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Eastonville Road – Londonderry Drive to Rex Road
Segment 1 Improvements
Stationing 14+55.00 – 47+00.00

Final Drainage Report

March 2024

HR Green Project No: 201662.08

Prepared For:

D.R. Horton

Contact: Riley Hillen, P.E.

9555 S. Kingston Ct.

Englewood, CO 80112

Prepared By:

HR Green Development, LLC

Contact: Colleen Monahan, P.E., LEED AP

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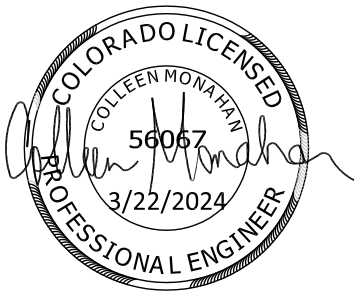
Engineer's Statement:

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.

Colleen Monahan, P.E., LEED AP

Date



State of Colorado No. 56067

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: _____ _____

Authorized Signature Date

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:

Table of Contents

Appendices

I. General Purpose, Location and Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for the Eastonville Road from Londonderry Drive to Rex Road Segment 1 Improvements 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. This drainage report will detail the improvements of Eastonville Road from Londonderry Drive to Grandview Filing No. 1 (Stations 14+55.00 to 47+00.00). Stations 47+00.00 to 79+32.00 contain the Segment 2 Improvements for the Eastonville Road from Londonderry Drive to Rex Road for the portion of the project north of Grandview Filing No. 1. The project is all one project, however, the planset has been broken into two segments to align with the Grandview Reserve Filings. A separate FDR describes Segment 2 of the project.

b. Location

Eastonville Road from Londonderry Drive to Grandview Filing No. 1, referred to as 'the site' herein, is an existing 26' wide temporary pavement (per field inspection- the existing pavement is not full depth, see Appendix A) road in El Paso County, Colorado. The site lies in existing 60' wide El Paso County Right-of-Way within Sections 21 and 28, Township 12 South, Range 64 West of the 6th Principal Meridian, in El Paso County, State of Colorado.

The site is bound by undeveloped land to the east and west that has historically been used as ranching lands. Falcon Regional Park, which contains ballparks and parking, and Falcon High School also border the site to the west. All lands to the east and west of the site are unplatted. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 0.61 miles (2.06 acres) of existing temporary pavement roadway north of Londonderry Drive and south of Grandview Reserve Filing No. 1. Per field inspection the existing pavement is not full depth, and therefore described as 'temporary' for the purpose of this report. The existing temporary pavement width for the length of the project is 26' wide. There are 4' wide gravel shoulders and native landscaped swales are located on both sides of the roadway. Offsite stormwater is bypassed under the road through a series of existing culverts. See Appendix A for an existing conditions photo.

The existing roadway has slopes ranging from 0.3% up to approximately 4%. The general topography of the surrounding area is typical of high desert, short prairie grass with gently rolling hillside with slopes ranging from 2% to 4%. The project site drains generally from the west to the east and is tributary to Black Squirrel Creek.

Per a NRCS soil survey, the site is made up of Type A Columbine gravelly sandy loam, Type A Blakeland loamy sand and Type B Stapleton sandy loam. The NRCS soil survey is presented in Appendix A.

Gieck Ranch Tributary #1 (Channel A) is the only drainageway that traverses the site in the west to east direction through an existing culvert under Eastonville Road that is just north of Segment 1. The channel is a mapped wetland and a wetland permit will be required for Segment 2 of this Eastonville Road improvement project. Channel A is not within a FEMA floodplain.

Existing utilities include an underground gas line that runs along the east and west sides of Eastonville, an existing raw water line that follows the west side of Eastonville north of Falcon Regional Park, an existing underground electric line along the west side of Eastonville Road, and an existing aboveground electrical line along the east side of Eastonville Road. An existing drainage map with these facilities is presented in Appendix F.

d. Floodplain Statement

Based on FEMA Firm map 08041C0552G December 7, 2018, the site is not located in any FEMA designated floodplain. See FEMA Firm Map in Appendix A. There is a Zone A floodplain north of the site and a Zone AE south of the site, both of which will not be altered with the associated Eastonville Road Segment 1 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. The 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

Inlet sizing was performed 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.

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. "Master Development Drainage Plan Meridian Ranch" prepared by Tech Contractors, July 2021.
3. "Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch" by Tech Contractors, August 2022.

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 is rolling range land typical of Colorado's semi-arid climates.

Within the Gieck Ranch Drainage Basin, ranching has historically been the predominant land use, with rolling topography between 2%-4% slopes. Recently urbanization is occurring within the drainage basin, most notably for this project are Meridian Ranch and Latigo Trails Developments. Both are single family residential neighborhoods located upstream to the west and northwest of the Eastonville Segment 1 Improvements project site.

b. Existing Subbasin Description

Basin E1 is 0.47 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 0.7 cfs Q_{100} = 1.7 cfs) is conveyed by an existing roadside swale on the northwest edge of Eastonville Road to DP1. Flows at DP1 then drain across Eastonville Road through an existing public 36" CMP culvert to DP2.

Basin E2 is 1.25 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 1.0 cfs Q_{100} = 3.5 cfs) is conveyed by an existing swale on the southeast edge of Eastonville Road to DP2. Flows at DP2 then drain southeast offsite in historic drainage patterns.

Basin E3 is 0.47 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 1.0 cfs Q_{100} = 2.1 cfs) is conveyed by an existing roadside swale on the northwest edge of Eastonville Road to DP3. Flows at DP3 then drain across Eastonville Road through an existing public 24" CMP culvert do DP4.

Basin E4 is 1.67 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 1.4 cfs Q_{100} = 4.6 cfs) is conveyed by an existing swale on the southeast edge of Eastonville Road to DP4. Flows at DP4 then drain southeast offsite in historic drainage patterns.

Basin E5 is 0.23 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 0.5 cfs Q_{100} = 1.1 cfs) is conveyed by an existing roadside swale on the northwest edge of Eastonville Road to DP5. Flows at DP5 then drain across Eastonville Road through an existing public 18" CMP culvert to DP6.

Basin E6 is 0.21 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 0.5 cfs Q_{100} = 1.1 cfs) is conveyed by an existing swale on the southeast edge of Eastonville Road to DP6. Flows at DP6 then drain southeast offsite in historic drainage patterns ultimately to the Gieck Ranch Tributary #1.

Basin E7 is 0.23 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 0.5 cfs Q_{100} = 1.2 cfs) is conveyed by an existing roadside swale on the northwest edge of Eastonville Road to DP7.1. Flows at DP7.1 then drain across Eastonville Road through an existing public 18" CMP culvert to DP8.1.

Basin E8 is 0.18 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 0.4 cfs Q_{100} = 0.9 cfs) is conveyed by an existing swale on the southeast edge of Eastonville Road to DP8.1. Flows at DP8.1 then drain southeast offsite in historic drainage patterns ultimately to the Gieck Ranch Tributary #1.

Basin E9 is 0.72 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 1.2 cfs Q_{100} = 2.7 cfs) is conveyed by an existing roadside swale on the northwest edge of Eastonville Road to DP7.2. Flows at DP7.2 then drain across Eastonville Road through an existing public 18" CMP culvert to DP8.2.

Basin E10 is 0.72 acres of temporary pavement to the crown of Eastonville Road roadway and existing swale native landscaped area. Stormwater from this basin (Q_5 = 1.3 cfs Q_{100} = 2.8 cfs) is conveyed by an existing swale on the southeast edge of Eastonville Road to DP8.2. Flows at DP8.2 then drain southeast offsite in historic drainage patterns ultimately to the Gieck Ranch Tributary #1.

Basin OS1 is 1.58 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 0.5 cfs Q_{100} = 3.6 cfs) drains via sheet flow into an existing roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP1. Flows at DP1 then drain across Eastonville Road through an existing public 36" CMP culvert to DP2. Flows at DP2 then drain southeast offsite in historic drainage patterns.

Basin OS2 is 12.21 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 3.6 cfs Q_{100} = 24.3 cfs) drains via sheet flow into an existing roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP3. Flows at DP3 then drain across Eastonville Road through an existing public 24" CMP culvert to DP4. Flows at DP4 then drain southeast offsite in historic drainage patterns.

Basin OS3.1 is 1.51 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 0.5 cfs Q_{100} = 3.6 cfs) drains via sheet flow into an existing roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP5. Flows at DP5 then drain across Eastonville Road through an existing public 18" CMP culvert to DP6. Flows at DP6 then drain southeast offsite in historic drainage patterns ultimately to the Gieck Ranch Tributary #1.

Basin OS3.2 is 2.86 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 1.0 cfs Q_{100} = 6.6 cfs) drains via sheet flow into an existing roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP7.1. Flows at DP7.1 then drain across Eastonville Road through an existing public 18" CMP culvert to DP8.1. Flows at DP8.1 then drain southeast offsite in historic drainage patterns ultimately to the Gieck Ranch Tributary #1.

Basin OS3.3 is 21.12 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 6.4 cfs Q_{100} = 42.7 cfs) drains via sheet flow into an existing roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP7.2. Flows at DP7.2 then drain across Eastonville Road through an existing public 18" CMP culvert to DP8.2. Flows at DP8.2 then drain southeast offsite in historic drainage patterns ultimately to the Gieck Ranch Tributary #1.

c. Proposed Subbasin Description

Description of Proposed Project

The proposed project includes improvements to Eastonville Road from Londonderry Drive to the north part of Grandview Filing No. 1. As described above, the current condition of the existing roadway in this area consists of 26' wide temporary pavement roadway with 4' wide gravel shoulders and native landscaped swales located on both sides of the roadway. Offsite stormwater is bypassed under the proposed roadway via proposed public RCP culverts.

The proposed improvements to Eastonville Road from Londonderry Drive to the north part of Grandview Filing No. 1 include removal of the 26' wide temporary pavement and replacing the road with a Modified Urban Minor Arterial Roadway Cross-Section consisting of 48' pavement and Type A EPC curb (53' back of curb to back of curb).

Eastonville Road Basins

Basin EA1 is 0.61 acres of proposed pavement to the crown of Eastonville Road and proposed landscaped area. Stormwater (Q_5 = 2.2 cfs Q_{100} = 4.1 cfs) is conveyed by curb & gutter on the northwest side of Eastonville Road. Runoff is then captured in a public 5' CDOT Type R Inlet at DP9. Flows from DP9 are conveyed through a proposed public storm sewer system which outfalls into Sand Filter Basin D. Sand Filter Basin D is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA2 is 1.23 acres of proposed pavement to the crown of Eastonville Road and proposed landscaped area. Stormwater (Q_5 = 2.2 cfs Q_{100} = 5.3 cfs) is conveyed by curb & gutter on the southeast side of Eastonville Road. Runoff is then captured in a public 5' CDOT Type R Inlet at DP10. Flows from DP10 are conveyed through a proposed public storm sewer system which outfalls into Sand Filter Basin D. Sand Filter Basin D is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA3 is 0.53 acres of proposed pavement to the crown of Eastonville Road and proposed landscaped area. Stormwater (Q_5 = 2.1 cfs Q_{100} = 3.4 cfs) is conveyed by curb & gutter on the northwest side of Eastonville Road. Runoff is then captured in a public 5' CDOT Type R Inlet at DP13. Flows at DP13 are conveyed across Eastonville Road through a public storm sewer system to Sand Filter Basin A. Sand Filter Basin A is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA4 is 0.90 acres of proposed pavement to the crown of Eastonville Road and proposed landscaped area. Stormwater (Q_5 = 2.0 cfs and 3.4 cfs) is conveyed by curb & gutter on the southeast side of Eastonville Road. Runoff is then captured in a public 5' CDOT Type R Inlet at DP10. Flows at DP14 are conveyed through a public storm sewer system to Sand Filter Basin A. Sand Filter Basin A is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA5 is 0.29 acres of landscaped area, gravel access road, and contains the private full spectrum sand filter basin A. Stormwater (Q_5 = 0.2 cfs Q_{100} = 0.3 cfs) from this basin sheet flows directly into Sand Filter Basin A. Sand Filter Basin A is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA6 is 1.11 acres of proposed pavement to the crown of Eastonville Road and proposed landscaped area. Stormwater (Q_5 = 3.0 cfs Q_{100} = 5.1 cfs) is conveyed by curb & gutter on the west side of Eastonville Road. Runoff is then captured in a public 10' CDOT Type R Inlet at DP16. Flows at DP16 are conveyed across Eastonville Road through a public storm sewer system to Extended Detention Basin B. Extended Detention Basin B is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA7 is 1.91 acres of proposed pavement to the crown of Eastonville Road and proposed landscaped area. Stormwater (Q_5 = 3.3 cfs Q_{100} = 5.6 cfs) is conveyed by curb & gutter on the east side of Eastonville

Road. Runoff is then captured in a public 10' CDOT Type R Inlet at DP17. Flows at DP17 are conveyed through a public storm sewer system to Extended Detention Basin B. Extended Detention Basin B is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA8 is 0.86 acres of landscaped area, gravel access road, and contains extended detention basin B. Stormwater (Q_5 = 0.5 cfs Q_{100} = 0.8 cfs) from this basin sheet flows directly into Extended Detention Basin B. Extended Detention Basin B is located southeast of the proposed Eastonville Road Segment 1 improvements outside of the proposed right-of-way within a proposed drainage easement.

Basin EA9 is 0.92 acres of landscaped area. Stormwater (Q_5 = 0.4 cfs Q_{100} = 0.6 cfs) from this basin sheet flows directly offsite towards DP20. Water quality will be accounted for via runoff reduction swales & grass buffers.

Basin EA10 is 0.37 acres of landscaped area. Stormwater (Q_5 = 0.2 cfs Q_{100} = 0.3 cfs) from this basin sheet flows directly offsite towards DP21. Water quality will be accounted for via runoff reduction swales & grass buffers.

Basin EA11 is 0.15 acres of landscaped area. Stormwater (Q_5 = 0.1 cfs Q_{100} = 0.1 cfs) from this basin sheet flows directly offsite towards DP22. Water quality will be accounted for via runoff reduction swales & grass buffers.

Basin EA12 is 0.26 acres of landscaped area. Stormwater (Q_5 = 0.2 cfs Q_{100} = 0.8 cfs) from this basin sheet flows directly into Pond D.

Basin EA13 is 0.21 acres of landscaped area. Stormwater (Q_5 = 0.1 cfs Q_{100} = 0.1 cfs) from this basin sheet flows directly offsite towards DP12. Water quality will be accounted for via runoff reduction swales & grass buffers.

Basin OS1 is 1.63 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 0.5 cfs Q_{100} = 3.6 cfs) drains via sheet flow into a proposed roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP1. Flows at DP1 then drain across Eastonville Road through a proposed public 18" RCP culvert to DP2. Flows at DP2 then drain southeast offsite in historic drainage patterns. Water quality treatment for the distrurbed area within this basin is accounted for by infiltration by grass overland flow.

Basin OS2 is 12.33 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 3.7 cfs Q_{100} = 24.5 cfs) drains via sheet flow into a proposed roadside swale on the northwest side of Eastonville Road. Stormwater then drains to DP3. Flows at DP3 then drain across Eastonville Road through a proposed public 30" RCP culvert to DP4. Flows at DP4 then drain southeast offsite in historic drainage patterns. Water quality treatment for the distrurbed area within this basin is accounted for by infiltration by grass overland flow.

Basin OS3 is 25.35 acres of offsite undeveloped area. Stormwater from this basin (Q_5 = 7.9 cfs Q_{100} = 53.3 cfs) drains via sheet flow into a proposed roadside swale on the northwest side of Eastonville Road. Stormwater then drains to a proposed public CDOT type D inlet at DP7. Flows at DP7 then drain across Eastonville Road through a proposed public storm sewer system. This storm sewer system outfalls at DP8 into the Gieck Ranch Tributary #1 where drainage will follow historic patterns. Water quality treatment for the distrurbed area within this basin is accounted for by infiltration by grass overland flow.

IV. Drainage Facility Design

a. General Concept

The proposed improvements to Eastonville Road from Londonderry Drive to the north part of Grandview Filing No. 1 include removal of the 26' wide temporary pavement and replacing the road with a Modified Urban Minor Arterial Roadway Cross-Section consisting of 48' pavement and Type A EPC curb (53' back of curb to back of curb). Inlets will be placed at low points. Stormwater from this roadway will be piped to either a full spectrum detention basin or full spectrum sand filters. All detention basins and water quality features will discharge at less than historic rates. Runoff generated from the site will release at historic design points at less than historic flow rates. A flow comparison of existing/proposed stormwater release rates offsite from the project is below:

Table 1 – Flow Comparison

DESIGN POINT	EX Q_5 (cfs)	PR Q_5 (cfs)	EX Q_{100} (cfs)	PR Q_{100} (cfs)
DP2	2.1	0.9	8.2	5.0
DP4	5.8	4.0	30.4	26.4
DP6	1.3	-	5.4	-
DP8 (8.1 & 8.2)	10.3	8.3	55.9	54.3
TOTAL	**19.5**	**12.7**	**99.9**	**84.2**

b. Water Quality & Detention

Sand Filter Basin A (Full Spectrum SFB).

Water quality and stormwater detention for Basins EA3-EA5 is provided in Sand Filter Basin A. SFB A is a private, full spectrum sand filter basin within the ACM ALF VIII JV SUB II LLC (previous Waterbury) property within a proposed drainage easement. In SFB A, a total of 1.72 acres of disturbed area from the proposed project at 55% composite imperviousness will be detained and treated for water quality. The WQCV is 0.025 ac-ft, the EURV is 0.102 ac-ft, and the 100-year detention volume is 0.173 ac-ft. The WQCV, EURV and 100-year storms are released in 13, 44 and 49 hours, respectively. A 15' access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 4.75' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard south toward DP4. SFB A outfalls towards DP4 at historic runoff rates. Runoff from DP4 will follow historic drainage patterns and not exceed historic flow rates.

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SFB A Water Quality Treatment Summary Table				
Basin ID	**Total Area (ac)**	**Total Proposed Disturbed Area (ac)**	**Area Trib to SFB A (ac)**	**Disturbed Area Treated via Runoff Reduction (ac)**
EA3	0.53	0.53	0.66	0
EA4	0.90	0.90	1.12	0
EA5	0.29	0.29	0.29	0
Total	1.72	1.72	1.72	0

Extended Detention Basin B (Full Spectrum EDB)

Water quality and detention for Basins EA6 – EA8 is provided in Extended Detention Basin B; a private, full spectrum extended detention basin within Filing No. 1 of Grandview Reserve within a proposed drainage easement. A total of 9.32 acres of disturbed area from the proposed project at 68% composite imperviousness will be treated and detained by EDB B for this phase of the Eastonville Road Improvements. The pond has been sized with consideration for the future segments of Eastonville Road and provides water quality and detention for the ultimate conditions at a future date. The ultimate conditions of EDB B calculations have been provided in the Appendix of this report. Ultimate conditions include fully built sections of Eastonville Road from Londonderry Road to Rex Road and is anticipated for Spring 2025. Interim condition pond sizing calculations have also been provided in the Appendix of this report. Interim conditions only include Eastonville road from Londonderry to Grandview Filing No.1. The ultimate conditions WQCV is 0.207 ac-ft, the EURV is 0.796 ac-ft, and the 100-year detention volume is 1.175 ac-ft. The WQCV, EURV and 100-year storms are released in 41, 69 and 70 hours, respectively. A forebay is located at the outfall into the pond and a 40” trickle channel conveys flow towards the outlet structure. A 15’ access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 15.5’ emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0’ of freeboard towards Gieck Ranch Tributary #1. EDB B outfalls towards DP8 at historic runoff rates. Runoff from DP8 will follow historic drainage patterns and not exceed historic flow rates.

EDB B Water Quality Treatment Summary Table				
Basin ID	**Total Area (ac)**	**Total Proposed Disturbed Area (ac)**	**Area Trib to SFB A (ac)**	**Disturbed Area Treated via Runoff Reduction (ac)**
EA6	1.11	1.11	1.11	0
EA7	1.91	1.91	1.91	0
EA8	0.86	0.86	0.86	0
Total	3.88	3.88	3.88	0

Sand Filter Basin D (Full Spectrum SFB).

Water quality and stormwater detention for Basins EA1-EA2, EA12 is provided in Sand Filter Basin D. SFB D is a private, full spectrum sand filter basin the ACM ALF VIII JV SUB II LLC (previous Waterbury) property within a proposed drainage easement. In SFB D, a total of 2.10 acres of disturbed area from the proposed project at 52% composite imperviousness will be detained and treated for water quality. The WQCV is 0.030 ac-ft, the EURV is 0.117 ac-ft, and the 100-year detention volume is 0.202 ac-ft. The WQCV, EURV and 100-year storms are released in 12, 40 and 43 hours, respectively. A 15' access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 30' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard south toward DP2. SFB D outfalls towards DP4 at historic runoff rates. Runoff from DP2 will follow historic drainage patterns and not exceed historic flow rates

SFB D Water Quality Treatment Summary Table				
Basin ID	**Total Area (ac)**	**Total Proposed Disturbed Area (ac)**	**Area Trib to SFB A (ac)**	**Disturbed Area Treated via Runoff Reduction (ac)**
EA1	0.61	0.61	0.61	0
EA2	1.23	1.23	1.23	0
EA12	0.26	0.26	0.26	0
Total	2.10	2.10	2.10	0

c. 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 are no wetlands in Segment 1 of the project and therefore no wetland permit is required for Segment 1.

VI. Four Step Method to Minimize Adverse Impacts of Urbanization

Step 1 – Reducing Runoff Volumes: Low impact development (LID) practices are utilized to reduce runoff at the source. Storm sewer outfalls have been designed at the upstream end of detention basins. This practice promotes infiltration in the detention basins and reduces peak runoff rates prior to runoff reaching outlet structures.

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 sand filter basins & an extended detention basin provide water quality treatment for the site. The WQCV is released over a period of at least 12 hours for SFBs and 40 hours for EDBs while the EURV is released over a period of 40-44 hours for SFBs and 68 - 72 hours for EDBs.

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. No impact will be made to the Gieck Ranch Tributary #1 by this project that requires additional stream stabilization.

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 has been provided below for public and private drainage infrastructure improvements. This includes cost estimates for the private full spectrum sand filter basin A, private full spectrum sand filter basin D and the private full spectrum extended detention basin B. All required stormwater infrastructure will be installed per El Paso County Requirements. The unit cost includes both materials and labor.

Private Infrastructure Cost Estimate			
Line Item	**Quantity**	**Unit Price**	**Cost**
18" Reinforced Concrete Pipe	239	$76 LF	$18,164
24" Reinforced Concrete Pipe	191.5	$91 LF	$17,427
18" CDOT FES	1	$456 EA	$456
10% Contingency			$3,605
TOTAL:			**$39,651**

Public Infrastructure Cost Estimate			
Line Item	**Quantity**	**Unit Price**	**Cost**
18" Reinforced Concrete Pipe	532	$76 LF	$29,032
30" Reinforced Concrete Pipe	632.5	$114 LF	$72,105
42" Reinforced Concrete Pipe	420	$187 LF	$51,986
18" CDOT FES	2	$456 EA	$912
30" CDOT FES	2	$684 EA	$1,368
42" CDOT FES	1	$912 EA	$912
6' DIA Storm Manhole	9	$7,734 EA	$69,606
5' CDOT Type R Inlet	6	$6,703 EA	$40,218
CDOT Type D Inlet	1	$6,931 EA	$6,931
Rip Rap, d50 size from 6"-24"	5	$97 Tons	$485
10% Contingency			$27,356
TOTAL:			**$300,911**

Private SFB A Cost Estimate			
Line Item	**Quantity**	**Unit Price**	**Cost**
Rip Rap, d50 size from 6"-24" (Inflow)	2	$97 Tons	$194
Sand Filter Media	72.5	$100 /CY	$7,250
4" Perforated PVC Underdrain	100	$10 /LF	$1,000
12" ABC Maintenance Access	25	$40 /CY	$1,000
Outlet Structure w/ Orifice Plate	1	$5,000 EA	$5,000
Rip Rap, d50 size from 6"-24" (Spillway)	60.5	$97 Tons	$5,869
18" RCP Outlet Pipe	54	$82 /LF	$4,428
18" RCP FES	1	$492 EA	$492
10% Contingency			$2,523
TOTAL:			**$27,756**
Private SFB D Cost Estimate			
Line Item	**Quantity**	**Unit Price**	**Cost**
Rip Rap, d50 size from 6"-24" (Inflow)	2	$97 Tons	$194
Sand Filter Media	72.5	$100 /CY	$7,250
4" Perforated PVC Underdrain	100	$10 /LF	$1,000
12" ABC Maintenance Access	25	$40 /CY	$1,000
Outlet Structure w/ Orifice Plate	1	$5,000 EA	$5,000
Rip Rap, d50 size from 6"-24" (Spillway)	60.5	$97 Tons	$5,869
18" RCP Outlet Pipe	54	$82 /LF	$4,428
18" RCP FES	1	$492 EA	$492
10% Contingency			$2,523
TOTAL:			**$27,756**

Private EDB B Cost Estimate				
Line Item	**Quantity**	**Unit Price**		**Cost**
Concrete Forebay	1	$5,000	EA	$5,000
Rip Rap, d50 size from 6"-24" (Inflow)	2.75	$97	Tons	$267
Concrete Trickle Channel	36	$100	/SY	$3,600
12" ABC Maintenance Access	114	$40	/CY	$4,560
Outlet Structure w/ Micropool, Trash Rack, Railng, Orifice Plate	1	$8,000	EA	$8,000
Rip Rap, d50 size from 6"-24" (Spillway)	87	$97	Tons	$8,439
18" RCP Outlet Pipe	31	$76	/LF	$2,356
10% Contingency				$3,222
TOTAL:				**$35,444**

IX. Hydraulic Grade Line Analysis

Hydraulic grade line analysis and final pipe sizes were analyzed, and calculations are provided in Appendix C. All proposed storm sewer has been designed in accordance with El Paso County Drainage Criteria Manuals.

X. Summary

Eastonville Road lies within the Gieck Ranch Drainage Basin. Water quality and detention for the proposed improvements is provided in full spectrum extended detention basins and two full spectrum sand filter basins, both within proposed drainage easements. There is one major drainageway that traverses north of the Segment 1 site: Gieck Ranch Tributary 1. This major drainage way will not be impacted by the proposed improvements. The water quality and detention 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 downstream properties.

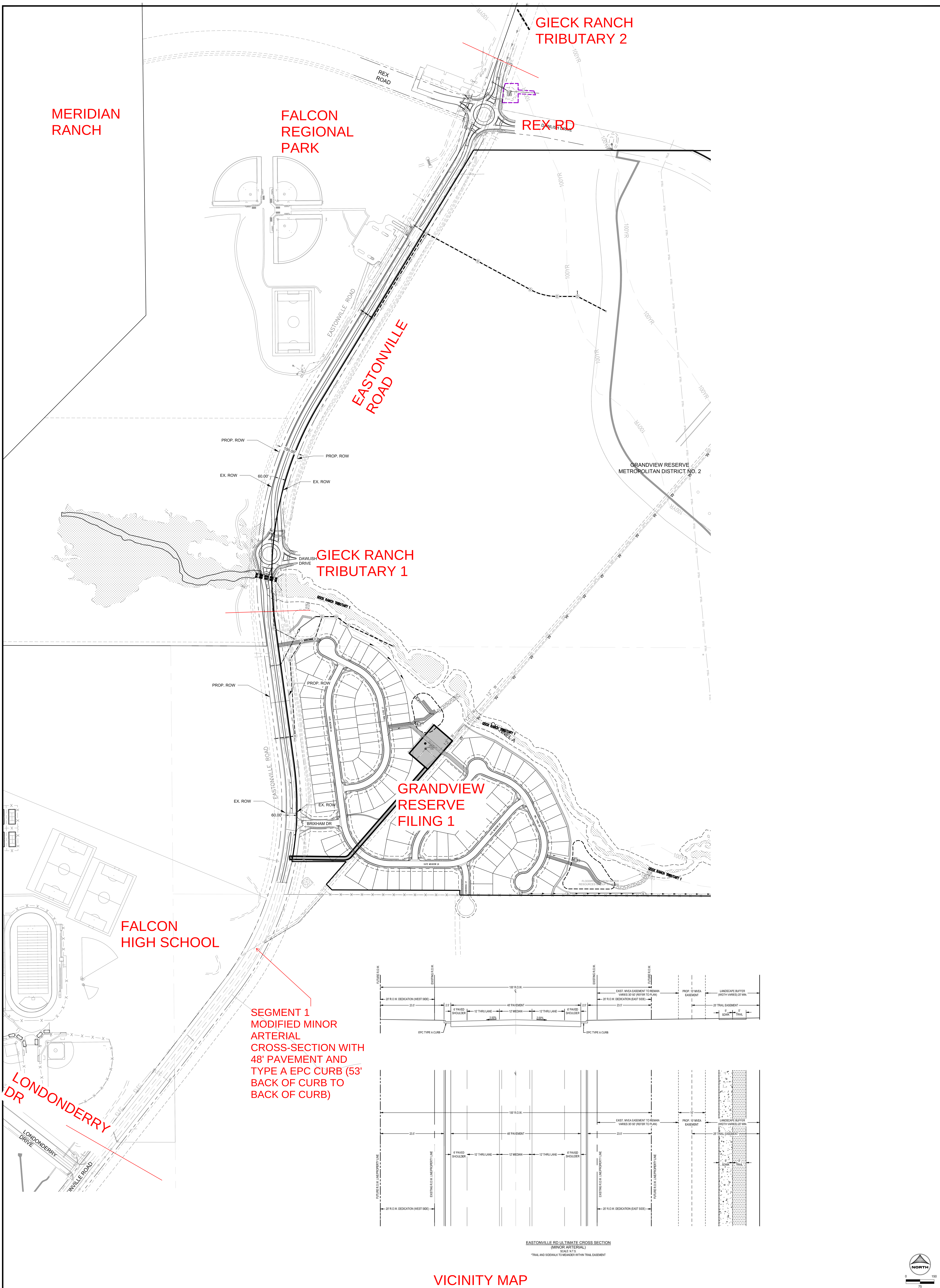
XI. Drawings

Please 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. “Master Development Drainage Plan Meridian Ranch” prepared by Tech Contractors, July 2021.
6. “The Sanctuary Filing 1 at Meridian Ranch” prepared by Tech Contactors, August 2022.

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



DRAWN BY:	CPM	JOB DATE:	8/29/2023
APPROVED:		JOB NUMBER:	201662.08
CAD DATE:	8/29/2023		
CAD FILE:	J:\2020\201662.08\CAD\Dwgs\Exhibits\-Overall-Exhibit		

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

NO.	DATE	BY	REVISION DESCRIPTION

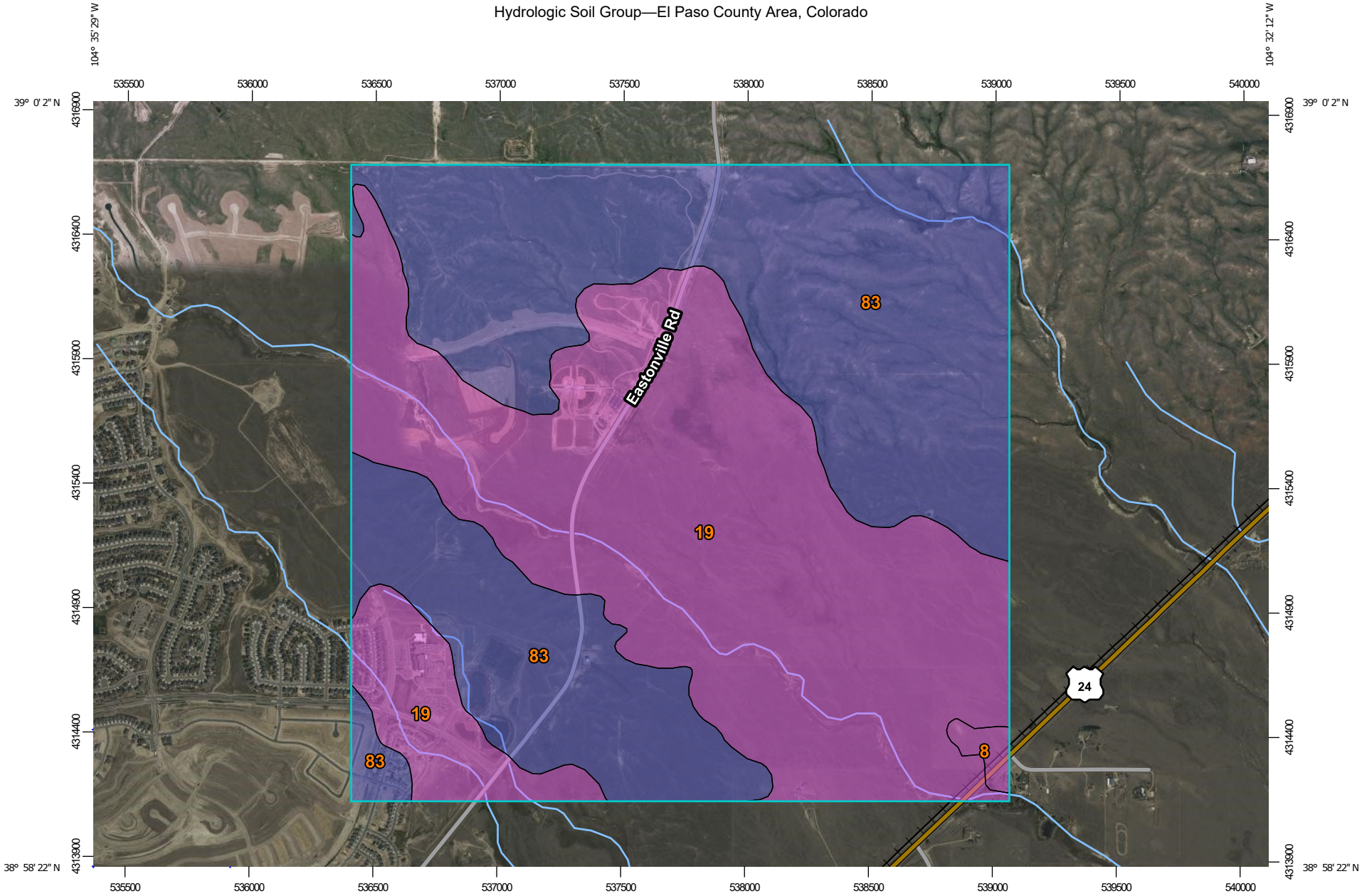
HRGreen
HR GREEN - COLORADO SPRINGS
7222 COMMERCE CENTER DR. SUITE 220
COLORADO SPRINGS CO 80919
PHONE: 719.622.6222
FAX: 844.273.1057

EASTONVILLE ROAD
DR HORTON
EL PASO COUNTY, CO

OVERALL EASTONVILLE PLAN

SHEET 1 | 1

Photo - at Londonderry and Eastonville looking north


104° 35' 29" W
104° 32' 12" W
39° 0' 2" N
38° 58' 22" N
535500
536000
536500
537000
537500
538000
538500
539000
539500
540000
4316900
4316400
4315900
4315400
4314900
4314400
4313900
Eastonville Rd
83
19
83
19
83
8
24
Map Scale: 1:21,700 if printed on A landscape (11" x 8.5") sheet.
N
0 300 600 1200 1800 Meters
0 1000 2000 4000 6000 Feet
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.

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 19, Aug 31, 2021

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
8	Blakeland loamy sand, 1 to 9 percent slopes	A	10.4	0.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	839.5	49.8%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	835.7	49.6%
Totals for Area of Interest			**1,685.6**	**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

NOTES TO USERS

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (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/.

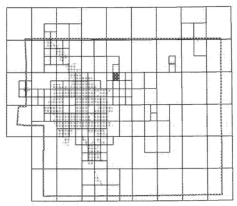
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

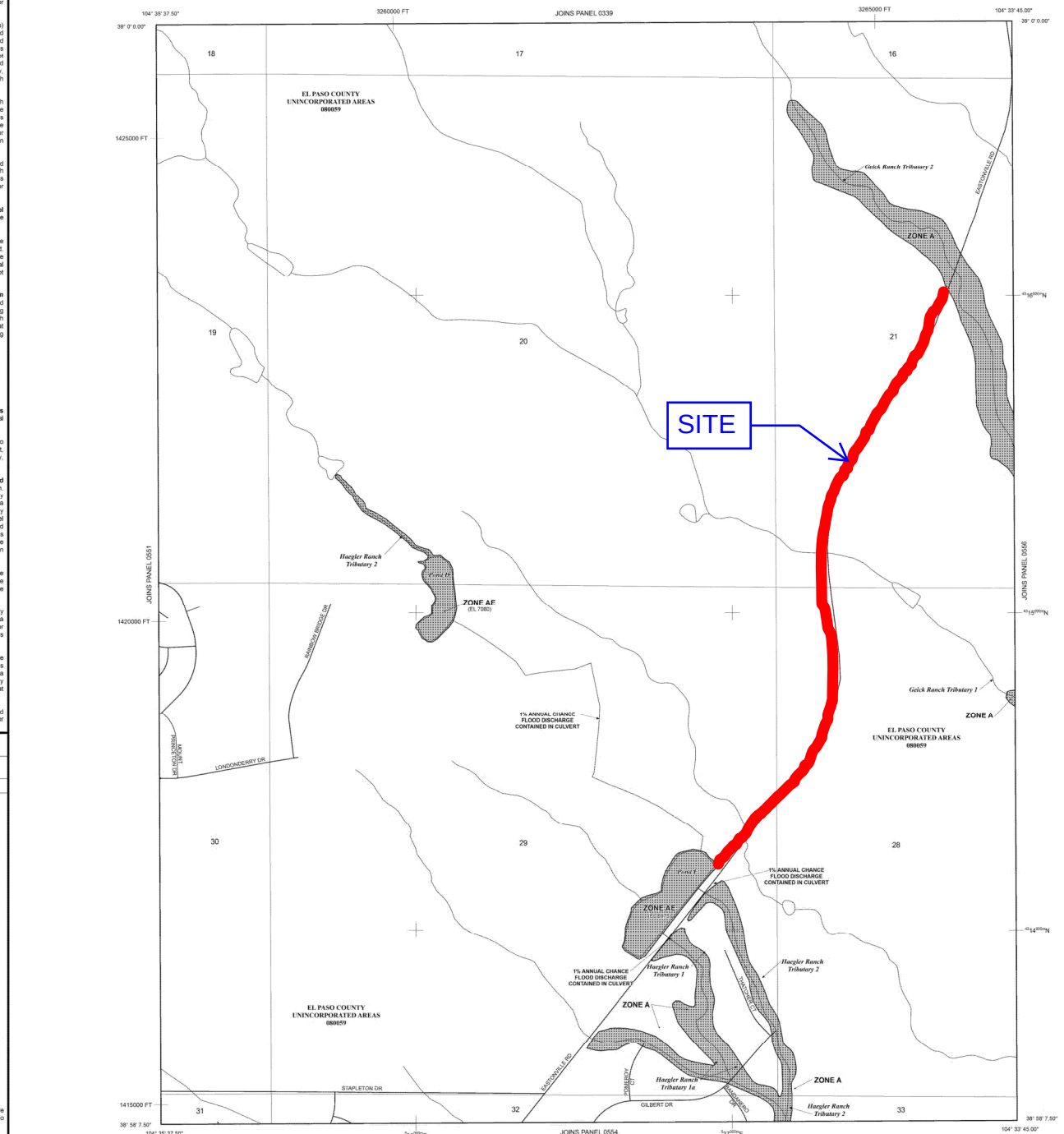
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

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.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST.

LEGEND

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

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

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard 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)
4175000mN — 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 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
DECEMBER 7, 2018

Federal Emergency Management Agency

NOAA Atlas 14, Volume 8, Version 2
Location name: Elbert, Colorado, USA*
Latitude: 38.9796°, Longitude: -104.5696°
Elevation: 6996 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** (0.189-0.303)	**0.291** (0.231-0.370)	**0.381** (0.301-0.486)	**0.461** (0.361-0.589)	**0.576** (0.440-0.768)	**0.671** (0.499-0.904)	**0.770** (0.554-1.06)	**0.875** (0.604-1.24)	**1.02** (0.678-1.48)	**1.14** (0.733-1.67)
10-min	**0.350** (0.277-0.444)	**0.426** (0.338-0.542)	**0.558** (0.441-0.711)	**0.674** (0.529-0.863)	**0.844** (0.644-1.12)	**0.982** (0.731-1.32)	**1.13** (0.811-1.56)	**1.28** (0.884-1.81)	**1.49** (0.992-2.17)	**1.66** (1.07-2.44)
15-min	**0.426** (0.338-0.541)	**0.520** (0.412-0.660)	**0.681** (0.537-0.867)	**0.823** (0.645-1.05)	**1.03** (0.785-1.37)	**1.20** (0.891-1.62)	**1.37** (0.988-1.90)	**1.56** (1.08-2.21)	**1.82** (1.21-2.65)	**2.03** (1.31-2.98)
30-min	**0.608** (0.482-0.771)	**0.740** (0.586-0.940)	**0.968** (0.764-1.23)	**1.17** (0.916-1.49)	**1.46** (1.11-1.94)	**1.70** (1.26-2.28)	**1.94** (1.40-2.68)	**2.20** (1.52-3.12)	**2.57** (1.71-3.73)	**2.86** (1.84-4.19)
60-min	**0.775** (0.615-0.984)	**0.933** (0.739-1.18)	**1.21** (0.956-1.54)	**1.46** (1.15-1.87)	**1.84** (1.41-2.47)	**2.16** (1.61-2.92)	**2.49** (1.80-3.45)	**2.85** (1.97-4.05)	**3.37** (2.24-4.90)	**3.78** (2.44-5.54)
2-hr	**0.943** (0.754-1.19)	**1.12** (0.898-1.42)	**1.46** (1.16-1.84)	**1.76** (1.39-2.23)	**2.22** (1.72-2.97)	**2.62** (1.97-3.52)	**3.04** (2.21-4.19)	**3.50** (2.45-4.95)	**4.16** (2.80-6.03)	**4.70** (3.06-6.85)
3-hr	**1.03** (0.829-1.29)	**1.22** (0.978-1.53)	**1.57** (1.25-1.97)	**1.90** (1.51-2.40)	**2.41** (1.88-3.22)	**2.86** (2.17-3.84)	**3.34** (2.45-4.60)	**3.88** (2.73-5.48)	**4.66** (3.15-6.74)	**5.29** (3.46-7.69)
6-hr	**1.20** (0.968-1.48)	**1.40** (1.13-1.74)	**1.78** (1.44-2.22)	**2.16** (1.73-2.70)	**2.76** (2.18-3.66)	**3.28** (2.52-4.39)	**3.86** (2.86-5.29)	**4.51** (3.20-6.34)	**5.46** (3.73-7.86)	**6.24** (4.12-9.01)
12-hr	**1.38** (1.13-1.70)	**1.61** (1.31-1.98)	**2.05** (1.66-2.53)	**2.48** (2.00-3.07)	**3.15** (2.51-4.15)	**3.74** (2.89-4.96)	**4.39** (3.28-5.96)	**5.12** (3.66-7.13)	**6.17** (4.25-8.82)	**7.04** (4.69-10.1)
24-hr	**1.60** (1.31-1.95)	**1.87** (1.54-2.28)	**2.38** (1.94-2.91)	**2.85** (2.32-3.51)	**3.60** (2.88-4.67)	**4.24** (3.29-5.56)	**4.94** (3.71-6.63)	**5.71** (4.12-7.87)	**6.82** (4.73-9.66)	**7.73** (5.20-11.0)
2-day	**1.85** (1.54-2.24)	**2.18** (1.80-2.63)	**2.76** (2.28-3.34)	**3.29** (2.70-4.01)	**4.11** (3.30-5.27)	**4.80** (3.76-6.22)	**5.54** (4.19-7.36)	**6.35** (4.62-8.68)	**7.50** (5.25-10.5)	**8.44** (5.73-11.9)
3-day	**2.03** (1.69-2.44)	**2.39** (1.98-2.87)	**3.02** (2.50-3.64)	**3.60** (2.97-4.36)	**4.47** (3.60-5.69)	**5.20** (4.08-6.70)	**5.98** (4.55-7.90)	**6.83** (4.99-9.28)	**8.03** (5.65-11.2)	**9.00** (6.15-12.7)
4-day	**2.18** (1.82-2.61)	**2.56** (2.13-3.06)	**3.22** (2.68-3.87)	**3.82** (3.16-4.62)	**4.73** (3.83-6.00)	**5.49** (4.33-7.04)	**6.30** (4.81-8.30)	**7.18** (5.26-9.72)	**8.43** (5.94-11.7)	**9.43** (6.46-13.3)
7-day	**2.58** (2.17-3.07)	**2.98** (2.50-3.54)	**3.68** (3.08-4.39)	**4.32** (3.60-5.18)	**5.29** (4.30-6.65)	**6.09** (4.84-7.76)	**6.96** (5.34-9.09)	**7.89** (5.82-10.6)	**9.21** (6.55-12.8)	**10.3** (7.10-14.4)
10-day	**2.93** (2.48-3.47)	**3.36** (2.84-3.98)	**4.13** (3.47-4.90)	**4.81** (4.02-5.74)	**5.83** (4.76-7.28)	**6.68** (5.32-8.45)	**7.58** (5.85-9.86)	**8.55** (6.34-11.4)	**9.92** (7.08-13.7)	**11.0** (7.65-15.4)
20-day	**3.91** (3.33-4.58)	**4.51** (3.84-5.29)	**5.52** (4.68-6.50)	**6.39** (5.39-7.55)	**7.63** (6.25-9.37)	**8.62** (6.90-10.8)	**9.64** (7.47-12.4)	**10.7** (7.98-14.1)	**12.2** (8.74-16.6)	**13.3** (9.31-18.4)
30-day	**4.70** (4.02-5.47)	**5.44** (4.65-6.34)	**6.65** (5.66-7.78)	**7.66** (6.49-9.00)	**9.06** (7.44-11.0)	**10.1** (8.15-12.5)	**11.2** (8.74-14.3)	**12.3** (9.24-16.2)	**13.8** (9.98-18.7)	**15.0** (10.5-20.6)
45-day	**5.67** (4.88-6.57)	**6.55** (5.63-7.60)	**7.97** (6.82-9.27)	**9.12** (7.77-10.7)	**10.7** (8.79-12.9)	**11.9** (9.56-14.5)	**13.0** (10.2-16.4)	**14.2** (10.6-18.4)	**15.6** (11.3-21.0)	**16.7** (11.9-23.0)
60-day	**6.48** (5.60-7.48)	**7.46** (6.43-8.62)	**9.01** (7.74-10.4)	**10.3** (8.77-11.9)	**11.9** (9.82-14.3)	**13.1** (10.6-16.0)	**14.3** (11.2-18.0)	**15.5** (11.7-20.0)	**16.9** (12.3-22.6)	**18.0** (12.8-24.6)

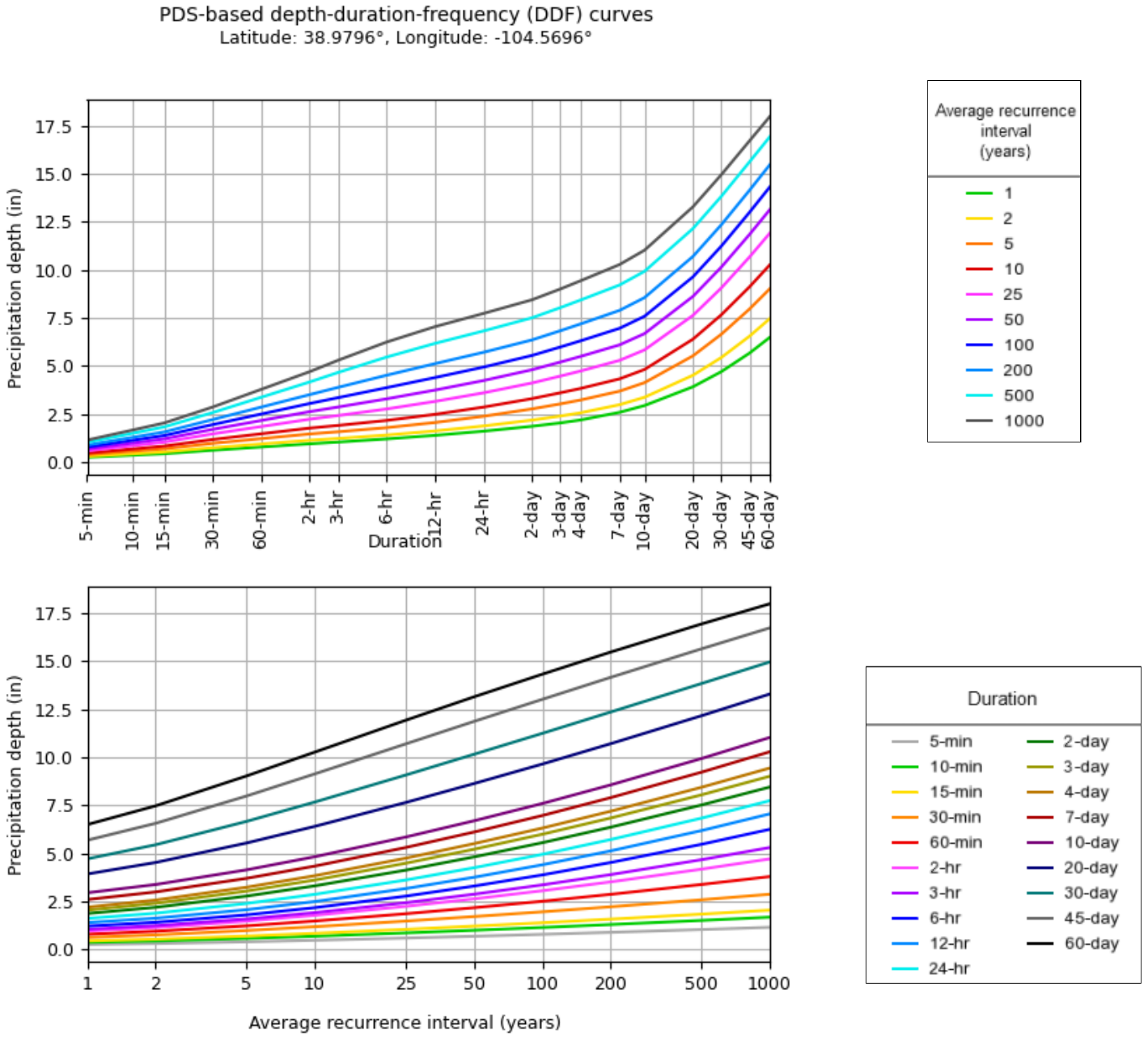
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



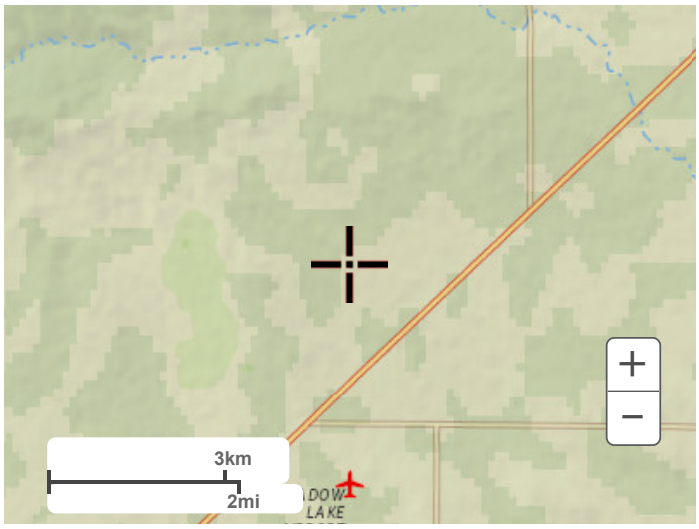
NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Nov 22 20:22:49 2023

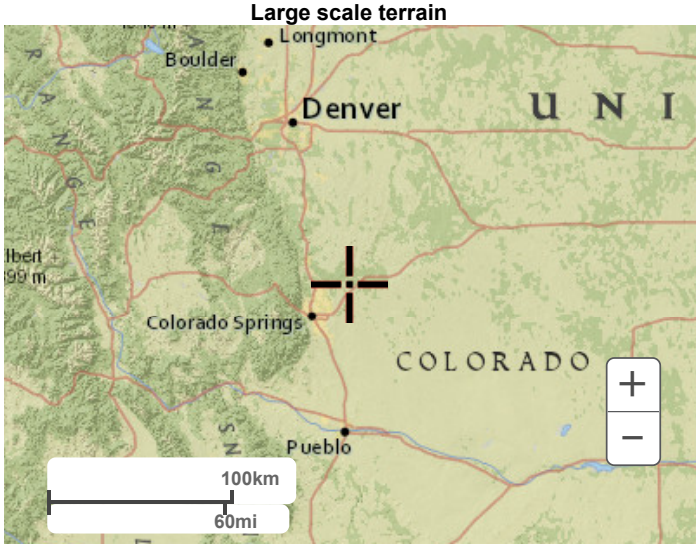
Back to Top

Maps & aerials

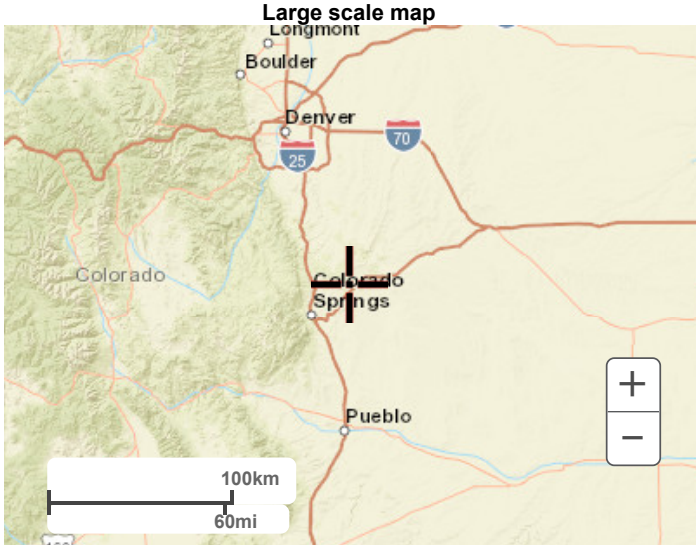
Small scale terrain



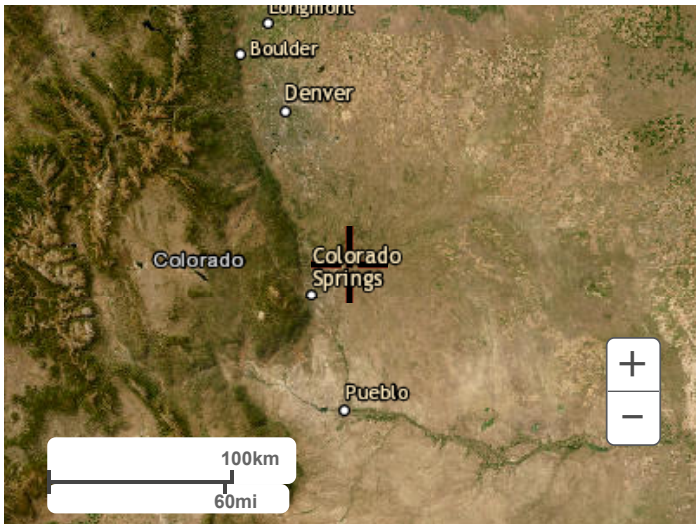
Large scale terrain



Large scale map



Large scale aerial



Back to Top

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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

APPENDIX B – HYDROLOGIC CALCULATIONS

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**SPC**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**3/11/2024**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
E1	0.47	46	0.7	1.7
E2	1.25	18	1.0	3.5
E3	0.47	58	1.0	2.1
E4	1.67	20	1.4	4.6
E5	0.23	45	0.5	1.1
E6	0.21	49	0.5	1.1
E7	0.23	45	0.5	1.2
E8	0.18	56	0.4	0.9
E9	0.72	46	1.2	2.7
E10	0.72	50	1.3	2.8
OS1	1.58	2	0.5	3.6
OS2	12.21	2	3.6	24.3
OS3.1	1.51	2	0.5	3.6
OS3.2	2.86	2	1.0	6.6
OS3.3	21.12	2	6.4	42.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	E1,OS1	1.2	4.9
2	E2,DP1	2.1	8.2
3	E3,OS2	4.5	26.1
4	DP3,E4	5.8	30.4
5	E5,OS3.1	0.9	4.5
6	DP5,E6	1.3	5.4
7.1	E7,OS3.2	1.4	7.5
8.1	DP7.1,E8	1.7	8.2
7.2	OS3.3,E9	7.4	45.3
8.2	DP7.2,E10	8.6	47.7

HRGreen	**EASTONVILLE ROAD** **EXISTING CONDITIONS** **EL PASO COUNTY, CO**

Calc'd by:	**SPC**
Checked by:	
Date:	**11/27/2023**

SOIL TYPE:	**HSG A&B**

COMPOSITE 'C' FACTORS

	LAND USE TYPE															TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	Paved			Historic Flow Analysis-- Greenbelts, Agriculture			Land Use Undefined			Land Use Undefined			Land Use Undefined						
	%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	2	0.09	0.36	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00				
BASIN	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
E1	0.21			0.26												0.47	46	0.45	0.63
E2	0.20			1.05												1.25	18	0.22	0.46
E3	0.27			0.20												0.47	58	0.56	0.70
E4	0.31			1.36												1.67	20	0.24	0.47
E5	0.10			0.13												0.23	45	0.44	0.62
E6	0.10			0.11												0.21	49	0.48	0.65
E7	0.10			0.13												0.23	45	0.44	0.62
E8	0.10			0.08												0.18	56	0.54	0.69
E9	0.32			0.40												0.72	46	0.45	0.63
E10	0.35			0.37												0.72	50	0.48	0.65
OS1				1.58												1.58	2	0.09	0.36
OS2				12.21												12.21	2	0.09	0.36
OS3.1				1.51												1.51	2	0.09	0.36
OS3.2				2.86												2.86	2	0.09	0.36
OS3.3				21.12												21.12	2	0.09	0.36

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**SPC**
	EXISTING CONDITIONS	**Checked by:**	
	EL PASO COUNTY, CO	**Date:**	**3/11/2024**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
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)
E1	0.45	0.47	117	11.6	5.7	10	1162	3.4	1.8	10.5	16.2
E2	0.22	1.25	87	2.4	11.2	10	518	1.7	1.3	6.6	17.9
E3	0.56	0.47	40	2.0	5.0	10	794	2.5	1.6	8.4	13.4
E4	0.24	1.67	113	5.5	9.5	10	830	2.5	1.6	8.7	18.2
E5	0.44	0.23	30	13.8	2.8	10	310	1.4	1.2	4.4	7.1
E6	0.48	0.21	30	13.8	2.6	10	310	1.4	1.2	4.4	7.0
E7	0.44	0.23	35	25.0	2.4	10	161	0.6	0.8	3.5	5.9
E8	0.54	0.18	25	1.0	5.1	10	161	0.6	0.8	3.5	8.6
E9	0.45	0.72	30	2.0	5.2	10	711	0.5	0.7	16.8	21.9
E10	0.48	0.72	30	2.0	4.9	10	711	0.5	0.7	16.8	21.7
OS1	0.09	1.58	300	2.8	22.8	10	213	4.5	2.1	1.7	24.4
OS2	0.09	12.21	300	4.1	20.0	10	1042	3.4	1.8	9.4	29.5
OS3.1	0.09	1.51	136	3.9	13.7	10	150	8.9	3.0	0.8	14.6
OS3.2	0.09	2.86	174	8.6	11.9	10	267	4.4	2.1	2.1	14.0
OS3.3	0.09	21.12	300	6.0	17.7	10	930	3.4	1.8	8.4	26.1

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

EASTONVILLE ROAD
EXISTING CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: SPC
Checked by:
Date: 3/11/2024

			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	
		E1	0.47	0.45	16.2	0.21	3.41	0.7															BASIN E1 CAPTURED @ DP1
	1	OS1	1.58	0.09	12.9	0.14	3.75	0.5	16.2	0.35	3.41	1.2				1.2	0.35	0.6	3.0	73	7.5	0.16	BASIN E1 AND OS1 COMBINE @ DP1 CAPTURED IN 36" CMP CULVERT, PIPED TO BASIN E2
	2	E2	1.25	0.22	13.4	0.27	3.69	1.0	16.3	0.63	3.39	2.1											FLOW @ DP2 CONVEYED OFFSITE
		E3	0.47	0.56	13.4	0.26	3.69	1.0															BASIN E3 CAPTURED @ DP3
	3	OS2	12.21	0.09	17.5	1.10	3.29	3.6	17.5	1.36	3.29	4.5				4.5	1.36	1.1	2.0	47	7.6	0.10	BASIN E3 AND OS2 COMBINE @ DP3 CAPTURED IN 24" CMP CULVERT, PIPED TO BASIN E4
	4	E4	1.67	0.24	15.2	0.40	3.50	1.4	17.6	1.76	3.28	5.8											FLOW @ DP4 CONVEYED OFFSITE
		E5	0.23	0.44	7.1	0.10	4.64	0.5															BASIN E5 CAPTURED @ DP5
	5	OS3.1	1.51	0.09	11.6	0.14	3.91	0.5	11.6	0.24	3.91	0.9				0.9	0.24	1.3	1.5	56	6.8	0.14	BASIN E5 AND OS3 COMBINE @ DP5 CAPTURED IN 18" CMP CULVERT, PIPED TO BASIN E6
	6	E6	0.21	0.48	7.0	0.10	4.67	0.5	11.7	0.34	3.89	1.3											FLOW @ DP6 CONVEYED OFFSITE
		E7	0.23	0.44	5.9	0.10	4.92	0.5															BASIN E7 CAPTURED @ DP7
	7.1	OS3.2	2.86	0.09	12.5	0.26	3.80	1.0	12.5	0.36	3.80	1.4				1.4	0.36	0.2	1.5	53	2.3	0.38	BASIN E7 AND OS4.1 COMBINE @ DP7.1 CAPTURED IN 18" CMP CULVERT, PIPED TO BASIN E8
	8.1	E8	0.18	0.54	8.6	0.10	4.36	0.4	12.8	0.46	3.75	1.7											FLOW @ DP8.1 CONVEYED OFFSITE
		E9	0.72	0.45	14.1	0.32	3.61	1.2															BASIN E9 CAPTURED @ DP7.2
	7.2	OS3.3	21.12	0.09	16.8	1.90	3.35	6.4	16.8	2.22	3.35	7.4				7.4	2.22	0.8	1.5	43	5.3	0.13	BASIN E9 AND OS 4.2 COMBINE @ DP7.2 CAPTURED IN 18" CMP CULVERT, PIPED TO BASIN E10
	8.2	E10	0.72	0.48	14.1	0.35	3.61	1.3	17.0	2.57	3.34	8.6											FLOW @ DP8.2 CONVEYED OFFSITE

HRGreen

EASTONVILLE ROAD
EXISTING CONDITIONS
DESIGN STORM: 100-YEAR

Calc'd by: SPC
Checked by:
Date: 3/11/2024

			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)	
		E1	0.47	0.63	16.2	0.30	5.72	1.7															BASIN E1 CAPTURED @ DP1
	1	OS1	1.58	0.36	12.9	0.57	6.30	3.6	16.2	0.86	5.72	4.9				4.9	0.86	0.6	3.0	73	7.5	0.16	BASIN E1 AND OS1 COMBINE @ DP1 CAPTURED IN 36" CMP CULVERT, PIPED TO BASIN E2
	2	E2	1.25	0.46	13.4	0.57	6.20	3.5	16.3	1.43	5.69	8.2											FLOW @ DP2 CONVEYED OFFSITE
		E3	0.47	0.70	13.4	0.33	6.20	2.1															BASIN E3 CAPTURED @ DP3
	3	OS2	12.21	0.36	17.5	4.40	5.53	24.3	17.5	4.73	5.53	26.1				26.1	4.73	1.1	2.0	47	7.6	0.10	BASIN E3 AND OS2 COMBINE @ DP3 CAPTURED IN 24" CMP CULVERT, PIPED TO BASIN E4
	4	E4	1.67	0.47	15.2	0.79	5.87	4.6	17.6	5.51	5.51	30.4											FLOW @ DP4 CONVEYED OFFSITE
		E5	0.23	0.62	7.1	0.14	7.79	1.1															BASIN E5 CAPTURED @ DP5
	5	OS3.1	1.51	0.36	11.6	0.54	6.56	3.6	11.6	0.69	6.56	4.5				4.5	0.69	1.3	1.5	56	6.8	0.14	BASIN E5 AND OS3 COMBINE @ DP5 CAPTURED IN 18" CMP CULVERT, PIPED TO BASIN E6
	6	E6	0.21	0.65	7.0	0.14	7.84	1.1	11.7	0.82	6.53	5.4											FLOW @ DP6 CONVEYED OFFSITE
		E7	0.23	0.62	5.9	0.14	8.26	1.2															BASIN E7 CAPTURED @ DP7
	7.1	OS3.2	2.86	0.36	12.5	1.03	6.38	6.6	12.5	1.17	6.38	7.5				7.5	1.17	0.2	1.5	53	2.3	0.38	BASIN E7 AND OS4.1 COMBINE @ DP7.1 CAPTURED IN 18" CMP CULVERT, PIPED TO BASIN E8
	8.1	E8	0.18	0.69	8.6	0.12	7.31	0.9	12.8	1.30	6.30	8.2											FLOW @ DP8.1 CONVEYED OFFSITE
		E9	0.72	0.63	14.1	0.45	6.06	2.7															BASIN E9 CAPTURED @ DP7.2
	7.2	OS3.3	21.12	0.36	16.8	7.60	5.62	42.7	16.8	8.05	5.62	45.3				45.3	8.05	0.8	1.5	43	5.3	0.13	BASIN E9 AND OS 4.2 COMBINE @ DP7.2 CAPTURED IN 18" CMP CULVERT, PIPED TO BASIN E10
	8.2	E10	0.72	0.65	14.1	0.47	6.06	2.8	17.0	8.52	5.60	47.7											FLOW @ DP8.2 CONVEYED OFFSITE

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**SPC**
	PROPOSED CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**3/14/2024**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
EA1	0.61	86	2.2	4.1
EA2	1.23	44	2.2	5.3
EA3	0.53	87	2.1	3.4
EA4	0.90	52	2.0	3.4
EA5	0.29	4	0.2	0.3
EA6	1.11	88	3.0	5.1
EA7	1.91	55	3.3	5.6
EA8	0.86	50	0.5	0.8
EA9	0.92	35	0.4	0.6
EA10	0.37	23	0.2	0.3
EA11	0.15	0	0.1	0.1
EA12	0.26	10	0.2	0.8
EA13	0.21	0	0.1	0.5
EA8 & EA9 *Per Segment 2 FDR	5.07	78	10.2	17.2
OS1	1.63	2	0.5	3.6
OS2	12.33	2	3.7	24.5
OS3	25.36	2	7.9	53.3

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
1	OS1	0.5	3.6
2	OS1, Pond D Release	0.9	5.0
3	OS2	3.7	24.5
4	OS2, POND A RELEASE	4.0	25.7
7	OS3	7.9	53.3
8	OS3, POND B RELEASE	8.3	54.3
9	EA1	2.2	4.1
10	DP9, EA2	4.2	9.0
11	DP10, EA12	4.3	9.5
12	EA13	0.1	0.5
13	EA3	2.1	3.4
14	DP13, EA4	3.9	6.5
15	DP14, EA5	4.0	6.7
16	EA6	3.0	5.1
17	DP16, EA7	6.3	10.5
18	DP17	6.3	10.5
19	DP18,EA8	6.6	11.1
18U	DP17, EA8 & EA9 *PER SEGMENT 2 FDR	15.6	26.2
19U	DP18, EA8	15.9	26.6
20	EA9	0.4	0.6
21	EA10	0.2	0.3
22	EA11	0.1	0.1

EASTONVILLE ROAD
PROPOSED CONDITIONS
EL PASO COUNTY, CO

Calc'd by: SPC

Checked by: CM

Date: 11/27/2023

SOIL TYPE: HSG A&B

COMPOSITE 'C' FACTORS

BASIN	LAND USE TYPE															TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	Paved			Historic Flow Analysis-- Greenbelts, Agriculture			Lawns			Gravel			Land Use Undefined						
	%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	2	0.09	0.36	0	0.08	0.35	80	0.59	0.70	0	0.00	0.00				
	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
EA1	0.52						0.09									0.61	86	0.78	0.87
EA2	0.54						0.69									1.23	44	0.44	0.62
EA3	0.46						0.07									0.53	87	0.79	0.88
EA4	0.47						0.43									0.90	52	0.51	0.67
EA5							0.28			0.01						0.29	4	0.11	0.37
EA6	0.97						0.14									1.11	88	0.80	0.88
EA7	1.05						0.86									1.91	55	0.53	0.69
EA8							0.76			0.10						0.86	9	0.14	0.39
EA9							0.92									0.92	0	0.08	0.35
EA10							0.37									0.37	0	0.08	0.35
EA11							0.15									0.15	0	0.08	0.35
EA12							0.23			0.03						0.26	10	0.14	0.39
EA13							0.21									0.21	0	0.08	0.35
OS1				1.63												1.63	2	0.09	0.36
OS2				12.33												12.33	2	0.09	0.36
OS3				25.36												25.36	2	0.09	0.36
EA8 & EA9 *Per Segment 2 FDR	3.94						1.13									5.07	78	0.72	0.82
SFB A	0.93			0.00			0.77			0.01			0.00			1.72	55		
EDB B	2.02			0.00			1.76			0.10			0.00			3.88	54		
SFB D	1.06			0.00			1.01			0.03			0.00			2.10	52		

HRGreen	**EASTONVILLE ROAD**	**Calc'd by:**	**SPC**
	PROPOSED CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**3/14/2024**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
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)
EA1	0.78	0.61	26	2.0	2.3	20	734	1.6	2.5	4.9	7.3
EA2	0.44	1.23	26	2.0	4.9	20	734	1.6	2.5	4.9	9.8
EA3	0.79	0.53	26	2.0	2.3	20	326	0.5	1.4	3.8	6.1
EA4	0.51	0.90	26	2.0	4.4	20	326	0.5	1.4	3.8	8.2
EA5	0.11	0.29	25	25.0	3.1	10	100	0.5	0.7	2.4	5.5
EA6	0.80	1.11	26	2.0	2.2	20	1304	0.6	1.5	14.0	16.3
EA7	0.53	1.91	26	2.0	4.2	20	1304	0.6	1.5	14.0	18.3
EA8	0.14	0.86	100	9.0	8.5	10	102	0.5	0.7	2.4	10.9
EA9	0.08	0.92	50	24.4	4.6	10	0	0	0.0	0.0	5.0
EA10	0.08	0.37	35	24.4	3.8	10	0	0	0.0	0.0	5.0
EA11	0.08	0.15	23	18.0	3.4	10	0	0	0.0	0.0	5.0
EA12	0.14	0.26	117	12.0	8.3	10	0	0	0.0	0.0	8.3
EA13	0.08	0.21	82	2.0	13.4	10	0	0	0.0	0.0	13.4
EA8 & EA9 *Per Segment 2 FDR	0.72	5.07	26	2.0	2.8	20	2500	0.7	1.7	24.9	27.7
OS1	0.09	1.63	100	2.7	13.3	10	633	1.5	1.2	8.6	22.0
OS2	0.09	12.33	100	4.3	11.4	10	1243	3.2	1.8	11.6	23.0
OS3	0.09	25.36	100	6.5	9.9	10	879	3.2	1.8	8.2	18.1

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

EASTONVILLE ROAD
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	3/14/2024

			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 (mi	
	1	OS1	1.63	0.09	14.1	0.15	3.62	0.5	14.1	0.15	3.62	**0.5**				0.5	0.15	0.5	1.5	115	4.2	0.46	BASIN OS1 @ DP1 CAPTURED IN 18" RCP CULVERT, DRAINS TO BASIN DP2
	2								14.5	0.15	3.62	**0.9**											FLOW @ DP2 CONVEYED OFFSITE (INCLUDES POND D 5-YR RELEASE RATE @ 0.4 CFS)
	3	OS2	12.33	0.09	17.5	1.11	3.29	3.7	17.5	1.11	3.29	**3.7**				3.7	1.11	2.6	2.5	186	13.5	0.23	BASIN OS2 @ DP3 CAPTURED IN 30" RCP CULVERT, DRAINS TO BASIN DP4
	4								17.7	1.11	3.29	**4.0**											FLOW @ DP4 CONVEYED OFFSITE (INCLUDES DETENTION POND A 5-YR RELEASE RATE @ 0.3 CFS)
	7	OS3	25.36	0.09	15.4	2.28	3.48	7.9	15.4	2.28	3.48	**7.9**				7.9	2.28	0.6	3.0	445	7.3	1.01	BASIN OS3 FLOW @ DP7 CAPTURTED IN CDOT TYPE D INLET, PIPED TO DP8
	8								16.5	2.28	3.48	**8.3**											FLOW @ DP4 CONVEYED OFFSITE (INCLUDES DETENTION POND B 5-YR RELEASE RATE @ 0.4 CFS)
	9	EA1	0.61	0.78	7.3	0.48	4.61	2.2	7.3	0.48	4.61	**2.2**				2.2	0.48	0.5	1.5	52	4.2	0.21	BASIN EA1 CAPTURED @ DP9 BY TYPE R INLET
	10	EA2	1.23	0.44	9.8	0.54	4.15	2.2	9.8	1.02	4.15	**4.2**				4.2	1.02	0.5	1.5	128	4.2	0.51	BASIN EA2 CAPTURED @ DP10 BY TYPE R INLET
	11	EA12	0.26	0.14	8.3	0.04	4.41	0.2	10.3	1.05	4.08	**4.3**											BASIN EA12 SHEEET FLOWS DIRECTLY TO SFB D
	12	EA13	0.21	0.08	10.5	0.02	4.06	0.1	10.5	0.02	4.08	**0.1**											FLOW @ DP12 CONVEYED OFFSITE
	13	EA3	0.53	0.79	6.1	0.42	4.87	2.1	6.1	0.42	4.87	**2.1**				2.1	0.42	1.3	1.5	56	6.8	0.14	BASIN EA3 CAPTURED @ DP13 BY TYPE R INLET
	14	EA4	0.90	0.51	8.2	0.46	4.42	2.0	8.2	0.88	4.42	**3.9**				3.9	0.88	1.3	1.5	56	6.8	0.14	BASIN EA4 CAPTURED @ DP14 BY TYPE R INLET
	15	EA5	0.29	0.11	5.5	0.03	5.03	0.2	8.4	0.91	4.40	**4.0**				4.0	0.91	0.5	1.5	36	4.2	0.14	BASIN EA5 SHEEET FLOWS DIRECTLY TO SFB A
	16	EA6	1.11	0.80	16.3	0.89	3.40	3.0	16.3	0.89	3.40	**3.0**				3.0	0.89	0.5	1.5	52	4.2	0.21	BASIN EA6 CAPTURED @ DP16 BY TYPE R INLET
	17	EA7	1.91	0.53	17.4	1.01	3.30	3.3	17.4	1.90	3.30	**6.3**				6.3	1.90	0.5	2.0	196	5.1	0.64	BASIN EA7 CAPTURED @ DP17 BY TYPE R INLET
	18								17.4	1.90	3.30	**6.3**				6.3	1.90	0.5	2.0	42	5.1	0.14	STORM MH @ D18, NO FUTURE FLOW
	19	EA8	0.86	0.14	10.9	0.12	4.00	0.5	17.5	2.02	3.29	**6.6**				6.6	2.02	0.5	2.0	196	5.1	0.64	BASIN EA8 SHEEET FLOWS DIRECTLY TO EDB B (NO FUTURE FLOWS)
	18U	EA8 & EA9 *Per Segment 2 FDR	5.07	0.72	24.0	3.64	2.81	10.2	24.0	5.54	2.81	**15.6**				15.6	5.54	0.5	2.0	42	5.1	0.14	FUTURE FLOW COMBINES @ DP18 WITH SEGMENT 1 FLOWS @ STORM MH
	19U	EA8	0.86	0.14	10.9	0.12	4.00	0.5	24.2	5.66	2.81	**15.9**											BASIN EA8 SHEEET FLOWS DIRECTLY TO EDB B INCLUDING FUTURE TRIBUTARY FLOW FROM SUBBASIN EA8 & EA9 PER THE EASTONVILLE ROAD SEGMENT 2 FDR
	20	EA9	0.92	0.08	5.0	0.07	5.17	0.4	5.0	0.07	5.17	**0.4**											BASIN EA9 SHEET FLOWS OFFSITE
	21	EA10	0.37	0.08	5.0	0.03	5.17	0.2	5.0	0.03	5.17	**0.2**											BASIN EA10 SHEET FLOWS OFFFSITE
	22	EA11	0.15	0.08	5.0	0.01	5.17	0.1	5.0	0.01	5.17	**0.1**											BASIN EA11 SHEET FLOWS OFFSITE

HRGreen

EASTONVILLE ROAD
PROPOSED CONDITIONS
DESIGN STORM: 100-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	3/14/2024

			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	OS1	1.63	0.36	14.1	0.59	6.07	3.6	14.1	0.59	6.07	**3.6**				3.6	0.59	0.5	1.5	115	4.2	0.46	BASIN OS1 @ DP1 CAPTURED IN 18" RCP CULVERT, DRAINS TO BASIN DP2
	2								14.5	0.59	6.07	**5.0**											FLOW @ DP2 CONVEYED OFFSITE (INCLUDES POND D 100-YR RELEASE RATE @ 1.4 CFS)
	3	OS2	12.33	0.36	17.5	4.44	5.53	24.5	17.5	4.44	5.53	**24.5**				24.5	4.44	2.6	2.5	186	13.5	0.23	BASIN OS2 @ DP3 CAPTURED IN 30" RCP CULVERT, DRAINS TO BASIN DP4
	4			2.00					17.7	4.44	5.53	**25.7**											FLOW @ DP4 CONVEYED OFFSITE (INCLUDES DETENTION POND A 100-YR RELEASE RATE @ 1.2 CFS)
	7	OS3	25.36	0.36	15.4	9.13	5.84	53.3	15.4	9.13	5.84	**53.3**				53.3	9.13	0.6	3.0	445	7.3	1.01	BASIN OS3 FLOW @ DP7 CAPTURTED IN CDOT TYPE D INLET, PIPED TO DP8
	8								16.5	9.13	5.84	**54.3**											FLOW @ DP4 CONVEYED OFFSITE (INCLUDES DETENTION POND B 100-YR RELEASE RATE @ 1.0 CFS)
	9	EA1	0.61	0.87	7.3	0.53	7.74	4.1	7.3	0.53	7.74	**4.1**				4.1	0.53	0.5	1.5	52	4.2	0.21	BASIN EA1 CAPTURED @ DP9 BY TYPE R INLET
	10	EA2	1.23	0.62	9.8	0.76	6.97	5.3	9.8	1.29	6.97	**9.0**				9.0	1.29	0.5	1.5	128	4.2	0.51	BASIN EA2 CAPTURED @ DP10 BY TYPE R INLET
	11	EA12	0.26	0.39	8.3	0.10	7.40	0.8	10.3	1.39	6.85	**9.5**											BASIN EA12 SHEEET FLOWS DIRECTLY TO SFB D
	12	EA13	0.21	0.35	10.5	0.07	6.82	0.5	10.5	0.07	6.85	**0.5**											FLOW @ DP12 CONVEYED OFFSITE
	13	EA3	0.53	0.79	6.1	0.42	8.18	3.4	6.1	0.42	8.18	**3.4**				3.4	0.42	1.3	1.5	56	6.8	0.14	BASIN EA3 CAPTURED @ DP13 BY TYPE R INLET
	14	EA4	0.90	0.51	8.2	0.46	7.42	3.4	8.2	0.88	7.42	**6.5**				6.5	0.88	1.3	1.5	56	6.8	0.14	BASIN EA4 CAPTURED @ DP14 BY TYPE R INLET
	15	EA5	0.29	0.11	5.5	0.03	8.45	0.3	8.4	0.91	7.38	**6.7**				6.7	0.91	0.5	1.5	36	4.2	0.14	BASIN EA5 SHEEET FLOWS DIRECTLY TO SFB A
	16	EA6	1.11	0.80	16.3	0.89	5.71	5.1	16.3	0.89	5.71	**5.1**				5.1	0.89	0.5	1.5	52	4.2	0.21	BASIN EA6 CAPTURED @ DP16 BY TYPE R INLET
	17	EA7	1.91	0.53	17.4	1.01	5.54	5.6	17.4	1.90	5.54	**10.5**				10.5	1.90	0.5	2.0	196	5.1	0.64	BASIN EA7 CAPTURED @ DP17 BY TYPE R INLET
	18								17.4	1.90	5.54	**10.5**				10.5	1.90	0.5	2.0	42	5.1	0.14	STORM MH @ D18, NO FUTURE FLOW
	19	EA8	0.86	0.14	10.9	0.12	6.72	0.8	17.5	2.02	5.52	**11.1**				11.1	2.02	0.5	2.0	196	5.1	0.64	BASIN EA8 SHEEET FLOWS DIRECTLY TO EDB B (NO FUTURE FLOWS)
	18U	EA8 & EA9 *Per Segment 2 FDR	5.07	0.72	24.0	3.64	4.72	17.2	24.0	5.54	4.72	**26.2**				26.2	5.54	0.5	2.0	42	5.1	0.14	FUTURE FLOW COMBINES @ DP18 WITH SEGMENT 1 FLOWS @ STORM MH
	19U	EA8	0.86	0.14	10.9	0.12	6.72	0.8	24.2	5.66	4.71	**26.6**											BASIN EA8 SHEEET FLOWS DIRECTLY TO EDB B INCLUDING FUTURE TRIBUTARY FLOW FROM SUBBASIN EA8 & EA9 PER THE EASTONVILLE ROAD SEGMENT 2 FDR
	20	EA9	0.92	0.08	5.0	0.07	8.68	0.6	5.0	0.07	8.68	**0.6**											BASIN EA9 SHEET FLOWS OFFSITE
	21	EA10	0.37	0.08	5.0	0.03	8.68	0.3	5.0	0.03	8.68	**0.3**											BASIN EA10 SHEET FLOWS OFFFSITE
	22	EA11	0.15	0.08	5.0	0.01	8.68	0.1	5.0	0.01	8.68	**0.1**											BASIN EA11 SHEET FLOWS OFFSITE

APPENDIX C – HYDRAULIC CALCULATIONS

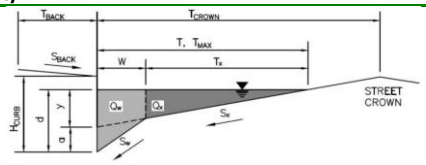
MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**

Inlet ID: **Eastonville Rd Capacity**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.006	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.2**	**18.6**	**cfs**

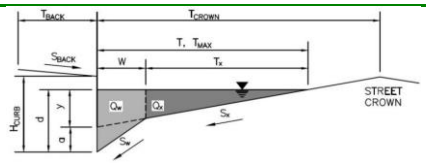
Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.50 cfs on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**
Inlet ID: **Inlet DP9**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

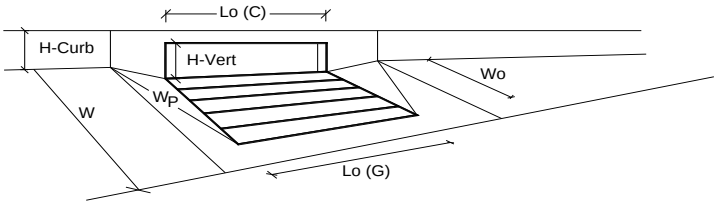
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



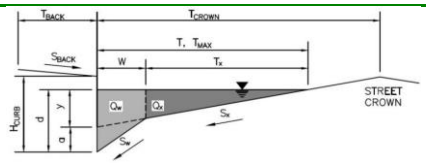
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**6.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.8	3.3	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**

Inlet ID: **Inlet DP10**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	23.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

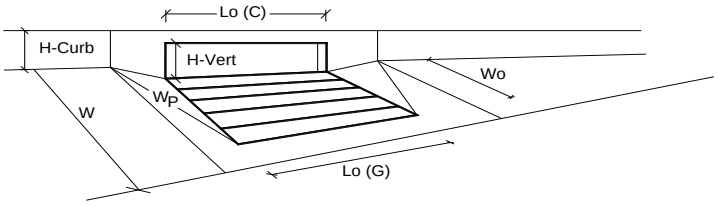
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



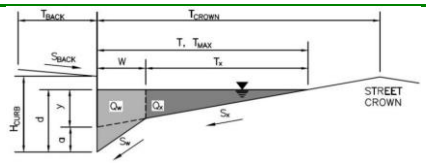
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**6.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.8	4.0	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**

Inlet ID: **Inlet DP13**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

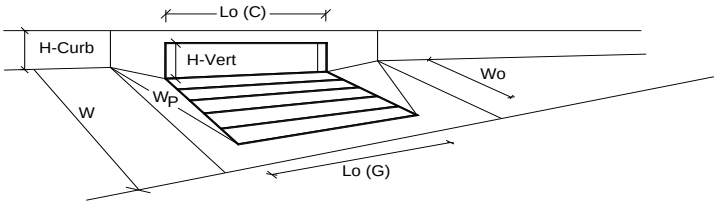
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



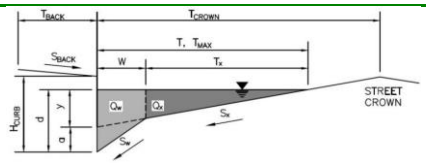
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**6.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.6	4.4	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**

Inlet ID: **Inlet DP14**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	23.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

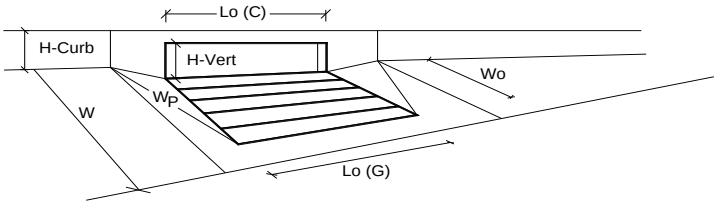
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**6.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.6	4.4	cfs

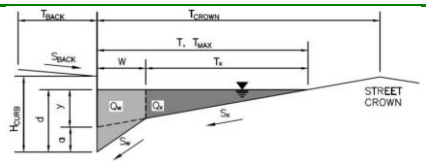
MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**

Inlet ID: **Inlet DP16**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

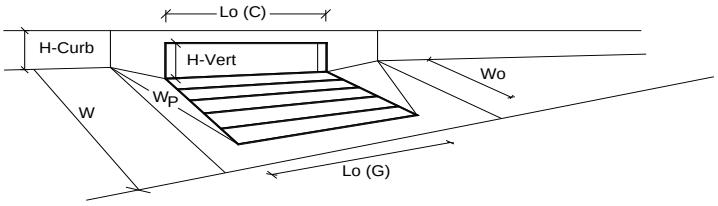
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.96	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**10.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.0	5.0	cfs

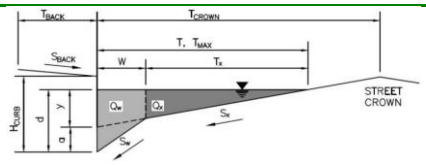
MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road - Segment 1 Improvements**

Inlet ID: **Inlet DP17**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	23.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

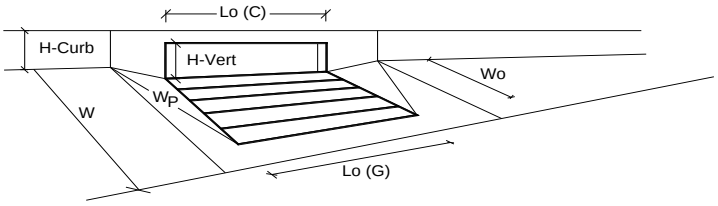
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.96	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**10.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.3	5.5	cfs

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Jan 5 2024

DP3

Invert Elev Dn (ft)	=	6973.30
Pipe Length (ft)	=	186.30
Slope (%)	=	2.61
Invert Elev Up (ft)	=	6978.16
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

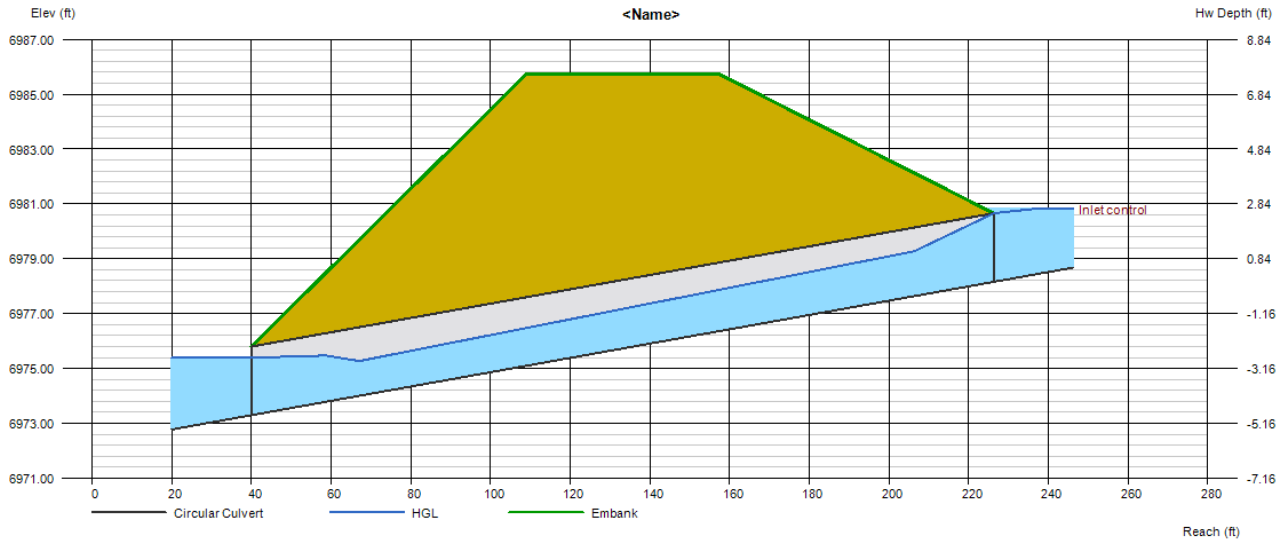
Top Elevation (ft)	=	6985.75
Top Width (ft)	=	48.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	24.60
Qmax (cfs)	=	24.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	24.60
Qpipe (cfs)	=	24.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.60
Veloc Up (ft/s)	=	6.97
HGL Dn (ft)	=	6975.39
HGL Up (ft)	=	6979.85
Hw Elev (ft)	=	6980.82
Hw/D (ft)	=	1.06
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jan 11 2024

Roadside Swale Capacity DP1

Trapezoidal

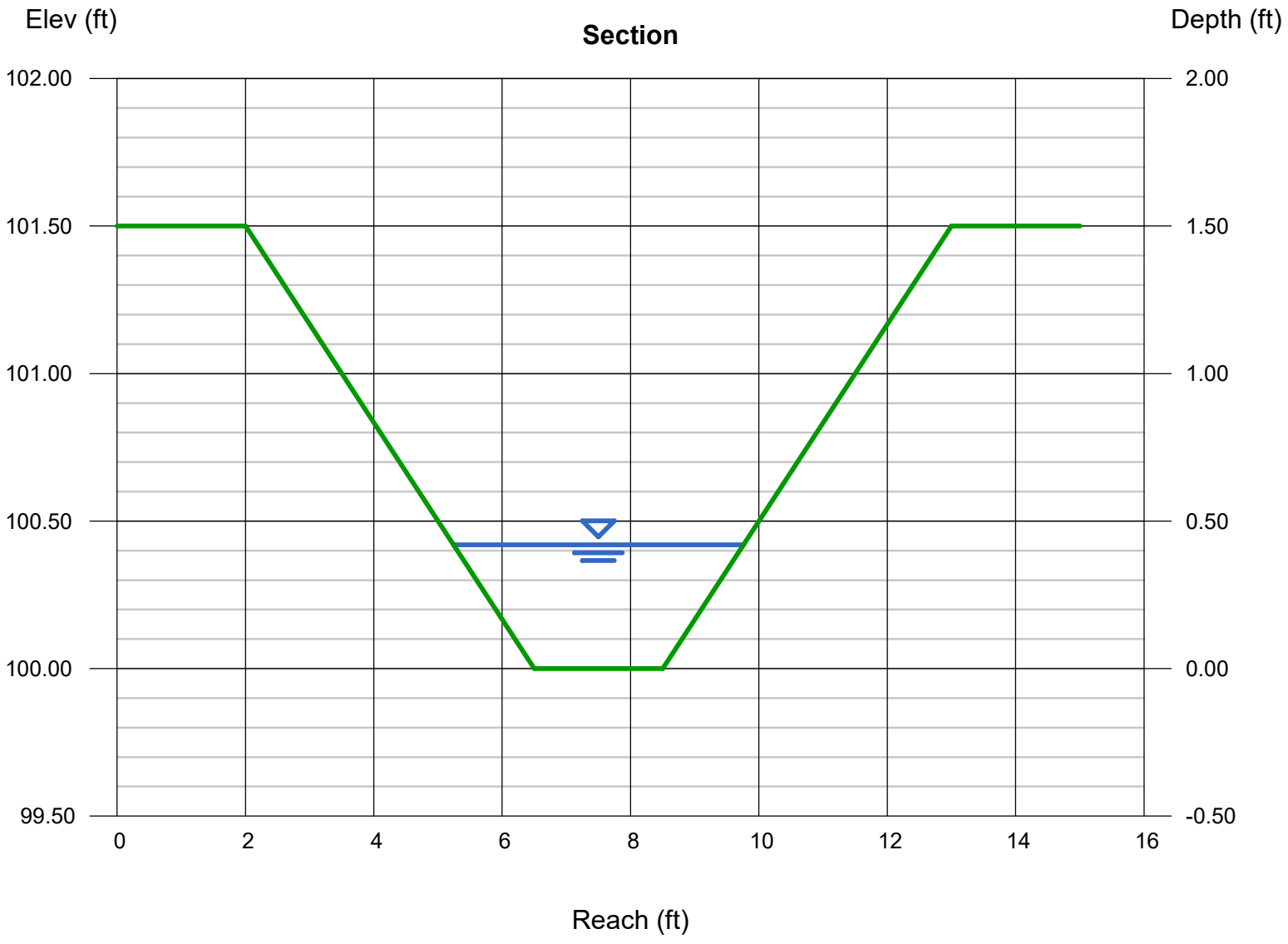
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.50

Highlighted

Depth (ft)	= 0.42
Q (cfs)	= 3.500
Area (sqft)	= 1.37
Velocity (ft/s)	= 2.56
Wetted Perim (ft)	= 4.66
Crit Depth, Yc (ft)	= 0.38
Top Width (ft)	= 4.52
EGL (ft)	= 0.52



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jan 11 2024

Roadside Swale Capacity DP3

Trapezoidal

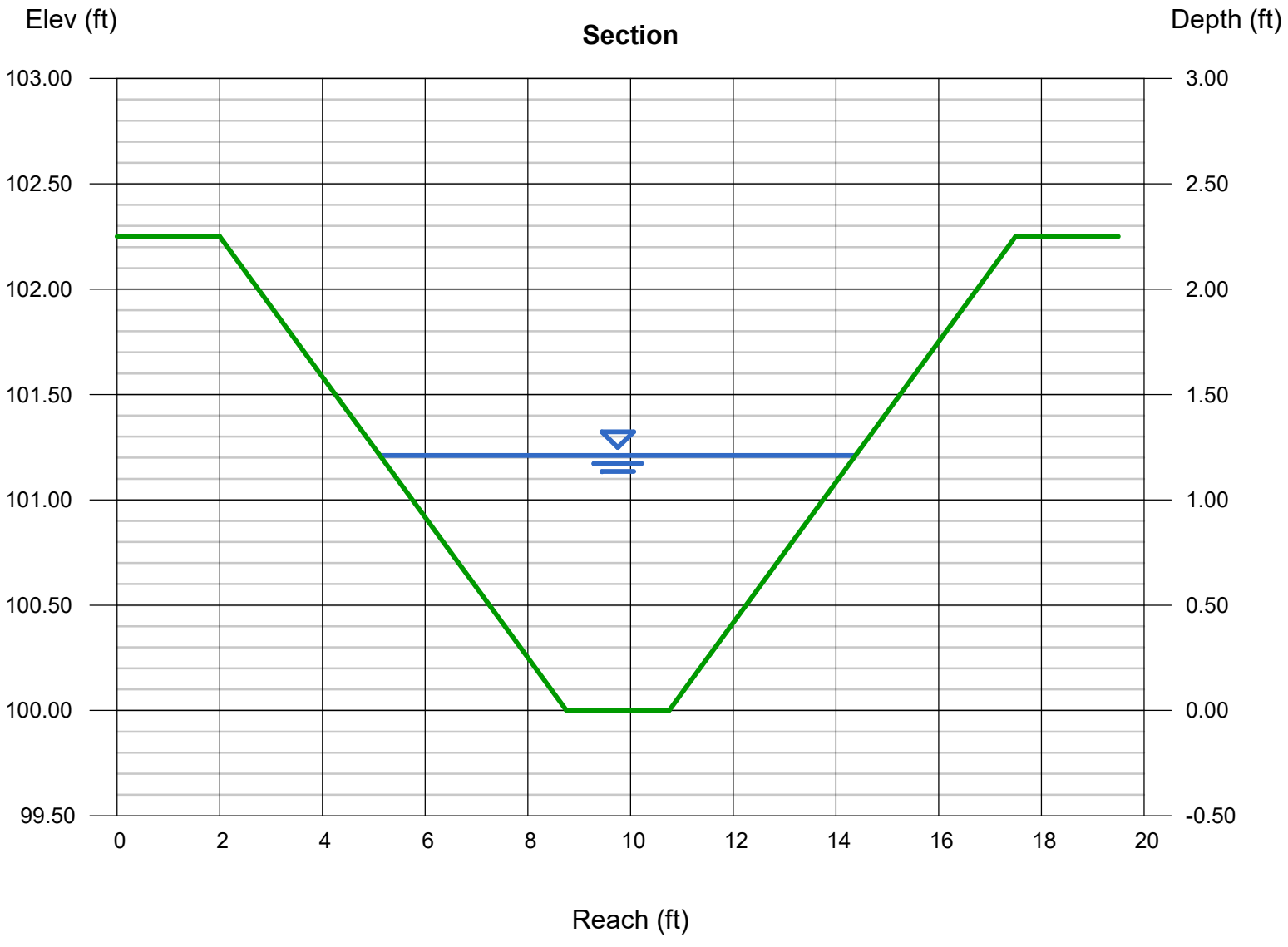
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.25
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 24.60

Highlighted

Depth (ft)	= 1.21
Q (cfs)	= 24.60
Area (sqft)	= 6.81
Velocity (ft/s)	= 3.61
Wetted Perim (ft)	= 9.65
Crit Depth, Yc (ft)	= 1.05
Top Width (ft)	= 9.26
EGL (ft)	= 1.41



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Jan 11 2024

Roadside Swale Capacity DP7

Trapezoidal

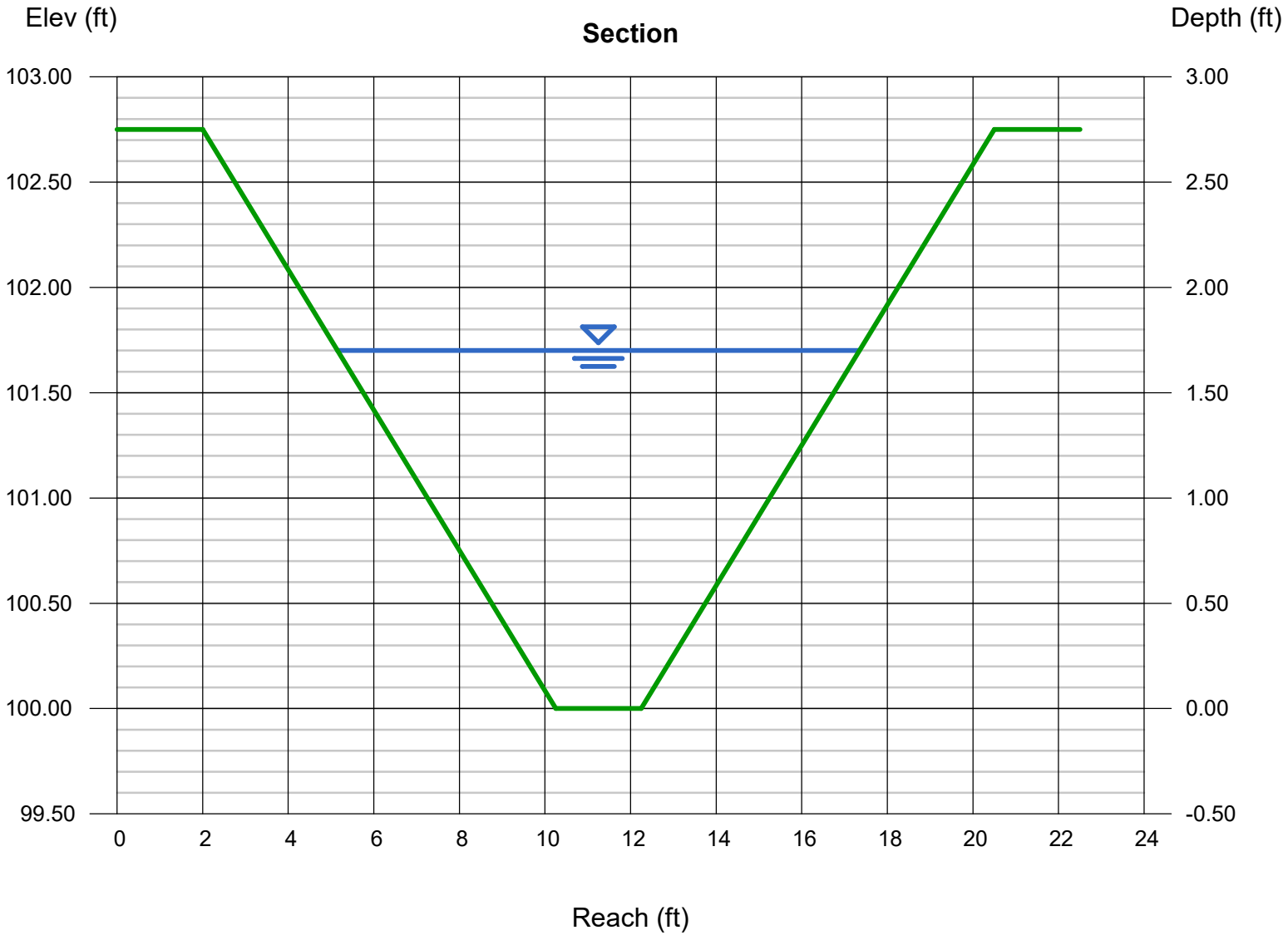
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.75
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 53.30

Highlighted

Depth (ft)	= 1.70
Q (cfs)	= 53.30
Area (sqft)	= 12.07
Velocity (ft/s)	= 4.42
Wetted Perim (ft)	= 12.75
Crit Depth, Yc (ft)	= 1.52
Top Width (ft)	= 12.20
EGL (ft)	= 2.00



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Mar 15 2024

EDB B Trickle Channel Capacity

Rectangular

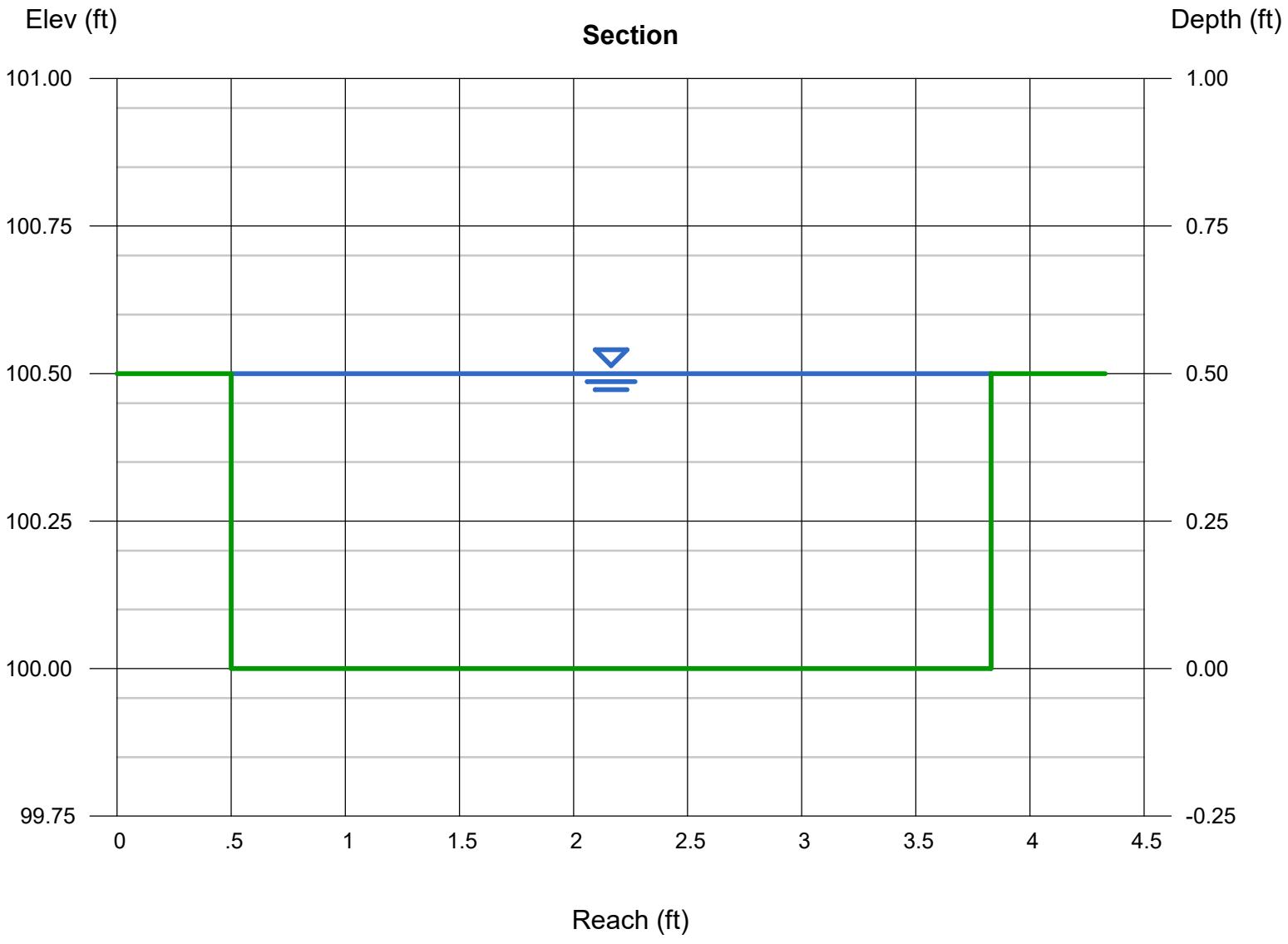
Bottom Width (ft)	= 3.33
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

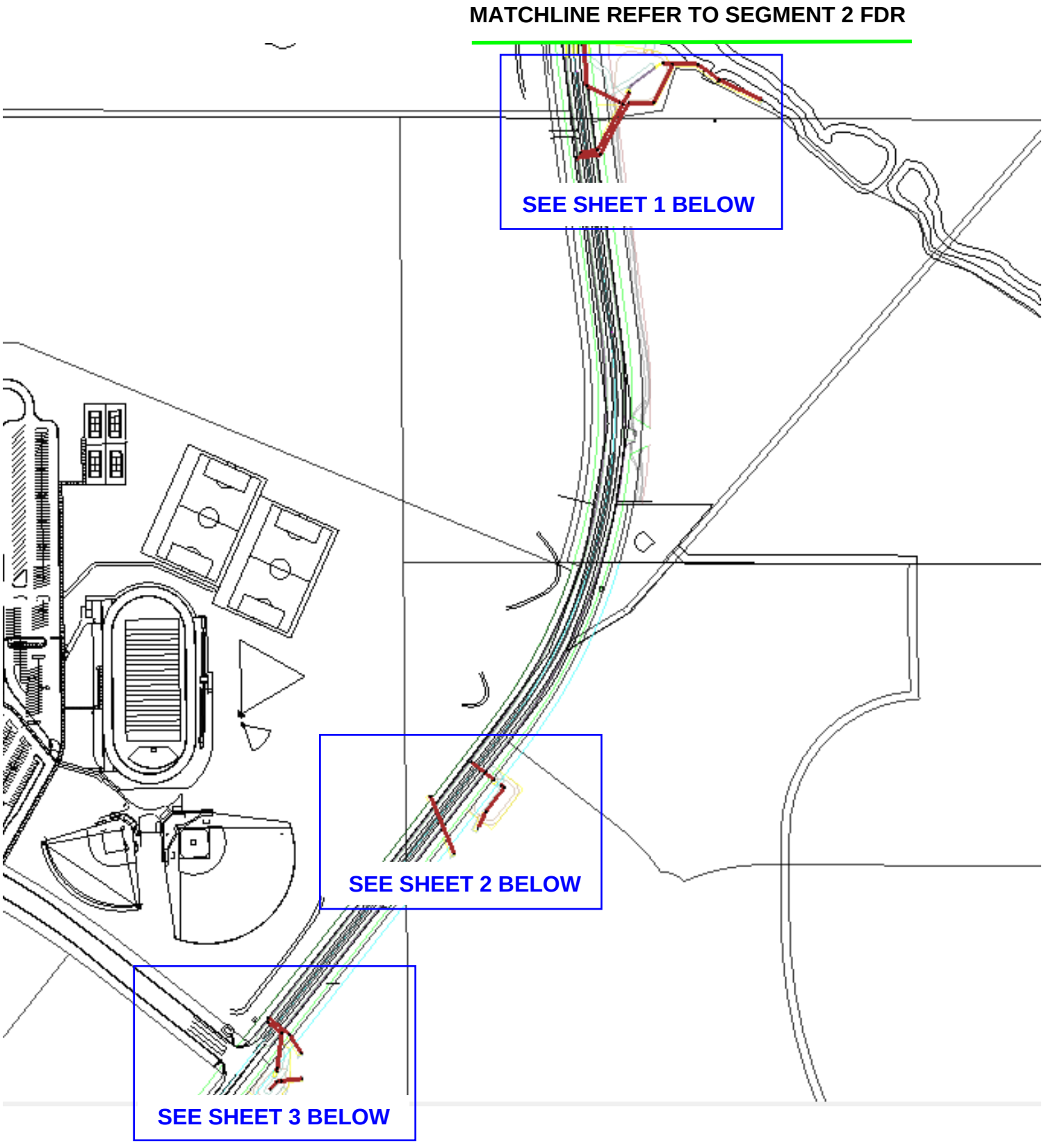
Compute by:	Known Depth
Known Depth (ft)	= 0.50

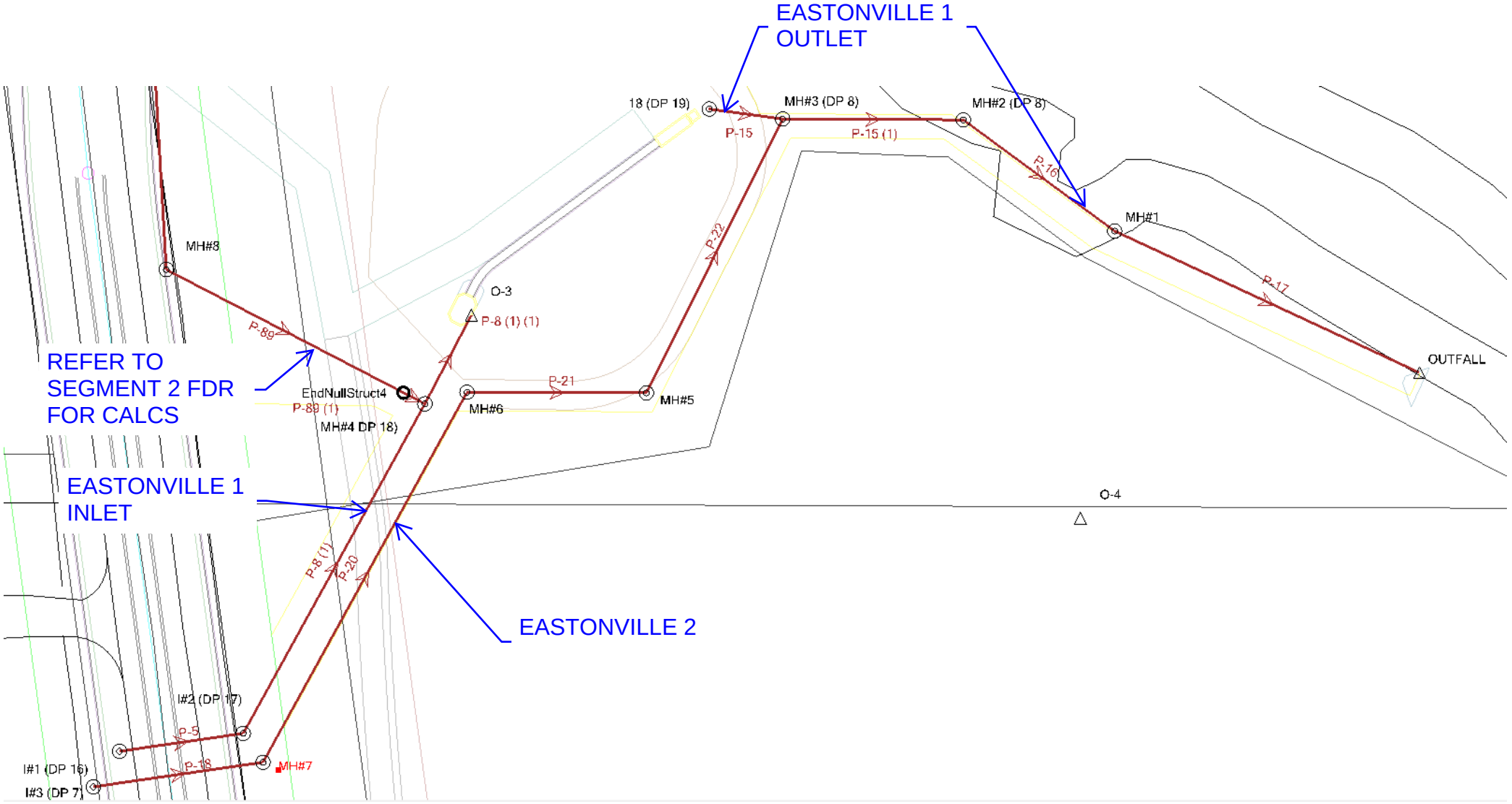
Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 7.707
Area (sqft)	= 1.67
Velocity (ft/s)	= 4.63
Wetted Perim (ft)	= 4.33
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 3.33
EGL (ft)	= 0.83

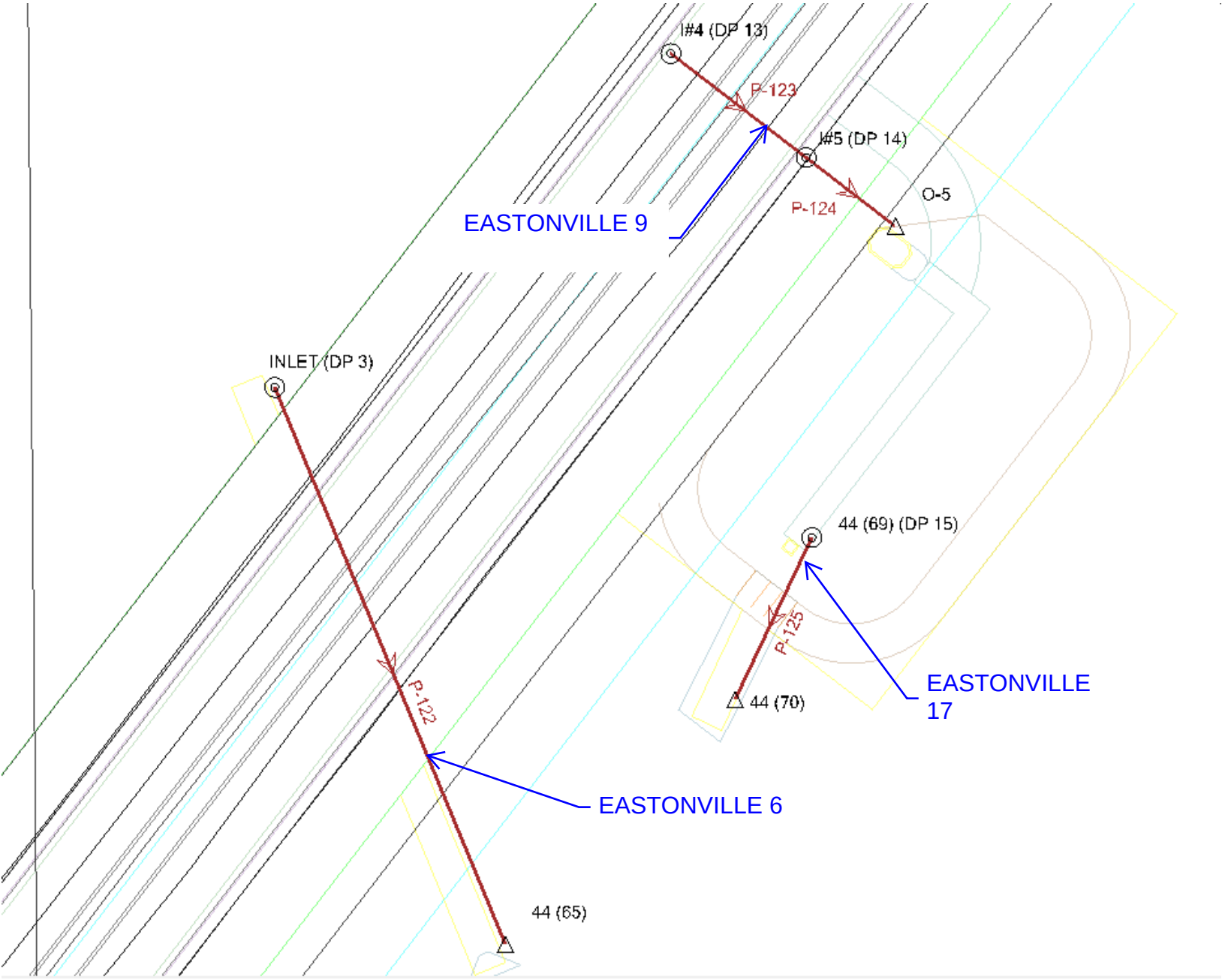


STORMCAD NETWORK LAYOUT: SEGMENT 1

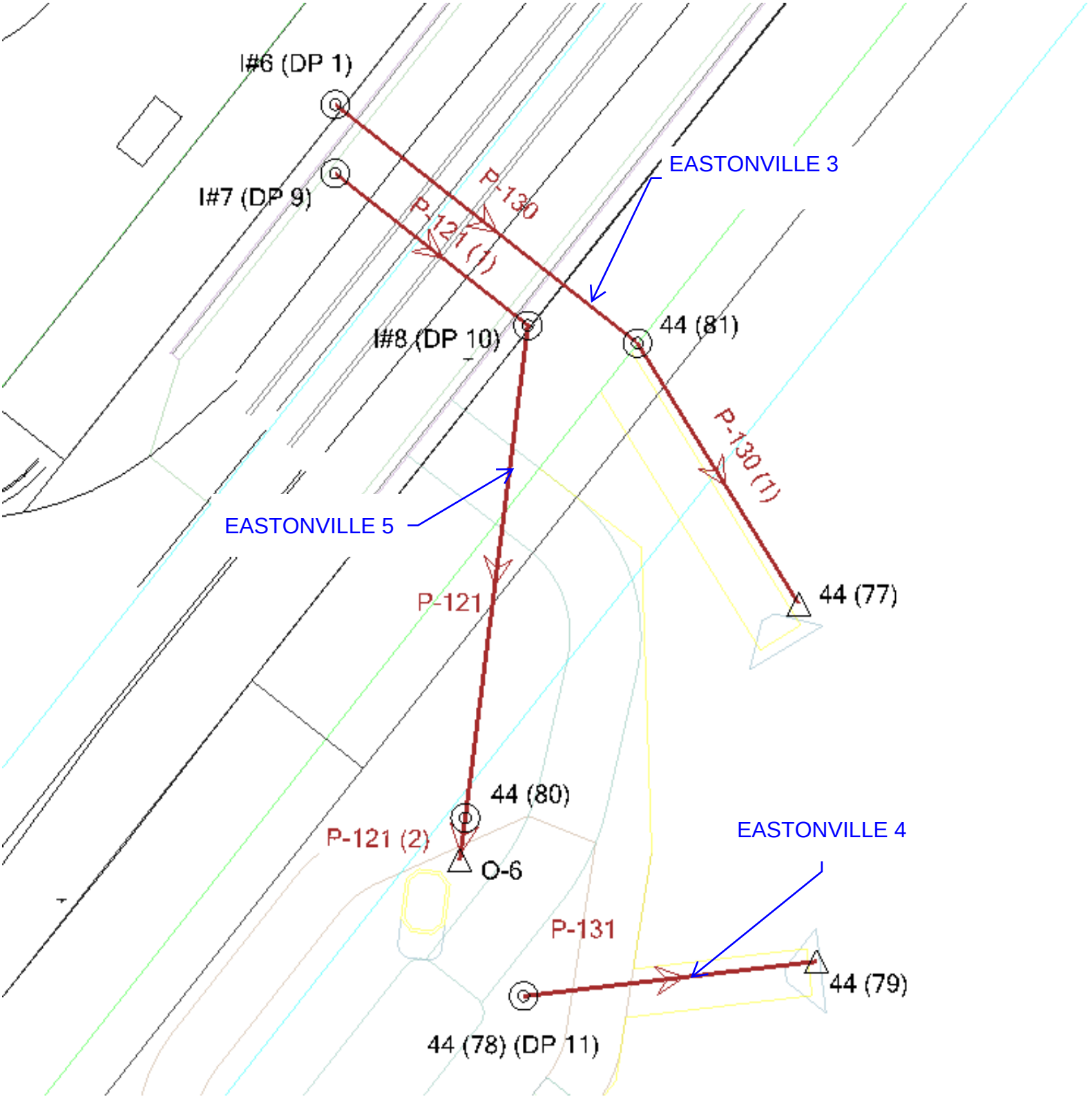



EASTONVILLE 1
OUTLET
18 (DP 19)
MH#3 (DP 8)
MH#2 (DP 8)
P-15
P-15 (1)
P-16
MH#1
P-17
OUTFALL
P-22
MH#8
P-89
O-3
P-8 (1) (1)
REFER TO
SEGMENT 2 FDR
FOR CALCS
EndNullStruct4
P-89 (1)
MH#4 DP 18)
MH#6
P-21
MH#5
EASTONVILLE 1
INLET
O-4
P-8 (1)
P-20
EASTONVILLE 2
I#2 (DP 17)
P-5
I#1 (DP 16)
P-18
MH#7
I#3 (DP 7)

SHEET 1


I#4 (DP 13)
P-123
I#5 (DP 14)
P-124
O-5
EASTONVILLE 9
INLET (DP 3)
44 (69) (DP 15)
P-125
44 (70)
EASTONVILLE 17
P-122
EASTONVILLE 6
44 (65)

SHEET 2


I#6 (DP 1)
I#7 (DP 9)
P-130
P-121 (1)
EASTONVILLE 3
I#8 (DP 10)
44 (81)
P-130 (1)
EASTONVILLE 5
P-121
44 (77)
44 (80)
P-121 (2)
O-6
EASTONVILLE 4
P-131
44 (79)
44 (78) (DP 11)

SHEET 3

100 YEAR TAILWATER CONDITION: PIPE SUMMARY TABLE

	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
66: P-8 (1) (1)	P-8 (1) (1)	MH#4 DP 18)	6,985.66	O-3	6,984.83	41.6	0.020	24.0	0.013	26.20	8.34	31.99	81.9	Concrete Pipe	6,988.54	6,987.98
67: P-124	P-124	I#5 (DP 14)	6,981.25	O-5	6,981.08	34.3	0.005	18.0	0.013	6.50	4.74	7.43	87.5	Concrete Pipe	6,982.33	6,982.10
68: P-121 (2)	P-121 (2)	44 (80)	6,970.65	O-6	6,970.61	9.0	0.005	24.0	0.013	9.00	2.86	15.95	56.4	Concrete Pipe	6,972.88	6,972.87
69: P-18	P-18	I#3 (DP 7)	6,985.73	MH#7	6,985.38	71.3	0.005	42.0	0.013	53.30	8.11	71.14	74.9	Concrete Pipe	6,988.48	6,988.38
70: P-20	P-20	MH#7	6,985.38	MH#6	6,984.50	175.6	0.005	42.0	0.013	53.30	8.11	71.14	74.9	Concrete Pipe	6,987.84	6,987.61
71: P-5	P-5	I#2 (DP 17)	6,989.29	I#1 (DP 16)	6,989.74	52.0	-0.009	18.0	0.013	5.10	5.59	9.77	52.2	Concrete Pipe	6,990.61	6,990.44
72: P-8 (1)	P-8 (1)	I#2 (DP 17)	6,988.79	MH#4 DP 18)	6,985.66	156.4	0.020	24.0	0.013	10.50	9.12	31.99	32.8	Concrete Pipe	6,989.95	6,989.64
73: P-21	P-21	MH#6	6,984.50	MH#5	6,984.13	74.6	0.005	42.0	0.013	53.30	8.11	71.14	74.9	Concrete Pipe	6,987.15	6,987.05
74: P-22	P-22	MH#5	6,984.13	MH#3 (DP 8)	6,981.11	127.1	0.024	42.0	0.013	53.30	14.61	154.95	34.4	Concrete Pipe	6,986.41	6,983.59
75: P-15	P-15	18 (DP 19)	6,983.26	MH#3 (DP 8)	6,983.11	30.8	0.005	18.0	0.013	3.00	3.98	7.43	40.4	Concrete Pipe	6,983.93	6,983.77
76: P-15 (1)	P-15 (1)	MH#3 (DP 8)	6,981.11	MH#2 (DP 8)	6,980.73	75.1	0.005	42.0	0.013	1.77	3.13	71.14	2.5	Concrete Pipe	6,983.59	6,983.59
77: P-16	P-16	MH#2 (DP 8)	6,980.63	MH#1	6,980.24	78.1	0.005	42.0	0.013	54.30	8.14	71.14	76.3	Concrete Pipe	6,982.94	6,982.55
78: P-123	P-123	I#4 (DP 13)	6,981.51	I#5 (DP 14)	6,981.25	52.0	0.005	18.0	0.013	3.40	4.11	7.43	45.8	Concrete Pipe	6,982.73	6,982.69
79: P-17	P-17	MH#1	6,980.14	OUTFALL	6,979.44	139.8	0.005	42.0	0.013	54.30	8.14	71.14	76.3	Concrete Pipe	6,982.45	6,981.73
80: P-125	P-125	44 (69) (DP 15)	6,978.42	44 (70)	6,977.55	54.5	0.016	18.0	0.013	1.20	4.67	13.30	9.0	Concrete Pipe	6,978.83	6,977.85
83: P-122	P-122	INLET (DP 3)	6,978.16	44 (65)	6,973.52	183.8	0.025	30.0	0.013	24.50	12.34	65.19	37.6	Concrete Pipe	6,979.85	6,974.58
84: P-121	P-121	I#8 (DP 10)	6,971.18	44 (80)	6,970.65	105.1	0.005	24.0	0.013	9.00	5.26	16.06	56.0	Concrete Pipe	6,973.03	6,972.89
85: P-130	P-130	I#6 (DP 1)	6,970.85	44 (81)	6,970.04	81.5	0.010	18.0	0.013	3.60	5.37	10.47	34.4	Concrete Pipe	6,971.57	6,970.79
86: P-130 (1)	P-130 (1)	44 (81)	6,970.04	44 (77)	6,969.39	65.0	0.010	18.0	0.013	3.60	5.39	10.50	34.3	Concrete Pipe	6,970.76	6,970.00
87: P-121 (1)	P-121 (1)	I#8 (DP 10)	6,971.68	I#7 (DP 9)	6,971.95	52.0	-0.005	18.0	0.013	4.10	4.37	7.57	54.2	Concrete Pipe	6,973.24	6,973.18
88: P-131	P-131	44 (78) (DP 11)	6,968.42	44 (79)	6,967.50	62.5	0.015	18.0	0.013	1.40	4.75	12.77	11.0	Concrete Pipe	6,968.87	6,967.84
126: P-111	P-111	MH#34	7,019.01	MH#39	7,017.01	146.6	0.014	18.0	0.013	3.40	5.94	12.28	27.7	Concrete Pipe	7,019.72	7,017.55
127: P-89	P-89	MH#8	6,986.87	MH#4 DP 18)	6,985.66	111.1	0.011	24.0	0.013	19.10	6.08	23.64	80.8	Concrete Pipe	6,990.43	6,989.64
128: P-25 (1)	P-25 (1)	CULVERT 2 (...	6,997.01	O-10	6,995.27	116.5	0.015		0.013	295.50	16.72	461.86	64.0	Concrete Box C	7,000.01	6,997.28
129: P-25	P-25	CULVERT 1 (...	6,997.01	O-7	6,995.27	116.6	0.015		0.013	245.50	15.71	461.72	53.2	Concrete Box C	6,999.67	6,997.02
131: P-107 (2)	P-107 (2) (1)	MH#26 (DP6. 1)	7,021.10	DP9	7,020.49	60.7	0.010	24.0	0.013	22.40	8.21	22.62	99.0	Concrete Pipe	7,022.79	7,022.11
132: P-103	P-103	I#9 (DP6)	7,022.86	MH#26 (DP6. 1)	7,021.84	42.7	0.024	18.0	0.013	2.40	1.36	16.22	14.8	Concrete Pipe	7,024.53	7,024.51
133: P-107 (2)	P-107 (2)	MH#27 (DP8)	7,021.66	MH#26 (DP6. 1)	7,021.09	56.6	0.010	24.0	0.013	21.00	6.68	22.62	92.8	Concrete Pipe	7,025.00	7,024.51
134: P-107	P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.41	37.8	0.016	15.0	0.013	2.20	1.79	8.13	27.1	Concrete Pipe	7,025.67	7,025.62
135: P-107 (1)	P-107 (1)	MH#27 (DP8)	7,021.66	DP 2	7,021.66	43.9	0.000	24.0	0.013	18.80	5.98	2.17	865.7	Concrete Pipe	7,025.93	7,025.62
136: P-95	P-95	I#8 (DP5)	7,023.30	I#9 (DP6)	7,023.06	47.5	0.005	18.0	0.013	1.30	3.16	7.43	17.5	Concrete Pipe	7,024.57	7,024.56
137: P-93	P-93	I#6 (DP2. 1)	7,022.36	I#7 (DP3. 1)	7,021.80	55.9	0.010	18.0	0.013	1.50	4.22	10.51	14.3	Concrete Pipe	7,022.99	7,023.02
138: Pipe - (34	Pipe - (34)	I#7 (DP3. 1)	7,021.80	FES OUTFALL 1	7,021.01	33.5	0.023	18.0	0.013	3.20	7.09	16.07	19.9	Concrete Pipe	7,023.01	7,023.00
140: P-44 (1)	P-44 (1)	MH#20	7,001.18	MH#21	6,998.52	266.5	0.010	48.0	0.013	112.10	8.92	143.63	78.0	Concrete Pipe	7,005.57	7,003.94
141: P-64	P-64	MH#21	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	112.10	12.80	145.88	76.8	Concrete Pipe	7,001.72	6,997.89
142: P-44	P-44	MH#19	7,003.94	MH#20	7,001.28	266.5	0.010	48.0	0.013	112.10	12.64	143.63	78.0	Concrete Pipe	7,007.14	7,005.63
143: P-26	P-26	DP 3	7,005.01	MH#19	7,004.04	81.5	0.012	48.0	0.013	112.10	8.92	156.73	71.5	Concrete Pipe	7,009.86	7,009.36
144: P-64 (1)	P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	112.10	16.57	203.15	55.2	Concrete Pipe	6,998.35	6,994.29
145: P-87	P-87	MH#10 (DP 1...	6,994.25	MH#9	6,989.76	320.7	0.014	24.0	0.013	19.10	9.26	26.78	71.3	Concrete Pipe	6,995.82	6,992.24
146: P-87 (1)	P-87 (1)	MH#9	6,989.76	MH#8	6,986.87	197.4	0.015	24.0	0.013	19.10	6.08	27.33	69.9	Concrete Pipe	6,992.21	6,990.80
147: P-84	P-84	I#4 (DP14)	6,995.69	MH#10 (DP 1...	6,994.25	8.1	0.179	18.0	0.013	8.80	4.98	44.40	19.8	Concrete Pipe	6,997.31	6,997.25
148: P-84 (1)	P-84 (1)	MH#10 (DP 1...	6,994.75	I#5 (DP 15)	6,995.50	53.9	-0.014	18.0	0.013	10.40	5.89	12.40	83.9	Concrete Pipe	6,997.78	6,997.25
149: P-66	P-66	MH#23	6,988.82	MH#24	6,988.08	149.0	0.005	48.0	0.013	112.10	8.92	101.56	110.4	Concrete Pipe	6,994.23	6,993.32
150: P-68	P-68	MH#24	6,988.08	MH#25 (DP13)	6,987.54	107.8	0.005	48.0	0.013	112.10	8.92	101.56	110.4	Concrete Pipe	6,993.36	6,992.70
151: P-77	P-77	DP12	6,990.32	MH#25 (DP13)	6,990.03	28.1	0.010	18.0	0.013	24.40	13.81	10.66	228.8	Concrete Pipe	6,994.22	6,992.70
152: P-74	P-74	MH#25 (DP13)	6,987.54	OUTLET SEGM...	6,986.67	173.3	0.005	48.0	0.013	136.40	10.85	101.56	134.3	Concrete Pipe	6,991.97	6,990.15

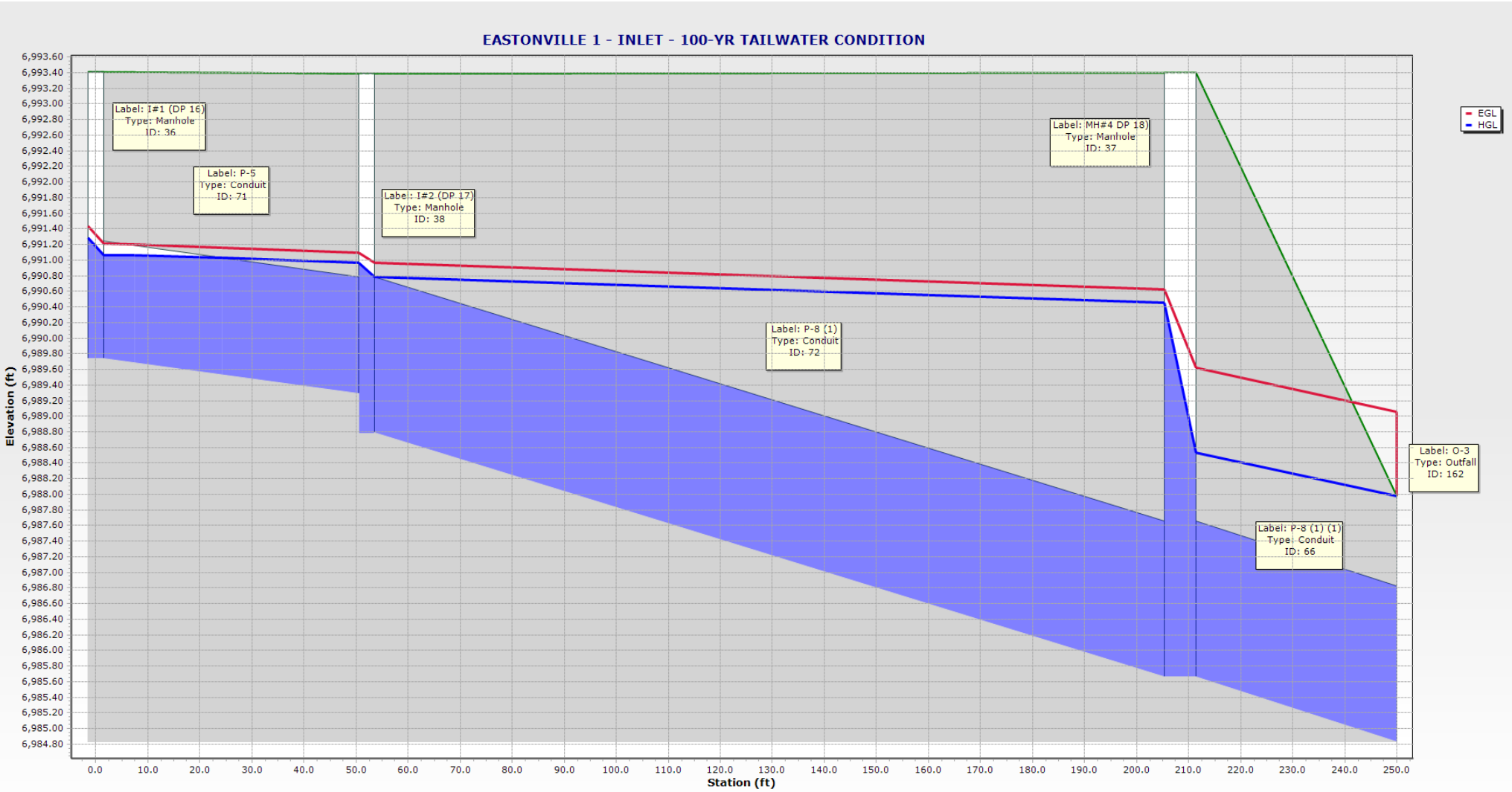
NOTE: EASTONVILLE 5 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 2 PIPES & STRUCTURES INCLUDED IN TABLE, REFER TO FDR FOR COMPLETE ANALYSIS.

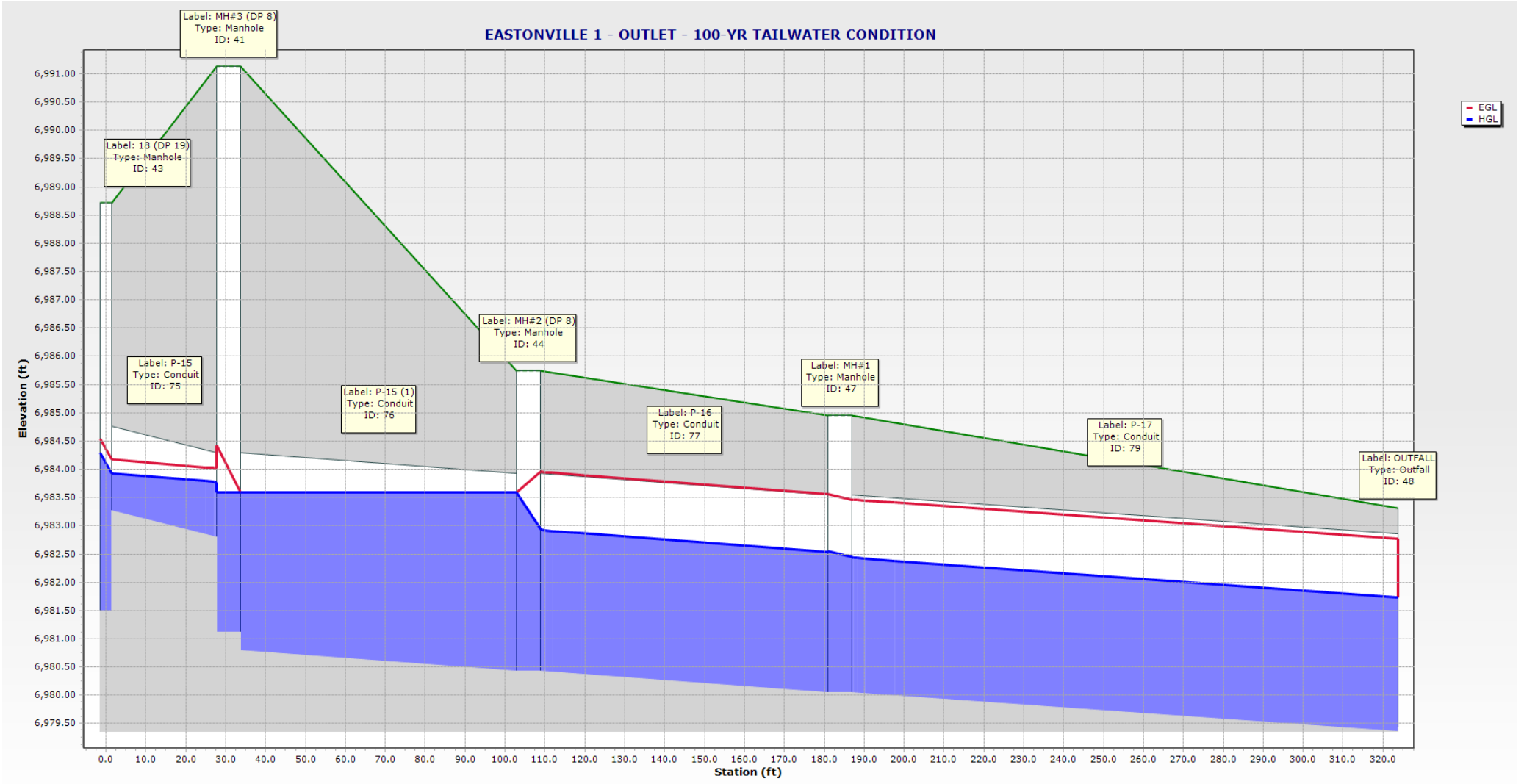
100 YEAR TAILWATER CONDITION: STRUCTURE SUMMARY TABLE

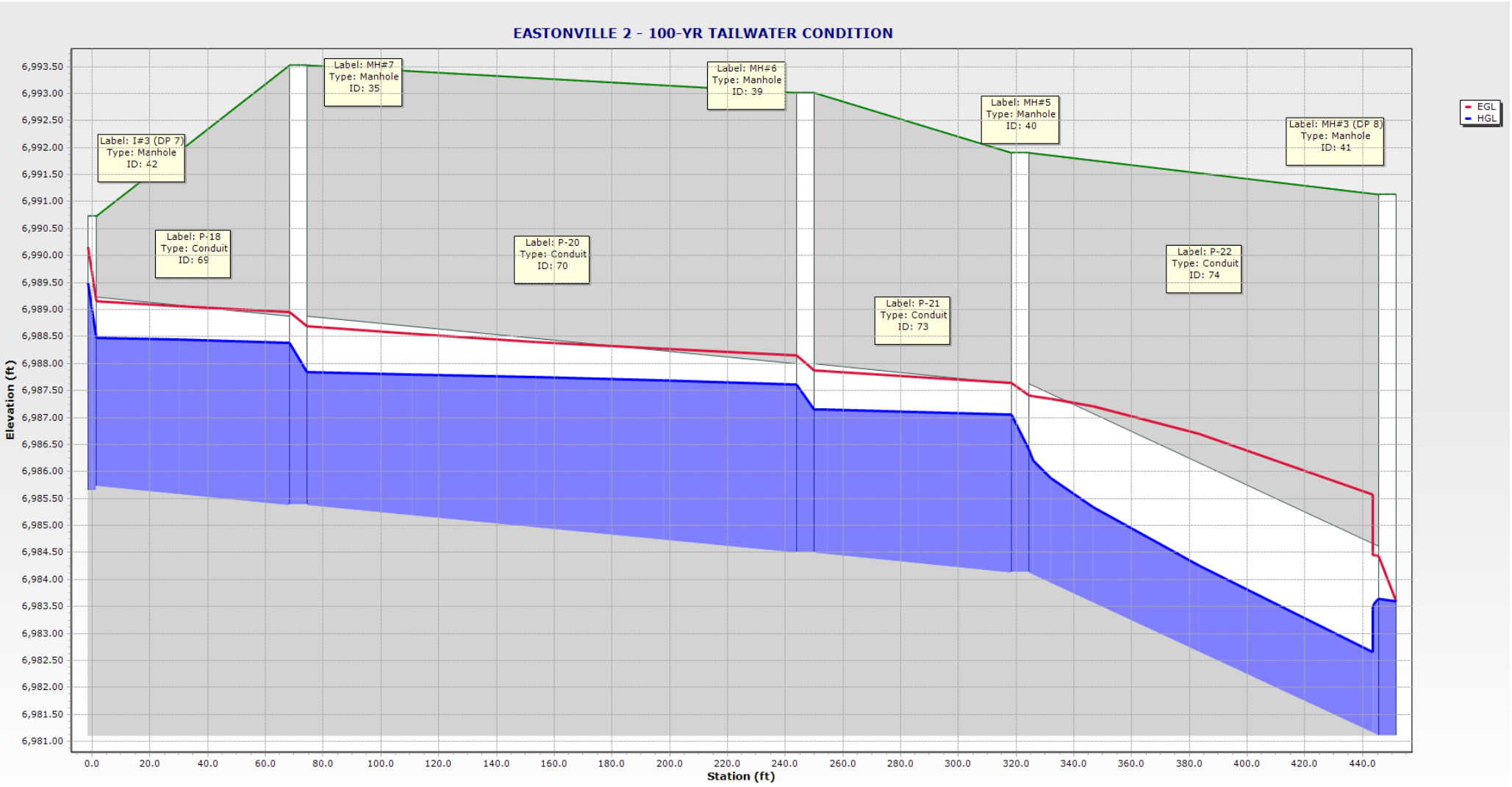
	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Notes	Elevation (Invert Out) (ft)	Headloss (ft)
35: MH#7	MH#7	6,993.52	6,993.52	53.30	2.47	6,987.84	6,988.38	STORM MH	6,985.38	0.54
36: I#1 (DP 16	I#1 (DP 16)	6,993.41	6,993.41	5.10	0.87	6,990.61	6,991.15	CDOT Type-	6,989.74	0.54
37: MH#4 DP	MH#4 DP 18)	6,993.40	6,993.40	26.20	2.88	6,988.54	6,989.64	STORM MH	6,985.66	1.10
38: I#2 (DP 17	I#2 (DP 17)	6,993.39	6,993.39	10.50	1.17	6,989.95	6,990.44	CDOT Type-	6,988.79	0.49
39: MH#6	MH#6	6,993.02	6,993.02	53.30	2.65	6,987.15	6,987.61	STORM MH	6,984.50	0.46
40: MH#5	MH#5	6,991.91	6,991.91	53.30	2.28	6,986.41	6,987.05	STORM MH	6,984.13	0.64
41: MH#3 (DP	MH#3 (DP 8)	6,991.13	6,991.13	1.77	2.48	6,983.59	6,983.59	STORM MH	6,981.11	0.00
42: I#3 (DP 7)	I#3 (DP 7)	6,990.73	6,990.73	53.30	2.83	6,988.48	6,989.49	CDOT Type-	6,985.73	1.01
43: 18 (DP 19)	18 (DP 19)	6,988.71	6,988.71	3.00	2.43	6,983.93	6,984.30	CDOT Type-	6,983.26	0.37
44: MH#2 (DP	MH#2 (DP 8)	6,985.74	6,985.74	54.30	2.31	6,982.94	6,983.59	STORM MH	6,980.63	0.65
45: I#4 (DP 13	I#4 (DP 13)	6,985.02	6,985.02	3.40	1.42	6,982.73	6,982.84	CDOT Type-	6,981.51	0.12
46: I#5 (DP 14	I#5 (DP 14)	6,985.02	6,985.02	6.50	1.28	6,982.33	6,982.69	CDOT Type-	6,981.25	0.36
47: MH#1	MH#1	6,984.95	6,984.95	54.30	2.31	6,982.45	6,982.55	STORM MH	6,980.14	0.10
49: 44 (69) (D	44 (69) (DP 15)	6,982.64	6,982.64	1.20	0.41	6,978.83	6,978.85	CDOT Type-	6,978.42	0.01
55: 44 (80)	44 (80)	6,975.21	6,975.21	9.00	2.13	6,972.88	6,972.89	Cylindrical S	6,970.65	0.01
56: 44 (81)	44 (81)	6,975.03	6,975.03	3.60	0.72	6,970.76	6,970.79	Cylindrical S	6,970.04	0.03
57: I#7 (DP 9)	I#7 (DP 9)	6,974.64	6,974.64	4.10	1.29	6,973.24	6,973.39	CDOT Type-	6,971.95	0.15
58: I#8 (DP 10	I#8 (DP 10)	6,974.64	6,974.64	9.00	1.85	6,973.03	6,973.18	CDOT Type-	6,971.18	0.15
59: I#6 (DP 1)	I#6 (DP 1)	6,973.20	6,973.20	3.60	0.72	6,971.57	6,972.00	CDOT Type-	6,970.85	0.42
60: 44 (78) (D	44 (78) (DP 11)	6,973.16	6,973.16	1.40	0.44	6,968.87	6,969.03	CDOT Type-	6,968.42	0.16
98: MH#26 (D	MH#26 (DP6.1)	7,027.15	7,027.15	22.40	1.69	7,022.79	7,024.51	STORM MH	7,021.10	1.73
99: MH#27 (D	MH#27 (DP8)	7,027.09	7,027.09	21.00	3.34	7,025.00	7,025.62	STORM MH	7,021.66	0.62
100: I#9 (DP6)	I#9 (DP6)	7,027.04	7,027.04	2.40	1.67	7,024.53	7,024.56	CDOT Type-	7,022.86	0.03
101: I#8 (DP5)	I#8 (DP5)	7,026.63	7,026.63	1.30	1.27	7,024.57	7,024.58	CDOT Type-	7,023.30	0.02
102: I#7 (DP3.	I#7 (DP3.1)	7,026.51	7,026.51	3.20	1.71	7,023.01	7,023.02	CDOT Type-	7,021.80	0.00
103: I#6 (DP2.	I#6 (DP2.1)	7,026.40	7,026.40	1.50	0.63	7,022.99	7,023.10	CDOT Type-	7,022.36	0.10
106: MH#34	MH#34	7,023.51	7,023.51	3.40	0.70	7,019.72	7,019.84	CDOT Type-	7,019.01	0.13
111: MH#21	MH#21	7,014.03	7,014.03	112.10	3.20	7,001.72	7,003.94	STORM MH	6,998.52	2.22
112: MH#20	MH#20	7,012.41	7,012.41	112.10	4.38	7,005.57	7,005.63	STORM MH	7,001.18	0.06
113: MH#19	MH#19	7,010.85	7,010.85	112.10	3.20	7,007.14	7,009.36	STORM MH	7,003.94	2.22
115: MH#22	MH#22	7,005.85	7,005.85	112.10	3.20	6,998.35	6,998.44	STORM MH	6,995.15	0.08
116: MH#9	MH#9	7,001.03	7,001.03	19.10	2.45	6,992.21	6,992.24	STORM MH	6,989.76	0.03
117: I#4 (DP1	I#4 (DP14)	7,000.17	7,000.17	8.80	1.62	6,997.31	6,997.89	CDOT Type-	6,995.69	0.58
118: MH#10 (	MH#10 (DP 1...	7,000.01	7,000.01	19.10	1.57	6,995.82	6,997.25	STORM MH	6,994.25	1.43
119: I#5 (DP 1	I#5 (DP 15)	6,999.67	6,999.67	10.40	1.88	6,997.78	6,998.59	CDOT Type-	6,995.50	0.81
120: MH#8	MH#8	6,996.13	6,996.13	19.10	3.77	6,990.43	6,990.80	STORM MH	6,986.87	0.37
121: MH#23	MH#23	6,995.25	6,995.25	112.10	5.41	6,994.23	6,994.29	STORM MH	6,988.82	0.06
122: MH#24	MH#24	6,993.32	6,993.32	112.10	5.25	6,993.32	6,993.39	STORM MH	6,988.08	0.06
123: DP12	DP12	6,993.02	6,993.02	24.40	2.71	6,993.02	6,997.47	CDOT Type-	6,990.32	4.44
124: MH#25 (	MH#25 (DP13)	6,992.79	6,992.79	136.40	4.43	6,991.97	6,992.70	STORM MH	6,987.54	0.73
190: INLET (D	INLET (DP 3)	6,980.96	6,980.96	24.50	1.69	6,979.85	6,980.98	CDOT FES	6,978.16	1.13
192: DP 7	DP 7	7,024.45	7,024.45	2.20	1.44	7,024.45	7,024.52	CDOT FES	7,023.01	0.07
193: DP 2	DP 2	7,024.26	7,024.26	18.80	2.25	7,024.26	7,025.10	CDOT FES	7,021.66	0.83
194: DP 3	DP 3	7,009.43	7,009.43	112.10	4.42	7,009.43	7,011.29	CDOT FES	7,005.01	1.86
196: CULVERT	CULVERT 1 (...	7,000.01	7,000.01	245.50	2.66	6,999.67	7,001.66	Dummy Null	6,997.01	1.99
197: CULVERT	CULVERT 2 (...	7,000.01	7,000.01	295.50	3.00	7,000.01	7,002.27	Dummy Null	6,997.01	2.26

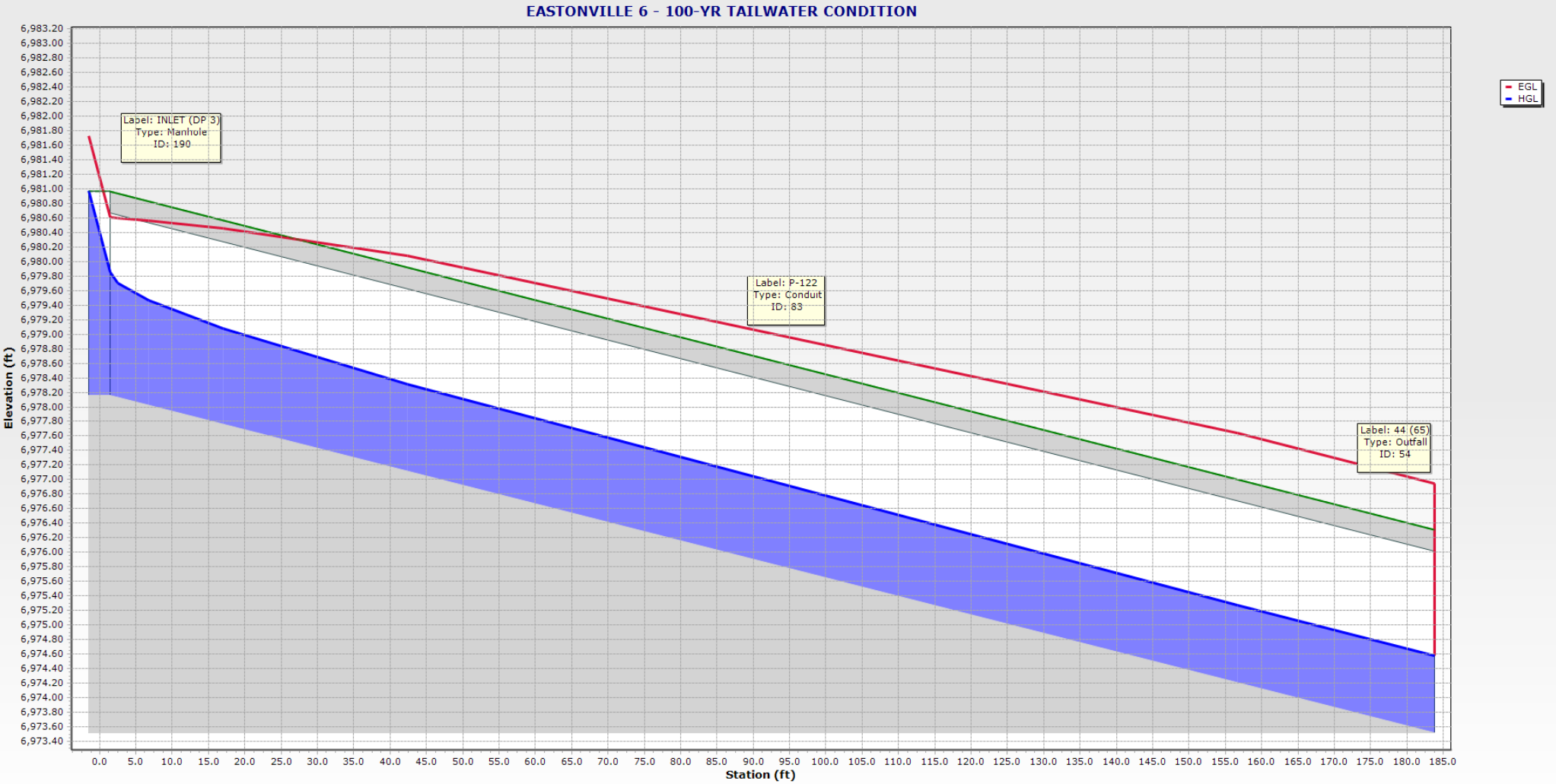
	ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)	Notes
48: OUTFALL	48	OUTFALL	6,983.32	6,979.44		6,981.73	54.30	CDOT FES
53: 44 (70)	53	44 (70)	6,979.33	6,977.55		6,977.85	1.20	CDOT FES
54: 44 (65)	54	44 (65)	6,976.31	6,973.52		6,974.58	24.50	CDOT FES
61: 44 (77)	61	44 (77)	6,971.10	6,969.39		6,970.00	3.60	CDOT FES
64: 44 (79)	64	44 (79)	6,969.82	6,967.50		6,967.84	1.40	CDOT FES
107: DP9	107	DP9	7,022.74	7,020.49		7,022.11	22.40	CDOT FES
108: FES OUTFALL 1	108	FES OUTFALL 1	7,023.00	7,021.01	7,023.00	7,023.00	3.20	CDOT FES
110: MH#39	110	MH#39	7,018.18	7,017.01		7,017.55	3.40	CDOT FES
125: OUTLET SEGMENT 3	125	OUTLET SEG...	6,991.09	6,986.67	6,988.30	6,990.15	136.40	CDOT FES
162: O-3	162	O-3	6,987.98	6,984.83	6,987.98	6,987.98	26.20	Dummy Null
164: O-5	164	O-5	6,982.10	6,981.08	6,982.10	6,982.10	6.50	Dummy Null
165: O-6	165	O-6	6,972.87	6,970.61	6,972.87	6,972.87	9.00	Dummy Null
203: O-7	203	O-7	6,998.27	6,995.27		6,997.02	245.50	Dummy Null
207: O-10	207	O-10	6,998.27	6,995.27		6,997.28	295.50	Dummy Null

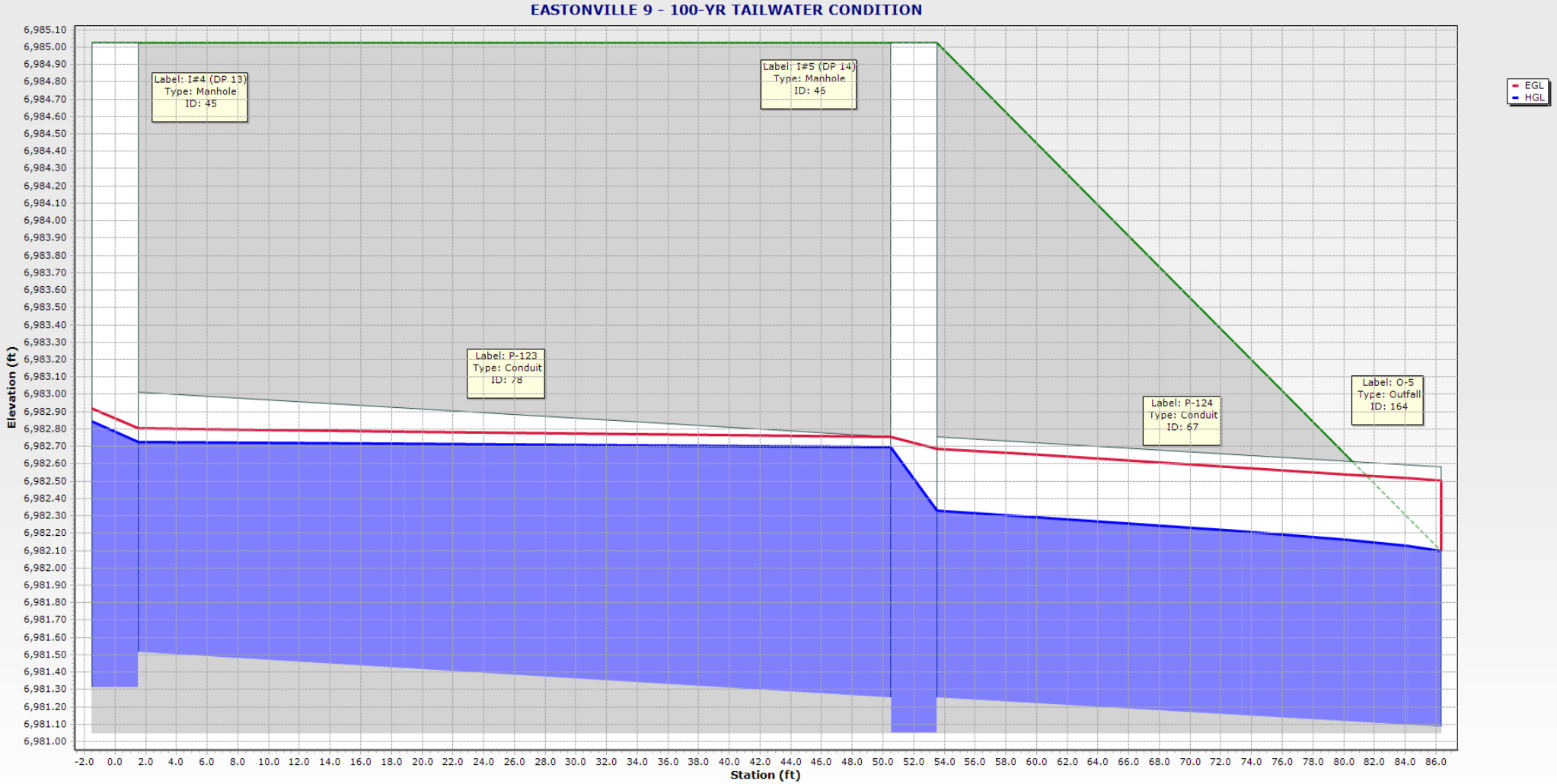
NOTE: EASTONVILLE 5 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 2 PIPES & STRUCTURES INCLUDED IN TABLE, REFER TO FDR FOR COMPLETE ANALYSIS.

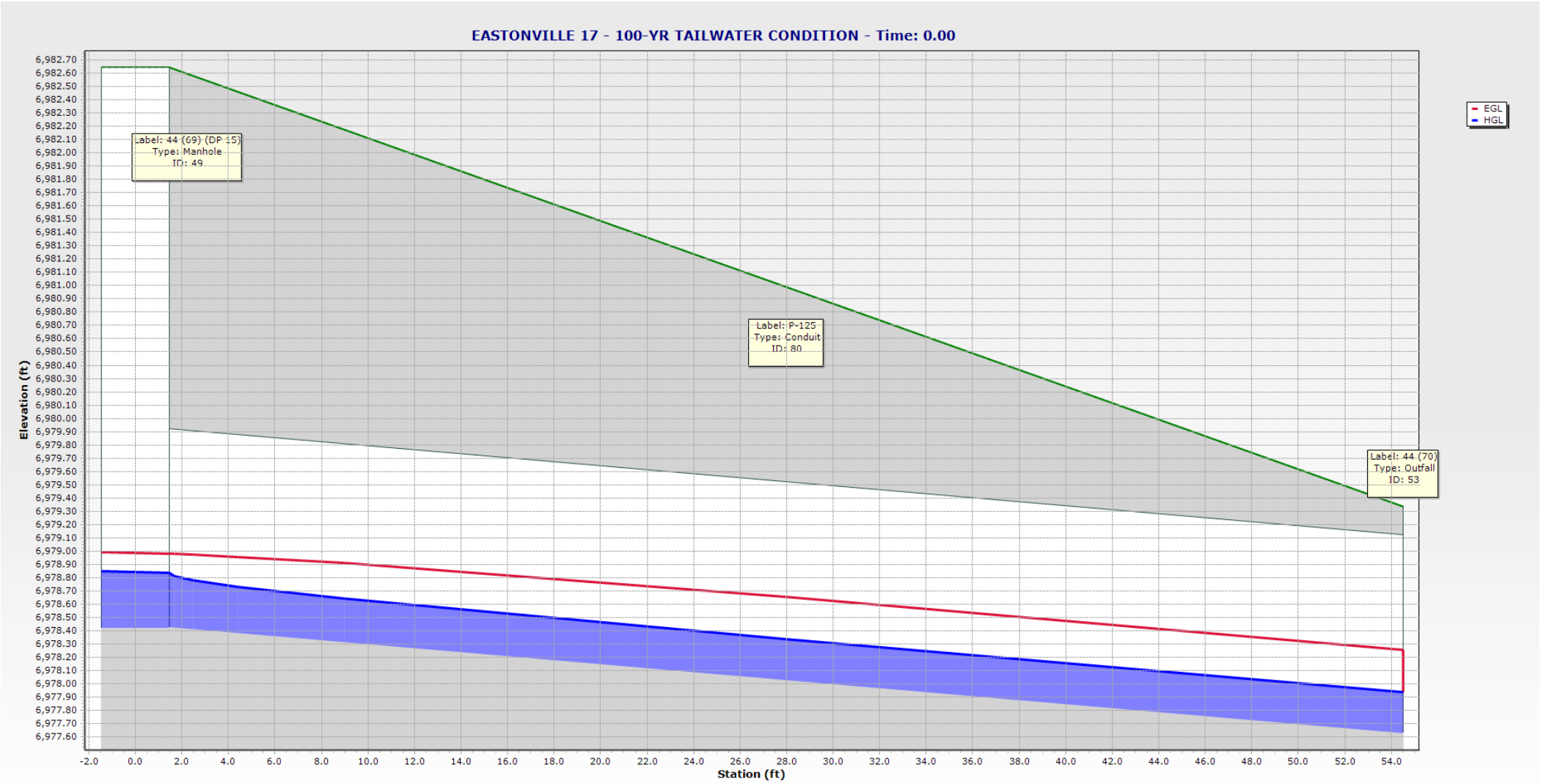

EASTONVILLE 1 - INLET - 100-YR TAILWATER CONDITION
Elevation (ft)
Station (ft)
EGL
HGL
Label: I#1 (DP 16)
Type: Manhole
ID: 36
Label: P-5
Type: Conduit
ID: 71
Label: I#2 (DP 17)
Type: Manhole
ID: 38
Label: MH#4 DP 18)
Type: Manhole
ID: 37
Label: P-8 (1)
Type: Conduit
ID: 72
Label: O-3
Type: Outfall
ID: 162
Label: P-8 (1) (1)
Type: Conduit
ID: 66

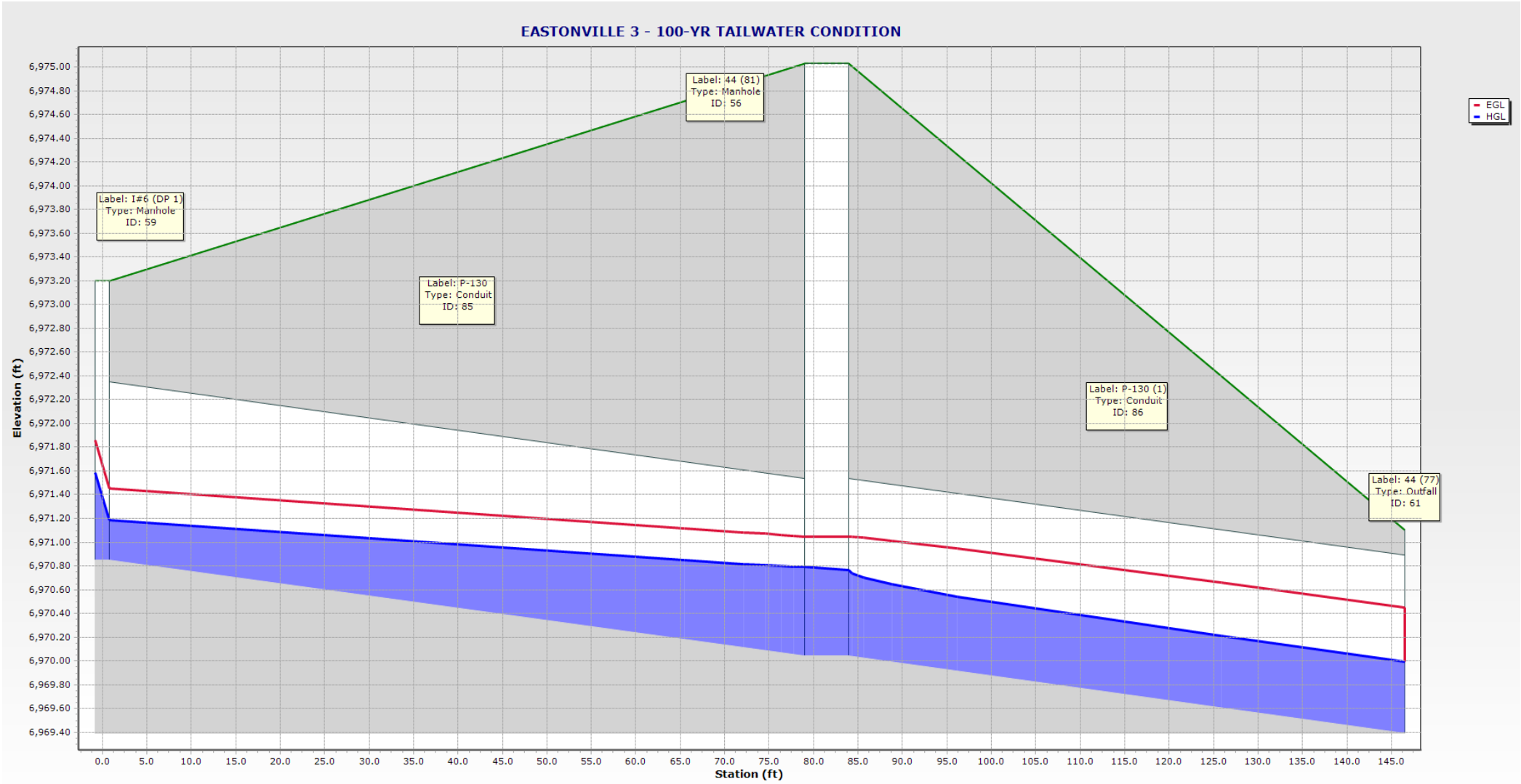

EASTONVILLE 1 - OUTLET - 100-YR TAILWATER CONDITION
Label: MH#3 (DP 8)
Type: Manhole
ID: 41
Label: 18 (DP 19)
Type: Manhole
ID: 43
Label: P-15
Type: Conduit
ID: 75
Label: P-15 (1)
Type: Conduit
ID: 76
Label: MH#2 (DP 8)
Type: Manhole
ID: 44
Label: P-16
Type: Conduit
ID: 77
Label: MH#1
Type: Manhole
ID: 47
Label: P-17
Type: Conduit
ID: 79
Label: OUTFALL
Type: Outfall
ID: 48
EGL
HGL
Elevation (ft)
6,991.00
6,990.50
6,990.00
6,989.50
6,989.00
6,988.50
6,988.00
6,987.50
6,987.00
6,986.50
6,986.00
6,985.50
6,985.00
6,984.50
6,984.00
6,983.50
6,983.00
6,982.50
6,982.00
6,981.50
6,981.00
6,980.50
6,980.00
6,979.50
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0 110.0 120.0 130.0 140.0 150.0 160.0 170.0 180.0 190.0 200.0 210.0 220.0 230.0 240.0 250.0 260.0 270.0 280.0 290.0 300.0 310.0 320.0
Station (ft)


EASTONVILLE 2 - 100-YR TAILWATER CONDITION
Label: I#3 (DP 7)
Type: Manhole
ID: 42
Label: MH#7
Type: Manhole
ID: 35
Label: MH#6
Type: Manhole
ID: 39
Label: MH#5
Type: Manhole
ID: 40
Label: MH#3 (DP 8)
Type: Manhole
ID: 41
Label: P-18
Type: Conduit
ID: 69
Label: P-20
Type: Conduit
ID: 70
Label: P-21
Type: Conduit
ID: 73
Label: P-22
Type: Conduit
ID: 74
EGL
HGL
Elevation (ft)
6,993.50
6,993.00
6,992.50
6,992.00
6,991.50
6,991.00
6,990.50
6,990.00
6,989.50
6,989.00
6,988.50
6,988.00
6,987.50
6,987.00
6,986.50
6,986.00
6,985.50
6,985.00
6,984.50
6,984.00
6,983.50
6,983.00
6,982.50
6,982.00
6,981.50
6,981.00
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
300.0
320.0
340.0
360.0
380.0
400.0
420.0
440.0
Station (ft)

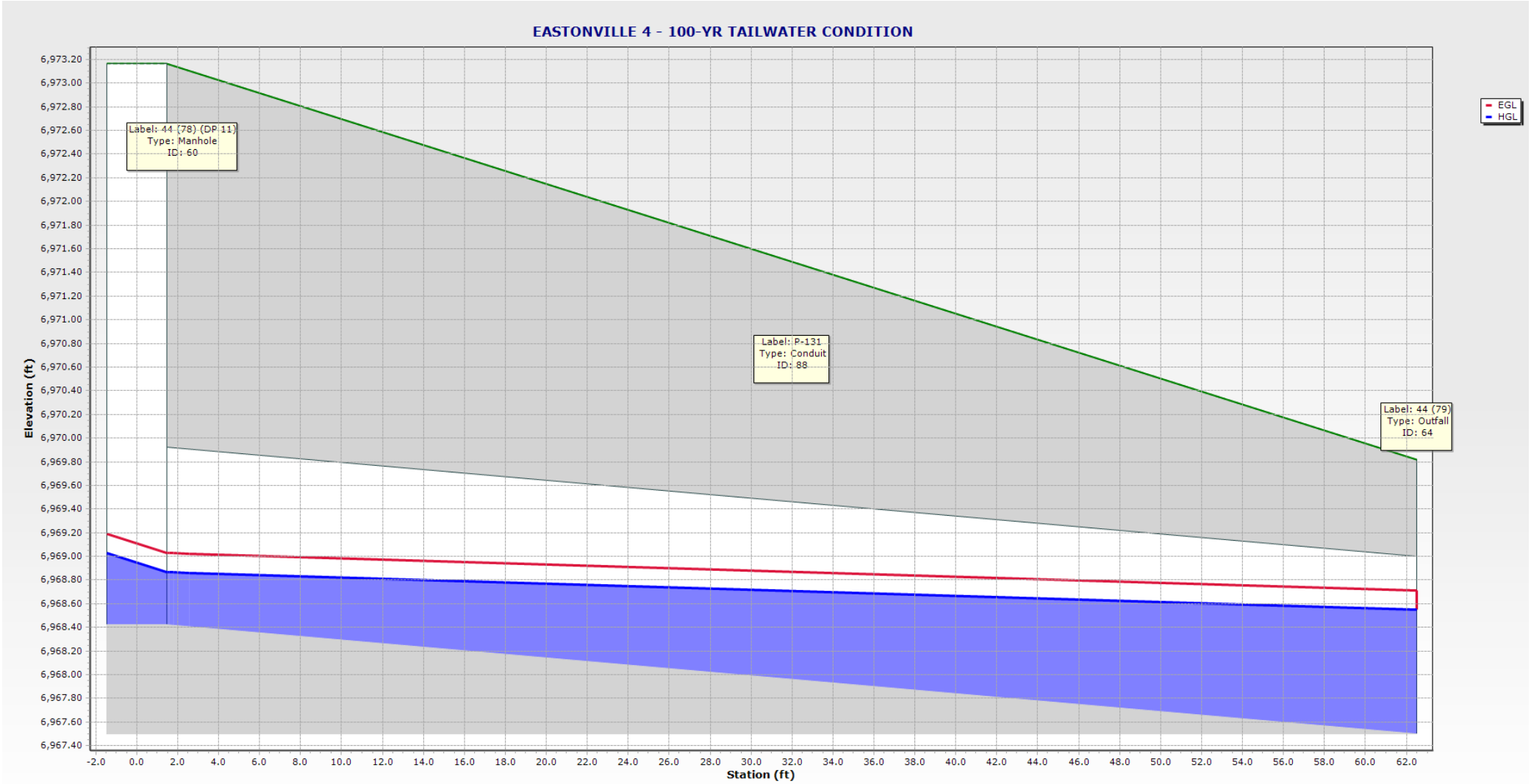

EASTONVILLE 6 - 100-YR TAILWATER CONDITION
Label: INLET (DP 3)
Type: Manhole
ID: 190
Label: P-122
Type: Conduit
ID: 83
Label: 44 (65)
Type: Outfall
ID: 54
EGL
HGL
Elevation (ft)
Station (ft)

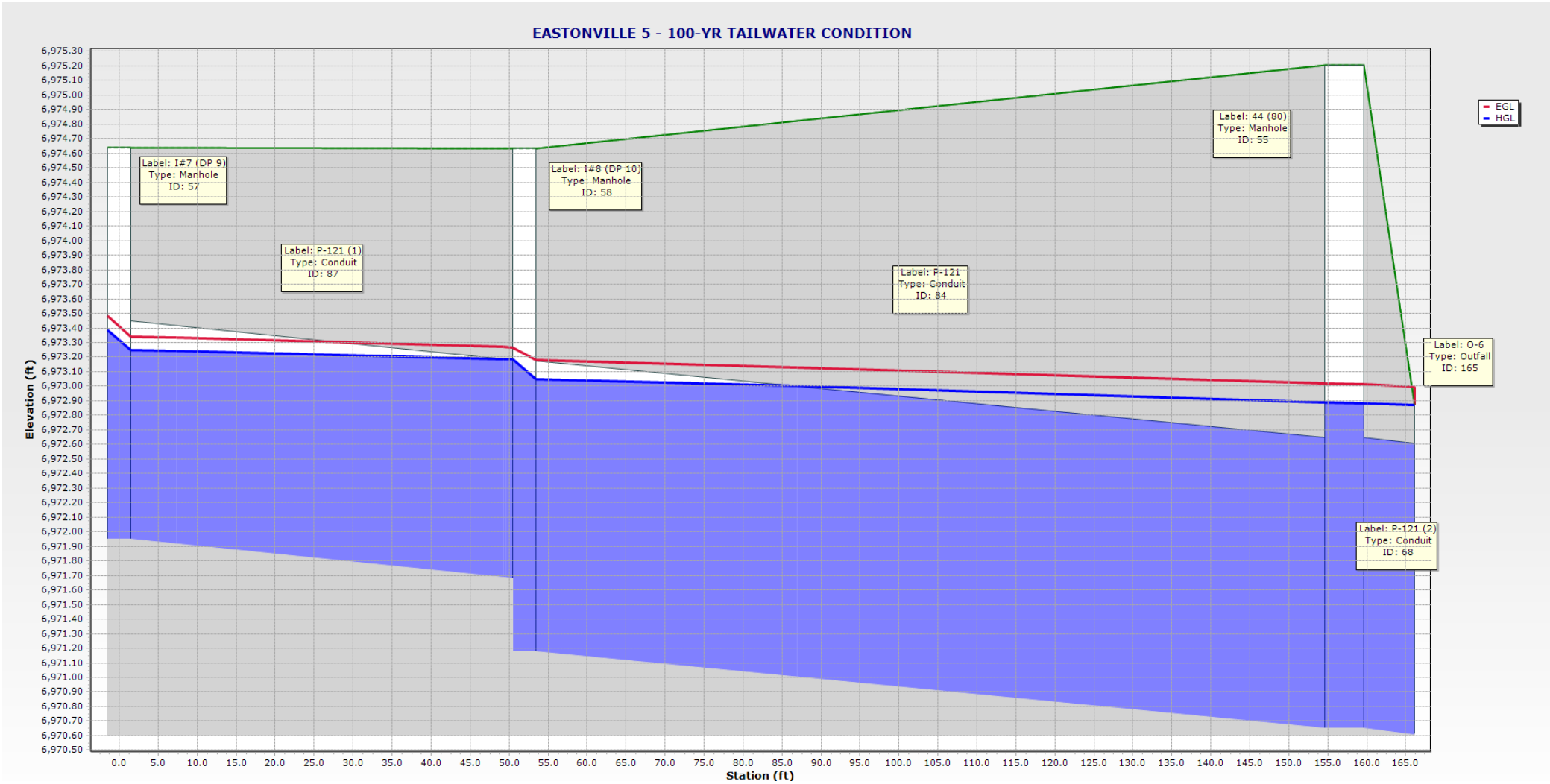

EASTONVILLE 9 - 100-YR TAILWATER CONDITION
Label: I#4 (DP 13)
Type: Manhole
ID: 45
Label: I#5 (DP 14)
Type: Manhole
ID: 46
Label: P-123
Type: Conduit
ID: 78
Label: P-124
Type: Conduit
ID: 67
Label: O-5
Type: Outfall
ID: 164
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 17 - 100-YR TAILWATER CONDITION - Time: 0.00
Label: 44 (69) (DP 15)
Type: Manhole
ID: 49
Label: P-125
Type: Conduit
ID: 80
Label: 44 (70)
Type: Outfall
ID: 53
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 3 - 100-YR TAILWATER CONDITION
Label: 44 (81)
Type: Manhole
ID: 56
Label: I#6 (DP 1)
Type: Manhole
ID: 59
Label: P-130
Type: Conduit
ID: 85
Label: P-130 (1)
Type: Conduit
ID: 86
Label: 44 (77)
Type: Outfall
ID: 61
EGL
HGL
Elevation (ft)
6,975.00
6,974.80
6,974.60
6,974.40
6,974.20
6,974.00
6,973.80
6,973.60
6,973.40
6,973.20
6,973.00
6,972.80
6,972.60
6,972.40
6,972.20
6,972.00
6,971.80
6,971.60
6,971.40
6,971.20
6,971.00
6,970.80
6,970.60
6,970.40
6,970.20
6,970.00
6,969.80
6,969.60
6,969.40
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0
135.0
140.0
145.0
Station (ft)

EASTONVILLE 4 - 100-YR TAILWATER CONDITION





NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS

5 YEAR TAILWATER CONDITION: PIPE SUMMARY TABLE

	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
66: P-8 (1) (1)	P-8 (1) (1)	MH#4 DP 18)	6,985.66	O-3	6,984.83	41.6	0.020	24.0	0.013	15.60	4.97	31.99	48.8	Concrete Pipe	6,988.57	6,988.37
67: P-124	P-124	I#5 (DP 14)	6,981.25	O-5	6,981.08	34.3	0.005	18.0	0.013	3.90	4.25	7.43	52.5	Concrete Pipe	6,982.28	6,982.25
68: P-121 (2)	P-121 (2)	44 (80)	6,970.65	O-6	6,970.61	9.0	0.005	24.0	0.013	4.20	1.34	15.95	26.3	Concrete Pipe	6,973.23	6,973.23
69: P-18	P-18	I#3 (DP 7)	6,985.73	MH#7	6,985.38	71.3	0.005	42.0	0.013	7.90	4.88	71.14	11.1	Concrete Pipe	6,986.58	6,986.42
70: P-20	P-20	MH#7	6,985.38	MH#6	6,984.50	175.6	0.005	42.0	0.013	7.90	4.88	71.14	11.1	Concrete Pipe	6,986.22	6,985.54
71: P-5	P-5	I#2 (DP 17)	6,989.29	I#1 (DP 16)	6,989.74	52.0	-0.009	18.0	0.013	3.00	4.87	9.77	30.7	Concrete Pipe	6,990.40	6,990.02
72: P-8 (1)	P-8 (1)	I#2 (DP 17)	6,988.79	MH#4 DP 18)	6,985.66	156.4	0.020	24.0	0.013	6.30	7.92	31.99	19.7	Concrete Pipe	6,989.68	6,988.96
73: P-21	P-21	MH#6	6,984.50	MH#5	6,984.13	74.6	0.005	42.0	0.013	7.90	4.88	71.14	11.1	Concrete Pipe	6,985.35	6,985.17
74: P-22	P-22	MH#5	6,984.13	MH#3 (DP 8)	6,981.11	127.1	0.024	42.0	0.013	7.90	8.44	154.95	5.1	Concrete Pipe	6,984.97	6,982.26
75: P-15	P-15	18 (DP 19)	6,983.26	MH#3 (DP 8)	6,983.11	30.8	0.005	18.0	0.013	0.30	2.06	7.43	4.0	Concrete Pipe	6,983.47	6,983.31
76: P-15 (1)	P-15 (1)	MH#3 (DP 8)	6,981.11	MH#2 (DP 8)	6,980.73	75.1	0.005	42.0	0.013	8.30	4.95	71.14	11.7	Concrete Pipe	6,981.98	6,981.70
77: P-16	P-16	MH#2 (DP 8)	6,980.63	MH#1	6,980.24	78.1	0.005	42.0	0.013	8.30	4.95	71.14	11.7	Concrete Pipe	6,981.50	6,981.05
78: P-123	P-123	I#4 (DP 13)	6,981.51	I#5 (DP 14)	6,981.25	52.0	0.005	18.0	0.013	2.10	3.61	7.43	28.3	Concrete Pipe	6,982.43	6,982.42
79: P-17	P-17	MH#1	6,980.14	OUTFALL	6,979.44	139.8	0.005	42.0	0.013	8.30	4.95	71.14	11.7	Concrete Pipe	6,981.01	6,980.25
80: P-125	P-125	44 (69) (DP 15)	6,978.42	44 (70)	6,977.55	54.5	0.016	18.0	0.013	0.30	3.09	13.30	2.3	Concrete Pipe	6,978.63	6,977.71
83: P-122	P-122	INLET (DP 3)	6,978.16	44 (65)	6,973.52	183.8	0.025	30.0	0.013	3.70	7.19	65.19	5.7	Concrete Pipe	6,978.80	6,973.93
84: P-121	P-121	I#8 (DP 10)	6,971.18	44 (80)	6,970.65	105.1	0.005	24.0	0.013	4.20	1.34	16.06	26.1	Concrete Pipe	6,973.27	6,973.23
85: P-130	P-130	I#6 (DP 1)	6,970.85	44 (81)	6,970.04	81.5	0.010	18.0	0.013	0.50	3.05	10.47	4.8	Concrete Pipe	6,971.11	6,970.31
86: P-130 (1)	P-130 (1)	44 (81)	6,970.04	44 (77)	6,969.39	65.0	0.010	18.0	0.013	0.50	3.05	10.50	4.8	Concrete Pipe	6,970.30	6,969.61
87: P-121 (1)	P-121 (1)	I#8 (DP 10)	6,971.68	I#7 (DP 9)	6,971.95	52.0	-0.005	18.0	0.013	2.20	3.71	7.57	29.1	Concrete Pipe	6,973.32	6,973.30
88: P-131	P-131	44 (78) (DP 11)	6,968.42	44 (79)	6,967.50	62.5	0.015	18.0	0.013	0.40	3.27	12.77	3.1	Concrete Pipe	6,968.66	6,967.68
126: P-111	P-111	MH#34	7,019.01	MH#39	7,017.01	146.6	0.014	18.0	0.013	1.70	4.88	12.28	13.8	Concrete Pipe	7,019.50	7,017.39
127: P-89	P-89	MH#8	6,986.87	MH#4 DP 18)	6,985.66	111.1	0.011	24.0	0.013	10.20	3.25	23.64	43.2	Concrete Pipe	6,989.18	6,988.96
128: P-25 (1)	P-25 (1)	CULVERT 2 (...	6,997.01	O-10	6,995.27	116.5	0.015		0.013	11.20	5.01	461.86	2.4	Concrete Box C	6,997.35	6,995.49
129: P-25	P-25	CULVERT 1 (...	6,997.01	O-7	6,995.27	116.6	0.015		0.013	11.20	5.01	461.72	2.4	Concrete Box C	6,997.35	6,995.49
131: P-107 (2)	P-107 (2) (1)	MH#26 (DP6.1)	7,021.10	DP9	7,020.49	60.7	0.010	24.0	0.013	2.90	4.95	22.62	12.8	Concrete Pipe	7,021.69	7,020.97
132: P-103	P-103	I#9 (DP6)	7,022.86	MH#26 (DP6.1)	7,021.84	42.7	0.024	18.0	0.013	1.20	5.37	16.22	7.4	Concrete Pipe	7,023.27	7,022.12
133: P-107 (2)	P-107 (2)	MH#27 (DP8)	7,021.66	MH#26 (DP6.1)	7,021.09	56.6	0.010	24.0	0.013	2.00	4.44	22.62	8.8	Concrete Pipe	7,022.15	7,022.07
134: P-107	P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.41	37.8	0.016	15.0	0.013	0.30	3.15	8.13	3.7	Concrete Pipe	7,023.22	7,022.58
135: P-107 (1)	P-107 (1)	MH#27 (DP8)	7,021.66	DP 2	7,021.66	43.9	0.000	24.0	0.013	1.70	0.76	2.17	78.3	Concrete Pipe	7,022.36	7,022.31
136: P-95	P-95	I#8 (DP5)	7,023.30	I#9 (DP6)	7,023.06	47.5	0.005	18.0	0.013	0.70	2.64	7.43	9.4	Concrete Pipe	7,023.61	7,023.42
137: P-93	P-93	I#6 (DP2.1)	7,022.36	I#7 (DP3.1)	7,021.80	55.9	0.010	18.0	0.013	0.80	3.51	10.51	7.6	Concrete Pipe	7,023.00	7,023.00
138: Pipe - (34	Pipe - (34)	I#7 (DP3.1)	7,021.80	FES OUTFALL 1	7,021.01	33.5	0.023	18.0	0.013	1.60	5.81	16.07	10.0	Concrete Pipe	7,023.00	7,023.00
140: P-44 (1)	P-44 (1)	MH#20	7,001.18	MH#21	6,998.52	266.5	0.010	48.0	0.013	6.10	5.68	143.63	4.2	Concrete Pipe	7,001.90	6,999.57
141: P-64	P-64	MH#21	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	6.10	5.74	145.88	4.2	Concrete Pipe	6,999.24	6,995.82
142: P-44	P-44	MH#19	7,003.94	MH#20	7,001.28	266.5	0.010	48.0	0.013	6.10	5.68	143.63	4.2	Concrete Pipe	7,004.66	7,001.84
143: P-26	P-26	DP 3	7,005.01	MH#19	7,004.04	81.5	0.012	48.0	0.013	6.10	6.03	156.73	3.9	Concrete Pipe	7,005.73	7,004.99
144: P-64 (1)	P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	6.10	7.23	203.15	3.0	Concrete Pipe	6,995.87	6,989.55
145: P-87	P-87	MH#10 (DP 1...	6,994.25	MH#9	6,989.76	320.7	0.014	24.0	0.013	10.20	7.94	26.78	38.1	Concrete Pipe	6,995.39	6,990.92
146: P-87 (1)	P-87 (1)	MH#9	6,989.76	MH#8	6,986.87	197.4	0.015	24.0	0.013	10.20	8.07	27.33	37.3	Concrete Pipe	6,990.90	6,989.29
147: P-84	P-84	I#4 (DP14)	6,995.69	MH#10 (DP 1...	6,994.25	8.1	0.179	18.0	0.013	5.20	16.82	44.40	11.7	Concrete Pipe	6,996.57	6,996.22
148: P-84 (1)	P-84 (1)	MH#10 (DP 1...	6,994.75	I#5 (DP 15)	6,995.50	53.9	-0.014	18.0	0.013	5.00	6.64	12.40	40.3	Concrete Pipe	6,996.36	6,996.22
149: P-66	P-66	MH#23	6,988.82	MH#24	6,988.08	149.0	0.005	48.0	0.013	6.10	4.45	101.56	6.0	Concrete Pipe	6,989.54	6,989.26
150: P-68	P-68	MH#24	6,988.08	MH#25 (DP13)	6,987.54	107.8	0.005	48.0	0.013	6.10	4.45	101.56	6.0	Concrete Pipe	6,989.26	6,989.27
151: P-77	P-77	DP12	6,990.32	MH#25 (DP13)	6,990.03	28.1	0.010	18.0	0.013	3.60	5.45	10.66	33.8	Concrete Pipe	6,991.04	6,990.64
152: P-74	P-74	MH#25 (DP13)	6,987.54	OUTLET SEGM...	6,986.67	173.3	0.005	48.0	0.013	26.00	6.76	101.56	25.6	Concrete Pipe	6,989.05	6,988.30

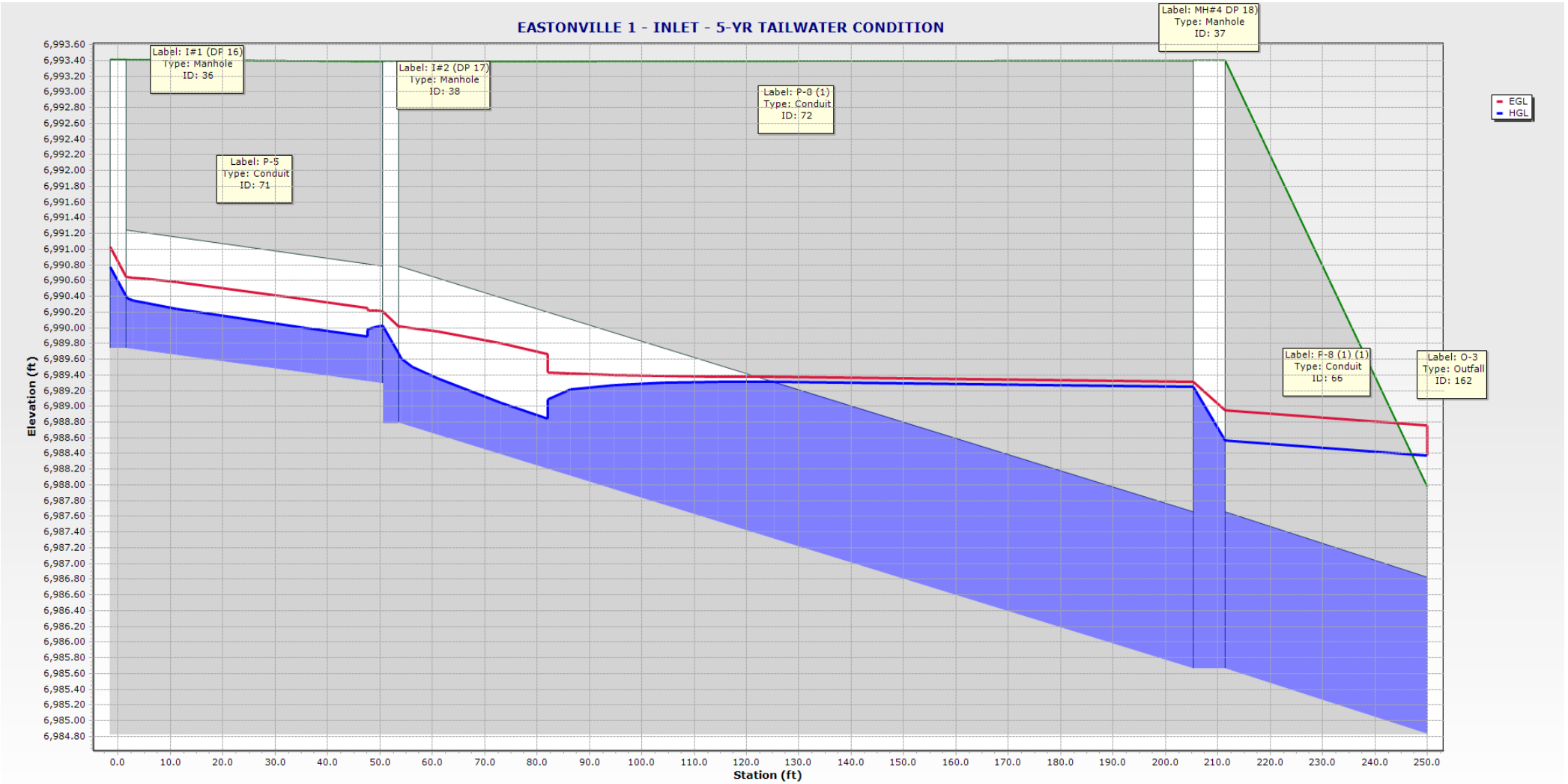
NOTE: EASTONVILLE 1 - INLET & EASTONVILLE 5 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 2 PIPES & STRUCTURES INCLUDED IN TABLE, REFER TO FDR FOR COMPLETE ANALYSIS.

5 YEAR TAILWATER CONDITION: STRUCTURE SUMMARY TABLE

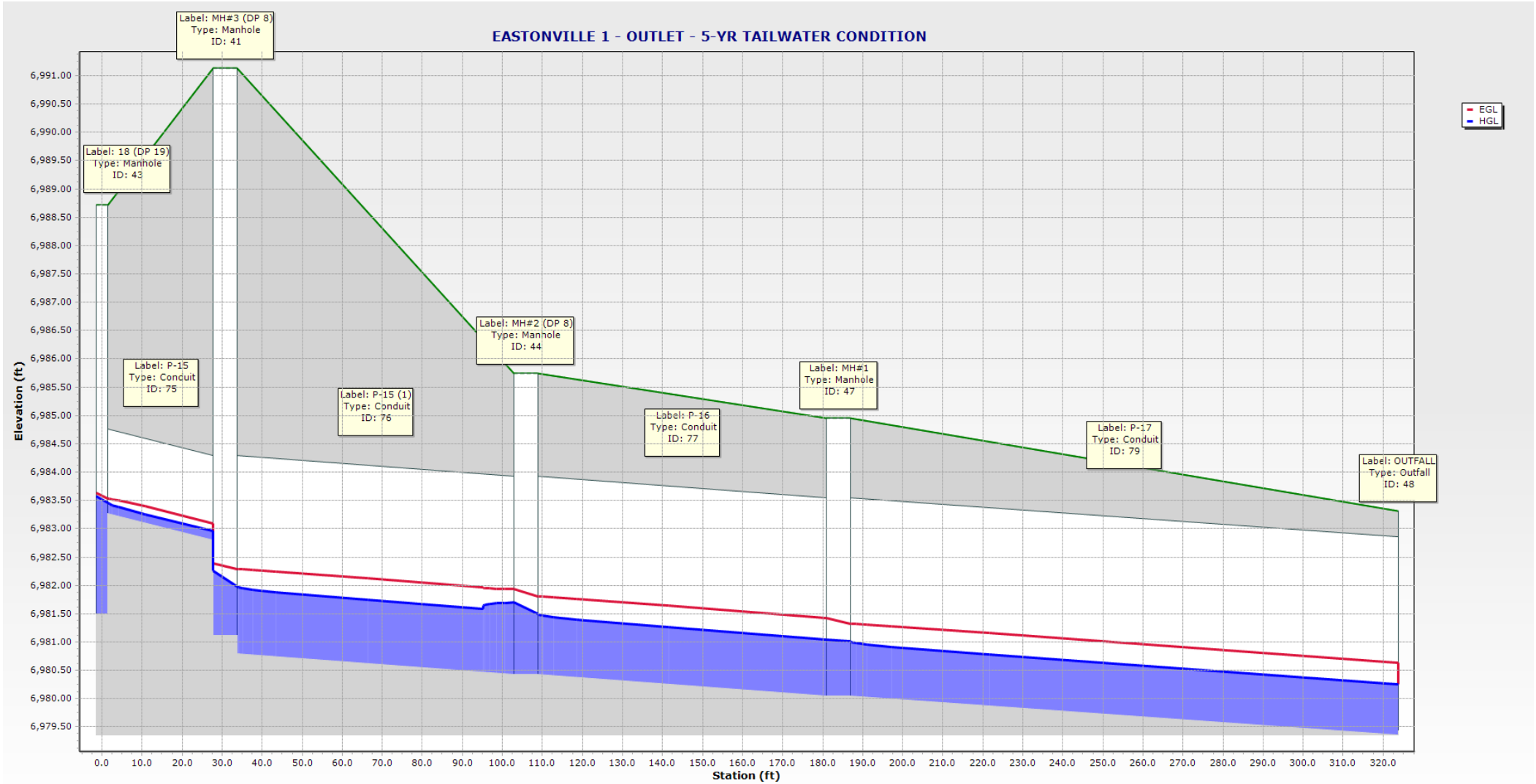
	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Notes	Elevation (Invert Out) (ft)	Headloss (ft)
35: MH#7	MH#7	6,993.52	6,993.52	7.90	0.85	6,986.22	6,986.42	STORM MH	6,985.38	0.19
36: I#1 (DP 16	I#1 (DP 16)	6,993.41	6,993.41	3.00	0.66	6,990.40	6,990.77	CDOT Type-	6,989.74	0.38
37: MH#4 DP	MH#4 DP 18)	6,993.40	6,993.40	15.60	2.91	6,988.57	6,988.96	STORM MH	6,985.66	0.39
38: I#2 (DP 17	I#2 (DP 17)	6,993.39	6,993.39	6.30	0.90	6,989.68	6,990.02	CDOT Type-	6,988.79	0.35
39: MH#6	MH#6	6,993.02	6,993.02	7.90	0.85	6,985.35	6,985.54	STORM MH	6,984.50	0.19
40: MH#5	MH#5	6,991.91	6,991.91	7.90	0.85	6,984.97	6,985.17	STORM MH	6,984.13	0.19
41: MH#3 (DP	MH#3 (DP 8)	6,991.13	6,991.13	8.30	0.87	6,981.98	6,982.26	STORM MH	6,981.11	0.28
42: I#3 (DP 7)	I#3 (DP 7)	6,990.73	6,990.73	7.90	0.93	6,986.58	6,987.03	CDOT Type-	6,985.73	0.45
43: 18 (DP 19)	18 (DP 19)	6,988.71	6,988.71	0.30	1.97	6,983.47	6,983.57	CDOT Type-	6,983.26	0.10
44: MH#2 (DP	MH#2 (DP 8)	6,985.74	6,985.74	8.30	0.87	6,981.50	6,981.70	STORM MH	6,980.63	0.20
45: I#4 (DP 13	I#4 (DP 13)	6,985.02	6,985.02	2.10	1.13	6,982.43	6,982.51	CDOT Type-	6,981.51	0.08
46: I#5 (DP 14	I#5 (DP 14)	6,985.02	6,985.02	3.90	1.23	6,982.28	6,982.42	CDOT Type-	6,981.25	0.15
47: MH#1	MH#1	6,984.95	6,984.95	8.30	0.87	6,981.01	6,981.04	STORM MH	6,980.14	0.03
49: 44 (69) (D	44 (69) (DP 15)	6,982.64	6,982.64	0.30	0.20	6,978.63	6,978.63	CDOT Type-	6,978.42	0.01
55: 44 (80)	44 (80)	6,975.21	6,975.21	4.20	2.58	6,973.23	6,973.23	Cylindrical S	6,970.65	0.00
56: 44 (81)	44 (81)	6,975.03	6,975.03	0.50	0.26	6,970.30	6,970.31	Cylindrical S	6,970.04	0.01
57: I#7 (DP 9)	I#7 (DP 9)	6,974.64	6,974.64	2.20	1.37	6,973.32	6,973.36	CDOT Type-	6,971.95	0.04
58: I#8 (DP 10	I#8 (DP 10)	6,974.64	6,974.64	4.20	2.09	6,973.27	6,973.30	CDOT Type-	6,971.18	0.03
59: I#6 (DP 1)	I#6 (DP 1)	6,973.20	6,973.20	0.50	0.26	6,971.11	6,971.25	CDOT Type-	6,970.85	0.14
60: 44 (78) (D	44 (78) (DP 11)	6,973.16	6,973.16	0.40	0.23	6,968.66	6,968.74	CDOT Type-	6,968.42	0.08
98: MH#26 (D	MH#26 (DP6.1)	7,027.15	7,027.15	2.90	0.60	7,021.69	7,022.07	STORM MH	7,021.10	0.38
99: MH#27 (D	MH#27 (DP8)	7,027.09	7,027.09	2.00	0.49	7,022.15	7,022.31	STORM MH	7,021.66	0.16
100: I#9 (DP6)	I#9 (DP6)	7,027.04	7,027.04	1.20	0.41	7,023.27	7,023.42	CDOT Type-	7,022.86	0.15
101: I#8 (DP5)	I#8 (DP5)	7,026.63	7,026.63	0.70	0.31	7,023.61	7,023.77	CDOT Type-	7,023.30	0.16
102: I#7 (DP3.	I#7 (DP3.1)	7,026.51	7,026.51	1.60	1.70	7,023.00	7,023.00	CDOT Type-	7,021.80	0.00
103: I#6 (DP2.	I#6 (DP2.1)	7,026.40	7,026.40	0.80	0.64	7,023.00	7,023.03	CDOT Type-	7,022.36	0.03
106: MH#34	MH#34	7,023.51	7,023.51	1.70	0.49	7,019.50	7,019.59	CDOT Type-	7,019.01	0.08
111: MH#21	MH#21	7,014.03	7,014.03	6.10	0.72	6,999.24	6,999.57	STORM MH	6,998.52	0.33
112: MH#20	MH#20	7,012.41	7,012.41	6.10	0.72	7,001.90	7,001.91	STORM MH	7,001.18	0.01
113: MH#19	MH#19	7,010.85	7,010.85	6.10	0.72	7,004.66	7,004.99	STORM MH	7,003.94	0.33
115: MH#22	MH#22	7,005.85	7,005.85	6.10	0.72	6,995.87	6,995.88	STORM MH	6,995.15	0.01
116: MH#9	MH#9	7,001.03	7,001.03	10.20	1.14	6,990.90	6,990.92	STORM MH	6,989.76	0.02
117: I#4 (DP1	I#4 (DP14)	7,000.17	7,000.17	5.20	0.88	6,996.57	6,997.11	CDOT Type-	6,995.69	0.55
118: MH#10 (	MH#10 (DP 1...	7,000.01	7,000.01	10.20	1.14	6,995.39	6,996.22	STORM MH	6,994.25	0.83
119: I#5 (DP 1	I#5 (DP 15)	6,999.67	6,999.67	5.00	0.46	6,996.36	6,996.89	CDOT Type-	6,995.50	0.53
120: MH#8	MH#8	6,996.13	6,996.13	10.20	2.52	6,989.18	6,989.29	STORM MH	6,986.87	0.10
121: MH#23	MH#23	6,995.25	6,995.25	6.10	0.72	6,989.54	6,989.55	STORM MH	6,988.82	0.01
122: MH#24	MH#24	6,993.32	6,993.32	6.10	1.18	6,989.26	6,989.26	STORM MH	6,988.08	0.00
123: DP12	DP12	6,993.02	6,993.02	3.60	0.73	6,991.04	6,991.47	CDOT Type-	6,990.32	0.42
124: MH#25 (	MH#25 (DP13)	6,992.79	6,992.79	26.00	1.51	6,989.05	6,989.27	STORM MH	6,987.54	0.22
190: INLET (D	INLET (DP 3)	6,980.96	6,980.96	3.70	0.63	6,978.80	6,979.13	CDOT FES	6,978.16	0.34
192: DP 7	DP 7	7,024.45	7,024.45	0.30	0.21	7,023.22	7,023.33	CDOT FES	7,023.01	0.11
193: DP 2	DP 2	7,024.26	7,024.26	1.70	0.35	7,022.36	7,022.43	CDOT FES	7,021.66	0.07
194: DP 3	DP 3	7,009.43	7,009.43	6.10	0.72	7,005.73	7,006.10	CDOT FES	7,005.01	0.37
196: CULVERT	CULVERT 1 (...	7,000.01	7,000.01	11.20	0.34	6,997.35	6,997.61	Dummy Null	6,997.01	0.25
197: CULVERT	CULVERT 2 (...	7,000.01	7,000.01	11.20	0.34	6,997.35	6,997.61	Dummy Null	6,997.01	0.25

	ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)	Notes
48: OUTFALL	48	OUTFALL	6,983.32	6,979.44		6,980.25	8.30	CDOT FES
53: 44 (70)	53	44 (70)	6,979.33	6,977.55		6,977.71	0.30	CDOT FES
54: 44 (65)	54	44 (65)	6,976.31	6,973.52		6,973.93	3.70	CDOT FES
61: 44 (77)	61	44 (77)	6,971.10	6,969.39		6,969.61	0.50	CDOT FES
64: 44 (79)	64	44 (79)	6,969.82	6,967.50		6,967.68	0.40	CDOT FES
107: DP9	107	DP9	7,022.74	7,020.49		7,020.97	2.90	CDOT FES
108: FES OUTFALL 1	108	FES OUTFALL 1	7,023.00	7,021.01	7,023.00	7,023.00	1.60	CDOT FES
110: MH#39	110	MH#39	7,018.18	7,017.01		7,017.39	1.70	CDOT FES
125: OUTLET SEGMENT 3	125	OUTLET SEG...	6,991.09	6,986.67	6,988.30	6,988.30	26.00	CDOT FES
162: O-3	162	O-3	6,987.98	6,984.83	6,988.37	6,988.37	15.60	Dummy Null
164: O-5	164	O-5	6,982.10	6,981.08	6,982.25	6,982.25	3.90	Dummy Null
165: O-6	165	O-6	6,972.87	6,970.61	6,973.23	6,973.23	4.20	Dummy Null
203: O-7	203	O-7	6,998.27	6,995.27		6,995.49	11.20	Dummy Null
207: O-10	207	O-10	6,998.27	6,995.27		6,995.49	11.20	Dummy Null

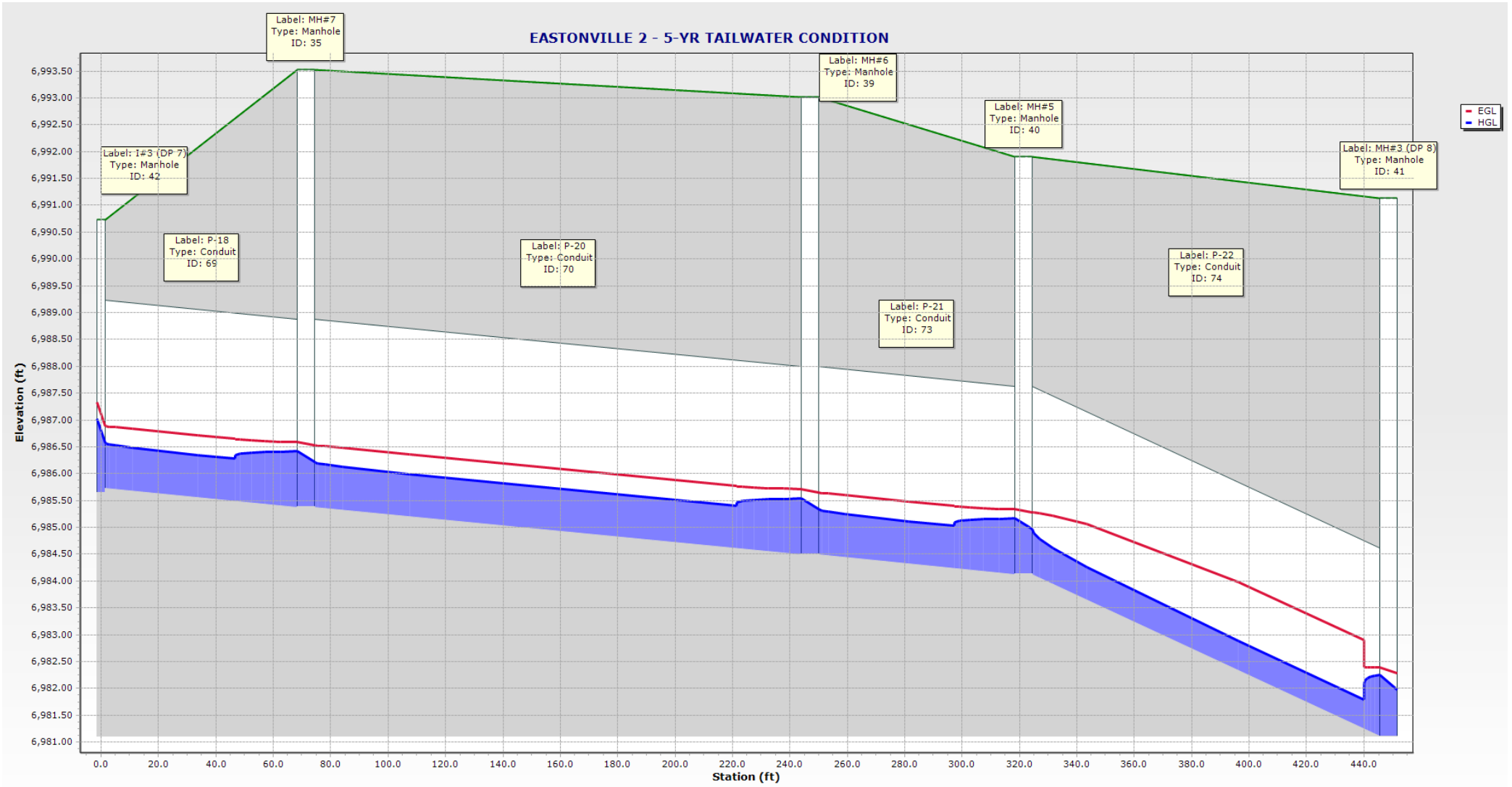
NOTE: EASTONVILLE 1 - INLET & EASTONVILLE 5 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 2 PIPES & STRUCTURES INCLUDED IN TABLE, REFER TO FDR FOR COMPLETE ANALYSIS.



NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS



NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS


EASTONVILLE 2 - 5-YR TAILWATER CONDITION
Label: MH#7
Type: Manhole
ID: 35
Label: MH#6
Type: Manhole
ID: 39
Label: MH#5
Type: Manhole
ID: 40
Label: MH#3 (DP 8)
Type: Manhole
ID: 41
Label: I#3 (DP 7)
Type: Manhole
ID: 42
Label: P-18
Type: Conduit
ID: 69
Label: P-20
Type: Conduit
ID: 70
Label: P-21
Type: Conduit
ID: 73
Label: P-22
Type: Conduit
ID: 74
EGL
HGL
Elevation (ft)
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6,984.00
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6,983.00
6,982.50
6,982.00
6,981.50
6,981.00
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20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
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360.0
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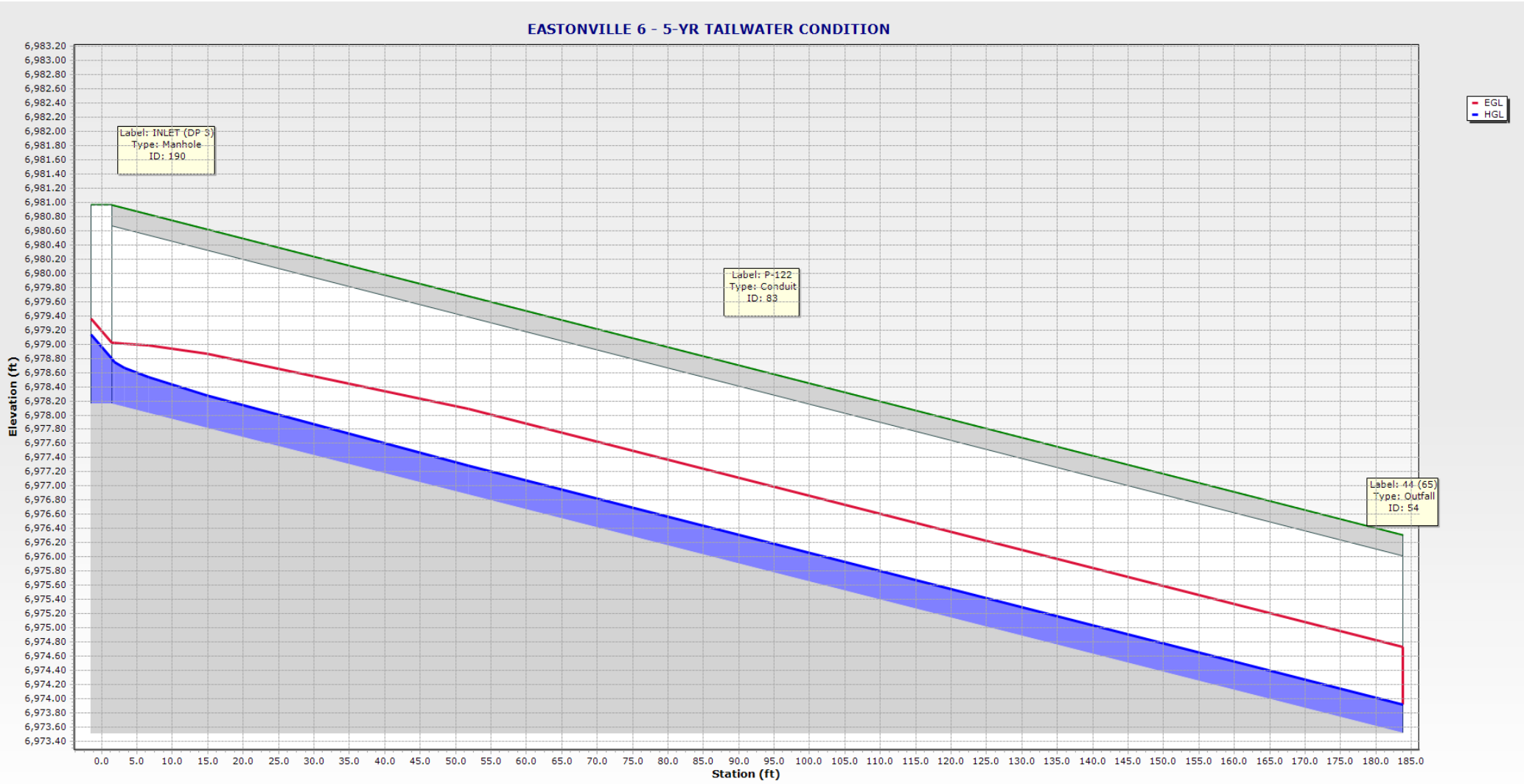
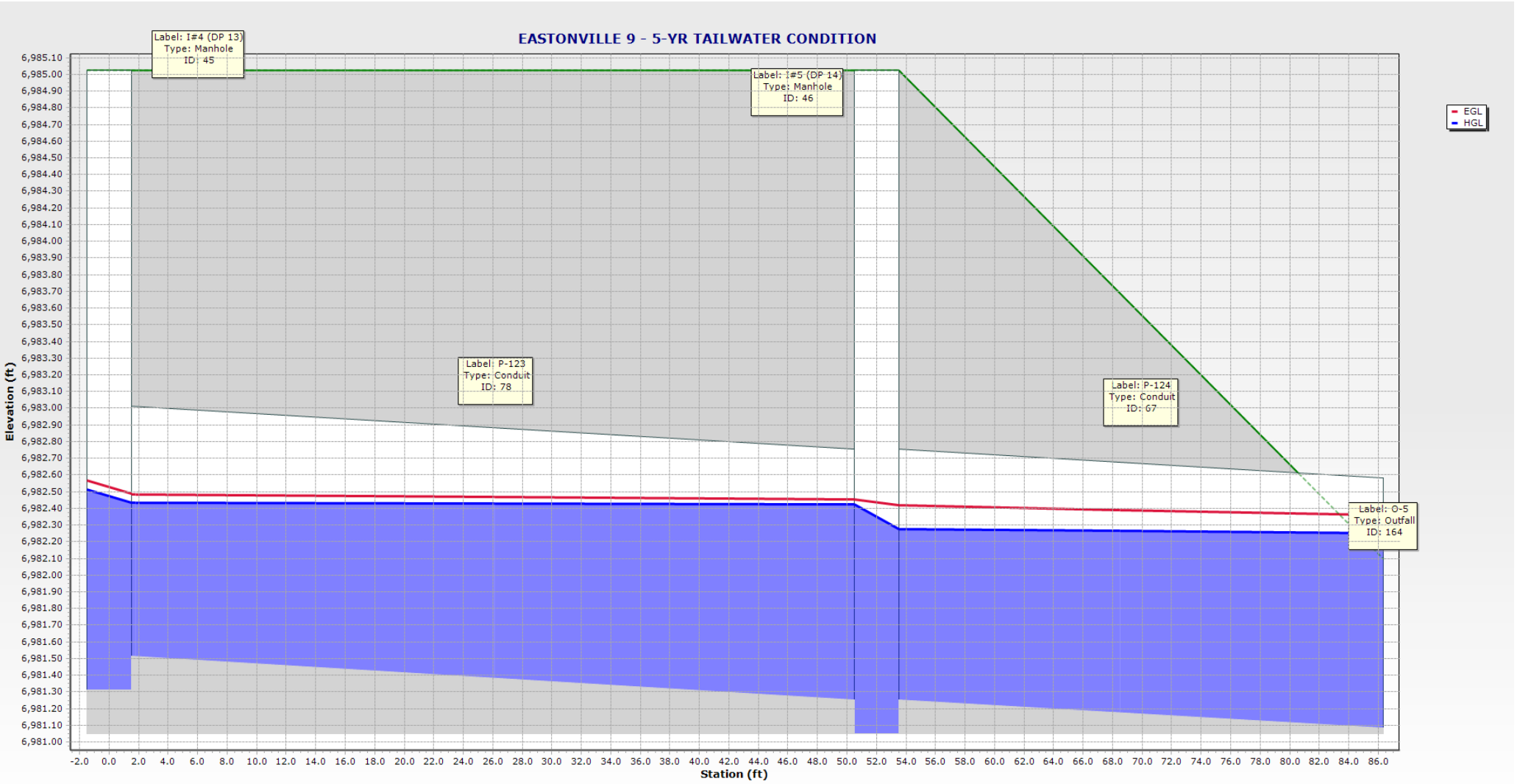
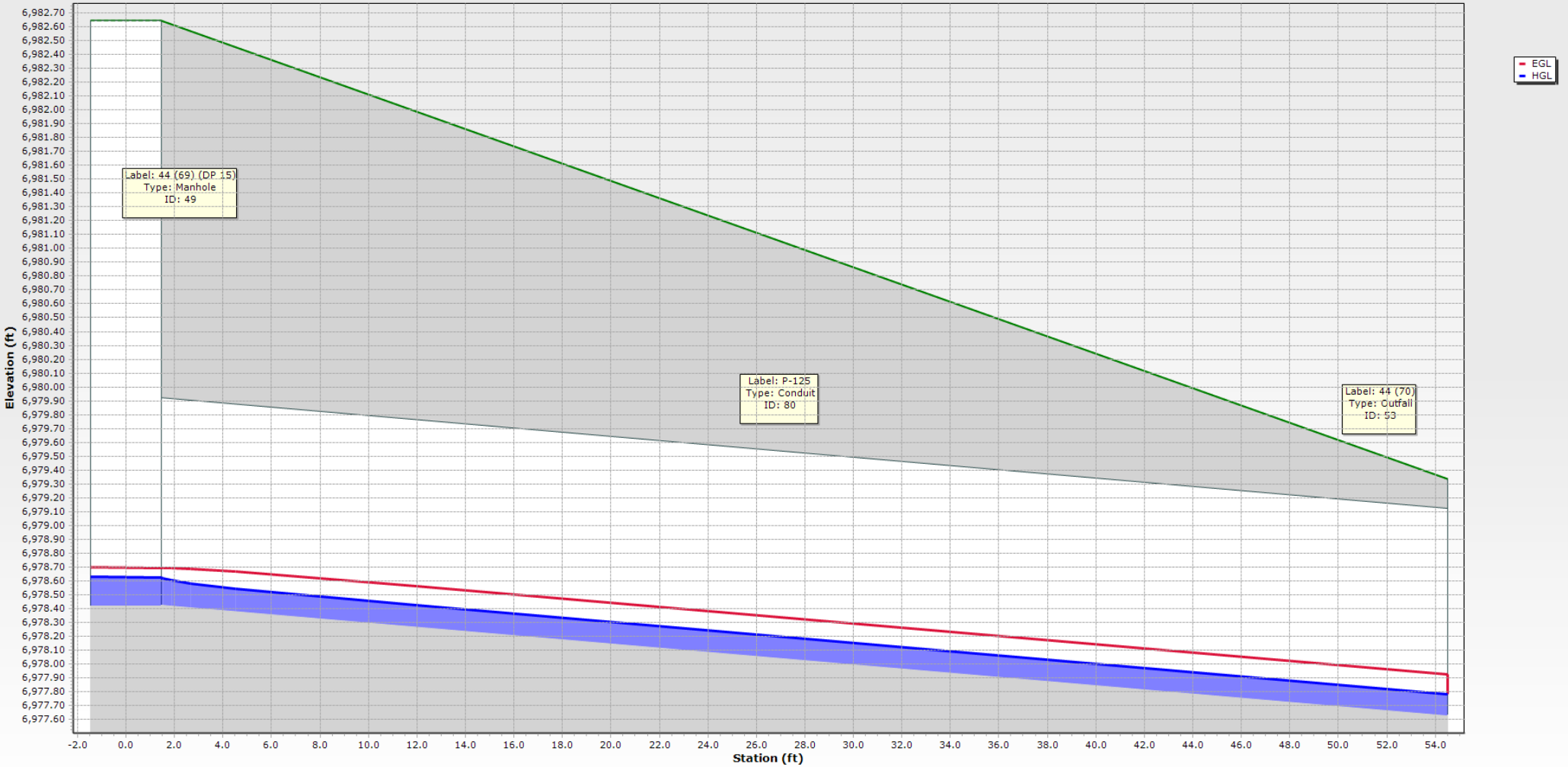
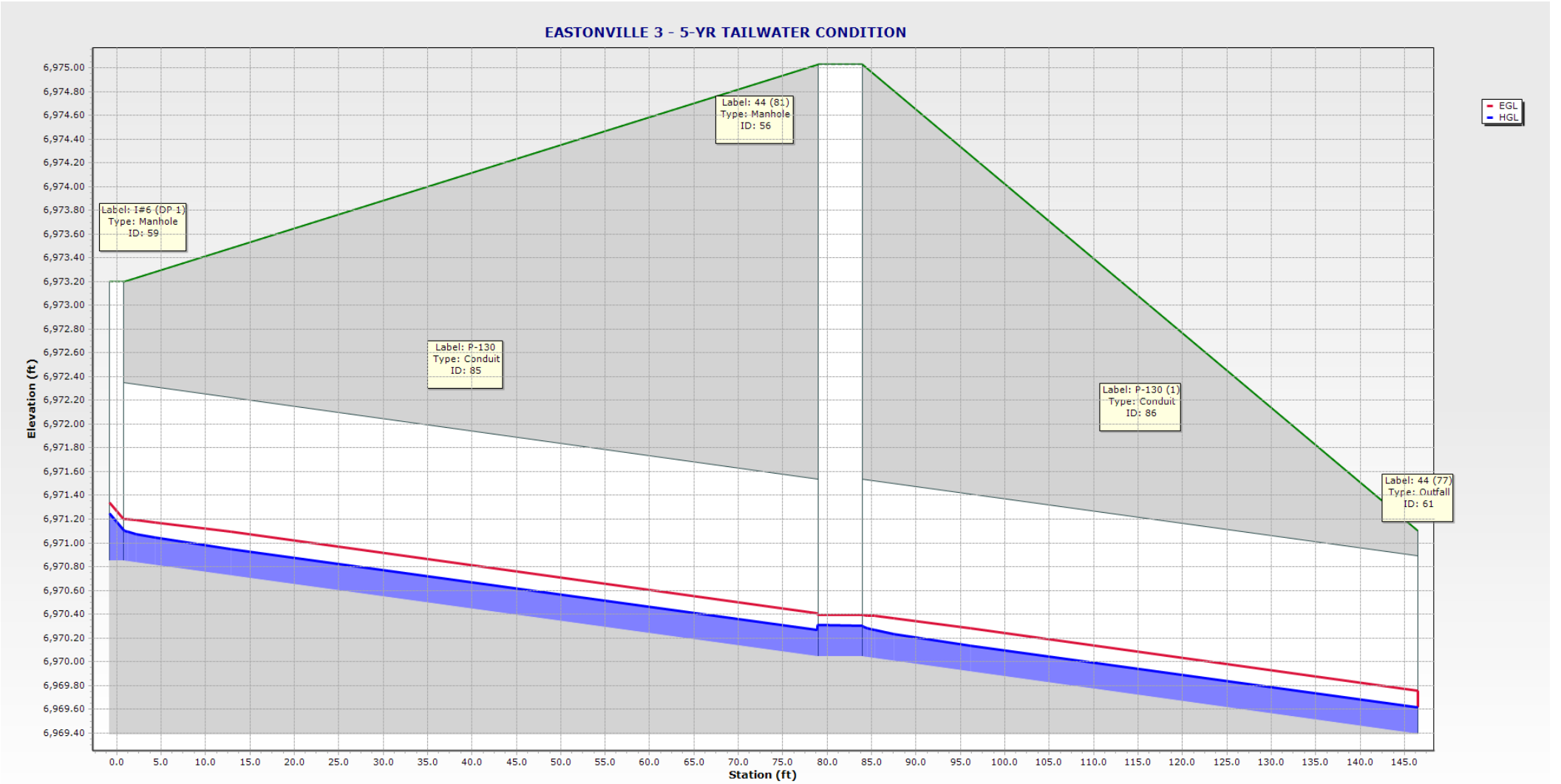
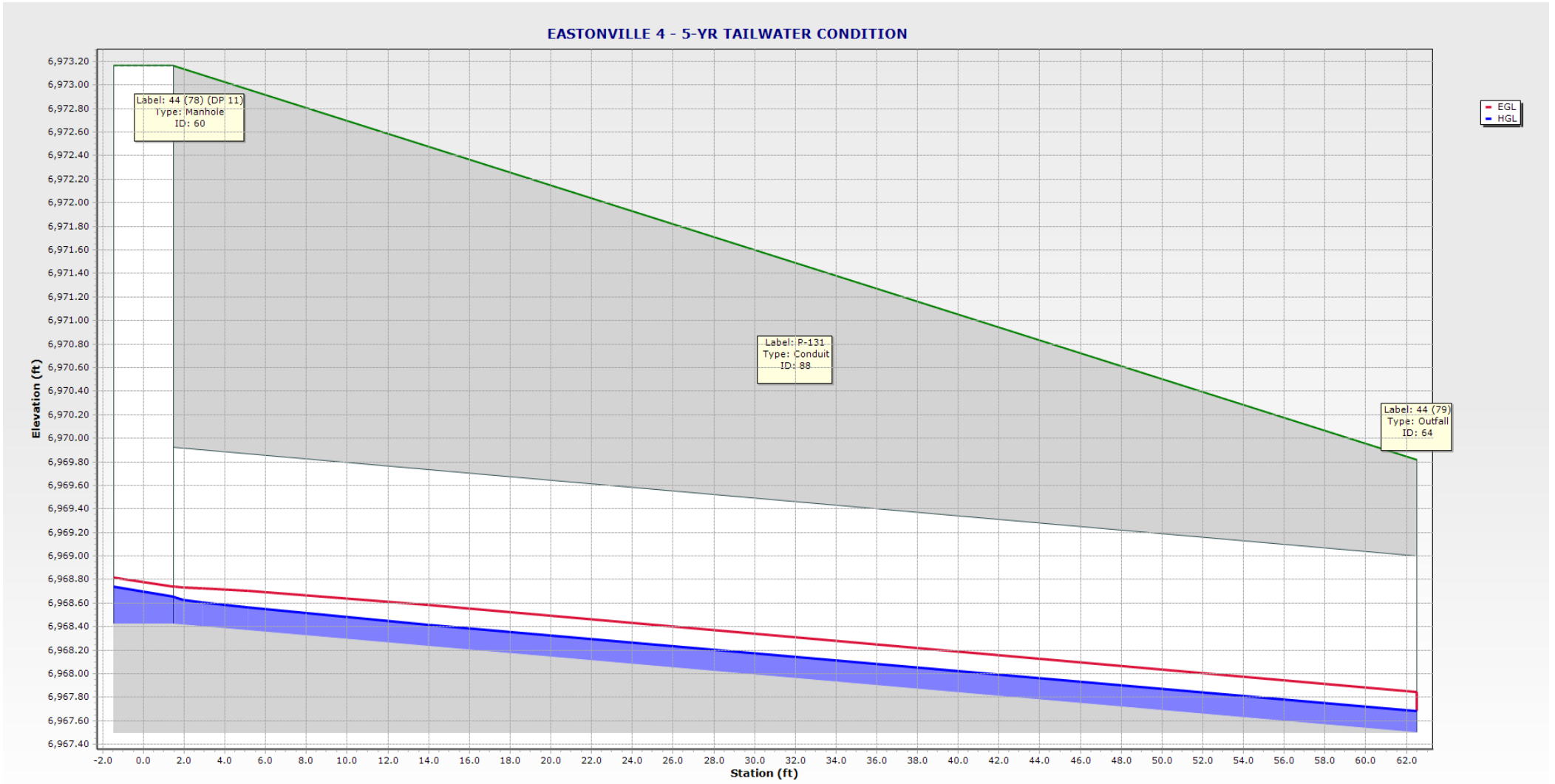
420.0
440.0
Station (ft)


EASTONVILLE 6 - 5-YR TAILWATER CONDITION
Label: INLET (DP 3)
Type: Manhole
ID: 190
Label: P-122
Type: Conduit
ID: 83
Label: 44 (65)
Type: Outfall
ID: 54
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 9 - 5-YR TAILWATER CONDITION
Label: I#4 (DP 13)
Type: Manhole
ID: 45
Label: I#5 (DP 14)
Type: Manhole
ID: 46
Label: P-123
Type: Conduit
ID: 78
Label: P-124
Type: Conduit
ID: 67
Label: O-5
Type: Outfall
ID: 164
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 17 - 5-YR TAILWATER CONDITION - Time: 0.00
Elevation (ft)
Station (ft)
EGL
HGL
Label: 44 (69) (DP 15)
Type: Manhole
ID: 49
Label: P-125
Type: Conduit
ID: 80
Label: 44 (70)
Type: Outfall
ID: 53


EASTONVILLE 3 - 5-YR TAILWATER CONDITION
Elevation (ft)
Station (ft)
EGL
HGL
Label: I#6 (DP 1)
Type: Manhole
ID: 59
Label: P-130
Type: Conduit
ID: 85
Label: 44 (81)
Type: Manhole
ID: 56
Label: P-130 (1)
Type: Conduit
ID: 86
Label: 44 (77)
Type: Outfall
ID: 61


EASTONVILLE 4 - 5-YR TAILWATER CONDITION
Label: 44 (78) (DP 11)
Type: Manhole
ID: 60
Label: P-131
Type: Conduit
ID: 88
Label: 44 (79)
Type: Outfall
ID: 64
EGL
HGL
Elevation (ft)
Station (ft)
6,973.20
6,973.00
6,972.80
6,972.60
6,972.40
6,972.20
6,972.00
6,971.80
6,971.60
6,971.40
6,971.20
6,971.00
6,970.80
6,970.60
6,970.40
6,970.20
6,970.00
6,969.80
6,969.60
6,969.40
6,969.20
6,969.00
6,968.80
6,968.60
6,968.40
6,968.20
6,968.00
6,967.80
6,967.60
6,967.40
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
32.0
34.0
36.0
38.0
40.0
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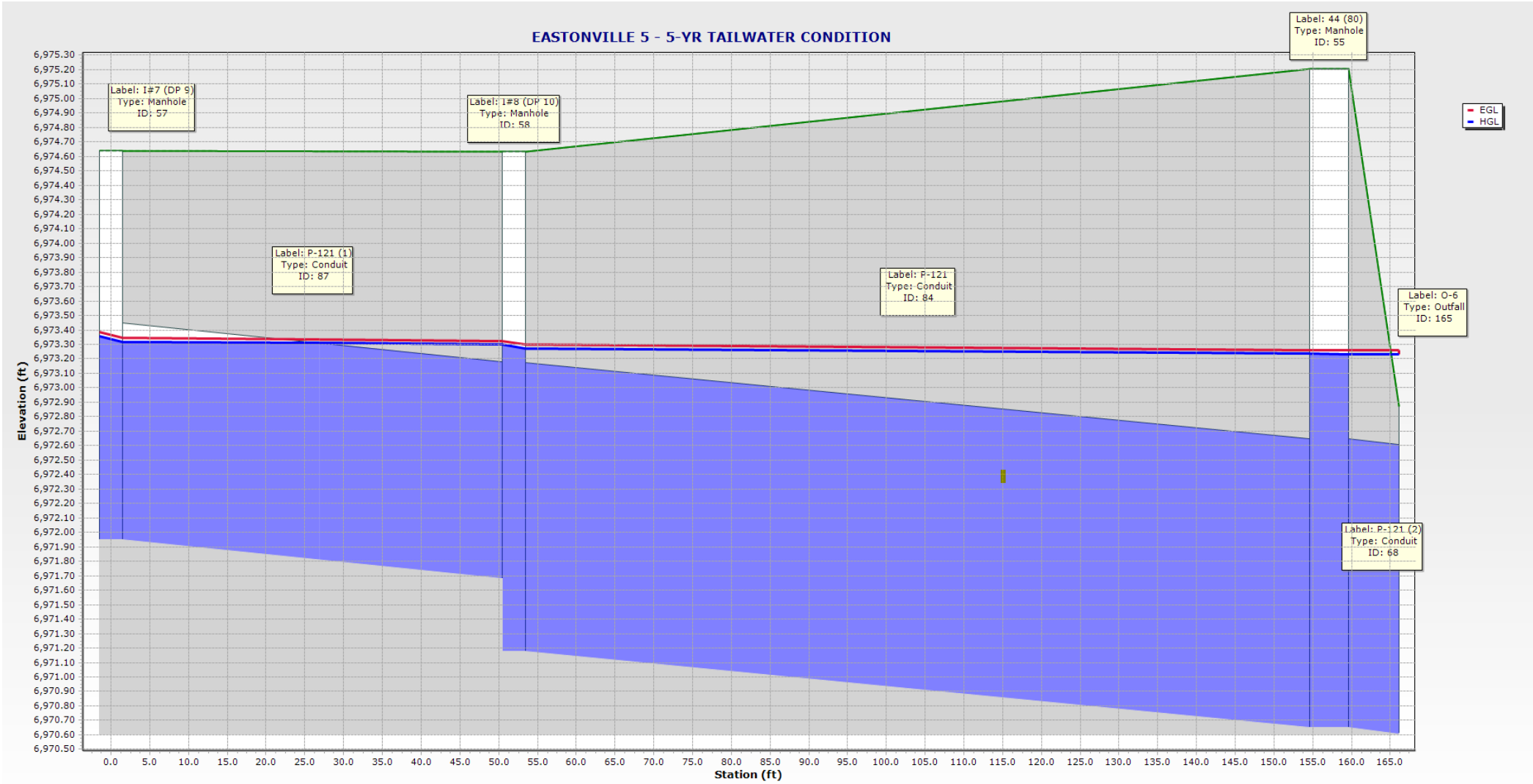
52.0
54.0
56.0
58.0
60.0
62.0



NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS

100 YEAR FREE OUTFALL CONDITION: PIPE SUMMARY TABLE

	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
66: P-8 (1) (1)	P-8 (1) (1)	MH#4 DP 18)	6,985.66	O-3	6,984.83	41.6	0.020	24.0	0.013	26.20	8.34	31.99	81.9	Concrete Pipe	6,988.54	6,987.98
67: P-124	P-124	I#5 (DP 14)	6,981.25	O-5	6,981.08	34.3	0.005	18.0	0.013	6.50	4.74	7.43	87.5	Concrete Pipe	6,982.33	6,982.10
68: P-121 (2)	P-121 (2)	44 (80)	6,970.65	O-6	6,970.61	9.0	0.005	24.0	0.013	9.00	5.23	15.95	56.4	Concrete Pipe	6,971.73	6,971.68
69: P-18	P-18	I#3 (DP 7)	6,985.73	MH#7	6,985.38	71.3	0.005	42.0	0.013	53.30	8.11	71.14	74.9	Concrete Pipe	6,988.48	6,988.38
70: P-20	P-20	MH#7	6,985.38	MH#6	6,984.50	175.6	0.005	42.0	0.013	53.30	8.11	71.14	74.9	Concrete Pipe	6,987.84	6,987.61
71: P-5	P-5	I#2 (DP 17)	6,989.29	I#1 (DP 16)	6,989.74	52.0	-0.009	18.0	0.013	5.10	5.59	9.77	52.2	Concrete Pipe	6,990.61	6,990.44
72: P-8 (1)	P-8 (1)	I#2 (DP 17)	6,988.79	MH#4 DP 18)	6,985.66	156.4	0.020	24.0	0.013	10.50	9.12	31.99	32.8	Concrete Pipe	6,989.95	6,989.64
73: P-21	P-21	MH#6	6,984.50	MH#5	6,984.13	74.6	0.005	42.0	0.013	53.30	8.11	71.14	74.9	Concrete Pipe	6,987.15	6,987.05
74: P-22	P-22	MH#5	6,984.13	MH#3 (DP 8)	6,981.11	127.1	0.024	42.0	0.013	53.30	14.61	154.95	34.4	Concrete Pipe	6,986.41	6,983.59
75: P-15	P-15	18 (DP 19)	6,983.26	MH#3 (DP 8)	6,983.11	30.8	0.005	18.0	0.013	3.00	3.98	7.43	40.4	Concrete Pipe	6,983.93	6,983.77
76: P-15 (1)	P-15 (1)	MH#3 (DP 8)	6,981.11	MH#2 (DP 8)	6,980.73	75.1	0.005	42.0	0.013	1.77	3.13	71.14	2.5	Concrete Pipe	6,983.59	6,983.59
77: P-16	P-16	MH#2 (DP 8)	6,980.63	MH#1	6,980.24	78.1	0.005	42.0	0.013	54.30	8.14	71.14	76.3	Concrete Pipe	6,982.94	6,982.55
78: P-123	P-123	I#4 (DP 13)	6,981.51	I#5 (DP 14)	6,981.25	52.0	0.005	18.0	0.013	3.40	4.11	7.43	45.8	Concrete Pipe	6,982.73	6,982.69
79: P-17	P-17	MH#1	6,980.14	OUTFALL	6,979.44	139.8	0.005	42.0	0.013	54.30	8.14	71.14	76.3	Concrete Pipe	6,982.45	6,981.73
80: P-125	P-125	44 (69) (DP 15)	6,978.42	44 (70)	6,977.55	54.5	0.016	18.0	0.013	1.20	4.67	13.30	9.0	Concrete Pipe	6,978.83	6,977.85
83: P-122	P-122	INLET (DP 3)	6,978.16	44 (65)	6,973.52	183.8	0.025	30.0	0.013	24.50	12.34	65.19	37.6	Concrete Pipe	6,979.85	6,974.58
84: P-121	P-121	I#8 (DP 10)	6,971.18	44 (80)	6,970.65	105.1	0.005	24.0	0.013	9.00	5.26	16.06	56.0	Concrete Pipe	6,972.25	6,971.75
85: P-130	P-130	I#6 (DP 1)	6,970.85	44 (81)	6,970.04	81.5	0.010	18.0	0.013	3.60	5.37	10.47	34.4	Concrete Pipe	6,971.57	6,970.79
86: P-130 (1)	P-130 (1)	44 (81)	6,970.04	44 (77)	6,969.39	65.0	0.010	18.0	0.013	3.60	5.39	10.50	34.3	Concrete Pipe	6,970.76	6,970.00
87: P-121 (1)	P-121 (1)	I#8 (DP 10)	6,971.68	I#7 (DP 9)	6,971.95	52.0	-0.005	18.0	0.013	4.10	4.37	7.57	54.2	Concrete Pipe	6,972.75	6,972.69
88: P-131	P-131	44 (78) (DP 11)	6,968.42	44 (79)	6,967.50	62.5	0.015	18.0	0.013	1.40	4.75	12.77	11.0	Concrete Pipe	6,968.87	6,967.84
126: P-111	P-111	MH#34	7,019.01	MH#39	7,017.01	146.6	0.014	18.0	0.013	3.40	5.94	12.28	27.7	Concrete Pipe	7,019.72	7,017.55
127: P-89	P-89	MH#8	6,986.87	MH#4 DP 18)	6,985.66	111.1	0.011	24.0	0.013	19.10	6.08	23.64	80.8	Concrete Pipe	6,990.43	6,989.64
128: P-25 (1)	P-25 (1)	CULVERT 2 (...	6,997.01	O-10	6,995.27	116.5	0.015		0.013	295.50	16.72	461.86	64.0	Concrete Box C	7,000.01	6,997.28
129: P-25	P-25	CULVERT 1 (...	6,997.01	O-7	6,995.27	116.6	0.015		0.013	245.50	15.71	461.72	53.2	Concrete Box C	6,999.67	6,997.02
131: P-107 (2)	P-107 (2) (1)	MH#26 (DP6.1)	7,021.10	DP9	7,020.49	60.7	0.010	24.0	0.013	22.40	8.21	22.62	99.0	Concrete Pipe	7,022.79	7,022.11
132: P-103	P-103	I#9 (DP6)	7,022.86	MH#26 (DP6.1)	7,021.84	42.7	0.024	18.0	0.013	2.40	1.36	16.22	14.8	Concrete Pipe	7,024.53	7,024.51
133: P-107 (2)	P-107 (2)	MH#27 (DP8)	7,021.66	MH#26 (DP6.1)	7,021.09	56.6	0.010	24.0	0.013	21.00	6.68	22.62	92.8	Concrete Pipe	7,025.00	7,024.51
134: P-107	P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.41	37.8	0.016	15.0	0.013	2.20	1.79	8.13	27.1	Concrete Pipe	7,025.67	7,025.62
135: P-107 (1)	P-107 (1)	MH#27 (DP8)	7,021.66	DP 2	7,021.66	43.9	0.000	24.0	0.013	18.80	5.98	2.17	865.7	Concrete Pipe	7,025.93	7,025.62
136: P-95	P-95	I#8 (DP5)	7,023.30	I#9 (DP6)	7,023.06	47.5	0.005	18.0	0.013	1.30	3.16	7.43	17.5	Concrete Pipe	7,024.57	7,024.56
137: P-93	P-93	I#6 (DP2.1)	7,022.36	I#7 (DP3.1)	7,021.80	55.9	0.010	18.0	0.013	1.50	4.22	10.51	14.3	Concrete Pipe	7,022.99	7,023.02
138: Pipe - (34	Pipe - (34)	I#7 (DP3.1)	7,021.80	FES OUTFALL 1	7,021.01	33.5	0.023	18.0	0.013	3.20	7.09	16.07	19.9	Concrete Pipe	7,023.01	7,023.00
140: P-44 (1)	P-44 (1)	MH#20	7,001.18	MH#21	6,998.52	266.5	0.010	48.0	0.013	112.10	8.92	143.63	78.0	Concrete Pipe	7,005.57	7,003.94
141: P-64	P-64	MH#21	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	112.10	12.80	145.88	76.8	Concrete Pipe	7,001.72	6,997.89
142: P-44	P-44	MH#19	7,003.94	MH#20	7,001.28	266.5	0.010	48.0	0.013	112.10	12.64	143.63	78.0	Concrete Pipe	7,007.14	7,005.63
143: P-26	P-26	DP 3	7,005.01	MH#19	7,004.04	81.5	0.012	48.0	0.013	112.10	8.92	156.73	71.5	Concrete Pipe	7,009.86	7,009.36
144: P-64 (1)	P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	112.10	16.57	203.15	55.2	Concrete Pipe	6,998.35	6,994.29
145: P-87	P-87	MH#10 (DP 1...	6,994.25	MH#9	6,989.76	320.7	0.014	24.0	0.013	19.10	9.26	26.78	71.3	Concrete Pipe	6,995.82	6,992.24
146: P-87 (1)	P-87 (1)	MH#9	6,989.76	MH#8	6,986.87	197.4	0.015	24.0	0.013	19.10	6.08	27.33	69.9	Concrete Pipe	6,992.21	6,990.80
147: P-84	P-84	I#4 (DP14)	6,995.69	MH#10 (DP 1...	6,994.25	8.1	0.179	18.0	0.013	8.80	4.98	44.40	19.8	Concrete Pipe	6,997.31	6,997.25
148: P-84 (1)	P-84 (1)	MH#10 (DP 1...	6,994.75	I#5 (DP 15)	6,995.50	53.9	-0.014	18.0	0.013	10.40	5.89	12.40	83.9	Concrete Pipe	6,997.78	6,997.25
149: P-66	P-66	MH#23	6,988.82	MH#24	6,988.08	149.0	0.005	48.0	0.013	112.10	8.92	101.56	110.4	Concrete Pipe	6,994.23	6,993.32
150: P-68	P-68	MH#24	6,988.08	MH#25 (DP13)	6,987.54	107.8	0.005	48.0	0.013	112.10	8.92	101.56	110.4	Concrete Pipe	6,993.36	6,992.70
151: P-77	P-77	DP12	6,990.32	MH#25 (DP13)	6,990.03	28.1	0.010	18.0	0.013	24.40	13.81	10.66	228.8	Concrete Pipe	6,994.22	6,992.70
152: P-74	P-74	MH#25 (DP13)	6,987.54	OUTLET SEGM...	6,986.67	173.3	0.005	48.0	0.013	136.40	10.85	101.56	134.3	Concrete Pipe	6,991.97	6,990.15

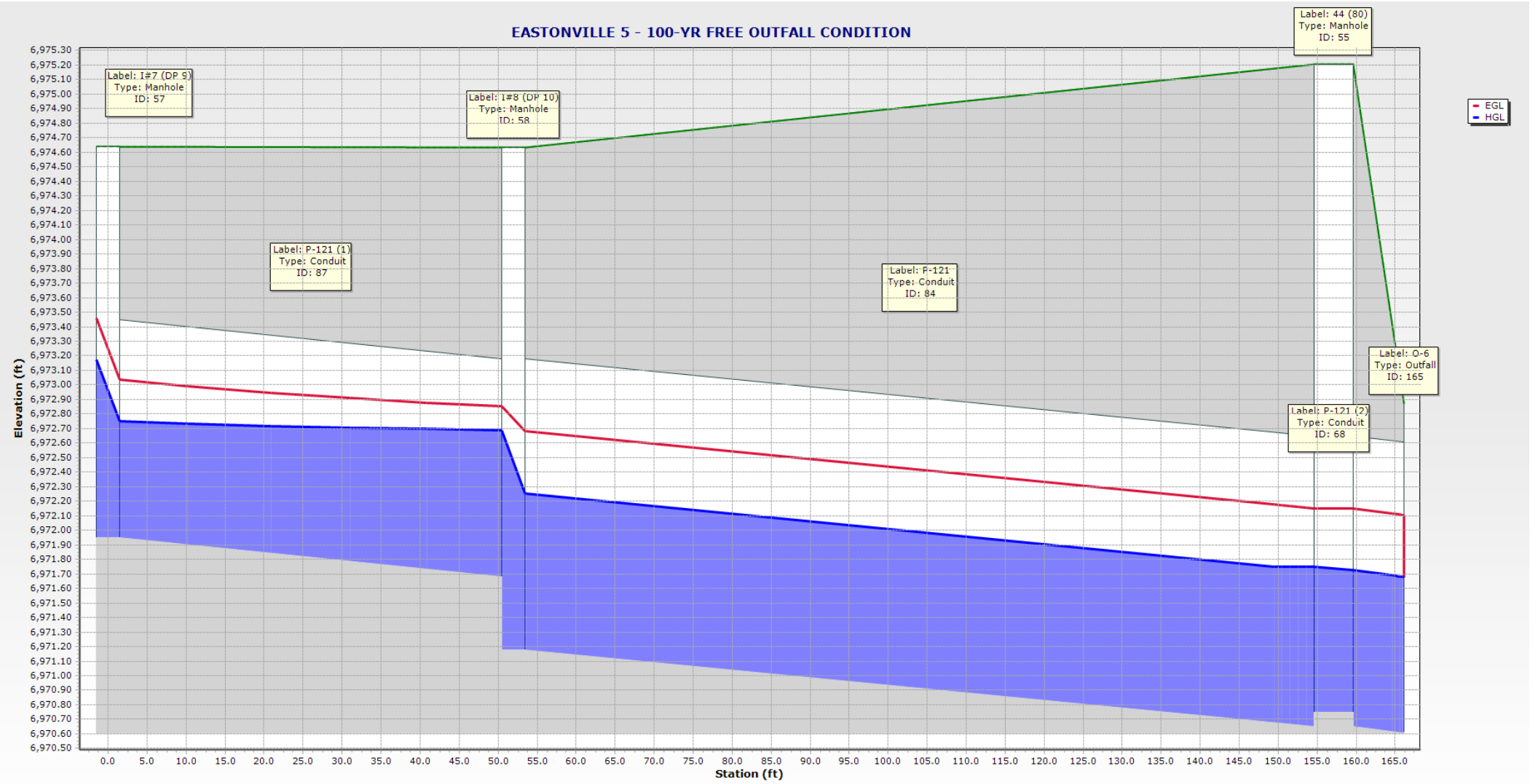
NOTE: SEE PROFILES FOR PIPES STUDIED WITH THIS ANALYSIS

100 YEAR FREE OUTFALL CONDITION: STRUCTURE SUMMARY TABLE

	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Notes	Elevation (Invert Out) (ft)	Headloss (ft)
35: MH#7	MH#7	6,993.52	6,993.52	53.30	2.47	6,987.84	6,988.38	STORM MH	6,985.38	0.54
36: I#1 (DP 16	I#1 (DP 16)	6,993.41	6,993.41	5.10	0.87	6,990.61	6,991.15	CDOT Type-	6,989.74	0.54
37: MH#4 DP	MH#4 DP 18)	6,993.40	6,993.40	26.20	2.88	6,988.54	6,989.64	STORM MH	6,985.66	1.10
38: I#2 (DP 17	I#2 (DP 17)	6,993.39	6,993.39	10.50	1.17	6,989.95	6,990.44	CDOT Type-	6,988.79	0.49
39: MH#6	MH#6	6,993.02	6,993.02	53.30	2.65	6,987.15	6,987.61	STORM MH	6,984.50	0.46
40: MH#5	MH#5	6,991.91	6,991.91	53.30	2.28	6,986.41	6,987.05	STORM MH	6,984.13	0.64
41: MH#3 (DP	MH#3 (DP 8)	6,991.13	6,991.13	1.77	2.48	6,983.59	6,983.59	STORM MH	6,981.11	0.00
42: I#3 (DP 7)	I#3 (DP 7)	6,990.73	6,990.73	53.30	2.83	6,988.48	6,989.49	CDOT Type-	6,985.73	1.01
43: 18 (DP 19)	18 (DP 19)	6,988.71	6,988.71	3.00	2.43	6,983.93	6,984.30	CDOT Type-	6,983.26	0.37
44: MH#2 (DP	MH#2 (DP 8)	6,985.74	6,985.74	54.30	2.31	6,982.94	6,983.59	STORM MH	6,980.63	0.65
45: I#4 (DP 13	I#4 (DP 13)	6,985.02	6,985.02	3.40	1.42	6,982.73	6,982.84	CDOT Type-	6,981.51	0.12
46: I#5 (DP 14	I#5 (DP 14)	6,985.02	6,985.02	6.50	1.28	6,982.33	6,982.69	CDOT Type-	6,981.25	0.36
47: MH#1	MH#1	6,984.95	6,984.95	54.30	2.31	6,982.45	6,982.55	STORM MH	6,980.14	0.10
49: 44 (69) (D	44 (69) (DP 15)	6,982.64	6,982.64	1.20	0.41	6,978.83	6,978.85	CDOT Type-	6,978.42	0.01
55: 44 (80)	44 (80)	6,975.21	6,975.21	9.00	0.98	6,971.73	6,971.75	Cylindrical S	6,970.65	0.02
56: 44 (81)	44 (81)	6,975.03	6,975.03	3.60	0.72	6,970.76	6,970.79	Cylindrical S	6,970.04	0.03
57: I#7 (DP 9)	I#7 (DP 9)	6,974.64	6,974.64	4.10	0.80	6,972.75	6,973.18	CDOT Type-	6,971.95	0.43
58: I#8 (DP 10	I#8 (DP 10)	6,974.64	6,974.64	9.00	1.07	6,972.25	6,972.69	CDOT Type-	6,971.18	0.44
59: I#6 (DP 1)	I#6 (DP 1)	6,973.20	6,973.20	3.60	0.72	6,971.57	6,972.00	CDOT Type-	6,970.85	0.42
60: 44 (78) (D	44 (78) (DP 11)	6,973.16	6,973.16	1.40	0.44	6,968.87	6,969.03	CDOT Type-	6,968.42	0.16
98: MH#26 (D	MH#26 (DP6.1)	7,027.15	7,027.15	22.40	1.69	7,022.79	7,024.51	STORM MH	7,021.10	1.73
99: MH#27 (D	MH#27 (DP8)	7,027.09	7,027.09	21.00	3.34	7,025.00	7,025.62	STORM MH	7,021.66	0.62
100: I#9 (DP6)	I#9 (DP6)	7,027.04	7,027.04	2.40	1.67	7,024.53	7,024.56	CDOT Type-	7,022.86	0.03
101: I#8 (DP5)	I#8 (DP5)	7,026.63	7,026.63	1.30	1.27	7,024.57	7,024.58	CDOT Type-	7,023.30	0.02
102: I#7 (DP3.	I#7 (DP3.1)	7,026.51	7,026.51	3.20	1.71	7,023.01	7,023.02	CDOT Type-	7,021.80	0.00
103: I#6 (DP2.	I#6 (DP2.1)	7,026.40	7,026.40	1.50	0.63	7,022.99	7,023.10	CDOT Type-	7,022.36	0.10
106: MH#34	MH#34	7,023.51	7,023.51	3.40	0.70	7,019.72	7,019.84	CDOT Type-	7,019.01	0.13
111: MH#21	MH#21	7,014.03	7,014.03	112.10	3.20	7,001.72	7,003.94	STORM MH	6,998.52	2.22
112: MH#20	MH#20	7,012.41	7,012.41	112.10	4.38	7,005.57	7,005.63	STORM MH	7,001.18	0.06
113: MH#19	MH#19	7,010.85	7,010.85	112.10	3.20	7,007.14	7,009.36	STORM MH	7,003.94	2.22
115: MH#22	MH#22	7,005.85	7,005.85	112.10	3.20	6,998.35	6,998.44	STORM MH	6,995.15	0.08
116: MH#9	MH#9	7,001.03	7,001.03	19.10	2.45	6,992.21	6,992.24	STORM MH	6,989.76	0.03
117: I#4 (DP1	I#4 (DP14)	7,000.17	7,000.17	8.80	1.62	6,997.31	6,997.89	CDOT Type-	6,995.69	0.58
118: MH#10 (	MH#10 (DP 1...	7,000.01	7,000.01	19.10	1.57	6,995.82	6,997.25	STORM MH	6,994.25	1.43
119: I#5 (DP 1	I#5 (DP 15)	6,999.67	6,999.67	10.40	1.88	6,997.78	6,998.59	CDOT Type-	6,995.50	0.81
120: MH#8	MH#8	6,996.13	6,996.13	19.10	3.77	6,990.43	6,990.80	STORM MH	6,986.87	0.37
121: MH#23	MH#23	6,995.25	6,995.25	112.10	5.41	6,994.23	6,994.29	STORM MH	6,988.82	0.06
122: MH#24	MH#24	6,993.32	6,993.32	112.10	5.25	6,993.32	6,993.39	STORM MH	6,988.08	0.06
123: DP12	DP12	6,993.02	6,993.02	24.40	2.71	6,993.02	6,997.47	CDOT Type-	6,990.32	4.44
124: MH#25 (	MH#25 (DP13)	6,992.79	6,992.79	136.40	4.43	6,991.97	6,992.70	STORM MH	6,987.54	0.73
190: INLET (D	INLET (DP 3)	6,980.96	6,980.96	24.50	1.69	6,979.85	6,980.98	CDOT FES	6,978.16	1.13
192: DP 7	DP 7	7,024.45	7,024.45	2.20	1.44	7,024.45	7,024.52	CDOT FES	7,023.01	0.07
193: DP 2	DP 2	7,024.26	7,024.26	18.80	2.25	7,024.26	7,025.10	CDOT FES	7,021.66	0.83
194: DP 3	DP 3	7,009.43	7,009.43	112.10	4.42	7,009.43	7,011.29	CDOT FES	7,005.01	1.86
196: CULVERT	CULVERT 1 (...	7,000.01	7,000.01	245.50	2.66	6,999.67	7,001.66	Dummy Null	6,997.01	1.99
197: CULVERT	CULVERT 2 (...	7,000.01	7,000.01	295.50	3.00	7,000.01	7,002.27	Dummy Null	6,997.01	2.26

	ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)	Notes
48: OUTFALL	48	OUTFALL	6,983.32	6,979.44		6,981.73	54.30	CDOT FES
53: 44 (70)	53	44 (70)	6,979.33	6,977.55		6,977.85	1.20	CDOT FES
54: 44 (65)	54	44 (65)	6,976.31	6,973.52		6,974.58	24.50	CDOT FES
61: 44 (77)	61	44 (77)	6,971.10	6,969.39		6,970.00	3.60	CDOT FES
64: 44 (79)	64	44 (79)	6,969.82	6,967.50		6,967.84	1.40	CDOT FES
107: DP9	107	DP9	7,022.74	7,020.49		7,022.11	22.40	CDOT FES
108: FES OUTFALL 1	108	FES OUTFALL 1	7,023.00	7,021.01	7,023.00	7,023.00	3.20	CDOT FES
110: MH#39	110	MH#39	7,018.18	7,017.01		7,017.55	3.40	CDOT FES
125: OUTLET SEGMENT 3	125	OUTLET SEG...	6,991.09	6,986.67	6,988.30	6,990.15	136.40	CDOT FES
162: O-3	162	O-3	6,987.98	6,984.83	6,987.98	6,987.98	26.20	Dummy Null
164: O-5	164	O-5	6,982.10	6,981.08	6,982.10	6,982.10	6.50	Dummy Null
165: O-6	165	O-6	6,972.87	6,970.61	6,972.87	6,971.68	9.00	Dummy Null
203: O-7	203	O-7	6,998.27	6,995.27		6,997.02	245.50	Dummy Null
207: O-10	207	O-10	6,998.27	6,995.27		6,997.28	295.50	Dummy Null

NOTE: SEE PROFILES FOR PIPES STUDIED WITH THIS ANALYSIS


EASTONVILLE 5 - 100-YR FREE OUTFALL CONDITION
Label: I#7 (DP 9)
Type: Manhole
ID: 57
Label: I#8 (DP 10)
Type: Manhole
ID: 58
Label: 44 (80)
Type: Manhole
ID: 55
Label: P-121 (1)
Type: Conduit
ID: 87
Label: P-121
Type: Conduit
ID: 84
Label: O-6
Type: Outfall
ID: 165
Label: P-121 (2)
Type: Conduit
ID: 68
EGL
HGL
Elevation (ft)
Station (ft)

5 YEAR FREE OUTFALL CONDITION: PIPE SUMMARY TABLE

	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
66: P-8 (1) (1)	P-8 (1) (1)	MH#4 DP 18)	6,985.66	O-3	6,984.83	41.6	0.020	24.0	0.013	15.60	10.12	31.99	48.8	Concrete Pipe	6,987.09	6,985.89
67: P-124	P-124	I#5 (DP 14)	6,981.25	O-5	6,981.08	34.3	0.005	18.0	0.013	3.90	4.25	7.43	52.5	Concrete Pipe	6,982.13	6,982.10
68: P-121 (2)	P-121 (2)	44 (80)	6,970.65	O-6	6,970.61	9.0	0.005	24.0	0.013	4.20	4.29	15.95	26.3	Concrete Pipe	6,971.37	6,971.31
69: P-18	P-18	I#3 (DP 7)	6,985.73	MH#7	6,985.38	71.3	0.005	42.0	0.013	7.90	4.88	71.14	11.1	Concrete Pipe	6,986.58	6,986.42
70: P-20	P-20	MH#7	6,985.38	MH#6	6,984.50	175.6	0.005	42.0	0.013	7.90	4.88	71.14	11.1	Concrete Pipe	6,986.22	6,985.54
71: P-5	P-5	I#2 (DP 17)	6,989.29	I#1 (DP 16)	6,989.74	52.0	-0.009	18.0	0.013	3.00	4.87	9.77	30.7	Concrete Pipe	6,990.40	6,990.02
72: P-8 (1)	P-8 (1)	I#2 (DP 17)	6,988.79	MH#4 DP 18)	6,985.66	156.4	0.020	24.0	0.013	6.30	7.92	31.99	19.7	Concrete Pipe	6,989.68	6,987.76
73: P-21	P-21	MH#6	6,984.50	MH#5	6,984.13	74.6	0.005	42.0	0.013	7.90	4.88	71.14	11.1	Concrete Pipe	6,985.35	6,985.17
74: P-22	P-22	MH#5	6,984.13	MH#3 (DP 8)	6,981.11	127.1	0.024	42.0	0.013	7.90	8.44	154.95	5.1	Concrete Pipe	6,984.97	6,982.26
75: P-15	P-15	18 (DP 19)	6,983.26	MH#3 (DP 8)	6,983.11	30.8	0.005	18.0	0.013	0.30	2.06	7.43	4.0	Concrete Pipe	6,983.47	6,983.31
76: P-15 (1)	P-15 (1)	MH#3 (DP 8)	6,981.11	MH#2 (DP 8)	6,980.73	75.1	0.005	42.0	0.013	8.30	4.95	71.14	11.7	Concrete Pipe	6,981.98	6,981.70
77: P-16	P-16	MH#2 (DP 8)	6,980.63	MH#1	6,980.24	78.1	0.005	42.0	0.013	8.30	4.95	71.14	11.7	Concrete Pipe	6,981.50	6,981.05
78: P-123	P-123	I#4 (DP 13)	6,981.51	I#5 (DP 14)	6,981.25	52.0	0.005	18.0	0.013	2.10	3.61	7.43	28.3	Concrete Pipe	6,982.35	6,982.34
79: P-17	P-17	MH#1	6,980.14	OUTFALL	6,979.44	139.8	0.005	42.0	0.013	8.30	4.95	71.14	11.7	Concrete Pipe	6,981.01	6,980.25
80: P-125	P-125	44 (69) (DP 15)	6,978.42	44 (70)	6,977.55	54.5	0.016	18.0	0.013	4.00	6.37	13.30	30.1	Concrete Pipe	6,979.19	6,978.20
83: P-122	P-122	INLET (DP 3)	6,978.16	44 (65)	6,973.52	183.8	0.025	30.0	0.013	3.70	7.19	65.19	5.7	Concrete Pipe	6,978.80	6,973.93
84: P-121	P-121	I#8 (DP 10)	6,971.18	44 (80)	6,970.65	105.1	0.005	24.0	0.013	4.20	4.29	16.06	26.1	Concrete Pipe	6,971.90	6,971.38
85: P-130	P-130	I#6 (DP 1)	6,970.85	44 (81)	6,970.04	81.5	0.010	18.0	0.013	0.50	3.05	10.47	4.8	Concrete Pipe	6,971.11	6,970.31
86: P-130 (1)	P-130 (1)	44 (81)	6,970.04	44 (77)	6,969.39	65.0	0.010	18.0	0.013	0.50	3.05	10.50	4.8	Concrete Pipe	6,970.30	6,969.61
87: P-121 (1)	P-121 (1)	I#8 (DP 10)	6,971.68	I#7 (DP 9)	6,971.95	52.0	-0.005	18.0	0.013	2.20	3.71	7.57	29.1	Concrete Pipe	6,972.51	6,972.23
88: P-131	P-131	44 (78) (DP 11)	6,968.42	44 (79)	6,967.50	62.5	0.015	18.0	0.013	4.30	4.36	12.77	33.7	Concrete Pipe	6,969.24	6,968.91
126: P-111	P-111	MH#34	7,019.01	MH#39	7,017.01	146.6	0.014	18.0	0.013	1.70	4.88	12.28	13.8	Concrete Pipe	7,019.50	7,017.39
127: P-89	P-89	MH#8	6,986.87	MH#4 DP 18)	6,985.66	111.1	0.011	24.0	0.013	10.20	7.25	23.64	43.2	Concrete Pipe	6,988.02	6,987.76
128: P-25 (1)	P-25 (1)	CULVERT 2 (...	6,997.01	O-10	6,995.27	116.5	0.015		0.013	11.20	5.01	461.86	2.4	Concrete Box C	6,997.35	6,995.49
129: P-25	P-25	CULVERT 1 (...	6,997.01	O-7	6,995.27	116.6	0.015		0.013	11.20	5.01	461.72	2.4	Concrete Box C	6,997.35	6,995.49
131: P-107 (2)	P-107 (2) (1)	MH#26 (DP6. 1)	7,021.10	DP9	7,020.49	60.7	0.010	24.0	0.013	2.90	4.95	22.62	12.8	Concrete Pipe	7,021.69	7,020.97
132: P-103	P-103	I#9 (DP6)	7,022.86	MH#26 (DP6. 1)	7,021.84	42.7	0.024	18.0	0.013	1.20	5.37	16.22	7.4	Concrete Pipe	7,023.27	7,022.12
133: P-107 (2)	P-107 (2)	MH#27 (DP8)	7,021.66	MH#26 (DP6. 1)	7,021.09	56.6	0.010	24.0	0.013	2.00	4.44	22.62	8.8	Concrete Pipe	7,022.15	7,022.07
134: P-107	P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.41	37.8	0.016	15.0	0.013	0.30	3.15	8.13	3.7	Concrete Pipe	7,023.22	7,022.58
135: P-107 (1)	P-107 (1)	MH#27 (DP8)	7,021.66	DP 2	7,021.66	43.9	0.000	24.0	0.013	1.70	0.76	2.17	78.3	Concrete Pipe	7,022.36	7,022.31
136: P-95	P-95	I#8 (DP5)	7,023.30	I#9 (DP6)	7,023.06	47.5	0.005	18.0	0.013	0.70	2.64	7.43	9.4	Concrete Pipe	7,023.61	7,023.42
137: P-93	P-93	I#6 (DP2. 1)	7,022.36	I#7 (DP3. 1)	7,021.80	55.9	0.010	18.0	0.013	0.80	3.51	10.51	7.6	Concrete Pipe	7,023.00	7,023.00
138: Pipe - (34	Pipe - (34)	I#7 (DP3. 1)	7,021.80	FES OUTFALL 1	7,021.01	33.5	0.023	18.0	0.013	1.60	5.81	16.07	10.0	Concrete Pipe	7,023.00	7,023.00
140: P-44 (1)	P-44 (1)	MH#20	7,001.18	MH#21	6,998.52	266.5	0.010	48.0	0.013	6.10	5.68	143.63	4.2	Concrete Pipe	7,001.90	6,999.57
141: P-64	P-64	MH#21	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	6.10	5.74	145.88	4.2	Concrete Pipe	6,999.24	6,995.82
142: P-44	P-44	MH#19	7,003.94	MH#20	7,001.28	266.5	0.010	48.0	0.013	6.10	5.68	143.63	4.2	Concrete Pipe	7,004.66	7,001.84
143: P-26	P-26	DP 3	7,005.01	MH#19	7,004.04	81.5	0.012	48.0	0.013	6.10	6.03	156.73	3.9	Concrete Pipe	7,005.73	7,004.99
144: P-64 (1)	P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	6.10	7.23	203.15	3.0	Concrete Pipe	6,995.87	6,989.55
145: P-87	P-87	MH#10 (DP 1...	6,994.25	MH#9	6,989.76	320.7	0.014	24.0	0.013	10.20	7.94	26.78	38.1	Concrete Pipe	6,995.39	6,990.92
146: P-87 (1)	P-87 (1)	MH#9	6,989.76	MH#8	6,986.87	197.4	0.015	24.0	0.013	10.20	8.07	27.33	37.3	Concrete Pipe	6,990.90	6,988.32
147: P-84	P-84	I#4 (DP14)	6,995.69	MH#10 (DP 1...	6,994.25	8.1	0.179	18.0	0.013	5.20	16.82	44.40	11.7	Concrete Pipe	6,996.57	6,996.22
148: P-84 (1)	P-84 (1)	MH#10 (DP 1...	6,994.75	I#5 (DP 15)	6,995.50	53.9	-0.014	18.0	0.013	5.00	6.64	12.40	40.3	Concrete Pipe	6,996.36	6,996.22
149: P-66	P-66	MH#23	6,988.82	MH#24	6,988.08	149.0	0.005	48.0	0.013	6.10	4.45	101.56	6.0	Concrete Pipe	6,989.54	6,989.26
150: P-68	P-68	MH#24	6,988.08	MH#25 (DP13)	6,987.54	107.8	0.005	48.0	0.013	6.10	4.45	101.56	6.0	Concrete Pipe	6,989.26	6,989.27
151: P-77	P-77	DP12	6,990.32	MH#25 (DP13)	6,990.03	28.1	0.010	18.0	0.013	3.60	5.45	10.66	33.8	Concrete Pipe	6,991.04	6,990.64
152: P-74	P-74	MH#25 (DP13)	6,987.54	OUTLET SEGM...	6,986.67	173.3	0.005	48.0	0.013	26.00	6.76	101.56	25.6	Concrete Pipe	6,989.05	6,988.30

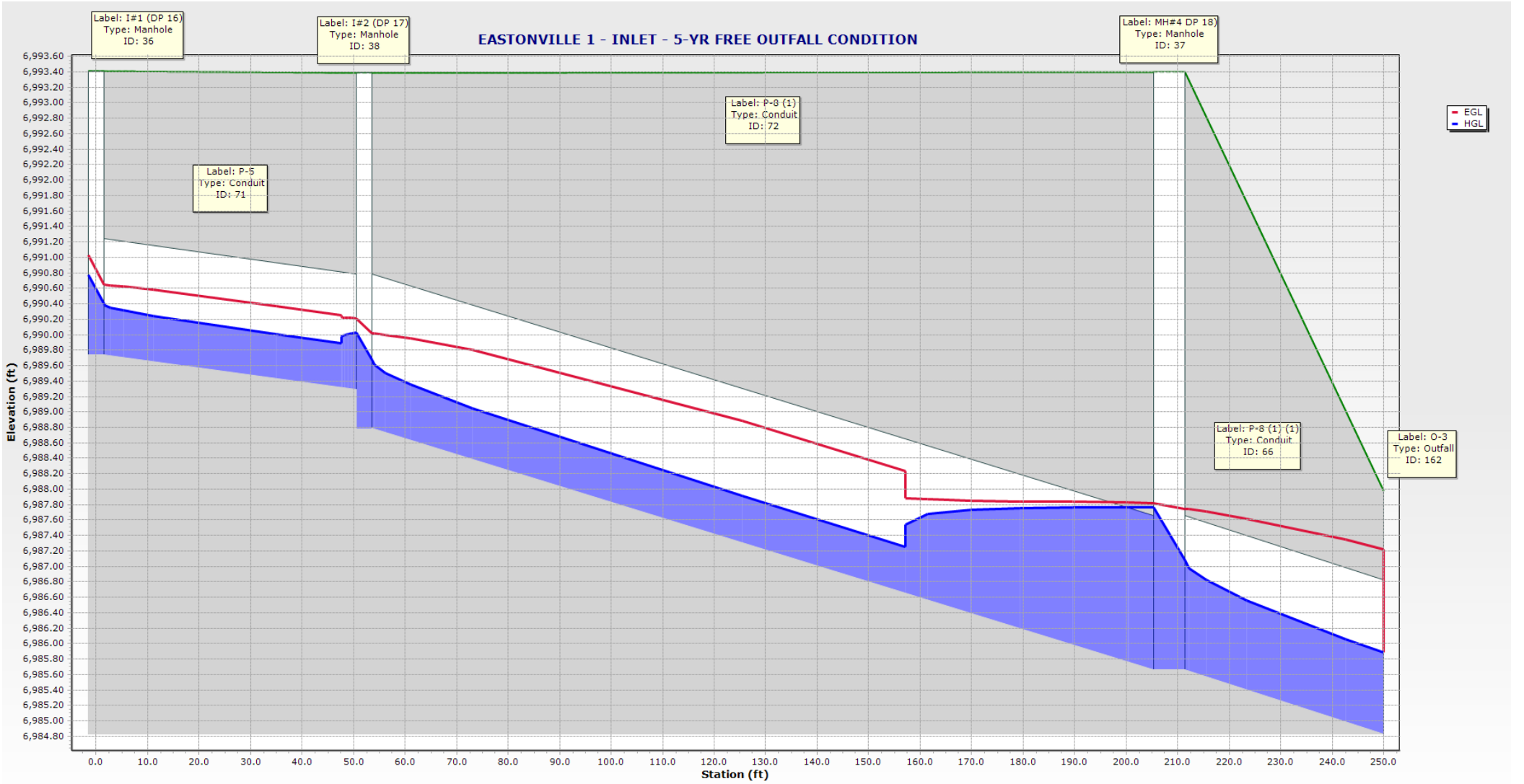
NOTE: SEE PROFILES FOR PIPES STUDIED WITH THIS ANALYSIS

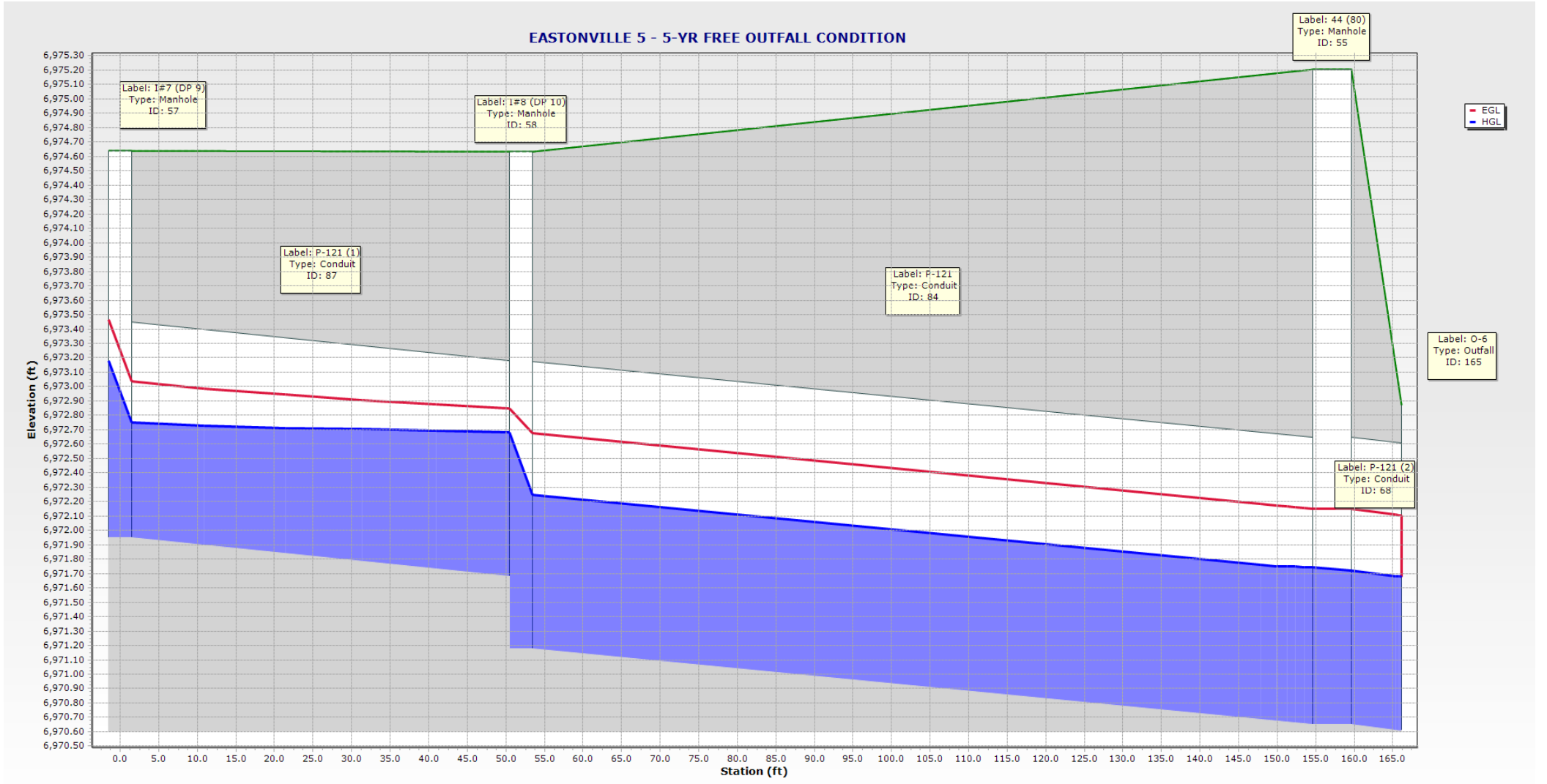
5 YEAR FREE OUTFALL CONDITION: STRUCTURE SUMMARY TABLE

	Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Notes	Elevation (Invert Out) (ft)	Headloss (ft)
35: MH#7	MH#7	6,993.52	6,993.52	7.90	0.85	6,986.22	6,986.42	STORM MH	6,985.38	0.19
36: I#1 (DP 16	I#1 (DP 16)	6,993.41	6,993.41	3.00	0.66	6,990.40	6,990.77	CDOT Type-	6,989.74	0.38
37: MH#4 DP	MH#4 DP 18)	6,993.40	6,993.40	15.60	1.42	6,987.09	6,987.76	STORM MH	6,985.66	0.67
38: I#2 (DP 17	I#2 (DP 17)	6,993.39	6,993.39	6.30	0.90	6,989.68	6,990.02	CDOT Type-	6,988.79	0.35
39: MH#6	MH#6	6,993.02	6,993.02	7.90	0.85	6,985.35	6,985.54	STORM MH	6,984.50	0.19
40: MH#5	MH#5	6,991.91	6,991.91	7.90	0.85	6,984.97	6,985.17	STORM MH	6,984.13	0.19
41: MH#3 (DP	MH#3 (DP 8)	6,991.13	6,991.13	8.30	0.87	6,981.98	6,982.26	STORM MH	6,981.11	0.28
42: I#3 (DP 7)	I#3 (DP 7)	6,990.73	6,990.73	7.90	0.93	6,986.58	6,987.03	CDOT Type-	6,985.73	0.45
43: 18 (DP 19)	18 (DP 19)	6,988.71	6,988.71	0.30	1.97	6,983.47	6,983.57	CDOT Type-	6,983.26	0.10
44: MH#2 (DP	MH#2 (DP 8)	6,985.74	6,985.74	8.30	0.87	6,981.50	6,981.70	STORM MH	6,980.63	0.20
45: I#4 (DP 13	I#4 (DP 13)	6,985.02	6,985.02	2.10	1.04	6,982.35	6,982.45	CDOT Type-	6,981.51	0.10
46: I#5 (DP 14	I#5 (DP 14)	6,985.02	6,985.02	3.90	1.09	6,982.13	6,982.34	CDOT Type-	6,981.25	0.21
47: MH#1	MH#1	6,984.95	6,984.95	8.30	0.87	6,981.01	6,981.04	STORM MH	6,980.14	0.03
49: 44 (69) (D	44 (69) (DP 15)	6,982.64	6,982.64	4.00	0.77	6,979.19	6,979.22	CDOT Type-	6,978.42	0.03
55: 44 (80)	44 (80)	6,975.21	6,975.21	4.20	0.72	6,971.37	6,971.38	Cylindrical S	6,970.65	0.01
56: 44 (81)	44 (81)	6,975.03	6,975.03	0.50	0.26	6,970.30	6,970.31	Cylindrical S	6,970.04	0.01
57: I#7 (DP 9)	I#7 (DP 9)	6,974.64	6,974.64	2.20	0.56	6,972.51	6,972.82	CDOT Type-	6,971.95	0.31
58: I#8 (DP 10	I#8 (DP 10)	6,974.64	6,974.64	4.20	0.72	6,971.90	6,972.17	CDOT Type-	6,971.18	0.27
59: I#6 (DP 1)	I#6 (DP 1)	6,973.20	6,973.20	0.50	0.26	6,971.11	6,971.25	CDOT Type-	6,970.85	0.14
60: 44 (78) (D	44 (78) (DP 11)	6,973.16	6,973.16	4.30	0.82	6,969.24	6,969.54	CDOT Type-	6,968.42	0.30
98: MH#26 (D	MH#26 (DP6.1)	7,027.15	7,027.15	2.90	0.60	7,021.69	7,022.07	STORM MH	7,021.10	0.38
99: MH#27 (D	MH#27 (DP8)	7,027.09	7,027.09	2.00	0.49	7,022.15	7,022.31	STORM MH	7,021.66	0.16
100: I#9 (DP6)	I#9 (DP6)	7,027.04	7,027.04	1.20	0.41	7,023.27	7,023.42	CDOT Type-	7,022.86	0.15
101: I#8 (DP5)	I#8 (DP5)	7,026.63	7,026.63	0.70	0.31	7,023.61	7,023.77	CDOT Type-	7,023.30	0.16
102: I#7 (DP3.	I#7 (DP3.1)	7,026.51	7,026.51	1.60	1.70	7,023.00	7,023.00	CDOT Type-	7,021.80	0.00
103: I#6 (DP2.	I#6 (DP2.1)	7,026.40	7,026.40	0.80	0.64	7,023.00	7,023.03	CDOT Type-	7,022.36	0.03
106: MH#34	MH#34	7,023.51	7,023.51	1.70	0.49	7,019.50	7,019.59	CDOT Type-	7,019.01	0.08
111: MH#21	MH#21	7,014.03	7,014.03	6.10	0.72	6,999.24	6,999.57	STORM MH	6,998.52	0.33
112: MH#20	MH#20	7,012.41	7,012.41	6.10	0.72	7,001.90	7,001.91	STORM MH	7,001.18	0.01
113: MH#19	MH#19	7,010.85	7,010.85	6.10	0.72	7,004.66	7,004.99	STORM MH	7,003.94	0.33
115: MH#22	MH#22	7,005.85	7,005.85	6.10	0.72	6,995.87	6,995.88	STORM MH	6,995.15	0.01
116: MH#9	MH#9	7,001.03	7,001.03	10.20	1.14	6,990.90	6,990.92	STORM MH	6,989.76	0.02
117: I#4 (DP1	I#4 (DP14)	7,000.17	7,000.17	5.20	0.88	6,996.57	6,997.11	CDOT Type-	6,995.69	0.55
118: MH#10 (	MH#10 (DP 1...	7,000.01	7,000.01	10.20	1.14	6,995.39	6,996.22	STORM MH	6,994.25	0.83
119: I#5 (DP 1	I#5 (DP 15)	6,999.67	6,999.67	5.00	0.46	6,996.36	6,996.89	CDOT Type-	6,995.50	0.53
120: MH#8	MH#8	6,996.13	6,996.13	10.20	1.35	6,988.02	6,988.32	STORM MH	6,986.87	0.30
121: MH#23	MH#23	6,995.25	6,995.25	6.10	0.72	6,989.54	6,989.55	STORM MH	6,988.82	0.01
122: MH#24	MH#24	6,993.32	6,993.32	6.10	1.18	6,989.26	6,989.26	STORM MH	6,988.08	0.00
123: DP12	DP12	6,993.02	6,993.02	3.60	0.73	6,991.04	6,991.47	CDOT Type-	6,990.32	0.42
124: MH#25 (	MH#25 (DP13)	6,992.79	6,992.79	26.00	1.51	6,989.05	6,989.27	STORM MH	6,987.54	0.22
190: INLET (D	INLET (DP 3)	6,980.96	6,980.96	3.70	0.63	6,978.80	6,979.13	CDOT FES	6,978.16	0.34
192: DP 7	DP 7	7,024.45	7,024.45	0.30	0.21	7,023.22	7,023.33	CDOT FES	7,023.01	0.11
193: DP 2	DP 2	7,024.26	7,024.26	1.70	0.35	7,022.36	7,022.43	CDOT FES	7,021.66	0.07
194: DP 3	DP 3	7,009.43	7,009.43	6.10	0.72	7,005.73	7,006.10	CDOT FES	7,005.01	0.37
196: CULVERT	CULVERT 1 (...	7,000.01	7,000.01	11.20	0.34	6,997.35	6,997.61	Dummy Null	6,997.01	0.25
197: CULVERT	CULVERT 2 (...	7,000.01	7,000.01	11.20	0.34	6,997.35	6,997.61	Dummy Null	6,997.01	0.25

	ID	Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)	Notes
48: OUTFALL	48	OUTFALL	6,983.32	6,979.44		6,980.25	8.30	CDOT FES
53: 44 (70)	53	44 (70)	6,979.33	6,977.55		6,978.20	4.00	CDOT FES
54: 44 (65)	54	44 (65)	6,976.31	6,973.52		6,973.93	3.70	CDOT FES
61: 44 (77)	61	44 (77)	6,971.10	6,969.39		6,969.61	0.50	CDOT FES
64: 44 (79)	64	44 (79)	6,969.82	6,967.50		6,968.91	4.30	CDOT FES
107: DP9	107	DP9	7,022.74	7,020.49		7,020.97	2.90	CDOT FES
108: FES OUTFALL 1	108	FES OUTFALL 1	7,023.00	7,021.01	7,023.00	7,023.00	1.60	CDOT FES
110: MH#39	110	MH#39	7,018.18	7,017.01		7,017.39	1.70	CDOT FES
125: OUTLET SEGMENT 3	125	OUTLET SEG...	6,991.09	6,986.67	6,988.30	6,988.30	26.00	CDOT FES
162: O-3	162	O-3	6,987.98	6,984.83		6,985.89	15.60	Dummy Null
164: O-5	164	O-5	6,982.10	6,981.08	6,982.10	6,982.10	3.90	Dummy Null
165: O-6	165	O-6	6,972.87	6,970.61		6,971.31	4.20	Dummy Null
203: O-7	203	O-7	6,998.27	6,995.27		6,995.49	11.20	Dummy Null
207: O-10	207	O-10	6,998.27	6,995.27		6,995.49	11.20	Dummy Null

NOTE: SEE PROFILES FOR PIPES STUDIED WITH THIS ANALYSIS


EASTONVILLE 1 - INLET - 5-YR FREE OUTFALL CONDITION
Label: I#1 (DP 16)
Type: Manhole
ID: 36
Label: I#2 (DP 17)
Type: Manhole
ID: 38
Label: MH#4 DP 18)
Type: Manhole
ID: 37
Label: P-8 (1)
Type: Conduit
ID: 72
Label: P-5
Type: Conduit
ID: 71
Label: P-8 (1) (1)
Type: Conduit
ID: 66
Label: O-3
Type: Outfall
ID: 162
EGL
HGL
Elevation (ft)
6,993.60
6,993.40
6,993.20
6,993.00
6,992.80
6,992.60
6,992.40
6,992.20
6,992.00
6,991.80
6,991.60
6,991.40
6,991.20
6,991.00
6,990.80
6,990.60
6,990.40
6,990.20
6,990.00
6,989.80
6,989.60
6,989.40
6,989.20
6,989.00
6,988.80
6,988.60
6,988.40
6,988.20
6,988.00
6,987.80
6,987.60
6,987.40
6,987.20
6,987.00
6,986.80
6,986.60
6,986.40
6,986.20
6,986.00
6,985.80
6,985.60
6,985.40
6,985.20
6,985.00
6,984.80
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
110.0
120.0
130.0
140.0
150.0
160.0
170.0
180.0
190.0
200.0
210.0
220.0
230.0
240.0
250.0
Station (ft)


EASTONVILLE 5 - 5-YR FREE OUTFALL CONDITION
Label: I#7 (DP 9)
Type: Manhole
ID: 57
Label: I#8 (DP 10)
Type: Manhole
ID: 58
Label: 44 (80)
Type: Manhole
ID: 55
Label: P-121 (1)
Type: Conduit
ID: 87
Label: P-121
Type: Conduit
ID: 84
Label: P-121 (2)
Type: Conduit
ID: 68
Label: O-6
Type: Outfall
ID: 165
EGL
HGL
Elevation (ft)
Station (ft)

APPENDIX D – WATER QUALITY & DETENTION

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Designer:	**SPC**
Company:	**HR Green**
Date:	**March 12, 2024**
Project:	**Eastonville Road - Segment 1 Improvements SFB A**
Location:	**El Paso County, CO**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 67.0 %
B) Tributary Area's Imperviousness Ratio (i = I_a/100)	i = 0.670
C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.21 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 99,317 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 1,695 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 0.7 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 4.00 ft / ft
C) Minimum Filter Area (Flat Surface Area)	A_{Min} = 832 sq ft
D) Actual Filter Area	A_{Actual} = 902 sq ft
E) Volume Provided	V_T = 27135 cu ft
3. Filter Material	Choose One: (•) 18" CDOT Class B or C Filter Material; ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One: (•) YES; ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 2.3 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 1,695 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 15/16 in

Design Procedure Form: Sand Filter (SF)

Designer: SPC
Company: HR Green
Date: March 12, 2024
Project: Eastonville Road - Segment 1 Improvements SFB A
Location: El Paso County, CO

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Engery dissapation at inlet points provided via riprap, and means of conveying flows in excess of the WQCV through the outlet is via the modified type 'C' inlet outlet structure grate, and a restricted outlet pipe.

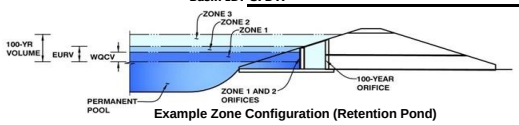
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Eastonville Road

Basin ID: SFB A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	SF		
Watershed Area =	1.72	acres	
Watershed Length =	1,100	ft	
Watershed Length to Centroid =	500	ft	
Watershed Slope =	0.030	ft/ft	
Watershed Imperviousness =	55.00%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	100.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Target WQCV Drain Time =	12.0	hours	
Location for 1-hr Rainfall Depths =	User Input		

6981

Note: L / W Ratio > 8

L / W Ratio = 16.15

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) =	0.025	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.102	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.095	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.133	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.167	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.210	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.246	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.291	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	0.464	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.078	acre-feet		
Approximate 5-yr Detention Volume =	0.106	acre-feet		
Approximate 10-yr Detention Volume =	0.138	acre-feet		
Approximate 25-yr Detention Volume =	0.150	acre-feet		
Approximate 50-yr Detention Volume =	0.156	acre-feet		
Approximate 100-yr Detention Volume =	0.173	acre-feet		

Define Zones and Basin Geometry

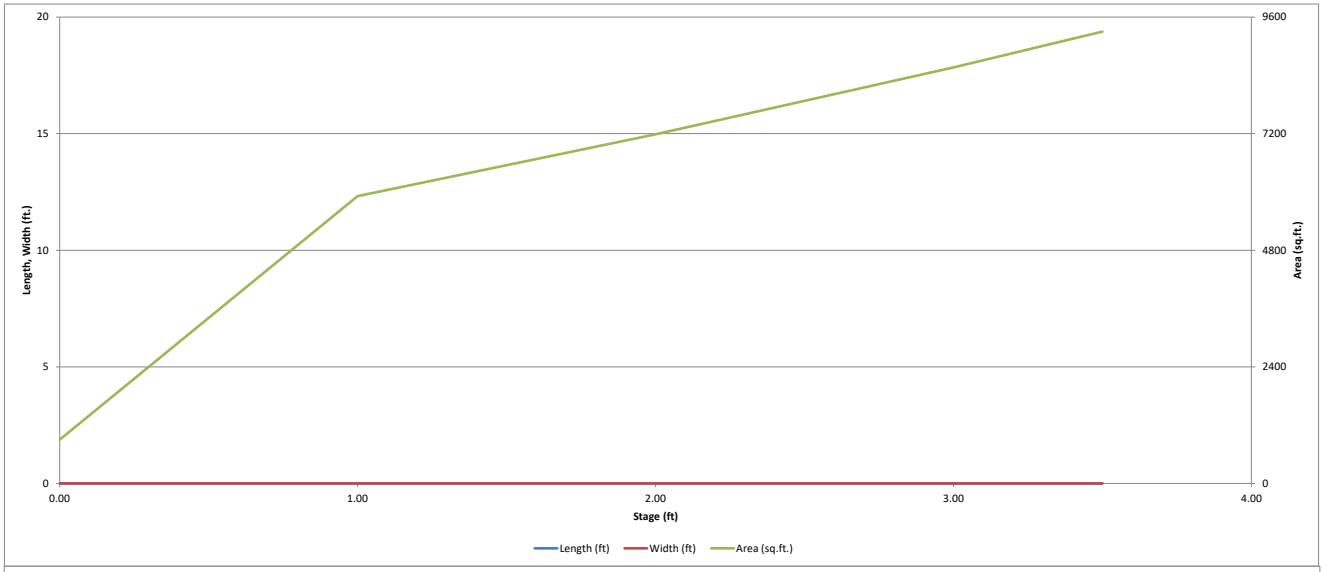
Zone 1 Volume (WQCV) =	0.025	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.077	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.071	acre-feet
Total Detention Basin Volume =	0.173	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	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

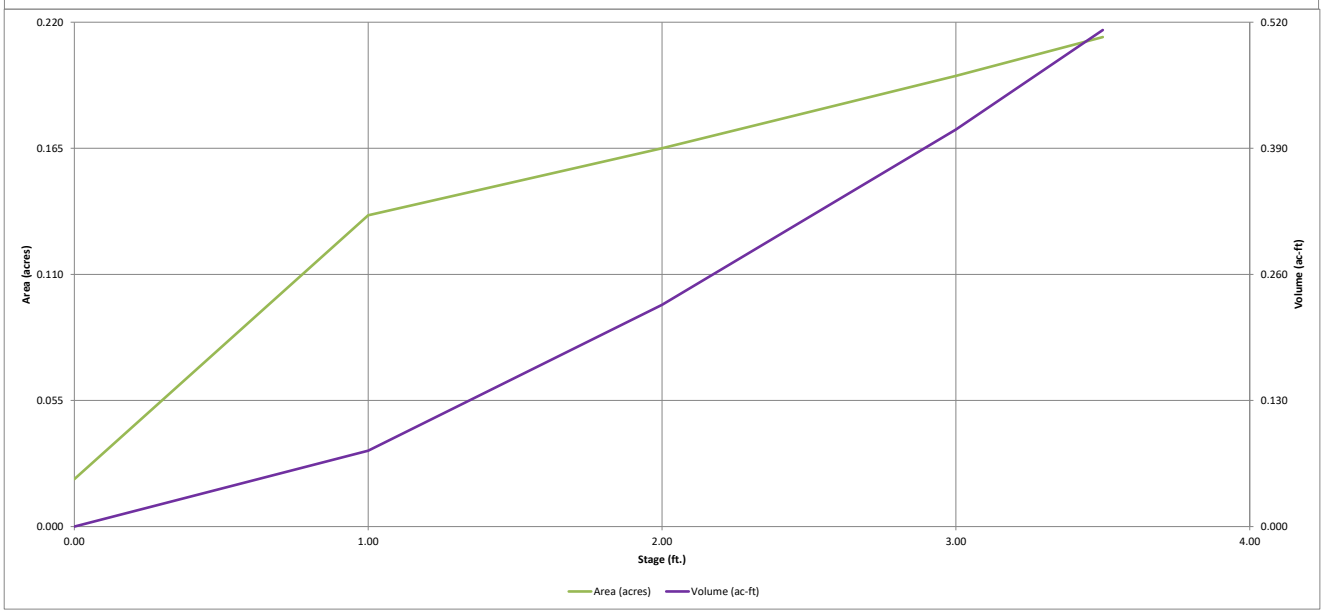
Depth Increment = ft

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)
Media Surface	--	0.00	--	--	--	902	0.021		
6982	--	1.00	--	--	--	5,914	0.136	3,408	0.078
6983	--	2.00	--	--	--	7,188	0.165	9,959	0.229
6984	--	3.00	--	--	--	8,563	0.197	17,834	0.409
6984.5	--	3.50	--	--	--	9,301	0.214	22,300	0.512

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



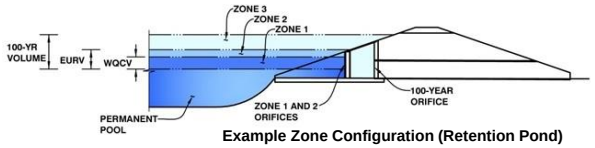


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **SFB A**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.51	0.025	Filtration Media
Zone 2 (EURV)	1.18	0.077	Circular Orifice
Zone 3 (100-year)	1.65	0.071	Weir&Pipe (Restrict)
Total (all zones)		0.173	

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

Underdrain Orifice Invert Depth =	2.33	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Diameter =	0.75	inches	Underdrain Orifice Centroid =	0.03	feet

Calculated Parameters for Underdrain

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 =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	0.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.00	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	1.18	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.02	N/A	feet
Vertical Orifice Diameter =	0.50	N/A	inches				

Calculated Parameters for Vertical Orifice

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			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	1.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.20	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	49.13	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.35	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.13	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.11	N/A	feet
Restrictor Plate Height Above Pipe Invert =	2.25		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.72	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.70	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.30	feet
Spillway Crest Length =	4.75	feet	Stage at Top of Freeboard =	3.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.20	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.41	acre-ft

Calculated Parameters for Spillway

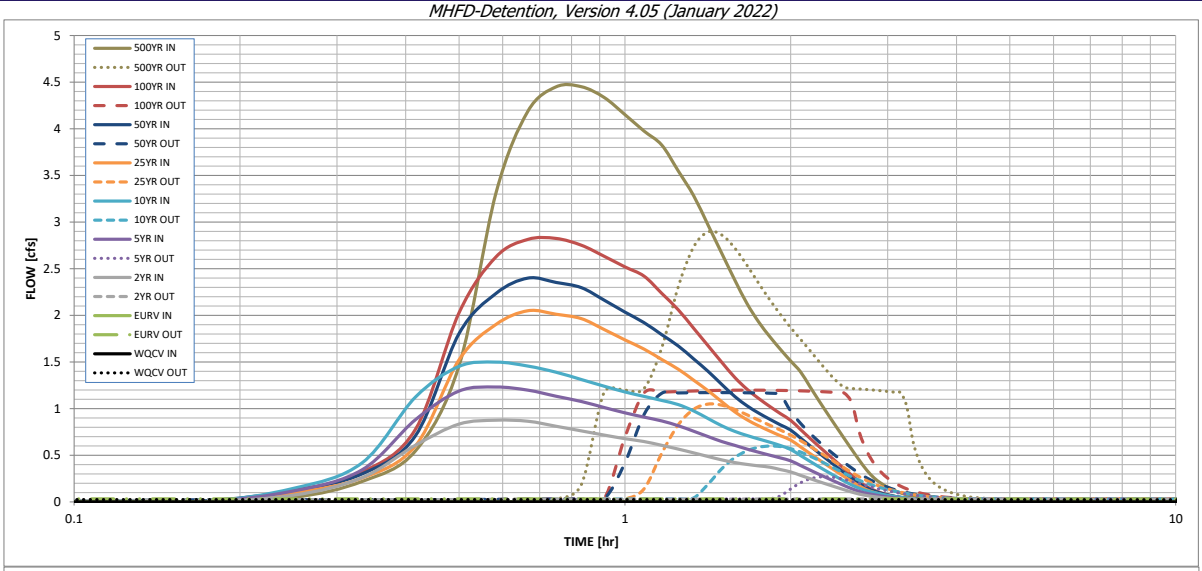
Routed Hydrograph Results

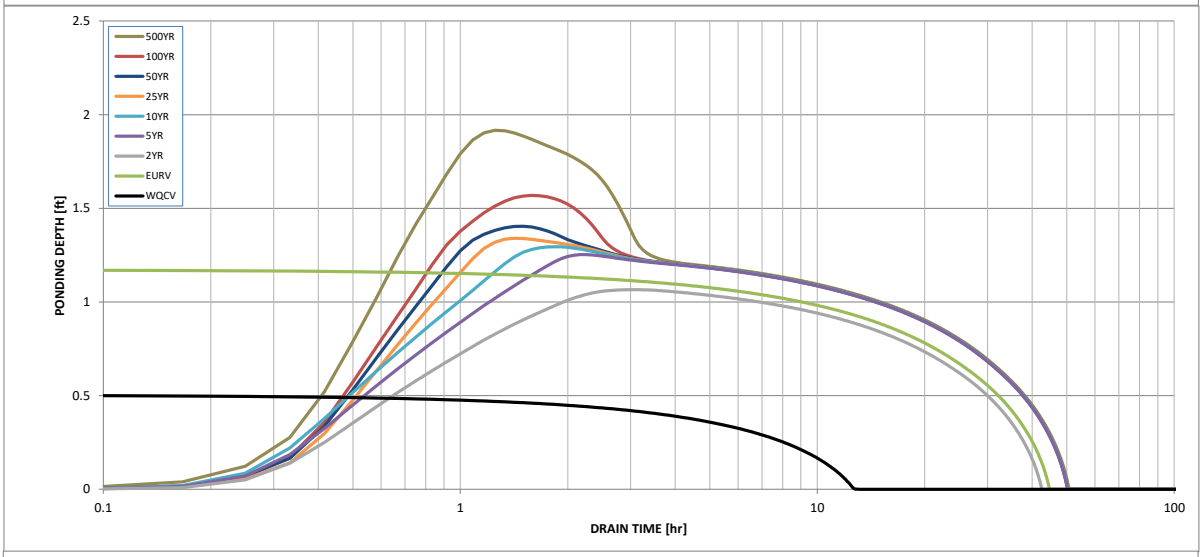
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

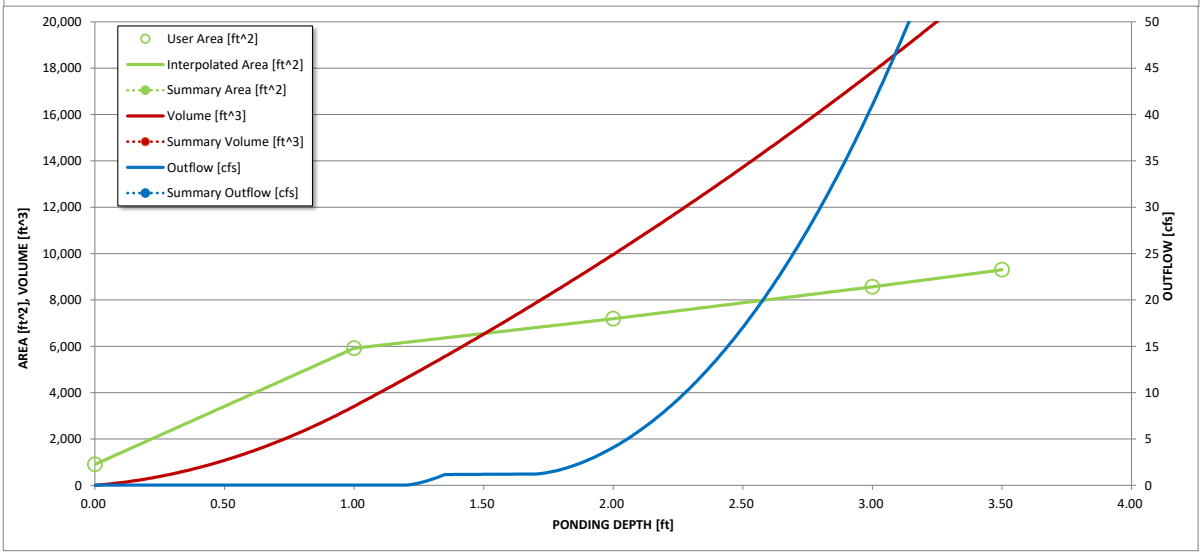
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.025	0.102	0.095	0.133	0.167	0.210	0.246	0.291	0.464
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.095	0.133	0.167	0.210	0.246	0.291	0.464
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	0.7	0.9	1.2	2.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.05	0.15	0.23	0.43	0.54	0.70	1.25
Peak Inflow Q (cfs) =	N/A	N/A	0.9	1.2	1.5	2.0	2.4	2.8	4.5
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.3	0.6	1.0	1.2	1.2	2.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	1.5	1.4	1.3	1.0	1.3
Structure Controlling Flow =	Filtration Media	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.1	0.2	0.2	0.2	0.2
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) =	12	43	41	48	48	47	47	46	44
Time to Drain 99% of Inflow Volume (hours) =	**13**	44	42	50	50	49	49	49	48
Maximum Ponding Depth (ft) =	0.51	1.18	1.07	1.25	1.29	1.34	1.40	1.57	1.92
Area at Maximum Ponding Depth (acres) =	0.08	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.16
Maximum Volume Stored (acre-ft) =	0.026	0.103	0.086	0.113	0.119	0.126	0.135	0.159	0.214

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 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	0.01	0.00	0.05
	0:15:00	0.00	0.00	0.07	0.12	0.14	0.10	0.12	0.12	0.22
	0:20:00	0.00	0.00	0.26	0.34	0.42	0.26	0.30	0.32	0.55
	0:25:00	0.00	0.00	0.61	0.88	1.12	0.60	0.71	0.78	1.46
	0:30:00	0.00	0.00	0.83	1.19	1.45	1.52	1.81	2.03	3.31
	0:35:00	0.00	0.00	0.88	1.23	1.50	1.90	2.23	2.63	4.19
	0:40:00	0.00	0.00	0.86	1.20	1.46	2.05	2.40	2.81	4.45
	0:45:00	0.00	0.00	0.81	1.13	1.39	2.01	2.35	2.82	4.45
	0:50:00	0.00	0.00	0.76	1.08	1.31	1.97	2.30	2.75	4.34
	0:55:00	0.00	0.00	0.72	1.01	1.24	1.85	2.16	2.63	4.15
	1:00:00	0.00	0.00	0.68	0.95	1.18	1.74	2.04	2.52	3.98
	1:05:00	0.00	0.00	0.65	0.91	1.13	1.64	1.92	2.42	3.83
	1:10:00	0.00	0.00	0.61	0.87	1.09	1.53	1.79	2.24	3.55
	1:15:00	0.00	0.00	0.57	0.82	1.04	1.42	1.67	2.06	3.28
	1:20:00	0.00	0.00	0.53	0.76	0.97	1.30	1.53	1.86	2.96
	1:25:00	0.00	0.00	0.49	0.70	0.89	1.19	1.40	1.67	2.66
	1:30:00	0.00	0.00	0.45	0.65	0.82	1.07	1.26	1.50	2.38
	1:35:00	0.00	0.00	0.42	0.61	0.76	0.97	1.13	1.33	2.12
	1:40:00	0.00	0.00	0.40	0.57	0.71	0.88	1.03	1.21	1.93
	1:45:00	0.00	0.00	0.39	0.53	0.67	0.81	0.95	1.11	1.77
	1:50:00	0.00	0.00	0.37	0.50	0.64	0.76	0.89	1.02	1.63
	1:55:00	0.00	0.00	0.35	0.47	0.60	0.71	0.83	0.95	1.51
	2:00:00	0.00	0.00	0.32	0.44	0.56	0.66	0.77	0.87	1.40
	2:05:00	0.00	0.00	0.28	0.39	0.50	0.59	0.68	0.78	1.24
	2:10:00	0.00	0.00	0.25	0.34	0.44	0.52	0.60	0.68	1.09
	2:15:00	0.00	0.00	0.22	0.30	0.38	0.45	0.52	0.60	0.94
	2:20:00	0.00	0.00	0.19	0.25	0.32	0.39	0.45	0.51	0.81
	2:25:00	0.00	0.00	0.16	0.21	0.27	0.33	0.38	0.43	0.68
	2:30:00	0.00	0.00	0.13	0.18	0.22	0.27	0.31	0.36	0.56
	2:35:00	0.00	0.00	0.10	0.14	0.18	0.22	0.25	0.28	0.44
	2:40:00	0.00	0.00	0.08	0.11	0.14	0.17	0.19	0.22	0.34
	2:45:00	0.00	0.00	0.07	0.09	0.12	0.13	0.15	0.16	0.26
	2:50:00	0.00	0.00	0.06	0.08	0.10	0.10	0.12	0.13	0.20
	2:55:00	0.00	0.00	0.05	0.06	0.08	0.08	0.09	0.10	0.16
	3:00:00	0.00	0.00	0.04	0.05	0.07	0.07	0.07	0.08	0.12
	3:05:00	0.00	0.00	0.03	0.04	0.06	0.05	0.06	0.06	0.10
	3:10:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.08
	3:15:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.06
	3:20:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.05
	3:25:00	0.00	0.00	0.02	0.02	0.03	0.02	0.03	0.02	0.04
	3:30:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:35:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.02
	3:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:45:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:50:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	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 OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: SPC
Company: HR Green
Date: March 12, 2024
Project: Eastonville Road - Segment 1 Improvements Pond B
Location: EL PASO COUNTY, CO

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 53.0 %
B) Tributary Area's Imperviousness Ratio (i = I_a / 100)	i = 0.530
C) Contributing Watershed Area	Area = 3.830 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ◉ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time (V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)	V_{DESIGN}= ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER}$ = (d_6*(V_{DESIGN}/0.43))	$V_{DESIGN\ OTHER}$= 0.067 ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed	
i) Percentage of Watershed consisting of Type A Soils	HSG_A = 100 %
ii) Percentage of Watershed consisting of Type B Soils	HSG_B = 0 %
iii) Percentage of Watershed consisting of Type C/D Soils	$HSG_{C/D}$ = 0 %
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A$ = 1.68 * $i^{1.28}$ For HSG B: $EURV_B$ = 1.36 * $i^{1.08}$ For HSG C/D: $EURV_{C/D}$ = 1.20 * $i^{1.08}$	$EURV_{DESIGN}$ = 0.238 ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$= ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	
5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 2% of the WQCV)	V_{FMIN} = 0.001 ac-ft
B) Actual Forebay Volume	V_F = 0.003 ac-ft
C) Forebay Depth (D_F = 18 inch maximum)	D_F = 15.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 8.40 cfs
ii) Forebay Discharge Design Flow (Q_F = 0.02 * Q_{100})	Q_F = 0.17 cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe ◉ Wall with Rect. Notch ○ Wall with V-Notch Weir — Flow too small for berm w/ pipe
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = 3.4 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: SPC
Company: HR Green
Date: March 12, 2024
Project: Eastonville Road - Segment 1 Improvements Pond B
Location: EL PASO COUNTY, CO

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 10 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 0.63 inches

E) Total Outlet Area — A_{ot} = 30.18 square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 3.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 1,095 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) — *S.S. Well Screen with 60% Open Area*

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio =

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 1825 sq. in.

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 2.76 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 61.12 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 29.9 inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: SPC
Company: HR Green
Date: March 12, 2024
Project: Eastonville Road - Segment 1 Improvements Pond B
Location: EL PASO COUNTY, CO

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

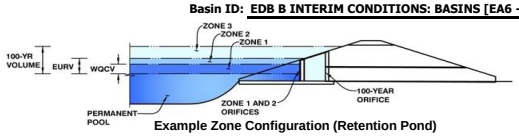
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Eastonville Road - Segment 1 Improvements

Basin ID: EDB B INTERIM CONDITIONS: BASINS [EA6 - EA8]



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB		Note: L / W Ratio > 8
Watershed Area =	3.88	acres	L / W Ratio = 18.12
Watershed Length =	1,750	ft	
Watershed Length to Centroid =	500	ft	
Watershed Slope =	0.009	ft/ft	
Watershed Imperviousness =	54.00%	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) =	0.070	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.247	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.185	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.245	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.293	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.364	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.434	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.522	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	0.888	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.159	acre-feet	
Approximate 5-yr Detention Volume =	0.209	acre-feet	
Approximate 10-yr Detention Volume =	0.254	acre-feet	
Approximate 25-yr Detention Volume =	0.310	acre-feet	
Approximate 50-yr Detention Volume =	0.344	acre-feet	
Approximate 100-yr Detention Volume =	0.385	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.070	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.177	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.138	acre-feet
Total Detention Basin Volume =	0.385	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

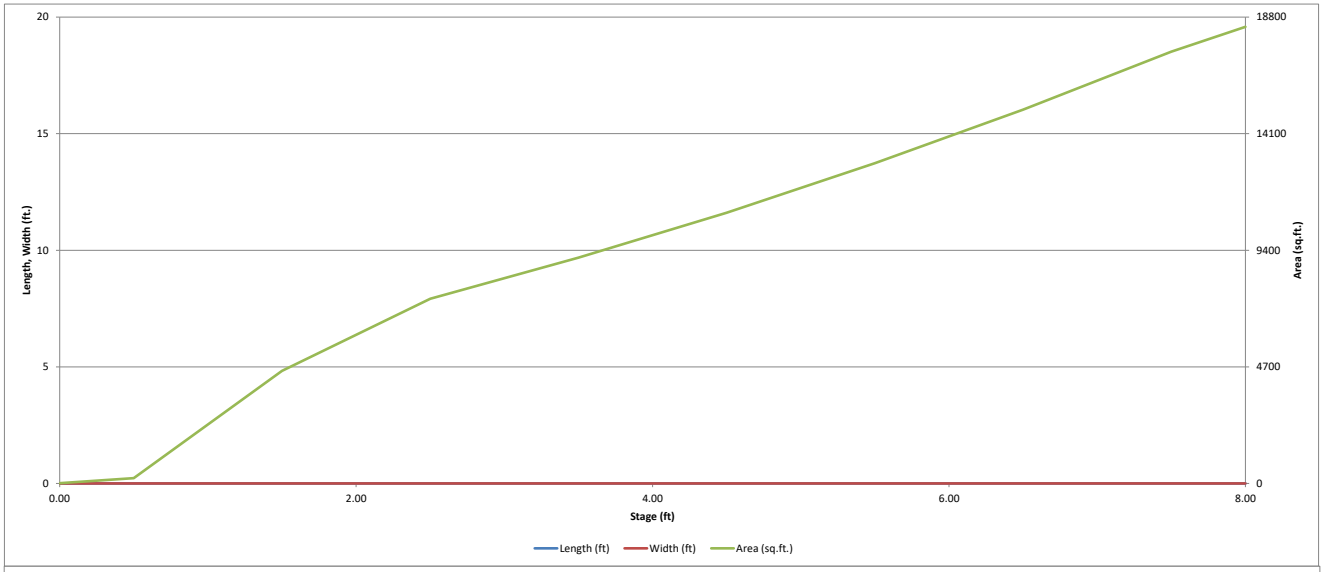
6983.5

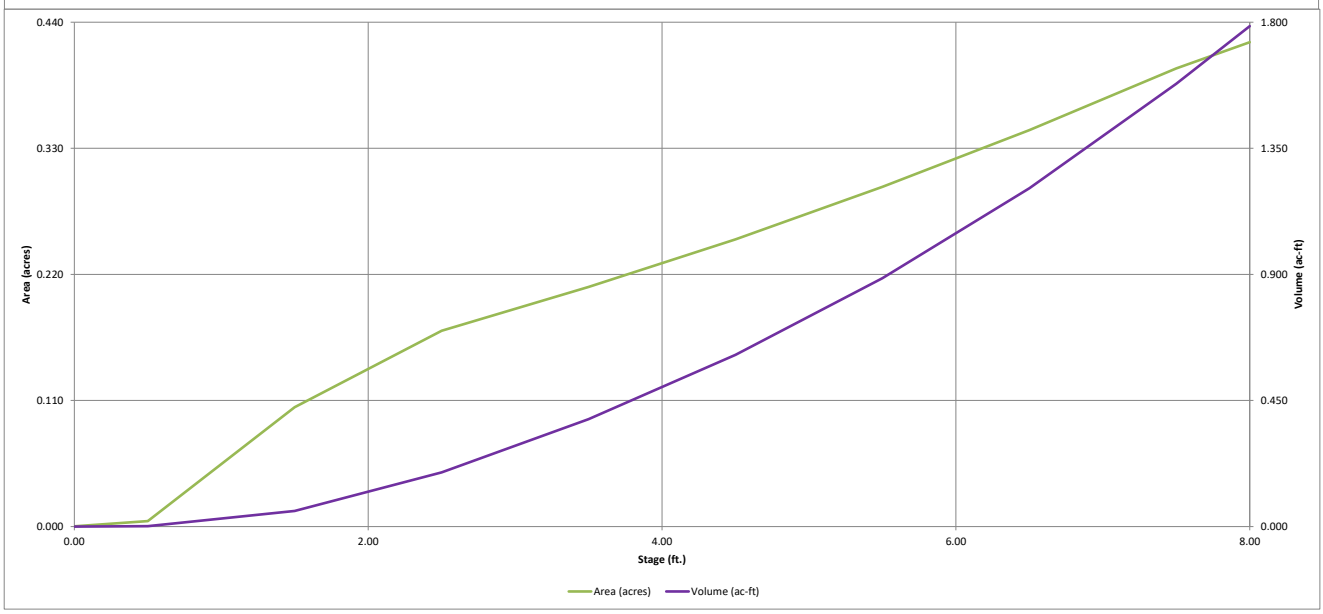
Depth Increment = ft

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		
6984	--	0.50	--	--	--	211	0.005	55	0.001
6985	--	1.50	--	--	--	4,539	0.104	2,430	0.056
6986	--	2.50	--	--	--	7,443	0.171	8,421	0.193
6987	--	3.50	--	--	--	9,104	0.209	16,695	0.383
6988	--	4.50	--	--	--	10,914	0.251	26,704	0.613
6989	--	5.50	--	--	--	12,910	0.296	38,616	0.886
6990	--	6.50	--	--	--	15,069	0.346	52,605	1.208
6991	--	7.50	--	--	--	17,408	0.400	68,844	1.580
6991.5	--	8.00	--	--	--	18,407	0.423	77,797	1.786

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



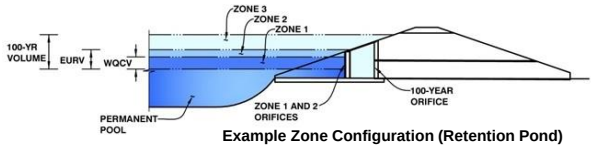


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road - Segment 1 Improvements**

Basin ID: **EDB B INTERIM CONDITIONS: BASINS [EA6 - EA8]**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.64	0.070	Orifice Plate
Zone 2 (EURV)	2.81	0.177	Rectangular Orifice
Zone 3 (100-year)	3.51	0.138	Weir&Pipe (Restrict)
Total (all zones)		0.385	

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

Calculated Parameters for Underdrain

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)	WQ Orifice Area per Row =	2.132E-03	ft^2
Depth at top of Zone using Orifice Plate =	1.62	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.31	sq. inches (diameter = 5/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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)	0.31	0.31	0.31					

	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 Rectangular	Not Selected		Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.18	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	2.76	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.33	N/A	feet
Vertical Orifice Height =	8.00	N/A	inches				
Vertical Orifice Width =	3.25		inches				

Calculated Parameters for Vertical Orifice

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		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.20	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	3.54	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected		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 Orifice Area =	1.77	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.50	feet
Spillway Crest Length =	15.50	feet	Stage at Top of Freeboard =	8.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.42	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.79	acre-ft

Calculated Parameters for Spillway

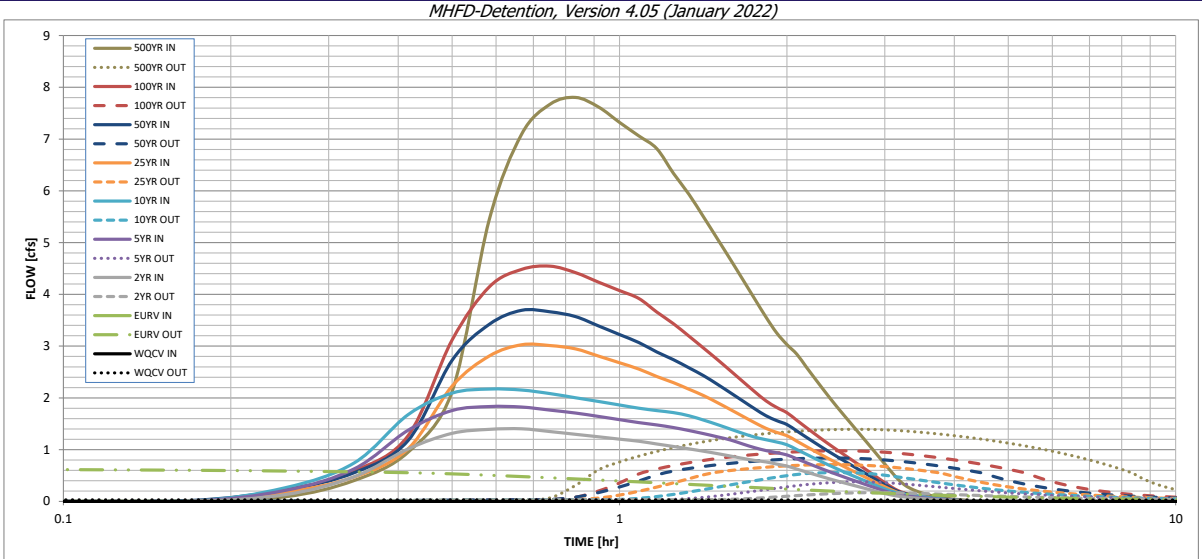
Routed Hydrograph Results

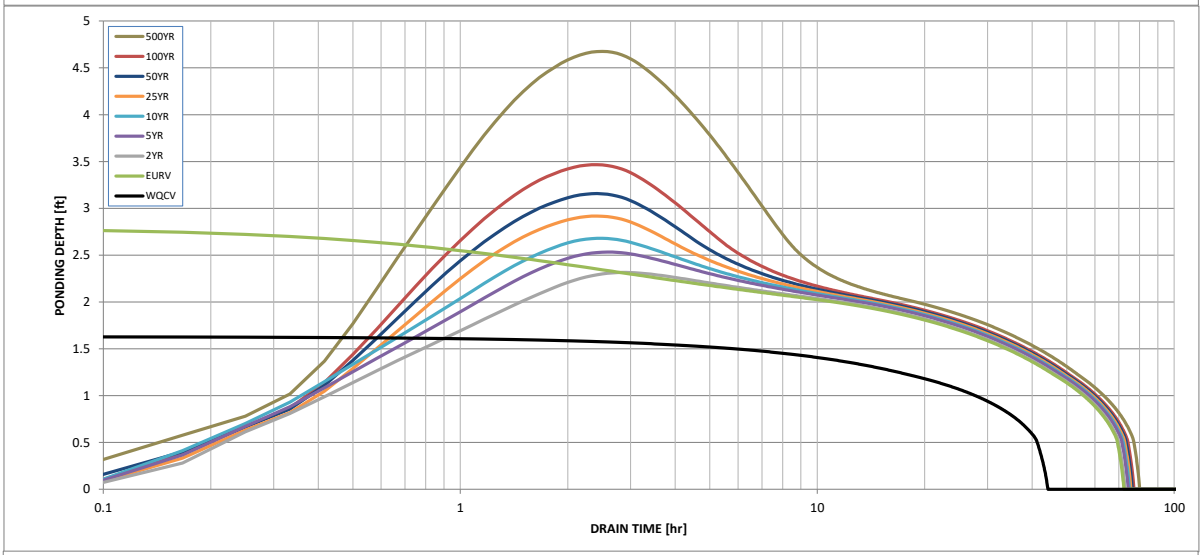
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

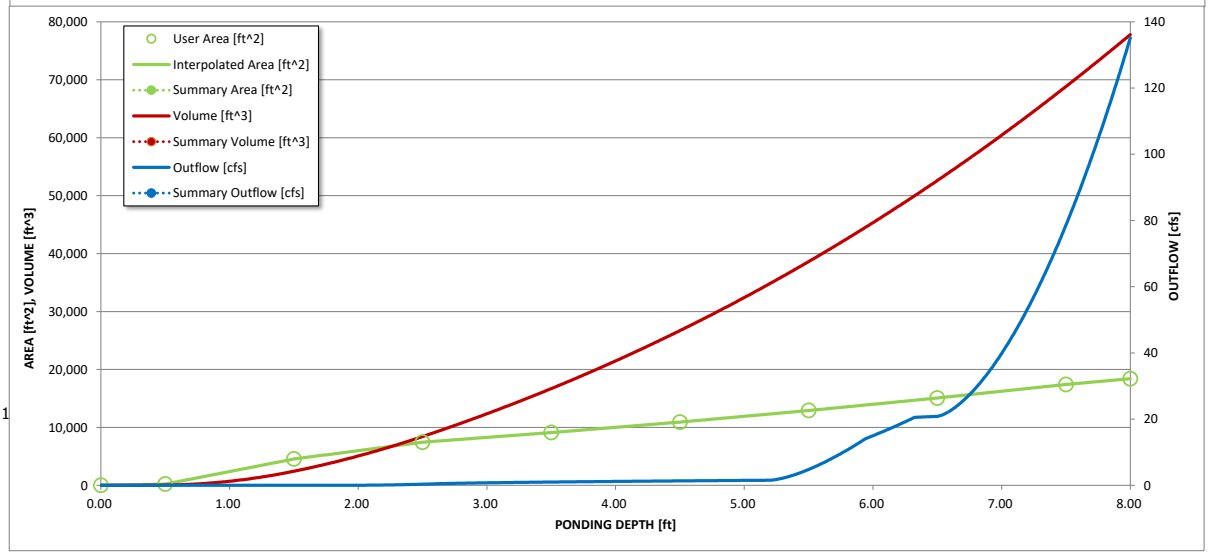
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.070	0.247	0.185	0.245	0.293	0.364	0.434	0.522	0.888
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.185	0.245	0.293	0.364	0.434	0.522	0.888
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.3	0.6	1.0	2.7
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	0.08	0.15	0.25	0.69
Peak Inflow Q (cfs) =	N/A	N/A	1.4	1.8	2.2	3.0	3.7	4.5	7.8
Peak Outflow Q (cfs) =	0.0	0.6	0.2	0.4	0.6	0.7	0.8	1.0	1.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	16.8	17.6	2.4	1.4	1.0	0.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	ertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	40	63	65	65	64	63	62	61	56
Time to Drain 99% of Inflow Volume (hours) =	**42**	68	69	70	70	70	70	69	69
Maximum Ponding Depth (ft) =	1.64	2.81	2.32	2.53	2.68	2.92	3.16	3.47	4.68
Area at Maximum Ponding Depth (acres) =	0.11	0.18	0.16	0.17	0.18	0.19	0.20	0.21	0.26
Maximum Volume Stored (acre-ft) =	0.071	0.248	0.162	0.198	0.225	0.267	0.312	0.375	0.656

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 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	0.01	0.00	0.09
	0:15:00	0.00	0.00	0.13	0.21	0.26	0.18	0.22	0.22	0.40
	0:20:00	0.00	0.00	0.48	0.63	0.74	0.47	0.55	0.59	0.95
	0:25:00	0.00	0.00	1.01	1.37	1.68	1.02	1.18	1.27	2.12
	0:30:00	0.00	0.00	1.32	1.76	2.09	2.23	2.73	3.12	5.45
	0:35:00	0.00	0.00	1.39	1.83	2.17	2.81	3.42	4.15	7.09
	0:40:00	0.00	0.00	1.40	1.82	2.15	3.03	3.69	4.48	7.67
	0:45:00	0.00	0.00	1.35	1.76	2.08	3.01	3.66	4.55	7.80
	0:50:00	0.00	0.00	1.30	1.71	2.00	2.95	3.57	4.42	7.62
	0:55:00	0.00	0.00	1.25	1.64	1.93	2.81	3.39	4.24	7.32
	1:00:00	0.00	0.00	1.20	1.58	1.86	2.68	3.22	4.07	7.06
	1:05:00	0.00	0.00	1.16	1.52	1.80	2.56	3.07	3.92	6.82
	1:10:00	0.00	0.00	1.11	1.48	1.75	2.41	2.89	3.66	6.34
	1:15:00	0.00	0.00	1.06	1.43	1.72	2.29	2.74	3.43	5.93
	1:20:00	0.00	0.00	1.02	1.37	1.65	2.17	2.58	3.19	5.49
	1:25:00	0.00	0.00	0.97	1.31	1.57	2.04	2.43	2.96	5.07
	1:30:00	0.00	0.00	0.92	1.25	1.48	1.91	2.26	2.74	4.67
	1:35:00	0.00	0.00	0.88	1.19	1.40	1.77	2.10	2.52	4.28
	1:40:00	0.00	0.00	0.83	1.11	1.31	1.64	1.94	2.32	3.91
	1:45:00	0.00	0.00	0.79	1.04	1.24	1.52	1.79	2.12	3.56
	1:50:00	0.00	0.00	0.76	0.98	1.19	1.41	1.66	1.94	3.26
	1:55:00	0.00	0.00	0.72	0.94	1.15	1.33	1.56	1.82	3.03
	2:00:00	0.00	0.00	0.68	0.90	1.09	1.27	1.49	1.71	2.85
	2:05:00	0.00	0.00	0.62	0.82	1.00	1.16	1.36	1.57	2.60
	2:10:00	0.00	0.00	0.57	0.75	0.91	1.06	1.24	1.43	2.36
	2:15:00	0.00	0.00	0.52	0.68	0.83	0.96	1.13	1.30	2.14
	2:20:00	0.00	0.00	0.47	0.61	0.74	0.87	1.02	1.17	1.93
	2:25:00	0.00	0.00	0.42	0.55	0.67	0.79	0.92	1.05	1.74
	2:30:00	0.00	0.00	0.38	0.49	0.60	0.70	0.82	0.95	1.56
	2:35:00	0.00	0.00	0.33	0.44	0.53	0.63	0.73	0.84	1.38
	2:40:00	0.00	0.00	0.30	0.39	0.47	0.55	0.64	0.74	1.21
	2:45:00	0.00	0.00	0.26	0.34	0.41	0.48	0.56	0.64	1.04
	2:50:00	0.00	0.00	0.22	0.29	0.35	0.41	0.48	0.55	0.88
	2:55:00	0.00	0.00	0.19	0.24	0.29	0.35	0.40	0.45	0.72
	3:00:00	0.00	0.00	0.15	0.20	0.24	0.28	0.32	0.36	0.57
	3:05:00	0.00	0.00	0.12	0.16	0.20	0.22	0.25	0.28	0.43
	3:10:00	0.00	0.00	0.10	0.14	0.16	0.17	0.19	0.21	0.32
	3:15:00	0.00	0.00	0.09	0.11	0.14	0.14	0.16	0.16	0.25
	3:20:00	0.00	0.00	0.07	0.10	0.12	0.11	0.13	0.13	0.20
	3:25:00	0.00	0.00	0.06	0.08	0.10	0.10	0.11	0.11	0.16
	3:30:00	0.00	0.00	0.05	0.07	0.09	0.08	0.09	0.09	0.13
	3:35:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.10
	3:40:00	0.00	0.00	0.04	0.05	0.06	0.06	0.06	0.06	0.08
	3:45:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.07
	3:50:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.05
	3:55:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.04
	4:00:00	0.00	0.00	0.02	0.02	0.03	0.02	0.03	0.02	0.03
	4:05:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	4:10:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.01	0.02
	4:15:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	4:20:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	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 OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

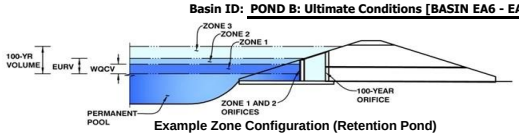
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Eastonville Road

Basin ID: POND B: Ultimate Conditions [BASIN EA6 - EA10]



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	9.32	acres
Watershed Length =	1,750	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.009	ft/ft
Watershed Imperviousness =	68.00%	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) =	0.207 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.796 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.584 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.764 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.909 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.093 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.274 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.491 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.398 acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.519 acre-feet		
Approximate 5-yr Detention Volume =	0.678 acre-feet		
Approximate 10-yr Detention Volume =	0.815 acre-feet		
Approximate 25-yr Detention Volume =	0.978 acre-feet		
Approximate 50-yr Detention Volume =	1.076 acre-feet		
Approximate 100-yr Detention Volume =	1.175 acre-feet		

Define Zones and Basin Geometry

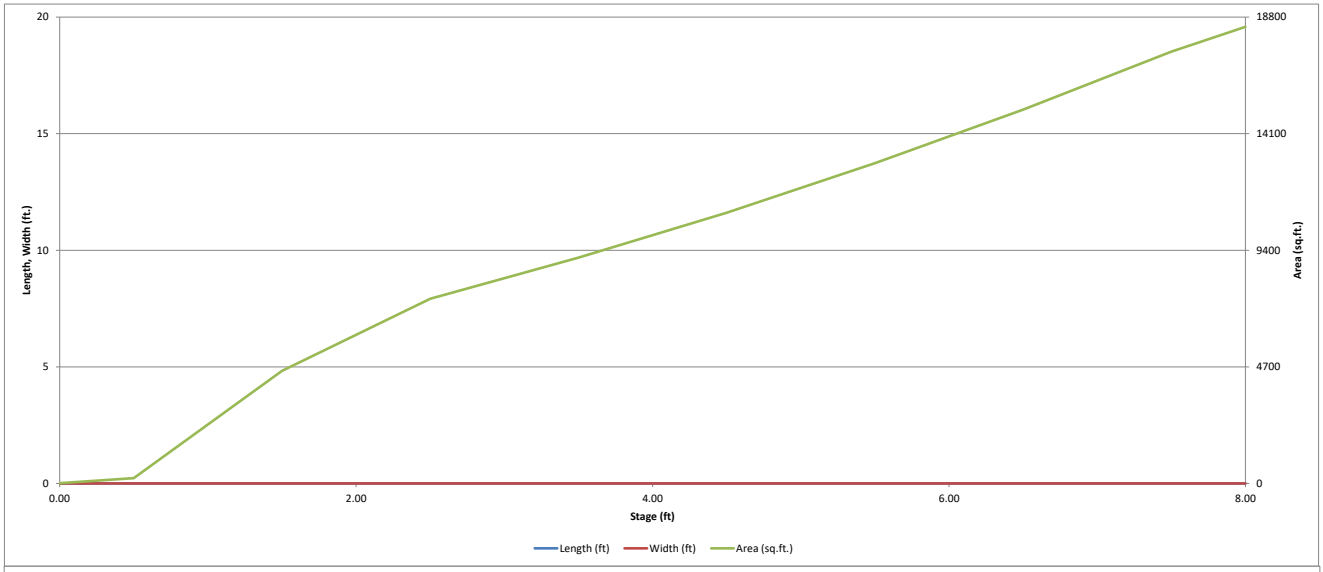
Zone 1 Volume (WQCV) =	0.207	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.590	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.378	acre-feet
Total Detention Basin Volume =	1.175	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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

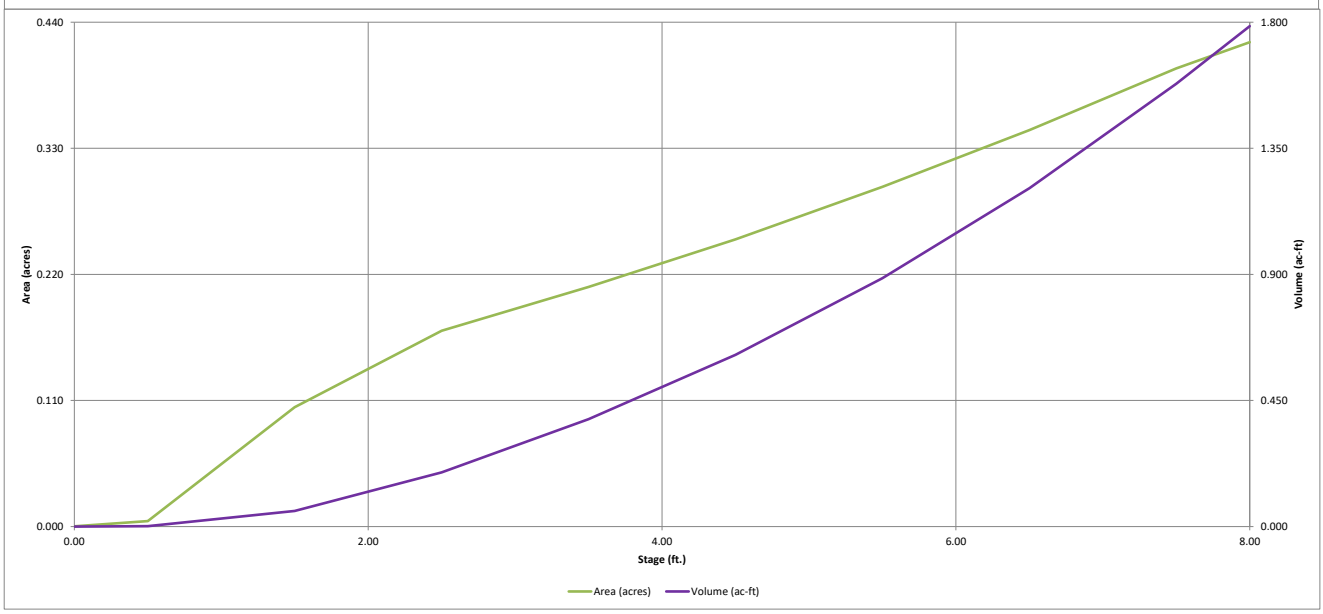
Depth Increment = ft

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)
6983.5 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
6984	--	0.50	--	--	--	211	0.005	55	0.001
6985	--	1.50	--	--	--	4,539	0.104	2,430	0.056
6986	--	2.50	--	--	--	7,443	0.171	8,421	0.193
6987	--	3.50	--	--	--	9,104	0.209	16,695	0.383
6988	--	4.50	--	--	--	10,914	0.251	26,704	0.613
6989	--	5.50	--	--	--	12,910	0.296	38,616	0.886
6990	--	6.50	--	--	--	15,069	0.346	52,605	1.208
6991	--	7.50	--	--	--	17,408	0.400	68,844	1.580
6991.5	--	8.00	--	--	--	18,407	0.423	77,797	1.786

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



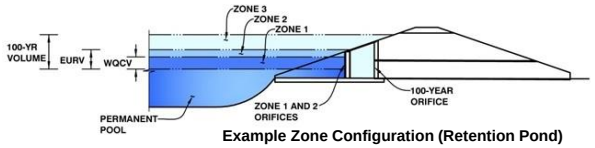


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **EDB B: Ultimate Conditions [BASIN EA6 - EA10]**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.58	0.207	Orifice Plate
Zone 2 (EURV)	5.19	0.590	Circular Orifice
Zone 3 (100-year)	6.41	0.378	Weir&Pipe (Restrict)
Total (all zones)		1.175	

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

Calculated Parameters for Underdrain

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)	WQ Orifice Area per Row =	5.451E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.58	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.79	sq. inches (diameter = 1 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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	0.87	1.73					
Orifice Area (sq. inches)	0.79	0.79	0.79					

	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			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.02	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	5.18	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.08	N/A	feet
Vertical Orifice Diameter =	2.00	N/A	inches				

Calculated Parameters for Vertical Orifice

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			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.20	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	25.92	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			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 Orifice Area =	0.24	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.17	N/A	feet
Restrictor Plate Height Above Pipe Invert =	3.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.91	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.50	feet
Spillway Crest Length =	15.50	feet	Stage at Top of Freeboard =	8.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.42	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.79	acre-ft

Calculated Parameters for Spillway

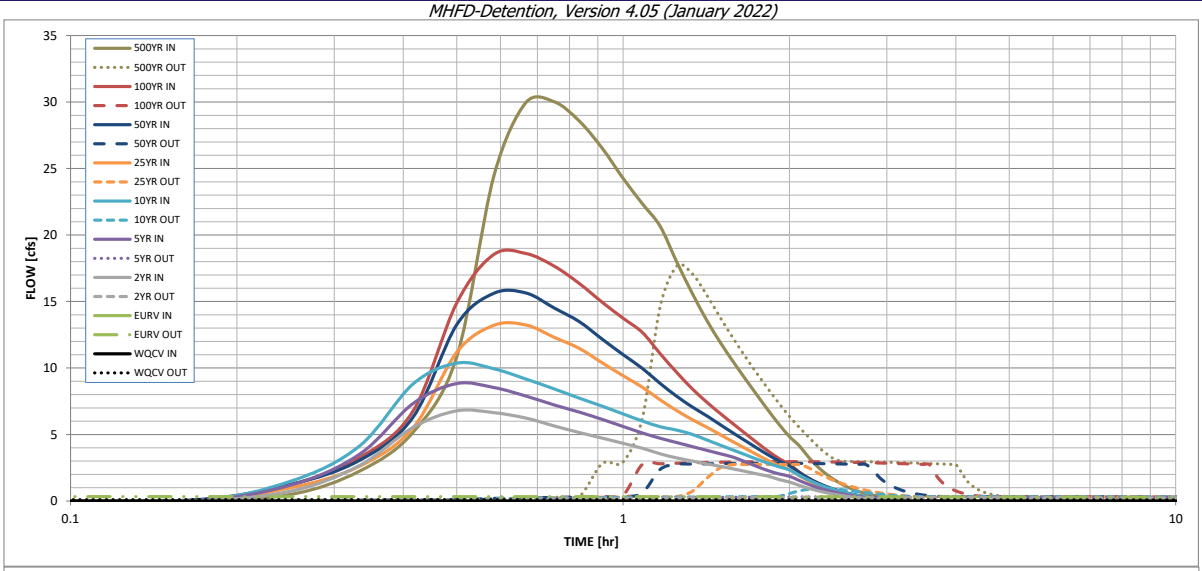
Routed Hydrograph Results

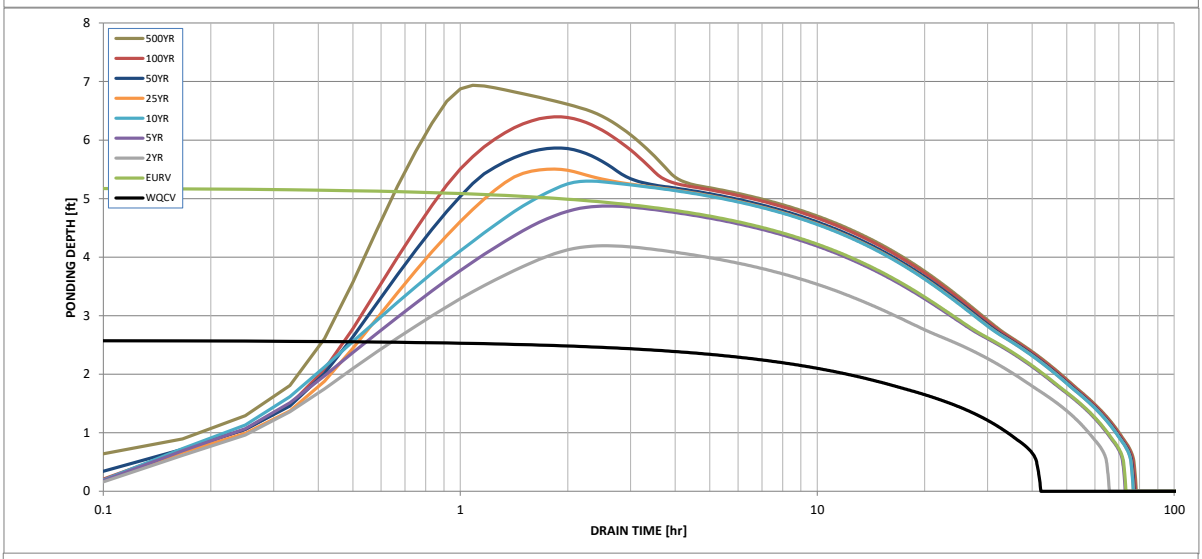
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

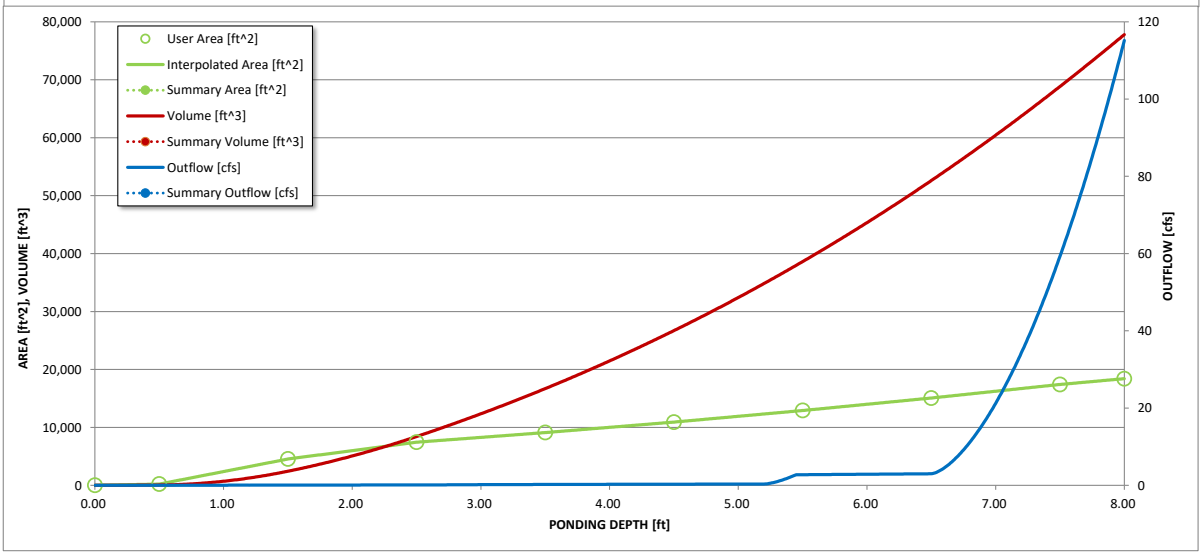
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.207	0.796	0.584	0.764	0.909	1.093	1.274	1.491	2.398
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.584	0.764	0.909	1.093	1.274	1.491	2.398
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.1	1.0	2.1	3.4	9.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.11	0.22	0.37	0.99
Peak Inflow Q (cfs) =	N/A	N/A	6.8	8.8	10.4	13.2	15.6	18.6	30.0
Peak Outflow Q (cfs) =	0.1	0.3	0.3	0.3	0.9	2.7	2.8	3.0	17.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.9	8.3	2.7	1.4	0.9	1.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.4	0.4	0.4
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) =	38	63	57	63	65	64	63	62	56
Time to Drain 99% of Inflow Volume (hours) =	**41**	69	62	68	71	71	70	70	68
Maximum Ponding Depth (ft) =	2.58	5.19	4.19	4.87	5.30	5.51	5.86	6.40	6.94
Area at Maximum Ponding Depth (acres) =	0.17	0.28	0.24	0.27	0.29	0.30	0.31	0.34	0.37
Maximum Volume Stored (acre-ft) =	0.207	0.797	0.537	0.709	0.825	0.886	0.996	1.170	1.361

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 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	0.08	0.01	0.49
	0:15:00	0.00	0.00	0.73	1.19	1.48	0.99	1.25	1.21	2.24
	0:20:00	0.00	0.00	2.67	3.51	4.13	2.61	3.06	3.26	5.16
	0:25:00	0.00	0.00	5.54	7.33	8.80	5.49	6.30	6.76	10.85
	0:30:00	0.00	0.00	6.78	8.83	10.36	11.19	13.26	14.89	24.41
	0:35:00	0.00	0.00	6.65	8.53	9.94	13.21	15.62	18.53	29.96
	0:40:00	0.00	0.00	6.24	7.89	9.17	13.24	15.64	18.61	30.03
	0:45:00	0.00	0.00	5.65	7.23	8.43	12.31	14.52	17.67	28.57
	0:50:00	0.00	0.00	5.15	6.68	7.73	11.47	13.48	16.35	26.52
	0:55:00	0.00	0.00	4.73	6.14	7.13	10.39	12.17	14.94	24.26
	1:00:00	0.00	0.00	4.33	5.60	6.55	9.42	11.00	13.74	22.36
	1:05:00	0.00	0.00	3.97	5.12	6.02	8.56	9.97	12.68	20.67
	1:10:00	0.00	0.00	3.55	4.72	5.59	7.61	8.84	11.08	17.99
	1:15:00	0.00	0.00	3.24	4.40	5.33	6.80	7.88	9.67	15.64
	1:20:00	0.00	0.00	3.01	4.09	5.01	6.12	7.08	8.45	13.60
	1:25:00	0.00	0.00	2.80	3.81	4.59	5.56	6.41	7.44	11.91
	1:30:00	0.00	0.00	2.60	3.55	4.20	4.98	5.73	6.57	10.46
	1:35:00	0.00	0.00	2.41	3.29	3.82	4.44	5.10	5.79	9.14
	1:40:00	0.00	0.00	2.22	2.93	3.47	3.94	4.52	5.05	7.92
	1:45:00	0.00	0.00	2.03	2.58	3.13	3.47	3.96	4.36	6.78
	1:50:00	0.00	0.00	1.86	2.27	2.83	3.03	3.45	3.73	5.75
	1:55:00	0.00	0.00	1.61	2.03	2.57	2.65	3.00	3.18	4.85
	2:00:00	0.00	0.00	1.43	1.86	2.34	2.36	2.66	2.75	4.16
	2:05:00	0.00	0.00	1.17	1.54	1.94	1.90	2.14	2.18	3.29
	2:10:00	0.00	0.00	0.95	1.25	1.58	1.52	1.70	1.72	2.58
	2:15:00	0.00	0.00	0.77	1.01	1.28	1.21	1.36	1.35	2.01
	2:20:00	0.00	0.00	0.63	0.82	1.04	0.97	1.09	1.06	1.57
	2:25:00	0.00	0.00	0.50	0.66	0.83	0.77	0.87	0.83	1.22
	2:30:00	0.00	0.00	0.40	0.52	0.66	0.61	0.69	0.64	0.94
	2:35:00	0.00	0.00	0.32	0.41	0.52	0.48	0.53	0.50	0.72
	2:40:00	0.00	0.00	0.25	0.32	0.40	0.37	0.41	0.39	0.56
	2:45:00	0.00	0.00	0.20	0.25	0.31	0.29	0.32	0.30	0.44
	2:50:00	0.00	0.00	0.15	0.19	0.24	0.23	0.25	0.24	0.35
	2:55:00	0.00	0.00	0.12	0.14	0.19	0.17	0.19	0.19	0.27
	3:00:00	0.00	0.00	0.08	0.10	0.14	0.13	0.14	0.14	0.20
	3:05:00	0.00	0.00	0.06	0.07	0.10	0.09	0.10	0.10	0.14
	3:10:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.06	0.09
	3:15:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.05
	3:20:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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 OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 2**

Designer: SPC
Company: HR Green
Date: March 13, 2024
Project: Eastonville Road - Segment 1 Improvements Pond D
Location: El Paso County, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter): I_a = 52.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a/100$): i = 0.520

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
$WQCV = 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)$: WQCV = 0.17 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 91,476 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
$V_{WQCV} = WQCV / 12 * Area$: V_{WQCV} = 1,292 cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm: d_6 = in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume: $V_{WQCV\ OTHER}$ = cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 1.0 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.: Z = 4.00 ft / ft

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 595 sq ft

D) Actual Filter Area: A_{Actual} = 969 sq ft

E) Volume Provided: V_T = 12536 cu ft

3. Filter Material

Choose One
- (•) 18" CDOT Class B or C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
- (•) YES
- ( ) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice: y = 2.1 ft

ii) Volume to Drain in 12 Hours: Vol_{12} = 1,292 cu ft

iii) Orifice Diameter, 3/8" Minimum: D_O = 13/16 in

Design Procedure Form: Sand Filter (SF)

Designer: SPC
Company: HR Green
Date: March 13, 2024
Project: Eastonville Road - Segment 1 Improvements Pond D
Location: El Paso County, CO

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Engery dissapation at inlet points provided via riprap, and means of conveying flows in excess of the WQCV through the outlet is via the modified type 'C' inlet outlet structure grate, and a restricted outlet pipe.

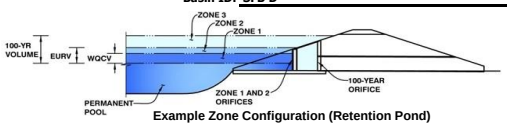
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Eastonville Road

Basin ID: SFB D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	SF		Note: L / W Ratio > 8
Watershed Area =	2.10	acres	L / W Ratio = 9.95
Watershed Length =	954	ft	
Watershed Length to Centroid =	605	ft	
Watershed Slope =	0.016	ft/ft	
Watershed Imperviousness =	52.00%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	100.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Target WQCV Drain Time =	12.0	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) =	0.030	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.117	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.110	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.157	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.197	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.251	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.294	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.350	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	0.562	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.089	acre-feet	
Approximate 5-yr Detention Volume =	0.121	acre-feet	
Approximate 10-yr Detention Volume =	0.160	acre-feet	
Approximate 25-yr Detention Volume =	0.174	acre-feet	
Approximate 50-yr Detention Volume =	0.182	acre-feet	
Approximate 100-yr Detention Volume =	0.202	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.030	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.087	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.085	acre-feet
Total Detention Basin Volume =	0.202	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	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

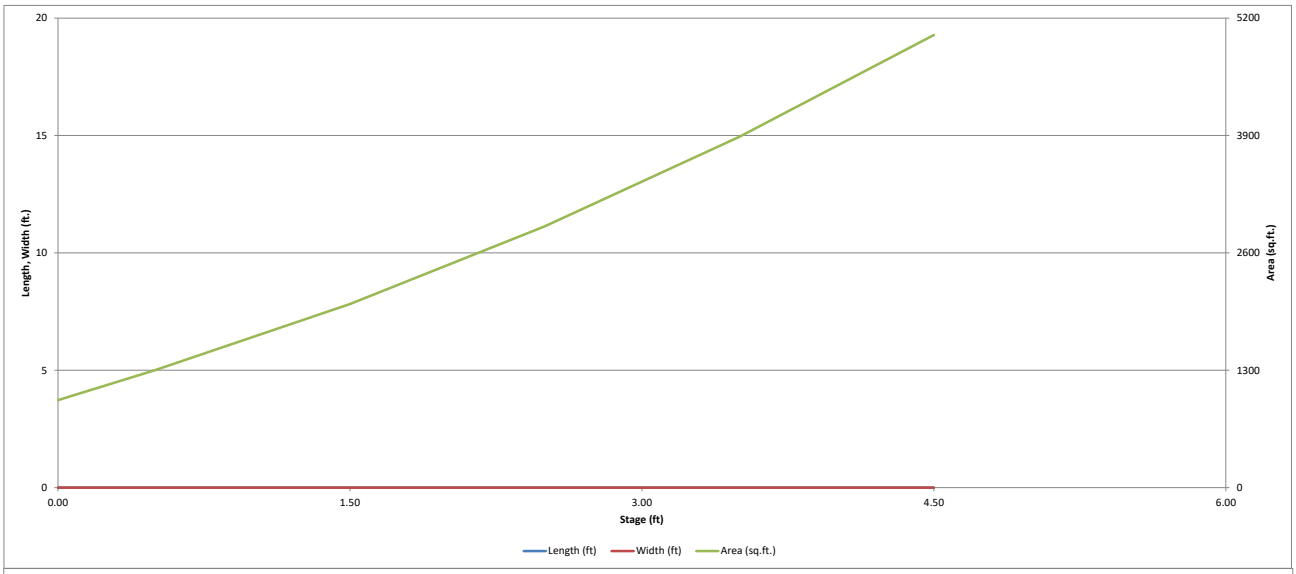
6970.5

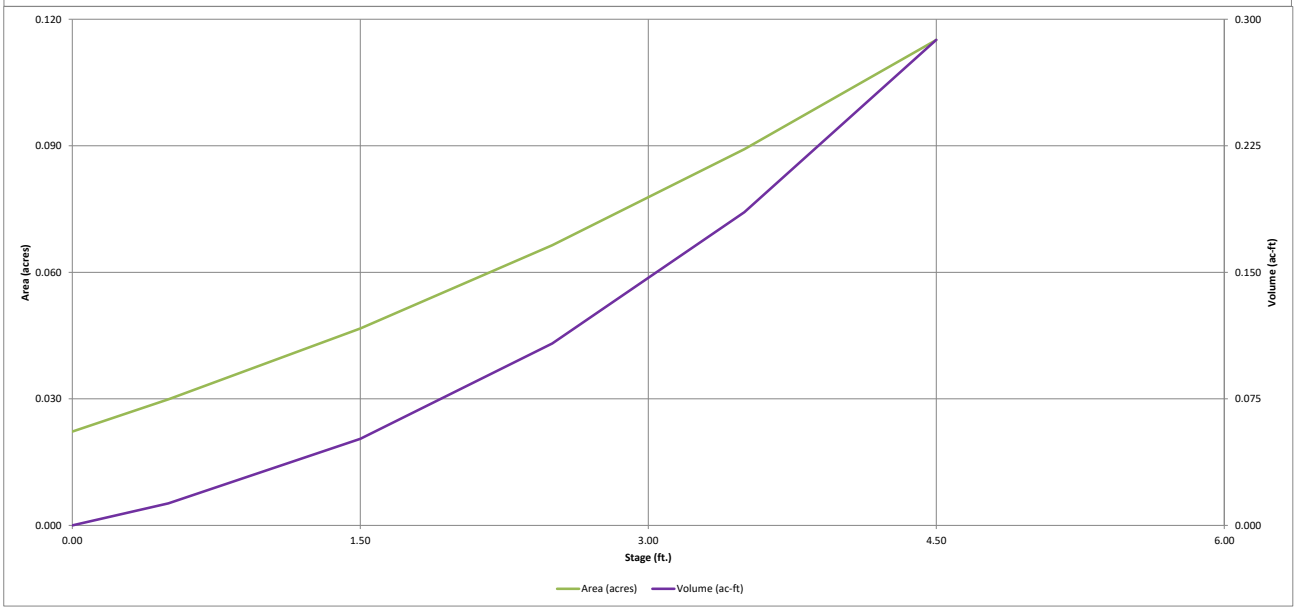
Depth Increment = ft

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)
Media Surface	--	0.00	--	--	--	969	0.022		
6971	--	0.50	--	--	--	1,302	0.030	568	0.013
	--	1.50	--	--	--	2,033	0.047	2,235	0.051
	--	2.50	--	--	--	2,893	0.066	4,698	0.108
	--	3.50	--	--	--	3,885	0.089	8,087	0.186
6,975.00	--	4.50	--	--	--	5,013	0.115	12,536	0.288

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



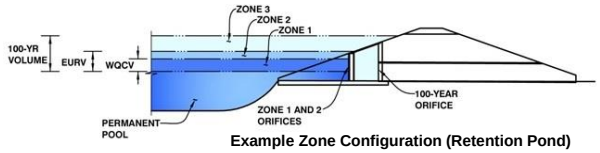


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **SFB D**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.99	0.030	Filtration Media
Zone 2 (EURV)	2.64	0.087	Circular Orifice
Zone 3 (100-year)	3.68	0.085	Weir&Pipe (Restrict)
Total (all zones)		0.202	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	2.08	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Diameter =	0.83	inches	Underdrain Orifice Centroid =	0.03	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)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.00	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	2.64	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.02	N/A	feet
Vertical Orifice Diameter =	0.38	N/A	inches				

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		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.65	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.65	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	48.50	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.08	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.13	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.11	N/A	feet
Restrictor Plate Height Above Pipe Invert =	2.27		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.73	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	3.40	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.10	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	4.50	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.12	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.29	acre-ft

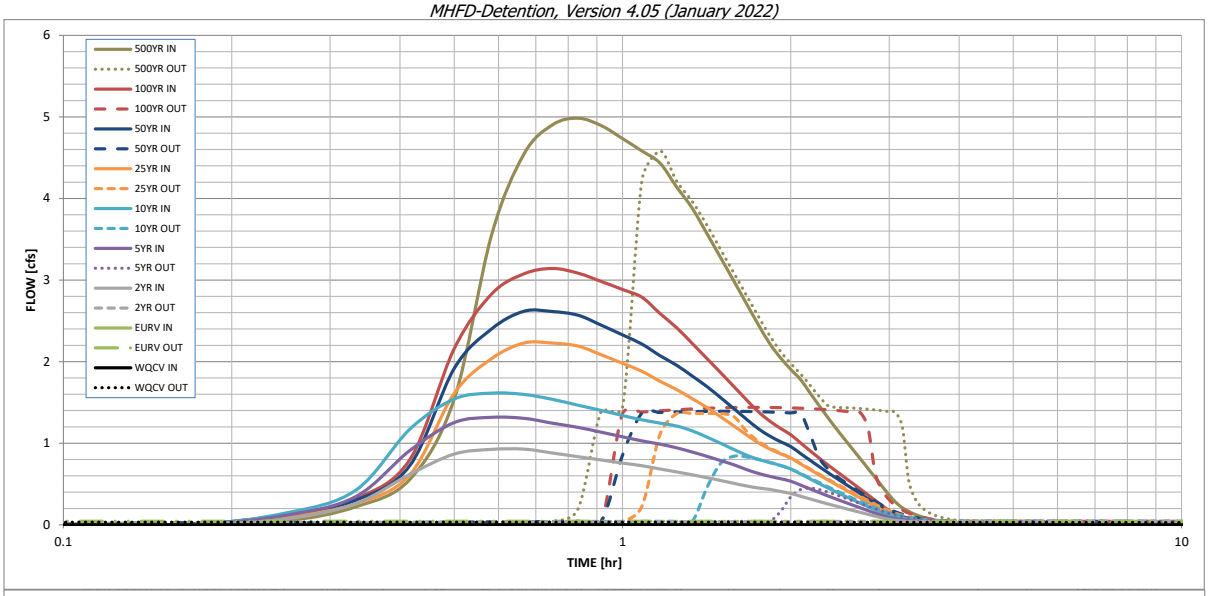
Routed Hydrograph Results

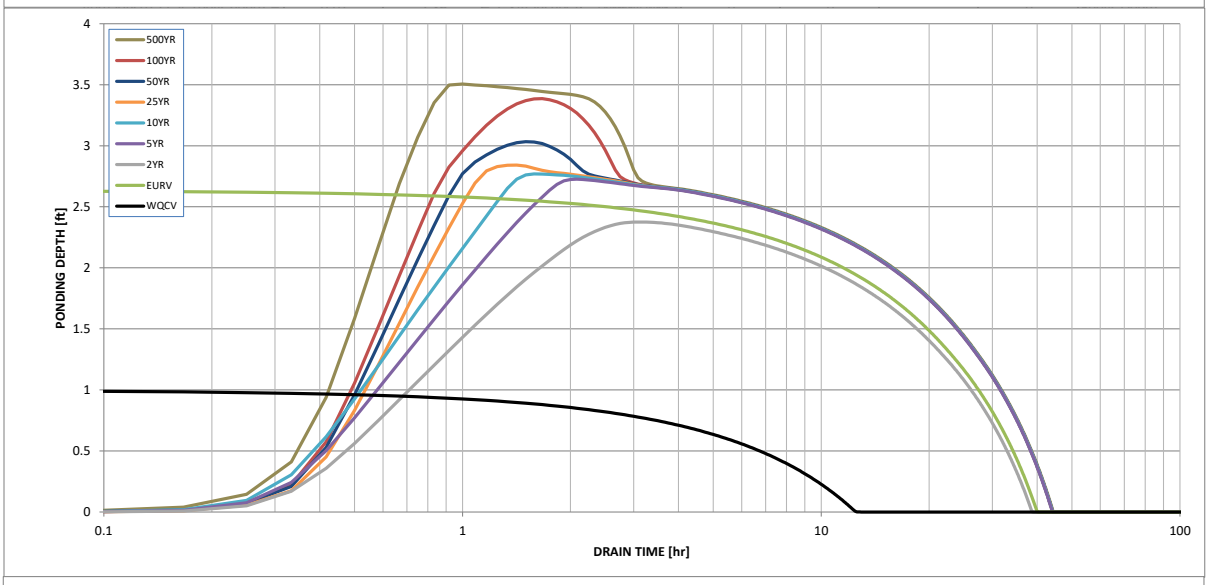
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

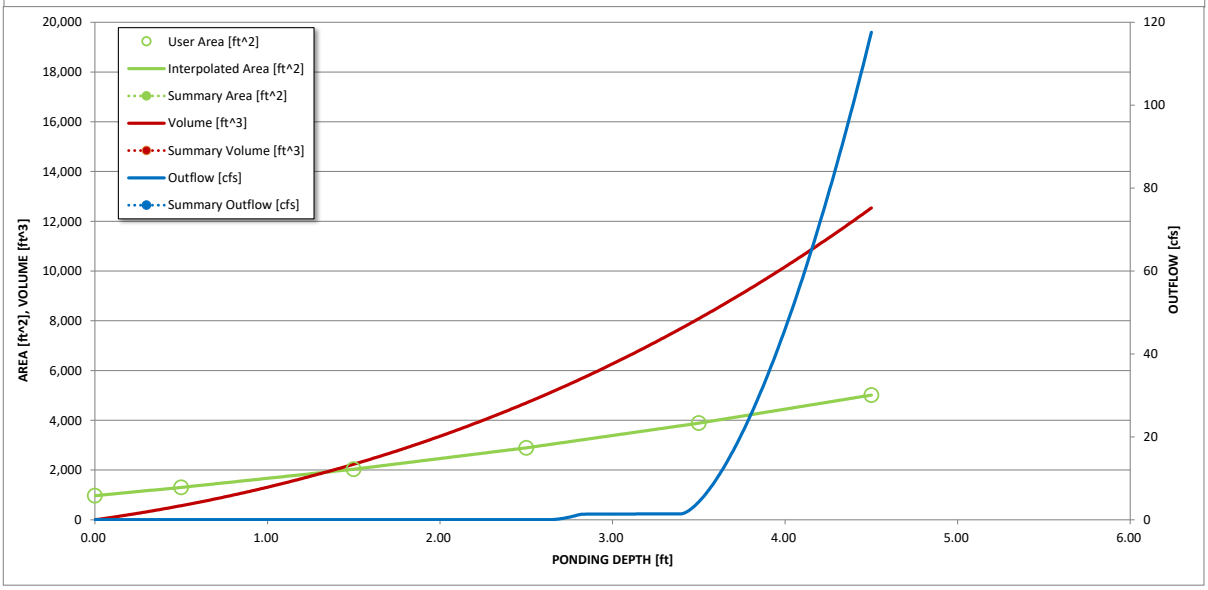
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.030	0.117	0.110	0.157	0.197	0.251	0.294	0.350	0.562
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.110	0.157	0.197	0.251	0.294	0.350	0.562
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	0.8	1.0	1.4	2.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.05	0.14	0.21	0.40	0.50	0.66	1.18
Peak Inflow Q (cfs) =	N/A	N/A	0.9	1.3	1.6	2.2	2.6	3.1	5.0
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.4	0.8	1.4	1.4	1.4	4.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.6	1.9	1.6	1.3	1.0	1.8
Structure Controlling Flow =	Filtration Media	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.1	0.2	0.2	0.2	0.2
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) =	12	38	37	42	42	41	40	40	37
Time to Drain 99% of Inflow Volume (hours) =	**12**	40	38	43	43	43	43	43	42
Maximum Ponding Depth (ft) =	1.00	2.64	2.38	2.73	2.77	2.84	3.03	3.39	3.51
Area at Maximum Ponding Depth (acres) =	0.04	0.07	0.06	0.07	0.07	0.07	0.08	0.09	0.09
Maximum Volume Stored (acre-ft) =	0.030	0.117	0.099	0.123	0.126	0.132	0.146	0.175	0.186

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 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	0.01	0.00	0.05
	0:15:00	0.00	0.00	0.07	0.12	0.14	0.10	0.12	0.12	0.22
	0:20:00	0.00	0.00	0.26	0.34	0.42	0.26	0.30	0.32	0.56
	0:25:00	0.00	0.00	0.62	0.91	1.17	0.61	0.73	0.80	1.54
	0:30:00	0.00	0.00	0.87	1.25	1.54	1.61	1.92	2.16	3.55
	0:35:00	0.00	0.00	0.92	1.32	1.61	2.04	2.40	2.83	4.55
	0:40:00	0.00	0.00	0.93	1.30	1.60	2.23	2.62	3.08	4.90
	0:45:00	0.00	0.00	0.88	1.24	1.54	2.23	2.61	3.14	4.98
	0:50:00	0.00	0.00	0.83	1.19	1.47	2.19	2.57	3.08	4.89
	0:55:00	0.00	0.00	0.79	1.13	1.40	2.08	2.45	2.98	4.73
	1:00:00	0.00	0.00	0.76	1.08	1.34	1.98	2.33	2.88	4.58
	1:05:00	0.00	0.00	0.72	1.03	1.29	1.88	2.21	2.79	4.43
	1:10:00	0.00	0.00	0.68	0.99	1.25	1.76	2.07	2.59	4.14
	1:15:00	0.00	0.00	0.65	0.94	1.21	1.66	1.96	2.42	3.88
	1:20:00	0.00	0.00	0.61	0.89	1.15	1.55	1.82	2.22	3.57
	1:25:00	0.00	0.00	0.58	0.84	1.07	1.44	1.69	2.04	3.27
	1:30:00	0.00	0.00	0.54	0.79	1.00	1.32	1.56	1.86	2.98
	1:35:00	0.00	0.00	0.51	0.73	0.92	1.21	1.42	1.69	2.71
	1:40:00	0.00	0.00	0.48	0.68	0.85	1.10	1.29	1.53	2.45
	1:45:00	0.00	0.00	0.45	0.63	0.80	1.00	1.18	1.39	2.22
	1:50:00	0.00	0.00	0.43	0.59	0.76	0.93	1.09	1.27	2.05
	1:55:00	0.00	0.00	0.41	0.56	0.73	0.87	1.02	1.18	1.90
	2:00:00	0.00	0.00	0.38	0.53	0.68	0.82	0.96	1.10	1.78
	2:05:00	0.00	0.00	0.35	0.49	0.62	0.75	0.87	1.00	1.61
	2:10:00	0.00	0.00	0.32	0.44	0.56	0.68	0.79	0.91	1.46
	2:15:00	0.00	0.00	0.28	0.39	0.50	0.61	0.71	0.82	1.31
	2:20:00	0.00	0.00	0.25	0.35	0.45	0.55	0.64	0.73	1.17
	2:25:00	0.00	0.00	0.23	0.31	0.40	0.49	0.57	0.65	1.04
	2:30:00	0.00	0.00	0.20	0.28	0.35	0.43	0.50	0.58	0.92
	2:35:00	0.00	0.00	0.18	0.24	0.31	0.38	0.44	0.51	0.80
	2:40:00	0.00	0.00	0.15	0.21	0.26	0.33	0.38	0.43	0.69
	2:45:00	0.00	0.00	0.13	0.17	0.22	0.27	0.32	0.37	0.58
	2:50:00	0.00	0.00	0.10	0.14	0.18	0.23	0.26	0.30	0.47
	2:55:00	0.00	0.00	0.08	0.11	0.15	0.18	0.21	0.23	0.36
	3:00:00	0.00	0.00	0.07	0.09	0.12	0.14	0.16	0.18	0.27
	3:05:00	0.00	0.00	0.05	0.07	0.10	0.10	0.12	0.13	0.21
	3:10:00	0.00	0.00	0.05	0.06	0.08	0.08	0.09	0.10	0.16
	3:15:00	0.00	0.00	0.04	0.05	0.07	0.07	0.08	0.08	0.13
	3:20:00	0.00	0.00	0.03	0.04	0.06	0.05	0.06	0.06	0.10
	3:25:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.08
	3:30:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.06
	3:35:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.05
	3:40:00	0.00	0.00	0.02	0.02	0.03	0.02	0.03	0.02	0.04
	3:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	3:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	4:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	4:05:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	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 OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

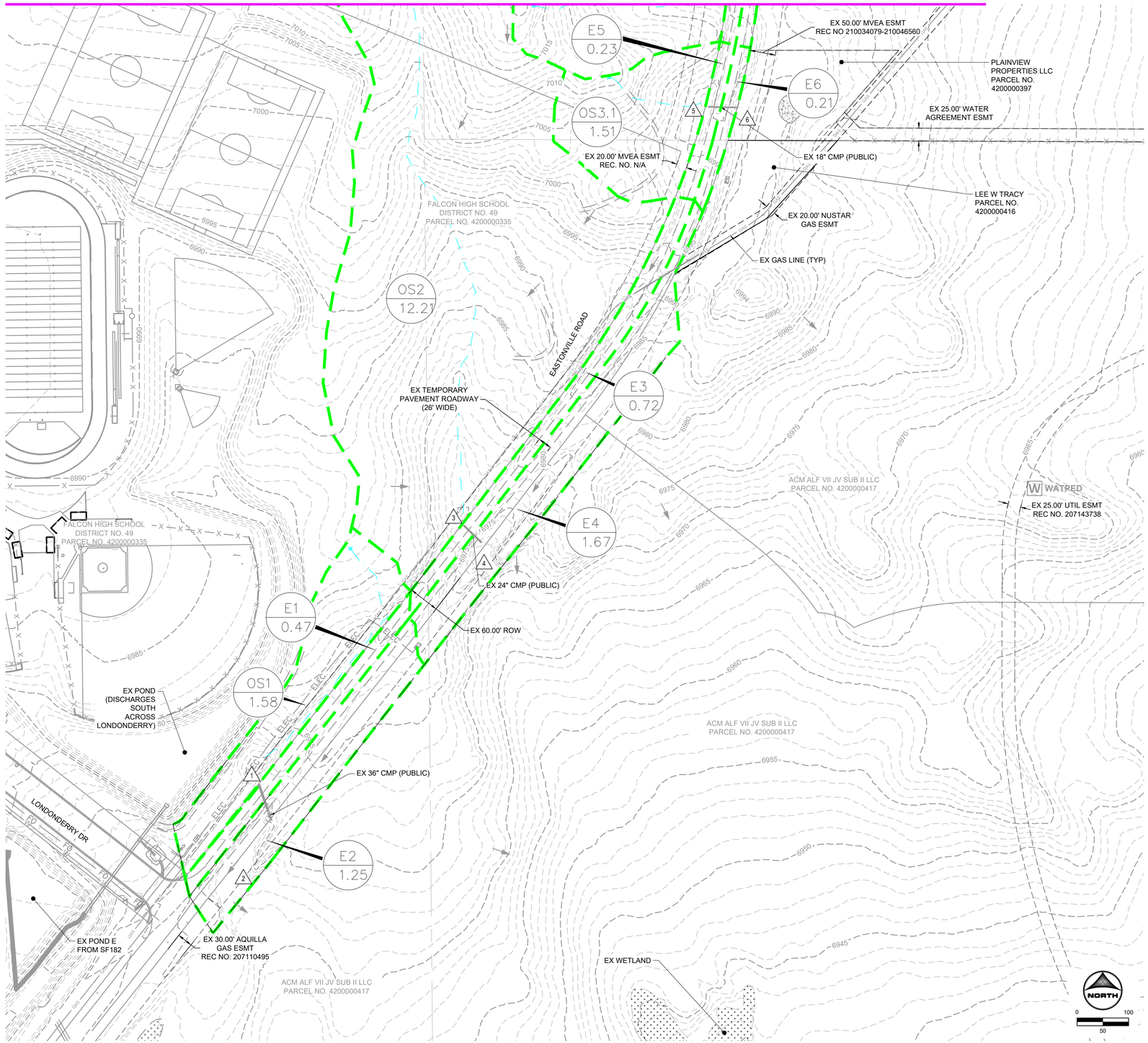
Stage - Storage Description	Stage [ft]	Area [ft²]	Area [acres]	Volume [ft³]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

APPENDIX E – DRAINAGE MAPS

SEE SHEET 2



LEGEND:

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
E1	0.47	46	0.7	1.7
E2	1.25	18	1.0	3.5
E3	0.47	58	1.0	2.1
E4	1.67	20	1.4	4.6
E5	0.23	45	0.5	1.1
E6	0.21	49	0.5	1.1
E7	0.23	45	0.5	1.2
E8	0.18	56	0.4	0.9
E9	0.72	46	1.2	2.7
E10	0.72	50	1.3	2.8
OS1	1.58	2	0.5	3.6
OS2	12.21	2	3.6	24.3
OS3.1	1.51	2	0.5	3.6
OS3.2	2.86	2	1.0	6.6
OS3.3	21.12	2	6.4	42.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
1	E1,OS1	1.2	4.9
2	E2,DP1	2.1	8.2
3	E3,OS2	4.5	26.1
4	DP3,E4	5.8	30.4
5	E5,OS3.1	0.9	4.5
6	DP5,E6	1.3	5.4
7.1	E7,OS3.2	1.4	7.5
8.1	DP7.1,E8	1.7	8.2
7.2	OS3.3,E9	7.4	45.3
8.2	DP7.2,E10	8.6	47.7

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CAD DATE: 3/22/2024
CAD FILE: J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_ex_Sep

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"
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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

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

EXISTING CONDITIONS - DRAINAGE MAP

SHEET DRN 1

MONAHAN, COLLEEN, 3/22/2024 10:07 AM

LEGEND:

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO.4200000400

EL PASO COUNTY
FALCON REGIONAL PARK
PARCEL NO.4200000400

GRANDVIEW RESERVE FILING 2
(EXISTING 4 SITE INVESTMENTS LLC
PARCEL NO. 4200000462)

MERIDIAN RANCH INVESTMENTS INC
PARCEL NO. 4200000451

GRANDVIEW RESERVE FILING 1
(MELODY HOMES INC. PARCEL NO.
4200000462)

EASTONVILLE ROAD

EX OVERHEAD ELEC (TYP)

EX 18" CMP (PUBLIC)

EX WETLANDS (JURISDICTIONAL)

GIECK RANCH TRIB. #1 (CHANNEL A)

EX GRAVEL ROADWAY
(WIDTH VARIES)

EX 20.00' MVEA ESMT
REC. NO. N/A

EX 50.00' MVEA ESMT
REC NO 210034079-210046560

E9
0.72

2.2%

E10
0.72

E7
0.23

E8
0.18

OS3.3
21.12

OS3.2
2.86

7.2

8.2

7.1

6.1

60.00' EX ROW

EX 60.00' ROW

EX 18" CMP (PUBLIC)

EX WETLANDS (JURISDICTIONAL)

EX 20.00' NUSTAR
GAS ESMT

EX GAS LINE (TYP)

NORTH
0 100
50

SEE SHEET 1

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
E1	0.47	46	0.7	1.7
E2	1.25	18	1.0	3.5
E3	0.47	58	1.0	2.1
E4	1.67	20	1.4	4.6
E5	0.23	45	0.5	1.1
E6	0.21	49	0.5	1.1
E7	0.23	45	0.5	1.2
E8	0.18	56	0.4	0.9
E9	0.72	46	1.2	2.7
E10	0.72	50	1.3	2.8
OS1	1.58	2	0.5	3.6
OS2	12.21	2	3.6	24.3
OS3.1	1.51	2	0.5	3.6
OS3.2	2.86	2	1.0	6.6
OS3.3	21.12	2	6.4	42.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
1	E1,OS1	1.2	4.9
2	E2,DP1	2.1	8.2
3	E3,OS2	4.5	26.1
4	DP3,E4	5.8	30.4
5	E5,OS3.1	0.9	4.5
6	DP5,E6	1.3	5.4
7.1	E7,OS3.2	1.4	7.5
8.1	DP7.1,E8	1.7	8.2
7.2	OS3.3,E9	7.4	45.3
8.2	DP7.2,E10	8.6	47.7

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HR GREEN - COLORADO SPRINGS
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COLORADO SPRINGS CO 80920
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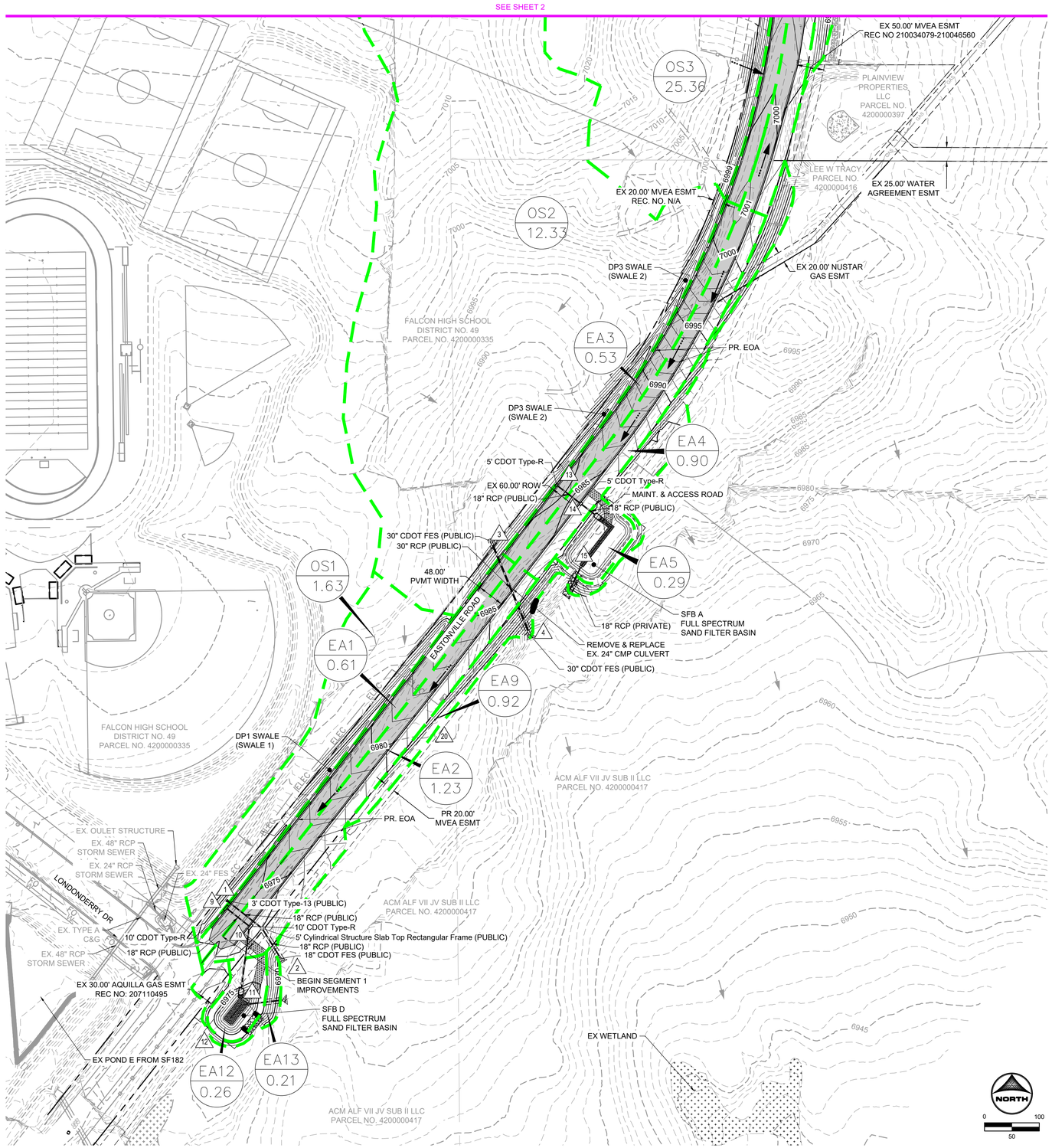
FAX: 713.965.0044

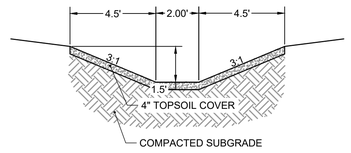
EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

EXISTING CONDITIONS - DRAINAGE MAP

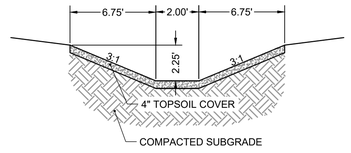
SHEET DRN 2

HR GREEN Xrefs: xg-1-dh01_FDR_EX; ex_drain_map_legend; xv-dsgn_662; xv-util_662; xv-row-662

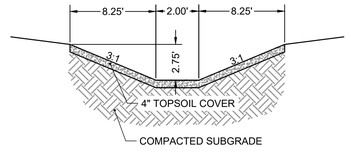




DRAINAGE SWALE 1
SCALE: NTS



DRAINAGE SWALE 2
SCALE: NTS



DRAINAGE SWALE 3
SCALE: NTS

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	1
PROPOSED BASIN LABEL	NAME AREA
PRELIMINARY 100-YR FLOODPLAIN	
WETLANDS	

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
EA1	0.61	86	2.2	4.1
EA2	1.23	44	2.2	5.3
EA3	0.53	87	2.1	3.4
EA4	0.90	52	2.0	3.4
EA5	0.29	4	0.2	0.3
EA6	1.11	88	3.0	5.1
EA7	1.91	55	3.3	5.6
EA8	0.86	50	0.5	0.8
EA9	0.92	35	0.4	0.6
EA10	0.37	23	0.2	0.3
EA11	0.15	0	0.1	0.1
EA12	0.26	10	0.2	0.8
EA13	0.21	0	0.1	0.5
EA8 & EA9 *Per Segment 2 FDR	5.07	78	10.2	17.2
OS1	1.63	2	0.5	3.6
OS2	12.33	2	3.7	24.5
OS3	25.36	2	7.9	53.3

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
1	OS1	0.5	3.6
2	OS1, Pond D Release	0.9	5.0
3	OS2	3.7	24.5
4	OS2, POND A RELEASE	4.0	25.7
7	OS3	7.9	53.3
8	OS3, POND B RELEASE	8.3	54.3
9	EA1	2.2	4.1
10	DP9, EA2	4.2	9.0
11	DP10, EA12	4.3	9.5
12	EA13	0.1	0.5
13	EA3	2.1	3.4
14	DP13, EA4	3.9	6.5
15	DP14, EA5	4.0	6.7
16	EA6	3.0	5.1
17	DP16, EA7	6.3	10.5
18	DP17	6.3	10.5
19	DP18,EA8	6.6	11.1
18U	DP17, EA8 & EA9 *PER SEGMENT 2 FDR	15.6	26.2
19U	DP18, EA8	15.9	26.6
20	EA9	0.4	0.6
21	EA10	0.2	0.3
22	EA11	0.1	0.1

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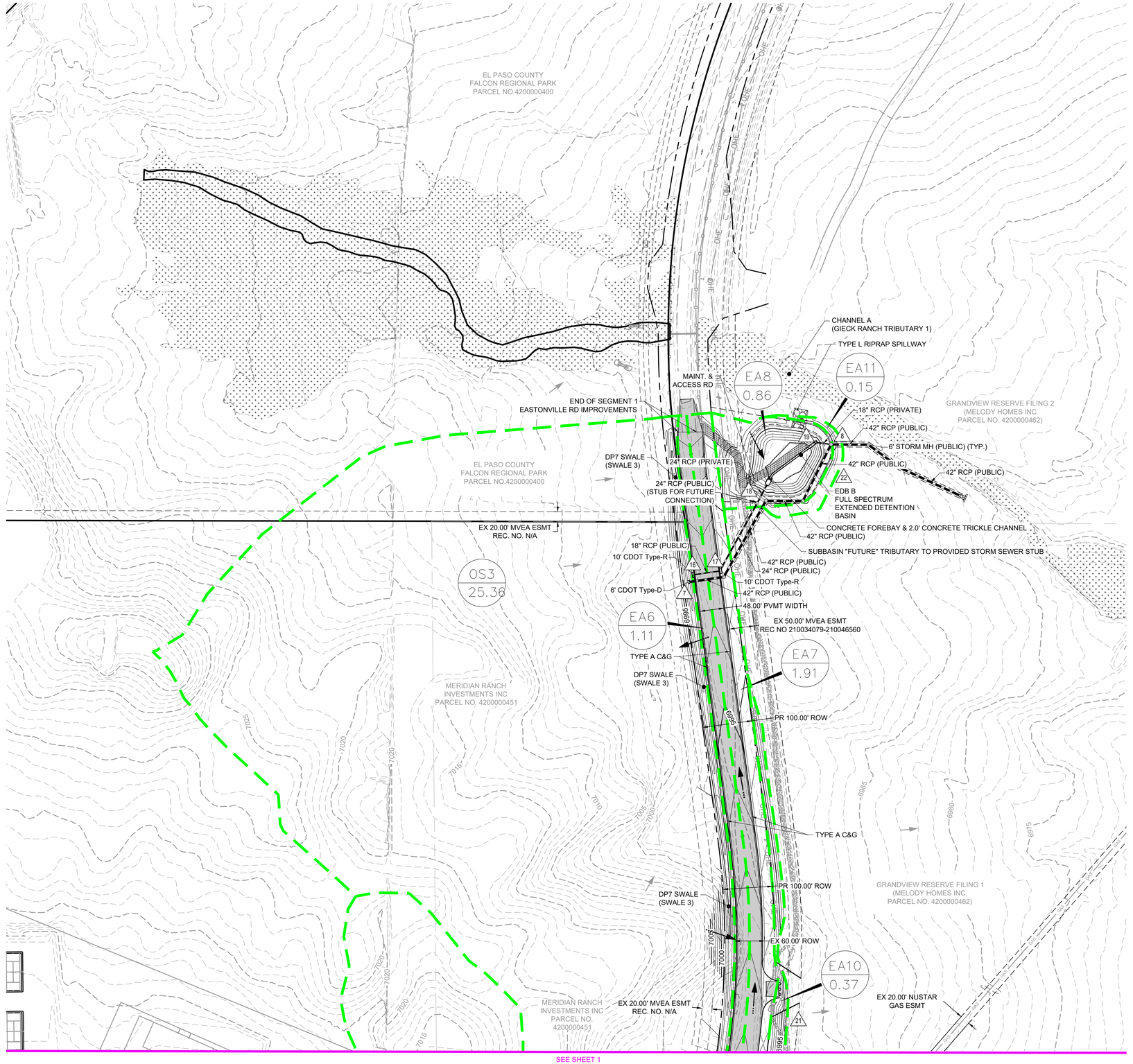
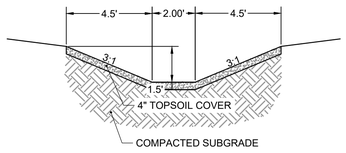
EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

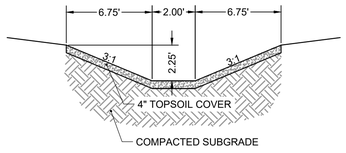
EASTONVILLE ROAD - SEGMENT 1
PROPOSED CONDITIONS DRAINAGE MAP

SHEET DRN 1

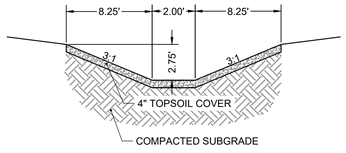




DRAINAGE SWALE 1
SCALE: NTS



DRAINAGE SWALE 2
SCALE: NTS



DRAINAGE SWALE 3
SCALE: NTS

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	1
PROPOSED BASIN LABEL	NAME / AREA
PRELIMINARY 100-YR FLOODPLAIN	
WETLANDS	

SUMMARY RUNOFF TABLE

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4	OS2, POND A RELEASE	4.0	25.7
7	OS3	7.9	53.3
8	OS3, POND B RELEASE	8.3	54.3
9	EA1	2.2	4.1
10	DP9, EA2	4.2	9.0
11	DP10, EA12	4.3	9.5
12	EA13	0.1	0.5
13	EA3	2.1	3.4
14	DP13, EA4	3.9	6.5
15	DP14, EA5	4.0	6.7
16	EA6	3.0	5.1
17	DP16, EA7	6.3	10.5
18	DP17	6.3	10.5
19	DP18,EA8	6.6	11.1
18U	DP17, EA8 & EA9 *PER SEGMENT 2 FDR	15.6	26.2
19U	DP18, EA8	15.9	26.6
20	EA9	0.4	0.6
21	EA10	0.2	0.3
22	EA11	0.1	0.1

NORTH
0 100
50

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EASTONVILLE ROAD - SEGMENT 1
PROPOSED CONDITIONS DRAINAGE MAP

SHEET DRN

2