Stormwater Site Plan

PREPARED FOR:

Greg Helle
1001 Shaw Road
Puyallup, WA 98372

PROJECT:

East Town Crossing
2902 E Pioneer
Puyallup, WA 98372
2230752.10

PREPARED BY:

Christopher Watt
Project Engineer

REVIEWED BY:

Todd C. Sawin, PE, DBIA, LEED AP
Principal

DATE:

November 2023
Revised February 2024
Revised April 2024

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Revised April 2024

TODD CHRISTOPHER SAWIN
STATE OF WASHINGTON
46416
REGISTERED
PROFESSIONAL ENGINEER
04/08/2024

I hereby state that this Stormwater Site Plan for the East Town Crossing project has been prepared by me or under my supervision and meets the standard of care and expertise that 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.

Table of Contents

Appendices

1.0 Project Overview

1.1 Purpose and Scope

This Stormwater Site Plan accompanies the site development plans for the East Town Crossing project located on Tax Parcels 0420264021, 0420264053, 0420264054, 0420351066, 0420351030, 0420351029, 0420351026. The site is bordered by E Pioneer to the north, Shaw Road E to the west, commercial businesses to the south, and vacant land to the east. The seven parcels contain approximately 10.93 acres that will be disturbed. Refer to Appendix A, Figure A-1 for a Vicinity Map.

This Stormwater Site Plan is for storm drainage approval. This report describes the design and analysis of the basic treatment, detention, and conveyance facilities proposed as part of the site improvements. This report will demonstrate that the stormwater design for this project will meet the requirements of the 2019 Department of Ecology (DOE) *Stormwater Management Manual for Western Washington* (*SMMWW*), as adopted by the City of Puyallup.

1.2 Existing Conditions Summary

1.2.1 Existing Site Features

The existing area is approximately 10.93 acres and is currently developed and undeveloped land cover. Within the seven parcels, a network of dirt and gravel access roads connect E Pioneer, Shaw Rd E, and the commercial property to the south. In the southwest parcels, there is an existing residential structure and a vacant residential lot. The majority of the landcover is made up of tall grass, shrubs, and a few trees.

The site contains a detention pond that receives runoff from the commercial property to the south before overflowing into the existing channel lining the east and north of the property. Apart from the detention pond, the site generally slopes from southeast to northwest with the large majority of runoff discharges to the northern portion of the channel. Small sections of the eastern part of the site discharge to the channel on to the east, but not enough to be significant. In general, the northern channel is the site’s point of discharge. A topographical survey of the project was prepared by Abbey Road Group. that shows existing site conditions. See Appendix A, Exhibit A-2 for the Existing Conditions Map.

1.2.2 Soils

The National Resources Conservation Service (NRCS) classifies the onsite soils as Briscot Loam in the northern two-thirds of the site and Puyallup fine sandy loam in the lower third of the site. Appendix A, Exhibit A-4 provides the NRCS soil map. Briscot Loam is classified as hydrologic soil group B/D with poorly draining characteristics. Puyallup fine sandy loam is classified as hydrologic soil group A with well-draining characteristics.

Krazan & Associates, Inc prepared a geotechnical report for the site. On March 4, 2021, two large-scale pilot infiltration tests were completed. Based on the results presented in the Geotechnical Report, it was determined that the soils at the site contain high silt content and are considered a very low to relatively impermeable layer. Migizi Group, Inc., confirmed in their Project Infiltration Letter, dated August 25, 2023 (provided as Appendix B, Exhibit B-1) that Krazan & Associates, Inc.’s findings result in a calculated 0 inches per hour infiltration rate. Thus, in opposition of the NRCS report, the entire site is not recommended for any infiltration due to the presence of unfavorable soils.

See Appendix B, Exhibit B-1 for the Krazan & Associates, Inc. Geotechnical Engineering Report and Appendix B-2 for the Migizi Group Geotechnical Letter.

1.3 Proposed Conditions Summary

The proposed improvements include storm conveyance, detention, grading, paving, and striping. Stormwater in proposed paved areas will be collected in a new collection system which will drain to one of five BioPods located throughout the site. After being treated, stormwater will be detained in one of three R-Tanks before being released to the existing channel to the north of the site.

See Appendix A, Exhibit A-3, for the Developed Conditions Map.

2.0 Offsite Analysis Report

2.1 Upstream Analysis

In existing conditions, the commercial property on the parcel to the south drains to the detention pond located on the southeastern portion of our site. Due to lack of maintenance, the existing stream has breached the detention ponds eastern berm and the control structure now detains and releases the streams flow as well as the runoff from the southern property. After release from the control structure, stormwater is conveyed to the Pioneer Way ditch located at the north property line and then via a storm pipe away from the site. For Phase 1 of this project, the existing detention pond will be maintained, however in Phase 2, it will be replaced with an R-Tank of equal volume and the stream will be relocated.

Shaw Road E to the west contains its own stormwater collection and conveyance system which prevents discharge to the site. However, Pioneer E to the north drains into channels on either side of the road, including the channel on the north end of the project site. Frontage improvements are proposed in this project that will contain a stormwater collection and conveyance system that will redirect runoff to the downstream connection.

2.2 Downstream Analysis

In existing condition, stormwater leaves the site on the northern portion of the channel that runs around the east and north of the site. A culvert collects the water from the channel and directs it northwest under the intersection of E Pioneer and Shaw Road E. A channel then runs along E Pioneer on the roadside of the railroad before it intersects another culvert directing water to the Puyallup River less than a mile away.

In the proposed plans for the project, the existing channel will be enhanced within the bounds of the site.

3.0 Permanent Stormwater Control Plan

This project is a new development that includes more than 5,000 square feet of impervious surfaces; therefore, all Minimum Requirements (MR) apply to this project. Refer to Appendix A, Exhibit A-5 for the Flow Chart for Determining Requirements for New Development.

The existing channel to the north and east of the site will be enhanced, while a new system is proposed collect all stormwater generated onsite as well as directed to the site. The proposed system will include catch basins that will convey stormwater through one of five BioPods (which is designed for enhanced treatment) before it is detained in one of three R-Tanks located around the site. A fourth R-Tank is proposed for Phase 2 to detain the runoff from the commercial property to the south. Stormwater from the R-Tanks will flow through a control structure that is designed to release water at flow rates similar to the natural forested condition. From this proposed manhole, the stormwater will flow through a 12” pipe into the enhanced stream. Note that this outfall will be upgraded to a 12” by 12” Mirafi wrapped washed rock channel in Phase 2. This will be to prevent fish from swimming back into the detention system on-site. The stream will direct water along Pioneer Way ditch, then the main stem of Deer Creek before discharging to the main body of the Puyallup River approximately 1.5 miles to the west-northwest. Refer to Sections 4.6 and 4.7 for more information on the proposed water quality and flow control plans.

Refer to the Water Quality Calculations (Appendix D, Exhibit D-2) for the areas used to size the proposed water quality facility and Appendix D for the Flow Control Modeling and the Water Quality Modeling.

4.0 Summary of Minimum Requirements

4.1 MR 1 – Preparation of Stormwater Site Plans

This report and project plans have been prepared to provide justification of the water quality and flow control design proposed for this project.

4.2 MR 2 - Construction Stormwater Pollution Prevention

A Construction Stormwater Pollution Prevention Plan (CSWPPP) has been prepared to satisfy MR 2 and is included as Appendix E of this report.

4.3 MR 3 – Source Control of Pollution

The proposed project is required to provide source control of pollution. Following are proposed measures to be implemented as part of the civil plans.

- All discharges to the city storm system require City of Puyallup approval.
- All pollutants, including waste materials and demolition debris created onsite during construction, shall be handled and disposed of in a manner that does not cause contamination of surface water.
- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste).
- Maintenance and repair of heavy equipment and vehicles that may result in discharge or spillage of pollutants to the ground or into surface water runoff must be conducted using spill prevention measures such as drip pans.
- Concrete Handling (BMP C151) shall be used to prevent or treat contamination of surface water runoff by pH modifying sources.

The CSWPPP provides details on the control of pollution during construction.

4.4 MR 4 – Preservation of Natural Drainage Systems and Outfalls

The existing land cover drains to the northern portion of the channel that wraps around the parcels east and north borders before running alongside E Pioneer and into the Puyallup River. The discharge to the channel will be maintained during developed conditions. Under proposed conditions, treated runoff will be discharged to the northwestern section of the channel where it will enter an existing culvert that redirects the stream diagonally across the intersection of E Pioneer and Shaw Road E, travel alongside E Pioneer to Deer Creek before joining the Puyallup River.

4.5 MR 5 – Onsite Stormwater Control

Onsite stormwater management Best Management Practices (BMPs) are not practical for the site due to native site soils, which have no infiltrative properties. With that in mind, per the Flow Chart for Determining MR #5 Requirements, refer to Appendix A, Exhibit A-6, List #2 of the List Approach is required. Below is a summary of the findings of List #2, refer to Appendix A, Exhibit A-7 for the Infeasibility Checklists.

Surface Type: Lawn and Landscaped Areas:
Chosen BMP: T5.13: Post-Construction Soil Quality and Depth.

Surface Type: Roofs:
All options on the List Approach are infeasible, runoff from roofs will be directed towards a detention system.

Surface Type: Other Hard Surfaces:
All options on the List Approach are infeasible, runoff will be directed towards a detention system.

Given the infeasibility of the List Approach BMPs, the proposed storm system will utilize R-Tanks and an Oldcastle BioPod system to provide flow control and water quality to mitigate stormwater onsite. The R-Tanks have been sized with MGS Flood to meet flow duration curves and the BioPod has been designed using the flows from the MGS Flood model and DOE GULD standards, refer to Appendix D, Exhibit D-2 for the water quality calculations. The MGS Flood Report for flow control is attached in Appendix D, Exhibit D-3.

The multifamily buildings, commercial buildings and associated surfaces utilize catch basins and roof drains to collect stormwater runoff that is conveyed to five underground BioPods to treat runoff before conveying to three separate R-Tanks. Note: a fourth R-Tank is to be added in phase 2. The two R-Tanks for the multifamily development are connected by a flat, 24” CPEP pipe that is being used as added detention not included in the calculations. Stormwater within these two R-Tanks is released by a control structure into a third R-Tank for the commercial development. An additional control structure releases water at flow rates matching existing forested conditions into a temporary outlet and, for the duration of construction, pumped into the city storm conveyance system. Once the stream relocation is completed, flow will be gravity release to the existing city conveyance system.

This project includes two bypass areas which could not be collected due to topographical challenges and the location of the enhanced stream These areas have been included in the flow control model.

Refer to Appendix D, Exhibit D-1 for the Conveyance Calculations and Analysis. This analysis, performed using Storm and Sanitary Sewer Analysis, shows that the proposed stormwater conveyance system has sufficient capacity to convey and contain the 25-year storm flow event of the fully developed project site. No proposed structures overtop and over 6-inches of freeboard is shown between the maximum hydraulic grade line and the proposed rim elevations of all proposed structures.

4.6 MR 6 – Runoff Treatment

Over 5,000 square feet of pollution-generating surface (PGIS) will be added as part of these improvements; therefore, water quality treatment will be provided. Four 6’ by 8’ BioPods, and one 4’ by 6’ BioPod are proposed to provide treatment for stormwater runoff and will be located upstream of the detention system. Per the DOE GULD standard specifications, the system is sized at a hydraulic load rating of 1.6 gallon per minute per square foot of media surface area of which the flow is based off the water quality design flow rate using the peak 15-minute flow rate using WWHM.

Additional pollution generating surfaces are proposed in Phase 2 of this project. Two additional BioPods will be proposed to treat the additional surfaces. Sizing of these devices will be provided in a future submittal.

Inclusive of the frontage improvements, the driveway approach onto Shaw Road will be treated via a treatment trade with Pioneer Way frontage improvements. Other than the driveway approach, Shaw Road improvements will not trigger the necessity for runoff treatment. Pioneer Way, on the other hand, will. Improvements will include road widening, curbing, and sidewalk. The new pollution generating hard surfaces will require treatment before being released into the enhanced stream. Sizing and specific device for treatment will be provided in a future submittal.

Refer to Appendix D, Exhibit D-2 for the Water Quality Calculations for Phase 1 and a copy of the GULD standards.

4.7 MR 7 – Flow Control

The proposed stormwater system will include collection and conveyance systems that will direct stormwater to three separate R-Tanks. Two R-Tanks are located in the southern portion of the site and work in tandem to detain water from the residential portion of the project. These two tanks are connected by a 24” CPEP pipe being utilized for added detention that is not included in the calculations as an additional factor of safety. At the end of one of the R-Tanks, a control structure controls the release of flow into a third R-Tank that serves to detain stormwater from the commercial area as well as provide flow through for the residential areas. A second control structure at the end of the third R-Tank controls the release of flow from the site into the enhanced stream at the north end of the site.

In Phase 2 of the project, an additional R-Tank will be connected to the tandem R-Tanks to replace the existing detention pond that serves the commercial property south of the project site. The plans show the approximate location as well as the rough size this R-Tank will be, however it will not be fully sized and modeled until the submittal of Phase 2 documents. To accompany the added volume of stormwater to the system, the two control structures will be replaced with new ones. Calculations and details for these modifications will be included with the submittal of Phase 2 documents.

Frontage improvements along Shaw Road is limited to new sidewalk, while Pioneer Way improvements extend to road widening and curb and sidewalk. Portions of the onsite as well as the extents of the frontage will be considered bypass for the onsite system and are included in the sizing of the R-Tanks and the release rate of the control structure. Design and calculations will be provided in a future submittal.

Refer to Appendix D, Exhibit D-3 for the Flow Control Calculations, Appendix A-3a for the Flow Control Basin Map, and Appendix D, Exhibit D-4 Vehicle Loading Evaluation for R-Tanks, for the Manufacturer’s Confirmation Letter that R-Tanks can support EV outrigger loads.

4.8 MR 8 – Wetland Protection

It is to our knowledge that no wetlands exist on or adjacent to the site that would be impacted by the proposed site development.

Refer to Appendix A, Exhibit A-8 and A-9 for the FEMA Map and FEMA Letter of Map Revision.

4.9 MR 9 – Operation and Maintenance

See Appendix C for a copy of the Operations and Maintenance Manual. This manual shall be readily available for inspection by the City of Puyallup. The maintenance and operations shall be the responsibility of the owner of the East Town Crossing project.

5.0 Wells and Septic Systems

The Department of Ecology (DOE) Well Report Map does not identify any wells present on the site. Any wells located will be decommissioned following the Tacoma-Pierce County Health Department (TPCHD) removal regulations.

Two septic systems were located in the 2019 survey provided by Abbey Road Group at the existing residential parcels. Both will be removed following TPCHD sewer removal regulations.

6.0 Fuel Tanks

To our knowledge, there are no existing fuel tanks on the site. If located during construction, the fuel tanks will be abandoned according to TPCHD and DOE standards.

7.0 Construction Stormwater Pollution Prevention Plan

A Temporary Erosion Control Plan is included with the plan set, and a CSWPPP for the project is included as Appendix E of this report.

8.0 Special Reports and Studies

A Geotechnical Report was prepared by Krazen & Associates, Inc., dated April 11, 2019. Refer to Appendix B-1. In addition, a letter from Migizi Group is included as Appendix B-2.

A Stream Restoration and Mitigation Plan was prepared by Soundview Consultants, dated September 2023. Refer to Appendix B-4.

The project site is not within a 100-year flood plain, as seen in Appendix A, Exhibit A-6.

9.0 Other Permits

A State Environmental Policy Act (SEPA) Checklist has been completed for this project. At the time of writing, a Clear, Fill, and Grade Permit was readied for issuance as Permit # PRGR-2023-0972. Coverage under DOE's Construction Stormwater General Permit must be obtained.

10.0 Operations and Maintenance Manual

Refer to Appendix C for the Maintenance Standards for the proposed drainage facilities and the Maintenance Checklist for the finished project site.

A Stormwater Maintenance Agreement will be recorded at the time of Occupancy in accordance with City Standards.

11.0 Conclusion

Based on our understanding and the attached documentation, we believe the proposed improvements conform to City of Puyallup and Washington State Department of Ecology standards. We conclude that this project, as proposed, will not have adverse impacts to the site or the downstream drainage system.

This analysis is based on data and records either supplied to or obtained by AHBL. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry.

AHBL, Inc.

Christopher Watt
Project Engineer

CJW/

April 2024
\\ahbl.com\data\Projects\2023\2230752\10_CIV\NON_CAD\REPORTS\SSP\20231020 Rpt (SSP) 2230723.10.docx

Appendix A

Exhibits

2215 North 30th Street,
Suite 300,
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

VICINITY MAP

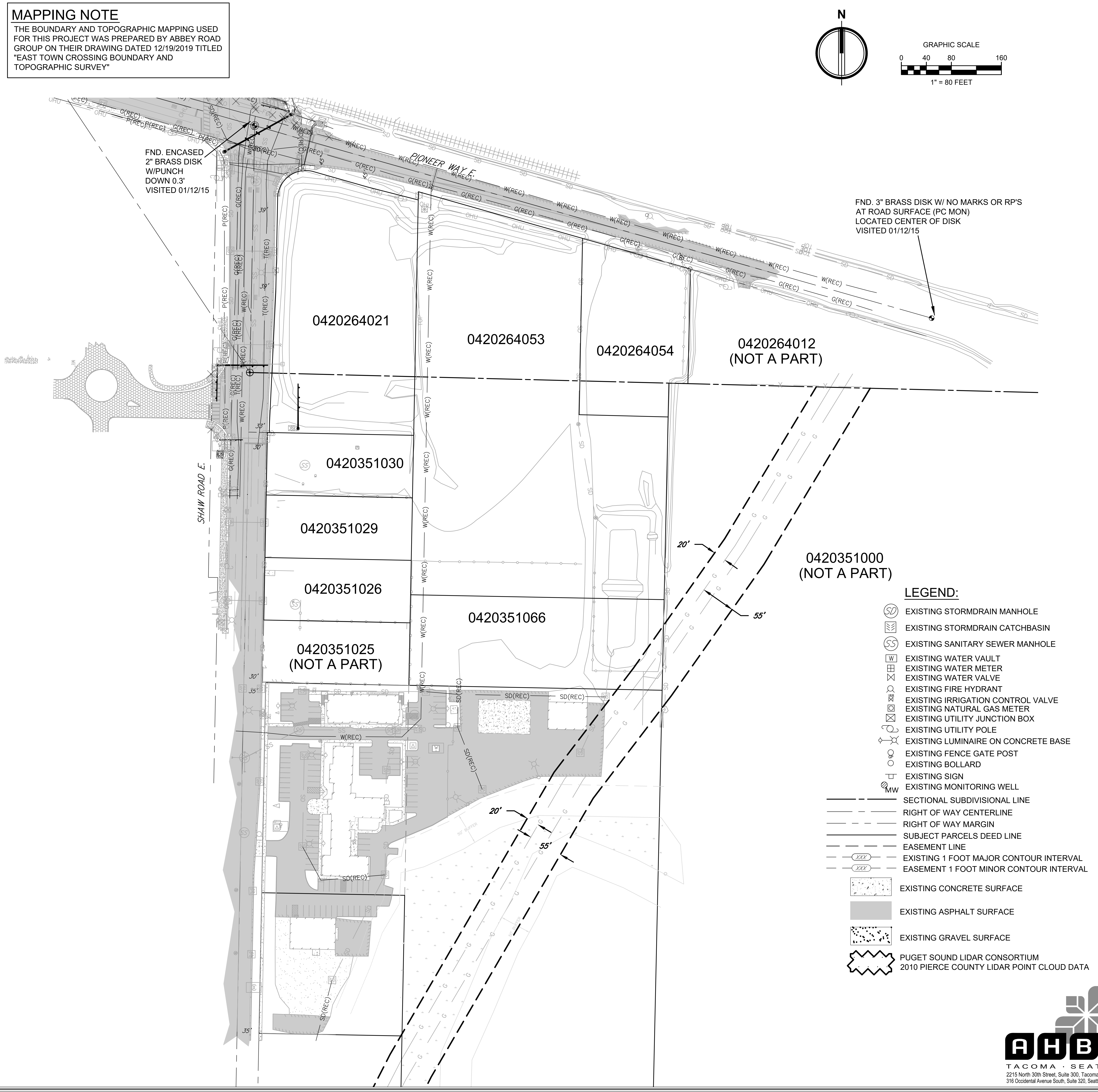
EAST TOWN CROSSING

2230752

FIGURE 1

MAPPING NOTE

THE BOUNDARY AND TOPOGRAPHIC MAPPING USED FOR THIS PROJECT WAS PREPARED BY ABBEY ROAD GROUP ON THEIR DRAWING DATED 12/19/2019 TITLED "EAST TOWN CROSSING BOUNDARY AND TOPOGRAPHIC SURVEY"



LEGEND:

SD EXISTING STORMDRAIN MANHOLE
EXISTING STORMDRAIN CATCHBASIN
SS EXISTING SANITARY SEWER MANHOLE
W EXISTING WATER VAULT
EXISTING WATER METER
EXISTING WATER VALVE
EXISTING FIRE HYDRANT
IRR EXISTING IRRIGATION CONTROL VALVE
EXISTING NATURAL GAS METER
EXISTING UTILITY JUNCTION BOX
EXISTING UTILITY POLE
EXISTING LUMINAIRE ON CONCRETE BASE
GP EXISTING FENCE GATE POST
EXISTING BOLLARD
EXISTING SIGN
MW EXISTING MONITORING WELL
SECTIONAL SUBDIVISIONAL LINE
RIGHT OF WAY CENTERLINE
RIGHT OF WAY MARGIN
SUBJECT PARCELS DEED LINE
EASEMENT LINE
XXX EXISTING 1 FOOT MAJOR CONTOUR INTERVAL
XXX EASEMENT 1 FOOT MINOR CONTOUR INTERVAL
EXISTING CONCRETE SURFACE
EXISTING ASPHALT SURFACE
EXISTING GRAVEL SURFACE
PUGET SOUND LIDAR CONSORTIUM
2010 PIERCE COUNTY LIDAR POINT CLOUD DATA

SURVEYOR'S NOTES

1. **HORIZONTAL DATUM:** BASIS OF BEARING AND SURVEY DATA PER WASHINGTON STATE
PLANE COORDINATE SYSTEM, SOUTH ZONE.

2. **BASIS OF BEARING:** HELD S 01° 21' 28" W OBSERVED ALONG THE EAST LINE OF THE NORTHEAST QUARTER OF SEC. 35, T. 20 N. R. 4 E. BETWEEN THE NORTHEAST CORNER OF THE NORTHEAST QUARTER MONUMENT AND THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER MONUMENT OF THE SAID SECTION AS SHOWN HEREON.

3. **VERTICAL DATUM:** NAVD88
AS DEFINED BY THE NATIONAL GEODETIC SURVEY (NGS)
PROJECT BENCHMARK:
DESIGNATION: 21 010
PID: DL2774

PUBLISHED ELEVATION: 75.70 FEET (NAVD 88)
DESCRIPTION: ENCASED STEEL ROD LOCATED IN EASTERLY GRAVEL SHOULDER AT THE INTERSECTION OF PIONEER WAY AND 134TH AVE. E.

4. ALL UTILITY LOCATES HAVE BEEN DETERMINED BY SURFACE LOCATION ONLY EITHER BY PHYSICAL STRUCTURES OR PAINT MARKINGS
AS DETERMINED BY UNDERGROUND + UTILITY LOCATE, INC. AND/OR UTILITY COMPANY. GAS PIPE LOCATION WITH IN THE PROPERTY DETERMINED BY MAP PROVIDE BY PUGET SOUND ENERGY, INC. ACTUAL UNDERGROUND LOCATION MAY VARY. EXISTING UTILITIES AS SHOWN MAY NOT BE THE SAME AFTER THIS DATE AS MAJOR CONSTRUCTION IS IN PROGRESS.

5. REFERENCE SURVEYS:
   1. 200303315001
   2. SP 9303315001
   3. ROS 8210040207

6. METHOD OF SURVEYING WAS:
   1. CONVENTIONAL TRAVERSE USING A TOPCON 800A TOTAL STATION.
   2. MONUMENTS FOUND MARCH 2008

TOPOGRAPHIC NOTE

THE EXISTING CULTURAL AND TOPOGRAPHICAL DATA SHOWN ON THESE DRAWINGS HAS BEEN PREPARED, IN PART, BASED UPON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, MCINNIS ENGINEERING CANNOT ENSURE ACCURACY AND THUS IS NOT RESPONSIBLE FOR THE ACCURACY OF THAT INFORMATION OR FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED INTO THESE DRAWINGS AS A RESULT.

SITE INFORMATION

PARCEL: 0420264021,
0420264054, 0420264053,
0420351066, 0420351030,
0420351029, 0420351026
ADDRESS: 2902 E PIONEER
PUYALLUP, WA 98372
ZONING: CG AND MF

SURVEYOR

ABBEY ROAD GROUP
CONTACT: LARRY WALKER
2102 E MAIN AVE, SUITE 109
PUYALLUP, WA 98372
OFFICE: 253-435-3699

AHBL
TACOMA · SEATTLE
2215 North 30th Street, Suite 300, Tacoma, WA 98403 253.383.2422 TEL
316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

Civil Engineers
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

EXISTING CONDITIONS MAP
EAST TOWN CROSSING

A-2

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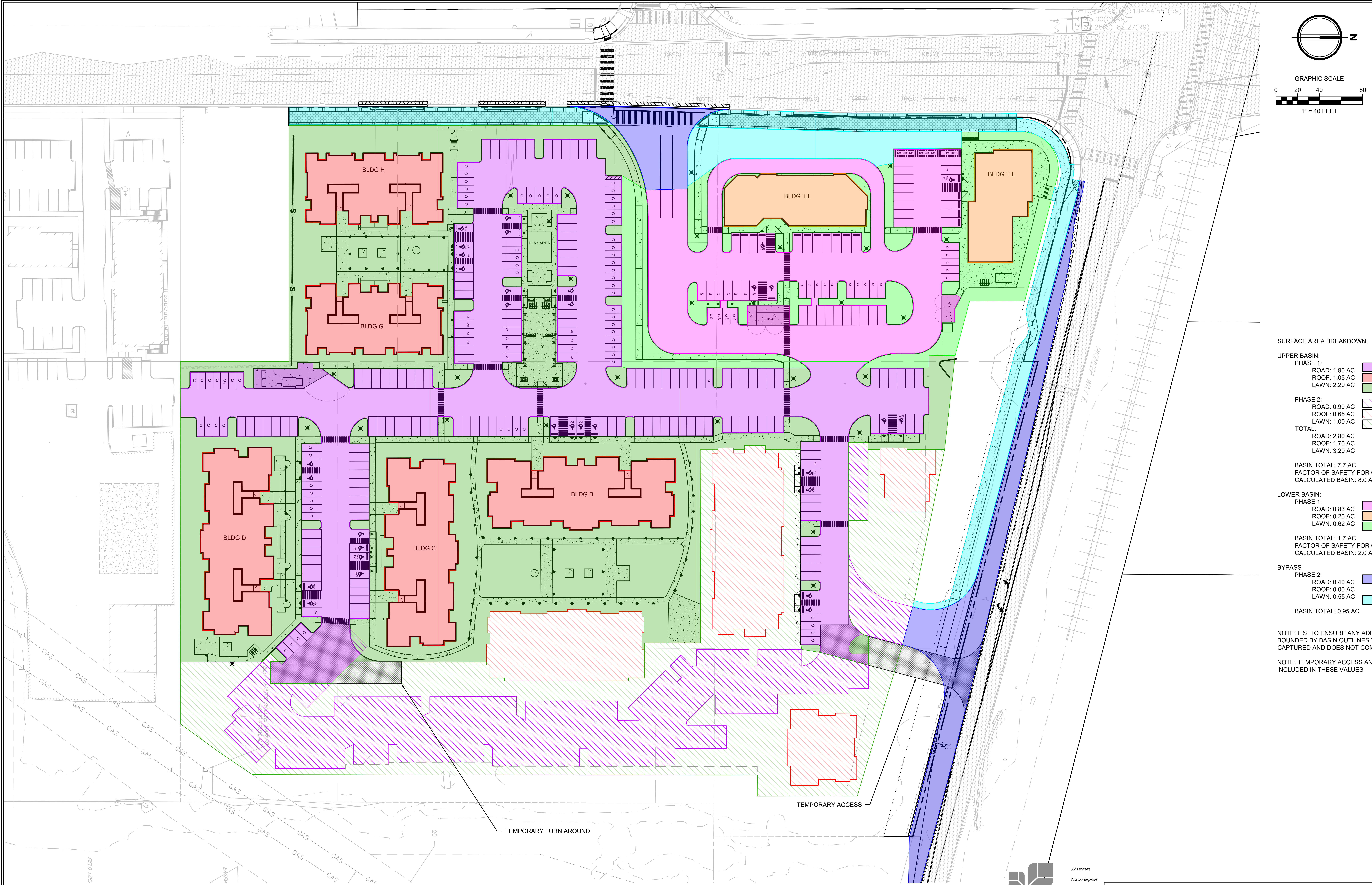
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

DEVELOPED CONDITIONS MAP

EAST TOWN CROSSING

A-3



SURFACE AREA BREAKDOWN:

UPPER BASIN:
PHASE 1:
ROAD: 1.90 AC 🟪
ROOF: 1.05 AC 🟥
LAWN: 2.20 AC 🟩

PHASE 2:
ROAD: 0.90 AC ▨
ROOF: 0.65 AC ▨
LAWN: 1.00 AC ▨
TOTAL:
ROAD: 2.80 AC
ROOF: 1.70 AC
LAWN: 3.20 AC

BASIN TOTAL: 7.7 AC
FACTOR OF SAFETY FOR CALCULATIONS: +0.3 AC
CALCULATED BASIN: 8.0 AC

LOWER BASIN:
PHASE 1:
ROAD: 0.83 AC 🟪
ROOF: 0.25 AC 🟧
LAWN: 0.62 AC 🟩

BASIN TOTAL: 1.7 AC
FACTOR OF SAFETY FOR CALCULATIONS: +0.3 AC
CALCULATED BASIN: 2.0 AC

BYPASS
PHASE 2:
ROAD: 0.40 AC 🟦
ROOF: 0.00 AC
LAWN: 0.55 AC 🟦

BASIN TOTAL: 0.95 AC

NOTE: F.S. TO ENSURE ANY ADDITIONAL RUNOFF NOT BOUNDED BY BASIN OUTLINES TO THE LEFT IS CAPTURED AND DOES NOT COMPROMISE THE SYSTEM.

NOTE: TEMPORARY ACCESS AND TURNAROUND IS NOT INCLUDED IN THESE VALUES

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DEVELOPED CONDITIONS BASIN MAP

EAST TOWN CROSSING

A-3a

United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Pierce County Area, Washington

October 26, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

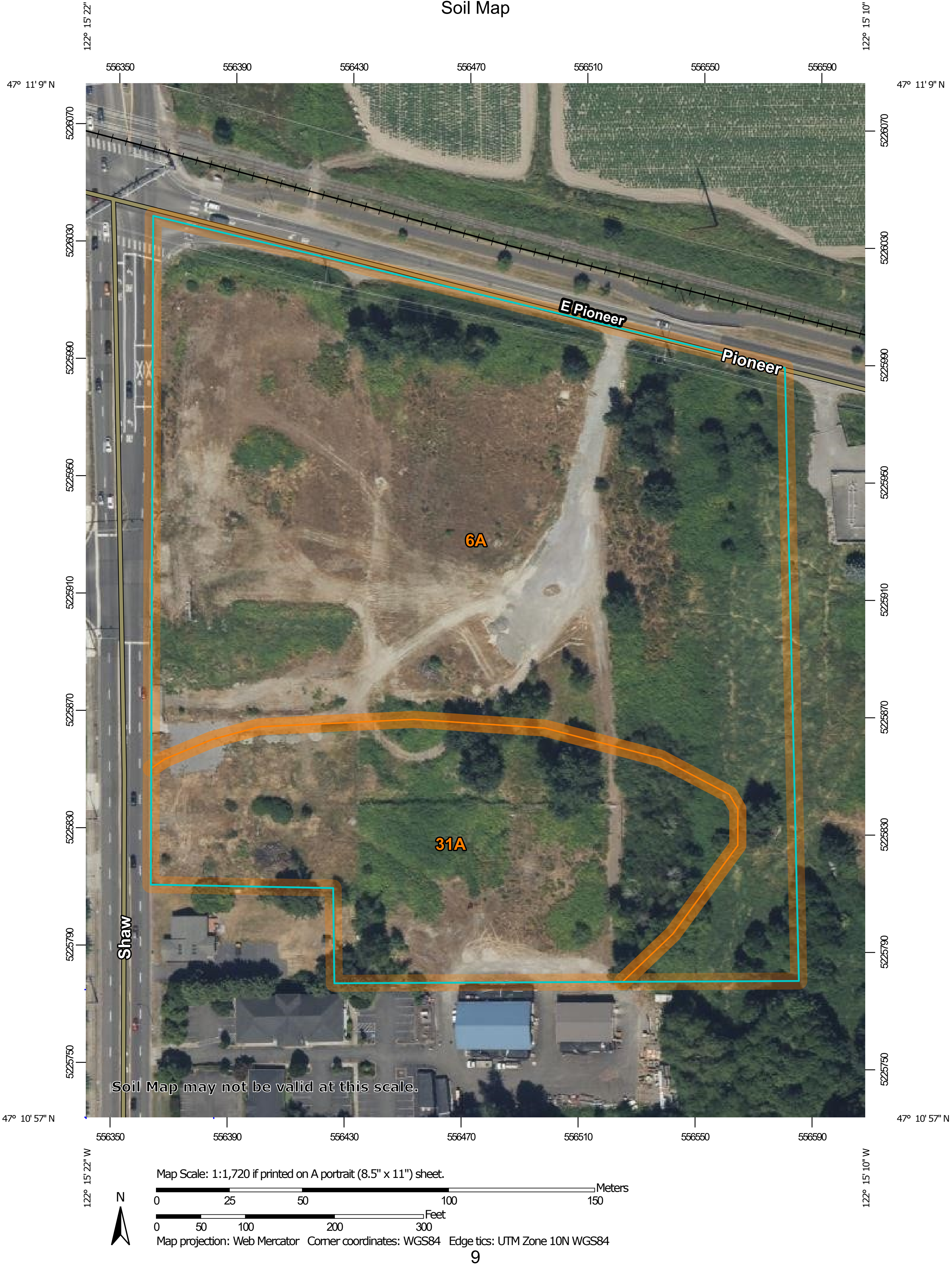
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:1,720 if printed on A portrait (8.5" x 11") sheet.

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 19, Aug 29, 2023

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	8.8	72.1%
31A	Puyallup fine sandy loam	3.4	27.9%
Totals for Area of Interest		**12.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Pierce County Area, Washington

6A—Briscot loam

Map Unit Setting

National map unit symbol: 2hrc
Elevation: 20 to 250 feet
Mean annual precipitation: 30 to 55 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Briscot, drained, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Briscot, Drained

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 38 inches: stratified fine sand to silt loam
H3 - 38 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 35 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F002XA007WA - Puget Lowlands Wet Forest
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Minor Components

Briscot, undrained

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

31A—Puyallup fine sandy loam

Map Unit Setting

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

Map Unit Composition

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

Description of Puyallup

Setting

Landform: Terraces, flood plains
Parent material: Alluvium

Typical profile

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

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 79 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Ecological site: F002XA008WA - Puget Lowlands Riparian Forest
Forage suitability group: Droughty Soils (G002XN402WA)
Other vegetative classification: Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Briscot, undrained

Percent of map unit: 2 percent

Landform: Depressions
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

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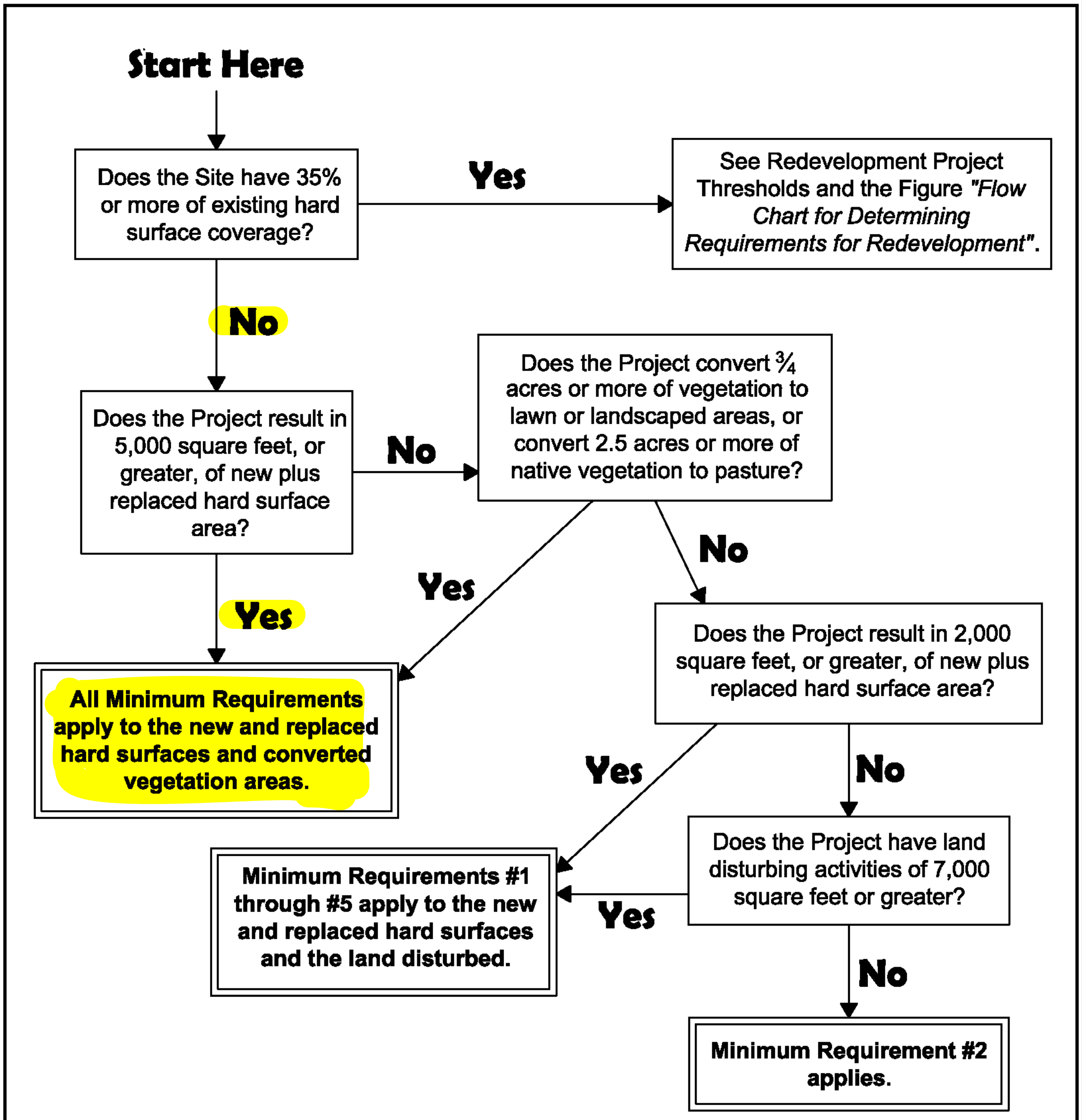
APPENDIX A-5

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



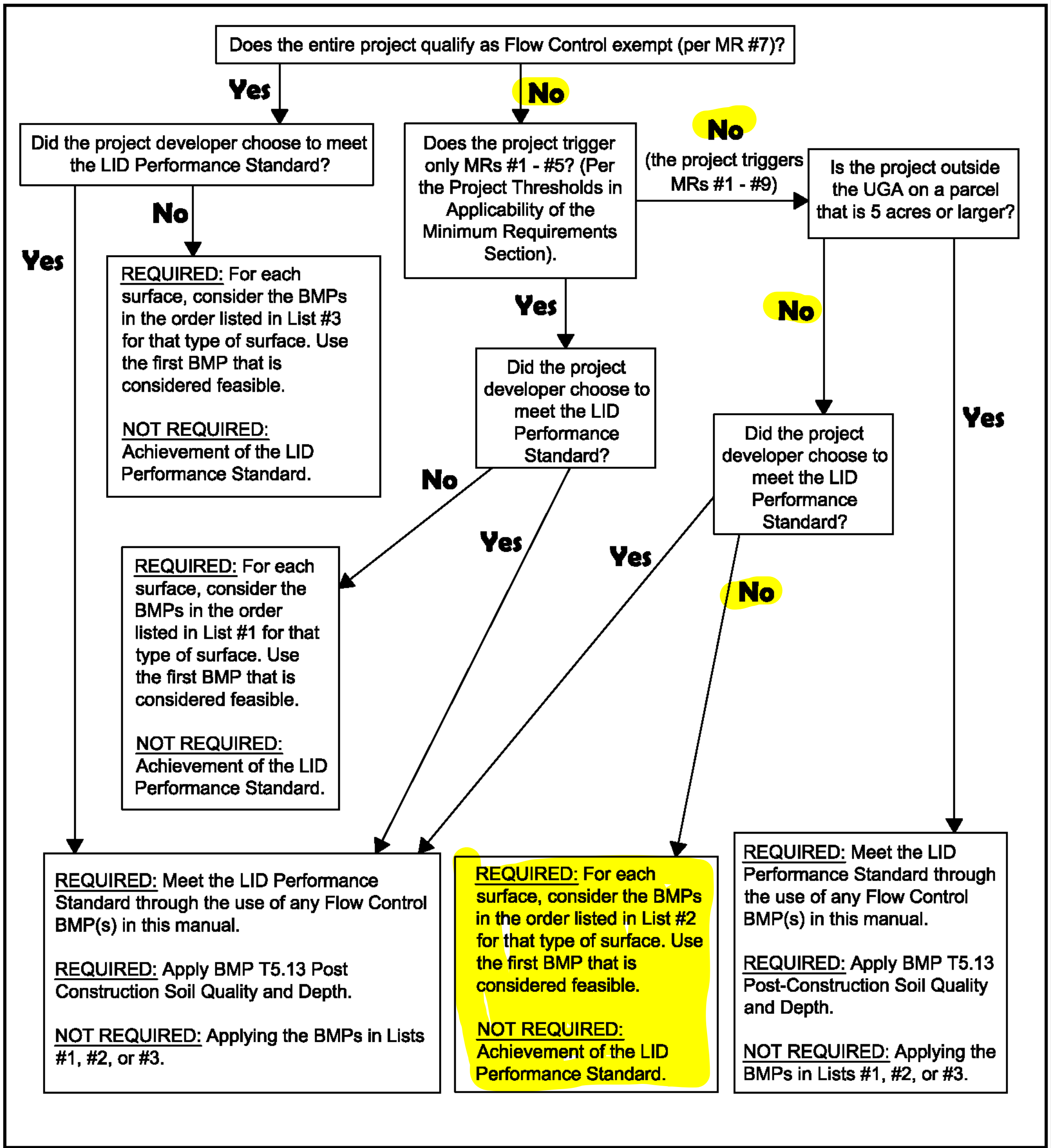
DEPARTMENT OF ECOLOGY
State of Washington

Flow Chart for Determining Requirements for New Development

Revised March 2019

APPENDIX A-6

Figure I-3.3: Flow Chart for Determining MR #5 Requirements



Does the entire project qualify as Flow Control exempt (per MR #7)?

Did the project developer choose to meet the LID Performance Standard?

Does the project trigger only MRs #1 - #5? (Per the Project Thresholds in Applicability of the Minimum Requirements Section).

Is the project outside the UGA on a parcel that is 5 acres or larger?

REQUIRED: For each surface, consider the BMPs in the order listed in List #3 for that type of surface. Use the first BMP that is considered feasible.

NOT REQUIRED: Achievement of the LID Performance Standard.

Did the project developer choose to meet the LID Performance Standard?

Did the project developer choose to meet the LID Performance Standard?

REQUIRED: For each surface, consider the BMPs in the order listed in List #1 for that type of surface. Use the first BMP that is considered feasible.

NOT REQUIRED: Achievement of the LID Performance Standard.

REQUIRED: Meet the LID Performance Standard through the use of any Flow Control BMP(s) in this manual.

REQUIRED: Apply BMP T5.13 Post Construction Soil Quality and Depth.

NOT REQUIRED: Applying the BMPs in Lists #1, #2, or #3.

REQUIRED: For each surface, consider the BMPs in the order listed in List #2 for that type of surface. Use the first BMP that is considered feasible.

NOT REQUIRED: Achievement of the LID Performance Standard.

REQUIRED: Meet the LID Performance Standard through the use of any Flow Control BMP(s) in this manual.

REQUIRED: Apply BMP T5.13 Post-Construction Soil Quality and Depth.

NOT REQUIRED: Applying the BMPs in Lists #1, #2, or #3.

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Flow Chart for Determining MR #5 Requirements

Revised March 2019

Appendix A-7:

Surface Type: Lawn and Landscaped Areas

Infeasibility Checklist
BMP T5.13 Post Construction Soil Quality and Depth

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-2 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	**Can the soil amendments be placed on slopes less than 33%?**	☒	☐	☐
2	**Will installing sheet flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (2a-2e).**	☐	☒	☐
2a	**Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act**	☐		
2b	**Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts**	☐		
2c	**Public health and safety standards**	☐		
2d	**Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way**	☐		
2e	**Critical Area Preservation Ordinance**	☐		

Surface Type: Roofs

Infeasibility Checklist
BMP T5.30 Full Dispersion

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-9 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the flow spreader and dispersion areas be placed 10 feet or more from any building structure?	☐	☒	☐
2	Can the flow spreader and dispersion areas be placed 5 feet or more from any other structure or property line?	☐	☒	☐
3	Can the dispersion areas be placed 50 feet or more from the top of any slope 15% or greater?	☐	☐	☐
4	Can the dispersion areas be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the dispersion area be located outside of critical areas, critical area buffers, streams, or lakes?	☐	☐	☐

6	Can the flow spreader and dispersion area maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
8	Will installing a full dispersion system cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (8a-8e).	☐	☐	☐
8a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
8b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
8c	Public health and safety standards	☐		
8d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
8e	Critical Area Preservation Ordinance	☐		
9	Can the design standards in BMP T5.30 be met?	☐	☐	☐
9a	Describe the design standard that cannot be met:			
Questions #10 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
10	Will the use of a full dispersion cause erosion or flooding problems onsite or on adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

Infeasibility Checklist
BMP T5.10A Downspout Full Infiltration

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-7 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the infiltration trench or drywell be placed 10 feet or more from any building structure?	☐	☐	☐
2	Can the infiltration trench or drywell be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the infiltration trench or drywell be placed 50 feet or more from the top of any slope 20% or greater?	☐	☐	☐
4	Can the infiltration trench or drywell be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the infiltration trench or drywell meet setback requirements from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Will installing an infiltration trench or drywell cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (6a-6e).	☐	☐	☐
6a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
6b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		

6c	Public health and safety standards	☐		
6d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
6e	Critical Area Preservation Ordinance	☐		
7	Can the design standards in BMP T5.10A be met?	☐	☐	☐
7a	Describe the design standards that cannot be met:			
Questions #8-10 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
8	Was the soil classified as being clay, sandy clay, clay loam, silty clay loam, sandy clay loam, or silt according to the USDA Textural Soil Triangle? (An answer of yes means this BMP is not feasible).	☐	☒	☐
9	Is the depth from proposed final grade to the seasonal high groundwater table or other impermeable layer equal to or greater than 3 feet?	☐	☒	☐
10	Is the depth from the bottom of the infiltration trench or drywell to the seasonal high groundwater table equal to or greater than 1 foot?	☐	☒	☐

Infeasibility Checklist
BMP T5.14 Rain Gardens

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-18 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries. Citation of the following do not need site-specific written recommendations from a Washington State Licensed Professional Engineer or Washington State Licensed Professional Geologist though some criteria may require professional services to determine if the infeasibility criteria apply.

Question Number	**Question**	**Yes**	**No**	**NA**
1	**Can the rain garden be placed 10 feet or more from any building structure?**	☐	☒	☐
2	Can the rain garden be placed 5 feet or more from any other structure or property line?	☐	☒	☐
3	Can the rain garden be placed 50 feet or more from the top of any slope greater than 20%?	☐	☐	☐
4	Can the rain garden be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the rain garden be located outside of designated erosion or landslide hazard areas?	☐	☐	☐
6	Can the rain garden be located greater than 100 feet from an underground storage tank whose capacity including tank and underground connecting pipe is 1100 gallons or more?	☐	☐	☐
7	Can the rain garden be located greater than 10 feet from an underground storage tank (tank used for petroleum product, chemical, or liquid hazardous waste storage) whose capacity including tank and underground connecting pipe is 1100 gallons or less?	☐	☐	☐
8	Can the rain garden be located greater than 100 feet of a closed or active landfill?	☐	☐	☐
9	Can the rain garden be located greater than 100 feet from drinking water well or a spring used for drinking water supply?	☐	☐	☐

10	Can the rain garden be placed 10 feet or more from small on-site sewage disposal drainfields? (For large on-site sewage disposal setbacks see WAC Chapter 246-727B).	☐	☐	☐
11	Can the rain garden be located on slopes less than 8%?	☐	☐	☐
12	Is the rain garden compatible with the surrounding drainage system (e.g., project drains to an existing stormwater system whose elevation precludes proper connection to a rain garden)?	☐	☐	☐
13	For properties with known soil or groundwater contamination, can the rain garden be located greater than 100 feet from an area known to have deep soil contamination?	☐	☐	☐
14	For properties with known soil or groundwater contamination, can the rain garden be located such that infiltration will not increase or change the direction of the migration of pollutants in the groundwater? (Based upon groundwater modeling).	☐	☐	☐
15	For properties with known soil or groundwater contamination, can the rain garden be located in an area that does not have contaminated surface soils that are proposed to remain in place?	☐	☐	☐
16	For properties with known soil or groundwater contamination, can the rain garden be located in areas not prohibited by an approved cleanup plan under the state Model Toxics Control Act or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW?	☐	☐	☐
17	For rain gardens that are constructed with imported compost materials, can the rain garden be located greater than ¼ mile from a phosphorus-sensitive waterbody? (Does not apply to discharges to Wapato Lake).	☐	☐	☐
18	Will installing a rain garden cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (18a-18e).	☐	☐	☐
18a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
18b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
18c	Public health and safety standards	☐		
18d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
18e	Critical Area Preservation Ordinance	☐		
Questions #19-20 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
19	Is the depth from the lowest level of the rain garden soil mix or any underlying gravel layer to the seasonal high groundwater table or other impermeable layer equal to or greater than 1 foot?	☐	☒	☐
20	Was the soil classified as having a measured native soil saturated hydraulic conductivity of 0.3 in/hour or more?	☐	☒	☐
Questions 21-28 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
21	Will the proposed rain garden location threaten the safety or reliability of preexisting underground utilities, preexisting underground storage tanks, preexisting structures, or preexisting road or parking lot surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐
22	Will the proposed rain garden location allow for a safe overflow pathway to the City stormwater system or a private stormwater system?	☐	☐	☐
23	Are there reasonable concerns about erosion, slope failure, or downgradient flooding due to infiltration? (An answer of yes means the BMP is infeasible).	☐	☐	☐

24	Is the project located in an area whose groundwater drains into an erosion hazard or landslide hazard area? (An answer of yes means the BMP is infeasible).	☐	☐	☐
25	Will infiltrating water threaten existing below grade basements? (An answer of yes means the BMP is infeasible).	☐	☐	☐
26	Will infiltrating water threaten shoreline structures such as bulkheads? (An answer of yes means the BMP is infeasible).	☐	☐	☐
27	Is there lack of usable space onsite for rain gardens at redevelopment sites? (An answer of yes means the BMP is infeasible).	☐	☐	☐
28	For public road projects, is there insufficient space within the ROW to install a rain garden? (An answer of yes means this BMP is infeasible).	☐	☐	☐

Infeasibility Checklist
BMP T7.30 Bioretention

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach

Questions #1-18 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries. Citation of the following do not need site-specific written recommendations from a Washington State Licensed Professional Engineer or Washington State Licensed Professional Geologist though some criteria may require professional services to determine if the infeasibility criteria apply.

Question Number	Question	Yes	No	NA
1	**Can the bioretention facility be placed 10 feet or more from any building structure?**	☐	☒	☐
2	Can the bioretention facility be placed 5 feet or more from any other structure or property line?	☐	☒	☐
3	Can the bioretention facility be placed 50 feet or more from the top of any slope greater than 20%?	☐	☐	☐
4	Can the bioretention facility be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the bioretention facility be located outside of designated erosion or landslide hazard areas?	☐	☐	☐
6	Can the bioretention facility be located greater than 100 feet from an underground storage tank whose capacity including tank and underground connecting pipe is 1100 gallons or more?	☐	☐	☐
7	Can the bioretention facility be located greater than 10 feet from an underground storage tank (tank used for petroleum product, chemical, or liquid hazardous waste storage) whose capacity including tank and underground connecting pipe is 1100 gallons or less?	☐	☐	☐
8	Can the bioretention facility be located greater than 100 feet of a closed or active landfill?	☐	☐	☐
9	Can the bioretention facility be located greater than 100 feet from drinking water well or a spring used for drinking water supply?	☐	☐	☐
10	Can the bioretention facility be placed 10 feet or more from small on-site sewage disposal drainfields? (For large on-site sewage disposal setbacks see WAC Chapter 246-727B).	☐	☐	☐
11	Can the bioretention facility be located on slopes less than 8%?	☐	☐	☐
12	Is the bioretention facility compatible with the surrounding drainage system (e.g., project drains to an existing stormwater system whose elevation precludes proper connection to the bioretention facility)?	☐	☐	☐
13	For properties with known soil or groundwater contamination, can the bioretention facility be located greater than 100 feet from an area known to have deep soil contamination?	☐	☐	☐
14	For properties with known soil or groundwater contamination, can the bioretention facility be located such that infiltration will not increase or change the direction of the migration of pollutants in the groundwater? (Based upon groundwater modeling).	☐	☐	☐

15	For properties with known soil or groundwater contamination, can the bioretention facility be located in an area that does not have contaminated surface soils that are proposed to remain in place?	☐	☐	☐
16	For properties with known soil or groundwater contamination, can the bioretention facility be located in areas not prohibited by an approved cleanup plan under the state Model Toxics Control Act or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW?	☐	☐	☐
17	For bioretention facilities that are constructed with imported compost materials, can the bioretention facility be located greater than ¼ mile from a phosphorus-sensitive waterbody? (Does not apply to discharges to Wapato Lake).	☐	☐	☐
18	Will installing a bioretention facility cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (18a-18e).	☐	☐	☐
18a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
18b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
18c	Public health and safety standards	☐		
18d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
18e	Critical Area Preservation Ordinance	☐		
Questions #19-21 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
19	Is the depth from the lowest level of the bioretention soil mix or any underlying gravel layer to the seasonal high groundwater table or other impermeable layer equal to or greater than 1 foot? This applies only if the contributing area to the bioretention facility has less than 5,000 square feet of pollution-generating impervious surface, and less than 10,000 square feet of impervious surface, and less than ¾ acre pervious surface.	☐	☒	☐
20	Is the depth from the lowest level of the bioretention soil mix or any underlying gravel layer to the seasonal high groundwater table or other impermeable layer equal to or greater than 3 feet? This applies only if the contributing area to the bioretention facility has: 5,000 square feet or greater of pollution-generating impervious surface, or 10,000 square feet or greater of impervious surface, or more ¾ acre pervious surface AND the bioretention facility cannot be broken down into amounts smaller than those listed above.	☐	☒	☐
21	Was the soil classified as having a measured native soil saturated hydraulic conductivity of 0.3 in/hour or more?	☐	☒	☐
Questions 22-29 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
22	Will the proposed bioretention facility location threaten the safety or reliability of preexisting underground utilities, preexisting underground storage tanks, preexisting structures, or preexisting road or parking lot surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐
23	Will the proposed bioretention facility location allow for a safe overflow pathway to the City stormwater system or a private stormwater system?	☐	☐	☐
24	Are there reasonable concerns about erosion, slope failure, or downgradient flooding due to infiltration? (An answer of yes means the BMP is infeasible).	☐	☐	☐
25	Is the project located in an area whose groundwater drains into an erosion hazard or landslide hazard area? (An answer of yes means the BMP is infeasible).	☐	☐	☐
26	Will infiltrating water threaten existing below grade basements? (An answer of yes means the BMP is infeasible).	☐	☐	☐

27	Will infiltrating water threaten shoreline structures such as bulkheads? (An answer of yes means the BMP is infeasible).	☐	☐	☐
28	Is there lack of usable space onsite for bioretention facilities at redevelopment sites? (An answer of yes means the BMP is infeasible).	☐	☐	☐
29	For public road projects, is there insufficient space within the ROW to install a bioretention facility? (An answer of yes means this BMP is infeasible).	☐	☐	☐

Infeasibility Checklist
BMP T5.10B Downspout Dispersion

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-10 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the dispersion trench or splashblocks be placed 10 feet or more from any building structure?	☐	☒	☐
2	Can the dispersion trench or splashblocks be placed 5 feet or more from any other structure or property line?	☐	☒	☐
3	Can the dispersion trench or splashblocks be placed 50 feet or more from the top of any slope 15% or greater?	☐	☐	☐
4	Can the dispersion trench or splashblocks be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the dispersion trench or splashblock maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Is it possible to maintain or construct a vegetated flowpath of at least 25 feet from the outlet of a dispersion trench and any property line, structure, stream, wetland, other infiltration or dispersion system, or impervious surface?	☐	☒	☐
7	Is it possible to maintain or construct a vegetated flowpath of at least 50 feet from the outlet of a dispersion trench and any slope greater than 15%?	☐	☐	☐
8	Is it possible to maintain or construct a vegetated flowpath of at least 50 feet from the outlet of splashblock and any property line, structure, slope over 15%, stream, wetland, other infiltration or dispersion system, or impervious surface?	☐	☐	☐
9	Will installing a dispersion trench or splashblocks cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (9a-9e).	☐	☐	☐
9a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
9b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
9c	Public health and safety standards	☐		
9d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
9e	Critical Area Preservation Ordinance	☐		
10	Can the design standards in BMP T5.10B be met?	☐	☐	☐
10a	Describe the design standard that cannot be met:			

Questions #11 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).

11	Will the use of a dispersion trench or splashblocks cause erosion or flooding problems onsite or on adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

Infeasibility Checklist
BMP T5.10C: Perforated Stub-out Connections

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-7 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the perforated stub-out connection be placed 10 feet or more from any building structure?	☐	☒	☐
2	Can the perforated stub-out connection be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the perforated stub-out connection be placed 50 feet or more from the top of any slope 20% or greater?	☐	☐	☐
4	Can the perforated stub-out connection be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the perforated stub-out connection meet setback requirements from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Will installing a perforated stub-out connection cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (6a-6e).	☐	☐	☐
6a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
6b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
6c	Public health and safety standards	☐		
6d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
6e	Critical Area Preservation Ordinance	☐		
7	Can the design standards in BMP T5.10C be met?	☐	☐	☐
7a	Describe the design standard that cannot be met:			
Questions #8 relates to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
8	Is the depth from the bottom of the perforated stub-out connection to the seasonal high groundwater table equal to or greater than 1 foot?	☐	☒	☐

Surface Type: Other Hard Surfaces

Infeasibility Checklist
BMP T5.15 Permeable Pavement

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-24 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries. Citation of the following do not need site-specific written recommendations from a

Washington State Licensed Professional Engineer or Washington State Licensed Professional Geologist though some criteria may require professional services to determine if the infeasibility criteria apply.				
Question Number	**Question**	**Yes**	**No**	**NA**
1	**Can the permeable pavement be placed 10 feet or more from any building structure?**	☐	☐	☐
2	Can the permeable pavement be placed 5 feet or more from any other structure or property line?	☐	☐	☐
3	Can the permeable pavement be placed 50 feet or more from the top of any slope greater than 20%?	☐	☐	☐
4	Can the permeable pavement be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the permeable pavement be located outside of designated erosion or landslide hazard areas?	☐	☐	☐
7	Can the permeable pavement be located greater than 10 feet from an underground storage tank (tank used for petroleum product, chemical, or liquid hazardous waste storage) whose capacity including tank and underground connecting pipe is 1100 gallons or less?	☐	☐	☐
8	Can the permeable pavement be located greater than 100 feet of a closed or active landfill?	☐	☐	☐
9	Can the permeable pavement be located greater than 100 feet from drinking water well or a spring used for drinking water supply if the permeable pavement is (or has run-on from) a pollution-generating hard surface?	☐	☐	☐
10	Can the permeable pavement be placed 10 feet or more from small on-site sewage disposal drainfields? (For large on-site sewage disposal setbacks see WAC Chapter 246-727B).	☐	☐	☐
11	Can the permeable pavement be constructed such that the subgrade is less than 6%?	☐	☐	☐
12	Can the permeable pavement be constructed such that the wearing course is less than 6% (after reasonable attempts have been made to design the grade)?	☐	☐	☐
13	Is the location for permeable pavement a multi-level parking garage, above a culvert, or a bridge? An answer of yes means the BMP is not feasible.	☐	☐	☐
14	Does the road receive more than very low traffic volumes? (Roads with a projected average daily traffic volume of 400 vehicles or less). This infeasibility criterion cannot be used for sidewalks or non-traffic bearing surfaces. An answer of yes means the BMP is not feasible.	☐	☐	☐
15	Does the road receive more than very low truck traffic? (Roads not subject to through truck traffic but may receive up to weekly use by utility trucks, daily school bus use, and multiple daily use by pick-up trucks, mail/parcel delivery trucks, and maintenance vehicles.). This infeasibility criterion cannot be used for sidewalks or non-traffic bearing surfaces. An answer of yes means the BMP is not feasible.	☐	☐	☐
16	Does the area typically generate high concentrations of oil due to high traffic turnover or frequent transfer of oil? (See SWMM for additional guidance.) An answer of yes means the BMP is not feasible.	☐	☐	☐
17	Can the permeable pavement be located outside of areas with industrial activity as identified in 40 CFR 122.26(b)14?	☐	☐	☐
18	Can permeable pavement be located outside of areas where the risk of concentrated pollutant spills is likely such as gas stations, truck stops, and industrial chemical storage areas?	☐	☐	☐
19	Can permeable pavement be located outside of areas likely to have long-term excessive sediment deposition after construction?	☐	☐	☐
20	For properties with known soil or groundwater contamination, can the permeable pavement be located greater than 100 feet from an area known to have deep soil contamination?	☐	☐	☐
21	For properties with known soil or groundwater contamination, can the permeable pavement be located such that infiltration will not increase or change the direction of the migration of pollutants in the groundwater? (Based upon groundwater modeling).	☐	☐	☐

22	For properties with known soil or groundwater contamination, can the permeable pavement be located in an area that does not have contaminated surface soils that are proposed to remain in place?	☐	☐	☐
23	For properties with known soil or groundwater contamination, can the permeable pavement be located in areas not prohibited by an approved cleanup plan under the state Model Toxics Control Act or Federal Superfund Law, or an environmental covenant under Chapter 64.70 RCW?	☐	☐	☐
24	Will installing permeable pavement cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (24a-24e).	☐	☐	☐
24a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
24b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
24c	Public health and safety standards	☐		
24d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
24e	Critical Area Preservation Ordinance	☐		
Questions #25-28 relate to infeasibility criteria that are based upon subsurface characteristics and require a soils report to determine infeasibility.				
25	Is the depth from the lowest layer designed as part of the permeable pavement section to the seasonal high groundwater elevation, bedrock, or other impermeable layer equal to or greater than 1 foot?	☐	☐	☐
26	For pollution generating pervious pavement surfaces, can the soil suitability criteria for treatment be met? (See SWMM – BMP T5.15)	☐	☐	☐
27	Was the soil classified as having a measured native soil saturated hydraulic conductivity of 0.3 in/hour or more?	☐	☒	☐
28	Is the existing impervious surface that will be replaced non-polluting generating and located over an outwash soil with a saturated hydraulic conductivity of 4 inches/hour or greater?	☐	☐	☐
Questions 29-40 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
29	Will the proposed permeable pavement location threaten the safety or reliability of preexisting underground utilities, preexisting underground storage tanks, preexisting structures, or preexisting road or parking lot surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐
30	Will infiltrating and ponded water compromise existing adjacent impervious pavements? (An answer of yes means the BMP is infeasible).	☐	☐	☐
31	Are there reasonable concerns about erosion, slope failure, or downgradient flooding due to infiltration? (An answer of yes means the BMP is infeasible).	☐	☐	☐
32	Can the permeable pavement be located outside area whose groundwater drains into an erosion hazard or landslide hazard area?	☐	☐	☐
33	Will infiltrating water threaten existing below grade basements? (An answer of yes means the BMP is infeasible).	☐	☐	☐
34	Will infiltrating water threaten shoreline structures such as bulkheads? (An answer of yes means the BMP is infeasible).	☐	☐	☐
35	Can permeable pavement be located away from the bottom of steep, erosion prone areas that are likely to erode sediment?	☐	☐	☐
36	Can permeable pavement be located away from fill soils that can become unstable when saturated?	☐	☐	☐
37	Will permeable pavement construction on steep slopes cause erosion and structural failure? (An answer of yes means the BMP is infeasible).	☐	☐	☐

38	Will permeable pavement construction on steep slopes cause runoff velocities that preclude adequate infiltration at the pavement surfaces? (An answer of yes means the BMP is infeasible).	☐	☐	☐
39	Can permeable pavement provide sufficient strength to support the anticipated loads?	☐	☐	☐
40	Are underlying soils suitable for supporting traffic loads when saturated?	☐	☒	☐

Infeasibility Checklist
BMP T5.12: Sheet Flow Dispersion

It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.

Questions #1-9 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.

Question Number	Question	Yes	No	NA
1	Can the sheet flow dispersions system be placed 10 feet or more from any building structure?	☐	☒	☐
2	Can the sheet flow dispersion system be placed 5 feet or more from any other structure or property line?	☐	☒	☐
3	Can the sheet flow dispersion system be placed 50 feet or more from the top of any slope 15% or greater?	☐	☐	☐
4	Can the sheet flow dispersion system be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the sheet flow dispersion system maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Is it possible to provide a vegetated flowpath width of 10 feet or greater for up to 20 feet of width of paved or impervious surface?	☐	☒	☐
7	For paved or impervious surfaces widths 20 feet or greater, is it possible to provide a vegetated flowpath width of 20 feet or greater (additional 10 feet of width must be added for each increment of 20 feet or more in width)?	☐	☒	☐
8	Will installing sheet flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (8a-8e).	☐	☐	☐
8a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
8b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
8c	Public health and safety standards	☐		
8d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
8e	Critical Area Preservation Ordinance	☐		
9	Can the design standards in BMP T5.12 be met?	☐	☐	☐
9a	Describe the design standard that cannot be met:			
Questions #10 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
10	Will the use of sheet flow dispersion cause erosion or flooding problems onsite or an adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

Infeasibility Checklist BMP T5.11: Concentrated Flow Dispersion				
It is not necessary to answer all questions when determining if a BMP is feasible for Minimum Requirement #5 – The List Approach. Unless otherwise noted, a single answer of No means the BMP is considered infeasible for meeting Minimum Requirement #5 – The List Approach.				
Questions #1-8 relate to infeasibility criteria that are based on conditions such as topography and distances to predetermined boundaries and certain design criteria.				
Question Number	**Question**	**Yes**	**No**	**NA**
1	Can the concentrated flow dispersion system be placed 10 feet or more from any building structure?	☐	☒	☐
2	Can the concentrated flow dispersion system be placed 5 feet or more from any other structure or property line?	☐	☒	☐
3	Can the concentrated flow dispersion system be placed 50 feet or more from the top of any slope 15% or greater?	☐	☐	☐
4	Can the concentrated flow dispersion system be placed 50 feet or more from geologically hazardous areas?	☐	☐	☐
5	Can the concentrated flow dispersion system maintain setbacks from Onsite Sewage Systems per WAC 246-272A-0210?	☐	☐	☐
6	Is it possible to maintain or construct a vegetated flowpath of at least 25 feet from the discharge location and any property line, structure, slope greater than 15%, surface water, or other hard surface?	☐	☒	☐
7	Will installing concentrated flow dispersion cause conflicts with any of the following? (An answer of yes means this BMP is infeasible.) Place a checkmark next to the applicable item (7a-7e).	☐	☐	☐
7a	Requirements of the Historic Preservation Laws and Archeology Laws, Federal Superfund or Washington State Model Toxics Control Act, Federal Aviation Administration requirements for airports, or Americans with Disability Act	☐		
7b	Special zoning district design criteria adopted and being implemented through any City of Puyallup planning efforts	☐		
7c	Public health and safety standards	☐		
7d	Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way	☐		
7e	Critical Area Preservation Ordinance	☐		
8	Can the design standards in BMP T5.11 be met?	☐	☐	☐
8a	Describe the design standard that cannot be met:			
Questions #9 require evaluation of site specific conditions and a written recommendation from an appropriate Washington State Licensed Professional (e.g., Professional Engineer, Professional Geologist, Professional Hydrogeologist).				
9	Will the use of concentrated flow dispersion cause erosion or flooding problems onsite or an adjacent properties? (An answer of yes means this BMP is not feasible).	☐	☐	☐

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 10. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Pierce County GIS, WA DNR, WSDOT, USFWS, Washington State Department of Ecology, and Puget Sound Regional Council. This information was compiled at scales of 1:1,200 to 1:24,000 during the time period 1996-2012.

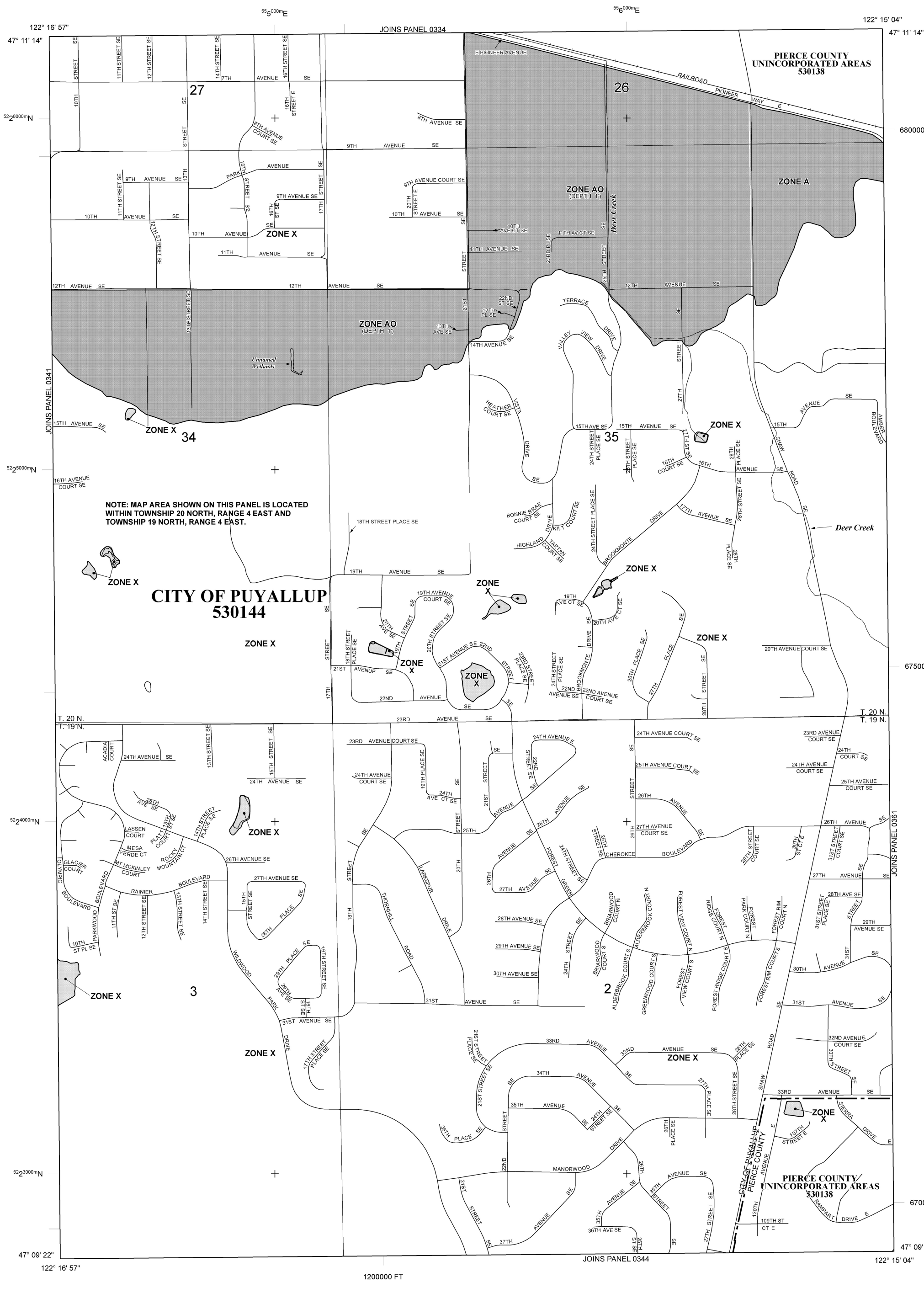
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

▨ SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▨ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▨ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▨ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% Annual Chance Floodplain Boundary
———	0.2% Annual Chance Floodplain Boundary
— —	Floodway boundary
— — —	Zone D boundary
• • • • • • •	CBRS and OPA boundary
▨ ←	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

Ⓐ——Ⓐ	Cross section line
㉓- - - -㉓	Transect line
- - - - - -	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
$^{49}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 10
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
March 7, 2017

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0342E

FIRM

FLOOD INSURANCE RATE MAP

PIERCE COUNTY, WASHINGTON
AND INCORPORATED AREAS

PANEL 342 OF 1375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PIERCE COUNTY	530138	0342	E
PUYALLUP, CITY OF	530144	0342	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
53053C0342E

EFFECTIVE DATE
MARCH 7, 2017

Federal Emergency Management Agency

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	**City of Puyallup** **Pierce County** **Washington**	**CHANNELIZATION** **CULVERT** **DETENTION BASIN**	**HYDROLOGIC ANALYSIS** **1D HYDRAULIC ANALYSIS** **UPDATED TOPOGRAPHIC DATA**
	COMMUNITY NO.: 530144		
IDENTIFIER	06-171 East Town Crossing	**APPROXIMATE LATITUDE & LONGITUDE: 47.184, -122.254** **SOURCE:** Other **DATUM:** WGS 84	

ANNOTATED MAPPING ENCLOSURES			ANNOTATED STUDY ENCLOSURES
TYPE: FIRM*	NO.: 53053C0342E	DATE: March 7, 2017	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: March 7, 2017
TYPE: FIRM	NO.: 53053C0361E	DATE: March 7, 2017	PROFILE(S): 363P, 365P(NEW), AND 366P(NEW) SUMMARY OF DISCHARGES TABLE: 2

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map

FLOODING SOURCE(S) & REVISED REACH(ES) **See Page 2 for Additional Flooding Sources**

Deer Creek - Pioneer - From just downstream of E Pioneer Ave & Shaw Road E to approximately 1,520 feet upstream of E Pioneer Ave & Shaw Road E
Pioneer South Creek - From just downstream of E Pioneer Ave & Shaw Road E to approximately 1,530 feet upstream of E Pioneer Ave & Shaw Road E

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Deer Creek – Pioneer	No BFEs*	BFEs	YES	NONE
	Zone X (unshaded)	Zone AE	YES	NONE
Pioneer South Creek	No BFEs	BFEs	YES	NONE
	Zone A	Zone AE	YES	NONE

* BFEs - Base (1-percent-annual-chance) Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

OTHER FLOODING SOURCES AFFECTED BY THIS REVISION

FLOODING SOURCE(S) & REVISED REACH(ES)

Pioneer South Creek Tributary - From confluence with Pioneer South Creek to approximately 1,860 feet upstream of confluence with Pioneer South Creek

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Pioneer South Creek Tributary	No BFEs*	BFEs	YES	NONE
	Zone A	Zone AE	YES	YES

* BFEs - Base (1-percent-annual-chance) Flood Elevations

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Kristen Meyers
Director, Mitigation Division
Federal Emergency Management Agency, Region X
Federal Regional Center
130 228th Street, Southwest
Bothell, WA 98021-8627
(425) 487-4543

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below, and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/bfe_status/bfe_main.asp

LOCAL NEWSPAPER	Name:	*The News Tribune*
	Dates:	May 4, 2022 and May 11, 2022

Within 90 days of the second publication in the local newspaper, any interested party may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

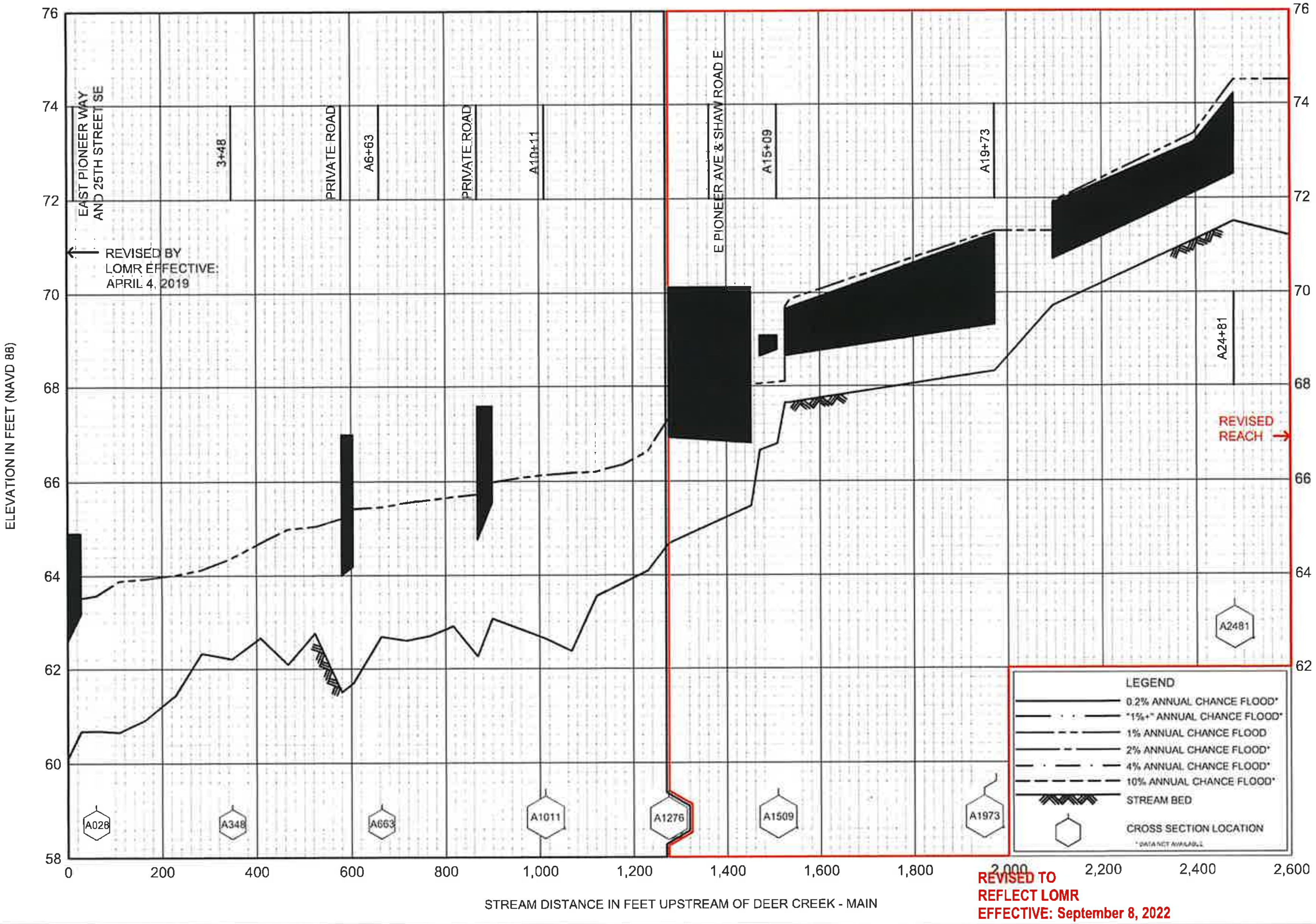
REVISED TO
REFLECT LOMR
EFFECTIVE: April 4,
2019

REVISED TO
REFLECT LOMR
EFFECTIVE: September 8, 2022

Table 2 – Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
DEBRA JANE CREEK					
At Mouth	1.3	45	62	69	85
At Confluence with Bonney Lake Outflow	0.8	26	34	38	48
At Upstream End of Debra Jane Lake	0.1	9	12	14	17
DEER CREEK					
At the BNSF Railroad crossing near E. Pioneer Way and 23rd Street SE	2.4	N/A	N/A	220	N/A
DEER CREEK - PIONEER					
Upstream of Shaw Road E	0.8	N/A	N/A	11	N/A
PIONEER SOUTH CREEK					
Upstream of Shaw Road E	1.7	N/A	N/A	35	N/A
PIONEER SOUTH CREEK TRIBUTARY					
At confluence with Pioneer South Creek	0.2	N/A	N/A	3	N/A

Revised Data



REVISED TO REFLECT LOMR EFFECTIVE: September 8, 2022

FLOOD PROFILES

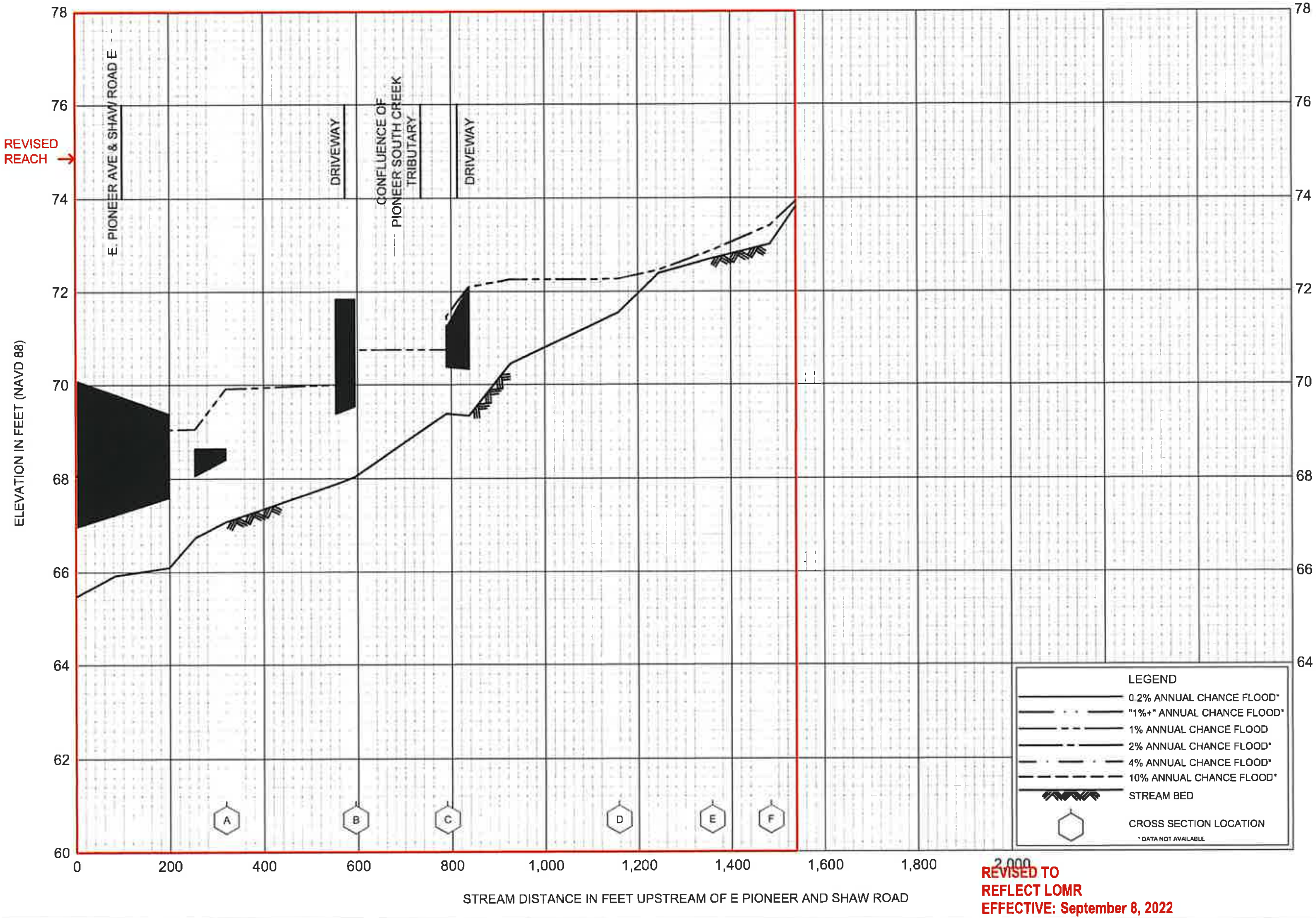
DEER CREEK - PIONEER

FEDERAL EMERGENCY MANAGEMENT AGENCY

PIERCE COUNTY, WA

AND INCORPORATED ARES

363P



REVISED TO REFLECT LOMR EFFECTIVE: September 8, 2022

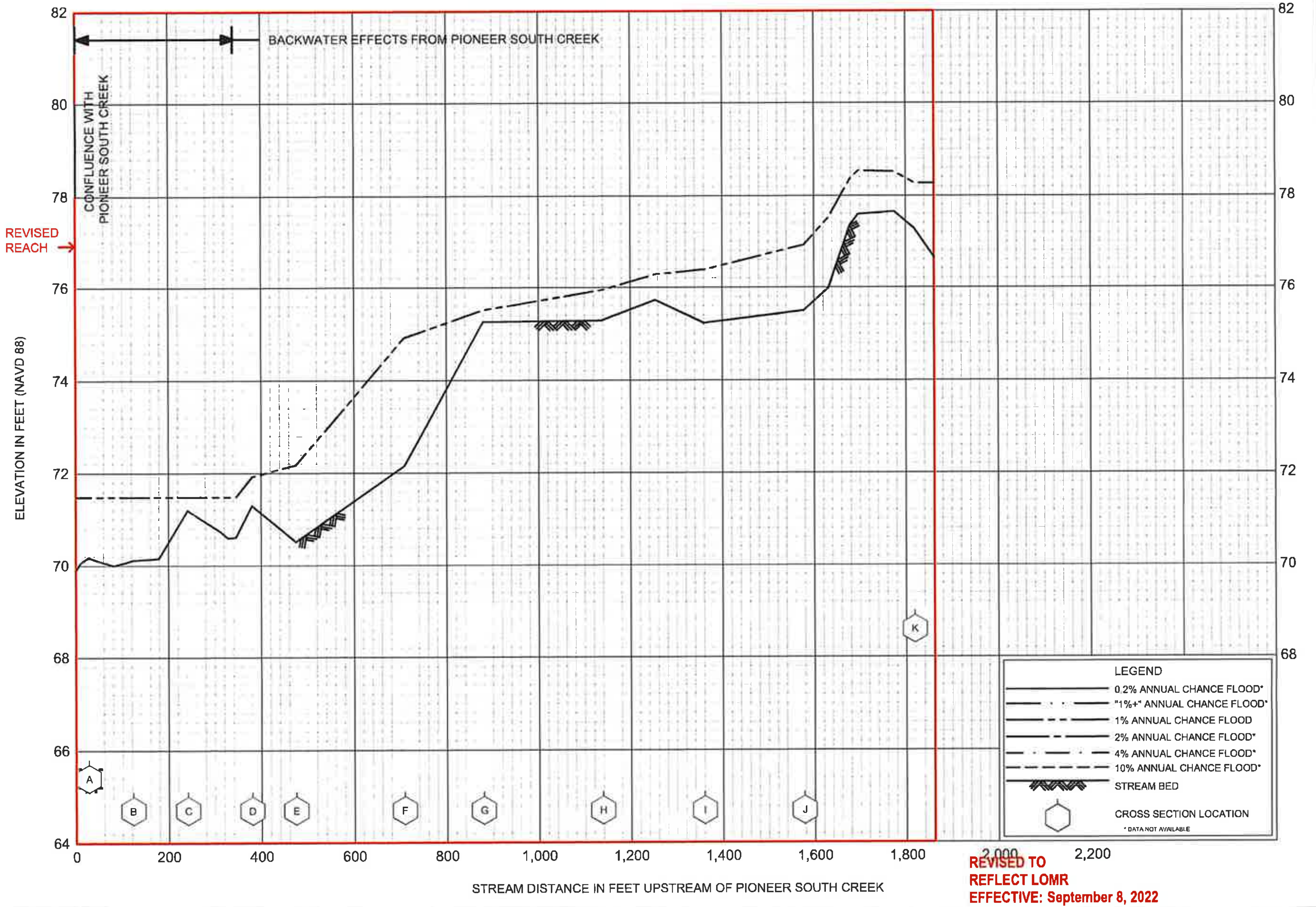
FLOOD PROFILES

PIONEER SOUTH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PIERCE COUNTY, WA
AND INCORPORATED AREAS

365P



REVISED TO
REFLECT LOMR
EFFECTIVE: September 8, 2022

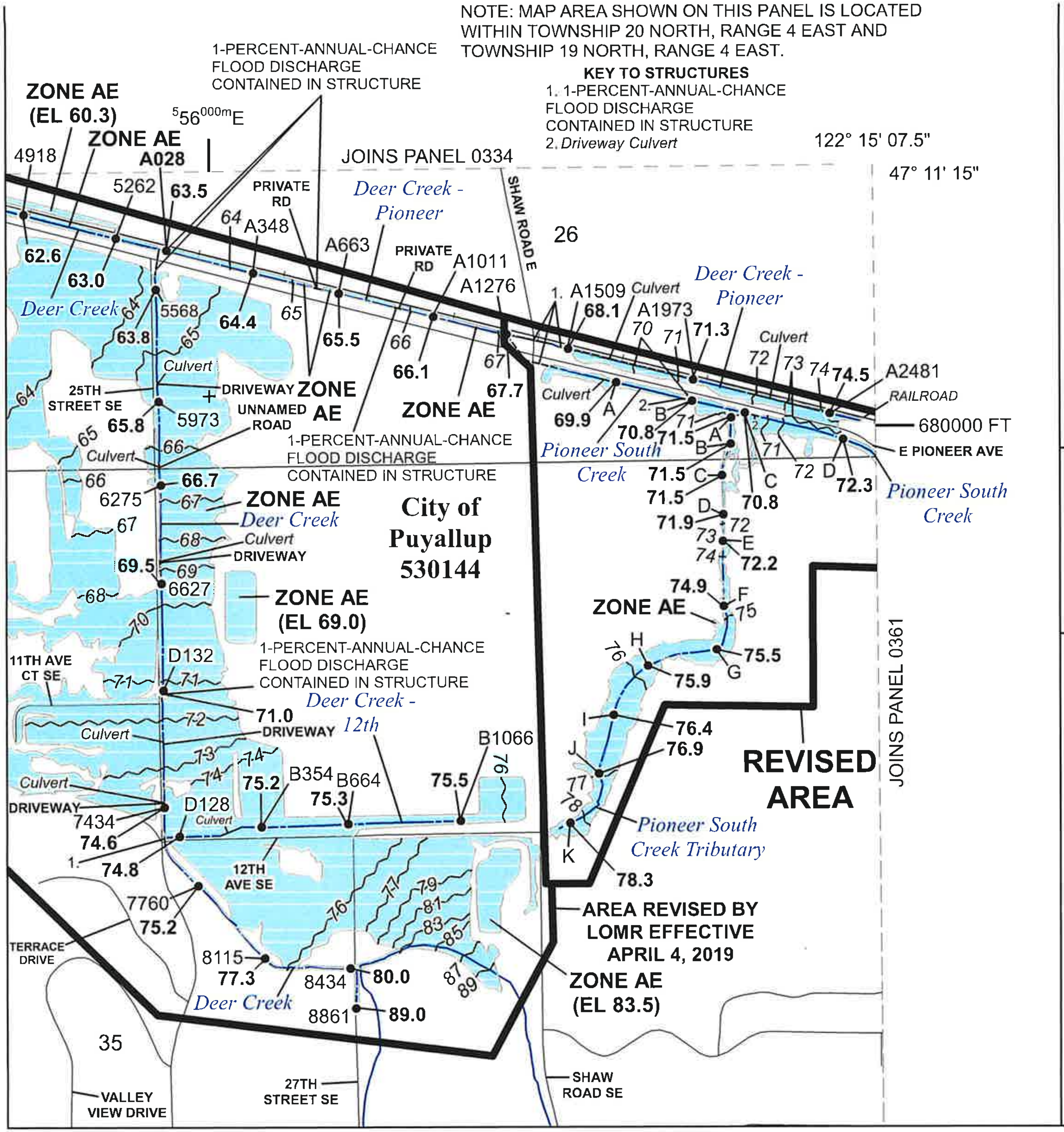
FLOOD PROFILES

PIONEER SOUTH CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

PIERCE COUNTY, WA

UNINCORPORATED AREAS



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 20 NORTH, RANGE 4 EAST AND TOWNSHIP 19 NORTH, RANGE 4 EAST.

KEY TO STRUCTURES

1. 1-PERCENT-ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN STRUCTURE
2. *Driveway Culvert*

SPECIAL FLOOD HAZARD AREAS	🟦	**Without Base Flood Elevation (BFE)** *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	**Regulatory Floodway**
OTHER AREAS OF FLOOD HAZARD	🟧	**0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile** *Zone X*
	▨	**Future Conditions 1% Annual Chance Flood Hazard** *Zone X*
	▨	**Area with Reduced Flood Risk due to Levee See Notes.** *Zone X*

SCALE

Map Projection:
NAD 1983 UTM Zone 10N;
Western Hemisphere; Vertical Datum: NAVD 88

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet

0 75 150 300 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PIERCE COUNTY, WASHINGTON
and Incorporated Areas

PANEL **342** OF **1375**

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
PIERCE COUNTY	530138	0342	E
PUYALLUP, CITY OF	530144	0342	E

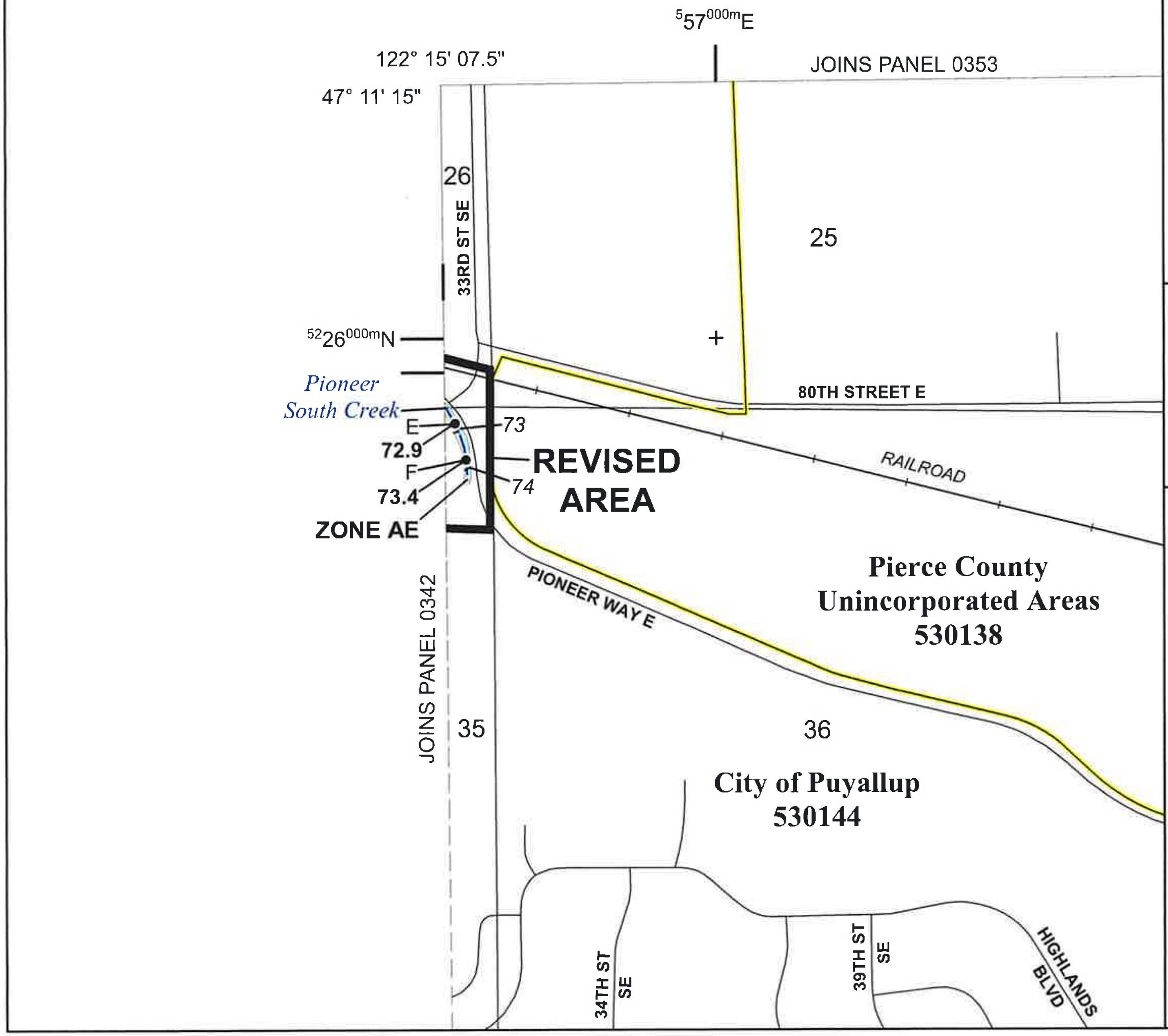
REVISED TO REFLECT LOMR EFFECTIVE: September 8, 2022

VERSION NUMBER
2.1.3.0

MAP NUMBER
53053C0342E

EFFECTIVE DATE
MARCH 7, 2017

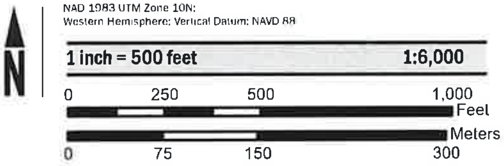
MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 19 NORTH, RANGE 4 EAST, TOWNSHIP 19 NORTH, RANGE 5 EAST, TOWNSHIP 20 NORTH, RANGE 4 EAST, AND TOWNSHIP 20 NORTH, RANGE 5 EAST.



SPECIAL FLOOD HAZARD AREAS		**Without Base Flood Elevation (BFE)** *Zone A, V, A99* **With BFE or Depth** *Zone AE, AO, AH, VE, AR*
	▨	**Regulatory Floodway**
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*

SCALE

Map Projection:
NAD 1983 UTM Zone 10N;
Western Hemisphere; Vertical Datum: NAVD 88



National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

PIERCE COUNTY, WASHINGTON
and Incorporated Areas

PANEL **361** OF **1375**

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
PIERCE COUNTY	530138	0361	E
PUYALLUP, CITY OF	530144	0361	E
SUMNER, CITY OF	530147	0361	E

REVISED TO REFLECT LOMR EFFECTIVE: September 8, 2022

VERSION NUMBER
2.1.3.0

MAP NUMBER
53053C0361E

EFFECTIVE DATE
MARCH 7, 2017

Appendix B

APPENDIX B-1

1033

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

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

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

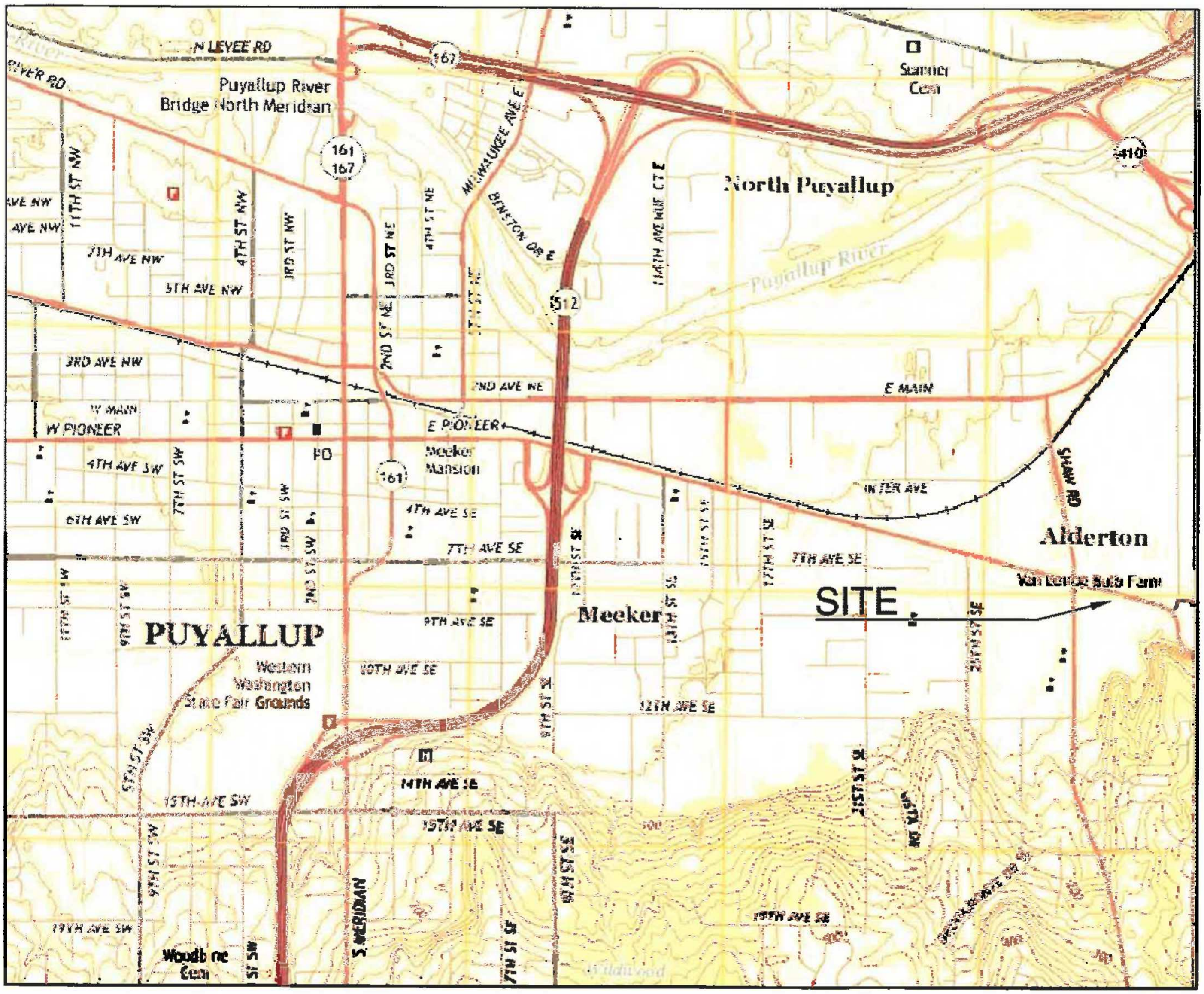
41415

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.

Vicinity Map

East Town Crossing

Shaw Rd & E Pioneer Way, Puyallup, WA

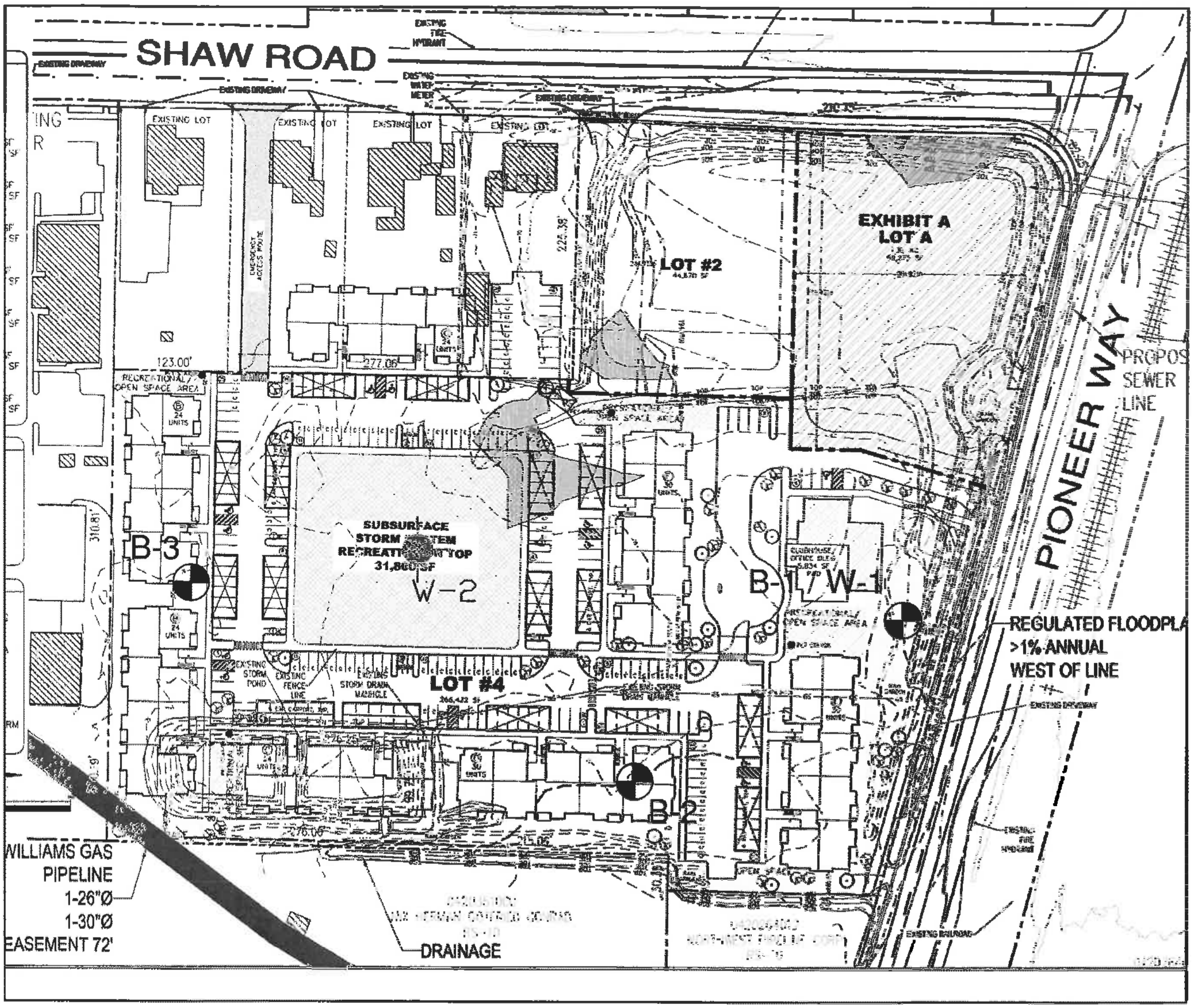
Project Number: 062-19007

Krazan & ASSOCIATES, INC.

Figure 1

Drawn By: T. Nunan
Date: April 2019

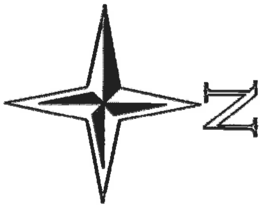
Not to Scale



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

Shaw Rd & E Pioneer Way, Puyallup, WA

Project Number: 062-19007

Krazan & ASSOCIATES, INC.

Figure 2

Drawn By: T. Nunan

Date: April 2019

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.

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
Field Engineer: Theresa Nunan
Date
Started: 3.11.2019
Completed: 3.11.2019
Backfilled: 3.11.2019
Equipment: Track Bobcat
Drilling Method: Hollow Stem Augers
Hammer Type: 140-lb. Manual
Notes: Monitoring Well W-1 installed in borehole.
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
							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
	▼	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							

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
							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
	▼	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							

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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.	

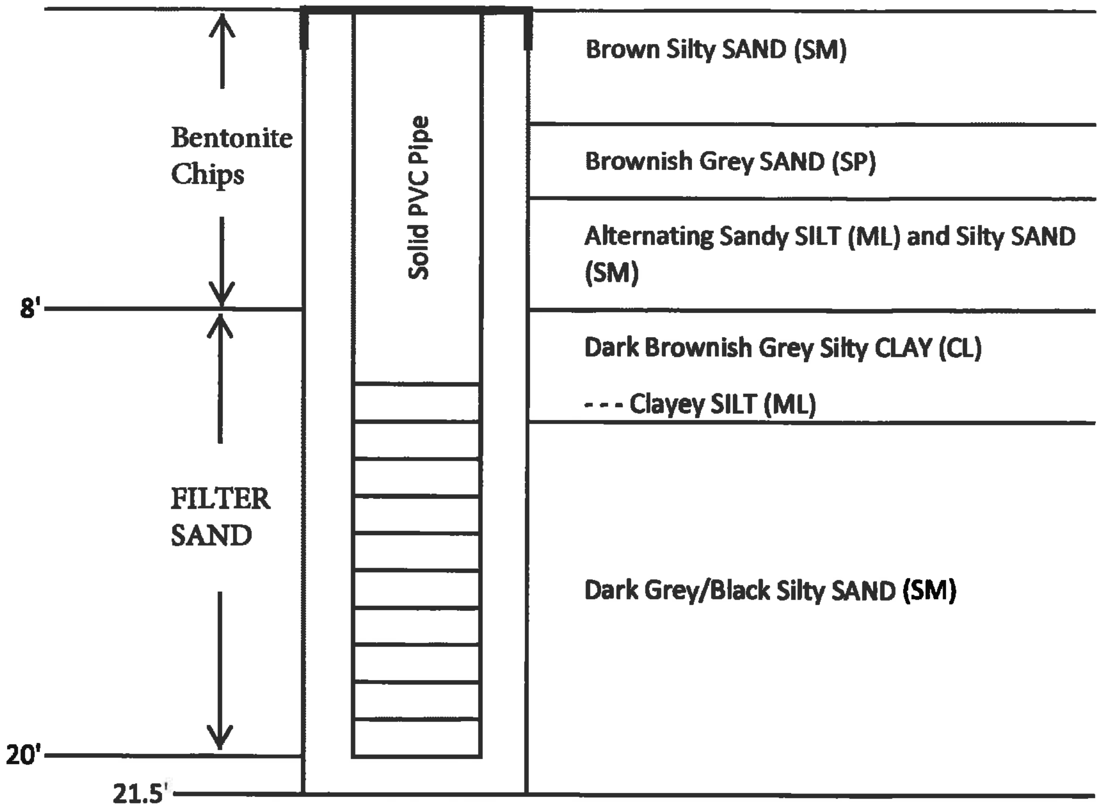
Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Graphic Log	Classification	Lab Results
	25	SPT	2-7	10 9 14	23		Dark Grey SAND (SP-SM) with Silt, trace gravel, fine to coarse grained, with occassional 3 to 4-inch thick seams gravel (GP-GM) with silt, medium dense, wet	
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

Krazan & ASSOCIATES, INC.

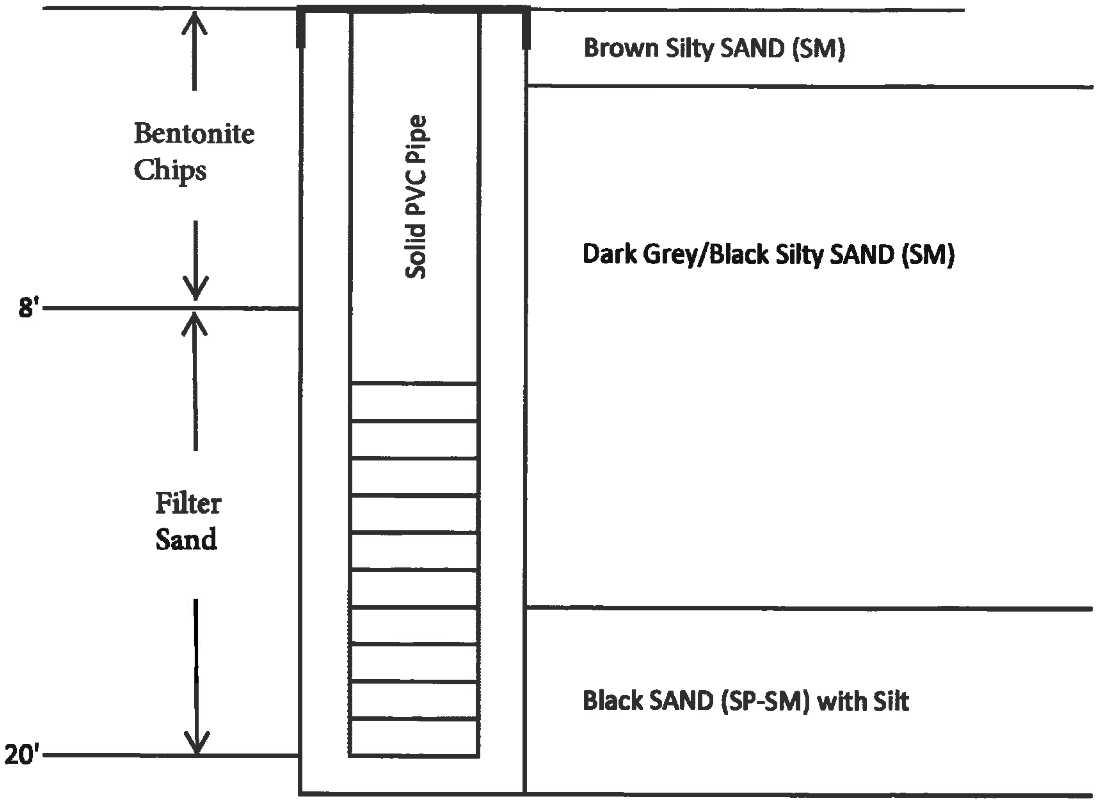
Project: East Town Crossing	**Project Number:** 062-19007	**Client:** Abbey Road Group	**Boring No.** **B-3**
Address, City, State: SE Corner Shaw Road & E. Pioneer Way, Puyallup, WA			**Drilling Company:** Geologic Drill Partners
Project Manager: Theresa Nunan	**Date** **Started:** 3.11.2019		**Equipment:** Track Bobcat
Field Engineer: Theresa Nunan	**Completed:** 3.11.2019		**Drilling Method:** Hollow Stem Augers
Notes:	**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			
	▼							
		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							

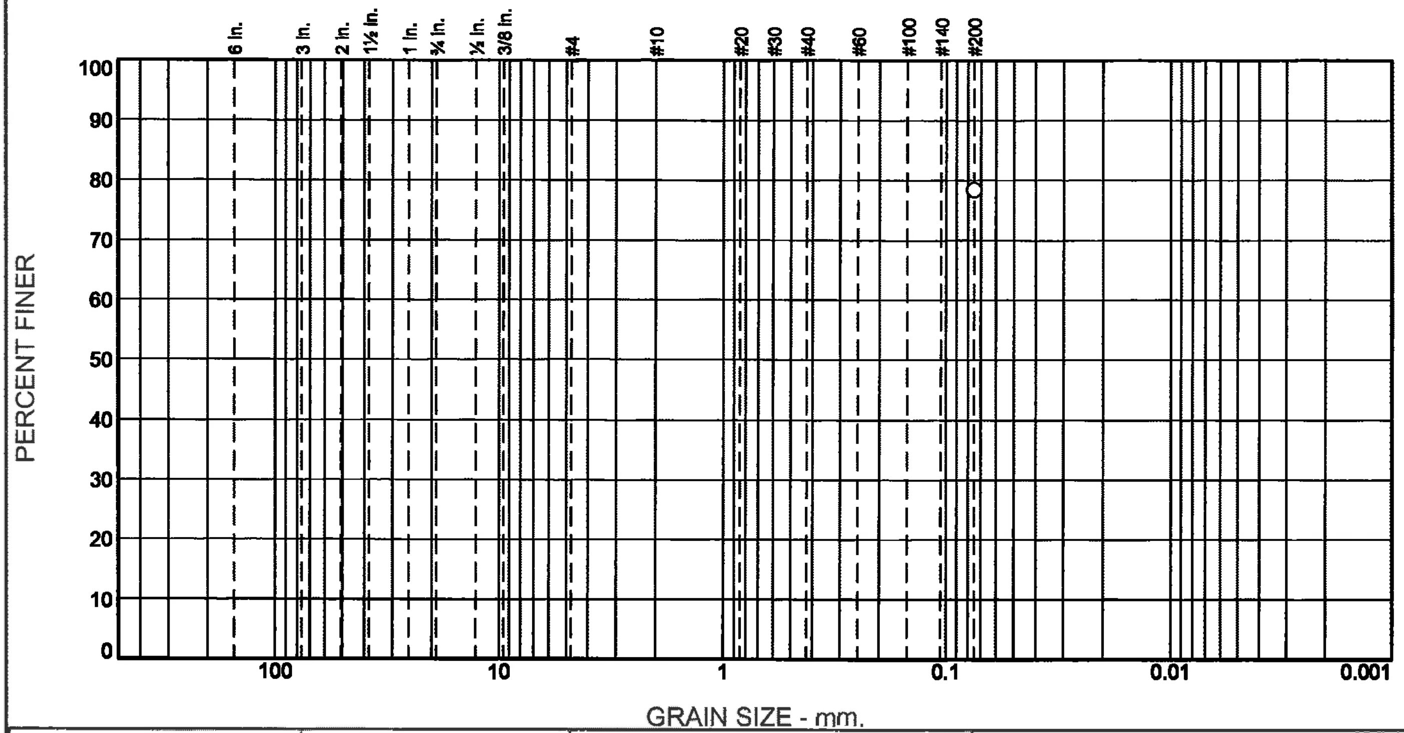
Monitoring Well
MW-1



Monitoring Well
MW-2



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

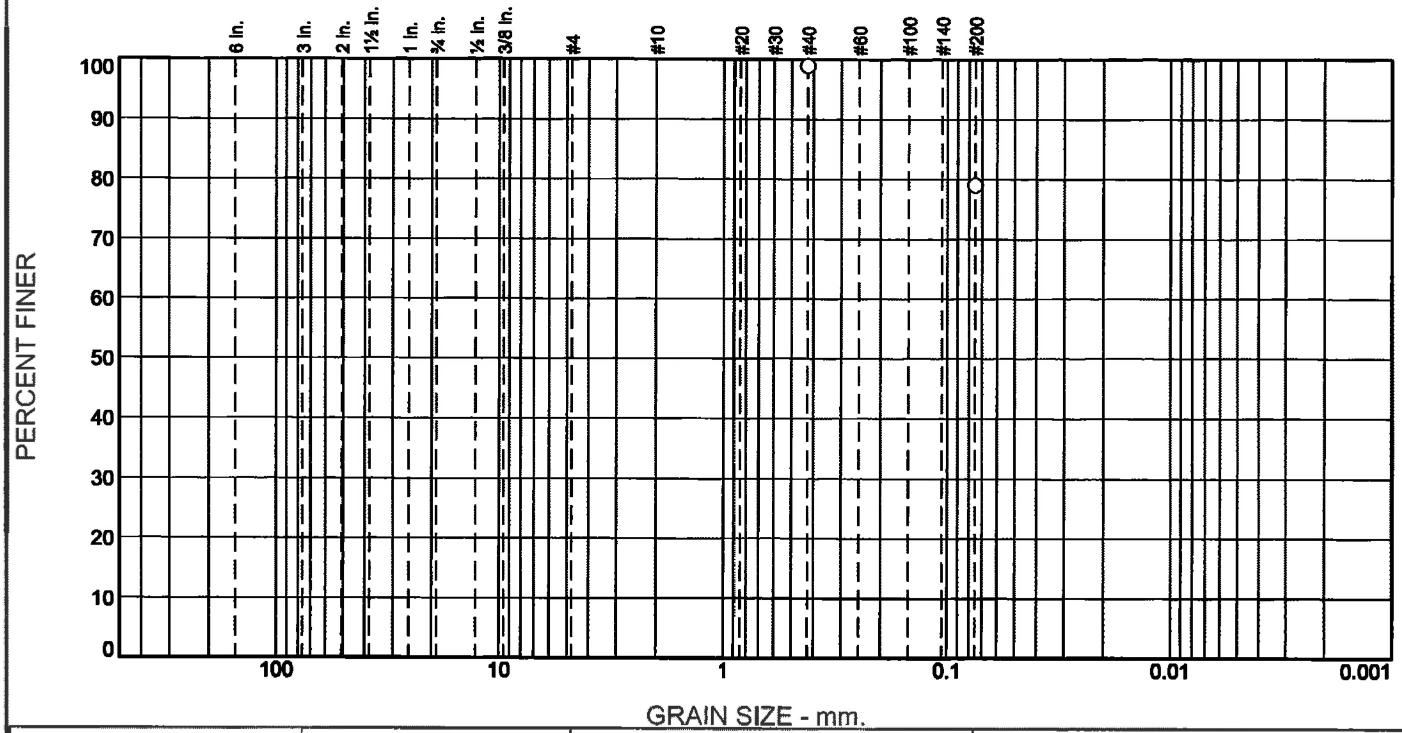
Location: B-1 Sample 1-2B
Sample Number: 19L131 **Depth:** 5'-6.5'

Date Sampled: 3-11-19

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 %

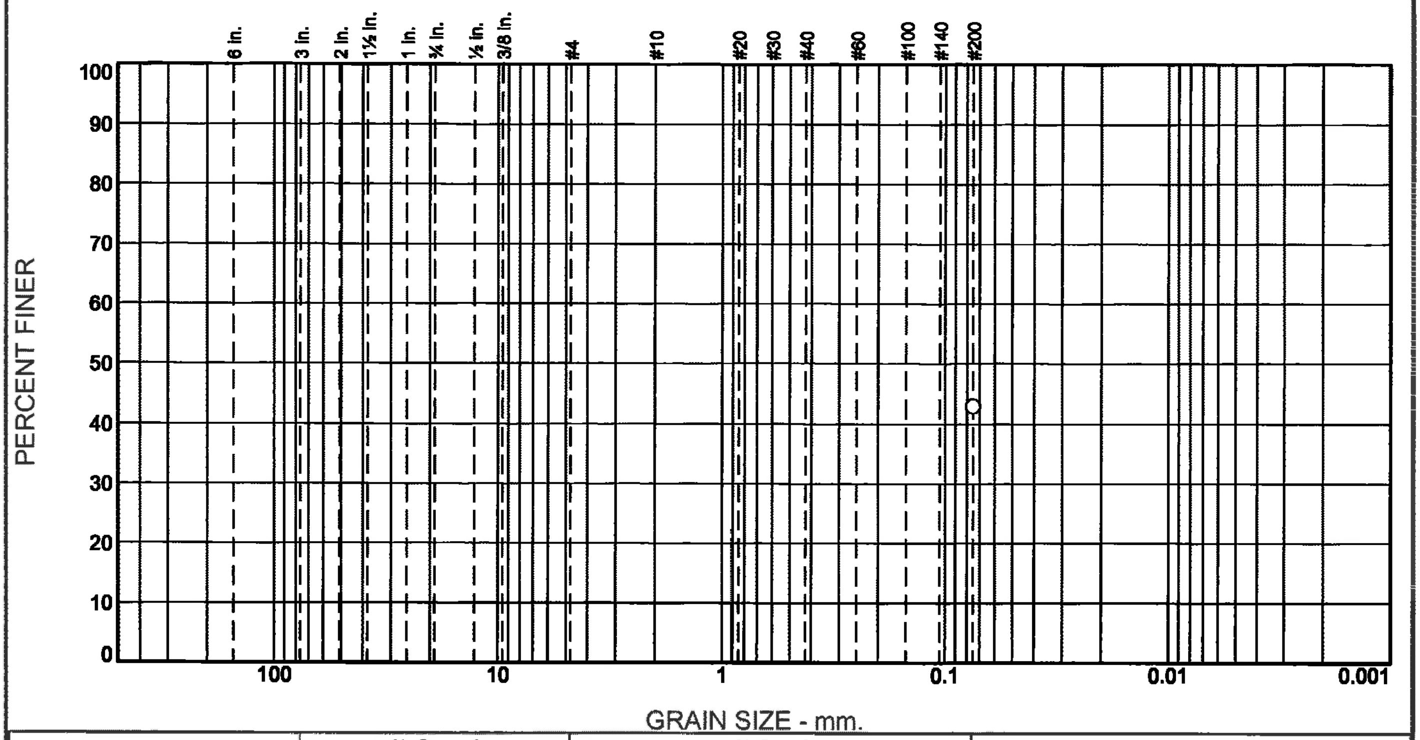
Date Received: 3-15-19 **Date Tested:** 3-15-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

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'

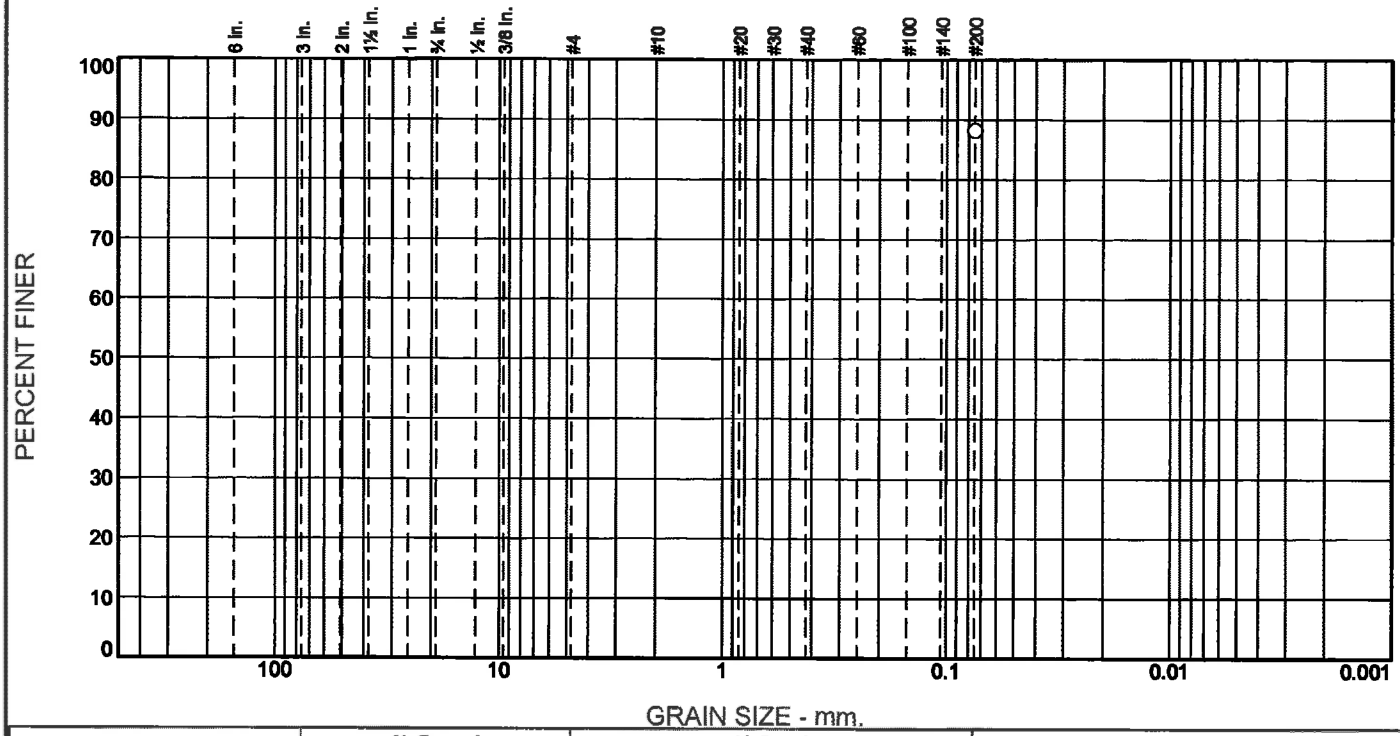
Date Sampled: 3-11-19

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'

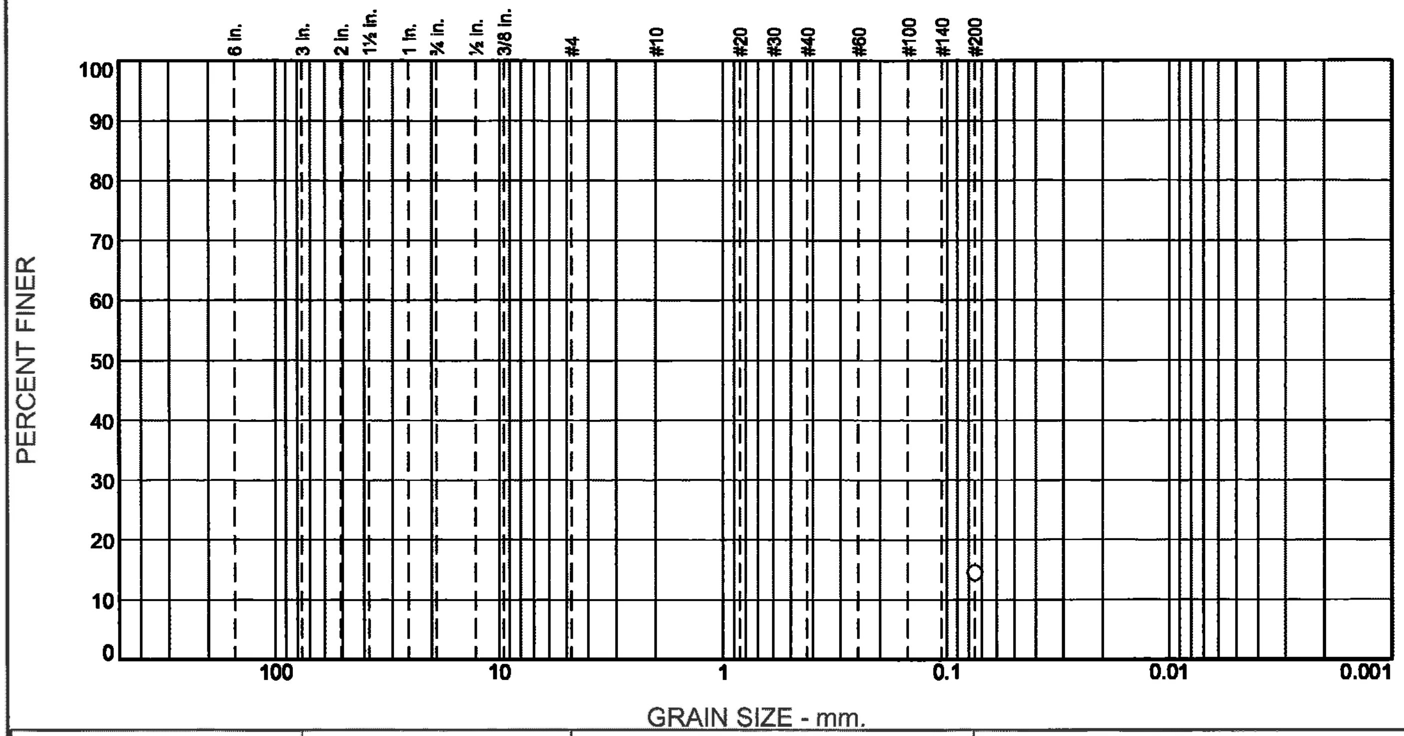
Date Sampled: 3-11-19

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'

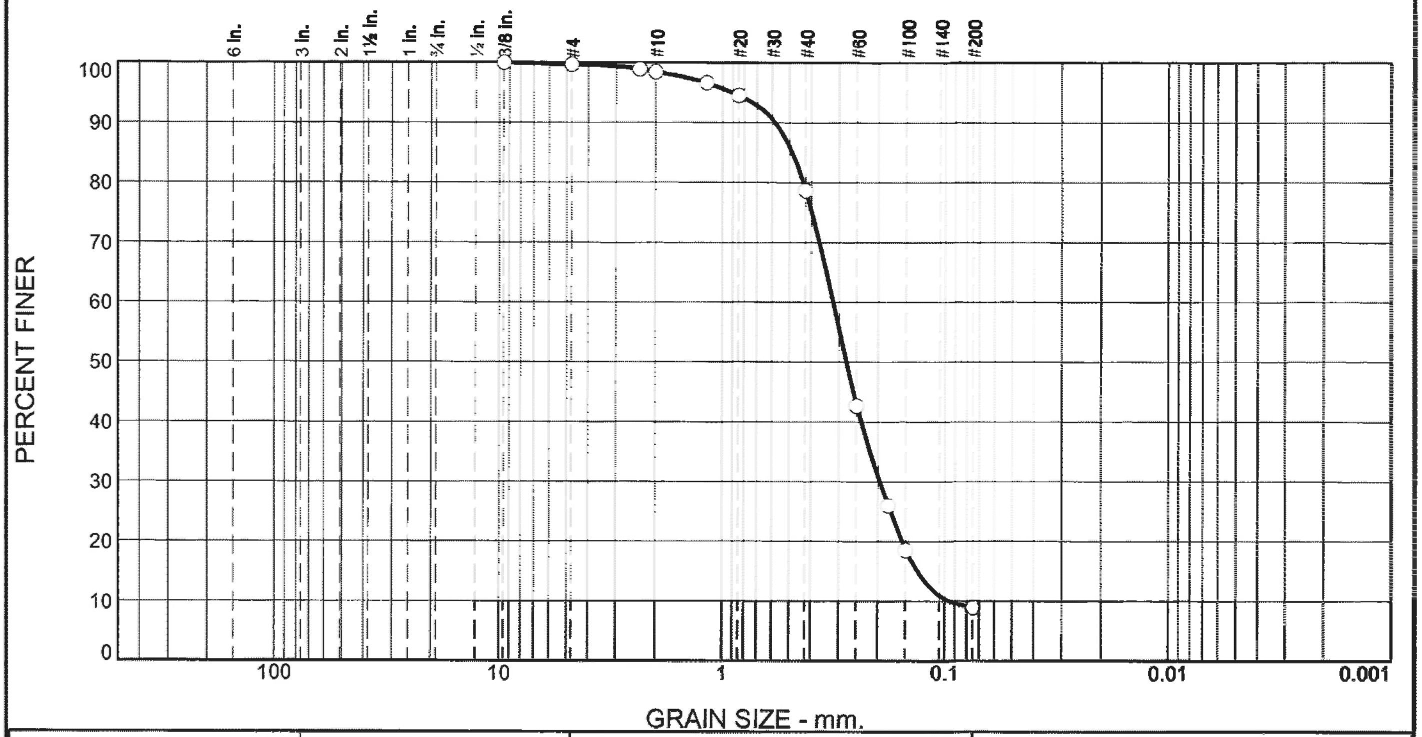
Date Sampled: 3-11-19

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 %

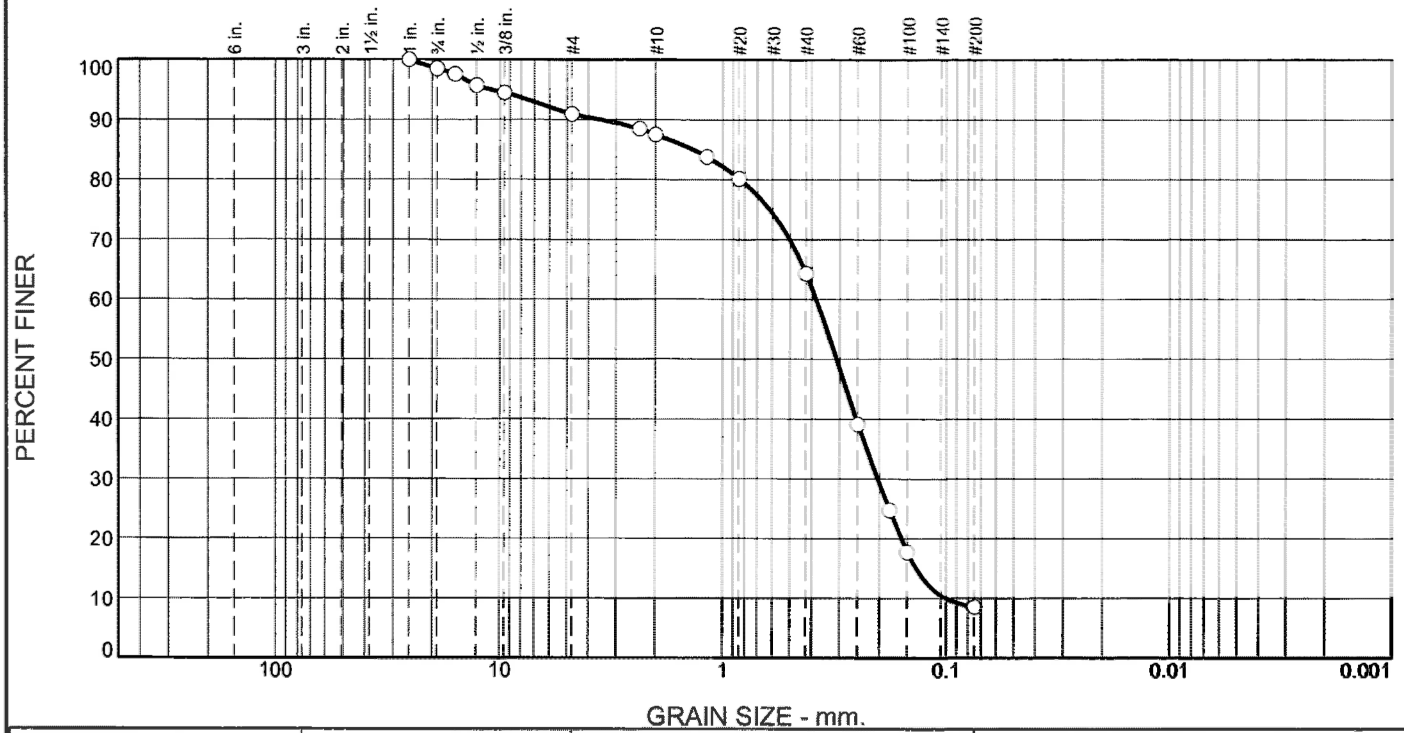
Date Received: 3-15-19 **Date Tested:** 3-22-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials laboratory Manager

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'

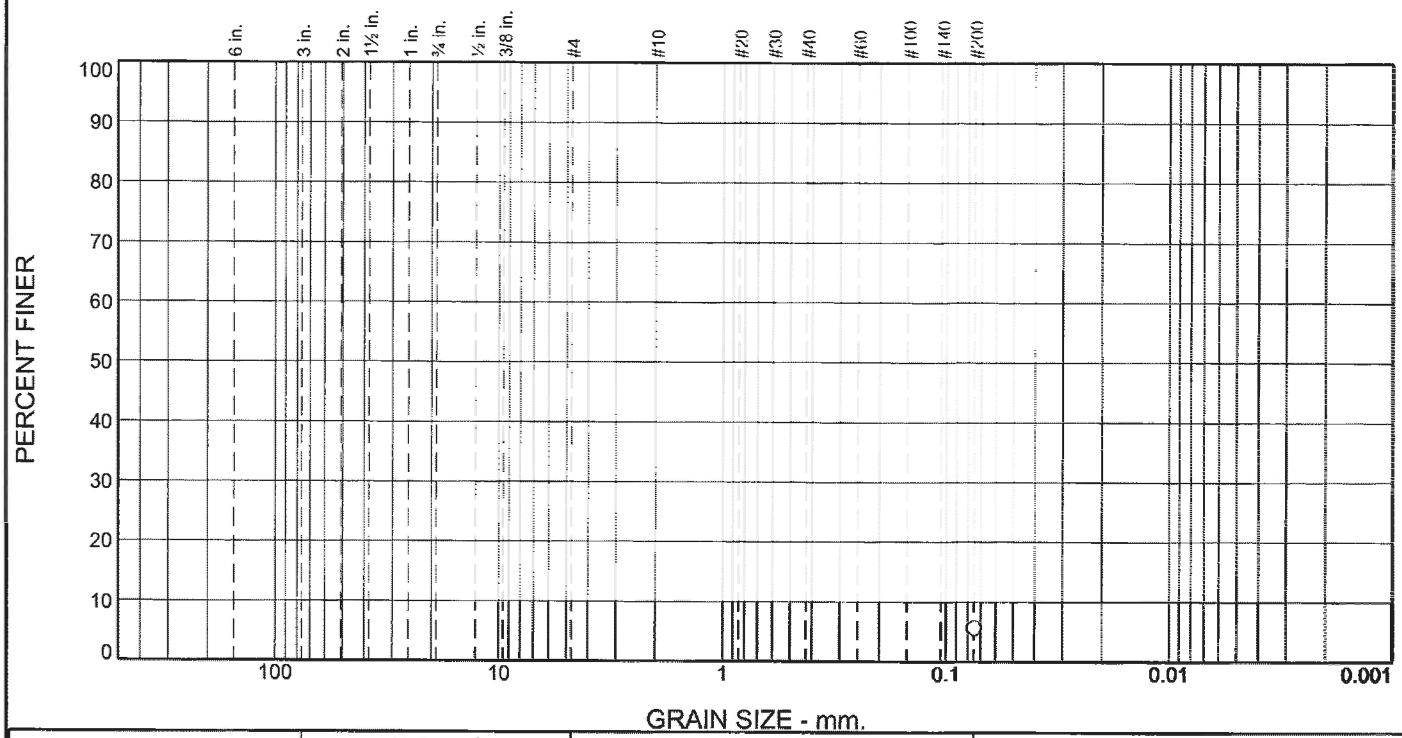
Date Sampled: 3-11-19

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 %

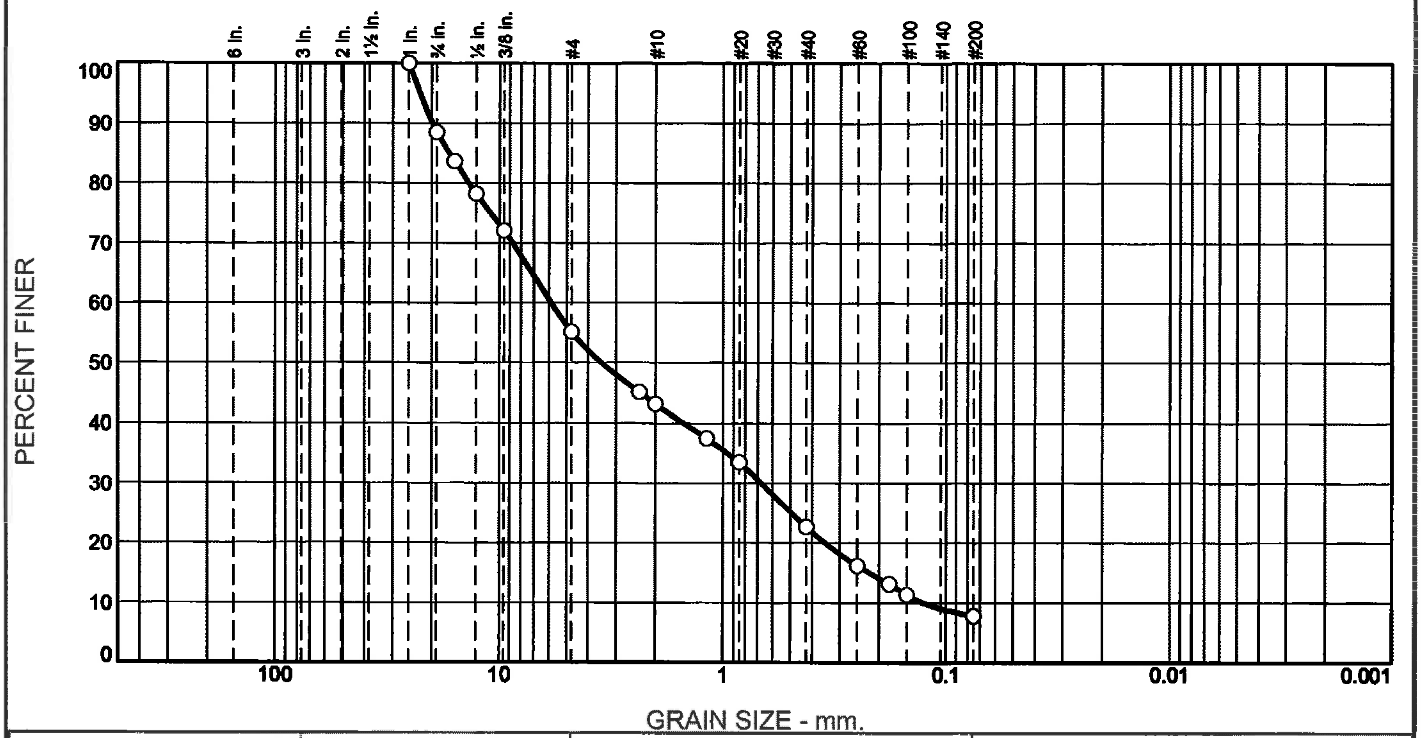
Date Received: 3-15-19 **Date Tested:** 3-11-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

Location: B-2 Sample 2-9
Sample Number: 19L135 **Depth:** 35'-36.5'
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	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
Page 1 of 2

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

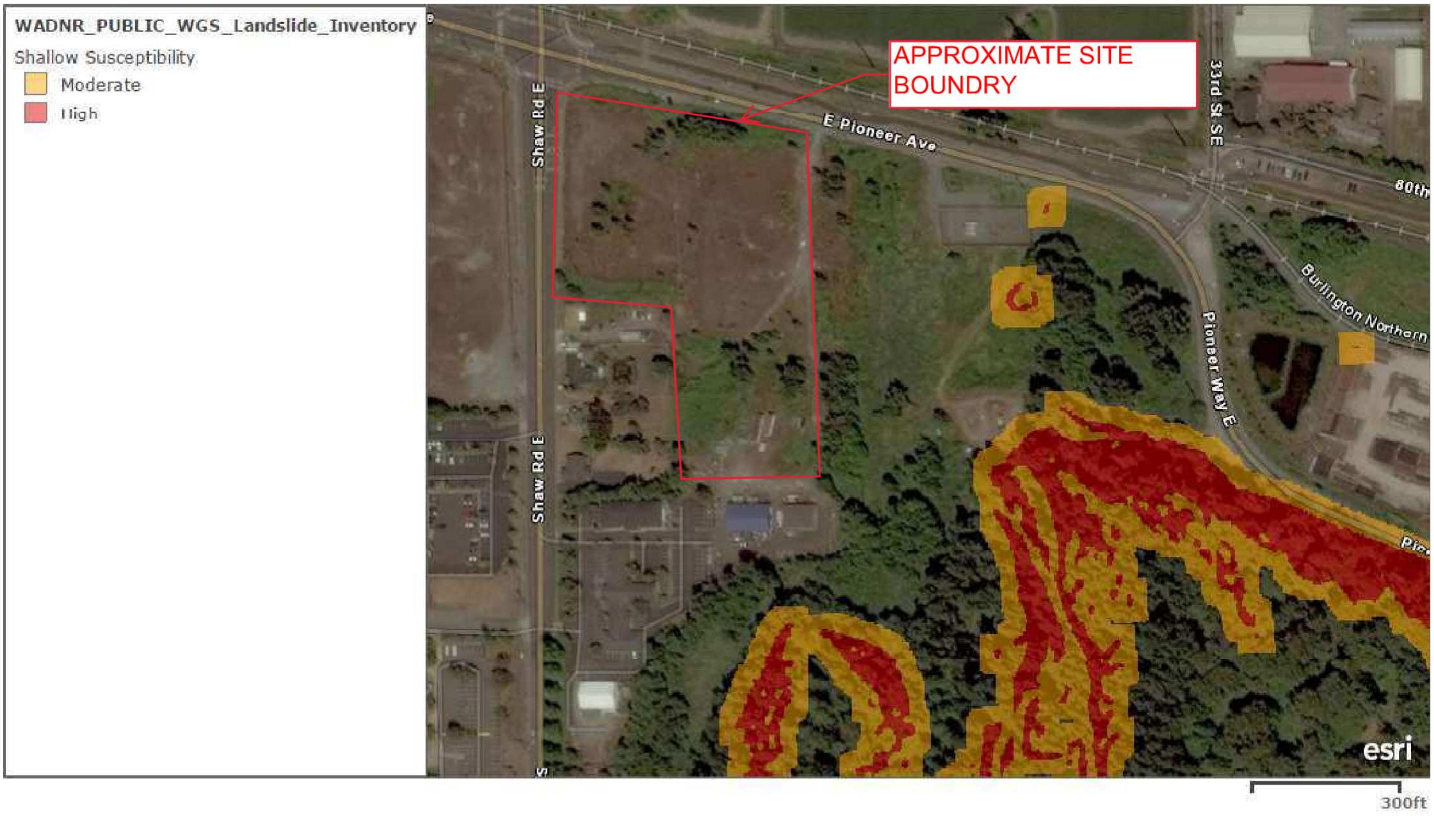
VIJAY CHAUDHARY
51061

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

Krazan

East Town Crossing

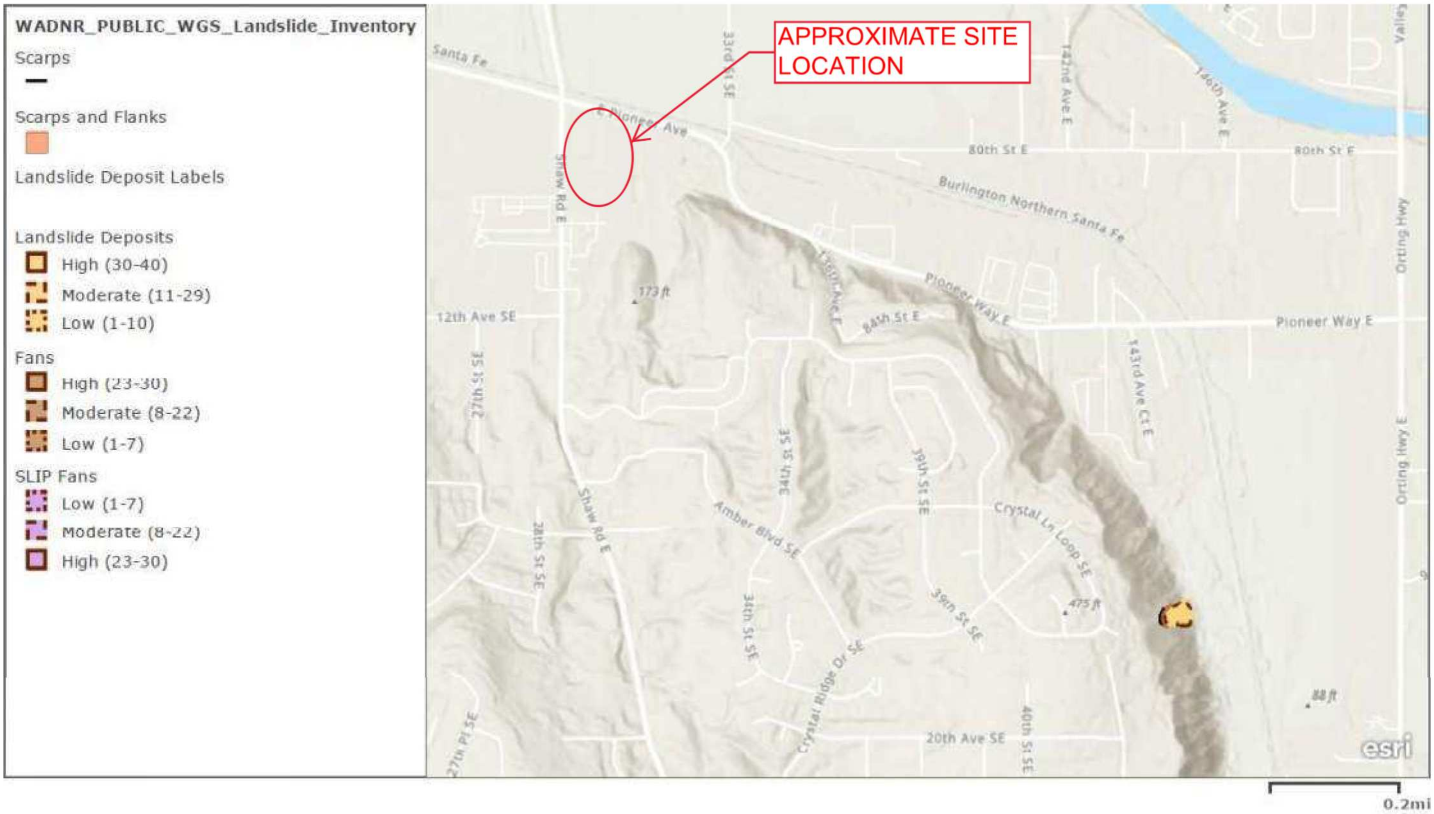
Date: July 2020

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

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

March 19, 2021

KA Project No. 062-190007
Page 1 of 3

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

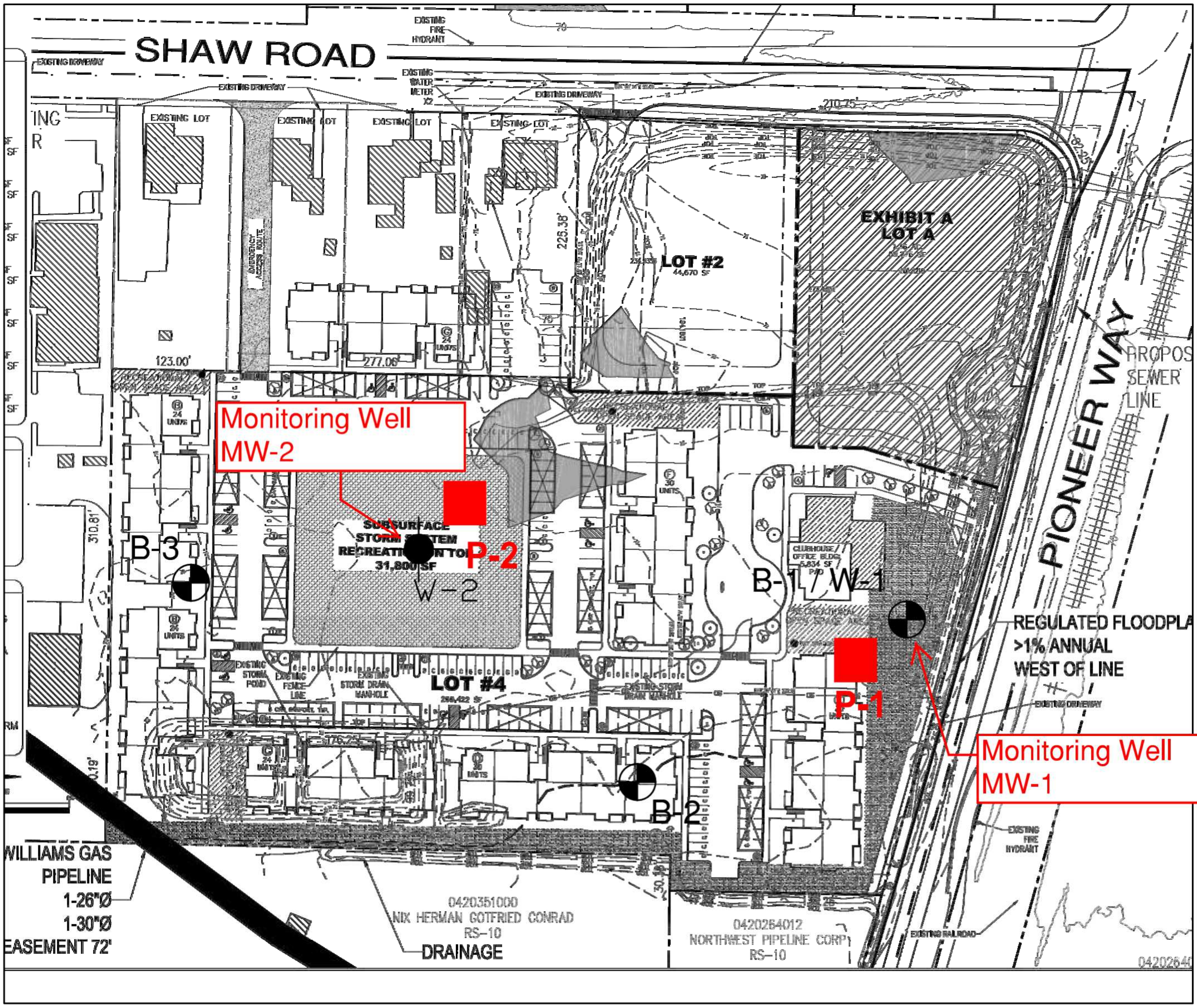
VIJAY CHAUDHARY
STATE OF WASHINGTON
51061
REGISTERED
PROFESSIONAL ENGINEER

Theresa R. Nunan

Theresa R. Nunan
Project Manager

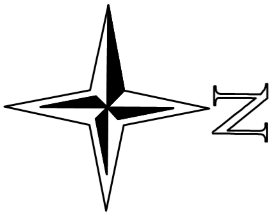
Vijay Chaudhary, P.E.
Assistant Regional Engineering Manager

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

Shaw Rd & E Pioneer Way, Puyallup, WA

Project Number: 062-19007

Krazan & ASSOCIATES, INC.

Figure 1

Drawn By: T. Nunan

Date: March 2021

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)

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,

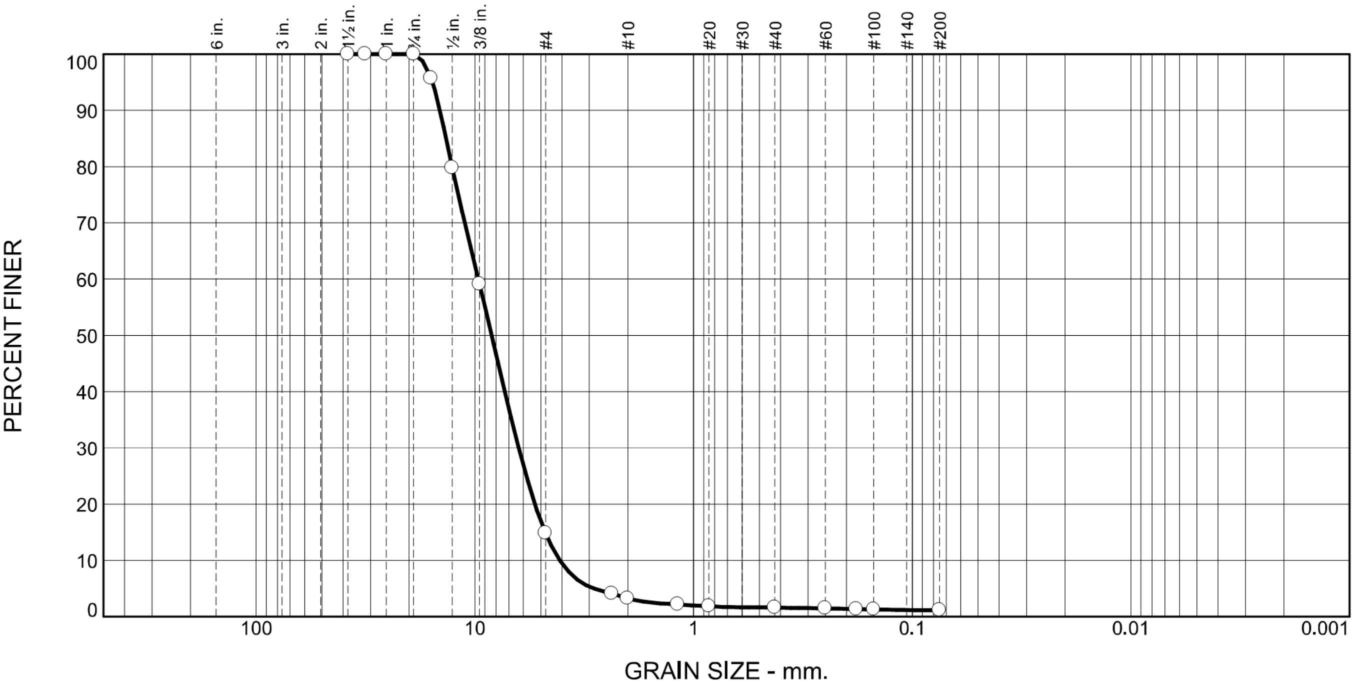
KRAZAN & ASSOCIATES, INC.

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

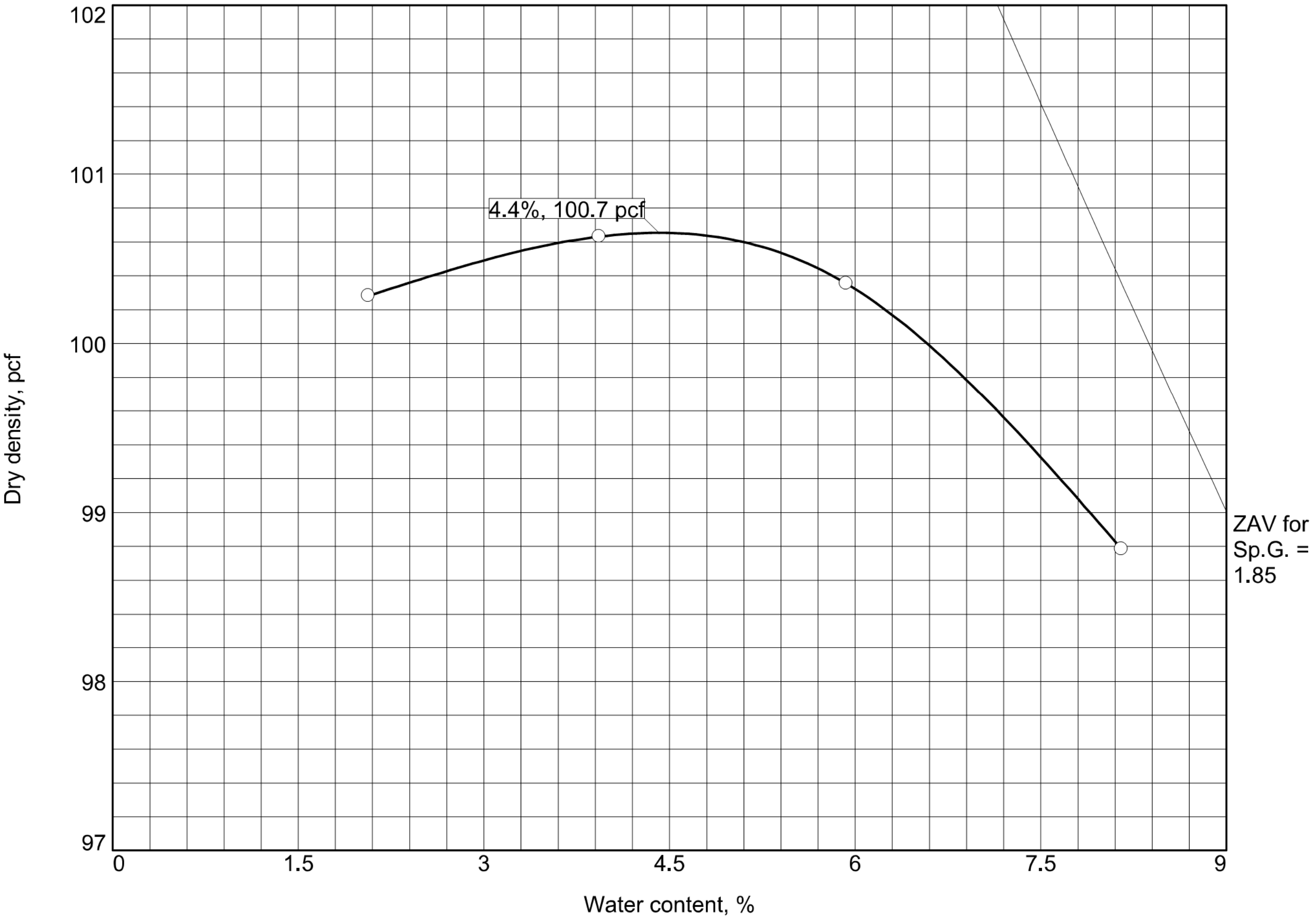
Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L892

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

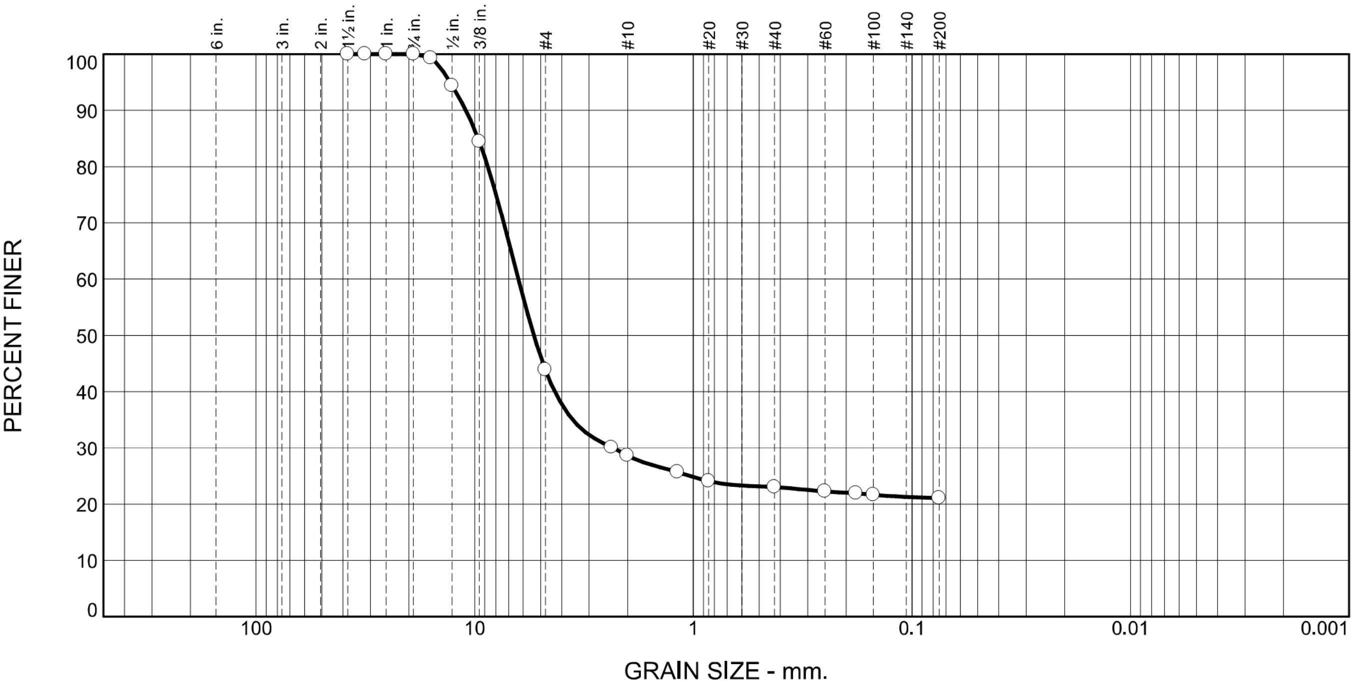
Remarks:

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

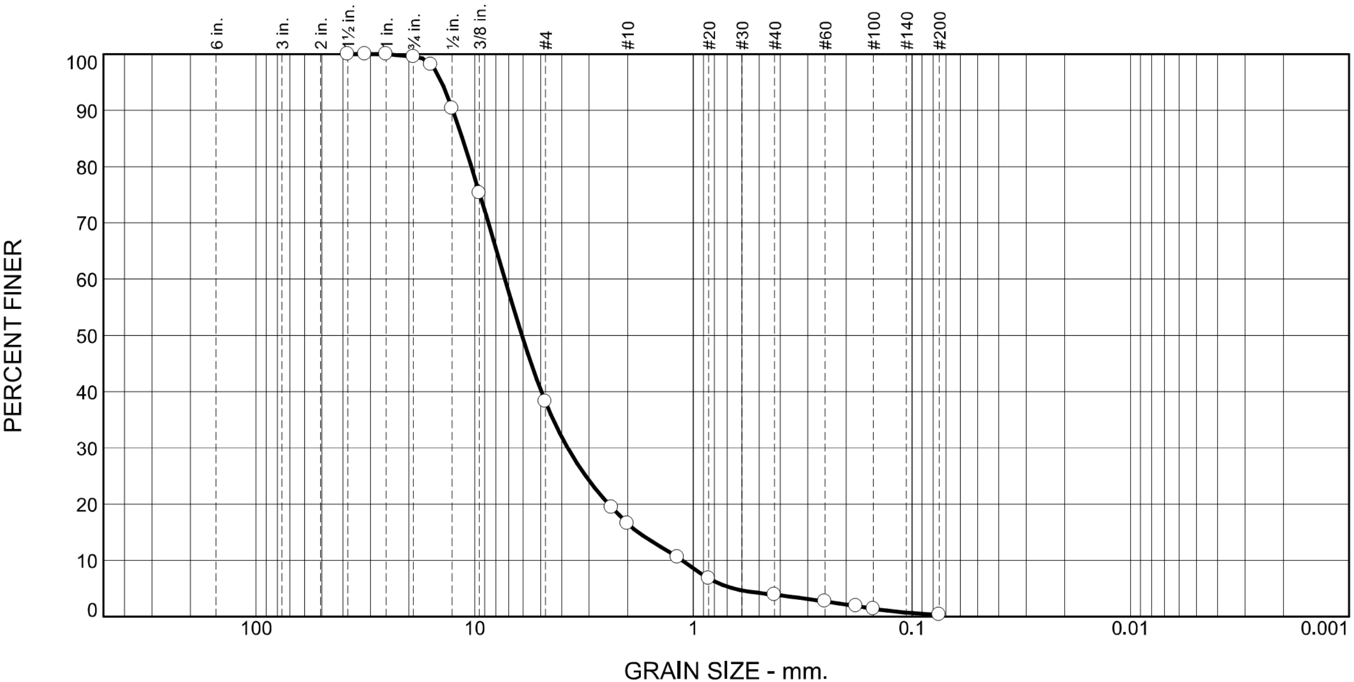
Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L892

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

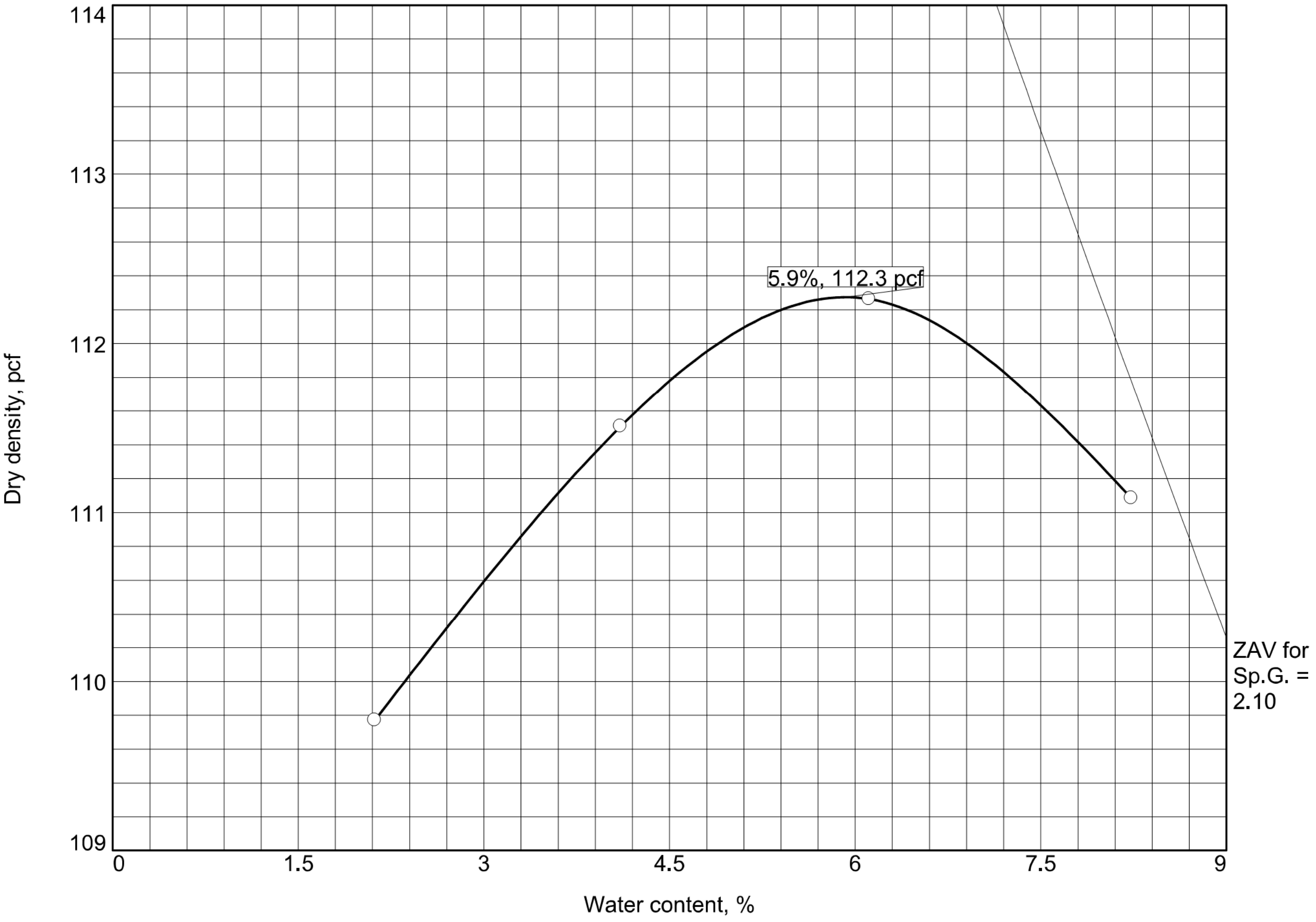
Source of Sample: Dan Lloyd Construction
Sample Number: 21L893
Date Sampled: 11-29-21

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

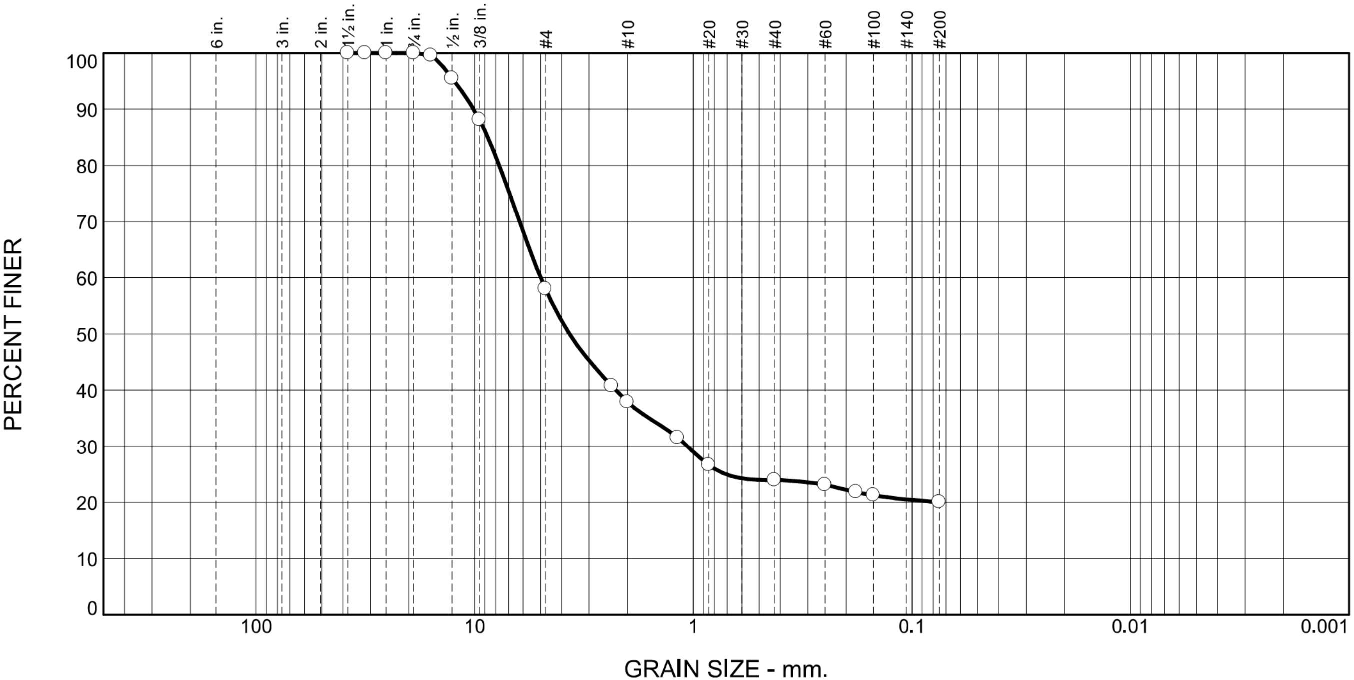
Remarks:

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**

APPENDIX B-2

MIGIZI GROUP, INC.

PO Box 44840
Tacoma, Washington 98448

PHONE (253) 537-9400
FAX (253) 537-9401

August 25, 2023

Absher Construction
1001 Shaw Road
Puyallup, WA 98372

Attention: Greg Helle
Executive VP, Operations

Subject: **Project Infiltration Feasibility Letter**
Proposed East Town Crossing Development
13102 East Pioneer Rd.
Puyallup, WA 98372
Parcel No. 0420264053, 0420264054, 0420351066

MGI Project Z0582

Dear Mr. Helle:

Migizi Group, Inc. (MGI) is pleased to submit this letter discussing the long-term feasibility of infiltration facilities and permeable pavement at the proposed East Town Crossing development along East Pioneer Road in Puyallup, WA. Previous geotechnical studies for this site were performed by Krazan & Associates and are attached. This includes a *Geotechnical Engineering Investigation* report, dated April 11, 2019, and a March 19, 2021, *Addendum Letter*.

The purpose of this letter is to summarize our geologic research for the project area and immediate region, our review of the previous site reconnaissance, geologic explorations, and infiltration testing performed by Krazan & Associates, and provide MGI's professional recommendations for infiltration feasibility at the site.

SITE AND PROJECT DESCRIPTION

The project site consists of three contiguous parcels, creating a roughly rectangular project area 10.00 acres in size, located along the south side of East Pioneer Road, just east of downtown Puyallup, WA, as shown on the enclosed Topographic and Location Map (Figure 1). The entire parcel is currently undeveloped. The vegetated property is bordered to the north by E Pioneer Rd., to the east by undeveloped land, to the west by Shaw Road, and to the south by a commercial property that houses Absher Construction Office.

The proposed improvements generally consist of eight three-story, wood framed, multi-family apartment buildings, with associated parking stalls, covered car ports, recreational and landscaping areas. A club house will also be constructed at the north end of the site. A total of 70 one-bedroom and 108 two-bedroom units will be created. Three underground storage stormwater facilities, called R-Tank modules, are planned for the detention of generated stormwater. ~~A modular wetland~~ will provide treatment.

Several BioPods

In addition to the R-Tank modules, stormwater management procedures will also involve the implementation of Low Impact Development (LID) best management practices (BMPs) to facilitate treatment and infiltration of onsite generated stormwater. This could also include implementation of shallow-depth LID BMPs such as pervious pavement roadways and rain gardens, which are common in developments where deeper infiltration has been proven infeasible due to shallow groundwater tables and/or hydraulically restrictive soils.

LOCAL GEOLOGY

The project area is located along the southern edge of the Puyallup River Valley and at the toe of the Puyallup Highlands slope, roughly between Sumner and Puyallup. The *Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington (2015)*, identifies the project area as Qa – Holocene Alluvium. Deposits tend to vary from massive deposits of loose fluvial silts, sands, and gravels, and can locally include sandy to silty estuarine deposits. Puyallup River deposits typically contain local deposits of peat or larger woody debris at depth. An excerpt of the geologic map of the immediate project area (Figure 2) can be found below:

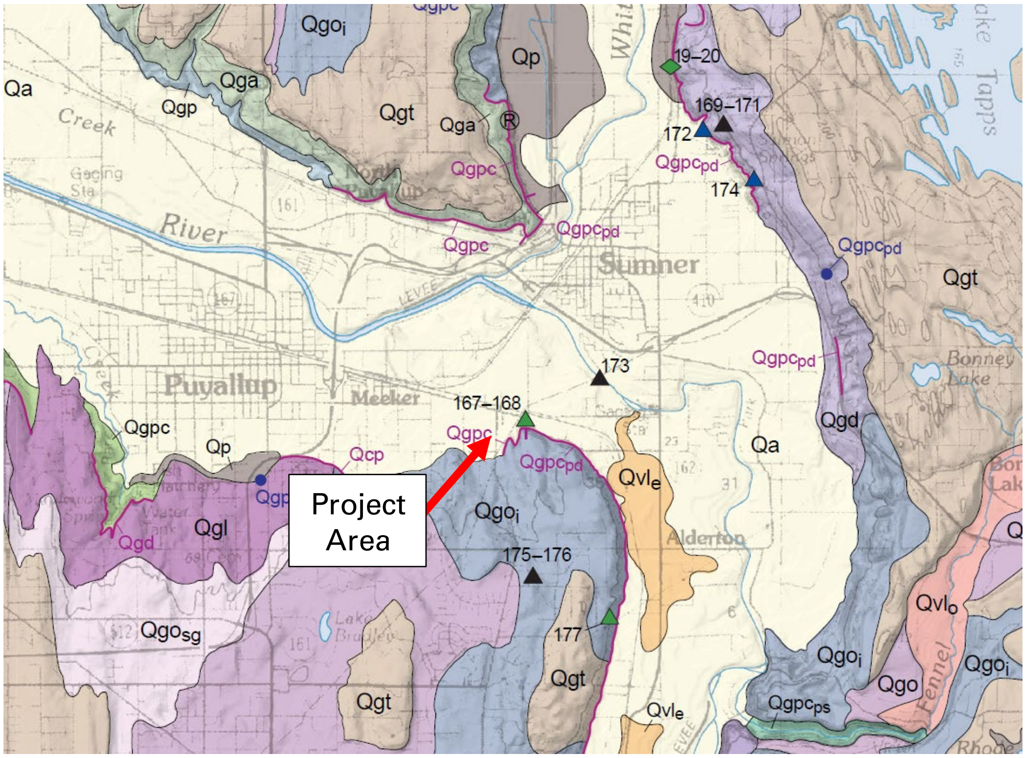


Figure 2: Immediate project area; excerpt of Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington, WSDNR, Schuster et al. 2015.

PREVIOUS PROJECT RECONNAISSANCE AND EXPLORATIONS

Previous explorations by Krazan & Associates included three hollow stem auger borings drilled across the site. In addition, two groundwater monitoring wells also installed at the same time. Drilling was conducted on March 11, 2019, which is within the wet season defined by Department of Ecology guidelines.

According to Krazan, shallow soils encountered in the borings are typical of alluvium deposits, ranging from poorly graded sand and silty sand to silty clay with interbedded seams of peat. Soils were generally observed to be moist to wet, and soft to medium dense or stiff. During drilling operations, groundwater was encountered at depths of between 7 to 8 feet below grade.

PREVIOUS INFILTRATION TESTING

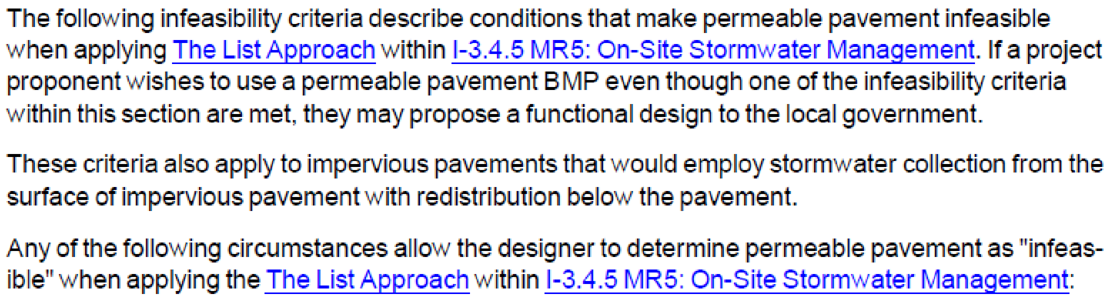
On March 4-5, 2021, Krazan conducted follow up infiltration testing of the project area adjacent to monitoring wells W-1 and W-2, as described in the attached *Addendum Letter*. Krazan elected to conduct two Large-Scale Pilot Infiltration Tests (PITs), labeled P-1 and P-2, with procedures outlined in the 2014 Stormwater Management Manual for Western Washington (SWMMWW). The excavations passed through shallow undocumented fill and into the native silty sand at approximately 2 feet below grade.

The Krazan *Addendum* indicates that field testing used the procedures listed in the 2014 SWMMWW. The two excavations were filled with water and allowed to presoak for the requisite timeframe. Water level measurements taken after presoak indicated that no head change was observed within P-2 and a head increase of 0.75 inches was measured in P-1. Due to a lack of infiltration during the testing period, tests were left open overnight, and measurements were taken the following morning. Measurements taken show that water levels had again risen, with 1.2 inches of head increase in P-1, and 0.3-inch head increase in P-2.

Based on these results, Krazan and Associates concluded that shallow soils of the upper three feet of the project area represented a hydraulic restrictive layer, with the calculated infiltration rate of **0 inches per hour**, based on Site Suitability Criteria of Vol. III, Section 3.3.7 of the 2014 SWMMWW.

PERMEABLE PAVEMENT FEASIBILITY

Currently, the City of Puyallup's stormwater management has adopted the 2019 Washington State Department of Ecology's *Stormwater Management Manual for Western Washington* (SWMMWW). Volume V covers runoff treatment, flow control, and the low impact development (LID) best management practices (BMP) library. Beginning on Page 748 through 751, V-5.6 considers the BMP Permeable Pavements, the Applications and Limitations, and the Infeasibility Criteria. The manual states on page 748:

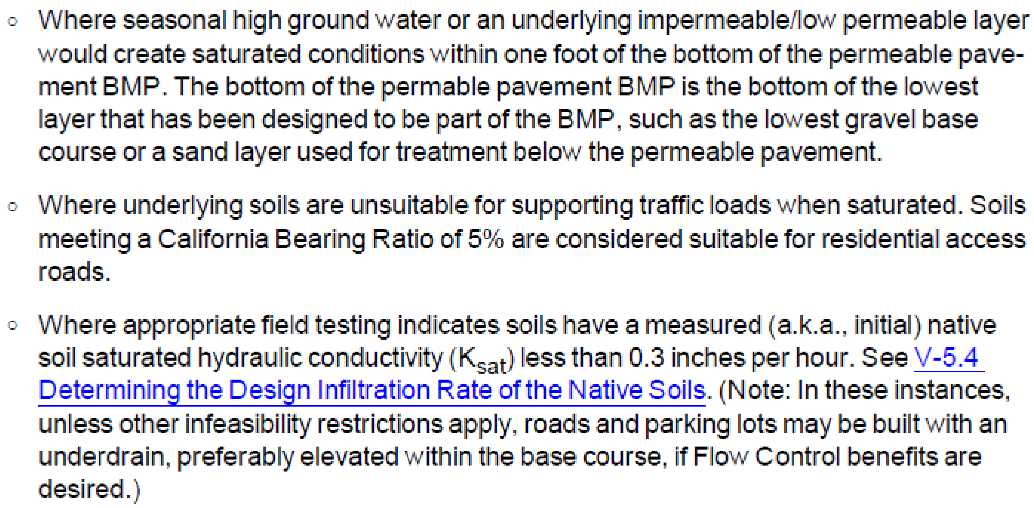


The following infeasibility criteria describe conditions that make permeable pavement infeasible when applying The List Approach within I-3.4.5 MR5: On-Site Stormwater Management. If a project proponent wishes to use a permeable pavement BMP even though one of the infeasibility criteria within this section are met, they may propose a functional design to the local government.

These criteria also apply to impervious pavements that would employ stormwater collection from the surface of impervious pavement with redistribution below the pavement.

Any of the following circumstances allow the designer to determine permeable pavement as "infeasible" when applying the The List Approach within I-3.4.5 MR5: On-Site Stormwater Management:

Specifically, three bullet points listed on page 750 of the manual note that:



- Where seasonal high ground water or an underlying impermeable/low permeable layer would create saturated conditions within one foot of the bottom of the permeable pavement BMP. The bottom of the permable pavement BMP is the bottom of the lowest layer that has been designed to be part of the BMP, such as the lowest gravel base course or a sand layer used for treatment below the permeable pavement.
- Where underlying soils are unsuitable for supporting traffic loads when saturated. Soils meeting a California Bearing Ratio of 5% are considered suitable for residential access roads.
- Where appropriate field testing indicates soils have a measured (a.k.a., initial) native soil saturated hydraulic conductivity (K_{sat}) less than 0.3 inches per hour. See V-5.4 Determining the Design Infiltration Rate of the Native Soils. (Note: In these instances, unless other infeasibility restrictions apply, roads and parking lots may be built with an underdrain, preferably elevated within the base course, if Flow Control benefits are desired.)

Volume III Chapter 3 section 2, beginning on page 468 of the 2019 Dept. of Ecology *Stormwater Management Manual*, considers the steps of preparing a stormwater site plan. Step 1 – "Analyze Existing Site Conditions to Determine LID Feasibility" states that a **hydraulic restrictive layer** is "ground water, soil layer with less than 0.3 in/hr Ksat, bedrock, etc." Field testing conducted by Krazan during the western Washington wet season, as described above, confirms that shallow onsite soils in the upper 3 feet are classified as a hydraulicly restrictive layer and are therefore unsuitable for infiltration of site produced stormwater. These shallow soils would be the exposed subgrade base for any proposed pervious pavement subgrade reservoir in areas of pavement for the East Town Crossing development.

CONCLUSIONS

Based on the infiltration testing information provided in the *Geotechnical Engineering Investigation* (April 11, 2019), and the *Addendum Letter* (March 19, 2021) written by Krazan & Associates, and the Criteria guidelines cited in Volumes III and V of the 2019 SWMMWW, it is our opinion that shallow infiltration through the use of permeable pavement is infeasible in the onsite native soils across the project area. Without significant improvement to the in-situ subgrade soils, which could seriously comprise the infiltration characteristics, soil-supported permeable asphalt would likely fail under long term dynamic load usage, such as HS20 loading conditions.

Based on the above, it is our opinion that any generated onsite stormwater should be directed to underground R-Tank modules for detention.

CLOSURE

We appreciate the opportunity to be of service on this project. If you have any questions regarding this letter or any aspects of the project, please feel free to contact our office.

Sincerely,

MIGIZI GROUP, INC.

22010893
Randall V. Conger-Best

James E. Brigham
20640

08/25/23

Randall V. Conger-Best, L.G.
Senior Staff Geologist

James E. Brigham, P.E.
Senior Principal Engineer

Attachments: *Krazan and Associates, Geotechnical Engineering Investigation,* April 11, 2019
Krazan and Associates, Addendum Letter, March 19, 2021

Figure A5 - Geo-technical Report

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

Offices Serving The Western United States
825 Center Street, Suite A • Tacoma, Washington 98409 • (253) 939-2500 • Fax: (253) 939-2556

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

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Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

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

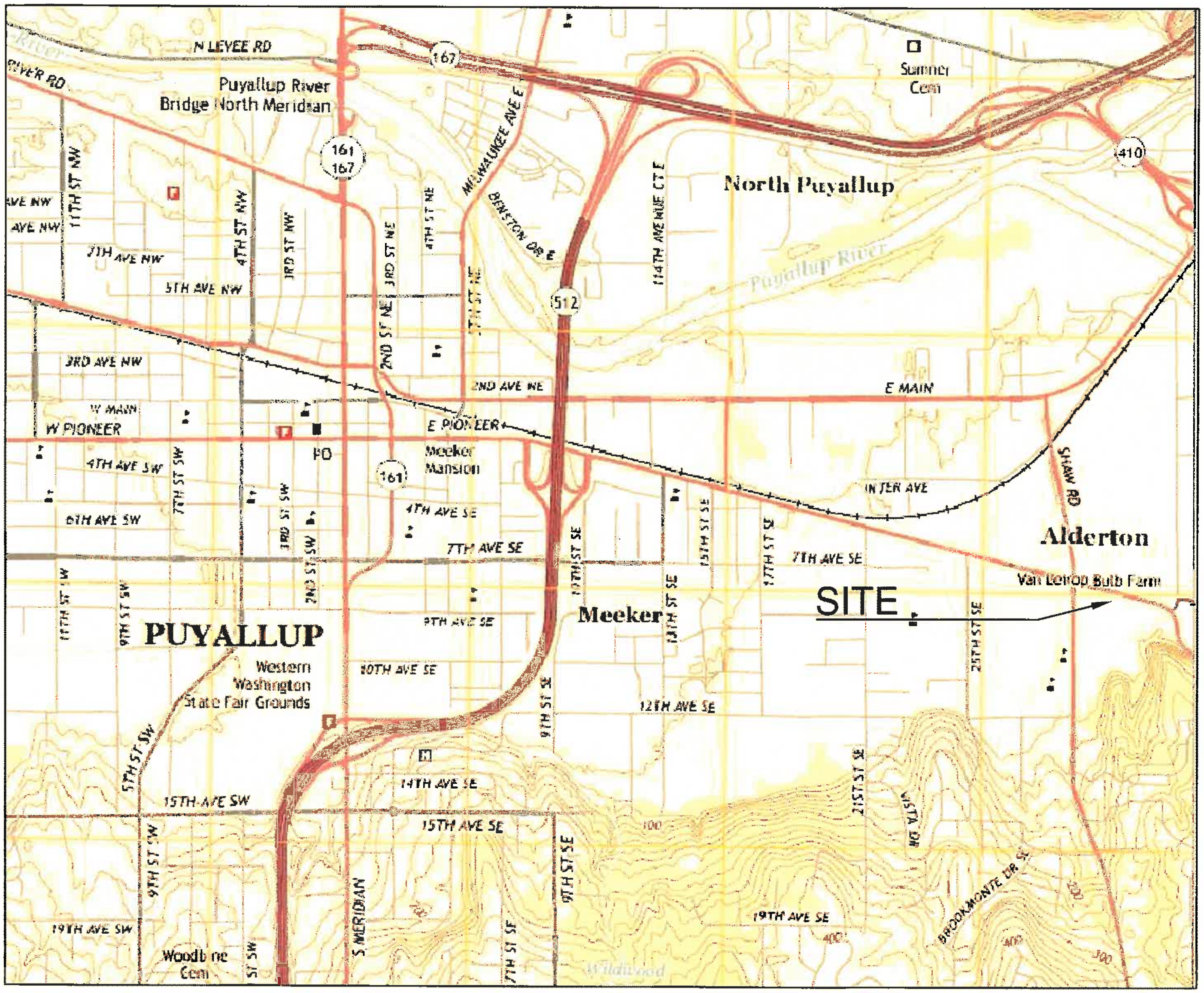
41415

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

Shaw Rd & E Pioneer Way, Puyallup, WA

Project Number: 062-19007

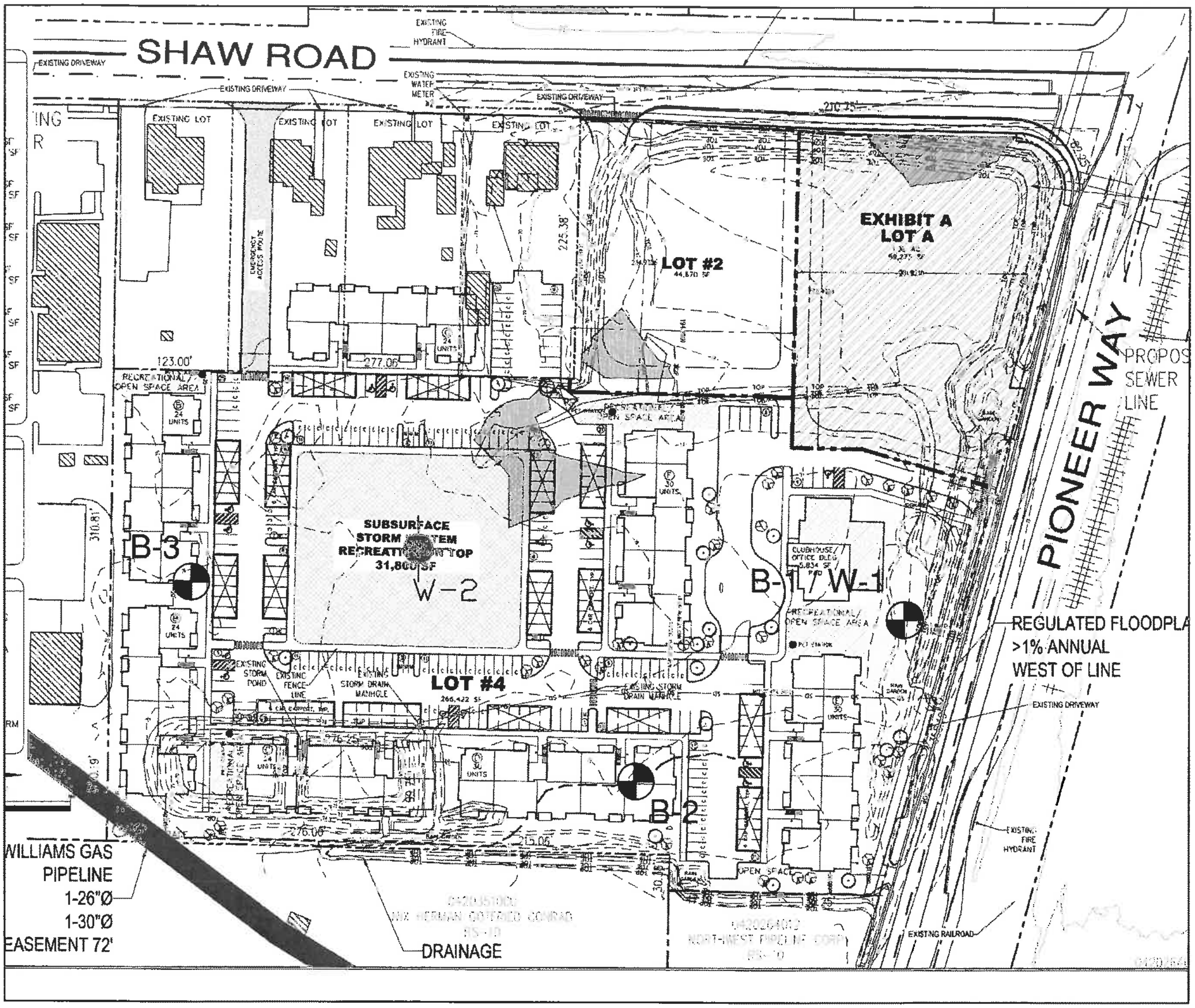
Krazan & ASSOCIATES, INC.

Figure 1

Drawn By: T. Nunan

Date: April 2019

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

Shaw Rd & E Pioneer Way, Puyallup, WA

Project Number: 062-19007

Krazan & ASSOCIATES, INC.

Figure 2

Drawn By: T. Nunan

Date: April 2019

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

Field Engineer: Theresa Nunan

Notes: Monitoring Well W-1 installed in borehole.

Date

Started: 3.11.2019

Completed: 3.11.2019

Backfilled: 3.11.2019

Equipment: Track Bobcat

Drilling Method: Hollow Stem Augers

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
							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
	▼	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
							- - - Becomes Clayey SILT (ML), with fine sand and thin roots, very soft	
	10	SPT	1-4	1 2 6	8			
							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
							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
	▼	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							

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
	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
							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	
	35	SPT	2-9	6 5 10	15			% 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
							End of Boring at 38.5 Feet	
	40							
	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

Completed: 3.11.2019

Drilling Method: Hollow Stem Augers

Notes:

Backfilled: 3.11.2019

Hammer Type: 140-lb. Manual

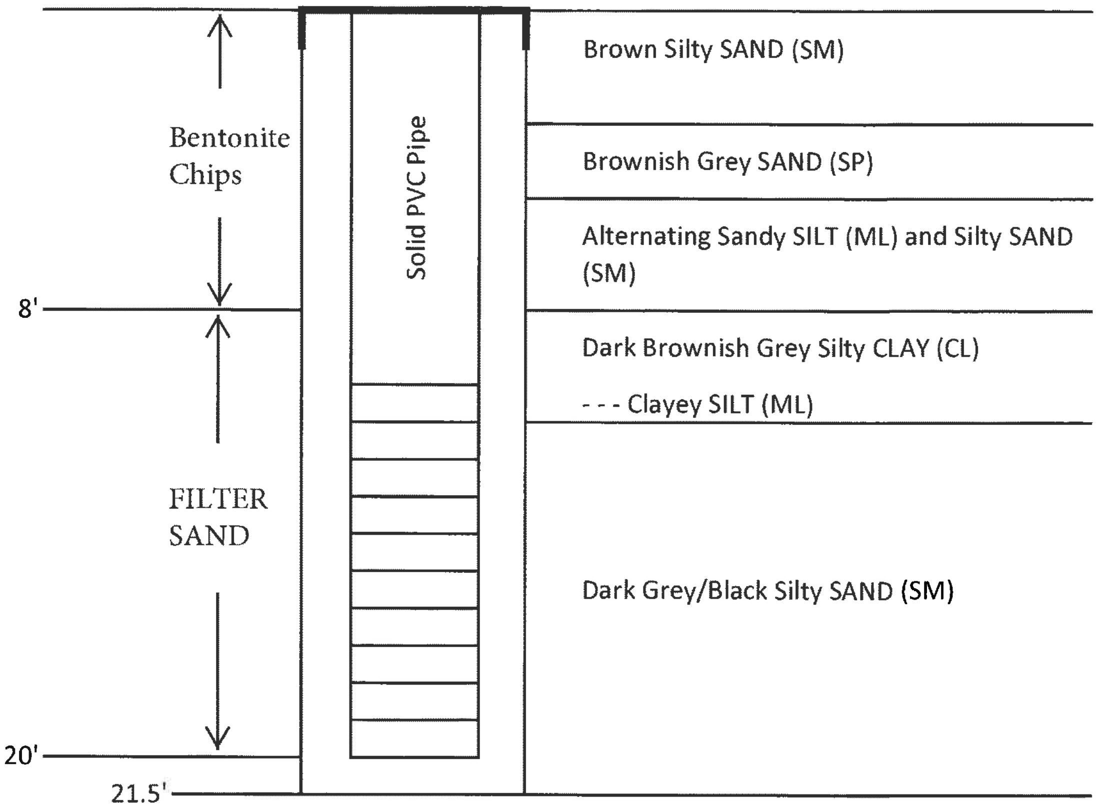
Ground Surface Elevation: 74 +/- feet MSL

Groundwater Depth: 7 feet

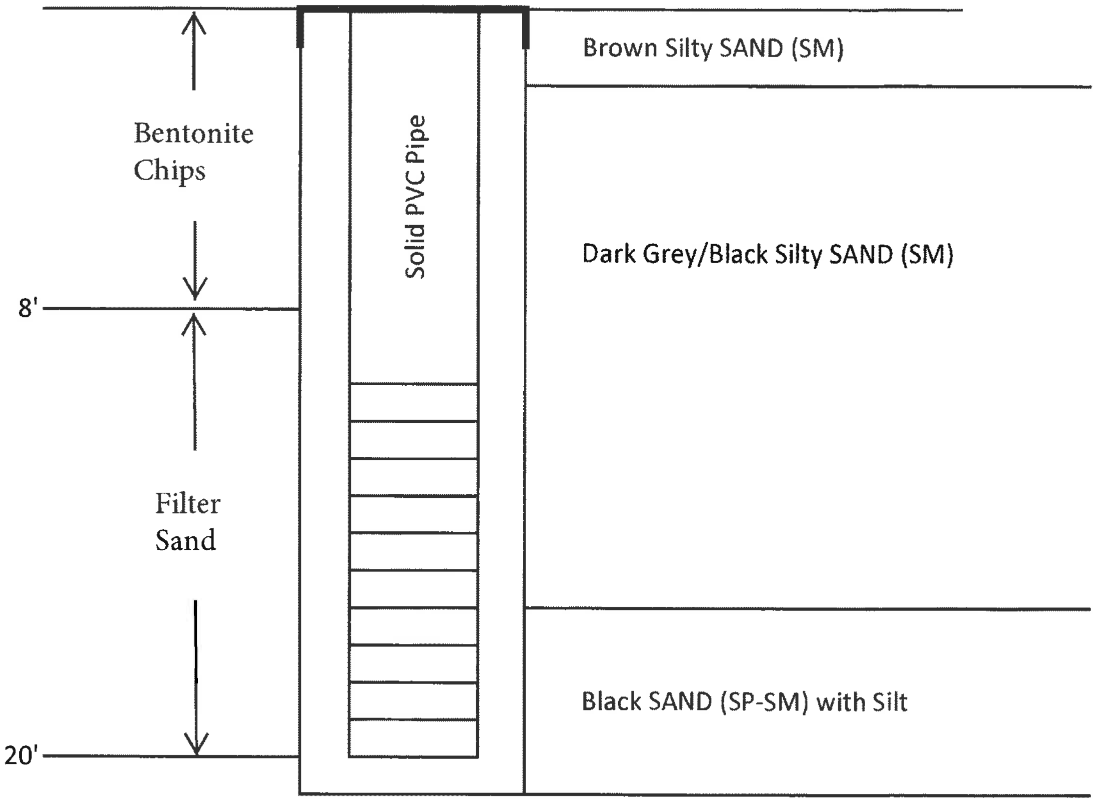
Total Depth of Boring: 21.5 ft.

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			
	▼							
		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							

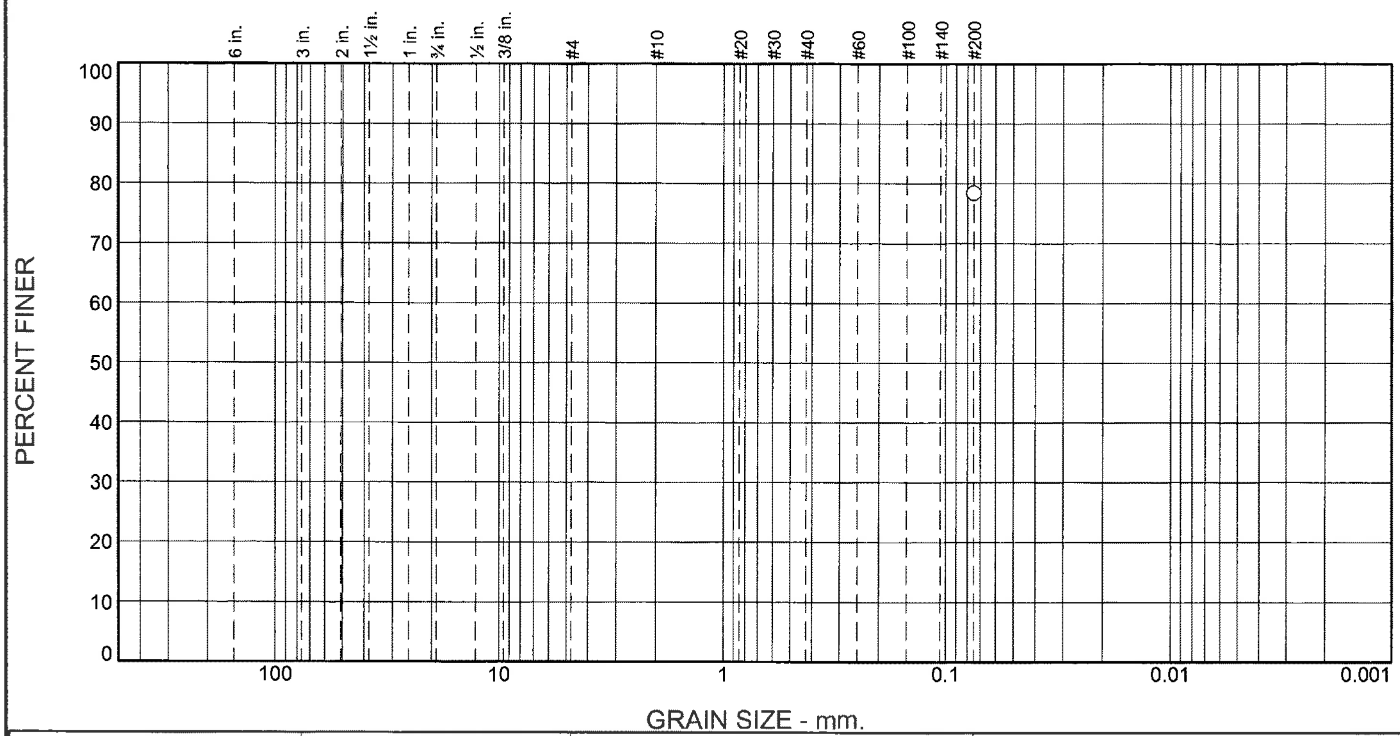
Monitoring Well
MW-1



Monitoring Well
MW-2



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'

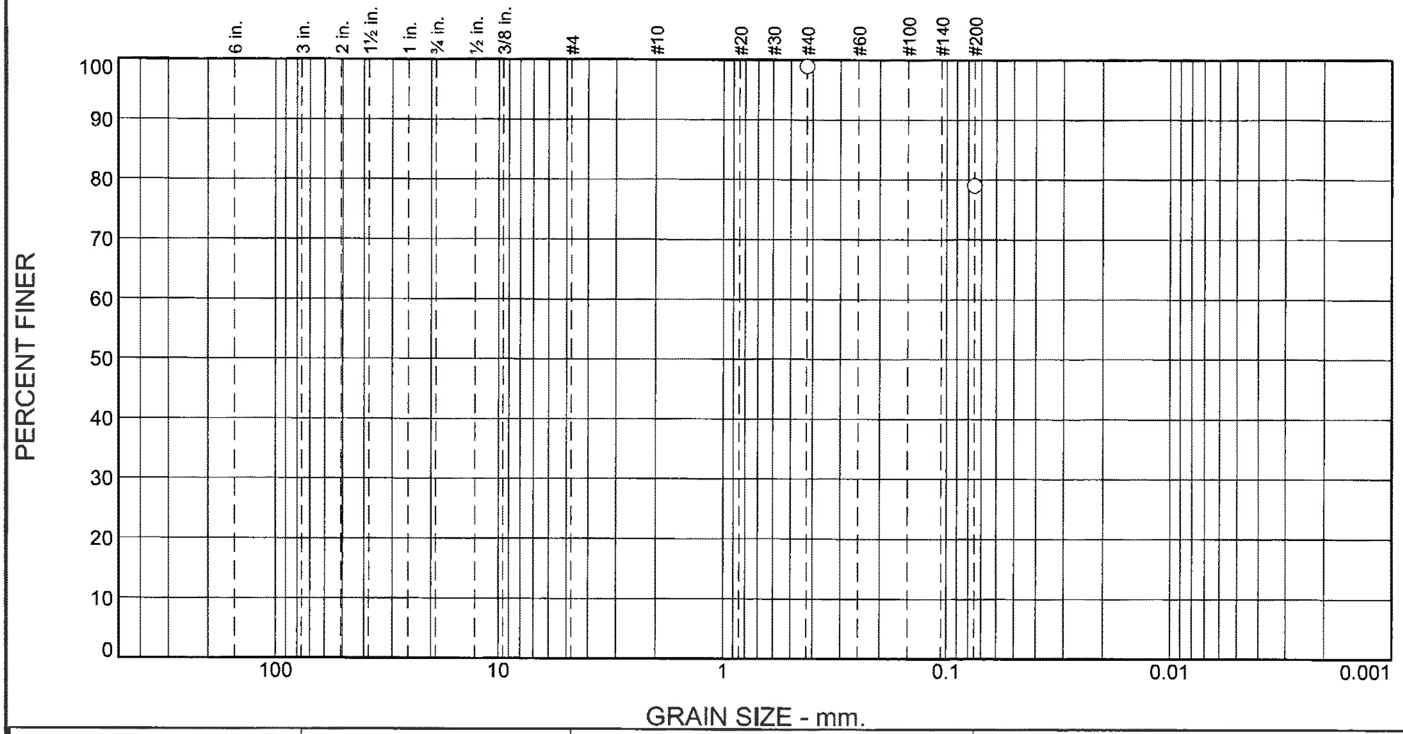
Date Sampled: 3-11-19

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'

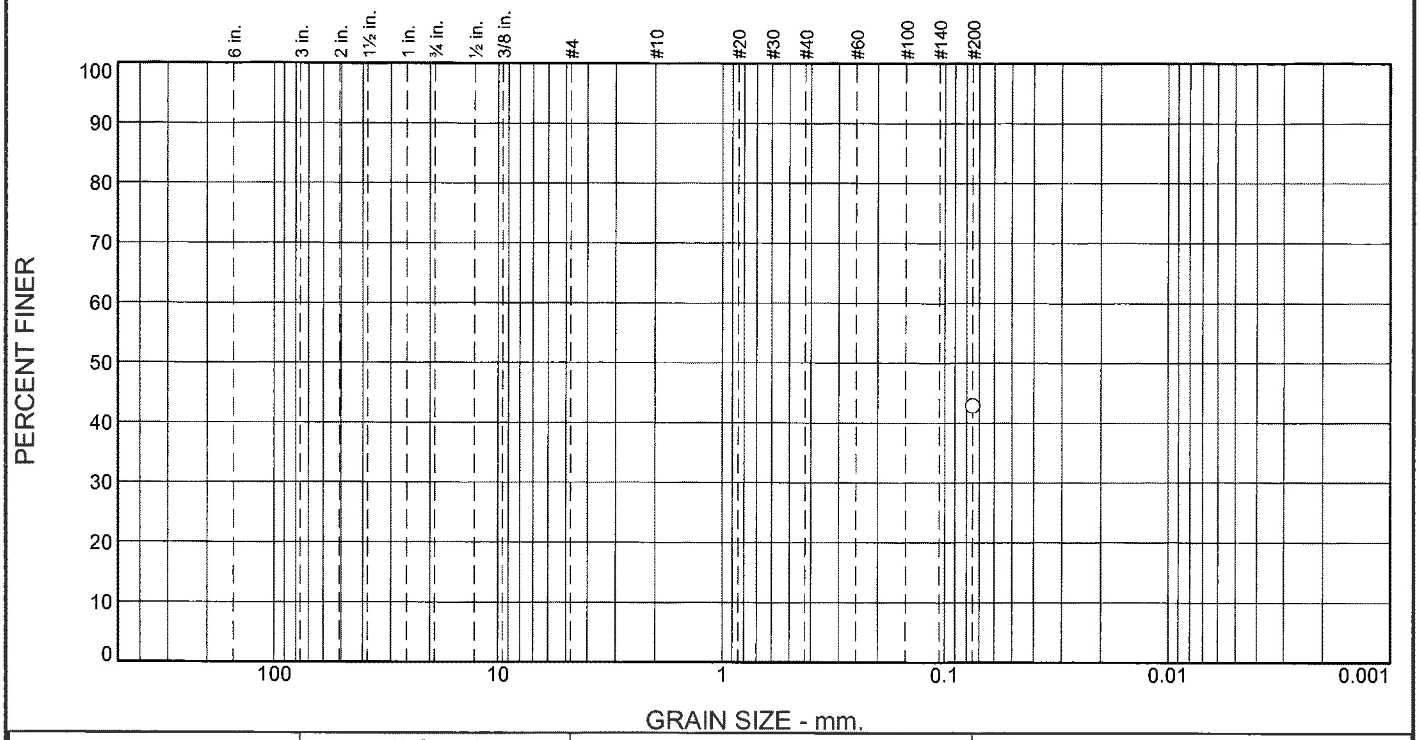
Date Sampled: 3-11-19

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'

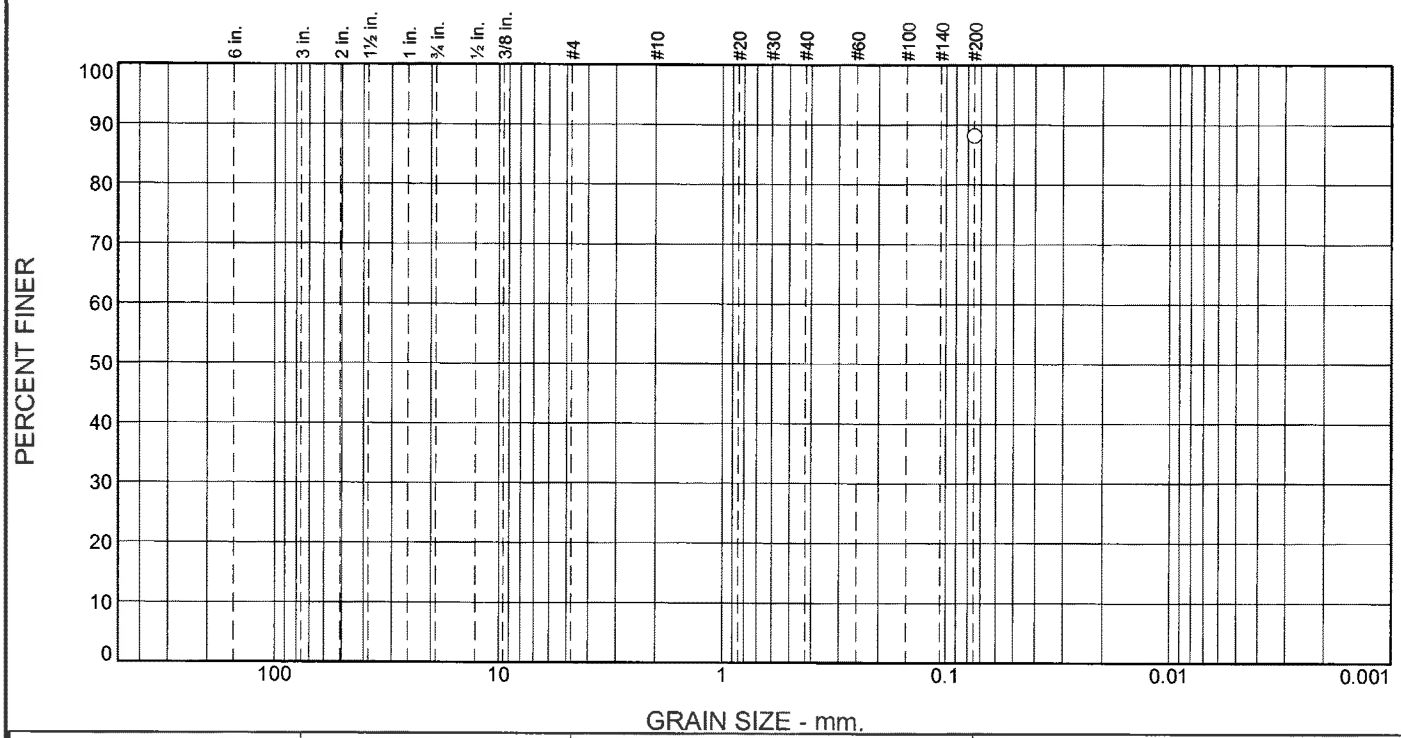
Date Sampled: 3-11-19

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

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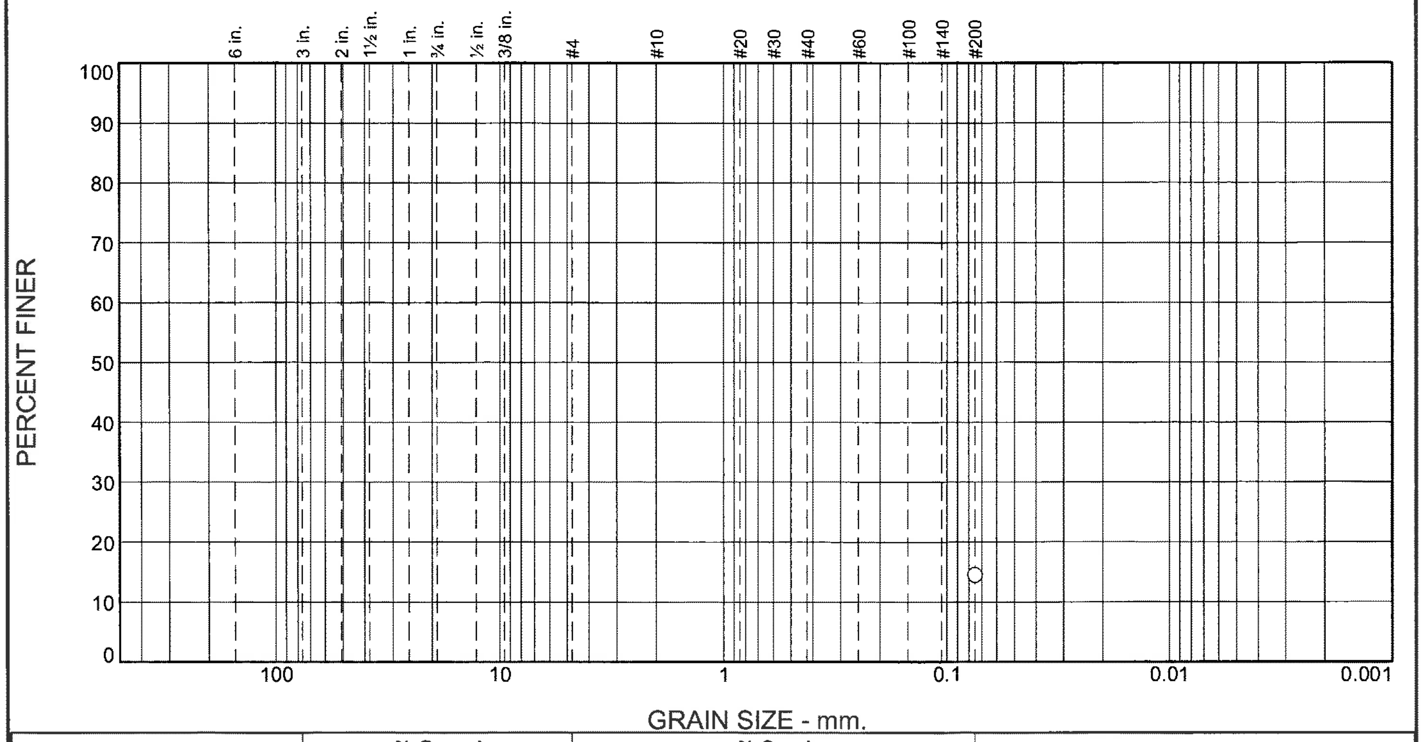
Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing
Project No: 062-19007 **Figure**

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

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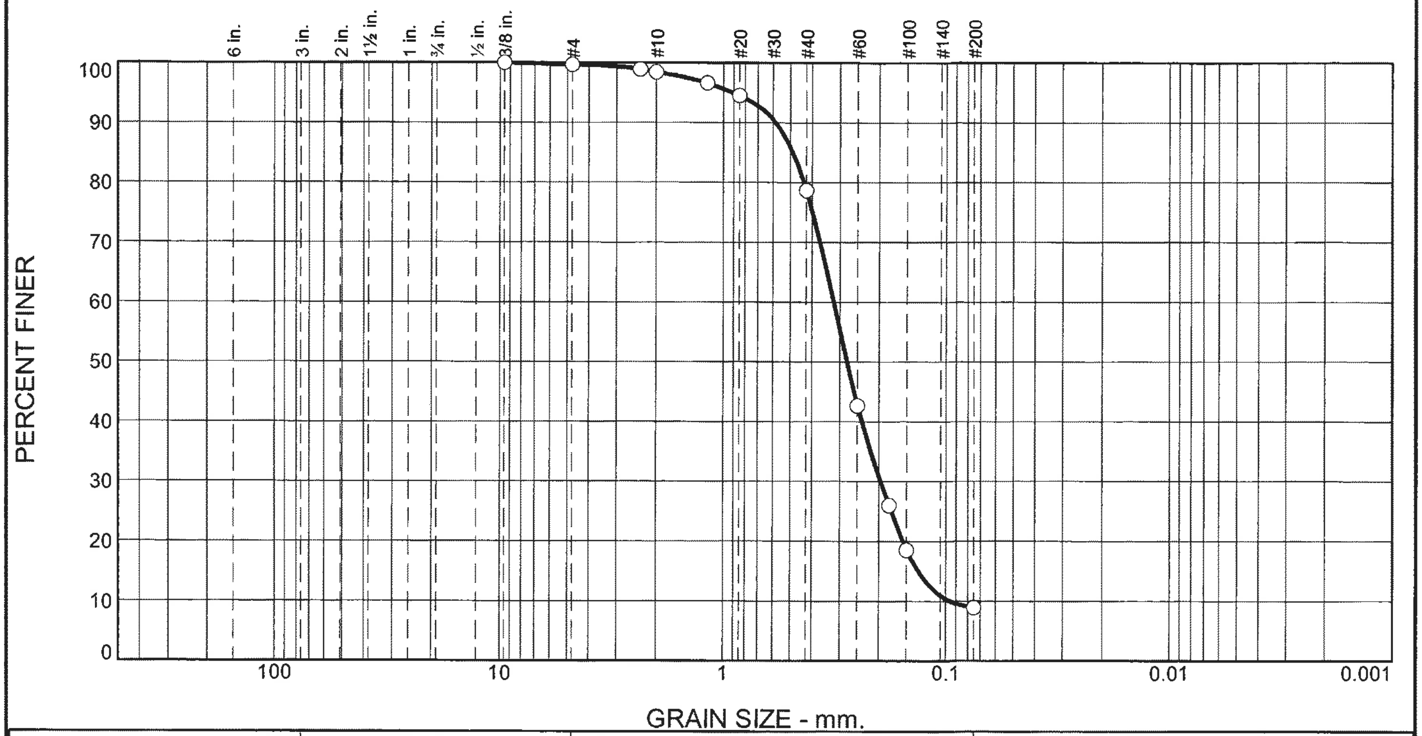
Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing

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

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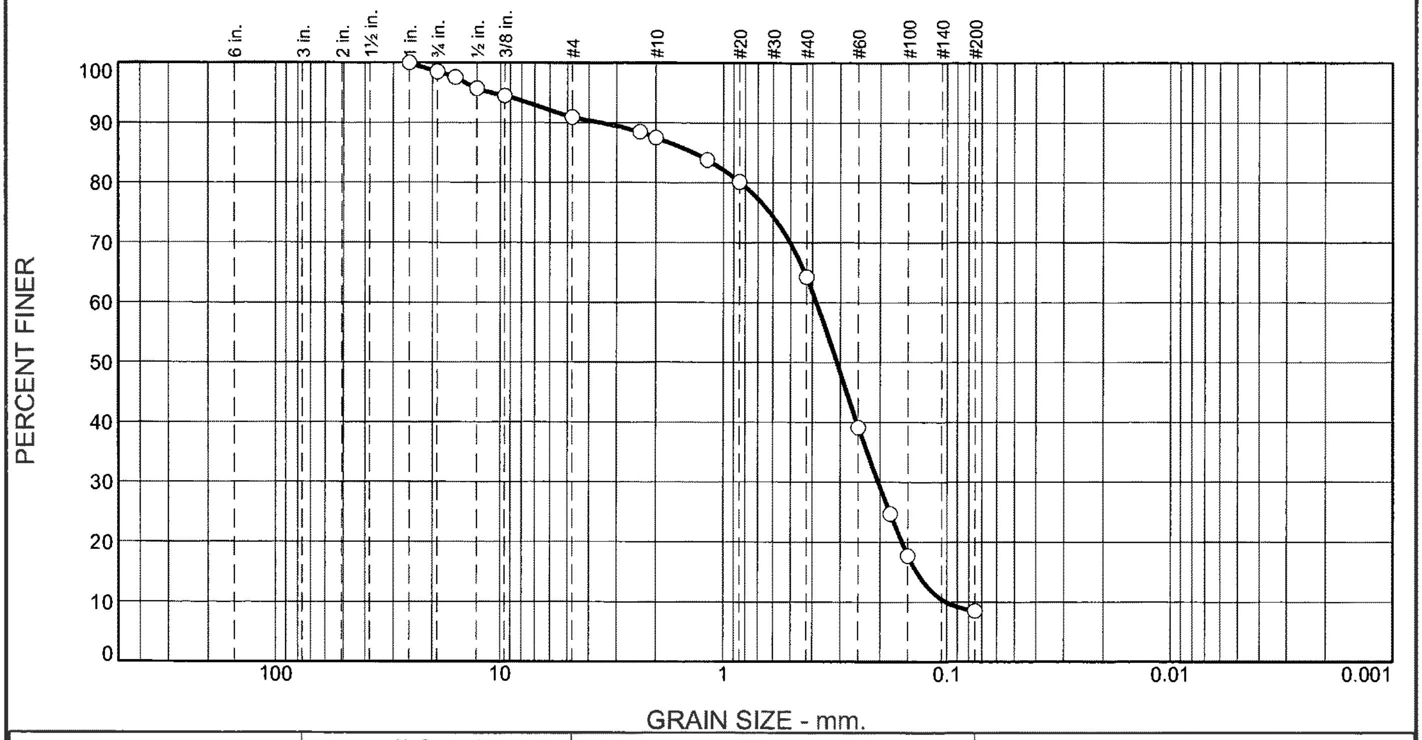
Client: Abbey Road Group Land Development Services Company.LLC.
Project: East Town Crossing
Project No: 062-19007 **Figure**

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 %

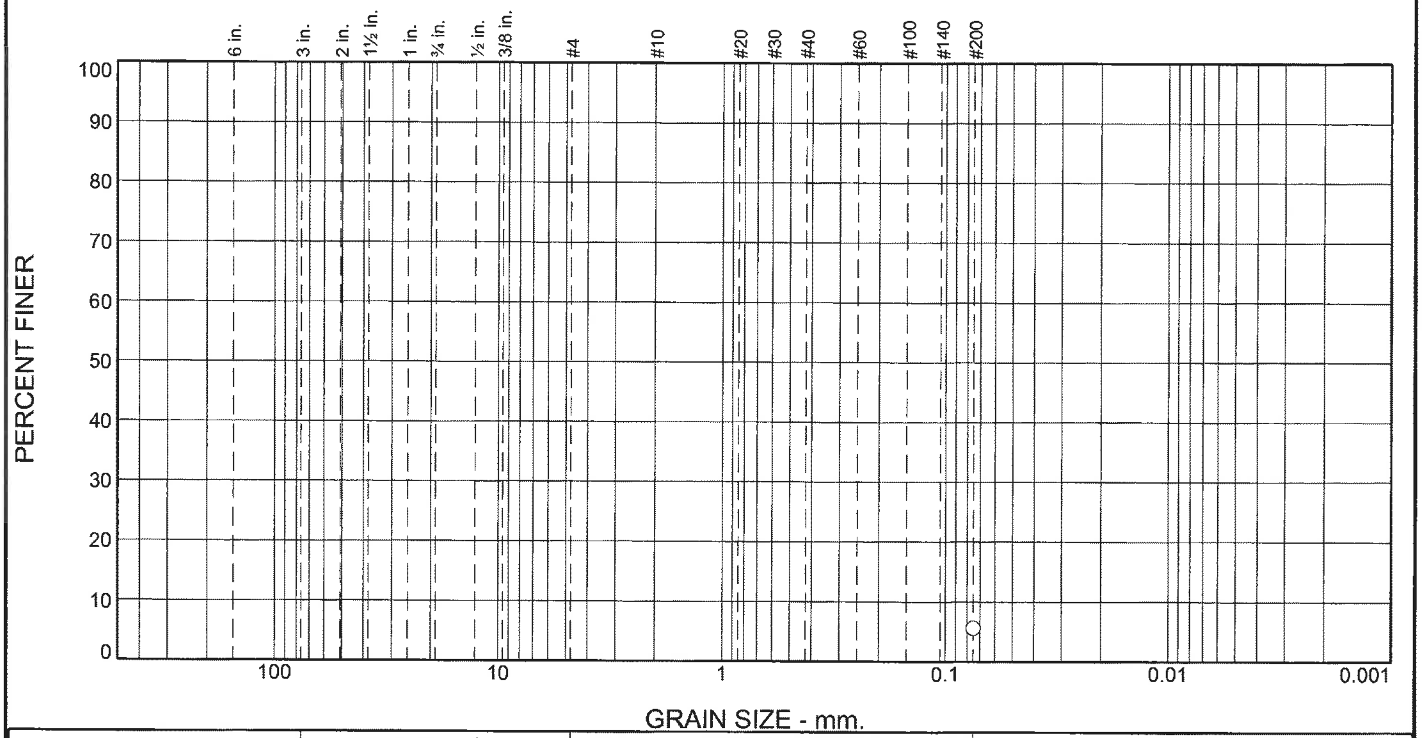
Date Received: 3-15-19 **Date Tested:** 3-22-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

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 %

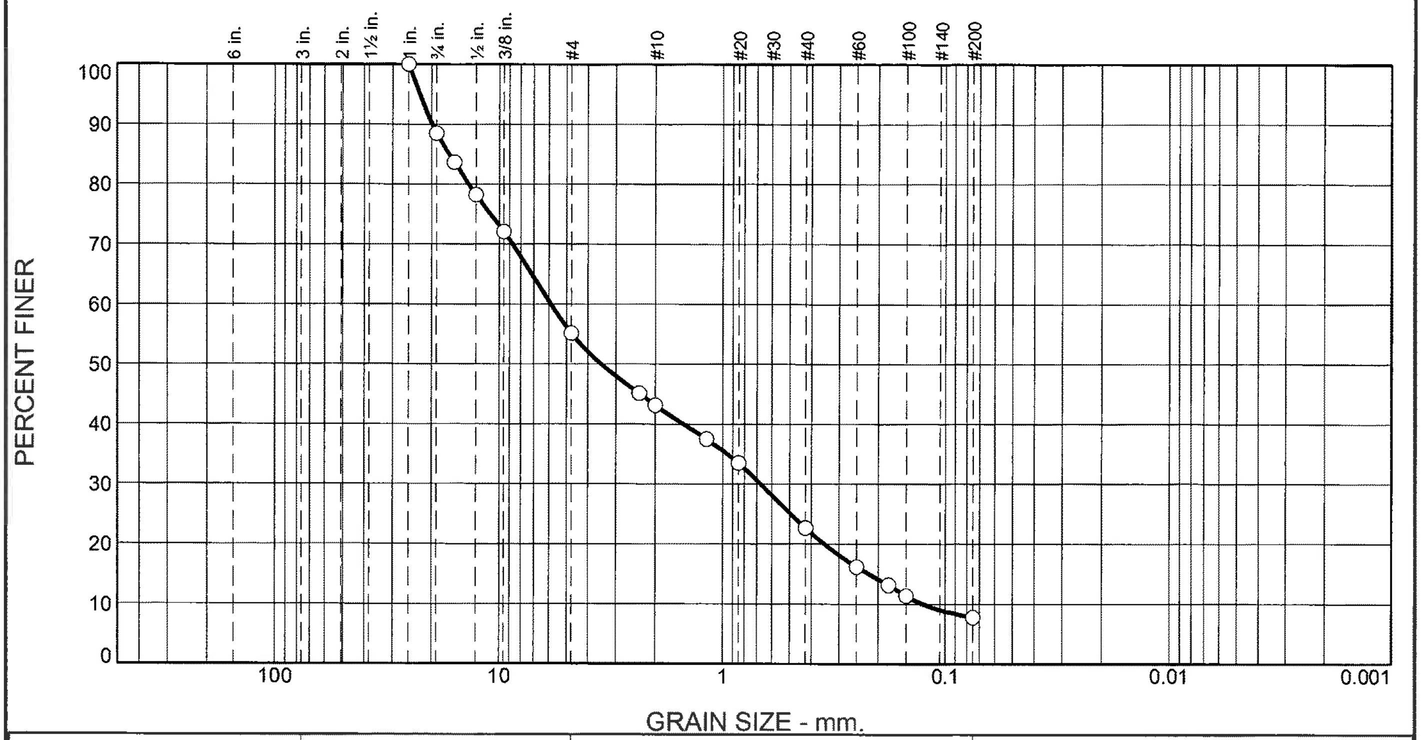
Date Received: 3-15-19 **Date Tested:** 3-11-19
Tested By: M.Thomas
Checked By: M.Thomas
Title: Materials Laboratory Manager

Location: B-2 Sample 2-9
Sample Number: 19L135 **Depth:** 35'-36.5'
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	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

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

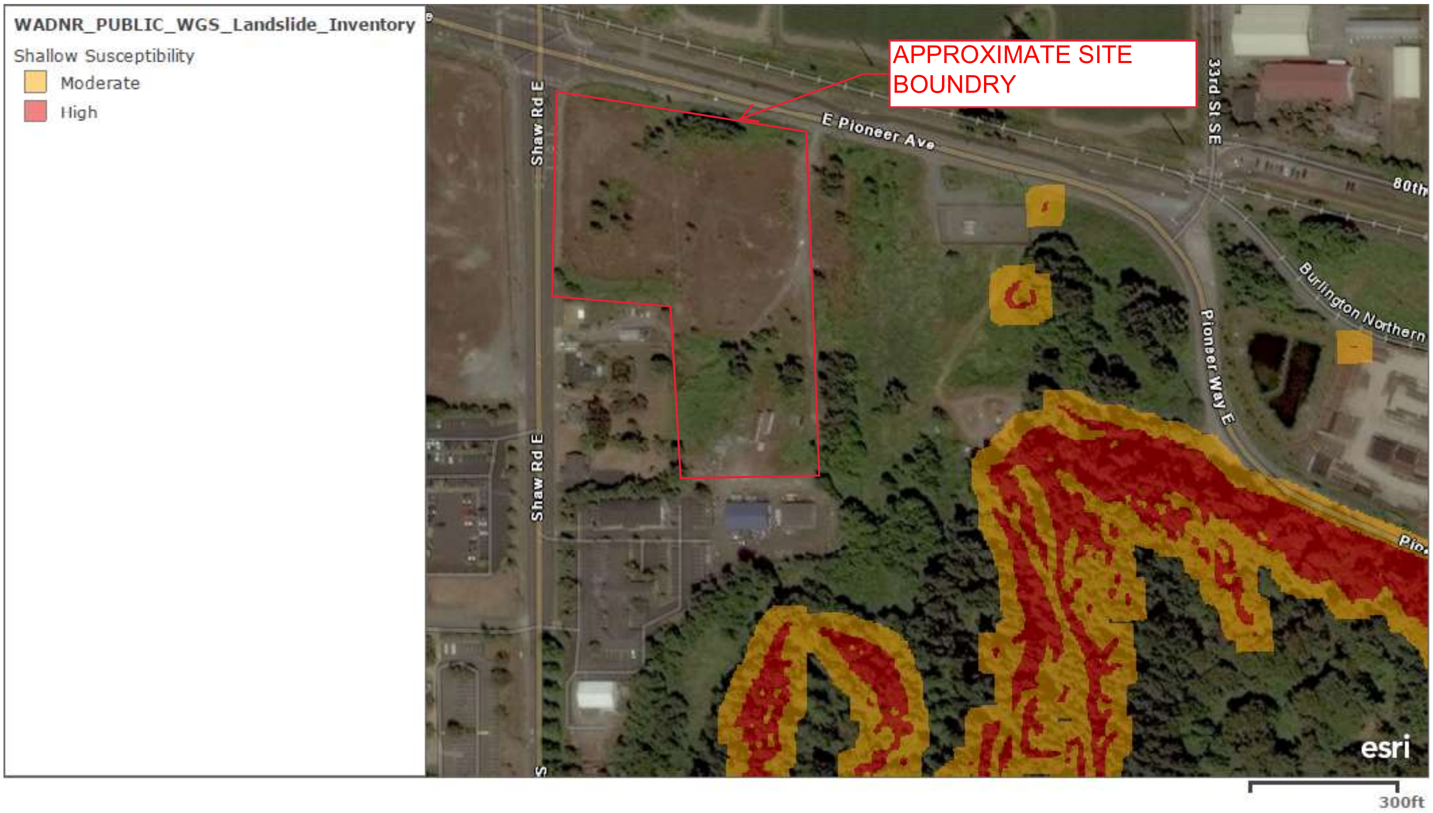
VIJAY CHAUDHARY
51061

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

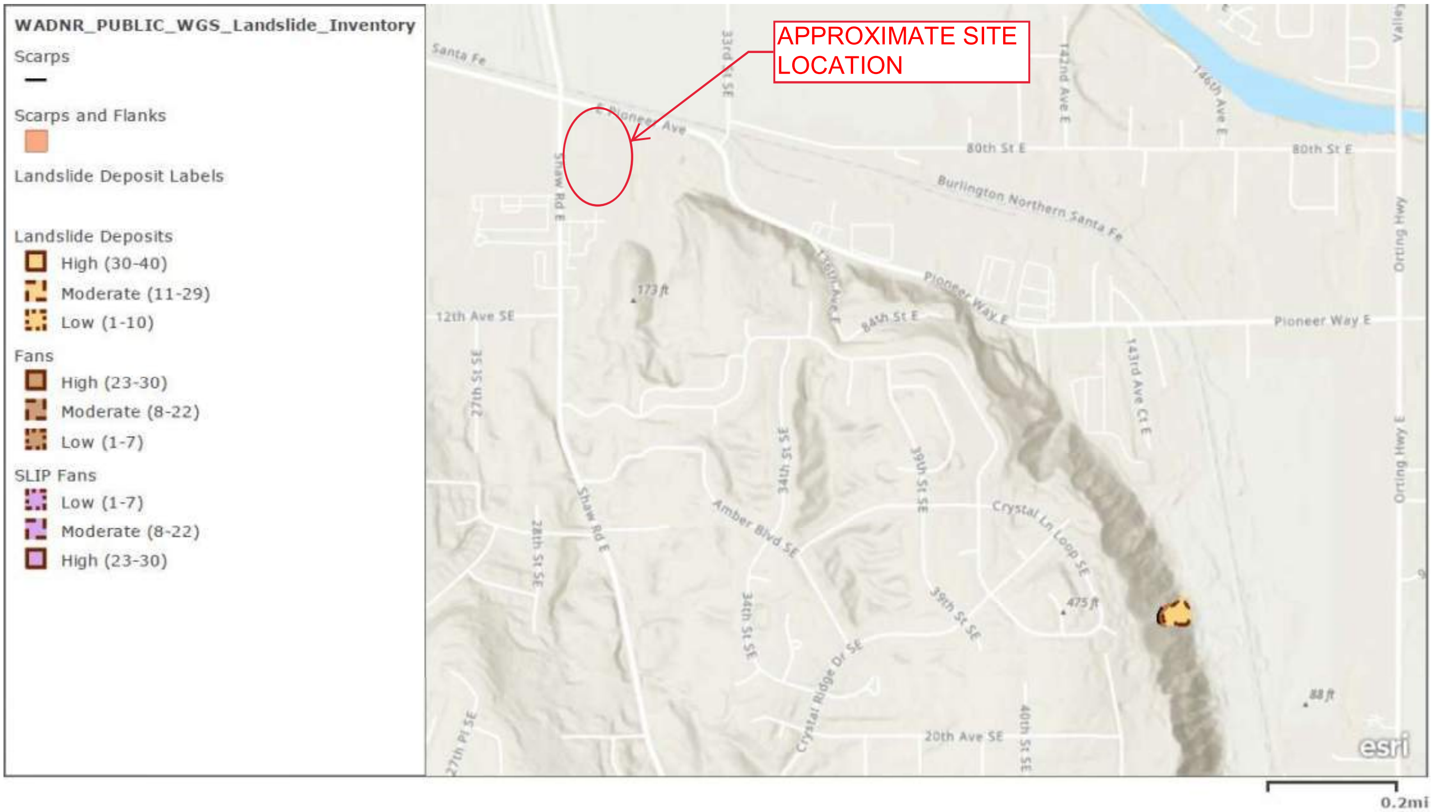
N

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

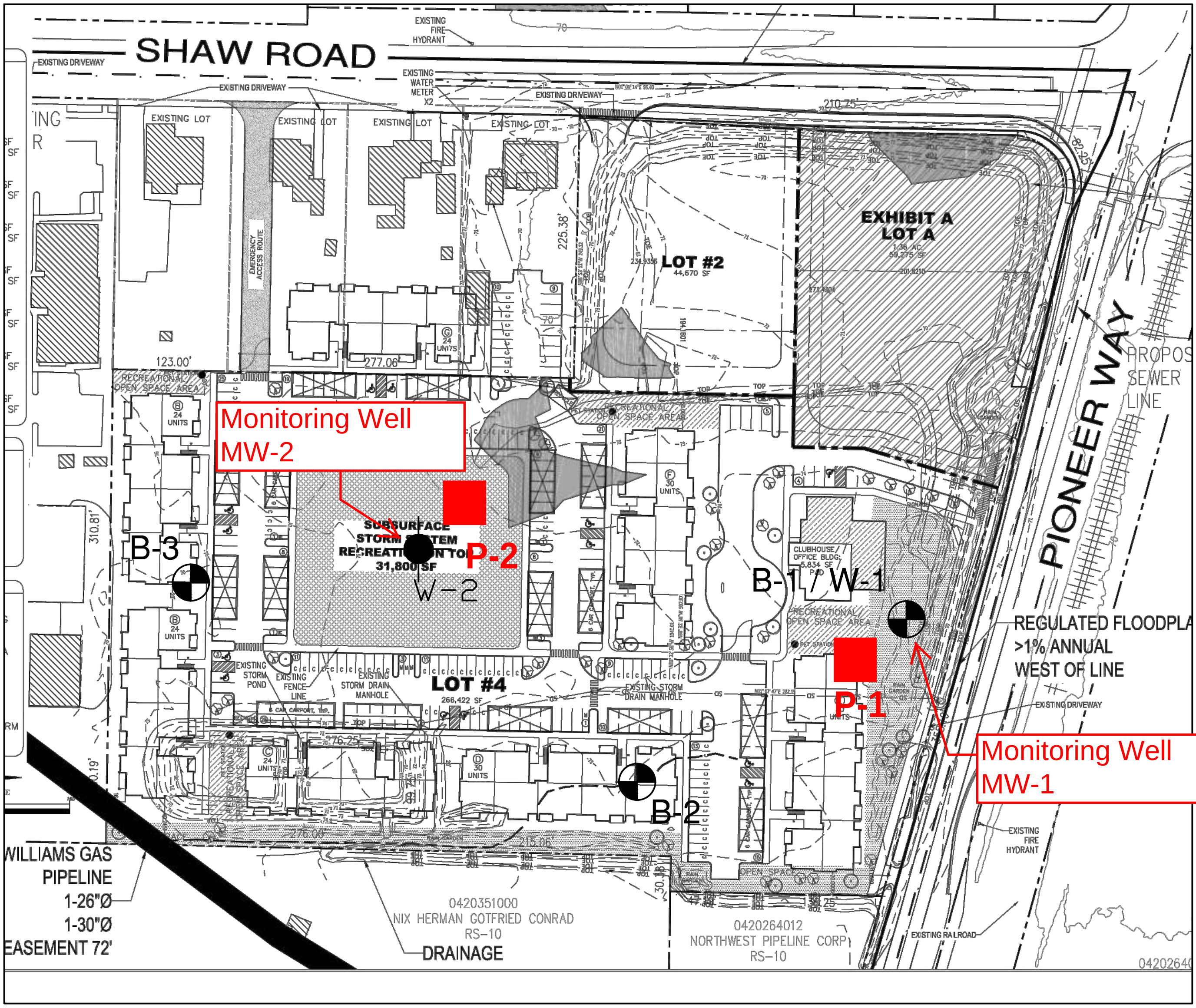
VIJAY CHAUDHARY
STATE OF WASHINGTON
51061
REGISTERED PROFESSIONAL ENGINEER

Theresa R. Nunan

Theresa R. Nunan
Project Manager

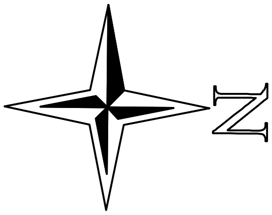
Vijay Chaudhary, P.E.
Assistant Regional Engineering Manager

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

Shaw Rd & E Pioneer Way, Puyallup, WA

Project Number: 062-19007

Krazan & ASSOCIATES, INC.

Figure 1

Drawn By: T. Nunan

Date: March 2021

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,

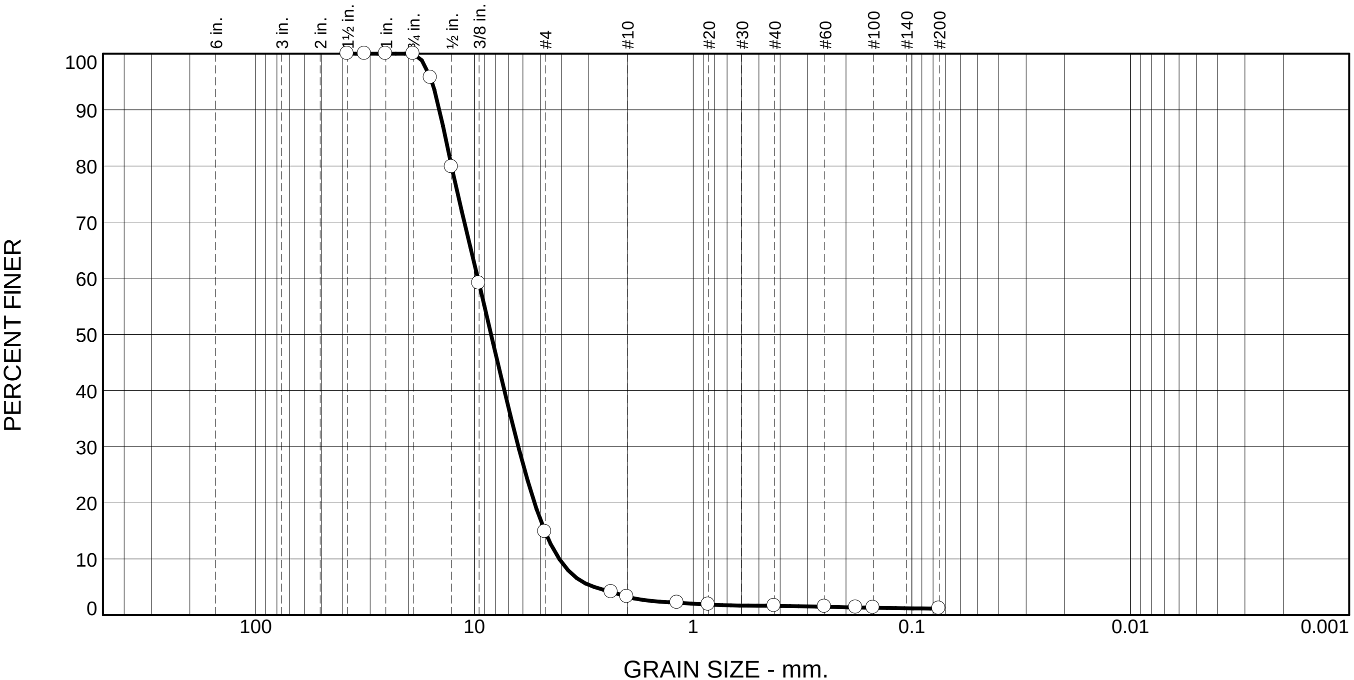
KRAZAN & ASSOCIATES, INC.

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

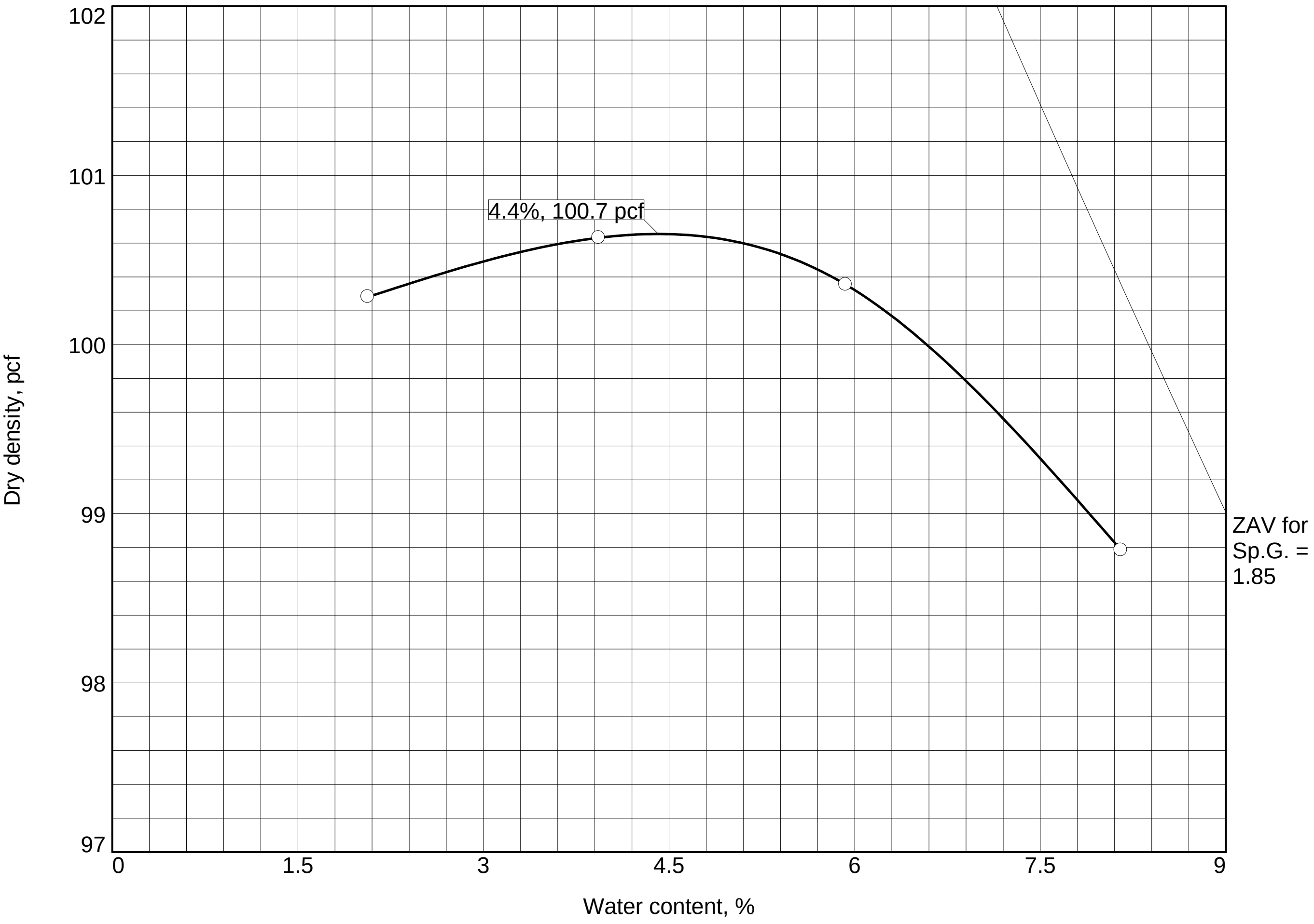
Source of Sample: Dan Lloyd Construction **Date Sampled:** 11-29-21
Sample Number: 21L892

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

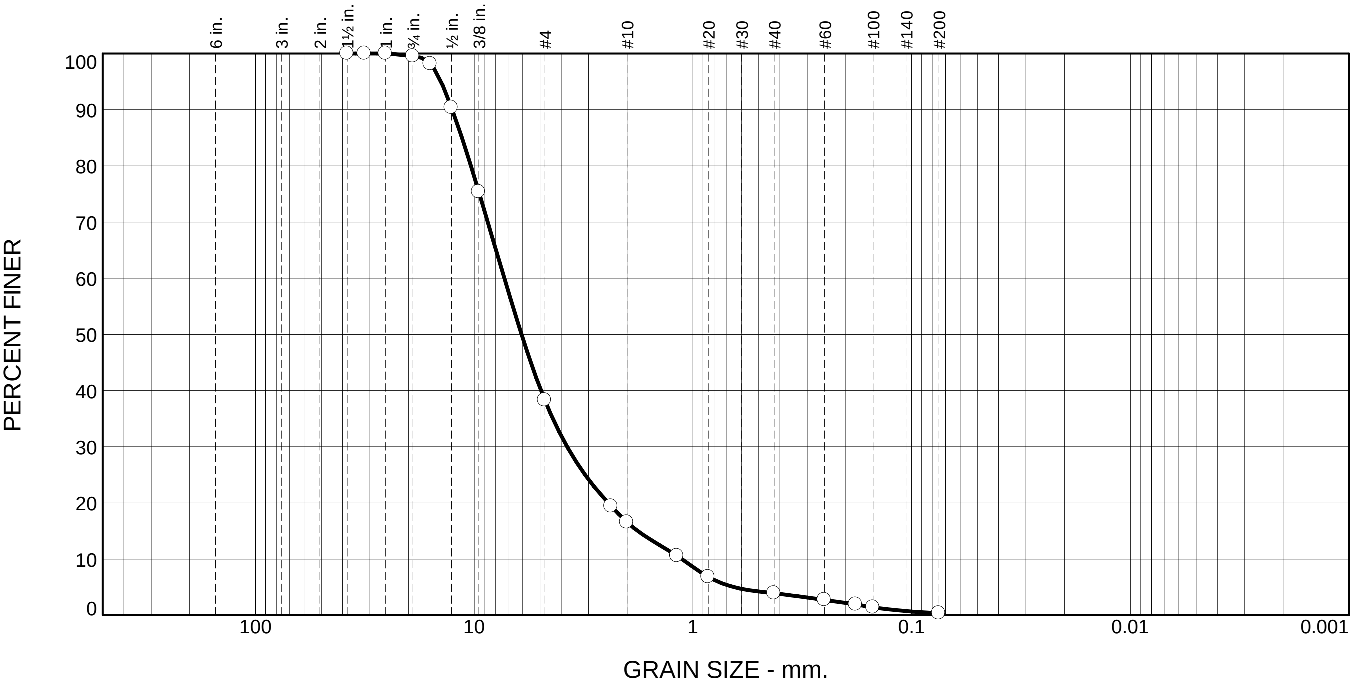
Source of Sample: Dan Lloyd Construction
Sample Number: 21L892
Date Sampled: 11-29-21

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

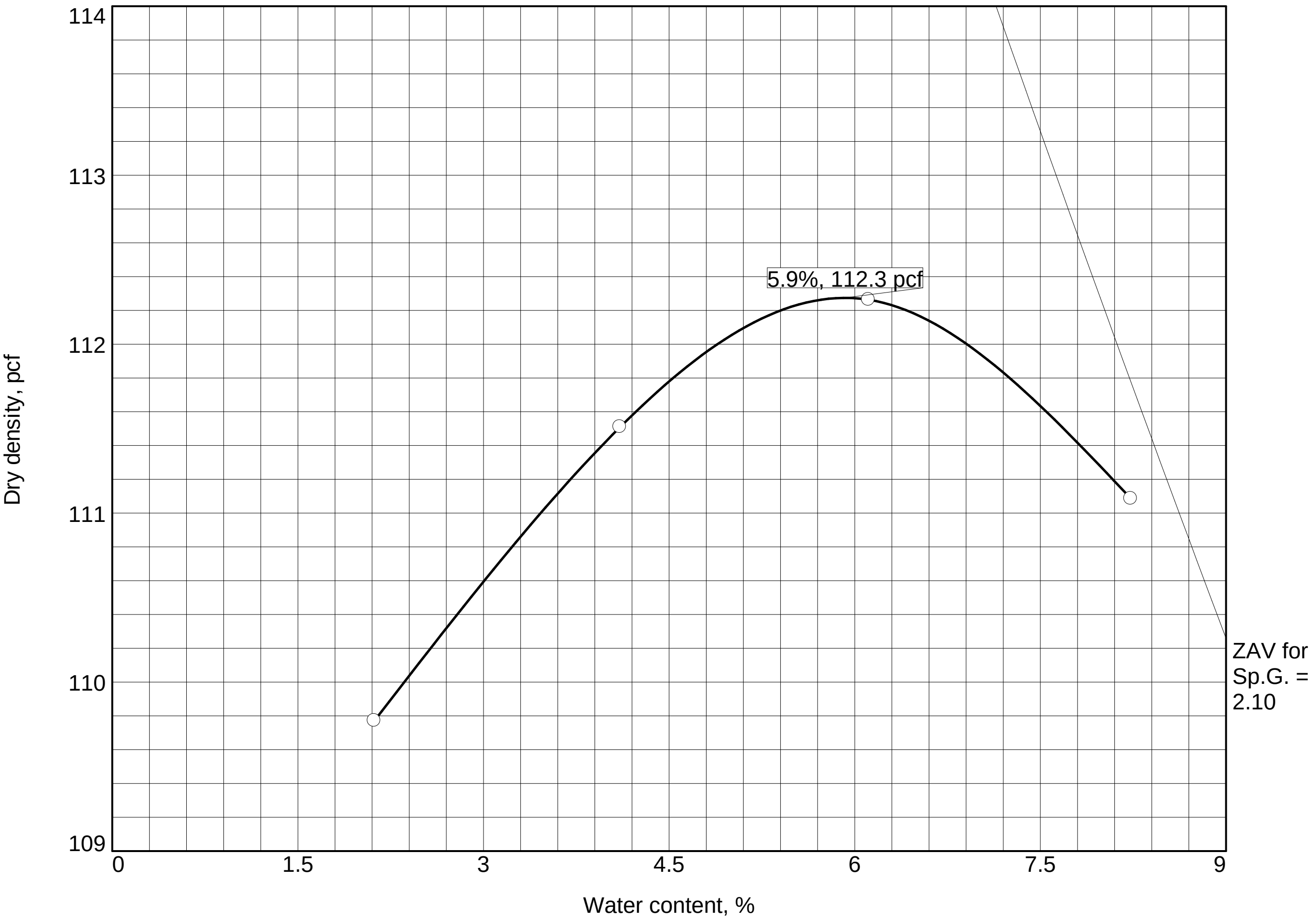
Source of Sample: Dan Lloyd Construction
Sample Number: 21L893
Date Sampled: 11-29-21

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

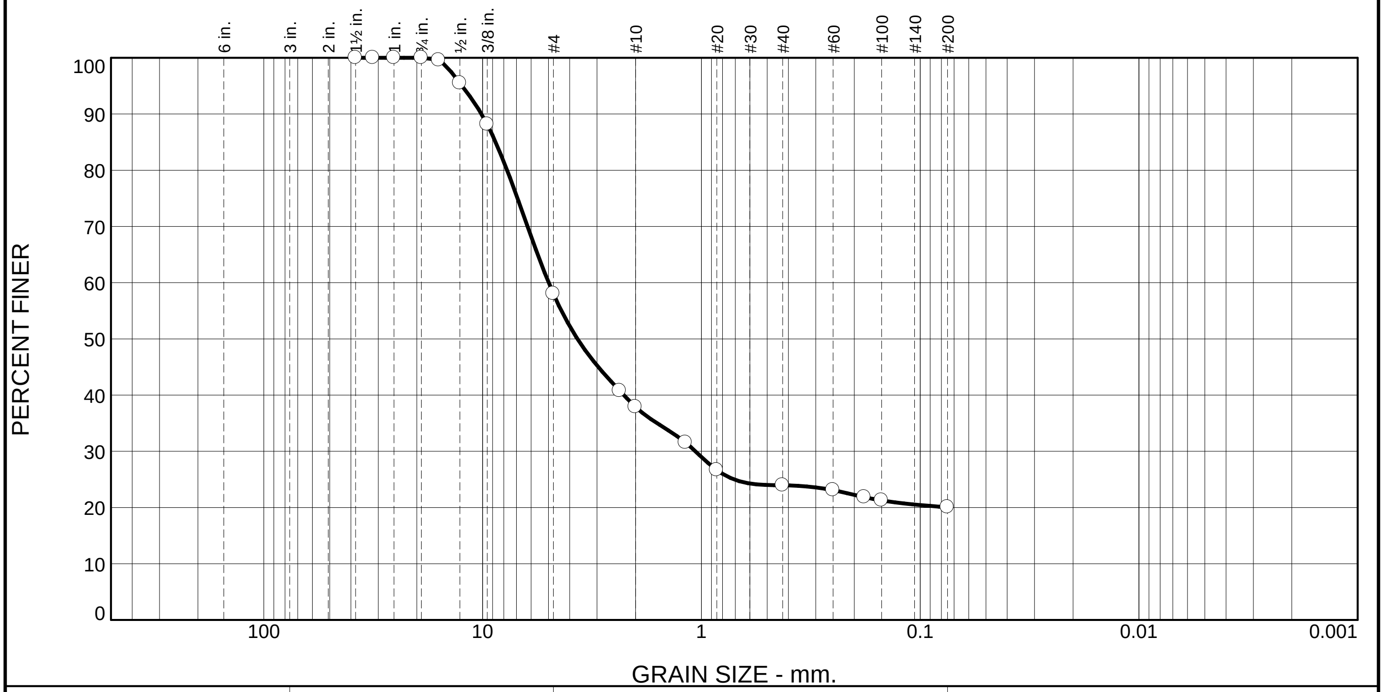
Remarks:

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**

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

March 19, 2021

KA Project No. 062-190007
Page 1 of 3

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

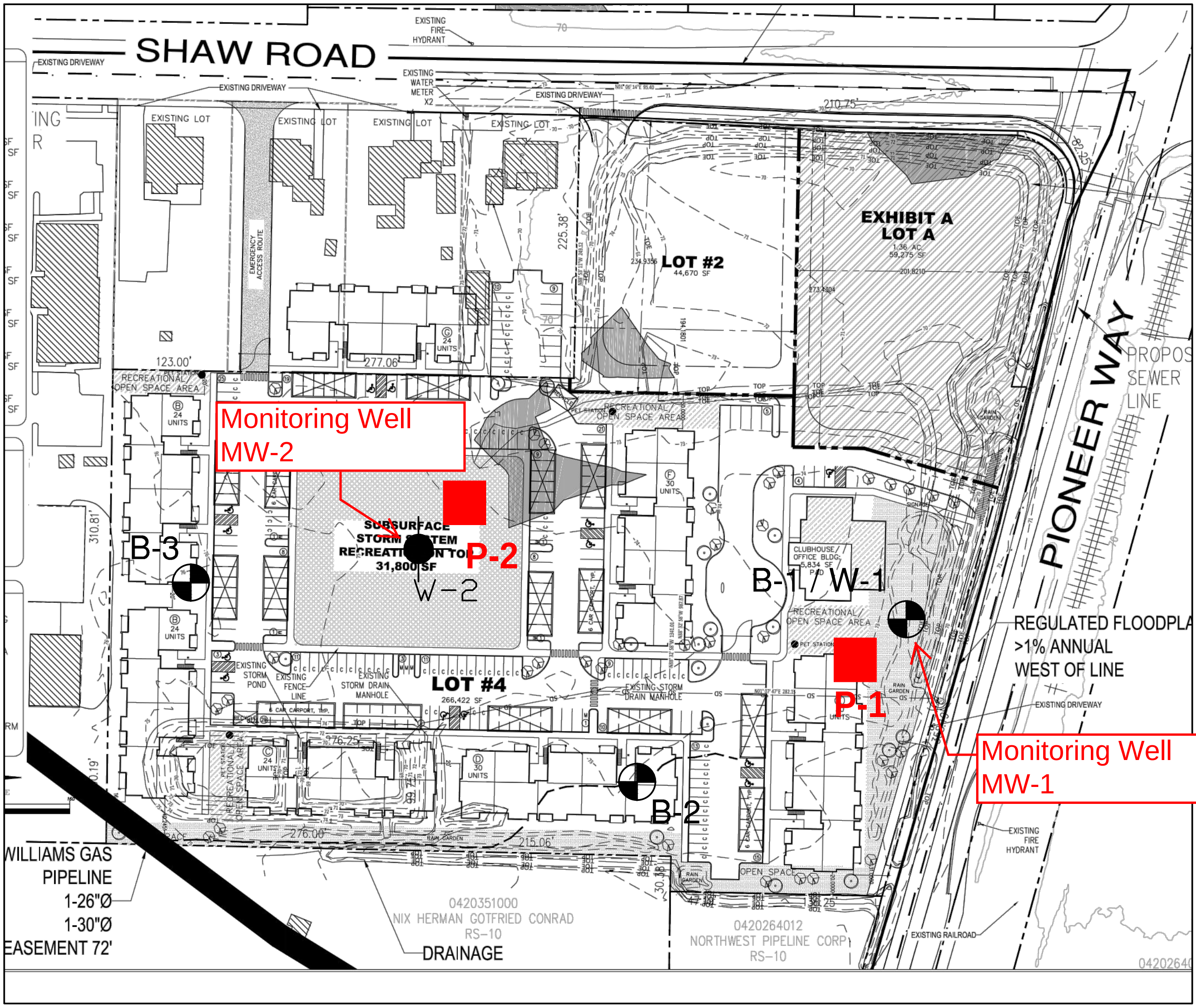
VIJAY CHAUDHARY
51061

Theresa R. Nunan

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

Shaw Rd & E Pioneer Way, Puyallup, WA

Project Number: 062-19007

Krazan & ASSOCIATES, INC.

Figure 1

Drawn By: T. Nunan
Date: March 2021

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)

APPENDIX B-3

Service Disabled Veteran Owned Small Business

Job #: 06-171

Project Name: East Town Crossing

As Of Date: 1/17/2023

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

Water Monitoring Information (Well #1):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
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
3/15/2021	East Town Crossing	B-1/W-1	66.54	6.30	Abbey Road Group	Water Monitoring Well Testing
3/22/2021	East Town Crossing	B-1/W-1	66.36	6.48	Abbey Road Group	Water Monitoring Well Testing
4/5/2021	East Town Crossing	B-1/W-1	66.28	6.56	Abbey Road Group	Water Monitoring Well Testing
4/13/2021	East Town Crossing	B-1/W-1	66.01	6.83	Abbey Road Group	Water Monitoring Well Testing
4/19/2021	East Town Crossing	B-1/W-1	65.82	7.02	Abbey Road Group	Water Monitoring Well Testing
4/22/2021	East Town Crossing	B-1/W-1	65.73	7.11	Abbey Road Group	Water Monitoring Well Testing
4/30/2021	East Town Crossing	B-1/W-1	65.77	7.07	Abbey Road Group	Water Monitoring Well Testing
5/072021	East Town Crossing	B-1/W-1	65.66	7.18	Abbey Road Group	Water Monitoring Well Testing
5/172021	East Town Crossing	B-1/W-1	65.39	7.45	Abbey Road Group	Water Monitoring Well Testing
5/24/2021	East Town Crossing	B-1/W-1	65.39	7.45	Abbey Road Group	Water Monitoring Well Testing
5/28/2021	East Town Crossing	B-1/W-1	65.34	7.50	Abbey Road Group	Water Monitoring Well Testing
6/4/2021	East Town Crossing	B-1/W-1	65.19	7.65	Abbey Road Group	Water Monitoring Well Testing
6/14/2021	East Town Crossing	B-1/W-1	65.49	7.35	Abbey Road Group	Water Monitoring Well Testing
6/22/2021	East Town Crossing	B-1/W-1	65.29	7.55	Abbey Road Group	Water Monitoring Well Testing
6/29/2021	East Town Crossing	B-1/W-1	65.03	7.81	Abbey Road Group	Water Monitoring Well Testing
7/8/2021	East Town Crossing	B-1/W-1	64.79	8.05	Abbey Road Group	Water Monitoring Well Testing
7/12/2021	East Town Crossing	B-1/W-1	64.64	8.20	Abbey Road Group	Water Monitoring Well Testing

Water Monitoring Information (Well #1):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
7/20/2021	East Town Crossing	B-1/W-1	64.42	8.42	Abbey Road Group	Water Monitoring Well Testing
7/27/2021	East Town Crossing	B-1/W-1	64.21	8.63	Abbey Road Group	Water Monitoring Well Testing
8/2/2021	East Town Crossing	B-1/W-1	64.05	8.79	Abbey Road Group	Water Monitoring Well Testing
8/10/2021	East Town Crossing	B-1/W-1	63.89	8.95	Abbey Road Group	Water Monitoring Well Testing
8/16/2021	East Town Crossing	B-1/W-1	63.82	9.02	Abbey Road Group	Water Monitoring Well Testing
8/23/2021	East Town Crossing	B-1/W-1	63.73	9.11	Abbey Road Group	Water Monitoring Well Testing
8/30/2021	East Town Crossing	B-1/W-1	63.69	9.15	Abbey Road Group	Water Monitoring Well Testing
9/9/2021	East Town Crossing	B-1/W-1	63.59	9.25	Abbey Road Group	Water Monitoring Well Testing
9/13/2021	East Town Crossing	B-1/W-1	63.54	9.30	Abbey Road Group	Water Monitoring Well Testing
9/20/2021	East Town Crossing	B-1/W-1	63.73	9.11	Abbey Road Group	Water Monitoring Well Testing
9/27/2021	East Town Crossing	B-1/W-1	63.89	8.95	Abbey Road Group	Water Monitoring Well Testing
10/4/2021	East Town Crossing	B-1/W-1	64.20	8.64	Abbey Road Group	Water Monitoring Well Testing
10/18/2021	East Town Crossing	B-1/W-1	64.20	8.64	Abbey Road Group	Water Monitoring Well Testing
10/25/2021	East Town Crossing	B-1/W-1	64.44	8.40	Abbey Road Group	Water Monitoring Well Testing
11/1/2021	East Town Crossing	B-1/W-1	65.34	7.50	Abbey Road Group	Water Monitoring Well Testing
11/8/2021	East Town Crossing	B-1/W-1	66.29	6.55	Abbey Road Group	Water Monitoring Well Testing
11/17/2021	East Town Crossing	B-1/W-1	66.29	6.55	Abbey Road Group	Water Monitoring Well Testing
11/22/2021	East Town Crossing	B-1/W-1	66.29	6.55	Abbey Road Group	Water Monitoring Well Testing
11/29/2021	East Town Crossing	B-1/W-1	66.52	6.32	Abbey Road Group	Water Monitoring Well Testing
12/6/2021	East Town Crossing	B-1/W-1	66.33	6.51	Abbey Road Group	Water Monitoring Well Testing
12/13/2021	East Town Crossing	B-1/W-1	67.49	5.35	Abbey Road Group	Water Monitoring Well Testing
1/3/2022	East Town Crossing	B-1/W-1	67.44	5.40	Abbey Road Group	Water Monitoring Well Testing
1/25/2022	East Town Crossing	B-1/W-1	63.80	9.04	Abbey Road Group	Water Monitoring Well Testing-Onsite Dewatering
1/28/2022	East Town Crossing	B-1/W-1	63.08	9.76	Abbey Road Group	Water Monitoring Well Testing-Onsite Dewatering (2 Pumps Running)
2/4/2022	East Town Crossing	B-1/W-1	65.01	7.83	Abbey Road Group	Water Monitoring Well Testing-Onsite Dewatering ended 2/03/2022
2/8/2022	East Town Crossing	B-1/W-1	65.54	7.30	Abbey Road Group	Water Monitoring Well Testing
2/16/2022	East Town Crossing	B-1/W-1	65.55	7.29	Abbey Road Group	Water Monitoring Well Testing
3/9/2022	East Town Crossing	B-1/W-1	66.94	5.90	Abbey Road Group	Water Monitoring Well Testing
3/22/2022	East Town Crossing	B-1/W-1	67.09	5.75	Abbey Road Group	Water Monitoring Well Testing
3/31/2022	East Town Crossing	B-1/W-1	66.33	6.51	Abbey Road Group	Water Monitoring Well Testing
4/12/2022	East Town Crossing	B-1/W-1	66.16	6.68	Abbey Road Group	Water Monitoring Well Testing
4/19/2022	East Town Crossing	B-1/W-1	66.06	6.78	Abbey Road Group	Water Monitoring Well Testing
4/25/2022	East Town Crossing	B-1/W-1	65.94	6.90	Abbey Road Group	Water Monitoring Well Testing
5/3/2022	East Town Crossing	B-1/W-1	66.08	6.76	Abbey Road Group	Water Monitoring Well Testing
5/10/2022	East Town Crossing	B-1/W-1	66.27	6.57	Abbey Road Group	Water Monitoring Well Testing

Water Monitoring Information (Well #1):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
5/18/2022	East Town Crossing	B-1/W-1	66.29	6.55	Abbey Road Group	Water Monitoring Well Testing
5/25/2022	East Town Crossing	B-1/W-1	66.84	6.00	Abbey Road Group	Water Monitoring Well Testing
6/1/2022	East Town Crossing	B-1/W-1	65.94	6.90	Abbey Road Group	Water Monitoring Well Testing
6/6/2022	East Town Crossing	B-1/W-1	66.14	6.70	Abbey Road Group	Water Monitoring Well Testing
6/16/2022	East Town Crossing	B-1/W-1	66.46	6.38	Abbey Road Group	Water Monitoring Well Testing
6/20/2022	East Town Crossing	B-1/W-1	66.14	6.70	Abbey Road Group	Water Monitoring Well Testing
6/30/2022	East Town Crossing	B-1/W-1	65.54	7.30	Abbey Road Group	Water Monitoring Well Testing
7/6/2022	East Town Crossing	B-1/W-1	65.44	7.40	Abbey Road Group	Water Monitoring Well Testing
7/11/2022	East Town Crossing	B-1/W-1	65.14	7.70	Abbey Road Group	Water Monitoring Well Testing
7/19/2022	East Town Crossing	B-1/W-1	64.84	8.00	Abbey Road Group	Water Monitoring Well Testing
7/28/2022	East Town Crossing	B-1/W-1	64.59	8.25	Abbey Road Group	Water Monitoring Well Testing
8/1/2022	East Town Crossing	B-1/W-1	64.49	8.35	Abbey Road Group	Water Monitoring Well Testing
8/10/2022	East Town Crossing	B-1/W-1	64.24	8.60	Abbey Road Group	Water Monitoring Well Testing
8/15/2022	East Town Crossing	B-1/W-1	64.19	8.65	Abbey Road Group	Water Monitoring Well Testing
8/25/2022	East Town Crossing	B-1/W-1	64.04	8.80	Abbey Road Group	Water Monitoring Well Testing
8/30/2022	East Town Crossing	B-1/W-1	63.89	8.95	Abbey Road Group	Water Monitoring Well Testing
9/6/2022	East Town Crossing	B-1/W-1	63.86	8.98	Abbey Road Group	Water Monitoring Well Testing
9/12/2022	East Town Crossing	B-1/W-1	63.69	9.15	Abbey Road Group	Water Monitoring Well Testing
9/19/2022	East Town Crossing	B-1/W-1	63.68	9.16	Abbey Road Group	Water Monitoring Well Testing
9/28/2022	East Town Crossing	B-1/W-1	63.64	9.20	Abbey Road Group	Water Monitoring Well Testing
10/7/2022	East Town Crossing	B-1/W-1	63.61	9.23	Abbey Road Group	Water Monitoring Well Testing
10/12/2022	East Town Crossing	B-1/W-1	63.68	9.16	Abbey Road Group	Water Monitoring Well Testing
10/17/2022	East Town Crossing	B-1/W-1	63.62	9.22	Abbey Road Group	Water Monitoring Well Testing
10/24/2022	East Town Crossing	B-1/W-1	63.84	9.00	Abbey Road Group	Water Monitoring Well Testing
10/31/2022	East Town Crossing	B-1/W-1	64.16	8.68	Abbey Road Group	Water Monitoring Well Testing
11/7/2022	East Town Crossing	B-1/W-1	65.04	7.80	Abbey Road Group	Water Monitoring Well Testing
11/14/2022	East Town Crossing	B-1/W-1	64.80	8.04	Abbey Road Group	Water Monitoring Well Testing
11/29/2022	East Town Crossing	B-1/W-1	65.12	7.72	Abbey Road Group	Water Monitoring Well Testing
12/5/2022	East Town Crossing	B-1/W-1	65.71	7.13	Abbey Road Group	Water Monitoring Well Testing
12/16/2022	East Town Crossing	B-1/W-1	65.73	7.11	Abbey Road Group	Water Monitoring Well Testing
12/20/2022	East Town Crossing	B-1/W-1	65.75	7.09	Abbey Road Group	Water Monitoring Well Testing
12/27/2022	East Town Crossing	B-1/W-1	67.19	5.65	Abbey Road Group	Water Monitoring Well Testing
1/3/2023	East Town Crossing	B-1/W-1	66.60	6.24	Abbey Road Group	Water Monitoring Well Testing
1/9/2023	East Town Crossing	B-1/W-1	66.61	6.23	Abbey Road Group	Water Monitoring Well Testing
1/17/2023	East Town Crossing	B-1/W-1	66.68	6.16	Abbey Road Group	Water Monitoring Well Testing

Job #: 06-171

Project Name: East Town Crossing

As Of Date: 1/17/2023

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

Water Monitoring Information (Well #2):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
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
3/15/2021	East Town Crossing	W-2	68.60	5.53	Abbey Road Group	Water Monitoring Well Testing
3/22/2021	East Town Crossing	W-2	68.32	5.81	Abbey Road Group	Water Monitoring Well Testing
4/5/2021	East Town Crossing	W-2	68.15	5.98	Abbey Road Group	Water Monitoring Well Testing
4/13/2021	East Town Crossing	W-2	67.91	6.22	Abbey Road Group	Water Monitoring Well Testing
4/19/2021	East Town Crossing	W-2	67.75	6.38	Abbey Road Group	Water Monitoring Well Testing
4/22/2021	East Town Crossing	W-2	67.62	6.51	Abbey Road Group	Water Monitoring Well Testing
4/30/2021	East Town Crossing	W-2	67.67	6.46	Abbey Road Group	Water Monitoring Well Testing
5/7/2021	East Town Crossing	W-2	67.63	6.50	Abbey Road Group	Water Monitoring Well Testing
5/17/2021	East Town Crossing	W-2	67.48	6.65	Abbey Road Group	Water Monitoring Well Testing
5/24/2021	East Town Crossing	W-2	67.51	6.62	Abbey Road Group	Water Monitoring Well Testing
5/28/2021	East Town Crossing	W-2	67.49	6.64	Abbey Road Group	Water Monitoring Well Testing
6/4/2021	East Town Crossing	W-2	67.17	6.96	Abbey Road Group	Water Monitoring Well Testing
6/14/2021	East Town Crossing	W-2	67.51	6.62	Abbey Road Group	Water Monitoring Well Testing
6/22/2021	East Town Crossing	W-2	67.50	6.63	Abbey Road Group	Water Monitoring Well Testing
6/29/2021	East Town Crossing	W-2	67.18	6.95	Abbey Road Group	Water Monitoring Well Testing
7/8/2021	East Town Crossing	W-2	67.08	7.05	Abbey Road Group	Water Monitoring Well Testing
7/12/2021	East Town Crossing	W-2	66.95	7.18	Abbey Road Group	Water Monitoring Well Testing
7/12/2021	East Town Crossing	W-2	66.73	7.40	Abbey Road Group	Water Monitoring Well Testing
7/12/2021	East Town Crossing	W-2	66.45	7.68	Abbey Road Group	Water Monitoring Well Testing
8/2/2021	East Town Crossing	W-2	66.39	7.74	Abbey Road Group	Water Monitoring Well Testing
8/10/2021	East Town Crossing	W-2	66.18	7.95	Abbey Road Group	Water Monitoring Well Testing

Water Monitoring Information (Well #2):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
8/16/2021	East Town Crossing	W-2	66.02	8.11	Abbey Road Group	Water Monitoring Well Testing
8/23/2021	East Town Crossing	W-2	65.87	8.26	Abbey Road Group	Water Monitoring Well Testing
8/30/2021	East Town Crossing	W-2	65.72	8.41	Abbey Road Group	Water Monitoring Well Testing
9/9/2021	East Town Crossing	W-2	65.58	8.55	Abbey Road Group	Water Monitoring Well Testing
9/13/2021	East Town Crossing	W-2	65.55	8.58	Abbey Road Group	Water Monitoring Well Testing
9/20/2021	East Town Crossing	W-2	65.66	8.47	Abbey Road Group	Water Monitoring Well Testing
9/27/2021	East Town Crossing	W-2	65.63	8.50	Abbey Road Group	Water Monitoring Well Testing
10/4/2021	East Town Crossing	W-2	65.70	8.43	Abbey Road Group	Water Monitoring Well Testing
10/18/2021	East Town Crossing	W-2	65.81	8.32	Abbey Road Group	Water Monitoring Well Testing
10/25/2021	East Town Crossing	W-2	65.98	8.15	Abbey Road Group	Water Monitoring Well Testing
11/1/2021	East Town Crossing	W-2	66.53	7.60	Abbey Road Group	Water Monitoring Well Testing
11/8/2021	East Town Crossing	W-2	67.23	6.90	Abbey Road Group	Water Monitoring Well Testing
11/17/2021	East Town Crossing	W-2	68.93	5.20	Abbey Road Group	Water Monitoring Well Testing
11/22/2021	East Town Crossing	W-2	68.98	5.15	Abbey Road Group	Water Monitoring Well Testing
11/29/2021	East Town Crossing	W-2	69.17	4.96	Abbey Road Group	Water Monitoring Well Testing
12/6/2021	East Town Crossing	W-2	68.92	5.21	Abbey Road Group	Water Monitoring Well Testing
12/13/2021	East Town Crossing	W-2	69.35	4.78	Abbey Road Group	Water Monitoring Well Testing
1/3/2022	East Town Crossing	W-2	69.30	4.83	Abbey Road Group	Water Monitoring Well Testing
1/25/2022	East Town Crossing	W-2	65.88	8.25	Abbey Road Group	Water Monitoring Well Testing-Onsite Dewatering
1/28/2022	East Town Crossing	W-2	65.05	9.08	Abbey Road Group	Water Monitoring Well Testing-Onsite Dewatering (2 Pumps Running)
2/4/2022	East Town Crossing	W-2	64.98	9.15	Abbey Road Group	Water Monitoring Well Testing-Onsite Dewatering ended 2/03/2022
2/8/2022	East Town Crossing	W-2	66.23	7.90	Abbey Road Group	Water Monitoring Well Testing
2/16/2022	East Town Crossing	W-2	67.13	7.00	Abbey Road Group	Water Monitoring Well Testing
3/9/2022	East Town Crossing	W-2	68.53	5.60	Abbey Road Group	Water Monitoring Well Testing
3/22/2022	East Town Crossing	W-2	68.43	5.70	Abbey Road Group	Water Monitoring Well Testing
3/31/2022	East Town Crossing	W-2	68.05	6.08	Abbey Road Group	Water Monitoring Well Testing
4/12/2022	East Town Crossing	W-2	67.97	6.16	Abbey Road Group	Water Monitoring Well Testing
4/19/2022	East Town Crossing	W-2	67.97	6.16	Abbey Road Group	Water Monitoring Well Testing
4/25/2022	East Town Crossing	W-2	67.73	6.40	Abbey Road Group	Water Monitoring Well Testing
5/3/2022	East Town Crossing	W-2	67.68	6.45	Abbey Road Group	Water Monitoring Well Testing
5/10/2022	East Town Crossing	W-2	67.83	6.30	Abbey Road Group	Water Monitoring Well Testing
5/18/2022	East Town Crossing	W-2	68.10	6.03	Abbey Road Group	Water Monitoring Well Testing
5/25/2022	East Town Crossing	W-2	68.43	5.70	Abbey Road Group	Water Monitoring Well Testing
6/1/2022	East Town Crossing	W-2	67.63	6.50	Abbey Road Group	Water Monitoring Well Testing
6/6/2022	East Town Crossing	W-2	67.85	6.28	Abbey Road Group	Water Monitoring Well Testing
6/16/2022	East Town Crossing	W-2	68.13	6.00	Abbey Road Group	Water Monitoring Well Testing
6/20/2022	East Town Crossing	W-2	68.03	6.10	Abbey Road Group	Water Monitoring Well Testing
6/30/2022	East Town Crossing	W-2	67.43	6.70	Abbey Road Group	Water Monitoring Well Testing

Water Monitoring Information (Well #2):

Date	Location	Boring Site #	Water Elevation	Depth	Source	Comments
7/6/2022	East Town Crossing	W-2	67.33	6.80	Abbey Road Group	Water Monitoring Well Testing
7/11/2022	East Town Crossing	W-2	67.03	7.10	Abbey Road Group	Water Monitoring Well Testing
7/19/2022	East Town Crossing	W-2	66.85	7.28	Abbey Road Group	Water Monitoring Well Testing
7/28/2022	East Town Crossing	W-2	66.88	7.25	Abbey Road Group	Water Monitoring Well Testing
8/1/2022	East Town Crossing	W-2	66.68	7.45	Abbey Road Group	Water Monitoring Well Testing
8/10/2022	East Town Crossing	W-2	66.48	7.65	Abbey Road Group	Water Monitoring Well Testing
8/15/2022	East Town Crossing	W-2	66.38	7.75	Abbey Road Group	Water Monitoring Well Testing
8/25/2022	East Town Crossing	W-2	66.28	7.85	Abbey Road Group	Water Monitoring Well Testing
8/30/2022	East Town Crossing	W-2	66.18	7.95	Abbey Road Group	Water Monitoring Well Testing
9/6/2022	East Town Crossing	W-2	66.15	7.98	Abbey Road Group	Water Monitoring Well Testing
9/12/2022	East Town Crossing	W-2	65.88	8.25	Abbey Road Group	Water Monitoring Well Testing
9/19/2022	East Town Crossing	W-2	65.86	8.27	Abbey Road Group	Water Monitoring Well Testing
9/28/2022	East Town Crossing	W-2	65.85	8.28	Abbey Road Group	Water Monitoring Well Testing
10/7/2022	East Town Crossing	W-2	65.76	8.37	Abbey Road Group	Water Monitoring Well Testing
10/12/2022	East Town Crossing	W-2	65.66	8.47	Abbey Road Group	Water Monitoring Well Testing
10/17/2022	East Town Crossing	W-2	65.49	8.64	Abbey Road Group	Water Monitoring Well Testing
10/24/2022	East Town Crossing	W-2	65.70	8.43	Abbey Road Group	Water Monitoring Well Testing
10/31/2022	East Town Crossing	W-2	65.97	8.16	Abbey Road Group	Water Monitoring Well Testing
11/7/2022	East Town Crossing	W-2	66.83	7.30	Abbey Road Group	Water Monitoring Well Testing
11/14/2022	East Town Crossing	W-2	66.85	7.28	Abbey Road Group	Water Monitoring Well Testing
11/29/2022	East Town Crossing	W-2	66.46	7.67	Abbey Road Group	Water Monitoring Well Testing
12/5/2022	East Town Crossing	W-2	66.88	7.25	Abbey Road Group	Water Monitoring Well Testing
12/16/2022	East Town Crossing	W-2	66.85	7.28	Abbey Road Group	Water Monitoring Well Testing
12/20/2022	East Town Crossing	W-2	66.61	7.52	Abbey Road Group	Water Monitoring Well Testing
12/27/2022	East Town Crossing	W-2	68.00	6.13	Abbey Road Group	Water Monitoring Well Testing
1/3/2023	East Town Crossing	W-2	68.26	5.87	Abbey Road Group	Water Monitoring Well Testing
1/9/2023	East Town Crossing	W-2	68.23	5.90	Abbey Road Group	Water Monitoring Well Testing
1/17/2023	East Town Crossing	W-2	67.44	6.69	Abbey Road Group	Water Monitoring Well Testing

MITIGATION PLAN

EAST TOWN CROSSING STREAM RESTORATION AND MIXED-USE DEVELOPMENT

MARCH 20, 2024

Soundview Consultants
Environmental Assessment
Planning + Land Use Solutions

MITIGATION PLAN

EAST TOWN CROSSING STREAM RESTORATION AND MIXED-USE DEVELOPMENT

MARCH 20, 2024

PROJECT LOCATION
2902, 13102, & 3104 EAST PIONEER AVENUE
813, 901, & 911 SHAW ROAD EAST
PUYALLUP, WASHINGTON 98374

PREPARED FOR
ASH DEVELOPMENT
1001 SHAW ROAD
PUYALLUP, WASHINGTON 98371

PREPARED BY
SOUNDVIEW CONSULTANTS LLC
2907 HARBORVIEW DRIVE
GIG HARBOR, WASHINGTON 98335
(253) 514-8952

Soundview Consultants
Environmental Assessment
Planning + Land Use Solutions

Executive Summary

Soundview Consultants LLC (SVC) has been assisting Ash Development (Applicant) with a Mitigation Plan for the proposed stream restoration and mixed-use development of a 10.93-acre site located at 2902, 13102, and 3104 East Pioneer Avenue and 813, 901, and 911 Shaw Road East in the City of Puyallup, Pierce County, Washington. The subject property consists of seven parcels situated in the Southeast ¼ of Section 26 and the Northeast ¼ of Section 35, Township 20 North, Range 4 East, W.M. (Pierce County Tax Parcel Numbers 0420264021, 0420264053, 0420264054, 0420351030, 0420351029, 0420351026 & 0420351066).

The subject property was previously investigated by John Comis Associates, LLC in 2008, 2009, and 2020 for the presence of potentially regulated wetlands, waterbodies, and fish and wildlife habitat conservation areas, with follow-up investigations in 2020 to verify initial findings. More recently, Habitat Technologies investigated the site in 2021 and again in 2022. Using current methodology, John Comis Associates (2020) and Habitat Technologies (2021) confirmed the absence of onsite wetlands. However, Habitat Technologies identified two streams on the eastern and northern portions of the site and one potential wetland offsite to the east of the site. Habitat Technologies later treated the potential wetland offsite to the east of the site as a wetland; however, no wetland hydrology indicators were observed during a summer site investigation (Habitat Technologies, 2022). The east stream (herein referred to as Stream Y) is classified as a Type IV water and the north stream (herein referred to as Stream Z) is classified as a Type III water per Puyallup Municipal Code (PMC) 21.06.1010(3)(a). Type III streams are subject to a standard 50-foot buffer, and Type IV streams are subject to a standard 35-foot buffer per PMC 21.06.1050(2). The wetland identified offsite to the east was preliminarily classified as a Category III wetland with an associated 80-foot buffer under PMC 21.06.930(2). In addition, John Comis Associates identified and delineated one wetland (previously Wetland A, herein referred to as Wetland 1) offsite to the south, as previously delineated by Herrera Environmental Consultants in 2000. Wetland 1 was classified as a Category II wetland subject to a standard 100-foot buffer per PMC 21.06.930(2).

SVC investigated the area offsite to the east for the presence of potentially-regulated wetlands, waterbodies, fish and wildlife habitat, and/or priority habitats or species in February 2023. Using current methodology, the site investigation confirmed the absence of wetlands in the area of Habitat Technologies' preliminary wetland determination in 2022. No areas met all three required wetland delineation criteria (a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology). Specifically, no wetland hydrology was observed under normal hydrologic conditions during the winter wet season when groundwater was fully recharged. No other potentially-regulated wetlands, waterbodies, or priority habitats or species were identified within 300 feet of the site. Offsite wetland determinations will be discussed in detail under separate cover. SVC conducted a joint site investigation with Washington State Department of Fish and Wildlife (WDFW) on July 19, 2023. During the site investigation, WDFW concluded that Streams Y and Z are Type F (fish habitat) streams.

The Applicant proposes a phased project to construct a mixed-use development. Phase I will include development of residential and commercial buildings, parking, utilities, stormwater infrastructure, and frontage improvements along Shaw Road East. Phase II of the project will implement the required frontage improvements along East Pioneer Avenue and expand the mixed-use development onsite. The proposed project has been carefully designed to avoid and minimize impacts to the greatest extent feasibly by utilizing the existing disturbed upland areas onsite. During Phase I, the proposed project will avoid in-water work and locate buildings and parking areas outside of modified buffers. Work within the critical area buffers will be limited to the utility crossings of the Stream Z buffer necessary to connect to existing infrastructure, the relocation of a power pole within the Stream Z buffer necessary to support required frontage improvements along East Pioneer Avenue, work necessary to provide site access from East Pioneer Avenue, and the work needed to maintain site drainage patterns. Stormwater discharge locations are proposed to be located landward of OHW. To ensure no net loss of ecological functions from Phase I, the project proposes to provide modified stream buffers that provide an equivalent buffer area as the standard buffers required per PMC 21.06.1050(2) and to rectify temporary buffer impacts (1,345 square feet) by seeding temporarily disturbed areas with a native seed mix. The proposed modified stream buffers consist of 866 square feet of Stream Z buffer decrease and 1,030 square feet of Stream Z increase.

During Phase II of the project, required frontage improvements and the proposed Stream Z crossing for site access cannot avoid critical area impacts. Given the location of Stream Z within the existing right-of-way (ROW) of East Pioneer Avenue, shifting Stream Z south is necessary and unavoidable to provide updated sidewalk, curb gutters, and landscaping to meet current City requirements. Given the proposed mixed-use development with several apartment buildings and commercial space, one site access point from Shaw Road East is not practicable. Therefore, the existing crossing from East Pioneer Avenue will need to be upgraded and widened to provide safe site access for the new development across the realigned Stream Z; the upgraded crossing will alleviate traffic issues by aiding in vehicle circulation and splitting use between two arterials and will also allow multiple access points for safety vehicles. The crossing will be designed as a bottomless culvert to allow for fish passage. Due to the realignment of Stream Z, the onsite buffer width for the new Stream Z channel is proposed to be less than the standard 50-foot buffer for a Type III stream required per PMC 21.06.1050(2), resulting in 3,594 square feet of buffer decrease. PMC 21.06.1030(1) states that relocation of Type II, III, and IV streams are permitted when the action will result in equal of better habitat and water quality and will not diminish the flow capacity of the stream. The mitigation actions described herein demonstrate how the project is anticipated to increase ecological functions when compared to the existing degraded conditions of the streams.

To offset the necessary and unavoidable direct impacts to Stream Z during Phase II, the project proposes to restore and realign Stream Z within a reestablished, riparian corridor on the northern portion of the project area. In the existing linear, ditched alignment, Stream Z is extremely degraded as the system lacks riparian cover, habitat complexity, and floodplain function and is situated in a roadside ditch with several piped segments. The proposal will provide a highly functional stream with large woody debris, flood benches, and dense riparian plantings that will all increase the complexity and functionality of the stream system. In addition, the Applicant proposes to voluntarily restore Stream Y in a new stream channel near the eastern property boundary and to enhance buffer areas surrounding the new stream channel during Phase II. In its existing alignment, Stream Y is diverted into a stormwater pond and then piped for approximately 471 feet before discharging into Stream Z along East Pioneer Avenue. Therefore, in its current alignment, Stream Y is extremely degraded and restoring the stream channel and providing buffer enhancement will increase stream habitat availability and functions. Habitat Technologies previously described Stream Z and Stream Y as seasonal streams. The streams are tributaries to Deer Creek, which provides habitats for a number of fish species. However, prior assessments by Habitat Technologies and the Puyallup Tribe did not document fish utilization within the ditch system associated with the Pioneer Way East Corridor east of the confluence with Deer Creek (Habitat Technologies, 2022). WDFW has classified the streams as Type

F (fish habitat). The proposed project will restore and enhance 74,796 square feet of buffer surrounding Streams Y and Z. The proposed buffer restoration and enhancement will provide 14,566 square feet of additional buffer in excess of the buffer areas that would be required under the standard 50-foot buffer required for Type III stream and a standard 35-foot buffer required for a Type IV stream.

The mitigation plan will provide a comprehensive stream restoration approach with watershed-level benefits to significantly increase stream functions of two tributaries that drain to Upper Deer Creek approximately 0.25-mile offsite to the west. Upper Deer Creek drains to the Puyallup River and is a gradient accessible stream for coho, Chinook, chum, pink and steelhead and also has known trout populations. In addition, Upper Deer Creek has documented water quality issues due to the 4A listing for high levels of bacteria from fecal coliform. Downgradient of the site, the Puyallup River also has documented water quality issues due to the 303d listings for high levels of bacteria from fecal coliform, high water temperatures, and high levels of mercury; these 303d listings resulted in the development of Puyallup River Watershed Fecal Coliform Total Maximum Daily Load (TMDL) Water Quality Report and Implementation Plan (WSDOE, 2011). The Puyallup River TMDL identifies Deer Creek in the Shaw Road area near the project site as an ideal area to restore riparian habitat. Further, both streams are within mapped FEMA 100-year floodplain but currently provide de minimis flood functions due to the straightened, ditched conditions. Restoring stream and riparian habitat will improve usable fish habitat within Stream Z over time, increase sediment and pollutant filtration to improve documented water quality issues, and provide flood benches to increase hydrologic functions and flow capacity that will reduce local flooding. Therefore, the project is aligned with the Puyallup River TMDL and is anticipated to result in a net gain in ecological functions in the watershed when compared to the existing degraded conditions of the stream that will be impacted from the frontage improvements and upgraded crossing. A Conceptual Mitigation Plan is provided in Chapter 2 of this report.

The City issued a Mitigated Determination of Non-Significance (MDNS) dated June 27, 2023 (City of Puyallup, 2023b) for the proposed project's Conceptual Mitigation Plan dated April 7, 2023 and provided conditions of approval in a Final Development Review Team Letter dated June 20, 2023 (City of Puyallup, 2023a). In addition, the City issues Civil Review Comments for the proposed site plan August 31, 2023 (City of Puyallup, 2023c). The proposed site plan and mitigation plan have been updated based on the City's conditions of approval provided in the Final Development Review Team Letter, the coordination with WDFW, and the civil review comments. Most recent changes to the site plan include a reduction in the number of proposed parking stalls, relocation of two buildings to reduce impacts to the buffer of Stream Z, and the relocation of a power pole along East Pioneer Avenue further within the buffer of Stream Z to support frontage improvements along the road.

The table below identifies the critical areas and summarizes the potential regulatory status by local, state, and federal agencies.

Wetland/ Waterbody Name	City Category/ Type[1]	State Category/Type[2]	Regulated Under PMC Chapter 21.06	Regulated Under RCW 90.48	Regulated Under Clean Water Act
Wetland 1	II	II	Yes	Yes	Likely
Stream Y	Type IV	F	Yes	Yes	Likely
Stream Z	Type III	F	Yes	Yes	Likely

Note:

1. Current Washington State Department of Ecology (WSDOE) wetland rating system (Hruby, 2014) per PMC 21.06.910(3); stream definitions per PMC 21.06.1010(3)(a) and Habitat Technologies (2021).
2. Current Washington State Department of Ecology (WSDOE) wetland rating system (Hruby, 2014) per PMC 21.06.910(3); stream classifications per Washington Administrative Code (WAC) 222-16-030.

The table below identifies the proposed stream impacts.

Stream	City Type[1]	State Type[2]	Impact Type	Impact Area
Z	Type III	Type F	Direct	592 LF

Note:

1. Stream definitions per PMC 21.06.1010(3)(a) and Habitat Technologies (2021).
2. Stream classification per Washington Administrative Code (WAC) 222-16-030.

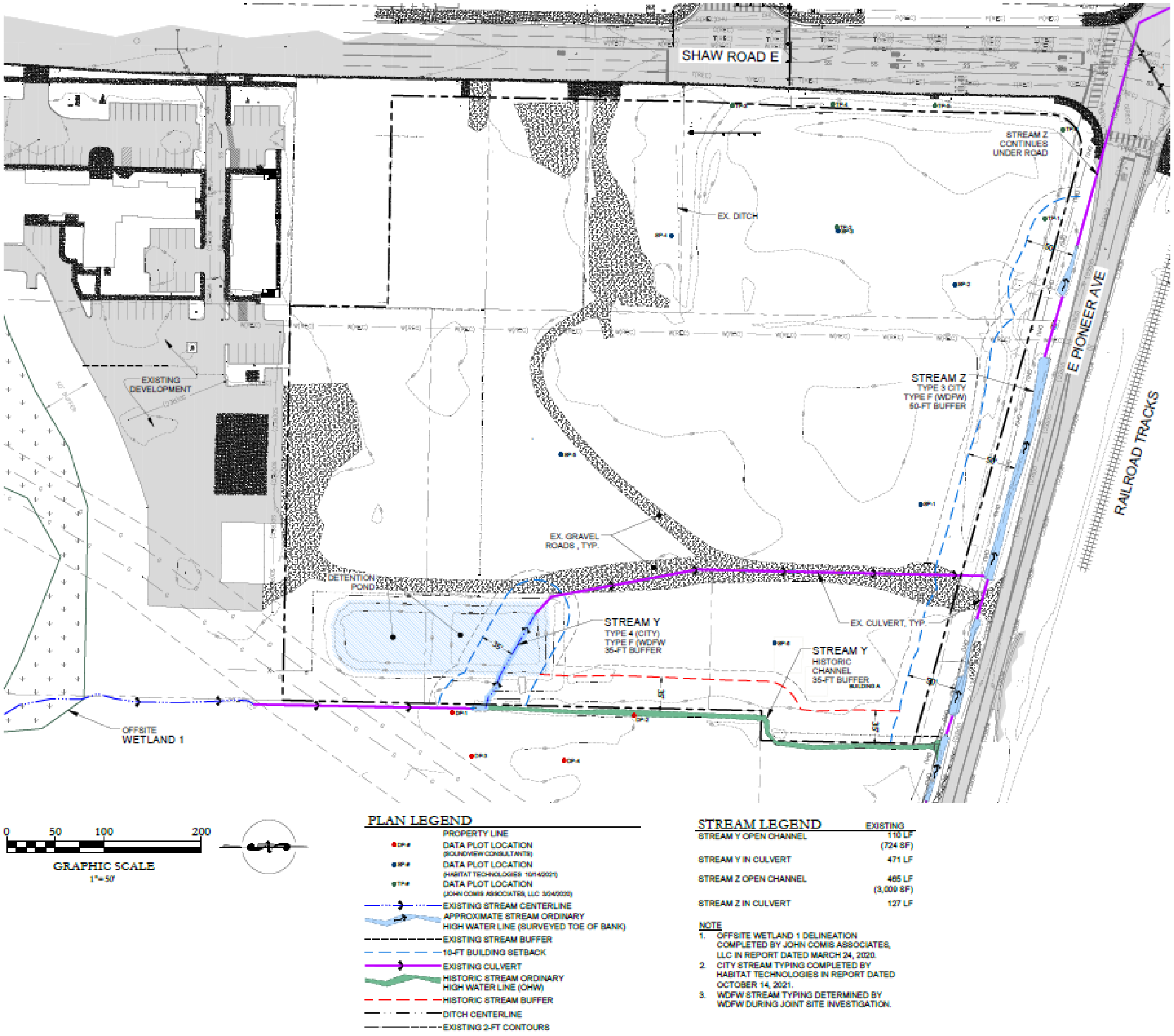
The summary table below identifies linear feet of stream segments in the project area pre- and post-development.

Stream	City Type[1]	State Type[2]	Condition	Existing	Proposed
Y	IV	F	Open Channel	110 LF	463 LF
			Culvert	471 LF	0 LF
			Total	**581 LF**	**463 LF**
Z	III	F	Open Channel	465 LF	475 LF
			Culvert	127 LF	138 LF
			Total	**592 LF**	**613 LF**

Note:

1. Stream definitions per PMC 21.06.1010(3)(a) and Habitat Technologies (2021).
2. Stream classification per Washington Administrative Code (WAC) 222-16-030.

Site Map


SHAW ROAD E
STREAM Z CONTINUES UNDER ROAD
EX. DITCH
E PIONEER AVE
STREAM Z
TYPE 3 CITY
TYPE F (WDFW)
50-FT BUFFER
RAILROAD TRACKS
EXISTING DEVELOPMENT
EX. GRAVEL ROADS, TYP.
DETENTION POND
STREAM Y
TYPE 4 (CITY)
TYPE F (WDFW
35-FT BUFFER
EX. CULVERT, TYP.
STREAM Y
HISTORIC CHANNEL
35-FT BUFFER
OFFSITE WETLAND 1
0
50
100
200
GRAPHIC SCALE
1"= 50'
PLAN LEGEND
PROPERTY LINE
DATA PLOT LOCATION (SOUNDVIEW CONSULTANTS)
DATA PLOT LOCATION (HABITAT TECHNOLOGIES 10/14/2021)
DATA PLOT LOCATION (JOHN COMIS ASSOCIATES, LLC 3/24/2020)
EXISTING STREAM CENTERLINE
APPROXIMATE STREAM ORDINARY HIGH WATER LINE (SURVEYED TOE OF BANK)
EXISTING STREAM BUFFER
10-FT BUILDING SETBACK
EXISTING CULVERT
HISTORIC STREAM ORDINARY HIGH WATER LINE (OHW)
HISTORIC STREAM BUFFER
DITCH CENTERLINE
EXISTING 2-FT CONTOURS
STREAM LEGEND
EXISTING
STREAM Y OPEN CHANNEL 110 LF (724 SF)
STREAM Y IN CULVERT 471 LF
STREAM Z OPEN CHANNEL 465 LF (3,009 SF)
STREAM Z IN CULVERT 127 LF
NOTE
1. OFFSITE WETLAND 1 DELINEATION COMPLETED BY JOHN COMIS ASSOCIATES, LLC IN REPORT DATED MARCH 24, 2020.
2. CITY STREAM TYPING COMPLETED BY HABITAT TECHNOLOGIES IN REPORT DATED OCTOBER 14, 2021.
3. WDFW STREAM TYPING DETERMINED BY WDFW DURING JOINT SITE INVESTIGATION.

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Appendices

Chapter 1. Regulatory Considerations

The proposed project utilizes a combination of prior referenced critical area reports and current site investigations for a complete determination of identified critical areas. John Comis Associates (2020) established the presence of offsite Wetland 1 (previously referred to as Wetland A) south of the subject property. Most recently, Habitat Technologies (2021) confirmed the absence of onsite wetlands and the presence of two onsite streams (Streams Y and Z) on the eastern and northern portions of the site, respectively. A copy of the prior referenced critical areas report is provided under separate cover. In addition, SVC's site investigation in February 2023 confirmed the absence of offsite wetlands to the east of the subject property. No other potentially-regulated wetlands, waterbodies, fish and wildlife habitat, or priority habitats or species were identified within 300 feet of the site during the site investigations.

1.1 Local Considerations

1.1.1 Buffer Standards

PMC 21.06.910(3) has adopted the current wetland rating system for western Washington (Hruby, 2014). Category II wetlands provide a high level of function and ecological characteristics. Wetland 1 was identified offsite to the south of the subject property by John Comis Associates (2020). Wetland 1 was classified as a Category II wetland subject to a standard 100-foot buffer per PMC 21.06.930(2). The buffer associated with Wetland 1 does not project onsite.

Habitat Technologies (2021) identified two streams on the eastern and northern portions of the site. The east stream (Stream Y) is classified as a Type IV water and the north stream (Stream Z) is classified as a Type III water per PMC 21.06.1010(3)(a). Type III streams are subject to a standard 50-foot buffer, and Type IV streams are subject to a standard 35-foot buffer per PMC 21.06.1050(2).

A building setback of 10 feet is required for all buildings and structures from the edges of all critical area buffers per PMC 21.06.840.

1.1.2 Mitigation Sequencing

The Applicant proposes necessary and unavoidable direct impacts to Stream Z. Under PMC 21.06.1020(1) and PMC 21.06.1080, adverse impacts to riparian and non-riparian habitats shall be fully mitigated in accordance with the standards set forth in PMC 21.06.610. Per PMC 21.06.610(1), when an alteration to a critical area is proposed, the applicant shall demonstrate that all reasonable efforts have been taken to avoid, minimize, or compensate for impacts in that order with the mitigation definition contain in PMC 21.06.210(84).

a) *Avoiding the impact altogether by not taking a certain action or parts of actions.*

   The Applicant proposes a phased project to construct a mixed-use development. Phase I will include development of residential and commercial buildings, parking, utilities, stormwater infrastructure, and frontage improvements along Shaw Road East. Phase II of the project will implement the required frontage improvements along East Pioneer Avenue and Stream Z crossing and expand the mixed-use development onsite.

The proposed project has been carefully designed to avoid and minimize impacts to the greatest extent feasibly by utilizing the existing disturbed upland areas onsite. During Phase I, the proposed project will avoid in-water work (i.e. work below OHW) and locate buildings and parking areas outside of modified buffers. To provide a reasonable site and building layout on the northwest corner of the site, the project proposes decreasing a portion of the Stream Z buffer width below the standard 50-foot buffer for a Type III stream required per PMC 21.06.1050(2). Work within the modified critical area buffers will be limited to the utility crossings of the Stream Z buffer necessary to connect to existing infrastructure, the relocation of a power pole within the Stream Z buffer necessary to support required frontage improvements along East Pioneer Avenue, work necessary to provide site access from East Pioneer Avenue, and the work needed to maintain site drainage patterns. Stormwater discharge locations are proposed to be located landward of OHW.

During Phase II of the project, required frontage improvements and the proposed stream crossing for site access cannot avoid critical area impacts. Given the location of Stream Z within the exiting right-of-way (ROW) of East Pioneer Avenue, shifting Stream Z south is also necessary and unavoidable to provide updated sidewalk, curb gutters, and landscaping to meet current City requirements. Due to the shifting of Stream Z to the south, the proposed site layout will result in a variable buffer width along the new Stream Z channel that is less than the standard 50-foot buffer width for a Type III stream specified under PMC 21.06.1050(2).

Given the proposed mixed-use development with several apartment buildings and commercial space, one site access point from Shaw Road East is not practicable. Therefore, the existing crossing from East Pioneer Avenue will need to be upgraded and widened to provide safe site access for the new development; this site access will alleviate traffic issues by aiding in vehicle circulation and splitting use between two arterials and will also allow multiple access points for safety vehicles. PMC 21.06.1030(1) states that relocation of Type II, III, and IV streams are permitted when the action will result in equal of better habitat and water quality and will not diminish the flow capacity of the stream; the mitigation actions described herein demonstrate how the project is anticipated to increase ecological functions when compared to the existing degraded conditions of the streams.

The project avoids direct impacts and take of listed threated or endangered species per PMC 21.06.1020(4) as no threatened or endangered species are present in the project area.

b) *Minimizing impacts by limiting the degree or magnitude of the action and its implementation.*

During Phase I, the proposed project has minimized impacts by avoiding in-water work, locating buildings and parking areas outside of modified buffer widths for the existing stream alignments and incorporating an underground stormwater vault that avoids the need for an above ground detention facility.

The site plan has also been revised to reduce the number of proposed parking stalls and relocated two buildings in proximity to Stream Z, reducing stream buffer impacts and allowing for and increased buffer width between Stream Z and the proposed development during Phase II. During Phase II, the proposed direct impacts to Stream Z are the minimum necessary to provide the required frontage improvements and upgrade the existing crossing from East Pioneer Avenue for safe site access. The upgraded crossing will consist of a bottomless, fish-passable, culvert. To accommodate future potential fish passage along Stream Z at the request of WDFW, the project proposes to install a box culvert to connect the new Stream Z channel to the existing downgradient piped Stream Z. Appropriate BMPs and TESC measures will be implemented for the duration of project activities to minimize potential construction impacts. The stream relocation work will be completed in the dry season when hydrology is either absent or minimal to limit temporary turbidity.

c) *Rectifying impacts by repairing, rehabilitating, or restoring the affected environment.*

During Phase I, the proposed project will rectify the temporary Stream Z buffer impacts by replanting temporarily impacted areas with a native seed mix. To rectify the proposed Stream Z buffer decrease below standard buffer width, the project proposes to add additional buffer area to provide an equivalent buffer area as the standard buffer required per PMC 21.06.1050(2). The proposed modified stream buffers consist of 866 square feet of Stream Z buffer decrease and 1,030 square feet of Stream Z increase.

To offset the necessary and unavoidable direct impacts to Stream Z during Phase II, the project proposes to restore and realign Stream Z within a reestablished riparian corridor on the northern portion of the project area. In the existing linear, ditched alignment, Stream Z is extremely degraded as the system lacks riparian cover, habitat complexity, and floodplain function and is situated in a roadside ditch with several piped segments. The proposal will provide a protected riparian corridor with a highly functional stream with large woody debris, flood benches, and dense riparian plantings that will all increase the complexity and functionality of the stream system. In addition, the Applicant proposes to voluntarily restore Stream Y to a new, offsite stream channel near the east property boundary and to enhance and restore the surrounding buffer during Phase II. In its existing alignment, Stream Y is diverted into a stormwater pond and then piped for approximately 471 feet before discharging into Stream Z along East Pioneer Avenue. Therefore, in its current alignment, Stream Y is extremely degraded and daylighting and creating a new stream channel will increase stream habitat availability and functions. The restored stream channels are proposed to be protected by 74,796 square feet of buffer, exceeding the buffer area that would result from a standard application of a 35-foot buffer to a Type IV stream and 50-foot buffer to a Type III stream by 14,566 square feet.

The mitigation plan will provide a comprehensive stream restoration approach with watershed-level benefits to significantly increase stream functions of two tributaries that drain to Upper Deer Creek approximately 0.25-mile offsite to the west. Upper Deer Creek drains to the Puyallup River and is a gradient accessible stream for coho, Chinook, chum, pink and steelhead and also has known trout populations. In addition, Upper Deer Creek has documented water quality issues due to the 4A listing for high levels of bacteria from fecal coliform. Downgradient of the site, the Puyallup River also has documented water quality issues due to the 303d listings for high levels of bacteria from fecal coliform, high water temperatures, and high levels of mercury; these 303d listings resulted in the development of Puyallup River Watershed Fecal Coliform Total Maximum Daily Load (TMDL) Water Quality Report and Implementation Plan (WSDOE, 2011). The Puyallup River TMDL identifies Deer Creek in the Shaw Road area near the project site as an ideal area to restore riparian habitat. Further, both streams are within mapped FEMA 100-year floodplain but currently provide de minimis flood functions due to the straightened, ditched conditions. Restoring stream and riparian habitat will improve usable fish habitat within Stream Z over time, increase sediment and pollutant filtration to improve documented water quality issues, and provide flood benches to increase hydrologic functions and flow capacity that will reduce local flooding. Therefore, the project is aligned with the Puyallup River TMDL, will result in equal or better habitat and water quality per PMC 21.06.1030(1), and is anticipated to result in a net gain in ecological functions in the watershed per PMC 21.06.1080(3) when compared to the existing degraded conditions of the stream that will be impacted from the frontage improvements and upgraded crossing.

d) *Reducing or eliminating an impact over time by preservation and maintenance operations during the life of the action.*

The stream restoration areas created during Phase II will be monitored for a period of up to 10 years to ensure success of the mitigation actions over time. In addition, the mitigation areas will be placed in a separate tract or dedicated to the City as a permanent protective mechanism per PMC 21.06.610(7) and PMC 21.06.830. Fencing and signage will also be provided per PMC 21.06.810 to reduce intrusion into the critical areas and prevent future impacts to the critical areas.

e) *Compensating for an impact by replacing or providing substitute resources or environments.*

See response to criterion C above. During Phase I, the proposed Stream Z buffer decrease will be compensated through the addition of buffer area. During Phase II, the unavoidable direct stream impacts will be compensated through onsite and offsite, in-kind stream creation mitigation measures. The project will ensure no net loss of area under PMC 21.06.1080(3) and PMC 21.06.610(2) by providing buffer enhancement and a minimum 1:1 ratio of creation to impacts to achieve equivalent or greater functions for Stream Z per PMC 21.06.1080(2). The mitigation will result in no net loss of ecological functions when compared to the existing degraded condition of the stream proposed to be impacted.

f) *Monitoring the mitigation and taking remedial action when necessary.*

The stream mitigation and voluntary restoration areas created during Phase II will be monitored for a period of 10 years to ensure success of the actions over time, consistent with PMC 21.06.630. Appropriate contingency measures will be implemented if monitoring indicates that goals and performance standards of the mitigation plan are not being met.

1.1.3 Performance Standards – Alteration of Streams and Riparian Habitats

PMC 21.06.1030 outlines standards for allowed alterations to streams and associated riparian habitats. Necessary and unavoidable stream impacts are required for frontage improvements, upgrading an existing crossing from East Pioneer Avenue for additional site access, and providing power to the property.

PMC 21.06.1030(2) states the following for proposed bridges/culverts:

> *Bridges are the preferred crossing for fish-bearing streams. Culverts are allowed only in Type II, III, and IV streams; provided, that they are designed according to the Washington Department of Fish and Wildlife criteria for fish passage, are necessary for utility crossings, road crossings, or other limited access situations, and are in accordance with a state Hydraulic Project Approval permit. The applicant or property owner shall keep any culvert free of debris and sediment at all times to allow free passage of water and, if applicable, fish. The city may require that a stream be removed from a culvert as a condition of approval, unless the culvert is not detrimental to fish habitat or water quality, or removal would be detrimental to fish or wildlife habitat or water quality.*

The proposed crossing will be in accordance with the most recent WDFW crossing design criteria for fish passage, and the Applicant will apply for a Hydraulic Project Approval (HPA) from WDFW. The crossing is essential for providing necessary site access. Having two site access points is required by City development standards and will alleviate traffic issues by aiding in vehicle circulation and splitting use between two arterials and will also allow multiple access points for safety vehicles. The new/upgraded crossing will be bottomless to allow free passage of water. The bottomless crossing will be monitored to ensure that it functions as intended over time.

PMC 21.06.1030(6) states that utility lines may be permitted to cross streams and riparian habitat areas subject to the following standards:

a) *Impacts to fish and wildlife shall be avoided to the maximum extent possible;*

   The proposed utility installations are necessary to connect to existing infrastructure and to maintain existing site drainage patterns. In addition, the relocation of an existing power pole adjacent to Stream Z further within the stream buffer is necessary to support frontage improvements. During Phase I, the project proposes to install a new power drop, consisting of a transformer box and electrical line within the existing Stream Z buffer. The new power drop will connect to an existing power line along East Pioneer Avenue; the proposed transformer box and electrical line will be located as near to an existing power pole as feasible to minimize the length of electrical line in the buffer. As documented in the Conceptual Mitigation Plan dated April 7, 2023, the project previously proposed to install a stormwater line in the Stream Z buffer during Phase I to connect to an existing pipe adjacent to East Pioneer Avenue using a manhole. The proposed stormwater discharge from the site has been redesigned to avoid the manhole connection as requested by WDFW. The proposed stormwater discharge will release treated and detained runoff into the Stream Z buffer. The discharge infrastructure is anticipated to consist of temporary release points during Phase I that will be replaced with a permanent discharge infrastructure during Phase II. The power pole proposed to be relocated is an existing impact within the stream buffer and will result only in new temporary impacts that will be fully restored.

b) *Installation shall be accomplished by boring beneath the scour depth and hyporheic zone of the water body and channel migration zone, where feasible;*

   The proposed stormwater discharge location and power pole relocation will be located landward of the Stream Z OHW. The proposed transformer box will be located within the existing Stream Z buffer; the proposed electrical line will cross a piped section of the existing and proposed Stream Z alignments. Due to the presence of piped stream sections, boring beneath the scour depth and hyporheic zone of the water body is not applicable.

c) *The utilities shall cross at an angle greater than 60 degrees to the centerline of the channel in streams or perpendicular to the channel centerline whenever boring under the channel is not feasible;*

   No stormwater crossing of the stream channel is proposed. The proposed transformer box and relocated power pole will be located within the existing Stream Z buffer; the proposed electrical line will cross a piped section of the existing and proposed Stream Z alignments.

d) *Crossings shall be contained within the footprint of an existing road or utility crossing where possible;*

The proposed stormwater discharge location has been revised as requested by WDFW to avoid a manhole connection to an existing pipe conveying Stream Z waters downgradient of the site. The proposed stormwater discharge location will be located landward of the Stream Z OHW and is designed to maintain existing site drainage patterns given the site grading.

No power crossings currently existing along East Pioneer Avenue and crossing location is limited by the proximity of adjacent power poles.

e) *The utility route shall avoid paralleling the stream or following a down-valley course near the channel where feasible; and*

The proposed stormwater discharge and electric utilities will be perpendicular to the stream to the extent feasible. In addition, the existing buffer conditions are degraded and temporary impacts are proposed to be restored using a native seed mix.

f) *The utility installation shall not increase or decrease the natural rate of channel migration.*

The proposed utility crossings will not disturb the new stream channel and will not increase or decrease the rate of channel migration.

1.2 State Considerations

The identified streams and offsite wetland are also likely to be regulated as natural surface waters by the WSDOE under the Revised Code of Washington (RCW) 90.48.

RCW 77.55 requires that in-water work requires Hydraulic Project Approval (HPA) from WDFW. WDFW conducted a joint site investigation with SVC on July 19, 2023. During the joint site investigation, WDFW determined that Streams Z and Y were Type F (fish habitat) streams based on the field observations and prior WDFW fish passage inventory assessment notes.

1.3 Federal Considerations

On January 18, 2023, USACE and EPA published a revised definition of “Waters of the United States.” The revised rule becomes effective on March 20, 2023. Under the 2023 revised rule, Waters of the United States is described as follows (USACE and EPA, 2023):

(a) Waters of the United States means:

(1) Waters which are: (i) Currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (ii) The territorial seas; or (iii) Interstate waters, including interstate wetlands;

(2) Impoundments of waters otherwise defined as waters of the United States under this definition, other than impoundments of waters identified under paragraph (a)(5) of this section;

(3) Tributaries of waters identified in paragraph (a)(1) or (2) of this section: (i) That are relatively permanent, standing or continuously flowing bodies of water; or (ii) That either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section;

(4) Wetlands adjacent to the following waters: (i) Waters identified in paragraph (a)(1) of this section; or (ii) Relatively permanent, standing or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3)(i) of this section and with a continuous surface connection to those waters; or (iii) Waters identified in paragraph (a)(2) or (3) of this section when the wetlands either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section;

(5) Intrastate lakes and ponds, streams, or wetlands not identified in paragraphs (a)(1) through (4) of this section: (i) That are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (a)(1) or (a)(3)(i) of this section; or (ii) That either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of waters identified in paragraph (a)(1) of this section.

Wetland 1 appears hydrologically connected to Stream Y. Streams Y and Z are relatively permanent tributaries that discharge into Upper Deer Creek and eventually the Puyallup River, a traditional navigable water. Therefore, the identified critical areas are likely jurisdictional under the Clean Water Act. The project proposal assumes that the USACE will assert jurisdiction over the identified streams and wetland. On May 25, 2023, the U.S. Supreme Court issued a decision affecting the definition of Waters of the United States in Sackett Et Ux. V Environmental Protection Agency Et Al. While USACE is in receipt of the Supreme Court decision, no formal, revised definition of Waters of the United States has been issued at the time of this report drafting. The proposed project therefore continues to assume that the identified streams and wetland are considered Waters of the United States.

Chapter 2. Conceptual Mitigation Plan

The proposed compensatory mitigation actions for the project attempt to strike a balance between achieving project goals as well as a positive ecological result. In general, joint USACE and EPA rules have been established that require more careful mitigation planning efforts utilizing a watershed approach in site selection (USACE & EPA, 2008). The proposed impacts and mitigation actions attempt to closely adhere to these rules and to the local critical areas regulations specified in PMC Chapter 21.06 and local watershed planning and restoration documents. This chapter presents the mitigation details for the proposed mixed-use project.

The Applicant will submit any proposed substantial changes to the project or mitigation plan, such as significant changes to the amount, location, or design of mitigation; the goals, benchmarks, or performance standards; the monitoring or adaptive management provisions, to WSDOE for review and approval prior to implementation. Minor changes, such as alterations to the species listed in the planting plan, will be documented in the as-built report.

2.1 Purpose and Need

The purpose of the proposed project is to provide a mixed-use development that will help alleviate the shortage of housing in the greater Seattle area and expand the local economy by providing new services to the area through available commercial space.

2.2 Description of Impacts

The Applicant proposes a phased project to construct a mixed-use development. Phase I will include development of residential and commercial buildings, parking, utilities, stormwater infrastructure, and frontage improvements along Shaw Road East. Phase II of the project will implement the required frontage improvements along East Pioneer Avenue and expand the mixed-use development onsite. The proposed project has been carefully designed to avoid and minimize impacts to the greatest extent feasibly by utilizing the existing disturbed upland areas onsite. During Phase I, the proposed project will avoid in-water work and locate buildings and parking areas outside of modified buffers. Work within the critical area buffers will be limited to the utility crossings of the Stream Z buffer necessary to connect to existing infrastructure, the relocation of a power pole within the Stream Z buffer necessary to support required frontage improvements along East Pioneer Avenue, work necessary to provide site access from East Pioneer Avenue, and the work needed to maintain site drainage patterns. Stormwater discharge locations are proposed to be located landward of OHW. During Phase II of the project, required frontage improvements and the proposed Stream Z crossing for site access cannot avoid critical area impacts. Mitigation sequencing for the proposed project is provided under Section 1.1.2 Mitigation Sequencing.

Under Phase I, approximately 1,345 square feet of temporary impacts to the existing Stream Z buffer are proposed are anticipated to install the power drop, which will consist of a transformer box and electrical line, and to relocate an existing power pole adjacent to East Pioneer Avenue to support required frontage improvements.

Under Phase II, the project requires the complete fill and relocation of 592 linear feet of the Stream Z channel to provide City-required frontage improvements. A crossing of the proposed, realigned

Stream Z channel is required to provide safe site access, allow multiple points of access for emergency vehicles, and alleviate traffic congestion by aiding in vehicle circulation and splitting use between two arterials. Due to the realignment of Stream Z, the onsite buffer width for the new stream channel will be less than the standard 50-foot buffer for a Type III stream required per PMC 21.06.1050(2), resulting in 3,594 square feet of buffer decrease. The site plan has recently been revised to reduce the number of proposed parking stalls and relocate two buildings on the northwest portion of the subject property, minimizing the proposed buffer decrease. Temporary construction impacts may also occur but will be minimized to the greatest extent feasible with the implementation of all appropriate BMPs and TESC measures.

The Applicant proposes to voluntarily restore Stream Y within a new stream channel near the east property boundary and to enhance and restore a buffer surrounding the stream channel. The proposed beneficial realignment of Stream Y may also result in temporary stream impacts. Habitat Technologies previously described Stream Z and Stream Y as seasonal streams. The streams are tributaries to Deer Creek, which provides habitats for a number of fish species. However, prior assessments by Habitat Technologies and the Puyallup Tribe did not document fish utilization within the ditch system associated with the Pioneer Way East Corridor east of the confluence with Deer Creek (Habitat Technologies, 2022). During the joint site investigation with WDFW, WDFW characterized Streams Y and Z as Type F (fish habitat) streams.

2.2.1 Permanent Stream Impacts

In the existing linear, ditched alignment, Stream Z is extremely degraded as the system is situated in a roadside ditch with several piped segments and lacks riparian cover, habitat complexity, and floodplain function. The stream consists of one long run that lacks pool and riffle sequences. The stream along the majority of its length is choked with non-native, invasive reed canarygrass, which reduces water velocity and creates low levels of dissolved oxygen due to the stagnant conditions and die-off of vegetative material. The majority of the onsite stream channel will be permanently filled, and portions of the stream piped will be modified pre- and post-development based on frontage improvement requirements and existing conditions. The proposed stream relocation will result in a permanent loss of existing degraded habitat. Refer to Appendix C for photographs of Stream Z in its existing degraded condition.

A summary of impacted streams is provided in Table 1 below.

Table 1. Stream Impact Summary

Stream	City Type[1]	State Type[2]	Impact Type	Impact Area
Z	Type III	Type F	Direct	592 LF

Notes:

1. Stream definitions per PMC 21.06.1010(3)(a) and Habitat Technologies (2021).
2. Stream typing per Washington Administrative Code (WAC) 222-16-030.

2.2.1 Temporary Stream Impacts

To minimize temporary impacts, stream relocation activities will occur in the summer during low stream flow or dry conditions. Dewatering activities associated with the realignment of Stream Z and restoration of Stream Y are not anticipated to significantly impact fish and other aquatic vertebrate species potentially present in the channels at the time of construction given the timeline of construction in the summer months when hydrology is minimal and with all appropriate BMPs and TESC measures in place.

If water is present in the existing stream channels prior to realignment, then fish exclusion, capture and relocation actions and water quality monitoring actions will be implemented. Temporary turbidity increases within the new stream channels of Streams Y and Z are likely to occur during the rewatering of the new stream channels. Rewatering within the new channels is not anticipated to be completed in more than one segment for each stream separately. The Washington Administrative Code (WAC) 173-201A-200(1)(e) makes allowances for a temporary area of mixing during and immediately after in-water construction activities subject to the constraints of WAC 173-201A-400(4) and (6). For waters less than or equal to 10 cfs flow at the time of construction, the point of compliance shall be 100 feet downstream of the action. Water quality monitoring will be completed to evaluate compliance during rewatering, and fish exclusion nets will remain in place until suspended sediment levels match the point of compliance. The proposed fish exclusion and sediment controls are anticipated to lead to an avoidance or significant reduction in direct fish exposure to elevated suspended sediments if fish are present in the streams. A Water Quality Monitoring Plan has been prepared under separate cover. A Fish Protection and Exclusion Plan will be prepared under separate cover if requested by regulatory agencies.

2.3 Stream and Riparian Mitigation Strategy

2.3.1 Phase I

1,345 square feet of temporary impacts to the existing Stream Z buffer resulting from the power drop (e.g. transformer box and electric line) will be restored through reseeding of the existing degraded buffer using a native seed mix. 1,030 of Stream Z buffer area will be added to offset the impacts to 866 square feet of buffer.

2.3.2 Phase II

The compensatory mitigation actions outlined herein are intended to compensate for lost stream functions and values by providing an overall improvement in water quality, hydrologic, and habitat functions according to the needs of the site, local sub-basin, and overall Puyallup River watershed. The unavoidable direct stream impacts will be compensated through onsite and offsite, in-kind stream creation mitigation measures. The project will ensure no net loss of area under PMC 21.06.1080(3) and PMC 21.06.610(2) by providing a minimum 1:1 stream creation to impact ratio to achieve equivalent or greater Stream Z functions per PMC 21.06.1080(2) (Table 2). To offset the necessary and unavoidable direct impacts to Stream Z, the project proposes to restore and realign Stream Z within a reestablished riparian corridor on the northern portion of the project area. Voluntary restoration of Stream Y will occur through realignment of the stream through a new stream channel that is located immediately offsite adjacent to the eastern property boundary and buffer restoration and enhancement. 74,796 square feet of buffer enhancement and restoration is proposed to protect the realigned Streams Y and Z.

In the existing linear, ditched alignment, Stream Z is extremely degraded as the system lacks riparian cover, habitat complexity, and floodplain function and is situated in a roadside ditch with several piped segments. The proposal will provide a protected riparian corridor with a highly functional stream with large woody debris, flood benches, and dense riparian plantings that will all increase the complexity and functionality of the stream system. In addition, the Applicant proposes to restore Stream Y to a new stream channel immediately offsite adjacent to the eastern property boundary and restore and enhance the stream buffer. In its existing alignment, Stream Y overflows into a stormwater pond and is then piped for approximately 471 feet before discharging into Stream Z along East Pioneer Avenue. The proposed realignment of Stream Y will daylight the stream, increasing functional stream habitat (Table 2). Table 2 quantifies the length and condition of stream segments onsite pre- and post-development.

Table 2. Summary of Stream Segments Pre- and Post-Development

Stream	City Type[1]	State Type[2]	Condition	Existing	Proposed
Y	IV	F	Open Channel	110 LF	463 LF
			Culvert	471 LF	0 LF
			Total	**581 LF**	**463 LF**
Z	III	F	Open Channel	465 LF	475 LF
			Culvert	127 LF	138 LF
			Total	**592 LF**	**613 LF**

Notes:

1. Stream definitions per PMC 21.06.1010(3)(a) and Habitat Technologies (2021).
2. Stream typing per Washington Administrative Code (WAC) 222-16-030.

The mitigation plan will provide a comprehensive stream restoration approach with watershed-level benefits to significantly increase stream functions of two tributaries that drain to Upper Deer Creek approximately 0.25-mile offsite to the west. Upper Deer Creek drains to the Puyallup River and is a gradient accessible stream for coho, Chinook, chum, pink and steelhead and also has known trout populations. In addition, Upper Deer Creek has documented water quality issues due to the 4A listing for high levels of bacteria from fecal coliform. Downgradient of the site, the Puyallup River also has documented water quality issues due to the 303d listings for high levels of bacteria from fecal coliform, high water temperatures, and high levels of mercury; these 303d listings resulted in the development of Puyallup River Watershed Fecal Coliform Total Maximum Daily Load (TMDL) Water Quality Report and Implementation Plan (WSDOE, 2011). The Puyallup River TMDL identifies Deer Creek in the Shaw Road area near the project site as an ideal area to restore riparian habitat. Further, both streams are within mapped FEMA 100-year floodplain but currently provide de minimis flood functions due to the straightened, ditched conditions. Restoring stream and riparian habitat will improve usable fish habitat within the streams over time, increase sediment and pollutant filtration to improve documented water quality issues, and provide flood benches to increase hydrologic functions and flow capacity that will reduce local flooding. Therefore, the project is aligned with the Puyallup River TMDL, will result in equal or better habitat and water quality per PMC 21.06.1030(1), and is anticipated to result in a net gain in ecological functions in the watershed per PMC 21.06.1080(3) when compared to the existing degraded conditions of the stream that will be impacted from the frontage improvements and upgraded crossing.

"Pilot channels" will be created for the new Streams Z and Y that will naturally scour to create a sinuous stream with pool and riffle structure. Creating a pilot channel allows the stream to naturally form within the constructed bankfull width. The restored Stream Z channel will connect to the existing downgradient piped stream infrastructure with a box culvert. The restored stream channels will consist of meandering channels with connected flood terrace habitats within a riparian corridor containing native forest, shrub, and herbaceous plant communities. The stream creation will provide gradual side slopes above the OHWM and created flood terraces. Large woody debris will be incorporated along the realigned and restored stream channels for additional habitat complexity and provide cover for aquatic wildlife. The proposed Stream Z and Stream Y upland buffers will also be restored and enhanced to provide sediment and pollutant filtration, reduction of surface flows, and habitat interspersion and complexity beneficial to urban fauna. Once established, the riparian habitat corridor will provide immediate and long-term benefits for terrestrial and aquatic wildlife and provide cool, clean, and clear water from the native plantings, which will increase stream shading, stormwater filtration, and wood recruitment as well as decreased streambank erosion.

The proposed native plant communities will be established according to location relative to the stream channels and topographic position within the remaining riparian corridor buffer areas. Tree and shrub plantings are proposed. Willows (*Salix* spp.) will dominate the banks of the stream channels to provide bank stability and shading. The proposed native species have been carefully selected according to indicator status and local vegetation observations to ensure the plants take root and thrive in the newly created riparian corridor. Given the limited space within the riparian corridor, smaller trees will be proposed to maximize use and plant quantities within the area to ensure dense screening and protections to Streams Y and Z. With establishment of the protective riparian corridor, fencing and signage around the entire sensitive areas tracts, and implementation of the required monitoring and maintenance actions, the mitigation areas are projected to be highly functional, persistent, and successful.

The proposed actions include, but are not limited to, the following:

- Install bottomless culvert crossing of the new Stream Z channel and box culvert to connect the new Stream Z channel to the existing piped stream infrastructure;
- Realign and restore Stream Z within a new riparian corridor;
- Realign and restore Stream Y within a new riparian corridor;
- Pre-treat invasive plants with an herbicide approved by the Washington State Department of Agriculture for use in aquatic areas. After pre-treatment, grub to remove the invasive plants and replant all cleared areas with native trees, shrubs, and ground covers listed in Appendix A; Pre-treatment of the invasive plants should occur a minimum of two weeks prior to removal;
- Replant all impacted areas with native trees, shrubs, and groundcovers listed in Appendix A, or substitutes approved by the responsible Project Scientist, to help retain soils, filter stormwater, and increase biodiversity;
- Install large woody debris habitat features within the realigned Stream Z channel and restored Stream Y channel;
- An approved native seed mix will be used to seed the disturbed mitigation areas after planting to reduce short-term erosion potential;
- Maintain and control invasive plants annually, at a minimum, or more frequently if necessary. Maintenance to reduce the growth and spread of invasive plants is not restricted to chemical applications but may include hand removal, if warranted;
- Provide dry-season irrigation as necessary to ensure native plant survival;
- Install split-rail fencing and critical area signage at the locations indicated in Appendix A;
- Store all construction equipment and materials outside of the critical areas and associated buffers;

- Direct exterior lights away from the streams and buffers wherever possible; and
- Place all activities that generate excessive noise (e.g., generators and air conditioning equipment) away from the streams and buffers where feasible.

2.4 Approach and Best Management Practices

Planting or seeding will occur immediately after grading is complete to the extent practicable. TESC measures will be implemented that consists of high-visibility fencing (HVF) installed around native vegetation along existing stream areas not proposed to be impacted, silt fencing between the graded areas and buffers, plastic sheeting on stockpiled materials, and seeding of disturbed soils. These TESC measures will be installed prior to the start of development or mitigation actions and actively managed for the duration of the project.

Equipment used will be typical for land clearing, grading, and excavation activities and will be kept in good working conditions and free of leaks. Equipment to be used will likely include excavators, backhoes, bulldozers, dump trucks, graders, et cetera. All equipment staging and materials stockpiles will be kept out of the critical areas and regulated buffers avoided by the proposed project, and the area will be kept free of spills and/or hazardous materials using a SPCCC prepared and implemented by the contractor. All clean fill material for site preparation will be sourced from upland areas onsite or from approved suppliers and will be free of pollutants and hazardous materials.

All equipment staging and materials stockpiles will be kept out of the identified critical areas and associated buffer areas, and the areas will need to be kept free of spills and/or hazardous materials. Construction materials along with all construction waste and debris will be effectively managed and stockpiled on paved surfaces and kept free of the critical areas and associated buffers. Following completion of the development, the entire site will be cleaned and detail graded using hand tools wherever necessary, and TESC measures will be removed.

Additional BMPs for the proposed in-water work are provided under separate cover in the Water Quality Monitoring Plan.

2.5 Mitigation Implementation

Compensatory mitigation and voluntary restoration actions will occur concurrently with the development of Phase II of the project. Initial actions will include excavation and grading required for Streams Z and Y realignment. Minor portions of the mitigation site may initially remain ungraded to ensure the separation of the proposed stream channels from the existing channels. Realignment of the streams should occur during the summer during low flow conditions and shall occur during in-water work windows approved by the regulatory agencies. Following the initial excavation and grading, native plants may be installed following consultation with the Project Scientist to determine feasibility given summer hydrology conditions. Streams Y and Z will then be realigned; minor excavation and grading work will be necessary in order to provide the connections between the new and existing stream channels. Native plants are anticipated to be fully installed during the fall or early winter (September 1– December 31) following the realignment of Streams Y and Z during the summer season. The mitigation site should be seeded prior to the beginning of the wet season to minimize erosion.

TESC measures will be implemented according to the TESC plan prepared for the proposed project. Typical TESC measures include silt fencing where appropriate to protect potential offsite critical areas, plastic sheeting on stockpiled materials, and seeding of disturbed soils which will be actively managed for the duration of the project.

The Project Scientist should be consulted prior and during the mitigation actions to ensure that mitigation actions are conducted according to the intent of the mitigation plan. The Project Scientist will inspect and approve the planting stock and review the planting plans with the landscaping contractor to ensure clear understanding of the plan prior to installation of plant materials. The Project Scientist will assist the landscape contractor in making any final adjustments in the planting schedule as needed, in response to field conditions.

The proposed actions will include the excavation of material to create the new Stream Z and Stream Y channels. Mitigation and restoration actions may be completed separately from clearing and grading actions in the rest of the Project Area. The new stream channels will be entirely excavated prior to the stream relocation, with a berm left on the upstream end of each channel to prevent the streams from immediately diverting into the new channel. Large woody debris will be installed following channel excavation. Soil amendments will be installed as needed throughout the riparian corridor. The onsite soil amendments may be sourced from scraped topsoil. Imported topsoil or soil amendments may be used at the discretion of the landscape contractor.

Re-watering of the streams should occur during in-water work windows approved by regulatory agencies. If water is present in the stream channels immediately prior to the realignment, then nets will be installed at the upstream and downstream ends of existing stream sections to be de-watered and fish capture and relocation efforts will proceed as needed. The fish protection efforts will be completed using netting to capture fish and relocate them to non-impacted areas. The realigned stream channels will then be re-watered. Sediment control structures may be installed within the new stream channels to address water quality issues. The existing stream channels may be filled immediately following the re-watering of the realigned stream channels.

The project sequencing is anticipated to as follows:

- Pre-construction conferences and regulatory notifications;
- Pre-treatment of non-native invasive plant species;
- Install TESC measures;
- Remove debris and invasive plant material from the mitigation areas;
- Rough grade the stream restoration areas according to the approved grading plan;
- Remove existing culverts within the mitigation site, install new bottomless crossing;
- Rough grade inspection;
- Finish grade and prepare grounds for planting in all mitigation areas;
- Install LWD;
- Install streambed substrates;
- Install new box culvert connection between new Stream Z channel and existing, downgradient, piped Stream Z;
- Dewater existing stream channel and rewater new stream channel;
- Monitor site hydrology;

- Plant inspections;
- Install plant materials and seed disturbed soils for erosion control;
- Post-construction inspection and as-built survey; and
- Post-construction maintenance, monitoring, and annual reporting.

2.5.1 Pre-Construction Meetings and Post-Construction Inspection

Two pre-construction meetings are recommended to be held involving representatives from the Applicant, Project Manager or Contractor, and Project Scientist.. The first pre-construction meeting should occur prior to commencement of mitigation actions, and the second meeting should occur onsite after construction staking has been placed by professional surveyors. The overall purpose of the first pre-construction meeting should be to discuss the primary intent of the stream relocation and regulatory requirements; identify points of contact; establish communication lines between the Project Scientist, Project Manager or Contractor and landscaping personnel; review project scheduling; and address any questions or issues associated with the mitigation plan. The overall purpose of the second pre-construction meeting should be to discuss project implementation, protection of onsite habitat, construction BMPs, and identify invasive species management actions.

Post-construction inspection of all mitigation areas will be necessary to verify the installation conforms to the approved plan. This post-construction inspection effort will occur after completion of the stream relocation and all appropriate seeding and planting actions. The post-construction inspection will be documented in an As-Built (Year 0) Report. Any significant changes to the mitigation design will also be coordinated with regulatory staff as specified in regulatory approvals and presented in the As-Built Report. During the post-construction inspection, the Project Scientist will identify and mark long-term monitoring plots and photographic stations in the field that represent representative conditions of the stream relocation and other mitigation areas. The long-term monitoring locations will be GPS located and included in the As-Built Report.

2.6 Goals, Objectives, and Performance Standards

The goals and objectives for the proposed onsite and offsite, in-kind mitigation actions are based on establishing and enhancing stream areas to compensate for the loss of stream areas. Non-compensatory mitigation actions are proposed to provide additional ecological benefits at the mitigation site. These non-compensatory mitigation actions include the replacement of one undersized culvert with an upgraded culvert to improve fish passage, and enhancement of all onsite buffer areas. In addition, the stream relocation will significantly improve overall habitat conditions. The goals and objectives of the proposed mitigation actions are as follows.

“Cover” is used in this Mitigation Plan to mean the proportion of the ground surface that is covered by vegetation when viewed from above. Native recruits will be utilized in assessing performance standards unless otherwise specified for a particular performance standard. Dead or dying plants may be replaced, and replacement plants may be utilized in assessing performance standards, unless otherwise specified for a particular performance standard.

Goal 1 – Compensate for the loss of 592 linear feet the existing Stream Z channel by realigning Stream Z.

Objective 1.1 – Create 613 linear feet of new Stream Z channel.

Performance Standard 1.1.1 – The new Stream Z channel will be created according to the final approved design and documented in the As-Built Report.

Performance Standard 1.1.2 – Large woody debris in the new Stream Z channel will be installed according to the final approved design and documented in the As-Built Report.

Goal 2 – Voluntarily restore 463 linear feet of Stream Y channel by restoring Stream Y into a new stream channel.

Objective 2.1 – Restore 463 linear feet of Stream Y channel.

Performance Standard 2.1.1 – The new Stream Y channel will be created according to the final approved design and documented in the As-Built Report.

Performance Standard 2.1.2 – Large woody debris in the new Stream Y channel will be installed according to the final approved design and documented in the As-Built Report.

Goal 3 – Establish and enhance 70,998 square feet (1.62 acres) of riparian buffers for the newly restored Streams Y and Z to protect the streams and to provide improvements in buffer functions over existing degraded buffer conditions.

Objective 3.1 – Establish 74,796 square feet (1.717 acres) of riparian buffer that is vegetated with native woody plant cover to create diverse horizontal and vertical vegetation structure and wildlife habitat.

Performance Standard 3.1.1 – In Year 1, survival of installed woody vegetation will be 100 percent in the riparian buffer areas.

Performance Standard 3.1.2 – Native woody plant species will cover at least 15 percent of the mitigation areas at the end of Year 2, 25 percent cover at the end of Year 3, 35 percent cover at the end of Year 5, 50 percent cover at the end of Year 7, and 65 percent by the end of Year 10.

Performance Standard 3.1.3 – In all monitoring years, the riparian buffer area will contain at least 2 species of native trees and 3 species of native shrubs.

Objective 3.2 – Effectively control and/or eliminate non-native invasive species in riparian buffer areas.

Performance Standard 3.2.1 – Non-native invasive plants will not make up more than 20 percent cover during all monitoring years. Non-native invasive plants are plants listed by the Washington State Noxious Weed Board.

Goal 4 – Protect stream processes and fish passage within the new Stream Z channel.

Objective 4.1 – Ensure the new bottomless culvert crossing of Stream Z and the new box culvert connection between the new Stream Z and the existing piped Stream Z allow for unobstructed flows.

Performance Standard 4.1.1 – The bottomless culvert crossing of Stream Z and the box culvert connection to the existing piped Stream Z will be installed according to the final approved design and documented in the As-Built Report.

Performance Standard 4.1.2 – Unobstructed streamflow conveyance through the bottomless culvert crossing of Stream Z will be observed in all monitoring years.

2.7 Plant Materials and Installation

2.7.1 Plant Materials

All plant materials to be used for the restoration actions will be nursery grown stock from a reputable, local source. Only native species are to be used; no hybrids or cultivars will be allowed. Plant material provided will be typical of their species or variety; if not cuttings they will exhibit normal, densely developed branches and vigorous, fibrous root systems. Plants will be sound, healthy, vigorous plants free from defects, and all forms of disease and infestation.

Container stock shall have been grown in its delivery container for not less than six months but not more than two years. Plants shall not exhibit rootbound conditions. Under no circumstances shall container stock be handled by their trunks, stems, or tops. Seed mixture used for hand or hydroseeding shall contain fresh, clean, and new crop seed mixed by an approved method. The mixture is specified in the plan set.

Fertilizer will be in the form of Agriform plant tabs or an approved like form. Mulch or coir rings may be installed around woody vegetation as determined to be necessary for plant survivability by the landscape contractor.

2.7.2 Plant Scheduling, Species, Density, and Location

Plant installation should occur as close to conclusion of clearing and grading activities as possible to limit erosion and limit the temporal loss of function provided by the onsite habitat. All plantings should occur between September 1 and May 1 to ensure plants do not dry out after installation, or temporary irrigation measures may be necessary. All plantings will be installed according to the procedures detailed in the following subsections and as outlined on the site plans in Appendix A.

2.7.3 Quality Control for Planting Plan

All plant material should be inspected by the landscape contractor or Project Biologist upon delivery. Plant material not conforming to the specifications above will be rejected and replaced by the landscape contractor. Rejected plant materials shall be immediately removed from the site.

The landscape contractor should provide the Project Biologist with documentation of plant material that includes the supplying nursery contact information, location of genetic source, plant species, plant quantities, and plant sizes.

2.7.4 Product Handling, Delivery, and Storage

All seed should be delivered in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. This material should be stored in a manner to prevent wetting and deterioration. All precautions customary in good trade practice shall be taken in preparing plants for moving. Workmanship that fails to meet industry standards will be rejected. Plants will be packed, transported, and handled with care to ensure protection against injury and from drying out. If plants cannot be planted immediately upon delivery they should be protected with soil, wet peat moss, or in a manner acceptable to the Project Biologist. Plants and mulch not installed immediately upon delivery shall be secured on the site to prevent theft or tampering. No plant shall be bound with rope or wire in a manner that could damage or break the branches. Plants transported on open vehicles should be secured with a protective covering to prevent windburn.

2.7.5 Preparation and Installation of Plant Materials

The landscape contractor shall verify the location of all elements of the mitigation plan with the responsible Project Biologist prior to installation. The responsible Project Biologist reserves the right to adjust the locations of landscape elements during the installation period as appropriate. If obstructions are encountered that are not shown on the drawings, planting operations will cease until alternate plant locations have been selected by and/or approved by the Project Biologist.

Circular plant pits with vertical sides will be excavated for all container stock. The pits should be at least 2 times the width of the rootball, and the depth of the pit should accommodate the entire root system. Please refer to planting detail in Appendix A.

Broken roots should be pruned with a sharp instrument and rootballs should be thoroughly soaked prior to installation. Set plant material upright in the planting pit to proper grade and alignment. Water plants thoroughly midway through backfilling and add Agriform tablets or similar. Water pits again upon completion of backfilling. No filling should occur around trunks or stems. Do not use frozen or muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water and install a 3- to 4-inch layer of mulch around the base of each container plant if determined to be necessary by the landscape contractor.

Topsoil, mulch, compost, or other amendments may be installed to ensure plant survivability at the discretion of the landscape contractor.

2.7.6 Temporary Irrigation Specifications

While the native species selected for the habitat restoration actions are hardy and typically thrive in northwest conditions and the proposed actions are planned in areas with sufficient hydroperiods for the species selected, some individual plants might perish due to dry conditions. Therefore, irrigation or regular watering may be provided as necessary for the duration of the first two growing seasons while the native plantings become established. If used, irrigation will be discontinued after two growing seasons. Irrigation is recommended two times per week. Frequency and amount of irrigation will be dependent upon climatic conditions and may require more or less frequency watering than two times per week.

2.7.7 Invasive Plant Control and Removal

Invasive species to be removed include reed canarygrass and all listed noxious weeds. To ensure non-native invasive species do not expand following the habitat restoration actions, non-native invasive plants within the entire mitigation area will be pretreated with a root-killing herbicide approved for use in aquatic sites (i.e., Rodeo) a minimum of two weeks prior to being cleared and grubbed from the restoration areas. A second application is strongly recommended in areas with dense cover of non-native, invasive species. The pre-treatment with herbicide should occur prior to all planned restoration actions, and spot treatment of surviving non-native invasive vegetation should be performed again each fall prior to senescence for a minimum of five years.

2.8 Maintenance & Monitoring Plan

Conceptual Maintenance and Monitoring Plans are described below in accordance with PMC 21.06.630 and anticipated conditions from other regulatory agencies. The Applicant is committed to compliance with the conceptual mitigation plan and overall success of the project. As such, the Applicant will continue to maintain the project, keeping the site free from non-native invasive vegetation and trash. Maintenance frequency may be altered depending on the success of the mitigation site as evaluated during the monitoring visits.

The mitigation actions will require continued monitoring and maintenance to ensure the mitigation actions are successful. Therefore, the mitigation site will be monitored for a period of 10 years with formal inspections by a qualified Project Scientist. An As-Built (Year 0) inspection will occur within 30 days of the completion of plant installation. The maintenance/monitoring period will begin upon completion of an as-built plan and certification from the Project Scientist certifying the mitigation was installed per the mitigation plan. Formal monitoring events will be scheduled during Years 1, 2, 3, 5, 7, and 10. Close-out assessment with also be conducted in Year 10.

Monitoring will consist of percent cover measurements and stem counts at permanent monitoring stations, walk-through surveys to identify invasive species presence and dead or dying enhancement plantings, photographs taken at fixed photo points, wildlife observations, and general qualitative habitat and wetland function observations. Data collected during monitoring visits will be appropriate for the performance standards of the relevant monitoring year. The permanent monitoring stations will be established such that the mitigation site is representatively sampled. Circular sample plots, approximately 30 feet in diameter (706 square feet), will be centered at each monitoring station. Sample plots will be located entirely within the proposed mitigation site. Sample plot shapes may need to be adjusted to ensure that sample plots do not cross the mitigation site boundaries; adjusted sample plot shapes should maintain the same area as the 30-foot-diameter circular sample plots. Mean survivorship and percent cover measurements from the sample plots will be used to estimate survivorship and percent cover across the mitigation site.

To determine survivorship, individual tree and shrub stems within the relevant circular sampling plots will be counted. Plants which grow several stems from a single base will be counted as one individual plant. These trees and shrubs will then be recorded as dead/dying or alive. To determine percent cover and species richness of woody vegetation, each species of tree or shrub within the approximately 30-foot-diameter circular sampling plots will be recorded and identified as native or invasive. Plants may be recorded by genus if species is unable to be determined at the time of the monitoring visit. Herbaceous vegetation will be sampled from a 10-foot diameter (78.5 square feet), established at the same location as the center of each tree and shrub sample plot. Herbaceous vegetation within the sampling plot will be recorded to at least the genus level and identified as native or invasive. A list of observed tree, shrub, and herbaceous genera or species, cover estimates, and wetland indicator status will be included within each monitoring report.

Non-native, invasive plant control will be performed throughout the monitoring period. Plants listed by the Washington Noxious Weed Board will be controlled to meet applicable performance standards. Herbicide applications will be made in accordance with the Washington Department of Agriculture pesticide application procedures unless prohibited by the City of Puyallup. Herbicides will be herbicides approved by the Washington State Department of Agriculture for use in aquatic areas and will only be applied by a licensed applicator in aquatic areas.

2.9 Reporting

Following the implementation of the mitigation actions, the responsible Project Scientist will prepare an As-Built (Year 0) Report and will be submitted to the City of Puyallup's project manager and appropriate agencies within 90 days following the post-construction monitoring event. Following each monitoring event, a monitoring report detailing the current ecological status of the mitigation actions, measurement of performance standards, and management recommendations will be prepared and submitted to the City of Puyallup and appropriate agencies within 90 days of each monitoring event to ensure full compliance with the mitigation plan, performance standards, and regulatory conditions of approval. Per PMC 21.06.630(2), monitoring reports are only required annually for the first three years following construction and at least upon the completion of the last monitoring year.

2.10 Contingency Plan and Long-Term Management Plan

If monitoring results indicate that performance standards are not being met, it may be necessary to implement all or part of the contingency plan. Careful attention to maintenance is essential in ensuring that problems do not arise. Should any portion of the site fail to meet the success criteria, a contingency plan will be developed. Such plans are adaptive and will be prepared on a case-by-case basis to reflect the failed mitigation characteristics. Contingency plans can include additional plant installation, erosion control, and plant substitutions including type, size, and location. The contingency measures outlined below can also be utilized in perpetuity to maintain the streams and buffers associated with the proposed mitigation site.

This project proposes 10 years of monitoring for the mitigation actions in compliance with the goals and performance standards outlined in Section 2.6 of this report. However, the agencies may request additional years of monitoring and formal reporting if the site has not met the goals and performance standards by Year 10.

Contingency/maintenance activities may include, but are not limited to:

1. Using plugs instead of seed for emergent vegetation coverage where seeded material does not become well-established;
2. Replacing plants lost to vandalism, drought, or disease, as necessary;
3. Replacing any plant species with a 20 percent or greater mortality rate after two growing seasons with the same species or native species of similar form and function;
4. Irrigating the mitigation areas only as necessary during dry weather if plants appear to be too dry, with a minimal quantity of water;
5. Reseeding and/or repair of mitigation areas as necessary if erosion or sedimentation occurs;
6. Spot treat non-native invasive plant species, and
7. Removing all trash or undesirable debris from all mitigation areas as necessary.

2.11 Financial Assurances

Per PMC 21.06.650, a mitigation surety is required ensure that mitigation is fully functional. The Applicant will provide a performance bond and monitoring and maintenance bond in an amount equal to 125 percent of the total estimated fair market cost of mitigation actions. Per PMC 21.06.650, the mitigation surety shall be based on a detailed itemized cost estimate of the mitigation activity including clearing and grading, plant materials, plant installation, irrigation, weed management, and other costs. The bond quantity worksheet will be provided for the Final Mitigation Plan.

2.12 Critical Area Protection

The mitigation areas will be placed in a separate tract or dedicated to the City as a permanent protective mechanism per PMC 21.06.610(7) and PMC 21.06.830. Critical area tracts shall be designated as native growth protection areas and shall be recorded on all documents of title of record for all affected lots and will be designated on the face of the plat or recorded drawing. Fencing and signage will also be provided per PMC 21.06.810 to reduce intrusion into the critical areas and prevent future impacts to the critical areas.

Chapter 3. Closure

The findings and conclusions documented in this report have been prepared for specific application for the East Town Crossing project. These findings and conclusions have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area. The conclusions and recommendations presented in this assessment report are professional opinions based on an interpretation of information currently available to us and are made within the operation scope, budget, and schedule of this project. No warranty, expressed or implied, is made. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, our observations and conclusions applicable to this assessment may need to be revised wholly or in part in the future.

Chapter 4. References

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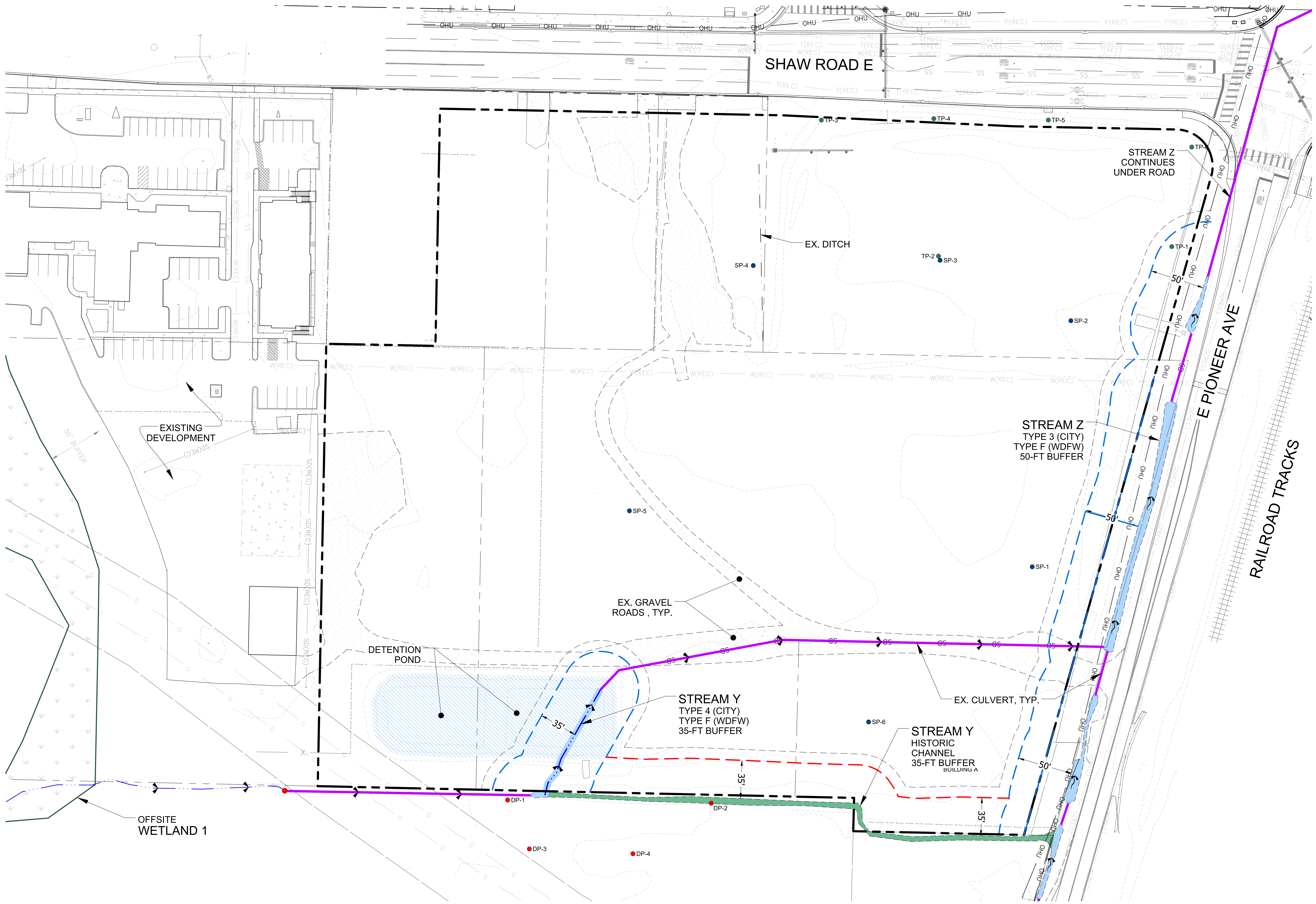
Appendix A – Proposed Site Plan Exhibits

EXISTING CONDITIONS

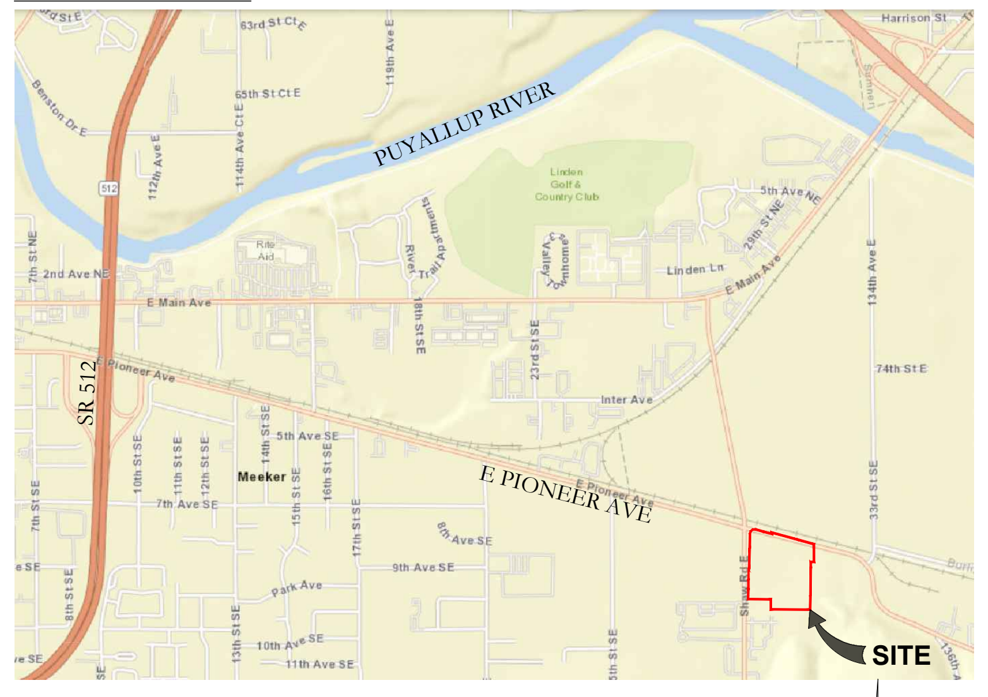


0 50 100 200

GRAPHIC SCALE

1"= 50'

VICINITY MAP



SOURCE: ESRI (ACCESSED 8/22/2022)

LOCATION

THE SE & NE ¼ OF SECTIONS 26 & 35,

TOWNSHIP 20N, RANGE 04E, WM

LAT: 47.184068° N LON: -122.254753° W

IN: PUYALLUP NEAR: ----

APPLICANT/OWNER

NAME: ASH DEVELOPMENT
ADDRESS: 1001 SHAW ROAD
PUYALLUP, WA 98371
CONTACT: GREG HELLE
PHONE: (253) 606-6799
E-MAIL: GREG.HELLE@ABSHERCO.COM

ENVIRONMENTAL CONSULTANT

SOUNDVIEW CONSULTANTS LLC
2907 HARBORVIEW DRIVE
GIG HARBOR, WA 98355
(253) 514-8952

SHEET INDEX

SHEET	SHEET TITLE
1.0	EXISTING CONDITIONS
2.0	PROPOSED SITE PLAN (PHASE I)

PLAN LEGEND

— — —	PROPERTY LINE
● DP-#	DATA PLOT LOCATION (SOUNDVIEW CONSULTANTS)
● SP-#	DATA PLOT LOCATION (HABITAT TECHNOLOGIES 10/14/2021)
● TP-#	DATA PLOT LOCATION (JOHN COMIS ASSOCIATES, LLC 3/24/2020)
—·—➤—·—	EXISTING STREAM CENTERLINE
🟦	APPROXIMATE STREAM ORDINARY HIGH WATER LINE (SURVEYED TOE OF BANK)
- - - -	EXISTING STREAM BUFFER
— — —	10-FT BUILDING SETBACK
——➤——	EXISTING CULVERT
🟩	HISTORIC STREAM ORDINARY HIGH WATER LINE (OHW)
— — —	HISTORIC STREAM BUFFER
— · — · —	DITCH CENTERLINE
- - - -	EXISTING 2-FT CONTOURS

STREAM LEGEND

	EXISTING
STREAM Y OPEN CHANNEL	110 LF (724 SF)
STREAM Y IN CULVERT	471 LF
STREAM Z OPEN CHANNEL	465 LF (3,009 SF)
STREAM Z IN CULVERT	127 LF

NOTE

1. OFFSITE WETLAND 1 DELINEATION COMPLETED BY JOHN COMIS ASSOCIATES, LLC IN REPORT DATED MARCH 24, 2020.
2. CITY STREAM TYPING COMPLETED BY HABITAT TECHNOLOGIES IN REPORT DATED OCTOBER 14, 2021.
3. WDFW STREAM TYPING DETERMINED BY WDFW DURING JOINT SITE INVESTIGATION.

SOURCE:

AHBL

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2215 North 30th Street, Suite 300 Tacoma, WA 98403
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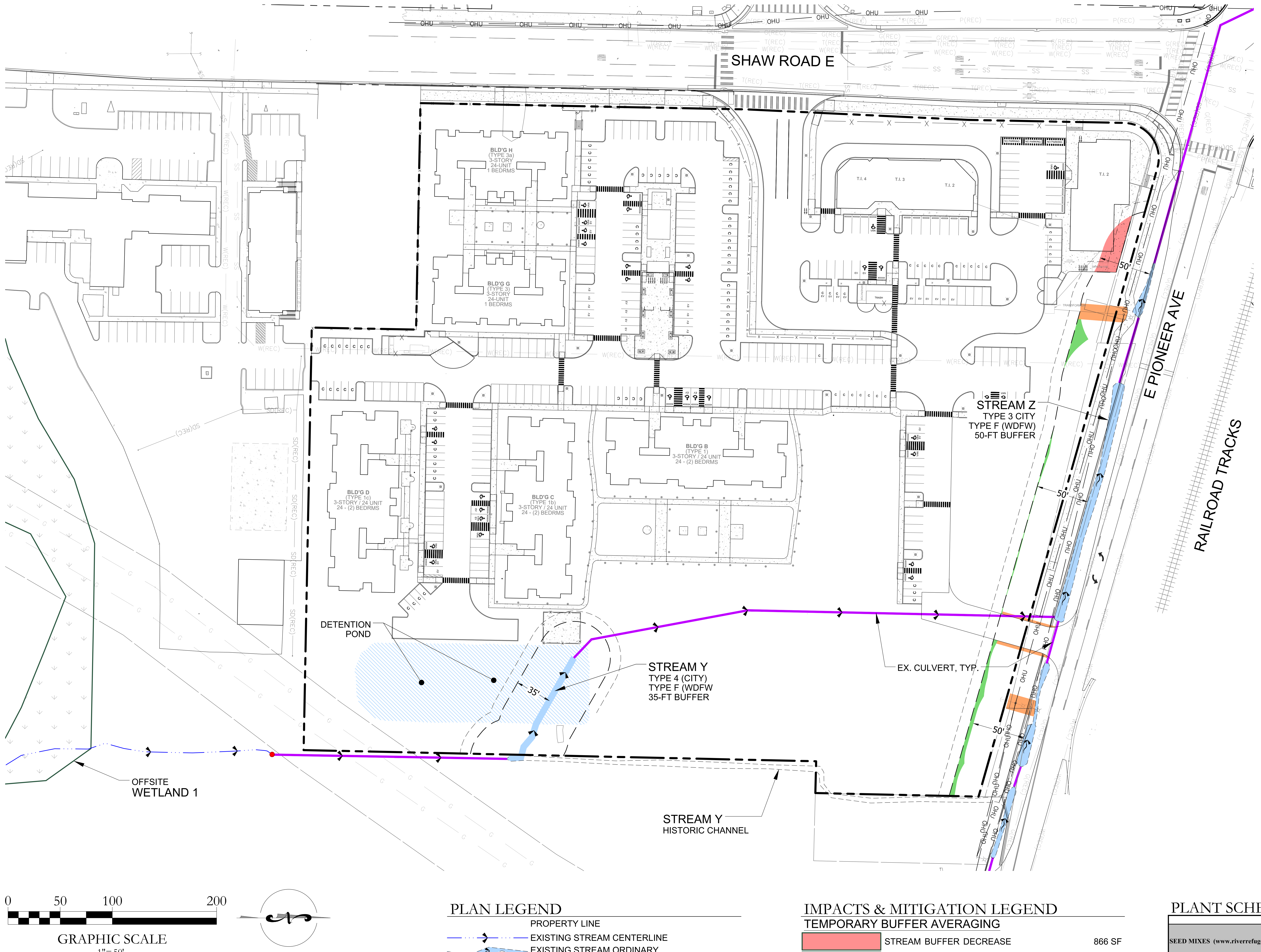
EAST TOWN CROSSING

2902 E PIONEER AVE
PUYALLUP, WA 98374

PIERCE COUNTY PARCEL NUMBERS:
0420264021, 0420264053, 0420264054, 0420351030,
0420351029, 0420351026, & 0420351066

DATE: 3/14/2024
JOB: 2544.0001
BY: MW
SCALE: AS SHOWN
SHEET: 1.0



PLAN LEGEND

PROPERTY LINE
EXISTING STREAM CENTERLINE
EXISTING STREAM ORDINARY HIGH WATER LINE (OHW)
EXISTING CULVERT
STREAM BUFFER
10-FT BUILDING SETBACK

IMPACTS & MITIGATION LEGEND

TEMPORARY BUFFER AVERAGING

🟥	STREAM BUFFER DECREASE	866 SF
🟩	STREAM BUFFER INCREASE	1,030 SF
	NET BUFFER GAIN	164 SF

TEMPORARY GRADING IMPACTS

🟧	STREAM BUFFER IMPACTS FOR DRIVEWAY & UTILITY INSTALLATION (TO BE RESTORED WITH NATIVE UPLAND GRASS SEED MIX)	1,345 SF

PLANT SCHEDULE

		Area (sf):	1,345
SEED MIXES (www.riverrefugeseed.com)		**WL Status**	**Buffer Plantings**
Native Upland Grass Mix #9	**20 lbs/acre**		**(Qty)**
Elymus glaucus	Blue wildrye	30%	
Bromus carinatus	California brome	25%	
Hordeum brachyantherum	Meadow barley	10%	
Festuca roemeri	Roemer's fescue	10%	
Deschampsia elongata	Slender hairgrass	10%	
Agrostis exarata	Spike bentgrass	5%	
Deschampsia cespitosa	Tufted hairgrass	5%	
Festuca rubra var. rubra	Red fescue	5%	
		Total (lbs):	**1**

1 - Scientific names and species identification taken from *Flora of the Pacific Northwest, 2nd Edition (Hitchcock and Cronquist, Ed. by Giblin, Ledger, Zika, and Olmstead, 2018).*

SOURCE:

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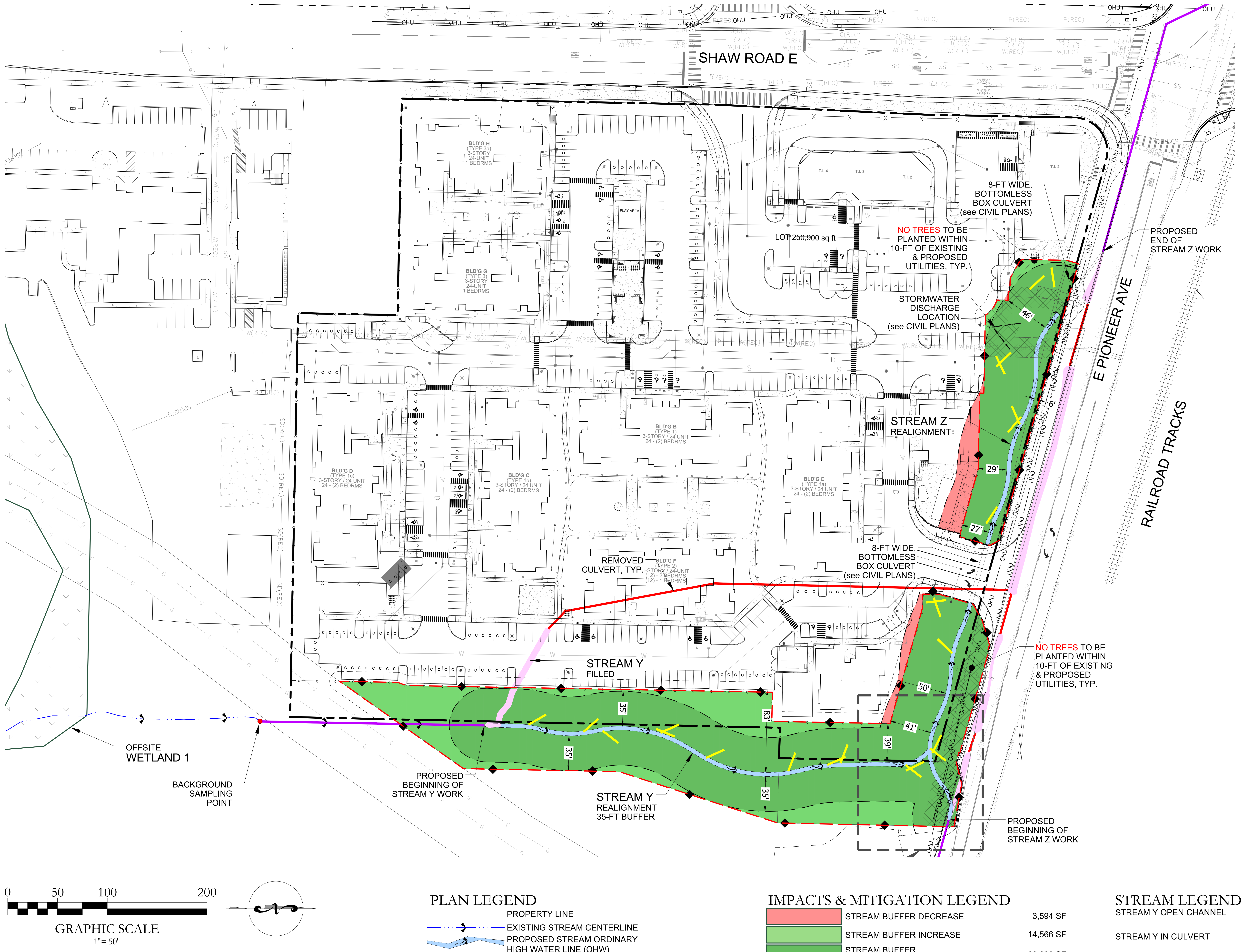
BY: MW
SCALE: AS SHOWN
SHEET: 2.0

PROPOSED SITE PLAN, IMPACTS & MITIGATION (PHASE II)



PLAN LEGEND

― ―	PROPERTY LINE
―·→·―	EXISTING STREAM CENTERLINE
≈	PROPOSED STREAM ORDINARY HIGH WATER LINE (OHW)
— —	STANDARD STREAM BUFFER
―	EXISTING / RETAINED CULVERT
═	PROPOSED CULVERT
▨	STREAM FILL
―	REMOVED CULVERT

IMPACTS & MITIGATION LEGEND

🟥	STREAM BUFFER DECREASE	3,594 SF
🟩	STREAM BUFFER INCREASE	14,566 SF
🟩	STREAM BUFFER RESTORATION/ENHANCEMENT (INCLUDES AREAS OF STREAM FILL WITHIN PROPOSED BUFFERS)	60,230 SF
— —	POST-CONSTRUCTION STREAM BUFFER/ CRITICAL AREA FENCE	
- - -	10-FT BUILDING SETBACK	
◆	CRITICAL AREA SIGN (24 SIGNS)	
―	LARGE WOODY DEBRIS (see SHEET 3.0)	

STREAM LEGEND

	EXISTING	PROPOSED
STREAM Y OPEN CHANNEL	110 LF (724 SF)	463 LF (1,836 SF)
STREAM Y IN CULVERT	471 LF	0 LF
STREAM Z OPEN CHANNEL	465 LF (3,009 SF)	475 LF (1,897 SF)
STREAM Z IN CULVERT	127 LF	138 LF

SOURCE: AHBL
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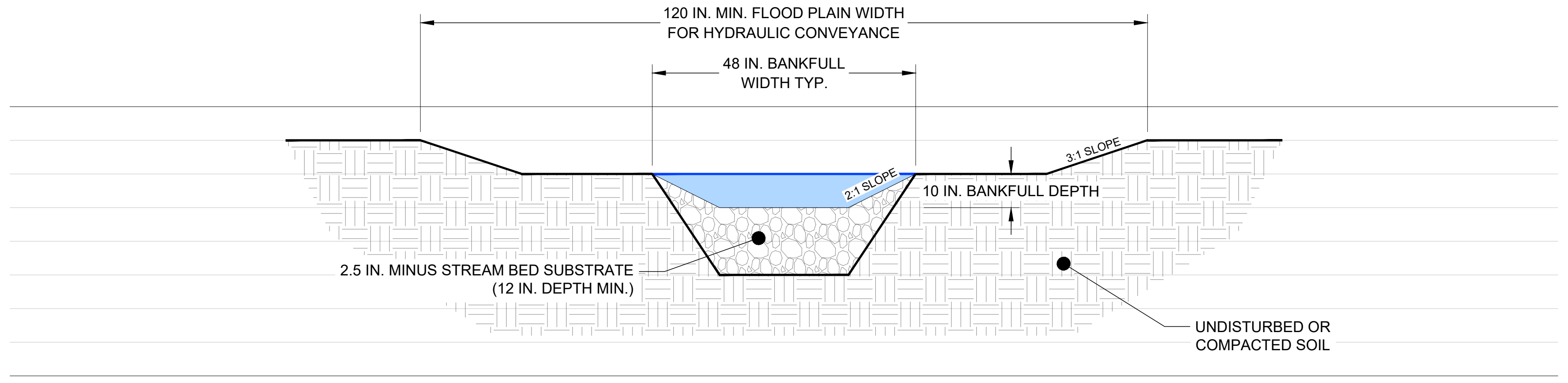
0420351029, 0420351026, & 0420351066

DATE: 3/14/2024
JOB: 2544.0001
BY: MW
SCALE: AS SHOWN
SHEET: 2.1

STREAM DETAILS (PHASE II)

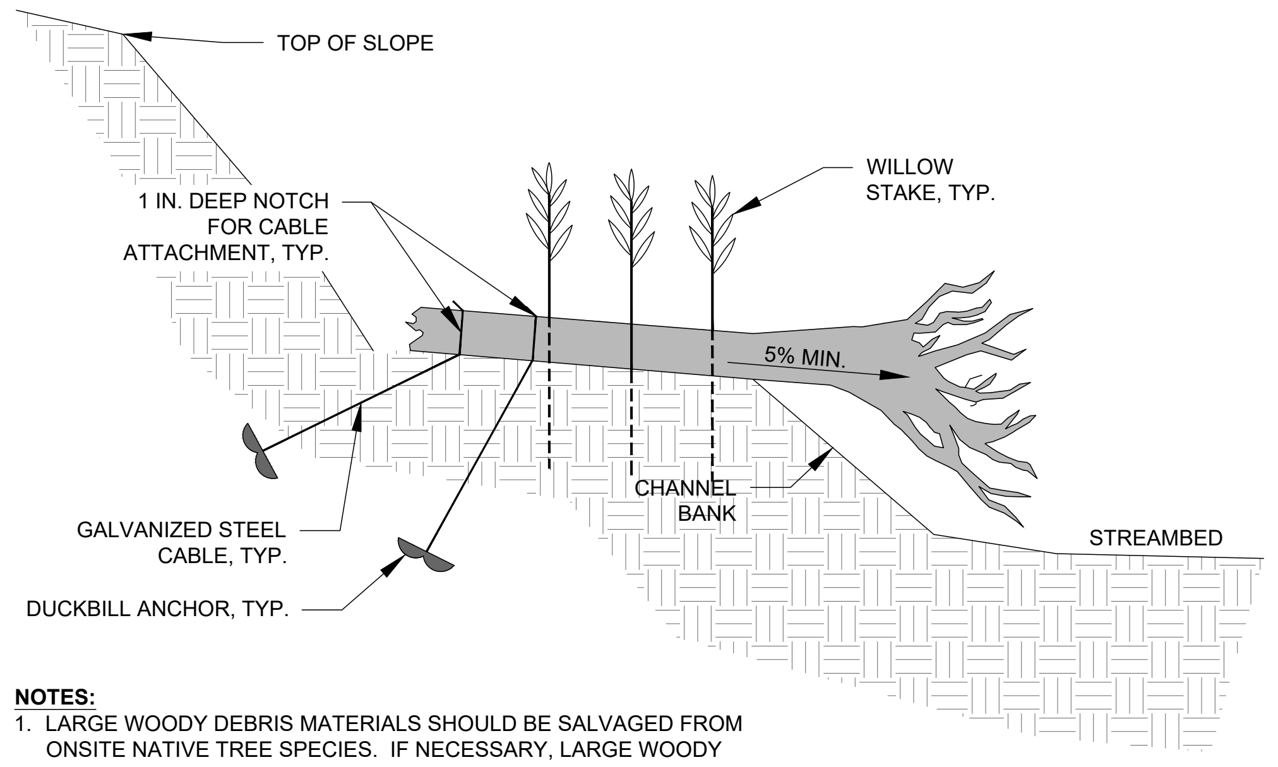


STREAMS Y & Z - PROPOSED CROSS SECTION, TYP.

SCALE: 1"=2'

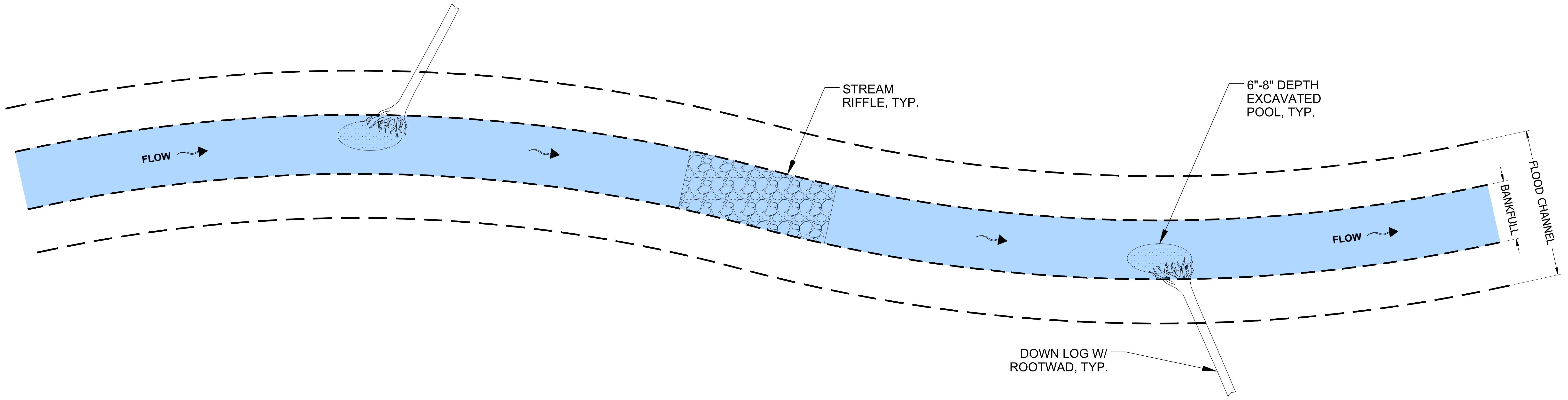
LWD INSTALLATION CROSS-SECTION (TYPICAL)

NOT TO SCALE



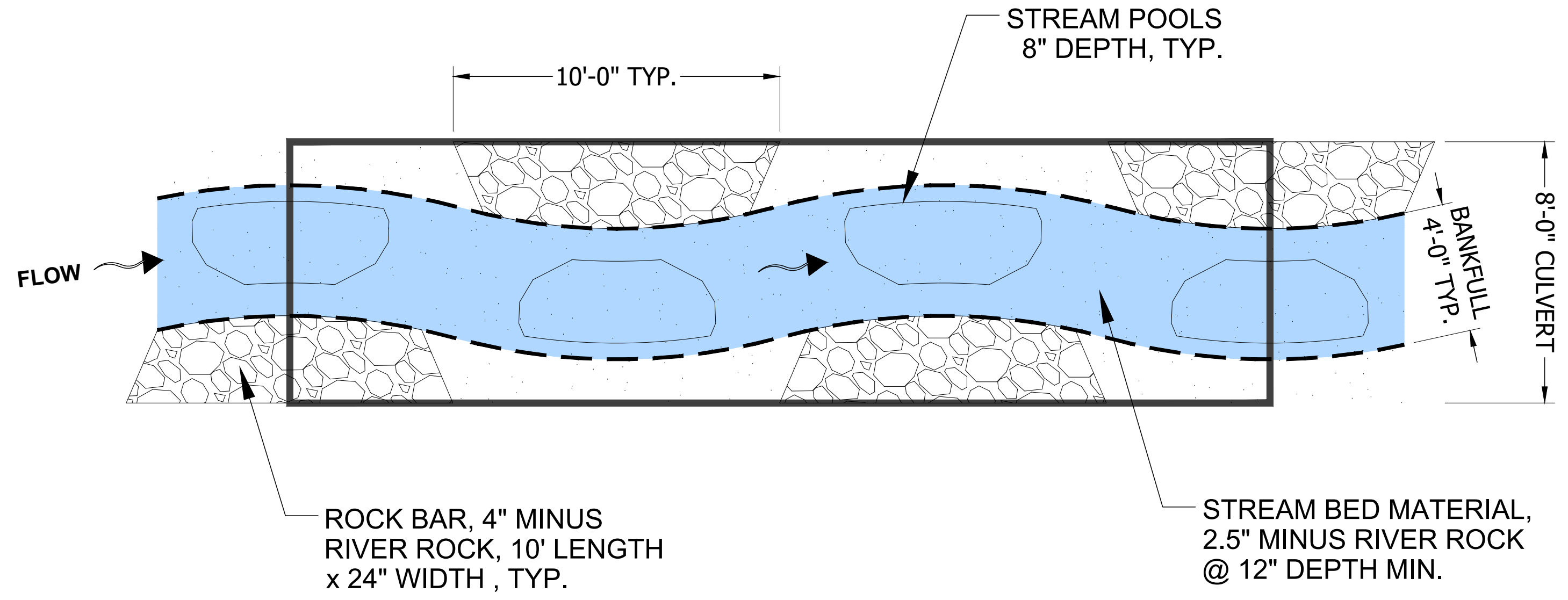
NOTES:

1. LARGE WOODY DEBRIS MATERIALS SHOULD BE SALVAGED FROM ONSITE NATIVE TREE SPECIES. IF NECESSARY, LARGE WOODY DEBRIS MATERIALS MAY BE IMPORTED ONSITE.
2. IMPORTED LOGS AND OTHER WOODY MATERIALS SHALL BE OF DOUGLAS-FIR, WESTERN REDCEDAR, OR OTHER SPECIES APPROVED BY THE PROJECT SCIENTIST.
3. LARGE WOODY DEBRIS SHALL HAVE ROOTWAD STILL ATTACHED. ROOT SPREAD SHALL HAVE RELATIVELY EVEN SPREAD WITH A MINUMUM DIAMETER OF TWO (2) TO THREE (3) FEET. ROOTWADS SHALL BE CLEANED PRIOR TO PLACEMENT.
4. FASTEN WOODY DEBRIS USING MINIMUM OF 2 GALVANIZED STEEL CABLES (DUCKBILL ANCHORS) PER PIECE OF LARGE WOODY DEBRIS.



STREAMS Y & Z - PROPOSED PLAN VIEW, TYP.

SCALE: 1"=5'



CULVERT DETAIL - PLAN VIEW, TYP.

SCALE: 1"=5'

SOURCE:

AHBL

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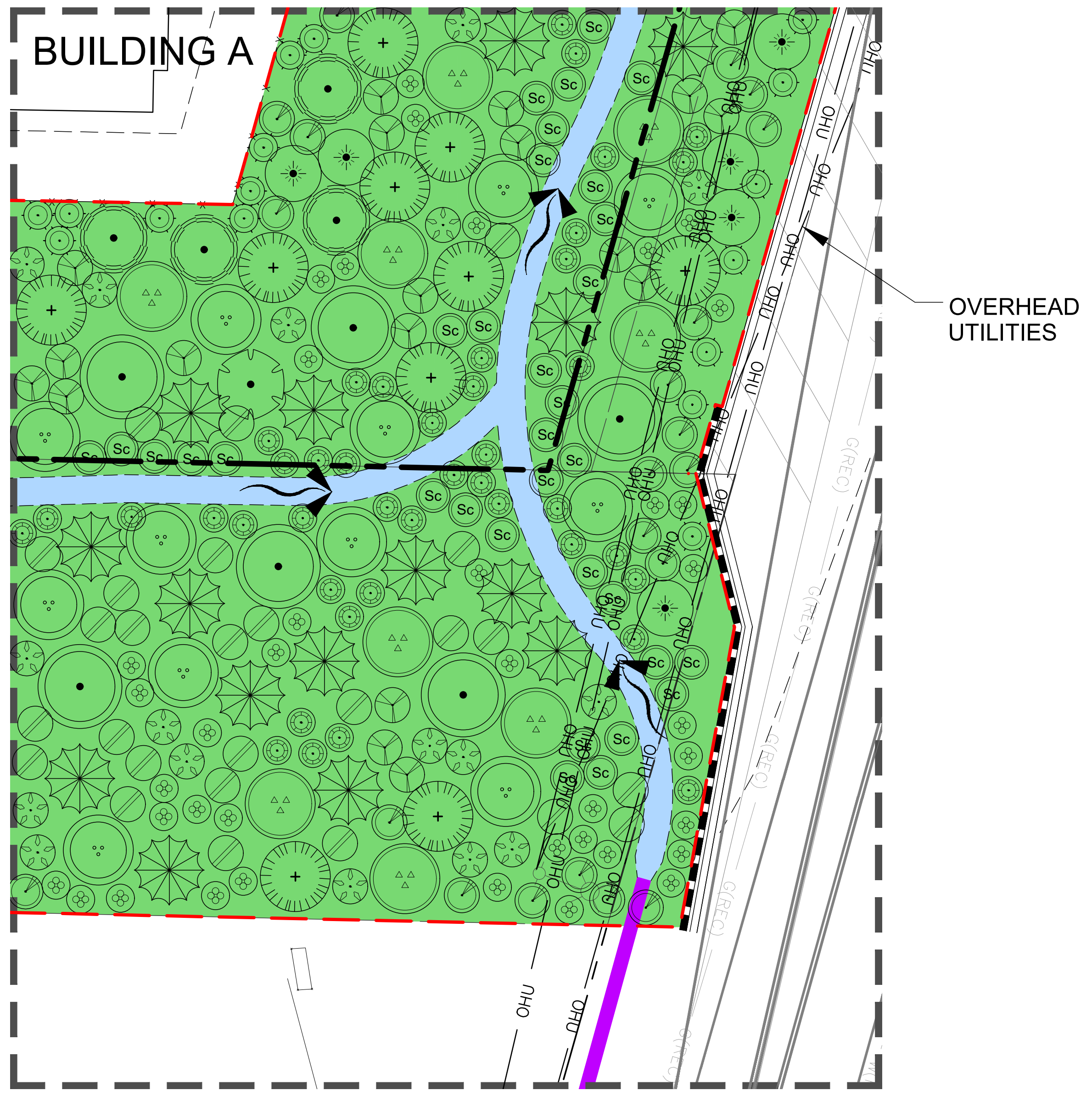
DATE: 3/14/2024
JOB: 2544.0001
BY: MW
SCALE: AS SHOWN
SHEET: 2.2

PLANTING TYPICAL, PLANT SCHEDULE, & PLANTING DETAILS (PHASE II)



PLANTING TYPICAL

SCALE: 1"=20'

PLANT & HABITAT FEATURE SCHEDULE

Area (sf):	74,796
Cov'g (%):	100
Trees (%):	50
Shrubs (%):	50

	Scientific Name	Common Name	WL Status	Buffer Plantings	Spacing (min.)	Height (min.)	Size (min.)	Planting Area
	TREES			**(Qty)**				
	Acer macrophyllum	bigleaf maple	FACU	36	**10 ft**	**3 ft**	**2 gal**	**Dry**
	Frangula purshiana (Rhamnus p.)	cascara	FAC	6	**10 ft**	**3 ft**	**1 gal**	**Dry**
	Prunus emarginata	bitter cherry	FACU	27	**10 ft**	**3 ft**	**2 gal**	**Dry**
	Pseudotsuga menziesii	Douglas fir	FACU	54	**10 ft**	**3 ft**	**2 gal**	**Dry**
Sc	***Salix scouleriana***	Scouler's willow	FAC	216	**5 ft**	**4 ft**	**Stakes**	**Dry**
	Thuja plicata	western redcedar	FAC	95	**10 ft**	**3 ft**	**2 gal**	**Moist - on hummock**
			Total:	**434**				
	SHRUBS			**(Qty)**				
	Acer circinatum	vine maple	FAC	78	**10 ft**	**4 ft**	**2 gal**	**Dry/Moist**
	Amelanchier alnifolia	serviceberry	FACU	31	**8 ft**	**3 ft**	**2 gal**	**Dry**
	Cornus stolonifera	red-osier dogwood	FACW	173	**4 ft**	**3 ft**	**1 gal**	**Moist/Wet**
	Corylus cornuta var. californica	western hazlenut	FACU	56	**10 ft**	**2 ft**	**2 gal**	**Moist**
	Holodiscus discolor	oceanspray	FACU	133	**5 ft**	**2 ft**	**1 gal**	**Dry**
	Oemleria cerasiformis	Indian plum	FACU	111	**5 ft**	**2 ft**	**2 gal**	**Dry**
NO SYMBOL	***Polystichum munitum***	western swordfern	FACU	415	**4 ft**	**1 ft**	**1 gal**	**Dry/Moist**
	Rosa gymnocarpa	bald hip rose	FACU	104	**4 ft**	**2 ft**	**1 gal**	**Dry/Moist**
	Rubus spectabilis var. spectabilis	salmonberry	FAC	277	**4 ft**	**2 ft**	**1 gal**	**Moist**
	Sambucus racemosa var. racemosa	red elderberry	FACU	111	**5 ft**	**2 ft**	**2 gal**	**Dry**
	Symphoricarpos albus var. laevigatus	common snowberry	FACU	243	**4 ft**	**2 ft**	**1 gal**	**Dry**
			Total:	**1732**				

SEED MIXES (www.riverrefugeseed.com)		**WL Status**	**Buffer Plantings**
Native Upland Grass Mix #9	**20 lbs/acre**		**(Qty)**
Elymus glaucus	Blue wildrye	30%	
Bromus carinatus	California brome	25%	
Hordeum brachyantherum	Meadow barley	10%	
Festuca roemeri	Roemer's fescue	10%	
Deschampsia elongata	Slender hairgrass	10%	
Agrostis exarata	Spike bentgrass	5%	
Deschampsia cespitosa	Tufted hairgrass	5%	
Festuca rubra var. rubra	Red fescue	5%	
		Total (lbs):	**35**

Habitat Structures	**(Qty)**	**Requirements**
Large Woody Debris	**23 Pieces**	**For salvaged large woody debris:** 35.31 cubic feet of large woody debris material mnimum. **For imported large woody debris:** 12 foot length minimum, 10 inch diameter minimum, with 2-3 foot minimum diameter rootwad attached.

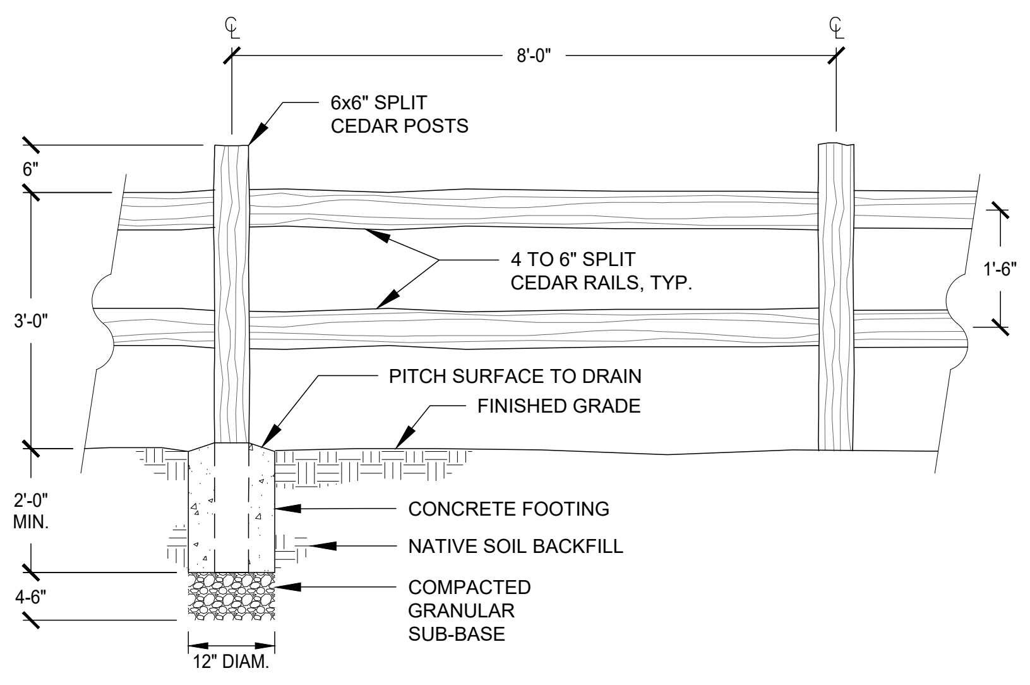
1 - Scientific names and species identification taken from *Flora of the Pacific Northwest, 2nd Edition (Hitchcock and Cronquist, Ed. by Giblin, Ledger, Zika, and Olmstead, 2018).*
2 - Over-sized container plants are suitable for replacement pending Wetland Scientist approval.
3 - Alternate native plant species may be substituted or added with Wetland Scientist approval.
4 - All disturbed and bare soil areas in the buffer to be seeded with a native grass seed mix.
5 - Shrub calculations based upon 5-ft average spacing.
6 - Tree calculations based upon 10-ft average spacing.
7 - *Polystichum munitum* to be planted in groups of 3 to 5 around the base of newly planted trees.

STREAMBED SUBSTRATE TABLE

STREAMBED SUBSTRATE SIZE	STREAM (REACH)	FEATURE	LENGTH (LF)	CROSS-SECTIONAL AREA OF GRAVEL (SF)	VOLUME OF GRAVEL (CF)
2.5 IN. MINUS	**STREAM Y**	CHANNEL & POOLS	463	2.98	1379.7
	STREAM Z	CHANNEL & POOLS	475	2.98	1415.5
				TOTAL 2.5 IN. MINUS GRAVEL (CF): **(CUBIC YARDS)**	**2795.2** **104**
4 IN. MINUS	**CULVERTS**	ROCK BARS & POOLS	138	3	414.0
				TOTAL 4 IN. MINUS GRAVEL (CF): **(CUBIC YARDS)**	**414.0** **16**

SPLIT RAIL FENCE DETAIL

NOT TO SCALE

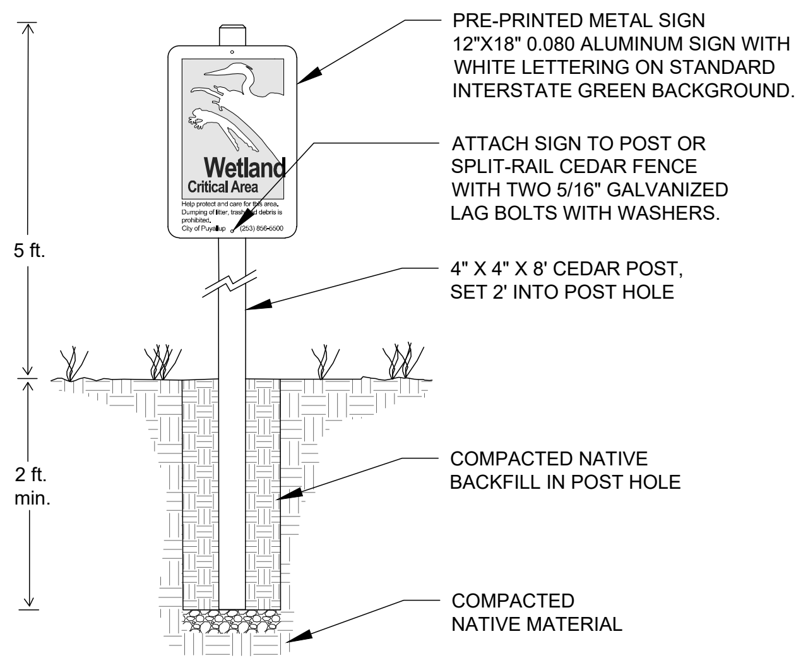


NOTES:

1. POSTS AND RAILINGS PRE-CUT FOR ASSEMBLY.
2. 3-RAIL DESIGNS ARE PERMITTED.
3. FENCE SHALL BE PLACED AT APPROVED BUFFER EDGE.
4. ALTERNATIVE WILDLIFE FRIENDLY FENCE DESIGNS ALLOWED WITH CITY OF PUYALLUP APPROVAL

CRITICAL AREA SIGN DETAIL

NOT TO SCALE

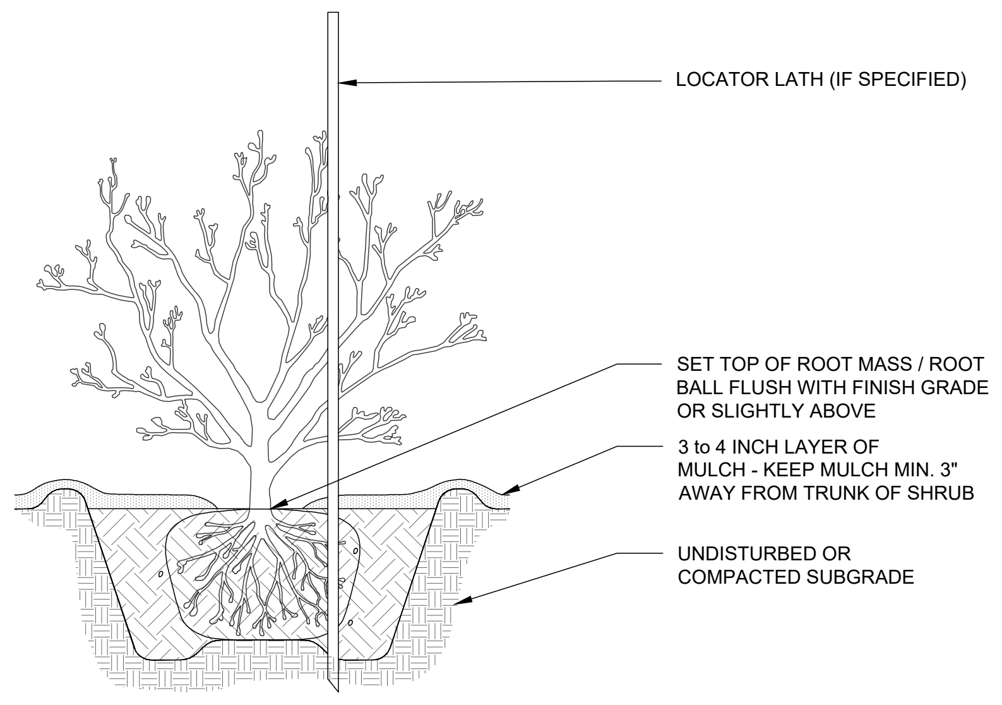


CRITICAL AREA BOUNDARY SIGN NOTES:

1. THE BOUNDARY AT THE OUTER EDGE OF THE CRITICAL AREA OR BUFFER SHALL BE IDENTIFIED WITH SIGNS OR MARKERS TO CLEARLY INDICATE THE LOCATION OF THE CRITICAL AREA
2. FENCING AND SIGNS SHALL BE MAINTAINED IN GOOD CONDITION SO AS TO BE VISIBLE AND UNOBSCURED.
3. PRE-PRINTED METAL SIGN AVAILABLE THROUGH:
   ZUMAR INDUSTRIES
   PHONE: 1-800-426-7967,
   WEBSITE: WWW.ZUMAR.COM

TREE AND SHRUB PLANTING DETAIL (TYPICAL)

NOT TO SCALE

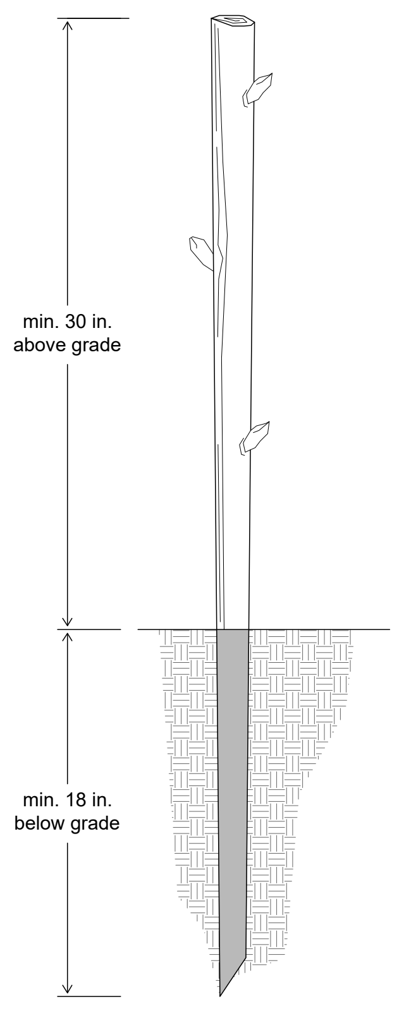


NOTES:

1. PLANT SHRUBS OF THE SAME SPECIES IN GROUPS OF 3 to 9 AS APPROPRIATE, OR AS SHOWN ON PLAN. AVOID INSTALLING PLANTS IN STRAIGHT LINES TO ACHIEVE A NATURAL-LOOKING LAYOUT.
2. EXCAVATE PIT TO FULL DEPTH OF ROOT MASS AND 2 X ROOT MASS DIAMETER. SPREAD ROOTS TO FULL WIDTH OF CANOPY. SCARIFY SIDES OF PIT.
3. MIDWAY THROUGH PLANTING ADD AGROFORM TABLET AND WATER THOROUGHLY.
4. BACKFILL TO BE COMPACTED USING WATER ONLY.
5. WATER IMMEDIATELY AFTER INSTALLATION.

LIVE STAKE PLANTING DETAIL (TYPICAL)

NOT TO SCALE



STORAGE OF LIVE STAKES:
ALL WOODY PLANT CUTTINGS COLLECTED MORE THAN 12 HR PRIOR TO INSTALLATION, MUST BE CAREFULLY BOUND, SECURED, AND STORED OUT OF DIRECT SUNLIGHT AND SUBMERGED IN CLEAN FRESH WATER FOR A PERIOD OF UP TO TWO WEEKS.

OUTDOOR TEMPERATURES MUST BE LESS THAN 50 DEGREES F AND TEMPERATURE INDOORS AND IN STORAGE CONTAINERS MUST BE BETWEEN 34 AND 50 DEGREES F.

IF THE LIVE STAKES CANNOT BE INSTALLED DURING THE DORMANT SEASON, CUT DURING THE DORMANT SEASON AND HOLD IN COLD STORAGE AT TEMPERATURES BETWEEN 33 AND 39 DEGREES F FOR UP TO 2 MONTHS.

NOTES:

1. LIVE STAKES TO BE A MIN. 1/2 INCH DIAMETER; MIN. 48 INCH LENGTH.
2. USE 1/2 INCH MIN. DIAMETER REBAR OR ROCK BAR TO MAKE PILOT HOLE WHEN PLANTING IN DENSE OR GRAVELY SOILS TO A MIN. DEPTH OF 18 INCHES.
3. MANUALLY INSERT LIVE STAKE INTO PILOT HOLE TAPERED END UP AND TEMP SOIL AROUND BASE. CUTTINGS SHOULD BE INSERTED TO A DEPTH OF AT LEAST 18 INCHES. LEAVE A MIN. OF 30" OF THE CUTTING ABOVE GROUND SURFACE TO ALLOW FOR SUCCESSFUL FOLIAGE DEVELOPMENT.
4. MINUMUM TWO BUDS ABOVE GRADE.
5. SET LIVE STAKES WITH DEAD-BLOW HAMMER.
6. WATER IMMEDIATELY AFTER INSTALLATION.

SOURCE:
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SCALE: AS SHOWN
SHEET: 3.0

Appendix B – Photographs

Typical degraded conditions of Stream Z within ROW of East Pioneer Avenue

Typical conditions of Stream Y

Existing Stream Z crossing providing access from East Pioneer Avenue to site (source: Google Earth)

Appendix C – Qualifications

All determinations and supporting documentation, including this ***Conceptual Mitigation Plan*** prepared for the ***East Town Crossing*** project were prepared by, or under the direction of, Alex Murphy and Matt DeCaro of SVC. Technical assistance was provided by Ben Wright. In addition, report preparation was completed by Kyla Caddey, and final quality assurance/ quality control was completed by Laura Livingston.

Alex Murphy, AICP

Senior Environmental Planner & Project Manager
Professional Experience: 7 years

Alex Murphy is a Planner and Project Manager with a background in land use planning, site planning & design, permitting, and project management. He has over 7 years of experience working for local jurisdictions in the Intermountain West and Pacific Northwest with an emphasis on maximizing opportunities for culturally and environmentally sensitive projects.

Alex earned a Bachelor of Landscape Architecture degree from Utah State University. He is a Certified Planner through the American Institute of Certified Planners and has received formal training in climate adaptation planning for coastal communities from NOAA. Mr. Murphy currently assists in wetland, stream, and shoreline delineations and fish and wildlife habitat assessments; conducts environmental code analysis; and prepares environmental assessment and mitigation reports. He also manages development projects, supporting clients through the regulatory and planning process for various land use proposals.

Matt DeCaro

Principal
Professional Experience: 14 years

Matt DeCaro is a Principal and Senior Scientist with a diverse background in environmental planning, wetland science, stream ecology, water quality, tree assessments, site remediation, NEPA compliance, and project management. He manages a wide range of industrial, commercial, and multi-family residential projects throughout Western Washington, providing environmental permitting and regulatory compliance assistance for land use projects from their planning stages through entitlement and construction. His local expertise, diverse professional background, and positive relationships with regulatory personnel are integral components of his successful project outcomes.

Matt earned a Bachelor of Science degree with a focus in Environmental Science from the Evergreen State College in Olympia, Washington, with additional graduate-level coursework and research in aquatic restoration and salmonid ecology. Matt has received 40-hour wetland delineation training (*Western Mountains, Valleys, & Coast and Arid West Regional Supplements*) and regularly performs wetland, stream, and shoreline delineations. Matt has been formally trained in the use of the *2014 Washington State Wetland Rating System* and *Determination of Ordinary High Water Mark* by WSDOE, and he is a Pierce County Qualified Wetland Specialist and Wildlife Biologist. He has attended USFWS survey workshops for multiple threatened and endangered species, and he is a Senior Author of WSDOT Biological Assessments. Matt holds 40-hour HAZWOPER training and has managed Phase I Environmental Site Assessments, subsurface investigations, and contaminant remediation projects throughout the Pacific Northwest. His diverse experience also includes NEPA compliance for federal permitting projects; noxious weed abatement; army ant research in the Costa Rican tropical rainforest; spotted owl surveys on federal and private lands; and salmonid spawning and migration surveys.

Ben Wright

Associate Principal and Senior Fisheries Biologist
Professional Experience: 20 years

Ben Wright is an Associate Principal and Senior Fisheries Biologist with a varied background in lake ecology, stream ecology, fisheries biology, water quality and climate science. Ben has 13 years of experience at the federal level providing technical assistance for both the development of infrastructure projects and management of aquatic resources. This technical assistance included providing oversight and design guidance on several restoration projects involving large woody debris installations, native riparian plantings, and stream channel relocations. He has experience developing biological assessments, water quality monitoring plans, and fisheries management plans. Ben has an additional 10 years of experience working on long-term ecological monitoring programs related to lakes, streams, water quality and climate. Ben currently works on permitting, design, construction guidance, and monitoring of several stream and wetland mitigation projects across western Washington.

Ben earned a Bachelor of Science degree in Genetics and Cell Biology with an emphasis in aquatic ecology from Washington State University and has a graduate certificate in Fisheries Management from Oregon State University. Ben's expertise includes endangered species monitoring, assessments and permitting, and NEPA documentation across disciplines gained during his work on federal highway projects. Ben also has experience in fish population assessments, utilizing genetic analysis, spawning escapement and movement studies. Ben has received formal training from the Washington State Department of Ecology in the Using the Revised 2014 Wetland Rating System for Western Washington, How to Determine the Ordinary High Water Mark, Navigating SEPA, How to Conduct a Forage Fish Survey and Puget Sound Costal Processes, Shoreline Modifications and Beach Restoration. Ben has completed 40-hour wetland delineation training for the Western Mountains, Valleys, & Coast and Arid West Regional Supplement. Most recently, Ben has completed a short course in River Sediment Dynamics from River Restoration Northwest.

Kyla Caddey, PWS, Certified Ecologist

Senior Environmental Scientist
Professional Experience: 8 years

Kyla Caddey is a Senior Environmental Scientist with a diverse background in stream and wetland ecology, wildlife ecology and conservation, wildlife and natural resource assessments and monitoring, and riparian habitat restoration at various public and private entities. Kyla has field experience performing in-depth studies in both the Pacific Northwest and Central American ecosystems which included various environmental science research and statistical analysis. Kyla has advanced expertise in federal- and state-listed endangered, threatened, and sensitive species surveys and assessment of aquatic and terrestrial systems throughout the Puget Sound region. She has completed hundreds of wetland delineations and has extensive knowledge and interest in hydric soil identification. As the senior writer, she provides informed project oversight and performs final quality assurance / quality control on various types of scientific reports for agency submittal, including: Biological

Assessments/Evaluations; Wetland, Shoreline, and Fish and Wildlife Habitat Assessments; Mitigation Plans, and Mitigation Monitoring Reports. She currently performs wetland, stream, and shoreline delineations and fish and wildlife habitat assessments; prepares scientific reports; and provides environmental permitting and regulatory compliance assistance to support a wide range of commercial, industrial, and multi-family residential land use projects.

Kyla earned a Bachelor of Science degree in Environmental Science and Resource Management from the University of Washington, Seattle with a focus in Wildlife Conservation and a minor in Quantitative Science. She has also completed additional coursework in Comprehensive Bird Biology from Cornell University. Ms. Caddey is a Certified Professional Wetland Scientist (PWS #3479) through the Society of Wetland Scientists and Certified Ecologist through the Ecological Society of America. She has received 40-hour wetland delineation training (Western Mtns, Valleys, & Coast and Arid West Regional Supplement), is a Pierce County Qualified Wetland Specialist and Wildlife Biologist, and is a USFWS-approved Mazama pocket gopher survey biologist. Kyla has been formally trained through the Washington State Department of Ecology, Coastal Training Program, and the Washington Native Plant Society in winter twig and grass, sedge, and rush identification for Western WA; Using the Credit-Debit Method in Estimating Wetland Mitigation Needs; How to Determine the Ordinary High Water Mark; Using Field Indicators for Hydric Soils; How to Administer Development Permits in Washington Shorelines; Puget Sound Coastal Processes; and Forage Fish Survey Techniques. Additionally, she has received formal training in preparing WSDOT Biological Assessments.

Laura Livingston

Senior Environmental Planner
Professional Experience: 9 years

Laura Livingston is an Environmental Planner with a background in water quality monitoring, invasive species monitoring, wildlife monitoring, wilderness stewardship, and erosion control projects. Laura has field experience working on natural resources projects, with an emphasis on stream and river projects, in the Northwest, Northeast, and Southwest United States. She has also worked on a variety of environmental science research, grant, and teaching projects requiring scientific writing, science communication, laboratory work, and statistical analysis. She currently performs ordinary high water delineations; conducts environmental code analysis; and prepares environmental assessment and mitigation reports, biological evaluations, and permit applications to support clients through the regulatory and planning process. Laura has a particular interest in shoreline projects and has prepared a variety of application materials to support projects within Shoreline Master Program jurisdictions.

Laura earned a Master of Science degree in Environmental Science from Washington State University, Pullman. She has received training from the Washington State Department of Ecology in How to Administer Shoreline Development Permits in Western Washington's Shorelines, Determining the Ordinary High Water Mark, the revised Washington State Wetland Rating System, Puget Sound Coastal Processes, How to Conduct a Forage Fish Survey, and Using the Credit-Debit Method for Estimating Mitigation Needs. Laura has also received training from the Washington State Department of Transportation in Biological Assessment Preparation for Transportation Projects and is listed by WSDOT as a junior author for preparing Biological Assessments. Laura is interested in stormwater management and has received a certificate in Low Impact Development Design from the Washington Stormwater Center.

Appendix C

Maintenance Report

Table V-A.2: Maintenance Standards - Infiltration (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
		(A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway and Berms over 4 feet in height.	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

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

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

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

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

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

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
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%. 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. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	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
	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). 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	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. 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.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	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.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
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.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault.	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault			compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

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

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with out thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulations that exceed 1-inch, at the surface of the water.	Extract oil from vault by vactoring. Disposal in accordance with state and local rules and regulations.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	See Table V-A.5: Maintenance Standards - Catch Basins Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Table V-A.17: Maintenance Standards - Coalescing Plate Oil/Water Separators

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulation that exceeds 1-inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Table V-A.18: Maintenance Standards - Catch Basin Inserts

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

Table V-A.19: Maintenance Standards - Media Filter Drain (MFD)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Sediment accumulation on grass filter strip	Sediment depth exceeds 2 inches or creates uneven grading that interferes with sheet flow.	Remove sediment deposits on grass treatment area of the embankment. When finished, embankment should be level from side to side and drain freely toward the toe of the embankment slope. There should be no areas of standing water once inflow has ceased.
	No-vegetation	Flow spreader is uneven or clogged so that flows are not uniformly distributed over entire embankment width.	Level the spreader and clean to spread flows evenly over entire embankment width.

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
	vegetation management			protocols)

Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".

[a] Frequency: A = Annually; B = Biannually (twice per year); M = Monthly; W = At least one visit should occur during the wet season (for debris/clog related maintenance, this inspection/maintenance visit should occur in the early fall, after deciduous trees have lost their leaves); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).

IPM - Integrated Pest Management

ISA - International Society of Arboriculture

Table V-A.22: Maintenance Standards - Permeable Pavement

Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Surface/Wearing Course				
Permeable Pavements, all	A, S		Runoff from adjacent pervious areas deposits soil, mulch or sediment on paving	• Clean deposited soil or other materials from permeable pavement or other adjacent surfacing • Check if surface elevation of planted area is too high, or slopes towards pavement, and can be regraded (prior to regrading, protect permeable pavement by covering with temporary plastic and secure covering in place) • Mulch and/or plant all exposed soils that may erode to pavement surface
Porous asphalt or pervious concrete		A or B	None (routine maintenance)	Clean surface debris from pavement surface using one or a combination of the following methods: • Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) • Vacuum/sweep permeable paving installation using: ◦ Walk-behind vacuum (sidewalks) ◦ High efficiency regenerative air or vacuum sweeper (roadways, parking lots) ◦ ShopVac or brush brooms (small areas) • Hand held pressure washer or power washer with rotating brushes Follow equipment manufacturer guidelines for when equipment is most effective for cleaning permeable pavement. Dry weather is more effective for some equipment.
	A[b]		Surface is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	• Review the overall performance of the facility (note that small clogged areas may not reduce overall performance of facility) • Test the surface infiltration rate using ASTM C1701 as a corrective maintenance indicator. Perform one test per installation, up to 2,500 square feet. Perform an additional test for each additional 2,500 square feet up to 15,000 square feet total. Above 15,000 square feet, add one test for every 10,000 square feet. • If the results indicate an infiltration rate of 10 inches per hour or less, then perform corrective maintenance to restore permeability. To clean clogged pavement surfaces, use one or combination of the following methods:

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency[a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				◦ Combined pressure wash and vacuum system calibrated to not dislodge wearing course aggregate. ◦ Hand held pressure washer or power washer with rotating brushes ◦ Pure vacuum sweepers Note: If the annual/biannual routine maintenance standard to clean the pavement surface is conducted using equipment from the list above, corrective maintenance may not be needed.
	A		Sediment present at the surface of the pavement	• Assess the overall performance of the pavement system during a rain event. If water runs off the pavement and/or there is ponding then see above. • Determine source of sediment loading and evaluate whether or not the source can be reduced/eliminated. If the source cannot be addressed, consider increasing frequency of routine cleaning (e.g., twice per year instead of once per year).
	Summer		Moss growth inhibits infiltration or poses slip safety hazard	• Sidewalks: Use a stiff broom to remove moss in the summer when it is dry • Parking lots and roadways: Pressure wash, vacuum sweep, or use a combination of the two for cleaning moss from pavement surface. May require stiff broom or power brush in areas of heavy moss.
	A		Major cracks or trip hazards and concrete spalling and raveling	• Fill potholes or small cracks with patching mixes • Large cracks and settlement may require cutting and replacing the pavement section. Replace in-kind where feasible. Replacing porous asphalt with conventional asphalt is acceptable if it is a small percentage of the total facility area and does not impact the overall facility function. • Take appropriate precautions during pavement repair and replacement efforts to prevent clogging of adjacent porous materials
Interlocking concrete paver blocks and aggregate pavers		A or B	None (routine maintenance)	Clean pavement surface using one or a combination of the following methods: • Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) • Vacuum/sweep permeable paving installation using: ◦ Walk-behind vacuum (sidewalks) ◦ High efficiency regenerative air or vacuum sweeper (roadways, parking lots) ◦ ShopVac or brush brooms (small areas) Note: Vacuum settings may have to be adjusted to prevent excess uptake of aggregate from paver openings or joints. Vacuum surface openings in dry weather to remove dry, encrusted sediment.
	A[b]		Surface is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	• Review the overall performance of the facility (note that small clogged areas may not reduce overall performance of facility) • Test the surface infiltration rate using ASTM C1701 as a corrective maintenance indicator. Perform one test per installation, up to 2,500 square feet. Perform an additional test for each additional 2,500 square feet up to 15,000 square feet total. Above 15,000 square feet, add one test for every 10,000 square feet. • If the results indicate an infiltration rate of 10 inches per hour or less, then perform corrective maintenance to restore permeability.

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
				• Clogging is usually an issue in the upper 2 to 3 centimeters of aggregate. Remove the upper layer of encrusted sediment, and fines, and/or vegetation from openings and joints between the pavers by mechanical means and/or suction equipment (e.g., pure vacuum sweeper). • Replace aggregate in paver cells, joints, or openings per manufacturer's recommendations
	A		Sediment present at the surface of the pavement	• Assess the overall performance of the pavement system during a rain event. If water runs off the pavement and/or there is ponding, then see above. • Determine source of sediment loading and evaluate whether or not the source can be reduced/eliminated. If the source cannot be addressed, consider increasing frequency of routine cleaning (e.g., twice per year instead of once per year).
	Summer		Moss growth inhibits infiltration or poses slip safety hazard	• Sidewalks: Use a stiff broom to remove moss in the summer when it is dry • Parking lots and roadways: Vacuum sweep or stiff broom/power brush for cleaning moss from pavement surface
	A		Paver block missing or damaged	Remove individual damaged paver blocks by hand and replace or repair per manufacturer's recommendations
	A		Loss of aggregate material between paver blocks	Refill per manufacturer's recommendations for interlocking paver sections
	A		Settlement of surface	May require resetting
Open-celled paving grid with gravel		A or B	None (routine maintenance)	• Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) • Follow equipment manufacturer guidelines for cleaning surface.
	A b		Aggregate is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	• Use vacuum truck to remove and replace top course aggregate • Replace aggregate in paving grid per manufacturer's recommendations
	A		Paving grid missing or damaged	• Remove pins, pry up grid segments, and replace gravel • Replace grid segments where three or more adjacent rings are broken or damaged • Follow manufacturer guidelines for repairing surface.
	A		Settlement of surface	May require resetting
	A		Loss of aggregate material in paving grid	Replenish aggregate material by spreading gravel with a rake (gravel level should be maintained at the same level as the plastic rings or no more than 1/4 inch above the top of rings). See manufacturer's recommendations.
		A	Weeds present	• Manually remove weeds • Presence of weeds may indicate that too many fines are present (refer to Actions Needed under "Aggregate is clogged" to address this issue)
Open-celled paving grid with grass		A or B	None (routine maintenance)	• Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) • Follow equipment manufacturer guidelines for cleaning surface.

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	**Routine Maintenance**		
	A[b]		Aggregate is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	Rehabilitate per manufacturer's recommendations.
	A		Paving grid missing or damaged	• Remove pins, pry up grid segments, and replace grass • Replace grid segments where three or more adjacent rings are broken or damaged • Follow manufacturer guidelines for repairing surface.
	A		Settlement of surface	May require resetting
	A		Poor grass coverage in paving grid	• Restore growing medium, reseed or plant, aerate, and/or amend vegetated area as needed • Traffic loading may be inhibiting grass growth; reconsider traffic loading if feasible
		As needed	None (routine maintenance)	Use a mulch mower to mow grass
		A	None (routine maintenance)	• Sprinkle a thin layer of compost on top of grass surface (1/2" top dressing) and sweep it in • Do not use fertilizer
		A	Weeds present	• Manually remove weeds • Mow, torch, or inoculate and replace with preferred vegetation
Inlets/Outlets/Pipes				
Inlet/outlet pipe	A		Pipe is damaged	Repair/replace
	A		Pipe is clogged	Remove roots or debris
Underdrain pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	Plant roots, sediment or debris reducing capacity of underdrain (may cause prolonged drawdown period)	• Jet clean or rotary cut debris/roots from underdrain(s) • If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly
Raised subsurface overflow pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	Plant roots, sediment or debris reducing capacity of underdrain	• Jet clean or rotary cut debris/roots from under-drain(s) • If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly
Outlet structure	A, S		Sediment, vegetation, or debris reducing capacity of outlet structure	• Clear the blockage • Identify the source of the blockage and take actions to prevent future blockages
Overflow	B		Native soil is exposed or other signs of erosion damage are present at discharge point	Repair erosion and stabilize surface
Aggregate Storage Reservoir				
Observation port	A, S		Water remains in the storage aggregate longer than anticipated by design after the end of a storm	If immediate cause of extended ponding is not identified, schedule investigation of subsurface materials or other potential causes of system failure.

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Vegetation				
Adjacent large shrubs or trees		As needed	Vegetation related fallout clogs or will potentially clog voids	• Sweep leaf litter and sediment to prevent surface clogging and ponding • Prevent large root systems from damaging subsurface structural components
		Once in May and Once in September	Vegetation growing beyond facility edge onto sidewalks, paths, and street edge	Edging and trimming of planted areas to control groundcovers and shrubs from overreaching the sidewalks, paths and street edge improves appearance and reduces clogging of permeable pavements by leaf litter, mulch and soil.
Leaves, needles, and organic debris		In fall (October to December) after leaf drop (1-3 times, depending on canopy cover)	Accumulation of organic debris and leaf litter	Use leaf blower or vacuum to blow or remove leaves, evergreen needles, and debris (i.e., flowers, blossoms) off of and away from permeable pavement

Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".

a Frequency: A= Annually; B= Biannually (twice per year); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).

b Inspection should occur during storm event.

Table V-A.23: Maintenance Standards - Vegetated Roofs

Activity	Objective	Schedule	Notes
Structural and Drainage Components			
Clear inlet pipes: Remove soil substrate, vegetation or other debris.	Maintain free drainage of inlet pipes.	Twice annually.	
Inspect drain pipe: Check for cracks settling and proper alignment, and correct and re-compact soils or fill material surrounding pipe, if necessary.	Maintain free drainage of inlet pipes.	Twice annually.	
Inspect fire ventilation points for proper operation	Fire and safety.	Twice annually.	
Maintain egress and ingress: Clear routes of obstructions and maintained to design standards.	Fire and safety.	Twice annually.	
Insects: (see note)			Roof garden design should provide drainage rates that do not allow pooling of water for periods that promote insect larvae development. If standing water is present for extended periods correct drainage problem. Chemical sprays should not be used.
Prevent release of contaminants: Identify activities (mechanical systems maintenance, pet access, etc.) that can potentially release pollutants to the roof garden and establish agreements to prevent release.	Water quality protection.	During construction of roof and then as determined by inspection.	Any cause of pollutant release should be corrected as soon as identified and the pollutant removed.
Vegetation and Growth Medium			
Invasive or nuisance plants: Remove manually and without herbicide applications.	Promote selected plant growth and survival, maintain aesthetics.	Twice annually.	At a minimum, schedule weeding with inspections to coincide with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).

Appendix D

Drainage Calculations

Project Description

File Name	20231115 Conveyance Calc.SPF
Description	Q:\2023\2230752\10_CIV\CAD_2230752-W-SD.dwg

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Santa Barbara UH
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	3
Subbasins	63
Nodes	117
Junctions	113
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	3
Links	116
Channels	0
Pipes	114
Pumps	0
Orifices	0
Weirs	0
Outlets	2
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-yr	Time Series	10-yr	Intensity	inches	Washington	Pierce	10.00	2.90	SCS Type IA 24-hr
2	25-yr	Time Series	25-yr	Intensity	inches	Washington	Pierce	25.00	3.50	SCS Type IA 24-hr
3	2-yr	Time Series	2-yr	Intensity	inches	Washington	Pierce	2.00	2.05	SCS Type IA 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	BLDG A_NORTH	0.05	100.00	98.00	76.00	2.03	1.81	0.08	0.02	0 00:05:00
2	BLDG A_SOUTH	0.05	100.00	98.00	76.00	2.03	1.81	0.08	0.02	0 00:05:00
3	BLDG B_NE	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
4	BLDG B_NW	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
5	BLDG B_SE	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
6	BLDG B_SW	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
7	BLDG C_NE	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
8	BLDG C_NW	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
9	BLDG C_SE	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
10	BLDG C_SW	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
11	BLDG CLUB_EAST	0.03	100.00	98.00	76.00	2.03	1.81	0.05	0.01	0 00:05:00
12	BLDG CLUB_WEST	0.03	100.00	98.00	76.00	2.03	1.81	0.05	0.01	0 00:05:00
13	BLDG D_NE	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
14	BLDG D_NW	0.06	100.00	98.00	76.00	2.03	1.81	0.11	0.03	0 00:05:00
15	BLDG D_SOUTH	0.12	100.00	98.00	76.00	2.03	1.81	0.21	0.06	0 00:05:00
16	BLDG E_EAST	0.08	100.00	98.00	76.00	2.03	1.81	0.15	0.04	0 00:05:00
17	BLDG E_WEST	0.16	100.00	98.00	76.00	2.03	1.81	0.29	0.08	0 00:05:00
18	BLDG F_EAST	0.10	100.00	98.00	76.00	2.03	1.81	0.18	0.05	0 00:05:00
19	BLDG F_WEST	0.10	100.00	98.00	76.00	2.03	1.81	0.18	0.05	0 00:05:00
20	BLDG G_EAST	0.08	100.00	98.00	76.00	2.03	1.81	0.14	0.04	0 00:05:00
21	BLDG G_WEST	0.10	100.00	98.00	76.00	2.03	1.81	0.18	0.05	0 00:05:00
22	BLDG H_EAST	0.10	100.00	98.00	76.00	2.03	1.81	0.18	0.05	0 00:05:00
23	BLDG H_WEST	0.08	100.00	98.00	76.00	2.03	1.81	0.15	0.04	0 00:05:00
24	BLDG T.I. EAST	0.05	100.00	98.00	76.00	2.03	1.81	0.08	0.02	0 00:05:00
25	BLDG T.I. NE	0.02	100.00	98.00	76.00	2.03	1.81	0.04	0.01	0 00:05:00
26	BLDG T.I. NW	0.04	100.00	98.00	76.00	2.03	1.81	0.08	0.02	0 00:05:00
27	BLDG T.I. SE	0.03	100.00	98.00	76.00	2.03	1.81	0.05	0.01	0 00:05:00
28	BLDG T.I. SW	0.04	100.00	98.00	76.00	2.03	1.81	0.08	0.02	0 00:05:00
29	BLDG T.I. WEST	0.06	100.00	98.00	76.00	2.03	1.81	0.10	0.03	0 00:05:00
30	SDCB 02	0.22	98.00	98.00	76.00	2.03	1.78	0.39	0.10	0 00:05:00
31	SDCB 03	0.13	100.00	98.00	76.00	2.03	1.81	0.23	0.06	0 00:05:00
32	SDCB 04	0.06	73.00	98.00	76.00	2.03	1.44	0.09	0.02	0 00:05:00
33	SDCB 05	0.24	90.00	98.00	76.00	2.03	1.67	0.40	0.10	0 00:05:00
34	SDCB 06	0.16	65.00	98.00	76.00	2.03	1.33	0.21	0.05	0 00:05:00
35	SDCB 07	0.09	64.00	98.00	76.00	2.03	1.31	0.12	0.03	0 00:05:00
36	SDCB 08	0.05	100.00	98.00	76.00	2.03	1.81	0.08	0.02	0 00:05:00
37	SDCB 09	0.25	82.00	98.00	76.00	2.03	1.56	0.39	0.10	0 00:05:00
38	SDCB 11	0.10	91.00	98.00	76.00	2.03	1.68	0.17	0.04	0 00:05:00
39	SDCB 12	0.10	99.00	98.00	76.00	2.03	1.79	0.18	0.05	0 00:05:00
40	SDCB 13	0.13	94.00	98.00	76.00	2.03	1.72	0.22	0.06	0 00:05:00
41	SDCB 14	0.22	68.00	98.00	76.00	2.03	1.37	0.30	0.07	0 00:05:00
42	SDCB 15	0.13	88.00	98.00	76.00	2.03	1.64	0.21	0.05	0 00:05:00
43	SDCB 16	0.14	65.00	98.00	76.00	2.03	1.33	0.19	0.05	0 00:05:00
44	SDCB 17	0.10	92.00	98.00	76.00	2.03	1.70	0.17	0.05	0 00:05:00
45	SDCB 19	0.46	78.00	98.00	76.00	2.03	1.50	0.69	0.17	0 00:05:00
46	SDCB 20	0.11	79.00	98.00	76.00	2.03	1.52	0.17	0.04	0 00:05:00
47	SDCB 21	0.09	93.00	98.00	76.00	2.03	1.71	0.15	0.04	0 00:05:00
48	SDCB 22	0.20	82.00	98.00	76.00	2.03	1.56	0.31	0.08	0 00:05:00
49	SDCB 23	0.20	86.00	98.00	76.00	2.03	1.61	0.32	0.08	0 00:05:00
50	SDCB 24	0.02	85.00	98.00	76.00	2.03	1.60	0.04	0.01	0 00:05:00
51	SDCB 25	0.03	65.00	98.00	76.00	2.03	1.33	0.03	0.01	0 00:05:00
52	SDCB 27	0.49	76.00	98.00	76.00	2.03	1.48	0.72	0.18	0 00:05:00
53	SDCB 28	0.20	73.00	98.00	76.00	2.03	1.44	0.28	0.07	0 00:05:00
54	SDCB 29	0.20	79.00	98.00	76.00	2.03	1.52	0.31	0.08	0 00:05:00
55	SDCB 30	0.43	77.00	98.00	76.00	2.03	1.49	0.64	0.16	0 00:05:00
56	SDCB 31	0.52	26.00	98.00	76.00	2.03	0.79	0.41	0.08	0 00:05:00
57	SDCB 32	0.19	73.00	98.00	76.00	2.03	1.44	0.27	0.07	0 00:05:00
58	SDCB 33	0.23	83.00	98.00	76.00	2.03	1.57	0.36	0.09	0 00:05:00
59	SDCB 34	0.14	76.00	98.00	76.00	2.03	1.48	0.20	0.05	0 00:05:00
60	SDCB 36	0.36	79.00	98.00	76.00	2.03	1.52	0.54	0.14	0 00:05:00
61	SDCB 37	0.07	96.00	98.00	76.00	2.03	1.75	0.13	0.03	0 00:05:00
62	SDCB 38	0.25	72.00	98.00	76.00	2.03	1.42	0.35	0.09	0 00:05:00
63	SDCB 40	0.11	0.00	98.00	76.00	2.03	0.43	0.05	0.01	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AREA DRAIN G1	Junction	73.07	77.13	0.00	0.00	0.00	0.00	73.07	0.00	4.06	0 00:00	0.00	0.00
2	AREA DRAIN H1	Junction	72.33	77.10	0.00	0.00	0.00	0.00	72.33	0.00	4.77	0 00:00	0.00	0.00
3	SDCB#01	Junction	66.90	74.84	67.40	0.00	0.00	0.11	67.76	0.00	7.08	0 00:00	0.00	0.00
4	SDCB#02	Junction	69.50	72.40	0.00	0.00	0.00	0.25	69.71	0.00	2.69	0 00:00	0.00	0.00
5	SDCB#03	Junction	69.86	72.19	0.00	0.00	0.00	0.10	70.03	0.00	2.16	0 00:00	0.00	0.00
6	SDCB#04	Junction	70.14	72.64	0.00	0.00	0.00	0.04	70.25	0.00	2.39	0 00:00	0.00	0.00
7	SDCB#05	Junction	68.96	72.11	0.00	0.00	0.00	0.37	69.22	0.00	2.89	0 00:00	0.00	0.00
8	SDCB#06	Junction	68.72	73.03	0.00	0.00	0.00	0.12	68.99	0.00	4.04	0 00:00	0.00	0.00
9	SDCB#07	Junction	69.08	71.79	0.00	0.00	0.00	0.07	69.21	0.00	2.58	0 00:00	0.00	0.00
10	SDCB#08	Junction	69.55	72.45	0.00	0.00	0.00	0.04	69.64	0.00	2.81	0 00:00	0.00	0.00
11	SDCB#09	Junction	68.51	72.35	0.00	0.00	0.00	0.59	68.98	0.00	3.37	0 00:00	0.00	0.00
12	SDCB#10	Junction	67.90	76.96	68.40	0.00	0.00	0.06	69.53	0.00	7.43	0 00:00	0.00	0.00
13	SDCB#11	Junction	73.48	76.58	0.00	0.00	0.00	0.15	73.58	0.00	3.00	0 00:00	0.00	0.00
14	SDCB#12	Junction	73.83	76.54	0.00	0.00	0.00	0.05	73.94	0.00	2.60	0 00:00	0.00	0.00
15	SDCB#13	Junction	73.87	76.58	0.00	0.00	0.00	0.06	73.99	0.00	2.59	0 00:00	0.00	0.00
16	SDCB#14	Junction	71.89	76.31	0.00	0.00	0.00	0.29	72.13	0.00	4.18	0 00:00	0.00	0.00
17	SDCB#15	Junction	71.68	76.25	0.00	0.00	0.00	0.38	72.00	0.00	4.25	0 00:00	0.00	0.00
18	SDCB#16	Junction	72.23	76.36	0.00	0.00	0.00	0.17	72.41	0.00	3.95	0 00:00	0.00	0.00
19	SDCB#17	Junction	72.75	76.55	0.00	0.00	0.00	0.08	72.90	0.00	3.65	0 00:00	0.00	0.00
20	SDCB#18	Junction	68.40	76.69	0.00	0.00	0.00	0.95	69.53	0.00	7.16	0 00:00	0.00	0.00
21	SDCB#19	Junction	70.35	75.25	0.00	0.00	0.00	0.66	70.72	0.00	4.53	0 00:00	0.00	0.00
22	SDCB#20	Junction	70.98	75.25	0.00	0.00	0.00	0.50	71.28	0.00	3.97	0 00:00	0.00	0.00
23	SDCB#21	Junction	71.81	75.25	0.00	0.00	0.00	0.04	71.90	0.00	3.35	0 00:00	0.00	0.00
24	SDCB#22	Junction	71.36	75.25	0.00	0.00	0.00	0.42	71.65	0.00	3.60	0 00:00	0.00	0.00
25	SDCB#23	Junction	71.93	75.25	0.00	0.00	0.00	0.24	72.14	0.00	3.11	0 00:00	0.00	0.00
26	SDCB#24	Junction	72.61	75.25	0.00	0.00	0.00	0.02	72.68	0.00	2.57	0 00:00	0.00	0.00
27	SDCB#25	Junction	72.79	75.25	0.00	0.00	0.00	0.01	72.83	0.00	2.42	0 00:00	0.00	0.00
28	SDCB#26	Junction	68.40	76.79	0.00	0.00	0.00	0.64	69.53	0.00	7.26	0 00:00	0.00	0.00
29	SDCB#27	Junction	71.20	75.25	0.00	0.00	0.00	0.65	71.57	0.00	3.68	0 00:00	0.00	0.00
30	SDCB#28	Junction	72.15	75.25	0.00	0.00	0.00	0.12	72.33	0.00	2.92	0 00:00	0.00	0.00
31	SDCB#29	Junction	71.72	75.40	0.00	0.00	0.00	0.34	71.95	0.00	3.45	0 00:00	0.00	0.00
32	SDCB#30	Junction	72.69	75.40	0.00	0.00	0.00	0.16	72.89	0.00	2.51	0 00:00	0.00	0.00
33	SDCB#31	Junction	70.25	77.16	0.00	0.00	0.00	0.27	70.51	0.00	6.65	0 00:00	0.00	0.00
34	SDCB#32	Junction	72.60	75.25	0.00	0.00	0.00	0.11	72.77	0.00	2.48	0 00:00	0.00	0.00
35	SDCB#33	Junction	70.81	75.25	0.00	0.00	0.00	0.14	70.97	0.00	4.28	0 00:00	0.00	0.00
36	SDCB#34	Junction	71.52	75.25	0.00	0.00	0.00	0.05	71.63	0.00	3.62	0 00:00	0.00	0.00
37	SDCB#35	Junction	68.40	77.00	0.00	0.00	0.00	0.30	69.53	0.00	7.47	0 00:00	0.00	0.00
38	SDCB#36	Junction	70.59	75.26	0.00	0.00	0.00	0.25	70.75	0.00	4.51	0 00:00	0.00	0.00
39	SDCB#37	Junction	71.52	75.67	0.00	0.00	0.00	0.12	71.69	0.00	3.98	0 00:00	0.00	0.00
40	SDCB#38	Junction	71.88	75.26	0.00	0.00	0.00	0.09	72.02	0.00	3.24	0 00:00	0.00	0.00
41	SDCB#40	Junction	73.22	76.27	0.00	0.00	0.00	0.00	73.24	0.00	3.03	0 00:00	0.00	0.00
42	SDCO#A1	Junction	72.71	76.38	0.00	0.00	0.00	0.04	72.81	0.00	3.57	0 00:00	0.00	0.00
43	SDCO#A2	Junction	73.21	76.54	0.00	0.00	0.00	0.02	73.28	0.00	3.26	0 00:00	0.00	0.00
44	SDCO#A3	Junction	74.00	75.03	0.00	0.00	0.00	0.02	74.07	0.00	0.96	0 00:00	0.00	0.00
45	SDCO#A4	Junction	73.96	75.89	0.00	0.00	0.00	0.02	74.03	0.00	1.86	0 00:00	0.00	0.00
46	SDCO#A5	Junction	73.23	76.82	0.00	0.00	0.00	0.02	73.30	0.00	3.52	0 00:00	0.00	0.00
47	SDCO#B1	Junction	74.33	78.08	0.00	0.00	0.00	0.05	74.39	0.00	3.69	0 00:00	0.00	0.00
48	SDCO#B2	Junction	75.11	77.80	0.00	0.00	0.00	0.03	75.19	0.00	2.61	0 00:00	0.00	0.00
49	SDCO#B3	Junction	75.28	77.92	0.00	0.00	0.00	0.03	75.36	0.00	2.56	0 00:00	0.00	0.00
50	SDCO#B4	Junction	75.41	77.95	0.00	0.00	0.00	0.03	75.49	0.00	2.46	0 00:00	0.00	0.00
51	SDCO#B5	Junction	71.99	78.08	0.00	0.00	0.00	0.06	72.13	0.00	5.95	0 00:00	0.00	0.00
52	SDCO#B6	Junction	72.81	78.02	0.00	0.00	0.00	0.03	72.89	0.00	5.13	0 00:00	0.00	0.00
53	SDCO#B7	Junction	72.87	77.95	0.00	0.00	0.00	0.03	72.95	0.00	5.00	0 00:00	0.00	0.00
54	SDCO#B8	Junction	72.81	78.02	0.00	0.00	0.00	0.03	72.89	0.00	5.13	0 00:00	0.00	0.00
55	SDCO#C1	Junction	72.21	76.85	0.00	0.00	0.00	0.06	73.12	0.00	3.73	0 00:00	0.00	0.00
56	SDCO#C10	Junction	72.74	76.81	0.00	0.00	0.00	0.03	72.96	0.00	3.85	0 00:00	0.00	0.00
57	SDCO#C2	Junction	74.28	76.87	0.00	0.00	0.00	0.03	74.33	0.00	2.54	0 00:00	0.00	0.00
58	SDCO#C3	Junction	74.37	76.91	0.00	0.00	0.00	0.03	74.45	0.00	2.46	0 00:00	0.00	0.00
59	SDCO#C4	Junction	74.29	76.83	0.00	0.00	0.00	0.03	74.37	0.00	2.46	0 00:00	0.00	0.00
60	SDCO#C5	Junction	71.44	76.97	0.00	0.00	0.00	0.05	71.57	0.00	5.40	0 00:00	0.00	0.00
61	SDCO#C6	Junction	72.54	77.11	0.00	0.00	0.00	0.03	72.62	0.00	4.49	0 00:00	0.00	0.00
62	SDCO#C7	Junction	72.66	76.99	0.00	0.00	0.00	0.03	72.74	0.00	4.25	0 00:00	0.00	0.00
63	SDCO#C8	Junction	72.19	76.97	0.00	0.00	0.00	0.03	72.27	0.00	4.70	0 00:00	0.00	0.00
64	SDCO#C9	Junction	72.19	76.88	0.00	0.00	0.00	0.03	72.41	0.00	4.47	0 00:00	0.00	0.00
65	SDCO#CLUB1	Junction	72.38	76.33	0.00	0.00	0.00	0.03	72.44	0.00	3.89	0 00:00	0.00	0.00
66	SDCO#CLUB2	Junction	72.72	76.59	0.00	0.00	0.00	0.01	72.77	0.00	3.82	0 00:00	0.00	0.00
67	SDCO#CLUB3	Junction	73.13	76.45	0.00	0.00	0.00	0.01	73.18	0.00	3.27	0 00:00	0.00	0.00
68	SDCO#CLUB4	Junction	72.72	76.62	0.00	0.00	0.00	0.01	72.77	0.00	3.85	0 00:00	0.00	0.00
69	SDCO#CLUB5	Junction	73.15	76.43	0.00	0.00	0.00	0.01	73.20	0.00	3.23	0 00:00	0.00	0.00
70	SDCO#COM01	Junction	70.05	73.56	0.00	0.00	0.00	0.03	70.86	0.00	2.70	0 00:00	0.00	0.00
71	SDCO#COM02	Junction	70.70	73.51	0.00	0.00	0.00	0.03	70.86	0.00	2.65	0 00:00	0.00	0.00
72	SDCO#COM04	Junction	70.78	73.59	0.00	0.00	0.00	0.05	70.85	0.00	2.74	0 00:00	0.00	0.00
73	SDCO#COM05	Junction	71.01	73.62	0.00	0.00	0.00	0.02	71.08	0.00	2.54	0 00:00	0.00	0.00
74	SDCO#COM06	Junction	71.60	73.47	0.00	0.00	0.00	0.02	71.67	0.00	1.80	0 00:00	0.00	0.00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
75	SDCO#COM07	Junction	70.25	73.18	0.00	0.00	0.00	0.02	70.32	0.00	2.86	0 00:00	0.00	0.00
76	SDCO#COM08	Junction	70.78	73.55	0.00	0.00	0.00	0.02	70.85	0.00	2.70	0 00:00	0.00	0.00
77	SDCO#COM09	Junction	70.17	73.63	0.00	0.00	0.00	0.02	70.22	0.00	3.41	0 00:00	0.00	0.00
78	SDCO#COM10	Junction	71.09	73.63	0.00	0.00	0.00	0.01	71.13	0.00	2.50	0 00:00	0.00	0.00
79	SDCO#COM11	Junction	71.09	73.63	0.00	0.00	0.00	0.01	71.14	0.00	2.49	0 00:00	0.00	0.00
80	SDCO#COM12	Junction	70.17	72.88	0.00	0.00	0.00	0.02	70.21	0.00	2.67	0 00:00	0.00	0.00
81	SDCO#COM13	Junction	70.87	73.41	0.00	0.00	0.00	0.02	70.93	0.00	2.48	0 00:00	0.00	0.00
82	SDCO#D1	Junction	72.84	77.30	0.00	0.00	0.00	0.05	72.93	0.00	4.37	0 00:00	0.00	0.00
83	SDCO#D2	Junction	74.65	77.29	0.00	0.00	0.00	0.06	74.76	0.00	2.53	0 00:00	0.00	0.00
84	SDCO#D3	Junction	74.71	77.29	0.00	0.00	0.00	0.06	74.83	0.00	2.46	0 00:00	0.00	0.00
85	SDCO#D4	Junction	73.53	77.46	0.00	0.00	0.00	0.06	73.61	0.00	3.85	0 00:00	0.00	0.00
86	SDCO#D5	Junction	74.47	77.03	0.00	0.00	0.00	0.03	74.53	0.00	2.50	0 00:00	0.00	0.00
87	SDCO#D6	Junction	74.79	77.33	0.00	0.00	0.00	0.03	74.85	0.00	2.48	0 00:00	0.00	0.00
88	SDCO#D7	Junction	74.72	77.28	0.00	0.00	0.00	0.03	74.80	0.00	2.48	0 00:00	0.00	0.00
89	SDCO#E1	Junction	72.07	76.54	0.00	0.00	0.00	0.08	72.20	0.00	4.34	0 00:00	0.00	0.00
90	SDCO#E2	Junction	72.43	76.80	0.00	0.00	0.00	0.08	72.56	0.00	4.24	0 00:00	0.00	0.00
91	SDCO#E3	Junction	73.14	76.57	0.00	0.00	0.00	0.08	73.27	0.00	3.30	0 00:00	0.00	0.00
92	SDCO#E4	Junction	72.64	76.50	0.00	0.00	0.00	0.04	72.73	0.00	3.77	0 00:00	0.00	0.00
93	SDCO#E5	Junction	72.96	76.75	0.00	0.00	0.00	0.04	73.05	0.00	3.70	0 00:00	0.00	0.00
94	SDCO#E6	Junction	73.56	76.50	0.00	0.00	0.00	0.04	73.65	0.00	2.85	0 00:00	0.00	0.00
95	SDCO#E7	Junction	74.24	76.76	0.00	0.00	0.00	0.08	74.37	0.00	2.39	0 00:00	0.00	0.00
96	SDCO#F1	Junction	71.77	77.26	0.00	0.00	0.00	0.05	71.87	0.00	5.39	0 00:00	0.00	0.00
97	SDCO#F2	Junction	72.50	76.98	0.00	0.00	0.00	0.05	72.55	0.00	4.43	0 00:00	0.00	0.00
98	SDCO#F3	Junction	73.46	77.21	0.00	0.00	0.00	0.05	73.57	0.00	3.64	0 00:00	0.00	0.00
99	SDCO#G1	Junction	73.29	77.07	0.00	0.00	0.00	0.05	73.37	0.00	3.70	0 00:00	0.00	0.00
100	SDCO#G2	Junction	74.47	77.01	0.00	0.00	0.00	0.05	74.57	0.00	2.44	0 00:00	0.00	0.00
101	SDCO#G3	Junction	72.89	77.15	0.00	0.00	0.00	0.04	72.99	0.00	4.16	0 00:00	0.00	0.00
102	SDCO#G4	Junction	74.22	76.76	0.00	0.00	0.00	0.04	74.31	0.00	2.45	0 00:00	0.00	0.00
103	SDCO#H1	Junction	72.76	77.10	0.00	0.00	0.00	0.05	72.82	0.00	4.28	0 00:00	0.00	0.00
104	SDCO#H2	Junction	73.13	77.02	0.00	0.00	0.00	0.05	73.23	0.00	3.79	0 00:00	0.00	0.00
105	SDCO#H3	Junction	74.20	76.74	0.00	0.00	0.00	0.05	74.30	0.00	2.44	0 00:00	0.00	0.00
106	SDCO#H4	Junction	72.79	77.00	0.00	0.00	0.00	0.04	72.86	0.00	4.14	0 00:00	0.00	0.00
107	SDCO#H5	Junction	72.94	75.70	0.00	0.00	0.00	0.04	73.03	0.00	2.67	0 00:00	0.00	0.00
108	SDCO#H6	Junction	74.06	76.59	0.00	0.00	0.00	0.04	74.15	0.00	2.44	0 00:00	0.00	0.00
109	WQ#1	Junction	67.90	73.16	0.00	0.00	0.00	0.59	68.38	0.00	4.78	0 00:00	0.00	0.00
110	WQ#2	Junction	70.66	76.71	0.00	0.00	0.00	0.15	70.73	0.00	5.98	0 00:00	0.00	0.00
111	WQ#3	Junction	69.48	76.48	0.00	0.00	0.00	0.38	69.64	0.00	6.84	0 00:00	0.00	0.00
112	WQ#4	Junction	69.60	76.07	0.00	0.00	0.00	0.66	69.99	0.00	6.08	0 00:00	0.00	0.00
113	WQ#5	Junction	70.30	76.23	0.00	0.00	0.00	0.64	70.56	0.00	5.67	0 00:00	0.00	0.00
114	TRENCH INLET	Outfall	67.32					0.11	67.32					
115	R-TANK 1	Storage Node	66.90	70.88	67.40		0.00	0.63	67.76				0.00	0.00
116	R-TANK 2	Storage Node	67.90	74.77	68.40		0.00	1.44	69.53				0.00	0.00
117	R-TANK 3	Storage Node	67.90	74.77	68.40		0.00	1.10	69.53				0.00	0.00

2-yr HGL for R-Tanks

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	{SD - Phase 1}.PIPE 02	Pipe	SDCB#02	SDCB#05	108.10	69.50	68.96	0.5000	12.000	0.0130	0.25	2.52	0.10	1.76	0.24	0.24	0.00	Calculated
2	{SD - Phase 1}.PIPE 03	Pipe	SDCB#03	SDCB#02	71.71	69.86	69.50	0.5000	8.000	0.0150	0.10	0.74	0.14	1.24	0.19	0.28	0.00	Calculated
3	{SD - Phase 1}.PIPE 04	Pipe	SDCB#04	SDCB#03	55.25	70.14	69.86	0.5100	8.004	0.0150	0.04	0.75	0.06	0.81	0.14	0.20	0.00	Calculated
4	{SD - Phase 1}.PIPE 05	Pipe	SDCB#05	SDCB#09	89.22	68.96	68.51	0.5000	12.000	0.0130	0.37	2.53	0.15	1.45	0.36	0.36	0.00	Calculated
5	{SD - Phase 1}.PIPE 06	Pipe	SDCB#06	SDCB#09	42.41	68.72	68.51	0.5000	8.004	0.0130	0.12	0.85	0.14	0.65	0.37	0.55	0.00	Calculated
6	{SD - Phase 1}.PIPE 07	Pipe	SDCB#07	SDCB#06	72.15	69.08	68.72	0.5000	8.000	0.0130	0.07	0.85	0.08	1.03	0.20	0.30	0.00	Calculated
7	{SD - Phase 1}.PIPE 08	Pipe	SDCB#08	SDCB#07	49.14	69.55	69.08	0.9600	8.004	0.0130	0.04	1.18	0.04	1.15	0.11	0.16	0.00	Calculated
8	{SD - Phase 1}.PIPE 09	Pipe	SDCB#09	WQ#1	21.39	68.51	68.40	0.5100	8.000	0.0130	0.59	0.87	0.68	2.58	0.41	0.62	0.00	Calculated
9	{SD - Phase 1}.PIPE 11	Pipe	SDCB#11	WQ#2	5.71	73.48	72.83	11.3800	8.000	0.0130	0.15	4.08	0.04	4.81	0.10	0.14	0.00	Calculated
10	{SD - Phase 1}.PIPE 12	Pipe	SDCB#12	SDCB#11	64.20	73.83	73.48	0.5500	8.004	0.0130	0.05	0.89	0.05	1.33	0.11	0.16	0.00	Calculated
11	{SD - Phase 1}.PIPE 13	Pipe	SDCB#13	SDCB#11	78.00	73.87	73.48	0.5000	8.004	0.0130	0.06	0.86	0.07	1.46	0.11	0.17	0.00	Calculated
12	{SD - Phase 1}.PIPE 14	Pipe	SDCB#14	SDCB#15	42.96	71.89	71.68	0.4900	12.000	0.0130	0.29	2.49	0.12	1.62	0.28	0.28	0.00	Calculated
13	{SD - Phase 1}.PIPE 15	Pipe	SDCB#15	WQ#3	6.67	71.68	71.65	0.4500	12.000	0.0130	0.38	2.39	0.16	2.03	0.29	0.29	0.00	Calculated
14	{SD - Phase 1}.PIPE 16	Pipe	SDCB#16	SDCB#14	67.53	72.23	71.89	0.5000	12.000	0.0130	0.17	2.53	0.07	1.46	0.21	0.21	0.00	Calculated
15	{SD - Phase 1}.PIPE 17	Pipe	SDCB#17	SDCB#16	36.65	72.75	72.57	0.4900	8.004	0.0130	0.08	0.85	0.10	1.54	0.14	0.21	0.00	Calculated
16	{SD - Phase 1}.PIPE 18	Pipe	SDCB#18	R-TANK 2	54.55	68.40	68.40	0.0000	24.000	0.0130	0.94	0.97	0.97	1.91	1.13	0.57	0.00	Calculated
17	{SD - Phase 1}.PIPE 20	Pipe	SDCB#20	SDCB#19	126.79	70.98	70.35	0.5000	12.000	0.0130	0.50	2.51	0.20	2.15	0.34	0.34	0.00	Calculated
18	{SD - Phase 1}.PIPE 21	Pipe	SDCB#21	SDCB#20	57.67	71.81	71.31	0.8700	8.004	0.0130	0.04	1.13	0.03	1.48	0.09	0.13	0.00	Calculated
19	{SD - Phase 1}.PIPE 22	Pipe	SDCB#22	SDCB#20	75.77	71.36	70.98	0.5000	12.000	0.0130	0.42	2.52	0.17	2.15	0.30	0.30	0.00	Calculated
20	{SD - Phase 1}.PIPE 23	Pipe	SDCB#23	SDCB#22	113.35	71.93	71.36	0.5000	12.000	0.0130	0.24	2.53	0.10	1.58	0.25	0.25	0.00	Calculated
21	{SD - Phase 1}.PIPE 24	Pipe	SDCB#24	SDCB#23	69.19	72.61	72.26	0.5100	8.004	0.0130	0.02	0.86	0.02	1.01	0.06	0.09	0.00	Calculated
22	{SD - Phase 1}.PIPE 25	Pipe	SDCB#25	SDCB#24	34.45	72.79	72.61	0.5200	8.004	0.0130	0.01	0.87	0.01	0.57	0.06	0.08	0.00	Calculated
23	{SD - Phase 1}.PIPE 26	Pipe	SDCB#26	SDCB#18	104.96	68.40	68.40	0.0000	24.000	0.0130	0.56	0.70	0.80	0.81	1.13	0.57	0.00	Calculated
24	{SD - Phase 1}.PIPE 27	Pipe	SDCB#27	WQ#5	80.37	71.20	70.80	0.5000	12.000	0.0130	0.64	2.51	0.26	2.60	0.35	0.35	0.00	Calculated
25	{SD - Phase 1}.PIPE 28	Pipe	SDCB#28	SDCB#27	122.98	72.15	71.54	0.5000	8.004	0.0130	0.12	0.85	0.14	1.77	0.17	0.25	0.00	Calculated
26	{SD - Phase 1}.PIPE 29	Pipe	SDCB#29	SDCB#27	82.06	71.72	71.20	0.6300	12.000	0.0130	0.34	2.84	0.12	1.70	0.30	0.30	0.00	Calculated
27	{SD - Phase 1}.PIPE 30	Pipe	SDCB#30	SDCB#29	128.14	72.69	72.05	0.5000	8.004	0.0130	0.16	0.86	0.18	1.90	0.19	0.29	0.00	Calculated
28	{SD - Phase 1}.PIPE 31	Pipe	SDCB#31	R-TANK 3	5.26	70.25	70.22	0.5700	12.000	0.0130	0.27	2.69	0.10	1.88	0.24	0.24	0.00	Calculated
29	{SD - Phase 1}.PIPE 40	Pipe	SDCB#40	SDCB#27	52.18	73.22	71.20	3.8700	12.000	0.0130	0.00	7.01	0.00	0.11	0.20	0.20	0.00	Calculated
30	{SD - Phase 1}.PIPE B1	Pipe	SDCO#B1	SDCB#18	50.72	74.33	69.73	9.0700	8.004	0.0130	0.05	3.64	0.02	3.74	0.06	0.09	0.00	Calculated
31	{SD - Phase 1}.PIPE B2	Pipe	SDCO#B2	SDCO#B1	60.72	75.11	74.50	1.0000	6.000	0.0130	0.03	0.56	0.05	1.47	0.08	0.15	0.00	Calculated
32	{SD - Phase 1}.PIPE B3	Pipe	SDCO#B3	SDCO#B2	16.77	75.28	75.11	1.0100	6.000	0.0130	0.03	0.56	0.05	1.42	0.08	0.16	0.00	Calculated
33	{SD - Phase 1}.PIPE B4	Pipe	SDCO#B4	SDCO#B1	85.66	75.41	74.50	1.0600	6.000	0.0130	0.03	0.58	0.05	1.50	0.07	0.15	0.00	Calculated
34	{SD - Phase 1}.PIPE B5	Pipe	SDCO#B5	R-TANK 3	8.62	71.99	71.95	0.4600	6.000	0.0130	0.05	0.38	0.14	1.38	0.13	0.26	0.00	Calculated
35	{SD - Phase 1}.PIPE B6	Pipe	SDCO#B6	SDCO#B5	81.80	72.81	71.99	1.0000	6.000	0.0130	0.03	0.56	0.05	0.88	0.11	0.22	0.00	Calculated
36	{SD - Phase 1}.PIPE B7	Pipe	SDCO#B7	SDCO#B6	6.36	72.87	72.81	0.9400	6.000	0.0130	0.03	0.54	0.05	1.37	0.08	0.16	0.00	Calculated
37	{SD - Phase 1}.PIPE B8	Pipe	SDCO#B8	SDCO#B5	81.80	72.81	71.99	1.0000	6.000	0.0130	0.03	0.56	0.05	0.88	0.11	0.22	0.00	Calculated
38	{SD - Phase 1}.PIPE C1	Pipe	SDCO#C1	SDCB#29	45.29	73.04	72.05	2.1900	8.004	0.0130	0.05	1.79	0.03	2.27	0.08	0.12	0.00	Calculated
39	{SD - Phase 1}.PIPE C10	Pipe	SDCO#C10	SDCO#C9	54.90	72.88	72.33	1.0000	6.000	0.0130	0.03	0.56	0.05	1.42	0.08	0.16	0.00	Calculated
40	{SD - Phase 1}.PIPE C2	Pipe	SDCO#C2	SDCO#C1	22.10	74.28	73.21	4.8400	6.000	0.0130	0.03	1.23	0.02	2.46	0.05	0.11	0.00	Calculated
41	{SD - Phase 1}.PIPE C3	Pipe	SDCO#C3	SDCO#C2	9.24	74.37	74.28	0.9700	6.000	0.0130	0.03	0.55	0.05	1.73	0.07	0.14	0.00	Calculated
42	{SD - Phase 1}.PIPE C4	Pipe	SDCO#C4	SDCO#C1	108.05	74.29	73.21	1.0000	6.000	0.0130	0.03	0.56	0.05	1.47	0.08	0.15	0.00	Calculated
43	{SD - Phase 1}.PIPE C5	Pipe	SDCO#C5	R-TANK 3	7.93	71.44	71.40	0.5000	8.004	0.0130	0.05	0.86	0.06	1.33	0.12	0.17	0.00	Calculated
44	{SD - Phase 1}.PIPE C6	Pipe	SDCO#C6	SDCO#C5	109.73	72.54	71.44	1.0000	6.000	0.0130	0.03	0.56	0.05	0.97	0.10	0.20	0.00	Calculated
45	{SD - Phase 1}.PIPE C7	Pipe	SDCO#C7	SDCO#C6	12.01	72.66	72.54	1.0000	6.000	0.0130	0.03	0.56	0.05	1.42	0.08	0.16	0.00	Calculated
46	{SD - Phase 1}.PIPE C8	Pipe	SDCO#C8	SDCO#C5	45.14	72.19	71.74	1.0000	6.000	0.0130	0.03	0.56	0.05	1.46	0.08	0.15	0.00	Calculated
47	{SD - Phase 1}.PIPE C9	Pipe	SDCO#C9	SDCO#C8	13.55	72.33	72.19	1.0300	6.000	0.0130	0.03	0.57	0.05	1.41	0.08	0.16	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
48	{SD - Phase 1}.PIPE COM01	Pipe	SDCO#COM04	SDCB#02	37.51	70.78	69.50	3.4100	8.004	0.0150	0.05	1.94	0.02	0.88	0.14	0.21	0.00	Calculated
49	{SD - Phase 1}.PIPE COM02	Pipe	SDCO#COM02	SDCO#COM01	49.39	70.70	70.21	0.9900	6.000	0.0130	0.03	0.56	0.05	0.64	0.33	0.66	0.00	Calculated
50	{SD - Phase 1}.PIPE COM04	Pipe	SDCO#COM04	SDCO#COM01	56.60	70.78	70.21	1.0100	6.000	0.0130	0.03	0.56	0.05	0.33	0.29	0.57	0.00	Calculated
51	{SD - Phase 1}.PIPE COM05	Pipe	SDCO#COM05	SDCO#COM04	22.78	71.01	70.78	1.0100	6.000	0.0130	0.02	0.56	0.04	1.27	0.07	0.14	0.00	Calculated
52	{SD - Phase 1}.PIPE COM06	Pipe	SDCO#COM06	SDCO#COM05	59.24	71.60	71.01	1.0000	6.000	0.0150	0.02	0.49	0.04	1.27	0.07	0.14	0.00	Calculated
53	{SD - Phase 1}.PIPE COM07	Pipe	SDCO#COM07	SDCB#04	21.49	70.25	70.14	0.5100	8.000	0.0130	0.02	0.86	0.02	0.72	0.09	0.13	0.00	Calculated
54	{SD - Phase 1}.PIPE COM08	Pipe	SDCO#COM08	SDCO#COM07	36.57	70.78	70.41	1.0100	6.000	0.0130	0.02	0.56	0.03	1.33	0.06	0.13	0.00	Calculated
55	{SD - Phase 1}.PIPE COM09	Pipe	SDCO#COM09	SDCB#05	34.88	70.17	68.96	3.4700	8.004	0.0130	0.02	2.25	0.01	0.38	0.15	0.23	0.00	Calculated
56	{SD - Phase 1}.PIPE COM10	Pipe	SDCO#COM10	SDCO#COM09	48.42	71.09	70.34	1.5500	6.000	0.0130	0.01	0.70	0.01	1.26	0.04	0.08	0.00	Calculated
57	{SD - Phase 1}.PIPE COM11	Pipe	SDCO#COM11	SDCO#COM09	74.62	71.09	70.34	1.0100	6.000	0.0130	0.01	0.56	0.02	1.16	0.05	0.11	0.00	Calculated
58	{SD - Phase 1}.PIPE COM12	Pipe	SDCO#COM12	SDCB#08	16.26	70.17	69.55	3.8100	8.000	0.0130	0.02	2.36	0.01	1.17	0.07	0.10	0.00	Calculated
59	{SD - Phase 1}.PIPE COM13	Pipe	SDCO#COM13	SDCO#COM12	45.72	70.87	70.34	1.1600	6.000	0.0130	0.02	0.60	0.03	1.41	0.06	0.13	0.00	Calculated
60	{SD - Phase 1}.PIPE D1	Pipe	SDCO#D1	SDCB#28	47.80	72.84	72.15	1.4400	8.004	0.0130	0.05	1.45	0.04	1.10	0.13	0.20	0.00	Calculated
61	{SD - Phase 1}.PIPE D2	Pipe	SDCO#D2	SDCO#D1	163.60	74.65	73.01	1.0000	6.000	0.0130	0.05	0.56	0.10	1.80	0.11	0.21	0.00	Calculated
62	{SD - Phase 1}.PIPE D3	Pipe	SDCO#D3	SDCO#D2	6.36	74.71	74.65	0.9400	6.000	0.0130	0.06	0.54	0.10	1.63	0.11	0.23	0.00	Calculated
63	{SD - Phase 1}.PIPE D4	Pipe	SDCO#D4	SDCB#29	54.62	73.36	72.05	2.4000	8.004	0.0130	0.05	1.99	0.03	2.45	0.08	0.12	0.00	Calculated
64	{SD - Phase 1}.PIPE D5	Pipe	SDCO#D5	SDCO#D4	32.05	74.47	73.53	2.9300	6.000	0.0130	0.03	0.96	0.03	1.73	0.07	0.14	0.00	Calculated
65	{SD - Phase 1}.PIPE D6	Pipe	SDCO#D6	SDCO#D5	10.82	74.79	74.47	2.9600	6.000	0.0130	0.03	0.96	0.03	2.08	0.06	0.12	0.00	Calculated
66	{SD - Phase 1}.PIPE D7	Pipe	SDCO#D7	SDCO#D4	119.28	74.72	73.53	1.0000	6.000	0.0130	0.03	0.56	0.05	1.45	0.08	0.15	0.00	Calculated
67	{SD - Phase 1}.PIPE E1	Pipe	SDCO#E1	SDCB#22	42.30	71.90	71.69	0.5000	6.000	0.0130	0.08	0.53	0.14	1.86	0.13	0.26	0.00	Calculated
68	{SD - Phase 1}.PIPE E4	Pipe	SDCO#E4	SDCB#23	42.52	72.48	72.26	0.5200	6.000	0.0130	0.04	0.53	0.07	1.53	0.09	0.18	0.00	Calculated
69	{SD - Phase 1}.PIPE G1	Pipe	SDCO#G1	SDCB#16	23.14	73.29	72.73	2.4200	6.000	0.0130	0.05	0.87	0.05	2.28	0.08	0.16	0.00	Calculated
70	{SD - Phase 1}.PIPE G2	Pipe	SDCO#G2	SDCO#G1	118.43	74.47	73.29	1.0000	6.000	0.0130	0.05	0.56	0.08	1.88	0.09	0.18	0.00	Calculated
71	{SD - Phase 1}.PIPE G3	Pipe	SDCO#G3	SDCB#17	29.24	72.89	72.75	0.4800	6.000	0.0130	0.04	0.39	0.09	0.95	0.13	0.25	0.00	Calculated
72	{SD - Phase 1}.PIPE G4	Pipe	SDCO#G4	SDCO#G3	116.18	74.22	73.06	1.0000	6.000	0.0130	0.04	0.56	0.07	1.59	0.09	0.17	0.00	Calculated
73	{SD - Phase 1}.PIPE H1	Pipe	SDCO#H1	SDCB#14	9.90	72.76	72.22	5.4500	8.004	0.0130	0.05	2.83	0.02	2.83	0.06	0.09	0.00	Calculated
74	{SD - Phase 1}.PIPE H2	Pipe	SDCO#H2	SDCO#H1	20.00	73.13	72.93	1.0000	6.000	0.0130	0.05	0.56	0.08	1.65	0.10	0.20	0.00	Calculated
75	{SD - Phase 1}.PIPE H3	Pipe	SDCO#H3	SDCO#H2	106.86	74.20	73.13	1.0000	6.000	0.0130	0.05	0.56	0.08	1.65	0.10	0.20	0.00	Calculated
76	{SD - Phase 1}.PIPE H4	Pipe	SDCO#H4	SDCB#15	24.70	72.79	72.18	2.4700	6.000	0.0130	0.04	0.88	0.04	2.18	0.07	0.14	0.00	Calculated
77	{SD - Phase 1}.PIPE H5	Pipe	SDCO#H5	SDCO#H4	14.98	72.94	72.79	1.0000	6.000	0.0130	0.04	0.56	0.07	1.74	0.08	0.17	0.00	Calculated
78	{SD - Phase 1}.PIPE H6	Pipe	SDCO#H6	SDCO#H5	112.34	74.06	72.94	1.0000	6.000	0.0130	0.04	0.56	0.07	1.55	0.09	0.18	0.00	Calculated
79	{SD - Phase 1}.PIPE RT-1	Pipe	R-TANK 1	SDCB#01	4.18	67.40	67.40	0.0000	24.000	0.0130	0.11	3.50	0.03	1.16	0.36	0.18	0.00	Calculated
80	{SD - Phase 1}.PIPE RT-2	Pipe	R-TANK 2	SDCB#10	5.00	68.40	68.40	0.0000	24.000	0.0130	0.06	3.20	0.02	1.10	1.13	0.56	0.00	Calculated
81	{SD - Phase 1}.PIPE RT-3	Pipe	R-TANK 3	SDCB#26	128.16	68.40	68.40	0.0000	24.000	0.0130	0.43	0.63	0.68	0.73	1.13	0.57	0.00	Calculated
82	{SD - Phase 1}.PIPE WQ#4	Pipe	WQ#4	SDCB#18	40.09	69.60	69.40	0.5000	12.000	0.0130	0.66	2.52	0.26	2.55	0.37	0.37	0.00	Calculated
83	{SD - Phase 2}.PIEP CLUB5	Pipe	SDCO#CLUB5	SDCO#CLUB4	42.78	73.15	72.72	1.0100	6.000	0.0130	0.01	0.56	0.02	1.20	0.05	0.11	0.00	Calculated
84	{SD - Phase 2}.PIPE 33	Pipe	SDCB#33	SDCB#31	113.81	70.81	70.25	0.4900	12.000	0.0130	0.14	2.50	0.06	1.17	0.21	0.21	0.00	Calculated
85	{SD - Phase 2}.PIPE 34	Pipe	SDCB#34	SDCB#33	74.43	71.52	71.14	0.5100	8.004	0.0130	0.05	0.86	0.06	1.39	0.11	0.16	0.00	Calculated
86	{SD - Phase 2}.PIPE 35	Pipe	SDCB#35	R-TANK 3	78.01	68.40	68.40	0.0000	24.000	0.0130	0.29	0.81	0.36	0.53	1.13	0.57	0.00	Calculated
87	{SD - Phase 2}.PIPE 36	Pipe	SDCB#36	SDCB#35	68.05	70.59	69.40	1.7500	12.000	0.0130	0.25	4.71	0.05	3.11	0.16	0.16	0.00	Calculated
88	{SD - Phase 2}.PIPE 37	Pipe	SDCB#37	SDCB#36	118.86	71.52	70.93	0.5000	8.004	0.0130	0.12	0.85	0.14	1.75	0.17	0.25	0.00	Calculated
89	{SD - Phase 2}.PIPE 38	Pipe	SDCB#38	SDCB#37	72.17	71.88	71.52	0.5000	8.004	0.0130	0.09	0.85	0.10	1.36	0.16	0.24	0.00	Calculated
90	{SD - Phase 2}.PIPE A1	Pipe	SDCO#A1	SDCB#32	22.91	72.71	72.60	0.4800	8.000	0.0130	0.04	0.84	0.05	0.84	0.13	0.20	0.00	Calculated
91	{SD - Phase 2}.PIPE A2	Pipe	SDCO#A2	SDCO#A1	33.15	73.21	72.88	1.0000	6.000	0.0130	0.02	0.56	0.04	1.34	0.07	0.13	0.00	Calculated
92	{SD - Phase 2}.PIPE A3	Pipe	SDCO#A3	SDCO#A2	78.60	74.00	73.21	1.0100	6.000	0.0130	0.02	0.56	0.04	1.34	0.07	0.13	0.00	Calculated
93	{SD - Phase 2}.PIPE A4	Pipe	SDCO#A4	SDCO#A5	72.96	73.96	73.23	1.0000	6.000	0.0130	0.02	0.56	0.04	1.34	0.07	0.13	0.00	Calculated
94	{SD - Phase 2}.PIPE A5	Pipe	SDCO#A5	SDCO#A1	35.48	73.23	72.88	0.9900	6.000	0.0130	0.02	0.56	0.04	1.34	0.07	0.13	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
95	{SD - Phase 2}.PIPE CLUB2	Pipe	SDCO#CLUB2	SDCO#CLUB1	33.61	72.72	72.38	1.0100	6.000	0.0130	0.01	0.56	0.02	1.10	0.06	0.11	0.00	Calculated
96	{SD - Phase 2}.PIPE CLUB3	Pipe	SDCO#CLUB3	SDCO#CLUB2	40.66	73.13	72.72	1.0100	6.000	0.0130	0.01	0.56	0.02	1.19	0.05	0.11	0.00	Calculated
97	{SD - Phase 2}.PIPE CLUB4	Pipe	SDCO#CLUB4	SDCO#CLUB1	32.02	72.72	72.38	1.0600	6.000	0.0130	0.01	0.58	0.02	1.11	0.06	0.11	0.00	Calculated
98	{SD - Phase 2}.PIPE E2	Pipe	SDCO#E2	SDCO#E1	35.98	72.43	72.07	1.0000	6.000	0.0130	0.08	0.56	0.13	1.85	0.13	0.26	0.00	Calculated
99	{SD - Phase 2}.PIPE E3	Pipe	SDCO#E3	SDCO#E2	71.44	73.14	72.43	0.9900	6.000	0.0130	0.08	0.56	0.14	1.91	0.13	0.26	0.00	Calculated
100	{SD - Phase 2}.PIPE E5	Pipe	SDCO#E5	SDCO#E4	31.53	72.96	72.64	1.0100	6.000	0.0130	0.04	0.57	0.07	1.54	0.09	0.18	0.00	Calculated
101	{SD - Phase 2}.PIPE E6	Pipe	SDCO#E6	SDCO#E5	59.72	73.56	72.96	1.0000	6.000	0.0130	0.04	0.56	0.07	1.59	0.09	0.18	0.00	Calculated
102	{SD - Phase 2}.PIPE E7	Pipe	SDCO#E7	SDCO#E3	109.59	74.24	73.14	1.0000	6.000	0.0130	0.08	0.56	0.14	1.95	0.13	0.25	0.00	Calculated
103	{SD - Phase 2}.PIPE F1	Pipe	SDCO#F1	SDCB#31	151.81	71.77	70.25	1.0000	6.000	0.0130	0.05	0.56	0.08	0.75	0.18	0.36	0.00	Calculated
104	{SD - Phase 2}.PIPE F2	Pipe	SDCO#F2	SDCB#35	17.47	72.50	69.90	14.8800	6.000	0.0130	0.05	2.16	0.02	4.28	0.05	0.11	0.00	Calculated
105	{SD - Phase 2}.PIPE F3	Pipe	SDCO#F3	SDCO#F2	96.17	73.46	72.50	1.0000	6.000	0.0130	0.05	0.56	0.08	2.29	0.08	0.16	0.00	Calculated
106	PIPE 32	Pipe	SDCB#32	SDCB#23	66.71	72.60	72.26	0.5100	8.000	0.0130	0.11	0.86	0.12	1.70	0.16	0.24	0.00	Calculated
107	Pipe ADG1	Pipe	AREA DRAIN G1	SDCB#16	21.66	73.07	72.92	0.6900	6.000	0.0150	0.00	0.40	0.00	0.00	0.00	0.00	0.00	Calculated
108	PIPE ADH1	Pipe	AREA DRAIN H1	SDCB#15	16.48	72.33	72.18	0.9100	6.000	0.0150	0.00	0.46	0.00	0.00	0.00	0.00	0.00	Calculated
109	PIPE CLUB1	Pipe	SDCO#CLUB1	SDCB#22	35.74	72.21	71.69	1.4500	8.000	0.0130	0.03	1.68	0.02	1.75	0.06	0.09	0.00	Calculated
110	PIPE WQ#1	Pipe	WQ#1	R-TANK 1	6.39	67.90	67.87	0.4700	8.000	0.0130	0.59	0.83	0.71	2.53	0.42	0.63	0.00	Calculated
111	PIPE WQ#2	Pipe	WQ#2	R-TANK 2	5.61	70.66	68.87	31.9100	12.000	0.0130	0.15	20.13	0.01	6.78	0.34	0.34	0.00	Calculated
112	PIPE WQ#3	Pipe	WQ#3	R-TANK 2	6.80	69.48	68.87	8.9700	12.000	0.0130	0.38	10.67	0.04	5.31	0.36	0.36	0.00	Calculated
113	PIPE WQ#4	Pipe	SDCB#19	WQ#4	40.09	70.35	70.10	0.6200	12.000	0.0130	0.66	2.81	0.24	2.70	0.35	0.35	0.00	Calculated
114	PIPE WQ#5	Pipe	WQ#5	SDCB#26	45.10	70.30	69.40	2.0000	12.000	0.0130	0.64	5.03	0.13	4.13	0.25	0.25	0.00	Calculated
115	{SD - Phase 1}.RT-1 OUTLET	Outlet	SDCB#01	TRENCH INLET		66.90	67.32				0.11							
116	{SD - Phase 1}.RT-2 OUTLET	Outlet	SDCB#10	R-TANK 1		67.90	66.90				0.06							

Subbasin Hydrology

Subbasin : BLDG A_NORTH

Input Data

Area (ac) 0.05
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.05		98

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

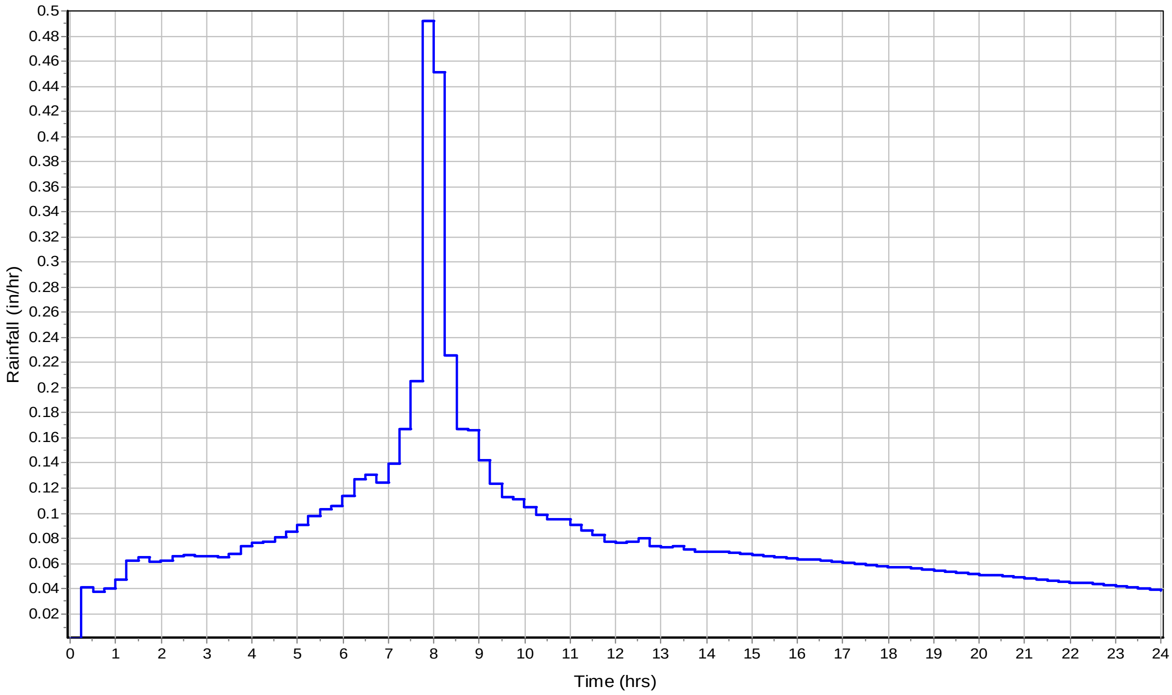
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Subbasin Runoff Results

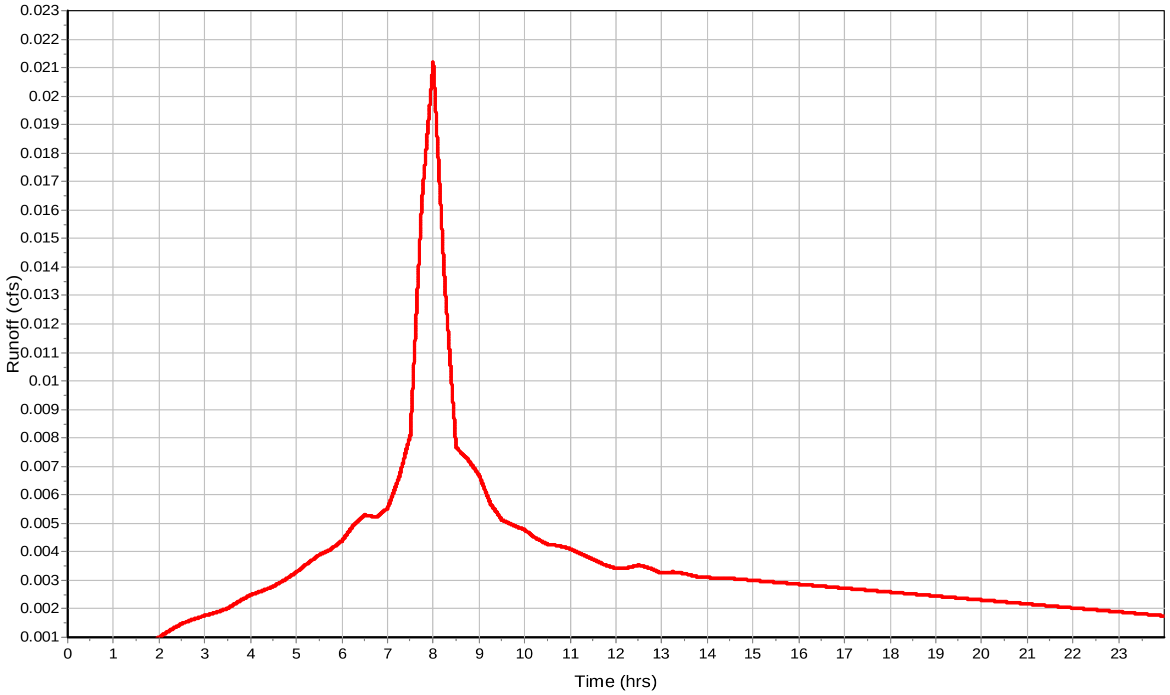
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG A_NORTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG A_SOUTH

Input Data

Area (ac) 0.05
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.05		98

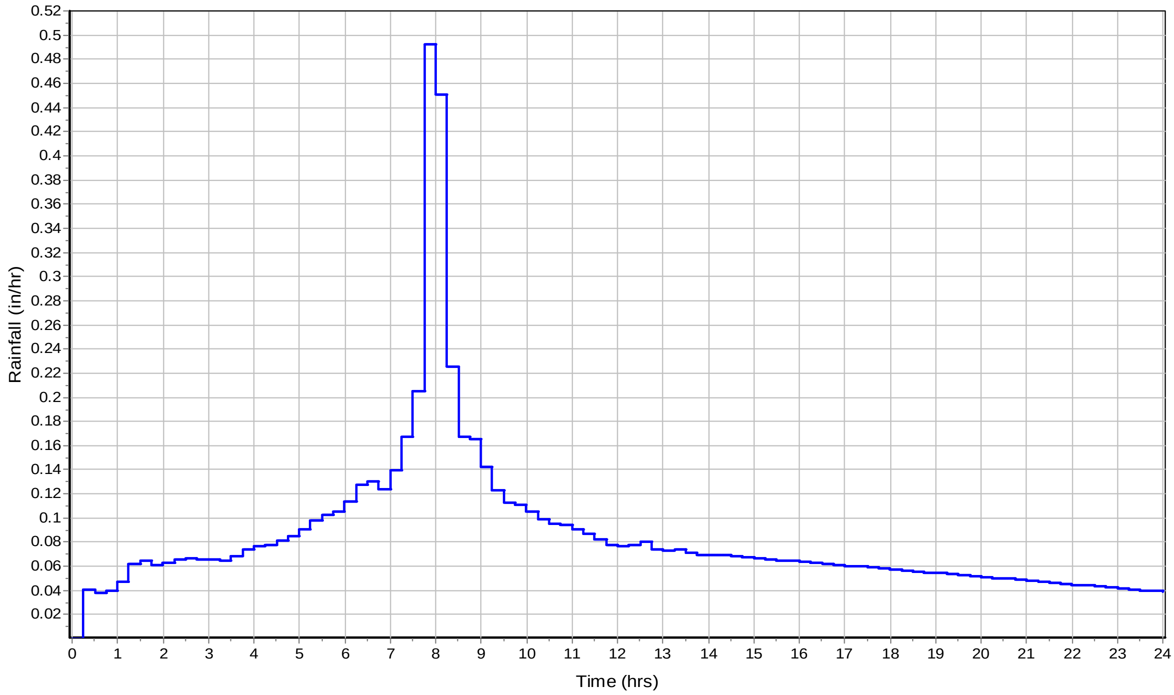
Time of Concentration

Subbasin Runoff Results

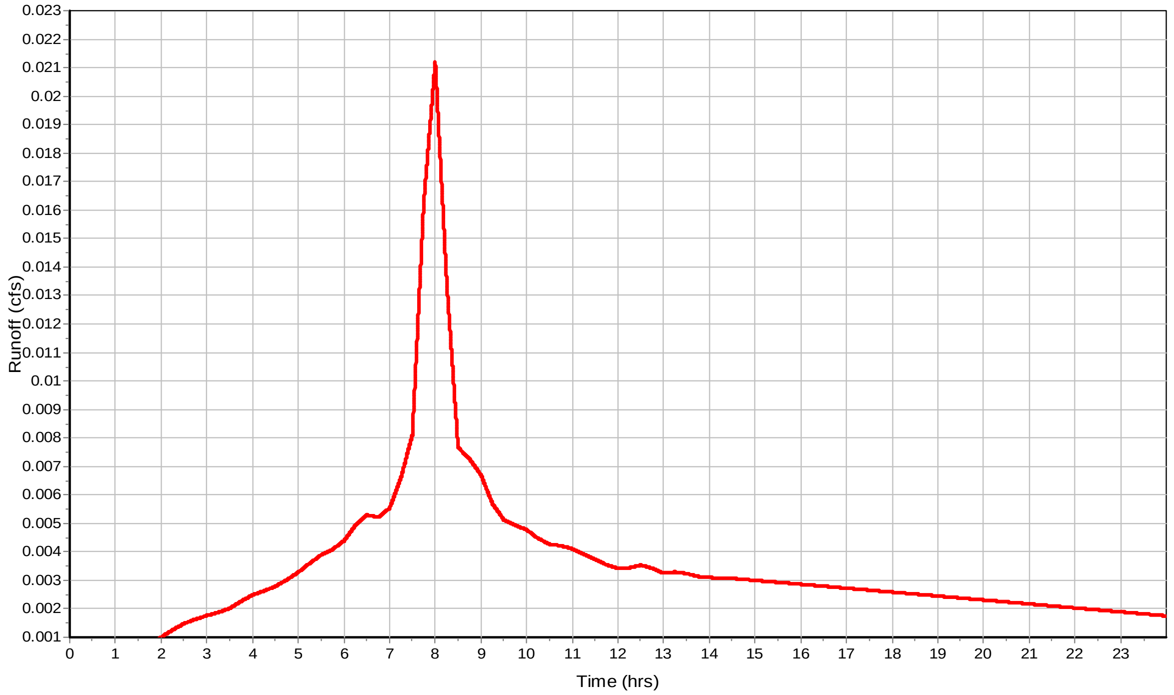
Total Rainfall (in) 2.03
Total Runoff (in) 1.81
Peak Runoff (cfs) 0.02
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG A_SOUTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

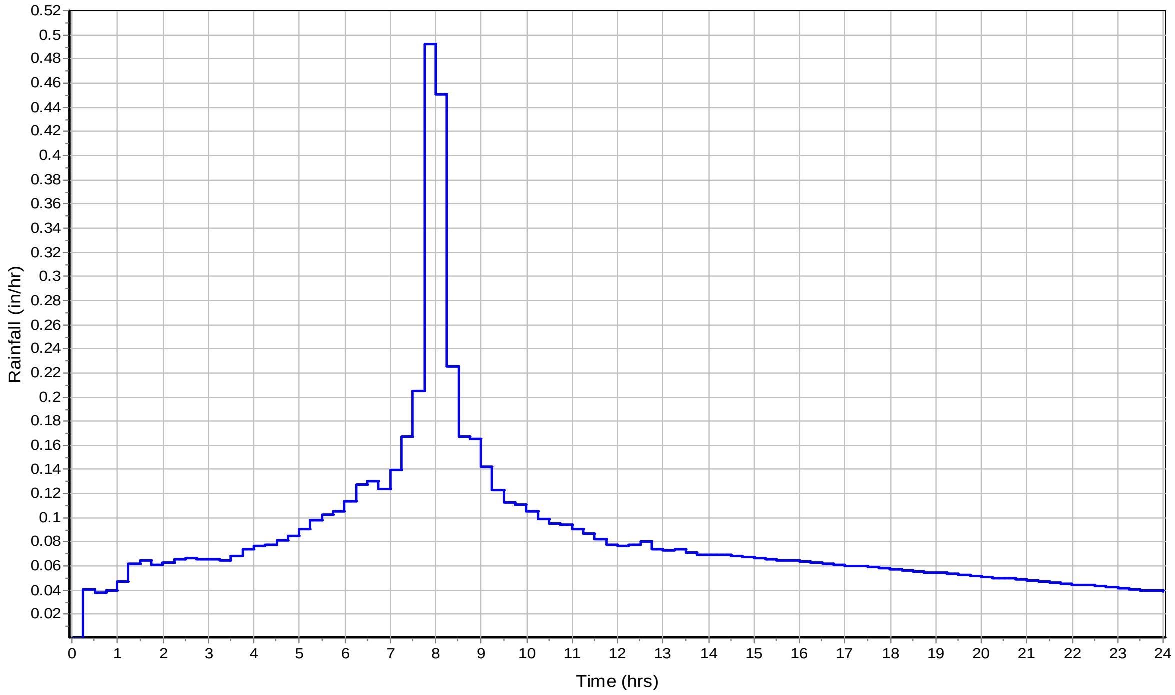
Time of Concentration

Subbasin Runoff Results

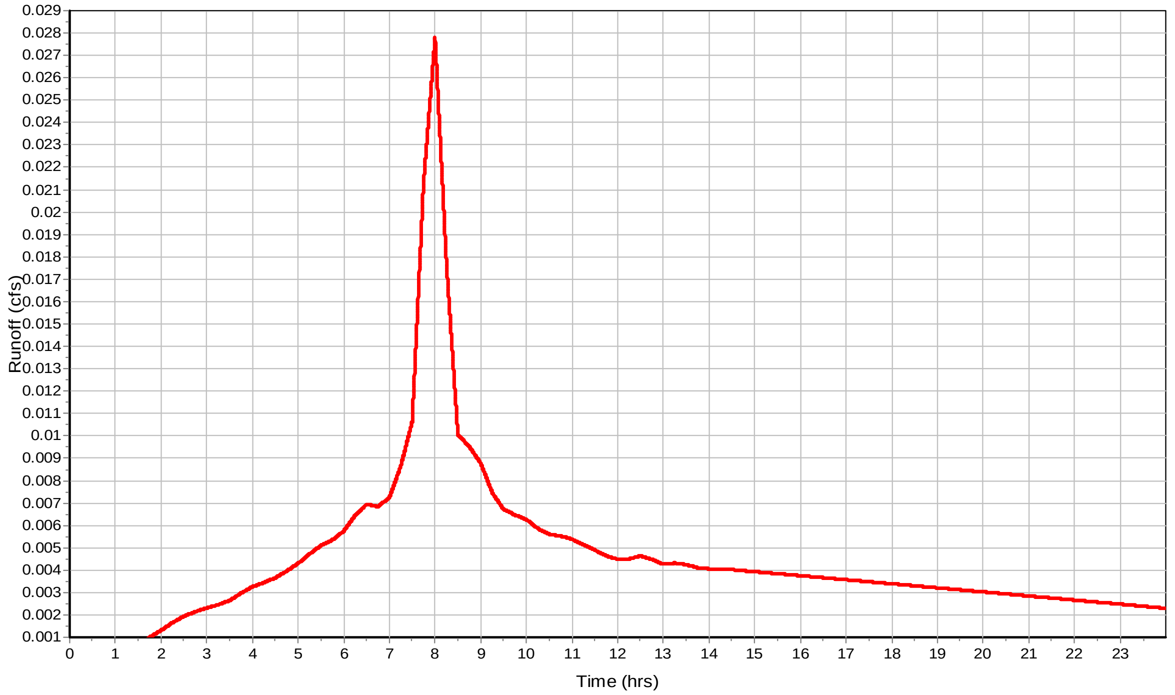
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

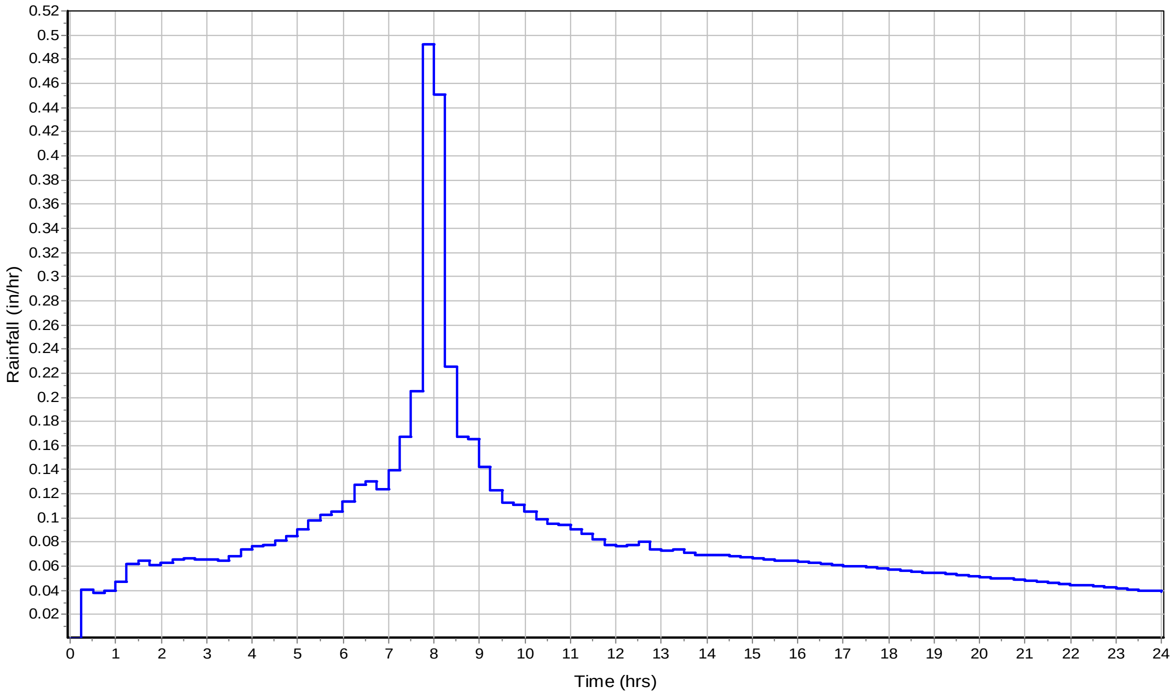
Time of Concentration

Subbasin Runoff Results

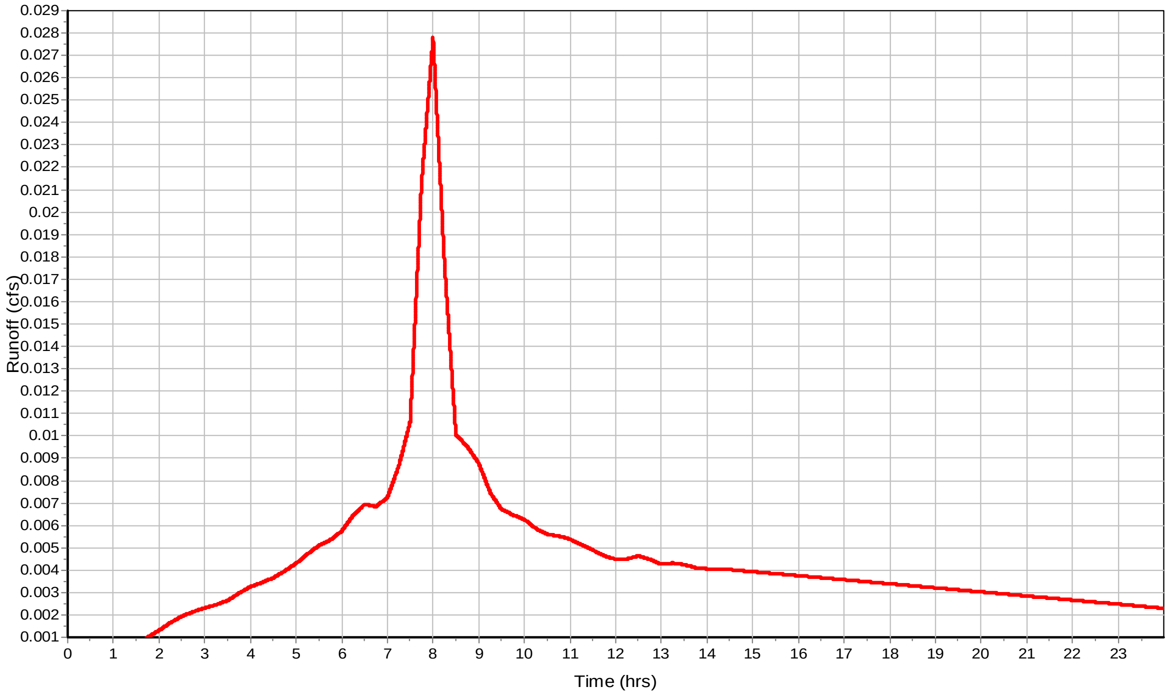
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_SE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

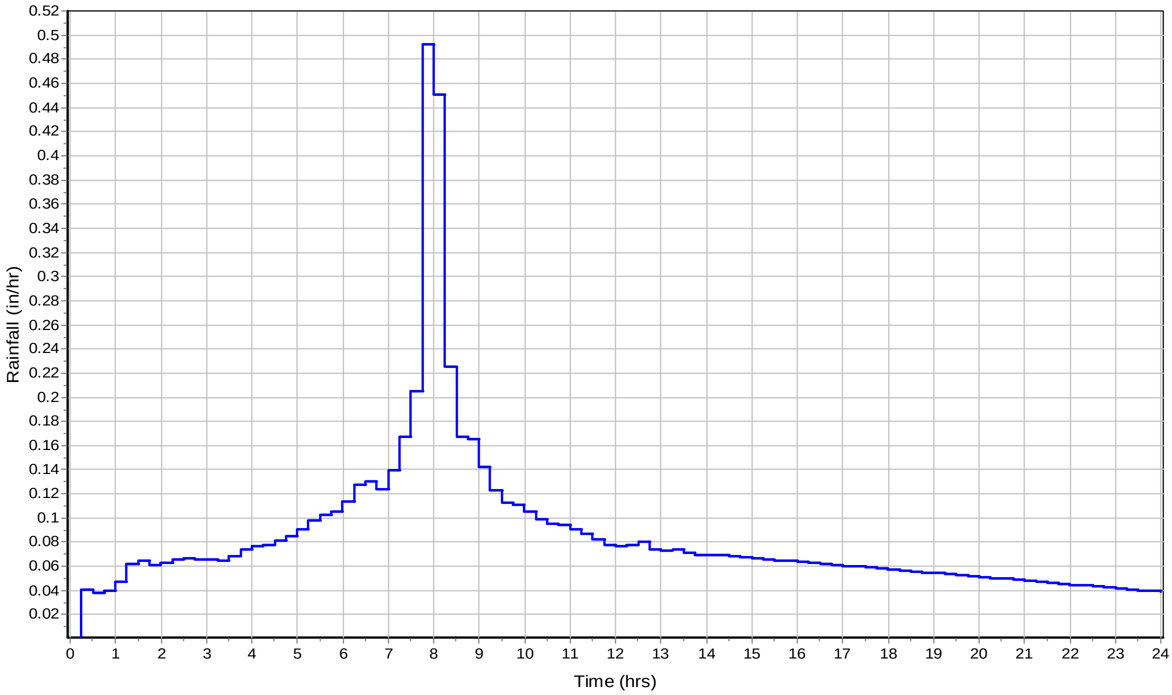
Time of Concentration

Subbasin Runoff Results

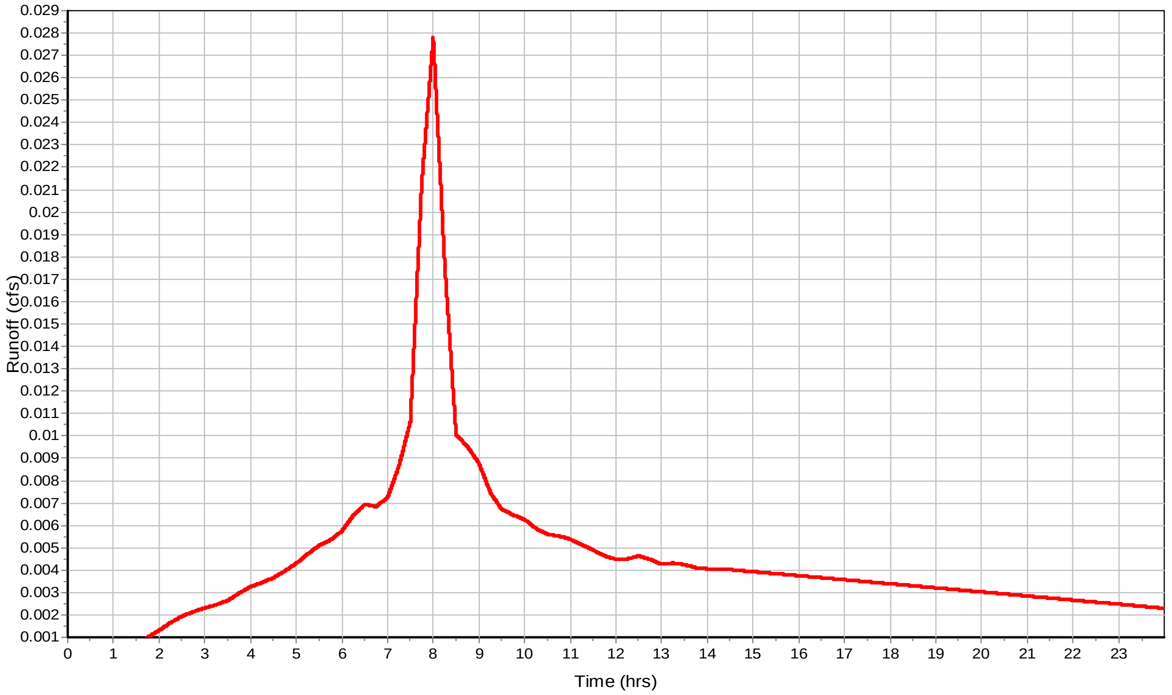
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_SW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

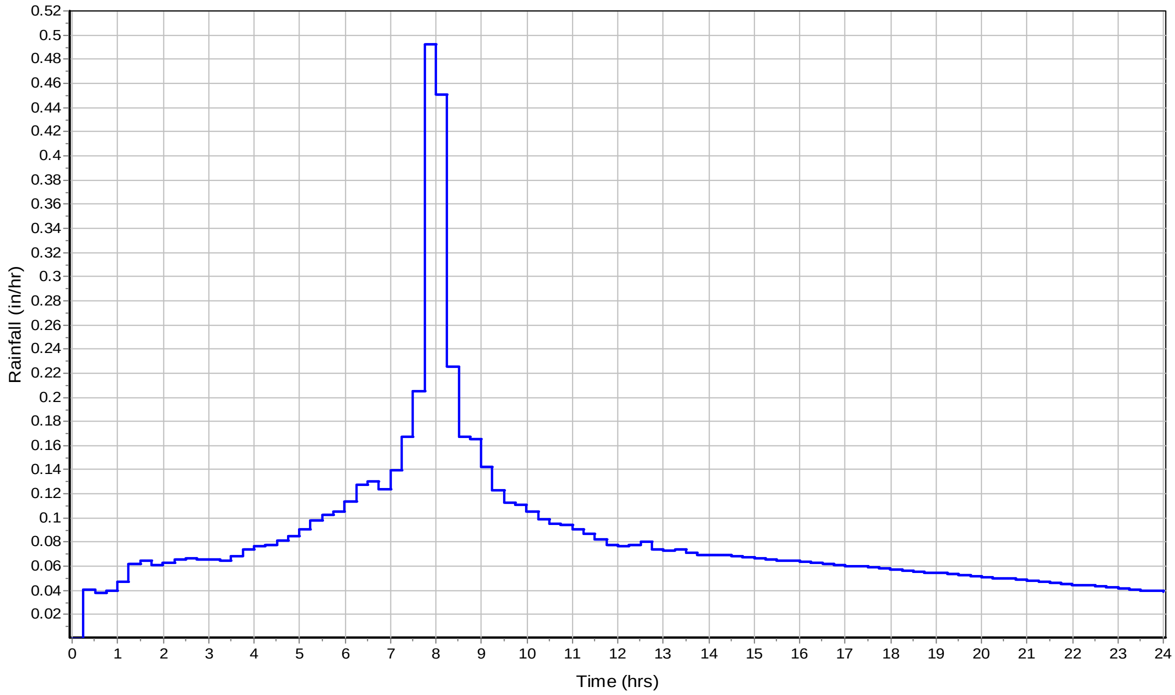
Time of Concentration

Subbasin Runoff Results

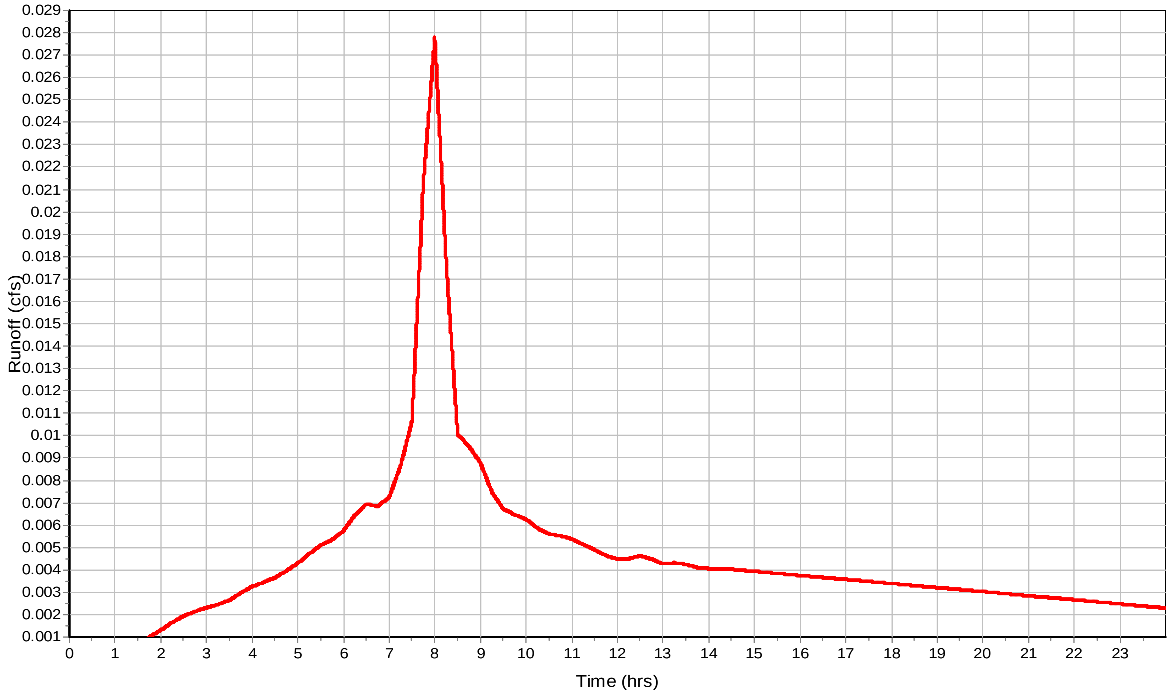
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

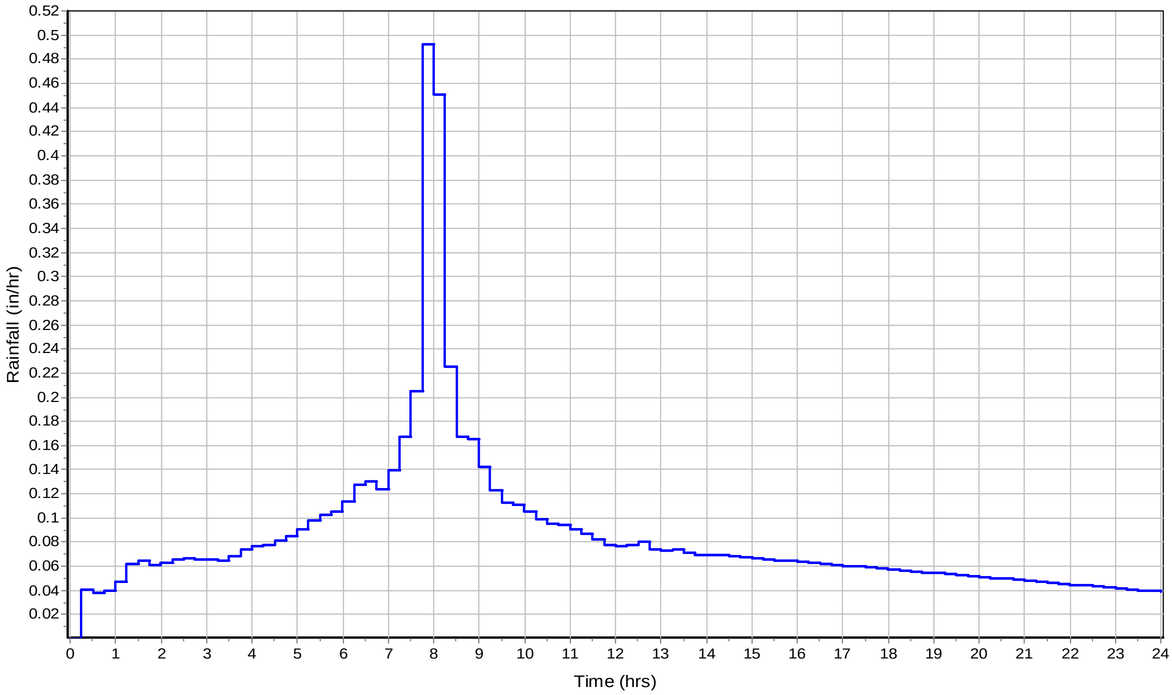
Time of Concentration

Subbasin Runoff Results

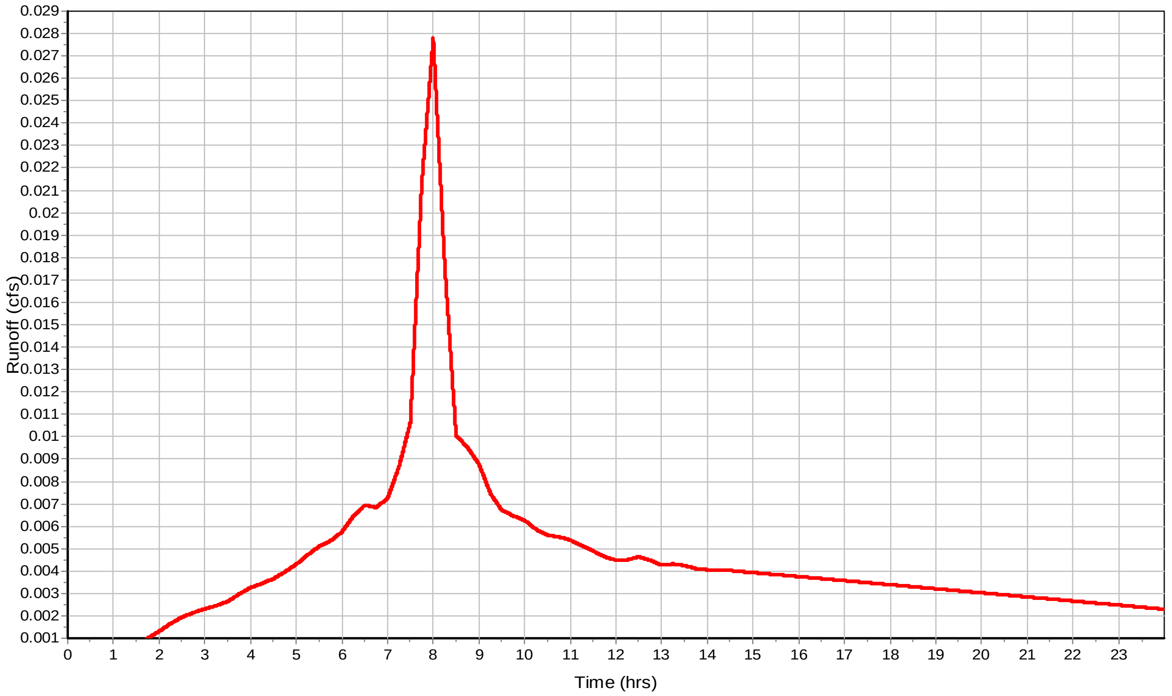
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_NW

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

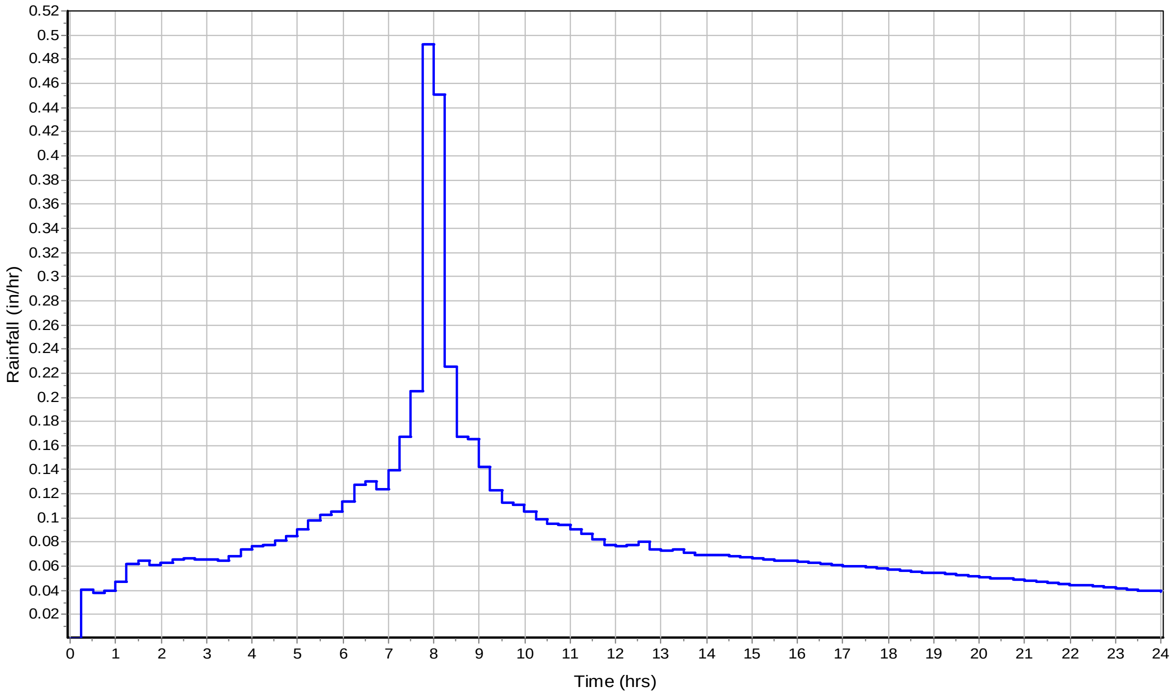
Time of Concentration

Subbasin Runoff Results

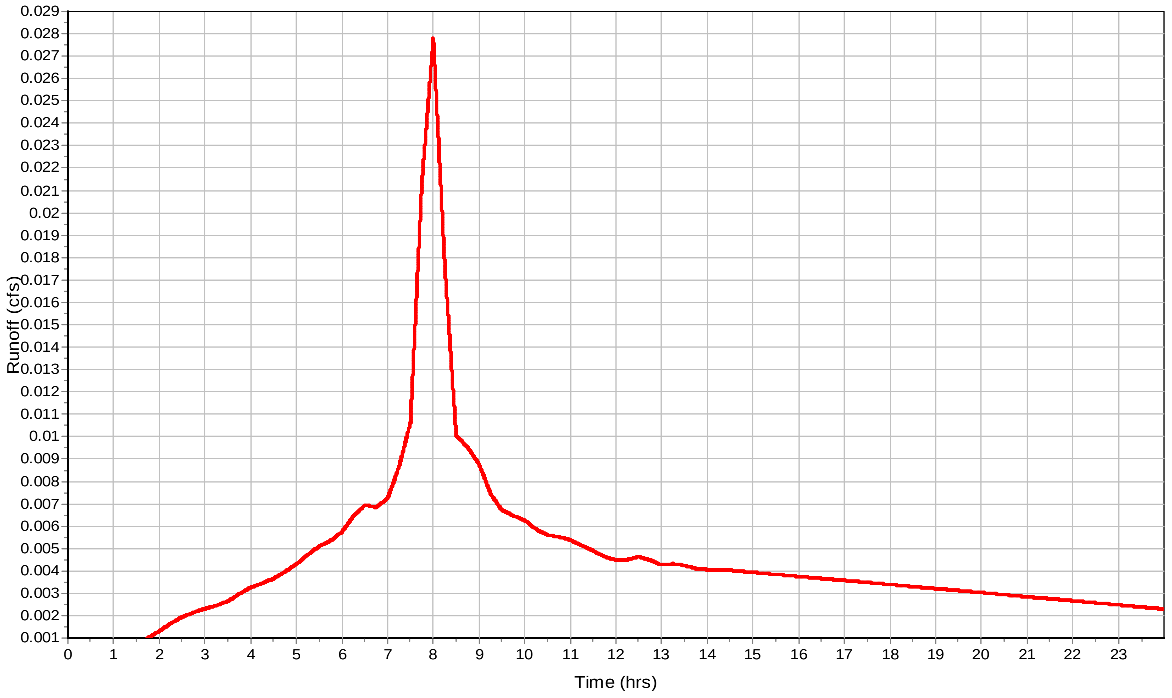
Total Rainfall (in) 2.03
Total Runoff (in) 1.81
Peak Runoff (cfs) 0.03
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG C_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_SE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

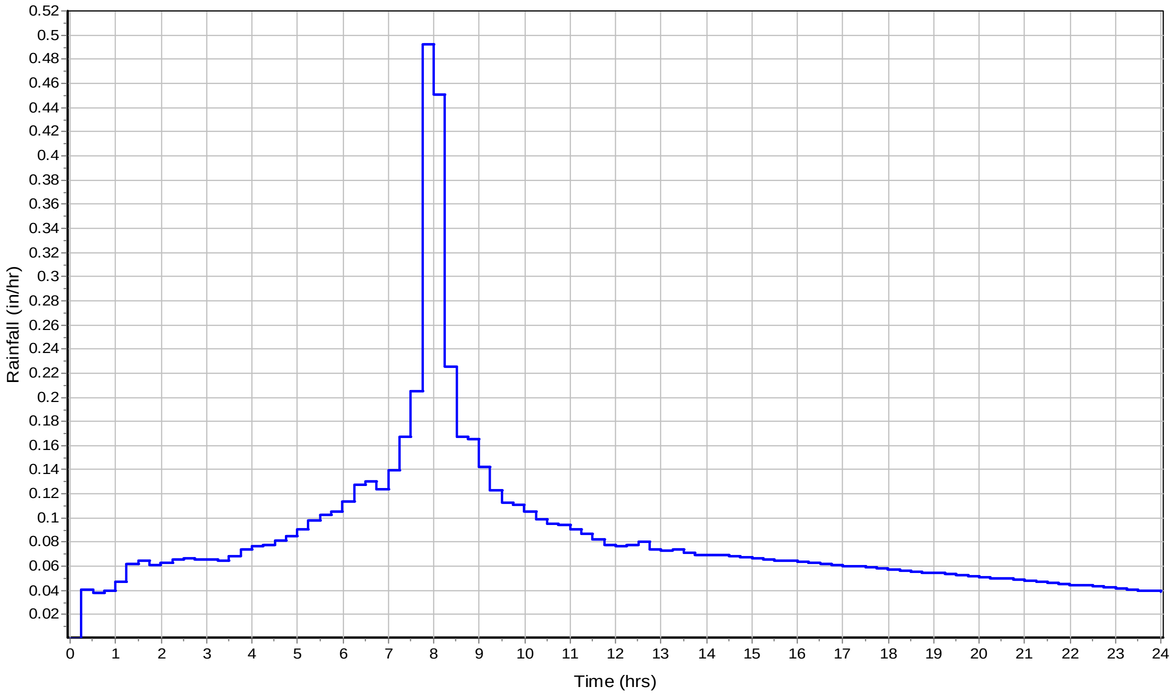
Time of Concentration

Subbasin Runoff Results

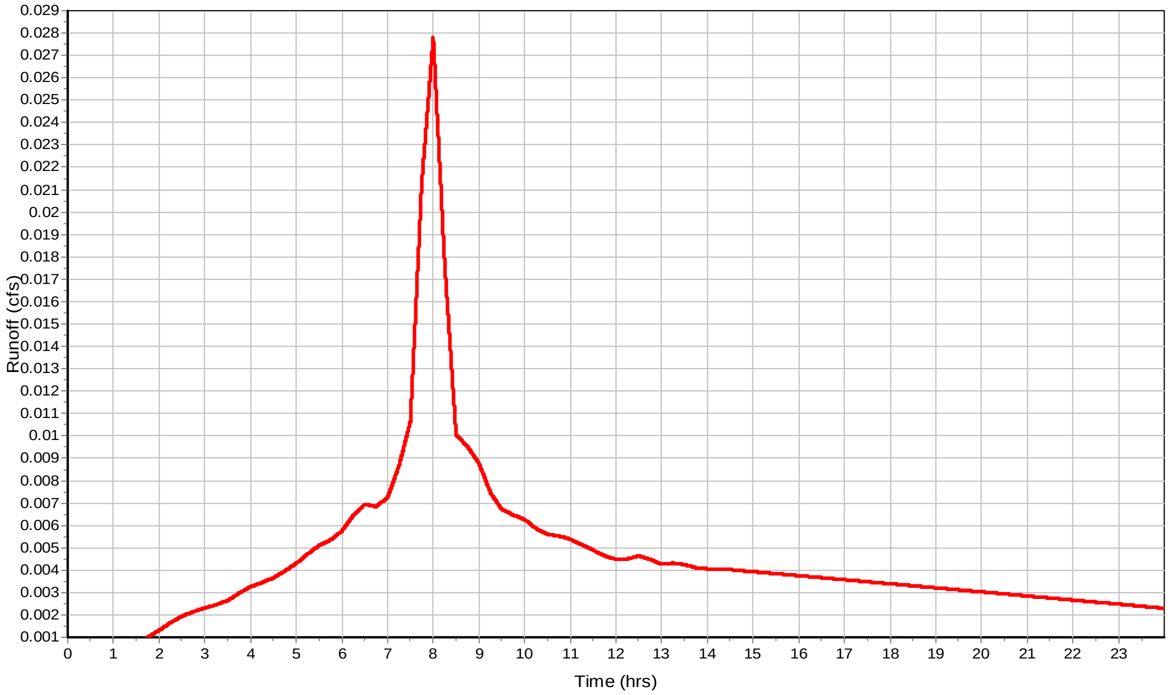
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_SW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

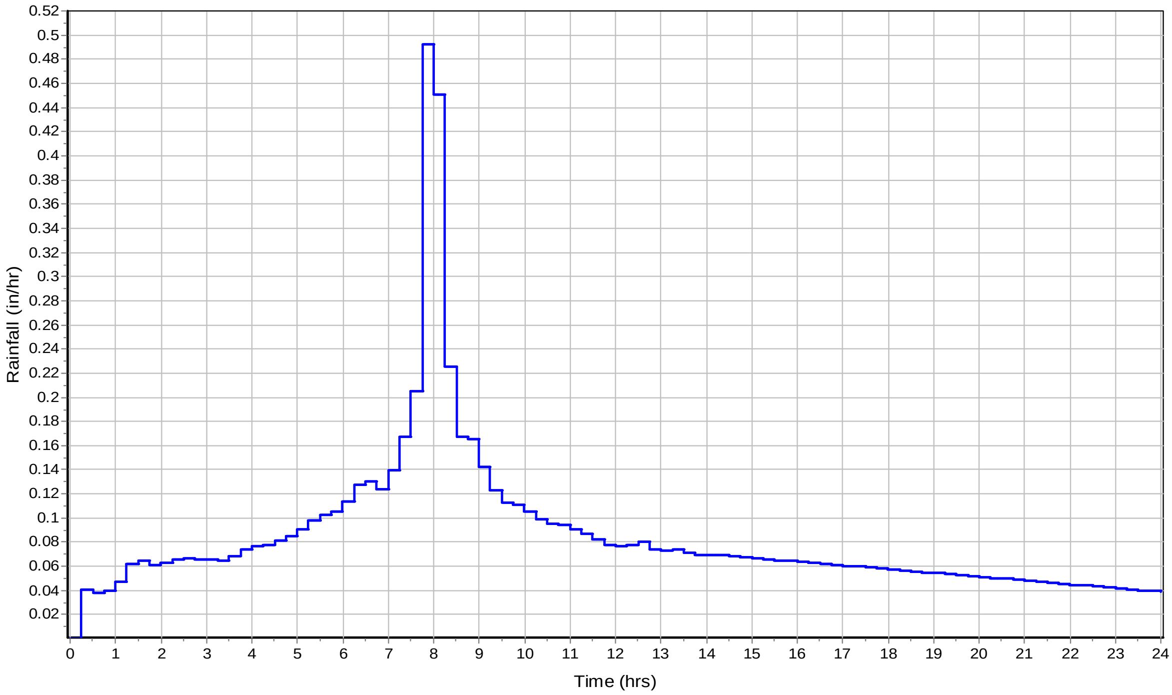
Time of Concentration

Subbasin Runoff Results

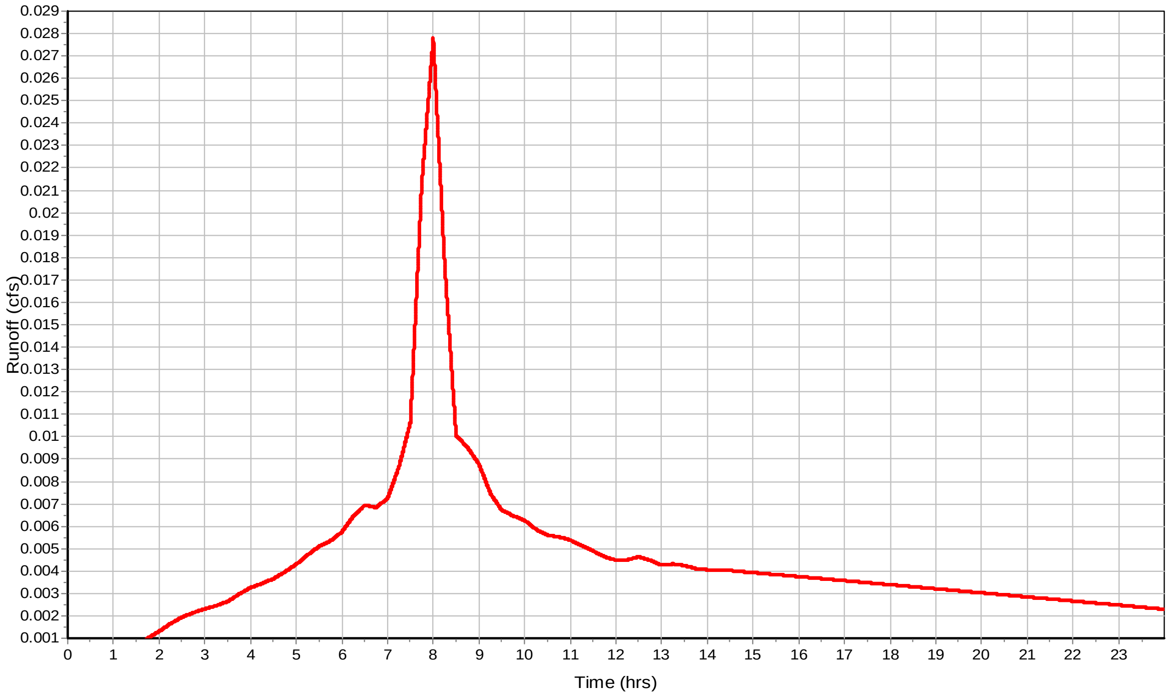
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG CLUB_EAST

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

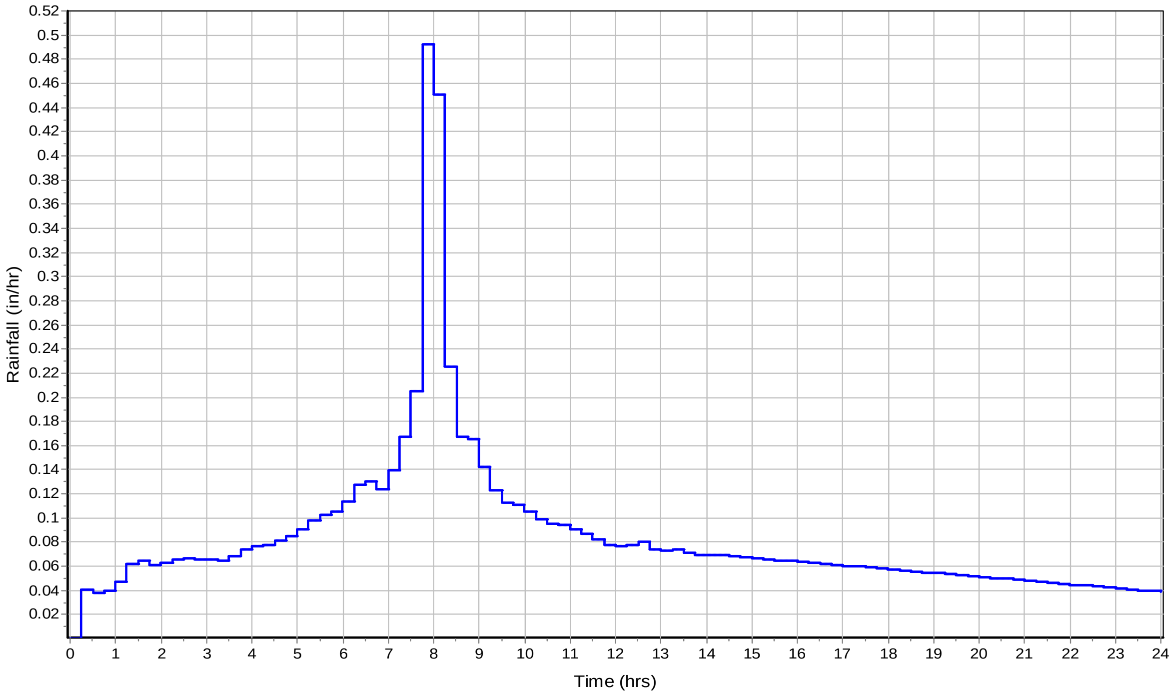
Time of Concentration

Subbasin Runoff Results

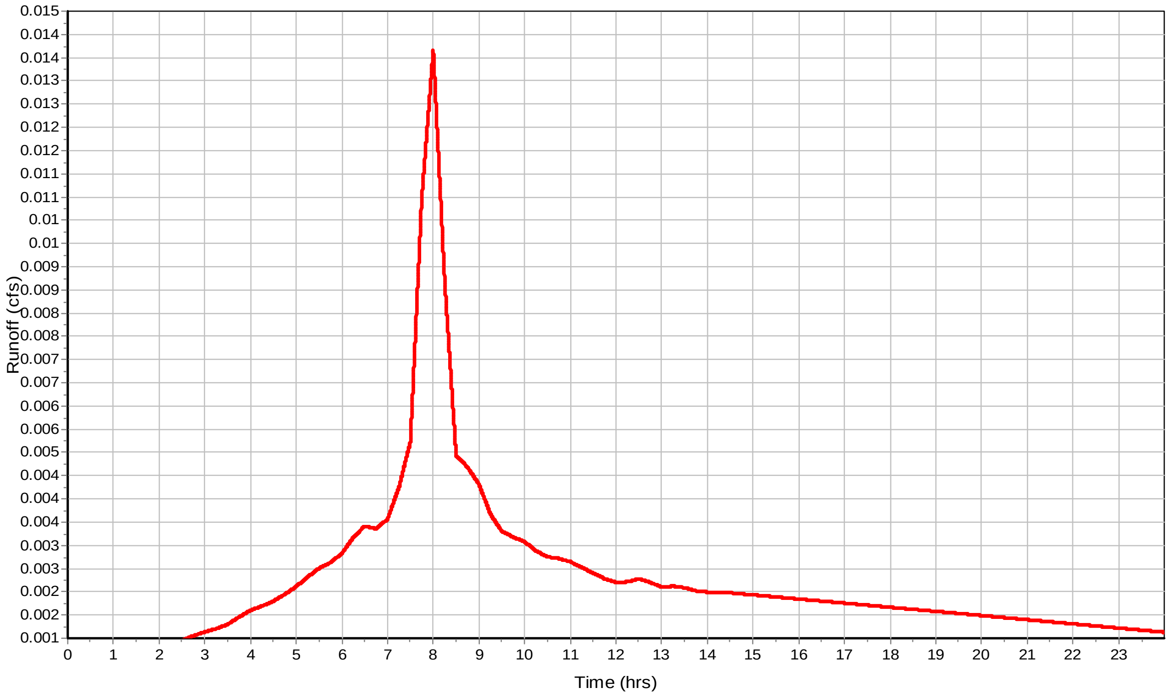
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.01
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG CLUB_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG CLUB_WEST

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

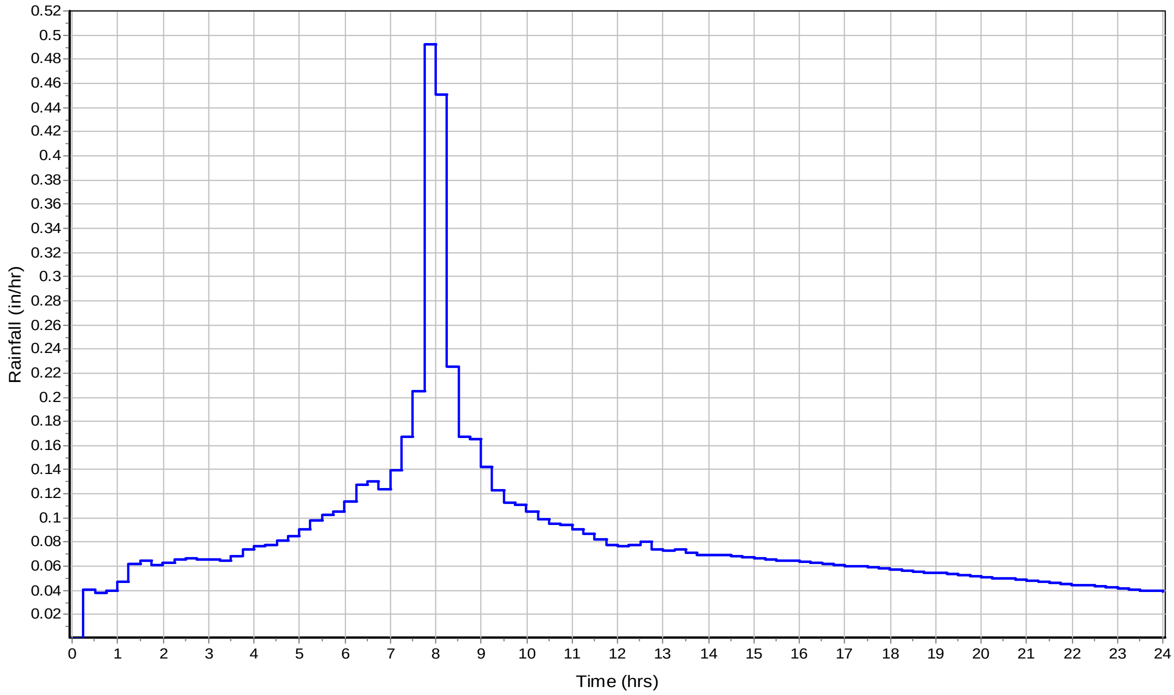
Time of Concentration

Subbasin Runoff Results

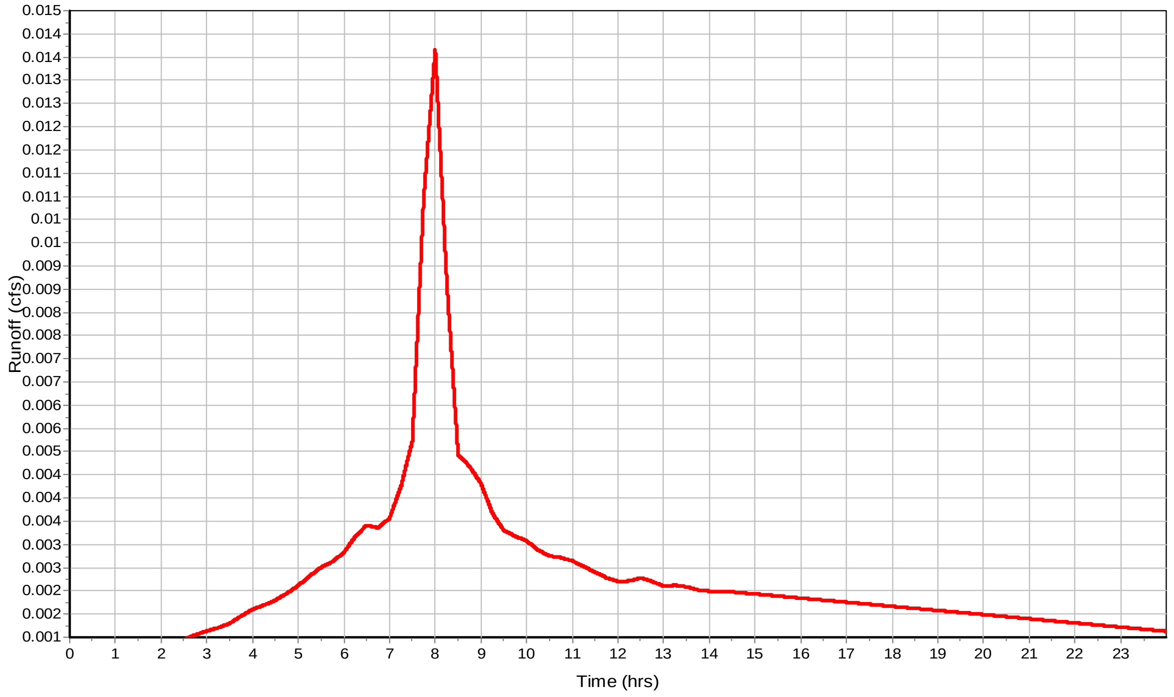
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.01
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG CLUB_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

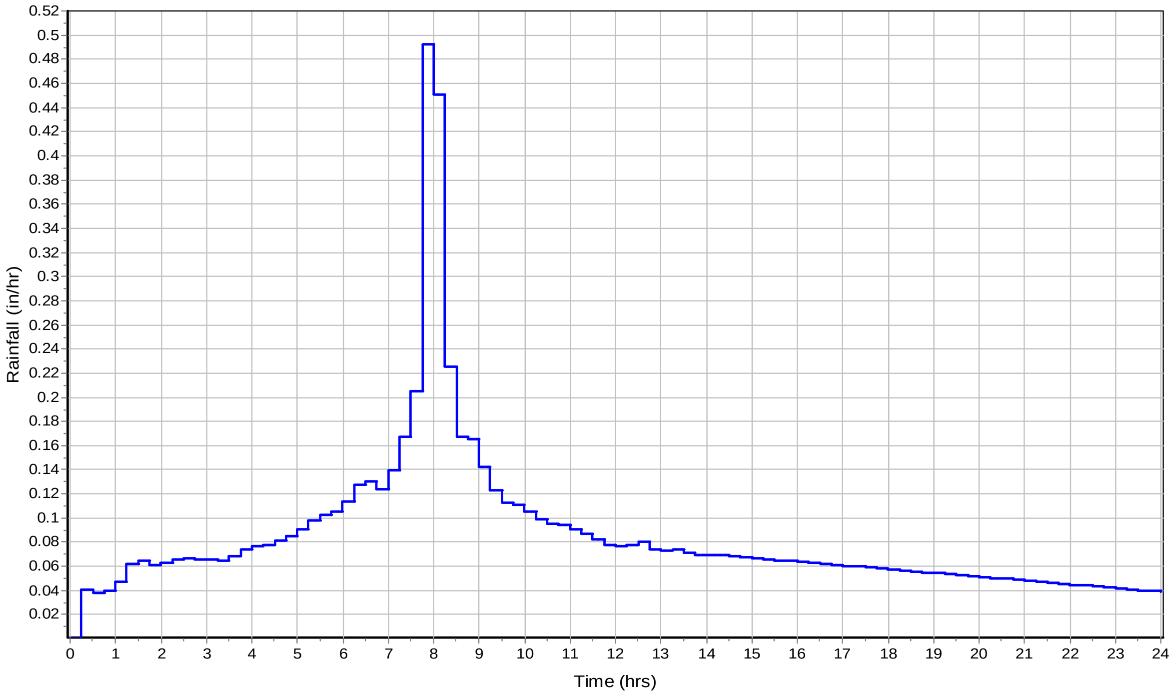
Time of Concentration

Subbasin Runoff Results

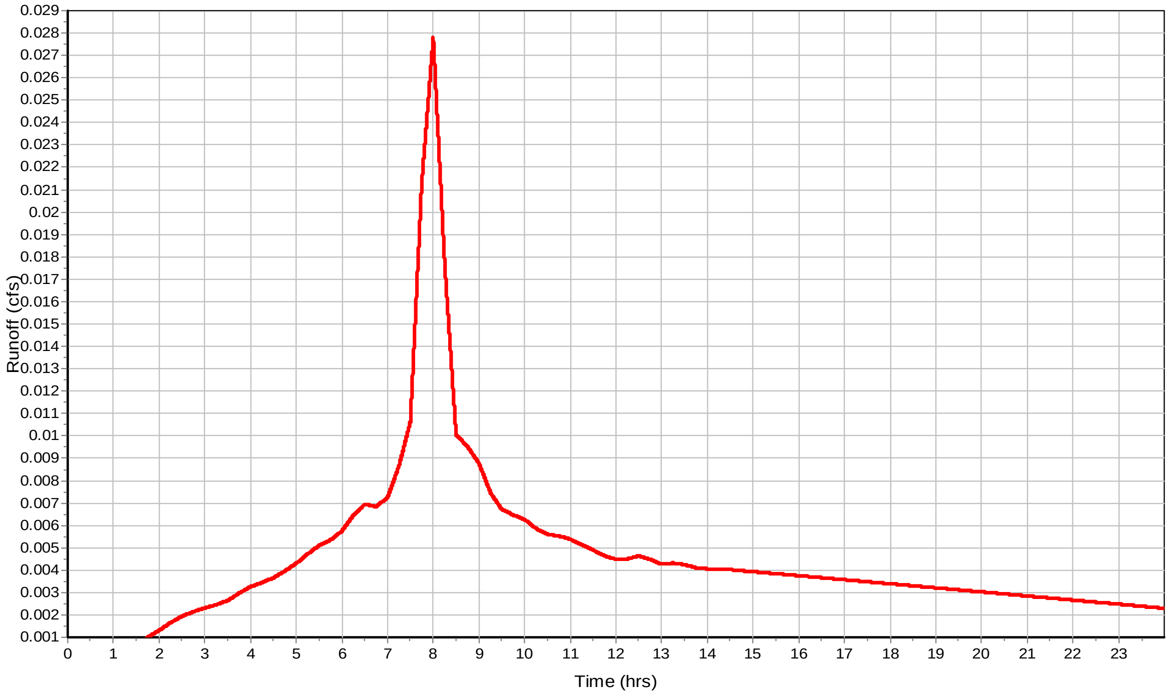
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

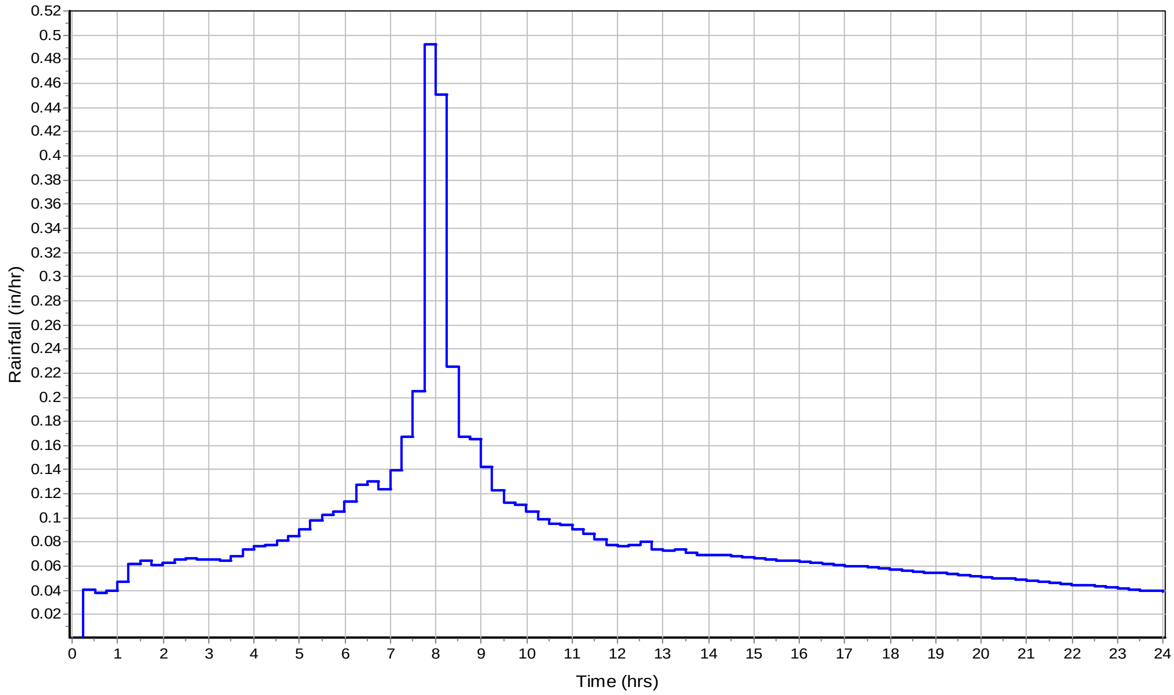
Time of Concentration

Subbasin Runoff Results

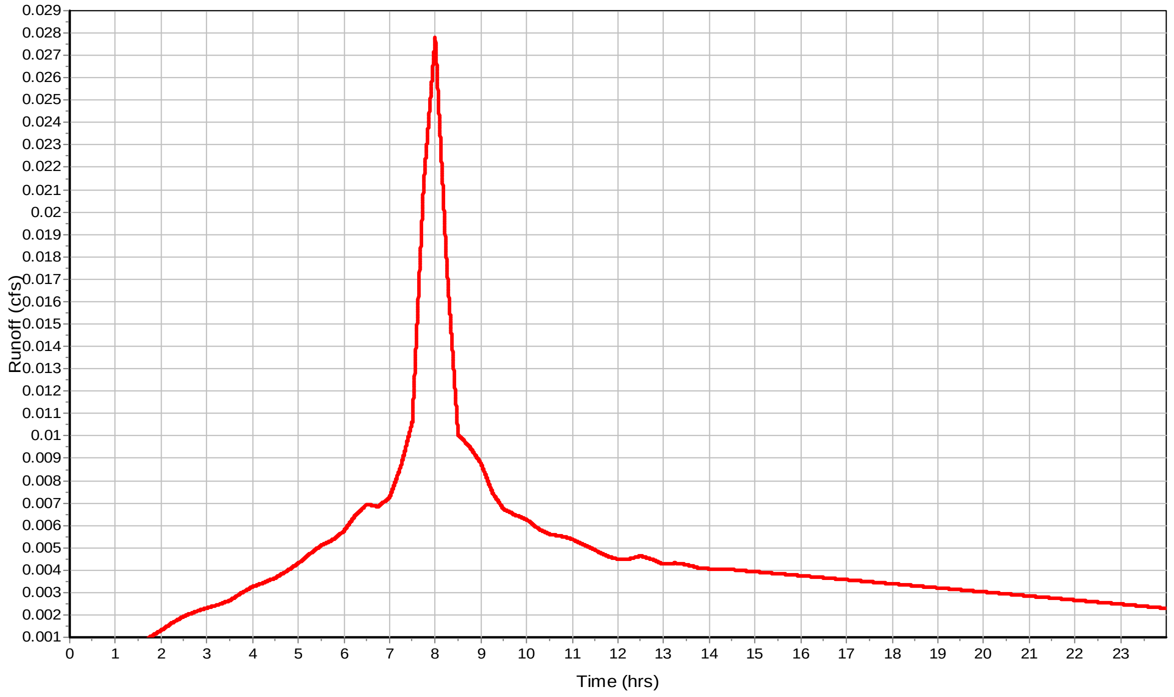
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_SOUTH

Input Data

Area (ac)	0.12
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.12		98

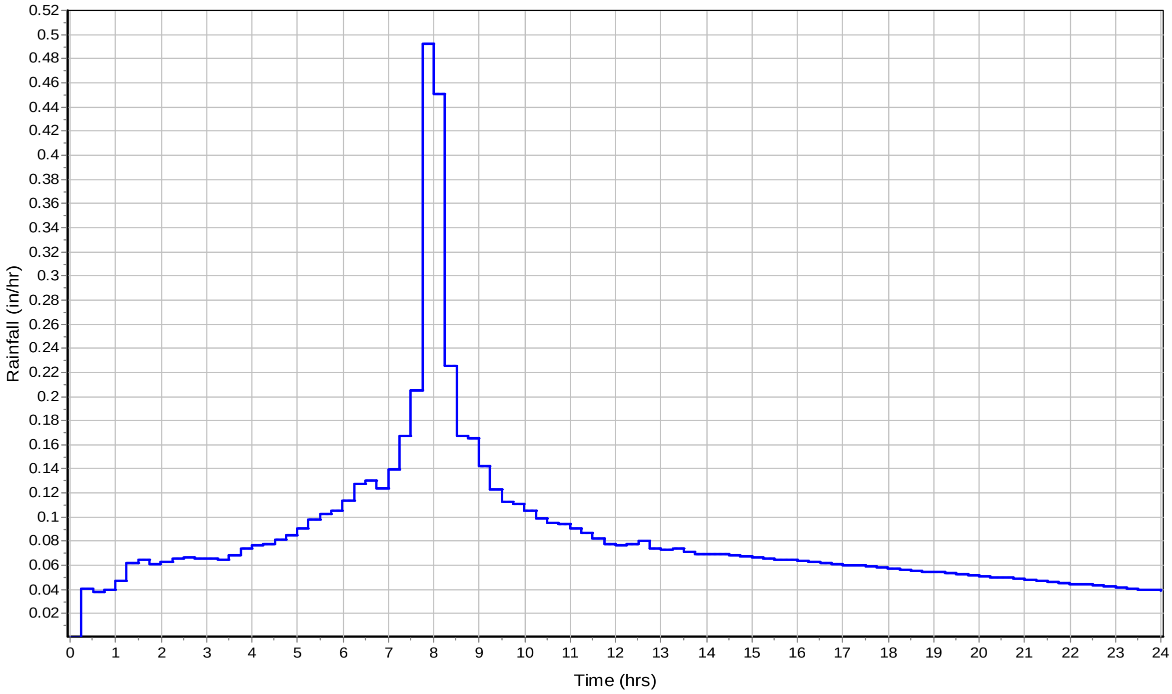
Time of Concentration

Subbasin Runoff Results

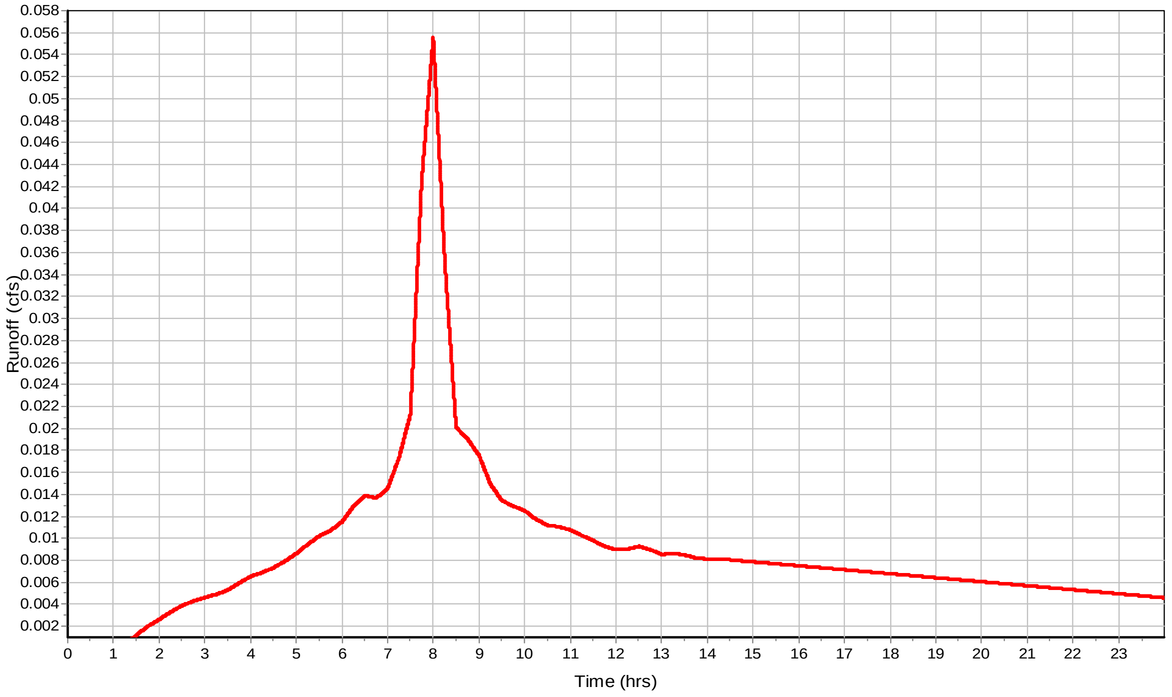
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.06
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_SOUTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG E_EAST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

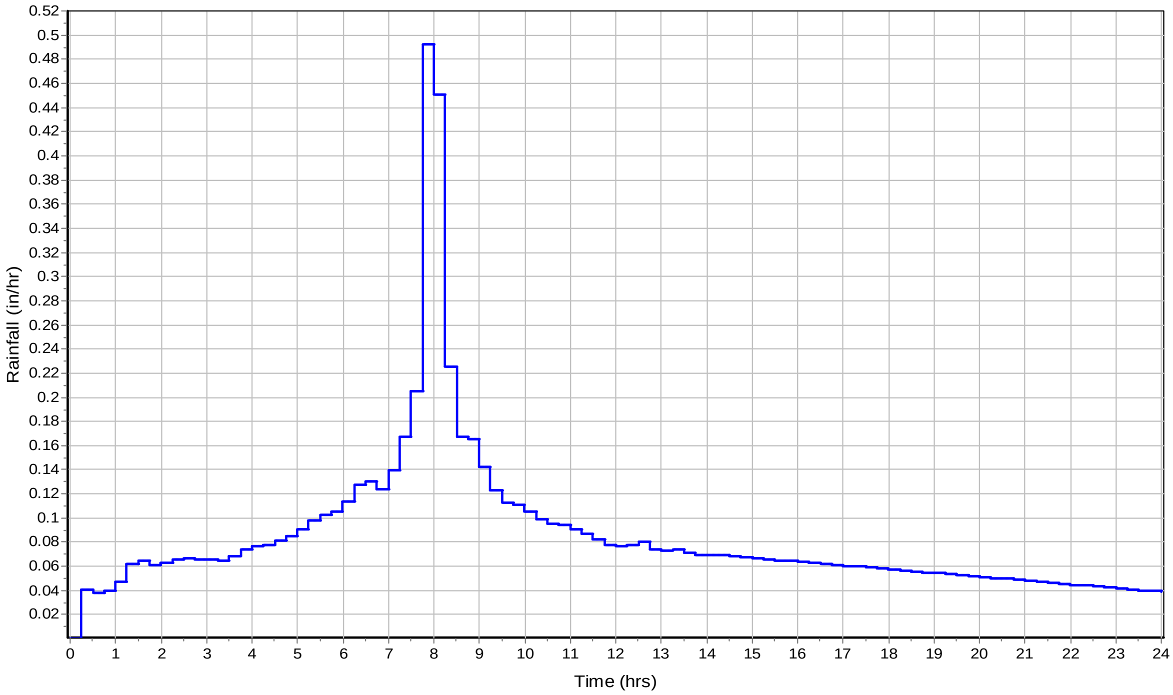
Time of Concentration

Subbasin Runoff Results

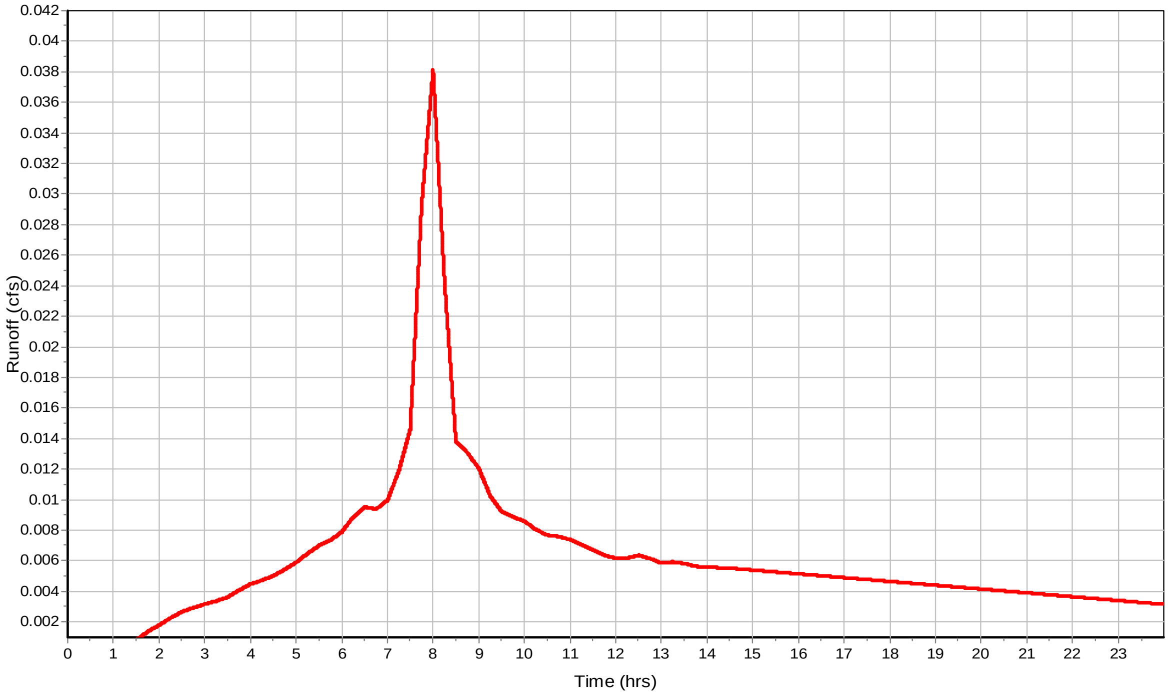
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG E_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG E_WEST

Input Data

Area (ac)	0.16
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.16		98

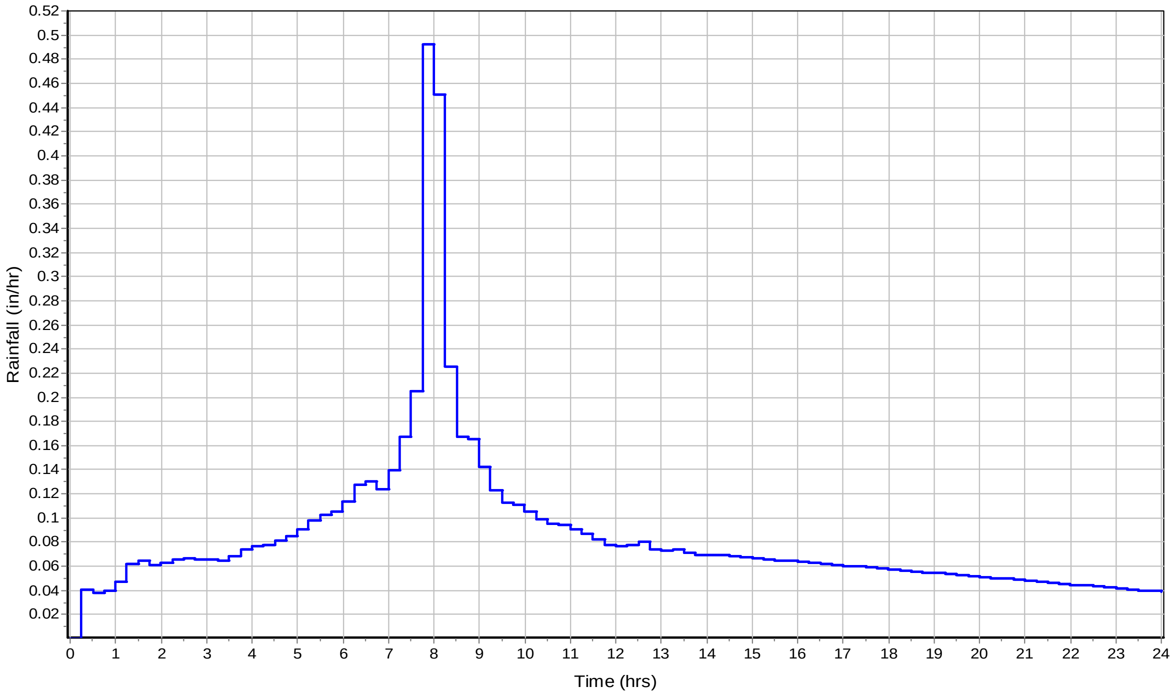
Time of Concentration

Subbasin Runoff Results

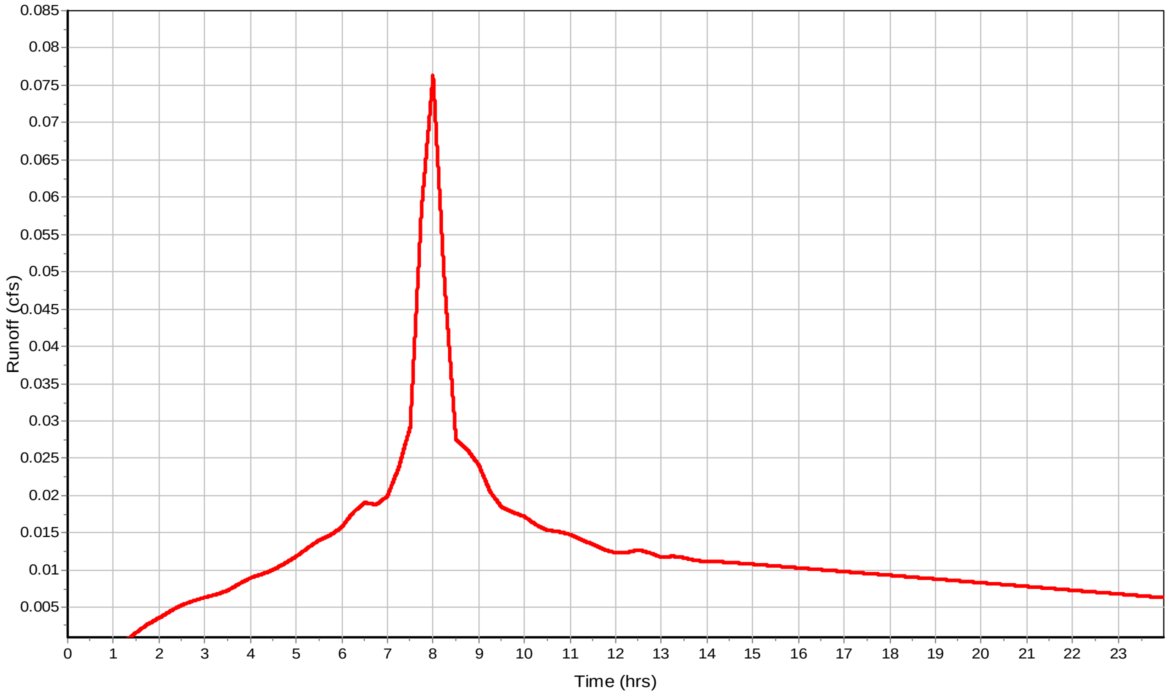
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG E_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG F_EAST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

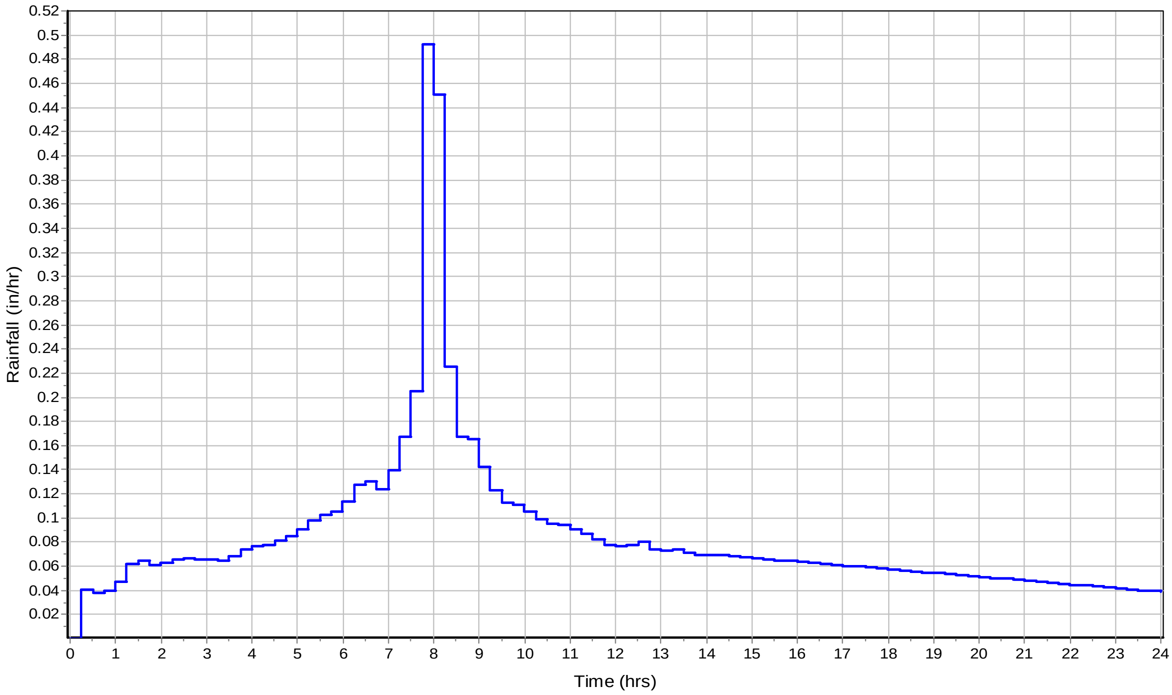
Time of Concentration

Subbasin Runoff Results

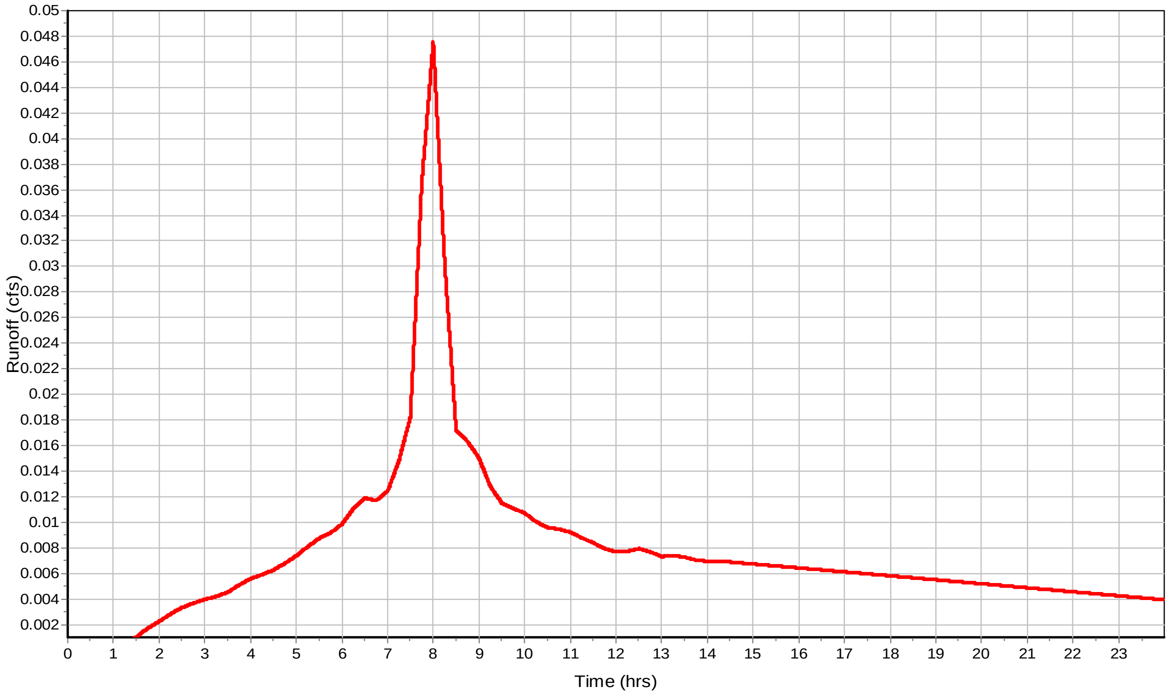
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG F_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG F_WEST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

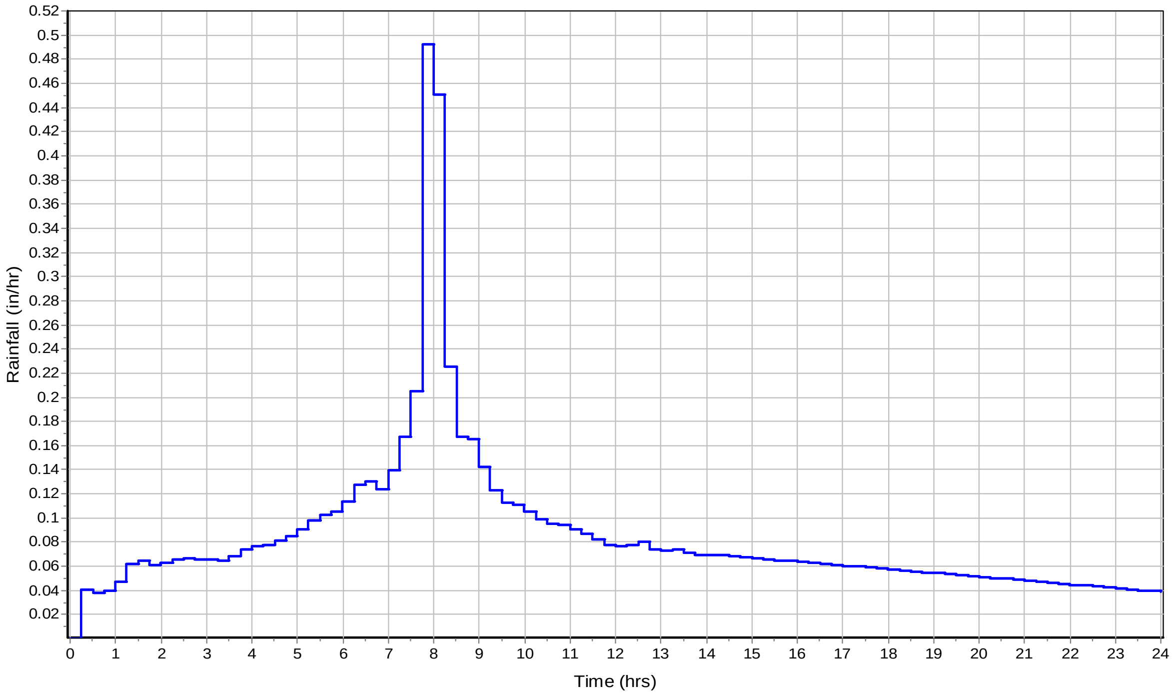
Time of Concentration

Subbasin Runoff Results

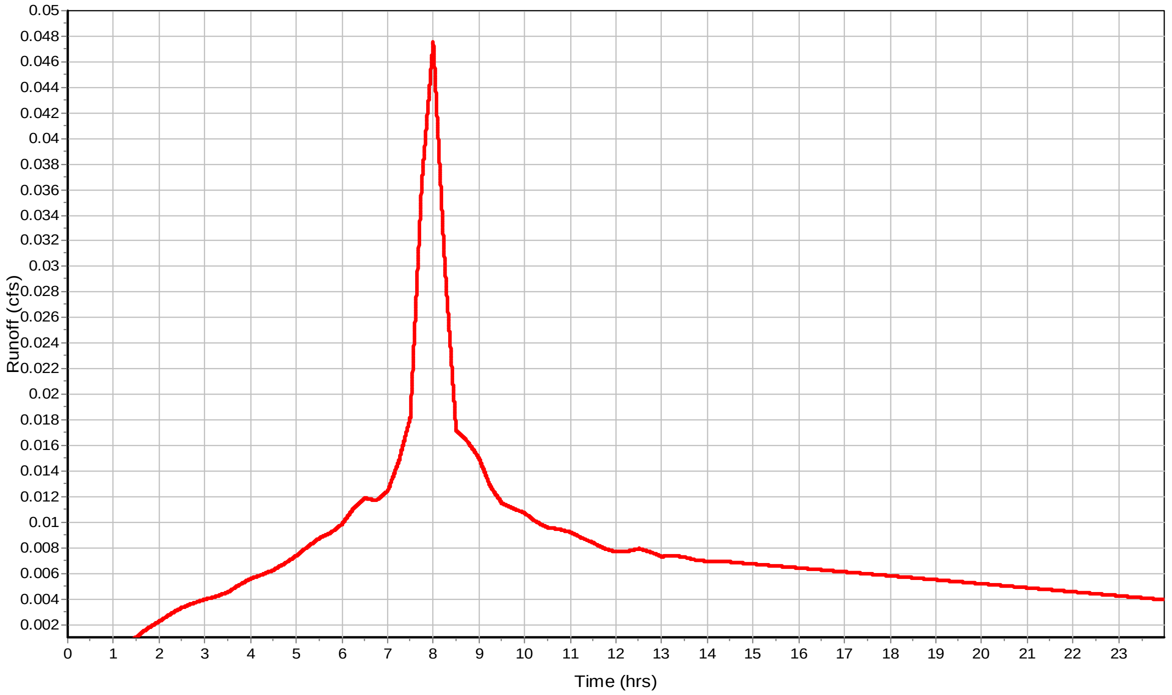
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG F_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG G_EAST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

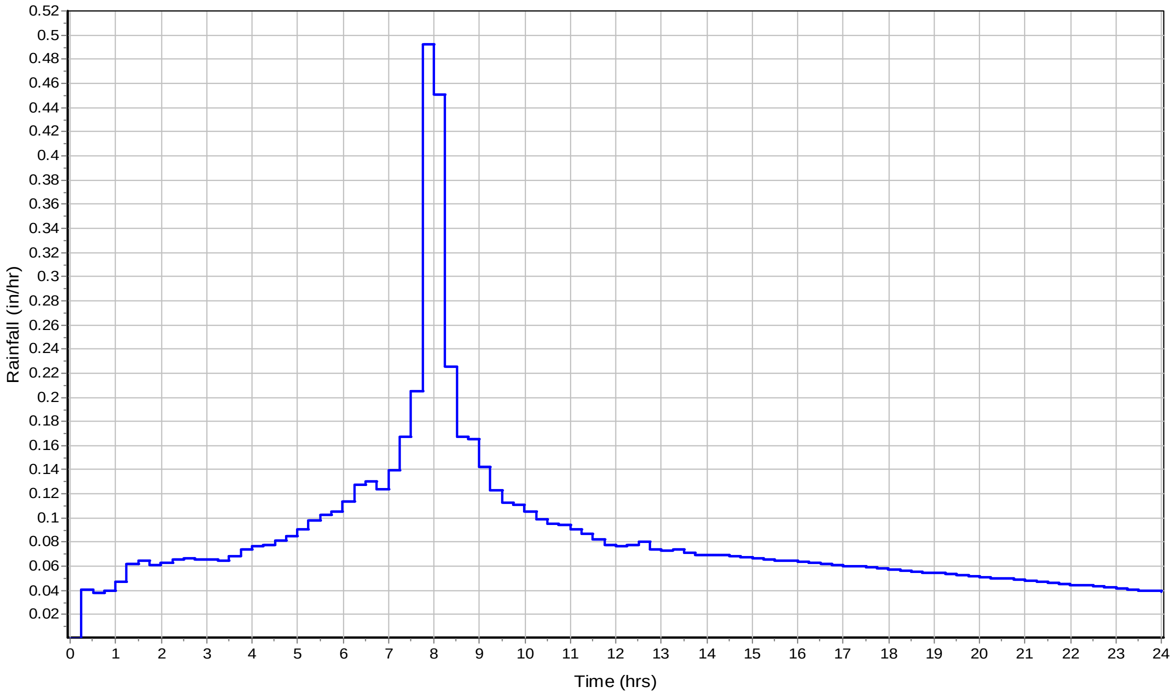
Time of Concentration

Subbasin Runoff Results

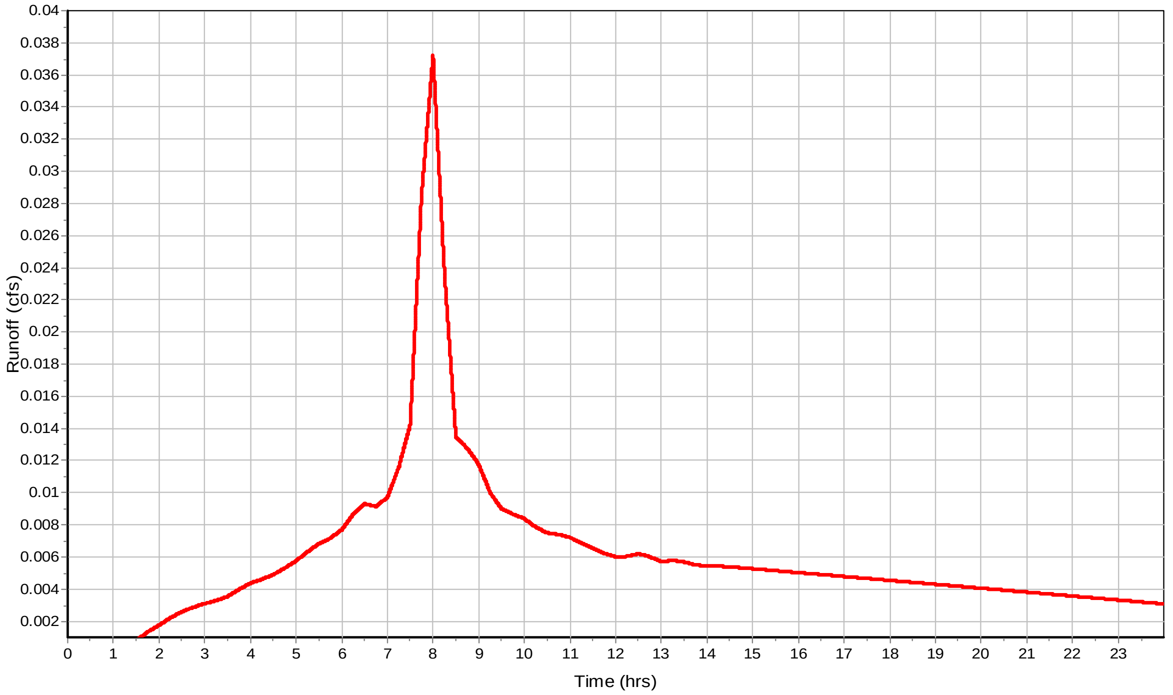
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG G_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG G_WEST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

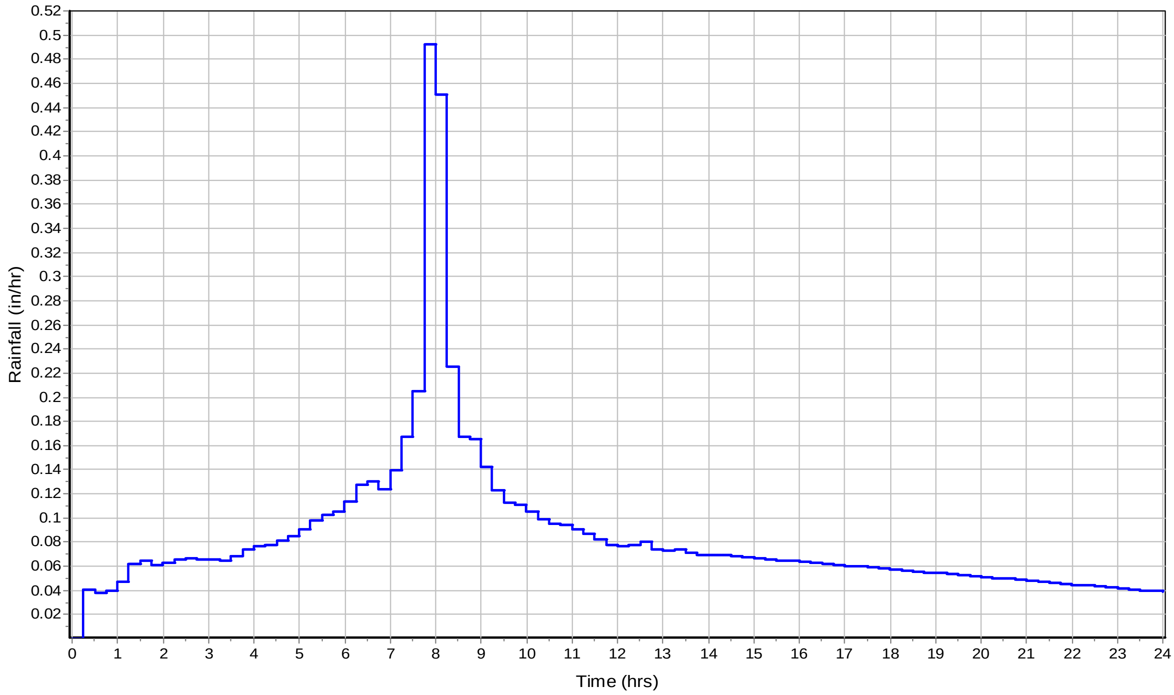
Time of Concentration

Subbasin Runoff Results

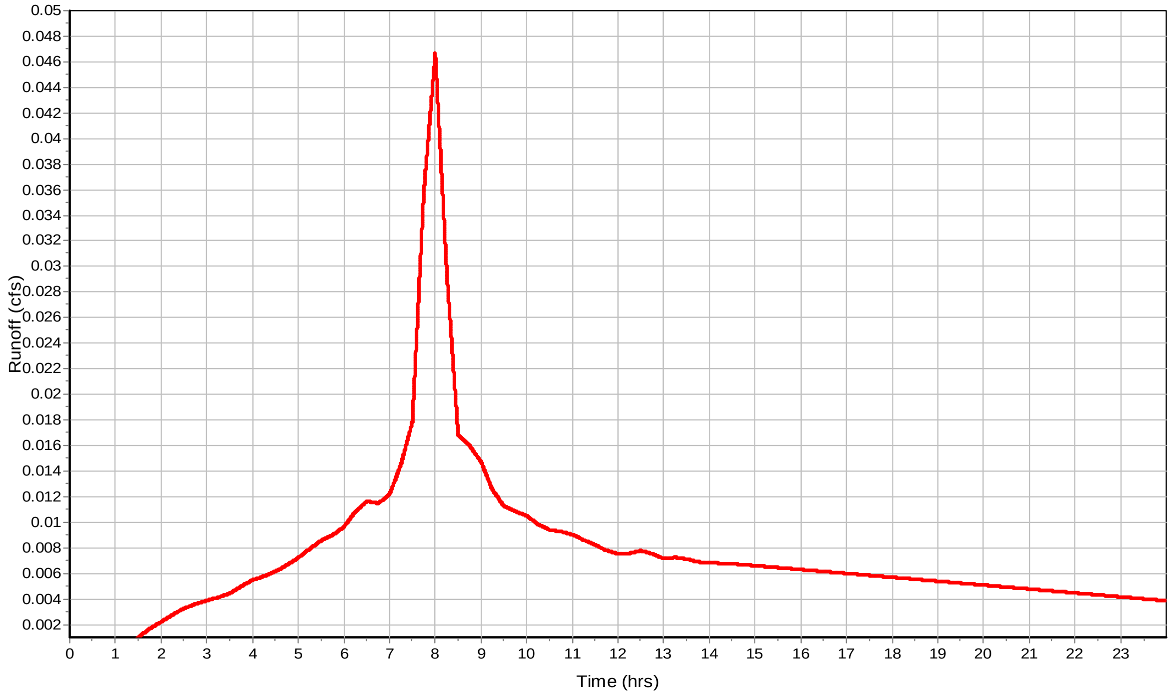
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG G_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG H_EAST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

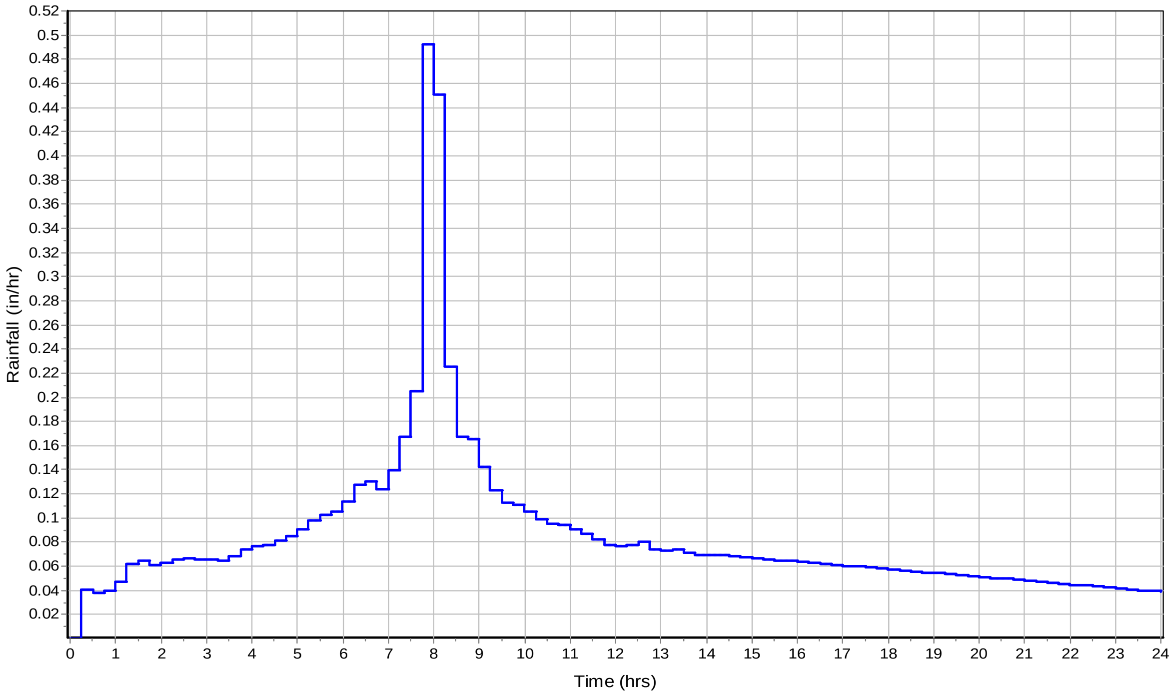
Time of Concentration

Subbasin Runoff Results

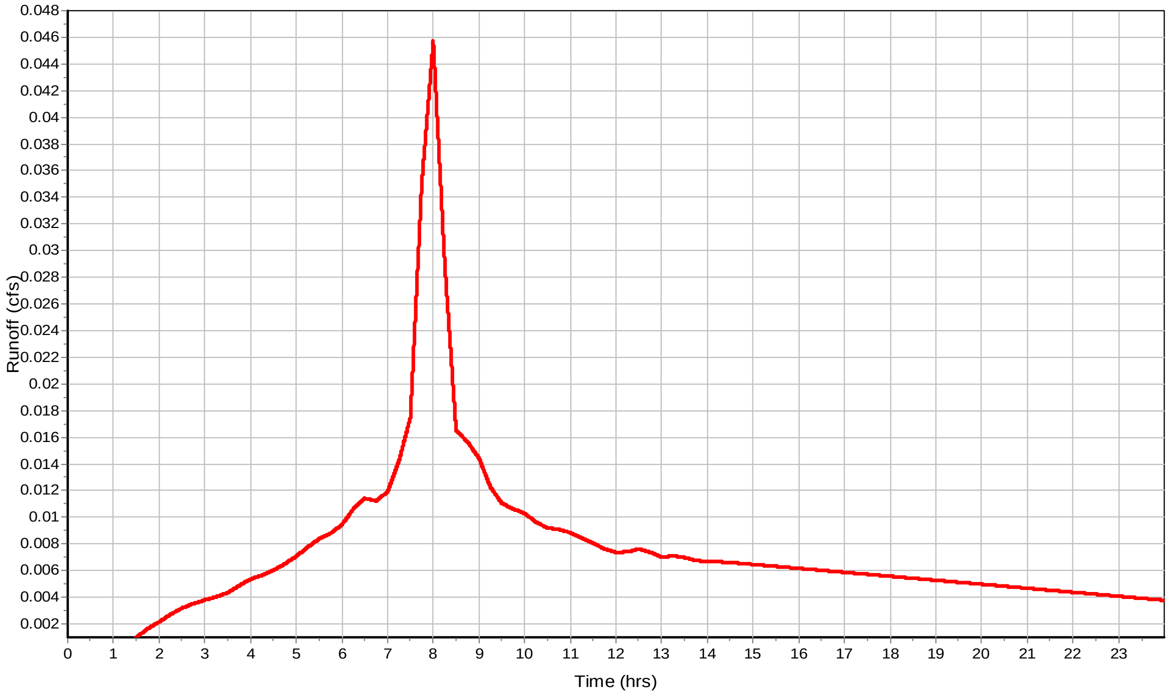
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG H_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG H_WEST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

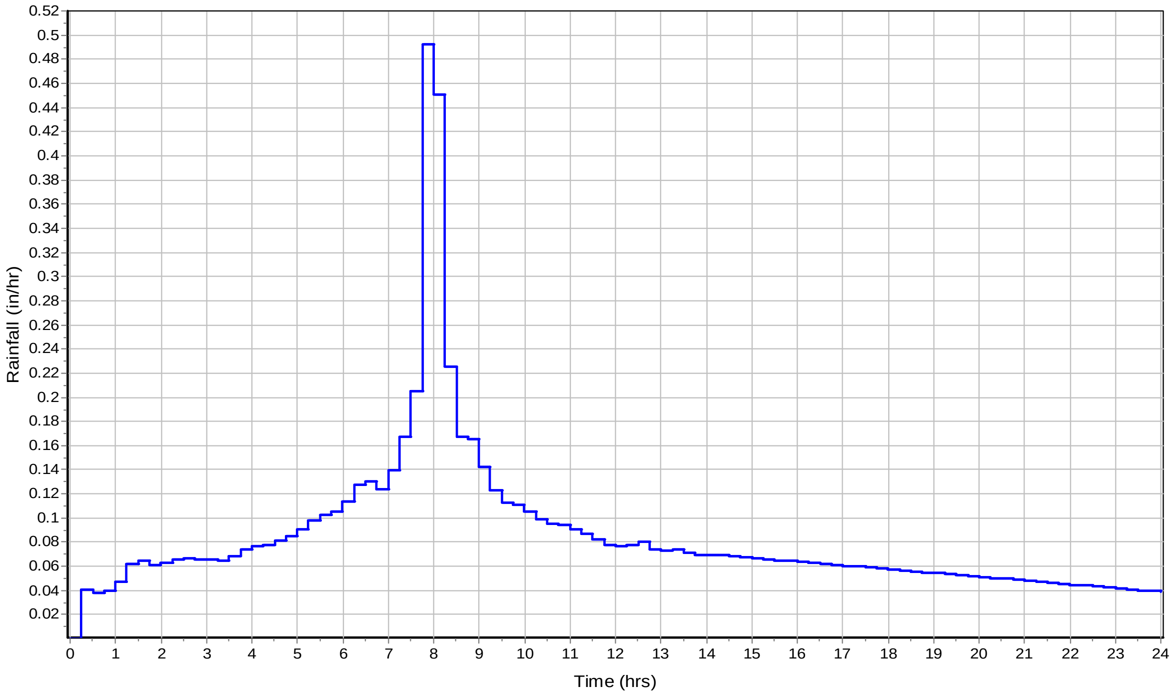
Time of Concentration

Subbasin Runoff Results

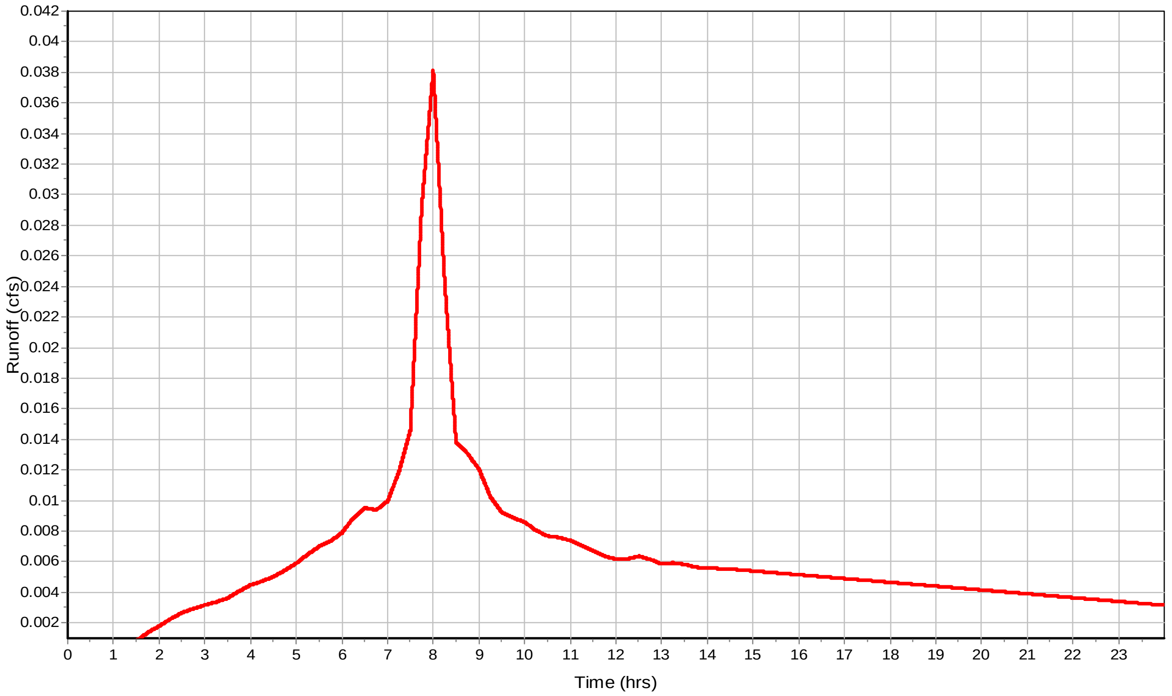
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG H_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. EAST

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

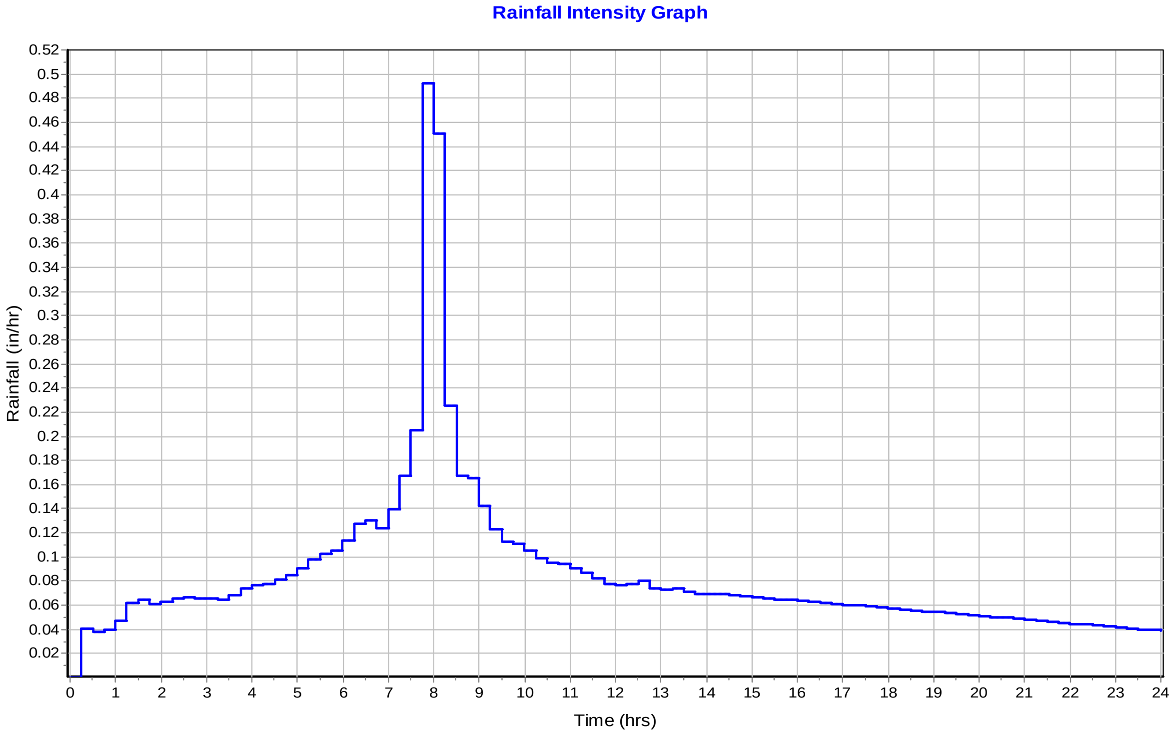
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.05		98

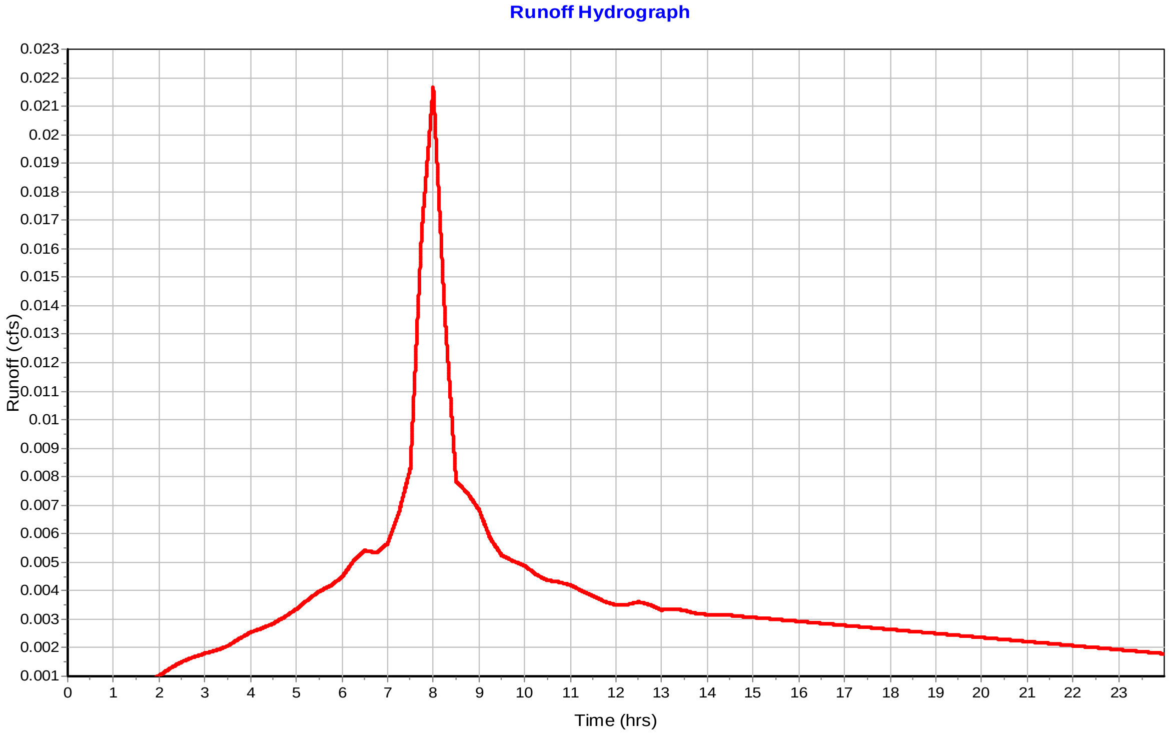
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. EAST





Subbasin : BLDG T.I. NE

Input Data

Area (ac)	0.02
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

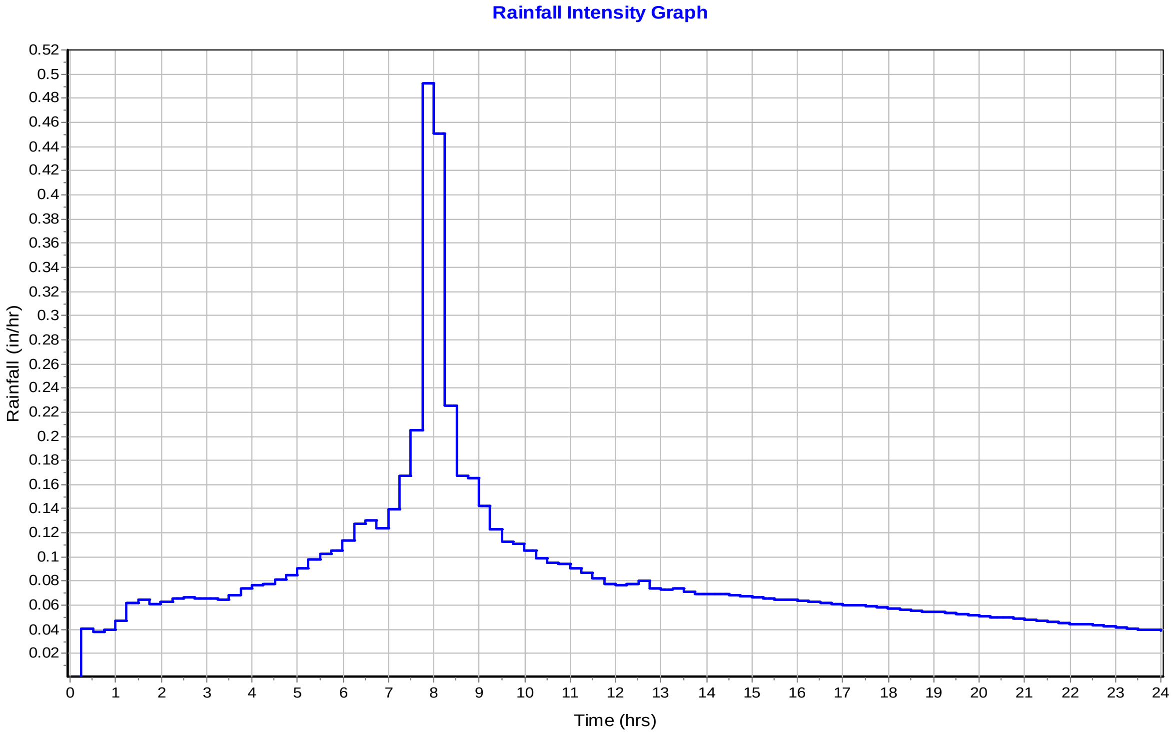
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.02		98

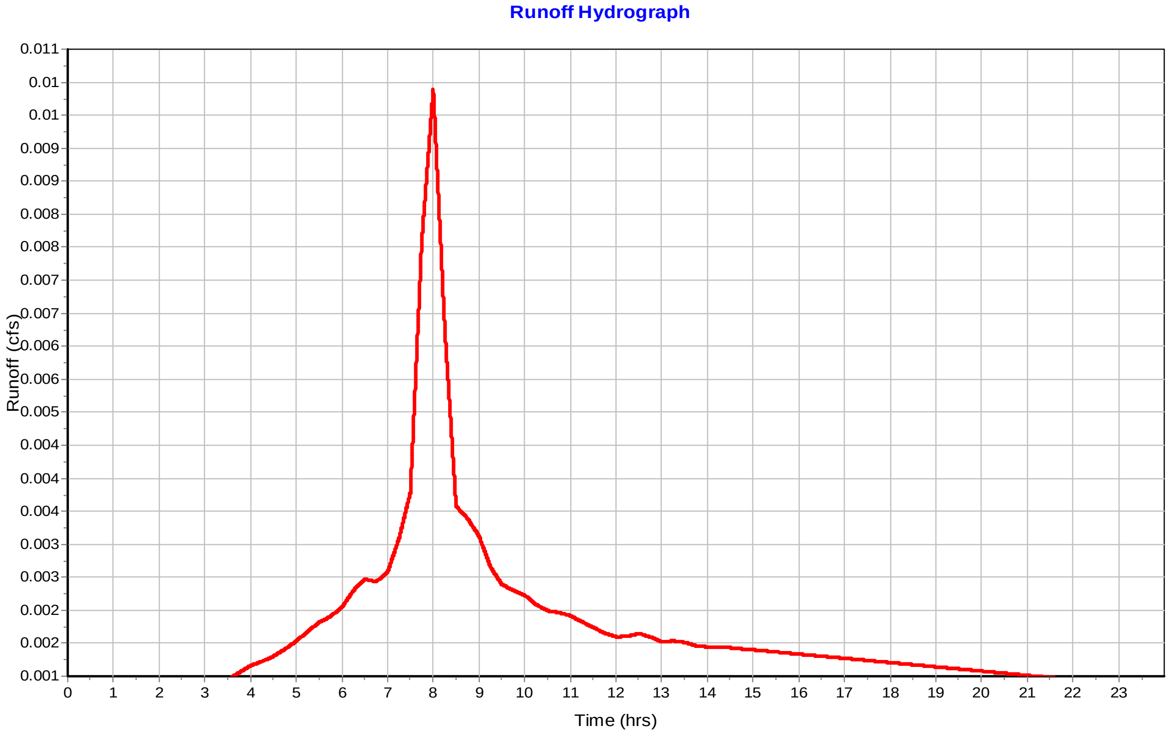
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.01
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. NE





Subbasin : BLDG T.I. NW

Input Data

Area (ac)	0.04
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.04		98

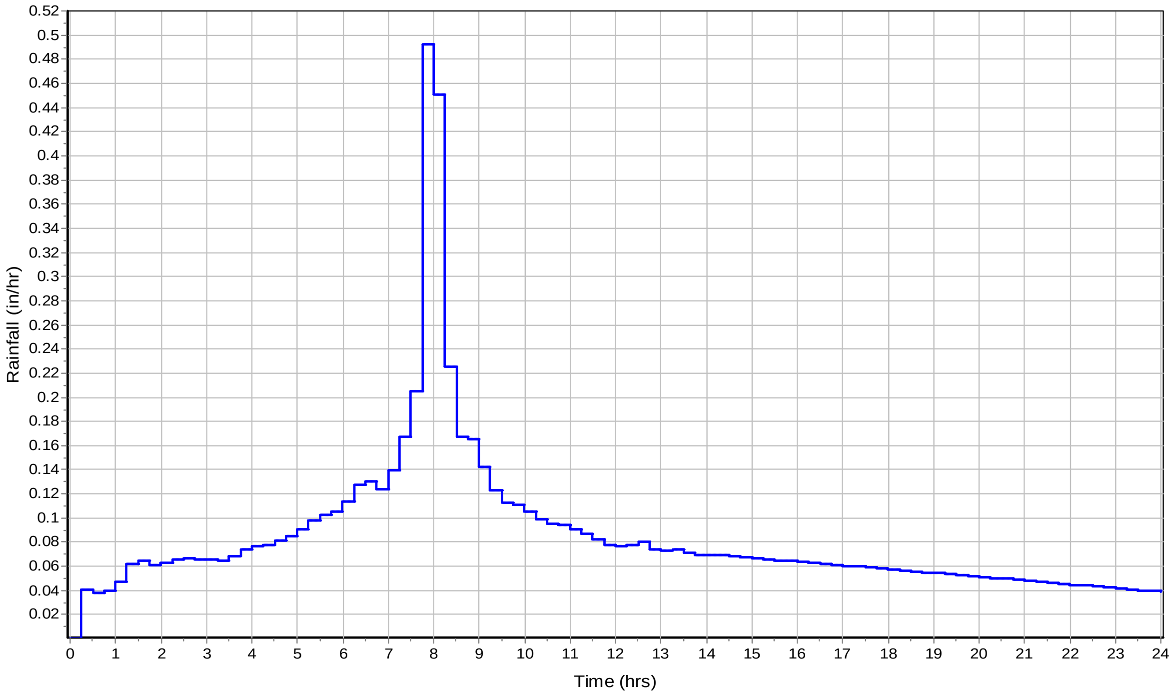
Time of Concentration

Subbasin Runoff Results

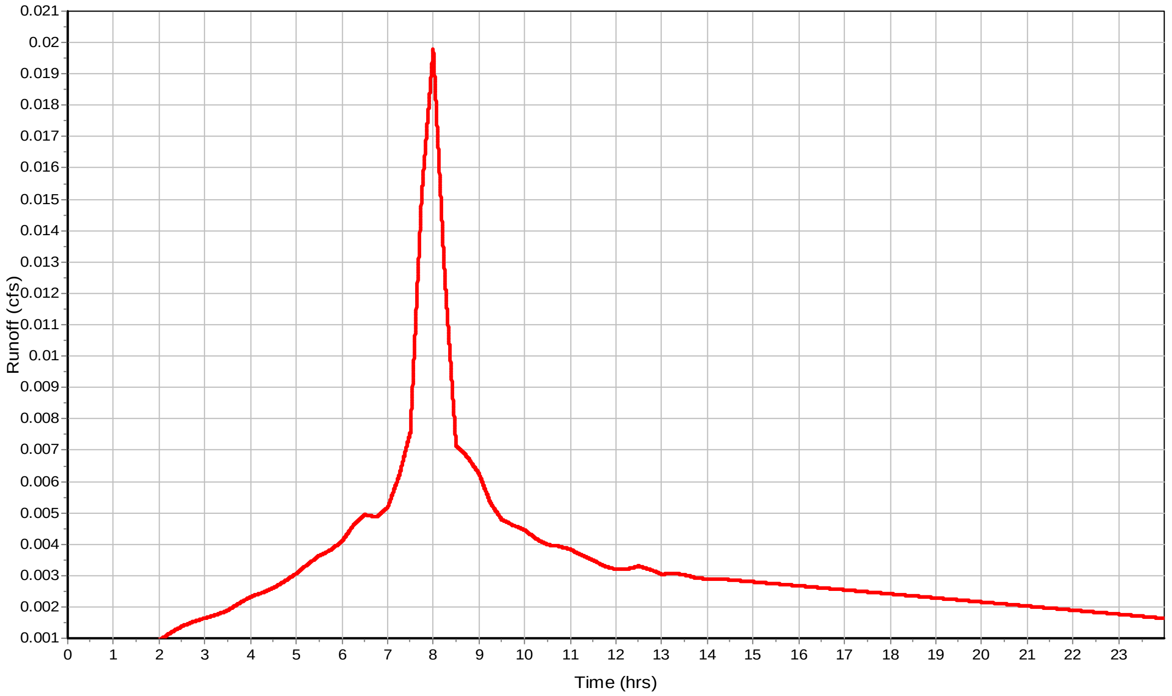
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. SE

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

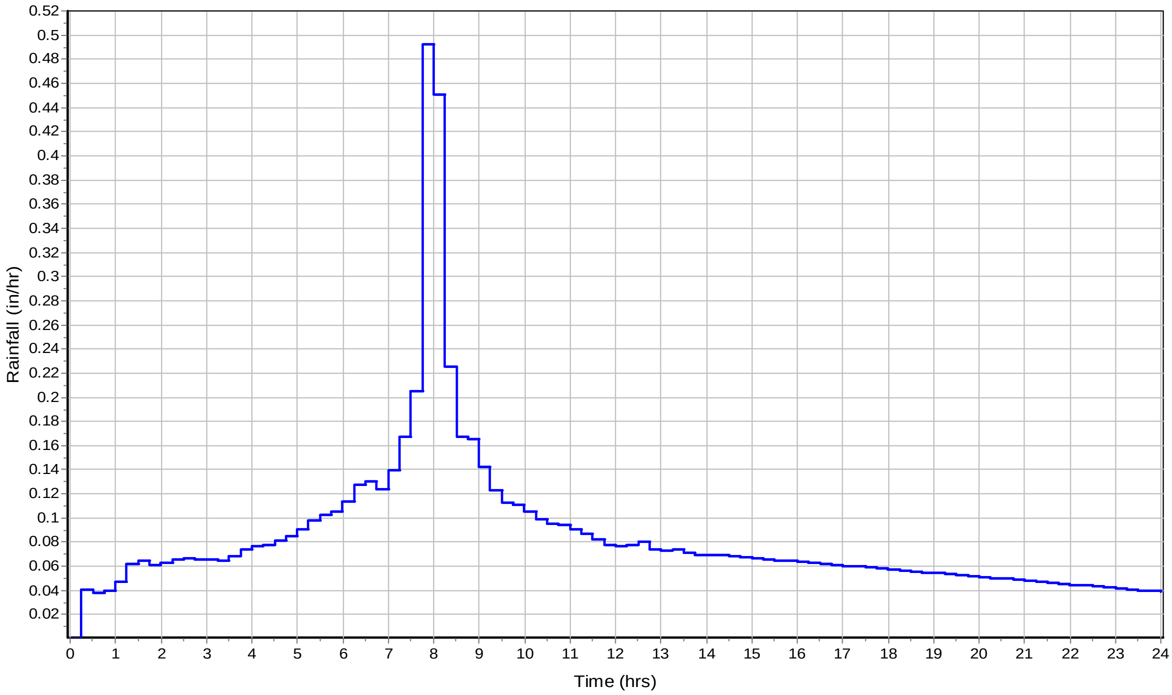
Time of Concentration

Subbasin Runoff Results

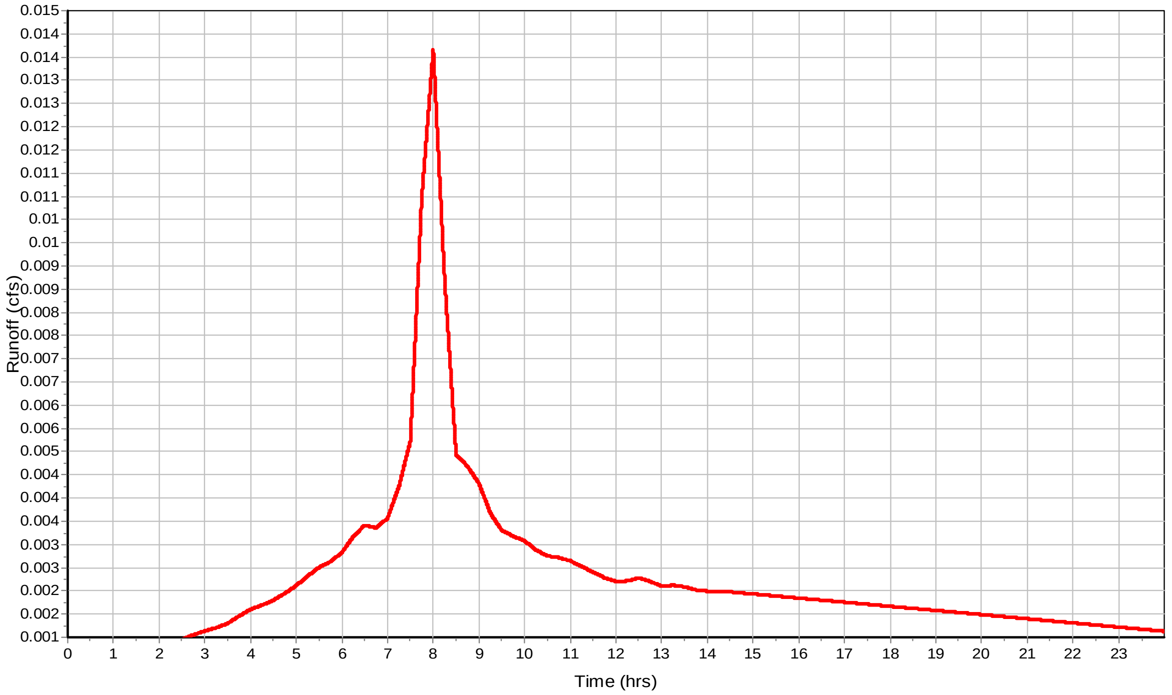
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.01
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. SW

Input Data

Area (ac)	0.04
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.04		98

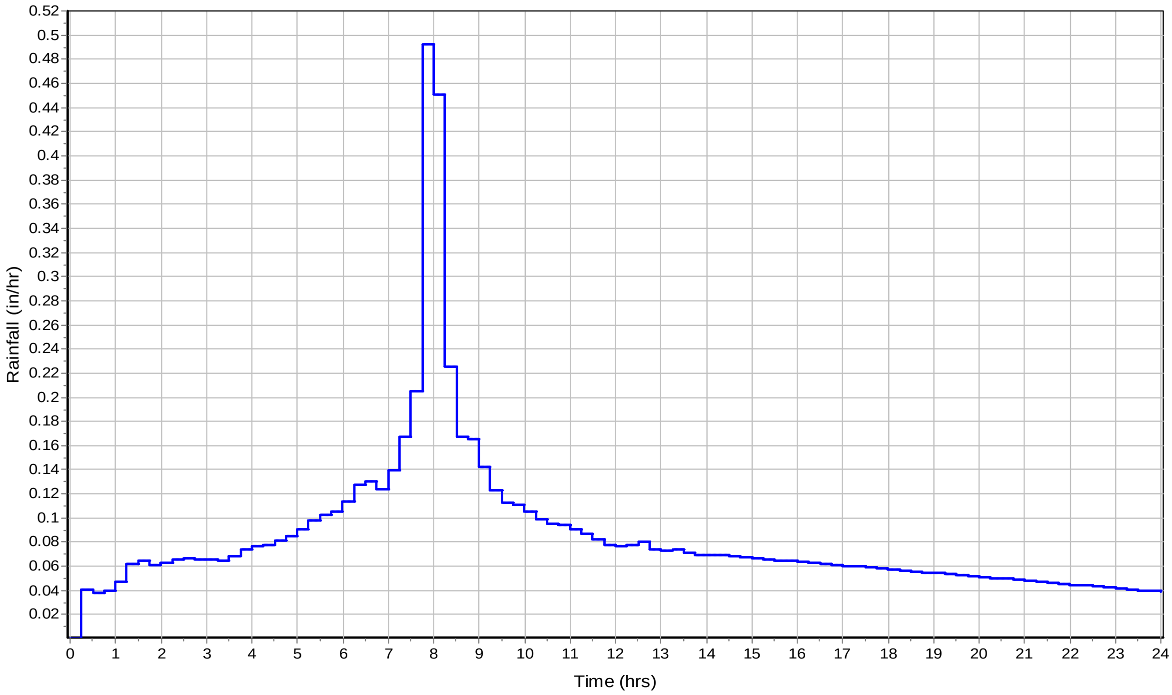
Time of Concentration

Subbasin Runoff Results

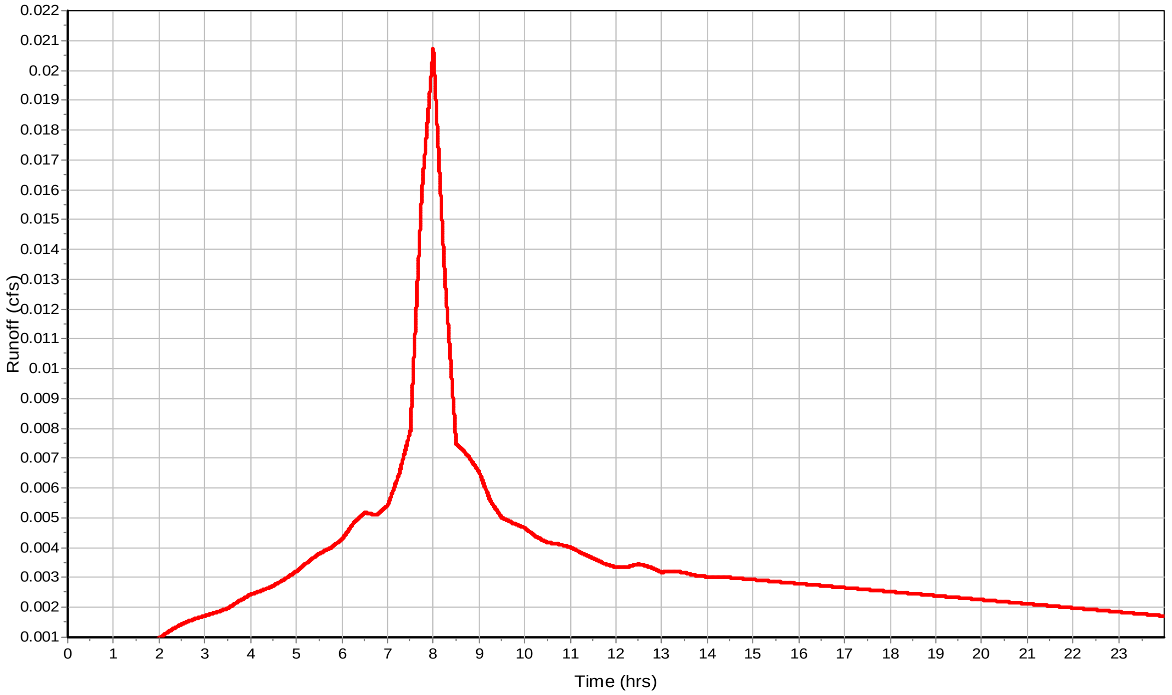
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. WEST

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

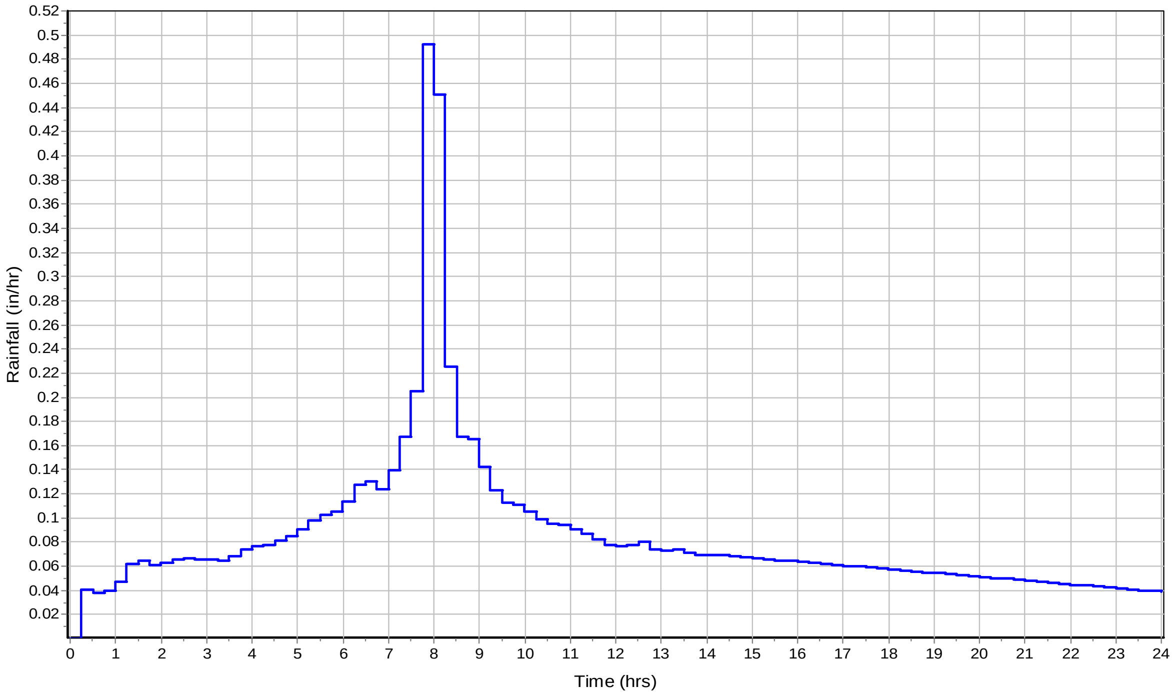
Time of Concentration

Subbasin Runoff Results

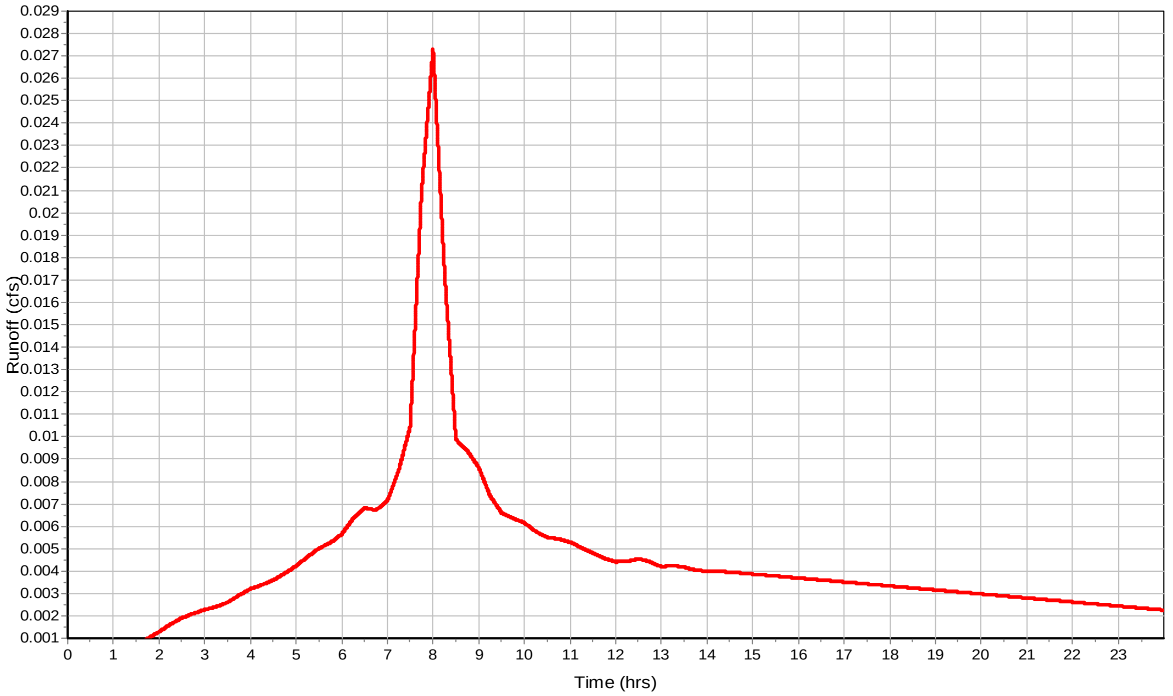
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 02

Input Data

Area (ac)	0.22
Impervious Area (%)	98
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.22		97.56

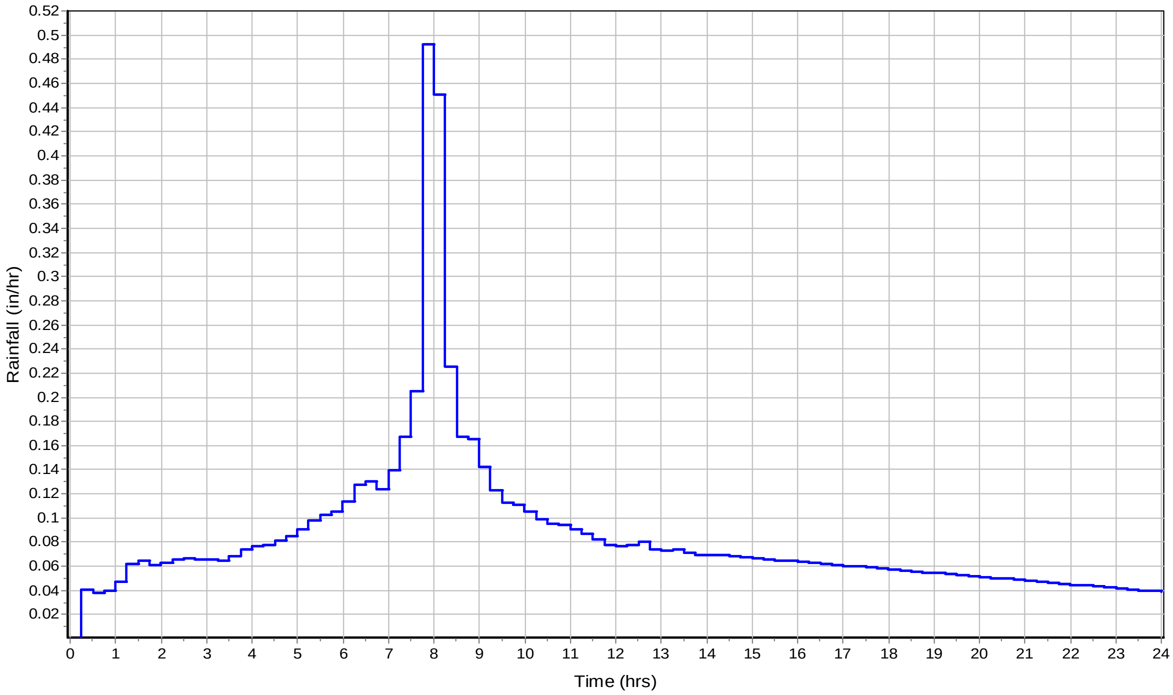
Time of Concentration

Subbasin Runoff Results

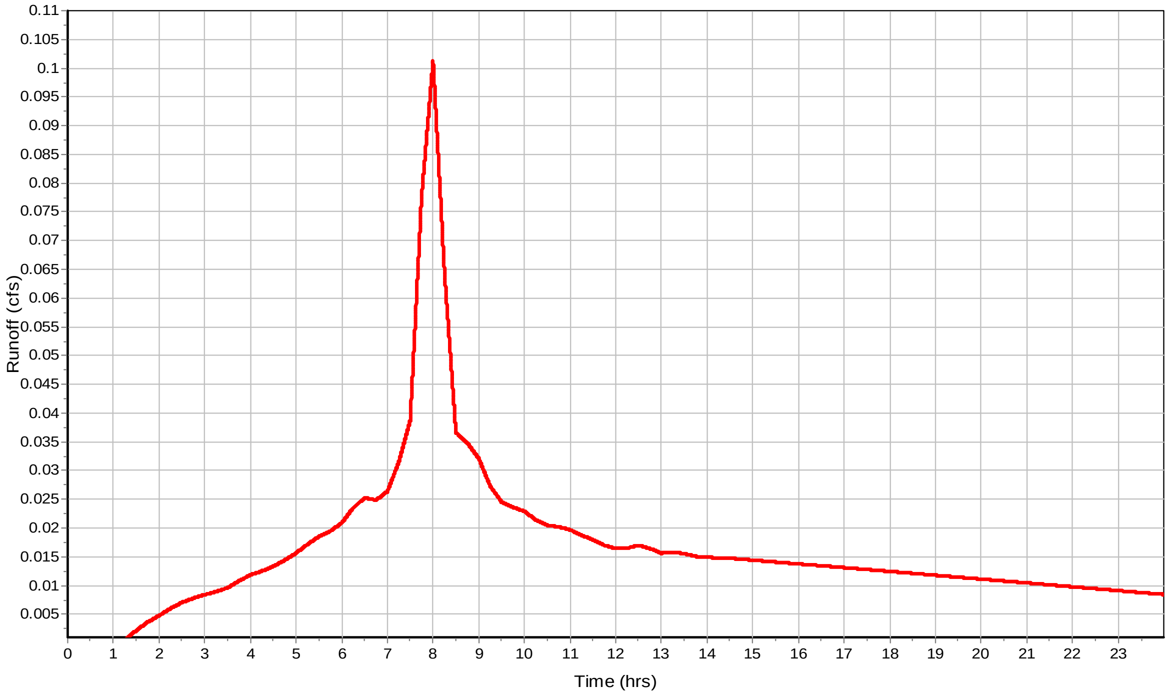
Total Rainfall (in)	2.03
Total Runoff (in)	1.78
Peak Runoff (cfs)	0.1
Weighted Curve Number	97.56
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 03

Input Data

Area (ac)	0.13
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		98

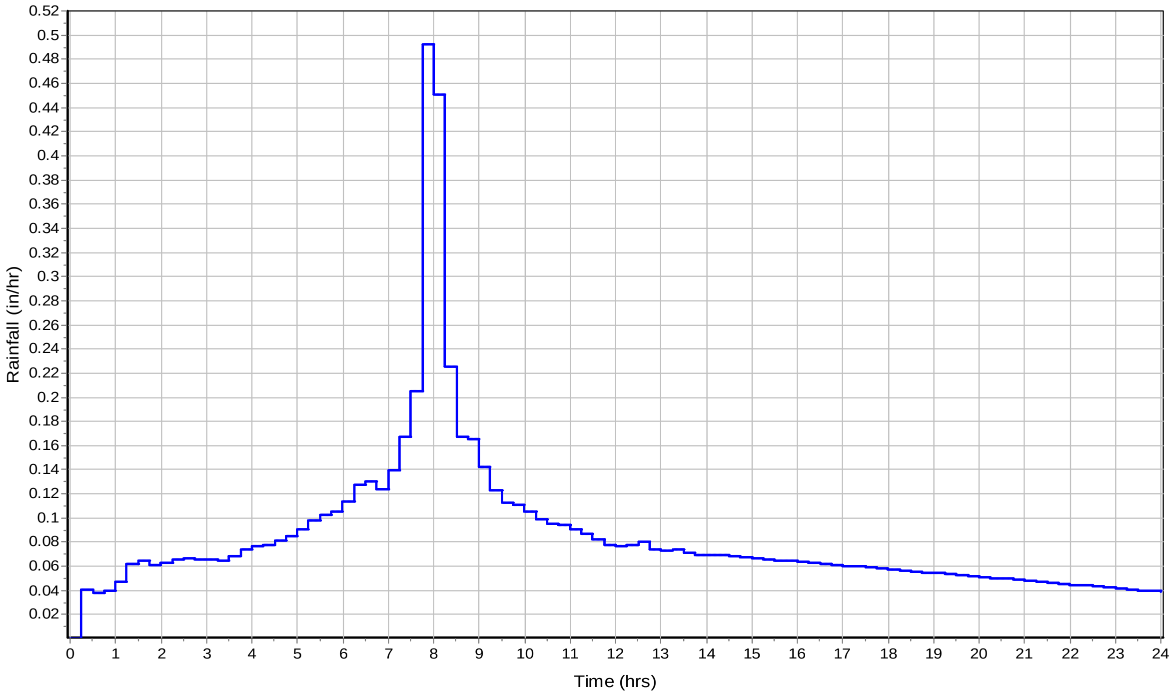
Time of Concentration

Subbasin Runoff Results

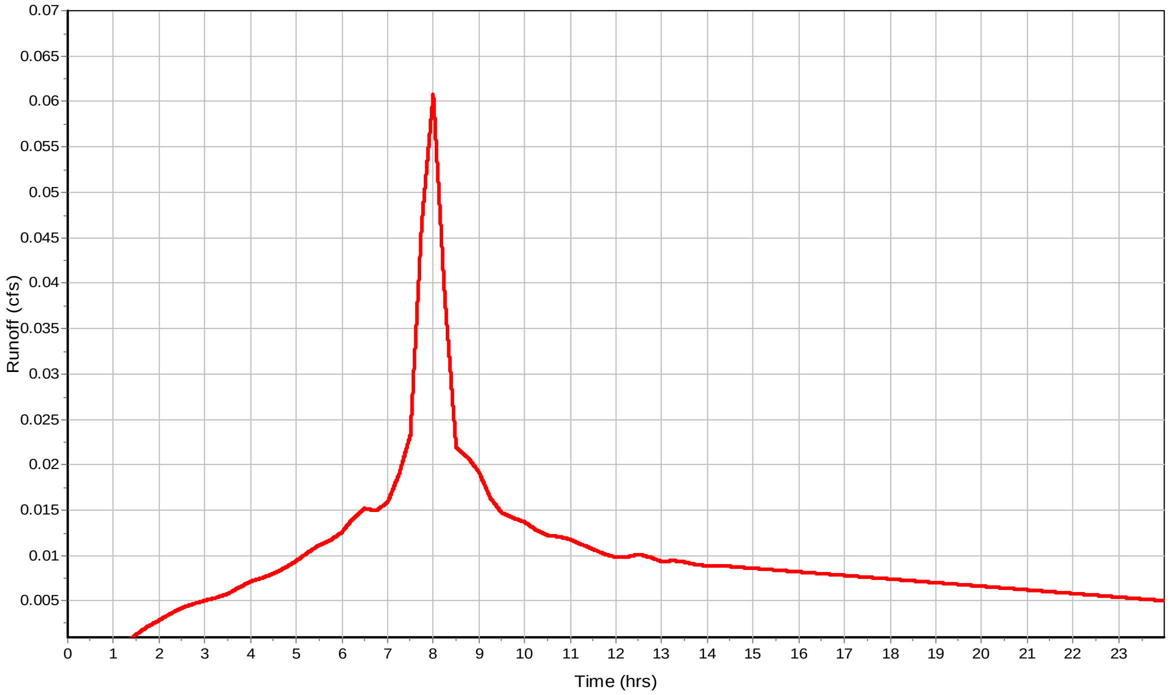
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.06
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 04

Input Data

Area (ac)	0.06
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		92.06

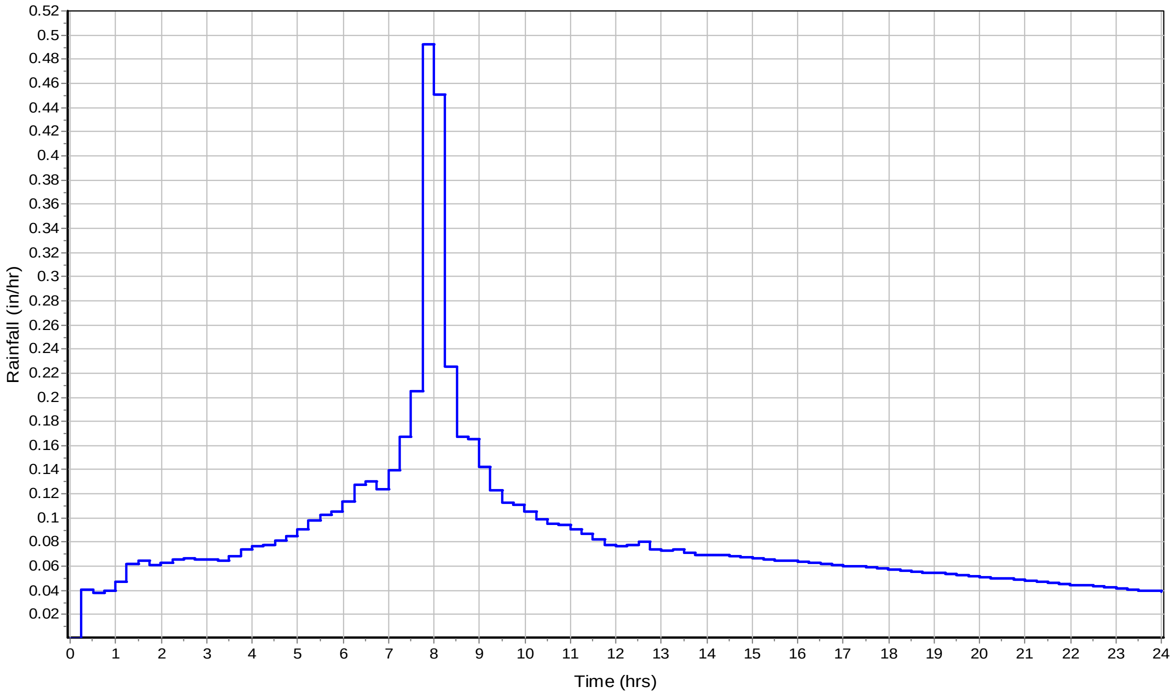
Time of Concentration

Subbasin Runoff Results

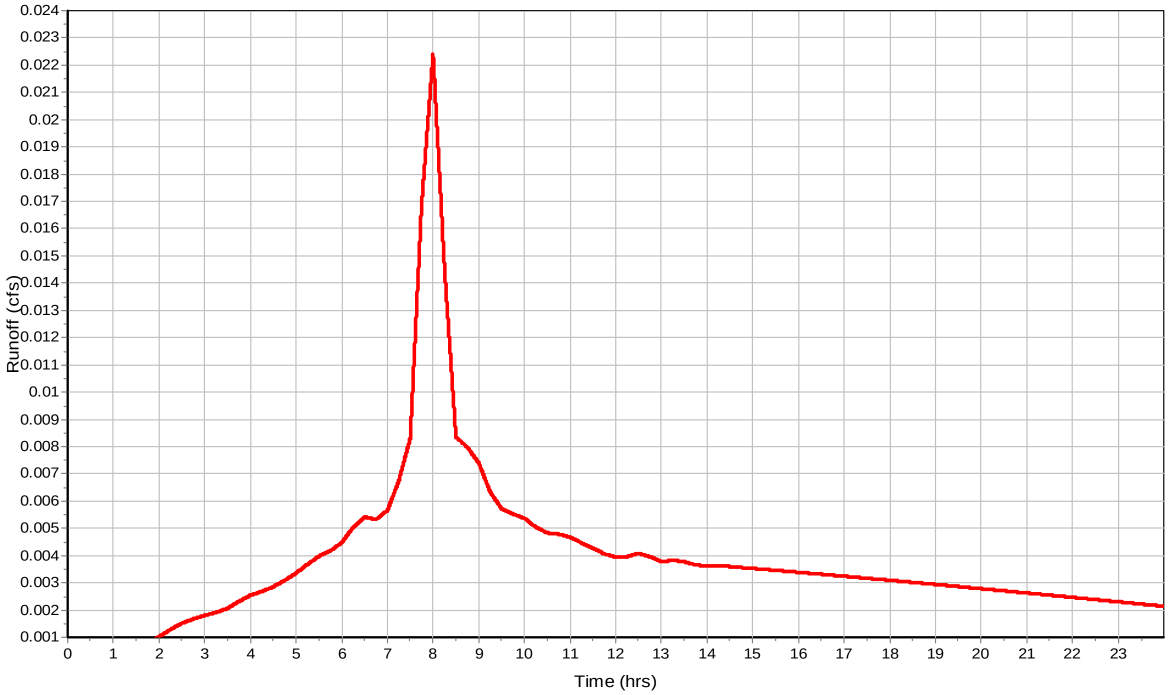
Total Rainfall (in)	2.03
Total Runoff (in)	1.44
Peak Runoff (cfs)	0.02
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 05

Input Data

Area (ac)	0.24
Impervious Area (%)	90
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.24		95.8

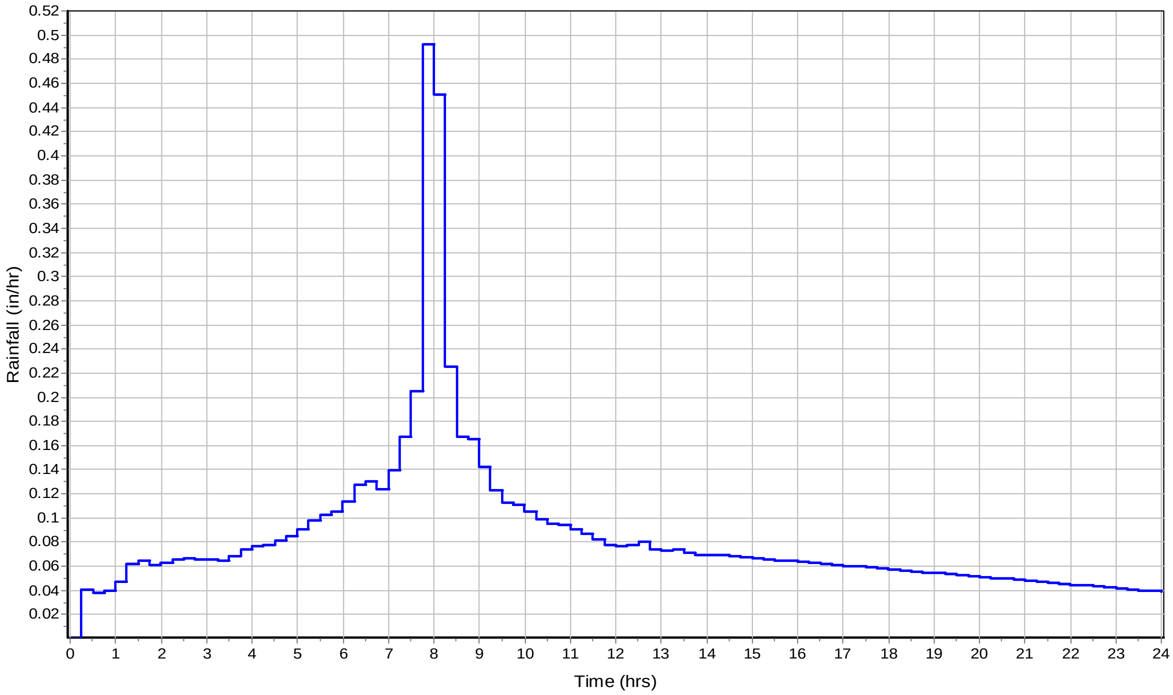
Time of Concentration

Subbasin Runoff Results

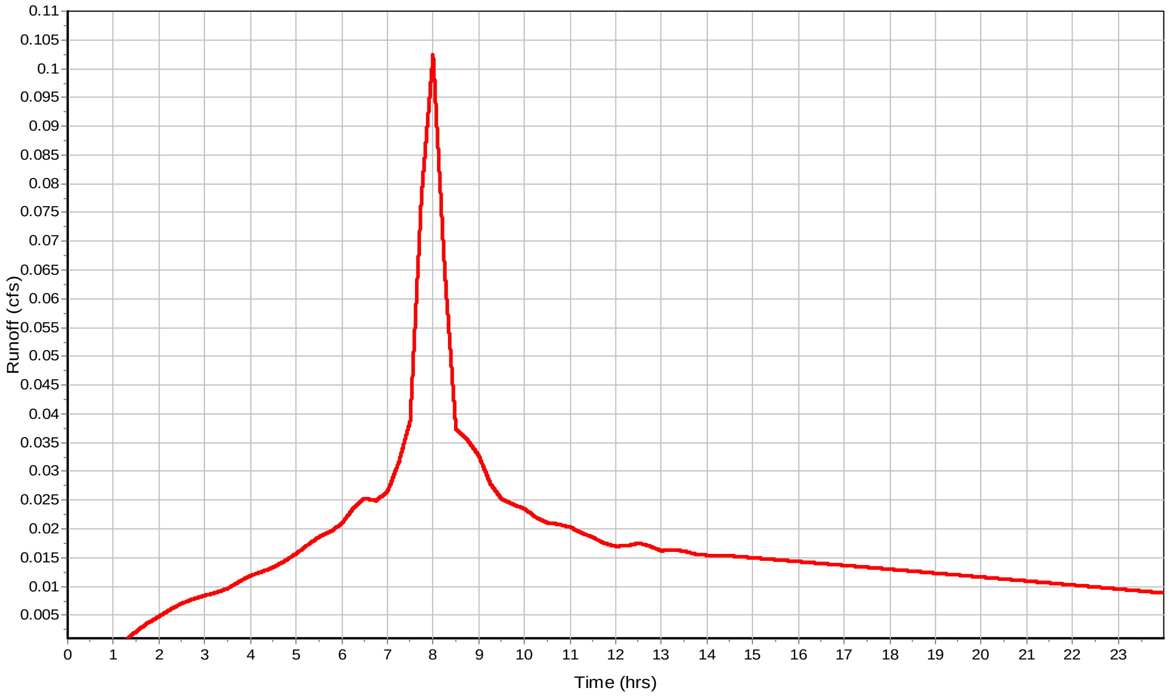
Total Rainfall (in)	2.03
Total Runoff (in)	1.67
Peak Runoff (cfs)	0.1
Weighted Curve Number	95.8
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 06

Input Data

Area (ac)	0.16
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.16		90.3

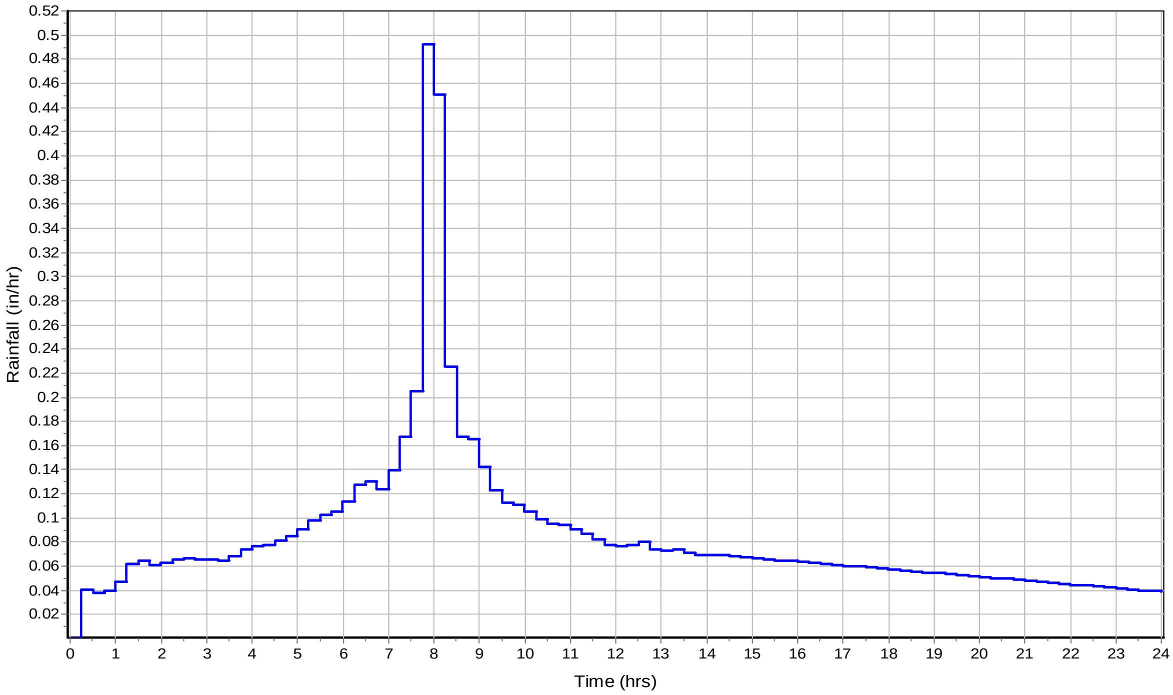
Time of Concentration

Subbasin Runoff Results

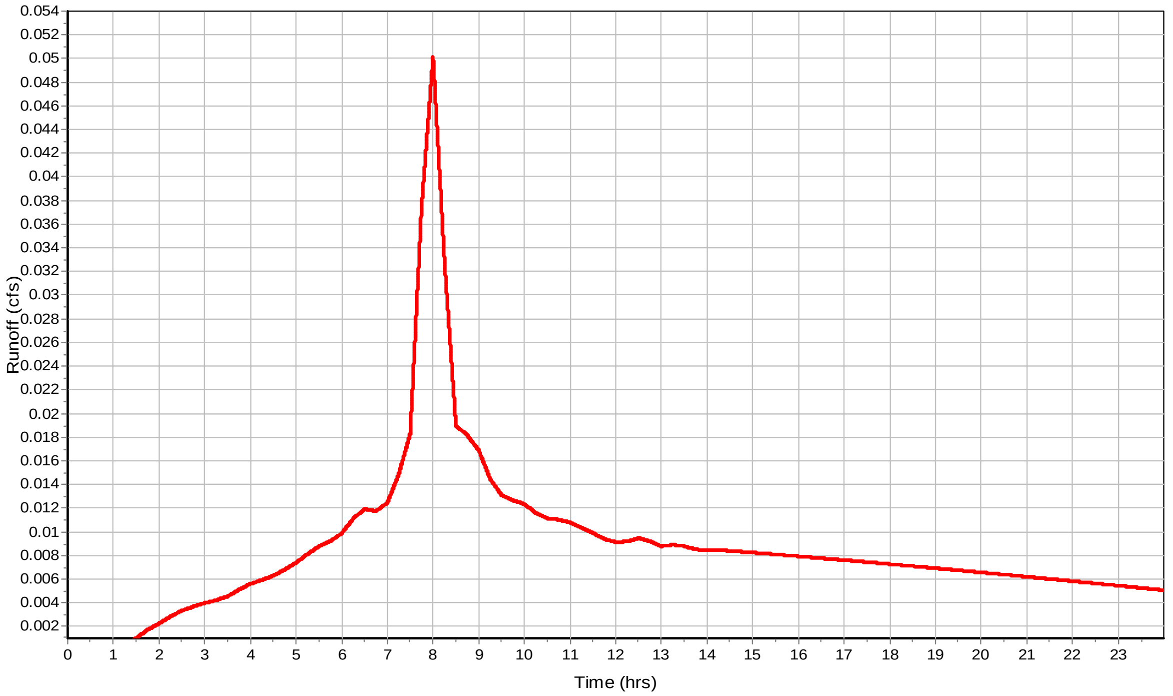
Total Rainfall (in)	2.03
Total Runoff (in)	1.33
Peak Runoff (cfs)	0.05
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 07

Input Data

Area (ac)	0.09
Impervious Area (%)	64
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.09		90.08

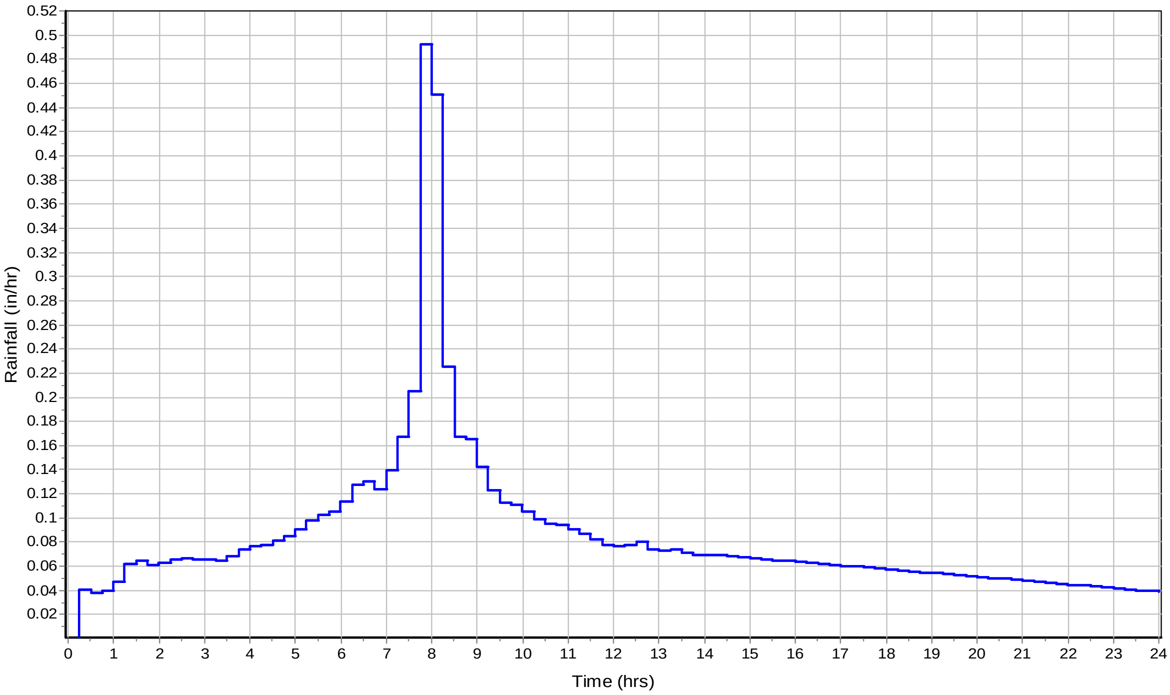
Time of Concentration

Subbasin Runoff Results

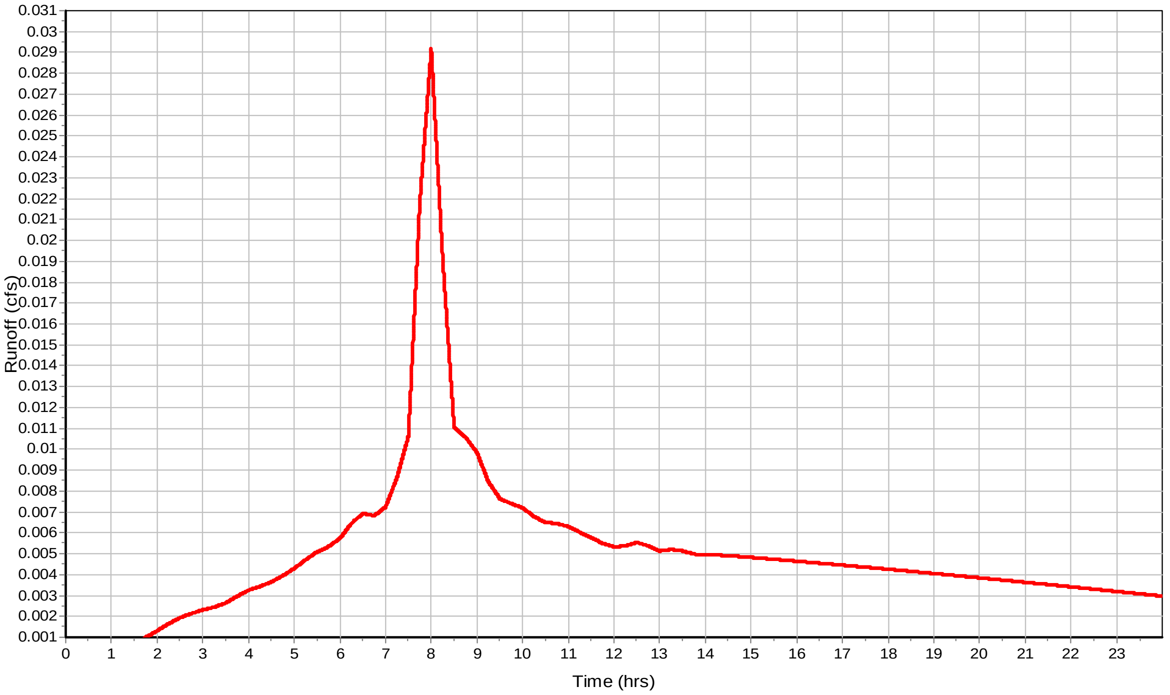
Total Rainfall (in)	2.03
Total Runoff (in)	1.31
Peak Runoff (cfs)	0.03
Weighted Curve Number	90.08
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 07

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 08

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.05		98

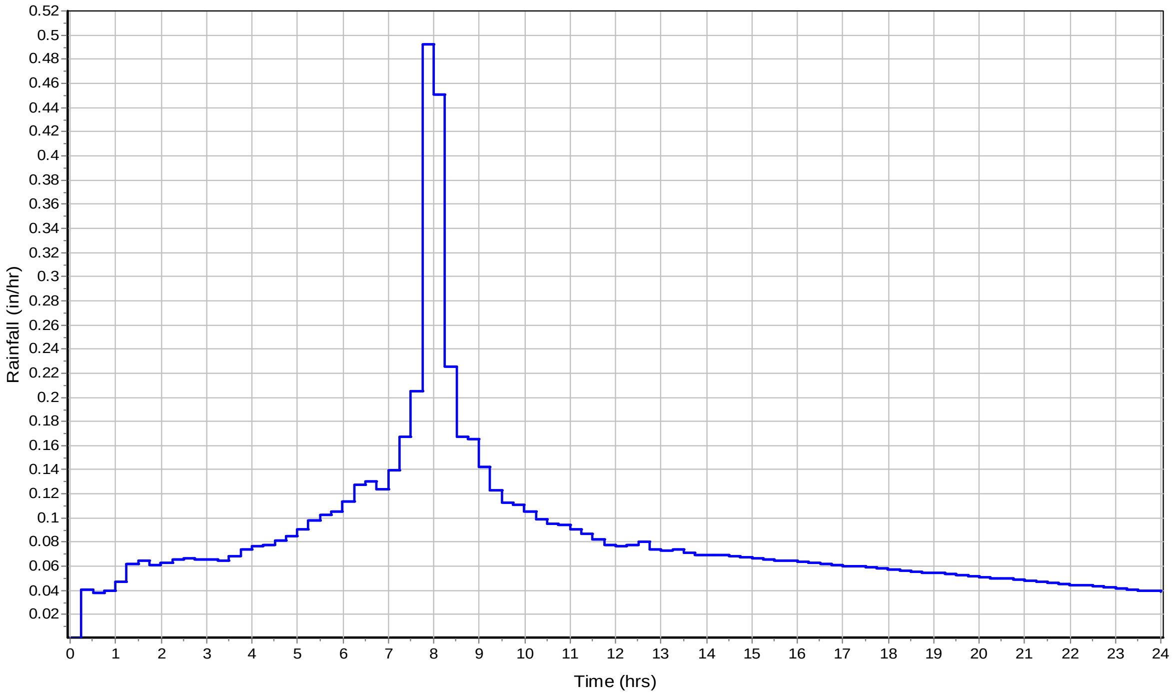
Time of Concentration

Subbasin Runoff Results

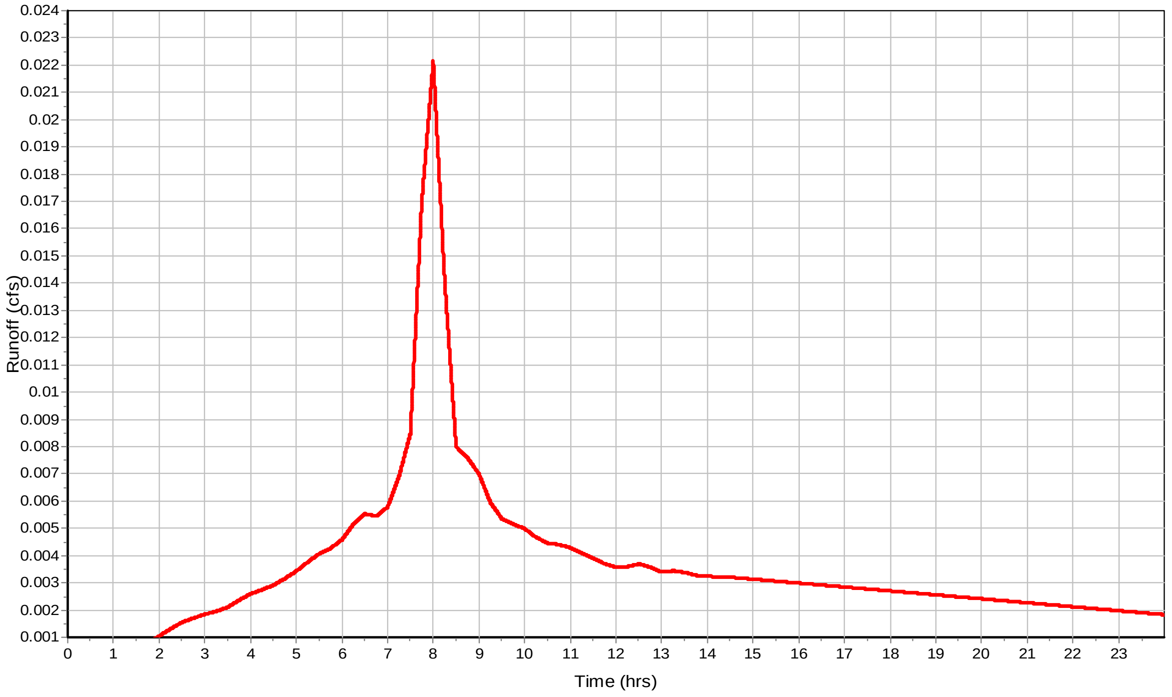
Total Rainfall (in)	2.03
Total Runoff (in)	1.81
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 08

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 09

Input Data

Area (ac)	0.25
Impervious Area (%)	82
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.25		94.04

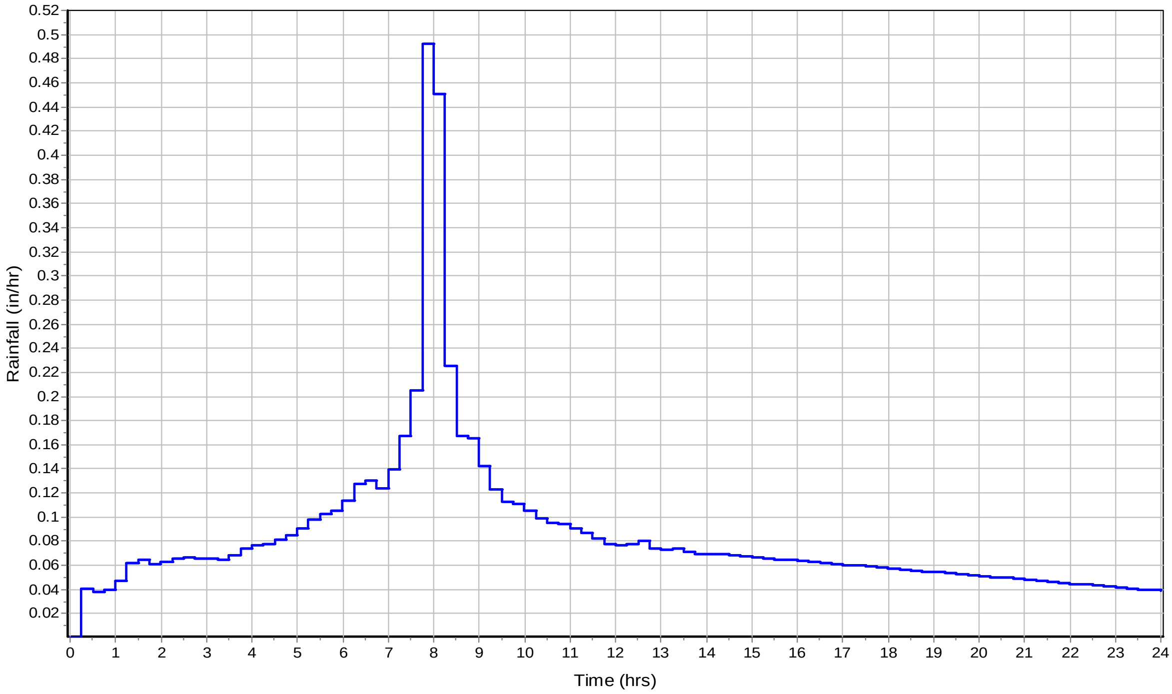
Time of Concentration

Subbasin Runoff Results

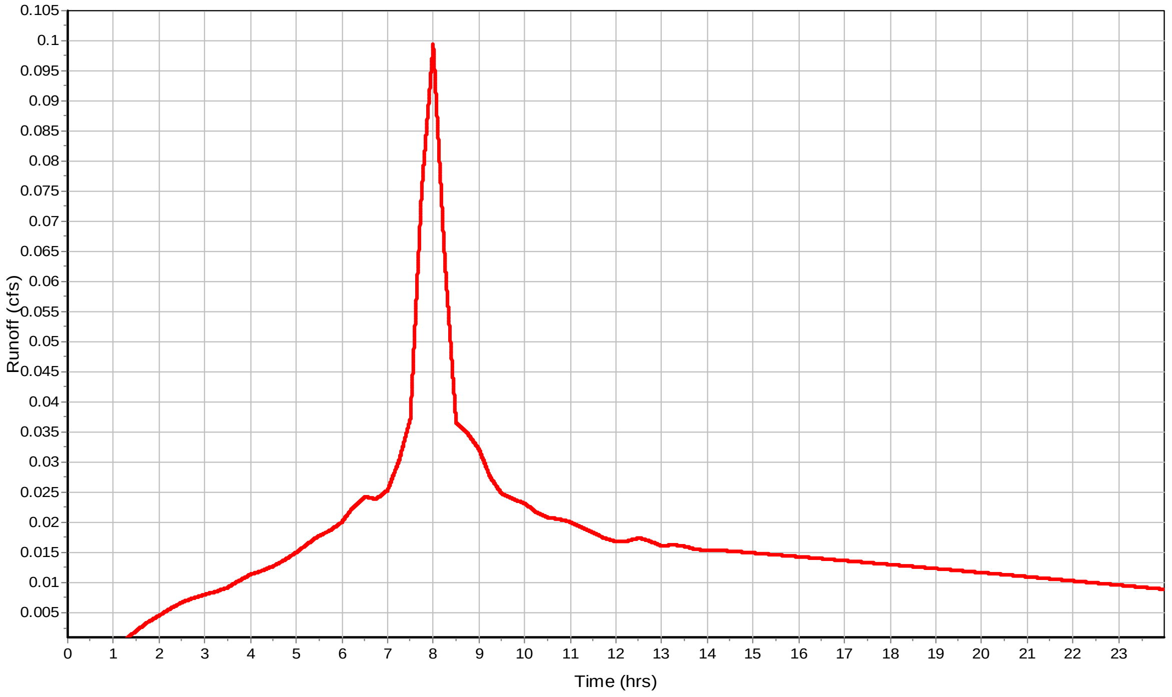
Total Rainfall (in)	2.03
Total Runoff (in)	1.56
Peak Runoff (cfs)	0.1
Weighted Curve Number	94.04
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 11

Input Data

Area (ac)	0.1
Impervious Area (%)	91
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		96.02

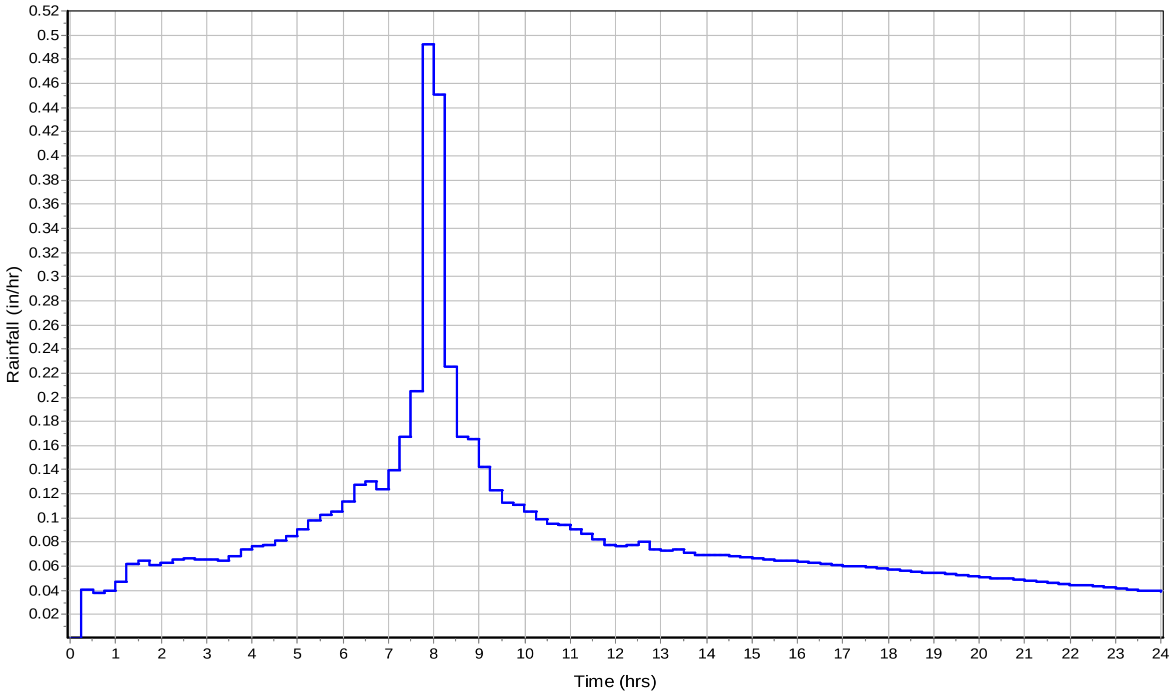
Time of Concentration

Subbasin Runoff Results

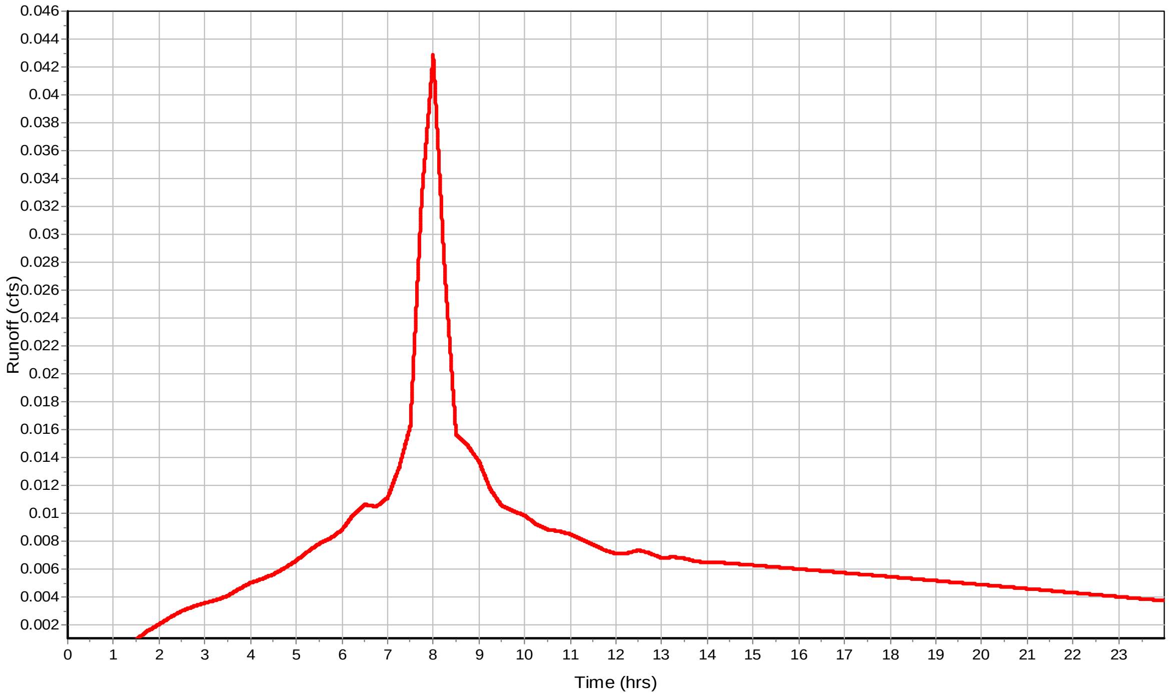
Total Rainfall (in)	2.03
Total Runoff (in)	1.68
Peak Runoff (cfs)	0.04
Weighted Curve Number	96.02
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 12

Input Data

Area (ac)	0.1
Impervious Area (%)	99
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		97.78

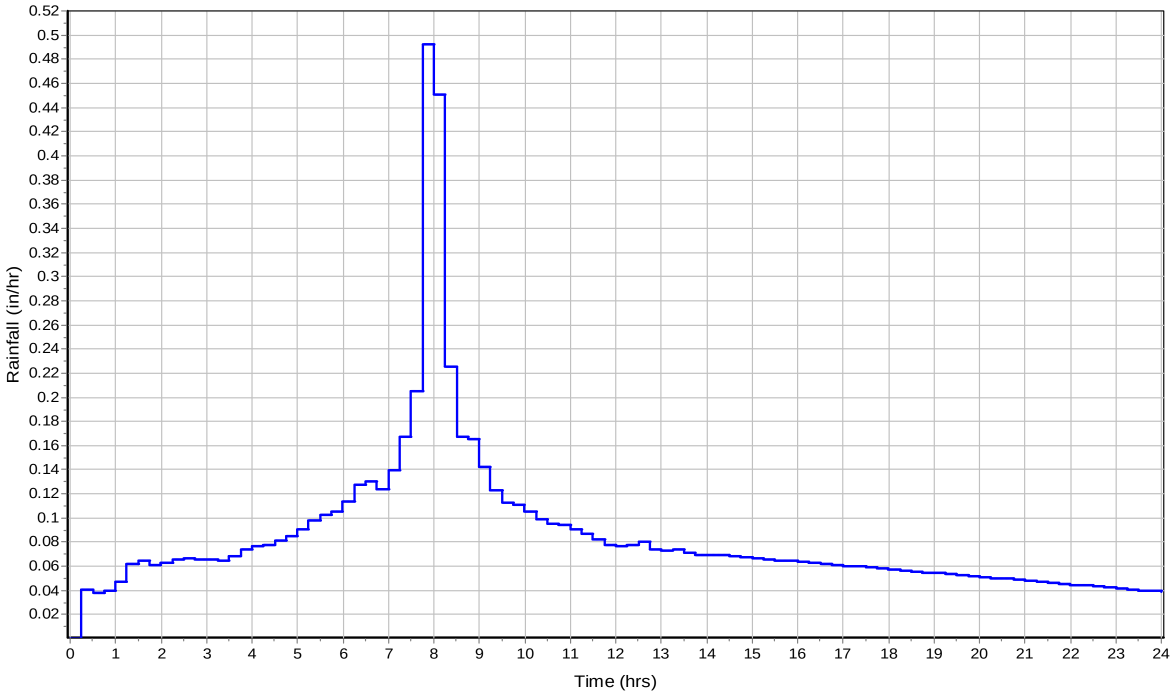
Time of Concentration

Subbasin Runoff Results

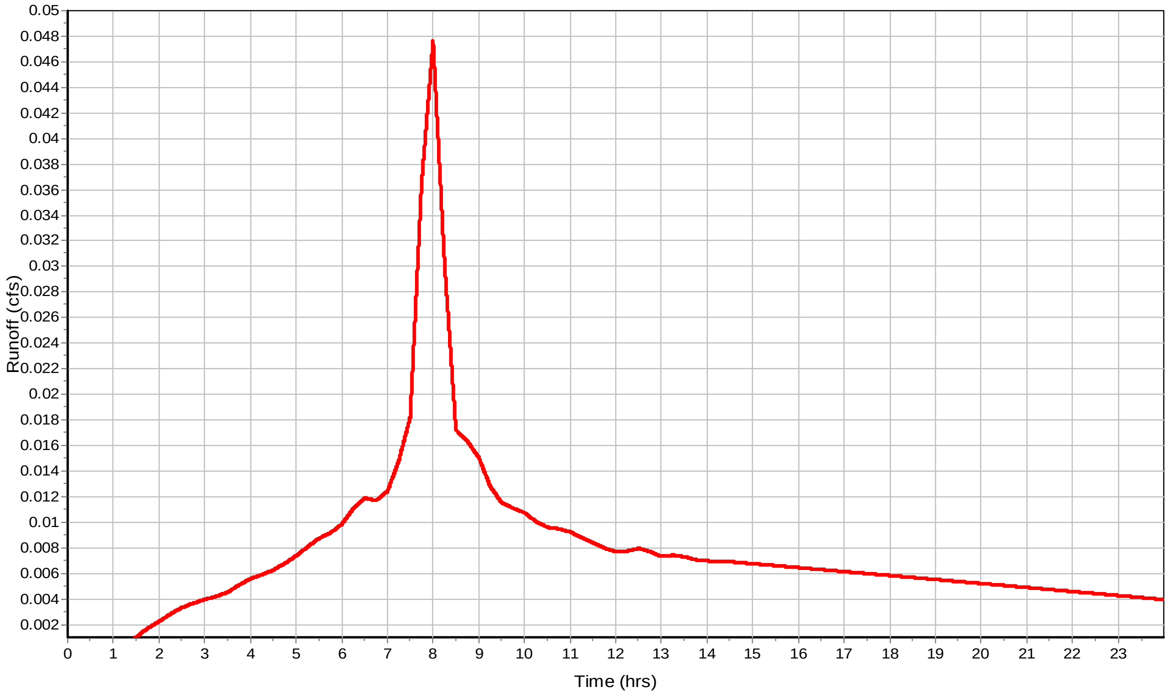
Total Rainfall (in)	2.03
Total Runoff (in)	1.79
Peak Runoff (cfs)	0.05
Weighted Curve Number	97.78
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 13

Input Data

Area (ac)	0.13
Impervious Area (%)	94
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		96.68

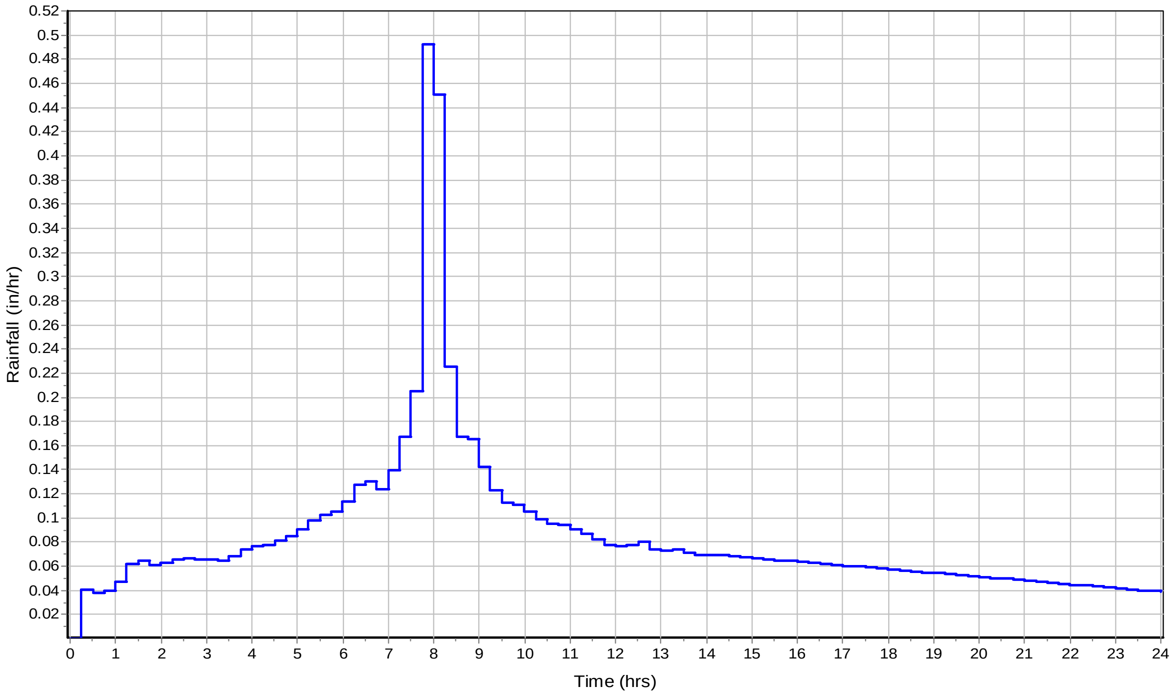
Time of Concentration

Subbasin Runoff Results

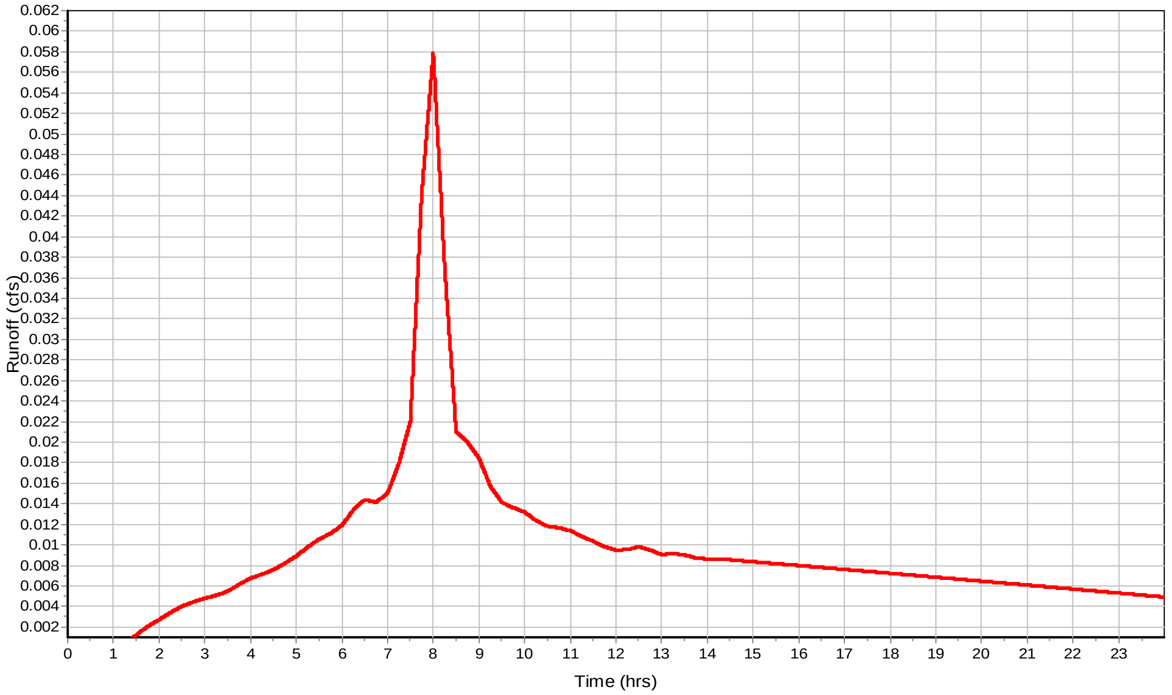
Total Rainfall (in)	2.03
Total Runoff (in)	1.72
Peak Runoff (cfs)	0.06
Weighted Curve Number	96.68
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 13

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 14

Input Data

Area (ac)	0.22
Impervious Area (%)	68
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.22		90.96

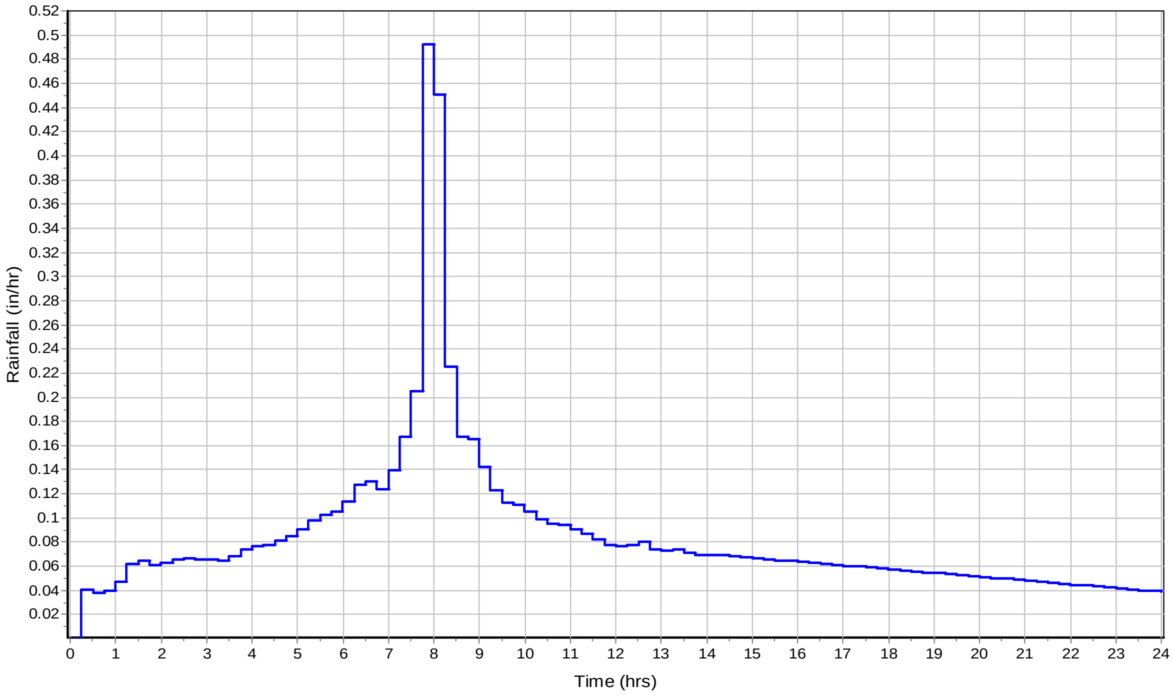
Time of Concentration

Subbasin Runoff Results

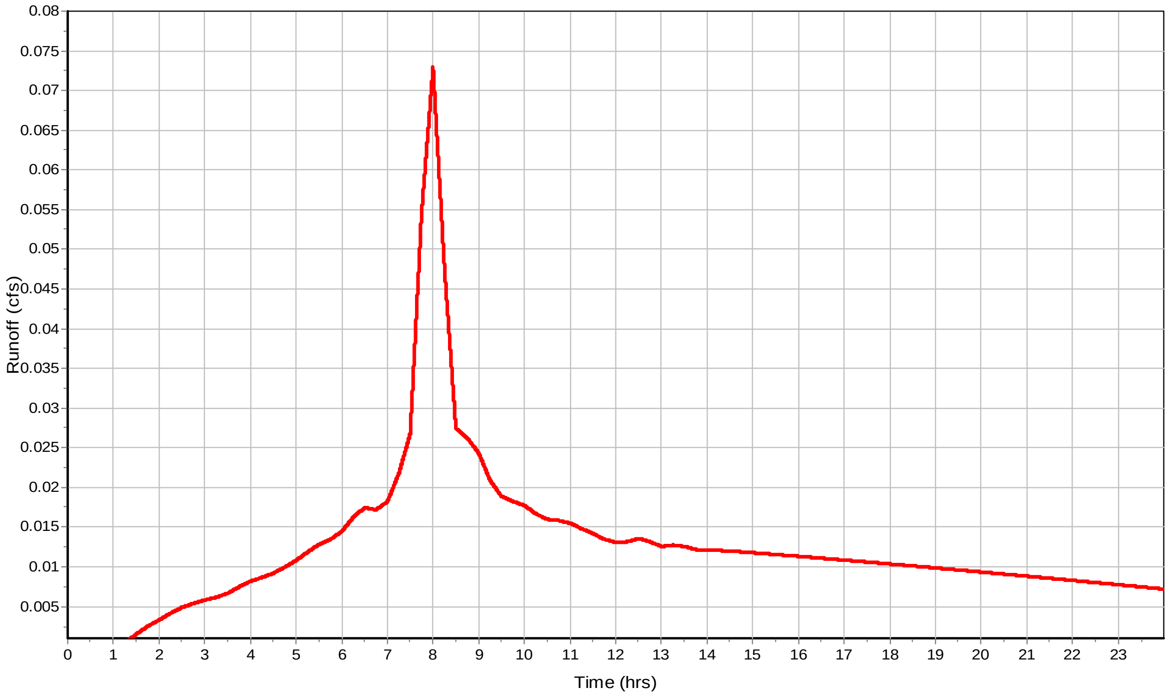
Total Rainfall (in)	2.03
Total Runoff (in)	1.37
Peak Runoff (cfs)	0.07
Weighted Curve Number	90.96
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 15

Input Data

Area (ac)	0.13
Impervious Area (%)	88
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		95.36

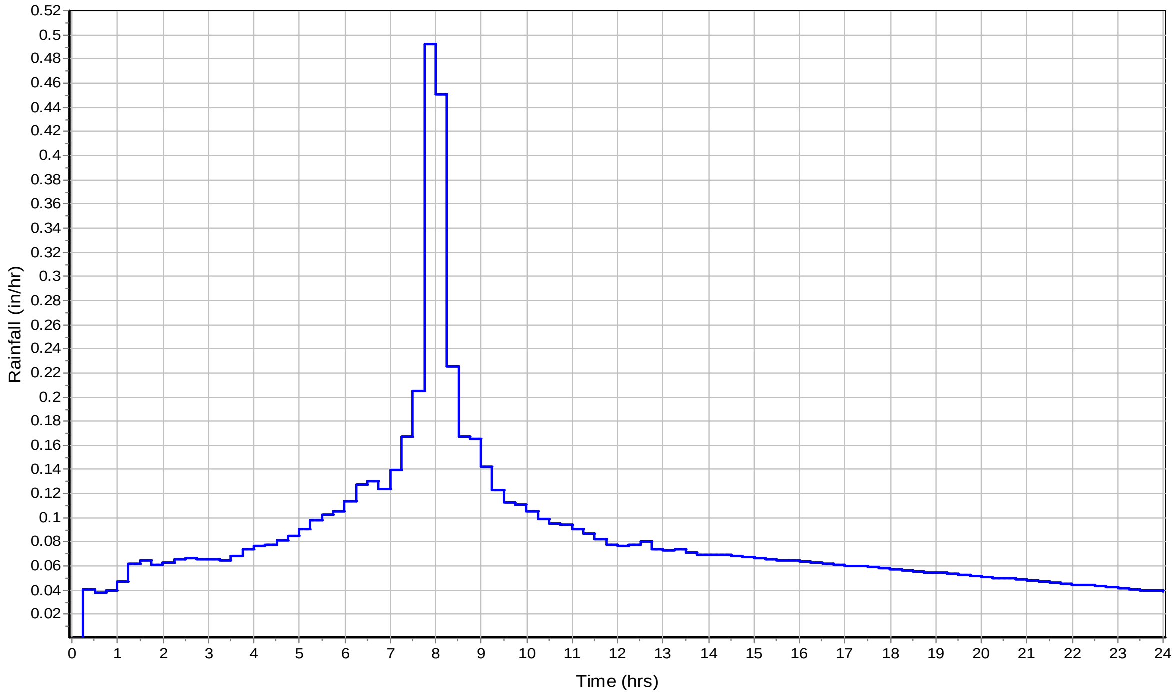
Time of Concentration

Subbasin Runoff Results

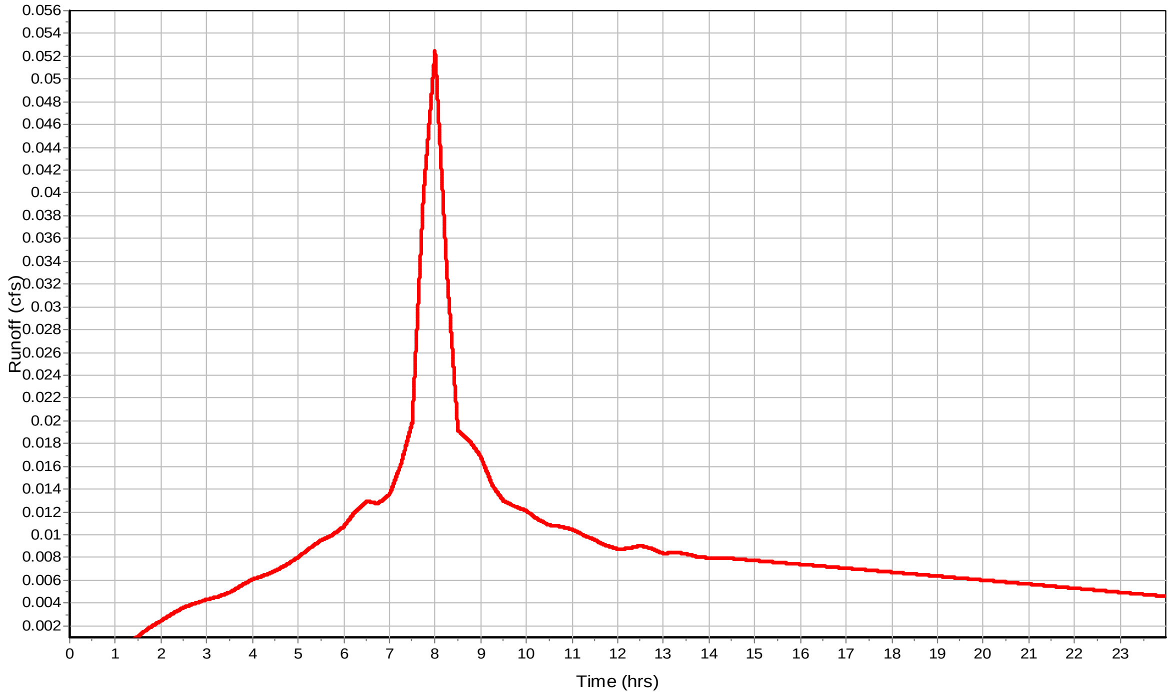
Total Rainfall (in)	2.03
Total Runoff (in)	1.64
Peak Runoff (cfs)	0.05
Weighted Curve Number	95.36
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 15

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 16

Input Data

Area (ac)	0.14
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.14		90.3

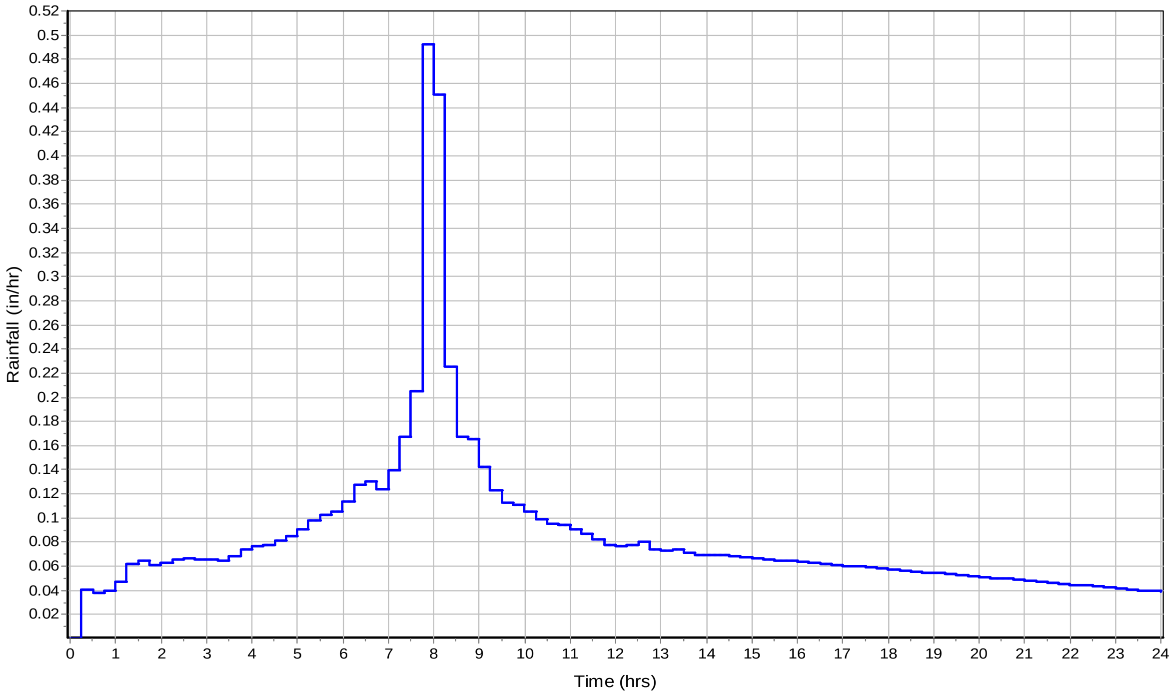
Time of Concentration

Subbasin Runoff Results

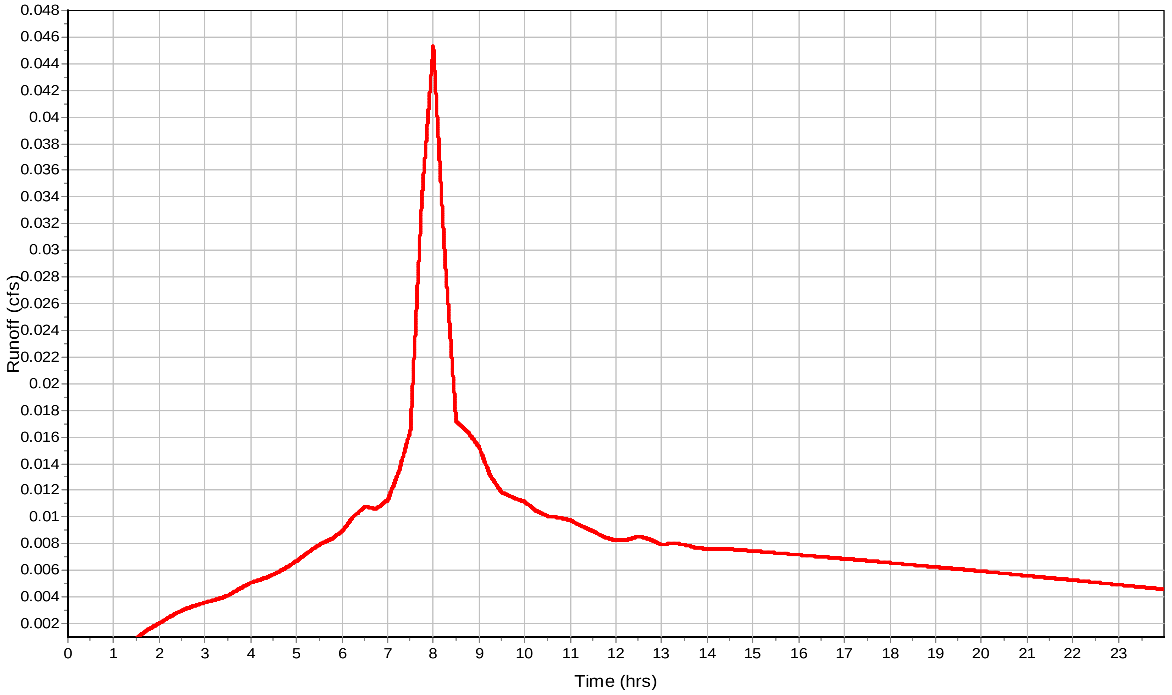
Total Rainfall (in)	2.03
Total Runoff (in)	1.33
Peak Runoff (cfs)	0.05
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 16

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 17

Input Data

Area (ac)	0.1
Impervious Area (%)	92
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		96.24

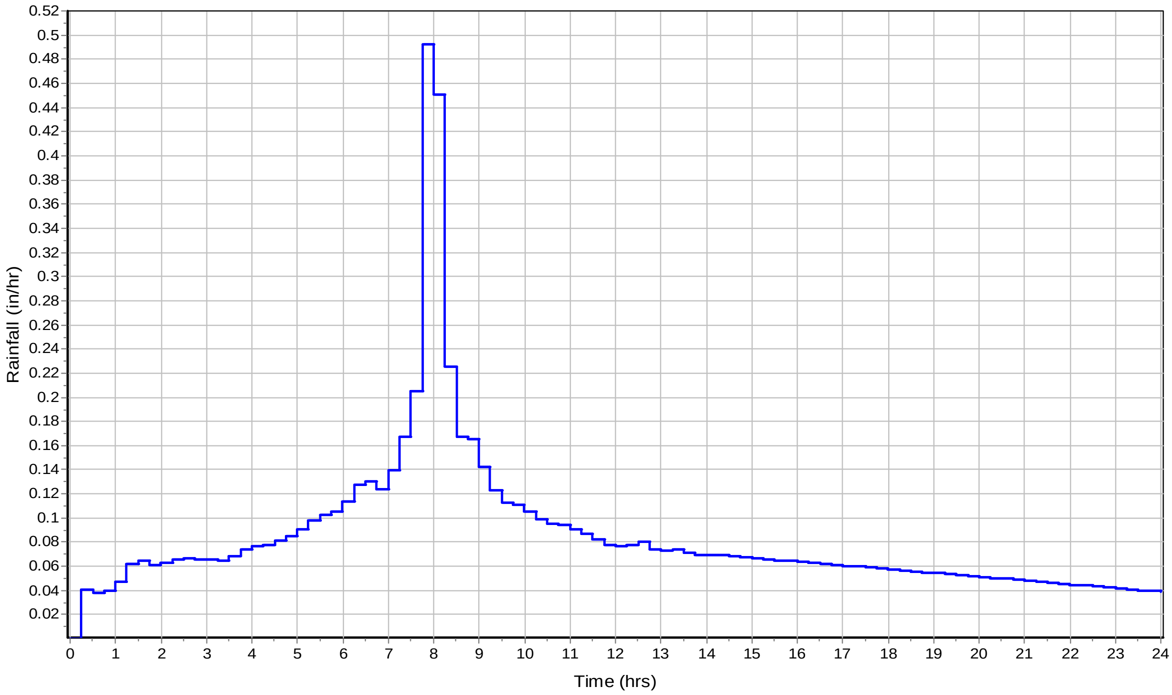
Time of Concentration

Subbasin Runoff Results

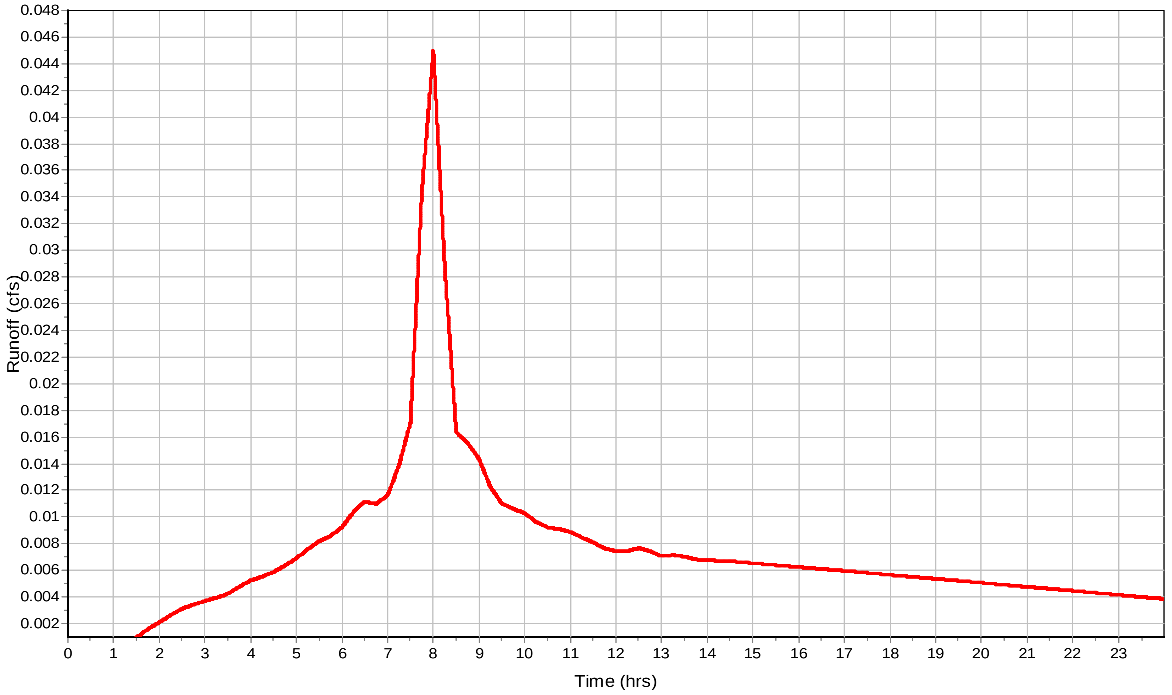
Total Rainfall (in)	2.03
Total Runoff (in)	1.7
Peak Runoff (cfs)	0.05
Weighted Curve Number	96.24
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 19

Input Data

Area (ac)	0.46
Impervious Area (%)	78
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.46		93.16

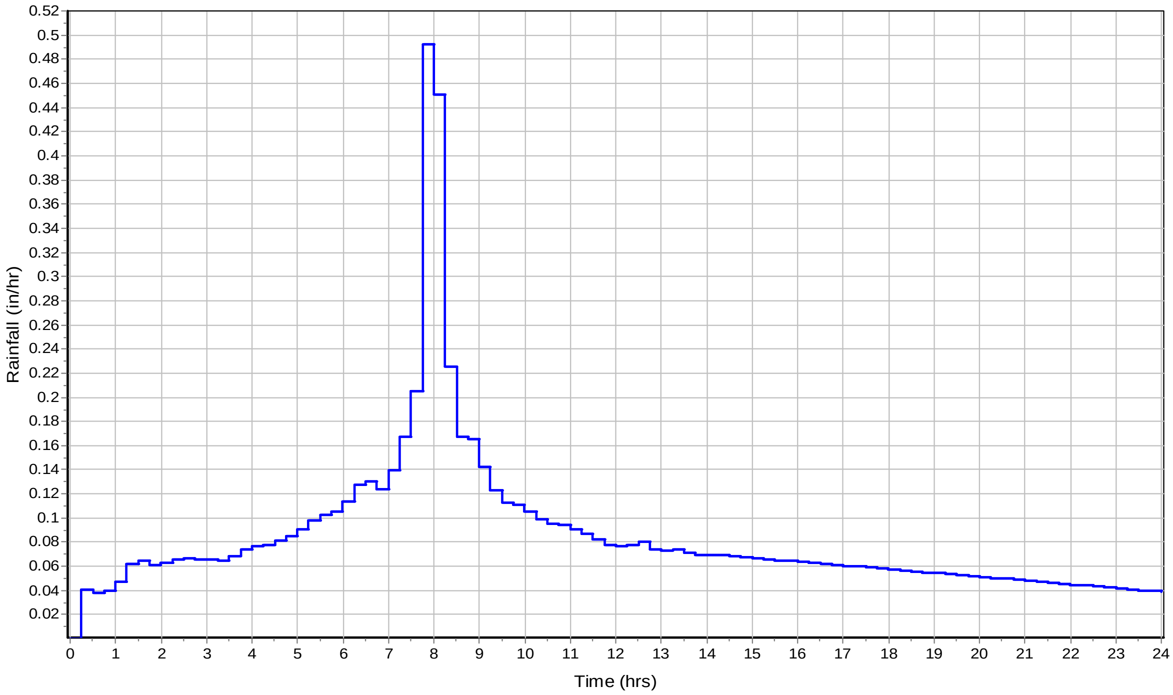
Time of Concentration

Subbasin Runoff Results

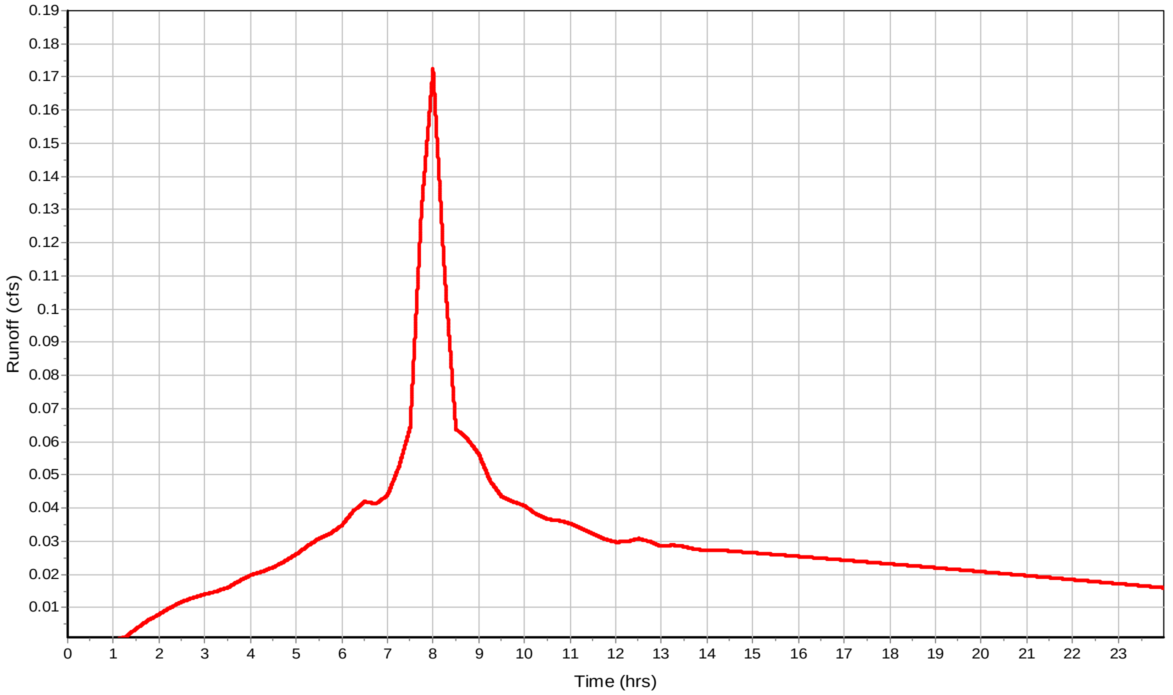
Total Rainfall (in)	2.03
Total Runoff (in)	1.5
Peak Runoff (cfs)	0.17
Weighted Curve Number	93.16
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 19

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 20

Input Data

Area (ac)	0.11
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.11		93.38

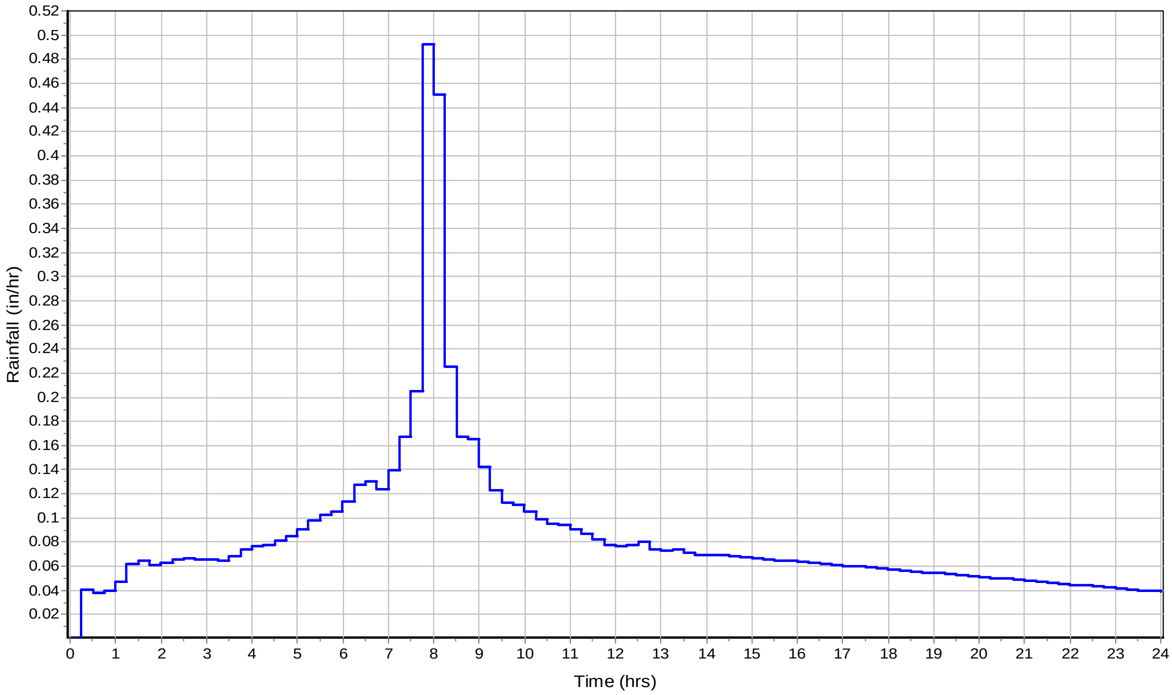
Time of Concentration

Subbasin Runoff Results

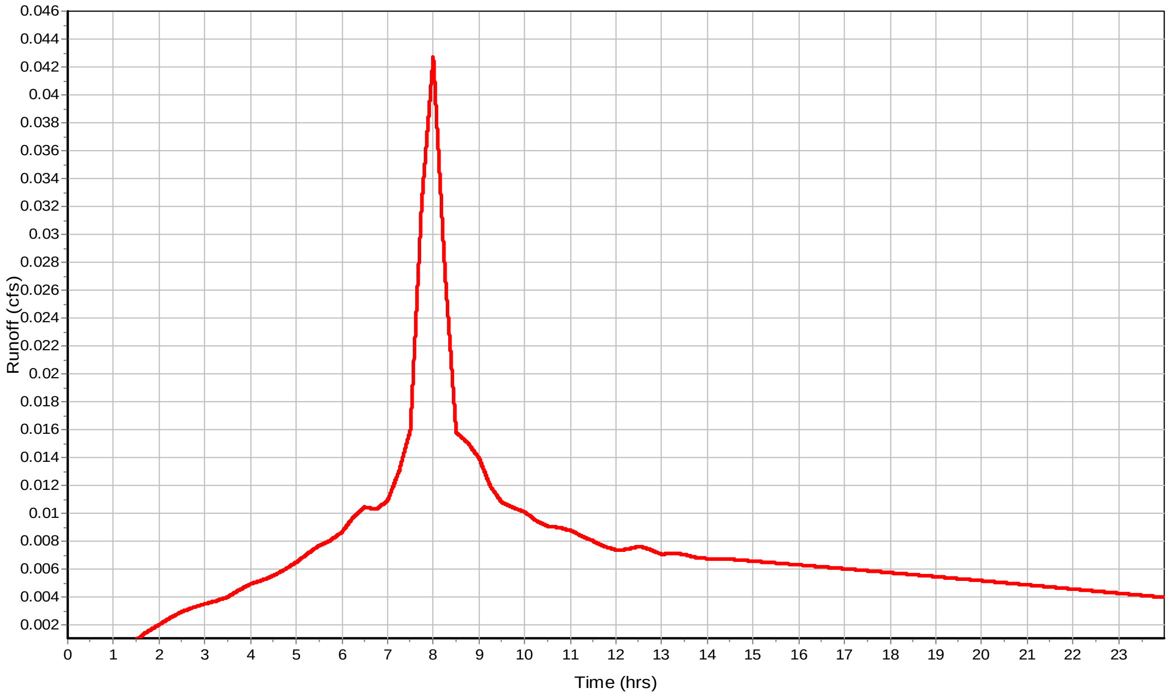
Total Rainfall (in)	2.03
Total Runoff (in)	1.52
Peak Runoff (cfs)	0.04
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 20

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 21

Input Data

Area (ac)	0.09
Impervious Area (%)	93
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.09		96.46

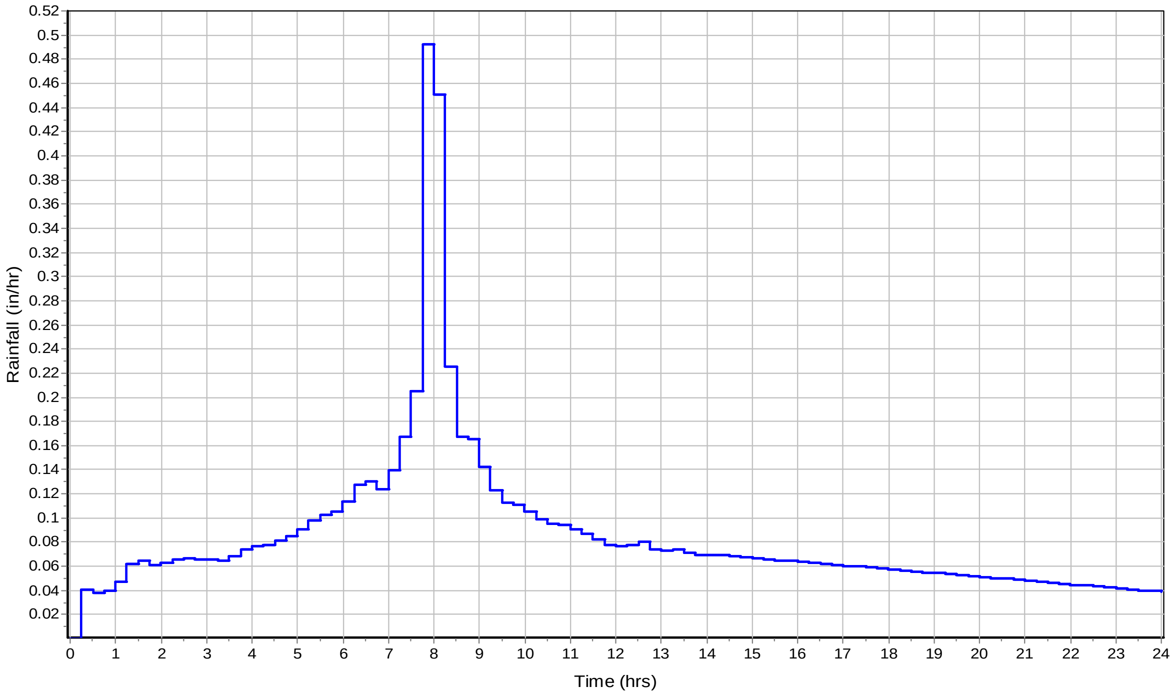
Time of Concentration

Subbasin Runoff Results

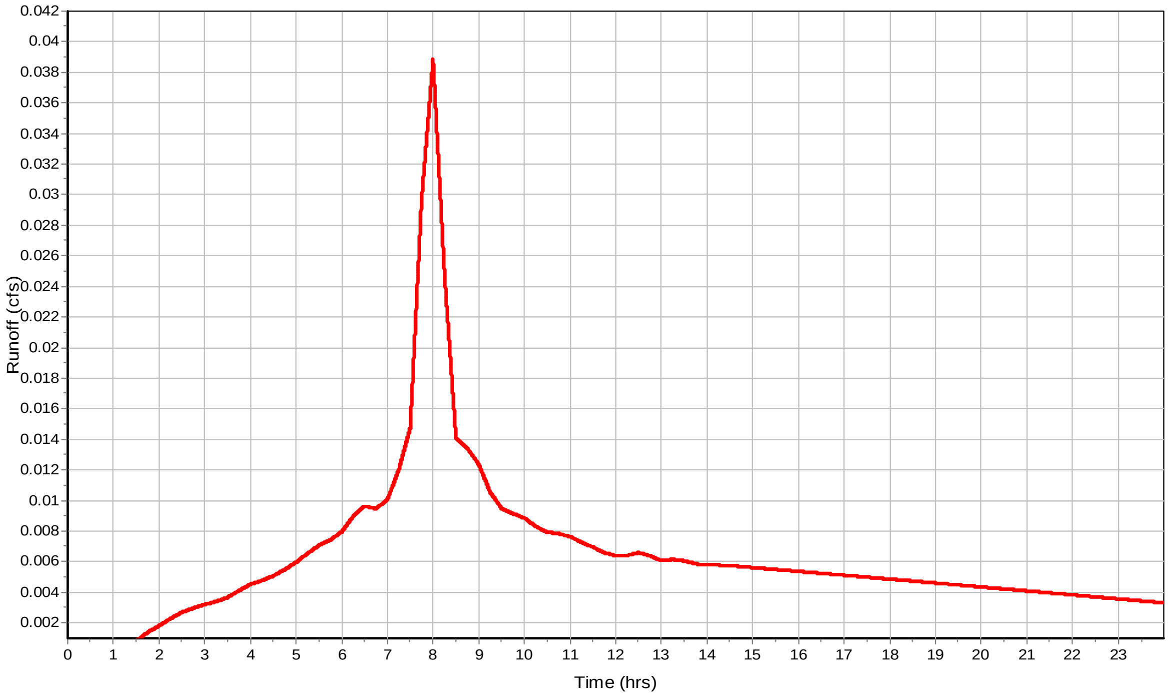
Total Rainfall (in)	2.03
Total Runoff (in)	1.71
Peak Runoff (cfs)	0.04
Weighted Curve Number	96.46
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 21

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 22

Input Data

Area (ac)	0.2
Impervious Area (%)	82
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		94.04

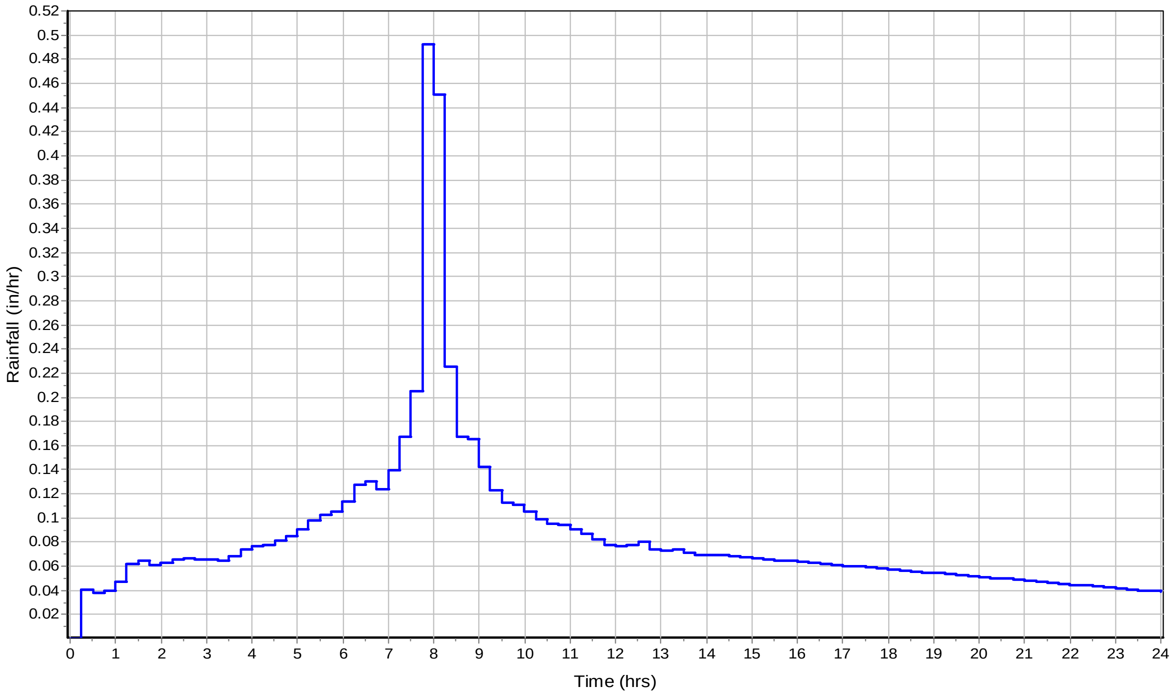
Time of Concentration

Subbasin Runoff Results

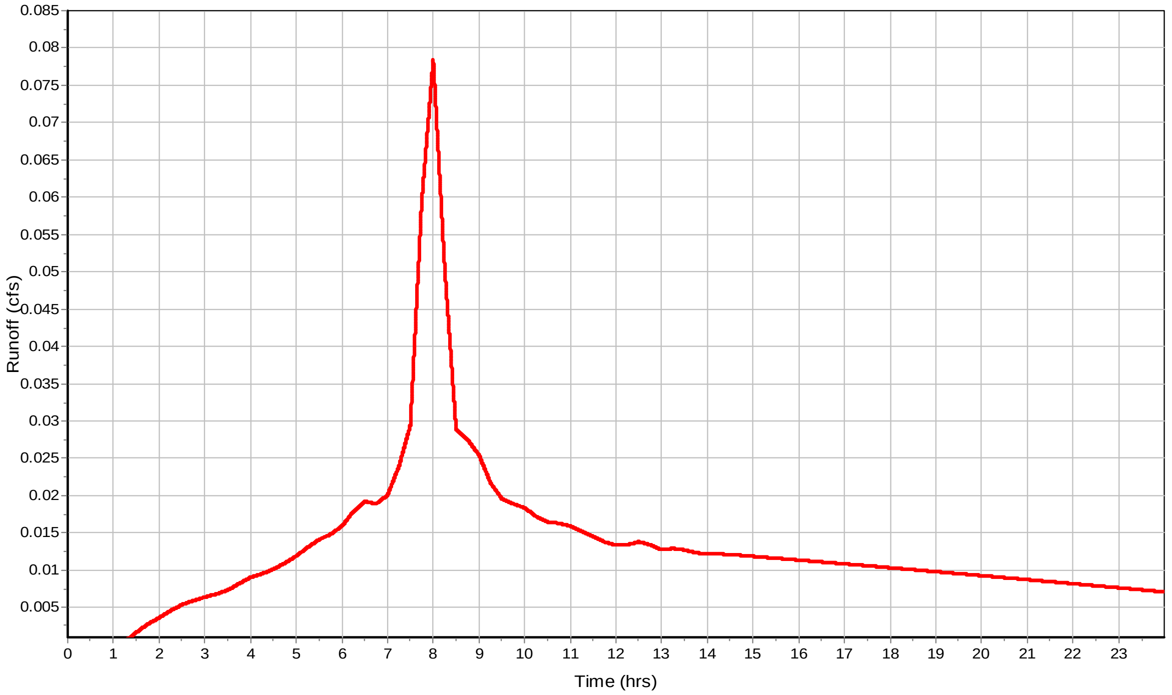
Total Rainfall (in)	2.03
Total Runoff (in)	1.56
Peak Runoff (cfs)	0.08
Weighted Curve Number	94.04
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 23

Input Data

Area (ac)	0.2
Impervious Area (%)	86
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		94.92

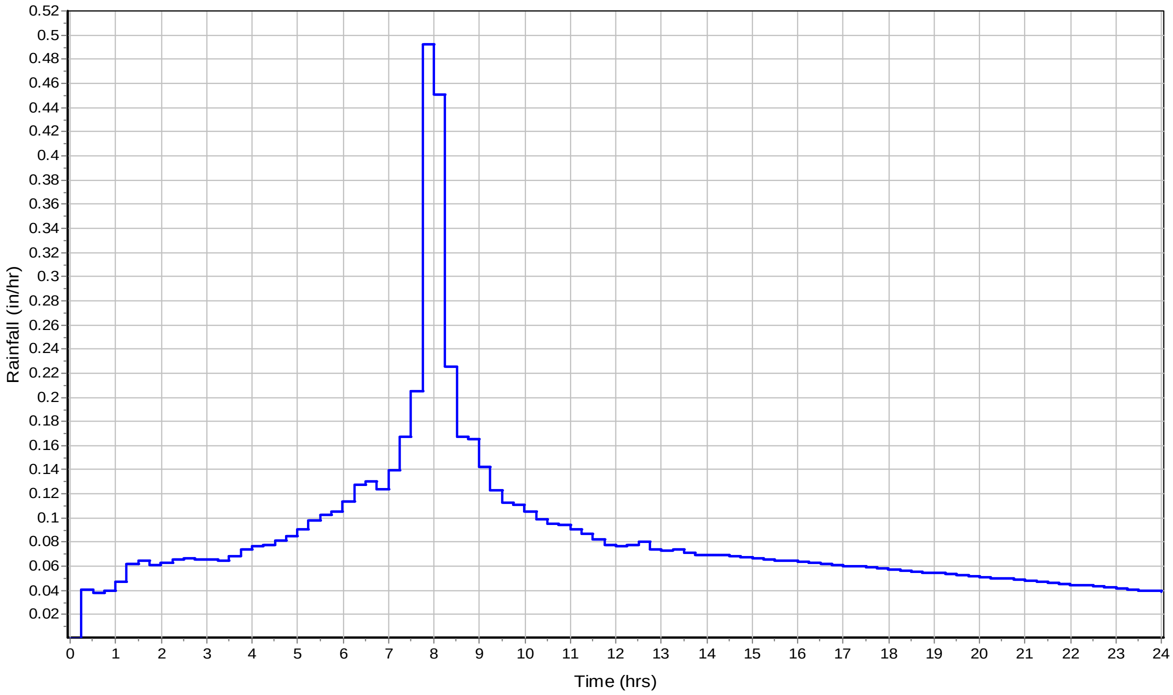
Time of Concentration

Subbasin Runoff Results

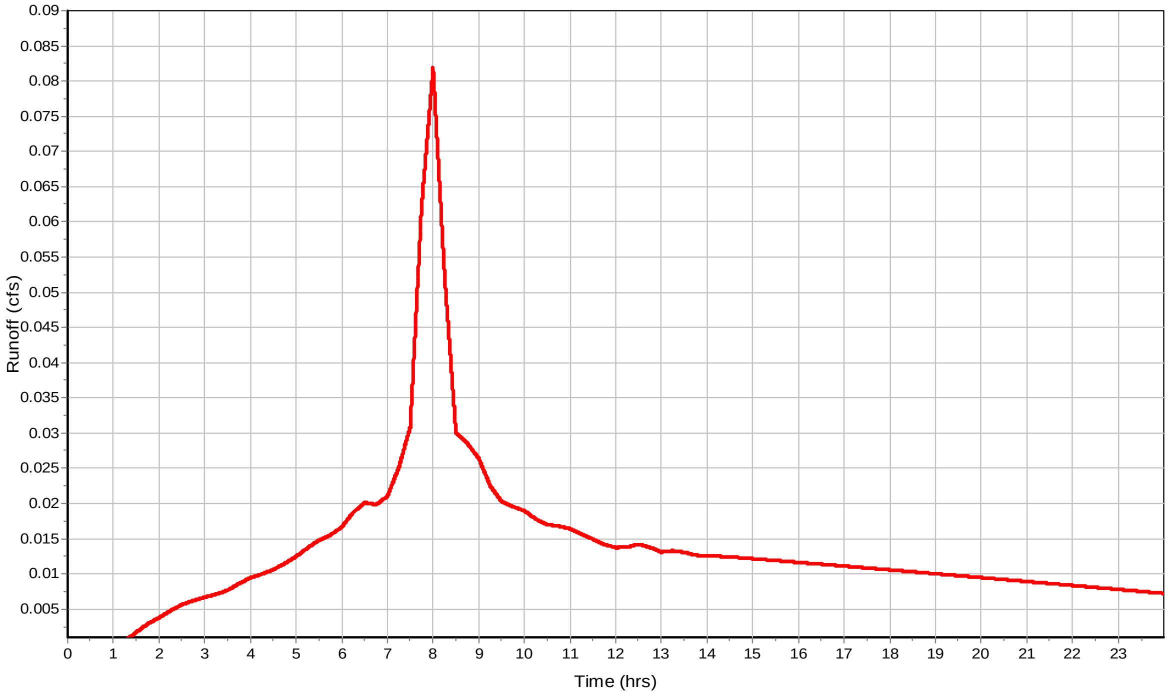
Total Rainfall (in)	2.03
Total Runoff (in)	1.61
Peak Runoff (cfs)	0.08
Weighted Curve Number	94.92
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 23

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 24

Input Data

Area (ac)	0.02
Impervious Area (%)	85
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.02		94.7

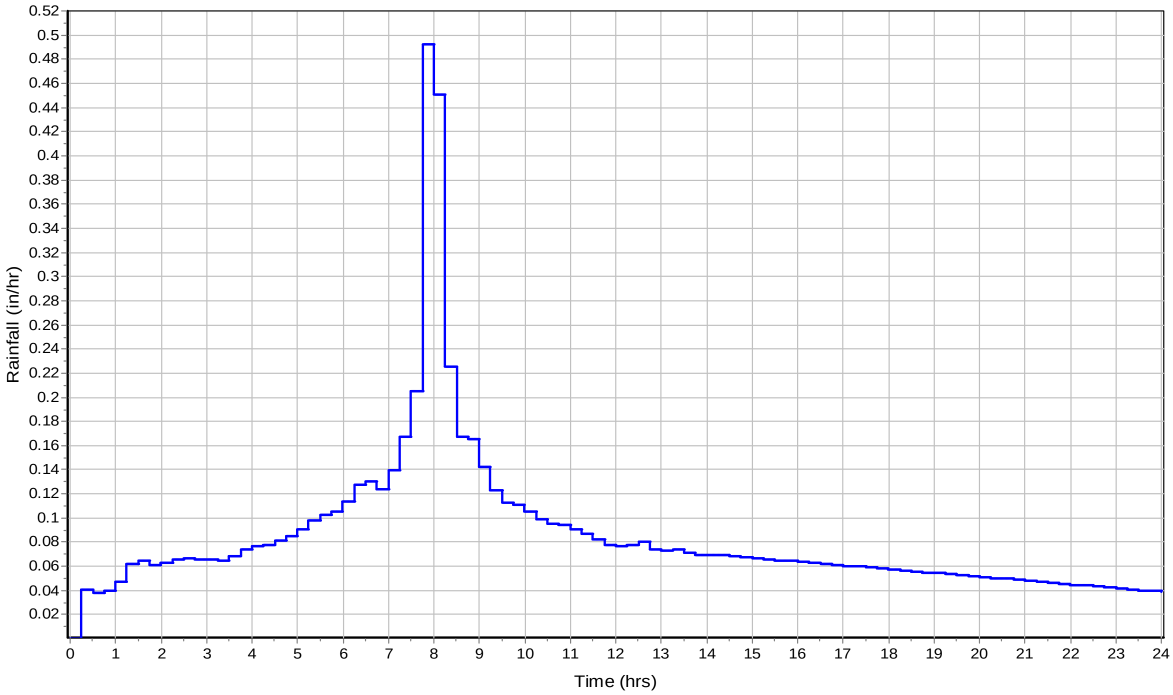
Time of Concentration

Subbasin Runoff Results

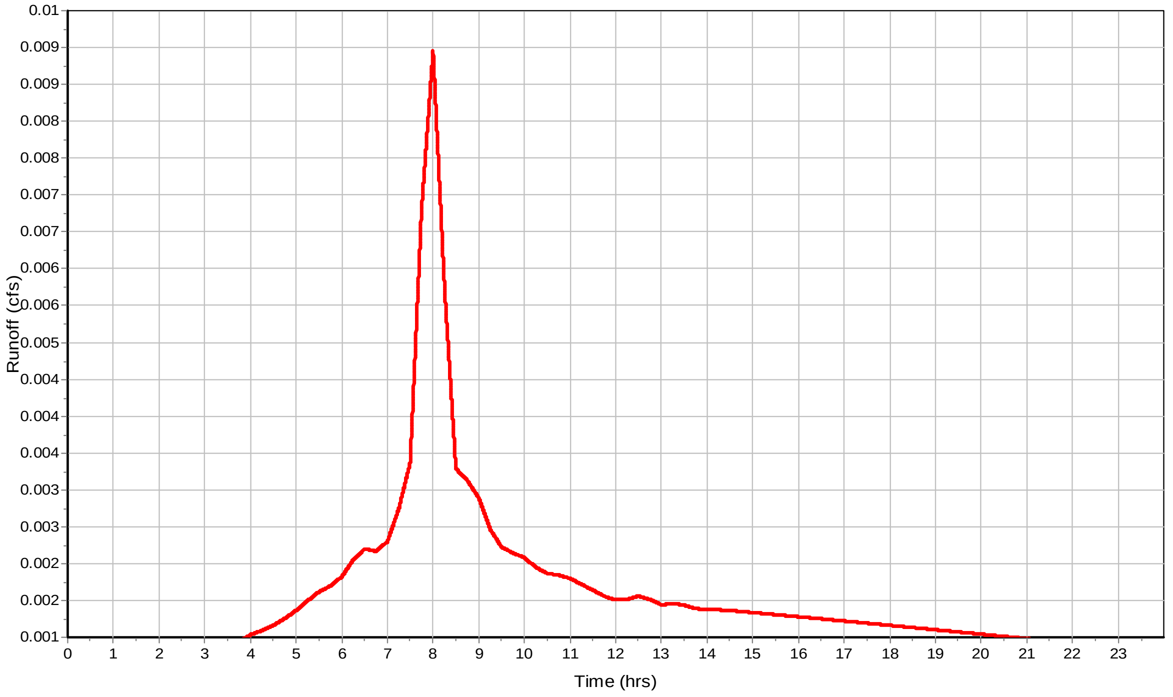
Total Rainfall (in)	2.03
Total Runoff (in)	1.6
Peak Runoff (cfs)	0.01
Weighted Curve Number	94.7
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 24

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 25

Input Data

Area (ac)	0.03
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		90.3

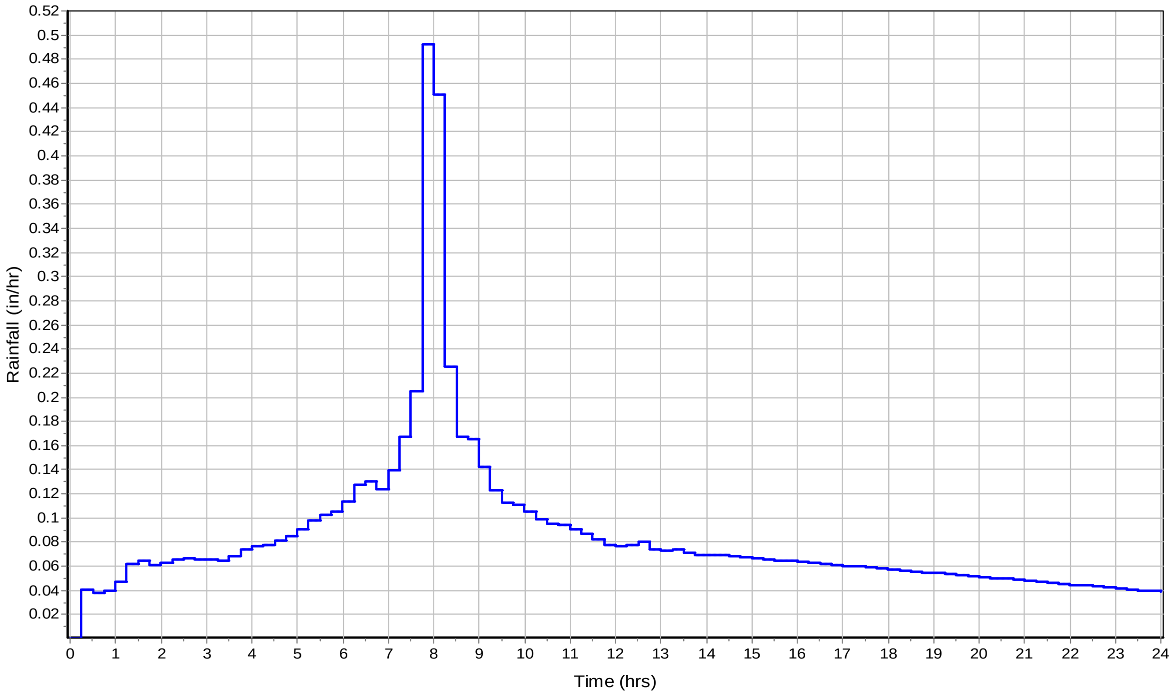
Time of Concentration

Subbasin Runoff Results

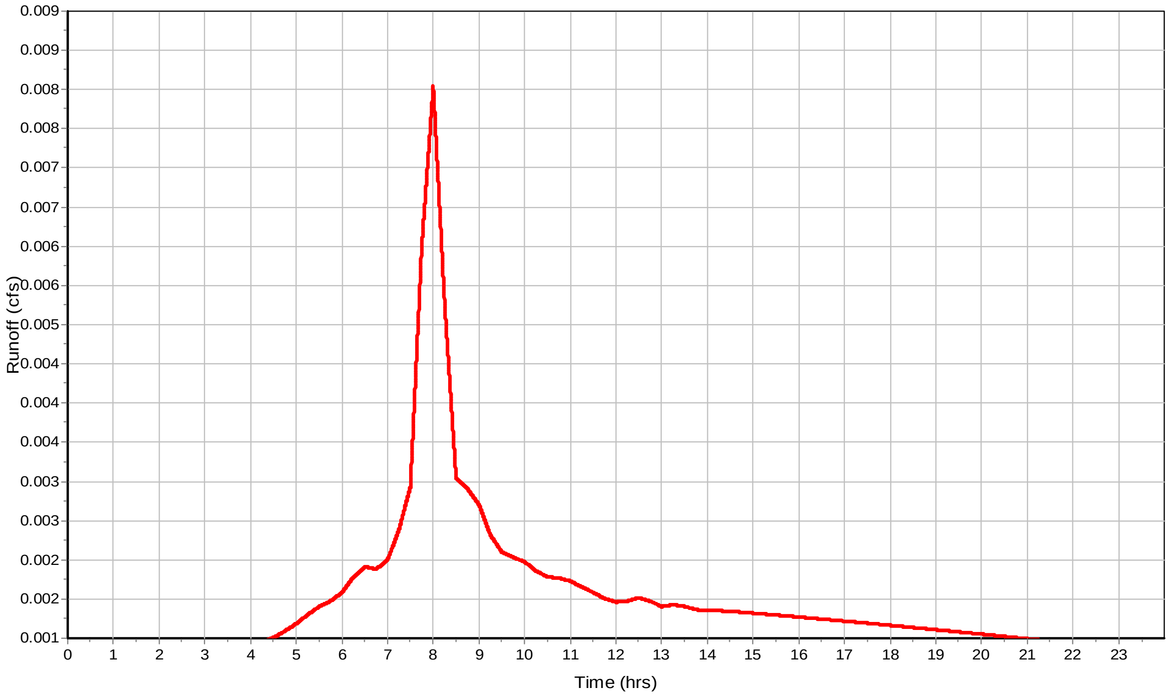
Total Rainfall (in)	2.03
Total Runoff (in)	1.33
Peak Runoff (cfs)	0.01
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 25

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 27

Input Data

Area (ac)	0.49
Impervious Area (%)	76
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.49		92.72

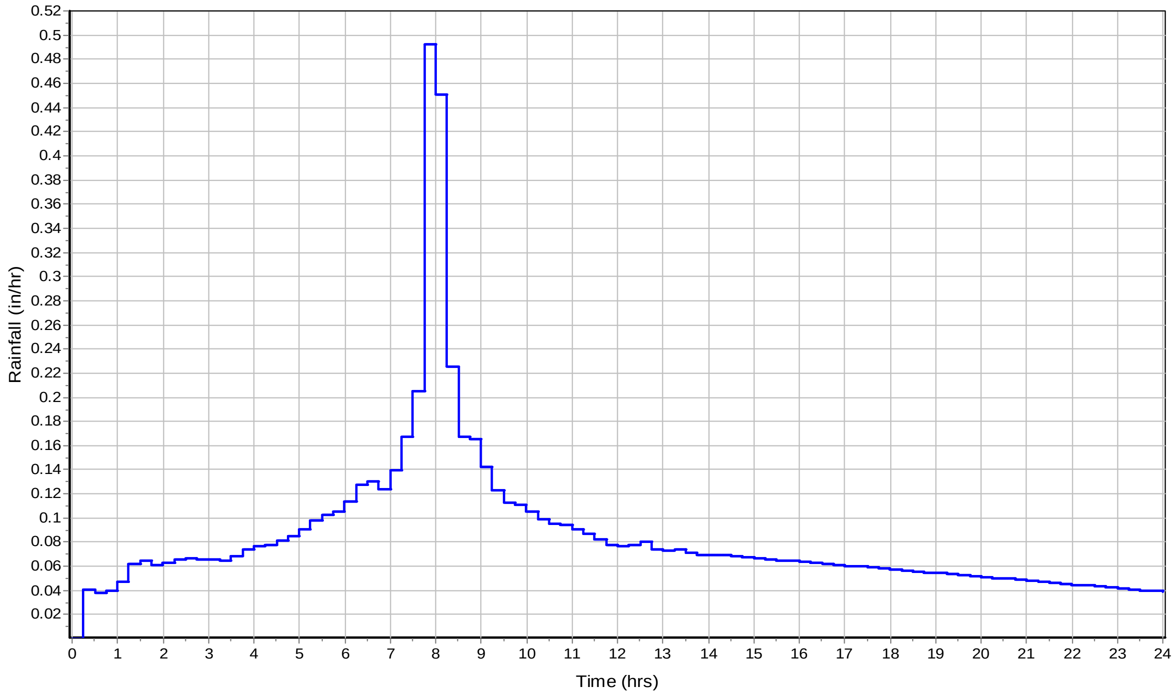
Time of Concentration

Subbasin Runoff Results

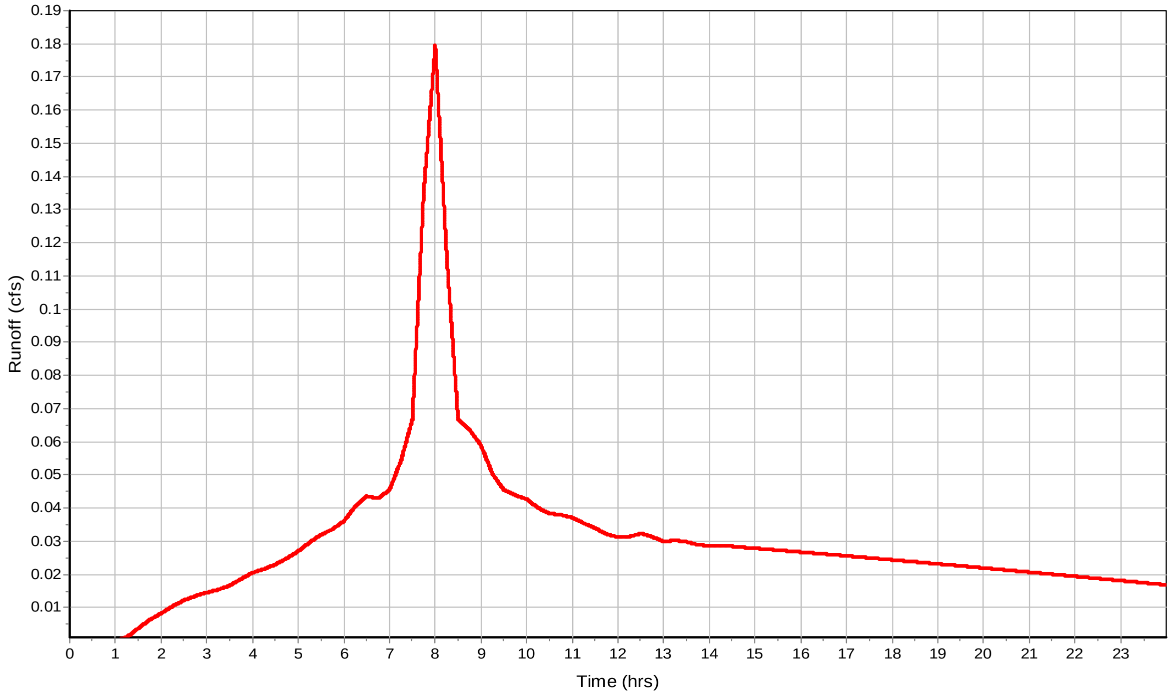
Total Rainfall (in)	2.03
Total Runoff (in)	1.48
Peak Runoff (cfs)	0.18
Weighted Curve Number	92.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 27

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 28

Input Data

Area (ac)	0.2
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

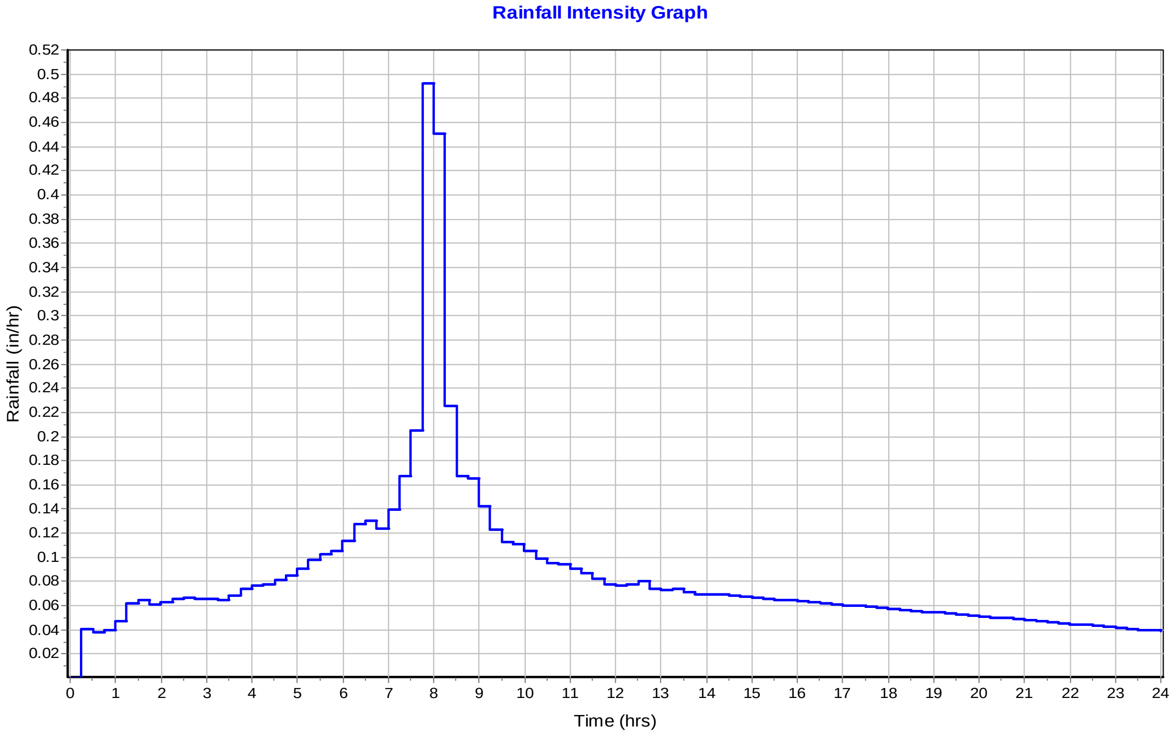
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		92.06

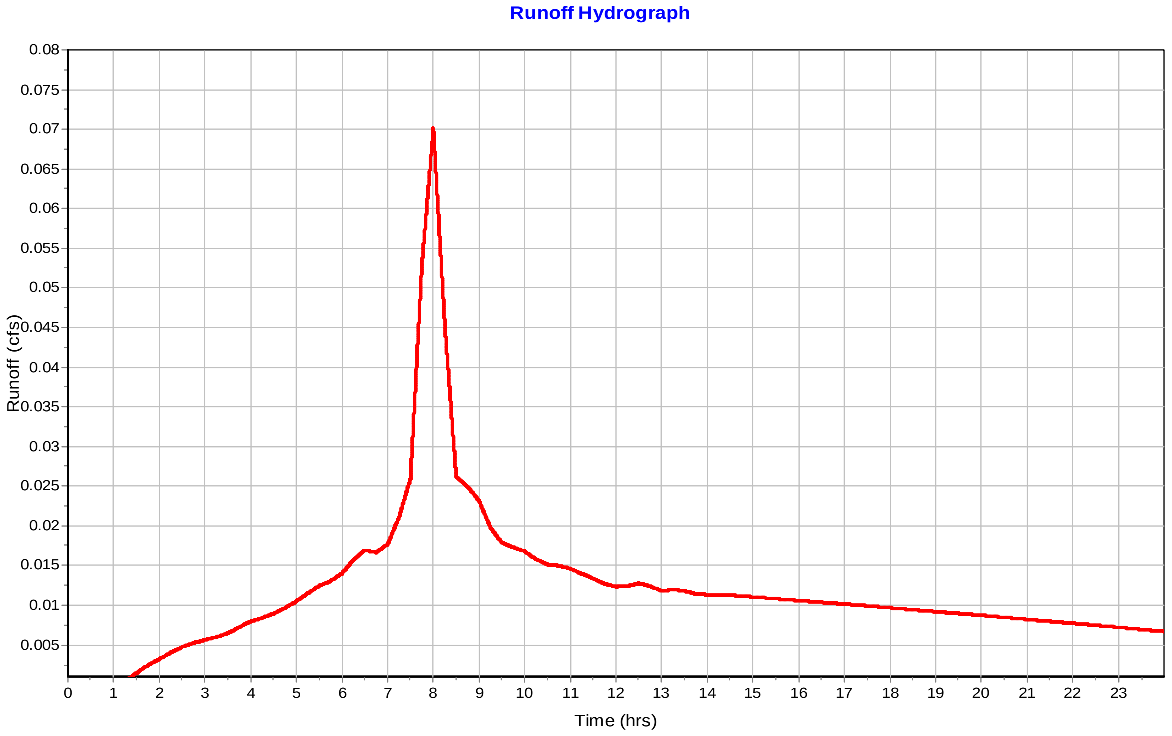
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.03
Total Runoff (in)	1.44
Peak Runoff (cfs)	0.07
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 28





Subbasin : SDCB 29

Input Data

Area (ac)	0.2
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		93.38

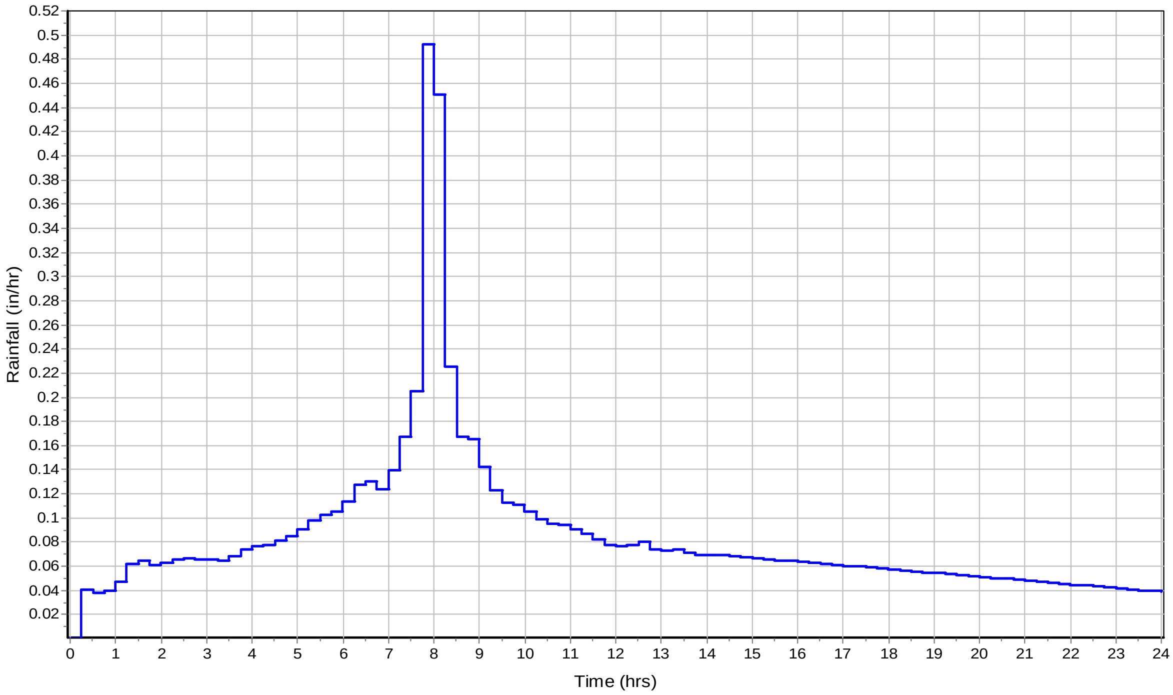
Time of Concentration

Subbasin Runoff Results

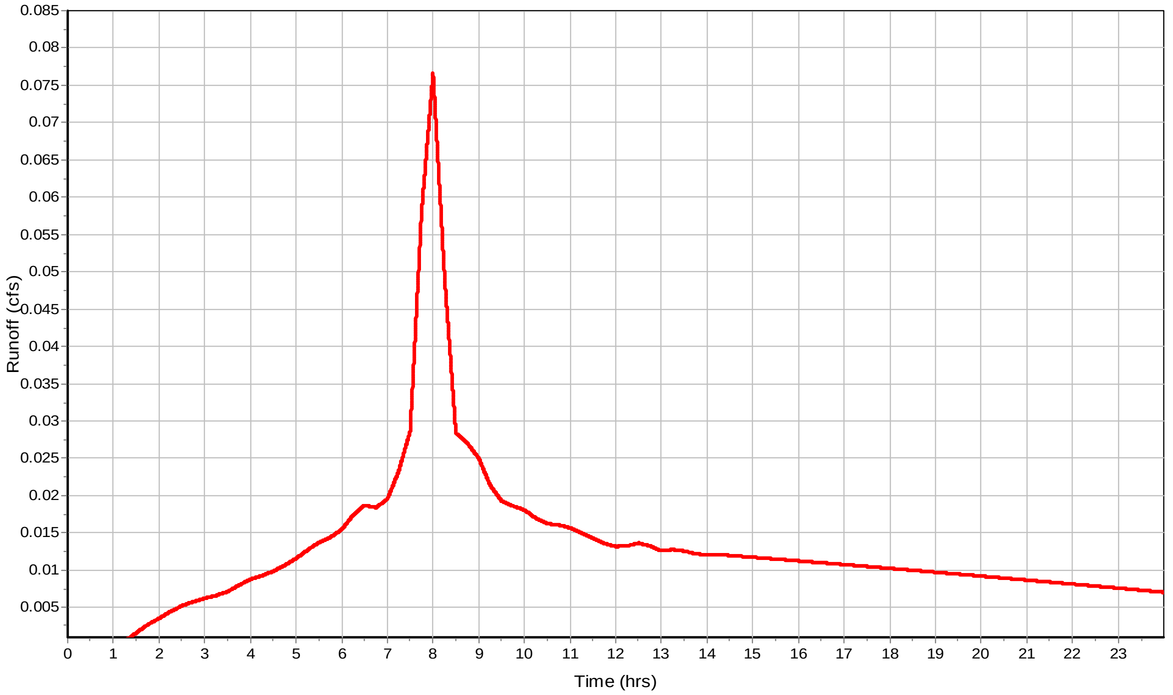
Total Rainfall (in)	2.03
Total Runoff (in)	1.52
Peak Runoff (cfs)	0.08
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 30

Input Data

Area (ac)	0.43
Impervious Area (%)	77
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

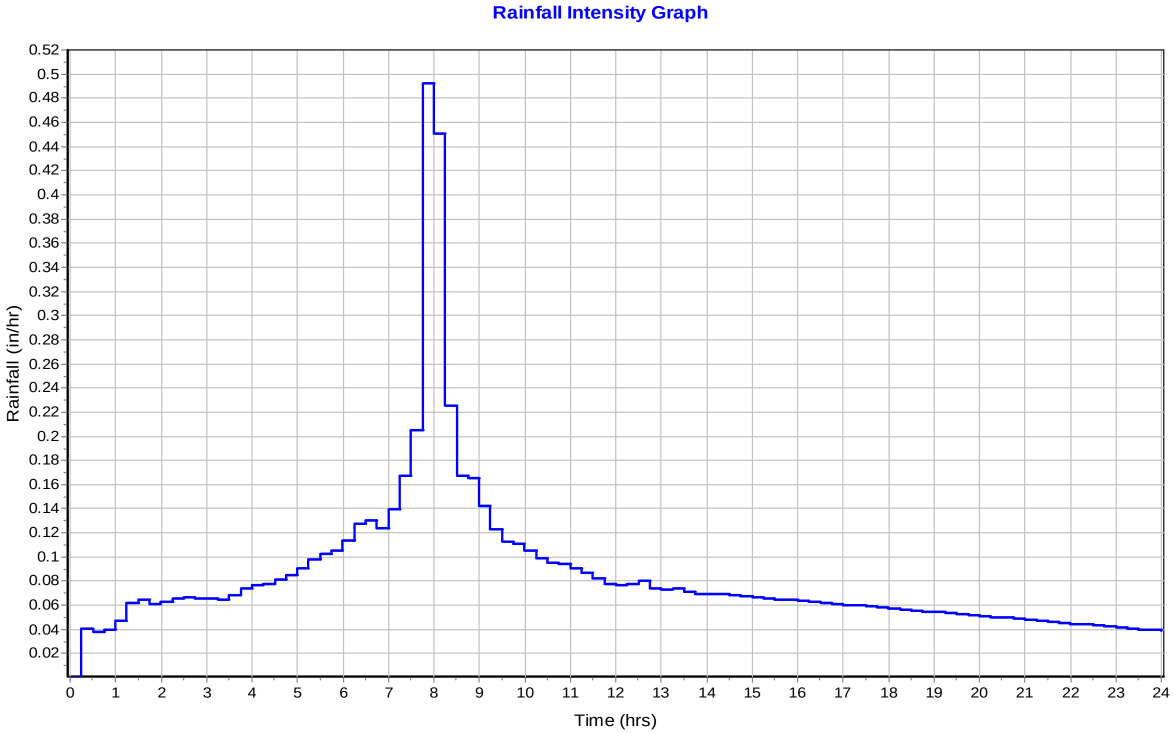
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.43		92.94

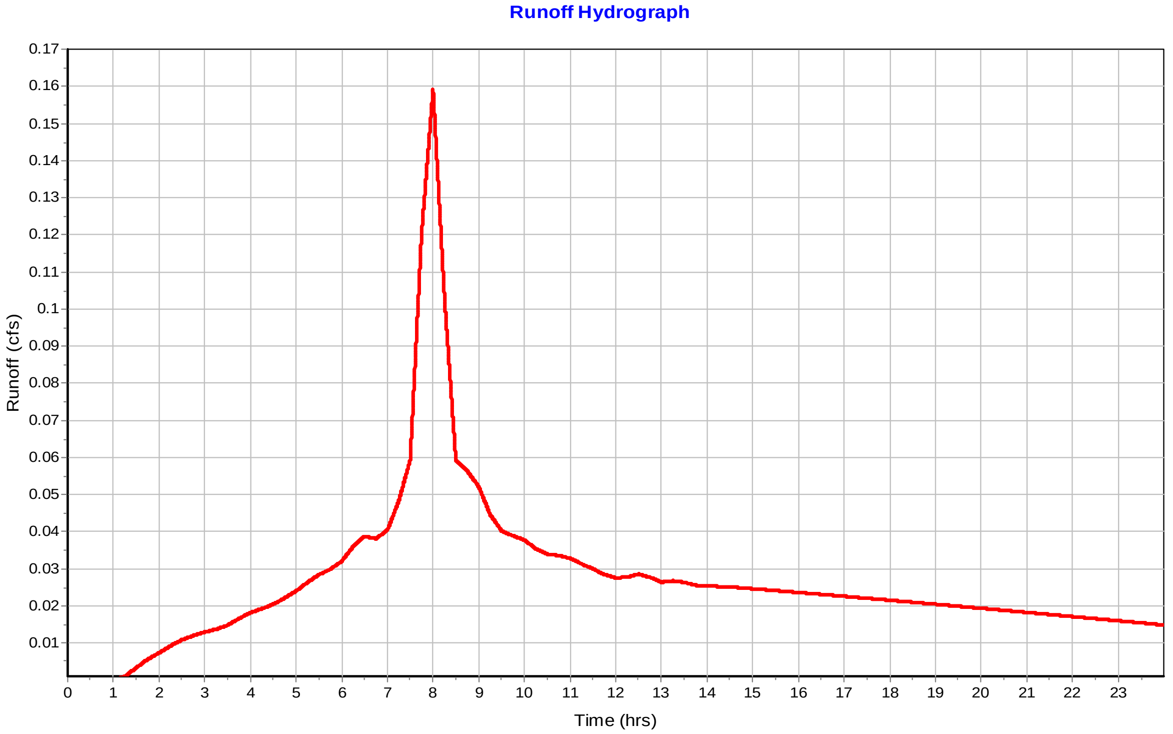
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.03
Total Runoff (in)	1.49
Peak Runoff (cfs)	0.16
Weighted Curve Number	92.94
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 30





Subbasin : SDCB 31

Input Data

Area (ac)	0.52
Impervious Area (%)	26
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

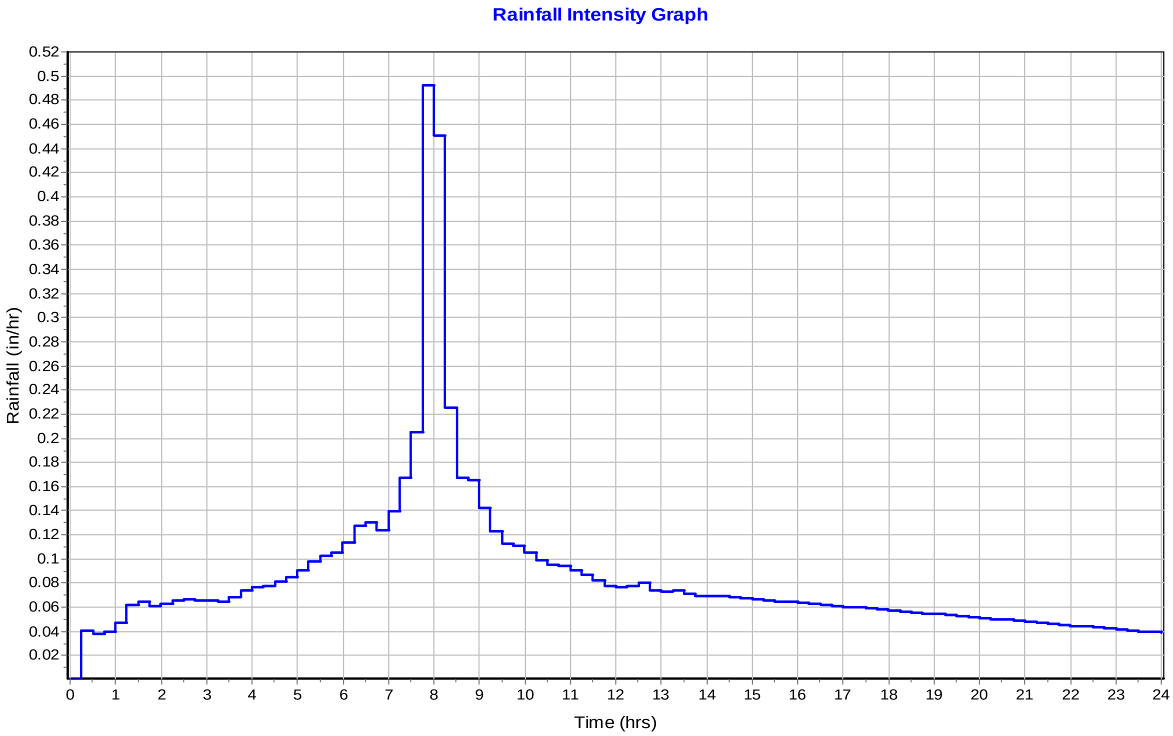
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.52		81.72

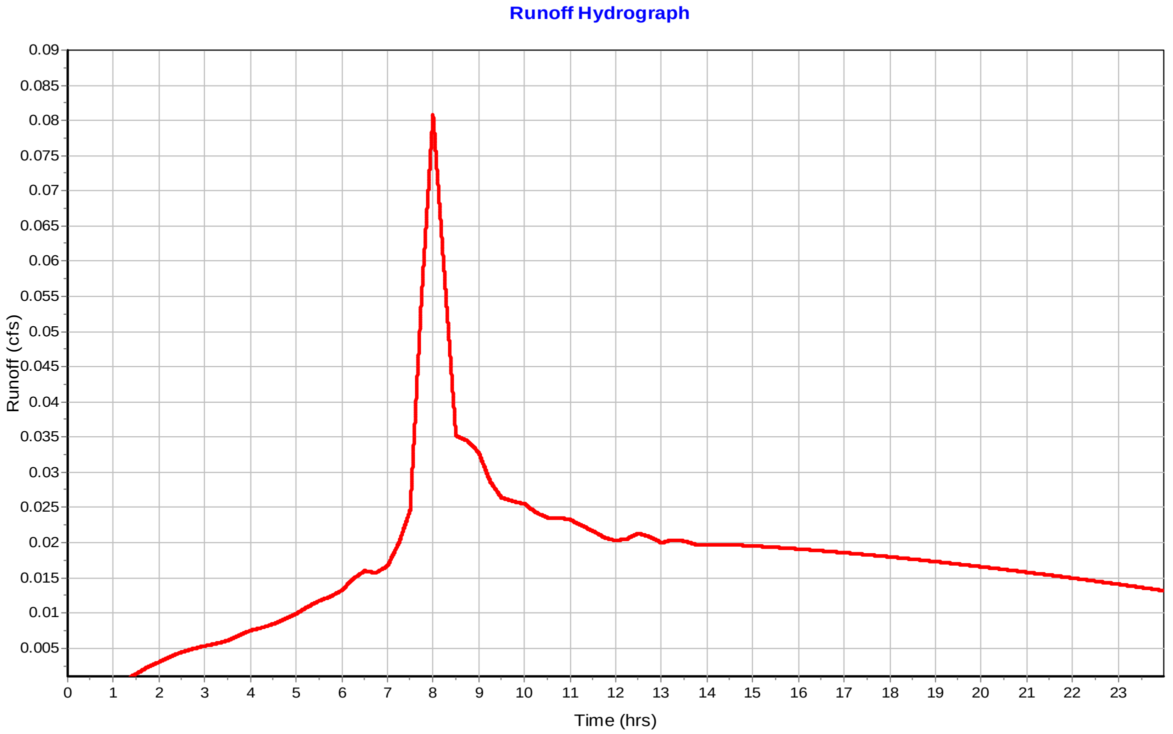
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.03
Total Runoff (in)	0.79
Peak Runoff (cfs)	0.08
Weighted Curve Number	81.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 31





Subbasin : SDCB 32

Input Data

Area (ac)	0.19
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.19		92.06

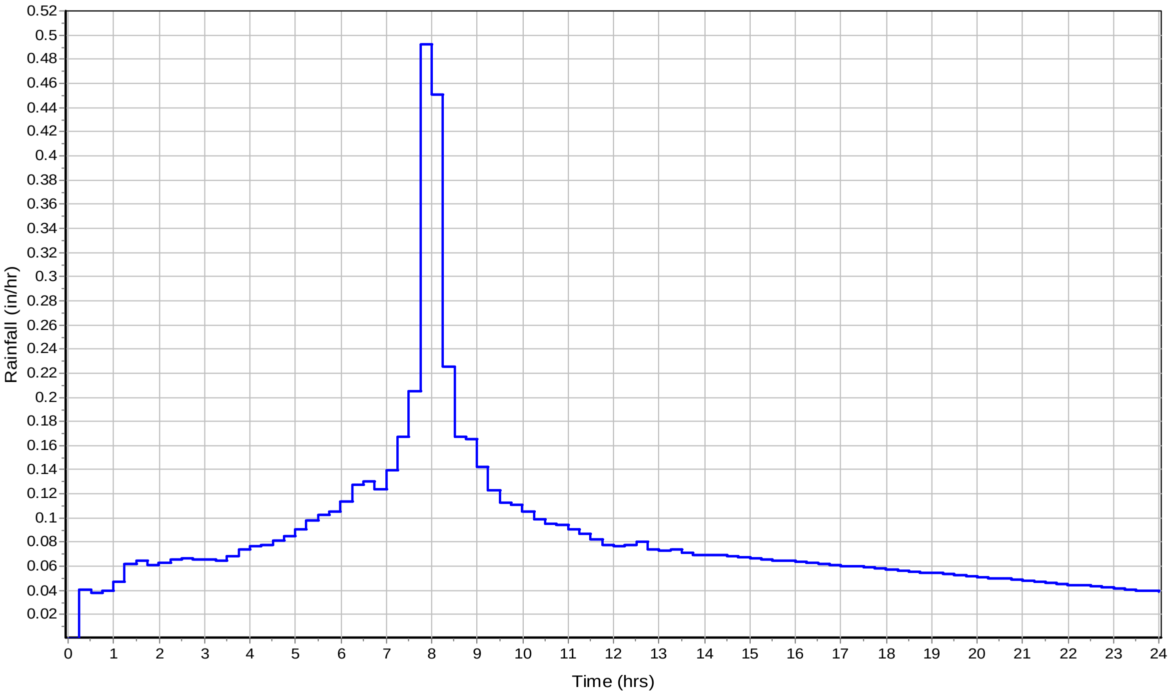
Time of Concentration

Subbasin Runoff Results

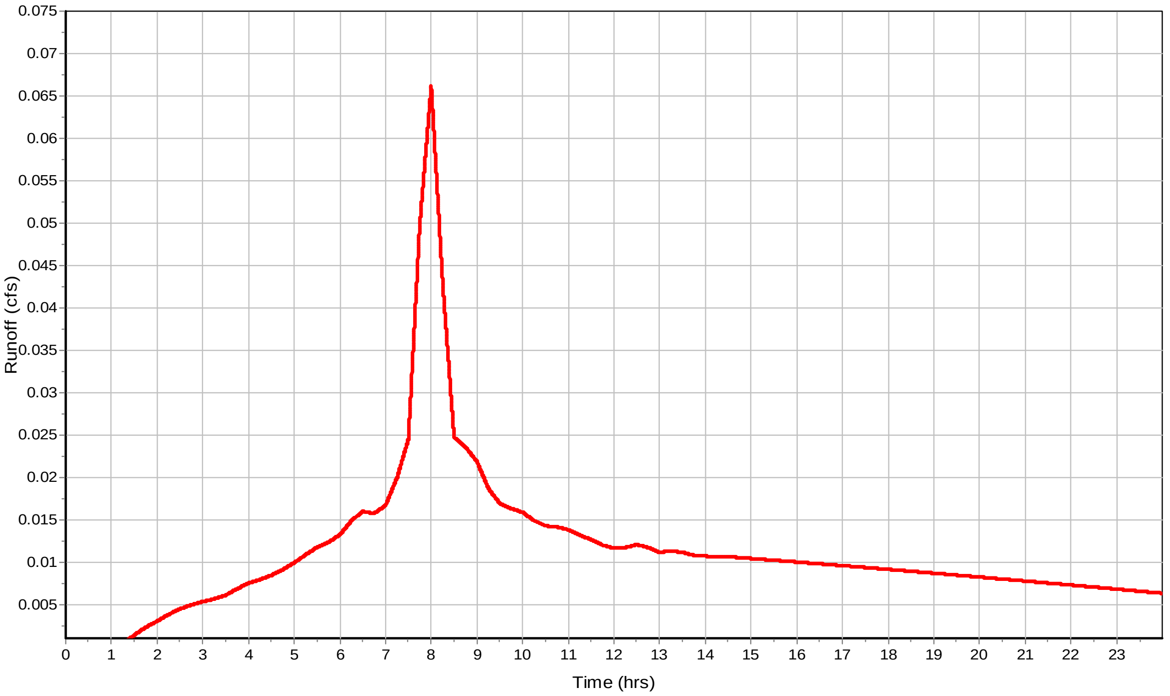
Total Rainfall (in)	2.03
Total Runoff (in)	1.44
Peak Runoff (cfs)	0.07
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 32

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 33

Input Data

Area (ac)	0.23
Impervious Area (%)	83
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.23		94.26

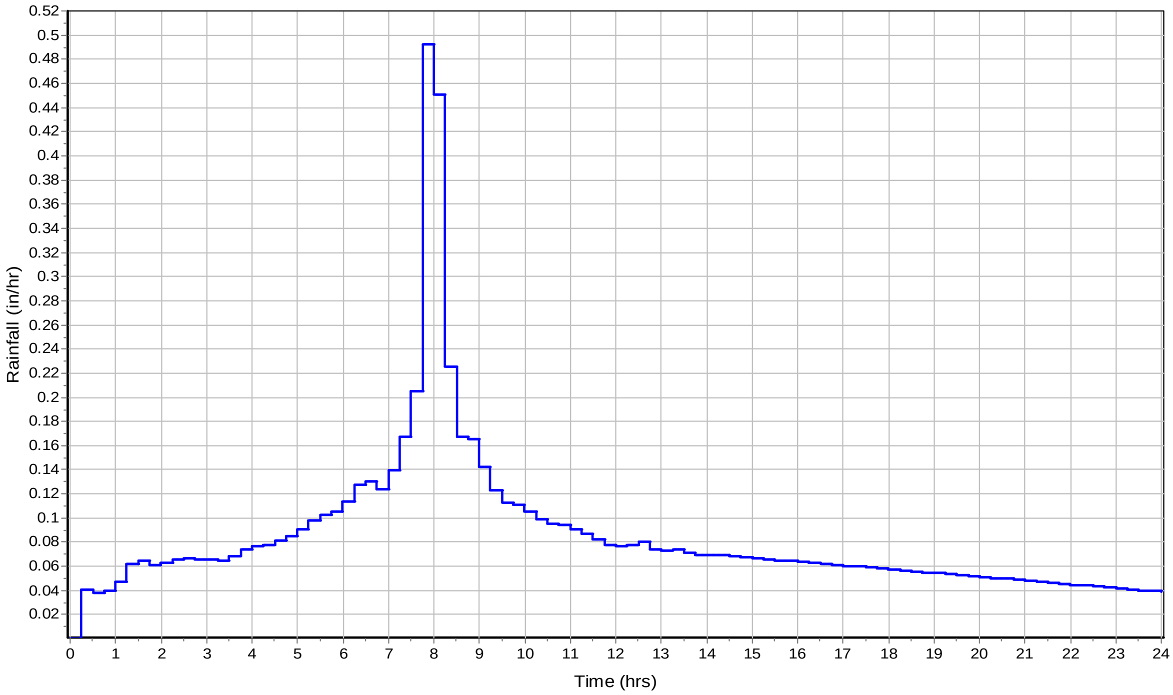
Time of Concentration

Subbasin Runoff Results

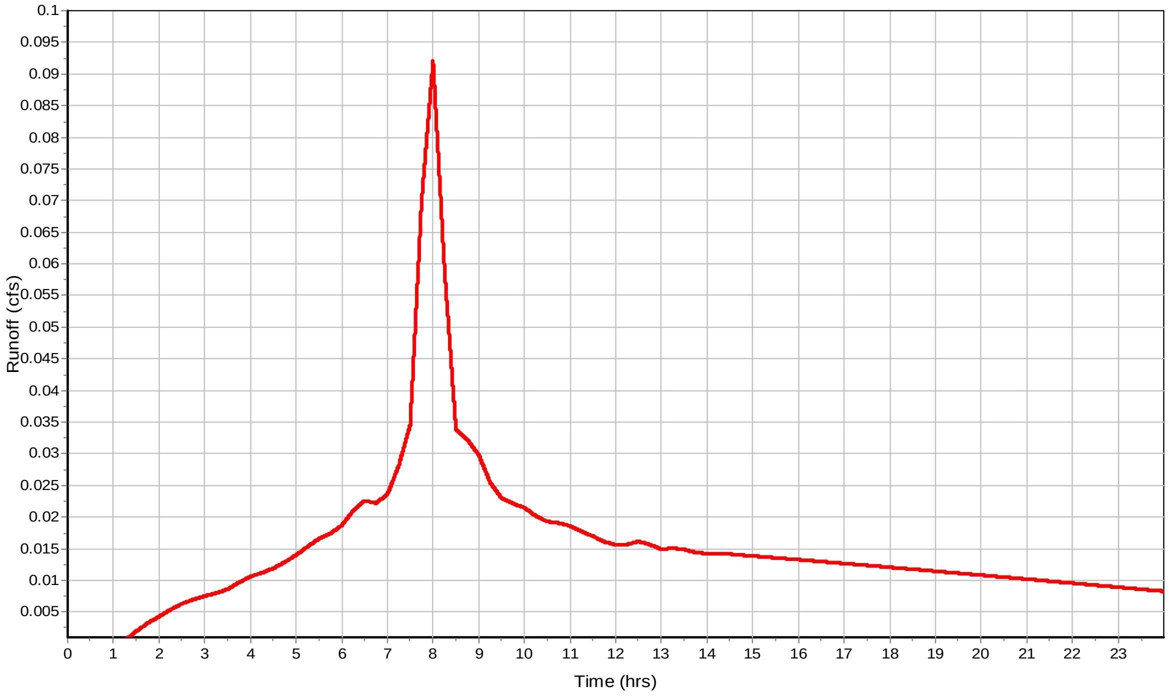
Total Rainfall (in)	2.03
Total Runoff (in)	1.57
Peak Runoff (cfs)	0.09
Weighted Curve Number	94.26
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 33

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 34

Input Data

Area (ac)	0.14
Impervious Area (%)	76
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.14		92.72

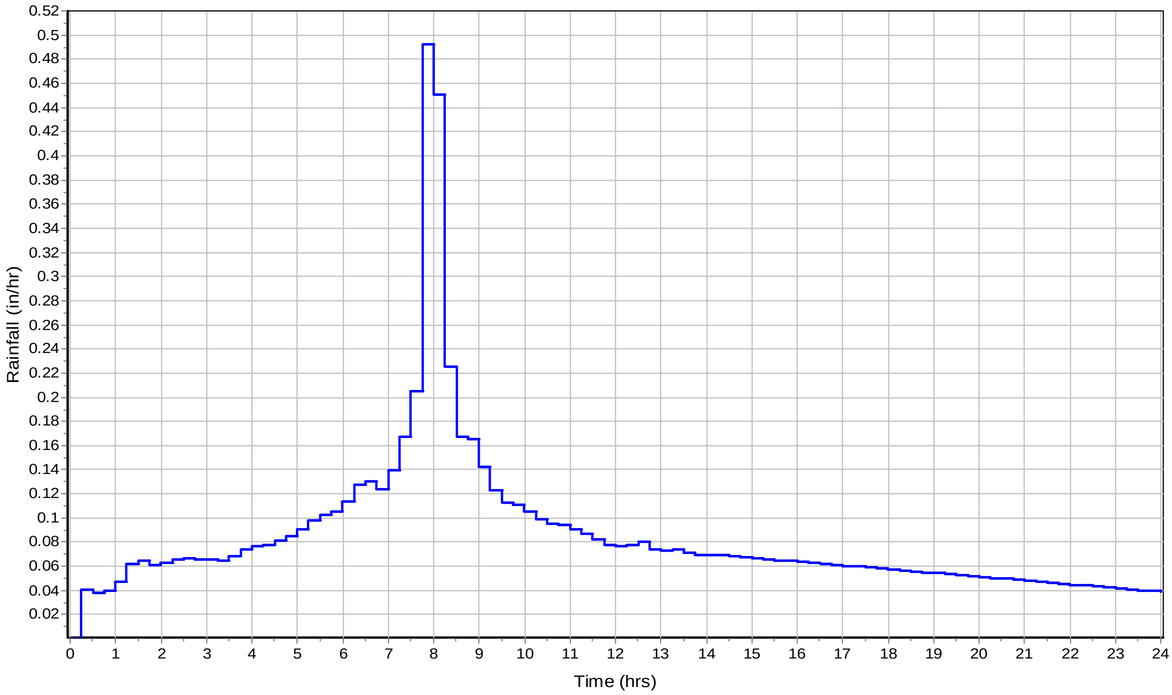
Time of Concentration

Subbasin Runoff Results

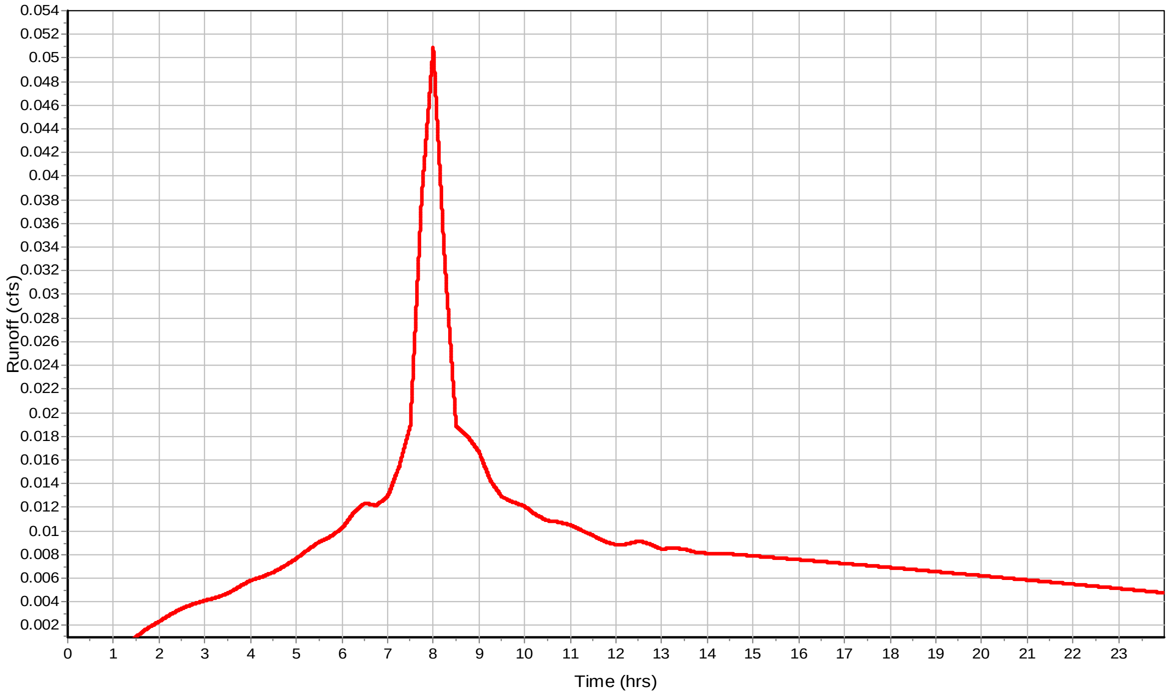
Total Rainfall (in)	2.03
Total Runoff (in)	1.48
Peak Runoff (cfs)	0.05
Weighted Curve Number	92.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 34

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 36

Input Data

Area (ac)	0.36
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.36		93.38

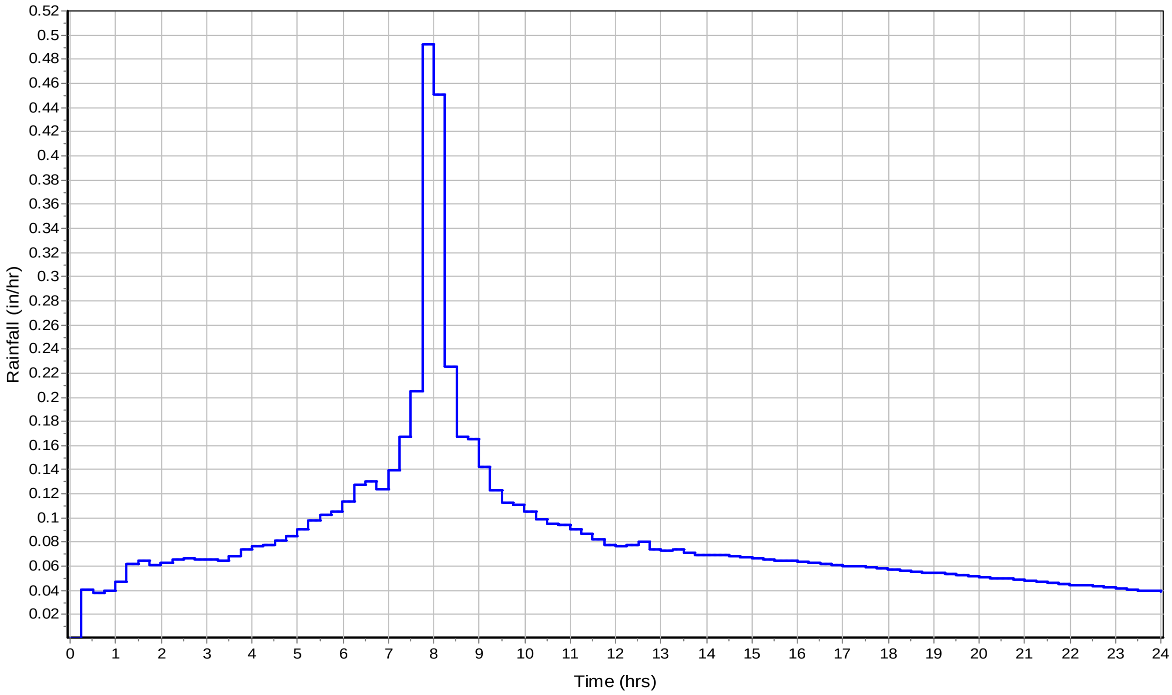
Time of Concentration

Subbasin Runoff Results

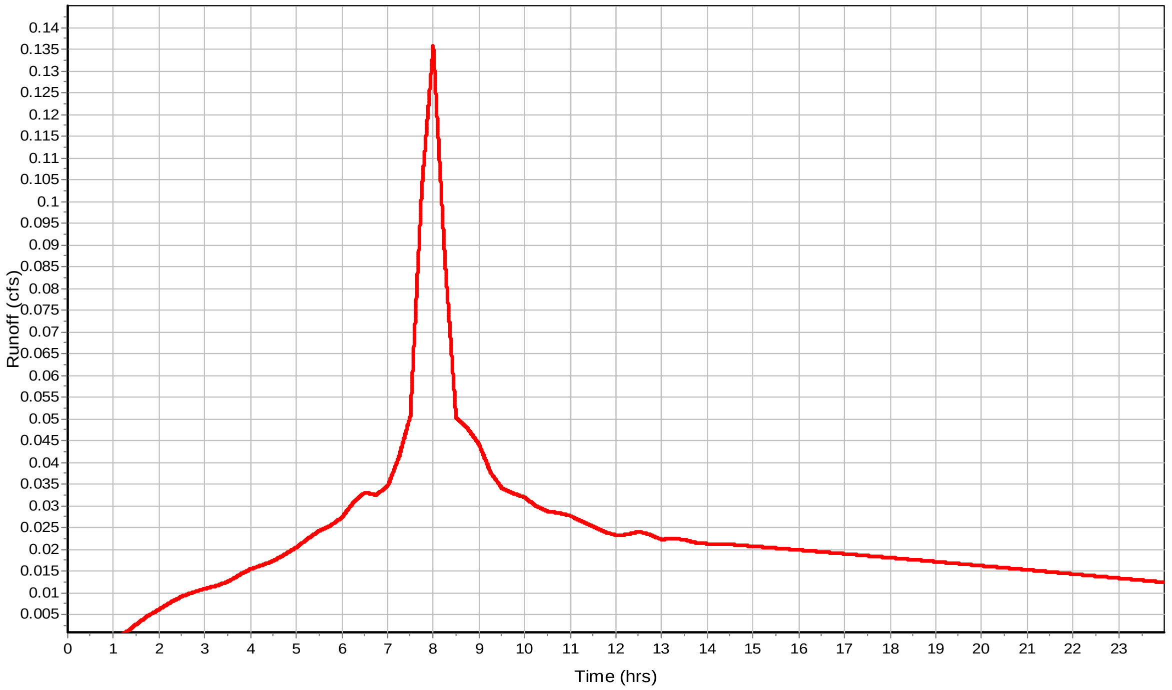
Total Rainfall (in)	2.03
Total Runoff (in)	1.52
Peak Runoff (cfs)	0.14
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 36

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 37

Input Data

Area (ac)	0.07
Impervious Area (%)	96
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
Composite Area & Weighted CN		0.07		97.12

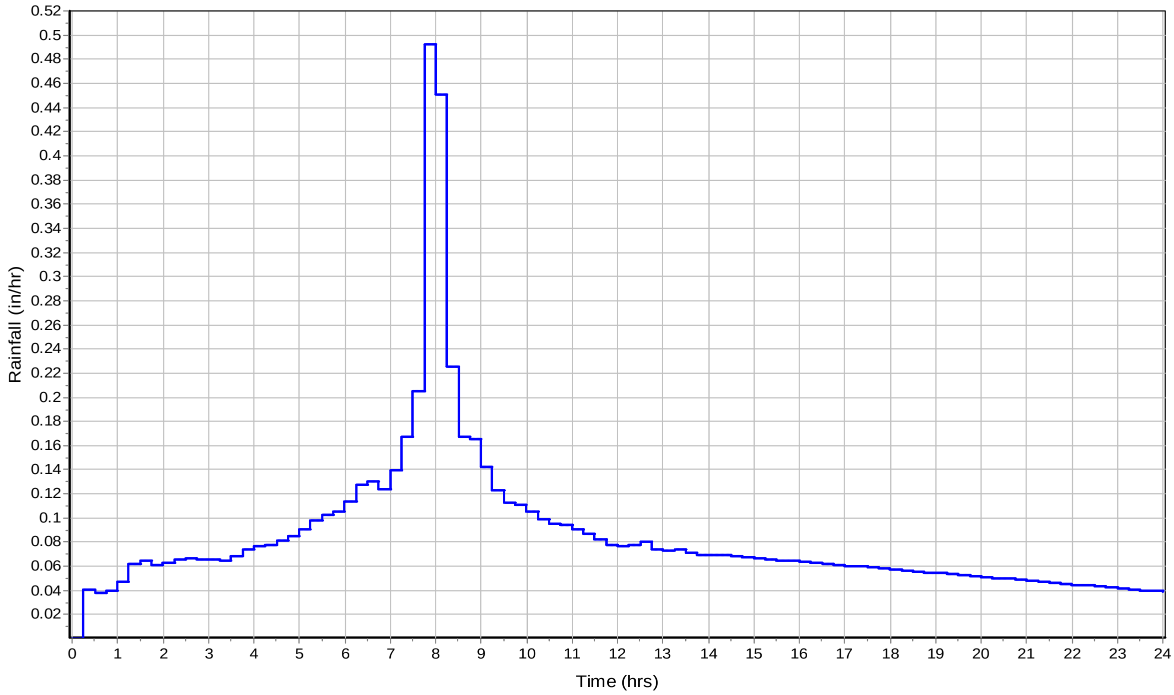
Time of Concentration

Subbasin Runoff Results

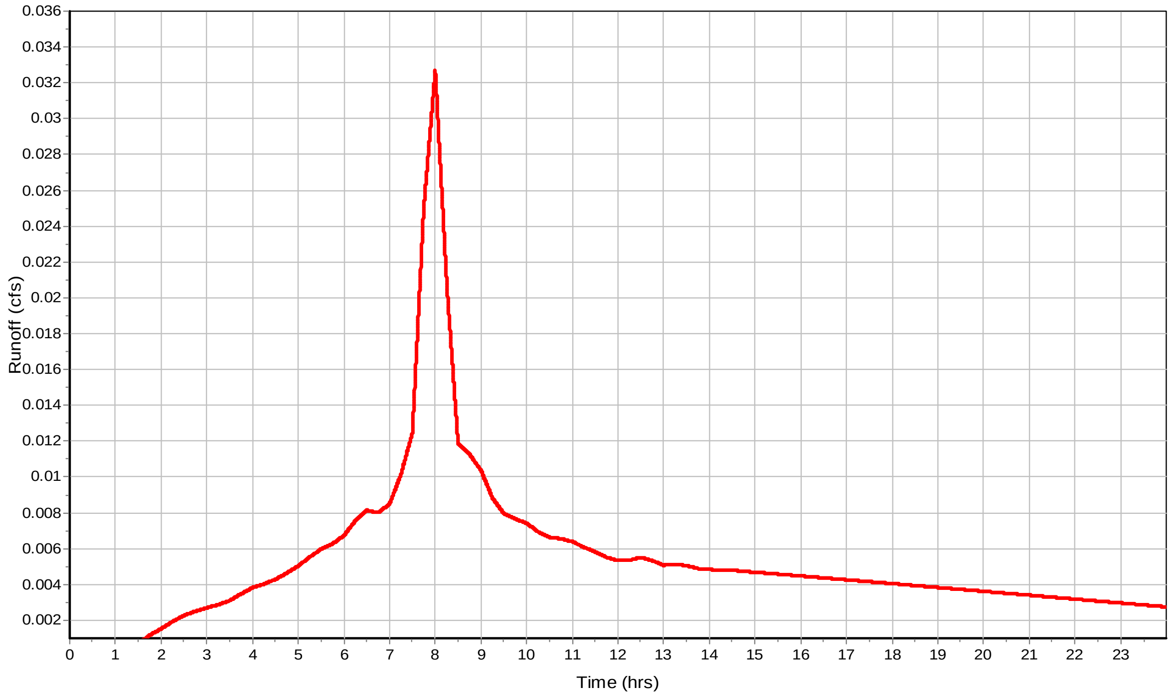
Total Rainfall (in)	2.03
Total Runoff (in)	1.75
Peak Runoff (cfs)	0.03
Weighted Curve Number	97.12
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 37

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 38

Input Data

Area (ac)	0.25
Impervious Area (%)	72
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.25		91.84

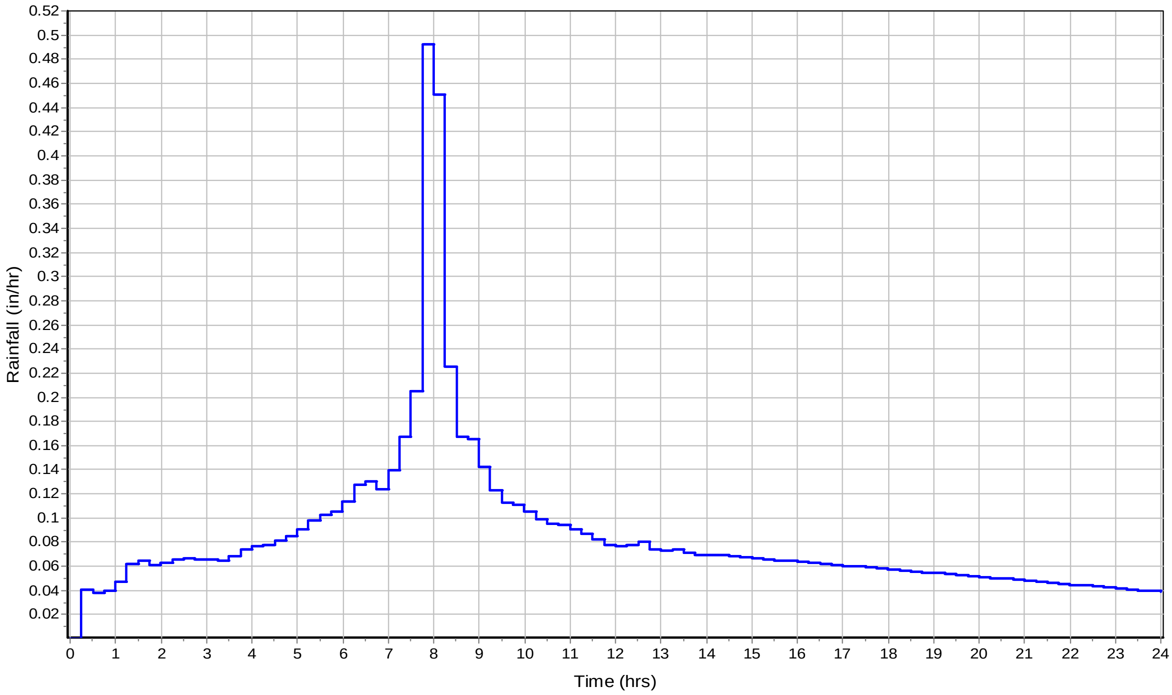
Time of Concentration

Subbasin Runoff Results

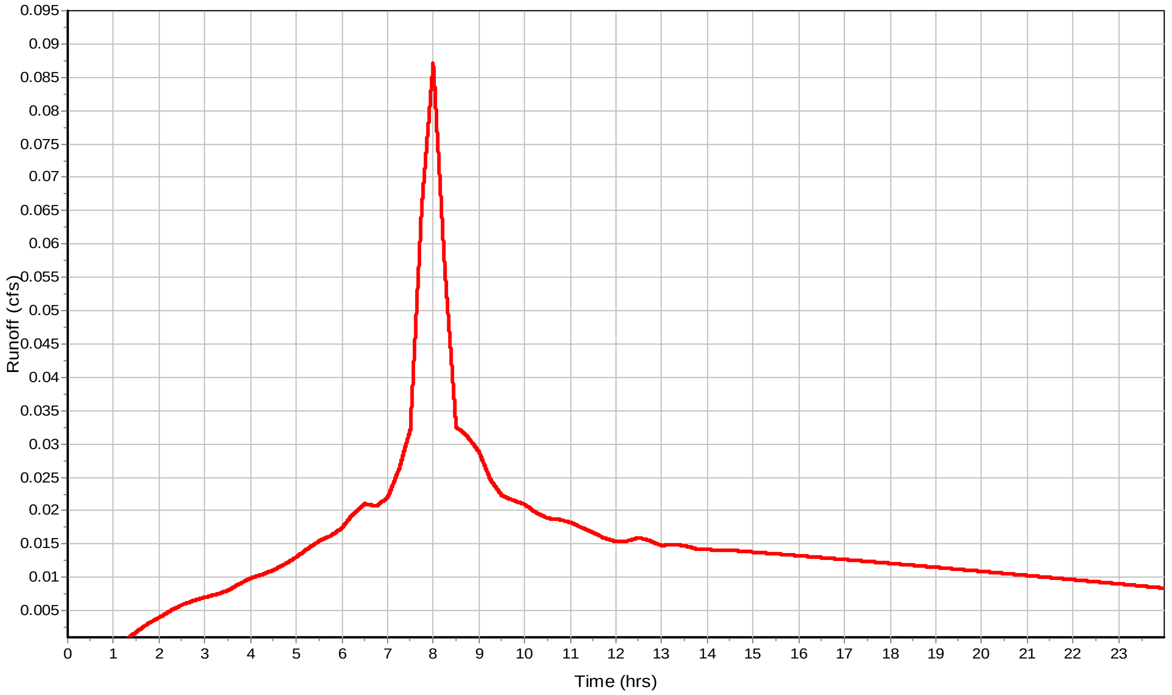
Total Rainfall (in)	2.03
Total Runoff (in)	1.42
Peak Runoff (cfs)	0.09
Weighted Curve Number	91.84
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 38

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 40

Input Data

Area (ac)	0.11
Impervious Area (%)	0
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	2-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.11		76

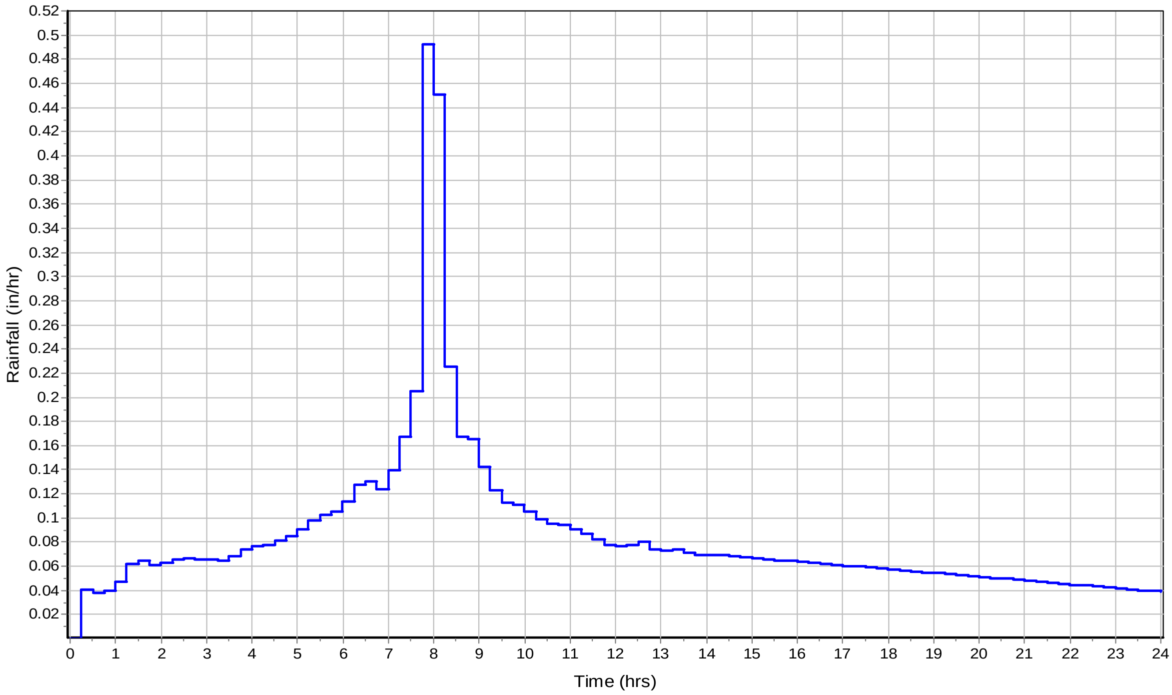
Time of Concentration

Subbasin Runoff Results

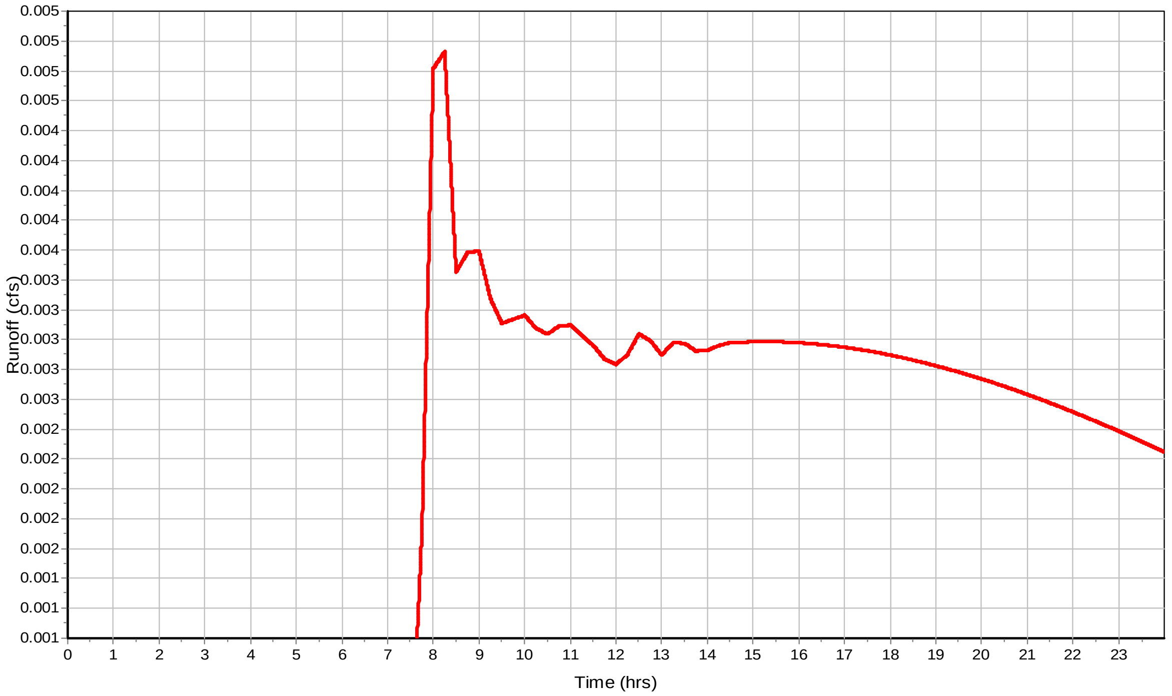
Total Rainfall (in)	2.03
Total Runoff (in)	0.43
Peak Runoff (cfs)	0.01
Weighted Curve Number	76
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 40

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	AREA DRAIN G1	73.07	77.13	4.06	0.00	-73.07	0.00	-77.13	0.00	42.72
2	AREA DRAIN H1	72.33	77.10	4.77	0.00	-72.33	0.00	-77.10	0.00	51.24
3	SDCB#01	66.90	74.84	7.94	67.40	0.50	0.00	-74.84	0.00	0.00
4	SDCB#02	69.50	72.40	2.90	0.00	-69.50	0.00	-72.40	0.00	22.80
5	SDCB#03	69.86	72.19	2.33	0.00	-69.86	0.00	-72.19	0.00	19.96
6	SDCB#04	70.14	72.64	2.50	0.00	-70.14	0.00	-72.64	0.00	22.00
7	SDCB#05	68.96	72.11	3.15	0.00	-68.96	0.00	-72.11	0.00	25.80
8	SDCB#06	68.72	73.03	4.31	0.00	-68.72	0.00	-73.03	0.00	43.72
9	SDCB#07	69.08	71.79	2.71	0.00	-69.08	0.00	-71.79	0.00	24.52
10	SDCB#08	69.55	72.45	2.90	0.00	-69.55	0.00	-72.45	0.00	26.80
11	SDCB#09	68.51	72.35	3.84	0.00	-68.51	0.00	-72.35	0.00	34.08
12	SDCB#10	67.90	76.96	9.06	68.40	0.50	0.00	-76.96	0.00	0.00
13	SDCB#11	73.48	76.58	3.10	0.00	-73.48	0.00	-76.58	0.00	29.20
14	SDCB#12	73.83	76.54	2.71	0.00	-73.83	0.00	-76.54	0.00	24.52
15	SDCB#13	73.87	76.58	2.71	0.00	-73.87	0.00	-76.58	0.00	24.52
16	SDCB#14	71.89	76.31	4.42	0.00	-71.89	0.00	-76.31	0.00	41.04
17	SDCB#15	71.68	76.25	4.57	0.00	-71.68	0.00	-76.25	0.00	42.84
18	SDCB#16	72.23	76.36	4.13	0.00	-72.23	0.00	-76.36	0.00	35.28
19	SDCB#17	72.75	76.55	3.80	0.00	-72.75	0.00	-76.55	0.00	37.60
20	SDCB#18	68.40	76.69	8.29	0.00	-68.40	0.00	-76.69	0.00	75.48
21	SDCB#19	70.35	75.25	4.90	0.00	-70.35	0.00	-75.25	0.00	46.80
22	SDCB#20	70.98	75.25	4.27	0.00	-70.98	0.00	-75.25	0.00	39.24
23	SDCB#21	71.81	75.25	3.44	0.00	-71.81	0.00	-75.25	0.00	33.28
24	SDCB#22	71.36	75.25	3.89	0.00	-71.36	0.00	-75.25	0.00	34.68
25	SDCB#23	71.93	75.25	3.32	0.00	-71.93	0.00	-75.25	0.00	27.84
26	SDCB#24	72.61	75.25	2.64	0.00	-72.61	0.00	-75.25	0.00	23.68
27	SDCB#25	72.79	75.25	2.46	0.00	-72.79	0.00	-75.25	0.00	21.52
28	SDCB#26	68.40	76.79	8.39	0.00	-68.40	0.00	-76.79	0.00	76.68
29	SDCB#27	71.20	75.25	4.05	0.00	-71.20	0.00	-75.25	0.00	36.52
30	SDCB#28	72.15	75.25	3.10	0.00	-72.15	0.00	-75.25	0.00	29.20
31	SDCB#29	71.72	75.40	3.68	0.00	-71.72	0.00	-75.40	0.00	32.16
32	SDCB#30	72.69	75.40	2.71	0.00	-72.69	0.00	-75.40	0.00	24.52
33	SDCB#31	70.25	77.16	6.91	0.00	-70.25	0.00	-77.16	0.00	70.92
34	SDCB#32	72.60	75.25	2.65	0.00	-72.60	0.00	-75.25	0.00	23.80
35	SDCB#33	70.81	75.25	4.44	0.00	-70.81	0.00	-75.25	0.00	41.28
36	SDCB#34	71.52	75.25	3.73	0.00	-71.52	0.00	-75.25	0.00	36.76
37	SDCB#35	68.40	77.00	8.60	0.00	-68.40	0.00	-77.00	0.00	79.20
38	SDCB#36	70.59	75.26	4.67	0.00	-70.59	0.00	-75.26	0.00	43.96
39	SDCB#37	71.52	75.67	4.15	0.00	-71.52	0.00	-75.67	0.00	41.80
40	SDCB#38	71.88	75.26	3.38	0.00	-71.88	0.00	-75.26	0.00	32.56
41	SDCB#40	73.22	76.27	3.05	0.00	-73.22	0.00	-76.27	0.00	24.60
42	SDCO#A1	72.71	76.38	3.67	0.00	-72.71	0.00	-76.38	0.00	36.00
43	SDCO#A2	73.21	76.54	3.33	0.00	-73.21	0.00	-76.54	0.00	33.96
44	SDCO#A3	74.00	75.03	1.03	0.00	-74.00	0.00	-75.03	0.00	6.36
45	SDCO#A4	73.96	75.89	1.93	0.00	-73.96	0.00	-75.89	0.00	17.16
46	SDCO#A5	73.23	76.82	3.59	0.00	-73.23	0.00	-76.82	0.00	37.08
47	SDCO#B1	74.33	78.08	3.75	0.00	-74.33	0.00	-78.08	0.00	36.96
48	SDCO#B2	75.11	77.80	2.69	0.00	-75.11	0.00	-77.80	0.00	26.28
49	SDCO#B3	75.28	77.92	2.64	0.00	-75.28	0.00	-77.92	0.00	25.68
50	SDCO#B4	75.41	77.95	2.54	0.00	-75.41	0.00	-77.95	0.00	24.48
51	SDCO#B5	71.99	78.08	6.09	0.00	-71.99	0.00	-78.08	0.00	67.08
52	SDCO#B6	72.81	78.02	5.21	0.00	-72.81	0.00	-78.02	0.00	56.52
53	SDCO#B7	72.87	77.95	5.08	0.00	-72.87	0.00	-77.95	0.00	54.96
54	SDCO#B8	72.81	78.02	5.21	0.00	-72.81	0.00	-78.02	0.00	56.52
55	SDCO#C1	72.21	76.85	4.64	0.00	-72.21	0.00	-76.85	0.00	37.68
56	SDCO#C10	72.74	76.81	4.07	0.00	-72.74	0.00	-76.81	0.00	41.16
57	SDCO#C2	74.28	76.87	2.59	0.00	-74.28	0.00	-76.87	0.00	25.08
58	SDCO#C3	74.37	76.91	2.54	0.00	-74.37	0.00	-76.91	0.00	24.48
59	SDCO#C4	74.29	76.83	2.54	0.00	-74.29	0.00	-76.83	0.00	24.48
60	SDCO#C5	71.44	76.97	5.53	0.00	-71.44	0.00	-76.97	0.00	56.76
61	SDCO#C6	72.54	77.11	4.57	0.00	-72.54	0.00	-77.11	0.00	48.84
62	SDCO#C7	72.66	76.99	4.33	0.00	-72.66	0.00	-76.99	0.00	45.96
63	SDCO#C8	72.19	76.97	4.78	0.00	-72.19	0.00	-76.97	0.00	51.36
64	SDCO#C9	72.19	76.88	4.69	0.00	-72.19	0.00	-76.88	0.00	48.60
65	SDCO#CLUB1	72.38	76.33	3.95	0.00	-72.38	0.00	-76.33	0.00	41.40
66	SDCO#CLUB2	72.72	76.59	3.87	0.00	-72.72	0.00	-76.59	0.00	40.44
67	SDCO#CLUB3	73.13	76.45	3.32	0.00	-73.13	0.00	-76.45	0.00	33.84
68	SDCO#CLUB4	72.72	76.62	3.90	0.00	-72.72	0.00	-76.62	0.00	40.80
69	SDCO#CLUB5	73.15	76.43	3.28	0.00	-73.15	0.00	-76.43	0.00	33.36
70	SDCO#COM01	70.05	73.56	3.51	0.00	-70.05	0.00	-73.56	0.00	34.20
71	SDCO#COM02	70.70	73.51	2.81	0.00	-70.70	0.00	-73.51	0.00	27.72
72	SDCO#COM04	70.78	73.59	2.81	0.00	-70.78	0.00	-73.59	0.00	25.72
73	SDCO#COM05	71.01	73.62	2.61	0.00	-71.01	0.00	-73.62	0.00	25.32
74	SDCO#COM06	71.60	73.47	1.87	0.00	-71.60	0.00	-73.47	0.00	16.44
75	SDCO#COM07	70.25	73.18	2.93	0.00	-70.25	0.00	-73.18	0.00	27.16

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
76	SDCO#COM08	70.78	73.55	2.77	0.00	-70.78	0.00	-73.55	0.00	27.24
77	SDCO#COM09	70.17	73.63	3.46	0.00	-70.17	0.00	-73.63	0.00	33.48
78	SDCO#COM10	71.09	73.63	2.54	0.00	-71.09	0.00	-73.63	0.00	24.48
79	SDCO#COM11	71.09	73.63	2.54	0.00	-71.09	0.00	-73.63	0.00	24.48
80	SDCO#COM12	70.17	72.88	2.71	0.00	-70.17	0.00	-72.88	0.00	24.48
81	SDCO#COM13	70.87	73.41	2.54	0.00	-70.87	0.00	-73.41	0.00	24.48
82	SDCO#D1	72.84	77.30	4.46	0.00	-72.84	0.00	-77.30	0.00	45.48
83	SDCO#D2	74.65	77.29	2.64	0.00	-74.65	0.00	-77.29	0.00	25.68
84	SDCO#D3	74.71	77.29	2.58	0.00	-74.71	0.00	-77.29	0.00	24.96
85	SDCO#D4	73.53	77.46	3.93	0.00	-73.53	0.00	-77.46	0.00	41.16
86	SDCO#D5	74.47	77.03	2.56	0.00	-74.47	0.00	-77.03	0.00	24.72
87	SDCO#D6	74.79	77.33	2.54	0.00	-74.79	0.00	-77.33	0.00	24.48
88	SDCO#D7	74.72	77.28	2.56	0.00	-74.72	0.00	-77.28	0.00	24.72
89	SDCO#E1	72.07	76.54	4.47	0.00	-72.07	0.00	-76.54	0.00	47.64
90	SDCO#E2	72.43	76.80	4.37	0.00	-72.43	0.00	-76.80	0.00	46.44
91	SDCO#E3	73.14	76.57	3.43	0.00	-73.14	0.00	-76.57	0.00	35.16
92	SDCO#E4	72.64	76.50	3.86	0.00	-72.64	0.00	-76.50	0.00	40.32
93	SDCO#E5	72.96	76.75	3.79	0.00	-72.96	0.00	-76.75	0.00	39.48
94	SDCO#E6	73.56	76.50	2.94	0.00	-73.56	0.00	-76.50	0.00	29.28
95	SDCO#E7	74.24	76.76	2.52	0.00	-74.24	0.00	-76.76	0.00	24.24
96	SDCO#F1	71.77	77.26	5.49	0.00	-71.77	0.00	-77.26	0.00	59.88
97	SDCO#F2	72.50	76.98	4.48	0.00	-72.50	0.00	-76.98	0.00	47.76
98	SDCO#F3	73.46	77.21	3.75	0.00	-73.46	0.00	-77.21	0.00	39.00
99	SDCO#G1	73.29	77.07	3.78	0.00	-73.29	0.00	-77.07	0.00	39.36
100	SDCO#G2	74.47	77.01	2.54	0.00	-74.47	0.00	-77.01	0.00	24.48
101	SDCO#G3	72.89	77.15	4.26	0.00	-72.89	0.00	-77.15	0.00	43.08
102	SDCO#G4	74.22	76.76	2.54	0.00	-74.22	0.00	-76.76	0.00	24.48
103	SDCO#H1	72.76	77.10	4.34	0.00	-72.76	0.00	-77.10	0.00	44.04
104	SDCO#H2	73.13	77.02	3.89	0.00	-73.13	0.00	-77.02	0.00	40.68
105	SDCO#H3	74.20	76.74	2.54	0.00	-74.20	0.00	-76.74	0.00	24.48
106	SDCO#H4	72.79	77.00	4.21	0.00	-72.79	0.00	-77.00	0.00	44.52
107	SDCO#H5	72.94	75.70	2.76	0.00	-72.94	0.00	-75.70	0.00	27.12
108	SDCO#H6	74.06	76.59	2.53	0.00	-74.06	0.00	-76.59	0.00	24.36
109	WQ#1	67.90	73.16	5.26	0.00	-67.90	0.00	-73.16	0.00	49.12
110	WQ#2	70.66	76.71	6.05	0.00	-70.66	0.00	-76.71	0.00	38.56
111	WQ#3	69.48	76.48	7.00	0.00	-69.48	0.00	-76.48	0.00	45.96
112	WQ#4	69.60	76.07	6.47	0.00	-69.60	0.00	-76.07	0.00	59.64
113	WQ#5	70.30	76.23	5.93	0.00	-70.30	0.00	-76.23	0.00	53.16

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AREA DRAIN G1	0.00	0.00	73.07	0.00	0.00	4.06	73.07	0.00	0 00:00	0 00:00	0.00	0.00
2	AREA DRAIN H1	0.00	0.00	72.33	0.00	0.00	4.77	72.33	0.00	0 00:00	0 00:00	0.00	0.00
3	SDCB#01	0.11	0.00	67.76	0.86	0.00	7.08	67.60	0.70	1 00:00	0 00:00	0.00	0.00
4	SDCB#02	0.25	0.10	69.71	0.21	0.00	2.69	69.59	0.09	0 08:00	0 00:00	0.00	0.00
5	SDCB#03	0.10	0.06	70.03	0.17	0.00	2.16	69.93	0.07	0 08:00	0 00:00	0.00	0.00
6	SDCB#04	0.04	0.02	70.25	0.11	0.00	2.39	70.19	0.05	0 08:00	0 00:00	0.00	0.00
7	SDCB#05	0.37	0.10	69.22	0.26	0.00	2.89	69.07	0.11	0 08:01	0 00:00	0.00	0.00
8	SDCB#06	0.12	0.05	68.99	0.27	0.00	4.04	68.80	0.08	0 08:01	0 00:00	0.00	0.00
9	SDCB#07	0.07	0.03	69.21	0.13	0.00	2.58	69.14	0.06	0 08:00	0 00:00	0.00	0.00
10	SDCB#08	0.04	0.02	69.64	0.09	0.00	2.81	69.59	0.04	0 08:00	0 00:00	0.00	0.00
11	SDCB#09	0.59	0.10	68.98	0.47	0.00	3.37	68.69	0.18	0 08:01	0 00:00	0.00	0.00
12	SDCB#10	0.06	0.00	69.53	1.63	0.00	7.43	68.97	1.07	1 00:00	0 00:00	0.00	0.00
13	SDCB#11	0.15	0.04	73.58	0.10	0.00	3.00	73.52	0.04	0 08:00	0 00:00	0.00	0.00
14	SDCB#12	0.05	0.05	73.94	0.11	0.00	2.60	73.88	0.05	0 08:00	0 00:00	0.00	0.00
15	SDCB#13	0.06	0.06	73.99	0.12	0.00	2.59	73.92	0.05	0 08:00	0 00:00	0.00	0.00
16	SDCB#14	0.29	0.07	72.13	0.24	0.00	4.18	71.99	0.10	0 08:01	0 00:00	0.00	0.00
17	SDCB#15	0.38	0.05	72.00	0.32	0.00	4.25	71.81	0.13	0 08:01	0 00:00	0.00	0.00
18	SDCB#16	0.17	0.05	72.41	0.18	0.00	3.95	72.31	0.08	0 08:00	0 00:00	0.00	0.00
19	SDCB#17	0.08	0.05	72.90	0.15	0.00	3.65	72.81	0.06	0 08:00	0 00:00	0.00	0.00
20	SDCB#18	0.95	0.00	69.53	1.13	0.00	7.16	69.08	0.68	1 00:00	0 00:00	0.00	0.00
21	SDCB#19	0.66	0.17	70.72	0.37	0.00	4.53	70.50	0.15	0 08:01	0 00:00	0.00	0.00
22	SDCB#20	0.50	0.04	71.28	0.30	0.00	3.97	71.11	0.13	0 08:01	0 00:00	0.00	0.00
23	SDCB#21	0.04	0.04	71.90	0.09	0.00	3.35	71.85	0.04	0 08:00	0 00:00	0.00	0.00
24	SDCB#22	0.42	0.08	71.65	0.29	0.00	3.60	71.48	0.12	0 08:01	0 00:00	0.00	0.00
25	SDCB#23	0.24	0.08	72.14	0.21	0.00	3.11	72.02	0.09	0 08:00	0 00:00	0.00	0.00
26	SDCB#24	0.02	0.01	72.68	0.07	0.00	2.57	72.64	0.03	0 08:01	0 00:00	0.00	0.00
27	SDCB#25	0.01	0.01	72.83	0.04	0.00	2.42	72.81	0.02	0 08:00	0 00:00	0.00	0.00
28	SDCB#26	0.64	0.00	69.53	1.13	0.00	7.26	69.09	0.69	1 00:00	0 00:00	0.00	0.00
29	SDCB#27	0.65	0.18	71.57	0.37	0.00	3.68	71.36	0.16	0 08:01	0 00:00	0.00	0.00
30	SDCB#28	0.12	0.07	72.33	0.18	0.00	2.92	72.23	0.08	0 08:01	0 00:00	0.00	0.00
31	SDCB#29	0.34	0.08	71.95	0.23	0.00	3.45	71.82	0.10	0 08:00	0 00:00	0.00	0.00
32	SDCB#30	0.16	0.16	72.89	0.20	0.00	2.51	72.78	0.09	0 08:00	0 00:00	0.00	0.00
33	SDCB#31	0.27	0.08	70.51	0.26	0.00	6.65	70.36	0.11	0 08:01	0 00:00	0.00	0.00
34	SDCB#32	0.11	0.07	72.77	0.17	0.00	2.48	72.67	0.07	0 08:00	0 00:00	0.00	0.00
35	SDCB#33	0.14	0.09	70.97	0.16	0.00	4.28	70.88	0.07	0 08:00	0 00:00	0.00	0.00
36	SDCB#34	0.05	0.05	71.63	0.11	0.00	3.62	71.57	0.05	0 08:00	0 00:00	0.00	0.00
37	SDCB#35	0.30	0.00	69.53	1.13	0.00	7.47	69.08	0.68	1 00:00	0 00:00	0.00	0.00
38	SDCB#36	0.25	0.14	70.75	0.16	0.00	4.51	70.66	0.07	0 08:00	0 00:00	0.00	0.00
39	SDCB#37	0.12	0.03	71.69	0.17	0.00	3.98	71.60	0.08	0 08:01	0 00:00	0.00	0.00
40	SDCB#38	0.09	0.09	72.02	0.14	0.00	3.24	71.94	0.06	0 08:00	0 00:00	0.00	0.00
41	SDCB#40	0.00	0.00	73.24	0.02	0.00	3.03	73.23	0.01	0 08:15	0 00:00	0.00	0.00
42	SDCO#A1	0.04	0.00	72.81	0.10	0.00	3.57	72.75	0.04	0 08:01	0 00:00	0.00	0.00
43	SDCO#A2	0.02	0.00	73.28	0.07	0.00	3.26	73.24	0.03	0 08:01	0 00:00	0.00	0.00
44	SDCO#A3	0.02	0.02	74.07	0.07	0.00	0.96	74.03	0.03	0 08:00	0 00:00	0.00	0.00
45	SDCO#A4	0.02	0.02	74.03	0.07	0.00	1.86	73.99	0.03	0 08:00	0 00:00	0.00	0.00
46	SDCO#A5	0.02	0.00	73.30	0.07	0.00	3.52	73.26	0.03	0 08:01	0 00:00	0.00	0.00
47	SDCO#B1	0.05	0.00	74.39	0.06	0.00	3.69	74.36	0.03	0 08:01	0 00:00	0.00	0.00
48	SDCO#B2	0.03	0.00	75.19	0.08	0.00	2.61	75.14	0.03	0 08:00	0 00:00	0.00	0.00
49	SDCO#B3	0.03	0.03	75.36	0.08	0.00	2.56	75.31	0.03	0 08:00	0 00:00	0.00	0.00
50	SDCO#B4	0.03	0.03	75.49	0.08	0.00	2.46	75.44	0.03	0 08:00	0 00:00	0.00	0.00
51	SDCO#B5	0.06	0.00	72.13	0.14	0.00	5.95	72.05	0.06	0 08:01	0 00:00	0.00	0.00
52	SDCO#B6	0.03	0.00	72.89	0.08	0.00	5.13	72.84	0.03	0 08:00	0 00:00	0.00	0.00
53	SDCO#B7	0.03	0.03	72.95	0.08	0.00	5.00	72.91	0.04	0 08:00	0 00:00	0.00	0.00
54	SDCO#B8	0.03	0.03	72.89	0.08	0.00	5.13	72.84	0.03	0 08:00	0 00:00	0.00	0.00
55	SDCO#C1	0.06	0.00	73.12	0.91	0.00	3.73	73.06	0.85	0 08:01	0 00:00	0.00	0.00
56	SDCO#C10	0.03	0.03	72.96	0.22	0.00	3.85	72.91	0.17	0 08:00	0 00:00	0.00	0.00
57	SDCO#C2	0.03	0.00	74.33	0.05	0.00	2.54	74.30	0.02	0 08:00	0 00:00	0.00	0.00
58	SDCO#C3	0.03	0.03	74.45	0.08	0.00	2.46	74.41	0.04	0 08:00	0 00:00	0.00	0.00
59	SDCO#C4	0.03	0.03	74.37	0.08	0.00	2.46	74.32	0.03	0 08:00	0 00:00	0.00	0.00
60	SDCO#C5	0.05	0.00	71.57	0.13	0.00	5.40	71.49	0.05	0 08:01	0 00:00	0.00	0.00
61	SDCO#C6	0.03	0.00	72.62	0.08	0.00	4.49	72.57	0.03	0 08:00	0 00:00	0.00	0.00
62	SDCO#C7	0.03	0.03	72.74	0.08	0.00	4.25	72.69	0.03	0 08:00	0 00:00	0.00	0.00
63	SDCO#C8	0.03	0.00	72.27	0.08	0.00	4.70	72.22	0.03	0 08:01	0 00:00	0.00	0.00
64	SDCO#C9	0.03	0.00	72.41	0.22	0.00	4.47	72.36	0.17	0 08:00	0 00:00	0.00	0.00
65	SDCO#CLUB1	0.03	0.00	72.44	0.06	0.00	3.89	72.41	0.03	0 08:01	0 00:00	0.00	0.00
66	SDCO#CLUB2	0.01	0.00	72.77	0.05	0.00	3.82	72.74	0.02	0 08:01	0 00:00	0.00	0.00
67	SDCO#CLUB3	0.01	0.01	73.18	0.05	0.00	3.27	73.15	0.02	0 08:00	0 00:00	0.00	0.00
68	SDCO#CLUB4	0.01	0.00	72.77	0.05	0.00	3.85	72.74	0.02	0 08:01	0 00:00	0.00	0.00
69	SDCO#CLUB5	0.01	0.01	73.20	0.05	0.00	3.23	73.17	0.02	0 08:00	0 00:00	0.00	0.00
70	SDCO#COM01	0.03	0.00	70.86	0.81	0.00	2.70	70.79	0.74	0 08:00	0 00:00	0.00	0.00
71	SDCO#COM02	0.03	0.03	70.86	0.16	0.00	2.65	70.81	0.11	0 08:00	0 00:00	0.00	0.00
72	SDCO#COM04	0.05	0.00	70.85	0.07	0.00	2.74	70.81	0.03	0 08:01	0 00:00	0.00	0.00
73	SDCO#COM05	0.02	0.00	71.08	0.07	0.00	2.54	71.04	0.03	0 08:01	0 00:00	0.00	0.00
74	SDCO#COM06	0.02	0.02	71.67	0.07	0.00	1.80	71.63	0.03	0 08:00	0 00:00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
75	SDCO#COM07	0.02	0.00	70.32	0.07	0.00	2.86	70.28	0.03	0 08:00	0 00:00	0.00	0.00
76	SDCO#COM08	0.02	0.02	70.85	0.07	0.00	2.70	70.81	0.03	0 08:00	0 00:00	0.00	0.00
77	SDCO#COM09	0.02	0.00	70.22	0.05	0.00	3.41	70.19	0.02	0 08:01	0 00:00	0.00	0.00
78	SDCO#COM10	0.01	0.01	71.13	0.04	0.00	2.50	71.11	0.02	0 08:00	0 00:00	0.00	0.00
79	SDCO#COM11	0.01	0.01	71.14	0.05	0.00	2.49	71.11	0.02	0 08:00	0 00:00	0.00	0.00
80	SDCO#COM12	0.02	0.00	70.21	0.04	0.00	2.67	70.19	0.02	0 08:00	0 00:00	0.00	0.00
81	SDCO#COM13	0.02	0.02	70.93	0.06	0.00	2.48	70.90	0.03	0 08:00	0 00:00	0.00	0.00
82	SDCO#D1	0.05	0.00	72.93	0.09	0.00	4.37	72.88	0.04	0 08:01	0 00:00	0.00	0.00
83	SDCO#D2	0.06	0.00	74.76	0.11	0.00	2.53	74.70	0.05	0 08:01	0 00:00	0.00	0.00
84	SDCO#D3	0.06	0.06	74.83	0.12	0.00	2.46	74.76	0.05	0 08:00	0 00:00	0.00	0.00
85	SDCO#D4	0.06	0.00	73.61	0.08	0.00	3.85	73.56	0.03	0 08:01	0 00:00	0.00	0.00
86	SDCO#D5	0.03	0.00	74.53	0.06	0.00	2.50	74.50	0.03	0 08:00	0 00:00	0.00	0.00
87	SDCO#D6	0.03	0.03	74.85	0.06	0.00	2.48	74.82	0.03	0 08:00	0 00:00	0.00	0.00
88	SDCO#D7	0.03	0.03	74.80	0.08	0.00	2.48	74.75	0.03	0 08:00	0 00:00	0.00	0.00
89	SDCO#E1	0.08	0.00	72.20	0.13	0.00	4.34	72.13	0.06	0 08:02	0 00:00	0.00	0.00
90	SDCO#E2	0.08	0.00	72.56	0.13	0.00	4.24	72.48	0.05	0 08:01	0 00:00	0.00	0.00
91	SDCO#E3	0.08	0.00	73.27	0.13	0.00	3.30	73.19	0.05	0 08:01	0 00:00	0.00	0.00
92	SDCO#E4	0.04	0.00	72.73	0.09	0.00	3.77	72.68	0.04	0 08:01	0 00:00	0.00	0.00
93	SDCO#E5	0.04	0.00	73.05	0.09	0.00	3.70	73.00	0.04	0 08:00	0 00:00	0.00	0.00
94	SDCO#E6	0.04	0.04	73.65	0.09	0.00	2.85	73.60	0.04	0 08:00	0 00:00	0.00	0.00
95	SDCO#E7	0.08	0.08	74.37	0.13	0.00	2.39	74.29	0.05	0 08:00	0 00:00	0.00	0.00
96	SDCO#F1	0.05	0.05	71.87	0.10	0.00	5.39	71.81	0.04	0 08:00	0 00:00	0.00	0.00
97	SDCO#F2	0.05	0.00	72.55	0.05	0.00	4.43	72.52	0.02	0 08:00	0 00:00	0.00	0.00
98	SDCO#F3	0.05	0.05	73.57	0.11	0.00	3.64	73.51	0.05	0 08:00	0 00:00	0.00	0.00
99	SDCO#G1	0.05	0.00	73.37	0.08	0.00	3.70	73.32	0.03	0 08:01	0 00:00	0.00	0.00
100	SDCO#G2	0.05	0.05	74.57	0.10	0.00	2.44	74.51	0.04	0 08:00	0 00:00	0.00	0.00
101	SDCO#G3	0.04	0.00	72.99	0.10	0.00	4.16	72.93	0.04	0 08:01	0 00:00	0.00	0.00
102	SDCO#G4	0.04	0.04	74.31	0.09	0.00	2.45	74.26	0.04	0 08:00	0 00:00	0.00	0.00
103	SDCO#H1	0.05	0.00	72.82	0.06	0.00	4.28	72.79	0.03	0 08:01	0 00:00	0.00	0.00
104	SDCO#H2	0.05	0.00	73.23	0.10	0.00	3.79	73.17	0.04	0 08:01	0 00:00	0.00	0.00
105	SDCO#H3	0.05	0.05	74.30	0.10	0.00	2.44	74.24	0.04	0 08:00	0 00:00	0.00	0.00
106	SDCO#H4	0.04	0.00	72.86	0.07	0.00	4.14	72.82	0.03	0 08:01	0 00:00	0.00	0.00
107	SDCO#H5	0.04	0.00	73.03	0.09	0.00	2.67	72.98	0.04	0 08:01	0 00:00	0.00	0.00
108	SDCO#H6	0.04	0.04	74.15	0.09	0.00	2.44	74.10	0.04	0 08:00	0 00:00	0.00	0.00
109	WQ#1	0.59	0.00	68.38	0.48	0.00	4.78	68.09	0.19	0 08:01	0 00:00	0.00	0.00
110	WQ#2	0.15	0.00	70.73	0.07	0.00	5.98	70.69	0.03	0 08:00	0 00:00	0.00	0.00
111	WQ#3	0.38	0.00	69.64	0.16	0.00	6.84	69.54	0.06	0 08:01	0 00:00	0.00	0.00
112	WQ#4	0.66	0.00	69.99	0.39	0.00	6.08	69.76	0.16	0 08:01	0 00:00	0.00	0.00
113	WQ#5	0.64	0.00	70.56	0.26	0.00	5.67	70.41	0.11	0 08:01	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)
1	{SD - Phase 1}.PIPE 02	108.10	69.50	0.00	68.96	0.00	0.54	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
2	{SD - Phase 1}.PIPE 03	71.71	69.86	0.00	69.50	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
3	{SD - Phase 1}.PIPE 04	55.25	70.14	0.00	69.86	0.00	0.28	0.5100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
4	{SD - Phase 1}.PIPE 05	89.22	68.96	0.00	68.51	0.00	0.45	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
5	{SD - Phase 1}.PIPE 06	42.41	68.72	0.00	68.51	0.00	0.21	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
6	{SD - Phase 1}.PIPE 07	72.15	69.08	0.00	68.72	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
7	{SD - Phase 1}.PIPE 08	49.14	69.55	0.00	69.08	0.00	0.47	0.9600	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
8	{SD - Phase 1}.PIPE 09	21.39	68.51	0.00	68.40	0.50	0.11	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
9	{SD - Phase 1}.PIPE 11	5.71	73.48	0.00	72.83	2.17	0.65	11.3800	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
10	{SD - Phase 1}.PIPE 12	64.20	73.83	0.00	73.48	0.00	0.35	0.5500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
11	{SD - Phase 1}.PIPE 13	78.00	73.87	0.00	73.48	0.00	0.39	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
12	{SD - Phase 1}.PIPE 14	42.96	71.89	0.00	71.68	0.00	0.21	0.4900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
13	{SD - Phase 1}.PIPE 15	6.67	71.68	0.00	71.65	2.17	0.03	0.4500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
14	{SD - Phase 1}.PIPE 16	67.53	72.23	0.00	71.89	0.00	0.34	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
15	{SD - Phase 1}.PIPE 17	36.65	72.75	0.00	72.57	0.34	0.18	0.4900	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
16	{SD - Phase 1}.PIPE 18	54.55	68.40	0.00	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
17	{SD - Phase 1}.PIPE 20	126.79	70.98	0.00	70.35	0.00	0.63	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
18	{SD - Phase 1}.PIPE 21	57.67	71.81	0.00	71.31	0.33	0.50	0.8700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
19	{SD - Phase 1}.PIPE 22	75.77	71.36	0.00	70.98	0.00	0.38	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
20	{SD - Phase 1}.PIPE 23	113.35	71.93	0.00	71.36	0.00	0.57	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
21	{SD - Phase 1}.PIPE 24	69.19	72.61	0.00	72.26	0.33	0.35	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
22	{SD - Phase 1}.PIPE 25	34.45	72.79	0.00	72.61	0.00	0.18	0.5200	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
23	{SD - Phase 1}.PIPE 26	104.96	68.40	0.00	68.40	0.00	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
24	{SD - Phase 1}.PIPE 27	80.37	71.20	0.00	70.80	0.50	0.40	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
25	{SD - Phase 1}.PIPE 28	122.98	72.15	0.00	71.54	0.34	0.61	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
26	{SD - Phase 1}.PIPE 29	82.06	71.72	0.00	71.20	0.00	0.52	0.6300	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
27	{SD - Phase 1}.PIPE 30	128.14	72.69	0.00	72.05	0.33	0.64	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
28	{SD - Phase 1}.PIPE 31	5.26	70.25	0.00	70.22	2.32	0.03	0.5700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
29	{SD - Phase 1}.PIPE 40	52.18	73.22	0.00	71.20	0.00	2.02	3.8700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
30	{SD - Phase 1}.PIPE B1	50.72	74.33	0.00	69.73	1.33	4.60	9.0700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
31	{SD - Phase 1}.PIPE B2	60.72	75.11	0.00	74.50	0.17	0.61	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
32	{SD - Phase 1}.PIPE B3	16.77	75.28	0.00	75.11	0.00	0.17	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
33	{SD - Phase 1}.PIPE B4	85.66	75.41	0.00	74.50	0.17	0.91	1.0600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
34	{SD - Phase 1}.PIPE B5	8.62	71.99	0.00	71.95	4.05	0.04	0.4600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
35	{SD - Phase 1}.PIPE B6	81.80	72.81	0.00	71.99	0.00	0.82	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
36	{SD - Phase 1}.PIPE B7	6.36	72.87	0.00	72.81	0.00	0.06	0.9400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
37	{SD - Phase 1}.PIPE B8	81.80	72.81	0.00	71.99	0.00	0.82	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
38	{SD - Phase 1}.PIPE C1	45.29	73.04	0.83	72.05	0.33	0.99	2.1900	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
39	{SD - Phase 1}.PIPE C10	54.90	72.88	0.14	72.33	0.14	0.55	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
40	{SD - Phase 1}.PIPE C2	22.10	74.28	0.00	73.21	1.00	1.07	4.8400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
41	{SD - Phase 1}.PIPE C3	9.24	74.37	0.00	74.28	0.00	0.09	0.9700	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
42	{SD - Phase 1}.PIPE C4	108.05	74.29	0.00	73.21	1.00	1.08	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
43	{SD - Phase 1}.PIPE C5	7.93	71.44	0.00	71.40	3.50	0.04	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
44	{SD - Phase 1}.PIPE C6	109.73	72.54	0.00	71.44	0.00	1.10	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
45	{SD - Phase 1}.PIPE C7	12.01	72.66	0.00	72.54	0.00	0.12	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
46	{SD - Phase 1}.PIPE C8	45.14	72.19	0.00	71.74	0.30	0.45	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
47	{SD - Phase 1}.PIPE C9	13.55	72.33	0.14	72.19	0.00	0.14	1.0300	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
48	{SD - Phase 1}.PIPE COM01	37.51	70.78	0.00	69.50	0.00	1.28	3.4100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
49	{SD - Phase 1}.PIPE COM02	49.39	70.70	0.00	70.21	0.16	0.49	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
50	{SD - Phase 1}.PIPE COM04	56.60	70.78	0.00	70.21	0.16	0.57	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
51	{SD - Phase 1}.PIPE COM05	22.78	71.01	0.00	70.78	0.00	0.23	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
52	{SD - Phase 1}.PIPE COM06	59.24	71.60	0.00	71.01	0.00	0.59	1.0000	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
53	{SD - Phase 1}.PIPE COM07	21.49	70.25	0.00	70.14	0.00	0.11	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
54	{SD - Phase 1}.PIPE COM08	36.57	70.78	0.00	70.41	0.16	0.37	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
55	{SD - Phase 1}.PIPE COM09	34.88	70.17	0.00	68.96	0.00	1.21	3.4700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
56	{SD - Phase 1}.PIPE COM10	48.42	71.09	0.00	70.34	0.17	0.75	1.5500	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
57	{SD - Phase 1}.PIPE COM11	74.62	71.09	0.00	70.34	0.17	0.75	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
58	{SD - Phase 1}.PIPE COM12	16.26	70.17	0.00	69.55	0.00	0.62	3.8100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
59	{SD - Phase 1}.PIPE COM13	45.72	70.87	0.00	70.34	0.17	0.53	1.1600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
60	{SD - Phase 1}.PIPE D1	47.80	72.84	0.00	72.15	0.00	0.69	1.4400	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
61	{SD - Phase 1}.PIPE D2	163.60	74.65	0.00	73.01	0.17	1.64	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
62	{SD - Phase 1}.PIPE D3	6.36	74.71	0.00	74.65	0.00	0.06	0.9400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
63	{SD - Phase 1}.PIPE D4	54.62	73.36	-0.17	72.05	0.33	1.31	2.4000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
64	{SD - Phase 1}.PIPE D5	32.05	74.47	0.00	73.53	0.00	0.94	2.9300	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
65	{SD - Phase 1}.PIPE D6	10.82	74.79	0.00	74.47	0.00	0.32	2.9600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
66	{SD - Phase 1}.PIPE D7	119.28	74.72	0.00	73.53	0.00	1.19	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
67	{SD - Phase 1}.PIPE E1	42.30	71.90	-0.17	71.69	0.33	0.21	0.5000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
68	{SD - Phase 1}.PIPE E4	42.52	72.48	-0.16	72.26	0.33	0.22	0.5200	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
69	{SD - Phase 1}.PIPE G1	23.14	73.29	0.00	72.73	0.50	0.56	2.4200	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
70	{SD - Phase 1}.PIPE G2	118.43	74.47	0.00	73.29	0.00	1.18	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
71	{SD - Phase 1}.PIPE G3	29.24	72.89	0.00	72.75	0.00	0.14	0.4800	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
72	{SD - Phase 1}.PIPE G4	116.18	74.22	0.00	73.06	0.17	1.16	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
73	{SD - Phase 1}.PIPE H1	9.90	72.76	0.00	72.22	0.33	0.54	5.4500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
74	{SD - Phase 1}.PIPE H2	20.00	73.13	0.00	72.93	0.17	0.20	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
75	{SD - Phase 1}.PIPE H3	106.86	74.20	0.00	73.13	0.00	1.07	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00

Flap Gate	No. of Barrels
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Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)
76	{SD - Phase 1}.PIPE H4	24.70	72.79	0.00	72.18	0.50	0.61	2.4700	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
77	{SD - Phase 1}.PIPE H5	14.98	72.94	0.00	72.79	0.00	0.15	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
78	{SD - Phase 1}.PIPE H6	112.34	74.06	0.00	72.94	0.00	1.12	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
79	{SD - Phase 1}.PIPE RT-1	4.18	67.40	0.50	67.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
80	{SD - Phase 1}.PIPE RT-2	5.00	68.40	0.50	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
81	{SD - Phase 1}.PIPE RT-3	128.16	68.40	0.50	68.40	0.00	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
82	{SD - Phase 1}.PIPE WQ#4	40.09	69.60	0.00	69.40	1.00	0.20	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
83	{SD - Phase 2}.PIEP CLUB5	42.78	73.15	0.00	72.72	0.00	0.43	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
84	{SD - Phase 2}.PIPE 33	113.81	70.81	0.00	70.25	0.00	0.56	0.4900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
85	{SD - Phase 2}.PIPE 34	74.43	71.52	0.00	71.14	0.33	0.38	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
86	{SD - Phase 2}.PIPE 35	78.01	68.40	0.00	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
87	{SD - Phase 2}.PIPE 36	68.05	70.59	0.00	69.40	1.00	1.19	1.7500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
88	{SD - Phase 2}.PIPE 37	118.86	71.52	0.00	70.93	0.34	0.59	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
89	{SD - Phase 2}.PIPE 38	72.17	71.88	0.00	71.52	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
90	{SD - Phase 2}.PIPE A1	22.91	72.71	0.00	72.60	0.00	0.11	0.4800	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
91	{SD - Phase 2}.PIPE A2	33.15	73.21	0.00	72.88	0.17	0.33	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
92	{SD - Phase 2}.PIPE A3	78.60	74.00	0.00	73.21	0.00	0.79	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
93	{SD - Phase 2}.PIPE A4	72.96	73.96	0.00	73.23	0.00	0.73	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
94	{SD - Phase 2}.PIPE A5	35.48	73.23	0.00	72.88	0.17	0.35	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
95	{SD - Phase 2}.PIPE CLUB2	33.61	72.72	0.00	72.38	0.00	0.34	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
96	{SD - Phase 2}.PIPE CLUB3	40.66	73.13	0.00	72.72	0.00	0.41	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
97	{SD - Phase 2}.PIPE CLUB4	32.02	72.72	0.00	72.38	0.00	0.34	1.0600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
98	{SD - Phase 2}.PIPE E2	35.98	72.43	0.00	72.07	0.00	0.36	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
99	{SD - Phase 2}.PIPE E3	71.44	73.14	0.00	72.43	0.00	0.71	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
100	{SD - Phase 2}.PIPE E5	31.53	72.96	0.00	72.64	0.00	0.32	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
101	{SD - Phase 2}.PIPE E6	59.72	73.56	0.00	72.96	0.00	0.60	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
102	{SD - Phase 2}.PIPE E7	109.59	74.24	0.00	73.14	0.00	1.10	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
103	{SD - Phase 2}.PIPE F1	151.81	71.77	0.00	70.25	0.00	1.52	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
104	{SD - Phase 2}.PIPE F2	17.47	72.50	0.00	69.90	1.50	2.60	14.8800	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
105	{SD - Phase 2}.PIPE F3	96.17	73.46	0.00	72.50	0.00	0.96	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
106	PIPE 32	66.71	72.60	0.00	72.26	0.33	0.34	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
107	Pipe ADG1	21.66	73.07	0.00	72.92	0.69	0.15	0.6900	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
108	PIPE ADH1	16.48	72.33	0.00	72.18	0.50	0.15	0.9100	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
109	PIPE CLUB1	35.74	72.21	-0.17	71.69	0.33	0.52	1.4500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
110	PIPE WQ#1	6.39	67.90	0.00	67.87	0.97	0.03	0.4700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
111	PIPE WQ#2	5.61	70.66	0.00	68.87	0.97	1.79	31.9100	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
112	PIPE WQ#3	6.80	69.48	0.00	68.87	0.97	0.61	8.9700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
113	PIPE WQ#4	40.09	70.35	0.00	70.10	0.50	0.25	0.6200	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
114	PIPE WQ#5	45.10	70.30	0.00	69.40	1.00	0.90	2.0000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00

Flap Gate	No. of Barrels
No	1
No	1
No	1
No	1
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Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	{SD - Phase 1}.PIPE 02	0.25	0 08:00	2.52	0.10	1.76	1.02	0.24	0.24	0.00		Calculated
2	{SD - Phase 1}.PIPE 03	0.10	0 08:00	0.74	0.14	1.24	0.96	0.19	0.28	0.00		Calculated
3	{SD - Phase 1}.PIPE 04	0.04	0 08:00	0.75	0.06	0.81	1.14	0.14	0.20	0.00		Calculated
4	{SD - Phase 1}.PIPE 05	0.37	0 08:01	2.53	0.15	1.45	1.03	0.36	0.36	0.00		Calculated
5	{SD - Phase 1}.PIPE 06	0.12	0 08:02	0.85	0.14	0.65	1.09	0.37	0.55	0.00		Calculated
6	{SD - Phase 1}.PIPE 07	0.07	0 08:00	0.85	0.08	1.03	1.17	0.20	0.30	0.00		Calculated
7	{SD - Phase 1}.PIPE 08	0.04	0 08:00	1.18	0.04	1.15	0.71	0.11	0.16	0.00		Calculated
8	{SD - Phase 1}.PIPE 09	0.59	0 08:01	0.87	0.68	2.58	0.14	0.41	0.62	0.00		Calculated
9	{SD - Phase 1}.PIPE 11	0.15	0 08:00	4.08	0.04	4.81	0.02	0.10	0.14	0.00		Calculated
10	{SD - Phase 1}.PIPE 12	0.05	0 08:00	0.89	0.05	1.33	0.80	0.11	0.16	0.00		Calculated
11	{SD - Phase 1}.PIPE 13	0.06	0 08:00	0.86	0.07	1.46	0.89	0.11	0.17	0.00		Calculated
12	{SD - Phase 1}.PIPE 14	0.29	0 08:01	2.49	0.12	1.62	0.44	0.28	0.28	0.00		Calculated
13	{SD - Phase 1}.PIPE 15	0.38	0 08:01	2.39	0.16	2.03	0.05	0.29	0.29	0.00		Calculated
14	{SD - Phase 1}.PIPE 16	0.17	0 08:00	2.53	0.07	1.46	0.77	0.21	0.21	0.00		Calculated
15	{SD - Phase 1}.PIPE 17	0.08	0 08:00	0.85	0.10	1.54	0.40	0.14	0.21	0.00		Calculated
16	{SD - Phase 1}.PIPE 18	0.94	0 08:18	0.97	0.97	1.91	0.48	1.13	0.57	0.00		Calculated
17	{SD - Phase 1}.PIPE 20	0.50	0 08:01	2.51	0.20	2.15	0.98	0.34	0.34	0.00		Calculated
18	{SD - Phase 1}.PIPE 21	0.04	0 08:00	1.13	0.03	1.48	0.65	0.09	0.13	0.00		Calculated
19	{SD - Phase 1}.PIPE 22	0.42	0 08:01	2.52	0.17	2.15	0.59	0.30	0.30	0.00		Calculated
20	{SD - Phase 1}.PIPE 23	0.24	0 08:00	2.53	0.10	1.58	1.20	0.25	0.25	0.00		Calculated
21	{SD - Phase 1}.PIPE 24	0.02	0 08:01	0.86	0.02	1.01	1.14	0.06	0.09	0.00		Calculated
22	{SD - Phase 1}.PIPE 25	0.01	0 08:00	0.87	0.01	0.57	1.01	0.06	0.08	0.00		Calculated
23	{SD - Phase 1}.PIPE 26	0.56	0 08:33	0.70	0.80	0.81	2.16	1.13	0.57	0.00		Calculated
24	{SD - Phase 1}.PIPE 27	0.64	0 08:01	2.51	0.26	2.60	0.52	0.35	0.35	0.00		Calculated
25	{SD - Phase 1}.PIPE 28	0.12	0 08:01	0.85	0.14	1.77	1.16	0.17	0.25	0.00		Calculated
26	{SD - Phase 1}.PIPE 29	0.34	0 08:00	2.84	0.12	1.70	0.80	0.30	0.30	0.00		Calculated
27	{SD - Phase 1}.PIPE 30	0.16	0 08:00	0.86	0.18	1.90	1.12	0.19	0.29	0.00		Calculated
28	{SD - Phase 1}.PIPE 31	0.27	0 08:01	2.69	0.10	1.88	0.05	0.24	0.24	0.00		Calculated
29	{SD - Phase 1}.PIPE 40	0.00	0 08:15	7.01	0.00	0.11	7.91	0.20	0.20	0.00		Calculated
30	{SD - Phase 1}.PIPE B1	0.05	0 08:01	3.64	0.02	3.74	0.23	0.06	0.09	0.00		Calculated
31	{SD - Phase 1}.PIPE B2	0.03	0 08:01	0.56	0.05	1.47	0.69	0.08	0.15	0.00		Calculated
32	{SD - Phase 1}.PIPE B3	0.03	0 08:00	0.56	0.05	1.42	0.20	0.08	0.16	0.00		Calculated
33	{SD - Phase 1}.PIPE B4	0.03	0 08:00	0.58	0.05	1.50	0.95	0.07	0.15	0.00		Calculated
34	{SD - Phase 1}.PIPE B5	0.05	0 08:01	0.38	0.14	1.38	0.10	0.13	0.26	0.00		Calculated
35	{SD - Phase 1}.PIPE B6	0.03	0 08:00	0.56	0.05	0.88	1.55	0.11	0.22	0.00		Calculated
36	{SD - Phase 1}.PIPE B7	0.03	0 08:00	0.54	0.05	1.37	0.08	0.08	0.16	0.00		Calculated
37	{SD - Phase 1}.PIPE B8	0.03	0 08:00	0.56	0.05	0.88	1.55	0.11	0.22	0.00		Calculated
38	{SD - Phase 1}.PIPE C1	0.05	0 08:01	1.79	0.03	2.27	0.33	0.08	0.12	0.00		Calculated
39	{SD - Phase 1}.PIPE C10	0.03	0 08:00	0.56	0.05	1.42	0.64	0.08	0.16	0.00		Calculated
40	{SD - Phase 1}.PIPE C2	0.03	0 08:00	1.23	0.02	2.46	0.15	0.05	0.11	0.00		Calculated
41	{SD - Phase 1}.PIPE C3	0.03	0 08:00	0.55	0.05	1.73	0.09	0.07	0.14	0.00		Calculated
42	{SD - Phase 1}.PIPE C4	0.03	0 08:00	0.56	0.05	1.47	1.23	0.08	0.15	0.00		Calculated
43	{SD - Phase 1}.PIPE C5	0.05	0 08:01	0.86	0.06	1.33	0.10	0.12	0.17	0.00		Calculated
44	{SD - Phase 1}.PIPE C6	0.03	0 08:00	0.56	0.05	0.97	1.89	0.10	0.20	0.00		Calculated
45	{SD - Phase 1}.PIPE C7	0.03	0 08:00	0.56	0.05	1.42	0.14	0.08	0.16	0.00		Calculated
46	{SD - Phase 1}.PIPE C8	0.03	0 08:01	0.56	0.05	1.46	0.52	0.08	0.15	0.00		Calculated
47	{SD - Phase 1}.PIPE C9	0.03	0 08:00	0.57	0.05	1.41	0.16	0.08	0.16	0.00		Calculated
48	{SD - Phase 1}.PIPE COM01	0.05	0 08:01	1.94	0.02	0.88	0.71	0.14	0.21	0.00		Calculated
49	{SD - Phase 1}.PIPE COM02	0.03	0 08:00	0.56	0.05	0.64	1.29	0.33	0.66	0.00		Calculated
50	{SD - Phase 1}.PIPE COM04	0.03	0 08:00	0.56	0.05	0.33	2.86	0.29	0.57	0.00		Calculated
51	{SD - Phase 1}.PIPE COM05	0.02	0 08:01	0.56	0.04	1.27	0.30	0.07	0.14	0.00		Calculated
52	{SD - Phase 1}.PIPE COM06	0.02	0 08:00	0.49	0.04	1.27	0.78	0.07	0.14	0.00		Calculated
53	{SD - Phase 1}.PIPE COM07	0.02	0 08:00	0.86	0.02	0.72	0.50	0.09	0.13	0.00		Calculated
54	{SD - Phase 1}.PIPE COM08	0.02	0 08:00	0.56	0.03	1.33	0.46	0.06	0.13	0.00		Calculated
55	{SD - Phase 1}.PIPE COM09	0.02	0 08:01	2.25	0.01	0.38	1.53	0.15	0.23	0.00		Calculated
56	{SD - Phase 1}.PIPE COM10	0.01	0 08:00	0.70	0.01	1.26	0.64	0.04	0.08	0.00		Calculated
57	{SD - Phase 1}.PIPE COM11	0.01	0 08:00	0.56	0.02	1.16	1.07	0.05	0.11	0.00		Calculated
58	{SD - Phase 1}.PIPE COM12	0.02	0 08:00	2.36	0.01	1.17	0.23	0.07	0.10	0.00		Calculated
59	{SD - Phase 1}.PIPE COM13	0.02	0 08:00	0.60	0.03	1.41	0.54	0.06	0.13	0.00		Calculated
60	{SD - Phase 1}.PIPE D1	0.05	0 08:01	1.45	0.04	1.10	0.72	0.13	0.20	0.00		Calculated
61	{SD - Phase 1}.PIPE D2	0.05	0 08:01	0.56	0.10	1.80	1.51	0.11	0.21	0.00		Calculated
62	{SD - Phase 1}.PIPE D3	0.06	0 08:00	0.54	0.10	1.63	0.07	0.11	0.23	0.00		Calculated
63	{SD - Phase 1}.PIPE D4	0.05	0 08:01	1.99	0.03	2.45	0.37	0.08	0.12	0.00		Calculated
64	{SD - Phase 1}.PIPE D5	0.03	0 08:00	0.96	0.03	1.73	0.31	0.07	0.14	0.00		Calculated
65	{SD - Phase 1}.PIPE D6	0.03	0 08:00	0.96	0.03	2.08	0.09	0.06	0.12	0.00		Calculated
66	{SD - Phase 1}.PIPE D7	0.03	0 08:00	0.56	0.05	1.45	1.37	0.08	0.15	0.00		Calculated
67	{SD - Phase 1}.PIPE E1	0.08	0 08:02	0.53	0.14	1.86	0.38	0.13	0.26	0.00		Calculated
68	{SD - Phase 1}.PIPE E4	0.04	0 08:01	0.53	0.07	1.53	0.46	0.09	0.18	0.00		Calculated
69	{SD - Phase 1}.PIPE G1	0.05	0 08:01	0.87	0.05	2.28	0.17	0.08	0.16	0.00		Calculated
70	{SD - Phase 1}.PIPE G2	0.05	0 08:00	0.56	0.08	1.88	1.05	0.09	0.18	0.00		Calculated
71	{SD - Phase 1}.PIPE G3	0.04	0 08:01	0.39	0.09	0.95	0.51	0.13	0.25	0.00		Calculated
72	{SD - Phase 1}.PIPE G4	0.04	0 08:00	0.56	0.07	1.59	1.22	0.09	0.17	0.00		Calculated
73	{SD - Phase 1}.PIPE H1	0.05	0 08:01	2.83	0.02	2.83	0.06	0.06	0.09	0.00		Calculated
74	{SD - Phase 1}.PIPE H2	0.05	0 08:01	0.56	0.08	1.65	0.20	0.10	0.20	0.00		Calculated

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
75	{SD - Phase 1}.PIPE H3	0.05	0 08:00	0.56	0.08	1.65	1.08	0.10	0.20	0.00		Calculated
76	{SD - Phase 1}.PIPE H4	0.04	0 08:01	0.88	0.04	2.18	0.19	0.07	0.14	0.00		Calculated
77	{SD - Phase 1}.PIPE H5	0.04	0 08:01	0.56	0.07	1.74	0.14	0.08	0.17	0.00		Calculated
78	{SD - Phase 1}.PIPE H6	0.04	0 08:00	0.56	0.07	1.55	1.21	0.09	0.18	0.00		Calculated
79	{SD - Phase 1}.PIPE RT-1	0.11	1 00:00	3.50	0.03	1.16	0.06	0.36	0.18	0.00		Calculated
80	{SD - Phase 1}.PIPE RT-2	0.06	1 00:00	3.20	0.02	1.10	0.08	1.13	0.56	0.00		Calculated
81	{SD - Phase 1}.PIPE RT-3	0.43	0 08:01	0.63	0.68	0.73	2.93	1.13	0.57	0.00		Calculated
82	{SD - Phase 1}.PIPE WQ#4	0.66	0 08:01	2.52	0.26	2.55	0.26	0.37	0.37	0.00		Calculated
83	{SD - Phase 2}.PIEP CLUB5	0.01	0 08:00	0.56	0.02	1.20	0.59	0.05	0.11	0.00		Calculated
84	{SD - Phase 2}.PIPE 33	0.14	0 08:00	2.50	0.06	1.17	1.62	0.21	0.21	0.00		Calculated
85	{SD - Phase 2}.PIPE 34	0.05	0 08:00	0.86	0.06	1.39	0.89	0.11	0.16	0.00		Calculated
86	{SD - Phase 2}.PIPE 35	0.29	0 08:00	0.81	0.36	0.53	2.45	1.13	0.57	0.00		Calculated
87	{SD - Phase 2}.PIPE 36	0.25	0 08:00	4.71	0.05	3.11	0.36	0.16	0.16	0.00		Calculated
88	{SD - Phase 2}.PIPE 37	0.12	0 08:01	0.85	0.14	1.75	1.13	0.17	0.25	0.00		Calculated
89	{SD - Phase 2}.PIPE 38	0.09	0 08:00	0.85	0.10	1.36	0.88	0.16	0.24	0.00		Calculated
90	{SD - Phase 2}.PIPE A1	0.04	0 08:01	0.84	0.05	0.84	0.45	0.13	0.20	0.00		Calculated
91	{SD - Phase 2}.PIPE A2	0.02	0 08:01	0.56	0.04	1.34	0.41	0.07	0.13	0.00		Calculated
92	{SD - Phase 2}.PIPE A3	0.02	0 08:00	0.56	0.04	1.34	0.98	0.07	0.13	0.00		Calculated
93	{SD - Phase 2}.PIPE A4	0.02	0 08:00	0.56	0.04	1.34	0.91	0.07	0.13	0.00		Calculated
94	{SD - Phase 2}.PIPE A5	0.02	0 08:01	0.56	0.04	1.34	0.44	0.07	0.13	0.00		Calculated
95	{SD - Phase 2}.PIPE CLUB2	0.01	0 08:01	0.56	0.02	1.10	0.51	0.06	0.11	0.00		Calculated
96	{SD - Phase 2}.PIPE CLUB3	0.01	0 08:00	0.56	0.02	1.19	0.57	0.05	0.11	0.00		Calculated
97	{SD - Phase 2}.PIPE CLUB4	0.01	0 08:01	0.58	0.02	1.11	0.48	0.06	0.11	0.00		Calculated
98	{SD - Phase 2}.PIPE E2	0.08	0 08:01	0.56	0.13	1.85	0.32	0.13	0.26	0.00		Calculated
99	{SD - Phase 2}.PIPE E3	0.08	0 08:01	0.56	0.14	1.91	0.62	0.13	0.26	0.00		Calculated
100	{SD - Phase 2}.PIPE E5	0.04	0 08:01	0.57	0.07	1.54	0.34	0.09	0.18	0.00		Calculated
101	{SD - Phase 2}.PIPE E6	0.04	0 08:00	0.56	0.07	1.59	0.63	0.09	0.18	0.00		Calculated
102	{SD - Phase 2}.PIPE E7	0.08	0 08:00	0.56	0.14	1.95	0.94	0.13	0.25	0.00		Calculated
103	{SD - Phase 2}.PIPE F1	0.05	0 08:00	0.56	0.08	0.75	3.37	0.18	0.36	0.00		Calculated
104	{SD - Phase 2}.PIPE F2	0.05	0 08:00	2.16	0.02	4.28	0.07	0.05	0.11	0.00		Calculated
105	{SD - Phase 2}.PIPE F3	0.05	0 08:00	0.56	0.08	2.29	0.70	0.08	0.16	0.00		Calculated
106	PIPE 32	0.11	0 08:00	0.86	0.12	1.70	0.65	0.16	0.24	0.00		Calculated
107	Pipe ADG1	0.00	0 00:00	0.40	0.00	0.00		0.00	0.00	0.00		Calculated
108	PIPE ADH1	0.00	0 00:00	0.46	0.00	0.00		0.00	0.00	0.00		Calculated
109	PIPE CLUB1	0.03	0 08:01	1.68	0.02	1.75	0.34	0.06	0.09	0.00		Calculated
110	PIPE WQ#1	0.59	0 08:01	0.83	0.71	2.53	0.04	0.42	0.63	0.00		Calculated
111	PIPE WQ#2	0.15	0 08:00	20.13	0.01	6.78	0.01	0.34	0.34	0.00		Calculated
112	PIPE WQ#3	0.38	0 08:01	10.67	0.04	5.31	0.02	0.36	0.36	0.00		Calculated
113	PIPE WQ#4	0.66	0 08:01	2.81	0.24	2.70	0.25	0.35	0.35	0.00		Calculated
114	PIPE WQ#5	0.64	0 08:01	5.03	0.13	4.13	0.18	0.25	0.25	0.00		Calculated

Storage Nodes

Storage Node : R-TANK 1

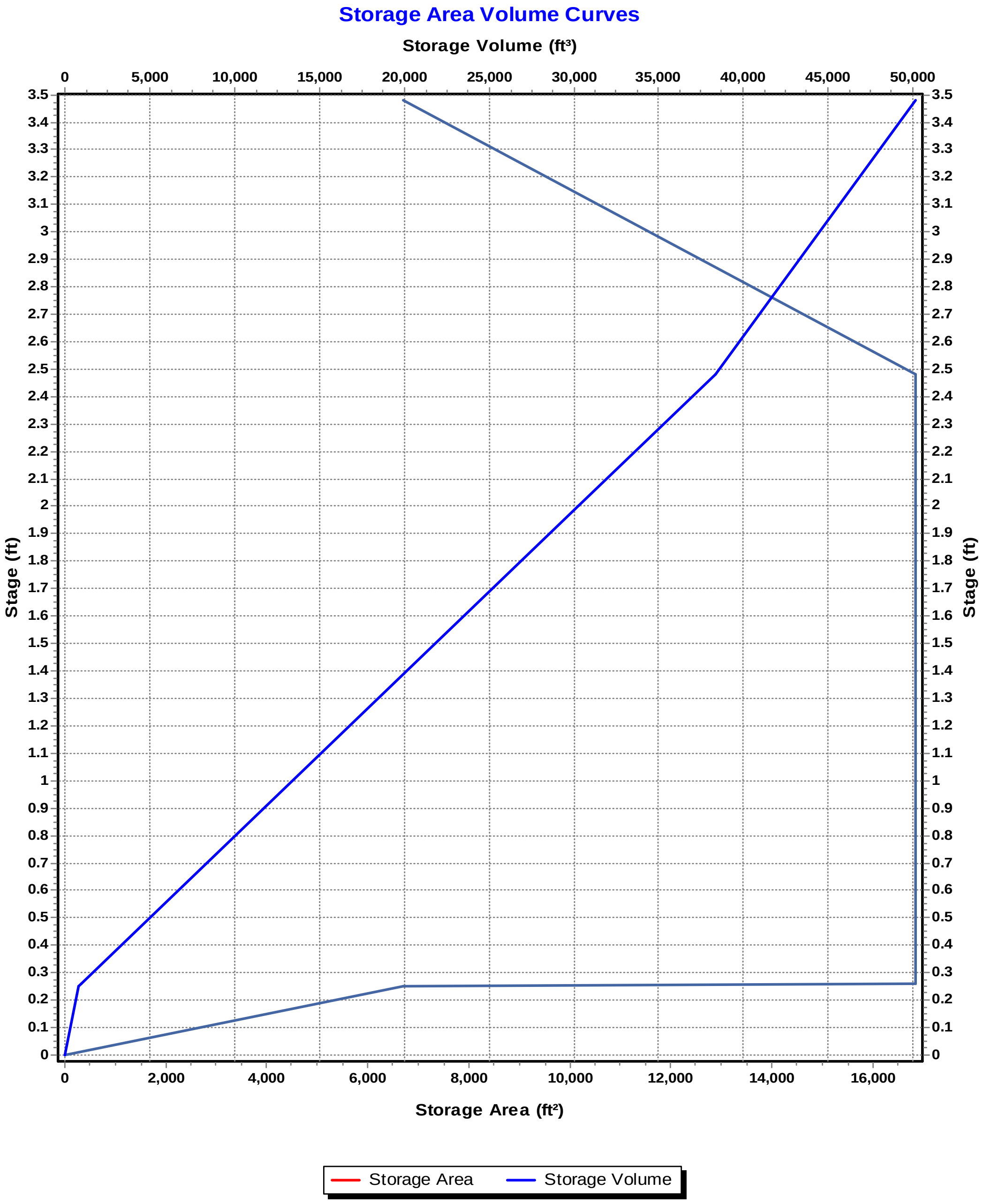
Input Data

Invert Elevation (ft)	66.90
Max (Rim) Elevation (ft)	70.88
Max (Rim) Offset (ft)	3.98
Initial Water Elevation (ft)	67.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R-TANK 1

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	6712	839
0.26	16850	956.81
2	16850	30275.81
2.48	16850	38363.81
3.48	6712	50144.81


Storage Area Volume Curves
Storage Volume (ft³)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
Stage (ft)
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Stage (ft)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : R-TANK 1 (continued)

Output Summary Results

Peak Inflow (cfs)	0.63
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.11
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	67.76
Max HGL Depth Attained (ft)	0.86
Average HGL Elevation Attained (ft)	67.64
Average HGL Depth Attained (ft)	0.74
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft^3)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : R-TANK 2

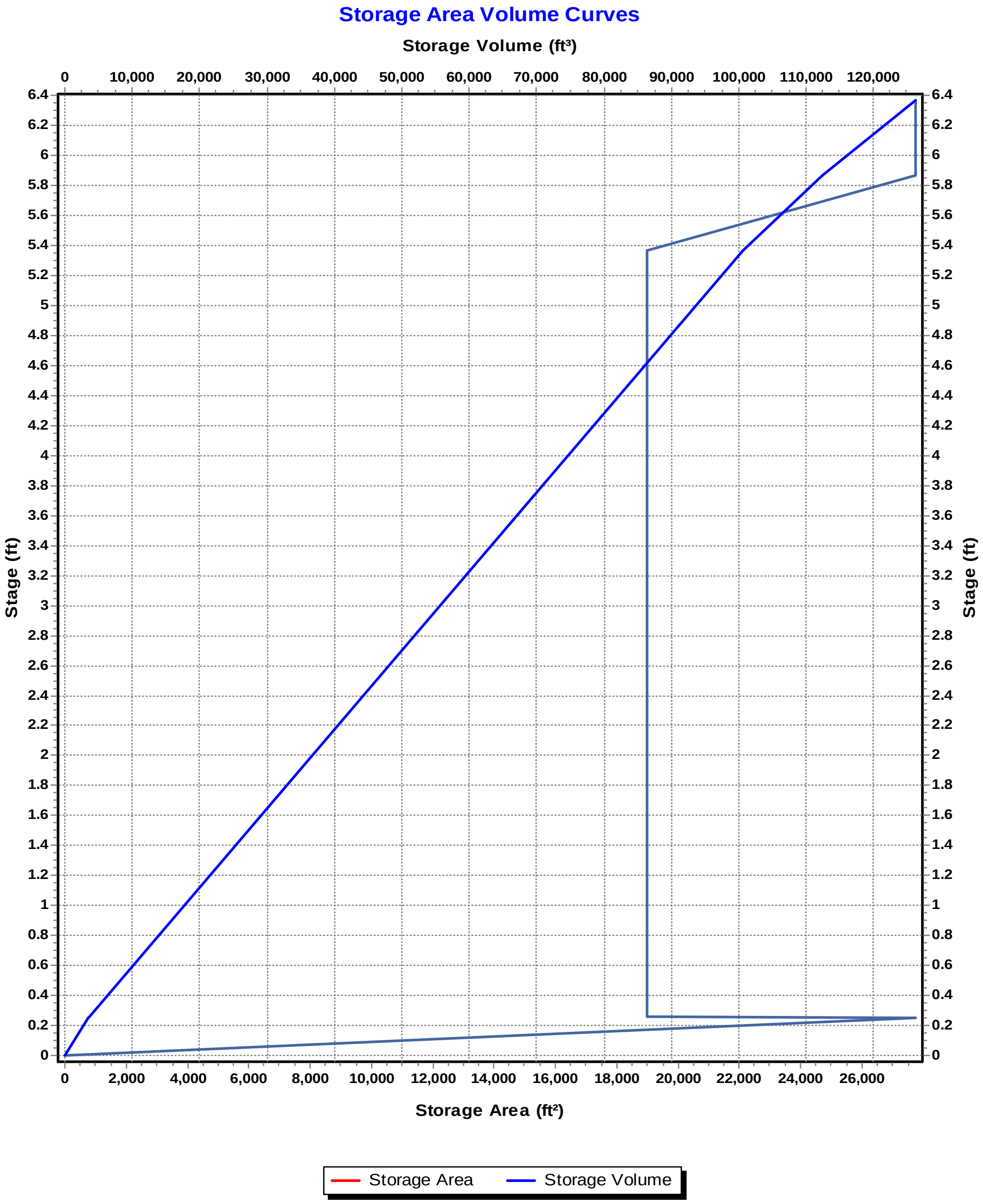
Input Data

Invert Elevation (ft)	67.90
Max (Rim) Elevation (ft)	74.77
Max (Rim) Offset (ft)	6.87
Initial Water Elevation (ft)	68.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R TANK 2

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	27750	3468.75
0.26	18980	3702.4
5.37	18980	100690.2
5.87	27750	112372.7
6.37	27750	126247.7


Storage Area Volume Curves
Storage Volume (ft³)
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
Stage (ft)
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Stage (ft)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : R-TANK 2 (continued)

Output Summary Results

```
Peak Inflow (cfs) .......................................................... 1.44
Peak Lateral Inflow (cfs) ............................................. 0
Peak Outflow (cfs) ...................................................... 0.06
Peak Exfiltration Flow Rate (cfm) ................................ 0
Max HGL Elevation Attained (ft) .................................. 69.53
Max HGL Depth Attained (ft) ....................................... 1.63
Average HGL Elevation Attained (ft) ............................ 69.03
Average HGL Depth Attained (ft) ................................. 1.13
Time of Max HGL Occurrence (days hh:mm) ............... 1  00:00
Total Exfiltration Volume (1000-ft³) ............................. 0
Total Flooded Volume (ac-in) ...................................... 0
Total Time Flooded (min) ............................................ 0
Total Retention Time (sec) .......................................... 0
```

Storage Node : R-TANK 3

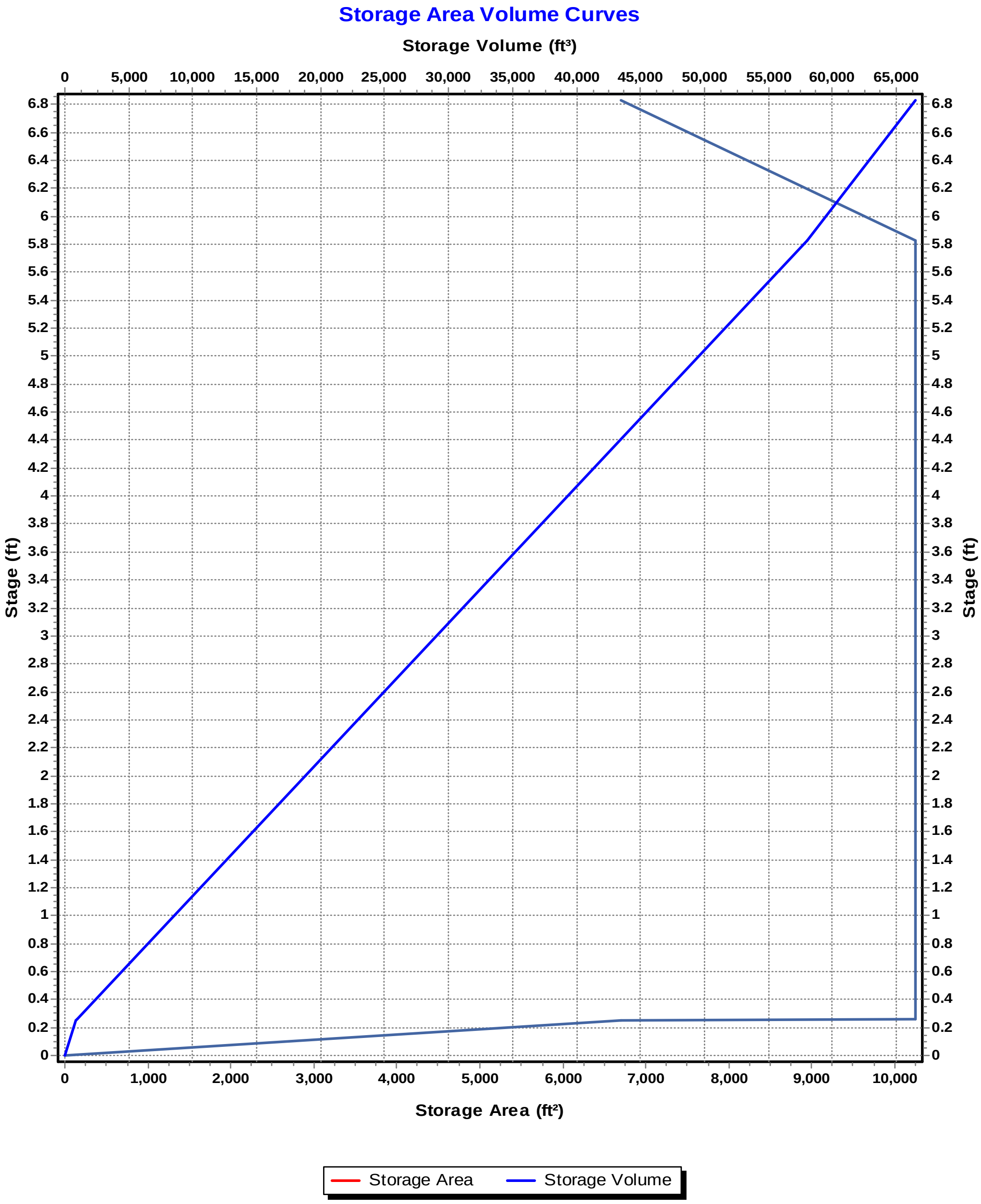
Input Data

Invert Elevation (ft)	67.90
Max (Rim) Elevation (ft)	74.77
Max (Rim) Offset (ft)	6.87
Initial Water Elevation (ft)	68.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R TANK 3

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	6708	838.5
0.26	10250	923.29
5.83	10250	58015.79
6.83	6708	66494.79


Storage Area Volume Curves
Storage Volume (ft³)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
60,000
65,000
Stage (ft)
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Storage Area (ft²)
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
Storage Area
Storage Volume

Storage Node : R-TANK 3 (continued)

Output Summary Results

Peak Inflow (cfs)	1.1
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.31
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	69.53
Max HGL Depth Attained (ft)	1.63
Average HGL Elevation Attained (ft)	69.07
Average HGL Depth Attained (ft)	1.17
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name	20231115 Conveyance Calc.SPF
Description	Q:\2023\2230752\10_CIV\CAD_2230752-W-SD.dwg

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Santa Barbara UH
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	3
Subbasins	63
Nodes	117
Junctions	113
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	3
Links	116
Channels	0
Pipes	114
Pumps	0
Orifices	0
Weirs	0
Outlets	2
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-yr	Time Series	10-yr	Intensity	inches	Washington	Pierce	10.00	2.90	SCS Type IA 24-hr
2	25-yr	Time Series	25-yr	Intensity	inches	Washington	Pierce	25.00	3.50	SCS Type IA 24-hr
3	2-yr	Time Series	2-yr	Intensity	inches	Washington	Pierce	2.00	2.05	SCS Type IA 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	BLDG A_NORTH	0.05	100.00	98.00	76.00	2.87	2.64	0.12	0.03	0 00:05:00
2	BLDG A_SOUTH	0.05	100.00	98.00	76.00	2.87	2.64	0.12	0.03	0 00:05:00
3	BLDG B_NE	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
4	BLDG B_NW	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
5	BLDG B_SE	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
6	BLDG B_SW	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
7	BLDG C_NE	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
8	BLDG C_NW	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
9	BLDG C_SE	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
10	BLDG C_SW	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
11	BLDG CLUB_EAST	0.03	100.00	98.00	76.00	2.87	2.64	0.08	0.02	0 00:05:00
12	BLDG CLUB_WEST	0.03	100.00	98.00	76.00	2.87	2.64	0.08	0.02	0 00:05:00
13	BLDG D_NE	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
14	BLDG D_NW	0.06	100.00	98.00	76.00	2.87	2.64	0.16	0.04	0 00:05:00
15	BLDG D_SOUTH	0.12	100.00	98.00	76.00	2.87	2.64	0.31	0.08	0 00:05:00
16	BLDG E_EAST	0.08	100.00	98.00	76.00	2.87	2.64	0.21	0.06	0 00:05:00
17	BLDG E_WEST	0.16	100.00	98.00	76.00	2.87	2.64	0.43	0.11	0 00:05:00
18	BLDG F_EAST	0.10	100.00	98.00	76.00	2.87	2.64	0.27	0.07	0 00:05:00
19	BLDG F_WEST	0.10	100.00	98.00	76.00	2.87	2.64	0.27	0.07	0 00:05:00
20	BLDG G_EAST	0.08	100.00	98.00	76.00	2.87	2.64	0.21	0.05	0 00:05:00
21	BLDG G_WEST	0.10	100.00	98.00	76.00	2.87	2.64	0.26	0.07	0 00:05:00
22	BLDG H_EAST	0.10	100.00	98.00	76.00	2.87	2.64	0.26	0.07	0 00:05:00
23	BLDG H_WEST	0.08	100.00	98.00	76.00	2.87	2.64	0.21	0.06	0 00:05:00
24	BLDG T.I. EAST	0.05	100.00	98.00	76.00	2.87	2.64	0.12	0.03	0 00:05:00
25	BLDG T.I. NE	0.02	100.00	98.00	76.00	2.87	2.64	0.06	0.01	0 00:05:00
26	BLDG T.I. NW	0.04	100.00	98.00	76.00	2.87	2.64	0.11	0.03	0 00:05:00
27	BLDG T.I. SE	0.03	100.00	98.00	76.00	2.87	2.64	0.08	0.02	0 00:05:00
28	BLDG T.I. SW	0.04	100.00	98.00	76.00	2.87	2.64	0.12	0.03	0 00:05:00
29	BLDG T.I. WEST	0.06	100.00	98.00	76.00	2.87	2.64	0.15	0.04	0 00:05:00
30	SDCB 02	0.22	98.00	98.00	76.00	2.87	2.61	0.57	0.15	0 00:05:00
31	SDCB 03	0.13	100.00	98.00	76.00	2.87	2.64	0.34	0.09	0 00:05:00
32	SDCB 04	0.06	73.00	98.00	76.00	2.87	2.18	0.14	0.03	0 00:05:00
33	SDCB 05	0.24	90.00	98.00	76.00	2.87	2.47	0.59	0.15	0 00:05:00
34	SDCB 06	0.16	65.00	98.00	76.00	2.87	2.05	0.32	0.08	0 00:05:00
35	SDCB 07	0.09	64.00	98.00	76.00	2.87	2.03	0.19	0.05	0 00:05:00
36	SDCB 08	0.05	100.00	98.00	76.00	2.87	2.64	0.12	0.03	0 00:05:00
37	SDCB 09	0.25	82.00	98.00	76.00	2.87	2.34	0.59	0.15	0 00:05:00
38	SDCB 11	0.10	91.00	98.00	76.00	2.87	2.49	0.25	0.06	0 00:05:00
39	SDCB 12	0.10	99.00	98.00	76.00	2.87	2.63	0.27	0.07	0 00:05:00
40	SDCB 13	0.13	94.00	98.00	76.00	2.87	2.54	0.33	0.09	0 00:05:00
41	SDCB 14	0.22	68.00	98.00	76.00	2.87	2.10	0.46	0.11	0 00:05:00
42	SDCB 15	0.13	88.00	98.00	76.00	2.87	2.44	0.30	0.08	0 00:05:00
43	SDCB 16	0.14	65.00	98.00	76.00	2.87	2.05	0.29	0.07	0 00:05:00
44	SDCB 17	0.10	92.00	98.00	76.00	2.87	2.51	0.26	0.07	0 00:05:00
45	SDCB 19	0.46	78.00	98.00	76.00	2.87	2.27	1.04	0.26	0 00:05:00
46	SDCB 20	0.11	79.00	98.00	76.00	2.87	2.29	0.26	0.06	0 00:05:00
47	SDCB 21	0.09	93.00	98.00	76.00	2.87	2.52	0.22	0.06	0 00:05:00
48	SDCB 22	0.20	82.00	98.00	76.00	2.87	2.34	0.46	0.12	0 00:05:00
49	SDCB 23	0.20	86.00	98.00	76.00	2.87	2.41	0.48	0.12	0 00:05:00
50	SDCB 24	0.02	85.00	98.00	76.00	2.87	2.39	0.05	0.01	0 00:05:00
51	SDCB 25	0.03	65.00	98.00	76.00	2.87	2.05	0.05	0.01	0 00:05:00
52	SDCB 27	0.49	76.00	98.00	76.00	2.87	2.23	1.09	0.27	0 00:05:00
53	SDCB 28	0.20	73.00	98.00	76.00	2.87	2.18	0.43	0.11	0 00:05:00
54	SDCB 29	0.20	79.00	98.00	76.00	2.87	2.29	0.46	0.12	0 00:05:00
55	SDCB 30	0.43	77.00	98.00	76.00	2.87	2.25	0.96	0.24	0 00:05:00
56	SDCB 31	0.52	26.00	98.00	76.00	2.87	1.38	0.72	0.16	0 00:05:00
57	SDCB 32	0.19	73.00	98.00	76.00	2.87	2.18	0.41	0.10	0 00:05:00
58	SDCB 33	0.23	83.00	98.00	76.00	2.87	2.35	0.54	0.14	0 00:05:00
59	SDCB 34	0.14	76.00	98.00	76.00	2.87	2.23	0.31	0.08	0 00:05:00
60	SDCB 36	0.36	79.00	98.00	76.00	2.87	2.29	0.81	0.20	0 00:05:00
61	SDCB 37	0.07	96.00	98.00	76.00	2.87	2.58	0.19	0.05	0 00:05:00
62	SDCB 38	0.25	72.00	98.00	76.00	2.87	2.17	0.54	0.13	0 00:05:00
63	SDCB 40	0.11	0.00	98.00	76.00	2.87	0.93	0.10	0.02	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AREA DRAIN G1	Junction	73.07	77.13	0.00	0.00	0.00	0.00	73.07	0.00	4.06	0 00:00	0.00	0.00
2	AREA DRAIN H1	Junction	72.33	77.10	0.00	0.00	0.00	0.00	72.33	0.00	4.77	0 00:00	0.00	0.00
3	SDCB#01	Junction	66.90	74.84	67.40	0.00	0.00	0.12	67.98	0.00	6.86	0 00:00	0.00	0.00
4	SDCB#02	Junction	69.50	72.40	0.00	0.00	0.00	0.36	69.76	0.00	2.64	0 00:00	0.00	0.00
5	SDCB#03	Junction	69.86	72.19	0.00	0.00	0.00	0.15	70.06	0.00	2.13	0 00:00	0.00	0.00
6	SDCB#04	Junction	70.14	72.64	0.00	0.00	0.00	0.06	70.27	0.00	2.37	0 00:00	0.00	0.00
7	SDCB#05	Junction	68.96	72.11	0.00	0.00	0.00	0.55	69.27	0.00	2.84	0 00:00	0.00	0.00
8	SDCB#06	Junction	68.72	73.03	0.00	0.00	0.00	0.18	69.15	0.00	3.88	0 00:00	0.00	0.00
9	SDCB#07	Junction	69.08	71.79	0.00	0.00	0.00	0.11	69.24	0.00	2.55	0 00:00	0.00	0.00
10	SDCB#08	Junction	69.55	72.45	0.00	0.00	0.00	0.06	69.65	0.00	2.80	0 00:00	0.00	0.00
11	SDCB#09	Junction	68.51	72.35	0.00	0.00	0.00	0.87	69.13	0.00	3.22	0 00:00	0.00	0.00
12	SDCB#10	Junction	67.90	76.96	68.40	0.00	0.00	0.08	70.14	0.00	6.82	0 00:00	0.00	0.00
13	SDCB#11	Junction	73.48	76.58	0.00	0.00	0.00	0.22	73.61	0.00	2.97	0 00:00	0.00	0.00
14	SDCB#12	Junction	73.83	76.54	0.00	0.00	0.00	0.07	73.96	0.00	2.58	0 00:00	0.00	0.00
15	SDCB#13	Junction	73.87	76.58	0.00	0.00	0.00	0.08	74.02	0.00	2.56	0 00:00	0.00	0.00
16	SDCB#14	Junction	71.89	76.31	0.00	0.00	0.00	0.43	72.20	0.00	4.11	0 00:00	0.00	0.00
17	SDCB#15	Junction	71.68	76.25	0.00	0.00	0.00	0.56	72.08	0.00	4.17	0 00:00	0.00	0.00
18	SDCB#16	Junction	72.23	76.36	0.00	0.00	0.00	0.25	72.44	0.00	3.92	0 00:00	0.00	0.00
19	SDCB#17	Junction	72.75	76.55	0.00	0.00	0.00	0.12	72.93	0.00	3.62	0 00:00	0.00	0.00
20	SDCB#18	Junction	68.40	76.69	0.00	0.00	0.00	1.64	70.14	0.00	6.55	0 00:00	0.00	0.00
21	SDCB#19	Junction	70.35	75.25	0.00	0.00	0.00	0.99	70.82	0.00	4.43	0 00:00	0.00	0.00
22	SDCB#20	Junction	70.98	75.25	0.00	0.00	0.00	0.74	71.35	0.00	3.90	0 00:00	0.00	0.00
23	SDCB#21	Junction	71.81	75.25	0.00	0.00	0.00	0.06	71.91	0.00	3.34	0 00:00	0.00	0.00
24	SDCB#22	Junction	71.36	75.25	0.00	0.00	0.00	0.62	71.72	0.00	3.53	0 00:00	0.00	0.00
25	SDCB#23	Junction	71.93	75.25	0.00	0.00	0.00	0.36	72.18	0.00	3.07	0 00:00	0.00	0.00
26	SDCB#24	Junction	72.61	75.25	0.00	0.00	0.00	0.03	72.69	0.00	2.56	0 00:00	0.00	0.00
27	SDCB#25	Junction	72.79	75.25	0.00	0.00	0.00	0.01	72.85	0.00	2.40	0 00:00	0.00	0.00
28	SDCB#26	Junction	68.40	76.79	0.00	0.00	0.00	0.98	70.14	0.00	6.65	0 00:00	0.00	0.00
29	SDCB#27	Junction	71.20	75.25	0.00	0.00	0.00	0.98	71.67	0.00	3.58	0 00:00	0.00	0.00
30	SDCB#28	Junction	72.15	75.25	0.00	0.00	0.00	0.19	72.37	0.00	2.88	0 00:00	0.00	0.00
31	SDCB#29	Junction	71.72	75.40	0.00	0.00	0.00	0.51	72.01	0.00	3.39	0 00:00	0.00	0.00
32	SDCB#30	Junction	72.69	75.40	0.00	0.00	0.00	0.24	72.94	0.00	2.46	0 00:00	0.00	0.00
33	SDCB#31	Junction	70.25	77.16	0.00	0.00	0.00	0.44	70.59	0.00	6.57	0 00:00	0.00	0.00
34	SDCB#32	Junction	72.60	75.25	0.00	0.00	0.00	0.16	72.81	0.00	2.44	0 00:00	0.00	0.00
35	SDCB#33	Junction	70.81	75.25	0.00	0.00	0.00	0.21	71.01	0.00	4.24	0 00:00	0.00	0.00
36	SDCB#34	Junction	71.52	75.25	0.00	0.00	0.00	0.08	71.66	0.00	3.59	0 00:00	0.00	0.00
37	SDCB#35	Junction	68.40	77.00	0.00	0.00	0.00	0.45	70.14	0.00	6.86	0 00:00	0.00	0.00
38	SDCB#36	Junction	70.59	75.26	0.00	0.00	0.00	0.38	70.79	0.00	4.47	0 00:00	0.00	0.00
39	SDCB#37	Junction	71.52	75.67	0.00	0.00	0.00	0.18	71.74	0.00	3.93	0 00:00	0.00	0.00
40	SDCB#38	Junction	71.88	75.26	0.00	0.00	0.00	0.13	72.06	0.00	3.20	0 00:00	0.00	0.00
41	SDCB#40	Junction	73.22	76.27	0.00	0.00	0.00	0.02	73.26	0.00	3.01	0 00:00	0.00	0.00
42	SDCO#A1	Junction	72.71	76.38	0.00	0.00	0.00	0.06	72.83	0.00	3.55	0 00:00	0.00	0.00
43	SDCO#A2	Junction	73.21	76.54	0.00	0.00	0.00	0.03	73.29	0.00	3.25	0 00:00	0.00	0.00
44	SDCO#A3	Junction	74.00	75.03	0.00	0.00	0.00	0.03	74.08	0.00	0.95	0 00:00	0.00	0.00
45	SDCO#A4	Junction	73.96	75.89	0.00	0.00	0.00	0.03	74.04	0.00	1.85	0 00:00	0.00	0.00
46	SDCO#A5	Junction	73.23	76.82	0.00	0.00	0.00	0.03	73.31	0.00	3.51	0 00:00	0.00	0.00
47	SDCO#B1	Junction	74.33	78.08	0.00	0.00	0.00	0.08	74.40	0.00	3.68	0 00:00	0.00	0.00
48	SDCO#B2	Junction	75.11	77.80	0.00	0.00	0.00	0.04	75.20	0.00	2.60	0 00:00	0.00	0.00
49	SDCO#B3	Junction	75.28	77.92	0.00	0.00	0.00	0.04	75.38	0.00	2.54	0 00:00	0.00	0.00
50	SDCO#B4	Junction	75.41	77.95	0.00	0.00	0.00	0.04	75.50	0.00	2.45	0 00:00	0.00	0.00
51	SDCO#B5	Junction	71.99	78.08	0.00	0.00	0.00	0.08	72.16	0.00	5.92	0 00:00	0.00	0.00
52	SDCO#B6	Junction	72.81	78.02	0.00	0.00	0.00	0.04	72.90	0.00	5.12	0 00:00	0.00	0.00
53	SDCO#B7	Junction	72.87	77.95	0.00	0.00	0.00	0.04	72.97	0.00	4.98	0 00:00	0.00	0.00
54	SDCO#B8	Junction	72.81	78.02	0.00	0.00	0.00	0.04	72.90	0.00	5.12	0 00:00	0.00	0.00
55	SDCO#C1	Junction	72.21	76.85	0.00	0.00	0.00	0.08	73.14	0.00	3.71	0 00:00	0.00	0.00
56	SDCO#C10	Junction	72.74	76.81	0.00	0.00	0.00	0.04	72.97	0.00	3.84	0 00:00	0.00	0.00
57	SDCO#C2	Junction	74.28	76.87	0.00	0.00	0.00	0.04	74.34	0.00	2.53	0 00:00	0.00	0.00
58	SDCO#C3	Junction	74.37	76.91	0.00	0.00	0.00	0.04	74.47	0.00	2.44	0 00:00	0.00	0.00
59	SDCO#C4	Junction	74.29	76.83	0.00	0.00	0.00	0.04	74.38	0.00	2.45	0 00:00	0.00	0.00
60	SDCO#C5	Junction	71.44	76.97	0.00	0.00	0.00	0.08	71.59	0.00	5.38	0 00:00	0.00	0.00
61	SDCO#C6	Junction	72.54	77.11	0.00	0.00	0.00	0.04	72.63	0.00	4.48	0 00:00	0.00	0.00
62	SDCO#C7	Junction	72.66	76.99	0.00	0.00	0.00	0.04	72.76	0.00	4.23	0 00:00	0.00	0.00
63	SDCO#C8	Junction	72.19	76.97	0.00	0.00	0.00	0.04	72.28	0.00	4.69	0 00:00	0.00	0.00
64	SDCO#C9	Junction	72.19	76.88	0.00	0.00	0.00	0.04	72.43	0.00	4.45	0 00:00	0.00	0.00
65	SDCO#CLUB1	Junction	72.38	76.33	0.00	0.00	0.00	0.04	72.45	0.00	3.88	0 00:00	0.00	0.00
66	SDCO#CLUB2	Junction	72.72	76.59	0.00	0.00	0.00	0.02	72.78	0.00	3.81	0 00:00	0.00	0.00
67	SDCO#CLUB3	Junction	73.13	76.45	0.00	0.00	0.00	0.02	73.20	0.00	3.25	0 00:00	0.00	0.00
68	SDCO#CLUB4	Junction	72.72	76.62	0.00	0.00	0.00	0.02	72.78	0.00	3.84	0 00:00	0.00	0.00
69	SDCO#CLUB5	Junction	73.15	76.43	0.00	0.00	0.00	0.02	73.22	0.00	3.21	0 00:00	0.00	0.00
70	SDCO#COM01	Junction	70.05	73.56	0.00	0.00	0.00	0.04	70.88	0.00	2.68	0 00:00	0.00	0.00
71	SDCO#COM02	Junction	70.70	73.51	0.00	0.00	0.00	0.04	70.89	0.00	2.62	0 00:00	0.00	0.00
72	SDCO#COM04	Junction	70.78	73.59	0.00	0.00	0.00	0.07	70.87	0.00	2.72	0 00:00	0.00	0.00
73	SDCO#COM05	Junction	71.01	73.62	0.00	0.00	0.00	0.03	71.09	0.00	2.53	0 00:00	0.00	0.00
74	SDCO#COM06	Junction	71.60	73.47	0.00	0.00	0.00	0.03	71.69	0.00	1.78	0 00:00	0.00	0.00

Node Summary

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Ponded Area	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(ft²)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
75	SDCO#COM07	Junction	70.25	73.18	0.00	0.00	0.00	0.03	70.33	0.00	2.85	0 00:00	0.00	0.00
76	SDCO#COM08	Junction	70.78	73.55	0.00	0.00	0.00	0.03	70.86	0.00	2.69	0 00:00	0.00	0.00
77	SDCO#COM09	Junction	70.17	73.63	0.00	0.00	0.00	0.03	70.23	0.00	3.40	0 00:00	0.00	0.00
78	SDCO#COM10	Junction	71.09	73.63	0.00	0.00	0.00	0.01	71.14	0.00	2.49	0 00:00	0.00	0.00
79	SDCO#COM11	Junction	71.09	73.63	0.00	0.00	0.00	0.02	71.15	0.00	2.48	0 00:00	0.00	0.00
80	SDCO#COM12	Junction	70.17	72.88	0.00	0.00	0.00	0.03	70.22	0.00	2.66	0 00:00	0.00	0.00
81	SDCO#COM13	Junction	70.87	73.41	0.00	0.00	0.00	0.03	70.95	0.00	2.46	0 00:00	0.00	0.00
82	SDCO#D1	Junction	72.84	77.30	0.00	0.00	0.00	0.08	72.95	0.00	4.35	0 00:00	0.00	0.00
83	SDCO#D2	Junction	74.65	77.29	0.00	0.00	0.00	0.08	74.78	0.00	2.51	0 00:00	0.00	0.00
84	SDCO#D3	Junction	74.71	77.29	0.00	0.00	0.00	0.08	74.86	0.00	2.43	0 00:00	0.00	0.00
85	SDCO#D4	Junction	73.53	77.46	0.00	0.00	0.00	0.08	73.62	0.00	3.84	0 00:00	0.00	0.00
86	SDCO#D5	Junction	74.47	77.03	0.00	0.00	0.00	0.04	74.54	0.00	2.49	0 00:00	0.00	0.00
87	SDCO#D6	Junction	74.79	77.33	0.00	0.00	0.00	0.04	74.86	0.00	2.47	0 00:00	0.00	0.00
88	SDCO#D7	Junction	74.72	77.28	0.00	0.00	0.00	0.04	74.81	0.00	2.47	0 00:00	0.00	0.00
89	SDCO#E1	Junction	72.07	76.54	0.00	0.00	0.00	0.11	72.23	0.00	4.31	0 00:00	0.00	0.00
90	SDCO#E2	Junction	72.43	76.80	0.00	0.00	0.00	0.11	72.59	0.00	4.21	0 00:00	0.00	0.00
91	SDCO#E3	Junction	73.14	76.57	0.00	0.00	0.00	0.11	73.29	0.00	3.28	0 00:00	0.00	0.00
92	SDCO#E4	Junction	72.64	76.50	0.00	0.00	0.00	0.05	72.75	0.00	3.75	0 00:00	0.00	0.00
93	SDCO#E5	Junction	72.96	76.75	0.00	0.00	0.00	0.05	73.07	0.00	3.68	0 00:00	0.00	0.00
94	SDCO#E6	Junction	73.56	76.50	0.00	0.00	0.00	0.06	73.67	0.00	2.83	0 00:00	0.00	0.00
95	SDCO#E7	Junction	74.24	76.76	0.00	0.00	0.00	0.11	74.39	0.00	2.37	0 00:00	0.00	0.00
96	SDCO#F1	Junction	71.77	77.26	0.00	0.00	0.00	0.07	71.89	0.00	5.37	0 00:00	0.00	0.00
97	SDCO#F2	Junction	72.50	76.98	0.00	0.00	0.00	0.07	72.56	0.00	4.42	0 00:00	0.00	0.00
98	SDCO#F3	Junction	73.46	77.21	0.00	0.00	0.00	0.07	73.59	0.00	3.62	0 00:00	0.00	0.00
99	SDCO#G1	Junction	73.29	77.07	0.00	0.00	0.00	0.07	73.39	0.00	3.68	0 00:00	0.00	0.00
100	SDCO#G2	Junction	74.47	77.01	0.00	0.00	0.00	0.07	74.59	0.00	2.42	0 00:00	0.00	0.00
101	SDCO#G3	Junction	72.89	77.15	0.00	0.00	0.00	0.05	73.01	0.00	4.14	0 00:00	0.00	0.00
102	SDCO#G4	Junction	74.22	76.76	0.00	0.00	0.00	0.05	74.33	0.00	2.43	0 00:00	0.00	0.00
103	SDCO#H1	Junction	72.76	77.10	0.00	0.00	0.00	0.07	72.84	0.00	4.26	0 00:00	0.00	0.00
104	SDCO#H2	Junction	73.13	77.02	0.00	0.00	0.00	0.07	73.25	0.00	3.77	0 00:00	0.00	0.00
105	SDCO#H3	Junction	74.20	76.74	0.00	0.00	0.00	0.07	74.32	0.00	2.42	0 00:00	0.00	0.00
106	SDCO#H4	Junction	72.79	77.00	0.00	0.00	0.00	0.05	72.88	0.00	4.12	0 00:00	0.00	0.00
107	SDCO#H5	Junction	72.94	75.70	0.00	0.00	0.00	0.05	73.05	0.00	2.65	0 00:00	0.00	0.00
108	SDCO#H6	Junction	74.06	76.59	0.00	0.00	0.00	0.06	74.17	0.00	2.42	0 00:00	0.00	0.00
109	WQ#1	Junction	67.90	73.16	0.00	0.00	0.00	0.87	68.53	0.00	4.63	0 00:00	0.00	0.00
110	WQ#2	Junction	70.66	76.71	0.00	0.00	0.00	0.22	70.75	0.00	5.96	0 00:00	0.00	0.00
111	WQ#3	Junction	69.48	76.48	0.00	0.00	0.00	0.56	70.15	0.00	6.33	0 00:00	0.00	0.00
112	WQ#4	Junction	69.60	76.07	0.00	0.00	0.00	0.99	70.14	0.00	5.93	0 00:00	0.00	0.00
113	WQ#5	Junction	70.30	76.23	0.00	0.00	0.00	0.98	70.63	0.00	5.60	0 00:00	0.00	0.00
114	TRENCH INLET	Outfall	67.32					0.12	67.32					
115	R-TANK 1	Storage Node	66.90	70.88	67.40		0.00	0.92	67.98				0.00	0.00
116	R-TANK 2	Storage Node	67.90	74.77	68.40		0.00	2.31	70.14				0.00	0.00
117	R-TANK 3	Storage Node	67.90	74.77	68.40		0.00	1.51	70.14				0.00	0.00

10-yr HGL for R-Tanks

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	{SD - Phase 1}.PIPE 02	Pipe	SDCB#02	SDCB#05	108.10	69.50	68.96	0.5000	12.000	0.0130	0.36	2.52	0.14	1.96	0.29	0.29	0.00	Calculated
2	{SD - Phase 1}.PIPE 03	Pipe	SDCB#03	SDCB#02	71.71	69.86	69.50	0.5000	8.000	0.0150	0.15	0.74	0.20	1.40	0.23	0.34	0.00	Calculated
3	{SD - Phase 1}.PIPE 04	Pipe	SDCB#04	SDCB#03	55.25	70.14	69.86	0.5100	8.004	0.0150	0.06	0.75	0.08	0.91	0.17	0.25	0.00	Calculated
4	{SD - Phase 1}.PIPE 05	Pipe	SDCB#05	SDCB#09	89.22	68.96	68.51	0.5000	12.000	0.0130	0.54	2.53	0.22	1.51	0.47	0.47	0.00	Calculated
5	{SD - Phase 1}.PIPE 06	Pipe	SDCB#06	SDCB#09	42.41	68.72	68.51	0.5000	8.004	0.0130	0.18	0.85	0.21	0.67	0.53	0.79	0.00	Calculated
6	{SD - Phase 1}.PIPE 07	Pipe	SDCB#07	SDCB#06	72.15	69.08	68.72	0.5000	8.000	0.0130	0.11	0.85	0.12	1.02	0.29	0.44	0.00	Calculated
7	{SD - Phase 1}.PIPE 08	Pipe	SDCB#08	SDCB#07	49.14	69.55	69.08	0.9600	8.004	0.0130	0.06	1.18	0.05	1.27	0.13	0.20	0.00	Calculated
8	{SD - Phase 1}.PIPE 09	Pipe	SDCB#09	WQ#1	21.39	68.51	68.40	0.5100	8.000	0.0130	0.87	0.87	1.00	2.90	0.53	0.80	0.00	> CAPACITY
9	{SD - Phase 1}.PIPE 11	Pipe	SDCB#11	WQ#2	5.71	73.48	72.83	11.3800	8.000	0.0130	0.22	4.08	0.05	5.22	0.12	0.18	0.00	Calculated
10	{SD - Phase 1}.PIPE 12	Pipe	SDCB#12	SDCB#11	64.20	73.83	73.48	0.5500	8.004	0.0130	0.07	0.89	0.08	1.45	0.13	0.19	0.00	Calculated
11	{SD - Phase 1}.PIPE 13	Pipe	SDCB#13	SDCB#11	78.00	73.87	73.48	0.5000	8.004	0.0130	0.08	0.86	0.10	1.60	0.14	0.21	0.00	Calculated
12	{SD - Phase 1}.PIPE 14	Pipe	SDCB#14	SDCB#15	42.96	71.89	71.68	0.4900	12.000	0.0130	0.43	2.49	0.17	1.75	0.35	0.35	0.00	Calculated
13	{SD - Phase 1}.PIPE 15	Pipe	SDCB#15	WQ#3	6.67	71.68	71.65	0.4500	12.000	0.0130	0.56	2.39	0.23	2.26	0.35	0.35	0.00	Calculated
14	{SD - Phase 1}.PIPE 16	Pipe	SDCB#16	SDCB#14	67.53	72.23	71.89	0.5000	12.000	0.0130	0.25	2.53	0.10	1.57	0.26	0.26	0.00	Calculated
15	{SD - Phase 1}.PIPE 17	Pipe	SDCB#17	SDCB#16	36.65	72.75	72.57	0.4900	8.004	0.0130	0.12	0.85	0.14	1.70	0.17	0.25	0.00	Calculated
16	{SD - Phase 1}.PIPE 18	Pipe	SDCB#18	R-TANK 2	54.55	68.40	68.40	0.0000	24.000	0.0130	1.63	0.97	1.69	1.92	1.74	0.87	0.00	> CAPACITY
17	{SD - Phase 1}.PIPE 20	Pipe	SDCB#20	SDCB#19	126.79	70.98	70.35	0.5000	12.000	0.0130	0.74	2.51	0.29	2.35	0.42	0.42	0.00	Calculated
18	{SD - Phase 1}.PIPE 21	Pipe	SDCB#21	SDCB#20	57.67	71.81	71.31	0.8700	8.004	0.0130	0.06	1.13	0.05	1.65	0.10	0.15	0.00	Calculated
19	{SD - Phase 1}.PIPE 22	Pipe	SDCB#22	SDCB#20	75.77	71.36	70.98	0.5000	12.000	0.0130	0.62	2.52	0.25	2.38	0.37	0.37	0.00	Calculated
20	{SD - Phase 1}.PIPE 23	Pipe	SDCB#23	SDCB#22	113.35	71.93	71.36	0.5000	12.000	0.0130	0.36	2.53	0.14	1.75	0.31	0.31	0.00	Calculated
21	{SD - Phase 1}.PIPE 24	Pipe	SDCB#24	SDCB#23	69.19	72.61	72.26	0.5100	8.004	0.0130	0.03	0.86	0.03	1.14	0.08	0.11	0.00	Calculated
22	{SD - Phase 1}.PIPE 25	Pipe	SDCB#25	SDCB#24	34.45	72.79	72.61	0.5200	8.004	0.0130	0.01	0.87	0.01	0.65	0.07	0.10	0.00	Calculated
23	{SD - Phase 1}.PIPE 26	Pipe	SDCB#26	SDCB#18	104.96	68.40	68.40	0.0000	24.000	0.0130	0.92	0.70	1.31	0.84	1.74	0.87	0.00	> CAPACITY
24	{SD - Phase 1}.PIPE 27	Pipe	SDCB#27	WQ#5	80.37	71.20	70.80	0.5000	12.000	0.0130	0.98	2.51	0.39	2.90	0.44	0.44	0.00	Calculated
25	{SD - Phase 1}.PIPE 28	Pipe	SDCB#28	SDCB#27	122.98	72.15	71.54	0.5000	8.004	0.0130	0.18	0.85	0.22	1.97	0.21	0.31	0.00	Calculated
26	{SD - Phase 1}.PIPE 29	Pipe	SDCB#29	SDCB#27	82.06	71.72	71.20	0.6300	12.000	0.0130	0.51	2.84	0.18	1.86	0.38	0.38	0.00	Calculated
27	{SD - Phase 1}.PIPE 30	Pipe	SDCB#30	SDCB#29	128.14	72.69	72.05	0.5000	8.004	0.0130	0.24	0.86	0.28	2.12	0.24	0.36	0.00	Calculated
28	{SD - Phase 1}.PIPE 31	Pipe	SDCB#31	R-TANK 3	5.26	70.25	70.22	0.5700	12.000	0.0130	0.44	2.69	0.16	2.14	0.31	0.31	0.00	Calculated
29	{SD - Phase 1}.PIPE 40	Pipe	SDCB#40	SDCB#27	52.18	73.22	71.20	3.8700	12.000	0.0130	0.02	7.01	0.00	0.15	0.26	0.26	0.00	Calculated
30	{SD - Phase 1}.PIPE B1	Pipe	SDCO#B1	SDCB#18	50.72	74.33	69.73	9.0700	8.004	0.0130	0.08	3.64	0.02	4.10	0.22	0.32	0.00	Calculated
31	{SD - Phase 1}.PIPE B2	Pipe	SDCO#B2	SDCO#B1	60.72	75.11	74.50	1.0000	6.000	0.0130	0.04	0.56	0.07	1.63	0.09	0.18	0.00	Calculated
32	{SD - Phase 1}.PIPE B3	Pipe	SDCO#B3	SDCO#B2	16.77	75.28	75.11	1.0100	6.000	0.0130	0.04	0.56	0.07	1.57	0.09	0.19	0.00	Calculated
33	{SD - Phase 1}.PIPE B4	Pipe	SDCO#B4	SDCO#B1	85.66	75.41	74.50	1.0600	6.000	0.0130	0.04	0.58	0.07	1.67	0.09	0.18	0.00	Calculated
34	{SD - Phase 1}.PIPE B5	Pipe	SDCO#B5	R-TANK 3	8.62	71.99	71.95	0.4600	6.000	0.0130	0.08	0.38	0.21	1.52	0.16	0.31	0.00	Calculated
35	{SD - Phase 1}.PIPE B6	Pipe	SDCO#B6	SDCO#B5	81.80	72.81	71.99	1.0000	6.000	0.0130	0.04	0.56	0.07	0.97	0.13	0.26	0.00	Calculated
36	{SD - Phase 1}.PIPE B7	Pipe	SDCO#B7	SDCO#B6	6.36	72.87	72.81	0.9400	6.000	0.0130	0.04	0.54	0.07	1.50	0.10	0.19	0.00	Calculated
37	{SD - Phase 1}.PIPE B8	Pipe	SDCO#B8	SDCO#B5	81.80	72.81	71.99	1.0000	6.000	0.0130	0.04	0.56	0.07	0.97	0.13	0.26	0.00	Calculated
38	{SD - Phase 1}.PIPE C1	Pipe	SDCO#C1	SDCB#29	45.29	73.04	72.05	2.1900	8.004	0.0130	0.08	1.79	0.04	2.53	0.10	0.15	0.00	Calculated
39	{SD - Phase 1}.PIPE C10	Pipe	SDCO#C10	SDCO#C9	54.90	72.88	72.33	1.0000	6.000	0.0130	0.04	0.56	0.07	1.57	0.09	0.19	0.00	Calculated
40	{SD - Phase 1}.PIPE C2	Pipe	SDCO#C2	SDCO#C1	22.10	74.28	73.21	4.8400	6.000	0.0130	0.04	1.23	0.03	2.81	0.06	0.13	0.00	Calculated
41	{SD - Phase 1}.PIPE C3	Pipe	SDCO#C3	SDCO#C2	9.24	74.37	74.28	0.9700	6.000	0.0130	0.04	0.55	0.07	1.90	0.08	0.16	0.00	Calculated
42	{SD - Phase 1}.PIPE C4	Pipe	SDCO#C4	SDCO#C1	108.05	74.29	73.21	1.0000	6.000	0.0130	0.04	0.56	0.07	1.64	0.09	0.18	0.00	Calculated
43	{SD - Phase 1}.PIPE C5	Pipe	SDCO#C5	R-TANK 3	7.93	71.44	71.40	0.5000	8.004	0.0130	0.08	0.86	0.09	1.47	0.14	0.21	0.00	Calculated
44	{SD - Phase 1}.PIPE C6	Pipe	SDCO#C6	SDCO#C5	109.73	72.54	71.44	1.0000	6.000	0.0130	0.04	0.56	0.07	1.07	0.12	0.24	0.00	Calculated
45	{SD - Phase 1}.PIPE C7	Pipe	SDCO#C7	SDCO#C6	12.01	72.66	72.54	1.0000	6.000	0.0130	0.04	0.56	0.07	1.57	0.09	0.19	0.00	Calculated
46	{SD - Phase 1}.PIPE C8	Pipe	SDCO#C8	SDCO#C5	45.14	72.19	71.74	1.0000	6.000	0.0130	0.04	0.56	0.07	1.62	0.09	0.18	0.00	Calculated
47	{SD - Phase 1}.PIPE C9	Pipe	SDCO#C9	SDCO#C8	13.55	72.33	72.19	1.0300	6.000	0.0130	0.04	0.57	0.07	1.55	0.09	0.19	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
48	{SD - Phase 1}.PIPE COM01	Pipe	SDCO#COM04	SDCB#02	37.51	70.78	69.50	3.4100	8.004	0.0150	0.07	1.94	0.04	0.98	0.17	0.26	0.00	Calculated
49	{SD - Phase 1}.PIPE COM02	Pipe	SDCO#COM02	SDCO#COM01	49.39	70.70	70.21	0.9900	6.000	0.0130	0.04	0.56	0.07	0.66	0.34	0.69	0.00	Calculated
50	{SD - Phase 1}.PIPE COM04	Pipe	SDCO#COM04	SDCO#COM01	56.60	70.78	70.21	1.0100	6.000	0.0130	0.04	0.56	0.07	0.45	0.29	0.59	0.00	Calculated
51	{SD - Phase 1}.PIPE COM05	Pipe	SDCO#COM05	SDCO#COM04	22.78	71.01	70.78	1.0100	6.000	0.0130	0.03	0.56	0.06	1.41	0.08	0.17	0.00	Calculated
52	{SD - Phase 1}.PIPE COM06	Pipe	SDCO#COM06	SDCO#COM05	59.24	71.60	71.01	1.0000	6.000	0.0150	0.03	0.49	0.06	1.41	0.08	0.17	0.00	Calculated
53	{SD - Phase 1}.PIPE COM07	Pipe	SDCO#COM07	SDCB#04	21.49	70.25	70.14	0.5100	8.000	0.0130	0.03	0.86	0.03	0.79	0.11	0.16	0.00	Calculated
54	{SD - Phase 1}.PIPE COM08	Pipe	SDCO#COM08	SDCO#COM07	36.57	70.78	70.41	1.0100	6.000	0.0130	0.03	0.56	0.05	1.47	0.08	0.15	0.00	Calculated
55	{SD - Phase 1}.PIPE COM09	Pipe	SDCO#COM09	SDCB#05	34.88	70.17	68.96	3.4700	8.004	0.0130	0.03	2.25	0.01	0.42	0.19	0.28	0.00	Calculated
56	{SD - Phase 1}.PIPE COM10	Pipe	SDCO#COM10	SDCO#COM09	48.42	71.09	70.34	1.5500	6.000	0.0130	0.01	0.70	0.02	1.38	0.05	0.10	0.00	Calculated
57	{SD - Phase 1}.PIPE COM11	Pipe	SDCO#COM11	SDCO#COM09	74.62	71.09	70.34	1.0100	6.000	0.0130	0.02	0.56	0.03	1.33	0.06	0.13	0.00	Calculated
58	{SD - Phase 1}.PIPE COM12	Pipe	SDCO#COM12	SDCB#08	16.26	70.17	69.55	3.8100	8.000	0.0130	0.03	2.36	0.01	1.30	0.08	0.12	0.00	Calculated
59	{SD - Phase 1}.PIPE COM13	Pipe	SDCO#COM13	SDCO#COM12	45.72	70.87	70.34	1.1600	6.000	0.0130	0.03	0.60	0.05	1.57	0.08	0.15	0.00	Calculated
60	{SD - Phase 1}.PIPE D1	Pipe	SDCO#D1	SDCB#28	47.80	72.84	72.15	1.4400	8.004	0.0130	0.08	1.45	0.05	1.20	0.16	0.24	0.00	Calculated
61	{SD - Phase 1}.PIPE D2	Pipe	SDCO#D2	SDCO#D1	163.60	74.65	73.01	1.0000	6.000	0.0130	0.08	0.56	0.14	2.00	0.13	0.26	0.00	Calculated
62	{SD - Phase 1}.PIPE D3	Pipe	SDCO#D3	SDCO#D2	6.36	74.71	74.65	0.9400	6.000	0.0130	0.08	0.54	0.15	1.79	0.14	0.28	0.00	Calculated
63	{SD - Phase 1}.PIPE D4	Pipe	SDCO#D4	SDCB#29	54.62	73.36	72.05	2.4000	8.004	0.0130	0.08	1.99	0.04	2.73	0.09	0.14	0.00	Calculated
64	{SD - Phase 1}.PIPE D5	Pipe	SDCO#D5	SDCO#D4	32.05	74.47	73.53	2.9300	6.000	0.0130	0.04	0.96	0.04	1.93	0.08	0.16	0.00	Calculated
65	{SD - Phase 1}.PIPE D6	Pipe	SDCO#D6	SDCO#D5	10.82	74.79	74.47	2.9600	6.000	0.0130	0.04	0.96	0.04	2.29	0.07	0.14	0.00	Calculated
66	{SD - Phase 1}.PIPE D7	Pipe	SDCO#D7	SDCO#D4	119.28	74.72	73.53	1.0000	6.000	0.0130	0.04	0.56	0.07	1.61	0.09	0.18	0.00	Calculated
67	{SD - Phase 1}.PIPE E1	Pipe	SDCO#E1	SDCB#22	42.30	71.90	71.69	0.5000	6.000	0.0130	0.11	0.53	0.20	2.06	0.16	0.32	0.00	Calculated
68	{SD - Phase 1}.PIPE E4	Pipe	SDCO#E4	SDCB#23	42.52	72.48	72.26	0.5200	6.000	0.0130	0.05	0.53	0.10	1.70	0.11	0.22	0.00	Calculated
69	{SD - Phase 1}.PIPE G1	Pipe	SDCO#G1	SDCB#16	23.14	73.29	72.73	2.4200	6.000	0.0130	0.07	0.87	0.08	2.53	0.10	0.19	0.00	Calculated
70	{SD - Phase 1}.PIPE G2	Pipe	SDCO#G2	SDCO#G1	118.43	74.47	73.29	1.0000	6.000	0.0130	0.07	0.56	0.12	2.09	0.11	0.22	0.00	Calculated
71	{SD - Phase 1}.PIPE G3	Pipe	SDCO#G3	SDCB#17	29.24	72.89	72.75	0.4800	6.000	0.0130	0.05	0.39	0.14	1.05	0.15	0.31	0.00	Calculated
72	{SD - Phase 1}.PIPE G4	Pipe	SDCO#G4	SDCO#G3	116.18	74.22	73.06	1.0000	6.000	0.0130	0.05	0.56	0.09	1.78	0.10	0.21	0.00	Calculated
73	{SD - Phase 1}.PIPE H1	Pipe	SDCO#H1	SDCB#14	9.90	72.76	72.22	5.4500	8.004	0.0130	0.07	2.83	0.02	3.06	0.07	0.11	0.00	Calculated
74	{SD - Phase 1}.PIPE H2	Pipe	SDCO#H2	SDCO#H1	20.00	73.13	72.93	1.0000	6.000	0.0130	0.07	0.56	0.12	1.82	0.12	0.24	0.00	Calculated
75	{SD - Phase 1}.PIPE H3	Pipe	SDCO#H3	SDCO#H2	106.86	74.20	73.13	1.0000	6.000	0.0130	0.07	0.56	0.12	1.82	0.12	0.24	0.00	Calculated
76	{SD - Phase 1}.PIPE H4	Pipe	SDCO#H4	SDCB#15	24.70	72.79	72.18	2.4700	6.000	0.0130	0.05	0.88	0.06	2.41	0.09	0.17	0.00	Calculated
77	{SD - Phase 1}.PIPE H5	Pipe	SDCO#H5	SDCO#H4	14.98	72.94	72.79	1.0000	6.000	0.0130	0.05	0.56	0.10	1.92	0.10	0.20	0.00	Calculated
78	{SD - Phase 1}.PIPE H6	Pipe	SDCO#H6	SDCO#H5	112.34	74.06	72.94	1.0000	6.000	0.0130	0.05	0.56	0.10	1.71	0.11	0.22	0.00	Calculated
79	{SD - Phase 1}.PIPE RT-1	Pipe	R-TANK 1	SDCB#01	4.18	67.40	67.40	0.0000	24.000	0.0130	0.12	3.50	0.04	1.15	0.58	0.29	0.00	Calculated
80	{SD - Phase 1}.PIPE RT-2	Pipe	R-TANK 2	SDCB#10	5.00	68.40	68.40	0.0000	24.000	0.0130	0.08	3.20	0.02	1.10	1.74	0.87	0.00	Calculated
81	{SD - Phase 1}.PIPE RT-3	Pipe	R-TANK 3	SDCB#26	128.16	68.40	68.40	0.0000	24.000	0.0130	0.48	0.63	0.77	0.72	1.74	0.87	0.00	Calculated
82	{SD - Phase 1}.PIPE WQ#4	Pipe	WQ#4	SDCB#18	40.09	69.60	69.40	0.5000	12.000	0.0130	0.99	2.52	0.39	2.82	0.64	0.64	0.00	Calculated
83	{SD - Phase 2}.PIEP CLUB5	Pipe	SDCO#CLUB5	SDCO#CLUB4	42.78	73.15	72.72	1.0100	6.000	0.0130	0.02	0.56	0.03	1.33	0.06	0.13	0.00	Calculated
84	{SD - Phase 2}.PIPE 33	Pipe	SDCB#33	SDCB#31	113.81	70.81	70.25	0.4900	12.000	0.0130	0.21	2.50	0.09	1.25	0.27	0.27	0.00	Calculated
85	{SD - Phase 2}.PIPE 34	Pipe	SDCB#34	SDCB#33	74.43	71.52	71.14	0.5100	8.004	0.0130	0.08	0.86	0.09	1.56	0.13	0.20	0.00	Calculated
86	{SD - Phase 2}.PIPE 35	Pipe	SDCB#35	R-TANK 3	78.01	68.40	68.40	0.0000	24.000	0.0130	0.44	0.81	0.54	0.61	1.74	0.87	0.00	Calculated
87	{SD - Phase 2}.PIPE 36	Pipe	SDCB#36	SDCB#35	68.05	70.59	69.40	1.7500	12.000	0.0130	0.38	4.71	0.08	3.48	0.40	0.40	0.00	Calculated
88	{SD - Phase 2}.PIPE 37	Pipe	SDCB#37	SDCB#36	118.86	71.52	70.93	0.5000	8.004	0.0130	0.18	0.85	0.21	1.96	0.20	0.31	0.00	Calculated
89	{SD - Phase 2}.PIPE 38	Pipe	SDCB#38	SDCB#37	72.17	71.88	71.52	0.5000	8.004	0.0130	0.13	0.85	0.16	1.54	0.20	0.30	0.00	Calculated
90	{SD - Phase 2}.PIPE A1	Pipe	SDCO#A1	SDCB#32	22.91	72.71	72.60	0.4800	8.000	0.0130	0.06	0.84	0.07	0.91	0.16	0.25	0.00	Calculated
91	{SD - Phase 2}.PIPE A2	Pipe	SDCO#A2	SDCO#A1	33.15	73.21	72.88	1.0000	6.000	0.0130	0.03	0.56	0.05	1.49	0.08	0.16	0.00	Calculated
92	{SD - Phase 2}.PIPE A3	Pipe	SDCO#A3	SDCO#A2	78.60	74.00	73.21	1.0100	6.000	0.0130	0.03	0.56	0.05	1.49	0.08	0.16	0.00	Calculated
93	{SD - Phase 2}.PIPE A4	Pipe	SDCO#A4	SDCO#A5	72.96	73.96	73.23	1.0000	6.000	0.0130	0.03	0.56	0.05	1.49	0.08	0.16	0.00	Calculated
94	{SD - Phase 2}.PIPE A5	Pipe	SDCO#A5	SDCO#A1	35.48	73.23	72.88	0.9900	6.000	0.0130	0.03	0.56	0.05	1.49	0.08	0.16	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
95	{SD - Phase 2}.PIPE CLUB2	Pipe	SDCO#CLUB2	SDCO#CLUB1	33.61	72.72	72.38	1.0100	6.000	0.0130	0.02	0.56	0.03	1.23	0.07	0.14	0.00	Calculated
96	{SD - Phase 2}.PIPE CLUB3	Pipe	SDCO#CLUB3	SDCO#CLUB2	40.66	73.13	72.72	1.0100	6.000	0.0130	0.02	0.56	0.03	1.32	0.06	0.13	0.00	Calculated
97	{SD - Phase 2}.PIPE CLUB4	Pipe	SDCO#CLUB4	SDCO#CLUB1	32.02	72.72	72.38	1.0600	6.000	0.0130	0.02	0.58	0.03	1.24	0.07	0.13	0.00	Calculated
98	{SD - Phase 2}.PIPE E2	Pipe	SDCO#E2	SDCO#E1	35.98	72.43	72.07	1.0000	6.000	0.0130	0.11	0.56	0.19	2.03	0.16	0.32	0.00	Calculated
99	{SD - Phase 2}.PIPE E3	Pipe	SDCO#E3	SDCO#E2	71.44	73.14	72.43	0.9900	6.000	0.0130	0.11	0.56	0.20	2.10	0.16	0.31	0.00	Calculated
100	{SD - Phase 2}.PIPE E5	Pipe	SDCO#E5	SDCO#E4	31.53	72.96	72.64	1.0100	6.000	0.0130	0.05	0.57	0.10	1.70	0.11	0.22	0.00	Calculated
101	{SD - Phase 2}.PIPE E6	Pipe	SDCO#E6	SDCO#E5	59.72	73.56	72.96	1.0000	6.000	0.0130	0.05	0.56	0.10	1.76	0.11	0.22	0.00	Calculated
102	{SD - Phase 2}.PIPE E7	Pipe	SDCO#E7	SDCO#E3	109.59	74.24	73.14	1.0000	6.000	0.0130	0.11	0.56	0.20	2.16	0.15	0.31	0.00	Calculated
103	{SD - Phase 2}.PIPE F1	Pipe	SDCO#F1	SDCB#31	151.81	71.77	70.25	1.0000	6.000	0.0130	0.07	0.56	0.12	0.78	0.23	0.46	0.00	Calculated
104	{SD - Phase 2}.PIPE F2	Pipe	SDCO#F2	SDCB#35	17.47	72.50	69.90	14.8800	6.000	0.0130	0.07	2.16	0.03	4.86	0.13	0.26	0.00	Calculated
105	{SD - Phase 2}.PIPE F3	Pipe	SDCO#F3	SDCO#F2	96.17	73.46	72.50	1.0000	6.000	0.0130	0.07	0.56	0.12	2.53	0.10	0.20	0.00	Calculated
106	PIPE 32	Pipe	SDCB#32	SDCB#23	66.71	72.60	72.26	0.5100	8.000	0.0130	0.16	0.86	0.19	1.89	0.19	0.29	0.00	Calculated
107	Pipe ADG1	Pipe	AREA DRAIN G1	SDCB#16	21.66	73.07	72.92	0.6900	6.000	0.0150	0.00	0.40	0.00	0.00	0.00	0.00	0.00	Calculated
108	PIPE ADH1	Pipe	AREA DRAIN H1	SDCB#15	16.48	72.33	72.18	0.9100	6.000	0.0150	0.00	0.46	0.00	0.00	0.00	0.00	0.00	Calculated
109	PIPE CLUB1	Pipe	SDCO#CLUB1	SDCB#22	35.74	72.21	71.69	1.4500	8.000	0.0130	0.04	1.68	0.02	1.90	0.07	0.11	0.00	Calculated
110	PIPE WQ#1	Pipe	WQ#1	R-TANK 1	6.39	67.90	67.87	0.4700	8.000	0.0130	0.87	0.83	1.05	2.90	0.53	0.80	0.00	> CAPACITY
111	PIPE WQ#2	Pipe	WQ#2	R-TANK 2	5.61	70.66	68.87	31.9100	12.000	0.0130	0.22	20.13	0.01	7.45	0.51	0.51	0.00	Calculated
112	PIPE WQ#3	Pipe	WQ#3	R-TANK 2	6.80	69.48	68.87	8.9700	12.000	0.0130	0.56	10.67	0.05	5.74	0.83	0.83	0.00	Calculated
113	PIPE WQ#4	Pipe	SDCB#19	WQ#4	40.09	70.35	70.10	0.6200	12.000	0.0130	0.99	2.81	0.35	2.98	0.44	0.44	0.00	Calculated
114	PIPE WQ#5	Pipe	WQ#5	SDCB#26	45.10	70.30	69.40	2.0000	12.000	0.0130	0.98	5.03	0.19	4.58	0.42	0.42	0.00	Calculated
115	{SD - Phase 1}.RT-1 OUTLET	Outlet	SDCB#01	TRENCH INLET		66.90	67.32				0.12							
116	{SD - Phase 1}.RT-2 OUTLET	Outlet	SDCB#10	R-TANK 1		67.90	66.90				0.08							

Subbasin Hydrology

Subbasin : BLDG A_NORTH

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.05		98

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

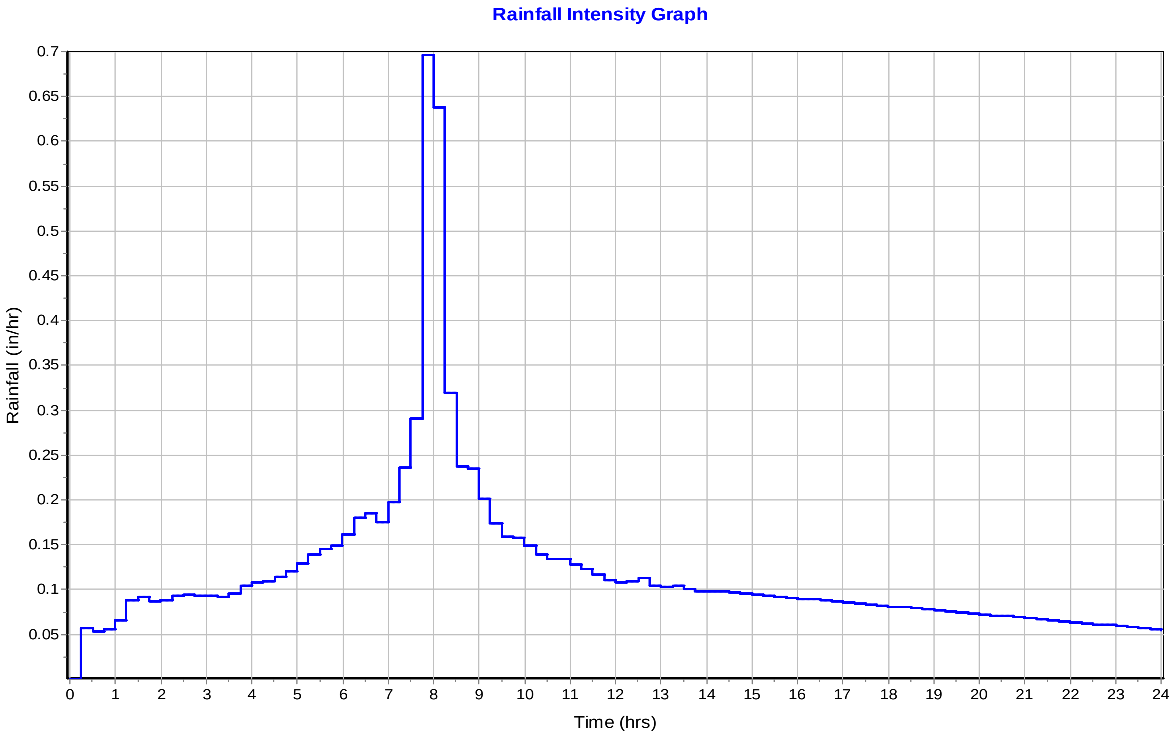
Where :

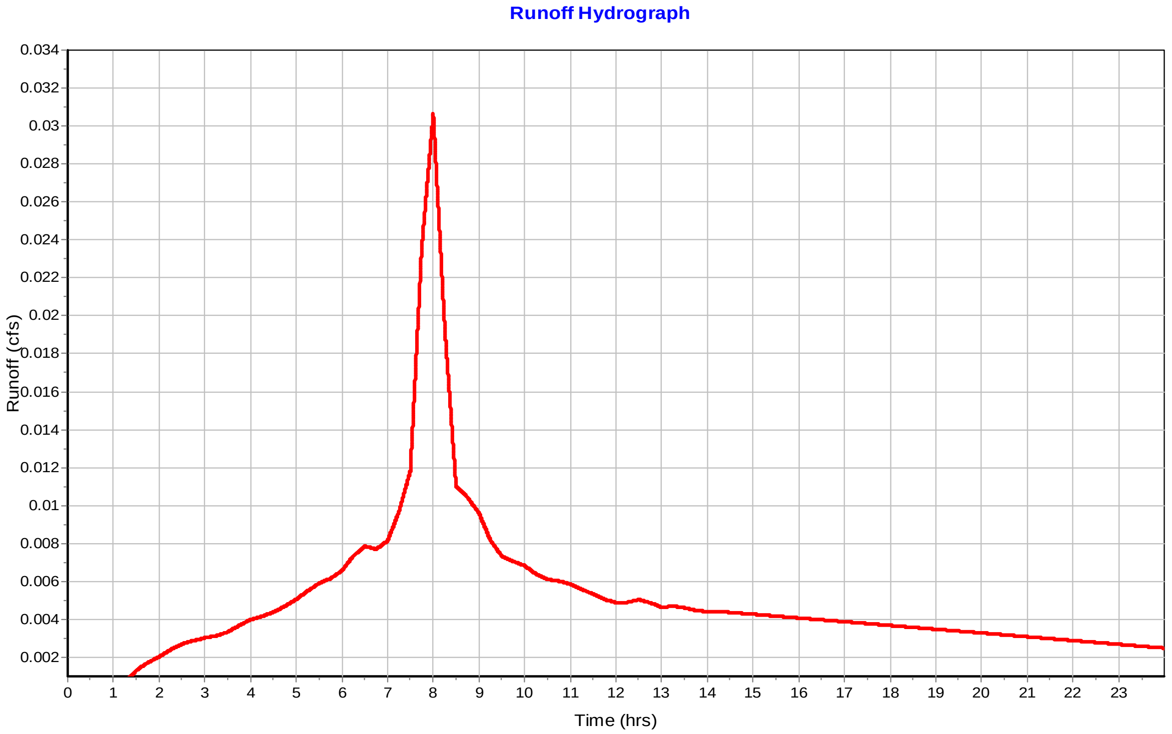
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Subbasin Runoff Results

Total Rainfall (in) 2.87
Total Runoff (in) 2.64
Peak Runoff (cfs) 0.03
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG A_NORTH





Subbasin : BLDG A_SOUTH

Input Data

Area (ac) 0.05
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.05		98

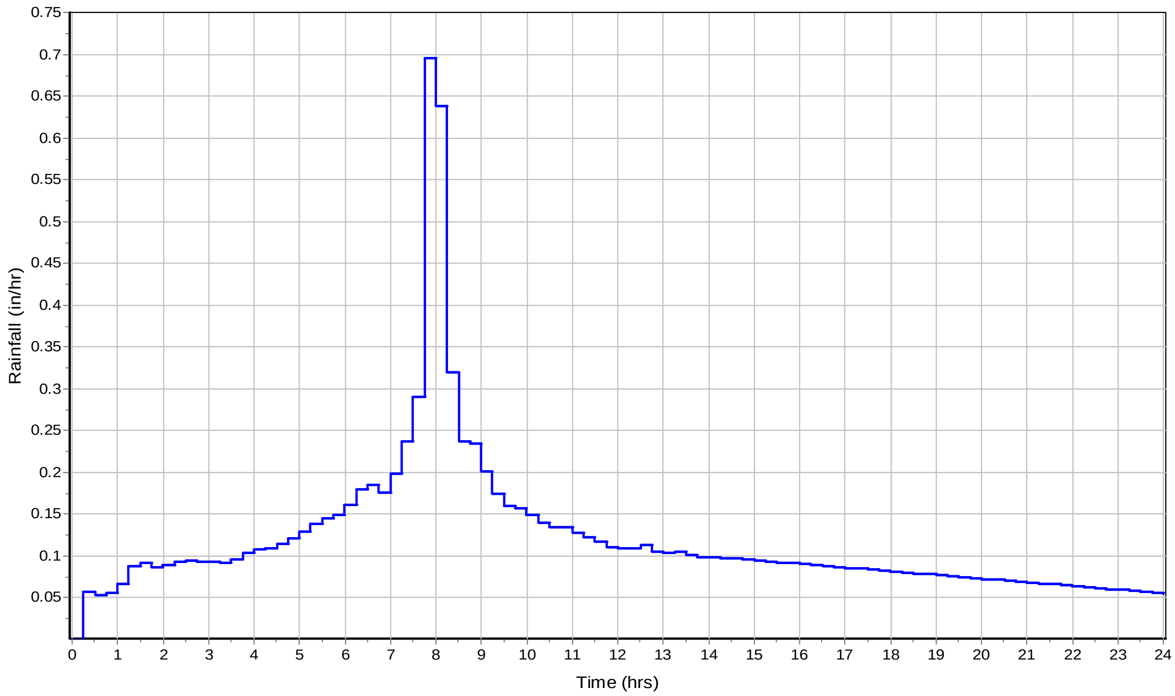
Time of Concentration

Subbasin Runoff Results

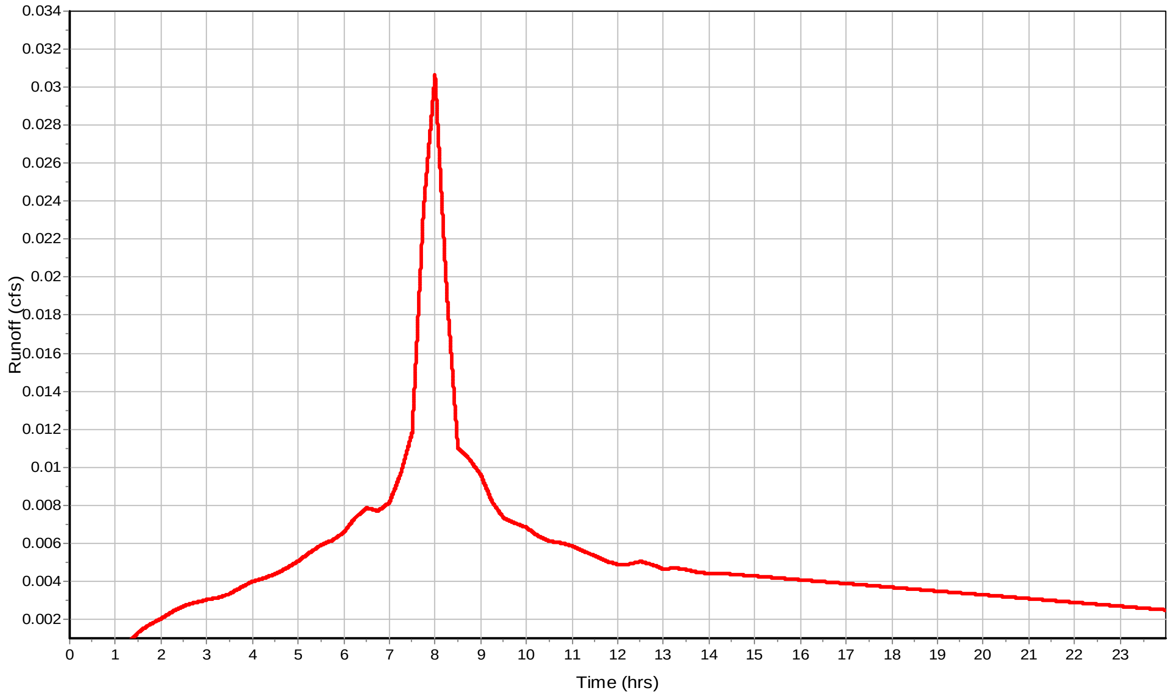
Total Rainfall (in) 2.87
Total Runoff (in) 2.64
Peak Runoff (cfs) 0.03
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG A_SOUTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

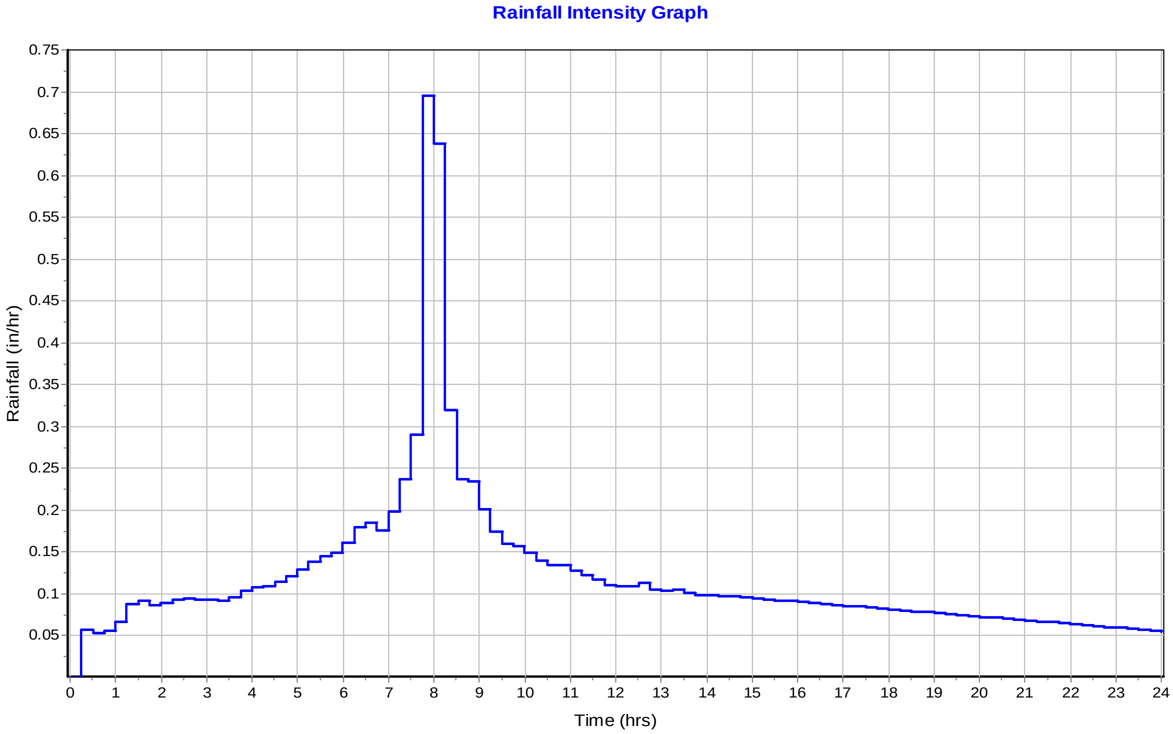
32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

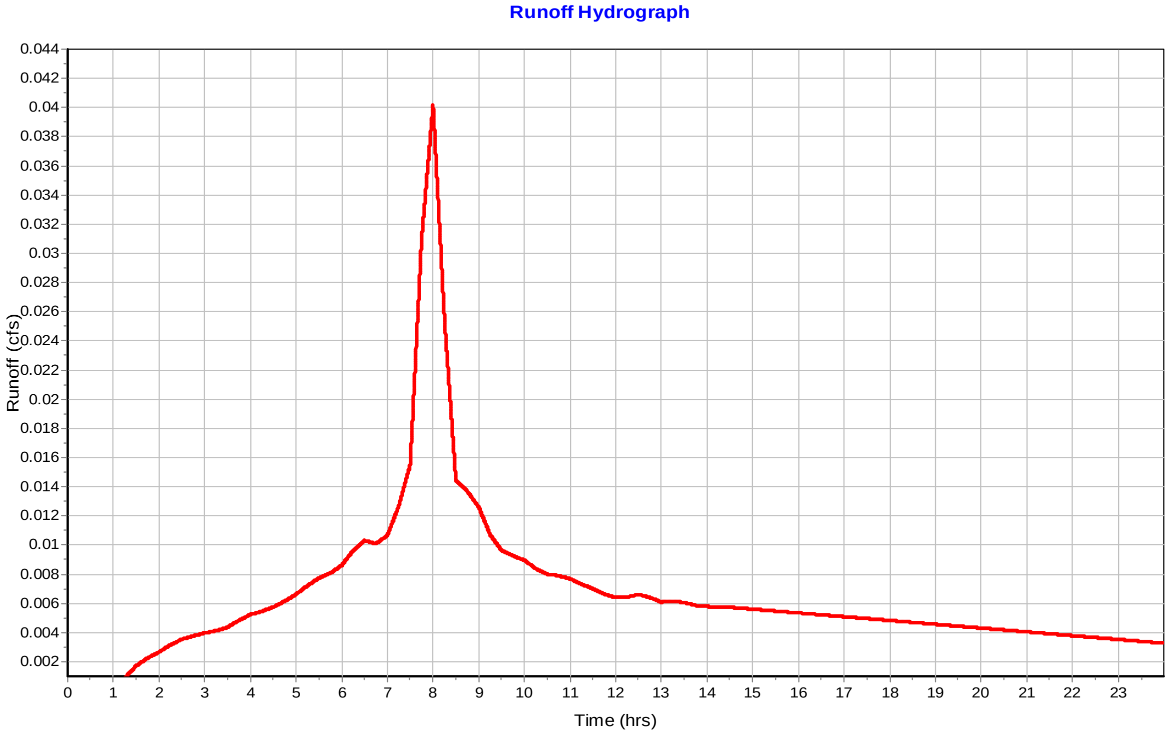
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_NE





Subbasin : BLDG B_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

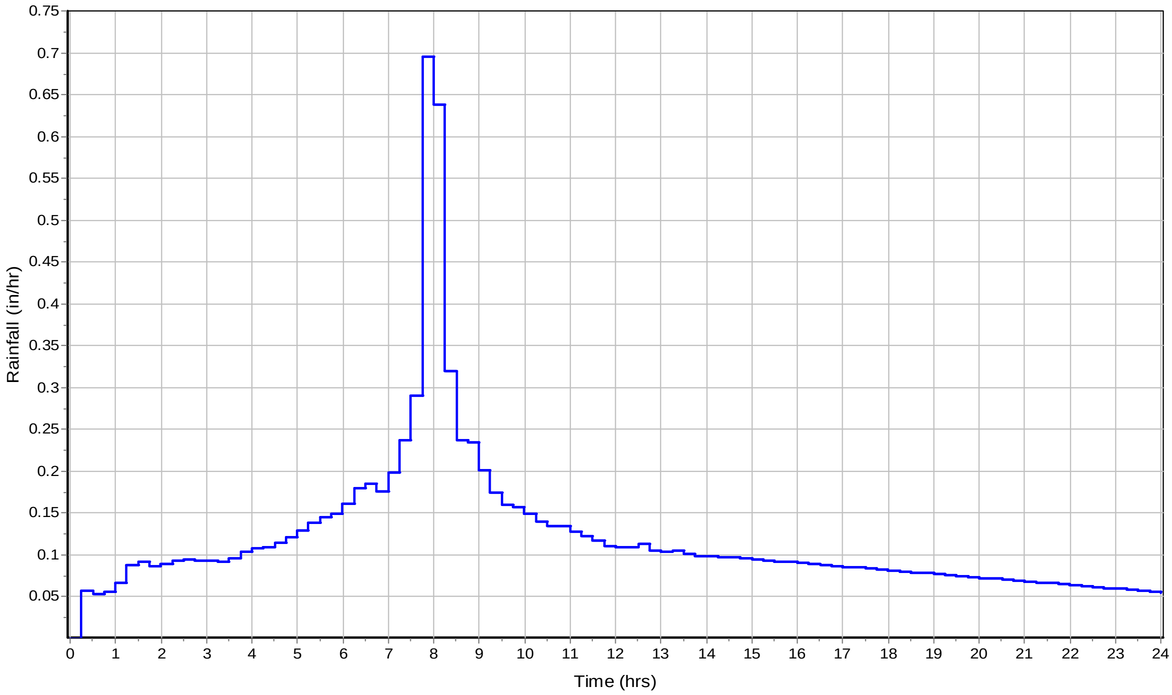
Time of Concentration

Subbasin Runoff Results

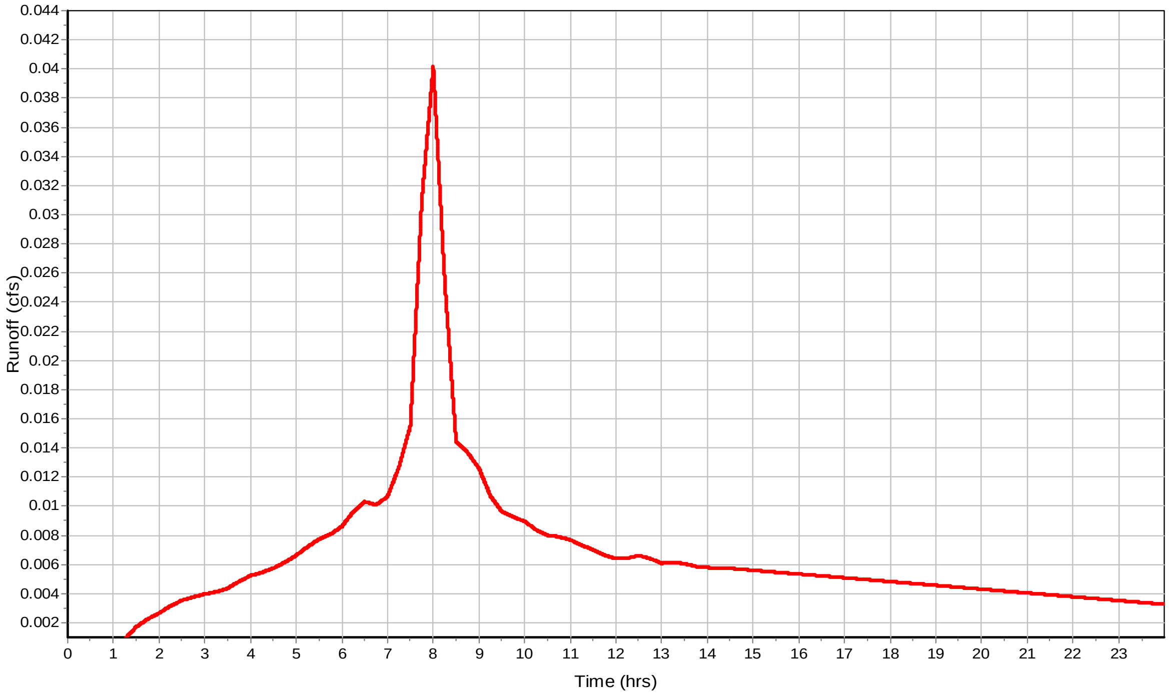
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_SE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

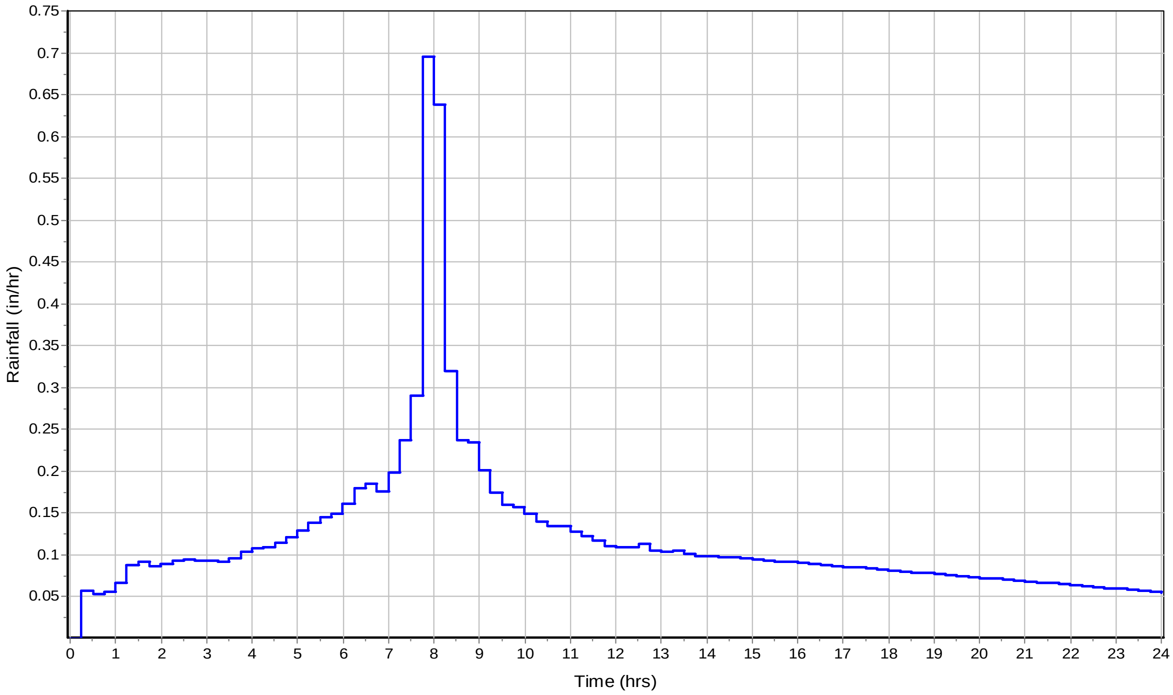
Time of Concentration

Subbasin Runoff Results

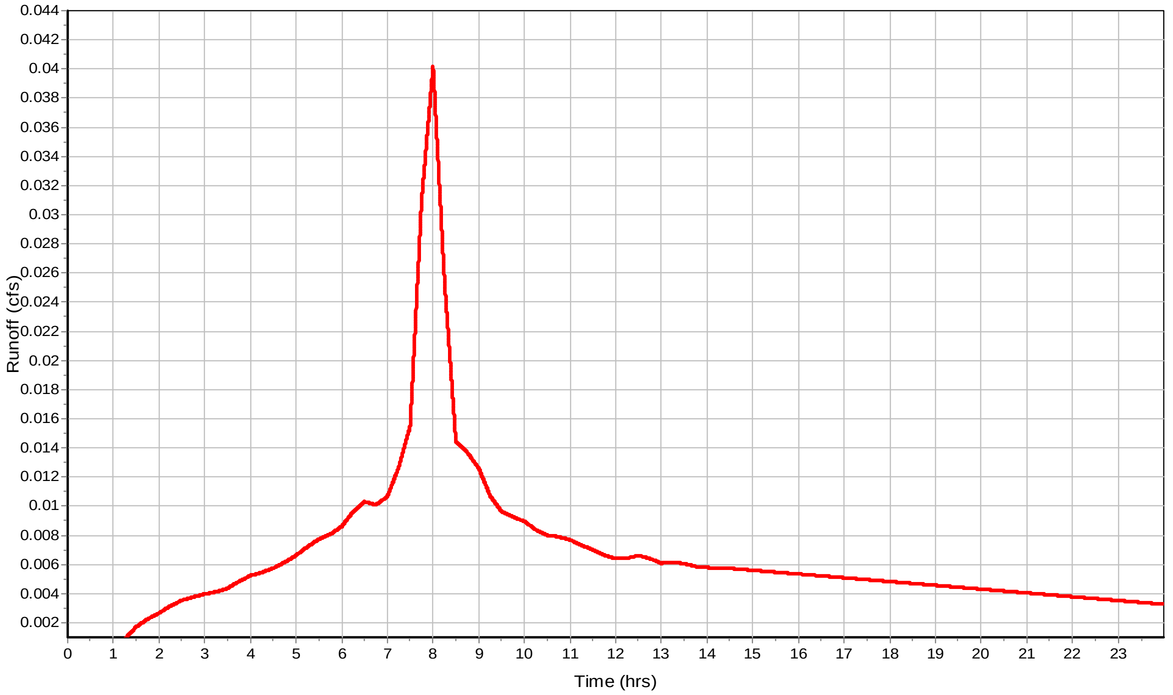
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_SW

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

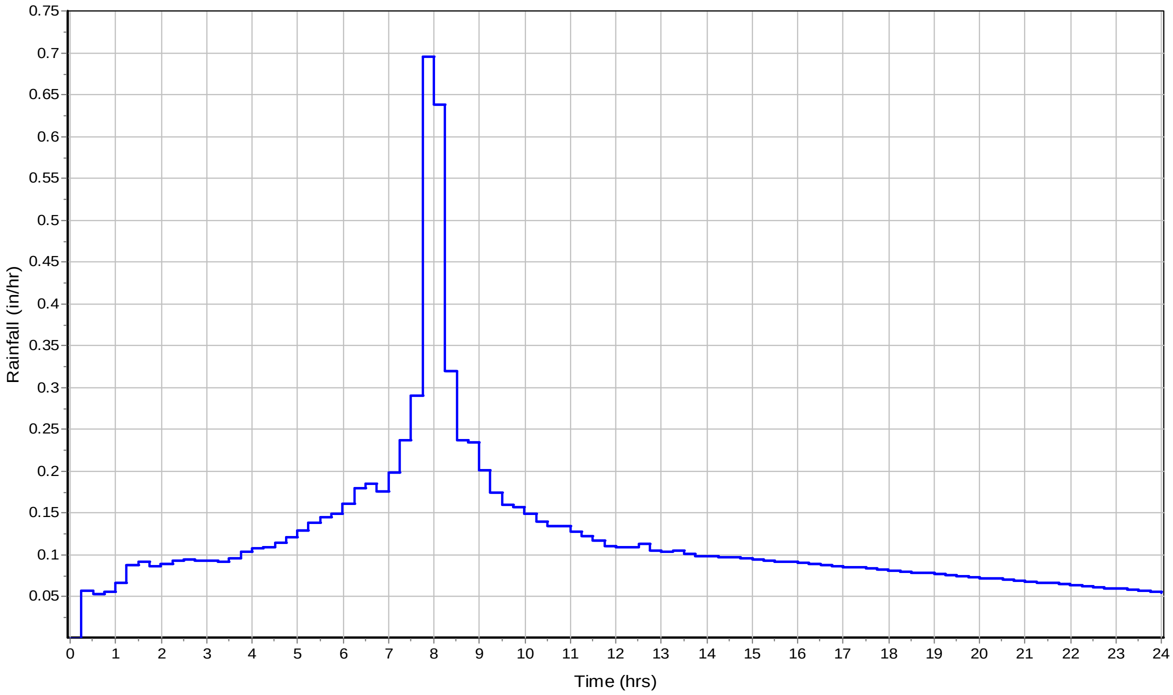
Time of Concentration

Subbasin Runoff Results

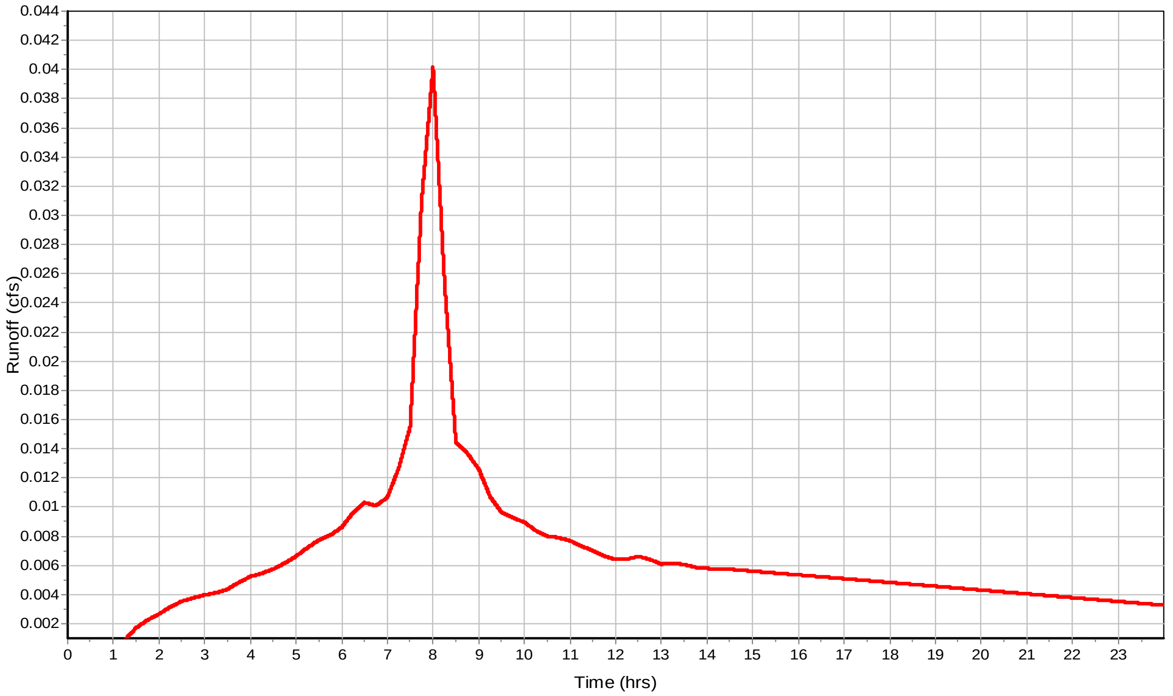
Total Rainfall (in) 2.87
Total Runoff (in) 2.64
Peak Runoff (cfs) 0.04
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG B_SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

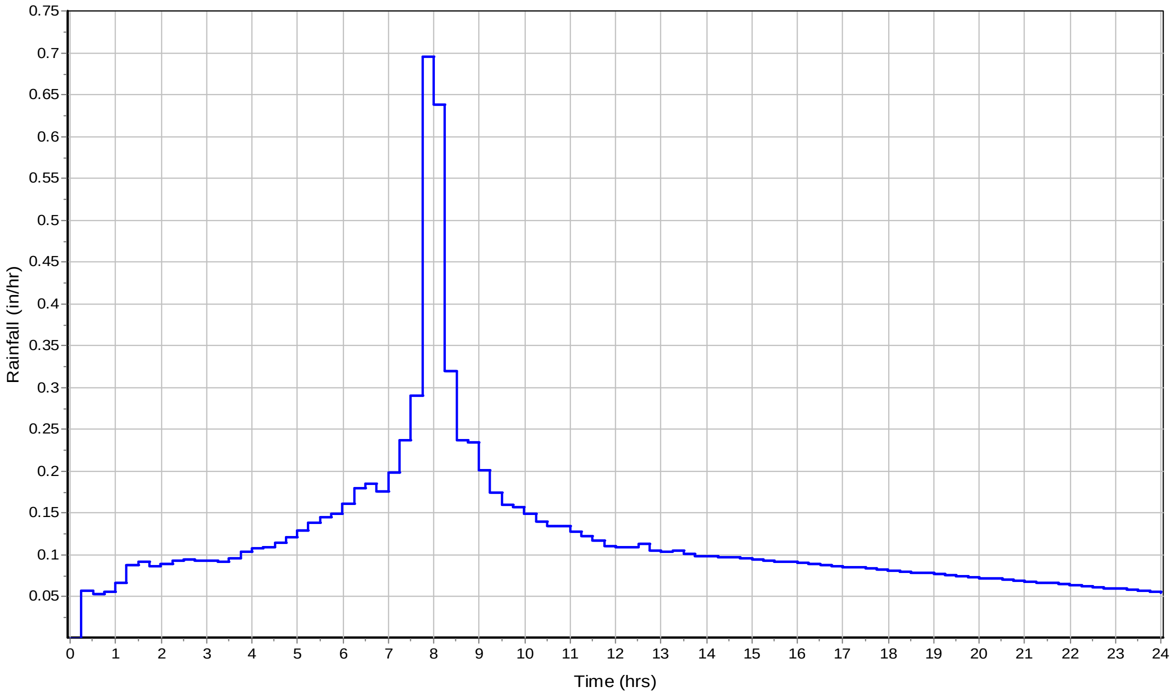
Time of Concentration

Subbasin Runoff Results

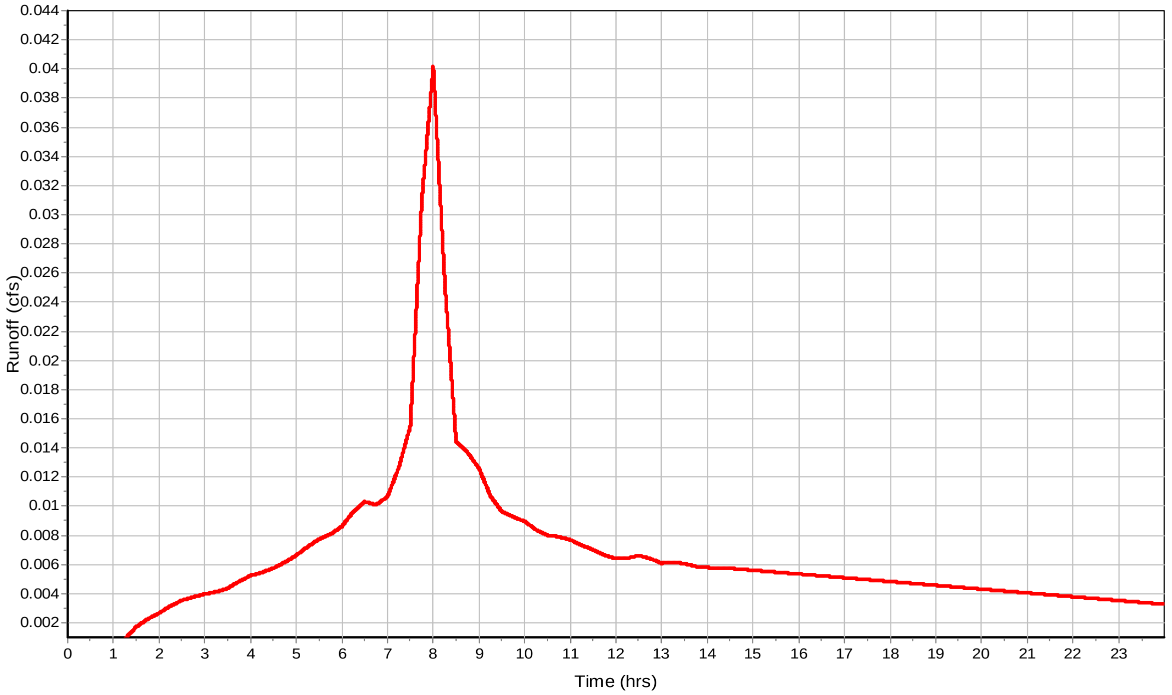
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

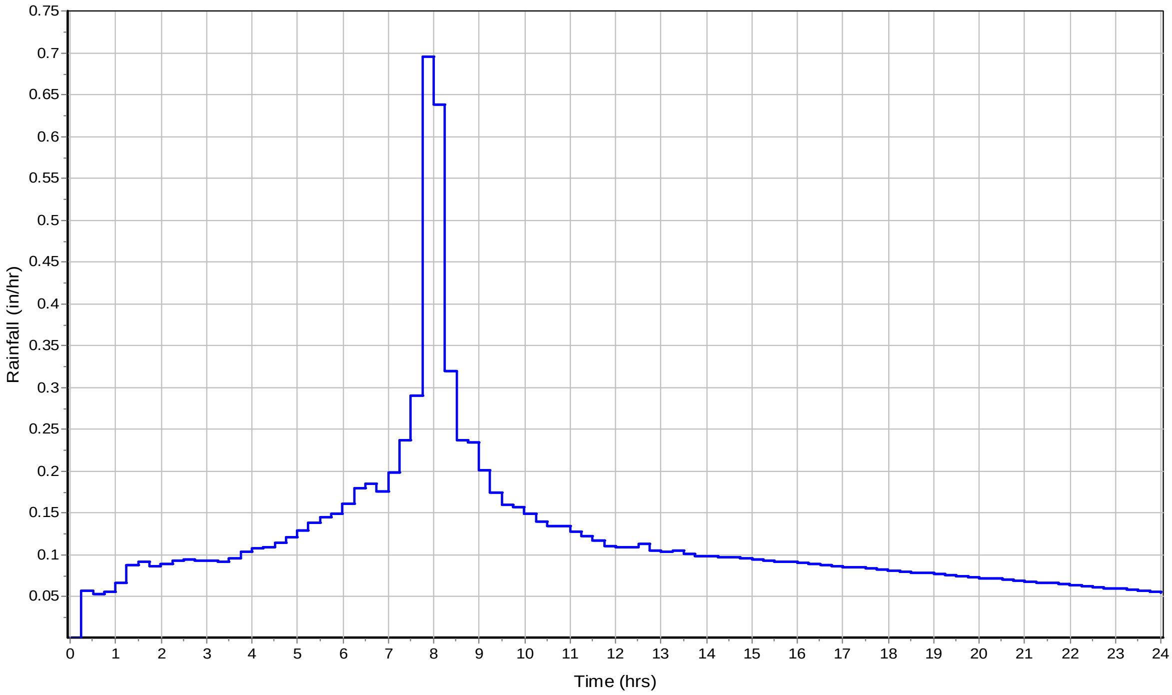
Time of Concentration

Subbasin Runoff Results

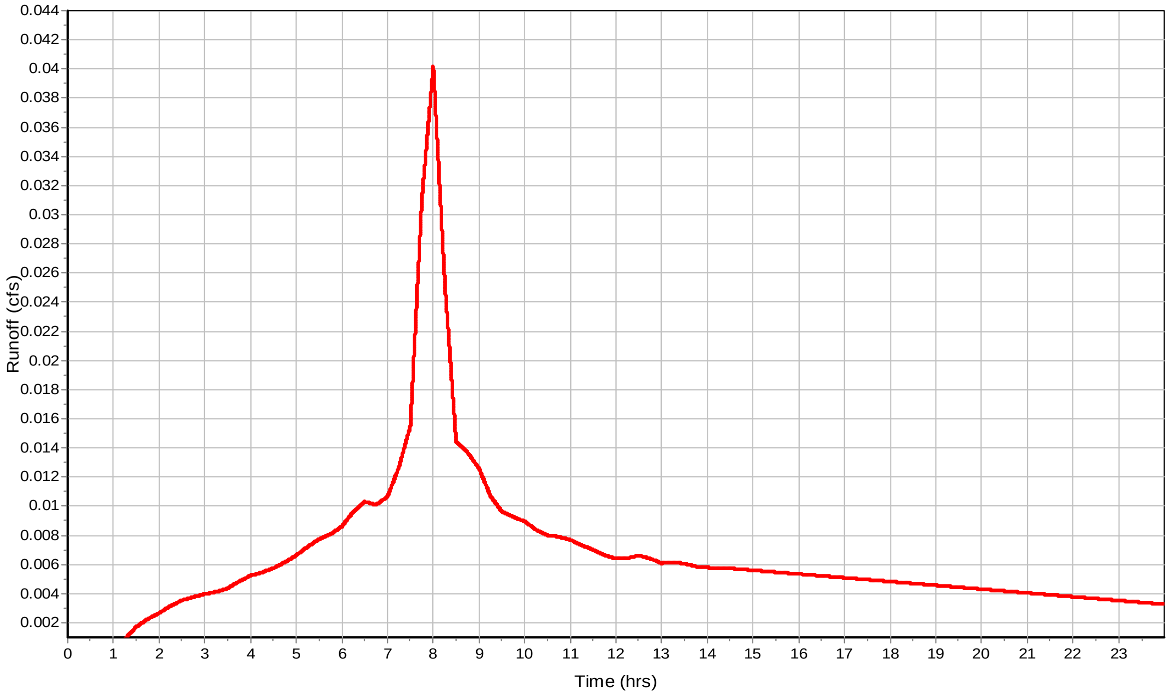
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_SE

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 10-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

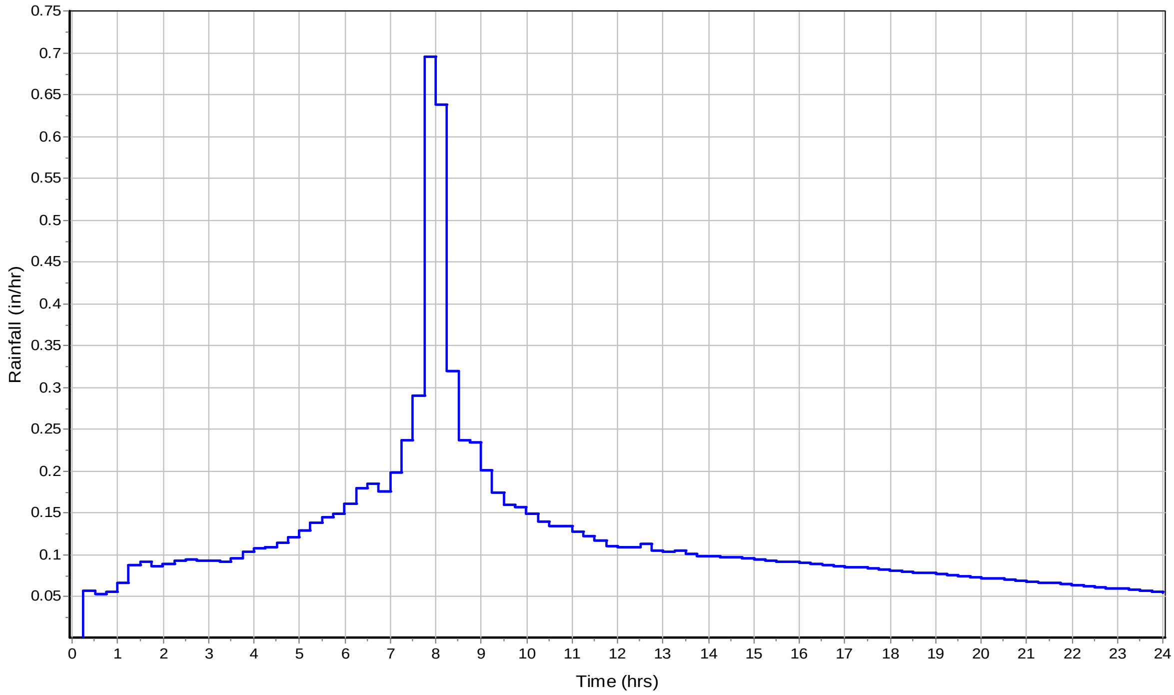
Time of Concentration

Subbasin Runoff Results

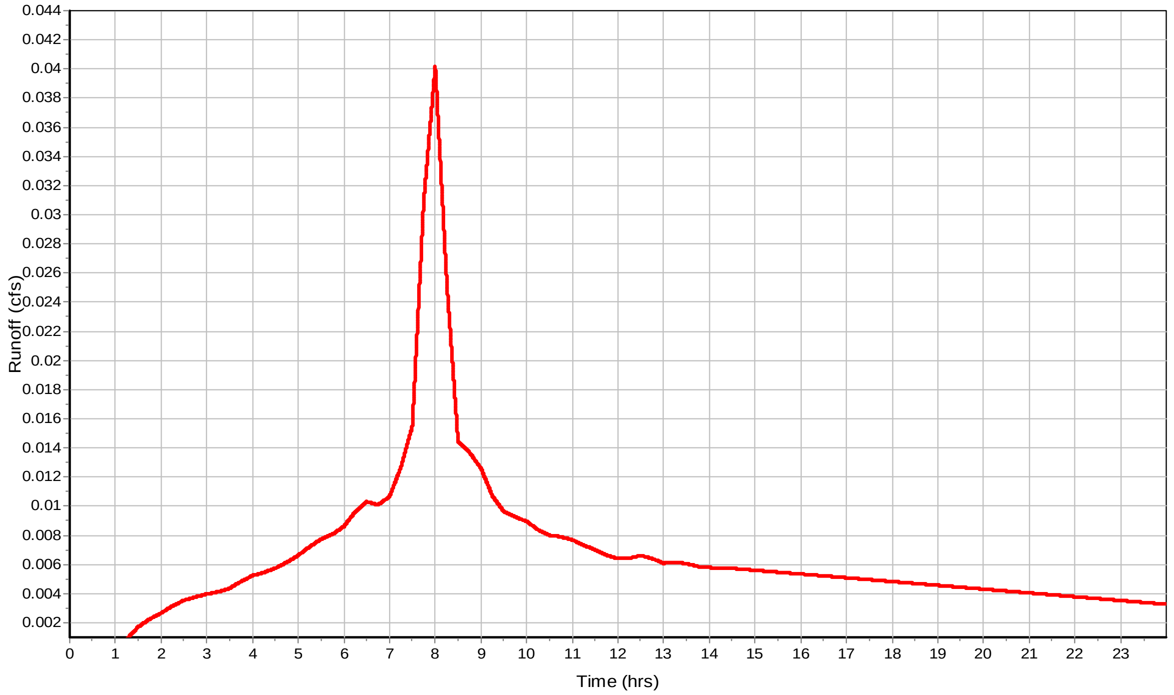
Total Rainfall (in) 2.87
Total Runoff (in) 2.64
Peak Runoff (cfs) 0.04
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG C_SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_SW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

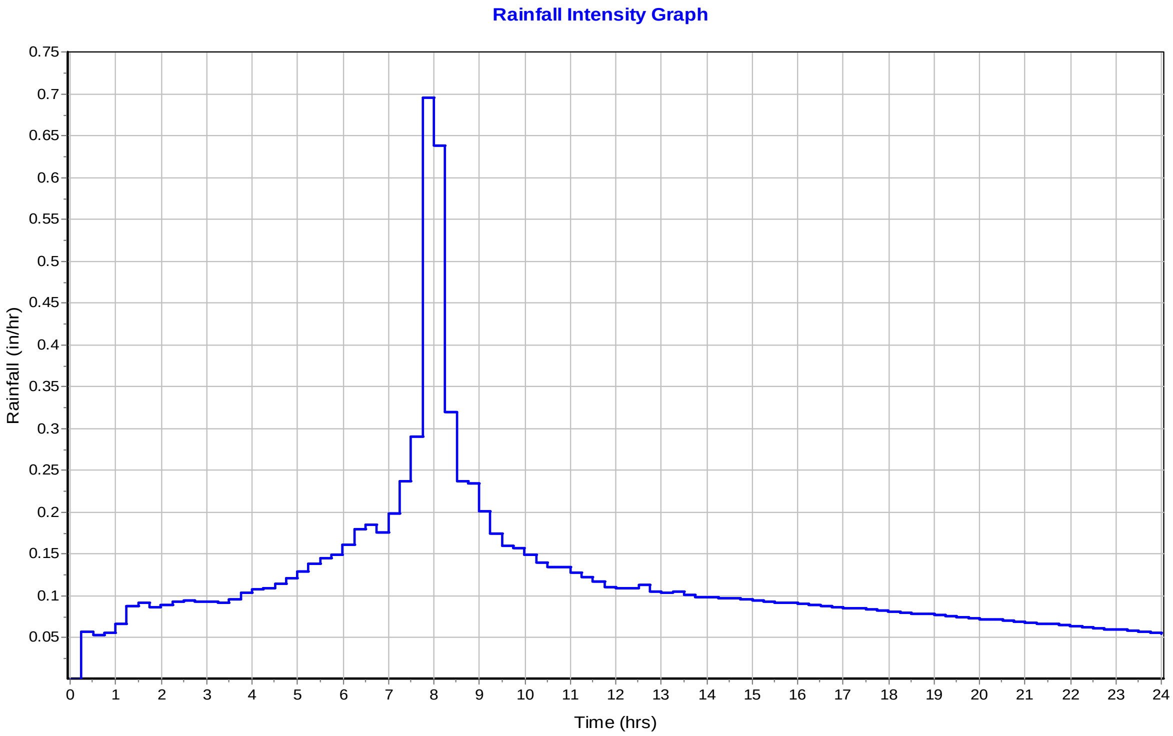
32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

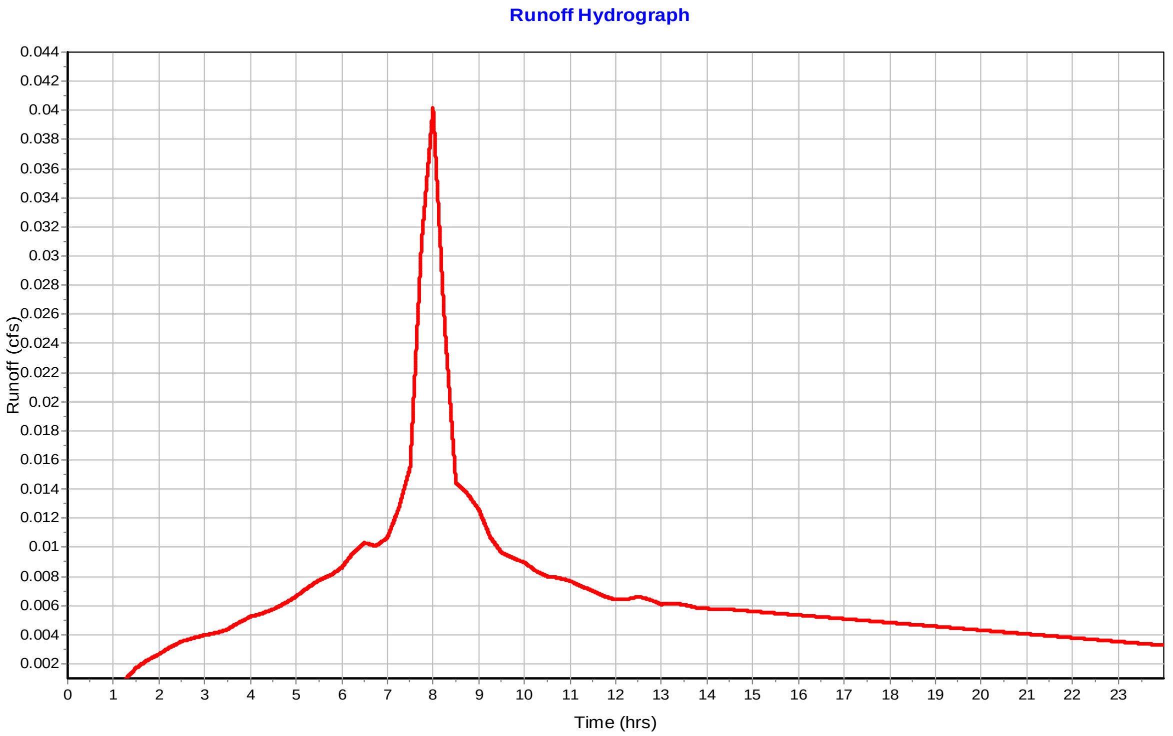
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_SW





Subbasin : BLDG CLUB_EAST

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

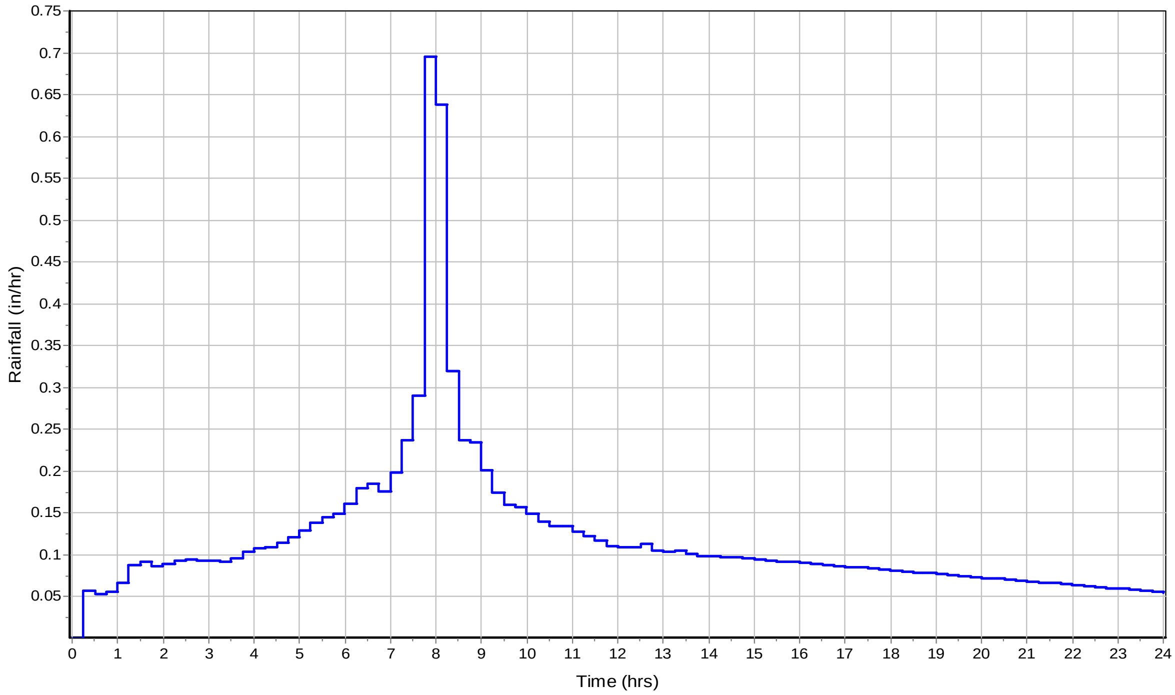
Time of Concentration

Subbasin Runoff Results

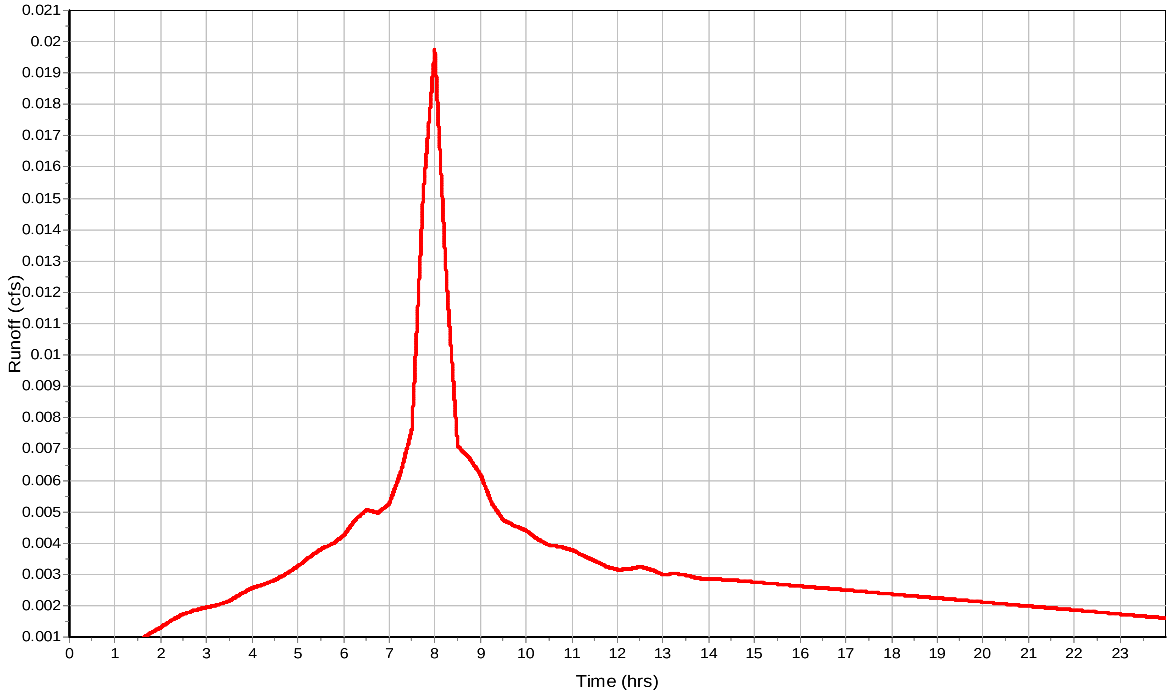
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG CLUB_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG CLUB_WEST

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

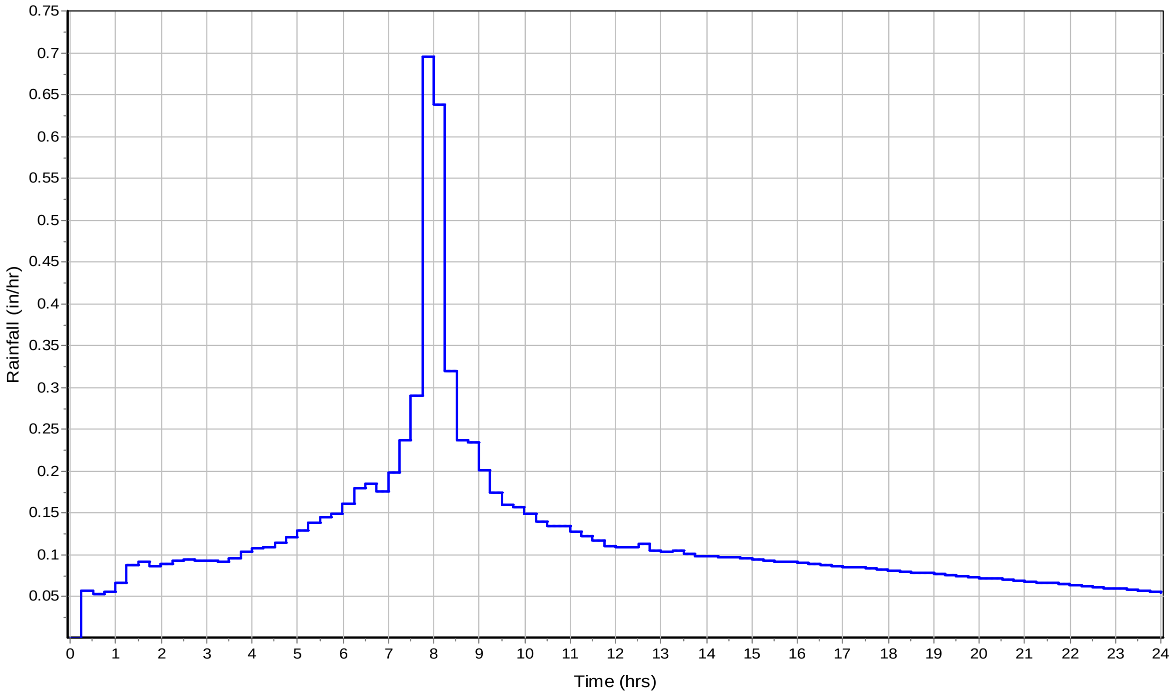
Time of Concentration

Subbasin Runoff Results

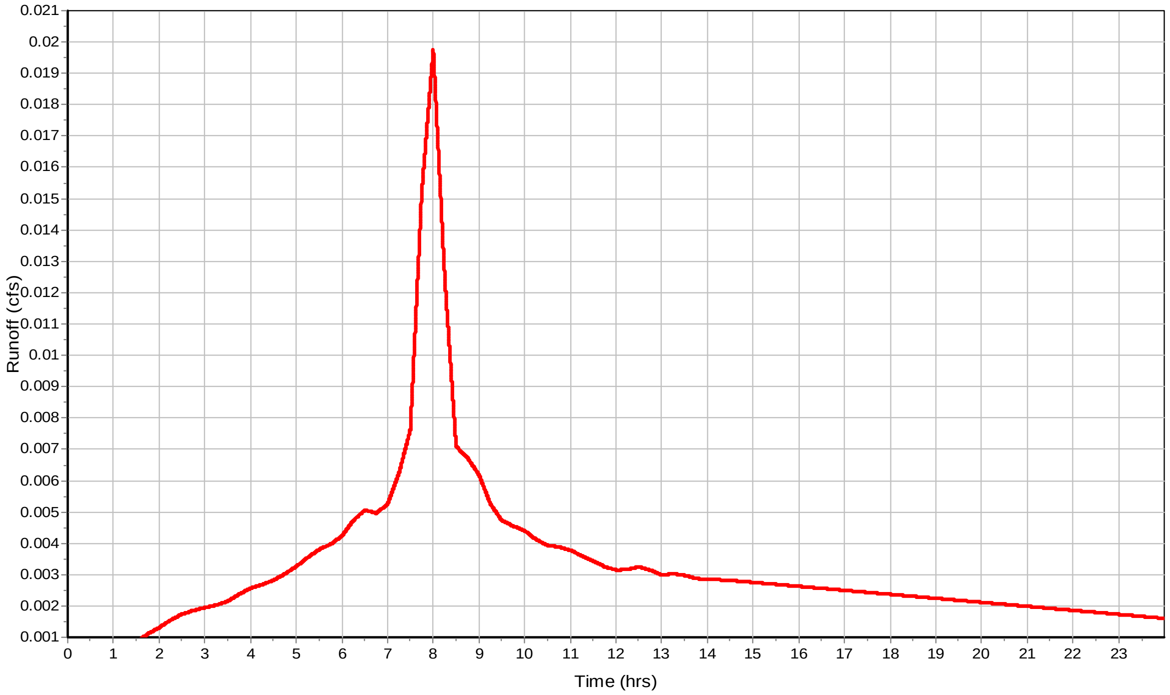
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG CLUB_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

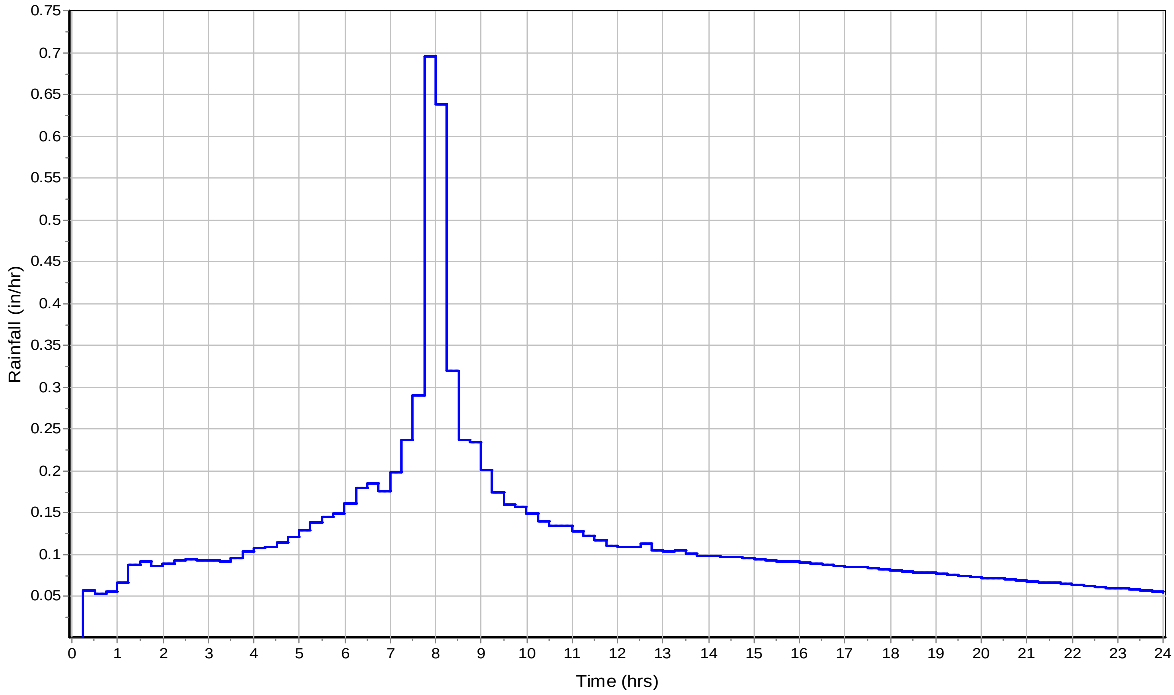
Time of Concentration

Subbasin Runoff Results

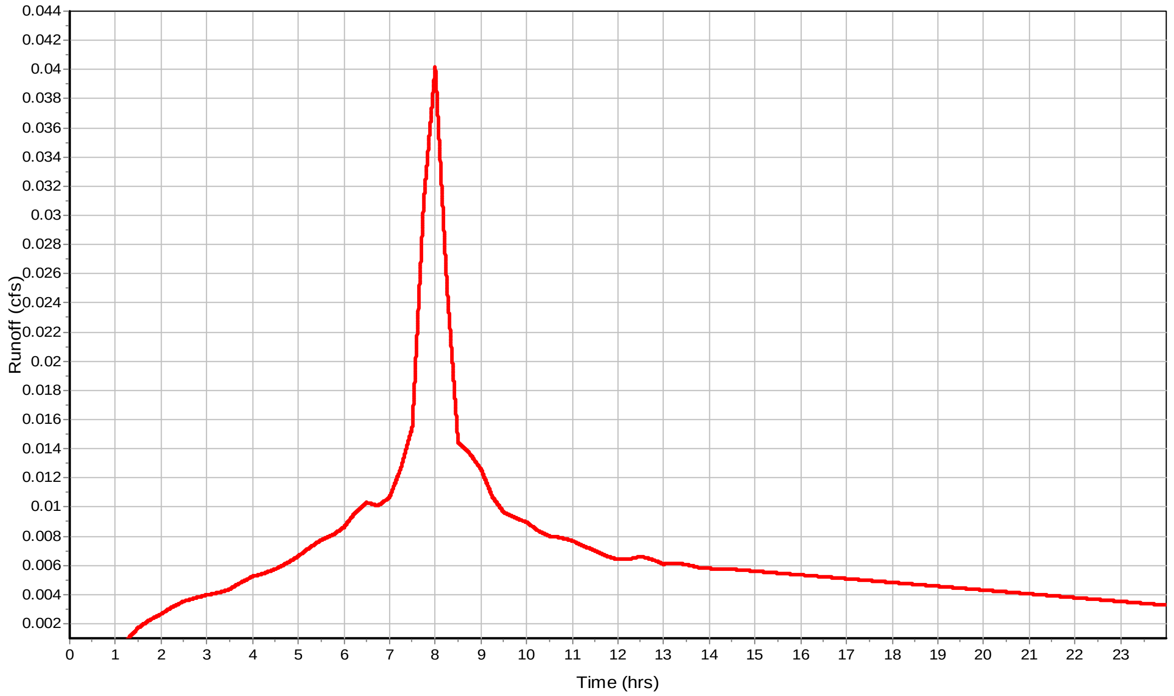
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

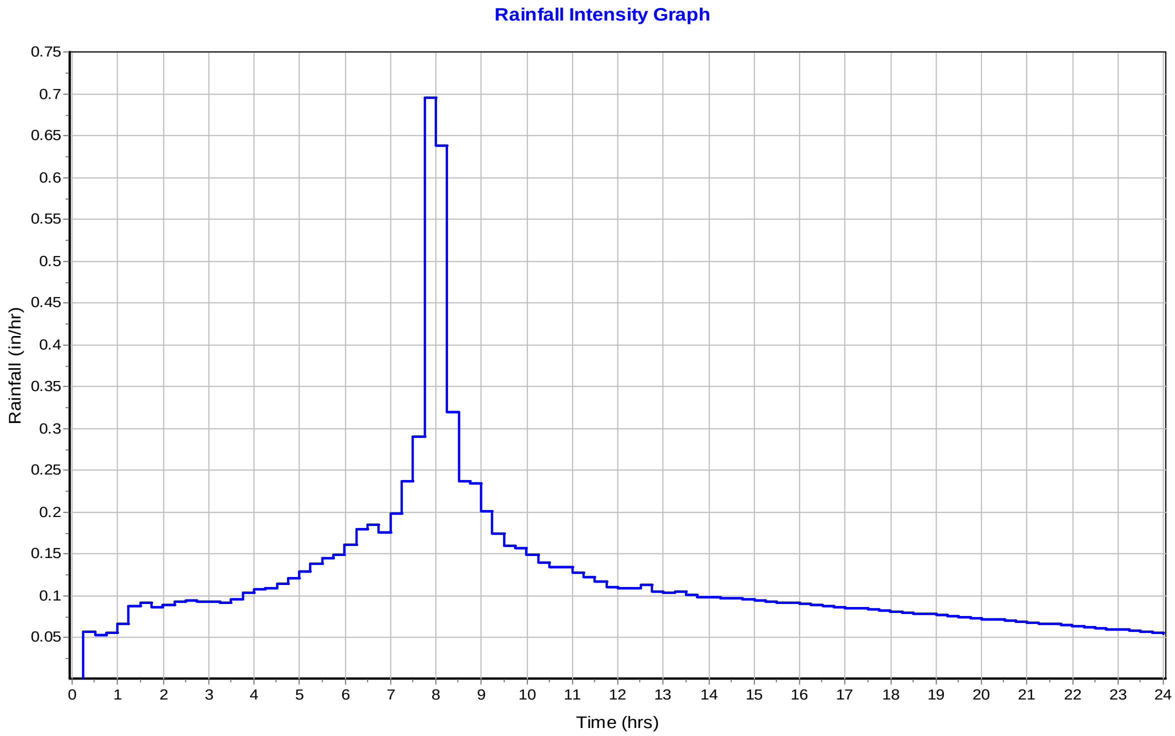
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

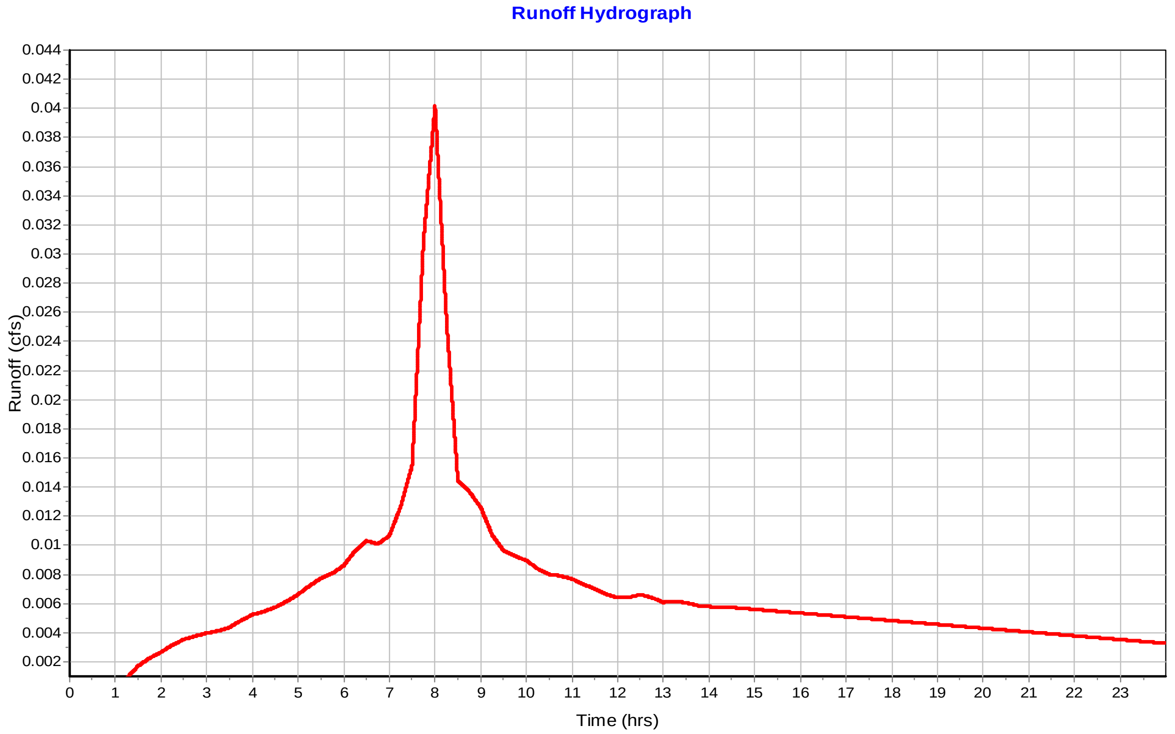
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_NW





Subbasin : BLDG D_SOUTH

Input Data

Area (ac)	0.12
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.12		98

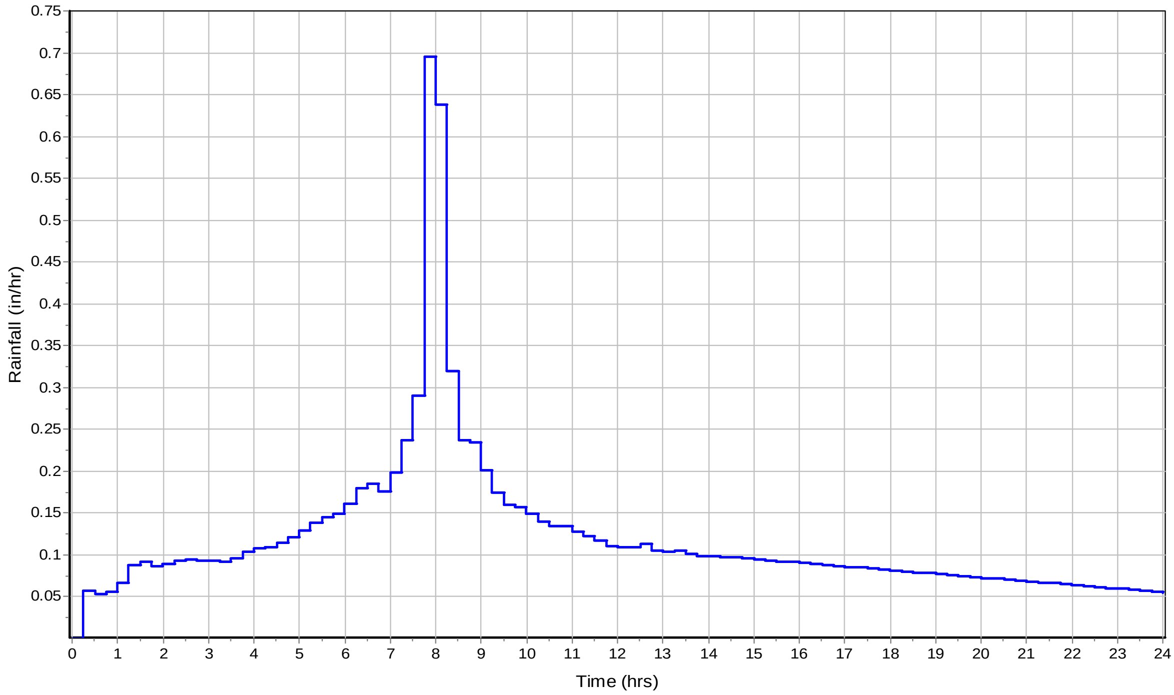
Time of Concentration

Subbasin Runoff Results

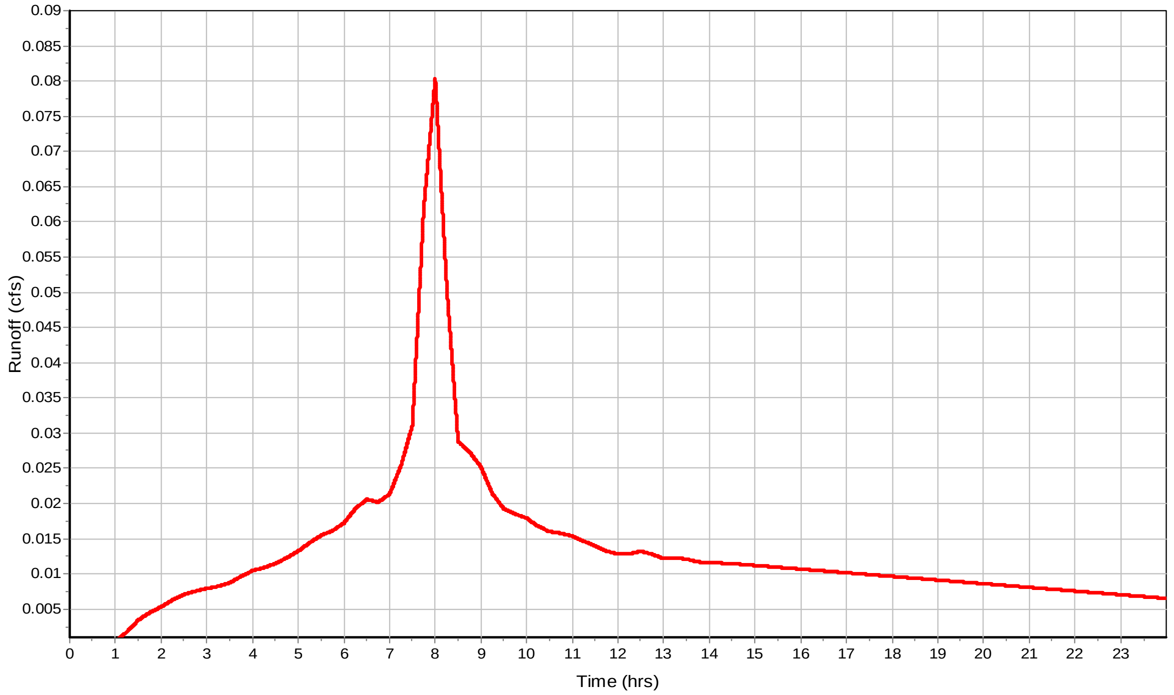
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_SOUTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG E_EAST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

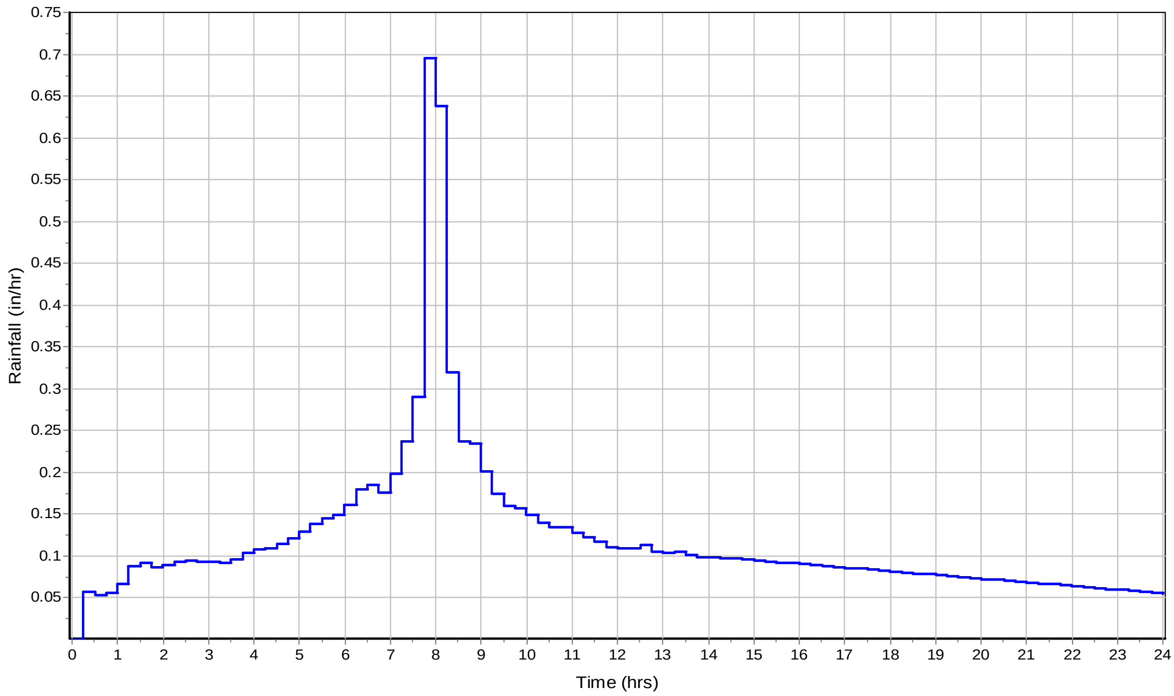
Time of Concentration

Subbasin Runoff Results

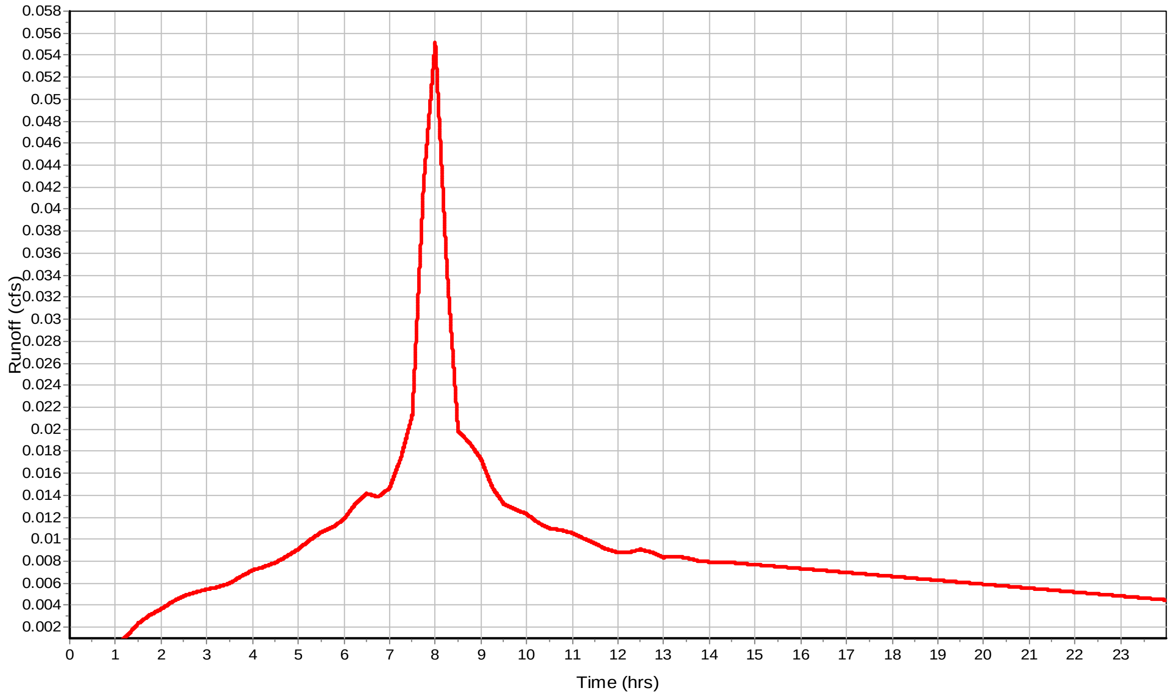
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.06
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG E_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG E_WEST

Input Data

Area (ac)	0.16
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.16		98

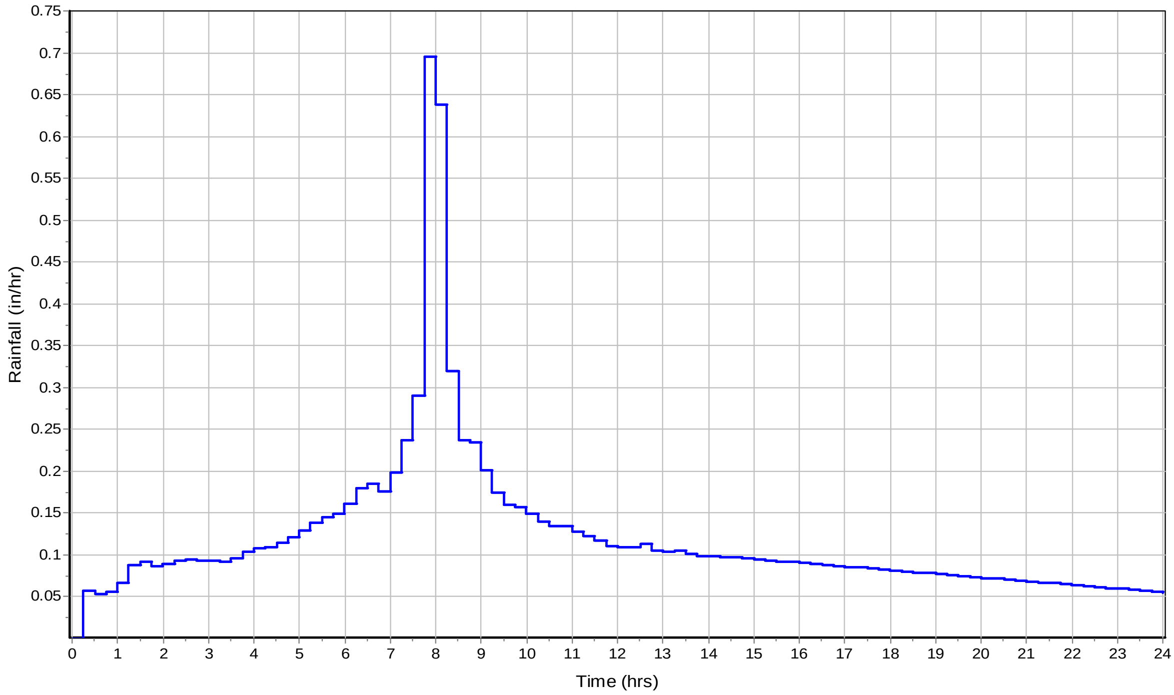
Time of Concentration

Subbasin Runoff Results

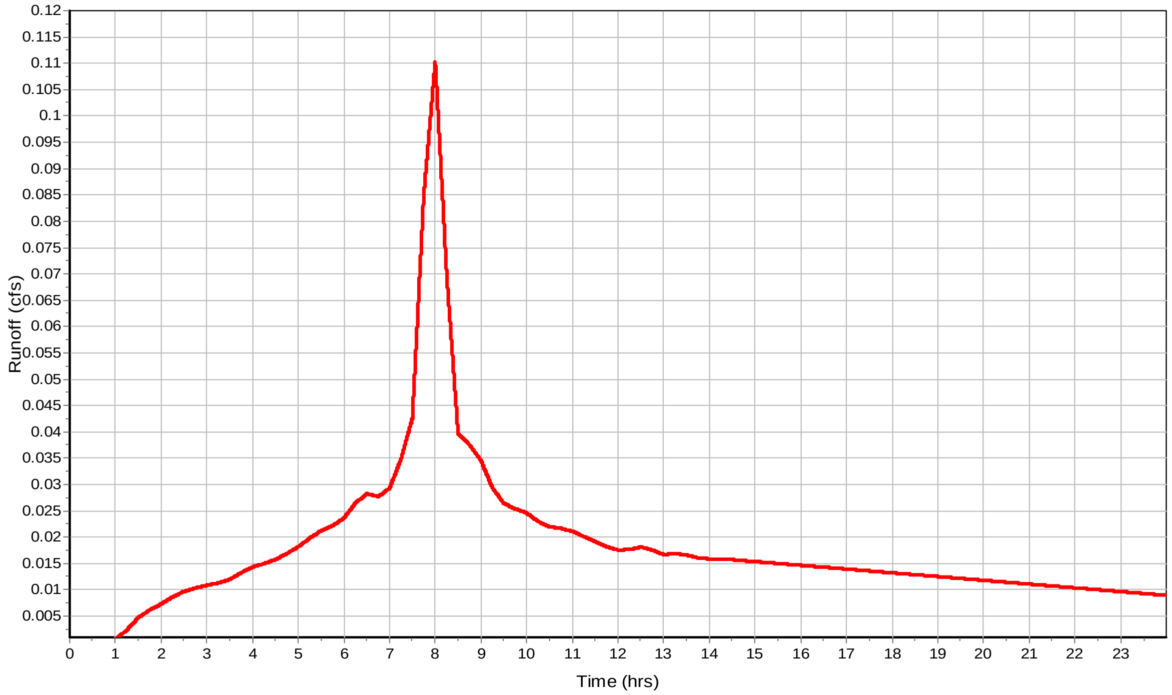
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.11
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG E_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG F_EAST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

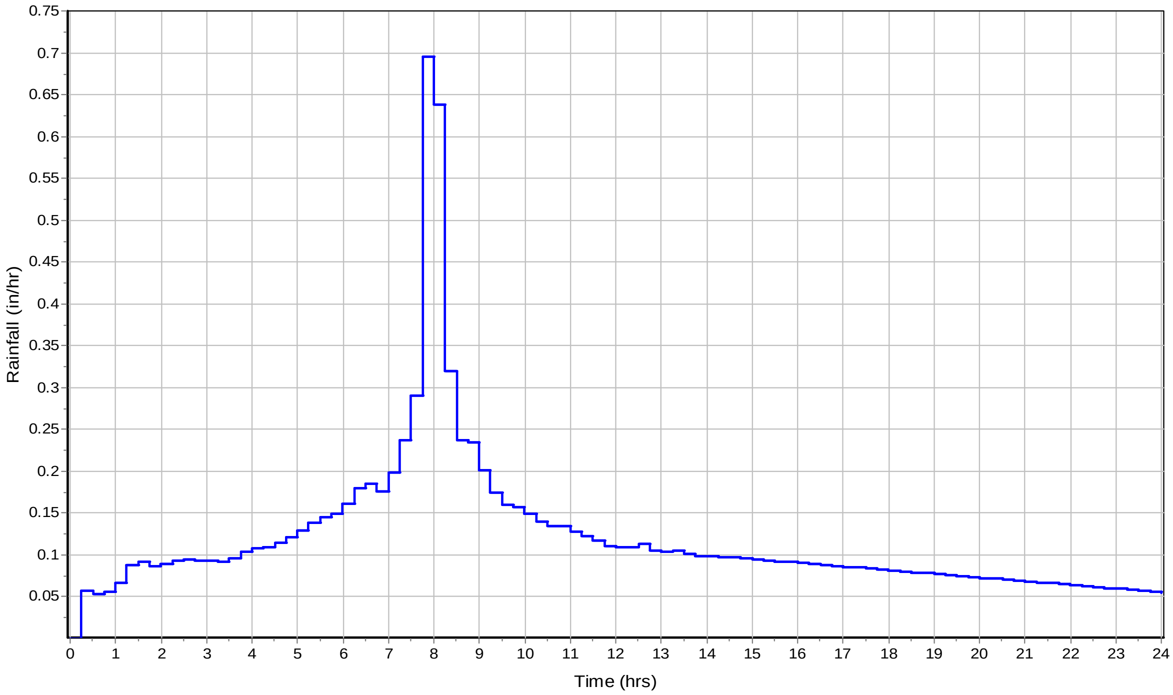
Time of Concentration

Subbasin Runoff Results

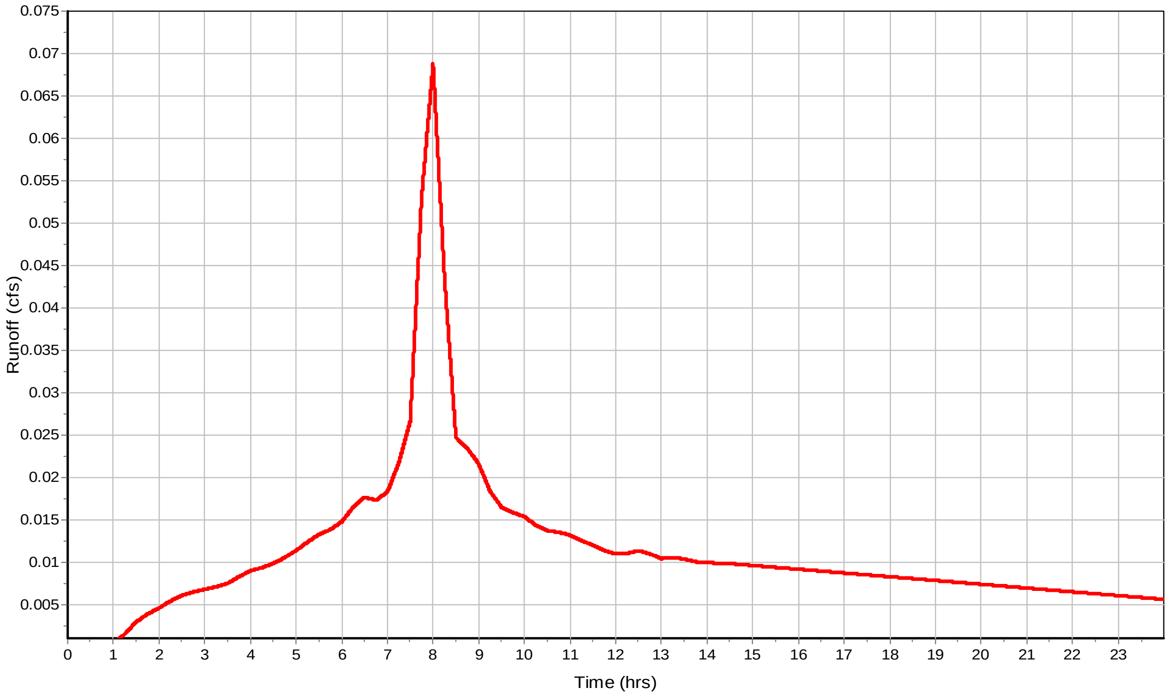
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG F_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG F_WEST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

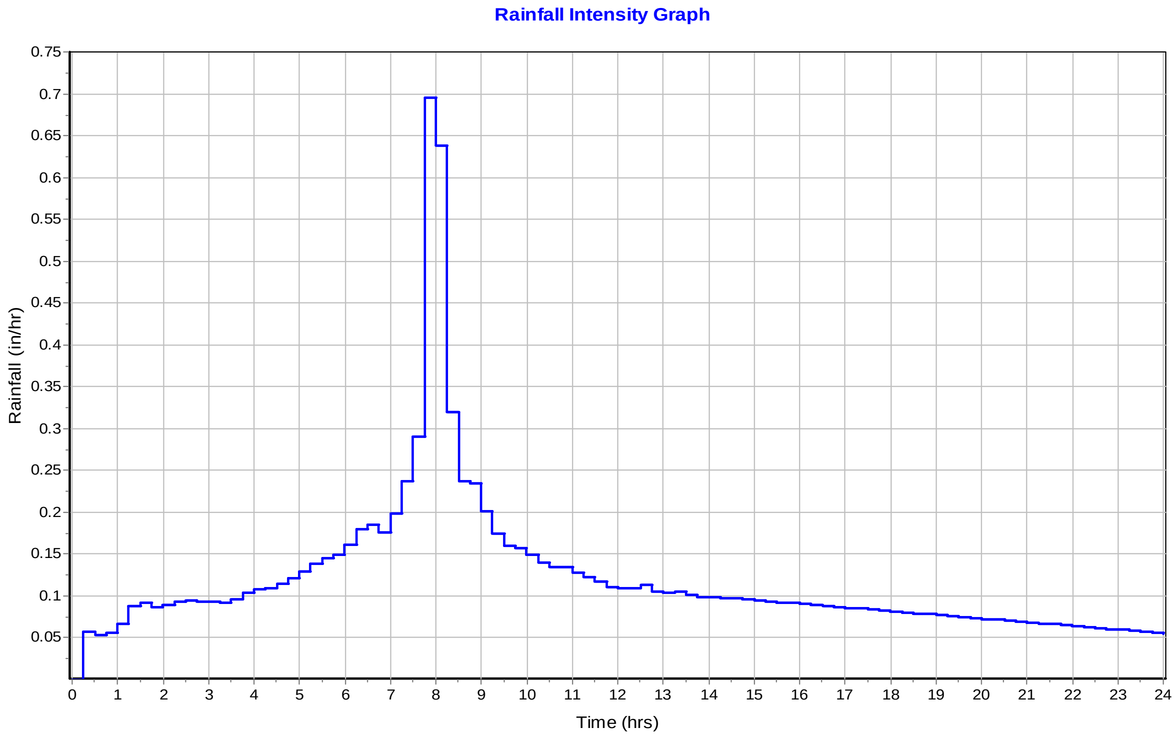
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

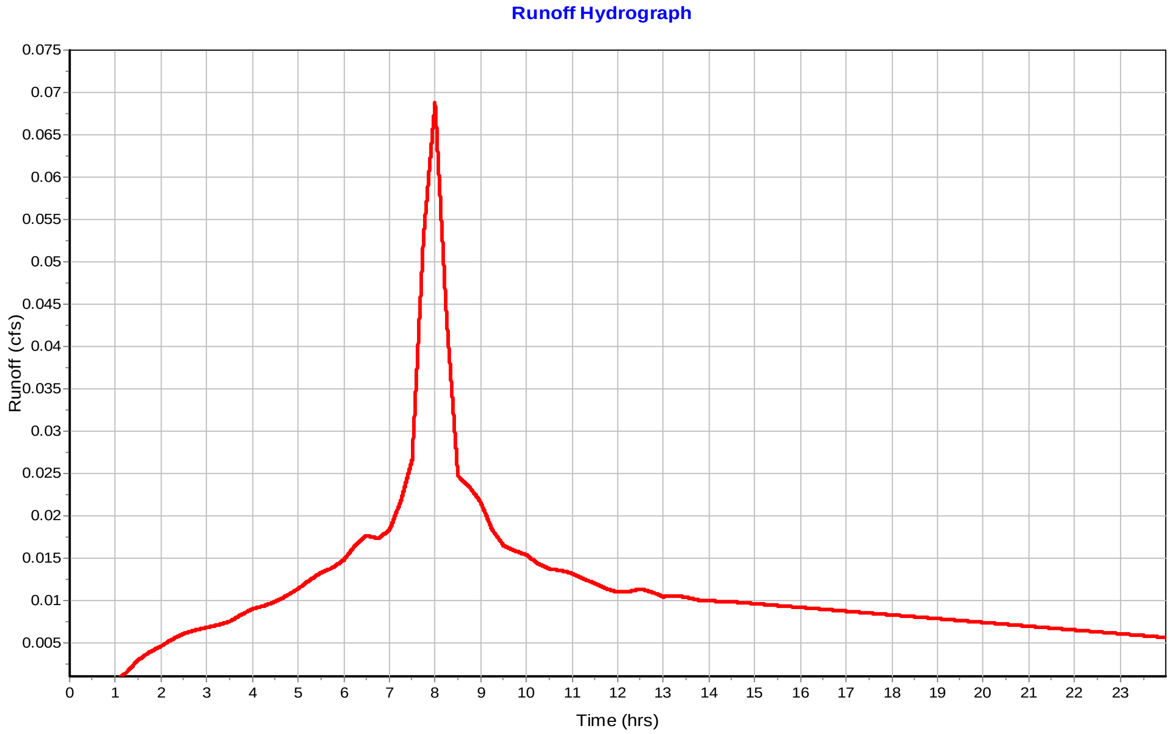
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG F_WEST





Subbasin : BLDG G_EAST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

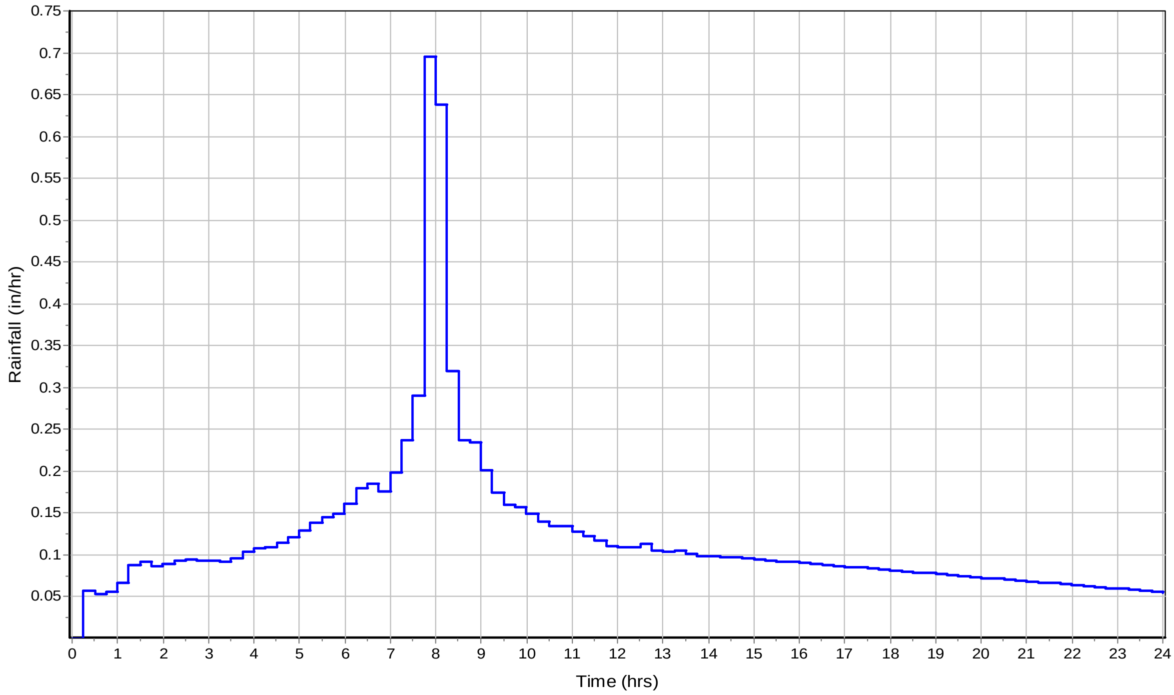
Time of Concentration

Subbasin Runoff Results

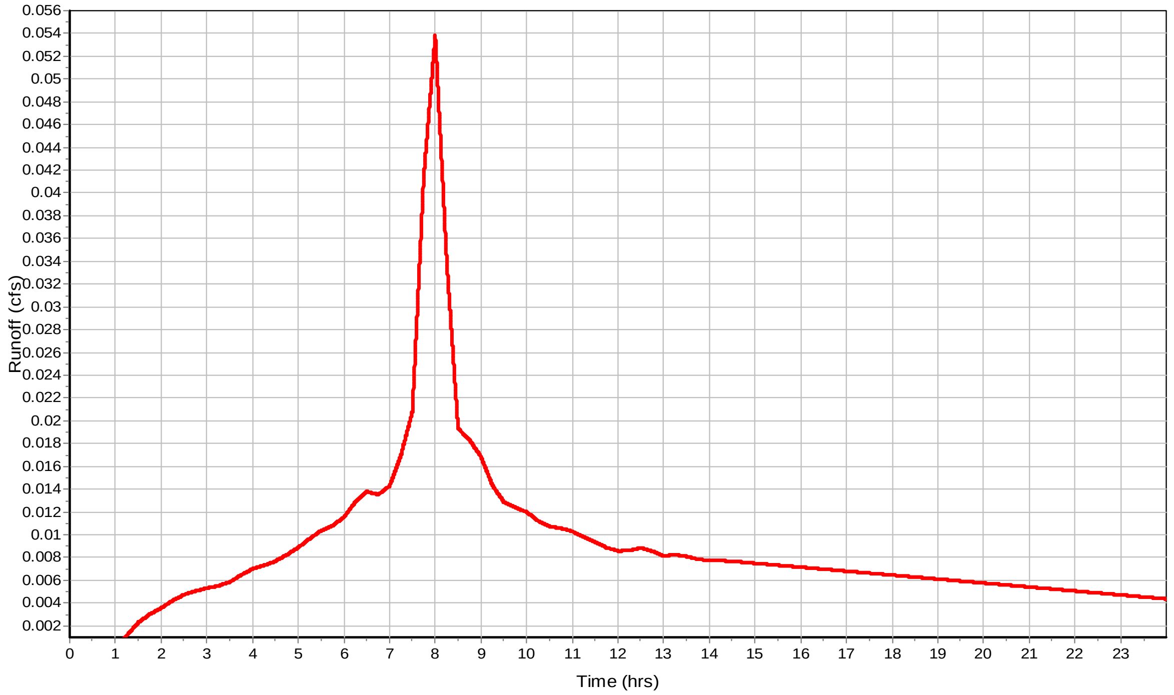
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG G_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG G_WEST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

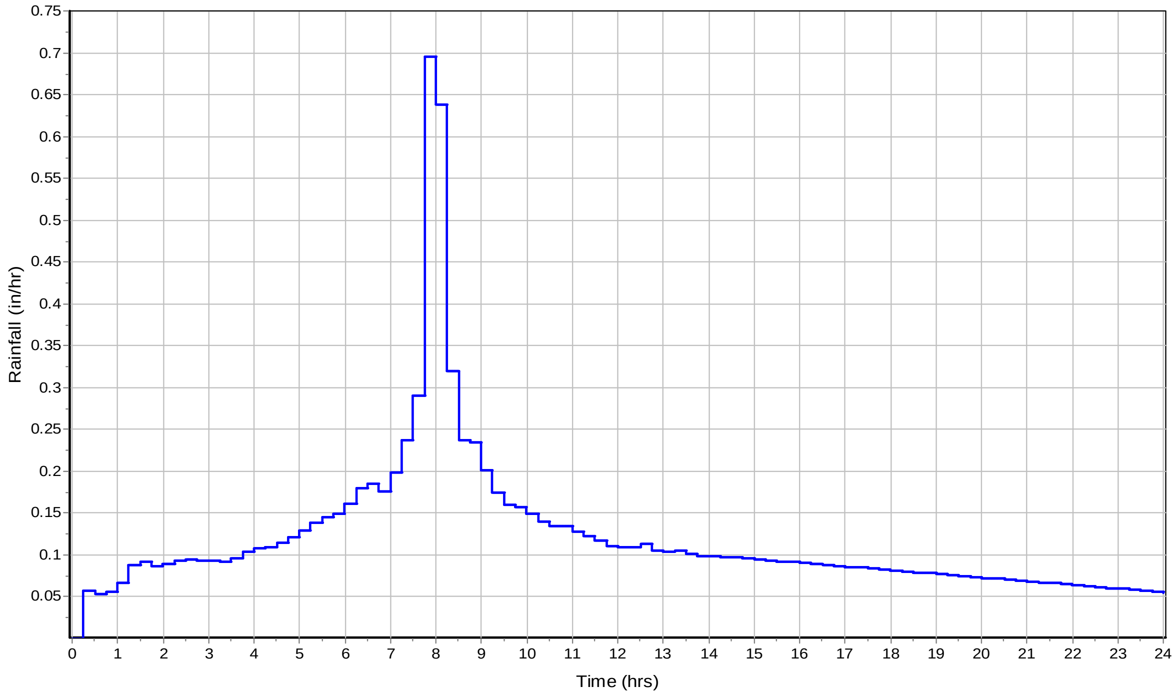
Time of Concentration

Subbasin Runoff Results

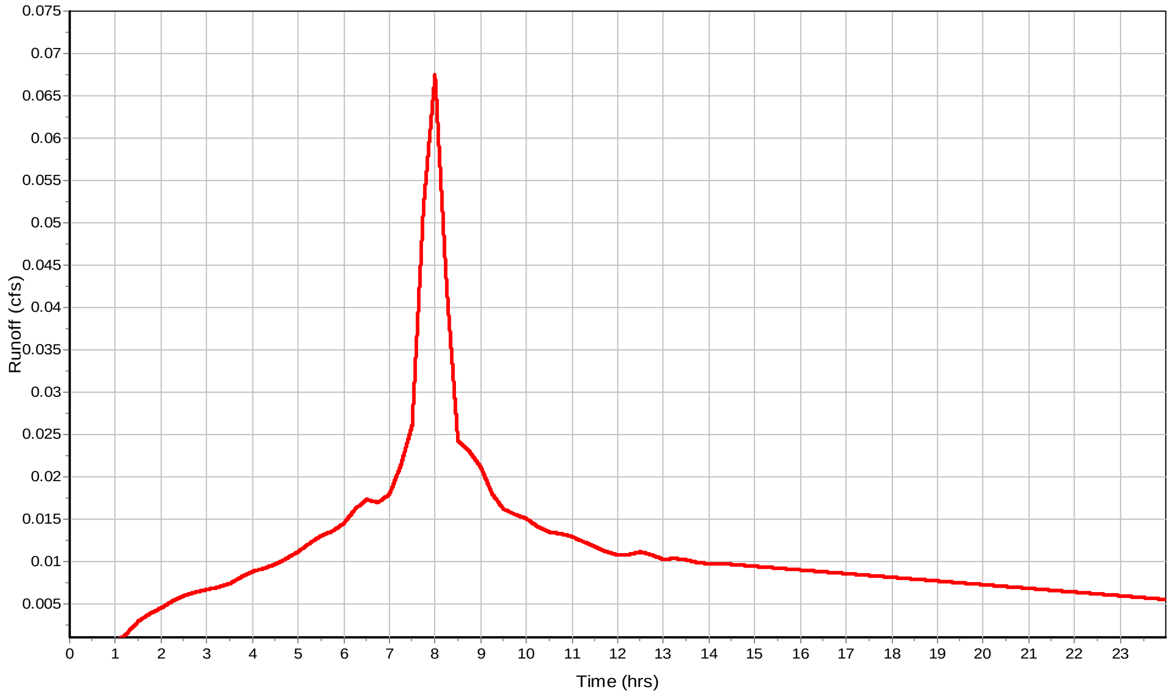
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG G_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG H_EAST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

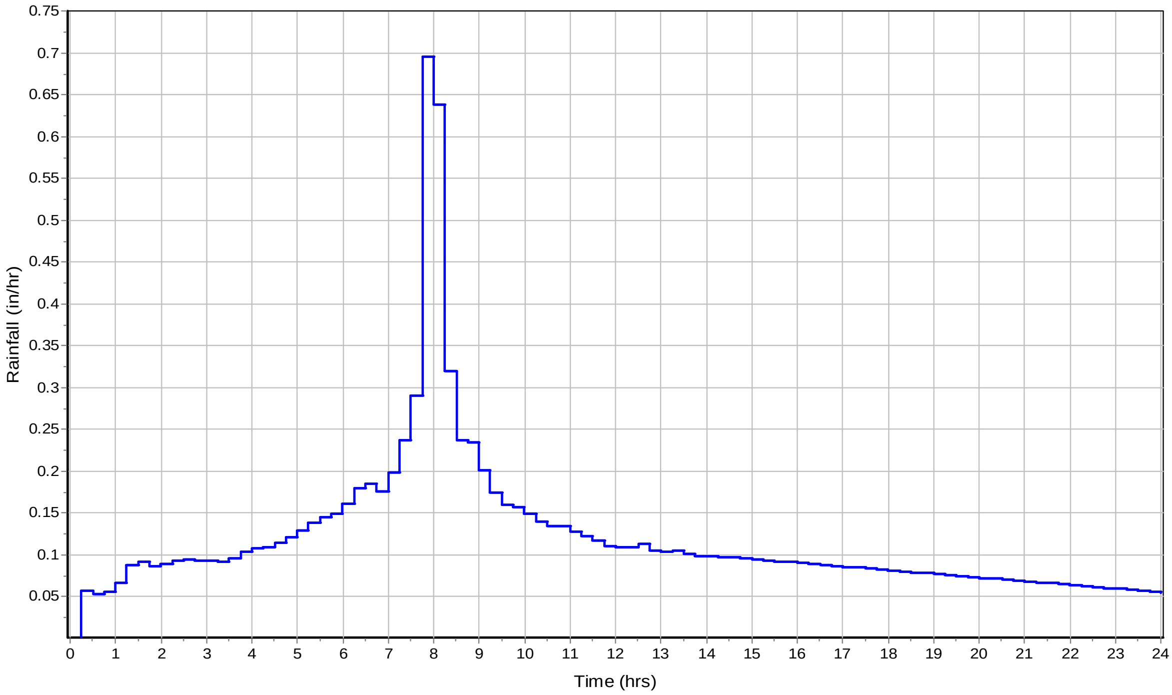
Time of Concentration

Subbasin Runoff Results

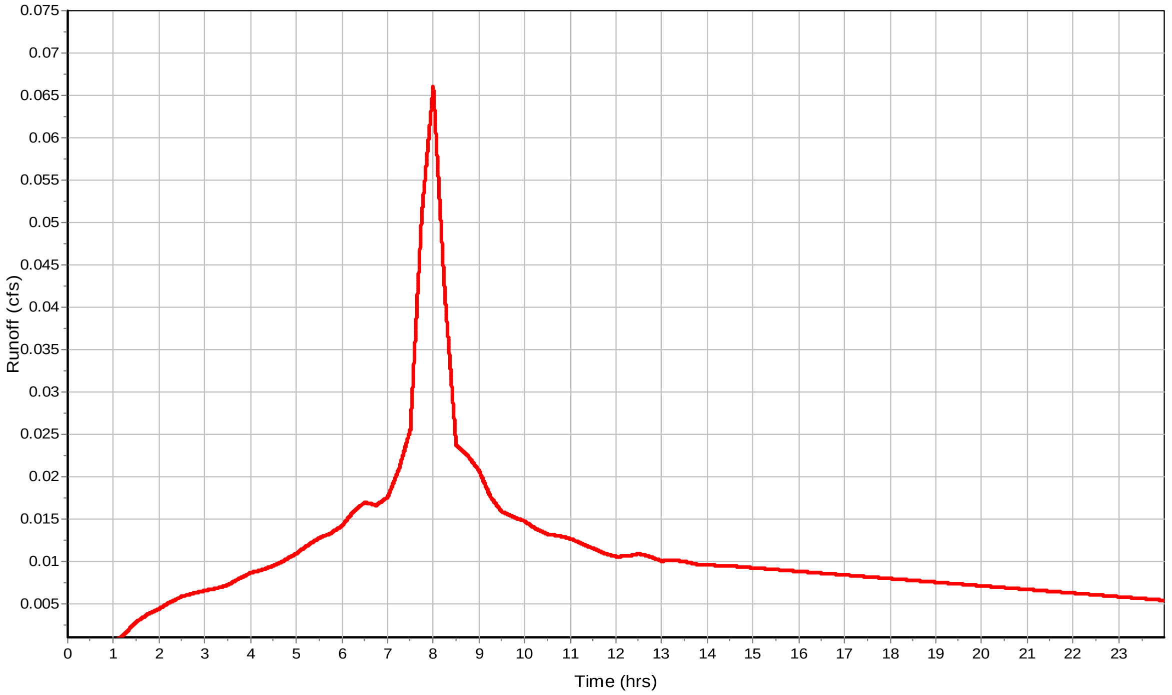
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG H_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG H_WEST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

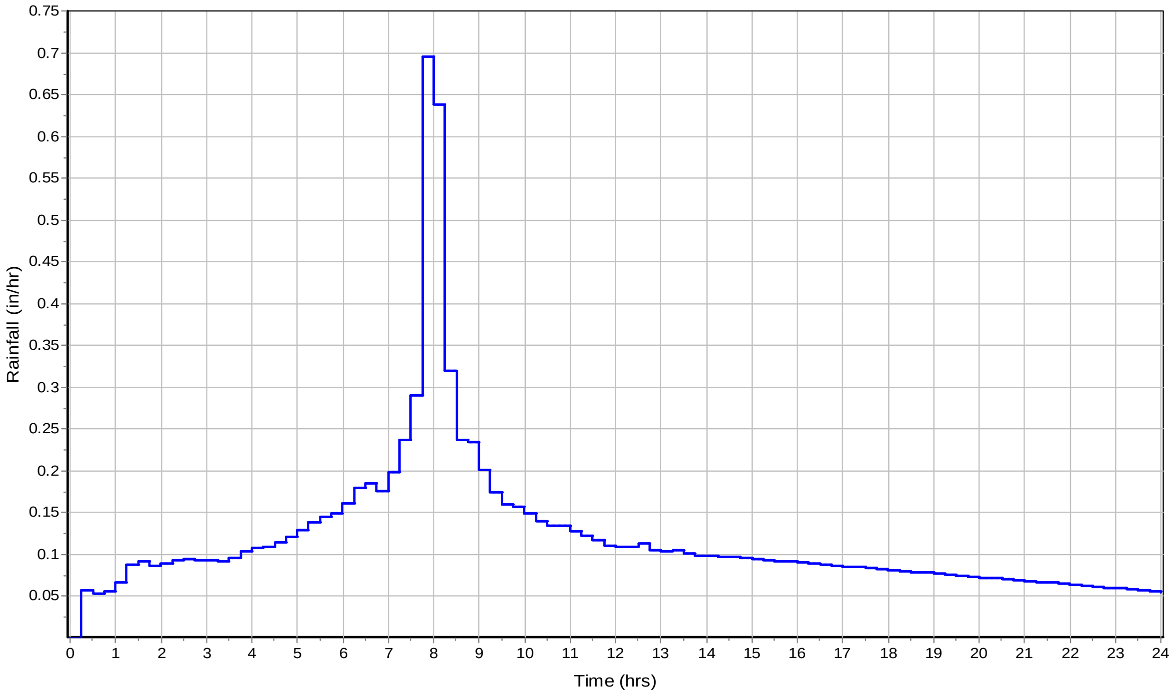
Time of Concentration

Subbasin Runoff Results

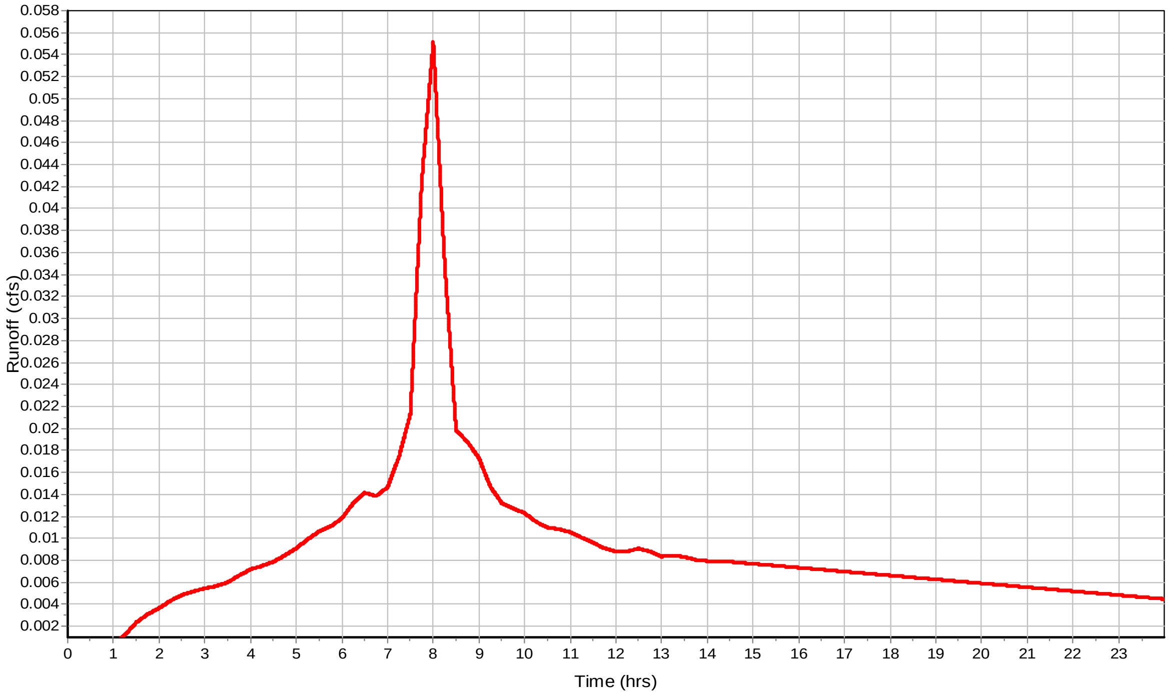
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.06
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG H_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. EAST

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.05		98

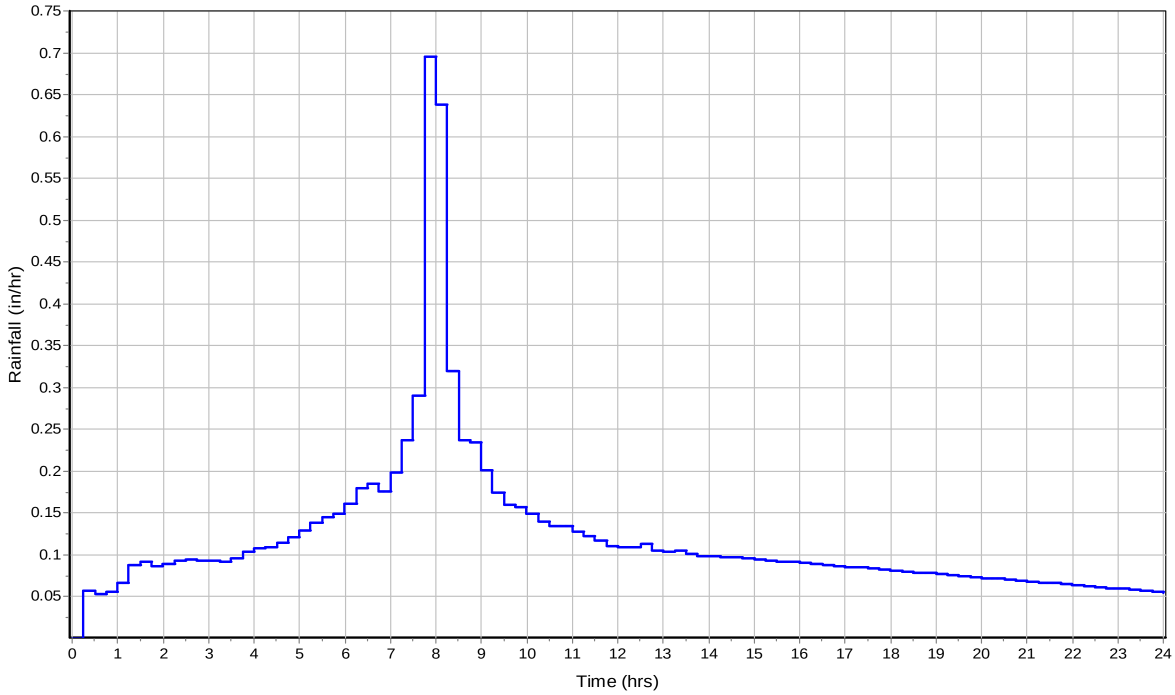
Time of Concentration

Subbasin Runoff Results

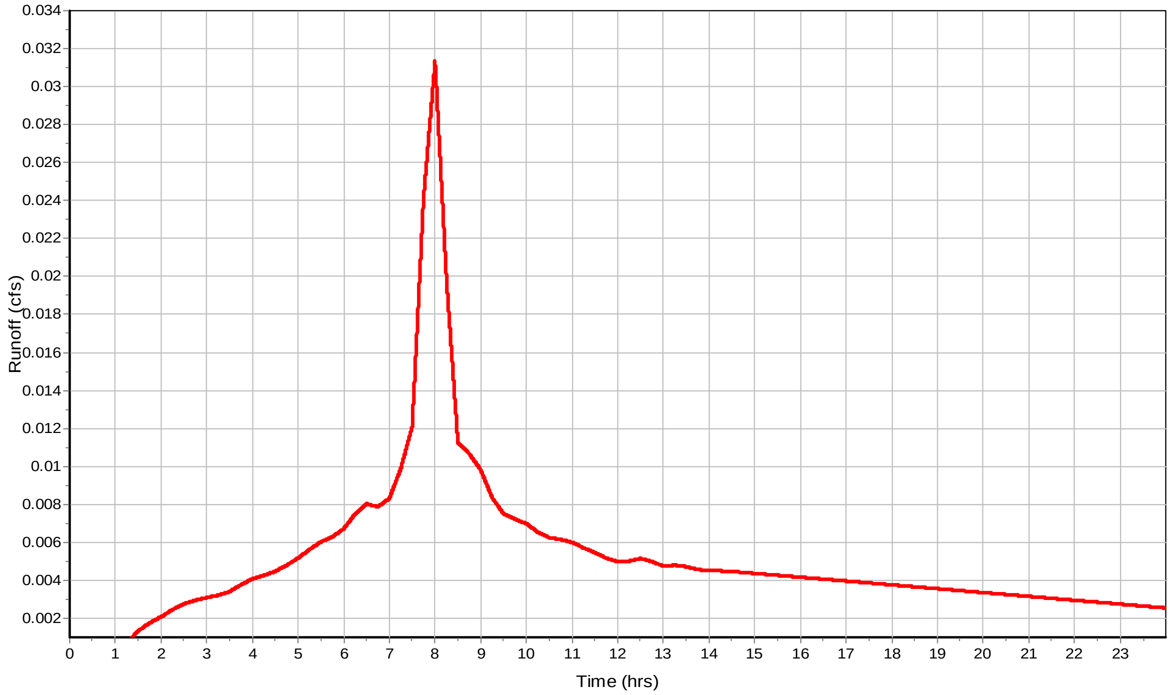
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. NE

Input Data

Area (ac)	0.02
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.02		98

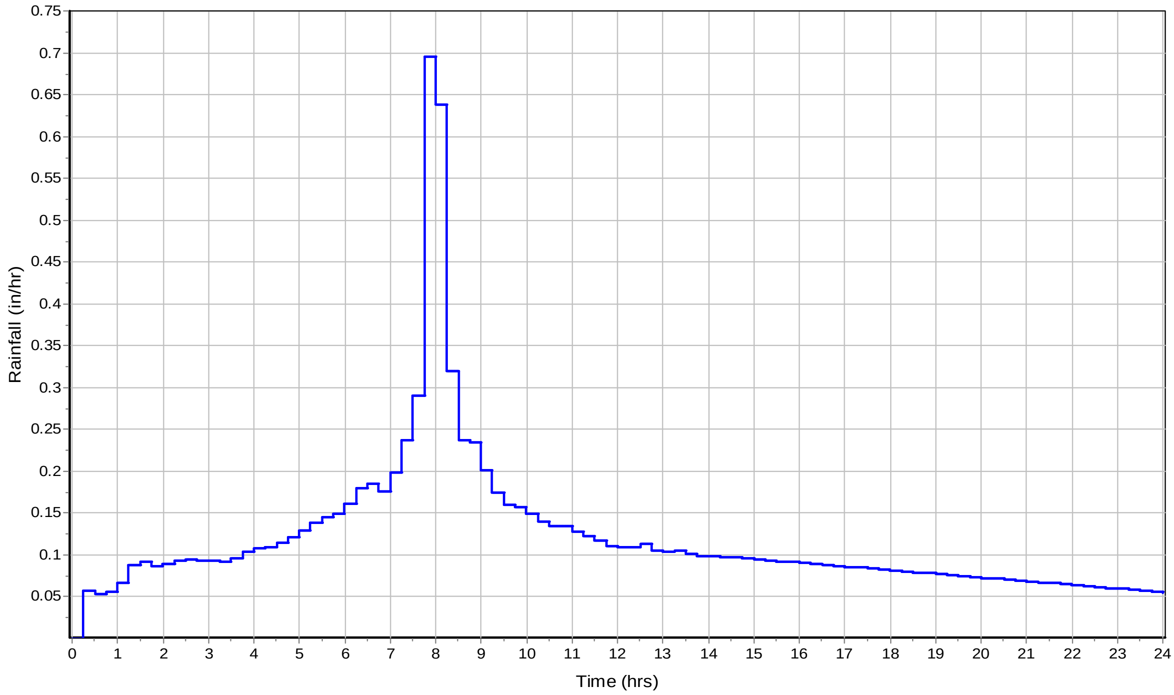
Time of Concentration

Subbasin Runoff Results

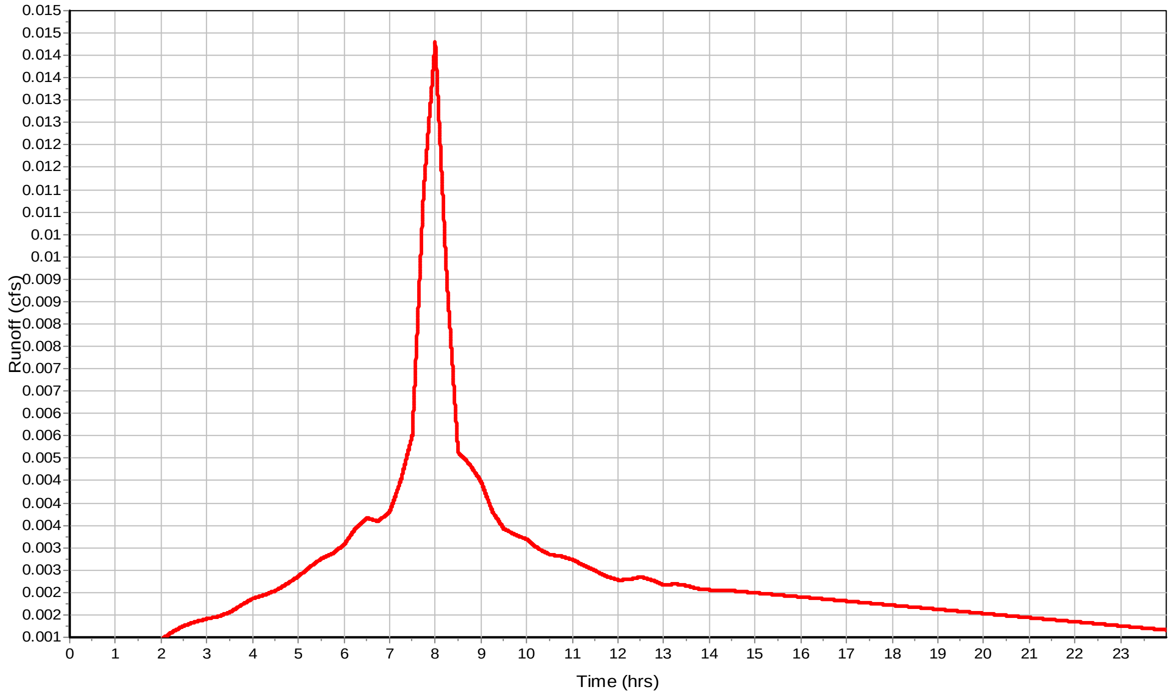
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.01
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. NW

Input Data

Area (ac)	0.04
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.04		98

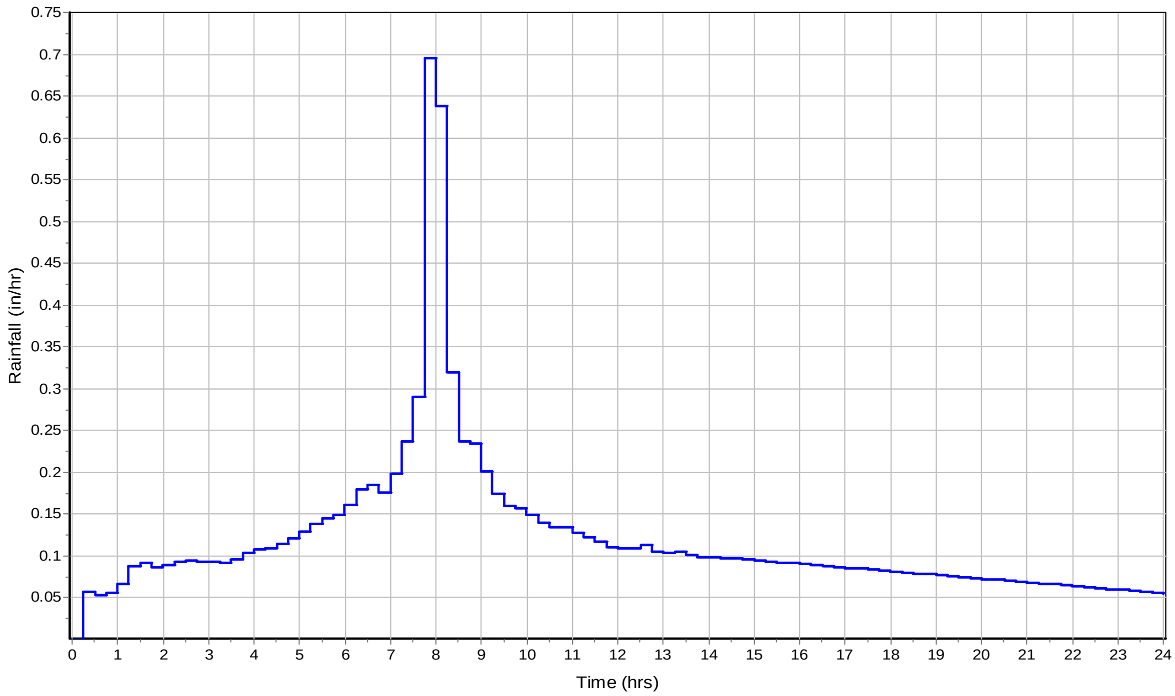
Time of Concentration

Subbasin Runoff Results

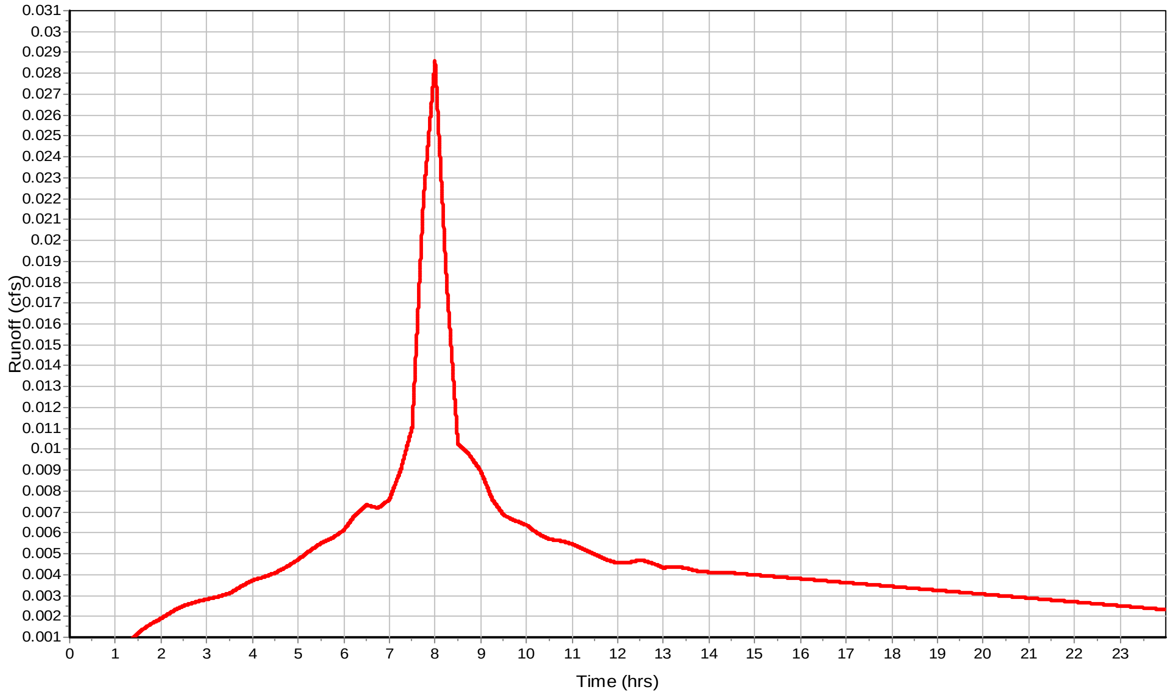
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. SE

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

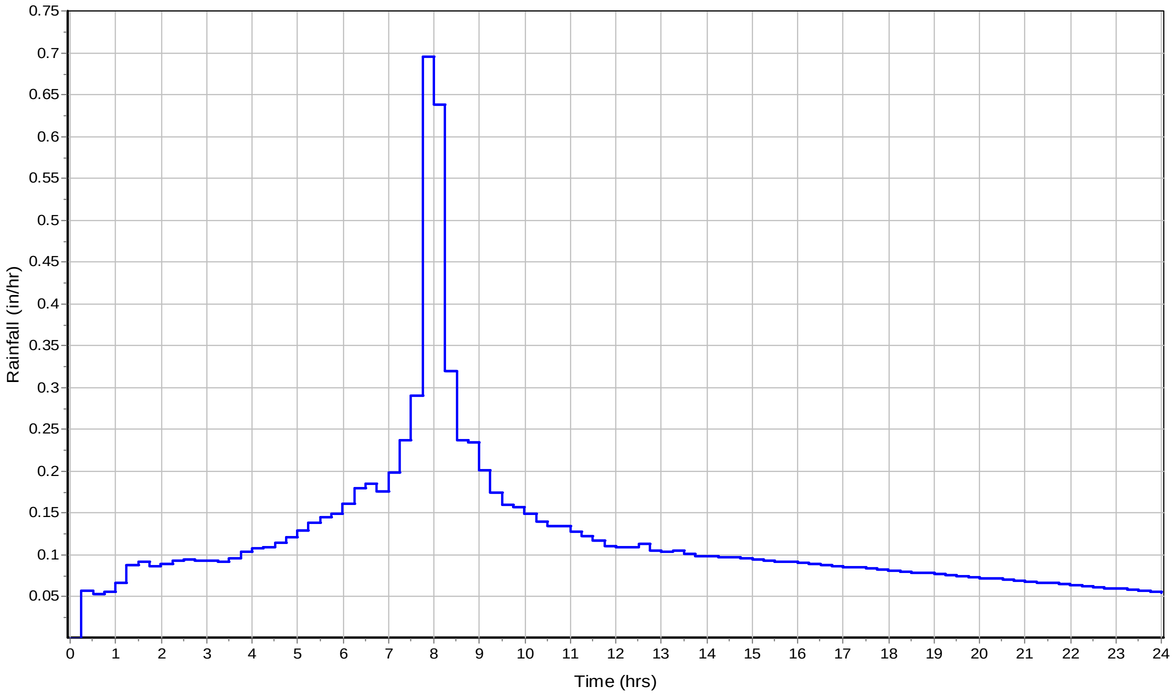
Time of Concentration

Subbasin Runoff Results

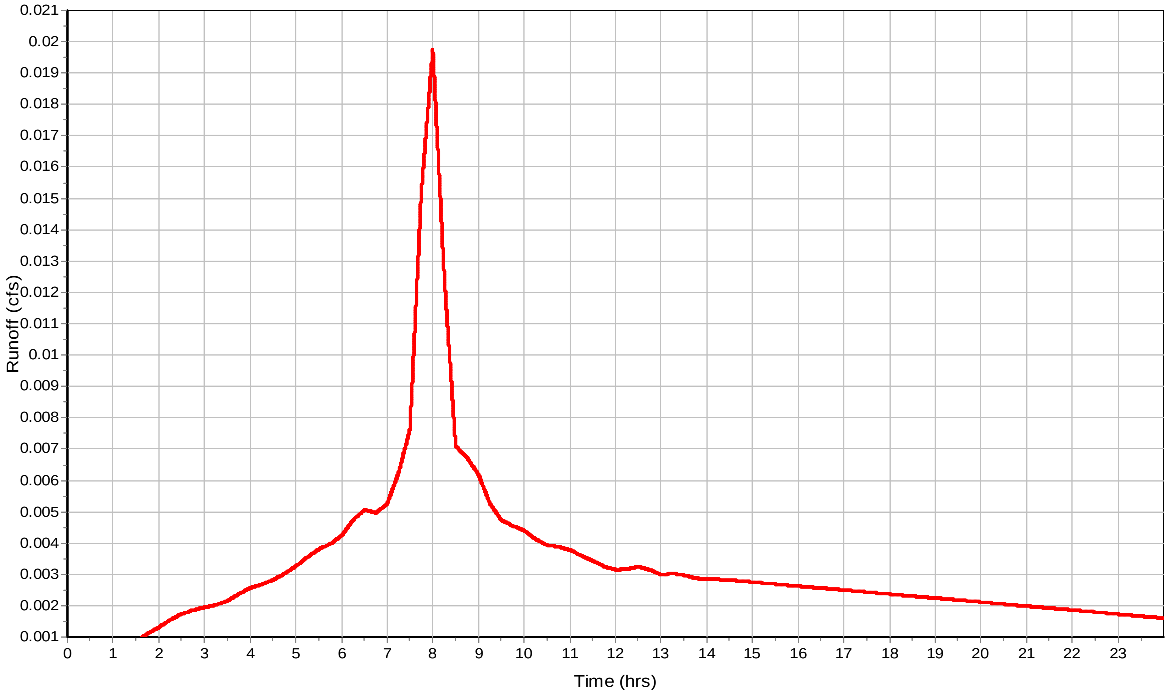
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. SW

Input Data

Area (ac)	0.04
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.04		98

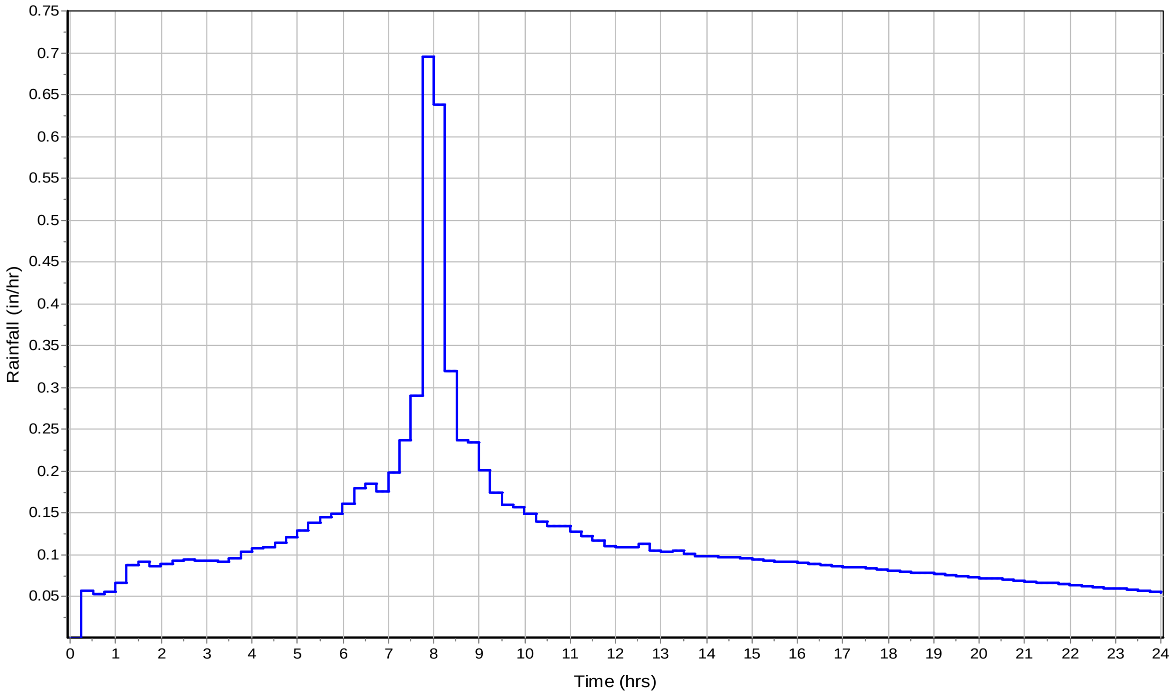
Time of Concentration

Subbasin Runoff Results

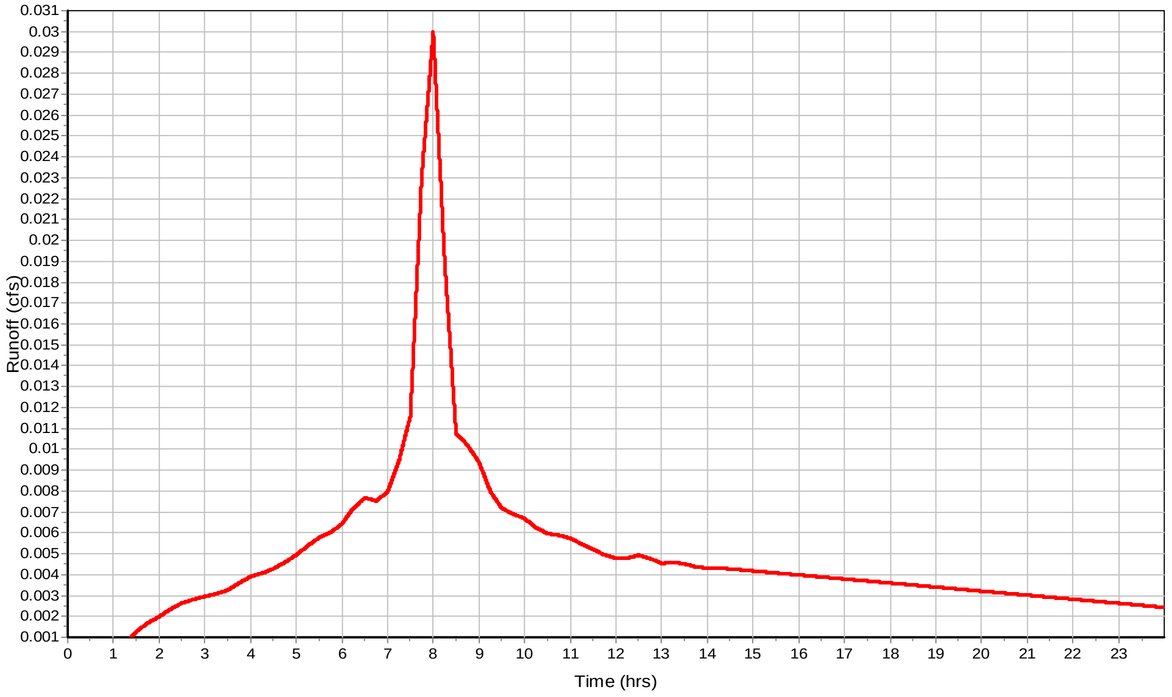
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. WEST

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

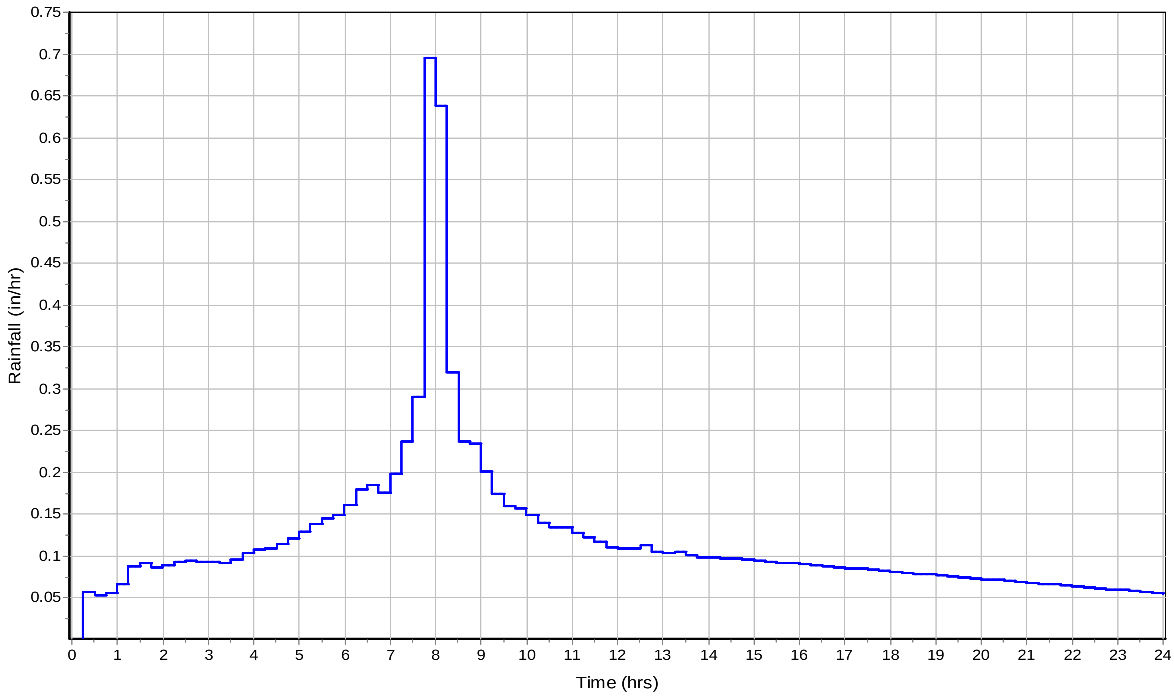
Time of Concentration

Subbasin Runoff Results

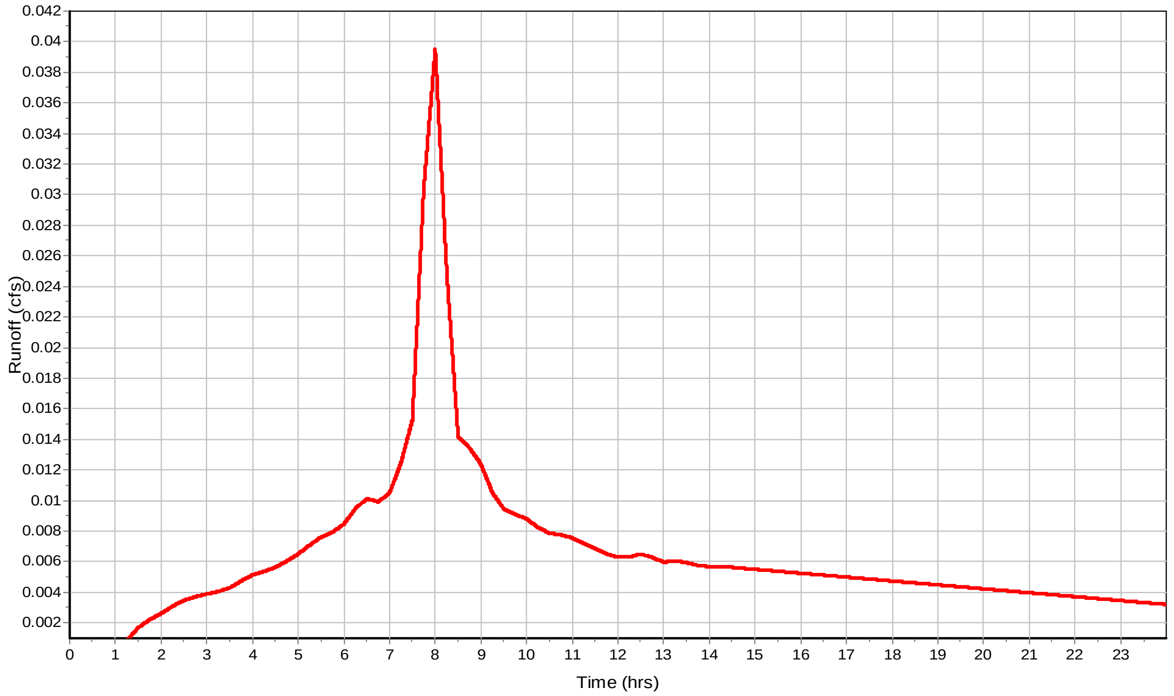
Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 02

Input Data

Area (ac)	0.22
Impervious Area (%)	98
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.22		97.56

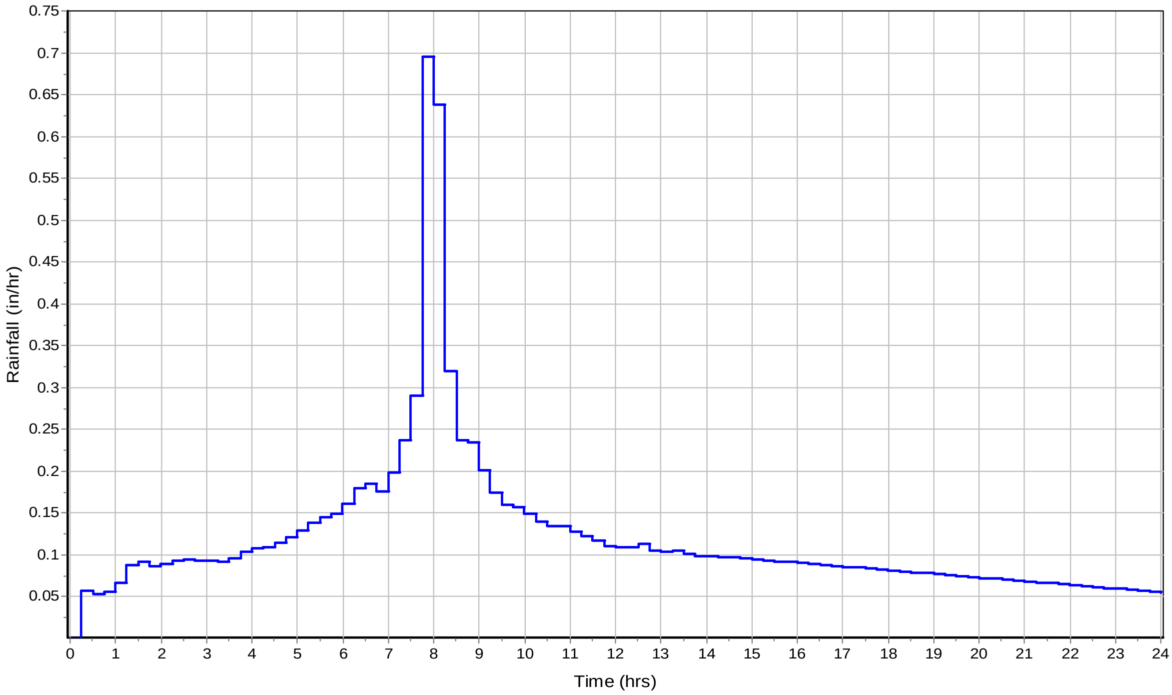
Time of Concentration

Subbasin Runoff Results

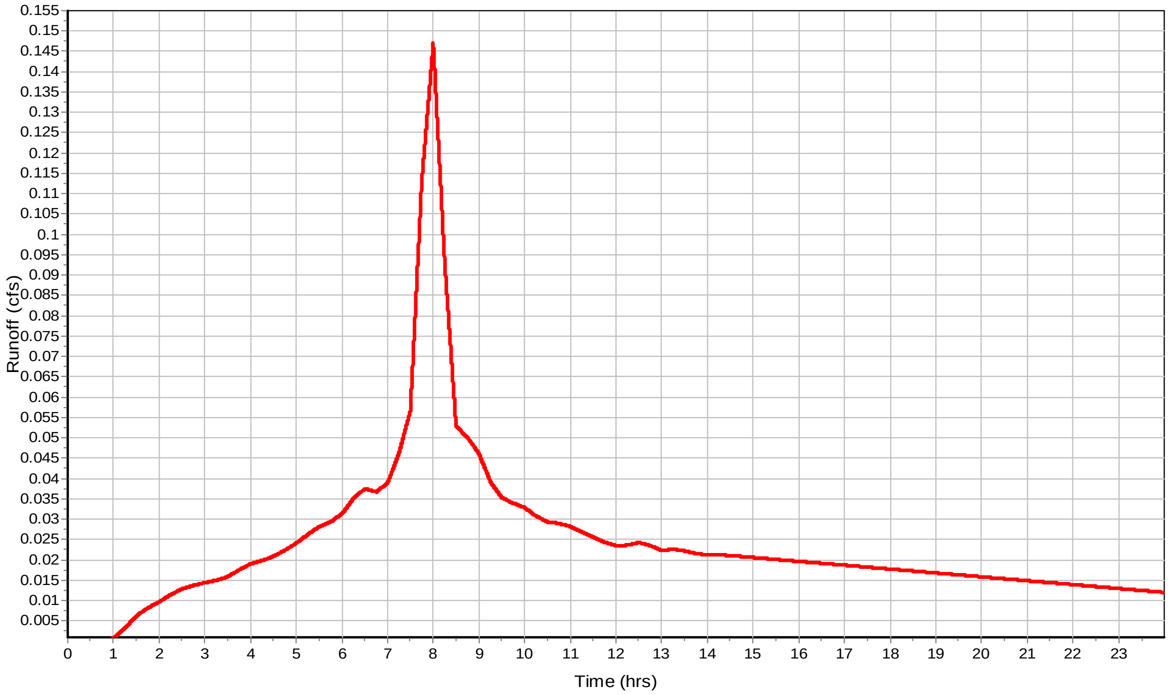
Total Rainfall (in)	2.87
Total Runoff (in)	2.61
Peak Runoff (cfs)	0.15
Weighted Curve Number	97.56
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 03

Input Data

Area (ac)	0.13
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

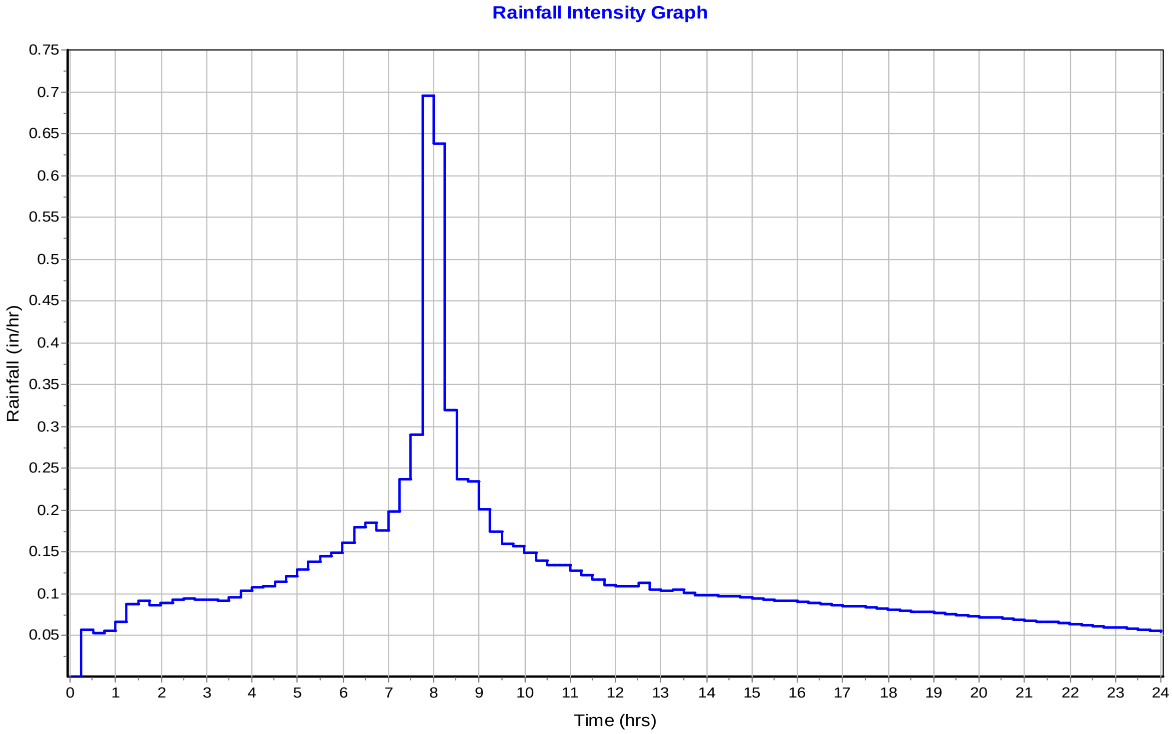
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		98

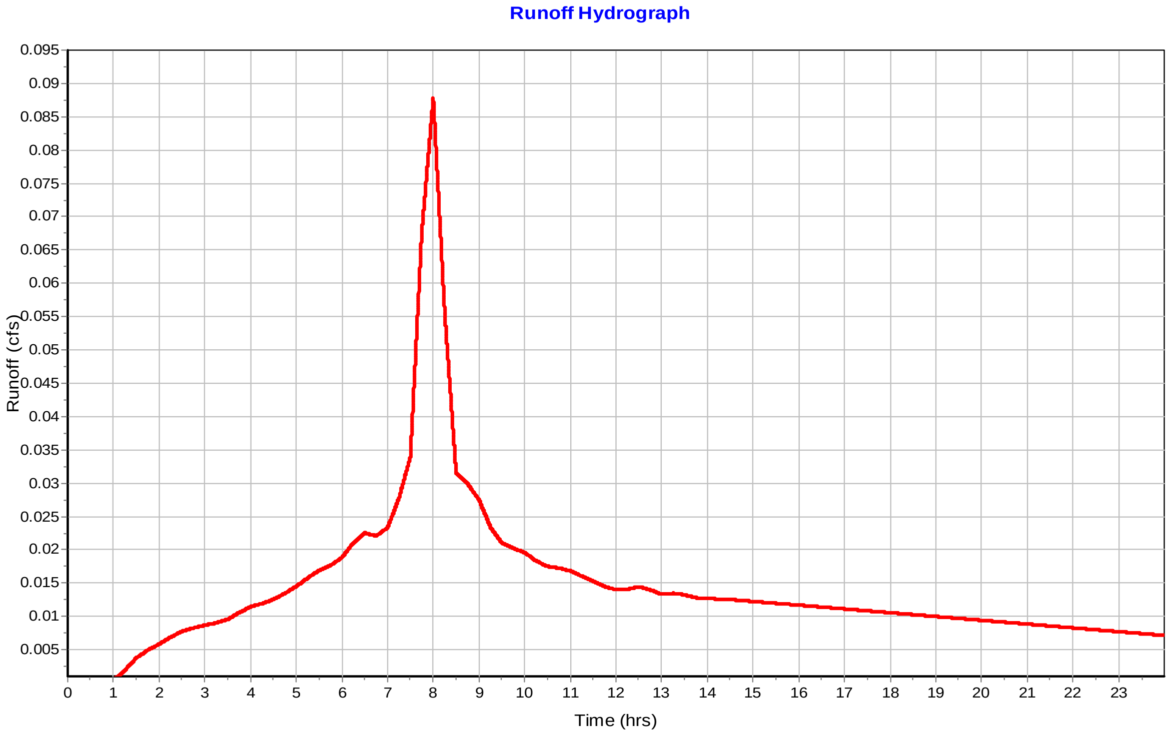
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.09
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 03





Subbasin : SDCB 04

Input Data

Area (ac)	0.06
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		92.06

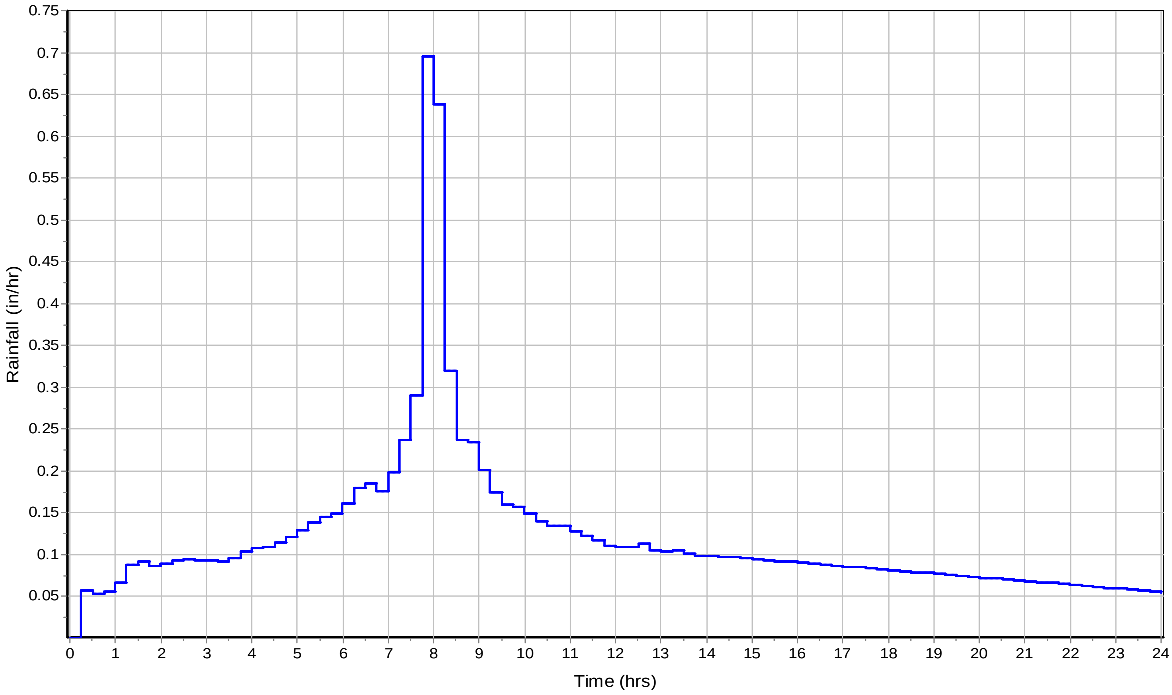
Time of Concentration

Subbasin Runoff Results

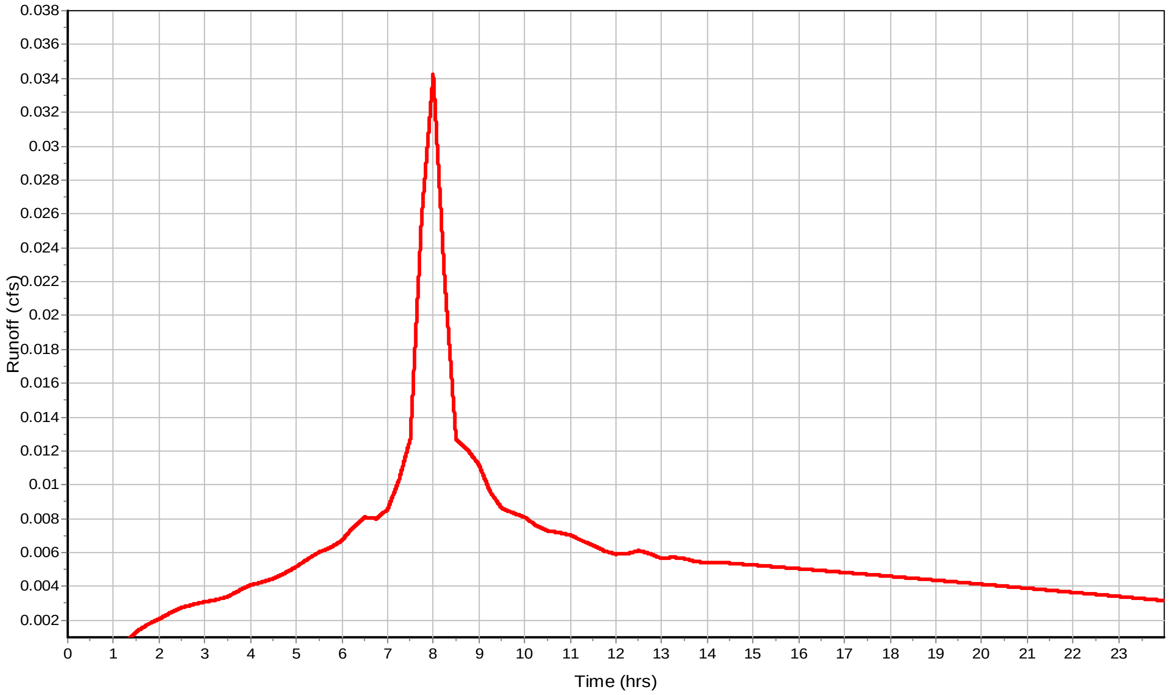
Total Rainfall (in)	2.87
Total Runoff (in)	2.18
Peak Runoff (cfs)	0.03
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 05

Input Data

Area (ac) 0.24
Impervious Area (%) 90
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.24		95.8

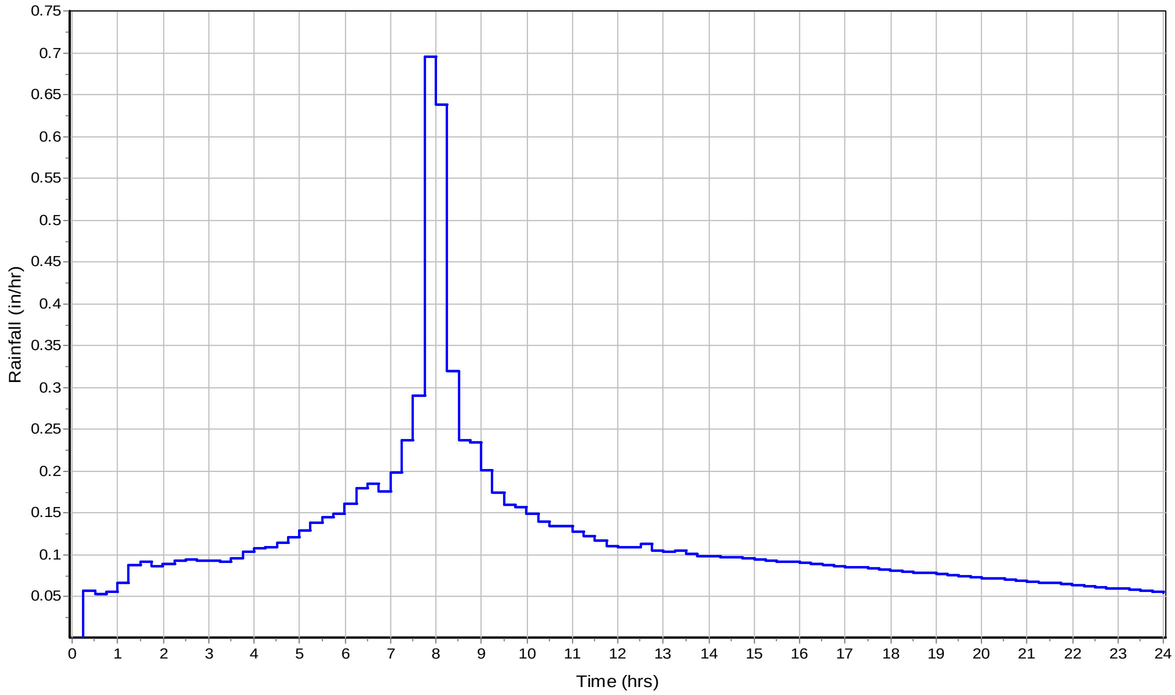
Time of Concentration

Subbasin Runoff Results

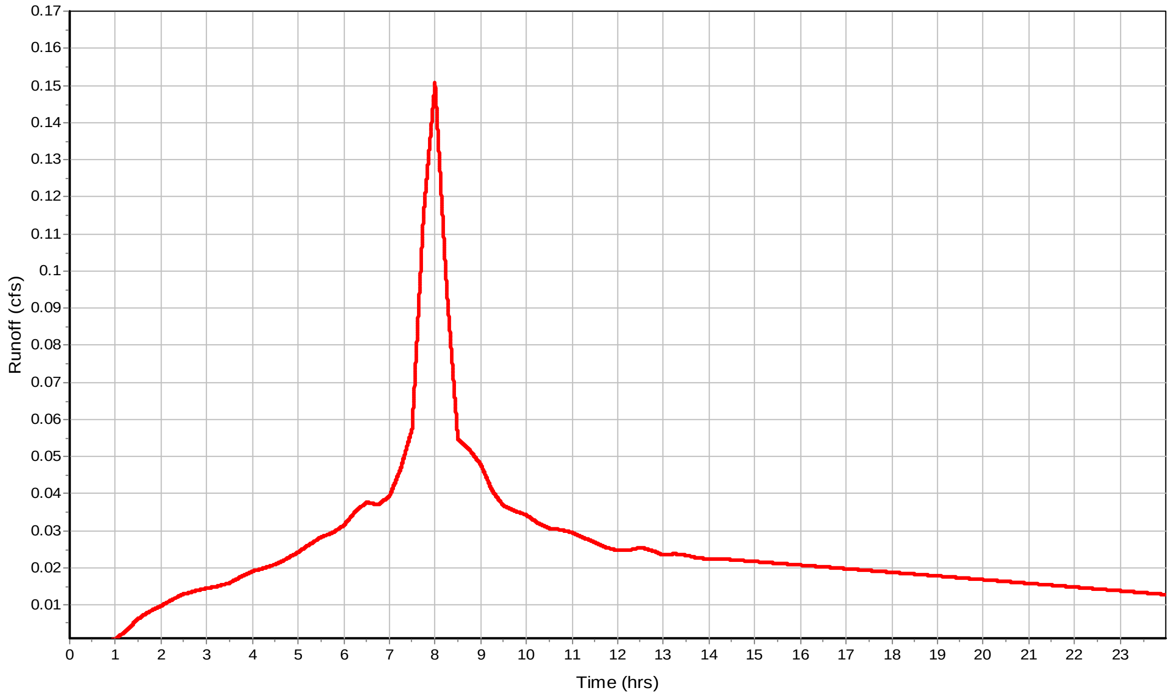
Total Rainfall (in) 2.87
Total Runoff (in) 2.47
Peak Runoff (cfs) 0.15
Weighted Curve Number 95.8
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : SDCB 05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 06

Input Data

Area (ac)	0.16
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.16		90.3

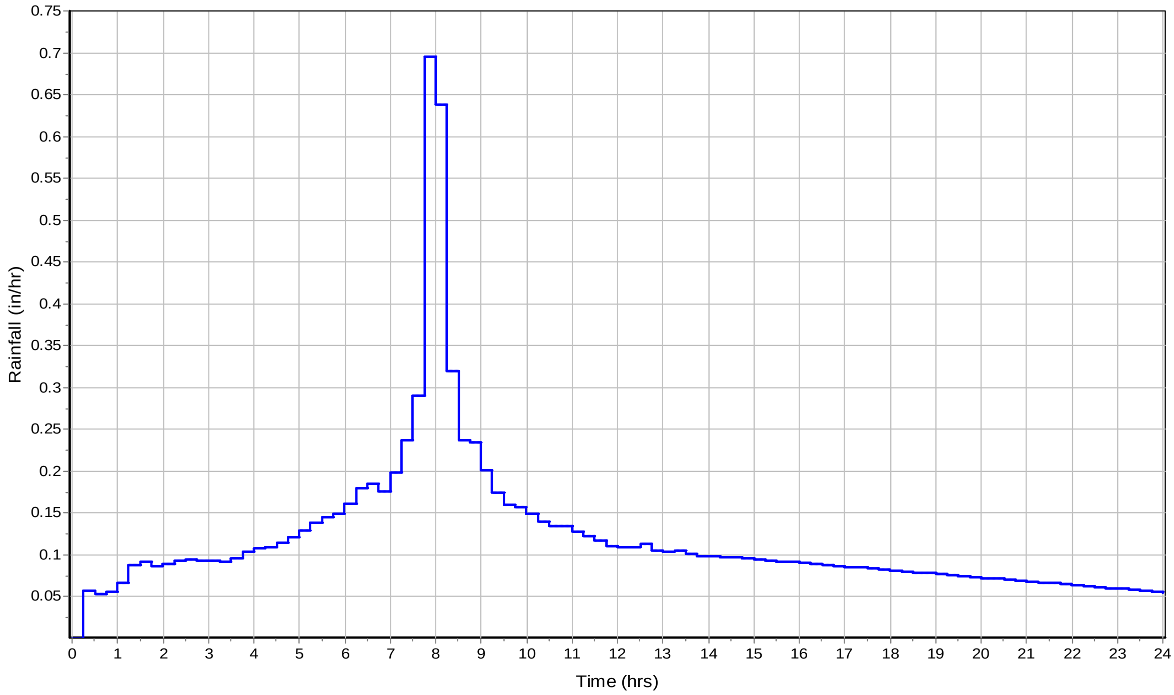
Time of Concentration

Subbasin Runoff Results

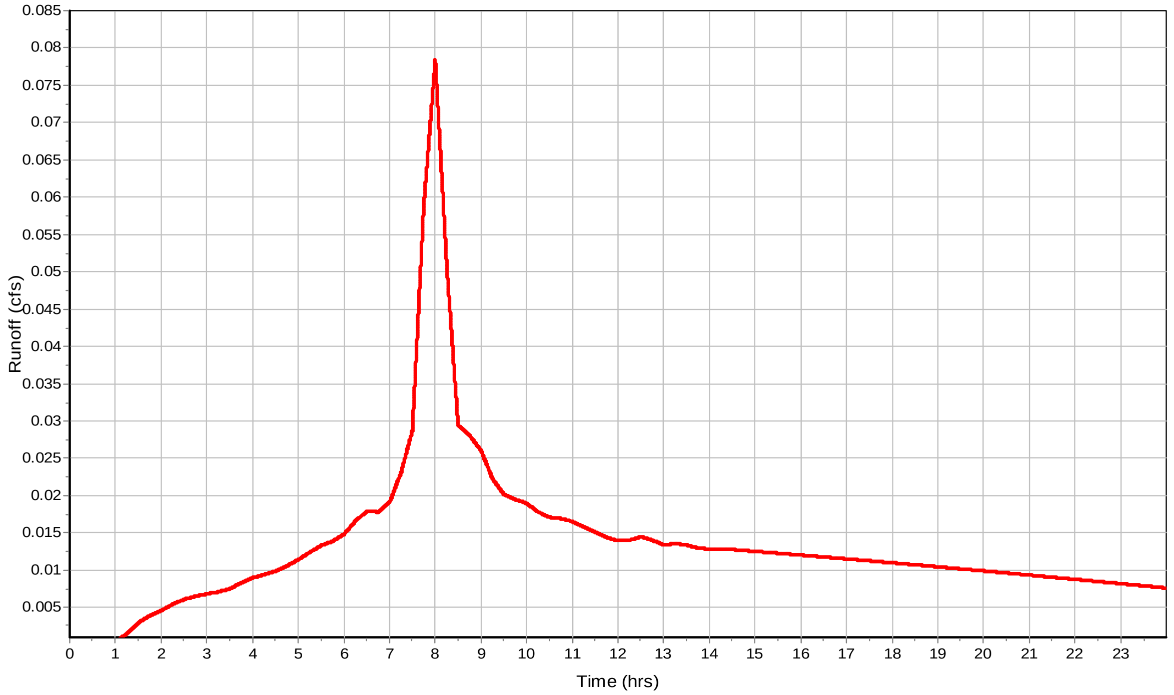
Total Rainfall (in)	2.87
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.08
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 07

Input Data

Area (ac)	0.09
Impervious Area (%)	64
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

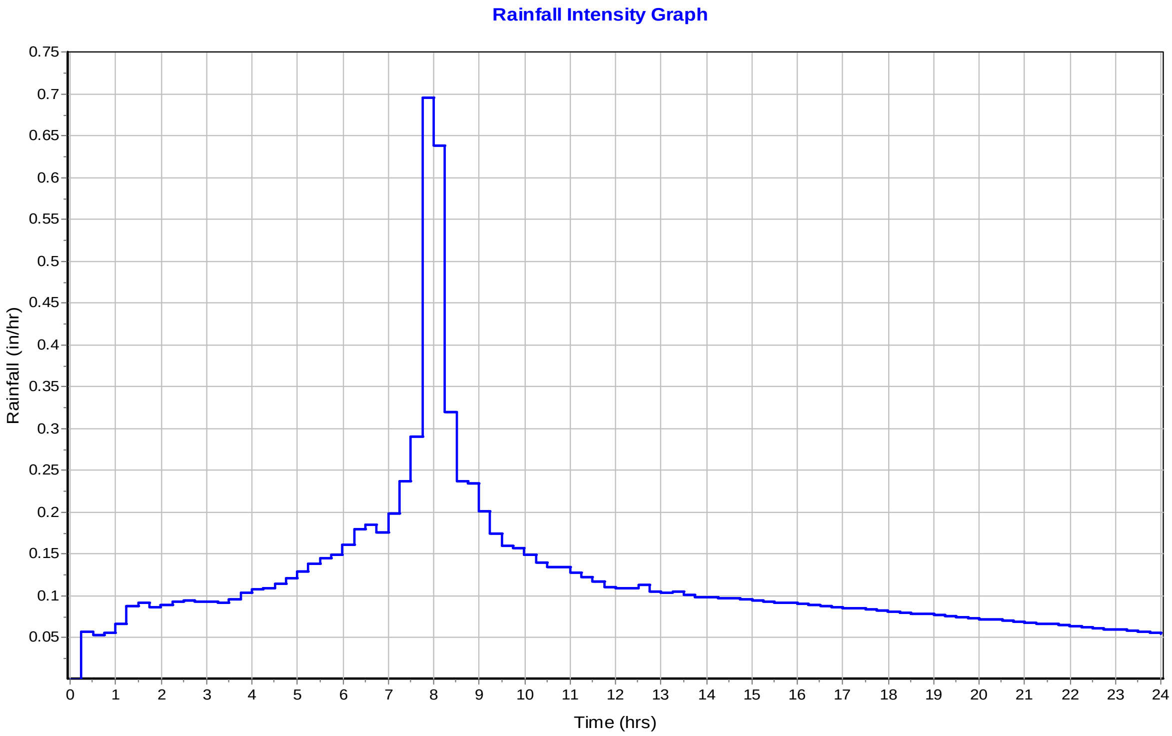
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.09		90.08

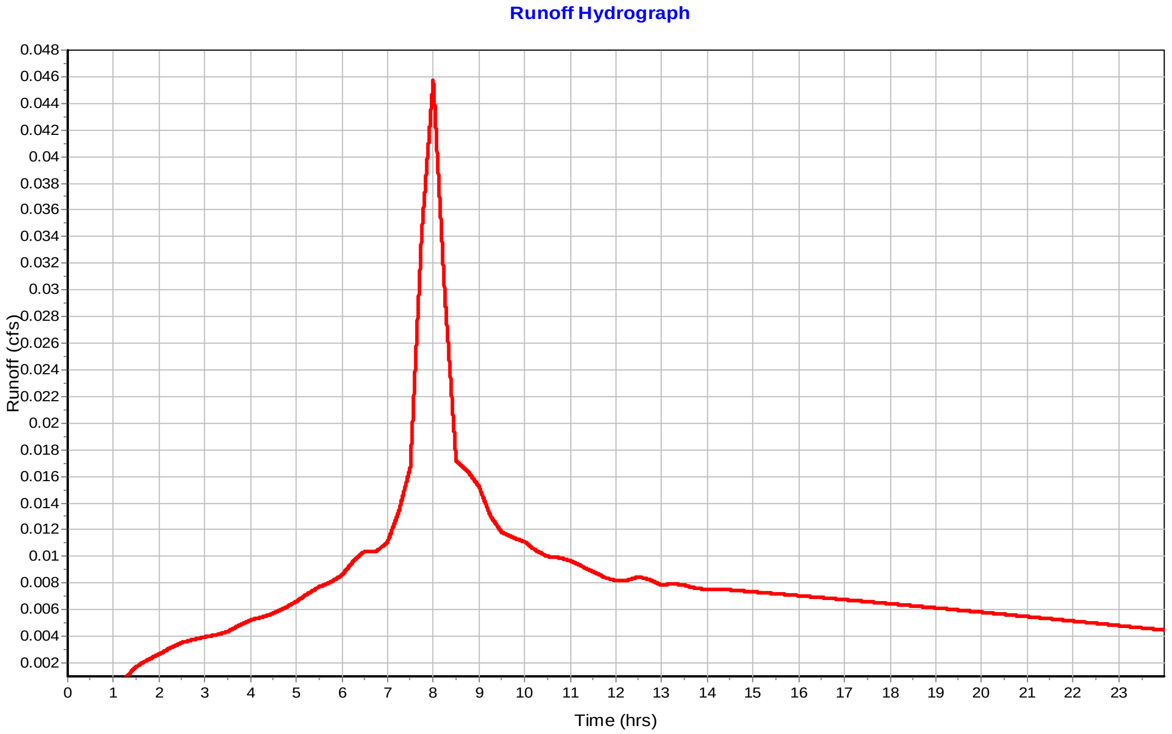
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.03
Peak Runoff (cfs)	0.05
Weighted Curve Number	90.08
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 07





Subbasin : SDCB 08

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

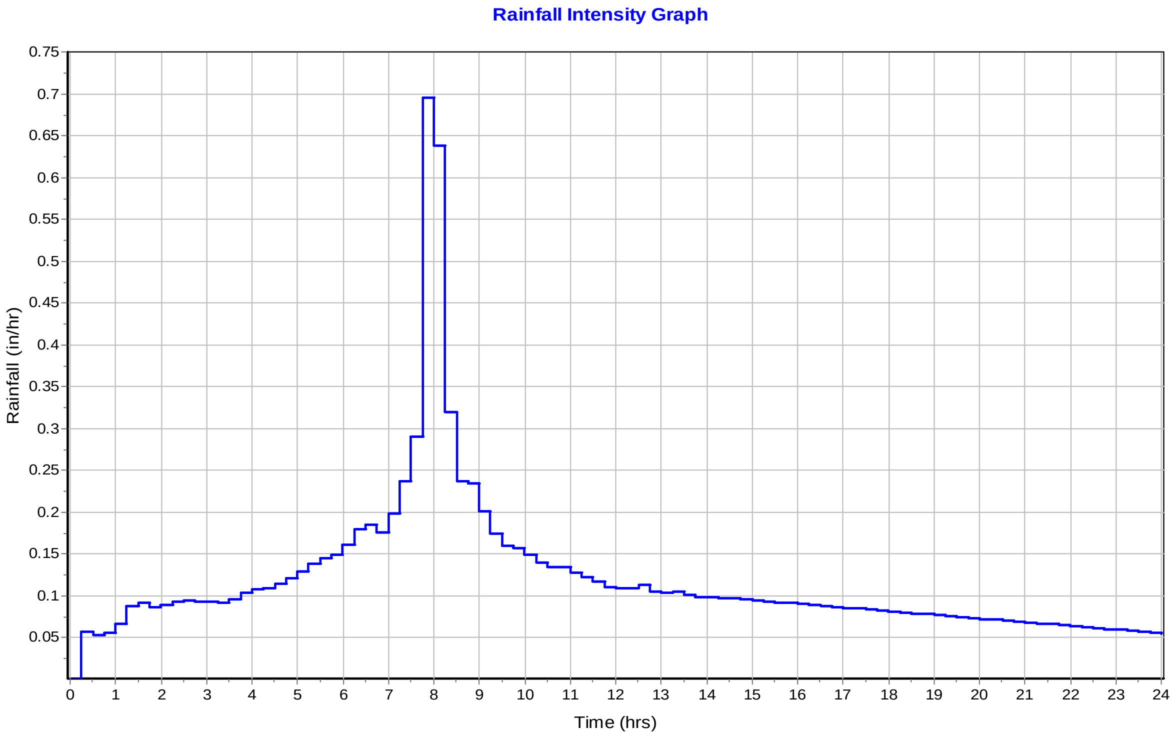
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.05		98

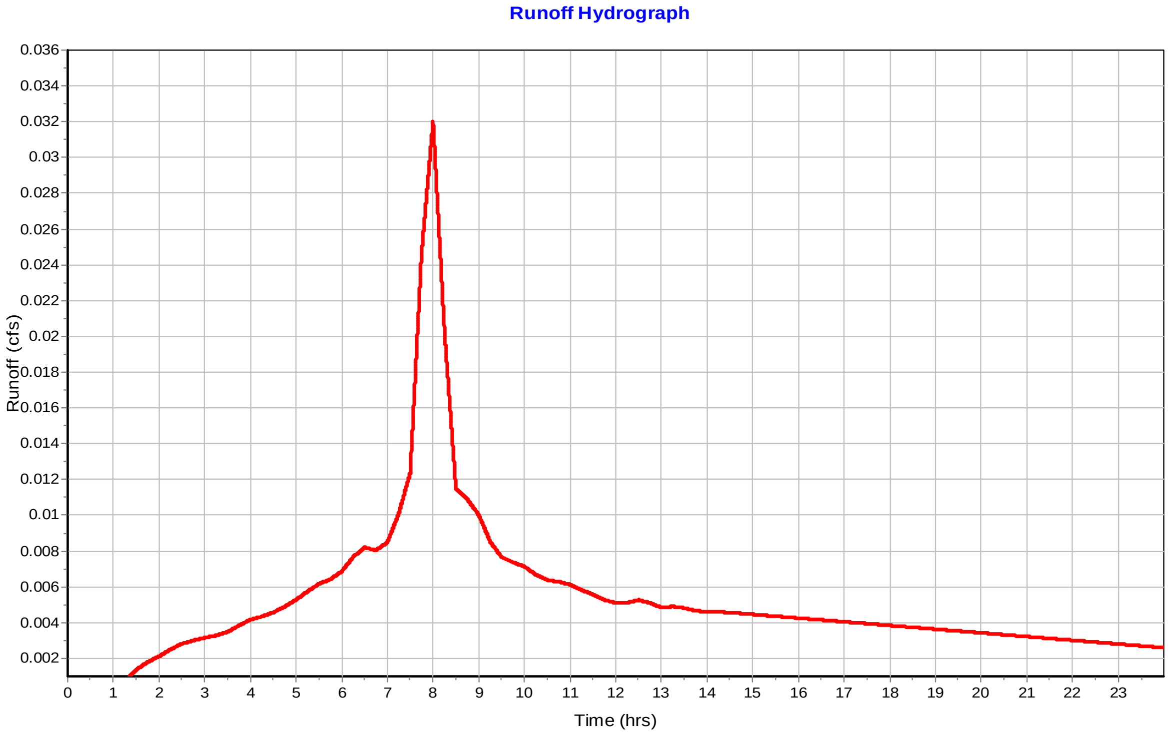
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.64
Peak Runoff (cfs)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 08





Subbasin : SDCB 09

Input Data

Area (ac)	0.25
Impervious Area (%)	82
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.25		94.04

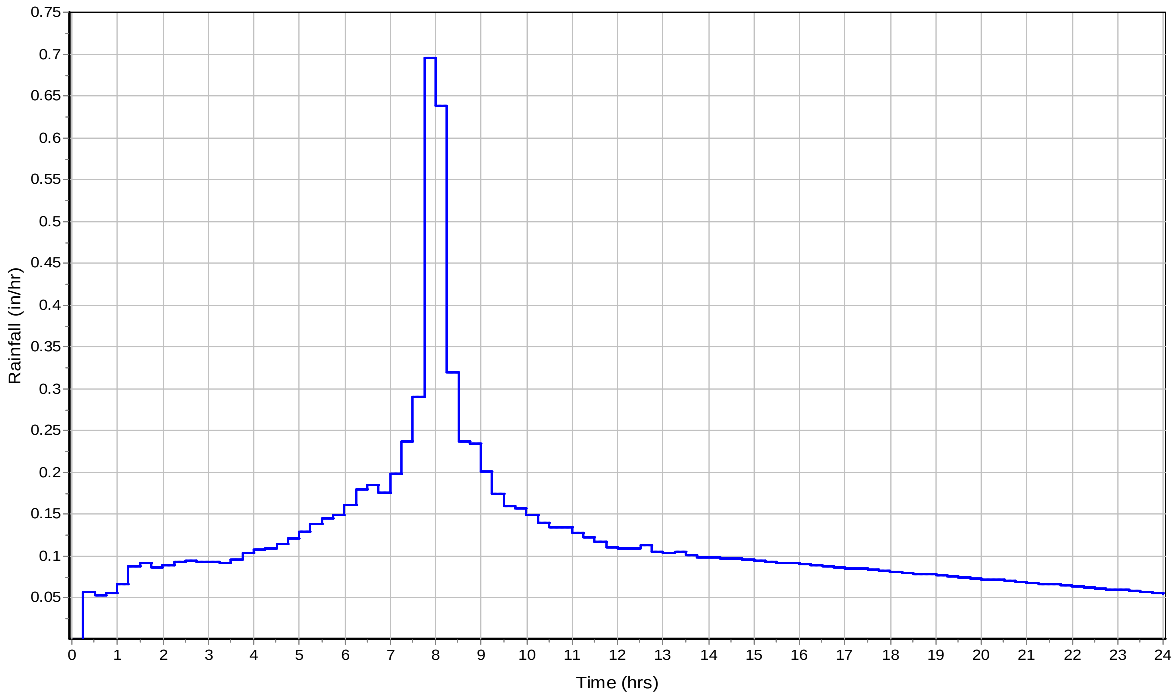
Time of Concentration

Subbasin Runoff Results

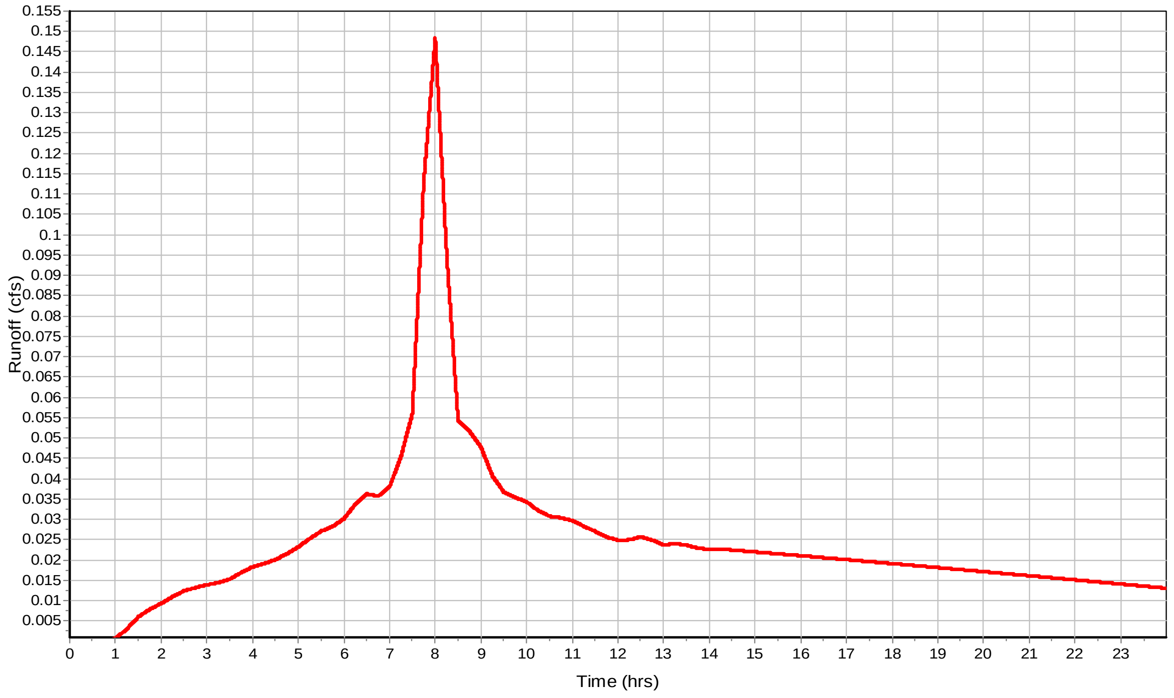
Total Rainfall (in)	2.87
Total Runoff (in)	2.34
Peak Runoff (cfs)	0.15
Weighted Curve Number	94.04
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 11

Input Data

Area (ac)	0.1
Impervious Area (%)	91
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		96.02

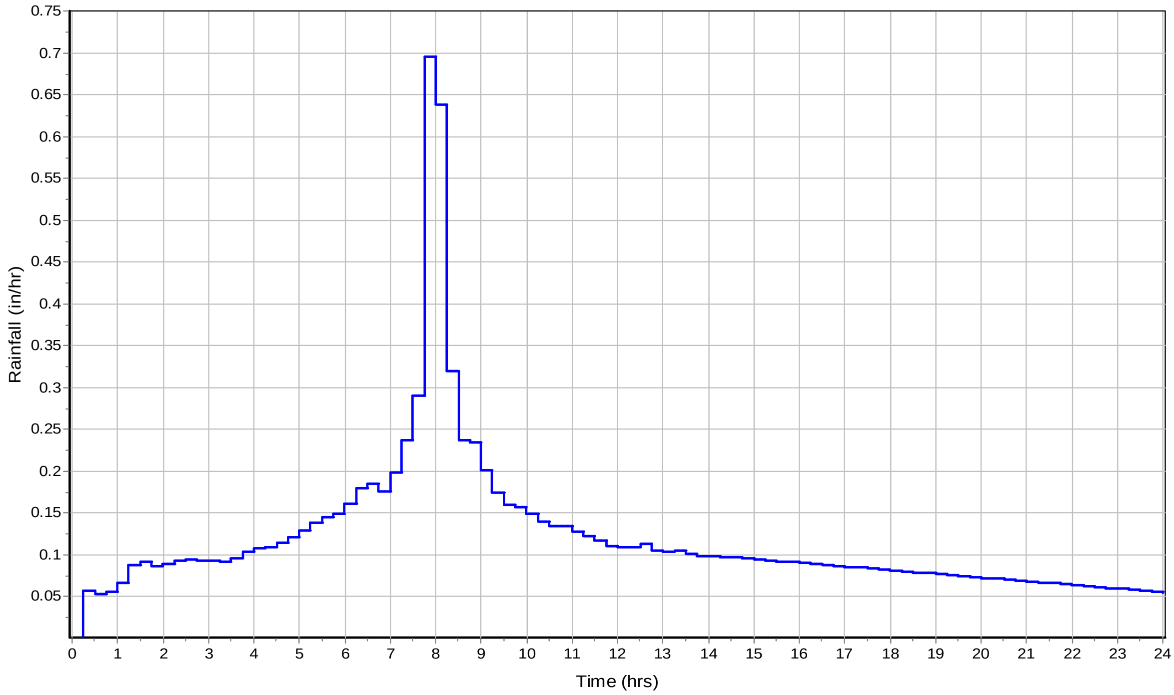
Time of Concentration

Subbasin Runoff Results

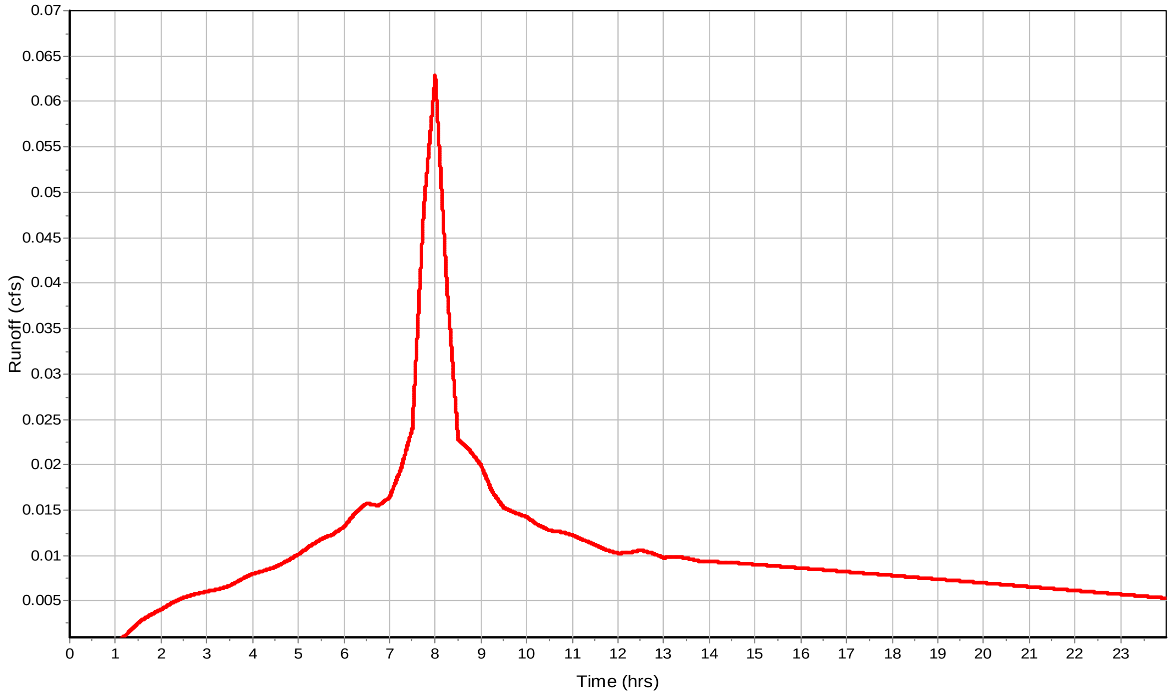
Total Rainfall (in)	2.87
Total Runoff (in)	2.49
Peak Runoff (cfs)	0.06
Weighted Curve Number	96.02
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 12

Input Data

Area (ac)	0.1
Impervious Area (%)	99
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		97.78

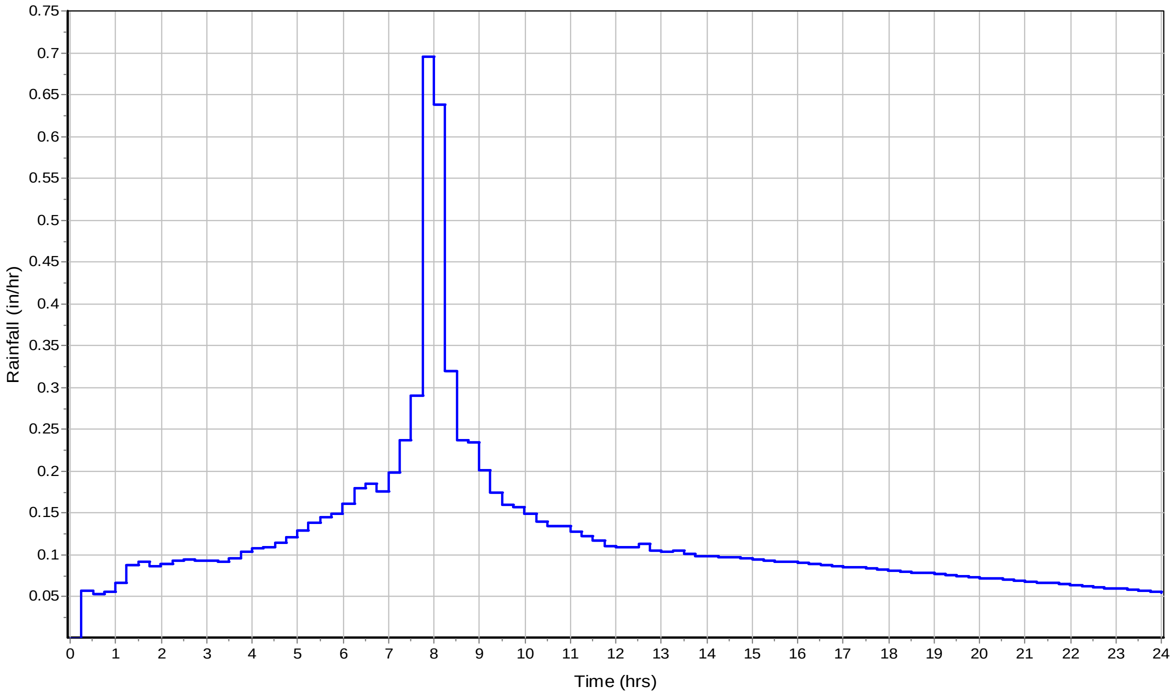
Time of Concentration

Subbasin Runoff Results

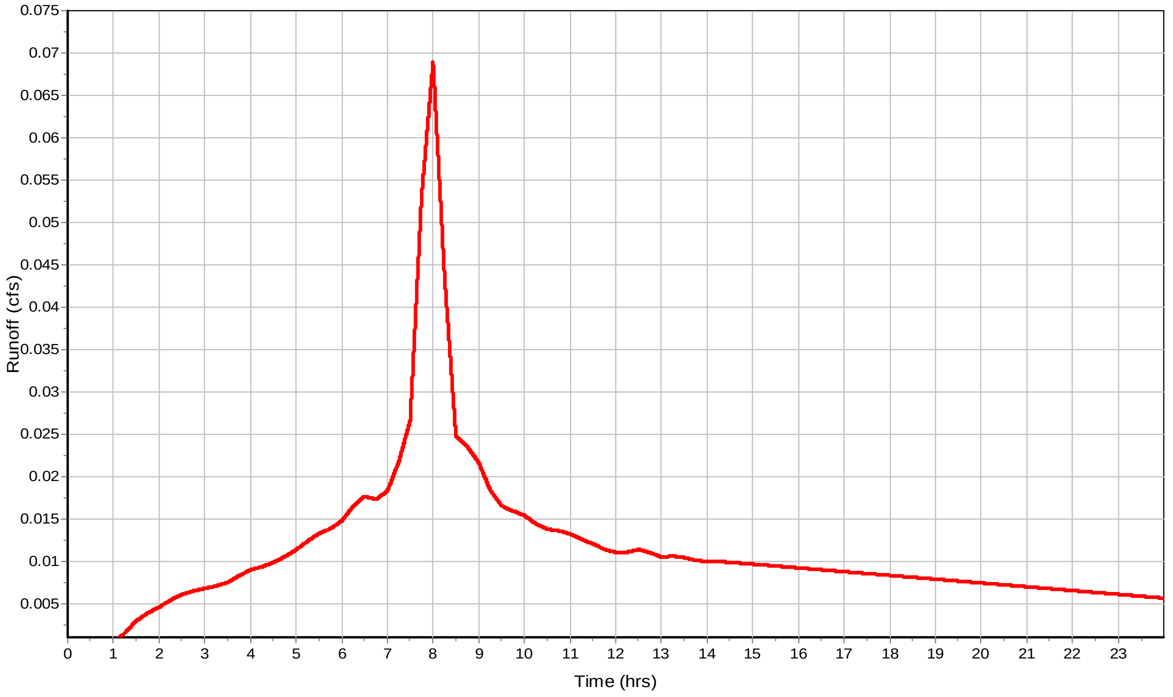
Total Rainfall (in)	2.87
Total Runoff (in)	2.63
Peak Runoff (cfs)	0.07
Weighted Curve Number	97.78
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 13

Input Data

Area (ac) 0.13
Impervious Area (%) 94
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		96.68

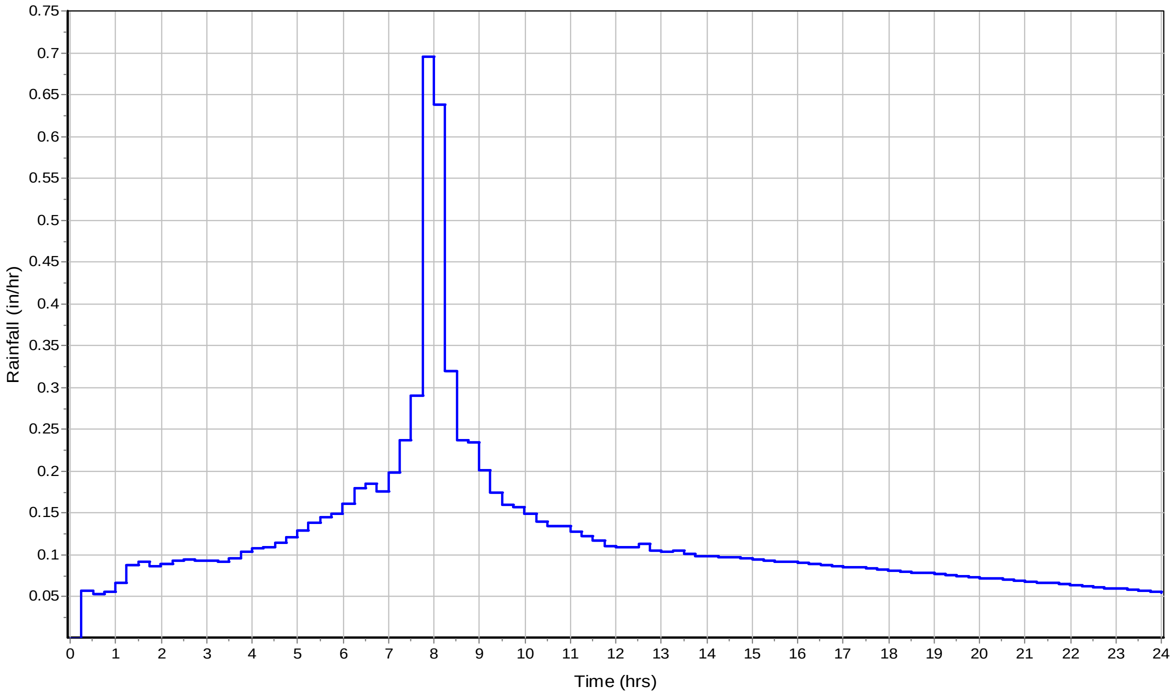
Time of Concentration

Subbasin Runoff Results

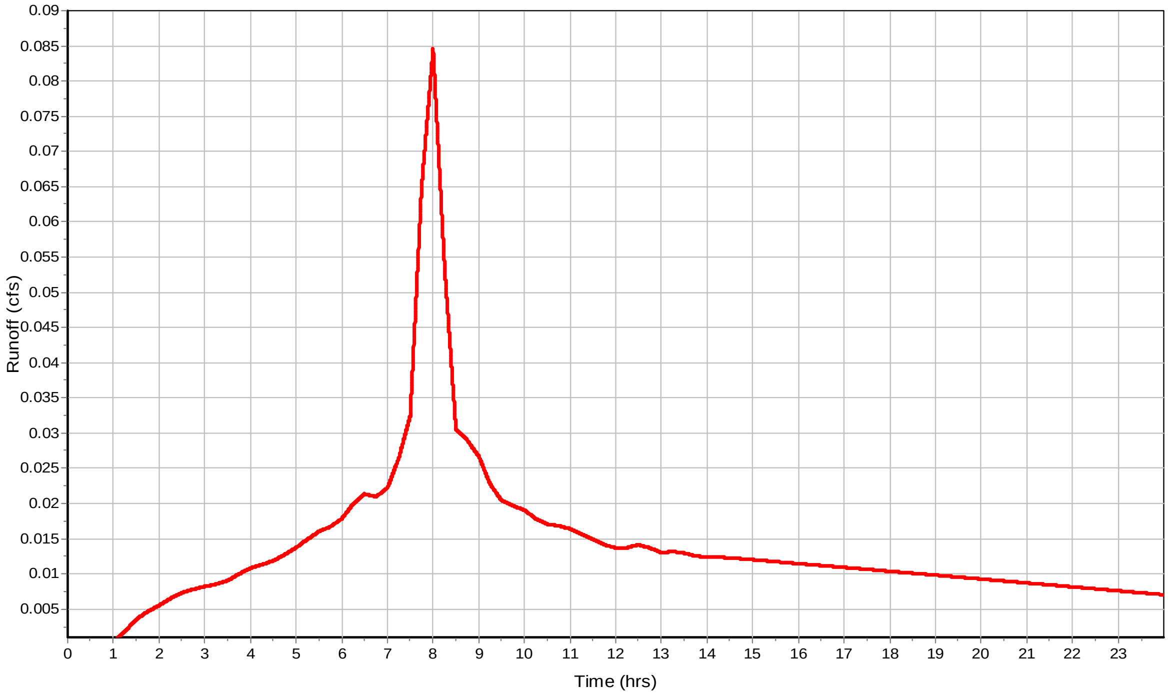
Total Rainfall (in) 2.87
Total Runoff (in) 2.54
Peak Runoff (cfs) 0.09
Weighted Curve Number 96.68
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : SDCB 13

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 14

Input Data

Area (ac)	0.22
Impervious Area (%)	68
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.22		90.96

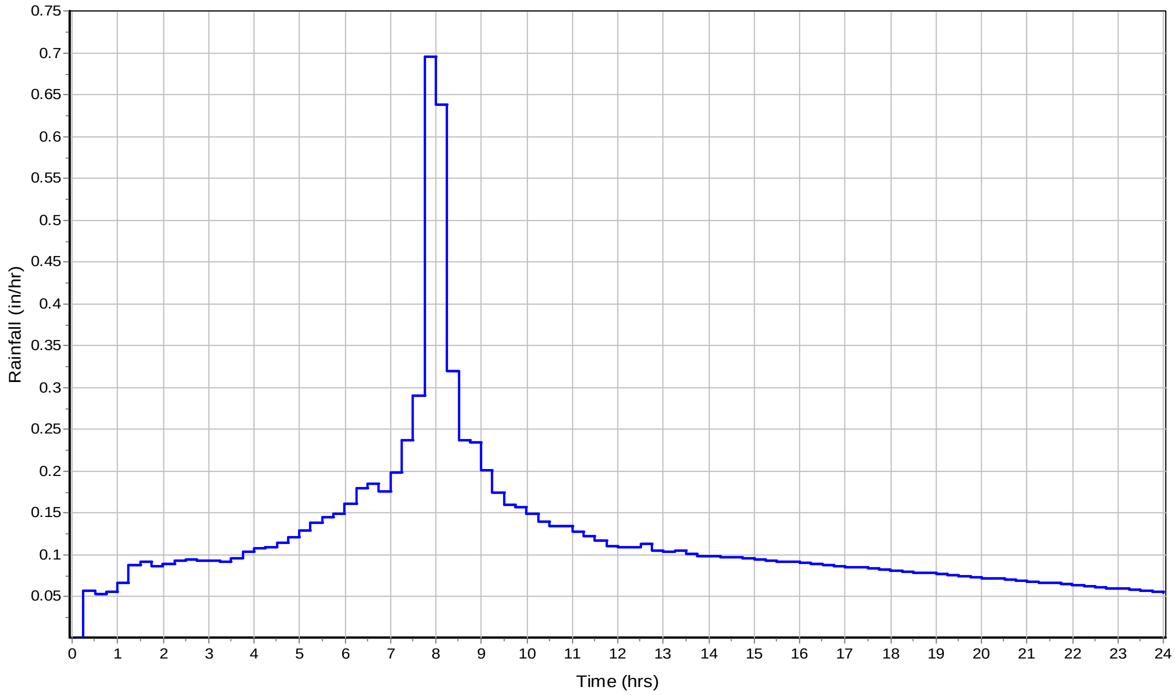
Time of Concentration

Subbasin Runoff Results

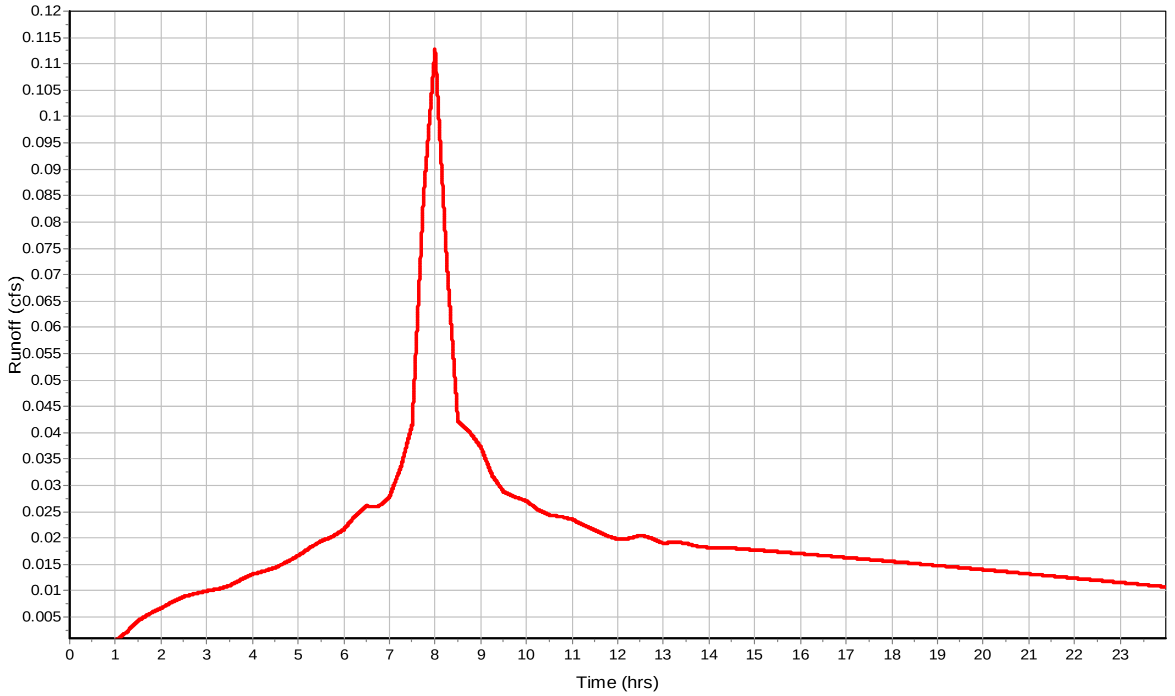
Total Rainfall (in)	2.87
Total Runoff (in)	2.1
Peak Runoff (cfs)	0.11
Weighted Curve Number	90.96
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 15

Input Data

Area (ac)	0.13
Impervious Area (%)	88
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		95.36

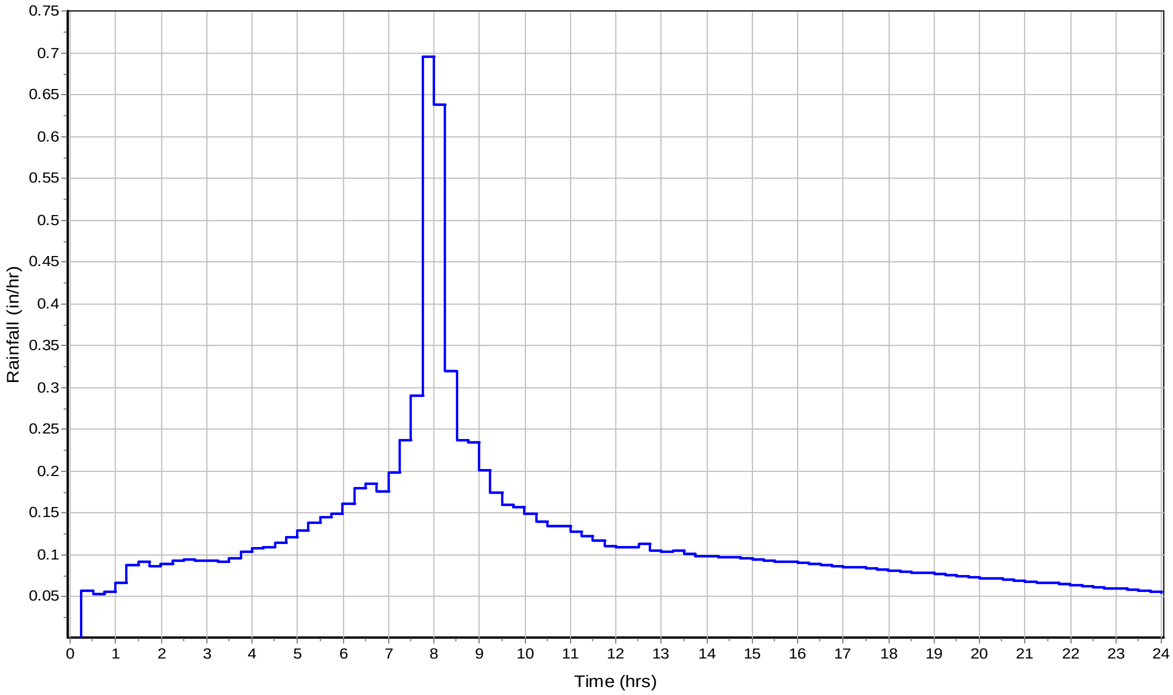
Time of Concentration

Subbasin Runoff Results

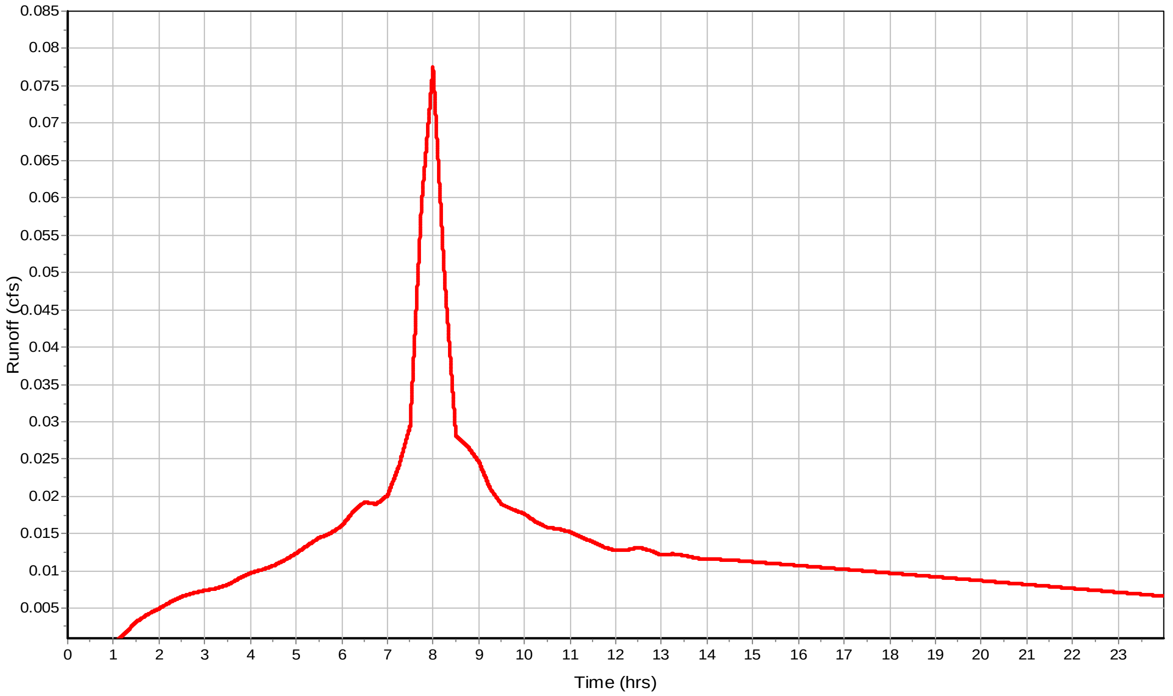
Total Rainfall (in)	2.87
Total Runoff (in)	2.44
Peak Runoff (cfs)	0.08
Weighted Curve Number	95.36
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 15

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 16

Input Data

Area (ac)	0.14
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.14		90.3

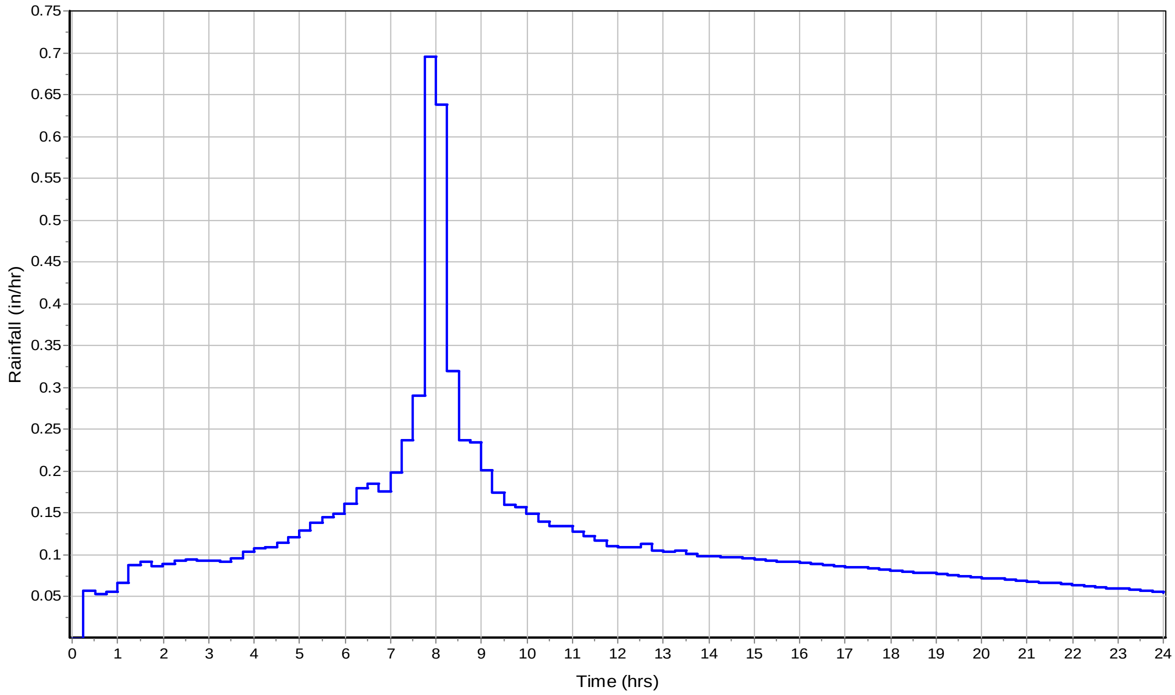
Time of Concentration

Subbasin Runoff Results

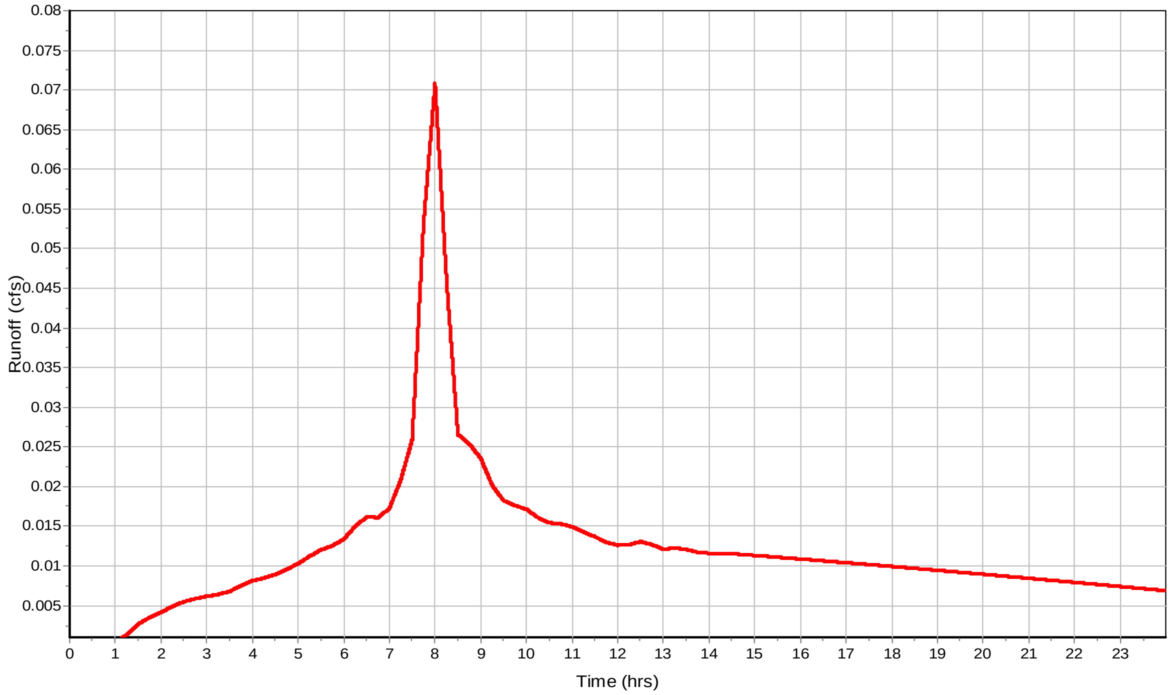
Total Rainfall (in)	2.87
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.07
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 16

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 17

Input Data

Area (ac)	0.1
Impervious Area (%)	92
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		96.24

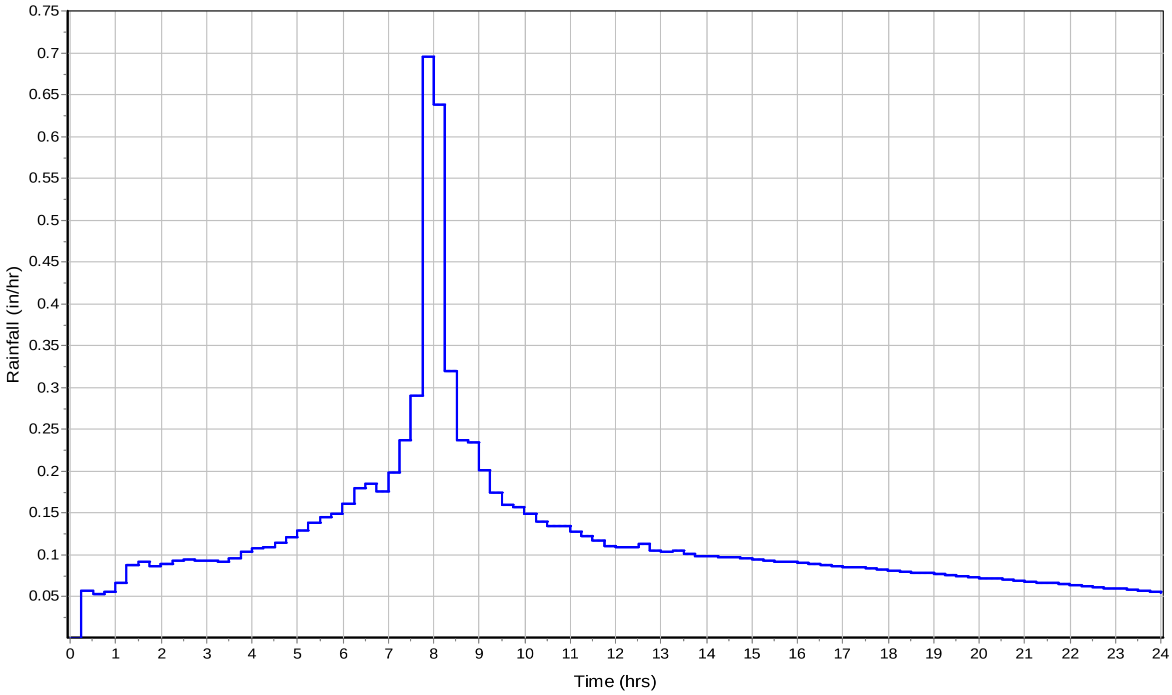
Time of Concentration

Subbasin Runoff Results

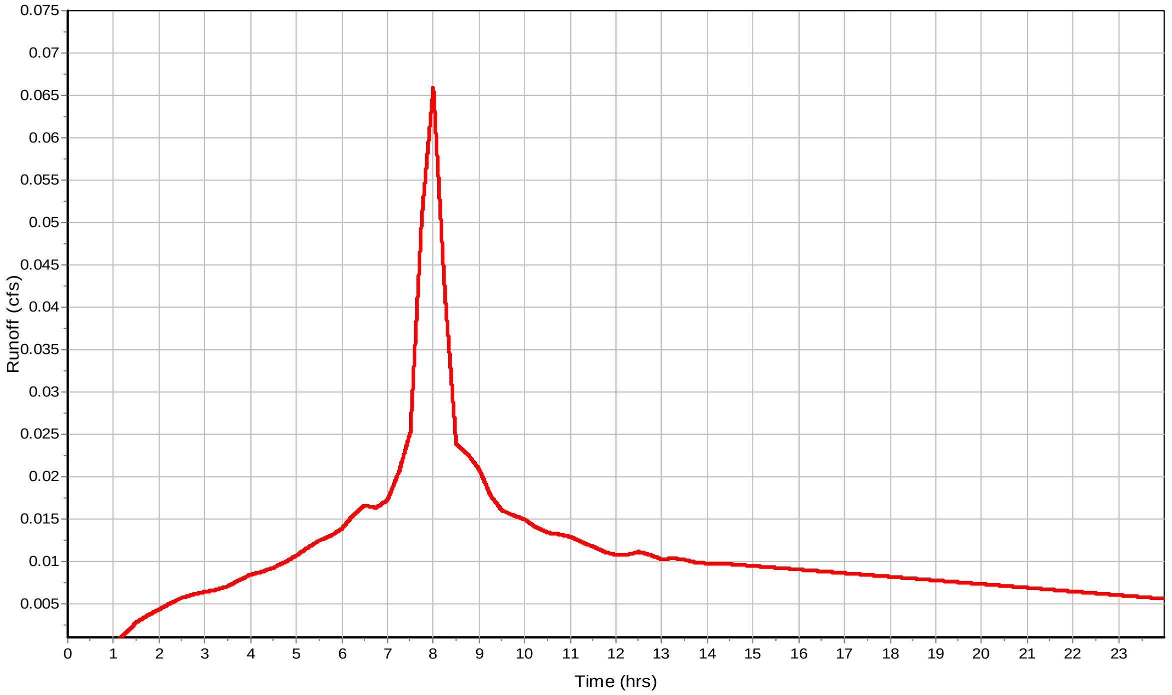
Total Rainfall (in)	2.87
Total Runoff (in)	2.51
Peak Runoff (cfs)	0.07
Weighted Curve Number	96.24
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 19

Input Data

Area (ac)	0.46
Impervious Area (%)	78
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.46		93.16

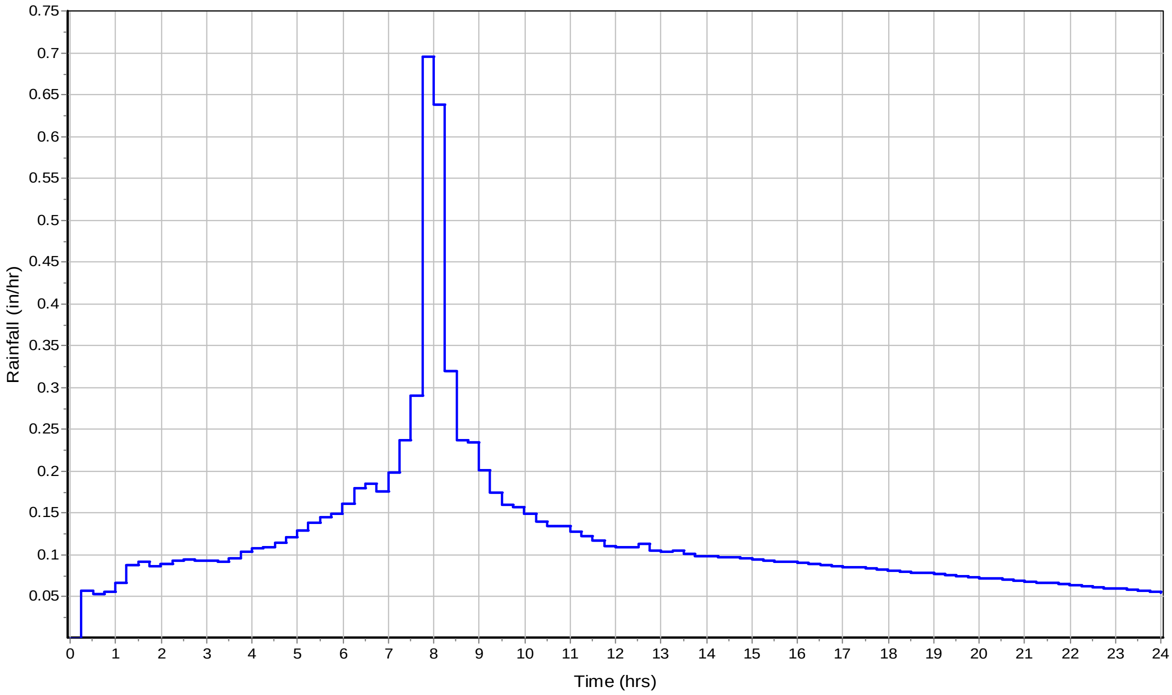
Time of Concentration

Subbasin Runoff Results

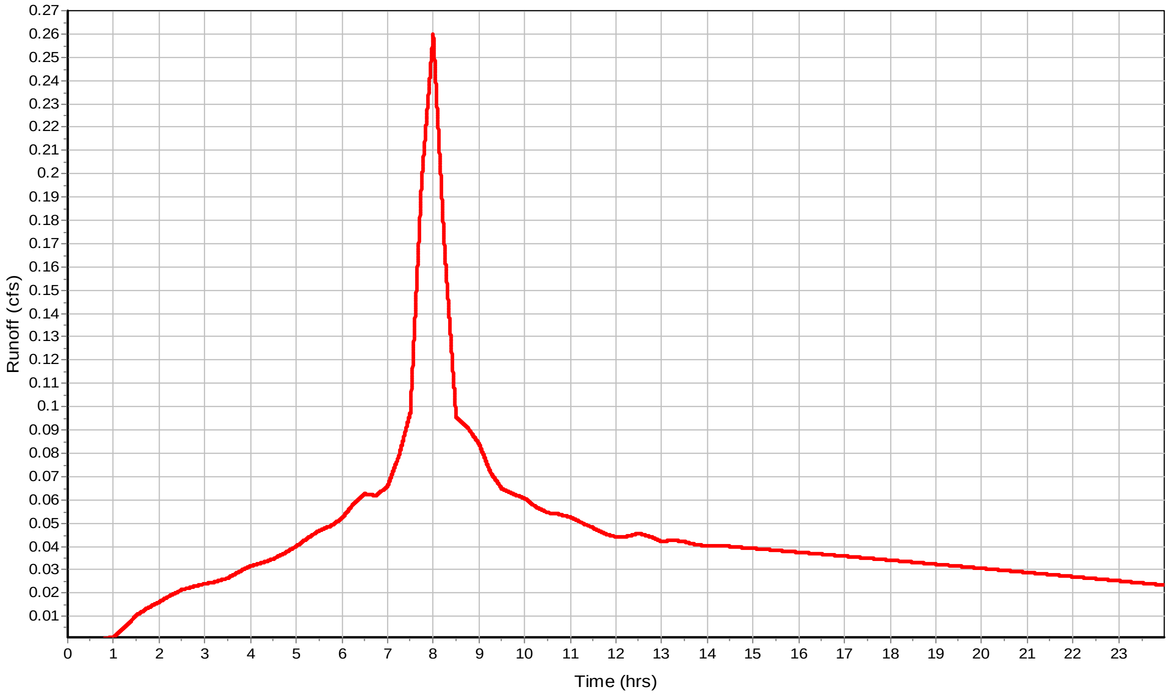
Total Rainfall (in)	2.87
Total Runoff (in)	2.27
Peak Runoff (cfs)	0.26
Weighted Curve Number	93.16
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 19

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 20

Input Data

Area (ac)	0.11
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.11		93.38

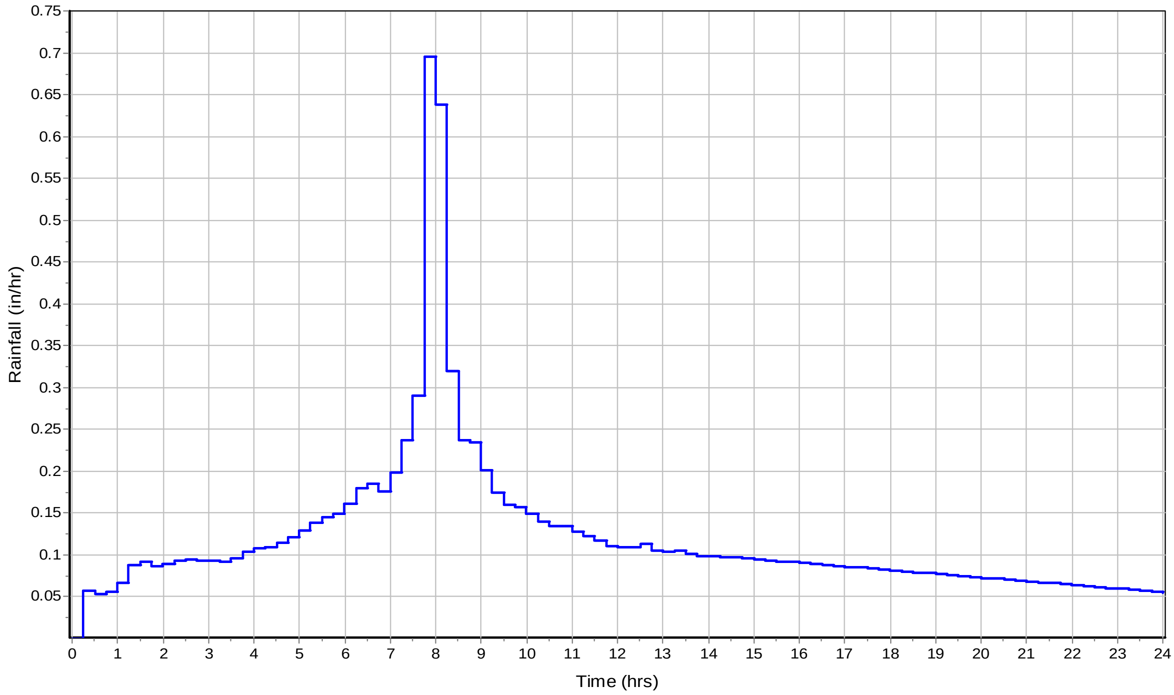
Time of Concentration

Subbasin Runoff Results

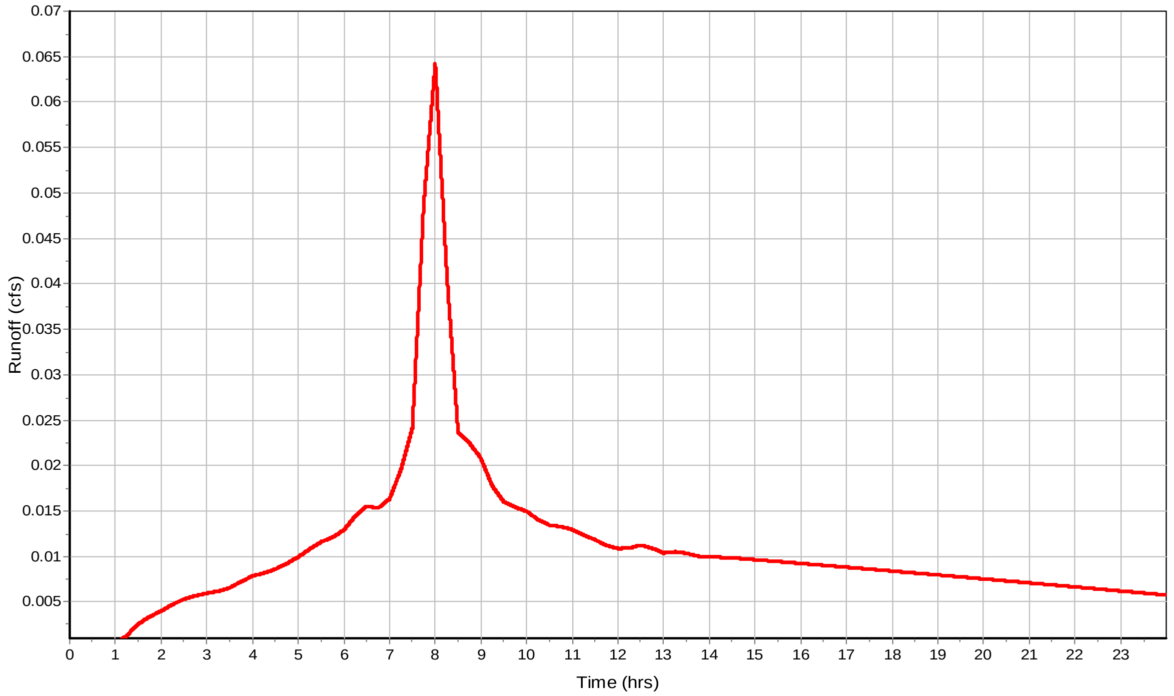
Total Rainfall (in)	2.87
Total Runoff (in)	2.29
Peak Runoff (cfs)	0.06
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 20

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 21

Input Data

Area (ac)	0.09
Impervious Area (%)	93
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.09		96.46

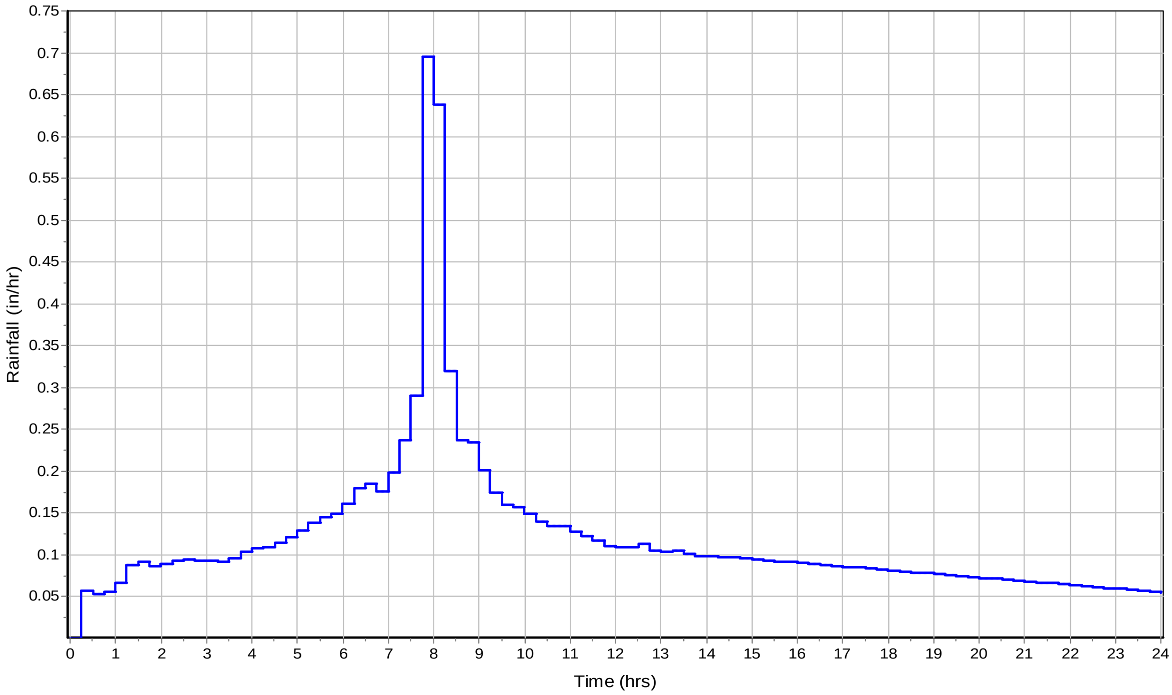
Time of Concentration

Subbasin Runoff Results

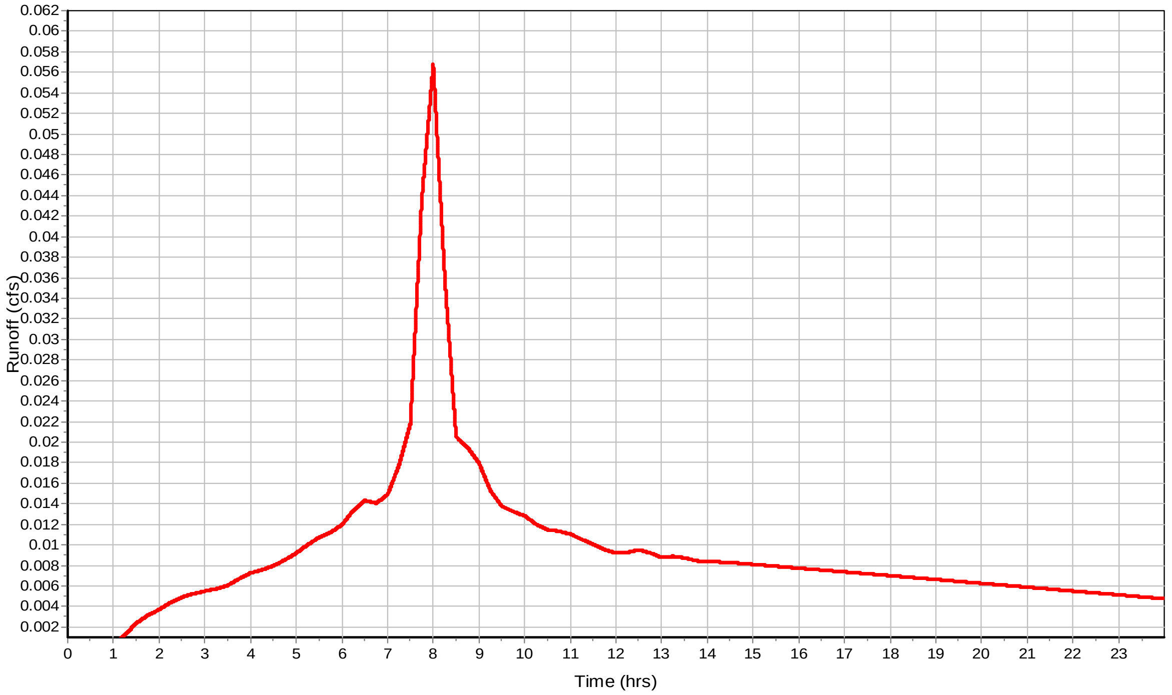
Total Rainfall (in)	2.87
Total Runoff (in)	2.52
Peak Runoff (cfs)	0.06
Weighted Curve Number	96.46
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 21

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 22

Input Data

Area (ac)	0.2
Impervious Area (%)	82
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		94.04

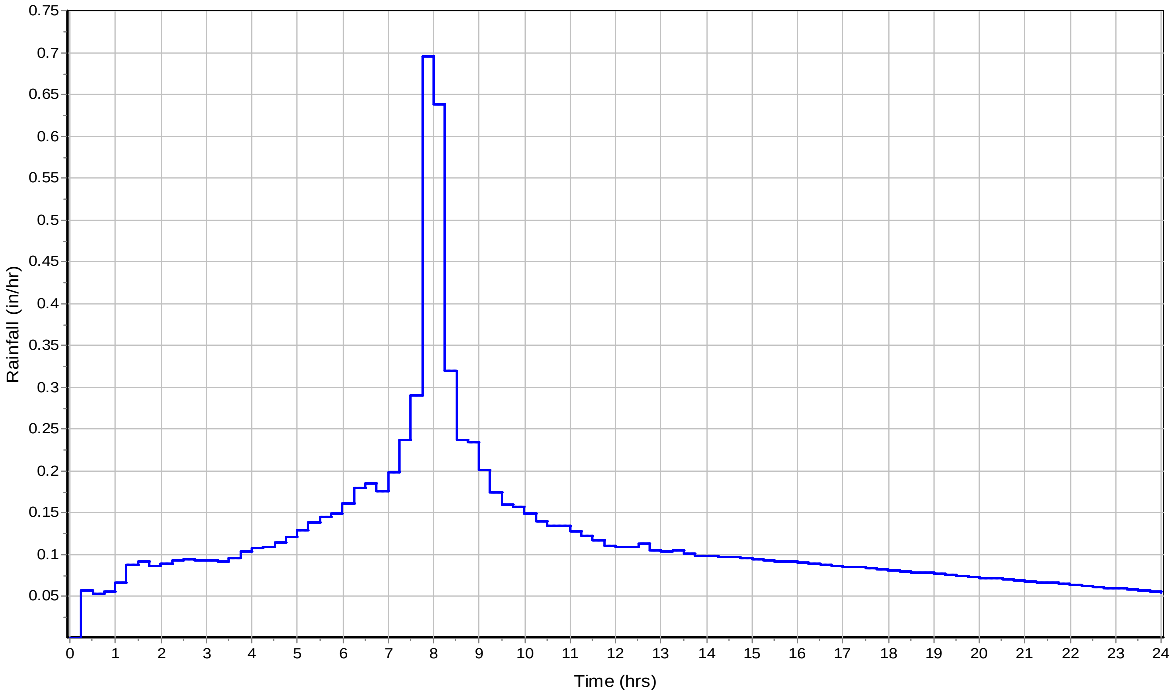
Time of Concentration

Subbasin Runoff Results

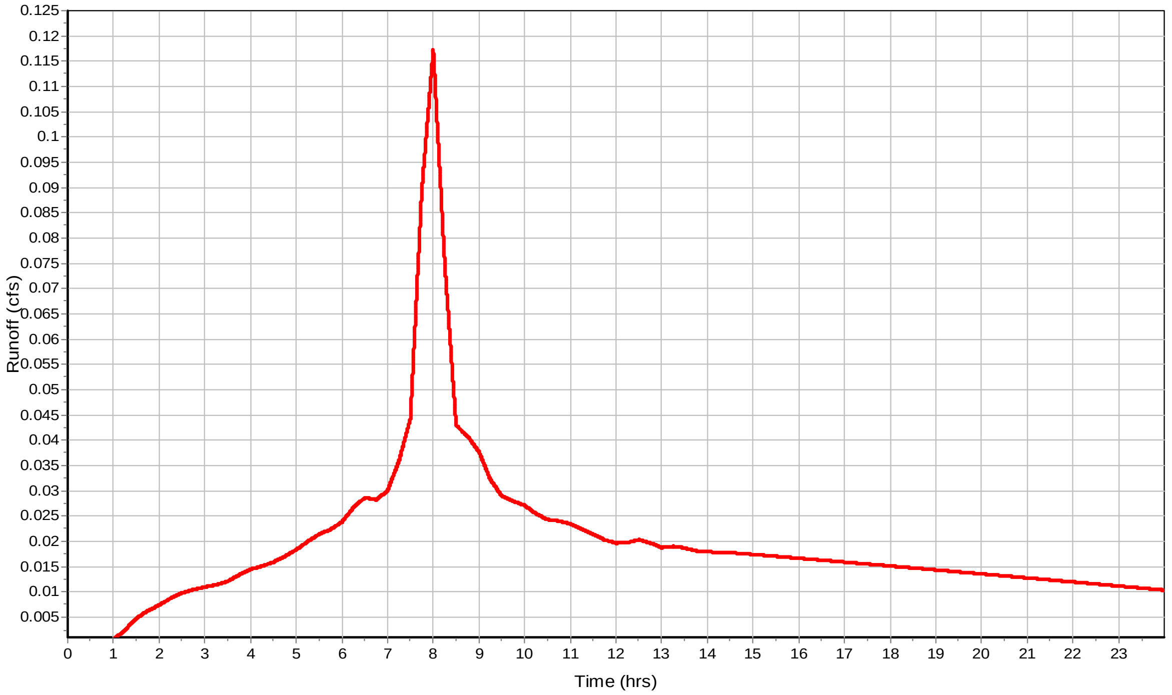
Total Rainfall (in)	2.87
Total Runoff (in)	2.34
Peak Runoff (cfs)	0.12
Weighted Curve Number	94.04
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 23

Input Data

Area (ac)	0.2
Impervious Area (%)	86
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		94.92

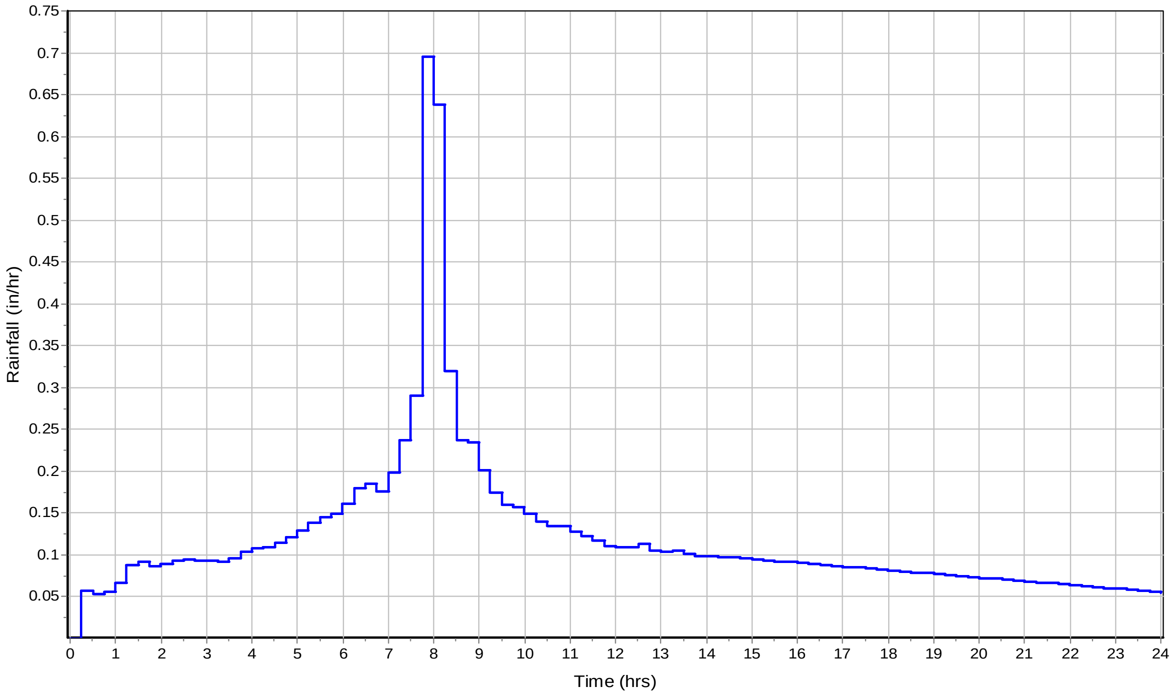
Time of Concentration

Subbasin Runoff Results

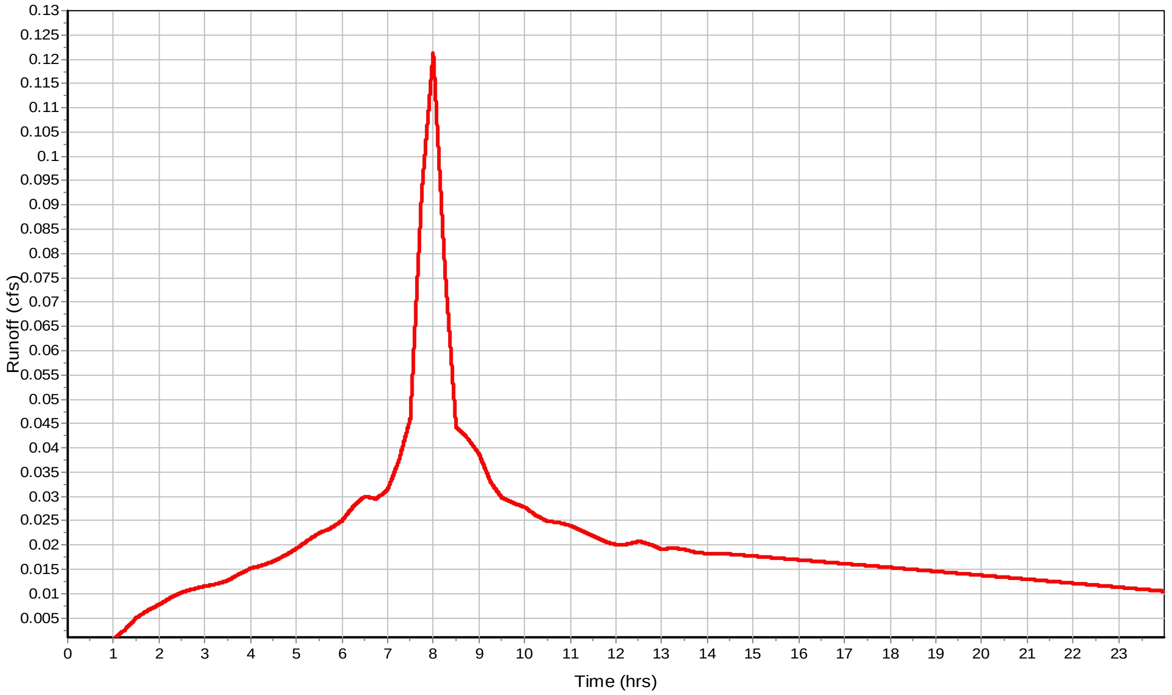
Total Rainfall (in)	2.87
Total Runoff (in)	2.41
Peak Runoff (cfs)	0.12
Weighted Curve Number	94.92
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 23

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 24

Input Data

Area (ac)	0.02
Impervious Area (%)	85
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.02		94.7

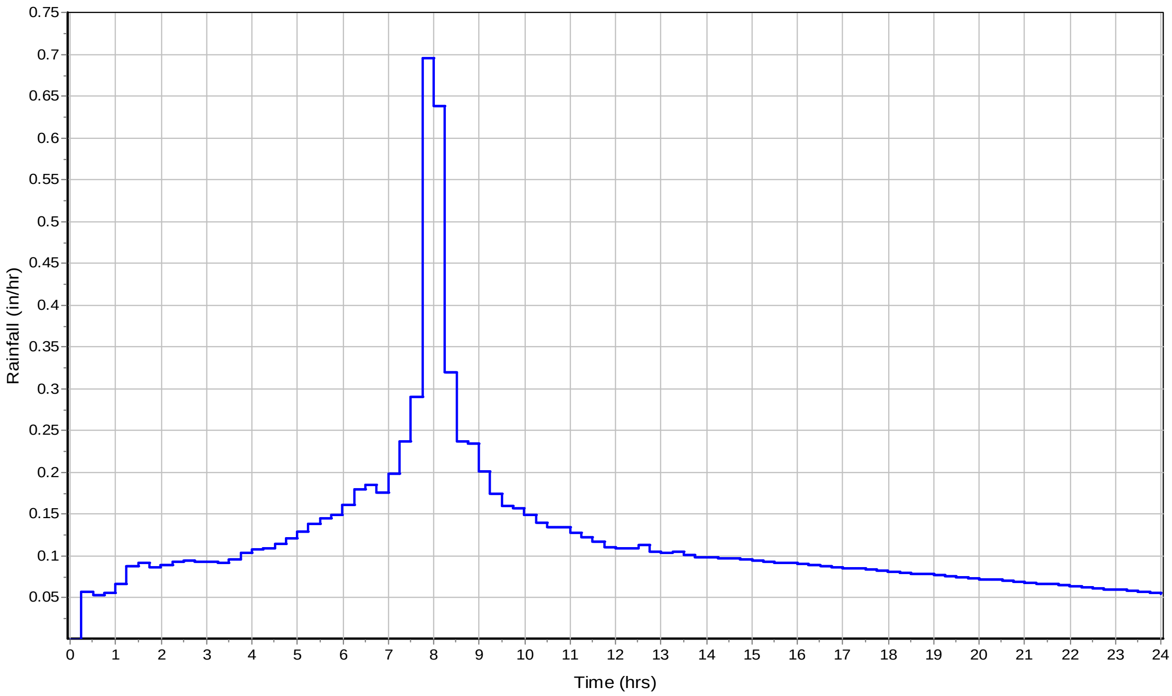
Time of Concentration

Subbasin Runoff Results

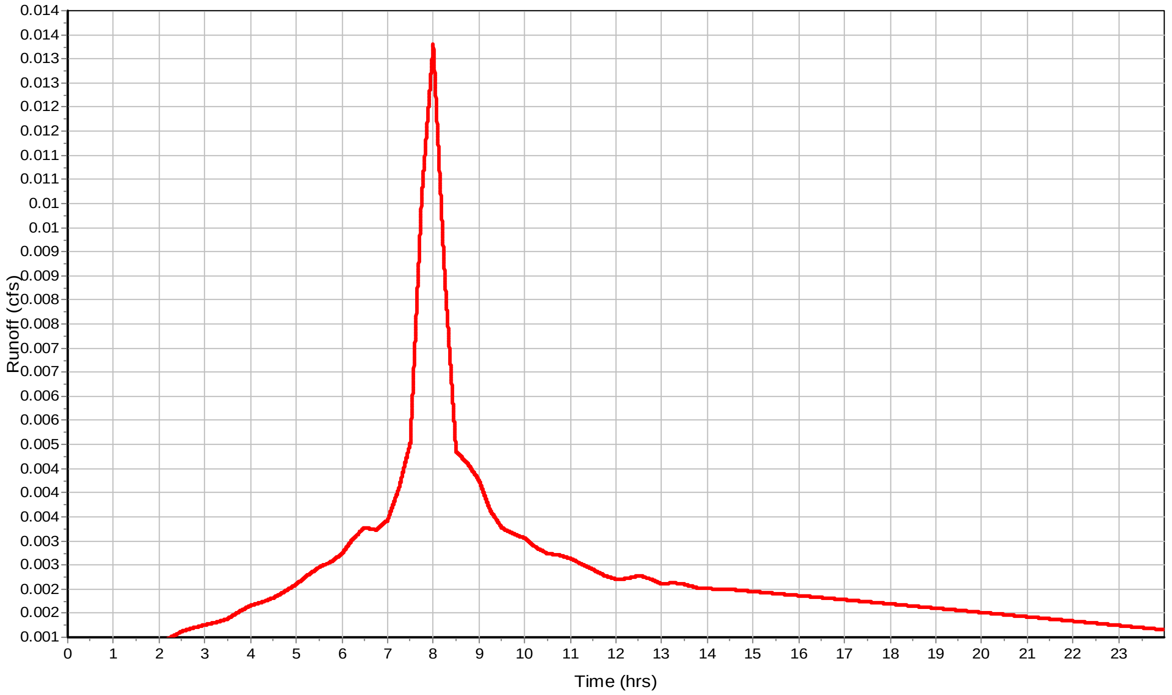
Total Rainfall (in)	2.87
Total Runoff (in)	2.39
Peak Runoff (cfs)	0.01
Weighted Curve Number	94.7
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 24

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 25

Input Data

Area (ac)	0.03
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		90.3

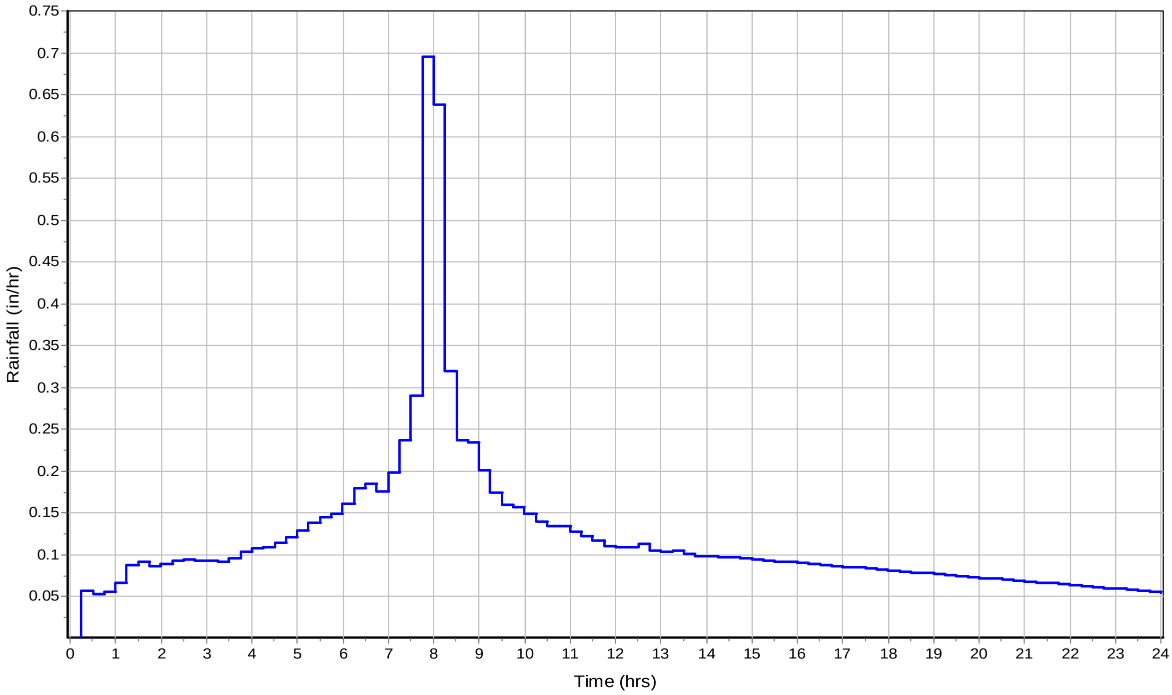
Time of Concentration

Subbasin Runoff Results

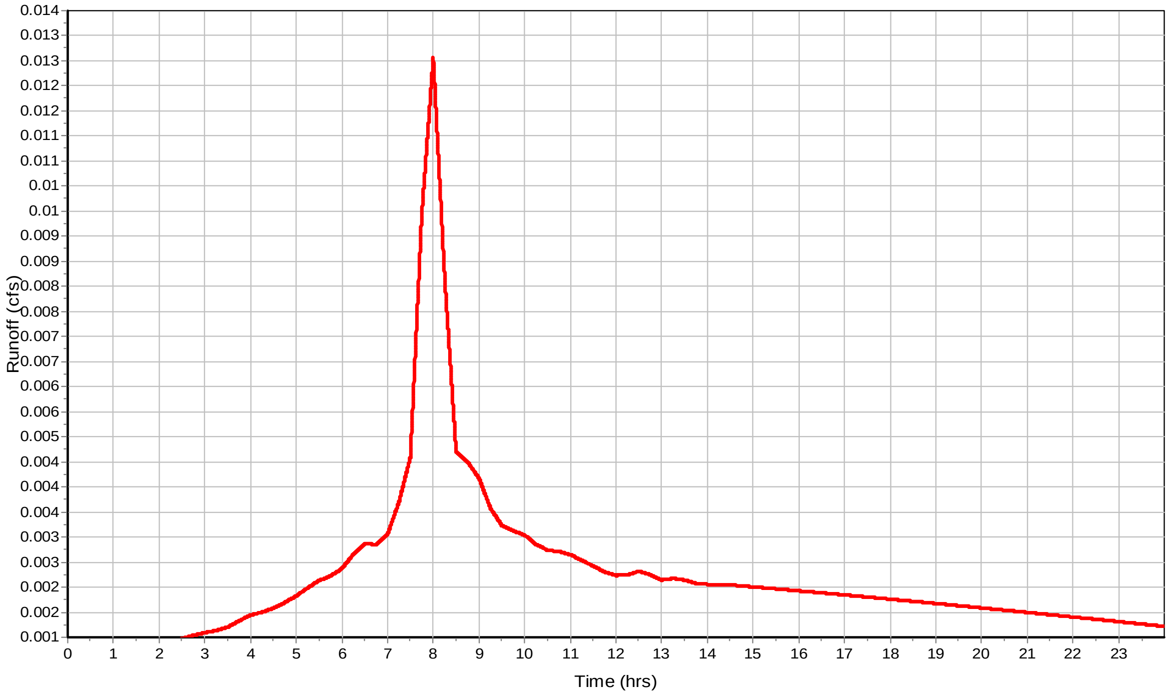
Total Rainfall (in)	2.87
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.01
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 25

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 27

Input Data

Area (ac)	0.49
Impervious Area (%)	76
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.49		92.72

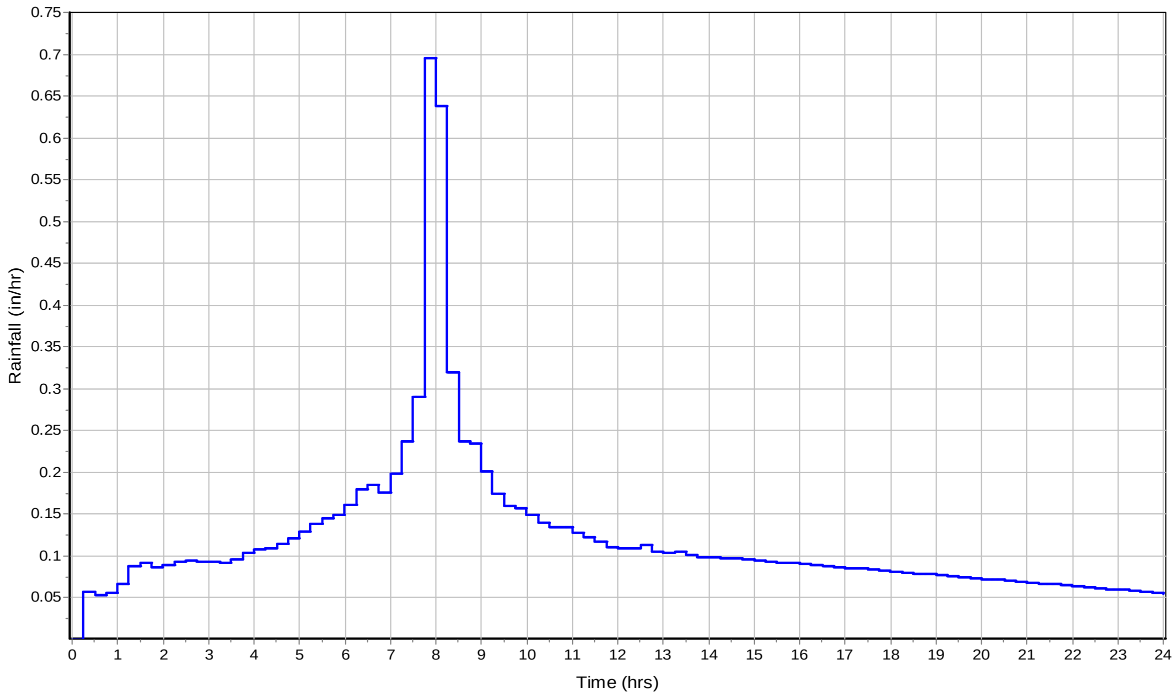
Time of Concentration

Subbasin Runoff Results

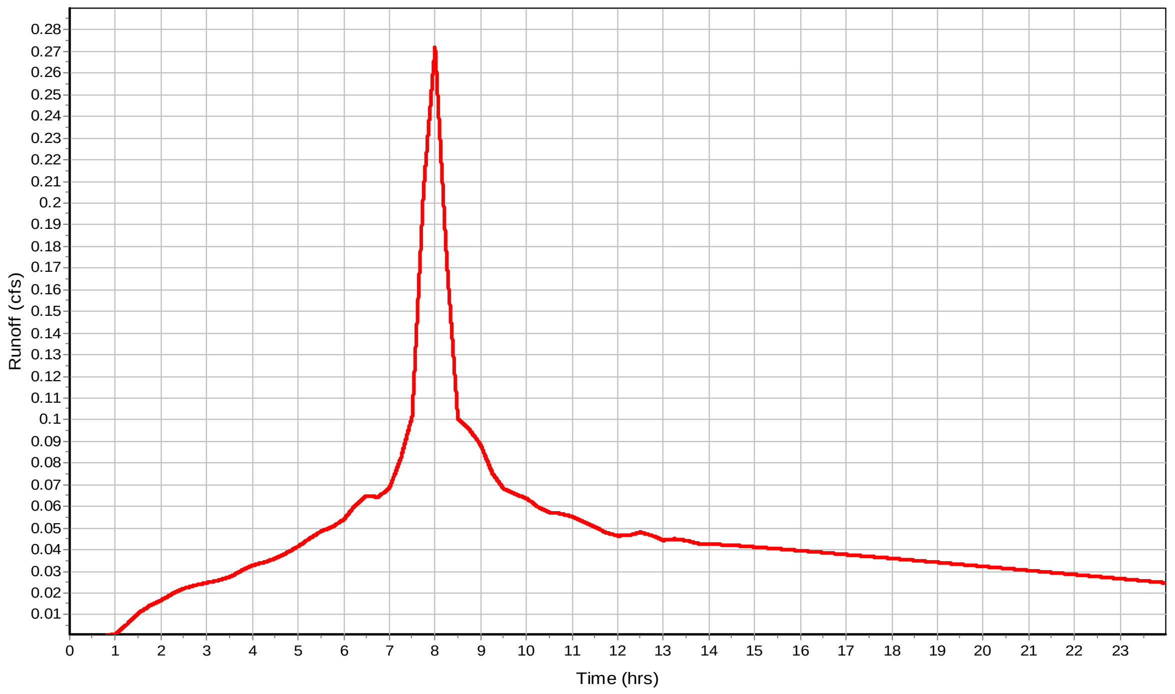
Total Rainfall (in)	2.87
Total Runoff (in)	2.23
Peak Runoff (cfs)	0.27
Weighted Curve Number	92.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 27

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 28

Input Data

Area (ac)	0.2
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		92.06

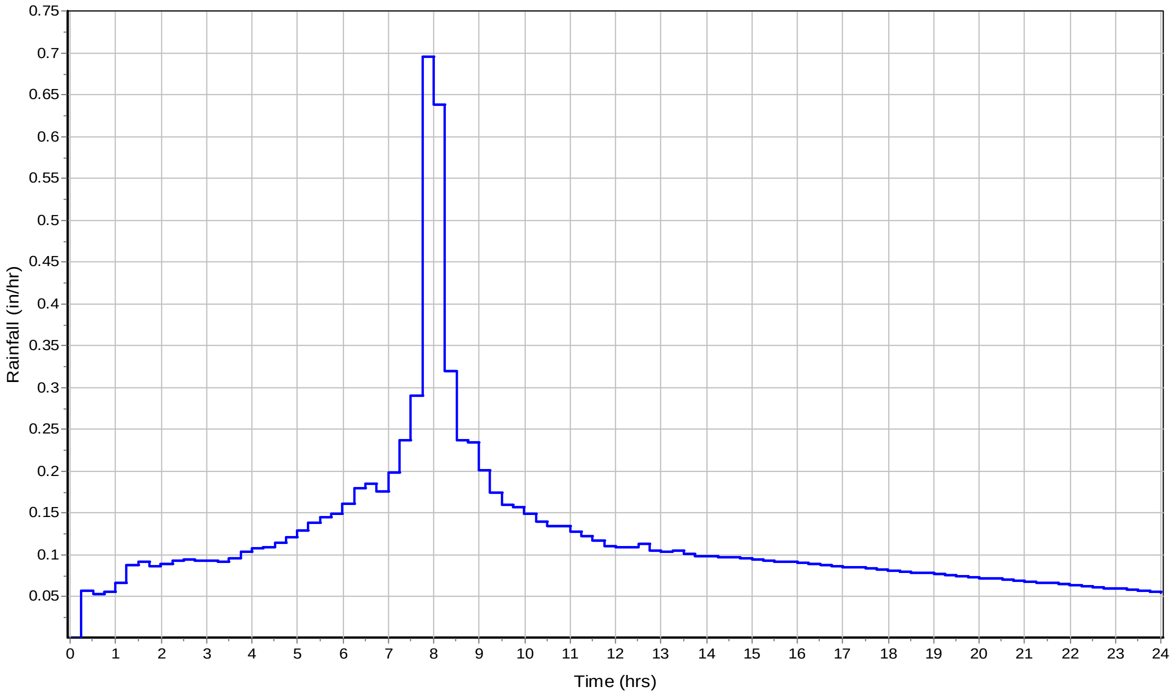
Time of Concentration

Subbasin Runoff Results

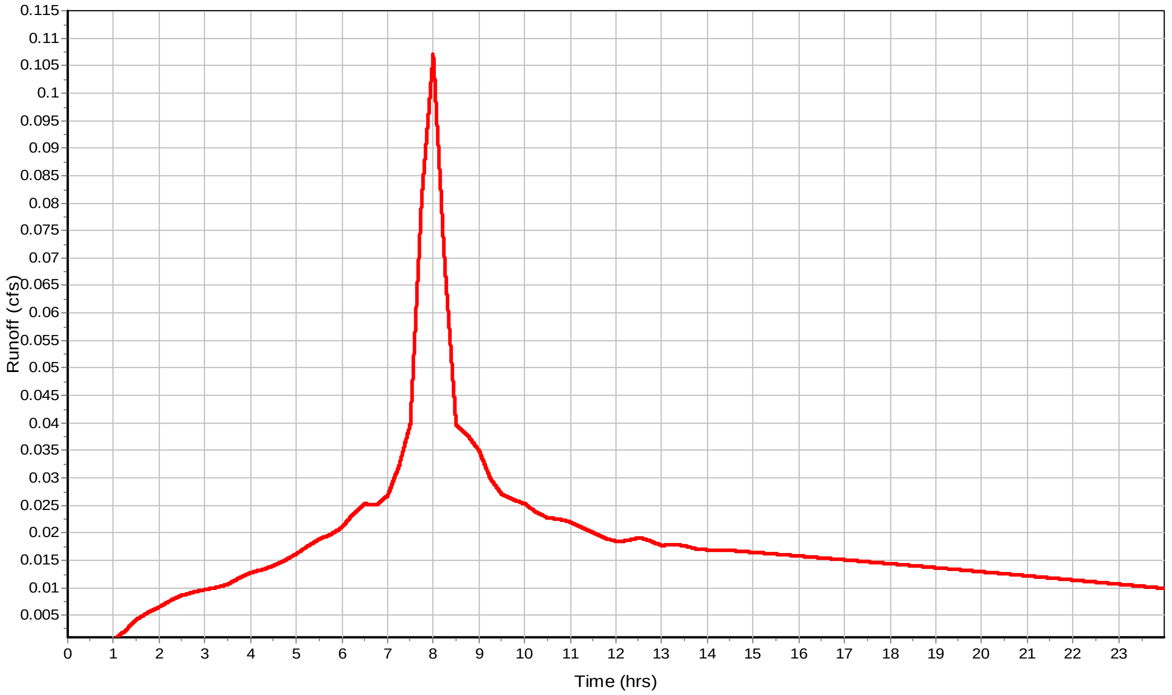
Total Rainfall (in)	2.87
Total Runoff (in)	2.18
Peak Runoff (cfs)	0.11
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 28

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 29

Input Data

Area (ac)	0.2
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		93.38

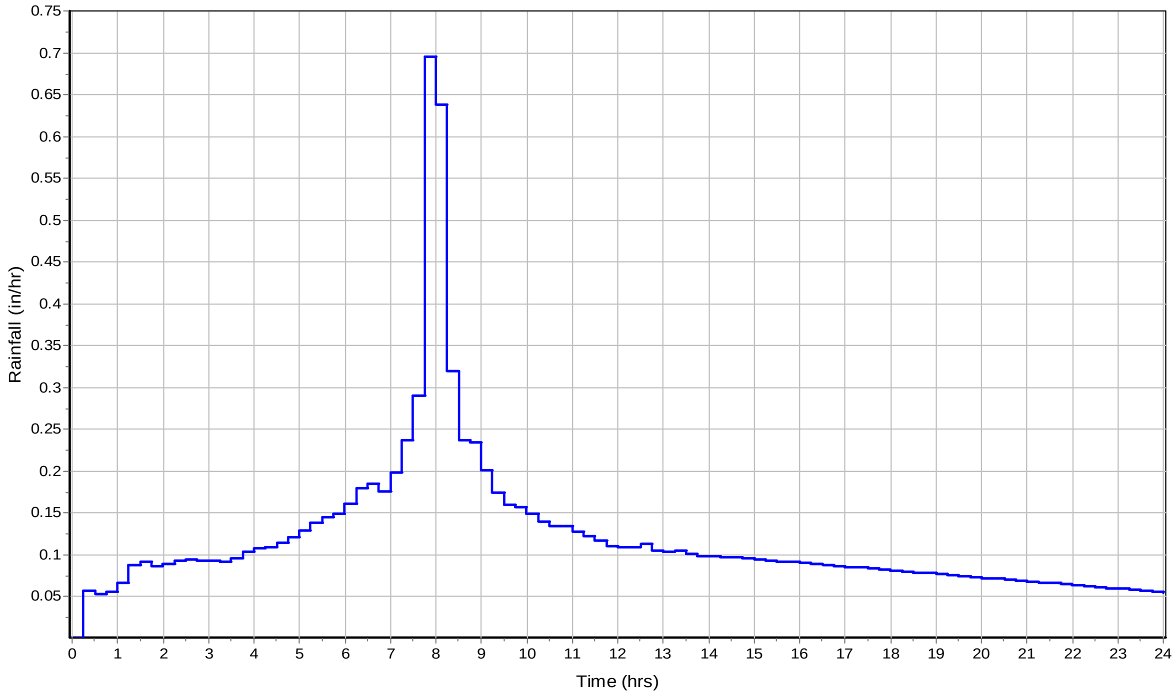
Time of Concentration

Subbasin Runoff Results

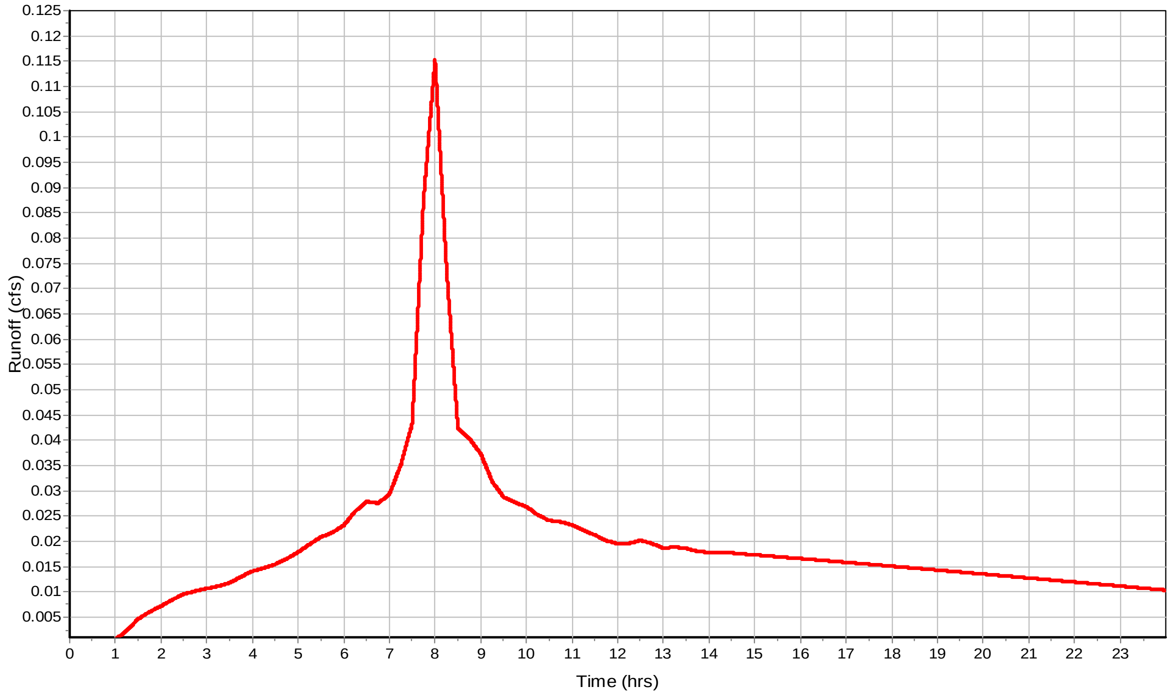
Total Rainfall (in)	2.87
Total Runoff (in)	2.29
Peak Runoff (cfs)	0.12
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 30

Input Data

Area (ac)	0.43
Impervious Area (%)	77
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

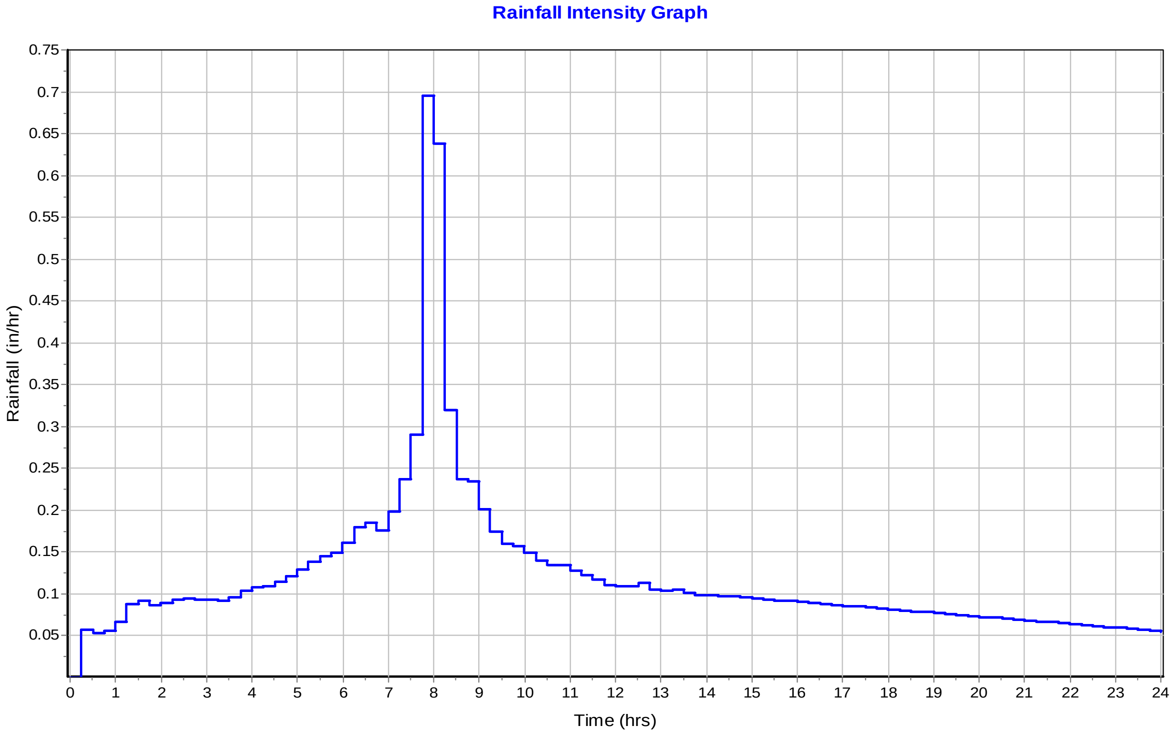
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.43		92.94

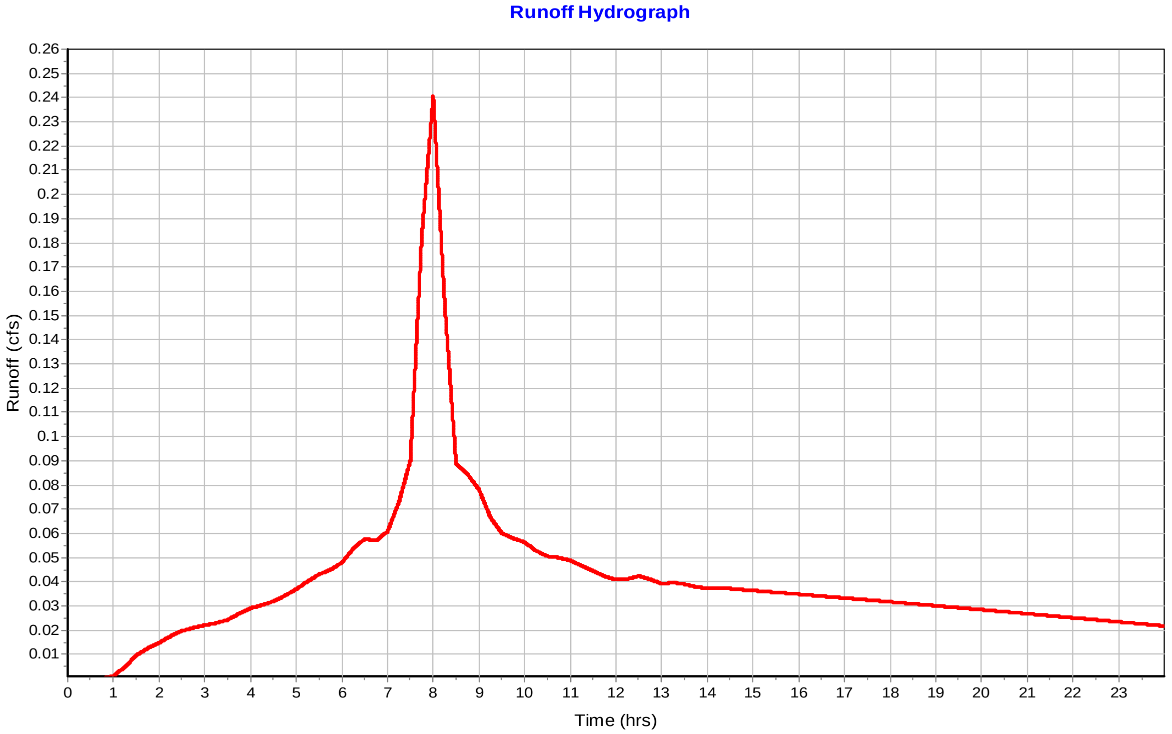
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	2.87
Total Runoff (in)	2.25
Peak Runoff (cfs)	0.24
Weighted Curve Number	92.94
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 30





Subbasin : SDCB 31

Input Data

Area (ac)	0.52
Impervious Area (%)	26
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.52		81.72

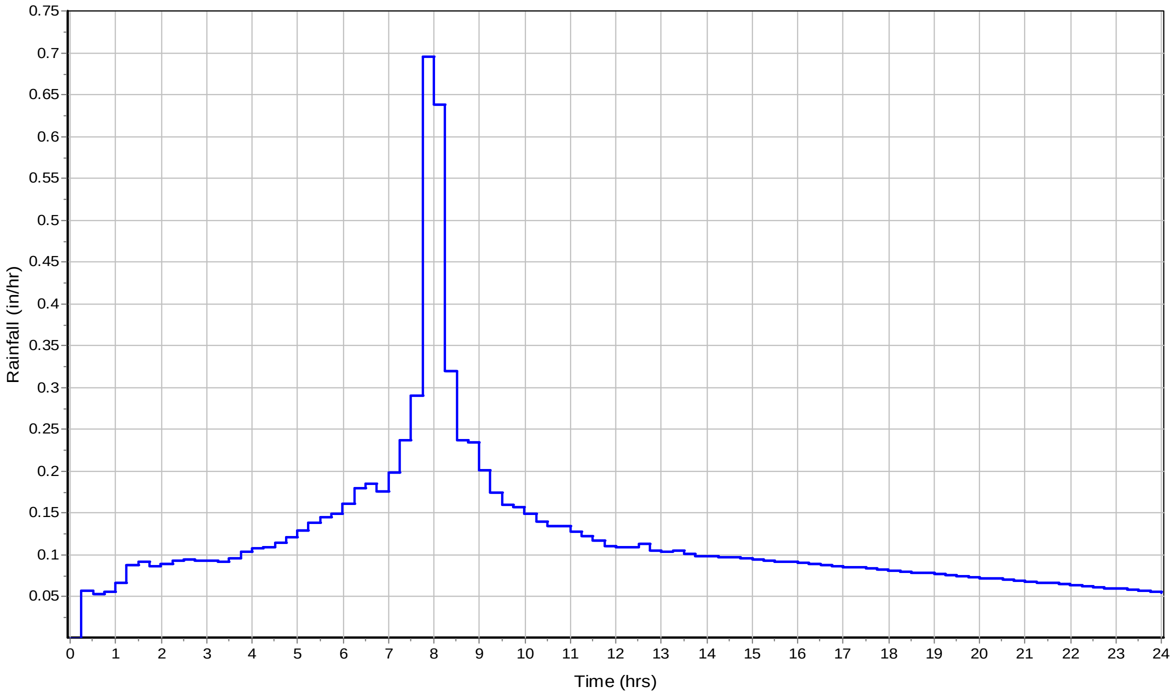
Time of Concentration

Subbasin Runoff Results

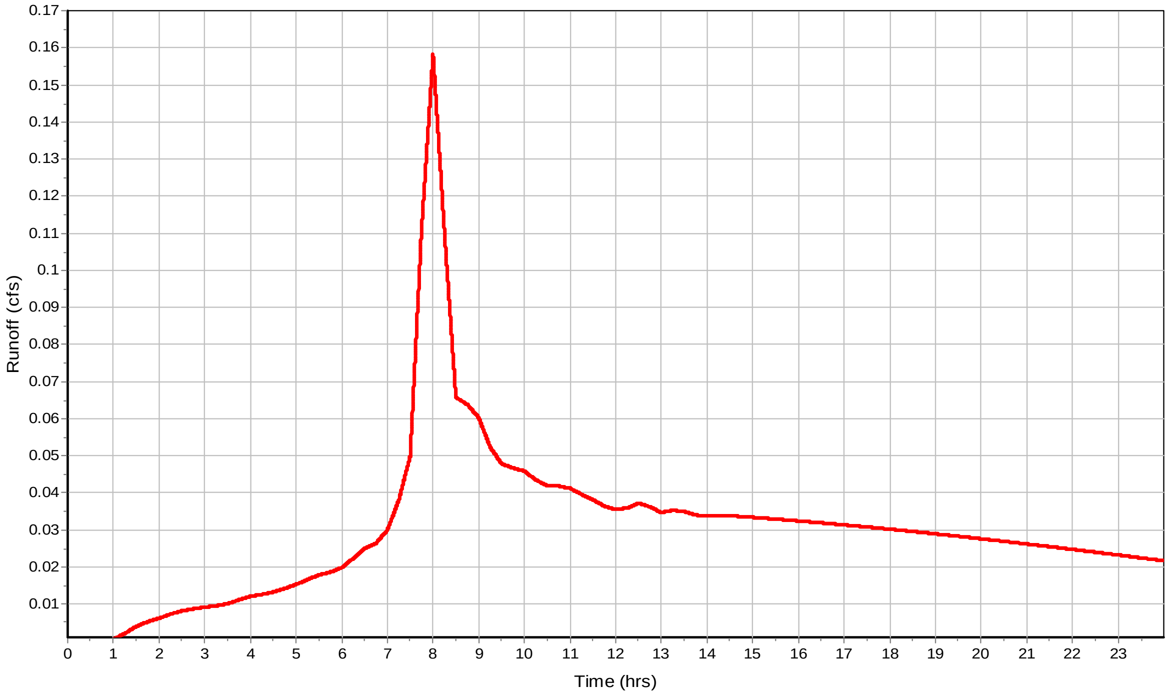
Total Rainfall (in)	2.87
Total Runoff (in)	1.38
Peak Runoff (cfs)	0.16
Weighted Curve Number	81.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 31

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 32

Input Data

Area (ac)	0.19
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.19		92.06

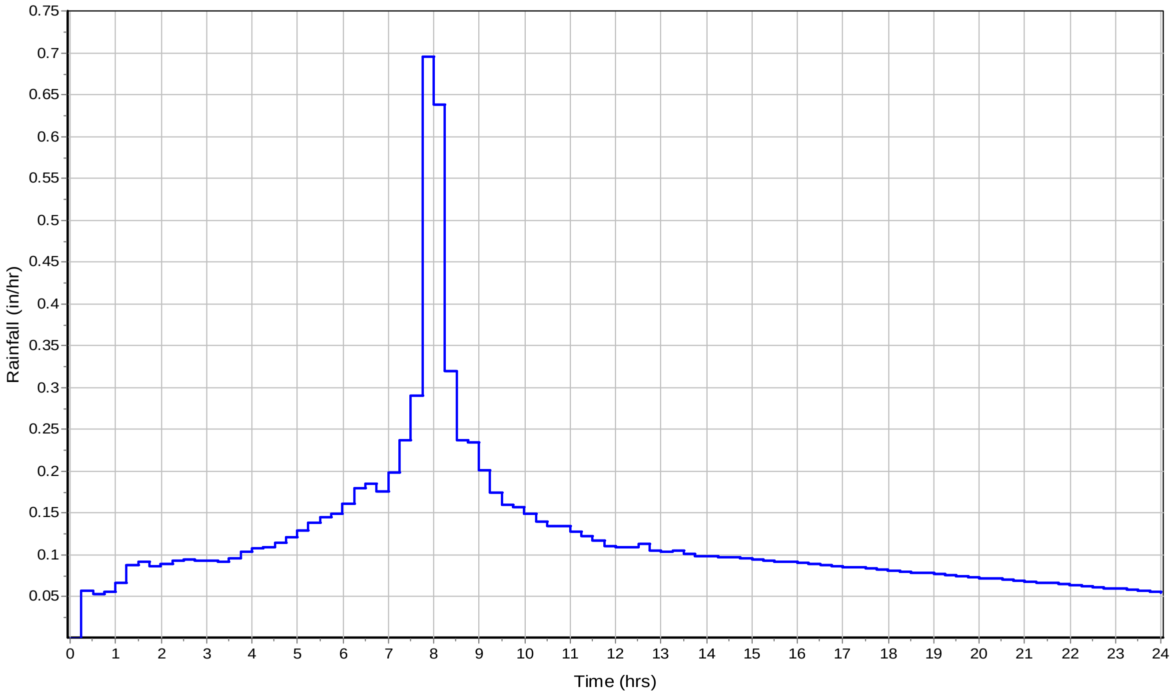
Time of Concentration

Subbasin Runoff Results

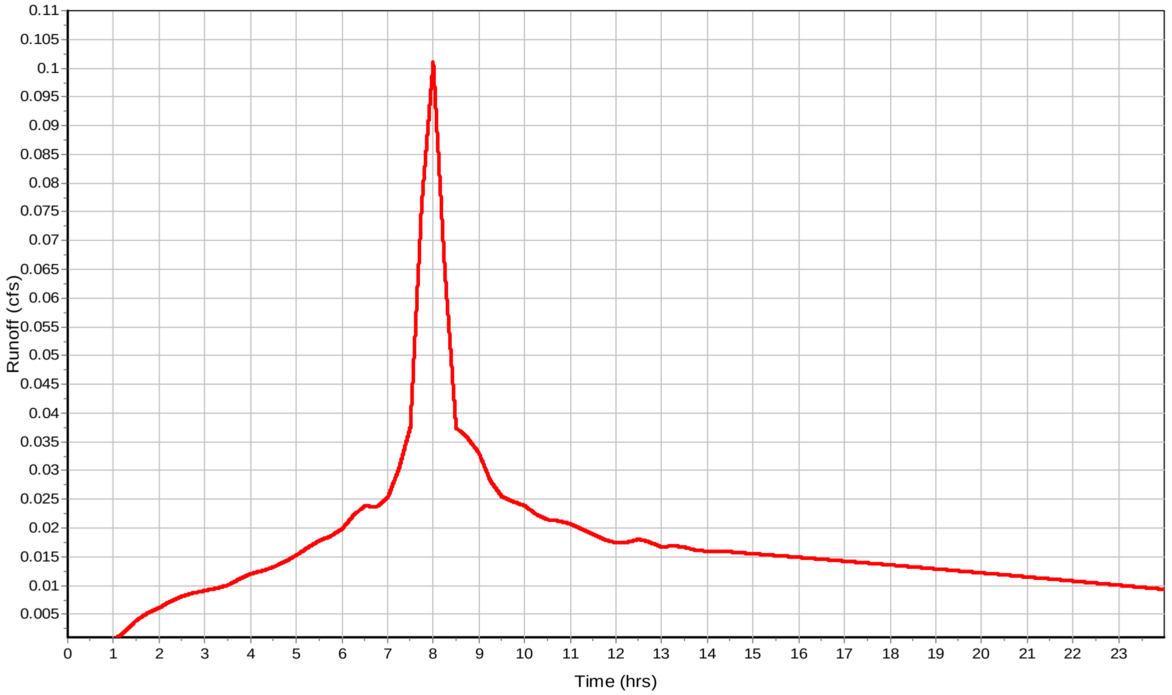
Total Rainfall (in)	2.87
Total Runoff (in)	2.18
Peak Runoff (cfs)	0.1
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 32

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 33

Input Data

Area (ac)	0.23
Impervious Area (%)	83
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.23		94.26

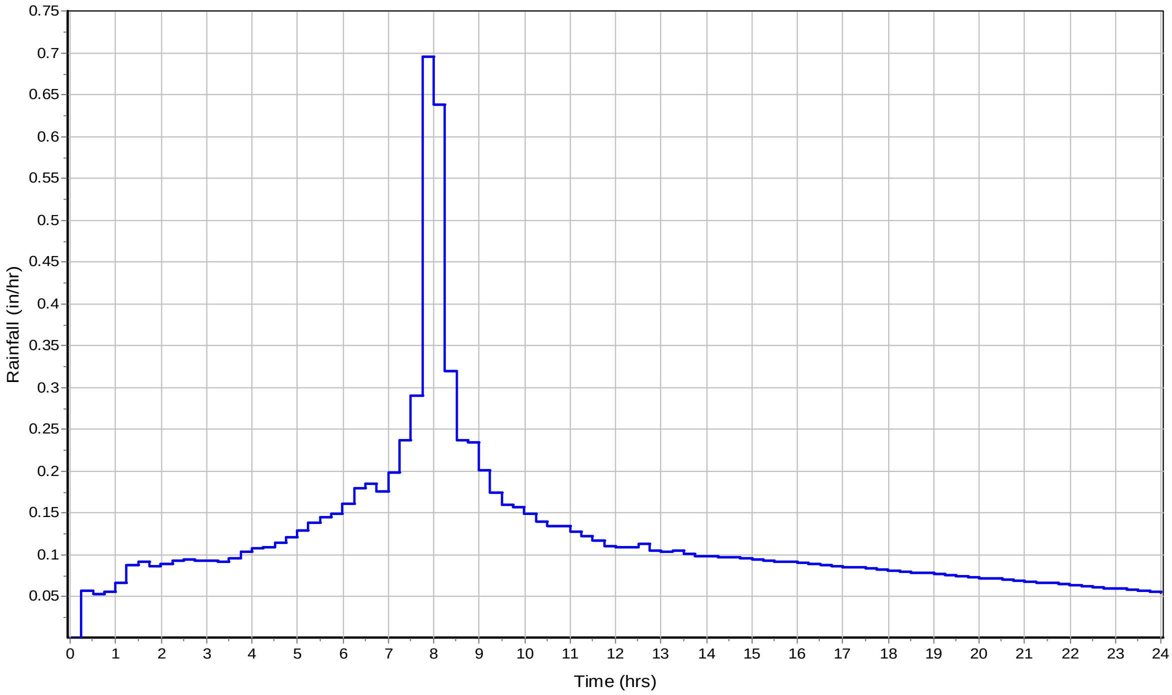
Time of Concentration

Subbasin Runoff Results

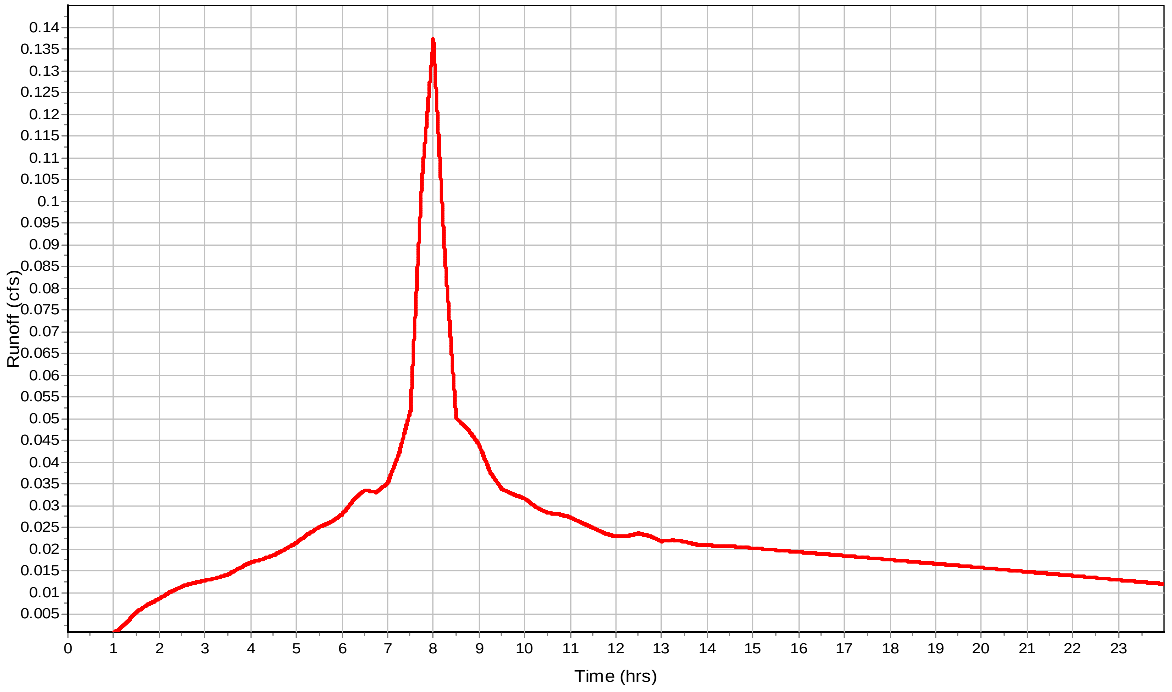
Total Rainfall (in)	2.87
Total Runoff (in)	2.35
Peak Runoff (cfs)	0.14
Weighted Curve Number	94.26
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 33

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 34

Input Data

Area (ac)	0.14
Impervious Area (%)	76
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.14		92.72

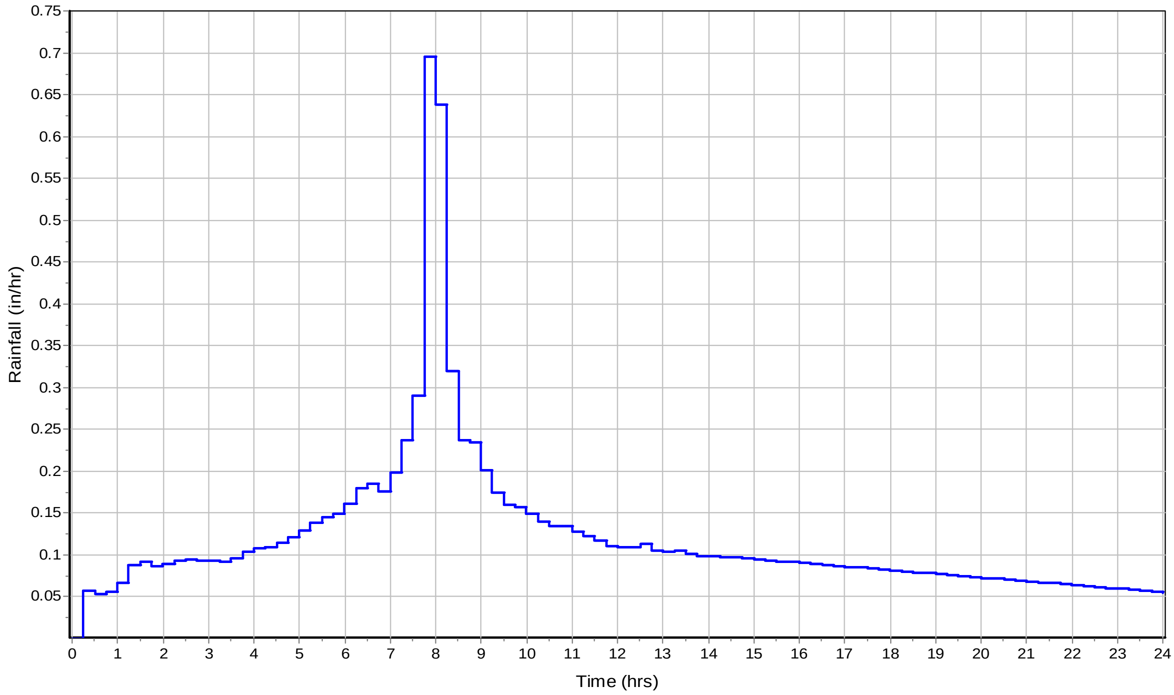
Time of Concentration

Subbasin Runoff Results

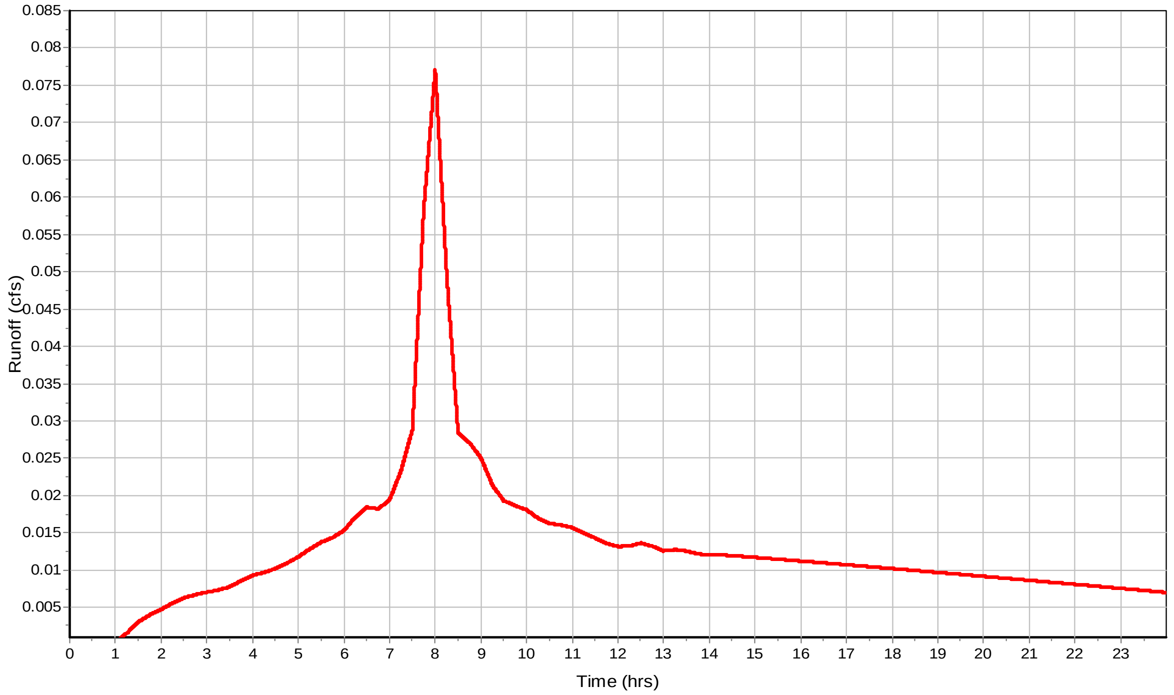
Total Rainfall (in)	2.87
Total Runoff (in)	2.23
Peak Runoff (cfs)	0.08
Weighted Curve Number	92.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 34

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 36

Input Data

Area (ac)	0.36
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.36		93.38

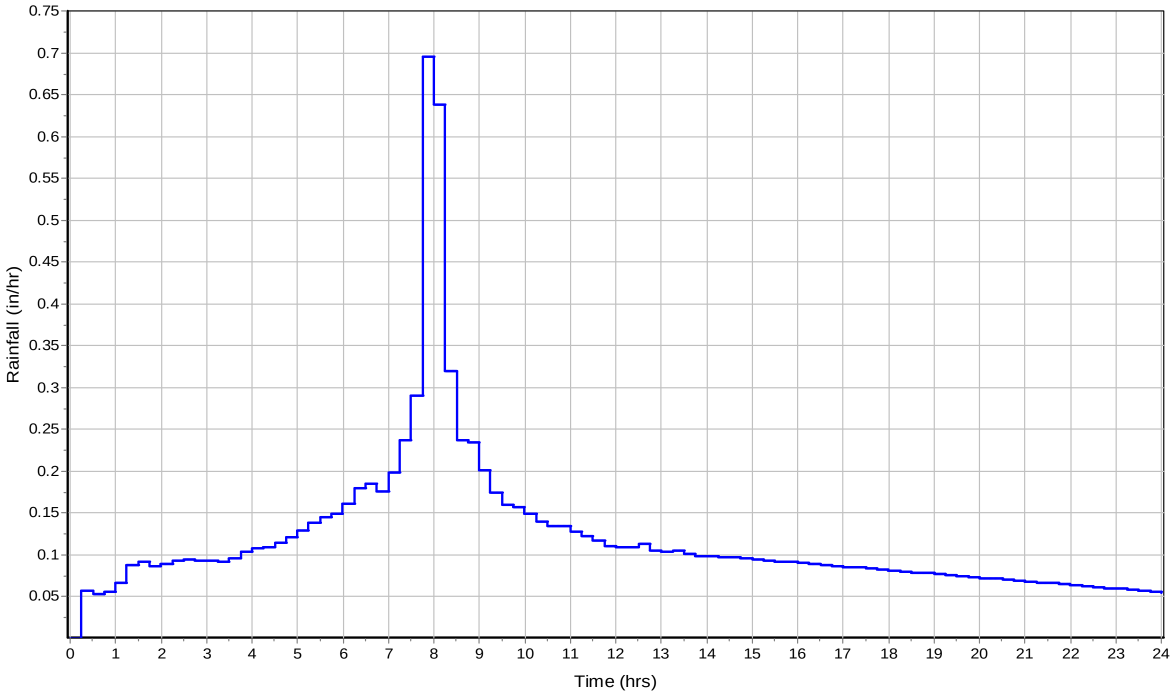
Time of Concentration

Subbasin Runoff Results

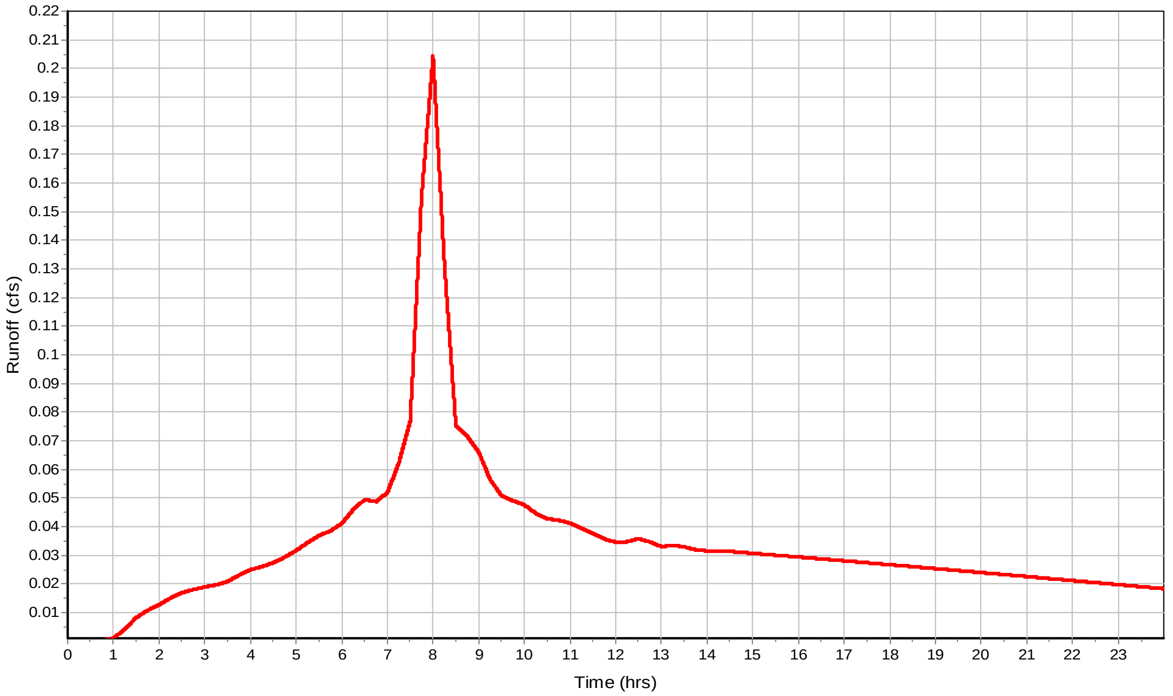
Total Rainfall (in)	2.87
Total Runoff (in)	2.29
Peak Runoff (cfs)	0.2
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 36

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 37

Input Data

Area (ac)	0.07
Impervious Area (%)	96
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.07		97.12

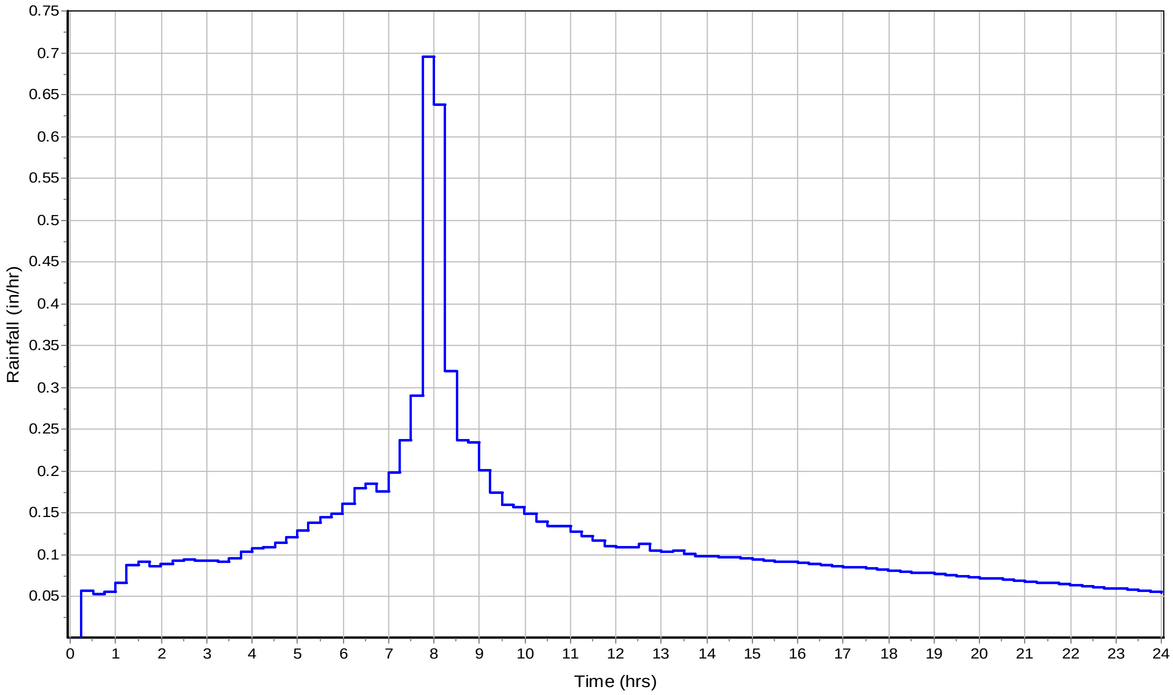
Time of Concentration

Subbasin Runoff Results

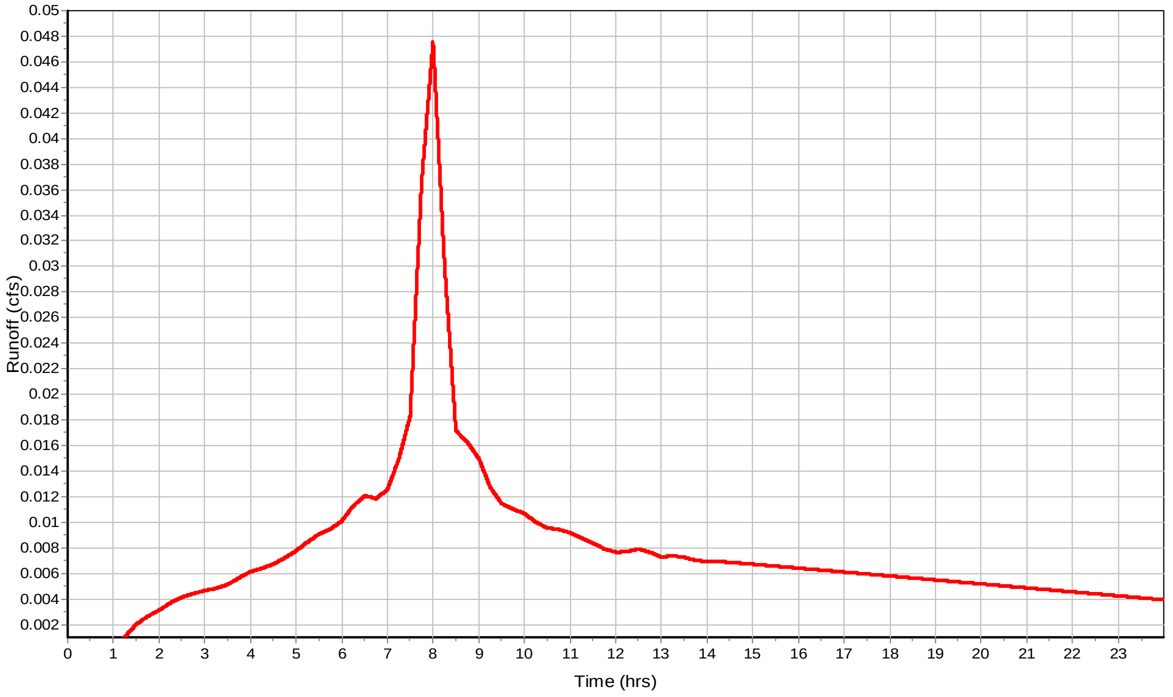
Total Rainfall (in)	2.87
Total Runoff (in)	2.58
Peak Runoff (cfs)	0.05
Weighted Curve Number	97.12
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 37

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 38

Input Data

Area (ac)	0.25
Impervious Area (%)	72
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.25		91.84

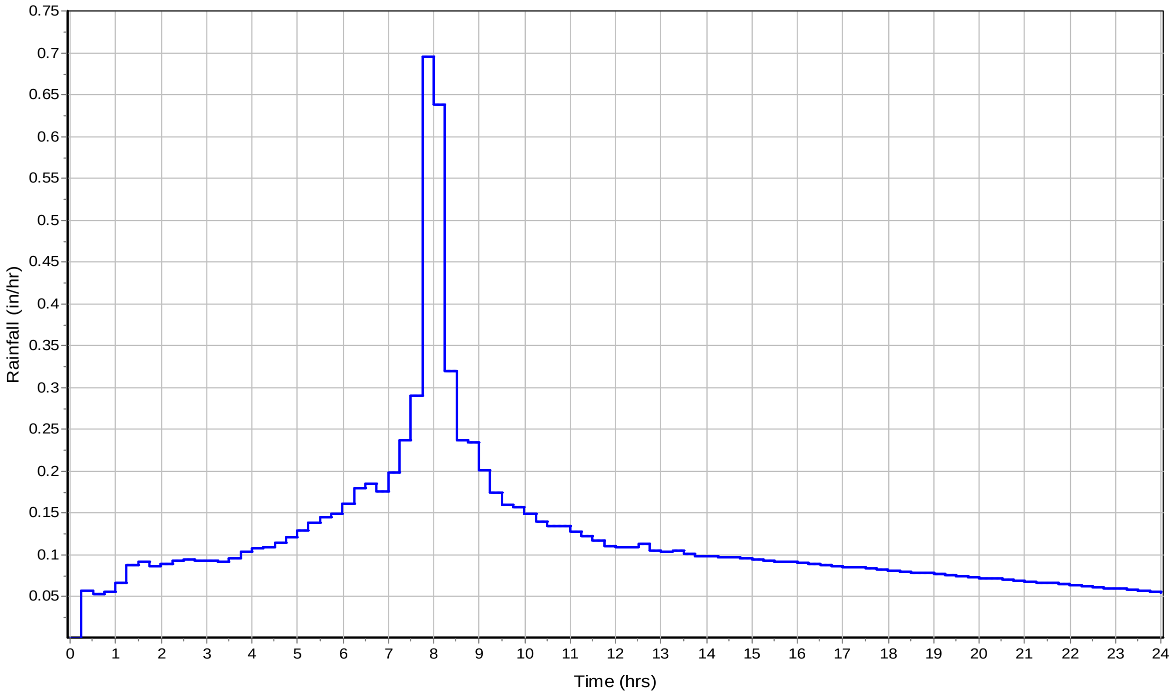
Time of Concentration

Subbasin Runoff Results

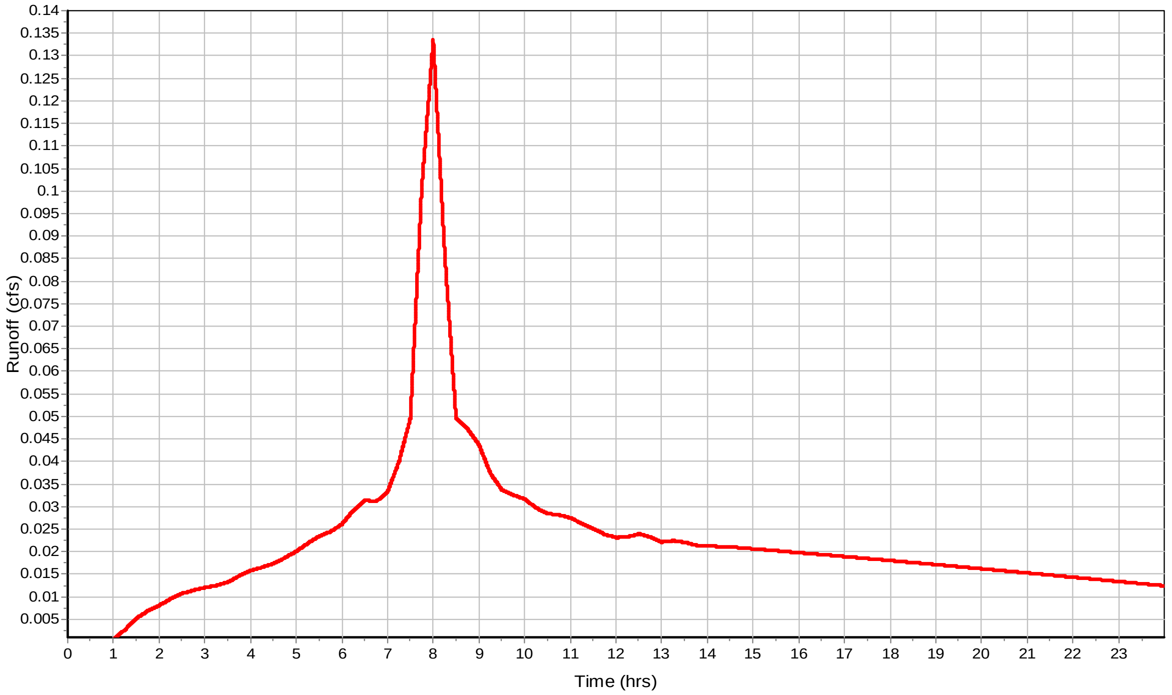
Total Rainfall (in)	2.87
Total Runoff (in)	2.17
Peak Runoff (cfs)	0.13
Weighted Curve Number	91.84
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 38

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 40

Input Data

Area (ac)	0.11
Impervious Area (%)	0
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	10-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.11		76

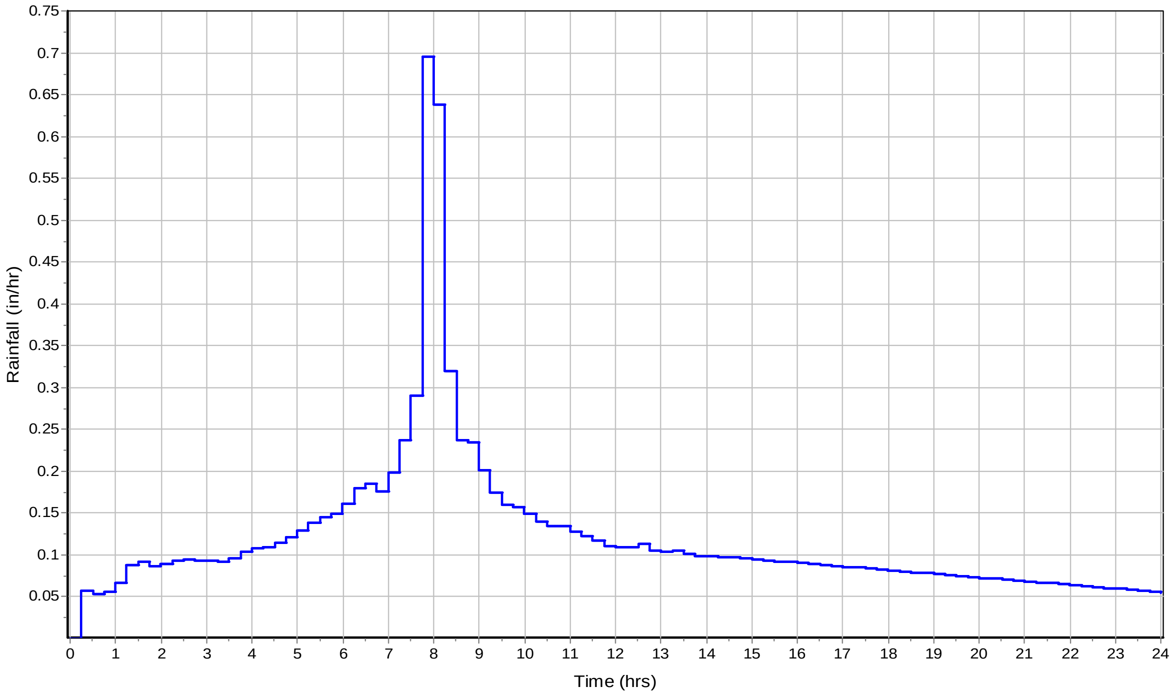
Time of Concentration

Subbasin Runoff Results

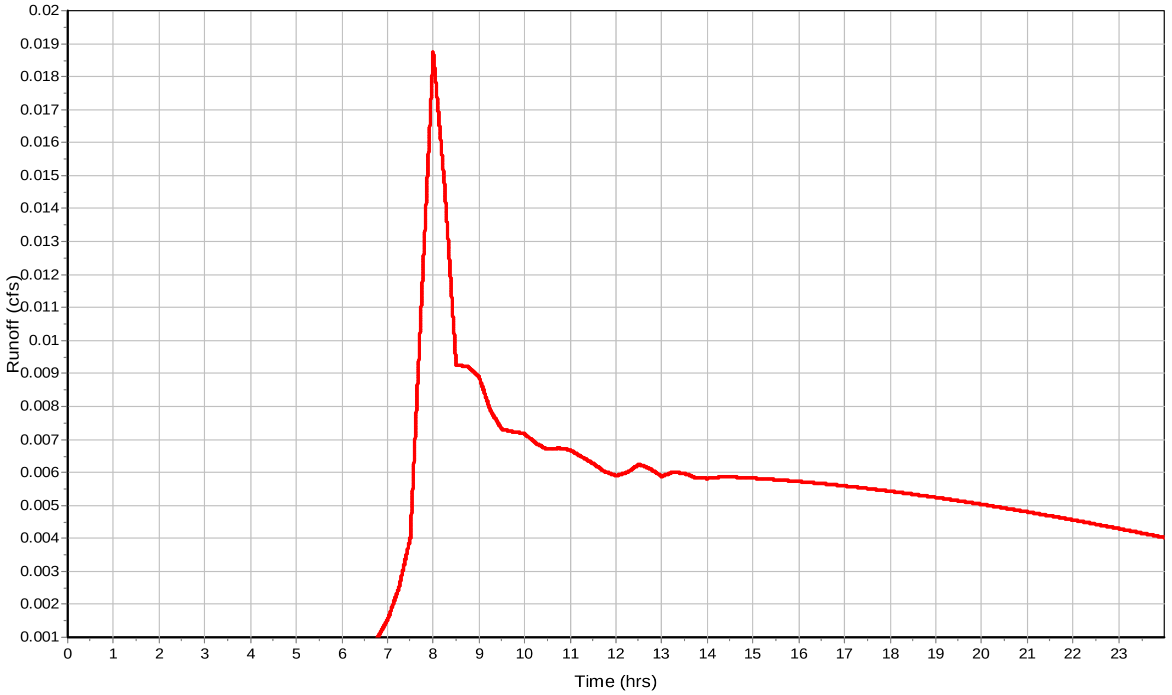
Total Rainfall (in)	2.87
Total Runoff (in)	0.93
Peak Runoff (cfs)	0.02
Weighted Curve Number	76
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 40

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	AREA DRAIN G1	73.07	77.13	4.06	0.00	-73.07	0.00	-77.13	0.00	42.72
2	AREA DRAIN H1	72.33	77.10	4.77	0.00	-72.33	0.00	-77.10	0.00	51.24
3	SDCB#01	66.90	74.84	7.94	67.40	0.50	0.00	-74.84	0.00	0.00
4	SDCB#02	69.50	72.40	2.90	0.00	-69.50	0.00	-72.40	0.00	22.80
5	SDCB#03	69.86	72.19	2.33	0.00	-69.86	0.00	-72.19	0.00	19.96
6	SDCB#04	70.14	72.64	2.50	0.00	-70.14	0.00	-72.64	0.00	22.00
7	SDCB#05	68.96	72.11	3.15	0.00	-68.96	0.00	-72.11	0.00	25.80
8	SDCB#06	68.72	73.03	4.31	0.00	-68.72	0.00	-73.03	0.00	43.72
9	SDCB#07	69.08	71.79	2.71	0.00	-69.08	0.00	-71.79	0.00	24.52
10	SDCB#08	69.55	72.45	2.90	0.00	-69.55	0.00	-72.45	0.00	26.80
11	SDCB#09	68.51	72.35	3.84	0.00	-68.51	0.00	-72.35	0.00	34.08
12	SDCB#10	67.90	76.96	9.06	68.40	0.50	0.00	-76.96	0.00	0.00
13	SDCB#11	73.48	76.58	3.10	0.00	-73.48	0.00	-76.58	0.00	29.20
14	SDCB#12	73.83	76.54	2.71	0.00	-73.83	0.00	-76.54	0.00	24.52
15	SDCB#13	73.87	76.58	2.71	0.00	-73.87	0.00	-76.58	0.00	24.52
16	SDCB#14	71.89	76.31	4.42	0.00	-71.89	0.00	-76.31	0.00	41.04
17	SDCB#15	71.68	76.25	4.57	0.00	-71.68	0.00	-76.25	0.00	42.84
18	SDCB#16	72.23	76.36	4.13	0.00	-72.23	0.00	-76.36	0.00	35.28
19	SDCB#17	72.75	76.55	3.80	0.00	-72.75	0.00	-76.55	0.00	37.60
20	SDCB#18	68.40	76.69	8.29	0.00	-68.40	0.00	-76.69	0.00	75.48
21	SDCB#19	70.35	75.25	4.90	0.00	-70.35	0.00	-75.25	0.00	46.80
22	SDCB#20	70.98	75.25	4.27	0.00	-70.98	0.00	-75.25	0.00	39.24
23	SDCB#21	71.81	75.25	3.44	0.00	-71.81	0.00	-75.25	0.00	33.28
24	SDCB#22	71.36	75.25	3.89	0.00	-71.36	0.00	-75.25	0.00	34.68
25	SDCB#23	71.93	75.25	3.32	0.00	-71.93	0.00	-75.25	0.00	27.84
26	SDCB#24	72.61	75.25	2.64	0.00	-72.61	0.00	-75.25	0.00	23.68
27	SDCB#25	72.79	75.25	2.46	0.00	-72.79	0.00	-75.25	0.00	21.52
28	SDCB#26	68.40	76.79	8.39	0.00	-68.40	0.00	-76.79	0.00	76.68
29	SDCB#27	71.20	75.25	4.05	0.00	-71.20	0.00	-75.25	0.00	36.52
30	SDCB#28	72.15	75.25	3.10	0.00	-72.15	0.00	-75.25	0.00	29.20
31	SDCB#29	71.72	75.40	3.68	0.00	-71.72	0.00	-75.40	0.00	32.16
32	SDCB#30	72.69	75.40	2.71	0.00	-72.69	0.00	-75.40	0.00	24.52
33	SDCB#31	70.25	77.16	6.91	0.00	-70.25	0.00	-77.16	0.00	70.92
34	SDCB#32	72.60	75.25	2.65	0.00	-72.60	0.00	-75.25	0.00	23.80
35	SDCB#33	70.81	75.25	4.44	0.00	-70.81	0.00	-75.25	0.00	41.28
36	SDCB#34	71.52	75.25	3.73	0.00	-71.52	0.00	-75.25	0.00	36.76
37	SDCB#35	68.40	77.00	8.60	0.00	-68.40	0.00	-77.00	0.00	79.20
38	SDCB#36	70.59	75.26	4.67	0.00	-70.59	0.00	-75.26	0.00	43.96
39	SDCB#37	71.52	75.67	4.15	0.00	-71.52	0.00	-75.67	0.00	41.80
40	SDCB#38	71.88	75.26	3.38	0.00	-71.88	0.00	-75.26	0.00	32.56
41	SDCB#40	73.22	76.27	3.05	0.00	-73.22	0.00	-76.27	0.00	24.60
42	SDCO#A1	72.71	76.38	3.67	0.00	-72.71	0.00	-76.38	0.00	36.00
43	SDCO#A2	73.21	76.54	3.33	0.00	-73.21	0.00	-76.54	0.00	33.96
44	SDCO#A3	74.00	75.03	1.03	0.00	-74.00	0.00	-75.03	0.00	6.36
45	SDCO#A4	73.96	75.89	1.93	0.00	-73.96	0.00	-75.89	0.00	17.16
46	SDCO#A5	73.23	76.82	3.59	0.00	-73.23	0.00	-76.82	0.00	37.08
47	SDCO#B1	74.33	78.08	3.75	0.00	-74.33	0.00	-78.08	0.00	36.96
48	SDCO#B2	75.11	77.80	2.69	0.00	-75.11	0.00	-77.80	0.00	26.28
49	SDCO#B3	75.28	77.92	2.64	0.00	-75.28	0.00	-77.92	0.00	25.68
50	SDCO#B4	75.41	77.95	2.54	0.00	-75.41	0.00	-77.95	0.00	24.48
51	SDCO#B5	71.99	78.08	6.09	0.00	-71.99	0.00	-78.08	0.00	67.08
52	SDCO#B6	72.81	78.02	5.21	0.00	-72.81	0.00	-78.02	0.00	56.52
53	SDCO#B7	72.87	77.95	5.08	0.00	-72.87	0.00	-77.95	0.00	54.96
54	SDCO#B8	72.81	78.02	5.21	0.00	-72.81	0.00	-78.02	0.00	56.52
55	SDCO#C1	72.21	76.85	4.64	0.00	-72.21	0.00	-76.85	0.00	37.68
56	SDCO#C10	72.74	76.81	4.07	0.00	-72.74	0.00	-76.81	0.00	41.16
57	SDCO#C2	74.28	76.87	2.59	0.00	-74.28	0.00	-76.87	0.00	25.08
58	SDCO#C3	74.37	76.91	2.54	0.00	-74.37	0.00	-76.91	0.00	24.48
59	SDCO#C4	74.29	76.83	2.54	0.00	-74.29	0.00	-76.83	0.00	24.48
60	SDCO#C5	71.44	76.97	5.53	0.00	-71.44	0.00	-76.97	0.00	56.76
61	SDCO#C6	72.54	77.11	4.57	0.00	-72.54	0.00	-77.11	0.00	48.84
62	SDCO#C7	72.66	76.99	4.33	0.00	-72.66	0.00	-76.99	0.00	45.96
63	SDCO#C8	72.19	76.97	4.78	0.00	-72.19	0.00	-76.97	0.00	51.36
64	SDCO#C9	72.19	76.88	4.69	0.00	-72.19	0.00	-76.88	0.00	48.60
65	SDCO#CLUB1	72.38	76.33	3.95	0.00	-72.38	0.00	-76.33	0.00	41.40
66	SDCO#CLUB2	72.72	76.59	3.87	0.00	-72.72	0.00	-76.59	0.00	40.44
67	SDCO#CLUB3	73.13	76.45	3.32	0.00	-73.13	0.00	-76.45	0.00	33.84
68	SDCO#CLUB4	72.72	76.62	3.90	0.00	-72.72	0.00	-76.62	0.00	40.80
69	SDCO#CLUB5	73.15	76.43	3.28	0.00	-73.15	0.00	-76.43	0.00	33.36
70	SDCO#COM01	70.05	73.56	3.51	0.00	-70.05	0.00	-73.56	0.00	34.20
71	SDCO#COM02	70.70	73.51	2.81	0.00	-70.70	0.00	-73.51	0.00	27.72
72	SDCO#COM04	70.78	73.59	2.81	0.00	-70.78	0.00	-73.59	0.00	25.72
73	SDCO#COM05	71.01	73.62	2.61	0.00	-71.01	0.00	-73.62	0.00	25.32
74	SDCO#COM06	71.60	73.47	1.87	0.00	-71.60	0.00	-73.47	0.00	16.44
75	SDCO#COM07	70.25	73.18	2.93	0.00	-70.25	0.00	-73.18	0.00	27.16

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
76	SDCO#COM08	70.78	73.55	2.77	0.00	-70.78	0.00	-73.55	0.00	27.24
77	SDCO#COM09	70.17	73.63	3.46	0.00	-70.17	0.00	-73.63	0.00	33.48
78	SDCO#COM10	71.09	73.63	2.54	0.00	-71.09	0.00	-73.63	0.00	24.48
79	SDCO#COM11	71.09	73.63	2.54	0.00	-71.09	0.00	-73.63	0.00	24.48
80	SDCO#COM12	70.17	72.88	2.71	0.00	-70.17	0.00	-72.88	0.00	24.48
81	SDCO#COM13	70.87	73.41	2.54	0.00	-70.87	0.00	-73.41	0.00	24.48
82	SDCO#D1	72.84	77.30	4.46	0.00	-72.84	0.00	-77.30	0.00	45.48
83	SDCO#D2	74.65	77.29	2.64	0.00	-74.65	0.00	-77.29	0.00	25.68
84	SDCO#D3	74.71	77.29	2.58	0.00	-74.71	0.00	-77.29	0.00	24.96
85	SDCO#D4	73.53	77.46	3.93	0.00	-73.53	0.00	-77.46	0.00	41.16
86	SDCO#D5	74.47	77.03	2.56	0.00	-74.47	0.00	-77.03	0.00	24.72
87	SDCO#D6	74.79	77.33	2.54	0.00	-74.79	0.00	-77.33	0.00	24.48
88	SDCO#D7	74.72	77.28	2.56	0.00	-74.72	0.00	-77.28	0.00	24.72
89	SDCO#E1	72.07	76.54	4.47	0.00	-72.07	0.00	-76.54	0.00	47.64
90	SDCO#E2	72.43	76.80	4.37	0.00	-72.43	0.00	-76.80	0.00	46.44
91	SDCO#E3	73.14	76.57	3.43	0.00	-73.14	0.00	-76.57	0.00	35.16
92	SDCO#E4	72.64	76.50	3.86	0.00	-72.64	0.00	-76.50	0.00	40.32
93	SDCO#E5	72.96	76.75	3.79	0.00	-72.96	0.00	-76.75	0.00	39.48
94	SDCO#E6	73.56	76.50	2.94	0.00	-73.56	0.00	-76.50	0.00	29.28
95	SDCO#E7	74.24	76.76	2.52	0.00	-74.24	0.00	-76.76	0.00	24.24
96	SDCO#F1	71.77	77.26	5.49	0.00	-71.77	0.00	-77.26	0.00	59.88
97	SDCO#F2	72.50	76.98	4.48	0.00	-72.50	0.00	-76.98	0.00	47.76
98	SDCO#F3	73.46	77.21	3.75	0.00	-73.46	0.00	-77.21	0.00	39.00
99	SDCO#G1	73.29	77.07	3.78	0.00	-73.29	0.00	-77.07	0.00	39.36
100	SDCO#G2	74.47	77.01	2.54	0.00	-74.47	0.00	-77.01	0.00	24.48
101	SDCO#G3	72.89	77.15	4.26	0.00	-72.89	0.00	-77.15	0.00	43.08
102	SDCO#G4	74.22	76.76	2.54	0.00	-74.22	0.00	-76.76	0.00	24.48
103	SDCO#H1	72.76	77.10	4.34	0.00	-72.76	0.00	-77.10	0.00	44.04
104	SDCO#H2	73.13	77.02	3.89	0.00	-73.13	0.00	-77.02	0.00	40.68
105	SDCO#H3	74.20	76.74	2.54	0.00	-74.20	0.00	-76.74	0.00	24.48
106	SDCO#H4	72.79	77.00	4.21	0.00	-72.79	0.00	-77.00	0.00	44.52
107	SDCO#H5	72.94	75.70	2.76	0.00	-72.94	0.00	-75.70	0.00	27.12
108	SDCO#H6	74.06	76.59	2.53	0.00	-74.06	0.00	-76.59	0.00	24.36
109	WQ#1	67.90	73.16	5.26	0.00	-67.90	0.00	-73.16	0.00	49.12
110	WQ#2	70.66	76.71	6.05	0.00	-70.66	0.00	-76.71	0.00	38.56
111	WQ#3	69.48	76.48	7.00	0.00	-69.48	0.00	-76.48	0.00	45.96
112	WQ#4	69.60	76.07	6.47	0.00	-69.60	0.00	-76.07	0.00	59.64
113	WQ#5	70.30	76.23	5.93	0.00	-70.30	0.00	-76.23	0.00	53.16

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AREA DRAIN G1	0.00	0.00	73.07	0.00	0.00	4.06	73.07	0.00	0 00:00	0 00:00	0.00	0.00
2	AREA DRAIN H1	0.00	0.00	72.33	0.00	0.00	4.77	72.33	0.00	0 00:00	0 00:00	0.00	0.00
3	SDCB#01	0.12	0.00	67.98	1.08	0.00	6.86	67.72	0.82	1 00:00	0 00:00	0.00	0.00
4	SDCB#02	0.36	0.15	69.76	0.26	0.00	2.64	69.61	0.11	0 08:00	0 00:00	0.00	0.00
5	SDCB#03	0.15	0.09	70.06	0.20	0.00	2.13	69.95	0.09	0 08:00	0 00:00	0.00	0.00
6	SDCB#04	0.06	0.03	70.27	0.13	0.00	2.37	70.20	0.06	0 08:00	0 00:00	0.00	0.00
7	SDCB#05	0.55	0.15	69.27	0.31	0.00	2.84	69.09	0.13	0 08:01	0 00:00	0.00	0.00
8	SDCB#06	0.18	0.08	69.15	0.43	0.00	3.88	68.82	0.10	0 08:01	0 00:00	0.00	0.00
9	SDCB#07	0.11	0.05	69.24	0.16	0.00	2.55	69.15	0.07	0 08:00	0 00:00	0.00	0.00
10	SDCB#08	0.06	0.03	69.65	0.10	0.00	2.80	69.59	0.04	0 08:00	0 00:00	0.00	0.00
11	SDCB#09	0.87	0.15	69.13	0.62	0.00	3.22	68.73	0.22	0 08:01	0 00:00	0.00	0.00
12	SDCB#10	0.08	0.00	70.14	2.24	0.00	6.82	69.31	1.41	1 00:00	0 00:00	0.00	0.00
13	SDCB#11	0.22	0.06	73.61	0.13	0.00	2.97	73.53	0.05	0 08:00	0 00:00	0.00	0.00
14	SDCB#12	0.07	0.07	73.96	0.13	0.00	2.58	73.89	0.06	0 08:00	0 00:00	0.00	0.00
15	SDCB#13	0.08	0.08	74.02	0.15	0.00	2.56	73.93	0.06	0 08:00	0 00:00	0.00	0.00
16	SDCB#14	0.43	0.11	72.20	0.31	0.00	4.11	72.01	0.12	0 08:00	0 00:00	0.00	0.00
17	SDCB#15	0.56	0.08	72.08	0.40	0.00	4.17	71.84	0.16	0 08:01	0 00:00	0.00	0.00
18	SDCB#16	0.25	0.07	72.44	0.21	0.00	3.92	72.32	0.09	0 08:00	0 00:00	0.00	0.00
19	SDCB#17	0.12	0.07	72.93	0.18	0.00	3.62	72.83	0.08	0 08:00	0 00:00	0.00	0.00
20	SDCB#18	1.64	0.00	70.14	1.74	0.00	6.55	69.40	1.00	1 00:00	0 00:00	0.00	0.00
21	SDCB#19	0.99	0.26	70.82	0.47	0.00	4.43	70.53	0.18	0 08:01	0 00:00	0.00	0.00
22	SDCB#20	0.74	0.06	71.35	0.37	0.00	3.90	71.14	0.16	0 08:01	0 00:00	0.00	0.00
23	SDCB#21	0.06	0.06	71.91	0.10	0.00	3.34	71.86	0.05	0 08:00	0 00:00	0.00	0.00
24	SDCB#22	0.62	0.12	71.72	0.36	0.00	3.53	71.51	0.15	0 08:01	0 00:00	0.00	0.00
25	SDCB#23	0.36	0.12	72.18	0.25	0.00	3.07	72.04	0.11	0 08:00	0 00:00	0.00	0.00
26	SDCB#24	0.03	0.01	72.69	0.08	0.00	2.56	72.65	0.04	0 08:01	0 00:00	0.00	0.00
27	SDCB#25	0.01	0.01	72.85	0.06	0.00	2.40	72.82	0.03	0 08:00	0 00:00	0.00	0.00
28	SDCB#26	0.98	0.00	70.14	1.74	0.00	6.65	69.41	1.01	1 00:00	0 00:00	0.00	0.00
29	SDCB#27	0.98	0.27	71.67	0.47	0.00	3.58	71.39	0.19	0 08:01	0 00:00	0.00	0.00
30	SDCB#28	0.19	0.11	72.37	0.22	0.00	2.88	72.24	0.09	0 08:01	0 00:00	0.00	0.00
31	SDCB#29	0.51	0.12	72.01	0.29	0.00	3.39	71.84	0.12	0 08:00	0 00:00	0.00	0.00
32	SDCB#30	0.24	0.24	72.94	0.25	0.00	2.46	72.80	0.11	0 08:00	0 00:00	0.00	0.00
33	SDCB#31	0.44	0.16	70.59	0.34	0.00	6.57	70.39	0.14	0 08:00	0 00:00	0.00	0.00
34	SDCB#32	0.16	0.10	72.81	0.21	0.00	2.44	72.69	0.09	0 08:00	0 00:00	0.00	0.00
35	SDCB#33	0.21	0.14	71.01	0.20	0.00	4.24	70.90	0.09	0 08:00	0 00:00	0.00	0.00
36	SDCB#34	0.08	0.08	71.66	0.14	0.00	3.59	71.58	0.06	0 08:00	0 00:00	0.00	0.00
37	SDCB#35	0.45	0.00	70.14	1.74	0.00	6.86	69.40	1.00	1 00:00	0 00:00	0.00	0.00
38	SDCB#36	0.38	0.20	70.79	0.20	0.00	4.47	70.68	0.09	0 08:00	0 00:00	0.00	0.00
39	SDCB#37	0.18	0.05	71.74	0.22	0.00	3.93	71.61	0.09	0 08:01	0 00:00	0.00	0.00
40	SDCB#38	0.13	0.13	72.06	0.18	0.00	3.20	71.96	0.08	0 08:00	0 00:00	0.00	0.00
41	SDCB#40	0.02	0.02	73.26	0.04	0.00	3.01	73.24	0.02	0 08:00	0 00:00	0.00	0.00
42	SDCO#A1	0.06	0.00	72.83	0.12	0.00	3.55	72.76	0.05	0 08:01	0 00:00	0.00	0.00
43	SDCO#A2	0.03	0.00	73.29	0.08	0.00	3.25	73.24	0.03	0 08:01	0 00:00	0.00	0.00
44	SDCO#A3	0.03	0.03	74.08	0.08	0.00	0.95	74.03	0.03	0 08:00	0 00:00	0.00	0.00
45	SDCO#A4	0.03	0.03	74.04	0.08	0.00	1.85	73.99	0.03	0 08:00	0 00:00	0.00	0.00
46	SDCO#A5	0.03	0.00	73.31	0.08	0.00	3.51	73.27	0.04	0 08:01	0 00:00	0.00	0.00
47	SDCO#B1	0.08	0.00	74.40	0.07	0.00	3.68	74.36	0.03	0 08:01	0 00:00	0.00	0.00
48	SDCO#B2	0.04	0.00	75.20	0.09	0.00	2.60	75.15	0.04	0 08:00	0 00:00	0.00	0.00
49	SDCO#B3	0.04	0.04	75.38	0.10	0.00	2.54	75.32	0.04	0 08:00	0 00:00	0.00	0.00
50	SDCO#B4	0.04	0.04	75.50	0.09	0.00	2.45	75.45	0.04	0 08:00	0 00:00	0.00	0.00
51	SDCO#B5	0.08	0.00	72.16	0.17	0.00	5.92	72.06	0.07	0 08:01	0 00:00	0.00	0.00
52	SDCO#B6	0.04	0.00	72.90	0.09	0.00	5.12	72.85	0.04	0 08:00	0 00:00	0.00	0.00
53	SDCO#B7	0.04	0.04	72.97	0.10	0.00	4.98	72.91	0.04	0 08:00	0 00:00	0.00	0.00
54	SDCO#B8	0.04	0.04	72.90	0.09	0.00	5.12	72.85	0.04	0 08:00	0 00:00	0.00	0.00
55	SDCO#C1	0.08	0.00	73.14	0.93	0.00	3.71	73.07	0.86	0 08:00	0 00:00	0.00	0.00
56	SDCO#C10	0.04	0.04	72.97	0.23	0.00	3.84	72.92	0.18	0 08:00	0 00:00	0.00	0.00
57	SDCO#C2	0.04	0.00	74.34	0.06	0.00	2.53	74.31	0.03	0 08:00	0 00:00	0.00	0.00
58	SDCO#C3	0.04	0.04	74.47	0.10	0.00	2.44	74.41	0.04	0 08:00	0 00:00	0.00	0.00
59	SDCO#C4	0.04	0.04	74.38	0.09	0.00	2.45	74.33	0.04	0 08:00	0 00:00	0.00	0.00
60	SDCO#C5	0.08	0.00	71.59	0.15	0.00	5.38	71.50	0.06	0 08:01	0 00:00	0.00	0.00
61	SDCO#C6	0.04	0.00	72.63	0.09	0.00	4.48	72.58	0.04	0 08:00	0 00:00	0.00	0.00
62	SDCO#C7	0.04	0.04	72.76	0.10	0.00	4.23	72.70	0.04	0 08:00	0 00:00	0.00	0.00
63	SDCO#C8	0.04	0.00	72.28	0.09	0.00	4.69	72.23	0.04	0 08:01	0 00:00	0.00	0.00
64	SDCO#C9	0.04	0.00	72.43	0.24	0.00	4.45	72.37	0.18	0 08:00	0 00:00	0.00	0.00
65	SDCO#CLUB1	0.04	0.00	72.45	0.07	0.00	3.88	72.41	0.03	0 08:01	0 00:00	0.00	0.00
66	SDCO#CLUB2	0.02	0.00	72.78	0.06	0.00	3.81	72.75	0.03	0 08:00	0 00:00	0.00	0.00
67	SDCO#CLUB3	0.02	0.02	73.20	0.07	0.00	3.25	73.16	0.03	0 08:00	0 00:00	0.00	0.00
68	SDCO#CLUB4	0.02	0.00	72.78	0.06	0.00	3.84	72.75	0.03	0 08:00	0 00:00	0.00	0.00
69	SDCO#CLUB5	0.02	0.02	73.22	0.07	0.00	3.21	73.18	0.03	0 08:00	0 00:00	0.00	0.00
70	SDCO#COM01	0.04	0.00	70.88	0.83	0.00	2.68	70.80	0.75	0 08:00	0 00:00	0.00	0.00
71	SDCO#COM02	0.04	0.04	70.89	0.19	0.00	2.62	70.82	0.12	0 08:00	0 00:00	0.00	0.00
72	SDCO#COM04	0.07	0.00	70.87	0.09	0.00	2.72	70.82	0.04	0 08:01	0 00:00	0.00	0.00
73	SDCO#COM05	0.03	0.00	71.09	0.08	0.00	2.53	71.04	0.03	0 08:00	0 00:00	0.00	0.00
74	SDCO#COM06	0.03	0.03	71.69	0.09	0.00	1.78	71.64	0.04	0 08:00	0 00:00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
75	SDCO#COM07	0.03	0.00	70.33	0.08	0.00	2.85	70.29	0.04	0 08:00	0 00:00	0.00	0.00
76	SDCO#COM08	0.03	0.03	70.86	0.08	0.00	2.69	70.81	0.03	0 08:00	0 00:00	0.00	0.00
77	SDCO#COM09	0.03	0.00	70.23	0.06	0.00	3.40	70.20	0.03	0 08:00	0 00:00	0.00	0.00
78	SDCO#COM10	0.01	0.01	71.14	0.05	0.00	2.49	71.11	0.02	0 08:00	0 00:00	0.00	0.00
79	SDCO#COM11	0.02	0.02	71.15	0.06	0.00	2.48	71.12	0.03	0 08:00	0 00:00	0.00	0.00
80	SDCO#COM12	0.03	0.00	70.22	0.05	0.00	2.66	70.19	0.02	0 08:00	0 00:00	0.00	0.00
81	SDCO#COM13	0.03	0.03	70.95	0.08	0.00	2.46	70.90	0.03	0 08:00	0 00:00	0.00	0.00
82	SDCO#D1	0.08	0.00	72.95	0.11	0.00	4.35	72.89	0.05	0 08:01	0 00:00	0.00	0.00
83	SDCO#D2	0.08	0.00	74.78	0.13	0.00	2.51	74.70	0.05	0 08:00	0 00:00	0.00	0.00
84	SDCO#D3	0.08	0.08	74.86	0.15	0.00	2.43	74.77	0.06	0 08:00	0 00:00	0.00	0.00
85	SDCO#D4	0.08	0.00	73.62	0.09	0.00	3.84	73.57	0.04	0 08:01	0 00:00	0.00	0.00
86	SDCO#D5	0.04	0.00	74.54	0.07	0.00	2.49	74.50	0.03	0 08:00	0 00:00	0.00	0.00
87	SDCO#D6	0.04	0.04	74.86	0.07	0.00	2.47	74.82	0.03	0 08:00	0 00:00	0.00	0.00
88	SDCO#D7	0.04	0.04	74.81	0.09	0.00	2.47	74.76	0.04	0 08:00	0 00:00	0.00	0.00
89	SDCO#E1	0.11	0.00	72.23	0.16	0.00	4.31	72.14	0.07	0 08:01	0 00:00	0.00	0.00
90	SDCO#E2	0.11	0.00	72.59	0.16	0.00	4.21	72.49	0.06	0 08:01	0 00:00	0.00	0.00
91	SDCO#E3	0.11	0.00	73.29	0.15	0.00	3.28	73.20	0.06	0 08:00	0 00:00	0.00	0.00
92	SDCO#E4	0.05	0.00	72.75	0.11	0.00	3.75	72.69	0.05	0 08:01	0 00:00	0.00	0.00
93	SDCO#E5	0.05	0.00	73.07	0.11	0.00	3.68	73.01	0.05	0 08:00	0 00:00	0.00	0.00
94	SDCO#E6	0.06	0.06	73.67	0.11	0.00	2.83	73.61	0.05	0 08:00	0 00:00	0.00	0.00
95	SDCO#E7	0.11	0.11	74.39	0.15	0.00	2.37	74.30	0.06	0 08:00	0 00:00	0.00	0.00
96	SDCO#F1	0.07	0.07	71.89	0.12	0.00	5.37	71.82	0.05	0 08:00	0 00:00	0.00	0.00
97	SDCO#F2	0.07	0.00	72.56	0.06	0.00	4.42	72.53	0.03	0 08:00	0 00:00	0.00	0.00
98	SDCO#F3	0.07	0.07	73.59	0.13	0.00	3.62	73.52	0.06	0 08:00	0 00:00	0.00	0.00
99	SDCO#G1	0.07	0.00	73.39	0.10	0.00	3.68	73.33	0.04	0 08:00	0 00:00	0.00	0.00
100	SDCO#G2	0.07	0.07	74.59	0.12	0.00	2.42	74.52	0.05	0 08:00	0 00:00	0.00	0.00
101	SDCO#G3	0.05	0.00	73.01	0.12	0.00	4.14	72.94	0.05	0 08:01	0 00:00	0.00	0.00
102	SDCO#G4	0.05	0.05	74.33	0.11	0.00	2.43	74.27	0.05	0 08:00	0 00:00	0.00	0.00
103	SDCO#H1	0.07	0.00	72.84	0.08	0.00	4.26	72.79	0.03	0 08:01	0 00:00	0.00	0.00
104	SDCO#H2	0.07	0.00	73.25	0.12	0.00	3.77	73.18	0.05	0 08:01	0 00:00	0.00	0.00
105	SDCO#H3	0.07	0.07	74.32	0.12	0.00	2.42	74.25	0.05	0 08:00	0 00:00	0.00	0.00
106	SDCO#H4	0.05	0.00	72.88	0.09	0.00	4.12	72.83	0.04	0 08:01	0 00:00	0.00	0.00
107	SDCO#H5	0.05	0.00	73.05	0.11	0.00	2.65	72.99	0.05	0 08:00	0 00:00	0.00	0.00
108	SDCO#H6	0.06	0.06	74.17	0.11	0.00	2.42	74.11	0.05	0 08:00	0 00:00	0.00	0.00
109	WQ#1	0.87	0.00	68.53	0.63	0.00	4.63	68.13	0.23	0 08:01	0 00:00	0.00	0.00
110	WQ#2	0.22	0.00	70.75	0.09	0.00	5.96	70.69	0.03	0 08:00	0 00:00	0.00	0.00
111	WQ#3	0.56	0.00	70.15	0.67	0.00	6.33	69.71	0.23	0 23:59	0 00:00	0.00	0.00
112	WQ#4	0.99	0.00	70.14	0.54	0.00	5.93	69.86	0.26	1 00:00	0 00:00	0.00	0.00
113	WQ#5	0.98	0.00	70.63	0.33	0.00	5.60	70.43	0.13	0 08:01	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)
1	{SD - Phase 1}.PIPE 02	108.10	69.50	0.00	68.96	0.00	0.54	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
2	{SD - Phase 1}.PIPE 03	71.71	69.86	0.00	69.50	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
3	{SD - Phase 1}.PIPE 04	55.25	70.14	0.00	69.86	0.00	0.28	0.5100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
4	{SD - Phase 1}.PIPE 05	89.22	68.96	0.00	68.51	0.00	0.45	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
5	{SD - Phase 1}.PIPE 06	42.41	68.72	0.00	68.51	0.00	0.21	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
6	{SD - Phase 1}.PIPE 07	72.15	69.08	0.00	68.72	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
7	{SD - Phase 1}.PIPE 08	49.14	69.55	0.00	69.08	0.00	0.47	0.9600	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
8	{SD - Phase 1}.PIPE 09	21.39	68.51	0.00	68.40	0.50	0.11	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
9	{SD - Phase 1}.PIPE 11	5.71	73.48	0.00	72.83	2.17	0.65	11.3800	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
10	{SD - Phase 1}.PIPE 12	64.20	73.83	0.00	73.48	0.00	0.35	0.5500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
11	{SD - Phase 1}.PIPE 13	78.00	73.87	0.00	73.48	0.00	0.39	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
12	{SD - Phase 1}.PIPE 14	42.96	71.89	0.00	71.68	0.00	0.21	0.4900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
13	{SD - Phase 1}.PIPE 15	6.67	71.68	0.00	71.65	2.17	0.03	0.4500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
14	{SD - Phase 1}.PIPE 16	67.53	72.23	0.00	71.89	0.00	0.34	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
15	{SD - Phase 1}.PIPE 17	36.65	72.75	0.00	72.57	0.34	0.18	0.4900	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
16	{SD - Phase 1}.PIPE 18	54.55	68.40	0.00	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
17	{SD - Phase 1}.PIPE 20	126.79	70.98	0.00	70.35	0.00	0.63	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
18	{SD - Phase 1}.PIPE 21	57.67	71.81	0.00	71.31	0.33	0.50	0.8700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
19	{SD - Phase 1}.PIPE 22	75.77	71.36	0.00	70.98	0.00	0.38	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
20	{SD - Phase 1}.PIPE 23	113.35	71.93	0.00	71.36	0.00	0.57	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
21	{SD - Phase 1}.PIPE 24	69.19	72.61	0.00	72.26	0.33	0.35	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
22	{SD - Phase 1}.PIPE 25	34.45	72.79	0.00	72.61	0.00	0.18	0.5200	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
23	{SD - Phase 1}.PIPE 26	104.96	68.40	0.00	68.40	0.00	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
24	{SD - Phase 1}.PIPE 27	80.37	71.20	0.00	70.80	0.50	0.40	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
25	{SD - Phase 1}.PIPE 28	122.98	72.15	0.00	71.54	0.34	0.61	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
26	{SD - Phase 1}.PIPE 29	82.06	71.72	0.00	71.20	0.00	0.52	0.6300	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
27	{SD - Phase 1}.PIPE 30	128.14	72.69	0.00	72.05	0.33	0.64	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
28	{SD - Phase 1}.PIPE 31	5.26	70.25	0.00	70.22	2.32	0.03	0.5700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
29	{SD - Phase 1}.PIPE 40	52.18	73.22	0.00	71.20	0.00	2.02	3.8700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
30	{SD - Phase 1}.PIPE B1	50.72	74.33	0.00	69.73	1.33	4.60	9.0700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
31	{SD - Phase 1}.PIPE B2	60.72	75.11	0.00	74.50	0.17	0.61	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
32	{SD - Phase 1}.PIPE B3	16.77	75.28	0.00	75.11	0.00	0.17	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
33	{SD - Phase 1}.PIPE B4	85.66	75.41	0.00	74.50	0.17	0.91	1.0600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
34	{SD - Phase 1}.PIPE B5	8.62	71.99	0.00	71.95	4.05	0.04	0.4600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
35	{SD - Phase 1}.PIPE B6	81.80	72.81	0.00	71.99	0.00	0.82	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
36	{SD - Phase 1}.PIPE B7	6.36	72.87	0.00	72.81	0.00	0.06	0.9400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
37	{SD - Phase 1}.PIPE B8	81.80	72.81	0.00	71.99	0.00	0.82	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
38	{SD - Phase 1}.PIPE C1	45.29	73.04	0.83	72.05	0.33	0.99	2.1900	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
39	{SD - Phase 1}.PIPE C10	54.90	72.88	0.14	72.33	0.14	0.55	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
40	{SD - Phase 1}.PIPE C2	22.10	74.28	0.00	73.21	1.00	1.07	4.8400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
41	{SD - Phase 1}.PIPE C3	9.24	74.37	0.00	74.28	0.00	0.09	0.9700	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
42	{SD - Phase 1}.PIPE C4	108.05	74.29	0.00	73.21	1.00	1.08	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
43	{SD - Phase 1}.PIPE C5	7.93	71.44	0.00	71.40	3.50	0.04	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
44	{SD - Phase 1}.PIPE C6	109.73	72.54	0.00	71.44	0.00	1.10	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
45	{SD - Phase 1}.PIPE C7	12.01	72.66	0.00	72.54	0.00	0.12	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
46	{SD - Phase 1}.PIPE C8	45.14	72.19	0.00	71.74	0.30	0.45	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
47	{SD - Phase 1}.PIPE C9	13.55	72.33	0.14	72.19	0.00	0.14	1.0300	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
48	{SD - Phase 1}.PIPE COM01	37.51	70.78	0.00	69.50	0.00	1.28	3.4100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
49	{SD - Phase 1}.PIPE COM02	49.39	70.70	0.00	70.21	0.16	0.49	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
50	{SD - Phase 1}.PIPE COM04	56.60	70.78	0.00	70.21	0.16	0.57	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
51	{SD - Phase 1}.PIPE COM05	22.78	71.01	0.00	70.78	0.00	0.23	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
52	{SD - Phase 1}.PIPE COM06	59.24	71.60	0.00	71.01	0.00	0.59	1.0000	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
53	{SD - Phase 1}.PIPE COM07	21.49	70.25	0.00	70.14	0.00	0.11	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
54	{SD - Phase 1}.PIPE COM08	36.57	70.78	0.00	70.41	0.16	0.37	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
55	{SD - Phase 1}.PIPE COM09	34.88	70.17	0.00	68.96	0.00	1.21	3.4700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
56	{SD - Phase 1}.PIPE COM10	48.42	71.09	0.00	70.34	0.17	0.75	1.5500	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
57	{SD - Phase 1}.PIPE COM11	74.62	71.09	0.00	70.34	0.17	0.75	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
58	{SD - Phase 1}.PIPE COM12	16.26	70.17	0.00	69.55	0.00	0.62	3.8100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
59	{SD - Phase 1}.PIPE COM13	45.72	70.87	0.00	70.34	0.17	0.53	1.1600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
60	{SD - Phase 1}.PIPE D1	47.80	72.84	0.00	72.15	0.00	0.69	1.4400	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
61	{SD - Phase 1}.PIPE D2	163.60	74.65	0.00	73.01	0.17	1.64	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
62	{SD - Phase 1}.PIPE D3	6.36	74.71	0.00	74.65	0.00	0.06	0.9400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
63	{SD - Phase 1}.PIPE D4	54.62	73.36	-0.17	72.05	0.33	1.31	2.4000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
64	{SD - Phase 1}.PIPE D5	32.05	74.47	0.00	73.53	0.00	0.94	2.9300	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
65	{SD - Phase 1}.PIPE D6	10.82	74.79	0.00	74.47	0.00	0.32	2.9600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
66	{SD - Phase 1}.PIPE D7	119.28	74.72	0.00	73.53	0.00	1.19	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
67	{SD - Phase 1}.PIPE E1	42.30	71.90	-0.17	71.69	0.33	0.21	0.5000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
68	{SD - Phase 1}.PIPE E4	42.52	72.48	-0.16	72.26	0.33	0.22	0.5200	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
69	{SD - Phase 1}.PIPE G1	23.14	73.29	0.00	72.73	0.50	0.56	2.4200	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
70	{SD - Phase 1}.PIPE G2	118.43	74.47	0.00	73.29	0.00	1.18	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
71	{SD - Phase 1}.PIPE G3	29.24	72.89	0.00	72.75	0.00	0.14	0.4800	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
72	{SD - Phase 1}.PIPE G4	116.18	74.22	0.00	73.06	0.17	1.16	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
73	{SD - Phase 1}.PIPE H1	9.90	72.76	0.00	72.22	0.33	0.54	5.4500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
74	{SD - Phase 1}.PIPE H2	20.00	73.13	0.00	72.93	0.17	0.20	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
75	{SD - Phase 1}.PIPE H3	106.86	74.20	0.00	73.13	0.00	1.07	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00

Flap Gate	No. of Barrels
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Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)
76	{SD - Phase 1}.PIPE H4	24.70	72.79	0.00	72.18	0.50	0.61	2.4700	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
77	{SD - Phase 1}.PIPE H5	14.98	72.94	0.00	72.79	0.00	0.15	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
78	{SD - Phase 1}.PIPE H6	112.34	74.06	0.00	72.94	0.00	1.12	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
79	{SD - Phase 1}.PIPE RT-1	4.18	67.40	0.50	67.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
80	{SD - Phase 1}.PIPE RT-2	5.00	68.40	0.50	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
81	{SD - Phase 1}.PIPE RT-3	128.16	68.40	0.50	68.40	0.00	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
82	{SD - Phase 1}.PIPE WQ#4	40.09	69.60	0.00	69.40	1.00	0.20	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
83	{SD - Phase 2}.PIEP CLUB5	42.78	73.15	0.00	72.72	0.00	0.43	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
84	{SD - Phase 2}.PIPE 33	113.81	70.81	0.00	70.25	0.00	0.56	0.4900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
85	{SD - Phase 2}.PIPE 34	74.43	71.52	0.00	71.14	0.33	0.38	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
86	{SD - Phase 2}.PIPE 35	78.01	68.40	0.00	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
87	{SD - Phase 2}.PIPE 36	68.05	70.59	0.00	69.40	1.00	1.19	1.7500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
88	{SD - Phase 2}.PIPE 37	118.86	71.52	0.00	70.93	0.34	0.59	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
89	{SD - Phase 2}.PIPE 38	72.17	71.88	0.00	71.52	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
90	{SD - Phase 2}.PIPE A1	22.91	72.71	0.00	72.60	0.00	0.11	0.4800	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
91	{SD - Phase 2}.PIPE A2	33.15	73.21	0.00	72.88	0.17	0.33	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
92	{SD - Phase 2}.PIPE A3	78.60	74.00	0.00	73.21	0.00	0.79	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
93	{SD - Phase 2}.PIPE A4	72.96	73.96	0.00	73.23	0.00	0.73	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
94	{SD - Phase 2}.PIPE A5	35.48	73.23	0.00	72.88	0.17	0.35	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
95	{SD - Phase 2}.PIPE CLUB2	33.61	72.72	0.00	72.38	0.00	0.34	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
96	{SD - Phase 2}.PIPE CLUB3	40.66	73.13	0.00	72.72	0.00	0.41	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
97	{SD - Phase 2}.PIPE CLUB4	32.02	72.72	0.00	72.38	0.00	0.34	1.0600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
98	{SD - Phase 2}.PIPE E2	35.98	72.43	0.00	72.07	0.00	0.36	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
99	{SD - Phase 2}.PIPE E3	71.44	73.14	0.00	72.43	0.00	0.71	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
100	{SD - Phase 2}.PIPE E5	31.53	72.96	0.00	72.64	0.00	0.32	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
101	{SD - Phase 2}.PIPE E6	59.72	73.56	0.00	72.96	0.00	0.60	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
102	{SD - Phase 2}.PIPE E7	109.59	74.24	0.00	73.14	0.00	1.10	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
103	{SD - Phase 2}.PIPE F1	151.81	71.77	0.00	70.25	0.00	1.52	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
104	{SD - Phase 2}.PIPE F2	17.47	72.50	0.00	69.90	1.50	2.60	14.8800	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
105	{SD - Phase 2}.PIPE F3	96.17	73.46	0.00	72.50	0.00	0.96	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
106	PIPE 32	66.71	72.60	0.00	72.26	0.33	0.34	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
107	Pipe ADG1	21.66	73.07	0.00	72.92	0.69	0.15	0.6900	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
108	PIPE ADH1	16.48	72.33	0.00	72.18	0.50	0.15	0.9100	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
109	PIPE CLUB1	35.74	72.21	-0.17	71.69	0.33	0.52	1.4500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
110	PIPE WQ#1	6.39	67.90	0.00	67.87	0.97	0.03	0.4700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
111	PIPE WQ#2	5.61	70.66	0.00	68.87	0.97	1.79	31.9100	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
112	PIPE WQ#3	6.80	69.48	0.00	68.87	0.97	0.61	8.9700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
113	PIPE WQ#4	40.09	70.35	0.00	70.10	0.50	0.25	0.6200	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
114	PIPE WQ#5	45.10	70.30	0.00	69.40	1.00	0.90	2.0000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00

Flap Gate	No. of Barrels
No	1
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Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	{SD - Phase 1}.PIPE 02	0.36	0 08:00	2.52	0.14	1.96	0.92	0.29	0.29	0.00		Calculated
2	{SD - Phase 1}.PIPE 03	0.15	0 08:00	0.74	0.20	1.40	0.85	0.23	0.34	0.00		Calculated
3	{SD - Phase 1}.PIPE 04	0.06	0 08:00	0.75	0.08	0.91	1.01	0.17	0.25	0.00		Calculated
4	{SD - Phase 1}.PIPE 05	0.54	0 08:01	2.53	0.22	1.51	0.98	0.47	0.47	0.00		Calculated
5	{SD - Phase 1}.PIPE 06	0.18	0 08:02	0.85	0.21	0.67	1.05	0.53	0.79	0.00		Calculated
6	{SD - Phase 1}.PIPE 07	0.11	0 08:00	0.85	0.12	1.02	1.18	0.29	0.44	0.00		Calculated
7	{SD - Phase 1}.PIPE 08	0.06	0 08:00	1.18	0.05	1.27	0.64	0.13	0.20	0.00		Calculated
8	{SD - Phase 1}.PIPE 09	0.87	0 08:01	0.87	1.00	2.90	0.12	0.53	0.80	0.00		> CAPACITY
9	{SD - Phase 1}.PIPE 11	0.22	0 08:00	4.08	0.05	5.22	0.02	0.12	0.18	0.00		Calculated
10	{SD - Phase 1}.PIPE 12	0.07	0 08:00	0.89	0.08	1.45	0.74	0.13	0.19	0.00		Calculated
11	{SD - Phase 1}.PIPE 13	0.08	0 08:00	0.86	0.10	1.60	0.81	0.14	0.21	0.00		Calculated
12	{SD - Phase 1}.PIPE 14	0.43	0 08:01	2.49	0.17	1.75	0.41	0.35	0.35	0.00		Calculated
13	{SD - Phase 1}.PIPE 15	0.56	0 08:01	2.39	0.23	2.26	0.05	0.35	0.35	0.00		Calculated
14	{SD - Phase 1}.PIPE 16	0.25	0 08:00	2.53	0.10	1.57	0.72	0.26	0.26	0.00		Calculated
15	{SD - Phase 1}.PIPE 17	0.12	0 08:00	0.85	0.14	1.70	0.36	0.17	0.25	0.00		Calculated
16	{SD - Phase 1}.PIPE 18	1.63	0 08:12	0.97	1.69	1.92	0.47	1.74	0.87	0.00		> CAPACITY
17	{SD - Phase 1}.PIPE 20	0.74	0 08:01	2.51	0.29	2.35	0.90	0.42	0.42	0.00		Calculated
18	{SD - Phase 1}.PIPE 21	0.06	0 08:00	1.13	0.05	1.65	0.58	0.10	0.15	0.00		Calculated
19	{SD - Phase 1}.PIPE 22	0.62	0 08:01	2.52	0.25	2.38	0.53	0.37	0.37	0.00		Calculated
20	{SD - Phase 1}.PIPE 23	0.36	0 08:00	2.53	0.14	1.75	1.08	0.31	0.31	0.00		Calculated
21	{SD - Phase 1}.PIPE 24	0.03	0 08:01	0.86	0.03	1.14	1.01	0.08	0.11	0.00		Calculated
22	{SD - Phase 1}.PIPE 25	0.01	0 08:00	0.87	0.01	0.65	0.88	0.07	0.10	0.00		Calculated
23	{SD - Phase 1}.PIPE 26	0.92	0 08:21	0.70	1.31	0.84	2.08	1.74	0.87	0.00		> CAPACITY
24	{SD - Phase 1}.PIPE 27	0.98	0 08:01	2.51	0.39	2.90	0.46	0.44	0.44	0.00		Calculated
25	{SD - Phase 1}.PIPE 28	0.18	0 08:01	0.85	0.22	1.97	1.04	0.21	0.31	0.00		Calculated
26	{SD - Phase 1}.PIPE 29	0.51	0 08:00	2.84	0.18	1.86	0.74	0.38	0.38	0.00		Calculated
27	{SD - Phase 1}.PIPE 30	0.24	0 08:00	0.86	0.28	2.12	1.01	0.24	0.36	0.00		Calculated
28	{SD - Phase 1}.PIPE 31	0.44	0 08:01	2.69	0.16	2.14	0.04	0.31	0.31	0.00		Calculated
29	{SD - Phase 1}.PIPE 40	0.02	0 08:00	7.01	0.00	0.15	5.80	0.26	0.26	0.00		Calculated
30	{SD - Phase 1}.PIPE B1	0.08	0 08:01	3.64	0.02	4.10	0.21	0.22	0.32	0.00		Calculated
31	{SD - Phase 1}.PIPE B2	0.04	0 08:00	0.56	0.07	1.63	0.62	0.09	0.18	0.00		Calculated
32	{SD - Phase 1}.PIPE B3	0.04	0 08:00	0.56	0.07	1.57	0.18	0.09	0.19	0.00		Calculated
33	{SD - Phase 1}.PIPE B4	0.04	0 08:00	0.58	0.07	1.67	0.85	0.09	0.18	0.00		Calculated
34	{SD - Phase 1}.PIPE B5	0.08	0 08:01	0.38	0.21	1.52	0.09	0.16	0.31	0.00		Calculated
35	{SD - Phase 1}.PIPE B6	0.04	0 08:00	0.56	0.07	0.97	1.41	0.13	0.26	0.00		Calculated
36	{SD - Phase 1}.PIPE B7	0.04	0 08:00	0.54	0.07	1.50	0.07	0.10	0.19	0.00		Calculated
37	{SD - Phase 1}.PIPE B8	0.04	0 08:00	0.56	0.07	0.97	1.41	0.13	0.26	0.00		Calculated
38	{SD - Phase 1}.PIPE C1	0.08	0 08:00	1.79	0.04	2.53	0.30	0.10	0.15	0.00		Calculated
39	{SD - Phase 1}.PIPE C10	0.04	0 08:00	0.56	0.07	1.57	0.58	0.09	0.19	0.00		Calculated
40	{SD - Phase 1}.PIPE C2	0.04	0 08:00	1.23	0.03	2.81	0.13	0.06	0.13	0.00		Calculated
41	{SD - Phase 1}.PIPE C3	0.04	0 08:00	0.55	0.07	1.90	0.08	0.08	0.16	0.00		Calculated
42	{SD - Phase 1}.PIPE C4	0.04	0 08:00	0.56	0.07	1.64	1.10	0.09	0.18	0.00		Calculated
43	{SD - Phase 1}.PIPE C5	0.08	0 08:01	0.86	0.09	1.47	0.09	0.14	0.21	0.00		Calculated
44	{SD - Phase 1}.PIPE C6	0.04	0 08:00	0.56	0.07	1.07	1.71	0.12	0.24	0.00		Calculated
45	{SD - Phase 1}.PIPE C7	0.04	0 08:00	0.56	0.07	1.57	0.13	0.09	0.19	0.00		Calculated
46	{SD - Phase 1}.PIPE C8	0.04	0 08:01	0.56	0.07	1.62	0.46	0.09	0.18	0.00		Calculated
47	{SD - Phase 1}.PIPE C9	0.04	0 08:00	0.57	0.07	1.55	0.15	0.09	0.19	0.00		Calculated
48	{SD - Phase 1}.PIPE COM01	0.07	0 08:01	1.94	0.04	0.98	0.64	0.17	0.26	0.00		Calculated
49	{SD - Phase 1}.PIPE COM02	0.04	0 08:00	0.56	0.07	0.66	1.25	0.34	0.69	0.00		Calculated
50	{SD - Phase 1}.PIPE COM04	0.04	0 08:00	0.56	0.07	0.45	2.10	0.29	0.59	0.00		Calculated
51	{SD - Phase 1}.PIPE COM05	0.03	0 08:01	0.56	0.06	1.41	0.27	0.08	0.17	0.00		Calculated
52	{SD - Phase 1}.PIPE COM06	0.03	0 08:00	0.49	0.06	1.41	0.70	0.08	0.17	0.00		Calculated
53	{SD - Phase 1}.PIPE COM07	0.03	0 08:00	0.86	0.03	0.79	0.45	0.11	0.16	0.00		Calculated
54	{SD - Phase 1}.PIPE COM08	0.03	0 08:00	0.56	0.05	1.47	0.41	0.08	0.15	0.00		Calculated
55	{SD - Phase 1}.PIPE COM09	0.03	0 08:00	2.25	0.01	0.42	1.38	0.19	0.28	0.00		Calculated
56	{SD - Phase 1}.PIPE COM10	0.01	0 08:00	0.70	0.02	1.38	0.58	0.05	0.10	0.00		Calculated
57	{SD - Phase 1}.PIPE COM11	0.02	0 08:00	0.56	0.03	1.33	0.94	0.06	0.13	0.00		Calculated
58	{SD - Phase 1}.PIPE COM12	0.03	0 08:00	2.36	0.01	1.30	0.21	0.08	0.12	0.00		Calculated
59	{SD - Phase 1}.PIPE COM13	0.03	0 08:00	0.60	0.05	1.57	0.49	0.08	0.15	0.00		Calculated
60	{SD - Phase 1}.PIPE D1	0.08	0 08:01	1.45	0.05	1.20	0.66	0.16	0.24	0.00		Calculated
61	{SD - Phase 1}.PIPE D2	0.08	0 08:00	0.56	0.14	2.00	1.36	0.13	0.26	0.00		Calculated
62	{SD - Phase 1}.PIPE D3	0.08	0 08:00	0.54	0.15	1.79	0.06	0.14	0.28	0.00		Calculated
63	{SD - Phase 1}.PIPE D4	0.08	0 08:01	1.99	0.04	2.73	0.33	0.09	0.14	0.00		Calculated
64	{SD - Phase 1}.PIPE D5	0.04	0 08:00	0.96	0.04	1.93	0.28	0.08	0.16	0.00		Calculated
65	{SD - Phase 1}.PIPE D6	0.04	0 08:00	0.96	0.04	2.29	0.08	0.07	0.14	0.00		Calculated
66	{SD - Phase 1}.PIPE D7	0.04	0 08:00	0.56	0.07	1.61	1.23	0.09	0.18	0.00		Calculated
67	{SD - Phase 1}.PIPE E1	0.11	0 08:02	0.53	0.20	2.06	0.34	0.16	0.32	0.00		Calculated
68	{SD - Phase 1}.PIPE E4	0.05	0 08:01	0.53	0.10	1.70	0.42	0.11	0.22	0.00		Calculated
69	{SD - Phase 1}.PIPE G1	0.07	0 08:01	0.87	0.08	2.53	0.15	0.10	0.19	0.00		Calculated
70	{SD - Phase 1}.PIPE G2	0.07	0 08:00	0.56	0.12	2.09	0.94	0.11	0.22	0.00		Calculated
71	{SD - Phase 1}.PIPE G3	0.05	0 08:01	0.39	0.14	1.05	0.46	0.15	0.31	0.00		Calculated
72	{SD - Phase 1}.PIPE G4	0.05	0 08:00	0.56	0.09	1.78	1.09	0.10	0.21	0.00		Calculated
73	{SD - Phase 1}.PIPE H1	0.07	0 08:01	2.83	0.02	3.06	0.05	0.07	0.11	0.00		Calculated
74	{SD - Phase 1}.PIPE H2	0.07	0 08:01	0.56	0.12	1.82	0.18	0.12	0.24	0.00		Calculated

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
75	{SD - Phase 1}.PIPE H3	0.07	0 08:00	0.56	0.12	1.82	0.98	0.12	0.24	0.00		Calculated
76	{SD - Phase 1}.PIPE H4	0.05	0 08:01	0.88	0.06	2.41	0.17	0.09	0.17	0.00		Calculated
77	{SD - Phase 1}.PIPE H5	0.05	0 08:01	0.56	0.10	1.92	0.13	0.10	0.20	0.00		Calculated
78	{SD - Phase 1}.PIPE H6	0.05	0 08:00	0.56	0.10	1.71	1.09	0.11	0.22	0.00		Calculated
79	{SD - Phase 1}.PIPE RT-1	0.12	1 00:00	3.50	0.04	1.15	0.06	0.58	0.29	0.00		Calculated
80	{SD - Phase 1}.PIPE RT-2	0.08	0 23:59	3.20	0.02	1.10	0.08	1.74	0.87	0.00		Calculated
81	{SD - Phase 1}.PIPE RT-3	0.48	0 07:57	0.63	0.77	0.72	2.97	1.74	0.87	0.00		Calculated
82	{SD - Phase 1}.PIPE WQ#4	0.99	0 08:01	2.52	0.39	2.82	0.24	0.64	0.64	0.00		Calculated
83	{SD - Phase 2}.PIEP CLUB5	0.02	0 08:00	0.56	0.03	1.33	0.54	0.06	0.13	0.00		Calculated
84	{SD - Phase 2}.PIPE 33	0.21	0 08:00	2.50	0.09	1.25	1.52	0.27	0.27	0.00		Calculated
85	{SD - Phase 2}.PIPE 34	0.08	0 08:00	0.86	0.09	1.56	0.80	0.13	0.20	0.00		Calculated
86	{SD - Phase 2}.PIPE 35	0.44	0 08:00	0.81	0.54	0.61	2.13	1.74	0.87	0.00		Calculated
87	{SD - Phase 2}.PIPE 36	0.38	0 08:00	4.71	0.08	3.48	0.33	0.40	0.40	0.00		Calculated
88	{SD - Phase 2}.PIPE 37	0.18	0 08:01	0.85	0.21	1.96	1.01	0.20	0.31	0.00		Calculated
89	{SD - Phase 2}.PIPE 38	0.13	0 08:00	0.85	0.16	1.54	0.78	0.20	0.30	0.00		Calculated
90	{SD - Phase 2}.PIPE A1	0.06	0 08:01	0.84	0.07	0.91	0.42	0.16	0.25	0.00		Calculated
91	{SD - Phase 2}.PIPE A2	0.03	0 08:01	0.56	0.05	1.49	0.37	0.08	0.16	0.00		Calculated
92	{SD - Phase 2}.PIPE A3	0.03	0 08:00	0.56	0.05	1.49	0.88	0.08	0.16	0.00		Calculated
93	{SD - Phase 2}.PIPE A4	0.03	0 08:00	0.56	0.05	1.49	0.82	0.08	0.16	0.00		Calculated
94	{SD - Phase 2}.PIPE A5	0.03	0 08:01	0.56	0.05	1.49	0.40	0.08	0.16	0.00		Calculated
95	{SD - Phase 2}.PIPE CLUB2	0.02	0 08:01	0.56	0.03	1.23	0.46	0.07	0.14	0.00		Calculated
96	{SD - Phase 2}.PIPE CLUB3	0.02	0 08:00	0.56	0.03	1.32	0.51	0.06	0.13	0.00		Calculated
97	{SD - Phase 2}.PIPE CLUB4	0.02	0 08:01	0.58	0.03	1.24	0.43	0.07	0.13	0.00		Calculated
98	{SD - Phase 2}.PIPE E2	0.11	0 08:01	0.56	0.19	2.03	0.30	0.16	0.32	0.00		Calculated
99	{SD - Phase 2}.PIPE E3	0.11	0 08:01	0.56	0.20	2.10	0.57	0.16	0.31	0.00		Calculated
100	{SD - Phase 2}.PIPE E5	0.05	0 08:00	0.57	0.10	1.70	0.31	0.11	0.22	0.00		Calculated
101	{SD - Phase 2}.PIPE E6	0.05	0 08:00	0.56	0.10	1.76	0.57	0.11	0.22	0.00		Calculated
102	{SD - Phase 2}.PIPE E7	0.11	0 08:00	0.56	0.20	2.16	0.85	0.15	0.31	0.00		Calculated
103	{SD - Phase 2}.PIPE F1	0.07	0 08:00	0.56	0.12	0.78	3.24	0.23	0.46	0.00		Calculated
104	{SD - Phase 2}.PIPE F2	0.07	0 08:00	2.16	0.03	4.86	0.06	0.13	0.26	0.00		Calculated
105	{SD - Phase 2}.PIPE F3	0.07	0 08:00	0.56	0.12	2.53	0.63	0.10	0.20	0.00		Calculated
106	PIPE 32	0.16	0 08:00	0.86	0.19	1.89	0.59	0.19	0.29	0.00		Calculated
107	Pipe ADG1	0.00	0 00:00	0.40	0.00	0.00		0.00	0.00	0.00		Calculated
108	PIPE ADH1	0.00	0 00:00	0.46	0.00	0.00		0.00	0.00	0.00		Calculated
109	PIPE CLUB1	0.04	0 08:01	1.68	0.02	1.90	0.31	0.07	0.11	0.00		Calculated
110	PIPE WQ#1	0.87	0 08:01	0.83	1.05	2.90	0.04	0.53	0.80	0.00		> CAPACITY
111	PIPE WQ#2	0.22	0 08:00	20.13	0.01	7.45	0.01	0.51	0.51	0.00		Calculated
112	PIPE WQ#3	0.56	0 08:01	10.67	0.05	5.74	0.02	0.83	0.83	0.00		Calculated
113	PIPE WQ#4	0.99	0 08:01	2.81	0.35	2.98	0.22	0.44	0.44	0.00		Calculated
114	PIPE WQ#5	0.98	0 08:01	5.03	0.19	4.58	0.16	0.42	0.42	0.00		Calculated

Storage Nodes

Storage Node : R-TANK 1

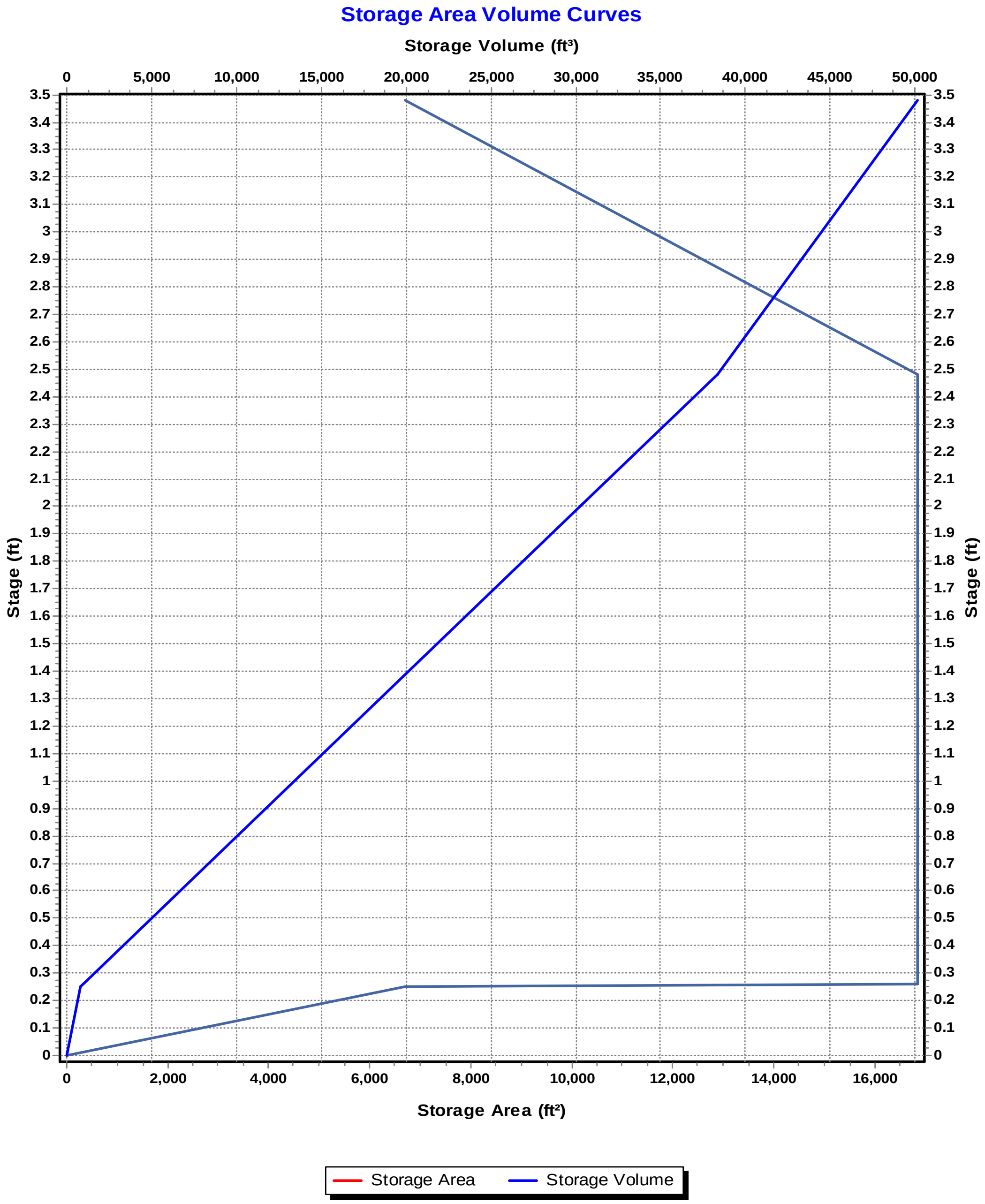
Input Data

Invert Elevation (ft)	66.90
Max (Rim) Elevation (ft)	70.88
Max (Rim) Offset (ft)	3.98
Initial Water Elevation (ft)	67.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R-TANK 1

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	6712	839
0.26	16850	956.81
2	16850	30275.81
2.48	16850	38363.81
3.48	6712	50144.81


Storage Area Volume Curves
Storage Volume (ft³)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
Stage (ft)
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : R-TANK 1 (continued)

Output Summary Results

Peak Inflow (cfs)	0.92
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.12
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	67.98
Max HGL Depth Attained (ft)	1.08
Average HGL Elevation Attained (ft)	67.75
Average HGL Depth Attained (ft)	0.85
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : R-TANK 2

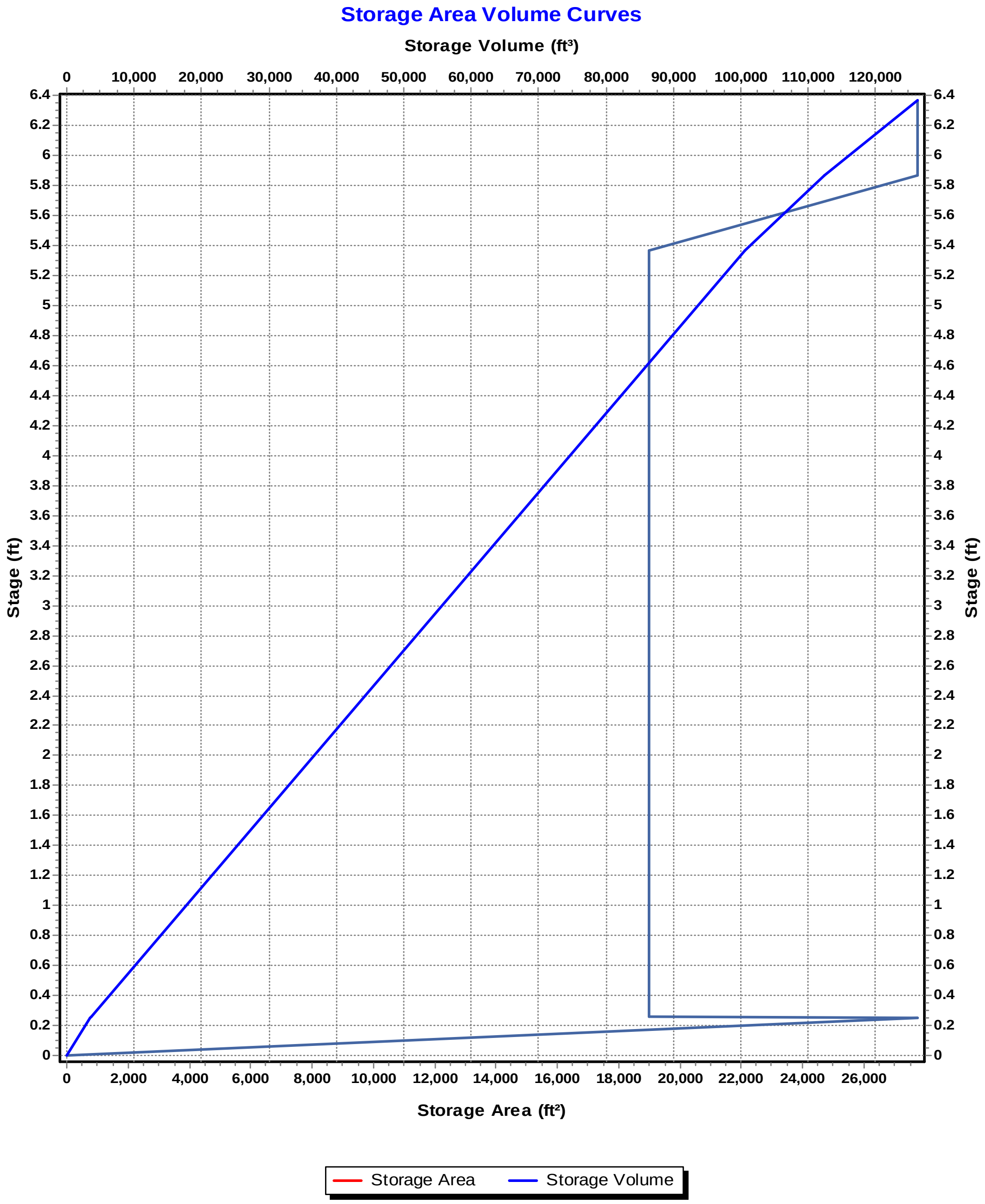
Input Data

Invert Elevation (ft)	67.90
Max (Rim) Elevation (ft)	74.77
Max (Rim) Offset (ft)	6.87
Initial Water Elevation (ft)	68.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R TANK 2

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	27750	3468.75
0.26	18980	3702.4
5.37	18980	100690.2
5.87	27750	112372.7
6.37	27750	126247.7


Storage Area Volume Curves
Storage Volume (ft³)
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
Stage (ft)
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : R-TANK 2 (continued)

Output Summary Results

Peak Inflow (cfs)	2.31
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.17
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	70.14
Max HGL Depth Attained (ft)	2.24
Average HGL Elevation Attained (ft)	69.35
Average HGL Depth Attained (ft)	1.45
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : R-TANK 3

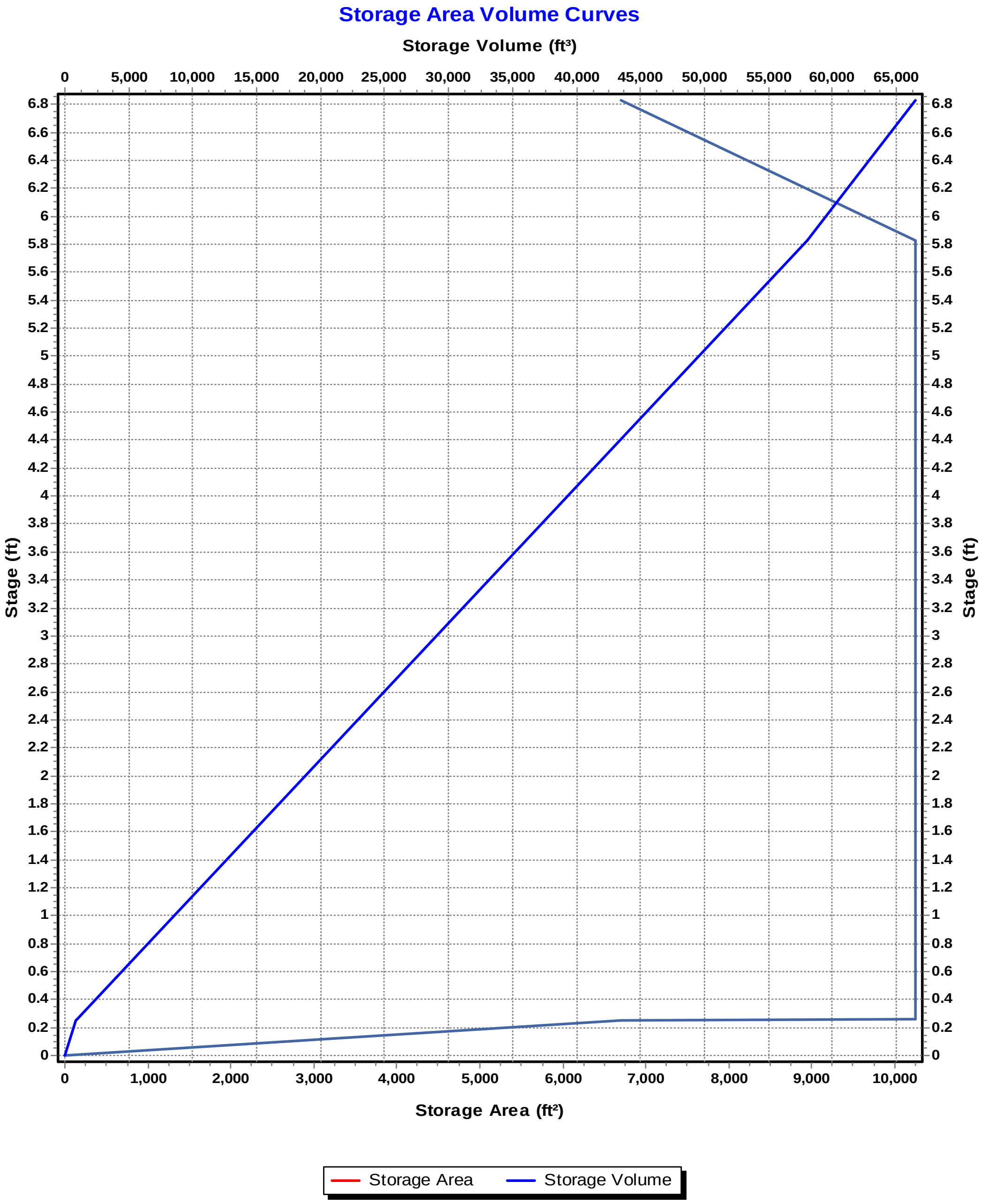
Input Data

Invert Elevation (ft)	67.90
Max (Rim) Elevation (ft)	74.77
Max (Rim) Offset (ft)	6.87
Initial Water Elevation (ft)	68.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R TANK 3

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	6708	838.5
0.26	10250	923.29
5.83	10250	58015.79
6.83	6708	66494.79


Storage Area Volume Curves
Storage Volume (ft³)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
60,000
65,000
Stage (ft)
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : R-TANK 3 (continued)

Output Summary Results

Peak Inflow (cfs)	1.51
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.43
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	70.14
Max HGL Depth Attained (ft)	2.24
Average HGL Elevation Attained (ft)	69.39
Average HGL Depth Attained (ft)	1.49
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft^3)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name	20231115 Conveyance Calc.SPF
Description	Q:\2023\2230752\10_CIV\CAD_2230752-W-SD.dwg

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Santa Barbara UH
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	3
Subbasins	63
Nodes	117
Junctions	113
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	3
Links	116
Channels	0
Pipes	114
Pumps	0
Orifices	0
Weirs	0
Outlets	2
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-yr	Time Series	10-yr	Intensity	inches	Washington	Pierce	10.00	2.90	SCS Type IA 24-hr
2	25-yr	Time Series	25-yr	Intensity	inches	Washington	Pierce	25.00	3.50	SCS Type IA 24-hr
3	2-yr	Time Series	2-yr	Intensity	inches	Washington	Pierce	2.00	2.05	SCS Type IA 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Impervious Area (%)	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	BLDG A_NORTH	0.05	100.00	98.00	76.00	3.46	3.24	0.15	0.04	0 00:05:00
2	BLDG A_SOUTH	0.05	100.00	98.00	76.00	3.46	3.24	0.15	0.04	0 00:05:00
3	BLDG B_NE	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
4	BLDG B_NW	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
5	BLDG B_SE	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
6	BLDG B_SW	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
7	BLDG C_NE	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
8	BLDG C_NW	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
9	BLDG C_SE	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
10	BLDG C_SW	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
11	BLDG CLUB_EAST	0.03	100.00	98.00	76.00	3.46	3.24	0.09	0.02	0 00:05:00
12	BLDG CLUB_WEST	0.03	100.00	98.00	76.00	3.46	3.24	0.09	0.02	0 00:05:00
13	BLDG D_NE	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
14	BLDG D_NW	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
15	BLDG D_SOUTH	0.12	100.00	98.00	76.00	3.46	3.24	0.38	0.10	0 00:05:00
16	BLDG E_EAST	0.08	100.00	98.00	76.00	3.46	3.24	0.26	0.07	0 00:05:00
17	BLDG E_WEST	0.16	100.00	98.00	76.00	3.46	3.24	0.52	0.13	0 00:05:00
18	BLDG F_EAST	0.10	100.00	98.00	76.00	3.46	3.24	0.33	0.08	0 00:05:00
19	BLDG F_WEST	0.10	100.00	98.00	76.00	3.46	3.24	0.33	0.08	0 00:05:00
20	BLDG G_EAST	0.08	100.00	98.00	76.00	3.46	3.24	0.26	0.07	0 00:05:00
21	BLDG G_WEST	0.10	100.00	98.00	76.00	3.46	3.24	0.32	0.08	0 00:05:00
22	BLDG H_EAST	0.10	100.00	98.00	76.00	3.46	3.24	0.31	0.08	0 00:05:00
23	BLDG H_WEST	0.08	100.00	98.00	76.00	3.46	3.24	0.26	0.07	0 00:05:00
24	BLDG T.I. EAST	0.05	100.00	98.00	76.00	3.46	3.24	0.15	0.04	0 00:05:00
25	BLDG T.I. NE	0.02	100.00	98.00	76.00	3.46	3.24	0.07	0.02	0 00:05:00
26	BLDG T.I. NW	0.04	100.00	98.00	76.00	3.46	3.24	0.14	0.04	0 00:05:00
27	BLDG T.I. SE	0.03	100.00	98.00	76.00	3.46	3.24	0.09	0.02	0 00:05:00
28	BLDG T.I. SW	0.04	100.00	98.00	76.00	3.46	3.24	0.14	0.04	0 00:05:00
29	BLDG T.I. WEST	0.06	100.00	98.00	76.00	3.46	3.24	0.19	0.05	0 00:05:00
30	SDCB 02	0.22	98.00	98.00	76.00	3.46	3.20	0.70	0.18	0 00:05:00
31	SDCB 03	0.13	100.00	98.00	76.00	3.46	3.24	0.42	0.11	0 00:05:00
32	SDCB 04	0.06	73.00	98.00	76.00	3.46	2.73	0.17	0.04	0 00:05:00
33	SDCB 05	0.24	90.00	98.00	76.00	3.46	3.05	0.73	0.19	0 00:05:00
34	SDCB 06	0.16	65.00	98.00	76.00	3.46	2.57	0.40	0.10	0 00:05:00
35	SDCB 07	0.09	64.00	98.00	76.00	3.46	2.56	0.24	0.06	0 00:05:00
36	SDCB 08	0.05	100.00	98.00	76.00	3.46	3.24	0.15	0.04	0 00:05:00
37	SDCB 09	0.25	82.00	98.00	76.00	3.46	2.90	0.73	0.18	0 00:05:00
38	SDCB 11	0.10	91.00	98.00	76.00	3.46	3.07	0.30	0.08	0 00:05:00
39	SDCB 12	0.10	99.00	98.00	76.00	3.46	3.22	0.33	0.08	0 00:05:00
40	SDCB 13	0.13	94.00	98.00	76.00	3.46	3.12	0.41	0.10	0 00:05:00
41	SDCB 14	0.22	68.00	98.00	76.00	3.46	2.63	0.57	0.14	0 00:05:00
42	SDCB 15	0.13	88.00	98.00	76.00	3.46	3.01	0.38	0.10	0 00:05:00
43	SDCB 16	0.14	65.00	98.00	76.00	3.46	2.57	0.36	0.09	0 00:05:00
44	SDCB 17	0.10	92.00	98.00	76.00	3.46	3.09	0.32	0.08	0 00:05:00
45	SDCB 19	0.46	78.00	98.00	76.00	3.46	2.82	1.29	0.32	0 00:05:00
46	SDCB 20	0.11	79.00	98.00	76.00	3.46	2.84	0.32	0.08	0 00:05:00
47	SDCB 21	0.09	93.00	98.00	76.00	3.46	3.11	0.27	0.07	0 00:05:00
48	SDCB 22	0.20	82.00	98.00	76.00	3.46	2.90	0.58	0.15	0 00:05:00
49	SDCB 23	0.20	86.00	98.00	76.00	3.46	2.97	0.59	0.15	0 00:05:00
50	SDCB 24	0.02	85.00	98.00	76.00	3.46	2.95	0.06	0.02	0 00:05:00
51	SDCB 25	0.03	65.00	98.00	76.00	3.46	2.57	0.06	0.02	0 00:05:00
52	SDCB 27	0.49	76.00	98.00	76.00	3.46	2.78	1.36	0.34	0 00:05:00
53	SDCB 28	0.20	73.00	98.00	76.00	3.46	2.73	0.54	0.13	0 00:05:00
54	SDCB 29	0.20	79.00	98.00	76.00	3.46	2.84	0.57	0.14	0 00:05:00
55	SDCB 30	0.43	77.00	98.00	76.00	3.46	2.80	1.20	0.30	0 00:05:00
56	SDCB 31	0.52	26.00	98.00	76.00	3.46	1.84	0.96	0.22	0 00:05:00
57	SDCB 32	0.19	73.00	98.00	76.00	3.46	2.73	0.51	0.13	0 00:05:00
58	SDCB 33	0.23	83.00	98.00	76.00	3.46	2.92	0.67	0.17	0 00:05:00
59	SDCB 34	0.14	76.00	98.00	76.00	3.46	2.78	0.38	0.10	0 00:05:00
60	SDCB 36	0.36	79.00	98.00	76.00	3.46	2.84	1.01	0.25	0 00:05:00
61	SDCB 37	0.07	96.00	98.00	76.00	3.46	3.16	0.23	0.06	0 00:05:00
62	SDCB 38	0.25	72.00	98.00	76.00	3.46	2.71	0.67	0.17	0 00:05:00
63	SDCB 40	0.11	0.00	98.00	76.00	3.46	1.34	0.15	0.03	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AREA DRAIN G1	Junction	73.07	77.13	0.00	0.00	0.00	0.00	73.07	0.00	4.06	0 00:00	0.00	0.00
2	AREA DRAIN H1	Junction	72.33	77.10	0.00	0.00	0.00	0.00	72.33	0.00	4.77	0 00:00	0.00	0.00
3	SDCB#01	Junction	66.90	74.84	67.40	0.00	0.00	0.13	68.14	0.00	6.70	0 00:00	0.00	0.00
4	SDCB#02	Junction	69.50	72.40	0.00	0.00	0.00	0.45	69.78	0.00	2.62	0 00:00	0.00	0.00
5	SDCB#03	Junction	69.86	72.19	0.00	0.00	0.00	0.18	70.09	0.00	2.10	0 00:00	0.00	0.00
6	SDCB#04	Junction	70.14	72.64	0.00	0.00	0.00	0.08	70.28	0.00	2.36	0 00:00	0.00	0.00
7	SDCB#05	Junction	68.96	72.11	0.00	0.00	0.00	0.67	69.33	0.00	2.78	0 00:00	0.00	0.00
8	SDCB#06	Junction	68.72	73.03	0.00	0.00	0.00	0.22	69.28	0.00	3.75	0 00:00	0.00	0.00
9	SDCB#07	Junction	69.08	71.79	0.00	0.00	0.00	0.13	69.30	0.00	2.49	0 00:00	0.00	0.00
10	SDCB#08	Junction	69.55	72.45	0.00	0.00	0.00	0.07	69.66	0.00	2.79	0 00:00	0.00	0.00
11	SDCB#09	Junction	68.51	72.35	0.00	0.00	0.00	1.06	69.26	0.00	3.09	0 00:00	0.00	0.00
12	SDCB#10	Junction	67.90	76.96	68.40	0.00	0.00	0.20	70.59	0.00	6.37	0 00:00	0.00	0.00
13	SDCB#11	Junction	73.48	76.58	0.00	0.00	0.00	0.26	73.63	0.00	2.95	0 00:00	0.00	0.00
14	SDCB#12	Junction	73.83	76.54	0.00	0.00	0.00	0.08	73.97	0.00	2.57	0 00:00	0.00	0.00
15	SDCB#13	Junction	73.87	76.58	0.00	0.00	0.00	0.10	74.03	0.00	2.55	0 00:00	0.00	0.00
16	SDCB#14	Junction	71.89	76.31	0.00	0.00	0.00	0.53	72.24	0.00	4.07	0 00:00	0.00	0.00
17	SDCB#15	Junction	71.68	76.25	0.00	0.00	0.00	0.69	72.12	0.00	4.13	0 00:00	0.00	0.00
18	SDCB#16	Junction	72.23	76.36	0.00	0.00	0.00	0.31	72.47	0.00	3.89	0 00:00	0.00	0.00
19	SDCB#17	Junction	72.75	76.55	0.00	0.00	0.00	0.14	72.95	0.00	3.60	0 00:00	0.00	0.00
20	SDCB#18	Junction	68.40	76.69	0.00	0.00	0.00	2.07	70.59	0.00	6.10	0 00:00	0.00	0.00
21	SDCB#19	Junction	70.35	75.25	0.00	0.00	0.00	1.22	70.89	0.00	4.36	0 00:00	0.00	0.00
22	SDCB#20	Junction	70.98	75.25	0.00	0.00	0.00	0.91	71.40	0.00	3.85	0 00:00	0.00	0.00
23	SDCB#21	Junction	71.81	75.25	0.00	0.00	0.00	0.07	71.92	0.00	3.33	0 00:00	0.00	0.00
24	SDCB#22	Junction	71.36	75.25	0.00	0.00	0.00	0.76	71.77	0.00	3.48	0 00:00	0.00	0.00
25	SDCB#23	Junction	71.93	75.25	0.00	0.00	0.00	0.44	72.21	0.00	3.04	0 00:00	0.00	0.00
26	SDCB#24	Junction	72.61	75.25	0.00	0.00	0.00	0.03	72.70	0.00	2.55	0 00:00	0.00	0.00
27	SDCB#25	Junction	72.79	75.25	0.00	0.00	0.00	0.02	72.85	0.00	2.40	0 00:00	0.00	0.00
28	SDCB#26	Junction	68.40	76.79	0.00	0.00	0.00	1.22	70.59	0.00	6.20	0 00:00	0.00	0.00
29	SDCB#27	Junction	71.20	75.25	0.00	0.00	0.00	1.22	71.74	0.00	3.51	0 00:00	0.00	0.00
30	SDCB#28	Junction	72.15	75.25	0.00	0.00	0.00	0.23	72.40	0.00	2.85	0 00:00	0.00	0.00
31	SDCB#29	Junction	71.72	75.40	0.00	0.00	0.00	0.63	72.04	0.00	3.36	0 00:00	0.00	0.00
32	SDCB#30	Junction	72.69	75.40	0.00	0.00	0.00	0.30	72.98	0.00	2.42	0 00:00	0.00	0.00
33	SDCB#31	Junction	70.25	77.16	0.00	0.00	0.00	0.57	70.64	0.00	6.52	0 00:00	0.00	0.00
34	SDCB#32	Junction	72.60	75.25	0.00	0.00	0.00	0.20	72.83	0.00	2.42	0 00:00	0.00	0.00
35	SDCB#33	Junction	70.81	75.25	0.00	0.00	0.00	0.26	71.03	0.00	4.22	0 00:00	0.00	0.00
36	SDCB#34	Junction	71.52	75.25	0.00	0.00	0.00	0.10	71.68	0.00	3.57	0 00:00	0.00	0.00
37	SDCB#35	Junction	68.40	77.00	0.00	0.00	0.00	0.56	70.59	0.00	6.41	0 00:00	0.00	0.00
38	SDCB#36	Junction	70.59	75.26	0.00	0.00	0.00	0.47	70.82	0.00	4.44	0 00:00	0.00	0.00
39	SDCB#37	Junction	71.52	75.67	0.00	0.00	0.00	0.22	71.76	0.00	3.91	0 00:00	0.00	0.00
40	SDCB#38	Junction	71.88	75.26	0.00	0.00	0.00	0.17	72.08	0.00	3.18	0 00:00	0.00	0.00
41	SDCB#40	Junction	73.22	76.27	0.00	0.00	0.00	0.03	73.27	0.00	3.00	0 00:00	0.00	0.00
42	SDCO#A1	Junction	72.71	76.38	0.00	0.00	0.00	0.07	72.86	0.00	3.52	0 00:00	0.00	0.00
43	SDCO#A2	Junction	73.21	76.54	0.00	0.00	0.00	0.04	73.30	0.00	3.24	0 00:00	0.00	0.00
44	SDCO#A3	Junction	74.00	75.03	0.00	0.00	0.00	0.04	74.09	0.00	0.94	0 00:00	0.00	0.00
45	SDCO#A4	Junction	73.96	75.89	0.00	0.00	0.00	0.04	74.05	0.00	1.84	0 00:00	0.00	0.00
46	SDCO#A5	Junction	73.23	76.82	0.00	0.00	0.00	0.04	73.32	0.00	3.50	0 00:00	0.00	0.00
47	SDCO#B1	Junction	74.33	78.08	0.00	0.00	0.00	0.10	74.41	0.00	3.67	0 00:00	0.00	0.00
48	SDCO#B2	Junction	75.11	77.80	0.00	0.00	0.00	0.05	75.21	0.00	2.59	0 00:00	0.00	0.00
49	SDCO#B3	Junction	75.28	77.92	0.00	0.00	0.00	0.05	75.39	0.00	2.53	0 00:00	0.00	0.00
50	SDCO#B4	Junction	75.41	77.95	0.00	0.00	0.00	0.05	75.51	0.00	2.44	0 00:00	0.00	0.00
51	SDCO#B5	Junction	71.99	78.08	0.00	0.00	0.00	0.10	72.18	0.00	5.90	0 00:00	0.00	0.00
52	SDCO#B6	Junction	72.81	78.02	0.00	0.00	0.00	0.05	72.91	0.00	5.11	0 00:00	0.00	0.00
53	SDCO#B7	Junction	72.87	77.95	0.00	0.00	0.00	0.05	72.98	0.00	4.97	0 00:00	0.00	0.00
54	SDCO#B8	Junction	72.81	78.02	0.00	0.00	0.00	0.05	72.91	0.00	5.11	0 00:00	0.00	0.00
55	SDCO#C1	Junction	72.21	76.85	0.00	0.00	0.00	0.10	73.15	0.00	3.70	0 00:00	0.00	0.00
56	SDCO#C10	Junction	72.74	76.81	0.00	0.00	0.00	0.05	72.98	0.00	3.83	0 00:00	0.00	0.00
57	SDCO#C2	Junction	74.28	76.87	0.00	0.00	0.00	0.05	74.35	0.00	2.52	0 00:00	0.00	0.00
58	SDCO#C3	Junction	74.37	76.91	0.00	0.00	0.00	0.05	74.48	0.00	2.43	0 00:00	0.00	0.00
59	SDCO#C4	Junction	74.29	76.83	0.00	0.00	0.00	0.05	74.39	0.00	2.44	0 00:00	0.00	0.00
60	SDCO#C5	Junction	71.44	76.97	0.00	0.00	0.00	0.10	71.61	0.00	5.36	0 00:00	0.00	0.00
61	SDCO#C6	Junction	72.54	77.11	0.00	0.00	0.00	0.05	72.64	0.00	4.47	0 00:00	0.00	0.00
62	SDCO#C7	Junction	72.66	76.99	0.00	0.00	0.00	0.05	72.77	0.00	4.22	0 00:00	0.00	0.00
63	SDCO#C8	Junction	72.19	76.97	0.00	0.00	0.00	0.05	72.29	0.00	4.68	0 00:00	0.00	0.00
64	SDCO#C9	Junction	72.19	76.88	0.00	0.00	0.00	0.05	72.44	0.00	4.44	0 00:00	0.00	0.00
65	SDCO#CLUB1	Junction	72.38	76.33	0.00	0.00	0.00	0.05	72.46	0.00	3.87	0 00:00	0.00	0.00
66	SDCO#CLUB2	Junction	72.72	76.59	0.00	0.00	0.00	0.02	72.79	0.00	3.80	0 00:00	0.00	0.00
67	SDCO#CLUB3	Junction	73.13	76.45	0.00	0.00	0.00	0.02	73.20	0.00	3.25	0 00:00	0.00	0.00
68	SDCO#CLUB4	Junction	72.72	76.62	0.00	0.00	0.00	0.02	72.79	0.00	3.83	0 00:00	0.00	0.00
69	SDCO#CLUB5	Junction	73.15	76.43	0.00	0.00	0.00	0.02	73.22	0.00	3.21	0 00:00	0.00	0.00
70	SDCO#COM01	Junction	70.05	73.56	0.00	0.00	0.00	0.05	70.90	0.00	2.66	0 00:00	0.00	0.00
71	SDCO#COM02	Junction	70.70	73.51	0.00	0.00	0.00	0.05	70.90	0.00	2.61	0 00:00	0.00	0.00
72	SDCO#COM04	Junction	70.78	73.59	0.00	0.00	0.00	0.09	70.88	0.00	2.71	0 00:00	0.00	0.00
73	SDCO#COM05	Junction	71.01	73.62	0.00	0.00	0.00	0.04	71.10	0.00	2.52	0 00:00	0.00	0.00
74	SDCO#COM06	Junction	71.60	73.47	0.00	0.00	0.00	0.04	71.70	0.00	1.77	0 00:00	0.00	0.00

MIN FREEBOARD ATTAINED IS GREATER THAN 0.5' FOR ALL STRUCTURES

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
75	SDCO#COM07	Junction	70.25	73.18	0.00	0.00	0.00	0.03	70.34	0.00	2.84	0 00:00	0.00	0.00
76	SDCO#COM08	Junction	70.78	73.55	0.00	0.00	0.00	0.03	70.87	0.00	2.68	0 00:00	0.00	0.00
77	SDCO#COM09	Junction	70.17	73.63	0.00	0.00	0.00	0.04	70.23	0.00	3.40	0 00:00	0.00	0.00
78	SDCO#COM10	Junction	71.09	73.63	0.00	0.00	0.00	0.02	71.14	0.00	2.49	0 00:00	0.00	0.00
79	SDCO#COM11	Junction	71.09	73.63	0.00	0.00	0.00	0.02	71.16	0.00	2.47	0 00:00	0.00	0.00
80	SDCO#COM12	Junction	70.17	72.88	0.00	0.00	0.00	0.04	70.23	0.00	2.65	0 00:00	0.00	0.00
81	SDCO#COM13	Junction	70.87	73.41	0.00	0.00	0.00	0.04	70.95	0.00	2.46	0 00:00	0.00	0.00
82	SDCO#D1	Junction	72.84	77.30	0.00	0.00	0.00	0.10	72.96	0.00	4.34	0 00:00	0.00	0.00
83	SDCO#D2	Junction	74.65	77.29	0.00	0.00	0.00	0.10	74.79	0.00	2.50	0 00:00	0.00	0.00
84	SDCO#D3	Junction	74.71	77.29	0.00	0.00	0.00	0.10	74.88	0.00	2.41	0 00:00	0.00	0.00
85	SDCO#D4	Junction	73.53	77.46	0.00	0.00	0.00	0.10	73.63	0.00	3.83	0 00:00	0.00	0.00
86	SDCO#D5	Junction	74.47	77.03	0.00	0.00	0.00	0.05	74.55	0.00	2.48	0 00:00	0.00	0.00
87	SDCO#D6	Junction	74.79	77.33	0.00	0.00	0.00	0.05	74.87	0.00	2.46	0 00:00	0.00	0.00
88	SDCO#D7	Junction	74.72	77.28	0.00	0.00	0.00	0.05	74.82	0.00	2.46	0 00:00	0.00	0.00
89	SDCO#E1	Junction	72.07	76.54	0.00	0.00	0.00	0.13	72.25	0.00	4.29	0 00:00	0.00	0.00
90	SDCO#E2	Junction	72.43	76.80	0.00	0.00	0.00	0.13	72.61	0.00	4.19	0 00:00	0.00	0.00
91	SDCO#E3	Junction	73.14	76.57	0.00	0.00	0.00	0.13	73.31	0.00	3.26	0 00:00	0.00	0.00
92	SDCO#E4	Junction	72.64	76.50	0.00	0.00	0.00	0.07	72.76	0.00	3.74	0 00:00	0.00	0.00
93	SDCO#E5	Junction	72.96	76.75	0.00	0.00	0.00	0.07	73.08	0.00	3.67	0 00:00	0.00	0.00
94	SDCO#E6	Junction	73.56	76.50	0.00	0.00	0.00	0.07	73.68	0.00	2.82	0 00:00	0.00	0.00
95	SDCO#E7	Junction	74.24	76.76	0.00	0.00	0.00	0.13	74.41	0.00	2.35	0 00:00	0.00	0.00
96	SDCO#F1	Junction	71.77	77.26	0.00	0.00	0.00	0.08	71.90	0.00	5.36	0 00:00	0.00	0.00
97	SDCO#F2	Junction	72.50	76.98	0.00	0.00	0.00	0.08	72.57	0.00	4.41	0 00:00	0.00	0.00
98	SDCO#F3	Junction	73.46	77.21	0.00	0.00	0.00	0.08	73.61	0.00	3.60	0 00:00	0.00	0.00
99	SDCO#G1	Junction	73.29	77.07	0.00	0.00	0.00	0.08	73.40	0.00	3.67	0 00:00	0.00	0.00
100	SDCO#G2	Junction	74.47	77.01	0.00	0.00	0.00	0.08	74.60	0.00	2.41	0 00:00	0.00	0.00
101	SDCO#G3	Junction	72.89	77.15	0.00	0.00	0.00	0.06	73.03	0.00	4.12	0 00:00	0.00	0.00
102	SDCO#G4	Junction	74.22	76.76	0.00	0.00	0.00	0.07	74.34	0.00	2.42	0 00:00	0.00	0.00
103	SDCO#H1	Junction	72.76	77.10	0.00	0.00	0.00	0.08	72.84	0.00	4.26	0 00:00	0.00	0.00
104	SDCO#H2	Junction	73.13	77.02	0.00	0.00	0.00	0.08	73.27	0.00	3.75	0 00:00	0.00	0.00
105	SDCO#H3	Junction	74.20	76.74	0.00	0.00	0.00	0.08	74.33	0.00	2.41	0 00:00	0.00	0.00
106	SDCO#H4	Junction	72.79	77.00	0.00	0.00	0.00	0.07	72.89	0.00	4.11	0 00:00	0.00	0.00
107	SDCO#H5	Junction	72.94	75.70	0.00	0.00	0.00	0.07	73.07	0.00	2.63	0 00:00	0.00	0.00
108	SDCO#H6	Junction	74.06	76.59	0.00	0.00	0.00	0.07	74.18	0.00	2.41	0 00:00	0.00	0.00
109	WQ#1	Junction	67.90	73.16	0.00	0.00	0.00	1.05	68.62	0.00	4.54	0 00:00	0.00	0.00
110	WQ#2	Junction	70.66	76.71	0.00	0.00	0.00	0.26	70.74	0.00	5.97	0 00:00	0.00	0.00
111	WQ#3	Junction	69.48	76.48	0.00	0.00	0.00	0.69	70.59	0.00	5.89	0 00:00	0.00	0.00
112	WQ#4	Junction	69.60	76.07	0.00	0.00	0.00	1.22	70.59	0.00	5.48	0 00:00	0.00	0.00
113	WQ#5	Junction	70.30	76.23	0.00	0.00	0.00	1.22	70.68	0.00	5.55	0 00:00	0.00	0.00
114	TRENCH INLET	Outfall	67.32					0.13	67.32					
115	R-TANK 1	Storage Node	66.90	70.88	67.40		0.00	1.11	68.14				0.00	0.00
116	R-TANK 2	Storage Node	67.90	74.77	68.40		0.00	2.92	70.59				0.00	0.00
117	R-TANK 3	Storage Node	67.90	74.77	68.40		0.00	1.83	70.59				0.00	0.00

MIN FREEBOARD ATTAINED IS GREATER THAN 0.5' FOR ALL STRUCTURES

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	{SD - Phase 1}.PIPE 02	Pipe	SDCB#02	SDCB#05	108.10	69.50	68.96	0.5000	12.000	0.0130	0.44	2.52	0.18	2.04	0.33	0.33	0.00	Calculated
2	{SD - Phase 1}.PIPE 03	Pipe	SDCB#03	SDCB#02	71.71	69.86	69.50	0.5000	8.000	0.0150	0.18	0.74	0.25	1.49	0.25	0.38	0.00	Calculated
3	{SD - Phase 1}.PIPE 04	Pipe	SDCB#04	SDCB#03	55.25	70.14	69.86	0.5100	8.004	0.0150	0.08	0.75	0.10	0.97	0.18	0.28	0.00	Calculated
4	{SD - Phase 1}.PIPE 05	Pipe	SDCB#05	SDCB#09	89.22	68.96	68.51	0.5000	12.000	0.0130	0.66	2.53	0.26	1.51	0.56	0.56	0.00	Calculated
5	{SD - Phase 1}.PIPE 06	Pipe	SDCB#06	SDCB#09	42.41	68.72	68.51	0.5000	8.004	0.0130	0.22	0.85	0.26	0.68	0.61	0.92	0.00	Calculated
6	{SD - Phase 1}.PIPE 07	Pipe	SDCB#07	SDCB#06	72.15	69.08	68.72	0.5000	8.000	0.0130	0.13	0.85	0.15	1.01	0.39	0.58	0.00	Calculated
7	{SD - Phase 1}.PIPE 08	Pipe	SDCB#08	SDCB#07	49.14	69.55	69.08	0.9600	8.004	0.0130	0.07	1.18	0.06	1.31	0.16	0.25	0.00	Calculated
8	{SD - Phase 1}.PIPE 09	Pipe	SDCB#09	WQ#1	21.39	68.51	68.40	0.5100	8.000	0.0130	1.05	0.87	1.22	3.28	0.58	0.86	0.00	> CAPACITY
9	{SD - Phase 1}.PIPE 11	Pipe	SDCB#11	WQ#2	5.71	73.48	72.83	11.3800	8.000	0.0130	0.26	4.08	0.06	5.42	0.13	0.20	0.00	Calculated
10	{SD - Phase 1}.PIPE 12	Pipe	SDCB#12	SDCB#11	64.20	73.83	73.48	0.5500	8.004	0.0130	0.08	0.89	0.09	1.51	0.14	0.22	0.00	Calculated
11	{SD - Phase 1}.PIPE 13	Pipe	SDCB#13	SDCB#11	78.00	73.87	73.48	0.5000	8.004	0.0130	0.10	0.86	0.12	1.67	0.15	0.23	0.00	Calculated
12	{SD - Phase 1}.PIPE 14	Pipe	SDCB#14	SDCB#15	42.96	71.89	71.68	0.4900	12.000	0.0130	0.53	2.49	0.21	1.83	0.40	0.40	0.00	Calculated
13	{SD - Phase 1}.PIPE 15	Pipe	SDCB#15	WQ#3	6.67	71.68	71.65	0.4500	12.000	0.0130	0.69	2.39	0.29	2.40	0.40	0.40	0.00	Calculated
14	{SD - Phase 1}.PIPE 16	Pipe	SDCB#16	SDCB#14	67.53	72.23	71.89	0.5000	12.000	0.0130	0.31	2.53	0.12	1.62	0.30	0.30	0.00	Calculated
15	{SD - Phase 1}.PIPE 17	Pipe	SDCB#17	SDCB#16	36.65	72.75	72.57	0.4900	8.004	0.0130	0.14	0.85	0.17	1.80	0.19	0.28	0.00	Calculated
16	{SD - Phase 1}.PIPE 18	Pipe	SDCB#18	R-TANK 2	54.55	68.40	68.40	0.0000	24.000	0.0130	2.05	0.97	2.12	1.82	2.00	1.00	225.00	SURCHARGED
17	{SD - Phase 1}.PIPE 20	Pipe	SDCB#20	SDCB#19	126.79	70.98	70.35	0.5000	12.000	0.0130	0.91	2.51	0.36	2.46	0.48	0.48	0.00	Calculated
18	{SD - Phase 1}.PIPE 21	Pipe	SDCB#21	SDCB#20	57.67	71.81	71.31	0.8700	8.004	0.0130	0.07	1.13	0.06	1.75	0.11	0.17	0.00	Calculated
19	{SD - Phase 1}.PIPE 22	Pipe	SDCB#22	SDCB#20	75.77	71.36	70.98	0.5000	12.000	0.0130	0.76	2.52	0.30	2.50	0.41	0.41	0.00	Calculated
20	{SD - Phase 1}.PIPE 23	Pipe	SDCB#23	SDCB#22	113.35	71.93	71.36	0.5000	12.000	0.0130	0.44	2.53	0.18	1.84	0.35	0.35	0.00	Calculated
21	{SD - Phase 1}.PIPE 24	Pipe	SDCB#24	SDCB#23	69.19	72.61	72.26	0.5100	8.004	0.0130	0.03	0.86	0.04	1.21	0.09	0.13	0.00	Calculated
22	{SD - Phase 1}.PIPE 25	Pipe	SDCB#25	SDCB#24	34.45	72.79	72.61	0.5200	8.004	0.0130	0.02	0.87	0.02	0.71	0.08	0.11	0.00	Calculated
23	{SD - Phase 1}.PIPE 26	Pipe	SDCB#26	SDCB#18	104.96	68.40	68.40	0.0000	24.000	0.0130	1.07	0.70	1.54	0.78	2.00	1.00	226.00	SURCHARGED
24	{SD - Phase 1}.PIPE 27	Pipe	SDCB#27	WQ#5	80.37	71.20	70.80	0.5000	12.000	0.0130	1.22	2.51	0.49	3.07	0.51	0.51	0.00	Calculated
25	{SD - Phase 1}.PIPE 28	Pipe	SDCB#28	SDCB#27	122.98	72.15	71.54	0.5000	8.004	0.0130	0.23	0.85	0.27	2.09	0.23	0.35	0.00	Calculated
26	{SD - Phase 1}.PIPE 29	Pipe	SDCB#29	SDCB#27	82.06	71.72	71.20	0.6300	12.000	0.0130	0.63	2.84	0.22	1.94	0.43	0.43	0.00	Calculated
27	{SD - Phase 1}.PIPE 30	Pipe	SDCB#30	SDCB#29	128.14	72.69	72.05	0.5000	8.004	0.0130	0.30	0.86	0.35	2.25	0.27	0.40	0.00	Calculated
28	{SD - Phase 1}.PIPE 31	Pipe	SDCB#31	R-TANK 3	5.26	70.25	70.22	0.5700	12.000	0.0130	0.56	2.69	0.21	2.29	0.36	0.36	0.00	Calculated
29	{SD - Phase 1}.PIPE 40	Pipe	SDCB#40	SDCB#27	52.18	73.22	71.20	3.8700	12.000	0.0130	0.03	7.01	0.00	0.17	0.30	0.30	0.00	Calculated
30	{SD - Phase 1}.PIPE B1	Pipe	SDCO#B1	SDCB#18	50.72	74.33	69.73	9.0700	8.004	0.0130	0.10	3.64	0.03	4.43	0.35	0.52	0.00	Calculated
31	{SD - Phase 1}.PIPE B2	Pipe	SDCO#B2	SDCO#B1	60.72	75.11	74.50	1.0000	6.000	0.0130	0.05	0.56	0.09	1.73	0.10	0.20	0.00	Calculated
32	{SD - Phase 1}.PIPE B3	Pipe	SDCO#B3	SDCO#B2	16.77	75.28	75.11	1.0100	6.000	0.0130	0.05	0.56	0.09	1.65	0.10	0.21	0.00	Calculated
33	{SD - Phase 1}.PIPE B4	Pipe	SDCO#B4	SDCO#B1	85.66	75.41	74.50	1.0600	6.000	0.0130	0.05	0.58	0.08	1.77	0.10	0.20	0.00	Calculated
34	{SD - Phase 1}.PIPE B5	Pipe	SDCO#B5	R-TANK 3	8.62	71.99	71.95	0.4600	6.000	0.0130	0.10	0.38	0.25	1.60	0.17	0.35	0.00	Calculated
35	{SD - Phase 1}.PIPE B6	Pipe	SDCO#B6	SDCO#B5	81.80	72.81	71.99	1.0000	6.000	0.0130	0.05	0.56	0.09	1.02	0.15	0.29	0.00	Calculated
36	{SD - Phase 1}.PIPE B7	Pipe	SDCO#B7	SDCO#B6	6.36	72.87	72.81	0.9400	6.000	0.0130	0.05	0.54	0.09	1.58	0.11	0.21	0.00	Calculated
37	{SD - Phase 1}.PIPE B8	Pipe	SDCO#B8	SDCO#B5	81.80	72.81	71.99	1.0000	6.000	0.0130	0.05	0.56	0.09	1.02	0.15	0.29	0.00	Calculated
38	{SD - Phase 1}.PIPE C1	Pipe	SDCO#C1	SDCB#29	45.29	73.04	72.05	2.1900	8.004	0.0130	0.10	1.79	0.05	2.67	0.11	0.16	0.00	Calculated
39	{SD - Phase 1}.PIPE C10	Pipe	SDCO#C10	SDCO#C9	54.90	72.88	72.33	1.0000	6.000	0.0130	0.05	0.56	0.09	1.65	0.10	0.21	0.00	Calculated
40	{SD - Phase 1}.PIPE C2	Pipe	SDCO#C2	SDCO#C1	22.10	74.28	73.21	4.8400	6.000	0.0130	0.05	1.23	0.04	2.97	0.07	0.14	0.00	Calculated
41	{SD - Phase 1}.PIPE C3	Pipe	SDCO#C3	SDCO#C2	9.24	74.37	74.28	0.9700	6.000	0.0130	0.05	0.55	0.09	2.00	0.09	0.18	0.00	Calculated
42	{SD - Phase 1}.PIPE C4	Pipe	SDCO#C4	SDCO#C1	108.05	74.29	73.21	1.0000	6.000	0.0130	0.05	0.56	0.09	1.73	0.10	0.20	0.00	Calculated
43	{SD - Phase 1}.PIPE C5	Pipe	SDCO#C5	R-TANK 3	7.93	71.44	71.40	0.5000	8.004	0.0130	0.10	0.86	0.11	1.55	0.16	0.23	0.00	Calculated
44	{SD - Phase 1}.PIPE C6	Pipe	SDCO#C6	SDCO#C5	109.73	72.54	71.44	1.0000	6.000	0.0130	0.05	0.56	0.09	1.13	0.14	0.27	0.00	Calculated
45	{SD - Phase 1}.PIPE C7	Pipe	SDCO#C7	SDCO#C6	12.01	72.66	72.54	1.0000	6.000	0.0130	0.05	0.56	0.09	1.65	0.10	0.21	0.00	Calculated
46	{SD - Phase 1}.PIPE C8	Pipe	SDCO#C8	SDCO#C5	45.14	72.19	71.74	1.0000	6.000	0.0130	0.05	0.56	0.09	1.71	0.10	0.20	0.00	Calculated
47	{SD - Phase 1}.PIPE C9	Pipe	SDCO#C9	SDCO#C8	13.55	72.33	72.19	1.0300	6.000	0.0130	0.05	0.57	0.09	1.63	0.10	0.21	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
48	{SD - Phase 1}.PIPE COM01	Pipe	SDCO#COM04	SDCB#02	37.51	70.78	69.50	3.4100	8.004	0.0150	0.09	1.94	0.04	1.04	0.19	0.28	0.00	Calculated
49	{SD - Phase 1}.PIPE COM02	Pipe	SDCO#COM02	SDCO#COM01	49.39	70.70	70.21	0.9900	6.000	0.0130	0.05	0.56	0.09	0.70	0.35	0.70	0.00	Calculated
50	{SD - Phase 1}.PIPE COM04	Pipe	SDCO#COM04	SDCO#COM01	56.60	70.78	70.21	1.0100	6.000	0.0130	0.05	0.56	0.08	0.47	0.30	0.60	0.00	Calculated
51	{SD - Phase 1}.PIPE COM05	Pipe	SDCO#COM05	SDCO#COM04	22.78	71.01	70.78	1.0100	6.000	0.0130	0.04	0.56	0.07	1.49	0.09	0.19	0.00	Calculated
52	{SD - Phase 1}.PIPE COM06	Pipe	SDCO#COM06	SDCO#COM05	59.24	71.60	71.01	1.0000	6.000	0.0150	0.04	0.49	0.08	1.49	0.09	0.19	0.00	Calculated
53	{SD - Phase 1}.PIPE COM07	Pipe	SDCO#COM07	SDCB#04	21.49	70.25	70.14	0.5100	8.000	0.0130	0.03	0.86	0.04	0.83	0.12	0.18	0.00	Calculated
54	{SD - Phase 1}.PIPE COM08	Pipe	SDCO#COM08	SDCO#COM07	36.57	70.78	70.41	1.0100	6.000	0.0130	0.03	0.56	0.06	1.55	0.09	0.17	0.00	Calculated
55	{SD - Phase 1}.PIPE COM09	Pipe	SDCO#COM09	SDCB#05	34.88	70.17	68.96	3.4700	8.004	0.0130	0.04	2.25	0.02	0.44	0.22	0.32	0.00	Calculated
56	{SD - Phase 1}.PIPE COM10	Pipe	SDCO#COM10	SDCO#COM09	48.42	71.09	70.34	1.5500	6.000	0.0130	0.02	0.70	0.02	1.44	0.06	0.11	0.00	Calculated
57	{SD - Phase 1}.PIPE COM11	Pipe	SDCO#COM11	SDCO#COM09	74.62	71.09	70.34	1.0100	6.000	0.0130	0.02	0.56	0.04	1.41	0.07	0.14	0.00	Calculated
58	{SD - Phase 1}.PIPE COM12	Pipe	SDCO#COM12	SDCB#08	16.26	70.17	69.55	3.8100	8.000	0.0130	0.04	2.36	0.02	1.38	0.09	0.13	0.00	Calculated
59	{SD - Phase 1}.PIPE COM13	Pipe	SDCO#COM13	SDCO#COM12	45.72	70.87	70.34	1.1600	6.000	0.0130	0.04	0.60	0.06	1.66	0.08	0.17	0.00	Calculated
60	{SD - Phase 1}.PIPE D1	Pipe	SDCO#D1	SDCB#28	47.80	72.84	72.15	1.4400	8.004	0.0130	0.10	1.45	0.07	1.25	0.18	0.27	0.00	Calculated
61	{SD - Phase 1}.PIPE D2	Pipe	SDCO#D2	SDCO#D1	163.60	74.65	73.01	1.0000	6.000	0.0130	0.10	0.56	0.17	2.12	0.14	0.28	0.00	Calculated
62	{SD - Phase 1}.PIPE D3	Pipe	SDCO#D3	SDCO#D2	6.36	74.71	74.65	0.9400	6.000	0.0130	0.10	0.54	0.18	1.88	0.15	0.31	0.00	Calculated
63	{SD - Phase 1}.PIPE D4	Pipe	SDCO#D4	SDCB#29	54.62	73.36	72.05	2.4000	8.004	0.0130	0.10	1.99	0.05	2.89	0.10	0.15	0.00	Calculated
64	{SD - Phase 1}.PIPE D5	Pipe	SDCO#D5	SDCO#D4	32.05	74.47	73.53	2.9300	6.000	0.0130	0.05	0.96	0.05	2.04	0.09	0.18	0.00	Calculated
65	{SD - Phase 1}.PIPE D6	Pipe	SDCO#D6	SDCO#D5	10.82	74.79	74.47	2.9600	6.000	0.0130	0.05	0.96	0.05	2.42	0.08	0.16	0.00	Calculated
66	{SD - Phase 1}.PIPE D7	Pipe	SDCO#D7	SDCO#D4	119.28	74.72	73.53	1.0000	6.000	0.0130	0.05	0.56	0.09	1.71	0.10	0.20	0.00	Calculated
67	{SD - Phase 1}.PIPE E1	Pipe	SDCO#E1	SDCB#22	42.30	71.90	71.69	0.5000	6.000	0.0130	0.13	0.53	0.25	2.16	0.18	0.35	0.00	Calculated
68	{SD - Phase 1}.PIPE E4	Pipe	SDCO#E4	SDCB#23	42.52	72.48	72.26	0.5200	6.000	0.0130	0.07	0.53	0.13	1.80	0.12	0.24	0.00	Calculated
69	{SD - Phase 1}.PIPE G1	Pipe	SDCO#G1	SDCB#16	23.14	73.29	72.73	2.4200	6.000	0.0130	0.08	0.87	0.09	2.67	0.11	0.21	0.00	Calculated
70	{SD - Phase 1}.PIPE G2	Pipe	SDCO#G2	SDCO#G1	118.43	74.47	73.29	1.0000	6.000	0.0130	0.08	0.56	0.15	2.20	0.12	0.24	0.00	Calculated
71	{SD - Phase 1}.PIPE G3	Pipe	SDCO#G3	SDCB#17	29.24	72.89	72.75	0.4800	6.000	0.0130	0.06	0.39	0.17	1.10	0.17	0.34	0.00	Calculated
72	{SD - Phase 1}.PIPE G4	Pipe	SDCO#G4	SDCO#G3	116.18	74.22	73.06	1.0000	6.000	0.0130	0.06	0.56	0.12	1.88	0.12	0.23	0.00	Calculated
73	{SD - Phase 1}.PIPE H1	Pipe	SDCO#H1	SDCB#14	9.90	72.76	72.22	5.4500	8.004	0.0130	0.08	2.83	0.03	3.31	0.08	0.12	0.00	Calculated
74	{SD - Phase 1}.PIPE H2	Pipe	SDCO#H2	SDCO#H1	20.00	73.13	72.93	1.0000	6.000	0.0130	0.08	0.56	0.14	1.91	0.13	0.26	0.00	Calculated
75	{SD - Phase 1}.PIPE H3	Pipe	SDCO#H3	SDCO#H2	106.86	74.20	73.13	1.0000	6.000	0.0130	0.08	0.56	0.14	1.92	0.13	0.27	0.00	Calculated
76	{SD - Phase 1}.PIPE H4	Pipe	SDCO#H4	SDCB#15	24.70	72.79	72.18	2.4700	6.000	0.0130	0.07	0.88	0.08	2.55	0.10	0.19	0.00	Calculated
77	{SD - Phase 1}.PIPE H5	Pipe	SDCO#H5	SDCO#H4	14.98	72.94	72.79	1.0000	6.000	0.0130	0.07	0.56	0.12	2.01	0.11	0.22	0.00	Calculated
78	{SD - Phase 1}.PIPE H6	Pipe	SDCO#H6	SDCO#H5	112.34	74.06	72.94	1.0000	6.000	0.0130	0.07	0.56	0.12	1.81	0.12	0.24	0.00	Calculated
79	{SD - Phase 1}.PIPE RT-1	Pipe	R-TANK 1	SDCB#01	4.18	67.40	67.40	0.0000	24.000	0.0130	0.13	3.50	0.04	1.15	0.74	0.37	0.00	Calculated
80	{SD - Phase 1}.PIPE RT-2	Pipe	R-TANK 2	SDCB#10	5.00	68.40	68.40	0.0000	24.000	0.0130	0.20	3.20	0.06	1.10	2.00	1.00	222.00	SURCHARGED
81	{SD - Phase 1}.PIPE RT-3	Pipe	R-TANK 3	SDCB#26	128.16	68.40	68.40	0.0000	24.000	0.0130	0.55	0.63	0.86	0.77	2.00	1.00	226.00	SURCHARGED
82	{SD - Phase 1}.PIPE WQ#4	Pipe	WQ#4	SDCB#18	40.09	69.60	69.40	0.5000	12.000	0.0130	1.22	2.52	0.49	2.98	1.00	1.00	0.00	Calculated
83	{SD - Phase 2}.PIEP CLUB5	Pipe	SDCO#CLUB5	SDCO#CLUB4	42.78	73.15	72.72	1.0100	6.000	0.0130	0.02	0.56	0.04	1.41	0.07	0.14	0.00	Calculated
84	{SD - Phase 2}.PIPE 33	Pipe	SDCB#33	SDCB#31	113.81	70.81	70.25	0.4900	12.000	0.0130	0.26	2.50	0.11	1.30	0.31	0.31	0.00	Calculated
85	{SD - Phase 2}.PIPE 34	Pipe	SDCB#34	SDCB#33	74.43	71.52	71.14	0.5100	8.004	0.0130	0.10	0.86	0.11	1.65	0.15	0.22	0.00	Calculated
86	{SD - Phase 2}.PIPE 35	Pipe	SDCB#35	R-TANK 3	78.01	68.40	68.40	0.0000	24.000	0.0130	0.54	0.81	0.67	0.65	2.00	1.00	226.00	SURCHARGED
87	{SD - Phase 2}.PIPE 36	Pipe	SDCB#36	SDCB#35	68.05	70.59	69.40	1.7500	12.000	0.0130	0.47	4.71	0.10	3.70	0.54	0.54	0.00	Calculated
88	{SD - Phase 2}.PIPE 37	Pipe	SDCB#37	SDCB#36	118.86	71.52	70.93	0.5000	8.004	0.0130	0.22	0.85	0.26	2.08	0.23	0.35	0.00	Calculated
89	{SD - Phase 2}.PIPE 38	Pipe	SDCB#38	SDCB#37	72.17	71.88	71.52	0.5000	8.004	0.0130	0.17	0.85	0.19	1.64	0.22	0.33	0.00	Calculated
90	{SD - Phase 2}.PIPE A1	Pipe	SDCO#A1	SDCB#32	22.91	72.71	72.60	0.4800	8.000	0.0130	0.07	0.84	0.09	0.91	0.19	0.28	0.00	Calculated
91	{SD - Phase 2}.PIPE A2	Pipe	SDCO#A2	SDCO#A1	33.15	73.21	72.88	1.0000	6.000	0.0130	0.04	0.56	0.07	1.57	0.09	0.18	0.00	Calculated
92	{SD - Phase 2}.PIPE A3	Pipe	SDCO#A3	SDCO#A2	78.60	74.00	73.21	1.0100	6.000	0.0130	0.04	0.56	0.07	1.58	0.09	0.18	0.00	Calculated
93	{SD - Phase 2}.PIPE A4	Pipe	SDCO#A4	SDCO#A5	72.96	73.96	73.23	1.0000	6.000	0.0130	0.04	0.56	0.07	1.57	0.09	0.18	0.00	Calculated
94	{SD - Phase 2}.PIPE A5	Pipe	SDCO#A5	SDCO#A1	35.48	73.23	72.88	0.9900	6.000	0.0130	0.04	0.56	0.07	1.56	0.09	0.18	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
95	{SD - Phase 2}.PIPE CLUB2	Pipe	SDCO#CLUB2	SDCO#CLUB1	33.61	72.72	72.38	1.0100	6.000	0.0130	0.02	0.56	0.04	1.29	0.07	0.15	0.00	Calculated
96	{SD - Phase 2}.PIPE CLUB3	Pipe	SDCO#CLUB3	SDCO#CLUB2	40.66	73.13	72.72	1.0100	6.000	0.0130	0.02	0.56	0.04	1.40	0.07	0.14	0.00	Calculated
97	{SD - Phase 2}.PIPE CLUB4	Pipe	SDCO#CLUB4	SDCO#CLUB1	32.02	72.72	72.38	1.0600	6.000	0.0130	0.02	0.58	0.04	1.30	0.07	0.15	0.00	Calculated
98	{SD - Phase 2}.PIPE E2	Pipe	SDCO#E2	SDCO#E1	35.98	72.43	72.07	1.0000	6.000	0.0130	0.13	0.56	0.24	2.13	0.18	0.36	0.00	Calculated
99	{SD - Phase 2}.PIPE E3	Pipe	SDCO#E3	SDCO#E2	71.44	73.14	72.43	0.9900	6.000	0.0130	0.13	0.56	0.24	2.21	0.17	0.35	0.00	Calculated
100	{SD - Phase 2}.PIPE E5	Pipe	SDCO#E5	SDCO#E4	31.53	72.96	72.64	1.0100	6.000	0.0130	0.07	0.57	0.12	1.79	0.12	0.24	0.00	Calculated
101	{SD - Phase 2}.PIPE E6	Pipe	SDCO#E6	SDCO#E5	59.72	73.56	72.96	1.0000	6.000	0.0130	0.07	0.56	0.12	1.85	0.12	0.24	0.00	Calculated
102	{SD - Phase 2}.PIPE E7	Pipe	SDCO#E7	SDCO#E3	109.59	74.24	73.14	1.0000	6.000	0.0130	0.13	0.56	0.24	2.27	0.17	0.34	0.00	Calculated
103	{SD - Phase 2}.PIPE F1	Pipe	SDCO#F1	SDCB#31	151.81	71.77	70.25	1.0000	6.000	0.0130	0.08	0.56	0.15	0.80	0.26	0.52	0.00	Calculated
104	{SD - Phase 2}.PIPE F2	Pipe	SDCO#F2	SDCB#35	17.47	72.50	69.90	14.8800	6.000	0.0130	0.08	2.16	0.04	5.12	0.26	0.52	0.00	Calculated
105	{SD - Phase 2}.PIPE F3	Pipe	SDCO#F3	SDCO#F2	96.17	73.46	72.50	1.0000	6.000	0.0130	0.08	0.56	0.15	2.67	0.11	0.22	0.00	Calculated
106	PIPE 32	Pipe	SDCB#32	SDCB#23	66.71	72.60	72.26	0.5100	8.000	0.0130	0.20	0.86	0.23	2.00	0.22	0.33	0.00	Calculated
107	Pipe ADG1	Pipe	AREA DRAIN G1	SDCB#16	21.66	73.07	72.92	0.6900	6.000	0.0150	0.00	0.40	0.00	0.00	0.00	0.00	0.00	Calculated
108	PIPE ADH1	Pipe	AREA DRAIN H1	SDCB#15	16.48	72.33	72.18	0.9100	6.000	0.0150	0.00	0.46	0.00	0.00	0.00	0.00	0.00	Calculated
109	PIPE CLUB1	Pipe	SDCO#CLUB1	SDCB#22	35.74	72.21	71.69	1.4500	8.000	0.0130	0.05	1.68	0.03	2.06	0.08	0.12	0.00	Calculated
110	PIPE WQ#1	Pipe	WQ#1	R-TANK 1	6.39	67.90	67.87	0.4700	8.000	0.0130	1.05	0.83	1.27	3.28	0.58	0.86	0.00	> CAPACITY
111	PIPE WQ#2	Pipe	WQ#2	R-TANK 2	5.61	70.66	68.87	31.9100	12.000	0.0130	0.26	20.13	0.01	6.86	0.52	0.52	0.00	Calculated
112	PIPE WQ#3	Pipe	WQ#3	R-TANK 2	6.80	69.48	68.87	8.9700	12.000	0.0130	0.69	10.67	0.06	5.85	1.00	1.00	140.00	SURCHARGED
113	PIPE WQ#4	Pipe	SDCB#19	WQ#4	40.09	70.35	70.10	0.6200	12.000	0.0130	1.22	2.81	0.43	3.12	0.50	0.50	0.00	Calculated
114	PIPE WQ#5	Pipe	WQ#5	SDCB#26	45.10	70.30	69.40	2.0000	12.000	0.0130	1.22	5.03	0.24	4.83	0.65	0.65	0.00	Calculated
115	{SD - Phase 1}.RT-1 OUTLET	Outlet	SDCB#01	TRENCH INLET		66.90	67.32				0.13							
116	{SD - Phase 1}.RT-2 OUTLET	Outlet	SDCB#10	R-TANK 1		67.90	66.90				0.08							

Subbasin Hydrology

Subbasin : BLDG A_NORTH

Input Data

Area (ac) 0.05
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.05		98

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

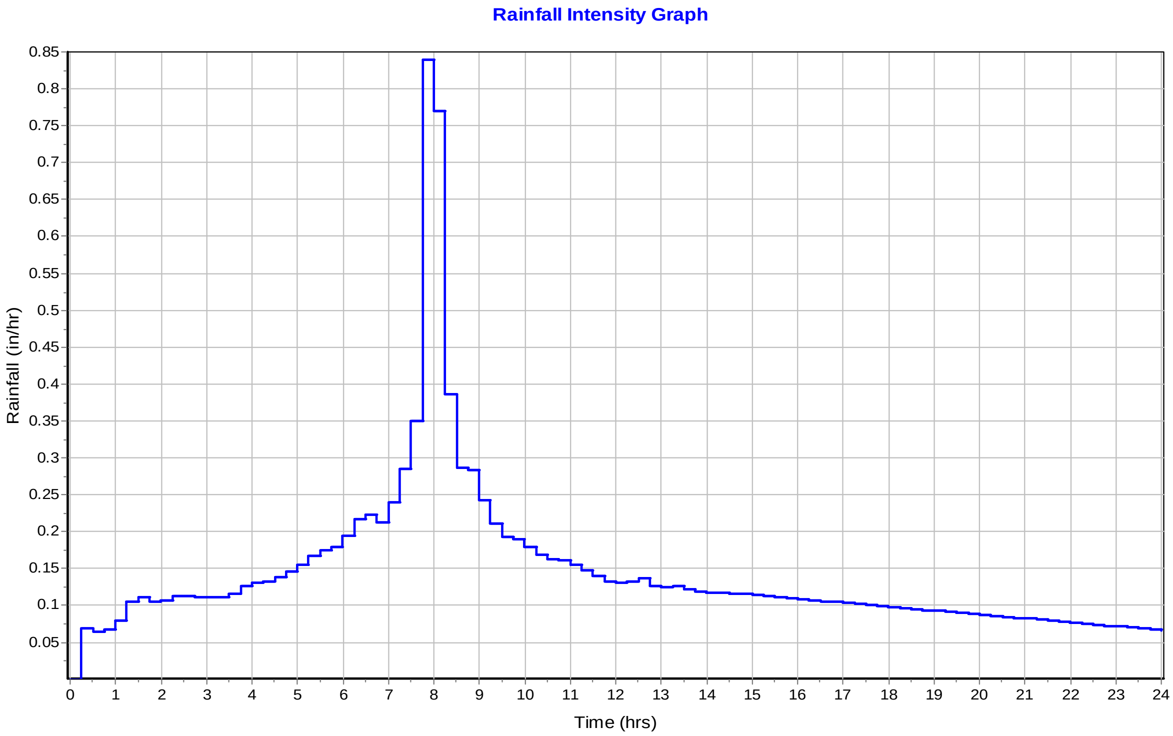
Where :

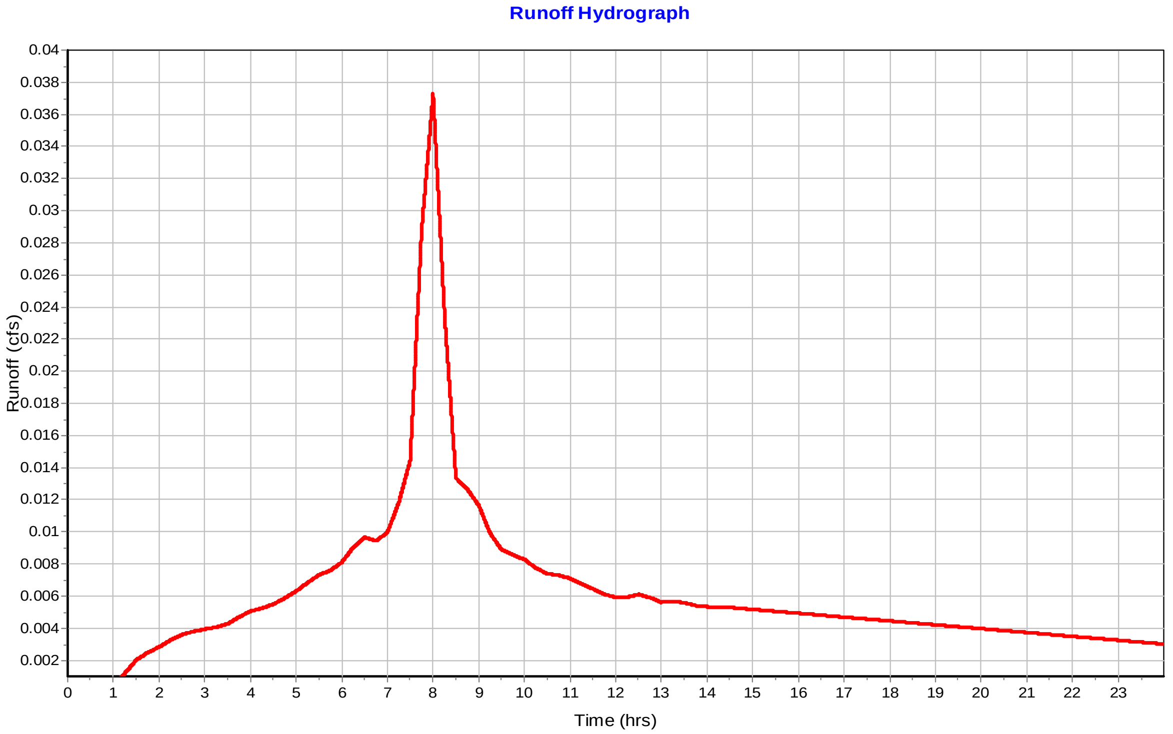
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG A_NORTH





Subbasin : BLDG A_SOUTH

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.05		98

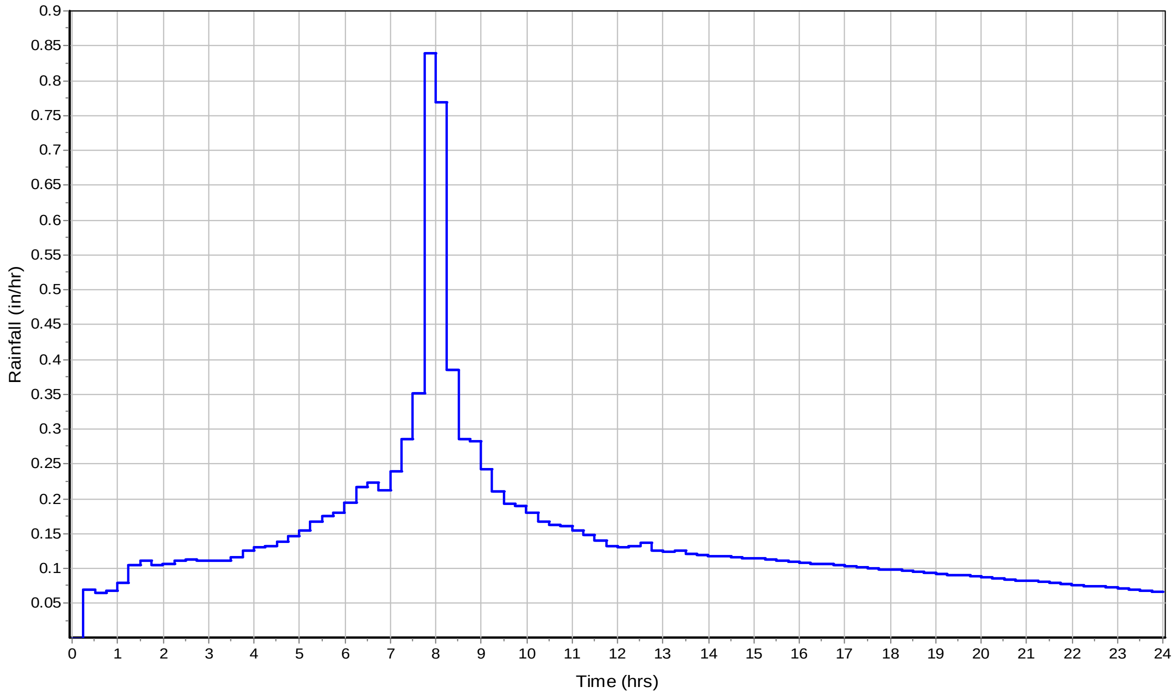
Time of Concentration

Subbasin Runoff Results

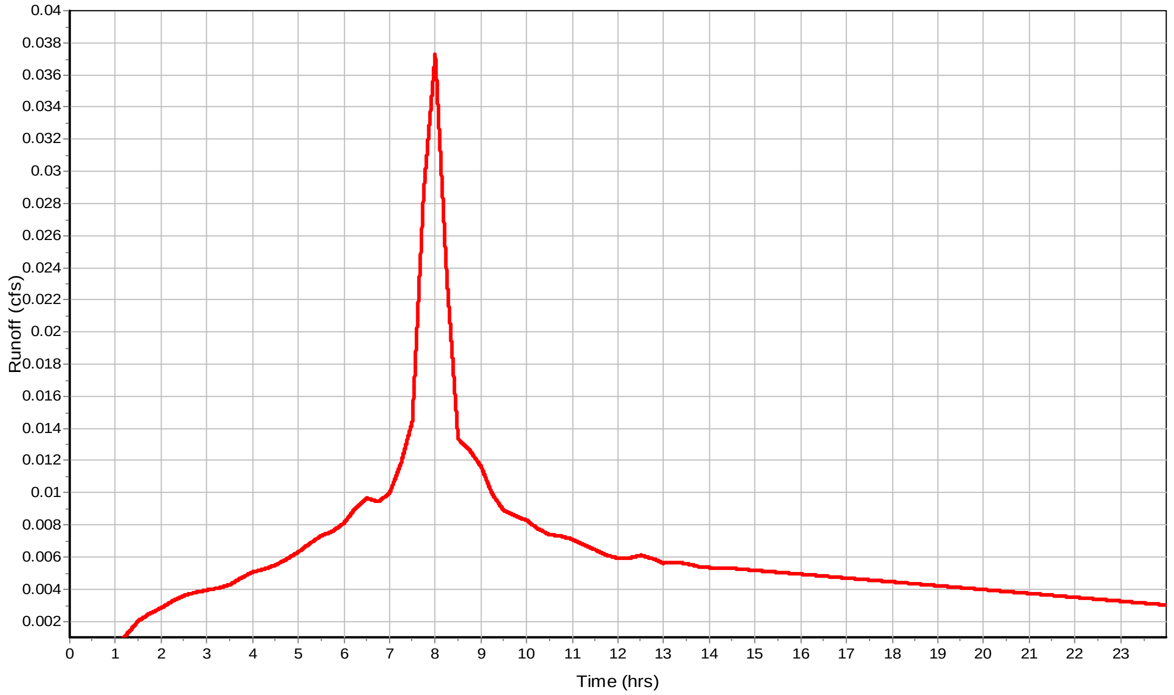
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG A_SOUTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_NE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

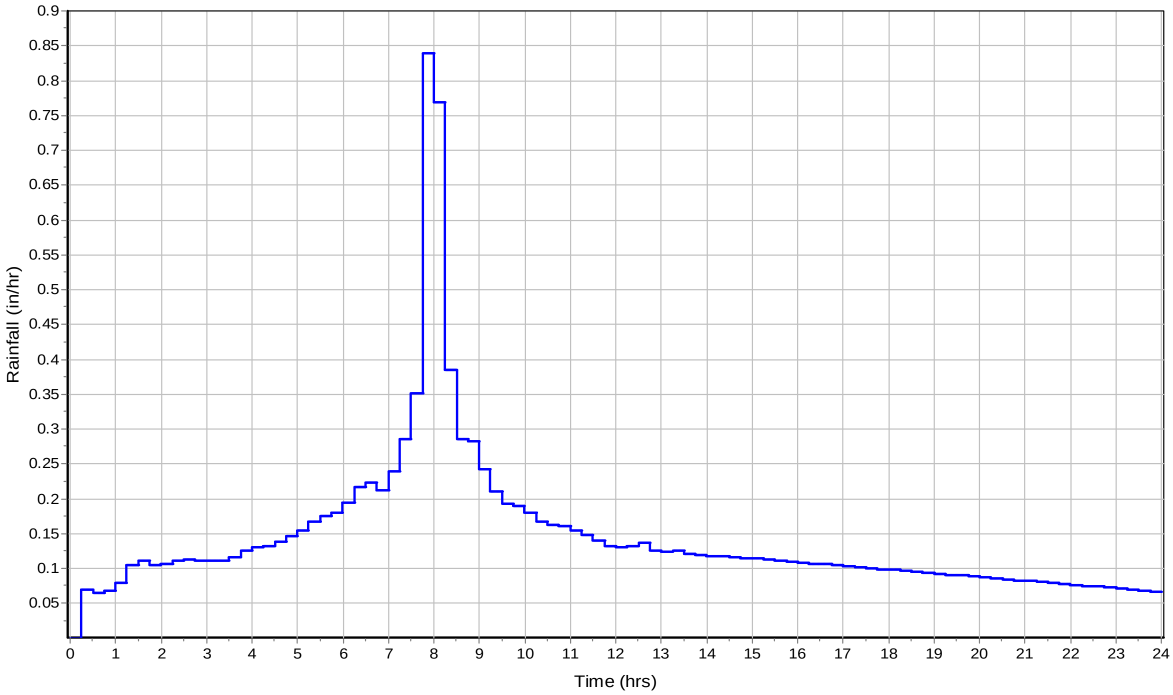
Time of Concentration

Subbasin Runoff Results

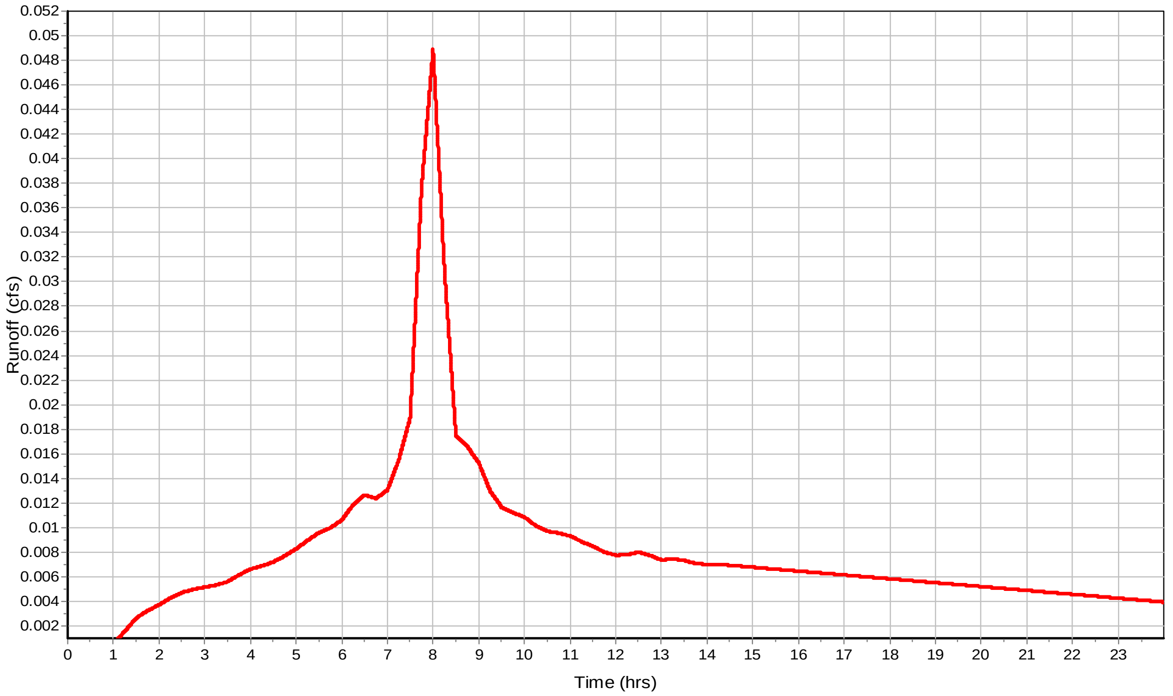
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

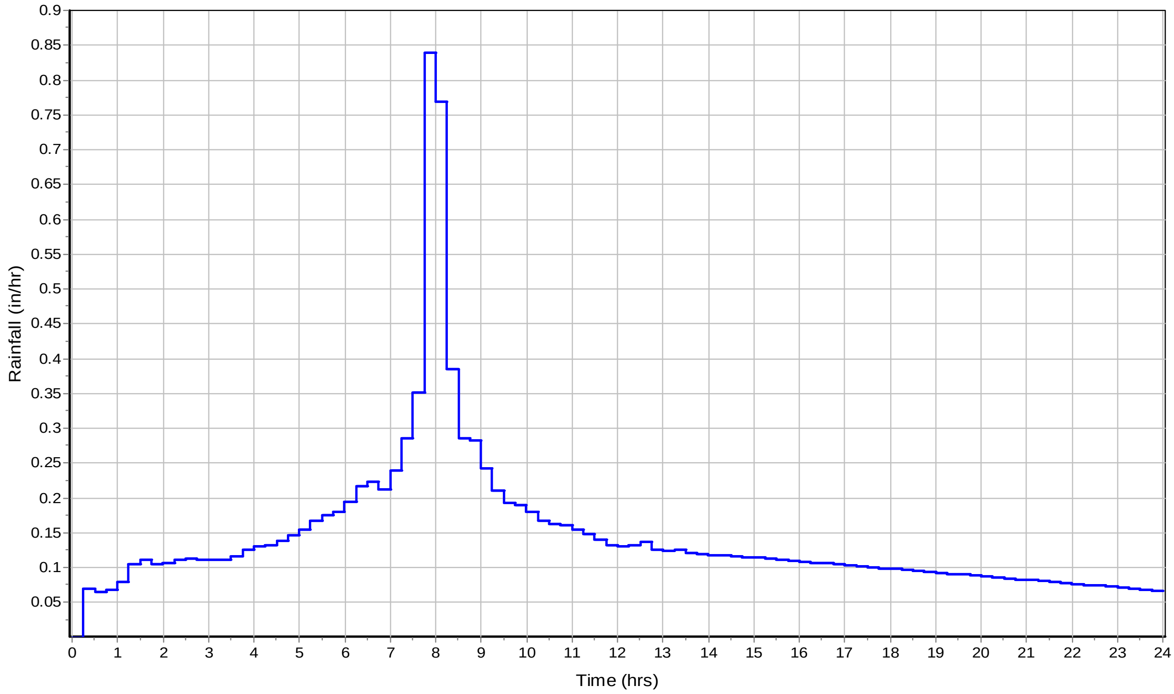
Time of Concentration

Subbasin Runoff Results

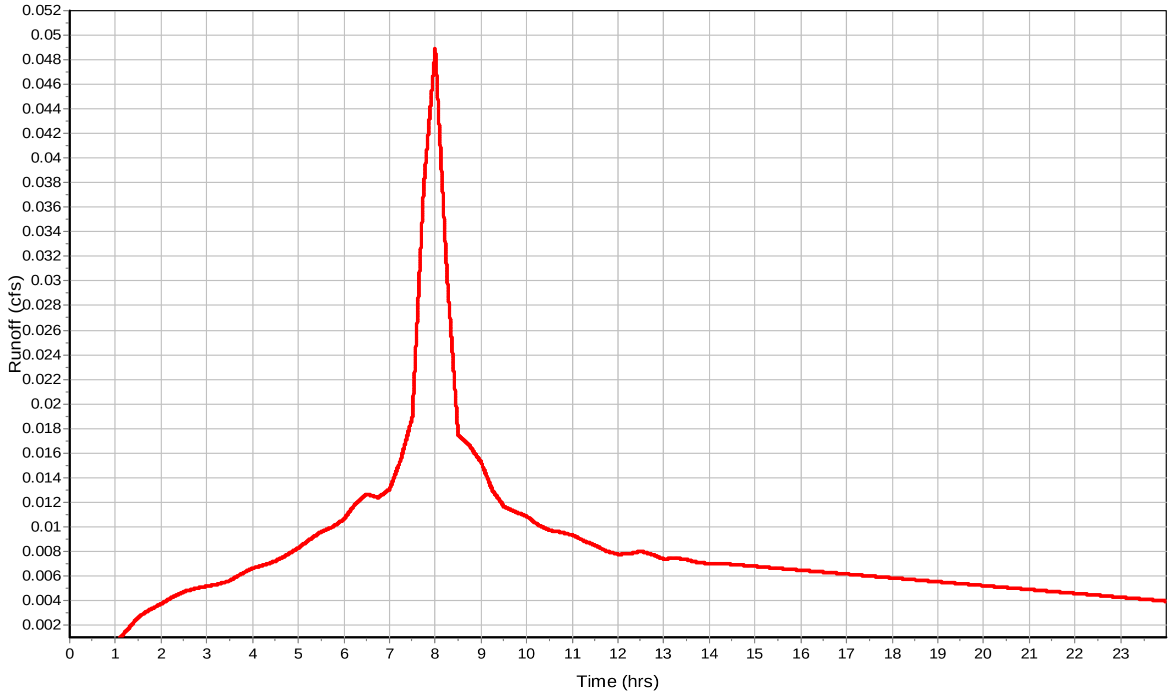
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_SE

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

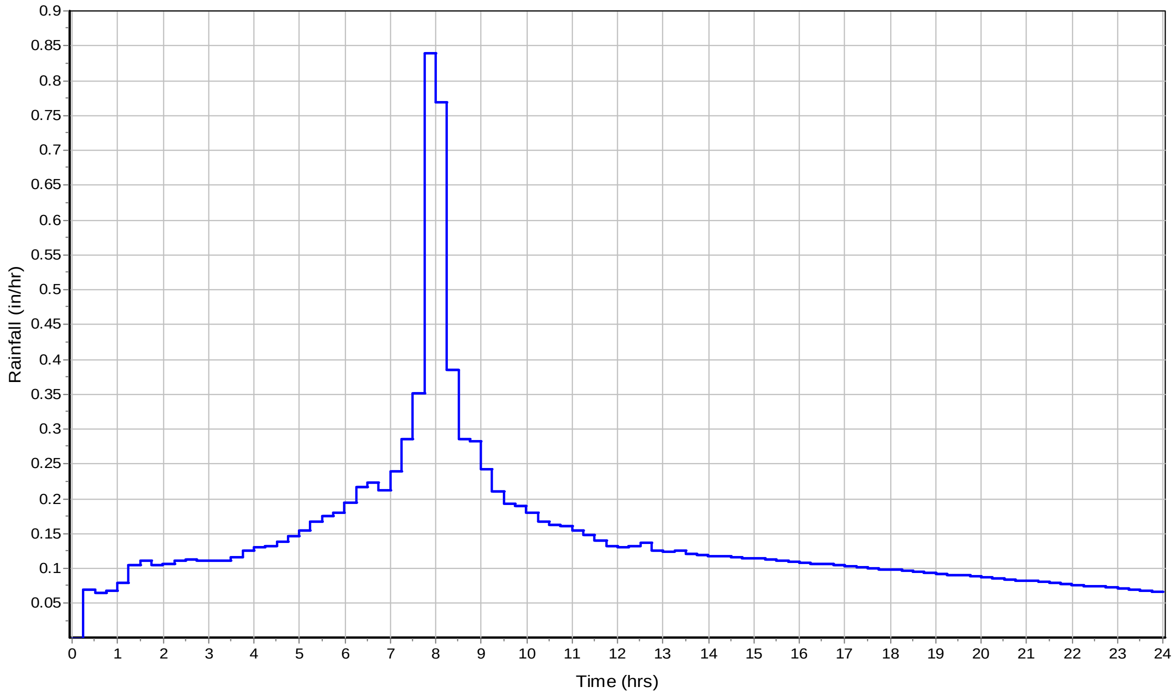
Time of Concentration

Subbasin Runoff Results

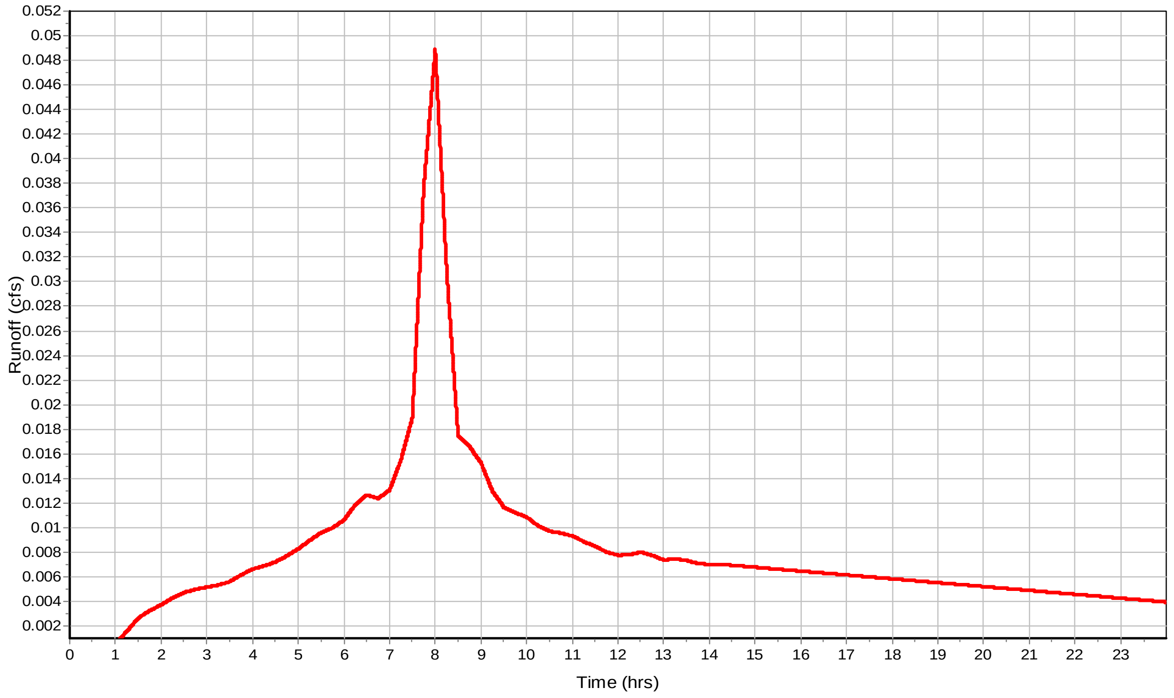
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG B_SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG B_SW

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

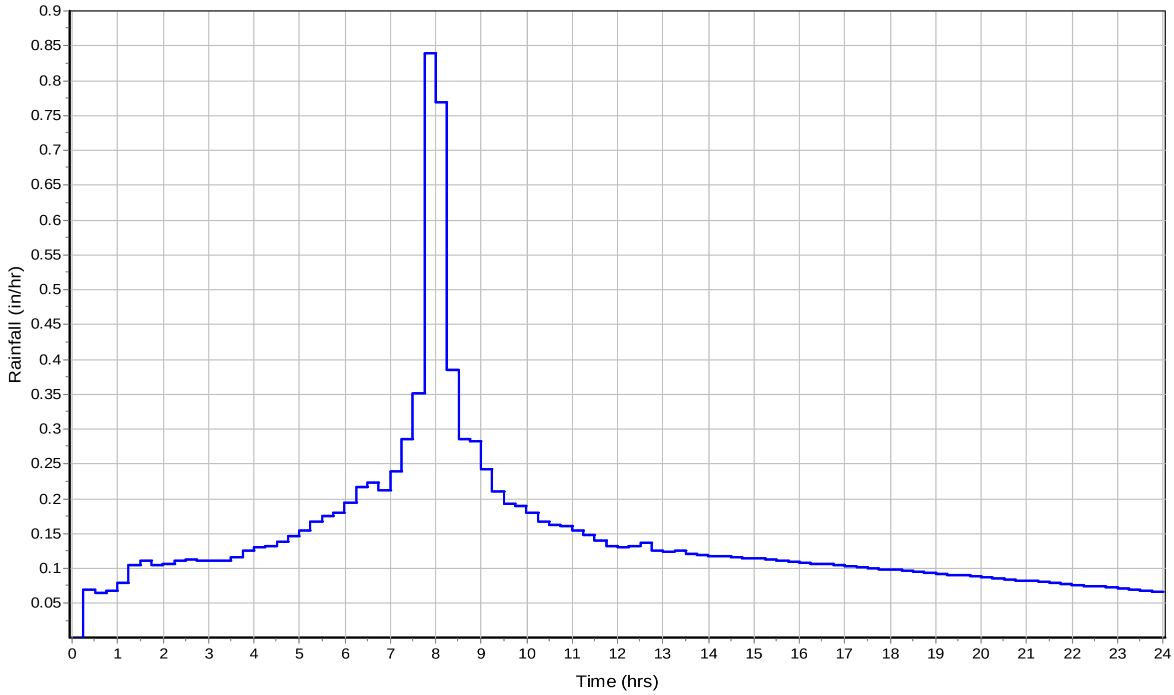
Time of Concentration

Subbasin Runoff Results

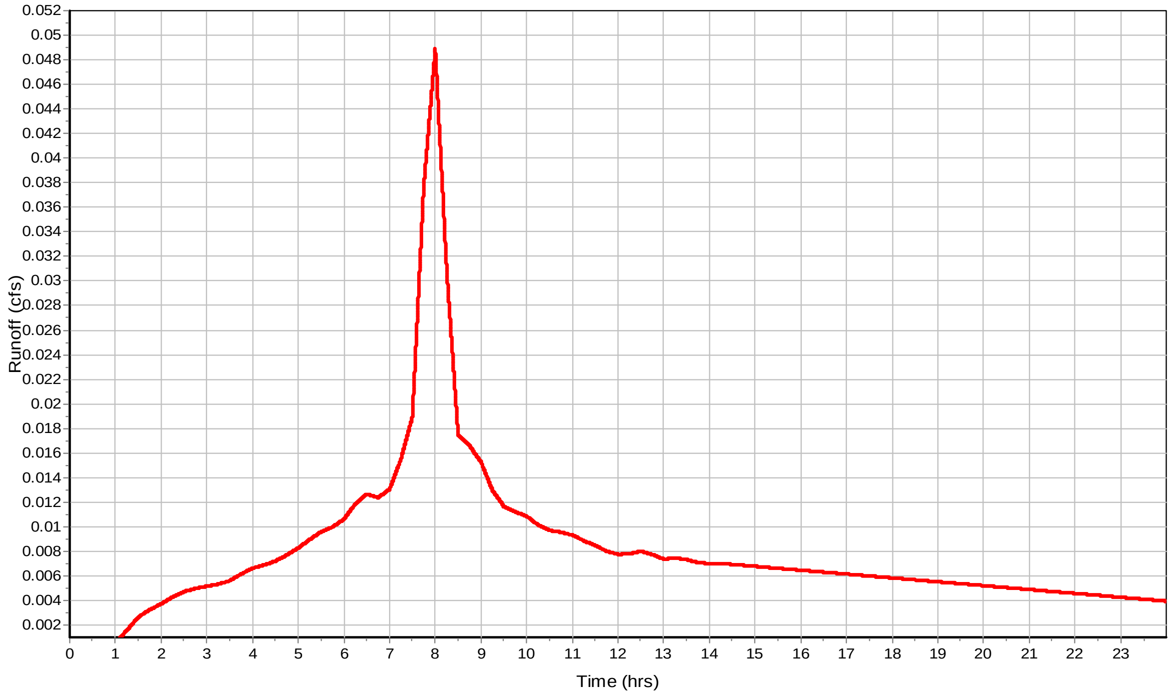
Total Rainfall (in) 3.46
Total Runoff (in) 3.24
Peak Runoff (cfs) 0.05
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG B_SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_NE

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

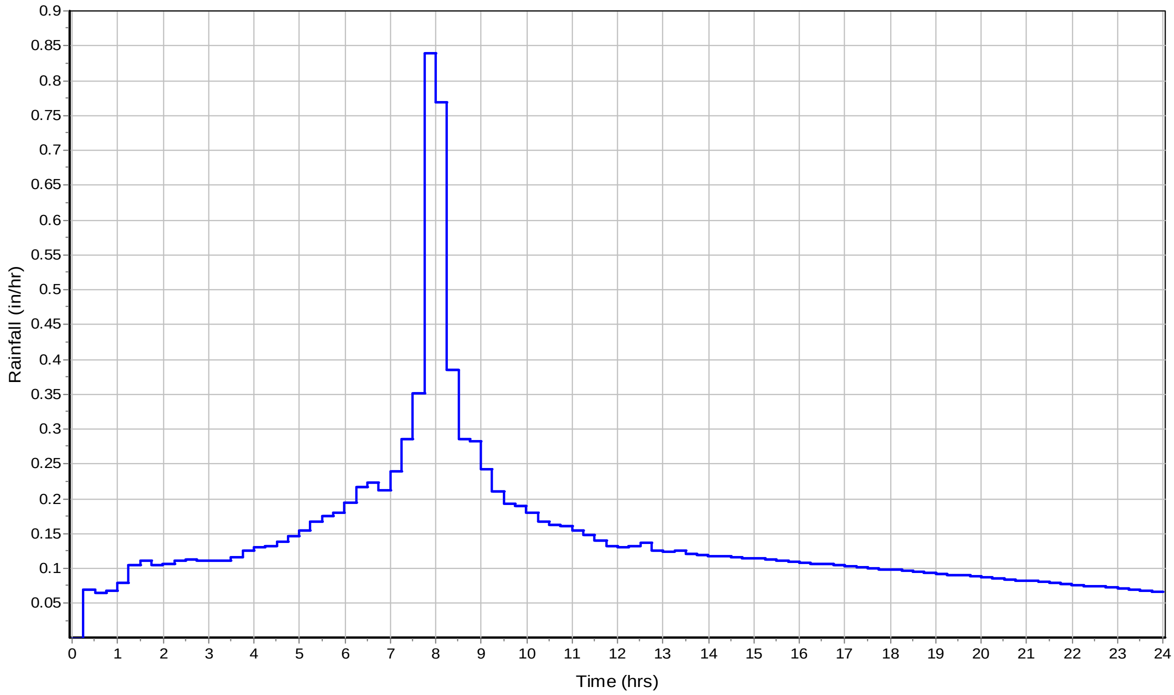
Time of Concentration

Subbasin Runoff Results

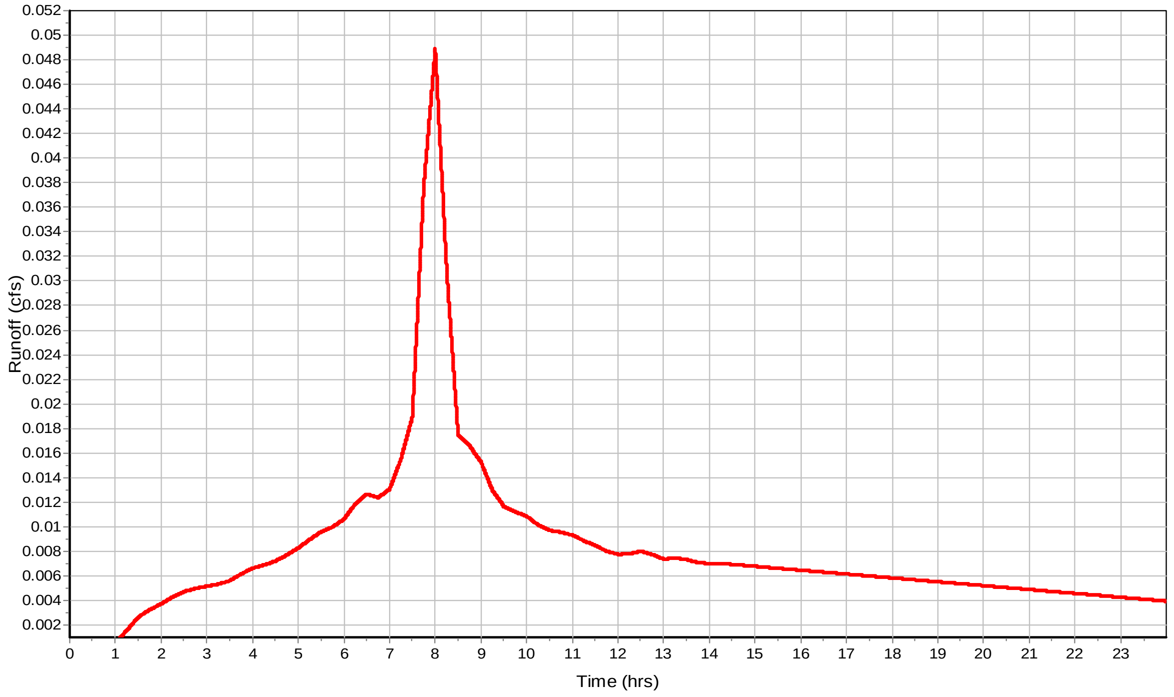
Total Rainfall (in) 3.46
Total Runoff (in) 3.24
Peak Runoff (cfs) 0.05
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG C_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_NW

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

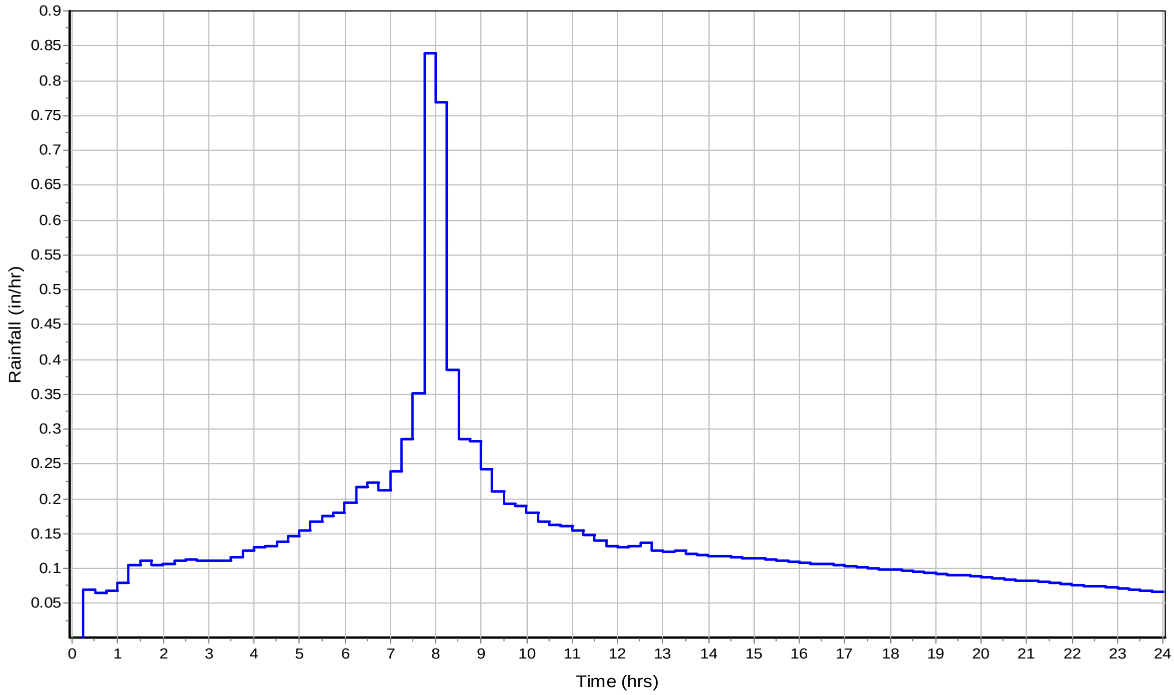
Time of Concentration

Subbasin Runoff Results

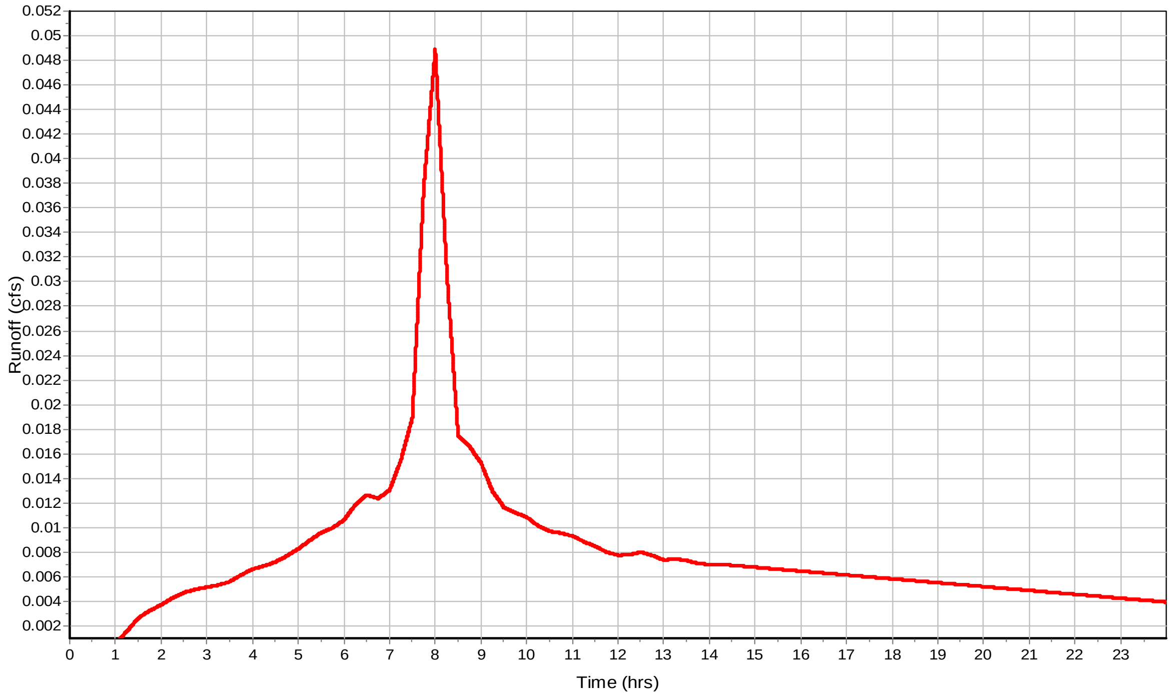
Total Rainfall (in) 3.46
Total Runoff (in) 3.24
Peak Runoff (cfs) 0.05
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG C_NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_SE

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

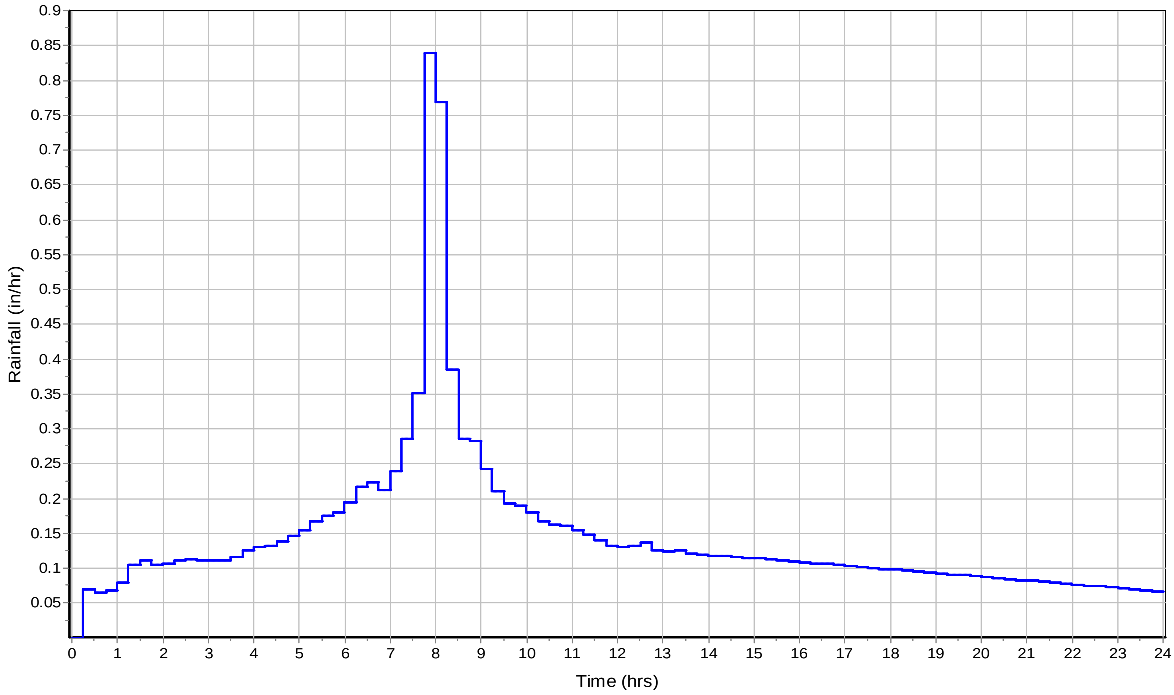
Time of Concentration

Subbasin Runoff Results

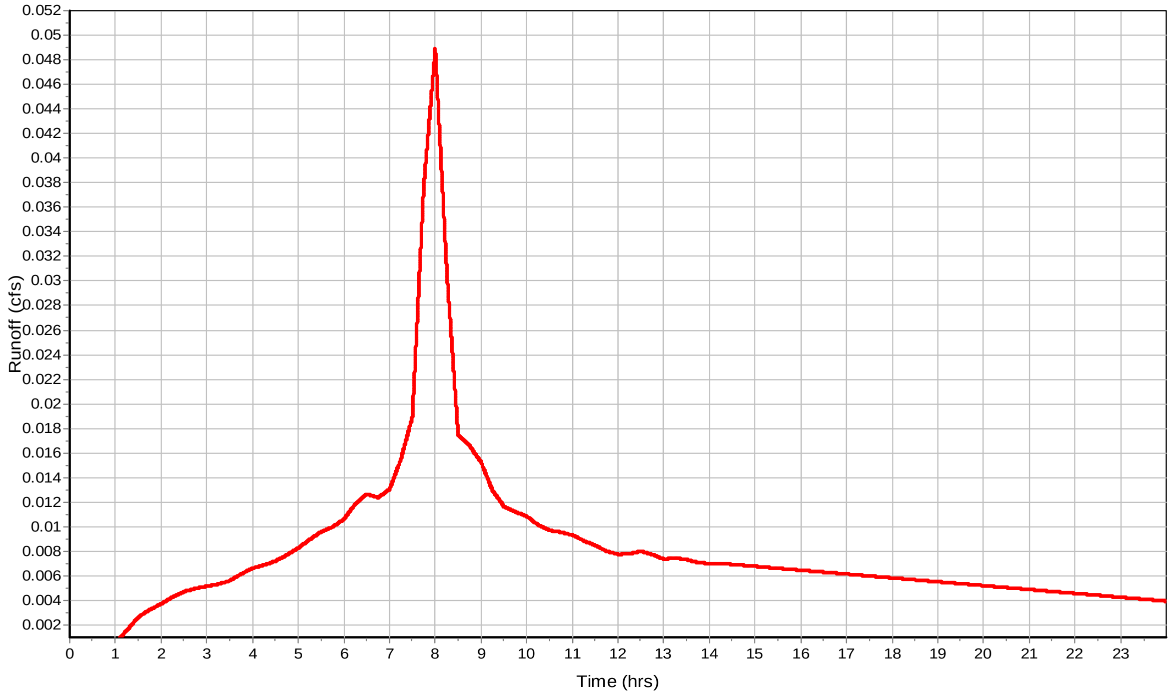
Total Rainfall (in) 3.46
Total Runoff (in) 3.24
Peak Runoff (cfs) 0.05
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG C_SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG C_SW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.06		98

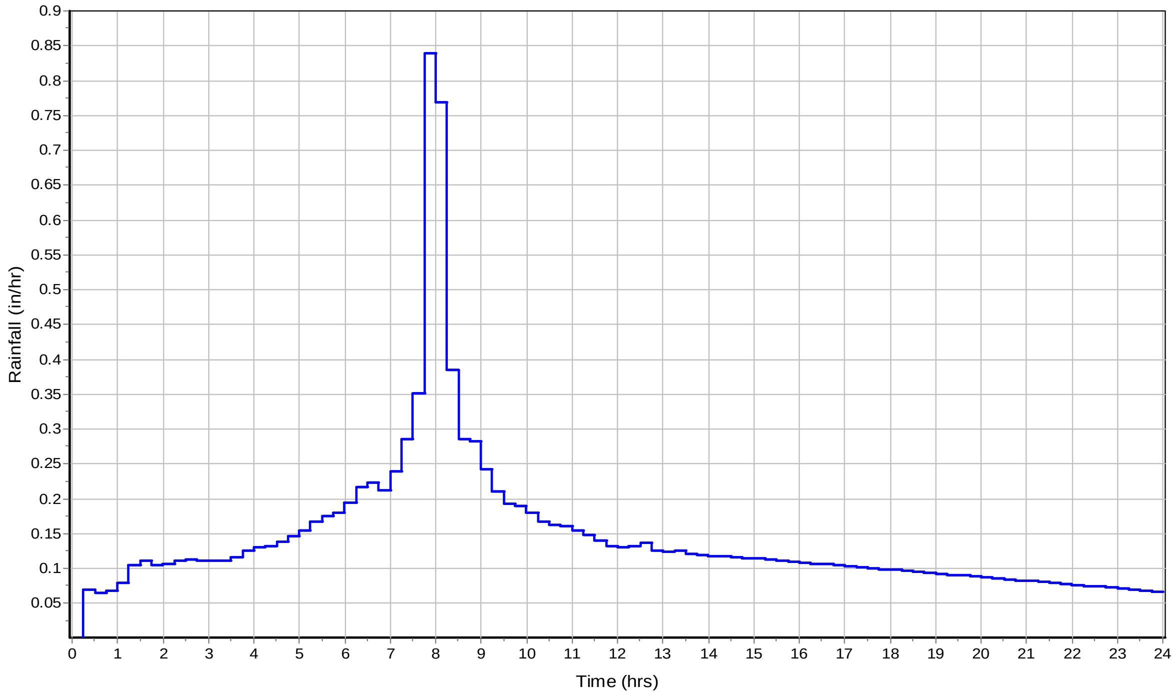
Time of Concentration

Subbasin Runoff Results

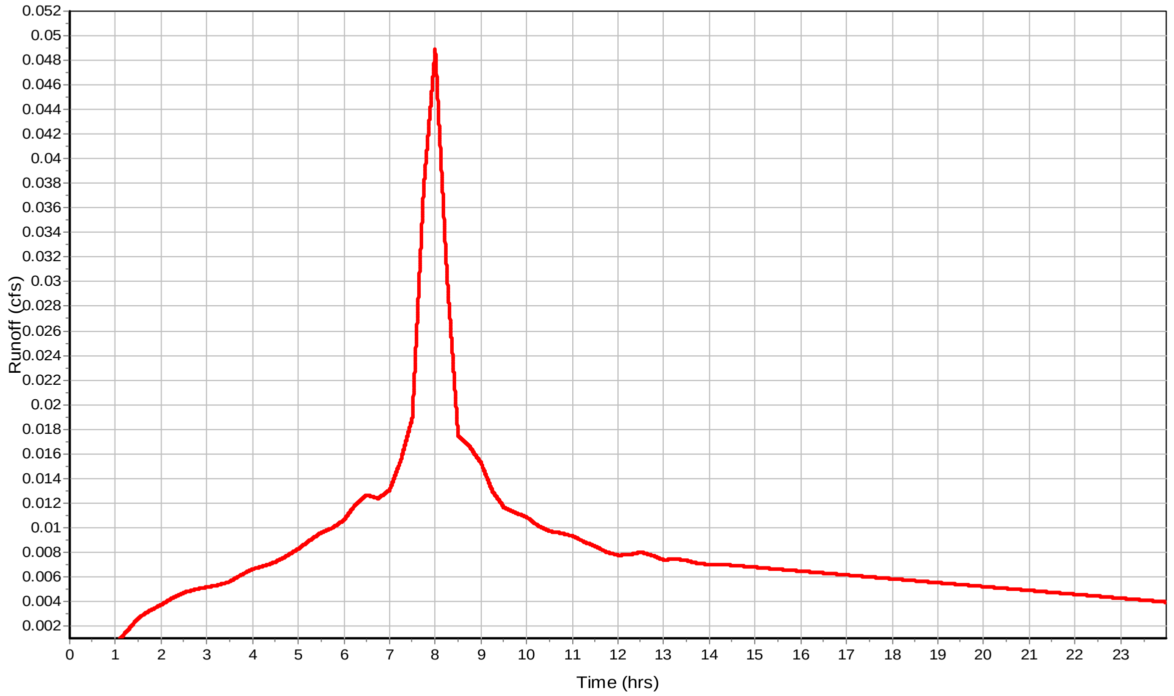
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG C_SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG CLUB_EAST

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

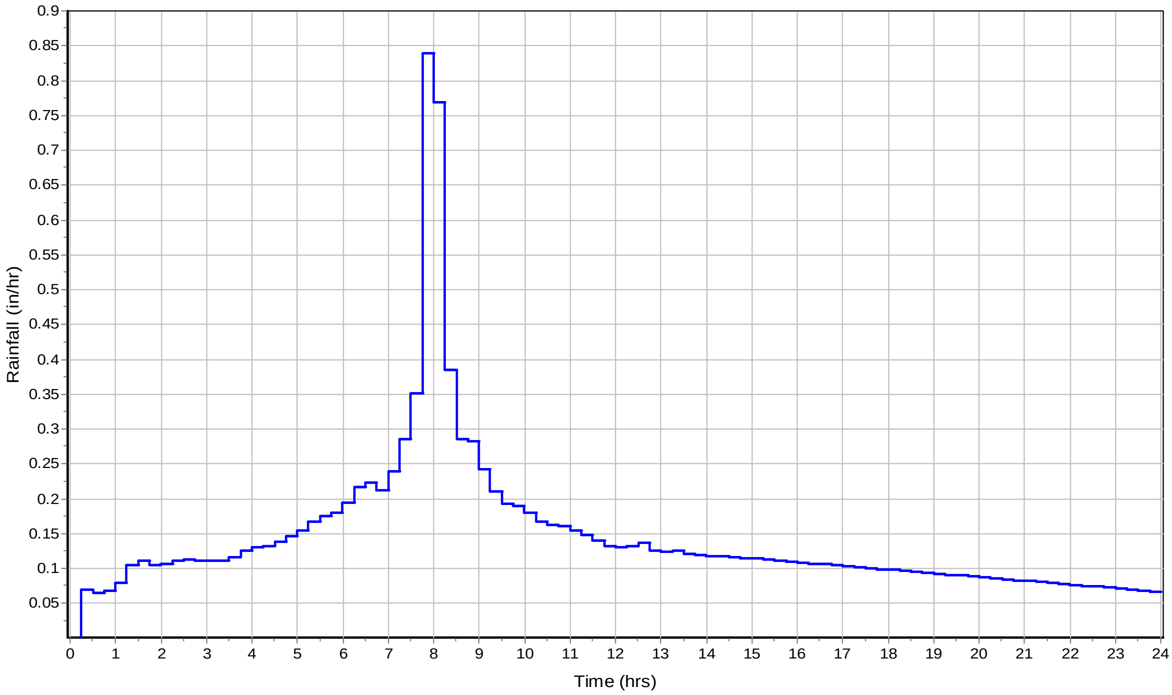
Time of Concentration

Subbasin Runoff Results

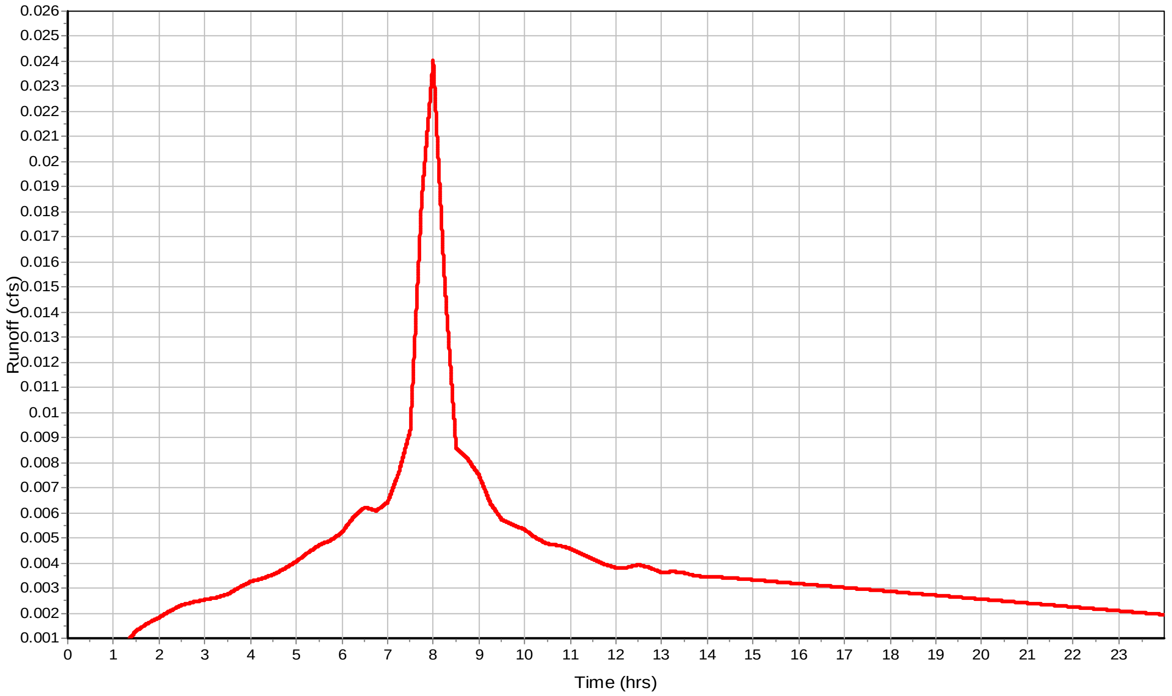
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG CLUB_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG CLUB_WEST

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

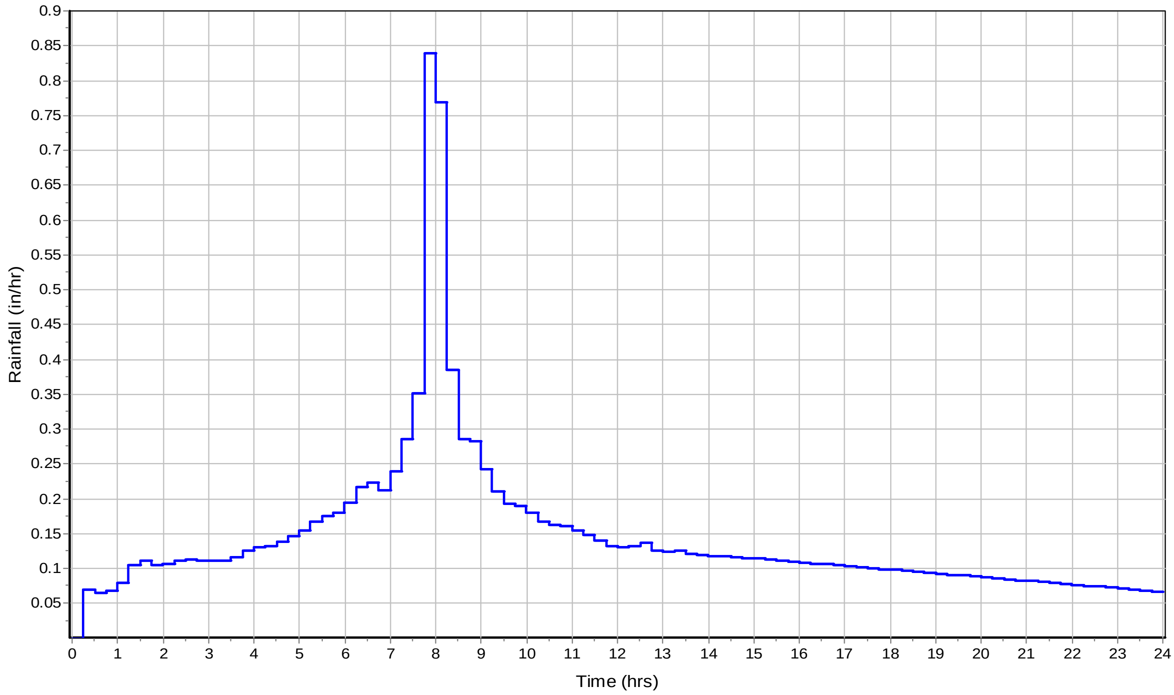
Time of Concentration

Subbasin Runoff Results

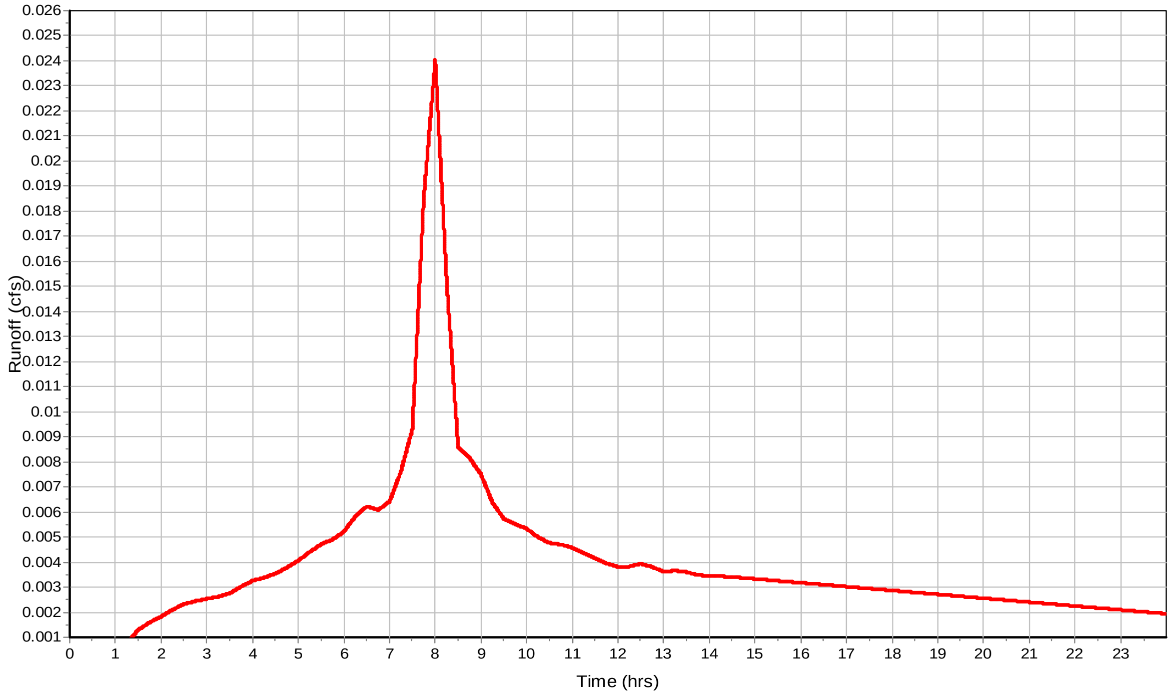
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG CLUB_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_NE

Input Data

Area (ac) 0.06
Impervious Area (%) 100
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

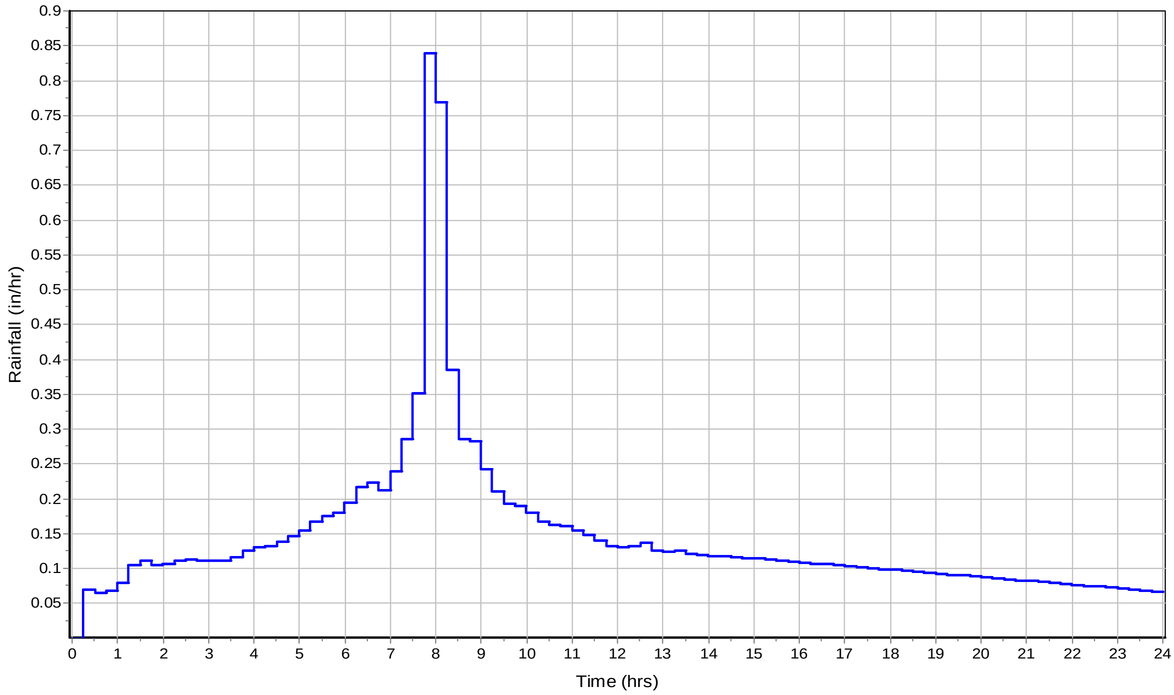
Time of Concentration

Subbasin Runoff Results

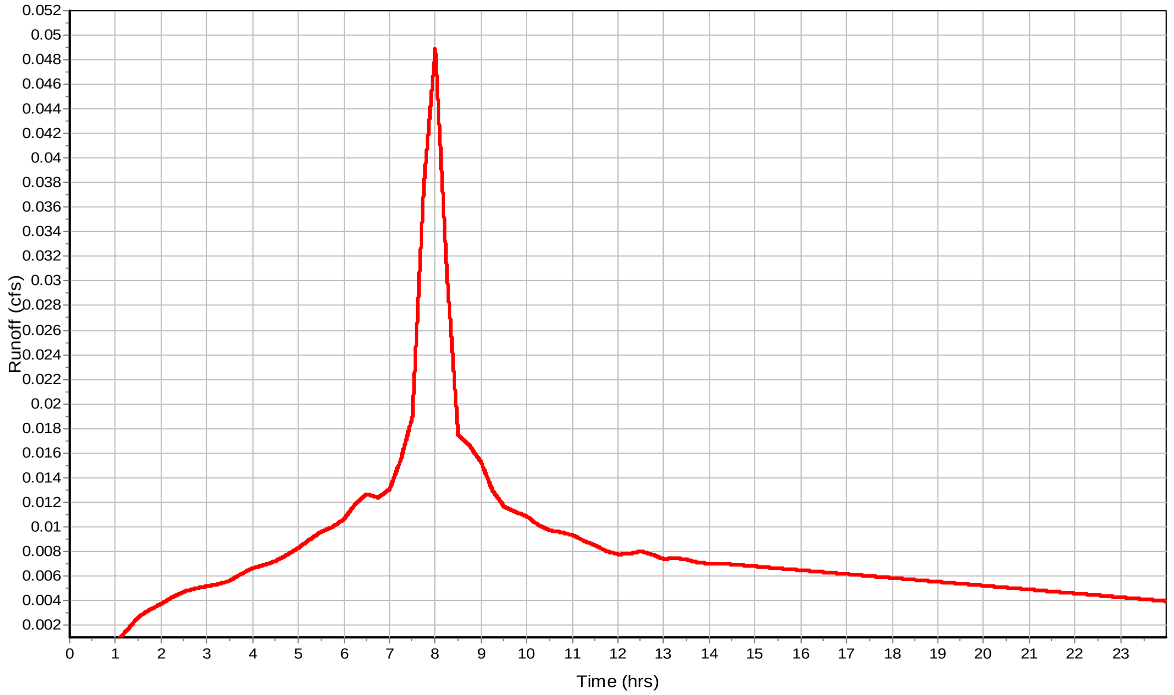
Total Rainfall (in) 3.46
Total Runoff (in) 3.24
Peak Runoff (cfs) 0.05
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : BLDG D_NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG D_NW

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

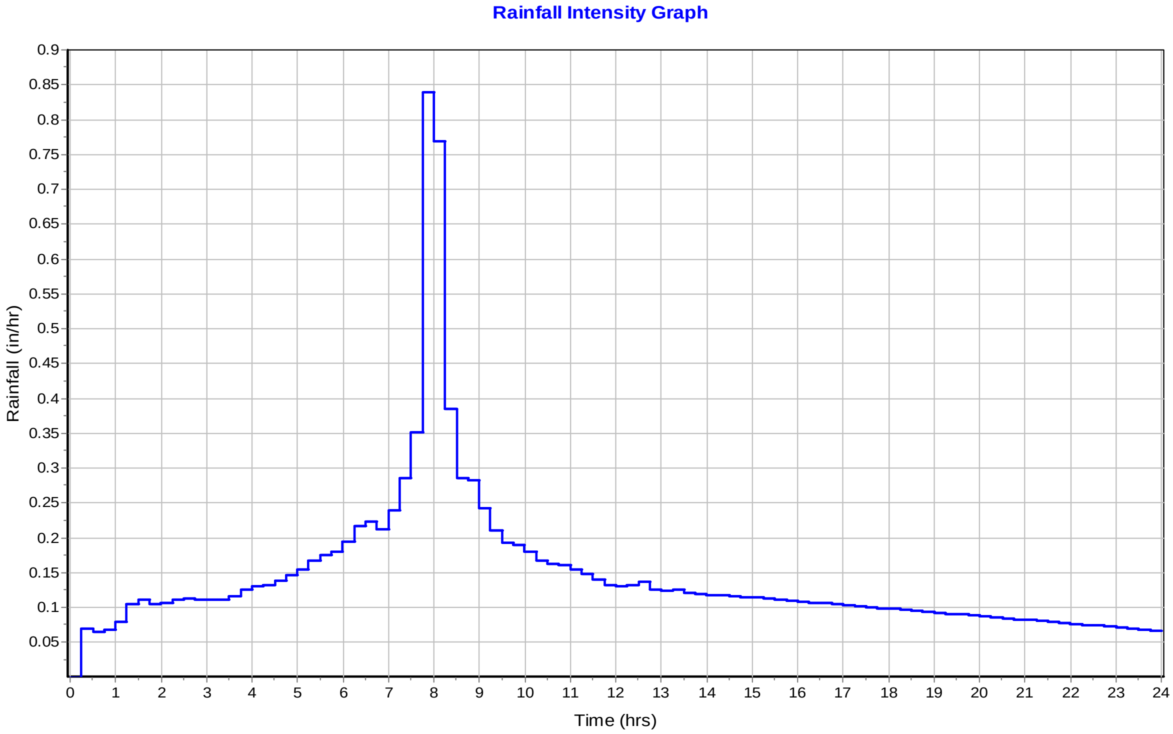
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

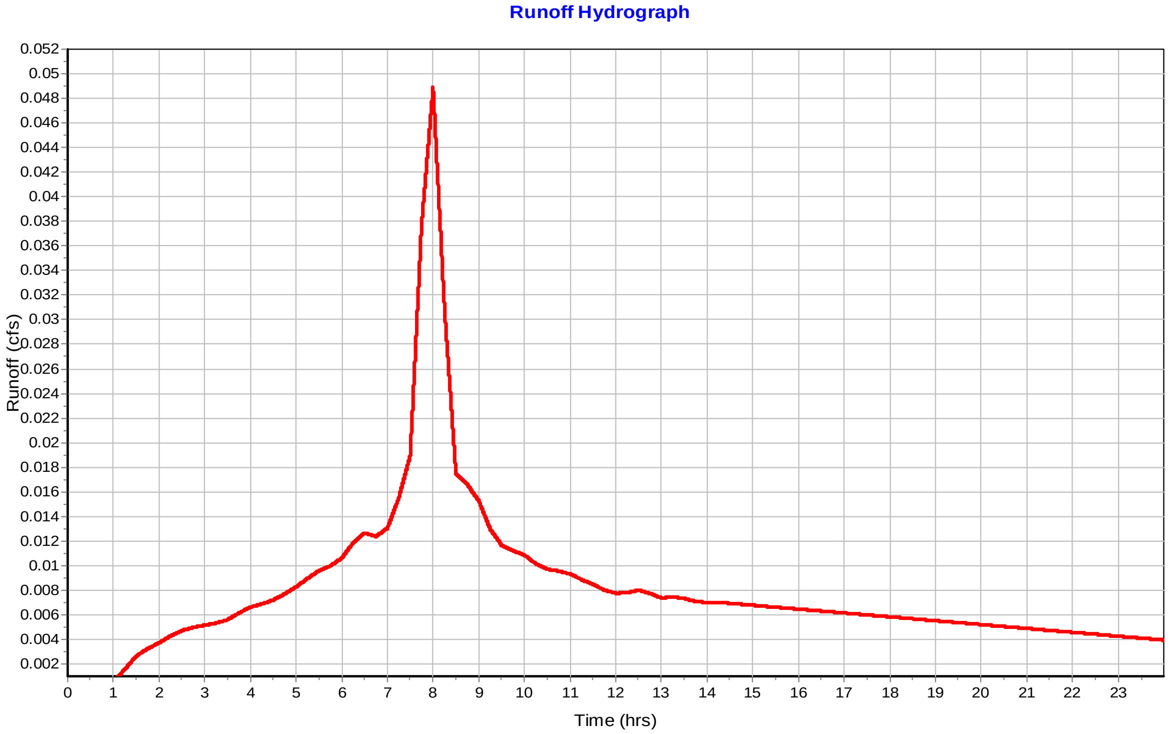
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_NW





Subbasin : BLDG D_SOUTH

Input Data

Area (ac)	0.12
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.12		98

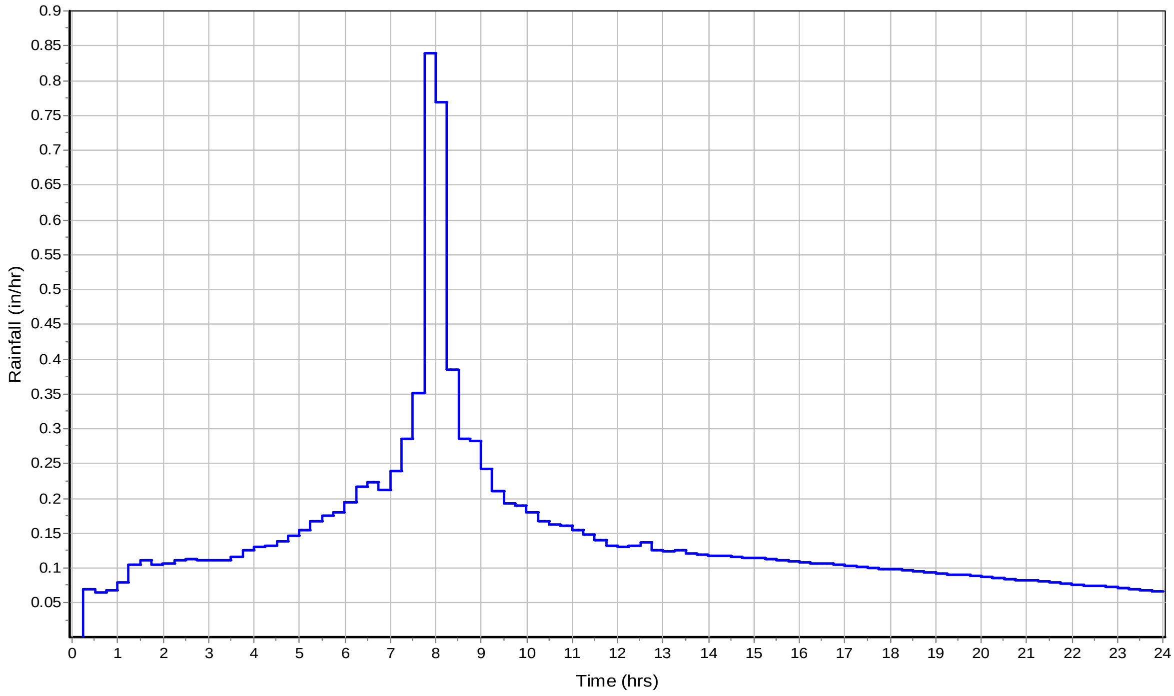
Time of Concentration

Subbasin Runoff Results

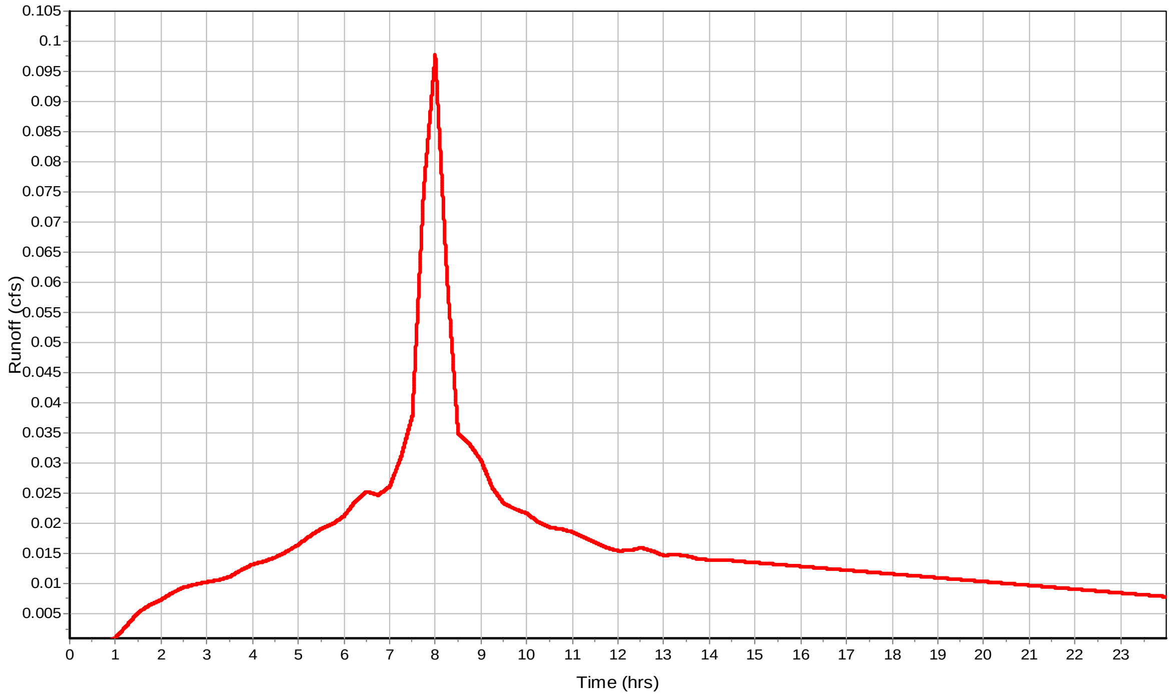
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.1
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG D_SOUTH

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG E_EAST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

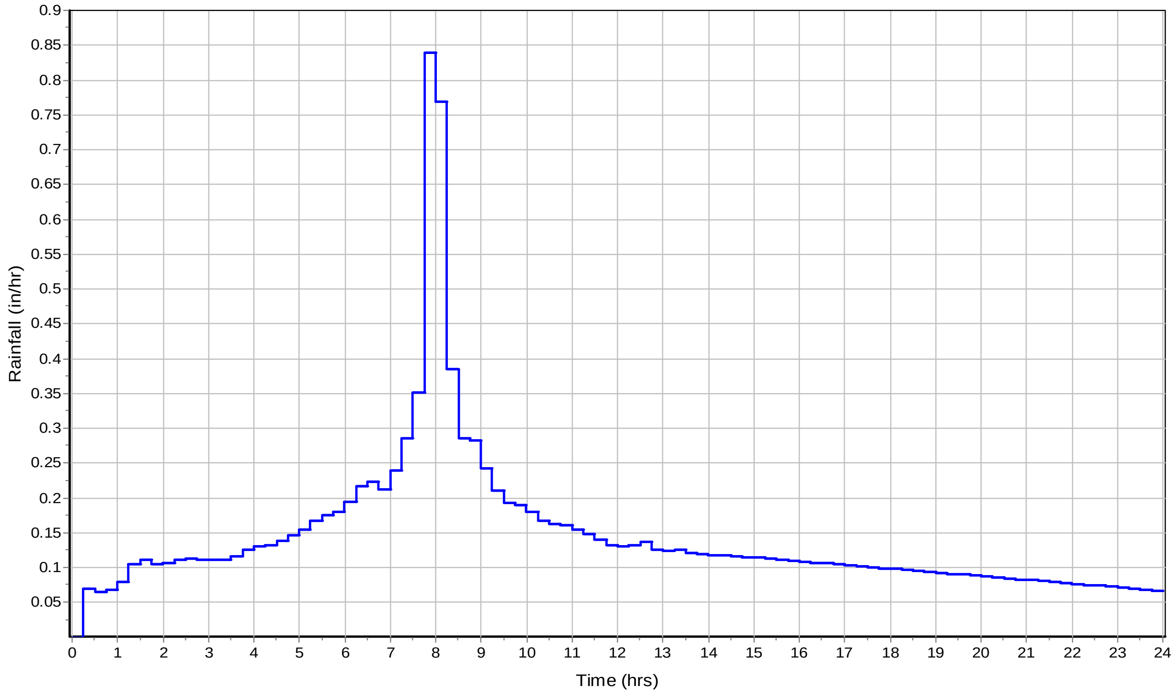
Time of Concentration

Subbasin Runoff Results

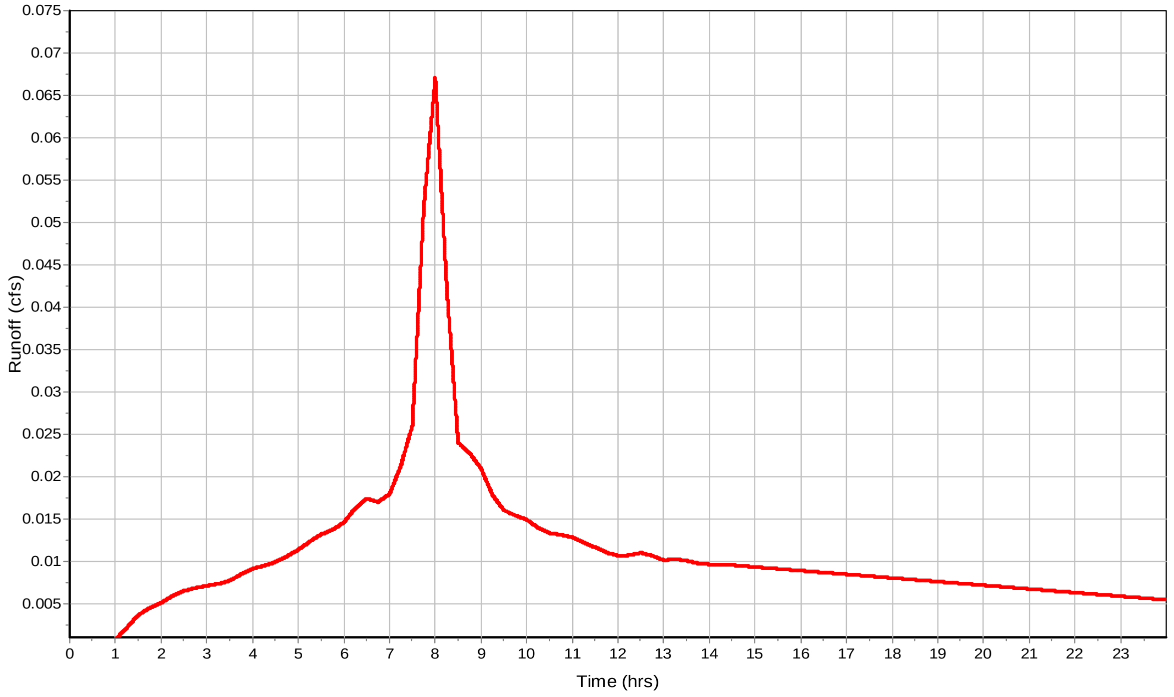
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG E_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG E_WEST

Input Data

Area (ac)	0.16
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.16		98

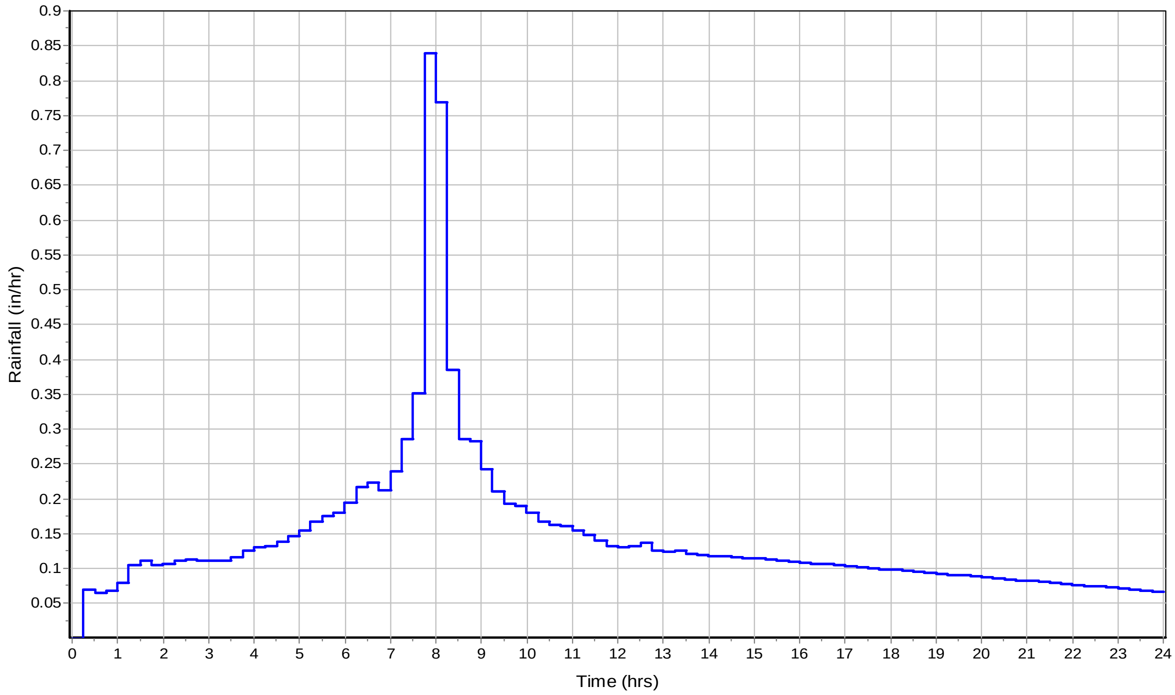
Time of Concentration

Subbasin Runoff Results

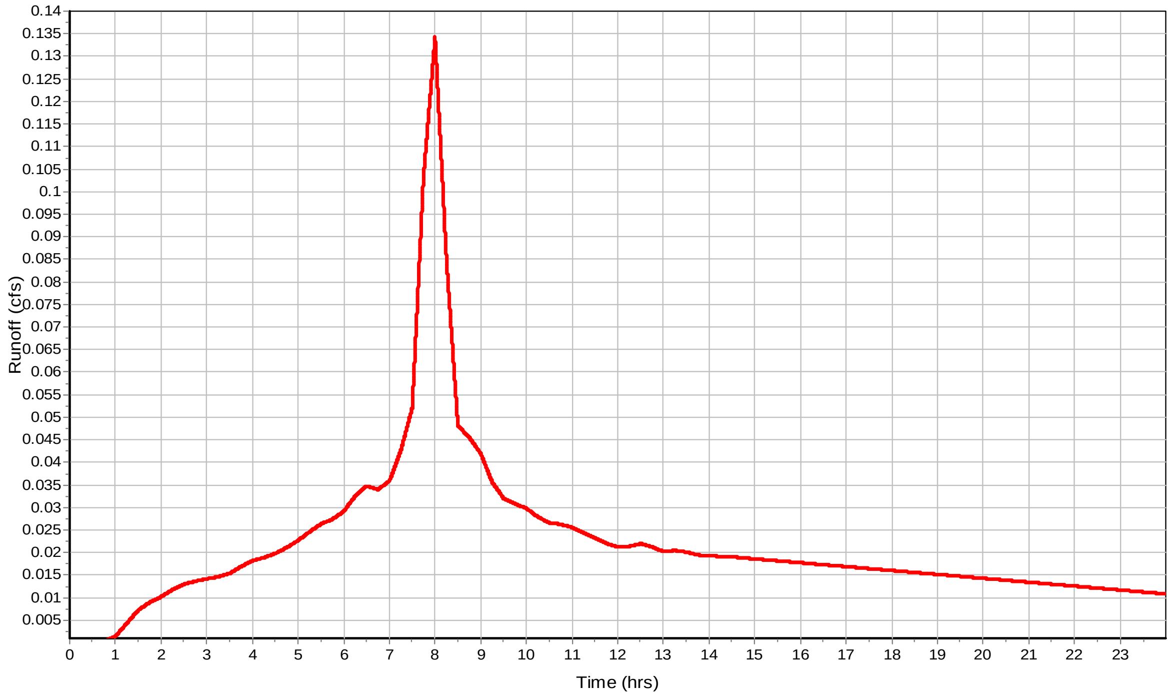
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.13
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG E_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG F_EAST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

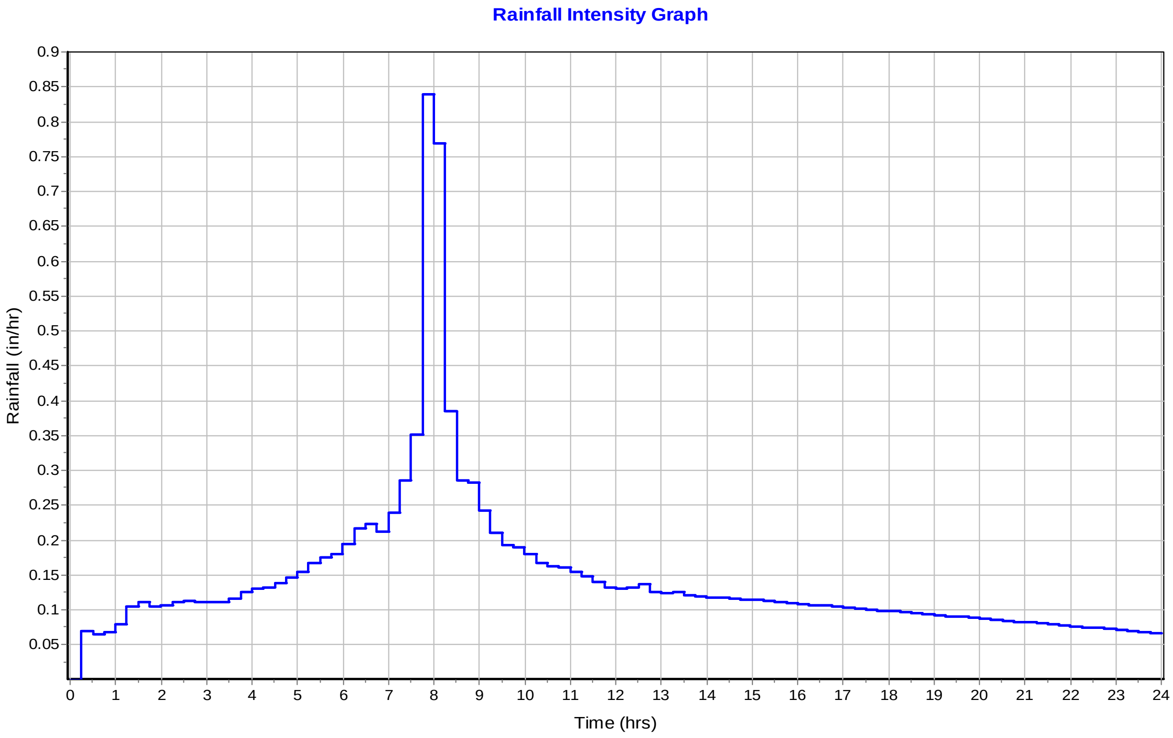
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

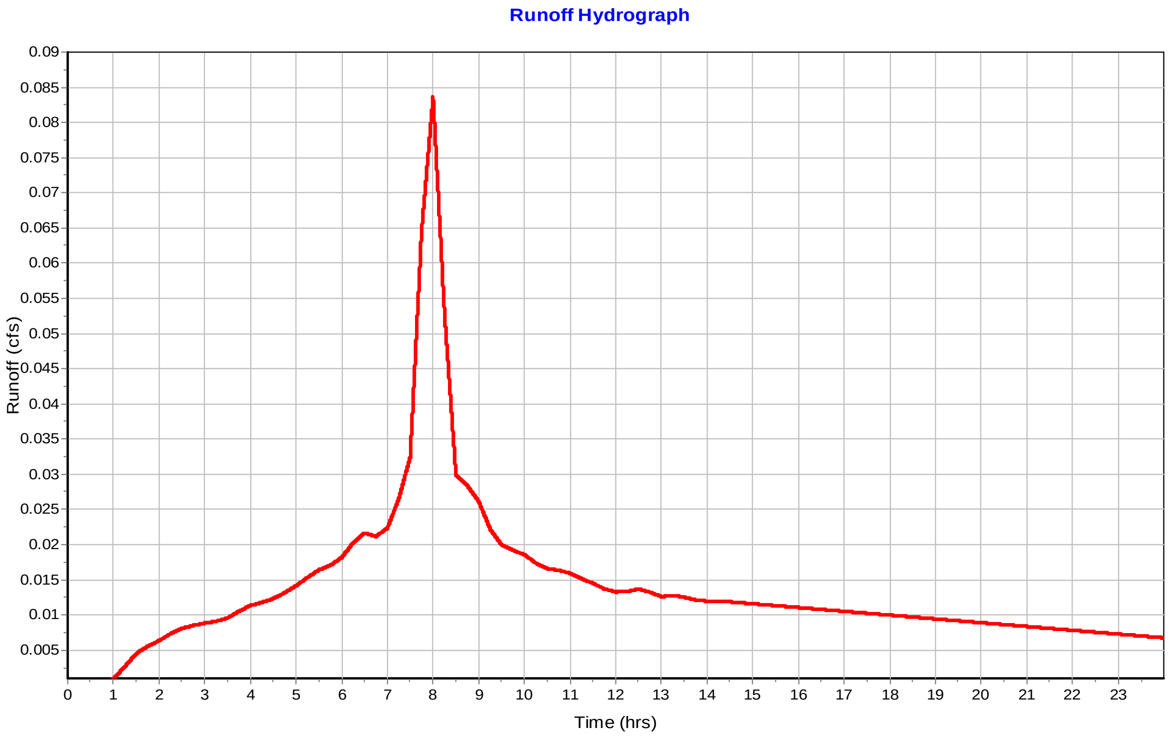
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG F_EAST





Subbasin : BLDG F_WEST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

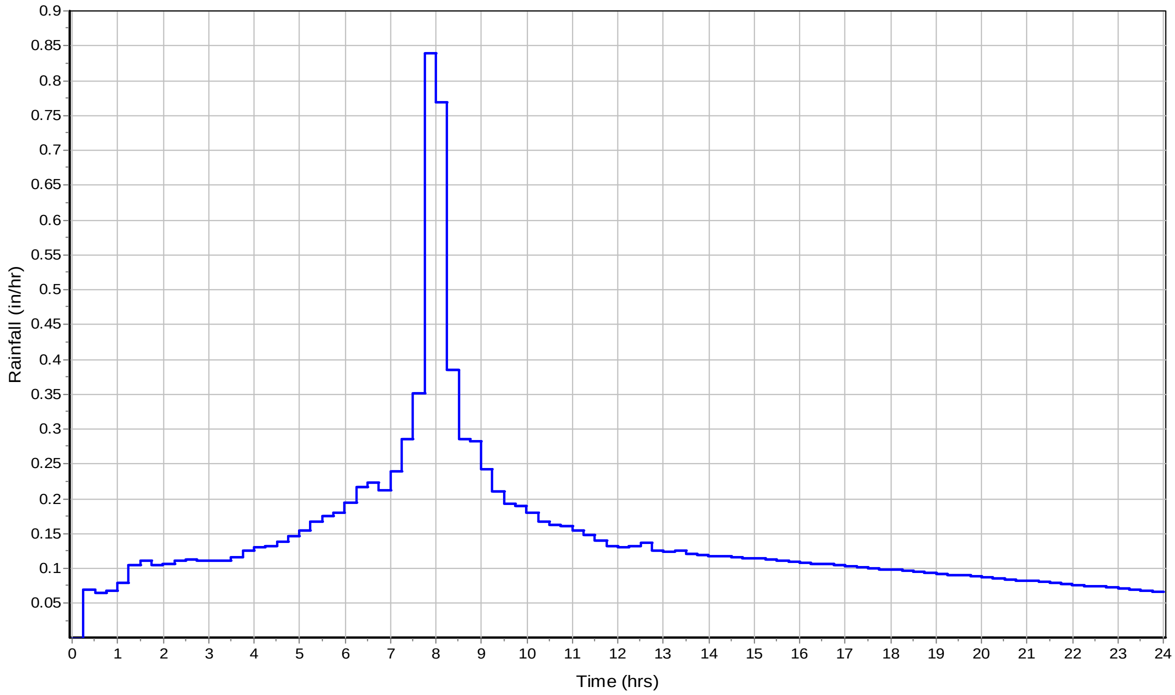
Time of Concentration

Subbasin Runoff Results

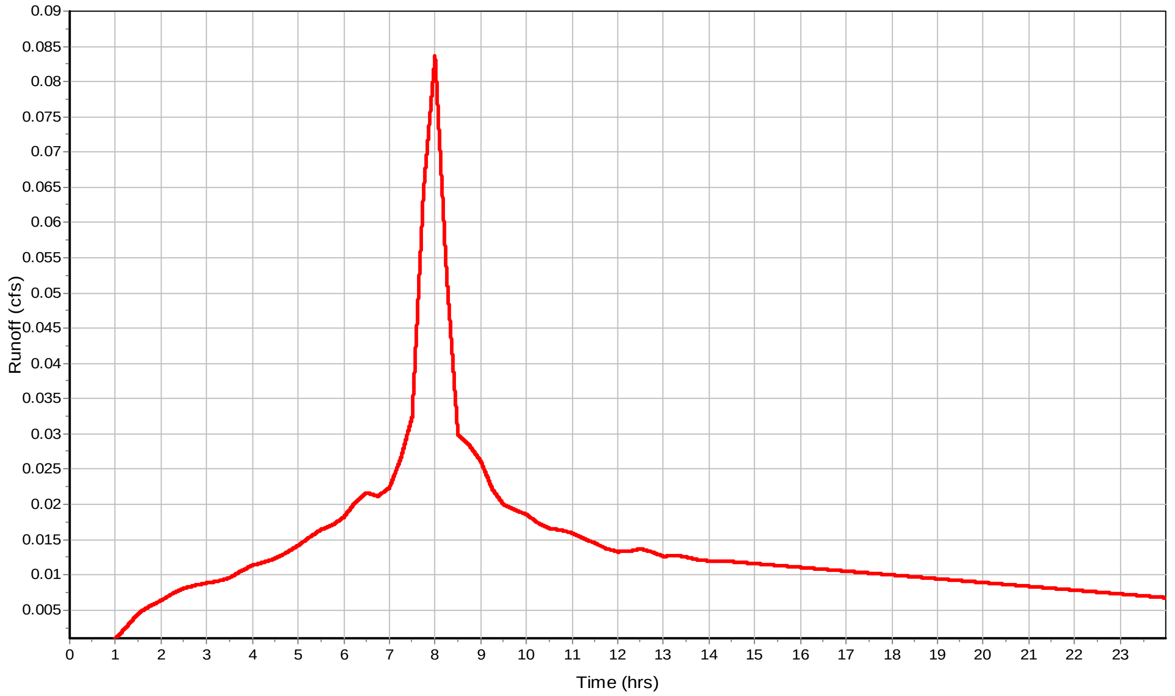
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG F_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG G_EAST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

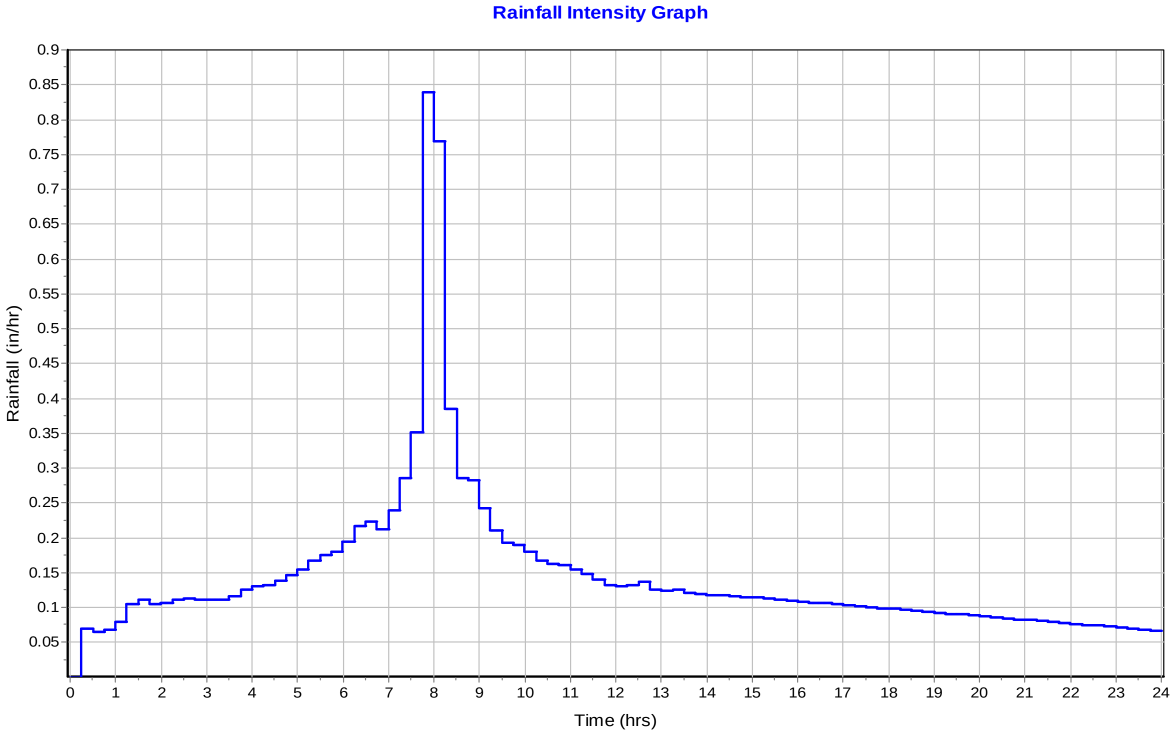
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

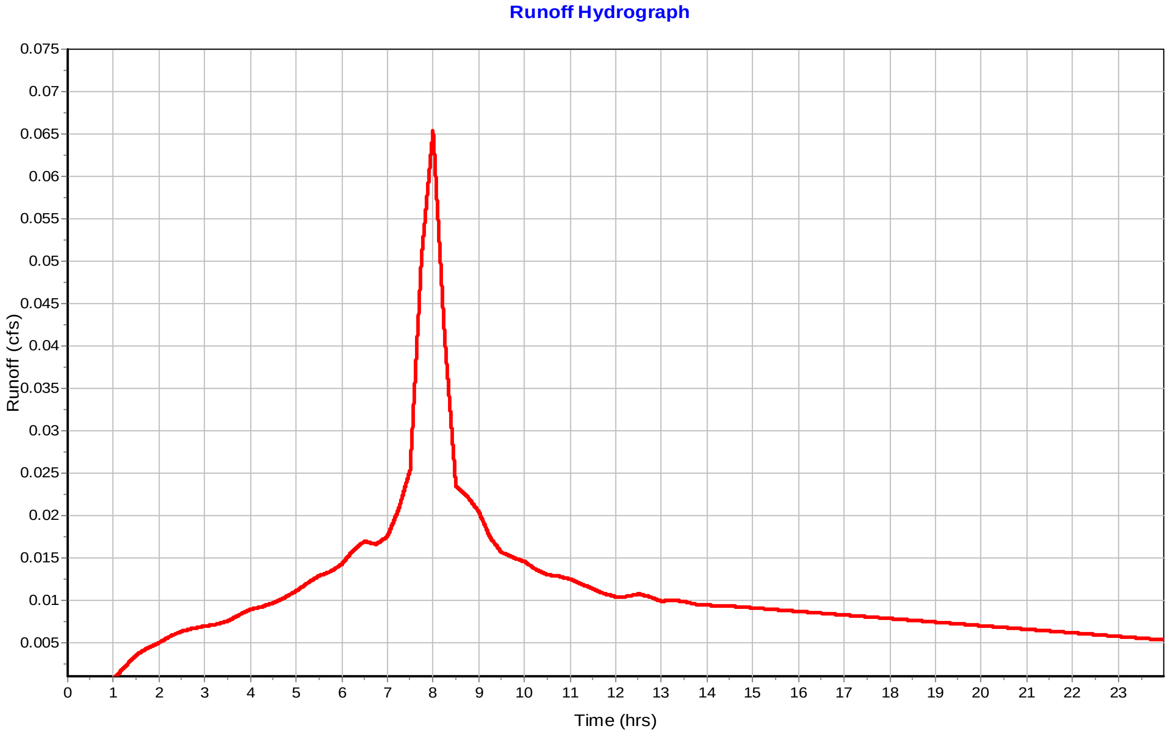
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG G_EAST





Subbasin : BLDG G_WEST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

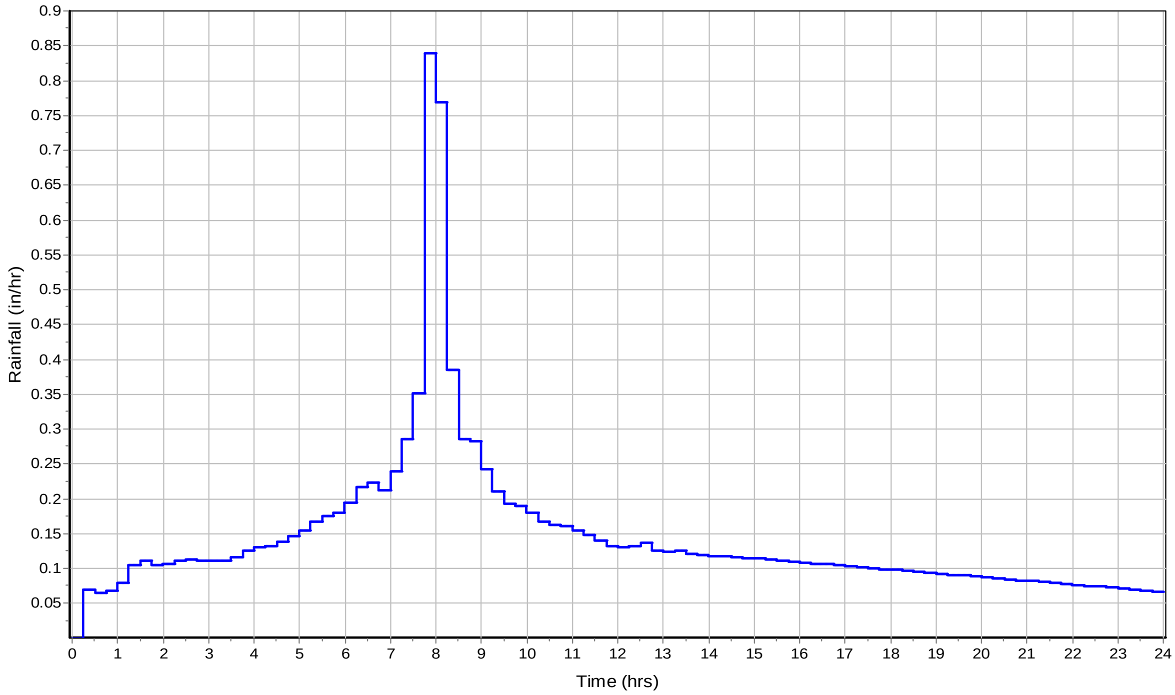
Time of Concentration

Subbasin Runoff Results

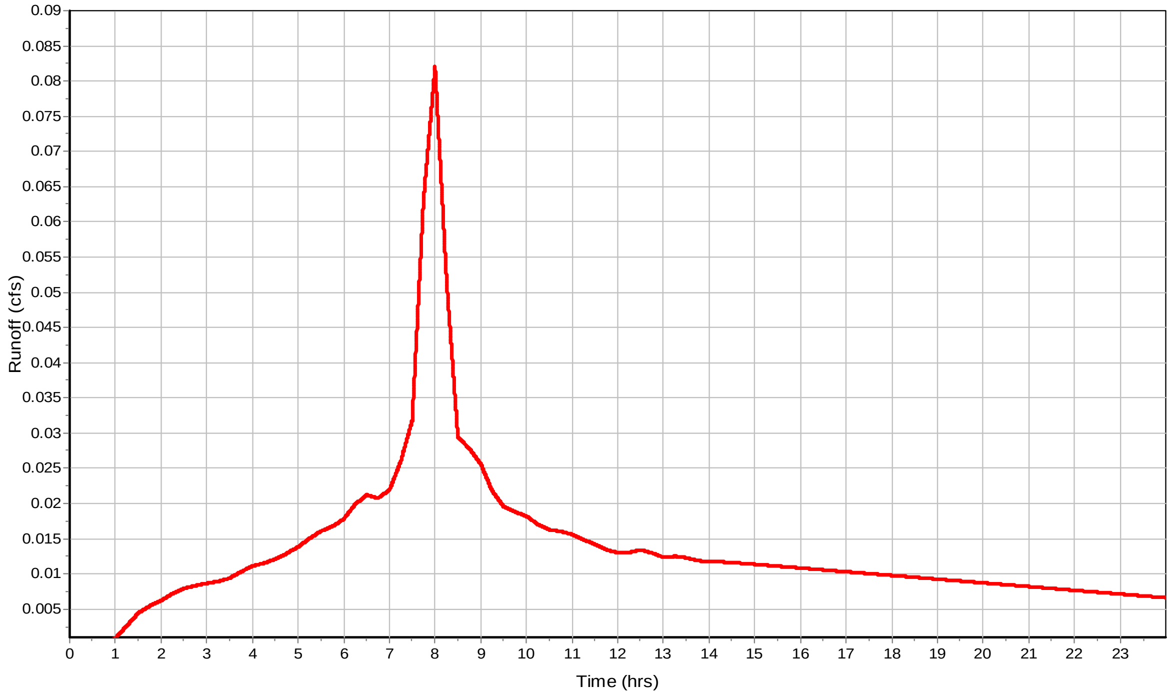
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG G_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG H_EAST

Input Data

Area (ac)	0.1
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		98

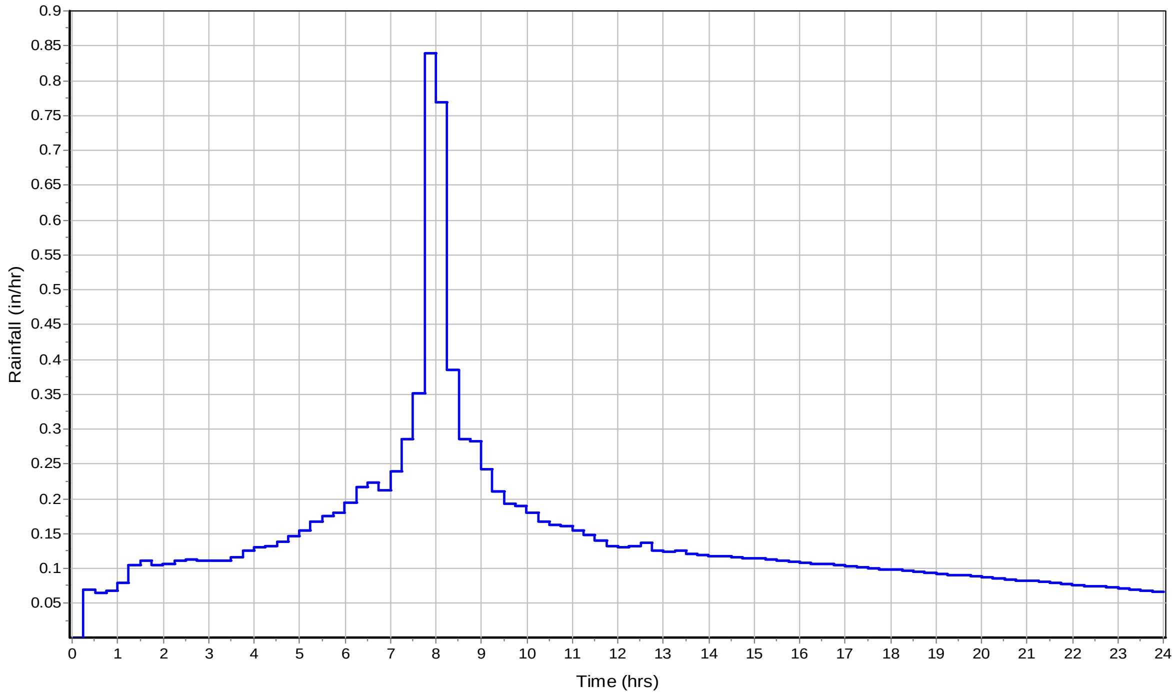
Time of Concentration

Subbasin Runoff Results

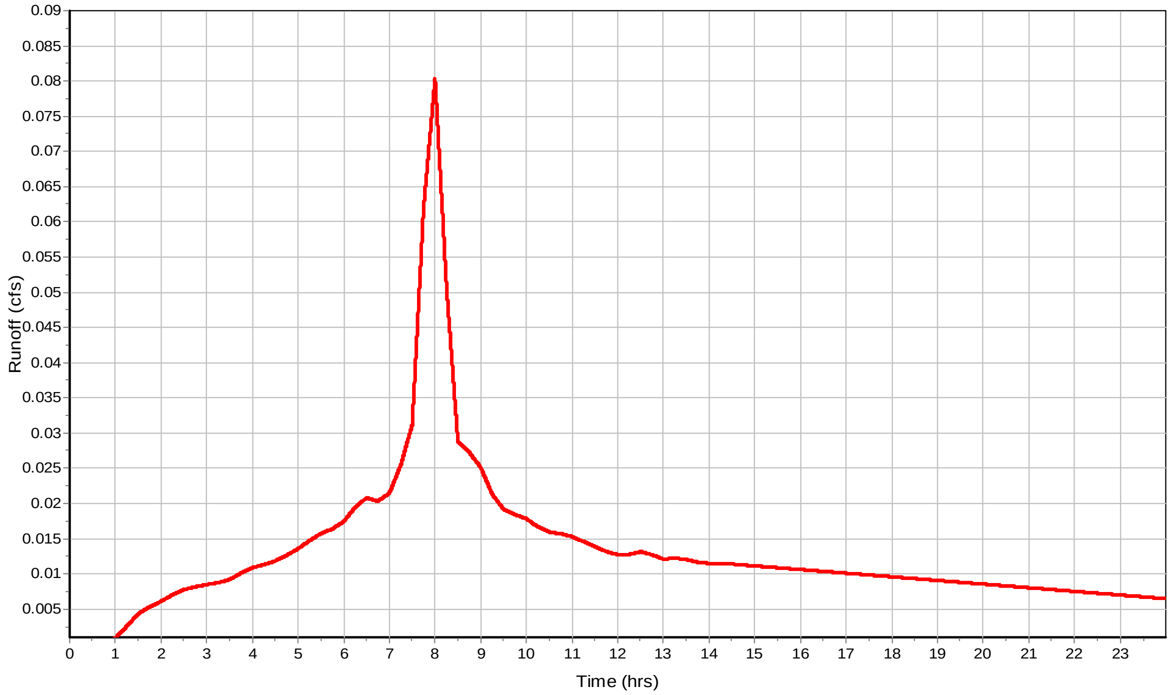
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG H_EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG H_WEST

Input Data

Area (ac)	0.08
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.08		98

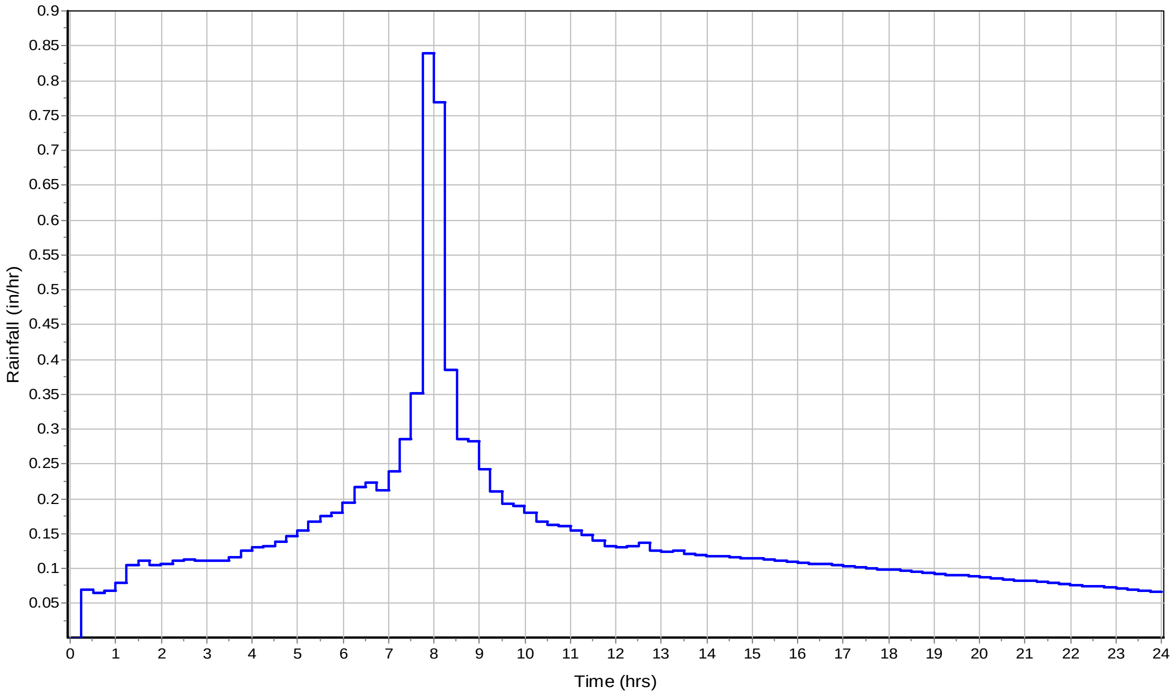
Time of Concentration

Subbasin Runoff Results

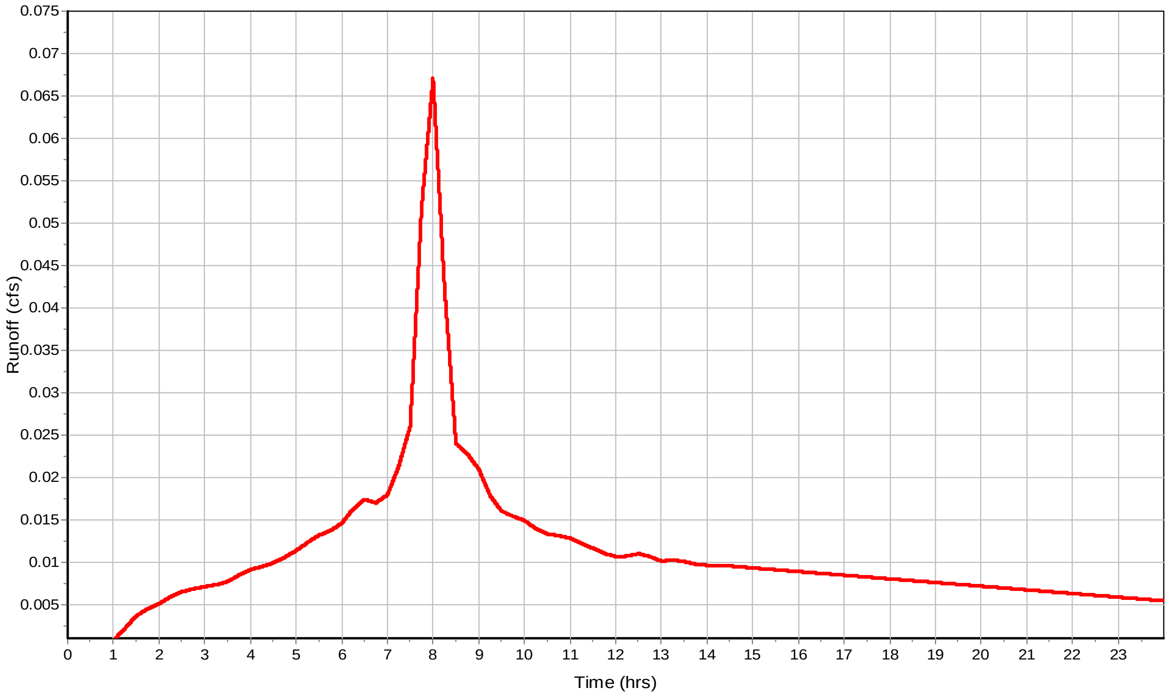
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG H_WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. EAST

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.05		98

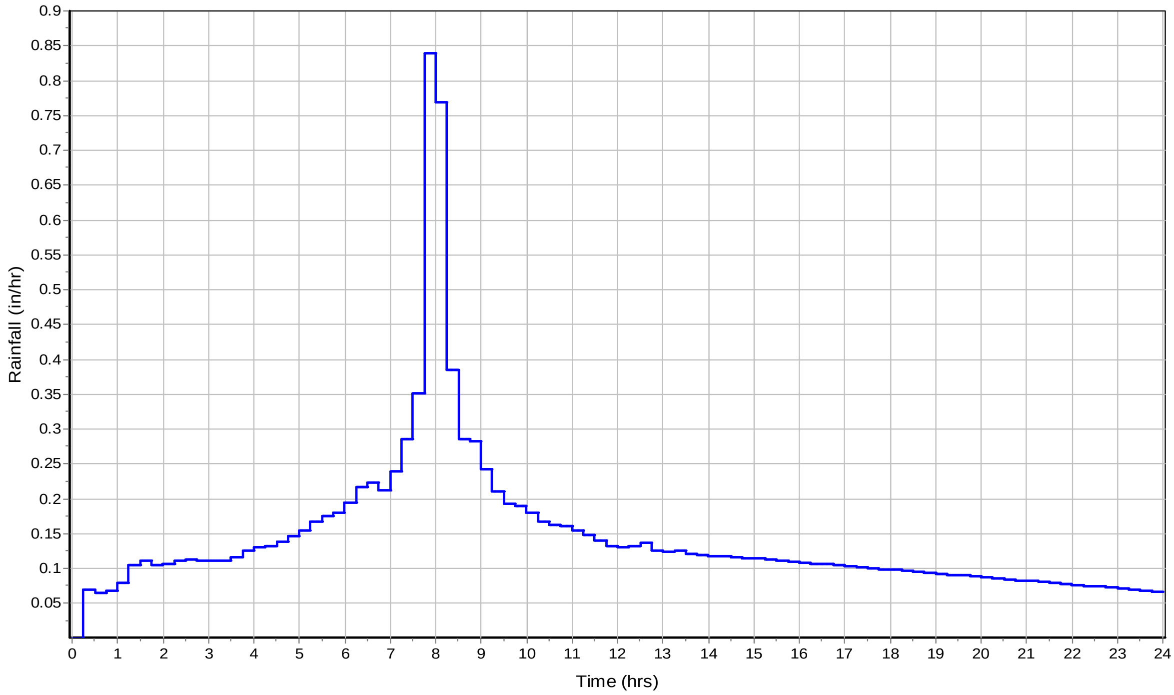
Time of Concentration

Subbasin Runoff Results

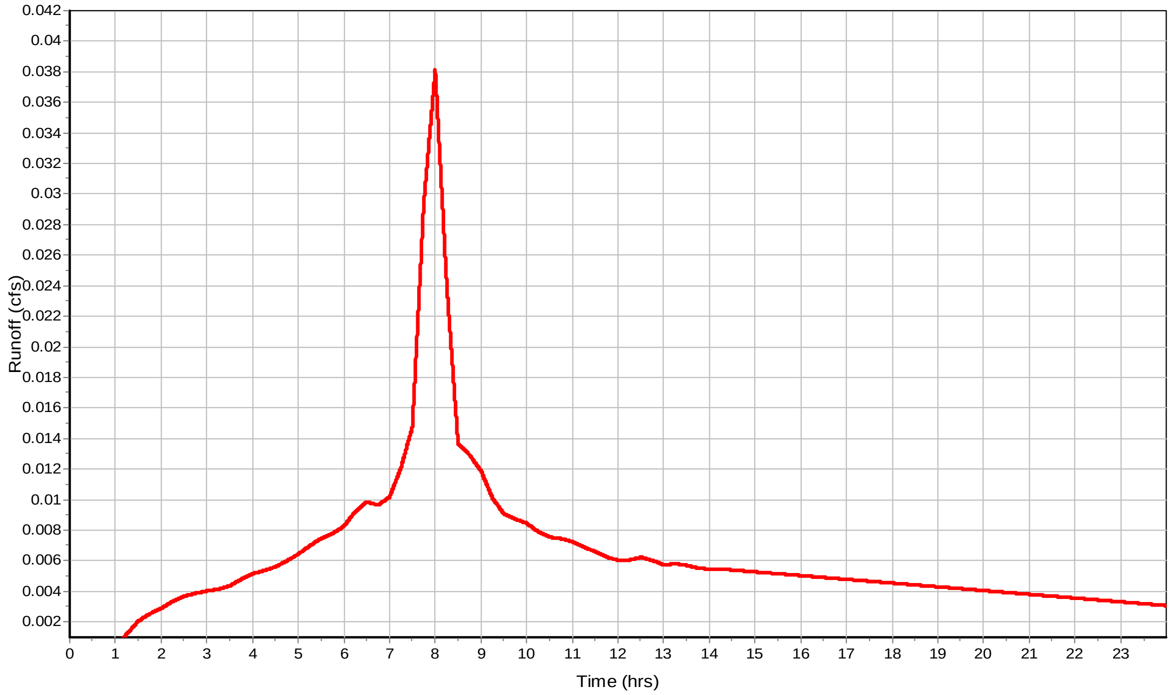
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. EAST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. NE

Input Data

Area (ac)	0.02
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.02		98

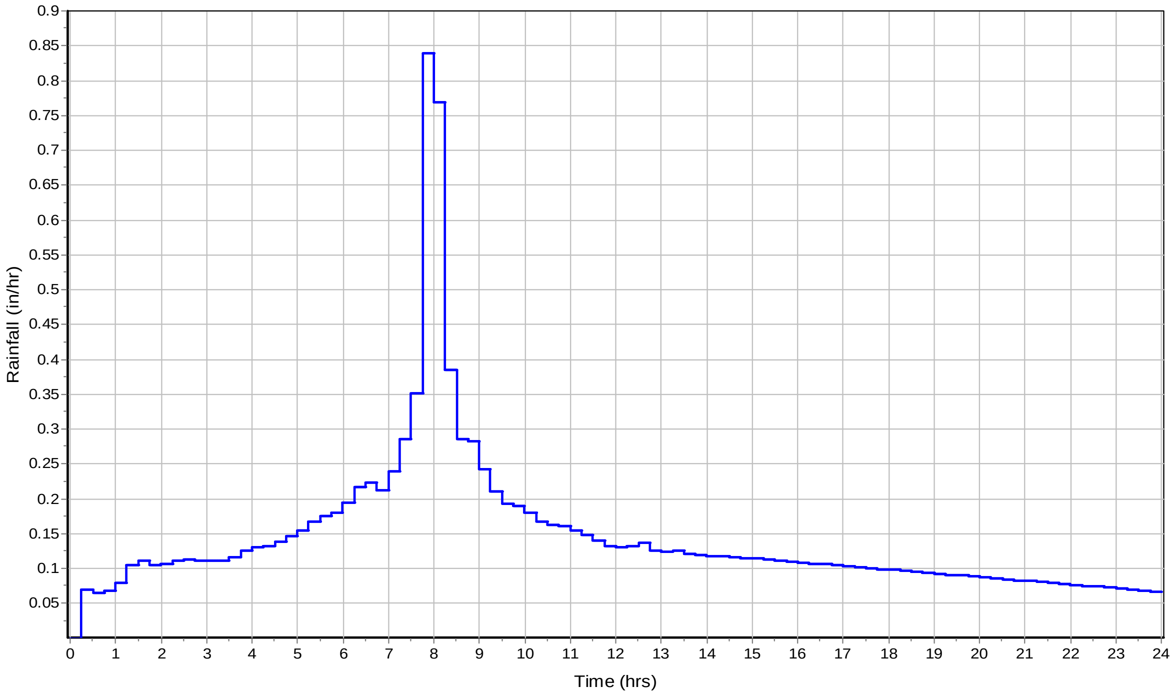
Time of Concentration

Subbasin Runoff Results

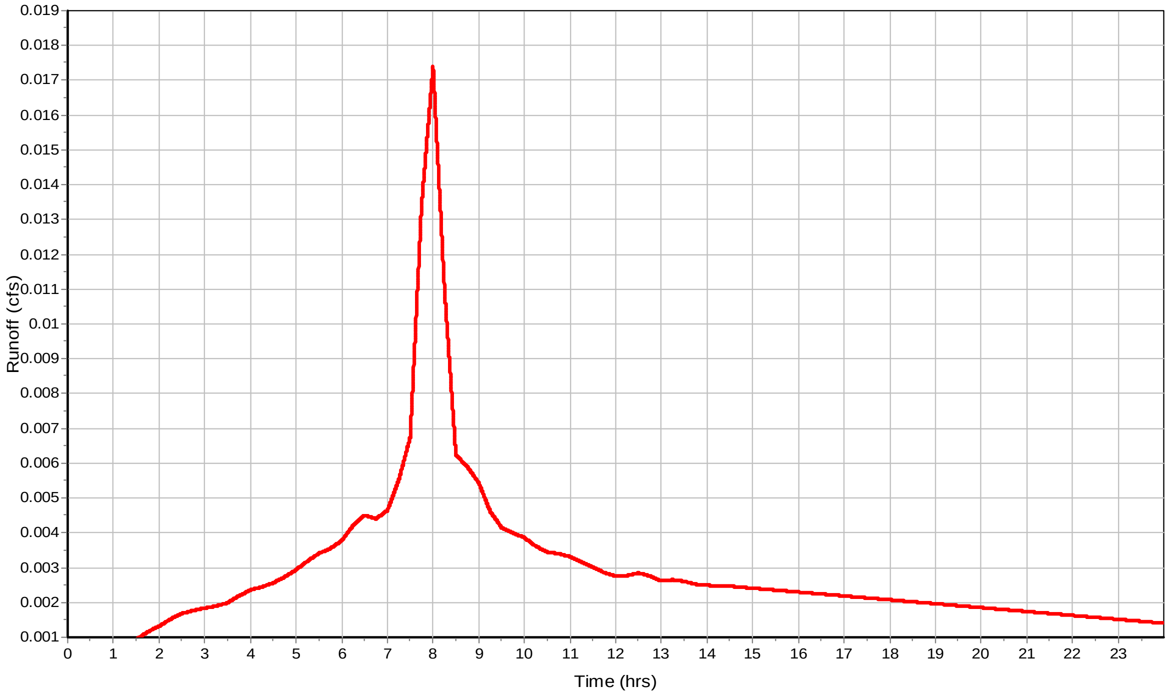
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. NE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. NW

Input Data

Area (ac)	0.04
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.04		98

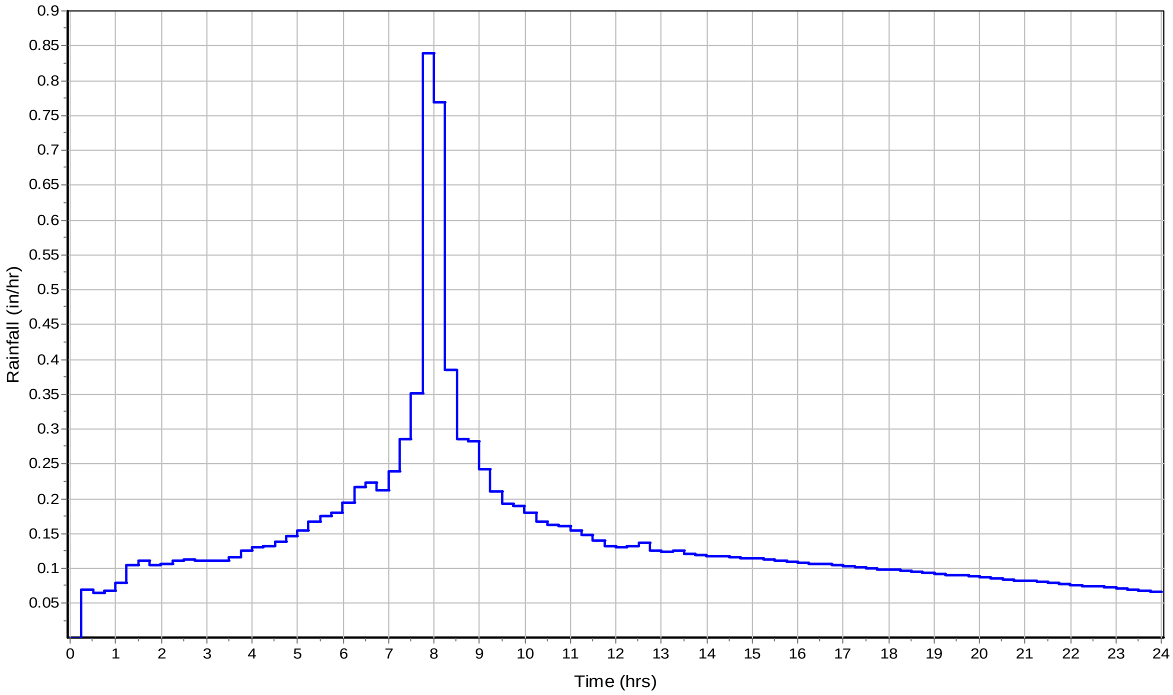
Time of Concentration

Subbasin Runoff Results

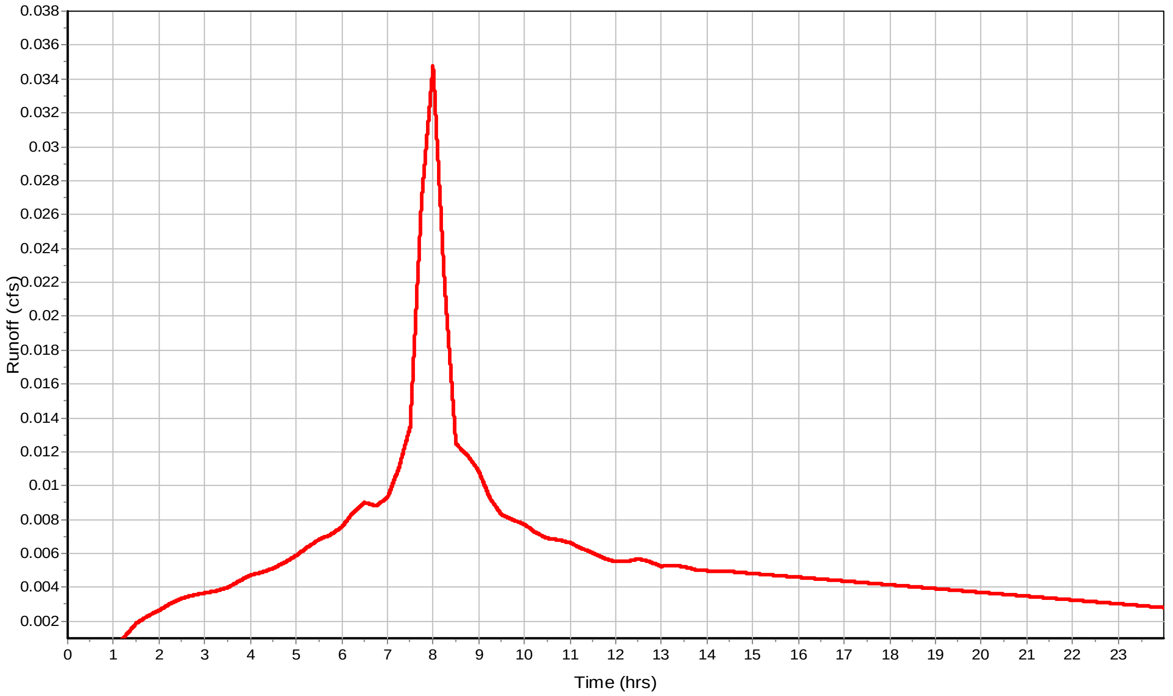
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. NW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. SE

Input Data

Area (ac)	0.03
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		98

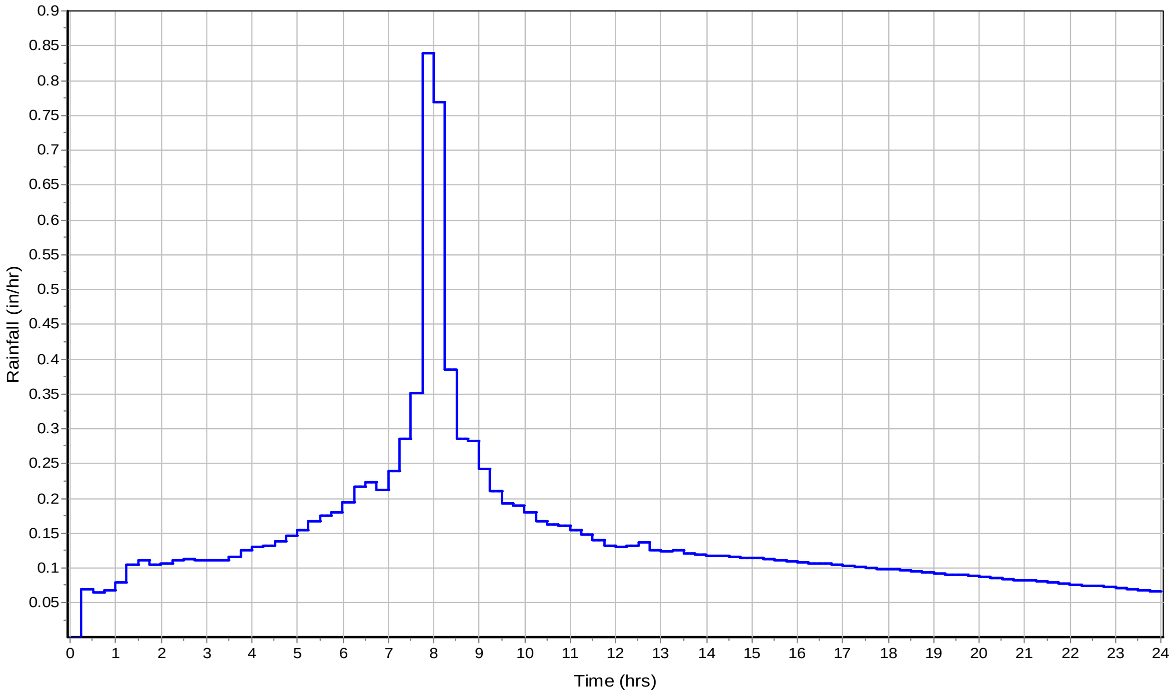
Time of Concentration

Subbasin Runoff Results

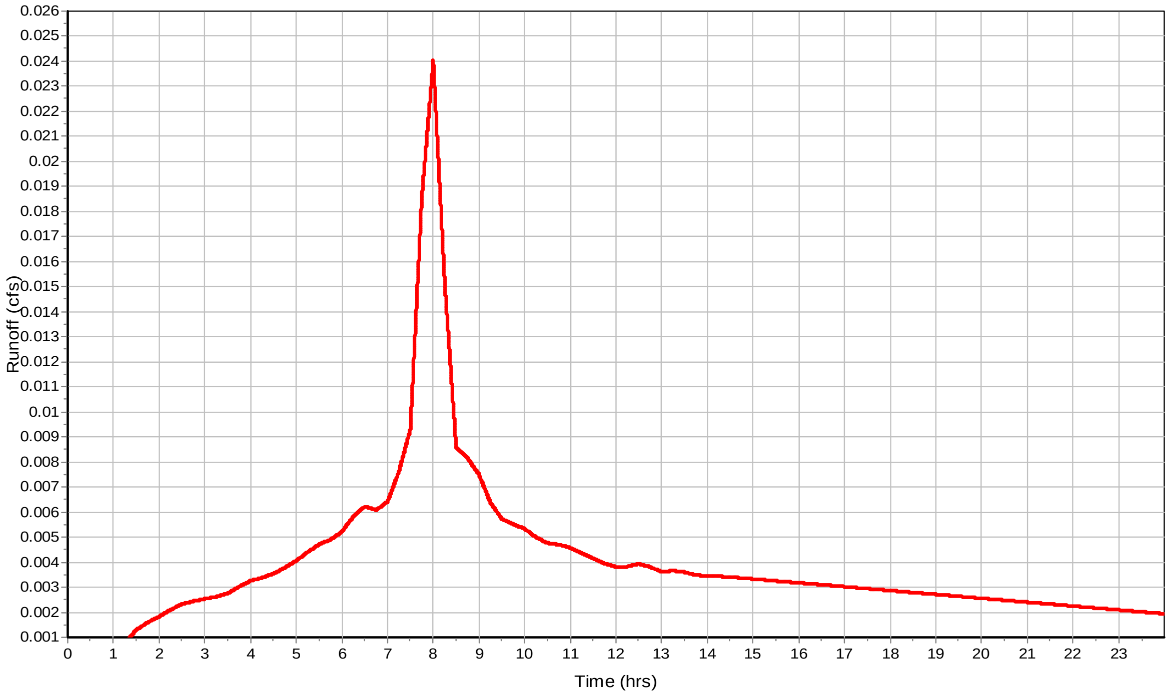
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.02
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. SE

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. SW

Input Data

Area (ac)	0.04
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.04		98

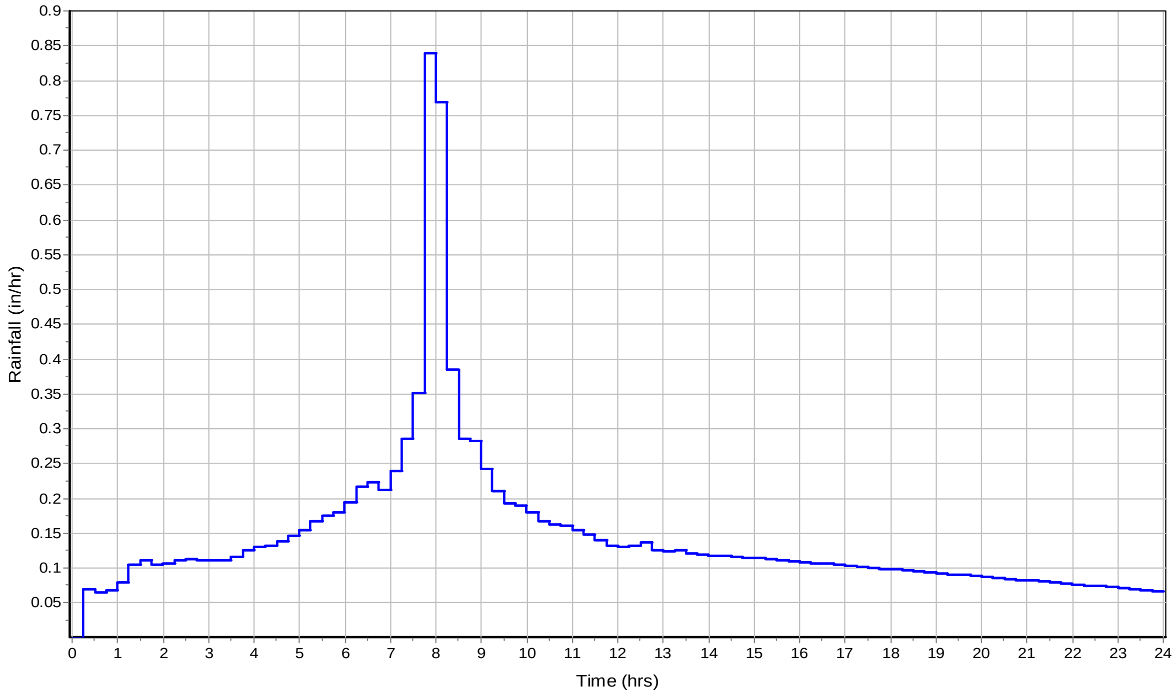
Time of Concentration

Subbasin Runoff Results

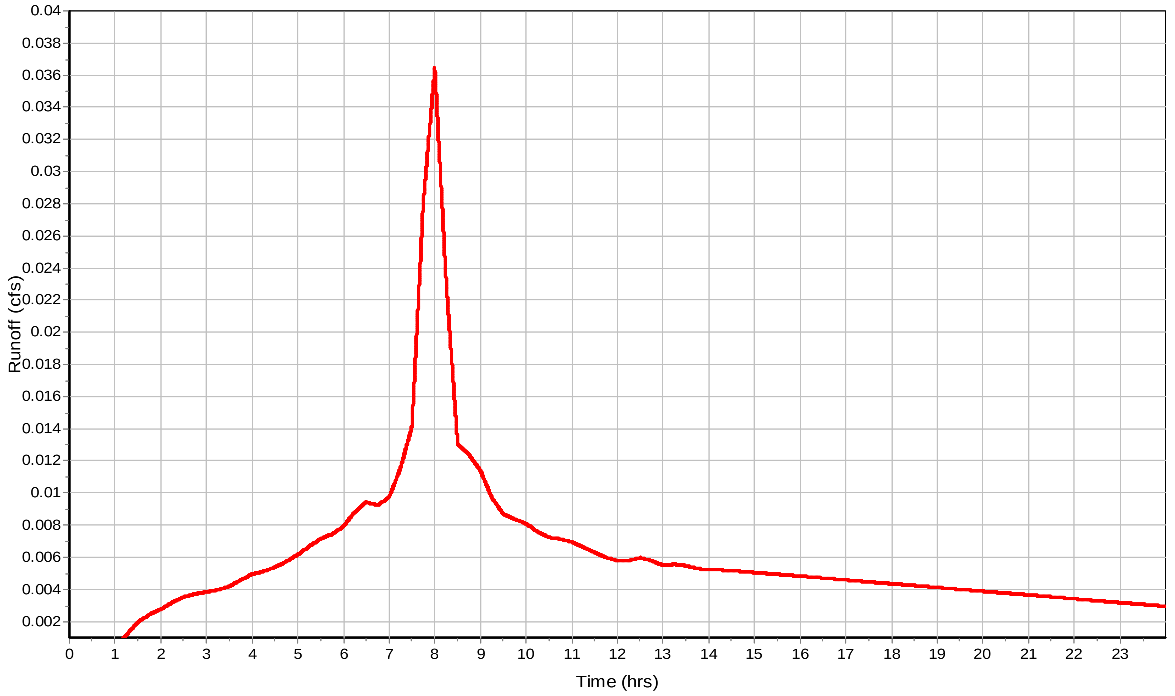
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. SW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BLDG T.I. WEST

Input Data

Area (ac)	0.06
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		98

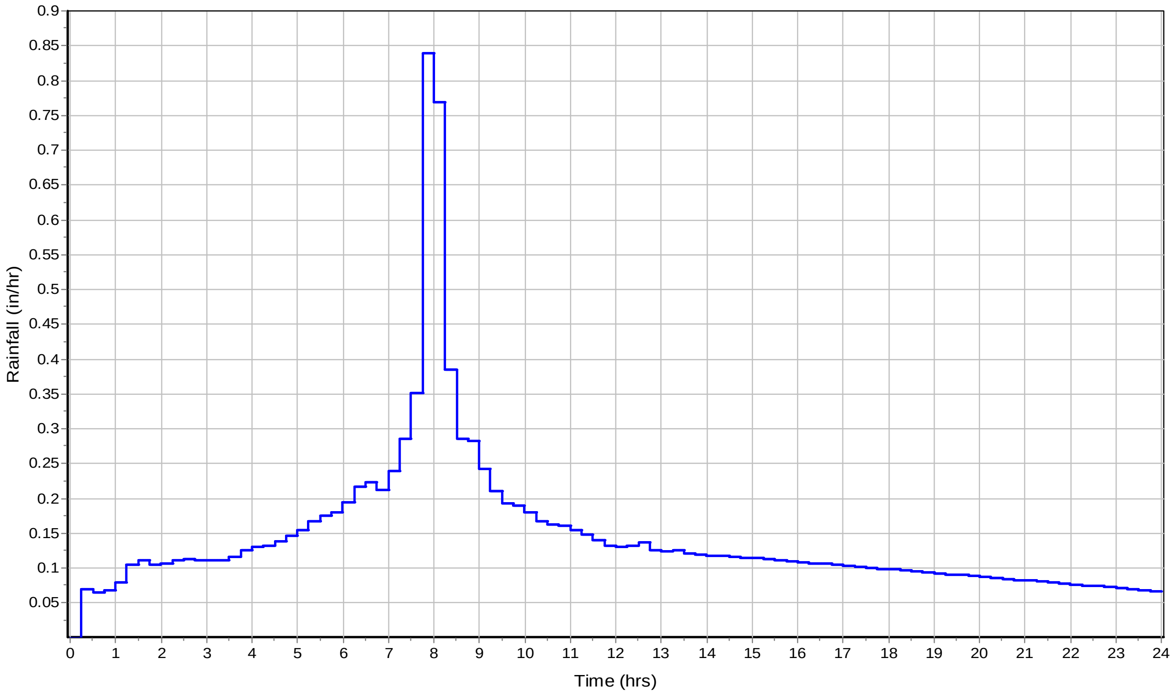
Time of Concentration

Subbasin Runoff Results

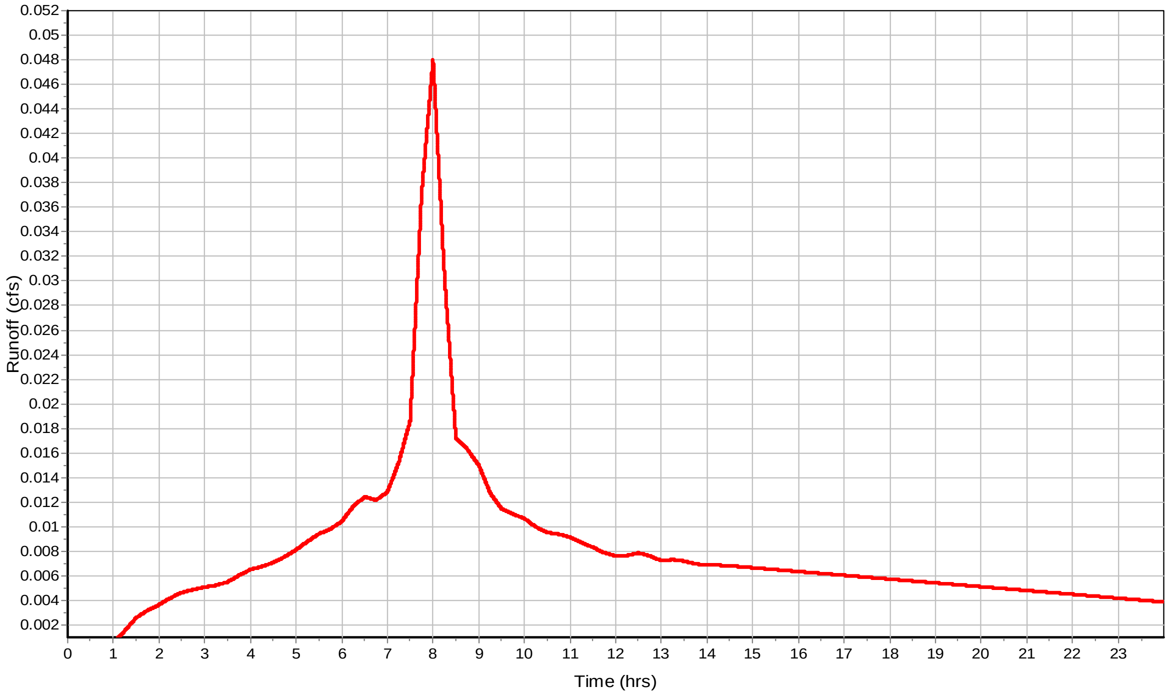
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.05
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : BLDG T.I. WEST

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 02

Input Data

Area (ac)	0.22
Impervious Area (%)	98
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.22		97.56

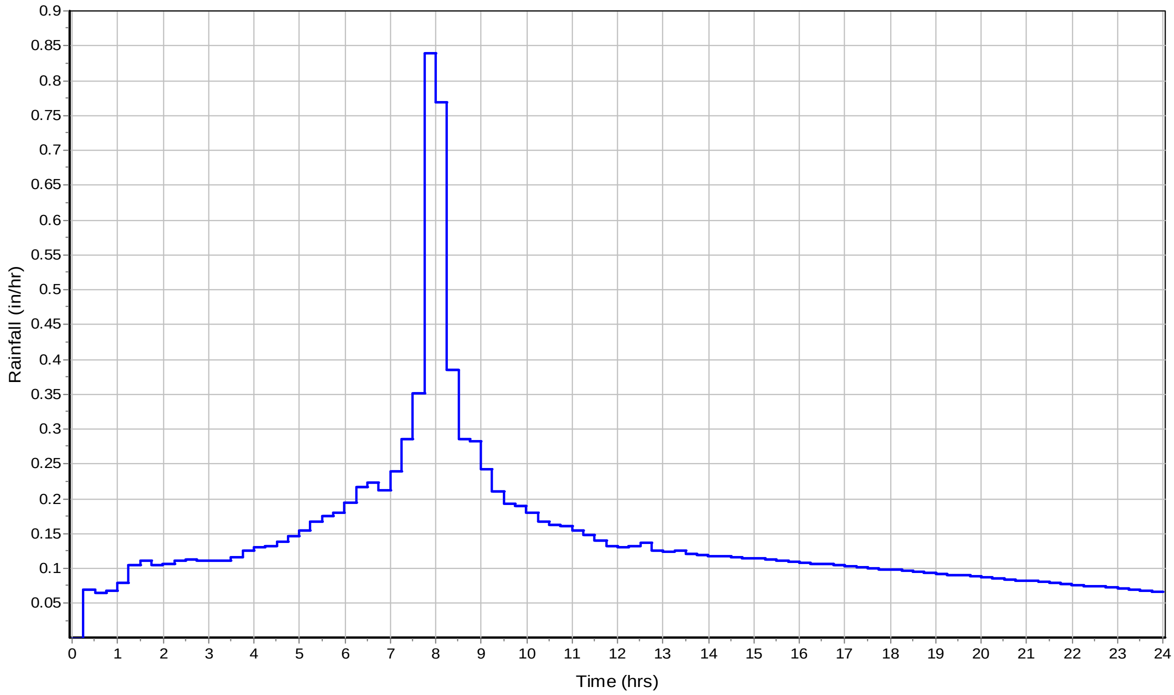
Time of Concentration

Subbasin Runoff Results

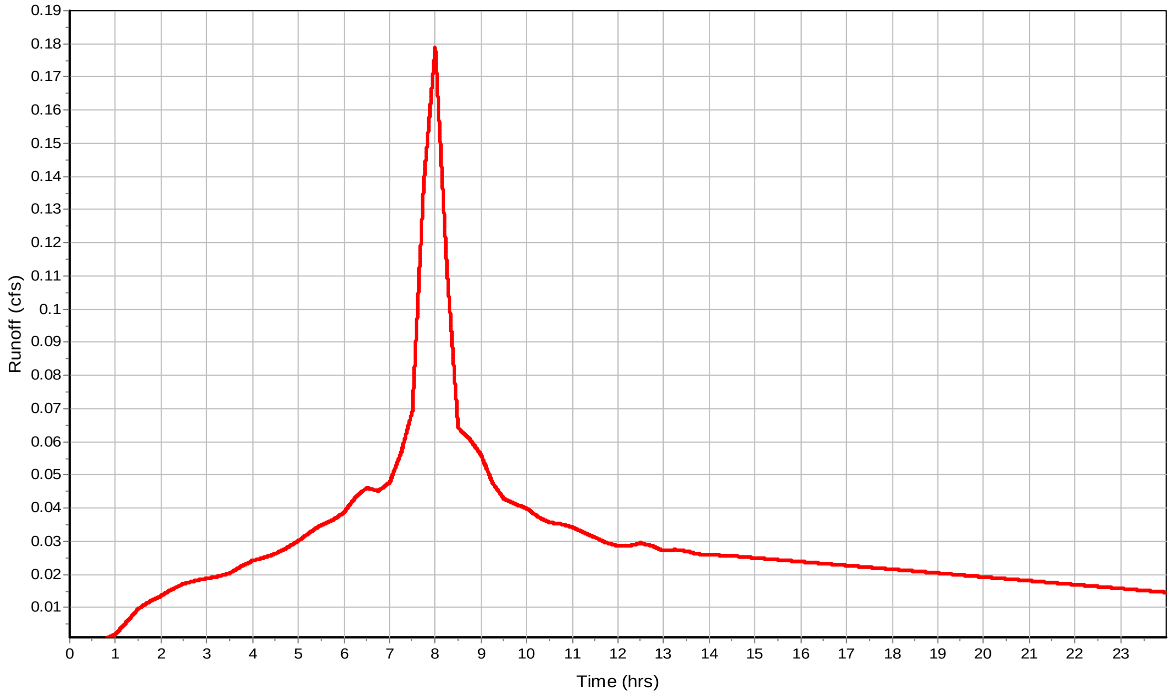
Total Rainfall (in)	3.46
Total Runoff (in)	3.2
Peak Runoff (cfs)	0.18
Weighted Curve Number	97.56
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 03

Input Data

Area (ac)	0.13
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		98

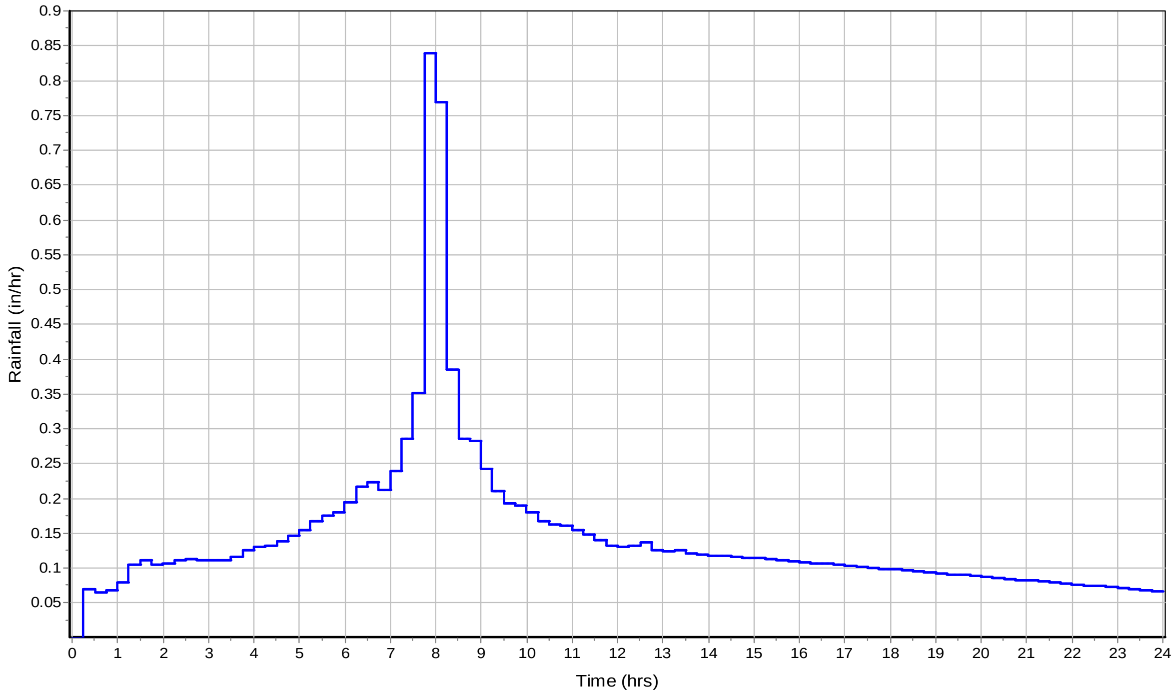
Time of Concentration

Subbasin Runoff Results

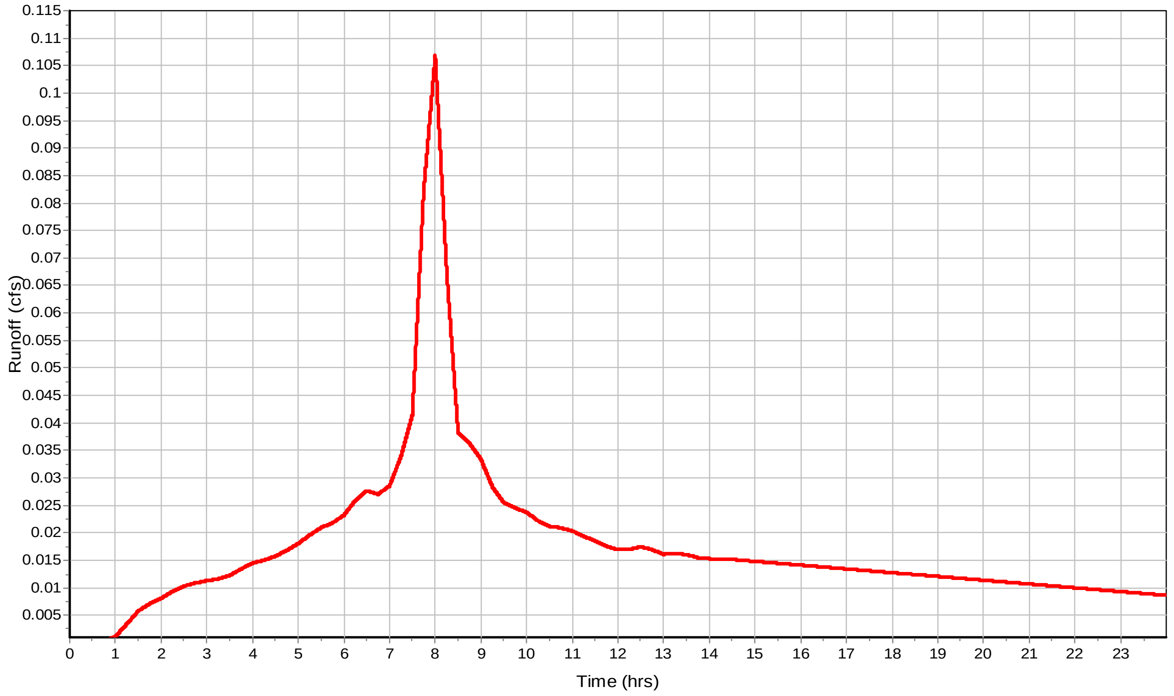
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.11
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 04

Input Data

Area (ac)	0.06
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.06		92.06

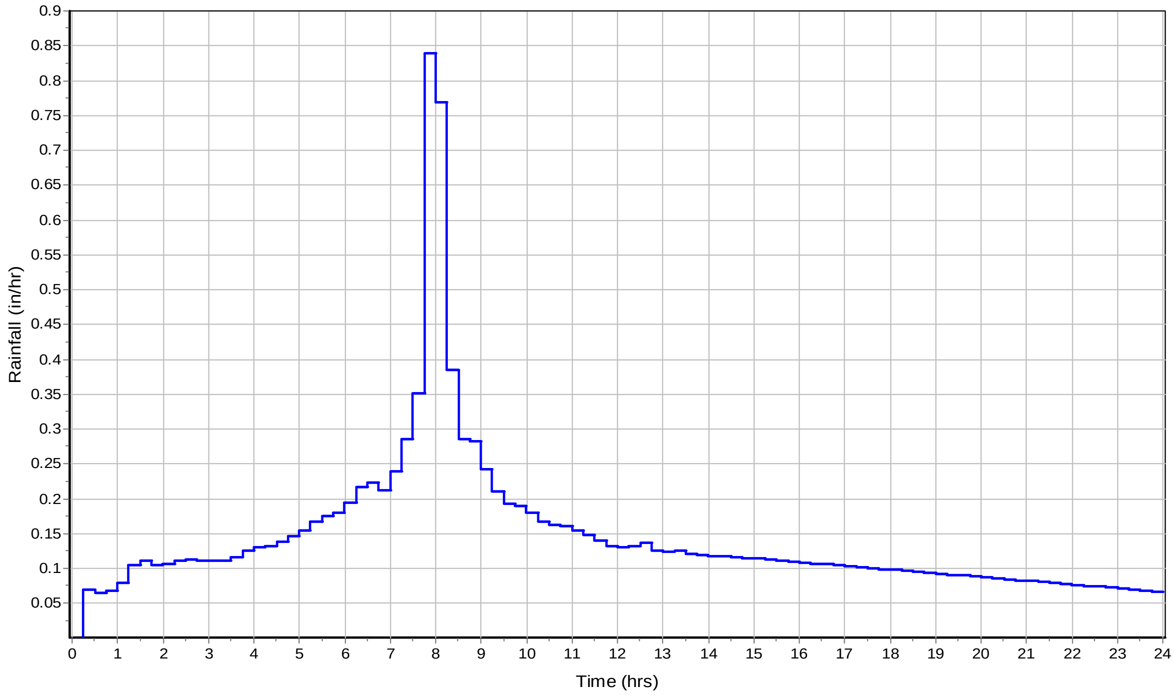
Time of Concentration

Subbasin Runoff Results

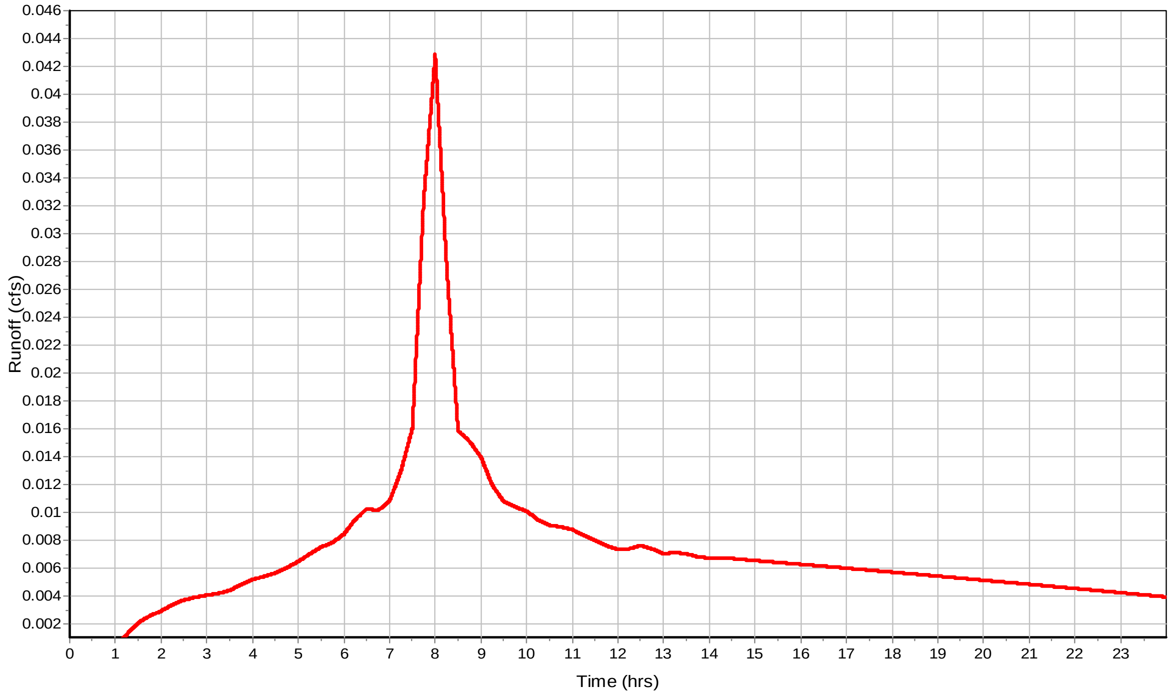
Total Rainfall (in)	3.46
Total Runoff (in)	2.73
Peak Runoff (cfs)	0.04
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 05

Input Data

Area (ac)	0.24
Impervious Area (%)	90
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.24		95.8

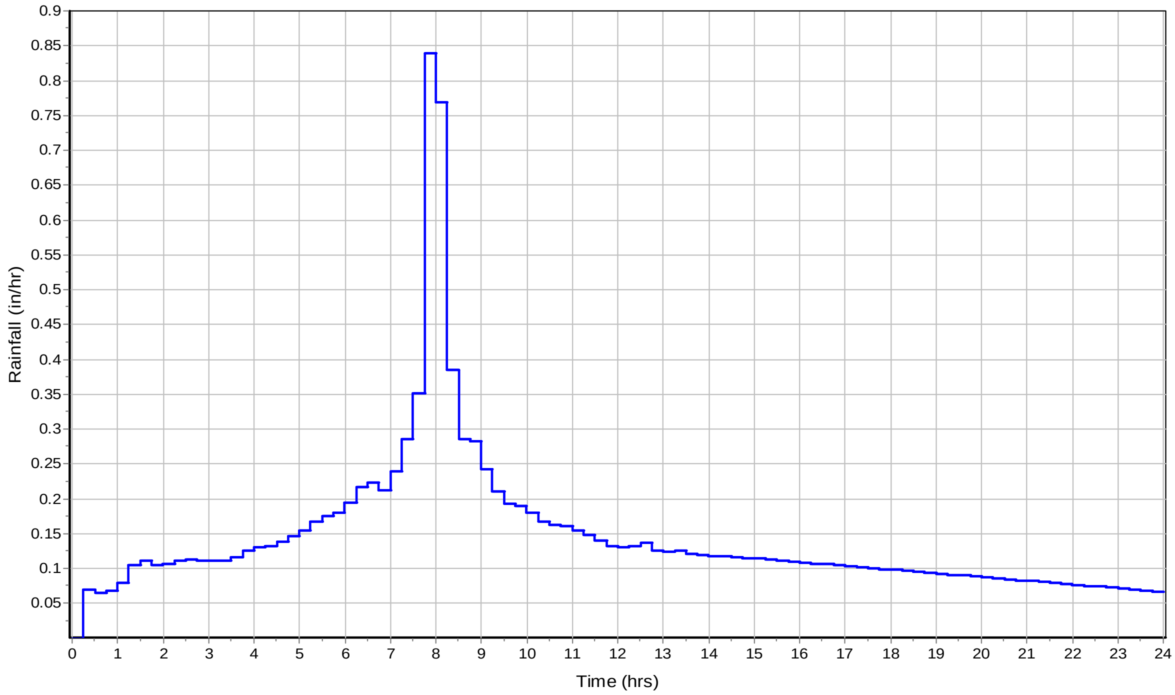
Time of Concentration

Subbasin Runoff Results

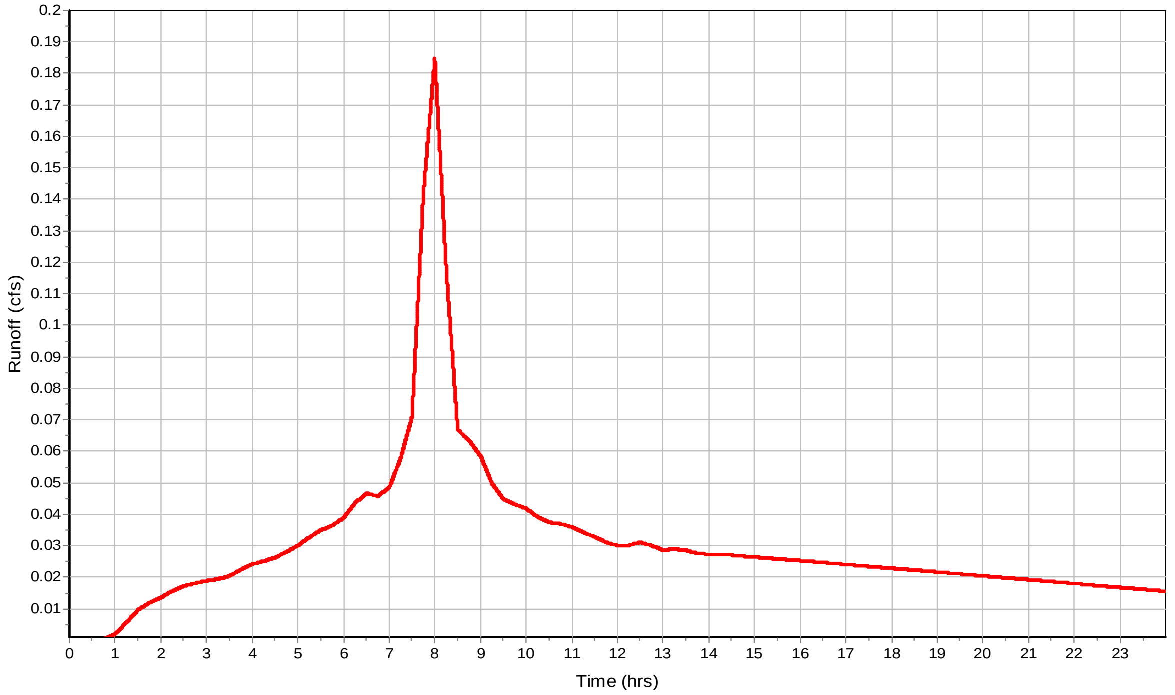
Total Rainfall (in)	3.46
Total Runoff (in)	3.05
Peak Runoff (cfs)	0.19
Weighted Curve Number	95.8
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 06

Input Data

Area (ac)	0.16
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.16		90.3

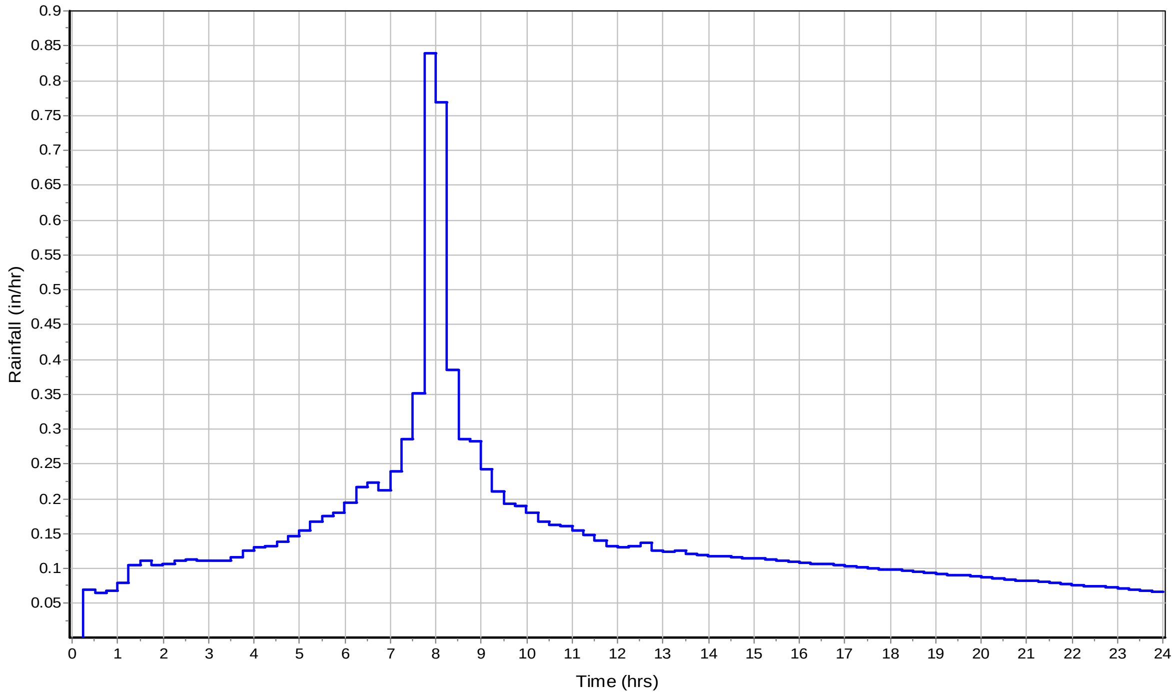
Time of Concentration

Subbasin Runoff Results

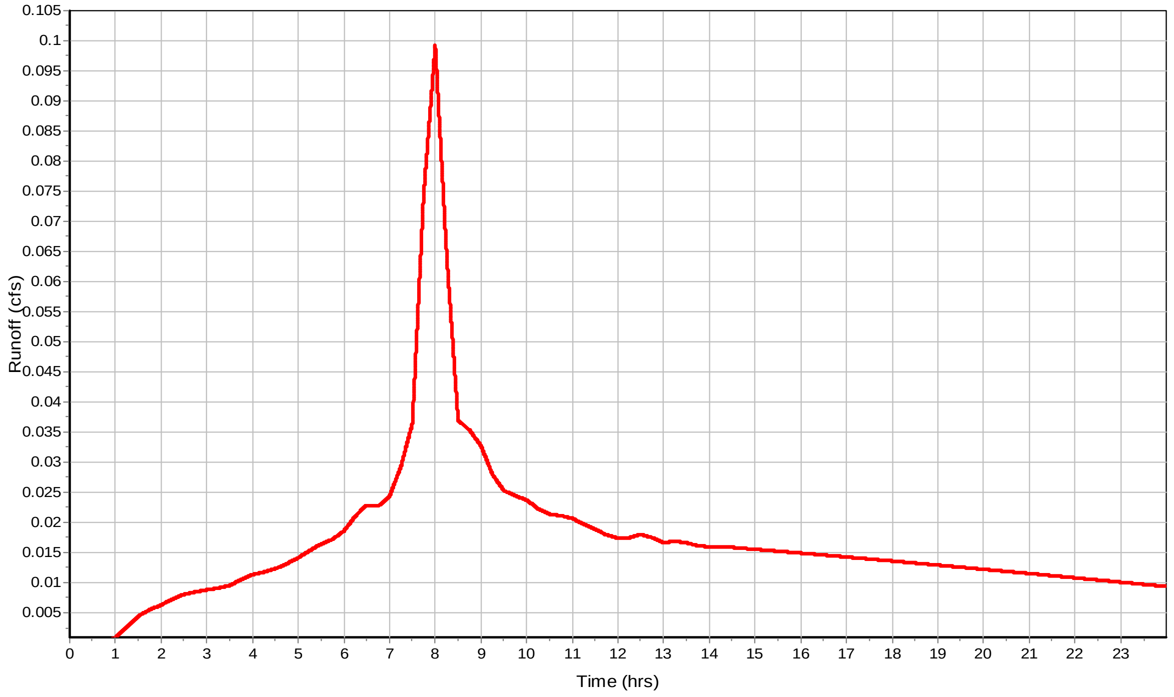
Total Rainfall (in)	3.46
Total Runoff (in)	2.57
Peak Runoff (cfs)	0.1
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 07

Input Data

Area (ac)	0.09
Impervious Area (%)	64
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.09		90.08

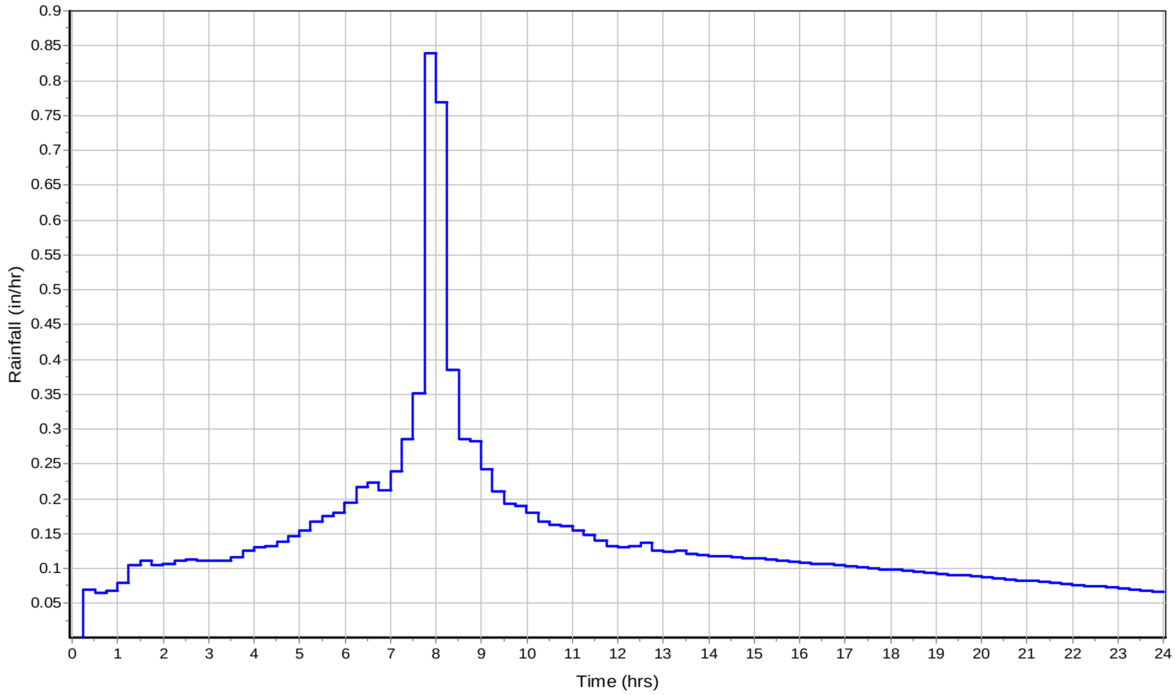
Time of Concentration

Subbasin Runoff Results

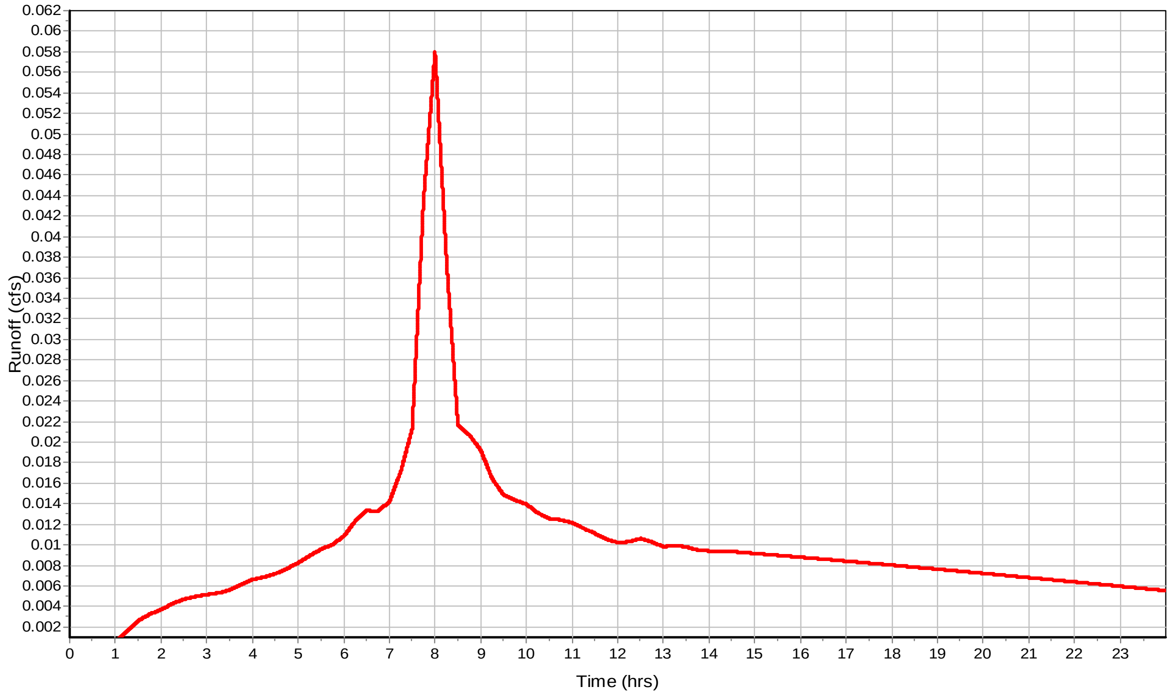
Total Rainfall (in)	3.46
Total Runoff (in)	2.56
Peak Runoff (cfs)	0.06
Weighted Curve Number	90.08
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 07

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 08

Input Data

Area (ac)	0.05
Impervious Area (%)	100
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.05		98

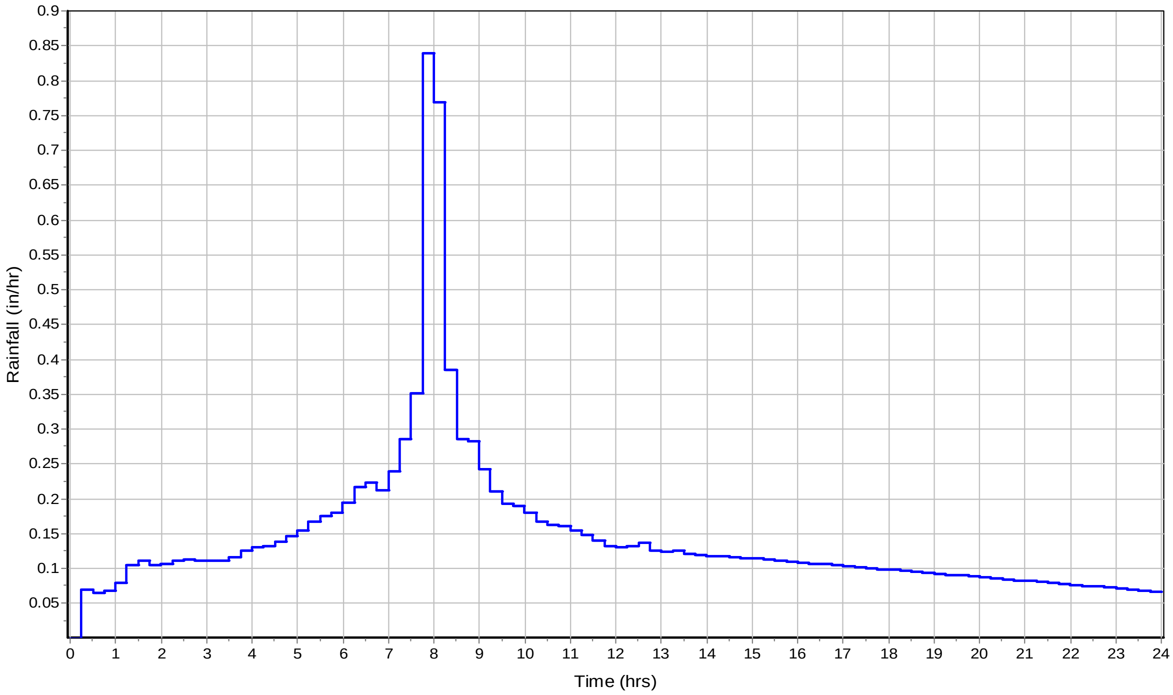
Time of Concentration

Subbasin Runoff Results

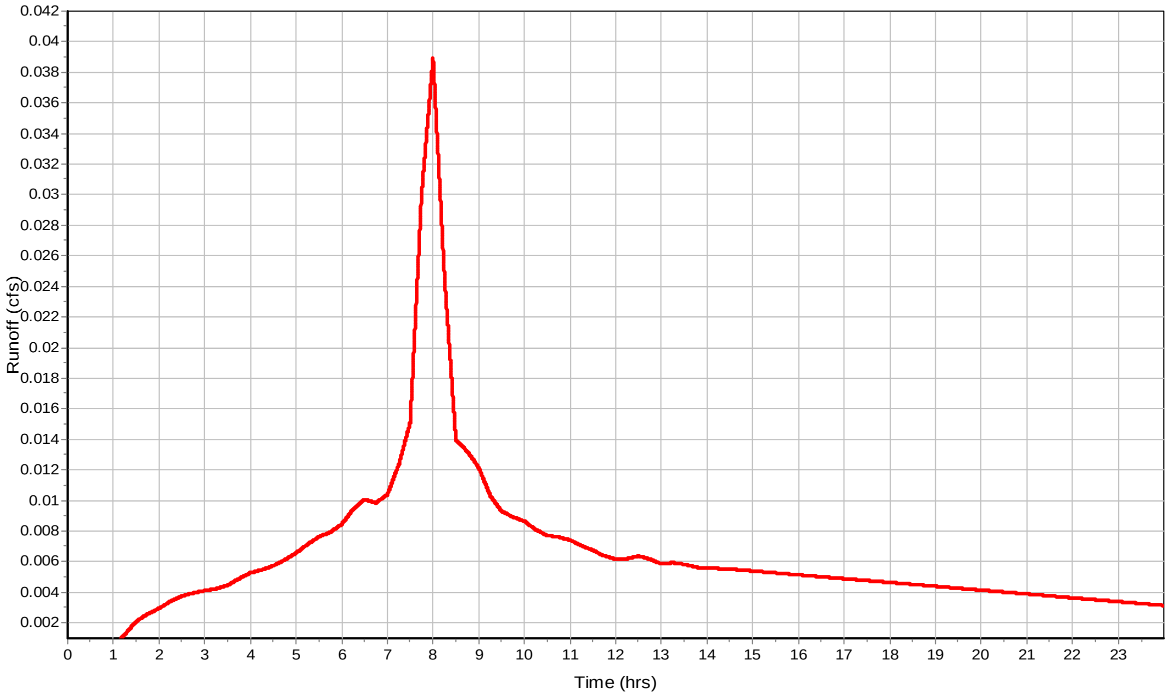
Total Rainfall (in)	3.46
Total Runoff (in)	3.24
Peak Runoff (cfs)	0.04
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 08

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 09

Input Data

Area (ac)	0.25
Impervious Area (%)	82
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.25		94.04

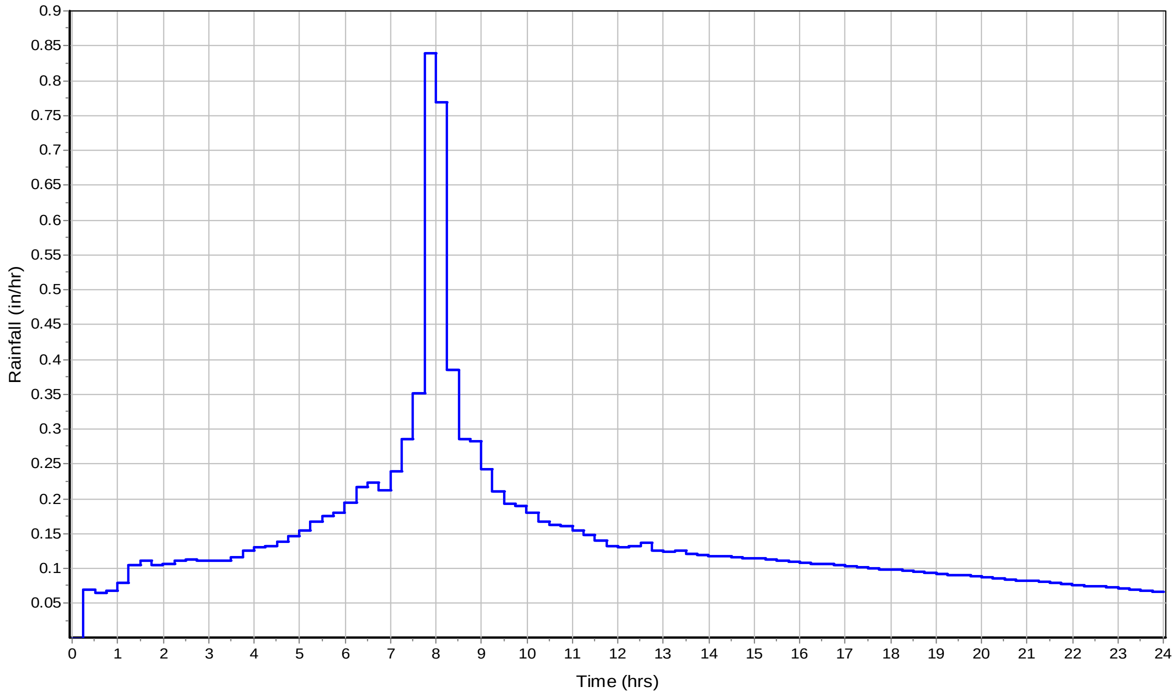
Time of Concentration

Subbasin Runoff Results

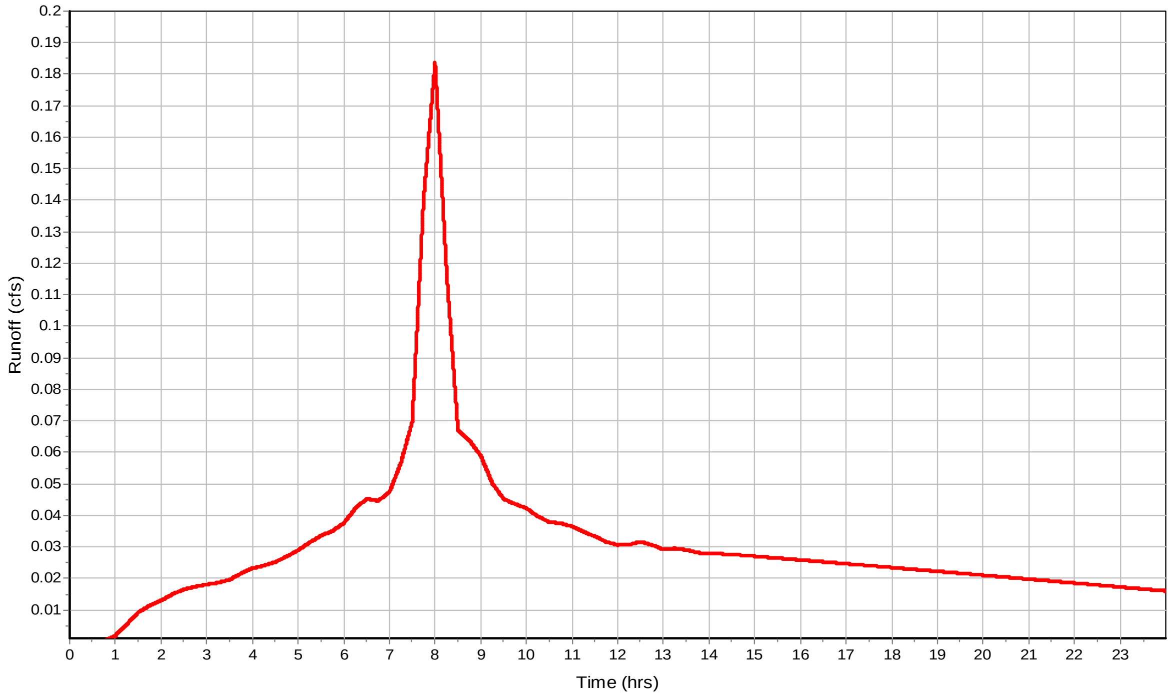
Total Rainfall (in)	3.46
Total Runoff (in)	2.9
Peak Runoff (cfs)	0.18
Weighted Curve Number	94.04
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 11

Input Data

Area (ac)	0.1
Impervious Area (%)	91
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		96.02

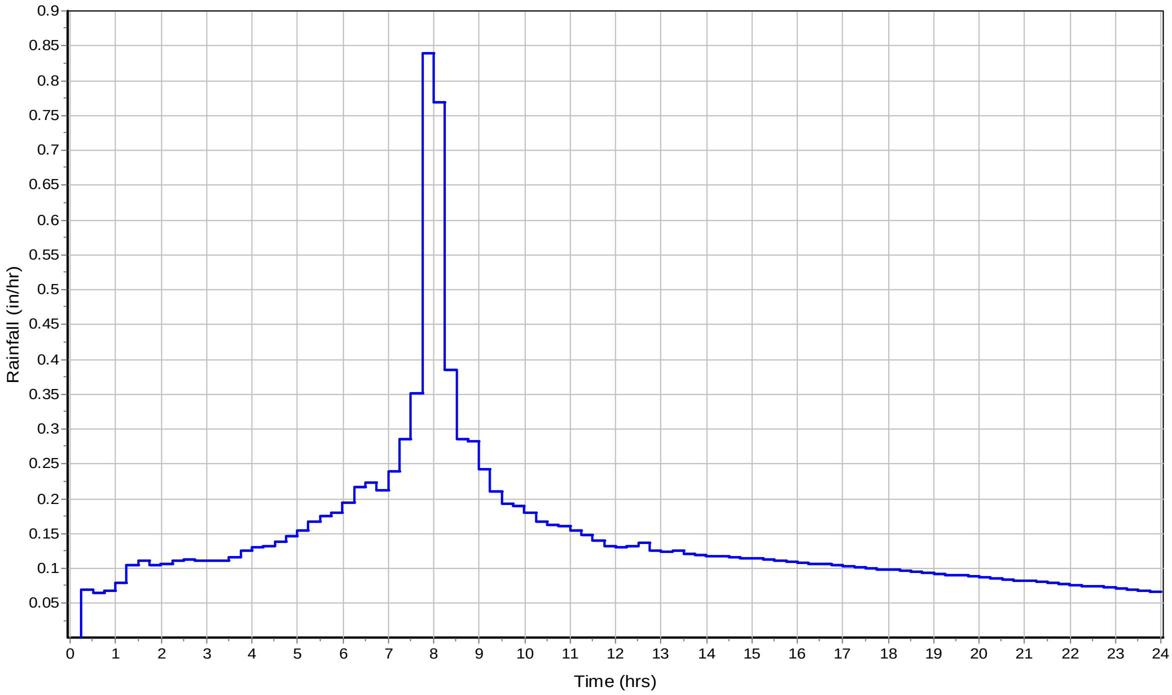
Time of Concentration

Subbasin Runoff Results

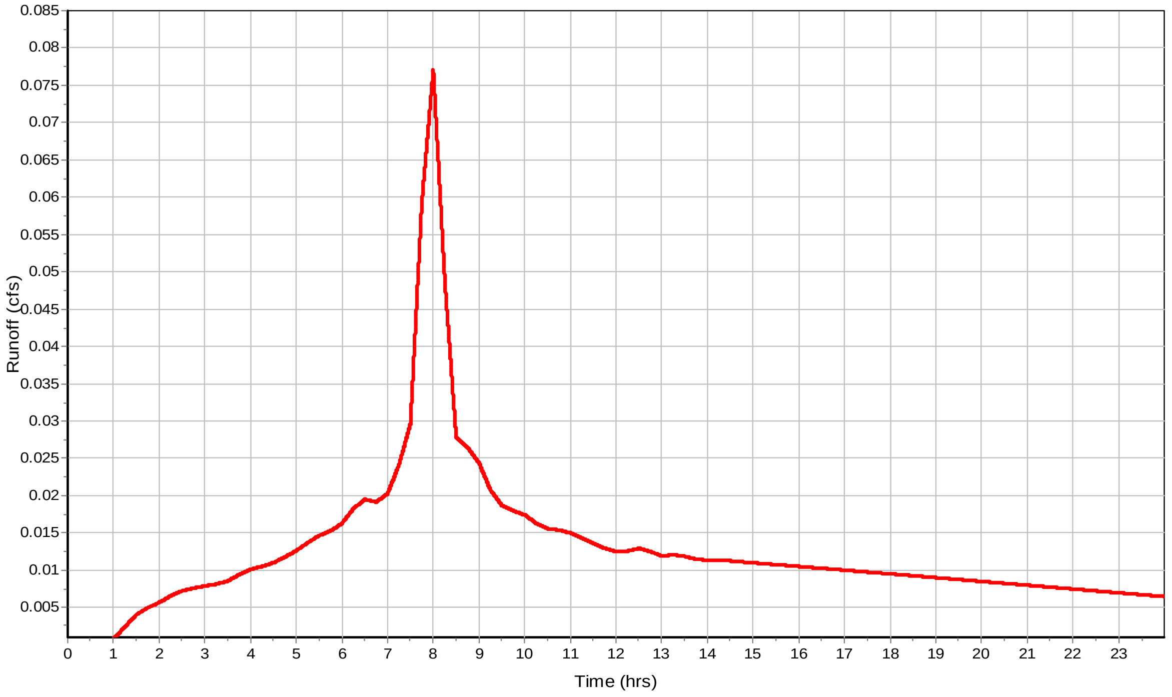
Total Rainfall (in)	3.46
Total Runoff (in)	3.07
Peak Runoff (cfs)	0.08
Weighted Curve Number	96.02
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 12

Input Data

Area (ac)	0.1
Impervious Area (%)	99
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		97.78

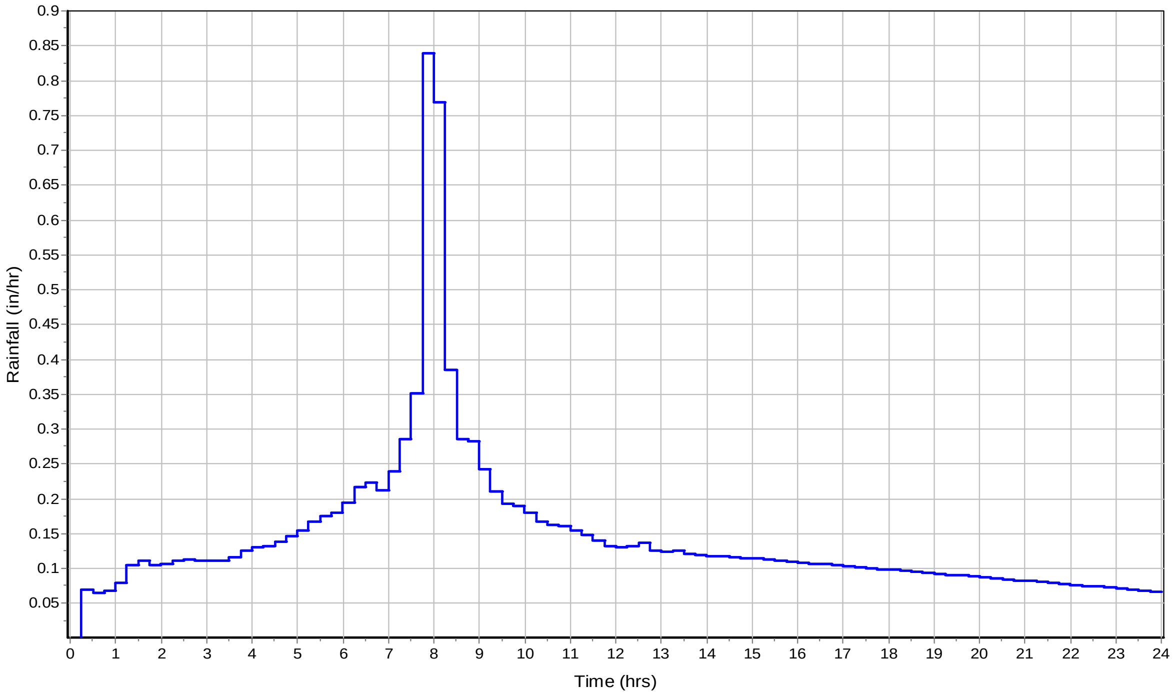
Time of Concentration

Subbasin Runoff Results

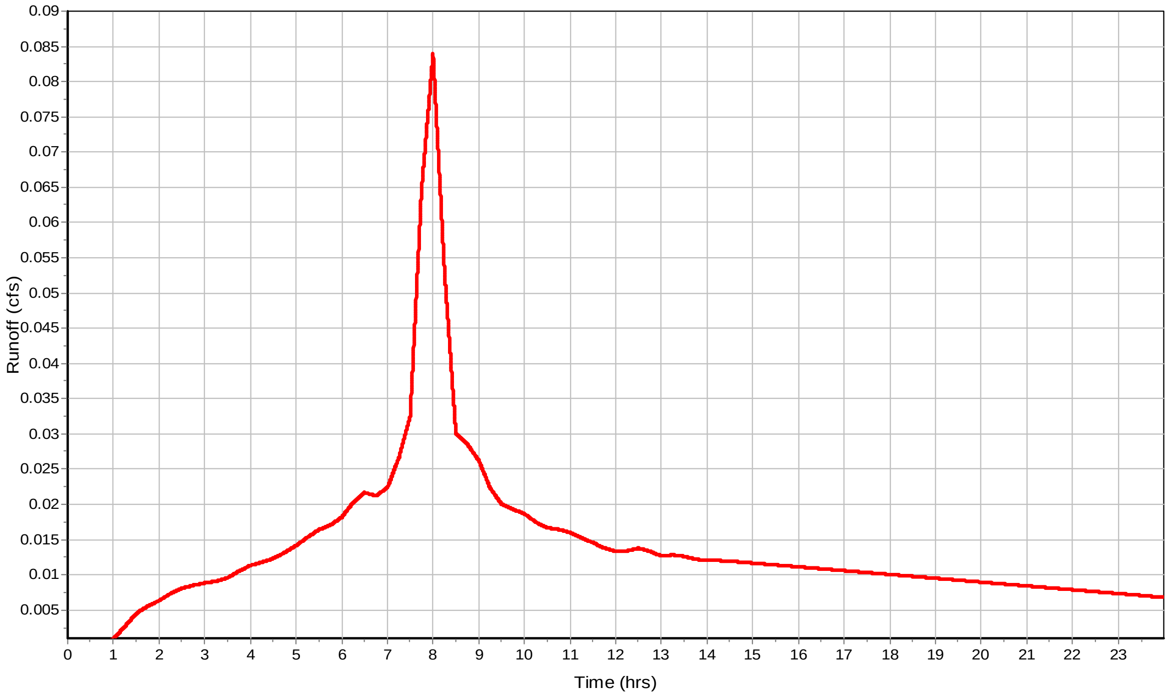
Total Rainfall (in)	3.46
Total Runoff (in)	3.22
Peak Runoff (cfs)	0.08
Weighted Curve Number	97.78
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 13

Input Data

Area (ac) 0.13
Impervious Area (%) 94
Impervious Area Curve Number 98
Pervious Area Curve Number 76
Rain Gage ID 25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		96.68

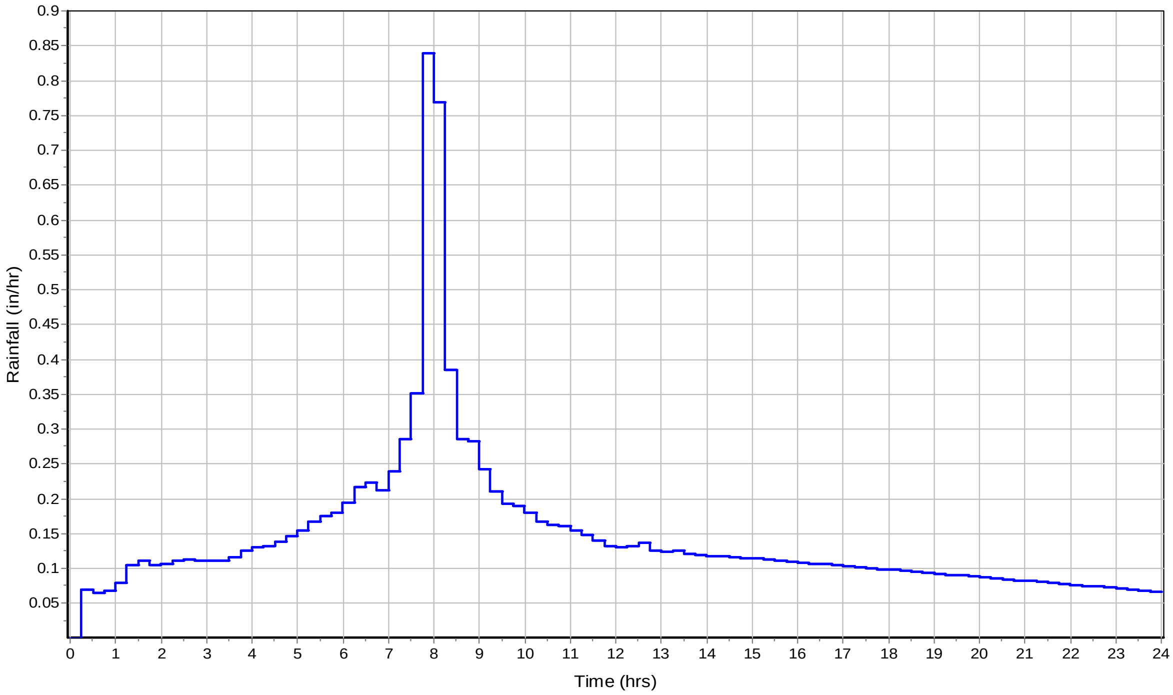
Time of Concentration

Subbasin Runoff Results

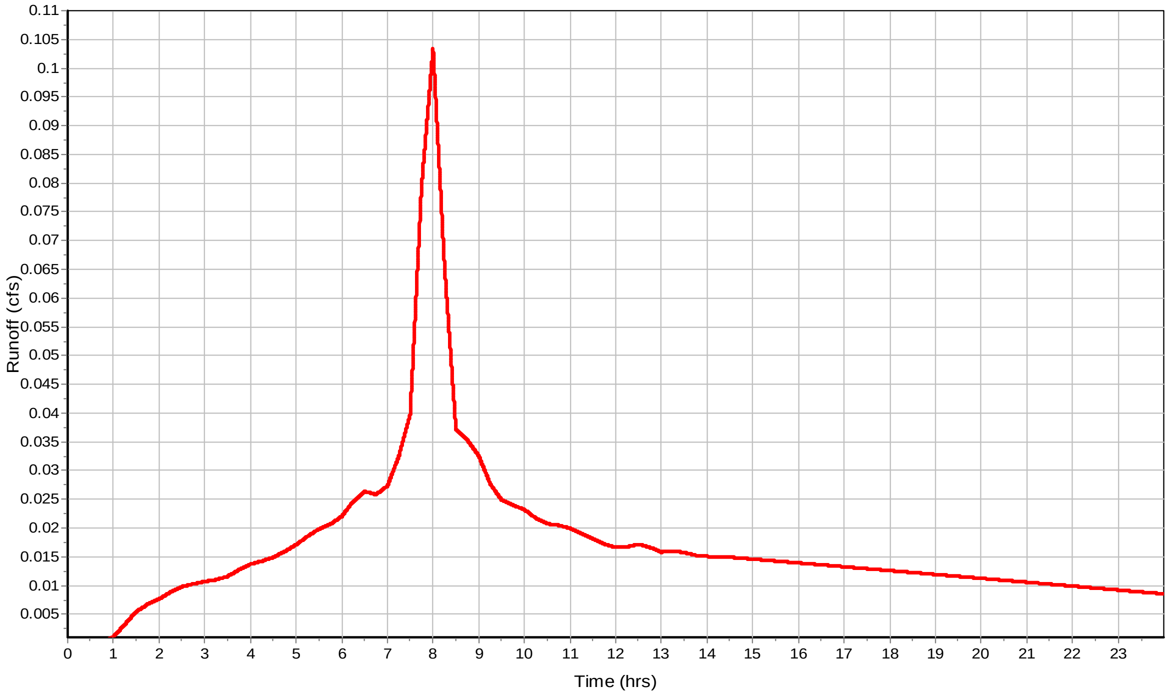
Total Rainfall (in) 3.46
Total Runoff (in) 3.12
Peak Runoff (cfs) 0.1
Weighted Curve Number 96.68
Time of Concentration (days hh:mm:ss) 0 00:00:00

Subbasin : SDCB 13

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 14

Input Data

Area (ac)	0.22
Impervious Area (%)	68
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.22		90.96

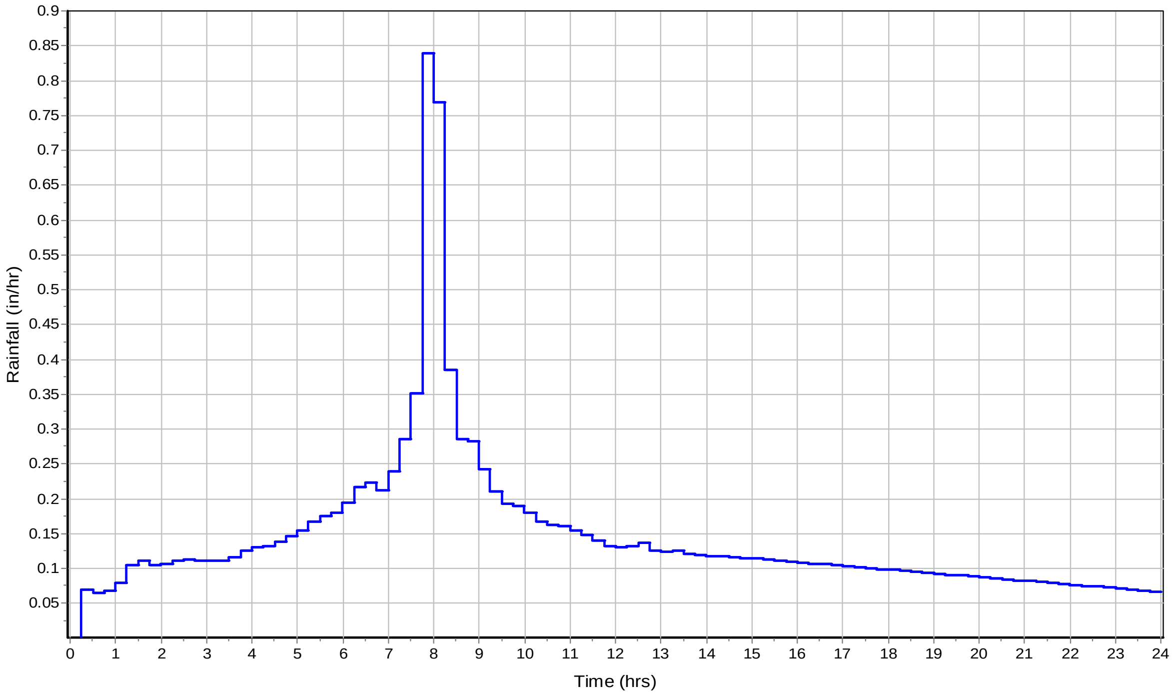
Time of Concentration

Subbasin Runoff Results

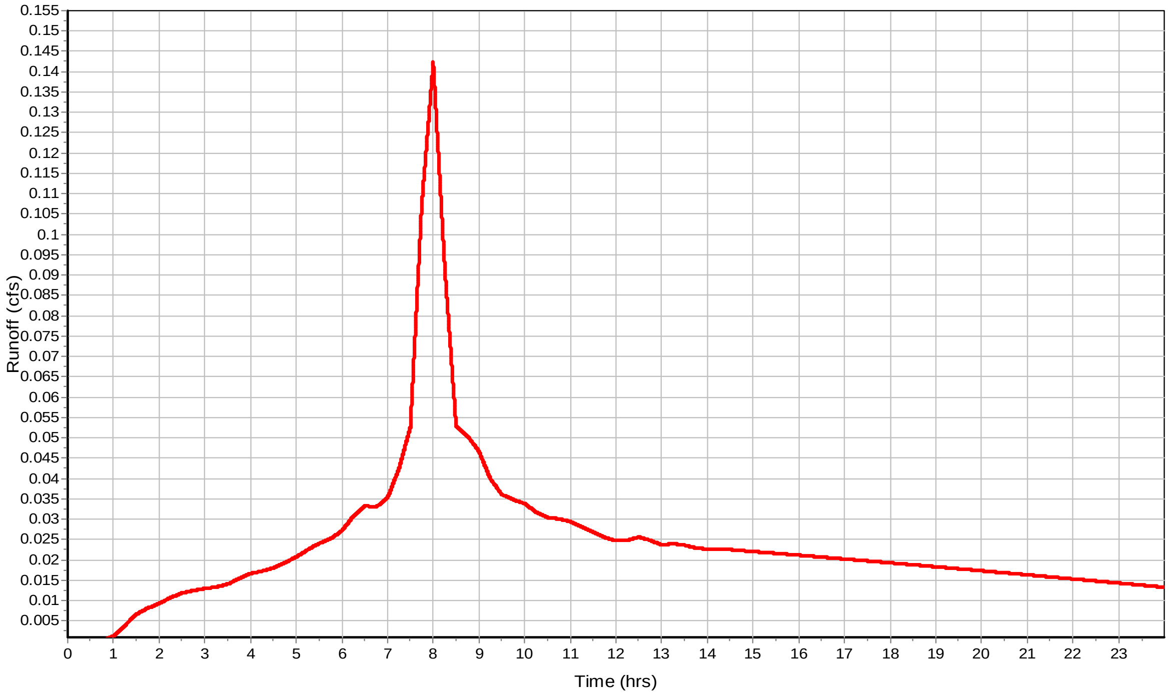
Total Rainfall (in)	3.46
Total Runoff (in)	2.63
Peak Runoff (cfs)	0.14
Weighted Curve Number	90.96
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 15

Input Data

Area (ac)	0.13
Impervious Area (%)	88
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

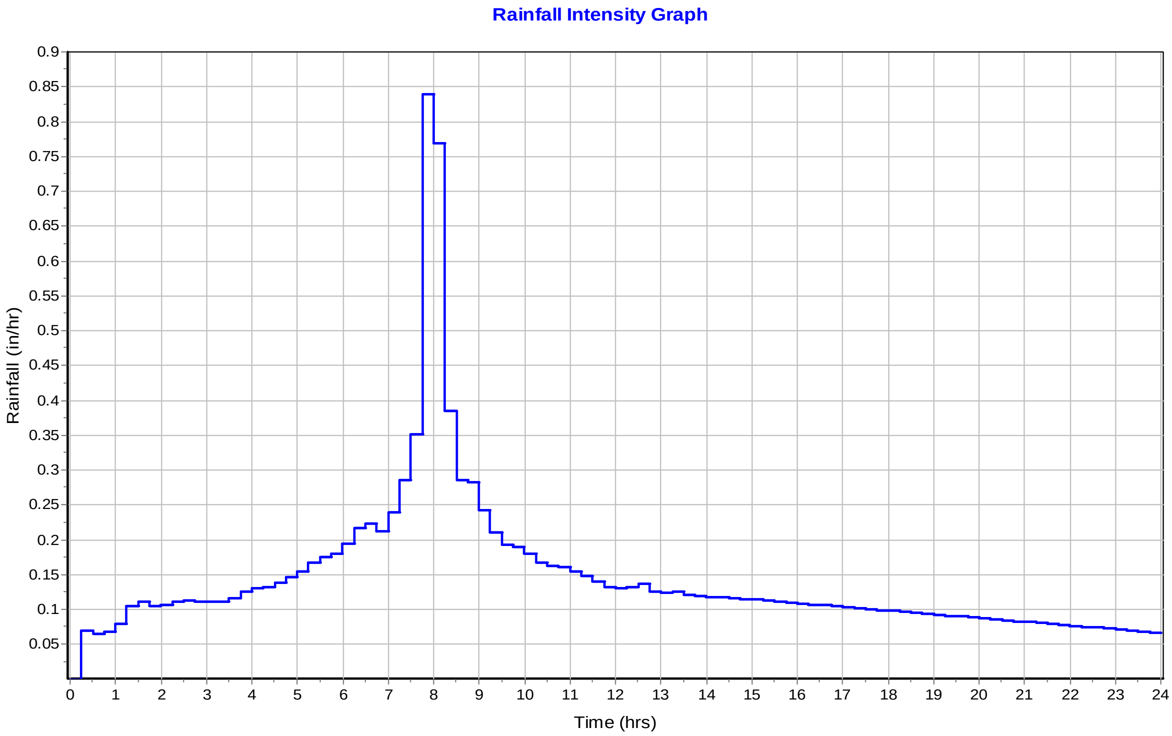
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.13		95.36

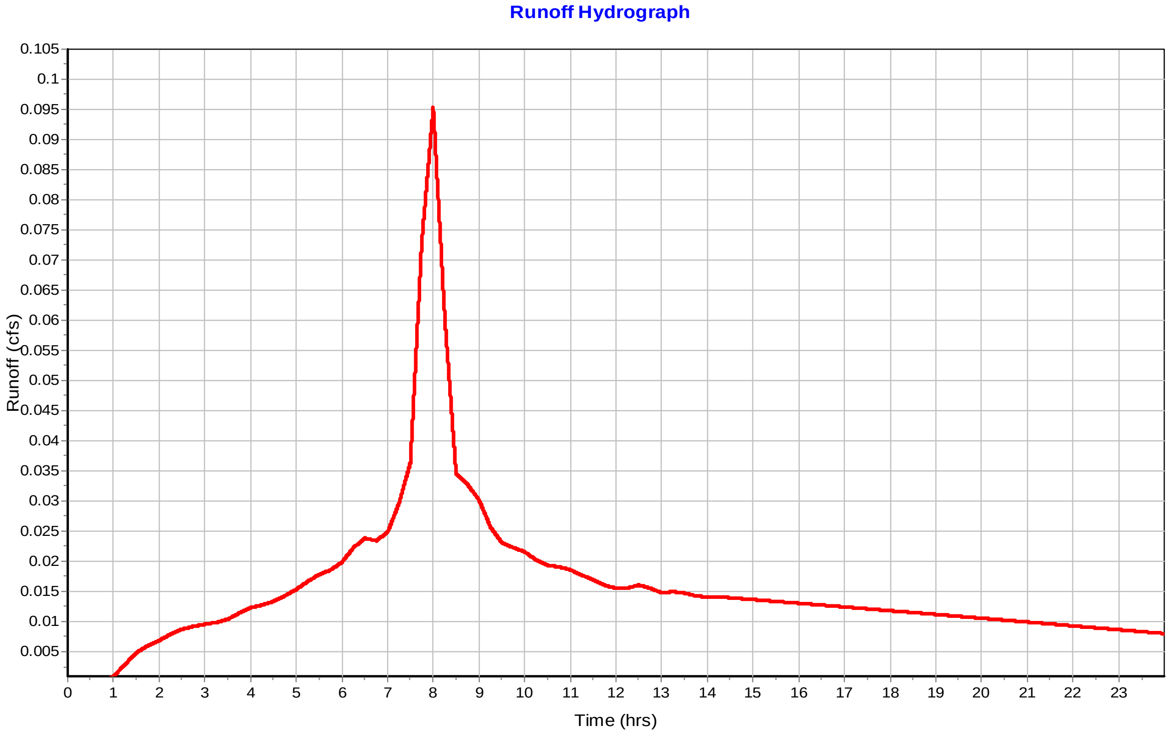
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	3.01
Peak Runoff (cfs)	0.1
Weighted Curve Number	95.36
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 15





Subbasin : SDCB 16

Input Data

Area (ac)	0.14
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

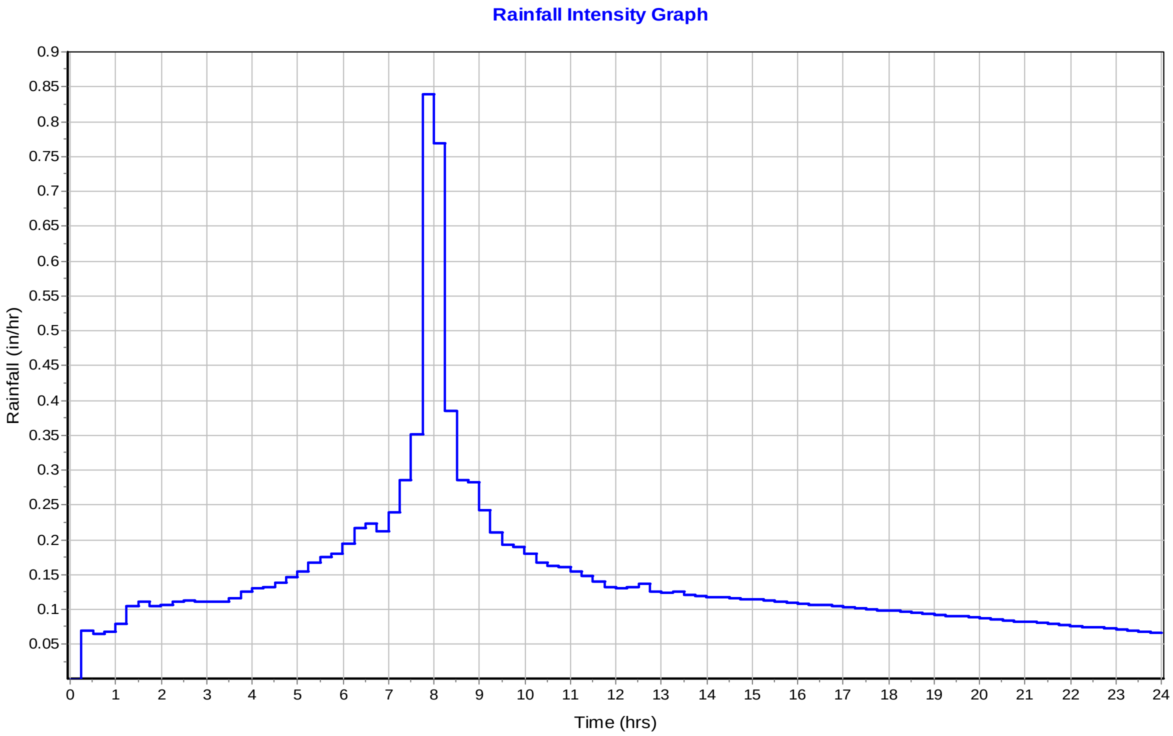
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.14		90.3

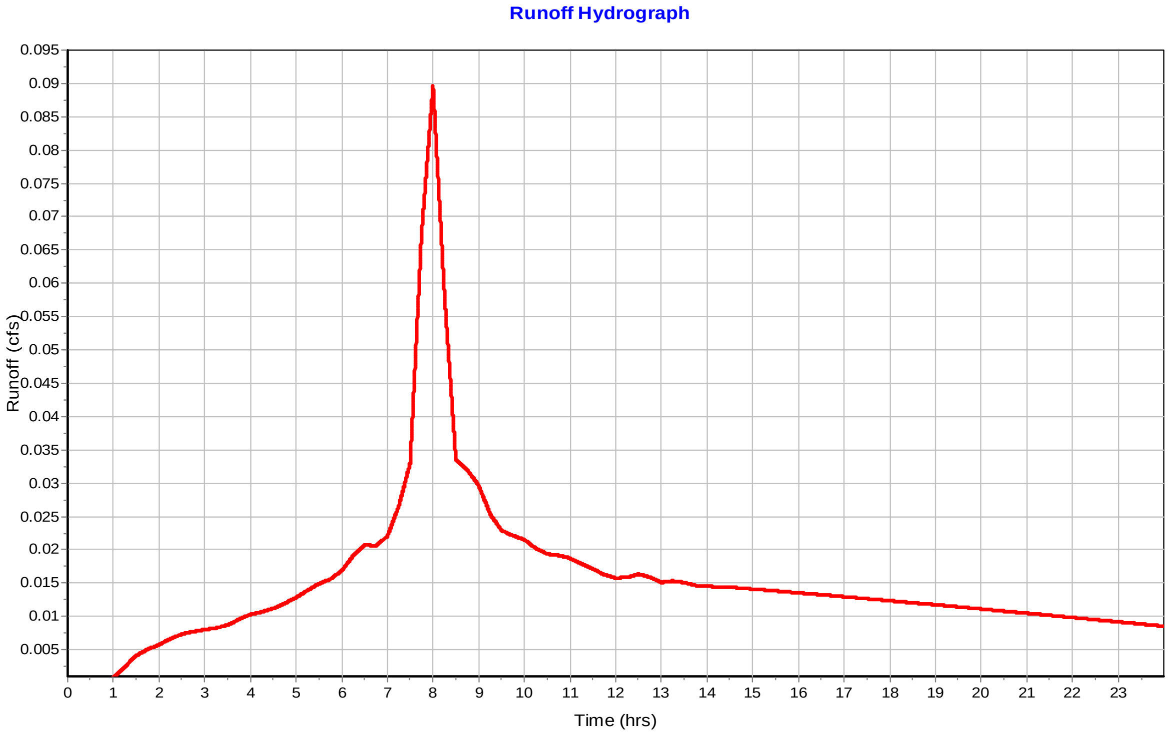
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	2.57
Peak Runoff (cfs)	0.09
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 16





Subbasin : SDCB 17

Input Data

Area (ac)	0.1
Impervious Area (%)	92
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.1		96.24

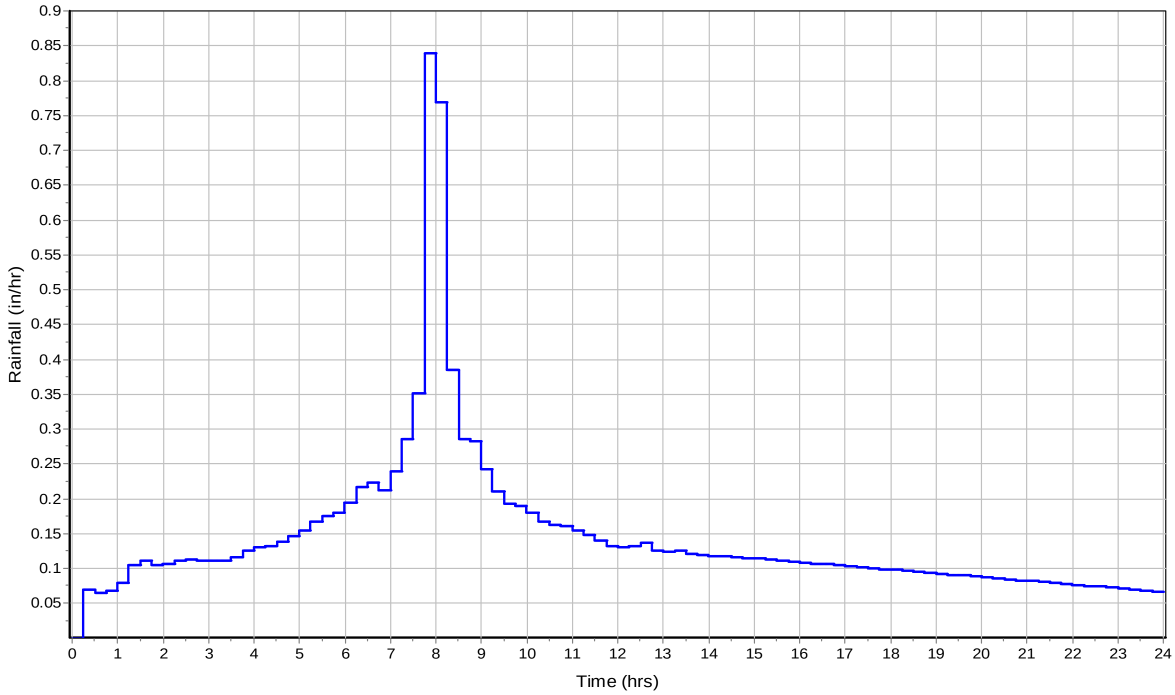
Time of Concentration

Subbasin Runoff Results

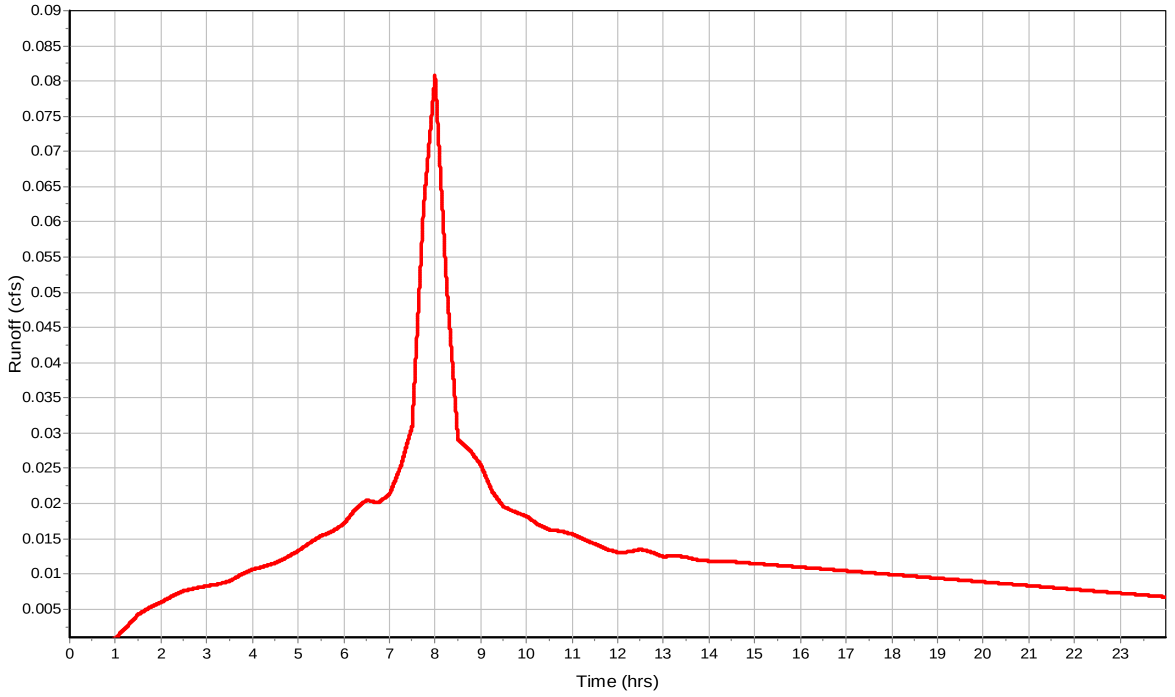
Total Rainfall (in)	3.46
Total Runoff (in)	3.09
Peak Runoff (cfs)	0.08
Weighted Curve Number	96.24
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 19

Input Data

Area (ac)	0.46
Impervious Area (%)	78
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.46		93.16

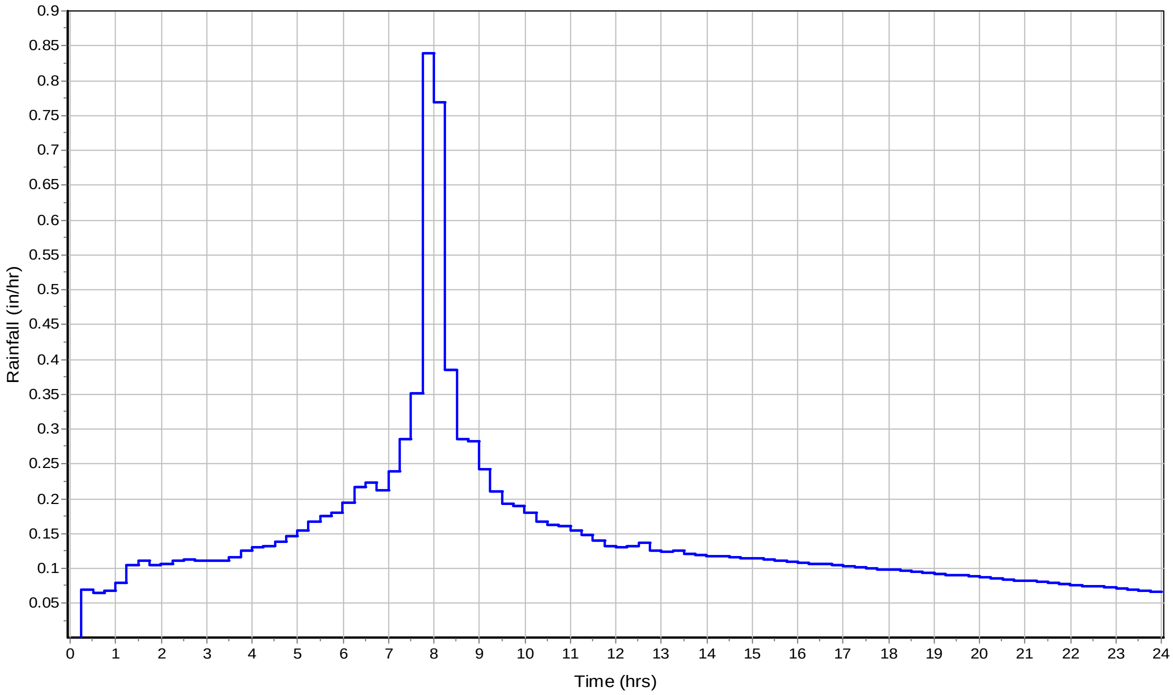
Time of Concentration

Subbasin Runoff Results

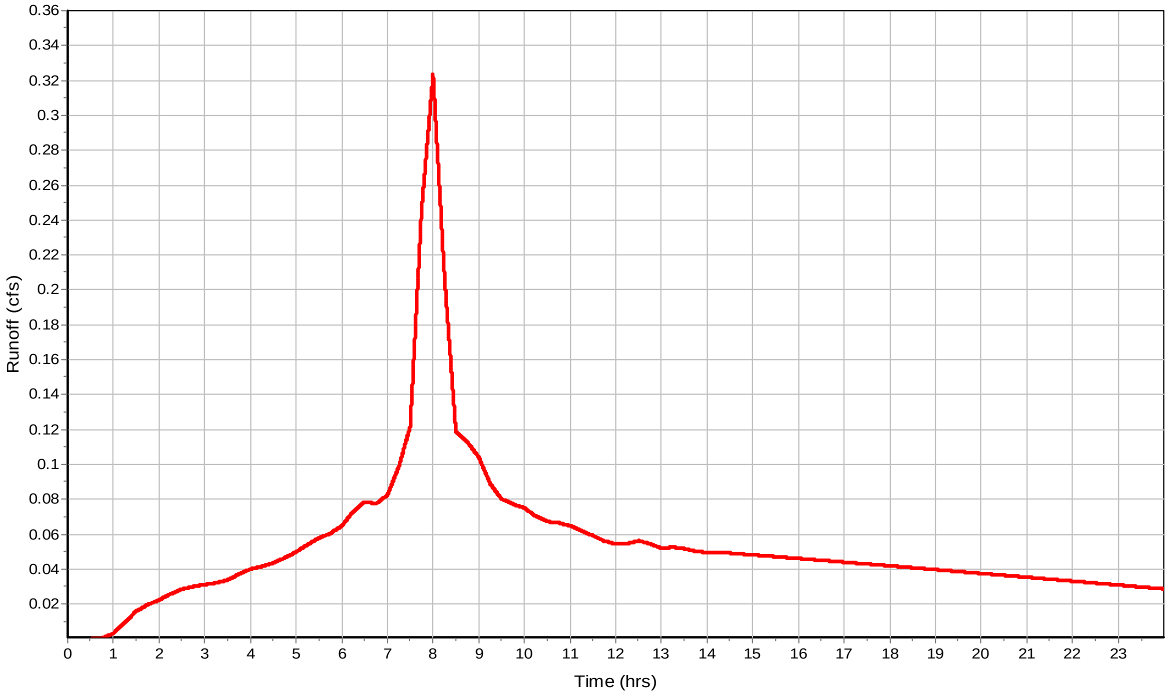
Total Rainfall (in)	3.46
Total Runoff (in)	2.82
Peak Runoff (cfs)	0.32
Weighted Curve Number	93.16
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 19

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 20

Input Data

Area (ac)	0.11
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.11		93.38

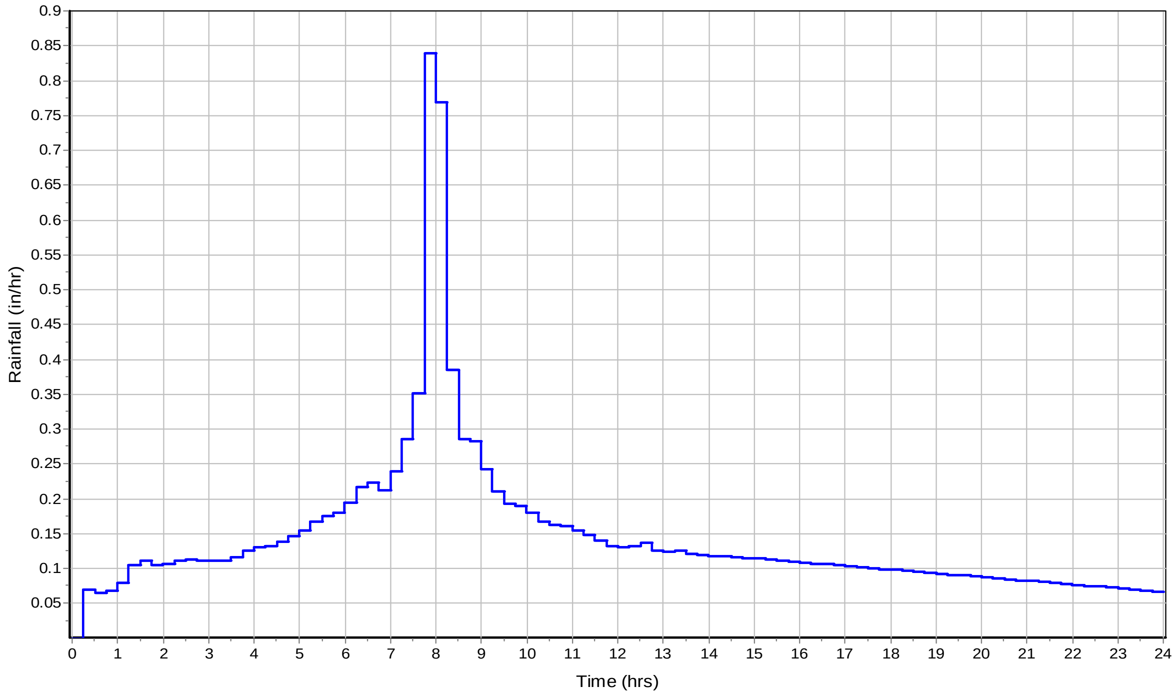
Time of Concentration

Subbasin Runoff Results

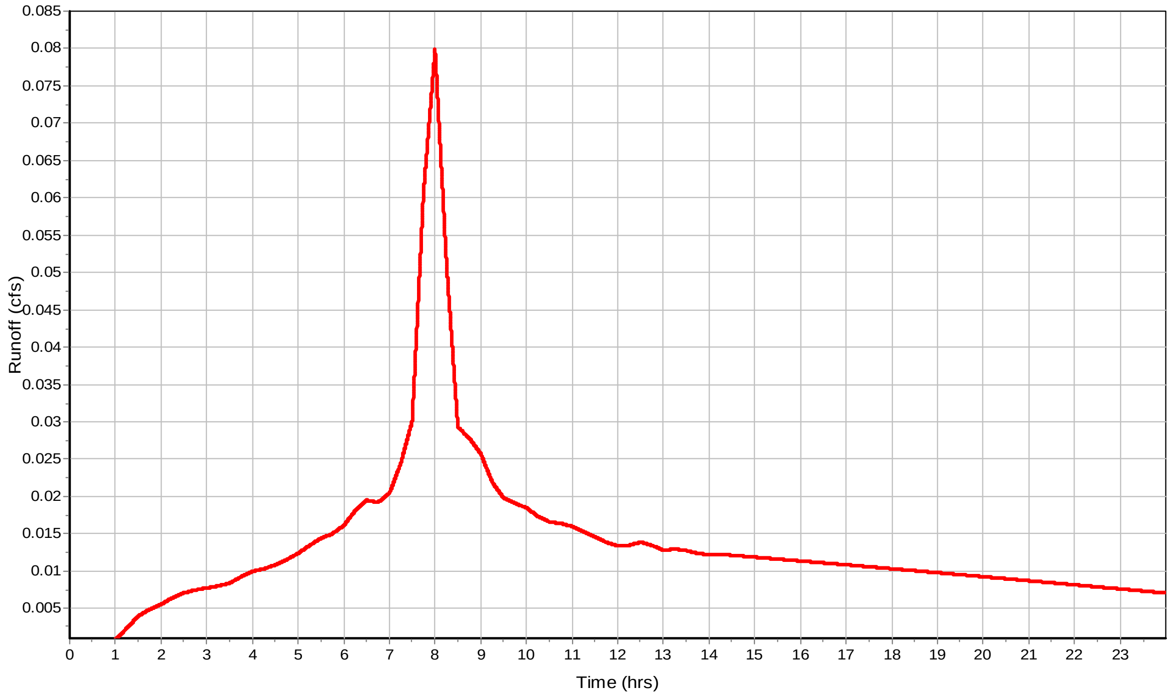
Total Rainfall (in)	3.46
Total Runoff (in)	2.84
Peak Runoff (cfs)	0.08
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 20

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 21

Input Data

Area (ac)	0.09
Impervious Area (%)	93
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.09		96.46

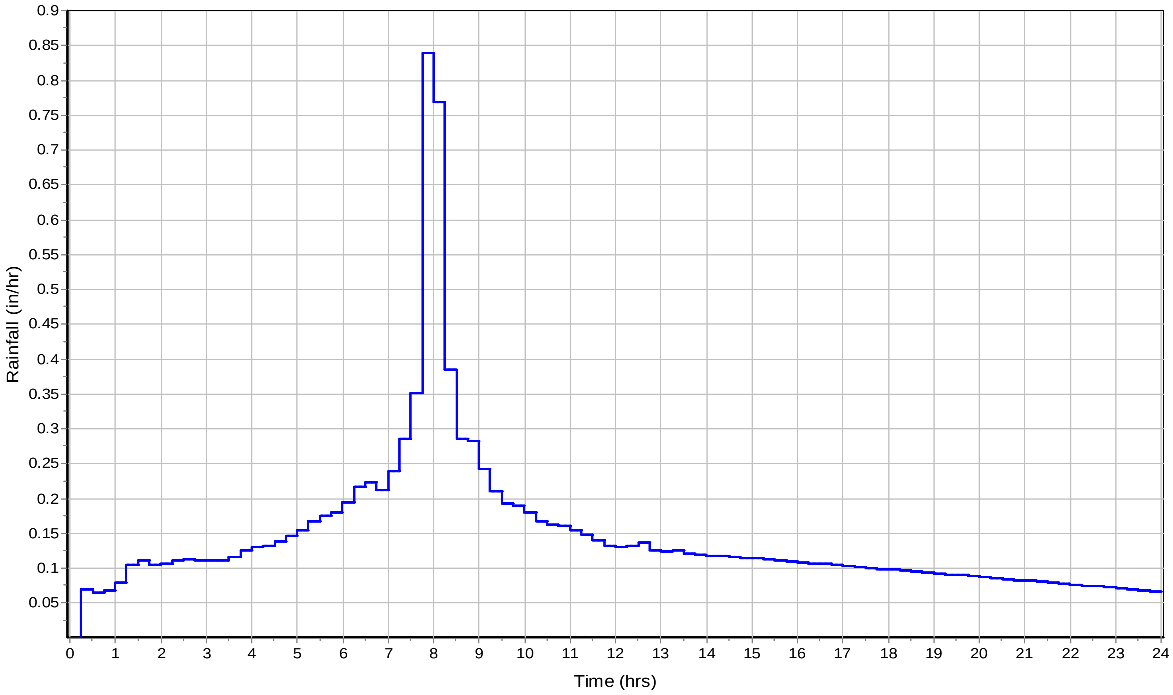
Time of Concentration

Subbasin Runoff Results

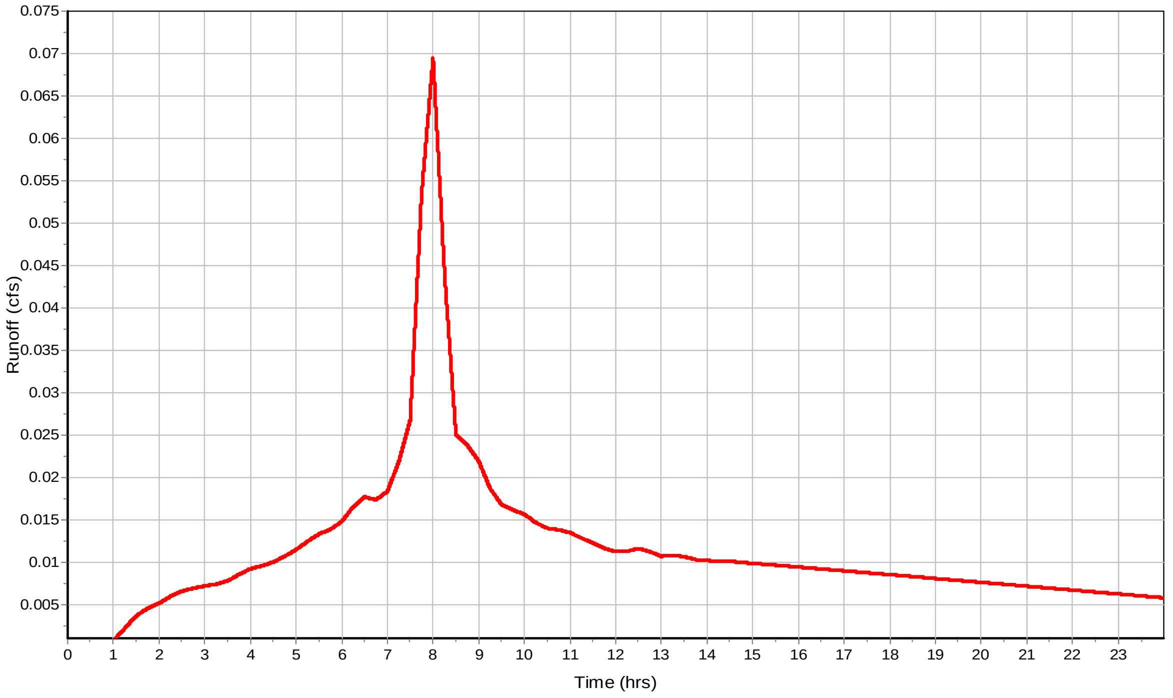
Total Rainfall (in)	3.46
Total Runoff (in)	3.11
Peak Runoff (cfs)	0.07
Weighted Curve Number	96.46
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 21

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 22

Input Data

Area (ac)	0.2
Impervious Area (%)	82
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		94.04

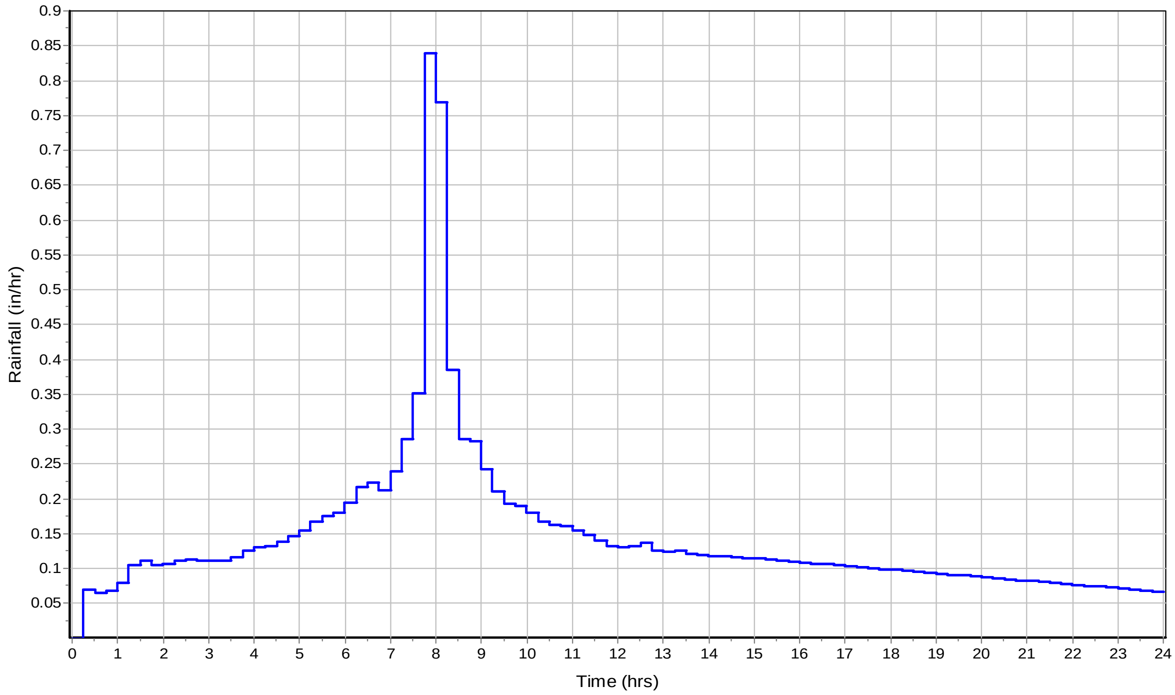
Time of Concentration

Subbasin Runoff Results

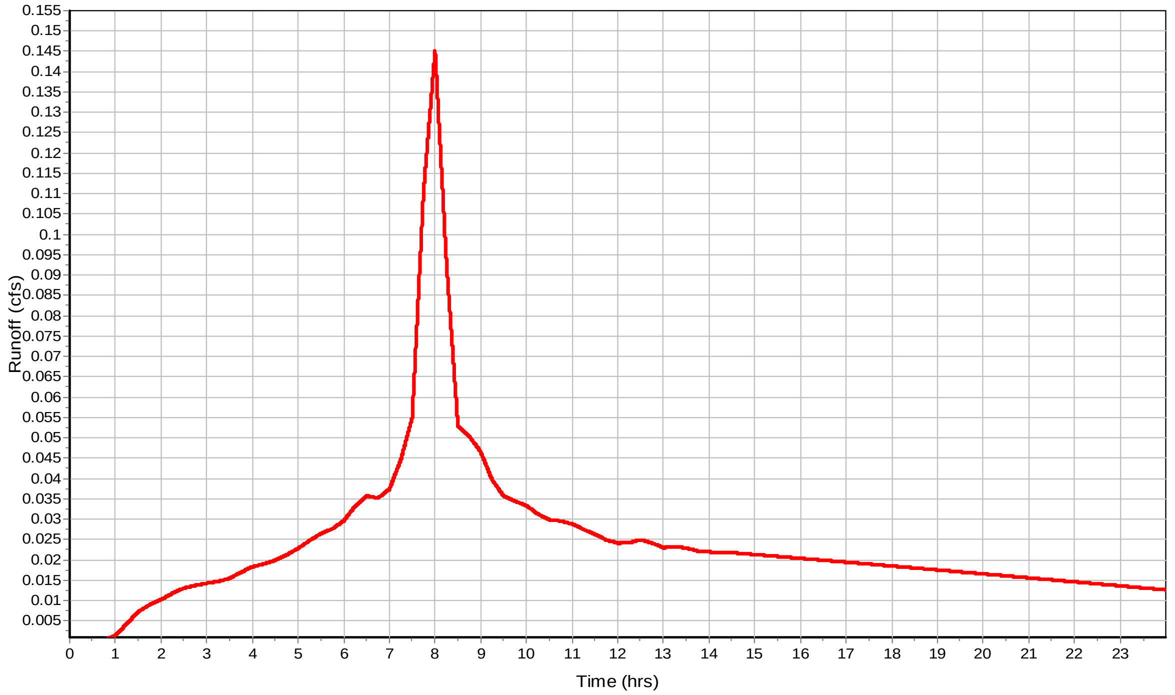
Total Rainfall (in)	3.46
Total Runoff (in)	2.9
Peak Runoff (cfs)	0.15
Weighted Curve Number	94.04
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 23

Input Data

Area (ac)	0.2
Impervious Area (%)	86
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32 Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN	0.2		94.92

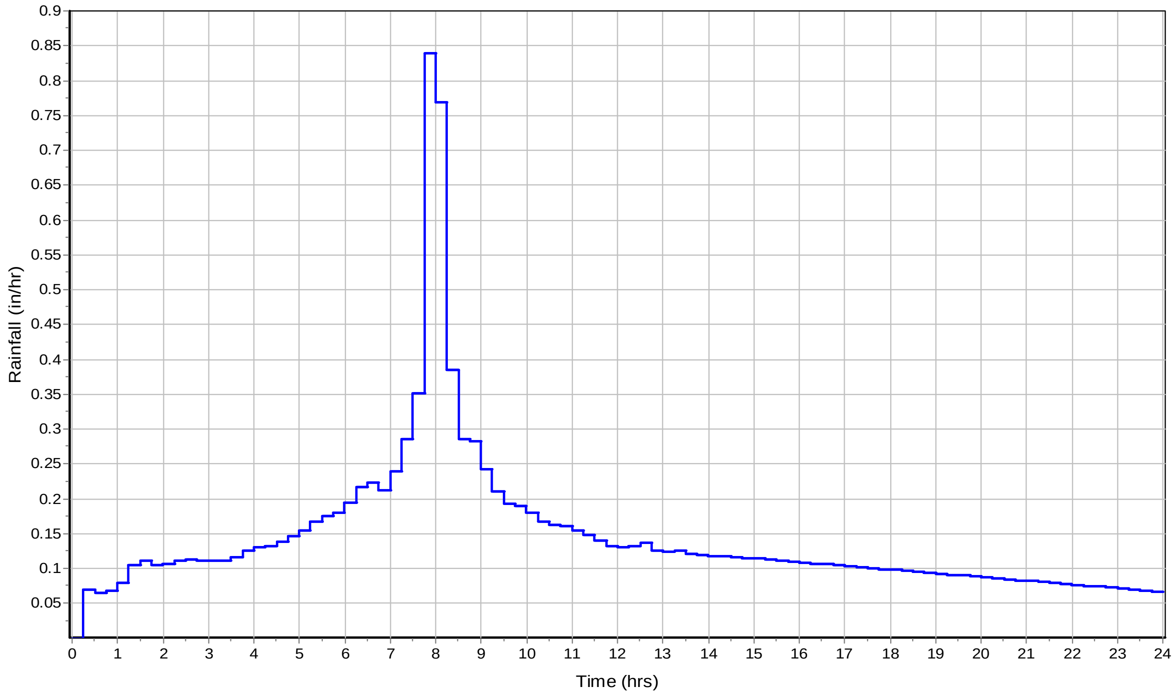
Time of Concentration

Subbasin Runoff Results

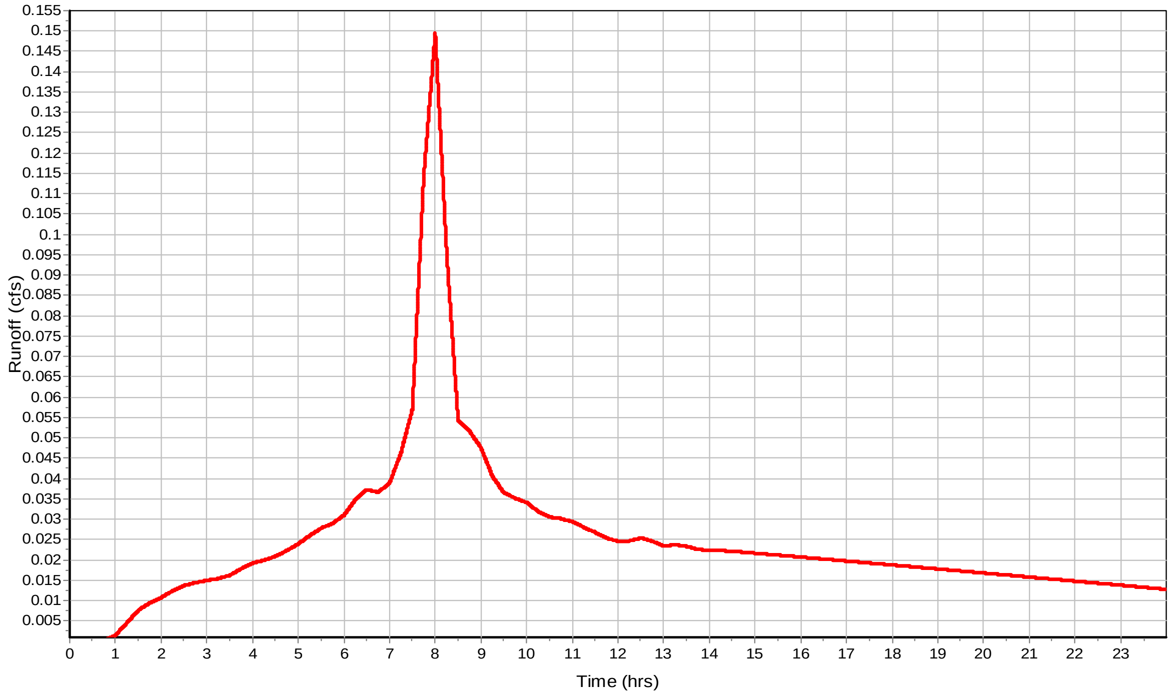
Total Rainfall (in)	3.46
Total Runoff (in)	2.97
Peak Runoff (cfs)	0.15
Weighted Curve Number	94.92
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 23

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 24

Input Data

Area (ac)	0.02
Impervious Area (%)	85
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.02		94.7

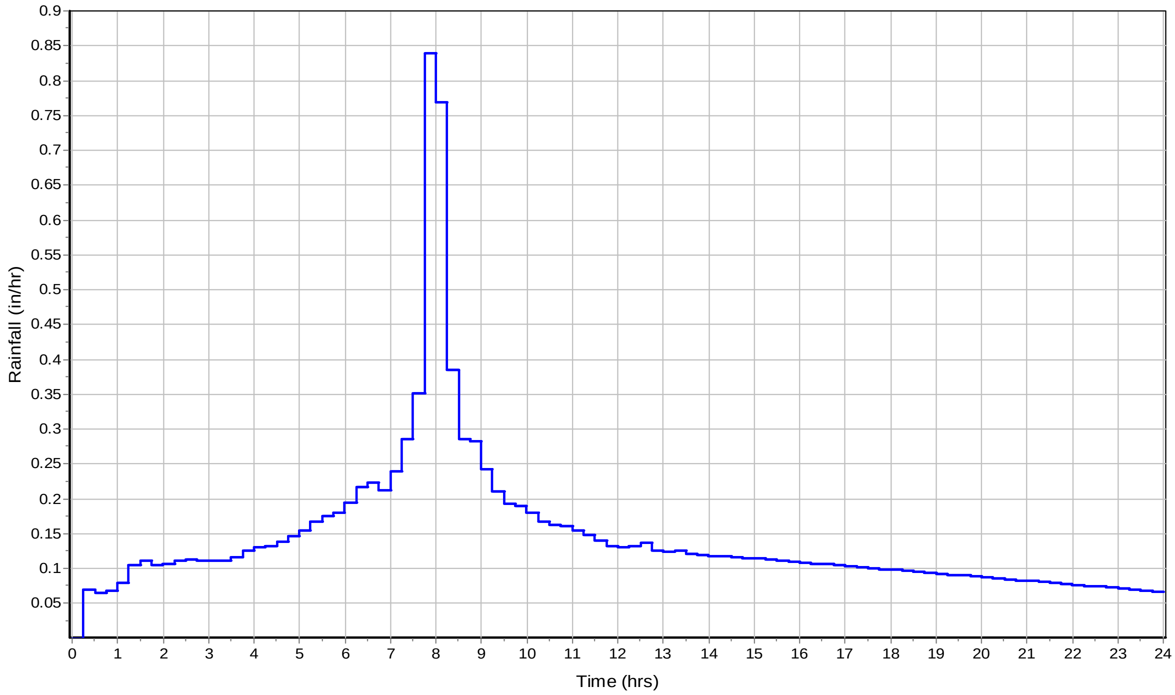
Time of Concentration

Subbasin Runoff Results

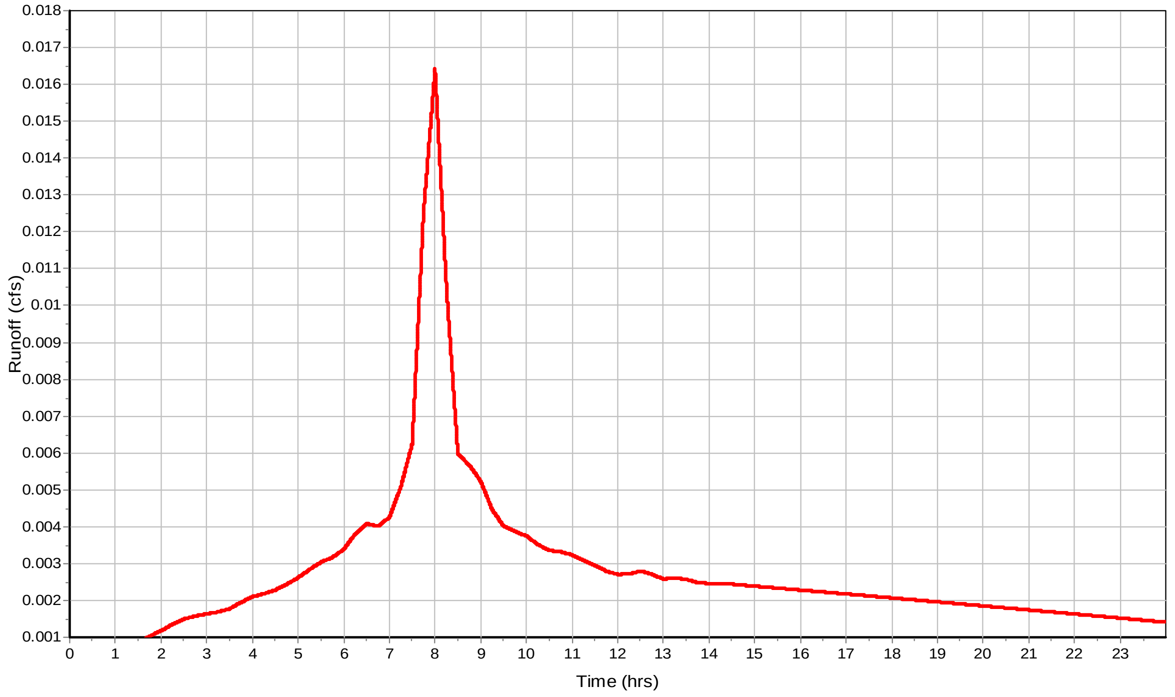
Total Rainfall (in)	3.46
Total Runoff (in)	2.95
Peak Runoff (cfs)	0.02
Weighted Curve Number	94.7
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 24

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 25

Input Data

Area (ac)	0.03
Impervious Area (%)	65
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.03		90.3

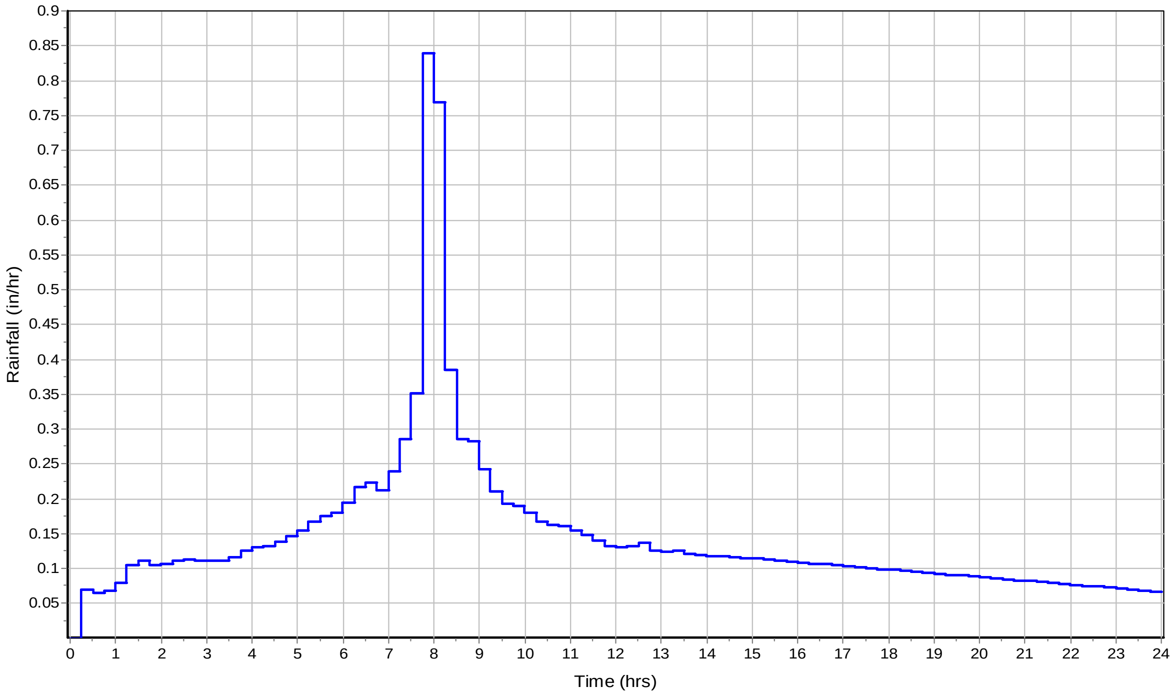
Time of Concentration

Subbasin Runoff Results

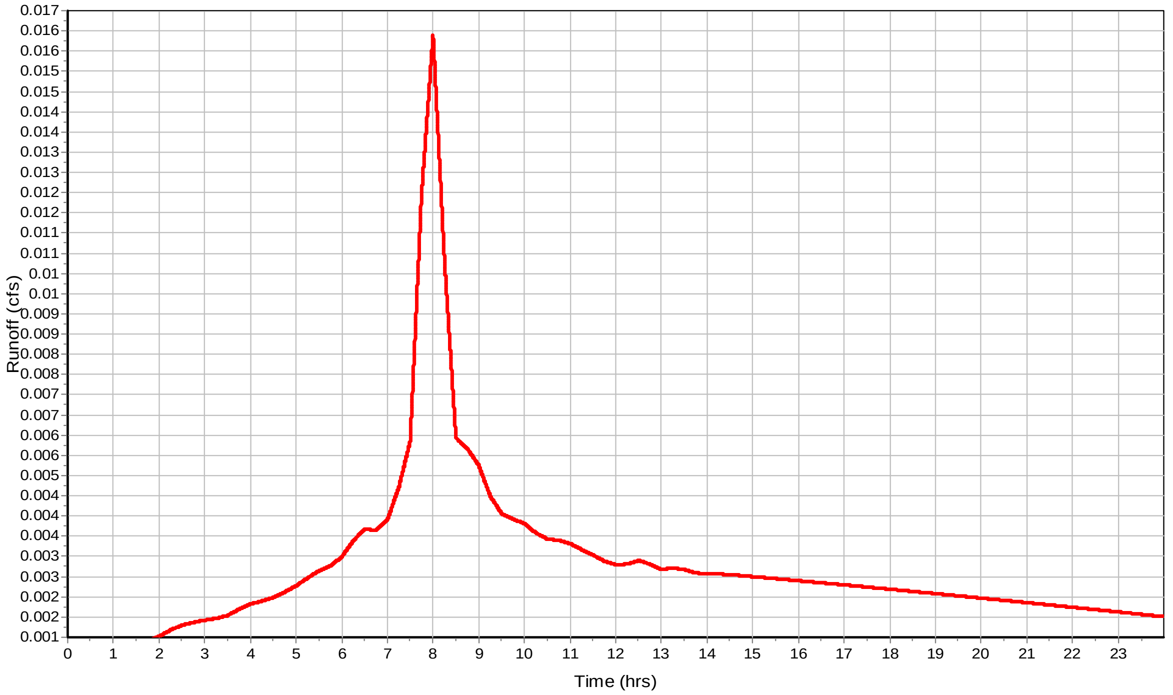
Total Rainfall (in)	3.46
Total Runoff (in)	2.57
Peak Runoff (cfs)	0.02
Weighted Curve Number	90.3
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 25

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 27

Input Data

Area (ac)	0.49
Impervious Area (%)	76
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.49		92.72

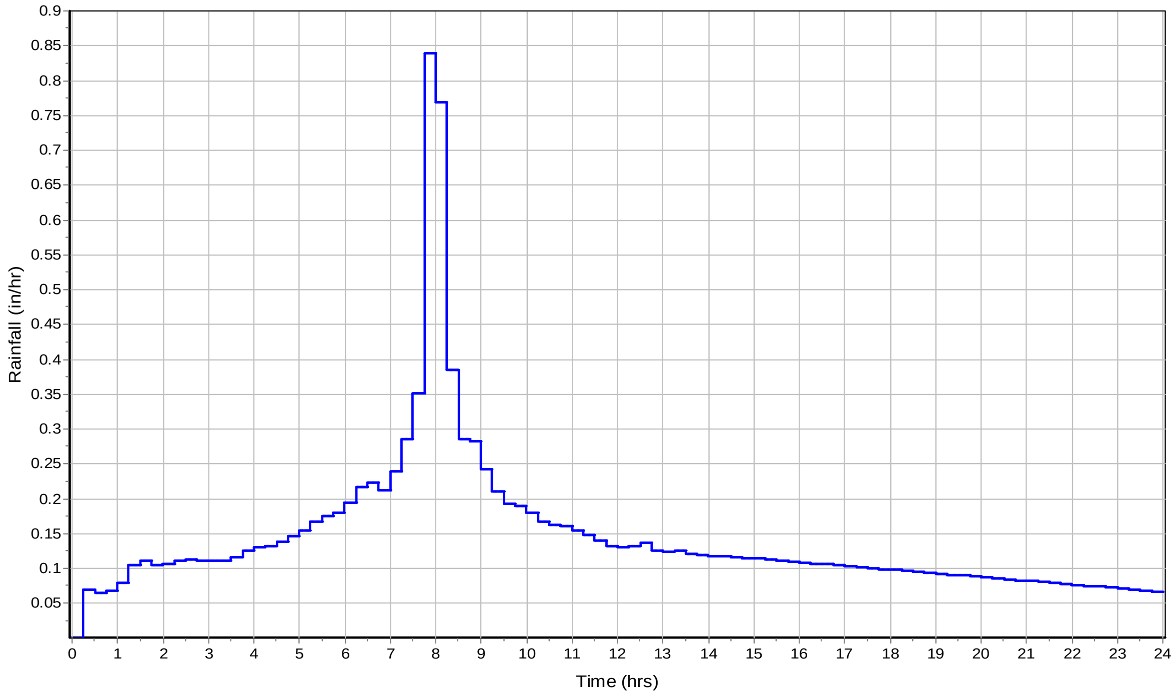
Time of Concentration

Subbasin Runoff Results

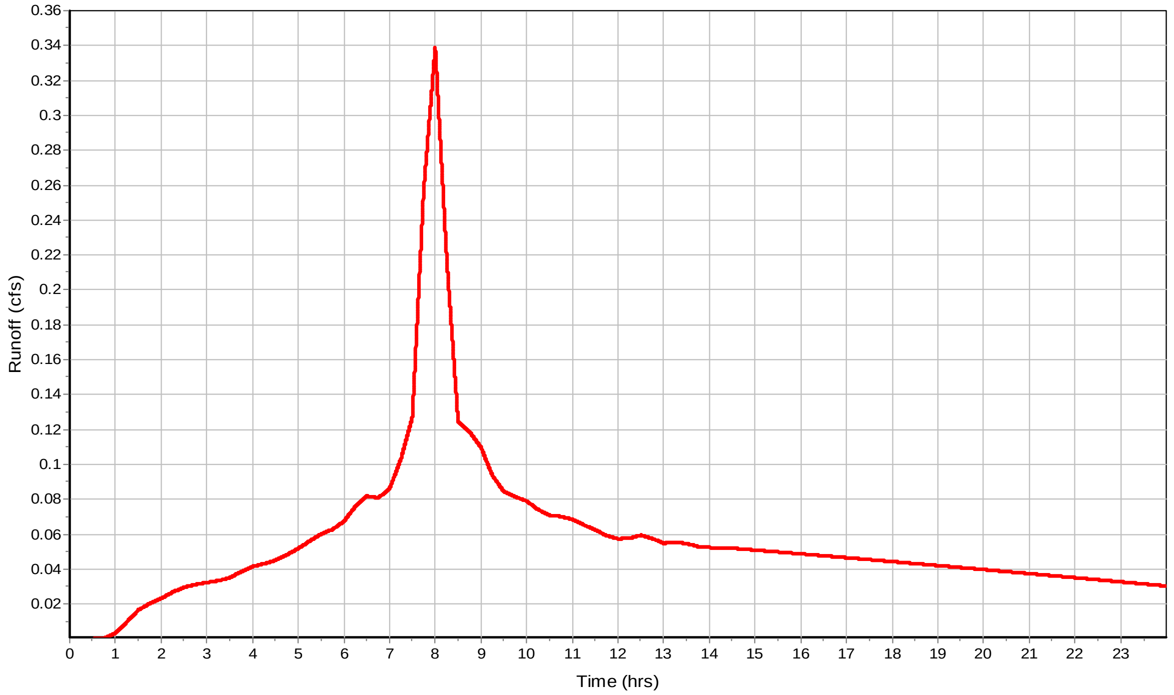
Total Rainfall (in)	3.46
Total Runoff (in)	2.78
Peak Runoff (cfs)	0.34
Weighted Curve Number	92.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 27

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 28

Input Data

Area (ac)	0.2
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

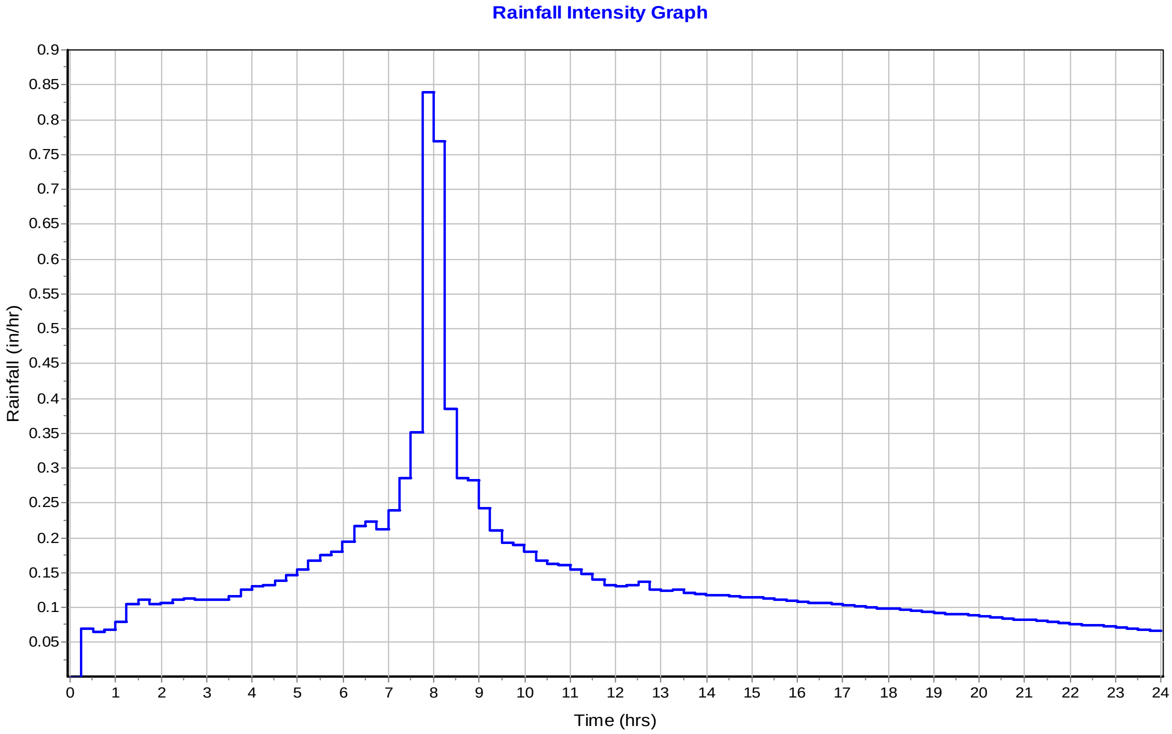
Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		92.06

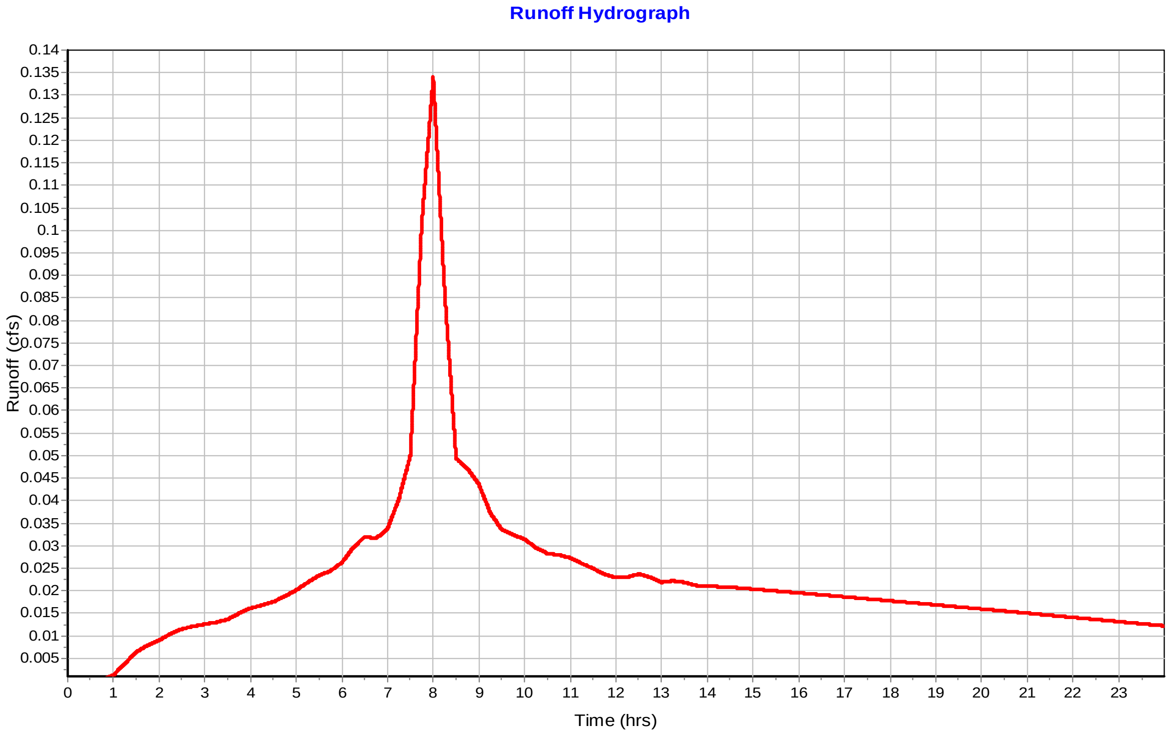
Time of Concentration

Subbasin Runoff Results

Total Rainfall (in)	3.46
Total Runoff (in)	2.73
Peak Runoff (cfs)	0.13
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 28





Subbasin : SDCB 29

Input Data

Area (ac)	0.2
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.2		93.38

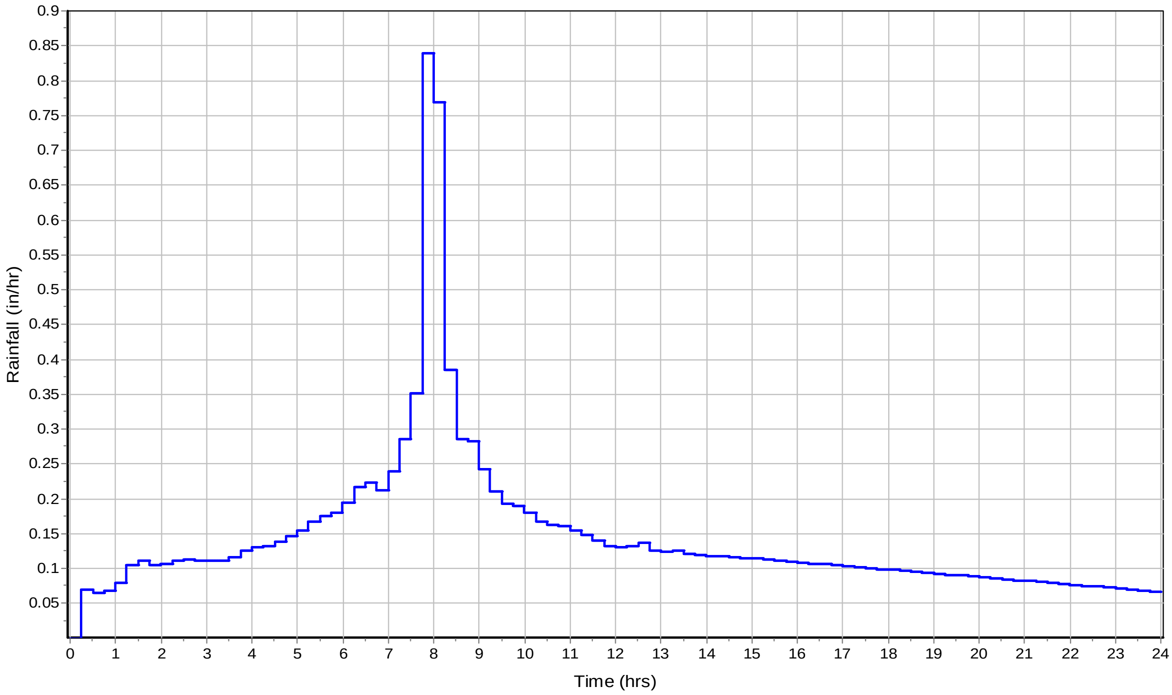
Time of Concentration

Subbasin Runoff Results

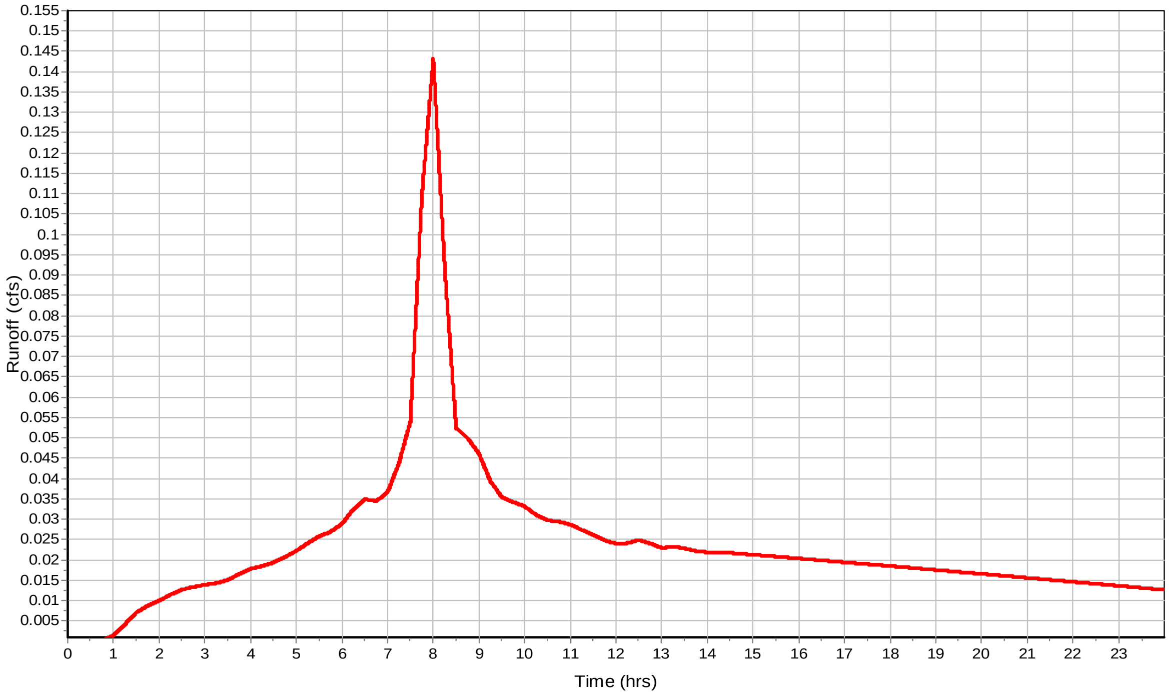
Total Rainfall (in)	3.46
Total Runoff (in)	2.84
Peak Runoff (cfs)	0.14
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 30

Input Data

Area (ac)	0.43
Impervious Area (%)	77
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.43		92.94

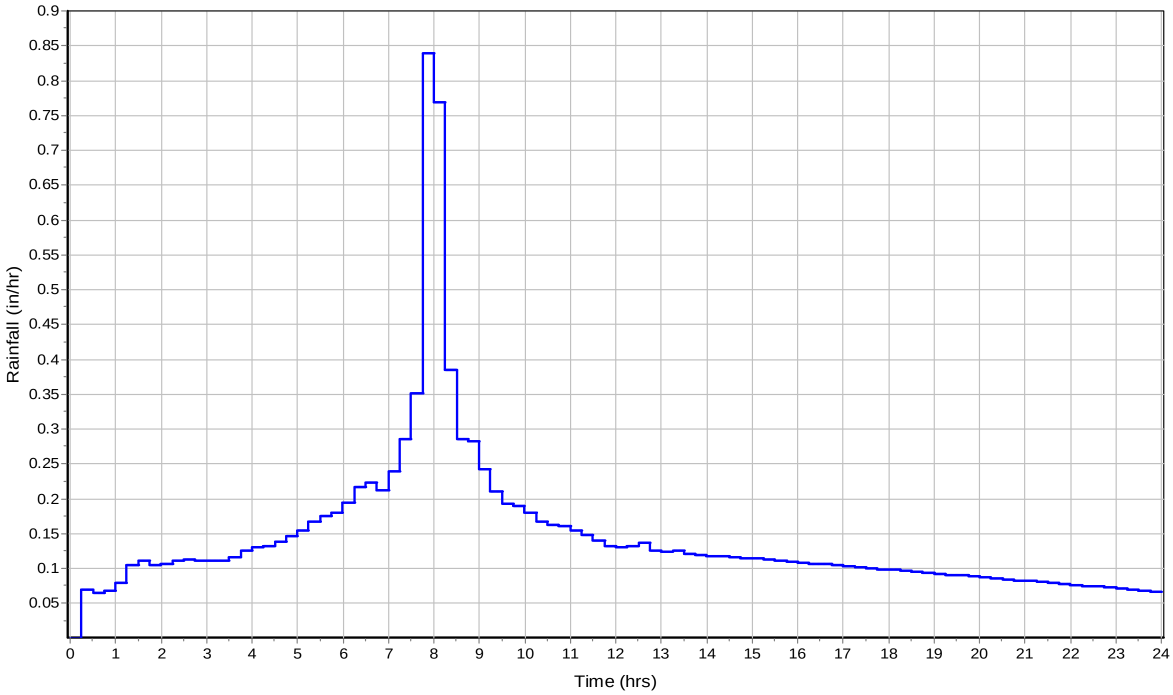
Time of Concentration

Subbasin Runoff Results

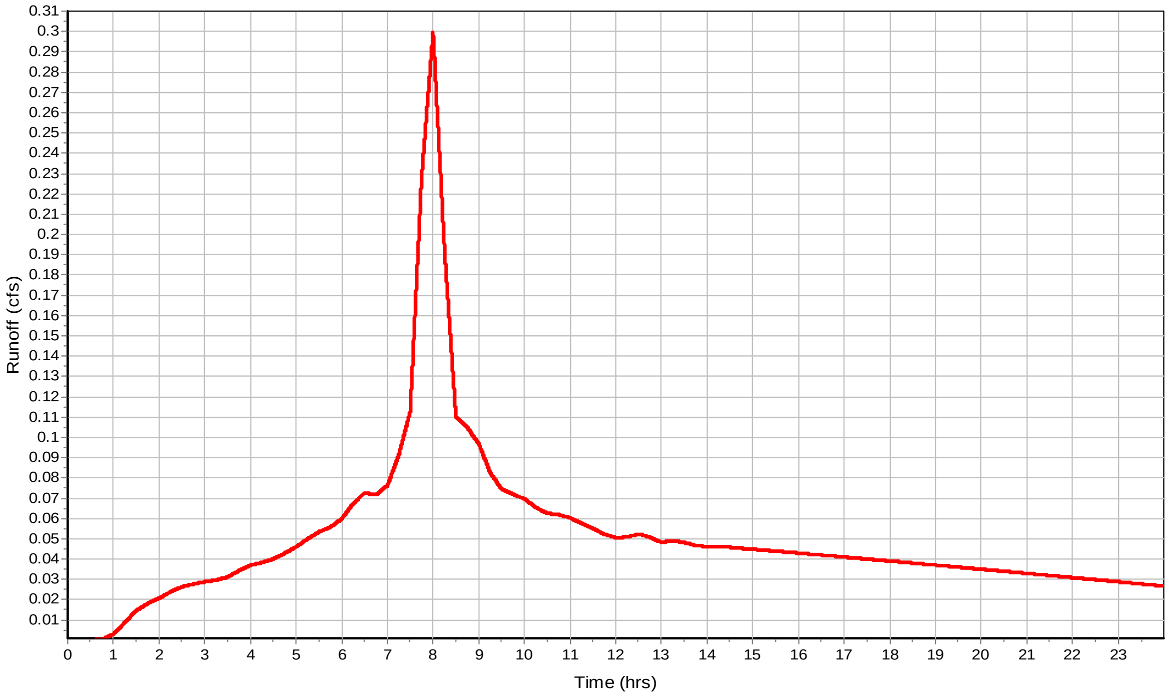
Total Rainfall (in)	3.46
Total Runoff (in)	2.8
Peak Runoff (cfs)	0.3
Weighted Curve Number	92.94
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 30

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 31

Input Data

Area (ac)	0.52
Impervious Area (%)	26
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.52		81.72

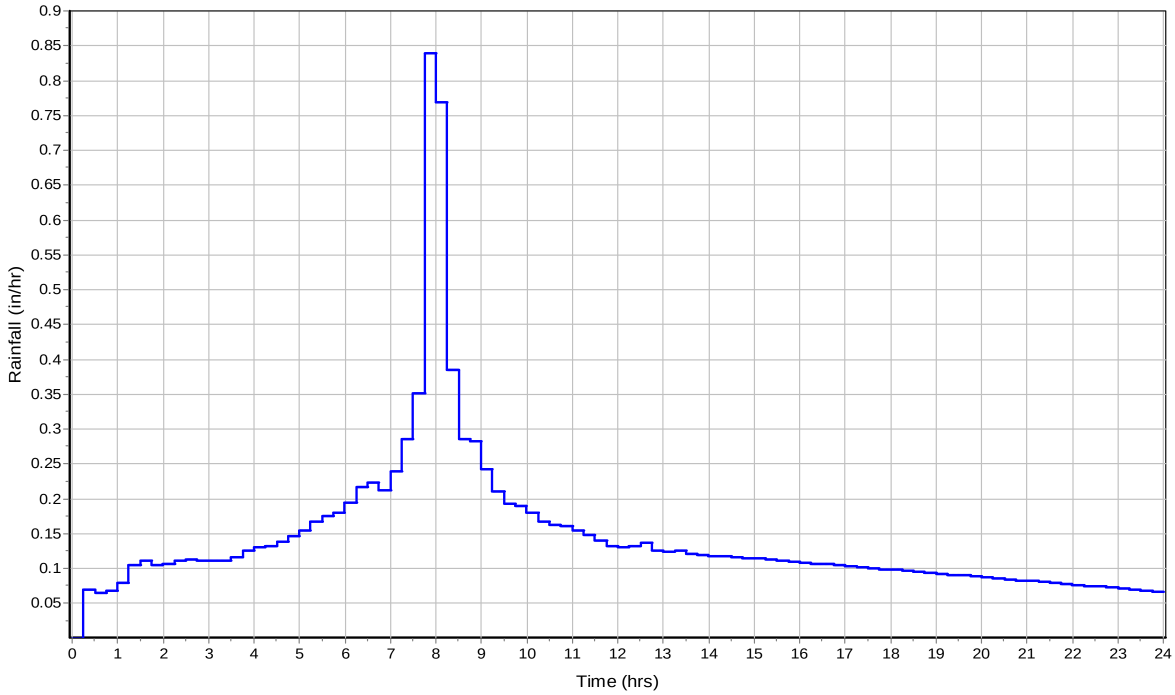
Time of Concentration

Subbasin Runoff Results

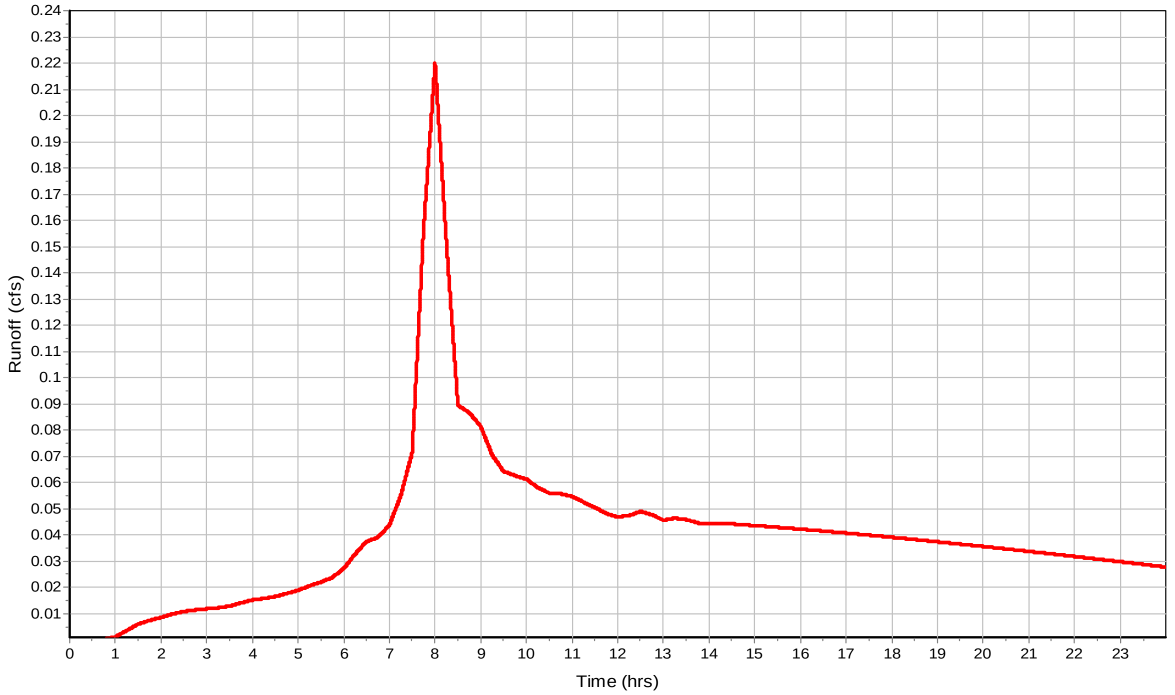
Total Rainfall (in)	3.46
Total Runoff (in)	1.84
Peak Runoff (cfs)	0.22
Weighted Curve Number	81.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 31

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 32

Input Data

Area (ac)	0.19
Impervious Area (%)	73
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.19		92.06

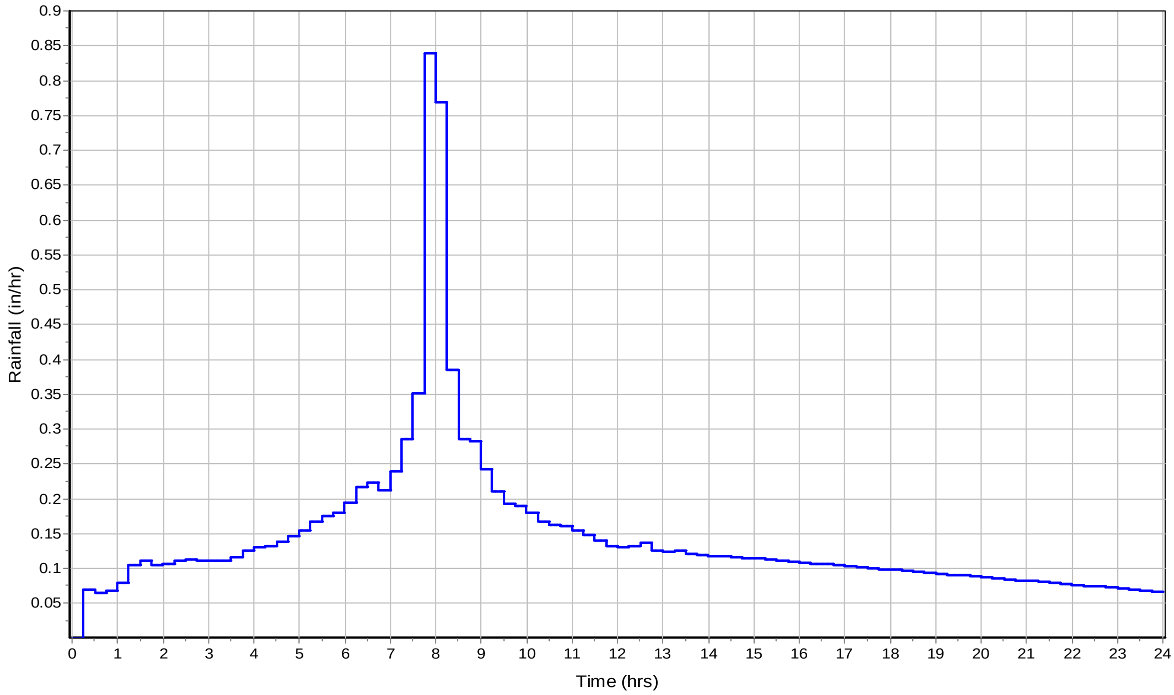
Time of Concentration

Subbasin Runoff Results

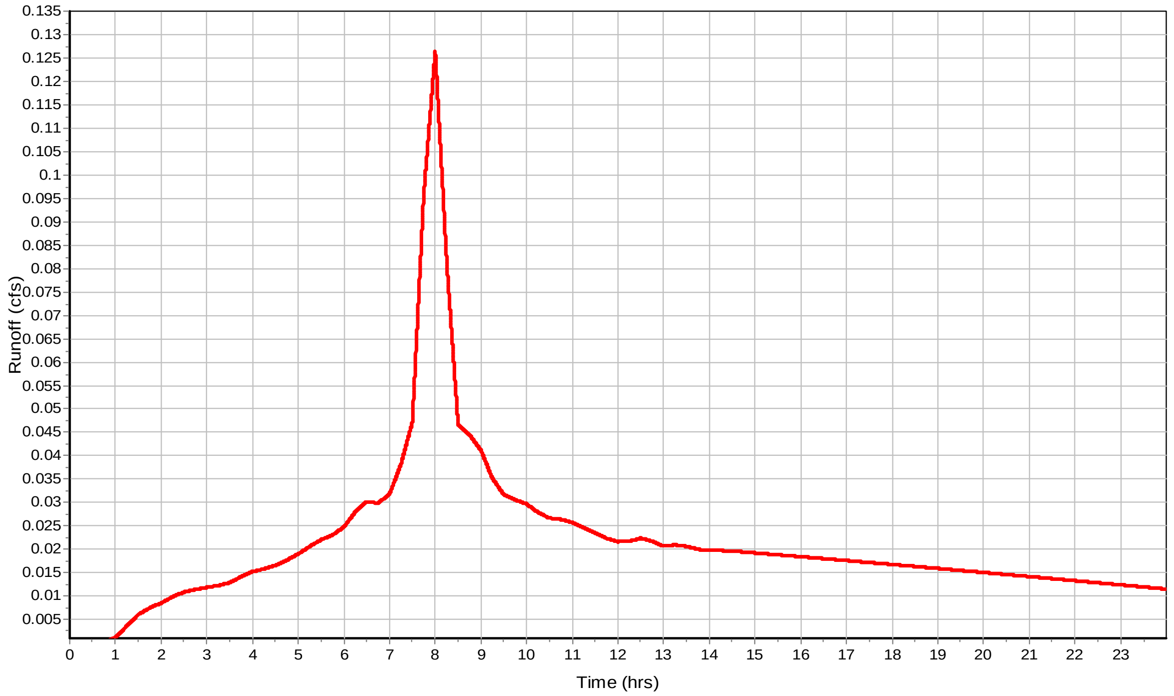
Total Rainfall (in)	3.46
Total Runoff (in)	2.73
Peak Runoff (cfs)	0.13
Weighted Curve Number	92.06
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 32

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 33

Input Data

Area (ac)	0.23
Impervious Area (%)	83
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.23		94.26

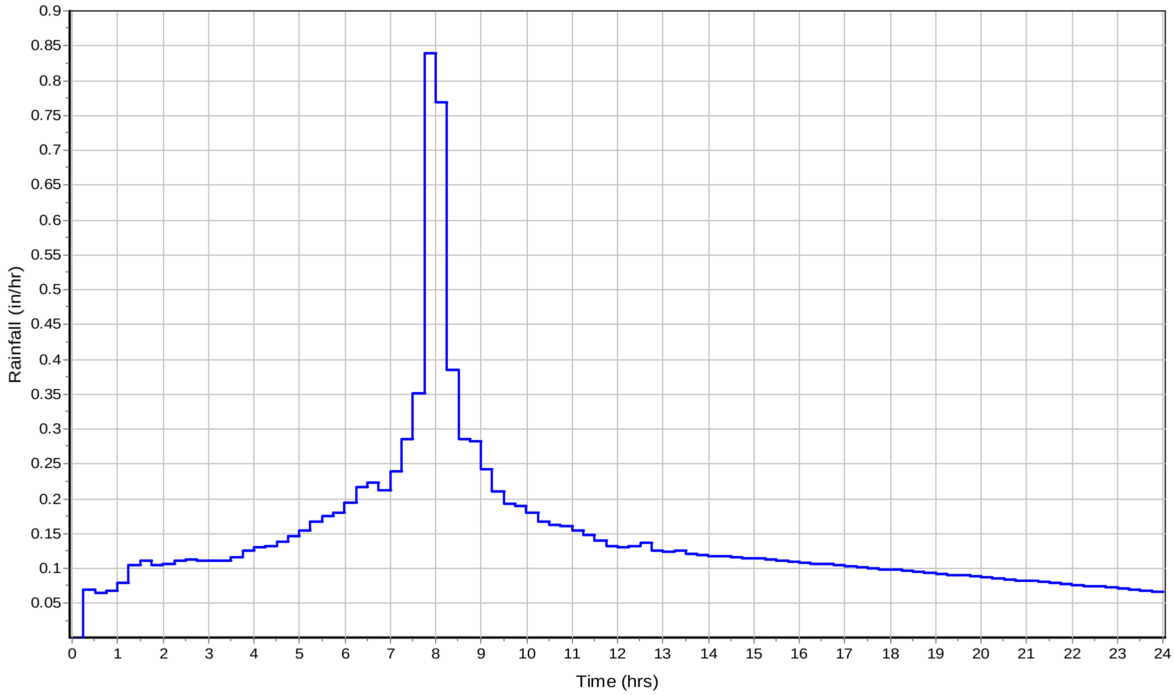
Time of Concentration

Subbasin Runoff Results

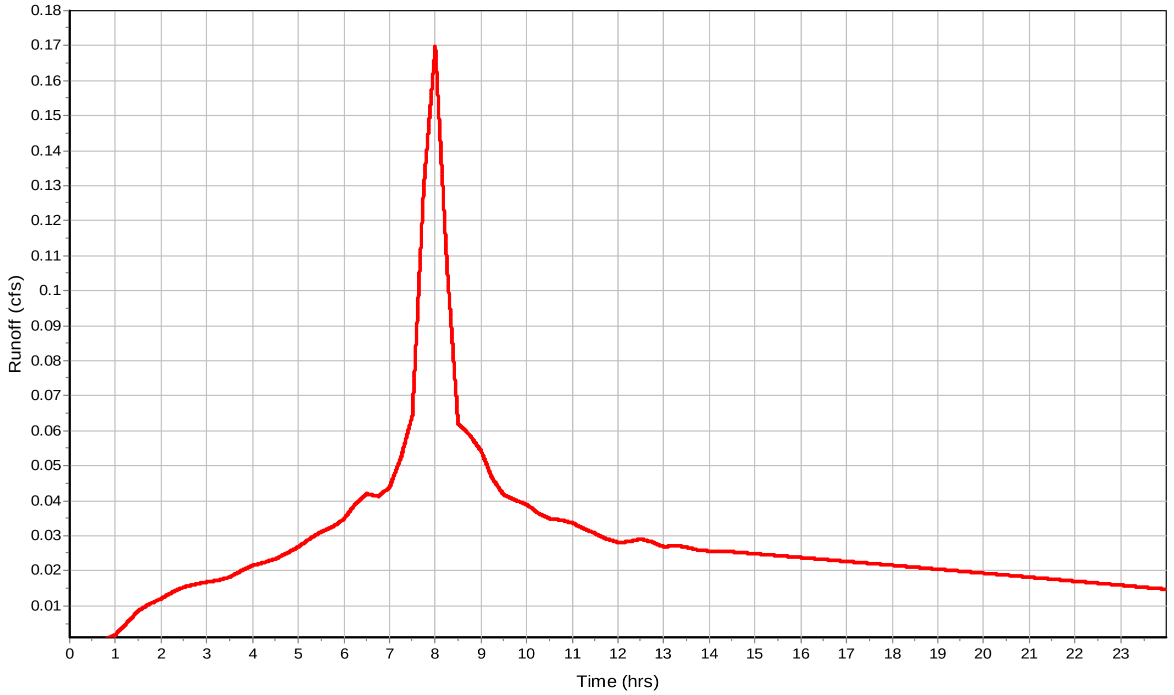
Total Rainfall (in)	3.46
Total Runoff (in)	2.92
Peak Runoff (cfs)	0.17
Weighted Curve Number	94.26
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 33

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 34

Input Data

Area (ac)	0.14
Impervious Area (%)	76
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.14		92.72

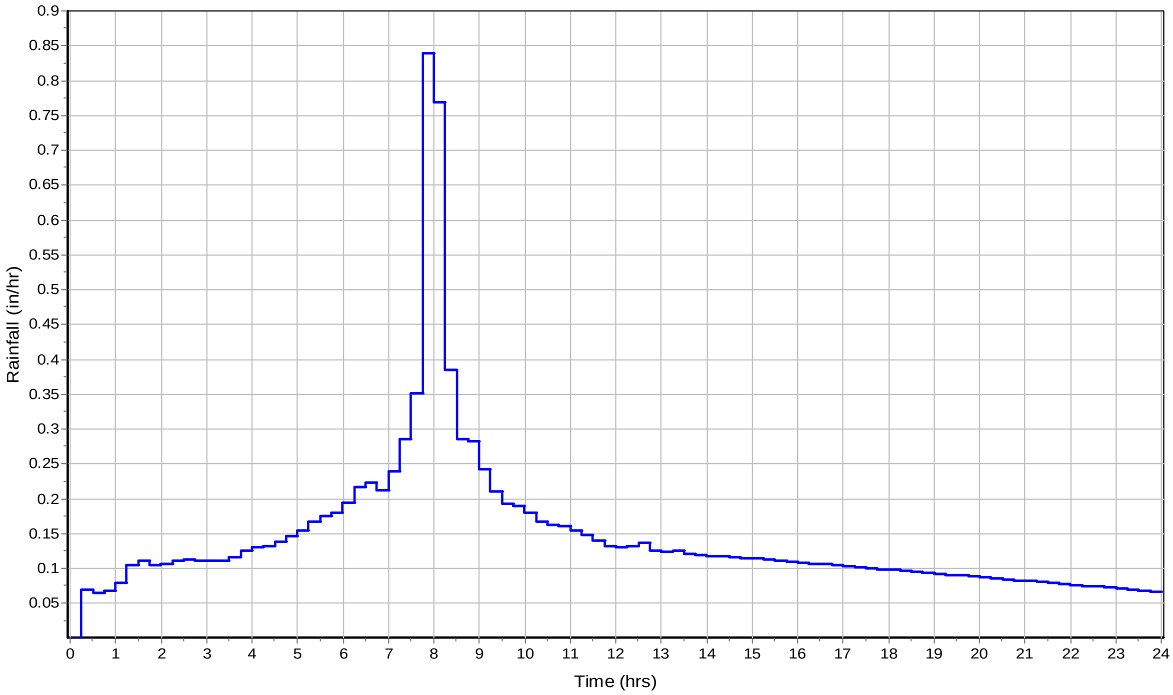
Time of Concentration

Subbasin Runoff Results

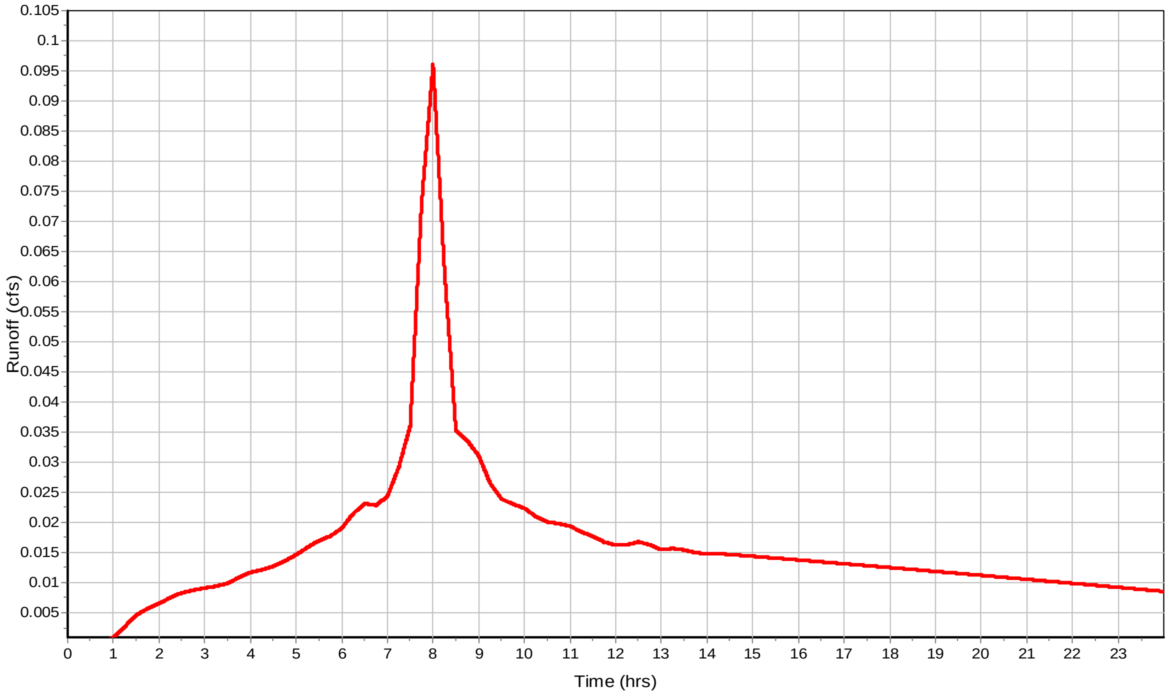
Total Rainfall (in)	3.46
Total Runoff (in)	2.78
Peak Runoff (cfs)	0.1
Weighted Curve Number	92.72
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 34

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 36

Input Data

Area (ac)	0.36
Impervious Area (%)	79
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.36		93.38

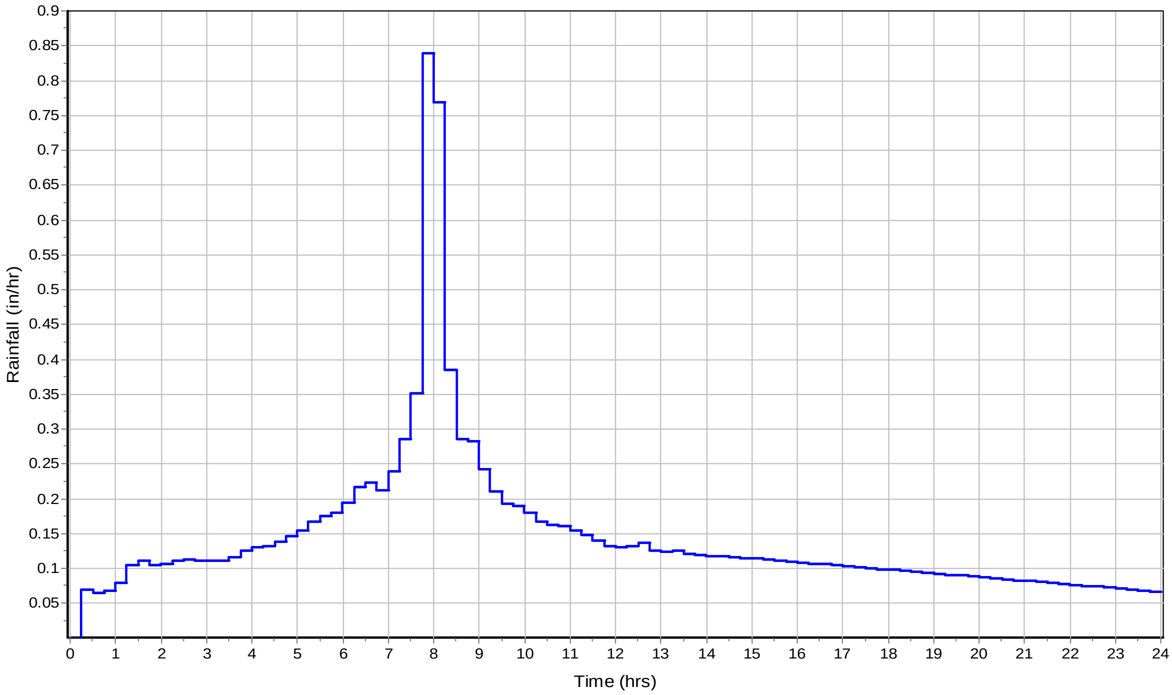
Time of Concentration

Subbasin Runoff Results

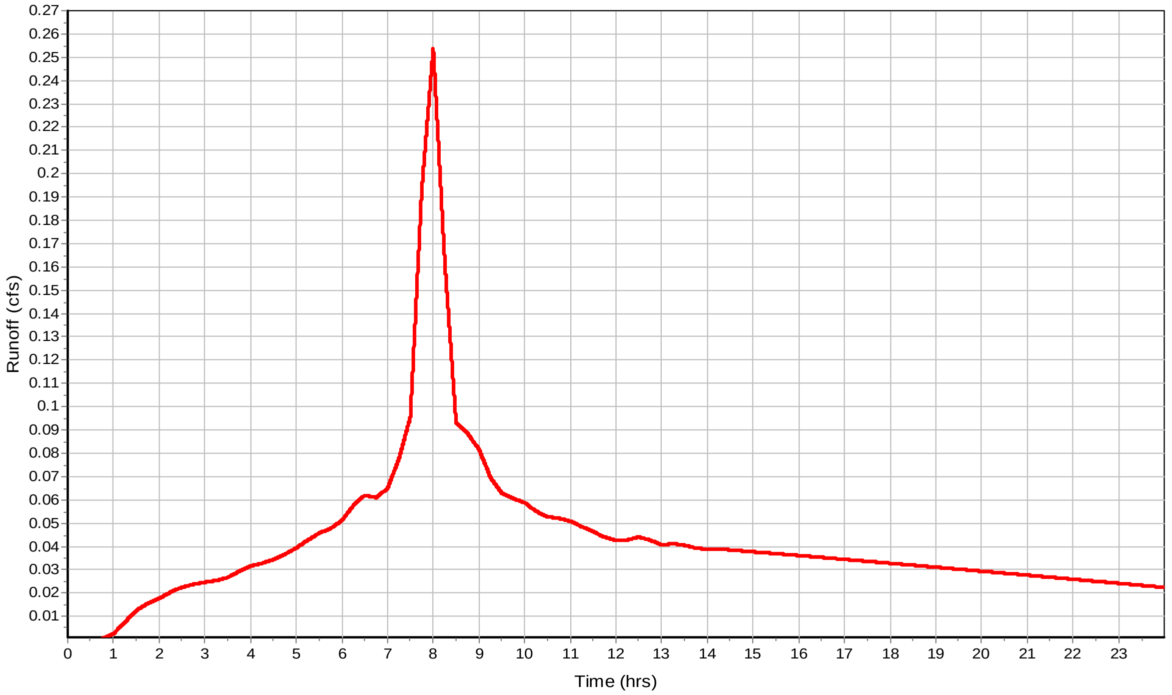
Total Rainfall (in)	3.46
Total Runoff (in)	2.84
Peak Runoff (cfs)	0.25
Weighted Curve Number	93.38
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 36

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 37

Input Data

Area (ac)	0.07
Impervious Area (%)	96
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.07		97.12

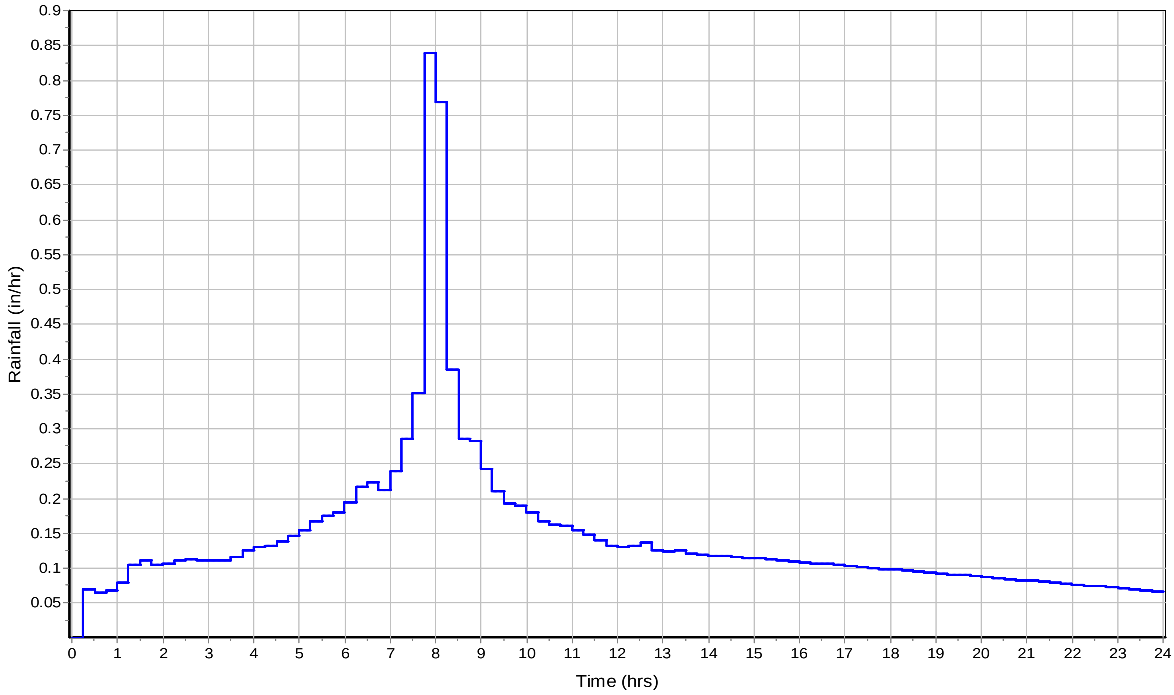
Time of Concentration

Subbasin Runoff Results

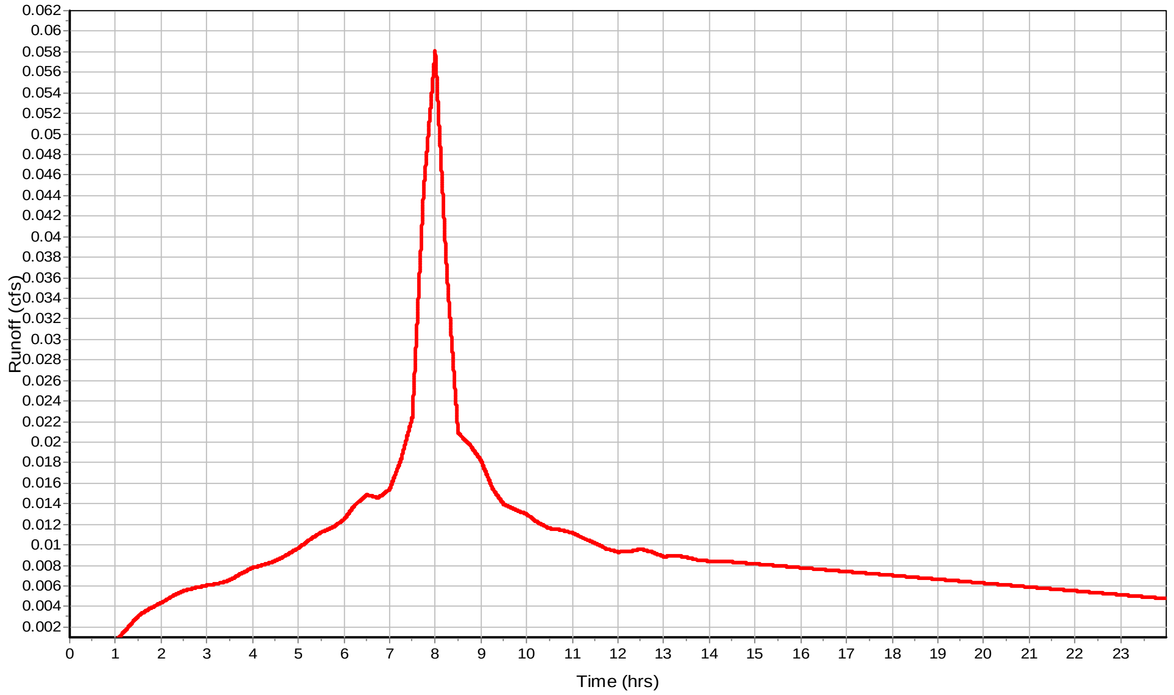
Total Rainfall (in)	3.46
Total Runoff (in)	3.16
Peak Runoff (cfs)	0.06
Weighted Curve Number	97.12
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 37

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 38

Input Data

Area (ac)	0.25
Impervious Area (%)	72
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.25		91.84

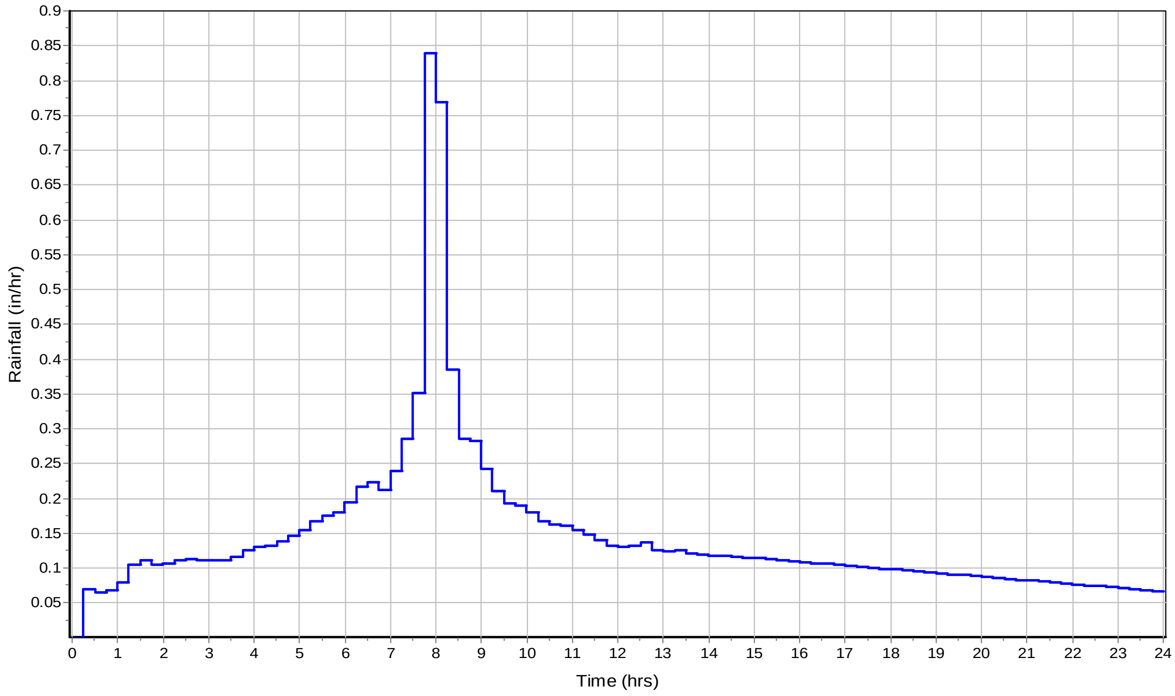
Time of Concentration

Subbasin Runoff Results

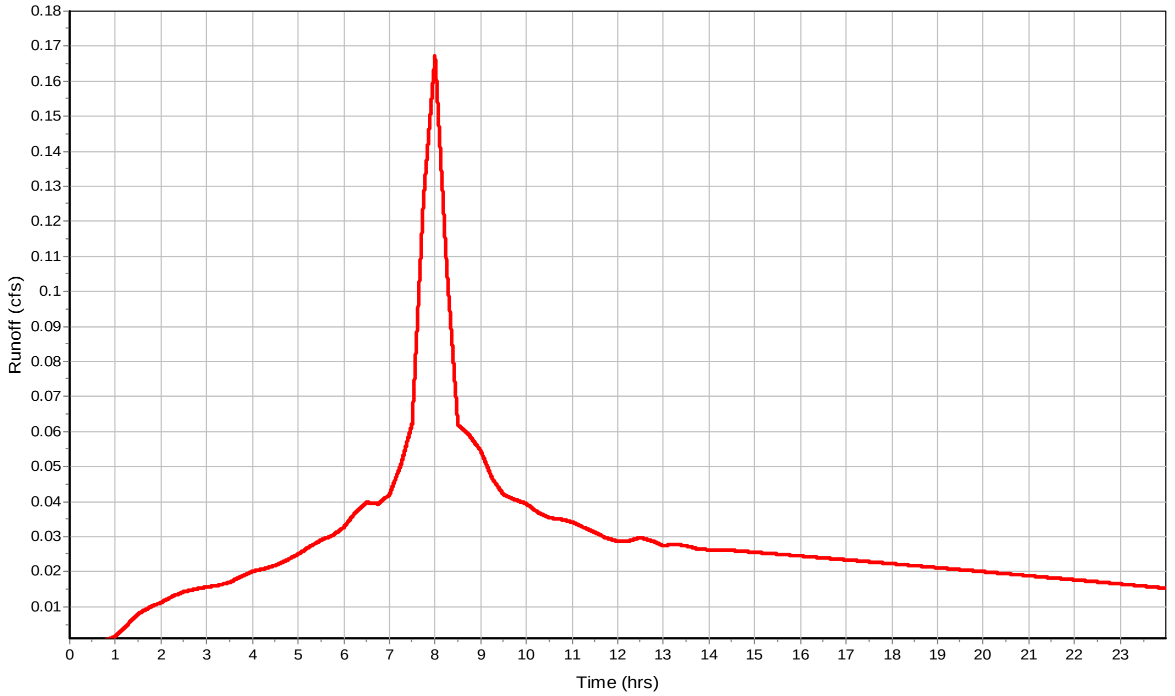
Total Rainfall (in)	3.46
Total Runoff (in)	2.71
Peak Runoff (cfs)	0.17
Weighted Curve Number	91.84
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 38

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : SDCB 40

Input Data

Area (ac)	0.11
Impervious Area (%)	0
Impervious Area Curve Number	98
Pervious Area Curve Number	76
Rain Gage ID	25-yr

Composite Curve Number

Soil/Surface Description	32	Area (acres)	Soil Group	Curve Number
Composite Area & Weighted CN		0.11		76

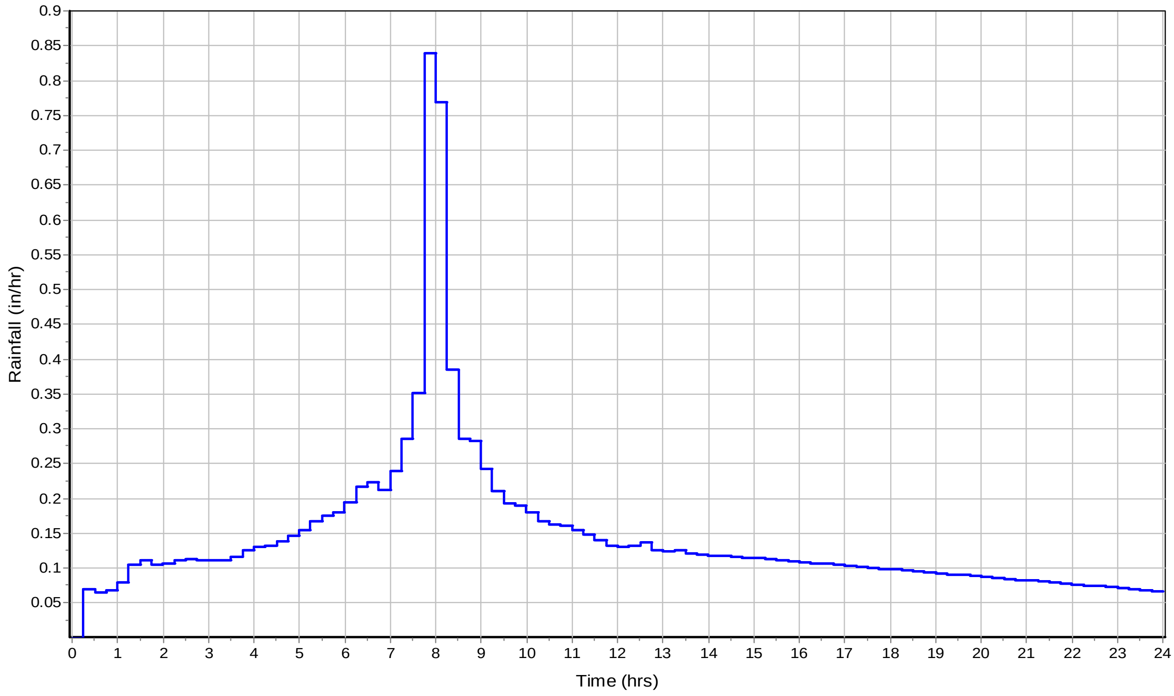
Time of Concentration

Subbasin Runoff Results

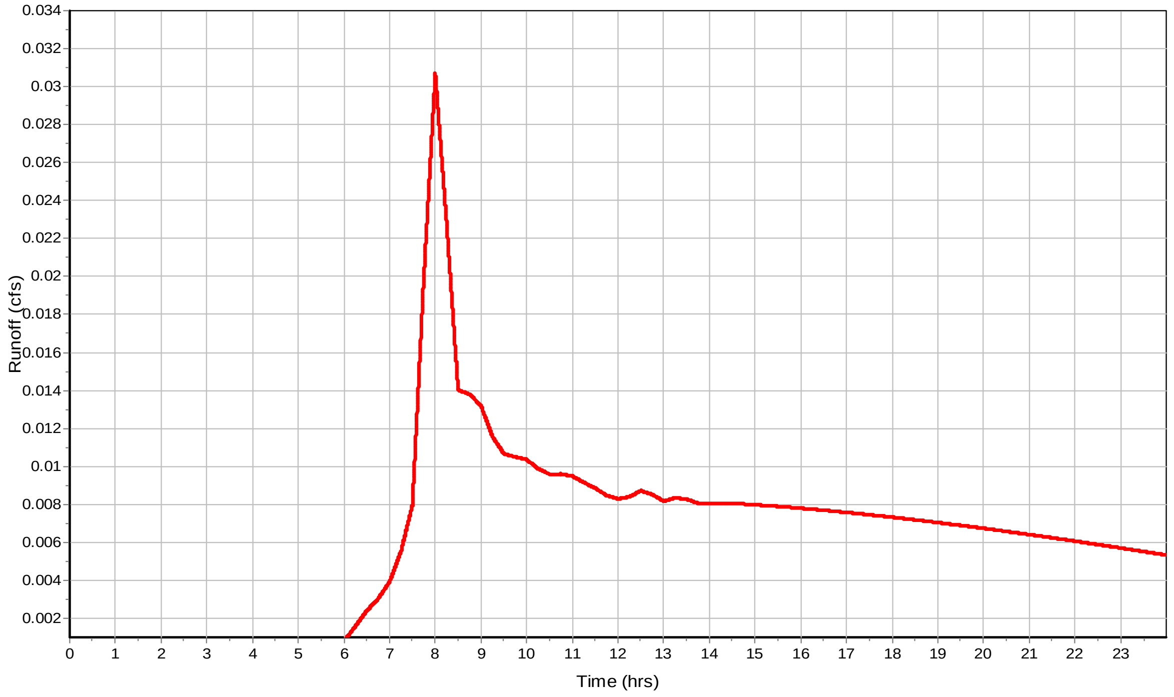
Total Rainfall (in)	3.46
Total Runoff (in)	1.34
Peak Runoff (cfs)	0.03
Weighted Curve Number	76
Time of Concentration (days hh:mm:ss)	0 00:00:00

Subbasin : SDCB 40

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^{2})	Minimum Pipe Cover (in)
1	AREA DRAIN G1	73.07	77.13	4.06	0.00	-73.07	0.00	-77.13	0.00	42.72
2	AREA DRAIN H1	72.33	77.10	4.77	0.00	-72.33	0.00	-77.10	0.00	51.24
3	SDCB#01	66.90	74.84	7.94	67.40	0.50	0.00	-74.84	0.00	0.00
4	SDCB#02	69.50	72.40	2.90	0.00	-69.50	0.00	-72.40	0.00	22.80
5	SDCB#03	69.86	72.19	2.33	0.00	-69.86	0.00	-72.19	0.00	19.96
6	SDCB#04	70.14	72.64	2.50	0.00	-70.14	0.00	-72.64	0.00	22.00
7	SDCB#05	68.96	72.11	3.15	0.00	-68.96	0.00	-72.11	0.00	25.80
8	SDCB#06	68.72	73.03	4.31	0.00	-68.72	0.00	-73.03	0.00	43.72
9	SDCB#07	69.08	71.79	2.71	0.00	-69.08	0.00	-71.79	0.00	24.52
10	SDCB#08	69.55	72.45	2.90	0.00	-69.55	0.00	-72.45	0.00	26.80
11	SDCB#09	68.51	72.35	3.84	0.00	-68.51	0.00	-72.35	0.00	34.08
12	SDCB#10	67.90	76.96	9.06	68.40	0.50	0.00	-76.96	0.00	0.00
13	SDCB#11	73.48	76.58	3.10	0.00	-73.48	0.00	-76.58	0.00	29.20
14	SDCB#12	73.83	76.54	2.71	0.00	-73.83	0.00	-76.54	0.00	24.52
15	SDCB#13	73.87	76.58	2.71	0.00	-73.87	0.00	-76.58	0.00	24.52
16	SDCB#14	71.89	76.31	4.42	0.00	-71.89	0.00	-76.31	0.00	41.04
17	SDCB#15	71.68	76.25	4.57	0.00	-71.68	0.00	-76.25	0.00	42.84
18	SDCB#16	72.23	76.36	4.13	0.00	-72.23	0.00	-76.36	0.00	35.28
19	SDCB#17	72.75	76.55	3.80	0.00	-72.75	0.00	-76.55	0.00	37.60
20	SDCB#18	68.40	76.69	8.29	0.00	-68.40	0.00	-76.69	0.00	75.48
21	SDCB#19	70.35	75.25	4.90	0.00	-70.35	0.00	-75.25	0.00	46.80
22	SDCB#20	70.98	75.25	4.27	0.00	-70.98	0.00	-75.25	0.00	39.24
23	SDCB#21	71.81	75.25	3.44	0.00	-71.81	0.00	-75.25	0.00	33.28
24	SDCB#22	71.36	75.25	3.89	0.00	-71.36	0.00	-75.25	0.00	34.68
25	SDCB#23	71.93	75.25	3.32	0.00	-71.93	0.00	-75.25	0.00	27.84
26	SDCB#24	72.61	75.25	2.64	0.00	-72.61	0.00	-75.25	0.00	23.68
27	SDCB#25	72.79	75.25	2.46	0.00	-72.79	0.00	-75.25	0.00	21.52
28	SDCB#26	68.40	76.79	8.39	0.00	-68.40	0.00	-76.79	0.00	76.68
29	SDCB#27	71.20	75.25	4.05	0.00	-71.20	0.00	-75.25	0.00	36.52
30	SDCB#28	72.15	75.25	3.10	0.00	-72.15	0.00	-75.25	0.00	29.20
31	SDCB#29	71.72	75.40	3.68	0.00	-71.72	0.00	-75.40	0.00	32.16
32	SDCB#30	72.69	75.40	2.71	0.00	-72.69	0.00	-75.40	0.00	24.52
33	SDCB#31	70.25	77.16	6.91	0.00	-70.25	0.00	-77.16	0.00	70.92
34	SDCB#32	72.60	75.25	2.65	0.00	-72.60	0.00	-75.25	0.00	23.80
35	SDCB#33	70.81	75.25	4.44	0.00	-70.81	0.00	-75.25	0.00	41.28
36	SDCB#34	71.52	75.25	3.73	0.00	-71.52	0.00	-75.25	0.00	36.76
37	SDCB#35	68.40	77.00	8.60	0.00	-68.40	0.00	-77.00	0.00	79.20
38	SDCB#36	70.59	75.26	4.67	0.00	-70.59	0.00	-75.26	0.00	43.96
39	SDCB#37	71.52	75.67	4.15	0.00	-71.52	0.00	-75.67	0.00	41.80
40	SDCB#38	71.88	75.26	3.38	0.00	-71.88	0.00	-75.26	0.00	32.56
41	SDCB#40	73.22	76.27	3.05	0.00	-73.22	0.00	-76.27	0.00	24.60
42	SDCO#A1	72.71	76.38	3.67	0.00	-72.71	0.00	-76.38	0.00	36.00
43	SDCO#A2	73.21	76.54	3.33	0.00	-73.21	0.00	-76.54	0.00	33.96
44	SDCO#A3	74.00	75.03	1.03	0.00	-74.00	0.00	-75.03	0.00	6.36
45	SDCO#A4	73.96	75.89	1.93	0.00	-73.96	0.00	-75.89	0.00	17.16
46	SDCO#A5	73.23	76.82	3.59	0.00	-73.23	0.00	-76.82	0.00	37.08
47	SDCO#B1	74.33	78.08	3.75	0.00	-74.33	0.00	-78.08	0.00	36.96
48	SDCO#B2	75.11	77.80	2.69	0.00	-75.11	0.00	-77.80	0.00	26.28
49	SDCO#B3	75.28	77.92	2.64	0.00	-75.28	0.00	-77.92	0.00	25.68
50	SDCO#B4	75.41	77.95	2.54	0.00	-75.41	0.00	-77.95	0.00	24.48
51	SDCO#B5	71.99	78.08	6.09	0.00	-71.99	0.00	-78.08	0.00	67.08
52	SDCO#B6	72.81	78.02	5.21	0.00	-72.81	0.00	-78.02	0.00	56.52
53	SDCO#B7	72.87	77.95	5.08	0.00	-72.87	0.00	-77.95	0.00	54.96
54	SDCO#B8	72.81	78.02	5.21	0.00	-72.81	0.00	-78.02	0.00	56.52
55	SDCO#C1	72.21	76.85	4.64	0.00	-72.21	0.00	-76.85	0.00	37.68
56	SDCO#C10	72.74	76.81	4.07	0.00	-72.74	0.00	-76.81	0.00	41.16
57	SDCO#C2	74.28	76.87	2.59	0.00	-74.28	0.00	-76.87	0.00	25.08
58	SDCO#C3	74.37	76.91	2.54	0.00	-74.37	0.00	-76.91	0.00	24.48
59	SDCO#C4	74.29	76.83	2.54	0.00	-74.29	0.00	-76.83	0.00	24.48
60	SDCO#C5	71.44	76.97	5.53	0.00	-71.44	0.00	-76.97	0.00	56.76
61	SDCO#C6	72.54	77.11	4.57	0.00	-72.54	0.00	-77.11	0.00	48.84
62	SDCO#C7	72.66	76.99	4.33	0.00	-72.66	0.00	-76.99	0.00	45.96
63	SDCO#C8	72.19	76.97	4.78	0.00	-72.19	0.00	-76.97	0.00	51.36
64	SDCO#C9	72.19	76.88	4.69	0.00	-72.19	0.00	-76.88	0.00	48.60
65	SDCO#CLUB1	72.38	76.33	3.95	0.00	-72.38	0.00	-76.33	0.00	41.40
66	SDCO#CLUB2	72.72	76.59	3.87	0.00	-72.72	0.00	-76.59	0.00	40.44
67	SDCO#CLUB3	73.13	76.45	3.32	0.00	-73.13	0.00	-76.45	0.00	33.84
68	SDCO#CLUB4	72.72	76.62	3.90	0.00	-72.72	0.00	-76.62	0.00	40.80
69	SDCO#CLUB5	73.15	76.43	3.28	0.00	-73.15	0.00	-76.43	0.00	33.36
70	SDCO#COM01	70.05	73.56	3.51	0.00	-70.05	0.00	-73.56	0.00	34.20
71	SDCO#COM02	70.70	73.51	2.81	0.00	-70.70	0.00	-73.51	0.00	27.72
72	SDCO#COM04	70.78	73.59	2.81	0.00	-70.78	0.00	-73.59	0.00	25.72
73	SDCO#COM05	71.01	73.62	2.61	0.00	-71.01	0.00	-73.62	0.00	25.32
74	SDCO#COM06	71.60	73.47	1.87	0.00	-71.60	0.00	-73.47	0.00	16.44
75	SDCO#COM07	70.25	73.18	2.93	0.00	-70.25	0.00	-73.18	0.00	27.16

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
76	SDCO#COM08	70.78	73.55	2.77	0.00	-70.78	0.00	-73.55	0.00	27.24
77	SDCO#COM09	70.17	73.63	3.46	0.00	-70.17	0.00	-73.63	0.00	33.48
78	SDCO#COM10	71.09	73.63	2.54	0.00	-71.09	0.00	-73.63	0.00	24.48
79	SDCO#COM11	71.09	73.63	2.54	0.00	-71.09	0.00	-73.63	0.00	24.48
80	SDCO#COM12	70.17	72.88	2.71	0.00	-70.17	0.00	-72.88	0.00	24.48
81	SDCO#COM13	70.87	73.41	2.54	0.00	-70.87	0.00	-73.41	0.00	24.48
82	SDCO#D1	72.84	77.30	4.46	0.00	-72.84	0.00	-77.30	0.00	45.48
83	SDCO#D2	74.65	77.29	2.64	0.00	-74.65	0.00	-77.29	0.00	25.68
84	SDCO#D3	74.71	77.29	2.58	0.00	-74.71	0.00	-77.29	0.00	24.96
85	SDCO#D4	73.53	77.46	3.93	0.00	-73.53	0.00	-77.46	0.00	41.16
86	SDCO#D5	74.47	77.03	2.56	0.00	-74.47	0.00	-77.03	0.00	24.72
87	SDCO#D6	74.79	77.33	2.54	0.00	-74.79	0.00	-77.33	0.00	24.48
88	SDCO#D7	74.72	77.28	2.56	0.00	-74.72	0.00	-77.28	0.00	24.72
89	SDCO#E1	72.07	76.54	4.47	0.00	-72.07	0.00	-76.54	0.00	47.64
90	SDCO#E2	72.43	76.80	4.37	0.00	-72.43	0.00	-76.80	0.00	46.44
91	SDCO#E3	73.14	76.57	3.43	0.00	-73.14	0.00	-76.57	0.00	35.16
92	SDCO#E4	72.64	76.50	3.86	0.00	-72.64	0.00	-76.50	0.00	40.32
93	SDCO#E5	72.96	76.75	3.79	0.00	-72.96	0.00	-76.75	0.00	39.48
94	SDCO#E6	73.56	76.50	2.94	0.00	-73.56	0.00	-76.50	0.00	29.28
95	SDCO#E7	74.24	76.76	2.52	0.00	-74.24	0.00	-76.76	0.00	24.24
96	SDCO#F1	71.77	77.26	5.49	0.00	-71.77	0.00	-77.26	0.00	59.88
97	SDCO#F2	72.50	76.98	4.48	0.00	-72.50	0.00	-76.98	0.00	47.76
98	SDCO#F3	73.46	77.21	3.75	0.00	-73.46	0.00	-77.21	0.00	39.00
99	SDCO#G1	73.29	77.07	3.78	0.00	-73.29	0.00	-77.07	0.00	39.36
100	SDCO#G2	74.47	77.01	2.54	0.00	-74.47	0.00	-77.01	0.00	24.48
101	SDCO#G3	72.89	77.15	4.26	0.00	-72.89	0.00	-77.15	0.00	43.08
102	SDCO#G4	74.22	76.76	2.54	0.00	-74.22	0.00	-76.76	0.00	24.48
103	SDCO#H1	72.76	77.10	4.34	0.00	-72.76	0.00	-77.10	0.00	44.04
104	SDCO#H2	73.13	77.02	3.89	0.00	-73.13	0.00	-77.02	0.00	40.68
105	SDCO#H3	74.20	76.74	2.54	0.00	-74.20	0.00	-76.74	0.00	24.48
106	SDCO#H4	72.79	77.00	4.21	0.00	-72.79	0.00	-77.00	0.00	44.52
107	SDCO#H5	72.94	75.70	2.76	0.00	-72.94	0.00	-75.70	0.00	27.12
108	SDCO#H6	74.06	76.59	2.53	0.00	-74.06	0.00	-76.59	0.00	24.36
109	WQ#1	67.90	73.16	5.26	0.00	-67.90	0.00	-73.16	0.00	49.12
110	WQ#2	70.66	76.71	6.05	0.00	-70.66	0.00	-76.71	0.00	38.56
111	WQ#3	69.48	76.48	7.00	0.00	-69.48	0.00	-76.48	0.00	45.96
112	WQ#4	69.60	76.07	6.47	0.00	-69.60	0.00	-76.07	0.00	59.64
113	WQ#5	70.30	76.23	5.93	0.00	-70.30	0.00	-76.23	0.00	53.16

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AREA DRAIN G1	0.00	0.00	73.07	0.00	0.00	4.06	73.07	0.00	0 00:00	0 00:00	0.00	0.00
2	AREA DRAIN H1	0.00	0.00	72.33	0.00	0.00	4.77	72.33	0.00	0 00:00	0 00:00	0.00	0.00
3	SDCB#01	0.13	0.00	68.14	1.24	0.00	6.70	67.81	0.91	1 00:00	0 00:00	0.00	0.00
4	SDCB#02	0.45	0.18	69.78	0.28	0.00	2.62	69.62	0.12	0 08:00	0 00:00	0.00	0.00
5	SDCB#03	0.18	0.11	70.09	0.23	0.00	2.10	69.96	0.10	0 08:00	0 00:00	0.00	0.00
6	SDCB#04	0.08	0.04	70.28	0.14	0.00	2.36	70.20	0.06	0 08:00	0 00:00	0.00	0.00
7	SDCB#05	0.67	0.18	69.33	0.37	0.00	2.78	69.11	0.15	0 08:01	0 00:00	0.00	0.00
8	SDCB#06	0.22	0.10	69.28	0.56	0.00	3.75	68.84	0.12	0 08:02	0 00:00	0.00	0.00
9	SDCB#07	0.13	0.06	69.30	0.22	0.00	2.49	69.16	0.08	0 08:02	0 00:00	0.00	0.00
10	SDCB#08	0.07	0.04	69.66	0.11	0.00	2.79	69.60	0.05	0 08:00	0 00:00	0.00	0.00
11	SDCB#09	1.06	0.18	69.26	0.75	0.00	3.09	68.76	0.25	0 08:02	0 00:00	0.00	0.00
12	SDCB#10	0.20	0.00	70.59	2.69	0.00	6.37	69.54	1.64	1 00:00	0 00:00	0.00	0.00
13	SDCB#11	0.26	0.08	73.63	0.15	0.00	2.95	73.54	0.06	0 08:00	0 00:00	0.00	0.00
14	SDCB#12	0.08	0.08	73.97	0.14	0.00	2.57	73.89	0.06	0 08:00	0 00:00	0.00	0.00
15	SDCB#13	0.10	0.10	74.03	0.16	0.00	2.55	73.94	0.07	0 08:00	0 00:00	0.00	0.00
16	SDCB#14	0.53	0.14	72.24	0.35	0.00	4.07	72.03	0.14	0 08:00	0 00:00	0.00	0.00
17	SDCB#15	0.69	0.10	72.12	0.44	0.00	4.13	71.86	0.18	0 08:01	0 00:00	0.00	0.00
18	SDCB#16	0.31	0.09	72.47	0.24	0.00	3.89	72.33	0.10	0 08:00	0 00:00	0.00	0.00
19	SDCB#17	0.14	0.08	72.95	0.20	0.00	3.60	72.83	0.08	0 08:00	0 00:00	0.00	0.00
20	SDCB#18	2.07	0.00	70.59	2.19	0.00	6.10	69.63	1.23	1 00:00	0 00:00	0.00	0.00
21	SDCB#19	1.22	0.32	70.89	0.54	0.00	4.36	70.56	0.21	0 08:01	0 00:00	0.00	0.00
22	SDCB#20	0.91	0.08	71.40	0.42	0.00	3.85	71.15	0.17	0 08:01	0 00:00	0.00	0.00
23	SDCB#21	0.07	0.07	71.92	0.11	0.00	3.33	71.86	0.05	0 08:00	0 00:00	0.00	0.00
24	SDCB#22	0.76	0.15	71.77	0.41	0.00	3.48	71.52	0.16	0 08:01	0 00:00	0.00	0.00
25	SDCB#23	0.44	0.15	72.21	0.28	0.00	3.04	72.05	0.12	0 08:00	0 00:00	0.00	0.00
26	SDCB#24	0.03	0.02	72.70	0.09	0.00	2.55	72.65	0.04	0 08:01	0 00:00	0.00	0.00
27	SDCB#25	0.02	0.02	72.85	0.06	0.00	2.40	72.82	0.03	0 08:00	0 00:00	0.00	0.00
28	SDCB#26	1.22	0.00	70.59	2.19	0.00	6.20	69.63	1.23	1 00:00	0 00:00	0.00	0.00
29	SDCB#27	1.22	0.34	71.74	0.54	0.00	3.51	71.41	0.21	0 08:01	0 00:00	0.00	0.00
30	SDCB#28	0.23	0.13	72.40	0.25	0.00	2.85	72.25	0.10	0 08:01	0 00:00	0.00	0.00
31	SDCB#29	0.63	0.14	72.04	0.32	0.00	3.36	71.86	0.14	0 08:00	0 00:00	0.00	0.00
32	SDCB#30	0.30	0.30	72.98	0.29	0.00	2.42	72.81	0.12	0 08:00	0 00:00	0.00	0.00
33	SDCB#31	0.57	0.22	70.64	0.39	0.00	6.52	70.43	0.18	0 08:00	0 00:00	0.00	0.00
34	SDCB#32	0.20	0.13	72.83	0.23	0.00	2.42	72.70	0.10	0 08:00	0 00:00	0.00	0.00
35	SDCB#33	0.26	0.17	71.03	0.22	0.00	4.22	70.91	0.10	0 08:00	0 00:00	0.00	0.00
36	SDCB#34	0.10	0.10	71.68	0.16	0.00	3.57	71.59	0.07	0 08:00	0 00:00	0.00	0.00
37	SDCB#35	0.56	0.00	70.59	2.19	0.00	6.41	69.63	1.23	1 00:00	0 00:00	0.00	0.00
38	SDCB#36	0.47	0.25	70.82	0.23	0.00	4.44	70.69	0.10	0 08:00	0 00:00	0.00	0.00
39	SDCB#37	0.22	0.06	71.76	0.24	0.00	3.91	71.62	0.10	0 08:00	0 00:00	0.00	0.00
40	SDCB#38	0.17	0.17	72.08	0.20	0.00	3.18	71.97	0.09	0 08:00	0 00:00	0.00	0.00
41	SDCB#40	0.03	0.03	73.27	0.05	0.00	3.00	73.24	0.02	0 08:00	0 00:00	0.00	0.00
42	SDCO#A1	0.07	0.00	72.86	0.15	0.00	3.52	72.77	0.06	0 08:01	0 00:00	0.00	0.00
43	SDCO#A2	0.04	0.00	73.30	0.09	0.00	3.24	73.25	0.04	0 08:01	0 00:00	0.00	0.00
44	SDCO#A3	0.04	0.04	74.09	0.09	0.00	0.94	74.04	0.04	0 08:00	0 00:00	0.00	0.00
45	SDCO#A4	0.04	0.04	74.05	0.09	0.00	1.84	74.00	0.04	0 08:00	0 00:00	0.00	0.00
46	SDCO#A5	0.04	0.00	73.32	0.09	0.00	3.50	73.27	0.04	0 08:01	0 00:00	0.00	0.00
47	SDCO#B1	0.10	0.00	74.41	0.08	0.00	3.67	74.36	0.03	0 08:00	0 00:00	0.00	0.00
48	SDCO#B2	0.05	0.00	75.21	0.10	0.00	2.59	75.15	0.04	0 08:00	0 00:00	0.00	0.00
49	SDCO#B3	0.05	0.05	75.39	0.11	0.00	2.53	75.32	0.04	0 08:00	0 00:00	0.00	0.00
50	SDCO#B4	0.05	0.05	75.51	0.10	0.00	2.44	75.45	0.04	0 08:00	0 00:00	0.00	0.00
51	SDCO#B5	0.10	0.00	72.18	0.19	0.00	5.90	72.07	0.08	0 08:01	0 00:00	0.00	0.00
52	SDCO#B6	0.05	0.00	72.91	0.10	0.00	5.11	72.85	0.04	0 08:00	0 00:00	0.00	0.00
53	SDCO#B7	0.05	0.05	72.98	0.11	0.00	4.97	72.92	0.05	0 08:00	0 00:00	0.00	0.00
54	SDCO#B8	0.05	0.05	72.91	0.10	0.00	5.11	72.85	0.04	0 08:00	0 00:00	0.00	0.00
55	SDCO#C1	0.10	0.00	73.15	0.94	0.00	3.70	73.08	0.87	0 08:00	0 00:00	0.00	0.00
56	SDCO#C10	0.05	0.05	72.98	0.24	0.00	3.83	72.92	0.18	0 08:00	0 00:00	0.00	0.00
57	SDCO#C2	0.05	0.00	74.35	0.07	0.00	2.52	74.31	0.03	0 08:00	0 00:00	0.00	0.00
58	SDCO#C3	0.05	0.05	74.48	0.11	0.00	2.43	74.42	0.05	0 08:00	0 00:00	0.00	0.00
59	SDCO#C4	0.05	0.05	74.39	0.10	0.00	2.44	74.33	0.04	0 08:00	0 00:00	0.00	0.00
60	SDCO#C5	0.10	0.00	71.61	0.17	0.00	5.36	71.51	0.07	0 08:01	0 00:00	0.00	0.00
61	SDCO#C6	0.05	0.00	72.64	0.10	0.00	4.47	72.58	0.04	0 08:00	0 00:00	0.00	0.00
62	SDCO#C7	0.05	0.05	72.77	0.11	0.00	4.22	72.71	0.05	0 08:00	0 00:00	0.00	0.00
63	SDCO#C8	0.05	0.00	72.29	0.10	0.00	4.68	72.23	0.04	0 08:01	0 00:00	0.00	0.00
64	SDCO#C9	0.05	0.00	72.44	0.25	0.00	4.44	72.37	0.18	0 08:00	0 00:00	0.00	0.00
65	SDCO#CLUB1	0.05	0.00	72.46	0.08	0.00	3.87	72.41	0.03	0 08:01	0 00:00	0.00	0.00
66	SDCO#CLUB2	0.02	0.00	72.79	0.07	0.00	3.80	72.75	0.03	0 08:00	0 00:00	0.00	0.00
67	SDCO#CLUB3	0.02	0.02	73.20	0.07	0.00	3.25	73.16	0.03	0 08:00	0 00:00	0.00	0.00
68	SDCO#CLUB4	0.02	0.00	72.79	0.07	0.00	3.83	72.75	0.03	0 08:00	0 00:00	0.00	0.00
69	SDCO#CLUB5	0.02	0.02	73.22	0.07	0.00	3.21	73.18	0.03	0 08:00	0 00:00	0.00	0.00
70	SDCO#COM01	0.05	0.00	70.90	0.85	0.00	2.66	70.81	0.76	0 08:00	0 00:00	0.00	0.00
71	SDCO#COM02	0.05	0.05	70.90	0.20	0.00	2.61	70.82	0.12	0 08:00	0 00:00	0.00	0.00
72	SDCO#COM04	0.09	0.00	70.88	0.10	0.00	2.71	70.82	0.04	0 08:01	0 00:00	0.00	0.00
73	SDCO#COM05	0.04	0.00	71.10	0.09	0.00	2.52	71.05	0.04	0 08:00	0 00:00	0.00	0.00
74	SDCO#COM06	0.04	0.04	71.70	0.10	0.00	1.77	71.64	0.04	0 08:00	0 00:00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
75	SDCO#COM07	0.03	0.00	70.34	0.09	0.00	2.84	70.29	0.04	0 08:00	0 00:00	0.00	0.00
76	SDCO#COM08	0.03	0.03	70.87	0.09	0.00	2.68	70.82	0.04	0 08:00	0 00:00	0.00	0.00
77	SDCO#COM09	0.04	0.00	70.23	0.06	0.00	3.40	70.20	0.03	0 08:00	0 00:00	0.00	0.00
78	SDCO#COM10	0.02	0.02	71.14	0.05	0.00	2.49	71.11	0.02	0 08:00	0 00:00	0.00	0.00
79	SDCO#COM11	0.02	0.02	71.16	0.07	0.00	2.47	71.12	0.03	0 08:00	0 00:00	0.00	0.00
80	SDCO#COM12	0.04	0.00	70.23	0.06	0.00	2.65	70.20	0.03	0 08:00	0 00:00	0.00	0.00
81	SDCO#COM13	0.04	0.04	70.95	0.08	0.00	2.46	70.91	0.04	0 08:00	0 00:00	0.00	0.00
82	SDCO#D1	0.10	0.00	72.96	0.12	0.00	4.34	72.89	0.05	0 08:01	0 00:00	0.00	0.00
83	SDCO#D2	0.10	0.00	74.79	0.14	0.00	2.50	74.71	0.06	0 08:00	0 00:00	0.00	0.00
84	SDCO#D3	0.10	0.10	74.88	0.17	0.00	2.41	74.78	0.07	0 08:00	0 00:00	0.00	0.00
85	SDCO#D4	0.10	0.00	73.63	0.10	0.00	3.83	73.57	0.04	0 08:00	0 00:00	0.00	0.00
86	SDCO#D5	0.05	0.00	74.55	0.08	0.00	2.48	74.50	0.03	0 08:00	0 00:00	0.00	0.00
87	SDCO#D6	0.05	0.05	74.87	0.08	0.00	2.46	74.82	0.03	0 08:00	0 00:00	0.00	0.00
88	SDCO#D7	0.05	0.05	74.82	0.10	0.00	2.46	74.76	0.04	0 08:00	0 00:00	0.00	0.00
89	SDCO#E1	0.13	0.00	72.25	0.18	0.00	4.29	72.14	0.07	0 08:01	0 00:00	0.00	0.00
90	SDCO#E2	0.13	0.00	72.61	0.18	0.00	4.19	72.50	0.07	0 08:01	0 00:00	0.00	0.00
91	SDCO#E3	0.13	0.00	73.31	0.17	0.00	3.26	73.21	0.07	0 08:00	0 00:00	0.00	0.00
92	SDCO#E4	0.07	0.00	72.76	0.12	0.00	3.74	72.69	0.05	0 08:01	0 00:00	0.00	0.00
93	SDCO#E5	0.07	0.00	73.08	0.12	0.00	3.67	73.01	0.05	0 08:00	0 00:00	0.00	0.00
94	SDCO#E6	0.07	0.07	73.68	0.12	0.00	2.82	73.61	0.05	0 08:00	0 00:00	0.00	0.00
95	SDCO#E7	0.13	0.13	74.41	0.17	0.00	2.35	74.31	0.07	0 08:00	0 00:00	0.00	0.00
96	SDCO#F1	0.08	0.08	71.90	0.13	0.00	5.36	71.83	0.06	0 08:00	0 00:00	0.00	0.00
97	SDCO#F2	0.08	0.00	72.57	0.07	0.00	4.41	72.53	0.03	0 08:00	0 00:00	0.00	0.00
98	SDCO#F3	0.08	0.08	73.61	0.15	0.00	3.60	73.52	0.06	0 08:00	0 00:00	0.00	0.00
99	SDCO#G1	0.08	0.00	73.40	0.11	0.00	3.67	73.34	0.05	0 08:00	0 00:00	0.00	0.00
100	SDCO#G2	0.08	0.08	74.60	0.13	0.00	2.41	74.53	0.06	0 08:00	0 00:00	0.00	0.00
101	SDCO#G3	0.06	0.00	73.03	0.14	0.00	4.12	72.95	0.06	0 08:00	0 00:00	0.00	0.00
102	SDCO#G4	0.07	0.07	74.34	0.12	0.00	2.42	74.27	0.05	0 08:00	0 00:00	0.00	0.00
103	SDCO#H1	0.08	0.00	72.84	0.08	0.00	4.26	72.80	0.04	0 08:01	0 00:00	0.00	0.00
104	SDCO#H2	0.08	0.00	73.27	0.14	0.00	3.75	73.19	0.06	0 08:00	0 00:00	0.00	0.00
105	SDCO#H3	0.08	0.08	74.33	0.13	0.00	2.41	74.25	0.05	0 08:00	0 00:00	0.00	0.00
106	SDCO#H4	0.07	0.00	72.89	0.10	0.00	4.11	72.83	0.04	0 08:01	0 00:00	0.00	0.00
107	SDCO#H5	0.07	0.00	73.07	0.13	0.00	2.63	72.99	0.05	0 08:00	0 00:00	0.00	0.00
108	SDCO#H6	0.07	0.07	74.18	0.12	0.00	2.41	74.11	0.05	0 08:00	0 00:00	0.00	0.00
109	WQ#1	1.05	0.00	68.62	0.72	0.00	4.54	68.17	0.27	0 08:02	0 00:00	0.00	0.00
110	WQ#2	0.26	0.00	70.74	0.08	0.00	5.97	70.70	0.04	0 08:00	0 00:00	0.00	0.00
111	WQ#3	0.69	0.00	70.59	1.11	0.00	5.89	69.90	0.42	1 00:00	0 00:00	0.00	0.00
112	WQ#4	1.22	0.00	70.59	0.99	0.00	5.48	70.03	0.43	1 00:00	0 00:00	0.00	0.00
113	WQ#5	1.22	0.00	70.68	0.38	0.00	5.55	70.46	0.16	0 08:01	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)
1	{SD - Phase 1}.PIPE 02	108.10	69.50	0.00	68.96	0.00	0.54	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
2	{SD - Phase 1}.PIPE 03	71.71	69.86	0.00	69.50	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
3	{SD - Phase 1}.PIPE 04	55.25	70.14	0.00	69.86	0.00	0.28	0.5100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
4	{SD - Phase 1}.PIPE 05	89.22	68.96	0.00	68.51	0.00	0.45	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
5	{SD - Phase 1}.PIPE 06	42.41	68.72	0.00	68.51	0.00	0.21	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
6	{SD - Phase 1}.PIPE 07	72.15	69.08	0.00	68.72	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
7	{SD - Phase 1}.PIPE 08	49.14	69.55	0.00	69.08	0.00	0.47	0.9600	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
8	{SD - Phase 1}.PIPE 09	21.39	68.51	0.00	68.40	0.50	0.11	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
9	{SD - Phase 1}.PIPE 11	5.71	73.48	0.00	72.83	2.17	0.65	11.3800	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
10	{SD - Phase 1}.PIPE 12	64.20	73.83	0.00	73.48	0.00	0.35	0.5500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
11	{SD - Phase 1}.PIPE 13	78.00	73.87	0.00	73.48	0.00	0.39	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
12	{SD - Phase 1}.PIPE 14	42.96	71.89	0.00	71.68	0.00	0.21	0.4900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
13	{SD - Phase 1}.PIPE 15	6.67	71.68	0.00	71.65	2.17	0.03	0.4500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
14	{SD - Phase 1}.PIPE 16	67.53	72.23	0.00	71.89	0.00	0.34	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
15	{SD - Phase 1}.PIPE 17	36.65	72.75	0.00	72.57	0.34	0.18	0.4900	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
16	{SD - Phase 1}.PIPE 18	54.55	68.40	0.00	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
17	{SD - Phase 1}.PIPE 20	126.79	70.98	0.00	70.35	0.00	0.63	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
18	{SD - Phase 1}.PIPE 21	57.67	71.81	0.00	71.31	0.33	0.50	0.8700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
19	{SD - Phase 1}.PIPE 22	75.77	71.36	0.00	70.98	0.00	0.38	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
20	{SD - Phase 1}.PIPE 23	113.35	71.93	0.00	71.36	0.00	0.57	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
21	{SD - Phase 1}.PIPE 24	69.19	72.61	0.00	72.26	0.33	0.35	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
22	{SD - Phase 1}.PIPE 25	34.45	72.79	0.00	72.61	0.00	0.18	0.5200	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
23	{SD - Phase 1}.PIPE 26	104.96	68.40	0.00	68.40	0.00	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
24	{SD - Phase 1}.PIPE 27	80.37	71.20	0.00	70.80	0.50	0.40	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
25	{SD - Phase 1}.PIPE 28	122.98	72.15	0.00	71.54	0.34	0.61	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
26	{SD - Phase 1}.PIPE 29	82.06	71.72	0.00	71.20	0.00	0.52	0.6300	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
27	{SD - Phase 1}.PIPE 30	128.14	72.69	0.00	72.05	0.33	0.64	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
28	{SD - Phase 1}.PIPE 31	5.26	70.25	0.00	70.22	2.32	0.03	0.5700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
29	{SD - Phase 1}.PIPE 40	52.18	73.22	0.00	71.20	0.00	2.02	3.8700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
30	{SD - Phase 1}.PIPE B1	50.72	74.33	0.00	69.73	1.33	4.60	9.0700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
31	{SD - Phase 1}.PIPE B2	60.72	75.11	0.00	74.50	0.17	0.61	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
32	{SD - Phase 1}.PIPE B3	16.77	75.28	0.00	75.11	0.00	0.17	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
33	{SD - Phase 1}.PIPE B4	85.66	75.41	0.00	74.50	0.17	0.91	1.0600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
34	{SD - Phase 1}.PIPE B5	8.62	71.99	0.00	71.95	4.05	0.04	0.4600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
35	{SD - Phase 1}.PIPE B6	81.80	72.81	0.00	71.99	0.00	0.82	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
36	{SD - Phase 1}.PIPE B7	6.36	72.87	0.00	72.81	0.00	0.06	0.9400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
37	{SD - Phase 1}.PIPE B8	81.80	72.81	0.00	71.99	0.00	0.82	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
38	{SD - Phase 1}.PIPE C1	45.29	73.04	0.83	72.05	0.33	0.99	2.1900	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
39	{SD - Phase 1}.PIPE C10	54.90	72.88	0.14	72.33	0.14	0.55	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
40	{SD - Phase 1}.PIPE C2	22.10	74.28	0.00	73.21	1.00	1.07	4.8400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
41	{SD - Phase 1}.PIPE C3	9.24	74.37	0.00	74.28	0.00	0.09	0.9700	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
42	{SD - Phase 1}.PIPE C4	108.05	74.29	0.00	73.21	1.00	1.08	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
43	{SD - Phase 1}.PIPE C5	7.93	71.44	0.00	71.40	3.50	0.04	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
44	{SD - Phase 1}.PIPE C6	109.73	72.54	0.00	71.44	0.00	1.10	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
45	{SD - Phase 1}.PIPE C7	12.01	72.66	0.00	72.54	0.00	0.12	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
46	{SD - Phase 1}.PIPE C8	45.14	72.19	0.00	71.74	0.30	0.45	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
47	{SD - Phase 1}.PIPE C9	13.55	72.33	0.14	72.19	0.00	0.14	1.0300	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
48	{SD - Phase 1}.PIPE COM01	37.51	70.78	0.00	69.50	0.00	1.28	3.4100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00
49	{SD - Phase 1}.PIPE COM02	49.39	70.70	0.00	70.21	0.16	0.49	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
50	{SD - Phase 1}.PIPE COM04	56.60	70.78	0.00	70.21	0.16	0.57	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
51	{SD - Phase 1}.PIPE COM05	22.78	71.01	0.00	70.78	0.00	0.23	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
52	{SD - Phase 1}.PIPE COM06	59.24	71.60	0.00	71.01	0.00	0.59	1.0000	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
53	{SD - Phase 1}.PIPE COM07	21.49	70.25	0.00	70.14	0.00	0.11	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
54	{SD - Phase 1}.PIPE COM08	36.57	70.78	0.00	70.41	0.16	0.37	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
55	{SD - Phase 1}.PIPE COM09	34.88	70.17	0.00	68.96	0.00	1.21	3.4700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
56	{SD - Phase 1}.PIPE COM10	48.42	71.09	0.00	70.34	0.17	0.75	1.5500	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
57	{SD - Phase 1}.PIPE COM11	74.62	71.09	0.00	70.34	0.17	0.75	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
58	{SD - Phase 1}.PIPE COM12	16.26	70.17	0.00	69.55	0.00	0.62	3.8100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
59	{SD - Phase 1}.PIPE COM13	45.72	70.87	0.00	70.34	0.17	0.53	1.1600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
60	{SD - Phase 1}.PIPE D1	47.80	72.84	0.00	72.15	0.00	0.69	1.4400	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
61	{SD - Phase 1}.PIPE D2	163.60	74.65	0.00	73.01	0.17	1.64	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
62	{SD - Phase 1}.PIPE D3	6.36	74.71	0.00	74.65	0.00	0.06	0.9400	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
63	{SD - Phase 1}.PIPE D4	54.62	73.36	-0.17	72.05	0.33	1.31	2.4000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
64	{SD - Phase 1}.PIPE D5	32.05	74.47	0.00	73.53	0.00	0.94	2.9300	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
65	{SD - Phase 1}.PIPE D6	10.82	74.79	0.00	74.47	0.00	0.32	2.9600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
66	{SD - Phase 1}.PIPE D7	119.28	74.72	0.00	73.53	0.00	1.19	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
67	{SD - Phase 1}.PIPE E1	42.30	71.90	-0.17	71.69	0.33	0.21	0.5000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
68	{SD - Phase 1}.PIPE E4	42.52	72.48	-0.16	72.26	0.33	0.22	0.5200	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
69	{SD - Phase 1}.PIPE G1	23.14	73.29	0.00	72.73	0.50	0.56	2.4200	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
70	{SD - Phase 1}.PIPE G2	118.43	74.47	0.00	73.29	0.00	1.18	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
71	{SD - Phase 1}.PIPE G3	29.24	72.89	0.00	72.75	0.00	0.14	0.4800	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
72	{SD - Phase 1}.PIPE G4	116.18	74.22	0.00	73.06	0.17	1.16	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
73	{SD - Phase 1}.PIPE H1	9.90	72.76	0.00	72.22	0.33	0.54	5.4500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
74	{SD - Phase 1}.PIPE H2	20.00	73.13	0.00	72.93	0.17	0.20	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
75	{SD - Phase 1}.PIPE H3	106.86	74.20	0.00	73.13	0.00	1.07	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00

Flap Gate	No. of Barrels
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Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)
76	{SD - Phase 1}.PIPE H4	24.70	72.79	0.00	72.18	0.50	0.61	2.4700	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
77	{SD - Phase 1}.PIPE H5	14.98	72.94	0.00	72.79	0.00	0.15	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
78	{SD - Phase 1}.PIPE H6	112.34	74.06	0.00	72.94	0.00	1.12	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
79	{SD - Phase 1}.PIPE RT-1	4.18	67.40	0.50	67.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
80	{SD - Phase 1}.PIPE RT-2	5.00	68.40	0.50	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
81	{SD - Phase 1}.PIPE RT-3	128.16	68.40	0.50	68.40	0.00	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
82	{SD - Phase 1}.PIPE WQ#4	40.09	69.60	0.00	69.40	1.00	0.20	0.5000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
83	{SD - Phase 2}.PIEP CLUB5	42.78	73.15	0.00	72.72	0.00	0.43	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
84	{SD - Phase 2}.PIPE 33	113.81	70.81	0.00	70.25	0.00	0.56	0.4900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
85	{SD - Phase 2}.PIPE 34	74.43	71.52	0.00	71.14	0.33	0.38	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
86	{SD - Phase 2}.PIPE 35	78.01	68.40	0.00	68.40	0.50	0.00	0.0000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000	0.00
87	{SD - Phase 2}.PIPE 36	68.05	70.59	0.00	69.40	1.00	1.19	1.7500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
88	{SD - Phase 2}.PIPE 37	118.86	71.52	0.00	70.93	0.34	0.59	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
89	{SD - Phase 2}.PIPE 38	72.17	71.88	0.00	71.52	0.00	0.36	0.5000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
90	{SD - Phase 2}.PIPE A1	22.91	72.71	0.00	72.60	0.00	0.11	0.4800	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
91	{SD - Phase 2}.PIPE A2	33.15	73.21	0.00	72.88	0.17	0.33	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
92	{SD - Phase 2}.PIPE A3	78.60	74.00	0.00	73.21	0.00	0.79	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
93	{SD - Phase 2}.PIPE A4	72.96	73.96	0.00	73.23	0.00	0.73	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
94	{SD - Phase 2}.PIPE A5	35.48	73.23	0.00	72.88	0.17	0.35	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
95	{SD - Phase 2}.PIPE CLUB2	33.61	72.72	0.00	72.38	0.00	0.34	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
96	{SD - Phase 2}.PIPE CLUB3	40.66	73.13	0.00	72.72	0.00	0.41	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
97	{SD - Phase 2}.PIPE CLUB4	32.02	72.72	0.00	72.38	0.00	0.34	1.0600	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
98	{SD - Phase 2}.PIPE E2	35.98	72.43	0.00	72.07	0.00	0.36	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
99	{SD - Phase 2}.PIPE E3	71.44	73.14	0.00	72.43	0.00	0.71	0.9900	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
100	{SD - Phase 2}.PIPE E5	31.53	72.96	0.00	72.64	0.00	0.32	1.0100	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
101	{SD - Phase 2}.PIPE E6	59.72	73.56	0.00	72.96	0.00	0.60	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
102	{SD - Phase 2}.PIPE E7	109.59	74.24	0.00	73.14	0.00	1.10	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
103	{SD - Phase 2}.PIPE F1	151.81	71.77	0.00	70.25	0.00	1.52	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
104	{SD - Phase 2}.PIPE F2	17.47	72.50	0.00	69.90	1.50	2.60	14.8800	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
105	{SD - Phase 2}.PIPE F3	96.17	73.46	0.00	72.50	0.00	0.96	1.0000	CIRCULAR	6.000	6.000	0.0130	0.5000	0.5000	0.0000	0.00
106	PIPE 32	66.71	72.60	0.00	72.26	0.33	0.34	0.5100	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
107	Pipe ADG1	21.66	73.07	0.00	72.92	0.69	0.15	0.6900	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
108	PIPE ADH1	16.48	72.33	0.00	72.18	0.50	0.15	0.9100	CIRCULAR	6.000	6.000	0.0150	0.5000	0.5000	0.0000	0.00
109	PIPE CLUB1	35.74	72.21	-0.17	71.69	0.33	0.52	1.4500	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
110	PIPE WQ#1	6.39	67.90	0.00	67.87	0.97	0.03	0.4700	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000	0.00
111	PIPE WQ#2	5.61	70.66	0.00	68.87	0.97	1.79	31.9100	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
112	PIPE WQ#3	6.80	69.48	0.00	68.87	0.97	0.61	8.9700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
113	PIPE WQ#4	40.09	70.35	0.00	70.10	0.50	0.25	0.6200	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00
114	PIPE WQ#5	45.10	70.30	0.00	69.40	1.00	0.90	2.0000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000	0.00

Flap Gate	No. of Barrels
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Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	{SD - Phase 1}.PIPE 02	0.44	0 08:00	2.52	0.18	2.04	0.88	0.33	0.33	0.00		Calculated
2	{SD - Phase 1}.PIPE 03	0.18	0 08:00	0.74	0.25	1.49	0.80	0.25	0.38	0.00		Calculated
3	{SD - Phase 1}.PIPE 04	0.08	0 08:00	0.75	0.10	0.97	0.95	0.18	0.28	0.00		Calculated
4	{SD - Phase 1}.PIPE 05	0.66	0 08:01	2.53	0.26	1.51	0.98	0.56	0.56	0.00		Calculated
5	{SD - Phase 1}.PIPE 06	0.22	0 08:03	0.85	0.26	0.68	1.04	0.61	0.92	0.00		Calculated
6	{SD - Phase 1}.PIPE 07	0.13	0 08:03	0.85	0.15	1.01	1.19	0.39	0.58	0.00		Calculated
7	{SD - Phase 1}.PIPE 08	0.07	0 08:00	1.18	0.06	1.31	0.63	0.16	0.25	0.00		Calculated
8	{SD - Phase 1}.PIPE 09	1.05	0 08:02	0.87	1.22	3.28	0.11	0.58	0.86	0.00		> CAPACITY
9	{SD - Phase 1}.PIPE 11	0.26	0 08:00	4.08	0.06	5.42	0.02	0.13	0.20	0.00		Calculated
10	{SD - Phase 1}.PIPE 12	0.08	0 08:00	0.89	0.09	1.51	0.71	0.14	0.22	0.00		Calculated
11	{SD - Phase 1}.PIPE 13	0.10	0 08:00	0.86	0.12	1.67	0.78	0.15	0.23	0.00		Calculated
12	{SD - Phase 1}.PIPE 14	0.53	0 08:00	2.49	0.21	1.83	0.39	0.40	0.40	0.00		Calculated
13	{SD - Phase 1}.PIPE 15	0.69	0 08:01	2.39	0.29	2.40	0.05	0.40	0.40	0.00		Calculated
14	{SD - Phase 1}.PIPE 16	0.31	0 08:00	2.53	0.12	1.62	0.69	0.30	0.30	0.00		Calculated
15	{SD - Phase 1}.PIPE 17	0.14	0 08:00	0.85	0.17	1.80	0.34	0.19	0.28	0.00		Calculated
16	{SD - Phase 1}.PIPE 18	2.05	0 08:10	0.97	2.12	1.82	0.50	2.00	1.00	225.00		SURCHARGED
17	{SD - Phase 1}.PIPE 20	0.91	0 08:01	2.51	0.36	2.46	0.86	0.48	0.48	0.00		Calculated
18	{SD - Phase 1}.PIPE 21	0.07	0 08:00	1.13	0.06	1.75	0.55	0.11	0.17	0.00		Calculated
19	{SD - Phase 1}.PIPE 22	0.76	0 08:01	2.52	0.30	2.50	0.51	0.41	0.41	0.00		Calculated
20	{SD - Phase 1}.PIPE 23	0.44	0 08:00	2.53	0.18	1.84	1.03	0.35	0.35	0.00		Calculated
21	{SD - Phase 1}.PIPE 24	0.03	0 08:01	0.86	0.04	1.21	0.95	0.09	0.13	0.00		Calculated
22	{SD - Phase 1}.PIPE 25	0.02	0 08:00	0.87	0.02	0.71	0.81	0.08	0.11	0.00		Calculated
23	{SD - Phase 1}.PIPE 26	1.07	0 08:16	0.70	1.54	0.78	2.24	2.00	1.00	226.00		SURCHARGED
24	{SD - Phase 1}.PIPE 27	1.22	0 08:01	2.51	0.49	3.07	0.44	0.51	0.51	0.00		Calculated
25	{SD - Phase 1}.PIPE 28	0.23	0 08:01	0.85	0.27	2.09	0.98	0.23	0.35	0.00		Calculated
26	{SD - Phase 1}.PIPE 29	0.63	0 08:00	2.84	0.22	1.94	0.70	0.43	0.43	0.00		Calculated
27	{SD - Phase 1}.PIPE 30	0.30	0 08:00	0.86	0.35	2.25	0.95	0.27	0.40	0.00		Calculated
28	{SD - Phase 1}.PIPE 31	0.56	0 08:00	2.69	0.21	2.29	0.04	0.36	0.36	0.00		Calculated
29	{SD - Phase 1}.PIPE 40	0.03	0 08:00	7.01	0.00	0.17	5.12	0.30	0.30	0.00		Calculated
30	{SD - Phase 1}.PIPE B1	0.10	0 08:00	3.64	0.03	4.43	0.19	0.35	0.52	0.00		Calculated
31	{SD - Phase 1}.PIPE B2	0.05	0 08:00	0.56	0.09	1.73	0.58	0.10	0.20	0.00		Calculated
32	{SD - Phase 1}.PIPE B3	0.05	0 08:00	0.56	0.09	1.65	0.17	0.10	0.21	0.00		Calculated
33	{SD - Phase 1}.PIPE B4	0.05	0 08:00	0.58	0.08	1.77	0.81	0.10	0.20	0.00		Calculated
34	{SD - Phase 1}.PIPE B5	0.10	0 08:01	0.38	0.25	1.60	0.09	0.17	0.35	0.00		Calculated
35	{SD - Phase 1}.PIPE B6	0.05	0 08:00	0.56	0.09	1.02	1.34	0.15	0.29	0.00		Calculated
36	{SD - Phase 1}.PIPE B7	0.05	0 08:00	0.54	0.09	1.58	0.07	0.11	0.21	0.00		Calculated
37	{SD - Phase 1}.PIPE B8	0.05	0 08:00	0.56	0.09	1.02	1.34	0.15	0.29	0.00		Calculated
38	{SD - Phase 1}.PIPE C1	0.10	0 08:00	1.79	0.05	2.67	0.28	0.11	0.16	0.00		Calculated
39	{SD - Phase 1}.PIPE C10	0.05	0 08:00	0.56	0.09	1.65	0.55	0.10	0.21	0.00		Calculated
40	{SD - Phase 1}.PIPE C2	0.05	0 08:00	1.23	0.04	2.97	0.12	0.07	0.14	0.00		Calculated
41	{SD - Phase 1}.PIPE C3	0.05	0 08:00	0.55	0.09	2.00	0.08	0.09	0.18	0.00		Calculated
42	{SD - Phase 1}.PIPE C4	0.05	0 08:00	0.56	0.09	1.73	1.04	0.10	0.20	0.00		Calculated
43	{SD - Phase 1}.PIPE C5	0.10	0 08:01	0.86	0.11	1.55	0.09	0.16	0.23	0.00		Calculated
44	{SD - Phase 1}.PIPE C6	0.05	0 08:00	0.56	0.09	1.13	1.62	0.14	0.27	0.00		Calculated
45	{SD - Phase 1}.PIPE C7	0.05	0 08:00	0.56	0.09	1.65	0.12	0.10	0.21	0.00		Calculated
46	{SD - Phase 1}.PIPE C8	0.05	0 08:01	0.56	0.09	1.71	0.44	0.10	0.20	0.00		Calculated
47	{SD - Phase 1}.PIPE C9	0.05	0 08:00	0.57	0.09	1.63	0.14	0.10	0.21	0.00		Calculated
48	{SD - Phase 1}.PIPE COM01	0.09	0 08:01	1.94	0.04	1.04	0.60	0.19	0.28	0.00		Calculated
49	{SD - Phase 1}.PIPE COM02	0.05	0 08:00	0.56	0.09	0.70	1.18	0.35	0.70	0.00		Calculated
50	{SD - Phase 1}.PIPE COM04	0.05	0 08:00	0.56	0.08	0.47	2.01	0.30	0.60	0.00		Calculated
51	{SD - Phase 1}.PIPE COM05	0.04	0 08:00	0.56	0.07	1.49	0.25	0.09	0.19	0.00		Calculated
52	{SD - Phase 1}.PIPE COM06	0.04	0 08:00	0.49	0.08	1.49	0.66	0.09	0.19	0.00		Calculated
53	{SD - Phase 1}.PIPE COM07	0.03	0 08:00	0.86	0.04	0.83	0.43	0.12	0.18	0.00		Calculated
54	{SD - Phase 1}.PIPE COM08	0.03	0 08:00	0.56	0.06	1.55	0.39	0.09	0.17	0.00		Calculated
55	{SD - Phase 1}.PIPE COM09	0.04	0 08:00	2.25	0.02	0.44	1.32	0.22	0.32	0.00		Calculated
56	{SD - Phase 1}.PIPE COM10	0.02	0 08:00	0.70	0.02	1.44	0.56	0.06	0.11	0.00		Calculated
57	{SD - Phase 1}.PIPE COM11	0.02	0 08:00	0.56	0.04	1.41	0.88	0.07	0.14	0.00		Calculated
58	{SD - Phase 1}.PIPE COM12	0.04	0 08:00	2.36	0.02	1.38	0.20	0.09	0.13	0.00		Calculated
59	{SD - Phase 1}.PIPE COM13	0.04	0 08:00	0.60	0.06	1.66	0.46	0.08	0.17	0.00		Calculated
60	{SD - Phase 1}.PIPE D1	0.10	0 08:01	1.45	0.07	1.25	0.64	0.18	0.27	0.00		Calculated
61	{SD - Phase 1}.PIPE D2	0.10	0 08:00	0.56	0.17	2.12	1.29	0.14	0.28	0.00		Calculated
62	{SD - Phase 1}.PIPE D3	0.10	0 08:00	0.54	0.18	1.88	0.06	0.15	0.31	0.00		Calculated
63	{SD - Phase 1}.PIPE D4	0.10	0 08:01	1.99	0.05	2.89	0.31	0.10	0.15	0.00		Calculated
64	{SD - Phase 1}.PIPE D5	0.05	0 08:00	0.96	0.05	2.04	0.26	0.09	0.18	0.00		Calculated
65	{SD - Phase 1}.PIPE D6	0.05	0 08:00	0.96	0.05	2.42	0.07	0.08	0.16	0.00		Calculated
66	{SD - Phase 1}.PIPE D7	0.05	0 08:00	0.56	0.09	1.71	1.16	0.10	0.20	0.00		Calculated
67	{SD - Phase 1}.PIPE E1	0.13	0 08:01	0.53	0.25	2.16	0.33	0.18	0.35	0.00		Calculated
68	{SD - Phase 1}.PIPE E4	0.07	0 08:01	0.53	0.13	1.80	0.39	0.12	0.24	0.00		Calculated
69	{SD - Phase 1}.PIPE G1	0.08	0 08:00	0.87	0.09	2.67	0.14	0.11	0.21	0.00		Calculated
70	{SD - Phase 1}.PIPE G2	0.08	0 08:00	0.56	0.15	2.20	0.90	0.12	0.24	0.00		Calculated
71	{SD - Phase 1}.PIPE G3	0.06	0 08:01	0.39	0.17	1.10	0.44	0.17	0.34	0.00		Calculated
72	{SD - Phase 1}.PIPE G4	0.06	0 08:00	0.56	0.12	1.88	1.03	0.12	0.23	0.00		Calculated
73	{SD - Phase 1}.PIPE H1	0.08	0 08:01	2.83	0.03	3.31	0.05	0.08	0.12	0.00		Calculated
74	{SD - Phase 1}.PIPE H2	0.08	0 08:01	0.56	0.14	1.91	0.17	0.13	0.26	0.00		Calculated

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
75	{SD - Phase 1}.PIPE H3	0.08	0 08:00	0.56	0.14	1.92	0.93	0.13	0.27	0.00		Calculated
76	{SD - Phase 1}.PIPE H4	0.07	0 08:01	0.88	0.08	2.55	0.16	0.10	0.19	0.00		Calculated
77	{SD - Phase 1}.PIPE H5	0.07	0 08:00	0.56	0.12	2.01	0.12	0.11	0.22	0.00		Calculated
78	{SD - Phase 1}.PIPE H6	0.07	0 08:00	0.56	0.12	1.81	1.03	0.12	0.24	0.00		Calculated
79	{SD - Phase 1}.PIPE RT-1	0.13	1 00:00	3.50	0.04	1.15	0.06	0.74	0.37	0.00		Calculated
80	{SD - Phase 1}.PIPE RT-2	0.20	0 20:28	3.20	0.06	1.10	0.08	2.00	1.00	222.00		SURCHARGED
81	{SD - Phase 1}.PIPE RT-3	0.55	0 07:53	0.63	0.86	0.77	2.77	2.00	1.00	226.00		SURCHARGED
82	{SD - Phase 1}.PIPE WQ#4	1.22	0 08:01	2.52	0.49	2.98	0.22	1.00	1.00	0.00		Calculated
83	{SD - Phase 2}.PIEP CLUB5	0.02	0 08:00	0.56	0.04	1.41	0.51	0.07	0.14	0.00		Calculated
84	{SD - Phase 2}.PIPE 33	0.26	0 08:00	2.50	0.11	1.30	1.46	0.31	0.31	0.00		Calculated
85	{SD - Phase 2}.PIPE 34	0.10	0 08:00	0.86	0.11	1.65	0.75	0.15	0.22	0.00		Calculated
86	{SD - Phase 2}.PIPE 35	0.54	0 08:00	0.81	0.67	0.65	2.00	2.00	1.00	226.00		SURCHARGED
87	{SD - Phase 2}.PIPE 36	0.47	0 08:00	4.71	0.10	3.70	0.31	0.54	0.54	0.00		Calculated
88	{SD - Phase 2}.PIPE 37	0.22	0 08:01	0.85	0.26	2.08	0.95	0.23	0.35	0.00		Calculated
89	{SD - Phase 2}.PIPE 38	0.17	0 08:00	0.85	0.19	1.64	0.73	0.22	0.33	0.00		Calculated
90	{SD - Phase 2}.PIPE A1	0.07	0 08:01	0.84	0.09	0.91	0.42	0.19	0.28	0.00		Calculated
91	{SD - Phase 2}.PIPE A2	0.04	0 08:01	0.56	0.07	1.57	0.35	0.09	0.18	0.00		Calculated
92	{SD - Phase 2}.PIPE A3	0.04	0 08:00	0.56	0.07	1.58	0.83	0.09	0.18	0.00		Calculated
93	{SD - Phase 2}.PIPE A4	0.04	0 08:00	0.56	0.07	1.57	0.77	0.09	0.18	0.00		Calculated
94	{SD - Phase 2}.PIPE A5	0.04	0 08:01	0.56	0.07	1.56	0.38	0.09	0.18	0.00		Calculated
95	{SD - Phase 2}.PIPE CLUB2	0.02	0 08:00	0.56	0.04	1.29	0.43	0.07	0.15	0.00		Calculated
96	{SD - Phase 2}.PIPE CLUB3	0.02	0 08:00	0.56	0.04	1.40	0.48	0.07	0.14	0.00		Calculated
97	{SD - Phase 2}.PIPE CLUB4	0.02	0 08:00	0.58	0.04	1.30	0.41	0.07	0.15	0.00		Calculated
98	{SD - Phase 2}.PIPE E2	0.13	0 08:01	0.56	0.24	2.13	0.28	0.18	0.36	0.00		Calculated
99	{SD - Phase 2}.PIPE E3	0.13	0 08:00	0.56	0.24	2.21	0.54	0.17	0.35	0.00		Calculated
100	{SD - Phase 2}.PIPE E5	0.07	0 08:00	0.57	0.12	1.79	0.29	0.12	0.24	0.00		Calculated
101	{SD - Phase 2}.PIPE E6	0.07	0 08:00	0.56	0.12	1.85	0.54	0.12	0.24	0.00		Calculated
102	{SD - Phase 2}.PIPE E7	0.13	0 08:00	0.56	0.24	2.27	0.80	0.17	0.34	0.00		Calculated
103	{SD - Phase 2}.PIPE F1	0.08	0 08:00	0.56	0.15	0.80	3.16	0.26	0.52	0.00		Calculated
104	{SD - Phase 2}.PIPE F2	0.08	0 08:00	2.16	0.04	5.12	0.06	0.26	0.52	0.00		Calculated
105	{SD - Phase 2}.PIPE F3	0.08	0 08:00	0.56	0.15	2.67	0.60	0.11	0.22	0.00		Calculated
106	PIPE 32	0.20	0 08:00	0.86	0.23	2.00	0.56	0.22	0.33	0.00		Calculated
107	Pipe ADG1	0.00	0 00:00	0.40	0.00	0.00		0.00	0.00	0.00		Calculated
108	PIPE ADH1	0.00	0 00:00	0.46	0.00	0.00		0.00	0.00	0.00		Calculated
109	PIPE CLUB1	0.05	0 08:01	1.68	0.03	2.06	0.29	0.08	0.12	0.00		Calculated
110	PIPE WQ#1	1.05	0 08:02	0.83	1.27	3.28	0.03	0.58	0.86	0.00		> CAPACITY
111	PIPE WQ#2	0.26	0 08:00	20.13	0.01	6.86	0.01	0.52	0.52	0.00		Calculated
112	PIPE WQ#3	0.69	0 08:01	10.67	0.06	5.85	0.02	1.00	1.00	140.00		SURCHARGED
113	PIPE WQ#4	1.22	0 08:01	2.81	0.43	3.12	0.21	0.50	0.50	0.00		Calculated
114	PIPE WQ#5	1.22	0 08:01	5.03	0.24	4.83	0.16	0.65	0.65	0.00		Calculated

Storage Nodes

Storage Node : R-TANK 1

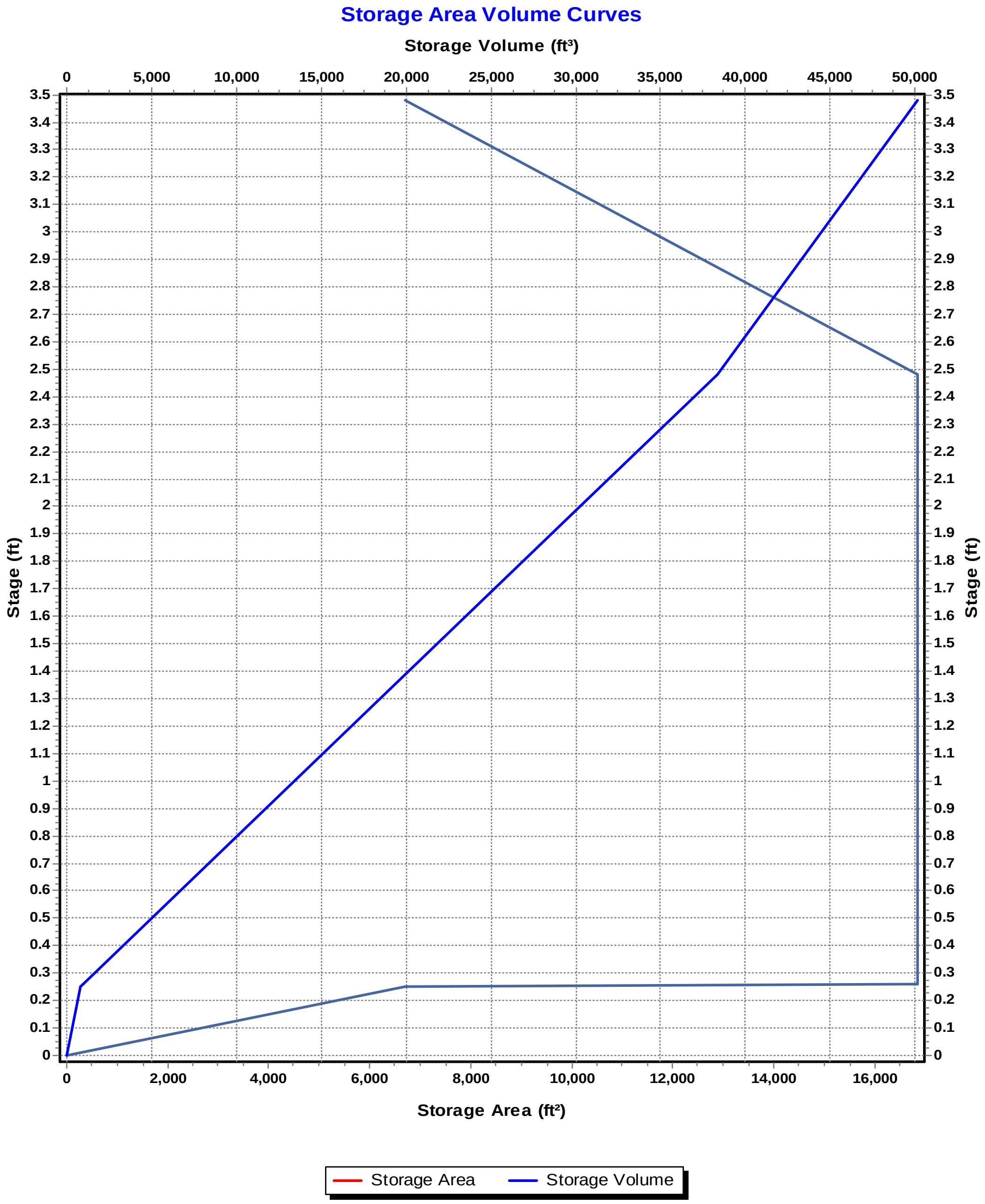
Input Data

Invert Elevation (ft)	66.90
Max (Rim) Elevation (ft)	70.88
Max (Rim) Offset (ft)	3.98
Initial Water Elevation (ft)	67.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R-TANK 1

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	6712	839
0.26	16850	956.81
2	16850	30275.81
2.48	16850	38363.81
3.48	6712	50144.81


Storage Area Volume Curves
Storage Volume (ft³)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
Stage (ft)
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Stage (ft)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : R-TANK 1 (continued)

Output Summary Results

Peak Inflow (cfs)	1.11
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.13
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	68.14
Max HGL Depth Attained (ft)	1.24
Average HGL Elevation Attained (ft)	67.84
Average HGL Depth Attained (ft)	0.94
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : R-TANK 2

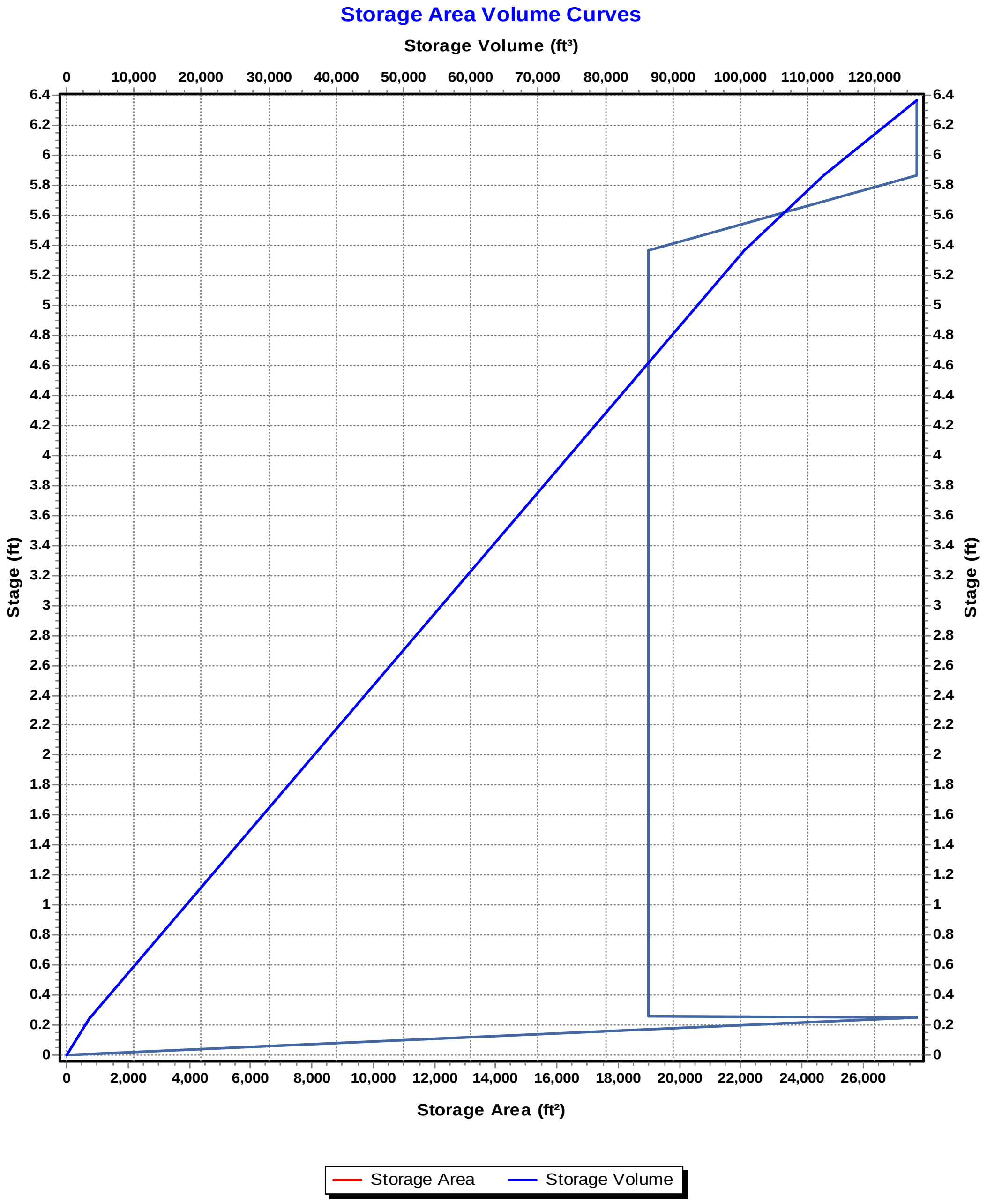
Input Data

Invert Elevation (ft)	67.90
Max (Rim) Elevation (ft)	74.77
Max (Rim) Offset (ft)	6.87
Initial Water Elevation (ft)	68.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R TANK 2

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	27750	3468.75
0.26	18980	3702.4
5.37	18980	100690.2
5.87	27750	112372.7
6.37	27750	126247.7


Storage Area Volume Curves
Storage Volume (ft³)
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
Stage (ft)
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Storage Area (ft²)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
Storage Area
Storage Volume

Storage Node : R-TANK 2 (continued)

Output Summary Results

Peak Inflow (cfs)	2.92
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.23
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	70.59
Max HGL Depth Attained (ft)	2.69
Average HGL Elevation Attained (ft)	69.58
Average HGL Depth Attained (ft)	1.68
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : R-TANK 3

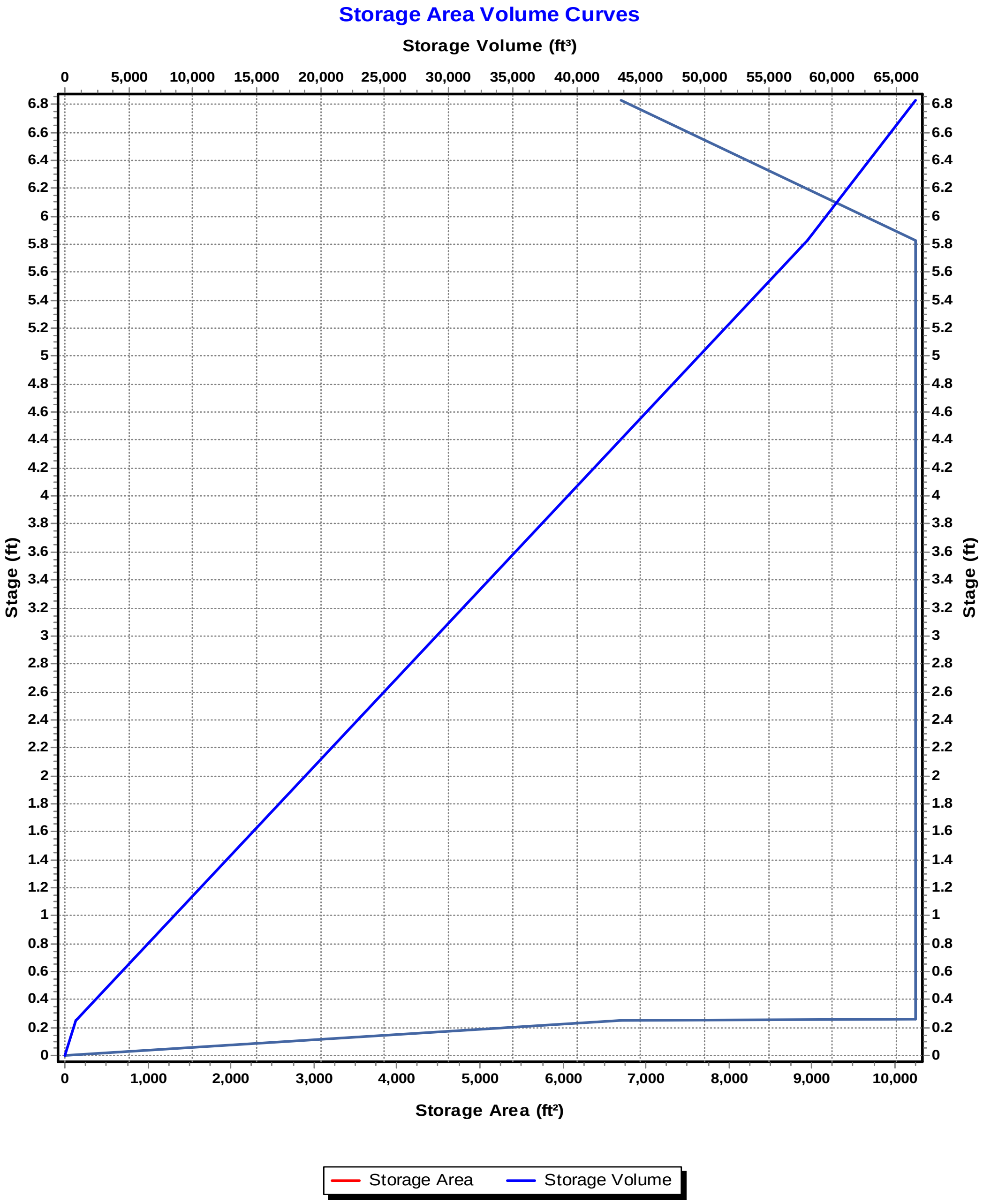
Input Data

Invert Elevation (ft)	67.90
Max (Rim) Elevation (ft)	74.77
Max (Rim) Offset (ft)	6.87
Initial Water Elevation (ft)	68.40
Initial Water Depth (ft)	0.50
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : R TANK 3

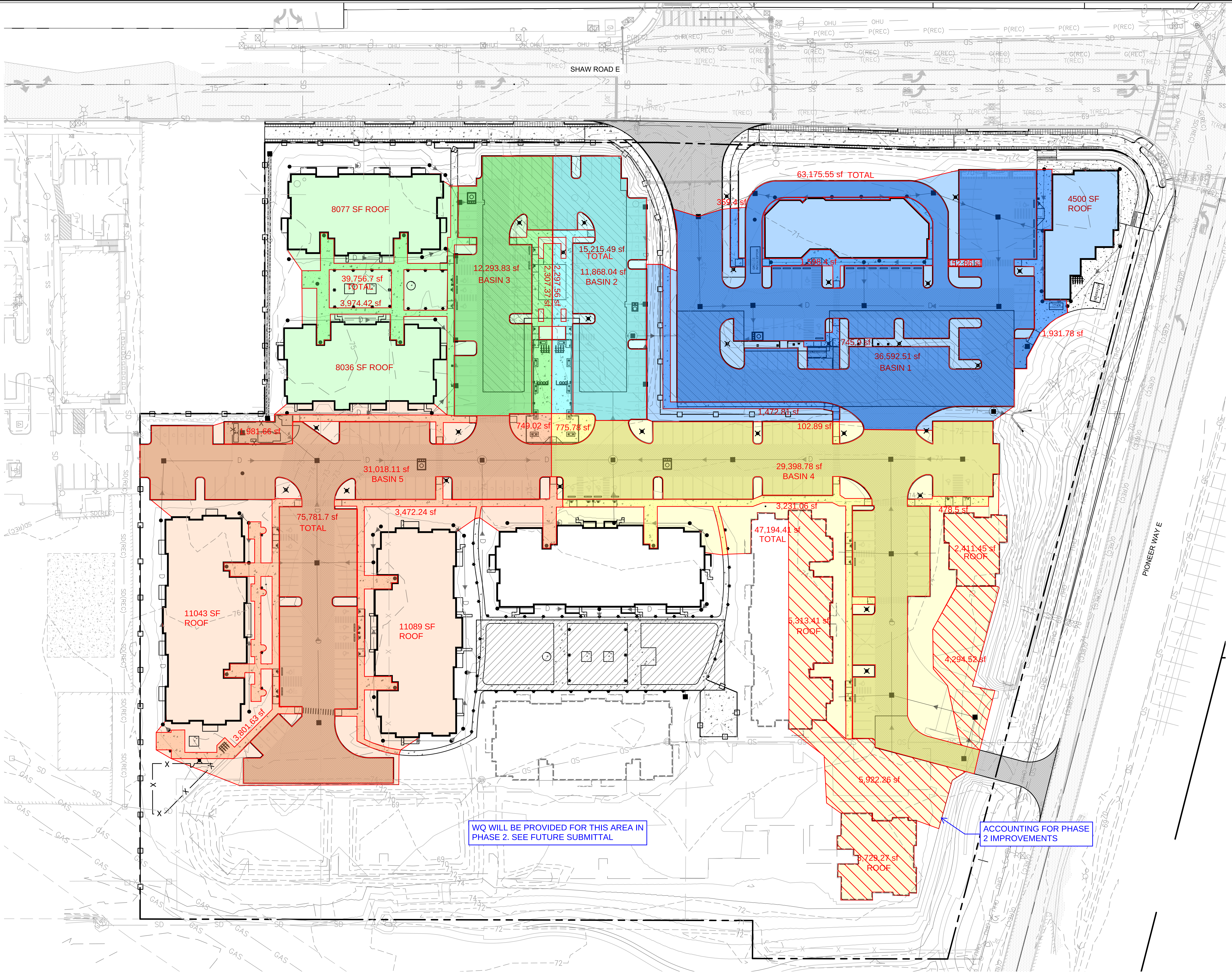
Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0	0
0.25	6708	838.5
0.26	10250	923.29
5.83	10250	58015.79
6.83	6708	66494.79


Storage Area Volume Curves
Storage Volume (ft³)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
60,000
65,000
Stage (ft)
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Storage Area (ft²)
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
Storage Area
Storage Volume

Storage Node : R-TANK 3 (continued)

Output Summary Results

Peak Inflow (cfs)	1.83
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0.34
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	70.59
Max HGL Depth Attained (ft)	2.69
Average HGL Elevation Attained (ft)	69.62
Average HGL Depth Attained (ft)	1.72
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0



WQ WILL BE PROVIDED FOR THIS AREA IN PHASE 2. SEE FUTURE SUBMITTAL

ACCOUNTING FOR PHASE 2 IMPROVEMENTS

BASIN 1: **1.45 AC TOTAL**
- ASPHALT: 0.85 AC
- LANDSCAPE: 0.22 AC
- ROOF: 0.24 AC
- PERVIOUS SIDEWALK: 0.14 AC

BASIN 2: **0.35 AC TOTAL**
- ASPHALT: 0.28 AC
- LANDSCAPE: 0.01 AC
- ROOF: 0.00 AC
- PERVIOUS SIDEWALK: 0.06 AC

BASIN 3: **0.91 AC TOTAL**
- ASPHALT: 0.29 AC
- LANDSCAPE: 0.10 AC
- ROOF: 0.37 AC
- PERVIOUS SIDEWALK: 0.15 AC

BASIN 4: **1.23 AC TOTAL**
- ASPHALT: 0.67 AC
- LANDSCAPE: 0.01 AC
- ROOF: 0.00 AC
- PERVIOUS SIDEWALK: 0.06 AC
- PH 2 ASPHALT: 0.08 AC
- PH 2 LANDSCAPE: 0.05 AC
- PH 2 ROOF: 0.26 AC
- PH 2 PERV SIDEWALK: 0.10 AC

BASIN 5: **1.74 AC TOTAL**
- ASPHALT: 0.72 AC
- LANDSCAPE: 0.28 AC
- ROOF: 0.51 AC
- PERVIOUS SIDEWALK: 0.23 AC

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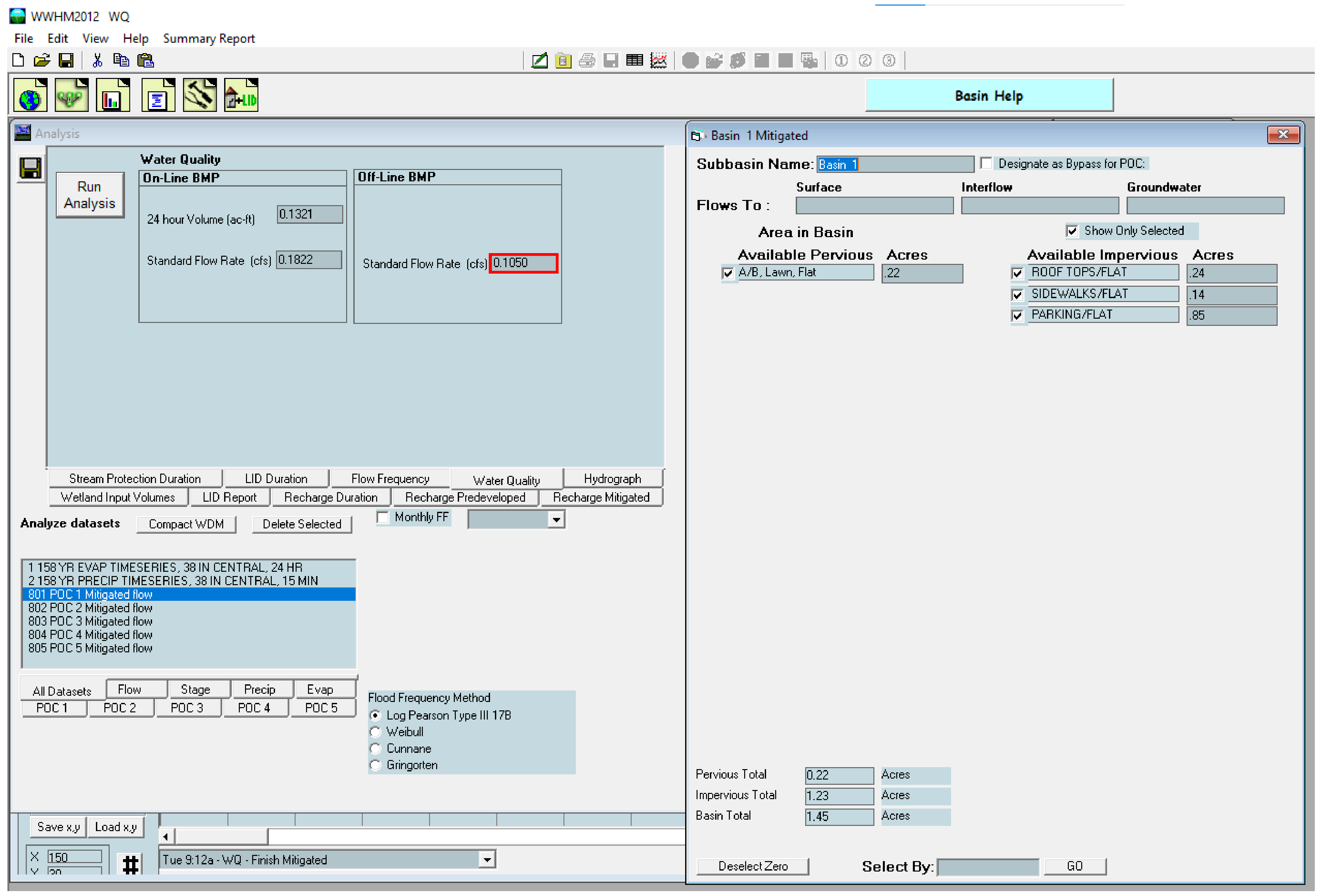
316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL
Civil Engineers
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

WQ BASIN MAP

EAST TOWN CENTER

D-2



Water Quality

On-Line BMP

24 hour Volume (ac-ft) 0.1321

Standard Flow Rate (cfs) 0.1822

Off-Line BMP

Standard Flow Rate (cfs) 0.1050

Analyze datasets ☐ Monthly FF

1 158 YR EVAP TIMESERIES, 38 IN CENTRAL, 24 HR
2 158 YR PRECIP TIMESERIES, 38 IN CENTRAL, 15 MIN
801 POC 1 Mitigated flow
802 POC 2 Mitigated flow
803 POC 3 Mitigated flow
804 POC 4 Mitigated flow
805 POC 5 Mitigated flow

Flood Frequency Method
● Log Pearson Type III 17B
○ Weibull
○ Cunnane
○ Gringorten

X 150

Tue 9:12a - WQ - Finish Mitigated

Basin 1 Mitigated

Subbasin Name: Basin 1 ☐ Designate as Bypass for POC:

Flows To : Surface Interflow Groundwater

Area in Basin ☑ Show Only Selected

Available Pervious	Acres
☑ A/B, Lawn, Flat	.22

Available Impervious	Acres
☑ ROOF TOPS/FLAT	.24
☑ SIDEWALKS/FLAT	.14
☑ PARKING/FLAT	.85

Pervious Total 0.22 Acres
Impervious Total 1.23 Acres
Basin Total 1.45 Acres

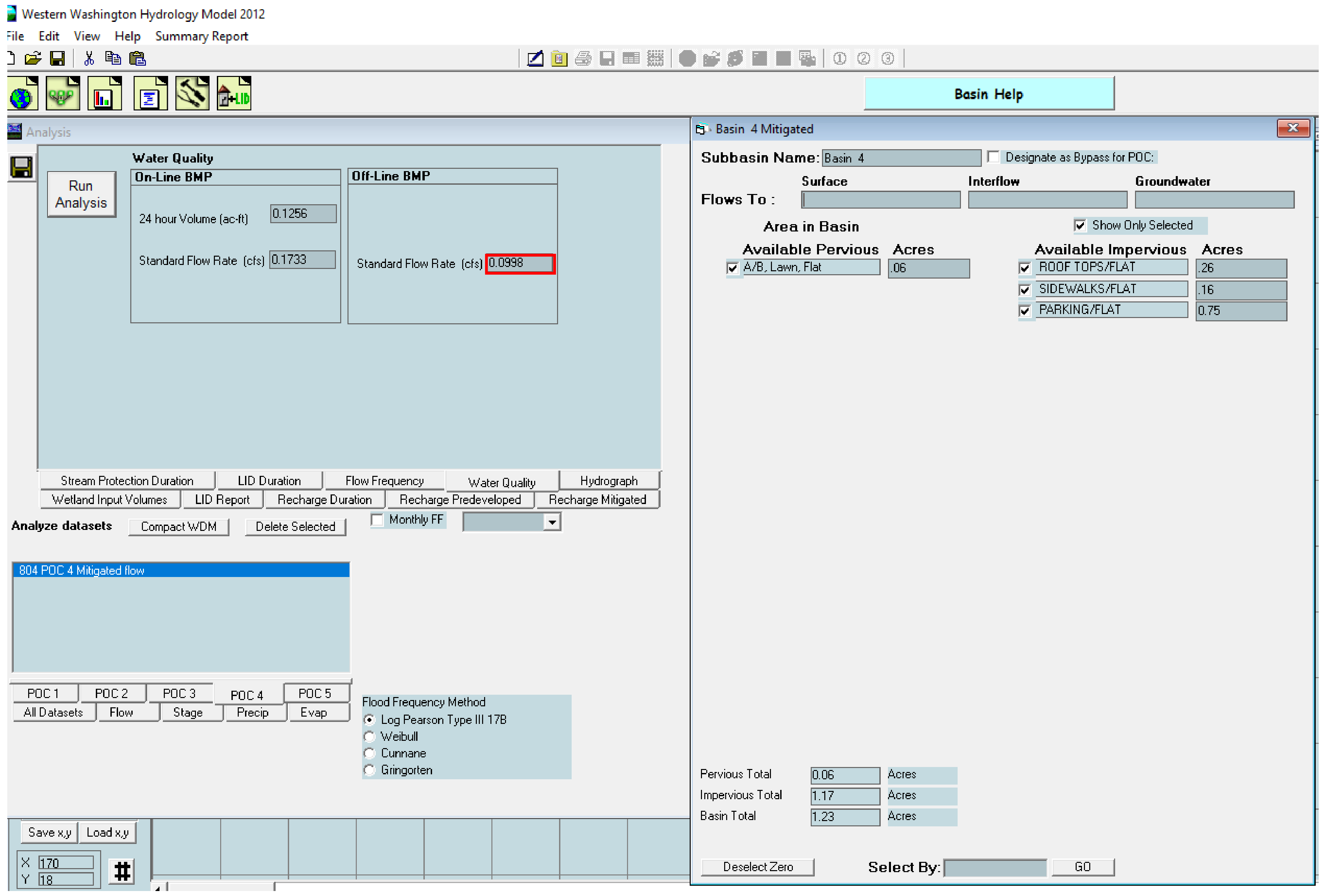
Select By:

BASIN 1: OFFLINE FLOW RATE = 0.1050 CFS

6X8 BIOPOD PERFORMANCE SPECIFICATIONS WITH WQ FLOW CAPACITY HIGHLIGHTED. SEE FOLLOWING PAGE FOR FULL DETAIL FROM OLDCASTLE

PERFORMANCE SPECIFICATIONS	
Treatment Flow Capacities:*	
NJDEP 80% Removal, 75 micron	0.144 cfs
WA Ecology GULD - Basic, Enhanced & Phosphorus	0.128 cfs
Bypass Capacity	5.0 cfs
*Contact Oldcastle for alternative treatment flow capacities.	

BASIN 1: 0.1050 CFS < 0.128 CFS
BASIN 3: 0.0691 CFS < 0.128 CFS
BASIN 4: 0.0998 CFS < 0.128 CFS
BASIN 5: 0.1246 CFS < 0.128 CFS



Water Quality

On-Line BMP

24 hour Volume (ac-ft) 0.1256

Standard Flow Rate (cfs) 0.1733

Off-Line BMP

Standard Flow Rate (cfs) 0.0998

Analyze datasets ☐ Monthly FF

804 POC 4 Mitigated flow

Flood Frequency Method
● Log Pearson Type III 17B
○ Weibull
○ Cunnane
○ Gringorten

X 170
Y 18

Basin 4 Mitigated

Subbasin Name: Basin 4 ☐ Designate as Bypass for POC:

Flows To : Surface Interflow Groundwater

Area in Basin ☑ Show Only Selected

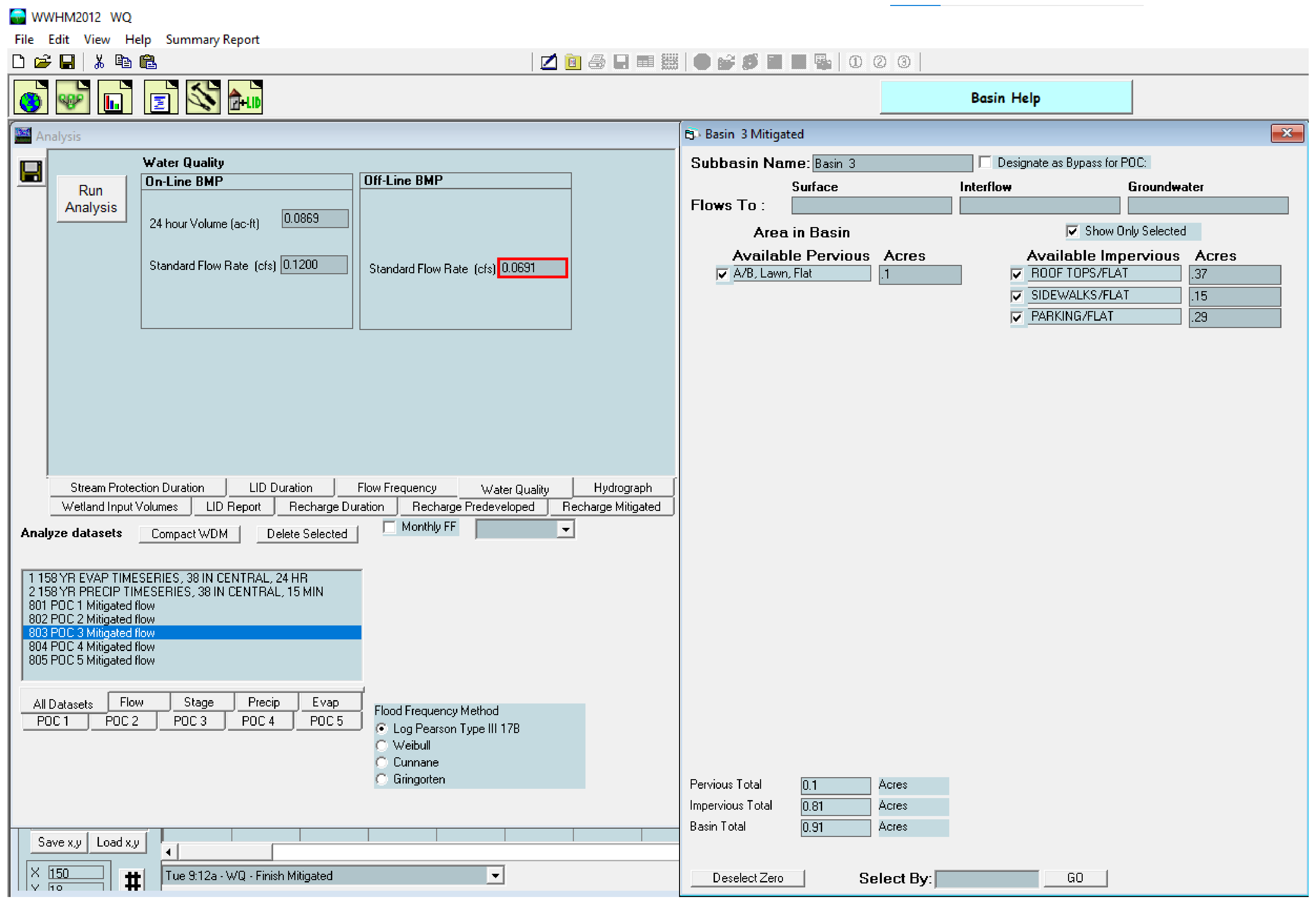
Available Pervious	Acres
☑ A/B, Lawn, Flat	.06

Available Impervious	Acres
☑ ROOF TOPS/FLAT	.26
☑ SIDEWALKS/FLAT	.16
☑ PARKING/FLAT	0.75

Pervious Total 0.06 Acres
Impervious Total 1.17 Acres
Basin Total 1.23 Acres

Select By:

BASIN 4: OFFLINE FLOW RATE = 0.0998 CFS



Water Quality

On-Line BMP

24 hour Volume (ac-ft) 0.0869

Standard Flow Rate (cfs) 0.1200

Off-Line BMP

Standard Flow Rate (cfs) 0.0691

Analyze datasets ☐ Monthly FF

1 158 YR EVAP TIMESERIES, 38 IN CENTRAL, 24 HR
2 158 YR PRECIP TIMESERIES, 38 IN CENTRAL, 15 MIN
801 POC 1 Mitigated flow
802 POC 2 Mitigated flow
803 POC 3 Mitigated flow
804 POC 4 Mitigated flow
805 POC 5 Mitigated flow

Flood Frequency Method
● Log Pearson Type III 17B
○ Weibull
○ Cunnane
○ Gringorten

X 150

Tue 9:12a - WQ - Finish Mitigated

Basin 3 Mitigated

Subbasin Name: Basin 3 ☐ Designate as Bypass for POC:

Flows To : Surface Interflow Groundwater

Area in Basin ☑ Show Only Selected

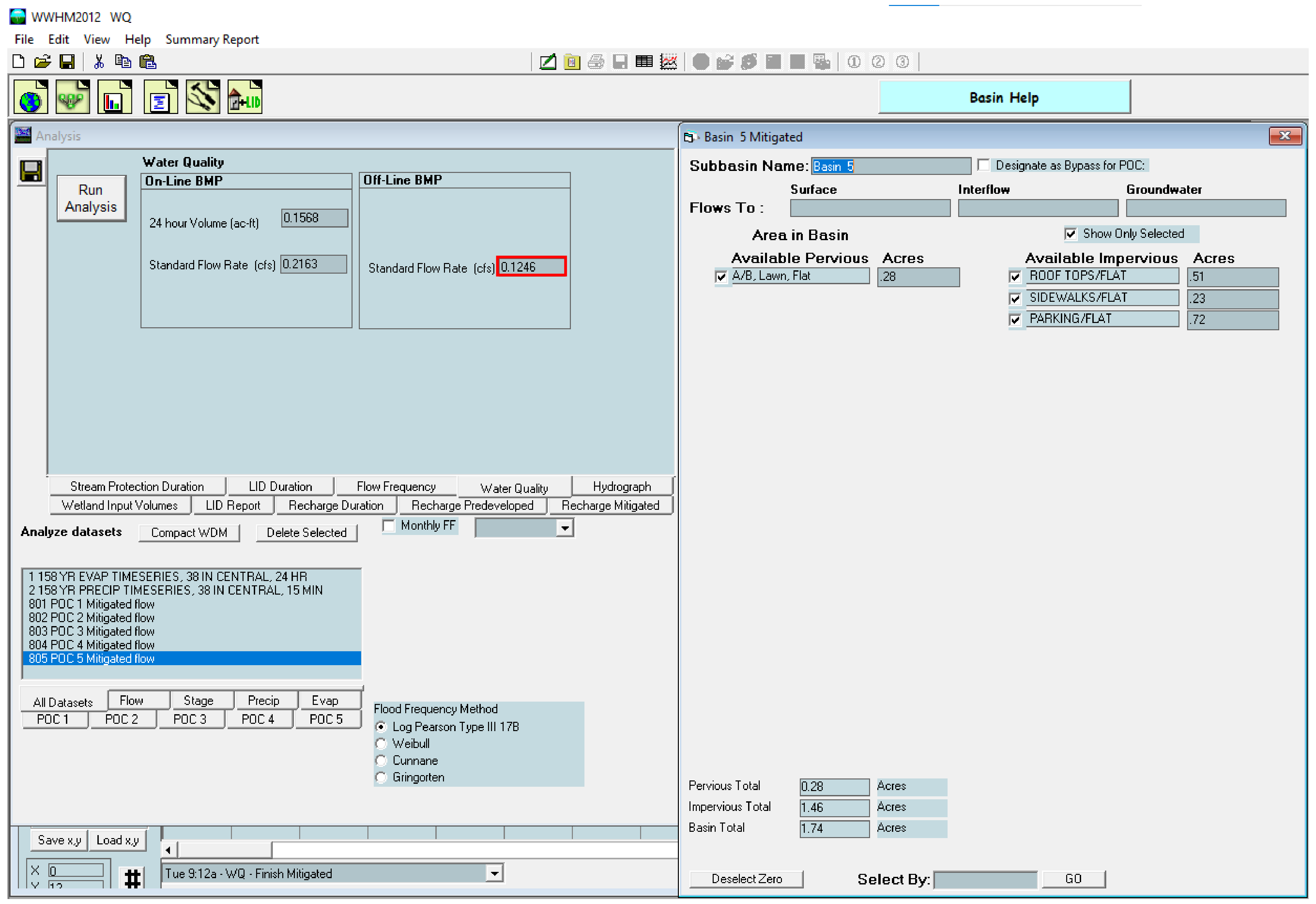
Available Pervious	Acres
☑ A/B, Lawn, Flat	.1

Available Impervious	Acres
☑ ROOF TOPS/FLAT	.37
☑ SIDEWALKS/FLAT	.15
☑ PARKING/FLAT	.29

Pervious Total 0.1 Acres
Impervious Total 0.81 Acres
Basin Total 0.91 Acres

Select By:

BASIN 3: OFFLINE FLOW RATE = 0.0691 CFS



Water Quality

On-Line BMP

24 hour Volume (ac-ft) 0.1568

Standard Flow Rate (cfs) 0.2163

Off-Line BMP

Standard Flow Rate (cfs) 0.1246

Analyze datasets ☐ Monthly FF

1 158 YR EVAP TIMESERIES, 38 IN CENTRAL, 24 HR
2 158 YR PRECIP TIMESERIES, 38 IN CENTRAL, 15 MIN
801 POC 1 Mitigated flow
802 POC 2 Mitigated flow
803 POC 3 Mitigated flow
804 POC 4 Mitigated flow
805 POC 5 Mitigated flow

Flood Frequency Method
● Log Pearson Type III 17B
○ Weibull
○ Cunnane
○ Gringorten

X 0

Tue 9:12a - WQ - Finish Mitigated

Basin 5 Mitigated

Subbasin Name: Basin 5 ☐ Designate as Bypass for POC:

Flows To : Surface Interflow Groundwater

Area in Basin ☑ Show Only Selected

Available Pervious	Acres
☑ A/B, Lawn, Flat	.28

Available Impervious	Acres
☑ ROOF TOPS/FLAT	.51
☑ SIDEWALKS/FLAT	.23
☑ PARKING/FLAT	.72

Pervious Total 0.28 Acres
Impervious Total 1.46 Acres
Basin Total 1.74 Acres

Select By:

BASIN 5: OFFLINE FLOW RATE = 0.1246 CFS

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316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

Civil Engineers
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

WQ CALCS FOR 6x8 BIOPOD

EAST TOWN CROSSING

D-2

2230752

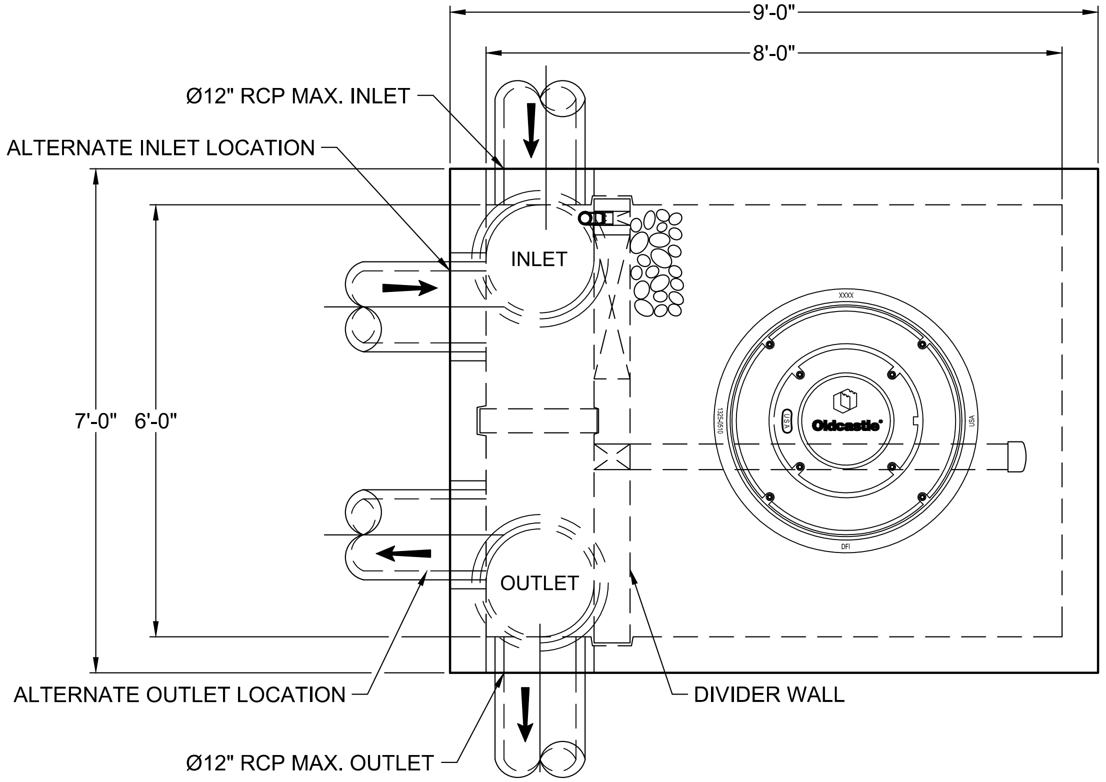
SITE SPECIFIC DATA	
Structure ID	ID
Treatment Flow Rate (cfs)	-
Peak Flow Rate (cfs)	-
Rim Elevation	-
Top of Vault Elevation	-

Pipe Data	Pipe Location	Pipe Size	Pipe Type	Invert Elevation
Inlet	-	-	-	-
Outlet	-	-	-	-

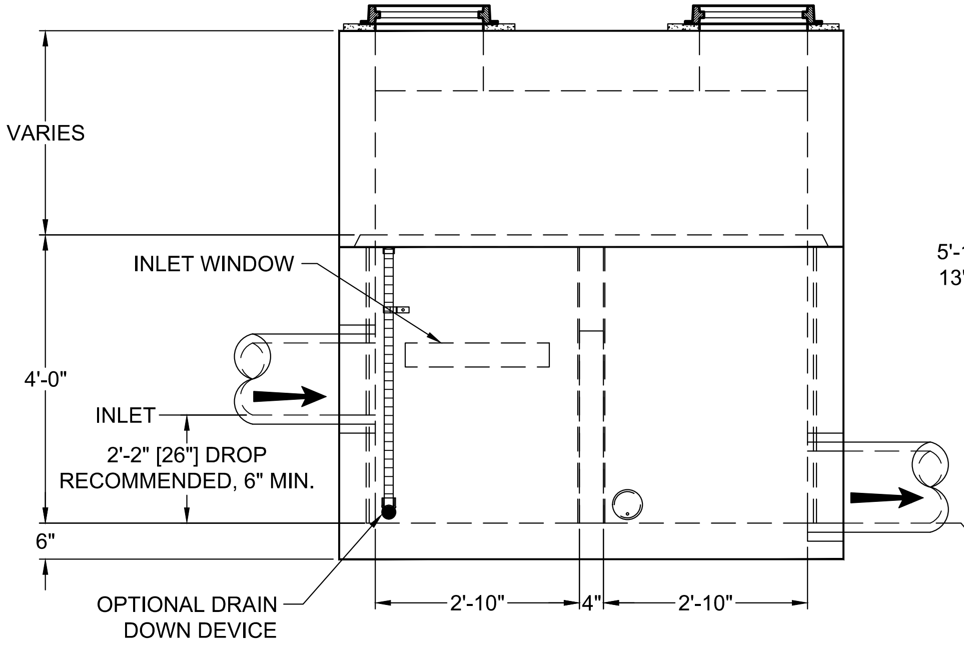
Notes:

PERFORMANCE SPECIFICATIONS	
Treatment Flow Capacities:*	
NJDEP 80% Removal, 75 micron	0.144 cfs
WA Ecology GULD - Basic, Enhanced & Phosphorus	0.128 cfs
Bypass Capacity	5.0 cfs

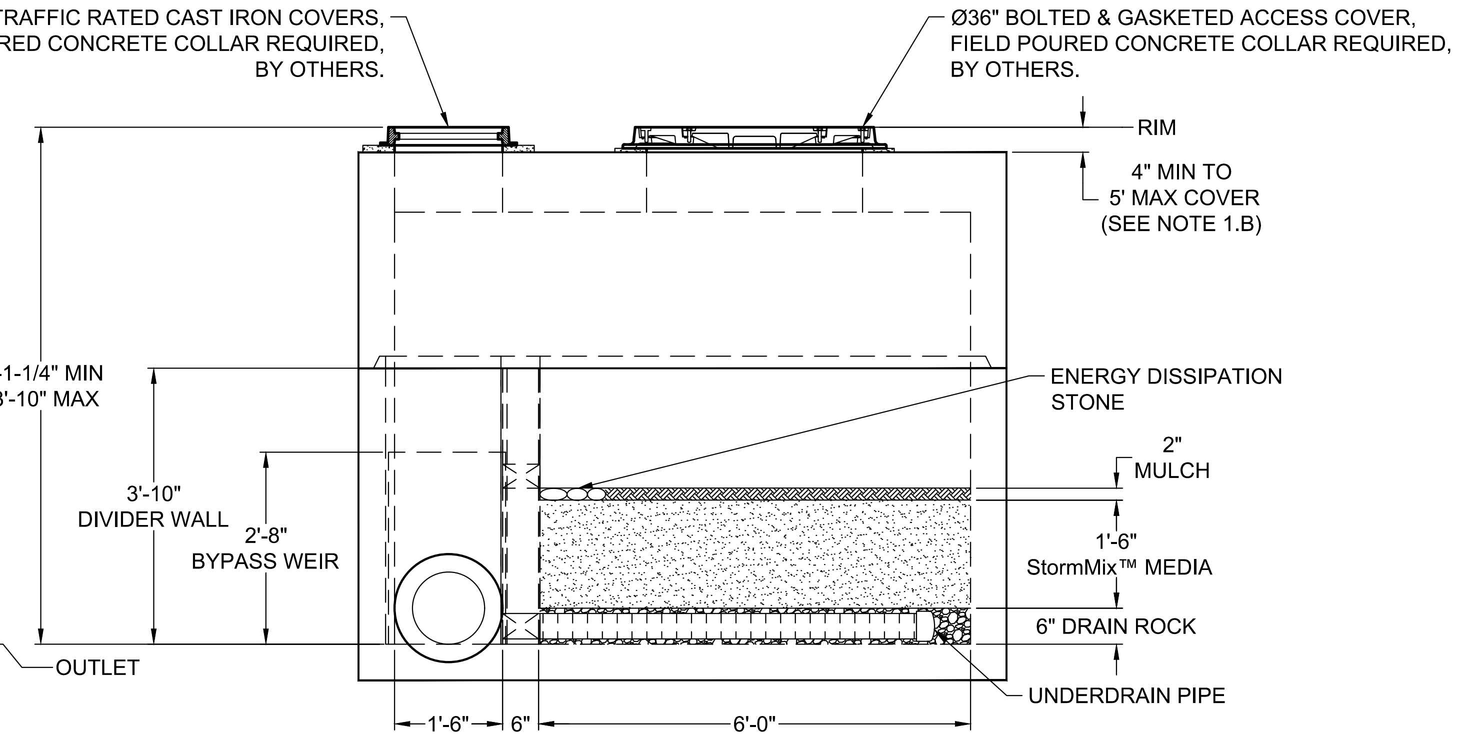
*Contact Oldcastle for alternative treatment flow capacities.



PLAN VIEW



LEFT END VIEW



ELEVATION VIEW

NOTES:

1. DESIGN LOADINGS:
   - A. AASHTO HS-20-44 (WITH IMPACT)
   - B. DESIGN SOIL COVER: 5'-0" MAXIMUM
   - C. ASSUMED WATER TABLE: BELOW BASE OF PRECAST (ENGINEER-OF-RECORD TO CONFIRM SITE WATER TABLE ELEVATION)
   - D. LATERAL EARTH PRESSURE: 45 PCF (DRAINED)
   - E. LATERAL LIVE LOAD SURCHARGE: 80 PSF (APPLIED TO 8'-0" BELOW GRADE)
   - F. NO LATERAL SURCHARGE FROM ADJACENT BUILDINGS, WALLS, PIERS, OR FOUNDATIONS.
2. CONCRETE 28-DAY MINIMUM COMPRESSIVE STRENGTH: 5,000 PSI MINIMUM.
3. REINFORCING: REBAR, ASTM A615/A706, GRADE 60
4. CEMENT: ASTM C150
5. REQUIRED ALLOWABLE SOIL BEARING CAPACITY: 2,500 PSF
6. REFERENCE STANDARD:
   - A. ASTM C890
   - B. ASTM C913
   - C. ACI 318-14
7. THIS STRUCTURE IS DESIGNED TO THE PARAMETERS NOTED HEREIN. ENGINEER-OF-RECORD SHALL VERIFY FY THAT NOTED PARAMETERS MEET OR EXCEED PROJECT REQUIREMENTS. IF DESIGN PARAMETERS ARE INCORRECT, REVIEWING ENGINEER/AUTHORITY SHALL NOTIFY OLDCASTLE INFRASTRUCTURE UPON REVIEW.
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12. MAXIMUM PICK WEIGHTS*:
    - A. TOP: XX,XXX LBS
    - B. BASE: XX,XXX LBS* (* COMBINED WEIGHT OF BASE INCLUDES BYPASS WEIR, DIVIDER WALL, ROCK & MEDIA)
13. INTERNALS SHALL CONSIST OF UNDERDRAIN PIPE, ROCK, STORMMIX™ MEDIA, MULCH, DIVIDER WALL, BYPASS WEIR AND OPTIONAL DRAIN DOWN.

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Biofiltration

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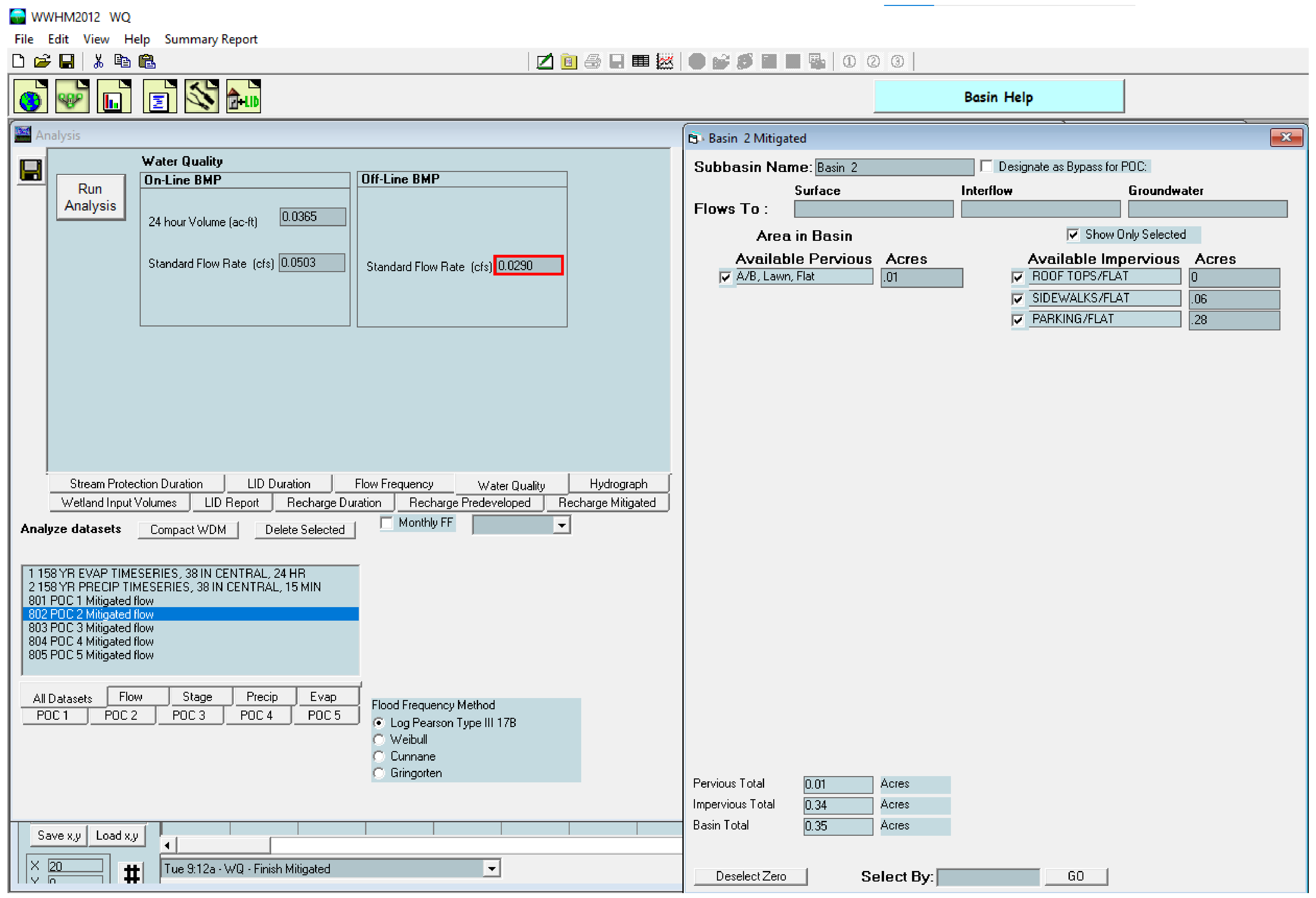
BioPod™ Biofilter System (STANDARD)
Underground Vault with Internal Bypass

CUSTOMER
-

PROJECT NAME
-

SHEET NAME	REVISION	SHEET
Specifier Drawing BPU-68IB	- REV DATE -	1 OF 1



Water Quality

On-Line BMP

24 hour Volume (ac-ft) 0.0365

Standard Flow Rate (cfs) 0.0503

Off-Line BMP

Standard Flow Rate (cfs) 0.0290

Analyze datasets

☐ Monthly FF

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801 POC 1 Mitigated flow
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805 POC 5 Mitigated flow

Flood Frequency Method
● Log Pearson Type III 17B
○ Weibull
○ Cunnane
○ Gringorten

X 20
Y 0

Tue 9:12a - WQ - Finish Mitigated

Basin 2 Mitigated

Subbasin Name: Basin 2 ☐ Designate as Bypass for POC:

Flows To : **Surface** **Interflow** **Groundwater**

Area in Basin ☑ Show Only Selected

Available Pervious	**Acres**
☑ A/B, Lawn, Flat	.01

Available Impervious	**Acres**
☑ ROOF TOPS/FLAT	0
☑ SIDEWALKS/FLAT	.06
☑ PARKING/FLAT	.28

Pervious Total	0.01	Acres
Impervious Total	0.34	Acres
Basin Total	0.35	Acres

Select By:

BASIN 2: OFFLINE FLOW RATE = 0.0290 CFS

4X6 BIOPOD PERFORMANCE SPECIFICATIONS WITH WQ FLOW CAPACITY HIGHLIGHTED. SEE FOLLOWING PAGE FOR FULL DETAIL FROM OLDCASTLE

PERFORMANCE SPECIFICATIONS	
Treatment Flow Capacities:*	
NJDEP 80% Removal, 75 micron	0.064 cfs
WA Ecology GULD - Basic, Enhanced & Phosphorus	0.057 cfs
Bypass Capactiy	5.0 cfs
*Contact Oldcastle for alternative treatment flow capacities.	

BASIN 2: 0.0290 CFS < 0.057 CFS

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316 Occidental Avenue South, Suite 320, Seattle, WA 98104 206.267.2425 TEL

Civil Engineers
Structural Engineers
Landscape Architects
Community Planners
Land Surveyors
Neighbors

WQ CALCS
EAST TOWN CROSSING

D-2
2230752

SITE SPECIFIC DATA	
Structure ID	ID
Treatment Flow Rate (cfs)	-
Peak Flow Rate (cfs)	-
Rim Elevation	-
Top of Vault Elevation	-

Pipe Data	Pipe Location	Pipe Size	Pipe Type	Invert Elevation
Inlet	-	-	-	-
Outlet	-	-	-	-
Notes:				

PERFORMANCE SPECIFICATIONS	
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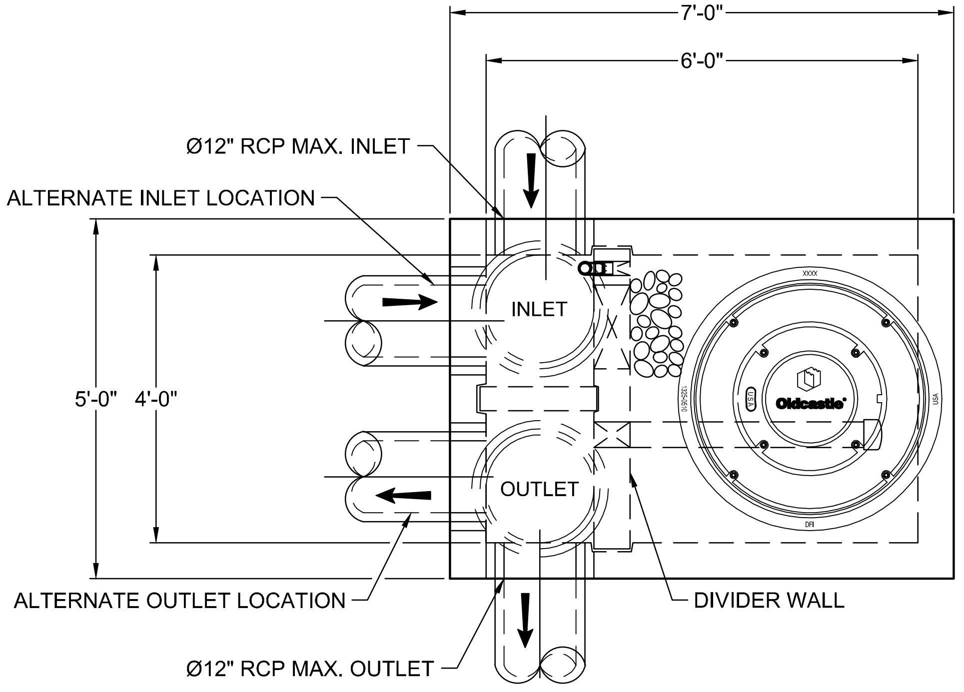
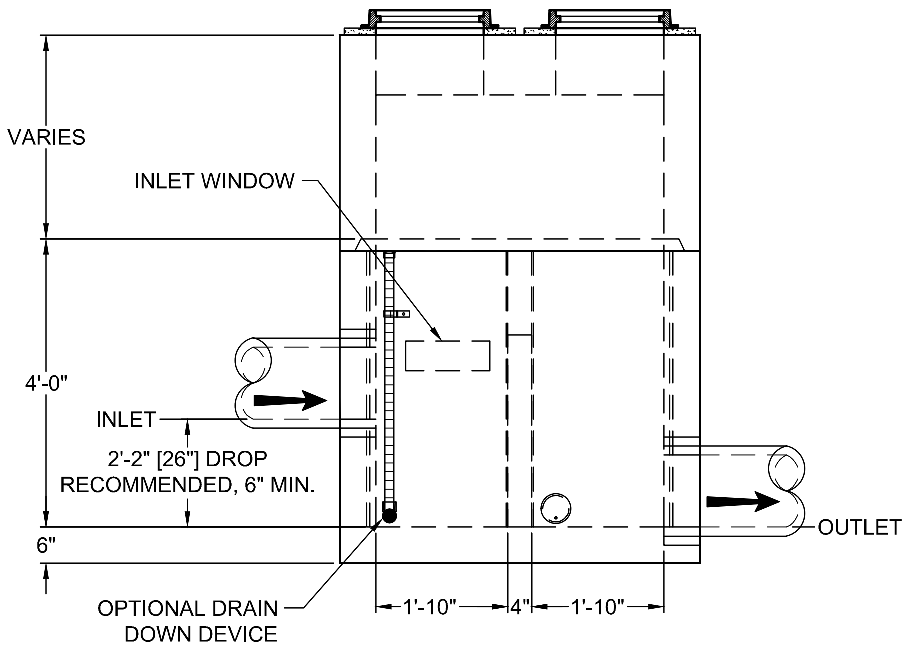
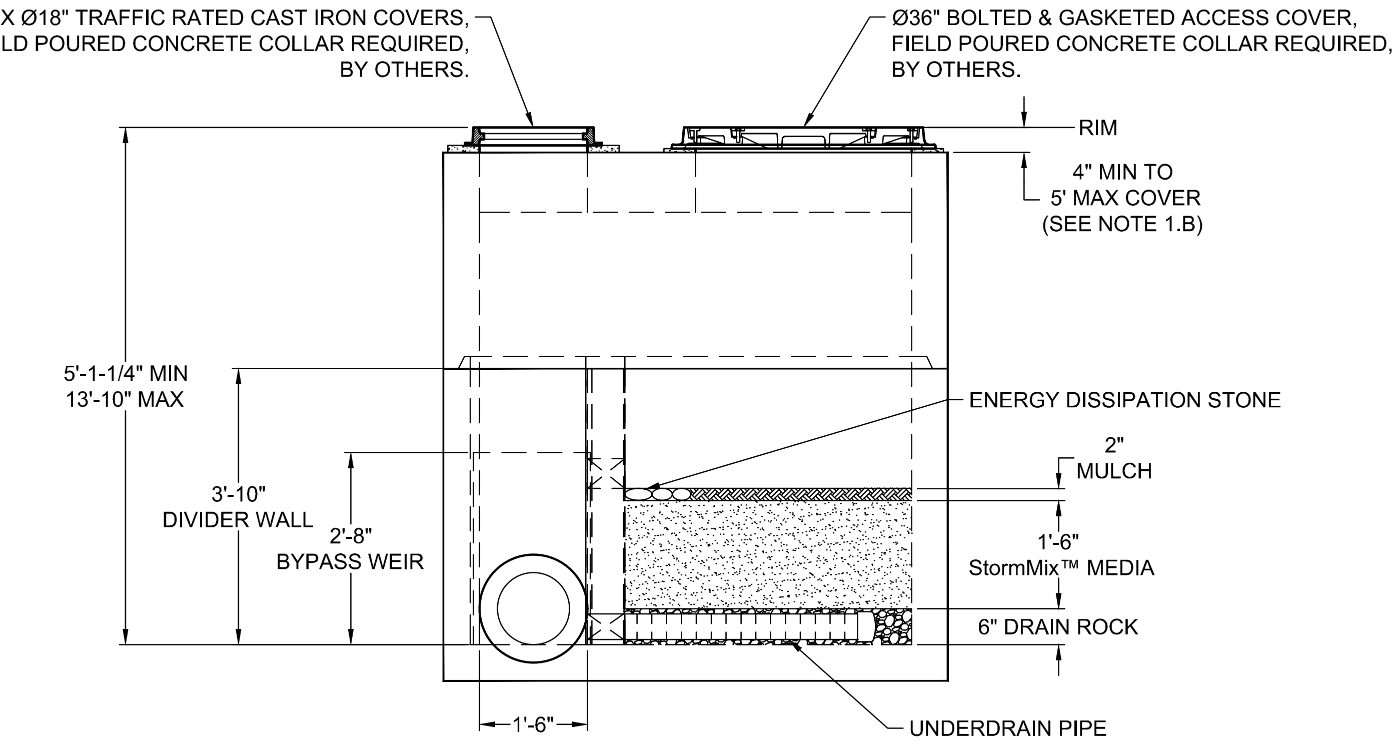


PLAN VIEW



LEFT END VIEW



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BioPod™ Biofilter System (STANDARD)
Underground Vault with Internal Bypass

CUSTOMER
-

PROJECT NAME
-

SHEET NAME	REVISION	SHEET
Specifier Drawing BPU-46IB	- REV DATE -	1 OF 1

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.59
Program License Number: 201710010
Project Simulation Performed on: 04/05/2024 3:37 PM
Report Generation Date: 04/05/2024 3:38 PM

Input File Name: 20231013 Storm Model Combined with Full Bypass.fld
Project Name: East Town
Analysis Title:
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 3
Precipitation Station : 95004005 Puget West 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 951040 Puget West 40 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) ***************

********************** WATERSHED DEFINITION ***********************

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	10.950	10.950
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	10.950	10.950

----------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : All Basins ----------

	-------Area (Acres) --------
C, Forest, Flat	10.950
Subbasin Total	10.950

----------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 3

---------- Subbasin : Upper Basin ----------

	-------Area (Acres) --------
C, Lawn, Flat	3.500
ROADS/FLAT	2.800
ROOF TOPS/FLAT	1.700
Subbasin Total	8.000

---------- Subbasin : Lower Basin ----------

	-------Area (Acres) --------
C, Lawn, Flat	0.920

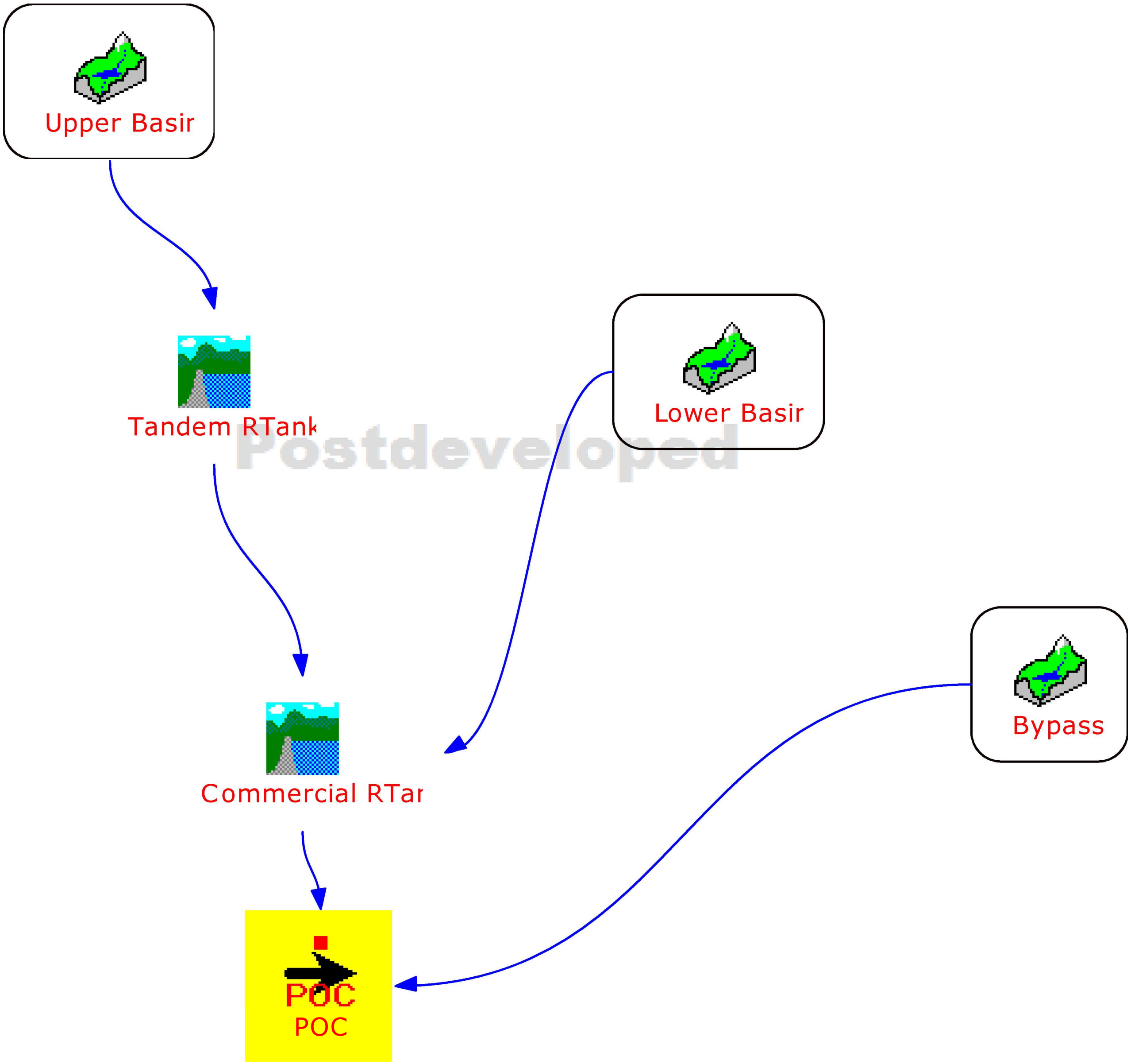
```
ROADS/FLAT            0.830
ROOF TOPS/FLAT             0.250
----------------------------------------------
Subbasin Total        2.000


 ---------- Subbasin : Bypass ----------
          -------Area (Acres) --------
C, Lawn, Flat         0.550
ROADS/FLAT            0.400
----------------------------------------------
Subbasin Total        0.950



************************* LINK DATA *******************************

----------------------SCENARIO: PREDEVELOPED
Number of Links:  0


************************* LINK DATA *******************************

----------------------SCENARIO: POSTDEVELOPED
Number of Links:  3


------------------------------------------
Link Name: Tandem RTank
Link Type:  Structure
Downstream Link Name: Commercial RTank  RT2-3

Prismatic Pond Option Used
Pond Floor Elevation (ft)         :   100.00
Riser Crest Elevation (ft)                :   105.87
Max Pond Elevation (ft)           :   106.37
Storage Depth (ft)                :   5.87
Pond Bottom Length (ft)           :    250.0
Pond Bottom Width (ft)            :    119.5
Pond Side Slopes (ft/ft)          : Z1= 0.00   Z2= 0.00  Z3= 0.00  Z4= 0.00
Bottom Area (sq-ft)               :   29875.
Area at Riser Crest El (sq-ft)    :   29,875.
                        (acres)   :    0.686
Volume at Riser Crest (cu-ft)     :   175,366.
                        (ac-ft)   :   4.026
Area at Max Elevation  (sq-ft)    :   29875.
                        (acres)   :    0.686
Vol at Max Elevation  (cu-ft)     :  190,304.
                        (ac-ft)   :   4.369

Hydraulic Conductivity (in/hr)    :  0.00
Massmann Regression Used to Estimate Hydralic Gradient
Depth to Water Table (ft)                 : 100.00
Bio-Fouling Potential             : Low
Maintenance                       : Average or Better

Riser Geometry
Riser Structure Type              : Circular
Riser Diameter (in)               : 18.00
Common Length (ft)                : 0.070
Riser Crest Elevation             : 105.87 ft

 Hydraulic Structure Geometry

Number of Devices:    2

     ---Device Number   1 ---
Device Type             :  Circular Orifice
Control Elevation (ft)  :  100.00
Diameter (in)           :  1.37
Orientation             : Horizontal
```

```
Elbow                    : No

     ---Device Number   2 ---
Device Type              :  Circular Orifice
Control Elevation (ft)   :  104.25
Diameter (in)            :  1.25
Orientation              : Vertical
Elbow                    : Yes


-----------------------------------------
Link Name: Commercial RTank     RT1
Link Type:  Structure
Downstream Link Name: POC

Prismatic Pond Option Used
Pond Floor Elevation (ft)          :    100.00
Riser Crest Elevation (ft)                  :    102.00
Max Pond Elevation (ft)            :    102.50
Storage Depth (ft)                 :    2.00
Pond Bottom Length (ft)            :     55.0
Pond Bottom Width (ft)             :     183.0
Pond Side Slopes (ft/ft)           : Z1= 0.00   Z2= 0.00  Z3= 0.00  Z4= 0.00
Bottom Area (sq-ft)                :    10065.
Area at Riser Crest El (sq-ft)     :    10,065.
                         (acres)   :     0.231
Volume at Riser Crest (cu-ft)      :    20,130.
                         (ac-ft)   :    0.462
Area at Max Elevation  (sq-ft)     :    10065.
                         (acres)   :     0.231
Vol at Max Elevation  (cu-ft)      :   25,162.
                         (ac-ft)   :    0.578

Constant Infiltration Option Used
Infiltration Rate (in/hr):  0.00

Riser Geometry
Riser Structure Type               : Circular
Riser Diameter (in)                : 18.00
Common Length (ft)                 : 0.230
Riser Crest Elevation              : 102.00 ft

 Hydraulic Structure Geometry

Number of Devices:    3

     ---Device Number   1 ---
Device Type              :  Circular Orifice
Control Elevation (ft)   :  100.00
Diameter (in)            :  2.12
Orientation              : Horizontal
Elbow                    : No

     ---Device Number   2 ---
Device Type              :  Circular Orifice
Control Elevation (ft)   :  101.10
Diameter (in)            :  3.00
Orientation              : Vertical
Elbow                    : Yes

     ---Device Number   3 ---
Device Type              :  Circular Orifice
Control Elevation (ft)   :  101.75
Diameter (in)            :  3.50
Orientation              : Vertical
Elbow                    : Yes


-----------------------------------------
Link Name: POC
Link Type:  Copy
```

```
Downstream Link: None


*********************FLOOD FREQUENCY AND DURATION STATISTICS*******************

---------------------SCENARIO: PREDEVELOPED
Number of Subbasins:  1
Number of Links:  0


---------------------SCENARIO: POSTDEVELOPED
Number of Subbasins:  3
Number of Links:  3


********** Link: POC                                   **********    Link Outflow 1 Frequency Stats
 Flood Frequency Data(cfs)
 (Recurrence Interval Computed Using Gringorten Plotting Position)
Tr (yrs)       Flood Peak (cfs)
========================================
   2-Year          0.299
   5-Year          0.425
   10-Year         0.486
   25-Year         0.622
   50-Year         0.650
   100-Year        0.732
   200-Year        0.765
   500-Year        0.807



 ***********Groundwater Recharge Summary *************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

             Total Predeveloped Recharge During Simulation
Model Element                      Recharge Amount (ac-ft)
-----------------------------------------------------------------------------------------------
Subbasin: All Basins                 1877.457
______________________________________________________
Total:                               1877.457

           Total Post Developed Recharge During Simulation
Model Element                      Recharge Amount (ac-ft)
-----------------------------------------------------------------------------------------------
Subbasin: Upper Basin                414.673
Subbasin: Lower Basin                109.000
Subbasin: Bypass                     65.163
Link:     Tandem RTank               Not Computed
Link:     Commercial RTank           Not Computed
Link:     POC              0.000
______________________________________________________
Total:                               588.835

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped:   11.883 ac-ft/year,  Post Developed:   3.727 ac-ft/year

 ***********Water Quality Facility Data *************

---------------------SCENARIO: PREDEVELOPED

Number of Links:  0


---------------------SCENARIO: POSTDEVELOPED

Number of Links:  3


********** Link: POC                                   **********
```

```
 2-Year Discharge Rate : 0.299 cfs

 15-Minute Timestep, Water Quality Treatment Design Discharge
 On-line Design Discharge Rate (91% Exceedance):  999.00 cfs
 Off-line Design Discharge Rate (91% Exceedance):  999.00 cfs


 Infiltration/Filtration Statistics--------------------
 Inflow Volume (ac-ft):  3765.30
 Inflow Volume Including PPT-Evap (ac-ft):  3765.30
 Total Runoff Infiltrated (ac-ft):  0.00,  0.00%
 Total Runoff Filtered (ac-ft):  0.00,  0.00%
 Primary Outflow To Downstream System (ac-ft):  3765.30
 Secondary Outflow To Downstream System (ac-ft):  0.00
 Volume Lost to ET (ac-ft):  0.00
 Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%


 ***********Compliance Point Results *************

Scenario Predeveloped Compliance Subbasin: All Basins

Scenario Postdeveloped Compliance Link: POC

    *** Point of Compliance Flow Frequency Data ***
    Recurrence Interval Computed Using Gringorten Plotting Position

        Predevelopment Runoff                  Postdevelopment Runoff
Tr (Years)       Discharge (cfs)           Tr (Years)      Discharge (cfs)
----------------------------------------------------------------------------------------------------------------------
  2-Year             0.301          2-Year             0.299
  5-Year             0.444          5-Year             0.425
  10-Year            0.580          10-Year            0.486
  25-Year            0.749          25-Year            0.622
  50-Year            0.910          50-Year            0.650
  100-Year           0.971          100-Year           0.732
  200-Year           0.996          200-Year           0.765
  500-Year           1.028          500-Year           0.807
 ** Record too Short to Compute Peak Discharge for These Recurrence Intervals


**** Flow Duration Performance ****
Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):             -11.9%   PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):          -11.9%   PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):                       -45.0%   PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):                         0.0%   PASS

-------------------------------------------------------------------------------------------
MEETS ALL FLOW DURATION DESIGN CRITERIA:   PASS
-------------------------------------------------------------------------------------------
```

Predeveloped


Upper Basir
Tandem RTank
Postdeveloped
Lower Basir
Bypass
Commercial RTar
POC
POC

verdantas

April 13, 2023 Project No. 8050.GF

Via Electronic Mail

Jason Bailey, PE
Engineering Services Manager - Urban Green Infrastructure
Ferguson Waterworks
PO Box 2778
12500 Jefferson Ave.
Newport News, VA 23602

RE: Evaluate Vehicle Loading
Over R-Tank Units

Dear Mr. Bailey:

Verdantas, LLC (Verdantas) has prepared this correspondence to summarize our comments concerning the support of specific equipment loads over ACF R-Tank HD, SD and UD units provided with sufficient stable cover to provide a minimum Factor of Safety (FS) to R-tank crushing when subject to combined cover and equipment loads. The following information was provided:

- Fire Vehicle Maximum Axle Load = Dual Tire Rear Tandem Axle Load of 48,000 pounds
- Fire Vehicle 18x18 inch Outrigger Load = 45,000 pounds
- Fire Vehicle 10x14 inch Outrigger Load = 45,000 pounds

As part of the R-Tank product development, Ferguson Waterworks had independent compressive (crush strength) testing performed on individual R-Tank units, at TRI Environmental of Austin, Texas. Based on this testing, the following maximum compressive (crush) strengths have been provided:

ACF HD R-tank:	33.4 pounds per square inch (psi)
ACF SD R-tank:	42.9 pounds per square inch (psi)
ACF UD R-tank:	134.2 pounds per square inch (psi)

A safety factor is to be applied to these compressive strengths value for design purposes.

Analysis

The unit weight of fill over the R-Tanks was assumed to be 130 pcf. Analysis applied a simplified surface load distribution with depth as determined by the area of load application increasing based on a 2 vertical:1 slope. A dynamic (Moving Vehicle) loading factor of 1.3 was applied to the maximum axle load.

A. <u>R-Tank Units, Traveling Fire Vehicle Maximum Axle Loading</u>

- HD R-Tank: Approximate FS of 2 with minimum 20-inch cover.
- SD R-Tank: FS greater than 2 with 18-inch cover (minimum recommended cover for SD units)
- UD R-Tank: FS greater than 2 with 12-inch cover (minimum recommended cover for UD units)

B. <u>R-Tank Units, 45,000-pound load supported by 18"x18" Outrigger</u>

- HD R-Tank Units: Approximate FS of 2 with minimum 36-inch cover
- SD R-Tank Units: Approximate FS of 2 with minimum 30-inch cover
- UD R-Tank Units: FS greater than 2 with minimum 12-inch cover

C. <u>R-Tank Units, 45,000-pound load supported by 10"x14" Outrigger</u>

- HD R-Tank Units: Not Determined (excessive depth of soil cover required)
- SD R-Tank Units: Approximate FS of 2 with minimum 36-inch cover
- UD R-Tank Units: Approximate FS of 2 with minimum 15-inch cover

It is noted that the ability of an R-Tank system to support loads is highly dependent on the installation of the system, placement of fill material and construction of the pavement section. To reduce the risk of damage to the R-Tank system, the installation should be performed in accordance with the best practices, outlined in the manufacturer's installation manual. In accordance with ACF R-Tank installation details and guidelines, a biaxial geogrid is to be installed 12 inches above the installed HD and SD R-Tanks, and 6 inches above the UD R-Tanks. Initial backfill is to consist graded aggregate (crushed stone) with a minimum thickness of 3 inches at the base, 24 inches along the sides and 12 inches over the top of the R-Tanks systems. A stable surface, free of rutting should be maintained.

Our comments and recommendations have been prepared in accordance with generally accepted engineering practices. If you have any questions concerning the enclosed or require further information, please do not hesitate to contact us.

Very truly yours,

VERDANTAS, LLC

James F. Cloonan, P.E.
Senior Consultant
(PE Registration DE, PA, NJ, MD)

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RTANK

R-TANK SUBSURFACE STORAGE SYSTEM
BUOYANCY CALCULATION

ACF WEST INC.
GEOSYNTHETICS
Products | Service | Solutions

PROJECT INFORMATION

Project Name	East Town Crossing
City/County	Puyallup
State	WA
Project #	23-004WA
Date	2/21/2024
Calculated By	JDV
Site Designation	R-Tank 1

STATIC PARAMETERS

Soil Density (unsaturated)	100.00 lbs/cf
Stone Density	140.00 lbs/cf
Water Density	62.40 lbs/cf

R-TANK INPUT PARAMETERS

Lowest Surface Elevation	72.83
Ground Water Elevation	71.00
R-Tank Module	SD Triple
Number of R-Tank Modules	4,972
Tank Invert Elevation	67.65
Top of Tank Elevation	69.88
R-Tank Module Height	2.23 ft
R-Tank Weight (modules only)	140,260.12 lbs
Liner Location	Excavation
Excavation Area	16,781.00 sf
Stone Base Depth	9.00 in
Stone Base Within Liner?	YES
Stone Cover Depth	12.00 in
Stone Cover Within Liner?	YES
Stone Volume	32654.69 cf
Stone Weight	4,571,656.06 lbs
Soil Cover Depth	1.95 ft
Soil Volume	32,708.97 cf
Soil Weight	3,270,896.58 lbs

RESULTS

Buoyant Force	4,168,467.52 lbs
Downward Force	7,982,812.76 lbs
Safety Factor (Must be at least 1.25)	1.92
Is Design Acceptable?	YES

Notes:

1. It is the responsibility of the design engineer to evaluate and verify if these calculations are acceptable for the project. ACF West does not certify these results and are provided as a preliminary evaluation.
2. This calculator's indication of an acceptable design is purely to signify that a safety factor of 1.25 was achieved with the data provided.
3. These calculations assume that the system is devoid of water.
4. The weight of additional items like Maintenance Ports, fabric, and liner were not included in the downforce calculation.
5. Saturated soil was not factored into the soil weight when the groundwater is above the system.

R-TANK SUBSURFACE STORAGE SYSTEM
BUOYANCY CALCULATION

PROJECT INFORMATION

Project Name	**East Town Crossing**
City/County	**Puyallup**
State	**WA**
Project #	**23-004WA**
Date	**2/21/2024**
Calculated By	**JDV**
Site Designation	**R-Tank 2**

STATIC PARAMETERS

Soil Density (unsaturated)	**100.00 lbs/cf**
Stone Density	**140.00 lbs/cf**
Water Density	**62.40 lbs/cf**

R-TANK INPUT PARAMETERS

Lowest Surface Elevation	**77.21**
Ground Water Elevation	**71.00**
R-Tank Module	**SD Septa**
Number of R-Tank Modules	**6,829**
Tank Invert Elevation	**68.65**
Top of Tank Elevation	**73.77**
R-Tank Module Height	**5.12 ft**
R-Tank Weight (modules only)	**428,396.83 lbs**
Liner Location	**Excavation**
Excavation Area	**22,811.00 sf**
Stone Base Depth	**9.00 in**
Stone Base Within Liner?	**YES**
Stone Cover Depth	**12.00 in**
Stone Cover Within Liner?	**YES**
Stone Volume	**49075.88 cf**
Stone Weight	**6,870,623.80 lbs**
Soil Cover Depth	**2.44 ft**
Soil Volume	**55,696.86 cf**
Soil Weight	**5,569,685.83 lbs**

RESULTS

Buoyant Force	**4,412,559.84 lbs**
Downward Force	**12,868,706.47 lbs**
Safety Factor (Must be at least 1.25)	**2.92**
Is Design Acceptable?	**YES**

Notes:

1. It is the responsibility of the design engineer to evaluate and verify if these calculations are acceptable for the project. ACF West does not certify these results and are provided as a preliminary evaluation.
2. This calculator's indication of an acceptable design is purely to signify that a safety factor of 1.25 was achieved with the data provided.
3. These calculations assume that the system is devoid of water.
4. The weight of additional items like Maintenance Ports, fabric, and liner were not included in the downforce calculation.
5. Saturated soil was not factored into the soil weight when the groundwater is above the system.

R TANK

R-TANK SUBSURFACE STORAGE SYSTEM BUOYANCY CALCULATION

ACF WEST INC.
GEOSYNTHETICS
Products | Service | Solutions

PROJECT INFORMATION

Project Name	**East Town Crossing**
City/County	**Puyallup**
State	**WA**
Project #	**23-004WA**
Date	**2/21/2024**
Calculated By	**JDV**
Site Designation	**R-Tank 3**

STATIC PARAMETERS

Soil Density (unsaturated)	**100.00 lbs/cf**
Stone Density	**140.00 lbs/cf**
Water Density	**62.40 lbs/cf**

R-TANK INPUT PARAMETERS

Lowest Surface Elevation	**76.74**
Ground Water Elevation	**71.00**
R-Tank Module	**HD Quad**
Number of R-Tank Modules	**3,727**
Tank Invert Elevation	**68.65**
Top of Tank Elevation	**74.23**
R-Tank Module Height	**5.58 ft**
R-Tank Weight (modules only)	**232,564.80 lbs**
Liner Location	**Excavation**
Excavation Area	**12,507.00 sf**
Stone Base Depth	**9.00 in**
Stone Base Within Liner?	**YES**
Stone Cover Depth	**12.00 in**
Stone Cover Within Liner?	**YES**
Stone Volume	**27652.49 cf**
Stone Weight	**3,871,348.07 lbs**
Soil Cover Depth	**1.51 ft**
Soil Volume	**18,916.84 cf**
Soil Weight	**1,891,683.75 lbs**

RESULTS

Buoyant Force	**2,419,354.08 lbs**
Downward Force	**5,995,596.62 lbs**
Safety Factor (Must be at least 1.25)	**2.48**
Is Design Acceptable?	**YES**

Notes:

1. It is the responsibility of the design engineer to evaluate and verify if these calculations are acceptable for the project. ACF West does not certify these results and are provided as a preliminary evaluation.
2. This calculator’s indication of an acceptable design is purely to signify that a safety factor of 1.25 was achieved with the data provided.
3. These calculations assume that the system is devoid of water.
4. The weight of additional items like Maintenance Ports, fabric, and liner were not included in the downforce calculation.
5. Saturated soil was not factored into the soil weight when the groundwater is above the system.

Appendix E

- Construction Stormwater Pollution Prevention Plan (CSWPPP)

Construction Stormwater Pollution Prevention Plan

PREPARED FOR:

Greg Helle
1001 Shaw Road
Puyallup, WA 98372

PROJECT:

East Town Crossing
2902 E Pioneer
Puyallup, WA 98372
2230723.10

PREPARED BY:

Christopher Watt
Project Engineer

REVIEWED BY:

Todd C. Sawin, PE, DBIA, LEED AP
Principal

DATE:

November 2023
Revised February 2024

Civil Engineers ● Structural Engineers ● Landscape Architects ● Community Planners ● Land Surveyors ● Neighbors

Construction Stormwater Pollution Prevention Plan

PREPARED FOR:

Greg Helle
1001 Shaw Road
Puyallup, WA 98372

PROJECT:

East Town Crossing
2902 E Pioneer
Puyallup, WA 98372
2230723.10

PREPARED BY:

Christopher Watt
Project Engineer

REVIEWED BY:

Todd C. Sawin, PE, DBIA, LEED AP
Principal

DATE:

November 2023
Revised February 2024

I hereby state that this Construction Stormwater Pollution Prevention Plan for the East Town Crossing project has been prepared by me or under my supervision and meets the standard of care and expertise that 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.

Table of Contents

Exhibits

1.0 Introduction

In 1972, Congress passed the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act (CWA), to restore and maintain the quality of the nation's waterways. The ultimate goal was to make sure that rivers and streams were fishable, swimmable, and drinkable. In 1987, the Water Quality Act (WQA) added provisions to the CWA that allowed the Environmental Protection Agency to govern stormwater discharges from construction sites. The National Pollutant Discharge Elimination System (NPDES) General Permit includes provisions for development of a Stormwater Pollution Prevention Plan (SWPPP) to maximize the potential benefits of pollution prevention and sediment and erosion control measures at construction sites.

The proposed project will disturb more than 1 acre of area, and therefore is required to obtain an NPDES General Permit for Stormwater Associated with Construction Activities.

The 2019 Department of Ecology (DOE) *Stormwater Management Manual for Western Washington (SMMWW)* requires a Construction SWPPP for projects that add or replace more than 2,000 square feet of impervious surfaces. The proposed project will exceed this threshold; therefore, a Construction SWPPP is required.

Development, implementation, and maintenance of the Construction SWPPP will provide the selected General Contractor with the framework for reducing soil erosion and minimizing pollutants in stormwater during construction of the proposed project. The Construction SWPPP will:

- Define the characteristics of the site and the type of construction that will occur.
- Describe the practices that will be implemented to control erosion and the release of pollutants in stormwater.
- Create an implementation schedule to ensure that the practices described in this Construction SWPPP are in fact implemented, and to evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in stormwater discharged from the site.
- Describe the final stabilization/termination design to minimize erosion and prevent stormwater impacts after construction is complete.

This Construction SWPPP:

- Identifies the SWPPP Coordinator with a description of this person's duties.
- Identifies the Stormwater Pollution Prevention Team (SWPP Team) that will assist in implementation of the Construction SWPPP during construction.
- Describes the existing site conditions, including existing land use for the site, the soil types at the site, as well as the location of surface waters that are located on or next to the site.
- Identifies the body or bodies of water that will receive runoff from the construction site, including the ultimate body of water that receives the stormwater.
- Identifies the drainage areas and potential stormwater contaminants.
- Describes the stormwater management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment, and pollutants in stormwater discharge.
- Describes the facility monitoring plan and how controls will be coordinated with construction activities.
- Describes the implementation schedule and provisions for amendment of the plan.

2.0 Project Description

The East Town Crossing project proposes to develop an approximately 10.93-acre site located on Tax Parcels 0420264021, 0420264053, 0420264054, 0420351066, 0420351030, 0420351029, 0420351026 in the City of Puyallup, Washington. Refer to Appendix A, Exhibit A-1 for the Vicinity Map.

The developed site includes 8 multifamily buildings, 1 property management/clubhouse building, 2 commercial buildings, associated parking, road access, and utilities. Perimeter and island landscaping will be provided as required by the City of Puyallup. The paved areas will drain to the proposed catch basins located the sites proposed local low points. Runoff collected in these catch basins will be treated by one of five BioPods before being conveyed to one of three R-Tanks where stormwater will be detained. Control structures will control the release rate of stormwater discharging to the enhanced channel that lines the east and north of the site. Stormwater ultimately discharges to the Puyallup River via open channels alongside E Pioneer, running west.

The proposal will follow the stormwater management design criteria outlined in the DOE 2019 *SMMWW*. Control methods during construction include working during the dry season, minimizing the amount of area that is disturbed at any given time, installing a stabilized construction entrance, placing inlet protection at catch basins and culvert entrances, utilizing straw wattles and Baker Tank and filtration assembly designed by Clearwater Services, and utilizing silt fence, if necessary.

Refer to Appendix F, Exhibits F-1 and F-2 for the TESC Plan and TESC Notes and Details respectively.

3.0 Existing Site Conditions

The existing area is approximately 10.93 acres and is currently developed and undeveloped land cover. Within the seven parcels, a network of dirt and gravel access roads connect E Pioneer, Shaw Rd E, and the commercial property to the south. In the southwest parcels, there is an existing residential structure and a vacant residential lot. The majority of the landcover is made up of tall grass, shrubs, and a few trees.

The site contains a detention pond that receives runoff from the commercial property to the south before overflowing into the existing channel lining the east and north of the property. Apart from the detention pond, the site generally slopes from southeast to northwest. The large majority of runoff discharges to the northern portion of the channel. A topographical survey of the project was prepared by Abbey Road Group. that shows existing site conditions. See Appendix A, Exhibit A-2 for the Existing Conditions Map.

4.0 Adjacent Areas and Drainage

In existing conditions, the commercial property to the south drains to the detention pond located on the southeastern parcel of the site and discharges to the channel lining the eastern portion of the site. The detention pond will be maintained in Phase 1 of construction, however, will be replaced by an underground detention system in Phase 2.

Shaw Road E to the west contains its own stormwater collection and conveyance system which prevents discharge to the site. However, Pioneer E to the north drains into channels on either side of the road, including the channel on the north end of the project site. Frontage improvements are proposed in this project during phase 2 that will redirect runoff to the downstream connection via an enhanced stream.

Stormwater leaves the site to the north via the channel that runs around the east and north of the site. A culvert collects the water from the channel and directs it northwest under the intersection of E Pioneer and Shaw Road E. A channel then runs along E Pioneer on the roadside of the railroad before it intersects another culvert directing water to the Puyallup River.

5.0 Critical Areas

There are no known critical areas on or near the project site.

6.0 Soils

The National Resources Conservation Service (NRCS) classifies the onsite soils as Briscot Loam in the northern two-thirds of the site and Puyallup fine sandy loam in the lower third of the site. Appendix A, Exhibit A-4 provides the NRCS soil map. Briscot Loam is classified as hydrologic soil group B/D with poorly draining characteristics. Puyallup fine sandy loam is classified as hydrologic soil group A with well-draining characteristics.

In addition to the NRCS information, Krazan & Associates, Inc prepared a geotechnical report for the site. On March 4, 2021, two large-scale pilot infiltration tests were completed. Based on the results presented in the Geotechnical Report, it was determined that the soils at the site contain high silt content and are considered a very low to relatively impermeable layer. Due to this, in opposition of the NRCS report, the entire site is not recommended for any infiltration due to the presence of unfavorable soils.

In relation to construction efforts, original testing by Krazan & Associates, Inc. shows that the underlying soils are unsuitable for supporting traffic loads when wet. It is recommended that a Geotechnical Engineer is present to provide guidance during construction.

See Appendix B, Exhibit B-1 for the Krazan & Associates, Inc. Geotechnical Engineering Report and Appendix B-2 for the Migizi Group Geotechnical Letter.

7.0 Potential Erosion Problems

Based on an investigation by Krazan & Associates, Inc., there are steep slopes located roughly 300 feet to the south and east of the site mapped as 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. Due to the presence of a developed and partially developed parcel separating the landslide hazard and the site, Krazan & Associates, Inc. believes there is minimum to no risk to the planned development from nearby slopes.

In relation to onsite soil, underlying soil is unsuitable for supporting traffic loads when wet. Appropriate measures should be taken to stabilize soils for construction work before the wet season.

8.0 Construction Stormwater Pollution Prevention Elements

The purpose of this section is to describe how each of the 12 Construction Stormwater Pollution Prevention elements has been addressed and to identify the type and location of BMPs used to satisfy the required element. If an element is not applicable to the project, a reason is provided.

8.1 Mark Clearing Limits

Prior to beginning land-disturbing activities, clearing limits will be marked with high visibility plastic or metal fencing (BMP C103) as shown on the TESC Plan in Appendix F, Exhibit F-1. All vegetated areas outside the marked clearing limits shall be preserved in existing conditions, as well as buffer zones (BMP C102) set up around the existing stream. Fencing will also be used to protect the existing storm facility.

8.2 Establish Construction Access

A stabilized construction entrance (BMP C105) is proposed at the northeast corner of the site off E Pioneer. If sediment is transported onto the road surface, the road shall be cleaned by shoveling or sweeping prior to washing. Sediment removal by washing alone will not be allowed. If sediment is tracked from the site, the City of Puyallup may require stabilization of internal roads to contain the sediment or require the installation of wheel wash basins. Construction roads / parking areas (BMP C107) will be stabilized wherever they are used.

8.3 Control Flow Rates

Straw wattles shall be provided to prevent erosion and control flow rates leaving the site. The velocity of water leaving the site shall not exceed 3 ft/s if the discharge is to the existing channel. Clearwater Services has designed a Baker Tank and filtration assembly to control the stormwater release rate and quality before its discharge to the channel. Permanent flow control systems must be constructed and functioning prior to constructing hard surfaces.

8.4 Install Sediment Controls

As part of initial construction activities, BMPs will be installed to trap sediment onsite. Inlet Protection (BMP C220) for existing catch basins and proposed catch basins within the project area and in the adjacent streets that may receive runoff shall be implemented. Silt fence (BMP C233) will be placed along all downgradient boundaries of the proposed project limits to prevent sediment laden runoff from leaving the site. A temporary sediment pond (BMP C241) will also be used, of which sizing calculations are included in the CFG Permit PRGR20230972.

Baker Tank sizing calculations are included in the CFG Permit PRGR20230972.

8.5 Stabilize Soils and Dust Control

Exposed areas and soil stockpiles must be stabilized according to the following schedule:

1. From April 1 to October 31, all disturbed areas at final grade and all exposed areas that are scheduled to remain unworked for more than 30 days shall be stabilized within 10 days.

2. From November 1 to March 31, all exposed soils at final grade shall be stabilized immediately using permanent or temporary measures. Exposed soils with an area greater than 5,000 square feet that are scheduled to remain unworked for more than 24 hours, and exposed areas of less than 5,000 square feet that will remain unworked for more than 7 days shall be stabilized immediately.

All disturbed areas that are not planned to be constructed on within 90 days from time of clearing and grading shall be revegetated with the native vegetation.

To stabilize soils, BMPs such as temporary and permanent seeding (BMP C120), mulching (BMP C121), nets and blankets (BMP C122), and plastic coverings (BMP C123) will be utilized. While Dust will be controlled following BMP C140.

8.6 Protect Slopes

The majority of the site has flat slopes of 0-3%. There are small, isolated areas with slopes greater than 3%, however, no slopes over 20% are being disturbed. All exposed soil not covered by buildings, roadway, or sidewalks will be Hydroseeded, and their slopes will be no greater than 2:1.

8.7 Protect Drain Inlets

Storm drain inlets shall be protected so that surface water runoff does not enter the conveyance system without first being filtered. Inlets shall be inspected weekly, at a minimum, and daily during storm events. Storm Drain Inlet Protection (BMP C220) will be provided.

8.8 Stabilize Channels and Outlets

There is an existing channel alongside E Pioneer that will be protected as necessary. Provide stabilization, including armoring material (if approved by the AHJ) adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems. Outlet protection (BMP C209) will be used to prevent scour at conveyance outlets and minimize downstream erosion.

8.9 Control Pollutants

All waste materials will be collected and stored in a securely closed metal dumpster. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of once per week, and the trash will be hauled to the local landfill. No construction materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of three times per week. Good housekeeping and spill control practices will be followed during construction to minimize stormwater contamination from petroleum products, fertilizers, and concrete.

Table 1 below lists several pollutants that are commonly found on construction sites that have the potential to contaminate storm runoff. These pollutants will be present, mainly in areas of building and pavement construction. The Contractor and the SWPPP/TESC Coordinator will be responsible for identifying areas where these pollutants are being used and monitor runoff coming from these areas. Pollutant sources will be covered with plastic if contaminated runoff is observed from these areas. If contaminated runoff is found in the sediment trap or soils, the Erosion Control Specialist will direct the Contractor to remove the polluted water/soil and dispose of it in an approved area offsite.

Table 1 – Potential Construction Site Stormwater Pollutants

Trade Name Material	Chemical/Physical Description(1)	Stormwater Pollutants(1)
Pesticides (insecticides, fungicides, herbicide, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand

Trade Name Material	**Chemical/Physical Description**[1]	**Stormwater Pollutants**[1]
Glue, adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic
Curing compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion	Solid Particles	Soil, Sediment

(1) Data obtained from MSDS when available

8.9.1 Required BMPs

The following BMPs or equivalent measures are required of all businesses and agencies during concrete pouring and asphalt application at temporary sites:

- Employees must be educated on the pollution hazards of concrete and asphalt application and cutting.

- Loose aggregate chunks and dust must be swept or shoveled and collected (not hosed down a storm drain) for recycling or proper disposal at the end of each workday, especially at work sites such as streets, driveways, parking lots, sidewalks, curbs, and gutters where rain can readily pick up the loose material and carry it to the nearest stormwater conveyance. Small amounts of excess concrete, grout, and mortar can be disposed of in the trash.

- Storm drain covers or similarly effective containment devices must be placed over all nearby drains at the beginning of each day. Shovel or vacuum slurry and remove from the site. All accumulated runoff and solids must be collected and properly disposed at the end of each workday, or more often if necessary.

- Exposed aggregate washing, where the top layer of unhardened concrete is hosed or scraped off to leave a rough finish, must be done with a mechanism for containment and collection of the discarded concrete slurry (such as the storm drain covers mentioned above). The easiest way to contain the washwater will be to direct the washings to a hole in the ground where the water can percolate into the ground and the solids later covered with soil.

- If directed to a drain, a catch basin filter insert must be used to remove the solids. This is especially useful if the activity must proceed on rainy days.

- Cleaning of concrete application and mixing equipment or concrete vehicles on the work site must be done in a designated area where the rinse water is controlled. The rinse water must either be collected for proper disposal or put into a hole in the ground where the water can percolate away, and the solids later covered with soil or recovered and disposed or recycled.

The use of any treatment BMP must not result in the violation of groundwater, surface water, or drinking water quality standards.

8.10 Control Dewatering

Most proposed improvements are above the observed groundwater, with the exception of some utility installment. Should groundwater be encountered during construction, dewatering control measures shall be used to prevent untreated discharge of sediment-laden water. Clean dewatering shall not be routed through stormwater sediment ponds. Measures may include vehicle transport offsite for legal disposal in a manner that does not pollute surface waters, or use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering (if approved by the AHJ).

8.11 Maintain BMPs

Temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure performance of their intended functions.

Sediment control BMPs such as silt fencing and drain inlet protection shall be inspected weekly or after a runoff-producing event. Temporary erosion and sediment control BMPs will be removed within 30 days after final site stabilization is achieved. The following inspection and maintenance practices will be used to maintain erosion and sediment controls:

- Built-up sediment will be removed from silt fencing when it has reached one-third the height of the fence.

- Silt fences will be inspected for depth of sediment, tears in the fabric, attachment to the fence posts, and to determine that fence posts are firmly in the ground. Accumulated sediment will be removed from behind the fence.

- Temporary and permanent seeding will be inspected for bare spots, washouts, and healthy growth.

- The Contractor Certified Erosion and Sedimentation Control Lead (CESCL) will provide erosion control inspection services and stormwater disposal monitoring through construction. The City Inspector will be notified of daily construction activities and scheduled meetings between the Erosion Control Inspector and the Contractor.

The maintenance inspection report will be made after each inspection. Copies of the report forms to be completed by the SWPPP Coordinator are attached as Appendix G of this Construction SWPPP. Completed forms will be provided to the City Inspector and will also be maintained onsite during the entire construction project. If construction activities or design modifications are made to the site plan that could impact stormwater, or if AHBL determines that the measures are not adequate to prevent erosion and the discharge of sediment from the site (based on turbidity measurements), this Construction SWPPP will be amended appropriately. The amended Construction SWPPP will have a description of the new activities that contribute to the increased pollutant loading and the planned source control activities.

8.12 Manage the Project

The following practices will be required during construction to properly manage activities:

- Comply with seasonal work limitations.
- Inspect, maintain, and repair BMPs.
- Identify a Certified Erosion and Sediment Control Lead (CESCL).
- Maintain the Construction SWPPP onsite at all times, including narrative and plans.

9.0 Construction Sequence and Phasing

9.1 Construction Sequence

The construction sequence is described below:

1. Arrange and attend a pre-construction meeting with the City of Puyallup.
2. Stake/flag clearing and construction limits.
3. Construct all temporary erosion control BMPs according to the TESC plan. Install inlet sediment protection in existing catch basins.
4. Install construction entrance.
5. Demolish existing site features indicated for removal.
6. Maintain erosion control measures in accordance with City of Puyallup standards and manufacturer recommendations.
7. Rough grade and fill site. All grading shall be done in conformance with the grading plan.
8. Construct storm system and install inlet sediment protection to new basins.
9. Install all remaining site utilities and associated infrastructure.
10. Apply erosion control mulch and seeding, straw mulch or equal, to areas that will not be brought to final grade or permanently vegetated within 7 days of exposure during the dry season, and 2 days of exposure during the wet season (October 1 – April 30).
11. Relocate erosion control measures or install new measures so that, as the site conditions change, the erosion and sediment control is always in accordance with the City of Puyallup Construction SWPPP minimum requirements.
12. Final grade site and install final surface treatments. Ensure that surface water is positively directed toward proposed storm collection facilities.
13. Remove remaining temporary erosion control items once site has been stabilized and upon approval of the City of Puyallup.

9.2 Construction Phasing

Work under this permit will be completed in two phases. Refer to the associated Plans.

10.0 Construction Schedule

Construction is scheduled to begin in TBD and is expected to be completed in TBD. The majority of earth moving activities will be scheduled during the dry season. During construction, measures will be taken to prevent the transportation of sediment from the site to receiving waters. These measures include the use of:

- Buffer Zones (BMP C102)
- Stabilized Construction Entrance (BMP C105)
- Construction Road / Parking Area Stabilization (BMP C107)
- Temporary and Permanent Seeding (BMP C120)
- Mulching (BMP C121)
- Nets and Blankets (BMP C122)
- Plastic Covering (BMP C123)
- Dust Control (BMP C140)
- Materials on Hand (BMP C150)
- Concrete Handling (BMP C151)
- Sawcutting and Surfacing Pollution Prevention (BMP C152)
- Material Delivery, Storage, and Containment (BMP C153)
- Outlet Protection (BMP C209)
- Storm Drain Inlet Protection (BMP C220)
- Silt Fence (BMP C233)
- Sediment Pond (Temporary) (BMP C241)

11.0 Financial/Ownership Responsibilities

The contractor is responsible for obtaining performance and maintenance bonds in accordance with City of Puyallup requirements.

12.0 Certified Erosion and Sediment Control Lead (CESCL)

The General Contractor shall be required to provide a CESCL prior to construction. Once this individual is identified, the City Inspector will be notified.

The Contractor will designate their CESCL here:

Name: ____

Address: ____

Phone: ____

Fax Number: _______________________________________

The CESCL is required to meet DOE certification requirements. The City Inspector will be provided with CESCL information.

The duties of the CESCL include:

- Implement the Construction SWPPP/TESC plan with the aid of the SWPP Team.

- Oversee maintenance practices identified as BMPs in the Construction SWPPP.

- Conduct or provide for inspection and monitoring activities.
- Sample stormwater for turbidity using a turbidity meter.
- Identify other potential pollutant sources and make sure they are added to the plan.
- Identify any deficiencies in the Construction SWPPP and make sure they are corrected.
- Ensure that any changes in construction plans are addressed in the Construction SWPPP.

To aid in the implementation of the Construction SWPPP, the members of the SWPP Team include the following: General Contractor, CESCL, City of Puyallup Inspector, City of Puyallup, the geotechnical engineering consultant, and AHBL.

The General Contractor will ensure that all housekeeping and monitoring procedures are implemented, while the CESCL will ensure the integrity of the structural BMPs. The SWPP Team will observe construction and erosion control practices and recommend revisions or additions to the Construction SWPPP and drawings.

Pollution Prevention Team

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESL)	TBD	
Resident Engineer	Todd Sawin (AHBL)	(253) 383-2422
Emergency Ecology Contact	TBD	
Emergency Permittee / Owner Contact	Greg Helle (Absher)	(253) 845-9544
Non-Emergency Owner Contact	TBD	
Monitoring Personnel	TBD	
Ecology Regional Office	Southwest Regional Office – Lacey	(360) 407-6300

13.0 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a logbook. A site logbook will be maintained for all on-site construction activities and will include:

- A record of the implementation of the CSWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form from under Appendix G.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the City of Puyallup.

13.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

13.2 Stormwater Quality Sampling

13.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter to sample site discharges for compliance with DOE. Sampling will be conducted at all discharge points at least once per week.

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency of at least 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the CSWPPP for compliance with Special Condition S9 (Stormwater Pollution Prevention Plan). Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement or maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

3. Document BMP implementation and maintenance in the site logbook

If turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
    - Southwest Region (Pierce): (360) 407-6300

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

13.2.2 pH Sampling

pH monitoring is required for "Significant concrete work" (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project).The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH: pH meter, pH test kit, or wide range pH indicator paper

14.0 Conclusion

This analysis is based on data and records either supplied to or obtained by AHBL, Inc. These documents are referenced within the text of the analysis. The analysis has been prepared utilizing procedures and practices within the standard accepted practices of the industry. We conclude that this project, as proposed, will not create any new problems within the existing downstream drainage system. This project will not noticeably aggravate any existing downstream problems due to either water quality or quantity.

AHBL, Inc.

Christopher Watt
Project Engineer

CJW/

October 2023
Revised February 2024

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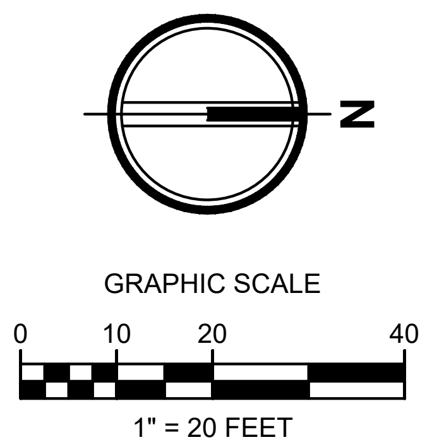
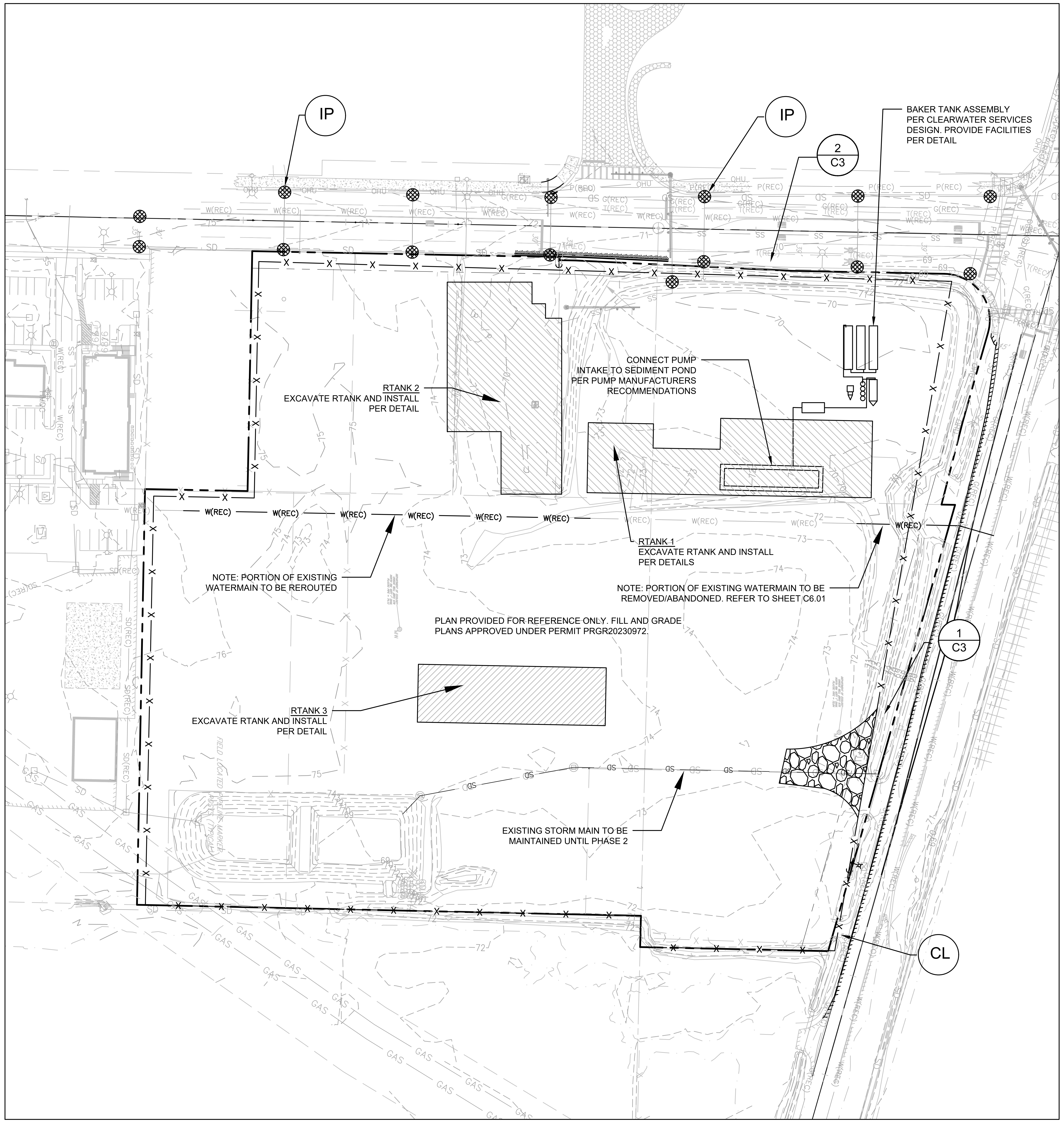
Appendix F

EAST TOWN CROSSING PHASE 1
SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.



GRAPHIC SCALE

1" = 20 FEET



NOTE:

MAINTAIN SEDIMENT POND AND BAKER TANKS AS DESIGNED IN CLEAR, FILL AND GRADE PLANS PER CFG APPLICATION NUMBER PRGR20230972

TESC LEGEND:

— — — — — — — —	CL	CLEARING/ GRADING/ DISTURBED LIMITS	
——X——X——X——	FF	FILTER FABRIC FENCE SEE DETAIL	2/C2
▨	CE	CONSTRUCTION ENTRANCE	1/C2
⊗	IP	INLET PROTECTION	3/C2 4/C2

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.

AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
2215 North 30th Street, Suite 300, Tacoma, WA 98403
253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:

EAST TOWN CROSSING PHASE 1

Project No.

2230752

04/09/2024

Sheet Title:

TESC PLAN

F-1

Know what's **below.**
Call before you dig.

EAST TOWN CROSSING PHASE 1
SEC. 26,35/ TWP. 20 N./ RGE. 4 E., W.M.

TESC INSPECTION NOTES:

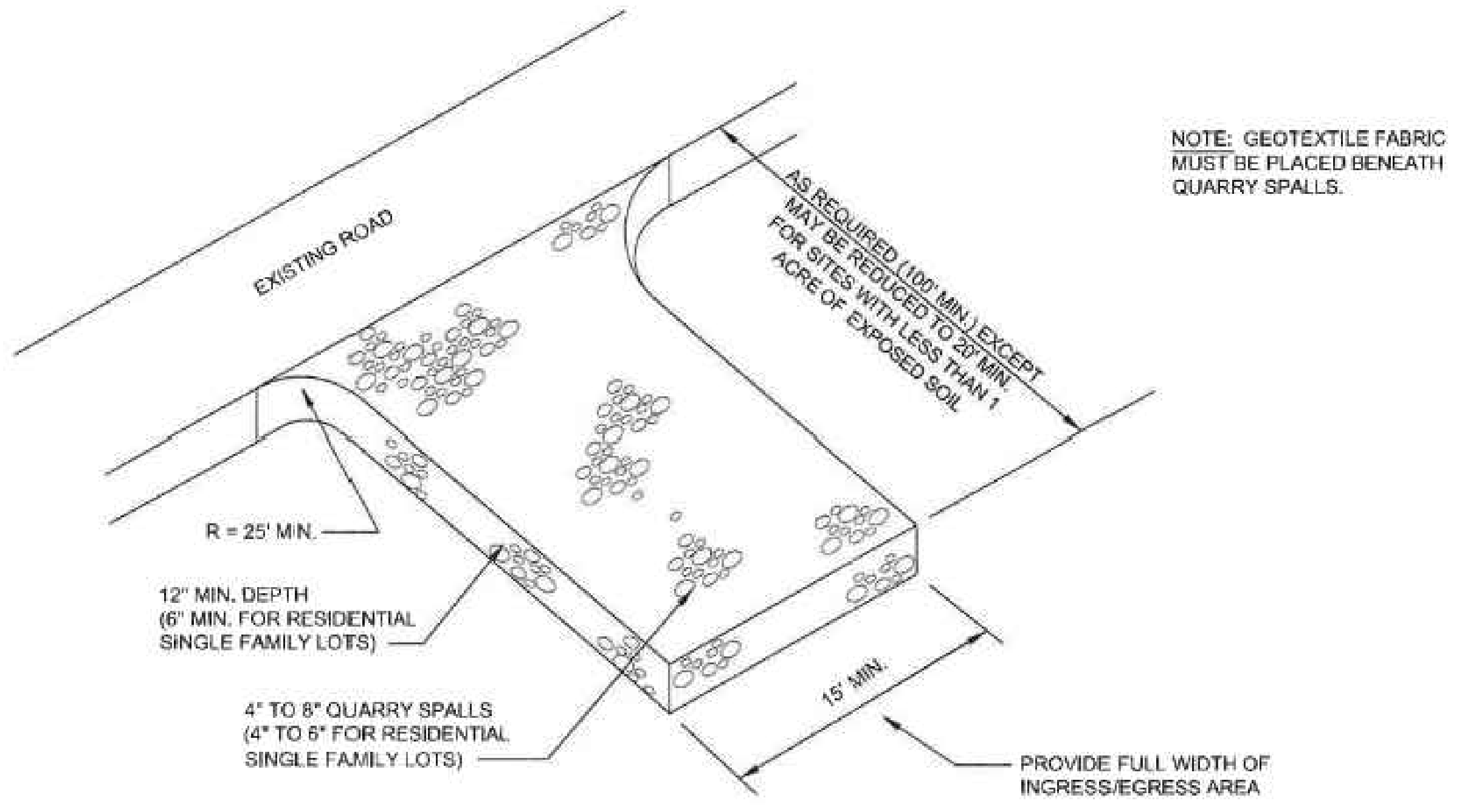
1. INSPECT ALL INLET PROTECTION ON CATCH BASINS. CLEAN OR REPLACE IF FULL OF SEDIMENT /DEBRIS AND REPAIR/REPLACE AS NEEDED IF DAMAGED TO MAINTAIN PROTECTION.
2. INSPECT ALL PERMANENT AND TEMPORARY STABILIZED SLOPES. REPAIR ANY DAMAGED SECTIONS AND RE-VEGETATE AS NEEDED TO ENSURE THE ESTABLISHMENT OF VEGETATION AND THAT NO EROSION OF THE SLOPES OCCUR.
3. INSPECT ALL FILTER FABRIC FENCING FOR SIGNS OF EROSION, DAMAGE OR FAILURES. REPAIR AND/OR REPLACE AS NEEDED. SEE FILTER FABRIC NOTES. SEDIMENT BUILD-UP ALONG FENCE SHALL BE REMOVED WHEN REACHES 1/3 THE FENCE HEIGHT. IF EROSION IS OCCURRING, CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS NEEDED TO PREVENT EROSION.
4. ANY FILL/CUT SLOPES SHALL BE INSPECTED FOR EROSION. IF SIGNS OF EROSION ARE PRESENT, INSTALL APPROPRIATE BMPS AS NEEDED TO STOP EROSION AND STABILIZE SLOPES.
5. TESC LEAD RESPONSIBLE FOR NOTIFYING ENGINEER IF ADDITIONAL MEASURES ARE WARRANTED.

PERMANENT STABILIZATION NOTES:

1. ALL EXPOSED SOILS AND SLOPES SHALL BE SEEDED OR OTHERWISE STABILIZED IMMEDIATELY AFTER CONSTRUCTION AND GRADING ACTIVITIES HAVE BEEN COMPLETED.
2. SILT FENCE, IF DEEMED APPROPRIATE, SHALL REMAIN FOR A MINIMUM OF 30 DAYS AFTER THE FINAL STABILIZATION OF THE SLOPES HAS OCCURRED.
3. ALL TEMPORARY EROSION CONTROL BMP'S SHALL BE REMOVED 30 DAYS AFTER FINAL STABILIZATION HAS OCCURRED AS DIRECTED BY CITY OR COUNTY INSPECTOR.
4. CONTRACTOR SHALL REFER TO THE CONSTRUCTION SWPP FOR APPLICABLE BMPS.

CONSTRUCTION ENTRANCE NOTES:

1. MATERIAL SHALL BE 4" TO 8" QUARRY SPALLS (4 TO 6 INCH FOR RESIDENTIAL SINGLE FAMILY LOTS) AND MAY BE TOP-DRESSED WITH 1 TO 3 INCH ROCK.
2. THE ROCK PAD SHALL BE AT LEAST 12" THICK AND 100' LONG (REDUCED TO 20 FEET FOR SITES LESS THAN 1 ACRE OF DISTURBED SOIL) WIDTH SHALL BE FULL WIDTH OF INGRESS AND EGRESS AREA. SMALLER PADS MAY BE APPROVED FOR SINGLE-FAMILY RESIDENTIAL AND COMMERCIAL SITES .
3. ADDITIONAL ROCK SHALL BE ADDED PERIODICALLY TO MAINTAIN FUNCTION OF THE PAD.
4. IF THE PAD DOES NOT ADEQUATELY REMOVE MUD FROM THE VEHICLE WHEELS, THE WHEELS SHALL BE HOSED OFF BEFORE THE VEHICLE ENTERS A PAVED STREET.THE WASHING SHALL BE DONE ON AN AREA COVERED WITH CRUSHED ROCK AND WASH WATER SHALL DRAIN TO A SEDIMENT RETENTION FACILITY OR THROUGH A SILT FENCE.
5. CONSTRUCTION ACCESS IS FORBIDDEN ALONG SHAW ROAD FOR THE DURATION OF CONSTRUCTION.

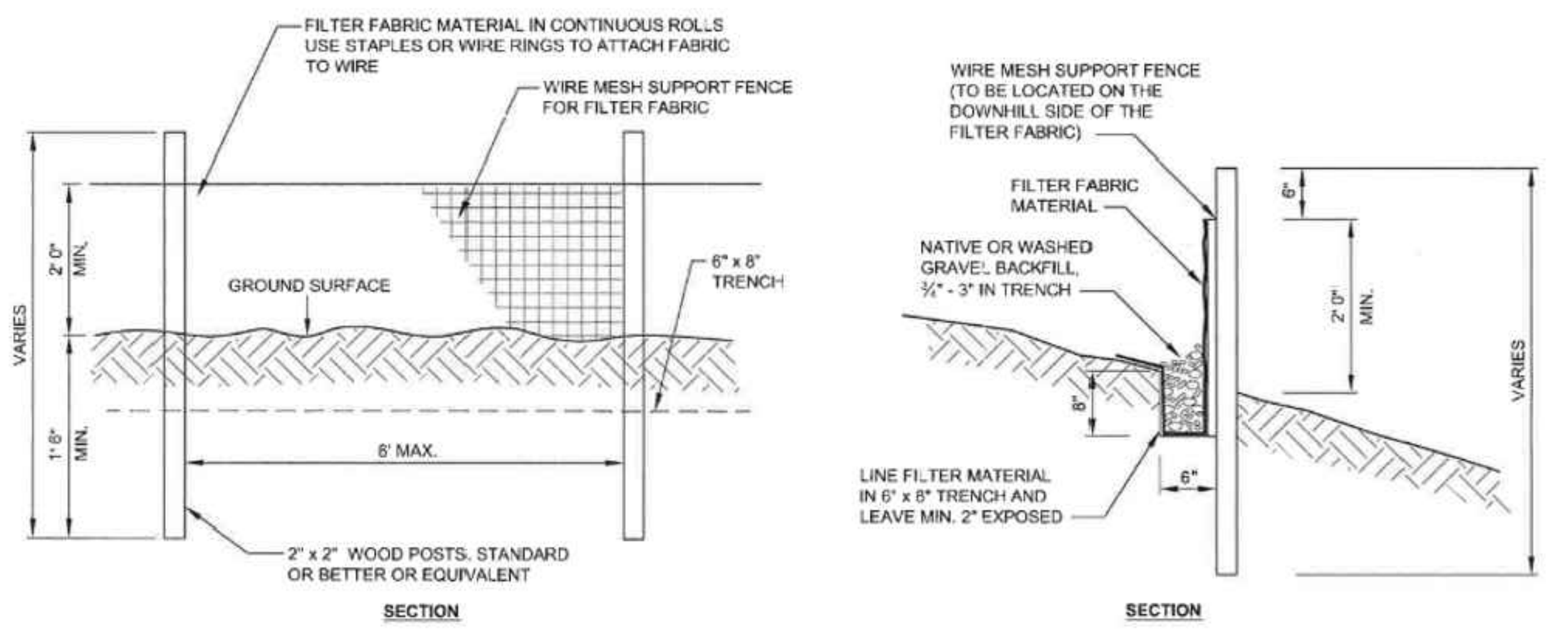


NOTE: GEOTEXTILE FABRIC MUST BE PLACED BENEATH QUARRY SPALLS.

1 CONSTRUCTION ENTRANCE
SCALE:NTS

FILTER FABRIC FENCE NOTES:

1. SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP. AND SECURELY FASTENED AT BOTH ENDS TO POSTS.
2. POSTS SHALL BE SPACED A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 30 INCHES).
3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8 INCHES WIDE AND 12 INCHES DEEP ALONG THE LINE OF POSTS
4. AND UPSLOPE FROM THE BARRIER. THIS TRENCH SHALL BE BACKFILLED WITH WASHED GRAVEL.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4 INCHES AND SHALL NOT EXTEND MORE THAN 24 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
6. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 20 INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 24 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
7. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING IS USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF ABOVE NOTES APPLYING.
8. FILTER FABRIC FENCES SHALL NOT BE REMOVED BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
9. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
10. SILT FENCES WILL BE INSTALLED PARALLEL TO ANY SLOPE CONTOURS.
11. CONTRIBUTING LENGTH TO FENCE WILL NOT BE GREATER THAN 100 FEET.
12. DO NOT INSTALL BELOW AN OUTLET PIPE OR WEIR.
13. INSTALL DOWNSLOPE OF EXPOSED AREAS.
14. DO NOT DRIVE OVER OR FILL OVER SILT FENCES.



2 FILTER FABRIC FENCE
SCALE:NTS

AMENDED SOILS NOTES:

- SOIL AMENDMENTS ARE REQUIRED FOR ALL DISTURBED AREAS IN ACCORDANCE WITH BMP L613: POST-CONSTRUCTION SOIL QUALITY AND DEPTH OF THE 2021 SURFACE WATER MANAGEMENT MANUAL
- AMENDED SOILS SHALL BE A MINIMUM OF 8" (NON-COMPACTED) WITH SUBSOILS SCARIFIED AT LEAST 4" WITH INCORPORATION OF THE UPPER MATERIAL TO AVOID STRATIFIED LAYERS, WHERE FEASIBLE.
- QUALITY OF COMPOST AND OTHER MATERIALS USED TO MEET THE ORGANIC CONTENT REQUIREMENTS ARE AS FOLLOWS:

a. THE ORGANIC CONTENT FOR "PRE-APPROVED" AMENDMENT RATES CAN BE MET ONLY USING COMPOST THAT MEETS THE DEFINITION OF "COMPOSTED MATERIALS" IN WAC 173-350-220. THE WAC IS AVAILABLE ONLINE AT: HTTP://WWW.ECY.WA.GOV/PROGRAMS/SWFA/FACILITIES/350.HTML THE COMPOST MUST ALSO HAVE AN ORGANIC MATTER CONTENT OF 35% TO 65%, AND A CARBON TO NITROGEN RATIO BELOW 25:1. THE CARBON TO NITROGEN RATIO MAY BE AS HIGH AS 35: 1 FOR PLANTINGS COMPOSED ENTIRELY OF PLANTS NATIVE TO THE PUGET SOUND LOWLANDS REGION.
b. CALCULATED AMENDMENT RATES MAY BE MET THROUGH USE OF COMPOSTED MATERIALS AS DEFINED ABOVE; OR OTHER ORGANIC MATERIALS AMENDED TO MEET THE CARBON TO NITROGEN RATIO REQUIREMENTS, AND MEETING THE CONTAMINANT STANDARDS OF GRADE A COMPOST.

- USE ONE OF THE FOLLOWING OPTIONS TO MEET THE POST CONSTRUCTION SOIL QUALITY AND DEPTH REQUIREMENTS. USE THE MOST RECENT VERSION OF "GUIDELINES FOR RESOURCES FOR IMPLEMENTING SOIL QUALITY AND DEPTH BMP T5.13" TO MEET THE REQUIREMENTS OF THIS BMP. THIS GUIDANCE CAN BE FOUND ONLINE AT:WWW.SOILSFORSALMON.ORG

a. LEAVE NATIVE VEGETATION AND SOIL UNDISTURBED, AND PROTECT FROM COMPACTION DURING CONSTRUCTION
b. AMEND EXISTING SITE TOPSOIL OR SUBSOIL EITHER AT DEFAULT "PRE-APPROVED" RATES, OR AT CUSTOM CALCULATED RATES BASED ON SPECIFIC TESTS OF THE SOIL AND AMENDMENT
c. STOCKPILE EXISTING TOPSOIL DURING GRADING, AND REPLACE IT PRIOR TO PLANTING. STOCKPILED TOPSOIL MUST ALSO BE AMENDED IF NEEDED TO MEET THE ORGANIC MATTER OR DEPTH REQUIREMENTS, EITHER AT A DEFAULT "PRE-APPROVED" RATE OR AT A CUSTOM CALCULATED RATE.
d. IMPORT TOPSOIL MIX OF SUFFICIENT ORGANIC CONTENT AND DEPTH TO MEET THE REQUIREMENTS. MORE THAN ONE METHOD MAY BE USED ON DIFFERENT PORTIONS OF THE SAME SITE. SOIL THAT ALREADY MEETS THE DEPTH AND ORGANIC MATTER QUALITY STANDARDS, AND IS NOT COMPACTED, DOES NOT NEED TO BE AMENDED.

- AMENDED SOILS SHALL BE MAINTAINED AS FOLLOWS:

a. SOIL QUALITY AND DEPTH SHOULD BE ESTABLISHED TOWARD THE END OF CONSTRUCTION AND ONCE ESTABLISHED, SHOULD BE PROTECTED FROM COMPACTION, SUCH AS FROM LARGE MACHINERY USE, AND FROM EROSION.
b. SOIL SHOULD BE PLANTED AND MULCHED AFTER INSTALLATION.
c. PLANT DEBRIS OR ITS EQUIVALENT SHOULD BE LEFT ON THE SOIL SURFACE TO REPLENISH ORGANIC MA TIER.
d. IT SHOULD BE POSSIBLE TO REDUCE USE OF IRRIGATION, FERTILIZERS, HERBICIDES AND PESTICIDES. THESE ACTIVITIES SHOULD BE ADJUSTED WHERE POSSIBLE,RATHER THAN CONTINUING TO IMPLEMENT FORMERLY ESTABLISHED PRACTICES.

- SEE PROJECT CONSTRUCTION SWPPP FOR ADDITIONAL INFORMATION OR SECTION 2.2.1.4 OF CHAPTER 2 OF VOLUME 6 OF THE 2021 SURFACE WATER MANAGEMENT MANUAL

MULCHING NOTES:

1. MULCH MATERIALS USED SHALL BE STRAW OR HAY, AND SHALL BE APPLIED AT THE RATE OF 75-100 POUNDS PER 1000 SQ. FT. (APPX 2" THICK).
2. MULCH SHALL BE APPLIED IN ALL AREAS WITH EXPOSED SLOPES GREATER THAN 2: 1.
3. MULCHING SHALL BE USED IMMEDIATELY AFTER SEEDING OR IN AREAS WHICH CANNOT BE SEEDED BECAUSE OF THE SEASON.
4. ALL AREAS NEEDING MULCH SHALL BE COVERED BY NOVEMBER 1.

CONTRACTOR NOTES:

1. INLET PROTECTION SHALL BE INSTALLED IN ALL NEWLY CONSTRUCTED CATCH BASINS AND ALONG ALL IMPACTED FRONTAGE AND OFFSITE AREAS PER THE REQUIREMENTS OF THE COUNTY INSPECTOR PER DETAIL 5 ON THIS SHEET 5.
2. CONSTRUCTION FENCE CAN BE UTILIZED IN PLACE OF FILTER FABRIC FENCE ONLY IN AREAS WHERE THE GRADES DO NOT ALLOW THE POTENTIAL FOR ANY STORMWATER TO LEAVE THE SITE.
3. ALL DEMOLISHED MATERIALS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF AT A CITY APPROVED LOCATION AND IN A MANNER CONSISTENT WITH CURRENT REGULATIONS AND REQUIREMENTS.
4. ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN (7) DAYS DURING THE DRY SEASON OR TWO (2) DAYS DURING THE WET SEASON, SHALL BE COVERED WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING, OR OTHER EQUIVALENT PER CURRENT CITY OR COUNTY STANDARDS. SEE SEEDING NOTES AND MULCHING NOTES ON THIS SHEET.
5. CONTRACTOR SHALL DESIGNATE A WASHINGTON DEPT OF ECOLOGY CERTIFIED EROSION CONTROL LEAD PERSON, AND SHALL COMPLY WITH THE CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THE PROJECT.
6. AT ANY TIME DURING CONSTRUCTION IT IS DETERMINED BY THE CITY OR COUNTY THAT MUD AND DEBRIS ARE BEING TRACKED ONTO PUBLIC STREETS WITH INSUFFICIENT CLEANUP, ALL WORK SHALL CEASE ON THE PROJECT UNTIL THIS CONDITION IS CORRECTED. THE CONTRACTOR AND/OR THE OWNER SHALL IMMEDIATELY TAKE ALL STEPS NECESSARY TO PREVENT FUTURE TRACKING OF MUD AND DEBRIS INTO THE PUBLIC ROW, WHICH MAY INCLUDE THE INSTALLATION OF A WHEEL WASH FACILITY ON-SITE.
7. SEDIMENT LADEN RUNOFF SHALL NOT BE ALLOWED TO DISCHARGE BEYOND THE LIMITS OF THE IMPROVEMENTS. ADDITIONAL MEASURES SHALL BE INSTALLED AS NEEDED.
8. SAND BAGS SHALL BE SECURELY PLACED AROUND INSTALLED CATCH BASINS WITH INLET PROTECTION AS FIELD AND WEATHER CONDITIONS WARRANT SO TO PROTECT ALL DISPERSION AND INFILTRATION TRENCHES SEDIMENT LADEN RUNOFF.
9. TREES WITHIN WORKING LIMITS TO BE SAVED, SHALL BE MARKED AS SUCH ON SITE AND PROTECTION FENCE PLACED AROUND EACH TREE.

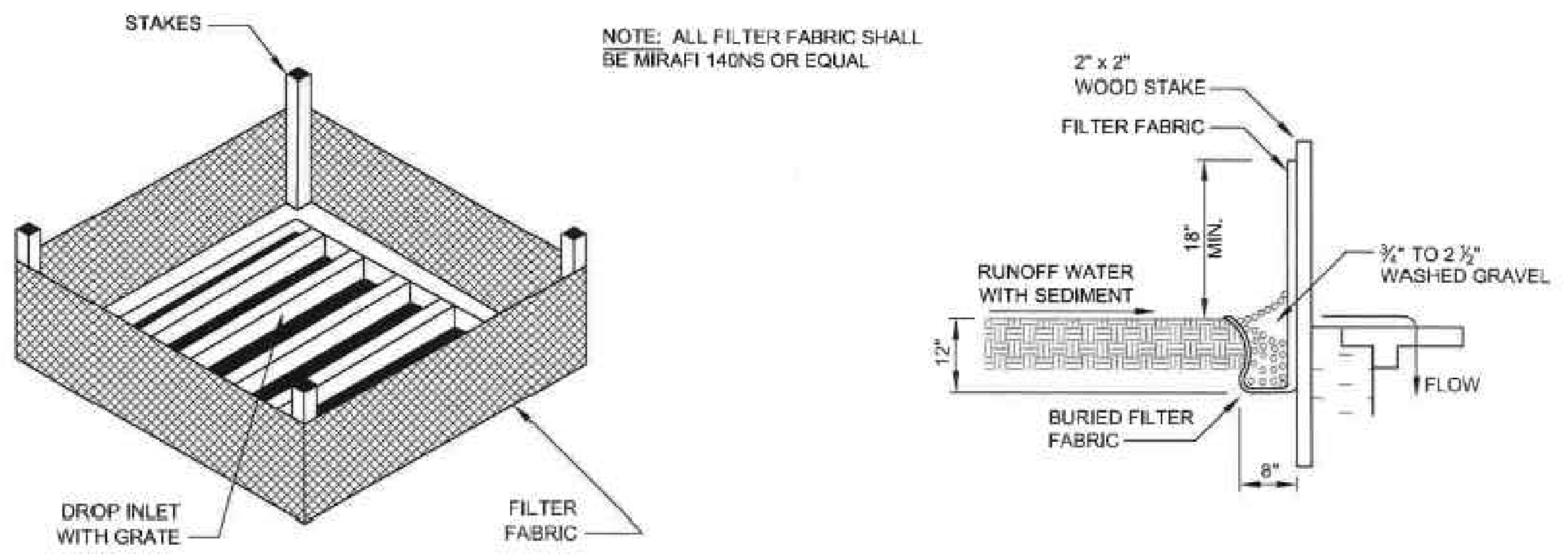
SEEDING NOTES:

1. THE FOLLOWING SEED MIXTURE SHALL BE AS BELOW AND SHALL BE APPLIED AT THE RATE RECOMMENDED BY THE SUPPLIER.

TABLE D.3.2.B TEMPORARY EROSION CONTROL SEED MIX

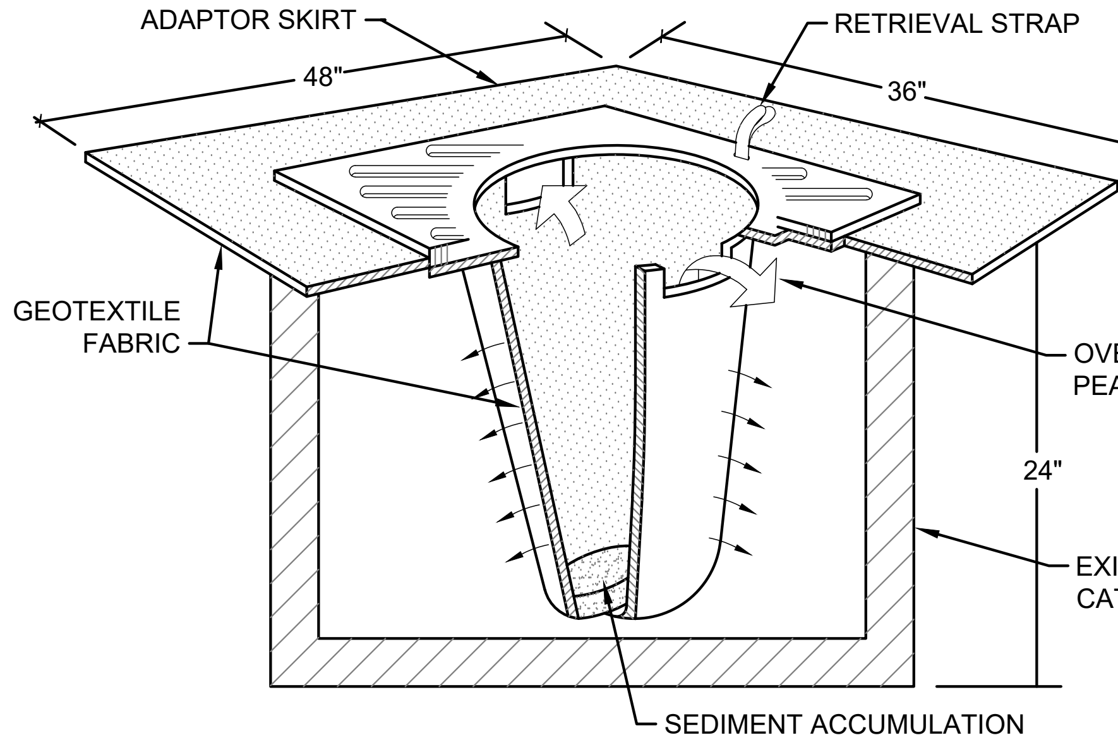
	% WEIGHT	% PURITY	% GERMINATION
CHEWINGS OR RED FESCUE FESTUCA *RUBRA VAR. COMMUTATA OR FESTUCA RUBRA*	40	98	90
ANNUAL OR PERENNIAL RYE *LOLIUM MULTIFLORUM OR LOLIUM PERENNE*	40	98	90
REDTOP OR COLONIAL BENTGRASS *AGROSTIS ALBA OR AGROSTIS TENUIS*	10	92	85
WHITE DUTCH CLOVER *TRIFOLIUM REPENS*	10	98	90

2. SEED BEDS PLANTED BETWEEN MAY 1 AND OCTOBER 31 WILL REQUIRE IRRIGATION AND OTHER MAINTENANCE AS NECESSARY TO FOSTER AND PROTECT THE ROOT STRUCTURE.
3. FOR SEED BEDS PLANTED BETWEEN OCTOBER 31 AND APRIL 30, ARMORING OF THE SEED BED WILL BE NECESSARY. {E.G., GEOTEXTILES, JUTE MAT, CLEAR PLASTIC COVERING),
4. BEFORE SEEDING, INSTALL NEEDED SURFACE RUNOFF CONTROL MEASURES SUCH AS GRADIENT TERRACES, INTERCEPTOR DIKES, SWALES, LEVEL SPREADERS AND SEDIMENT BASINS.
5. THE SEEDBED SHALL BE FIRM WITH A FAIRLY FINE SURFACE, FOLLOWING SURFACE ROUGHENING. PERFORM ALL OPERATIONS ACROSS OR AT RIGHT ANGLES TO THE SLOPE.
6. FERTILIZERS ARE TO BE USED ACCORDING TO SUPPLIER'S RECOMMENDATIONS. AMOUNTS USED SHOULD BE MINIMIZED, ESPECIALLY ADJACENT TO WATER BODIES AND WETLANDS.



NOTE: ALL FILTER FABRIC SHALL BE MIRAFI 140NS OR EQUAL

3 INLET PROTECTION WITH FABRIC FENCE
SCALE:NTS



NOTES:
1. FILTERS SHALL BE INSPECTED AFTER EACH STORM EVENT AND CLEANED OR REPLACED WHEN 1/3 FULL.
2. INSTALL INLET PROTECTION IN ALL NEW STORM STRUCTURES THAT WILL COLLECT STORMWATER AS THEY ARE INSTALLED.

4 INLET PROTECTION W/ FILTER SOCK
SCALE:NTS

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.

AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
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253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:
EAST TOWN CROSSING PHASE 1

Project No.
2230752

04/09/2024

Sheet Title:
TESC NOTES AND DETAILS

F-2

Appendix G

Inspection Logs

East Town Crossing

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inches or more

Inspector: Date:
Inspector's Qualifications:

Days since last rainfall: Amount of last rainfall: inches

Stabilization Measures

Drainage Area	Date Since Last Disturbance	Date of Next Disturbance	Stabilized (yes/No)	Stabilized With	Condition

Stabilization required:

To be performed by: ________________________________ On or before: ________________
____

East Town Crossing

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Site Entrance:

Date:

Temporary Construction Entrance

Drainage Area Perimeter	Does Rock Pad Adequately Remove Mud from Vehicle Wheels?	Is Rock Pad Clogged with Mud?	Have Quarry Spalls Been Moved to the Roadway?

Maintenance required for temporary construction entrances:

To be performed by: ______________________________ On or before: _______________

____

East Town Crossing

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Perimeter Structural Controls:

Date:

Silt Fence

Drainage Area Perimeter	Has Silt Reached 1/3 of Fence Height?	Is Fence Properly Secured?	Is There Evidence of Washout or Overtopping?

Maintenance required for silt fence and straw bales:

To be performed by: ________________________________ On or before: ________________

____

East Town Crossing

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Inlet Protection:

Date:

Storm Drain Barriers

Inlet	Has Silt Reached 1/3 of Barrier Height?	Is Barrier Properly Secured?	Is There Evidence of Washout or Overtopping?

Maintenance required for storm drain barriers:

To be performed by: ________________________________ On or before: ________________
____

East Town Crossing

Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Changes required to the pollution prevention plan:

Reasons for changes:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: ____ Date: ___________________

Construction Stormwater
SITE INSPECTION CHECKLIST

Project___________ Permit No._________ Inspector__________ Date_______ Time_____

Site BMPs	**Overall Condition**	**Need Repair?**	**Comments/Observations**
Clearing Limits			
●*Buffer Zones around sensitive areas*	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
Construction Access/Roads			
●*Stabilized site entrance*	G F P	Y N	
●*Stabilized roads/parking area*	G F P	Y N	
●	G F P	Y N	
Control Flow Rates			
●*Swale*	G F P	Y N	
●	G F P	Y N	
●*Sediment pond*	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
Install Sediment Controls			
●*Sediment pond/trap*	G F P	Y N	
●*Silt fence*	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
Preserve Vegetation/Stabilize Soils			
●*Nets and blankets*	G F P	Y N	
●*Mulch*	G F P	Y N	
●*Seeding*	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
Protect Slopes			
●*Terrace*	G F P	Y N	
●*Pipe slope drains*	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
Protect Drain Inlets			
●*Inserts*	G F P	Y N	
●	G F P	Y N	
●	G F P	Y N	
Stabilize Channels and Outlets			
●*Conveyance channels*	G F P	Y N	
●*Energy dissipators*	G F P	Y N	
●	G F P	Y N	
Control Pollutants			
●*Chemical Storage Area covered*	G F P	Y N	
●*Concrete handling*	G F P	Y N	
●	G F P	Y N	
Control De-watering			
●	G F P	Y N	

G=Good F=Fair P=Poor Y=Yes N=No

Construction Stormwater
SITE INSPECTION CHECKLIST

Project___________ Permit No._________ Inspector__________ Date_______ Time_____

Will existing BMPs need to be modified or removed, or other BMPs installed? YES NO

IF YES, list the action items to be completed on the following table:

Actions to be Completed	Date Completed/ Initials
1.	
2.	
3.	
4.	
5.	
6.	

Describe current weather conditions.

Approximate amount of precipitation since last inspection: __________ inches
and precipitation in the past 24 hours*: __________inches
**based on an on-site rain gauge or local weather data.*

Describe discharging stormwater, if present. Note the presence of suspended sediment, "cloudiness", discoloration, or oil sheen.

Was water quality sampling part of this inspection? YES NO
If yes, record results below (attach separate sheet, if necessary):

Parameter:	Method (circle one)	Result	Units
Turbidity	tube, meter, laboratory		NTU (cm, if tube used)
pH	paper, kit, meter		pH standard units

Is the site in compliance with the SWPPP and the permit requirements? YES NO

If no, indicate tasks necessary to bring site into compliance on the "Actions to be Completed" table above, and include dates each job WILL BE COMPLETED.
If no, has the non-compliance been reported to Dept. of Ecology? YES NO
If no, should the SWPPP be modified: YES NO

Sign the following certification:

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief."

Inspection completed on:____________ by: (print+signature)______________________

Title/Qualification of Inspector:____

Appendix H

Best Management Practices (BMPs)

BMP C102	Buffer Zones
BMP C103	High Visibility Fence
BMP C105	Stabilized Construction Entrance
BMP C107	Construction Road / Parking Area Stabilization
BMP C120	Temporary and Permanent Seeding
BMP C121	Mulching
BMP C122	Nets and Blankets
BMP C123	Plastic Covering
BMP C140	Dust Control
BMP C150	Materials on Hand
BMP C151	Concrete Handling
BMP C152	Sawcutting and Surface Pollution Prevention
BMP C153	Material Delivery, Storage, and Containment
BMP C160	Certified Erosion and Sediment Control Lead
BMP C209	Outlet Protection
BMP C220	Storm Drain Inlet Protection
BMP C233	Silt Fence
BMP C241	Sediment Pond (Temporary)

BMP C102: Buffer Zones

Purpose

Creation of an undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and stormwater runoff velocities.

Conditions of Use

Buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Contractors can use vegetative buffer zone BMPs to protect natural swales and they can incorporate them into the natural landscaping of an area.

Do not use critical-areas buffer zones as sediment treatment areas. These areas shall remain completely undisturbed. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

The types of buffer zones can change the level of protection required as shown below:

Designated Critical Area Buffers - buffers that protect Critical Areas, as defined by the Washington State Growth Management Act, and are established and managed by the local permitting authority. These should not be disturbed and must protected with sediment control BMPs to prevent impacts. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Vegetative Buffer Zones - areas that may be identified in undisturbed vegetation areas or managed vegetation areas that are outside any Designated Critical Area Buffer. They may be utilized to provide an additional sediment control area and/or reduce runoff velocities. If being used for preservation of natural vegetation, they should be arranged in clumps or strips. They can be used to protect natural swales and incorporated into the natural landscaping area.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas and buffer zones. Steel construction fencing is the most effective method to protect sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.
- Do not push debris or extra soil into the buffer zone area because it will cause damage by

burying and smothering vegetation.

- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233: Silt Fence to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100’ minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100’).

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Table II-3.2: Stabilized Construction Access Geotextile Standards (continued)

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½″	99-100

Table II-3.3: Stabilized Construction Access Alternative Material Requirements (continued)

Sieve Size	Percent Passing
2″	65-100
¾″	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

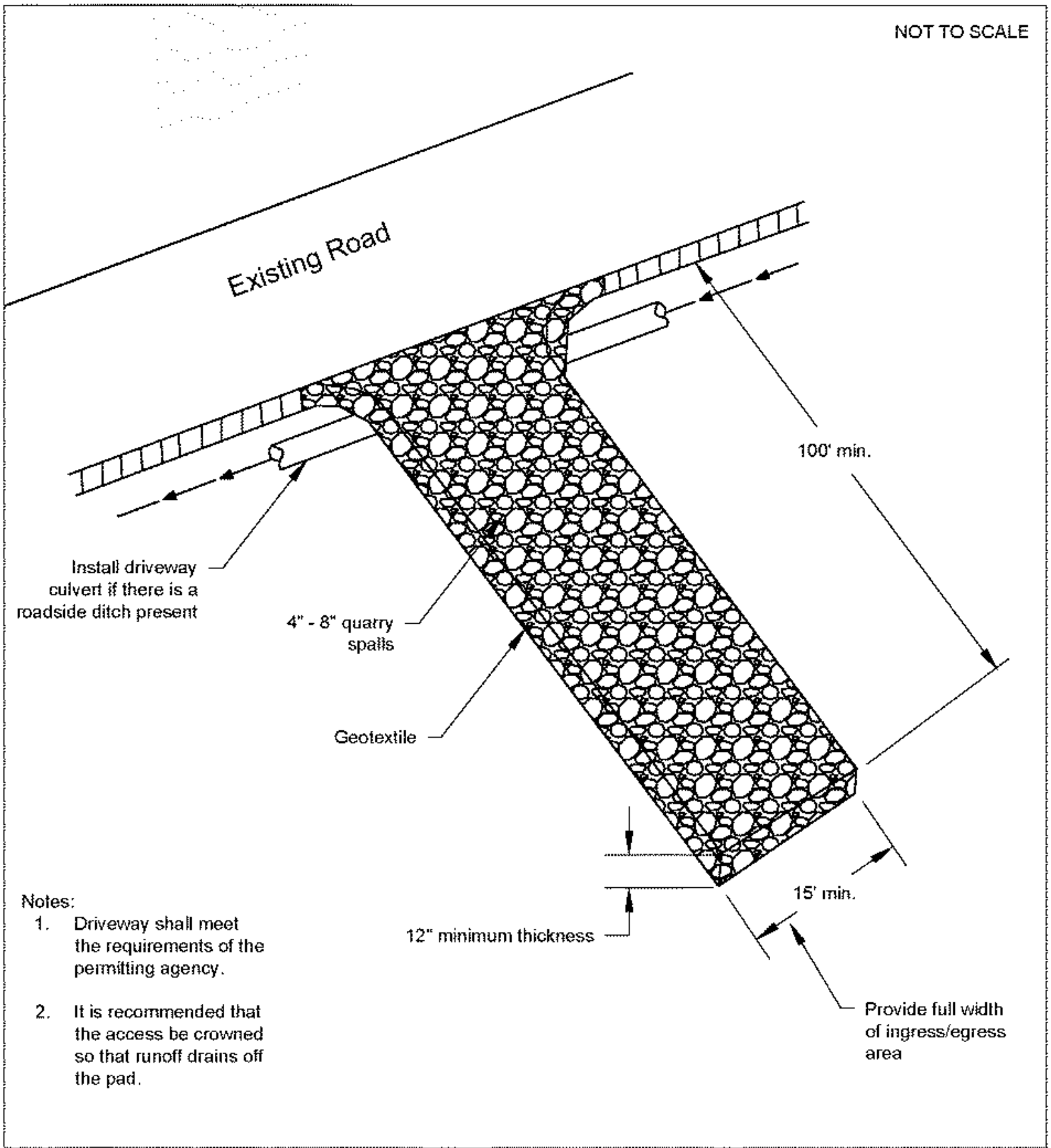
Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of BMP C106: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), BMP C103: High-Visibility Fence shall be installed to control traffic.

- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

Figure II-3.1: Stabilized Construction Access



Notes:

1. Driveway shall meet the requirements of the permitting agency.
2. It is recommended that the access be crowned so that runoff drains off the pad.

DEPARTMENT OF
ECOLOGY
State of Washington

Stabilized Construction Access

Revised June 2018

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C107: Construction Road / Parking Area Stabilization

Purpose

Stabilizing roads, parking areas, and other on-site vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or stormwater runoff.

Conditions of Use

Roads and parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.

BMP C103: High-Visibility Fence shall be installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

Design and Installation Specifications

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and BMP C252: Treating and Disposing of High pH Water is necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheetflows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation that water can flow through, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands or their buffers. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the drainage system (see BMP C220: Inlet Protection).

Maintenance Standards

Inspect stabilized areas regularly, especially after large storm events.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See BMP T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

  Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
    - Irrigation.
    - Reapplication of mulch.
    - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	*Festuca arundin-*	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	*acea* or *Festuca elatior*			
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba* or *Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes runoff.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

- compost;
- or blends of these.

Tackifier shall be plant-based, such as guar or alpha plantago, or chemical-based such as polyacrylamide or polymers.

Generally, mulches come in 40-50 pound bags. Seed and fertilizer are added at time of application.

Recycled cellulose may contain polychlorinated biphenyl (PCBs). Ecology recommends that products should be evaluated for PCBs prior to use.

Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

Any mulch or tackifier product used shall be installed per the manufacturer's instructions.

Design and Installation Specifications

For mulch materials, application rates, and specifications, see Table II-3.6: Mulch Standards and Guidelines. Consult with the local supplier or the local conservation district for their recommendations. Increase the application rate until the ground is 95% covered (i.e. not visible under the mulch layer). Note: Thickness may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.

Where the option of "Compost" is selected, it should be a coarse compost that meets the size gradations listed in Table II-3.5: Size Gradations of Compost as Mulch Material when tested in accordance with Test Method 02.02-B found in *Test Methods for the Examination of Composting and Compost* (Thompson, 2001).

Table II-3.5: Size Gradations of Compost as Mulch Material

Sieve Size	Percent Passing
3"	100%
1"	90% - 100%
3/4"	70% - 100%
1/4"	40% - 100%

Mulch used within the ordinary high-water mark of surface waters should be selected to minimize potential flotation of organic matter. Composted organic materials have higher specific gravities (densities) than straw, wood, or chipped material. Consult the Hydraulic Permit Authority (HPA) for mulch mixes if applicable.

Maintenance Standards

The thickness of the mulch cover must be maintained.

Any areas that experience erosion shall be remulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the problem shall be fixed and the eroded area remulched.

Table II-3.6: Mulch Standards and Guidelines

Mulch Material	Guideline	Description
Straw	**Quality Standards**	Air-dried; free from undesirable seed and coarse material.
	Application Rates	2"-3" thick; 5 bales per 1,000 sf or 2-3 tons per acre
	Remarks	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. The thickness of straw may be reduced by half when used in conjunction with seeding. In windy areas straw must be held in place by crimping, using a tackifier, or covering with netting. Blown straw always has to be held in place with a tackifier as even light winds will blow it away. Straw, however, has several deficiencies that should be considered when selecting mulch materials. It often introduces and/or encourages the propagation of weed species and it has no significant long-term benefits It should also not be used within the ordinary high-water elevation of surface waters (due to flotation).
Hydromulch	**Quality Standards**	No growth inhibiting factors.
	Application Rates	Approx. 35-45 lbs per 1,000 sf or 1,500 - 2,000 lbs per acre
	Remarks	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers longer than about 3/4 - 1 inch clog hydromulch equipment. Fibers should be kept to less than 3/4 inch.
Compost	**Quality Standards**	No visible water or dust during handling. Must be produced per WAC 173-350, Solid Waste Handling Standards, but may have up to 35% biosolids.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs per cubic yard)
	Remarks	More effective control can be obtained by increasing thickness to 3". Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Compost used for mulch has a coarser size gradation than compost used for BMP C125: Topsoiling / Composting or BMP T5.13: Post-Construction Soil Quality and Depth. It is more stable and practical to use in wet areas and during rainy weather conditions. Do not use near wetlands or near phosphorous impaired water bodies.
Chipped Site Vegetation	**Quality Standards**	Gradations from fines to 6 inches in length for texture, variation, and interlocking properties. Include a mix of various sizes so that the average size is between 2- and 4- inches.
	Application Rates	2" thick min.;

Table II-3.6: Mulch Standards and Guidelines (continued)

Mulch Material	Guideline	Description
	Remarks	This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning. Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If permanent seeding or planting is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment. Note: thick application of this material over existing grass, herbaceous species, and some groundcovers could smother and kill vegetation.
Wood-Based Mulch	Quality Standards	No visible water or dust during handling. Must be purchased from a supplier with a Solid Waste Handling Permit or one exempt from solid waste regulations.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs. per cubic yard)
	Remarks	This material is often called "wood straw" or "hog fuel". The use of mulch ultimately improves the organic matter in the soil. Special caution is advised regarding the source and composition of wood-based mulches. Its preparation typically does not provide any weed seed control, so evidence of residual vegetation in its composition or known inclusion of weed plants or seeds should be monitored and prevented (or minimized).
Wood Strand Mulch	Quality Standards	A blend of loose, long, thin wood pieces derived from native conifer or deciduous trees with high length-to-width ratio.
	Application Rates	2" thick min.
	Remarks	Cost-effective protection when applied with adequate thickness. A minimum of 95-percent of the wood strand shall have lengths between 2 and 10-inches, with a width and thickness between 1/16 and 1/2-inches. The mulch shall not contain resin, tannin, or other compounds in quantities that would be detrimental to plant life. Sawdust or wood shavings shall not be used as mulch. [Specification 9-14.4(4) from the *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT, 2016)

BMP C122: Nets and Blankets

Purpose

Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage ways during high flows.

Nets (commonly called matting) are strands of material woven into an open, but high-tensile strength net (for example, coconut fiber matting). Blankets are strands of material that are not tightly woven, but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets, but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use

Erosion control netting and blankets shall be made of natural plant fibers unaltered by synthetic materials.

Erosion control nets and blankets should be used:

- To aid permanent vegetated stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
- For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap.

Disadvantages of nets and blankets include:

- Surface preparation is required.
- On slopes steeper than 2.5H:1V, net and blanket installers may need to be roped and harnessed for safety.
- They cost at least $4,000-6,000 per acre installed.

Advantages of nets and blankets include:

- Installation without mobilizing special equipment.
- Installation by anyone with minimal training
- Installation in stages or phases as the project progresses.
- Installers can hand place seed and fertilizer as they progress down the slope.
- Installation in any weather.
- There are numerous types of nets and blankets that can be designed with various parameters in mind. Those parameters include: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

An alternative to nets and blankets in some limited conditions is BMP C202: Riprap Channel Lining. Ensure that BMP C202: Riprap Channel Lining is appropriate before using it as a substitute for nets and blankets.

Design and Installation Specifications

- See Figure II-3.3: Channel Installation (Clackamas County et al., 2008) and Figure II-3.4: Slope Installation for typical orientation and installation of nets and blankets used in channels and as slope protection. Note: these are typical only; all nets and blankets must be installed per manufacturer's installation instructions.
- Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.
- Installation of nets and blankets on slopes:
    1. Complete final grade and track walk up and down the slope.
    2. Install hydromulch with seed and fertilizer.
    3. Dig a small trench, approximately 12 inches wide by 6 inches deep along the top of the slope.
    4. Install the leading edge of the net/blanket into the small trench and staple approximately every 18 inches. NOTE: Staples are metal, "U"-shaped, and a minimum of 6 inches long. Longer staples are used in sandy soils. Biodegradable stakes are also available.
    5. Roll the net/blanket slowly down the slope as the installer walks backward. NOTE: The net/blanket rests against the installer's legs. Staples are installed as the net/blanket is unrolled. It is critical that the proper staple pattern is used for the net/blanket being installed. The net/blanket is not to be allowed to roll down the slope on its own as this stretches the net/blanket, making it impossible to maintain soil contact. In addition, no one is allowed to walk on the net/blanket after it is in place.
    6. If the net/blanket is not long enough to cover the entire slope length, the trailing edge of the upper net/blanket should overlap the leading edge of the lower net/blanket and be stapled. On steeper slopes, this overlap should be installed in a small trench, stapled, and covered with soil.
- With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the designer consult the manufacturer's information and that a site visit takes place in order to ensure that the product specified is appropriate. Information is also available in WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Division 8-01 and Division 9-14 (WSDOT, 2016).
- Use jute matting in conjunction with mulch (BMP C121: Mulching). Excelsior, woven straw blankets and coir (coconut fiber) blankets may be installed without mulch. There are many other types of erosion control nets and blankets on the market that may be appropriate in certain circumstances.
- In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
- Extremely steep, unstable, wet, or rocky slopes are often appropriate candidates for use of synthetic blankets, as are riverbanks, beaches and other high-energy environments. If

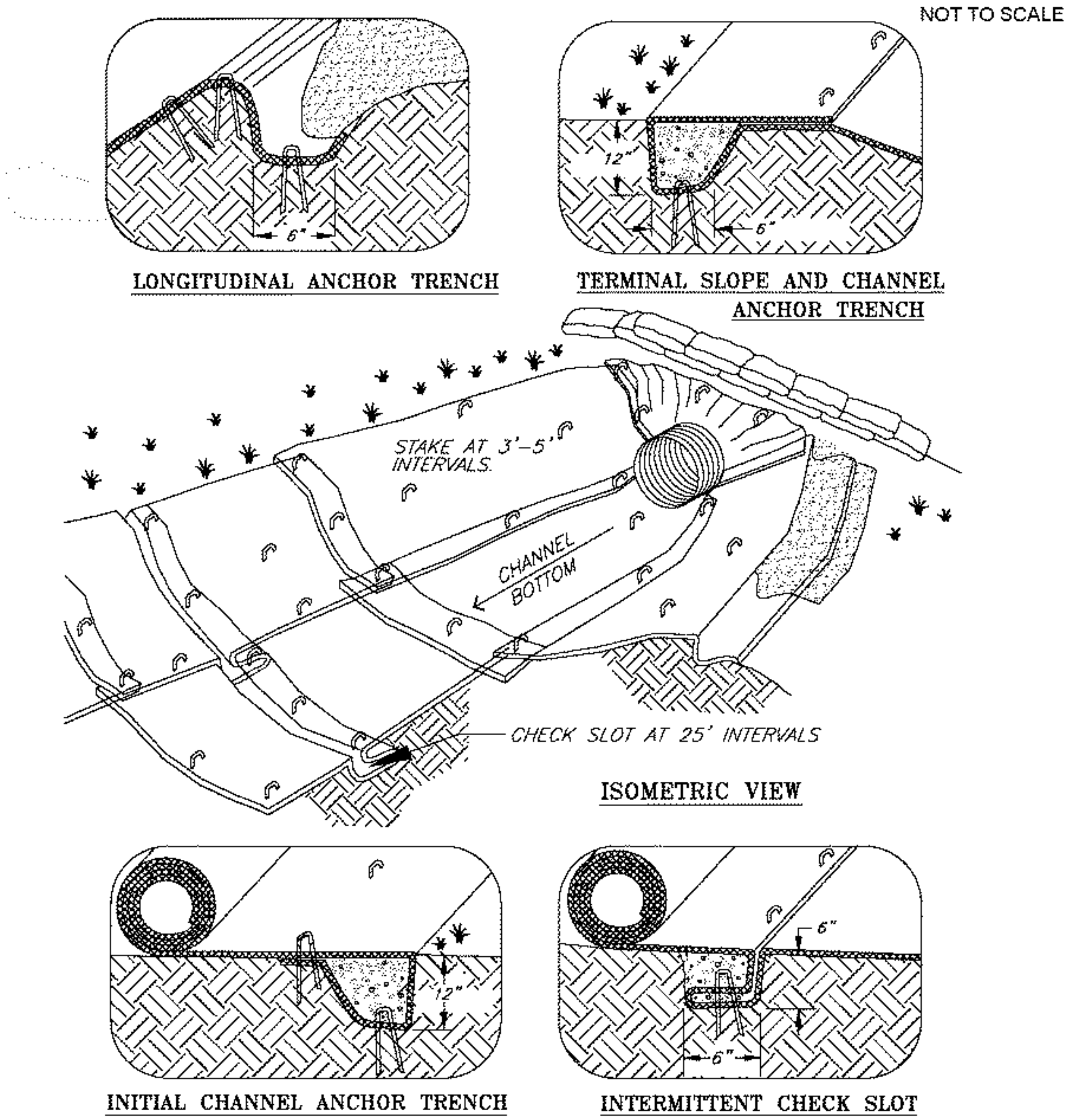
synthetic blankets are used, the soil should be hydromulched first.

- 100-percent biodegradable blankets are available for use in sensitive areas. These organic blankets are usually held together with a paper or fiber mesh and stitching which may last up to a year.
- Most netting used with blankets is photodegradable, meaning it breaks down under sunlight (not UV stabilized). However, this process can take months or years even under bright sun. Once vegetation is established, sunlight does not reach the mesh. It is not uncommon to find non-degraded netting still in place several years after installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Maintenance Standards

- Maintain good contact with the ground. Erosion must not occur beneath the net or blanket.
- Repair and staple any areas of the net or blanket that are damaged or not in close contact with the ground.
- Fix and protect eroded areas if erosion occurs due to poorly controlled drainage.

Figure II-3.3: Channel Installation



Notes:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.

(Clackamas County et al., 2008)

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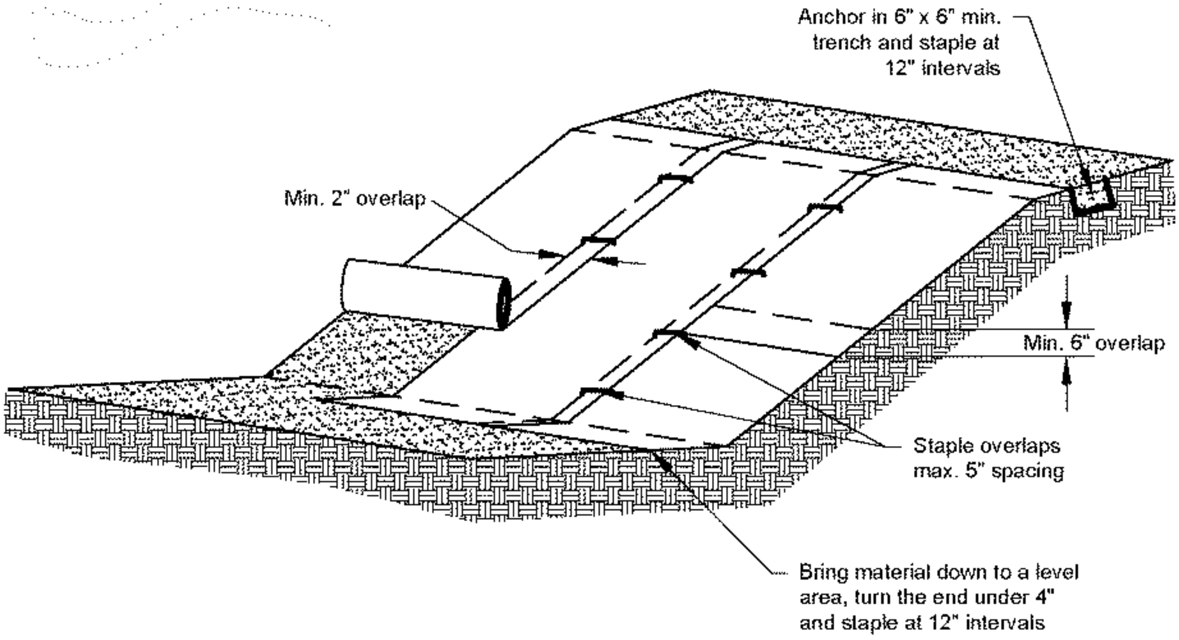
State of Washington

Channel Installation

Revised July 2016

Figure II-3.4: Slope Installation



Notes:

1. Slope surface shall be smooth before placement for proper soil contact.
2. Stapling pattern as per manufacturer's recommendations.
3. Do not stretch blankets/mattings tight - allow the rolls to mold to any irregularities.
4. For slopes less than 3H:1V, rolls may be placed in horizontal strips.
5. If there is a berm at the top of the slope, anchor upslope of the berm.
6. Lime, fertilize, and seed before installation. Planting of shrubs, trees, etc. should occur after installation.

NOT TO SCALE

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Slope Installation

Revised June 2016

BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.

- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. However, the relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for applications greater than six months.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional onsite measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill rolled plastic covering products.
- Although the plastic material is inexpensive to purchase, the cost of installation, maintenance, removal, and disposal add to the total costs of this BMP.
- Whenever plastic is used to protect slopes, install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include:
    - Temporary ditch liner.
    - Pond liner in temporary sediment pond.
    - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
    - Emergency slope protection during heavy rains.
    - Temporary drainpipe (“elephant trunk”) used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
    1. Run plastic up and down the slope, not across the slope.
    2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.

3. Provide a minimum of 8-inch overlap at the seams.
4. On long or wide slopes, or slopes subject to wind, tape all seams.
5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil, which causes extreme erosion.
8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.

- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to BMP C105: Stabilized Construction Access and BMP C106: Wheel Wash.
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection, but the downstream protections still apply.

  Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.
- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
    - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
    - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
    - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
    - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
    - Encourage the use of alternate, paved routes, if available.
    - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
    - Limit dust-causing work on windy days.
    - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible pipe, sandbags, geotextile fabric and steel “T” posts.

- Materials should be stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or project proponent could keep a stockpile of materials that are available for use on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at their office or yard. The office or yard must be less than an hour from the project site.

Design and Installation Specifications

Depending on project type, size, complexity, and length, materials and quantities will vary. A good minimum list of items that will cover numerous situations includes:

- Clear Plastic, 6 mil
- Drainpipe, 6 or 8 inch diameter
- Sandbags, filled
- Straw Bales for mulching
- Quarry Spalls
- Washed Gravel
- Geotextile Fabric
- Catch Basin Inserts
- Steel "T" Posts
- Silt fence material
- Straw Wattles

Maintenance Standards

- All materials with the exception of the quarry spalls, steel “T” posts, and gravel should be kept covered and out of both sun and rain.
- Re-stock materials as needed.

BMP C151: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see BMP C154: Concrete Washout Area)
3. De minimus washout to formed areas awaiting concrete

Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to BMP C154: Concrete Washout Area for information on concrete washout areas.
    - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in BMP C154: Concrete Washout Area.
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMP C252: Treating and Disposing of High pH Water for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
    - Significant concrete work (as defined in the CSWGP).
    - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
    - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

BMP C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds

- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

    - 1-Water Resistant Nylon Bag
    - 3-Oil Absorbent Socks 3”x 4’
    - 2-Oil Absorbent Socks 3”x 10’
    - 12-Oil Absorbent Pads 17”x19”
    - 1-Pair Splash Resistant Goggles
    - 3-Pair Nitrile Gloves
    - 10-Disposable Bags with Ties
    - Instructions

Maintenance Standards

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements. Construction sites one acre or larger that discharge to waters of the State must designate a Certified Erosion and Sediment Control Lead (CESCL) as the responsible representative.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections.

The CESCL shall:

- Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.

  Ecology has provided the minimum requirements for CESCL course training, as well as a list of ESC training and certification providers at:

  https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control

  OR

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information go to:

  http://www.envirocertintl.org/cpesc/

Specifications

- CESCL certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or project proponent and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL. See II-2 Construction Stormwater Pollution Prevention Plans (Construction SWPPPs).
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region, but must be on site whenever earthwork activities are

occurring that could generate release of turbid water.

- Duties and responsibilities of the CESCL shall include, but are not limited to the following:
    - Maintaining a permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
    - Directing BMP installation, inspection, maintenance, modification, and removal.
    - Updating all project drawings and the Construction SWPPP with changes made.
    - Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR).
    - Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
    - Keeping daily logs, and inspection reports. Inspection reports should include:
        - Inspection date/time.
        - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
        - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
        - Any water quality monitoring performed during inspection.
        - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
        - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
            1. Locations of BMPs inspected.
            2. Locations of BMPs that need maintenance.
            3. Locations of BMPs that failed to operate as designed or intended.
            4. Locations of where additional or different BMPs are required.

BMP C209: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of Use

Use outlet protection at the outlets of all ponds, pipes, ditches, or other conveyances that discharge to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

- The receiving channel at the outlet of a pipe shall be protected from erosion by lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1–foot above the maximum tailwater elevation, or 1-foot above the crown, whichever is higher. For pipes larger than 18 inches in diameter, the outlet protection lining of the channel shall be four times the diameter of the outlet pipe.
- Standard wingwalls, tapered outlets, and paved channels should also be considered when appropriate for permanent culvert outlet protection (WSDOT, 2015).
- BMP C122: Nets and Blankets or BMP C202: Riprap Channel Lining provide suitable options for lining materials.
- With low flows, BMP C201: Grass-Lined Channels can be an effective alternative for lining material.
- The following guidelines shall be used for outlet protection with riprap:
    - If the discharge velocity at the outlet is less than 5 fps, use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
    - For 5 to 10 fps discharge velocity at the outlet, use 24-inch to 48-inch riprap. Minimum

thickness is 2 feet.

  - For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
  - Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See BMP C122: Nets and Blankets.
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See I-2.11 Hydraulic Project Approvals.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

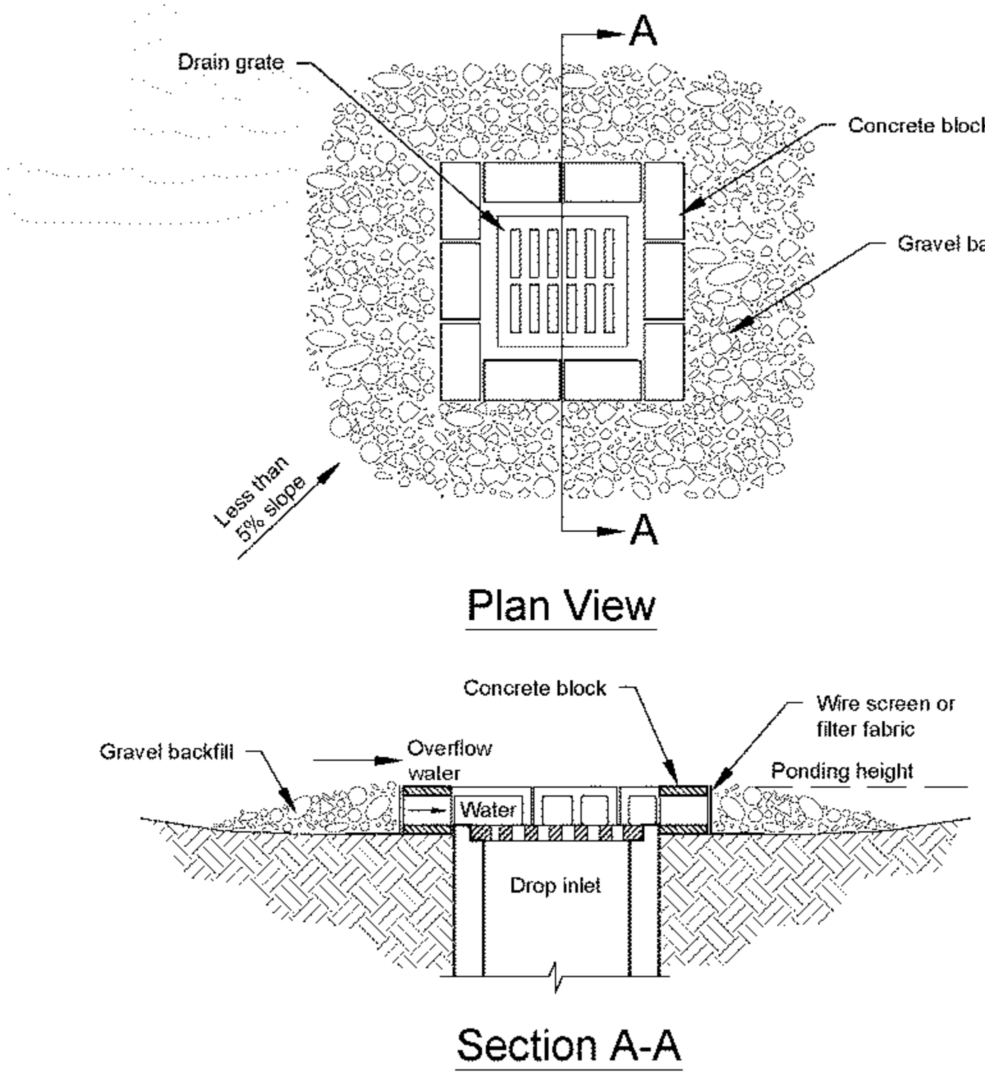
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure II-3.17: Block and Gravel Filter. Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
    - Provide a slope of 3H:1V on the upstream side of the berm.
    - Provide a slope of 2H:1V on the downstream side of the berm.
    - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
    - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
    - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

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Block and Gravel Filter

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Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
  - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
  - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
  - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

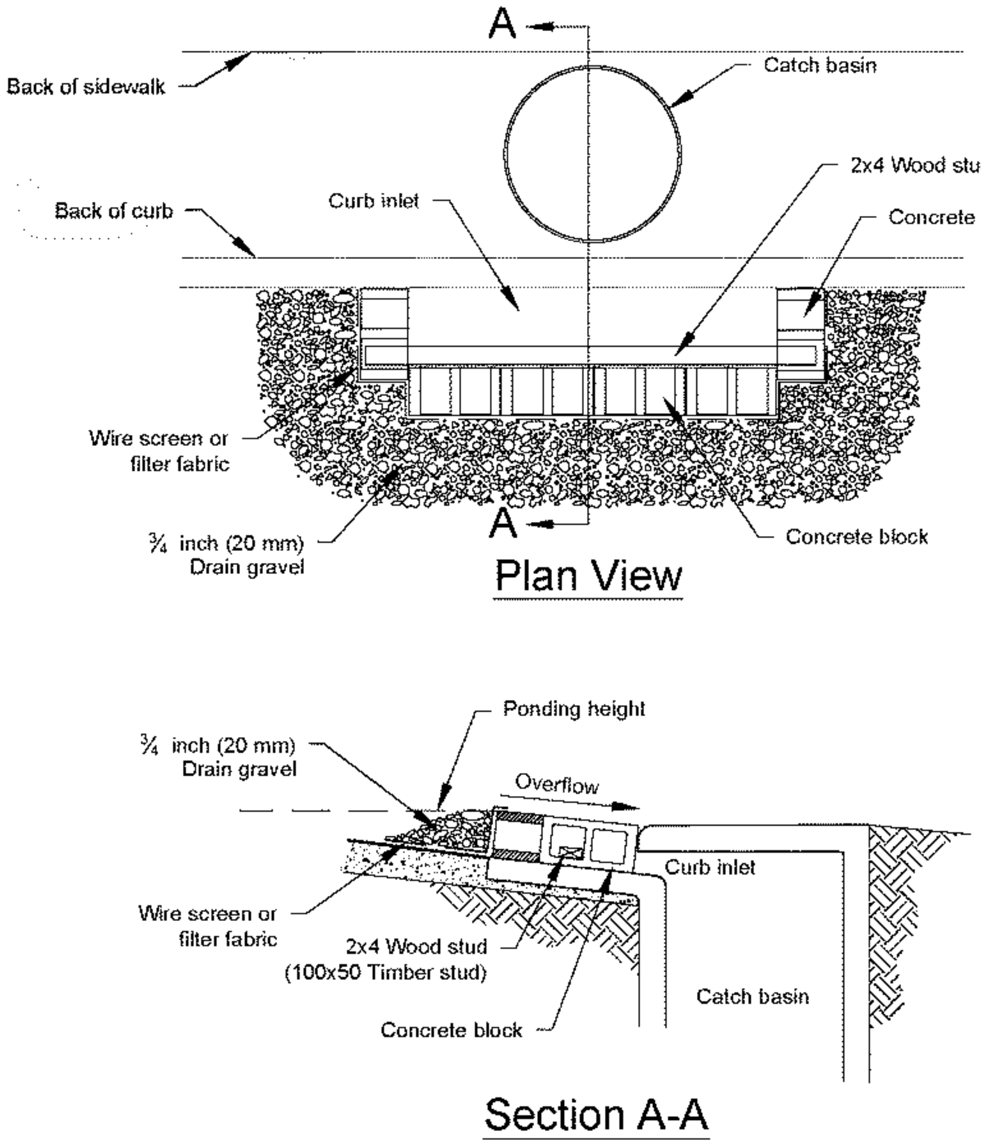
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-3.18: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection



Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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Block and Gravel Curb Inlet Protection

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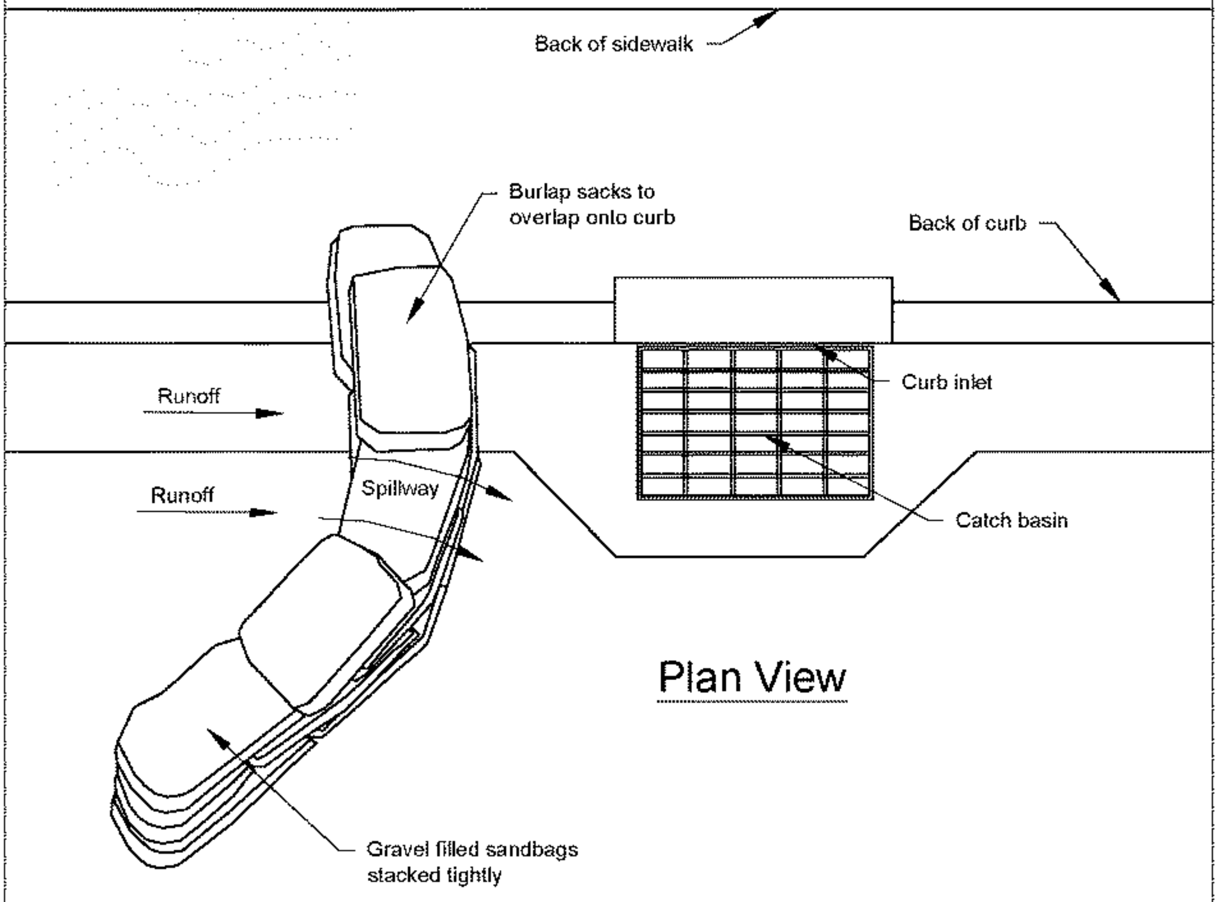
Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure II-3.19: Curb and Gutter Barrier. Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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Curb and Gutter Barrier

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Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C233: Silt Fence

Purpose

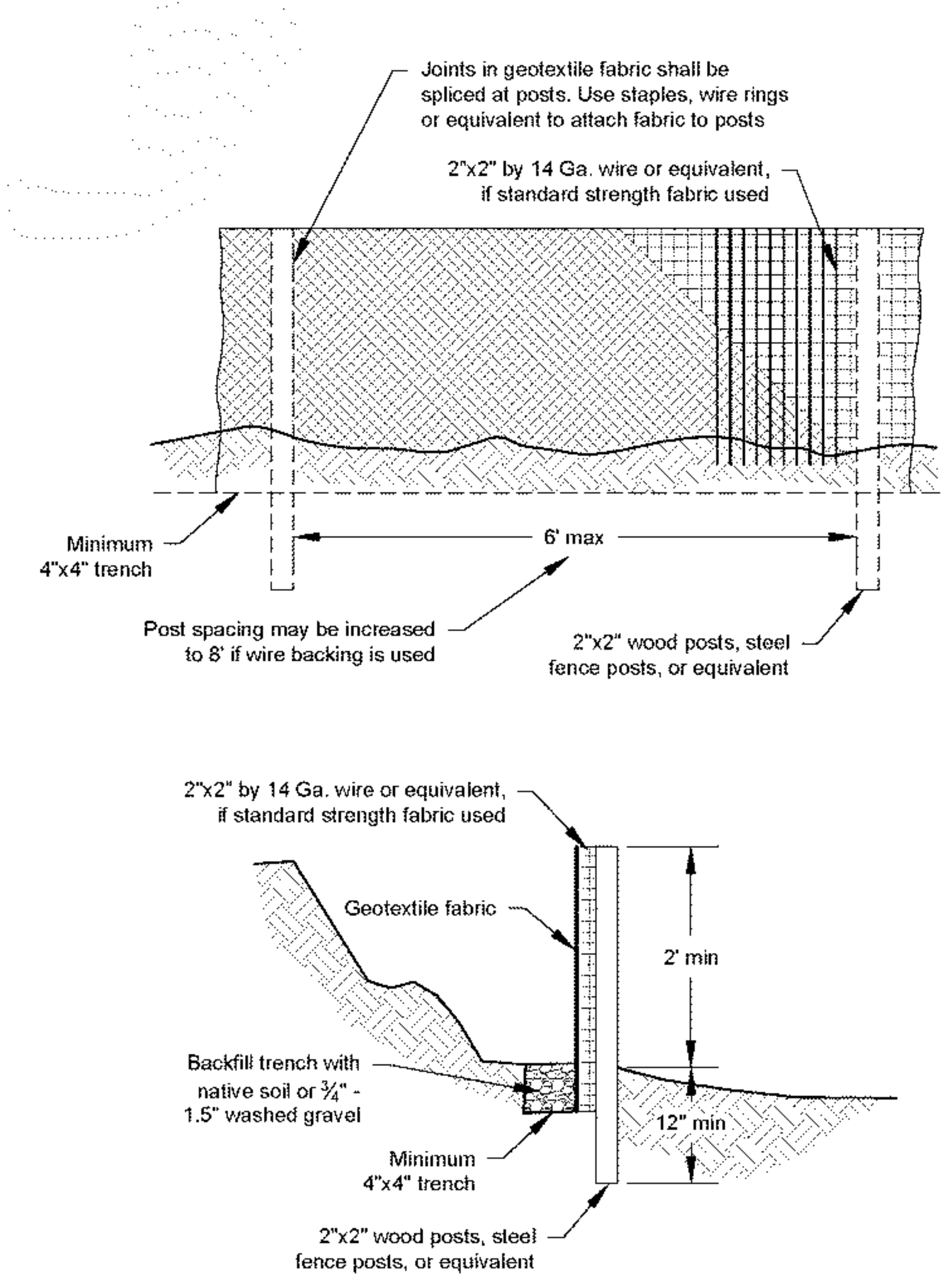
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence



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Silt Fence

Revised July 2017

Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table II-3.11: Geotextile Fabric Standards for Silt Fence):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to Figure II-3.22: Silt Fence for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:
    1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
    2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

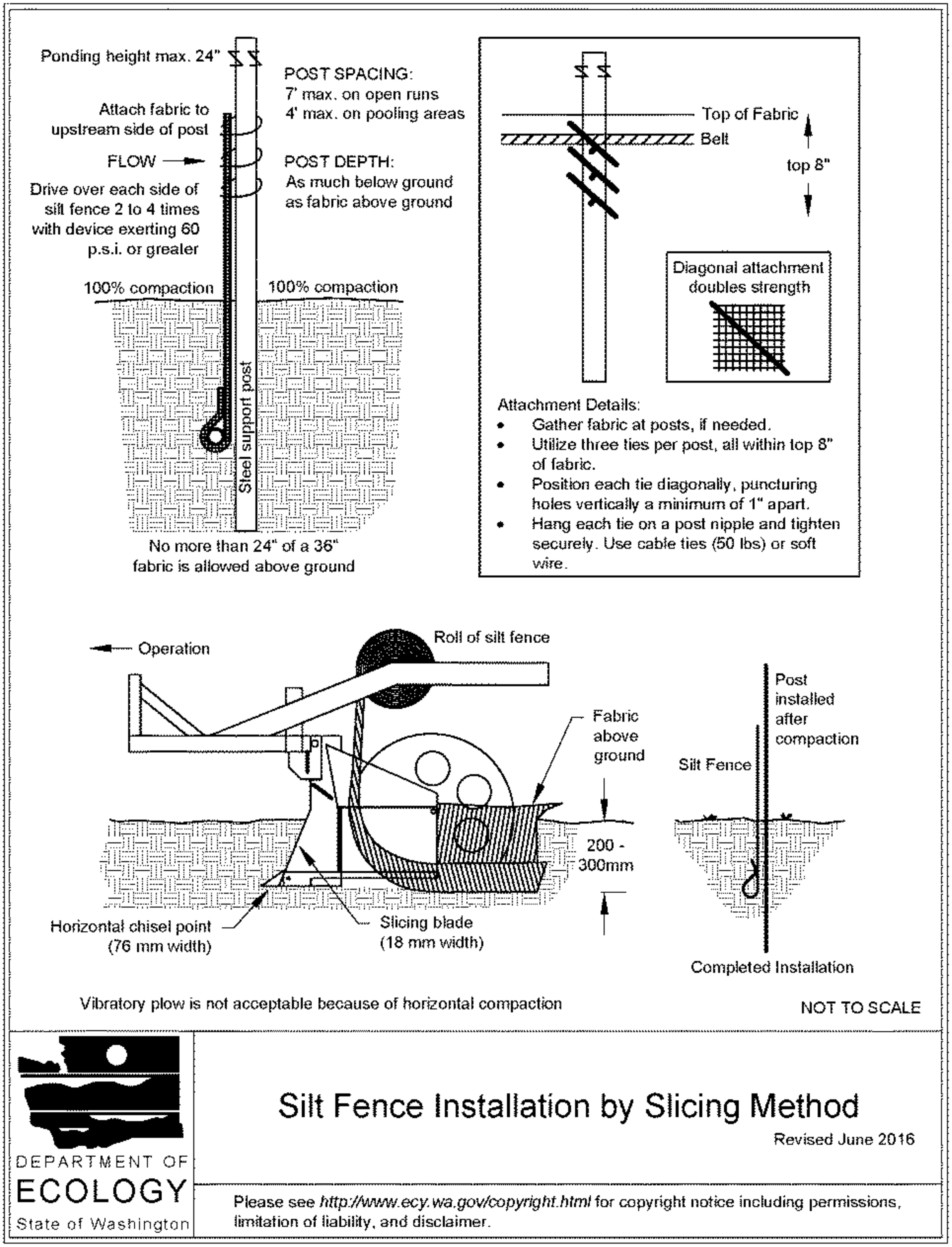
3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
    - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.
11. Locate silt fences on contour as much as possible, except at the ends of the fence,

where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.
    - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
    - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-3.23: Silt Fence Installation by Slicing Method for slicing method details. The following are specifications for silt fence installation using the slicing method:
    1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
    2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
    3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
    4. Install posts with the nipples facing away from the geotextile fabric.
    5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
    6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.
    7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.
    8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C241: Sediment Pond (Temporary)

Purpose

Sediment ponds are temporary ponds used during construction to remove sediment from runoff originating from disturbed areas of the project site. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Consequently, they usually reduce turbidity only slightly.

Conditions of Use

- Use a sediment pond where the contributing drainage area to the pond is 3 acres or more. Ponds must be used in conjunction with other Construction Stormwater BMPs to reduce the amount of sediment flowing into the pond.
- Do not install sediment ponds on sites where failure of the BMP would result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment ponds are attractive to children and can be dangerous. Compliance with local ordinances regarding health and safety must be addressed. If fencing of the pond is required, show the type of fence and its location on the drawings in the Construction SWPPP.
- Sediment ponds that can impound 10 acre-ft (435,600 cu-ft, or 3.26 million gallons) or more, or have an embankment of more than 6 feet, are subject to the Washington Dam Safety Regulations (Chapter 173-175 WAC). See BMP D.1: Detention Ponds for more information regarding dam safety considerations for detention ponds.
- Projects that are constructing permanent Flow Control BMPs or Runoff Treatment BMPs that use ponding for treatment may use the rough-graded or final-graded permanent BMP footprint for the temporary sediment pond. When permanent BMP footprints are used as temporary sediment ponds, the surface area requirement of the temporary sediment pond must be met. If the surface area requirement of the sediment pond is larger than the surface area of the permanent BMP, then the sediment pond shall be enlarged beyond the permanent BMP footprint to comply with the surface area requirement.

  The permanent control structure must be temporarily replaced with a control structure that only allows water to leave the temporary sediment pond from the surface or by pumping. Alternatively, the permanent control structure may used if it is temporarily modified by plugging any outlet holes below the riser. The permanent control structure must be installed as part of the permanent BMP after the site is fully stabilized.

Design and Installation Specifications

General

- See Figure II-3.28: Sediment Pond Plan View, Figure II-3.29: Sediment Pond Cross Section, and Figure II-3.30: Sediment Pond Riser Detail for details.
- Use of permanent infiltration BMP footprints for temporary sediment ponds during

construction tends to clog the soils and reduce their capacity to infiltrate. If permanent infiltration BMP footprints are used, the sides and bottom of the temporary sediment pond must only be rough excavated to a minimum of 2 feet above final grade of the permanent infiltration BMP. Final grading of the permanent infiltration BMP shall occur only when all contributing drainage areas are fully stabilized. Any proposed permanent pretreatment BMP prior to the infiltration BMP should be fully constructed and used with the temporary sediment pond to help prevent clogging of the soils. See Element 13: Protect Low Impact Development BMPs for more information about protecting permanent infiltration BMPs.

- The pond shall be divided into two roughly equal volume cells by a permeable divider that will reduce turbulence while allowing movement of water between the cells. The divider shall be at least one-half the height of the riser, and at least one foot below the top of the riser. Wire-backed, 2- to 3-foot high, high strength geotextile fabric supported by treated 4"x4"s can be used as a divider. Alternatively, staked straw bales wrapped with geotextile fabric may be used. If the pond is more than 6 feet deep, a different divider design must be proposed. A riprap embankment is one acceptable method of separation for deeper ponds. Other designs that satisfy the intent of this provision are allowed as long as the divider is permeable, structurally sound, and designed to prevent erosion under and around the divider.
- The most common structural failure of sediment ponds is caused by piping. Piping refers to two phenomena: (1) water seeping through fine-grained soil, eroding the soil grain by grain and forming pipes or tunnels; and, (2) water under pressure flowing upward through a granular soil with a head of sufficient magnitude to cause soil grains to lose contact and capability for support.

  The most critical construction practices to prevent piping are:

  - Tight connections between the riser and outlet pipe, and other pipe connections.
  - Adequate anchoring of the riser.
  - Proper soil compaction of the embankment and riser footing.
  - Proper construction of anti-seep devices.

Sediment Pond Geometry

To determine the sediment pond geometry, first calculate the design surface area (SA) of the pond, measured at the top of the riser pipe. Use the following equation:

$$SA = 2 \times Q_2/0.00096$$

or

2080 square feet per cfs of inflow

See BMP C240: Sediment Trap for more information on the above equation.

The basic geometry of the pond can now be determined using the following design criteria:

- Required surface area SA (from the equation above) at the top of the riser.
- Minimum 3.5-foot depth from the top of the riser to the bottom of the pond.

- Maximum 3H:1V interior side slopes and maximum 2H:1V exterior slopes. The interior slopes can be increased to a maximum of 2H:1V if fencing is provided at or above the maximum water surface.
- One foot of freeboard between the top of the riser and the crest of the emergency spillway.
- Flat bottom.
- Minimum 1-foot deep spillway.
- Length-to-width ratio between 3:1 and 6:1.

Sediment Pond Discharge

The outlet for the pond consists of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 100-year storm. If, due to site conditions and basin geometry, a separate emergency spillway is not feasible, the principal spillway must pass the entire peak runoff expected from the 100-year storm. However, an attempt to provide a separate emergency spillway should always be made. Base the runoff calculations on the site conditions during construction. The flow through the dewatering orifice cannot be utilized when calculating the 100-year storm elevation because of its potential to become clogged; therefore, available spillway storage must begin at the principal spillway riser crest.

The principal spillway designed by the procedures described below will result in some reduction in the peak rate of runoff. However, the design will not control the discharge flow rates to the extent required to comply with I-3.4.7 MR7: Flow Control. The size of the contributing basin, the expected life of the construction project, the anticipated downstream effects, and the anticipated weather conditions during construction should be considered to determine the need for additional discharge control.

Principal Spillway: Determine the required diameter for the principal spillway (riser pipe). The diameter shall be the minimum necessary to pass the peak volumetric flow rate using a 15-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Use Figure II-3.31: Riser Inflow Curves to determine the riser diameter.

To aid in determining sediment depth, one-foot intervals shall be prominently marked on the riser.

Emergency Overflow Spillway: Size the emergency overflow spillway for the peak volumetric flow rate using a 10-minute time step from a Type 1A, 100-year, 24-hour frequency storm for the developed condition. See BMP D.1: Detention Ponds for additional guidance for Emergency Overflow Spillway design

Dewatering Orifice: Size of the dewatering orifice(s) (minimum 1-inch diameter) using a modified version of the discharge equation for a vertical orifice and a basic equation for the area of a circular orifice. Determine the required area of the orifice with the following equation:

$$A_o = \frac{A_S(2h)^{0.5}}{0.6 \times 3600 T g^{0.5}}$$

where

A_O = orifice area (square feet)

A_S = pond surface area (square feet)

h = head of water above orifice (height of riser in feet)

T = dewatering time (24 hours)

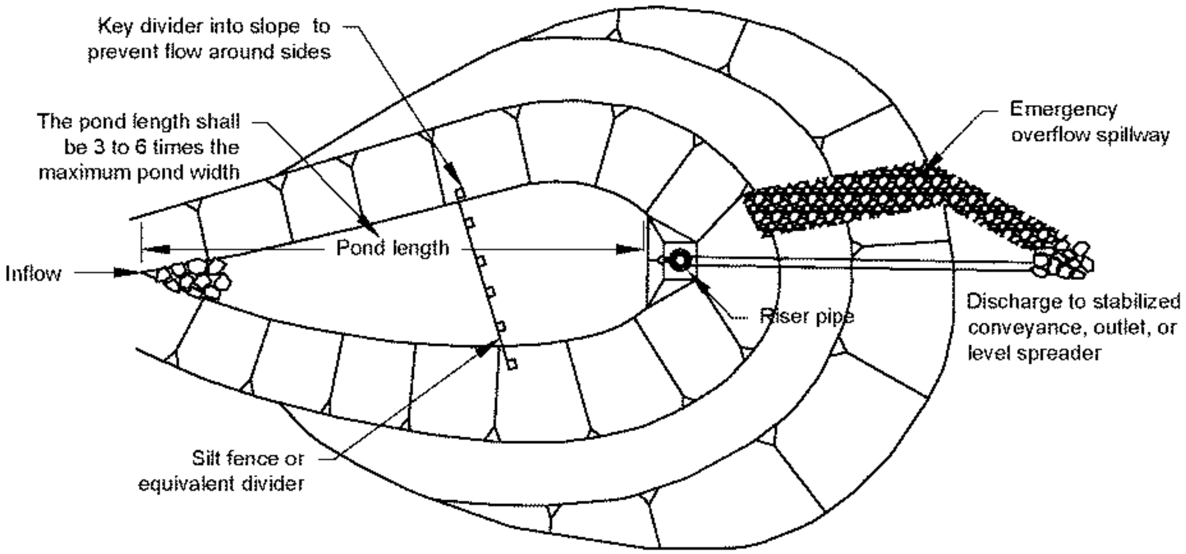
g = acceleration of gravity (32.2 feet/second^2)

Convert the orifice area (in square feet) to the orifice diameter D (in inches):

$$D = 24 \times \sqrt{\frac{A_o}{\pi}} = 13.54 \times \sqrt{A_o}$$

The vertical, perforated tubing connected to the dewatering orifice must be at least 2 inches larger in diameter than the orifice to improve flow characteristics. The size and number of perforations in the tubing should be large enough so that the tubing does not restrict flow. The orifice should control the flow rate.

Figure II-3.28: Sediment Pond Plan View



Note: Pond may be formed by berm or by partial or complete excavation

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Sediment Pond Plan View

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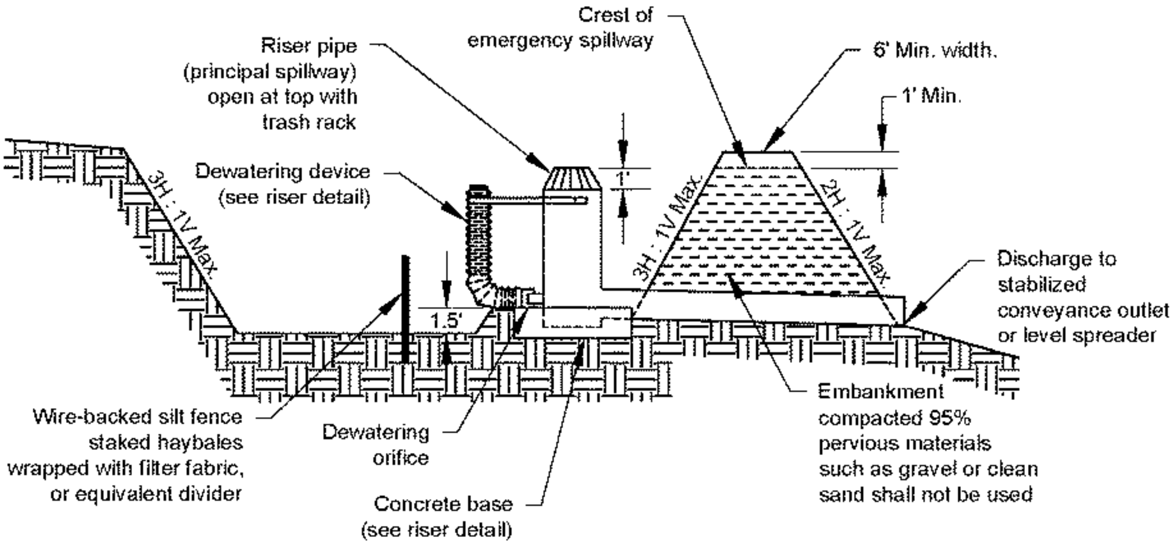
Figure II-3.29: Sediment Pond Cross Section



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Sediment Pond Cross Section

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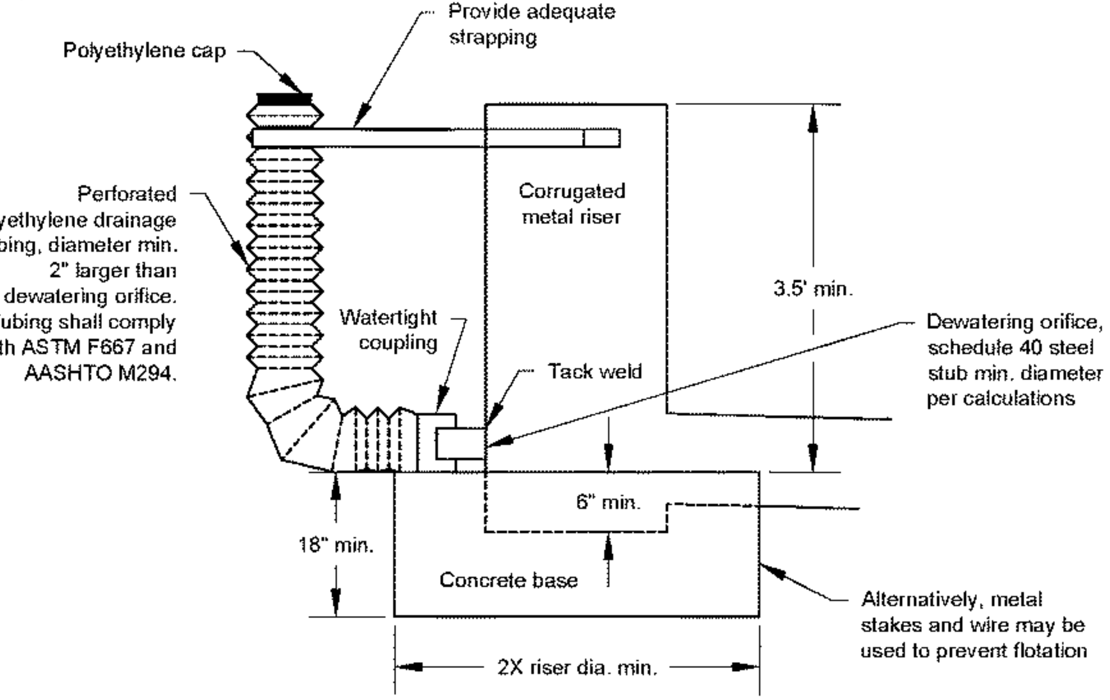
Figure II-3.30: Sediment Pond Riser Detail



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Sediment Pond Riser Detail

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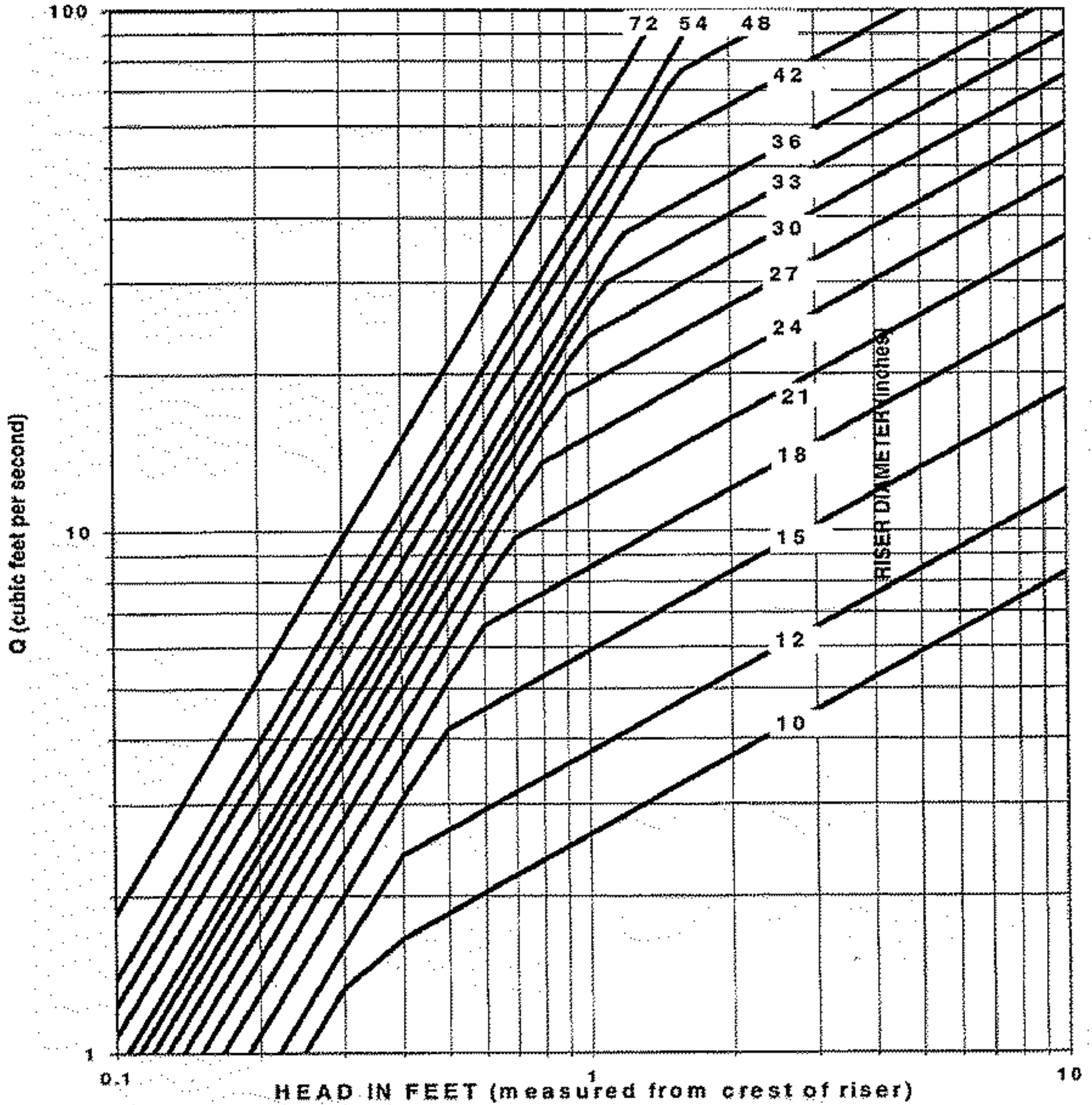
Figure II-3.31: Riser Inflow Curves



$Q_{weir} = 9.739\ DH^{3/2}$

$Q_{orifice} = 3.782\ D^2H^{1/2}$

Q in cfs, D and H in feet

Slope change occurs at weir-orifice transition

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Riser Inflow Curves

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Maintenance Standards

- Remove sediment from the pond when it reaches 1 foot in depth.
- Repair any damage to the pond embankments or slopes.