		
0.300000	0.000574	0.000172	0.003716		
0.333333	0.000574	0.000191	0.003917		
0.366667	0.000574	0.000210	0.004108		
0.400000	0.000574	0.000230	0.004291		
0.433333	0.000574	0.000249	0.004466		
0.466667	0.000574	0.000268	0.004634		
0.500000	0.000574	0.000287	0.004797		
0.533333	0.000574	0.000306	0.004954		
0.566667	0.000574	0.000325	0.005107		
0.600000	0.000574	0.000344	0.005255		
0.633333	0.000574	0.000363	0.005399		
0.666667	0.000574	0.000383	0.005539		
0.700000	0.000574	0.000402	0.005676		
0.733333	0.000574	0.000421	0.005810		
0.766667	0.000574	0.000440	0.005940		

0.800000	0.000574	0.000459	0.006068
0.833333	0.000574	0.000478	0.006193
0.866667	0.000574	0.000497	0.006316
0.900000	0.000574	0.000517	0.006436
0.933333	0.000574	0.000536	0.006554
0.966667	0.000574	0.000555	0.006670
1.000000	0.000574	0.000574	0.006784
1.033333	0.000574	0.000593	0.006896
1.066667	0.000574	0.000612	0.007007
1.100000	0.000574	0.000631	0.007115
1.133333	0.000574	0.000650	0.007222
1.166667	0.000574	0.000670	0.007328
1.200000	0.000574	0.000689	0.007432
1.233333	0.000574	0.000708	0.007534
1.266667	0.000574	0.000727	0.007635
1.300000	0.000574	0.000746	0.007735
1.333333	0.000574	0.000765	0.007834
1.366667	0.000574	0.000784	0.007931
1.400000	0.000574	0.000803	0.008027
1.433333	0.000574	0.000823	0.008122
1.466667	0.000574	0.000842	0.008216
1.500000	0.000574	0.000861	0.008309
1.533333	0.000574	0.000880	0.008401
1.566667	0.000574	0.000899	0.008492
1.600000	0.000574	0.000918	0.008581
1.633333	0.000574	0.000937	0.008670
1.666667	0.000574	0.000957	0.008758
1.700000	0.000574	0.000976	0.008846
1.733333	0.000574	0.000995	0.008932
1.766667	0.000574	0.001014	0.028043
1.800000	0.000574	0.001033	0.107784
1.833333	0.000574	0.001052	0.220617
1.866667	0.000574	0.001071	0.356180
1.900000	0.000574	0.001090	0.506537
1.933333	0.000574	0.001110	0.663781
1.966667	0.000574	0.001129	0.819793
2.000000	0.000574	0.001148	0.966633
2.033333	0.000574	0.001167	1.097274
2.066667	0.000574	0.001186	1.206546
2.100000	0.000574	0.001205	1.292255
2.133333	0.000574	0.001224	1.356441
2.166667	0.000574	0.001243	1.421845
2.200000	0.000574	0.001263	1.477310
2.233333	0.000574	0.001282	1.530758
2.266667	0.000574	0.001301	1.582394
2.300000	0.000574	0.001320	1.632392
2.333333	0.000574	0.001339	1.680898
2.366667	0.000574	0.001358	1.728038
2.400000	0.000574	0.001377	1.773922
2.433333	0.000574	0.001397	1.818645
2.466667	0.000574	0.001416	1.862291
2.500000	0.000574	0.001435	1.904935
2.533333	0.000574	0.001454	1.946642
2.566667	0.000574	0.001473	1.987472
2.600000	0.000574	0.001492	2.027478
2.633333	0.000574	0.001511	2.066707
2.666667	0.000574	0.001530	2.105204
2.700000	0.000574	0.001550	2.143008
2.733333	0.000574	0.001569	2.180156
2.766667	0.000574	0.001588	2.216679
2.800000	0.000574	0.001607	2.252609
2.833333	0.000574	0.001626	2.287974
2.866667	0.000574	0.001645	2.322800
2.900000	0.000574	0.001664	2.357110
2.933333	0.000574	0.001684	2.390927
2.966667	0.000574	0.001703	2.424271
3.000000	0.000574	0.001722	2.457163
3.033333	0.000574	0.001741	2.489619

END FTABLE 4
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
WDM      2 PREC     ENGL    1              RCHRES   2     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    1              RCHRES   3     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1         1     WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1         1     WDM   1001 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1         1     WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1         1     WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
RCHRES   4 HYDR   RO     1 1         1     WDM   1008 FLOW     ENGL      REPL
RCHRES   4 HYDR   STAGE  1 1         1     WDM   1009 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        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

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

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

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

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

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

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

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

  MASS-LINK        18
RCHRES     OFLOW  OVOL   2                  COPY           INPUT  MEAN
  END MASS-LINK    18

END MASS-LINK

END RUN
```

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

www.clearcreeksolutions.com

Figure D4 - Pioneer Existing Asphalt Flows
WWHM Report

WWHM2012

PROJECT REPORT

06-171 East Town - Pioneer Existing Asphalt Flows

General Model Information

Project Name:	East town Flows
Site Name:	East Town Flows
Site Address:	
City:	Puyallup
Report Date:	11/30/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

PreExistnig Frontage Flows to Flow Splitter

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.277655
Impervious Total	0.277655
Basin Total	0.277655

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PreExistnig Frontage Flows to Flow Splitter

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.277655
Impervious Total	0.277655
Basin Total	0.277655

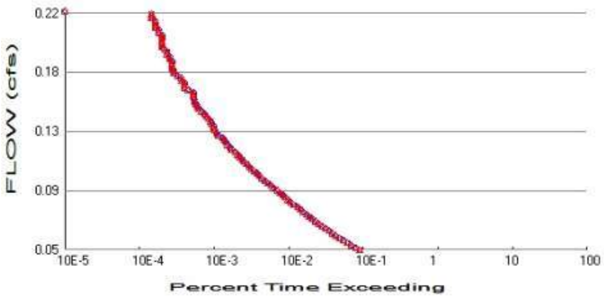
Element Flows To:

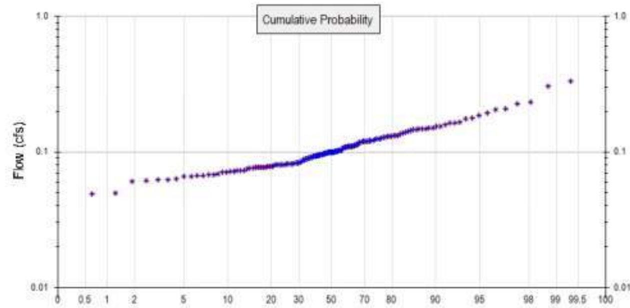
Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.277655

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.277655

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.09957
5 year	0.133569
10 year	0.158268
25 year	0.192057
50 year	0.219166
100 year	0.247989

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.09957
5 year	0.133569
10 year	0.158268
25 year	0.192057
50 year	0.219166
100 year	0.247989

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.118	0.118
1903	0.130	0.130
1904	0.147	0.147
1905	0.066	0.066
1906	0.075	0.075
1907	0.099	0.099
1908	0.082	0.082
1909	0.100	0.100
1910	0.096	0.096
1911	0.108	0.108

1912	0.178	0.178
1913	0.077	0.077
1914	0.332	0.332
1915	0.067	0.067
1916	0.125	0.125
1917	0.050	0.050
1918	0.100	0.100
1919	0.063	0.063
1920	0.082	0.082
1921	0.070	0.070
1922	0.110	0.110
1923	0.076	0.076
1924	0.145	0.145
1925	0.061	0.061
1926	0.118	0.118
1927	0.101	0.101
1928	0.071	0.071
1929	0.142	0.142
1930	0.150	0.150
1931	0.072	0.072
1932	0.078	0.078
1933	0.077	0.077
1934	0.125	0.125
1935	0.068	0.068
1936	0.092	0.092
1937	0.121	0.121
1938	0.068	0.068
1939	0.084	0.084
1940	0.150	0.150
1941	0.164	0.164
1942	0.111	0.111
1943	0.110	0.110
1944	0.159	0.159
1945	0.120	0.120
1946	0.094	0.094
1947	0.073	0.073
1948	0.099	0.099
1949	0.154	0.154
1950	0.085	0.085
1951	0.131	0.131
1952	0.147	0.147
1953	0.136	0.136
1954	0.080	0.080
1955	0.076	0.076
1956	0.070	0.070
1957	0.080	0.080
1958	0.100	0.100
1959	0.100	0.100
1960	0.081	0.081
1961	0.226	0.226
1962	0.097	0.097
1963	0.072	0.072
1964	0.208	0.208
1965	0.097	0.097
1966	0.078	0.078
1967	0.110	0.110
1968	0.093	0.093
1969	0.083	0.083

1970	0.094	0.094
1971	0.092	0.092
1972	0.304	0.304
1973	0.175	0.175
1974	0.128	0.128
1975	0.132	0.132
1976	0.141	0.141
1977	0.061	0.061
1978	0.102	0.102
1979	0.111	0.111
1980	0.106	0.106
1981	0.101	0.101
1982	0.081	0.081
1983	0.110	0.110
1984	0.109	0.109
1985	0.124	0.124
1986	0.063	0.063
1987	0.113	0.113
1988	0.066	0.066
1989	0.066	0.066
1990	0.080	0.080
1991	0.121	0.121
1992	0.116	0.116
1993	0.129	0.129
1994	0.089	0.089
1995	0.069	0.069
1996	0.092	0.092
1997	0.083	0.083
1998	0.099	0.099
1999	0.113	0.113
2000	0.093	0.093
2001	0.077	0.077
2002	0.137	0.137
2003	0.079	0.079
2004	0.120	0.120
2005	0.233	0.233
2006	0.108	0.108
2007	0.120	0.120
2008	0.099	0.099
2009	0.075	0.075
2010	0.097	0.097
2011	0.101	0.101
2012	0.095	0.095
2013	0.089	0.089
2014	0.088	0.088
2015	0.143	0.143
2016	0.095	0.095
2017	0.146	0.146
2018	0.087	0.087
2019	0.129	0.129
2020	0.106	0.106
2021	0.089	0.089
2022	0.149	0.149
2023	0.186	0.186
2024	0.195	0.195
2025	0.098	0.098
2026	0.110	0.110
2027	0.120	0.120

2028	0.047	0.047
2029	0.077	0.077
2030	0.163	0.163
2031	0.049	0.049
2032	0.081	0.081
2033	0.103	0.103
2034	0.078	0.078
2035	0.099	0.099
2036	0.081	0.081
2037	0.108	0.108
2038	0.102	0.102
2039	0.205	0.205
2040	0.081	0.081
2041	0.102	0.102
2042	0.120	0.120
2043	0.131	0.131
2044	0.090	0.090
2045	0.073	0.073
2046	0.081	0.081
2047	0.100	0.100
2048	0.082	0.082
2049	0.121	0.121
2050	0.091	0.091
2051	0.127	0.127
2052	0.098	0.098
2053	0.083	0.083
2054	0.163	0.163
2055	0.093	0.093
2056	0.131	0.131
2057	0.062	0.062
2058	0.123	0.123
2059	0.155	0.155

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3316	0.3316
2	0.3038	0.3038
3	0.2334	0.2334
4	0.2256	0.2256
5	0.2077	0.2077
6	0.2052	0.2052
7	0.1948	0.1948
8	0.1862	0.1862
9	0.1781	0.1781
10	0.1754	0.1754
11	0.1645	0.1645
12	0.1631	0.1631
13	0.1628	0.1628
14	0.1586	0.1586
15	0.1546	0.1546
16	0.1537	0.1537
17	0.1504	0.1504
18	0.1503	0.1503
19	0.1485	0.1485
20	0.1475	0.1475
21	0.1474	0.1474
22	0.1456	0.1456

23	0.1447	0.1447
24	0.1429	0.1429
25	0.1422	0.1422
26	0.1406	0.1406
27	0.1369	0.1369
28	0.1363	0.1363
29	0.1319	0.1319
30	0.1313	0.1313
31	0.1311	0.1311
32	0.1307	0.1307
33	0.1305	0.1305
34	0.1294	0.1294
35	0.1288	0.1288
36	0.1284	0.1284
37	0.1274	0.1274
38	0.1251	0.1251
39	0.1247	0.1247
40	0.1242	0.1242
41	0.1226	0.1226
42	0.1213	0.1213
43	0.1211	0.1211
44	0.1208	0.1208
45	0.1203	0.1203
46	0.1200	0.1200
47	0.1198	0.1198
48	0.1196	0.1196
49	0.1195	0.1195
50	0.1178	0.1178
51	0.1176	0.1176
52	0.1163	0.1163
53	0.1129	0.1129
54	0.1128	0.1128
55	0.1109	0.1109
56	0.1107	0.1107
57	0.1103	0.1103
58	0.1102	0.1102
59	0.1099	0.1099
60	0.1099	0.1099
61	0.1097	0.1097
62	0.1089	0.1089
63	0.1082	0.1082
64	0.1080	0.1080
65	0.1076	0.1076
66	0.1062	0.1062
67	0.1057	0.1057
68	0.1028	0.1028
69	0.1023	0.1023
70	0.1021	0.1021
71	0.1018	0.1018
72	0.1011	0.1011
73	0.1007	0.1007
74	0.1006	0.1006
75	0.1003	0.1003
76	0.0999	0.0999
77	0.0997	0.0997
78	0.0996	0.0996
79	0.0996	0.0996
80	0.0994	0.0994

81	0.0990	0.0990
82	0.0989	0.0989
83	0.0989	0.0989
84	0.0986	0.0986
85	0.0984	0.0984
86	0.0978	0.0978
87	0.0969	0.0969
88	0.0969	0.0969
89	0.0969	0.0969
90	0.0959	0.0959
91	0.0947	0.0947
92	0.0946	0.0946
93	0.0939	0.0939
94	0.0936	0.0936
95	0.0935	0.0935
96	0.0934	0.0934
97	0.0929	0.0929
98	0.0923	0.0923
99	0.0920	0.0920
100	0.0919	0.0919
101	0.0908	0.0908
102	0.0897	0.0897
103	0.0894	0.0894
104	0.0891	0.0891
105	0.0888	0.0888
106	0.0876	0.0876
107	0.0869	0.0869
108	0.0849	0.0849
109	0.0835	0.0835
110	0.0835	0.0835
111	0.0829	0.0829
112	0.0825	0.0825
113	0.0821	0.0821
114	0.0818	0.0818
115	0.0815	0.0815
116	0.0812	0.0812
117	0.0812	0.0812
118	0.0811	0.0811
119	0.0808	0.0808
120	0.0807	0.0807
121	0.0806	0.0806
122	0.0805	0.0805
123	0.0803	0.0803
124	0.0802	0.0802
125	0.0793	0.0793
126	0.0783	0.0783
127	0.0781	0.0781
128	0.0775	0.0775
129	0.0774	0.0774
130	0.0769	0.0769
131	0.0768	0.0768
132	0.0766	0.0766
133	0.0764	0.0764
134	0.0758	0.0758
135	0.0755	0.0755
136	0.0752	0.0752
137	0.0727	0.0727
138	0.0725	0.0725

139	0.0722	0.0722
140	0.0720	0.0720
141	0.0712	0.0712
142	0.0702	0.0702
143	0.0702	0.0702
144	0.0687	0.0687
145	0.0681	0.0681
146	0.0679	0.0679
147	0.0671	0.0671
148	0.0663	0.0663
149	0.0660	0.0660
150	0.0656	0.0656
151	0.0626	0.0626
152	0.0626	0.0626
153	0.0624	0.0624
154	0.0610	0.0610
155	0.0606	0.0606
156	0.0496	0.0496
157	0.0487	0.0487
158	0.0466	0.0466

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0498	4926	4926	100	Pass
0.0515	4343	4343	100	Pass
0.0532	3798	3798	100	Pass
0.0549	3358	3358	100	Pass
0.0566	2980	2980	100	Pass
0.0583	2653	2653	100	Pass
0.0601	2369	2369	100	Pass
0.0618	2120	2120	100	Pass
0.0635	1926	1926	100	Pass
0.0652	1718	1718	100	Pass
0.0669	1537	1537	100	Pass
0.0686	1393	1393	100	Pass
0.0703	1263	1263	100	Pass
0.0720	1137	1137	100	Pass
0.0737	1043	1043	100	Pass
0.0754	961	961	100	Pass
0.0772	861	861	100	Pass
0.0789	788	788	100	Pass
0.0806	727	727	100	Pass
0.0823	641	641	100	Pass
0.0840	589	589	100	Pass
0.0857	539	539	100	Pass
0.0874	493	493	100	Pass
0.0891	462	462	100	Pass
0.0908	424	424	100	Pass
0.0926	390	390	100	Pass
0.0943	347	347	100	Pass
0.0960	317	317	100	Pass
0.0977	291	291	100	Pass
0.0994	265	265	100	Pass
0.1011	241	241	100	Pass
0.1028	222	222	100	Pass
0.1045	208	208	100	Pass
0.1062	192	192	100	Pass
0.1080	175	175	100	Pass
0.1097	163	163	100	Pass
0.1114	150	150	100	Pass
0.1131	138	138	100	Pass
0.1148	131	131	100	Pass
0.1165	123	123	100	Pass
0.1182	115	115	100	Pass
0.1199	105	105	100	Pass
0.1216	94	94	100	Pass
0.1234	91	91	100	Pass
0.1251	84	84	100	Pass
0.1268	79	79	100	Pass
0.1285	76	76	100	Pass
0.1302	71	71	100	Pass
0.1319	62	62	100	Pass
0.1336	60	60	100	Pass
0.1353	56	56	100	Pass
0.1370	54	54	100	Pass
0.1388	54	54	100	Pass

0.1405	52	52	100	Pass
0.1422	50	50	100	Pass
0.1439	46	46	100	Pass
0.1456	43	43	100	Pass
0.1473	41	41	100	Pass
0.1490	38	38	100	Pass
0.1507	34	34	100	Pass
0.1524	33	33	100	Pass
0.1542	32	32	100	Pass
0.1559	30	30	100	Pass
0.1576	30	30	100	Pass
0.1593	29	29	100	Pass
0.1610	29	29	100	Pass
0.1627	29	29	100	Pass
0.1644	25	25	100	Pass
0.1661	22	22	100	Pass
0.1678	22	22	100	Pass
0.1695	22	22	100	Pass
0.1713	20	20	100	Pass
0.1730	20	20	100	Pass
0.1747	18	18	100	Pass
0.1764	16	16	100	Pass
0.1781	16	16	100	Pass
0.1798	15	15	100	Pass
0.1815	15	15	100	Pass
0.1832	15	15	100	Pass
0.1849	15	15	100	Pass
0.1867	14	14	100	Pass
0.1884	14	14	100	Pass
0.1901	13	13	100	Pass
0.1918	13	13	100	Pass
0.1935	12	12	100	Pass
0.1952	11	11	100	Pass
0.1969	11	11	100	Pass
0.1986	11	11	100	Pass
0.2003	11	11	100	Pass
0.2021	11	11	100	Pass
0.2038	11	11	100	Pass
0.2055	10	10	100	Pass
0.2072	10	10	100	Pass
0.2089	9	9	100	Pass
0.2106	9	9	100	Pass
0.2123	9	9	100	Pass
0.2140	9	9	100	Pass
0.2157	8	8	100	Pass
0.2175	8	8	100	Pass
0.2192	8	8	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

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

Model Default Modifications

Total of 0 changes have been made.

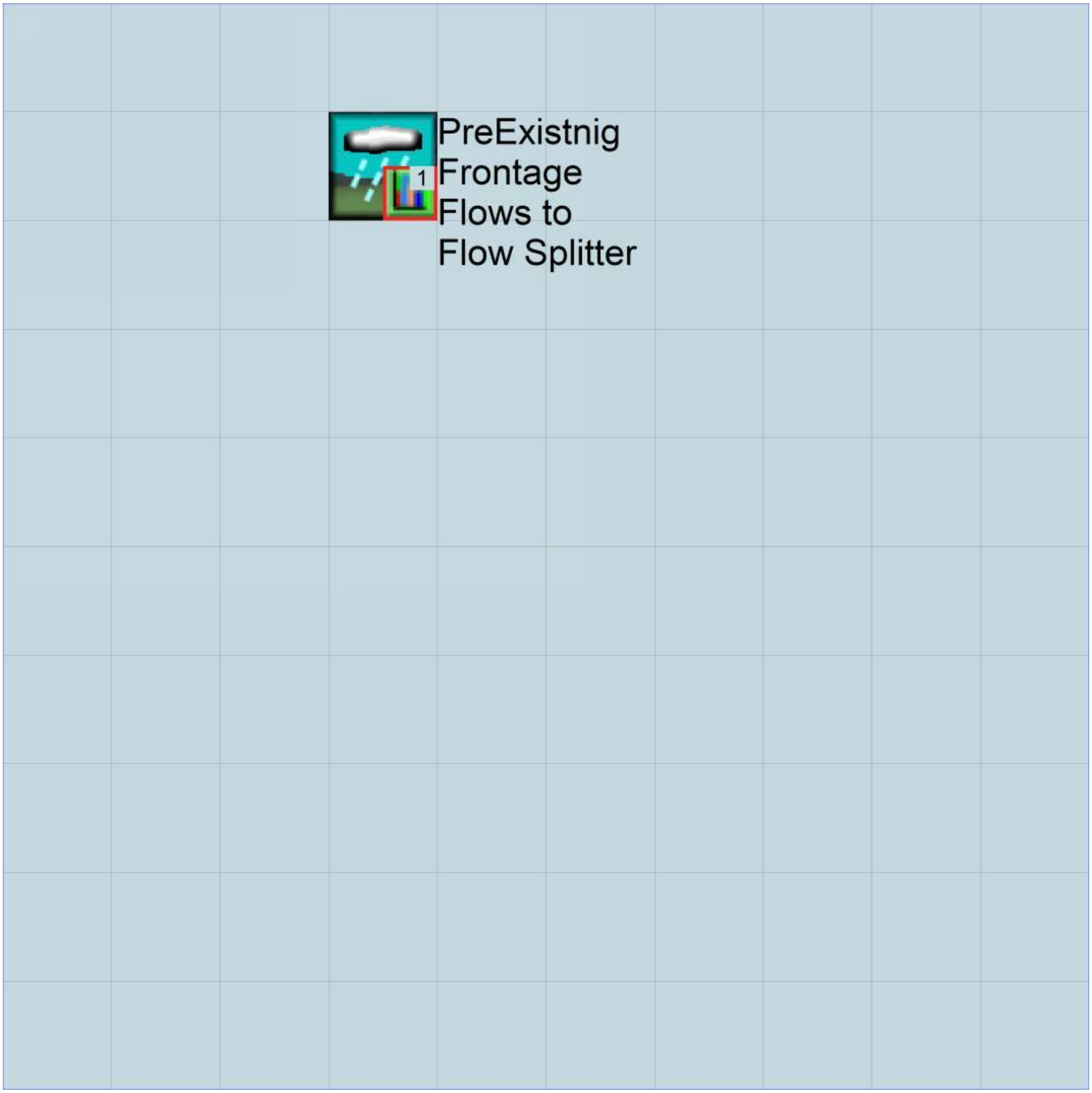
PERLND Changes

No PERLND changes have been made.

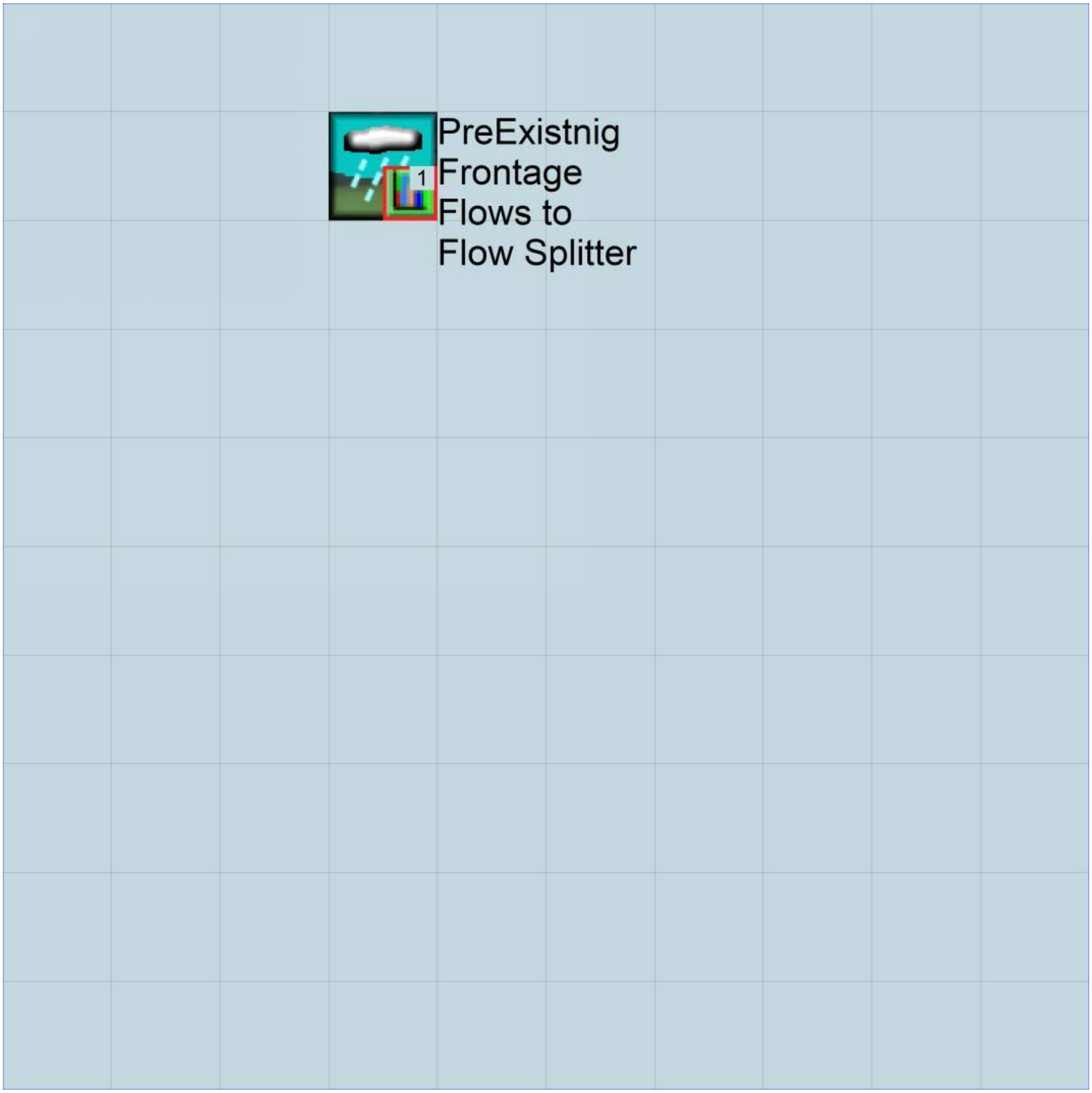
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   East town Flows.wdm
MESSU      25   PreEast town Flows.MES
           27   PreEast town Flows.L61
           28   PreEast town Flows.L62
           30   POCEast town Flows1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        PreExistnig Frontage Flow   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           ***
  END GEN-INFO
  *** Section PWATER***

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

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

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

```
  END PWAT-PARM1

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

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

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

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

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

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND
```

```
SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PreExistnig Frontage Flows to Flow Splitter ***
IMPLND   1                    0.277655     COPY   501     15

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

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



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

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

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

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

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

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

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

END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   East town Flows.wdm
MESSU      25   MitEast town Flows.MES
           27   MitEast town Flows.L61
           28   MitEast town Flows.L62
           30   POCEast town Flows1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        PreExistnig Frontage Flow   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           ***
  END GEN-INFO
  *** Section PWATER***

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

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

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

```
  END PWAT-PARM1

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

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

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

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

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

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND
```

```
SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PreExistnig Frontage Flows to Flow Splitter ***
IMPLND   1                    0.277655     COPY   501     15

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

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



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

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

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

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

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

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

SPEC-ACTIONS
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     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
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

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

www.clearcreeksolutions.com

Figure D5 - Pioneer New Improvements ONLY
WWHM Report

WWHM2012

PROJECT REPORT

06-171 FRONTAGE - NEW IMPROVEMENTS
FLOWING TOWARD STREET ONLY

General Model Information

Project Name:	East town Flows
Site Name:	East Town Flows
Site Address:	
City:	Puyallup
Report Date:	11/30/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Proposed Frontage Flows to Flow Splitter

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.018797
Pervious Total	0.018797
Impervious Land Use	acre
ROADS FLAT	0.241753
SIDEWALKS FLAT	0.083435
Impervious Total	0.325188
Basin Total	0.343985

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Proposed Frontage Flows to Flow Splitter

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.018797
Pervious Total	0.018797
Impervious Land Use	acre
ROADS FLAT	0.241753
SIDEWALKS FLAT	0.083435
Impervious Total	0.325188
Basin Total	0.343985

Element Flows To:

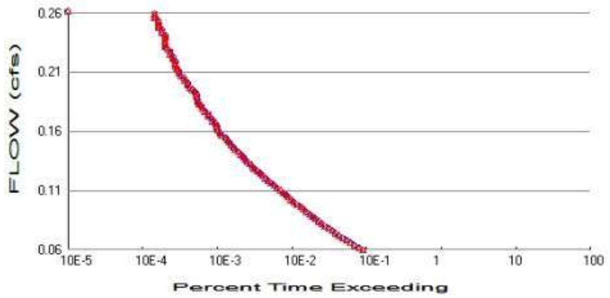
Surface	Interflow	Groundwater

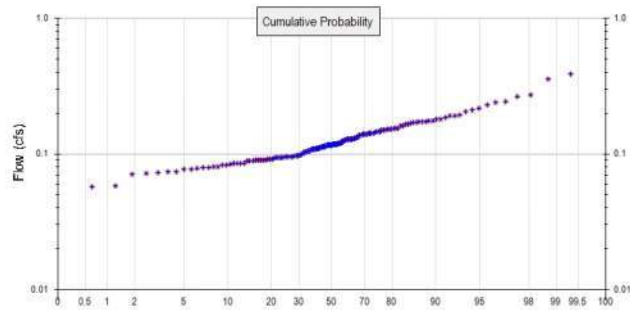
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area:	0.018797
Total Impervious Area:	0.325188

Mitigated Landuse Totals for POC #1

Total Pervious Area:	0.018797
Total Impervious Area:	0.325188

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.116655
5 year	0.15651
10 year	0.185465
25 year	0.225082
50 year	0.256869
100 year	0.290666

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.116655
5 year	0.15651
10 year	0.185465
25 year	0.225082
50 year	0.256869
100 year	0.290666

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.138	0.138
1903	0.153	0.153
1904	0.173	0.173
1905	0.078	0.078
1906	0.088	0.088
1907	0.116	0.116
1908	0.095	0.095
1909	0.117	0.117
1910	0.112	0.112
1911	0.126	0.126

1912	0.212	0.212
1913	0.091	0.091
1914	0.388	0.388
1915	0.079	0.079
1916	0.146	0.146
1917	0.058	0.058
1918	0.117	0.117
1919	0.073	0.073
1920	0.096	0.096
1921	0.082	0.082
1922	0.129	0.129
1923	0.090	0.090
1924	0.170	0.170
1925	0.071	0.071
1926	0.138	0.138
1927	0.118	0.118
1928	0.083	0.083
1929	0.166	0.166
1930	0.176	0.176
1931	0.085	0.085
1932	0.091	0.091
1933	0.090	0.090
1934	0.146	0.146
1935	0.080	0.080
1936	0.108	0.108
1937	0.142	0.142
1938	0.080	0.080
1939	0.098	0.098
1940	0.176	0.176
1941	0.193	0.193
1942	0.130	0.130
1943	0.129	0.129
1944	0.186	0.186
1945	0.140	0.140
1946	0.110	0.110
1947	0.085	0.085
1948	0.116	0.116
1949	0.180	0.180
1950	0.099	0.099
1951	0.154	0.154
1952	0.173	0.173
1953	0.160	0.160
1954	0.094	0.094
1955	0.089	0.089
1956	0.082	0.082
1957	0.094	0.094
1958	0.118	0.118
1959	0.117	0.117
1960	0.095	0.095
1961	0.264	0.264
1962	0.114	0.114
1963	0.084	0.084
1964	0.243	0.243
1965	0.113	0.113
1966	0.092	0.092
1967	0.129	0.129
1968	0.109	0.109
1969	0.098	0.098

1970	0.110	0.110
1971	0.108	0.108
1972	0.356	0.356
1973	0.205	0.205
1974	0.150	0.150
1975	0.155	0.155
1976	0.165	0.165
1977	0.071	0.071
1978	0.120	0.120
1979	0.130	0.130
1980	0.124	0.124
1981	0.118	0.118
1982	0.095	0.095
1983	0.129	0.129
1984	0.128	0.128
1985	0.145	0.145
1986	0.073	0.073
1987	0.132	0.132
1988	0.077	0.077
1989	0.077	0.077
1990	0.094	0.094
1991	0.142	0.142
1992	0.136	0.136
1993	0.151	0.151
1994	0.104	0.104
1995	0.080	0.080
1996	0.108	0.108
1997	0.097	0.097
1998	0.115	0.115
1999	0.132	0.132
2000	0.109	0.109
2001	0.090	0.090
2002	0.160	0.160
2003	0.093	0.093
2004	0.140	0.140
2005	0.273	0.273
2006	0.126	0.126
2007	0.141	0.141
2008	0.116	0.116
2009	0.088	0.088
2010	0.114	0.114
2011	0.118	0.118
2012	0.111	0.111
2013	0.105	0.105
2014	0.103	0.103
2015	0.167	0.167
2016	0.111	0.111
2017	0.171	0.171
2018	0.103	0.103
2019	0.152	0.152
2020	0.124	0.124
2021	0.104	0.104
2022	0.174	0.174
2023	0.218	0.218
2024	0.229	0.229
2025	0.115	0.115
2026	0.129	0.129
2027	0.141	0.141

2028	0.055	0.055
2029	0.090	0.090
2030	0.191	0.191
2031	0.057	0.057
2032	0.095	0.095
2033	0.120	0.120
2034	0.091	0.091
2035	0.116	0.116
2036	0.094	0.094
2037	0.127	0.127
2038	0.120	0.120
2039	0.240	0.240
2040	0.094	0.094
2041	0.120	0.120
2042	0.140	0.140
2043	0.154	0.154
2044	0.105	0.105
2045	0.085	0.085
2046	0.095	0.095
2047	0.117	0.117
2048	0.096	0.096
2049	0.142	0.142
2050	0.106	0.106
2051	0.149	0.149
2052	0.115	0.115
2053	0.097	0.097
2054	0.191	0.191
2055	0.109	0.109
2056	0.153	0.153
2057	0.073	0.073
2058	0.144	0.144
2059	0.181	0.181

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3883	0.3883
2	0.3559	0.3559
3	0.2734	0.2734
4	0.2642	0.2642
5	0.2433	0.2433
6	0.2403	0.2403
7	0.2286	0.2286
8	0.2180	0.2180
9	0.2118	0.2118
10	0.2055	0.2055
11	0.1926	0.1926
12	0.1910	0.1910
13	0.1907	0.1907
14	0.1857	0.1857
15	0.1810	0.1810
16	0.1800	0.1800
17	0.1761	0.1761
18	0.1760	0.1760
19	0.1739	0.1739
20	0.1730	0.1730
21	0.1728	0.1728
22	0.1706	0.1706

23	0.1695	0.1695
24	0.1674	0.1674
25	0.1665	0.1665
26	0.1647	0.1647
27	0.1604	0.1604
28	0.1599	0.1599
29	0.1545	0.1545
30	0.1537	0.1537
31	0.1536	0.1536
32	0.1531	0.1531
33	0.1528	0.1528
34	0.1516	0.1516
35	0.1508	0.1508
36	0.1504	0.1504
37	0.1492	0.1492
38	0.1465	0.1465
39	0.1461	0.1461
40	0.1455	0.1455
41	0.1435	0.1435
42	0.1420	0.1420
43	0.1418	0.1418
44	0.1415	0.1415
45	0.1409	0.1409
46	0.1406	0.1406
47	0.1403	0.1403
48	0.1400	0.1400
49	0.1400	0.1400
50	0.1380	0.1380
51	0.1377	0.1377
52	0.1362	0.1362
53	0.1322	0.1322
54	0.1321	0.1321
55	0.1299	0.1299
56	0.1297	0.1297
57	0.1292	0.1292
58	0.1291	0.1291
59	0.1289	0.1289
60	0.1287	0.1287
61	0.1285	0.1285
62	0.1276	0.1276
63	0.1267	0.1267
64	0.1264	0.1264
65	0.1260	0.1260
66	0.1244	0.1244
67	0.1238	0.1238
68	0.1204	0.1204
69	0.1200	0.1200
70	0.1198	0.1198
71	0.1196	0.1196
72	0.1184	0.1184
73	0.1180	0.1180
74	0.1178	0.1178
75	0.1176	0.1176
76	0.1174	0.1174
77	0.1174	0.1174
78	0.1167	0.1167
79	0.1166	0.1166
80	0.1165	0.1165

81	0.1160	0.1160
82	0.1159	0.1159
83	0.1158	0.1158
84	0.1155	0.1155
85	0.1152	0.1152
86	0.1145	0.1145
87	0.1135	0.1135
88	0.1135	0.1135
89	0.1135	0.1135
90	0.1123	0.1123
91	0.1110	0.1110
92	0.1108	0.1108
93	0.1099	0.1099
94	0.1097	0.1097
95	0.1095	0.1095
96	0.1094	0.1094
97	0.1088	0.1088
98	0.1082	0.1082
99	0.1077	0.1077
100	0.1077	0.1077
101	0.1064	0.1064
102	0.1051	0.1051
103	0.1047	0.1047
104	0.1043	0.1043
105	0.1040	0.1040
106	0.1026	0.1026
107	0.1025	0.1025
108	0.0994	0.0994
109	0.0978	0.0978
110	0.0978	0.0978
111	0.0971	0.0971
112	0.0966	0.0966
113	0.0961	0.0961
114	0.0958	0.0958
115	0.0955	0.0955
116	0.0951	0.0951
117	0.0950	0.0950
118	0.0950	0.0950
119	0.0946	0.0946
120	0.0945	0.0945
121	0.0943	0.0943
122	0.0942	0.0942
123	0.0941	0.0941
124	0.0939	0.0939
125	0.0929	0.0929
126	0.0917	0.0917
127	0.0914	0.0914
128	0.0908	0.0908
129	0.0906	0.0906
130	0.0900	0.0900
131	0.0900	0.0900
132	0.0898	0.0898
133	0.0897	0.0897
134	0.0888	0.0888
135	0.0884	0.0884
136	0.0881	0.0881
137	0.0852	0.0852
138	0.0849	0.0849

139	0.0847	0.0847
140	0.0844	0.0844
141	0.0834	0.0834
142	0.0822	0.0822
143	0.0822	0.0822
144	0.0804	0.0804
145	0.0797	0.0797
146	0.0795	0.0795
147	0.0786	0.0786
148	0.0777	0.0777
149	0.0773	0.0773
150	0.0769	0.0769
151	0.0734	0.0734
152	0.0733	0.0733
153	0.0731	0.0731
154	0.0715	0.0715
155	0.0709	0.0709
156	0.0581	0.0581
157	0.0570	0.0570
158	0.0545	0.0545

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0583	4925	4925	100	Pass
0.0603	4339	4339	100	Pass
0.0623	3795	3795	100	Pass
0.0643	3353	3353	100	Pass
0.0663	2975	2975	100	Pass
0.0684	2649	2649	100	Pass
0.0704	2368	2368	100	Pass
0.0724	2119	2119	100	Pass
0.0744	1927	1927	100	Pass
0.0764	1718	1718	100	Pass
0.0784	1534	1534	100	Pass
0.0804	1393	1393	100	Pass
0.0824	1262	1262	100	Pass
0.0844	1136	1136	100	Pass
0.0864	1040	1040	100	Pass
0.0884	960	960	100	Pass
0.0904	861	861	100	Pass
0.0924	787	787	100	Pass
0.0944	727	727	100	Pass
0.0964	642	642	100	Pass
0.0984	587	587	100	Pass
0.1004	539	539	100	Pass
0.1024	495	495	100	Pass
0.1045	461	461	100	Pass
0.1065	425	425	100	Pass
0.1085	392	392	100	Pass
0.1105	349	349	100	Pass
0.1125	317	317	100	Pass
0.1145	291	291	100	Pass
0.1165	266	266	100	Pass
0.1185	244	244	100	Pass
0.1205	222	222	100	Pass
0.1225	209	209	100	Pass
0.1245	192	192	100	Pass
0.1265	174	174	100	Pass
0.1285	163	163	100	Pass
0.1305	150	150	100	Pass
0.1325	137	137	100	Pass
0.1345	130	130	100	Pass
0.1365	124	124	100	Pass
0.1385	115	115	100	Pass
0.1406	106	106	100	Pass
0.1426	95	95	100	Pass
0.1446	91	91	100	Pass
0.1466	85	85	100	Pass
0.1486	79	79	100	Pass
0.1506	75	75	100	Pass
0.1526	71	71	100	Pass
0.1546	63	63	100	Pass
0.1566	60	60	100	Pass
0.1586	56	56	100	Pass
0.1606	54	54	100	Pass
0.1626	54	54	100	Pass

0.1646	53	53	100	Pass
0.1666	48	48	100	Pass
0.1686	46	46	100	Pass
0.1706	42	42	100	Pass
0.1726	42	42	100	Pass
0.1746	38	38	100	Pass
0.1767	35	35	100	Pass
0.1787	34	34	100	Pass
0.1807	32	32	100	Pass
0.1827	30	30	100	Pass
0.1847	30	30	100	Pass
0.1867	29	29	100	Pass
0.1887	29	29	100	Pass
0.1907	28	28	100	Pass
0.1927	26	26	100	Pass
0.1947	24	24	100	Pass
0.1967	22	22	100	Pass
0.1987	22	22	100	Pass
0.2007	20	20	100	Pass
0.2027	20	20	100	Pass
0.2047	18	18	100	Pass
0.2067	17	17	100	Pass
0.2087	17	17	100	Pass
0.2107	16	16	100	Pass
0.2127	15	15	100	Pass
0.2148	15	15	100	Pass
0.2168	15	15	100	Pass
0.2188	14	14	100	Pass
0.2208	14	14	100	Pass
0.2228	13	13	100	Pass
0.2248	13	13	100	Pass
0.2268	12	12	100	Pass
0.2288	11	11	100	Pass
0.2308	11	11	100	Pass
0.2328	11	11	100	Pass
0.2348	11	11	100	Pass
0.2368	11	11	100	Pass
0.2388	11	11	100	Pass
0.2408	10	10	100	Pass
0.2428	10	10	100	Pass
0.2448	9	9	100	Pass
0.2468	9	9	100	Pass
0.2488	9	9	100	Pass
0.2509	9	9	100	Pass
0.2529	8	8	100	Pass
0.2549	8	8	100	Pass
0.2569	8	8	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

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

Model Default Modifications

Total of 0 changes have been made.

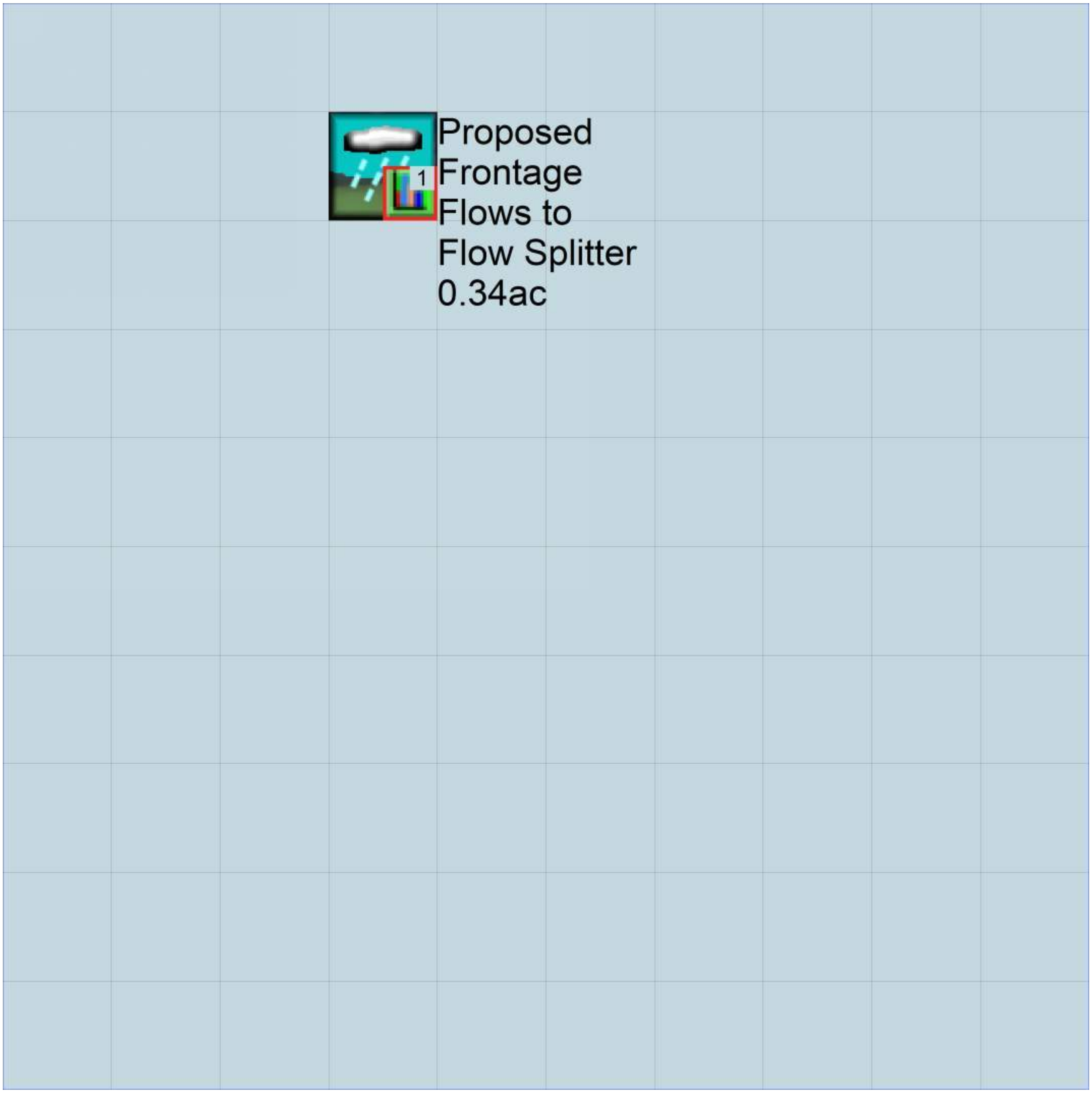
PERLND Changes

No PERLND changes have been made.

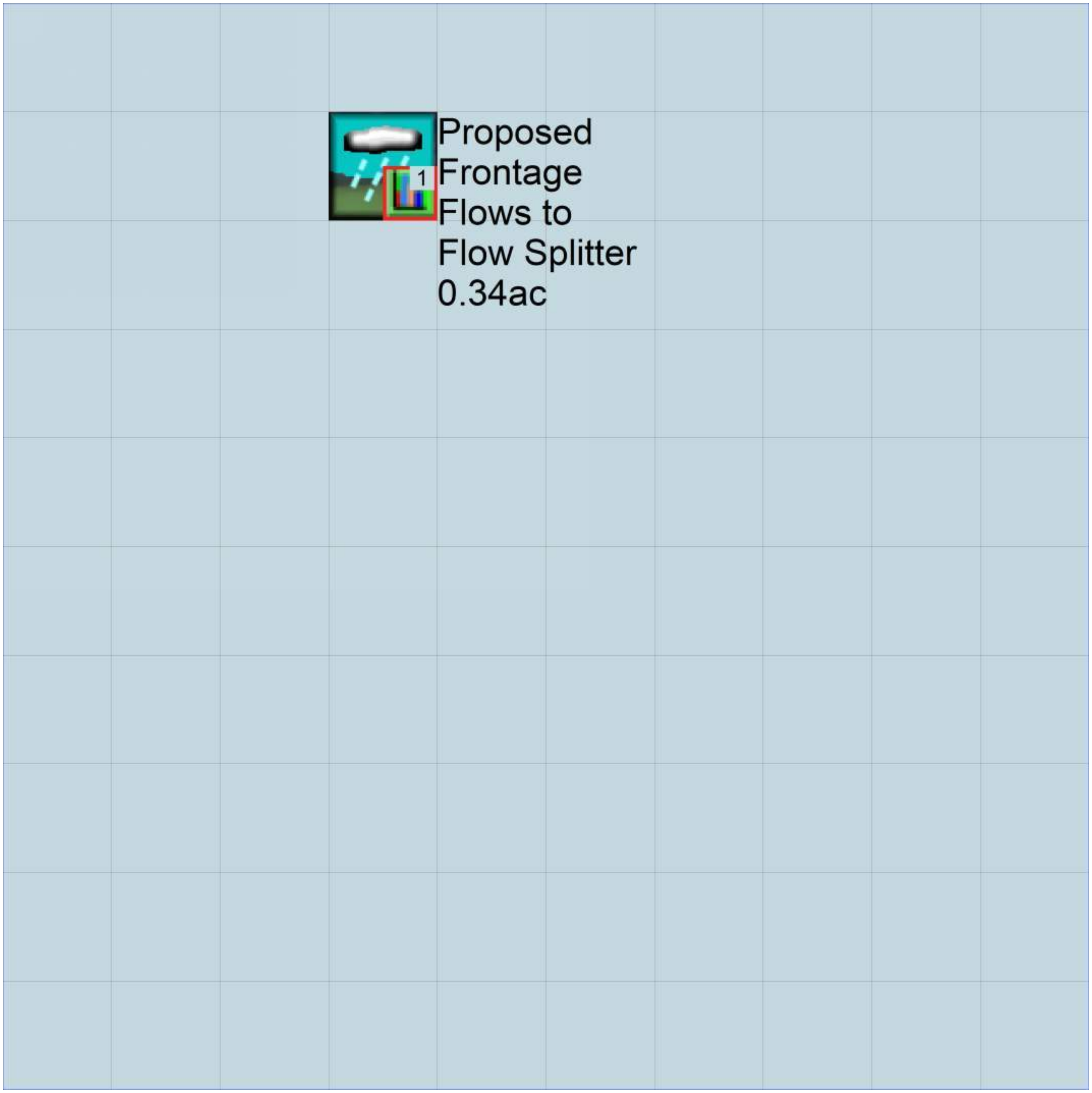
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   East town Flows.wdm
MESSU      25   PreEast town Flows.MES
           27   PreEast town Flows.L61
           28   PreEast town Flows.L62
           30   POCEast town Flows1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       1
      IMPLND       8
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Proposed Frontage Flows t   MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out            ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
```

```
  END IWAT-PARM2

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Proposed Frontage Flows to Flow Splitter ***
PERLND   7                    0.018797     COPY   501     12
PERLND   7                    0.018797     COPY   501     13
IMPLND   1                    0.241753     COPY   501     15
IMPLND   8                    0.083435     COPY   501     15

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

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



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

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

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   East town Flows.wdm
MESSU      25   MitEast town Flows.MES
           27   MitEast town Flows.L61
           28   MitEast town Flows.L62
           30   POCEast town Flows1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       1
      IMPLND       8
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Proposed Frontage Flows t   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                            User  t-series Engl Metr ***
                                           in  out           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
```

```
  END IWAT-PARM2

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Proposed Frontage Flows to Flow Splitter ***
PERLND   7                    0.018797     COPY   501     12
PERLND   7                    0.018797     COPY   501     13
IMPLND   1                    0.241753     COPY   501     15
IMPLND   8                    0.083435     COPY   501     15

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

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


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

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

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
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     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
END EXT TARGETS

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

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

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


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

www.clearcreeksolutions.com

Figure D6 - Flow Comparison New vs. Existing IMP Surfaces WWHM Report

WWHM2012

PROJECT REPORT

06-171 PIONEER - FLOW RETURNS FOR EXISTING ASPHALT AND IMPERVIOUS IMPROVEMENTS

General Model Information

Project Name:	East town Flows
Site Name:	East Town Flows
Site Address:	
City:	Puyallup
Report Date:	11/30/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Proposed Frontage Flows to Flow Splitter

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.277655
Impervious Total	0.277655
Basin Total	0.277655

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Proposed Frontage Flows to Flow Splitter

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Flat	0.018797
Pervious Total	0.018797
Impervious Land Use	acre
ROADS FLAT	0.241753
SIDEWALKS FLAT	0.083435
Impervious Total	0.325188
Basin Total	0.343985

Element Flows To:

Surface	Interflow	Groundwater

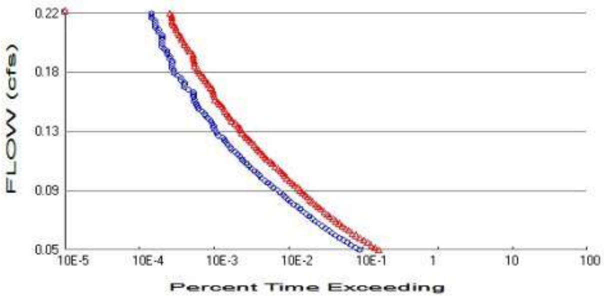
Routing Elements

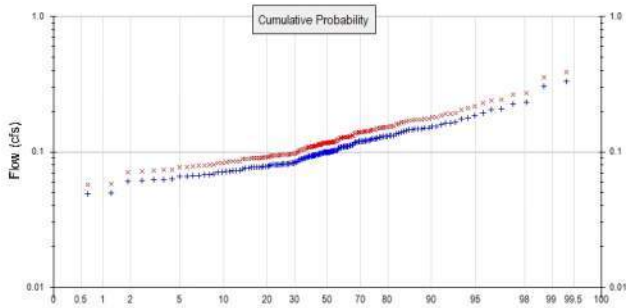
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.277655

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.018797
Total Impervious Area: 0.325188

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.09957
5 year	0.133569
10 year	0.158268
25 year	0.192057
50 year	0.219166
100 year	0.247989

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.116655
5 year	0.15651
10 year	0.185465
25 year	0.225082
50 year	0.256869
100 year	0.290666

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.118	0.138
1903	0.130	0.153
1904	0.147	0.173
1905	0.066	0.078
1906	0.075	0.088
1907	0.099	0.116
1908	0.082	0.095
1909	0.100	0.117
1910	0.096	0.112
1911	0.108	0.126

1912	0.178	0.212
1913	0.077	0.091
1914	0.332	0.388
1915	0.067	0.079
1916	0.125	0.146
1917	0.050	0.058
1918	0.100	0.117
1919	0.063	0.073
1920	0.082	0.096
1921	0.070	0.082
1922	0.110	0.129
1923	0.076	0.090
1924	0.145	0.170
1925	0.061	0.071
1926	0.118	0.138
1927	0.101	0.118
1928	0.071	0.083
1929	0.142	0.166
1930	0.150	0.176
1931	0.072	0.085
1932	0.078	0.091
1933	0.077	0.090
1934	0.125	0.146
1935	0.068	0.080
1936	0.092	0.108
1937	0.121	0.142
1938	0.068	0.080
1939	0.084	0.098
1940	0.150	0.176
1941	0.164	0.193
1942	0.111	0.130
1943	0.110	0.129
1944	0.159	0.186
1945	0.120	0.140
1946	0.094	0.110
1947	0.073	0.085
1948	0.099	0.116
1949	0.154	0.180
1950	0.085	0.099
1951	0.131	0.154
1952	0.147	0.173
1953	0.136	0.160
1954	0.080	0.094
1955	0.076	0.089
1956	0.070	0.082
1957	0.080	0.094
1958	0.100	0.118
1959	0.100	0.117
1960	0.081	0.095
1961	0.226	0.264
1962	0.097	0.114
1963	0.072	0.084
1964	0.208	0.243
1965	0.097	0.113
1966	0.078	0.092
1967	0.110	0.129
1968	0.093	0.109
1969	0.083	0.098

1970	0.094	0.110
1971	0.092	0.108
1972	0.304	0.356
1973	0.175	0.205
1974	0.128	0.150
1975	0.132	0.155
1976	0.141	0.165
1977	0.061	0.071
1978	0.102	0.120
1979	0.111	0.130
1980	0.106	0.124
1981	0.101	0.118
1982	0.081	0.095
1983	0.110	0.129
1984	0.109	0.128
1985	0.124	0.145
1986	0.063	0.073
1987	0.113	0.132
1988	0.066	0.077
1989	0.066	0.077
1990	0.080	0.094
1991	0.121	0.142
1992	0.116	0.136
1993	0.129	0.151
1994	0.089	0.104
1995	0.069	0.080
1996	0.092	0.108
1997	0.083	0.097
1998	0.099	0.115
1999	0.113	0.132
2000	0.093	0.109
2001	0.077	0.090
2002	0.137	0.160
2003	0.079	0.093
2004	0.120	0.140
2005	0.233	0.273
2006	0.108	0.126
2007	0.120	0.141
2008	0.099	0.116
2009	0.075	0.088
2010	0.097	0.114
2011	0.101	0.118
2012	0.095	0.111
2013	0.089	0.105
2014	0.088	0.103
2015	0.143	0.167
2016	0.095	0.111
2017	0.146	0.171
2018	0.087	0.103
2019	0.129	0.152
2020	0.106	0.124
2021	0.089	0.104
2022	0.149	0.174
2023	0.186	0.218
2024	0.195	0.229
2025	0.098	0.115
2026	0.110	0.129
2027	0.120	0.141

2028	0.047	0.055
2029	0.077	0.090
2030	0.163	0.191
2031	0.049	0.057
2032	0.081	0.095
2033	0.103	0.120
2034	0.078	0.091
2035	0.099	0.116
2036	0.081	0.094
2037	0.108	0.127
2038	0.102	0.120
2039	0.205	0.240
2040	0.081	0.094
2041	0.102	0.120
2042	0.120	0.140
2043	0.131	0.154
2044	0.090	0.105
2045	0.073	0.085
2046	0.081	0.095
2047	0.100	0.117
2048	0.082	0.096
2049	0.121	0.142
2050	0.091	0.106
2051	0.127	0.149
2052	0.098	0.115
2053	0.083	0.097
2054	0.163	0.191
2055	0.093	0.109
2056	0.131	0.153
2057	0.062	0.073
2058	0.123	0.144
2059	0.155	0.181

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3316	0.3883
2	0.3038	0.3559
3	0.2334	0.2734
4	0.2256	0.2642
5	0.2077	0.2433
6	0.2052	0.2403
7	0.1948	0.2286
8	0.1862	0.2180
9	0.1781	0.2118
10	0.1754	0.2055
11	0.1645	0.1926
12	0.1631	0.1910
13	0.1628	0.1907
14	0.1586	0.1857
15	0.1546	0.1810
16	0.1537	0.1800
17	0.1504	0.1761
18	0.1503	0.1760
19	0.1485	0.1739
20	0.1475	0.1730
21	0.1474	0.1728
22	0.1456	0.1706

23	0.1447	0.1695
24	0.1429	0.1674
25	0.1422	0.1665
26	0.1406	0.1647
27	0.1369	0.1604
28	0.1363	0.1599
29	0.1319	0.1545
30	0.1313	0.1537
31	0.1311	0.1536
32	0.1307	0.1531
33	0.1305	0.1528
34	0.1294	0.1516
35	0.1288	0.1508
36	0.1284	0.1504
37	0.1274	0.1492
38	0.1251	0.1465
39	0.1247	0.1461
40	0.1242	0.1455
41	0.1226	0.1435
42	0.1213	0.1420
43	0.1211	0.1418
44	0.1208	0.1415
45	0.1203	0.1409
46	0.1200	0.1406
47	0.1198	0.1403
48	0.1196	0.1400
49	0.1195	0.1400
50	0.1178	0.1380
51	0.1176	0.1377
52	0.1163	0.1362
53	0.1129	0.1322
54	0.1128	0.1321
55	0.1109	0.1299
56	0.1107	0.1297
57	0.1103	0.1292
58	0.1102	0.1291
59	0.1099	0.1289
60	0.1099	0.1287
61	0.1097	0.1285
62	0.1089	0.1276
63	0.1082	0.1267
64	0.1080	0.1264
65	0.1076	0.1260
66	0.1062	0.1244
67	0.1057	0.1238
68	0.1028	0.1204
69	0.1023	0.1200
70	0.1021	0.1198
71	0.1018	0.1196
72	0.1011	0.1184
73	0.1007	0.1180
74	0.1006	0.1178
75	0.1003	0.1176
76	0.0999	0.1174
77	0.0997	0.1174
78	0.0996	0.1167
79	0.0996	0.1166
80	0.0994	0.1165

81	0.0990	0.1160
82	0.0989	0.1159
83	0.0989	0.1158
84	0.0986	0.1155
85	0.0984	0.1152
86	0.0978	0.1145
87	0.0969	0.1135
88	0.0969	0.1135
89	0.0969	0.1135
90	0.0959	0.1123
91	0.0947	0.1110
92	0.0946	0.1108
93	0.0939	0.1099
94	0.0936	0.1097
95	0.0935	0.1095
96	0.0934	0.1094
97	0.0929	0.1088
98	0.0923	0.1082
99	0.0920	0.1077
100	0.0919	0.1077
101	0.0908	0.1064
102	0.0897	0.1051
103	0.0894	0.1047
104	0.0891	0.1043
105	0.0888	0.1040
106	0.0876	0.1026
107	0.0869	0.1025
108	0.0849	0.0994
109	0.0835	0.0978
110	0.0835	0.0978
111	0.0829	0.0971
112	0.0825	0.0966
113	0.0821	0.0961
114	0.0818	0.0958
115	0.0815	0.0955
116	0.0812	0.0951
117	0.0812	0.0950
118	0.0811	0.0950
119	0.0808	0.0946
120	0.0807	0.0945
121	0.0806	0.0943
122	0.0805	0.0942
123	0.0803	0.0941
124	0.0802	0.0939
125	0.0793	0.0929
126	0.0783	0.0917
127	0.0781	0.0914
128	0.0775	0.0908
129	0.0774	0.0906
130	0.0769	0.0900
131	0.0768	0.0900
132	0.0766	0.0898
133	0.0764	0.0897
134	0.0758	0.0888
135	0.0755	0.0884
136	0.0752	0.0881
137	0.0727	0.0852
138	0.0725	0.0849

139	0.0722	0.0847
140	0.0720	0.0844
141	0.0712	0.0834
142	0.0702	0.0822
143	0.0702	0.0822
144	0.0687	0.0804
145	0.0681	0.0797
146	0.0679	0.0795
147	0.0671	0.0786
148	0.0663	0.0777
149	0.0660	0.0773
150	0.0656	0.0769
151	0.0626	0.0734
152	0.0626	0.0733
153	0.0624	0.0731
154	0.0610	0.0715
155	0.0606	0.0709
156	0.0496	0.0581
157	0.0487	0.0570
158	0.0466	0.0545

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0498	4926	8903	180	Fail
0.0515	4343	7939	182	Fail
0.0532	3798	7041	185	Fail
0.0549	3358	6277	186	Fail
0.0566	2980	5579	187	Fail
0.0583	2653	4923	185	Fail
0.0601	2369	4404	185	Fail
0.0618	2120	3944	186	Fail
0.0635	1926	3543	183	Fail
0.0652	1718	3186	185	Fail
0.0669	1537	2883	187	Fail
0.0686	1393	2617	187	Fail
0.0703	1263	2375	188	Fail
0.0720	1137	2158	189	Fail
0.0737	1043	1977	189	Fail
0.0754	961	1808	188	Fail
0.0772	861	1649	191	Fail
0.0789	788	1498	190	Fail
0.0806	727	1376	189	Fail
0.0823	641	1268	197	Fail
0.0840	589	1159	196	Fail
0.0857	539	1068	198	Fail
0.0874	493	990	200	Fail
0.0891	462	923	199	Fail
0.0908	424	841	198	Fail
0.0926	390	784	201	Fail
0.0943	347	733	211	Fail
0.0960	317	658	207	Fail
0.0977	291	612	210	Fail
0.0994	265	566	213	Fail
0.1011	241	526	218	Fail
0.1028	222	488	219	Fail
0.1045	208	461	221	Fail
0.1062	192	428	222	Fail
0.1080	175	403	230	Fail
0.1097	163	362	222	Fail
0.1114	150	333	222	Fail
0.1131	138	310	224	Fail
0.1148	131	282	215	Fail
0.1165	123	264	214	Fail
0.1182	115	248	215	Fail
0.1199	105	226	215	Fail
0.1216	94	213	226	Fail
0.1234	91	201	220	Fail
0.1251	84	191	227	Fail
0.1268	79	174	220	Fail
0.1285	76	164	215	Fail
0.1302	71	150	211	Fail
0.1319	62	143	230	Fail
0.1336	60	131	218	Fail
0.1353	56	127	226	Fail
0.1370	54	123	227	Fail
0.1388	54	115	212	Fail
0.1405	52	106	203	Fail

0.1422	50	95	190	Fail
0.1439	46	91	197	Fail
0.1456	43	87	202	Fail
0.1473	41	82	200	Fail
0.1490	38	78	205	Fail
0.1507	34	75	220	Fail
0.1524	33	71	215	Fail
0.1542	32	66	206	Fail
0.1559	30	62	206	Fail
0.1576	30	57	190	Fail
0.1593	29	56	193	Fail
0.1610	29	54	186	Fail
0.1627	29	54	186	Fail
0.1644	25	53	211	Fail
0.1661	22	50	227	Fail
0.1678	22	46	209	Fail
0.1695	22	45	204	Fail
0.1713	20	42	209	Fail
0.1730	20	40	200	Fail
0.1747	18	38	211	Fail
0.1764	16	35	218	Fail
0.1781	16	34	212	Fail
0.1798	15	33	220	Fail
0.1815	15	30	200	Fail
0.1832	15	30	200	Fail
0.1849	15	30	200	Fail
0.1867	14	29	207	Fail
0.1884	14	29	207	Fail
0.1901	13	29	223	Fail
0.1918	13	26	200	Fail
0.1935	12	25	208	Fail
0.1952	11	24	218	Fail
0.1969	11	22	200	Fail
0.1986	11	22	200	Fail
0.2003	11	20	181	Fail
0.2021	11	20	181	Fail
0.2038	11	19	172	Fail
0.2055	10	18	180	Fail
0.2072	10	17	170	Fail
0.2089	9	17	188	Fail
0.2106	9	16	177	Fail
0.2123	9	15	166	Fail
0.2140	9	15	166	Fail
0.2157	8	15	187	Fail
0.2175	8	15	187	Fail
0.2192	8	14	175	Fail

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

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

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

Model Default Modifications

Total of 0 changes have been made.

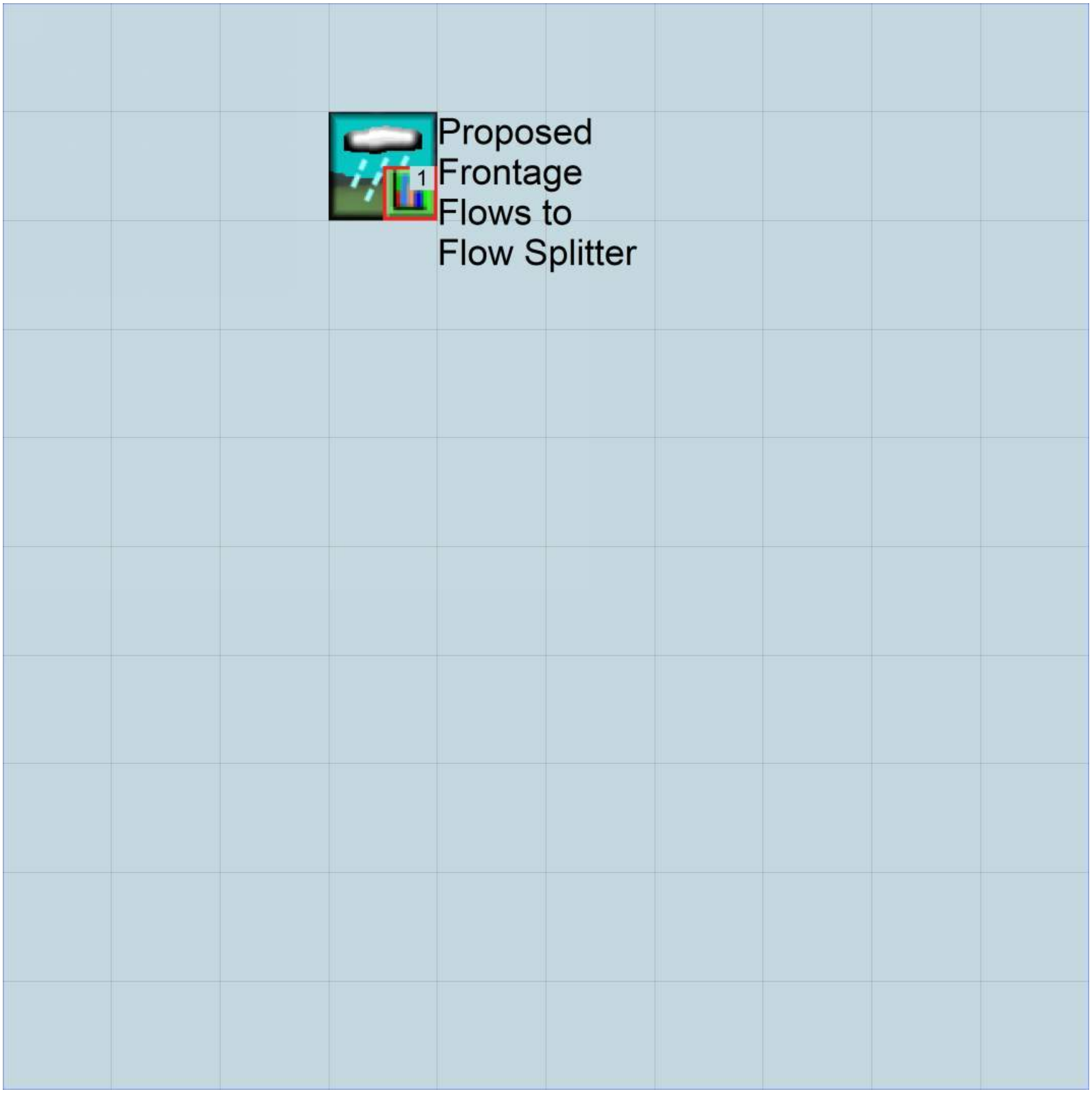
PERLND Changes

No PERLND changes have been made.

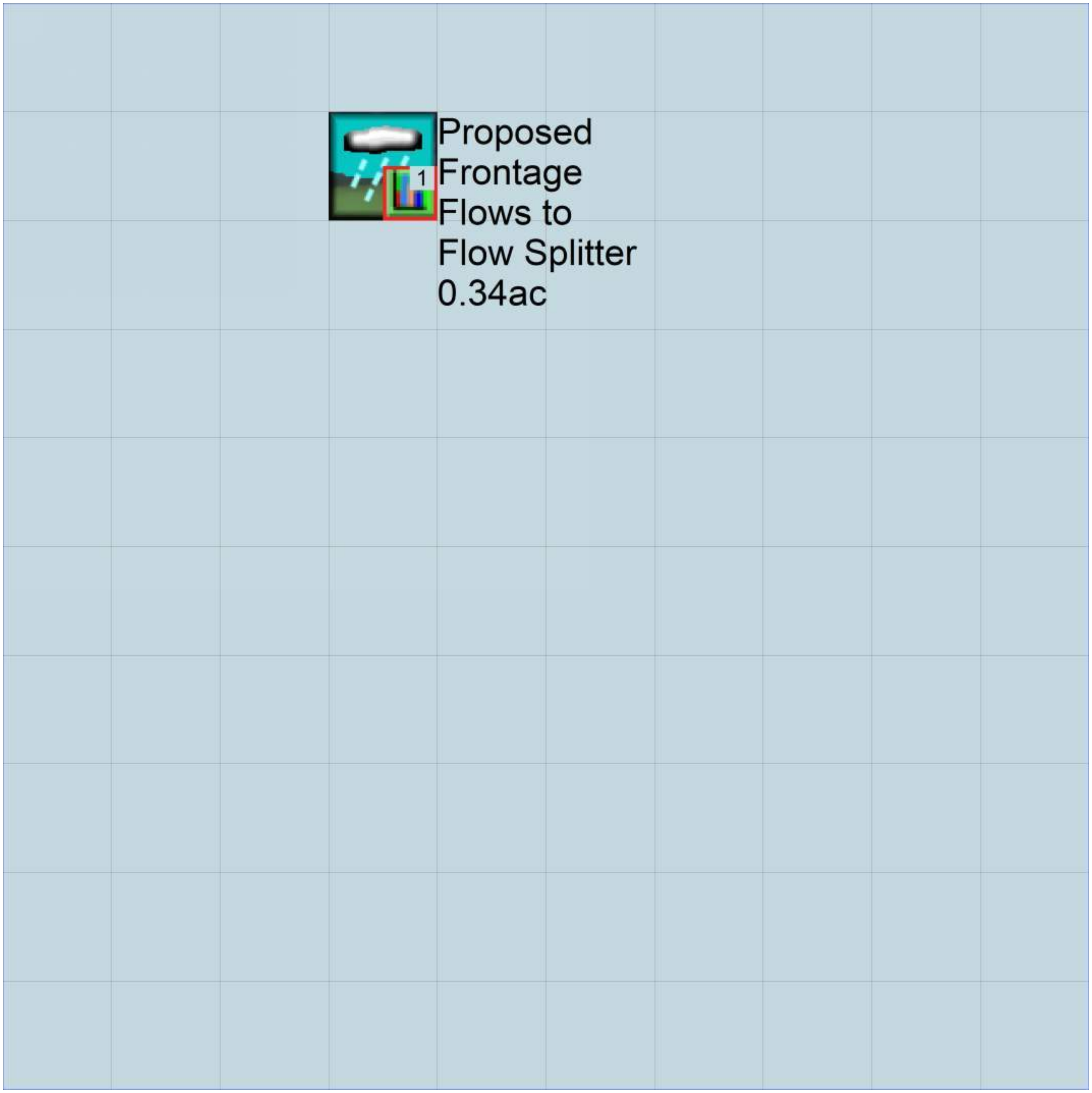
IMPLND Changes

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
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   East town Flows.wdm
MESSU      25   PreEast town Flows.MES
           27   PreEast town Flows.L61
           28   PreEast town Flows.L62
           30   POCEast town Flows1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Proposed Frontage Flows t   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          ***
  END GEN-INFO
  *** Section PWATER***

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

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

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

```
  END PWAT-PARM1

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

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

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

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

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

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND
```

```
SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Proposed Frontage Flows to Flow Splitter ***
IMPLND   1                    0.277655     COPY   501     15

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

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



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

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

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

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

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

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

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

END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       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   East town Flows.wdm
MESSU      25   MitEast town Flows.MES
           27   MitEast town Flows.L61
           28   MitEast town Flows.L62
           30   POCEast town Flows1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       1
      IMPLND       8
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Proposed Frontage Flows t   MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                            User  t-series Engl Metr ***
                                            in  out           ***
    7     A/B, Lawn, Flat          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

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

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

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
```

```
  END IWAT-PARM2

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Proposed Frontage Flows to Flow Splitter ***
PERLND   7                    0.018797     COPY   501     12
PERLND   7                    0.018797     COPY   501     13
IMPLND   1                    0.241753     COPY   501     15
IMPLND   8                    0.083435     COPY   501     15

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

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



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

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

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

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

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

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
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     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
END EXT TARGETS

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

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

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


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

www.clearcreeksolutions.com

Appendix E
Onsite Basin

EAST TOWN CROSSING

SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

ONSITE BASIN MAP

Impervious Type : Roof	Area	Acre
Building A	8,025	0.18422865
Building B	10,900	0.250229568
Building C	10,900	0.250229568
Building D	10,900	0.250229568
Building E	10,900	0.250229568
Building F	9,436	0.216620753
Building G	8,025	0.18422865
Building H	8,025	0.18422865
Commercial BLDG 1	6,700	0.153810836
Commercial BLDG 2	3,502	0.080394858
Club House	2,909	0.066781451
Covered Bus Stop	2,727	0.062603306
		0
All Roof Top Area	92,949	2.183952068

Basin Component Types	SQ FT	ACRE
Total Roof	92,949	2.183952068
Total PGIS (Asphalt)	81,727	1.920277256
Total Porous Asphalt	90,049	2.11581297
Total Conc. Sidewalks	4,581	0.107636278
Total Porous Conc. Walks	30,616	0.71936090
Total Dumpster IMP SURF	2,009	0.047203947
Total Vegetation	139,156	3.269642857
Total Basin Area	441,087	10.36388628

Drive aisles must be permeable if feasible per Ecology MR5 [Storm Report; Onsite Basin Map]

LEGEND:

IMPERVIOUS PAVEMENT 81,727 SF

SCALE: 1" = 40 FOR 24" X 36" SHEET

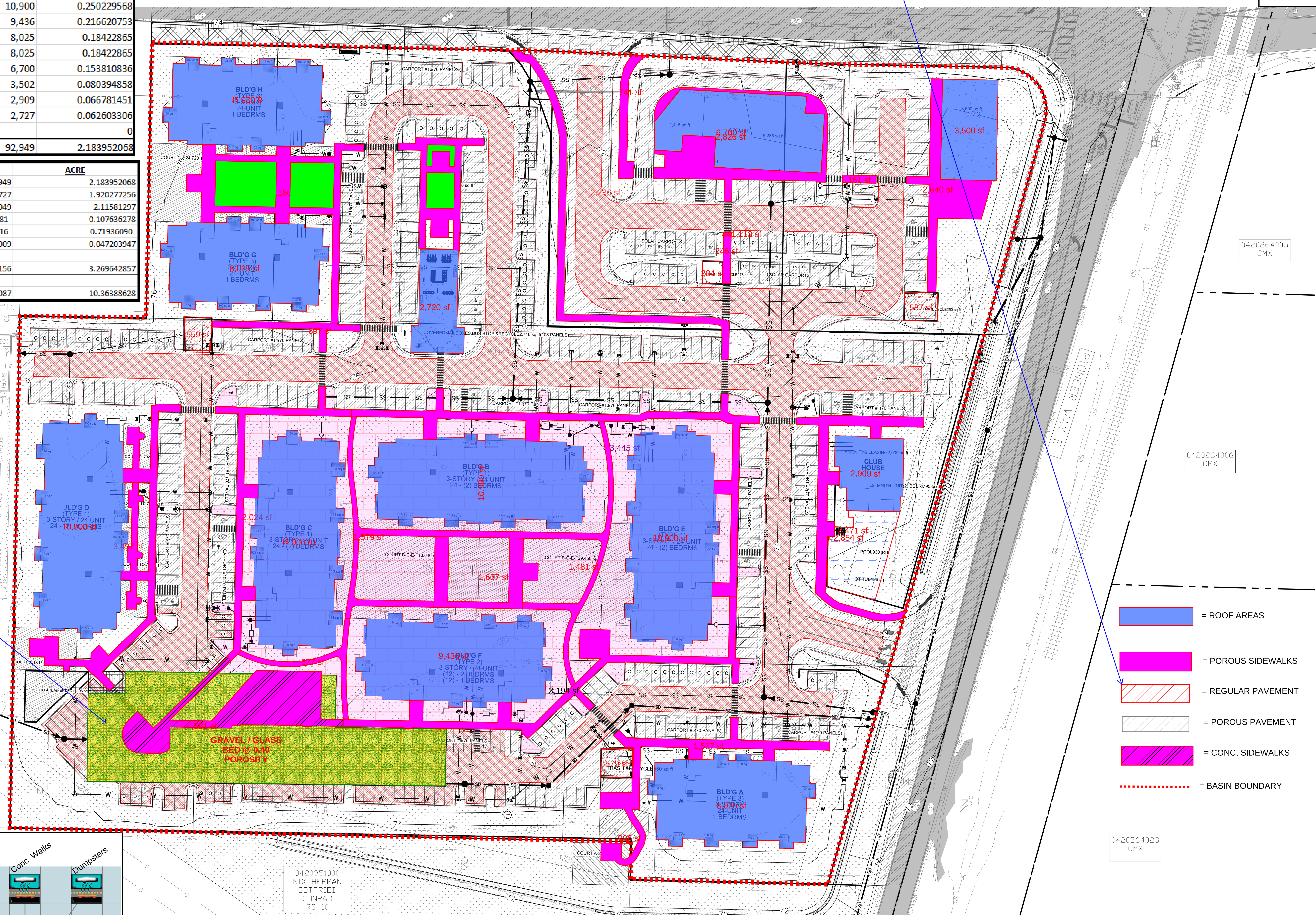
LINE IS 1" AT FULL SCALE

APPROVED

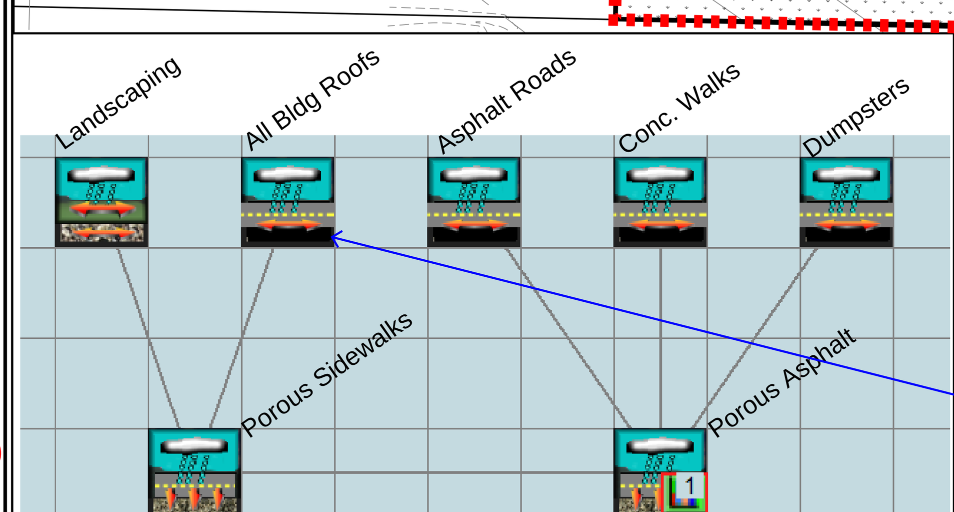
BY: CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.



Clarify...how are the new improvements over the top of the converted pond being accounted for flow control and water quality [Storm Report; Onsite BasinMap]



Per Ecology, roof runoff must be evaluated per MR5 BMPs. BMP T5.10A is not applicable (high density multi-family) then bioretention must be considered. If bioretention infeasible, then roof infiltration would require a minimum separation of 5ft to the restrictive layer...which is not possible based on the geotech analysis. (A separation down to 3ft would be allowed if supported by a mounding analysis). [Storm Report; Onsite Basin Map]

Due to the minimal depth to the restrictive layer on this site, any infiltration facility other than permeable pavement will require a mounding analysis in accordance with Ecology 3.3.4. [Storm Report;

Figure E1 - Onsite Basin Map

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

CALL BEFORE YOU DIG (811)
WWW.WASHINGTON811.COM

TITLE: East Town Crossing
ONSITE BASIN MAP
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

Abbey Road Group Land Development Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

REVISIONS: BY: CHK: APR: DATE: PER:

JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 11/11/2021
SHEET:

Figure E2 – Onsite Stormwater Calculations
WWHM Report

WWHM2012

PROJECT REPORT

06-171 East Town Onsite Stormwater
Calculations for Porous Pavement 12-9-2021

General Model Information

Project Name:	06-171 EAST TOWN ONSITE
Site Name:	EAST TOWN ONSITE
Site Address:	
City:	PUYALLUP
Report Date:	12/9/2021
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

ONSITE BASIN

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	10.363886
Pervious Total	10.363886
Impervious Land Use	acre
Impervious Total	0
Basin Total	10.363886

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

LANDSCAPING

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
A B, Lawn, Flat	3.2696	

Element Flows To:

Surface	Interflow	Groundwater
POROUS SIDEWALKS	POROUS SIDEWALKS	

ALL ROOFS

Bypass:	No
Impervious Land Use	acre
ROOF TOPS FLAT LAT	2.184

Element Flows To:

Outlet 1	Outlet 2
POROUS SIDEWALKS	

ASPHALT ROADS

Bypass:	No
Impervious Land Use	acre
ROADS FLAT LAT	1.9203

Element Flows To:

Outlet 1	Outlet 2
POROUS ASPHALT	

CONCRETE SIDEWALKS

Bypass:	No
Impervious Land Use	acre
SIDEWALKS FLAT LAT	0.10764

Element Flows To:

Outlet 1	Outlet 2
POROUS ASPHALT	

DUMPSTERS

Bypass:	No
Impervious Land Use	acre
ROADS FLAT LAT	0.0472

Element Flows To:

Outlet 1	Outlet 2
POROUS ASPHALT	

Routing Elements
Predeveloped Routing

Mitigated Routing

POROUS SIDEWALKS

Pavement Area:0.7028 acre.Pavement Length:6123.20 ft.
Pavement Width: 5.00 ft.
Pavement slope 1:0 To 1
Pavement thickness: 0.3333
Pour Space of Pavement: 0.5
Material thickness of second layer: 0.083333
Pour Space of material for second layer: 0.5
Material thickness of third layer: 0.583333
Pour Space of material for third layer: 0.4
Infiltration On
Infiltration rate: 2
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 1207.237
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 1207.237
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 29.792
Element Flows To:

Outlet 1	Outlet 2
POROUS ASPHALT	POROUS ASPHALT

Permeable Pavement Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.702	0.000	0.000	0.000
0.0111	0.702	0.003	0.000	1.417
0.0222	0.702	0.006	0.000	1.417
0.0333	0.702	0.009	0.000	1.417
0.0444	0.702	0.012	0.000	1.417
0.0556	0.702	0.015	0.000	1.417
0.0667	0.702	0.018	0.000	1.417
0.0778	0.702	0.021	0.000	1.417
0.0889	0.702	0.025	0.000	1.417
0.1000	0.702	0.028	0.000	1.417
0.1111	0.702	0.031	0.000	1.417
0.1222	0.702	0.034	0.000	1.417
0.1333	0.702	0.037	0.000	1.417
0.1444	0.702	0.040	0.000	1.417
0.1556	0.702	0.043	0.000	1.417
0.1667	0.702	0.046	0.000	1.417
0.1778	0.702	0.050	0.000	1.417
0.1889	0.702	0.053	0.000	1.417
0.2000	0.702	0.056	0.000	1.417
0.2111	0.702	0.059	0.000	1.417
0.2222	0.702	0.062	0.000	1.417
0.2333	0.702	0.065	0.000	1.417
0.2444	0.702	0.068	0.000	1.417
0.2556	0.702	0.071	0.000	1.417
0.2667	0.702	0.075	0.000	1.417
0.2778	0.702	0.078	0.000	1.417
0.2889	0.702	0.081	0.000	1.417
0.3000	0.702	0.084	0.000	1.417
0.3111	0.702	0.087	0.000	1.417

0.3222	0.702	0.090	0.000	1.417
0.3333	0.702	0.093	0.000	1.417
0.3444	0.702	0.096	0.000	1.417
0.3556	0.702	0.100	0.000	1.417
0.3667	0.702	0.103	0.000	1.417
0.3778	0.702	0.106	0.000	1.417
0.3889	0.702	0.109	0.000	1.417
0.4000	0.702	0.112	0.000	1.417
0.4111	0.702	0.115	0.000	1.417
0.4222	0.702	0.118	0.000	1.417
0.4333	0.702	0.121	0.000	1.417
0.4444	0.702	0.125	0.000	1.417
0.4556	0.702	0.128	0.000	1.417
0.4667	0.702	0.131	0.000	1.417
0.4778	0.702	0.134	0.000	1.417
0.4889	0.702	0.137	0.000	1.417
0.5000	0.702	0.140	0.000	1.417
0.5111	0.702	0.143	0.000	1.417
0.5222	0.702	0.146	0.000	1.417
0.5333	0.702	0.149	0.000	1.417
0.5444	0.702	0.153	0.000	1.417
0.5556	0.702	0.156	0.000	1.417
0.5667	0.702	0.159	0.000	1.417
0.5778	0.702	0.162	0.000	1.417
0.5889	0.702	0.166	0.000	1.417
0.6000	0.702	0.170	0.000	1.417
0.6111	0.702	0.174	0.000	1.417
0.6222	0.702	0.178	0.000	1.417
0.6333	0.702	0.182	0.000	1.417
0.6444	0.702	0.185	0.000	1.417
0.6556	0.702	0.189	0.000	1.417
0.6667	0.702	0.193	0.000	1.417
0.6778	0.702	0.197	0.000	1.417
0.6889	0.702	0.201	0.000	1.417
0.7000	0.702	0.205	0.000	1.417
0.7111	0.702	0.209	0.000	1.417
0.7222	0.702	0.213	0.000	1.417
0.7333	0.702	0.217	0.000	1.417
0.7444	0.702	0.221	0.000	1.417
0.7556	0.702	0.224	0.000	1.417
0.7667	0.702	0.228	0.000	1.417
0.7778	0.702	0.232	0.000	1.417
0.7889	0.702	0.236	0.000	1.417
0.8000	0.702	0.240	0.000	1.417
0.8111	0.702	0.244	0.000	1.417
0.8222	0.702	0.248	0.000	1.417
0.8333	0.702	0.252	0.000	1.417
0.8444	0.702	0.256	0.000	1.417
0.8556	0.702	0.260	0.000	1.417
0.8667	0.702	0.264	0.000	1.417
0.8778	0.702	0.267	0.000	1.417
0.8889	0.702	0.271	0.000	1.417
0.9000	0.702	0.275	0.000	1.417
0.9111	0.702	0.279	0.000	1.417
0.9222	0.702	0.283	0.000	1.417
0.9333	0.702	0.287	0.000	1.417
0.9444	0.702	0.291	0.000	1.417
0.9556	0.702	0.295	0.000	1.417

0.9667	0.702	0.299	0.000	1.417
0.9778	0.702	0.303	0.000	1.417
0.9889	0.702	0.306	0.000	1.417
1.0000	0.702	0.314	0.000	1.417

POROUS ASPHALT

Pavement Area:2.0672 acre.Pavement Length:	4502.45 ft.
Pavement Width:	20.00 ft.
	Pavement slope 1:0 To 1
Pavement thickness:	0.3333
Pour Space of Pavement:	0.5
Material thickness of second layer:	0.083333
Pour Space of material for second layer:	0.5
Material thickness of third layer:	0.583333
Pour Space of material for third layer:	0.4
Infiltration On	
Infiltration rate:	2
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	1699.401
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	1699.401
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	71.629

Element Flows To:
Outlet 1 Outlet 2

Permeable Pavement Hydraulic Table

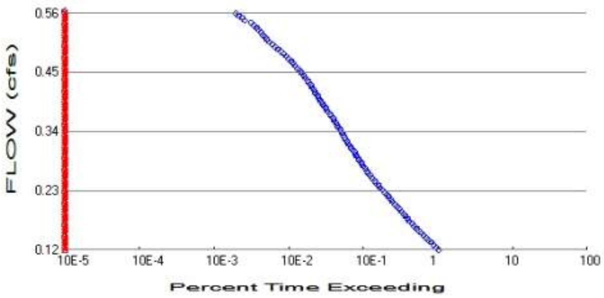
Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	2.067	0.000	0.000	0.000
0.0111	2.067	0.009	0.000	4.168
0.0222	2.067	0.018	0.000	4.168
0.0333	2.067	0.027	0.000	4.168
0.0444	2.067	0.036	0.000	4.168
0.0556	2.067	0.045	0.000	4.168
0.0667	2.067	0.055	0.000	4.168
0.0778	2.067	0.064	0.000	4.168
0.0889	2.067	0.073	0.000	4.168
0.1000	2.067	0.082	0.000	4.168
0.1111	2.067	0.091	0.000	4.168
0.1222	2.067	0.101	0.000	4.168
0.1333	2.067	0.110	0.000	4.168
0.1444	2.067	0.119	0.000	4.168
0.1556	2.067	0.128	0.000	4.168
0.1667	2.067	0.137	0.000	4.168
0.1778	2.067	0.147	0.000	4.168
0.1889	2.067	0.156	0.000	4.168
0.2000	2.067	0.165	0.000	4.168
0.2111	2.067	0.174	0.000	4.168
0.2222	2.067	0.183	0.000	4.168
0.2333	2.067	0.192	0.000	4.168
0.2444	2.067	0.202	0.000	4.168
0.2556	2.067	0.211	0.000	4.168
0.2667	2.067	0.220	0.000	4.168
0.2778	2.067	0.229	0.000	4.168
0.2889	2.067	0.238	0.000	4.168
0.3000	2.067	0.248	0.000	4.168
0.3111	2.067	0.257	0.000	4.168
0.3222	2.067	0.266	0.000	4.168

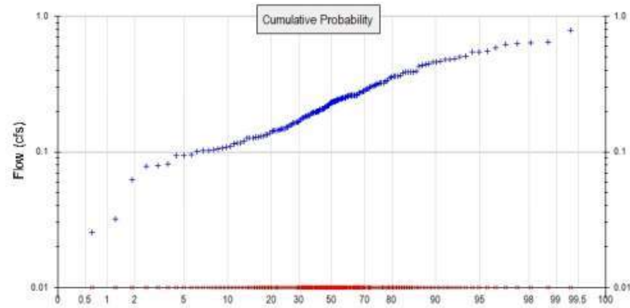
0.3333	2.067	0.275	0.000	4.168
0.3444	2.067	0.284	0.000	4.168
0.3556	2.067	0.294	0.000	4.168
0.3667	2.067	0.303	0.000	4.168
0.3778	2.067	0.312	0.000	4.168
0.3889	2.067	0.321	0.000	4.168
0.4000	2.067	0.330	0.000	4.168
0.4111	2.067	0.339	0.000	4.168
0.4222	2.067	0.349	0.000	4.168
0.4333	2.067	0.358	0.000	4.168
0.4444	2.067	0.367	0.000	4.168
0.4556	2.067	0.376	0.000	4.168
0.4667	2.067	0.385	0.000	4.168
0.4778	2.067	0.395	0.000	4.168
0.4889	2.067	0.404	0.000	4.168
0.5000	2.067	0.413	0.000	4.168
0.5111	2.067	0.422	0.000	4.168
0.5222	2.067	0.431	0.000	4.168
0.5333	2.067	0.441	0.000	4.168
0.5444	2.067	0.450	0.000	4.168
0.5556	2.067	0.459	0.000	4.168
0.5667	2.067	0.468	0.000	4.168
0.5778	2.067	0.477	0.000	4.168
0.5889	2.067	0.489	0.000	4.168
0.6000	2.067	0.500	0.000	4.168
0.6111	2.067	0.512	0.000	4.168
0.6222	2.067	0.523	0.000	4.168
0.6333	2.067	0.535	0.000	4.168
0.6444	2.067	0.546	0.000	4.168
0.6556	2.067	0.558	0.000	4.168
0.6667	2.067	0.569	0.000	4.168
0.6778	2.067	0.581	0.000	4.168
0.6889	2.067	0.592	0.000	4.168
0.7000	2.067	0.604	0.000	4.168
0.7111	2.067	0.615	0.000	4.168
0.7222	2.067	0.627	0.000	4.168
0.7333	2.067	0.638	0.000	4.168
0.7444	2.067	0.650	0.000	4.168
0.7556	2.067	0.661	0.000	4.168
0.7667	2.067	0.673	0.000	4.168
0.7778	2.067	0.684	0.000	4.168
0.7889	2.067	0.696	0.000	4.168
0.8000	2.067	0.707	0.000	4.168
0.8111	2.067	0.718	0.000	4.168
0.8222	2.067	0.730	0.000	4.168
0.8333	2.067	0.741	0.000	4.168
0.8444	2.067	0.753	0.000	4.168
0.8556	2.067	0.764	0.000	4.168
0.8667	2.067	0.776	0.000	4.168
0.8778	2.067	0.787	0.000	4.168
0.8889	2.067	0.799	0.000	4.168
0.9000	2.067	0.810	0.000	4.168
0.9111	2.067	0.822	0.000	4.168
0.9222	2.067	0.833	0.000	4.168
0.9333	2.067	0.845	0.000	4.168
0.9444	2.067	0.856	0.000	4.168
0.9556	2.067	0.868	0.000	4.168
0.9667	2.067	0.879	0.000	4.168

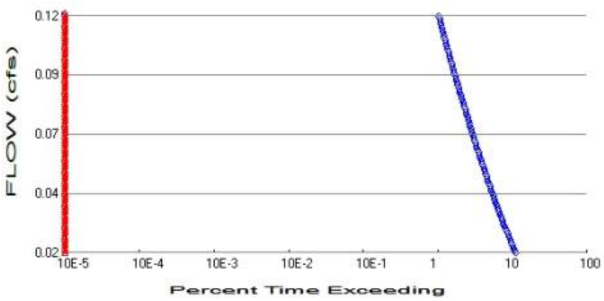
0.9778	2.067	0.891	0.000	4.168
0.9889	2.067	0.902	0.000	4.168
1.0000	2.067	0.925	0.000	4.168

Analysis Results

POC 1







\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 10.363886
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.2696
Total Impervious Area: 7.029228

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.234167
5 year	0.36029
10 year	0.433193
25 year	0.512156
50 year	0.56295
100 year	0.607024

Flow Frequency Return Periods for Mitigated. POC #1

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

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.190	0.000
1903	0.144	0.000
1904	0.247	0.000
1905	0.120	0.000
1906	0.062	0.000
1907	0.363	0.000
1908	0.261	0.000
1909	0.256	0.000
1910	0.362	0.000
1911	0.235	0.000
1912	0.787	0.000
1913	0.367	0.000
1914	0.094	0.000
1915	0.153	0.000
1916	0.233	0.000
1917	0.080	0.000
1918	0.250	0.000
1919	0.194	0.000
1920	0.238	0.000
1921	0.260	0.000
1922	0.262	0.000
1923	0.208	0.000
1924	0.101	0.000
1925	0.128	0.000
1926	0.227	0.000
1927	0.166	0.000
1928	0.179	0.000
1929	0.362	0.000
1930	0.232	0.000
1931	0.221	0.000
1932	0.168	0.000
1933	0.187	0.000
1934	0.477	0.000
1935	0.220	0.000
1936	0.198	0.000
1937	0.317	0.000
1938	0.195	0.000
1939	0.016	0.000
1940	0.214	0.000
1941	0.130	0.000
1942	0.322	0.000
1943	0.163	0.000
1944	0.337	0.000
1945	0.259	0.000
1946	0.153	0.000
1947	0.108	0.000
1948	0.498	0.000
1949	0.433	0.000
1950	0.126	0.000
1951	0.163	0.000
1952	0.645	0.000
1953	0.586	0.000
1954	0.207	0.000
1955	0.181	0.000
1956	0.096	0.000
1957	0.310	0.000

1958	0.623	0.000
1959	0.390	0.000
1960	0.115	0.000
1961	0.390	0.000
1962	0.211	0.000
1963	0.103	0.000
1964	0.107	0.000
1965	0.438	0.000
1966	0.128	0.000
1967	0.196	0.000
1968	0.206	0.000
1969	0.195	0.000
1970	0.301	0.000
1971	0.461	0.000
1972	0.303	0.000
1973	0.393	0.000
1974	0.216	0.000
1975	0.490	0.000
1976	0.262	0.000
1977	0.117	0.000
1978	0.430	0.000
1979	0.126	0.000
1980	0.251	0.000
1981	0.229	0.000
1982	0.110	0.000
1983	0.390	0.000
1984	0.177	0.000
1985	0.279	0.000
1986	0.233	0.000
1987	0.446	0.000
1988	0.279	0.000
1989	0.256	0.000
1990	0.293	0.000
1991	0.235	0.000
1992	0.305	0.000
1993	0.315	0.000
1994	0.462	0.000
1995	0.105	0.000
1996	0.505	0.000
1997	0.208	0.000
1998	0.250	0.000
1999	0.025	0.000
2000	0.186	0.000
2001	0.102	0.000
2002	0.334	0.000
2003	0.287	0.000
2004	0.254	0.000
2005	0.464	0.000
2006	0.148	0.000
2007	0.156	0.000
2008	0.249	0.000
2009	0.165	0.000
2010	0.144	0.000
2011	0.131	0.000
2012	0.196	0.000
2013	0.147	0.000
2014	0.102	0.000
2015	0.200	0.000

2016	0.081	0.000
2017	0.355	0.000
2018	0.635	0.000
2019	0.628	0.000
2020	0.198	0.000
2021	0.324	0.000
2022	0.134	0.000
2023	0.271	0.000
2024	0.544	0.000
2025	0.243	0.000
2026	0.386	0.000
2027	0.146	0.000
2028	0.127	0.000
2029	0.262	0.000
2030	0.480	0.000
2031	0.158	0.000
2032	0.094	0.000
2033	0.144	0.000
2034	0.141	0.000
2035	0.547	0.000
2036	0.291	0.000
2037	0.078	0.000
2038	0.240	0.000
2039	0.032	0.000
2040	0.137	0.000
2041	0.183	0.000
2042	0.552	0.000
2043	0.264	0.000
2044	0.352	0.000
2045	0.237	0.000
2046	0.276	0.000
2047	0.204	0.000
2048	0.271	0.000
2049	0.242	0.000
2050	0.173	0.000
2051	0.247	0.000
2052	0.147	0.000
2053	0.259	0.000
2054	0.323	0.000
2055	0.133	0.000
2056	0.116	0.000
2057	0.182	0.000
2058	0.216	0.000
2059	0.381	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.7873	0.0000
2	0.6450	0.0000
3	0.6355	0.0000
4	0.6281	0.0000
5	0.6230	0.0000
6	0.5856	0.0000
7	0.5525	0.0000
8	0.5468	0.0000
9	0.5441	0.0000
10	0.5050	0.0000

11	0.4985	0.0000
12	0.4897	0.0000
13	0.4800	0.0000
14	0.4774	0.0000
15	0.4636	0.0000
16	0.4623	0.0000
17	0.4613	0.0000
18	0.4461	0.0000
19	0.4378	0.0000
20	0.4332	0.0000
21	0.4303	0.0000
22	0.3926	0.0000
23	0.3903	0.0000
24	0.3901	0.0000
25	0.3896	0.0000
26	0.3864	0.0000
27	0.3812	0.0000
28	0.3668	0.0000
29	0.3632	0.0000
30	0.3625	0.0000
31	0.3622	0.0000
32	0.3553	0.0000
33	0.3520	0.0000
34	0.3366	0.0000
35	0.3337	0.0000
36	0.3237	0.0000
37	0.3227	0.0000
38	0.3222	0.0000
39	0.3167	0.0000
40	0.3147	0.0000
41	0.3102	0.0000
42	0.3051	0.0000
43	0.3029	0.0000
44	0.3011	0.0000
45	0.2925	0.0000
46	0.2911	0.0000
47	0.2872	0.0000
48	0.2791	0.0000
49	0.2787	0.0000
50	0.2760	0.0000
51	0.2713	0.0000
52	0.2708	0.0000
53	0.2643	0.0000
54	0.2623	0.0000
55	0.2621	0.0000
56	0.2617	0.0000
57	0.2613	0.0000
58	0.2598	0.0000
59	0.2593	0.0000
60	0.2589	0.0000
61	0.2564	0.0000
62	0.2557	0.0000
63	0.2539	0.0000
64	0.2509	0.0000
65	0.2496	0.0000
66	0.2495	0.0000
67	0.2494	0.0000
68	0.2472	0.0000

69	0.2472	0.0000
70	0.2427	0.0000
71	0.2416	0.0000
72	0.2404	0.0000
73	0.2384	0.0000
74	0.2372	0.0000
75	0.2351	0.0000
76	0.2345	0.0000
77	0.2335	0.0000
78	0.2327	0.0000
79	0.2319	0.0000
80	0.2292	0.0000
81	0.2273	0.0000
82	0.2206	0.0000
83	0.2200	0.0000
84	0.2163	0.0000
85	0.2162	0.0000
86	0.2145	0.0000
87	0.2115	0.0000
88	0.2079	0.0000
89	0.2077	0.0000
90	0.2068	0.0000
91	0.2060	0.0000
92	0.2045	0.0000
93	0.1995	0.0000
94	0.1984	0.0000
95	0.1984	0.0000
96	0.1962	0.0000
97	0.1960	0.0000
98	0.1951	0.0000
99	0.1948	0.0000
100	0.1943	0.0000
101	0.1898	0.0000
102	0.1868	0.0000
103	0.1863	0.0000
104	0.1833	0.0000
105	0.1818	0.0000
106	0.1815	0.0000
107	0.1787	0.0000
108	0.1771	0.0000
109	0.1728	0.0000
110	0.1685	0.0000
111	0.1663	0.0000
112	0.1652	0.0000
113	0.1632	0.0000
114	0.1631	0.0000
115	0.1584	0.0000
116	0.1560	0.0000
117	0.1532	0.0000
118	0.1531	0.0000
119	0.1477	0.0000
120	0.1472	0.0000
121	0.1468	0.0000
122	0.1465	0.0000
123	0.1445	0.0000
124	0.1444	0.0000
125	0.1438	0.0000
126	0.1410	0.0000

127	0.1374	0.0000
128	0.1335	0.0000
129	0.1333	0.0000
130	0.1308	0.0000
131	0.1301	0.0000
132	0.1278	0.0000
133	0.1278	0.0000
134	0.1269	0.0000
135	0.1264	0.0000
136	0.1258	0.0000
137	0.1200	0.0000
138	0.1166	0.0000
139	0.1159	0.0000
140	0.1145	0.0000
141	0.1097	0.0000
142	0.1080	0.0000
143	0.1069	0.0000
144	0.1054	0.0000
145	0.1030	0.0000
146	0.1020	0.0000
147	0.1017	0.0000
148	0.1012	0.0000
149	0.0958	0.0000
150	0.0939	0.0000
151	0.0935	0.0000
152	0.0814	0.0000
153	0.0796	0.0000
154	0.0778	0.0000
155	0.0623	0.0000
156	0.0320	0.0000
157	0.0253	0.0000
158	0.0163	0.0000

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0187	613285	0	0	Pass
0.0197	592787	0	0	Pass
0.0207	573397	0	0	Pass
0.0217	555114	0	0	Pass
0.0227	537719	0	0	Pass
0.0237	520932	0	0	Pass
0.0247	505143	0	0	Pass
0.0257	490019	0	0	Pass
0.0267	475393	0	0	Pass
0.0277	461543	0	0	Pass
0.0287	448025	0	0	Pass
0.0297	435006	0	0	Pass
0.0307	422430	0	0	Pass
0.0316	410297	0	0	Pass
0.0326	398497	0	0	Pass
0.0336	387250	0	0	Pass
0.0346	376558	0	0	Pass
0.0356	366143	0	0	Pass
0.0366	356337	0	0	Pass
0.0376	346697	0	0	Pass
0.0386	337390	0	0	Pass
0.0396	328415	0	0	Pass
0.0406	319828	0	0	Pass
0.0416	311407	0	0	Pass
0.0426	303208	0	0	Pass
0.0436	295452	0	0	Pass
0.0446	287806	0	0	Pass
0.0456	280493	0	0	Pass
0.0465	273513	0	0	Pass
0.0475	266643	0	0	Pass
0.0485	259995	0	0	Pass
0.0495	253569	0	0	Pass
0.0505	247253	0	0	Pass
0.0515	241214	0	0	Pass
0.0525	235342	0	0	Pass
0.0535	229691	0	0	Pass
0.0545	223985	0	0	Pass
0.0555	218500	0	0	Pass
0.0565	213182	0	0	Pass
0.0575	208029	0	0	Pass
0.0585	202988	0	0	Pass
0.0595	198113	0	0	Pass
0.0605	193404	0	0	Pass
0.0615	188750	0	0	Pass
0.0624	184263	0	0	Pass
0.0634	180052	0	0	Pass
0.0644	175897	0	0	Pass
0.0654	171908	0	0	Pass
0.0664	167975	0	0	Pass
0.0674	164152	0	0	Pass
0.0684	160496	0	0	Pass
0.0694	156950	0	0	Pass
0.0704	153404	0	0	Pass

0.0714	149970	0	0	Pass
0.0724	146645	0	0	Pass
0.0734	143321	0	0	Pass
0.0744	140164	0	0	Pass
0.0754	137006	0	0	Pass
0.0764	133903	0	0	Pass
0.0773	130967	0	0	Pass
0.0783	128031	0	0	Pass
0.0793	125150	0	0	Pass
0.0803	122380	0	0	Pass
0.0813	119665	0	0	Pass
0.0823	116951	0	0	Pass
0.0833	114347	0	0	Pass
0.0843	111854	0	0	Pass
0.0853	109416	0	0	Pass
0.0863	107034	0	0	Pass
0.0873	104763	0	0	Pass
0.0883	102491	0	0	Pass
0.0893	100331	0	0	Pass
0.0903	98170	0	0	Pass
0.0913	96120	0	0	Pass
0.0922	94015	0	0	Pass
0.0932	92076	0	0	Pass
0.0942	90137	0	0	Pass
0.0952	88309	0	0	Pass
0.0962	86425	0	0	Pass
0.0972	84597	0	0	Pass
0.0982	82824	0	0	Pass
0.0992	81107	0	0	Pass
0.1002	79611	0	0	Pass
0.1012	78060	0	0	Pass
0.1022	76397	0	0	Pass
0.1032	74846	0	0	Pass
0.1042	73350	0	0	Pass
0.1052	71910	0	0	Pass
0.1062	70525	0	0	Pass
0.1071	69085	0	0	Pass
0.1081	67700	0	0	Pass
0.1091	66370	0	0	Pass
0.1101	65096	0	0	Pass
0.1111	63877	0	0	Pass
0.1121	62658	0	0	Pass
0.1131	61495	0	0	Pass
0.1141	60220	0	0	Pass
0.1151	59168	0	0	Pass
0.1161	58060	0	0	Pass
0.1171	56896	0	0	Pass

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1171	56896	0	0	Pass
0.1216	52991	0	0	Pass
0.1261	48426	0	0	Pass
0.1306	45068	0	0	Pass
0.1351	41290	0	0	Pass
0.1396	38581	0	0	Pass
0.1441	35540	0	0	Pass
0.1486	33279	0	0	Pass
0.1531	30570	0	0	Pass
0.1576	28681	0	0	Pass
0.1621	26531	0	0	Pass
0.1666	24997	0	0	Pass
0.1711	23163	0	0	Pass
0.1756	21861	0	0	Pass
0.1801	20360	0	0	Pass
0.1846	19241	0	0	Pass
0.1891	17889	0	0	Pass
0.1936	16869	0	0	Pass
0.1982	15640	0	0	Pass
0.2027	14742	0	0	Pass
0.2072	13745	0	0	Pass
0.2117	12991	0	0	Pass
0.2162	12116	0	0	Pass
0.2207	11485	0	0	Pass
0.2252	10681	0	0	Pass
0.2297	10088	0	0	Pass
0.2342	9379	0	0	Pass
0.2387	8842	0	0	Pass
0.2432	8210	0	0	Pass
0.2477	7795	0	0	Pass
0.2522	7257	0	0	Pass
0.2567	6842	0	0	Pass
0.2612	6432	0	0	Pass
0.2657	6166	0	0	Pass
0.2702	5845	0	0	Pass
0.2747	5595	0	0	Pass
0.2792	5281	0	0	Pass
0.2837	5048	0	0	Pass
0.2882	4791	0	0	Pass
0.2927	4569	0	0	Pass
0.2972	4347	0	0	Pass
0.3017	4185	0	0	Pass
0.3062	3948	0	0	Pass
0.3107	3749	0	0	Pass
0.3152	3540	0	0	Pass
0.3198	3391	0	0	Pass
0.3243	3237	0	0	Pass
0.3288	3106	0	0	Pass
0.3333	2972	0	0	Pass
0.3378	2871	0	0	Pass
0.3423	2743	0	0	Pass
0.3468	2629	0	0	Pass
0.3513	2483	0	0	Pass

0.3558	2379	0	0	Pass
0.3603	2267	0	0	Pass
0.3648	2180	0	0	Pass
0.3693	2061	0	0	Pass
0.3738	1962	0	0	Pass
0.3783	1845	0	0	Pass
0.3828	1758	0	0	Pass
0.3873	1665	0	0	Pass
0.3918	1588	0	0	Pass
0.3963	1514	0	0	Pass
0.4008	1459	0	0	Pass
0.4053	1375	0	0	Pass
0.4098	1311	0	0	Pass
0.4143	1244	0	0	Pass
0.4188	1194	0	0	Pass
0.4233	1133	0	0	Pass
0.4278	1089	0	0	Pass
0.4323	1026	0	0	Pass
0.4368	991	0	0	Pass
0.4414	926	0	0	Pass
0.4459	878	0	0	Pass
0.4504	820	0	0	Pass
0.4549	783	0	0	Pass
0.4594	724	0	0	Pass
0.4639	675	0	0	Pass
0.4684	630	0	0	Pass
0.4729	598	0	0	Pass
0.4774	551	0	0	Pass
0.4819	516	0	0	Pass
0.4864	476	0	0	Pass
0.4909	437	0	0	Pass
0.4954	395	0	0	Pass
0.4999	365	0	0	Pass
0.5044	335	0	0	Pass
0.5089	304	0	0	Pass
0.5134	282	0	0	Pass
0.5179	267	0	0	Pass
0.5224	249	0	0	Pass
0.5269	235	0	0	Pass
0.5314	219	0	0	Pass
0.5359	207	0	0	Pass
0.5404	188	0	0	Pass
0.5449	173	0	0	Pass
0.5494	144	0	0	Pass
0.5539	132	0	0	Pass
0.5584	119	0	0	Pass
0.5630	108	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
POROUS ASPHALT POC	☐	1546.45			☐	100.00			
POROUS SIDEWALKS	☐	1098.59			☐	100.00			
Total Volume Infiltrated		2645.04	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

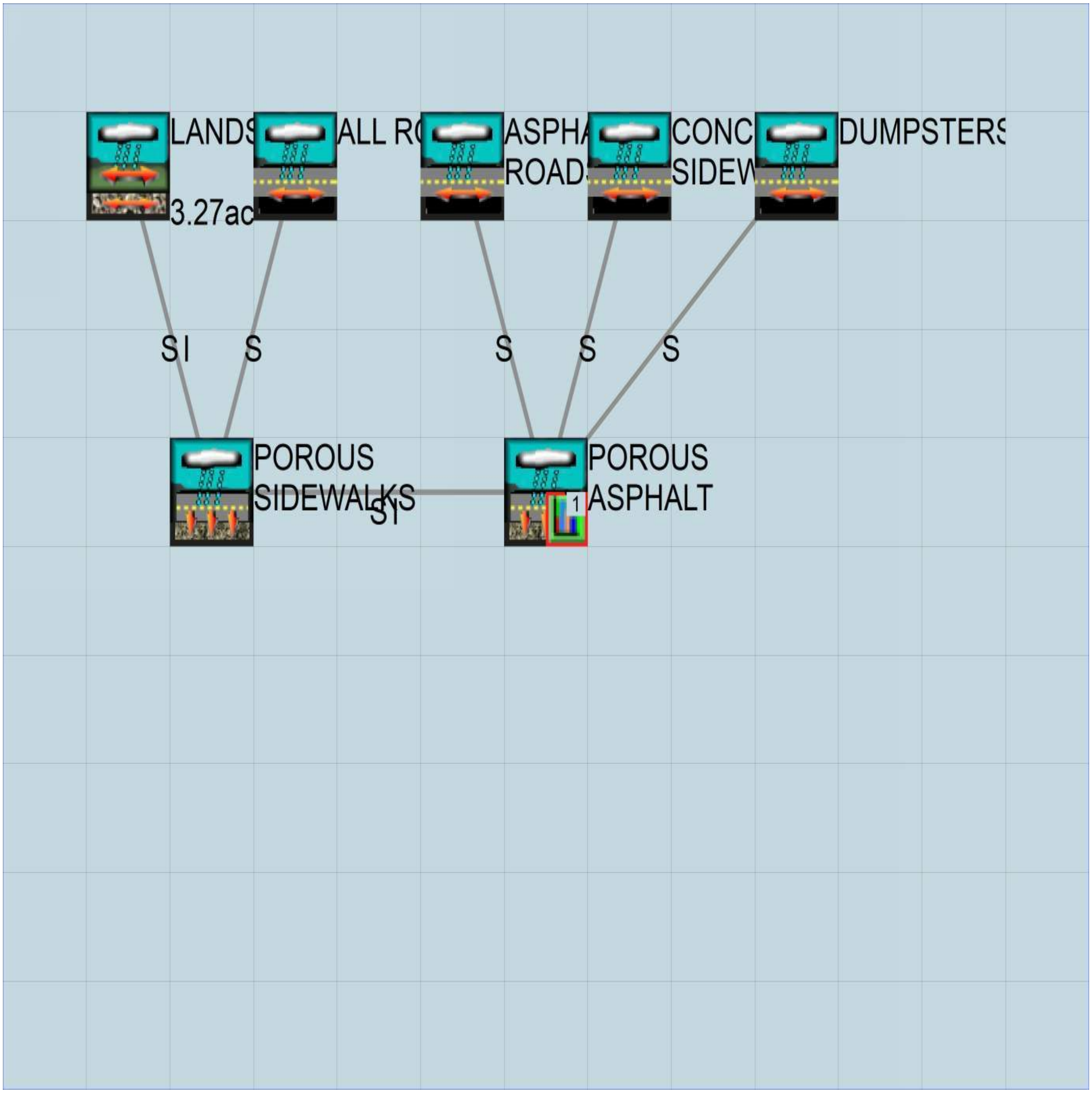
No PERLND changes have been made.

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
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   06-171 EAST TOWN ONSITE.wdm
MESSU      25   Pre06-171 EAST TOWN ONSITE.MES
           27   Pre06-171 EAST TOWN ONSITE.L61
           28   Pre06-171 EAST TOWN ONSITE.L62
           30   POC06-171 EAST TOWN ONSITE1.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        ONSITE BASIN               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#   ***
ONSITE BASIN***
PERLND  10                   10.363886     COPY   501     12
PERLND  10                   10.363886     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   06-171 EAST TOWN ONSITE.wdm
MESSU      25   Mit06-171 EAST TOWN ONSITE.MES
           27   Mit06-171 EAST TOWN ONSITE.L61
           28   Mit06-171 EAST TOWN ONSITE.L62
           30   POC06-171 EAST TOWN ONSITE1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      38
      IMPLND      16
      IMPLND      17
      IMPLND      18
      IMPLND      19
      IMPLND      20
      RCHRES       1
      IMPLND      21
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1         POROUS ASPHALT              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           ***
   38      A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

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

```
   38         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  *********
   38         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 ***
   38         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
   38              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   38              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   38            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   38              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

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

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   16         0    0    1    0    0    0
   17         0    0    1    0    0    0
   18         0    0    1    0    0    0
   19         0    0    1    0    0    0
   20         0    0    1    0    0    0
   21         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   *********
   16         0    0    4    0    0    0    1    9
```

```
    17         0    0    4    0    0    0    1    9
    18         0    0    4    0    0    0    1    9
    19         0    0    4    0    0    0    1    9
    20         0    0    4    0    0    0    1    9
    21         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     ***
    16         0    0    0    0    0
    17         0    0    0    0    0
    18         0    0    0    0    0
    19         0    0    0    0    0
    20         0    0    0    0    0
    21         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    16           400      0.01       0.1       0.1
    17           400      0.01       0.1       0.1
    18           400      0.01       0.1       0.1
    19           400      0.01       0.1       0.1
    20           400      0.01       0.1       0.1
    21           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    16             0         0
    17             0         0
    18             0         0
    19             0         0
    20             0         0
    21             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    16             0         0
    17             0         0
    18             0         0
    19             0         0
    20             0         0
    21             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
LANDSCAPING***
PERLND  38                      4.6519     IMPLND  20     54
PERLND  38                      4.6519     IMPLND  20     55
ALL ROOFS***
IMPLND  16                      3.1074     IMPLND  20     53
IMPLND  21                      2.0672     RCHRES   2      5
ASPHALT ROADS***
IMPLND  17                      0.9289     IMPLND  21     53
CONCRETE SIDEWALKS***
IMPLND  18                      0.0521     IMPLND  21     53
DUMPSTERS***
IMPLND  19                      0.0228     IMPLND  21     53
IMPLND  20                      0.7028     RCHRES   1      5
```

```
******Routing******
IMPLND  17                  1.9203     COPY     1     15
IMPLND  18                 0.10764     COPY     1     15
IMPLND  19                  0.0472     COPY     1     15
RCHRES   1                             IMPLND  21     71
RCHRES   1                             COPY     1     17
RCHRES   1                             PERLND  21     71
RCHRES   1                             COPY     1     17
RCHRES   2                       1     COPY   501     17
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                   ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG              ***
                                           in  out                             ***
    1     POROUS SIDEWALKS-011    2    1    1    1   28    0    1
    2     POROUS ASPHALT          2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                        ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0      2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0      2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      1.16       0.0       0.0       0.5       0.0
    2             2      0.85       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                           ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES
```

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
FTABLE 1
91 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.702847	0.000000	0.000000	0.000000		
0.011111	0.702847	0.003124	0.000000	1.417407		
0.022222	0.702847	0.006248	0.000000	1.417407		
0.033333	0.702847	0.009371	0.000000	1.417407		
0.044444	0.702847	0.012495	0.000000	1.417407		
0.055556	0.702847	0.015619	0.000000	1.417407		
0.066667	0.702847	0.018743	0.000000	1.417407		
0.077778	0.702847	0.021866	0.000000	1.417407		
0.088889	0.702847	0.024990	0.000000	1.417407		
0.100000	0.702847	0.028114	0.000000	1.417407		
0.111111	0.702847	0.031238	0.000000	1.417407		
0.122222	0.702847	0.034361	0.000000	1.417407		
0.133333	0.702847	0.037485	0.000000	1.417407		
0.144444	0.702847	0.040609	0.000000	1.417407		
0.155556	0.702847	0.043733	0.000000	1.417407		
0.166667	0.702847	0.046856	0.000000	1.417407		
0.177778	0.702847	0.049980	0.000000	1.417407		
0.188889	0.702847	0.053104	0.000000	1.417407		
0.200000	0.702847	0.056228	0.000000	1.417407		
0.211111	0.702847	0.059351	0.000000	1.417407		
0.222222	0.702847	0.062475	0.000000	1.417407		
0.233333	0.702847	0.065599	0.000000	1.417407		
0.244444	0.702847	0.068723	0.000000	1.417407		
0.255556	0.702847	0.071847	0.000000	1.417407		
0.266667	0.702847	0.074970	0.000000	1.417407		
0.277778	0.702847	0.078094	0.000000	1.417407		
0.288889	0.702847	0.081218	0.000000	1.417407		
0.300000	0.702847	0.084342	0.000000	1.417407		
0.311111	0.702847	0.087465	0.000000	1.417407		
0.322222	0.702847	0.090589	0.000000	1.417407		
0.333333	0.702847	0.093713	0.000000	1.417407		
0.344444	0.702847	0.096837	0.000000	1.417407		
0.355556	0.702847	0.099960	0.000000	1.417407		
0.366667	0.702847	0.103084	0.000000	1.417407		
0.377778	0.702847	0.106208	0.000000	1.417407		
0.388889	0.702847	0.109332	0.000000	1.417407		
0.400000	0.702847	0.112455	0.000000	1.417407		
0.411111	0.702847	0.115579	0.000000	1.417407		
0.422222	0.702847	0.118703	0.000000	1.417407		
0.433333	0.702847	0.121827	0.000000	1.417407		
0.444444	0.702847	0.124951	0.000000	1.417407		
0.455556	0.702847	0.128074	0.000000	1.417407		
0.466667	0.702847	0.131198	0.000000	1.417407		
0.477778	0.702847	0.134322	0.000000	1.417407		
0.488889	0.702847	0.137446	0.000000	1.417407		
0.500000	0.702847	0.140569	0.000000	1.417407		
0.511111	0.702847	0.143693	0.000000	1.417407		
0.522222	0.702847	0.146817	0.000000	1.417407		
0.533333	0.702847	0.149941	0.000000	1.417407		
0.544444	0.702847	0.153064	0.000000	1.417407		
0.555556	0.702847	0.156188	0.000000	1.417407		
0.566667	0.702847	0.159312	0.000000	1.417407		
0.577778	0.702847	0.162436	0.000000	1.417407		
0.588889	0.702847	0.166340	0.000000	1.417407		
0.600000	0.702847	0.170245	0.000000	1.417407		
0.611111	0.702847	0.174150	0.000000	1.417407		
0.622222	0.702847	0.178054	0.000000	1.417407		
0.633333	0.702847	0.181959	0.000000	1.417407		
0.644444	0.702847	0.185864	0.000000	1.417407		
0.655556	0.702847	0.189769	0.000000	1.417407		
0.666667	0.702847	0.193673	0.000000	1.417407		
0.677778	0.702847	0.197578	0.000000	1.417407		

0.688889	0.702847	0.201483	0.000000	1.417407
0.700000	0.702847	0.205387	0.000000	1.417407
0.711111	0.702847	0.209292	0.000000	1.417407
0.722222	0.702847	0.213197	0.000000	1.417407
0.733333	0.702847	0.217102	0.000000	1.417407
0.744444	0.702847	0.221006	0.000000	1.417407
0.755556	0.702847	0.224911	0.000000	1.417407
0.766667	0.702847	0.228816	0.000000	1.417407
0.777778	0.702847	0.232720	0.000000	1.417407
0.788889	0.702847	0.236625	0.000000	1.417407
0.800000	0.702847	0.240530	0.000000	1.417407
0.811111	0.702847	0.244434	0.000000	1.417407
0.822222	0.702847	0.248339	0.000000	1.417407
0.833333	0.702847	0.252244	0.000000	1.417407
0.844444	0.702847	0.256149	0.000000	1.417407
0.855556	0.702847	0.260053	0.000000	1.417407
0.866667	0.702847	0.263958	0.000000	1.417407
0.877778	0.702847	0.267863	0.000000	1.417407
0.888889	0.702847	0.271767	0.000000	1.417407
0.900000	0.702847	0.275672	0.000000	1.417407
0.911111	0.702847	0.279577	0.000000	1.417407
0.922222	0.702847	0.283481	0.000000	1.417407
0.933333	0.702847	0.287386	0.000000	1.417407
0.944444	0.702847	0.291291	0.000000	1.417407
0.955556	0.702847	0.295196	0.000000	1.417407
0.966667	0.702847	0.299100	0.000000	1.417407
0.977778	0.702847	0.303005	0.000000	1.417407
0.988889	0.702847	0.306910	0.000000	1.417407
1.000000	0.702847	0.314719	0.000003	1.417407

END FTABLE 1
FTABLE 2
91 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	2.067241	0.000000	0.000000	0.000000		
0.011111	2.067241	0.009188	0.000000	4.168935		
0.022222	2.067241	0.018375	0.000000	4.168935		
0.033333	2.067241	0.027563	0.000000	4.168935		
0.044444	2.067241	0.036751	0.000000	4.168935		
0.055556	2.067241	0.045939	0.000000	4.168935		
0.066667	2.067241	0.055126	0.000000	4.168935		
0.077778	2.067241	0.064314	0.000000	4.168935		
0.088889	2.067241	0.073502	0.000000	4.168935		
0.100000	2.067241	0.082690	0.000000	4.168935		
0.111111	2.067241	0.091877	0.000000	4.168935		
0.122222	2.067241	0.101065	0.000000	4.168935		
0.133333	2.067241	0.110253	0.000000	4.168935		
0.144444	2.067241	0.119441	0.000000	4.168935		
0.155556	2.067241	0.128628	0.000000	4.168935		
0.166667	2.067241	0.137816	0.000000	4.168935		
0.177778	2.067241	0.147004	0.000000	4.168935		
0.188889	2.067241	0.156192	0.000000	4.168935		
0.200000	2.067241	0.165379	0.000000	4.168935		
0.211111	2.067241	0.174567	0.000000	4.168935		
0.222222	2.067241	0.183755	0.000000	4.168935		
0.233333	2.067241	0.192942	0.000000	4.168935		
0.244444	2.067241	0.202130	0.000000	4.168935		
0.255556	2.067241	0.211318	0.000000	4.168935		
0.266667	2.067241	0.220506	0.000000	4.168935		
0.277778	2.067241	0.229693	0.000000	4.168935		
0.288889	2.067241	0.238881	0.000000	4.168935		
0.300000	2.067241	0.248069	0.000000	4.168935		
0.311111	2.067241	0.257257	0.000000	4.168935		
0.322222	2.067241	0.266444	0.000000	4.168935		
0.333333	2.067241	0.275632	0.000000	4.168935		
0.344444	2.067241	0.284820	0.000000	4.168935		
0.355556	2.067241	0.294008	0.000000	4.168935		
0.366667	2.067241	0.303195	0.000000	4.168935		
0.377778	2.067241	0.312383	0.000000	4.168935		
0.388889	2.067241	0.321571	0.000000	4.168935		

```
  0.400000  2.067241  0.330758  0.000000  4.168935
  0.411111  2.067241  0.339946  0.000000  4.168935
  0.422222  2.067241  0.349134  0.000000  4.168935
  0.433333  2.067241  0.358322  0.000000  4.168935
  0.444444  2.067241  0.367509  0.000000  4.168935
  0.455556  2.067241  0.376697  0.000000  4.168935
  0.466667  2.067241  0.385885  0.000000  4.168935
  0.477778  2.067241  0.395073  0.000000  4.168935
  0.488889  2.067241  0.404260  0.000000  4.168935
  0.500000  2.067241  0.413448  0.000000  4.168935
  0.511111  2.067241  0.422636  0.000000  4.168935
  0.522222  2.067241  0.431824  0.000000  4.168935
  0.533333  2.067241  0.441011  0.000000  4.168935
  0.544444  2.067241  0.450199  0.000000  4.168935
  0.555556  2.067241  0.459387  0.000000  4.168935
  0.566667  2.067241  0.468575  0.000000  4.168935
  0.577778  2.067241  0.477762  0.000000  4.168935
  0.588889  2.067241  0.489247  0.000000  4.168935
  0.600000  2.067241  0.500732  0.000000  4.168935
  0.611111  2.067241  0.512216  0.000000  4.168935
  0.622222  2.067241  0.523701  0.000000  4.168935
  0.633333  2.067241  0.535186  0.000000  4.168935
  0.644444  2.067241  0.546670  0.000000  4.168935
  0.655556  2.067241  0.558155  0.000000  4.168935
  0.666667  2.067241  0.569640  0.000000  4.168935
  0.677778  2.067241  0.581124  0.000000  4.168935
  0.688889  2.067241  0.592609  0.000000  4.168935
  0.700000  2.067241  0.604094  0.000000  4.168935
  0.711111  2.067241  0.615578  0.000000  4.168935
  0.722222  2.067241  0.627063  0.000000  4.168935
  0.733333  2.067241  0.638548  0.000000  4.168935
  0.744444  2.067241  0.650032  0.000000  4.168935
  0.755556  2.067241  0.661517  0.000000  4.168935
  0.766667  2.067241  0.673002  0.000000  4.168935
  0.777778  2.067241  0.684486  0.000000  4.168935
  0.788889  2.067241  0.695971  0.000000  4.168935
  0.800000  2.067241  0.707456  0.000000  4.168935
  0.811111  2.067241  0.718940  0.000000  4.168935
  0.822222  2.067241  0.730425  0.000000  4.168935
  0.833333  2.067241  0.741910  0.000000  4.168935
  0.844444  2.067241  0.753394  0.000000  4.168935
  0.855556  2.067241  0.764879  0.000000  4.168935
  0.866667  2.067241  0.776364  0.000000  4.168935
  0.877778  2.067241  0.787848  0.000000  4.168935
  0.888889  2.067241  0.799333  0.000000  4.168935
  0.900000  2.067241  0.810818  0.000000  4.168935
  0.911111  2.067241  0.822302  0.000000  4.168935
  0.922222  2.067241  0.833787  0.000000  4.168935
  0.933333  2.067241  0.845272  0.000000  4.168935
  0.944444  2.067241  0.856756  0.000000  4.168935
  0.955556  2.067241  0.868241  0.000000  4.168935
  0.966667  2.067241  0.879726  0.000000  4.168935
  0.977778  2.067241  0.891210  0.000000  4.168935
  0.988889  2.067241  0.902695  0.000000  4.168935
  1.000000  2.067241  0.925664  0.000003  4.168935
  END FTABLE  2
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
WDM      1 EVAP     ENGL    1              RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    1              RCHRES   2     EXTNL  POTEV

END EXT SOURCES
```

```
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
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
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

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

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

  MASS-LINK       18
RCHRES     OFLOW  OVOL   2                 COPY           INPUT  MEAN
  END MASS-LINK   18

  MASS-LINK       53
IMPLND     IWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   53

  MASS-LINK       54
PERLND     PWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   54

  MASS-LINK       55
PERLND     PWATER IFWO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   55

  MASS-LINK       71
RCHRES     OFLOW  OVOL   1   12.00000      IMPLND         EXTNL  SURLI
  END MASS-LINK   71

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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

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

www.clearcreeksolutions.com

Appendix F
Additional Project Details

Figure F1 - Porous Pavement Drivable Surface Detail

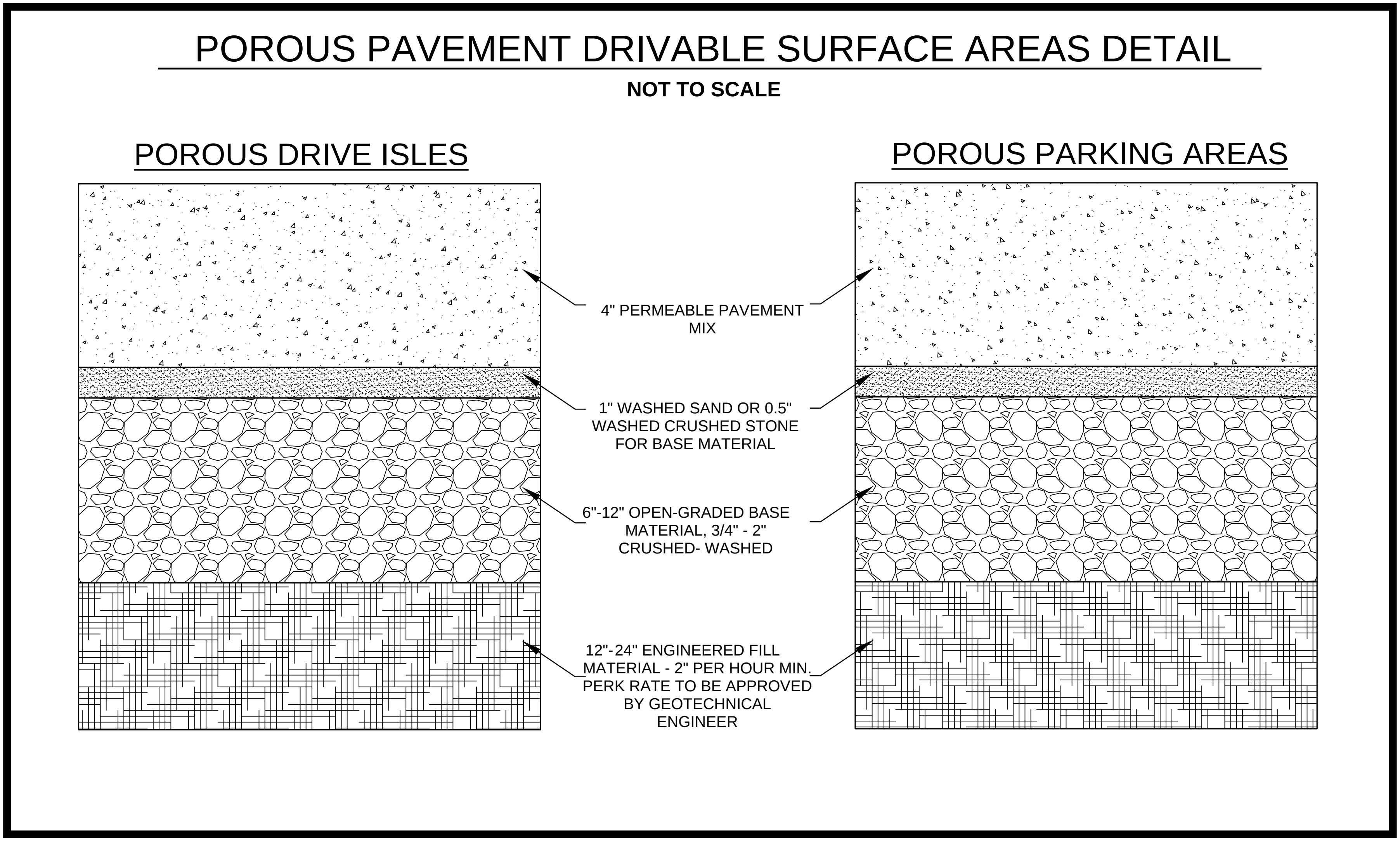


Figure F2 - Porous Concrete Sidewalk Detail

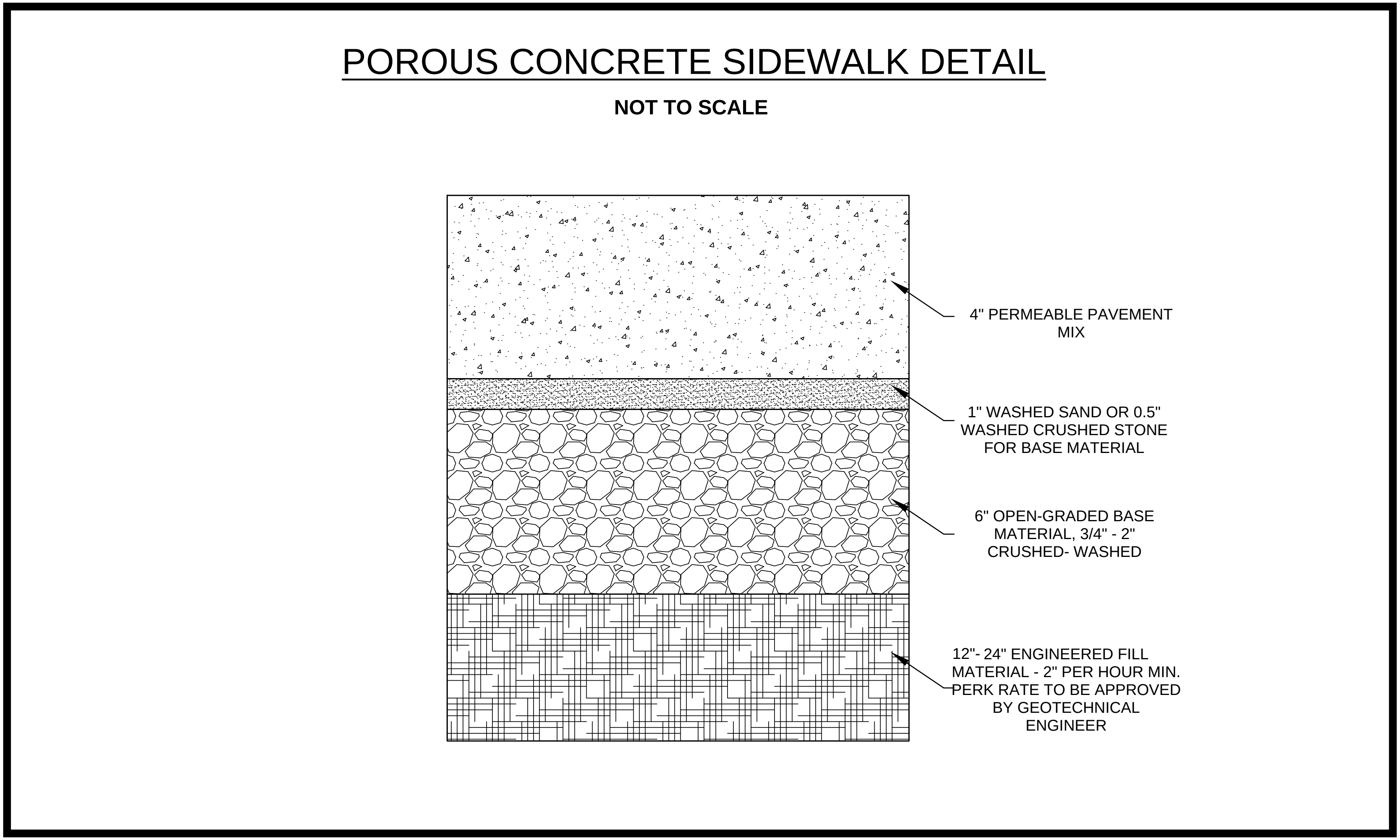
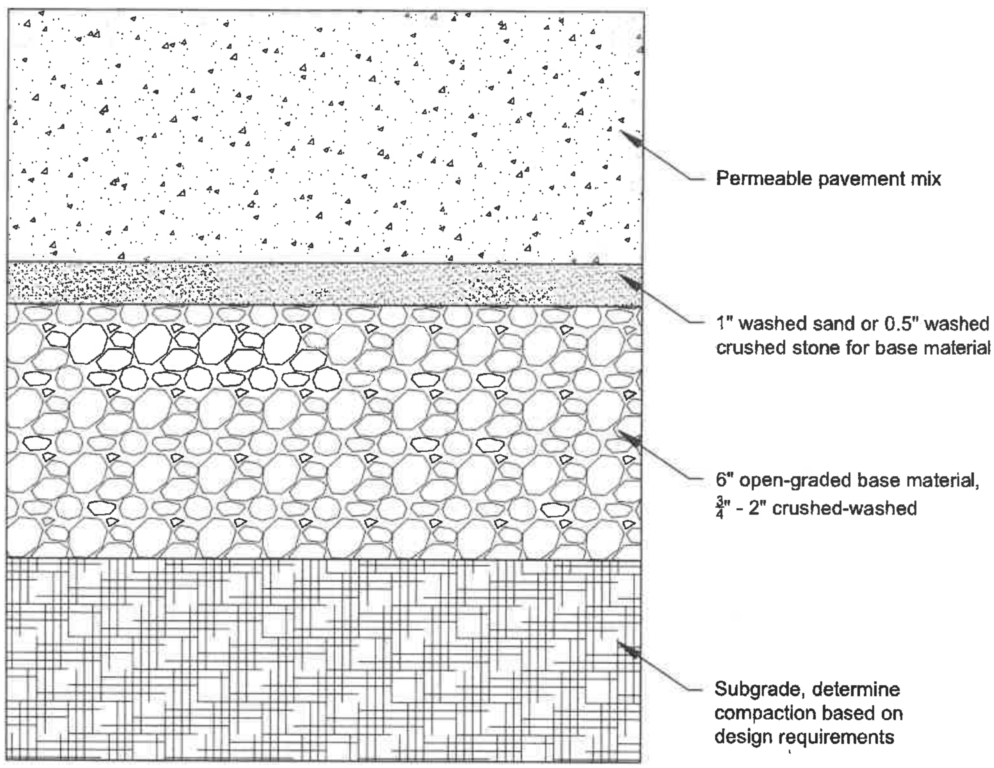


Figure F3 - DOE Figure V-5.3.4 Example of Permeable Pavement

Figure V-5.3.4 Example of a Permeable Pavement (Concrete or Asphalt) Section



NOT TO SCALE

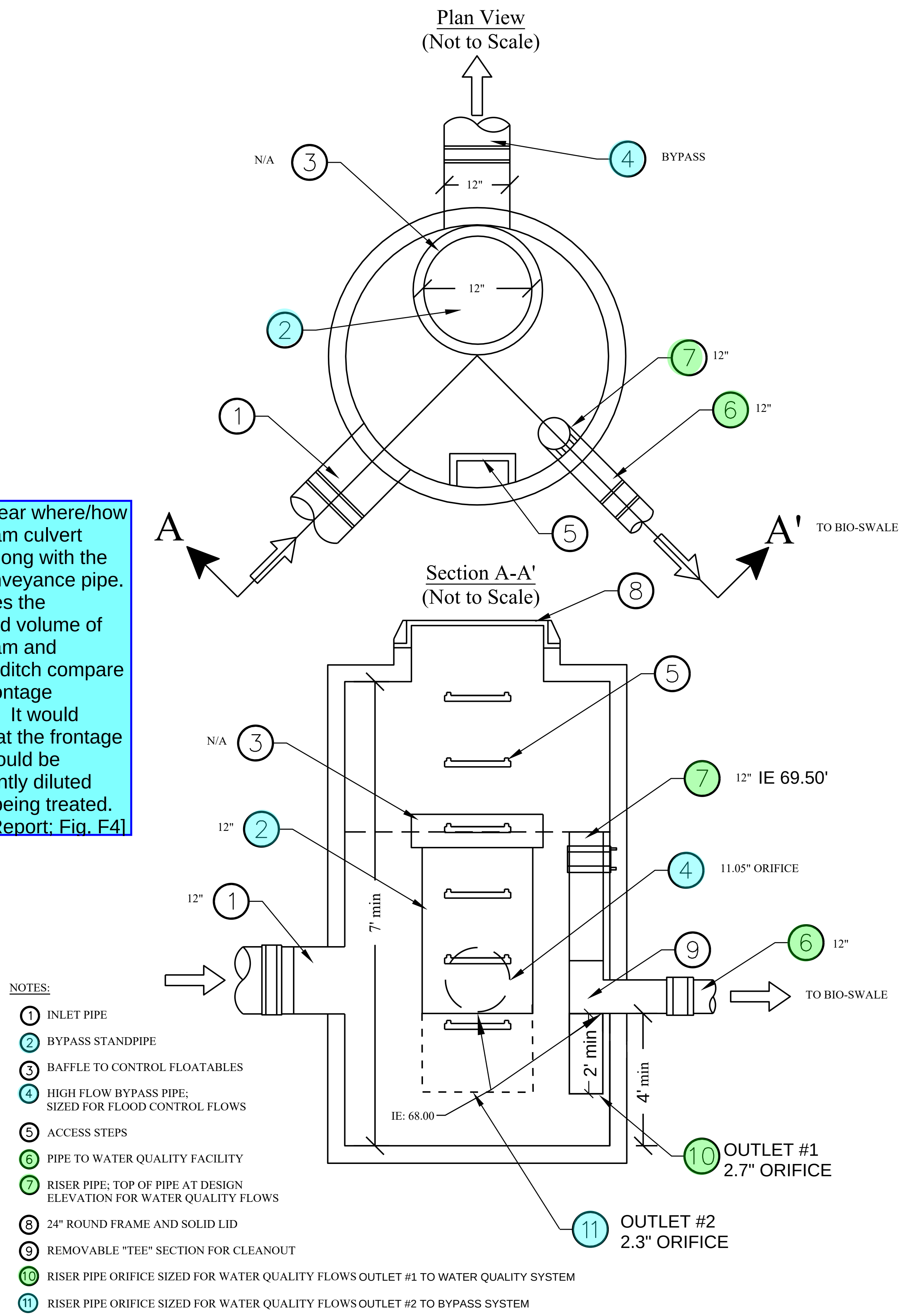
DEPARTMENT OF ECOLOGY
State of Washington

Figure V-5.3.4
Example of a Permeable Pavement (Concrete or Asphalt) Section

Revised January 2016

60" FLOW SPLITTER CONTROL STRUCTURE DETAIL

NTS



It is unclear where/how the stream culvert enters along with the road conveyance pipe. How does the combined volume of the stream and easterly ditch compare to the frontage volume? It would seem that the frontage runoff would be significantly diluted prior to being treated. [Storm Report; Fig. F4]

Figure F4 - 60" Flow Splitter Detail

EAST TOWN CROSSING

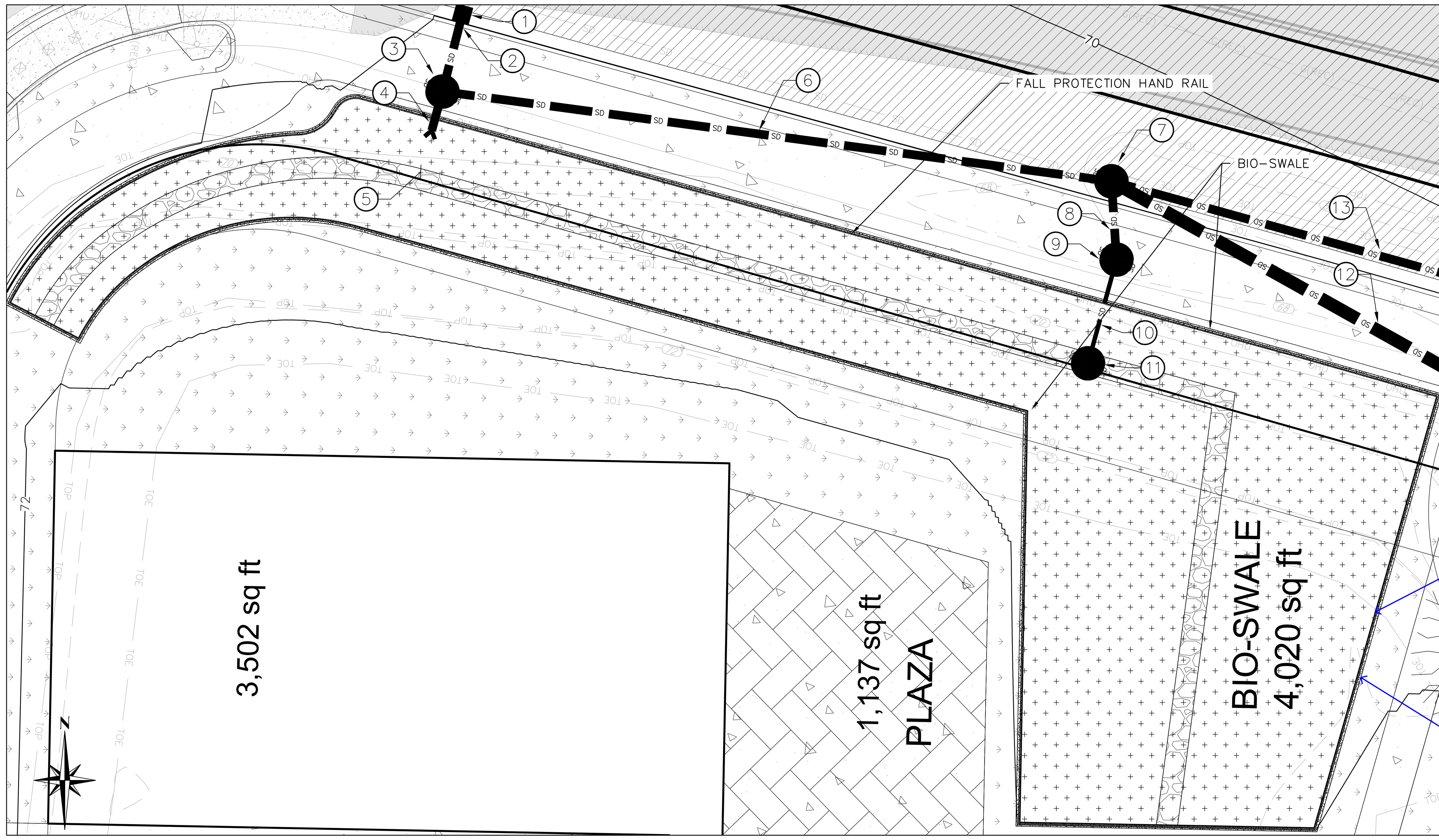
SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.
PIONEER WAY E. STREAM RELOCATION
BIO-SWALE DETAILS

APPROVED

BY ____________
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

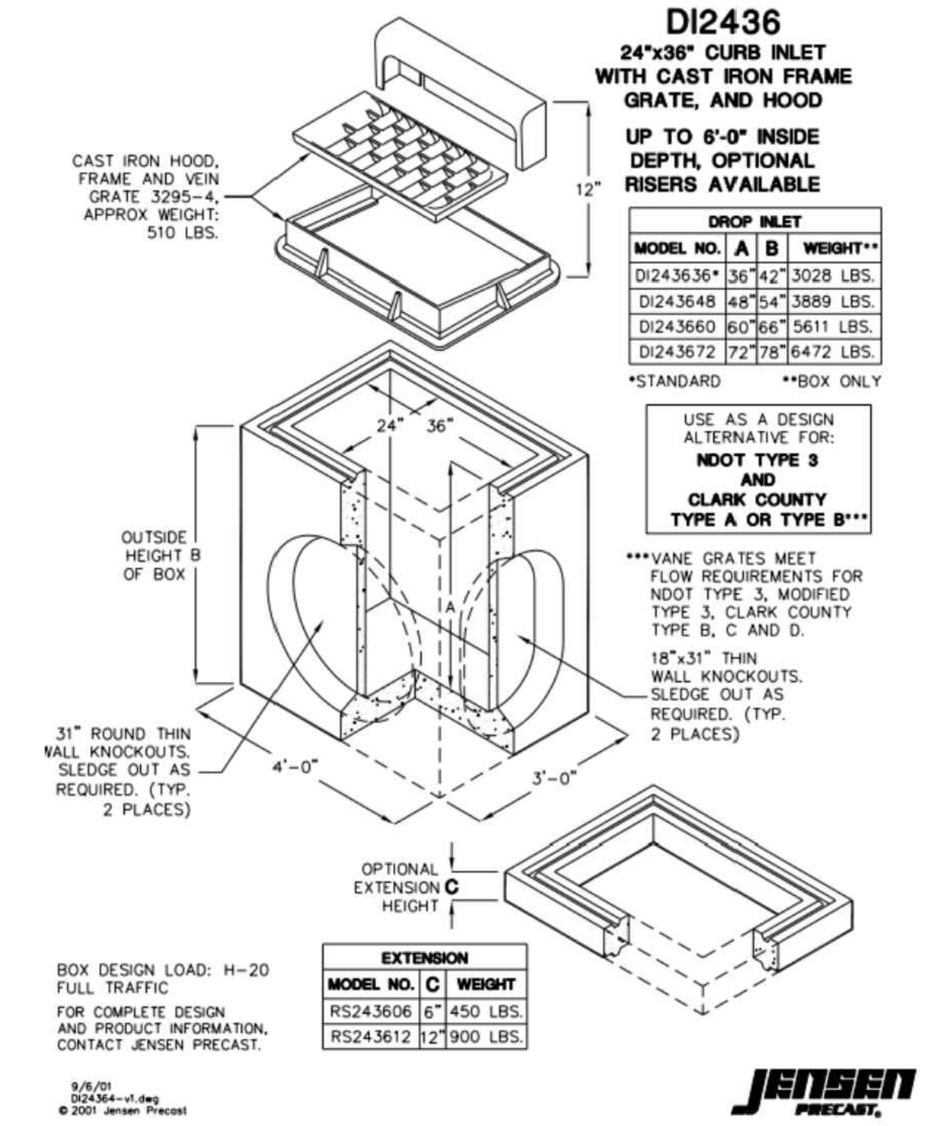


This area differs from the biocell shown on the Basin Map. [Storm Report; Bioswale Details]

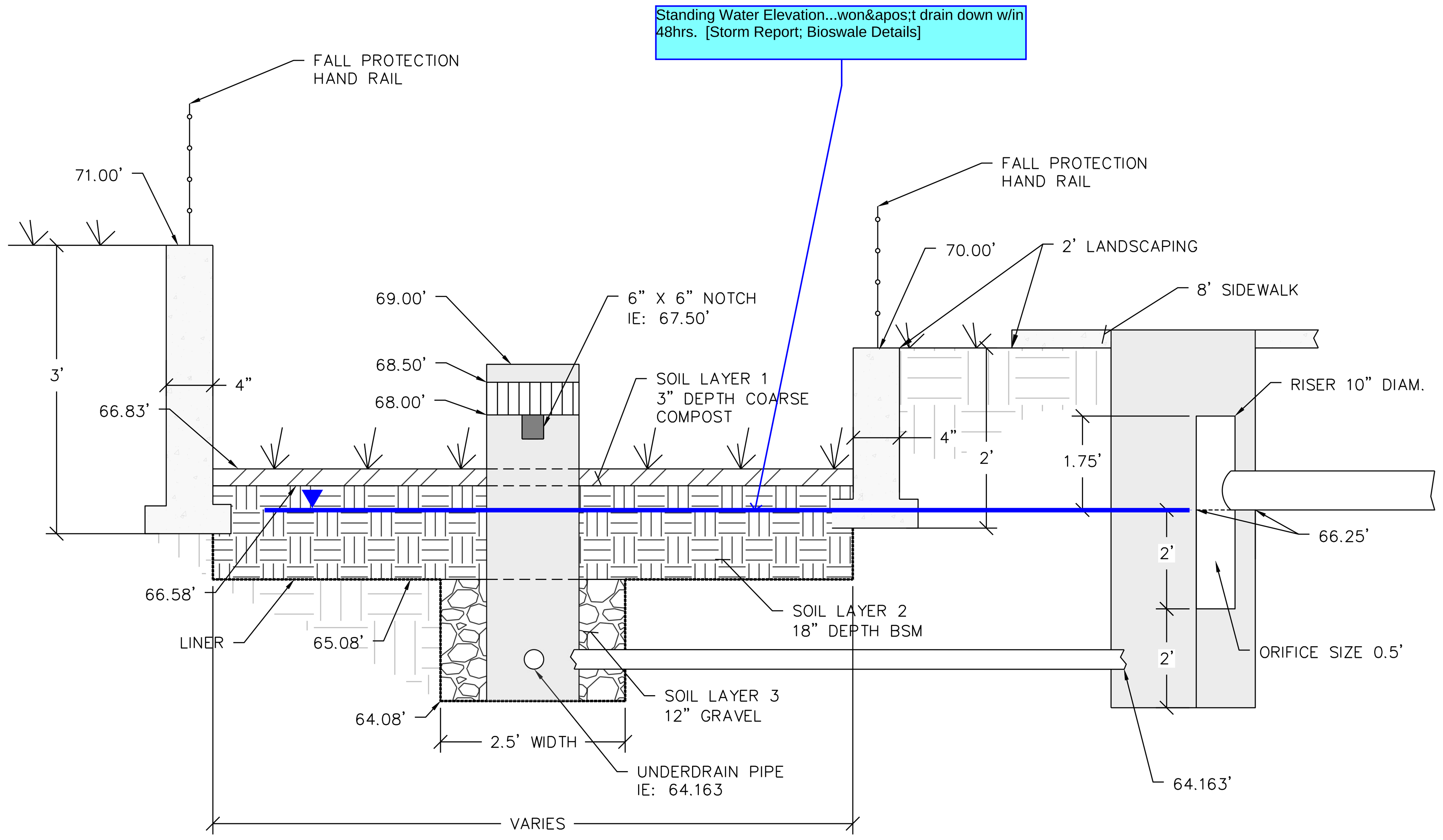
Any storm facility serving public infrastructure must be in ROW or a tract dedicated to the City. [Storm Report; Bioswale Details]

BIO-SWALE DETAIL

1" = 15'

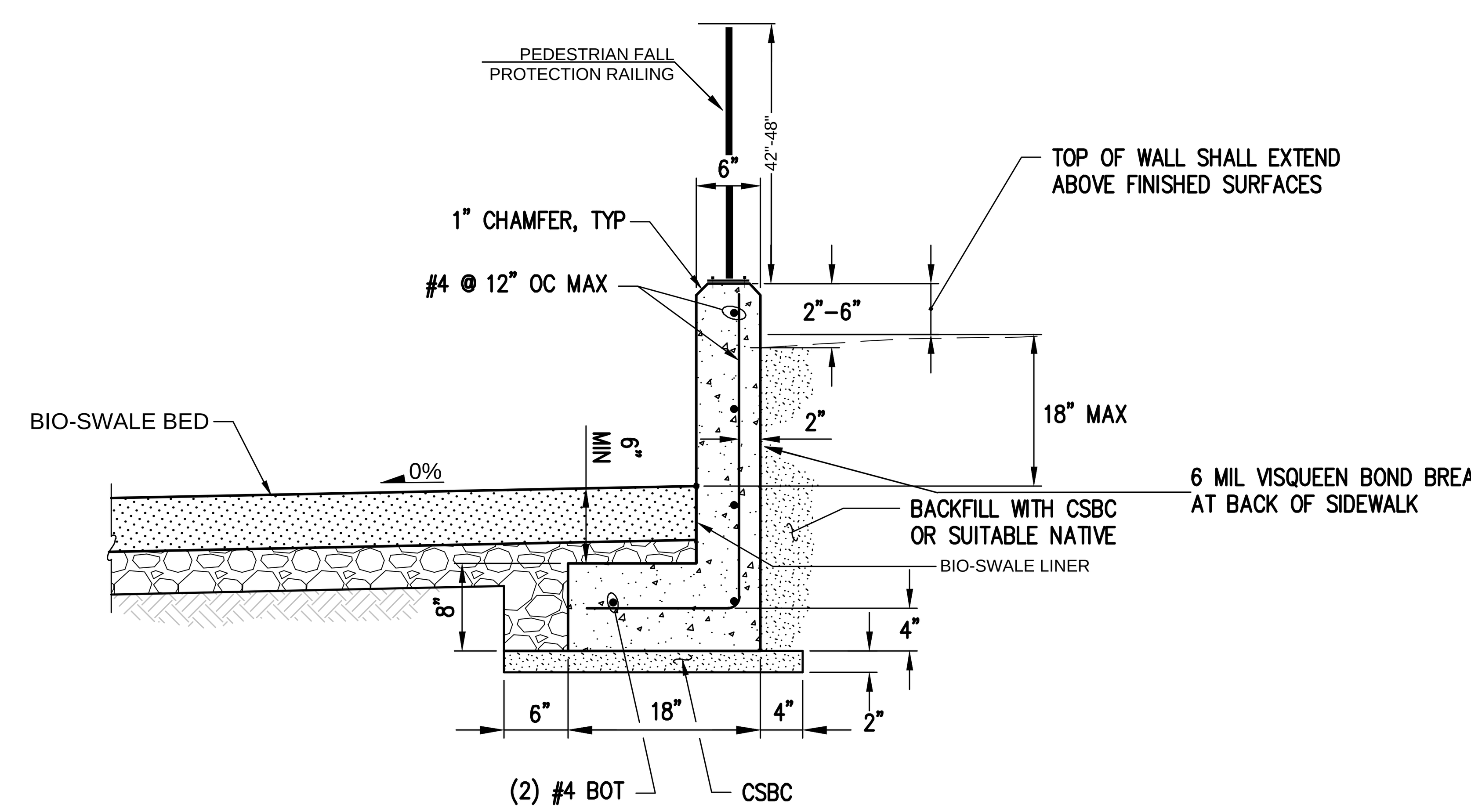


Standing Water Elevation...won't drain down w/in 48hrs. [Storm Report; Bioswale Details]



BIO-SWALE SECTION

NOT TO SCALE



CEMENT CONCRETE CUT WALL DETAIL

NTS

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

CALL BEFORE YOU DIG (811)
WWW.WASHINGTON811.COM

TITLE: East Town Crossing
BIO-SWALE DETAILS
Puyallup, WA

FOR: East Town Crossing, LLC.
1001 Shaw Road
Puyallup, WA 98372

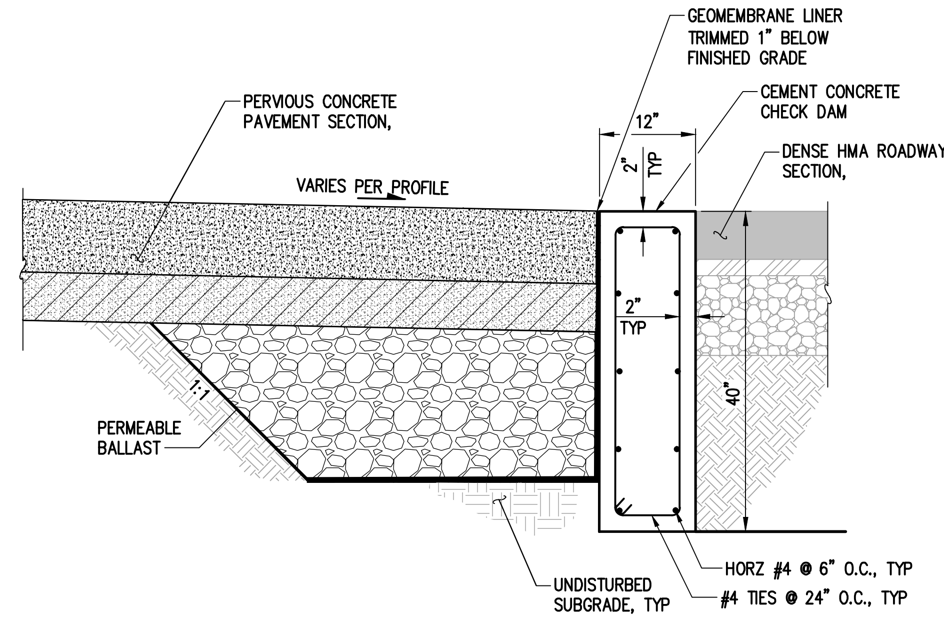
Abbey Road Group
Land Development
Services Company, LLC
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159

REVISIONS: BY: | CHK: | APR: | DATE: | PER:

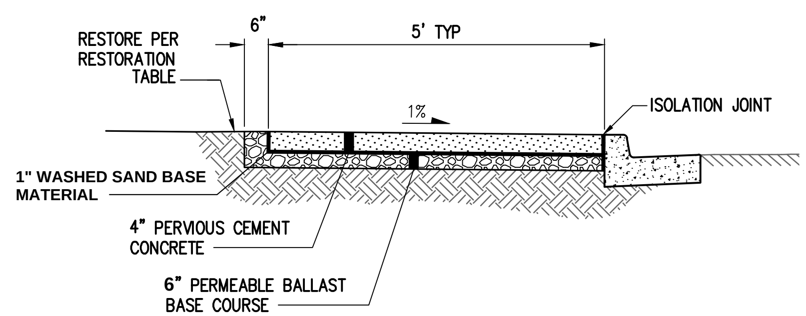
JOB #: 06-171-1
DESIGNED BY: JMB
DEVELOPMENT REVIEW: PRB
APPROVED BY: GH
DRAFTED BY: HPJ
DATE: 12/09/2021
SHEET:

Figure F5 - Bio-Swale Details

FIGURE F6 PERMEABLE PAVEMENT DETAILS



PREMEABLE OVERFLOW PROTECTION
NTS

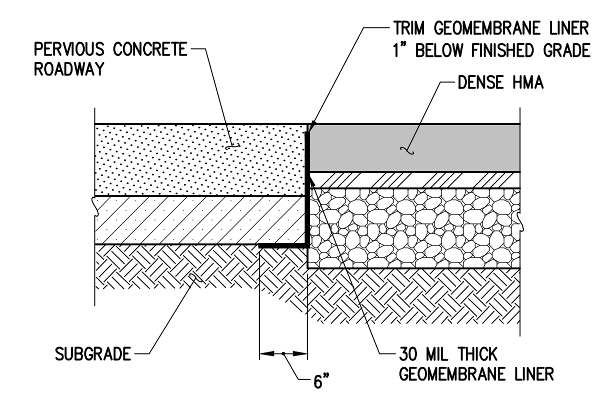


NOTES
1. CONTRACTION JOINTS SHALL BE SAWCUT USING AN EARLY-ENTRY DRY-CUT SAW. CONTRACTION JOINTS SHALL BE PLANNED AT 10' O.C. SEE SPECIAL PROVISION SECTION 5-06 FOR ADDITIONAL INFORMATION.
2. ISOLATION JOINTS WITH ISOLATION JOINT FILLER SHALL BE PLANNED WHERE PERVIOUS CONCRETE ABUTS FIXED OBJECTS.

PERVIOUS CONCRETE SIDEWALK SECTION
NTS

RESTORATION TABLE			
PROJECT LOCATION	RESTORATION TYPE	RESTORATION	COMMENTS
TYPICAL	LAWN/UNIMPROVED GRASS	SEED OVER 4" TOPSOIL TYPE A	HYDROSEED WITH SEEDED LAWN MIX, FINISH GRADE SHALL BE SMOOTH AND CONSISTENT WITH EXISTING GRADE. SLOPE NOT TO EXCEED 3H:1V
TYPICAL	PRIVATE LANDSCAPE AREAS/ UNIMPROVED AREAS	3" BARK MULCH OVER 4" TOPSOIL TYPE A	FINISHED GRADE SHALL BE SMOOTH AND CONSISTENT WITH EXISTING GRADE
TYPICAL	GRAVEL	CSBC PLACED AT 3" TYPICAL DEPTH	PLACE CSBC FROM BACK OF CURB, BACK OF WALK, EDGE OF SHOULDER, OR EDGE OF PAVEMENT TO EXISTING GRADE FOR 3'. GRADE NOT TO EXCEED 4H:1V

NOTE
LOCATIONS OF RESTORATION ARE TYPICAL AND MAY BE REVISED BASED ON PROPERTY OWNER'S PREFERENCE AND APPROVAL BY CITY. FINAL RESTORATION TYPE SHALL BE DETERMINED BY THE CITY.



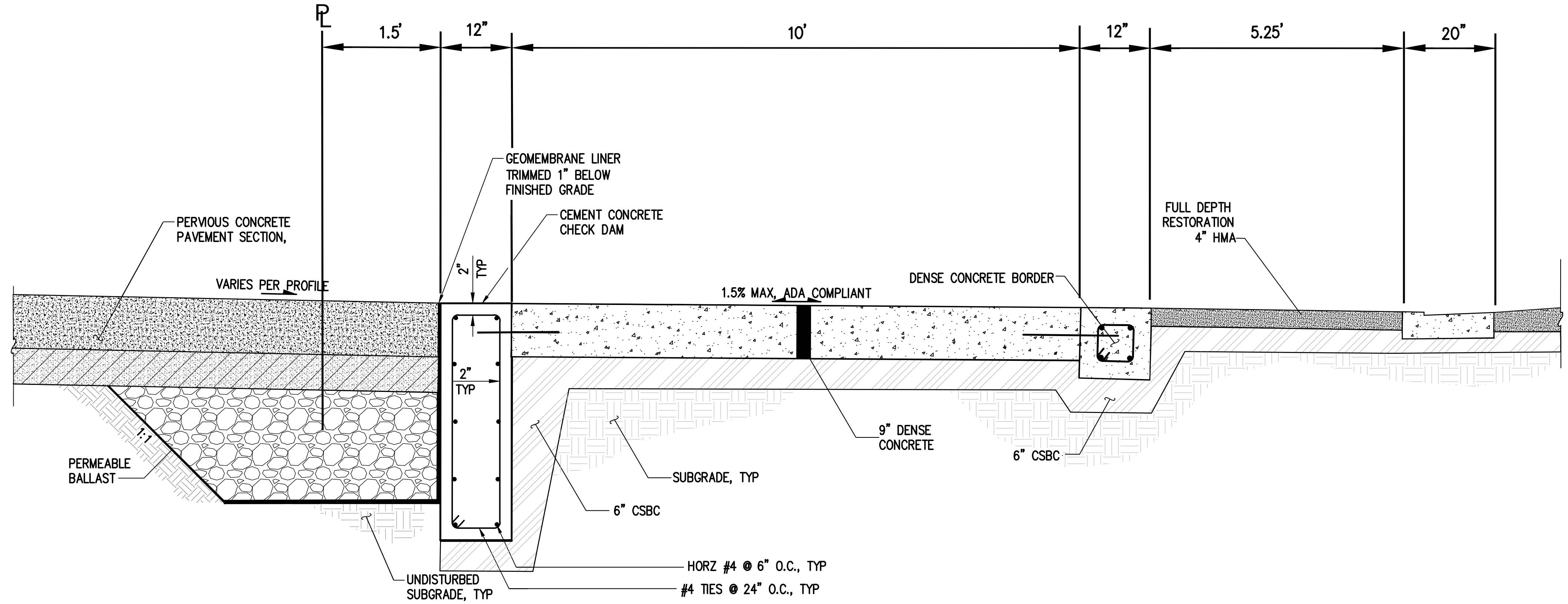
NOTES
1. CONTRACTOR SHALL INSTALL GEOMEMBRANE LINER AT TIE-IN OF PERVIOUS CONCRETE PAVEMENT AND DENSE HMA WHERE SPECIFIED ON PLANS.
2. GEOMEMBRANE SHALL BE INSTALLED PER THIS DETAIL AT OTHER LOCATION SPECIFIED ON PLANS, WHERE PERVIOUS CONCRETE ROADWAY ABUTS OTHER DENSE SURFACES. SEE TYPICAL SECTIONS FOR MATERIALS AND DEPTHS.

GEOMEMBRANE LINER TRANSVERSE INSTALLATION DETAIL
NTS

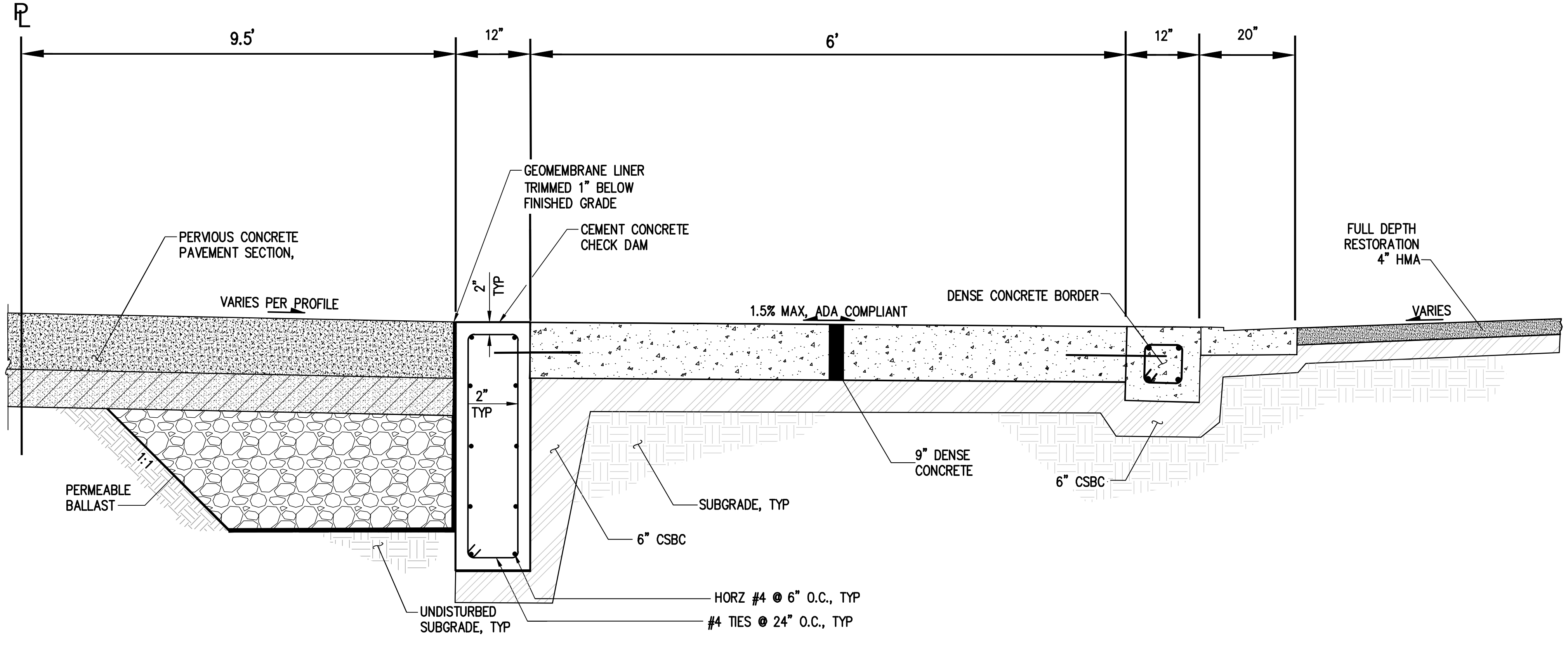
Abbey Road Group Land Development Services Company, LLC
2102 EAST MAIN AVE. SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159
AbbeyRoad GROUP

FIGURE F7 PROJECT ACCESS SECTIONS

Abbey Road Group
Land Development
Services Company, LLC
2102 EAST MAIN AVE, SUITE 109
PUYALLUP, WA 98372
P.O. Box 1224, Puyallup, WA 98371
(253) 435-3699, Fax (253) 446-3159



SHAW ROAD DECORATIVE CONCRETE ACCESS
NTS



PIONEER WAY DECORATIVE CONCRETE ACCESS
NTS