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Grandview Reserve Phase 2
Preliminary Drainage Report

December 2023

HR Green Project No: 201662.202

Prepared For:

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EDARP Filing No.:
PUDSP236

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Ken Huhn, P.E. Date

State of Colorado No. 54022

For and on behalf of HR Green Development, LLC

Owner/Developer's Statement:

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

By: Date

Authorized Signature

Address: D.R. Horton
9555 S. Kingston Court
Englewood, CO

El Paso County Statement

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development code, as amended.

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Conditions:

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I. General Purpose, Location and Description

a. Purpose

The purpose of this Preliminary Drainage Report (PDR) for the Grandview Reserve Subdivision Phase 2 is to describe the onsite and offsite drainage patterns, size drainage infrastructure to safely capture and convey developed runoff to water quality and detention facilities, and to safely route detained stormwater to adequate outfalls.

b. Location

The Grandview Reserve Phase 2 site is located in unincorporated El Paso County, Colorado. The Phase 2 location (referred to as the site herein) is located northwest of Grandview Reserve Filings 1-4 and MST2, and southeast of the intersection of Eastonville Road & Rex Road.

The site lies within a tract of land within Sections 21 and 28, Township 12 South, Range 64 West of the 6th Principal Meridian, in El Paso County, State of Colorado. A Vicinity Map is included in **Appendix A**.

The site is bound by a segment of Rex Road to be developed with this project to the northeast and undeveloped land that has historically been used as ranching lands. The east of the site will be a future phase of the Grandview Reserve Subdivision. The south and west of the site is bound by Grandview Reserve Filings 1-4 and MST2. A vicinity map is presented in Appendix A.

The Gieck Ranch Tributary #2 “MST2” is a part of the Gieck Ranch Drainage Basin tributary to Black Squirrel Creek. The channel draining through the site is an ongoing project with associated CLOMR Report and the PCD File No. is CDR228 with El Paso County. The Grandview Reserve improvements will follow any requirements of that report. There is another floodplain channel to the north of Rex Road that will not be disturbed by this phase of development and studies as a future project.

The existing surrounding platted developments include the Grandview Reserve Phase 1 Filings 1-4, and the Meridian Ranch Subdivision is west of the site on the west side of Eastonville Road.

c. Description of Property

68.72 per other documents

The site is approximately 70.67 acres of proposed residential development with associated right of way, open space tracts, public improvements, and stormwater treatment infrastructure.

The existing groundcover and topography of the site is native grasses/weeds and exposed soil on gently rolling hillside with slopes ranging from 2% to 4%.

Per a NRCS soil survey, the site is made up of Type A Columbine gravelly sandy loam. The NRCS soil survey is presented in **Appendix A**.

There is one major drainageway through the site. The Gieck Ranch Tributary #2 (MST2 as referenced in the MDDP) traverses the site along its southwestern boundary and forms the southwest boundary for Phase 2. This drainageway generally flows from the northwest to the southeast towards Highway 24, before crossing through existing drainage infrastructure. The CLOMR report by HR Green for MST2 is ongoing and pending approval for this channel. Refer to the CLOMR report included in **Appendix E** for more specific design information regarding the MST2 channel. Gieck Ranch Tributary #3 traverses the site along its northeastern

boundary and forms the northeast boundary for Phase 2 along Rex Road. This channel will not be disturbed by this phase of development. Indicate when/what phase or filing this channel will be evaluated with.

There are no known irrigation facilities in the area.

There are no known existing utilities or other encumbrances on site.

d. Floodplain Statement

Based on FEMA Firm map 08041C0552G & 08041C0556G (eff. 12/7/2018), the site contains flood Zone A through the site which is part of the Gieck Ranch Tributary #2. See FEMA Firm Maps in **Appendix A**. This floodplain is being studied and revised in the Gieck Ranch Tributary # 2 CLOMR report. A copy of the current revised floodplain map is also provided in **Appendix A**. There is a Zone A floodplain northeast of the site which will not be altered with this projects improvements.

II. Drainage Design Criteria

a. Drainage Criteria

Hydrologic data and calculations were performed using Drainage Criteria Manual Volume 1 of El Paso County (EPCDCM), with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual (CCSDCM), May 2014 revised January 2021.

Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event) using rainfall values from the NOAA Atlas 14 Point Precipitation Frequency Data Server. Runoff was calculated per CCSDCM Section 6.3.0 - Rational Method. Private, full spectrum pond design was completed using the latest version of Mile High Flood District's (MHFD) UD-Detention per CCSDCM Section 13.3.2.1 – Private, full spectrum Detention. Detention pond allowable release rate will be limited to less than historic rates.

Rainfall Depths per NOAA Atlas 14		
Return Period (yr)	5	100
1-hr Rainfall Depth (in)	1.21	2.49

Storm sewer and inlet sizing shown is preliminary at this stage of the project. Calculations for the storm sewer system on site will be provided with the Final Drainage Report (FDR) for the project. The sizing methodology that will be used is per the methods described in EPCDCM Section III Chapter 7 – Street Drainage and Storm Water Inlets. Storm sewer sizing was performed per the methods described in EPCDCM Section III Chapter 8 – Storm Drains and Appurtenances.

This preliminary drainage report follows any recommendations and is in conformance with the previously approved MDDP for the site prepared by HR Green, "*Grandview Reserve Master Development Drainage Plan",* HR Green, November 2020 (MDDP).

III. Drainage Basins and Subbasins

a. Major Basin Description

The site is located within the Gieck Ranch Drainage Basin. The site's drainage characteristics were previously studied in the following reports:

1. “Gieck Ranch Drainage Basin Planning Study” prepared by Drexel, Barrel & Co, February 2010.
2. “Grandview Reserve Master Development Drainage Plan” prepared by HR Green, August 2021.
3. “Grandview Reserve Filing No. 1 Preliminary Drainage Report” prepared by Galloway & Company, Inc., September 2022.
4. “Grandview Reserve CLOMR REPORT” prepared by HR Green, March 2023

Gieck Ranch Drainage Basin is a 22.05 square mile watershed located in El Paso County, Colorado. Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains to the Arkansas River. The majority of the basin is undeveloped and rolling range land of 2% - 4% slopes.

The Grandview Reserve MDDP divided the site into 8 major drainage basins (A-H), where each basin is tributary to a full spectrum detention pond facility. The Grandview Reserve Phase 2 improvements are located in subbasins B3 and C1 of the MDDP.

There are no known existing irrigation facilities or other obstructions that could influence or will be influenced by local drainage characteristics. Proposed local drainage characteristics will continue to follow historic patterns. Indicate if there are any offsite flows entering the project site.

b. Existing Subbasin Description

The Grandview Reserve Phase 2 site drains from the northwest to the southeast slopes ranging from 2% - 4%. The site has historically drained into the Gieck Ranch Tributary #2 (the existing MST2).

The existing subbasins for the Grandview Reserve Phase 2 site were studied the approved MDDP for Grandview Reserve. This site is located within subbasins B3 and C1 of this report and are described as follows.

“Subbasin B3 is located between MS and EF and to the northeast of east of basin B2. The existing MST2 tributary runs through the basin. The site drains towards the southeast and towards Detention Pond B. Current planning documents call for high, medium-high, and medium density dwelling units along with a pocket park. The basin is 118.90 acres, with a composite impervious value of 49.42% and runoff rates for the 5 and 100 year of 92.76 cfs and 295.27 cfs respectively.”

“Subbasin C1 is located to the northeast of east of basin B1 and the existing MST2 tributary runs through the middle of the basin. The basin drains towards the southeast and towards Detention Pond C. Current planning documents call for an institutional parcel, medium and high density dwelling units and a pocket park. The basin is 77.83 acres, with a composite impervious value of 51.20% and runoff rates for the 5 and 100 year of 77.99 cfs and 238.03 cfs respectively.”

Only provide relevant sheets from the report.

A copy of the approved MDDP has been included in **Appendix** [illegible] of this report. The proposed drainage conditions for this development will follow historic drainage patterns as described in the MDDP.

c. Proposed Subbasin Description

Description of Proposed Project

The proposed drainage conditions for the site generally follow historic drainage patterns. The site drains from the northwest to the southeast at slopes between 0.6% - 4%, into proposed public storm sewer systems via sheetflow/curb & gutter/channel flow which drain to proposed private extended detention basins for treatment and flood attenuation. The northwestern half of the site will drain to and be treated by “Pond A”, and the southeastern half of the site will drain to and be treated by “Pond B”. Both of these detention ponds will outfall

into the rerouted channel MST2. Drainage from both of these ponds has been accounted for in the channel re-alignment design and is detailed in the CLOMR report.

There is no anticipated offsite flow that will enter the site.

Swales not shown on Drainage Map. Please clarify how flows will reach their intented design points and ultimately the pond. Or if any WQ exclusions are applicable.

Subbasins Tributary to and Treated by Pond A

Basin A1-A is 3.22 acres of landscaped area, townhome lot area, and the proposed full spectrum detention facility Pond A. Stormwater (Q_5 = 2.2 cfs Q_{100} = 8.5 cfs) is conveyed via grass swales in Tract A to the private detention facility, Pond A at DP25-A.

Per ECM Section 3.3.1.J.1 all public pipe must be RCP

Basin A2-A is 1.23 acres of landscaped area and townhome lot area. Stormwater (Q_5 = 1.7 cfs Q_{100} = 4.6 cfs) is conveyed via grass swales in a rear yard swale to the public 18" HDPE culvert crossing at DP23-A.

Basin B1-A is 0.26 acres of right-of-way (ROW) area, landscaped area, ~~and townhome lot area~~. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP20-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin B2-A is 1.02 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 2.6 cfs Q_{100} = 5.3 cfs) is conveyed via curb and gutter in the public right-of-way to DP19-A, where flows combine with those of subbasin ~~B1-A,~~ B3-A, and B4-A. Runoff then follows patterns of subbasin B1-A and drains to a public type R inlet at DP20-A, and ultimately draining to Pond A via the proposed public storm sewer network.

From drainage map, Basin B4-A appears to go towards DP 18-A

Basin B3-A is 0.87 acres of right-of-way (ROW) area, asphalt parking lot, landscaped area, and townhome lot area. Stormwater (Q_5 = 2.6 cfs Q_{100} = 5.2 cfs) is conveyed via curb and gutter in the public right-of-way to DP19-A, where flows combine with those of subbasin ~~B1-A,~~ B2-A and B4-A. Runoff then follows patterns of subbasin B1-A and drains to a public type R inlet at DP20-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin B4-A is 0.86 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 2.3 cfs Q_{100} = 4.9 cfs) is conveyed via curb and gutter in the public right-of-way to DP18-A, where flows combine with those of subbasin B1-A. Runoff then follows patterns of subbasin B1-A and drains to DP19-A, then to a public type R inlet at DP20-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Per routing spreadsheet, Basin B1-A combines at DP20-A

Basin C1-A is 0.56 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 1.5 cfs Q_{100} = 3.1 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP21-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin D1-A is 0.82 acres of landscaped area, and townhome lot area. Stormwater (Q_5 = 1.3 cfs Q_{100} = 3.2 cfs) is conveyed via a swale in Tract D to a public type C inlet at DP17-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin E1-A is 0.18 acres of right-of-way (ROW) area, landscaped area, ~~and townhome lot area.~~ Stormwater (Q_5 = 0.6 cfs Q_{100} = 1.2 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP14-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin E2-A is 0.73 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 1.9 cfs Q_{100} = 3.9 cfs) is conveyed via curb and gutter in the public right-of-way to DP13-A, where flows combine with those of subbasin E1-A. Runoff then follows patterns of subbasin E1-A and drains to a public type R inlet at DP14-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Per routing spreadsheet, this basin combines with Basins E3-A & E4-A at DP 13-A. Basin E1-A combines at BP 14-A. Verify and update report or

Basin E2-A is combined at DP 13-A according to spreadsheet. Revise report or spreadsheet to match

Basin E3-A is 0.95 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 2.7 cfs Q_{100} = 5.4 cfs) is conveyed via curb and gutter in the public right-of-way to DP12-A, where flows combine with those of subbasin E2-A, and E4-A. Runoff then follows patterns of subbasin E2-A draining to DP13-A and then drains to a public type R inlet at DP14-A, ultimately draining to Pond A via the proposed public storm sewer network.

Basin E4-A is 1.12 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 3.0 cfs Q_{100} = 6.1 cfs) is conveyed via curb and gutter in the public right-of-way to DP12-A, where flows combine with those of subbasin ~~E2-A, and~~ E4-A. Runoff then follows patterns of subbasin E2-A draining to DP13-A and then drains to a public type R inlet at DP14-A, ultimately draining to Pond A via the proposed public storm sewer network.

Per routing spreadsheet combines with Basin E6-A. Revise report or spreadsheet to match

Basin E5-A is 1.23 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 3.3 cfs Q_{100} = 6.7 cfs) is conveyed via curb and gutter in the public right-of-way to DP11-A, where flows combine with those of subbasin E1-A. Runoff then follows patterns of subbasin E1-A draining to a public type R inlet at DP14-A, ultimately draining to Pond A via the proposed public storm sewer network.

Basin E6-A is 0.96 acres of right-of-way (ROW) area, asphalt parking lot, landscaped area, and townhome lot area. Stormwater (Q_5 = 2.3 cfs Q_{100} = 4.8 cfs) is conveyed via curb and gutter in the public right-of-way to DP10-A, where flows combine with those of subbasin E5-A. Runoff then follows patterns of subbasin E5-A draining to DP11-A, then to a public type R inlet at DP14-A, and ultimately draining to Pond A via the proposed public storm sewer network

DP15-A per routing spreadsheet

Basin F1-A is 0.40 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 1.2 cfs Q_{100} = 2.4 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP16-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Area doesn't match with spreadsheet Please update.

Basin G1-A is 3.22 acres of landscaped area, and townhome lot area. Stormwater (Q_5 = 3.9 cfs Q_{100} = 13.1 cfs) is conveyed via grass swales in Tract AB to a public type C inlet at DP9-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin H1-A is 0.41 acres of right-of-way (ROW) area, landscaped area, ~~and townhome lot area.~~ Stormwater (Q_5 = 1.2 cfs Q_{100} = 2.3 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP6-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin H2-A is 1.05 acres of right-of-way (ROW) area, asphalt parking lot, landscaped area, and townhome lot area. Stormwater (Q_5 = 2.8 cfs Q_{100} = 5.6 cfs) is conveyed via curb and gutter in the public right-of-way to DP5-A, ~~where flows combine with those of subbasin H1-A.~~ Runoff then follows patterns of subbasin H1-A draining to a public type R inlet at DP6-A, ultimately draining to Pond A via the proposed public storm sewer network.

Per routing spreadsheet, only Basins H3-A & H4-A are combined at DP3-A.

Basin H3-A is 0.70 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 1.9 cfs Q_{100} = 4.0 cfs) is conveyed via curb and gutter in the public right-of-way to DP3-A, where flows combine with those of subbasin H1-A, H4-A, and H5-A. Runoff then follows patterns of subbasin H1-A draining to a public type R inlet at DP6-A, ultimately draining to Pond A via the proposed public storm sewer network.

Area doesn't match with spreadsheet Please update.

Basin H4-A is 0.78 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 4.3 cfs Q_{100} = 8.8 cfs) is conveyed via curb and gutter in the public right-of-way to DP3-A, where flows combine with those of subbasin H1-A, H3-A, and H5-A. Runoff then follows patterns of subbasin H1-A

draining to a public type R inlet at DP6-A, ultimately draining to Pond A via the proposed public storm sewer network.

Area doesn't match with spreadsheet Please update.

Basin H5-A is 3.75 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 5.7 cfs Q_{100} = 13.5 cfs) is conveyed via curb and gutter in the public right-of-way to DP2-A, ~~where flows combine with those of subbasin H1-A~~. Runoff then follows patterns of subbasin H1-A draining to DP3-A and then to a public type R inlet at DP6-A, ultimately draining to Pond A via the proposed public storm sewer network.

Per routing spreadsheet, Basin 5H-A combines with Basin H1-A at DP6-A. Please revise report or spreadsheet to match.

Basin I1-A is 0.63 acres of right-of-way (ROW) area, landscaped area, and townhome lot area. Stormwater (Q_5 = 1.3 cfs Q_{100} = 2.9 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP7-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Basin J1-A is 1.55 acres of landscaped area, and townhome lot area. Stormwater (Q_5 = 1.8 cfs Q_{100} = 5.1 cfs) is conveyed via grass swales in Tract O to a public type C inlet at DP4-A, and ultimately draining to Pond A via the proposed public storm sew

Area doesn't match with spreadsheet Please update.

Basin K1-A is 0.63 acres of right-of-way (ROW) area, and landscaped area. Stormwater (Q_5 = 4.1 cfs Q_{100} = 8.3 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP1-A, and ultimately draining to Pond A via the proposed public storm sewer network.

Subbasins Tributary to and Treated by Pond B

PLease update all basin flows in this section to match with hydrology spreadsheet.

Basin A-B is 3.52 acres of landscaped area, duplex lot area, townhome lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP1-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin B-B is 2.50 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP1-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin C-B is 0.85 acres of landscaped area, duplex lot area, townhome lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP2-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin D-B is 1.05 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP2-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin E-B is 4.05 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP6-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin F-B is 2.95 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP5-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin G-B is 2.15 acres of landscaped area and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP8-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Swales not shown on Drainage Map. Please clarify how flows will reach their intented design points and ultimately the pond. Or if any WQ exclusions are applicable.

Basin H-B is 4.77 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP9-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin I-B is 2.05 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP11-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin J-B is 2.77 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP13-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin K-B is 2.30 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP13-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin L-B is 2.14 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP13-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin M-B is 1.81 acres of landscaped area, duplex lot area, and right-of-way (ROW) area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via curb and gutter in the public right-of-way to a public type R inlet at DP15-B, and ultimately draining to Pond B via the proposed public storm sewer network.

Basin N-B is 4.10 acres of landscaped area, and duplex lot area. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via rear yard swales to DP17-B in Pond B.

Basin O-B is 1.18 acres of landscaped area which contains the proposed full spectrum detention facility Pond B. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed via sheet flow to DP17-B in Pond B.

IV. Drainage Facility Design

This statement conflicts with what is shown as the Q ratios on the two MHFD-Detention spreadsheet.

a. General Concept

The proposed improvements will generally follow historic drainage patterns. Inlets will be placed at low points and in the public ROW where the street capacity would be exceeded. Stormwater from the development will be routed via a proposed public storm sewer system to a full spectrum detention pond which release runoff into MST2. All ponds and water quality features will discharge at less than historic rates.

b. Water Quality & Detention

Labeled on map as Gieck Ranch Trib #2. Please revise to clarify and/or to remove discrepancy.

Pond A (Full Spectrum Detention Basin)

Water quality and detention for Basins A-A through K-A is provided in Pond A; a private, full spectrum extended detention basin within Phase 2 of Grandview Reserve. A total of 30.60 acres at 47% composite imperviousness will be detained. The pond has been sized to provide water quality treatment, and detention for up to the 100-yr storm volume to be released at or below historic rates. The WQCV is 0.505 ac-ft, the EURV is 1.630 ac-ft, and the 100-year detention volume is 2.603 ac-ft. The WQCV, EURV and 100-year storms are released in 43, 72 and 74 hours, respectively. A forebay is located at the outfall into the pond and a 4.0’ trickle channel conveys flow towards the outlet structure. A 10’ access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 60’ emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0’ of freeboard towards MST2.

Per DCM Section 11.2.2 minimum width for access is 15'. Please revise

Labeled on map as Gieck Ranch Trib #2. Please revise to clarify and/or to remove discrepancy.

Pond B (Full Spectrum Detention Basin)

Water quality and detention for Basins A-B through O-B is provided in Pond B; a private, full spectrum extended detention basin within Phase 2 of Grandview Reserve. A total of 38.19 acres at 43% composite imperviousness will be detained. The pond has been sized to provide water quality treatment, and detention for up to the 100-yr storm volume to be released at or below historic rates. The WQCV is 0.597 ac-ft, the EURV is 1.815 ac-ft, and the 100-year detention volume is 2.974 ac-ft. The WQCV, EURV and 100-year storms are released in 42, 72 and 72 hours, respectively. A forebay is located at the outfall into the pond and a 4.0' trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 77.5' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards MST2.

Per DCM Section 11.2.2 minimum width for access is 15'. Please revise

c. Channel Improvements

The Gieck Ranch Tributary #2 is proposed to be rerouted. As part of this rerouting of the channel, offsite upstream tributary flows will be captured upstream from the proposed Rex Road extension and be conveyed via culvert to the rerouted channel along the Grandview Reserve Phase 2 western boundary. An analysis has been done for the channel with both existing and future condition flows as described within the Grandview Reserve CLOMR Report, HR Green; September 2021; revised January 2022 (CLOMR). Both scenarios, throughout the channel fall within the channel stability criteria.

Indicate if channel improvements plans have been submitted yet for review or when they plan to be. Include project # if they have.

d. Inspection and Maintenance

After completion of construction and upon the Board of County Commissioners acceptance, it is anticipated that all drainage facilities within the public Right-of-Way are to be owned and maintained by El Paso County.

All private detention ponds are to be owned and maintained by the Grandview Reserve Metropolitan District NO. 2 (DISTRICT), once established, unless an agreement is reached stating otherwise. Maintenance access for all full spectrum detention facilities will be provided from public Right-of-Way. Maintenance access for the drainageways will be provided through the proposed tracts.

V. Wetlands Mitigation

There is one existing wetlands on site associated with the Gieck Ranch Tributary #2. The wetlands are contained within the existing channel and classified as non-jurisdictional. The wetlands USACE determination will be provided with the Grandview Reserve CLOMR Report, HR Green; April 2022, which can be found in **Appendix E**. Wetlands maintenance will be the responsibility of the Grandview Reserve Metropolitan District No. 2.

VI. Four Step Process of Urbanization

In the MDDP Summary submitted with the Sketch Plan (SKP-20-001) it is noted that due to the increased volume of flow, low impact design should be taken into account for design of each filing. Please include additional information on where and how this is being accomplished within such a high density area.

Step 1 – Reducing Runoff Volumes: Low Impact Development (LID) practices are utilized to reduce runoff at the source. In general, stormwater discharges are routed across pervious areas prior to capture in storm sewer. This practice promotes infiltration and reduces peak runoff rates. The Impervious Reduction Factor (IRF) method will be used in the final design and calculations provided with the FDR.

Step 2 – Treat and slowly release the WQCV: This step utilizes full spectrum water quality and detention to capture the WQCV and slowly release runoff from the site. Onsite full spectrum detention pond provides water

quality treatment for the site. The WQCV is released over a period of 40 hours while the EURV is release over a period of 72 hours.

Step 3 – Stabilize stream channels: This step establishes practices to stabilize drainageways and provide scour protection at stormwater outfalls. Erosion protection is provided at all concentrated stormwater discharge points in the form of riprap pads.

Step 4 – Consider the need for source controls: No industrial or commercial uses are proposed within this development and therefore no source controls are proposed.

VII. Drainage and Bridge Fees

Gieck Ranch drainage basin has not been established as a fee basin within El Paso County. Therefore, no drainage basin fees are due at time of platting.

VIII. Opinion of Probable Cost

An engineer's opinion of probable cost will be provided with the Final Drainage Report (FDR) for the site.

IX. Hydraulic Grade Line Analysis

Hydraulic grade line analysis and final pipe sizes will be provided with the FDR for the site.

X. Summary

The Grandview Reserve Phase 2 site lies within the Gieck Ranch Drainage Basin. Water quality and detention for the site is provided in full spectrum water quality and detention ponds. There is one major drainageway that traverses the site: Gieck Ranch Tributary #2. The water quality and detention features ponds will be maintained by the Grandview Reserve Metropolitan District No. 2 (DISTRICT). All drainage facilities were sized per the El Paso County Drainage Criteria Manuals.

The development of this project will not adversely affect adjacent or downstream properties.

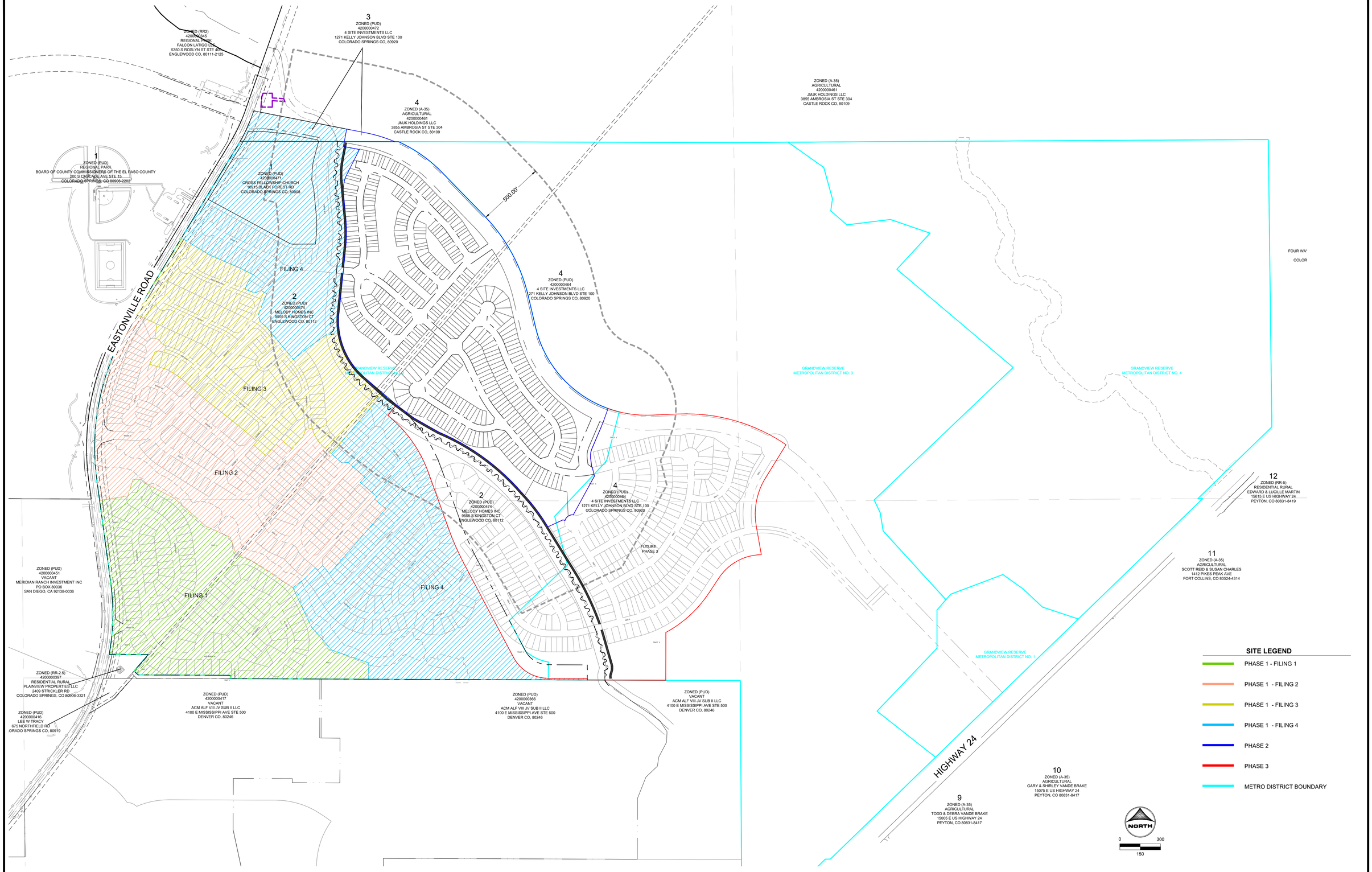
XI. Drawings

Refer to the appendices for vicinity and drainage basin maps.

XII. References

1. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
2. Drainage Criteria Manual of El Paso, Colorado, October 2018.
3. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.
4. "Gieck Ranch Drainage Basin Planning Study" prepared by Drexel, Barrel & Co, February 2010.
5. "Grandview Reserve Master Development Drainage Plan" prepared by HR Green, August 2021.
6. "Grandview Reserve Filing No. 1 Preliminary Drainage Report" prepared by Galloway & Company, Inc., September 2022.
7. "Grandview Reserve CLOMR REPORT" prepared by HR Green, March 2023

APPENDIX A – VICINITY MAP, PHOTOS, SOIL MAP, FEMA MAP



DRAWN BY:	DLH	JOB DATE:	----
APPROVED:	KMH	JOB NUMBER:	201662.2
CAD DATE:	12/15/2023		
CAD FILE:	J:\2020\201662\CAD\Dwgs\C\PUD_Phase_2_662.202\Exhibit\Vicinity_Map		

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PKWY SUITE 230
COLORADO SPRINGS CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

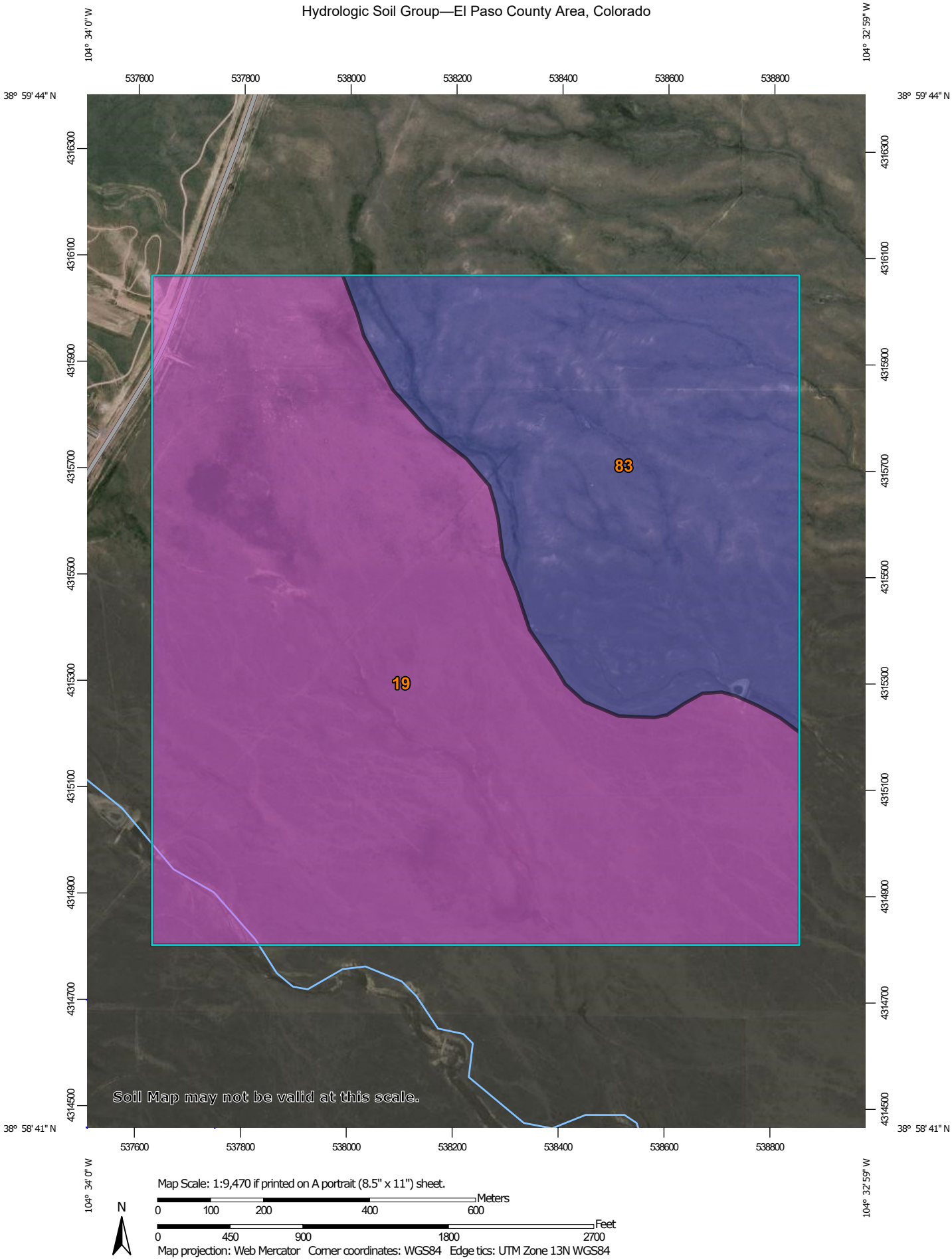
GRANDVIEW RESERVE - PHASE 2
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

GRANDVIEW PHASE 2
VICINITY MAP

SHEET
MAP

1


104° 34' 0" W
104° 32' 59" W
38° 59' 44" N
38° 58' 41" N
537600
537800
538000
538200
538400
538600
538800
4316300
4316100
4315900
4315700
4315500
4315300
4315100
4314900
4314700
4314500
83
19
Soil Map may not be valid at this scale.
Map Scale: 1:9,470 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 100 200 400 600
Feet
0 450 900 1800 2700
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Jun 12, 2021

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	254.0	66.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	127.8	33.5%
Totals for Area of Interest			**381.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

104°35'37.96"W 39°0'6.61"N

104°33'44.61"W 38°58'N

FLOOD HAZARD INFORMATION

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

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

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

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

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

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

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://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 website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to 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.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **12/14/2023 3:20 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88

For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

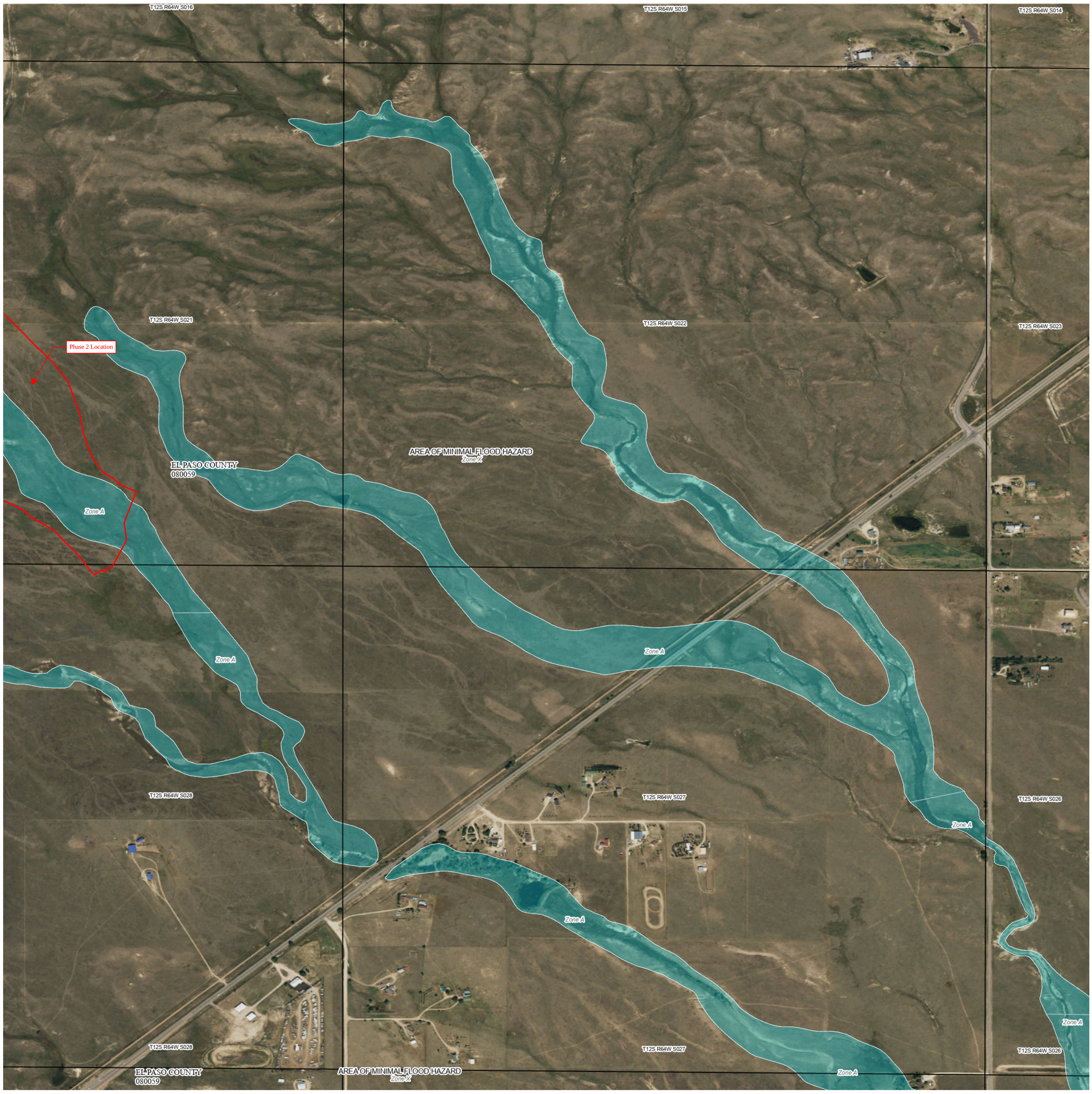
PANEL **552** OF **1275**

Panel Contains:

COMMUNITY	NUMBER	PANEL
EL PASO COUNTY	080059	0552

MAP NUMBER
08041C0552G
EFFECTIVE DATE
December 07, 2018

104°33'45.46"W 39°0'6.61"N



104°31'52.11"W 38°58'N

FLOOD HAZARD INFORMATION

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

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

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

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

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
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OTHER FEATURES
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- 17.5 Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

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This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **12/14/2023 3:22 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: No elevation features on this FIRM
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **556** OF **1275**

Panel Contains:

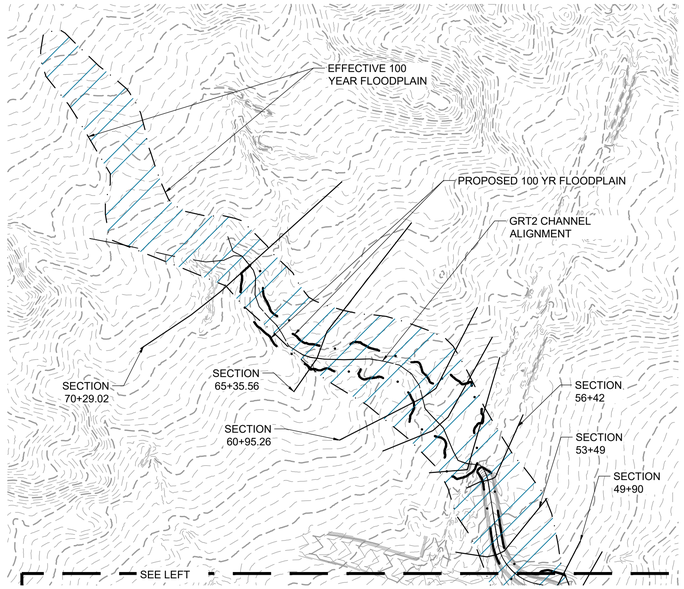
COMMUNITY	NUMBER	PANEL
EL PASO COUNTY	080059	0556

MAP NUMBER
08041C0556G
EFFECTIVE DATE
December 07, 2018

SEE RIGHT

EASTONVILLE RD

SECTION 49+90
PR 10'x4' CULVERT
SECTION 45+80
SECTION 45+20
SECTION 43+65
SECTION 43+20
SECTION 42+10
SECTION 40+70
SECTION 40+25
SECTION 39+25
SECTION 38+80
SECTION 38+30
SECTION 36+50
SECTION 34+05
SECTION 33+60
SECTION 30+40
SECTION 27+15
SECTION 26+75
SECTION 24+60
SECTION 24+20
SECTION 22+60
SECTION 47+30
SECTION 47+00
SECTION 46+62.7
SECTION 46+36.94
SECTION 44+85
SECTION 44+40
PR(3) 8'x4' CULVERTS
SECTION 37+60
SECTION 36+85
SECTION 25+70
SECTION 25+45
SECTION 20+45
SECTION -20+00
SECTION 37+12.84
SECTION 36+18.51
SECTION 34+24.50
SECTION 32+14.73
SECTION 28+82.47
SECTION 27+72.34
SECTION 27+08.73
SECTION 25+92.31
SECTION 25+27.18
SECTION 23+03.17
SECTION 21+21.94
SECTION 18+14.04
SECTION 17+40
SECTION 14+90
SECTION 13+64
SECTION 15+56.67
SECTION 12+97.03
SECTION 10+84.03
SECTION 9+66.01
SECTION 15+35
SECTION 14+40
SECTION 13+85
SECTION 12+30
SECTION 10+50
SECTION 7+45
SECTION 7+00
SECTION 7+54.34
SECTION 6+42.96
SECTION 5+23.77
SECTION 2+90.78
SECTION 2+14.43
SECTION 1+48.72
SECTION 0+33.13
SECTION 5+90
SECTION 4+45
SECTION 4+00
SECTION 2+00
SECTION 0+70.18
SECTION -0+90.21
SECTION -2+96.57
SECTION -5+30.97
SECTION -7+34.97
PROPOSED 100 YR FLOODPLAIN
GEICK RANCH TRIBUTARY
PROPOSED 100 YR FLOODPLAIN
PROPOSED GRT2 CHANNEL ALIGNMENT
EAST FORK TRIBUTARY
EFFECTIVE 100 YEAR FLOODPLAIN
EXISTING GEICK RANCH TRIBUTARY 2 ALIGNMENT
EFFECTIVE 100 YEAR FLOODPLAIN



LEGEND:

- EFFECTIVE 100 YEAR FLOODPLAIN
- PROPOSED 100 YEAR FLOODPLAIN
- MAJOR TOPO
- MINOR TOPO
- GRANDVIEW RESERVE DEVELOPMENT BOUNDARY

COLORADO LICENSED
GREGORY L. PAZ
37081
3-23-23
PROFESSIONAL ENGINEER

NOTES:

1. BASIS OF BEARINGS: THE EAST LINE OF SECTION 21, BEING MONUMENTED AT THE SOUTHEAST CORNER BY A 3-1/4" ALUMINUM SURVEYOR'S CAP STAMPED "PS INC PLS 30087 1996", BEING APPROPRIATELY MARKED, AND BEING MONUMENTED AT THE NORTHEAST CORNER BY A 3-1/4" ALUMINUM SURVEYOR'S CAP STAMPED "PS INC PLS 30087 1996", BEING APPROPRIATELY MARKED, BEING ASSUMED TO BEAR NORTH 00 DEGREES 52 MINUTES 26 SECONDS WEST, A DISTANCE OF 5290.17 FEET.

NAVD88

NORTH
0 150 300
HRGreen

Job No.:	201662
Prepared By:	SJF
Date:	3/21/2023

FLOODPLAIN EXHIBIT

FIG.2

APPENDIX B – HYDROLOGIC CALCULATIONS

NOAA Atlas 14, Volume 8, Version 2
Location name: Peyton, Colorado, USA*
Latitude: 38.9877°, Longitude: -104.5596°
Elevation: 6971 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.239** (0.189-0.304)	**0.291** (0.230-0.371)	**0.382** (0.300-0.487)	**0.461** (0.360-0.591)	**0.576** (0.438-0.771)	**0.670** (0.497-0.906)	**0.769** (0.552-1.06)	**0.874** (0.602-1.24)	**1.02** (0.675-1.48)	**1.14** (0.731-1.67)
10-min	**0.350** (0.276-0.446)	**0.427** (0.337-0.544)	**0.559** (0.439-0.714)	**0.675** (0.528-0.866)	**0.844** (0.642-1.13)	**0.982** (0.728-1.33)	**1.13** (0.808-1.56)	**1.28** (0.881-1.82)	**1.49** (0.989-2.17)	**1.66** (1.07-2.44)
15-min	**0.427** (0.337-0.543)	**0.520** (0.410-0.663)	**0.681** (0.536-0.870)	**0.823** (0.643-1.06)	**1.03** (0.783-1.38)	**1.20** (0.888-1.62)	**1.37** (0.985-1.90)	**1.56** (1.07-2.22)	**1.82** (1.21-2.65)	**2.03** (1.30-2.98)
30-min	**0.607** (0.480-0.773)	**0.740** (0.583-0.942)	**0.967** (0.761-1.24)	**1.17** (0.912-1.50)	**1.46** (1.11-1.95)	**1.69** (1.26-2.29)	**1.94** (1.39-2.68)	**2.20** (1.51-3.12)	**2.56** (1.70-3.73)	**2.85** (1.83-4.19)
60-min	**0.774** (0.611-0.985)	**0.932** (0.735-1.19)	**1.21** (0.952-1.55)	**1.46** (1.14-1.88)	**1.84** (1.40-2.47)	**2.15** (1.60-2.92)	**2.49** (1.79-3.45)	**2.85** (1.96-4.05)	**3.35** (2.22-4.90)	**3.76** (2.42-5.54)
2-hr	**0.941** (0.749-1.19)	**1.12** (0.894-1.42)	**1.46** (1.15-1.84)	**1.76** (1.39-2.24)	**2.22** (1.71-2.97)	**2.61** (1.96-3.52)	**3.03** (2.20-4.19)	**3.49** (2.43-4.94)	**4.14** (2.78-6.02)	**4.68** (3.04-6.84)
3-hr	**1.03** (0.824-1.29)	**1.22** (0.973-1.53)	**1.57** (1.25-1.98)	**1.90** (1.50-2.40)	**2.41** (1.88-3.23)	**2.86** (2.16-3.85)	**3.34** (2.44-4.60)	**3.87** (2.72-5.47)	**4.64** (3.13-6.72)	**5.27** (3.44-7.67)
6-hr	**1.19** (0.961-1.48)	**1.40** (1.12-1.74)	**1.78** (1.43-2.23)	**2.16** (1.72-2.71)	**2.76** (2.17-3.67)	**3.28** (2.50-4.40)	**3.86** (2.85-5.29)	**4.50** (3.19-6.33)	**5.44** (3.70-7.84)	**6.21** (4.10-8.98)
12-hr	**1.38** (1.12-1.70)	**1.61** (1.30-1.98)	**2.05** (1.66-2.53)	**2.47** (1.99-3.07)	**3.14** (2.49-4.15)	**3.73** (2.87-4.96)	**4.38** (3.26-5.96)	**5.10** (3.64-7.12)	**6.14** (4.23-8.80)	**7.01** (4.67-10.1)
24-hr	**1.59** (1.30-1.95)	**1.86** (1.52-2.28)	**2.37** (1.93-2.90)	**2.84** (2.30-3.50)	**3.58** (2.86-4.66)	**4.22** (3.27-5.55)	**4.92** (3.69-6.62)	**5.68** (4.09-7.86)	**6.79** (4.71-9.65)	**7.70** (5.17-11.0)
2-day	**1.85** (1.53-2.24)	**2.17** (1.79-2.63)	**2.75** (2.26-3.34)	**3.28** (2.68-4.00)	**4.09** (3.28-5.26)	**4.78** (3.73-6.21)	**5.52** (4.17-7.36)	**6.33** (4.59-8.67)	**7.48** (5.23-10.5)	**8.42** (5.71-12.0)
3-day	**2.02** (1.68-2.44)	**2.38** (1.97-2.86)	**3.01** (2.48-3.64)	**3.58** (2.94-4.35)	**4.45** (3.58-5.68)	**5.18** (4.06-6.69)	**5.97** (4.52-7.90)	**6.81** (4.97-9.28)	**8.02** (5.63-11.2)	**8.99** (6.13-12.7)
4-day	**2.17** (1.81-2.61)	**2.55** (2.12-3.06)	**3.21** (2.66-3.86)	**3.81** (3.14-4.61)	**4.72** (3.80-6.00)	**5.48** (4.31-7.04)	**6.29** (4.79-8.30)	**7.17** (5.24-9.73)	**8.42** (5.93-11.8)	**9.42** (6.45-13.3)
7-day	**2.57** (2.16-3.06)	**2.97** (2.48-3.54)	**3.67** (3.06-4.39)	**4.31** (3.58-5.17)	**5.27** (4.28-6.64)	**6.08** (4.81-7.76)	**6.94** (5.32-9.09)	**7.87** (5.80-10.6)	**9.20** (6.53-12.8)	**10.3** (7.08-14.4)
10-day	**2.92** (2.46-3.46)	**3.35** (2.82-3.98)	**4.11** (3.44-4.89)	**4.79** (3.99-5.73)	**5.81** (4.73-7.28)	**6.66** (5.29-8.45)	**7.56** (5.82-9.85)	**8.53** (6.32-11.4)	**9.90** (7.06-13.7)	**11.0** (7.63-15.4)
20-day	**3.90** (3.31-4.57)	**4.50** (3.81-5.28)	**5.51** (4.65-6.49)	**6.37** (5.36-7.55)	**7.61** (6.22-9.37)	**8.60** (6.87-10.8)	**9.62** (7.44-12.4)	**10.7** (7.95-14.1)	**12.1** (8.71-16.6)	**13.3** (9.28-18.4)
30-day	**4.68** (3.99-5.46)	**5.42** (4.61-6.33)	**6.63** (5.63-7.76)	**7.64** (6.45-8.99)	**9.03** (7.39-11.0)	**10.1** (8.11-12.5)	**11.2** (8.70-14.3)	**12.3** (9.20-16.2)	**13.8** (9.95-18.7)	**14.9** (10.5-20.6)
45-day	**5.64** (4.84-6.55)	**6.52** (5.58-7.58)	**7.94** (6.77-9.25)	**9.09** (7.71-10.6)	**10.6** (8.73-12.8)	**11.8** (9.49-14.5)	**13.0** (10.1-16.4)	**14.1** (10.6-18.4)	**15.6** (11.3-21.0)	**16.7** (11.8-22.9)
60-day	**6.45** (5.55-7.46)	**7.42** (6.37-8.59)	**8.96** (7.68-10.4)	**10.2** (8.69-11.9)	**11.8** (9.74-14.2)	**13.1** (10.5-16.0)	**14.2** (11.1-17.9)	**15.4** (11.6-20.0)	**16.8** (12.2-22.6)	**17.9** (12.7-24.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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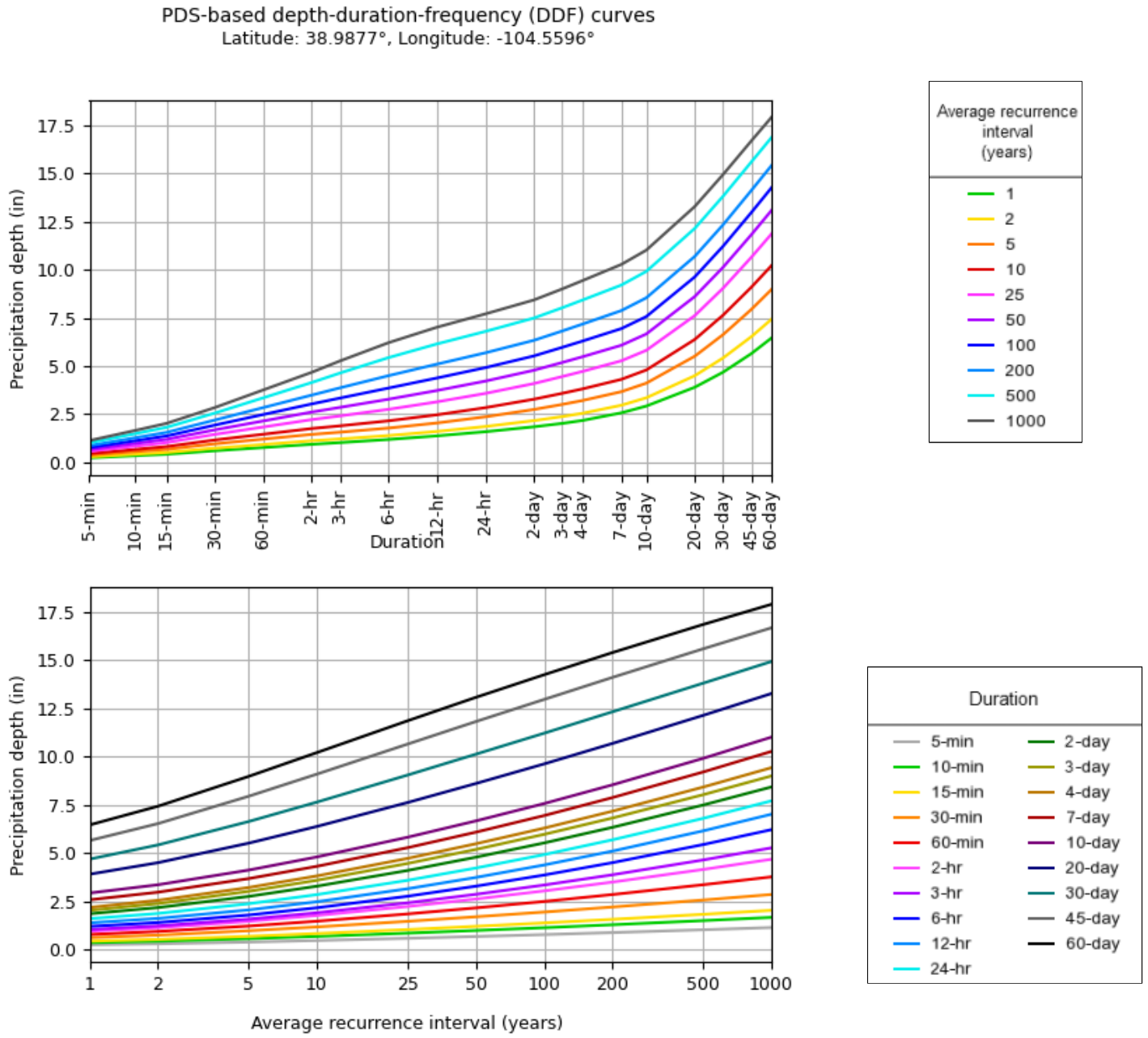
PF graphical



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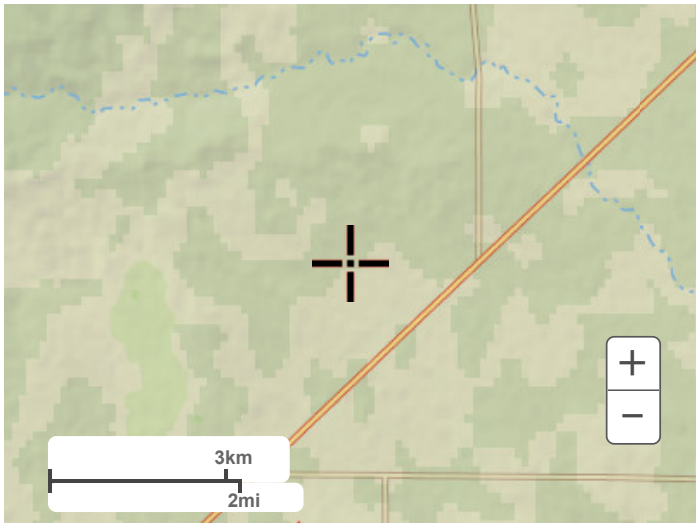
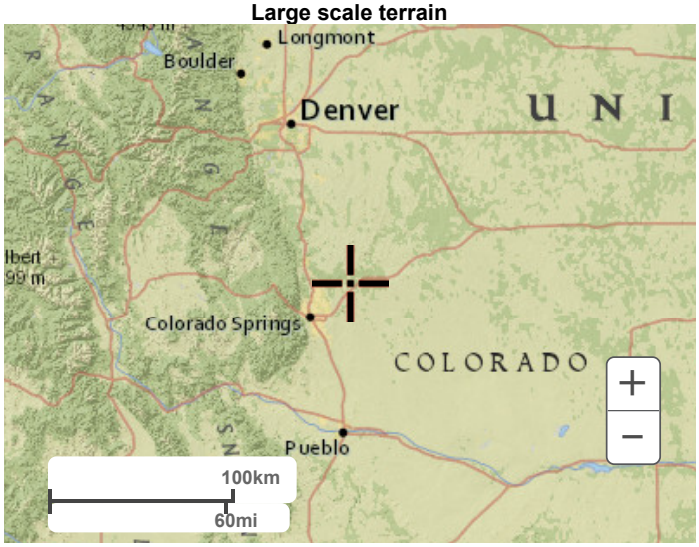
Maps & aerials

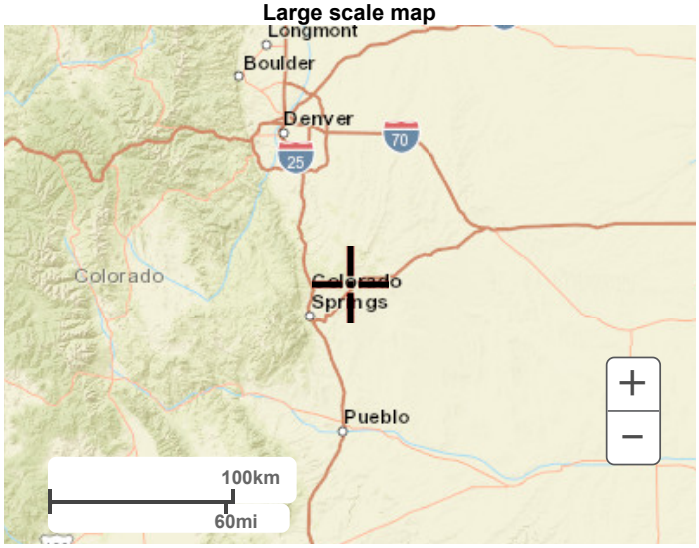
Small scale terrain



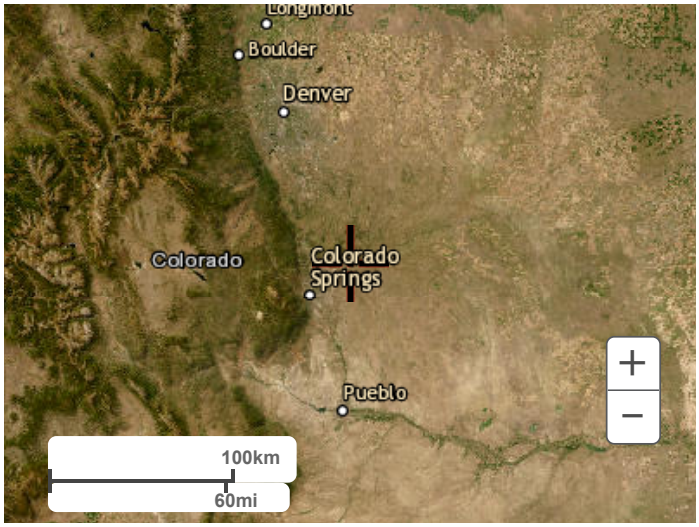
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

GRANDVIEW RESERVE (PHASE II)
PROPOSED CONDITIONS
EL PASO COUNTY, CO

Calc'd by:	**SPC**
Checked by:	**KH**
Date:	**12/15/2023**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A1-A	3.22	14	2.2	8.5
A2-A	1.23	35	1.7	4.6
B1-A	0.26	79	0.8	1.6
B2-A	1.02	64	2.6	5.3
B3-A	0.87	69	2.6	5.2
B4-A	0.86	61	2.3	4.9
C1-A	0.56	67	1.5	3.1
D1-A	0.82	38	1.3	3.2
E1-A	0.18	77	0.6	1.2
E2-A	0.73	67	1.9	3.9
E3-A	0.95	69	2.7	5.4
E4-A	1.12	66	3.0	6.1
E5-A	1.23	68	3.3	6.7
E6-A	0.96	63	2.3	4.8
F1-A	0.40	68	1.2	2.4
G1-A	4.69	20	3.9	13.1
H1-A	0.41	70	1.2	2.3
H2-A	1.05	70	2.8	5.6
H3-A	0.70	63	1.9	4.0
H4-A	1.78	66	4.3	8.8
H5-A	3.72	44	5.7	13.5
I1-A	0.63	57	1.3	2.9
J1-A	1.55	28	1.8	5.1
K1-A	1.66	68	4.1	8.3

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1-A	K1-A	4.1	8.3
2-A	H5-A	5.7	13.5
2.1-A	DPS 1-A, 2-A	9.4	21.0
3-A	H3-A, H4-A	6.0	12.3
4-A	J1-A	1.8	5.1
4.1-A	DPS 2.1-A, 4-A	10.5	24.4
5-A	H2-A	2.8	5.6
6-A	H1-A, DPS 3-A, 5-A	8.7	17.8
7-A	I1-A	1.3	2.9
8-A	DPS 4.1-A, 6-A, 7-A	19.6	43.2
9-A	G1-A	3.9	13.1
9.1-A	DPS 8-A, 9-A	22.7	54.0
10-A	E6-A	2.3	4.8
11-A	E5-A, DPS 10-A	4.2	8.5
12-A	E3-A, E4-A	5.6	11.5
13-A	E2-A, DPS 12-A	6.4	12.9
14-A	E1-A, DPS 11-A, 13-A	8.9	18.2
15-A	F1-A	1.2	2.4
16-A	DPS 9.1-A, 14-A, 15-A	29.1	65.9
17-A	D1-A	1.3	3.2
17.1-A	DPS 16-A, 17-A	29.5	67.2
18-A	B4-A	2.3	4.9
19-A	B2-A, B3-A, DPS 18-A	6.3	12.9
20-A	B1-A, DPS 19-A	6.6	13.5
21-A	C1-A	1.5	3.1
22-A	DPS 17.1-A, 20-A, 21-A	34.9	78.0
23-A	A2-A	1.7	4.6
24-A	DPS 23-A	1.7	4.5
25-A	A1-A, DPS 22-A, 24-A	37.6	87.1

GRANDVIEW RESERVE (PHASE II)
PROPOSED CONDITIONS
EL PASO COUNTY, CO

Calc'd by: SPC
Checked by: KH
Date: 12/15/2023

SOIL TYPE:	HSG A&B

COMPOSITE 'C' FACTORS

	LAND USE TYPE																		TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	Paved			Gravel			Lawns			Typical Townhome Lots			Minor Arterial ROW Typ.			Local ROW Typ.						
	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}				
	100	0.90	0.96	80	0.59	0.70	0	0.08	0.35	53	0.48	0.64	68	0.63	0.76	90	0.82	0.90				
BASIN	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
A1-A				0.14			2.42			0.66									3.22	14	0.18	0.42
A2-A							0.41			0.82									1.23	35	0.35	0.54
B1-A							0.03									0.23			0.26	79	0.73	0.83
B2-A							0.06			0.56						0.40			1.02	64	0.59	0.72
B3-A	0.09						0.07			0.37						0.34			0.87	69	0.63	0.76
B4-A							0.09			0.46						0.31			0.86	61	0.56	0.70
C1-A							0.01			0.33						0.22			0.56	67	0.61	0.74
D1-A							0.23			0.59									0.82	38	0.37	0.56
E1-A							0.03									0.15			0.18	77	0.71	0.82
E2-A							0.05			0.32						0.35			0.73	67	0.62	0.74
E3-A							0.00			0.54						0.41			0.95	69	0.63	0.75
E4-A							0.02			0.68						0.41			1.12	66	0.60	0.73
E5-A	0.09						0.05			0.65						0.44			1.23	68	0.62	0.75
E6-A	0.09						0.18			0.27						0.41			0.96	63	0.59	0.73
F1-A							0.00			0.23						0.17			0.40	68	0.62	0.75
G1-A							2.96			1.73									4.69	20	0.23	0.46
H1-A							0.09									0.32			0.41	70	0.65	0.78
H2-A	0.10						0.05			0.49						0.42			1.05	70	0.64	0.76
H3-A							0.07			0.33						0.30			0.70	63	0.58	0.72
H4-A							0.02			1.12						0.64			1.78	66	0.60	0.73
H5-A							1.04			1.14			1.54						3.72	44	0.43	0.61
I1-A							0.15			0.21						0.28			0.63	57	0.54	0.69
J1-A							0.74			0.81									1.55	28	0.29	0.50
K1-A							0.00						1.66						1.66	68	0.63	0.76
POND A	0.38			0.14			8.76			12.31			3.20			5.80			30.60	47	0.45	0.62

GRANDVIEW RESERVE (PHASE II)

PROPOSED CONDITIONS

EL PASO COUNTY, CO

Calc'd by: SPC

Checked by: KH

Date: 12/15/2023

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	tc=(L/180)+10	Design tc
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)	tc max	tc design (min)
A1-A	0.18	3.22	100	2.8	11.9	7	529	2.9	1.2	7.3	19.2	13.5	13.5
A2-A	0.35	1.23	68	4.9	6.7	15	470	2.2	2.2	3.5	10.2	13.0	10.2
B1-A	0.73	0.26	41	0.5	5.4	20	340	0.6	1.5	3.7	9.1	12.1	9.1
B2-A	0.59	1.02	32	0.7	6.1	20	614	2.9	3.4	3.0	9.2	13.6	9.2
B3-A	0.63	0.87	42	2.9	3.9	20	544	2.9	3.4	2.7	6.6	13.3	6.6
B4-A	0.56	0.86	43	4.8	3.8	20	480	2.7	3.3	2.4	6.3	12.9	6.3
C1-A	0.61	0.56	53	2.9	4.6	20	318	0.6	1.5	3.4	8.0	12.1	8.0
D1-A	0.37	0.82	100	4.6	8.1	15	196	2.3	2.3	1.4	9.5	11.6	9.5
E1-A	0.71	0.18	41	1.0	4.5	20	186	1.0	2.0	1.5	6.1	11.3	6.1
E2-A	0.62	0.73	38	0.6	6.4	20	570	2.8	3.3	2.9	9.2	13.4	9.2
E3-A	0.63	0.95	68	4.2	4.4	20	656	2.6	3.2	3.4	7.8	14.0	7.8
E4-A	0.60	1.12	66	4.5	4.5	20	656	2.4	3.1	3.5	8.1	14.0	8.1
E5-A	0.62	1.23	54	3.0	4.5	20	677	1.8	2.7	4.2	8.7	14.1	8.7
E6-A	0.59	0.96	74	1.0	8.0	20	495	3.5	3.7	2.2	10.2	13.2	10.2
F1-A	0.62	0.40	63	3.0	4.8	20	197	1.0	2.0	1.6	6.5	11.4	6.5
G1-A	0.23	4.69	100	10.0	7.4	15	822	2.0	2.1	6.5	13.9	15.1	13.9
H1-A	0.65	0.41	79	2.0	5.8	20	284	0.6	1.5	3.0	8.8	12.0	8.8
H2-A	0.64	1.05	41	0.8	5.9	20	667	2.0	2.8	3.9	9.8	13.9	9.8
H3-A	0.58	0.70	41	2.8	4.3	20	467	2.5	3.2	2.5	6.7	12.8	6.7
H4-A	0.60	1.78	62	2.5	5.3	20	1089	3.0	3.5	5.2	10.5	16.4	10.5
H5-A	0.43	3.72	100	4.8	7.3	20	1343	2.3	3.0	7.4	14.7	18.0	14.7
I1-A	0.54	0.63	81	0.6	11.0	20	114	0.6	1.5	1.2	12.2	11.1	11.1
J1-A	0.29	1.55	100	4.5	9.0	15	321	2.4	2.3	2.3	11.3	12.3	11.3
K1-A	0.63	1.66	45	3.4	3.8	20	1409	2.4	3.1	7.6	11.4	18.1	11.4

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

Labels appear to be switched for these 2 columsn

GRANDVIEW RESERVE (PHASE II)
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: SPC
Checked by: KH
Date: 12/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	1-A	K1-A	0.63	1.66	11.4	1.05	3.93	4.1	11.4	1.05	3.93	**4.1**				4.1	1.05	0.5	1.5	85	2.1	0.67	
	2-A	H5-A	0.43	3.72	14.7	1.60	3.55	5.7	14.7	1.60	3.55	**5.7**				5.7	1.60	0.5	1.5	6	2.1	0.04	
	2.1-A								14.7	2.65	3.55	**9.4**				9.4	2.65	0.5	2.0	300	2.9	1.70	
	3-A	H3-A	0.58	0.70	6.7	0.41	4.72	1.9	10.5	1.47	4.05	**6.0**	6.0	1.47	0.6					160	0.8	3.44	
		H4-A	0.60	1.78	10.5	1.07	4.05	4.3															
	4-A	J1-A	0.29	1.55	11.3	0.45	3.94	1.8	11.3	0.45	3.94	**1.8**				1.8	0.45	0.5	1.5	26	2.1	0.21	
	4.1-A								16.4	3.09	3.39	**10.5**				10.5	3.09	0.5	2.0	46	2.9	0.26	
	5-A	H2-A	0.64	1.05	9.8	0.67	4.16	2.8	9.8	0.67	4.16	**2.8**	2.8	0.67	0.6					80	0.8	1.72	
	6-A	H1-A	0.65	0.41	8.8	0.27	4.32	1.2	14.0	2.41	3.63	**8.7**				8.7	2.41	0.5	1.5	3	2.1	0.02	
	7-A	I1-A	0.54	0.63	11.1	0.34	3.98	1.3	11.1	0.34	3.98	**1.3**				1.3	0.34	0.5	1.0	28	1.3	0.35	
	8-A								16.7	5.84	3.36	**19.6**				19.6	5.84	0.5	3.0	250	4.7	0.88	
	9-A	G1-A	0.23	4.69	13.9	1.07	3.64	3.9	13.9	1.07	3.64	**3.9**				3.9	1.07	0.5	1.0	24	1.3	0.31	
	9.1-A								17.6	6.91	3.28	**22.7**				22.7	6.91	0.5	3.0	86	4.7	0.30	
	10-A	E6-A	0.59	0.96	10.2	0.57	4.10	2.3	10.2	0.57	4.10	**2.3**	2.3	0.57	1.8					731	1.3	9.08	
	11-A	E5-A	0.62	1.23	8.7	0.76	4.34	3.3	19.3	1.33	3.14	**4.2**	4.2	1.33	0.6					217	0.8	4.67	
	12-A	E3-A	0.63	0.95	7.8	0.60	4.50	2.7	8.1	1.27	4.45	**5.6**	5.6	1.27	2.7					506	1.6	5.16	
		E4-A	0.60	1.12	8.1	0.67	4.45	3.0															
	13-A	E2-A	0.62	0.73	9.2	0.45	4.25	1.9	13.2	1.71	3.71	**6.4**	6.4	1.71	0.6					25	0.8	0.54	
	14-A	E1-A	0.71	0.18	6.1	0.13	4.88	0.6	24.0	3.17	2.82	**8.9**				8.9	3.17	0.5	2.0	6	2.9	0.03	
	15-A	F1-A	0.62	0.40	6.5	0.25	4.78	1.2	6.5	0.25	4.78	**1.2**				1.2	0.25	0.5	1.5	29	2.1	0.23	
	16-A								24.0	10.33	2.82	**29.1**				29.1	10.33	0.5	3.0	173	4.7	0.61	

HRGreen

GRANDVIEW RESERVE (PHASE II)
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: SPC
Checked by: KH
Date: 12/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	17-A	D1-A	0.37	0.82	9.5	0.30	4.20	1.3	9.5	0.30	4.20	**1.3**				1.3	0.30	0.5	1.5	26	2.1	0.21	
	17.1-A								24.6	10.63	2.78	**29.5**				29.5	10.63	0.5	3.0	241	4.7	0.85	
	18-A	B4-A	0.56	0.86	6.3	0.48	4.83	2.3	6.3	0.48	4.83	**2.3**	2.3	0.48	0.6					268	0.8	5.77	
	19-A	B2-A	0.59	1.02	9.2	0.60	4.26	2.6	12.1	1.63	3.85	**6.3**	6.3	1.63	0.6					85	0.8	1.83	
		B3-A	0.63	0.87	6.6	0.55	4.75	2.6															
	20-A	B1-A	0.73	0.26	9.1	0.19	4.27	0.8	13.9	1.82	3.64	**6.6**				6.6	1.82	0.5	1.5	6	2.1	0.04	
	21-A	C1-A	0.61	0.56	8.0	0.34	4.47	1.5	8.0	0.34	4.47	**1.5**				1.5	0.34	0.5	1.5	29	2.1	0.23	
	22-A								25.5	12.79	2.73	**34.9**				34.9	12.79	0.5	3.0	34	4.7	0.12	
	23-A	A2-A	0.35	1.23	10.2	0.43	4.10	1.7	10.2	0.43	4.10	**1.7**				1.7	0.43	0.5	1.5	80	2.1	0.63	
	24-A								10.9	0.43	4.01	**1.7**	1.7	0.43	2.0					400	1.4	4.71	
	25-A	A1-A	0.18	3.22	13.5	0.59	3.68	2.2	25.6	13.81	2.72	**37.6**											

GRANDVIEW RESERVE (PHASE II)

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	SPC
Checked by:	KH
Date:	12/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	1-A																						
		K1-A	1.66	0.76	11.4	1.26	6.60	8.3	11.4	1.26	6.60	**8.3**				8.3	1.26	0.5	1.5	85	2.1	0.67	
	2-A																						
		H5-A	3.72	0.61	14.7	2.26	5.97	13.5	14.7	2.26	5.97	**13.5**				13.5	2.26	0.5	1.5	6	2.1	0.04	
	2.1-A								14.7	3.53	5.96	**21.0**				21.0	3.53	0.5	2.0	300	2.9	1.70	
	3-A																						
		H3-A	0.70	0.72	6.7	0.50	7.92	4.0	10.5	1.81	6.80	**12.3**	12.3	1.81	0.6					160	0.8	3.44	
		H4-A	1.78	0.73	10.5	1.30	6.80	8.8															
	4-A																						
		J1-A	1.55	0.50	11.3	0.78	6.62	5.1	11.3	0.78	6.62	**5.1**				5.1	0.78	0.5	1.5	26	2.1	0.21	
	4.1-A								16.4	4.30	5.68	**24.4**				24.4	4.30	0.5	2.0	46	2.9	0.26	
	5-A																						
		H2-A	1.05	0.76	9.8	0.80	6.98	5.6	9.8	0.80	6.98	**5.6**	5.6	0.80	0.6					80	0.8	1.72	
	6-A																						
		H1-A	0.41	0.78	8.8	0.32	7.25	2.3	14.0	2.92	6.09	**17.8**				17.8	2.92	0.5	1.5	3	2.1	0.02	
	7-A																						
		I1-A	0.63	0.69	11.1	0.43	6.67	2.9	11.1	0.43	6.67	**2.9**				2.9	0.43	0.5	1.0	28	1.3	0.35	
	8-A								16.7	7.66	5.64	**43.2**				43.2	7.66	0.5	3.0	250	4.7	0.88	
	9-A																						
		G1-A	4.69	0.46	13.9	2.14	6.11	13.1	13.9	2.14	6.11	**13.1**				13.1	2.14	0.5	1.0	24	1.3	0.31	
	9.1-A								17.6	9.80	5.51	**54.0**				54.0	9.80	0.5	3.0	86	4.7	0.30	
	10-A																						
		E6-A	0.96	0.73	10.2	0.70	6.88	4.8	10.2	0.70	6.88	**4.8**	4.8	0.70	1.8					731	1.3	9.08	
	11-A																						
		E5-A	1.23	0.75	8.7	0.92	7.29	6.7	19.3	1.62	5.28	**8.5**	8.5	1.62	0.6					217	0.8	4.67	
	12-A																						
		E3-A	0.95	0.75	7.8	0.72	7.55	5.4	8.1	1.53	7.47	**11.5**	11.5	1.53	2.7					506	1.6	5.16	
		E4-A	1.12	0.73	8.1	0.82	7.47	6.1															
	13-A																						
		E2-A	0.73	0.74	9.2	0.54	7.14	3.9	13.2	2.08	6.23	**12.9**	12.9	2.08	0.6					25	0.8	0.54	
	14-A																						
		E1-A	0.18	0.82	6.1	0.15	8.19	1.2	24.0	3.84	4.73	**18.2**				18.2	3.84	0.5	2.0	6	2.9	0.03	
	15-A																						
		F1-A	0.40	0.75	6.5	0.30	8.03	2.4	6.5	0.30	8.03	**2.4**				2.4	0.30	0.5	1.5	29	2.1	0.23	
	16-A								24.0	13.94	4.73	**65.9**				65.9	13.94	0.5	3.0	173	4.7	0.61	

GRANDVIEW RESERVE (PHASE II)

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	SPC
Checked by:	KH
Date:	12/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	17-A								9.5	0.46	7.06	**3.2**				3.2	0.46	0.5	1.5	26	2.1	0.21	
	17.1-A								24.6	14.40	4.66	**67.2**				67.2	14.40	0.5	3.0	241	4.7	0.85	
	18-A	B4-A	0.86	0.70	6.3	0.60	8.10	4.9	6.3	0.60	8.10	**4.9**	4.9	0.60	0.6					268	0.8	5.77	
	19-A	B2-A	1.02	0.72	9.2	0.74	7.15	5.3	12.1	2.00	6.46	**12.9**	12.9	2.00	0.6					85	0.8	1.83	
		B3-A	0.87	0.76	6.6	0.66	7.98	5.2															
	20-A	B1-A	0.26	0.83	9.1	0.22	7.17	1.6	13.9	2.22	6.11	**13.5**				13.5	2.22	0.5	1.5	6	2.1	0.04	
	21-A	C1-A	0.56	0.74	8.0	0.41	7.50	3.1	8.0	0.41	7.50	**3.1**				3.1	0.41	0.5	1.5	29	2.1	0.23	
	22-A								25.5	17.03	4.58	**78.0**				78.0	17.03	0.5	3.0	34	4.7	0.12	
	23-A	A2-A	1.23	0.54	10.2	0.67	6.88	4.6	10.2	0.67	6.88	**4.6**				4.6	0.67	0.5	1.5	80	2.1	0.63	
	24-A								10.9	0.67	6.73	**4.5**	4.5	0.67	2.0					400	1.4	4.71	
	25-A	A1-A	3.22	0.42	13.5	1.37	6.18	8.5	25.6	19.07	4.57	**87.1**											

HRGreen	**GRANDVIEW RESERVE (PHASE II- DUPLEXES)**	**Calc'd by:**	**CBM**
	PROPOSED CONDITIONS	**Checked by:**	**SPC**
	EL PASO COUNTY, CO	**Date:**	**12/15/2023**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A-B	3.52	39	6.6	11.0
B-B	2.50	55	6.2	10.4
C-B	0.83	47	1.9	3.2
D-B	1.05	45	2.4	4.1
E-B	4.05	45	8.4	14.0
F-B	2.95	43	6.1	10.3
G-B	2.15	56	4.8	8.1
H-B	4.77	40	8.7	14.7
I-B	2.06	51	4.1	7.0
J-B	2.77	60	6.6	11.0
K-B	2.30	58	5.9	9.8
L-B	2.14	39	4.6	7.7
M-B	1.81	44	4.0	6.8
N-B	4.10	20	6.8	11.5
O-B	1.18	0	2	3.1

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
DP1-B	A,B	11.9	20.0
DP2-B	C,D	4.2	7.1
DP3-B	A,B,C,D	0.0	26.5
DP4-B	E	8.4	14.0
DP5-B	F	6.1	10.3
DP6-B	E,F	0.0	24.0
DP7-B	A,B,C,D,E,F	0.0	49.3
DP8-B	G	4.8	8.1
DP9-B	H	8.7	14.7
DP10-B	G,H	0.0	22.5
DP11-B	I	7.9	15.8
DP12-B	A,B,C,D,E,F,I	0.0	62.1
DP13-B	J,K,L	14.4	27.4
DP14-B	A-L	0.0	109.3
DP15-B	M	7.5	12.9
DP16-B	A-M	68.3	120.6

GRANDVIEW RESERVE (PHASE II- DUPLEXES)
PROPOSED CONDITIONS
EL PASO COUNTY, CO

Calc'd by: CBM
Checked by: SPC
Date: 12/15/2023

SOIL TYPE:	HSG A&B

COMPOSITE 'C' FACTORS

	LAND USE TYPE																	
	EPC LOCAL			Duplex			Lawns			EPC MINOR ARTERIAL			Townhome			TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}				
	90	0.82	0.90	47	0.40	0.58	0	0.08	0.35	68	0.63	0.76	53	0.48	0.64				
BASIN	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
A-B	0.48			1.51			1.09			0.00			0.44			3.52	39	0.37	0.56
B-B	0.48			2.02			0.00			0.00			0.00			2.50	55	0.48	0.64
C-B	0.26			0.25			0.25			0.00			0.08			0.83	47	0.44	0.62
D-B	0.44			0.15			0.46			0.00			0.00			1.05	45	0.44	0.62
E-B	0.71			2.26			0.83			0.00			0.25			4.05	45	0.41	0.59
F-B	0.57			1.59			0.79			0.00			0.00			2.95	43	0.40	0.58
G-B	0.00			0.00			0.38			1.77			0.00			2.15	56	0.53	0.69
H-B	0.00			1.42			1.56			1.79			0.00			4.77	40	0.38	0.57
I-B	0.22			1.80			0.03			0.00			0.00			2.06	51	0.44	0.61
J-B	0.89			1.84			0.04			0.00			0.00			2.77	60	0.53	0.68
K-B	0.84			1.24			0.22			0.00			0.00			2.30	58	0.52	0.67
L-B	0.70			0.46			0.99			0.00			0.00			2.14	39	0.39	0.58
M-B	0.50			0.73			0.58			0.00			0.00			1.81	44	0.41	0.59
N-B	0.00			1.76			2.35			0.00			0.00			4.10	20	0.22	0.45
O-B	0.00			0.00			1.18			0.00			0.00			1.18	0	0.08	0.35
Pond B	6.09			17.04			10.74			3.56			0.77			**38.19**	**43**		

HRGreen	**GRANDVIEW RESERVE (PHASE II- DUPLEXES)**	**Calc'd by:**	**CBM**
	PROPOSED CONDITIONS	**Checked by:**	**SPC**
	EL PASO COUNTY, CO	**Date:**	**12/15/2023**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	*tc=(L/180)+10*	Design tc
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)	*tc max*	*tc design (min)*
A-B	0.37	3.52	100	2.0	10.7	20	1225	2.6	3.2	6.3	17.0	17.4	17.0
B-B	0.48	2.50	100	2.0	9.0	20	575	2.6	3.2	3.0	12.0	13.8	12.0
C-B	0.44	0.83	100	2.0	9.6	20	800	2.6	3.2	4.1	13.7	15.0	13.7
D-B	0.44	1.05	100	2.0	9.6	20	650	2.6	3.2	3.4	13.0	14.2	13.0
E-B	0.41	4.05	100	2.0	10.0	20	1100	2.9	3.4	5.4	15.4	16.7	15.4
F-B	0.40	2.95	100	2.0	10.3	20	830	2.9	3.4	4.1	14.3	15.2	14.3
G-B	0.53	2.15	30	2.0	4.5	20	1600	1.0	2.0	13.3	17.9	19.1	17.9
H-B	0.38	4.77	100	2.0	10.5	20	1450	1.0	2.0	12.1	22.5	18.6	18.6
I-B	0.44	2.06	100	2.0	9.6	20	1420	2.3	3.0	7.8	17.4	18.4	17.4
J-B	0.53	2.77	100	2.0	8.3	20	1290	2.3	3.0	7.1	15.4	17.7	15.4
K-B	0.52	2.30	100	2.0	8.4	20	890	3.0	3.5	4.3	12.7	15.5	12.7
L-B	0.39	2.14	100	2.0	10.3	20	520	2.0	2.8	3.1	13.4	13.4	13.4
M-B	0.41	1.81	100	2.0	10.0	20	520	2.3	3.0	2.9	12.8	13.4	12.8
N-B	0.22	4.10	100	2.0	12.8	20	460	0.8	1.8	4.3	17.1	13.1	13.1
O-B	0.08	1.18	25	2.0	7.4	20	50	1.0	2.0	0.4	7.8	10.4	7.8

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

GRANDVIEW RESERVE (PHASE II- DUPLEXES)

PROPOSED CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by:	CBM
Checked by:	SPC
Date:	12/15/2023

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
		A-B	3.52	0.56	17.0	1.97	3.33	6.6															BASIN A CAPTURED IN 15' TYPE R @ DP1
													4.2	1.26	2.4					475	3.1	2.56	DP1 FLOWBY CAPTURED BY @ DP12
	DP1-B	B-B	2.50	0.64	12.0	1.60	3.86	6.2	17.0	3.57	3.33	11.9				7.7	2.31	2.0	1.5	7	8.4	0.01	BASIN B CAPTURED IN 15' TYPE R @ DP1, PIPED TO DP3
		C-B	0.83	0.62	13.7	0.51	3.66	1.9															BASIN C CAPTURED IN 10' TYPE R @ DP2
													0.1	0.04	2.4						3.1	0.00	
	DP2-B	D-B	1.05	0.62	13.0	0.65	3.74	2.4	13.7	1.16	3.66	4.2				4.1	1.12	2.0	1.5	27	8.4	0.05	BASIN D CAPTURED IN 10' TYPE R @ DP2, PIPED TO DP3
	DP3-B								17.0	4.73		0.0				0.0	4.73	2.0	1.5	58	8.4	0.11	DP3 FLOW TO DP7
													1.9	0.54	0.8					640	1.8	5.96	FLOWBY CAPTURED @ DP15
	DP4-B	E-B	4.05	0.59	15.4	2.40	3.48	8.4	15.4	2.40	3.48	8.4				6.5	1.87	2.0	1.5	27	8.4	0.05	
													3.2	0.90	0.8					675	1.8	6.29	FLOWBY CAPTURED @ DP15
	DP5-B	F-B	2.95	0.58	14.3	1.71	3.59	6.1	14.3	1.71	3.59	6.1				2.9	0.81	2.0	1.5	7	8.4	0.01	
	DP6-B								15.4	4.11		0.0				0.0	0.00	2.0	1.5	62	8.4	0.12	PIPE TO DP7
	DP7-B								17.1	8.85		0.0				0.0	8.85	2.0	2.0	420	10.2	0.69	PIPE TO DP12
													0.3	0.10	0.8					1000	1.8	9.32	**FLOWBY CAPTURED BY PHASE 3 STORM**
	DP8-B	G-B	2.15	0.69	17.9	1.48	3.26	4.8	17.9	1.48	3.26	4.8				4.5	1.38	2.0	1.5	19	8.4	0.04	
													3.1	0.98	0.8					1000	1.8	9.32	**FLOWBY CAPTURED BY PHASE 3 STORM**
	DP9-B	H-B	4.77	0.57	18.6	2.73	3.20	8.7	18.6	2.73	3.20	8.7				5.6	1.75	2.0	1.5	34	8.4	0.07	
	DP10-B								18.7	4.21		0.0				0.0	4.21	2.0	2.0	650	10.2	1.06	PIPE TO DP14
													0.2	0.06	2.4					215	3.1	1.16	FLOWBY CAPTURED @ DP13
	DP11-B	I-B	2.06	0.61	17.4	1.26	3.30	4.1	19.5	2.52	3.12	7.9				7.7	2.46	2.0	1.5	7	8.4	0.01	
	DP12-B								19.6	11.37		0.0				0.0	11.37	2.0	2.5	58	11.8	0.08	PIPE TO DP14
		J-B	2.77	0.68	15.4	1.88	3.48	6.6															
		K-B	2.30	0.67	12.7	1.55	3.77	5.9															
	DP13-B	L-B	2.14	0.58	13.4	1.24	3.69	4.6	20.7	4.73	3.04	14.4				14.4	4.73	2.0	2.0	7	10.2	0.01	SUMP INLET-PIPE TO DP14, OVERTOP CROWN AND CURB INTO POND
	DP14-B								20.7	20.30		0.0				0.0	20.30	2.0	1.5	58	8.4	0.11	PIPE TO DP16
	DP15-B	M-B	1.81	0.59	12.8	1.08	3.75	4.0	21.3	2.52	2.99	7.5				7.5	2.52	2.0	2.0	7	10.2	0.01	SUMP INLET, OVERTOP CURB INTO POND
	DP16-B								21.3	22.82	2.99	68.3											PIPE TO POND X TO BE DETAINED AND RELEASED AT LESS THAN HISTORIC RATES
	DP17-B	N-B	4.10	0.45	13.1	1.84	3.72	6.8															BASIN N SWALE FLOW TO POND X
		O-B	1.18	0.35	7.8	0.41	4.49	1.9															BASIN O SHEET FLOW INTO POND X

Missing flow rate for design point

Highlighted flows cannot be 0 cfs. Appears that intensity is missing. Please update.

HRGreen

GRANDVIEW RESERVE (PHASE II- DUPLEXES)

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	**CBM**
Checked by:	**SPC**
Date:	**12/15/2023**

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
		A-B	3.52	0.56	17.0	1.97	5.60	11.0															BASIN A CAPTURED IN 15' TYPE R @ DP1
	DP1-B	B-B	2.50	0.64	12.0	1.60	6.48	10.4	17.0	3.57	5.60	20.0	9.8	1.75	2.4	10.2	1.82	2.0	1.5	475 7	3.1 8.4	2.56 0.01	DP1 FLOWBY CAPTURED BY @ DP12 BASIN B CAPTURED IN 15' TYPE R @ DP1, PIPED TO DP3
		C-B	0.83	0.62	13.7	0.51	6.14	3.2															BASIN C CAPTURED IN 10' TYPE R @ DP2
	DP2-B	D-B	1.05	0.62	13.0	0.65	6.27	4.1	13.7	1.16	6.14	7.1	1.3	0.21	2.4	5.8	0.94	2.0	1.5	27	3.1 8.4	0.00 0.05	BASIN D CAPTURED IN 10' TYPE R @ DP2, PIPED TO DP3
	DP3-B								17.0	4.73	5.59	26.5				26.5	4.73	2.0	1.5	58	8.4	0.11	DP3 FLOW TO DP7
	DP4-B	E-B	4.05	0.59	15.4	2.40	5.85	14.0	15.4	2.40	5.85	14.0	5.6	0.97	0.8	8.4	1.44	2.0	1.5	640 27	1.8 8.4	5.96 0.05	FLOWBY CAPTURED @ DP15
	DP5-B	F-B	2.95	0.58	14.3	1.71	6.03	10.3	14.3	1.71	6.03	10.3	3.2	0.53	0.8	7.1	1.18	2.0	1.5	675 7	1.8 8.4	6.29 0.01	FLOWBY CAPTURED @ DP15
	DP6-B								15.4	4.11	5.84	24.0				24.0	24.03	2.0	1.5	62	8.4	0.12	PIPE TO DP7
	DP7-B								17.1	8.85	5.58	49.3				49.3	8.85	2.0	2.0	420	10.2	0.69	PIPE TO DP12
	DP8-B	G-B	2.15	0.69	17.9	1.48	5.47	8.1	17.9	1.48	5.47	8.1	0.3	0.05	0.8	7.8	1.43	2.0	1.5	1000 19	1.8 8.4	9.32 0.04	**FLOWBY CAPTURED BY PHASE 3 STORM**
	DP9-B	H-B	4.77	0.57	18.6	2.73	5.37	14.7	18.6	2.73	5.37	14.7	3.1	0.57	0.8	11.6	2.16	2.0	1.5	1000 34	1.8 8.4	9.32 0.07	**FLOWBY CAPTURED BY PHASE 3 STORM**
	DP10-B								18.7	4.21	5.36	22.5				22.5	4.21	2.0	2.0	650	10.2	1.06	PIPE TO DP14
	DP11-B	I-B	2.06	0.61	17.4	1.26	5.54	7.0	19.5	3.01	5.24	15.8	3.7	0.70	2.4	12.1	2.31	2.0	1.5	215 7	3.1 8.4	1.16 0.01	FLOWBY CAPTURED @ DP13
	DP12-B								19.6	11.85	5.24	62.1				62.1	11.85	2.0	2.5	58	11.8	0.08	PIPE TO DP14
		J-B	2.77	0.68	15.4	1.88	5.85	11.0															
		K-B	2.30	0.67	12.7	1.55	6.33	9.8															
	DP13-B	L-B	2.14	0.58	13.4	1.24	6.19	7.7	20.7	5.37	5.10	27.4				27.4	5.37	2.0	2.0	7	10.2	0.01	SUMP INLET-PIPE TO DP14, OVERTOP CROWN AND CURB INTO POND
	DP14-B								20.7	21.44	5.10	109.3				109.3	21.44	2.0	1.5	58	8.4	0.11	PIPE TO DP16
	DP15-B	M-B	1.81	0.59	12.8	1.08	6.30	6.8	21.3	2.58	5.02	12.9				12.9	2.58	2.0	2.0	7	10.2	0.01	SUMP INLET, OVERTOP CURB INTO POND
	DP16-B								21.3	24.01	5.02	120.6											PIPE TO POND X TO BE DETAINED AND RELEASED AT LESS THAN HISTORIC RATES
	DP17-B	N-B	4.10	0.45	13.1	1.84	6.25	11.5															BASIN N SWALE FLOW TO POND X
		O-B	1.18	0.35	7.8	0.41	7.55	3.1															BASIN O SHEET FLOW INTO POND X

APPENDIX C – HYDRAULIC CALCULATIONS
(TO BE PROVIDED WITH FDR)

APPENDIX D – WATER QUALITY & DETENTION

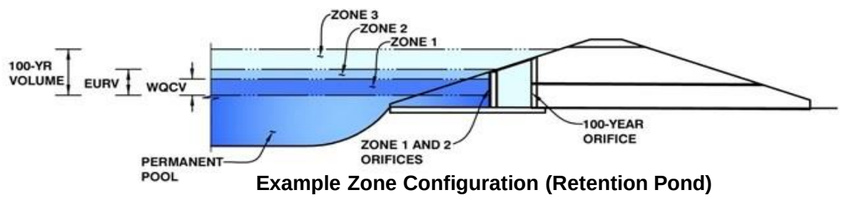
Note that the pond calcs will be reviewed in more detail with the FDR and subsequent submission of CDs. Can't do a full review of these calcs without the pond details in the CDs.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Grandview Reserve - Phase 2**

Basin ID: **Pond A**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	30.60	acres
Watershed Length =	2,327	ft
Watershed Length to Centroid =	1,283	ft
Watershed Slope =	0.018	ft/ft
Watershed Imperviousness =	47.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.505	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.630	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.93 in.) =	0.924	acre-feet	0.93	inches
5-yr Runoff Volume (P1 = 1.21 in.) =	1.247	acre-feet	1.21	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	1.576	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	2.182	acre-feet	1.84	inches
50-yr Runoff Volume (P1 = 2.15 in.) =	2.828	acre-feet	2.15	inches
100-yr Runoff Volume (P1 = 2.49 in.) =	3.654	acre-feet	2.49	inches
500-yr Runoff Volume (P1 = 3.35 in.) =	5.721	acre-feet	3.35	inches
Approximate 2-yr Detention Volume =	0.817	acre-feet		
Approximate 5-yr Detention Volume =	1.112	acre-feet		
Approximate 10-yr Detention Volume =	1.407	acre-feet		
Approximate 25-yr Detention Volume =	1.906	acre-feet		
Approximate 50-yr Detention Volume =	2.217	acre-feet		
Approximate 100-yr Detention Volume =	2.603	acre-feet		

Define Zones and Basin Geometry

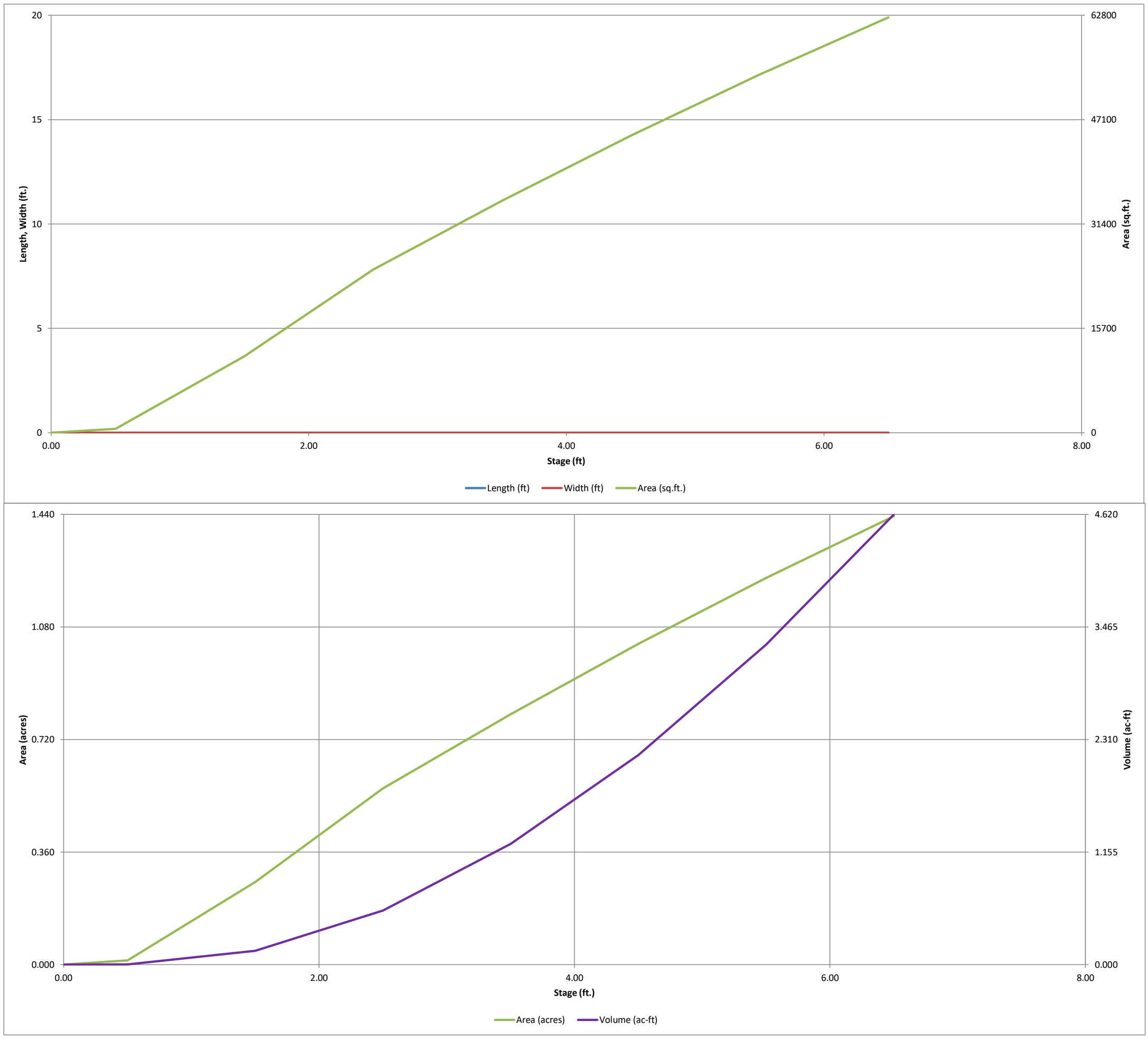
Zone 1 Volume (WQCV) =	0.505	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.124	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.973	acre-feet
Total Detention Basin Volume =	2.603	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 6,966.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
	--	0.50	--	--	--	592	0.014	150	0.003
	--	1.50	--	--	--	11,497	0.264	6,195	0.142
	--	2.50	--	--	--	24,552	0.564	24,219	0.556
	--	3.50	--	--	--	34,874	0.801	53,932	1.238
	--	4.50	--	--	--	44,697	1.026	93,718	2.151
	--	5.50	--	--	--	53,878	1.237	143,005	3.283
	--	6.50	--	--	--	62,472	1.434	201,180	4.618

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

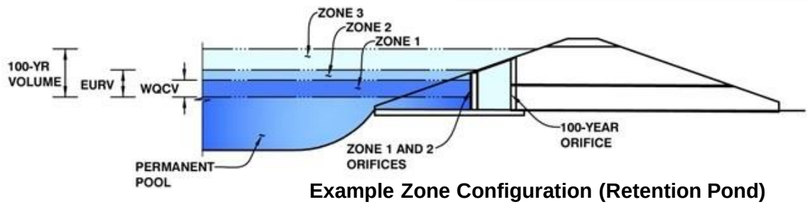


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Grandview Reserve - Phase 2

Basin ID: Pond A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.41	0.505	Orifice Plate
Zone 2 (EURV)	3.96	1.124	Circular Orifice
Zone 3 (100-year)	4.93	0.973	Weir&Pipe (Restrict)
Total (all zones)		2.603	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.41	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	1.77	sq. inches (diameter = 1-1/2 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.229E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.60					
Orifice Area (sq. inches)	1.77	1.77	1.77					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.42	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.96	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	3.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.05	N/A	ft^2
Vertical Orifice Centroid =	0.13	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.67	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	0%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.00	N/A	feet
Overflow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	9.84	N/A	
Overflow Grate Open Area w/o Debris =	11.52	N/A	ft^2
Overflow Grate Open Area w/ Debris =	11.52	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	11.33		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.17	N/A	ft^2
Outlet Orifice Centroid =	0.53	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.83	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	60.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.38	feet
Stage at Top of Freeboard =	6.38	feet
Basin Area at Top of Freeboard =	1.41	acres
Basin Volume at Top of Freeboard =	4.45	acre-ft

Routed Hydrograph Results

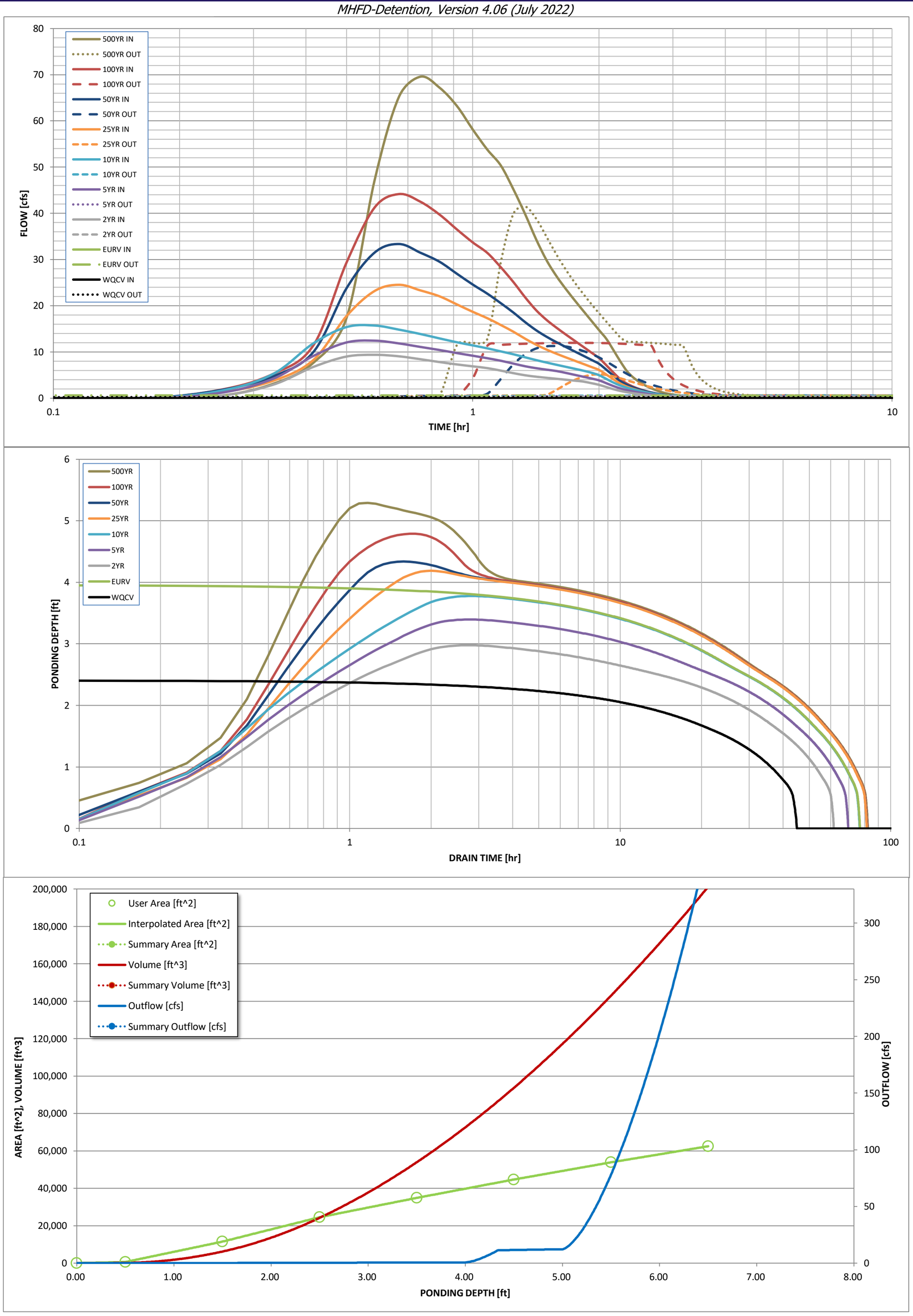
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.93	1.21	1.46	1.84	2.15	2.49	3.35
CUHP Runoff Volume (acre-ft) =	0.505	1.630	0.924	1.247	1.576	2.182	2.828	3.654	5.721
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.924	1.247	1.576	2.182	2.828	3.654	5.721
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.3	1.5	6.1	12.1	27.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.01	0.05	0.20	0.40	0.89
Peak Inflow Q (cfs) =	N/A	N/A	9.4	12.4	15.7	24.5	33.4	44.2	69.6
Peak Outflow Q (cfs) =	0.2	0.6	0.4	0.5	0.6	5.2	11.3	12.0	41.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.6	2.2	3.5	1.9	1.0	1.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	0.9	1.0	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	67	55	61	67	70	67	65	59
Time to Drain 99% of Inflow Volume (hours) =	**43**	72	59	66	72	76	75	74	71
Maximum Ponding Depth (ft) =	2.41	3.96	2.98	3.40	3.78	4.19	4.34	4.79	5.29
Area at Maximum Ponding Depth (acres) =	0.54	0.90	0.68	0.77	0.86	0.95	0.99	1.09	1.19
Maximum Volume Stored (acre-ft) =	0.506	1.630	0.847	1.151	1.462	1.835	1.980	2.447	3.028

Q ratios should be less than or equal to 1.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

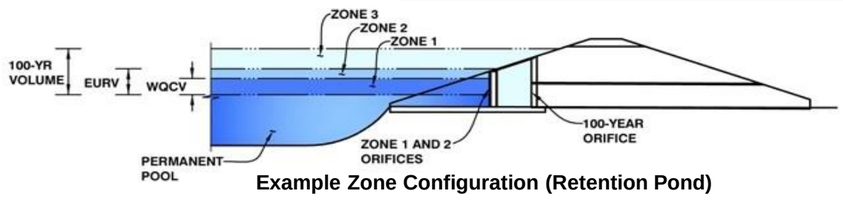
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.54
	0:15:00	0.00	0.00	0.52	1.14	1.58	1.25	1.74	1.79	3.07
	0:20:00	0.00	0.00	2.88	4.16	5.18	3.72	4.68	5.21	7.64
	0:25:00	0.00	0.00	6.76	9.13	11.85	8.24	9.96	11.41	17.34
	0:30:00	0.00	0.00	9.00	12.06	15.38	17.76	23.77	29.33	47.12
	0:35:00	0.00	0.00	9.39	12.44	15.72	23.19	31.50	41.25	65.17
	0:40:00	0.00	0.00	9.06	11.85	14.83	24.53	33.36	44.16	69.56
	0:45:00	0.00	0.00	8.43	11.09	13.88	23.32	31.48	42.51	67.19
	0:50:00	0.00	0.00	7.82	10.42	12.93	22.04	29.52	39.73	63.23
	0:55:00	0.00	0.00	7.30	9.76	12.10	20.29	26.93	36.51	58.14
	1:00:00	0.00	0.00	6.89	9.18	11.42	18.69	24.59	33.70	53.78
	1:05:00	0.00	0.00	6.50	8.64	10.78	17.30	22.61	31.44	50.35
	1:10:00	0.00	0.00	5.96	8.09	10.12	15.83	20.55	28.33	45.20
	1:15:00	0.00	0.00	5.41	7.48	9.50	14.38	18.53	25.13	39.83
	1:20:00	0.00	0.00	4.96	6.91	8.84	12.87	16.46	21.83	34.36
	1:25:00	0.00	0.00	4.64	6.49	8.24	11.57	14.69	19.03	29.84
	1:30:00	0.00	0.00	4.40	6.17	7.71	10.51	13.29	16.92	26.42
	1:35:00	0.00	0.00	4.19	5.87	7.23	9.62	12.12	15.26	23.64
	1:40:00	0.00	0.00	3.99	5.47	6.78	8.83	11.08	13.78	21.19
	1:45:00	0.00	0.00	3.79	5.05	6.36	8.11	10.11	12.42	18.93
	1:50:00	0.00	0.00	3.59	4.64	5.96	7.42	9.20	11.13	16.79
	1:55:00	0.00	0.00	3.25	4.26	5.51	6.76	8.31	9.89	14.75
	2:00:00	0.00	0.00	2.89	3.86	4.98	6.11	7.44	8.69	12.81
	2:05:00	0.00	0.00	2.40	3.23	4.16	5.10	6.15	7.10	10.36
	2:10:00	0.00	0.00	1.94	2.61	3.36	4.06	4.84	5.51	7.92
	2:15:00	0.00	0.00	1.56	2.11	2.72	3.15	3.69	4.09	5.82
	2:20:00	0.00	0.00	1.28	1.73	2.26	2.48	2.89	3.13	4.45
	2:25:00	0.00	0.00	1.06	1.44	1.88	2.00	2.31	2.46	3.47
	2:30:00	0.00	0.00	0.88	1.19	1.56	1.62	1.88	1.95	2.71
	2:35:00	0.00	0.00	0.73	0.99	1.29	1.32	1.52	1.55	2.12
	2:40:00	0.00	0.00	0.59	0.81	1.05	1.06	1.22	1.22	1.64
	2:45:00	0.00	0.00	0.48	0.65	0.85	0.85	0.98	0.95	1.26
	2:50:00	0.00	0.00	0.39	0.53	0.69	0.68	0.78	0.74	0.98
	2:55:00	0.00	0.00	0.32	0.42	0.55	0.54	0.62	0.59	0.78
	3:00:00	0.00	0.00	0.26	0.34	0.44	0.44	0.50	0.48	0.63
	3:05:00	0.00	0.00	0.21	0.27	0.35	0.35	0.40	0.38	0.50
	3:10:00	0.00	0.00	0.16	0.21	0.27	0.27	0.31	0.30	0.39
	3:15:00	0.00	0.00	0.12	0.15	0.21	0.21	0.23	0.23	0.29
	3:20:00	0.00	0.00	0.08	0.11	0.15	0.15	0.17	0.16	0.21
	3:25:00	0.00	0.00	0.05	0.07	0.10	0.10	0.11	0.11	0.14
	3:30:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.07	0.08
	3:35:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.03	0.04
	3:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Grandview Reserve Phase 2**

Basin ID: **Pond B**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	38.19	acres
Watershed Length =	2,173	ft
Watershed Length to Centroid =	1,171	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	43.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.597	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.815	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.93 in.) =	1.033	acre-feet	0.93	inches
5-yr Runoff Volume (P1 = 1.21 in.) =	1.395	acre-feet	1.21	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	1.771	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	2.481	acre-feet	1.84	inches
50-yr Runoff Volume (P1 = 2.15 in.) =	3.268	acre-feet	2.15	inches
100-yr Runoff Volume (P1 = 2.49 in.) =	4.283	acre-feet	2.49	inches
500-yr Runoff Volume (P1 = 3.35 in.) =	6.832	acre-feet	3.35	inches
Approximate 2-yr Detention Volume =	0.908	acre-feet		
Approximate 5-yr Detention Volume =	1.236	acre-feet		
Approximate 10-yr Detention Volume =	1.571	acre-feet		
Approximate 25-yr Detention Volume =	2.140	acre-feet		
Approximate 50-yr Detention Volume =	2.503	acre-feet		
Approximate 100-yr Detention Volume =	2.974	acre-feet		

Define Zones and Basin Geometry

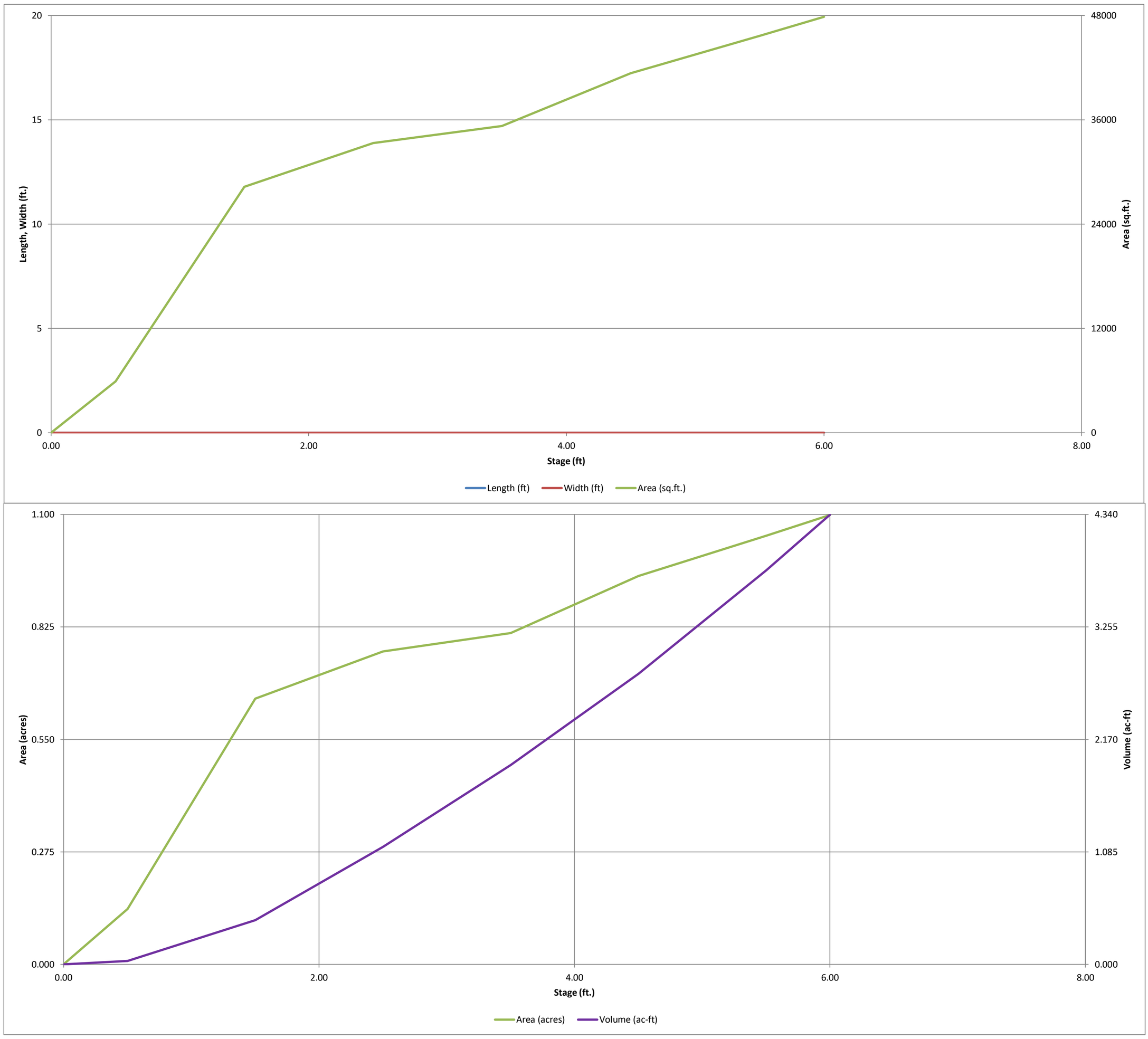
Zone 1 Volume (WQCV) =	0.597	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.218	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.158	acre-feet
Total Detention Basin Volume =	2.974	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 6,929.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
	--	0.50	--	--	--	5,911	0.136	1,480	0.034
	--	1.50	--	--	--	28,305	0.650	18,588	0.427
	--	2.50	--	--	--	33,324	0.765	49,402	1.134
	--	3.50	--	--	--	35,278	0.810	83,703	1.922
	--	4.50	--	--	--	41,358	0.949	122,021	2.801
	--	5.50	--	--	--	45,643	1.048	165,522	3.800
	--	6.00	--	--	--	47,848	1.098	188,895	4.336

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

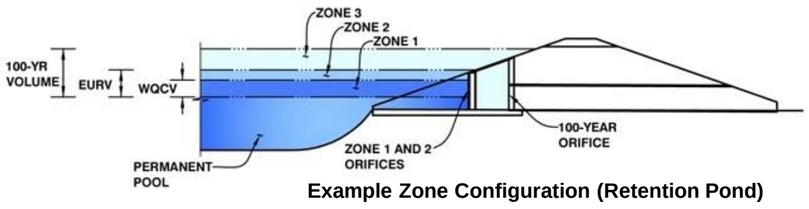


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Grandview Reserve Phase 2**

Basin ID: **Pond B**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.76	0.597	Orifice Plate
Zone 2 (EURV)	3.37	1.218	Circular Orifice
Zone 3 (100-year)	4.68	1.158	Weir&Pipe (Restrict)
Total (all zones)		2.974	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	1.76	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	2.95	sq. inches (diameter = 1-15/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	2.049E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.60	1.20					
Orifice Area (sq. inches)	2.95	2.95	2.95					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.76	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.37	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	1.38	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.01	N/A	ft^2
Vertical Orifice Centroid =	0.06	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.38	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.67	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.38	N/A	feet
Overflow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	6.19	N/A	
Overflow Grate Open Area w/o Debris =	11.52	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.76	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	13.75		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.86	N/A	ft^2
Outlet Orifice Centroid =	0.65	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.72	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	77.50	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.50	feet
Stage at Top of Freeboard =	6.00	feet
Basin Area at Top of Freeboard =	1.10	acres
Basin Volume at Top of Freeboard =	4.34	acre-ft

Routed Hydrograph Results

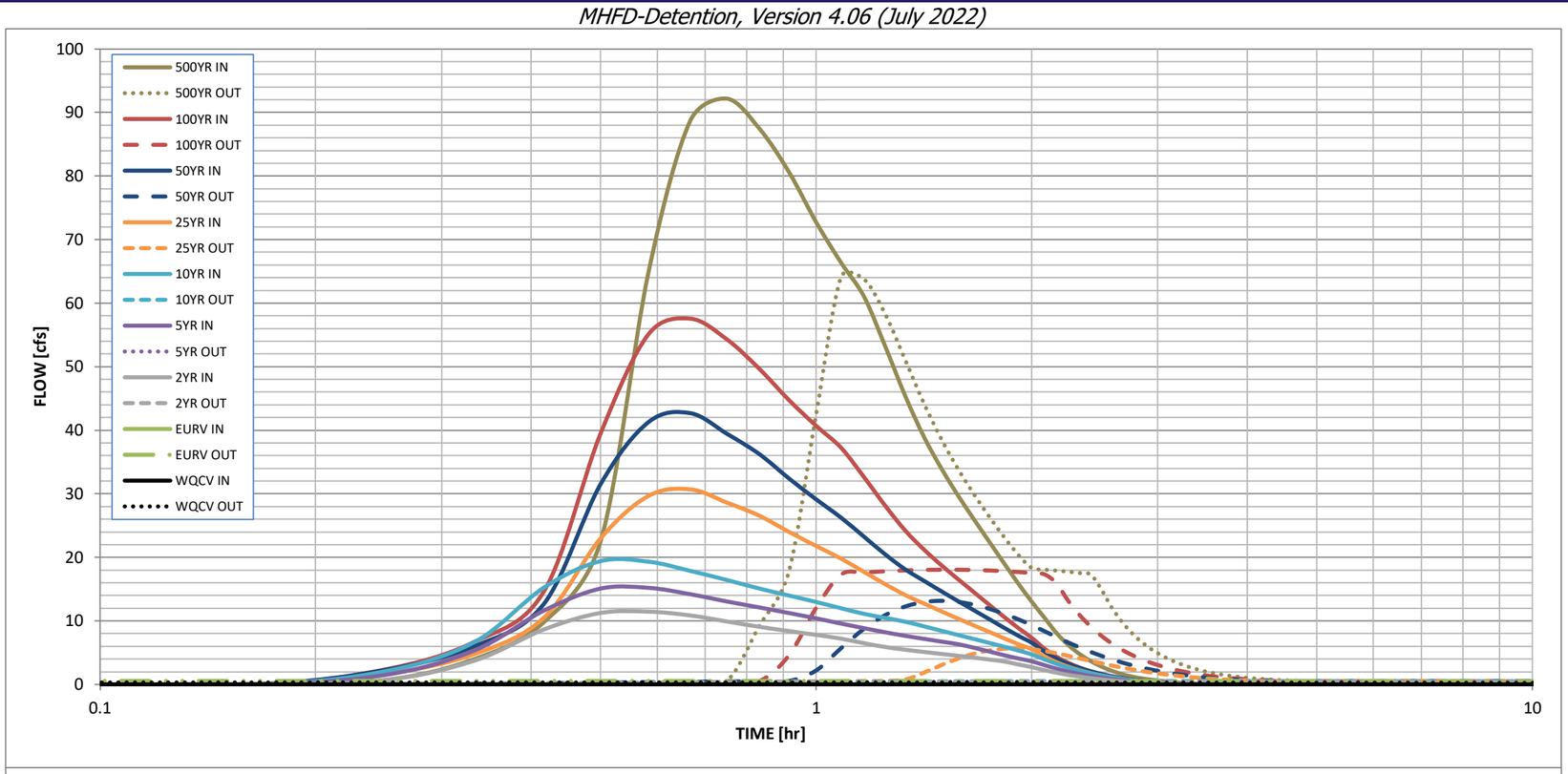
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

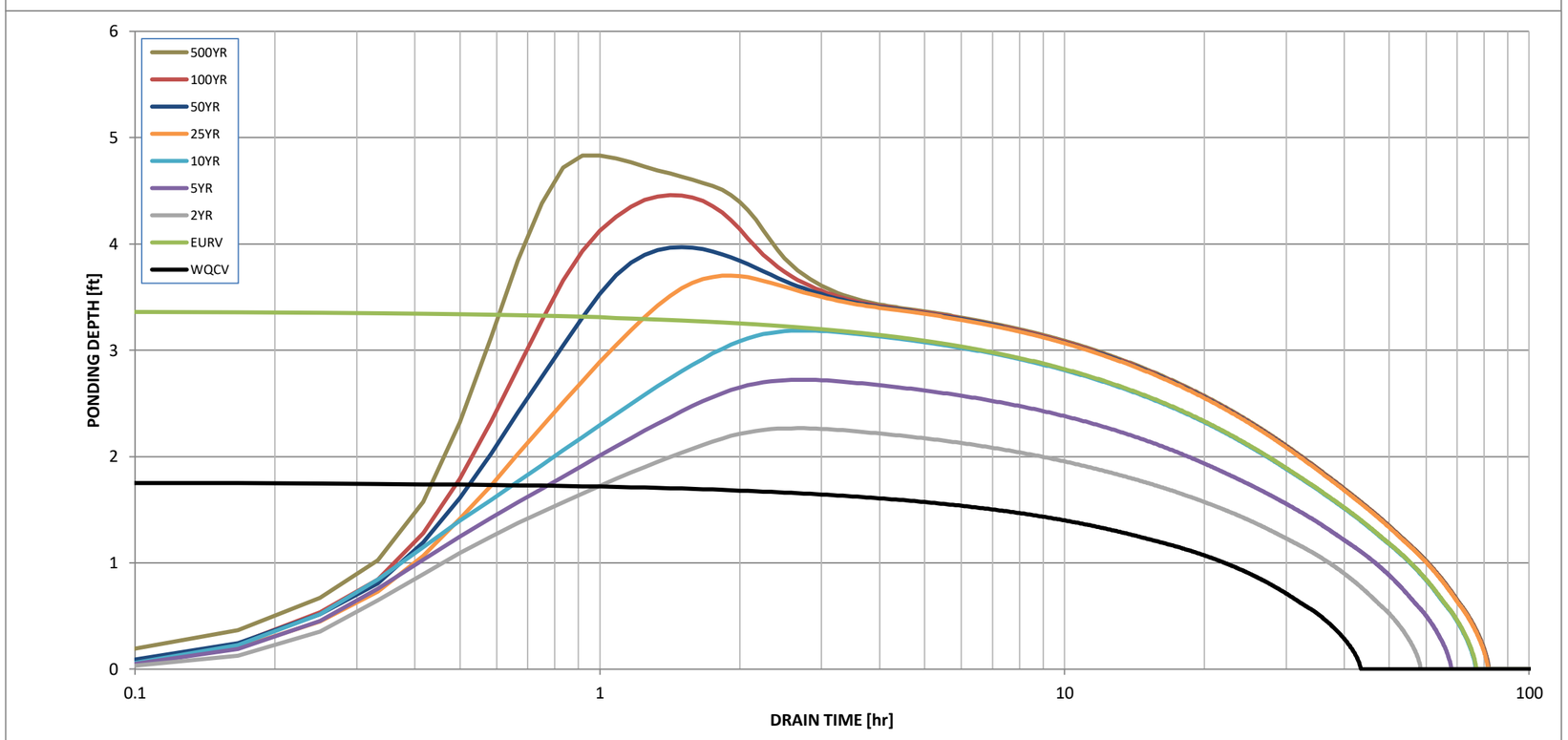
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.93	1.21	1.46	1.84	2.15	2.49	3.35
CUHP Runoff Volume (acre-ft) =	0.597	1.815	1.033	1.395	1.771	2.481	3.268	4.283	6.832
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.033	1.395	1.771	2.481	3.268	4.283	6.832
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.2	0.4	2.2	9.1	18.2	40.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.06	0.24	0.48	1.06
Peak Inflow Q (cfs) =	N/A	N/A	11.5	15.2	19.4	30.7	42.7	57.6	92.2
Peak Outflow Q (cfs) =	0.3	0.6	0.4	0.5	0.5	5.7	13.2	18.1	64.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.2	1.4	2.6	1.4	1.0	1.6
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	1.1	1.5	1.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	66	51	59	66	68	66	63	58
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	55	64	72	75	74	72	69
Maximum Ponding Depth (ft) =	1.76	3.37	2.27	2.72	3.19	3.70	3.97	4.46	4.83
Area at Maximum Ponding Depth (acres) =	0.68	0.80	0.74	0.77	0.80	0.84	0.88	0.94	0.98
Maximum Volume Stored (acre-ft) =	0.600	1.817	0.954	1.304	1.665	2.086	2.318	2.754	3.120

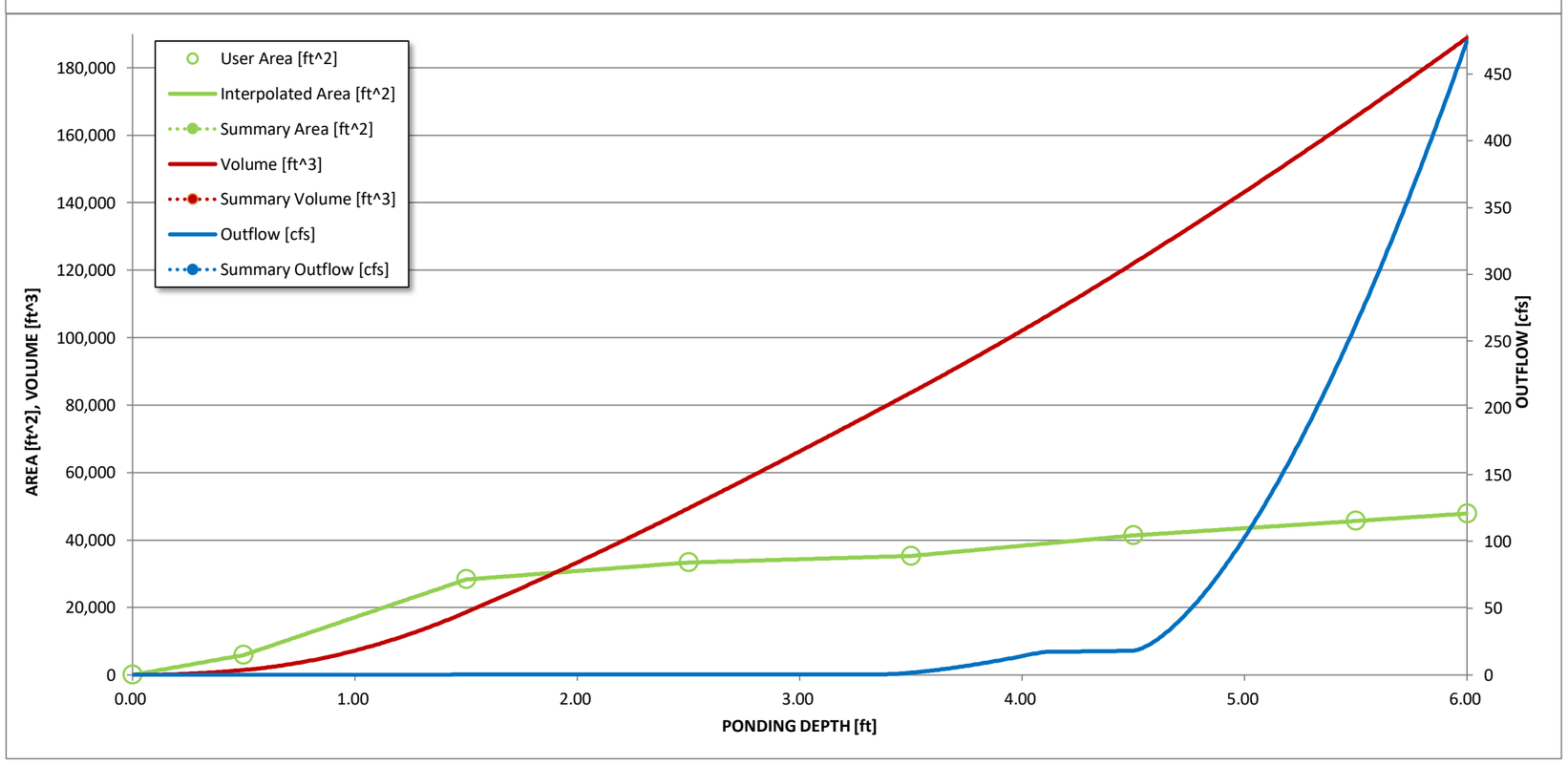
Q ratios should be less than or equal to 1.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.71
	0:15:00	0.00	0.00	0.68	1.49	2.06	1.63	2.27	2.35	3.99
	0:20:00	0.00	0.00	3.75	5.36	6.67	4.79	6.02	6.71	9.81
	0:25:00	0.00	0.00	8.65	11.62	15.24	10.49	12.68	14.63	22.51
	0:30:00	0.00	0.00	11.25	15.08	19.40	22.98	31.51	39.48	64.89
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	2:15:00	0.00	0.00	1.50	2.03	2.65	2.78	3.23	3.40	4.78
	2:20:00	0.00	0.00	1.23	1.65	2.17	2.24	2.59	2.66	3.69
	2:25:00	0.00	0.00	0.99	1.34	1.76	1.79	2.07	2.08	2.84
	2:30:00	0.00	0.00	0.80	1.09	1.42	1.44	1.65	1.62	2.18
	2:35:00	0.00	0.00	0.64	0.87	1.13	1.13	1.30	1.25	1.65
	2:40:00	0.00	0.00	0.51	0.68	0.89	0.89	1.02	0.97	1.28
	2:45:00	0.00	0.00	0.41	0.53	0.70	0.69	0.79	0.76	1.00
	2:50:00	0.00	0.00	0.32	0.42	0.55	0.55	0.63	0.60	0.79
	2:55:00	0.00	0.00	0.25	0.32	0.43	0.43	0.49	0.48	0.62
	3:00:00	0.00	0.00	0.19	0.24	0.33	0.33	0.37	0.36	0.47
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	3:10:00	0.00	0.00	0.09	0.12	0.17	0.17	0.19	0.18	0.23
	3:15:00	0.00	0.00	0.06	0.08	0.11	0.11	0.12	0.12	0.14
	3:20:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.06	0.08
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	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX E – REFERENCES

For Reference Material, please only include sheets that are relevant to this portion of the project (Phase 2). Also, highlight specific information, such as basins & DP's being discussed within this report.

HRGreen

HRGREEN.COM

Grandview Reserve
Master Development Drainage Plan

August 2021

HR Green Project No: 191850

Prepared For:

4 SITE INVESTMENTS, LLC

Mr. Peter Martz or Paul Howard

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Colorado Springs, CO 80920

719-499-8416

Prepared By:

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Engineer's Statement

This report and plan for the drainage design of the development, Grandview Reserve, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the *El Paso County Drainage Criteria* Manual and is in conformity with the master plan of the drainage basin. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____

Greg Panza, PE Date

State of Colorado No. 37081

For and on behalf of HR Green Development, LLC

Developer's Statement

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

4 Site Investments LLC

By: _____

Title: _____

Address: _____

_____

El Paso County:

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2 and the Engineering Criteria Manual, as amended.

_____ _____

Jennifer Irvine, P.E. Date

County Engineer/ECM Administrator

Master Development Drainage Plan – Grandview Reserve

I. General Purpose, Location and Description

a. Purpose and Scope of study

The Purpose of this Master Development Drainage Plan (MDDP) is to describe the onsite and offsite drainage patterns, existing and proposed storm infrastructure as it relates to preliminary water quality and stormwater detention, areas tributary to the site and the planned storm water management for Grandview Reserve 2 development. The items discussed in this report are preliminary in nature and final drainage calculations and design will be required as development proceeds. This report provides a general drainage concept and guidance for future development of Grandview Reserve.

b. DBPS Investigations

The Gieck Ranch Drainage Basin Planning Study (DBPS) Preliminary Design Report prepared by Drexel, Barrell was reviewed to determine existing plans and constraints that would influence the design of Grandview Reserve. The proposed plans for Grandview Reserve are in general conformance with the DBPS.

The DBPS shows 4 reaches through Grandview Reserve. The Main Stem (MS) in the south western portion of the site, the Main Stem Tributary #2 (MST2) to the north and east of the Main Stem, the East Fork Tributary (EFT) in the middle of the site north and east of MST2, and the East Fork Upper (EF) at the north east side of the site. These drainageways have been reviewed in the following reports and further analysis will be completed of these major drainageways in future planning documents.

- Unnamed Tributary Black Squirrel Creek, Four Way Ranch Letter of Map Revisions, Kiowa Engineering, March 2004
- Haegler and Gieck Drainage Basins Letter of Map Revision, Four Way Ranch Subdivision, Kiowa, March 2004
- Unnamed Tributary Black Squirrel Creek Drainage Basin, Letter of Map Revision, Elbert Road Site, Kiowa Engineering, February 2006
- Geick Ranch Drainage Basin Planning Study (DBPS), Drexel Barrell, October 2010 (not approved)
- Meridian Ranch Master Development Drainage Plan (MDDP), Tech Contractors, January 2018

c. Agency Jurisdictions

Listed below are the jurisdictions that this project will conform to:

El Paso County

Falcon Colorado Municipal Code (where applicable)

Federal Emergency Management Agency

d. General Project Description

Grandview Reserve is located in Falcon, Colorado within El Paso County and contains approximately 776 acres within the south half of section 21 and 22 and the north half of section 27 and 28, Township 12 South, and Range 66 West of the Sixth Principal Meridian in Ela Paso County, Colorado. See below for approximate site location.

Figure 1 - Site Map

e. Data Sources

Listed Below are the technical resources reviewed in the preparation of this MDDP:

City of Colorado Springs Drainage Criteria Manual (DCM), Volumes 1 and 2

Mile High Flood District

NOAA Atlas 14

NRCS Soil Survey for El Paso County Area, Colorado

FEMA FIRM 08041C0556G and FIRM 08041C0552G (eff. 12/7/2018)

El Paso County Assessor Property Records

f. Applicable Criteria and Standards

Per the DBPS, flows from the proposed site will be limited to historic flows in an effort to maintain the stability and of the existing channels with the drainage basin. The master plan follows the Drainage Criteria Manual for El Paso County which refers to the City of Colorado Springs Drainage Criteria Manuals as amended.

II. Project Characteristics

a. Location in Drainage Basin, offsite flows, size

Grandview Reserve is located within the Gieck Ranch Drainage Basin which covers approximately 22 square miles. This drainage basin is tributary to Black Squirrel Creek and joins said creek just to the south of Elicott, CO about 18 miles to the south. Black Squirrel Creek eventually drains to the Arkansas River in Pueblo Colorado. The majority of the Gieck Ranch Drainage basin is undeveloped consisting of rural farmland. The Gieck Ranch Drainage basin lies north of the Haegler Ranch drainage basin.

As part of the Fourway LOMR discussed above, the study reviewed the hydrology and hydraulics for the Main Stem Tributaries, however only a small portion of the site within Grandview was analyzed. The peak flows rates for the Main Stem for the 100 year event was 413 cfs and for the Main Stem Tributary (MST2) was 280 cfs.

For the East Fork tributaries (EF and EFT), the DBPS established 100 year flow rates of 595 cfs for the East Fork (EF) and 217 cfs for the East Fork Tributary (EFT)

Generally offsite flows are conveyed through the site via the 4 tributaries. Minor offsite basins may sheet flow onto the site. These flows will be routed through the site via the 4 tributaries.

b. Compliance with DBPS

This MDDP is in general conformance with the guidelines outlined in the Gieck Ranch DBPS. Grandview Reserve will construct multiple full spectrum detention facilities to limit the effects of development and mimic natural flow patterns.

Existing downstream infrastructure is currently limited to the historic drainage channels and minimal downstream improvements exist. As such, the site follows the DBPS and restricts offsite flow rates to not exceed historic flow rates. The sites ultimate outfalls will generally be along the same historic tributaries. Although outfall rates will be at or below historic, the cumulative volume of runoff will increase and therefore downstream facilities may see an increase in the duration of flows. This may provide a net benefit to the downstream facilities by providing more water to assist with the sustenance of vegetation however it should be noted that increased volume may expedite potential erosion or channel movement.

c. Site Characteristic

Per the NRCS web soil survey, the site is made up entirely of Type A and B soils. The majority of which are Type A soils. The predominate soils are Blakeland loamy sand, Columbine gravelly sandy loam, and Stapleton sandy loam. The first two soils are Type A soil and cover approximately 55.1% of the site and the later soil is a Type B soil and covers the remaining 44.9% of the site. See Appendix A for the NRCS soil map.

Current ground cover is predominantly short- to mid-grass prairie grasslands and former farmland which consists of nonnative weeds and grasses. The site has very few, if any, trees and a minimal number of shrubs are found on the site.

d. Major drainage ways and structures

As mentioned previously, 4 major drainage ways exist on the site. These convey existing on and off-site flows and current on-site flows through the site in a southeasterly direction. The drainageways eventually cross Highway 24 via culverts and other structures; further survey will be conducted to determine their effectiveness as the development of the site progresses.

A breached stock pond is located along the Main Stem; while it is breached, it still causes some ponding along the channel. As development occurs, this dam will be completely removed, and the region of the channel will be regraded to match the existing character of the remainder of the Main Stem channel. Improvements along the Main Stem Channel will be limited to the previously described reach.

Main Stem Tributary will be realigned through the site and will meander through a designated 100-foot corridor generally maintaining a 1% slope with a series of grade control structures. MST will be constructed to achieve a channel that is high functioning and will require low maintenance.

East Fork and East Fork Tributary improvements will be implemented to ensure the channels are high functioning low maintenance drainageway corridors.

e. Existing and proposed land uses

The existing site is open rangeland and farmland with no visible structures. The proposed development will consist of low, medium, and high density residential, along with two institutional sites, multiple pocket park sites, a large community park and a commercial area adjacent to Highway 24. The current land plan assumes approximately 3,261 dwelling units will be constructed on the site.

Land Use	MAX DU/AC
Low	2
Medium	4
Medium – High	8
High	12

III. Hydrologic Analysis

a. Major Basins and subbasins

Major Basin Description

- Previous basin study: Gieck Ranch Drainage Basin Planning Study
- Per FEMA FIRM 08041C0556G and 08041C0552G (eff. 12/7/2018), Grandview Reserve has four mapped channels within its boundaries. .
- Per aerial imaging, no major irrigation is in the vicinity that would affect Grandview Reserve.

The site has been divided into 8 major drainage basins per where each basin is tributary to a full spectrum detention pond facility. These basins and associated sub basins are described in more detail in the next section of this report.

Subbasin Description

The entire site drains in a south easterly direction and is divided into 8 major drainage basins and a total of 18 subbasins together as described below.

- Subbasin A1 is located in the southwestern corner of the site, to the south and west of MS. The basin drains towards the southeast to proposed detention pond A. Current planning documents call for medium density dwelling units and a small pocket park. The basin is 37.00 acres, with a composite impervious value of 35.22% and runoff rates for the 5 and 100 year of 30.72 cfs and 100.64 cfs respectively. The pond will discharge at predevelopment rates and into MS via the ponds outlet structure.
- Subbasin B1 is located between MS and MST2 to the east of subbasin A1. The basin drains towards the southeast and towards subbasin B2. Current planning documents call for medium density dwelling units and some parkland area. The basin is 37.00 acres, with a composite impervious value of 45.00% and runoff rates for the 5 and 100 year of 29.46 cfs and 97.08 cfs respectively.
- Subbasin B2 is located between MS and MST2 to the northeast of subbasin A1. The basin drains towards the southeast and towards Detention Pond B. Current planning documents call for medium density dwelling units. The basin is 24.89 acres, with a composite impervious value of 43.26% and runoff rates for the 5 and 100 year of 12.02 cfs and 42.26 cfs respectively.
- Subbasin B3 is located between MS and EF and to the northeast of east of basin B2. The existing MST2 tributary runs through the basin. The site drains towards the southeast and towards Detention Pond B. Current planning documents call for high, medium-high, and medium density dwelling units along with a pocket park. The basin is 118.90 acres, with a composite impervious value of 49.42% and runoff rates for the 5 and 100 year of 92.76 cfs and 295.27 cfs respectively.
- Subbasin C1 is located to the northeast of east of basin B1 and the existing MST2 tributary runs through the middle of the basin. The basin drains towards the southeast and towards Detention Pond C. Current planning documents call for an institutional parcel, medium and high density dwelling units and a pocket park. The basin is 77.83 acres, with a composite impervious value of 51.20% and runoff rates for the 5 and 100 year of 77.99 cfs and 238.03 cfs respectively.
- Subbasin D1 is located between MS and MST2 to the east of Basin B3 and adjacent to the MST2 channel. The basin drains towards the southeast and towards drainage basin D2. Current planning documents call for medium density dwelling units along with a pocket park. The basin is 24.33 acres, with a composite impervious value of 53.89% and runoff rates for the 5 and 100 year of 24.15 cfs and 70.07 cfs respectively.
- Subbasin D2 is located between MS and MST2 to the south of basins D1 and B3. The basin drains towards the southwest and towards detention pond D. Current planning documents call for high density dwelling units along with a pocket park and a commercial parcel. The basin is 77.90 acres, with a composite impervious value of 62.10% and runoff rates for the 5 and 100 year of 98.47 cfs and 252.18 cfs respectively.
- Subbasin E1 is located just east of EFT along the northern portion of the site. The basin drains towards the southeast and towards basins F3 and F4. Current planning documents call for low

density dwelling units. The basin is 88.60 acres, with a composite impervious value of 19.54% and runoff rates for the 5 and 100 year of 46.88 cfs and 178.04 cfs respectively.

- Subbasin F1 is located east of basin E1 and between EFT and EF along the northern portion of the site. The basin drains towards the southeast and towards basin F3 and F4. Current planning documents call for a large community park, high density dwelling units, commercial site and an institution parcel. The basin is 33.73 acres, with a composite impervious value of 25.00% and runoff rates for the 5 and 100 year of 16.28 cfs and 58.95 cfs respectively.
- Subbasin F2 is located east of the existing drainage channel EFT. The basin drains towards the southwest and towards basin F4 and to the EFT drainage channel which runs parallel to the north east with Highway 24. Current planning documents call for high density dwelling units and commercial space. The basin is 67.64 acres, with a composite impervious value of 51.39% and runoff rates for the 5 and 100 year of 60.11 cfs and 170.90 cfs respectively.
- Subbasin F3 is located west of the existing drainage channel EF. The basin drains towards the southeast towards drainage channel EF but will be conveyed south towards subbasin F4. Current planning documents call for medium density dwelling units. The basin is 12.84 acres, with a composite impervious value of 45.00% and runoff rates for the 5 and 100 year of 11.36 cfs and 32.93 cfs respectively.
- Subbasin F4 is located west of the existing drainage channel EF and south of subbasins F1 and F3. The basin drains towards the southeast towards detention pond F. Current planning documents call for medium and medium-high density dwelling units. The basin is 51.81 acres, with a composite impervious value of 49.54% and runoff rates for the 5 and 100 year of 42.32 cfs and 124.89 cfs respectively.
- Subbasin G1 is located west of the existing drainage channel EFT along the northern property boundary. The basin drains towards the southeast towards detention pond G. Current planning documents call for medium density dwelling units and a park. The basin is 20.13 acres, with a composite impervious value of 36.52% and runoff rates for the 5 and 100 year of 13.78 cfs and 43.95 cfs respectively.
- Subbasin G2 is located east of the existing drainage channel EFT along the northern property boundary. The basin drains towards the southeast towards detention pond G. Current planning documents call for low density dwelling units. The basin is 15.14 acres, with a composite impervious value of 25.00% and runoff rates for the 5 and 100 year of 6.55 cfs and 23.95 cfs respectively.
- Subbasin H1 is located in the northeast corner of the site and east of the existing drainage channel EFT. The basin drains towards the south towards subbasin H4. Current planning documents call for low density dwelling units and a small park. The basin is 20.71 acres, with a composite impervious value of 24.49% and runoff rates for the 5 and 100 year of 5.68 cfs and 27.62 cfs respectively.
- Subbasin H2 is located south of basin G2 and east of the existing drainage channel EFT. The basin drains towards the south towards subbasin H4. Current planning documents call for medium density dwelling units and a small park. The basin is 18.55 acres, with a composite

impervious value of 46.68% and runoff rates for the 5 and 100 year of 16.24 cfs and 47.62 cfs respectively.

- Subbasin H3 is located south of basin H2 and east of the existing drainage channel EFT. The basin drains towards the southeast towards subbasin H4. Current planning documents call for medium density dwelling units and a small park. The basin is 6.01 acres, with a composite impervious value of 40.57% and runoff rates for the 5 and 100 year of 5.21 cfs and 15.60 cfs respectively.
- Subbasin H4 is located south of basin H2 and east of the existing drainage channel EFT and basin H3. The basin drains towards the south towards detention pond H. Current planning documents call for medium density dwelling units and park/open space area. The basin is 27.65 acres, with a composite impervious value of 38.24% and runoff rates for the 5 and 100 year of 20.93 cfs and 64.71 cfs respectively.

The above mentioned basins are large planning area basins and as drainage reports are developed for the individual developed parcels additional drainage reports and calculations will be required. It is expected that storm drainage infrastructure consisting of inlets, storm sewer and open drainage channels will be constructed as the property develops.

- Offsite Basins as shown in the Meridian Ranch MDDP include basins HG4, HG5, HG6A, HG6B, HG13, and HG14. Flow contributing to the site from these basins will be routed through the existing tributaries. Flow rates as shown in the MDDP Ranch report include the following flows and associated tributary areas.

Offsite Flow Summary					
Basin Description	**Ultimate Design Point**	**Basin Area (ac)**	**Receiving Tributary**	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
HG4	G6	57	Main Stem	2	42
HG5	G6	72	Main Stem	3	52
HG6A	G6	88	Main Stem	3	51
HG6B	G6	66	Main Stem	2	35
HG13	G08	54	Main Stem Tributary 2	4	59
HG14	G08	147	Main Stem Tributary 2	5	83

Offsite Flow Summary				
Design Point	**Basin Area (ac)**	**Receiving Tributary**	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
G6	760	Main Stem	36	628
G08	201	Main Stem Tributary 2	8	122

These basins along with the offsite basins which lie east of Eastonville Road contribute flows onto the site through the major tributaries. Estimate oncoming flows for each tributary are as follows:

Offsite Flow Summary		
Tributary	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
Main Stem	36	628
Main Stem Tributary 2	8	122
East Fork Tributary*	56	116
East Fork*	175	357

*Flows from Gieck Ranch DBPS, Oct 2010

As hydraulic analysis continues for the channels, these offsite flows will be used to size the channels for proper conveyance of the flow however it should be noted that the flows mentioned for the Main Stem and Main Stem Tributary 2 assume proper conveyance of the flow through (below or above) Eastonville Road. Due to the unknown nature of these conditions at the time of buildout, a probable scenario of the split flows will require analysis and agreed upon flow rates to each channel will be required. Currently some of the flow shown going to the Main Stem Tributary 2 may be diverted into the Main Stem. Previous analysis done by JR Engineering assumed approximately 160 additional cfs going to the Main Stem Tributary #2 during the 100-year event and as such it is recommended the following flows be used for analysis of the oncoming offsite flows:

Revised Offsite Flow Summary		
Tributary	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
Main Stem**	67	413
Main Stem Tributary 2**	59	280
East Fork Tributary*	61	217
East Fork*	180	595

*Flows from Gieck Ranch DBPS, Oct 2010

**Flows from 4 Way Ranch LOMR, Mar 2004

Please note that the preliminary drainage reports will be required to reconcile any differences between the various reports done for these channels.

b. Methodology

Design rainfall was determined utilizing figures from the NOAA Atlas 14, Volume 8, Version 2 to determine the 5-year and 100-year rainfall values for 1, 6 and 24-hour events. The 1-hour rainfall depths are 1.22 and 2.50 in/hr respectively, 6 hour 1.79 and 3.87 in/hr respectively and 2.36 and 4.90 in/hr for the 24 hour event. The rainfall values were then used as inputs into the Colorado Urban Hydrograph Procedure (CUHP) spreadsheets to determine runoff values for both pre-development and post-development site.

CUHP is an evolution of the Snyder unit hydrograph and is calibrated for use along the Colorado Front Range. 1 Hour rainfall amounts are input into the program to produce a storm hyetograph that is then uses to calculate a storm hydrograph for each basin depending on the subbasins properties including

slope, length, shape, impervious area, pervious depression storage area, and various infiltration rates. Tabular hydrographs are then computed and can be used in EPA SWMM. The CUHP results are included within Appendix B.

EPA SWMM was used to determine flow routing via the kinematic wave method. Subbasins were routed to their respective design points and detention ponds for both the developed and predeveloped condition to determine peak runoff amounts for the 5-year and 100-year storm events. Information from these models along with information and calculations performed in the Colorado Springs BMP spreadsheets was used to determine pond sizing calculations and release rates.

c. Basin Hydrology

A summary of the flows for both the predeveloped and developed cases for each basin, subbasin and Pond are found on next page along with the full computation found in Appendix B.

SWMM Basin and Pond Summary						
Basin Description	**Basin Area (ac)**	**% Impervious**	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**	**5 Year Pond Volume (ac-ft)**	**100 Year Pond Volume (ac-ft)**
A1	45.38	35.22%	30.72	100.64		
			Pond A		1.83	3.50
B1	37.00	45.00%	29.46	97.08		
B2	24.89	43.26%	12.02	42.26		
B3	118.90	49.42%	92.76	295.27		
			Pond B		5.90	19.00
C1	77.83	51.20%	77.99	238.03		
			Pond C		3.91	6.87
D1	24.33	44.14%	24.15	70.07		
D2	77.90	62.10%	98.47	252.18		
			Pond D		6.61	10.19
E1	88.60	19.54%	46.88	178.04		
			Pond E		1.96	2.44
F1	33.73	25.00%	16.28	58.95		
F2	67.64	51.39%	60.11	170.90		
F3	12.84	45.00%	11.36	32.93		
F4	51.81	46.54%	42.32	124.89		
			Pond F		7.38	12.62
G1	20.13	36.52%	13.78	43.95		
G2	15.14	25.00%	6.55	23.95		
			Pond G		0.72	2.03
H1	20.71	24.49%	5.68	27.62		
H2	18.55	43.68%	16.24	47.62		
H3	6.01	40.57%	5.21	15.60		
H4	27.65	38.24%	20.93	64.71		
			Pond H		2.93	6.17

IV. Hydraulic Analysis

a. Major Drainageways

In general, the site runoff flows towards the 4 major drainageways and in a southeasterly direction. These basins are described in more detail below:

Main Stem

The Main Stem (MS) is in the southwestern portion of the site. Offsite flows collect and are conveyed under Eastonville Road via a culvert. MS travels in a southeasterly direction and combines with the Main Stem Tributary #2 (MST2) just off site where it is then conveyed past Highway 24 via a culvert. An existing breached stock pond exists in the approximate center point of the channel within the site. Jurisdictional wetlands exist within this channel and the area is within a Zone A floodplain towards the southern portion of the site. This channel sees only intermittent flows at this time however once development occurs there may be a more constant baseflow.

Proposed improvements for MS include the removal of the breached stock pond berm and regrading of the affected stretch of channel to restore its historic state. Proposed flow rates through MS are not to exceed historic flowrates and as such, the remainder of the channel is to remain in its current state sans any preemptive check structures; modeling indicates the channel shall remain stable despite the removal of the existing berm.

Main Stem Tributary #2

MST2 crosses Eastonville road via an existing culvert and flows through the site in a southeasterly direction. Portions of this channel are within a mapped floodplain as shown in the existing FIRM Panel. Per a July email from the USACE this drainage channel was preliminarily determined to be a non-jurisdictional waters/wetland.

Proposed improvements for MST2 include the realignment of the channel, generally shifting the channel towards the west to accommodate the proposed land plan. There is to be a dedicated 100’ corridor in which the valley will meander. Preliminary analysis indicates the valley will have an average width of approximately 63’ at the elevation necessary to meet freeboard requirements; initial sizing approximates the bankfull width to be 6.8’. The valley and channel thalweg will generally follow the same profile, with some deviation as the bankfull channel meanders through the valley in turn decreasing the low flow channels average slope. The average valley profile is to be approximately 1% with a series of grade control structures to both decrease elevation and dissipate energy to meet natural channel criteria as outline in El Paso County criteria and agreed upon channel parameters.

East Fork Tributary

The East Fork tributary (EFT) crosses the north property line and flows are conveyed through the site via a natural channel. The channel has been mapped as a Zone A floodplain per the existing FIRM panel; it appears any hydraulic effects of the crossing at Eastonville Road was not accounted for in the floodplain delineation. While the current floodplain delineation shows the channel continuing through Highway 24, there is no existing crossing for this section of the drainage channel below Highway 24 and instead the flows are conveyed to the northeast towards the East Fork Upper (EF). Per a July email from the USACE this drainage channel was preliminarily determined to be a non-jurisdictional waters/wetland.

Per SWMM modeling the current velocities will require channel stabilization. The EFT channel is to be engineered later in the design which will likely include a combination of channel widening, lowering of slope facilitated by the implementation of drop structures to meet non erosive velocity requirements. Bank stabilization, should it be necessary, may include coir rolls, erosion control blankets, live willow staking, soil lifts and/or other measures to ensure successful bank stabilization. The drainageway will require further analysis and design which will be completed as the project progresses.

East Fork Upper

The EF crosses the north property line approximately 1500' east of the EFT crossing. The flow through the site is via a natural channel and travels in a southeasterly direction. The channel is mapped as a Zone A floodplain, and the channel crosses Highway 24 via an existing shallow bridge. The current floodplain delineation shows EF and EFT eventually merging approximately 1750' southeast of the site, however, as mentioned above Highway 24 blocks the flow of the EFT and flows are conveyed northeast to the EF bridge crossing.

Per SWMM modeling the current velocities will require channel stabilization. The EF channel is to be engineered later in the design which will likely include a combination of channel widening, lowering of slope facilitated by the implementation of drop structures to meet non erosive velocity requirements. Bank stabilization, should it be necessary, may include coir rolls, erosion control blankets, live willow staking, soil lifts and/or other measures to ensure successful bank stabilization. The drainageway will require further analysis and design which will be completed as the project progresses.

V. Environmental Evaluations

a. Significant existing or potential wetland and riparian areas impacts

As part of this work, the developer has engaged Ecosystem Services, LLC (ECOS) to perform environmental studies of the site that will be submitted with the planning documents. Major information from this report related to the wetlands shows that two of the tributaries through the site, the Main Stem and the East Fork contain jurisdictional wetlands and the other two tributaries, the East Fork Tributary and the Main Stem Tributary #2 are non-jurisdictional wetlands.

At this time, only minor improvements to the jurisdictional channels are proposed. These stream improvements will be made with keeping the natural habitat intact and the natural function of these channels as it is to maintain the wetland habitat. The non-jurisdictional channels will be modified, and the design of those channels is forthcoming.

b. Stormwater quality considerations and proposed practices

As part of the development, full spectrum detention facilities will be installed to provide water quality for the development. The facilities will be designed using El Paso County criteria and provide stormwater quality by slowing the release of stormwater captured by the ponds and allowing solids to settle out. Additionally, when possible, the revised drainage channels, which were not jurisdictional wetlands, will be used to convey stormwater via a natural channel. Stormwater must be treated before entering the natural channels. The natural channel will provide a pervious means to transport stormwater and provide some water quality benefits as well.

On site practices for the homes, schools, churches, and other buildings should use means such that impervious areas drain across pervious area to allow for infiltration during the minor events. This would

include discharge of the gutters onto landscape areas vs. directly connecting to storm sewer and using natural ditches and swales where it is logical and makes sense to convey stormwater in lieu of storm sewer piping.

c. Permitting requirements

When work infringes upon the wetlands or floodplain a 404 Permit will be required. If the work within the waterways is minimal, it will likely be covered under a nationwide 404 permit; it is however possible that an individual permits will be required.

The Colorado Department of Public Health and Environment will require permits for any disturbance that exceed 1 acre of land. Should groundwater be encountered, a dewatering permit will also be required.

El Paso County will require an Erosion and Stormwater Quality Control Permit and any other construction permits required to complete the construction of the site.

FEMA will require a permit for floodplain development prior to the commencement of any construction or development within any special flood hazard area (SFHA).

FEMA will require a letter of map revision (LOMR) should work alter the base flood elevation (BFE) of any area falling withing the floodplain as shown in FEMA FIRM 08041C0556G and FIRM 08041C0552G (eff. 12/7/2018).

d. 4-Step Process

In accordance with the Engineering Criteria Manual I.7.2.A and DCM V2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume, and considering the need for Industrial Commercial BMPs.

Step 1 – Reducing Runoff Volumes: The development of the project site includes a variety of land uses including open and vegetated areas interspersed to help disconnect imperious areas and reduce runoff volumes.

Step 2 – Stabilize Drainageways: Altered channels will be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation will also be selected to stabilize the channel by reducing the velocity of flows and decreasing any scour. Should the final channel require, grade control structures may be implemented to further reduce flow velocities and protect against erosion. These improvements will help stabilize drainageways.

Step 3 – Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV via detention ponds that are designed per current El Paso County DCM V2.

Step 4 – Consider the need for Industrial and Commercial BMP’s: A site specific storm water quality and erosion control plan and narrative will be prepared with subsequent land use approvals prepared in conjunction with the report prior to any construction. Site specific temporary source control BMPs as well as permanent BMPs are detailed in this plan and narrative. Guidelines detailed in the El Paso DCM V2 4.2 pertaining to the covering and storage handline and spill containment and control shall be followed as necessary.

VI. Selected Plan

a. Plan Hydrology

This MDDP schematically addressed on-site and off-site drainage patterns using the existing topography and proposed land use plan for the overall drainage design. Individual preliminary and final drainage reports will better define the planning areas as the site is developed. These reports will include inlet design, storm sewer hydraulics, street design and other requirements typical of more detailed drainage reports.

The overall site is divided into 8 separate major basins, basins A-H and contribute to individual detention ponds for each major basin. Basin sizes range from 35 acres to 181 acres in size. Basins A, B, C and D drain and eventually discharge into the Main Stem and Main Stem Tributary #2. Basins E, F, G, and H drain towards the East Fork Drainage channel.

The sub-basins are described in additional detail above.

b. Detention Ponds

The site plans propose the construction of 8 separate full spectrum detention facilities.

- Pond A is located in the southwest corner of the site and discharges into the Main Stem drainageway. The pond is planned to store a maximum of 4.05 ac-ft during the 100 year event and have a peak outflow of 55.9 cfs which is slightly below the pre development peak outflow of 57.1 cfs. The 5 year storage volume is 2.46 ac-ft with a peak outflow of 3.7 cfs.

- Pond B is located to the east of Pond A and the Main Stem and discharges into the Main Stem Tributary #2. The pond is planned to store a maximum of 16.60 ac-ft during the 100 year event and have a peak outflow of 165.4 cfs which is slightly above the pre development peak outflow of 164.2 cfs. The 5 year storage volume is 8.44 ac-ft with a peak outflow of 2.6 cfs.

- Pond C is located near the center of the western portion of the site near the existing Main Stem Tributary #2. The pond discharges into a revised open channel to be designed and discharges to the Main Stem Tributary #2 which merges with the Main Stem Tributary just off site. The pond is planned to store a maximum of 6.91 ac-ft during the 100 year event and have a peak outflow of 119.2 cfs which is slightly below the pre development peak outflow of 120.2 cfs. The 5 year storage volume is 4.07 ac-ft with a peak outflow of 1.5 cfs.

- Pond D is located near the southern portion of the site adjacent to Highway 24. The pond discharges into the Main Stem right after the Main Stem and Main Stem Tributary #2 merge. The pond is planned to store a maximum of 9.41 ac-ft during the 100 year event and have a peak outflow of 154.4 cfs which equals the predevelopment peak flow rate. The 5 year storage volume is 6.28 ac-ft with a peak outflow of 2.0 cfs.

- Pond E is located in the middle of the site just east of the East Fork drainage way. The pond discharges into the East Fork drainageway. The pond is planned to store a maximum of 2.40 ac-ft during the 100 year event and have a peak outflow of 163.4 cfs which is greater than the pre

development peak outflow of 157.99 cfs. The 5 year storage volume is 1.70 ac-ft with a peak outflow of 18.8 cfs.

- Pond F is located near the south east corner of the site just west of the East Fork Tributary drainageway. The pond discharges into the East Fork Tributary drainageway. The pond is planned to store a maximum of 12.40 ac-ft during the 100 year event and have a peak outflow of 235.5 cfs which is greater than the pre development peak outflow of 221.11 cfs. The 5 year storage volume is 8.07 ac-ft with a peak outflow of 14.5 cfs.

- Pond G is located near the north east corner of the site just west of the East Fork Tributary drainageway. The pond discharges into the East Fork Tributary drainageway at an upstream location within the site. The pond is planned to store a maximum of 2.54 ac-ft during the 100 year event and have a peak outflow of 50.7 cfs which is slightly greater than the pre development peak outflow of 48.48 cfs. The 5 year storage volume is 1.69 ac-ft with a peak outflow of 9.1 cfs.

- Pond H is located near the south east corner of the site just east of the East Fork Tributary drainageway and adjacent to Highway 24. The pond discharges into the East Fork Tributary drainageway. The pond is planned to store a maximum of 6.60 ac-ft during the 100 year event and have a peak outflow of 99.1 cfs which matches the pred development peak outflow. The 5 year storage volume is 4.03 ac-ft with a peak outflow of 1.3 cfs.

Overall runoff from the site will by and large match the predevelopment peak flows. The volume of water will increase however as the drainage channels are designs, continuous simulation models will be done to see the effects of prolonged runoff rates. Predevelopment and post development flows for the 5-year and 100-year events are summarized in the following table for the 4 site outfalls.

OUTFALL	Predevelopment		Postdevelopment*	
	5 year	100 year	5 year	100 year
1	80.03	479.80	67.69	466.95
2	85.96	597.41	61.68	536.11
3	30.00	154.35	8.58	160.70
4	341.05	1335.77	276.10	1291.25

*Values to be refined with Preliminary and Final Drainage Reports for each filing

VII. Drawings

Please refer to the appendices for vicinity maps and drainage basin maps.

VIII. Summary

Grandview Reserve is a large master planned community consisting of various densities of dwelling units to include single family homes, multifamily homes, parks, institutional sites, and commercial areas. Due to development increased runoff will occur. To mitigate downstream impacts 8 large full spectrum detention facilities will be built to reduce the runoff rate to near historic levels. These detention facilities will provide water quality enhancements to account for the increased urbanization of the upstream catchment areas.

Additional analysis will be required and completed to review the hydraulics of the proposed major drainage channels and be included in future submittals. The proposed design, as described in this report, is not anticipated to cause any adverse impact to downstream properties however as noted previously due to the increased volume of water, downstream tributaries will see increases in the volume of flow. It is advised that low impact design be considered when designing and developing each filing. This shall include those items listed in the four-step process above and any additional measures that are within reason to disconnect impervious areas and increase infiltration. This will alleviate the additional volume of water due to development. Although the rate will remain at or below historic levels, the amount of time the channels will see water will increase which may cause more channel movement than historic. Downstream planning efforts should allow for the natural migration and movement of the channel by continuing to provide large floodplain areas to allow movement of the channel.

IX. References

El Paso County – Drainage Criteria Manual, 2014

City of Colorado Springs – Drainage Criteria Manual, May 2014

Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

Unnamed Tributary Black Squirrel Cree, Four Way Ranch Letter of Map Revisions, Kiowa Engineering, March 2004

Haegler and Gieck Drainage Basins Letter of Map Revision, Four Way Ranch Subdivision, Kiowa, March 2004

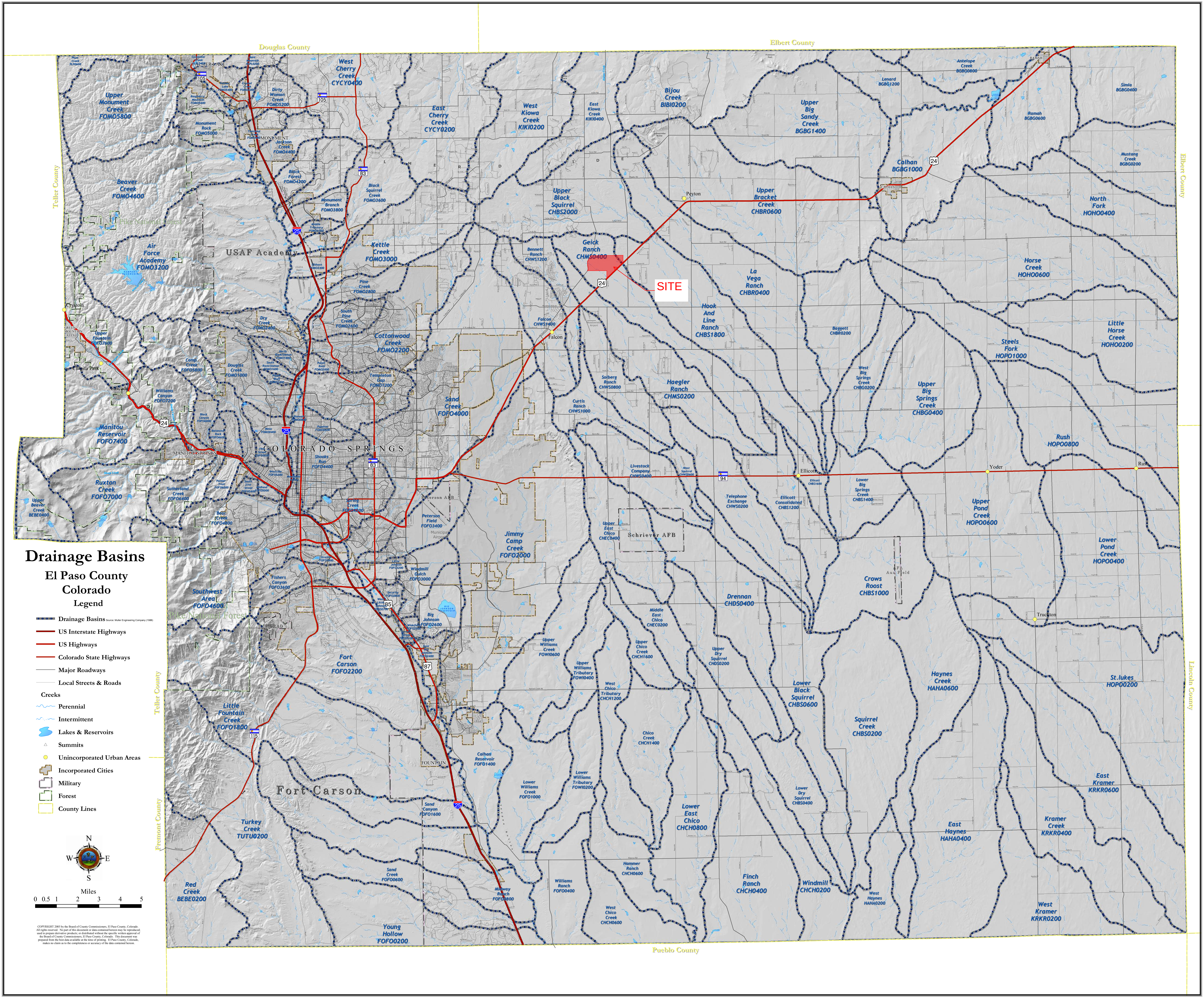
Unnamed Tributary Black Squirrel Creek Drainage Basin, Letter of Map Revision, Elbert Road Site, Kiowa Engineering, February 2006

Geick Ranch Drainage Basin Planning Study (DBPS), Drexel Barrell, October 2010 (not approved)

EPC Engineering Criteria Manual (Appendix I updated July, 2019)

Meridian Ranch MDDP, January 2018

Appendix A


Drainage Basins
El Paso County
Colorado
Legend
Drainage Basins
US Interstate Highways
US Highways
Colorado State Highways
Major Roadways
Local Streets & Roads
Creeks
Perennial
Intermittent
Lakes & Reservoirs
Summits
Unincorporated Urban Areas
Incorporated Cities
Military
Forest
County Lines
N
W
E
S
Miles
0 0.5 1 2 3 4 5
SITE
Douglas County
Elbert County
Teller County
Lincoln County
Pueblo County
Fremont County
COLORADO SPRINGS
USAF Academy
Fort Carson
Schriever AFB
Peyton
Falcon
Ellicott
Yoder
Rush
Truckton
Upper Monument Creek FOMO5800
West Cherry Creek CYCY0400
East Cherry Creek CYCY0200
West Kiowa Creek KIKI0200
Bijou Creek BIBI0200
Upper Big Sandy Creek BGBG1400
Calhan BGBG1000
Beaver Creek FOMO4600
Upper Black Squirrel CHBS2000
Upper Bracket Creek CHBR0600
North Fork HOHO0400
Air Force Academy FOMO3200
Kettle Creek FOMO3000
Geick Ranch CHMS0400
La Vega Ranch CHBR0400
Horse Creek HOHO0600
Hook And Line Ranch CHBS1800
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Cottonwood Creek FOMO2200
Haegler Ranch CHMS0200
Upper Big Springs Creek CHBG0400
Sand Creek FOFO4000
Manitou Reservoir FOFO7400
Rush HOPO0800
Ruxton Creek FOFO7000
Upper Pond Creek HOPO0600
Jimmy Camp Creek FOFO2000
Lower Pond Creek HOPO0400
Crows Roost CHBS1000
Drennan CHBS0400
Southwest Area FOFO4600
Fort Carson FOFO2200
Haynes Creek HAHA0600
St.lukes HOPO0200
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Little Fountain Creek FOFO1800
East Kramer KRKR0600
Lower East Chico CHCH0800
East Haynes HAHA0400
Kramer Creek KRKR0400
Turkey Creek TUTU0200
Finch Ranch CHCH0400
Windmill CHCH0200
Red Creek BEBE0200
West Kramer KRKR0200
Young Hollow FOFO0200
24
25
83
94
85
87
115
105

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 (NAVD88). 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 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones 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 (NAVD88)**. 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, MD 20910-3282

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 provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

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.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

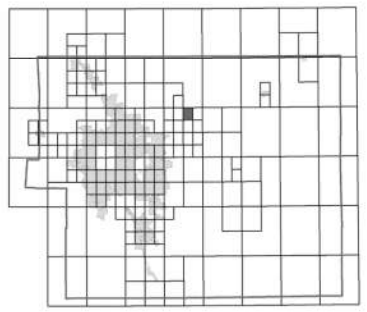
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

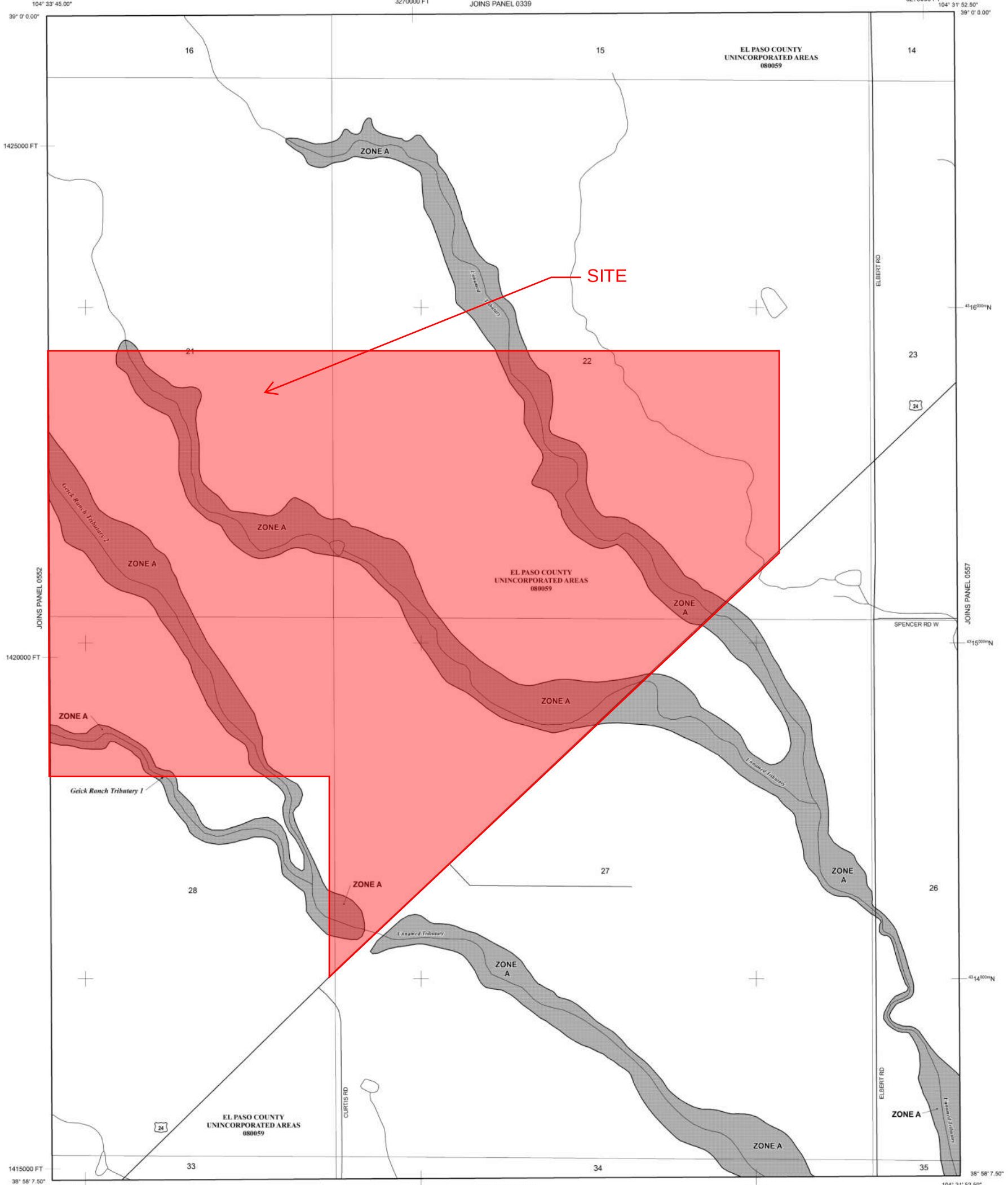
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



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 Area 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.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	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 (NAVD 88)

A A	Cross section line
23 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
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 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0556G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 556 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0556	G

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
08041C0556G

MAP REVISED

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 (NAVD88). 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 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones 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 (NAVD88)**. 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, MD 20910-3282

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 provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

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.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

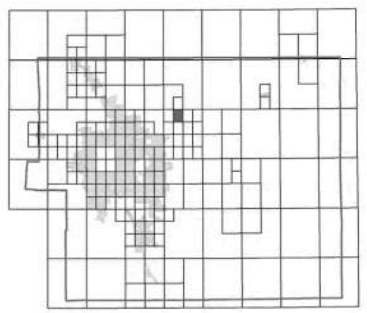
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

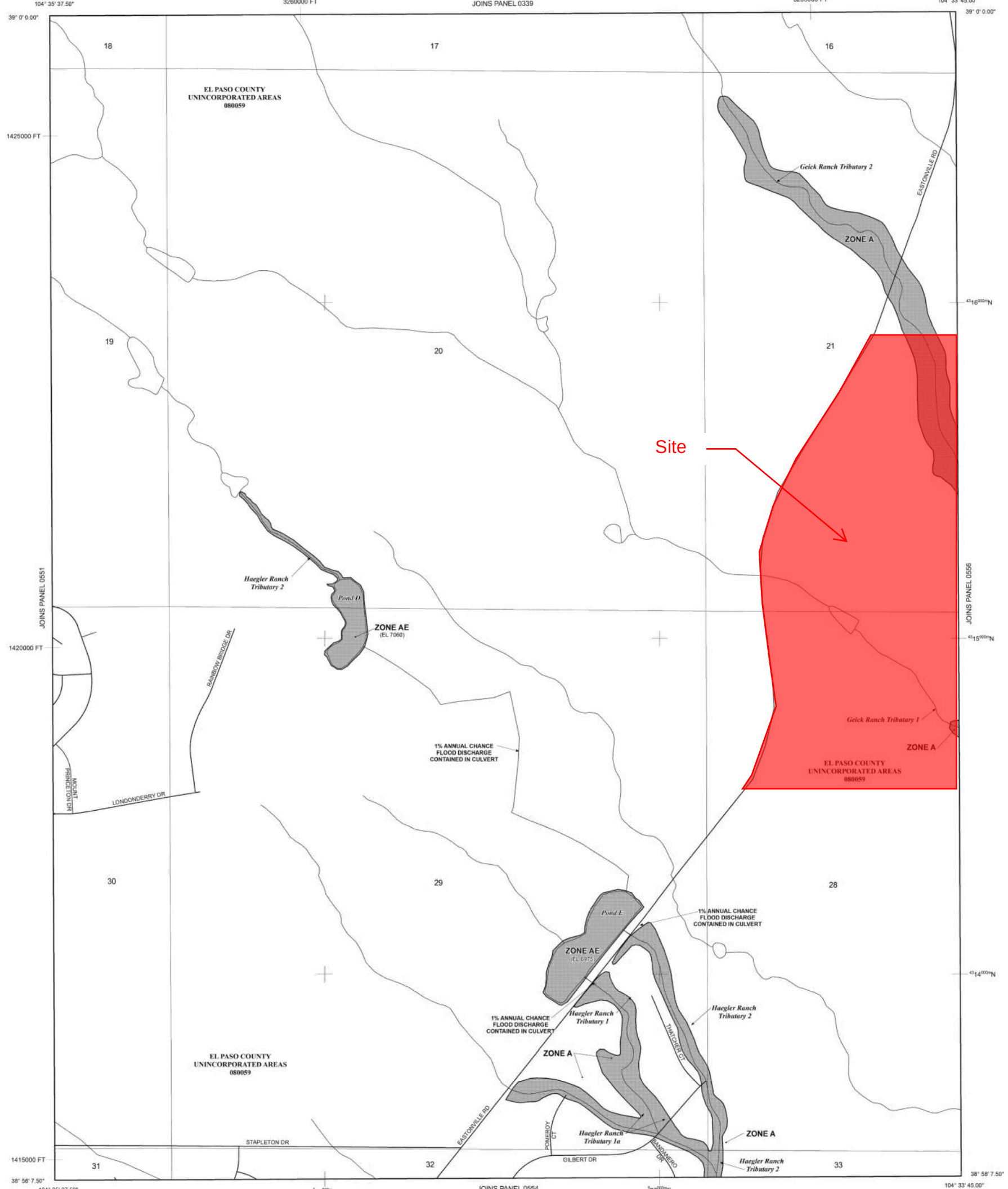
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



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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.

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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.

Floodplain boundary

Floodway boundary

Zone D Boundary

CBRS and OPA boundary

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 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4276000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

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 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0552G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 552 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

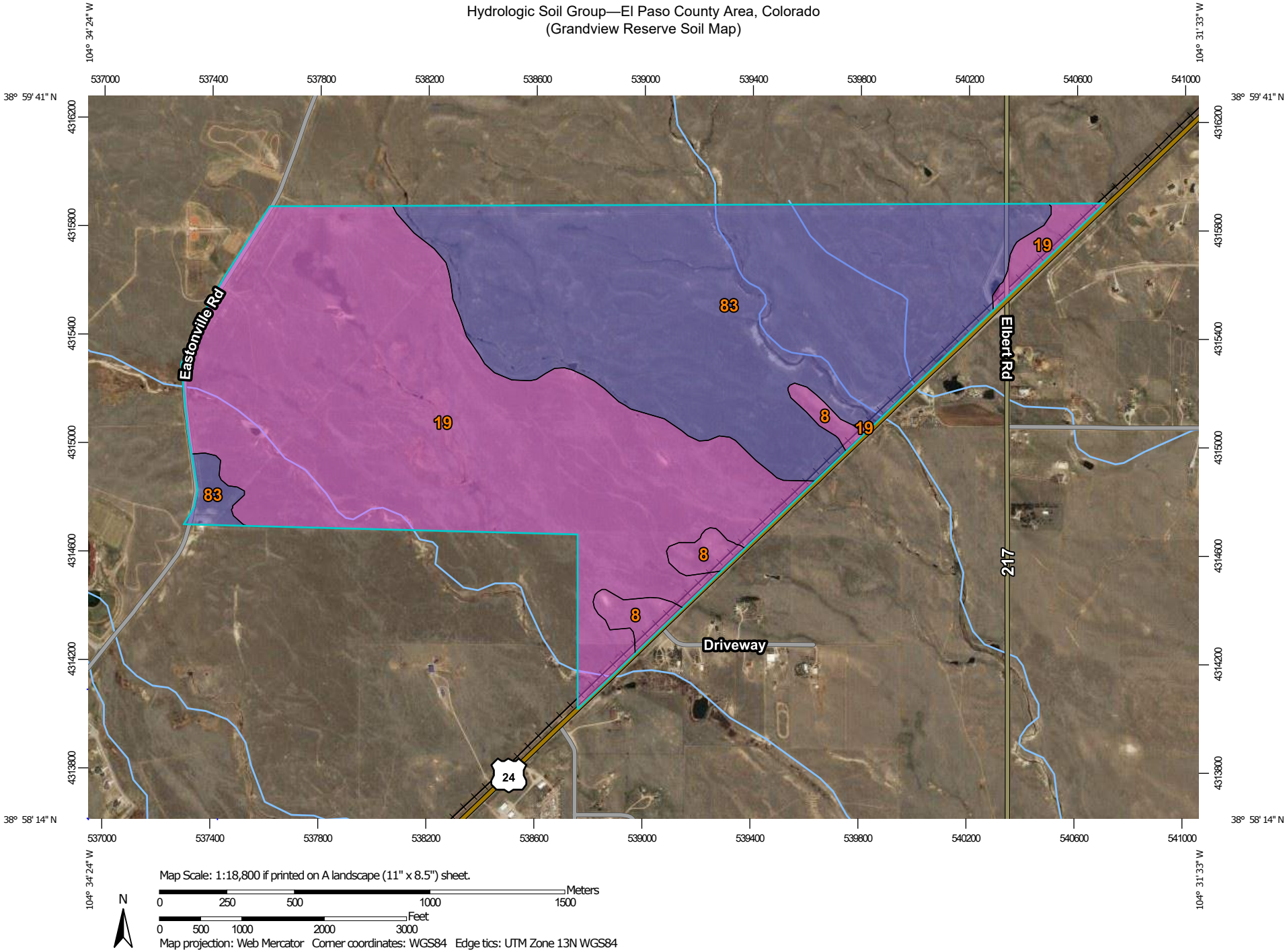
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

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
08041C0552G

MAP REVISED

Hydrologic Soil Group—El Paso County Area, Colorado
(Grandview Reserve Soil Map)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

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.

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: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	22.4	2.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	450.7	52.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	385.4	44.9%
Totals for Area of Interest			**858.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

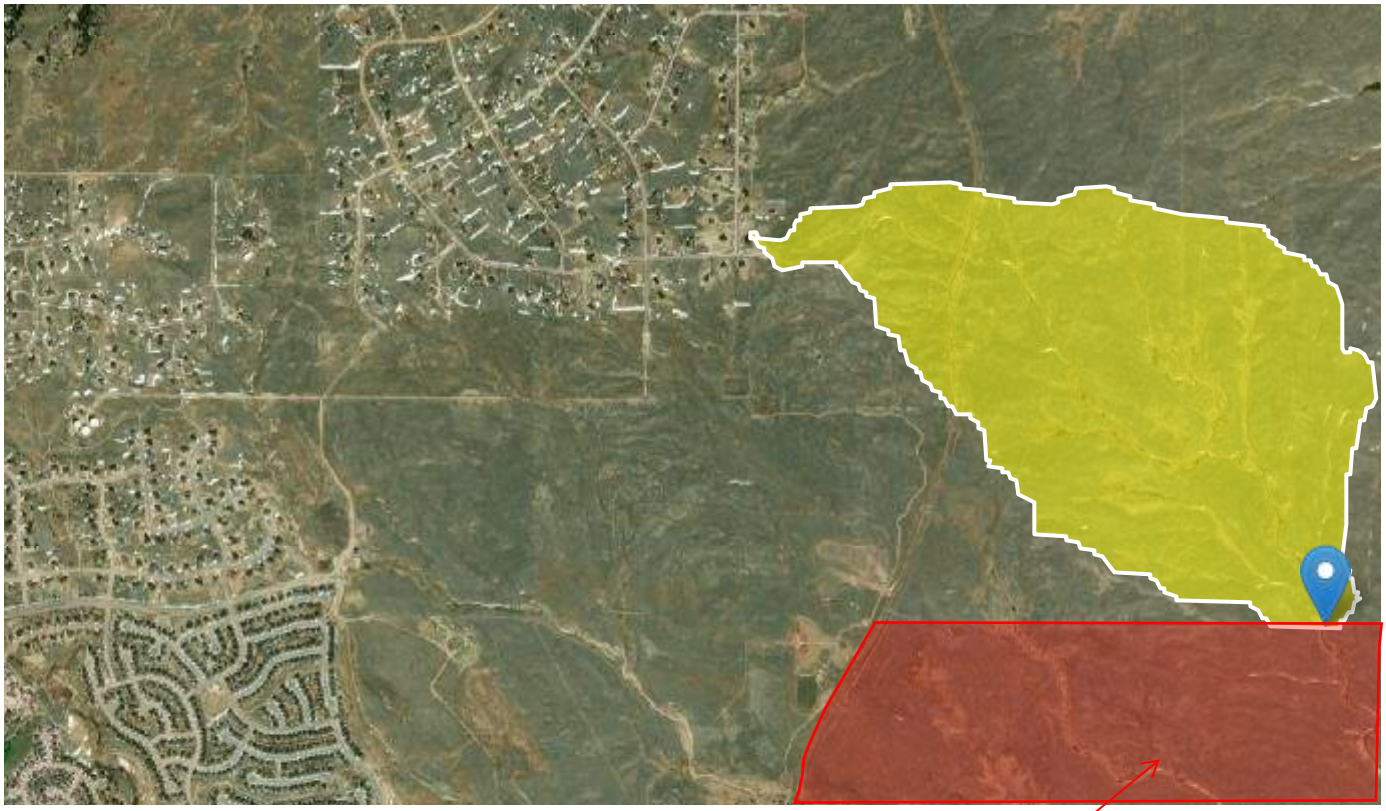
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EAST FORK

Region ID: CO
Workspace ID: CO20200817220340831000
Clicked Point (Latitude, Longitude): 38.99090, -104.54663
Time: 2020-08-17 16:03:57 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	4	percent
DRNAREA	Area that drains to a point on a stream	0.84	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.9	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.86	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	58.28	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.22	dimensionless

Application Version: 4.4.0

EAST FORK TRIBUTARY BASIN DELINATION

Region ID: CO
Workspace ID: CO20200817220732890000
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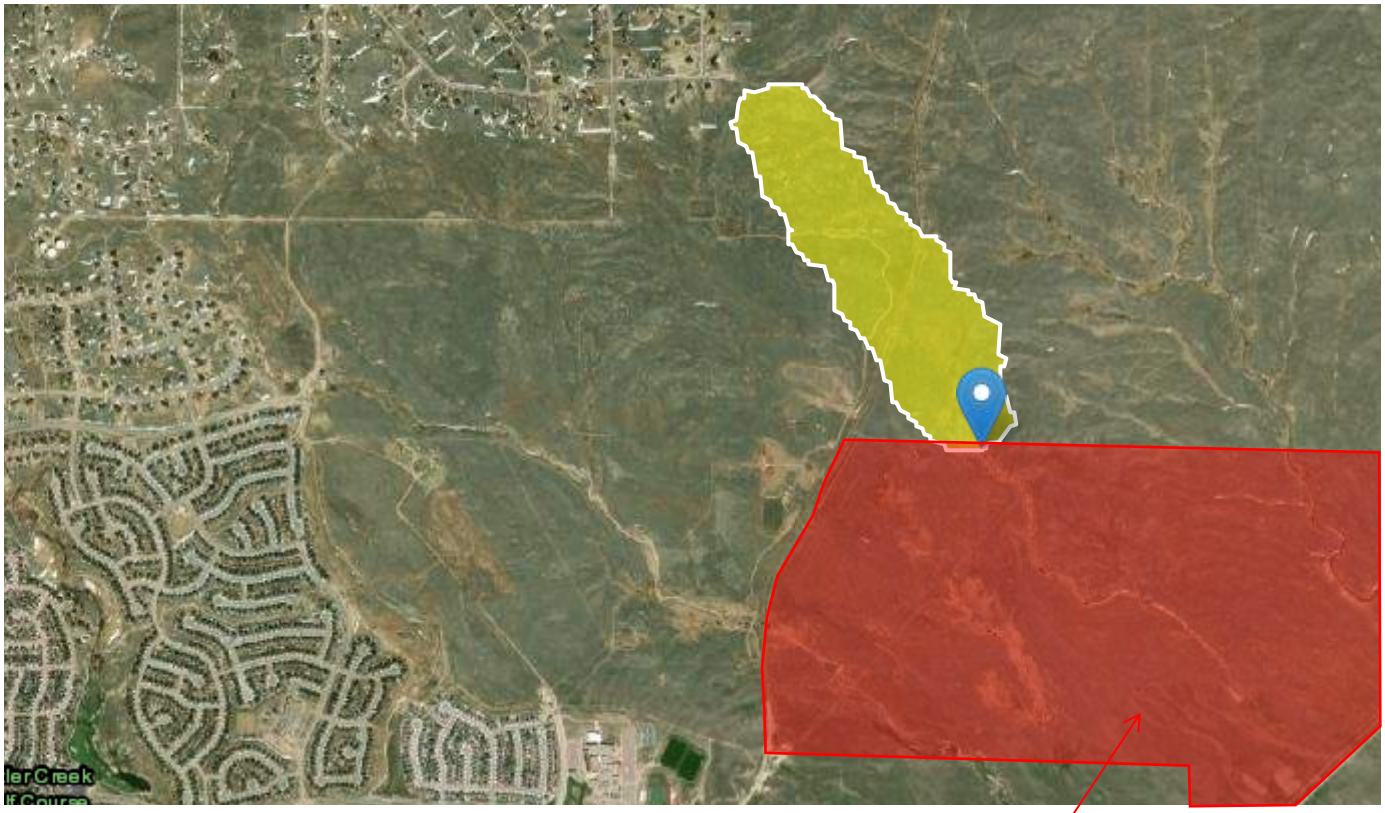
Time: 2020-08-17 16:07:50 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.22	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.92	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.86	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	54.53	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.23	dimensionless

Application Version: 4.4.0

MAIN STEM

Region ID: CO
Workspace ID: CO20200817221517278000
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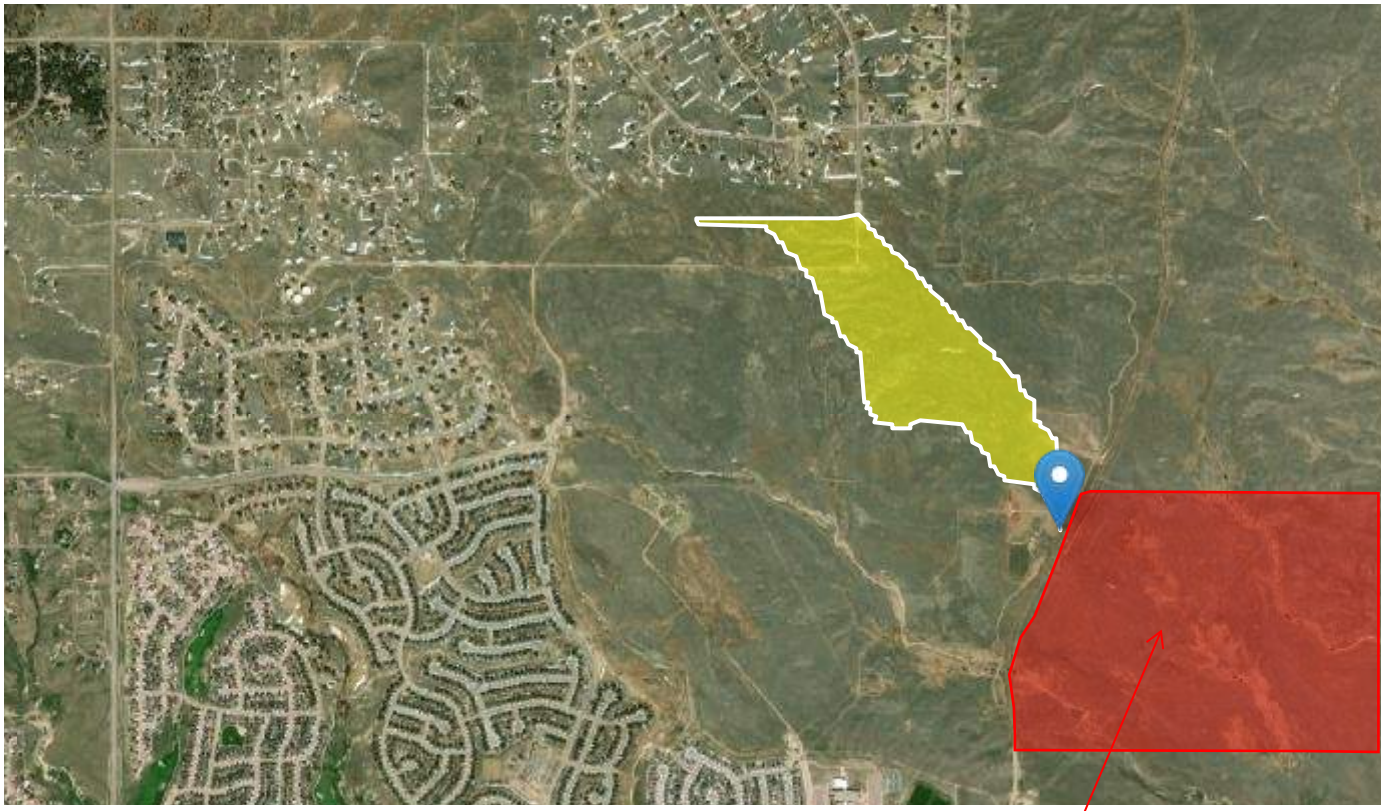
Time: 2020-08-17 16:15:34 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.17	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.87	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	55.04	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.22	dimensionless

Application Version: 4.4.0

MAIN STEM TRIBUTARY NUMBER 2

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Workspace ID: CO20200817221139984000
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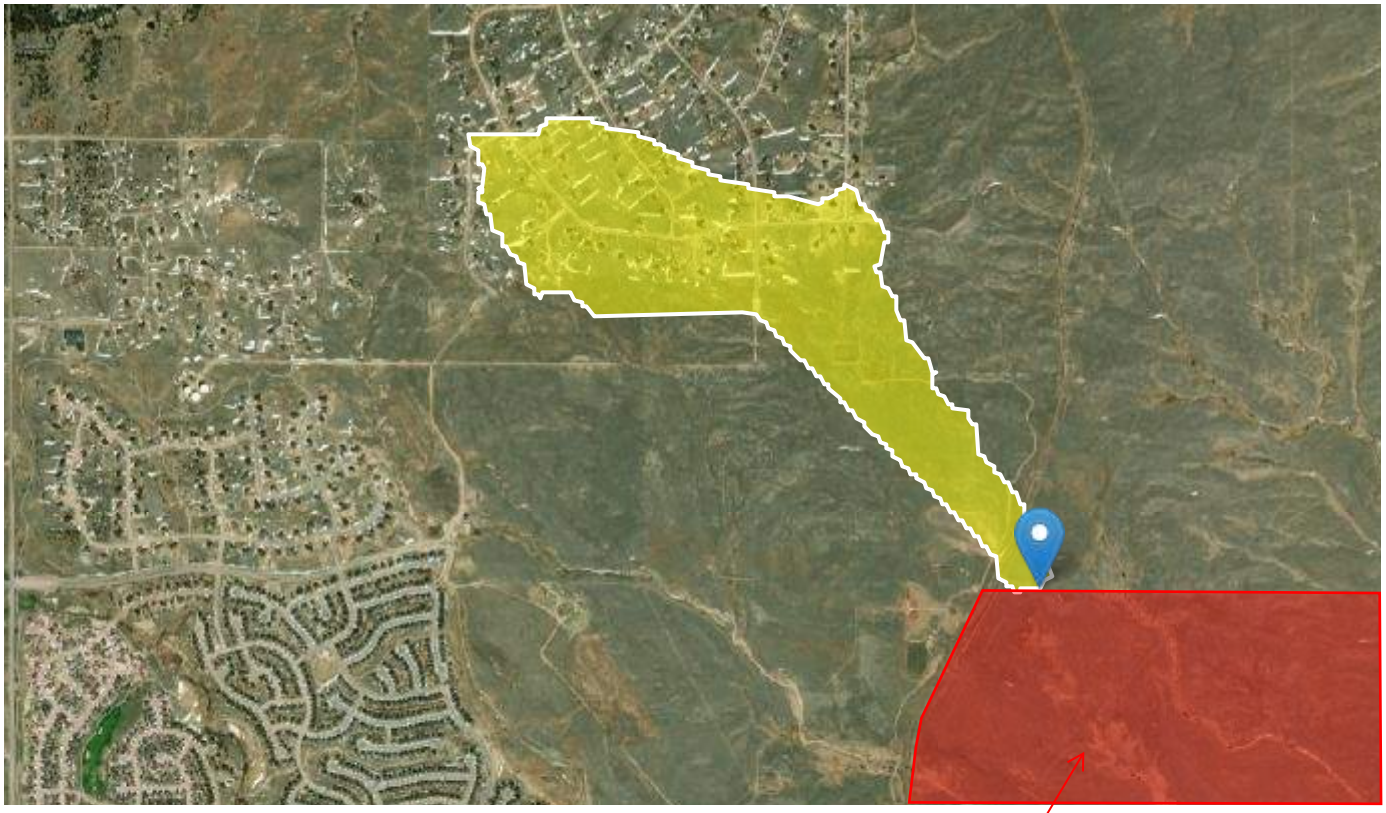
Time: 2020-08-17 16:11:57 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.44	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.94	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.87	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	56.49	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.23	dimensionless

Application Version: 4.4.0

Appendix B

Basin Description	Park/Open Space	High Density/Schools	Med/High Density	Med Density	Low Density	Commercial	Total Impervious	Total Acreage	Composite Percent Impervious	Predominant Soil Group	5 Year C Factor	100 Year C Factor
Impervious Percentage	10%	65%	55%	45%	25%	75%						
A1	12.68	0.00	0.00	32.70	0.00	0.00	15.98	45.38	35.22%	B	0.38	0.71
					Pond A			**45.38**	**35.22%**			
B1	0.00	0.00	0.00	37.00	0.00	0.00	16.65	37.00	45.00%	A	0.4	0.61
B2	1.24	0.00	0.00	23.65	0.00	0.00	10.77	24.89	43.26%	A	0.38	0.59
B3	7.42	12.64	53.20	45.64	0.00	0.00	58.76	118.90	49.42%	A	0.36	0.5
					Pond B			**180.79**	**47.66%**			
C1	4.19	30.61	1.70	41.33	0.00	0.00	39.85	77.83	51.20%	A	0.38	0.59
					Pond C			**77.83**	**51.20%**			
D1	0.60	0.00	0.00	23.73	0.00	0.00	10.74	24.33	44.14%	A	0.39	0.6
D2	5.60	64.10	0.00	0.00	0.00	8.20	48.38	77.90	62.10%	A	0.39	0.6
					Pond D			**102.23**	**57.82%**			
E1	32.26	0.00	0.00	0.00	56.34	0.00	17.31	88.60	19.54%	B	0.12	0.59
					Pond E			**88.60**	**19.54%**			
F1	0.00	0.00	0.00	0.00	33.73	0.00	8.43	33.73	25.00%	B	0.15	0.61
F2	18.34	40.50	0.00	0.00	0.00	8.80	34.76	67.64	51.39%	B	0.36	0.7
F3	0.00	0.00	0.00	12.84	0.00	0.00	5.78	12.84	45.00%	B	0.45	0.74
F4	6.24	0.00	29.80	15.77	0.00	0.00	24.11	51.81	46.54%	B	0.37	0.64
					Pond F			**166.02**	**44.02%**			
G1	4.88	0.00	0.00	15.25	0.00	0.00	7.35	20.13	36.52%	B	0.25	0.66
G2	0.00	0.00	0.00	0.00	15.14	0.00	3.79	15.14	25.00%	B	0.45	0.74
					Pond G			**35.27**	**31.57%**			
H1	0.70	0.00	0.00	0.00	20.01	0.00	5.07	20.71	24.49%	A	0.38	0.75
H2	0.70	0.00	0.00	17.85	0.00	0.00	8.10	18.55	43.68%	B	0.43	0.75
H3	0.76	0.00	0.00	5.25	0.00	0.00	2.44	6.01	40.57%	B	0.4	0.72
H4	5.34	0.00	0.00	22.31	0.00	0.00	10.57	27.65	38.24%	B	0.37	0.7
					Pond H			**72.92**	**35.91%**			

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.157	0.143	37.3	5.59	19.4	3.95	9.3	57	164,729	0.25	40,666	35.0	13	40,592	0.29
B1		0.158	0.131	33.0	4.82	17.2	3.41	8.0	53	134,310	0.08	11,390	35.0	4	11,363	0.12
B2		0.158	0.109	58.5	6.42	30.4	4.54	10.7	20	90,351	0.08	7,662	40.0	2	7,665	0.07
B3		0.158	0.221	39.1	8.15	20.3	5.76	13.6	142	431,607	0.08	36,602	40.0	12	36,572	0.10
C1		0.158	0.183	30.3	5.75	15.7	4.06	9.6	120	281,797	0.08	23,898	35.0	10	23,870	0.13
D1		0.157	0.108	31.5	4.11	16.4	2.91	6.9	36	88,318	0.25	21,803	35.0	8	21,721	0.33
D2		0.157	0.182	37.7	6.77	19.6	4.78	11.3	97	282,777	0.25	69,809	40.0	22	69,820	0.29
E1		0.157	0.193	28.9	5.77	15.0	4.08	9.6	144	321,618	0.25	79,397	35.0	32	79,287	0.37
F1		0.157	0.125	37.2	5.07	19.4	3.58	8.5	42	122,440	0.25	30,227	35.0	10	30,151	0.29
F2		0.157	0.171	45.1	7.42	23.5	5.24	12.4	70	245,533	0.25	60,614	40.0	16	60,563	0.24
F3		0.157	0.081	37.8	3.84	19.6	2.72	6.4	16	46,609	0.25	11,506	35.0	4	11,472	0.28
F4		0.157	0.151	43.2	6.52	22.5	4.61	10.9	56	186,981	0.25	46,160	40.0	13	46,174	0.25
G1		0.157	0.099	38.8	4.45	20.2	3.14	7.4	24	73,072	0.25	18,039	35.0	6	17,996	0.28
G2		0.157	0.087	42.3	4.33	22.0	3.06	7.2	17	54,958	0.25	13,567	35.0	4	13,536	0.26
H1		0.158	0.101	43.7	4.89	22.7	3.45	8.1	22	75,177	0.08	6,375	35.0	2	6,365	0.09
H2		0.157	0.095	37.0	4.21	19.2	2.97	7.0	24	67,337	0.25	16,623	35.0	5	16,581	0.29
H3		0.157	0.057	32.6	2.94	16.9	2.08	4.9	9	21,816	0.25	5,384	35.0	2	5,324	0.32
H4		0.157	0.114	36.7	4.72	19.1	3.33	7.9	35	100,370	0.25	24,778	35.0	8	24,718	0.29

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.11	0.05	0.01	0.08	0.10	0.09	0.16	0.27	0.09	0.10	0.04	0.09	0.06	0.04	0.02	0.06	0.02	0.08
25	4.37	0.49	0.15	0.79	0.97	3.50	6.05	10.68	3.53	3.91	1.60	3.64	2.24	1.57	0.20	2.24	0.93	3.12
30	10.53	3.60	1.09	6.02	7.25	7.38	16.27	26.19	8.12	11.07	3.32	9.60	4.86	3.39	1.51	4.78	1.85	6.93
35	13.03	4.33	1.65	10.87	9.95	8.12	21.83	32.34	9.70	15.57	3.65	12.69	5.57	3.87	1.85	5.37	1.92	8.07
40	12.83	4.07	1.66	11.85	9.38	7.47	22.23	30.31	9.45	16.46	3.47	12.98	5.40	3.78	1.79	5.14	1.75	7.79
45	11.55	3.53	1.62	11.26	7.98	6.50	20.38	26.01	8.49	15.82	3.11	12.23	4.86	3.47	1.67	4.59	1.53	6.96
50	10.17	3.04	1.54	10.00	6.77	5.67	17.95	22.15	7.48	14.39	2.76	11.00	4.32	3.11	1.50	4.06	1.35	6.14
55	9.05	2.66	1.43	8.60	5.79	4.90	15.88	18.86	6.66	12.88	2.47	9.83	3.87	2.81	1.33	3.61	1.17	5.45
60	7.99	2.29	1.30	7.68	4.93	4.29	14.03	16.29	5.88	11.66	2.18	8.89	3.45	2.54	1.21	3.19	1.03	4.80
65	7.10	2.03	1.20	6.77	4.36	3.80	12.42	14.16	5.23	10.56	1.95	8.00	3.08	2.27	1.09	2.84	0.92	4.27
70	6.40	1.81	1.12	5.94	3.79	3.34	11.15	12.11	4.73	9.49	1.77	7.19	2.79	2.06	0.98	2.57	0.82	3.86
75	5.77	1.58	1.04	5.41	3.22	2.88	10.06	10.06	4.26	8.60	1.60	6.55	2.52	1.88	0.89	2.31	0.71	3.47
80	5.13	1.36	0.96	4.88	2.66	2.41	8.99	8.20	3.79	7.91	1.42	5.99	2.27	1.72	0.82	2.05	0.60	3.07
85	4.50	1.14	0.88	4.36	2.14	2.00	7.91	6.93	3.32	7.26	1.25	5.45	2.01	1.56	0.75	1.79	0.50	2.68
90	3.87	0.93	0.82	3.84	1.88	1.73	6.84	6.11	2.85	6.61	1.08	4.92	1.75	1.39	0.68	1.53	0.43	2.28
95	3.26	0.83	0.77	3.32	1.69	1.55	5.78	5.38	2.41	5.96	0.91	4.39	1.50	1.23	0.61	1.30	0.38	1.94
100	2.83	0.75	0.72	2.81	1.50	1.38	4.97	4.66	2.10	5.31	0.79	3.85	1.29	1.07	0.54	1.14	0.35	1.70
105	2.57	0.68	0.68	2.39	1.31	1.22	4.48	3.95	1.91	4.67	0.72	3.32	1.15	0.92	0.47	1.04	0.31	1.55
110	2.35	0.60	0.63	2.21	1.12	1.06	4.09	3.25	1.74	4.03	0.66	2.90	1.06	0.82	0.40	0.95	0.27	1.41
115	2.13	0.53	0.58	2.03	0.93	0.90	3.72	2.54	1.58	3.55	0.60	2.63	0.97	0.76	0.36	0.86	0.24	1.27
120	1.92	0.45	0.53	1.86	0.74	0.74	3.35	1.84	1.42	3.27	0.54	2.44	0.88	0.70	0.34	0.77	0.20	1.14
125	1.70	0.38	0.49	1.68	0.55	0.58	2.99	1.14	1.26	3.04	0.49	2.25	0.79	0.64	0.31	0.68	0.16	1.01
130	1.49	0.30	0.44	1.50	0.36	0.43	2.63	0.49	1.10	2.81	0.43	2.07	0.71	0.59	0.29	0.59	0.13	0.87
135	1.28	0.22	0.39	1.33	0.17	0.27	2.27	0.14	0.94	2.59	0.37	1.89	0.62	0.53	0.26	0.51	0.09	0.74
140	1.06	0.15	0.35	1.15	0.01	0.12	1.91	0.06	0.79	2.37	0.31	1.71	0.53	0.48	0.24	0.42	0.05	0.61
145	0.85	0.08	0.33	0.98	0.01	0.03	1.55	0.04	0.63	2.16	0.25	1.53	0.45	0.42	0.22	0.33	0.02	0.47
150	0.64	0.01	0.31	0.80	0.01	0.01	1.19	0.03	0.47	1.94	0.20	1.35	0.36	0.37	0.19	0.25	0.01	0.34
155	0.43	0.00	0.29	0.62	0.01	0.01	0.84	0.02	0.32	1.72	0.14	1.17	0.28	0.32	0.17	0.16	0.00	0.21
160	0.22	0.00	0.28	0.45	0.00	0.01	0.48	0.02	0.16	1.51	0.08	0.99	0.19	0.26	0.15	0.07	0.00	0.09
165	0.08	0.00	0.26	0.27	0.00	0.00	0.19	0.01	0.06	1.29	0.03	0.81	0.11	0.21	0.12	0.02	0.00	0.03
170	0.03	0.00	0.24	0.11	0.00	0.00	0.06	0.01	0.02	1.07	0.01	0.64	0.04	0.15	0.10	0.01	0.00	0.01
175	0.01	0.00	0.23	0.01	0.00	0.00	0.03	0.00	0.01	0.86	0.00	0.46	0.01	0.10	0.07	0.01	0.00	0.01
180	0.01	0.00	0.21	0.01	0.00	0.00	0.02	0.00	0.01	0.64	0.00	0.28	0.01	0.05	0.05	0.00	0.00	0.01
185	0.01	0.00	0.20	0.01	0.00	0.00	0.01	0.00	0.01	0.43	0.00	0.12	0.00	0.01	0.03	0.00	0.00	0.00
190	0.01	0.00	0.18	0.00	0.00	0.00	0.01	0.00	0.00	0.22	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.00
195	0.00	0.00	0.16	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
200	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
205	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
210	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
215	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
225	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
230	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
235	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
240	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
245	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
280	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
285	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
290	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
295	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
305	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
310	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
315	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
325	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
330	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
335	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
340	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	40.28	42.09	12.13	63.61	82.42	32.48	55.24	98.24	32.62	35.61	14.87	33.35	20.73	14.60	17.60	20.82	8.64	28.84
10	57.05	52.23	19.82	128.67	120.14	35.66	95.11	143.90	42.37	66.66	15.76	55.34	24.18	16.70	22.15	23.32	8.39	35.18
15	55.14	49.14	19.80	142.11	113.71	32.86	95.34	135.22	40.64	69.88	14.91	55.08	23.11	16.08	21.50	22.10	7.65	33.53
20	50.23	42.59	19.29	135.55	96.28	27.58	88.48	111.47	36.78	67.16	13.37	52.19	21.00	14.87	20.10	19.77	6.45	30.09
25	42.58	36.47	18.42	120.63	81.39	24.10	76.12	94.77	31.35	61.81	11.56	47.11	18.05	13.08	17.96	17.02	5.72	25.74
30	38.19	31.93	17.17	102.86	69.70	20.86	66.79	79.97	28.11	53.81	10.39	40.94	16.29	11.74	15.92	15.24	4.99	23.02
35	33.80	27.39	15.55	91.99	58.90	17.81	59.27	68.09	24.87	48.71	9.22	37.24	14.54	10.64	14.50	13.46	4.28	20.30
40	29.41	24.26	14.30	81.13	52.19	15.90	51.76	59.63	21.63	44.21	8.05	33.54	12.78	9.53	13.08	11.71	3.85	17.61
45	26.49	21.61	13.35	70.68	45.48	14.00	46.02	51.18	19.57	39.70	7.32	29.84	11.49	8.43	11.66	10.66	3.41	16.01
50	23.93	18.96	12.40	64.49	38.78	12.09	41.69	42.72	17.67	35.20	6.62	26.88	10.45	7.76	10.59	9.61	2.98	14.41
55	21.37	16.30	11.45	58.31	32.07	10.19	37.36	34.27	15.77	32.56	5.93	24.72	9.41	7.10	9.75	8.56	2.54	12.81
60	18.81	13.65	10.50	52.12	25.36	8.28	33.03	27.80	13.87	29.94	5.23	22.56	8.38	6.45	8.92	7.50	2.10	11.21
65	16.25	11.00	9.72	45.94	22.24	6.95	28.70	24.98	11.97	27.33	4.53	20.40	7.34	5.79	8.08	6.45	1.71	9.61
70	13.69	9.78	9.16	39.75	20.01	6.31	24.37	22.16	10.07	24.72	3.84	18.25	6.30	5.14	7.24	5.40	1.56	8.01
75	11.32	8.90	8.59	33.57	17.77	5.68	20.04	19.34	8.39	22.11	3.17	16.09	5.27	4.48	6.40	4.58	1.42	6.85
80	10.47	8.01	8.03	28.12	15.53	5.04	18.15	16.52	7.75	19.50	2.94	13.93	4.65	3.83	5.56	4.23	1.27	6.31
85	9.62	7.13	7.47	26.06	13.30	4.41	16.71	13.70	7.12	16.89	2.71	11.77	4.31	3.30	4.72	3.88	1.13	5.78
90	8.76	6.25	6.91	24.00	11.06	3.77	15.27	10.89	6.49	14.28	2.48	10.65	3.96	3.08	4.25	3.53	0.98	5.25
95	7.91	5.36	6.34	21.94	8.83	3.14	13.82	8.07	5.86	13.26	2.24	9.93	3.62	2.86	3.97	3.18	0.84	4.71
100	7.06	4.48	5.78	19.87	6.59	2.50	12.38	5.25	5.22	12.39	2.01	9.21	3.27	2.64	3.69	2.83	0.69	4.18
105	6.20	3.59	5.22	17.81	4.36	1.87	10.94	2.43	4.59	11.51	1.78	8.49	2.92	2.42	3.41	2.48	0.55	3.65
110	5.35	2.71	4.65	15.75	2.12	1.23	9.49	0.00	3.96	10.64	1.55	7.77	2.58	2.20	3.13	2.13	0.40	3.11
115	4.50	1.82	4.09	13.69	0.00	0.60	8.05		3.32	9.77	1.32	7.05	2.23	1.99	2.85	1.78	0.26	2.58
120	3.64	0.94	3.83	11.63		0.00	6.61		2.69	8.90	1.08	6.33	1.89	1.77	2.57	1.43	0.11	2.04
125	2.79	0.06	3.65	9.57			5.17		2.06	8.03	0.85	5.62	1.54	1.55	2.29	1.08	0.00	1.51
130	1.94	0.00	3.46	7.50			3.72		1.43	7.16	0.62	4.90	1.20	1.33	2.02	0.72		0.98
135	1.08		3.27	5.44			2.28		0.79	6.29	0.39	4.18	0.85	1.11	1.74	0.37		0.44
140	0.23		3.08	3.38			0.84		0.16	5.42	0.16	3.46	0.50	0.89	1.46	0.02		0.00
145	0.00		2.90	1.32			0.00		0.00	4.55	0.00	2.74	0.16	0.68	1.18	0.00		
150			2.71	0.00						3.68		2.02	0.00	0.46	0.90			
155			2.52							2.81		1.30		0.24	0.62			
160			2.33							1.94		0.58		0.02	0.34			
165			2.15							1.07		0.00		0.00	0.06			
170			1.96							0.20					0.00			
175			1.77							0.00								
180			1.58															
185			1.40															
190			1.21															
195			1.02															
200			0.83															
205			0.64															
210			0.46															
215			0.27															
220			0.08															
225			0.00															

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.156	0.142	37.3	5.57	19.4	3.93	9.3	57	164,729	1.56	257,605	45.0	67	257,125	1.47
B1		0.157	0.130	33.0	4.80	17.2	3.39	8.0	53	134,310	1.17	157,714	40.0	49	157,336	1.32
B2		0.157	0.109	58.5	6.39	30.4	4.52	10.6	20	90,351	1.17	106,094	50.0	21	106,130	0.83
B3		0.157	0.220	39.1	8.11	20.3	5.73	13.5	142	431,607	1.17	506,815	45.0	140	506,418	1.18
C1		0.157	0.182	30.3	5.72	15.7	4.04	9.5	120	281,797	1.17	330,900	40.0	111	330,490	1.43
D1		0.156	0.107	31.5	4.10	16.4	2.90	6.8	36	88,318	1.56	138,112	40.0	40	137,590	1.64
D2		0.156	0.181	37.7	6.75	19.6	4.77	11.2	97	282,777	1.56	442,208	45.0	115	442,279	1.47
E1		0.156	0.192	28.8	5.76	15.0	4.07	9.6	144	321,618	1.56	502,948	40.0	158	502,220	1.78
F1		0.156	0.124	37.2	5.06	19.4	3.57	8.4	42	122,440	1.56	191,472	45.0	49	190,993	1.47
F2		0.156	0.170	45.1	7.40	23.5	5.23	12.3	70	245,533	1.56	383,966	50.0	87	383,641	1.28
F3		0.156	0.081	37.7	3.83	19.6	2.71	6.4	16	46,609	1.56	72,888	45.0	18	72,670	1.43
F4		0.156	0.150	43.2	6.50	22.5	4.59	10.8	56	186,981	1.56	292,403	45.0	68	292,494	1.32
G1		0.156	0.099	38.8	4.44	20.2	3.14	7.4	24	73,072	1.56	114,270	45.0	28	113,996	1.41
G2		0.156	0.087	42.3	4.31	22.0	3.05	7.2	17	54,958	1.56	85,944	45.0	20	85,743	1.32
H1		0.157	0.100	43.7	4.86	22.7	3.44	8.1	22	75,177	1.17	88,277	45.0	22	88,139	1.06
H2		0.156	0.095	37.0	4.20	19.2	2.97	7.0	24	67,337	1.56	105,301	45.0	27	105,031	1.46
H3		0.156	0.057	32.6	2.93	16.9	2.07	4.9	9	21,816	1.56	34,116	40.0	10	33,729	1.58
H4		0.156	0.114	36.7	4.70	19.1	3.32	7.8	35	100,370	1.56	156,958	45.0	41	156,578	1.48

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
20	0.19	0.10	0.03	0.16	0.20	0.16	0.27	0.47	0.16	0.17	0.07	0.16	0.10	0.07	0.04	0.10	0.04	0.14
25	8.12	3.13	0.92	4.86	6.18	6.49	11.23	19.84	6.56	7.27	2.97	6.77	4.15	2.92	1.31	4.16	1.72	5.78
30	34.59	26.76	8.08	44.30	53.77	25.80	50.87	85.32	27.24	33.89	11.70	30.29	16.76	11.74	11.22	16.64	6.64	23.63
35	55.93	43.27	15.49	97.67	95.72	36.82	90.40	139.23	42.28	63.07	16.51	52.88	24.75	17.20	18.33	24.08	8.94	35.59
40	64.93	48.76	18.92	129.21	110.70	40.00	109.38	157.99	48.34	79.01	18.22	63.75	27.87	19.43	21.16	26.79	9.51	40.19
45	66.80	48.19	20.36	140.35	108.85	39.34	114.87	155.63	49.45	85.76	18.42	67.82	28.46	20.06	21.89	27.12	9.32	40.86
50	64.59	44.98	20.74	138.21	100.81	37.49	112.26	146.93	47.76	86.73	17.78	67.62	27.55	19.63	21.22	26.14	8.91	39.39
55	61.26	40.75	20.19	127.94	90.29	34.77	106.51	135.02	45.25	83.59	16.83	64.71	26.19	18.75	19.74	24.71	8.30	37.23
60	57.64	36.45	19.11	117.17	79.70	32.18	100.16	123.69	42.57	79.90	15.87	61.71	24.78	17.90	18.34	23.24	7.72	34.96
65	54.17	32.98	18.06	106.73	71.53	30.21	94.06	114.66	40.04	76.47	14.98	58.85	23.43	17.05	17.02	21.88	7.28	32.86
70	49.50	29.39	16.95	95.81	63.09	26.87	86.32	101.69	36.49	71.24	13.57	54.41	21.31	15.53	15.43	19.83	6.47	29.87
75	44.49	25.88	15.77	86.25	54.40	23.41	77.73	86.59	32.81	64.76	12.22	49.38	19.24	14.13	13.98	17.82	5.68	26.80
80	39.66	22.48	14.61	77.59	45.94	20.04	69.44	72.09	29.24	59.04	10.92	44.90	17.27	12.84	12.74	15.86	4.91	23.82
85	35.05	19.22	13.48	69.37	38.02	16.98	61.48	60.25	25.85	53.80	9.69	40.70	15.40	11.62	11.61	14.01	4.19	20.99
90	30.75	16.13	12.47	61.54	32.26	14.46	54.04	51.51	22.66	48.89	8.53	36.78	13.66	10.48	10.54	12.25	3.57	18.32
95	26.60	13.89	11.62	54.03	28.03	12.58	46.90	44.50	19.60	44.35	7.40	33.11	11.95	9.39	9.51	10.59	3.11	15.80
100	22.94	12.24	10.86	46.67	24.54	11.06	40.40	38.42	16.94	39.99	6.40	29.55	10.37	8.32	8.50	9.19	2.75	13.72
105	20.31	10.86	10.14	40.05	21.41	9.70	35.55	32.88	15.01	35.72	5.68	26.07	9.12	7.30	7.50	8.16	2.43	12.18
110	18.18	9.62	9.45	35.53	18.50	8.47	31.77	27.72	13.44	31.55	5.10	22.87	8.17	6.44	6.54	7.31	2.14	10.90
115	16.30	8.47	8.77	32.01	15.69	7.31	28.48	22.84	12.06	27.80	4.58	20.38	7.35	5.79	5.80	6.55	1.87	9.75
120	14.59	7.37	8.10	28.94	12.97	6.22	25.53	18.25	10.79	24.99	4.12	18.44	6.63	5.26	5.26	5.86	1.61	8.71
125	13.00	6.29	7.44	26.14	10.33	5.18	22.79	13.83	9.62	22.73	3.68	16.78	5.96	4.78	4.81	5.22	1.37	7.73
130	11.49	5.24	6.78	23.51	7.70	4.19	20.20	9.50	8.50	20.76	3.27	15.27	5.33	4.35	4.41	4.61	1.14	6.80
135	10.07	4.20	6.11	20.95	5.08	3.19	17.76	5.87	7.45	18.98	2.89	13.89	4.74	3.94	4.05	4.03	0.92	5.93
140	8.73	3.16	5.48	18.46	2.69	2.20	15.47	3.75	6.46	17.33	2.52	12.59	4.18	3.56	3.69	3.48	0.69	5.09
145	7.39	2.12	5.01	16.03	1.47	1.36	13.20	2.42	5.47	15.78	2.16	11.37	3.64	3.20	3.35	2.93	0.47	4.26
150	6.05	1.15	4.66	13.61	0.84	0.87	10.94	1.51	4.47	14.31	1.79	10.21	3.10	2.86	3.02	2.38	0.29	3.42
155	4.72	0.63	4.37	11.19	0.46	0.56	8.68	0.88	3.48	12.94	1.43	9.09	2.55	2.51	2.69	1.83	0.18	2.58
160	3.38	0.36	4.11	8.77	0.25	0.35	6.42	0.45	2.49	11.57	1.06	7.96	2.01	2.17	2.36	1.28	0.12	1.77
165	2.17	0.20	3.86	6.35	0.13	0.20	4.29	0.17	1.60	10.20	0.72	6.83	1.47	1.83	2.03	0.80	0.07	1.09
170	1.37	0.11	3.63	3.98	0.05	0.11	2.67	0.04	1.00	8.84	0.44	5.70	0.97	1.49	1.70	0.51	0.04	0.70
175	0.88	0.05	3.40	2.12	0.01	0.04	1.71	0.03	0.65	7.48	0.28	4.58	0.60	1.15	1.37	0.33	0.02	0.45
180	0.56	0.02	3.18	1.17	0.00	0.01	1.09	0.02	0.41	6.11	0.18	3.45	0.39	0.80	1.05	0.20	0.01	0.28
185	0.33	0.00	2.96	0.66	0.00	0.01	0.67	0.02	0.25	4.75	0.11	2.36	0.25	0.50	0.72	0.12	0.00	0.16
190	0.18	0.00	2.74	0.36	0.00	0.01	0.38	0.01	0.13	3.39	0.06	1.46	0.15	0.32	0.41	0.06	0.00	0.08
195	0.08	0.00	2.52	0.19	0.00	0.00	0.19	0.01	0.06	2.17	0.03	0.93	0.08	0.21	0.22	0.03	0.00	0.03
200	0.02	0.00	2.30	0.09	0.00	0.00	0.07	0.01	0.02	1.36	0.01	0.60	0.04	0.13	0.12	0.01	0.00	0.01
205	0.01	0.00	2.07	0.03	0.00	0.00	0.02	0.00	0.01	0.88	0.00	0.37	0.01	0.08	0.07	0.00	0.00	0.01
210	0.01	0.00	1.85	0.00	0.00	0.00	0.01	0.00	0.01	0.56	0.00	0.22	0.00	0.04	0.04	0.00	0.00	0.00
215	0.01	0.00	1.63	0.00	0.00	0.00	0.01	0.00	0.00	0.33	0.00	0.11	0.00	0.02	0.02	0.00	0.00	0.00
220	0.00	0.00	1.41	0.00	0.00	0.00	0.01	0.00	0.00	0.18	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00
225	0.00	0.00	1.19	0.00	0.00	0.00	0.01	0.00	0.00	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
230	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
235	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
240	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
245	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
280	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
285	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
290	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
295	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
305	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
310	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
315	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
325	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
330	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
335	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
340	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	40.40	42.25	12.21	64.08	82.83	32.53	55.47	98.57	32.71	35.78	14.89	33.49	20.77	14.63	17.67	20.86	8.64	28.91
10	57.06	52.24	19.84	129.10	120.16	35.66	95.22	143.91	42.37	66.77	15.76	55.38	24.18	16.70	22.15	23.33	8.39	35.19
15	55.13	49.12	19.80	142.11	113.65	32.85	95.32	135.16	40.63	69.88	14.91	55.08	23.11	16.08	21.49	22.10	7.65	33.52
20	50.21	42.56	19.29	135.46	96.16	27.57	88.44	111.36	36.77	67.15	13.37	52.17	21.00	14.87	20.09	19.76	6.45	30.08
25	42.57	36.46	18.41	120.46	81.35	24.10	76.05	94.73	31.34	61.78	11.56	47.08	18.04	13.08	17.95	17.02	5.72	25.74
30	38.18	31.92	17.16	102.78	69.66	20.85	66.76	79.93	28.10	53.77	10.39	40.93	16.29	11.74	15.92	15.24	4.99	23.02
35	33.79	27.37	15.54	91.92	58.88	17.80	59.25	68.07	24.86	48.70	9.22	37.23	14.53	10.63	14.50	13.46	4.28	20.29
40	29.40	24.25	14.30	81.06	52.17	15.90	51.73	59.61	21.62	44.19	8.04	33.53	12.78	9.53	13.08	11.71	3.85	17.61
45	26.48	21.60	13.35	70.65	45.46	13.99	46.01	51.16	19.56	39.69	7.32	29.82	11.49	8.43	11.66	10.66	3.41	16.01
50	23.92	18.95	12.40	64.46	38.75	12.09	41.68	42.70	17.67	35.18	6.62	26.87	10.45	7.76	10.59	9.61	2.97	14.41
55	21.36	16.29	11.45	58.28	32.04	10.18	37.35	34.24	15.77	32.55	5.93	24.71	9.41	7.10	9.75	8.55	2.54	12.81
60	18.80	13.64	10.50	52.09	25.33	8.28	33.02	27.79	13.87	29.94	5.23	22.56	8.38	6.45	8.91	7.50	2.10	11.20
65	16.24	10.99	9.72	45.91	22.24	6.95	28.69	24.97	11.97	27.33	4.53	20.40	7.34	5.79	8.07	6.45	1.71	9.60
70	13.68	9.78	9.16	39.72	20.00	6.31	24.36	22.15	10.07	24.71	3.84	18.24	6.30	5.14	7.23	5.39	1.56	8.00
75	11.32	8.90	8.59	33.53	17.76	5.68	20.03	19.33	8.39	22.10	3.17	16.08	5.26	4.48	6.39	4.58	1.42	6.85
80	10.47	8.01	8.03	28.11	15.53	5.04	18.15	16.52	7.75	19.49	2.94	13.92	4.65	3.83	5.56	4.23	1.27	6.31
85	9.61	7.13	7.47	26.05	13.29	4.41	16.71	13.70	7.12	16.88	2.71	11.77	4.31	3.30	4.72	3.88	1.13	5.78
90	8.76	6.24	6.90	23.99	11.06	3.77	15.26	10.88	6.49	14.27	2.48	10.65	3.96	3.08	4.25	3.53	0.98	5.25
95	7.91	5.36	6.34	21.93	8.82	3.14	13.82	8.06	5.85	13.25	2.24	9.93	3.61	2.86	3.97	3.18	0.84	4.71
100	7.05	4.47	5.78	19.87	6.58	2.50	12.38	5.24	5.22	12.38	2.01	9.21	3.27	2.64	3.69	2.83	0.69	4.18
105	6.20	3.59	5.21	17.80	4.35	1.87	10.93	2.42	4.59	11.51	1.78	8.49	2.92	2.42	3.41	2.48	0.55	3.64
110	5.35	2.70	4.65	15.74	2.11	1.23	9.49	0.00	3.95	10.64	1.55	7.77	2.58	2.20	3.13	2.13	0.40	3.11
115	4.49	1.82	4.09	13.68	0.00	0.60	8.05		3.32	9.77	1.32	7.05	2.23	1.99	2.85	1.78	0.25	2.58
120	3.64	0.94	3.83	11.62		0.00	6.60		2.69	8.90	1.08	6.33	1.89	1.77	2.57	1.43	0.11	2.04
125	2.79	0.05	3.65	9.56			5.16		2.06	8.03	0.85	5.61	1.54	1.55	2.29	1.07	0.00	1.51
130	1.93	0.00	3.46	7.49			3.72		1.42	7.16	0.62	4.89	1.19	1.33	2.01	0.72		0.97
135	1.08		3.27	5.43			2.27		0.79	6.29	0.39	4.17	0.85	1.11	1.73	0.37		0.44
140	0.23		3.08	3.37			0.83		0.16	5.42	0.15	3.45	0.50	0.89	1.45	0.02		0.00
145	0.00		2.90	1.31			0.00		0.00	4.55	0.00	2.74	0.16	0.67	1.17	0.00		
150			2.71	0.00						3.68		2.02	0.00	0.46	0.89			
155			2.52							2.81		1.30		0.24	0.61			
160			2.33							1.94		0.58		0.02	0.34			
165			2.14							1.07		0.00		0.00	0.06			
170			1.96							0.20					0.00			
175			1.77							0.00								
180			1.58															
185			1.39															
190			1.21															
195			1.02															
200			0.83															
205			0.64															
210			0.46															
215			0.27															
220			0.08															
225			0.00															

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.097	0.131	25.0	4.03	13.0	2.84	6.7	85	164,729	0.57	94,676	35.0	31	94,308	0.68
B1		0.092	0.139	18.2	3.44	9.5	2.43	5.7	95	134,310	0.58	77,837	30.0	29	77,220	0.80
B2		0.093	0.113	33.3	4.40	17.3	3.11	7.3	35	90,351	0.56	50,405	35.0	12	50,284	0.48
B3		0.109	0.171	35.1	6.09	18.2	4.30	10.2	159	431,607	0.31	135,184	35.0	37	135,109	0.31
C1		0.089	0.205	15.3	3.91	7.9	2.76	6.5	238	281,797	0.64	181,072	30.0	76	180,336	0.97
D1		0.092	0.115	17.3	3.03	9.0	2.14	5.1	66	88,318	0.67	59,557	30.0	24	58,560	0.99
D2		0.084	0.229	15.9	4.30	8.3	3.04	7.2	229	282,777	0.87	246,138	30.0	98	245,292	1.26
E1		0.114	0.151	26.8	4.61	13.9	3.25	7.7	155	321,618	0.41	131,675	35.0	47	131,227	0.53
F1		0.107	0.097	32.8	3.94	17.1	2.78	6.6	48	122,440	0.47	56,968	35.0	16	56,751	0.48
F2		0.088	0.198	21.9	4.83	11.4	3.41	8.1	145	245,533	0.75	184,862	35.0	60	183,986	0.89
F3		0.092	0.087	20.4	2.87	10.6	2.03	4.8	30	46,609	0.68	31,862	30.0	11	31,302	0.88
F4		0.121	0.121	41.5	5.37	21.6	3.79	8.9	58	186,981	0.36	67,763	35.0	17	67,675	0.34
G1		0.096	0.093	25.2	3.31	13.1	2.34	5.5	37	73,072	0.59	43,083	30.0	14	42,758	0.68
G2		0.107	0.067	37.3	3.43	19.4	2.42	5.7	19	54,958	0.47	25,571	35.0	7	25,468	0.43
H1		0.109	0.078	39.3	3.85	20.4	2.72	6.4	25	75,177	0.31	23,258	35.0	6	23,195	0.27
H2		0.092	0.101	20.5	3.09	10.6	2.18	5.2	42	67,337	0.67	45,076	30.0	16	44,528	0.88
H3		0.094	0.058	19.2	2.36	10.0	1.67	3.9	15	21,816	0.64	13,878	30.0	5	13,432	0.87
H4		0.095	0.111	22.8	3.45	11.9	2.44	5.7	57	100,370	0.61	61,173	30.0	21	60,592	0.76

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	77.33	93.25	30.09	102.59	220.53	65.84	199.90	128.93	44.36	115.64	29.50	42.62	37.03	18.62	23.03	42.42	14.61	55.54
10	82.78	86.57	34.71	158.92	211.37	57.29	212.53	153.31	47.44	142.37	26.77	58.18	35.84	18.73	24.44	38.99	12.72	53.96
15	70.87	64.60	32.47	154.15	146.87	42.55	148.71	136.86	43.94	117.23	20.78	56.54	30.18	17.61	23.25	30.20	9.82	43.13
20	57.63	49.16	28.07	139.10	107.74	32.08	108.63	110.77	37.50	92.72	16.66	52.59	24.96	15.66	21.07	24.25	7.67	35.72
25	47.82	39.67	24.21	116.79	80.83	25.68	83.75	93.90	32.69	72.89	13.46	46.34	20.75	13.62	18.22	19.53	6.26	28.56
30	39.89	30.81	21.23	103.58	53.91	19.28	58.88	77.26	28.57	61.39	11.05	41.06	17.44	12.21	16.48	16.06	5.00	24.34
35	34.20	21.94	18.25	90.37	40.79	13.08	41.89	67.52	24.45	50.16	8.64	37.09	14.97	10.80	14.74	12.59	3.73	20.17
40	28.51	17.08	16.20	78.14	31.82	10.94	33.60	57.77	21.87	38.93	6.23	33.12	12.50	9.45	13.00	9.12	2.78	16.00
45	22.81	14.12	14.45	70.52	22.85	8.81	25.30	48.03	19.44	28.50	5.21	29.15	10.02	8.61	11.70	7.55	2.35	11.83
50	17.12	11.17	12.70	62.89	13.88	6.68	17.01	38.28	17.01	24.76	4.40	26.80	7.55	7.77	10.67	6.39	1.93	10.13
55	15.14	8.21	10.96	55.26	4.91	4.55	8.72	30.20	14.58	21.02	3.60	24.47	6.69	6.93	9.63	5.24	1.51	8.74
60	13.25	5.26	9.21	47.63	0.00	2.41	0.43	26.95	12.15	17.28	2.80	22.14	5.86	6.09	8.60	4.08	1.09	7.35
65	11.35	2.30	7.46	40.01		0.28	0.00	23.70	9.73	13.53	1.99	19.80	5.04	5.25	7.56	2.92	0.66	5.96
70	9.45	0.00	6.57	32.38		0.00		20.45	8.85	9.79	1.19	17.47	4.21	4.41	6.53	1.77	0.24	4.57
75	7.55		5.99	29.45				17.20	8.04	6.05	0.39	15.14	3.39	3.73	5.49	0.61	0.00	3.18
80	5.65		5.41	26.90				13.96	7.23	2.30	0.00	12.80	2.56	3.45	4.78	0.00		1.79
85	3.76		4.83	24.36				10.71	6.42	0.00		11.25	1.74	3.17	4.43			0.40
90	1.86		4.24	21.82				7.46	5.61			10.48	0.92	2.89	4.09			0.00
95	0.00		3.66	19.28				4.21	4.80			9.70	0.09	2.61	3.74			
100			3.08	16.73				0.96	3.99			8.92	0.00	2.33	3.40			
105			2.50	14.19				0.00	3.18			8.14		2.05	3.05			
110			1.91	11.65					2.37			7.37		1.77	2.71			
115			1.33	9.11					1.57			6.59		1.49	2.36			
120			0.75	6.57					0.76			5.81		1.21	2.02			
125			0.16	4.02					0.00			5.03		0.93	1.67			
130			0.00	1.48								4.25		0.65	1.33			
135				0.00								3.48		0.37	0.98			
140												2.70		0.09	0.64			
145												1.92		0.00	0.29			
150												1.14			0.00			
155												0.37						
160												0.00						

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.36	0.64	0.20	0.23	1.74	0.44	2.08	0.18	0.10	0.95	0.20	0.04	0.18	0.04	0.05	0.28	0.09	0.30
15	2.32	4.09	1.30	1.64	11.12	2.79	13.53	1.21	0.67	6.30	1.29	0.24	1.17	0.28	0.33	1.79	0.56	1.93
20	6.67	9.83	3.33	5.52	26.84	6.88	33.61	5.50	2.52	16.68	3.21	1.29	3.22	1.04	1.05	4.47	1.38	5.10
25	20.87	22.60	7.93	17.10	59.49	18.93	77.51	25.66	9.83	42.33	8.75	7.68	9.89	4.07	3.28	12.38	4.00	15.21
30	30.38	29.46	11.46	31.45	75.68	24.15	98.47	43.67	15.39	59.83	11.36	14.72	13.78	6.23	5.43	16.24	5.21	20.93
35	30.72	26.67	12.02	36.88	66.79	21.82	89.51	46.88	16.28	60.11	10.60	17.33	13.54	6.55	5.68	15.19	4.80	20.15
40	27.81	22.58	11.45	35.92	54.47	18.39	74.71	42.71	15.34	53.80	9.29	17.30	12.26	6.29	5.48	13.31	4.14	17.97
45	24.51	19.22	10.58	32.86	44.66	15.44	62.27	37.28	13.93	46.86	8.06	16.18	10.85	5.79	5.07	11.52	3.55	15.68
50	21.78	16.55	9.82	29.65	36.85	13.05	52.12	32.55	12.68	41.47	7.06	14.80	9.70	5.34	4.66	10.08	3.07	13.90
55	19.37	13.99	9.08	26.95	30.79	10.72	43.60	28.65	11.43	36.51	6.07	13.55	8.65	4.91	4.30	8.67	2.59	12.22
60	17.19	12.08	8.45	24.37	26.55	9.18	37.60	25.43	10.42	31.82	5.18	12.40	7.70	4.50	3.96	7.40	2.19	10.64
65	15.12	10.81	7.94	22.29	22.96	8.12	32.85	22.34	9.59	27.79	4.57	11.31	6.80	4.17	3.65	6.51	1.94	9.21
70	13.24	9.76	7.45	20.59	19.65	7.15	28.46	19.37	8.80	25.18	4.16	10.45	5.97	3.90	3.41	5.91	1.74	8.23
75	11.79	8.53	6.89	18.85	16.26	6.00	23.71	16.54	7.92	22.91	3.71	9.69	5.33	3.60	3.17	5.26	1.52	7.41
80	10.62	7.22	6.30	17.03	13.53	4.85	19.26	14.42	6.99	20.51	3.23	8.91	4.82	3.27	2.93	4.59	1.29	6.62
85	9.57	6.07	5.76	15.23	12.11	3.89	16.78	12.86	6.11	18.18	2.78	8.12	4.36	2.94	2.68	3.95	1.07	5.87
90	8.59	5.20	5.35	13.56	11.42	3.34	15.58	11.48	5.49	15.96	2.36	7.34	3.93	2.63	2.44	3.35	0.88	5.16
95	7.65	4.76	5.07	12.35	10.98	3.08	14.84	10.17	5.07	13.90	2.00	6.56	3.52	2.36	2.21	2.83	0.74	4.47
100	6.58	4.29	4.75	11.49	9.92	2.75	13.45	8.75	4.63	11.66	1.65	5.77	3.04	2.14	2.00	2.33	0.63	3.69
105	5.52	3.91	4.43	10.66	9.00	2.49	12.15	7.33	4.21	9.81	1.45	5.11	2.58	1.98	1.85	2.03	0.57	2.99
110	4.54	3.64	4.12	9.86	8.35	2.30	11.26	5.94	3.80	8.73	1.33	4.64	2.14	1.83	1.74	1.86	0.53	2.52
115	3.70	3.43	3.83	9.09	7.88	2.17	10.60	4.61	3.41	8.10	1.24	4.29	1.76	1.69	1.63	1.74	0.49	2.27
120	3.19	3.19	3.52	8.32	7.31	2.00	9.84	3.37	3.02	7.53	1.15	3.97	1.51	1.55	1.52	1.61	0.46	2.09
125	2.62	2.47	3.05	7.36	5.48	1.52	7.54	2.39	2.55	6.26	0.91	3.63	1.23	1.38	1.38	1.28	0.35	1.70
130	2.11	1.84	2.57	6.30	3.83	1.12	5.34	1.80	2.09	4.91	0.70	3.29	0.99	1.21	1.23	0.99	0.27	1.34
135	1.69	1.37	2.11	5.27	2.67	0.82	3.79	1.42	1.65	3.82	0.54	2.96	0.80	1.05	1.09	0.76	0.20	1.06
140	1.35	1.02	1.70	4.28	1.82	0.60	2.64	1.13	1.23	2.98	0.42	2.63	0.64	0.89	0.95	0.58	0.15	0.84
145	1.08	0.74	1.34	3.35	1.21	0.42	1.78	0.90	0.87	2.30	0.31	2.32	0.51	0.74	0.82	0.44	0.11	0.65
150	0.86	0.52	1.07	2.50	0.80	0.29	1.19	0.71	0.64	1.75	0.23	2.01	0.41	0.59	0.69	0.33	0.08	0.50
155	0.67	0.37	0.89	1.83	0.51	0.20	0.79	0.56	0.52	1.31	0.17	1.71	0.32	0.45	0.57	0.24	0.06	0.38
160	0.51	0.25	0.74	1.42	0.29	0.14	0.47	0.43	0.42	0.98	0.13	1.41	0.25	0.33	0.45	0.18	0.04	0.29
165	0.40	0.16	0.62	1.18	0.13	0.08	0.23	0.33	0.34	0.73	0.09	1.12	0.19	0.24	0.34	0.13	0.03	0.22
170	0.31	0.09	0.51	0.98	0.03	0.04	0.08	0.25	0.28	0.52	0.06	0.83	0.15	0.18	0.25	0.09	0.02	0.16
175	0.23	0.04	0.42	0.82	0.00	0.01	0.00	0.19	0.22	0.36	0.04	0.55	0.11	0.15	0.19	0.05	0.01	0.11
180	0.17	0.01	0.35	0.67	0.00	0.00	0.00	0.14	0.18	0.23	0.02	0.35	0.08	0.12	0.15	0.03	0.00	0.08
185	0.12	0.00	0.29	0.56	0.00	0.00	0.00	0.10	0.14	0.13	0.01	0.24	0.06	0.10	0.13	0.01	0.00	0.05
190	0.08	0.00	0.23	0.46	0.00	0.00	0.00	0.07	0.11	0.06	0.00	0.19	0.04	0.08	0.11	0.00	0.00	0.03
195	0.05	0.00	0.19	0.38	0.00	0.00	0.00	0.05	0.09	0.02	0.00	0.15	0.02	0.07	0.09	0.00	0.00	0.01
200	0.02	0.00	0.15	0.30	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.12	0.01	0.05	0.08	0.00	0.00	0.00
205	0.01	0.00	0.11	0.24	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.10	0.00	0.04	0.06	0.00	0.00	0.00
210	0.00	0.00	0.08	0.18	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.08	0.00	0.03	0.05	0.00	0.00	0.00
215	0.00	0.00	0.06	0.14	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.06	0.00	0.03	0.04	0.00	0.00	0.00
220	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.05	0.00	0.02	0.03	0.00	0.00	0.00
225	0.00	0.00	0.02	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.01	0.03	0.00	0.00	0.00
230	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.02	0.00	0.00	0.00
235	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00
240	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00
245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.096	0.134	24.4	4.01	12.7	2.83	6.7	87	164,729	1.93	317,756	40.0	101	316,720	2.22
B1		0.091	0.141	17.8	3.42	9.2	2.42	5.7	98	134,310	1.82	243,813	35.0	97	241,630	2.62
B2		0.092	0.115	32.5	4.38	16.9	3.09	7.3	36	90,351	1.79	161,555	40.0	42	161,041	1.70
B3		0.089	0.250	19.5	5.26	10.2	3.72	8.8	285	431,607	1.88	813,554	40.0	295	807,930	2.48
C1		0.088	0.210	14.7	3.88	7.6	2.74	6.5	247	281,797	1.91	539,141	35.0	238	535,192	3.07
D1		0.092	0.116	17.1	3.02	8.9	2.14	5.0	67	88,318	2.03	179,570	35.0	70	176,587	2.88
D2		0.083	0.230	15.8	4.30	8.2	3.04	7.2	231	282,777	2.25	634,968	35.0	252	632,818	3.24
E1		0.113	0.150	26.5	4.56	13.8	3.23	7.6	157	321,618	1.75	563,176	40.0	178	561,356	2.01
F1		0.106	0.096	32.4	3.90	16.9	2.76	6.5	49	122,440	1.81	221,916	40.0	59	221,037	1.75
F2		0.088	0.199	21.7	4.82	11.3	3.40	8.0	146	245,533	2.12	520,116	40.0	171	517,601	2.53
F3		0.091	0.088	20.1	2.86	10.5	2.02	4.8	30	46,609	2.04	95,234	35.0	33	93,473	2.56
F4		0.090	0.168	22.4	4.39	11.7	3.10	7.3	108	186,981	2.06	385,413	40.0	125	383,174	2.42
G1		0.095	0.095	24.6	3.29	12.8	2.33	5.5	38	73,072	1.94	142,048	40.0	44	140,977	2.18
G2		0.106	0.067	36.8	3.40	19.2	2.41	5.7	19	54,958	1.81	99,609	45.0	24	99,196	1.58
H1		0.107	0.078	38.6	3.80	20.1	2.69	6.3	25	75,177	1.49	111,730	45.0	28	111,424	1.33
H2		0.092	0.102	20.2	3.08	10.5	2.18	5.1	43	67,337	2.03	136,549	35.0	48	134,796	2.57
H3		0.093	0.059	18.9	2.36	9.8	1.66	3.9	15	21,816	1.99	43,454	35.0	16	42,019	2.60
H4		0.094	0.113	22.3	3.44	11.6	2.43	5.7	58	100,370	1.96	197,106	35.0	65	195,054	2.34

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.94	1.68	0.52	4.22	4.78	1.15	5.37	0.48	0.27	2.45	0.53	1.71	0.48	0.11	0.13	0.73	0.23	0.79
15	3.15	5.42	1.79	15.33	15.49	3.64	18.05	1.65	0.90	8.65	1.69	5.85	1.57	0.37	0.45	2.35	0.73	2.57
20	8.70	11.45	4.00	34.16	32.52	8.58	40.38	7.60	3.38	20.68	4.00	14.14	4.16	1.40	1.40	5.60	1.74	6.52
25	28.66	29.50	10.41	82.19	78.37	24.79	95.14	38.37	14.16	53.76	11.42	39.02	13.48	5.86	4.98	16.26	5.32	20.51
30	74.80	79.47	28.38	209.96	197.61	59.58	206.21	118.53	40.66	125.47	27.36	93.76	34.55	16.72	18.14	39.34	13.13	51.86
35	97.97	97.08	39.09	293.34	238.03	70.07	252.18	167.02	54.90	167.34	32.93	122.79	43.48	22.15	25.18	47.62	15.60	64.71
40	100.64	91.72	42.26	295.27	217.83	65.95	236.84	178.04	58.95	170.90	31.93	124.89	43.95	23.88	27.51	46.23	14.96	64.17
45	95.76	81.74	41.60	270.79	188.54	59.25	209.67	171.37	58.16	160.16	29.55	117.59	41.86	23.95	27.62	42.78	13.70	60.43
50	88.61	71.93	39.52	241.02	158.77	52.39	182.92	159.94	55.68	145.90	26.81	107.63	38.81	23.14	26.37	38.80	12.35	55.33
55	80.64	61.06	36.70	210.38	128.15	44.77	154.98	145.85	52.10	131.63	23.79	97.40	35.39	21.94	24.69	34.43	10.81	49.97
60	73.72	51.53	33.93	181.32	108.02	38.53	133.43	134.19	48.66	118.30	21.04	88.02	32.46	20.78	23.06	30.45	9.45	45.14
65	67.40	45.18	31.76	156.70	93.56	34.56	118.85	123.94	46.04	106.27	18.72	79.39	29.76	19.73	21.51	27.09	8.44	40.65
70	57.62	37.36	28.86	133.61	72.90	28.24	97.25	107.68	41.56	90.84	15.78	67.48	25.37	18.01	19.61	22.80	7.03	34.05
75	48.65	30.42	25.90	111.95	54.03	22.66	76.20	90.77	36.98	77.55	13.35	57.62	21.48	16.38	17.89	19.26	5.84	28.96
80	41.32	23.90	22.84	92.09	37.59	17.26	56.56	75.87	32.23	65.51	11.01	48.88	18.30	14.67	16.16	15.88	4.69	24.47
85	35.33	18.17	19.94	74.04	27.23	12.61	40.76	64.74	27.82	54.76	8.95	41.21	15.71	13.05	14.51	12.91	3.68	20.55
90	30.19	13.24	17.37	58.22	21.17	8.92	31.25	55.66	23.97	45.42	7.12	34.55	13.49	11.51	12.93	10.27	2.78	17.14
95	25.62	9.81	15.52	44.14	17.61	6.75	25.52	47.90	21.14	36.94	5.47	28.49	11.50	10.09	11.40	7.89	2.02	14.01
100	21.38	7.91	14.06	33.30	15.21	5.47	21.73	40.83	18.87	29.27	4.09	22.92	9.66	8.92	9.98	5.89	1.52	11.11
105	17.42	6.73	12.77	27.35	13.68	4.57	19.13	34.26	16.87	22.78	3.22	17.88	7.94	8.04	8.89	4.60	1.23	8.49
110	13.78	5.95	11.60	23.68	12.61	3.96	17.35	28.05	15.05	18.35	2.68	13.86	6.34	7.30	8.07	3.81	1.03	6.41
115	10.62	5.43	10.50	21.24	11.96	3.53	16.10	22.23	13.36	15.62	2.31	11.46	4.94	6.63	7.37	3.28	0.89	5.17
120	8.32	5.07	9.45	19.57	11.75	3.23	15.37	16.77	11.75	13.81	2.05	9.95	3.86	6.02	6.74	2.90	0.79	4.39
125	6.31	3.83	8.12	15.88	8.79	2.37	11.92	11.58	10.02	11.03	1.55	7.84	2.90	5.36	6.08	2.19	0.58	3.35
130	4.73	2.80	6.80	11.73	6.09	1.72	8.39	8.10	8.35	8.30	1.14	5.91	2.18	4.72	5.44	1.60	0.42	2.49
135	3.52	2.07	5.52	8.70	4.24	1.26	6.01	5.78	6.72	6.17	0.83	4.41	1.63	4.12	4.82	1.17	0.31	1.84
140	2.61	1.55	4.31	6.55	2.89	0.93	4.27	4.12	5.15	4.58	0.63	3.26	1.22	3.56	4.24	0.88	0.23	1.34
145	1.91	1.13	3.21	4.92	1.91	0.66	2.93	2.90	3.70	3.47	0.47	2.44	0.90	3.00	3.67	0.66	0.17	0.99
150	1.39	0.81	2.32	3.64	1.29	0.47	2.00	2.02	2.57	2.64	0.35	1.86	0.66	2.45	3.11	0.50	0.13	0.75
155	1.04	0.58	1.76	2.65	0.79	0.33	1.33	1.36	1.85	1.99	0.26	1.41	0.49	1.91	2.56	0.37	0.09	0.57
160	0.80	0.40	1.36	1.97	0.41	0.22	0.80	0.91	1.35	1.51	0.20	1.08	0.37	1.40	2.02	0.28	0.07	0.44
165	0.62	0.26	1.05	1.39	0.15	0.13	0.40	0.69	0.98	1.15	0.14	0.84	0.29	0.96	1.49	0.20	0.05	0.34
170	0.49	0.14	0.81	0.91	0.02	0.07	0.13	0.54	0.70	0.85	0.10	0.63	0.23	0.68	1.00	0.14	0.03	0.25
175	0.37	0.06	0.63	0.53	0.00	0.02	0.00	0.43	0.50	0.58	0.06	0.45	0.18	0.50	0.66	0.09	0.02	0.18
180	0.28	0.02	0.49	0.26	0.00	0.00	0.00	0.33	0.35	0.37	0.03	0.30	0.13	0.36	0.46	0.05	0.01	0.12
185	0.19	0.00	0.39	0.08	0.00	0.00	0.00	0.25	0.26	0.21	0.01	0.18	0.09	0.26	0.33	0.02	0.00	0.07
190	0.12	0.00	0.32	0.00	0.00	0.00	0.00	0.18	0.21	0.09	0.00	0.09	0.06	0.19	0.24	0.00	0.00	0.04
195	0.07	0.00	0.26	0.00	0.00	0.00	0.00	0.12	0.17	0.02	0.00	0.03	0.03	0.13	0.18	0.00	0.00	0.01
200	0.03	0.00	0.21	0.00	0.00	0.00	0.00	0.07	0.13	0.00	0.00	0.00	0.02	0.10	0.13	0.00	0.00	0.00
205	0.01	0.00	0.16	0.00	0.00	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.08	0.10	0.00	0.00	0.00
210	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.00	0.00	0.00	0.06	0.07	0.00	0.00	0.00
215	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.05	0.06	0.00	0.00	0.00
220	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.04	0.05	0.00	0.00	0.00
225	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.04	0.00	0.00	0.00
230	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00
235	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00
240	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	79.48	95.51	30.93	212.33	229.82	66.81	201.50	131.02	45.09	117.17	29.92	92.63	37.90	18.89	23.57	43.06	14.85	56.70
10	84.67	87.92	35.54	282.68	215.27	57.76	213.46	154.59	47.98	143.83	27.05	104.96	36.56	18.95	24.84	39.42	12.85	54.86
15	71.63	65.18	33.09	218.45	147.65	42.75	148.95	137.43	44.32	117.53	20.92	85.95	30.43	17.77	23.57	30.43	9.89	43.38
20	58.21	48.97	28.30	170.33	107.98	32.20	108.75	111.17	37.59	92.99	16.68	69.02	25.18	15.74	21.25	24.29	7.66	35.92
25	47.87	39.61	24.48	132.75	78.94	25.61	83.53	93.98	32.85	72.85	13.48	54.84	20.77	13.71	18.39	19.57	6.27	28.68
30	40.08	30.32	21.34	107.50	49.89	19.02	58.31	77.43	28.63	61.37	11.00	46.28	17.51	12.26	16.59	16.00	4.96	24.34
35	34.09	21.04	18.21	82.24	39.94	13.05	41.79	67.50	24.41	49.89	8.52	38.16	14.92	10.82	14.79	12.42	3.65	20.00
40	28.10	16.93	16.26	57.04	30.26	10.85	33.38	57.58	21.90	38.40	6.04	30.04	12.33	9.48	12.98	8.85	2.77	15.66
45	22.11	13.83	14.43	48.62	20.58	8.66	24.98	47.65	19.41	28.45	5.18	21.93	9.74	8.62	11.74	7.51	2.33	11.51
50	16.99	10.74	12.59	40.20	10.90	6.46	16.57	37.72	16.92	24.63	4.35	18.95	7.50	7.76	10.67	6.32	1.89	10.06
55	15.00	7.64	10.76	31.78	1.22	4.26	8.16	30.14	14.43	20.80	3.52	16.25	6.63	6.90	9.60	5.12	1.46	8.61
60	13.00	4.55	8.92	23.36	0.00	2.07	0.00	26.83	11.95	16.97	2.70	13.54	5.77	6.04	8.53	3.93	1.02	7.17
65	11.00	1.45	7.15	14.94		0.00		23.53	9.65	13.14	1.87	10.83	4.91	5.18	7.46	2.74	0.58	5.72
70	9.01	0.00	6.53	6.53				20.22	8.82	9.32	1.04	8.13	4.04	4.32	6.39	1.55	0.15	4.27
75	7.01		5.92	0.00				16.91	7.99	5.49	0.22	5.42	3.18	3.72	5.32	0.36	0.00	2.82
80	5.01		5.31					13.60	7.16	1.66	0.00	2.72	2.31	3.43	4.76	0.00		1.38
85	3.02		4.70					10.29	6.33	0.00		0.01	1.45	3.15	4.41			0.00
90	1.02		4.09					6.98	5.50			0.00	0.59	2.86	4.05			
95	0.00		3.47					3.67	4.67				0.00	2.57	3.69			
100			2.86					0.36	3.84					2.29	3.34			
105			2.25					0.00	3.01					2.00	2.98			
110			1.64						2.18					1.71	2.62			
115			1.03						1.35					1.43	2.27			
120			0.41						0.52					1.14	1.91			
125			0.00						0.00					0.85	1.55			
130														0.57	1.19			
135														0.28	0.84			
140														0.00	0.48			
145															0.12			
150															0.00			

Appendix C

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  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------
SWMM Pre Development 5 Year

  ***********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ***********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ NO
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 01/01/2005 00:00:00
  Ending Date .............. 01/01/2005 06:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Routing Time Step ........ 30.00 sec


  *************************        Volume        Volume
  Flow Routing Continuity        acre-feet      10^6 gal
  *************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.000         0.000
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........        12.024         3.918
  External Outflow .........        12.024         3.918
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....        -0.002
```

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.08	0.31	6945.31	0 00:35	0.30
24	JUNCTION	0.10	0.44	6934.44	0 00:40	0.44
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.10	0.48	6911.48	0 00:35	0.48
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.11	0.48	6900.48	0 00:35	0.48
65	JUNCTION	0.17	0.69	6880.69	0 00:36	0.69
66	JUNCTION	0.24	0.89	6868.89	0 00:40	0.89
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0 00:00	0.00
73	JUNCTION	0.11	0.43	6902.43	0 00:35	0.42

80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.11	0.48	6872.48	0	00:35	0.47
85	JUNCTION	0.06	0.30	6874.30	0	00:35	0.30
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.11	0.44	6911.44	0	00:41	0.43
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.11	0.42	6900.42	0	00:36	0.42
PondH	JUNCTION	0.11	0.47	6866.47	0	00:36	0.47
PondF	JUNCTION	0.24	0.89	6866.89	0	00:41	0.88
PondD	JUNCTION	0.10	0.48	6881.48	0	00:37	0.47
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
31	OUTFALL	0.00	0.00	6953.00	0	00:00	0.00
51	OUTFALL	0.00	0.00	6920.00	0	00:00	0.00
74	OUTFALL	0.00	0.00	6897.00	0	00:00	0.00
67	OUTFALL	0.00	0.00	6865.50	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	13.03	13.03	0 00:35	0.304	0.304	0.000
20	JUNCTION	4.33	4.33	0 00:35	0.085	0.085	0.000
21	JUNCTION	1.66	1.66	0 00:40	0.0573	0.0573	0.000

22		JUNCTION	11.85	11.85	0	00:40	0.274	0.274	0.000
23		JUNCTION	0.00	5.99	0	00:35	0	0.142	0.000
24		JUNCTION	0.00	11.85	0	00:40	0	0.274	0.000
30		JUNCTION	9.95	9.95	0	00:35	0.179	0.179	0.000
40		JUNCTION	8.12	8.12	0	00:35	0.162	0.162	0.000
41		JUNCTION	22.23	22.23	0	00:40	0.522	0.522	0.000
42		JUNCTION	0.00	8.12	0	00:35	0	0.162	0.000
50		JUNCTION	32.34	32.34	0	00:35	0.593	0.593	0.000
60		JUNCTION	9.70	9.70	0	00:35	0.226	0.226	0.000
61		JUNCTION	16.46	16.46	0	00:40	0.453	0.453	0.000
62		JUNCTION	3.65	3.65	0	00:35	0.0858	0.0858	0.000
63		JUNCTION	12.98	12.98	0	00:40	0.345	0.345	0.000
64		JUNCTION	0.00	13.35	0	00:35	0	0.311	0.000
65		JUNCTION	0.00	26.04	0	00:36	0	0.657	0.000
66		JUNCTION	0.00	16.46	0	00:40	0	0.453	0.000
70		JUNCTION	5.57	5.57	0	00:35	0.135	0.135	0.000
71		JUNCTION	3.87	3.87	0	00:35	0.101	0.101	0.000
72		JUNCTION	0.00	3.87	0	00:35	0	0.101	0.000
73		JUNCTION	0.00	3.87	0	00:35	0	0.101	0.000
80		JUNCTION	1.85	1.85	0	00:35	0.0476	0.0476	0.000
81		JUNCTION	5.37	5.37	0	00:35	0.124	0.124	0.000
82		JUNCTION	1.92	1.92	0	00:35	0.0398	0.0398	0.000
83		JUNCTION	8.07	8.07	0	00:35	0.185	0.185	0.000
84		JUNCTION	0.00	7.22	0	00:35	0	0.172	0.000

85	JUNCTION	0.00	1.92	0	00:35	0	0.0398	0.000
PondC	JUNCTION	0.00	9.95	0	00:35	0	0.179	0.000
PondA	JUNCTION	0.00	13.03	0	00:35	0	0.304	0.000
PondB	JUNCTION	0.00	17.56	0	00:41	0	0.416	0.000
PondE	JUNCTION	0.00	32.34	0	00:35	0	0.593	0.000
PondG	JUNCTION	0.00	9.42	0	00:36	0	0.236	0.000
PondH	JUNCTION	0.00	17.11	0	00:36	0	0.397	0.000
PondF	JUNCTION	0.00	42.32	0	00:41	0	1.11	0.000
PondD	JUNCTION	0.00	30.00	0	00:38	0	0.685	0.000
Outfall2	OUTFALL	0.00	17.56	0	00:41	0	0.416	0.000
Outfall1	OUTFALL	0.00	13.03	0	00:35	0	0.304	0.000
Outfall4	OUTFALL	0.00	17.11	0	00:36	0	0.397	0.000
Outfall3	OUTFALL	0.00	30.00	0	00:38	0	0.685	0.000
31	OUTFALL	0.00	9.95	0	00:35	0	0.179	0.000
51	OUTFALL	0.00	32.34	0	00:35	0	0.593	0.000
74	OUTFALL	0.00	9.42	0	00:36	0	0.236	0.000
67	OUTFALL	0.00	42.32	0	00:41	0	1.11	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	67.36	3.82	17.56	0.416
Outfall1	55.28	3.40	13.03	0.304
Outfall4	59.31	4.14	17.11	0.397
Outfall3	60.56	7.00	30.00	0.685
31	50.97	2.17	9.95	0.179
51	51.53	7.12	32.34	0.593
74	58.61	2.49	9.42	0.236
67	65.97	10.41	42.32	1.110
System	58.70	40.55	169.75	3.918

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	13.03	0 00:35			
200	DUMMY	4.33	0 00:35			
201	DUMMY	1.66	0 00:40			
202	CONDUIT	5.95	0 00:36	10.09	0.00	0.04
204	DUMMY	11.85	0 00:40			
205	CONDUIT	11.83	0 00:41	11.82	0.01	0.06
300	DUMMY	9.95	0 00:35			
400	DUMMY	8.12	0 00:35			
401	CONDUIT	8.03	0 00:37	8.38	0.02	0.10
402	DUMMY	22.23	0 00:40			
500	DUMMY	32.34	0 00:35			
601	DUMMY	16.46	0 00:40			
602	CONDUIT	16.42	0 00:41	6.99	0.07	0.18
603	DUMMY	9.70	0 00:35			
604	DUMMY	3.65	0 00:35			
605	CONDUIT	13.32	0 00:36	11.62	0.01	0.07
606	DUMMY	12.98	0 00:40			
607	CONDUIT	26.04	0 00:36	12.42	0.02	0.09
700	DUMMY	5.57	0 00:35			
701	DUMMY	3.87	0 00:35			
702	DUMMY	3.87	0 00:35			
703	CONDUIT	3.86	0 00:36	4.80	0.01	0.08
801	DUMMY	1.85	0 00:35			

802	DUMMY	5.37	0	00:35			
803	CONDUIT	7.18	0	00:36	6.34	0.01	0.07
804	DUMMY	1.92	0	00:35			
806	DUMMY	8.07	0	00:35			
805	CONDUIT	1.91	0	00:37	4.00	0.01	0.06
301	DUMMY	9.95	0	00:35			
101	DUMMY	13.03	0	00:35			
206	DUMMY	17.56	0	00:41			
501	DUMMY	32.34	0	00:35			
704	DUMMY	9.42	0	00:36			
807	DUMMY	17.11	0	00:36			
608	DUMMY	42.32	0	00:41			
403	DUMMY	30.00	0	00:38			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Apr 10 17:42:01 2020
Analysis ended on: Fri Apr 10 17:42:01 2020
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/01/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	193.874	63.177
External Outflow	193.874	63.177
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.000	

****
Highest Flow Instability Indexes
****
Link 205 (1)
Link 206 (1)

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.08	0.31	6945.31	0 00:35	0.30
24	JUNCTION	0.13	0.58	6934.58	0 00:40	0.58
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.10	0.48	6911.48	0 00:35	0.48
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.11	0.48	6900.48	0 00:35	0.48
65	JUNCTION	0.17	0.69	6880.69	0 00:36	0.69
66	JUNCTION	0.24	0.89	6868.89	0 00:40	0.89
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0 00:00	0.00

73	JUNCTION	0.11	0.43	6902.43	0	00:35	0.42
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.11	0.48	6872.48	0	00:35	0.47
85	JUNCTION	0.06	0.30	6874.30	0	00:35	0.30
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.13	0.58	6911.58	0	00:40	0.58
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.11	0.42	6900.42	0	00:36	0.42
PondH	JUNCTION	0.11	0.47	6866.47	0	00:36	0.47
PondF	JUNCTION	0.24	0.89	6866.89	0	00:41	0.88
PondD	JUNCTION	0.10	0.48	6881.48	0	00:37	0.47
31	JUNCTION	0.00	0.00	6953.00	0	00:00	0.00
51	JUNCTION	0.00	0.00	6920.00	0	00:00	0.00
67	JUNCTION	0.00	0.00	6865.50	0	00:00	0.00
74	JUNCTION	0.00	0.00	6897.00	0	00:00	0.00
OS1	JUNCTION	0.00	0.00	6950.00	0	00:00	0.00
OS2	JUNCTION	0.00	0.00	6924.00	0	00:00	0.00
OS3	JUNCTION	0.00	0.00	6930.00	0	00:00	0.00
OS4	JUNCTION	0.00	0.00	6905.00	0	00:00	0.00
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	13.03	13.03	0 00:35	0.304		

0.304	0.000						
20		JUNCTION	4.33	4.33	0	00:35	0.085
0.085	0.000						
21		JUNCTION	1.66	1.66	0	00:40	0.0573
0.0573	0.000						
22		JUNCTION	11.85	11.85	0	00:40	0.274
0.274	0.000						
23		JUNCTION	0.00	5.99	0	00:35	0
0.142	0.000						
24		JUNCTION	0.00	21.23	0	00:40	0
0.452	0.000						
30		JUNCTION	9.95	9.95	0	00:35	0.179
0.179	0.000						
40		JUNCTION	8.12	8.12	0	00:35	0.162
0.162	0.000						
41		JUNCTION	22.23	22.23	0	00:40	0.522
0.522	0.000						
42		JUNCTION	0.00	8.12	0	00:35	0
0.162	0.000						
50		JUNCTION	32.34	32.34	0	00:35	0.593
0.593	0.000						
60		JUNCTION	9.70	9.70	0	00:35	0.226
0.226	0.000						
61		JUNCTION	16.46	16.46	0	00:40	0.453
0.453	0.000						
62		JUNCTION	3.65	3.65	0	00:35	0.0858
0.0858	0.000						
63		JUNCTION	12.98	12.98	0	00:40	0.345
0.345	0.000						
64		JUNCTION	0.00	13.35	0	00:35	0
0.311	0.000						
65		JUNCTION	0.00	26.04	0	00:36	0
0.657	0.000						
66		JUNCTION	0.00	16.46	0	00:40	0
0.453	0.000						
70		JUNCTION	5.57	5.57	0	00:35	0.135
0.135	0.000						
71		JUNCTION	3.87	3.87	0	00:35	0.101
0.101	0.000						
72		JUNCTION	0.00	3.87	0	00:35	0
0.101	0.000						
73		JUNCTION	0.00	3.87	0	00:35	0
0.101	0.000						
80		JUNCTION	1.85	1.85	0	00:35	0.0476
0.0476	0.000						
81		JUNCTION	5.37	5.37	0	00:35	0.124
0.124	0.000						
82		JUNCTION	1.92	1.92	0	00:35	0.0398

0.0398	0.000						
83		JUNCTION	8.07	8.07	0	00:35	0.185
0.185	0.000						
84		JUNCTION	0.00	7.22	0	00:35	0
0.172	0.000						
85		JUNCTION	0.00	1.92	0	00:35	0
0.0398	0.000						
PondC		JUNCTION	0.00	9.95	0	00:35	0
0.179	0.000						
PondA		JUNCTION	0.00	13.03	0	00:35	0
0.304	0.000						
PondB		JUNCTION	0.00	26.96	0	00:40	0
0.594	0.000						
PondE		JUNCTION	0.00	32.34	0	00:35	0
0.593	0.000						
PondG		JUNCTION	0.00	189.42	0	00:36	0
29.3	0.000						
PondH		JUNCTION	0.00	17.11	0	00:36	0
0.397	0.000						
PondF		JUNCTION	0.00	42.32	0	00:41	0
1.11	0.000						
PondD		JUNCTION	0.00	30.00	0	00:38	0
0.685	0.000						
31		JUNCTION	0.00	9.95	0	00:35	0
0.179	0.000						
51		JUNCTION	0.00	93.34	0	00:35	0
10.4	0.000						
67		JUNCTION	0.00	231.47	0	00:40	0
30.4	0.000						
74		JUNCTION	0.00	189.42	0	00:36	0
29.3	0.000						
OS1		JUNCTION	67.00	67.00	0	00:00	10.8
10.8	0.000						
OS2		JUNCTION	59.00	59.00	0	00:00	9.53
9.53	0.000						
OS3		JUNCTION	61.00	61.00	0	00:00	9.86
9.85	0.000						
OS4		JUNCTION	180.00	180.00	0	00:00	29.1
29.1	0.000						
Outfall2		OUTFALL	0.00	85.96	0	00:40	0
10.1	0.000						
Outfall1		OUTFALL	0.00	80.03	0	00:35	0
11.1	0.000						
Outfall4		OUTFALL	0.00	341.05	0	00:36	0
41.2	0.000						
Outfall3		OUTFALL	0.00	30.00	0	00:38	0
0.685	0.000						

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	100.00	62.68	85.96	10.120
Outfall1	100.00	68.88	80.03	11.121
Outfall4	100.00	255.45	341.05	41.246
Outfall3	60.56	7.00	30.00	0.685
System	90.14	394.01	536.81	63.172

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	13.03	0	00:35			
200	DUMMY	4.33	0	00:35			
201	DUMMY	1.66	0	00:40			
202	CONDUIT	5.95	0	00:36	10.09	0.00	0.04
204	DUMMY	11.85	0	00:40			
205	CONDUIT	21.20	0	00:40	14.13	0.01	0.08
300	DUMMY	9.95	0	00:35			
400	DUMMY	8.12	0	00:35			
401	CONDUIT	8.03	0	00:37	8.38	0.02	0.10
402	DUMMY	22.23	0	00:40			
500	DUMMY	32.34	0	00:35			
601	DUMMY	16.46	0	00:40			
602	CONDUIT	16.42	0	00:41	6.99	0.07	0.18
603	DUMMY	9.70	0	00:35			

604	DUMMY	3.65	0	00:35			
605	CONDUIT	13.32	0	00:36	11.62	0.01	0.07
606	DUMMY	12.98	0	00:40			
607	CONDUIT	26.04	0	00:36	12.42	0.02	0.09
700	DUMMY	5.57	0	00:35			
701	DUMMY	3.87	0	00:35			
702	DUMMY	3.87	0	00:35			
703	CONDUIT	3.86	0	00:36	4.80	0.01	0.08
801	DUMMY	1.85	0	00:35			
802	DUMMY	5.37	0	00:35			
803	CONDUIT	7.18	0	00:36	6.34	0.01	0.07
804	DUMMY	1.92	0	00:35			
806	DUMMY	8.07	0	00:35			
805	CONDUIT	1.91	0	00:37	4.00	0.01	0.06
301	DUMMY	9.95	0	00:35			
101	DUMMY	13.03	0	00:35			
206	DUMMY	26.96	0	00:40			
501	DUMMY	32.34	0	00:35			
704	DUMMY	189.42	0	00:36			
807	DUMMY	17.11	0	00:36			
608	DUMMY	42.32	0	00:41			
403	DUMMY	30.00	0	00:38			
41	DUMMY	9.95	0	00:35			
42	DUMMY	93.34	0	00:35			
43	DUMMY	231.47	0	00:40			
44	DUMMY	189.42	0	00:36			
45	DUMMY	180.00	0	00:00			
46	DUMMY	67.00	0	00:00			
47	DUMMY	59.00	0	00:00			
48	DUMMY	61.00	0	00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:32:27 2020
Analysis ended on: Mon Sep 21 16:32:27 2020
Total elapsed time: < 1 sec

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------
SWMM 100 Year Pre Development

  ***********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ***********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ NO
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 01/01/2005 00:00:00
  Ending Date .............. 01/01/2005 06:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Routing Time Step ........ 30.00 sec


  *************************        Volume        Volume
  Flow Routing Continuity        acre-feet      10^6 gal
  *************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.000         0.000
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........        82.644        26.931
  External Outflow .........        82.609        26.919
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.043
```

****
Highest Flow Instability Indexes
****
Link 608 (1)

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.04
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.21	0.59	6945.59	0 00:45	0.58
24	JUNCTION	0.36	1.43	6935.43	0 00:45	1.42
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.24	1.05	6912.05	0 00:40	1.05
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.27	1.04	6901.04	0 00:45	1.03
65	JUNCTION	0.43	1.52	6881.52	0 00:45	1.52
66	JUNCTION	0.61	2.08	6870.08	0 00:50	2.08
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0 00:00	0.00
73	JUNCTION	0.27	0.94	6902.94	0 00:45	0.94

80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.32	1.19	6873.19	0	00:45	1.18
85	JUNCTION	0.15	0.64	6874.64	0	00:40	0.64
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.39	1.43	6912.43	0	00:46	1.42
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.27	0.94	6900.94	0	00:46	0.94
PondH	JUNCTION	0.32	1.18	6867.18	0	00:46	1.18
PondF	JUNCTION	0.61	2.08	6868.08	0	00:51	2.08
PondD	JUNCTION	0.25	1.05	6882.05	0	00:42	1.05
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
31	OUTFALL	0.00	0.00	6953.00	0	00:00	0.00
51	OUTFALL	0.00	0.00	6920.00	0	00:00	0.00
74	OUTFALL	0.00	0.00	6897.00	0	00:00	0.00
67	OUTFALL	0.00	0.00	6865.50	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	13.03	13.03	0 00:35	0.304	0.304	0.000
20	JUNCTION	4.33	4.33	0 00:35	0.085	0.085	0.000
21	JUNCTION	20.74	20.74	0 00:50	0.794	0.794	0.000

22		JUNCTION	140.35	140.35	0	00:45	3.79	3.79 0.000
23		JUNCTION	0.00	23.90	0	00:45	0	0.879 0.000
24		JUNCTION	0.00	140.35	0	00:45	0	3.79 0.000
30		JUNCTION	110.70	110.70	0	00:40	2.47	2.47 0.000
40		JUNCTION	40.00	40.00	0	00:40	1.03	1.03 0.000
41		JUNCTION	114.87	114.87	0	00:45	3.31	3.31 0.000
42		JUNCTION	0.00	40.00	0	00:40	0	1.03 0.000
50		JUNCTION	157.99	157.99	0	00:40	3.76	3.76 0.000
60		JUNCTION	49.45	49.45	0	00:45	1.43	1.43 0.000
61		JUNCTION	86.73	86.73	0	00:50	2.87	2.87 0.000
62		JUNCTION	18.42	18.42	0	00:45	0.544	0.544 0.000
63		JUNCTION	67.82	67.82	0	00:45	2.19	2.19 0.000
64		JUNCTION	0.00	67.87	0	00:45	0	1.97 0.000
65		JUNCTION	0.00	135.62	0	00:45	0	4.16 0.000
66		JUNCTION	0.00	86.73	0	00:50	0	2.87 0.000
70		JUNCTION	28.46	28.46	0	00:45	0.853	0.853 0.000
71		JUNCTION	20.06	20.06	0	00:45	0.641	0.641 0.000
72		JUNCTION	0.00	20.06	0	00:45	0	0.641 0.000
73		JUNCTION	0.00	20.06	0	00:45	0	0.641 0.000
80		JUNCTION	21.89	21.89	0	00:45	0.659	0.659 0.000
81		JUNCTION	27.12	27.12	0	00:45	0.786	0.786 0.000
82		JUNCTION	9.51	9.51	0	00:40	0.252	0.252 0.000
83		JUNCTION	40.86	40.86	0	00:45	1.17	1.17 0.000
84		JUNCTION	0.00	49.01	0	00:45	0	1.44 0.000

85	JUNCTION	0.00	9.51	0	00:40	0	0.252	0.000
PondC	JUNCTION	0.00	110.70	0	00:40	0	2.47	0.000
PondA	JUNCTION	0.00	13.03	0	00:35	0	0.304	0.000
PondB	JUNCTION	0.00	164.21	0	00:46	0	4.66	0.000
PondE	JUNCTION	0.00	157.99	0	00:40	0	3.76	0.000
PondG	JUNCTION	0.00	48.48	0	00:45	0	1.49	0.000
PondH	JUNCTION	0.00	99.16	0	00:45	0	2.87	0.000
PondF	JUNCTION	0.00	221.11	0	00:46	0	7.02	0.000
PondD	JUNCTION	0.00	154.35	0	00:45	0	4.34	0.000
Outfall2	OUTFALL	0.00	164.21	0	00:46	0	4.66	0.000
Outfall1	OUTFALL	0.00	13.03	0	00:35	0	0.304	0.000
Outfall4	OUTFALL	0.00	99.16	0	00:45	0	2.87	0.000
Outfall3	OUTFALL	0.00	154.35	0	00:45	0	4.34	0.000
31	OUTFALL	0.00	110.70	0	00:40	0	2.47	0.000
51	OUTFALL	0.00	157.99	0	00:40	0	3.76	0.000
74	OUTFALL	0.00	48.48	0	00:45	0	1.49	0.000
67	OUTFALL	0.00	221.11	0	00:46	0	7.02	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	76.53	37.73	164.21	4.665
Outfall1	55.28	3.40	13.03	0.304
Outfall4	67.08	26.46	99.16	2.867
Outfall3	67.92	39.52	154.35	4.336
31	53.89	28.39	110.70	2.472
51	58.47	39.76	157.99	3.757
74	67.08	13.78	48.48	1.494
67	74.31	58.49	221.11	7.022
System	65.07	247.53	962.28	26.917

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	13.03	0 00:35			
200	DUMMY	4.33	0 00:35			
201	DUMMY	20.74	0 00:50			
202	CONDUIT	23.89	0 00:46	15.49	0.01	0.08
204	DUMMY	140.35	0 00:45			
205	CONDUIT	140.32	0 00:46	24.86	0.09	0.20
300	DUMMY	110.70	0 00:40			
400	DUMMY	40.00	0 00:40			
401	CONDUIT	39.84	0 00:42	13.30	0.10	0.21
402	DUMMY	114.87	0 00:45			
500	DUMMY	157.99	0 00:40			
601	DUMMY	86.73	0 00:50			
602	CONDUIT	86.65	0 00:51	11.22	0.36	0.42
603	DUMMY	49.45	0 00:45			
604	DUMMY	18.42	0 00:45			
605	CONDUIT	67.80	0 00:45	19.12	0.05	0.15
606	DUMMY	67.82	0 00:45			
607	CONDUIT	135.63	0 00:46	20.33	0.08	0.19
700	DUMMY	28.46	0 00:45			
701	DUMMY	20.06	0 00:45			
702	DUMMY	20.06	0 00:45			
703	CONDUIT	20.04	0 00:46	7.87	0.08	0.19
801	DUMMY	21.89	0 00:45			

802	DUMMY	27.12	0	00:45			
803	CONDUIT	48.96	0	00:46	11.36	0.06	0.17
804	DUMMY	9.51	0	00:40			
806	DUMMY	40.86	0	00:45			
805	CONDUIT	9.46	0	00:42	6.45	0.04	0.13
301	DUMMY	110.70	0	00:40			
101	DUMMY	13.03	0	00:35			
206	DUMMY	164.21	0	00:46			
501	DUMMY	157.99	0	00:40			
704	DUMMY	48.48	0	00:45			
807	DUMMY	99.16	0	00:45			
608	DUMMY	221.11	0	00:46			
403	DUMMY	154.35	0	00:45			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Apr 10 13:11:18 2020
Analysis ended on: Fri Apr 10 13:11:18 2020
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/01/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	836.701	272.651
External Outflow	836.646	272.634
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.007	

****
Highest Flow Instability Indexes
****
Link 205 (1)
Link 608 (1)
Link 206 (1)

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.03
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.28	0.97	6945.97	0 00:45	0.97
24	JUNCTION	0.45	1.91	6935.91	0 00:45	1.91
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.24	1.05	6912.05	0 00:40	1.05
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.27	1.04	6901.04	0 00:45	1.03
65	JUNCTION	0.43	1.52	6881.52	0 00:45	1.52
66	JUNCTION	0.61	2.08	6870.08	0 00:50	2.08
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00

72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.27	0.94	6902.94	0	00:45	0.94
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.32	1.19	6873.19	0	00:45	1.18
85	JUNCTION	0.15	0.64	6874.64	0	00:40	0.64
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.48	1.91	6912.91	0	00:45	1.90
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.27	0.94	6900.94	0	00:46	0.94
PondH	JUNCTION	0.32	1.18	6867.18	0	00:46	1.18
PondF	JUNCTION	0.61	2.08	6868.08	0	00:51	2.08
PondD	JUNCTION	0.25	1.05	6882.05	0	00:42	1.05
31	JUNCTION	0.00	0.00	6953.00	0	00:00	0.00
51	JUNCTION	0.00	0.00	6920.00	0	00:00	0.00
67	JUNCTION	0.00	0.00	6865.50	0	00:00	0.00
74	JUNCTION	0.00	0.00	6897.00	0	00:00	0.00
OS1	JUNCTION	0.00	0.00	6950.00	0	00:00	0.00
OS2	JUNCTION	0.00	0.00	6924.00	0	00:00	0.00
OS3	JUNCTION	0.00	0.00	6930.00	0	00:00	0.00
OS4	JUNCTION	0.00	0.00	6905.00	0	00:00	0.00
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent

10		JUNCTION	66.80	66.80	0	00:45	1.92	1.92
0.000								
20		JUNCTION	48.76	48.76	0	00:40	1.18	1.18
0.000								
21		JUNCTION	20.74	20.74	0	00:50	0.794	0.794
0.000								
22		JUNCTION	140.35	140.35	0	00:45	3.79	3.79
0.000								
23		JUNCTION	0.00	68.56	0	00:45	0	1.97
0.000								
24		JUNCTION	0.00	249.20	0	00:45	0	6.26
0.000								
30		JUNCTION	110.70	110.70	0	00:40	2.47	2.47
0.000								
40		JUNCTION	40.00	40.00	0	00:40	1.03	1.03
0.000								
41		JUNCTION	114.87	114.87	0	00:45	3.31	3.31
0.000								
42		JUNCTION	0.00	40.00	0	00:40	0	1.03
0.000								
50		JUNCTION	157.99	157.99	0	00:40	3.76	3.76
0.000								
60		JUNCTION	49.45	49.45	0	00:45	1.43	1.43
0.000								
61		JUNCTION	86.73	86.73	0	00:50	2.87	2.87
0.000								
62		JUNCTION	18.42	18.42	0	00:45	0.544	0.544
0.000								
63		JUNCTION	67.82	67.82	0	00:45	2.19	2.19
0.000								
64		JUNCTION	0.00	67.87	0	00:45	0	1.97
0.000								
65		JUNCTION	0.00	135.62	0	00:45	0	4.16
0.000								
66		JUNCTION	0.00	86.73	0	00:50	0	2.87
0.000								
70		JUNCTION	28.46	28.46	0	00:45	0.853	0.853
0.000								
71		JUNCTION	20.06	20.06	0	00:45	0.641	0.641
0.000								
72		JUNCTION	0.00	20.06	0	00:45	0	0.641
0.000								
73		JUNCTION	0.00	20.06	0	00:45	0	0.641
0.000								
80		JUNCTION	21.89	21.89	0	00:45	0.659	0.659
0.000								
81		JUNCTION	27.12	27.12	0	00:45	0.786	0.786
0.000								

82	JUNCTION	9.51	9.51	0	00:40	0.252	0.252	0.000
83	JUNCTION	40.86	40.86	0	00:45	1.17	1.17	0.000
84	JUNCTION	0.00	49.01	0	00:45	0	1.44	0.000
85	JUNCTION	0.00	9.51	0	00:40	0	0.252	0.000
PondC	JUNCTION	0.00	110.70	0	00:40	0	2.47	0.000
PondA	JUNCTION	0.00	66.80	0	00:45	0	1.92	0.000
PondB	JUNCTION	0.00	317.41	0	00:45	0	8.22	0.000
PondE	JUNCTION	0.00	157.99	0	00:40	0	3.76	0.000
PondG	JUNCTION	0.00	643.48	0	00:45	0	97.6	0.000
PondH	JUNCTION	0.00	99.16	0	00:45	0	2.87	0.000
PondF	JUNCTION	0.00	221.11	0	00:46	0	7.02	0.000
PondD	JUNCTION	0.00	154.35	0	00:45	0	4.34	0.000
31	JUNCTION	0.00	110.70	0	00:40	0	2.47	0.000
51	JUNCTION	0.00	374.99	0	00:40	0	38.8	0.000
67	JUNCTION	0.00	864.52	0	00:46	0	105	0.000
74	JUNCTION	0.00	643.48	0	00:45	0	97.6	0.000
OS1	JUNCTION	413.00	413.00	0	00:00	66.7	66.7	0.000
OS2	JUNCTION	280.00	280.00	0	00:00	45.2	45.2	0.000
OS3	JUNCTION	217.00	217.00	0	00:00	35.1	35	0.000
OS4	JUNCTION	595.00	595.00	0	00:00	96.1	96.1	0.000
Outfall2	OUTFALL	0.00	597.41	0	00:45	0	53.4	0.000
Outfall1	OUTFALL	0.00	479.80	0	00:45	0	68.6	0.000
Outfall4	OUTFALL	0.00	1335.77	0	00:45	0	146	0.000
Outfall3	OUTFALL	0.00	154.35	0	00:45	0	4.34	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	100.00	330.89	597.41	53.430
Outfall1	100.00	424.90	479.80	68.605
Outfall4	100.00	905.71	1335.77	146.242
Outfall3	67.92	39.52	154.35	4.336
System	91.98	1701.02	2567.34	272.613

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	66.80	0	00:45			
200	DUMMY	48.76	0	00:40			
201	DUMMY	20.74	0	00:50			
202	CONDUIT	68.51	0	00:45	21.36	0.04	0.14
204	DUMMY	140.35	0	00:45			
205	CONDUIT	248.90	0	00:45	29.30	0.16	0.27
300	DUMMY	110.70	0	00:40			
400	DUMMY	40.00	0	00:40			
401	CONDUIT	39.84	0	00:42	13.30	0.10	0.21
402	DUMMY	114.87	0	00:45			
500	DUMMY	157.99	0	00:40			
601	DUMMY	86.73	0	00:50			
602	CONDUIT	86.65	0	00:51	11.22	0.36	0.42

603	DUMMY	49.45	0	00:45			
604	DUMMY	18.42	0	00:45			
605	CONDUIT	67.80	0	00:45	19.12	0.05	0.15
606	DUMMY	67.82	0	00:45			
607	CONDUIT	135.63	0	00:46	20.33	0.08	0.19
700	DUMMY	28.46	0	00:45			
701	DUMMY	20.06	0	00:45			
702	DUMMY	20.06	0	00:45			
703	CONDUIT	20.04	0	00:46	7.87	0.08	0.19
801	DUMMY	21.89	0	00:45			
802	DUMMY	27.12	0	00:45			
803	CONDUIT	48.96	0	00:46	11.36	0.06	0.17
804	DUMMY	9.51	0	00:40			
806	DUMMY	40.86	0	00:45			
805	CONDUIT	9.46	0	00:42	6.45	0.04	0.13
301	DUMMY	110.70	0	00:40			
101	DUMMY	66.80	0	00:45			
206	DUMMY	317.41	0	00:45			
501	DUMMY	157.99	0	00:40			
704	DUMMY	643.48	0	00:45			
807	DUMMY	99.16	0	00:45			
608	DUMMY	221.11	0	00:46			
403	DUMMY	154.35	0	00:45			
41	DUMMY	110.70	0	00:40			
42	DUMMY	374.99	0	00:40			
43	DUMMY	864.52	0	00:46			
44	DUMMY	643.48	0	00:45			
45	DUMMY	595.00	0	00:00			
46	DUMMY	413.00	0	00:00			
47	DUMMY	280.00	0	00:00			
48	DUMMY	217.00	0	00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:37:19 2020
Analysis ended on: Mon Sep 21 16:37:19 2020
Total elapsed time: < 1 sec

SWMM 5 Year Post Development

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/02/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	39.629	12.914
External Outflow	23.957	7.807
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	15.654	5.101
Continuity Error (%)	0.045	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.01
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.04	0.75	6945.75	0 00:30	0.74
24	JUNCTION	0.21	1.17	6935.17	0 00:30	1.16
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.17	0.20	6953.20	0 02:23	0.20
67	JUNCTION	0.16	0.59	6866.09	0 01:57	0.59
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.03	0.82	6911.82	0 00:30	0.81
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	0.03	0.21	6920.21	0 01:12	0.21
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.03	0.66	6900.66	0 00:35	0.66
65	JUNCTION	0.05	1.10	6881.10	0 00:35	1.10
66	JUNCTION	0.08	1.71	6869.71	0 00:35	1.71

70	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.03	0.55	6902.55	0	00:35	0.54
74	JUNCTION	0.02	0.24	6897.24	0	01:15	0.24
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.04	0.80	6872.80	0	00:30	0.79
85	JUNCTION	0.02	0.48	6874.48	0	00:30	0.47
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.16	0.59	6865.59	0	01:57	0.59
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	5.89	6.37	6917.37	0	01:30	6.37
PondC	STORAGE	4.70	5.56	6961.56	0	02:23	5.56
PondA	STORAGE	4.01	4.67	6953.67	0	01:46	4.67
PondD	STORAGE	5.54	6.51	6887.51	0	02:25	6.51
PondE	STORAGE	4.04	4.77	6927.77	0	01:12	4.77
PondF	STORAGE	5.76	6.73	6872.73	0	02:02	6.73
PondG	STORAGE	0.11	1.20	6901.20	0	01:15	1.20
PondH	STORAGE	4.49	5.12	6871.12	0	02:09	5.12

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	30.72	30.72	0 00:35	0.705	0.705	0.000
20	JUNCTION	29.46	29.46	0 00:30	0.578	0.578	0.000
21	JUNCTION	12.02	12.02	0 00:35	0.376		

0.376	0.000							
22		JUNCTION	92.76	92.76	0	00:30	2.04	
2.04	0.000							
23		JUNCTION	0.00	40.92	0	00:30	0	
0.954	0.000							
24		JUNCTION	0.00	93.26	0	00:30	0	
2.96	0.000							
30		JUNCTION	77.99	77.99	0	00:30	1.38	
1.38	0.000							
31		JUNCTION	0.00	1.52	0	02:23	0	
0.925	0.000							
67		JUNCTION	0.00	23.06	0	01:57	0	
2.4	-0.000							
40		JUNCTION	24.15	24.15	0	00:30	0.438	
0.438	0.000							
41		JUNCTION	98.47	98.47	0	00:30	1.83	
1.83	0.000							
42		JUNCTION	0.00	24.15	0	00:30	0	
0.438	-0.000							
50		JUNCTION	46.88	46.88	0	00:35	0.982	
0.982	0.000							
51		JUNCTION	0.00	18.70	0	01:12	0	
0.69	0.000							
60		JUNCTION	16.28	16.28	0	00:35	0.424	
0.424	0.000							
61		JUNCTION	60.11	60.11	0	00:35	1.38	
1.38	0.000							
62		JUNCTION	11.36	11.36	0	00:30	0.234	
0.234	0.000							
63		JUNCTION	42.32	42.32	0	00:30	0.975	
0.975	0.000							
64		JUNCTION	0.00	26.88	0	00:35	0	
0.659	0.000							
65		JUNCTION	0.00	69.12	0	00:35	0	
1.63	0.000							
66		JUNCTION	0.00	60.11	0	00:35	0	
1.38	0.000							
70		JUNCTION	13.78	13.78	0	00:30	0.32	
0.32	0.000							
71		JUNCTION	6.55	6.55	0	00:35	0.191	
0.191	0.000							
72		JUNCTION	0.00	6.55	0	00:35	0	
0.191	0.000							
73		JUNCTION	0.00	6.55	0	00:35	0	
0.191	0.000							
74		JUNCTION	0.00	9.05	0	01:15	0	
0.51	-0.000							
80		JUNCTION	5.68	5.68	0	00:35	0.173	

0.173	0.000						
81		JUNCTION	16.24	16.24	0	00:30	0.333
0.333	0.000						
82		JUNCTION	5.21	5.21	0	00:30	0.1
0.1	0.000						
83		JUNCTION	20.93	20.93	0	00:30	0.453
0.453	0.000						
84		JUNCTION	0.00	21.67	0	00:30	0
0.507	0.000						
85		JUNCTION	0.00	5.21	0	00:30	0
0.1	0.000						
Outfall2		OUTFALL	0.00	34.45	0	01:30	0
2.22	0.000						
Outfall1		OUTFALL	0.00	5.43	0	01:46	0
0.441	0.000						
Outfall4		OUTFALL	0.00	35.27	0	01:51	0
3.71	0.000						
Outfall3		OUTFALL	0.00	2.52	0	02:25	0
1.43	0.000						
PondB		STORAGE	0.00	134.27	0	00:31	0
3.91	0.047						
PondC		STORAGE	0.00	77.99	0	00:30	0
1.38	0.005						
PondA		STORAGE	0.00	30.72	0	00:35	0
0.705	0.012						
PondD		STORAGE	0.00	120.96	0	00:30	0
2.27	0.003						
PondE		STORAGE	0.00	46.88	0	00:35	0
0.982	0.118						
PondF		STORAGE	0.00	129.20	0	00:35	0
3.01	0.014						
PondG		STORAGE	0.00	20.07	0	00:35	0
0.51	0.116						
PondH		STORAGE	0.00	47.25	0	00:32	0
1.06	0.001						

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum
	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt		Occurrence	Outflow
Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days	hr:min	CFS
PondB	241.825	30	0	0	296.729	37	0	01:30	34.45
PondC	111.256	19	0	0	174.130	30	0	02:23	1.52
PondA	53.736	15	0	0	79.797	22	0	01:46	5.43
PondD	192.634	28	0	0	287.984	41	0	02:24	2.52
PondE	56.473	16	0	0	85.437	24	0	01:11	18.70
PondF	235.289	29	0	0	351.325	44	0	02:02	16.38
PondG	2.647	0	0	0	31.290	6	0	01:15	9.05
PondH	88.617	17	0	0	127.653	25	0	02:09	4.21

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	99.64	2.76	34.45	2.223
Outfall1	99.67	0.55	5.43	0.441
Outfall4	99.67	4.61	35.27	3.709
Outfall3	99.69	1.78	2.52	1.434
System	99.67	9.70	73.13	7.806

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	30.72	0	00:35			
200	DUMMY	29.46	0	00:30			
201	DUMMY	12.02	0	00:35			
202	CONDUIT	40.84	0	00:31	18.27	0.02	0.11
203	CONDUIT	1.52	0	02:24	6.34	0.00	0.05
204	DUMMY	92.76	0	00:30			
205	CONDUIT	93.43	0	00:31	22.09	0.06	0.17
300	DUMMY	77.99	0	00:30			
400	DUMMY	24.15	0	00:30			
401	CONDUIT	23.53	0	00:32	11.46	0.06	0.16
402	DUMMY	98.47	0	00:30			
500	DUMMY	46.88	0	00:35			
601	DUMMY	60.11	0	00:35			
602	CONDUIT	60.09	0	00:35	10.17	0.25	0.34
603	DUMMY	16.28	0	00:35			
604	DUMMY	11.36	0	00:30			
605	CONDUIT	26.88	0	00:35	14.61	0.02	0.09
606	DUMMY	42.32	0	00:30			
607	CONDUIT	69.12	0	00:31	16.65	0.04	0.14
700	DUMMY	13.78	0	00:30			
701	DUMMY	6.55	0	00:35			
702	DUMMY	6.55	0	00:35			
703	CONDUIT	6.54	0	00:36	5.62	0.03	0.11
801	DUMMY	5.68	0	00:35			
802	DUMMY	16.24	0	00:30			
803	CONDUIT	21.49	0	00:32	8.87	0.03	0.11
804	DUMMY	5.21	0	00:30			
806	DUMMY	20.93	0	00:30			
805	CONDUIT	5.08	0	00:32	5.42	0.02	0.09
808	CONDUIT	23.06	0	01:57	2.25	0.00	0.06
800	CONDUIT	8.95	0	01:25	2.34	0.00	0.02
600	CONDUIT	18.26	0	01:17	5.75	0.00	0.03
101	DUMMY	5.43	0	01:46			
206	DUMMY	34.45	0	01:30			
301	DUMMY	1.52	0	02:23			
501	DUMMY	18.70	0	01:12			
704	DUMMY	9.05	0	01:15			
807	DUMMY	4.21	0	02:09			
608	DUMMY	16.38	0	02:02			
403	DUMMY	2.52	0	02:25			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 13 19:10:46 2020
Analysis ended on: Mon Apr 13 19:10:46 2020
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/02/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	949.387	309.372
External Outflow	930.375	303.177
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	20.095	6.548
Continuity Error (%)	-0.114	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.04	0.75	6945.75	0 00:30	0.74
24	JUNCTION	0.21	1.17	6935.17	0 00:30	1.16
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.17	0.20	6953.20	0 02:23	0.20
67	JUNCTION	1.87	1.97	6867.47	0 01:59	1.97
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.03	0.82	6911.82	0 00:30	0.81
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	0.71	0.71	6920.71	0 00:32	0.71
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.03	0.66	6900.66	0 00:35	0.66
65	JUNCTION	0.05	1.10	6881.10	0 00:35	1.10
66	JUNCTION	0.08	1.71	6869.71	0 00:35	1.71
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00

71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.03	0.55	6902.55	0	00:35	0.54
74	JUNCTION	1.36	1.40	6898.40	0	01:15	1.40
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.04	0.80	6872.80	0	00:30	0.79
85	JUNCTION	0.02	0.48	6874.48	0	00:30	0.47
OS1	JUNCTION	0.45	0.45	6953.05	0	00:00	0.45
OS3	JUNCTION	0.71	0.71	6923.51	0	00:00	0.71
OS4	JUNCTION	1.21	1.21	6901.01	0	00:00	1.21
OS2	JUNCTION	0.42	0.42	6924.42	0	00:00	0.42
Outfall2	OUTFALL	0.42	0.42	6910.42	0	03:03	0.42
Outfall1	OUTFALL	0.45	0.45	6947.45	0	01:12	0.45
Outfall4	OUTFALL	1.87	1.97	6866.97	0	01:59	1.97
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	6.42	6.96	6917.96	0	02:52	6.96
PondC	STORAGE	4.70	5.56	6961.56	0	02:23	5.56
PondA	STORAGE	5.16	6.43	6955.43	0	02:35	6.43
PondD	STORAGE	5.57	6.66	6887.66	0	02:07	6.65
PondE	STORAGE	3.99	4.85	6927.85	0	01:03	4.85
PondF	STORAGE	5.76	6.72	6872.72	0	02:04	6.72
PondG	STORAGE	0.11	1.20	6901.20	0	01:15	1.20
PondH	STORAGE	4.38	5.01	6871.01	0	02:39	5.01

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	30.72	30.72	0 00:35	0.705	0.705	0.000

20	JUNCTION	29.46	29.46	0	00:30	0.578	0.578	0.000
21	JUNCTION	12.02	12.02	0	00:35	0.376	0.376	0.000
22	JUNCTION	92.76	92.76	0	00:30	2.04	2.04	0.000
23	JUNCTION	0.00	40.92	0	00:30	0	0.954	0.000
24	JUNCTION	0.00	93.26	0	00:30	0	2.96	0.000
30	JUNCTION	77.99	77.99	0	00:30	1.38	1.38	0.000
31	JUNCTION	0.00	1.52	0	02:23	0	0.925	0.000
67	JUNCTION	0.00	201.42	0	01:59	0	147	0.000
40	JUNCTION	24.15	24.15	0	00:30	0.438	0.438	0.000
41	JUNCTION	98.47	98.47	0	00:30	1.83	1.83	0.000
42	JUNCTION	0.00	24.15	0	00:30	0	0.438	-0.000
50	JUNCTION	46.88	46.88	0	00:35	0.982	0.982	0.000
51	JUNCTION	0.00	85.04	0	01:03	0	50	0.000
60	JUNCTION	16.28	16.28	0	00:35	0.424	0.424	0.000
61	JUNCTION	60.11	60.11	0	00:35	1.38	1.38	0.000
62	JUNCTION	11.36	11.36	0	00:30	0.234	0.234	0.000
63	JUNCTION	42.32	42.32	0	00:30	0.975	0.975	0.000
64	JUNCTION	0.00	26.88	0	00:35	0	0.659	0.000
65	JUNCTION	0.00	69.12	0	00:35	0	1.63	0.000
66	JUNCTION	0.00	60.11	0	00:35	0	1.38	0.000
70	JUNCTION	13.78	13.78	0	00:30	0.32	0.32	0.000
71	JUNCTION	6.55	6.55	0	00:35	0.191	0.191	0.000
72	JUNCTION	0.00	6.55	0	00:35	0	0.191	0.000
73	JUNCTION	0.00	6.55	0	00:35	0	0.191	0.000

74		JUNCTION	0.00	189.05	0	01:15	0	
146	0.000							
80		JUNCTION	5.68	5.68	0	00:35	0.173	
0.173	0.000							
81		JUNCTION	16.24	16.24	0	00:30	0.333	
0.333	0.000							
82		JUNCTION	5.21	5.21	0	00:30	0.1	
0.1	0.000							
83		JUNCTION	20.93	20.93	0	00:30	0.453	
0.453	0.000							
84		JUNCTION	0.00	21.67	0	00:30	0	
0.507	0.000							
85		JUNCTION	0.00	5.21	0	00:30	0	
0.1	0.000							
OS1		JUNCTION	67.00	67.00	0	00:00	54.1	
54.1	0.000							
OS3		JUNCTION	61.00	61.00	0	00:00	49.3	
49.3	0.000							
OS4		JUNCTION	180.00	180.00	0	00:00	145	
145	0.000							
OS2		JUNCTION	59.00	59.00	0	00:00	47.7	
47.7	0.000							
Outfall2		OUTFALL	0.00	61.68	0	02:52	0	
49.4	0.000							
Outfall1		OUTFALL	0.00	67.69	0	02:35	0	
54.5	0.000							
Outfall4		OUTFALL	0.00	276.10	0	01:07	0	
198	0.000							
Outfall3		OUTFALL	0.00	8.58	0	02:07	0	
1.45	0.000							
PondB		STORAGE	0.00	134.27	0	00:31	0	
3.91	-0.000							
PondC		STORAGE	0.00	77.99	0	00:30	0	
1.38	0.005							
PondA		STORAGE	0.00	30.72	0	00:35	0	
0.705	0.003							
PondD		STORAGE	0.00	120.96	0	00:30	0	
2.27	0.003							
PondE		STORAGE	0.00	46.88	0	00:35	0	
0.982	0.190							
PondF		STORAGE	0.00	129.20	0	00:35	0	
3.01	0.010							
PondG		STORAGE	0.00	20.07	0	00:35	0	
0.51	0.116							
PondH		STORAGE	0.00	47.25	0	00:32	0	
1.06	0.003							

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondB	321.956	38	0	0	389.908	46	0 02:51	2.68
PondC	111.256	19	0	0	174.130	30	0 02:23	1.52
PondA	59.417	29	0	0	88.970	44	0 02:35	0.69
PondD	184.527	30	0	0	278.950	45	0 02:07	8.58
PondE	46.471	16	0	0	72.497	25	0 01:03	24.04
PondF	238.240	29	0	0	353.902	43	0 02:03	15.59
PondG	2.647	0	0	0	31.289	6	0 01:15	9.05
PondH	86.593	14	0	0	132.766	21	0 02:39	1.11

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CFS	CFS	10^6 gal
Outfall2	99.97	61.16	61.68	49.385
Outfall1	99.97	67.44	67.69	54.456
Outfall4	99.89	245.24	276.10	197.866
Outfall3	99.69	1.80	8.58	1.447
System	99.88	375.63	407.24	303.154

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	30.72	0	00:35			
200	DUMMY	29.46	0	00:30			
201	DUMMY	12.02	0	00:35			
202	CONDUIT	40.84	0	00:31	18.27	0.02	0.11
203	CONDUIT	1.52	0	02:24	6.34	0.00	0.05
204	DUMMY	92.76	0	00:30			
205	CONDUIT	93.43	0	00:31	22.09	0.06	0.17
300	DUMMY	77.99	0	00:30			
400	DUMMY	24.15	0	00:30			
401	CONDUIT	23.53	0	00:32	11.46	0.06	0.16
402	DUMMY	98.47	0	00:30			
500	DUMMY	46.88	0	00:35			
601	DUMMY	60.11	0	00:35			
602	CONDUIT	60.09	0	00:35	10.17	0.25	0.34
603	DUMMY	16.28	0	00:35			
604	DUMMY	11.36	0	00:30			
605	CONDUIT	26.88	0	00:35	14.61	0.02	0.09
606	DUMMY	42.32	0	00:30			
607	CONDUIT	69.12	0	00:31	16.65	0.04	0.14
700	DUMMY	13.78	0	00:30			
701	DUMMY	6.55	0	00:35			
702	DUMMY	6.55	0	00:35			
703	CONDUIT	6.54	0	00:36	5.62	0.03	0.11
801	DUMMY	5.68	0	00:35			
802	DUMMY	16.24	0	00:30			
803	CONDUIT	21.49	0	00:32	8.87	0.03	0.11
804	DUMMY	5.21	0	00:30			
806	DUMMY	20.93	0	00:30			
805	CONDUIT	5.08	0	00:32	5.42	0.02	0.09

808	CONDUIT	201.42	0	01:59	4.47	0.03	0.20
800	CONDUIT	189.04	0	01:19	6.57	0.02	0.14
600	CONDUIT	84.88	0	01:06	9.93	0.00	0.06
EastForkTrib	CONDUIT	61.00	0	00:32	3.08	0.01	0.07
EastFork	CONDUIT	180.00	0	00:24	4.29	0.03	0.15
MainStem	CONDUIT	67.00	0	01:15	2.39	0.00	0.05
MainStemTrib	CONDUIT	59.00	0	03:06	2.28	0.00	0.04
101	DUMMY	0.69	0	02:35			
206	DUMMY	2.68	0	02:52			
301	DUMMY	1.52	0	02:23			
501	DUMMY	24.04	0	01:03			
704	DUMMY	9.05	0	01:15			
807	DUMMY	1.11	0	02:39			
608	DUMMY	15.59	0	02:04			
403	DUMMY	8.58	0	02:07			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:22:13 2020
Analysis ended on: Mon Sep 21 16:22:14 2020
Total elapsed time: 00:00:01

SWMM 100 Year Post Development

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/02/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	123.320	40.186
External Outflow	105.086	34.244
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	18.084	5.893
Continuity Error (%)	0.122	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.02
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.06	1.35	6946.35	0 00:35	1.34
24	JUNCTION	0.27	2.22	6936.22	0 00:51	2.22
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.24	1.68	6954.68	0 00:59	1.68
67	JUNCTION	0.24	2.30	6867.80	0 01:13	2.30
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.05	1.40	6912.40	0 00:35	1.38
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	0.04	0.74	6920.74	0 00:49	0.74
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.06	1.19	6901.19	0 00:40	1.19
65	JUNCTION	0.09	1.92	6881.92	0 00:40	1.92

66	JUNCTION	0.13	3.12	6871.12	0	00:40	3.12
70	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.06	1.02	6903.02	0	00:45	1.02
74	JUNCTION	0.05	0.60	6897.60	0	01:12	0.60
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.07	1.45	6873.45	0	00:40	1.45
85	JUNCTION	0.03	0.82	6874.82	0	00:35	0.81
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.24	2.30	6867.30	0	01:13	2.30
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	6.72	9.85	6920.85	0	01:16	9.85
PondC	STORAGE	5.17	7.08	6963.08	0	00:59	7.08
PondA	STORAGE	5.81	8.60	6957.60	0	01:13	8.59
PondD	STORAGE	5.66	8.08	6889.08	0	01:04	8.08
PondE	STORAGE	4.04	5.84	6928.84	0	00:49	5.84
PondF	STORAGE	5.86	8.17	6874.17	0	01:09	8.17
PondG	STORAGE	0.20	2.69	6902.69	0	01:12	2.68
PondH	STORAGE	4.95	6.51	6872.51	0	01:12	6.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	100.64	100.64	0 00:40	2.37	2.37	0.000
20	JUNCTION	97.08	97.08	0 00:35	1.81	1.81	0.000

21		JUNCTION	42.26	42.26	0	00:40	1.2	1.2	0.000
22		JUNCTION	295.27	295.27	0	00:40	6.04	6.04	0.000
23		JUNCTION	0.00	136.17	0	00:35	0	3.01	0.000
24		JUNCTION	0.00	334.84	0	00:51	0	9.43	-0.000
30		JUNCTION	238.03	238.03	0	00:35	4	4	0.000
31		JUNCTION	0.00	115.75	0	00:59	0	3.39	0.000
67		JUNCTION	0.00	270.41	0	01:13	0	9.72	-0.000
40		JUNCTION	70.07	70.07	0	00:35	1.32	1.32	0.000
41		JUNCTION	252.18	252.18	0	00:35	4.73	4.73	0.000
42		JUNCTION	0.00	70.07	0	00:35	0	1.32	0.000
50		JUNCTION	178.04	178.04	0	00:40	4.2	4.2	0.000
51		JUNCTION	0.00	164.75	0	00:49	0	3.95	0.000
60		JUNCTION	58.95	58.95	0	00:40	1.65	1.65	0.000
61		JUNCTION	170.90	170.90	0	00:40	3.87	3.87	0.000
62		JUNCTION	32.93	32.93	0	00:35	0.699	0.699	0.000
63		JUNCTION	124.89	124.89	0	00:40	2.87	2.87	0.000
64		JUNCTION	0.00	90.88	0	00:40	0	2.35	0.000
65		JUNCTION	0.00	215.63	0	00:40	0	5.22	0.000
66		JUNCTION	0.00	170.90	0	00:40	0	3.87	0.000
70		JUNCTION	43.95	43.95	0	00:40	1.05	1.05	0.000
71		JUNCTION	23.95	23.95	0	00:45	0.742	0.742	0.000
72		JUNCTION	0.00	23.95	0	00:45	0	0.742	0.000
73		JUNCTION	0.00	23.95	0	00:45	0	0.742	0.000
74		JUNCTION	0.00	42.13	0	01:12	0	1.79	-0.000

80	JUNCTION	27.62	27.62	0	00:45	0.833	0.833	0.000
81	JUNCTION	47.62	47.62	0	00:35	1.01	1.01	0.000
82	JUNCTION	15.60	15.60	0	00:35	0.314	0.314	0.000
83	JUNCTION	64.71	64.71	0	00:35	1.46	1.46	0.000
84	JUNCTION	0.00	73.73	0	00:40	0	1.84	0.000
85	JUNCTION	0.00	15.60	0	00:35	0	0.314	0.000
Outfall2	OUTFALL	0.00	256.11	0	01:16	0	10.3	0.000
Outfall1	OUTFALL	0.00	53.95	0	01:13	0	2.03	0.000
Outfall4	OUTFALL	0.00	478.86	0	01:05	0	16.7	0.000
Outfall3	OUTFALL	0.00	160.70	0	01:04	0	5.21	0.000
PondB	STORAGE	0.00	447.00	0	00:49	0	12.4	0.062
PondC	STORAGE	0.00	238.03	0	00:35	0	4	0.130
PondA	STORAGE	0.00	100.64	0	00:40	0	2.37	0.096
PondD	STORAGE	0.00	320.21	0	00:35	0	6.05	0.105
PondE	STORAGE	0.00	178.04	0	00:40	0	4.2	0.178
PondF	STORAGE	0.00	385.87	0	00:41	0	9.08	0.109
PondG	STORAGE	0.00	67.73	0	00:40	0	1.8	0.079
PondH	STORAGE	0.00	153.03	0	00:38	0	3.61	0.143

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum
	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt		Outflow
Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days hr:min	CFS
PondB	363.135	43	0	0	827.701	97	0 01:15	256.11
PondC	146.763	26	0	0	299.338	52	0 00:58	115.75
PondA	75.030	37	0	0	152.554	76	0 01:12	53.95
PondD	192.591	31	0	0	418.291	67	0 01:04	160.70
PondE	48.028	17	0	0	106.230	37	0 00:48	164.75
PondF	250.108	31	0	0	549.589	67	0 01:09	229.20
PondG	5.811	1	0	0	88.594	16	0 01:11	42.13
PondH	131.315	21	0	0	268.983	42	0 01:12	80.17

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	99.64	12.77	256.11	10.280
Outfall1	99.69	2.53	53.95	2.035
Outfall4	99.67	20.76	478.86	16.717
Outfall3	99.69	6.47	160.70	5.209
System	99.67	42.53	924.48	34.241

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	100.64	0	00:40			
200	DUMMY	97.08	0	00:35			
201	DUMMY	42.26	0	00:40			
202	CONDUIT	136.36	0	00:36	26.17	0.08	0.19
203	CONDUIT	115.74	0	00:59	23.03	0.37	0.42
204	DUMMY	295.27	0	00:40			
205	CONDUIT	334.86	0	00:51	31.89	0.22	0.32
300	DUMMY	238.03	0	00:35			
400	DUMMY	70.07	0	00:35			
401	CONDUIT	69.37	0	00:36	15.63	0.17	0.28
402	DUMMY	252.18	0	00:35			
500	DUMMY	178.04	0	00:40			
601	DUMMY	170.90	0	00:40			
602	CONDUIT	170.58	0	00:41	13.26	0.71	0.62
603	DUMMY	58.95	0	00:40			
604	DUMMY	32.93	0	00:35			
605	CONDUIT	90.74	0	00:41	20.83	0.06	0.17
606	DUMMY	124.89	0	00:40			
607	CONDUIT	215.42	0	00:40	23.26	0.13	0.24
700	DUMMY	43.95	0	00:40			
701	DUMMY	23.95	0	00:45			
702	DUMMY	23.95	0	00:45			
703	CONDUIT	23.94	0	00:45	8.29	0.09	0.20
801	DUMMY	27.62	0	00:45			
802	DUMMY	47.62	0	00:35			
803	CONDUIT	73.66	0	00:40	12.80	0.09	0.21
804	DUMMY	15.60	0	00:35			
806	DUMMY	64.71	0	00:35			
805	CONDUIT	15.43	0	00:37	7.47	0.06	0.16
808	CONDUIT	270.40	0	01:13	4.87	0.04	0.23
800	CONDUIT	41.98	0	01:17	4.06	0.00	0.06
600	CONDUIT	164.38	0	00:51	12.48	0.01	0.09
101	DUMMY	53.95	0	01:13			
206	DUMMY	256.11	0	01:16			
301	DUMMY	115.75	0	00:59			
501	DUMMY	164.75	0	00:49			
704	DUMMY	42.13	0	01:12			
807	DUMMY	80.17	0	01:12			
608	DUMMY	229.20	0	01:09			

403 DUMMY 160.70 0 01:04

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 13 19:00:38 2020
Analysis ended on: Mon Apr 13 19:00:38 2020
Total elapsed time: < 1 sec

SWMM 100 Year Output 9-21-20

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/02/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	3854.070	1255.906
External Outflow	3828.229	1247.485
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	28.186	9.185
Continuity Error (%)	-0.061	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.02
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.06	1.35	6946.35	0 00:35	1.34
24	JUNCTION	0.27	2.22	6936.22	0 00:51	2.22
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.24	1.68	6954.68	0 00:59	1.68
67	JUNCTION	3.45	4.11	6869.61	0 01:12	4.11
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.05	1.40	6912.40	0 00:35	1.38
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	1.48	1.48	6921.48	0 00:21	1.48
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.06	1.19	6901.19	0 00:40	1.19
65	JUNCTION	0.09	1.92	6881.92	0 00:40	1.92
66	JUNCTION	0.13	3.12	6871.12	0 00:40	3.12
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00

71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.06	1.02	6903.02	0	00:45	1.02
74	JUNCTION	2.57	2.66	6899.66	0	01:12	2.66
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.07	1.45	6873.45	0	00:40	1.45
85	JUNCTION	0.03	0.82	6874.82	0	00:35	0.81
OS1	JUNCTION	1.33	1.33	6953.93	0	00:00	1.33
OS3	JUNCTION	1.48	1.48	6924.28	0	00:00	1.48
OS4	JUNCTION	2.38	2.38	6902.18	0	00:00	2.38
OS2	JUNCTION	1.06	1.06	6925.06	0	00:00	1.06
Outfall2	OUTFALL	1.06	1.06	6911.06	0	01:47	1.06
Outfall1	OUTFALL	1.33	1.33	6948.33	0	00:39	1.33
Outfall4	OUTFALL	3.45	4.11	6869.11	0	01:12	4.11
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	6.72	9.85	6920.85	0	01:16	9.85
PondC	STORAGE	5.17	7.08	6963.08	0	00:59	7.08
PondA	STORAGE	5.81	8.60	6957.60	0	01:13	8.59
PondD	STORAGE	5.66	8.08	6889.08	0	01:04	8.08
PondE	STORAGE	4.04	5.84	6928.84	0	00:49	5.84
PondF	STORAGE	5.86	8.17	6874.17	0	01:09	8.17
PondG	STORAGE	0.20	2.69	6902.69	0	01:12	2.68
PondH	STORAGE	4.95	6.51	6872.51	0	01:12	6.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	100.64	100.64	0 00:40	2.37	2.37	0.000

20		JUNCTION	97.08	97.08	0	00:35	1.81	1.81	0.000
21		JUNCTION	42.26	42.26	0	00:40	1.2	1.2	0.000
22		JUNCTION	295.27	295.27	0	00:40	6.04	6.04	0.000
23		JUNCTION	0.00	136.17	0	00:35	0	3.01	0.000
24		JUNCTION	0.00	334.84	0	00:51	0	9.43	-0.000
30		JUNCTION	238.03	238.03	0	00:35	4	4	0.000
31		JUNCTION	0.00	115.75	0	00:59	0	3.39	0.000
67		JUNCTION	0.00	865.98	0	01:12	0	489	0.000
40		JUNCTION	70.07	70.07	0	00:35	1.32	1.32	0.000
41		JUNCTION	252.18	252.18	0	00:35	4.73	4.73	0.000
42		JUNCTION	0.00	70.07	0	00:35	0	1.32	0.000
50		JUNCTION	178.04	178.04	0	00:40	4.2	4.2	0.000
51		JUNCTION	0.00	381.75	0	00:49	0	179	0.000
60		JUNCTION	58.95	58.95	0	00:40	1.65	1.65	0.000
61		JUNCTION	170.90	170.90	0	00:40	3.87	3.87	0.000
62		JUNCTION	32.93	32.93	0	00:35	0.699	0.699	0.000
63		JUNCTION	124.89	124.89	0	00:40	2.87	2.87	0.000
64		JUNCTION	0.00	90.88	0	00:40	0	2.35	0.000
65		JUNCTION	0.00	215.63	0	00:40	0	5.22	0.000
66		JUNCTION	0.00	170.90	0	00:40	0	3.87	0.000
70		JUNCTION	43.95	43.95	0	00:40	1.05	1.05	0.000
71		JUNCTION	23.95	23.95	0	00:45	0.742	0.742	0.000
72		JUNCTION	0.00	23.95	0	00:45	0	0.742	0.000
73		JUNCTION	0.00	23.95	0	00:45	0	0.742	0.000

74	JUNCTION	0.00	637.13	0	01:12	0	482 0.000
80	JUNCTION	27.62	27.62	0	00:45	0.833	0.833 0.000
81	JUNCTION	47.62	47.62	0	00:35	1.01	1.01 0.000
82	JUNCTION	15.60	15.60	0	00:35	0.314	0.314 0.000
83	JUNCTION	64.71	64.71	0	00:35	1.46	1.46 0.000
84	JUNCTION	0.00	73.73	0	00:40	0	1.84 0.000
85	JUNCTION	0.00	15.60	0	00:35	0	0.314 0.000
OS1	JUNCTION	413.00	413.00	0	00:00	334	334 0.000
OS3	JUNCTION	217.00	217.00	0	00:00	175	175 -0.000
OS4	JUNCTION	595.00	595.00	0	00:00	481	481 0.000
OS2	JUNCTION	280.00	280.00	0	00:00	226	226 0.000
Outfall2	OUTFALL	0.00	536.11	0	01:16	0	236 0.000
Outfall1	OUTFALL	0.00	466.95	0	01:13	0	335 0.000
Outfall4	OUTFALL	0.00	1291.25	0	01:05	0	671 0.000
Outfall3	OUTFALL	0.00	160.70	0	01:04	0	5.21 0.000
PondB	STORAGE	0.00	447.00	0	00:49	0	12.4 0.062
PondC	STORAGE	0.00	238.03	0	00:35	0	4 0.130
PondA	STORAGE	0.00	100.64	0	00:40	0	2.37 0.096
PondD	STORAGE	0.00	320.21	0	00:35	0	6.05 0.105
PondE	STORAGE	0.00	178.04	0	00:40	0	4.2 0.178
PondF	STORAGE	0.00	385.87	0	00:41	0	9.08 0.109
PondG	STORAGE	0.00	67.73	0	00:40	0	1.8 0.079
PondH	STORAGE	0.00	153.03	0	00:38	0	3.61 0.143

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondB	363.135	43	0	0	827.701	97	0 01:15	256.11
PondC	146.763	26	0	0	299.338	52	0 00:58	115.75
PondA	75.030	37	0	0	152.554	76	0 01:12	53.95
PondD	192.591	31	0	0	418.291	67	0 01:04	160.70
PondE	48.028	17	0	0	106.230	37	0 00:48	164.75
PondF	250.108	31	0	0	549.589	67	0 01:09	229.20
PondG	5.811	1	0	0	88.594	16	0 01:11	42.13
PondH	131.315	21	0	0	268.983	42	0 01:12	80.17

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CFS	CFS	10^6 gal
Outfall2	99.97	292.00	536.11	235.796
Outfall1	99.97	415.18	466.95	335.258
Outfall4	99.92	831.58	1291.25	671.130
Outfall3	99.69	6.47	160.70	5.209
System	99.89	1545.23	2428.13	1247.393

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	100.64	0	00:40			
200	DUMMY	97.08	0	00:35			
201	DUMMY	42.26	0	00:40			
202	CONDUIT	136.36	0	00:36	26.17	0.08	0.19
203	CONDUIT	115.74	0	00:59	23.03	0.37	0.42
204	DUMMY	295.27	0	00:40			
205	CONDUIT	334.86	0	00:51	31.89	0.22	0.32
300	DUMMY	238.03	0	00:35			
400	DUMMY	70.07	0	00:35			
401	CONDUIT	69.37	0	00:36	15.63	0.17	0.28
402	DUMMY	252.18	0	00:35			
500	DUMMY	178.04	0	00:40			
601	DUMMY	170.90	0	00:40			
602	CONDUIT	170.58	0	00:41	13.26	0.71	0.62
603	DUMMY	58.95	0	00:40			
604	DUMMY	32.93	0	00:35			
605	CONDUIT	90.74	0	00:41	20.83	0.06	0.17
606	DUMMY	124.89	0	00:40			
607	CONDUIT	215.42	0	00:40	23.26	0.13	0.24
700	DUMMY	43.95	0	00:40			
701	DUMMY	23.95	0	00:45			
702	DUMMY	23.95	0	00:45			
703	CONDUIT	23.94	0	00:45	8.29	0.09	0.20
801	DUMMY	27.62	0	00:45			
802	DUMMY	47.62	0	00:35			
803	CONDUIT	73.66	0	00:40	12.80	0.09	0.21
804	DUMMY	15.60	0	00:35			
806	DUMMY	64.71	0	00:35			
805	CONDUIT	15.43	0	00:37	7.47	0.06	0.16

808	CONDUIT	865.97	0	01:12	6.70	0.14	0.41
800	CONDUIT	637.10	0	01:15	9.35	0.06	0.27
600	CONDUIT	381.54	0	00:50	16.34	0.02	0.15
EastForkTrib	CONDUIT	217.00	0	00:21	4.75	0.02	0.15
EastFork	CONDUIT	595.00	0	00:16	6.34	0.10	0.30
MainStem	CONDUIT	413.00	0	00:40	4.75	0.03	0.13
MainStemTrib	CONDUIT	280.00	0	01:49	4.12	0.02	0.11
101	DUMMY	53.95	0	01:13			
206	DUMMY	256.11	0	01:16			
301	DUMMY	115.75	0	00:59			
501	DUMMY	164.75	0	00:49			
704	DUMMY	42.13	0	01:12			
807	DUMMY	80.17	0	01:12			
608	DUMMY	229.20	0	01:09			
403	DUMMY	160.70	0	01:04			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:06:21 2020
Analysis ended on: Mon Sep 21 16:06:21 2020
Total elapsed time: < 1 sec

Appendix D

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond A
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters		
	User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	10	10	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	0.61	0.61	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	3.40	3.40	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	2.96	2.96	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	4.50	4.50	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters		
	User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	370.3	370.3	ft
B) Width of Basin at Top of EURV, W_{PCM} =	113.6	113.6	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	4.60	4.60	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	371.1	371.1	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	114.4	114.4	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	13.03				57.08	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.32				0.84	
0:10		2.12				2.93	
0:15		6.24				8.14	
0:20		19.45				26.66	
0:25		29.43				70.19	
0:30		30.68				95.65	
0:35		28.10				100.37	
0:40		24.84				96.25	
0:45		22.05				89.32	
0:50		19.61				81.43	
0:55		17.40				74.41	
1:00		15.33				68.04	
1:05		13.43				58.60	
1:10		11.93				49.54	
1:15		10.74				42.06	
1:20		9.68				35.93	
1:25		8.69				30.71	
1:30		7.74				26.07	
1:35		6.69				21.81	
1:40		5.63				17.82	
1:45		4.64				14.14	
1:50		3.79				10.94	
1:55		3.24				8.55	
2:00		2.68				6.51	
2:05		2.16				4.89	
2:10		1.73				3.64	
2:15		1.39				2.70	
2:20		1.11				1.98	
2:25		0.88				1.45	
2:30		0.68				1.07	
2:35		0.53				0.82	
2:40		0.41				0.64	
2:45		0.32				0.50	
2:50		0.24				0.39	
2:55		0.17				0.29	
3:00		0.12				0.20	
3:05		0.08				0.13	
3:10		0.05				0.07	
3:15		0.02				0.03	
3:20		0.01				0.01	
3:25		0.00				0.00	
3:30							
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6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond A
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	Input Parameters COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft) $H_{weir\ front}$ =	4.50	4.50	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox) $L_{weir\ front}$ =	8.00	9.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate) $S_{weir\ sides}$ =	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox) Horizontal $L_{weir\ sides}$ =	8.00	5.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area) Grate Open Area =	70%	70%	%
F) Debris Clogging % Debris Clogging =	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox) $H_{grate\ top}$ =	4.50	4.50	ft
H) Overflow Grate Slope Length (inside edge of dropbox) Slope $L_{weir\ sides}$ =	8.00	5.00	ft
I) Overflow Grate Open Area (without debris) Open Area $_{(No\ Clogging)}$ =	44.80	31.50	sq ft
J) Overflow Grate Open Area (with debris) Open Area $_{(Clogged)}$ =	22.40	15.75	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	Input Parameters COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft) Pipe Invert Depth =	1.50	1.50	ft
C) Outlet Pipe Diameter Pipe Diameter =	36.00	30.00	inches
D) Restrictor Plate Height above Pipe Invert Plate Height =	22.42	28.11	inches
E) Half-Central Angle of Restrictor Plate on Pipe Theta =	1.82	2.63	radians
F) Outlet Orifice Area Outlet Ao =	4.63	4.78	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert $Outlet_{centroid}$ =	1.06	1.22	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4) Open Area Ratio =	9.68	6.59	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	Input Parameters COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft) $H_{spillway\ invert}$ =	5.90	6.00	ft
B) Spillway Crest Length $L_{spillway\ crest}$ =	42.00	33.00	ft
C) Spillway End Slopes (H:V) $S_{spillway\ ends}$ =	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface Freeboard Depth=	1.00	1.00	ft
E) Spillway Design Flow Depth Flow $Depth_{spillway}$ =	0.80	1.00	ft
F) Stage at Top of Freeboard Freeboard Top Stage =	7.70	8.00	ft
G) Basin Area at Top of Freeboard Max Basin Area =	1.27	1.29	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.64	1.66		2.16				7.27	
Predevelopment Peak Q (cfs) =	N/A	N/A		13.0				57.1	
Peak Inflow (cfs) =	N/A	N/A		30.7				100.4	
Peak Outflow (cfs) =	0.3	0.5		4.6				56.3	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.4				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.1				1.2	
Time to Drain 97% of Volume (hr) =	39	69		73				61	
Time to Drain 99% of Volume (hr) =	41	72		77				72	
Maximum Ponding Depth (ft) =	3.40	4.50		4.70				5.90	
Area at Max Ponding Depth (ac) =	0.80	0.97		0.98				1.09	
Maximum Volume Stored (ac-ft) =	0.64	1.66		1.87				3.11	

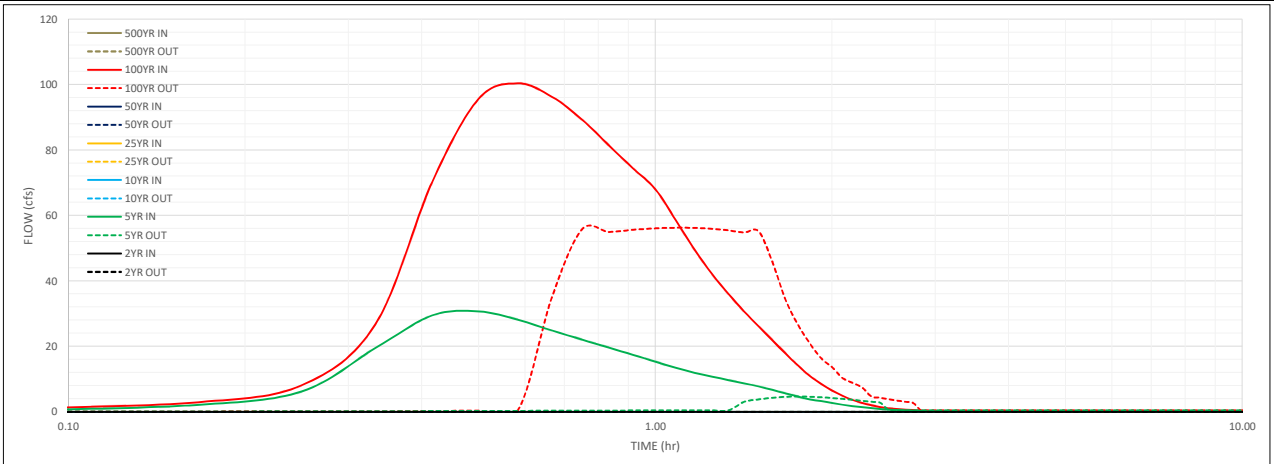
Results based on COS DCM Inputs

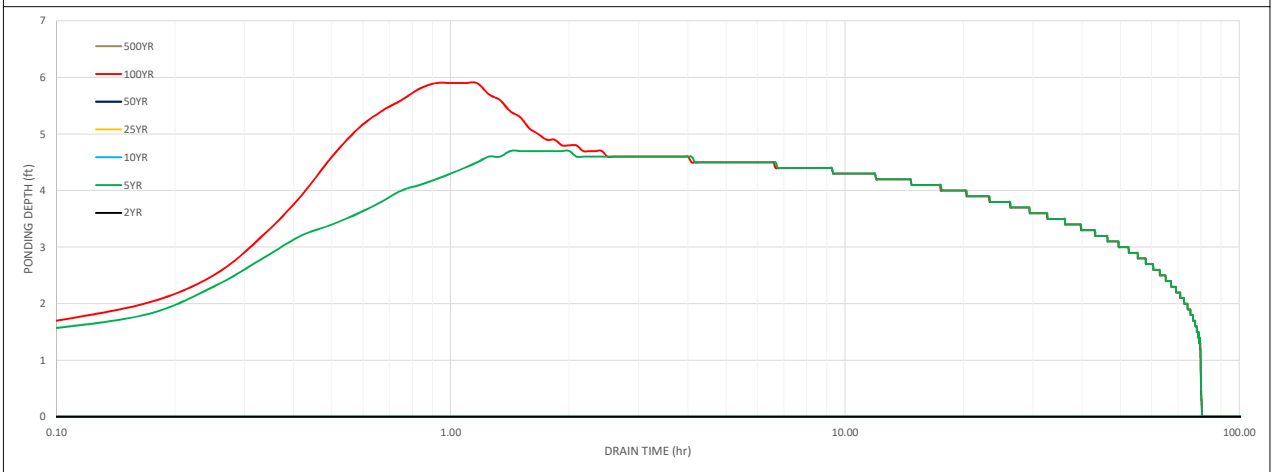
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.64	1.66		2.16				7.27	
Predevelopment Peak Q (cfs) =	N/A	N/A		13.0				57.1	
Peak Inflow (cfs) =	N/A	N/A		30.7				100.4	
Peak Outflow (cfs) =	0.3	0.5		4.3				57.5	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.3				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.2				1.8	
Time to Drain 97% of Volume (hr) =	39	69		73				61	
Time to Drain 99% of Volume (hr) =	41	72		77				72	
Maximum Ponding Depth (ft) =	3.40	4.50		4.70				5.90	
Area at Max Ponding Depth (ac) =	0.80	0.97		0.98				1.09	
Maximum Volume Stored (ac-ft) =	0.64	1.66		1.87				3.11	

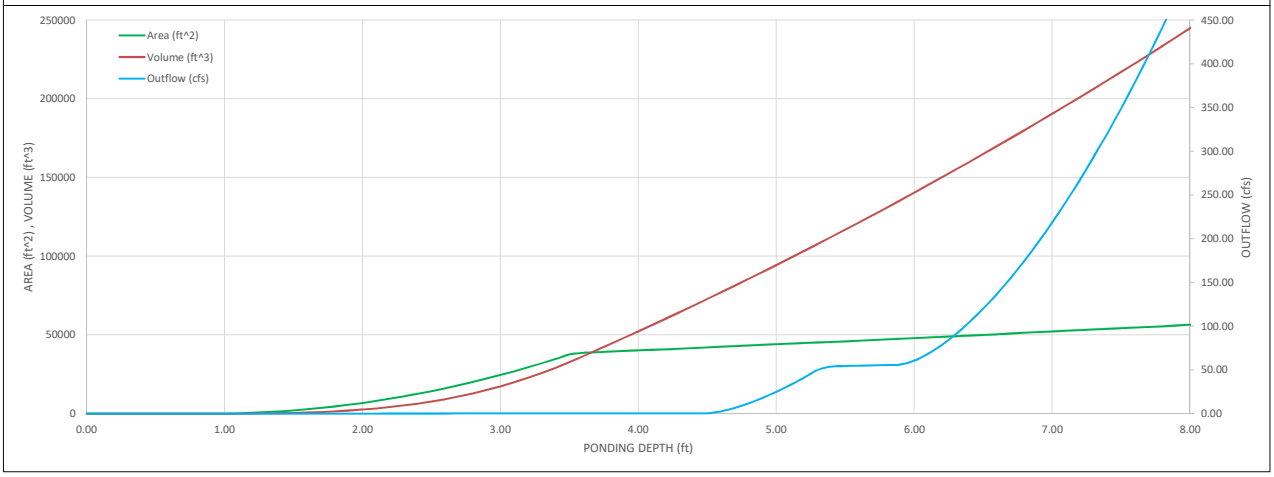
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 3 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond A
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond B
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters: User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	14	14	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	1.49	1.49	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	4.70	4.70	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	1.49	1.49	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	6.00	6.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters: User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	644.7	644.7	ft
B) Width of Basin at Top of EURV, W_{PCM} =	191.2	191.2	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	6.10	6.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	645.5	645.5	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	192.0	192.0	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	17.56				164.21	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.69				2.08	
0:10		5.80				8.30	
0:15		16.64				20.58	
0:20		42.42				58.80	
0:25		68.16				179.82	
0:30		75.65				276.49	
0:35		71.78				307.62	
0:40		64.91				331.81	
0:45		58.24				366.22	
0:50		52.24				365.58	
0:55		47.02				346.26	
1:00		42.99				321.76	
1:05		39.68				290.00	
1:10		36.25				252.97	
1:15		32.60				216.52	
1:20		29.09				182.15	
1:25		26.07				152.09	
1:30		23.97				127.70	
1:35		22.28				109.78	
1:40		20.74				96.42	
1:45		19.35				85.46	
1:50		18.07				76.27	
1:55		16.77				68.63	
2:00		14.81				60.20	
2:05		12.66				51.42	
2:10		10.67				42.95	
2:15		8.88				35.32	
2:20		7.28				28.18	
2:25		5.90				21.64	
2:30		4.82				15.96	
2:35		4.08				11.89	
2:40		3.58				9.39	
2:45		3.19				7.53	
2:50		2.86				6.09	
2:55		2.60				4.98	
3:00		2.39				4.12	
3:05		2.22				3.47	
3:10		2.09				2.97	
3:15		1.97				2.55	
3:20		1.86				2.21	
3:25		1.77				2.08	
3:30		1.70				1.98	
3:35		1.63				1.88	
3:40		1.58				1.81	
3:45		1.54				1.75	
3:50		1.51				1.70	
3:55		1.49				1.67	
4:00		1.47				1.65	
4:05		1.46				1.64	
4:10		1.46				1.64	
4:15		1.46				1.64	
4:20		1.46				1.64	
4:25		1.45				1.64	
4:30		1.45				1.63	
4:35		1.45				1.63	
4:40		1.45				1.63	
4:45		1.45				1.63	
4:50		1.44				1.63	
4:55		1.44				1.63	
5:00		1.44				1.62	
5:05		1.44				1.62	
5:10		1.44				1.62	
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5:20		1.43				1.62	
5:25		1.43				1.61	
5:30		1.43				1.61	
5:35		1.43				1.61	

5:40		1.42				1.61	
5:45		1.42				1.61	
5:50		1.42				1.60	
5:55		1.42				1.60	
6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond B
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)

(Assumes that top of grate is flush with the top of the concrete dropbox)

A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)
B) Overflow Weir Front Edge Length (inside edge of dropbox)
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)
D) Horizontal Length of Weir Sides (inside edge of dropbox)
E) Overflow Grate Open Area % (grate open area / total grate area)
F) Debris Clogging %
G) Height of Grate Upper Edge (at back side of dropbox)
H) Overflow Grate Slope Length (inside edge of dropbox)
I) Overflow Grate Open Area (without debris)
J) Overflow Grate Open Area (with debris)

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.00	6.00	ft
$L_{weir\ front}$ =	17.00	17.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	17.00	7.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.00	6.00	ft
Slope $L_{weir\ sides}$ =	17.00	7.00	ft
Open Area $_{(No\ Clogging)}$ =	202.30	83.30	sq ft
Open Area $_{(Clogged)}$ =	101.15	41.65	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	54.00	48.00	inches
Plate Height =	37.00	42.00	inches
Theta =	1.95	2.42	radians
Outlet Ao =	11.61	11.66	sq ft
$Outlet_{centroid}$ =	1.73	1.87	ft
Open Area Ratio =	17.42	7.14	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	9.50	9.30	ft
$L_{spillway\ crest}$ =	136.00	122.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	0.90	1.00	ft
Freeboard Top Stage =	11.40	11.30	ft
Max Basin Area =	3.70	3.68	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.41	5.73		6.67				31.72	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.6				164.2	
Peak Inflow (cfs) =	N/A	N/A		75.7				366.2	
Peak Outflow (cfs) =	1.1	1.4		1.4				166.4	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				0.8	
Time to Drain 97% of Volume (hr) =	40	68		76				61	
Time to Drain 99% of Volume (hr) =	42	72		80				73	
Maximum Ponding Depth (ft) =	4.70	6.00		6.10				9.10	
Area at Max Ponding Depth (ac) =	1.92	2.83		2.85				3.32	
Maximum Volume Stored (ac-ft) =	2.41	5.73		6.04				15.28	

Results based on COS DCM Inputs

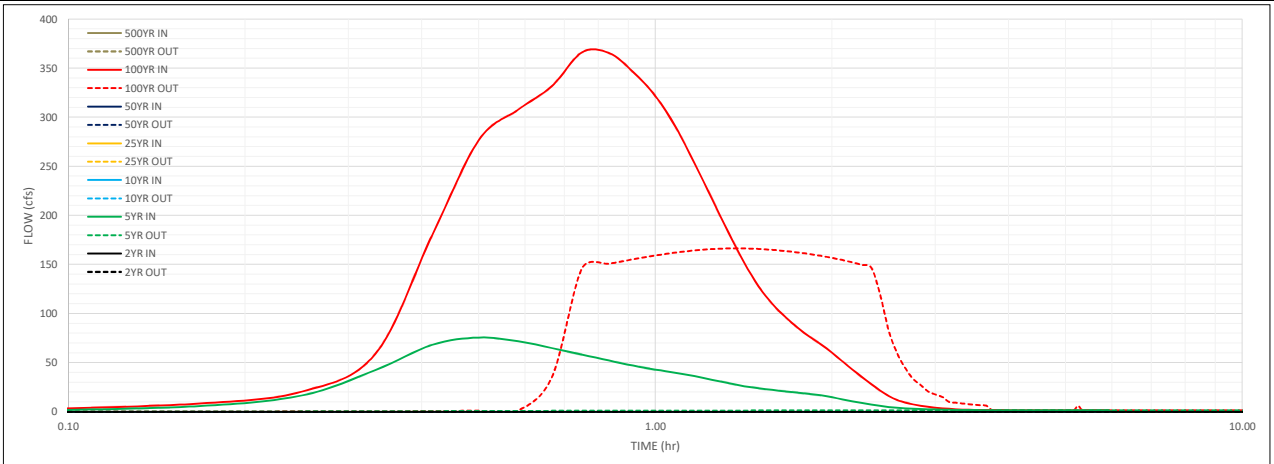
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.41	5.73		6.67				31.72	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.6				164.2	
Peak Inflow (cfs) =	N/A	N/A		75.7				366.2	
Peak Outflow (cfs) =	1.1	1.4		1.4				166.5	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				2.0	
Time to Drain 97% of Volume (hr) =	40	68		76				61	
Time to Drain 99% of Volume (hr) =	42	72		80				73	
Maximum Ponding Depth (ft) =	4.70	6.00		6.10				9.20	
Area at Max Ponding Depth (ac) =	1.92	2.83		2.85				3.34	
Maximum Volume Stored (ac-ft) =	2.41	5.73		6.04				15.62	

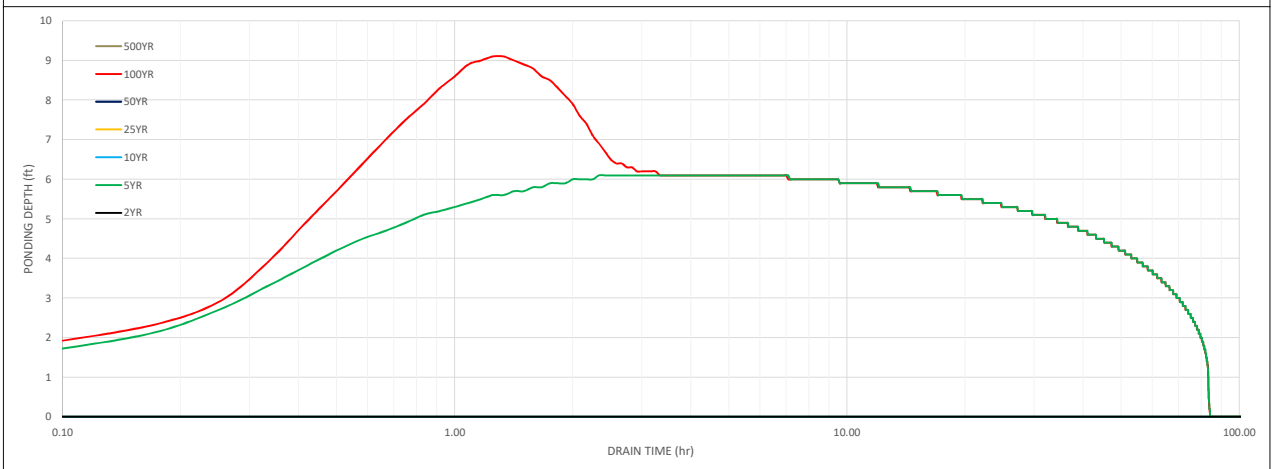
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

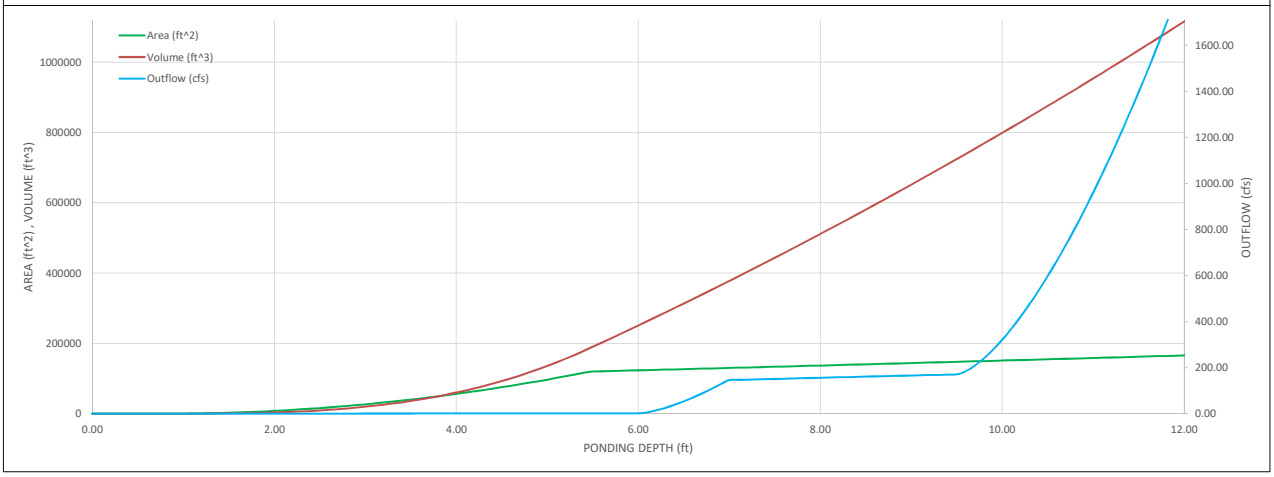
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond B
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond C
Date: April 6, 2020 — Last Edited: April 08, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters		
	User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	12	12	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	1.05	1.05	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	4.00	4.00	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	17.07	17.07	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	6.00	6.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters		
	User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	453.3	453.3	ft
B) Width of Basin at Top of EURV, W_{PCM} =	177.8	177.8	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	6.10	6.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	454.1	454.1	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	178.6	178.6	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	9.95				120.21	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		1.75				4.56	
0:10		11.33				15.20	
0:15		27.93				32.42	
0:20		61.14				76.70	
0:25		78.99				190.43	
0:30		71.29				238.04	
0:35		58.22				222.59	
0:40		47.28				193.29	
0:45		38.58				162.70	
0:50		32.22				131.89	
0:55		27.64				110.47	
1:00		23.60				95.05	
1:05		20.00				74.37	
1:10		16.49				54.92	
1:15		14.05				38.35	
1:20		12.80				27.93	
1:25		12.09				21.76	
1:30		11.62				18.07	
1:35		10.55				15.64	
1:40		9.56				14.06	
1:45		8.84				12.98	
1:50		8.33				12.35	
1:55		7.74				12.15	
2:00		5.88				9.32	
2:05		4.08				6.49	
2:10		2.79				4.48	
2:15		1.86				3.04	
2:20		1.21				1.99	
2:25		0.80				1.32	
2:30		0.49				0.80	
2:35		0.25				0.40	
2:40		0.09				0.14	
2:45		0.01				0.01	
2:50		0.00				0.00	
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Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond C
Date: April 6, 2020 — Last Edited: April 08, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)

(Assumes that top of grate is flush with the top of the concrete dropbox)

A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)
B) Overflow Weir Front Edge Length (inside edge of dropbox)
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)
D) Horizontal Length of Weir Sides (inside edge of dropbox)
E) Overflow Grate Open Area % (grate open area / total grate area)
F) Debris Clogging %
G) Height of Grate Upper Edge (at back side of dropbox)
H) Overflow Grate Slope Length (inside edge of dropbox)
I) Overflow Grate Open Area (without debris)
J) Overflow Grate Open Area (with debris)

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.00	6.00	ft
$L_{weir\ front}$ =	12.00	11.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	12.00	11.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.00	6.00	ft
Slope $L_{weir\ sides}$ =	12.00	11.00	ft
Open Area $_{(No\ Clogging)}$ =	100.80	84.70	sq ft
Open Area $_{(Clogged)}$ =	50.40	42.35	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	48.00	42.00	inches
Plate Height =	33.13	39.36	inches
Theta =	1.96	2.63	radians
Outlet Ao =	9.25	9.37	sq ft
$Outlet_{centroid}$ =	1.54	1.71	ft
Open Area Ratio =	10.90	9.04	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	8.00	999.00	ft
$L_{spillway\ crest}$ =	79.00	42.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	1.00		ft
Freeboard Top Stage =	10.00		ft
Max Basin Area =	2.34		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.36	4.79		4.34				12.42	
Predevelopment Peak Q (cfs) =	N/A	N/A		10.0				120.2	
Peak Inflow (cfs) =	N/A	N/A		79.0				238.0	
Peak Outflow (cfs) =	0.6	1.7		1.5				119.2	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		N/A				1.2	
Time to Drain 97% of Volume (hr) =	39	67		65				63	
Time to Drain 99% of Volume (hr) =	41	72		69				72	
Maximum Ponding Depth (ft) =	4.00	6.00		5.60				7.10	
Area at Max Ponding Depth (ac) =	1.32	1.85		1.80				1.98	
Maximum Volume Stored (ac-ft) =	1.36	4.79		4.07				6.91	

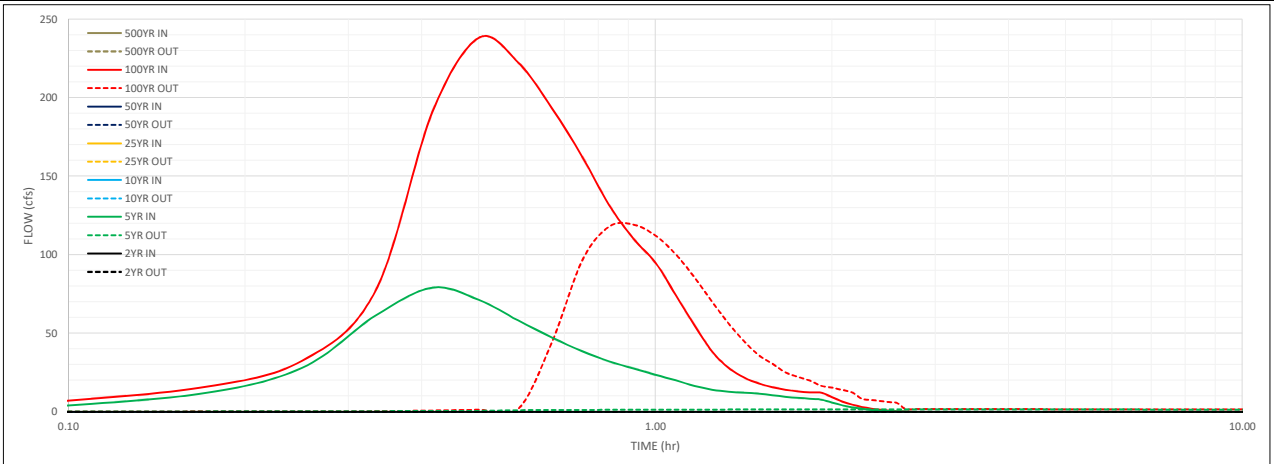
Results based on COS DCM Inputs

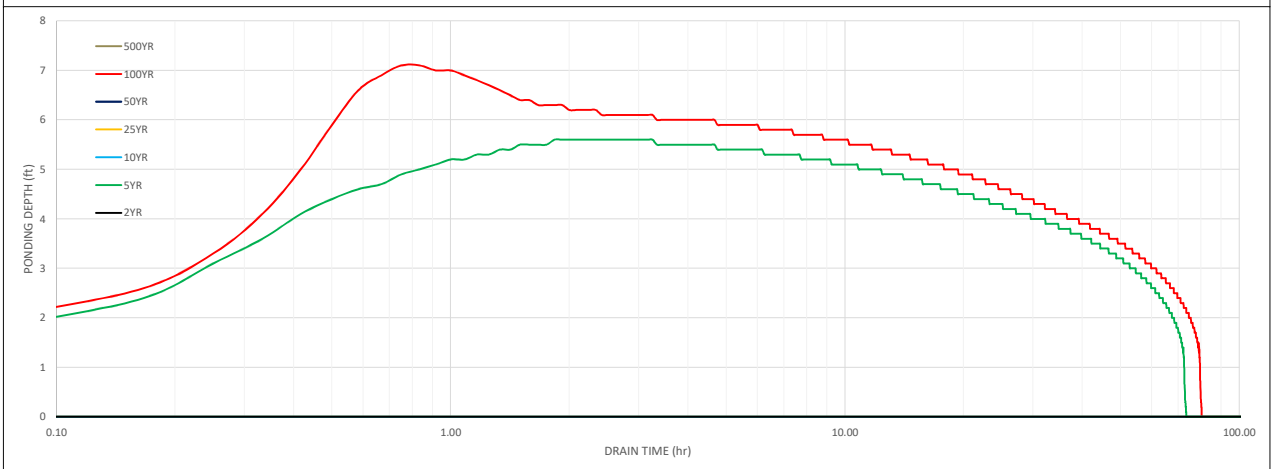
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.36	4.79		4.34				12.42	
Predevelopment Peak Q (cfs) =	N/A	N/A		10.0				120.2	
Peak Inflow (cfs) =	N/A	N/A		79.0				238.0	
Peak Outflow (cfs) =	0.6	1.7		1.5				116.8	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		N/A				1.3	
Time to Drain 97% of Volume (hr) =	39	67		65				63	
Time to Drain 99% of Volume (hr) =	41	72		69				72	
Maximum Ponding Depth (ft) =	4.00	6.00		5.60				7.10	
Area at Max Ponding Depth (ac) =	1.32	1.85		1.80				1.98	
Maximum Volume Stored (ac-ft) =	1.36	4.79		4.07				6.91	

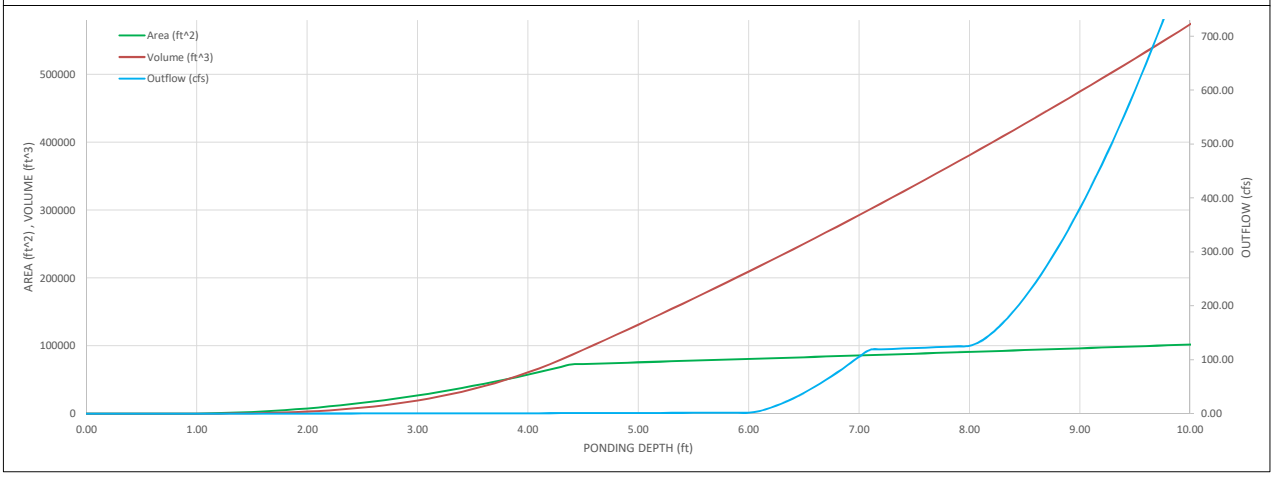
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond C
Date: April 6, 2020 — Last Edited: April 08, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond D
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters		
	User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	13	13	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	1.34	1.34	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	4.50	4.50	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	20.83	20.83	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	6.50	6.50	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters		
	User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	588.5	588.5	ft
B) Width of Basin at Top of EURV, W_{PCM} =	180.1	180.1	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	6.60	6.60	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	589.3	589.3	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	180.9	180.9	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	30.00				154.35	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		1.91				5.05	
0:10		13.55				18.88	
0:15		36.44				44.44	
0:20		87.25				108.47	
0:25		118.48				244.10	
0:30		113.01				314.40	
0:35		95.70				305.49	
0:40		80.03				273.09	
0:45		67.12				239.63	
0:50		56.09				204.40	
0:55		48.05				175.96	
1:00		41.91				156.02	
1:05		36.47				129.55	
1:10		30.68				102.47	
1:15		25.11				77.55	
1:20		21.41				56.75	
1:25		19.34				42.46	
1:30		18.14				33.79	
1:35		16.52				28.16	
1:40		14.92				24.40	
1:45		13.77				21.80	
1:50		12.92				19.98	
1:55		12.02				18.83	
2:00		9.58				15.10	
2:05		6.95				10.86	
2:10		4.98				7.82	
2:15		3.53				5.61	
2:20		2.44				3.93	
2:25		1.66				2.73	
2:30		1.13				1.86	
2:35		0.72				1.18	
2:40		0.41				0.67	
2:45		0.20				0.31	
2:50		0.08				0.11	
2:55		0.04				0.05	
3:00		0.02				0.02	
3:05		0.01				0.01	
3:10		0.01				0.01	
3:15		0.00				0.00	
3:20						0.00	
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Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond D
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters: User Input	Input Parameters: COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	$H_{weir\ front}$ =	6.50	6.50 ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	$L_{weir\ front}$ =	11.00	9.00 ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	$S_{weir\ sides}$ =	0.00	0.00 ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	Horizontal $L_{weir\ sides}$ =	11.00	9.00 ft
E) Overflow Grate Open Area % (grate open area / total grate area)	Grate Open Area =	70%	70% %
F) Debris Clogging %	Debris Clogging =	50%	50% %
G) Height of Grate Upper Edge (at back side of dropbox)	$H_{grate\ top}$ =	6.50	6.50 ft
H) Overflow Grate Slope Length (inside edge of dropbox)	Slope $L_{weir\ sides}$ =	11.00	9.00 ft
I) Overflow Grate Open Area (without debris)	Open Area $_{(No\ Clogging)}$ =	84.70	56.70 sq ft
J) Overflow Grate Open Area (with debris)	Open Area $_{(Clogged)}$ =	42.35	28.35 sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters: User Input	Input Parameters: COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	Pipe Invert Depth =	1.50	1.50 ft
C) Outlet Pipe Diameter	Pipe Diameter =	48.00	48.00 inches
D) Restrictor Plate Height above Pipe Invert	Plate Height =	44.00	44.00 inches
E) Half-Central Angle of Restrictor Plate on Pipe	Theta =	2.56	2.56 radians
F) Outlet Orifice Area	Outlet Ao =	12.07	12.07 sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	$Outlet_{centroid}$ =	1.93	1.93 ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	Open Area Ratio =	7.02	4.70

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters: User Input	Input Parameters: COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	$H_{spillway\ invert}$ =	8.00	999.00 ft
B) Spillway Crest Length	$L_{spillway\ crest}$ =	105.00	42.00 ft
C) Spillway End Slopes (H:V)	$S_{spillway\ ends}$ =	4.00	4.00 ft / ft
D) Freeboard above Maximum Water Surface	Freeboard Depth=	1.00	1.00 ft
E) Spillway Design Flow Depth	Flow $Depth_{spillway}$ =	1.00	ft
F) Stage at Top of Freeboard	Freeboard Top Stage =	10.00	ft
G) Basin Area at Top of Freeboard	Max Basin Area =	2.95	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.96	6.56		6.97				18.57	
Predevelopment Peak Q (cfs) =	N/A	N/A		30.0				154.4	
Peak Inflow (cfs) =	N/A	N/A		118.5				314.4	
Peak Outflow (cfs) =	0.9	2.2		2.2				161.7	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		N/A				1.8	
Time to Drain 97% of Volume (hr) =	40	67		70				62	
Time to Drain 99% of Volume (hr) =	42	72		75				72	
Maximum Ponding Depth (ft) =	4.50	6.50		6.50				7.90	
Area at Max Ponding Depth (ac) =	1.71	2.43		2.43				2.63	
Maximum Volume Stored (ac-ft) =	1.96	6.56		6.59				10.13	

Results based on COS DCM Inputs

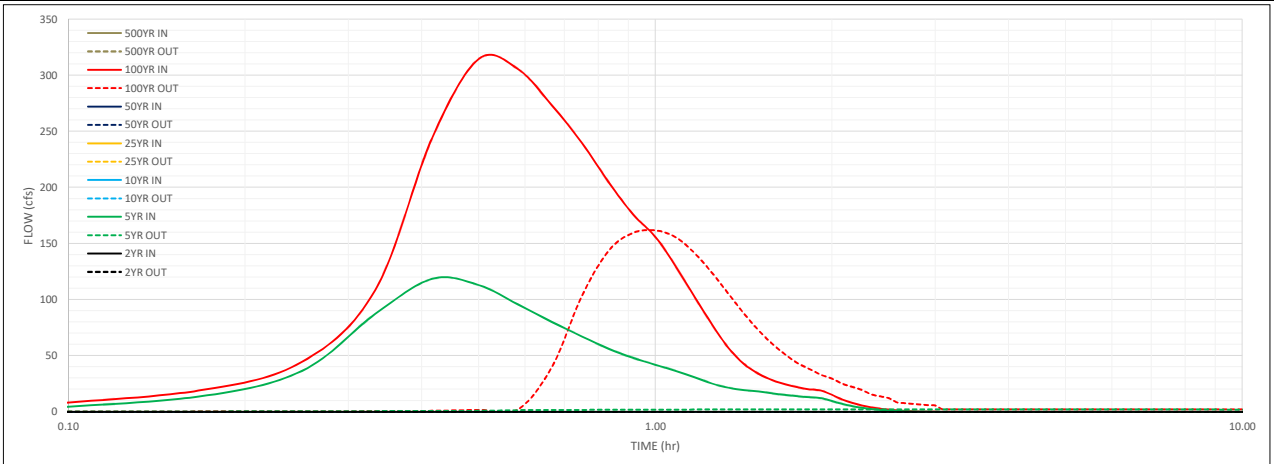
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.96	6.56		6.97				18.57	
Predevelopment Peak Q (cfs) =	N/A	N/A		30.0				154.4	
Peak Inflow (cfs) =	N/A	N/A		118.5				314.4	
Peak Outflow (cfs) =	0.9	2.2		2.2				153.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		N/A				2.8	
Time to Drain 97% of Volume (hr) =	40	67		70				63	
Time to Drain 99% of Volume (hr) =	42	72		75				72	
Maximum Ponding Depth (ft) =	4.50	6.50		6.50				8.10	
Area at Max Ponding Depth (ac) =	1.71	2.43		2.43				2.66	
Maximum Volume Stored (ac-ft) =	1.96	6.56		6.59				10.66	

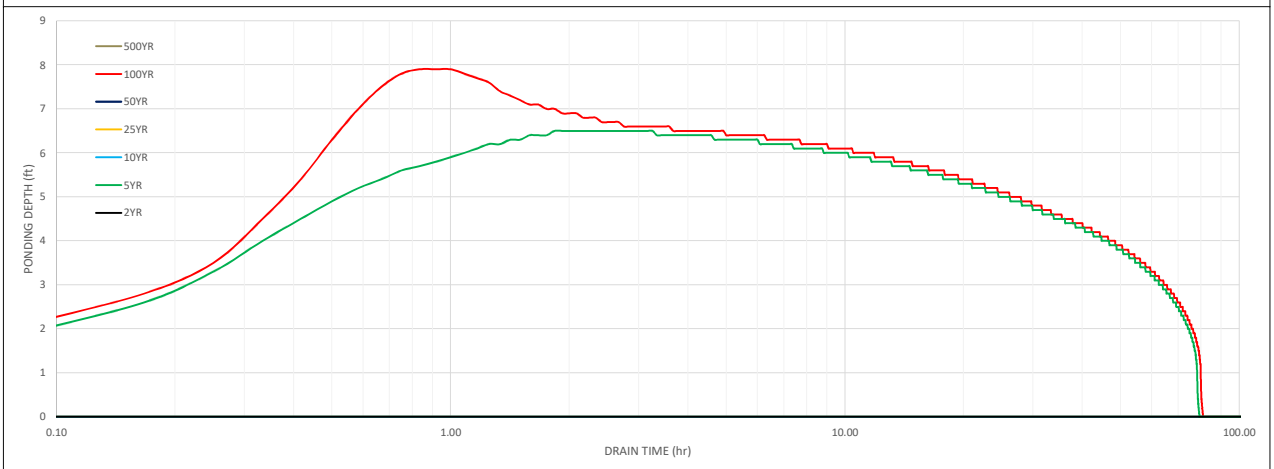
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

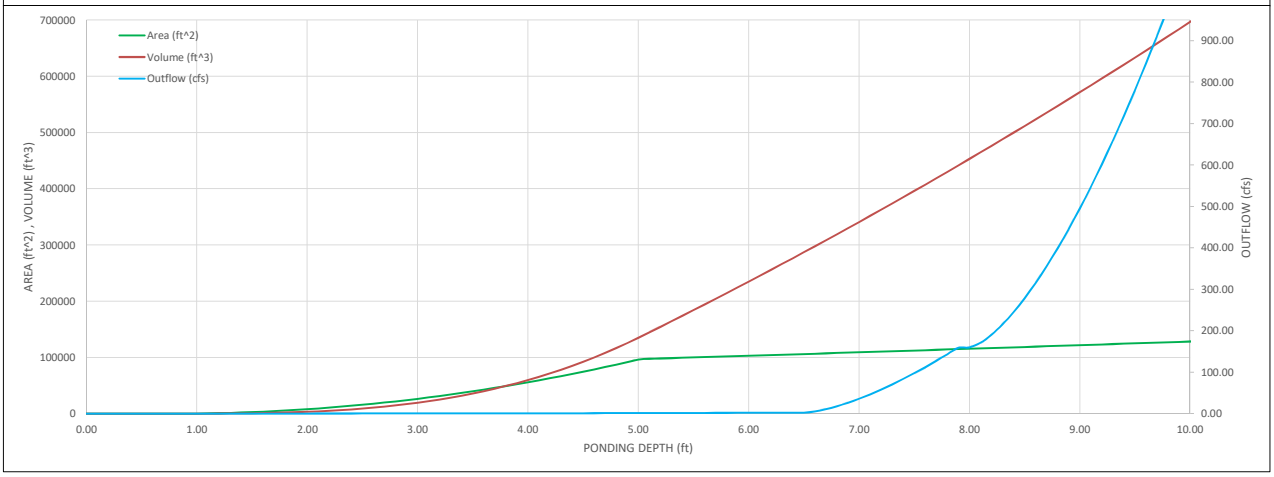
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) **Sheet 3 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond D
Date: April 6, 2020 Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond E
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters: User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	10	10	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	0.67	0.67	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	3.60	3.60	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	0.67	0.67	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	4.50	4.50	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters: User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	327.0	327.8	ft
B) Width of Basin at Top of EURV, W_{PCM} =	127.7	127.7	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	4.60	4.60	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	327.8	327.8	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	128.5	128.5	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	32.34				157.99	

B) Adjust "Time Interval" to match hydrograph data

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time Interval: 5.0 minutes

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.16				0.43	
0:10		1.11				1.54	
0:15		5.07				7.00	
0:20		23.64				35.29	
0:25		41.87				110.52	
0:30		46.56				162.17	
0:35		43.13				176.94	
0:40		37.83				172.03	
0:45		33.03				161.08	
0:50		29.04				147.26	
0:55		25.75				135.35	
1:00		22.65				124.96	
1:05		19.67				109.31	
1:10		16.82				92.46	
1:15		14.63				77.36	
1:20		13.01				65.86	
1:25		11.61				56.57	
1:30		10.30				48.68	
1:35		8.90				41.54	
1:40		7.47				34.92	
1:45		6.08				28.67	
1:50		4.75				22.81	
1:55		3.50				17.32	
2:00		2.49				12.10	
2:05		1.86				8.45	
2:10		1.45				6.02	
2:15		1.16				4.29	
2:20		0.92				3.03	
2:25		0.73				2.11	
2:30		0.57				1.42	
2:35		0.44				0.96	
2:40		0.34				0.71	
2:45		0.26				0.55	
2:50		0.20				0.44	
2:55		0.15				0.34	
3:00		0.11				0.26	
3:05		0.07				0.19	
3:10		0.05				0.13	
3:15		0.03				0.08	
3:20		0.02				0.04	
3:25		0.01				0.02	
3:30		0.00				0.00	
3:35		0.00				0.00	
3:40		0.00					
3:45		0.00					
3:50		0.00					
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6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond E
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	Input Parameters COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft) $H_{weir\ front}$ =	4.50	4.50	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox) $L_{weir\ front}$ =	15.00	9.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate) $S_{weir\ sides}$ =	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox) Horizontal $L_{weir\ sides}$ =	15.00	9.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area) Grate Open Area =	70%	70%	%
F) Debris Clogging % Debris Clogging =	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox) $H_{grate\ top}$ =	4.50	4.50	ft
H) Overflow Grate Slope Length (inside edge of dropbox) Slope $L_{weir\ sides}$ =	15.00	9.00	ft
I) Overflow Grate Open Area (without debris) Open Area $_{(No\ Clogging)}$ =	157.50	56.70	sq ft
J) Overflow Grate Open Area (with debris) Open Area $_{(Clogged)}$ =	78.75	28.35	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	Input Parameters COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft) Pipe Invert Depth =	1.50	1.50	ft
C) Outlet Pipe Diameter Pipe Diameter =	60.00	54.00	inches
D) Restrictor Plate Height above Pipe Invert Plate Height =	43.00	50.00	inches
E) Half-Central Angle of Restrictor Plate on Pipe Theta =	2.02	2.59	radians
F) Outlet Orifice Area Outlet Ao =	15.06	15.37	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert $Outlet_{centroid}$ =	1.99	2.18	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4) Open Area Ratio =	10.46	3.69	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	Input Parameters COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft) $H_{spillway\ invert}$ =	5.80	999.00	ft
B) Spillway Crest Length $L_{spillway\ crest}$ =	100.00	42.00	ft
C) Spillway End Slopes (H:V) $S_{spillway\ ends}$ =	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface Freeboard Depth=	1.00	1.00	ft
E) Spillway Design Flow Depth Flow $Depth_{spillway}$ =	0.70		ft
F) Stage at Top of Freeboard Freeboard Top Stage =	7.50		ft
G) Basin Area at Top of Freeboard Max Basin Area =	1.22		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.81	1.70		3.01				12.89	
Predevelopment Peak Q (cfs) =	N/A	N/A		32.3				158.0	
Peak Inflow (cfs) =	N/A	N/A		46.6				176.9	
Peak Outflow (cfs) =	0.3	0.4		18.0				164.2	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.6				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.1				1.0	
Time to Drain 97% of Volume (hr) =	44	69		71				54	
Time to Drain 99% of Volume (hr) =	46	72		76				69	
Maximum Ponding Depth (ft) =	3.60	4.50		4.80				5.70	
Area at Max Ponding Depth (ac) =	0.88	0.96		0.98				1.06	
Maximum Volume Stored (ac-ft) =	0.81	1.70		1.99				2.91	

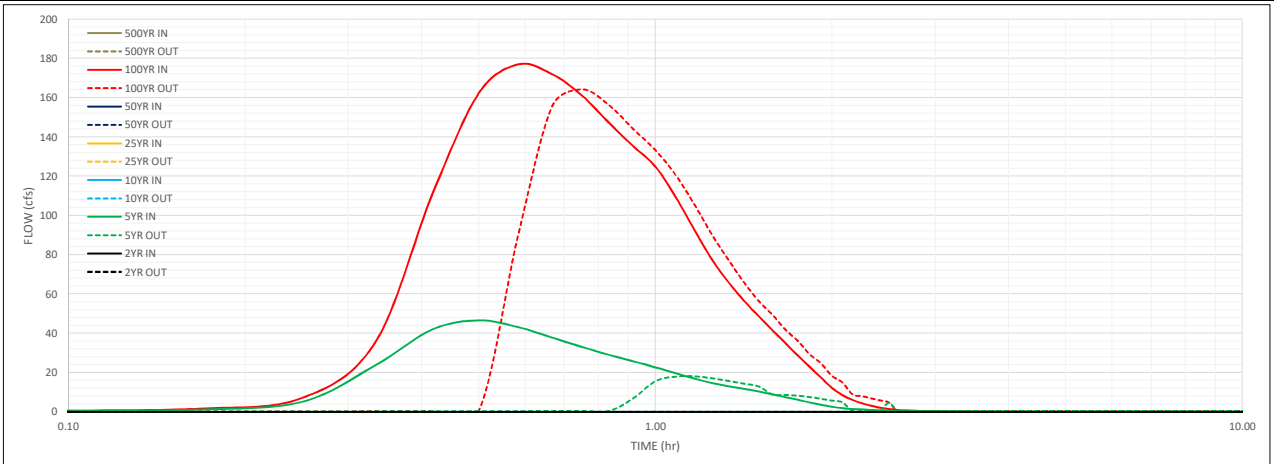
Results based on COS DCM Inputs

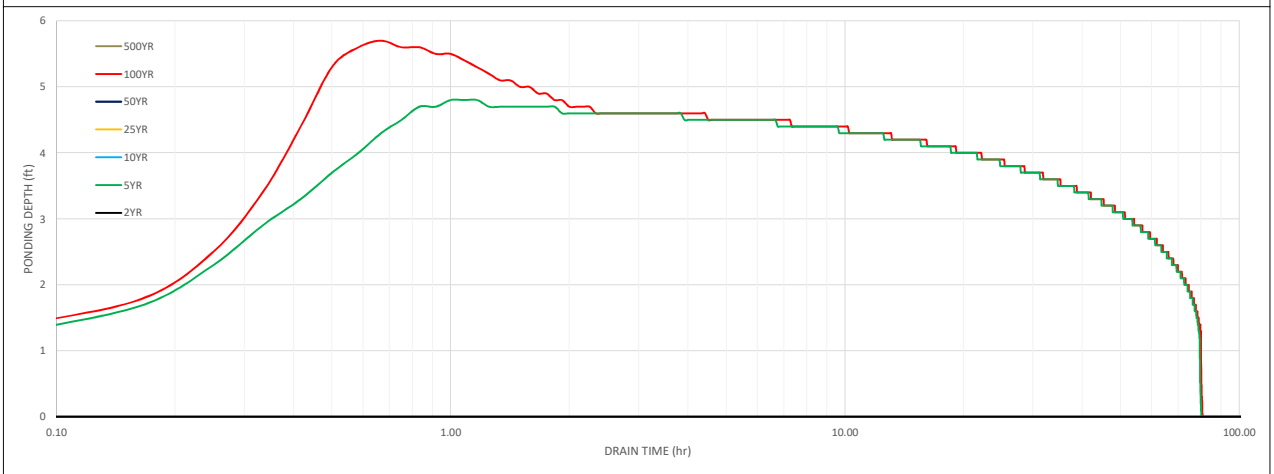
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.81	1.70		3.01				12.89	
Predevelopment Peak Q (cfs) =	N/A	N/A		32.3				158.0	
Peak Inflow (cfs) =	N/A	N/A		46.6				176.9	
Peak Outflow (cfs) =	0.3	0.4		16.3				153.2	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.5				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		0.3				2.8	
Time to Drain 97% of Volume (hr) =	44	69		71				54	
Time to Drain 99% of Volume (hr) =	46	72		76				69	
Maximum Ponding Depth (ft) =	3.60	4.50		4.90				6.10	
Area at Max Ponding Depth (ac) =	0.88	0.96		0.99				1.10	
Maximum Volume Stored (ac-ft) =	0.81	1.70		2.09				3.34	

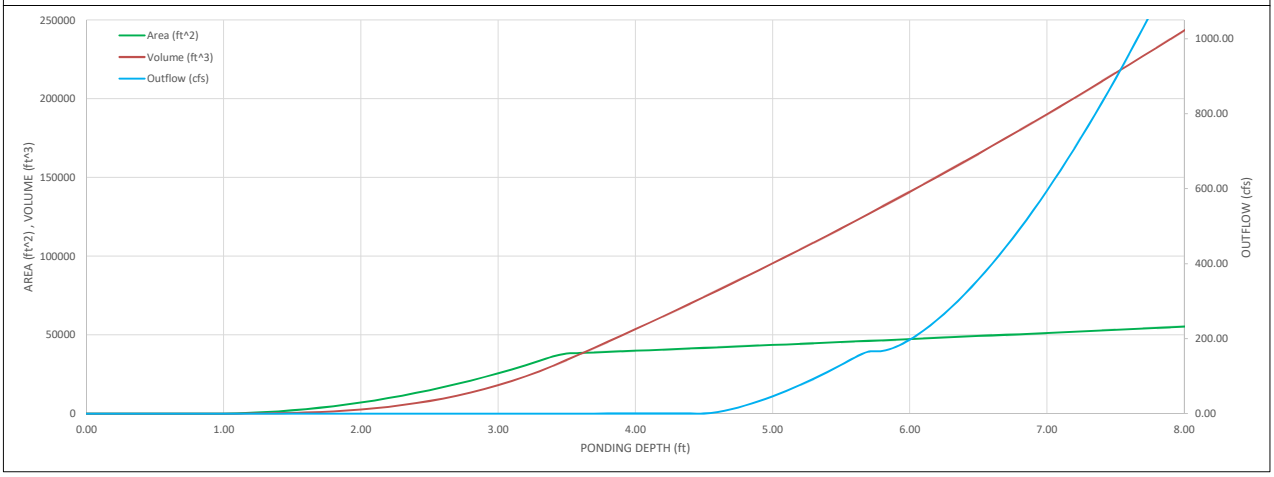
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond E
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond F
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters		
	User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	14	13	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	1.55	1.47	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	4.80	4.50	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	1.55	7.84	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	6.00	6.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters		
	User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	570.9	570.9	ft
B) Width of Basin at Top of EURV, W_{PCM} =	217.0	217.0	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	6.10	6.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	571.7	571.7	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	217.8	217.8	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	42.34				221.11	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.52				1.80	
0:10		5.98				8.99	
0:15		19.71				25.32	
0:20		58.79				77.64	
0:25		94.74				207.48	
0:30		103.82				301.83	
0:35		97.47				329.97	
0:40		87.23				323.46	
0:45		77.84				304.34	
0:50		69.34				281.05	
0:55		61.26				257.82	
1:00		54.52				237.51	
1:05		49.46				211.11	
1:10		45.22				185.26	
1:15		40.70				161.15	
1:20		36.24				139.03	
1:25		32.06				119.17	
1:30		28.34				101.90	
1:35		24.61				86.26	
1:40		21.24				72.79	
1:45		19.05				62.33	
1:50		17.44				54.79	
1:55		16.04				48.91	
2:00		13.99				42.35	
2:05		11.69				35.81	
2:10		9.57				29.96	
2:15		7.79				24.91	
2:20		6.28				20.57	
2:25		5.03				16.95	
2:30		4.03				13.95	
2:35		3.21				11.42	
2:40		2.52				9.20	
2:45		1.92				7.18	
2:50		1.38				5.32	
2:55		0.95				3.69	
3:00		0.65				2.49	
3:05		0.46				1.70	
3:10		0.33				1.17	
3:15		0.24				0.81	
3:20		0.18				0.56	
3:25		0.14				0.38	
3:30		0.11				0.26	
3:35		0.08				0.18	
3:40		0.06				0.13	
3:45		0.05				0.10	
3:50		0.03				0.07	
3:55		0.02				0.05	
4:00		0.02				0.04	
4:05		0.01				0.03	
4:10		0.01				0.02	
4:15		0.00				0.01	
4:20						0.01	
4:25						0.00	
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Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond F
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)

(Assumes that top of grate is flush with the top of the concrete dropbox)

A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)
B) Overflow Weir Front Edge Length (inside edge of dropbox)
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)
D) Horizontal Length of Weir Sides (inside edge of dropbox)
E) Overflow Grate Open Area % (grate open area / total grate area)
F) Debris Clogging %
G) Height of Grate Upper Edge (at back side of dropbox)
H) Overflow Grate Slope Length (inside edge of dropbox)
I) Overflow Grate Open Area (without debris)
J) Overflow Grate Open Area (with debris)

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.00	6.00	ft
$L_{weir\ front}$ =	13.00	10.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	13.00	10.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.00	6.00	ft
Slope $L_{weir\ sides}$ =	13.00	10.00	ft
Open Area $_{(No\ Clogging)}$ =	118.30	70.00	sq ft
Open Area $_{(Clogged)}$ =	59.15	35.00	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	66.00	60.00	inches
Plate Height =	46.05	54.00	inches
Theta =	1.98	2.50	radians
Outlet Ao =	17.70	18.61	sq ft
$Outlet_{centroid}$ =	2.14	2.38	ft
Open Area Ratio =	6.68	3.76	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	7.60	999.00	ft
$L_{spillway\ crest}$ =	126.00	42.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	0.90		ft
Freeboard Top Stage =	9.50		ft
Max Basin Area =	3.37		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.62	5.94		7.80				26.37	
Predevelopment Peak Q (cfs) =	N/A	N/A		42.3				221.1	
Peak Inflow (cfs) =	N/A	N/A		103.8				330.0	
Peak Outflow (cfs) =	1.1	1.5		15.1				227.3	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.4				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.2				1.9	
Time to Drain 97% of Volume (hr) =	42	68		72				61	
Time to Drain 99% of Volume (hr) =	45	72		77				72	
Maximum Ponding Depth (ft) =	4.80	6.00		6.30				7.60	
Area at Max Ponding Depth (ac) =	2.12	2.84		2.89				3.08	
Maximum Volume Stored (ac-ft) =	2.62	5.94		6.82				10.70	

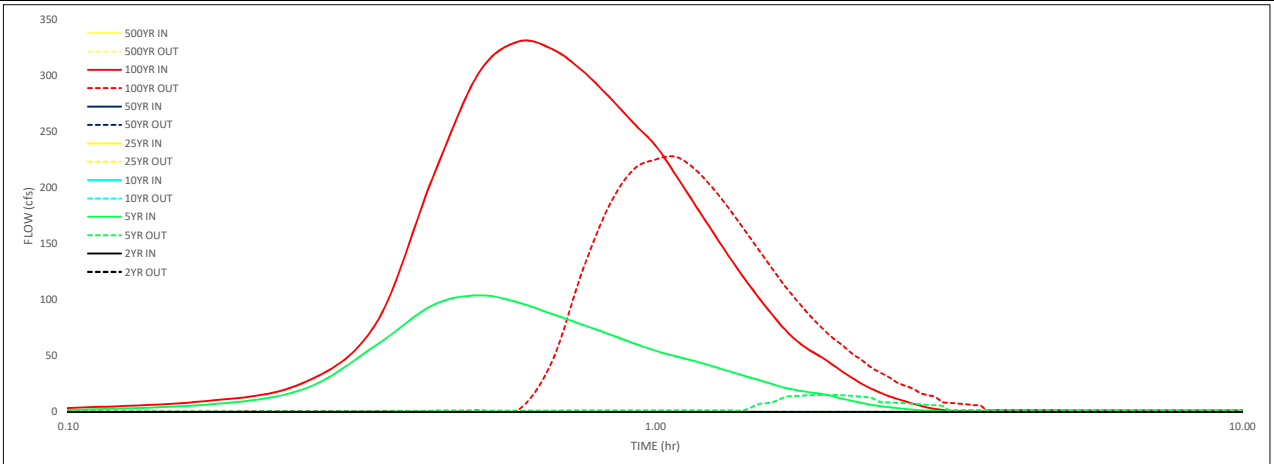
Results based on COS DCM Inputs

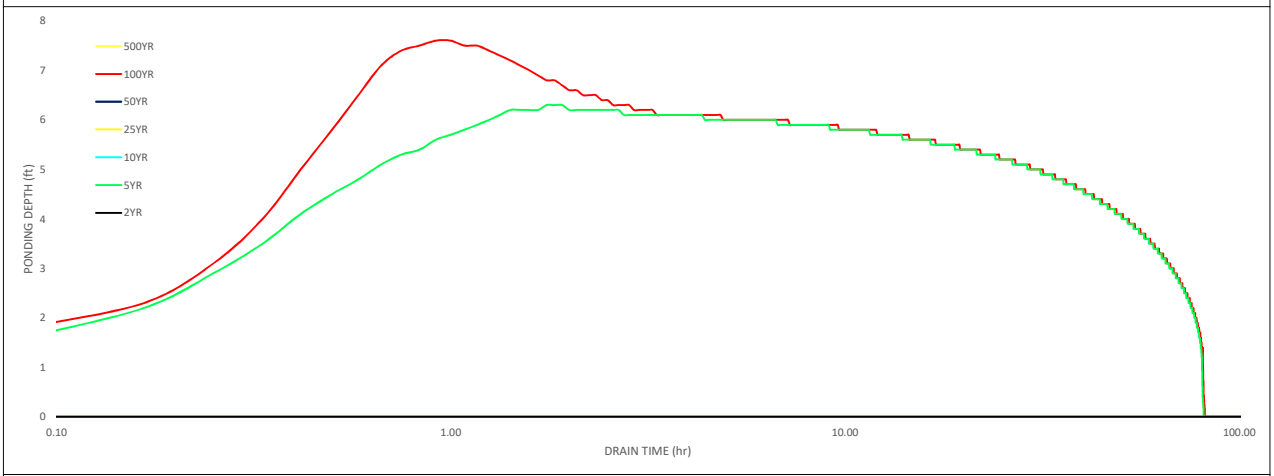
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.21	5.94		7.80				26.37	
Predevelopment Peak Q (cfs) =	N/A	N/A		42.3				221.1	
Peak Inflow (cfs) =	N/A	N/A		103.8				330.0	
Peak Outflow (cfs) =	1.1	1.4		13.2				214.5	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.3				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		0.2				3.0	
Time to Drain 97% of Volume (hr) =	36	69		74				63	
Time to Drain 99% of Volume (hr) =	38	73		78				73	
Maximum Ponding Depth (ft) =	4.50	6.00		6.30				7.80	
Area at Max Ponding Depth (ac) =	1.81	2.84		2.89				3.11	
Maximum Volume Stored (ac-ft) =	2.21	5.94		6.82				11.32	

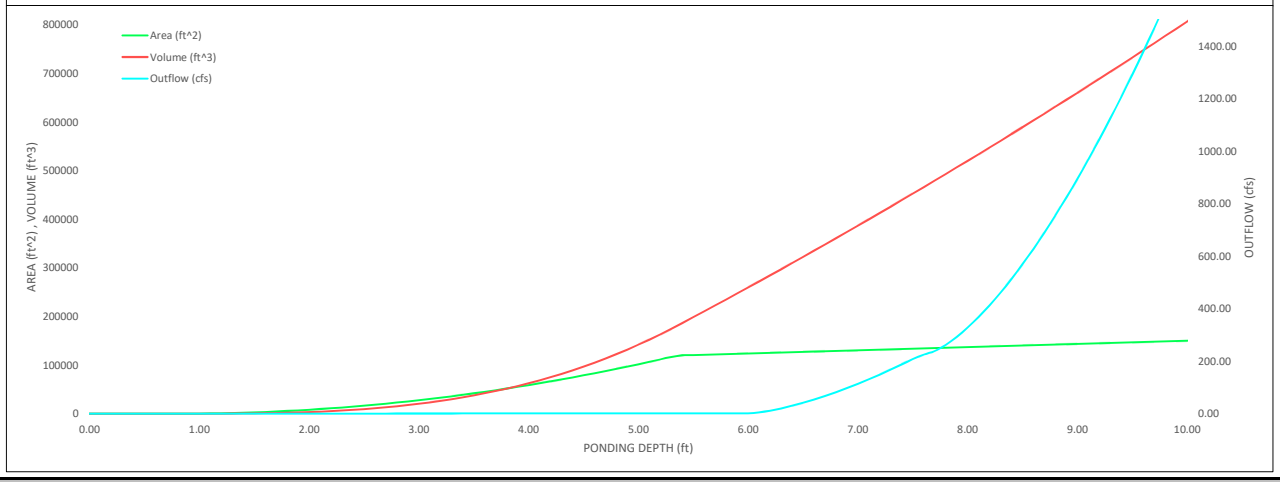
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond F
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters		
	User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	9	9	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	0.49	0.49	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	3.20	3.20	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	1.94	1.94	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	4.00	4.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters		
	User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	349.7	349.7	ft
B) Width of Basin at Top of EURV, W_{PCM} =	105.4	105.4	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	4.10	4.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	350.5	350.5	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	106.2	106.2	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	9.42				48.48	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.18				0.49	
0:10		1.27				1.75	
0:15		3.86				5.05	
0:20		12.69				17.55	
0:25		19.21				47.38	
0:30		20.06				63.86	
0:35		18.72				67.51	
0:40		16.88				66.01	
0:45		15.24				62.38	
0:50		13.74				57.86	
0:55		12.37				53.71	
1:00		11.12				49.93	
1:05		10.01				44.10	
1:10		9.05				38.52	
1:15		8.20				33.58	
1:20		7.42				29.30	
1:25		6.67				25.48	
1:30		5.98				22.03	
1:35		5.28				18.97	
1:40		4.64				16.31	
1:45		4.05				13.93	
1:50		3.52				11.83	
1:55		3.12				10.10	
2:00		2.67				8.48	
2:05		2.26				7.10	
2:10		1.90				5.93	
2:15		1.58				4.93	
2:20		1.30				4.04	
2:25		1.05				3.25	
2:30		0.82				2.54	
2:35		0.62				1.90	
2:40		0.46				1.36	
2:45		0.35				0.99	
2:50		0.28				0.73	
2:55		0.22				0.54	
3:00		0.17				0.39	
3:05		0.13				0.28	
3:10		0.10				0.19	
3:15		0.07				0.13	
3:20		0.05				0.09	
3:25		0.04				0.07	
3:30		0.03				0.06	
3:35		0.02				0.04	
3:40		0.02				0.03	
3:45		0.01				0.03	
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Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters		
	User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft) $H_{weir\ front}$ =	4.00	4.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox) $L_{weir\ front}$ =	26.00	26.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate) $S_{weir\ sides}$ =	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox) Horizontal $L_{weir\ sides}$ =	26.00	26.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area) Grate Open Area =	70%	70%	%
F) Debris Clogging % Debris Clogging =	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox) $H_{grate\ top}$ =	4.00	4.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox) Slope $L_{weir\ sides}$ =	26.00	26.00	ft
I) Overflow Grate Open Area (without debris) Open Area $_{(No\ Clogging)}$ =	473.20	473.20	sq ft
J) Overflow Grate Open Area (with debris) Open Area $_{(Clogged)}$ =	236.60	236.60	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters		
	User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft) Pipe Invert Depth =	1.50	1.50	ft
C) Outlet Pipe Diameter Pipe Diameter =	30.00	27.00	inches
D) Restrictor Plate Height above Pipe Invert Plate Height =	22.22	26.24	inches
E) Half-Central Angle of Restrictor Plate on Pipe Theta =	2.07	2.80	radians
F) Outlet Orifice Area Outlet Ao =	3.90	3.94	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert $Outlet_{centroid}$ =	1.03	1.12	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4) Open Area Ratio =	121.39	119.97	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters		
	User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft) $H_{spillway\ invert}$ =	5.40	4.90	ft
B) Spillway Crest Length $L_{spillway\ crest}$ =	136.00	23.00	ft
C) Spillway End Slopes (H:V) $S_{spillway\ ends}$ =	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface Freeboard Depth=	1.00	1.00	ft
E) Spillway Design Flow Depth Flow $Depth_{spillway}$ =	0.30	0.90	ft
F) Stage at Top of Freeboard Freeboard Top Stage =	6.70	6.80	ft
G) Basin Area at Top of Freeboard Max Basin Area =	1.08	1.09	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.47	1.15		1.57				5.51	
Predevelopment Peak Q (cfs) =	N/A	N/A		9.4				48.5	
Peak Inflow (cfs) =	N/A	N/A		20.1				67.5	
Peak Outflow (cfs) =	0.2	0.3		9.4				47.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		1.0				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				0.1	
Time to Drain 97% of Volume (hr) =	41	69		73				63	
Time to Drain 99% of Volume (hr) =	43	72		78				74	
Maximum Ponding Depth (ft) =	3.20	4.00		4.10				4.80	
Area at Max Ponding Depth (ac) =	0.67	0.85		0.85				0.91	
Maximum Volume Stored (ac-ft) =	0.47	1.15		1.24				1.85	

Results based on COS DCM Inputs

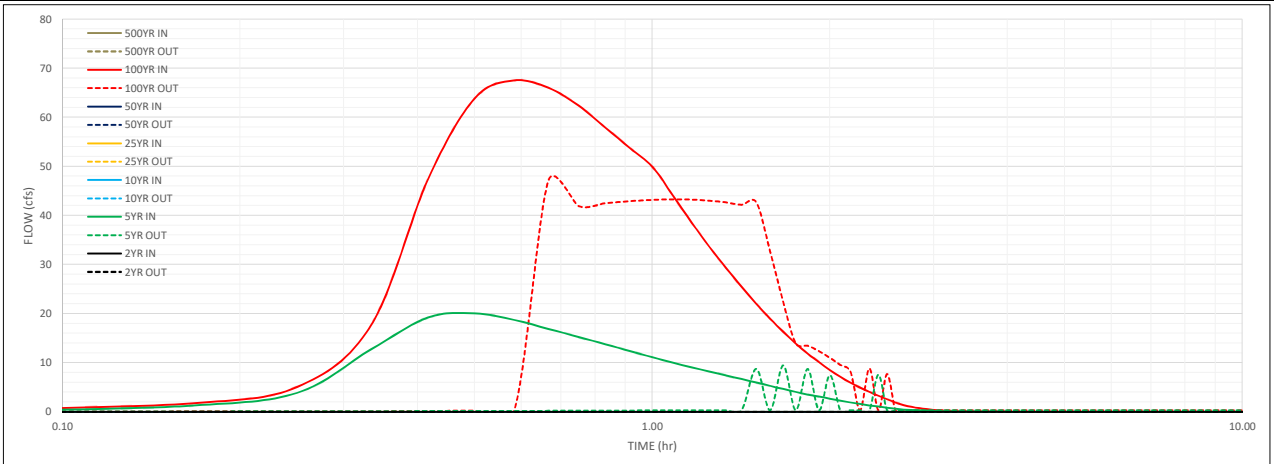
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.47	1.15		1.57				5.51	
Predevelopment Peak Q (cfs) =	N/A	N/A		9.4				48.5	
Peak Inflow (cfs) =	N/A	N/A		20.1				67.5	
Peak Outflow (cfs) =	0.2	0.3		9.4				47.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		1.0				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				0.1	
Time to Drain 97% of Volume (hr) =	41	69		73				63	
Time to Drain 99% of Volume (hr) =	43	72		78				74	
Maximum Ponding Depth (ft) =	3.20	4.00		4.10				4.80	
Area at Max Ponding Depth (ac) =	0.67	0.85		0.85				0.91	
Maximum Volume Stored (ac-ft) =	0.47	1.15		1.24				1.85	

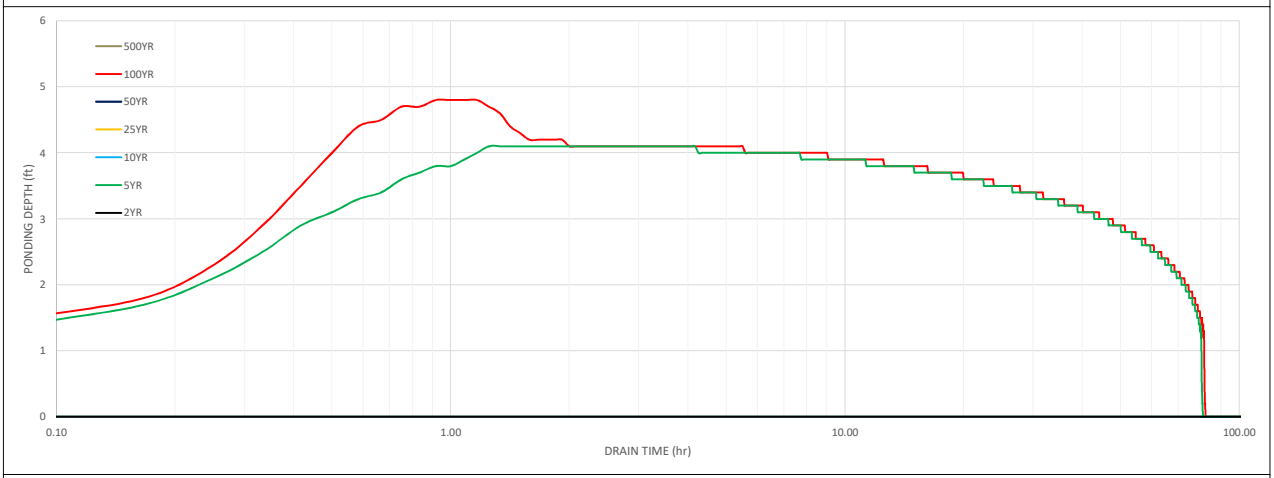
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

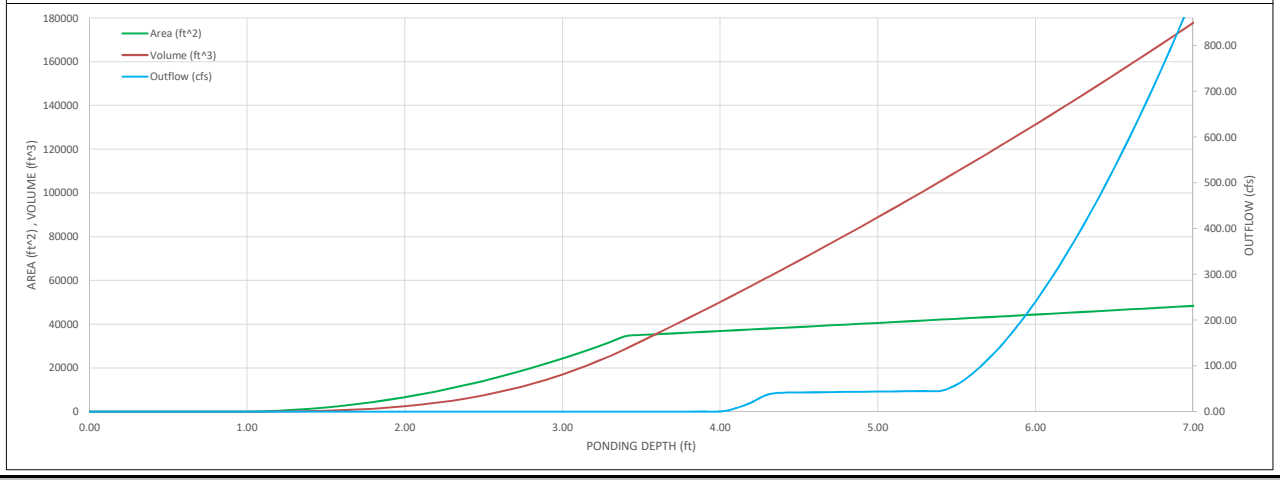
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — **Sheet 1 of 3**

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters		
	User Input	COS DCM	
A) Average Infiltration Rate of WQCV, i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface, y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area, Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows, # WQCV rows =	11	11	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	0.86	0.86	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	3.80	3.80	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	4.73	4.73	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	5.00	5.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s), Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters		
	User Input	COS DCM	
A) Length of Basin at Top of EURV, L_{PCM} =	468.4	468.4	ft
B) Width of Basin at Top of EURV, W_{PCM} =	141.1	141.1	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	5.10	5.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	469.2	469.2	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	141.9	141.9	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.), $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	17.11				99.16	

B) Adjust "Time Interval" to match hydrograph data

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time Interval: 5.0 minutes

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.41				1.20	
0:10		3.42				4.91	
0:15		10.22				13.16	
0:20		29.97				40.46	
0:25		45.35				109.08	
0:30		46.22				147.68	
0:35		41.85				152.97	
0:40		36.79				145.92	
0:45		32.51				134.77	
0:50		28.57				122.07	
0:55		24.90				110.10	
1:00		21.86				99.42	
1:05		19.69				85.33	
1:10		17.78				73.97	
1:15		15.86				63.12	
1:20		14.00				53.39	
1:25		12.24				44.73	
1:30		10.61				36.81	
1:35		9.00				29.80	
1:40		7.68				24.16	
1:45		6.80				19.99	
1:50		6.25				17.20	
1:55		5.79				15.20	
2:00		4.96				12.77	
2:05		4.07				10.46	
2:10		3.32				8.57	
2:15		2.70				7.04	
2:20		2.18				5.80	
2:25		1.75				4.76	
2:30		1.37				3.85	
2:35		1.07				3.04	
2:40		0.81				2.31	
2:45		0.60				1.65	
2:50		0.43				1.12	
2:55		0.31				0.76	
3:00		0.23				0.51	
3:05		0.17				0.34	
3:10		0.12				0.23	
3:15		0.09				0.16	
3:20		0.07				0.12	
3:25		0.06				0.09	
3:30		0.05				0.07	
3:35		0.04				0.06	
3:40		0.03				0.05	
3:45		0.03				0.04	
3:50		0.02				0.03	
3:55		0.01				0.02	
4:00		0.01				0.01	
4:05		0.01				0.01	
4:10		0.00				0.01	
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Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)

(Assumes that top of grate is flush with the top of the concrete dropbox)

A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)
B) Overflow Weir Front Edge Length (inside edge of dropbox)
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)
D) Horizontal Length of Weir Sides (inside edge of dropbox)
E) Overflow Grate Open Area % (grate open area / total grate area)
F) Debris Clogging %
G) Height of Grate Upper Edge (at back side of dropbox)
H) Overflow Grate Slope Length (inside edge of dropbox)
I) Overflow Grate Open Area (without debris)
J) Overflow Grate Open Area (with debris)

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	5.00	5.00	ft
$L_{weir\ front}$ =	9.00	7.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	9.00	7.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	5.00	5.00	ft
Slope $L_{weir\ sides}$ =	9.00	7.00	ft
Open Area $_{(No\ Clogging)}$ =	56.70	34.30	sq ft
Open Area $_{(Clogged)}$ =	28.35	17.15	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction (Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	42.00	42.00	inches
Plate Height =	34.00	34.00	inches
Theta =	2.24	2.24	radians
Outlet Ao =	8.34	8.34	sq ft
$Outlet_{centroid}$ =	1.54	1.54	ft
Open Area Ratio =	6.80	4.11	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	6.70	999.00	ft
$L_{spillway\ crest}$ =	136.00	27.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	0.50		ft
Freeboard Top Stage =	8.20		ft
Max Basin Area =	1.89		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.03	2.73		3.25				11.08	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.1				99.2	
Peak Inflow (cfs) =	N/A	N/A		46.2				153.0	
Peak Outflow (cfs) =	0.4	0.7		4.2				101.9	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				1.7	
Time to Drain 97% of Volume (hr) =	39	68		73				62	
Time to Drain 99% of Volume (hr) =	41	72		77				72	
Maximum Ponding Depth (ft) =	3.80	5.00		5.10				6.20	
Area at Max Ponding Depth (ac) =	1.09	1.52		1.53				1.65	
Maximum Volume Stored (ac-ft) =	1.03	2.73		2.90				4.65	

Results based on COS DCM Inputs

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.03	2.73		3.25				11.08	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.1				99.2	
Peak Inflow (cfs) =	N/A	N/A		46.2				153.0	
Peak Outflow (cfs) =	0.4	0.7		3.6				98.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		0.2				2.8	
Time to Drain 97% of Volume (hr) =	39	68		73				62	
Time to Drain 99% of Volume (hr) =	41	72		77				73	
Maximum Ponding Depth (ft) =	3.80	5.00		5.20				6.40	
Area at Max Ponding Depth (ac) =	1.09	1.52		1.54				1.68	
Maximum Volume Stored (ac-ft) =	1.03	2.73		3.05				4.98	

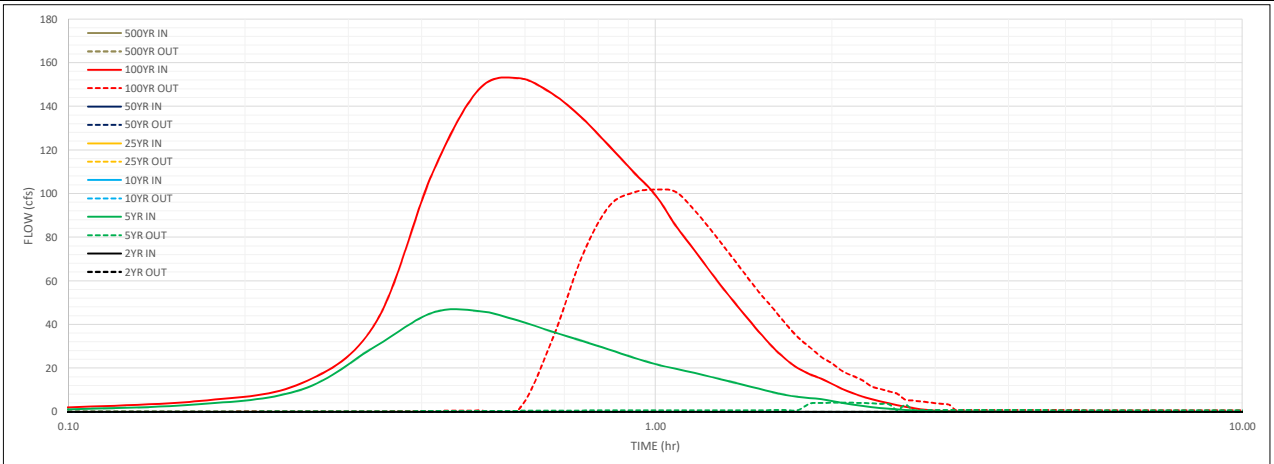
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

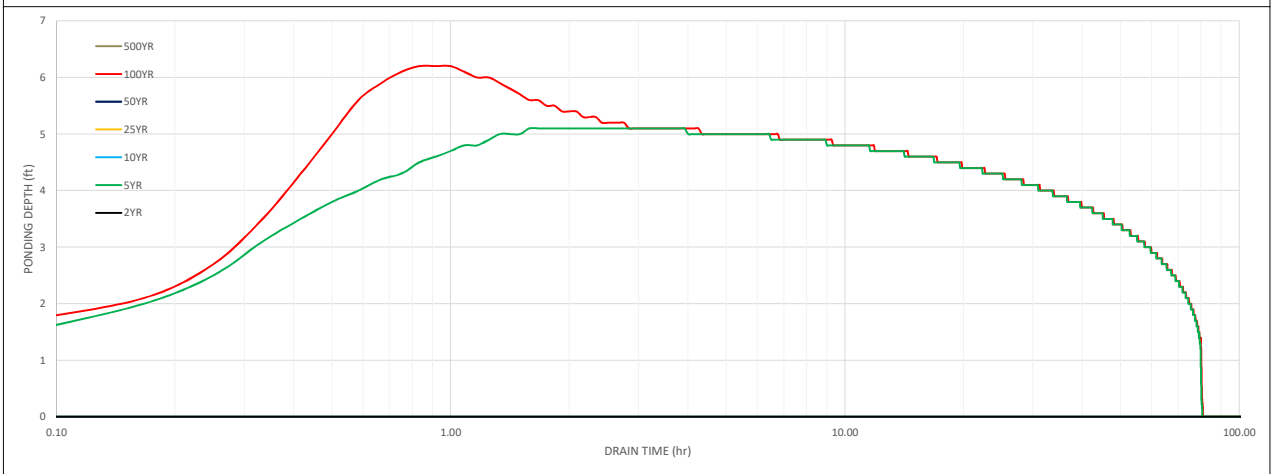
COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) **Sheet 3 of 3**

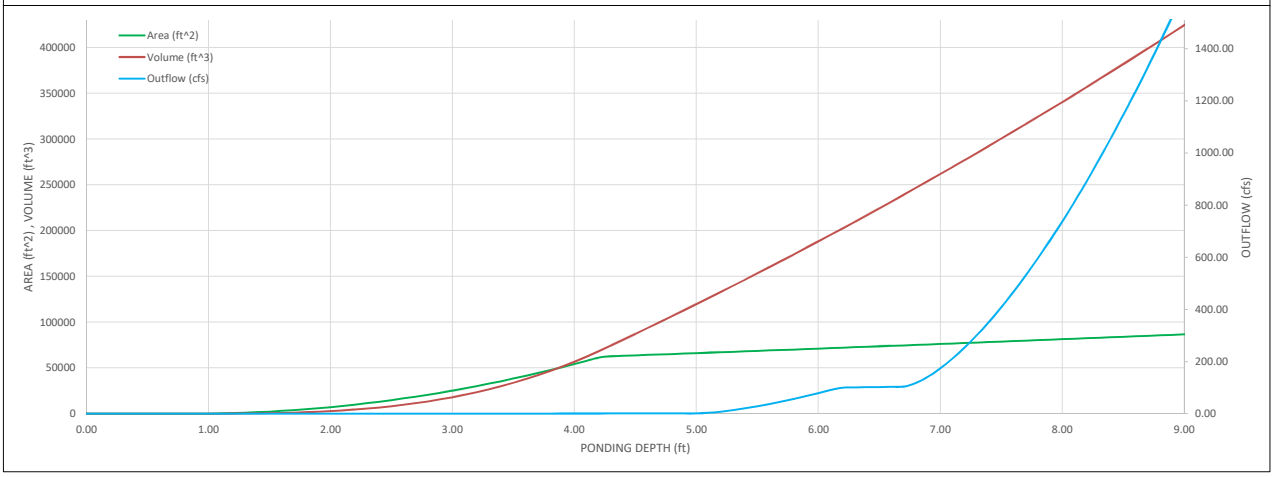
Designer: Chris McFarland

Project: Grandview Reserve Pond G

Date: April 6, 2020 Last Edited: April 13, 2020



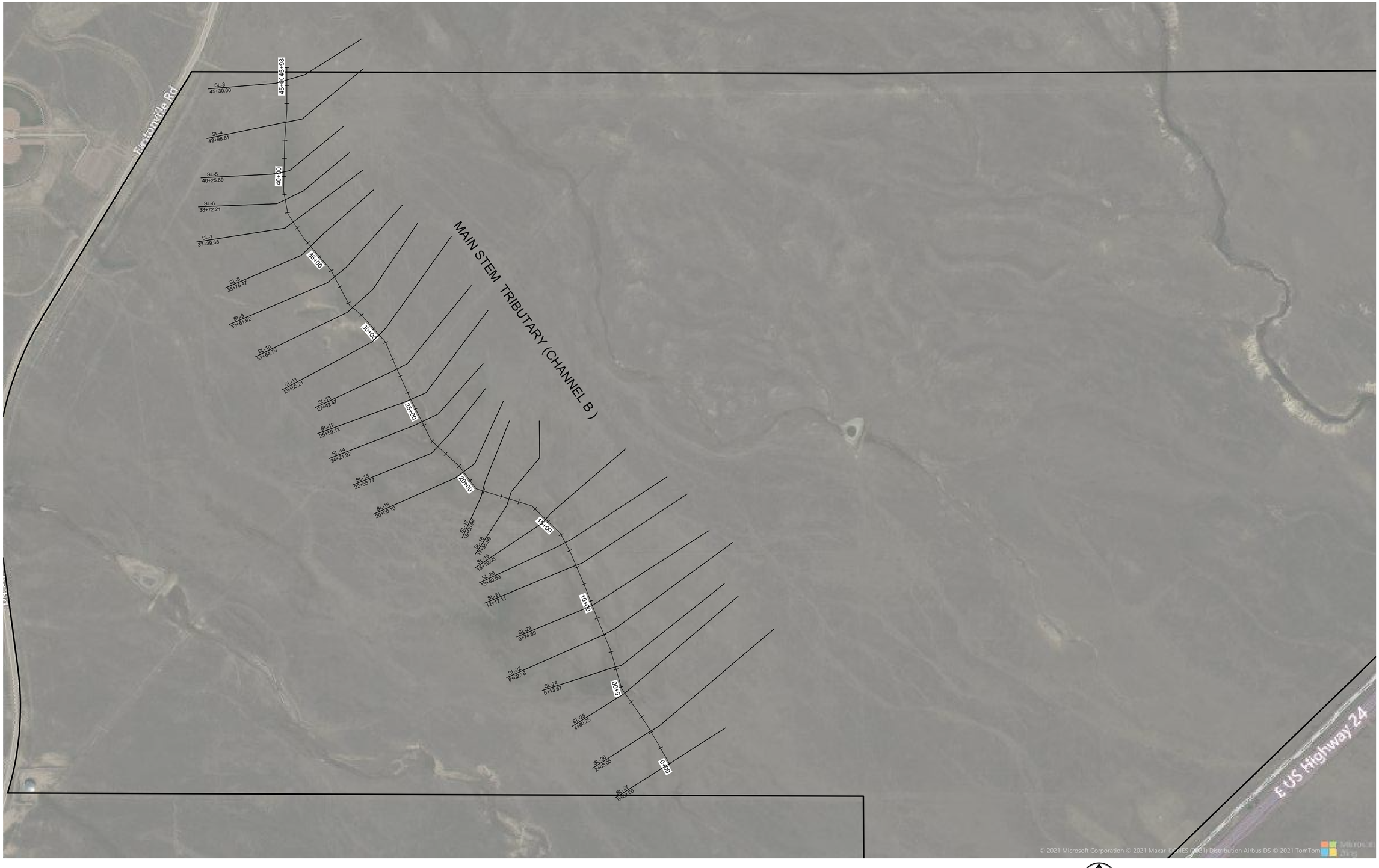




Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Appendix E

IGEL, TREVOR, 8/12/2021 2:47 PM



NORTH

0 250
125

HRGreen

Job No.:	201662.03
Prepared By:	TBI
Date:	8/11/2021

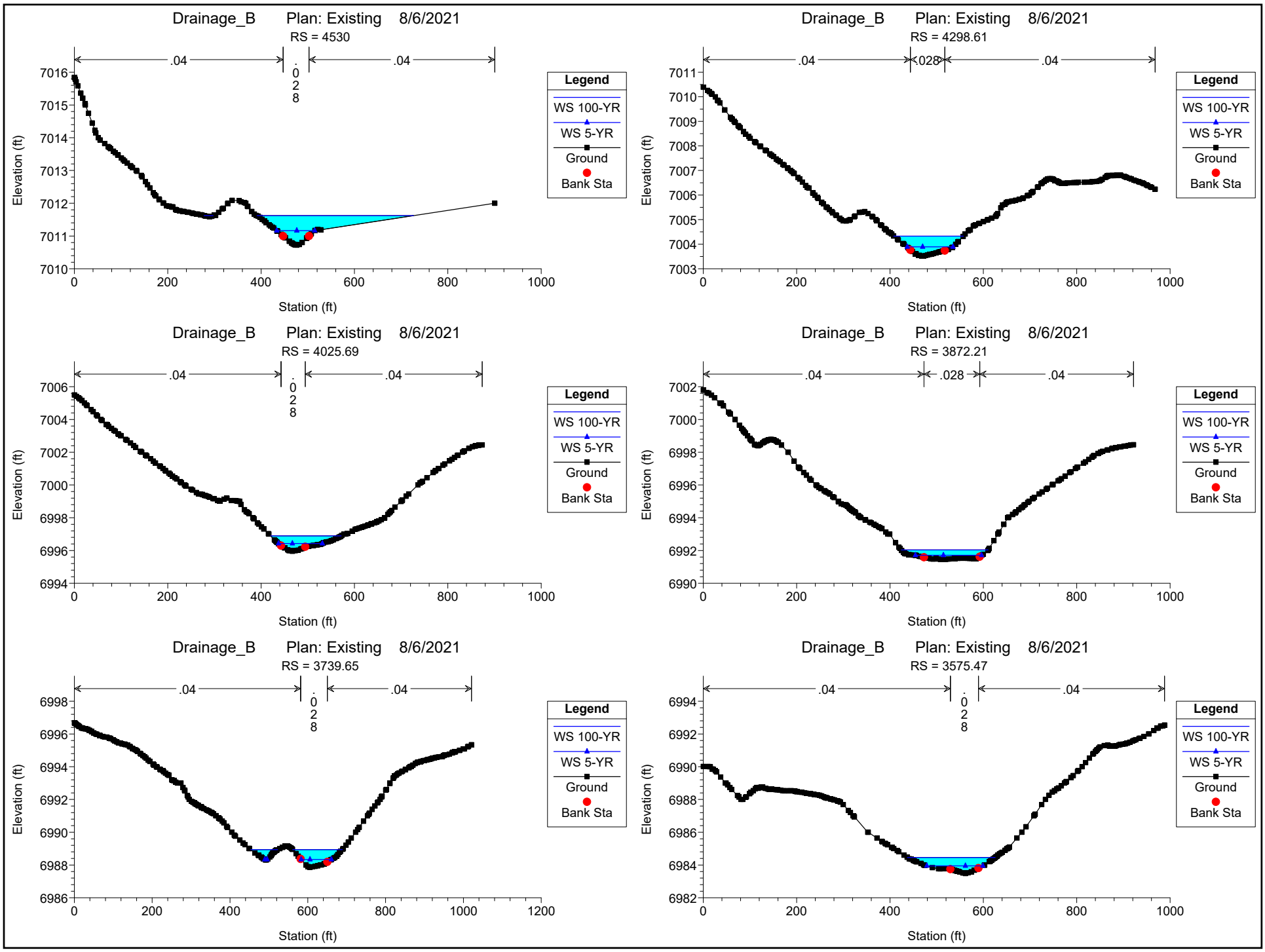
EXISTING MODEL CROSS SECTIONS

FIG.A

HRGreen DRAWING PATH:J:\2020\201662.03\CAD\Dwgs_Exhibits\01-Existing MODEL CROSS SECTIONS.dwg

HEC-RAS Plan: Existing River: Drainage B Reach: Alignment - (2)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Power LOB	Power Chan	Power ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/ft s)	(lb/ft s)	(lb/ft s)
Alignment - (2)	4530	100-YR	280.00	7010.72	7011.62	7011.62	7011.80	0.008420	4.14	115.80	0.82	0.12	0.41	0.13	0.18	1.71	0.17
Alignment - (2)	4530	5-YR	59.00	7010.72	7011.16	7011.16	7011.31	0.015603	3.15	20.24	0.97	0.08	0.32	0.08	0.07	1.00	0.07
Alignment - (2)	4298.61	100-YR	280.00	7003.52	7004.33	7004.33	7004.60	0.011446	4.51	75.98	0.95	0.19	0.51	0.25	0.32	2.29	0.50
Alignment - (2)	4298.61	5-YR	59.00	7003.52	7003.89	7003.89	7004.02	0.016302	2.85	22.00	0.96	0.06	0.28	0.09	0.04	0.79	0.08
Alignment - (2)	4025.69	100-YR	280.00	6995.96	6996.89	6996.89	6997.16	0.010606	4.76	80.74	0.93	0.21	0.54	0.27	0.37	2.57	0.57
Alignment - (2)	4025.69	5-YR	59.00	6995.96	6996.43	6996.43	6996.56	0.013192	3.02	22.56	0.90	0.06	0.29	0.09	0.04	0.87	0.09
Alignment - (2)	3872.21	100-YR	280.00	6991.45	6992.03	6992.03	6992.25	0.013013	3.94	80.99	0.96	0.24	0.43	0.18	0.45	1.68	0.27
Alignment - (2)	3872.21	5-YR	59.00	6991.45	6991.71	6991.71	6991.80	0.018167	2.44	25.07	0.96	0.07	0.23	0.05	0.05	0.55	0.03
Alignment - (2)	3739.65	100-YR	390.70	6987.86	6988.94	6988.94	6989.24	0.009468	4.89	107.95	0.90	0.19	0.55	0.25	0.31	2.67	0.52
Alignment - (2)	3739.65	5-YR	68.95	6987.86	6988.33	6988.33	6988.48	0.015568	3.13	22.67	0.97	0.02	0.32	0.07	0.01	0.99	0.05
Alignment - (2)	3575.47	100-YR	390.70	6983.48	6984.46	6984.46	6984.75	0.011370	5.06	107.93	0.97	0.34	0.60	0.25	0.83	3.04	0.50
Alignment - (2)	3575.47	5-YR	68.95	6983.48	6983.94	6983.94	6984.07	0.014396	3.04	27.39	0.93	0.12	0.30	0.06	0.14	0.90	0.05
Alignment - (2)	3361.62	100-YR	390.70	6979.44	6980.59	6980.59	6980.96	0.010660	5.41	92.08	0.96	0.23	0.65	0.37	0.43	3.54	0.97
Alignment - (2)	3361.62	5-YR	68.95	6979.44	6979.96	6979.96	6980.11	0.014781	3.22	23.64	0.96	0.04	0.33	0.13	0.02	1.05	0.15
Alignment - (2)	3164.79	100-YR	390.70	6975.30	6976.21	6976.21	6976.50	0.010031	4.74	107.61	0.91	0.23	0.53	0.27	0.43	2.50	0.56
Alignment - (2)	3164.79	5-YR	68.95	6975.30	6975.66	6975.66	6975.79	0.015475	2.92	25.80	0.95	0.10	0.28	0.08	0.10	0.83	0.08
Alignment - (2)	2955.21	100-YR	390.70	6970.48	6971.89	6971.89	6972.19	0.008109	5.43	119.58	0.87	0.13	0.61	0.27	0.21	3.33	0.61
Alignment - (2)	2955.21	5-YR	68.95	6970.48	6971.18	6971.18	6971.33	0.010373	3.40	26.43	0.85	0.09	0.32	0.11	0.09	1.10	0.13
Alignment - (2)	2742.47	100-YR	390.70	6965.00	6966.28	6966.28	6966.73	0.009026	5.74	84.97	0.92	0.33	0.68	0.21	0.82	3.93	0.38
Alignment - (2)	2742.47	5-YR	68.95	6965.00	6965.47	6965.47	6965.66	0.014494	3.51	20.49	0.97	0.12	0.37	0.05	0.13	1.29	0.04
Alignment - (2)	2559.12	100-YR	390.70	6957.93	6959.77	6959.77	6960.47	0.008921	6.81	61.70	0.95	0.21	0.88	0.25	0.40	6.00	0.52
Alignment - (2)	2559.12	5-YR	68.95	6957.93	6958.63	6958.63	6958.90	0.014366	4.22	16.34	1.01		0.48			2.05	
Alignment - (2)	2421.92	100-YR	390.70	6954.85	6956.44	6956.44	6957.02	0.009346	6.37	70.02	0.95	0.26	0.81	0.37	0.54	5.15	0.99
Alignment - (2)	2421.92	5-YR	68.95	6954.85	6955.49	6955.49	6955.72	0.014603	3.85	18.05	0.99		0.42	0.06		1.63	0.04
Alignment - (2)	2258.77	100-YR	390.70	6950.91	6952.55	6952.55	6953.14	0.009029	6.48	70.14	0.95	0.25	0.82	0.36	0.51	5.32	0.95
Alignment - (2)	2258.77	5-YR	68.95	6950.91	6951.55	6951.55	6951.79	0.013876	3.94	17.90	0.98		0.43	0.12		1.71	0.13
Alignment - (2)	2060.1	100-YR	390.70	6945.95	6947.97	6947.97	6948.64	0.007977	7.08	69.96	0.92	0.35	0.91	0.34	0.94	6.44	0.85
Alignment - (2)	2060.1	5-YR	68.95	6945.95	6946.75	6946.75	6947.05	0.012983	4.37	16.11	0.98	0.09	0.50	0.06	0.08	2.18	0.04
Alignment - (2)	1906.96	100-YR	390.70	6942.93	6944.96	6944.96	6945.50	0.006399	6.55	88.19	0.83	0.18	0.77	0.31	0.31	5.02	0.78
Alignment - (2)	1906.96	5-YR	68.95	6942.93	6943.68	6943.68	6943.98	0.012807	4.45	15.91	0.98	0.06	0.51	0.10	0.05	2.27	0.11
Alignment - (2)	1755.99	100-YR	597.69	6940.90	6942.46	6942.46	6943.03	0.010131	6.24	105.07	0.98	0.21	0.80	0.36	0.39	4.99	0.93
Alignment - (2)	1755.99	5-YR	86.00	6940.90	6941.55	6941.55	6941.73	0.016031	3.40	25.67	1.00		0.36	0.12		1.23	0.13
Alignment - (2)	1519.95	100-YR	597.69	6936.99	6938.53	6938.53	6938.92	0.009285	6.44	150.76	0.95	0.18	0.82	0.43	0.30	5.28	1.24
Alignment - (2)	1519.95	5-YR	86.00	6936.99	6937.78	6937.78	6937.98	0.008294	3.68	29.86	0.80		0.34	0.06		1.27	0.05
Alignment - (2)	1350.59	100-YR	597.69	6933.90	6935.19	6935.19	6935.65	0.009350	5.88	125.14	0.94	0.28	0.72	0.36	0.61	4.20	0.92
Alignment - (2)	1350.59	5-YR	86.00	6933.90	6934.33	6934.33	6934.50	0.014571	3.30	27.04	0.96	0.07	0.34	0.09	0.05	1.11	0.08
Alignment - (2)	1212.11	100-YR	597.69	6931.60	6932.77	6932.77	6933.20	0.011126	5.81	125.93	1.00	0.33	0.73	0.52	0.79	4.26	1.66
Alignment - (2)	1212.11	5-YR	86.00	6931.60	6932.09	6932.06	6932.21	0.010257	2.82	34.67	0.81	0.06	0.24	0.09	0.05	0.68	0.10
Alignment - (2)	974.69	100-YR	597.69	6928.54	6929.54	6929.54	6929.91	0.012309	5.01	127.84	1.00	0.31	0.60	0.23	0.71	3.02	0.41
Alignment - (2)	974.69	5-YR	86.00	6928.54	6928.96	6928.96	6929.09	0.017451	2.81	30.71	0.98	0.02	0.28		0.01	0.78	
Alignment - (2)	802.78	100-YR	597.69	6925.60	6926.84	6926.84	6927.25	0.011014	5.65	129.11	0.99	0.50	0.70	0.36	1.60	3.97	0.93
Alignment - (2)	802.78	5-YR	86.00	6925.60	6926.18	6926.13	6926.29	0.010327	2.74	34.35	0.80	0.12	0.23	0.06	0.15	0.64	0.04
Alignment - (2)	613.67	100-YR	597.69	6923.23	6924.06	6924.06	6924.39	0.013105	4.68	139.34	1.00	0.22	0.55	0.26	0.38	2.60	0.51
Alignment - (2)	613.67	5-YR	86.00	6923.23	6923.58	6923.58	6923.67	0.019440	2.49	35.29	0.99		0.24	0.11		0.59	0.11
Alignment - (2)	460.25	100-YR	597.69	6921.03	6922.26	6922.26	6922.59	0.007909	5.11	160.82	0.85	0.18	0.56	0.23	0.30	2.85	0.45
Alignment - (2)	460.25	5-YR	86.00	6921.03	6921.55	6921.46	6921.64	0.007343	2.52	35.52	0.69	0.06	0.19	0.04	0.04	0.48	0.03
Alignment - (2)	208.05	100-YR	597.69	6917.96	6918.53	6918.53	6918.76	0.025003	5.16	163.15	1.31	0.12	0.75	0.68	0.13	3.88	2.30
Alignment - (2)	208.05	5-YR	86.00	6917.96	6918.17	6918.17	6918.24	0.031904	2.87	42.68	1.24		0.33	0.29		0.95	0.54
Alignment - (2)	2.6	100-YR	597.42	6912.97	6914.97	6914.97	6915.51	0.010321	7.88	148.43	1.04	0.32	1.14	0.40	0.79	8.97	1.12
Alignment - (2)	2.6	5-YR	85.99	6912.97	6913.98	6913.98	6914.31	0.011008	4.72	20.88	0.94	0.16	0.54	0.16	0.25	2.54	0.24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RS = 4530
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Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_B Plan: Existing 8/6/2021
RS = 4298.61
.04
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.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
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Station (ft)
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WS 100-YR
WS 5-YR
Ground
Bank Sta
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Station (ft)
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WS 100-YR
WS 5-YR
Ground
Bank Sta
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Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
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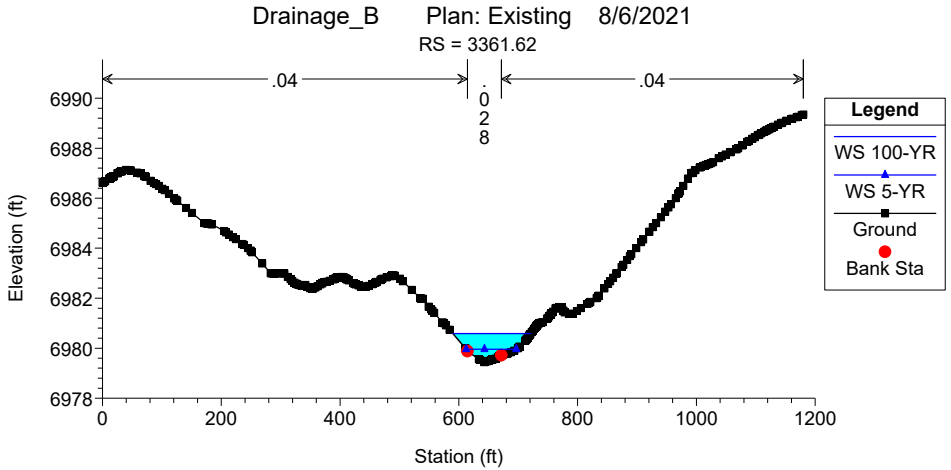
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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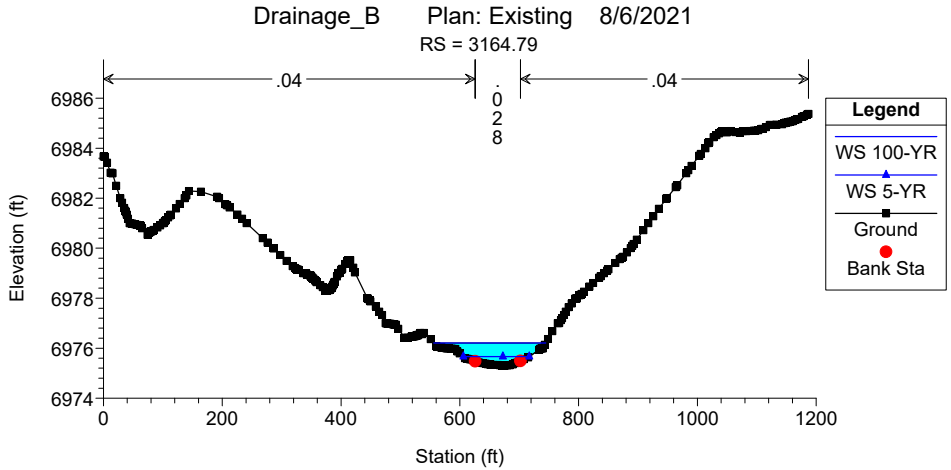
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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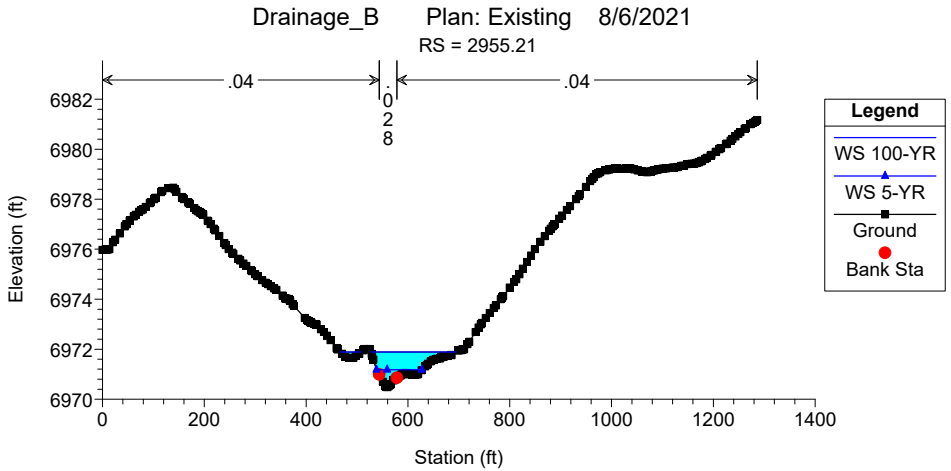
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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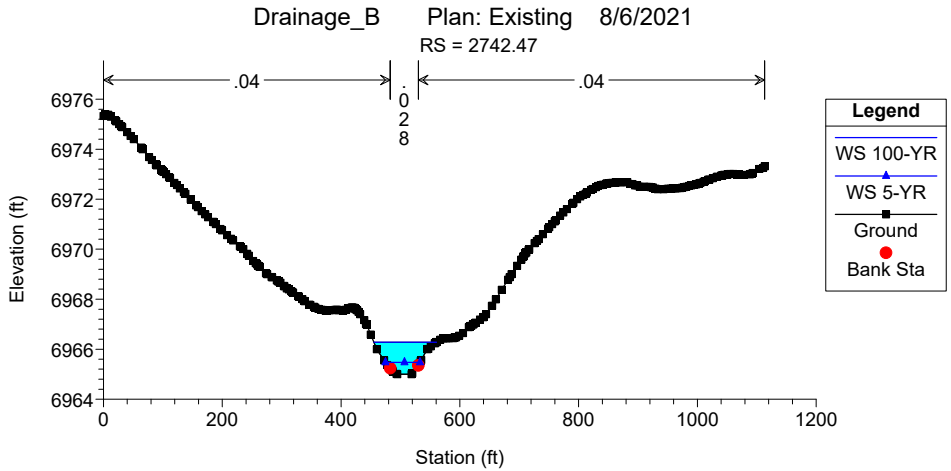
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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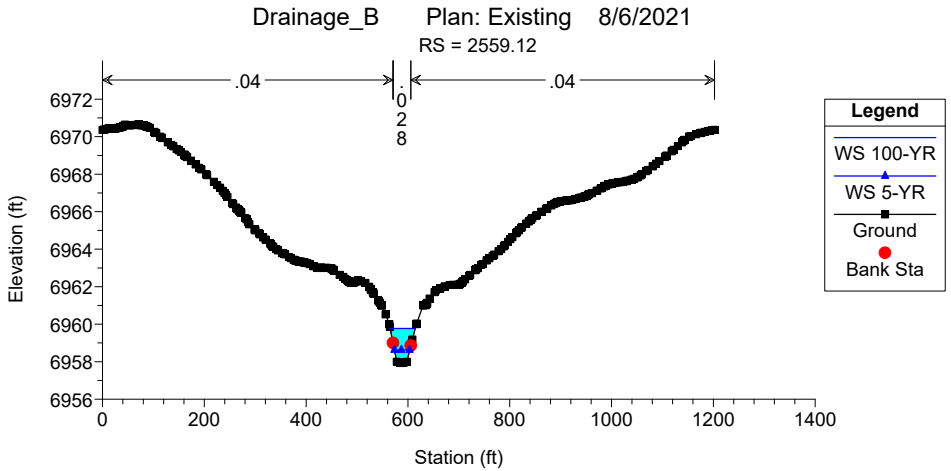
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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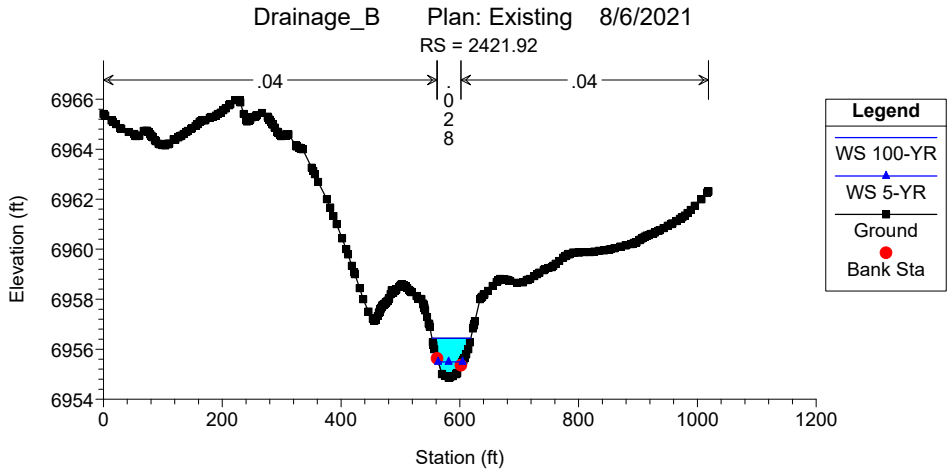
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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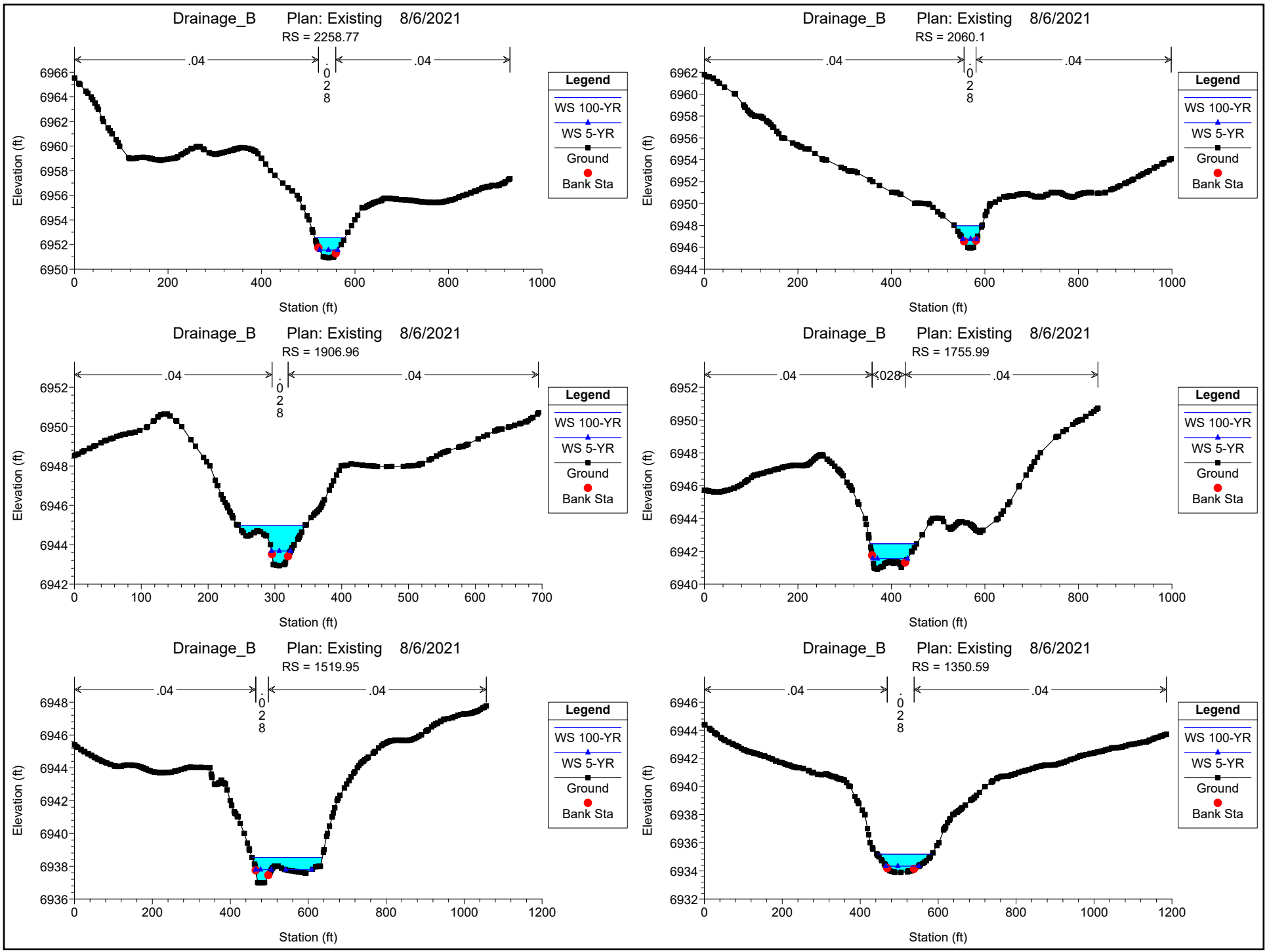
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_B Plan: Existing 8/6/2021
RS = 2060.1
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_B Plan: Existing 8/6/2021
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.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_B Plan: Existing 8/6/2021
RS = 1755.99
.04
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.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_B Plan: Existing 8/6/2021
RS = 1519.95
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_B Plan: Existing 8/6/2021
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.028
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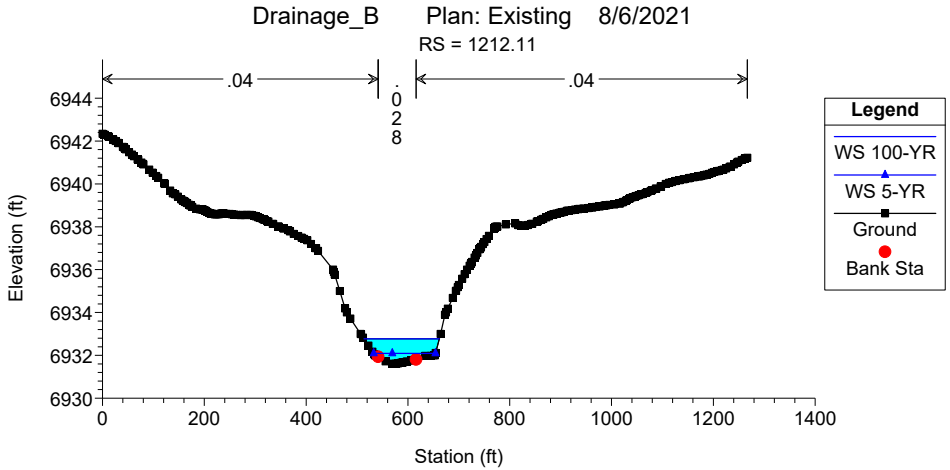
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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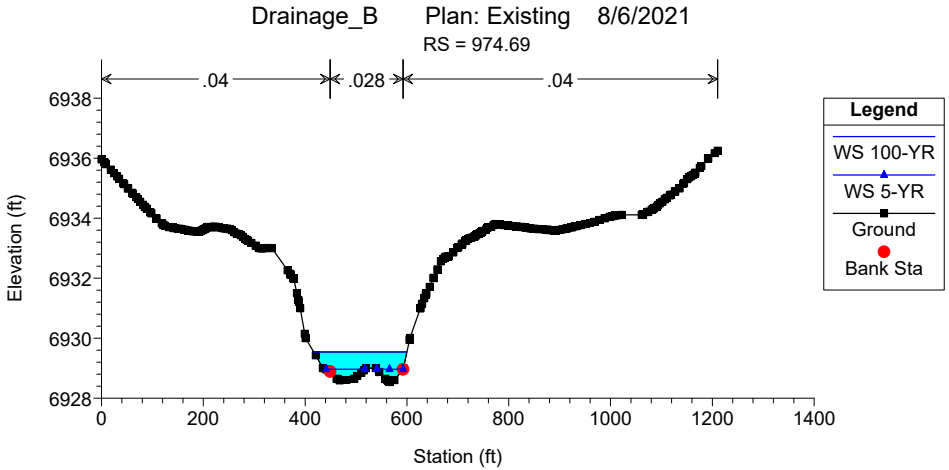
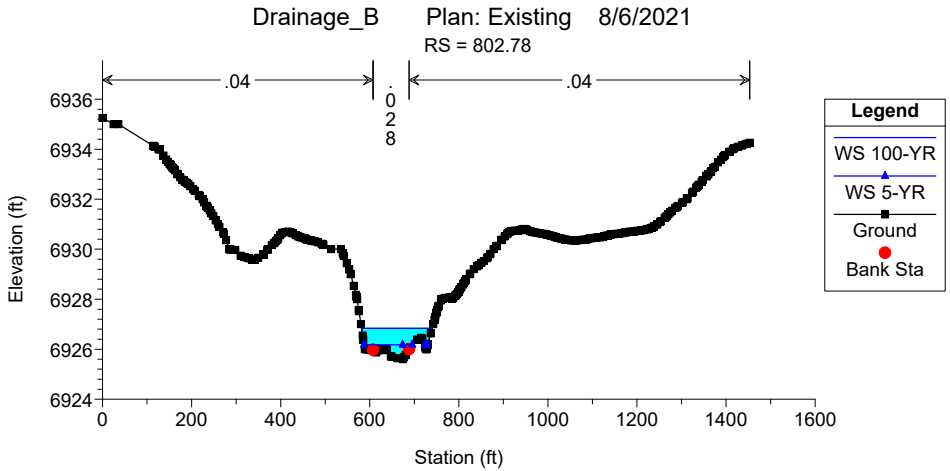
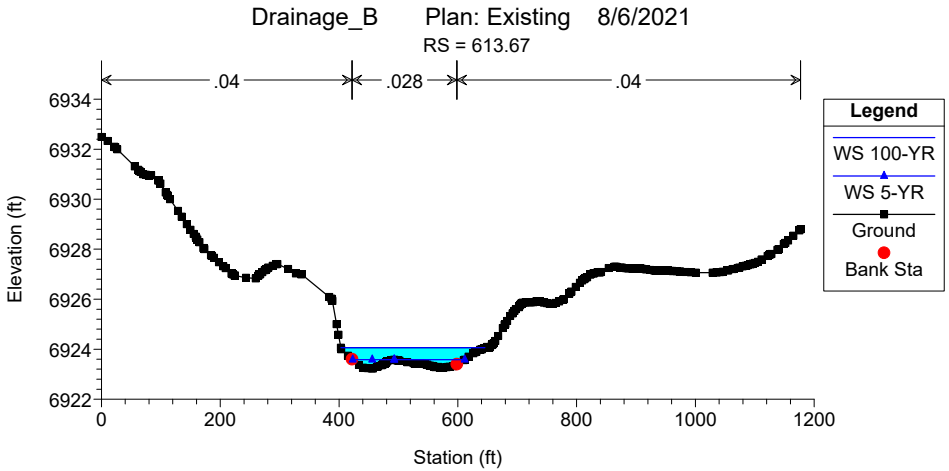
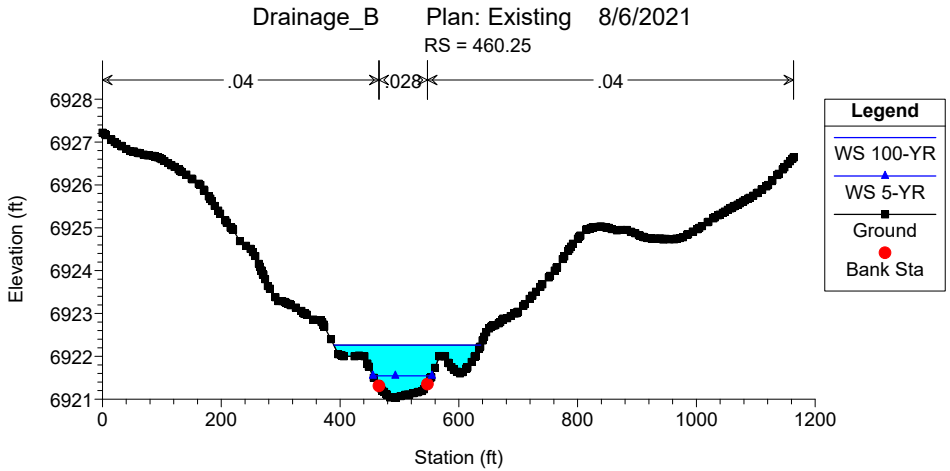
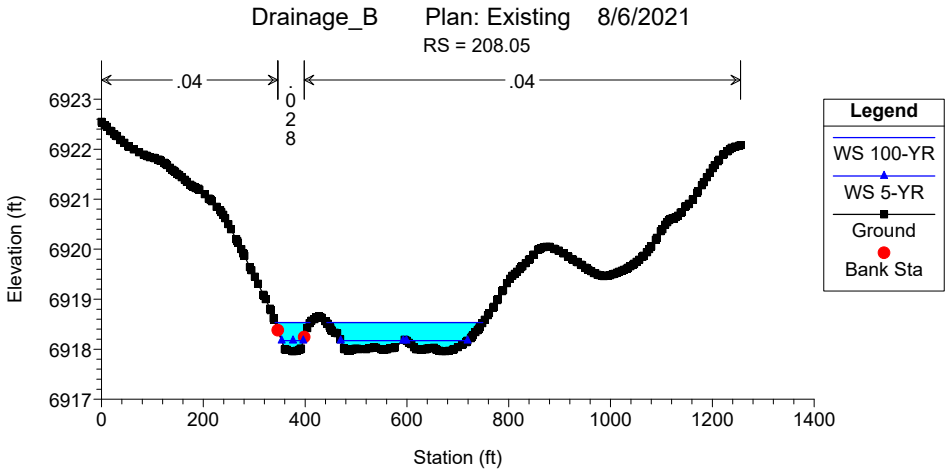
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta

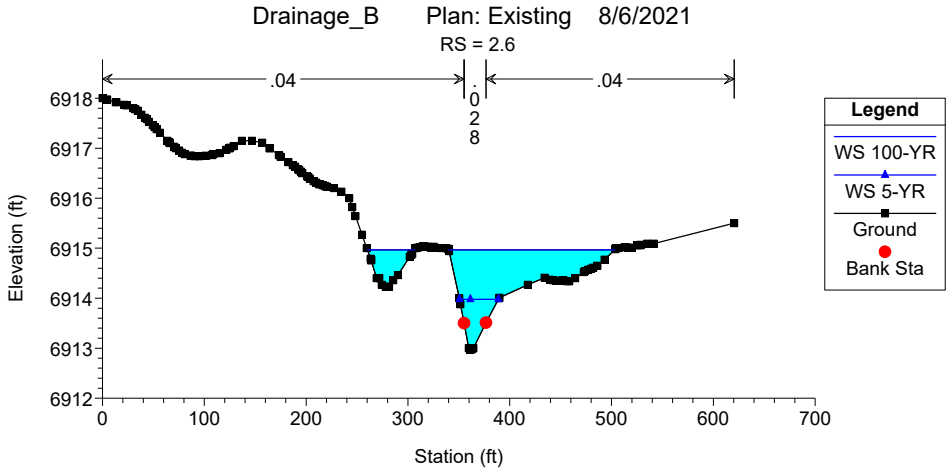

Drainage_B Plan: Existing 8/6/2021
RS = 974.69
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_B Plan: Existing 8/6/2021
RS = 802.78
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_B Plan: Existing 8/6/2021
RS = 613.67
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_B Plan: Existing 8/6/2021
RS = 460.25
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_B Plan: Existing 8/6/2021
RS = 208.05
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_B Plan: Existing 8/6/2021
RS = 2.6
.04
.028
.04
Elevation (ft)
6918
6917
6916
6915
6914
6913
6912
0
100
200
300
400
500
600
700
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta

Appendix F

IGEL, TREVOR, 8/12/2021 2:49 PM

Fairfax Rd

Fairfax Rd

MAIN STEM (CHANNEL A)

37+16
35+00
30+00
25+00
20+00
15+00
10+00
5+00
0+00

SL-3
37+12.84

SL-4
36+18.51

SL-5
34+24.50

SL-6
32+14.73

SL-7
28+82.47

SL-8
27+72.34

SL-9
26+80.20

SL-10
25+82.31

SL-11
25+27.16

SL-12
23+03.17

SL-13
21+21.94

SL-14
18+14.04

SL-15
15+56.67

SL-16
12+97.03

SL-17
10+64.03

SL-18
8+42.08

SL-19
5+23.71

SL-20
2+90.78

SL-21
2+14.43

SL-22
1+48.12

SL-23
0+35.13

NORTH

0 250
125

HRGreen

Job No.:	201662.02
Prepared By:	TBI
Date:	8/11/2021

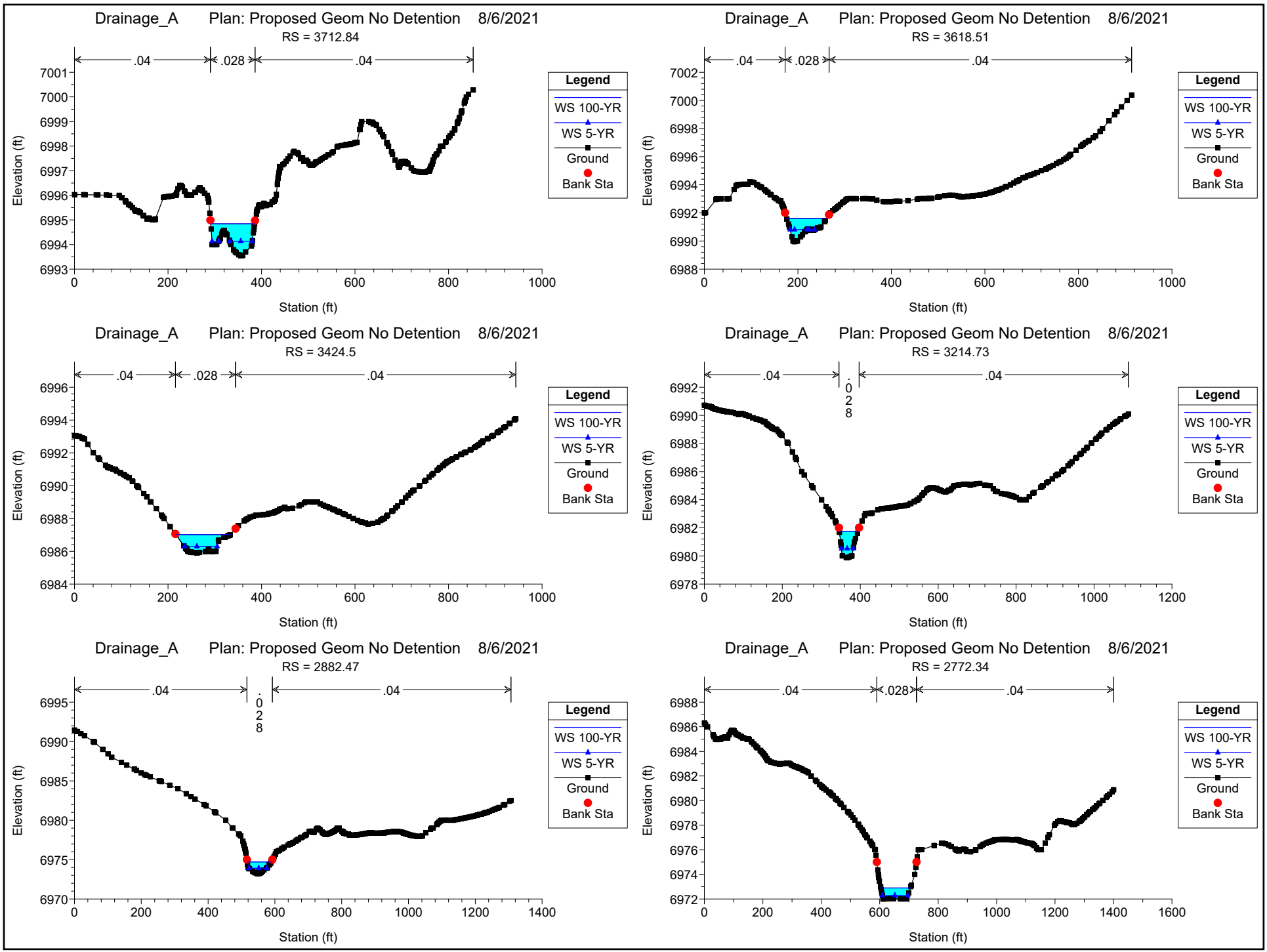
CHANNEL A MODEL
CROSS SECTIONS

FIG.A

HRGreen DRAWING PATH:J:\2020\201662.02\CAD\Dwgs_Exhibits\01-MODEL CROSS SECTIONS.dwg

HEC-RAS Plan: PR_No_Detention River: Drainage A Reach: Alignment - (2)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Power LOB	Power Chan	Power ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/ft s)	(lb/ft s)	(lb/ft s)
Alignment - (2)	3712.84	100-YR	413.00	6993.54	6994.84	6994.84	6995.27	0.012379	5.24	78.75	1.01		0.65			3.39	
Alignment - (2)	3712.84	5-YR	67.00	6993.54	6994.13	6994.13	6994.30	0.016774	3.26	20.58	1.00		0.34			1.11	
Alignment - (2)	3618.51	100-YR	413.00	6989.96	6991.61	6991.61	6992.06	0.012115	5.42	76.24	1.01		0.68			3.66	
Alignment - (2)	3618.51	5-YR	67.00	6989.96	6990.82	6990.82	6991.01	0.015635	3.54	18.93	1.00		0.38			1.35	
Alignment - (2)	3424.5	100-YR	413.00	6985.91	6987.02	6987.02	6987.39	0.013081	4.88	84.55	1.01		0.59			2.88	
Alignment - (2)	3424.5	5-YR	67.00	6985.91	6986.30	6986.30	6986.45	0.016765	3.12	21.47	0.99		0.32			1.00	
Alignment - (2)	3214.73	100-YR	413.00	6979.87	6981.76	6981.76	6982.42	0.010605	6.55	63.05	1.00		0.87			5.69	
Alignment - (2)	3214.73	5-YR	67.00	6979.87	6980.52	6980.52	6980.79	0.014361	4.16	16.10	1.01		0.47			1.97	
Alignment - (2)	2882.47	100-YR	413.00	6973.22	6974.71	6974.71	6975.21	0.011487	5.72	72.23	1.00		0.72			4.13	
Alignment - (2)	2882.47	5-YR	67.00	6973.22	6973.90	6973.87	6974.06	0.012544	3.19	21.03	0.90		0.31			0.98	
Alignment - (2)	2772.34	100-YR	413.00	6972.00	6972.90	6972.90	6973.31	0.012758	5.14	80.40	1.02		0.63			3.25	
Alignment - (2)	2772.34	5-YR	67.00	6972.00	6972.29	6972.29	6972.42	0.017777	2.91	23.04	1.00		0.29			0.85	
Alignment - (2)	2592.31	100-YR	479.80	6964.02	6966.01	6966.01	6966.73	0.010427	6.80	70.59	1.01		0.91			6.22	
Alignment - (2)	2592.31	5-YR	80.03	6964.02	6964.82	6964.82	6965.09	0.014202	4.17	19.19	1.00		0.47			1.98	
Alignment - (2)	2527.18	100-YR	479.80	6962.89	6964.83	6964.83	6965.52	0.010519	6.69	71.69	1.01		0.90			5.99	
Alignment - (2)	2527.18	5-YR	80.03	6962.89	6963.64	6963.64	6963.92	0.013864	4.20	19.05	1.00		0.48			2.00	
Alignment - (2)	2303.17	100-YR	479.80	6959.99	6962.42	6962.38	6963.11	0.009556	6.70	71.65	0.97		0.87			5.86	
Alignment - (2)	2303.17	5-YR	80.03	6959.99	6961.06	6960.97	6961.32	0.009677	4.15	19.30	0.87		0.43			1.77	
Alignment - (2)	2121.94	100-YR	479.80	6957.99	6960.51	6960.51	6961.34	0.009879	7.30	65.68	1.00		1.01			7.34	
Alignment - (2)	2121.94	5-YR	80.03	6957.99	6958.91	6958.91	6959.28	0.013151	4.88	16.40	1.01		0.59			2.88	
Alignment - (2)	1814.04	100-YR	479.80	6953.99	6956.15	6956.15	6956.92	0.010160	7.04	68.15	1.01		0.96			6.74	
Alignment - (2)	1814.04	5-YR	80.03	6953.99	6954.76	6954.76	6955.08	0.013386	4.54	17.62	1.00		0.53			2.41	
Alignment - (2)	1556.67	100-YR	479.80	6949.87	6952.10	6952.10	6952.67	0.009989	6.07	80.71	0.97	0.09	0.76		0.10	4.63	
Alignment - (2)	1556.67	5-YR	80.03	6949.87	6950.72	6950.72	6951.03	0.013371	4.47	17.92	1.00		0.52			2.31	
Alignment - (2)	1297.03	100-YR	479.80	6941.99	6945.29	6945.29	6946.29	0.009589	8.02	59.80	1.00		1.15			9.21	
Alignment - (2)	1297.03	5-YR	80.03	6941.99	6943.40	6943.27	6943.76	0.008428	4.83	16.57	0.84		0.52			2.51	
Alignment - (2)	1084.03	100-YR	479.80	6939.97	6942.57	6942.57	6943.09	0.011853	5.81	82.59	1.02		0.75			4.33	
Alignment - (2)	1084.03	5-YR	80.03	6939.97	6941.17	6941.17	6941.50	0.013605	4.64	17.26	1.01		0.55			2.55	
Alignment - (2)	642.96	100-YR	479.80	6930.00	6932.27	6932.27	6932.98	0.010616	6.78	70.78	1.01		0.91			6.20	
Alignment - (2)	642.96	5-YR	80.03	6930.00	6931.22		6931.37	0.005127	3.14	25.52	0.64		0.24			0.75	
Alignment - (2)	523.77	100-YR	479.80	6929.58	6931.06	6931.06	6931.63	0.011302	6.09	78.84	1.01		0.79			4.81	
Alignment - (2)	523.77	5-YR	80.03	6929.58	6930.16	6930.16	6930.36	0.016078	3.63	22.05	1.02		0.40			1.44	
Alignment - (2)	290.78	100-YR	479.80	6924.69	6926.15	6926.15	6926.73	0.010915	6.13	78.32	1.00		0.79			4.85	
Alignment - (2)	290.78	5-YR	80.03	6924.69	6925.22	6925.22	6925.43	0.015614	3.64	21.97	1.01		0.40			1.45	
Alignment - (2)	214.43	100-YR	479.80	6922.96	6924.83	6924.83	6925.53	0.010512	6.74	71.18	1.01		0.90			6.10	
Alignment - (2)	214.43	5-YR	80.03	6922.96	6923.66	6923.66	6923.94	0.014503	4.21	18.99	1.01		0.48			2.04	
Alignment - (2)	148.72	100-YR	479.80	6920.98	6922.82	6922.82	6923.52	0.010380	6.71	71.47	1.00		0.90			6.02	
Alignment - (2)	148.72	5-YR	80.03	6920.98	6921.69	6921.69	6921.95	0.014036	4.11	19.47	1.00		0.46			1.90	
Alignment - (2)	33.13	100-YR	479.80	6918.00	6920.43	6920.43	6921.12	0.010447	6.63	72.42	1.00		0.88			5.83	
Alignment - (2)	33.13	5-YR	80.03	6918.00	6919.14	6919.14	6919.45	0.013835	4.53	17.68	1.01		0.53			2.41	


Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 3712.84
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 3618.51
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 3424.5
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 3214.73
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 2882.47
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 2772.34
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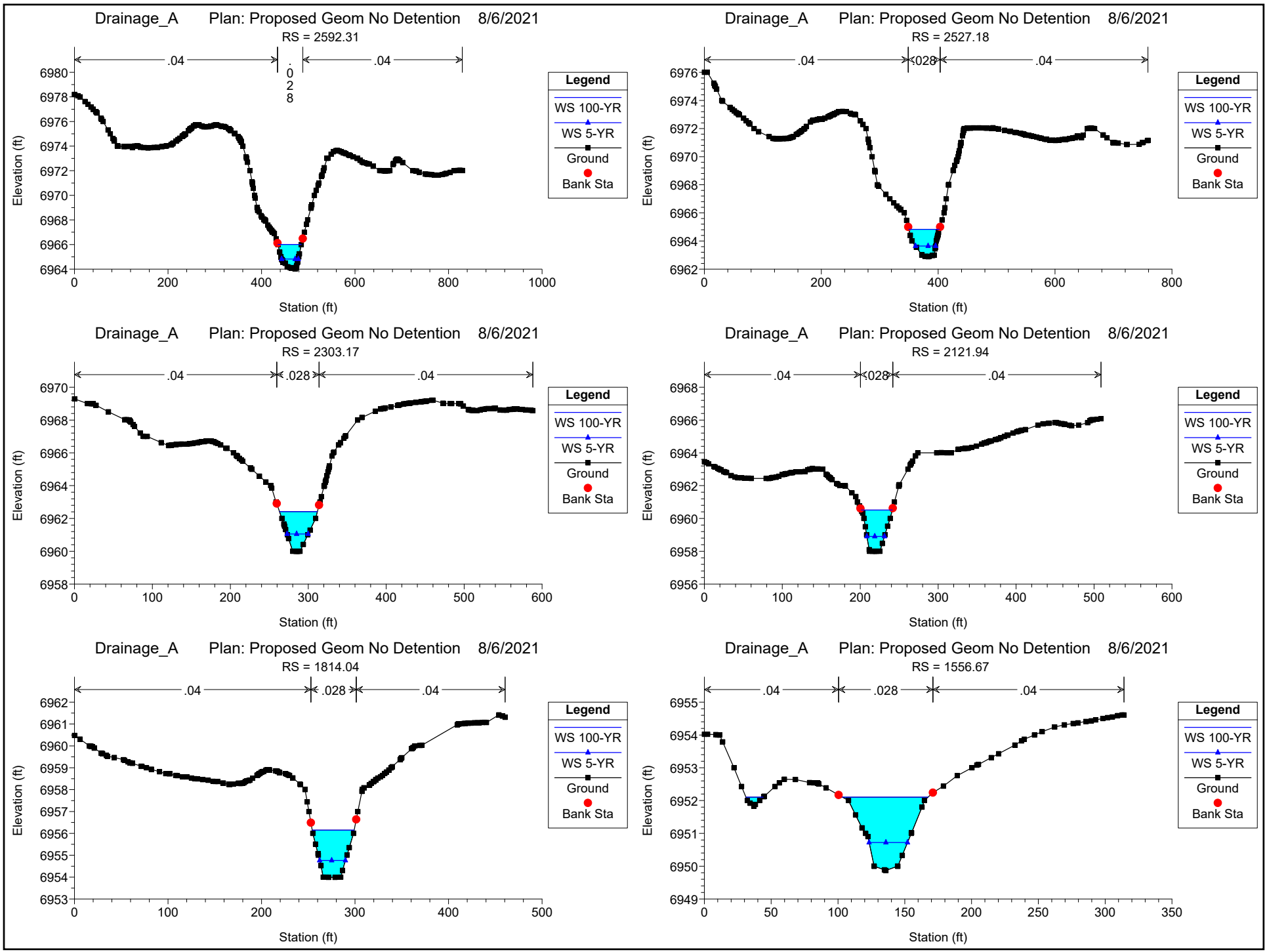
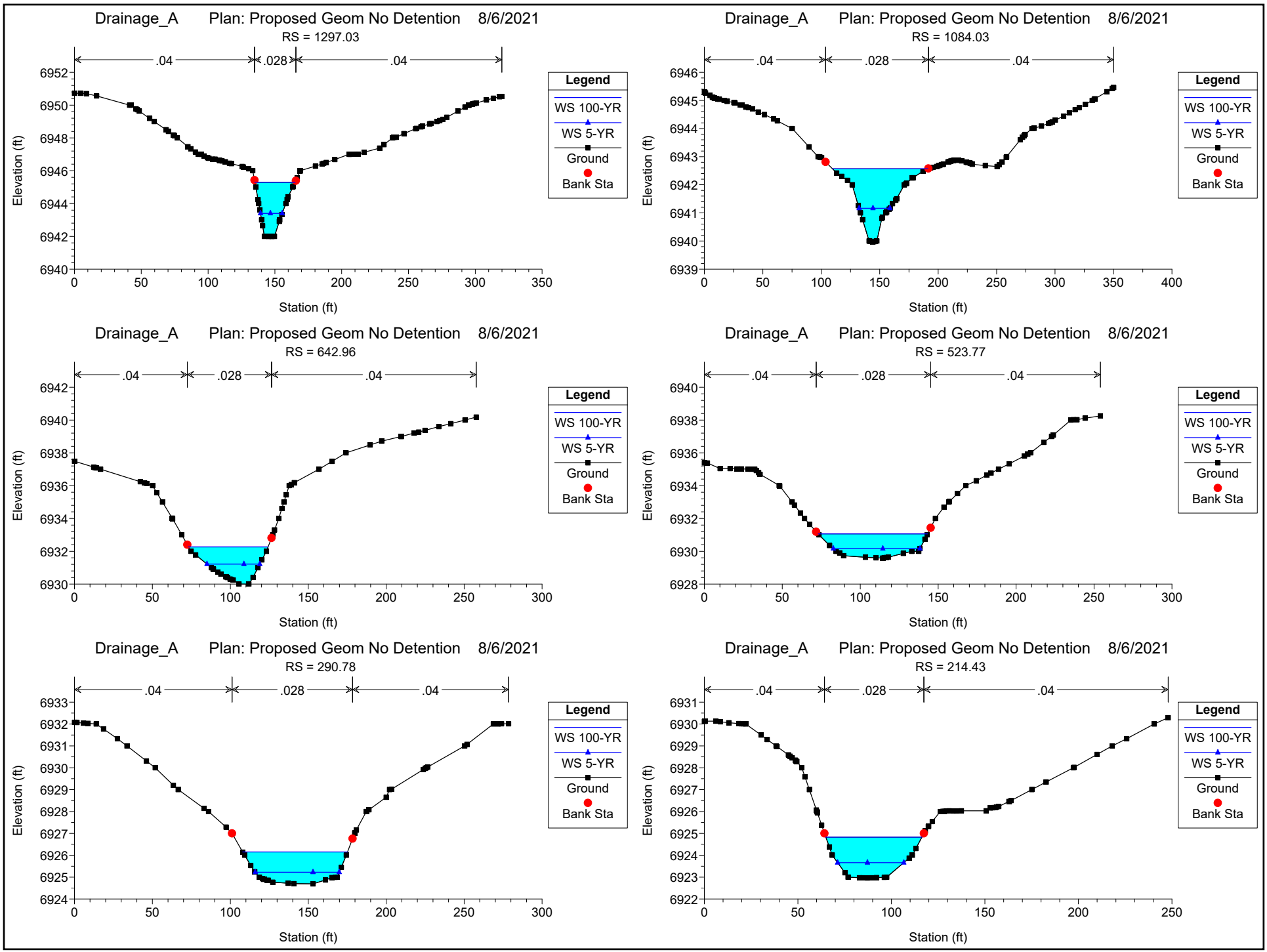
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 2592.31
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 2527.18
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 2303.17
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 2121.94
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 1814.04
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 1556.67
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta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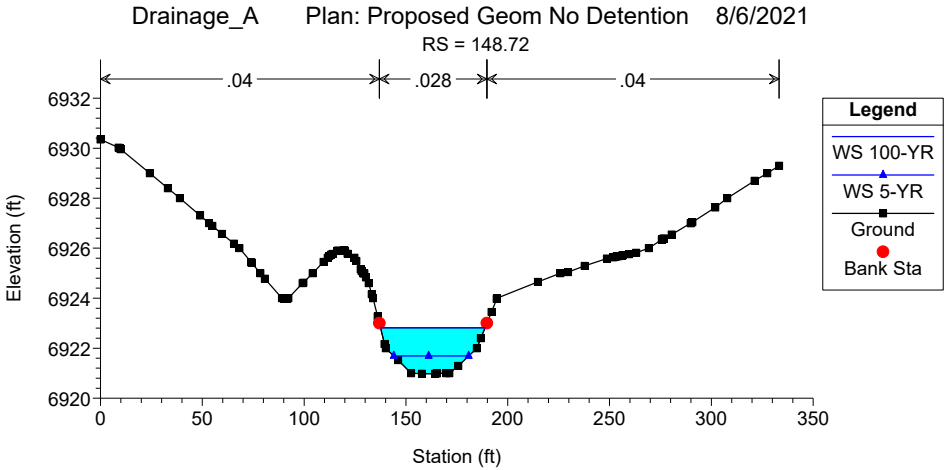
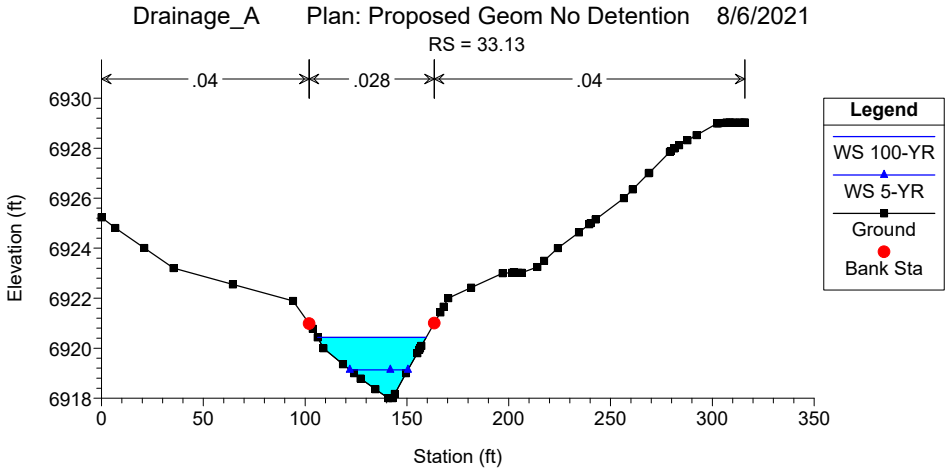
RS = 1297.03
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 1084.03
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 642.96
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 523.77
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 290.78
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta
Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 214.43
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 148.72
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta


Drainage_A Plan: Proposed Geom No Detention 8/6/2021
RS = 33.13
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
Ground
Bank Sta

NORTH

0 250
125

HRGreen

Job No.:	201662.03
Prepared By:	TBI
Date:	8/12/2021

PROPOSED MODEL CROSS SECTIONS

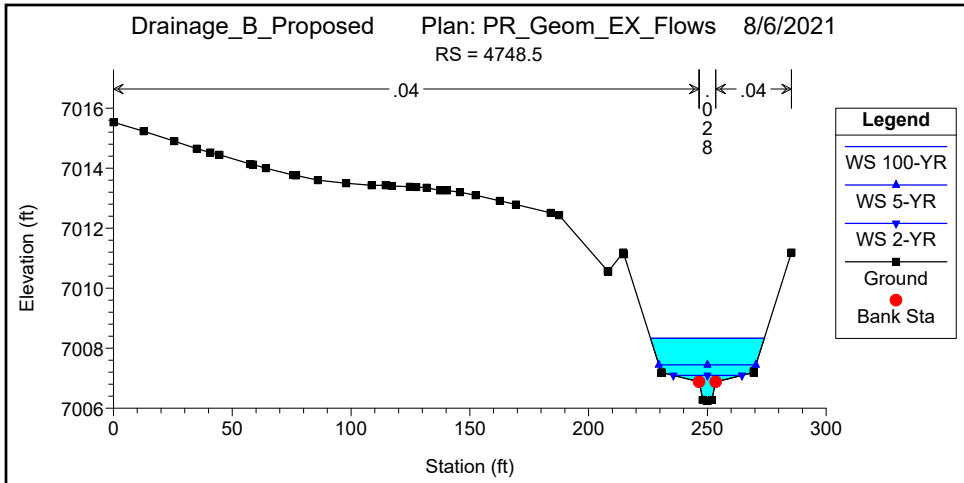
FIG.A

HEC-RAS Plan: PR_GEOM_EX_FLOWS River: Channel B Reach: Alignment Channe

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Power LOB	Power Chan	Power ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/ft s)	(lb/ft s)	(lb/ft s)
Alignment Channe	4748.5	100-YR	280.00	7006.24	7008.33	7008.24	7008.81	0.008996	7.62	59.94	0.97	0.63	1.05	0.63	2.41	7.97	2.42
Alignment Channe	4748.5	5-YR	59.00	7006.24	7007.45	7007.45	7007.68	0.008149	4.81	20.62	0.83	0.20	0.51	0.20	0.36	2.46	0.36
Alignment Channe	4700	100-YR	280.00	7005.80	7007.96		7008.39	0.007882	7.27	62.72	0.91	0.58	0.94	0.58	2.12	6.86	2.12
Alignment Channe	4700	5-YR	59.00	7005.80	7007.02	7007.02	7007.25	0.007985	4.77	20.79	0.82	0.20	0.50	0.20	0.36	2.40	0.36
Alignment Channe	4662.69	100-YR	280.00	7005.46	7007.47	7007.47	7008.02	0.011159	8.22	55.66	1.07	0.74	1.24	0.74	3.01	10.16	3.01
Alignment Channe	4662.69	5-YR	59.00	7005.46	7006.67	7006.67	7006.91	0.008170	4.81	20.61	0.83	0.20	0.51	0.20	0.36	2.46	0.36
Alignment Channe	4636.96	100-YR	280.00	7002.89	7004.93	7004.90	7005.46	0.010312	7.99	57.19	1.03	0.70	1.16	0.70	2.78	9.29	2.78
Alignment Channe	4636.96	5-YR	59.00	7002.89	7004.10	7004.10	7004.34	0.008058	4.78	20.72	0.83	0.20	0.51	0.20	0.36	2.42	0.36
Alignment Channe	4580	100-YR	280.00	7002.32	7004.42	7004.33	7004.89	0.008981	7.61	59.97	0.97	0.63	1.04	0.63	2.41	7.95	2.41
Alignment Channe	4580	5-YR	59.00	7002.32	7003.53	7003.53	7003.77	0.008191	4.81	20.59	0.83	0.20	0.51	0.20	0.36	2.47	0.36
Alignment Channe	4520	100-YR	280.00	7001.72	7003.73	7003.73	7004.29	0.011154	8.22	55.66	1.07	0.74	1.24	0.74	3.00	10.16	3.00
Alignment Channe	4520	5-YR	59.00	7001.72	7002.94	7002.94	7003.17	0.008055	4.78	20.72	0.83	0.20	0.51	0.20	0.36	2.42	0.36
Alignment Channe	4485	100-YR	280.00	6998.22	7000.33	7000.23	7000.79	0.008854	7.58	60.26	0.96	0.63	1.03	0.63	2.38	7.82	2.38
Alignment Channe	4485	5-YR	59.00	6998.22	6999.43	6999.43	6999.67	0.008075	4.79	20.70	0.83	0.20	0.51	0.20	0.36	2.43	0.36
Alignment Channe	4440	100-YR	280.00	6997.82	6999.99		7000.41	0.007644	7.20	63.37	0.90	0.56	0.92	0.56	2.05	6.64	2.05
Alignment Channe	4440	5-YR	59.00	6997.82	6999.06	6999.06	6999.27	0.007204	4.59	21.58	0.78	0.19	0.46	0.19	0.33	2.13	0.33
Alignment Channe	4365	100-YR	280.00	6997.15	6999.15	6999.15	6999.71	0.011185	8.23	55.62	1.07	0.74	1.24	0.74	3.01	10.20	3.01
Alignment Channe	4365	5-YR	59.00	6997.15	6998.37	6998.37	6998.59	0.007751	4.72	21.01	0.81	0.19	0.49	0.19	0.35	2.32	0.35
Alignment Channe	4320	100-YR	280.00	6992.85	6994.95	6994.86	6995.42	0.009001	7.62	59.92	0.97	0.63	1.05	0.63	2.42	7.97	2.42
Alignment Channe	4320	5-YR	59.00	6992.85	6994.07	6994.07	6994.30	0.008005	4.77	20.77	0.82	0.20	0.50	0.20	0.36	2.40	0.36
Alignment Channe	4210	100-YR	280.00	6991.75	6993.76	6993.76	6994.31	0.011161	8.22	55.65	1.07	0.74	1.24	0.74	3.01	10.16	3.01
Alignment Channe	4210	5-YR	59.00	6991.75	6992.97	6992.97	6993.20	0.007905	4.75	20.87	0.82	0.20	0.50	0.20	0.35	2.37	0.35
Alignment Channe	4070	100-YR	280.00	6990.35	6992.40	6992.40	6992.81	0.008921	7.44	69.51	0.96	0.30	1.01	0.61	0.89	7.50	2.24
Alignment Channe	4070	5-YR	59.00	6990.35	6991.56	6991.56	6991.80	0.008275	4.83	20.51	0.84	0.20	0.52	0.20	0.37	2.50	0.37
Alignment Channe	4025	100-YR	280.00	6985.85	6987.95	6987.86	6988.42	0.008940	7.60	60.06	0.97	0.63	1.04	0.63	2.40	7.91	2.40
Alignment Channe	4025	5-YR	59.00	6985.85	6987.06	6987.06	6987.30	0.008424	4.86	20.37	0.84	0.20	0.52	0.20	0.37	2.55	0.37
Alignment Channe	3925	100-YR	280.00	6984.85	6986.86	6986.86	6987.42	0.011256	8.24	55.49	1.07	0.74	1.24	0.74	3.03	10.26	3.03
Alignment Channe	3925	5-YR	59.00	6984.85	6986.06	6986.06	6986.30	0.008087	4.79	20.69	0.83	0.20	0.51	0.20	0.36	2.43	0.36
Alignment Channe	3880	100-YR	280.00	6980.35	6984.85		6984.89	0.000291	2.35	198.09	0.20	0.05	0.08	0.05	0.06	0.18	0.06
Alignment Channe	3880	5-YR	59.00	6980.35	6981.92		6981.99	0.001771	2.73	35.82	0.41	0.08	0.15	0.08	0.10	0.41	0.10
Alignment Channe	3830	100-YR	280.00	6979.90	6984.60	6982.19	6984.78	0.000681	3.73	87.49	0.30	0.17	0.19	0.17	0.42	0.70	0.42
Alignment Channe	3830	5-YR	59.00	6979.90	6981.49	6980.92	6981.59	0.001625	2.78	25.28	0.39	0.09	0.15	0.09	0.13	0.42	0.13
Alignment Channe	3825		Culvert														
Alignment Channe	3760	100-YR	280.00	6979.27	6981.78	6981.78	6982.88	0.008939	8.85	34.61	0.99	1.03	1.31	1.03	5.42	11.58	5.42
Alignment Channe	3760	5-YR	59.00	6979.27	6980.36	6980.28	6980.70	0.008018	4.77	13.40	0.82	0.21	0.50	0.21	0.41	2.40	0.41
Alignment Channe	3650	100-YR	390.70	6978.28	6980.80		6981.29	0.007384	7.87	80.68	0.91	0.66	1.05	0.66	2.70	8.22	2.70
Alignment Channe	3650	5-YR	68.95	6978.28	6979.56	6979.56	6979.80	0.007808	4.92	23.55	0.82	0.22	0.52	0.22	0.44	2.57	0.44
Alignment Channe	3405	100-YR	390.70	6976.08	6978.36	6978.36	6979.04	0.011518	9.17	69.24	1.11	0.92	1.47	0.92	4.29	13.49	4.29
Alignment Channe	3405	5-YR	68.95	6976.08	6977.34	6977.34	6977.59	0.008491	5.07	22.85	0.86	0.24	0.56	0.24	0.47	2.83	0.47
Alignment Channe	3360	100-YR	390.70	6971.58	6973.91	6973.86	6974.54	0.010411	8.86	71.69	1.06	0.85	1.36	0.85	3.86	12.05	3.86
Alignment Channe	3360	5-YR	68.95	6971.58	6972.83	6972.83	6973.09	0.008634	5.10	22.71	0.86	0.24	0.57	0.24	0.47	2.89	0.47
Alignment Channe	3040	100-YR	390.70	6968.69	6971.20	6970.99	6971.70	0.007461	7.90	80.40	0.91	0.67	1.05	0.67	2.73	8.32	2.73
Alignment Channe	3040	5-YR	68.95	6968.69	6969.96	6969.96	6970.21	0.008491	5.07	22.83	0.86	0.23	0.56	0.23	0.47	2.84	0.47
Alignment Channe	2715	100-YR	390.70	6965.77	6968.07	6968.07	6968.74	0.011236	9.10	69.82	1.10	0.90	1.44	0.90	4.18	13.14	4.18
Alignment Channe	2715	5-YR	68.95	6965.77	6967.04	6967.04	6967.29	0.008451	5.06	22.87	0.85	0.23	0.56	0.23	0.46	2.82	0.46
Alignment Channe	2675	100-YR	390.70	6961.77	6964.18	6964.07	6964.75	0.009096	8.46	75.09	1.00	0.77	1.23	0.77	3.36	10.38	3.36
Alignment Channe	2675	5-YR	68.95	6961.77	6963.04	6963.04	6963.29	0.008411	5.05	22.91	0.85	0.23	0.56	0.23	0.46	2.81	0.46
Alignment Channe	2570	100-YR	390.70	6960.72	6963.03	6963.03	6963.69	0.011094	9.06	70.19	1.09	0.84	1.43	0.89	3.89	12.95	4.12
Alignment Channe	2570	5-YR	68.95	6960.72	6961.98	6961.98	6962.24	0.008643	5.11	22.68	0.86	0.24	0.57	0.24	0.47	2.90	0.47
Alignment Channe	2545	100-YR	390.70	6958.22	6960.64	6960.51	6961.20	0.008854	8.38	75.79	0.99	0.76	1.20	0.76	3.26	10.07	3.26
Alignment Channe	2545	5-YR	68.95	6958.22	6959.51	6959.51	6959.74	0.007720	4.89	23.65	0.82	0.22	0.52	0.22	0.43	2.54	0.43
Alignment Channe	2460	100-YR	390.70	6957.37	6959.66	6959.66	6960.34	0.011438	9.16	69.39	1.11	0.91	1.46	0.91	4.25	13.41	4.25
Alignment Channe	2460	5-YR	68.95	6957.37	6958.63	6958.63	6958.89	0.008667	5.11	22.66	0.86	0.24	0.57	0.24	0.47	2.91	0.47
Alignment Channe	2420	100-YR	390.70	6953.37	6955.91		6956.39	0.007043	7.74	82.01	0.89	0.64	1.01	0.64	2.57	7.80	2.57
Alignment Channe	2420	5-YR	68.95	6953.37	6954.71		6954.90	0.006138	4.49	25.72	0.74	0.19	0.43	0.19	0.36	1.93	0.36
Alignment Channe	2260	100-YR	390.70	6951.93	6954.44	6954.22	6954.94	0.007451	7.89	80.43	0.91	0.67	1.05	0.67	2.73	8.31	2.73
Alignment Channe	2260	5-YR	68.95	6951.93	6953.19	6953.19	6953.45	0.008646	5.11	22.68	0.86	0.24	0.57	0.24	0.47	2.90	0.47
Alignment Channe	2045	100-YR	390.70	6950.00	6952.28	6952.28	6952.96	0.011523	9.18	69.23	1.11	0.92	1.47	0.92	4.29	13.50	4.29
Alignment Channe	2045	5-YR	68.95	6950.00	6951.25	6951.25	6951.51	0.008766	5.13	22.58	0.87	0.24	0.57	0.24	0.48	2.94	0.48
Alignment Channe	2000	100-YR	390.70	6945.50	6948.10		6948.53	0.006304	7.45	85.22	0.84	0.59	0.92	0.59	2.29	6.89	2.29
Alignment Channe	2000	5-YR	68.95	6945.50	6946.76	6946.76	6947.01	0.008518	5.07	22.83	0.86	0.24	0.56	0.24	0.47	2.84	0.47
Alignment Channe	1740	100-YR	597.69	6942.90	6945.81	6945.64	6946.52	0.008796	9.55	101.93	1.02	0.95	1.46	0.95	4.74	13.92	4.74
Alignment Channe	1740	5-YR	86.00	6942.90	6944.25	6944.25	6944.53	0.008827	5.45	26.46	0.88	0.29	0.63	0.29	0.64	3.43	0.64
Alignment Channe	1445	100-YR	597.69	6939.94	6942.69	6942.69	6943.55	0.011516	10.47	92.83	1.15	1.16	1.79	1.16	6.32	18.76	6.32
Alignment Channe	1445	5-YR	86.00	6939.94	6941.29	6941.29	6941.57	0.008918	5.46	26.37	0.89	0.29	0.63	0.29	0.65	3.46	0.65
Alignment Channe	1400	100-YR	597.69	6935.44	6938.21	6938.19	6939.05	0.011170	10.36	93.81	1.13	1.13	1.75	1.13	6.11	18.13	6.11
Alignment Channe	1400	5-YR	86.00	6935.44	6936.79	6936.79	6937.07	0.009053	5.49	26.22	0.89	0.29	0.64	0.29	0.66	3.53	0.66
Alignment Channe	1050	100-YR	597.69	6931.94	6934.86	6934.69	6935.56	0.008741	9.52	102.30	1.01	0.80	1.45	0.94	4.00	13.82	4.71
Alignment Channe	1050	5-YR	86.00	6931.94	6933.29	6933.29	6933.57	0.009073	5.50	26.20	0.90	0.29	0.64	0.29	0.66	3.53	0.66
Alignment Channe	745	100-YR	597.69	6928.90	6931.64	6931.64	6932.50	0.011556	10.48	92.73	1.15	1.16	1.80	1.16	6.33	18.84	6.33
Alignment Channe	745	5-YR	86.00	6928.90	6930.24	6930.24	6930.53	0.008979	5.48	26.30	0.89	0.29	0.64	0.29	0.65	3.50	0.65
Alignment Channe	700	100-YR	597.69	6924.40	6927.27	6927.14	6928.01	0.009447	9.78	99.43	1.05	1.00	1.54	1.00	5.12	15.07	5.12
Alignment Channe	700	5-YR	86.00	6924.40	6925.75	6925.75	6926.03	0.008903	5.46	26.38	0.89	0.29	0.63	0.29	0.65	3.46	0.65

HEC-RAS Plan: PR_GEOM_EX_FLOWS River: Channel B Reach: Alignment Channe (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Froude # Chl	Shear LOB	Shear Chan	Shear ROB	Power LOB	Power Chan	Power ROB
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/ft s)	(lb/ft s)	(lb/ft s)
Alignment Channe	590	100-YR	597.69	6923.40	6926.43		6927.06	0.007427	9.01	108.08	0.94	0.84	1.28	0.84	3.96	11.55	3.96
Alignment Channe	590	5-YR	86.00	6923.40	6924.75	6924.75	6925.03	0.008880	5.46	26.41	0.89	0.29	0.63	0.29	0.65	3.45	0.65
Alignment Channe	445	100-YR	597.69	6922.10	6924.85	6924.85	6925.71	0.011516	10.47	92.83	1.15	1.16	1.79	1.16	6.32	18.76	6.32
Alignment Channe	445	5-YR	86.00	6922.10	6923.45	6923.45	6923.73	0.008918	5.46	26.37	0.89	0.29	0.63	0.29	0.65	3.46	0.65
Alignment Channe	400	100-YR	597.69	6917.60	6920.46	6920.35	6921.21	0.009682	9.84	98.47	1.06	1.01	1.56	1.02	5.24	15.38	5.25
Alignment Channe	400	5-YR	86.00	6917.60	6918.95	6918.94	6919.23	0.008982	5.45	26.29	0.89	0.29	0.63	0.29	0.65	3.44	0.65
Alignment Channe	200	100-YR	597.69	6915.80	6918.80	6918.55	6919.44	0.007830	9.17	106.11	0.96	0.87	1.33	0.87	4.19	12.24	4.19
Alignment Channe	200	5-YR	86.00	6915.80	6917.15	6917.15	6917.43	0.008995	5.48	26.29	0.89	0.29	0.64	0.29	0.66	3.50	0.66
Alignment Channe	70.18	100-YR	597.69	6914.63	6917.40	6917.40	6918.23	0.011055	10.32	94.86	1.13	1.12	1.74	0.96	6.03	17.90	5.07
Alignment Channe	70.18	5-YR	86.00	6914.63	6915.98	6915.98	6916.26	0.009065	5.50	26.21	0.90	0.29	0.64	0.29	0.66	3.53	0.67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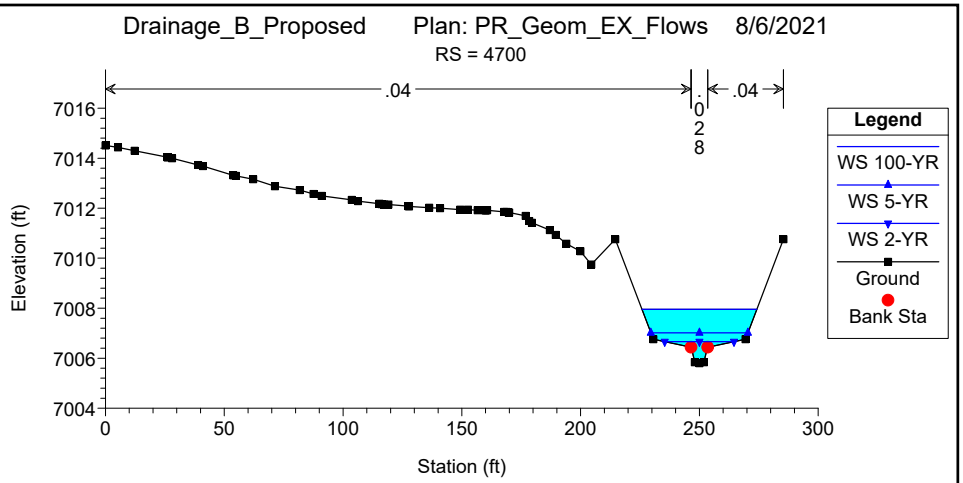
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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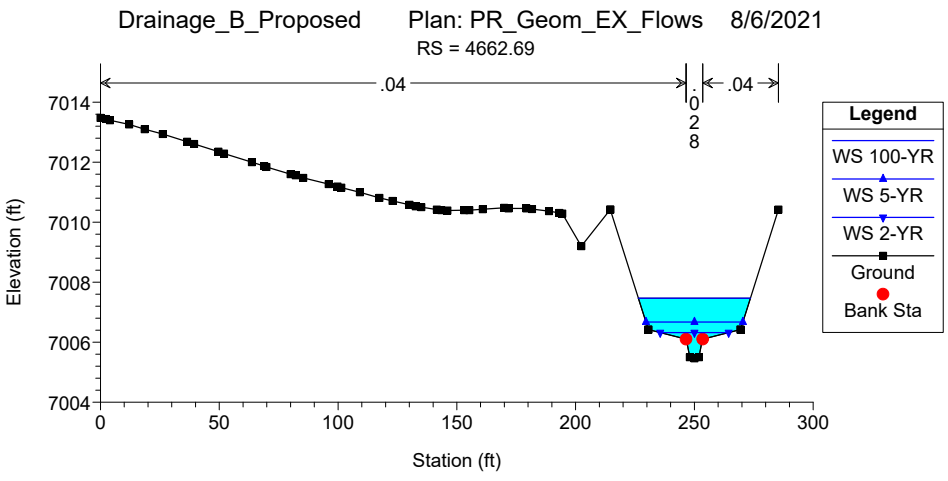
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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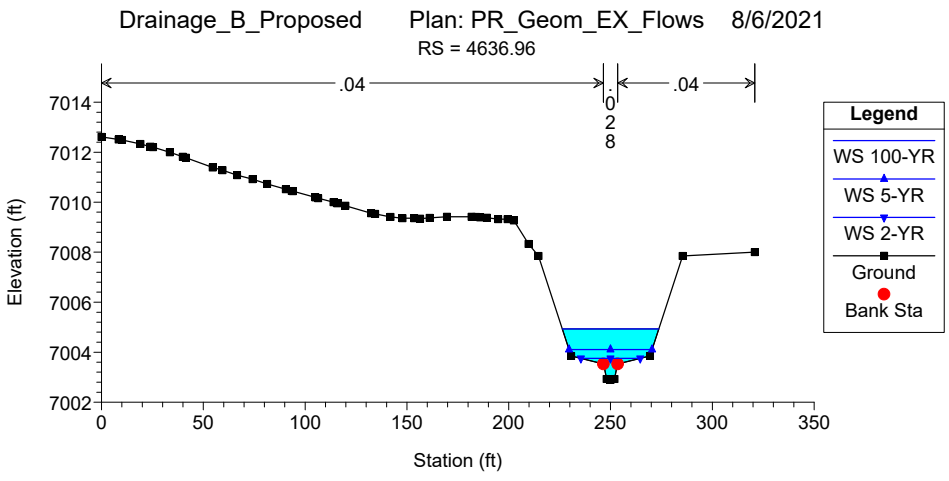
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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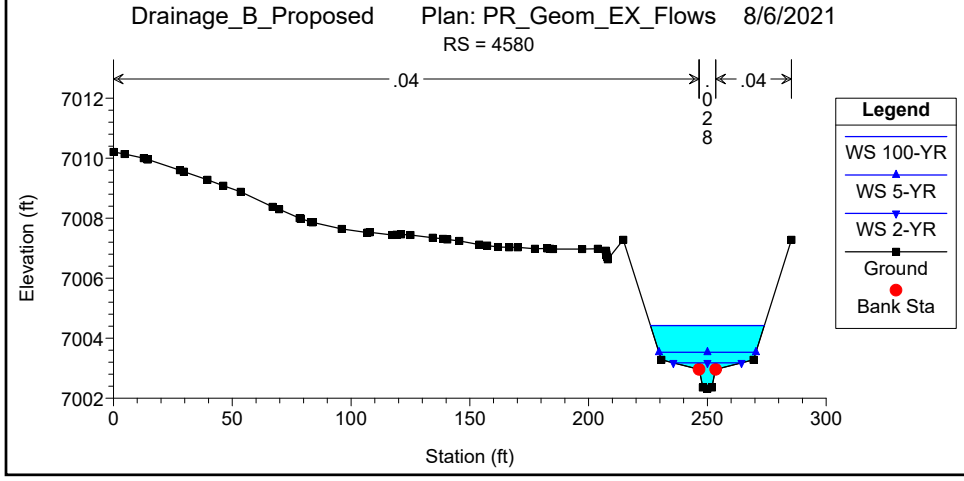
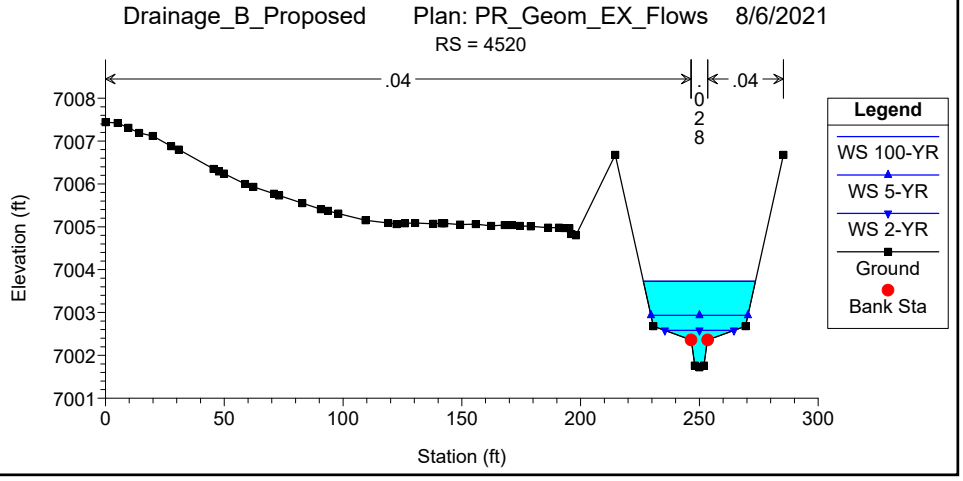
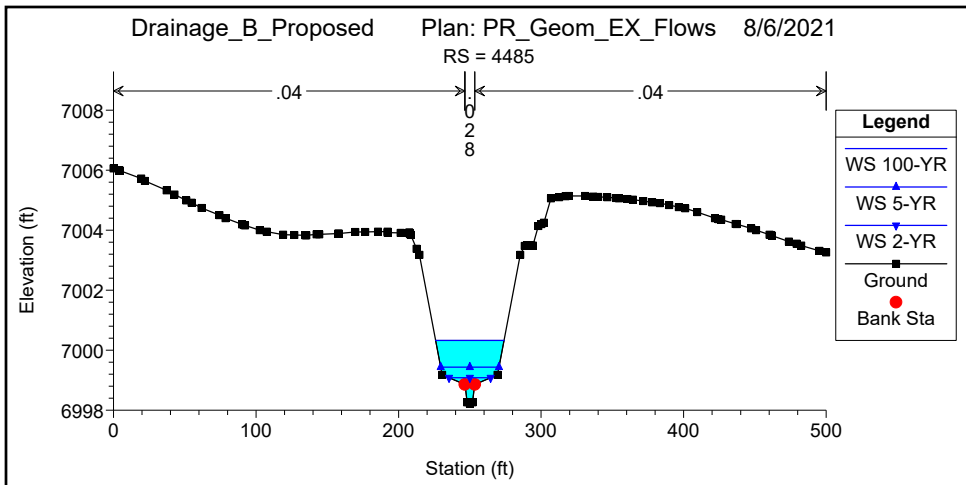
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 4580
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 4520
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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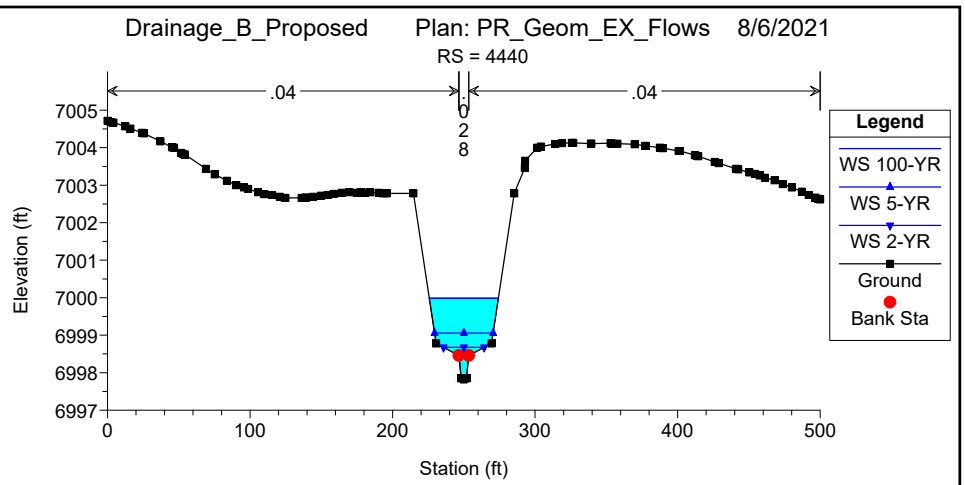
RS = 4485
.04
.04
.02
8
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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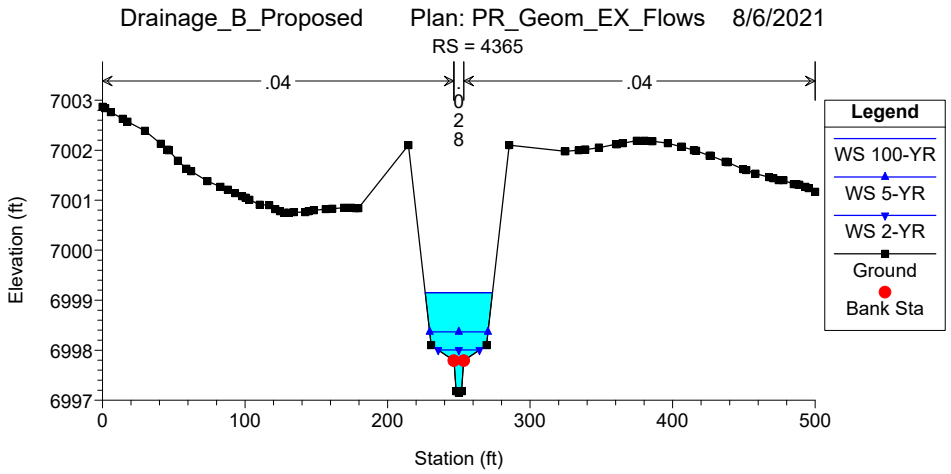
.04
.04
.02
8
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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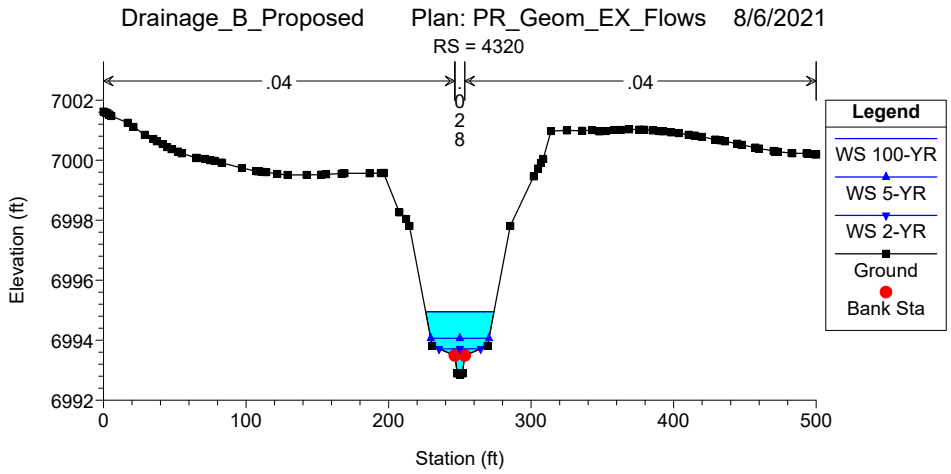
.02
8
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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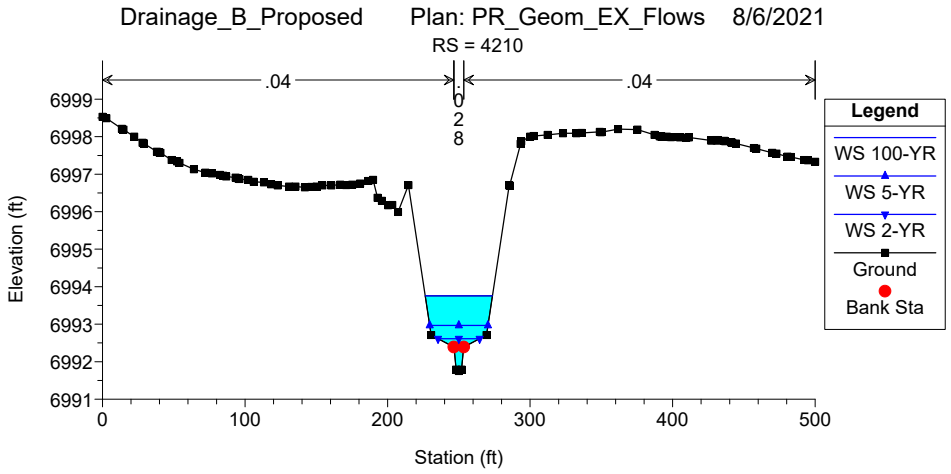
.04
.04
.02
8
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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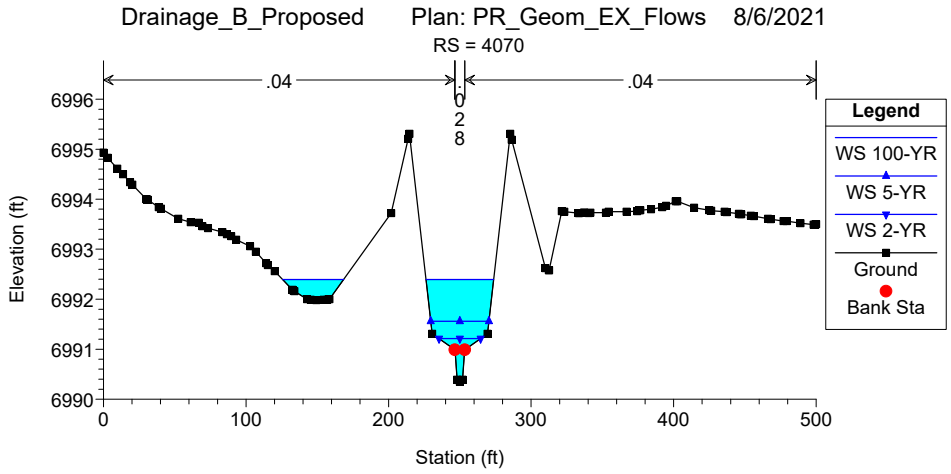
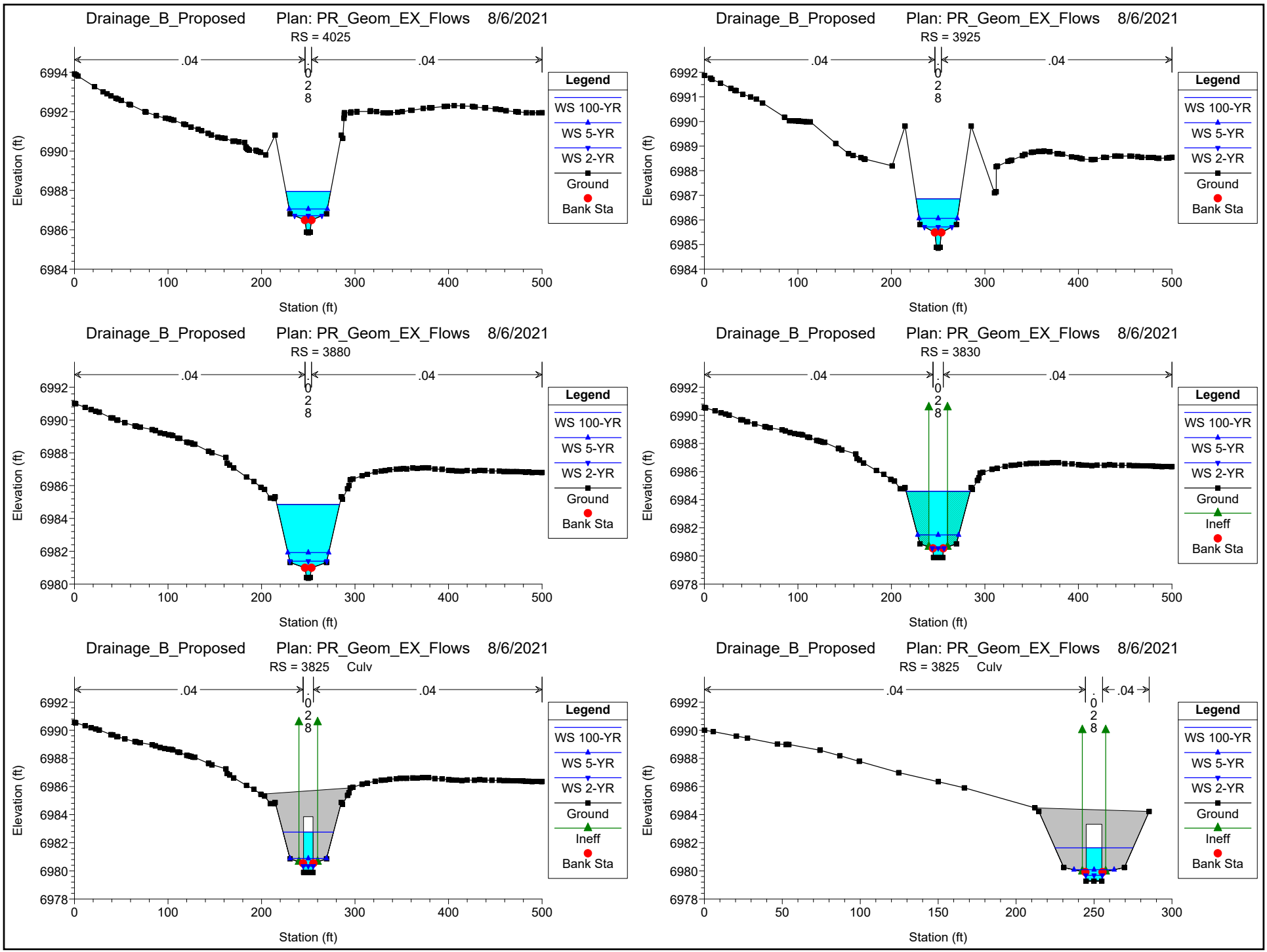
.04
.02
8
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 4070
.04
.04
.02
8
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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RS = 4025
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 3925
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 3880
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 3830
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Ineff
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 3825 Culv
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Ineff
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 3825 Culv
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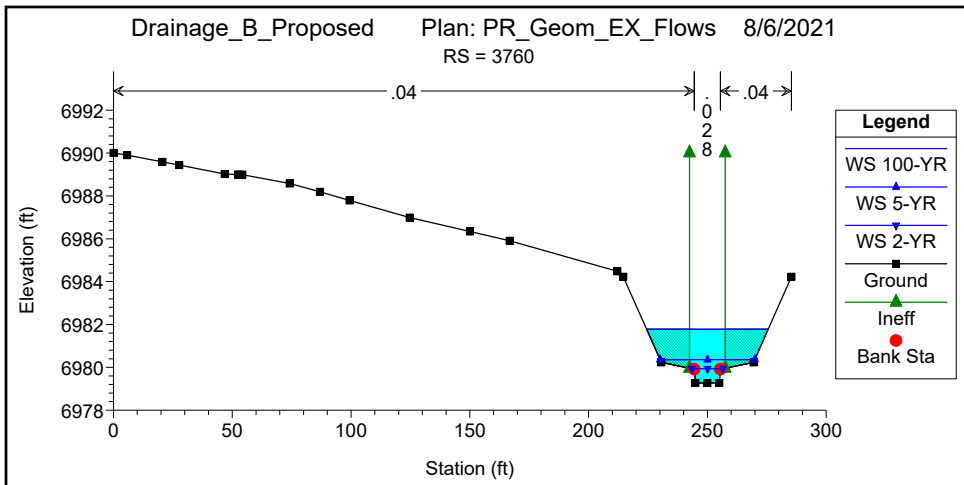
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Ineff
Bank Sta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.04
.028
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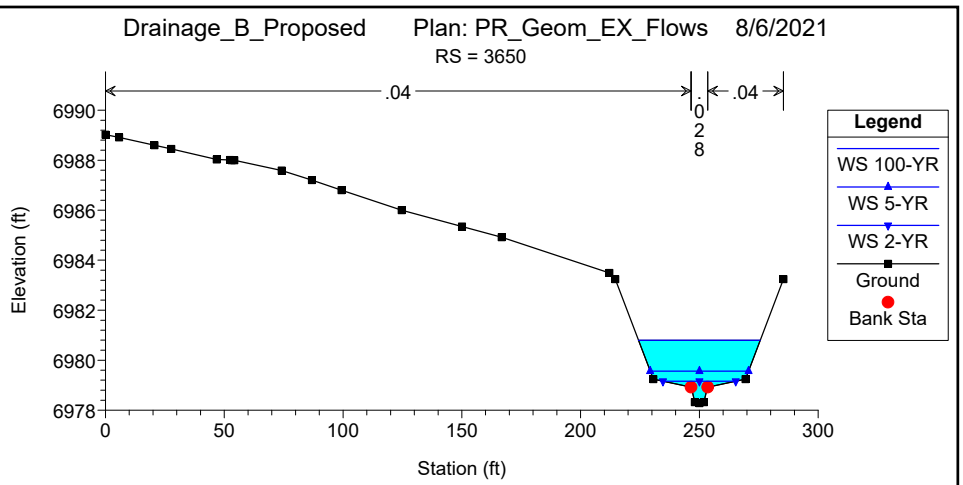
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Ineff
Bank Sta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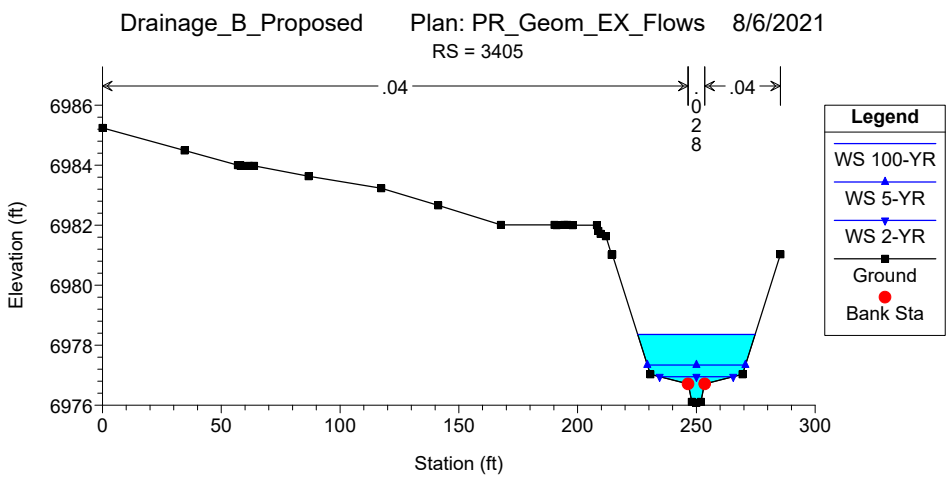
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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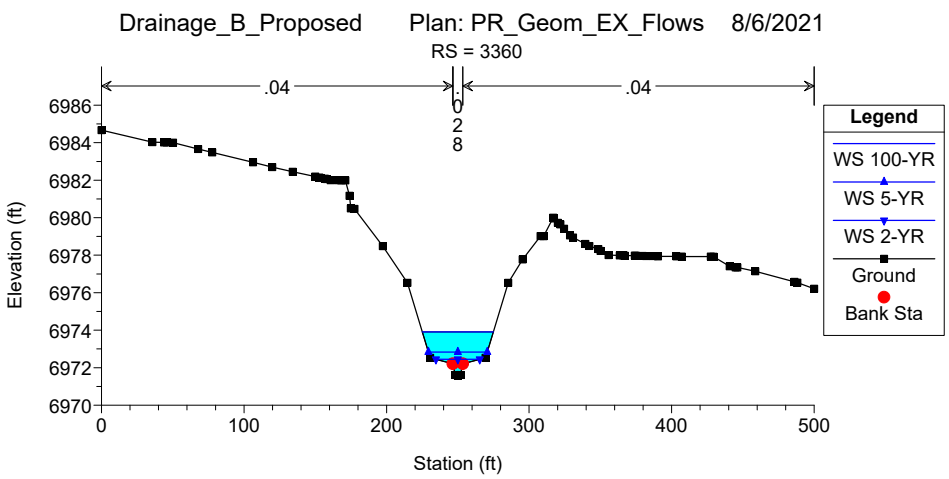
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
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.04
.028
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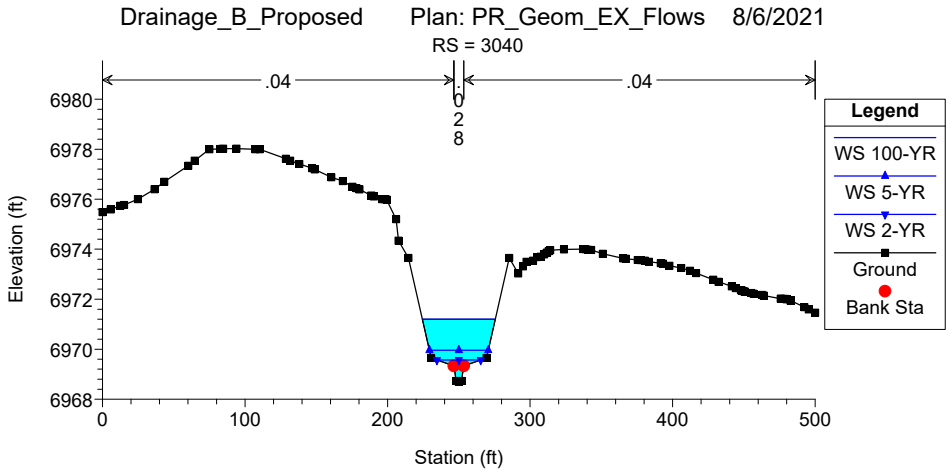
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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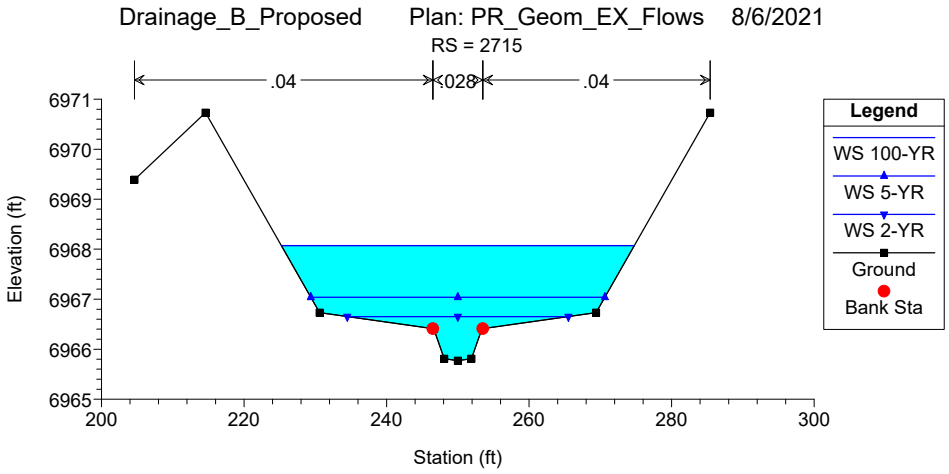
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
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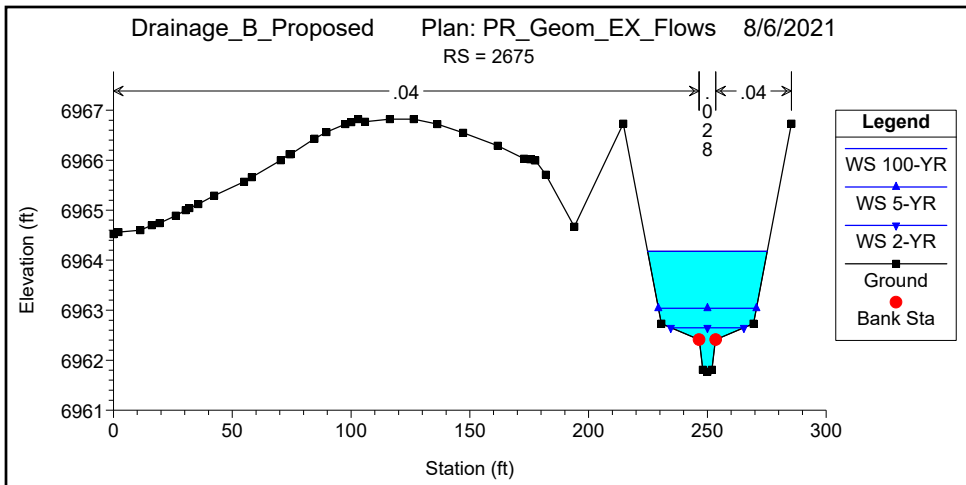
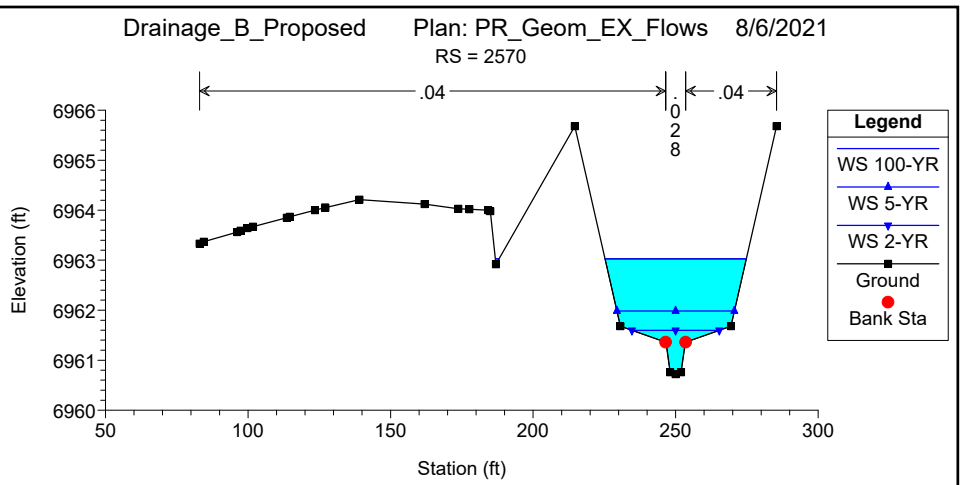
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 2675
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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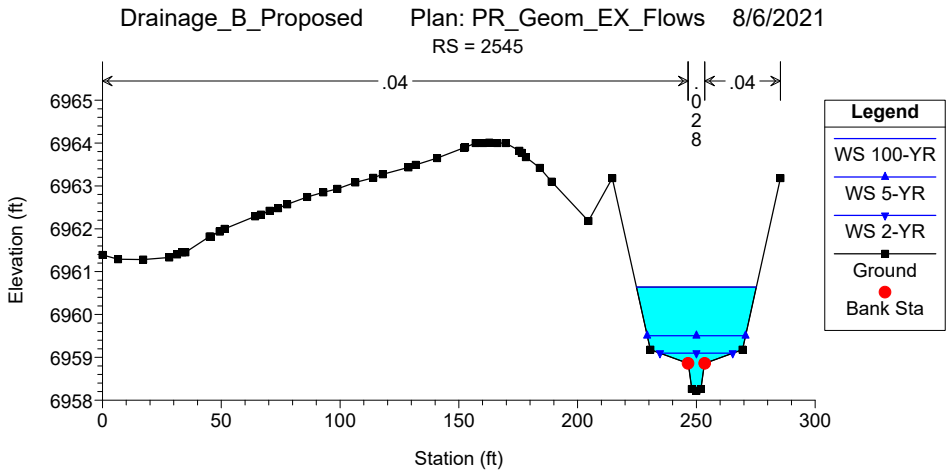
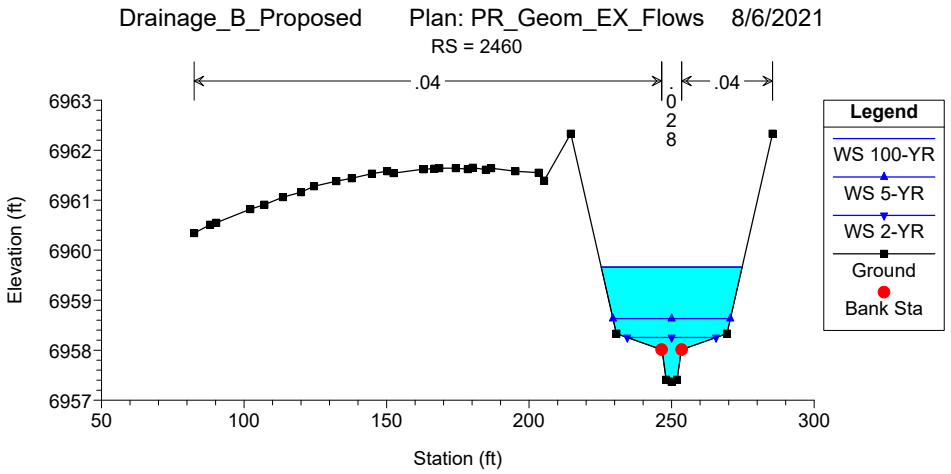
RS = 2570
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 2545
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta


Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
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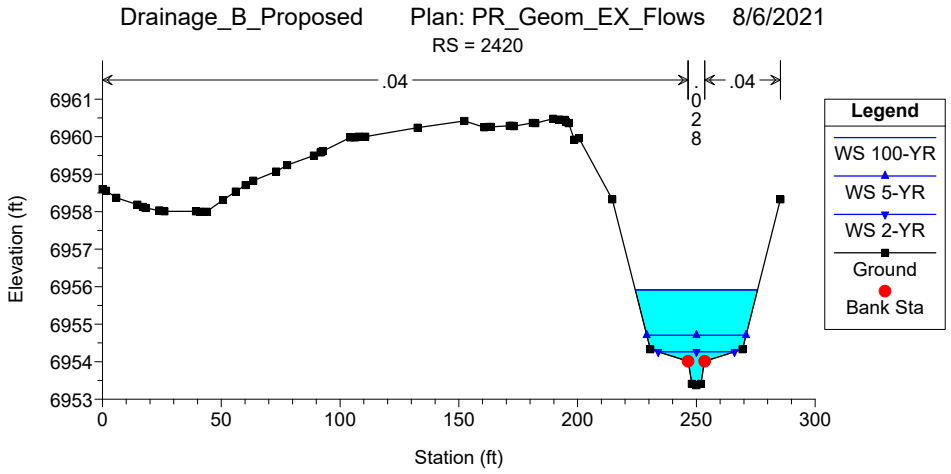
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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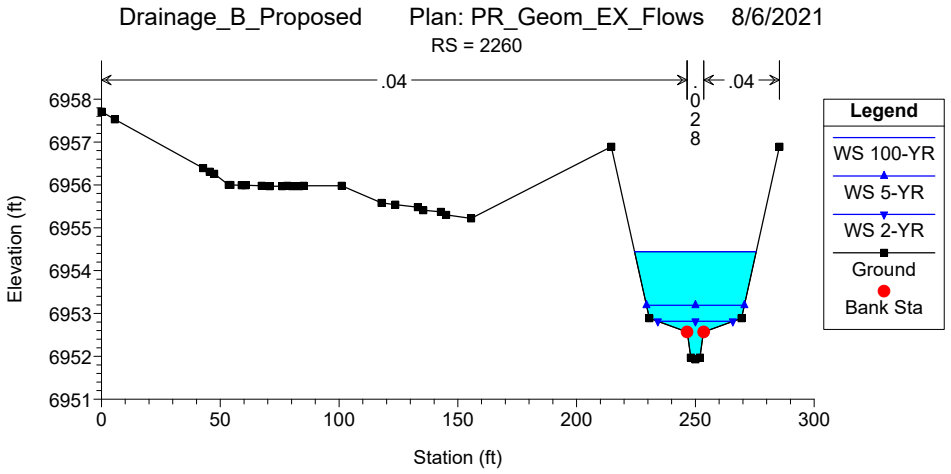
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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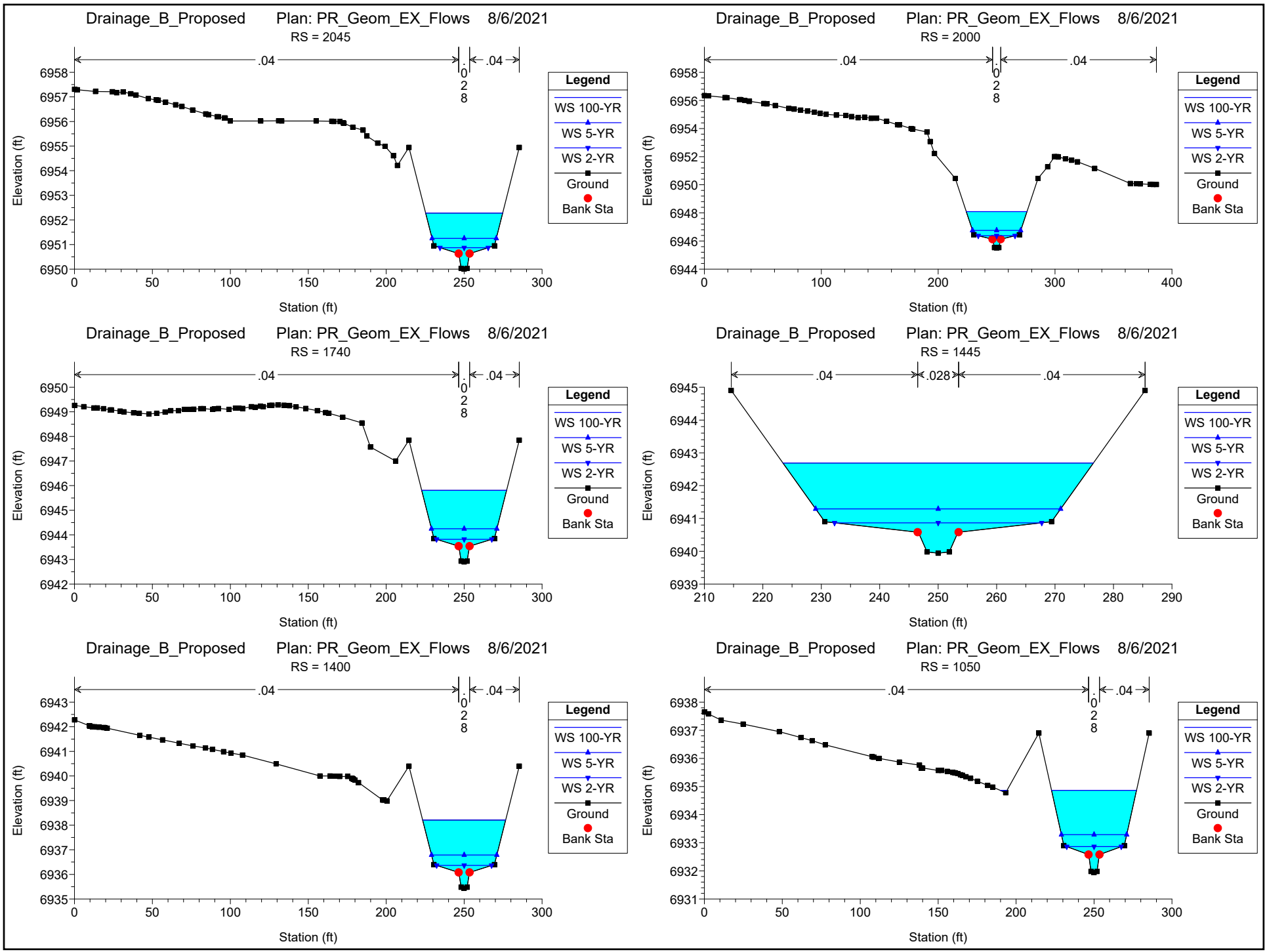
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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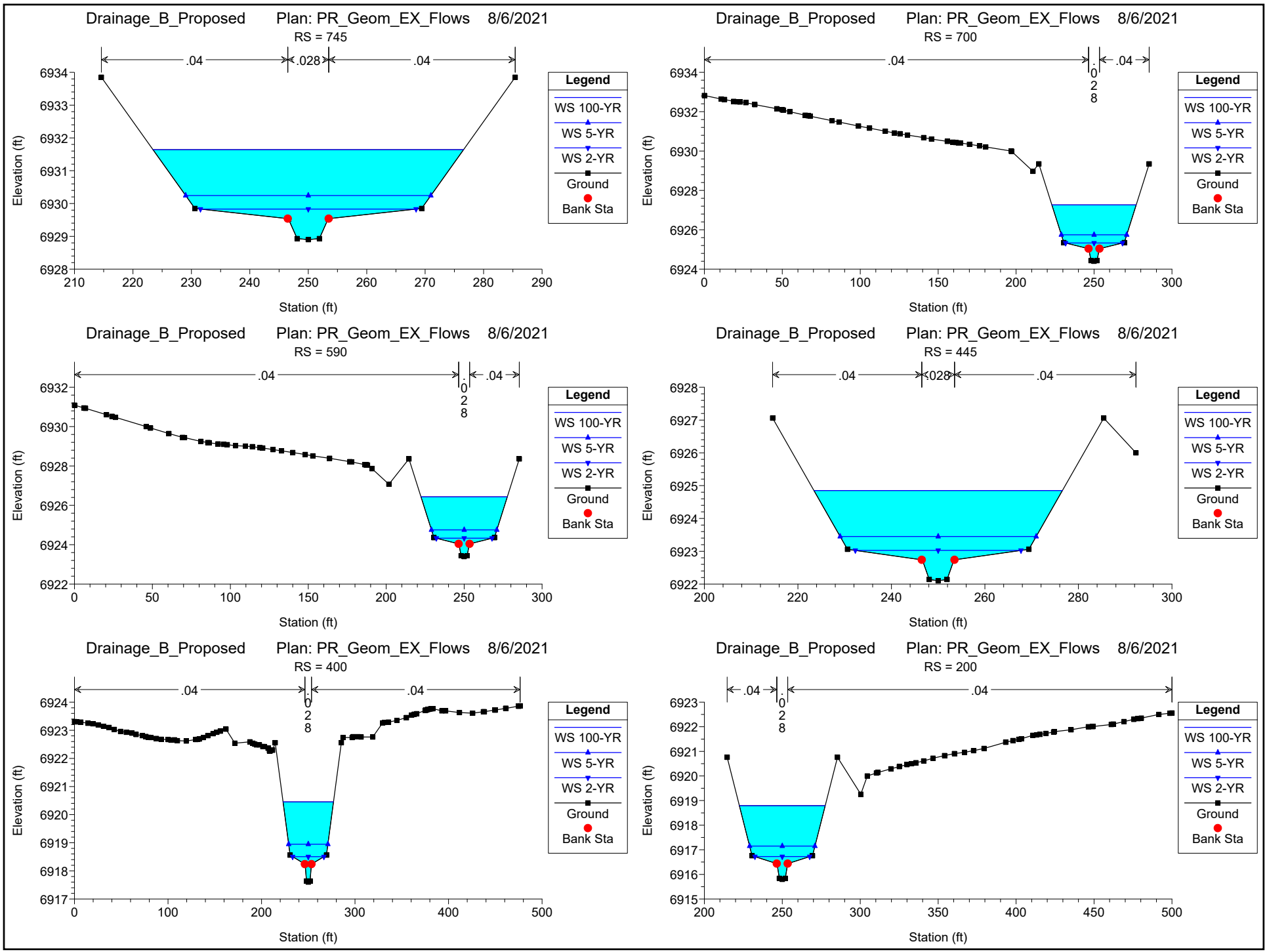
RS = 2045
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 2000
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 1740
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 1445
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 1400
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 1050
.04
.04
.028
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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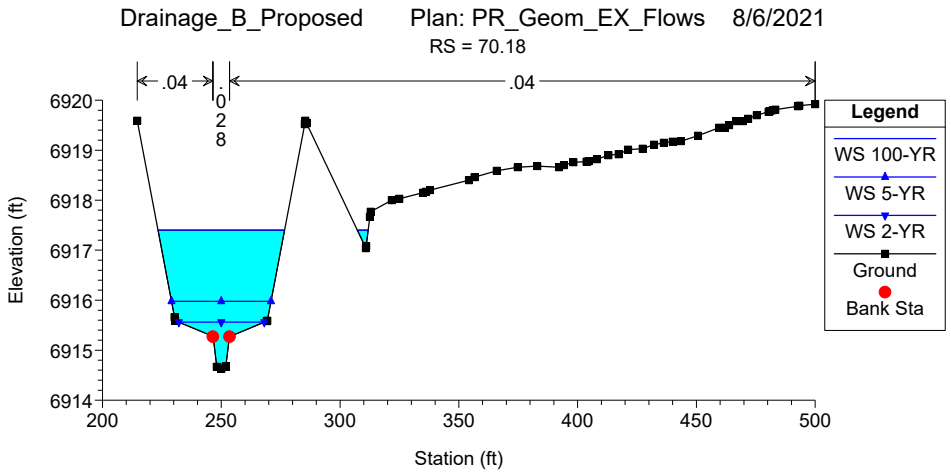
RS = 745
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 700
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 590
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 445
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 400
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta
Drainage_B_Proposed Plan: PR_Geom_EX_Flows 8/6/2021
RS = 200
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta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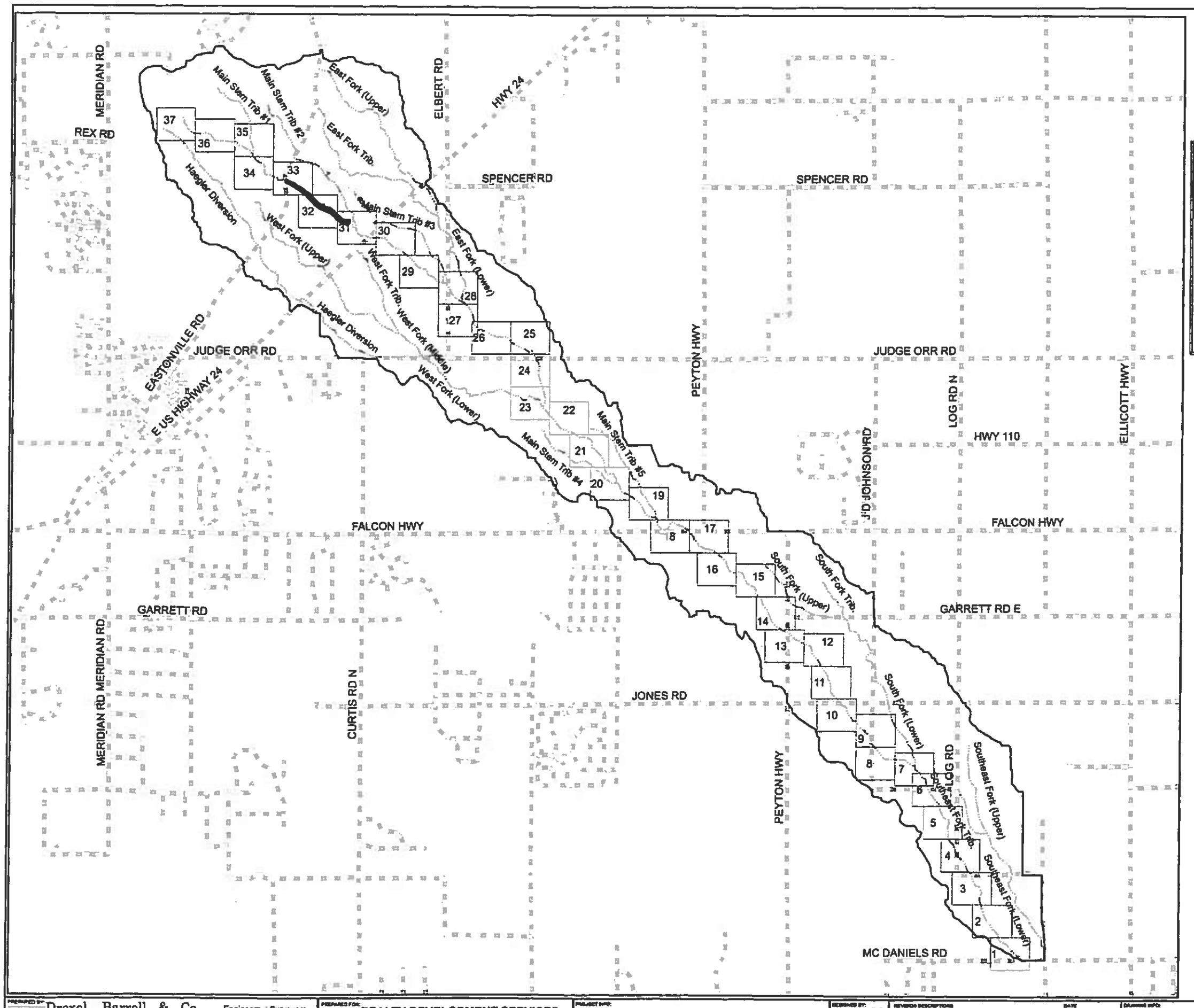
RS = 70.18
.04
.028
.04
Elevation (ft)
6920
6919
6918
6917
6916
6915
6914
200
250
300
350
400
450
500
Station (ft)
Legend
WS 100-YR
WS 5-YR
WS 2-YR
Ground
Bank Sta

Appendix G



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

Drexel, Barrell & Co. Engineers Surveyors
1800 38TH STREET
2 S 7TH STREET
6513 W 4TH STREET
CONTACT: ROBERT BENNETT
BOULDER, COLORADO 80301 (303) 442-4338
COLORADO SPRINGS, COLORADO 80905 (719) 268-0887
GREELEY, COLORADO 80634 (970) 381-8645

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1622

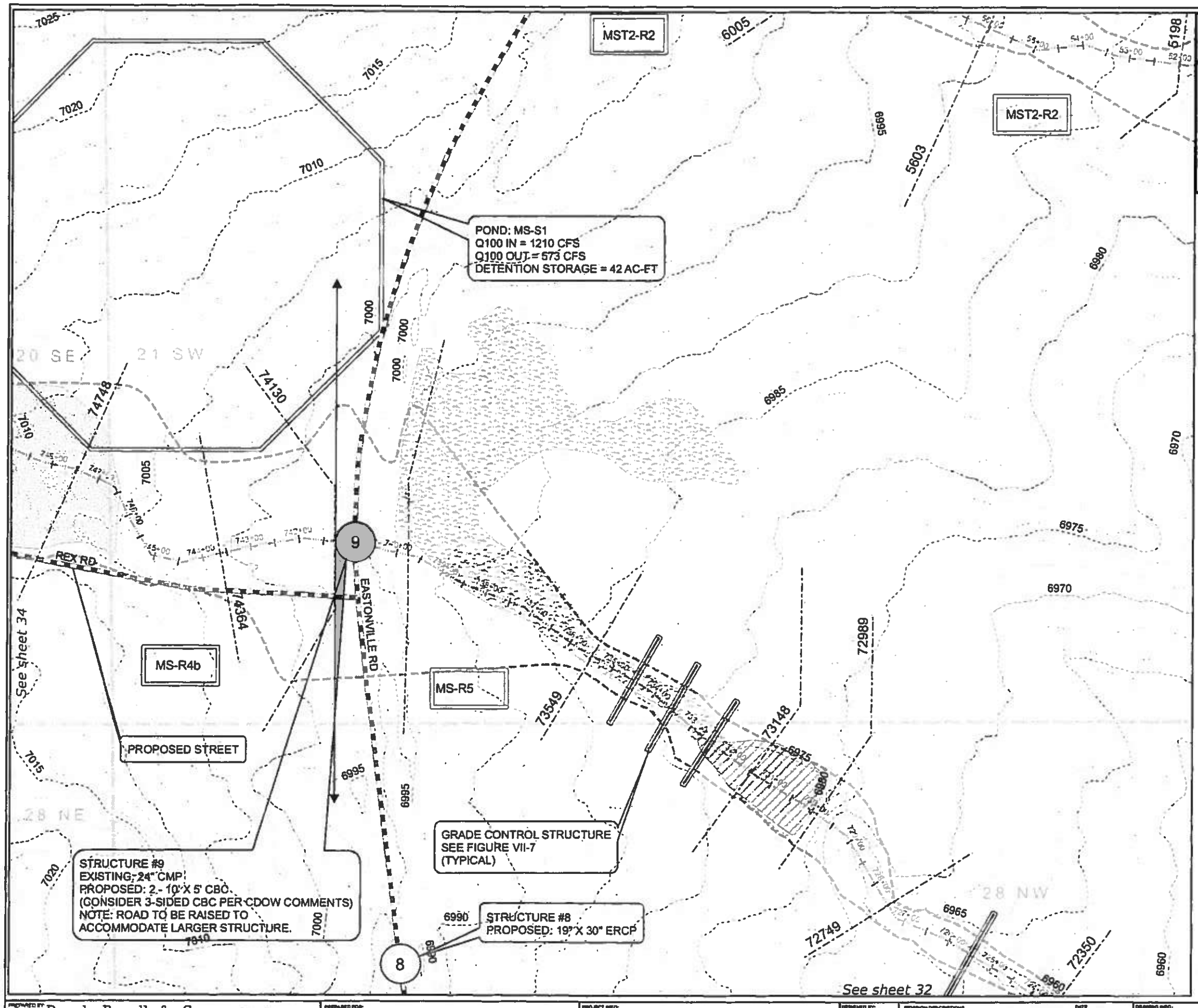
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: SLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
MAIN STEM

DATE: AUGUST 2007
SCALE: H: 1" = 6000' V:
JOB NO: C7706-1
DRAWING NO: 6D 038
SET: PL
SHEET: K1



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

0 100 200 Feet

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MS-R4b	1.76	1094	4.24
MS-R5	1.88	573	5.00

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MS-R4b	Channelization
MS-R5	Vegetation Augmentation

Note:
See Technical Addenda for grade control data.

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Drexel, Barrell & Co. Engineers Surveyors
1800 28TH STREET, BOULDER, COLORADO 80301 (303) 443-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0845
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

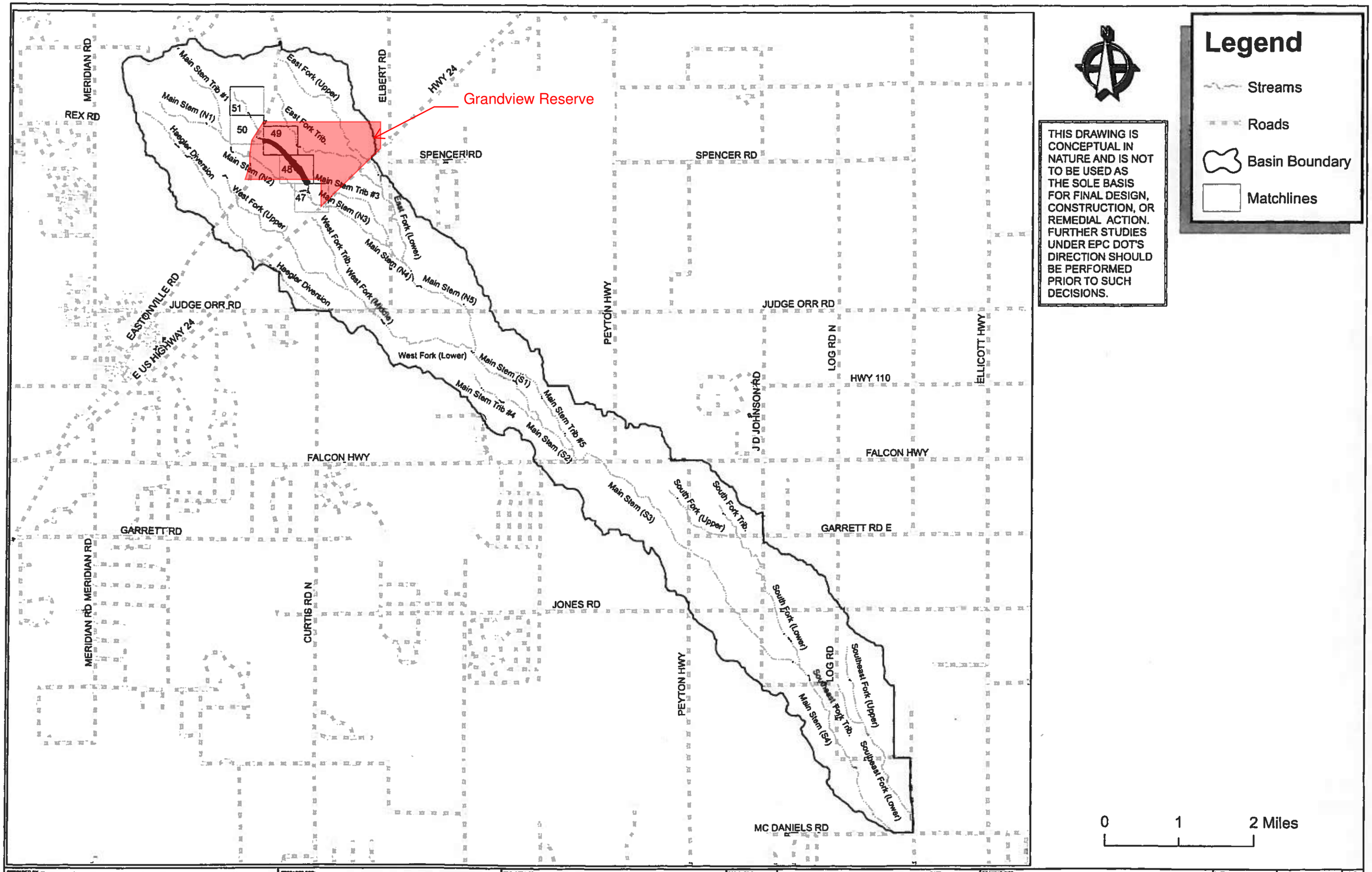
PROJECT INFO:
GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/NLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPC/DOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO:
GIECK RANCH DBPS
PLAN VIEW
MAIN STEM #33

DATE: AUGUST 2007
JOB NO: C7706-2
SET: PL
SCALE: H: 1" = 200' V: NONE
DRAWING NO: 6D 038
SHEET: 33



PREPARED BY: Drexel, Barrell & Co. Engineers | Surveyors
1560 30TH STREET
3 S 7TH STREET
6513 W 4TH STREET
CONTACT: ROBERT BENNETT
SOULDER, COLORADO 80301 (303) 442-4338
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-9646

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

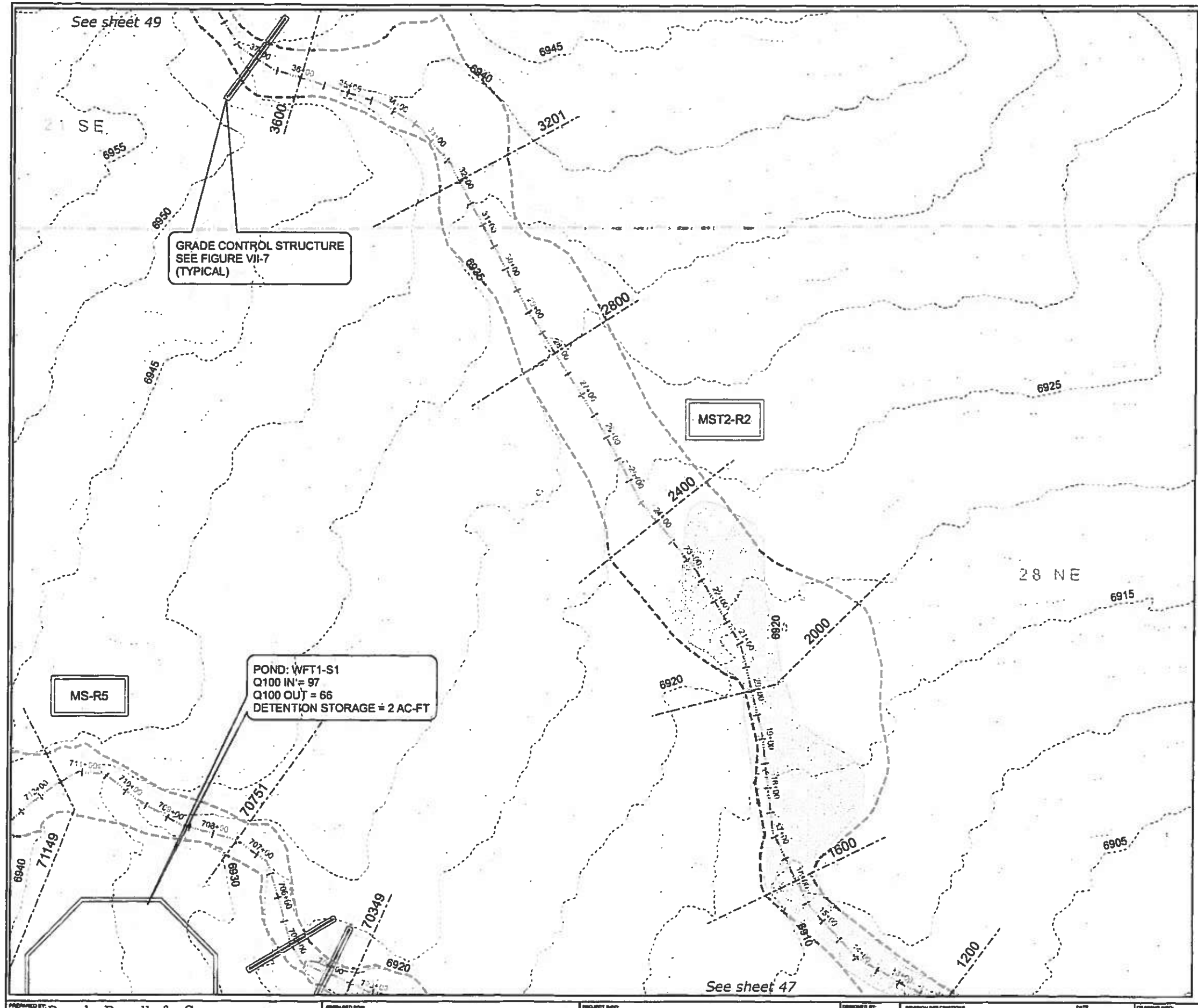
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
MAIN STEM TRIBUTARY #2

DATE: AUGUST 2007
JOB NO: C7706-1
SET: PL
SCALE: H 1" = 6000' V
DRAWING NO.: 6D 038
SHEET: K5



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MST2-R2	1.93	271	3.16

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MST2-R2	Vegetation Augmentation

Note:
See Technical Addenda for grade control data.

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PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1609 35TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
5313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-9648
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 308
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

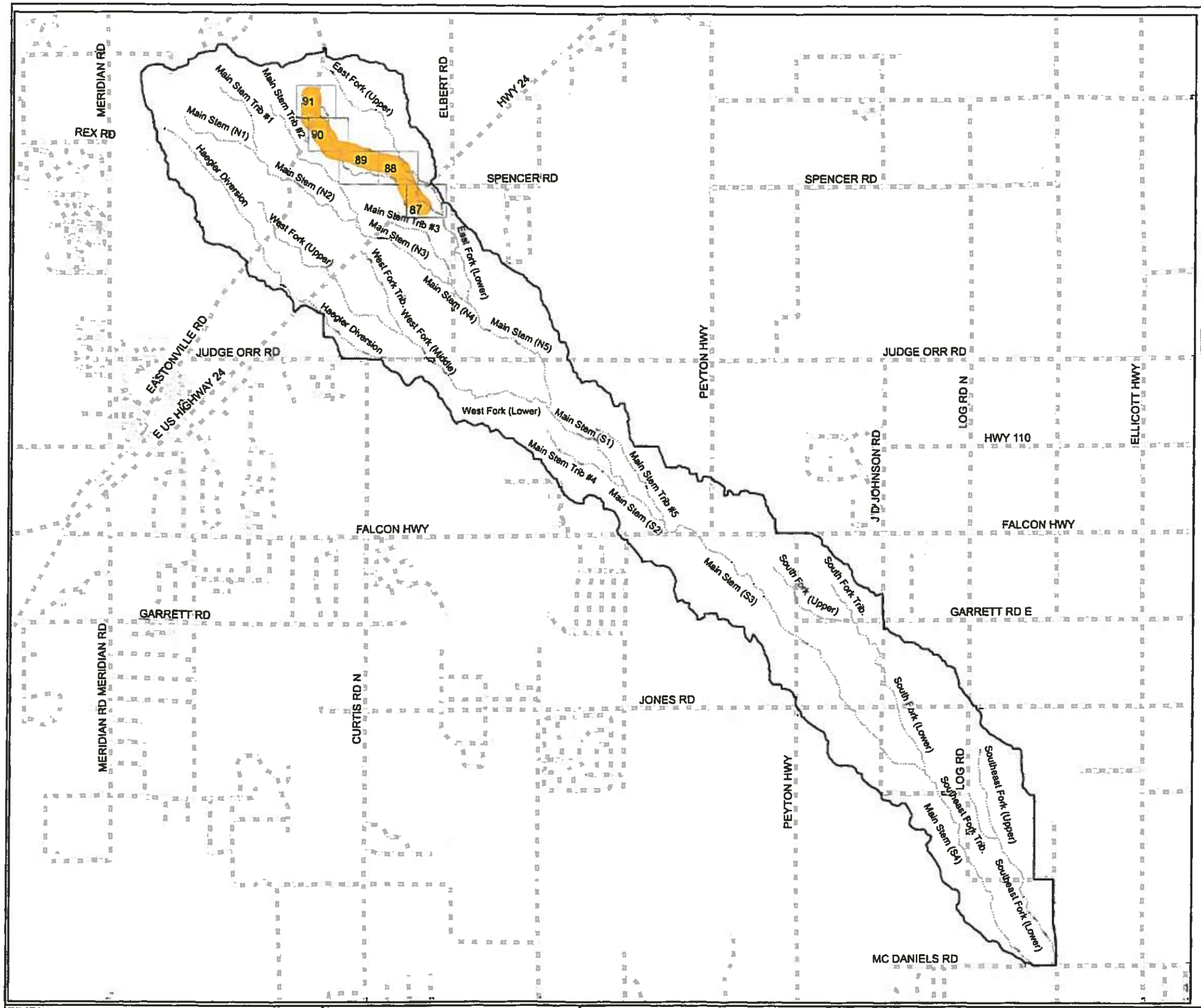
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
MAIN STEM TRIBUTARY-2 #2

DATE: AUGUST 2007
JOB NO: C7706-2
SET: PL
SCALE: 1" = 200' / NONE
DRAWING NO: 6D 038
SHEET: 48



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers Surveyors
1638 38TH STREET
3 S 7TH STREET
5313 W 4TH STREET
CONTACT: ROBERT BENNETT
BOULDER, COLORADO 80301 (303) 443-4335
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-6845

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1922

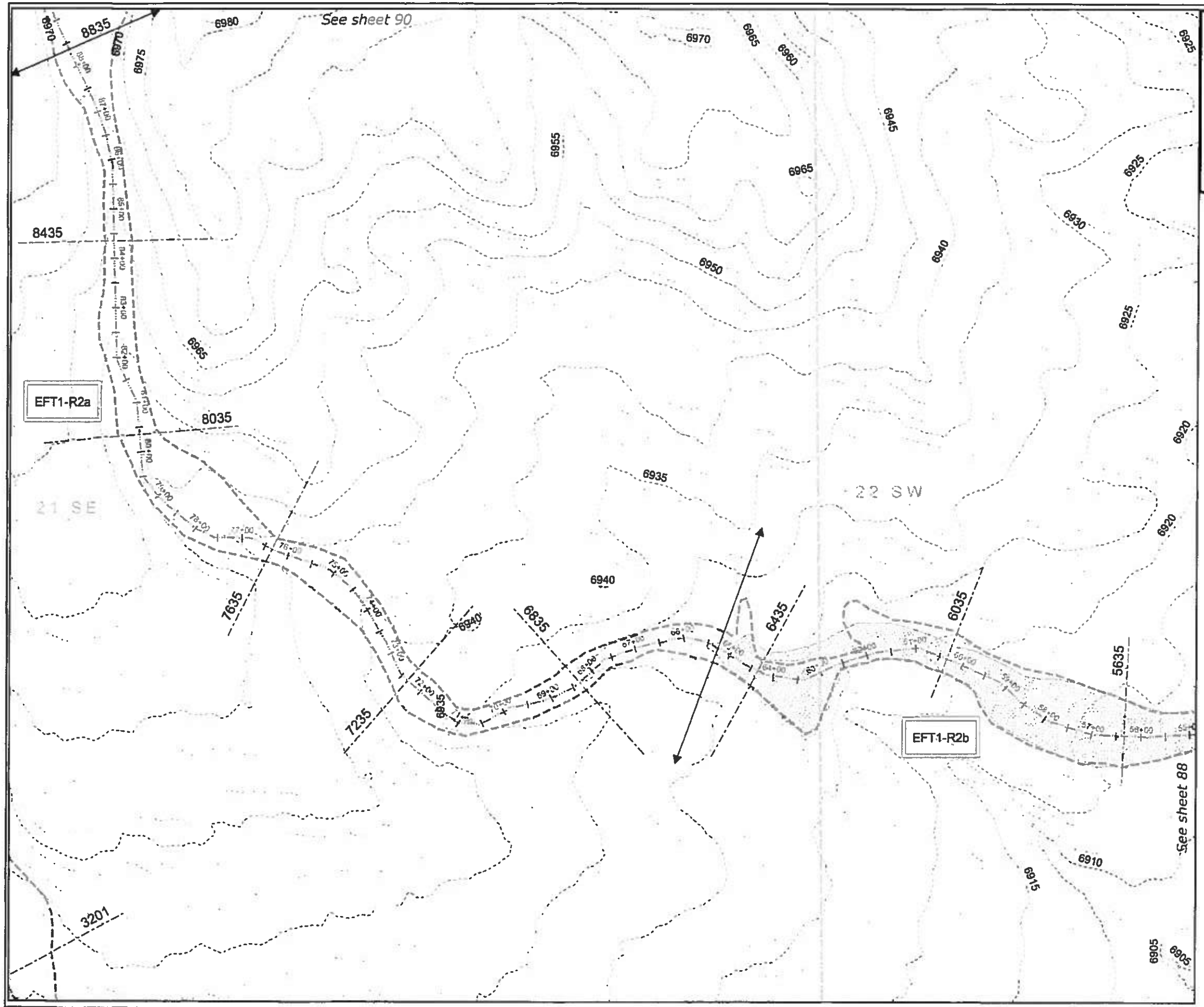
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS — DATE

DRAWING INFO: GIECK RANCH
KEY MAP
EAST FORK TRIBUTARY

DATE: AUGUST 2007
JOB NO: C7706-1
SCALE: H: 1" = 6000' V:
DRAWING NO.: 6D 038
SHEET: K11



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
EFT1-R2a	1.83	217	3.73
EFT1-R2b	1.60	217	2.68

RECOMMENDED PLAN IMPROVEMENTS

Reach	
EFT1-R2a	As-needed Improvements
EFT1-R2b	As-needed Improvements

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 28TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
5613 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-6445
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY D' SULLIVAN (719) 227-1022

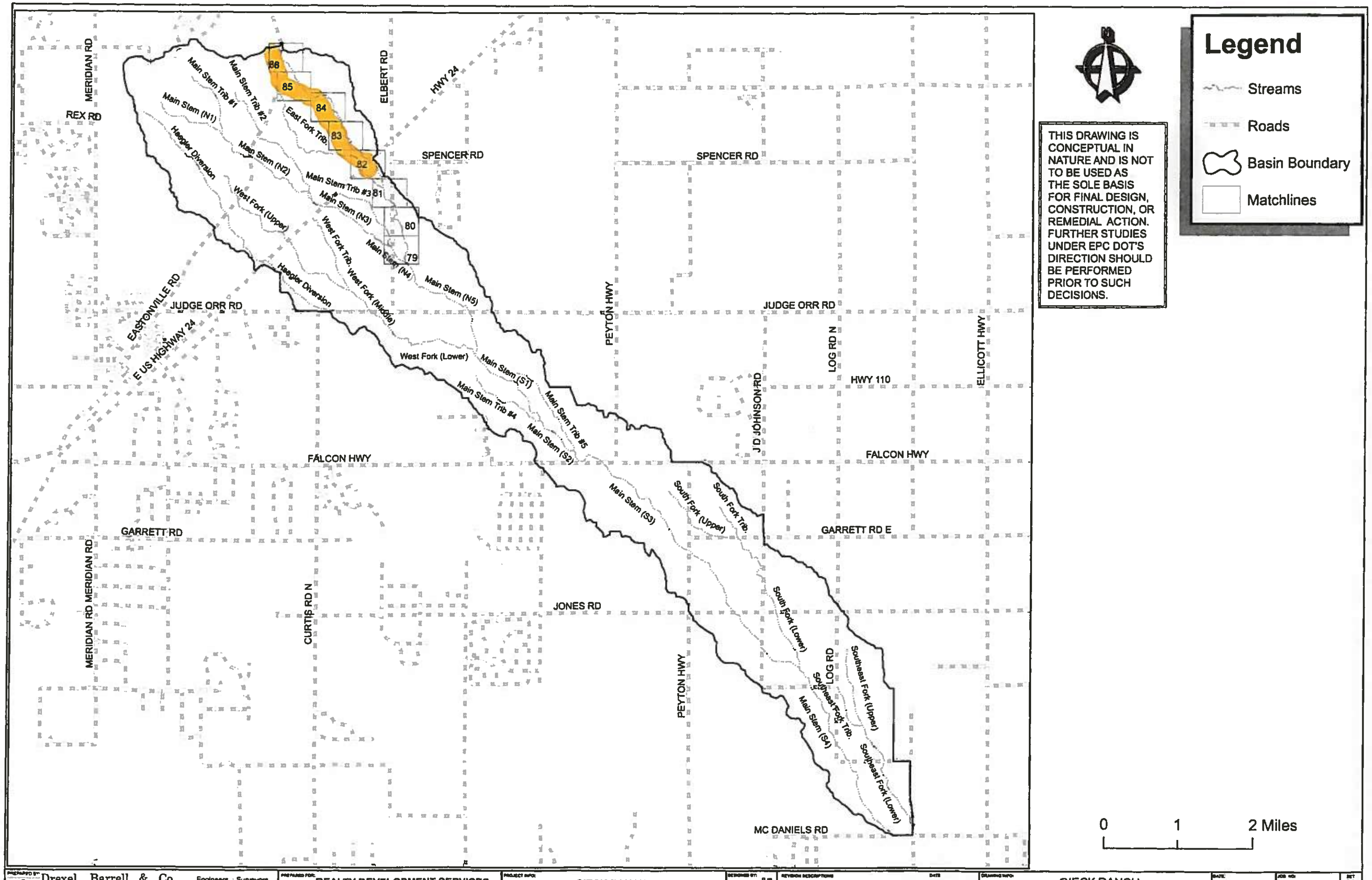
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTION: PER EPC FINAL REVIEW — DATE: JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
EAST FORK TRIBUTARY #3

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET: PL
SHEET: 89



PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1898 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 358-0887
6313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0648
CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1822

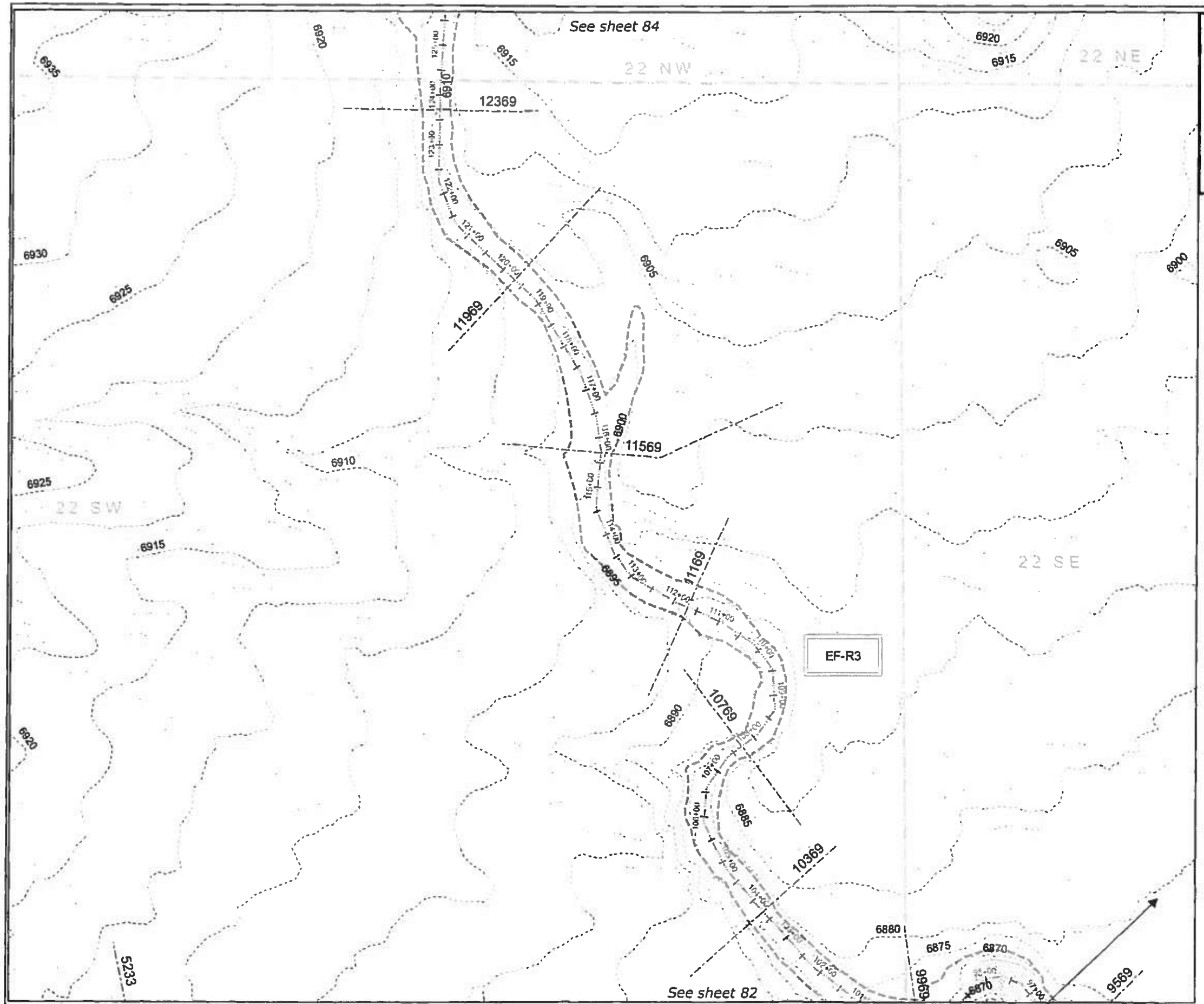
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: SLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
EAST FORK

DATE: AUGUST 2007
SCALE: H: 1" = 6000' V:
JOB NO: C7706-1
DRAWING NO: 6D 038
SHT: PL
SHEET: K10



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
EF-R3	1.53	595	5.09

RECOMMENDED PLAN IMPROVEMENTS

Reach	
EF-R3	As-needed Improvements

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

Drexel, Barrell & Co. Engineers Surveyors
1888 38TH STREET
3 S 7TH STREET
8513 W 4TH STREET
BOULDER, COLORADO 80301 (303) 443-4335
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-9445
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
23 NORTH TEJON STREET, SUITE 200
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: SLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTION: PER EPC FINAL REVIEW
DATE: JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
EAST FORK #5

DATE: AUGUST 2007
JOB NO: C7706-2
SHEET: PL
SCALE: 1" = 200' / NONE
DRAWING NO.: 6D 038
SHEET: 83

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 25 2019

East Fork Tributary 1 Reach 3 - Proposed Channel_Capacity

Trapezoidal

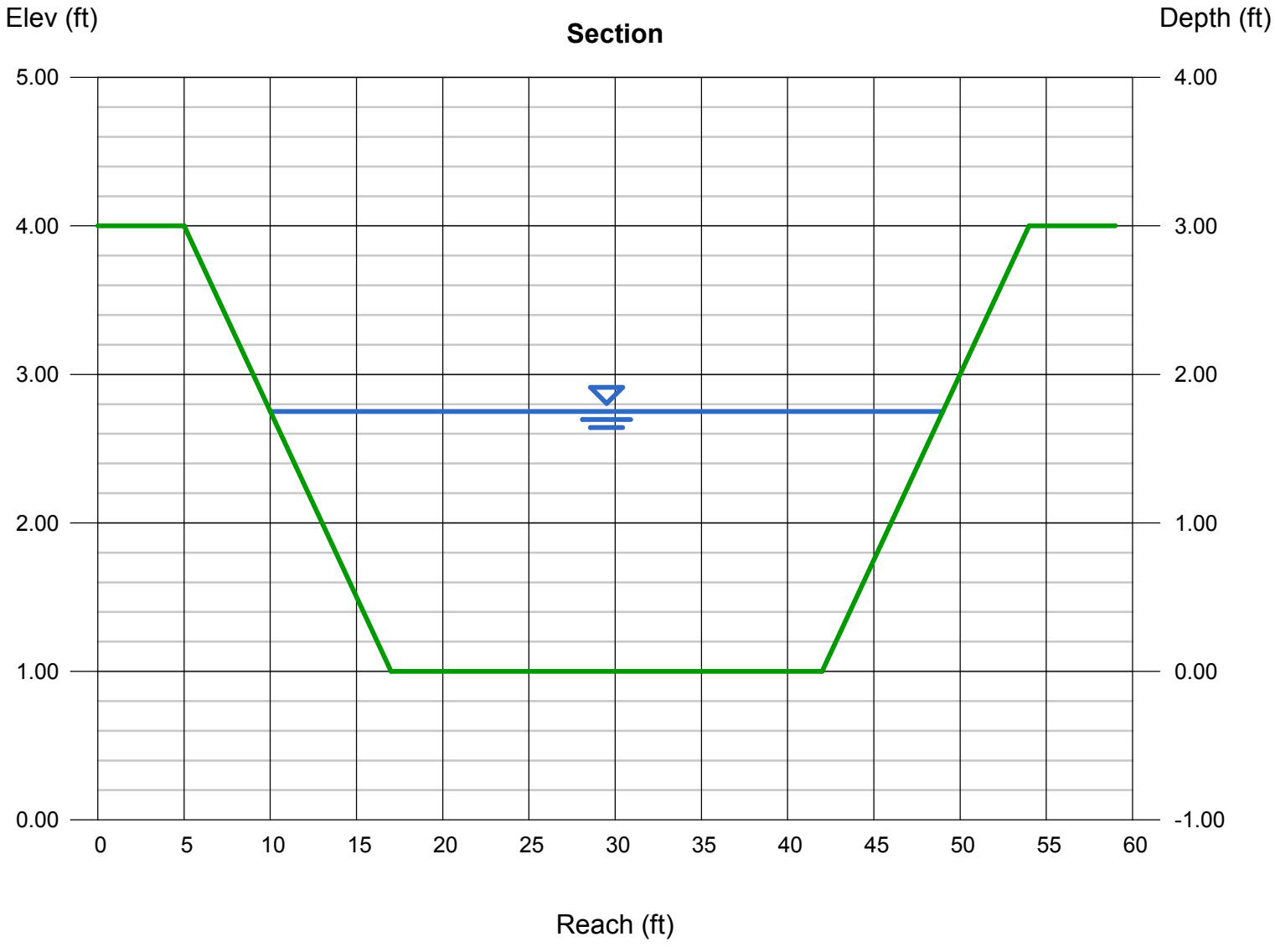
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.69
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 217.00

Highlighted

Depth (ft)	= 1.75
Q (cfs)	= 217.00
Area (sqft)	= 56.00
Velocity (ft/s)	= 3.88
Wetted Perim (ft)	= 39.43
Crit Depth, Yc (ft)	= 1.24
Top Width (ft)	= 39.00
EGL (ft)	= 1.98



Channel Report

East Fork Tributary 1 Reach 3 - Proposed Channel_Velocity

Trapezoidal

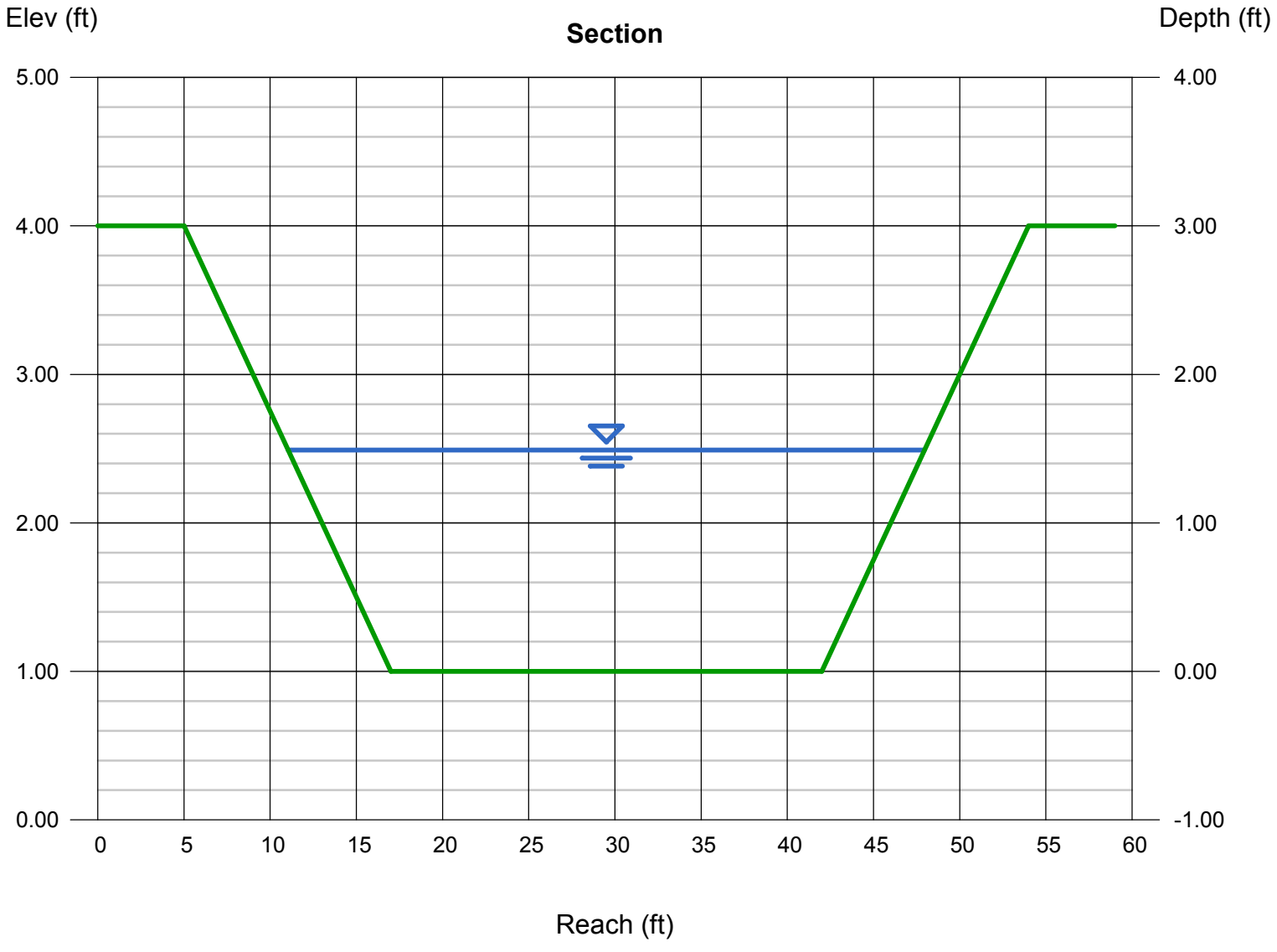
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.69
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 217.00

Highlighted

Depth (ft)	= 1.49
Q (cfs)	= 217.00
Area (sqft)	= 46.13
Velocity (ft/s)	= 4.70
Wetted Perim (ft)	= 37.29
Crit Depth, Yc (ft)	= 1.24
Top Width (ft)	= 36.92
EGL (ft)	= 1.83



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 18 2019

East Fork Tributary 1 Reach 2 - Proposed Channel_Capacity

Trapezoidal

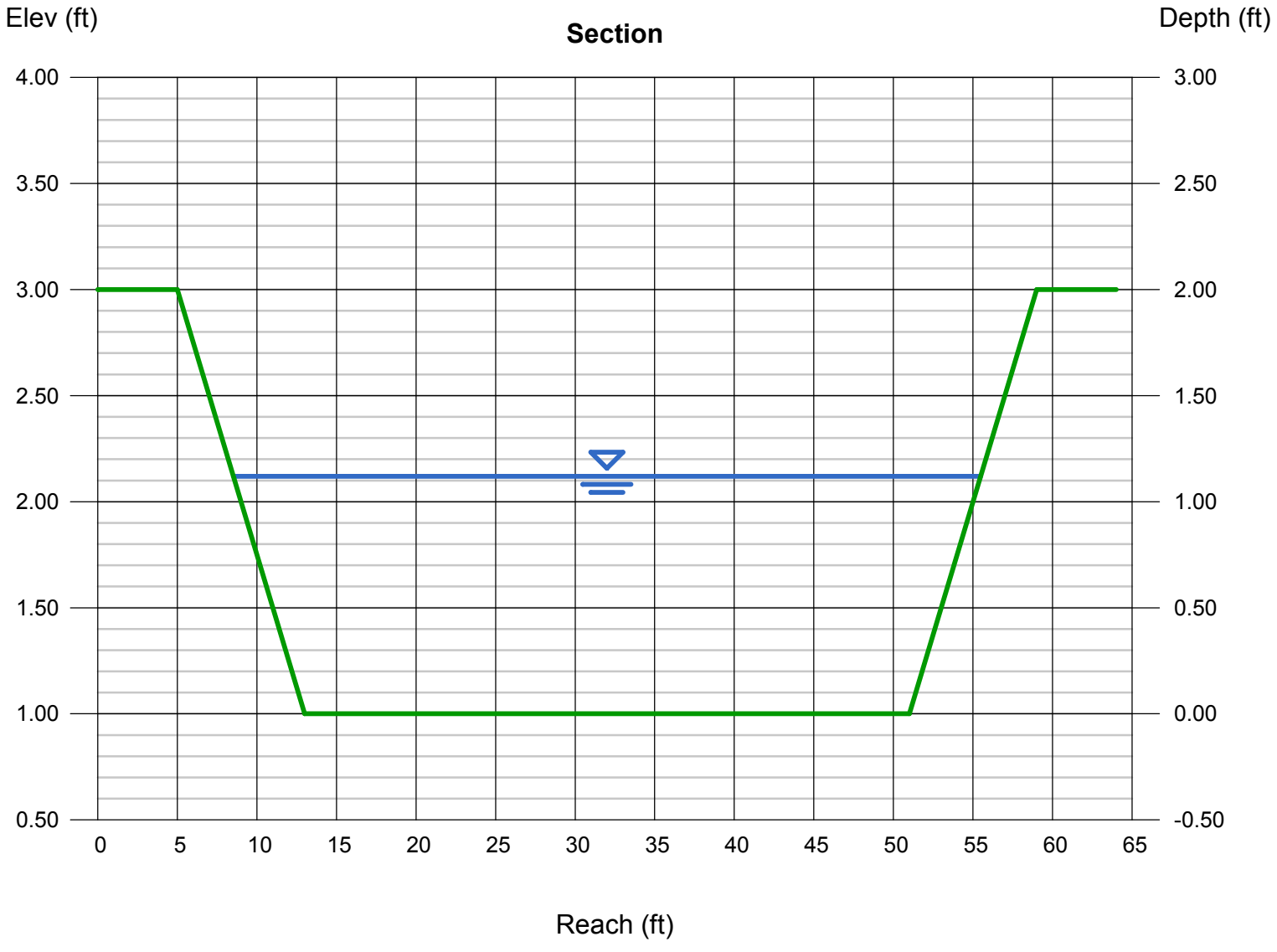
Bottom Width (ft)	= 38.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.58
N-Value	= 0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	= 177.00

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 177.00
Area (sqft)	= 47.58
Velocity (ft/s)	= 3.72
Wetted Perim (ft)	= 47.24
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 46.96
EGL (ft)	= 1.34



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 18 2019

East Fork Tributary 1 Reach 2 - Proposed Channel_Velocity

Trapezoidal

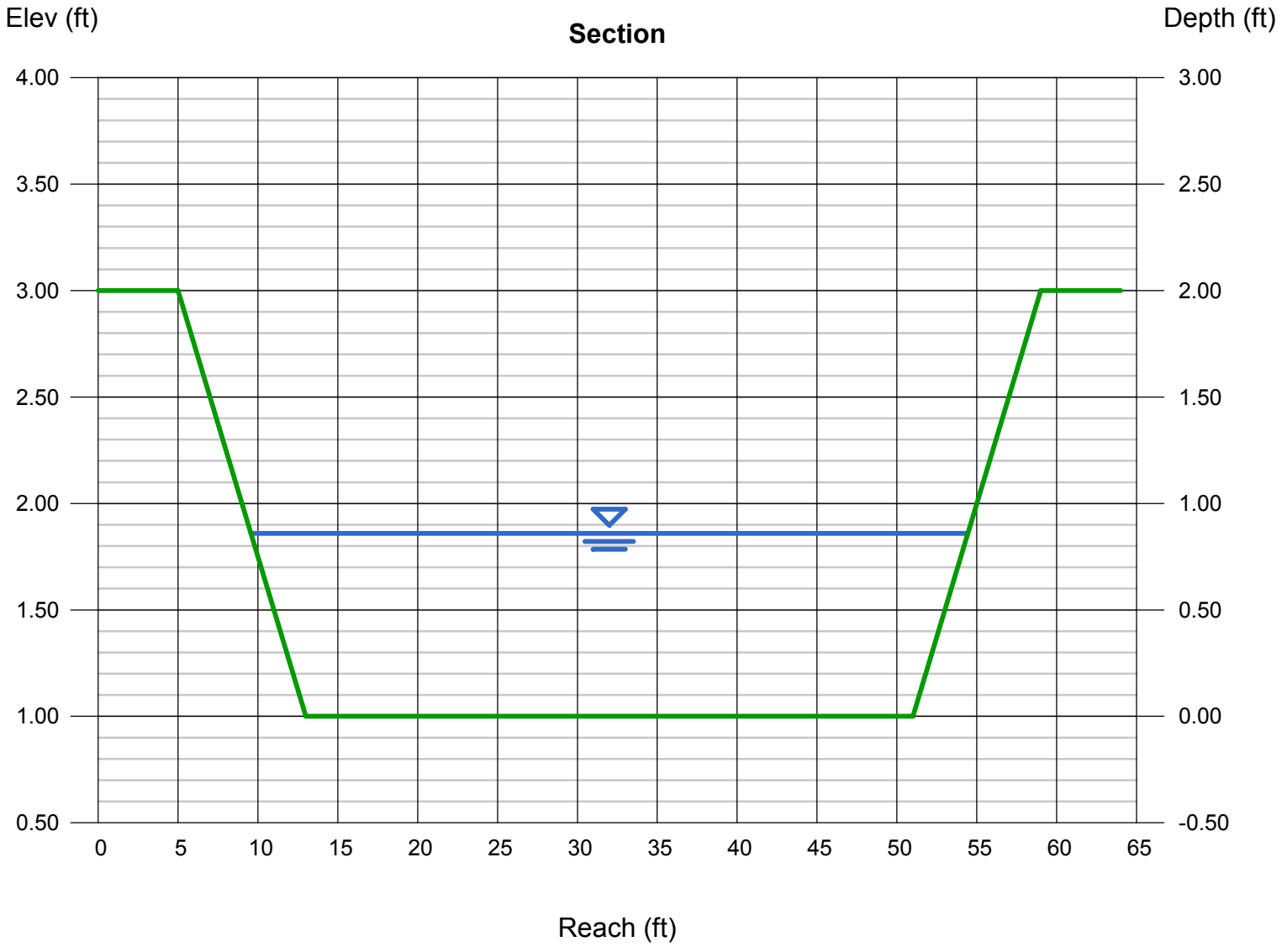
Bottom Width (ft)	= 38.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.58
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 177.00

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 177.00
Area (sqft)	= 35.64
Velocity (ft/s)	= 4.97
Wetted Perim (ft)	= 45.09
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 44.88
EGL (ft)	= 1.24



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Main Stem Trib 2

Gieck Ranch Tributary 2 - Proposed Channel Section Capacity Check

Trapezoidal

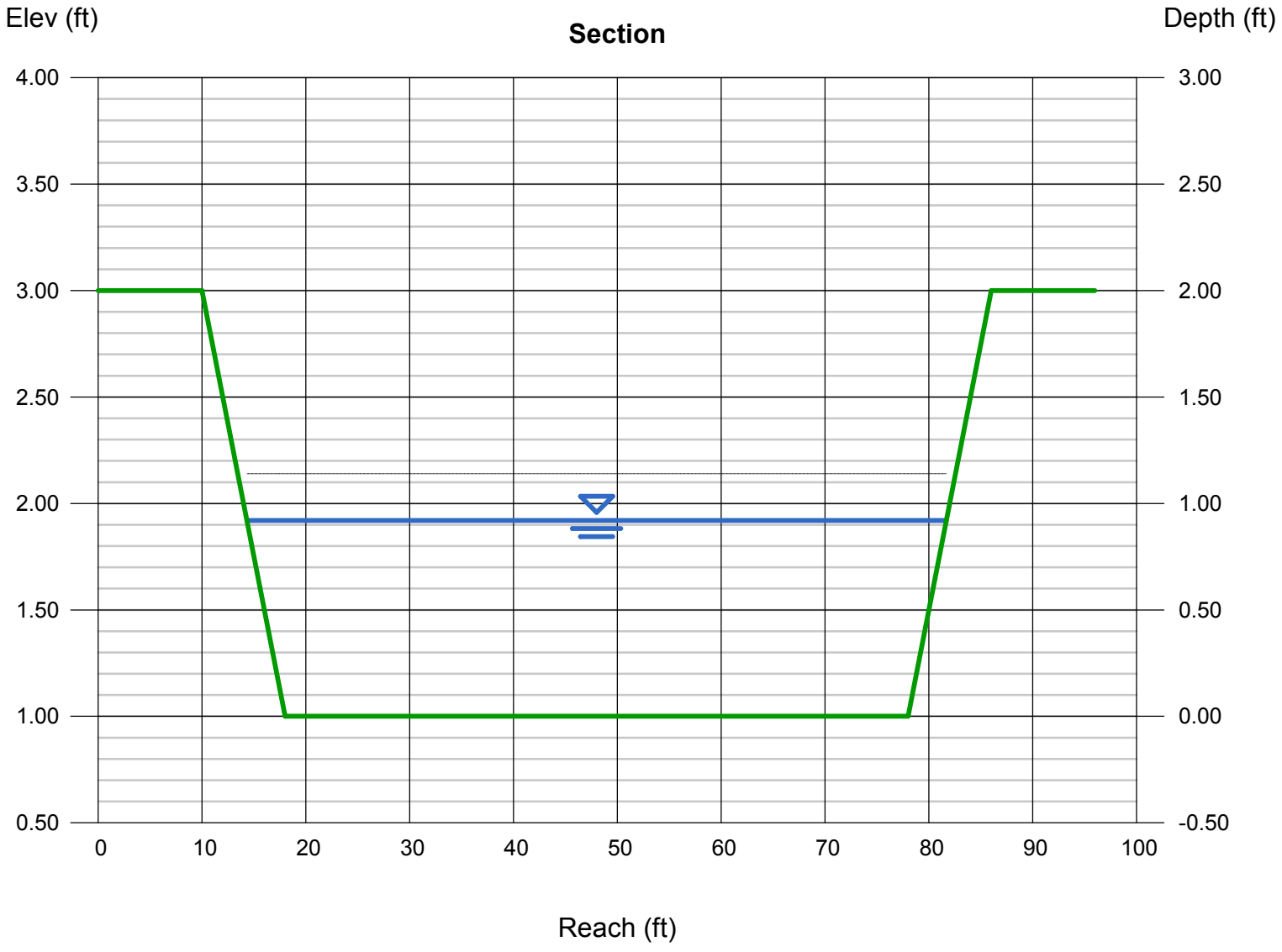
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	= 220.00

Highlighted

Depth (ft)	= 0.92
Q (cfs)	= 220.00
Area (sqft)	= 58.59
Velocity (ft/s)	= 3.76
Wetted Perim (ft)	= 67.59
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 67.36
EGL (ft)	= 1.14



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Main Stem Trib 2

Gieck Ranch Tributary 2 - Proposed Channel Section Velocity Check

Trapezoidal

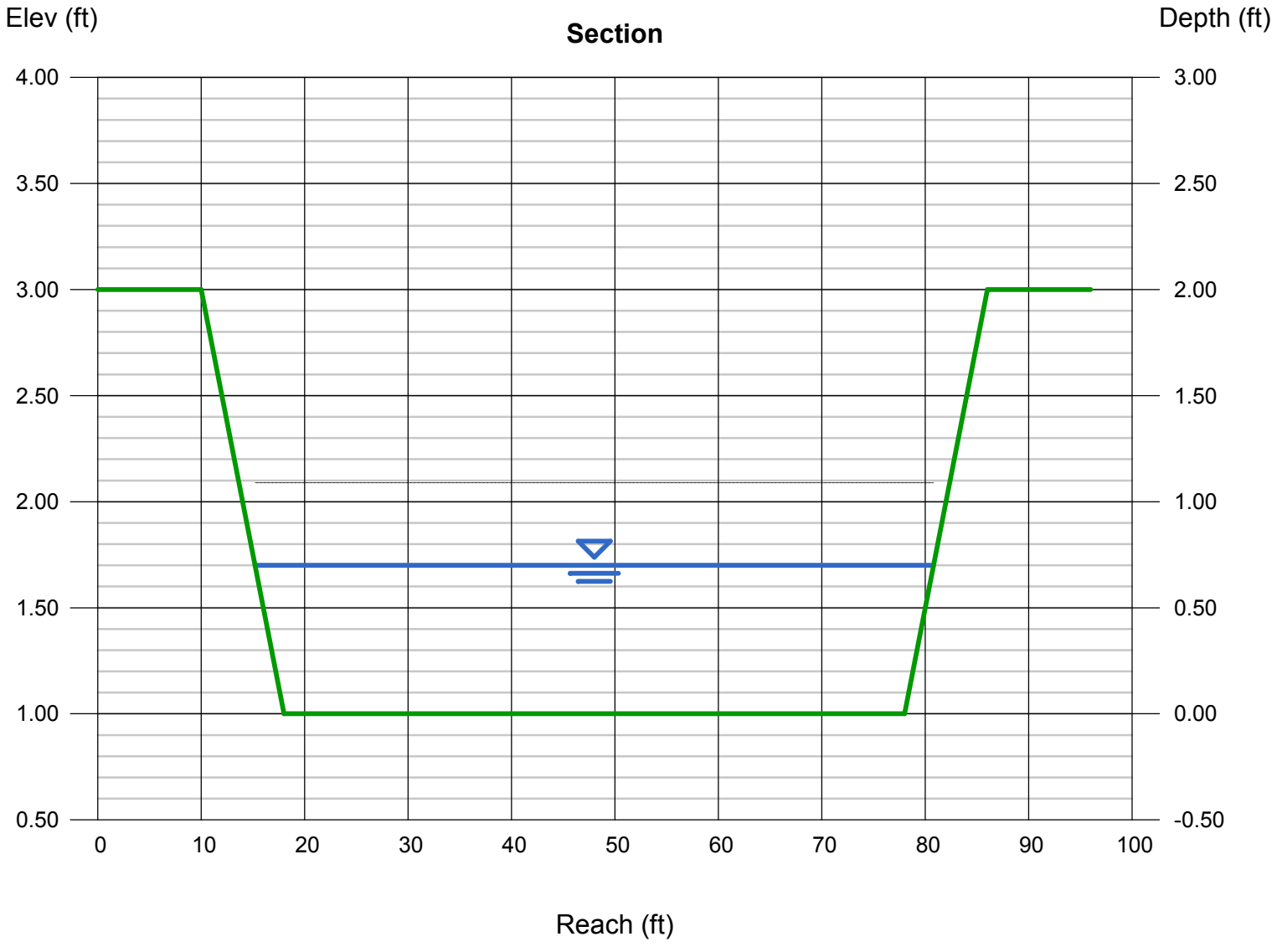
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 220.00

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 220.00
Area (sqft)	= 43.96
Velocity (ft/s)	= 5.00
Wetted Perim (ft)	= 65.77
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 65.60
EGL (ft)	= 1.09



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2_Reach 1 - Proposed Channel Section Capacity Check

Main Stem

Trapezoidal

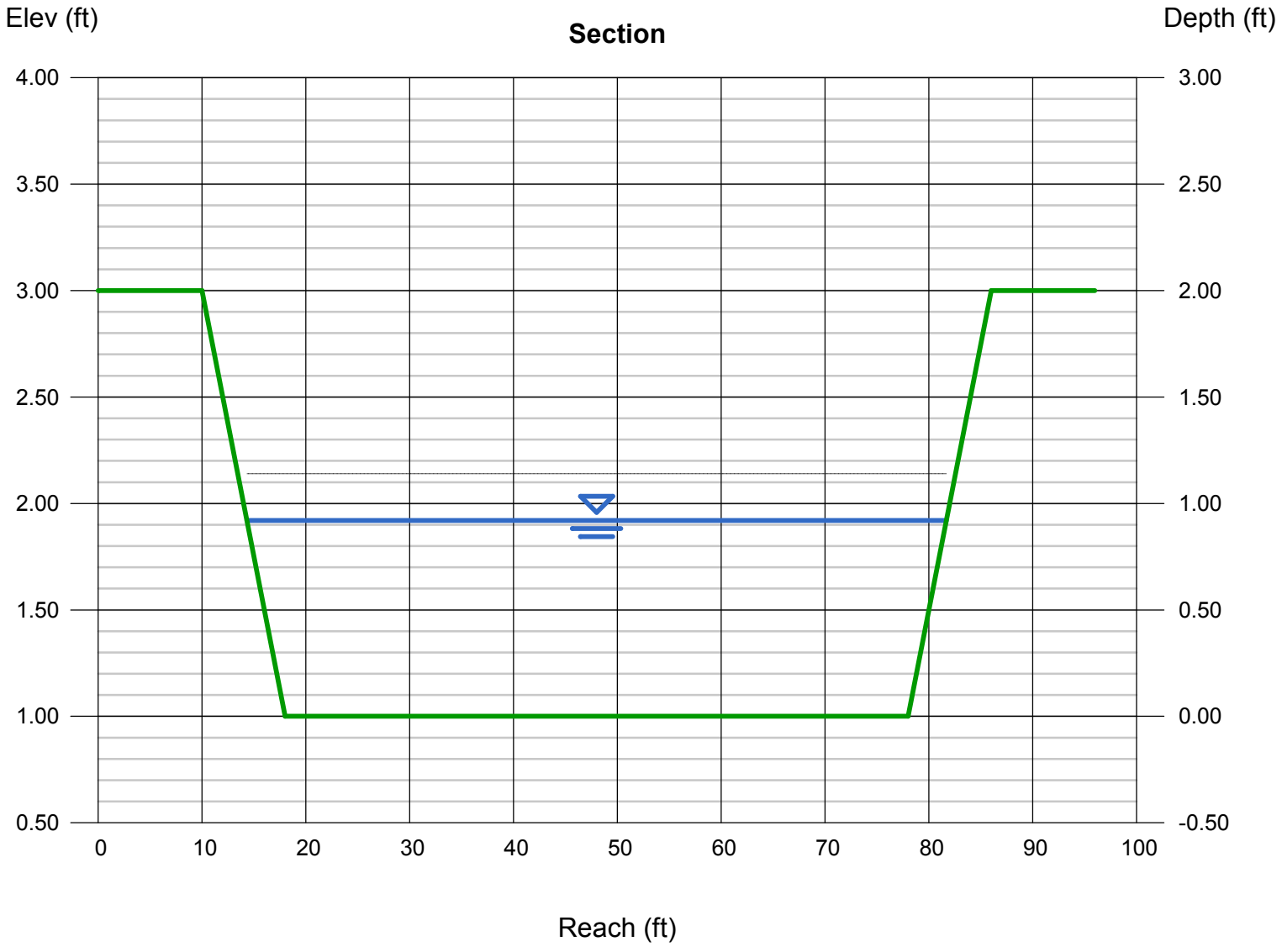
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	= 220.00

Highlighted

Depth (ft)	= 0.92
Q (cfs)	= 220.00
Area (sqft)	= 58.59
Velocity (ft/s)	= 3.76
Wetted Perim (ft)	= 67.59
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 67.36
EGL (ft)	= 1.14



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2, Reach 1 - Proposed Channel Section Velocity Check

Main Stem

Trapezoidal

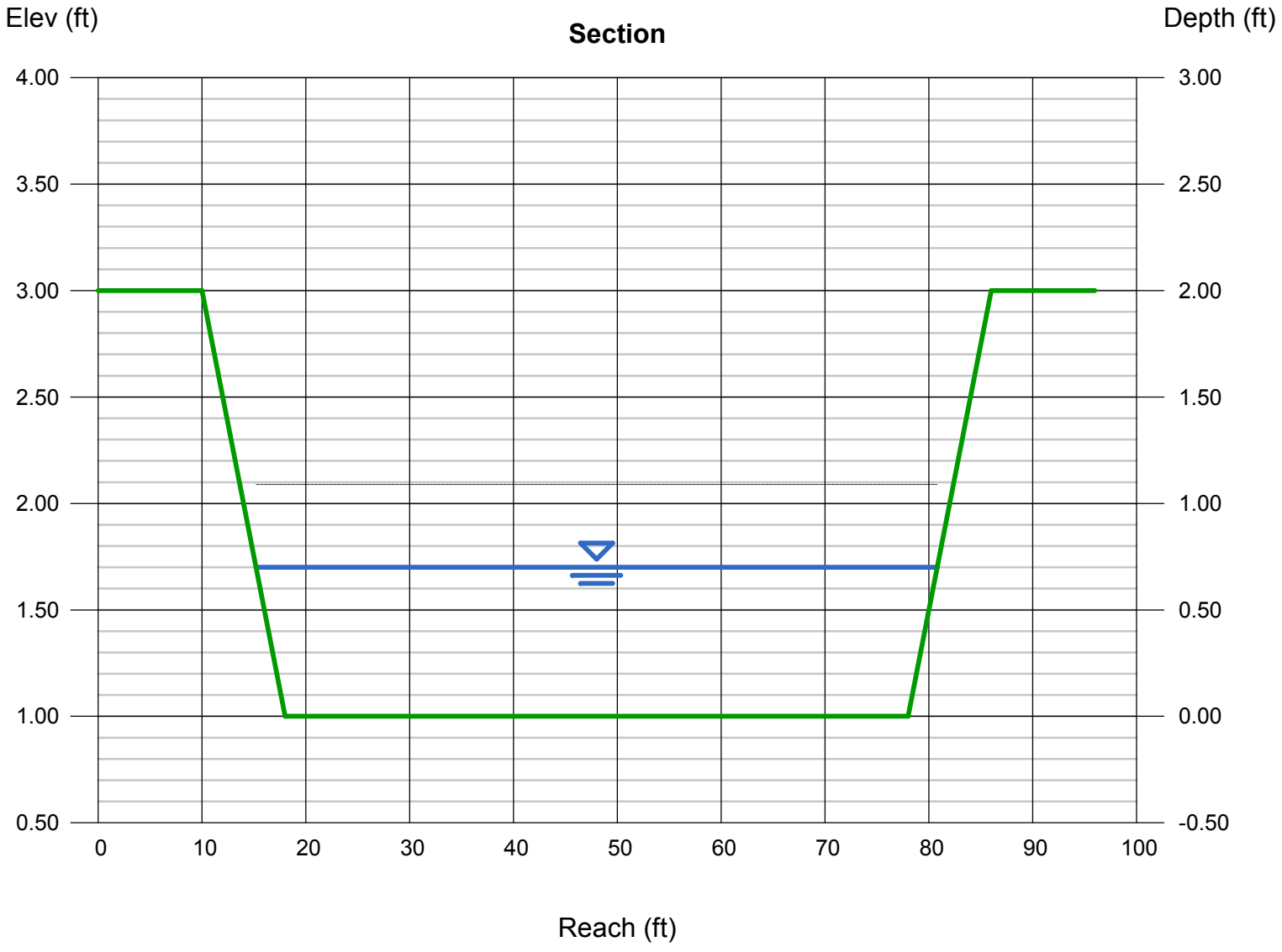
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 220.00

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 220.00
Area (sqft)	= 43.96
Velocity (ft/s)	= 5.00
Wetted Perim (ft)	= 65.77
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 65.60
EGL (ft)	= 1.09



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2, Reach 2 - Proposed Channel Section Capacity Check

Main Stem

Trapezoidal

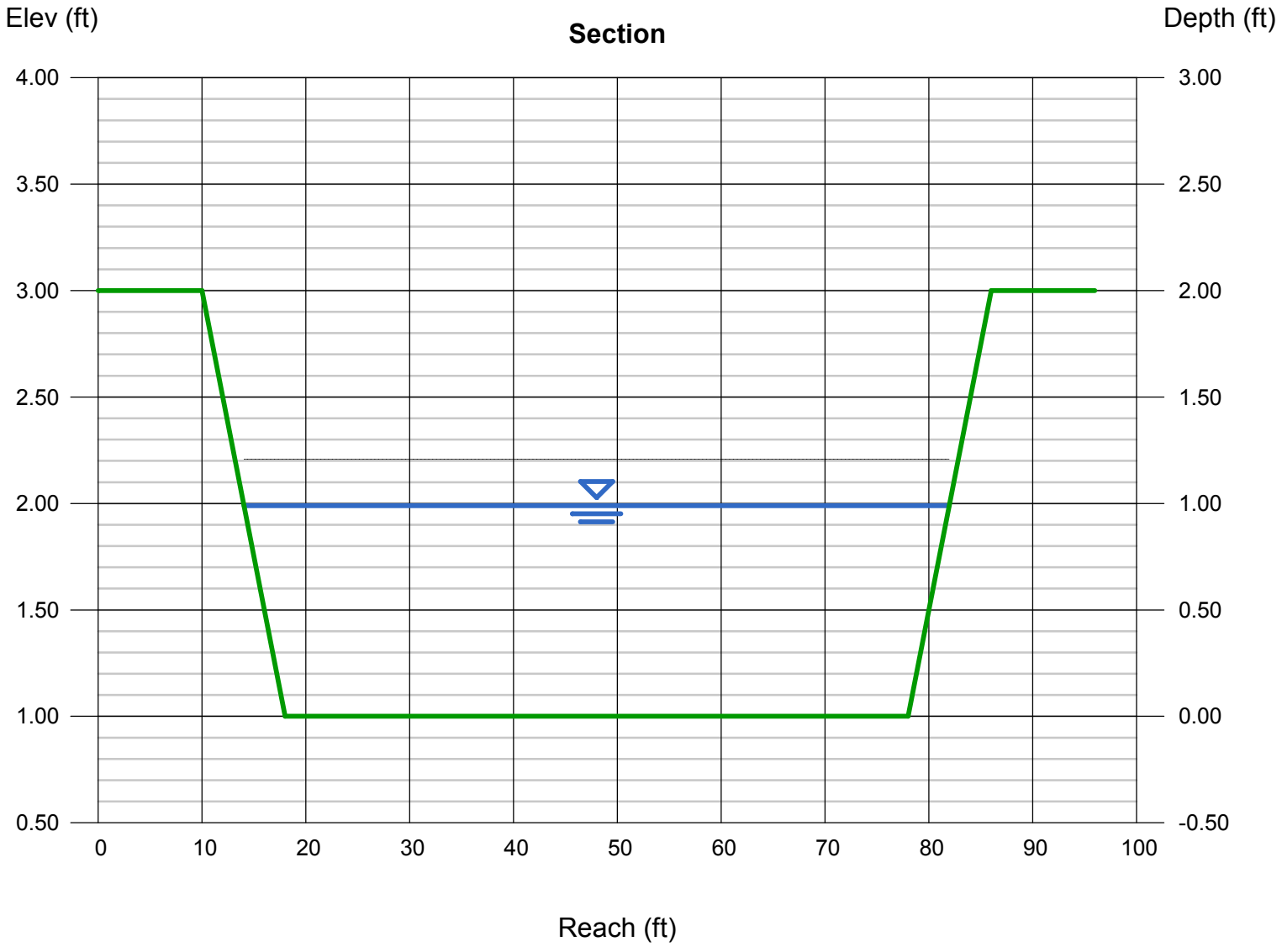
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.80
N-Value	= 0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	= 237.00

Highlighted

Depth (ft)	= 0.99
Q (cfs)	= 237.00
Area (sqft)	= 63.32
Velocity (ft/s)	= 3.74
Wetted Perim (ft)	= 68.16
Crit Depth, Yc (ft)	= 0.78
Top Width (ft)	= 67.92
EGL (ft)	= 1.21



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2_Reach 2 - Proposed Channel Section Velocity Check

Main Stem

Trapezoidal

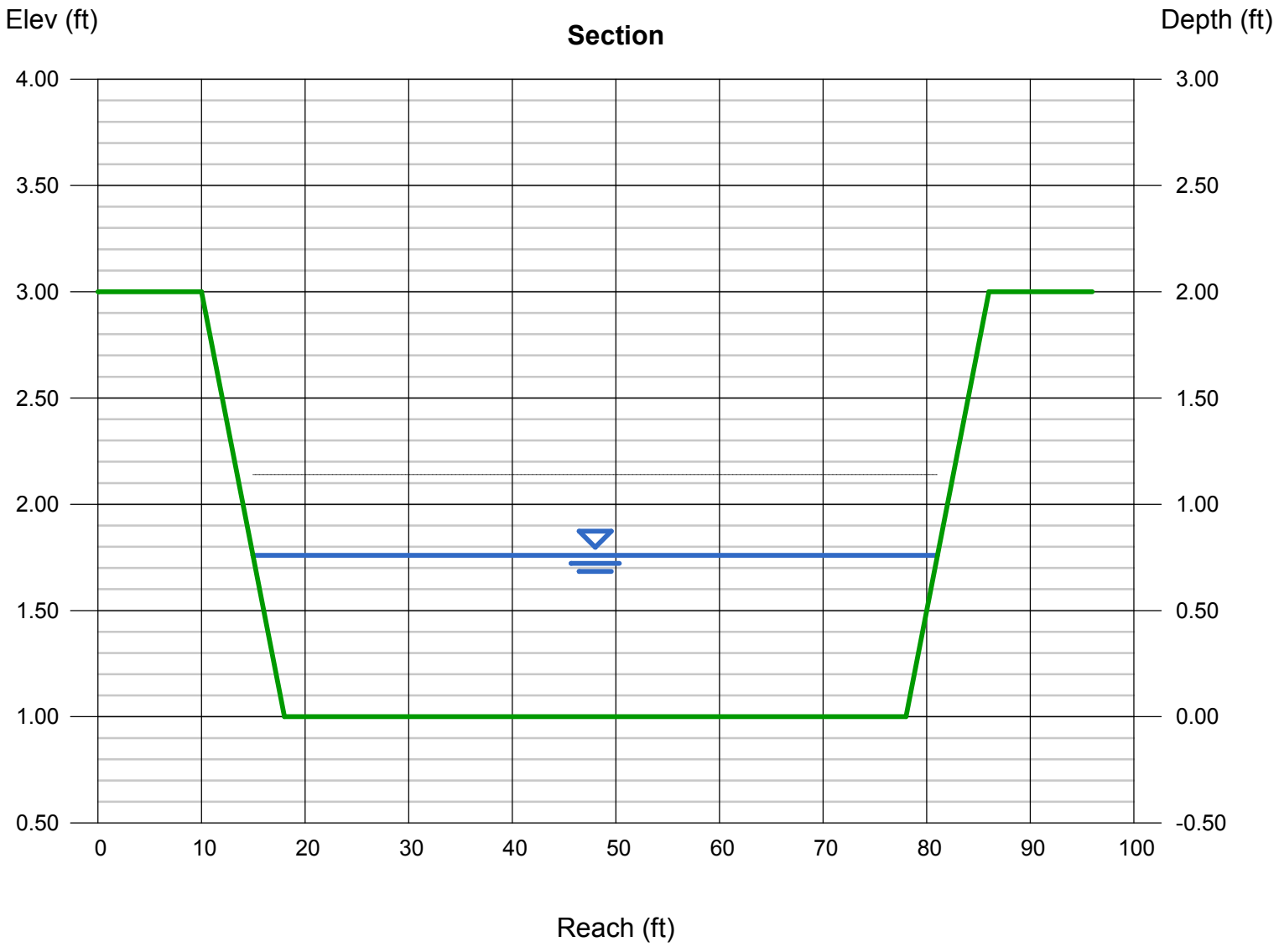
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.80
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 237.00

Highlighted

Depth (ft)	= 0.76
Q (cfs)	= 237.00
Area (sqft)	= 47.91
Velocity (ft/s)	= 4.95
Wetted Perim (ft)	= 66.27
Crit Depth, Yc (ft)	= 0.78
Top Width (ft)	= 66.08
EGL (ft)	= 1.14



MASTER DEVELOPMENT DRAINAGE PLAN
MERIDIAN RANCH

OFFSITE FLOWS ONTO GRANDVIEW RESERVE

GRANDVIEW RESERVE

EXISTING 36" CMP

EXISTING 36" CMP

EXISTING 48" CMP

EXISTING 18" CMP

EXISTING 18" CMP

EXISTING 18" CMP

3-EXISTING 48" RCP'S

EXISTING 48" RCP 24" CMP (PLUGGED)

4-EXISTING 36" RCP'S

29" x18" ARCH CMP

29" x18" ARCH CMP (floats?)

18" CMP

18" CMP

18" CMP

HP

24" CMP

36" CMP

18" CMP

18" CMP

24" CMP

OS1 998

OS2 142

OS3 127

OS4 87

OS5 37

OS6 84

OS7 21

OS8 26

OS9 99

HB1 15

HB2 68

HB3 81

HB4 39

HB5 88

HB6 105

HB7 20

HB8 86

HB9 195

HB10 195

HB11 58

HB12 51

HG1 35

HG2 58

HG3 117

HG4 57

HG5 72

HG6A 88

HG6B 66

HG7 63

HG8 85

HG9 114

HG10 88

HG11 131

HG12 83

HG13 54

HG14 147

HG15 164

HG18 21

HG19 3

HG20 1

HG21 14

HF01 44

HH1 63

FUTURE POND B

BENNETT RANCH
CHWS1200

GIECK RANCH
CHMS0400

FALCON
CHWS1400

HAEGLER RANCH
CHMS0200

GIECK BASIN

BENNETT BASIN

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)

1 inch = 500 ft.

LEGEND

MAJOR BASIN BOUNDARY

MINOR BASIN BOUNARY

SCS MODEL ID / SIZE ACRES — EB15 / 65 — BASIN IDENTIFICATION

H8 B10 DESIGN POINTS

MAJOR CONTOUR INTERVAL

MINOR CONTOUR INTERVAL

100 YEAR FLOOD PLAIN

HISTORIC CONDITIONS - SCS MAP

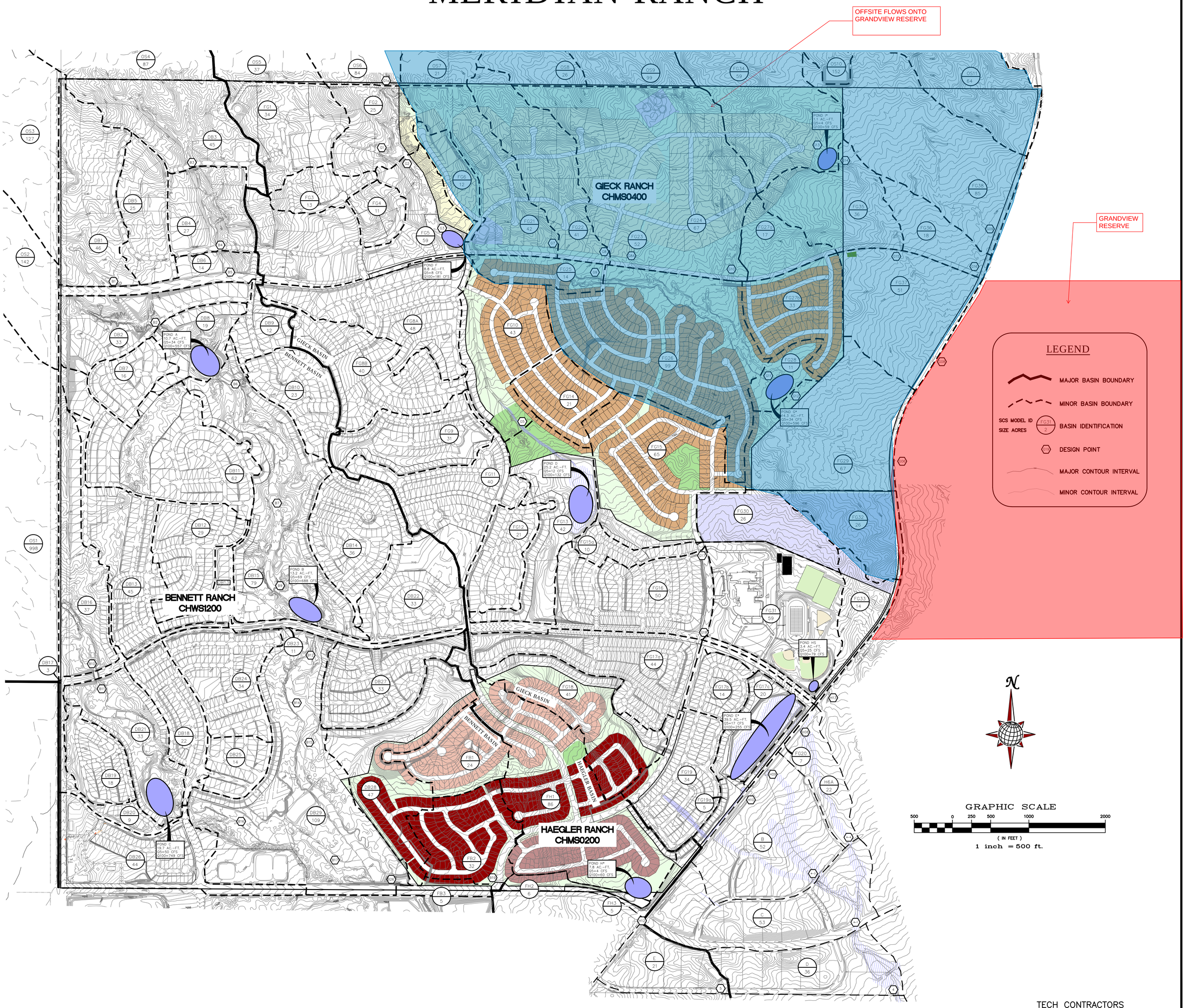
AUG 2017

TECH CONTRACTORS
10305 ANGELES ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.7608

FIGURE 4

S:\Civil Proj\Meridian Ranch MDDP\dwg\Plan Sheets\2017 Basin Maps\2017-MDDP-HIST.dwg, HIS-SCS-MAP, 8/17/2017 10:59:19 AM

MASTER DEVELOPMENT DRAINAGE PLAN
MERIDIAN RANCH



*NOTE: PRELIMINARY STORAGE VOLUMES AND OUTFLOW QUANTITIES HAVE BEEN PROVIDED FOR EACH OF THE FUTURE DETENTION FACILITIES LOCATED WITHIN THE DEVELOPMENT. THE ACTUAL STORAGE VOLUMES AND DISCHARGE RATES WILL BE DETERMINED UPON A COMPLETE ANALYSIS FOR EACH DETENTION FACILITY PRIOR TO CONSTRUCTION. THE VALUES GIVEN FOR DISCHARGE AND VOLUME ARE ESTIMATES FOR PLANNING PURPOSES ONLY.

DEVELOPED CONDITIONS - SCS MAP

NOV 2017

FIGURE 5

TECH CONTRACTORS
10305 ANGELES ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.7608

Appendix H

OFFSITE CONTRIBUTION
Q100 ~ 280 CFS
Q5 ~ 59 CFS
OFFSITE AREA ~0.44 SQUARE MILES
CN VALUE~56.49
SEE STREAMSTATS MAP

OFFSITE CONTRIBUTION
Q100 ~ 217 CFS
Q5 ~ 61 CFS
OFFSITE AREA ~0.22 SQUARE MILES
CN VALUE~54.53
SEE STREAMSTATS MAP

OFFSITE CONTRIBUTION
Q100 ~ 595 CFS
Q5 ~ 180 CFS
OFFSITE AREA ~0.84 SQUARE MILES
CN VALUE~58.28
SEE STREAMSTATS MAP

OFFSITE CONTRIBUTION
Q100 ~ 413 CFS
Q5 ~ 67 CFS
OFFSITE AREA ~0.17 SQUARE MILES
CN VALUE ~55.04
SEE STREAMSTATS MAP

EASTONVILLE ROAD

EAST FORK

EAST FORK TRIBUTARY

MAIN STEM TRIBUTARY NUMBER 2

MAIN STEM

STATE HIGHWAY 24

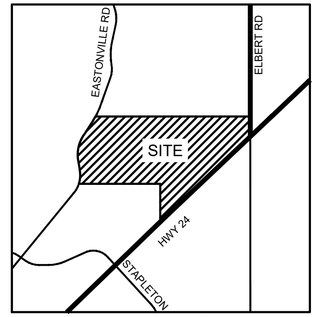
EXISTING 24" CMP CULVERT

EXISTING 18" CMP CULVERT

EXISTING BRIDGE

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
A1	10	13.03	66.80
B1	20	4.33	48.76
B2	21	1.66	20.74
	22	11.85	140.35
	23	5.99	68.56
B3	24	21.23	249.20
C1	30	9.95	110.70
	31	9.95	110.70
D1	40	8.12	40.00
D2	41	22.23	114.87
	42	8.12	40.00
E1	50	32.34	157.99
	51	32.34	157.99
F1	60	9.70	49.45
F2	61	16.46	86.73
F3	62	3.65	18.42
F4	63	12.98	67.82
	64	13.35	67.87
	65	26.04	135.62

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
	66	16.46	86.73
	67	51.47	269.52
G1	70	5.57	28.46
G2	71	3.87	20.06
	72	3.87	20.06
	73	3.87	20.06
	74	9.42	48.48
H1	80	1.85	21.89
H2	81	5.37	27.12
H3	82	1.92	9.51
H4	83	8.07	40.86
	84	7.22	49.01
	85	1.92	9.51
OS1	OS1	67.00	413.00
OS2	OS2	59.00	280.00
OS3	OS3	61.00	217.00
OS4	OS4	180.00	595.00
	Outfall1	80.03	479.80
	Outfall2	85.96	597.41
	Outfall3	30.00	154.35
	Outfall4	341.05	1335.77



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) (XX) C5, (XX) C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

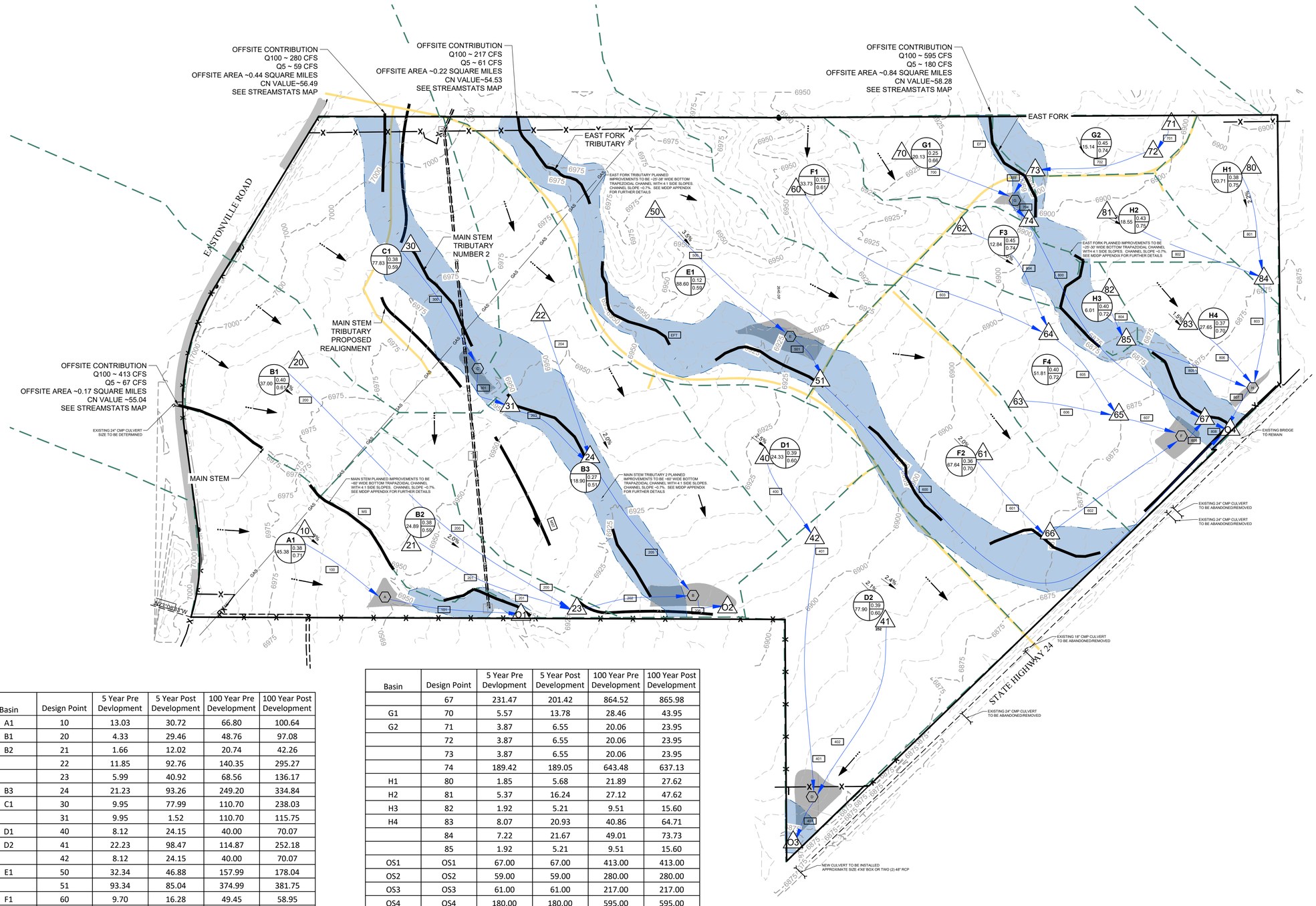
0 200 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

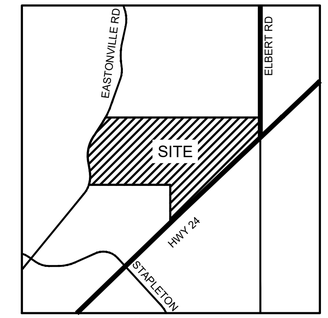
EXISTING EX1

FIG.EX1



Basin	Design Point	5 Year Pre Devlopment	5 Year Post Development	100 Year Pre Development	100 Year Post Development
A1	10	13.03	30.72	66.80	100.64
B1	20	4.33	29.46	48.76	97.08
B2	21	1.66	12.02	20.74	42.26
	22	11.85	92.76	140.35	295.27
	23	5.99	40.92	68.56	136.17
B3	24	21.23	93.26	249.20	334.84
C1	30	9.95	77.99	110.70	238.03
	31	9.95	1.52	110.70	115.75
D1	40	8.12	24.15	40.00	70.07
D2	41	22.23	98.47	114.87	252.18
	42	8.12	24.15	40.00	70.07
E1	50	32.34	46.88	157.99	178.04
	51	93.34	85.04	374.99	381.75
F1	60	9.70	16.28	49.45	58.95
F2	61	16.46	60.11	86.73	170.90
F3	62	3.65	11.36	18.42	32.93
F4	63	12.98	42.32	67.82	124.89
	64	13.35	26.88	67.87	90.88
	65	26.04	69.12	135.62	215.63
	66	16.46	60.11	86.73	170.90

Basin	Design Point	5 Year Pre Devlopment	5 Year Post Development	100 Year Pre Development	100 Year Post Development
	67	231.47	201.42	864.52	865.98
G1	70	5.57	13.78	28.46	43.95
G2	71	3.87	6.55	20.06	23.95
	72	3.87	6.55	20.06	23.95
	73	3.87	6.55	20.06	23.95
	74	189.42	189.05	643.48	637.13
H1	80	1.85	5.68	21.89	27.62
H2	81	5.37	16.24	27.12	47.62
H3	82	1.92	5.21	9.51	15.60
H4	83	8.07	20.93	40.86	64.71
	84	7.22	21.67	49.01	73.73
	85	1.92	5.21	9.51	15.60
OS1	OS1	67.00	67.00	413.00	413.00
OS2	OS2	59.00	59.00	280.00	280.00
OS3	OS3	61.00	61.00	217.00	217.00
OS4	OS4	180.00	180.00	595.00	595.00
	Outfall1	80.03	67.69	479.80	466.95
	Outfall2	85.96	61.68	597.41	536.11
	Outfall3	30.00	8.58	154.35	160.70
	Outfall4	341.05	276.10	1335.77	1291.25



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) XX C5, XX C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

PRELIMINARY CHANNEL GEOMETRY (BY OTHERS)

MAIN STEM
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

MAIN STEM TRIBUTARY 2
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 2
BOTTOM WIDTH: 38'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 1
BOTTOM WIDTH: 25'
SIDE SLOPES: 4:1

NORTH
0 400
200

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR1

FIG.DR1

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EASTONVILLE ROAD

EAST FORK TRIBUTARY

MAIN STEM TRIBUTARY NUMBER 2

MAIN STEM TRIBUTARY PROPOSED REALIGNMENT

SEE DR3

SEE SHEET DR3

SEE SHEET DR5

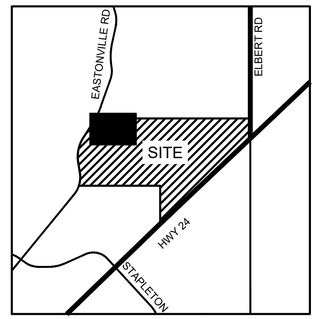
C1
77.83
0.36
0.50

234
30

300
234

177
22

2.6%
2.2%
2.3%



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION A
- POTENTIAL WATER QUALITY LOCATION WQ
- SWMM CONVEYANCE ELEMENT SWMM
- PROPOSED PEAK FLOW RATE (CFS) 850
- DESIGN POINT X
- PROPOSED BASIN LABEL XX / AREA (AC.) XX XX BASIN DESIGNATION / % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

Is this Land Use legend supposed to be in color for the colors (like yellow and orange) shown on this map? Either way, please provide a Legend for all of the shaded colors show on these maps.

NORTH

0 100
50

HRGreen

Job No.:	191897.01
Prepared By:	CMM
Date:	4/9/2020

PROPOSED DR2

FIG.DR2

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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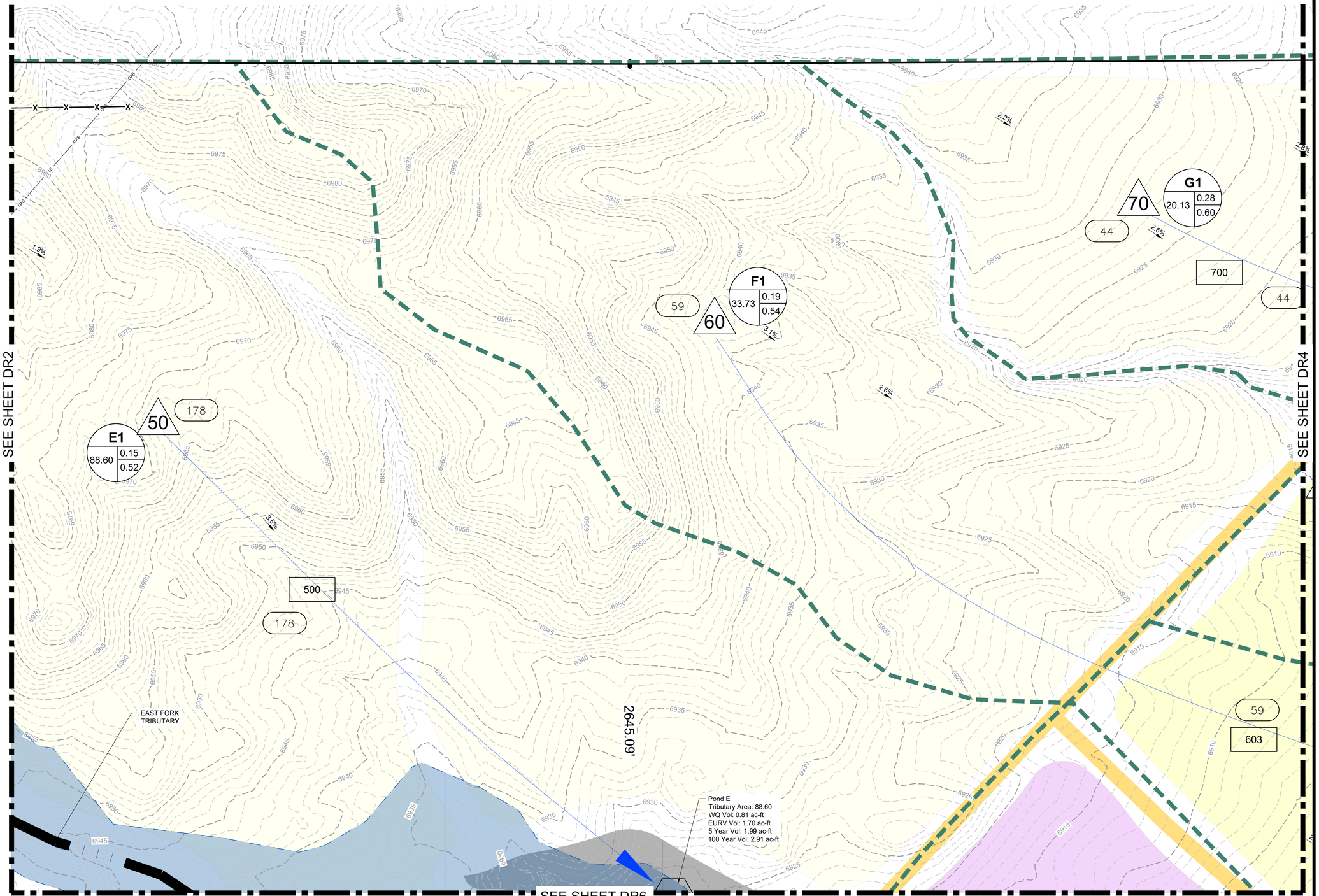
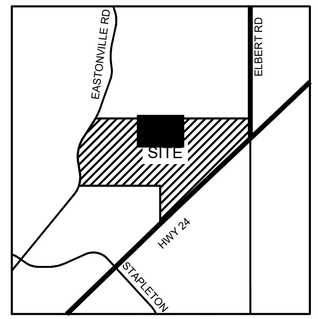
SEE SHEET DR2

SEE SHEET DR4

SEE SHEET DR6





VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (A)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) (XX) (XX) % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 100

50

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR3

FIG.DR3

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

IGEL, TREVOR, 4/16/2020 2:54 PM

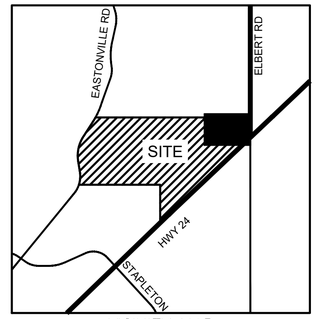
SEE SHEET DR3

EAST FORK

Pond G
Tributary Area: 35.27
WQ Vol: 0.47 ac-ft
ERV Vol: 1.15 ac-ft
5 Year Vol: 1.24 ac-ft
100 Year Vol: 1.85 ac-ft

G2	0.19	
15.14	0.54	
H1	0.15	
20.71	0.30	
H2	0.35	
18.55	0.63	
F3	0.42	
12.84	0.64	
H3	0.32	
6.01	0.61	
H4	0.30	
27.65	0.60	

SEE SHEET DR7



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR (5250)
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR (5250)
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX / AREA (AC.) XX XX % IMPERVIOUSNESS / BASIN DESIGNATION)

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

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Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR4

FIG.DR4

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SEE SHEET DR2

EASTONVILLE ROAD

MAIN STEM TRIBUTARY NUMBER 2

Pond C
Tributary Area: 77.63
WQ Vol: 1.36 ac-ft
EURV Vol: 4.79 ac-ft
5 Year Vol: 4.07 ac-ft
100 Year Vol: 6.91 ac-ft

97
20
B1
37.00 | 0.31 | 0.46
2.3%
200
97
C
114
301
T
2.6%

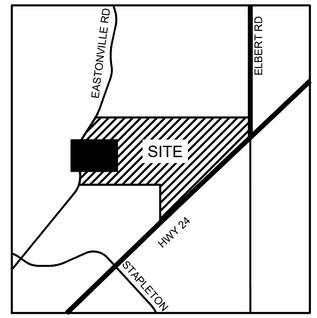
MAIN STEM

101
10
A1
45.38 | 0.27 | 0.59
2.2%
2.4%

B2
24.89 | 0.39 | 0.44
21
42
200
97
2.0%

SEE SHEET DR6

SEE SHEET DR9



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) (XX) (XX) % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 100
50

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR5

FIG.DR5

SEE SHEET DR3

SEE SHEET DR5

SEE SHEET DR7

SEE SHEET DR10

EAST FORK TRIBUTARY

MAIN STEM TRIBUTARY NUMBER 2

204
177

203
114

501
165

205
267

401
69

400
70

31

24

51

42

40

B3
118.90 | 0.15 | 0.30

D1
24.33 | 0.31 | 0.46

E

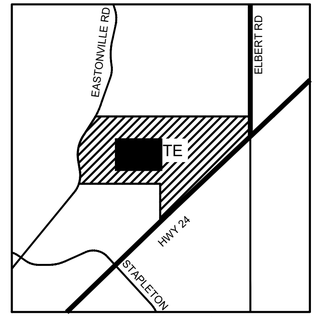
2.0%

1.8%

2.5%

1.9%

1.5%



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION
- AREA (AC.) (XX) (XX) % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 100
50

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR6

FIG.DR6

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SEE SHEET DR2

SEE SHEET DR3

SEE SHEET DR6

SEE SHEET DR8

SEE SHEET DR11

EAST FORK TRIBUTARY

EAST FORK

EAST FORK TRIBUTARY

F4
51.81 | 0.11 | 0.50

F2
67.64 | 0.41 | 0.67

64

63

65

66

61

85

74

606

605

91

607

162

600

164

601

171

602

171

171

Pond F
Tributary Area: 165.72
WQ Vol: 2.62 ac-ft
EURV Vol: 5.94 ac-ft
5 Year Vol: 6.82 ac-ft
100 Year Vol: 10.70 ac-ft

1.9%

2.0%

2.3%

EASTONVILLE RD

ELBERT RD

SITE

HWY 24

STAPLETON

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) — BASIN DESIGNATION; AREA (AC.) XX | XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR7

FIG.DR7

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SEE SHEET DR3

SEE SHEET DR7

SEE SHEET DR11

H3
6.01 | 0.32 / 0.61

H4
27.65 | 0.30 / 0.60

F4
51.81 | 0.11 / 0.50

82 83 85 65 67 O4

804 803 806 805 807 808 605 606 607 608 602

16 65 74 15 80 91 162 258 218 467 74 171

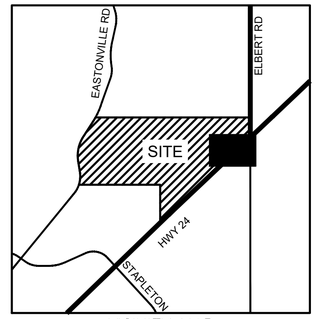
EAST FORK

EAST FORK TRIBUTARY

Pond H
Tributary Area: 72.92
WQ Vol: 1.03 ac-ft
EURV Vol: 2.73 ac-ft
5 Year Vol: 2.90 ac-ft
100 Year Vol: 4.65 ac-ft

Pond F
Tributary Area: 165.72
WQ Vol: 2.62 ac-ft
EURV Vol: 5.94 ac-ft
5 Year Vol: 6.82 ac-ft
100 Year Vol: 10.70 ac-ft

1.5%
3%
2.3%



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
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- WATERSHED BOUNDARY
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- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX | XX / XX) — BASIN DESIGNATION / AREA (AC.) / % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR8

FIG.DR8

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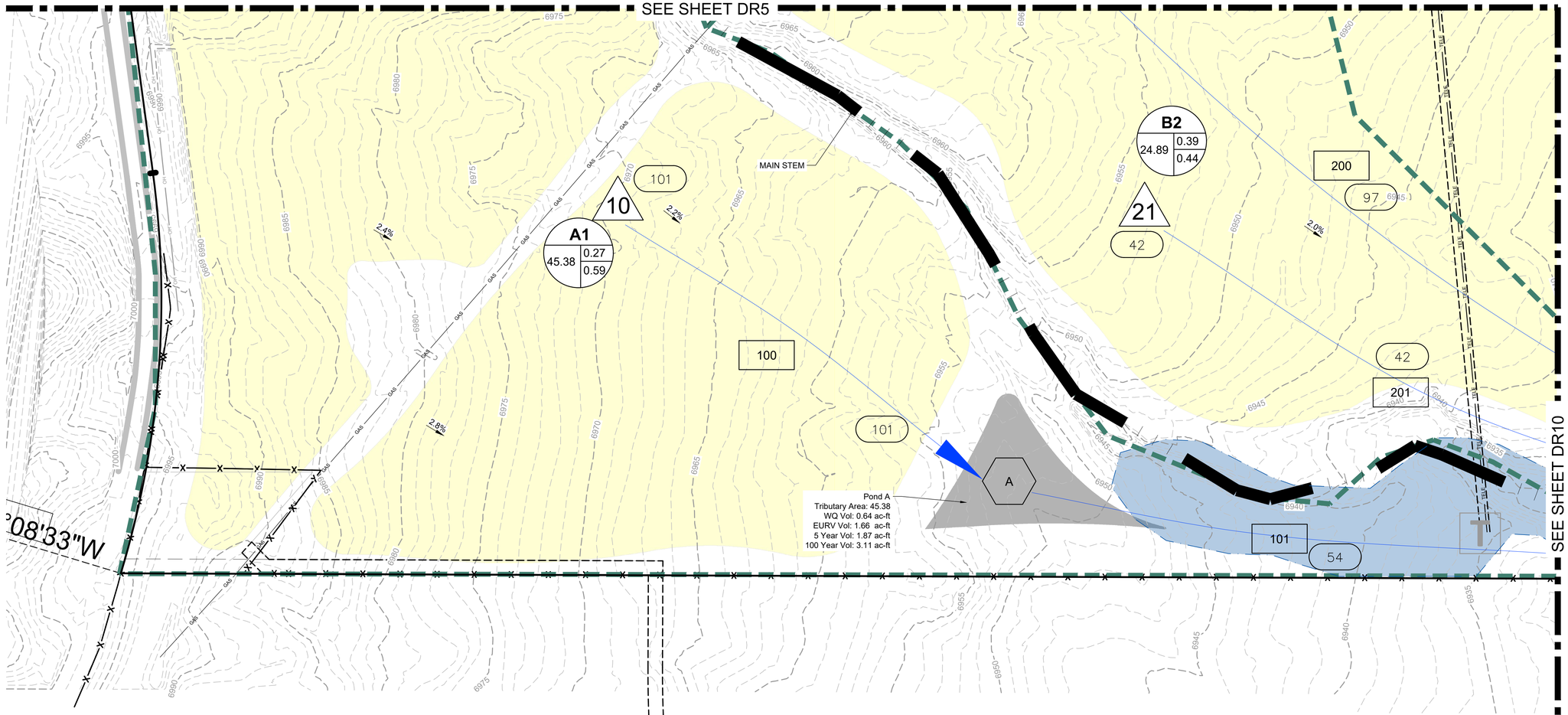
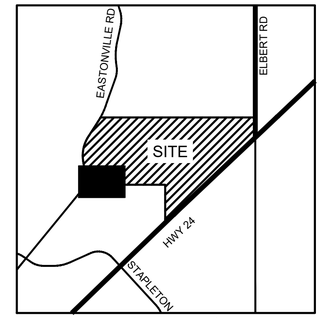
SEE SHEET DR5

SEE SHEET DR10





VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) — BASIN DESIGNATION; AREA (AC.) XX | XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 100

50

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR9

FIG.DR9

SEE SHEET DR6

SEE SHEET DR9

SEE SHEET DR11

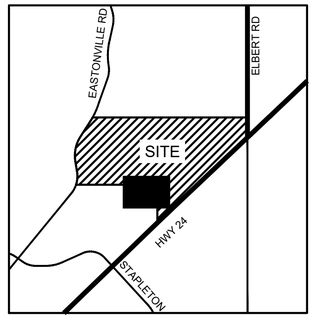
MAIN STEM TRIBUTARY NUMBER 2

Pond B
Tributary Area: 180.79
WQ Vol: 2.41 ac-ft
EURV Vol: 5.73 ac-ft
5 Year Vol: 6.04 ac-ft
100 Year Vol: 15.28 ac-ft

205
267
200
42
97
201
54
O1
23
202
136
B
164
206
O2
101
401
69
402
252

1.5%
2.2%
1.8%
1.7%

6935 6930 6925 6920 6915 6910 6905 6900 6895 6890 6885



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — A
- PROPOSED BASIN LABEL — XX (BASIN DESIGNATION); AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY (5)
- MEDIUM DENSITY (8)
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR10

FIG.DR10

SEE SHEET DR8

SEE SHEET DR10

STATE HIGHWAY 24

D2
77.90 | 0.47 | 0.60

41
252

402
252

401
69

Pond D
Tributary Area: 102.23
WQ Vol: 1.96 ac-ft
EURV Vol: 6.56 ac-ft
5 Year Vol: 6.59 ac-ft
100 Year Vol: 10.13 ac-ft

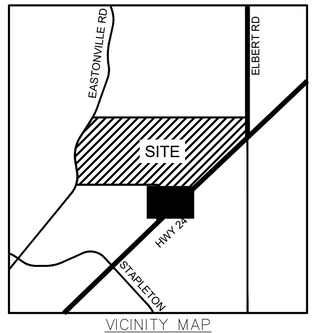
D

161
403

O3
161

1.7%
1.9%
1.8%
1.7%
1.8%

6890 6895 6885 6880 6875 6870



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX / XX XX) — BASIN DESIGNATION; AREA (AC.); % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH
0 100
50

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR11

FIG.DR11

APPENDIX F – DRAINAGE MAPS

OFFSITE CONTRIBUTION
Q100 ~ 280 CFS
Q5 ~ 59 CFS
OFFSITE AREA ~0.44 SQUARE MILES
CN VALUE~56.49
SEE STREAMSTATS MAP

OFFSITE CONTRIBUTION
Q100 ~ 217 CFS
Q5 ~ 61 CFS
OFFSITE AREA ~0.22 SQUARE MILES
CN VALUE~54.53
SEE STREAMSTATS MAP

OFFSITE CONTRIBUTION
Q100 ~ 595 CFS
Q5 ~ 180 CFS
OFFSITE AREA ~0.84 SQUARE MILES
CN VALUE~58.28
SEE STREAMSTATS MAP

OFFSITE CONTRIBUTION
Q100 ~ 413 CFS
Q5 ~ 67 CFS
OFFSITE AREA ~0.17 SQUARE MILES
CN VALUE ~55.04
SEE STREAMSTATS MAP

EASTONVILLE ROAD

EAST FORK

EAST FORK TRIBUTARY

PHASE 2 BOUNDARY

MAIN STEM TRIBUTARY NUMBER 2

MAIN STEM

Have project boundary be more pronounced

EXISTING BRIDGE

EXISTING 24" CMP CULVERT

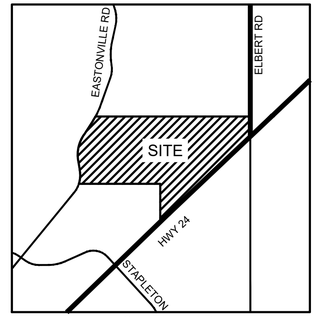
EXISTING 24" CMP CULVERT

EXISTING 18" CMP CULVERT

EXISTING 24" CMP CULVERT

STATE HIGHWAY 24

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
A1	10	13.03	66.80
B1	20	4.33	48.76
B2	21	1.66	20.74
	22	11.85	140.35
	23	5.99	68.56
B3	24	21.23	249.20
C1	30	9.95	110.70
	31	9.95	110.70
D1	40	8.12	40.00
D2	41	22.23	114.87
	42	8.12	40.00
E1	50	32.34	157.99
	51	93.34	374.99
F1	60	9.70	49.45
F2	61	16.46	86.73
F3	62	3.65	18.42
F4	63	12.98	67.82
	64	13.35	67.87
	65	26.04	135.62
	66	16.46	86.73
	67	231.47	864.52
G1	70	5.57	28.46
G2	71	3.87	20.06
	72	3.87	20.06
	73	3.87	20.06
	74	189.42	643.48
H1	80	1.85	21.89
H2	81	5.37	27.12
H3	82	1.92	9.51
H4	83	8.07	40.86
	84	7.22	49.01
	85	1.92	9.51
OS1	OS1	67.00	413.00
OS2	OS2	59.00	280.00
OS3	OS3	61.00	217.00
OS4	OS4	180.00	595.00
	Outfall1	80.03	479.80
	Outfall2	85.96	597.41
	Outfall3	30.00	154.35
	Outfall4	341.05	1335.77



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) XX C5 XX C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 200
100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

EXISTING EX1

Please add both on and offsite drainage flow arrows to this map.

Also add scale and north arrow.

Property owner information

DP labels are hard to read. Please make a little larger.

Can't read DP label

Provide street names

Information in this column matches with C5 value in spreadsheet. Please revise table or spreadsheet accordingly to match

Update flows in these tables. Several do not match hydrology spreadsheet

Missing DP 17-B

Use Design Point designations, as done on other DP Table, such as "DPs 1-B, 2-B" instead of "A,B,C,D"

Label storm infrastructure (MH, inlet, pipes, culverts, swales, etc) and include if it's public/private. Sizes do not need to provided at this time).

The report narrative above states that this whole basin is tributary to design point 23-A via grass swales. But I don't see any swales. Everything appears to flow to Gieck Ranch Trib #2. Please clarify/revise to remove discrepancy.

Fix all overlapping text

Label HP & LP's

Show and label Phase 2 boundary

Unless this maintenance path acts as a berm with a swale on the north side (which I'm not seeing from the topo), then these orange areas are not actually tributary to the ponds as stated in the report narrative above.

Add north arrow and scale

We need to know how much of the proposed area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful (two examples provided):

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A1-A	3.22	14	2.2	8.5
A2-A	1.23	35	1.7	4.6
B1-A	0.26	79	0.8	1.6
B2-A	1.02	64	2.6	5.3
B3-A	0.87	69	2.6	5.2
B4-A	0.86	61	2.3	4.9
C1-A	0.56	67	1.5	3.1
D1-A	0.82	38	1.3	3.2
E1-A	0.18	77	0.6	1.2
E2-A	0.73	67	1.9	3.9
E3-A	0.95	69	2.7	5.4
E4-A	1.12	66	3.0	6.1
E5-A	1.23	68	3.3	6.7
E6-A	0.96	63	2.3	4.8
F1-A	0.40	68	1.2	2.4
G1-A	4.69	20	3.9	13.1
H1-A	0.41	70	1.2	2.3
H2-A	1.05	70	2.8	5.6
H3-A	0.70	63	1.9	4.0
H4-A	1.78	66	4.3	8.8
H5-A	3.72	44	5.7	13.5
I1-A	0.63	57	1.3	2.9
J1-A	1.55	28	1.8	5.1
K1-A	1.66	68	4.1	8.3

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1-A	K1-A	4.1	8.3
2-A	H5-A	5.7	13.5
2.1-A	DPS 1-A, 2-A	9.4	21.0
3-A	H3-A, H4-A	6.0	12.3
4-A	J1-A	1.8	5.1
4.1-A	DPS 2.1-A, 4-A	10.5	24.4
5-A	H2-A	2.8	5.6
6-A	H1-A, DPS 3-A, 5-A	8.7	17.8
7-A	I1-A	1.3	2.9
8-A	DPS 4.1-A, 6-A, 7-A	19.6	43.2
9-A	G1-A	3.9	13.1
9.1-A	DPS 8-A, 9-A	22.7	54.0
10-A	E6-A	2.3	4.8
11-A	E5-A, DPS 10-A	4.2	8.5
12-A	E3-A, E4-A	5.6	11.5
13-A	E2-A, DPS 12-A	6.4	12.9
14-A	E1-A, DPS 11-A, 13-A	8.9	18.2
15-A	F1-A	1.2	2.4
16-A	DPS 9.1-A, 14-A, 15-A	29.1	65.9
17-A	D1-A	1.3	3.2
17.1-A	DPS 16-A, 17-A	29.5	67.2
18-A	B4-A	2.3	4.9
19-A	B2-A, B3-A, DPS 18-A	6.3	12.9
20-A	B1-A, DPS 19-A	6.6	13.5
21-A	C1-A	1.5	3.1
22-A	DPS 17.1-A, 20-A, 21-A	34.9	78.0
23-A	A2-A	1.7	4.6
24-A	DPS 23-A	1.7	4.5
25-A	A1-A, DPS 22-A, 24-A	37.6	87.1

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
A-B	3.52	39	6.6	11.0
B-B	2.50	55	6.2	10.4
C-B	0.83	47	1.9	3.2
D-B	1.05	45	2.4	4.1
E-B	4.05	45	8.7	14.6
F-B	2.95	43	6.1	10.3
G-B	2.15	56	4.8	8.1
H-B	4.77	40	8.7	14.7
I-B	2.06	51	4.1	7.0
J-B	2.77	60	6.6	11.0
K-B	2.30	58	5.9	9.8
L-B	2.14	39	4.6	7.7
M-B	1.81	44	4.0	6.8
N-B	4.10	20	6.8	11.5
O-B	1.18	0	2	3.1

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
DP1-B	A,B	11.9	20.0
DP2-B	C,D	4.2	7.1
DP3-B	A,B,C,D	0.0	26.5
DP4-B	E	8.7	14.6
DP5-B	F	6.1	10.3
DP6-B	E,F	0.0	24.6
DP7-B	A,B,C,D,E,F	0.0	49.8
DP8-B	G	4.8	8.1
DP9-B	H	8.7	14.7
DP10-B	G,H	0.0	22.5
DP11-B	I	7.9	15.8
DP12-B	A,B,C,D,E,F,I	0.0	62.6
DP13-B	J,K,L	14.4	27.4
DP14-B	A-L	0.0	109.7
DP15-B	M	7.8	13.4
DP16-B	A-M	68.9	121.7

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED DRAINAGE SWALE
- PROPERTY LINE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL — 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

Water Quality Treatment Summary Table

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
A	4.50	4.50	4.50				
B	1.25	1.25		1.25			
C	6.00	4.00				4.00	ECM App I.7.1.B.5
D	2.50	2.50	1.00		0.50	1.00	ECM App I.7.1.B.7
E	3.00		3.00				
F	8.25						
Total	25.50	12.25	8.50	1.25	0.50	5.00	
Comments		[For each row, the sum of the values in Columns 4-7 must be greater than or equal to the value in Column 3 above.]	[Values in this column can be more than Column 3 if over-treating non-disturbed areas of the same land-use.]	[See RR calc spreadsheet.]	[Total must be <20% of site and <1ac.]		
		Total Proposed Disturbed Area (ac)	Total Proposed Treated Area (ac)		Total Proposed Disturbed Area Excluded from WQ (ac)	Non-Excluded Area to be Treated (value must ≤ Total Proposed Treated Area) (ac)	
		12.25	9.75		5.50	6.75	

PBMP SUMMARY TABLE

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1.1	1.43	RG-A1.1
A3.1	1.87	RG-A3.1
B1,B2	8.60	EDB-B
OA2,A2	0.95	EXCLUDED*

* EXCLUDED BASED ON < 1-ACRE OF DEVELOPED ROADWAY AREA PER ECM APP. 17.C.1.a

DRAWN BY: CBM — JOB DATE: ----
APPROVED: KMH — JOB NUMBER: 201662
CAD DATE: 12/15/2023
CAD FILE: J:\2020\201662\CAD\Dwgs\C\PUD_Phase_2_662.202\Drainage\02-DR

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 — 1". IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DES

E 2

D·R·HORTON America's Builder

####

PROPOSED DRAINAGE CONDITIONS

SHEET DRN 1

V1_Drainage Report - Preliminary Review 1.pdf Markup Summary

Callout (32)

Subject: Callout
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Color:
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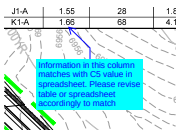
Have project boundary be more pronounced



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Information in this column matches with C5 value in spreadsheet. Please revise table or spreadsheet accordingly to match

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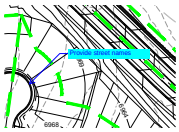

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Provide street names

Subject: Callout
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Author: CDurham
Date: 1/30/2024 5:35:24 PM
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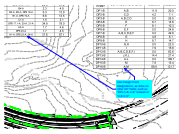
Space:

Fix all overlapping text



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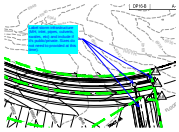
Layer:
Space:

Use Design Point designations, as done on other DP Table, such as "DPs 1-B, 2-B" instead of "A,B,C,D"



Subject: Callout
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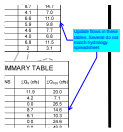
Layer:
Space:

Label storm infrastructure (MH, inlet, pipes, culverts, swales, etc) and include if it's public/private. Sizes do not need to provided at this time).



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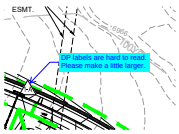
Layer:
Space:

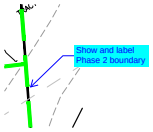
Update flows in these tables. Several do not match hydrology spreadsheet

---



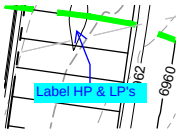
Subject: Callout
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/30/2024 5:40:46 PM
Status:
Color:
Layer:
Space:

DP labels are hard to read. Please make a little larger.



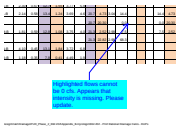
Subject: Callout
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/30/2024 5:41:23 PM
Status:
Color:
Layer:
Space:

Show and label Phase 2 boundary



Subject: Callout
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/30/2024 5:43:49 PM
Status:
Color:
Layer:
Space:

Label HP & LP's

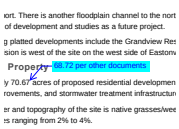


Subject: Callout
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:49:59 PM
Status:
Color:
Layer:
Space:

Highlighted flows cannot be 0 cfs. Appears that intensity is missing. Please update.

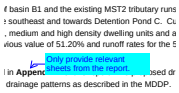
Subject: Callout
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:50:25 PM
Status:
Color:
Layer:
Space:

Missing flow rate for design point



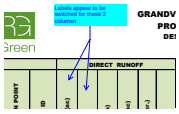
Subject: Callout
Page Label: 4
Author: CDurham
Date: 1/31/2024 8:43:19 AM
Status:
Color:
Layer:
Space:

68.72 per other documents



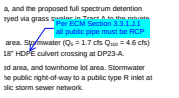
Subject: Callout
Page Label: 6
Author: CDurham
Date: 1/31/2024 9:03:51 AM
Status:
Color:
Layer:
Space:

Only provide relevant sheets from the report.



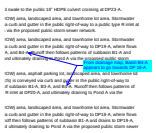
Subject: Callout
Page Label: 23
Author: CDurham
Date: 1/31/2024 9:09:41 AM
Status:
Color:
Layer:
Space:

Labels appear to be switched for these 2 columsn



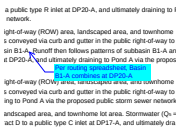
Subject: Callout
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:27:24 AM
Status:
Color:
Layer:
Space:

Per ECM Section 3.3.1.J.1 all public pipe must be RCP



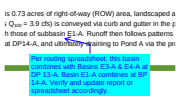
Subject: Callout
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:34:28 AM
Status:
Color:
Layer:
Space:

From drainage map, Basin B4-A appears to go towards DP 18-A



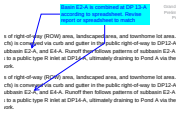
Subject: Callout
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:37:04 AM
Status:
Color:
Layer:
Space:

Per routing spreadsheet, Basin B1-A combines at DP20-A



Subject: Callout
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:42:51 AM
Status:
Color:
Layer:
Space:

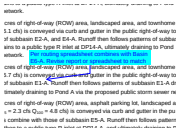
Per routing spreadsheet, this basin combines with Basins E3-A & E4-A at DP 13-A. Basin E1-A combines at BP 14-A. Verify and update report or spreadsheet accordingly.



Subject: Callout
Page Label: 8
Author: CDurham
Date: 1/31/2024 9:44:51 AM
Status:
Color:
Layer:
Space:

Basin E2-A is combined at DP 13-A according to spreadsheet. Revise report or spreadsheet to match

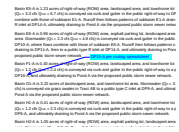
---



Subject: Callout
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:38:24 AM
Status:
Color:
Layer:
Space:

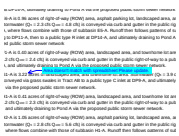
Per routing spreadsheet combines with Basin E6-A. Revise report or spreadsheet to match

---



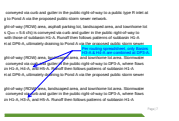
Subject: Callout
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:16:56 AM
Status:
Color:
Layer:
Space:

DP15-A per routing spreadsheet



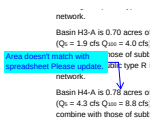
Subject: Callout
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:18:40 AM
Status:
Color:
Layer:
Space:

Area doesn't match with spreadsheet Please update.



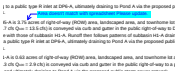
Subject: Callout
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:47:13 AM
Status:
Color:
Layer:
Space:

Per routing spreadsheet, only Basins H3-A & H4-A are combined at DP3-A.



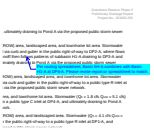
Subject: Callout
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:47:41 AM
Status:
Color:
Layer:
Space:

Area doesn't match with spreadsheet Please update.



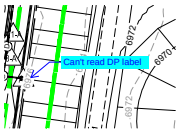
Subject: Callout
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:48:02 AM
Status:
Color:
Layer:
Space:

Area doesn't match with spreadsheet Please update.



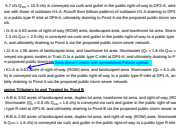
Subject: Callout
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:52:11 AM
Status:
Color:
Layer:
Space:

Per routing spreadsheet, Basin 5H-A combines with Basin H1-A at DP6-A. Please revise report or spreadsheet to match.



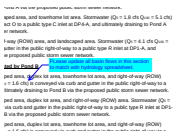
Subject: Callout
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/31/2024 10:53:27 AM
Status:
Color:
Layer:
Space:

Can't read DP label



Subject: Callout
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:54:53 AM
Status:
Color:
Layer:
Space:

Area doesn't match with spreadsheet Please update.



Subject: Callout
Page Label: 9
Author: CDurham
Date: 1/31/2024 11:06:52 AM
Status:
Color:
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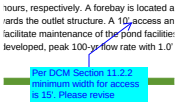
Space:

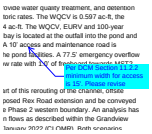
PLease update all basin flows in this section to match with hydrology spreadsheet.



Subject: Callout
Page Label: 10
Author: CDurham
Date: 1/31/2024 11:12:45 AM
Status:
Color:
Layer:
Space:

Per DCM Section 11.2.2 minimum width for access is 15'. Please revise

---

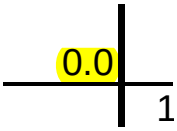


Subject: Callout
Page Label: 11
Author: CDurham
Date: 1/31/2024 11:14:33 AM
Status:
Color:
Layer:
Space:

Per DCM Section 11.2.2 minimum width for access is 15'. Please revise

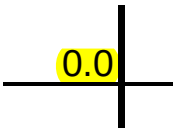
---

Highlight (18)



Subject: Highlight
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:48:42 PM
Status:
Color:
Layer:
Space:

0.0



Subject: Highlight
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:48:55 PM
Status:
Color:
Layer:
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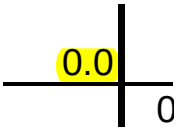
0.0



Subject: Highlight
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:48:57 PM
Status:
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Layer:
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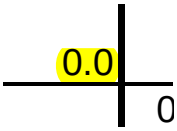
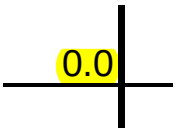
0.0



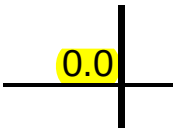
Subject: Highlight
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:48:59 PM
Status:
Color:
Layer:
Space:

0.0



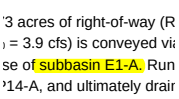
Subject: Highlight
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:49:01 PM
Status:
Color:
Layer:
Space:

0.0



Subject: Highlight
Page Label: 30
Author: CDurham
Date: 1/30/2024 5:49:03 PM
Status:
Color:
Layer:
Space:

0.0


'3 acres of right-of-way (R
= 3.9 cfs) is conveyed via
se of subbasin E1-A. Run
'14-A, and ultimately drair

Subject: Highlight
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:41:35 AM
Status:
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Layer:
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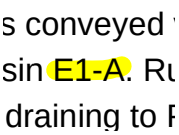
subbasin E1-A.


s conveyed
sin E1-A. Ru
draining to F

Subject: Highlight
Page Label: 8
Author: CDurham
Date: 1/31/2024 9:45:46 AM
Status:
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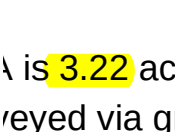
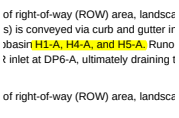
Layer:
Space:


A is 3.22 ac
veyed via q

Subject: Highlight
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:17:03 AM
Status:
Color:
Layer:
Space:

3.22


of right-of-way (ROW) area, landsca
s) is conveyed via curb and gutter in
basin H1-A, H4-A, and H5-A. Runo
inlet at DP6-A, ultimately draining t

of right-of-way (ROW) area, landsca

Subject: Highlight
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:39:36 AM
Status:
Color:
Layer:
Space:

H1-A, H4-A, and H5-A.

A is 0.78 ac
fs Q_{100} = 8.

Subject: Highlight
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:46:28 AM
Status:
Color:
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Space:

0.78

---

of right-of-way (ROW) area, landsca
s) is conveyed via curb and gutter ir
basin H1-A, H3-A, and H5-A. Runo

Subject: Highlight
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:47:21 AM
Status:
Color:
Layer:
Space:

H1-A, H3-A, and H5-A.

A is 3.75 ac
fs Q_{100} = 1

Subject: Highlight
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:48:08 AM
Status:
Color:
Layer:
Space:

3.75

Subject: Highlight
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:50:47 AM
Status:
Color:
Layer:
Space:

Runoff then follows patterns of subbasin H1-A draining to DP3-A and
then to a public type R inlet at DP6-A

A is 0.63 ac
conveyed v

Subject: Highlight
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:54:56 AM
Status:
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Layer:
Space:

0.63

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aining to Pond A via the proposed public
Tributary to and Treated by Pond B
3.52 acres of landscaped area, duplex
water (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is con
R inlet at DP1-B, and ultimately draining
2.50 acres of landscaped area, duplex
= 1.6 cfs) is conveyed via curb and gutte
ately draining to Pond B via the propose

Subject: Highlight
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:56:20 AM
Status:
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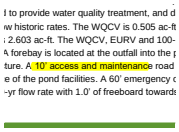

Subject: Highlight
Page Label: 10
Author: CDurham
Date: 1/31/2024 11:12:15 AM
Status:
Color:
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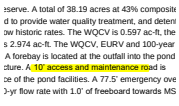
Space:

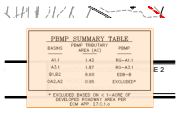
10’ access and maintenanc



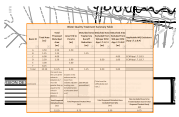
Subject: Highlight
Page Label: 11
Author: CDurham
Date: 1/31/2024 11:14:14 AM
Status:
Color:
Layer:
Space:

10’ access and maintenance ro

Image (2)

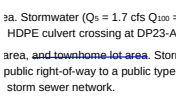


Subject: Image
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 9:45:59 AM
Status:
Color:
Layer:
Space:

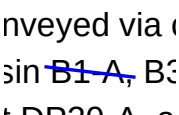


Subject: Image
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 9:47:08 AM
Status:
Color:
Layer:
Space:

Line (9)



Subject: Line
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:29:34 AM
Status:
Color:
Layer:
Space:



Subject: Line
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:31:10 AM
Status:
Color:
Layer:
Space:

conveyed
sin ~~B1-A,~~ B
at DP20-A

Subject: Line
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:31:46 AM
Status:
Color:
Layer:
Space:

---

rea. Stormwater (Q_5 = 1.3 cfs Q_{100} =
-A, and ultimately draining to Pond

area, ~~and townhome lot area.~~ Storm
public right-of-way to a public type R
storm sewer network.

area, and townhome lot area. Storm

Subject: Line
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:39:12 AM
Status:
Color:
Layer:
Space:

---

ight-of-way (ROW
s conveyed via cu
sin ~~E2-A, and~~ E4
public type R inle

Subject: Line
Page Label: 8
Author: CDurham
Date: 1/31/2024 9:44:46 AM
Status:
Color:
Layer:
Space:

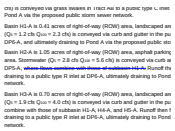
---

ea. Stormwater (Q_5 = 3.9 cfs Q_{100}
t at DP9-A, and ultimately draining

area, ~~and townhome lot area.~~ Storm
public right-of-way to a public type
torm sewer network.

ng lot, landscaped area, and town

Subject: Line
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:29:53 AM
Status:
Color:
Layer:
Space:

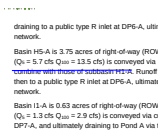


Subject: Line
Page Label: 8
Author: CDurham
Date: 1/31/2024 10:31:18 AM
Status:
Color:
Layer:
Space:

---

a. Stormwater
-A, ~~where flows~~
to DP3-A and
orm sewer

Subject: Line
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:50:31 AM
Status:
Color:
Layer:
Space:



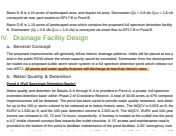
Subject: Line
Page Label: 9
Author: CDurham
Date: 1/31/2024 10:50:37 AM
Status:
Color:
Layer:
Space:

Polygon (2)

Subject: Polygon
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:11:15 AM
Status:
Color:
Layer:
Space:

Subject: Polygon
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:14:02 AM
Status:
Color:
Layer:
Space:

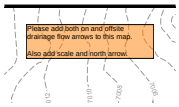
SW - Highlight (1)



Subject: SW - Highlight
Page Label: 10
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:39:48 AM
Status:
Color:
Layer:
Space:

All ponds and water quality features will discharge at less than historic rates.

SW - Textbox (4)



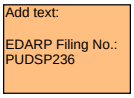
Subject: SW - Textbox
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:05:23 AM
Status:
Color:
Layer:
Space:

Please add both on and offsite drainage flow arrows to this map.

Also add scale and north arrow.

Subject: SW - Textbox
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 9:45:30 AM
Status:
Color:
Layer:
Space:

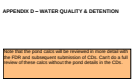
We need to know how much of the proposed area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful (two examples provided):



Subject: SW - Textbox
Page Label: 1
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:53:07 AM
Status:
Color:
Layer:
Space:

Add text:

EDARP Filing No.: PUDSP236



Subject: SW - Textbox
Page Label: 33
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 3:32:23 PM
Status:
Color:
Layer:
Space:

Note that the pond calcs will be reviewed in more detail with the FDR and subsequent submission of CDs. Can't do a full review of these calcs without the pond details in the CDs.

SW - Textbox with Arrow (10)

Subject: SW - Textbox with Arrow
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:25:00 AM
Status:
Color:
Layer:
Space:

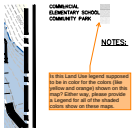
Unless this maintenance path acts as a berm with a swale on the north side (which I'm not seeing from the topo), then these orange areas are not actually tributary to the ponds as stated in the report narrative above.

Subject: SW - Textbox with Arrow
Page Label: 7
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:17:42 AM
Status:
Color:
Layer:
Space:

Swales not shown on Drainage Map. Please clarify how flows will reach their intented design points and ultimately the pond. Or if any WQ exclusions are applicable.

Subject: SW - Textbox with Arrow
Page Label: [1] DRAINAGE MAP
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:24:26 AM
Status:
Color:
Layer:
Space:

The report narrative above states that this whole basin is tributary to design point 23-A via grass swales. But I don't see any swales. Everything appears to flow to Gieck Ranch Trib #2. Please clarify/revise to remove discrepancy.



Subject: SW - Textbox with Arrow
Page Label: [1] 00-Drainage Basins-DR2
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:28:34 AM
Status:
Color:
Layer:
Space:

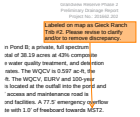
Is this Land Use legend supposed to be in color for the colors (like yellow and orange) shown on this map? Either way, please provide a Legend for all of the shaded colors show on these maps.

Subject: SW - Textbox with Arrow
Page Label: 10
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:29:29 AM
Status:
Color:
Layer:
Space:

Swales not shown on Drainage Map. Please clarify how flows will reach their intented design points and ultimately the pond. Or if any WQ exclusions are applicable.

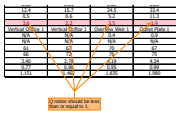
Subject: SW - Textbox with Arrow
Page Label: 10
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:40:11 AM
Status:
Color:
Layer:
Space:

Labeled on map as Gieck Ranch Trib #2. Please revise to clarify and/or to remove discrepancy.



Subject: SW - Textbox with Arrow
Page Label: 11
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:40:01 AM
Status:
Color:
Layer:
Space:

Labeled on map as Gieck Ranch Trib #2. Please revise to clarify and/or to remove discrepancy.

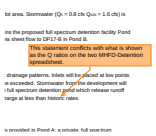


Subject: SW - Textbox with Arrow
Page Label: 36
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:39:12 AM
Status:
Color:
Layer:
Space:

Q ratios should be less than or equal to 1.

Subject: SW - Textbox with Arrow
Page Label: 41
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:38:41 AM
Status:
Color:
Layer:
Space:

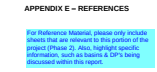
Q ratios should be less than or equal to 1.



Subject: SW - Textbox with Arrow
Page Label: 10
Author: Glenn Reese - EPC Stormwater
Date: 1/29/2024 10:41:21 AM
Status:
Color:
Layer:
Space:

This statement conflicts with what is shown as the Q ratios on the two MHFD-Detention spreadsheet.

Text Box (9)



Subject: Text Box
Page Label: 44
Author: CDurham
Date: 1/30/2024 5:10:55 PM
Status:
Color:
Layer:
Space:

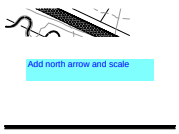
For Reference Material, please only include sheets that are relevant to this portion of the project (Phase 2). Also, highlight specific information, such as basins & DP's being discussed within this report.

Subject: Text Box
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/30/2024 5:33:33 PM
Status:
Color:
Layer:
Space:

Property owner information

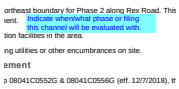
Subject: Text Box
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/30/2024 5:38:17 PM
Status:
Color:
Layer:
Space:

Missing DP 17-B



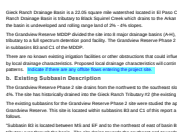
Subject: Text Box
Page Label: [1] DRAINAGE MAP
Author: CDurham
Date: 1/30/2024 5:42:03 PM
Status:
Color:
Layer:
Space:

Add north arrow and scale



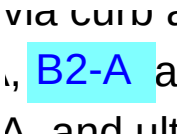
Subject: Text Box
Page Label: 5
Author: CDurham
Date: 1/31/2024 8:45:34 AM
Status:
Color:
Layer:
Space:

Indicate when/what phase or filing this channel will be evaluated with.



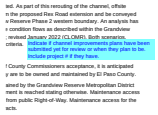
Subject: Text Box
Page Label: 6
Author: CDurham
Date: 1/31/2024 9:04:52 AM
Status:
Color:
Layer:
Space:

Indicate if there are any offsite flows entering the project site.



Subject: Text Box
Page Label: 7
Author: CDurham
Date: 1/31/2024 9:32:40 AM
Status:
Color:
Layer:
Space:

B2-A



Subject: Text Box
Page Label: 11
Author: CDurham
Date: 1/31/2024 11:17:08 AM
Status:
Color:
Layer:
Space:

Indicate if channel improvements plans have been submitted yet for review or when they plan to be. Include project # if they have.

Subject: Text Box
Page Label: 11
Author: CDurham
Date: 1/31/2024 11:27:15 AM
Status:
Color:
Layer:
Space:

In the MDDP Summary submitted with the Sketch Plan (SKP-20-001) it is noted that due to the increased volume of flow, low impact design should be taken into account for design of each filing. Please include additional information on where and how this is being accomplished within such a high density area.